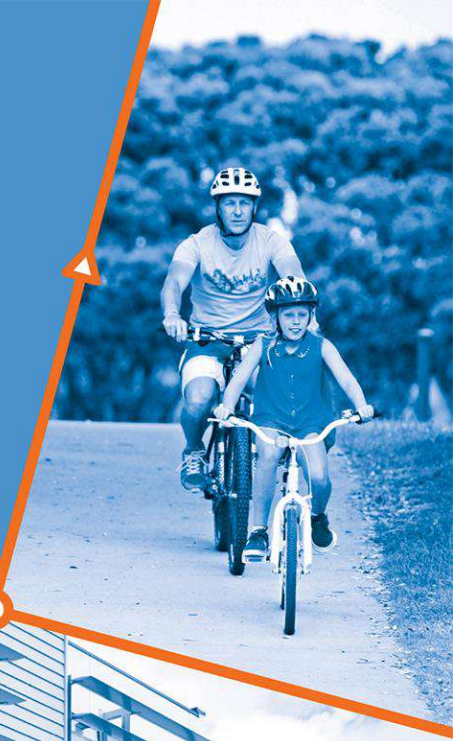
Supporting Growth

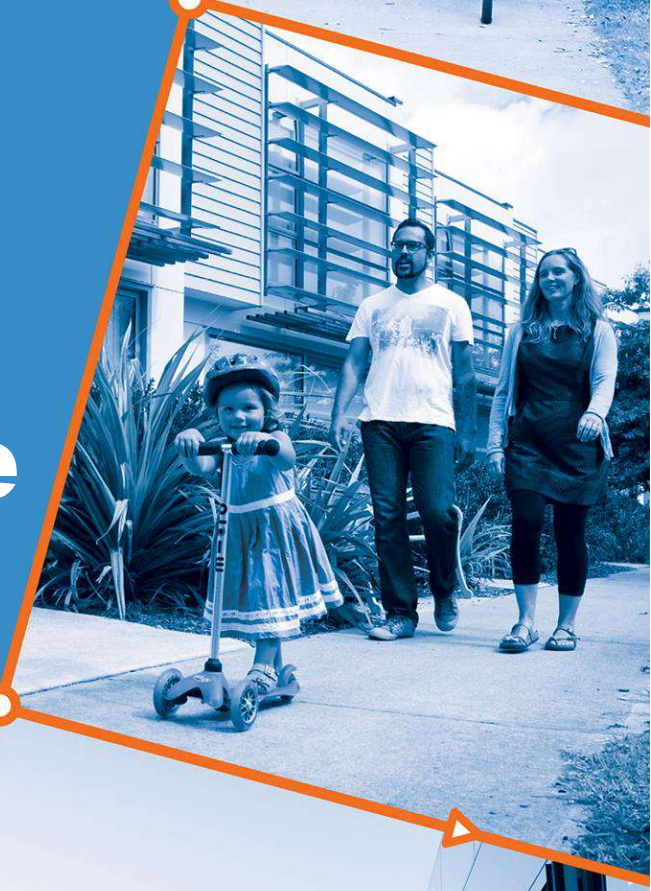
Drury Local Detailed Business Case

Options Assessment Report

Version 0.3

31 July 2020







TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

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Disclaimer

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

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Acronyms

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

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-Opāheke is within the Southern growth area. Auckland's growth areas including the Southern growth area are shown in Figure 1-1.



Figure 1-1 Southern Growth Area

1.2 Drury-Opāheke – Overview and Issues

Drury-Opāheke is within the Southern growth area, as identified in Figure 1-1. 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-Opāheke, Pukekohe-Paerata and Clarks Beach. The bulk of the growth in the Southern growth area is expected to occur in Drury-Opāheke 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-Opāheke area as shown in Figure 1-2. The structure plan signals the anticipated future urban land use pattern for Drury-Opāheke. The structure plan will form the basis of subsequent plan changes.

The urgency for route protection in the Drury-Opāheke 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-Opāheke area and Southern growth area as a whole.

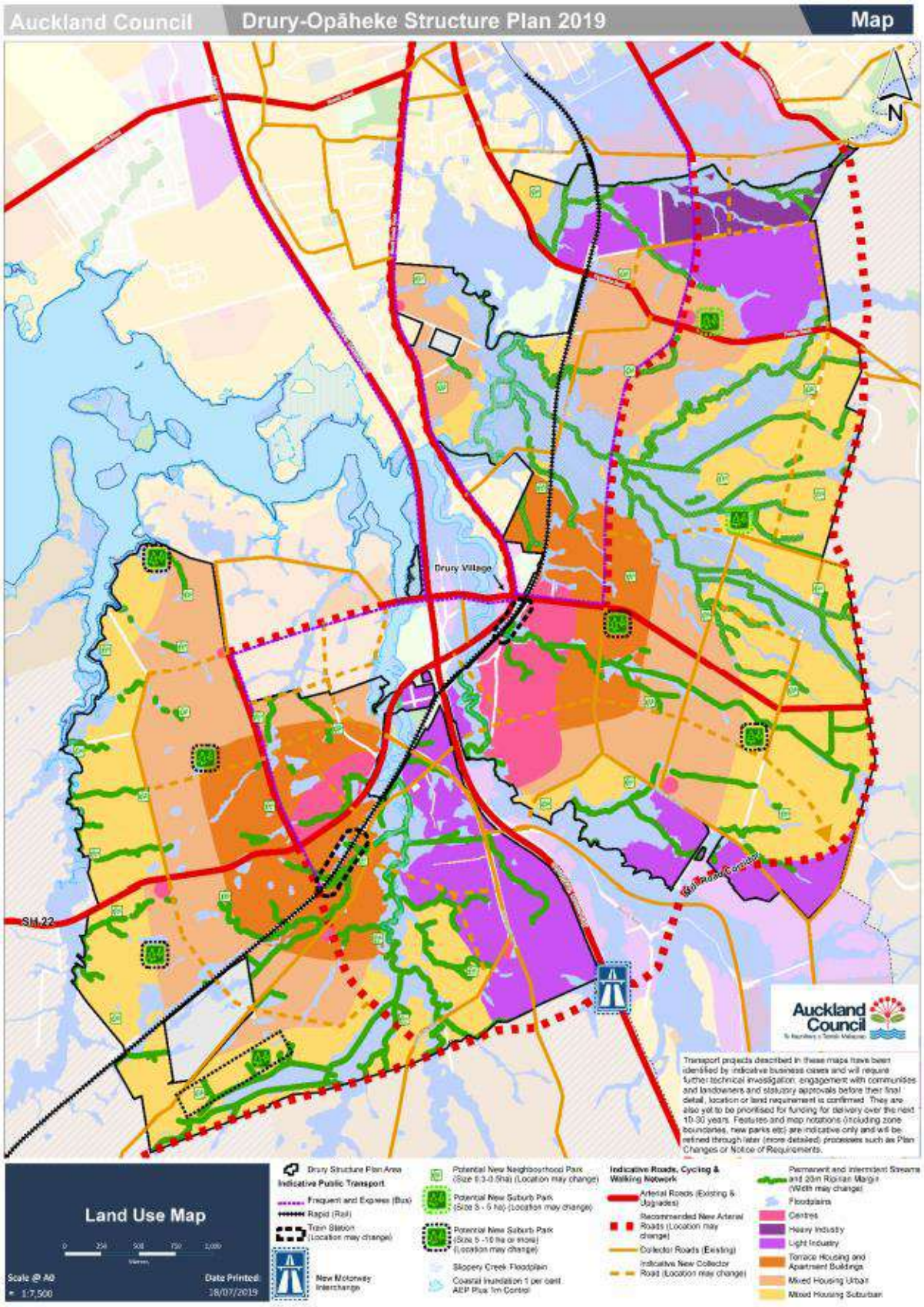


Figure 1-2 Auckland Council Drury-Opāheke Structure Plan (Source: Auckland Council, 2019)

1.3 Purpose of this Report

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

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

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

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

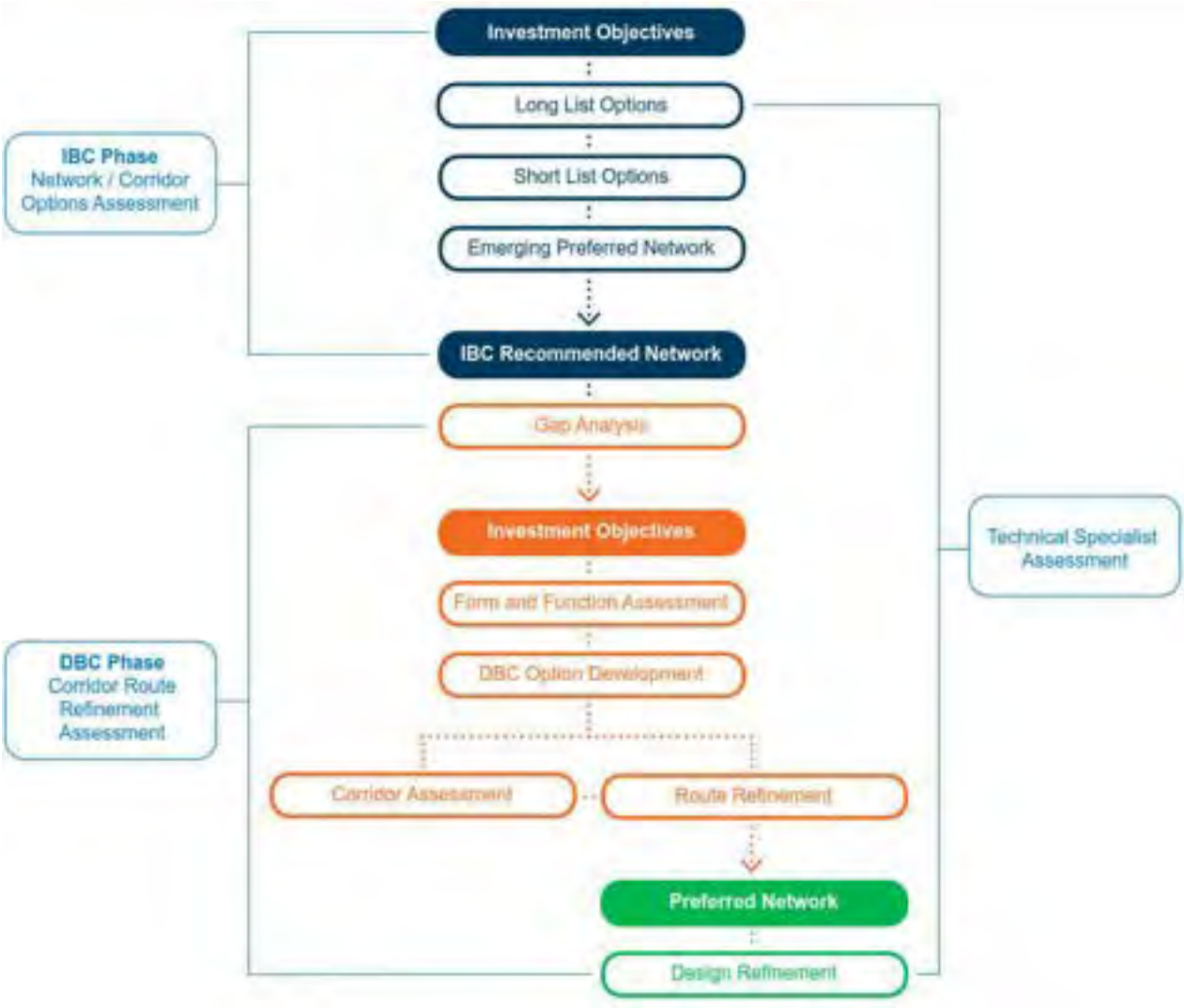


Figure 1-3 Overall Options Assessment Process

1.4 Structure of this Report

The structure of the Report is as follows:

- A general overview of the option development process
- Outline the consideration of alternatives for the preferred corridors (IBC)
- Outline the consideration of alternatives for the preferred alignment/routes that are the subject of the DBC supported by this report.

2 Overview of the Option Development and Evaluation Process

2.1 Overview

The consideration of alternative options for projects within the Drury Local DBC involved the following stages:

- The identification by Auckland Council of future growth areas (Warkworth, North Auckland, North West Auckland and South Auckland) through AUPOIP zoning and FULSS;
- Developing an understanding of the problems and issues faced, and determining the most appropriate transport responses to support growth during the Programme Business Case (2016);
- The identification of Indicative Strategic Transport Networks (corridors) within, and connecting to growth areas through the Southern Indicative Business Cases;
- Grouping the corridors within the South Indicative Strategic Transport Network into five packages and subsequent Detailed Business Case groupings including the Drury Local DBC;
- Consideration of alternative route options of Drury Local Projects, through the Drury Local DBC; and
- Further refinement of the route in order to determine the extent of the designations necessary for each Project (corridor).

The Southern growth area was identified by Auckland Council through the development and confirmation of the AUPOIP future urban zoning and FULSS and therefore is not discussed further in this Report.

The Drury Local Indicative Transport Network was identified through the Supporting Growth South IBC. A summary of the option development and evaluation process undertaken during the IBC is provided in Section 3 of this Report.

This Report is focused on the refinement of the transport corridors recommended by the IBC. The option development and evaluation process for these stages is described in detail in Sections 4 to 8 of this Report.

2.2 Option Evaluation Process

In order to evaluate and compare options, a programme wide assessment framework which included a Multi-Criteria Assessment (MCA), was developed by the Project Team in consultation with AT, Waka Kotahi and manawhenua.

The MCA was developed to be used throughout the Supporting Growth Programme and has been used in both the IBC and DBC option evaluation process. Project teams were given the opportunity to "localise" the option evaluation process to make it specific to the programme area. Localisation could be made to both the MCA framework assessed, and the process through which the assessment was made. Some amendments were made for Drury Local at the IBC and DBC phase. These are explained in Section 3 and 5 respectively.

The MCA framework is a common tool that is often used to assist in the decision-making process and provides an opportunity to understand how different options compare against a set of standard and grouped criteria. The MCA framework developed by the Project Team involved the following:

- **Assessment criteria:** Investment Objectives 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:** Partner and landowner feedback, policy analysis, value for money and resilience.

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

The appropriateness of scoring options was determined by the Project Team based on the design of the options being assessed and whether scoring the options would provide a clear and beneficial differentiation between the options. This process is described further in Section 5.3.

The MCA was not the sole means of assessing options but was a tool that informed and was complementary to the decision-making process. The process incorporated input from AT and Waka Kotahi, manawhenua, feedback from the consultation and engagement process, subject-matter experts and the Project Team. Manawhenua representatives have expressed views, provided specialist advice and raised key issues though workshops and hui held throughout the process.

Table 2-1: MCA Framework

#	Investment Objective			Measure
	Investment Objectives vary for each Project as identified in the sections below			Options assessed against the investment objectives. 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	Mana Whenua	Extent of *effects on sites and places of cultural heritage value to Manawhenua (including Sites and Places of Significance to Mana Whenua Schedule, Auckland Unitary Plan)*
Social	**2. Socio – economic impacts**	2a	Land use futures / integration with planned landuse	To what extent will the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – ie 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 (ie 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 2-2: 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 criteria was completed by 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 guidelines, a description of each of the options, a link to the Supporting Growth GIS, and an assessment template where they documented their approach and key assumptions that informed their assessment.

On the day of a workshop, the assessments and recommendations were respectfully challenged in a group setting. Experts then considered the issues raised and finalised their assessment and recommendations.

In addition to the MCA framework, several additional (and important) inputs are included in the assessment framework (refer Table 2-3). For this report, this assessment focused on project partner and landowner feedback.

Table 2-3: 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 partners and landowners
Policy Analysis	• Options alignment with the strategic policy framework including the Unitary Plan, the Auckland Plan and the Drury-Opāheke 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	• Provide 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.

3 Summary of Corridor Option Development and Assessment

As outlined in Figure 1-3, the overall options assessment process commenced with an assessment of various network and corridor options which informed the South Indicative Strategic Transport Network recommended by the South IBC. This Section provides a summary of the process and outcomes of the corridor option development and assessment undertaken for the Southern growth area.

3.1 Overview

The over-arching options assessment process for the South IBC is summarised in Figure 3-1**.**

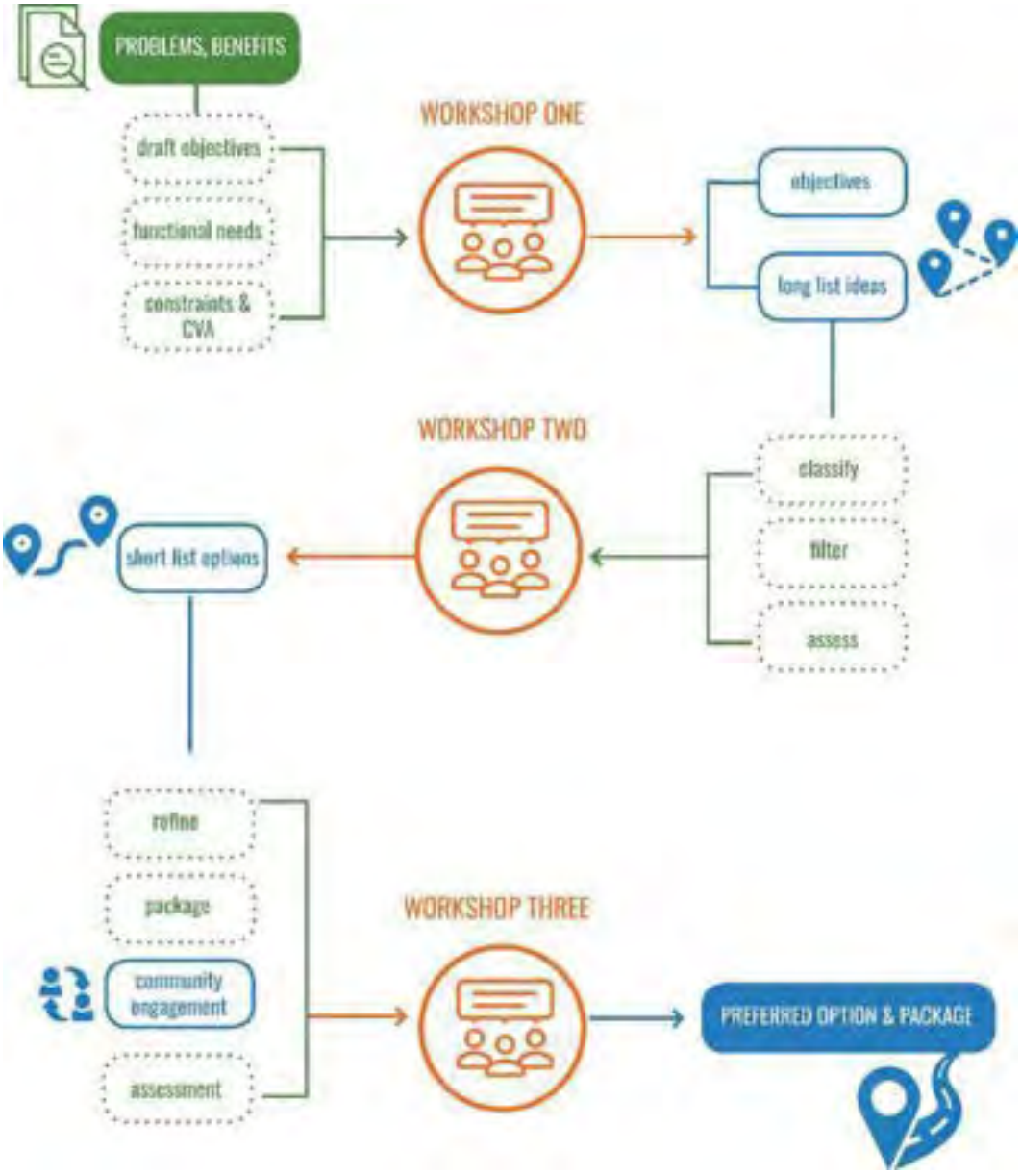


Figure 3-1: Over-arching Options Assessment Process

The IBC options 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 the South IBC investment objectives 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 Transport, Waka Kotahi, 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 3.2 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 3.3 for further details on the short list development and assessment.

3.2 Longlist Options Development and Assessment

3.2.1 Longlist Option Development

Key steps to the development of the long list options are outlined in Figure 3-2. This process was documented as part of the South IBC Options Assessment undertaken in 2018.

The long list 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.

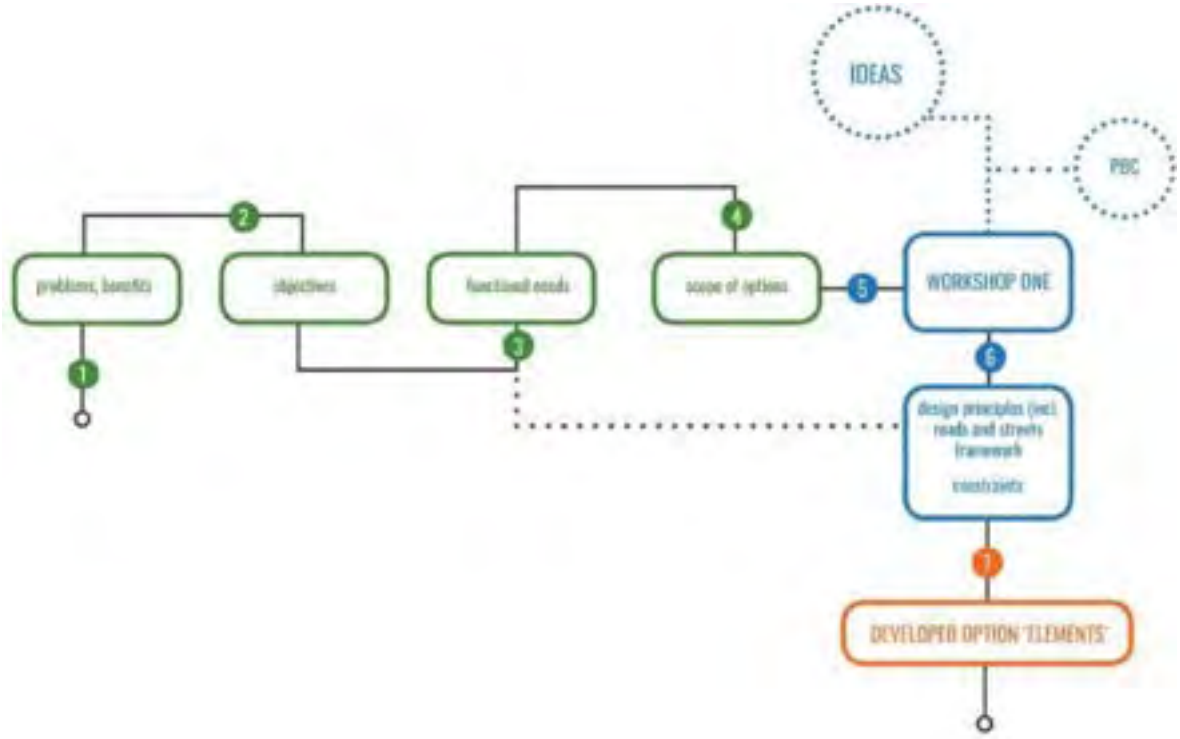


Figure 3-2 Development of Options

For the South IBC, around 460 options were initially identified including 88 options for the Opāheke-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 Local Projects included:

- Opāheke-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

3.2.2 Longlist Option Assessment

At the commencement of the long list assessment phase, the programme-wide MCA framework was 'localised' to make it more directly applicable to the South IBC and the specifics of the Southern growth area. This localisation 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.

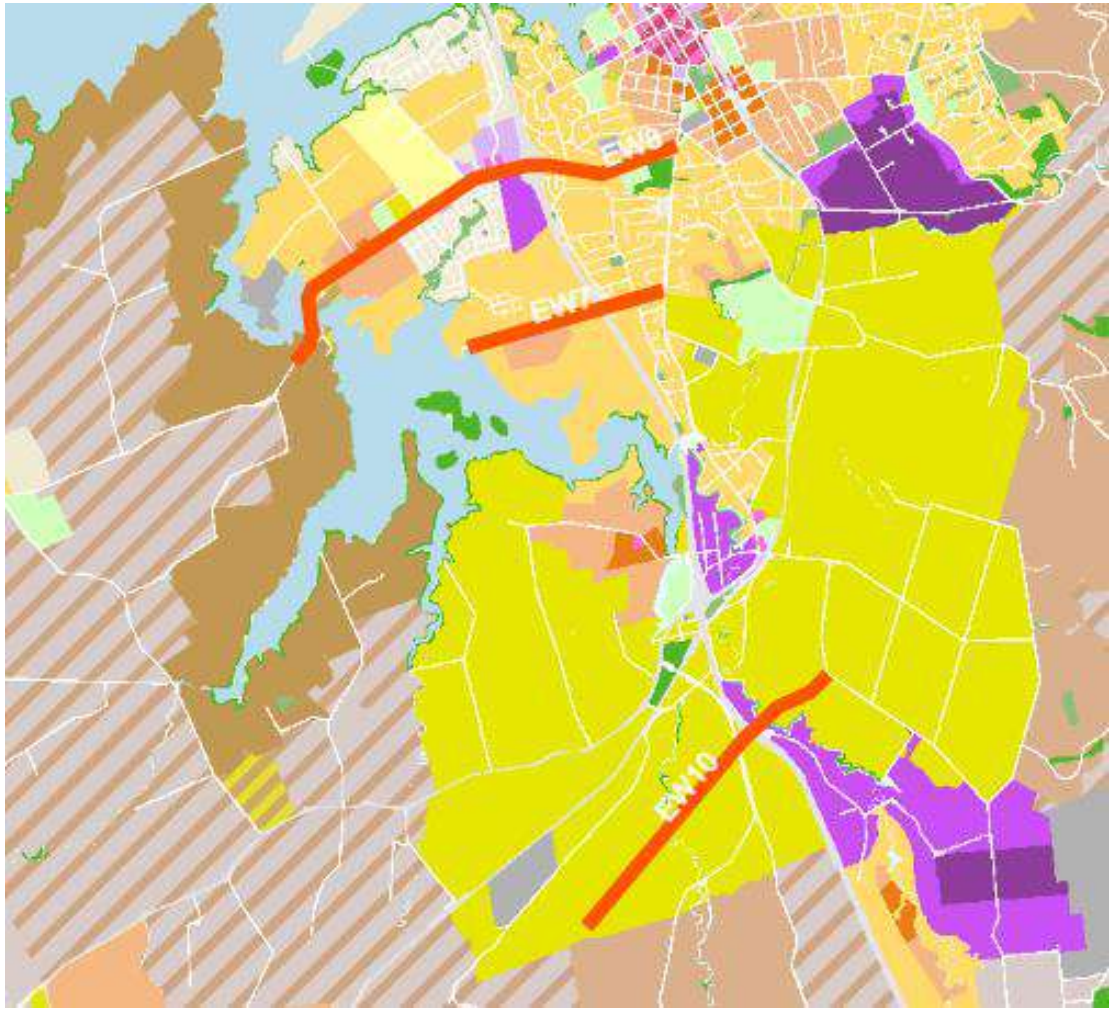
Each of the long list options were assessed using the localised MCA framework. Key steps in the options assessment were detailed in the 2018 South IBC Options Assessment and include:

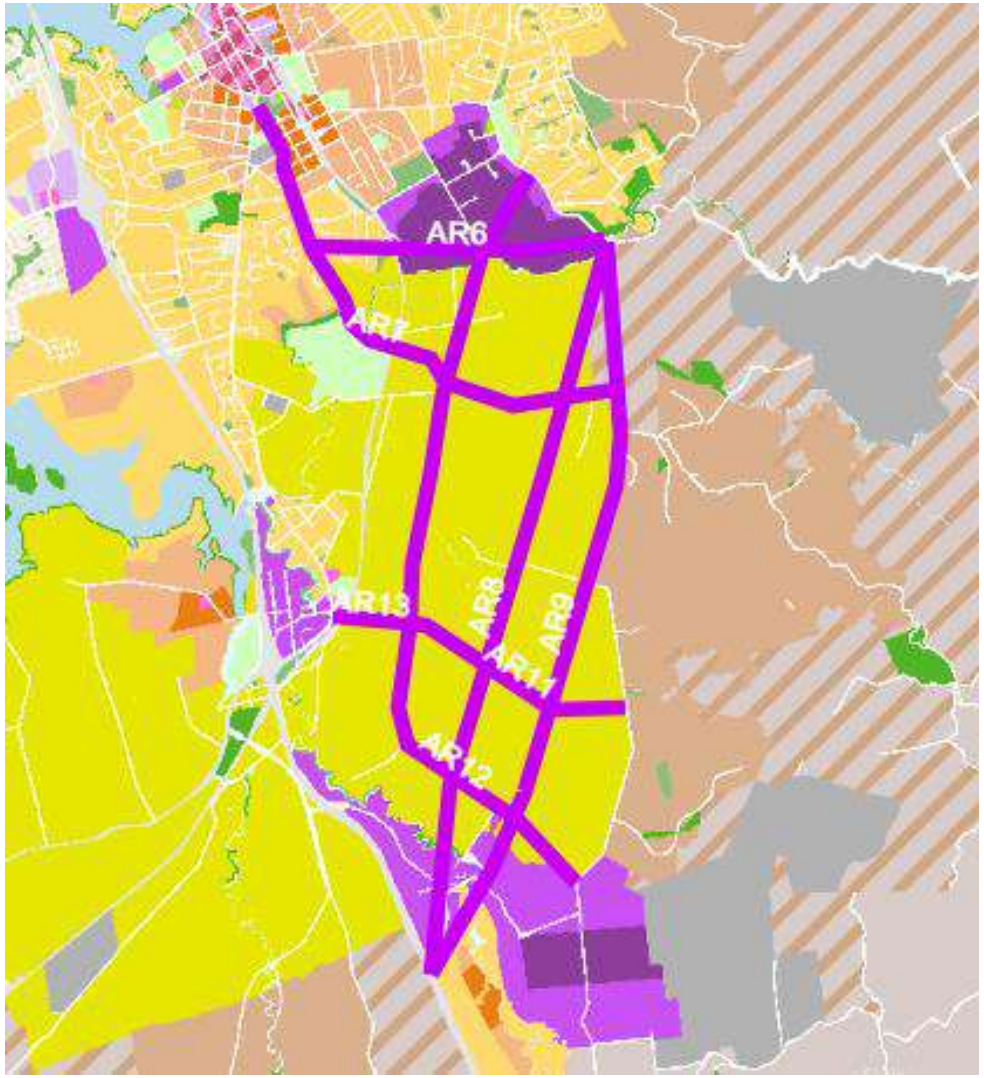
1. Initial scoring and assessment of non-scored criteria by subject experts
2. Manawhenua hui
3. Workshop 2 – collaborative evaluation of options and feedback from Partners
4. Scores refined
5. Long list refinement (amended and additional options) and assessment
6. Identification of Short list.

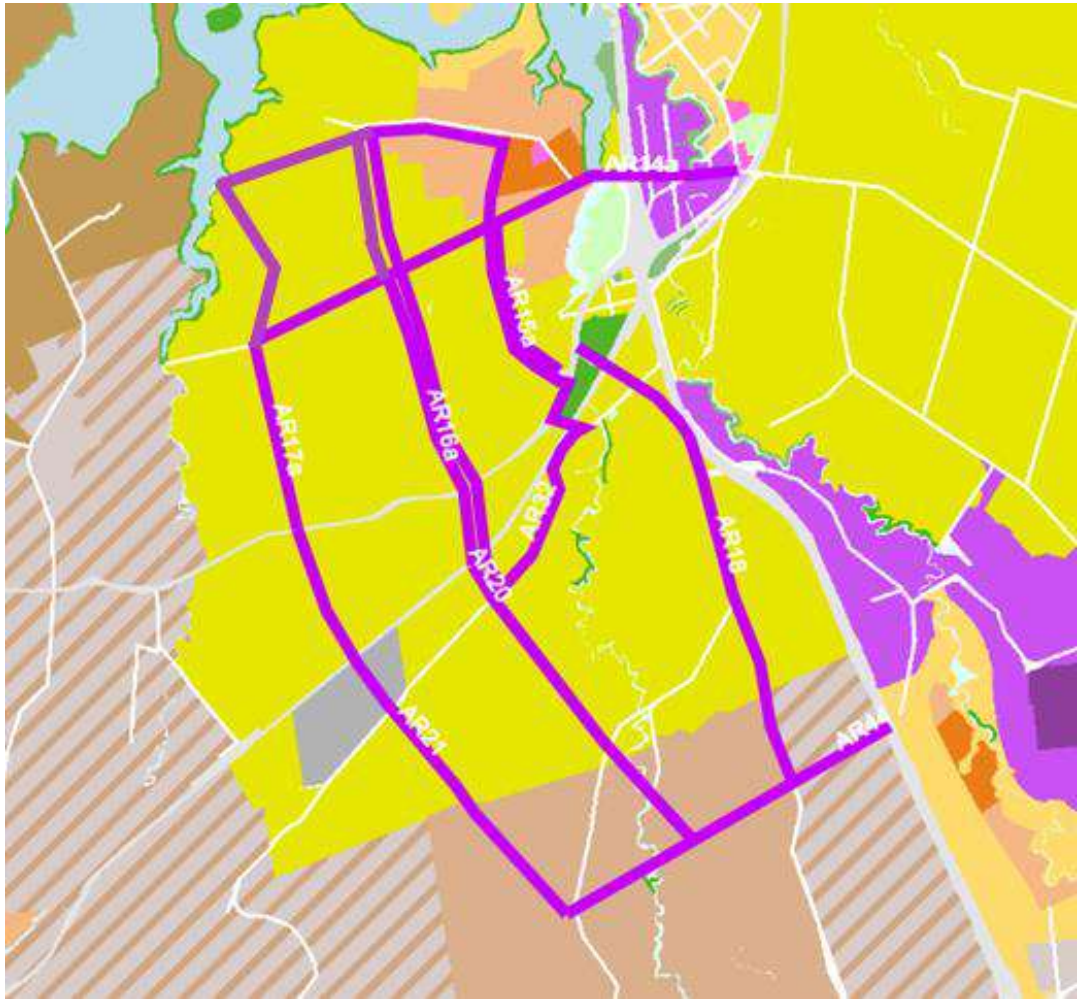
3.2.3 Identification of Short list / Recommendations

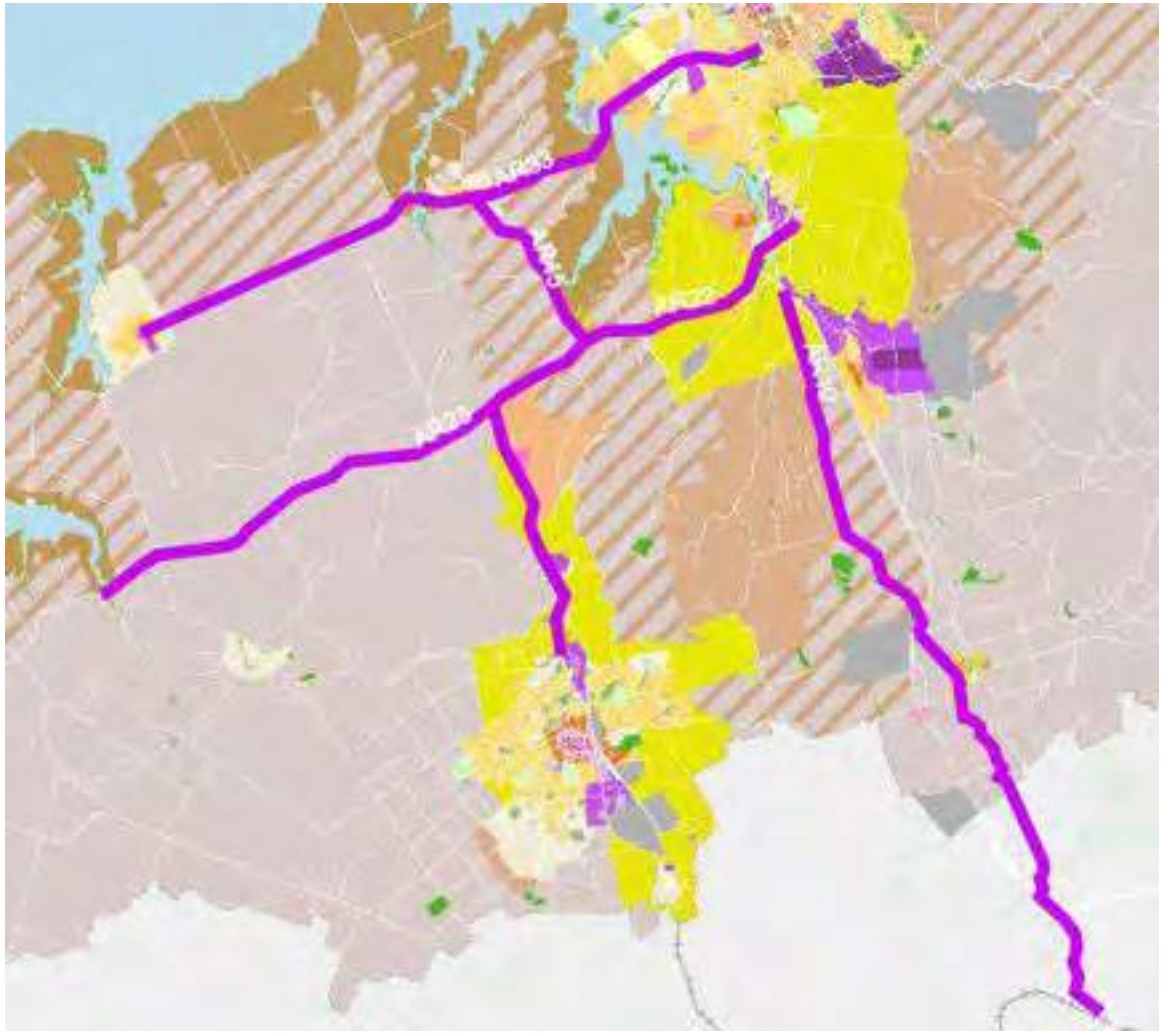
Table 3-1 provides an overview of the options assessed, recommendations and reasoning within the IBC short list phase for Drury Local projects. These options were taken forward and included in the Indicative Strategic Transport Network identified in Section 3.4.

Table 3-1 Long list option assessment recommendations

Options	Progress to short list?	Options Figure
Drury Opāheke – 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 investment objectives, **EW8** was recommended for the short list for further testing. • **EW10** was recommended for the short list, providing the most benefits against the investment objectives and land use integration. Potential environmental effects can be further investigated.	

Drury Opāheke – 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).	

Drury Opāheke – 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 it doubles up on other options (AR14a, 15a and 16a).	

Drury Opāheke – west arterials (outside FUZ) • **AR19** • **AR22A** • **AR22B** • **AR22C** • **AR22D** • **AR23** • **AR33** • **AR45.**	• Although not scoring particularly well against the investment objectives, 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 investment objectives 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.	

3.3 Shortlist Options Development and Assessment

3.3.1 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 in Figure 3-3 and is summarised below. This process was documented as part of the South IBC Options Assessment undertaken in 2018.

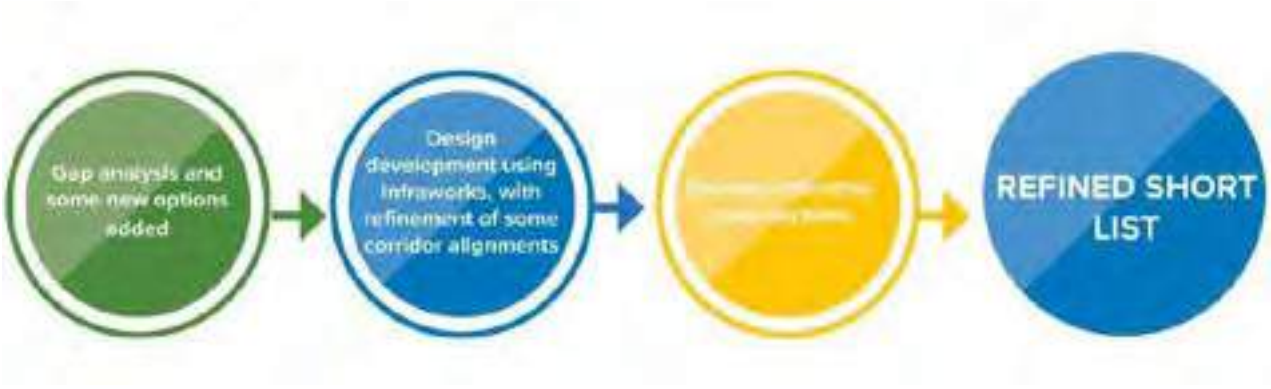


Figure 3-3 Short List Development Process

Based on feedback received at Workshop 2 and the gap analysis undertaken, some additional options were generated. All options were then refined and realigned using Infraworks and the 2D GIS viewer 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 as part of the DBC.

To enable assessment of the options (including impacts and costs), indicative cross-sections were prepared and provided to specialists based on draft cross-sections developed by AT for future growth arterials prior to the formation of the Supporting Growth Programme. 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.

3.3.2 Shortlist Option Assessment

The same general framework was used throughout the long list and short list evaluation. However, a higher level of design detail, technical assessment and specialist input was applied at the short list evaluation phase (relative to the long list evaluation) 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. Investment objectives 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.

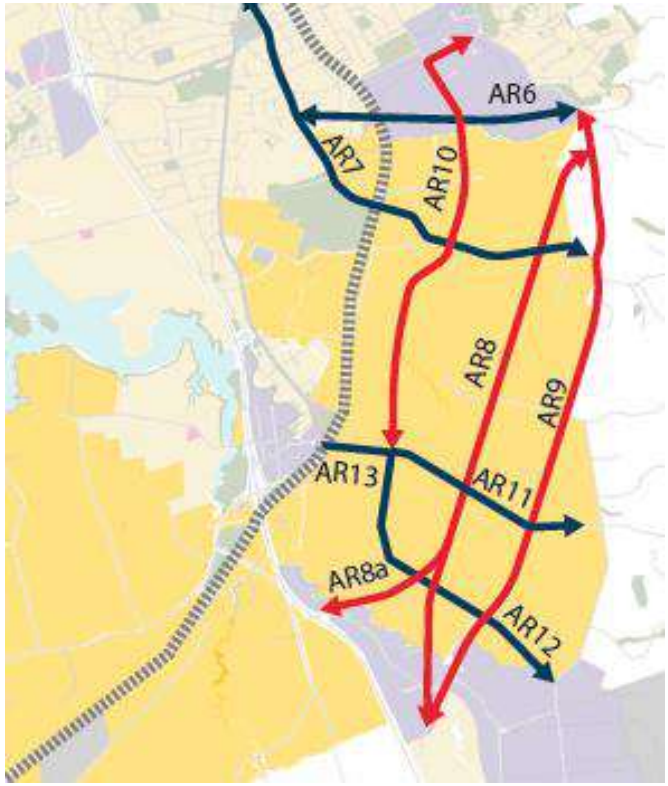
3.3.3 Recommendations

Table 3-2 provides an overview of the options assessed, recommendations and reasoning within the IBC short list phase for Drury Local projects. These options were taken forward and included in the Indicative Strategic Transport Network identified in Section 3.4.

Table 3-2 Short list option assessment recommendations

Options	Recommendation / Reasoning	Options Figure
Drury Opāheke – 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 to the preferred network as none of the options scored particularly well against any of the investment objectives.	

Options	Recommendation / Reasoning	Options Figure
Drury Opāheke – 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 Opāheke – 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 Opāheke 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 Opāheke Road making the road run more efficiently. It provides access to the proposed Mill Road and supports high demand for bus trips on Opāheke 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.	

3.4 Indicative Strategic Transport Network Identification

The Southern IBC recommended the Indicative Strategic Transport Network for south Auckland shown in Figure 3-4. This network was endorsed by the AT and Waka Kotahi boards in May 2019.

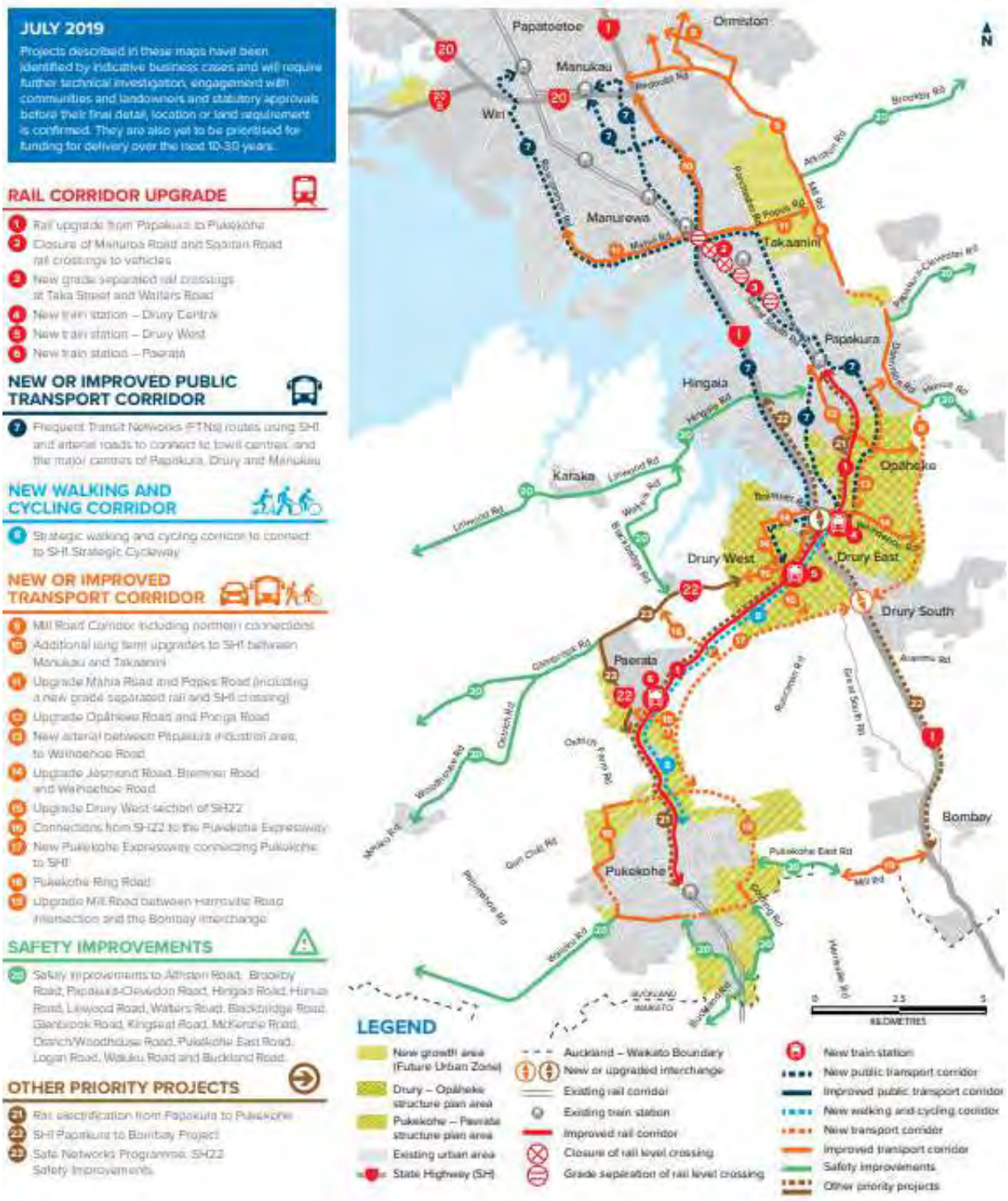


Figure 3-4 Southern growth area – Indicative Strategic Transport Network

The corridors identified in the Indicative Strategic Transport Network were assessed and grouped into five packages to pursue the Detailed Business Case and route protection processes. Packages include Strategic Rail, Strategic South, Drury Local, Takaanini Local and FTN and Pukekohe Local. The recommended network that forms the Drury Local DBC is outlined in Table 3-3, illustrated in Figure 3-5 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
- **New arterial network** at Opāheke-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 3-3 IBC Recommended Network - Drury Local Projects

Shortlist Reference	Option name and description
AR7	**Opāheke Road Upgrade and Ponga Road Upgrade** Opāheke Road arterial upgrade from the intersection with the new Opāheke 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 Opāheke north-south FTN in the west to the proposed Mill Road in the east.
AR10	**Opāheke 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 Jesmond to Bremner link 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

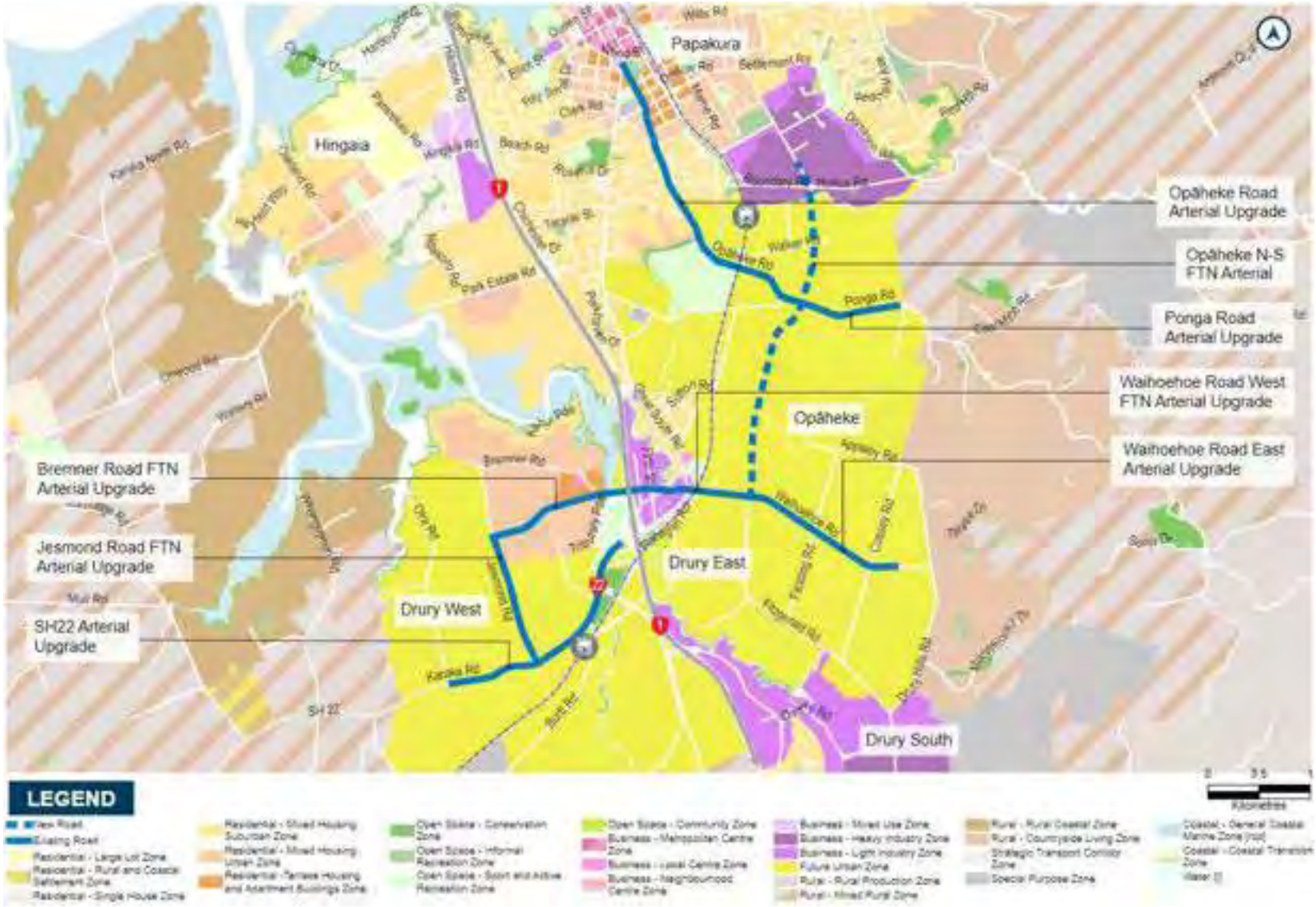


Figure 3-5 Indicative Transport Network – Drury Local (as per the IBC)

4 Summary of Route Refinement Option Development and Assessment

4.1 Overview

The progression from the IBC to the DBC saw the identification of the preferred network at a 'macro' level during IBC to 'micro' detail at the DBC phase. An overview of the DBC option assessment process is provided in Figure 4-1 and described in Sections 4.2 to Section 8.

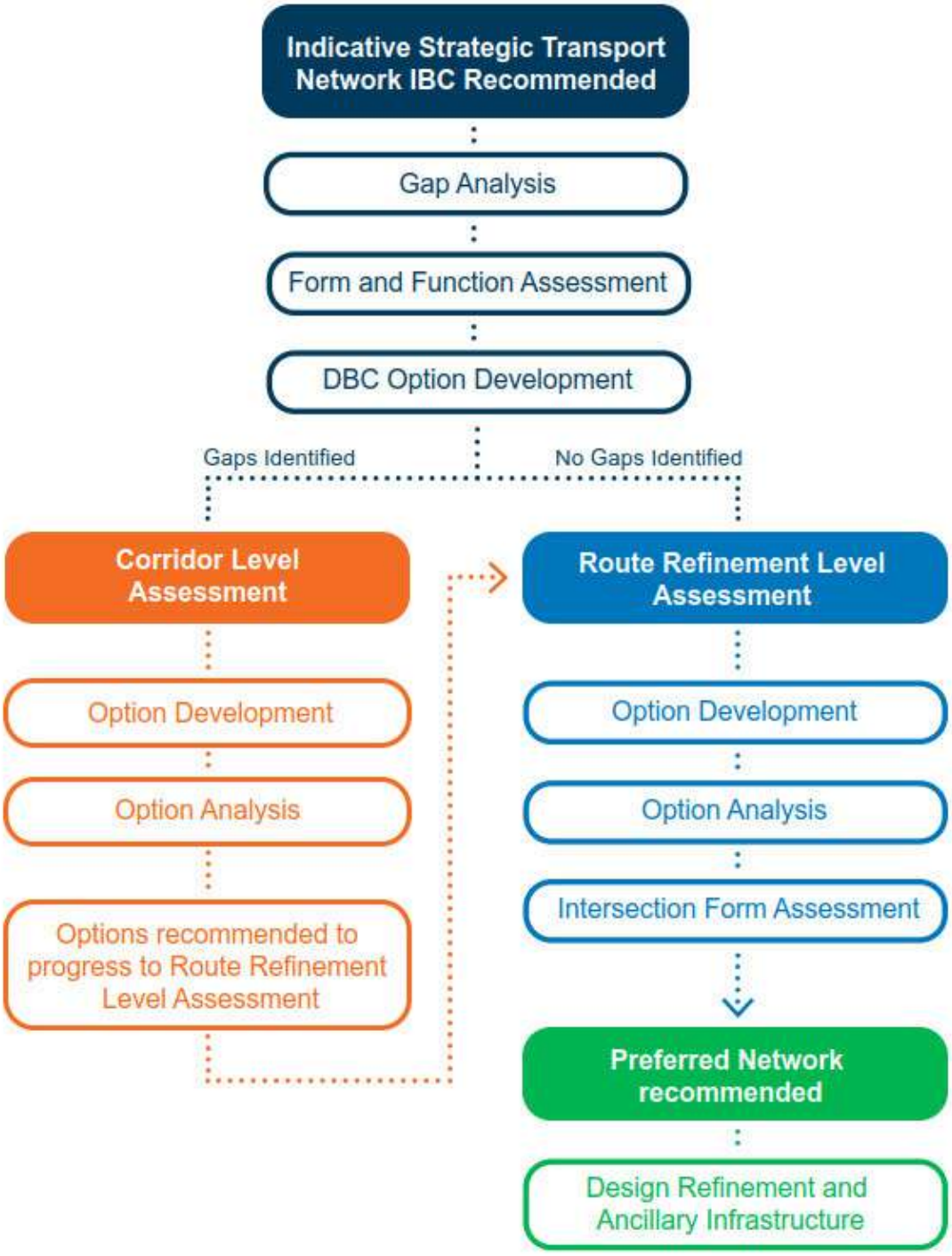


Figure 4-1 Overview of DBC Option Assessment process

4.2 Gap Analysis

In review of the recommended Indicative Strategic Transport Network, a gap analysis was undertaken by the Project Team to identify the scope of further options assessment required to determine the preferred options of the Drury Local projects.

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 IBC including policy direction and statutory documents (for example, plan changes), and to identify gaps or issues that require further consideration during the DBC phase.

The gap analysis included the following:

- Review of Supporting Growth Programme Business Case (formerly Transport for Urban Growth (TFUG)) recommendations.
- Review the South IBC (main document and Options Assessment Report), including the long list and the short list options, and the reasons why options were recommended or discounted.
- 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 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 Sections 9 to 15.

4.3 Form and Function Considerations

During the IBC phase of the business cases, detailed recommendations on corridor form and width were largely deferred to the DBC investigation phase. This level of detail was generally considered beyond the scope of the IBC phase. As such, during the DBC phase, assessments were undertaken to determine the form and function of DBC projects. This section outlines the form and function assessment process. Assessments for each project are summarised in Sections 9 to 15 below.

4.3.1 Corridor Form and Function

At a programme level, a corridor form and function assessment tool has been developed to support consistent decision making. The intent of the tool is to encourage well-rounded thinking about both the place and movement function of corridors and avoid focus being placed on a single element, for example the role of the corridor in moving general traffic.

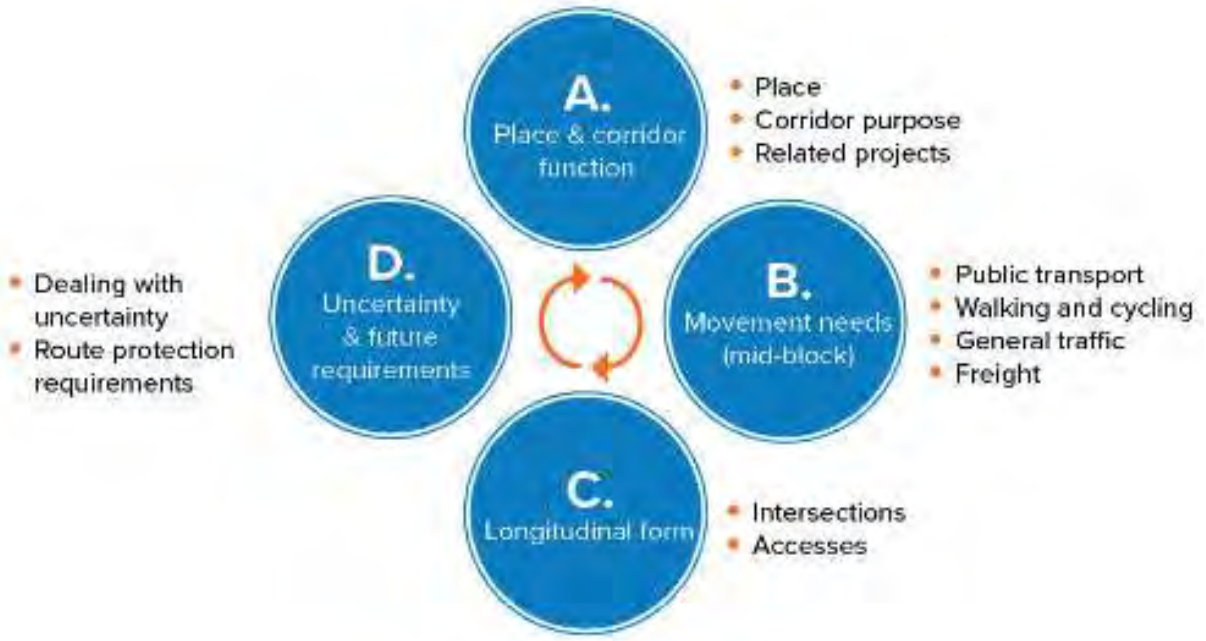
The key principles of the assessment process include:

- 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.
- 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 for the Supporting Growth Programme were confirmed through a collaborative process with AT and Waka Kotahi. This included a set of standard cross section typologies that could be implemented across the Supporting Growth Programme and its networks. This decision was then socialised with the project owner (AT or Waka Kotahi) and approval obtained to proceed to design.

Figure 4-2: Corridor assessment principles

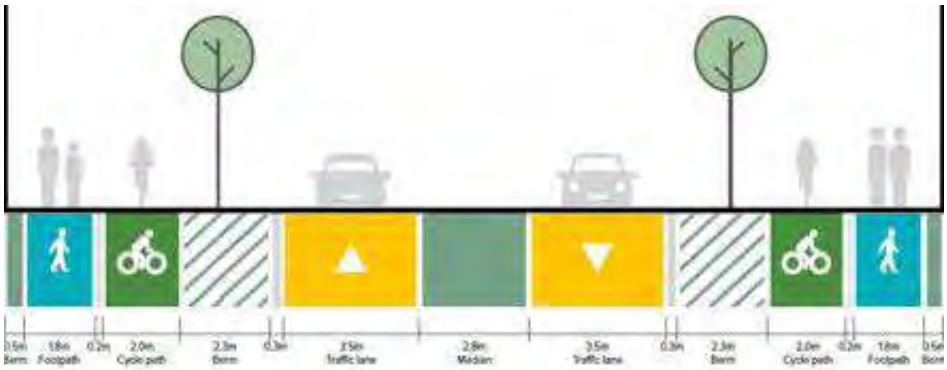


The form and function assessment undertaken for each Drury Local corridor is summarised in each of the sections 9 to 15 below. Table 4-1 and Figure 4-3 provide an overview of the form and function for the Drury Local projects.

Table 4-1 Drury Local Four-Lane Arterial 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	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
Opāheke North-South FTN	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 4-2 Drury Local Two-Lane Arterial Corridors

2 Lane Arterials	
	
Project	**Cross section**
Waihoehoe Road East	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	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
Opāheke Road	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

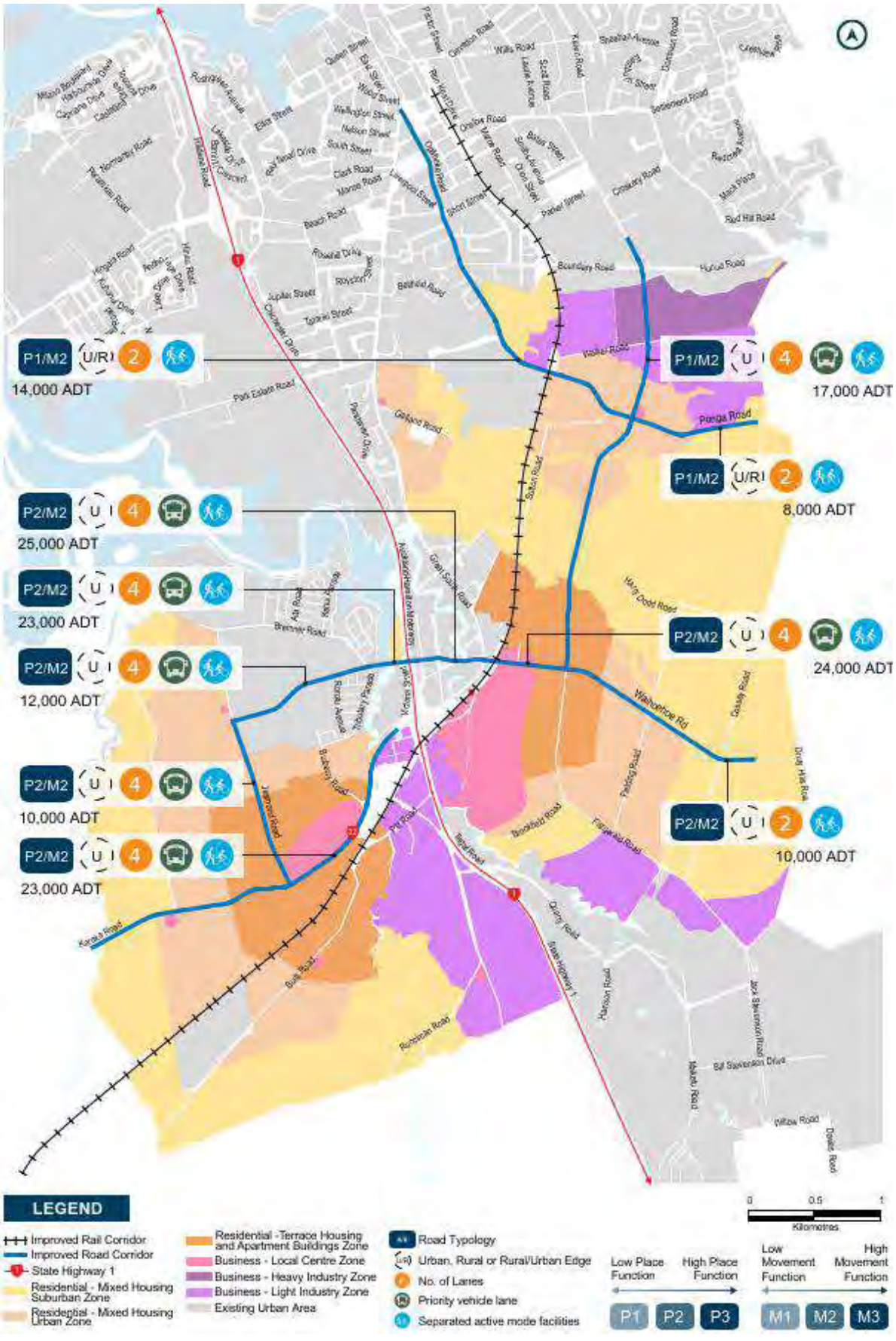


Figure 4-3 Drury Local Form and Function showing Drury-Opāheke Structure Plan

4.4 Approach to Option Development

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

The gap analysis identified whether the IBC recommended option 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, etc. The analysis also identified whether the IBC options assessment had sufficiently considered alternatives proportional to the scale of potential effects of each Project.

Where new information was identified, or where the IBC options 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, additional options assessment was undertaken through route refinement.

Overall, the gap analysis concluded that for the Drury Local Projects adequate consideration of alternative corridors was undertaken at the IBC phase and that any new information or changes since the IBC did not require additional corridor assessment. As such, the route refinement process was adopted to provide an appropriate level of options assessment for alignment selection in the DBC phase. Table 4-3 provides an overview of the recommended option development process and options to be considered for each of the Drury Local Projects. It also outlines the type of assessment that was undertaken for each Project further discussed in Section 5.3. Sections 9 to 15 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 road to widen. For Opāheke 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 at the IBC phase. 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 IBC. 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 4-3 Overview of assessment approach and options developed

Element	Assessment process	Options
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 taken forward to investigate which side of the existing roads to widen MCA assessment – qualitative only (not scored)	• Option B2: • Option B2 A (north) • Option B2 B (south) • Option B2 C (centre)
Waihoehoe Road West FTN Upgrade: from Great South Road in the west to the new Opāheke 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 Opāheke 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)

Opāheke 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)
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)
Ponga Road Upgrade **From Opāheke 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)
Opāheke Road Upgrade (Rural): **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)
Opāheke Road Upgrade (Urban) **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 Opāheke 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 (Opāheke Road)

4.5 Interdependencies in the network

The following tables provide an overview of the interdependencies and relationships between Drury Local Projects and other Te Tupu Ngātahi and Waka Kotahi Projects.

Table 4-4 Inter-relationship between other Te Tupu Ngātahi projects in the South and projects within this package of works

Package	Project(s)	Inter-relationships with Drury Local Projects	Dependency
Rail DBC package (proceeding in parallel)	Additional rail capacity between Pukekohe and Papakura	Additional capacity on the rail (including grade separated crossings) improves the viability of the **Drury Local FTN routes** connecting to the stations. Improves connectivity and transport choices within and beyond Drury growth area	**Critical Dependency**
	New rail stations	The viability of both the Drury Local FTN and cycling network are dependent on good connections to economic and social opportunities, both within and beyond Drury. Connection to the rail network with new rail stations at Drury West (located adjacent to **Jesmond Road** and **SH22**) and Drury Central (located adjacent to **Bremner Road** and **Waihoehoe Road**) will improve accessibility through more attractive and connected multimodal transport choices.	**Critical Dependency**
	Regional Active Mode corridor between Drury and Pukekohe	Walking and cycling paths along the road upgrade projects in the **Drury Local package** will connect to this **regional active mode corridor**. Together these projects will help support a transformational mode shift towards walking and cycling in the South.	Supports / complements the project
Mill Road	Mill Road Corridor	The **Waihoehoe Road** and **Opāheke/Ponga Road** upgrade projects are being coordinated with and will connect to the proposed Mill Road corridor project. Mill Road provides a strategic (people and freight) movement function, and alternative to SH1. This improves resilience of the network. The additional **N-S arterial** through Opāheke provides a further north-south connection improving the resilience of the network; however the function is to provide for more local trips within Drury, avoiding using Mill Road.	Supports / complements the project
Pukekohe	New Pukekohe Expressway	The proposed Expressway is key to transitioning to the more urban focused functionality of **SH22**; supporting the urban context of Drury West. The prime function of the Expressway will be to provide the strategic and freight transport movements between Drury and Pukekohe (currently carried on **SH22)**.	Supports / complements the project
	Pukekohe Expressway Northern Connector	The most northern connector directly connects both **SH22** and **Jesmond Road** with the Drury West Rail station. This will provide an integral connection between the Drury West centre and station, improving access and connection to more attractive and connected multimodal transport choices.	**Critical Dependency**
Takaanini Local/FTN	Takaanini FTNs	The FTN network upgrades proposed on **Jesmond**, **Bremner** and **Waihoehoe** will connect into this broader FTN network, providing more attractive and connected transport choices within and beyond Drury	**Critical Dependency**

Table 4-5 Other transport projects inter-related to the Drury Local projects

Projects	Inter-relationship and Influences on Drury Local	Dependency
SH1 Papakura-to-Bombay (P2B)	The P2B project was identified as part of the recommended South IBC network but is now being delivered by Waka Kotahi. Of key relevance to this package, Stage 1 includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the **SH22** upgrade project. There is also a direct inter-relationship with the **Bremner Upgrade/FTN project**, as P2B will necessitate an upgrade/replacement of the existing **Bremner Road** crossing of SH1.	Critical Dependency
SH22 Drury-to-Paerata (Safe Network Programme)	The Safe Network Programme is in the funding application process for short-term safety improvements in the SH22 area **Upgrades on SH22** between SH1 and Oira Road are being considered as part of this Drury Local DBC. Evidence from the Safe Network Programme DBC around safety problems and long-term capacity issues on SH22 has been used to support this Drury Local DBC.	Critical Dependency
Papakura-to-Pukekohe rail electrification	Rail electrification will remove the need for passengers to change trains at Papakura, increasing the attractiveness of **public transport in** the South. This directly enhances the **FTN connections (Bremner, Jesmond, Waihoehoe, NS)** to the stations, improving connectivity and transport choices within and beyond Drury growth area. This project is part of the Government's commitment to emission reduction, reliability and resilience and critical to urban development in the South.	Critical Dependency
Wiri-to-Quay Park Third Main Line	Will support overall growth of Southern growth area as well as improve network reliability and resilience. This directly enhances the **FTN connections (Bremner, Jesmond, Waihoehoe, NS)** to the stations, improving connectivity and transport choices within and beyond Drury growth area.	Critical Dependency

5 Route Refinement Assessment Process

5.1 Overview

Following the DBC options assessment process outlined in Figure 4-1, the route refinement options were assessed to establish the emerging preferred network for Drury Local. The assessment used the MCA framework developed for the Supporting Growth Programme, adapting its use to suit the Drury context and the DBC options being assessed at the route refinement stage. The route refinement process is shown in Figure 5-1.



Figure 5-1 Route Refinement Assessment Process

5.2 Option Assessment Process

The route refinement options were loaded into the Supporting Growth GIS constraints viewer to enable expert assessment. The viewer contained constraints and local site information which was able to be turned on and off with 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 with those criteria in mind. 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 asked to indicate a preference between options in terms of the level of potential effects on matters within their discipline areas if possible 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 5.5.4 to discuss and respectfully challenge the assessments.

5.3 Use of the MCA Framework in the Route Refinement Options Process

There were two approaches to using the MCA framework in the route refinement process- scoring the options, or a qualitative assessment of the options. Both approaches used the same MCA framework localised to suit the Drury Local projects.

This localisation involved the removal of criteria relating to transport system integration and user safety. The reasoning for this was due to these criteria repeating the themes that were being assessed under the investment objectives. Some of the measures relating to size and shape of parcels and access were moved from the land use futures criterion to the land requirement criterion to be assessed by a property specialist. Additionally, Manawhenua's preference 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 at the IBC phase. This was undertaken for Bremner Road East FTN Arterial options (Stage 1) and the Opāheke 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 due to 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.

5.4 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 Local projects:

- 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 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.

5.5 Project Partner Involvement and Landowner Engagement

Throughout the route refinement assessment process, a range of consultation and engagement was undertaken with Project partners (Auckland Transport, Waka Kotahi, 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 9 to 15.

5.5.1 Manawhenua

Four hui with specific discussion of the Drury Local alternatives assessment were held with manawhenua as follows:

- **30 August 2019** – Hui 1: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke North-South (N-S) and SH22.
- **3 October 2019** – Hui 2: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial & SH22.
- **7 November 2019** – Hui 3: Bremner Road East.
- **20 February 2020** – Hui 4: Waihoehoe Road East, Ponga Road and Opāheke Road
- **2 July 2020 –** Hui 5: Opāheke Road / Settlement Road intersection

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.

5.5.2 Auckland Council

Three workshops specific to the Drury Local options assessment were held with the Council as follows:

- **5 September 2019** - Workshop 1: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22
- **11 November 2019** – Workshop 2: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22.
- **22 January 2020** – Workshop 3: Opāheke Road, Ponga Road and Waihoehoe Road East.

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.

5.5.3 Auckland Transport and Waka Kotahi

AT and Waka Kotahi are a part of the Project Team contributing to the options assessment. Additional meetings were held with Project Team members and specialists to discuss options and any issues to be addressed. Specific workshops were also held with internal stakeholders from AT Waka Kotahi to discuss the assessment and options.

Four workshops specific to the Drury Local options assessment were held with AT and Waka Kotahi as follows:

- **12 September 2019** - Workshop 1: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22
- **14 October 2019** – Workshop 2: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22
- **17 December 2019** – Workshop 3: Bremner Road East
- **19 February 2020** – Workshop 4: Waihoehoe Road East, Ponga Road and Opāheke Road
- **15 July 2020** – Workshops 5 (AT only): Opāheke Road ./ Settlement Road intersection

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.

5.5.4 Community Engagement

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Local projects area on the draft preferred options for SH22 Arterial Upgrade, Jesmond Road FTN Arterial Upgrade, Bremner Road FTN Arterial Upgrade, Waihoehoe Road West FTN Arterial Upgrade and the Opāheke N-S FTN Arterial Upgrade. 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 Arterial, Ponga Road Arterial and Opāheke Road Arterial 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 Arterial, Ponga Road Arterial and Opāheke Road Arterial was provided. Feedback was sought from the public through Social Pinpoint using interactive tools such as surveys and interactive mapping.

The feedback received from landowners generally related to alignment concerns, loss of property, 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.

5.6 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 include Options Assessment Findings Workshops and Te Tupu Ngātahi 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 Opāheke-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 Te Tupu Ngātahi 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.

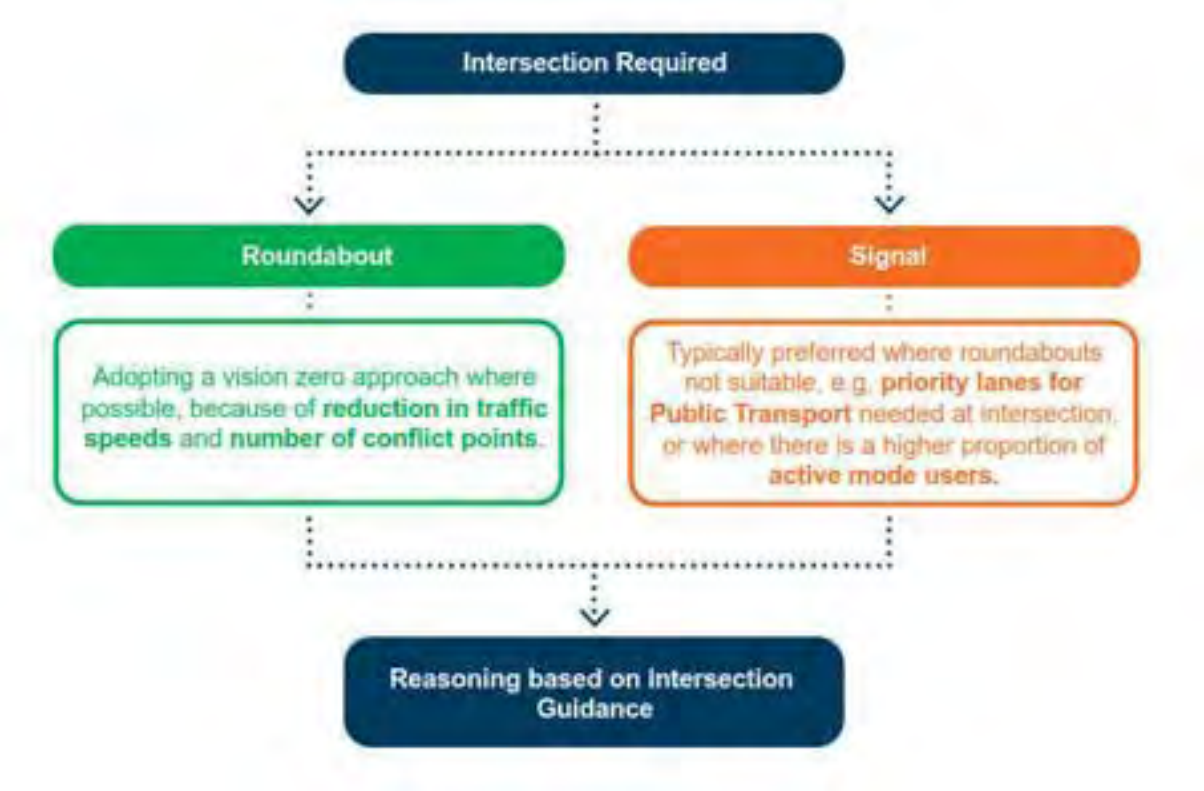
The following Project Team workshops were undertaken for the Drury Local Projects. The outcomes of these workshops are detailed in Sections 7 to 13:

- **22 August 2019** – Options Assessment Findings Workshop: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22.
- **6 September 2019** – Te Tupu Ngātahi Project Team Workshop: Bremner Road, Jesmond Road, Waihoehoe Road West, Opāheke N-S FTN Arterial and SH22.
- **25 September 2019** – Te Tupu Ngātahi Project Team Workshop: Bremner East
- **23 October 2019** – Te Tupu Ngātahi Project Team Workshop: Bremner East
- **19 December 2019** – Options Assessment Findings and Te Tupu Ngātahi Project Team Workshop: Opāheke Road, Ponga Road and Waihoehoe Road East

6 Intersection Form Assessment Process

Once the preferred route refinement options were identified, an assessment was undertaken to determine preferred intersection forms across the network. Figure 6-1 outlines this process of deciding on the typology, where an intersection is required.

Figure 6-1: Intersection typology decision-making



Considerations for intersections in the Drury Local Projects included:

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

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

are also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to the site-specific factors. These factors are summarised in Figure 6-2.

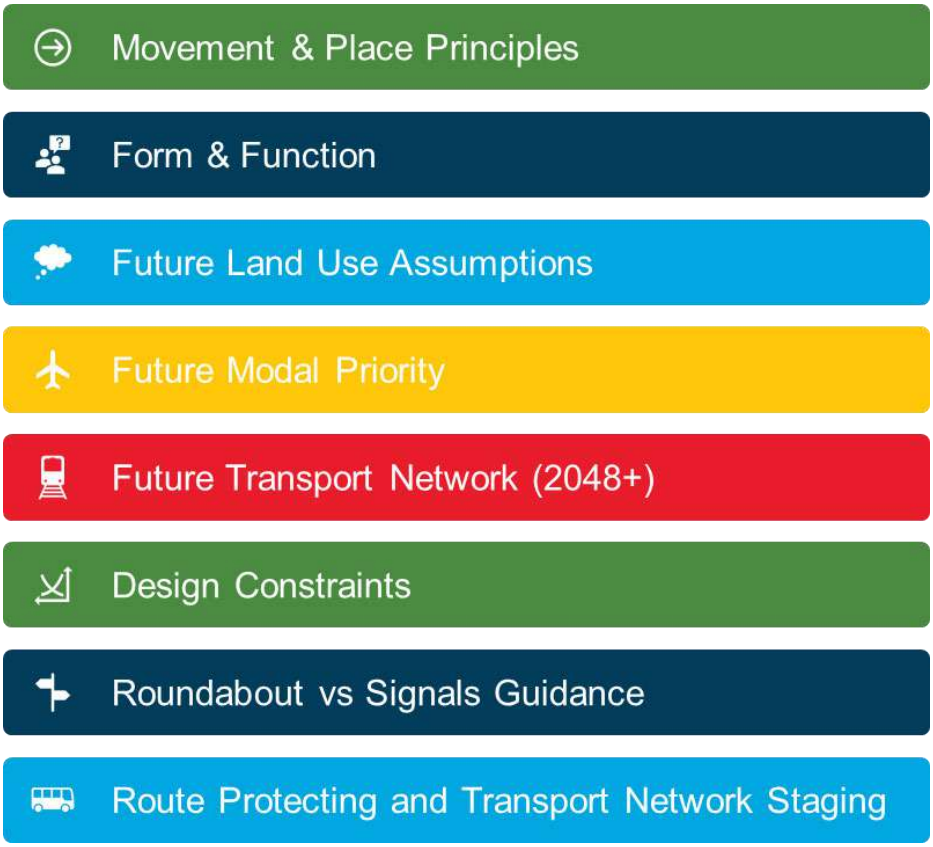


Figure 6-2 Intersection considerations

The intersection form assessment undertaken for each Drury Local Project corridor is summarised in each of the sections 9 to 15 below. Figure 4-3 provides an overview of the form and function for the Drury Local Projects.

7 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 further minimising impacts of the preferred option.

This process was particularly useful where each option assessed had both positive and negative impacts, allowing a more balanced approached that adopted positive, and avoided negative, impacts where possible. Where design refinements were made, they are outlined in the discussion of each of the Project's preferred options.

8 Approach to Stormwater Infrastructure

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

1. Identification of 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, form of the transport route, road hierarchy and how connectivity to any adjacent properties is to be provided. This approach is summarised in Table 8-1:

Table 8-1 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. 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.

9 State Highway 22 Arterial Upgrade

9.1 Overview

9.1.1 IBC assessment summary

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-Opāheke 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.

9.1.2 IBC to DBC Gap analysis summary

A gap analysis was undertaken for SH22 as described in Section 4.2. 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-Opāheke 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-Opāheke Structure Plan

Recommendations

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 phase to investigate which side of the road to widen. Recommendations included:

- To confirm whether the widening could fit within the existing designation (6707).
- Liaise with Auckland Council on structure planning to inform the form of SH22.
- Extend 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-Opāheke Structure Plan

9.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the SH22 Arterial Upgrade. Table 9-1 provides a summary of the assumptions and outcomes of the assessment.

Table 9-1 SH 22 Form and Function Assumptions and Summary

SH22		
Criteria	**Summary**	**Comments**
Place and Movement	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. Two bus routes are proposed be running with10-12 minutes 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)
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).

9.2 DBC Option Development

The purpose of the SH22 arterial upgrade is to improve capacity and safety on the SH22 corridor to the east of Oira Road 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 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 arterial routes. The three options for the SH22 Upgrade are shown in Figure 9-1.

9.3 DBC Options Assessment

9.3.1 Assessment

The assessment undertaken for SH22 follows the processes previously discussed in Section 5. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 9-1 and Table 9-2 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.

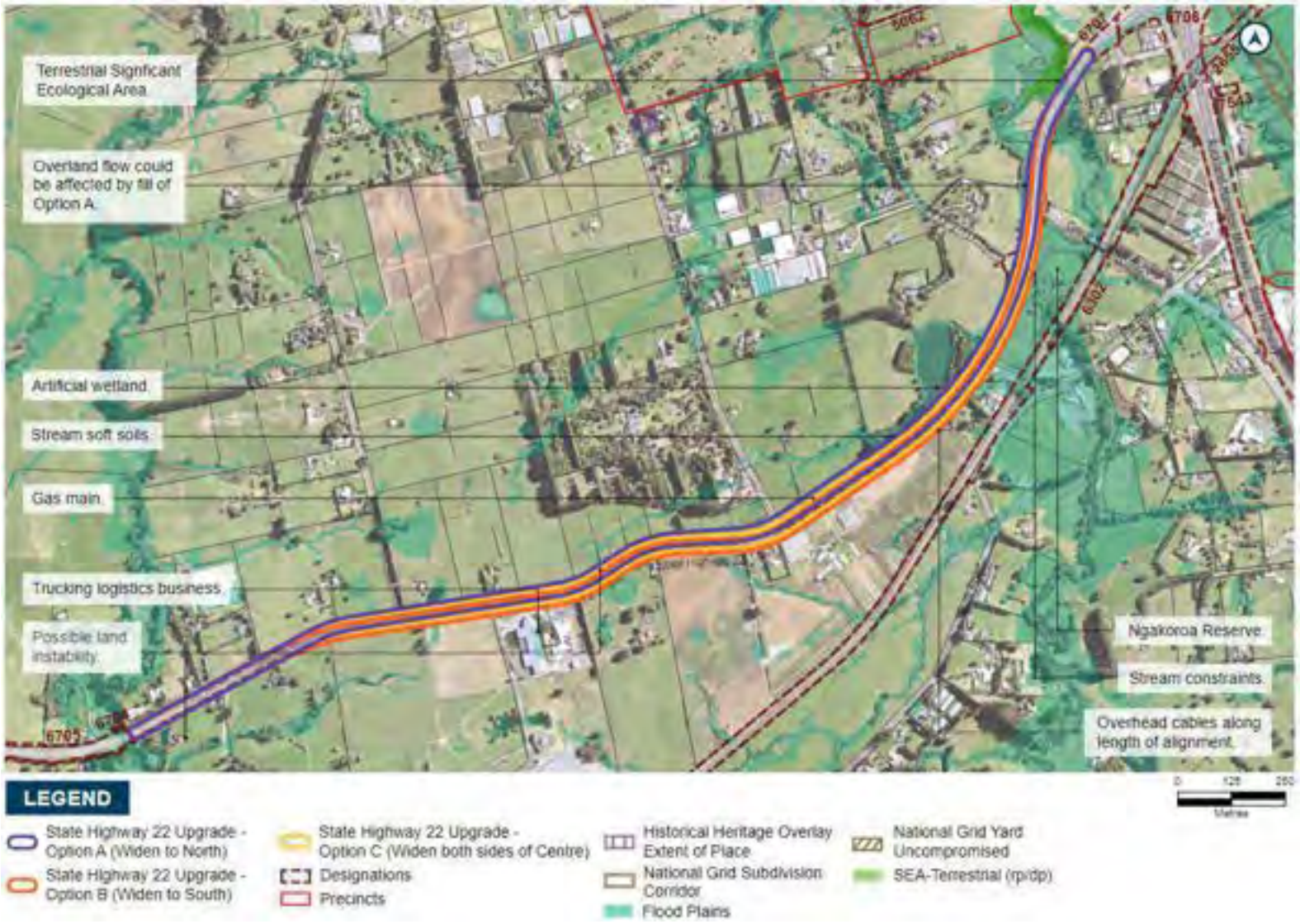


Figure 9-1 Indicative alignment of State Highway 22 Options for route refinement showing constraints and considerations

Table 9-2 SH22 Options Assessment Findings Summary

State Highway 22 Arterial Upgrade Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 Local area as it urbanises. The current form is not supportive of the anticipated growth, with 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 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 IO2. ***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 will occur to align 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	**Historic Heritage** No historic heritage constraints were identified for any of the options (nothing to influence the alignment).
	Social 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. Dependent on mitigation and management the social impact on the reserve, enhancement of the reserve could provide additional benefits and mitigate the impacts. Urban Design: All three options present no 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 show low property impact overall as a result of mainly requiring partial acquisitions. 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.

	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. 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.

9.3.2 Partner 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, [redacted]

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.

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 Local 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 property.

9.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners and the community, a preferred option for SH22 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. 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), overland flow paths and artificial wetland to the north west
- 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

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 Investment Objectives as outlined in Table 9-2.

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.

9.3.4 Discounted Options

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

Table 9-3 Discounted Options - SH22

Option	Reasoning
Option A	This option was discounted for the following reasons: • Slightly more impact on overland flow paths • Impact on significant ecological area
Option B	This option was discounted 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 • Impact on significant ecological area
Option C	This option was discounted 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

9.3.5 Intersection Form

Along the preferred corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 9-4, outlining the recommended outcomes for each.

Table 9-4 SH22 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		
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	Roundabout
	Karaka Road ↔	•	50km/h	High	Med	Med		

							suggests a lower active mode demand, put still within cycling catchment of Drury West Town Centre	
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					

9.4 SH22 Summary

As outlined, through the assessment process and feedback from project partners and landowners, the preferred option for the SH22 FTN Arterial 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.

10 Jesmond Road Frequent Transit Network Arterial Upgrade

10.1 Overview

10.1.1 IBC assessment summary

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 Opāheke-Drury Structure Plan has developed, and the proposed land use has changed. At 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 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 identified.

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 10-1: IBC Drury West Long List Options



Figure 10-2: IBC Drury West Short List Options

10.1.2 IBC to DBC gap analysis summary

A gap analysis was undertaken for Jesmond Road as described in Section 4.2. 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-Opāheke 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 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. If the rail station location changes substantially, the connection with Jesmond Road would need to be reviewed.

10.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the Jesmond Road FTN Arterial Upgrade. Table 10-1 provides a summary of the assumptions and outcomes of the assessment.

Table 10-1 Jesmond Road Form and Function Assumptions and Summary

Jesmond Road		
Criteria	**Summary**	**Comments**
Place and Movement	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 a 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 a 7-minute frequency during peak hours, and 10-minute during the day.
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

10.2 DBC Option Development

The purpose of the Jesmond Road 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 Jesmond Road FTN Arterial Upgrade included specialist assessment of three options from the intersection with State Highway 22 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 Arterial Upgrade are shown in Figure 10-3

10.3 DBC Options Assessment

10.3.1 Assessment

The assessment undertaken for Jesmond Road follows the processes previously discussed in Section 5. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 10-3 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.

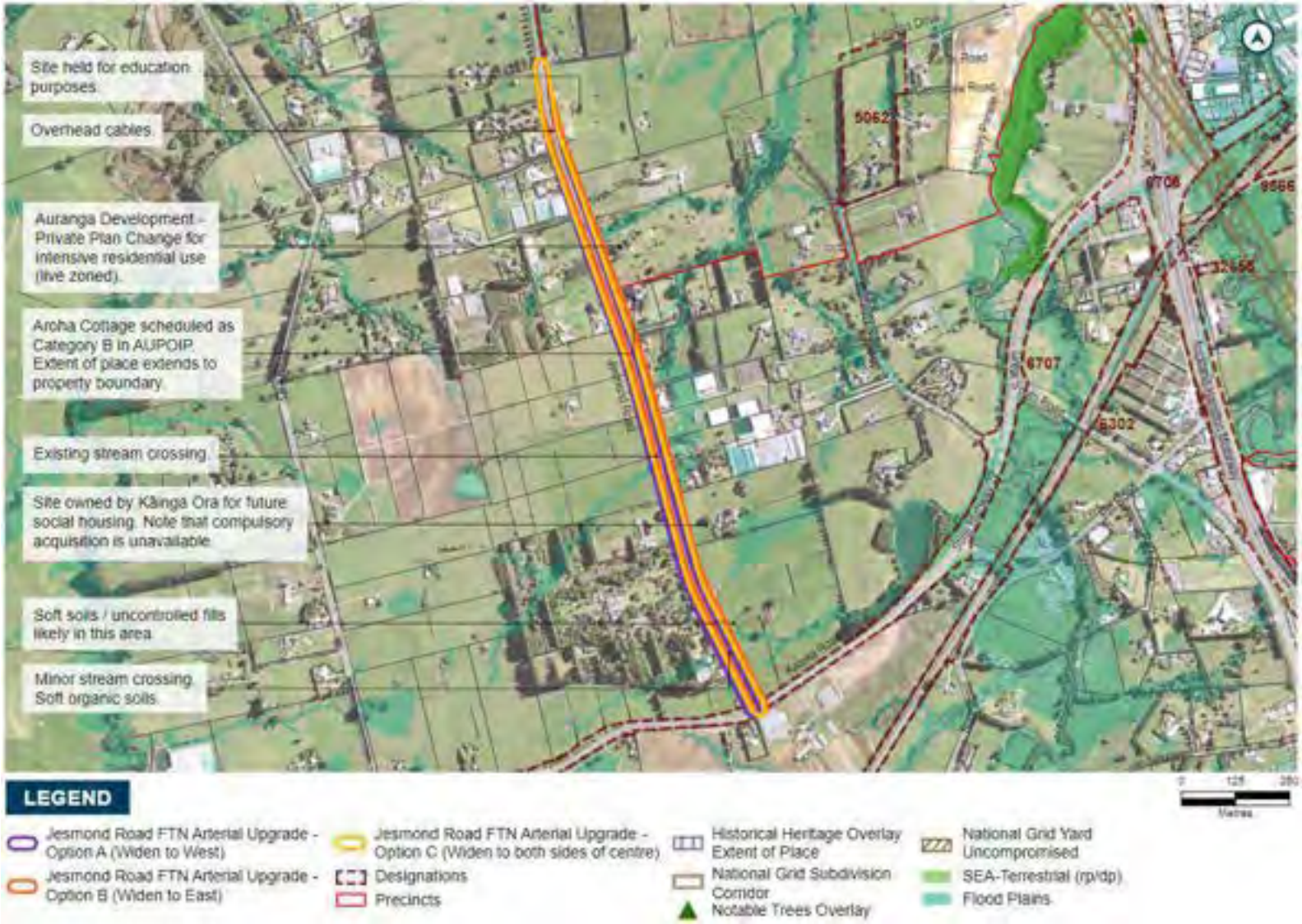


Figure 10-3 Indicative alignment of Jesmond Road Options for route refinement showing constraints and considerations

Table 10-2 Jesmond Road Options Assessment Findings Summary

Jesmond Road FTN Arterial Upgrade – Intersection with SH22 to intersection with Bremner Road	
Performance against investment 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 IO2 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	**Historic 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. *Note: landowner consulted during June 2019 consultation and is open to relocating*
	Social <u>Social:</u> 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, HNZ and heritage site) as it requires the least amount of land where these services are located. <u>Urban design</u>: 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. <u>Land requirement:</u> Option A has the least impact on MoE, HNZBL sites and the least properties requiring full acquisition. This option is also likely to have less overall property impacts as many joint right-of-ways 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). <u>Health and wellbeing:</u> 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	The upgrade of Jesmond Road presents an opportunity to restore the riparian habitat along streams and improvement of habitat for native species.

10.3.2 Partner and Landowner Engagement

[redacted]

[redacted]

[redacted]

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 noted that the Ministry of Education site is not necessarily a constraint as the Ministry of Education may be open to provide land. 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 Local projects 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.

10.3.3 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 Jesmond Road 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 Ministry of Education 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 (acknowledging that the land owner is open to relocating the cottage).
- 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 Investment Objectives as outlined in Table 10-2.

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.

10.3.4 Discounted Options

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

Table 10-3 Discounted Options - Jesmond Road

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 • Results in a greater impact on public reserve
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 • Impact on live-zoned properties • Temporary traffic management during construction more complex

10.3.5 Intersection Form

Along the preferred corridor, there are two intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 10-4, outlining the recommended outcomes for each.

Table 10-4 Jesmond Road 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 9.3.5.								

10.4 Jesmond Road 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 Arterial 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 Bremner Road Frequent Transit Network Arterial Upgrade

11.1 Overview

11.1.1 IBC assessment summary

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 Opāheke-Drury future urban zone as shown in Figure 11-1 and Figure 11-2. 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.

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



Figure 11-1 IBC Drury West Long List Options



Figure 11-2 IBC Drury West Short List Options

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.

11.1.2 IBC to DBC gap analysis summary

A gap analysis was undertaken for Bremner Road as described in Section 4.2. 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 Opāheke 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. 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 alignment is being agreed through the Plan Change 6 provisions and landowner agreements, no further options assessment is required. This alignment should still be designated as part of the proposed Drury Local network. However, Auckland Transport 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.

11.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the Bremner Road FTN Arterial Upgrade Corridor. Table 11-1 provides a summary of the assumptions and outcomes of the assessment.

Table 11-1 Bremner Road Form and Function Assumptions and Summary

Bremner Road (Jesmond Road – Great South Road)		
Criteria	**Summary**	**Comments**
Place and Movement	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. DBV of 15 that would likely be impacted by traffic, therefore bus priority lanes are recommended
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

11.2 DBC Option Development

The Bremner Road FTN Arterial Upgrade has been split into three sections for options assessment purposes. The sections are shown in Figure 11-3 and include:

- **Bremner Road FTN Arterial 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 Auckland Transport were party to. No options assessment required.
- **Bremner Road FTN Arterial 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 Arterial 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 increased 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 11-3 Bremner Road FTN Arterial Assessment Sections

11.3 DBC Options Assessment – Bremner Road FTN Arterial Central section

The purpose of the Bremner Road FTN Arterial 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 Bremner Road Central 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 Bremner Road Central are shown in Figure 11-4.

11.3.1 Assessment

The assessment undertaken for Bremner Road Central follows the processes previously discussed in Section 5. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations and constraints identified are shown in Figure 11-4.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 Indicative alignment of Bremner Road - Central section Options for route refinement showing constraints and considerations

Table 11-2 Bremner Road Central Options Assessment Findings Summary

Bremner Road Central Corridor – Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 (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 form of this corridor supports IO2 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	**Historic 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). Likely some impacts on new site recorded: Runciman Farm recorded within 100m of Bremer Road (R12/113) since the IBC phase.
	Social <u>Social Cohesion:</u> 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. <u>Urban Design:</u> 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. <u>Land requirement:</u> All options affect Council reserve land (DoC approval would be required). 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. <u>Health and Wellbeing:</u> 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.

11.3.2 Partner 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.

[redacted]

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).

Workshops were held with AT and Waka Kotahi on 12 September, 14 October and 17 December 2019. During these workshops, attendees reached a general consensus 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 Local projects on 10th March 2020.

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Local projects 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.

11.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partner including manawhenua and Auckland Council and landowners, a preferred option for Bremner Road Central 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
- [redacted]
- This option avoids scheduled archaeological sites to the north of the existing road
- It has the least property impacts
- 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 Investment Objectives as outlined in Table 11-2.

11.3.4 Discounted Options

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

Table 11-3 Discounted Options - Bremner Road Central

Option	Reasoning
Option A	This option was discounted for the following reasons: • This option would impact on the scheduled item of historic heritage at 51 Bremner Road • Greater property impact • Larger impact on vegetation and habitat in the coastal marine area.
Option C	This option was discounted for the following reasons: • 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 • Impact on vegetation and habitat in the coastal marine area. • Complexity of bridge construction staging and traffic management

11.3.5 Intersection Form

Along the preferred Bremner Road Central corridor, one intersection needs to be upgraded. A summary of the assessment (described in Section 6) undertaken for this intersection is shown in Table 11-4, outlining the recommended outcome.

Table 11-4 Bremner Road 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 already agreed in PC6 and under construction. • 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		

11.4 DBC Option Assessment – Bremner Road FTN Arterial - East section

11.4.1 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 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 11-5 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.

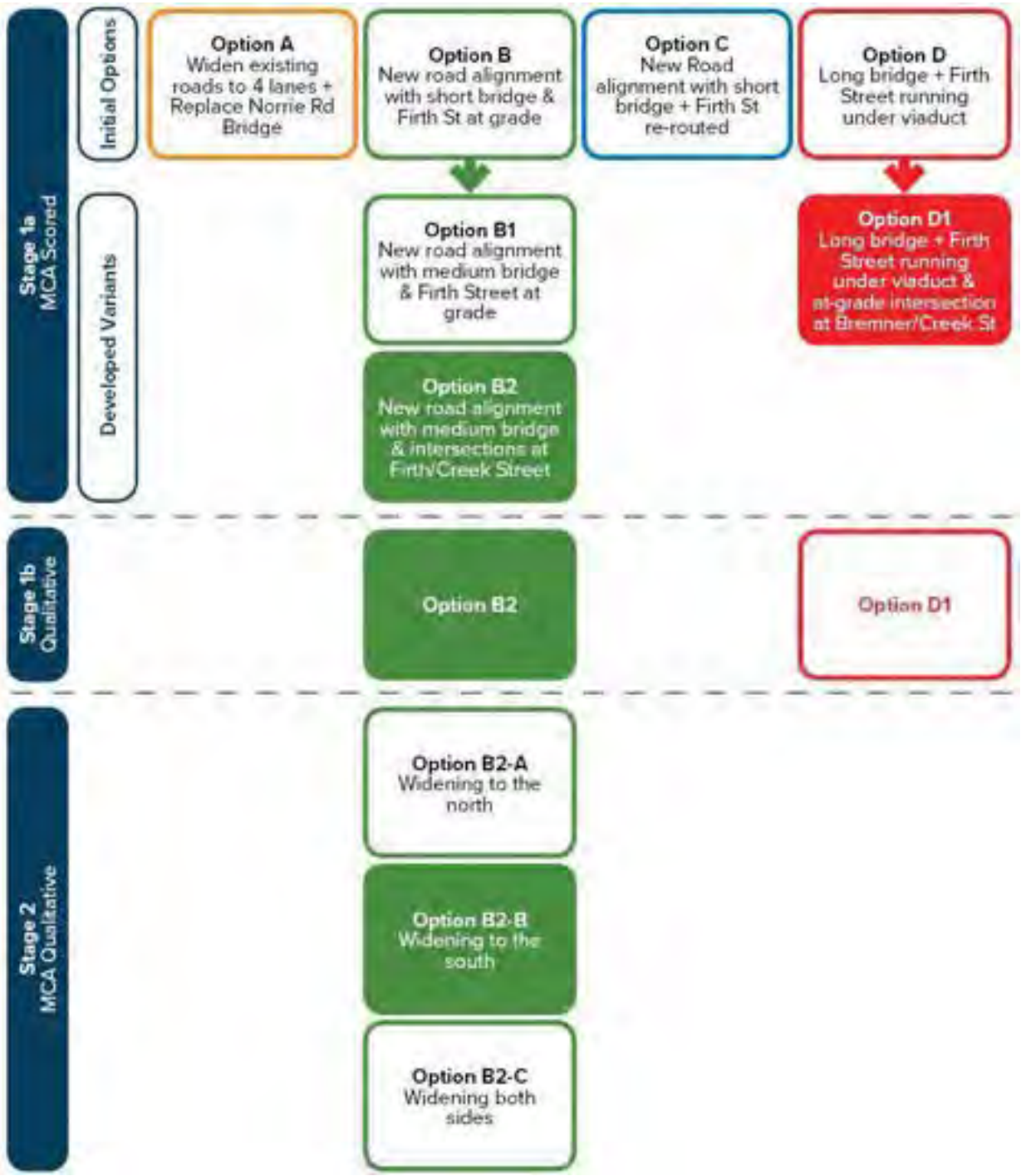


Figure 11-5 Bremner East Process

11.4.2 Stage 1a

The purpose of the Bremner Road 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 11-5.

Table 11-5 Bremner Road 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 – East section are shown in the figures below.



Figure 11-6: Option A - Upgrade of existing roads



Figure 11-7: Option B – Short bridge, Firth Street at grade



Figure 11-8: Option B1 – Medium bridge, Firth Street at grade



Figure 11-9: Option B2 – Medium bridge, intersections at Firth and Creek Street



Figure 11-10: Option C – short bridge, Firth Street rerouted



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

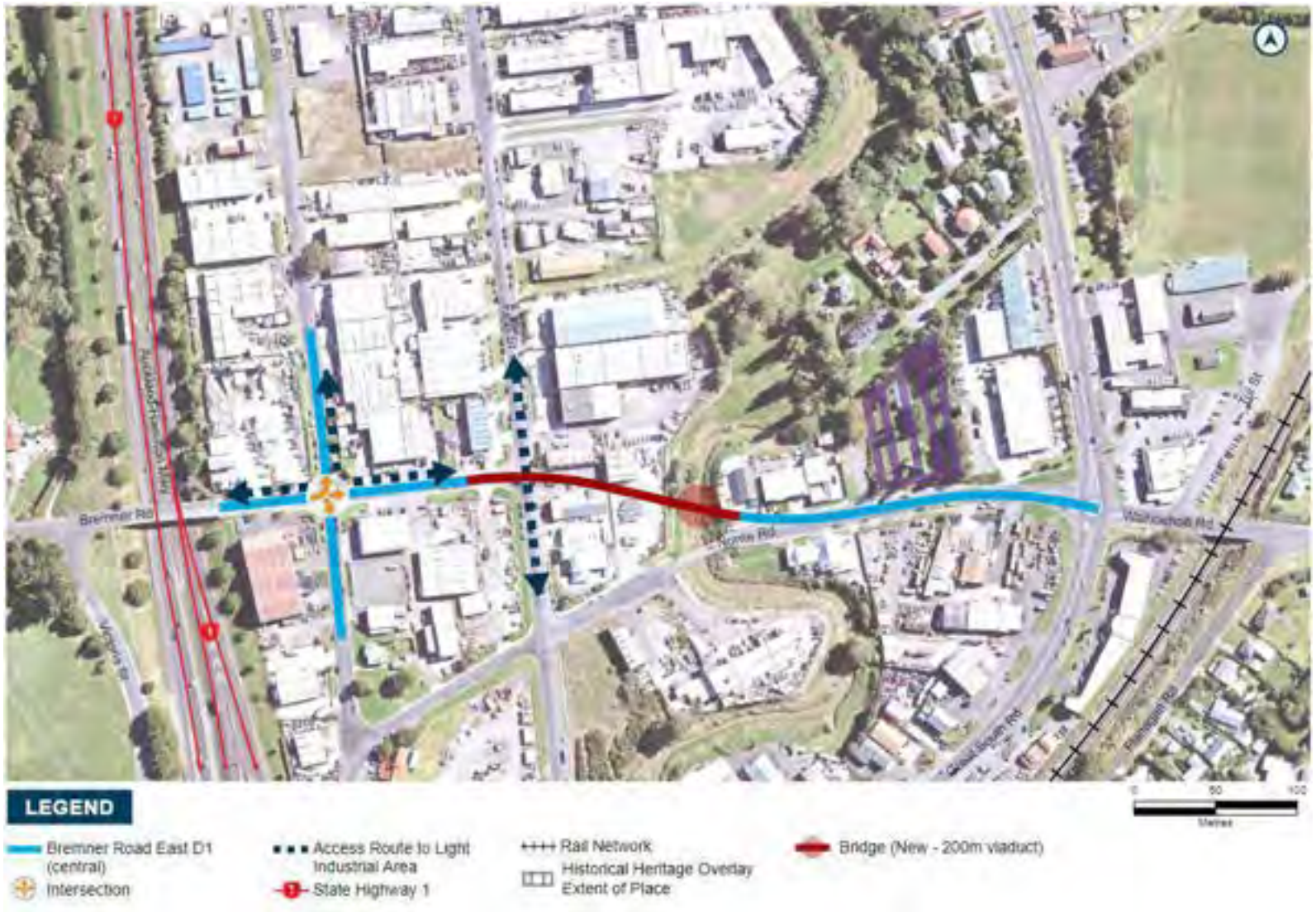


Figure 11-12: Option D1 – long bridge, Firth Street under

11.4.2.1 Assessment

All options were scored against the MCA framework and reasons for the score recorded. In summary, Table 11-6 below demonstrates a heatmap and scores of each option considered and Table 11-7 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 11-6 Bremner 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 11-7 Bremner Road East Stage 1a Options Assessment Findings Summary

Bremner Road East Corridor – Stage 1a Options Assessment Findings Summary	
Performance against investment objectives	***Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury area*** All options score positively for Investment Objective 1, 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. 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 Investment Objective 2. 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 against Investment Objective 2, 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 <u>Social Cohesion</u> 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. <u>Land use features / integration with land use</u> 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. 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). All options have very similar impacts on both landowners and lessees. 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 to retain Norrie Road Bridge for walking and cycling facilities. However, removing Norrie Road Bridge has positive impacts on flooding in the wider area.

11.4.2.2 Partner 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.

[redacted]

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 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 was also discussed, and that there may be no more piping of streams (bridging only). 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 which is attractive. Feedback from the second workshop is discussed in Stage 2.

11.4.2.3 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 Arterial 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
- 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.

11.4.2.4 Discounted Options

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

Table 11-8 Discounted Options - Bremner Road 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 • 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.

11.4.3 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 11-5 and shown in Figure 11-9 and Figure 11-12 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 11-9.

Table 11-9 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 cost than 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 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.

11.4.3.1 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 11-10 Comparative Cost estimates for Bremner 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.

11.4.3.2 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

The removal of 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, doesn't reach the bridge deck.

Removal of the Norrie Road bridge does 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 reduces 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 have 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 provides an increased level of flood protection for the road compared to the existing (completely out of the 100-year floodplain) which is betterment (i.e. value for money decision rather than mitigation of an effect)

- 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.

11.4.3.3 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 starts to flood in the 10-year event and 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.

11.4.3.4 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 11-13. 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 11-13 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.

Should the intersection of Creek Street operate as a priority intersection this would impact the scoring of Option D1, as this is likely to impact 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.

11.4.3.5 Partner Engagement

As discussed in Section 0, 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 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.

11.4.3.6 Preferred and Discounted Option

Following the further assessment described above, Option B2 was identified as the preferred option for Jesmond Road. 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.

11.4.4 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 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 East are shown in Figure 11-14.

11.4.4.1 Assessment

The assessment undertaken for Bremner Road East Stage 2 route refinement follows the processes previously discussed in Section 5. Three options for route refinement of Option B2 were assessed qualitatively against the MCA framework. Considerations and constraints identified are shown in Figure 11-14 and Table 11-11 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 11-14 Indicative alignment of Bremner Road East Options for route refinement showing constraints and considerations

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

Bremner Road East Corridor – Stage 2 Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 provides 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 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 further. Option B2 has been chosen as the preferred option for multiple reasons, including scoring positively against investment objectives. 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 IO1 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 form of this corridor, supports IO2 through the provision of multi-modal facilities and travel choices, connecting with the rest of the Bremner Road corridor to provide for seamless east-west connectivity – particularly for the FTN – through the Drury area through to Drury Central Rail Station, in which this connection improves 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 <u>Social Cohesion</u> 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, 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. <u>Urban Design</u> 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 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, examples include: • 6 lane wide Bremner Road will potentially offer limited opportunity to develop a desirable urban form between the junctions at Creek and Firth streets. <u>Land Requirement</u> 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. <u>Health and Wellbeing</u> 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. <u>Business Disruption</u> For all options the biggest impact for business within proximity of the construction will be during the construction phase. This could include 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 either space within 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 the same 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. However, 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. If the closure of Norrie Road during construction is not a significant issue as access to the area can be maintained via GSR/Firth Street. A such, either Option A or B could be considered similar in terms of construction.

	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, 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 11-15 Norrie Road maintaining access (retaining wall instead of batter). • 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) • 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. • 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.

11.4.4.2 Landowner Engagement

In December 2019 and January 2020, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Local projects area on the draft preferred option for the Bremner Road 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.

11.4.4.3 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 an Auckland Council Cultural Heritage Inventory (CHI) building will be impacted because of this with mitigation of effects on the former cheese factory at 12 Norrie Road 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 Investment Objectives as outlined in Table 11-11.

11.4.4.4 Discounted Options

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

Table 11-12 Discounted Options - Bremner Road East Stage 2

Option	Reasoning
Option A	This option was discounted for the following reasons: • This option 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 • 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.

11.4.4.5 Intersection Form

Along the preferred Bremner Road East corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 11-13, outlining the recommended outcomes for each.

Table 11-13 Bremner Road 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		
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		

11.4.5 Bremner Road FTN Arterial – East Conclusion

The preferred option for Bremner Road East FTN Arterial 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 East FTN Arterial Upgrade.

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.

11.5 Bremner Road FTN Arterial 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 East FTN Arterial Upgrade is Option B2-B and the preferred option for Bremner Road Central FTN Arterial Upgrade 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.

12 Waihoehoe Road FTN Arterial / Arterial Upgrade

12.1 Overview

12.1.1 IBC assessment summary

TFUG did not recommend upgrading Waihoehoe Road, 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 central, 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 12-1: IBC Drury East Long List Options



Figure 12-2: IBC Drury East Short List Options

12.1.2 IBC to DBC Gap analysis summary

A gap analysis was undertaken for Waihoehoe Road as described in Section 4.2. 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-Opāheke 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, North Island Main Trick 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.

12.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the Waihoehoe Road West FTN Arterial Upgrade and Waihoehoe Road West Arterial Upgrades. Table 12-1 provides a summary of the assumptions and outcomes of the assessment for Waihoehoe Road East and West.

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

Waihoehoe Road (East of N-S Arterial)		
Criteria	**Summary**	**Comments**
Place and Movement	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).

Bus	No bus	No bus routes on this section
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
Waihoehoe Road (West of N-S Arterial)		
Criteria	**Summary**	**Comments**
Place and Movement	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	Based on DBV, bus priority lanes for section west of N-S arterial and GSR (26 DBV)
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.

12.2 DBC Option Development

The purpose of the Waihoehoe Road 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. The Waihoehoe Road corridor has been split into two sections for options assessment purposes based on the form and function assessment above. The sections are shown in Figure 12-3 and include:

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

Route refinement for Waihoehoe Road West and East sections included specialist assessment of three options for each section: widening to the north, south or both sides of the existing alignment. For Waihoehoe Road West, each option utilizes the 30m typical cross section consistent with other Drury Local four lane arterial routes. For Waihoehoe Road East, each option utilizes the 24m typical cross section consistent with other two lane arterial upgrades.



Figure 12-3 Waihoehoe Option Assessment Sections

12.3 DBC Option Assessment – Waihoehoe Road West FTN Arterial Upgrade

Route refinement for Waihoehoe Road West 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 are shown in Figure 12-4.

12.3.1 Assessment

The assessment undertaken for Waihoehoe Road West follows the processes previously discussed in Section 5. The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 12-4 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) and landowners.



Figure 12-4 Indicative alignment of Waihoehoe Road West Options for route refinement showing constraints and considerations

Table 12-2 Waihoehe Road West Options Assessment Findings Summary

Waihoehe Road FTN Arterial Upgrade West section – Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 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. 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. 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	**Historic heritage** No historic heritage constraints were identified for any of the options. Therefore historic heritage is not a differentiator between the options.
	Social 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 road side 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 along the alignment.
	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. 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.

12.3.2 Partner 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. [redacted]

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 Waihoehoe Road West.

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, the Supporting Growth Programme sought feedback from landowners within the proposed Drury Local projects area on the draft preferred option for the Waihoehoe Road West FTN Arterial corridor. Minimal specific feedback was received on the Waihoehoe Road West FTN Arterial corridor. 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.

12.3.3 Preferred 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 Waihoehoe Road West 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 and requires the least full property acquisitions.
- 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 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 Investment Objectives as outlined in Table 12-2.

During design refinement, specific consideration was made to ensuring access to side streets including Tui Street and Flanagan Road.

12.3.4 Discounted Options

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

Table 12-3 Discounted Options - Waihoehoe Road West

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

12.3.5 Intersection Form

Along the preferred Waihoehoe Road West corridor, there are two intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 12-4, outlining the recommended outcomes for each.

Table 12-4 Waihoehoe Road West 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 • Potential ped signals just south for rail access hence operationally preferred to coordinate signals	Signalised Intersection
	SH22 ➔➔	4	50km/h	Med	High	High		
	Waihoehoe Road ➔	4	50km/h	FTN	High	Med		
Opāheke N-S FTN Arterial / Waihoehoe Intersection	Opāheke 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		

12.4 DBC Option Assessment – Waihoehoe Road East Arterial Upgrade

Route refinement for Waihoehoe Road East 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 Waihoehoe Road East are shown in Figure 12-5.

12.4.1 Assessment

The assessment undertaken for Waihoehoe Road East follows the processes previously discussed in Section 5. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 12-5 and Table 12-5 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), stakeholders and landowners.

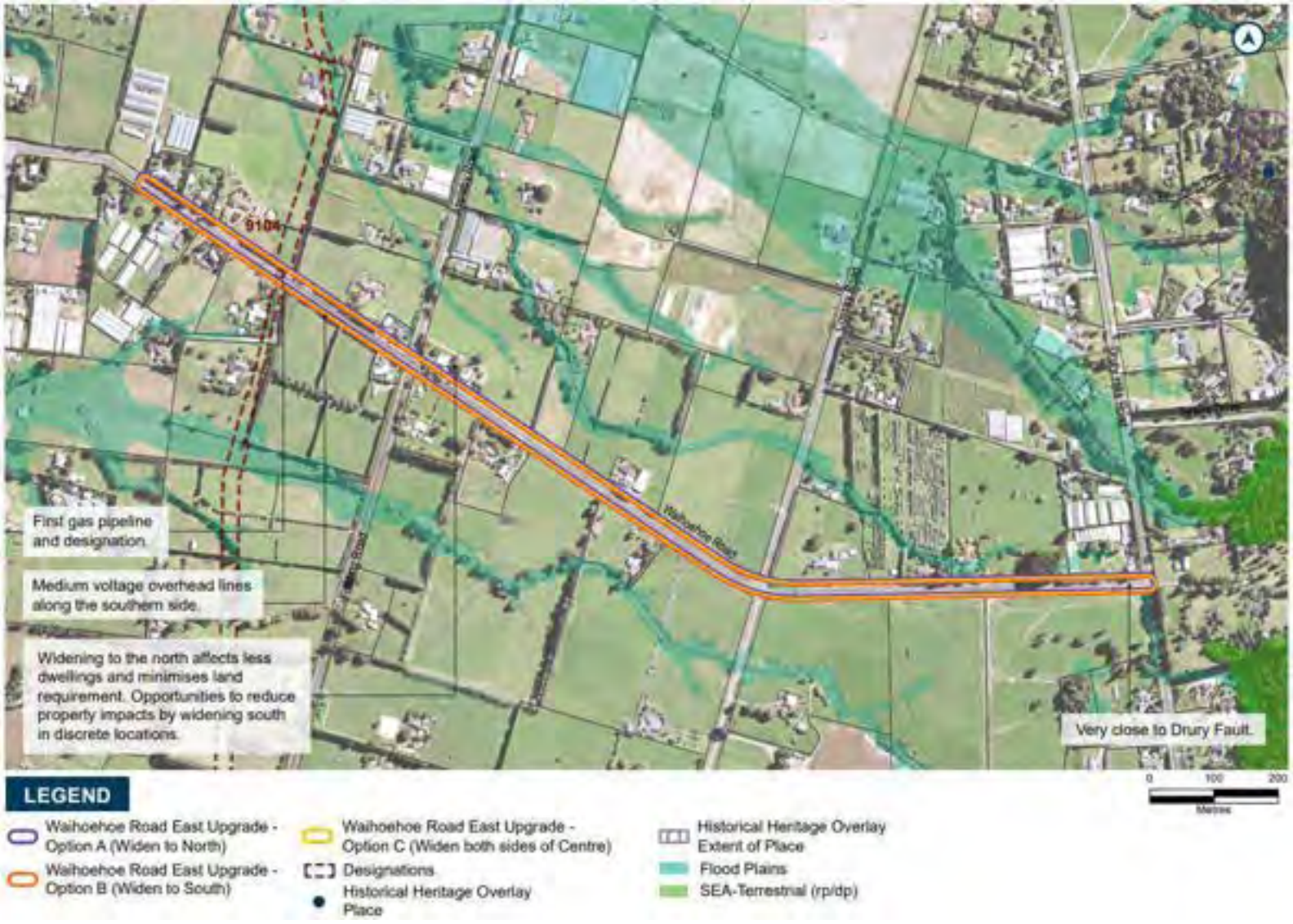


Figure 12-5 Indicative alignment of Waihoehoe Road East Options for route refinement showing constraints and considerations

Table 12-5 Waihoehoe Road East Options Assessment Findings Summary

Waihoehoe Road FTN Arterial Upgrade East section	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 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. 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 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	**Historic heritage** No differentiation between each option with regard to historic heritage.
	Social <u>Social</u>: 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. <u>Urban design:</u> No differentiation between each option with regard to urban design. <u>Land requirement:</u> 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 A & C is preferred. There is not likely to be any full purchases, but some improvements and businesses (lessees) may be impacted. <u>Health and Wellbeing:</u> 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. Natural hazards: No differentiating factors between the options with regard to natural hazards.
	Economic Utilities: No differentiators between options. Works on most existing utilities will be required with all three options. 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 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).

12.4.2 Partner 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.

A 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 East arterial 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 Waihoehoe Road East Arterial, Ponga Road Arterial and Opāheke 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 West was not given however feedback from respondents on Social Pinpoint was generally neutral, and there was general support for roundabouts over signalised intersections.

12.4.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including manawhenua and Auckland Council, a preferred option for Waihoehoe Road East 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 option has less property impacts overall as less dwellings are impacted due to the alignment adjoining larger parcels used for farming or and existing dwellings are sufficiently set back from the road and proposed works.
- Widening to the north at the western end of the alignment enables consistency in which side of the road is widened with the preferred option of Waihoehoe Road West.

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.

All route refinement options provided the same level of achievement against the Investment Objectives as outlined in Table 12-5.

12.4.4 Discounted Options

The following table summarises the reasons for discounting Option C.

Table 12-6 Discounted Options - Waihoehoe Road East

Option	Reasoning
Option C	This option was discounted for the following reasons: • Does not enable consistency in which side of the road is widened with the preferred option of Waihoehoe Road West. • Temporary traffic management during construction more complex

12.4.5 Intersection Form

Along this corridor, there are four intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 12-7, outlining the recommended outcomes for each.

Table 12-7 Waihoehoe Road East Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints/Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Opāheke N-S FTN Arterial / Waihoehoe Intersection included within the Waihoehoe Road West Corridor. See Section 12.3.5**.**								
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		

12.5 Waihoehoe Road Summary

As outlined, through the assessment process and feedback from project partners including manawhenua and Auckland Council the preferred options were identified. For Waihoehoe Road West FTN Arterial Upgrade is to widen generally to the north (Option A). The preferred option for Waihoehoe Road East Arterial 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 a signalised intersection be implemented at the Waihoehoe Road intersection with Great South Road. Roundabouts were recommended at the Waihoehoe Road intersections with Opāheke N-S, Appleby Road and Cossey Road.

13 Opāheke North South Frequent Transit Network Arterial

13.1 Overview

13.1.1 IBC assessment summary

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 IBC to DBC Gap analysis summary

A gap analysis was undertaken for Opāheke N-S FTN Arterial as described in Section 4.2. The below provides a summary on the outcomes of this gap analysis.

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

- The intended future land use along the corridor (as per AC's Drury-Opāheke 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 Opāheke 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 Opāheke N-S FTN Arterial between SH1 in the east and the proposed Mill Road corridor in the west. It also examined whether an Opāheke N-S FTN Arterial should retain the intersections with Hunua Road in the north and Fitzgerald Road in the south.

The Otūwairoa Stream floodplain is the major constraint to development in the Drury-Opāheke area and is not included as developable area in the Drury-Opāheke 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 Opāheke 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 Opāheke to Papakura for walking, cycling and private motor vehicles.

The Opāheke 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-Opāheke 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 Opāheke 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 Opāheke 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 Opāheke 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 4.3, a form and function assessment was undertaken for the Opāheke North-South FTN Arterial. Table 13-1 provides a summary of the assumptions and outcomes of the assessment.

Table 13-1 Opāheke North-South FTN Arterial Form and Function Assumptions and Summary

N-S Arterial (Hunua to Waihoehoe)		
Criteria	**Summary**	**Comments**
Place and Movement	P1	Place value classified as P1 using the RASF typology. This typology is justified based on majority of the route passing through low/medium density residential, industrial at the northern end and some medium/high density residential in the southern section.
	M2	Movement value classified as M2 using the RASF typology. This typology is justified 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, and 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.
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	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.

N-S Arterial (Hunua to Waihoehoe)		
Criteria	**Summary**	**Comments**
Freight	No priority	Not a strategic freight route. However, Drury town centre is identified as a future freight generating area but also a minor future freight area nearby. Mill Road which is also NS arterial is like to carry more freight traffic.

13.2 DBC Option Development

The Opāheke 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 Opāheke 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 Opāheke North-South FTN Arterial section are shown in Figure 3-4.

13.3 DBC Option Assessment

13.3.1 Assessment

The assessment undertaken for Opāheke N-S FTN Arterial follows the processes previously discussed in Section 5. 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 3-4. 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.

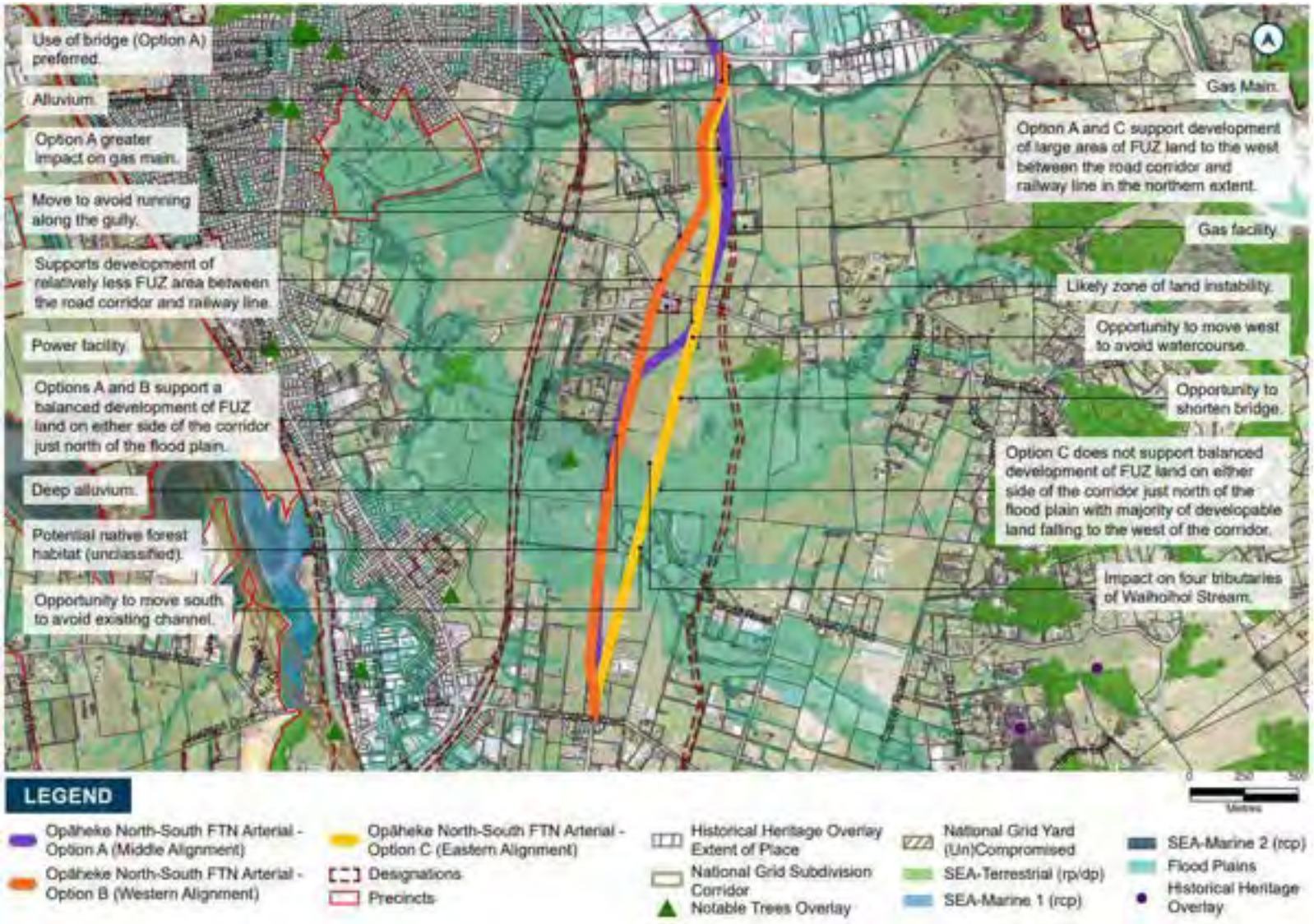


Figure 13-3 Indicative alignment of Opāheke North-South Options for route refinement showing constraints and considerations

Table 13-2 Opāheke North-South 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 landuse		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 Opāheke N-S FTN Arterial Options Assessment Findings Summary

Opāheke North-South FTN Arterial Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives and there is no differentiation between the three options with regard to these objectives. ***Enable quality urbanisation in the Drury-Opāheke growth area by providing and additional N-S arterial connection between proposed centres*** The Opāheke 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-Opāheke 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 Opāheke 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 Opāheke N-S FTN Arterial on the other hand supports network resilience by attracting more of the local Drury/Opāheke 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 IO2 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-Opāheke 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	**Historic 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 <u>Social Cohesion:</u> 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. <u>Urban Design:</u> 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. And 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. 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 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 to cross a floodplain. However, Option A crosses the flood plain further west than Option C and it avoids some of the gully filling effects/culverts for both Options B and C. Ecology: impacts scored low adverse impact (-2) for all options. 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). Option C crosses more tributary streams therefore likely a minor increase the requirements for construction access and environmental protection.
Opportunities	• Future opportunities 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 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 Opāheke-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.

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 Local projects area on the draft preferred option for the Opāheke 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 Opāheke 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 Opāheke 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 Investment Objectives as outlined in Table 13-3.

During 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

13.3.4 Discounted Options

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

Table 13-4 Discounted Options - Opāheke North South 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 in the gully. • This option has geotechnical constraints that may impact construction times for fill embankments. • This option crosses more tributary streams which would likely cause a minor increase in the requirement for access and environmental protection

13.3.5 Intersection Form

Along this corridor, there are three intersections to be upgraded. A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 13-5, outlining the recommended outcomes for each.

Table 13-5 Opāheke 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		
Opāheke N-S Arterial / Hunua Intersection	Opāheke 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		
Opāheke N-S Arterial / Walker Road Intersection	Opāheke 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-Opāheke Structure Plan.	Roundabout
	Walker Road (East-West) ← →	2	<50km/h	Low	Med	Low		
Opāheke N-S Arterial / Ponga Road 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
	Opāheke N-S Arterial ↓↑	4	50km/h	FTN	Med	Med		
Opāheke N-S Arterial / Waihoehoe Intersection included within the Waihoehoe Road Corridor. See Section 12.3.5.								

13.4 Opāheke North South FTN Arterial Summary

As outlined, through the assessment process and feedback from project partners including manawhenua and Auckland Council, the preferred option for the Opāheke N-S FTN Arterial Upgrade is Option A (central alignment) with some small design changes made during design refinement to ensure impacts on streams and existing utilities are minimised and known poor ground conditions are avoided where possible.

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

14 Ponga Road Arterial Upgrade

14.1 Overview

14.1.1 IBC assessment summary

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 Opāheke and Ponga Roads at the short list stage.

Although the upgrade of Ponga Road was identified to potentially affect a large number of properties, particularly through earthworks, and works would be required in a floodplain and require stream crossings , the upgrade of Ponga Road was recommended through the IBC because, in combination with Opāheke 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 than 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 14-1: IBC Drury East Long List Options



Figure 14-2: IBC Drury East Short List Options

14.1.2 IBC to DBC Gap analysis

A gap analysis was undertaken for Ponga Road as described in Section 4.2.

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-Opāheke 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, Opāheke Road and the new Opāheke 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.

14.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the Ponga Road Arterial Upgrade. Table 14-1 provides a summary of the assumptions and outcomes of the initial assessment for Ponga Road and Opāheke Road.

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

Ponga Road		
Criteria	**Summary**	**Comments**
Place and Movement	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
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 Opāheke Rd, which is identified to form part of the primary cycle network

Ponga Road		
Criteria	**Summary**	**Comments**
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.

14.2 DBC Option Development

Route refinement for the Ponga Road Arterial Upgrade included specialist assessment of three options from Opāheke 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 Arterial Upgrade are shown in Figure 14-3.

14.3 DBC Options Assessment

14.3.1 Assessment

The assessment undertaken for Ponga Road follows the route refinement assessment processes previously discussed in Section 5. The three options were assessed qualitatively against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 14-3 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.

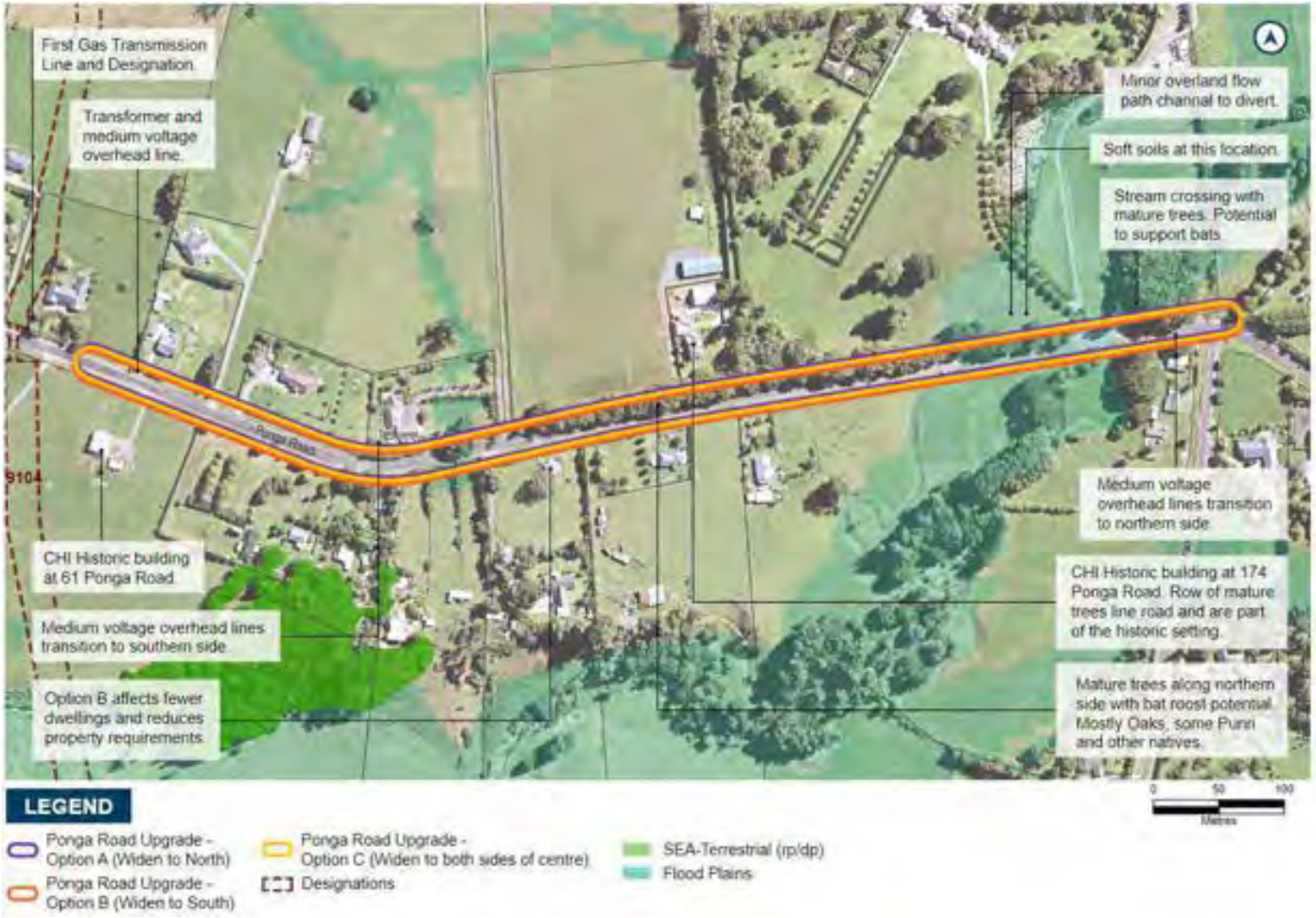


Figure 14-3 Indicative alignment of Ponga Road Options for route refinement showing constraints and considerations

Table 14-2 Ponga Road Options Assessment Findings Summary

Ponga Road: Arterial Upgrade Options Assessment Findings Summary	
Performance against investment objectives	Note: All three options achieve the investment objectives 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 Opāheke Area.*** The Opāheke/Ponga corridor provides a multimodal link between the Opāheke 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 IO1 were not significant in determining the preferred option, although, Option A for Opāheke 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 & Opāheke by providing high quality, safe and attractive PT and active mode facilities on Opāheke/ Ponga Road corridor*** The form of this corridor supports IO2 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	**Historic heritage** Option B is preferred, with minor redesign 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 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 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 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 shouldn't 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	• 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).

14.3.2 Partner 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 mana whenua about the options. Manawhenua raised an area of interest in the high section of Ponga Road (out of the project area).

A 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 Waihoehoe Road East Arterial, Ponga Road Arterial and Opāheke 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 Ponga Road was not given however feedback from respondents on Social Pinpoint was generally neutral, and there was general support for roundabouts over signalised intersections.

14.3.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including manawhenua and Auckland Council, a preferred option for Ponga Road 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 (trees may support roosting 'Threatened: Nationally Critical' long tailed bats), 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 Investment Objectives as outlined in Table 14-2.

14.3.4 Discounted Options

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

Table 14-3 Discounted Options - Ponga Road

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

14.3.5 Intersection Form

Along this corridor, there is one intersection to be upgraded at Opāheke N-S FTN Arterial and Opāheke Road. This intersection is included in the Opāheke N-S FTN Arterial corridor and is assessed in Section 13.3.5.

14.4 Ponga Road Summary

As outlined, through the assessment process and feedback from project partners including manawhenua and Auckland Council, the preferred option for the Ponga Road Arterial Upgrade is Option B, widening to the south of the existing road corridor to ensure impacts are minimised where possible.

Through the intersection form assessment it was recommended that a roundabout be implemented at the Ponga Road intersection with Opāheke N-S FTN Arterial and Opāheke Road.

15 Opāheke Road Arterial Upgrade

15.1 Overview

15.1.1 IBC assessment summary

TFUG recommended upgrading Opāheke Road. At the IBC, a number of new and upgraded arterials were investigated in Opāheke and Drury east. This included the upgrade of Hunua and Boundary Roads as well as the upgrade of Opāheke Road and Ponga Road at the short list stage. Upgrade of Opāheke Road included removal of a level crossing, which was identified as making the road run more efficiently (particularly for public transport) and to address safety concerns. It provides access to the proposed Opāheke N-S FTN Arterial and continuing onto Ponga Road it provides access to the proposed Mill Road corridor and supports high demand for bus trips on Opāheke Road. The upgrade of Opāheke and Ponga Roads (AR 7 as shown in Figure 15-2) 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 Opāheke Road could potentially affect a large number of properties, particularly through earthworks, and that works in a floodplain and stream crossings would be required. The Opāheke Road connection was generally supported in public consultation.

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

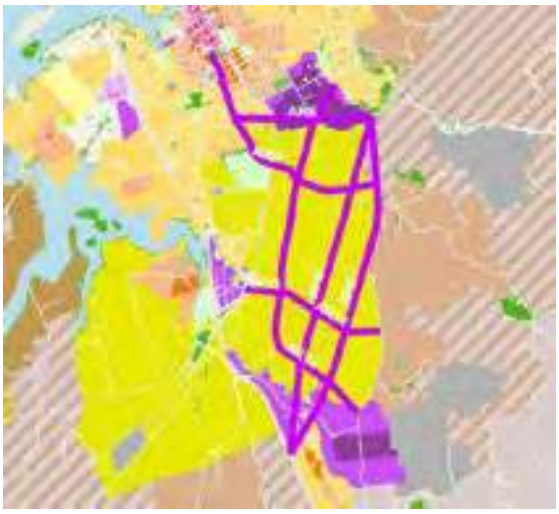


Figure 15-1: IBC Drury East Long List Options



Figure 15-2: IBC Drury East Short List Options

15.1.2 IBC to DBC Gap analysis

A gap analysis was undertaken for Opāheke Road as described in Section 4.2.

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

- The intended future land use along the corridor (as per AC's Drury-Opāheke 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 Opāheke Road needs to be aligned with development of the proposed Mill Road corridor, Ponga Road and the new Opāheke N-S FTN Arterial
- Development has begun at Bellfield Estate Special Housing Area to the west of Opāheke Road
- Preliminary concept plans for Opāheke Park 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.

15.1.3 Corridor Form and Function Assessment

Following the methodology summarised in Section 4.3, a form and function assessment was undertaken for the Opāheke Road Arterial Upgrade. Table 15-1 provides a summary of the assumptions and outcomes of the initial assessment for Opāheke Road.

Table 15-1 Opāheke Road Form and Function Assumptions and Summary

Opāheke Road		
Criteria	**Summary**	**Comments**
Place and Movement	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, currently primarily low-density residential (little variation), uncertain if 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 with only route 374 running in every 10 mins during peak periods.

Opāheke Road		
Criteria	**Summary**	**Comments**
Active Modes	Protected Cycle lanes & Footpath on both sides	Segregated paths planned for active mode. Opāheke 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.

15.1.3.1 Opāheke Road urban: Two Lane Cross Section Assessment (20m vs. 24m)

Opāheke 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 Opāheke 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.

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 Opāheke Road were assessed. The assessment recommended a departure from a 24m cross section along the Opāheke 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
- The cost for property acquisition is high at around $25-30M, and the additional widening is not considered to deliver sufficient benefit to justify this 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 Opāheke 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 Opāheke 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 Opāheke Road Rural corridor (Section 15.2), and one for the route refinement of the Opāheke Road / Settlement Road intersection which forms part of the Opāheke Road Urban corridor (Section 15.3).

15.2 Opāheke Road Rural

15.2.1 DBC Option Development

The Opāheke Road Rural section 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 Opāheke Road Arterial Upgrade are shown in Figure 15-3.

15.2.2 DBC Options Assessment

15.2.2.1 Assessment

The assessment undertaken for Opāheke Road Rural follows the processes previously discussed Section 5. The three options were qualitatively assessed against the MCA framework by each subject matter expert. Considerations made and constraints identified are shown in Figure 15-3 and Table 15-2 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.

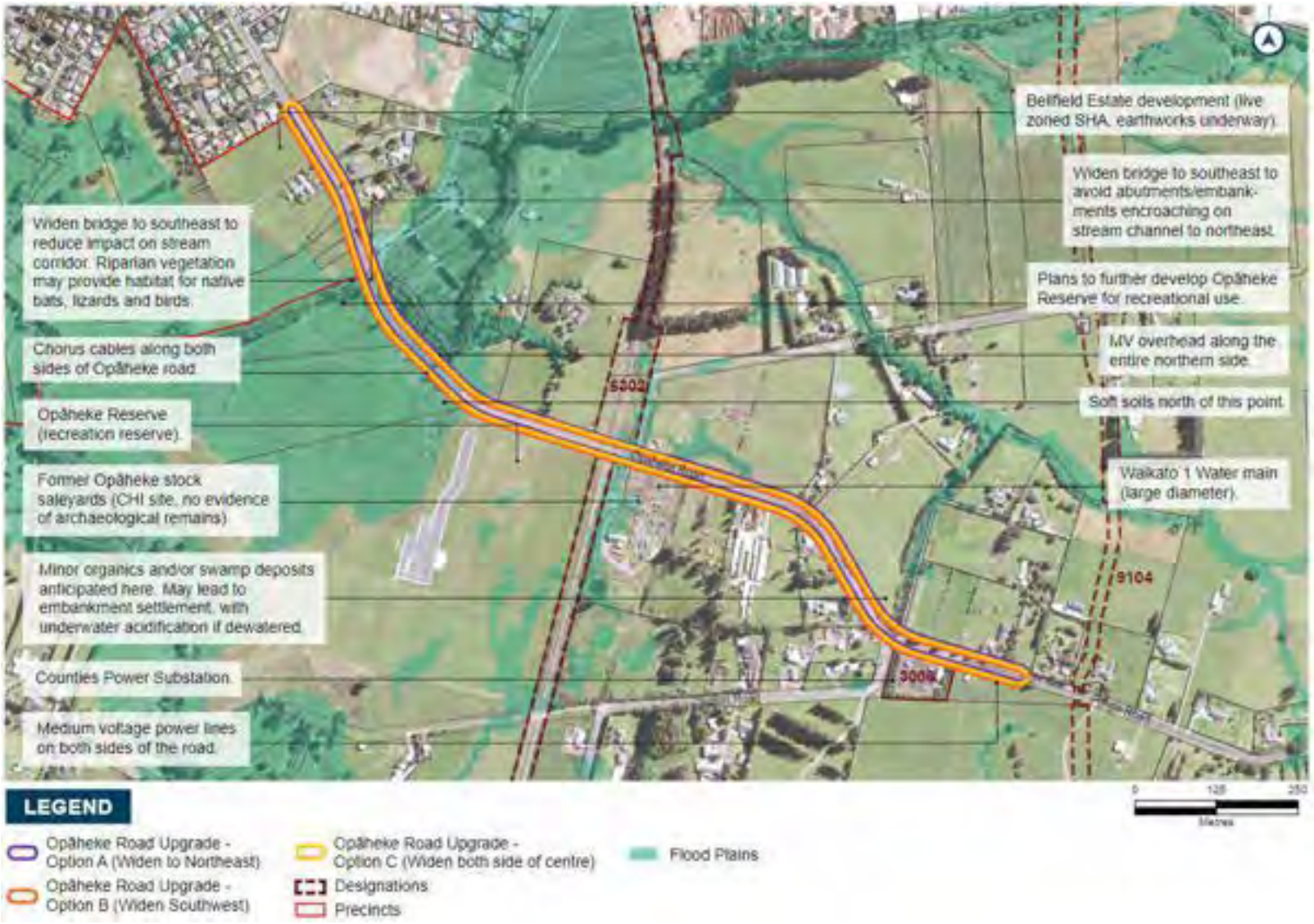


Figure 15-3 Indicative alignment of Opāheke Road Rural Options for route refinement showing constraints and considerations

Table 15-2 Opāheke Road Rural Options Assessment Findings Summary

Opāheke Road Rural : Arterial Upgrade Options Assessment Findings Summary	
Performance against investment objectives	***Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Opāheke Area.*** The Opāheke/Ponga corridor provides a multimodal link between the Opāheke 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 IO1 were not significant in determining the preferred option, although, Option A for Opāheke 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 & Opāheke by providing high quality, safe and attractive PT and active mode facilities on Opāheke/ Ponga Road corridor*** The form of this corridor supports IO2 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. 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 is assessed and recorded by a built heritage specialist to determine its heritage significance and establish a permanent record of the structure.
	Social 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 Opāheke 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 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 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, particularly advantageous for bridge structures. Option A or B are preferred. However, widening both sides decreases the scale of property access modification work required.
Opportunities	• The upgrade of Opāheke Road presents the opportunity to enhance the connections with Otūwairoa 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.

15.2.2.2 Partner 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.

A 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 Opāheke 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 Opāheke 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.

15.2.2.3 Preferred Option

Following the MCA assessment and consideration of feedback received from project partners including manawhenua and Auckland Council, a preferred option for Opāheke Road Rural 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 impacts on live-zoned property and special housing area to the southwest that is currently under development.
- Has less impact on Auckland Council Parks land (recreational uses) 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 Investment Objectives as outlined in Table 15-2.

Following identification of the preferred option, discussions with Watercare identified that 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. Moving the alignment north at this location also reduces impacts on the recently upgraded Opāheke Sports Fields and provides construction benefits of being able to construct the rail bridge offline (reducing traffic disruption during construction).

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

1. Utilise the existing Opāheke 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 Opāheke 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.

15.2.2.4 Discounted Options

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

Table 15-3 Discounted Options - Opāheke Road Rural

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

15.2.2.5 Intersection Form

Along this corridor, there are two intersections to be upgraded A summary of the assessment (described in Section 6) undertaken for these intersections is shown in Table 15-4, outlining the recommended outcomes for each

Table 15-4 Opāheke Road Rural Arterial Intersection Form Assessment

Intersection		Form		Modal Priority			Justification/Constraints /Triggers	Preferred Intersection Form
Name	Arms	Lanes	Speed	PT	Active Mode	Freight		
Opāheke Rd / Bellfield Development	Opāheke 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		
• **Opāheke N-S FTN Arterial / Opāheke Road Intersection included within the Opāheke N-S Arterial Corridor. See Section 13.3.5.**								

15.2.2.6 Opāheke Road NIMT Rail Crossing

The Opāheke Road Arterial 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 15-5 set out this process and outcomes.

Table 15-5 Opāheke Road NIMT Rail Crossing Decision Tree Options Assessment

Decision #	Decision to be made	Decision / reasons
1	Does the Opāheke 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 Opāheke 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 Opāheke N-S FTN Arterial Hunua Road if the Opāheke 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 Opāheke 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.

15.3 Opāheke Road Urban – Opāheke / Settlement Intersection

15.3.1 DBC Option Development

The Opāheke Road Urban corridor will be upgraded 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 Opāheke Road / Settlement Road intersection. Therefore, options were developed for the Opāheke 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 (Opāheke Road)

The four options for the Opāheke Road / Settlement Road intersection are shown in Figure 15-4 to Figure 15-7.



Figure 15-4 Option A – Signalised intersection with active modes

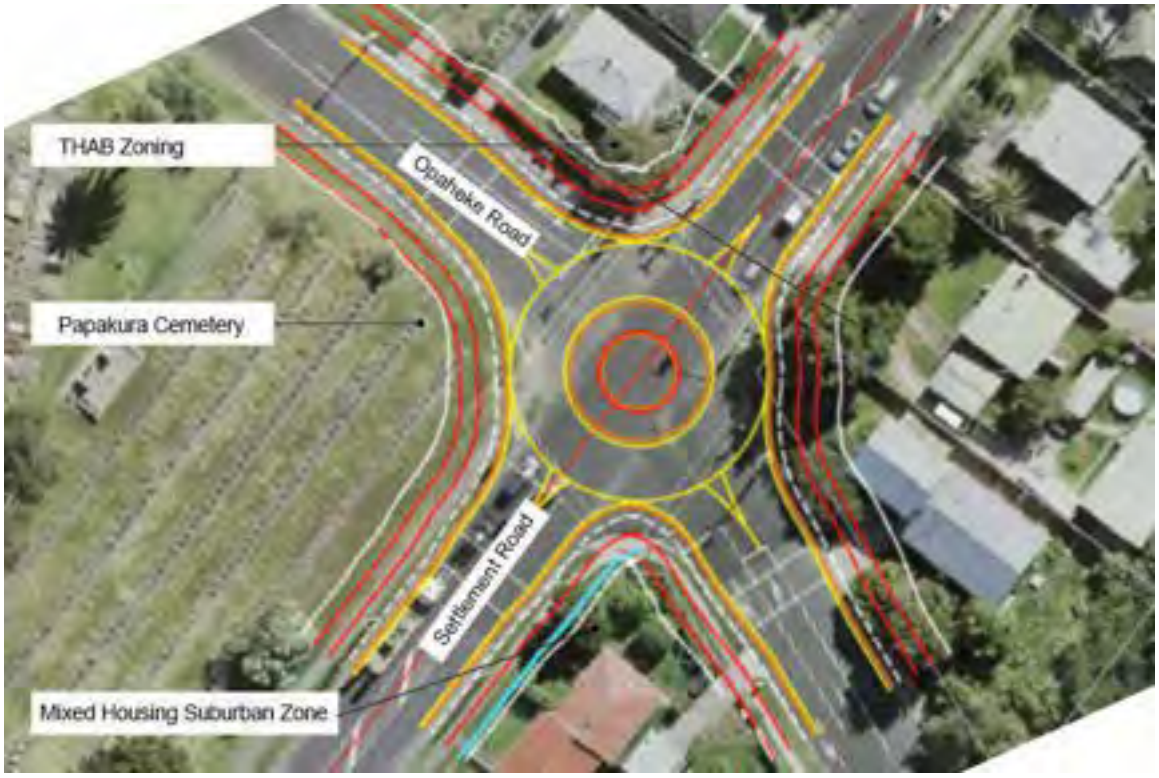


Figure 15-5 Option B – Roundabout in centre of existing intersection



Figure 15-6 Option C – Roundabout on eastern side (Settlement Road)



Figure 15-7 Option D – Roundabout on southern side (Opāheke Road)

15.3.2 DBC Options Assessment

15.3.2.1 Assessment

The assessment undertaken for Opāheke Road Urban follows the processes previously discussed Section -5. The four options were qualitatively assessed against the MCA framework by subject matter experts. Table 15-6 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.

Table 15-6 Opāheke Road Urban Options Assessment Findings Summary

Opāheke Road Urban: Opāheke Road / Settlement Road intersection Options Assessment Findings Summary	
Performance against investment objectives and Transport matters	Overall all the options align well with the investment objectives 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 IO2 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 Opāheke 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	**Historic 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 body plots.
	Social 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 body 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 and Land use integration: When looking at 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. With regard to 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.

15.3.2.2 Partner 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 body 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 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 AC have a preference for a 3-5m set back of built structures from memorials and body 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 body 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 body plots should be contacted if the Cemetery is impacted.

15.3.2.3 Further 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 body plots informed by Auckland Council, the following compromise of active mode facilities from the AT agreed 5.25m width would need to be made:

- Only a 3.3m shared path could be provided on the north western corner adjacent to the body plots
- A reduction to 4.25m wide separated facilities further north adjacent to the body plots on Opāheke Road
- On the north east corner on the opposite side of the cemetery, a reduction to 4.5m adjoining 14 Opāheke Road.

Option D does not compromise the active mode facilities.

[redacted]

[redacted]

[redacted]

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

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.

15.3.2.4 Preferred Option

Following further investigation and engagement with project partners, a preferred option for the Opāheke 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 Opāheke Road/ Settlement Road intersection. The preferred option was chosen because:

- It meets investment objectives (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 the Papakura rail 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.

15.3.2.5 Discounted Options

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

Table 15-8 Discounted Options - Opāheke Road / Settlement Road Intersection

Option	Reasoning
Option A	This option was discounted for the following reasons: • Lower level of safety for road users • Option A would lock in a sub-standard facility • Requires works within the Papakura Cemetery • Does not have sufficient space to accommodate the active modes upgrade as well as adequate berm and kerb space required. • Proximity to body plots – would require approval from Local Board and Auckland Council. Consultation with Returned Services Association and potentially the family of the adjacent body plots. • Takes slivers off the properties which looks to leave them not very viable for the owners for future development (in THAB zone).
Option B	This option was discounted because the significant impacts on body 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 development potential and support of the future land use • Unlikely to be an appropriate intersection treatment due to the sharp turn radius in the south-western quadrant

15.4 Opāheke Road Summary

As outlined, through the assessment process and feedback from project partners including manawhenua and Auckland Council, the preferred option for the Opāheke Road Rural Arterial 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 Opāheke Road Rural it was recommended that roundabouts be implemented at the Opāheke Road intersections with Bellfield Estate and Opāheke N-S FTN Arterial and Ponga Road.

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

16 Preferred Network

The preferred network for the Drury Local DBC is outlined in Table 16-1 and illustrated in Figure 16-1.

Table 16-1 Drury Local DBC Preferred Network

Project	Recommended Option
SH22 Arterial Upgrade	Combined Options A, B and C.
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 Upgrades	
Waihoehoe Road West FTN Upgrade	Option A – widen to the north
Waihoehoe Road East Upgrade	Combined Option A and B – widen to the north and south
Opāheke North-South FTN Arterial	Option A – central alignment
Ponga Road Upgrade	Option B – widen to the south
Opāheke Road Arterial Upgrades	
Opāheke Road Rural Upgrade	Option A – widen to the northeast
Opāheke Road Urban Upgrade – Opāheke Road / Settlement Road intersection	Option D – southern roundabout on Opāheke Road

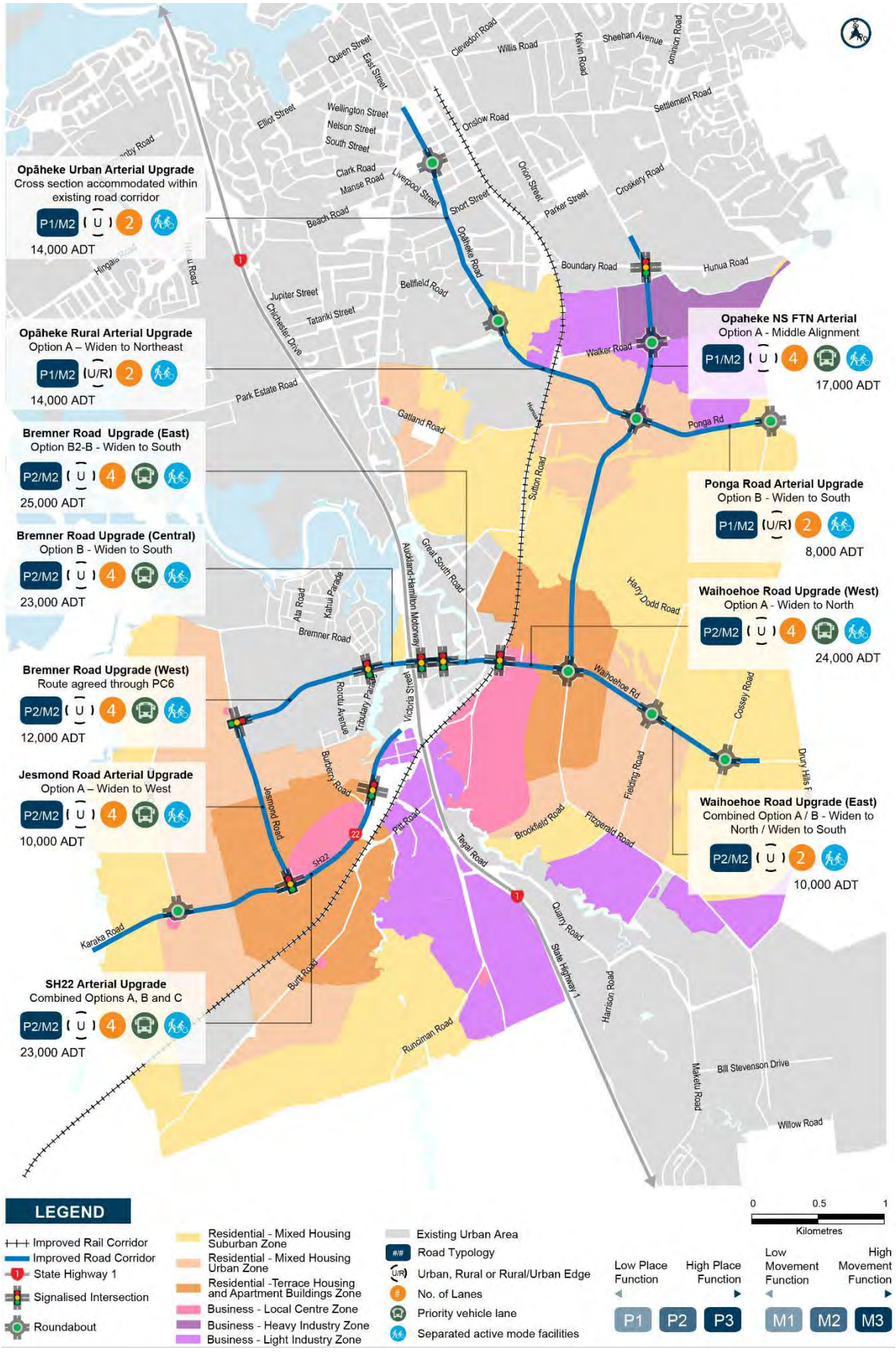


Figure 16-1 Recommended Drury Local DBC Network showing Drury-Opāheke Structure Plan

Supporting Growth

South

Drury Local DBC

Appendix B - Transport and Economics Report



Version 0.2

23 October 2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Document Status

Responsibility	Name
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Revision Status

Version	Date	Reason for Issue
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0.2	21/10/2020	Minor updates following AT and Waka Kotahi review
0.3		

Disclaimer

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

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Appendices

Appendix 1. Transport Modelling Specifications

Appendix 2. Land Use Scenarios

Appendix 3. Economic Assessment Further Details

Acronyms

Acronym	Description
ADT	Average Daily Traffic (number of vehicles per day)
ALT	Alliance Leadership Team
SATURN	Meso-simulation modelling software package used for transport assessment – Simulation and Assignment of Traffic to Urban Road Network
AMP	Alliance Management Plan
AMT	Alliance Management Team
AT	Auckland Transport
BFG Legal	Bell Gully Buddle Findlay JV
FUZ	Future Urban Zone
FULSS	Future Urban Land Supply Strategy
GIS	Geographic Information System
IPAA	Interim Programme Alliance Agreement
KPI	Key Performance Indicator
MSM	Macro Strategic Model
NOP	Non-Owner Participant (Aecom, Beca, Bell Gully, Buddle Findlay)
NZTA	New Zealand Transport Agency
OP	Owner Participant
PAA	Programme Alliance Agreement
PAB	Programme Alliance Board
PCG	Project Control Group
PMO	Programme Management Office
PT	Public Transport
QoS 1	Quality of Service 1
RT	Rapid Transit
SGA	Supporting Growth Alliance

1 Introduction

1.1. Purpose and scope of the report

This report has been prepared for the Drury Local Detailed Business Case (DBC) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (the Transport Agency). The purpose of this transport and economic assessment report is to summarise the assessment undertaken to support the Drury Local DBC. This includes the assessment process and transportation evidence to reach the recommended network. It also details how the recommended network influence investment objectives and concurrently how it translates to economic value.

Like the rest of the DBC, this report is targeted at informing a decision to proceed to Route Protection. This means it has a greater focus on flexibility and concepts rather than the more detailed analysis that could be expected for a project being prepared for imminent implementation. This report focusses on transportation issues, with the more detailed description of the option assessment process described in the Assessment of Alternatives Report.

The Drury Local DBC proposes an urban arterial network to support the expected future growth in Drury-Opāheke. The recommended network includes provision for general traffic, walking and cycling, and frequent public transport. Overall, it aims to improve connectivity within and through the Drury-Opāheke area, providing high quality, safe and attractive transport environments.

It comprises of five separate projects which together form the strategic transport network as shown below:

- State Highway 22 (SH 22) Urban Arterial Upgrade
- Jesmond to Waihoehoe East FTN Arterial Upgrade
- Waihoehoe Road East Arterial Upgrade
- Opāheke North-South FTN Arterial
- Ponga Road and Opāheke Road Arterial Upgrade

1.2. Report Structure

The report has been split into several sections, covering the following:

Section 2 summarises the recommended network, investment objectives defined for the Drury Local Business Case and the associated KPIs set for each of these objectives.

Section 3 summarises the transport assessment undertaken to reach the recommended network.

Section 4 summarises the economic analysis undertaken to produce the economic assessment

Section 5 includes sensitivity testing on the recommended network, by considering key risks and wider staging implications

Section 6 summarises the key outcomes and assessment matters linked to transport and economic assessment

2 Recommended Network

The following section outlines a summary of the transport assessment of the recommended network package for the Drury Local DBC. The recommended transport network for the Drury Local DBC consists of both corridor and intersection improvements which are discussed below separately

2.4 South Recommended Network

A series of Business Cases and public engagement (including corridors in Drury Package) have been undertaken over the past four years as part of a wider programme of transport initiatives needed to support the growth in this southern part of Auckland. These include:

- Transport for Future Urban Growth Programme Business Case (TfUG) (2016)
- South Indicative Business Case (IBC) (2018)
- Integrated Transport Assessment Report (2019), which fed into the Auckland Council Drury-Ōpāheke Structure Plan

The previous work identified these transport corridors for more detail analysis, which then lead this assessment process and transportation evidence to reach the recommended network suitable for route protection.

The Drury Package was developed as part of a wider programme of transport initiatives needed to support the growth in the southern part of Auckland. Those other projects have been designed to be complementary to the Drury Package and operate as an integrated network. That wider programme includes projects such as the Drury and Paerata train stations, and the Pukekohe Expressway and Mill Road corridors, as shown in Figure 2-1.

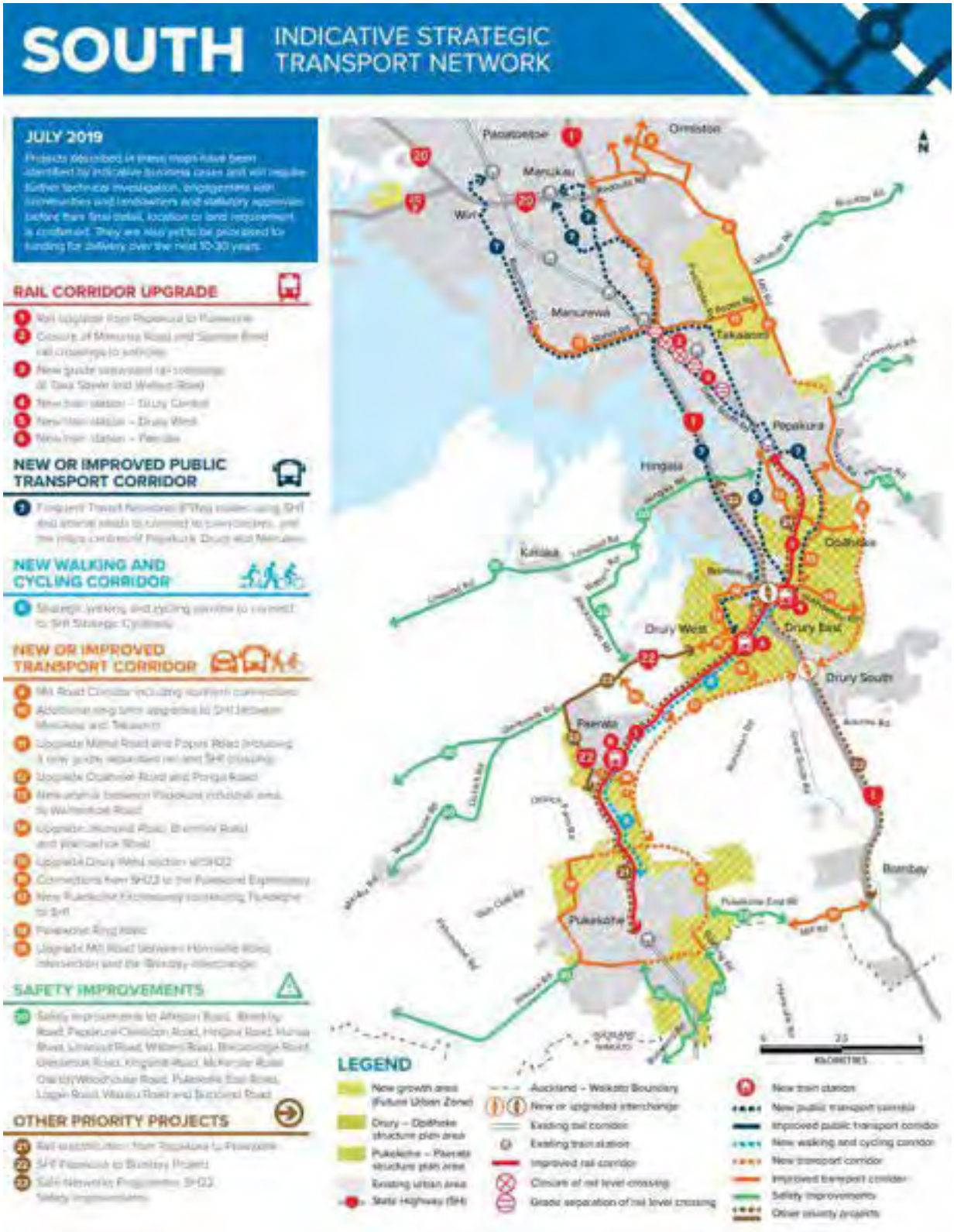


Figure 2-1: South Auckland Indicative Strategic Transport Network

2.5 Transport Corridors

The recommended network was derived as an outcome of this network planning process and provides a safe, reliable network that supports growth, offers sustainable travel choice and access to employment and social amenities. The network and corridor planning have been based on the Objectives and desired outcomes, rather than a modelling-driven 'deficiency' analysis. With the focus on long-term route protection, the analysis has assumed and/or sought some flexibility tin the exact final form of the implemented project.

The strategic transport corridors in the Drury Package can be summarised as follows:

- **The State Highway 22 (SH 22) Arterial Upgrade** consists of the widening of 3km of the existing two-lane SH 22 alignment to a four-lane arterial standard, with walking and cycling facilities between the State Highway 1 (SH1) Drury Interchange and the extent of the FUZ between Woodlyn Drive and Oira Road. The posted speed on the section is proposed to be lowered to 50kph.
- **Jesmond, Bremner and Waihoehoe West Arterial Upgrade** proposes the widening of the existing corridor to a four-lane FTN arterial standard. The new Bremner Road section proposes a new arterial road alignment from Jesmond Road in the west to the intersection with the existing Bremner Road through Auranga Development (Jesmond to Bremner Link). All proposed upgrades include dedicated walking and cycling facilities from SH22/ Jesmond to Waihoehoe West/Fitzgerald Road.
- **The Waihoehoe Road East Arterial Upgrade** consists of the widening of the existing Waihoehoe East Road alignment to a two-lane arterial standard from west of the proposed intersection with Opāheke North-South Arterial in the east to just east of Cossey Road in the east to tie into the future Mill Road corridor.
- **The Opāheke North-South FTN Arterial** is a proposed new 30m four-lane FTN arterial between Hunua Road in the north and Waihoehoe Road in the south and include dedicated walking and cycling facilities.
- **Ponga Road and Opaheke Road Arterial Upgrade** consists of the widening of the existing alignment to enable a two-lane arterial, with dedicated walking and cycling facilities from future Mill Road corridor to the extent of the Future Urban Zone near Lorelei Place in the northwest.

The detail network elements for the recommended corridors can be summarised as shown below in Figure 2-2 and Table 2-1.

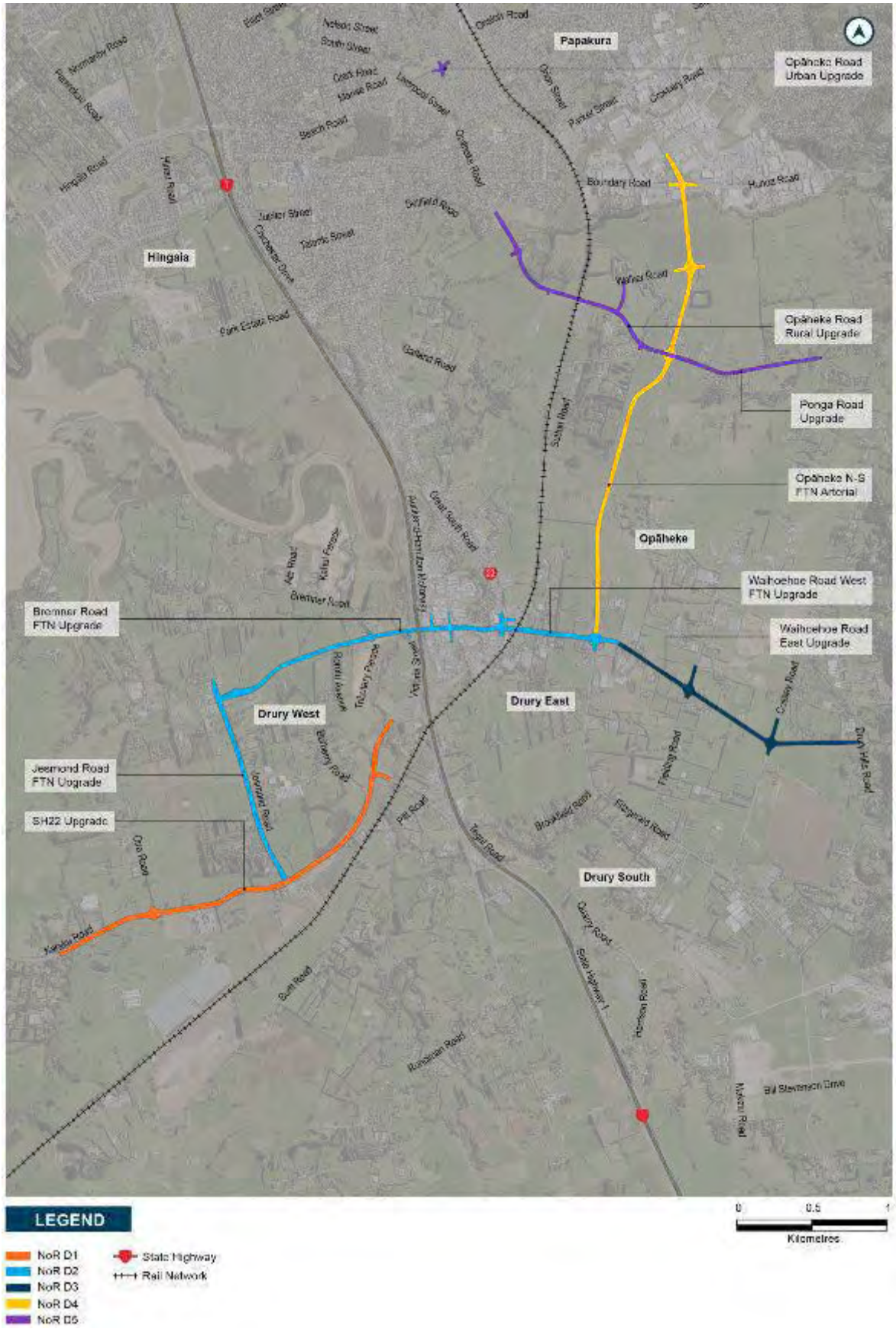


Figure 2-2 Drury Package

Table 2-1: Network Features for Recommended Corridors

Road Section	Network Features
SH22 Upgrade	- Section starts from west of Oira Road to Drury Interchange - 30m wide, 4-lane arterial corridor (divided carriageway) - Likely posted speed of 50kph - Intersection upgrades at Jesmond and Great South Road, Oira Road, crossing facilities - 1.8m footpaths on both sides - 2m wide dedicated cycle lanes - Safe corridor to support urban growth, traffic shared with Pukekohe Expressway
Jesmond Road, Bremner Road, Waihoehoe Road West Upgrade	- Section from SH22/Jesmond intersection to Waihoehoe/Fitzgerald Road - 30m wide carriageway, 4-lane cross-section - 2 lane FTN route for priority vehicles, 2 lanes for general traffic - Localised widening around intersections to increase capacity, upgrade in intersection form - Likely posted speed 50kph - 1.8m footpaths on both sides - 2m wide dedicated cycle lanes - 3m spacing for bus shelter - New widened corridor along Bremner Road-Norrie Road
Waihoehoe Road East Upgrade	- Section from Waihoehoe/Fitzgerald Road intersection to Drury Hills - 24m wide carriageway, 2-lane arterial road - Upgraded intersections forms with safe crossing facilities along the corridor - Likely posted speed 50kph - 1.8m footpaths on both sides - 2m wide dedicated cycle lanes - Strategic connections between N-S Arterial and Mill Road
Opaheke N-S Arterial Road	- Section traverses from Waihoehoe Road in south to Hunua/Boundary Road in north - 30m wide carriageway, 4-lane cross-section - 2 lane FTN route, 2 lane general traffic - Likely posted speed 50kph - New roundabouts and intersections to increase capacity, safe crossing facilities - 1.8m footpaths on both sides - 2m wide dedicated cycle lanes - 3m spacing for bus shelter
Opaheke, Ponga Road Upgrade	- Mill Road in east to Papakura section - 24m wide carriageway, 2-lane arterial road - Likely posted speed 50kph - Upgraded intersection form and facilities - Segregated walking, cycling route consistent with N-S Arterial Road

2.6 Transport Intersections

The intersections on the proposed corridors are proposed to be upgraded to provide adequate capacity to accommodate the expected growth in transport demand and provide safe crossing facilities for all users. The proposed intersection form and function for the recommended corridors are summarised below in Table 2-2.

Table 2-2: Proposed Intersections for Recommended Network

Intersection	Current Form	Proposed Form	Proposed Approach Lanes
Oira Road/SH 22	Priority	Roundabout	Multi-lane roundabout with protected walking and cycling facilities
Jesmond Road/SH 22/SH 22 North Connection	Priority	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Great South Road/SH 22	Priority	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Jesmond Road/Bremner Link	N/A	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Bremner Road/Bremner Road link	N/A	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Bremner Road/Creek Street	Give-way controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Bremner Road/Firth Street	Give-way controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Waihoehoe Road West/Great South Road	Roundabout	Signals	Multi-lane signalised intersection with protected walking and cycling facilities
Waihoehoe Road West/Fitzgerald Road/Opāheke N-S	Give-way controlled intersection	Signals	Multi-lane signalised intersection with protected walking and cycling facilities

Waihoehoe Road East/Appleby Road	Give-way controlled intersection	Roundabout	Single lane roundabout with protected walking and cycling facilities
Waihoehoe Road East/Cossey Road	Give-way controlled intersection	Roundabout	Single lane roundabout with protected walking and cycling facilities
Opāheke Road/Ponga Road/N-S Arterial	n/a	Roundabout	Multi-lane Roundabout with protected walking and cycling facilities
Walker Rd/N-S Arterial	n/a	Roundabout	Multi-lane Roundabout with protected walking and cycling facilities
Hunua Road/N-S Arterial	Priority	Signal	Multi-lane signalised intersection with protected walking and cycling facilities
Opāheke Road / Settlement Road	Signal	Roundabout	Single-lane Roundabout with protected walking and cycling facilities

2.7 Investments Objectives and KPI's

The transport assessment has been based on the investment objectives defined for the Drury Local Business Case and the associated KPIs set for each of these objectives. A consistent set of investment objectives and KPIs apply to Jesmond, Bremner and Waihoehoe Road upgrade projects as shown in Table 2-3. Table 2-4 shows a slightly varied set of investment objectives which apply to the SH22 upgrade project. A summary of the investment objective and associated KPIs which apply to the new N-S arterial project is shown in Table 2-5.

A 'bank' of KPIs and measures which link to the benefits have been developed. The benefits bank consists of themes relating to access, safety, environment, value for money and place. These five benefit themes demonstrate alignment with the GPS and the Auckland Plan. The established KPIs ensure the investment objectives and benefit themes are at the forefront of decision making.

The transport modelling undertaken establishes how each option performs when measured against the investment objectives and KPI's.

The Drury Package was developed as part of a wider programme of transport initiatives needed to support the growth in the southern part of Auckland. That wider programme includes projects such as the rail corridor upgrade to 4 tracking, the new rail stations in Drury Central, Drury West and Paerata, the Pukekohe Expressway and Mill Road Corridors. These projects have been designed to be complementary to the Drury Package and operate as an integrated network. While the transport assessment has attempted to measure the KPI's individually for each element of this package, some

KPI's are best measured for a whole Auckland network. Therefore, it is recommended that forethought should be taken when using some of the KPI's for individual elements, such as vehicle emissions.

2.7.1 Bremner, Jesmond, Waihoehoe & Opāheke/ Ponga Road Upgrade Projects Investment Objectives & Associated KPIs

Table 2-3: Jesmond, Bremner, Waihoehoe and Opāheke/ Ponga Upgrades Investment Objectives and associated KPIs

Key Performance Indicator	Measure	Outcome
Investment Objective 1: Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Opāheke area.		
KPI1a: Active modes provision	KMs of new and improved transport network with enough active mode crossings / corridor width appropriate to the known place function, built form and movement function	10 km
KPI1b: Amenity of the street	KMs of new and improved transport network with enough space for street furniture/lighting and tree planting appropriate to the known place function and built form	10 km
KPI1c: Performance of critical connections - Strategic road network	% of vehicle kilometres travelled in peak congestion (>90% v/c) in AM peak	22% in Do-min scenario 11.6% in Preferred Option
	FTN reduces delays on urban strategic corridors in AM peak	Reduces the delay on Jesmond Rd – Bremner Rd – Waihoehoe Rd route from 3mins (Do-min) to 1min 20s (Preferred Option)
	FTN reduces traffic volumes on urban strategic corridors	Reduces traffic volumes in Drury local roads by 10% (5,300 daily trips)
	Lane capacity on key corridors in BC area in AM peak	SH22 Eastbound (from Oira Rd to SH1 interchange) is at 40%-50% capacity in Preferred Option compared to 60% - 100% in Do-min scenario.
KPI1d: Change in human health	Reduction of NO_2	Preferred Option reduces 0.3 tonnes of NO_2 annually compared to Do-min.
	Reduction of PM_{10}	Preferred Option reduces 0.6 tonnes of PM_{10} annually compared to Do-min.

KPI1e: Change in emission	Reduction of CO_2	Preferred Option reduces 1,268 tonnes of CO_2 annually compared to Do-min.
	Reduction in fuel consumption	Preferred Option reduces 575 tonnes of fuel annually compared to Do-min.
KPI1f: Access to Jobs	Jobs within 30 by Car and 45 mins / 60 mins by PT from Drury in AM peak (% / No.)	In Preferred Option, the number of jobs that can be accessible within 30mins by Car are 91,200 jobs (1,700 jobs or 2% increase compared to Do-min) In Preferred Option, the number of jobs that can be accessible within 45mins by PT are 107,400 jobs (23,200 jobs or 28% increase compared to Do-min) In Preferred Option, the number of jobs that can be accessible within 60mins by PT are 313,000 jobs (94,500 jobs or 43% increase compared to Do-min)
KPI1g: Access to Local Town Centre	Catchment within 800m walk of Drury local town centre (%/No.)	2,700 dwellings within 800m walk of Drury local town centre
	Catchment within 3km cycle of Drury local town centre (%/No.)	43,000 dwellings (or 33% of all dwellings in the South region) within 3km cycle of Drury local town centre
Objective 2: 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 Jesmond Road, Bremner Road, Waihoehoe Road and Opāheke/ Ponga Road		
KPI2a: Provision of PT	KMs of new connector and FTN PT facilities	8 km in total – 4km of FTN and 4km of arterial upgrade with provision of PT
KPI2b: Quality of PT network	% of passenger kms travelled in peak congestion (>90 v/c) in AM peak	2.3% in 2016, reducing to only 0.04% for Preferred Option (2048+)
	PT travel time improvement	Jesmond Road, Bremner Road, Waihoehoe Road FTN upgrade results in a total of 8min journey time savings along the corridor
	% of hours spent in severe congestion (v/c >0,9) by PT vehiclesInvestment	10.6% in 2016, 11.8% with Drury Local Do-min (2048+), and 0.5% for Preferred Option (2048+)
KPI2c: Mode share (local and regional trips)	% Active mode share for trips in AM peak – local trips	15% - for all South region 32% - Drury area
	% PT mode share for trips in AM peak – regional trips heading to North (screen-line at Takaanini)	32% - for all South region to North 52% - Drury area to North PT mode share by buses on FTN routes in Preferred Option compared to Do-min: Jesmond Road: 8% (vs. 0% Do-min) Bremner Road: 10% (vs. 3% Do-min)

		Waihoehoe Road: 24% (vs. 7% Do-min)
KPI2d: New PT users	Number of new PT boarding's on rapid transit in BC area during AM peak (2-hour period)	1,400 new PT (bus – both directions) boarding's in the AM peak along these corridors in Preferred Option compared to 2016 scenario.
KPI2e: New Active Mode users	Number of new daily walking and cycling movements on key corridors in BC area	- Jesmond Road: + 2300 trips - Bremner Road: + 1400 trips - Waihoehoe Road: + 2500 trips - Opaheke / Ponga Road: + 1000 trips
	Number of additional cycle-km and walk-km in BC area	The Preferred Option shows an additional of 600 cycle-km and 1,500 walk-km daily compared to Do-min
KPI2f: Access to PT network	Contribution to rail patronage	- Rail patronage to Drury West station increases by 10% - Rail patronage to Drury Central station increases by 40%
	Number of PT trips to City Centre, Isthmus & North, Manukau and Airport in AM peak period (2-hour period)	In Preferred Option, PT trips from Drury to: - CBD: 1,700 trips (29% increase compared to Do-min) - Isthmus & North: 1,100 trips (31% increase compared to Do-min) - Manukau: 350 trips (40% increase compared to Do-min) - Airport: 300 trips (46% increase compared to Do-min)
KPI2g: Access to active mode network	Catchment within 500m cycle of QoS1 & QoS2 (Quality of Service 1 & 2 for Auckland Cycle Facilities)	23% of all dwellings on the South (in 2048+) are within 500m of new / upgraded arterial network, (or 30,000 dwellings)
KPI2h: Reduction in Deaths and Serious Injuries	All modes DSIs	A total of 6 DSIs in the last 10 years (2010 to 2019) - all modes (excluding SH22). In 2048+, the Preferred Option will reduce 4.5 million vehicle-km travelled per year compared to Do-min. This reduction and the proposed road design aligned with Vision Zero (AT) and Road to Zero (Waka Kotahi) will likely reduce DSIs on these corridors significantly in 2048+ .
	Active modes DSIs	2 Active mode DSIs in the last 10 years. Active mode DSIs are expected to be reduced by providing safer facilities to walking and cycling on these corridors.

2.7.2 SH22 Upgrade Project Investment Objectives and Associated KPIs

Table 2-4: SH22 Upgrade from Oira Road to Drury Interchange Investment Objectives and associated KPIs

Key Performance Indicator	Measure	Outcome
Investment Objective 1: To support imminent growth and the planned town centre in Drury by improving connectivity and accessibility along this section of SH22		
KPI3a: Access to Jobs	Jobs within 30 by Car and 45 mins / 60 mins by PT in AM peak (% / No.)	In Preferred Option, the number of jobs that can be accessible within 30mins by Car are 91,200 jobs (or 2% increase compared to Do-min) In Preferred Option, the number of jobs that can be accessible within 45mins by PT are 107,400 jobs (or 28% increase compared to Do-min) In Preferred Option, the number of jobs that can be accessible within 60mins by PT are 313,000 jobs (or 43% increase compared to Do-min)
KPI3b: Performance of critical connections - SH22	SH22 reduces delays in AM peak	SH22 Eastbound from Oaira Rd to SH1 interchange has 38s delay in Preferred Option, compared to 3mins34s delay if without SH22 Upgrade. That is an approx. of 2mins saving per vehicle in AM peak.
Investment Objective 2: Significantly reduce the risk of DSIs from private vehicle crashes and to provide a safe connection for active modes along this section of SH22		
KPI4a: Reduction in Deaths and Serious Injuries	All modes DSIs	A total of 13 DSIs in the last 10 years (2010 to 2019) - all modes (on SH22). In 2048+, the Preferred Option will reduce 4.5 million vehicle-km travelled per year compared to Do-min. This reduction and the proposed road design aligned with Vision Zero (AT) and Road to Zero (Waka Kotahi) will likely reduce DSIs on these corridors significantly in 2048+ .
	Active modes DSIs	2 Active mode DSIs in the last 10 years. Active mode DSIs are expected to be reduced by providing safer facilities to walking and cycling on SH22.
Investment Objective 3: 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		
KPI5a: Active modes provision	KMs of new and improved transport network with enough active mode crossings / corridor width appropriate to the known place function, built form and movement function	3 km

KPI5b: Amenity of the street	FTN reduces traffic volumes on urban strategic corridors	Reduces traffic volumes in Drury local roads by 10% (5,300 daily trips)
	KMs of new and improved transport network with enough space for street furniture/lighting and tree planting appropriate to the known place function and built form	3 km

2.7.3 Opāheke N-S FTN/ Arterial Project Investment Objectives and Associated KPIs

Table 2-5: Opāheke N-S FTN/ Arterial Investment Objectives and associated KPIs

Key Performance Indicator	Measure	Outcome
Investment Objective 1: Enable quality urbanisation in the Drury-Opāheke growth area by improving N-S arterial connection between proposed centres		
KPI6a: Access to Jobs	Jobs within 30 by Car and 45 mins by PT in AM peak (% / No.)	In Preferred Option, the number of jobs that can be accessible within 30mins by Car are 91,200 jobs (or 1% increase compared to No-Opāheke Scenario) In Preferred Option, the number of jobs that can be accessible within 45mins by PT are 107,400 jobs (or 11% increase compared to No-Opāheke Scenario)
KPI6b: Change in human health	Reduction of NO_2	Preferred Option reduces 29kg of NO_2 annually compared to No-Opāheke Scenario.
	Reduction of PM_{10}	Preferred Option reduces 54kg of PM_{10} annually compared to No-Opāheke Scenario.
KPI6c: Change in emission	Reduction of CO_2	Preferred Option reduces 185 tonnes of CO_2 annually compared to No-Opāheke Scenario.
	Reduction in fuel consumption	Preferred Option reduces 74 tonnes of fuel annually compared to No-Opāheke Scenario.
Investment Objective 2: Improve transport choice and network resilience by providing a safe and attractive multi-modal transport connection between Drury and Papakura		
KPI7a: Availability of alternatives to strategic connection	Every strategic network connection has an appropriate alternative to key destinations	Provides a fit-for-purpose corridor for local trips. I.e. no need to use Mill Rd or SH1 for trips within Drury and Opāheke

KPI7b: Performance of critical connections **- Strategic road network**	% of vehicle kilometres travelled in peak congestion (>90% v/c) in AM peak	14.7% in No-Opāheke scenario 11.6% in Preferred Option
	% of freight vehicle kilometres travelled in peak congestion (>90% v/c) in AM Peak and Inter peak	For Freight in AM Peak: 13.4% in No-Opāheke scenario 13.1% in Preferred Option For Freight in IP - no congestion shown in all scenarios
	Opāheke N-S reduces delays on key corridor(s) between Drury and Papakura in AM peak	Great South Road Northbound from Waihoehoe Rd to Beach Road has 5mins52s delay in Preferred Option, compared to 8mins34s delay if without Opāheke N-S. That is an approx. of 2min40s saving per vehicle in AM peak.
KPI7c: Provision of high-quality active modes network	% / KMs of new and improved cycle network achieving required QoS1 & QoS2	3 km
KPI7d: Provision of PT	KMs of new connector and RTN PT services	3 km
KPI7e: Quality of PT network	PT travel time improvement	New corridor reduces PT travel time by 4min on Opāheke N-S, and 2min45s on Great South Rd between Drury and Papakura
	% of hours spent in severe congestion (v/c >0,9) by PT vehicles	10.6% in 2016 2.6% in No- Opāheke N-S (2048+), and 0.5% in Preferred Option (2048+)
	% of passenger kms travelled in peak congestion (>90 v/c) in AM peak	2.3% in 2016 0.3% in No- Opāheke N-S (2048+), and 0.04% in Preferred Option (2048+)
KPI7f: Mode share (local and regional trip	% Active mode share for trips in AM peak – local trips	15% - for all South region 32% - Drury area
	Improve % PT mode share for AM peak trips on other FTN routes and for the region.	32% - for all South region to North 52% - Drury area to North PT mode share by buses on FTN routes in Preferred Option compared to No- Opāheke N-S scenario: Opāheke N-S: 18% (vs. 0% No- Opāheke) Jesmond Road: 8% (vs. 6% No- Opāheke) Bremner Road: 10% (vs. 8% No- Opāheke) Waihoehoe Road: 24% (vs. 18% No- Opāheke)
KPI7g: New PT users	Number of new PT boarding's on Opāheke N-S during AM peak	440 new PT (bus) boarding's along corridor
KPI7h: New Cycle users	Number of new daily walking and cycling	900 new daily walking cycling trips excluding trips to stations.

	movements on Opāheke N-S	
KPI7i: Access to PT network	Contribution to rail patronage	- Rail patronage to Drury West station increases by 10% - Rail patronage to Drury Central station increases by 40%
	Number of PT trips to City Centre, Isthmus & North, Manukau and Airport in AM peak period (2-hour period)	In Preferred Option, PT trips from Drury to: - CBD: 1,700 trips (29% increase compared to Do-min) - Isthmus & North: 1,100 trips (31% increase compared to Do-min) - Manukau: 350 trips (40% increase compared to Do-min) - Airport: 300 trips (46% increase compared to Do-min)
KPI7k: Access to active mode network	Catchment within 500m cycle of QoS1 & QoS2 (Quality of Service 1 & 2 for Auckland Cycle Facilities)	23% of all dwellings on the South (in 2048+) are within 500m of new/upgraded arterial routes, (or 30,000 dwellings)

3 Transport Analysis

This section describes the network planning undertaken to respond to the planned future growth. The methodology sets out the land use assumptions, transport network assumptions and the analysis tools and frameworks used. The network analysis sets out the operational evidence and transport network planning undertaken to reach the recommended corridors and intersections.

3.1 Methodology

This summary provides an overview of the methodology used to assess the transport network for the proposed Drury Local Package. This includes land use assumptions, transport network assumptions and the analysis tools used throughout the network planning process.

3.1.1 Land Use Assumptions

Land use data was the main input used to inform the expected growth in transport demand, which then informed the network planning. For network planning purposes, a 2048+ (full build-out of planned development) land use scenario was used to develop the recommended network, which reflects the needs for long-term transport infrastructure.

Land Use Scenarios

The development of the land use scenarios includes several inputs from future land use plans, forecasts and policies, which includes:

- Unitary Plan Zoning
- Precinct Plans
- Council Plan Changes
- Council Structure Plans, such as the Drury-Opāheke Structure Plan and the Paerata-Pukekohe Structure Plan
- Outcomes identified in the Auckland Plan, including for Homes and Places; Transport and Access; and Opportunity and Prosperity
- Strategic Framework used in Transport for Urban Growth (TfUG) (only applicable for areas with no Structure Plan)
- Master Planning by landowners through Private Plan Changes

Assessment Years

The development of the land use scenarios includes different analytical years to inform staging, economic assessments and the development of the recommended network. The different assessment years and their intended use are summarised below in **Table 3-1**.

Table 3-1: Summary of Land Use Assessment Years

Assessment Year	Network Planning and Staging	Economic Assessments	Recommended network
2016	√	√√√	√
2028, 2038 & 2048 (interim years)	√√√	√√√	√
2048+ (full build-out)	√√√	√√√	√√√

relative significance low (√), relative significance high (√√√) and base year reference (*)

The different analytical years and their intended use can be summarised as follows:

- The 2016 land-use scenarios were used as a baseline to represent the base year transport context
- The interim land-use scenarios (2028, 2038 & 2048) were mainly used for network planning, staging and economic assessments.
- The 2048+ land-use scenario was agreed with Auckland Council to be the most appropriate scenario to be used for route protection purposes. This is not a specified date but reflects the full build-out (post 2048) of planned development, which then informs the long-term infrastructure needs.

The I-11 land use forecast series was agreed by Waka Kotahi (NZTA), AT and AC as the most appropriate land use scenarios to use. This also includes the interpretation of the Future Urban Land Supply Strategy (FULSS). The inputs include Stats NZ Medium growth population forecasts and detailed demographic trends, via 64 person-categories, 8 household categories, 6 employment types and 3 educational role categories.

Based on the I-11 land use forecast series, the Auckland Forecasting Centre (AFC[1]) created each forecast scenario used by SGA for the interim and full build-out scenarios.

AFC created the forecasts for the IBC and DBC. These include the 2046+ (used in the IBC) and 2048+ (used in the DBC) datasets that include the full build-out in growth areas. Refer to Appendix 3 for further details about the difference between IBC and DBC land use scenarios.

[1] AFC = Auckland Forecasting Centre, which is a collaboration between Auckland Council, Auckland Transport and the NZ Transport Agency

3.1.2 Transport Network Assumptions

The transport network assumptions detail the network planning inputs used to undertake the transport assessment. This includes a range of committed and planned transport projects expected to be built by 2048+ to reflect the cumulative effect of growth and wider transport infrastructure investment.

The Drury, Opaheke and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the Auckland Unitary Plan (AUP) and Auckland Council have recently completed structure planning for this area, which includes planned transport projects.

The Drury – Opāheke Structure Plan developed by Auckland Council in 2019 is shown in Figure 3-1, indicating both the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) in the Drury and Opaheke area. Furthermore, there is also a range of regional projects either under construction or expect to be built by 2048+.

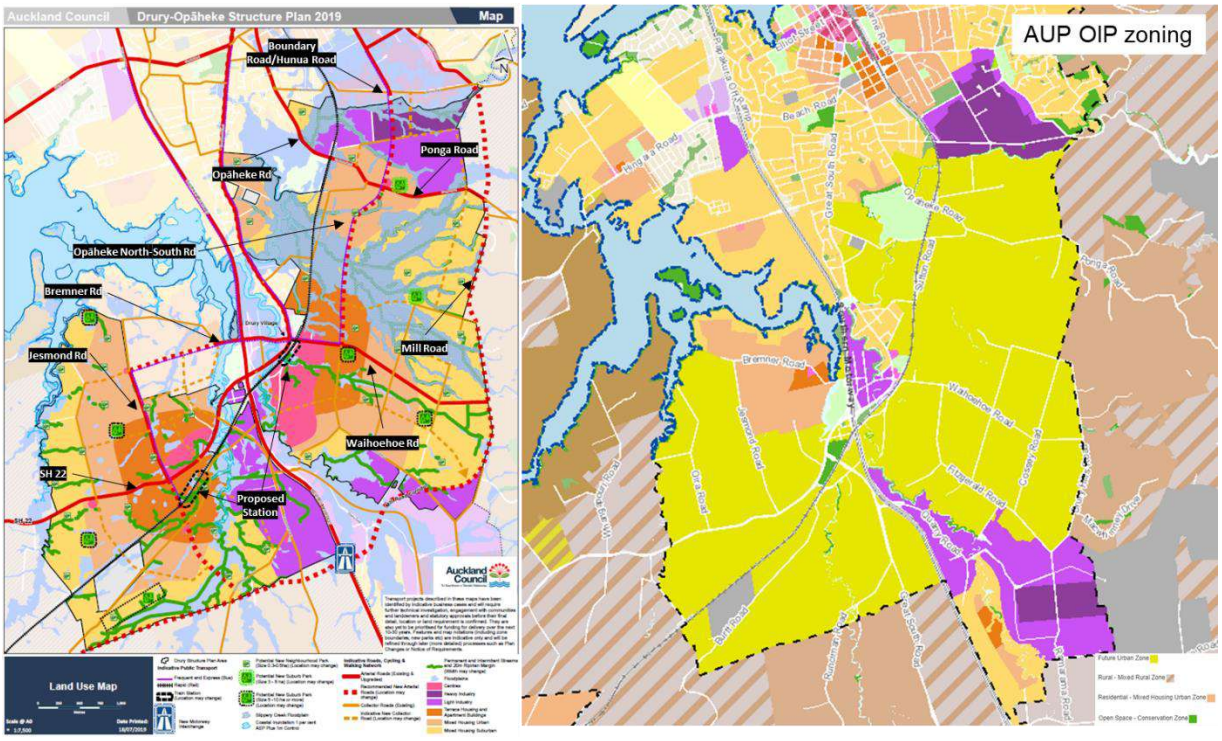


Figure 3-1: Future transport and land use adjacent to Drury Local Package

The future transport projects in southern growth areas are:

- New rail stations at Drury Central, Drury West, and associated park and ride facilities*
- New Mill Road Corridor - a strategic alternative route from Manukau to Drury in the long term, running parallel and to the east of State Highway 1 (SH1) *
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity**
- SH 22 Drury-to-Paerata (Safe Network Programme which proposes short term safety upgrades)**
- Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings)**
- Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and the NIMT***
- New rail stations at Paerata, and associated park and ride facilities***

- New Pukekohe Expressway – an alternative route to SH 22 between SH 1 (east of the proposed Drury South interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road) and connections between Pukekohe Expressway to SH22***
- State Highway 22 Upgrade ***
- Jesmond to Waihoehoe West FTN Upgrade ***
- Waihoehoe Road East Upgrade ***
- Ōpāheke North-South FTN Arterial ***
- Ponga Road and Ōpāheke Road Upgrade***
- The future collector roads indicated in the Drury – Ōpāheke Structure Plan are expected to develop through developer contributions as areas get urbanised. ***

Note: funding approved*, funding partially approved** and subject to planning and funding approvals*** (as at the date of this report).

Furthermore, the indicative future public transport up to 2048+ are shown below in Figure 3-2.

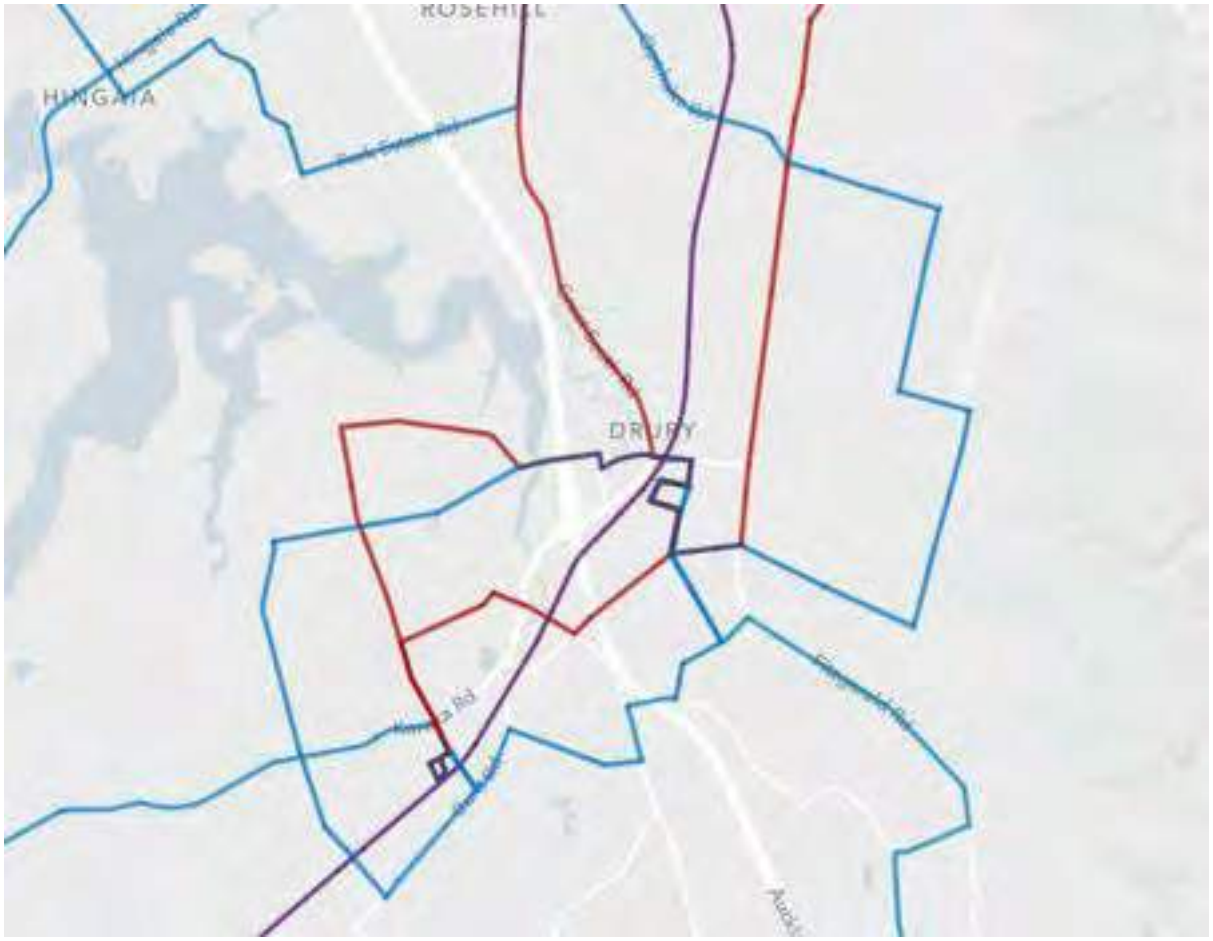


Figure 3-2: South Auckland Indicative Public Transport Network (2048+)[2]

[2] The public transport network and frequencies will evolve over time as the future urban area urbanises

3.1.3 Approach to Transport Analysis

This section provides an overview of the transport analysis approach. This includes the network planning approach, assessment tools, modelling and frameworks used to develop the recommended network.

Figure 3-3 provides an overview of the transport network assessment process, showing how each network planning translates to strategic, corridor and intersection assessments and the respective assessments tools used.

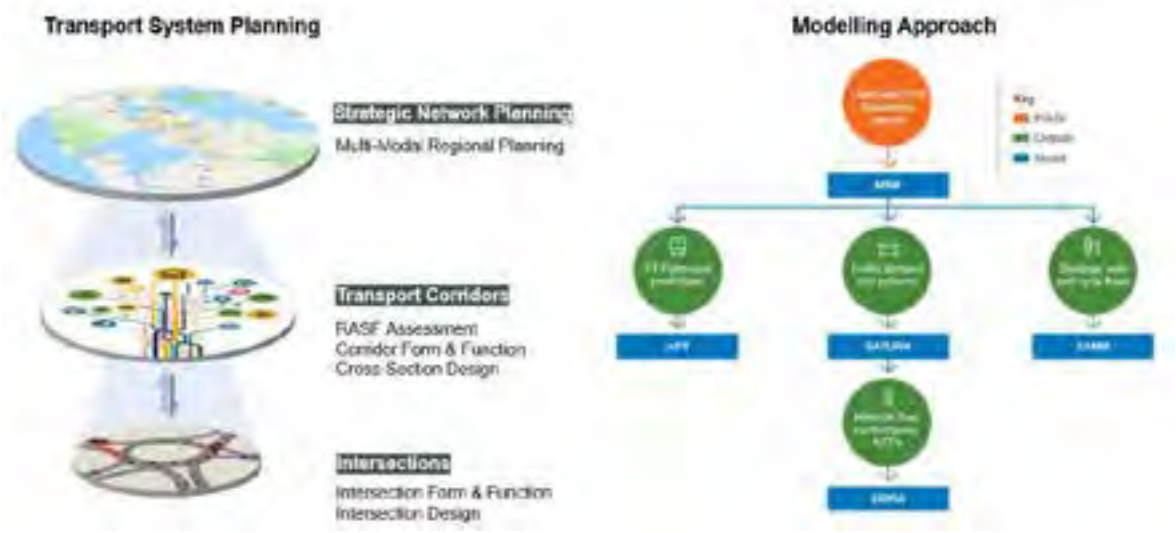


Figure 3-3: Overview of the transport network assessment

Transport System Planning

The Transport System Planning for the Supporting Growth Programme was developed as part of network planning for the wider area and concurrently with the Structure Planning undertaken by Auckland Council. The Drury Local Package is shown below in Figure 3-4 (highlighted in blue) and it also provides context for other south-wide networks being planned and delivered concurrently. Those wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the problems.

The underlying premise is to design safe transport systems (for all road users) that can respond to the timing, scale and form of urban development triggers and staging of future infrastructure corridors.



Figure 3-4: South Study Area, Drury Local Package Relative to Wider South Networks

Transport Corridors

The transport corridors for the Supporting Growth Programme was developed as part of wider system and network planning, covering multiple strategic and arterial corridors across business cases for the wider area.

The development of the corridor design involves the following:

- AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority.
- The Corridor Form Assessment Framework (CFAF) which qualitatively and quantitatively assesses each transport mode and element to define the desired corridor form and function requirements and ensure all modes are considered.
- The RASF and CFAF results were then used to develop cross-sections for each corridor in consultation with AT and Waka Kotahi to meet current design standards.

Intersection assessment

In addition to the corridor form and function, an intersection form and function assessment has been undertaken to determine a suitable footprint required for route protection.

As part of network planning, decision-making for selecting the safest intersection controls are carefully considered for each corridor on the Supporting Growth network.

The assessment of intersection form adopts a Safe System approach by recommending roundabouts as the first choice for intersections due to the safety benefits for road users resulting from slowing down through traffic and reducing the number of conflict points. Intersections are assessed against a range of site-specific factors and considers changes/ design features to meet the needs of different users safely and effectively.

The intersection form and function assessment undertaken was based on 2048+ network and land use assumptions to determine the following:

- Intersection type (roundabout or signalised) using SGA guidance to determine whether this would be a roundabout or a signal would be more appropriate route protection strategy
- Intersection size (determined by SiDRA modelling)
- Intersection design for route protection

For each intersection typology chosen, design features are also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to the site-specific factors. These factors are summarised in Figure 3-5

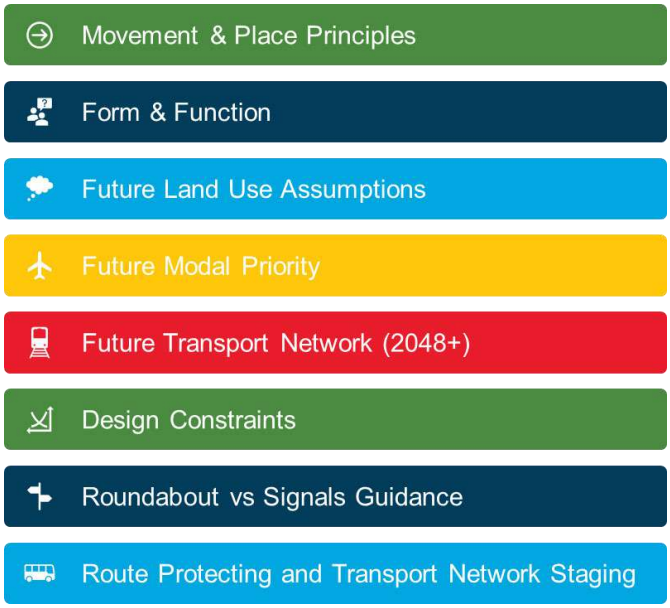


Figure 3-5 Intersection considerations

Transport Modelling

Throughout the transport analysis process, a range of different transport modelling tools has been used to undertake quantitative assessments of the transport system which informed decisions about planning transport network, corridors and intersections.

Figure 3-6 provides an overview of the modelling tools used and their interdependencies, showing the modelling hierarchy and the respective assessments tools used.

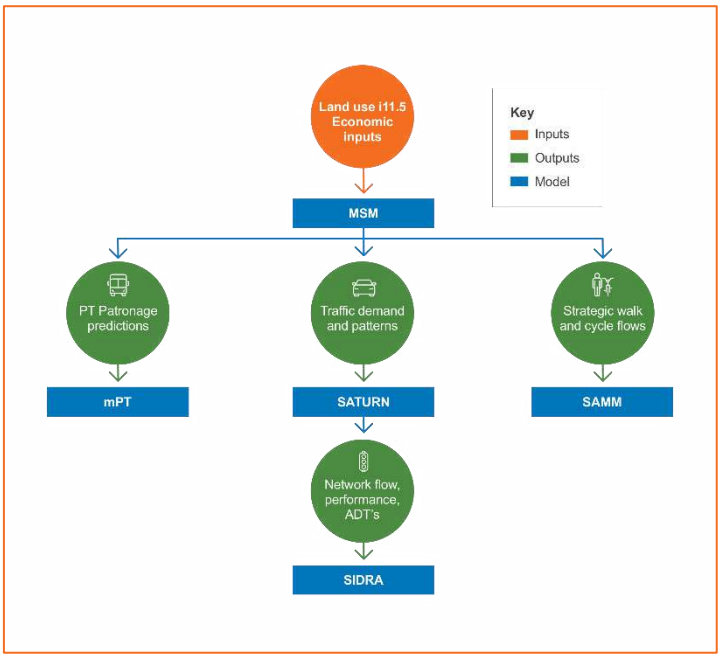


Figure 3-6: Modelling hierarchy and associated outputs

The future transport environment is assessed using forecasting transport models, owned by the Auckland Forecasting Centre (AFC). The modelling methodology undertaken for the Drury Local business case options follows the hierarchical modelling structure used previously on other major transport projects across the Auckland Region and New Zealand. This hierarchy involves key components, all of which operate with different geographical scope and network detail:

- **Strategic multi-modal models:**
  - MSM is a regional multi-modal model for Auckland, which translate land use (such as population and employment) to travel patterns (which creates estimates of car, truck and PT movements) at a strategic and region-wide level;
  - MPT is the Regional Public Transport Model linked with MSM to provide detailed PT forecasts
- **Southern sector model:**
  - The Southern Sector SATURN Model (S3M) is a mesoscopic traffic model for south Auckland (the extent of the microscopic model is from Flat Bush in the north to Pukekohe in the south). This model loads the forecasted vehicle trip patterns from MSM onto the road network to investigate the traffic effects at a more detailed level.
- **Active modes models**
  - AFC Strategic Active Modes Model (SAMM), this tool gives strategic-level estimates of walking and cycling demands.
  - SGA active modes station access model, this tool is only used to provide estimates of walking and cycling to major stations.

- **Intersection modelling**
  - SIDRA modelling has been undertaken to assess the operational outputs of key intersections along the project corridors. The demand was informed by the S3M model. SIDRA software was used for intersection modelling, traffic flows on intersections and network performance.

Appendix 1 provide more model specifications and details for each respective model package used.

3.2 Transport Network Analysis

The following section describes the transport analysis undertaken to reach the recommended network for the Drury Local DBC. This includes the network, corridor and intersection assessments set out in the assessment methodology, including:

- AT's Roads and Streets Framework (RASF)
- The Corridor Form Assessment Framework (CFAF)
- Cross-Section Design
- Intersection Form and Function.
- Intersection Design

3.2.1 Roads and Streets Framework (RASF)

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority.

The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode. The future transport and land use adjacent to Drury Local Package.

For the Drury Local Package, the Drury – Opāheke Structure Plan developed by Auckland Council in 2019 as shown in Figure 3-1, were used as the primary input to assess the movement and place value. Which set out the expected pattern of urban development and the future transport projects (subject to planning and funding approvals) in the Drury and Opaheke area.

Each corridor, within Drury Local Package was assessed based on the following:

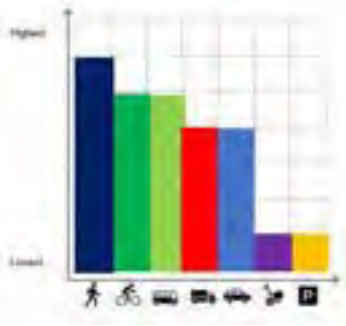
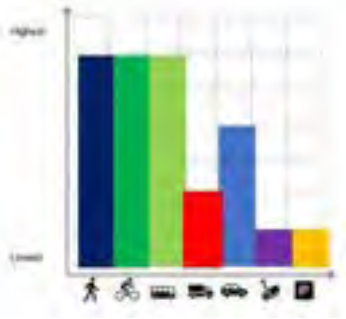
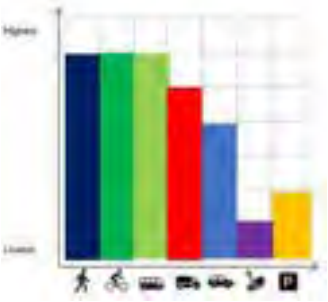
- Place function – for existing and long term 2048+
- Movement function – for existing and long term 2048+
- Modal priority – that reflect a 2048+ environment

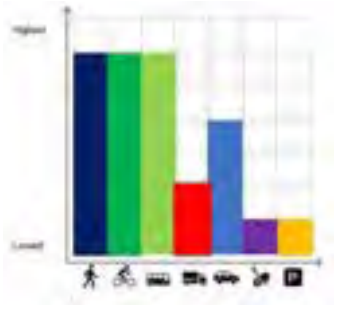
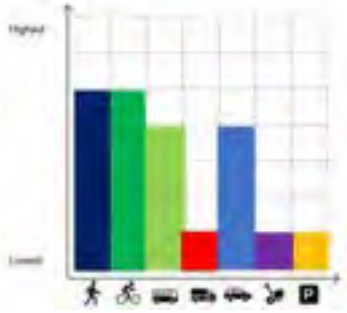
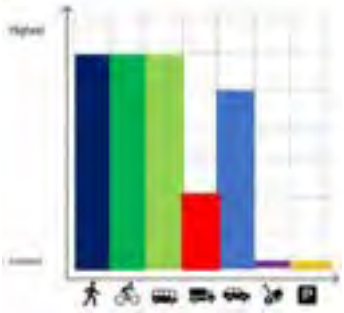
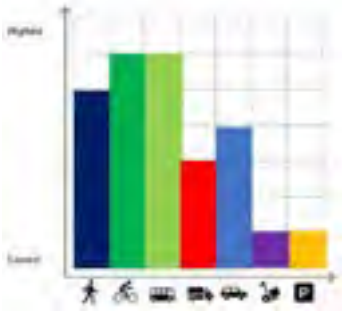
The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function, that will be used to inform future development and operation of the corridor. A 'mandate' for each road corridor is developed by Auckland Transport and approved by the RASF Committee, comprising senior officers from Auckland Transport and Auckland Council. This is a new process adopted by Auckland Transport so the RASF mandate for the corridors assessed here are draft and yet to be formally approved by the RSAF committee.

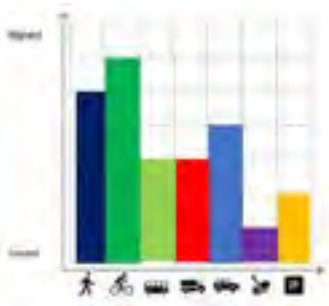
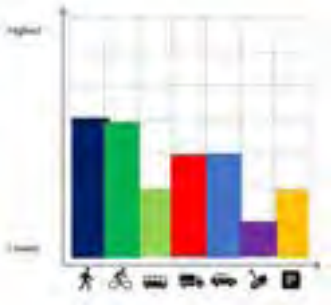
The development of the corridor design is based on AT's Roads and Street Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of the framework is to provide a consistent regional context to each section and identify the likely priority applied to each mode.

Table 3-2 provides a summary of the RASF mandates for the for Drury Local Package, including the existing and future typology (movement and place value) and future modal priority.

Table 3-2: RSAF mandates for Drury Local

State Highway 22 (SH 22) Urban Arterial Upgrade	Future Modal Priority
Existing typology P1/M3, Future typology P2/M2 **Key Features** - **Movement function will likely to remain high in the interim, sub-regional importance providing through movements to the sub-regions until Pukekohe Expressway is built. In future, the movement function will reduce to medium strategic significance and increased public transport, walking and cycling priority.** - **Place function will transition from low to medium following the urbanisation around the area**	
Jesmond Urban Arterial Upgrade	**Future Modal Priority**
Existing typology P1/M1, Future typology P2/M2 **Key Features** - **Movement function likely to increase and it becomes a key north-south route within the Drury West, and part of the FTN network** - **Place function will transition from medium to high residential zoning following the Opaheke Structure Plan** - **Strategic cycle network and walking facilities connecting to Drury West centre and train station**	
Bremner East (existing) Upgrade	**Future Modal Priority**
Existing typology P1/M1, Future typology P1/M2 **Key Features** - **Movement function will transition from a low to medium significance with a strategic public transport connection between Drury East and West that connect to the future Drury Central train station. It also provides a key through-route for cycling and walking.** - **Place function is expected to remain the same, mostly industrial zoning and minor land use changes**	
Bremner Central (existing & new) Upgrade	**Future Modal Priority**

Future typology P1/M2 **Key Features** - **Medium strategic significance connecting sub-regions Drury West and East, forming part of FTN corridor** - **Low density residential zone with local catchments** - **Provides key through-route network for cycling and walking**	
Waihoehoe Road (East) Upgrade	**Future Modal Priority**
Existing typology P1/M1, Future typology P1/M2 **Key Features** - **Movement function is medium with strategic connections between Drury East and North-South Arterial. Ties up with Mill Road** - **Place function remains the same, mostly rural low-density zoning** - **Primary cycling and walking route providing connections to Drury train station and town centre**	
Waihoehoe Road (West) Upgrade	**Future Modal Priority**
Existing typology P1/M1, Future typology P2/M2 **Key Features** - **Movement function upgrades from low to medium strategic importance** - **It forms the major east-west connection, with Great South Road and N-S Arterial road** - **Place function will transition from light industrial rural environment to high-density residential zoning with the proposed rail stations as per Opaheke Structure Plan** **Primary cycling and walking route and high-frequency PT corridor**	
N-S Arterial Road	**Future Modal Priority**
Future typology P2/M2 **Key Features** - **Movement function is medium strategic importance connecting Drury east to Papakura** - **Part of FTN route with primary walking and cycling network** - **Place function is medium residential and industrial as per Opaheke Structure Plan, high density residential in the south end**	
Opaheke Road Upgrade	**Future Modal Priority**

Existing typology P1/M1, Future typology P1/M2 **Key Features** - **Corridor has medium strategic importance distributing traffic from Mill Road, connecting industrial and residential land use** - **Place function changes from low-density residential, rural to medium-density mixed-use (residential/industrial) development** - **Good walking cycling connectivity from Opaheke to Papakura**	
Ponga Road Upgrade	**Future Modal Priority**
Existing typology P1/M1, Future typology P1/M2 **Key Features** - **Corridor has medium strategic importance distributing traffic from Mill Road and N-S Arterial, connecting local areas** - **Place function changes from low (rural) to medium density, mostly industrial land use** - **Provides continuous walking cycling network from Mill Road, N-S Arterial to Opaheke**	

It is also important to note that the long-term planning used for these corridors mean that much of the specific local detail to confirm the RSAF mandates are not yet known (such as locations of schools, local centres and specific subdivision proposals). As such, it is expected that the RASF mandates would need to be refreshed as these corridors are developed and urbanised.

3.2.2 Corridor Form Assessment Framework (CFAF)

The CFAF was used primarily for the purpose of multi-modal corridors. The corridor assessment framework is considered a tool which formalises the optioneering process and provides consistent decision-making across all corridors assessed.

A route protection recommendation is the key output from the form and function process. The output recommends either 2 or 4 lanes and other corridor elements which influence the corridor footprint. All modes should be accounted for in the cross-section.

The outputs from the form and function fed into what would be included in the cross-section for each corridor. SGA has developed a series of generic[3] cross-sections to simplify and standardise the DBC and route-protection process. The cross-sections include:

- spacing for segregated active modes and pedestrians;
- medians;
- buffers for property boundaries;
- berms, to provide space for bus stops, pedestrian and cycling conflict etc.; and
- traffic lanes.

[3] Refer to **Error! Reference source not found.** for generic cross-sections

The form and function of a corridor is determined using a combination of 'place' and 'movement' significance on the individual setting. The place factors consider the existing land use, future land use plans and trip generators present in the catchment area.

Based on the density of residential, industrial or mixed land use; and local/regional trip attraction areas e.g. metro stations, schools, hospitals the place assessment is made.

The hierarchy in the regional road network (PT network, strategic freight network) and/or existing/ proposed traffic counts (ADT) determines the future typology and recommendations for a corridor function.

Figure 3-7 provides an overview of CFAF assessment and endorsement process. Table 3-3 provide a summary or the inputs and outputs of the CFAF tool used during the assessment.

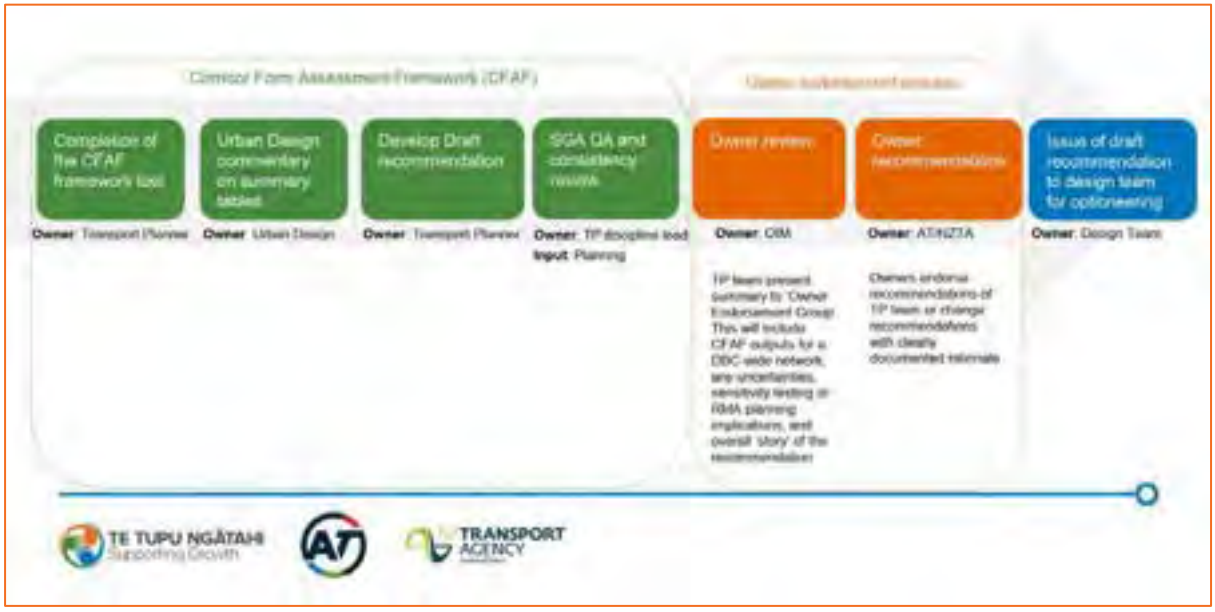


Figure 3-7: CFAF Approval Process

Table 3-3: Inputs and Outputs of the CFAF tool

Inputs	Modelling inputs required	Parameters	Outputs	Impact on modelling
Place and corridor function	No	Qualitative assessment based on the Roads and Streets Framework (RASF)	Determines the purpose of the route and feeds into wider modal priority assessment[4]	N/A
Public transport	No	SGA Remix File[5]	A public transport/priority lane is recommended if	PT lanes included in MSM where

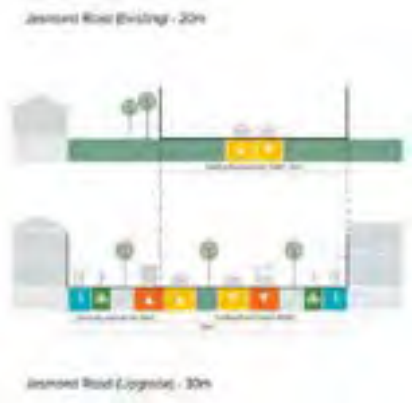
[4] Modal priority is included with the RASF guidelines to determine if the future corridor is suitable for various vehicle users

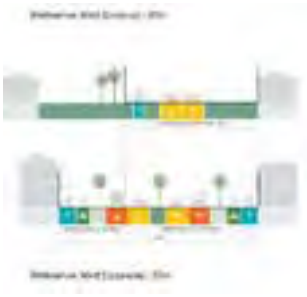
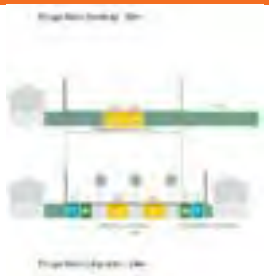
[5] SGA Remix File refers to the Auckland Transport vision of the 2048+ bus network. Data and routes are subject to change.

			there are >12 planned buses used	appropriate, used for mPT model outputs
Walking and cycling	No	SGA primary and secondary walking and cycling network used, based on urban design framework	Helps with geometric design, determining suitable paths and which sides to include the facility	Chosen facility type for different corridors coded into SAMM
General traffic	Yes	ADT volumes used, extracted from SATURN. More than 2 lanes are considered when daily flows exceed 15,000 ADT or 1,500 vehicles per hour during the peak period	Determines if the corridor will be route protected for 2 or 4 lanes of general traffic	Number of lanes included in MSM, used for SATURN outputs
Freight	Yes	User Class 3 (heavy vehicles) divided by total of all user classes (all vehicles) to determine the percentage of freight. Data extracted from SATURN. If the percentage exceeds 10%, this may trigger looking into interventions	Determines if a freight/priority lane would be most appropriate along the route	Priority lanes included in MSM where appropriate
Speed Environment	No	Assumption based on RASF and future land use. Parameters for high and low speed based on the IBC design philosophy	High level assessment concludes a low speed of 50km or a high speed of 80km. These are the base assumptions for the speed, subject to vary through the DBC Optioneering process	Speed along each network included in MSM, used for SATURN outputs

The Corridor Form Assessment Framework (CFAF) has been designed to provide a consistent methodology to define the desired corridor form and function requirements and ensure all modes are considered. The CFAF results for Drury Local is summarised in Table 3-4.

Table 3-4: Drury Local Form and Function Recommendations

State Highway 22 (SH 22) Urban Arterial Upgrade	CFAF Summary
	• Traffic volume 20,100 -22,000 ADT • Sub-regional corridor sharing its strategic function with proposed Pukekohe Expressway • 2 general traffic lanes and 2 priority vehicle lanes for PT services; high frequency bus route and strategic freight route • 4 lane corridors with medium/high density residential land use properties
Jesmond Urban Arterial Upgrade	CFAF Summary
	• Traffic volume 6700-11,000 ADT • Strategic arterial road network with FTN function between SH22-SH1 • Proposed urbanised corridor with active mode connectivity to Drury Town Centre • Total Number of lanes - 4
Bremner East (existing) Upgrade	CFAF Summary
	• High traffic volume on the section 16,900-23,000 ADT • Part of FTN with 2 traffic lanes + 2 PT priority lanes • High connectivity and proximity to Drury Town Centre and Drury Central & West rail stations • Total Number of lanes - 4
Waihoehoe Road (East) Upgrade	CFAF Summary
	• Traffic volume 6,700-10,000 ADT • Primary east-west link between 2 north-south corridors N-S Arterial and Mill Road • 2 general traffic lanes with high frequency buses during peak hours

Waihoehoe Road (West) Upgrade	CFAF Summary
	• Traffic volume 18,200 -25,000 ADT • 4 lane east-west connection link between Great South Road and North-South Arterial • Medium/high density land use surrounding
N-S Arterial Road	CFAF Summary
	• Traffic volume 10,500-14,000 ADT • Strategic North-South connection supplementary to Mill Road • Total 4 lanes including 2 bus priority lanes with proposed cycle network • Land use varies from high to low residential zones along the stretch of corridor
Opaheke Road Upgrade (Rural and Urban*)	CFAF Summary
	• Traffic volume 5400-14,000 ADT • 2 general traffic lanes providing linkages to town centres, neighbourhoods and industrial areas Note*: Opaheke Road Urban section does have urban walking facilities.
Ponga Road Upgrade	**CFAF Summary**
	• Traffic volume 5400-8000 ADT • 2 general traffic lanes providing linkages to town centres, neighbourhoods and industrial areas

Note: I-11.4 land use scenario were used for CFAF but table also include I-11.5 forecast to provide low to high ADT range.

3.2.3 Intersection Form and Function

This intersection form and function sets out the decision-making approach used to recommend whether roundabouts or signalised intersections are more appropriate for key intersections within the Drury Package.

The intersection form and function were based on the proposed cross-sections in the CFAF above. The corridor form and function approach were agreed and supported by AT, NZTA and SGA. Thereafter the intersection form and function assessment were undertaken to determine intersection type and intersection size to inform the intersection concept design for route protection. The summary decision-making approach are shown below in

Figure **3-8**.



Figure 3-8: Decision-making approach

As part of network planning, decision-making for selecting the safest intersection controls are carefully considered for each corridor using a range of factors.

For the purposes of the intersection assessment the following factors were considered:

- Safety
- Transport network function (movement) and land use function (place)
- Form and Level of Service (LOS)/ Quality of service required for different modes
- Land use integration
- Site specific constraints
- Design constraints
- Roundabout vs signals guidance
- Network stating and route protecting
- Future land used assumptions

- Future transport network assumptions

For each intersection typology chosen, design features are also considered to ensure that the intersection meets the needs of different users safely and effectively and responds to the site-specific factors. The intersection form and function results were agreed and endorsed by AT, NZTA and SGA.

For each intersection, SIDRA modelling and Saturn modelling was undertaken to determine intersection size requirements to inform the intersection concept design. Table 3-5 provide an intersection summary or the proposed intersection form and the associated modelling results for 2048+.

Table 3-5: SIDRA outputs for Drury Local Intersections

Intersection Summary								
Name	Arms	Proposed Form	AM			PM		
			LOS	DOS	Delay (s)	LOS	DOS	Delay (s)
SH22/ Oira Road	- Karaka East Road - Karaka West Road - Oira Road	Roundabout	B	0.84	27.5	A	0.69	13.2
SH22/Jesmond Road	- SH22 - Jesmond Road - Northern Connector	Signalised	D	0.81	57.5	C	0.91	55.7
SH22/GSR	- SH22 - GSR - New Collector	Signalised	D	0.89	72.3	C	0.82	50.2
Jesmond/ Bremner	- Jesmond Road - New Bremner Road	Signalised	D	0.64	55.2	D	0.93	63.6
Bremner/ Waihoehoe Road	- Bremner Road - Waihoehoe Road - GSR	Signalised	E	0.99	88.4	D	0.98	97.6
Bremner/ Old Bremner Road	- New Bremner Road - Old Bremner Road - Collector Road	Signalised	C	0.83	65.7	C	0.77	65.7
Bremner/ Creek Road	- Bremner Road - Creek Street	Signalised	B	0.58	69.5	B	0.58	69.5
Bremner/ Firth Road	- Bremner Road - Firth Street	Signalised	D	0.91	65.4	C	0.87	50.9
Waihoehoe Road/ N-S Arterial	- Waihoehoe Road - N-S Arterial - Fitzgerald Road	Roundabout	A	0.585	10.9	A	0.573	14.4
Opaheke Road/ N-S Arterial	- Opaheke Road - Ponga Road - N-S Arterial	Roundabout	A	0.684	13.2	A	0.3	10
N-S Arterial/ Hunua Road	- Hunua Road - Boundary Road - N-S Arterial	Signalised	D	0.89	70.1	C	0.79	45.7

4 Economic Assessment

4.1 Introduction

4.1.1 Purpose

This section details the economic appraisal for the Drury Package of projects in the Supporting Growth Alliance (SGA) programme. The components of the Drury Package were identified and agreed in the Indicative Business Case (IBC) for the Southern growth area in Auckland. This appraisal is undertaken in accordance with the NZ Transport Agency's Economic Evaluation Manual (EEM). The Drury Package comprises 4 project elements:

- Upgrading the Bremner Road, Jesmond Road and Waihoehoe Road corridors to an urban arterial with an FTN function
- Changes to SH22 from a rural highway to an urban arterial
- Changing of the Ponga Road-Opaheke Road from rural road to urban arterial
- Development of the Opaheke North-South Arterial connecting Drury to Opaheke and Papakura

The projects included in the Drury Package are shown in the figure below:

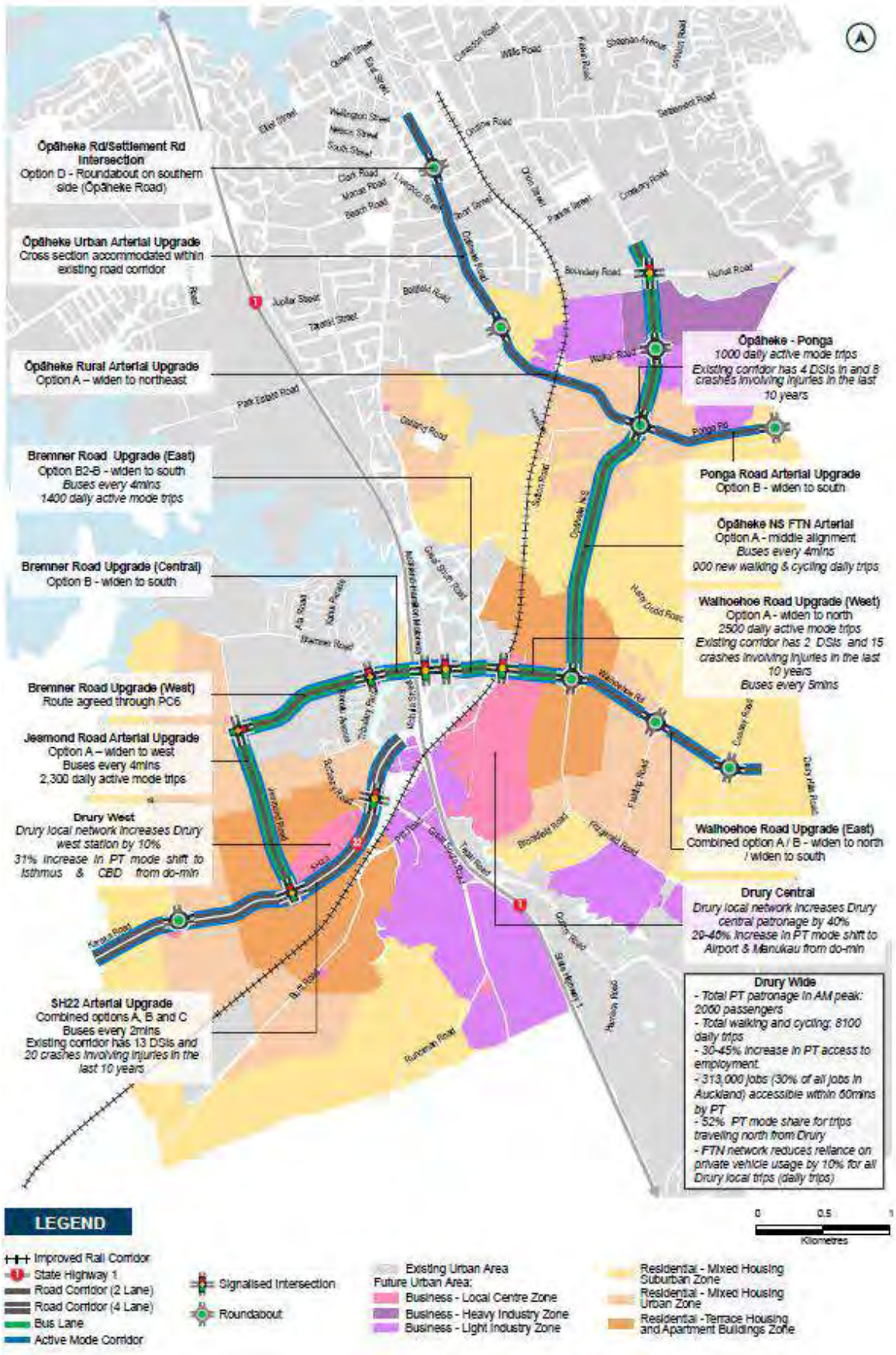


Figure 4-1: Drury Package Projects

4.1.2 Approach and Key Issues

The Drury Package Detailed Business Case (DBC) is for the purposes of route protection, rather than imminent implementation. The appraisal has therefore been targeted at this decision (to progress to route protection), rather than at the more detailed assessment that could be expected for an implementation decision. The appraisal has also been undertaken in the context of the following:

- Estimates of the type, scale, sequencing and rate of growth have been made for the DBC, however the resulting growth is highly subjective to other regulatory processes such as Structure Plans, Plan Changes, sub-division consents and economic demand
- The SGA Programme, via its owners and partners, will make decisions on the implementation of specific projects based on separate prioritisation and decision processes over the next 30+ years
- The SGA business cases have focused on the transport elements and footprints to support the long-term, full build-out of the area. The actual land use development is likely to occur progressively in stages, which allow more detailed sequencing and staging decisions (e.g. some corridors could be improved with initial upgrades that are expanded in later years)
- The SGA Programme identified a whole network of improvements to support the growth with the desired outcomes for this area. The Drury Package comprises only a sub-set of that wider network, which means that the appraisal of each element is inter-dependent on the assumptions made about the timing of the other elements in the network

Based on the purpose, scope and identified issues, the appraisal has adopted some key principles:

- A level of detail suitable to the route protection decision, rather than imminent implementation
- A focus on the whole Package, but with simplified methods to estimate the economic performance of the sub-elements
- A focus on the appraisal of the full build-out project rather than analysis of fine-grained staging options
- Simplified modelling approach with limited analysis of project inter-dependencies, rather than extensive analysis of the various possible combination of project sequencing in the wider network
- Analysis of the project under a range of potential scenarios of project timing, discount rates etc, rather than a focus on a single BCR
- The Drury Package has been assessed against a ‘Reference’ Do Minimum scenario (that includes an assumed sequencing of adjacent projects), rather than a ‘true’ Do Minimum that includes only committed projects. This is to avoid the potential for double counting of common benefits that would be assigned to whichever project is assumed to be implemented first

4.1.3 Modelling Tools and Scenarios

The transport user costs have been estimated based on a suite of transport models, owned by the Auckland Forecasting Centre (AFC). The models include:

- The regional multi-modal model (MSM) - creates estimates of car, truck and PT movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future PT usage. Generally, these models are run using regional assumptions as per recent ATAP planning, but with scenario-specific inputs in the growth areas. The option and Drury Local DM are modelled in MSM for Year 2028,2038,2048 and 2048+ and their outcomes have been used for obtaining PT benefits, Crash savings and WEBs. The Modelled scenarios in MSM are defined in **Table** 4-2 and each of the benefits are discussed in detail in **Section 4.3**.

- A local traffic model (SATURN). This uses the traffic demands from MSM on a more detailed representation of the road network. For the economic analysis the outputs from Saturn are extracted from the same scenarios i.e. Option Preferred Scenario and Drury Local Do-min Scenario for the modelled years 2028,2038,2048 and 2048+

- A strategic active mode (walk/cycling) model (SAMM). This tool gives strategic-level estimates of walking and cycling demands that respond to land use, the quality of the walking/cycling network and the relative change in costs for competing car and PT modes. It derives land use and network data directly from the Macro Strategic Model (MSM) whilst using the same refined zone system as used in the Macro PT Model (MPT). The model has a strong interface with MSM to provide key inputs but can be operated independently to assess specific changes to the active mode network.

The MSM was used to derive PT user benefits and provides traffic demand estimates for the SATURN model. The SATURN model was used to estimate benefits to general traffic, while the SAMM model was used to estimate benefits to walking and cycling. Each mode (PT, general traffic, walking and cycling) were appraised separately, albeit with the changes in mode share reflected in the demands for each mode. Sector to Sector analysis have been carried out for understanding the benefits pattern of each mode, the analysis and the discussion with the Peer reviewer are presented in the **Appendices 3**.

Although the regional model was suitably validated against observed 2016 conditions, analysis against 2013 census data did indicate that not all 2016 commuter trip distribution patterns were well replicated. However, because the land use in the growth areas will significantly transform travel patterns in this area, those 2013 patterns will be of limited relevance to those future conditions. This means that while the predicted travel and benefit patterns appear plausible, the detailed travel movements will continue to have some uncertainty.

The modelling has been based on the latest regional growth assumptions, as reflected in the 'Scenario I11.5' forecasts released by the AFC in January 2020. Those forecasts are based on Statistics NZ medium population growth estimates for Auckland. In those forecasts the staging of greenfield growth is based on direction indicated in Auckland Council's Future Urban Land Supply Strategy (FULSS). The Standard Scenario I-11.5 forecasts extend to the year 2048, however, this does not include full build out in the growth areas. Therefore, an additional long-term scenario was developed for SGA referred to as 2048+. This is based on the standard 2048 forecasts but reflects

full build-out in the greenfield growth areas. The timing for full development build-out is uncertain, however for the purposes of this appraisal the 2048+ model results were allocated to the year 2053, estimated from the typical rate of growth predicted for the area. Although, Drury would be largely built out by 2048+ there would be continuing growth in the southern SGA as new areas adjacent to Drury start to be developed.

Due to the inter-dependencies with other projects in this area, Do Minimum and Option scenarios were created for each modelled year, based on a Reference scenario. The Reference scenario included an assumed sequencing of the full IBC network. For example, the 2028 Reference model only included a sub-set of the IBC networks, while the 2048+ Reference model included the full IBC network.

If the project being appraised (e.g. the Drury Package), was included in the Reference model for the forecast year, then this was used as the Option scenario. A matching Do Minimum was then created for that year that excluded the project being assessed. If the Reference model did not include the candidate project, then this was adopted as the Do Minimum. An Option scenario was then created by adding the candidate project.

For example, in the 2048+ model, the Reference model was adopted as the Option scenario for the Drury Package as it includes the whole, fully-developed IBC network. A Do Minimum was created for 2048+ by removing only the Drury Package. Conversely in 2028, The Reference Model did not include the NS Arterial in Drury Package, so the Do Minimum was created excluding the Drury Local projects present in 2028. Following table shows the projects included in the Reference network for the Year 2028,2038 and 2048.

Table 4-1: Projects included in Reference Netwrk of Year – 2028,2038,2048[6]

Projects	2028	2038	2048/2048+
New rail stations at Paerata, Drury Central, Drury West, and associated park and ride facilities	✓	✓	✓
SH 1 Papakura-to-Bombay		✓	✓
Additional rail capacity between Pukekohe and Papakura (4 tracking, electrification and associated grade separations at road/rail crossings)		✓	✓
New Pukekohe Expressway and connections		✓	✓
Mill Road Corridor	✓	✓	✓
SH 22 upgrade	✓	✓	✓
Jesmond to Waihoehoe West FTN Upgrade	✓	✓	✓
Waihoehoe Road East Upgrade	✓	✓	✓

[6] The network assumptions are just reference networks and not the final staging recommendations.

Ōpāheke North-South FTN Arterial		✓	✓
Ponga Road and Ōpāheke Road Upgrade		✓	✓
SH 22 Drury-to-Paerata (Safe Network Programme)	✓	✓	✓
FTN on Porchester / Mahia / Roscommon Roads and Great South Road from Drury to Manukau		✓	✓

4.1.4 Modelling of Public Transport Projects

The Drury Package is expected to contribute to public transport (PT) usage as follows:

1. Via a more frequent and reliable FTN service between Drury West and Papakura via the 'FTN' route running along Jesmond Road, Bremner Road, Waihoehoe Road and the North South arterial

2. By improved access to the Drury West and Drury Stations. This includes via improved vehicle, bus, walk and cycle facilities access the stations. The benefits of providing the stations themselves sits with the SGA Rail business Case, however the improved access sits with the Drury Local package

3. Improved urban environment, footprint, walk/cycle facilities and bus facilities on Ponga-Opaheke Road that allows for more attractive and easier access to local bus services

4. By extra road space on SH22 that allows for more reliable (and potentially prioritised) bus services on this route.

The bulk of the PT benefits are expected from items 1 and 2, with much smaller contributions from items 3 and 4. The PT benefits were modelled and assessed as follows:

- MSM model runs with and without the full Drury Package:
    - The Do Minimum scenarios included low-frequency bus services through the corridor (using adjacent roads in Opaheke) and 'standard' walk-access links from adjacent zones to the train stations. These limited services used existing roads where available or other routes such as collector roads or Mill Road in Opaheke. The low frequency assumed for these Do-min services is related to the constrained and unreliable corridor such as the one lane Norrie Rd bridge.
    - The Option model included higher frequency bus services on the FTN corridor and shortened walk-access from adjacent zones to the train stations to reflect provision of walk-cycle facilities on the access roads. The walk access lengths are modelled based on analytical judgement i.e the access from zones located at a fair distance from the station is modelled as a longer access than from the zones right next to the station. The benefits of station access trips are calculated from MSM as PT benefits and not from SAMM.
- An MSM model run that excluded only the North-South arterial, to understand the contribution that element made to the overall package

- Estimation of the total package and North-South arterial PT benefits from the MSM runs, with assumed allocation of the residual benefits to the Jesmond/Bremner/Waihoehoe element. Small proportions of the residual benefits were allocated to SH22 and Ponga-Opaheke elements. Those assumptions are described later in this report.

4.1.5 Modelling of Walk/Cycle Benefits

The SAMM model was run only for the full build-out 2048+ scenario, with benefits allocated to earlier years based on assumed growth profiles. The SAMM model was run with the full IBC network and for a scenario without the Drury Package. This provided the overall package benefits. The contributions of each sub-element were assumed based on their estimated contribution to the overall network.

4.1.6 Modelling of Traffic Benefits

Some of the projects (such as Ponga/Opaheke Road upgrades) involve urbanisation of rural roads but no significant change in road capacity or connectivity. Those 'urbanisation' benefits are not readily captured by the traffic models but to the extent that they benefit pedestrians and cyclists are included in SAMM.

The SH22 project was found to be sensitive to these key assumptions:

- The existence of the parallel Pukekohe Expressway. The Expressway was assumed to be in place in the 2048 models, which would reduce the benefits of the SH22 project. The Expressway is expected to be a long-term project, so it is considered appropriate to not include that adjacent project in earlier model years.
- The treatment of speeds and intersection controls in the Do Minimum scenario. It was assumed that the speed would be reduced and small-scale intersection controls (signals) assumed in the Do Minimum to support at a basic level the assumed development of the wider area. The option than involved extra lane capacity and larger intersections. This approach was adopted to avoid 'disbenefits' by assuming extra intersection delays and reduced speeds assigned solely to the Option. It is however recognised that different assumptions could be used which would generate different outputs.

The SATURN model was used to calculate benefits to traffic. This included:

- Comparison of with and without the full Drury Package
- The impact of just the North-South Arterial
- The impact of the SH22 project
- Tests for the SH22 project in the 2038 models with and without the Pukekohe Expressway

4.1.7 Modelled Scenarios

For the purpose of economic assessment, three scenarios were modelled in MSM and Saturn: -

- The Preferred option scenario termed as *AllSouth*

- The Drury Local Do min Scenario (Option Preferred Scenario minus the Drury Local Projects) termed *AllSouth_wo_DruryBC* in the MSM.
- The Do min scenario for the NS Arterial (Option Preferred scenario minus the NS Arterial) is termed as *AllSouth_wo_NS* in the MSM.

Table 4-2 summarises the scenarios modelled in MSM and Saturn for the economic assessment for all the modelled years (2028, 2038, 2048 and 2048+). For the rest of the project elements such as Bremner-Jesmond- Waihoehoe, State highway 22 and Opaheke-Ponga road, a percentage of benefits have been allocated to the difference of Total Drury Local Package benefits and the NS Arterial Benefits.

Table 4-3: Individual projects in Drury Local Business Case Packagelists the four individual projects in the Drury Local Package and

Table 4-4 shows the allocation % of the benefit difference between total Drury Local Project and North South Arterial benefits. The allocation percentage have been broadly applied to four categories - Traffic benefits (comprising of travel time cost, congestion cost, trip reliability, vehicle operation cost), PT benefits, Active mode benefits and Crash Benefits. The basis for this allocation has been described briefly in this table and explained in detail in **Section 4.3**.

Table 4-2: Scenario List in MSM and Saturn

Assessed Scenarios	MSM Scenario Name	Comparison
DBC Emerging Preferred Scenario	ATAP3_DBC_Pref_AllSouth	Option
DBC Drury Local Do Minimum Scenario	ATAP3_DBC_Pref_AllSouth_wo_DruryBC	Do Min
DBC NS Arterial Do Minimum Scenario	ATAP3_DBC_Pref_AllSouth_wo_NS	Do Min

Table 4-3: Individual projects in Drury Local Business Case Package

Individual Projects	Scenario Name in Economics Analysis	Benefits Obtained from
Bremner, Jesmond, Waihoehoe (BJW)	AllSouth_wo_BJW	% Allocated from the Drury Local Package benefits as obtained from the Model
State highway (SH22)	AllSouth_wo_SH22	
Opaheke Ponga (Opa-Pon)	AllSouth_wo_OP	
NS Opaheke Arterial (NS)	AllSouth_wo_NS	Benefits obtained from the Model

Table 4-4: Core Allocation Percentage Split of the difference of the Total Package benefit and North South Arterial benefit

Benefit Type	BJW	SH22	Opa-Ponga	Comments
Traffic	30%	50%	20%	The bulk of the extra benefits lies with SH22, as its capacity have been improved from 2 laning to 4 laning. Only a low share was allocated to Opaheke-Ponga as the road through capacity remains the same as Do Minimum. Traffic benefits are expected due to intersections with side roads etc. BJW has improved capacity on Bremner east (removal of 1-lane bridge etc).
Active Modes	70%	5%	25%	The Active mode benefit split is calculated based on the contribution of active mode km of each of the individual projects, obtained from SAMM.
PT	85%	10%	5%	The bulk of the PT benefits lies with the BJW due to improved PT services on this FTN route. Minor benefits allocated to the other two elements from improved street and bus facilities and extra capacity on SH22
Crash	40%	40%	20%	Major portion of crash benefits is due to mode shift from cars to PT for BJW and speed reductions and urbanization on SH22 and Opaheke-Ponga.

4.2 Evaluation Framework

This economic evaluation has been undertaken in accordance with the NZ Transport Agency Economic Evaluation Manual (EEM), as effective 1 July 2018.

4.2.1 Economic evaluation approach

The overall economic evaluation is based on the following assumptions:

- Assessment of base and congested (CRV) travel time benefits from the SATURN models;
- Assessment of base running vehicle operating costs (VOC) from the SATURN models;
- Base Date of 1 July 2019;
- Time Zero, construction start date and duration specified for each sub-project as in **Table** 4-5
- Discount rate 6% applied to all annual benefits and costs, and sensitivity tested at 3% and 8%;
- Analysis period of 40 years, and sensitivity tested at 60 years;
- Traffic reliability benefits assumed as 8% of the base travel time benefit;
- Public transport reliability benefits as 70% percentage of PT user benefits in the commuter peaks and 30% in other periods. The basis for this is discussed later in this report;
- CO_2 benefits as 5% of VOC benefits;
- Travel Time user cost is a mixture of Urban Arterial and Rural Strategic composite costs. The Rural Strategic value was included to reflect the impact on the longer-distance strategic trips on SH1, which would more closely align with the occupancy and trip purpose of 'Rural Strategic' trips than 'Urban Arterial' trips. The percentage of Rural Strategic is

calculated from the Sector-Sector traffic benefits calculation as in **Appendix 3**. The proportion of benefits due to the trips between External North and External South Zones to the total benefits is considered as percentage of rural strategic and rest is Urban Arterial. For the sake of simplicity, the sector-sector benefit analysis is done only for morning peak period and the same percentage is applied for other peaks.

- Walking and cycling benefits were estimated based on trip demand and travel cost matrices from SAMM, using the same method as used for PT benefits in the MSM
- Modelling based mostly on the whole package, with extra model runs to understand the contribution of some key elements. Otherwise, the allocation to sub-elements was based on assumptions, depending on the type of benefit
- WEBS calculated for a test-case of the full package in 2048+ in accordance with the EEM, then applied to sub-elements using an adopted percentage uplift to the conventional benefits. The analysis is done for three principal type WEBS – Agglomeration, Imperfect Competition impact and Labour supply impact. The process of the WEB calculation for each type is described in **Section 4.3.8**.

The key assessments are discussed in further detail below

Table 4-5: Core Time Zero, Construction Start Date and Period Assumption

Individual Projects	Time Zero	Construction Start Year from Time Zero	Construction period (in years)
Bremner, Jesmond, Waihoehoe	1 July 2028	2	3
State Highway (SH22)	1 July 2028	2	2
Opaheke Ponga	1 July 2042	2	2
NS Opaheke Arterial	1 July 2042	2	3

The benefit update factors used in the evaluation are shown in **Table** 4-6. Their function is to update the standard values provided by the EEM, dated in 2002, 2008 and 2015.

Table 4-6: Update factors for benefits

Travel time costs	July 2002	1.54
Vehicle operation costs	July 2015	1.1
Passenger transport user benefits	July 2008	1.24
Walking and cycling benefits	July 2008	1.24
Travel behaviour change benefits	July 2008	1.24

4.2.2 Expansion of Benefits from Transport Models

PT benefits were assessed directly from the MSM scenarios using the demand and generalised cost matrices. A similar method can be used for general traffic outcomes in the MSM for larger-scale

projects, however for the Drury Package the local SATURN model was used instead. Annualisation factors for private transport are shown in the following tables.

Table 4-7: Traffic annualisation factors (2-hr models)

Period	Modelled period used	Equivalent periods per day	Days per year
Weekday AM	AM	2	245
Weekday PM	PM	2	245
Weekday Interpeak	IP	7.2	245
Weekday evening/night	IP	3.9	245
Weekend / holiday	IP	13	120

A differentiated set of factors was used for Public Transport indicators as its usage profile is different from the private cars'.

Table 4-8: Annualisation factors for public transport (2-hr models)

Period	Annual factor
AM	245
Interpeak	1524
PM	245

4.3 Benefits Analysis and Discussion

4.3.1 Core Results

Based on the methodology described, the net present values of benefits were evaluated and compared against the Do Minimum for each individual Project elements and then aggregated to obtain total Drury Package Benefits. **Table** 4-9 summarises the benefits of elements and the Drury Package generated from a set of 'core' assumptions. The 'core' assumptions over project timing, discount rate and analysis period were then varied to get a wider range of BCRs. The core results are presented here to aid discussion, however the overall range of BCR's is presented later in this section.

Table 4-9: Summary of Core Benefits of Individual projects in the Drury Package

Items	NPV Benefits ($m)				
	BJW	SH22	NS	OPa-Pon	Package
Traffic Travel Time	5.4	10.2	186.4	0.4	202.4
Traffic Congestion	2.5	4.5	39.5	1.4	47.9
Traffic Reliability	0.4	0.8	14.9	0.0	16.2
Vehicle Operating Costs	3.1	5.1	47.1	2.3	57.6
Active Mode	36.3	2.7	33.7	20.8	93.4
Crash Savings	9.5	9.8	16.6	9.9	45.8
PT Benefits	236.5	28.1	42.7	31.4	338.7
CO_2	0.2	0.3	2.4	0.1	2.9
PV Total Net Benefits	293.9	61.4	383.2	66.4	804.9
WEBs %	30%	30%	30%	30%	30%
Total WEBs Benefits	88.2	18.4	115.0	19.9	241.5
PV Benefits Including WEBs	**382.1**	**79.8**	**498.2**	**86.3**	**1046.3**

Key Observations

- The traffic benefits are largely derived from the NS Arterial Project, as it provides a new link between two communities, while the other projects improve existing roads so generally have lower time savings.
- The development of walking and cycling facilities along the Drury urbanised corridors is about 14 km in length and passes through future communities of some 60,000 people. Providing the ability to walk on these corridors is therefore expected to have significant benefits. Hence, the active mode benefits proportion is considered reasonable for the scale of this project. In

the Drury Package the active mode benefits are similar for BJW and NS, but since the start date of NS is shifted to 2042 it yields more benefits compared to BJW. A good portion of benefits is also obtained from Opaheke-Ponga Road due to upgrade of walking and cycling facilities.

- Although the crash benefits for the analysis period appear to be similar for the projects but they are different for the modelled years. Since, the Time Zero of the NS and Opa-Pon is in Year 2042 they yield much greater benefits for the analysis period. Thus, the Project Opa Ponga although having only 15% share of the total project compared to 30% for BJW/SH22 gives similar crash benefits as other projects.

- PT benefits are mostly obtained due to the improved FTN Routes and other frequent Bus Services proposed for BJW. The PT reliability benefits are included in the PT benefits, the details are given in **Section 4.3.3** and further sensitivity testing with the PT Reliability proportion is done in **Section 4.5.** Given that the FTN route is specifically targeted at providing frequent, reliable services this scale of benefit is considered reasonable

- Wider Economic Benefits (WEBs) provide a significant contribution in the benefits for Drury Local package. The calculation of WEBs is done based on guidelines laid out in EEM and the outcome is considered reasonable as it significantly improves accessibility to rail stations, major employment area and future major town centre at Drury.

4.3.2 Traffic Travel Time and Congestion Savings

The travel time costs have been calculated based on the matrix-based Saturn outputs. The travel time components included:

- Base travel time; and
- Congested travel time (defined as ‘CRV’ in the EEM).

The base travel time applies to the total travel times, whereas the CRV has been applied to the mean delay time from the transport model outputs. In theory, CRV should be applied to where the CRV value has been applied to sections of road deemed congested, such as:

- Urban roads in the model use the methodology for urban roads, whereby CRV only applies to links with a Volume/Capacity (V/C) ratio greater than 70%; and
- All bottleneck delay, such as at intersections.

However, due to the nature of the matrix-based outputs, the CRV has been applied to all the mean delay time calculated by the transport models, due to the inability to distinguish individual V/C on each section of road for each origin-destination pair. This is deemed to be acceptable given minimal delays at V/C lower than 70%.

4.3.3 Trip Reliability Benefits

The travel time reliability can generally be improved by upgrading the road network, improving the connectivity and improving the PT services. Traffic reliability was assumed to be 8% of the travel time benefits.

Improvement in PT reliability is expected from this project due to the provision of separated bus lanes for majority of the FTN route between Drury west and Papakura, parts of this existing FTN route

already exists in the Do-min, however, these are only two lane rural roads with conflict points at key intersections and bottlenecks at Norrie Rd and the GSR intersection. The proposed FTN facility will allow quicker, more frequent and more reliable services through this corridor. Improved PT reliability is also expected from extra road space on SH22 that allows for more reliable (and potentially prioritised) bus services on this route. The improved access to the rail station provided through the walk and cycle further contribute to the improved reliability of the PT usage. PT reliability benefits were therefore assumed to be 70% of the user benefits. This was based on the EEM guidance where reliability is a function of the estimated minutes late of existing services, as follows

Reliability benefit = EL × (VTT($/h)/60) × AML × NPT

where:
EL is the equivalent time to a minute late ratio from table A18.1
VTT is the vehicle travel time ($/h) from table A4.2 in Appendix A4
AML is the reduction in average minutes late (minutes)
NPT is the number of passengers affected.

Because this is green field area the proposed DM services do not generally exist but are assumed to be provided at only a very basic level. Therefore, the reliability benefits were estimated as a ratio of user benefits, based on testing variables of the following assumptions for the FTN route:

- 7km FTN route
- Assumed Do Minimum and Option bus speeds, as set out in **Table** 4-10 below
- VTT = $7.80/hr, and with the above assumptions, these give a time saving per passenger
- Estimated Average minutes late (AML) based on assumed variability as a percentage of travel time
- EL = 4.8 from Table A18.1
- Calculated Reliability Benefit per passenger
- Calculate Ratio of Reliability to travel time benefit
- Capped ratio at maximum of 100% as per EEM

The assumptions tested and results are in the following table:

Table 4-10: Evaluation of PT Reliability Percentage based on variability of assumptions

	DM Speed Tests				DM Variability Tests (high)				DM Variability Tests (low)				IP			
	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10	Test 11	Test 12	Test 13	Test 14	Test 15	Test 16
Corridor Length, km	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Do Minimum Bus Speed, kph	20	23	26	30	20	23	26	30	20	23	26	30	20	23	26	30
Option Bus Speed, kph	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Time Saving, min	9.0	6.3	4.2	2.0	9.0	6.3	4.2	2.0	9.0	6.3	4.2	2.0	9.0	6.3	4.2	2.0
VoT, $/hr	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Time Benefits per pax	$ 1.17	$ 0.81	$ 0.54	$ 0.26	$ 1.17	$ 0.81	$ 0.54	$ 0.26	$ 1.17	$ 0.81	$ 0.54	$ 0.26	$ 1.17	$ 0.81	$ 0.54	$ 0.26
DM Variability, +-	10%	10%	10%	10%	15%	15%	15%	15%	7%	7%	7%	7%	5%	5%	5%	5%
Opt Variability, +-	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	4%	4%	4%	4%
DM Time , minutes	2.10	1.83	1.62	1.40	3.15	2.74	2.42	2.10	1.47	1.28	1.13	0.98	1.05	0.91	0.81	0.70
Opt Time, minutes	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.48	0.48	0.48	0.48
Variability Saving, min (AML)	1.50	1.23	1.02	0.80	2.55	2.14	1.82	1.50	0.87	0.68	0.53	0.38	0.57	0.43	0.33	0.22
el parameter	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Reliability Benefits, $/pax	$ 0.94	$ 0.77	$ 0.63	$ 0.50	$ 1.59	$ 1.33	$ 1.14	$ 0.94	$ 0.54	$ 0.42	$ 0.33	$ 0.24	$ 0.36	$ 0.27	$ 0.20	$ 0.14
Reliability/Time Saving Ratio	80%	94%	117%	192%	136%	164%	211%	360%	46%	52%	61%	91%	30%	33%	38%	53%
Capped Ratio	80%	94%	100%	100%	100%	100%	100%	100%	46%	52%	61%	91%	30%	33%	38%	53%

The first range of tests was done based on variability of Do-min bus speed. The next range of tests were done by varying the variability % of Do-min bus time. A separate test is done for IP, where Do-min variability is considered lower due to less traffic on the roads.

The above shows that under range of assumptions tested the reliability benefits ratio is close to 100%. However, to be conservative and also recognising the uncertainties involved, a value of 70% was adopted for AM and PM. The Interpeak PT reliability is assumed to be 30% which is consistent with EEM guidelines. The peer reviewer has indicated that this proportion is generally not inconsistent with other major PT projects in Auckland. The PT Reliability percentage is also sensitivity tested in **Section 4.5.5**.

4.3.4 Vehicle Operating Costs.

Vehicle operating costs for private travel were estimated based on applying running costs to the SATURN model outputs. PT operating costs were included as a system cost item (rather than user cost), as outlined later in this section.

4.3.5 Active Mode Benefits

The active mode benefits were obtained from SAMM, based on the change in demands and generalised costs (the same method used for PT benefits from MSM). The road sections where cycling facilities are upgraded are designated as buffered or protected cycle lane in the Option Model and are measured against the Do-min where cycle facilities are excluded for the Drury Local projects (except the ones present in the base year). The walk benefits are measured by removing the footpath on some of the rural roads in Do-min Scenario where the footpath does not exist in the base year as shown in red in **Figure** 4-2.

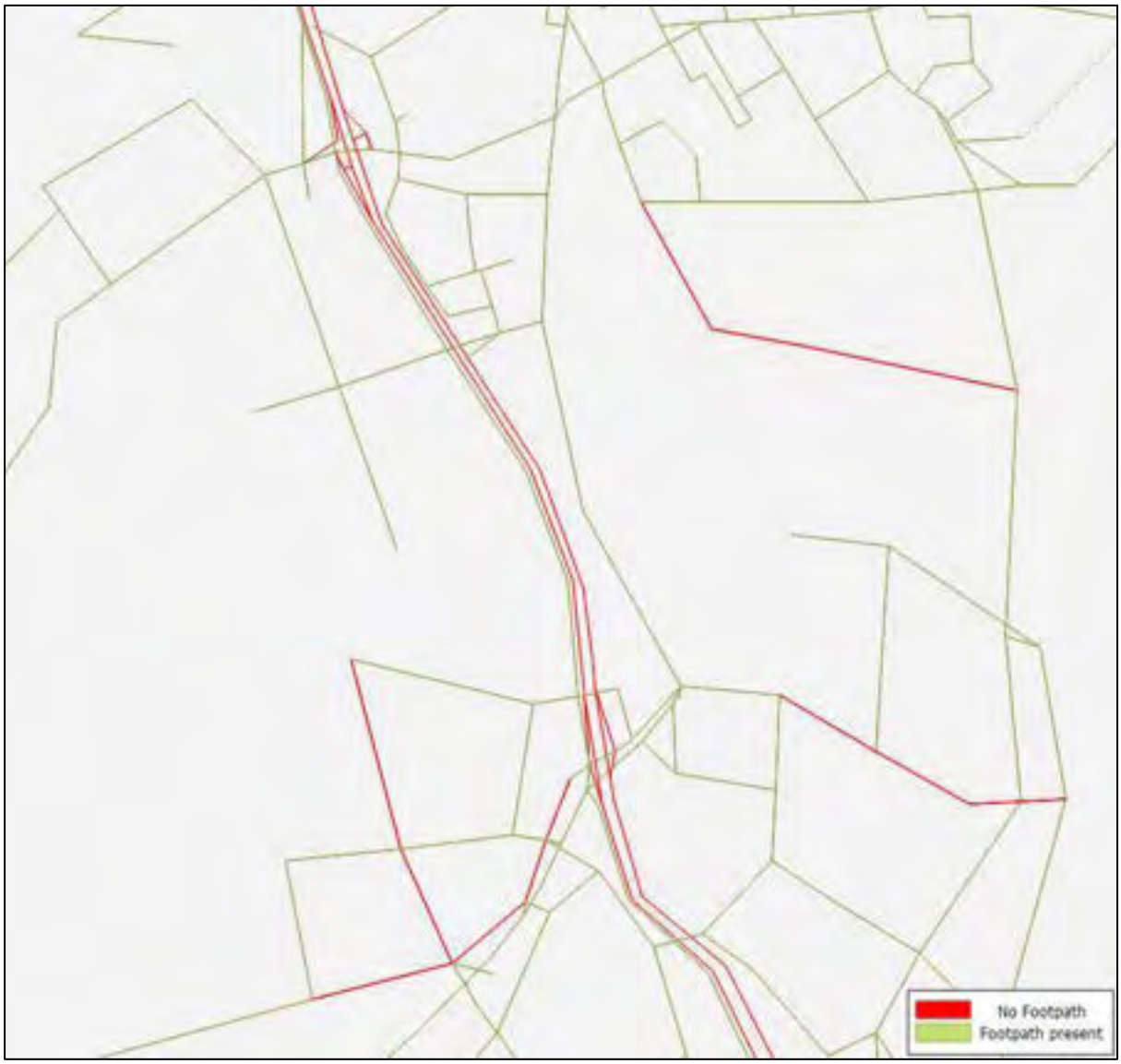


Figure 4-2: Footpath locations in Do-min Scenario in Year 2048+

There are various components to the active mode benefits as shown below.

Travel Time Benefits

The user travel cost benefits were assessed using the demand and perceived costs matrices in SAMM. They are split into two purposes – Home based Work (HBW) and Other (includes Home based education, Home based other and Non-Home based). The value of time used for the Home-based work purpose is $7.8/hr and for other non-work travel purpose is $6.9/hr and are multiplied with the update factor of 1.54 (Year 2019). Due to better connectivity and upgraded cycle facility and availability of footpaths there is reasonable travel time savings for the active mode users.

Table 4-11: Active Mode Travel Time Benefit – Year 2048+

Mode	Base	Option	Benefits (generalised minutes)		VoT, $/hr		Update Factor	Annual Factor	Annual TT Benefit (NZ $million)		
			HBW	Other	HBW	Other			HBW	Other	TOTAL
Cycle	Package	Preferred	351	1104	$7.80	$6.90	1.54	365	$0.03	$0.07	$0.1
Walk	Package	Preferred	1,988	78,463	$7.80	$4.49	1.54	365	$0.15	$3.3	$3.44

Note: The value of time for the Walk Other has been reduced by 35% of the EEM recommended based on discussion with the peer reviewer. The reviewer considered Walk Other purpose benefits to be potentially over-stated relative to HBW purpose. Hence the 35% reduction was to attain similar benefits/trip rate for both Walk HBW and Other trips. A separate test was undertaken in SAMM with the TDM effect (conversion of a proportion of mechanised short trip (<3km) to active mode trips in MSM) turned off for HBO trips and the outputs obtained were very similar to the reduced VOT outputs.

Health Benefits, Safety and Decongestion Benefits

Additionally, road traffic reduction and health benefits were estimated from the amount of cycle and walk km as obtained from SAMM. The walk and cycle trips-km were calculated in SAMM by multiplying the cycle/walk trips with the cycle/walk distance travelled. The change in predicted walk and cycle-km is multiplied with the cyclist ($1.45 per cyclist per km) and pedestrian composite benefit factor ($2.70 per pedestrian per km) as obtained from EEM.

The decongestion benefits obtained due to cycling are calculated by multiplying the cycle kms by the road traffic reduction factor ($1.56/veh/km obtained from EEM) and the number of car users who experience mode-shift, it is calculated as the ratio of Car Diversion rate for cycle and car occupancy (the diversion rate assumed to be 83% and car occupancy to be 1.2). The safety benefits for cyclists is obtained by multiplying the cycle kms with the safety factor as obtained from EEM. Table 4-12 shows the calculation of health, safety and de-congestion benefits

Table 4-12: Active Mode Health, Safety and Decongestion Benefit – Year 2048+

Mode	Base	Option	Km Increase	Health factor	Safety Factor	Update Factor	Benefits ($m)		
							Health	Safety	Decongestion
Cycle	Package	Preferred	570	1.4	0.05	1.24	$0.36	$0.01	$0.28
Walk	Package	Preferred	1513	2.7	-	1.24	$1.85	-	-

Certain amount of health benefits is also obtained from the PT walk trips (trips that walk to the stops/station to access PT service) from MSM. The health benefits obtained from MSM PT walk trips are presented in the Table 4-13. It should be noted that these are additional to the benefits derived from SAMM

Table 4-13: PT Stop/Station Walk trips Health benefits from MSM – Year 2048+

Mode	Base	Option	Km Increase	Health factor	Update Factor	Health Benefits ($m)
Walk	Package	Preferred	1,930	2.7	1.24	$2.4

These benefits were estimated for the whole Drury Package and the NS Arterial from 2048+ models. The difference of the benefits was then allocated to the rest of the sub-elements of the package and to earlier years based on the split outlined in

Table 4-4. The allocation between elements was based on broad estimates of the contribution to the network.

The active mode benefits for earlier years were assessed as a proportion of the 2048+ benefits, based on the population data for the Drury local zones in the *landuse v5*. The assumed proportions for the intermediate years are as follows:

- 2028 = 30%
- 2038 = 60%
- 2048 = 80%
- 2048+ = 100%

4.3.6 Crash Cost Savings

Crash reduction benefits were estimated using average crash costs per vehicle kilometer travelled (VKT) for different road categories, as used in the IBC. This capture both changes in the total VKT (e.g. from mode shift) and the effects of shifting traffic between different road categories. The crash rates used were calculated based on the total recorded crashes in the Auckland Region over the last 5 years and the VKT by road type and speed from the 2016 MSM regional model and are outlined in Table 4-14.

Table 4-14: Crash Costs per Type of Road

Road Type	Speed	Veh Km (millions/year)	Crash Cost (million NZ$/year)	Cents/Veh km
Motorway	All speeds	4,687.6	126.2	2.69
Arterial	<80	4,659.8	525.7	11.28
	>=80	68.97	10.0	14.56
Local	All speeds	1,698.8	139.6	8.22
Rural	<80	486	21.5	4.43
	>=80	1,390	242.7	17.46
All categories		12,991.3	1065.9	8.20

This method assumes that the new roads proposed would perform only as well as the 'average' arterial roads in Auckland. This would not capture the higher standard of road proposed, which could be expected to have a better crash performance due to fully separated walking and cycling facilities, wider berms and medians, reduced vehicle access and hence turning conflicts etc. Therefore, the standard arterial road crash rates were reduced by 20% for travel on the new roads. The 20% reduction was based on consideration of expected reductions for individual treatments for elements included in the project (e.g. separated cycle facilities, flush medians, etc). Those reductions varied between 4% and 55%, depending on the treatment and type of crashes addressed. An overall 20% reduction was adopted as representative of the higher standard roads proposed through adoption of current safe-system and Vision-Zero policies and standards.

4.3.7 Benefits – PT Users

Compared to the do-minimum, the option scenario has better PT services in terms of frequency and route, which leads to an increase in PT patronage. Due to increased frequency and better serviceability there are significant travel time savings for the PT users compared to the Do-min Scenario. The PT benefits are estimated by multiplying the value of time (as obtained from EEM) of each trip purpose to the passenger hours obtained from the MSM. The value of time used for the Home-based work purpose is $7.80/hr, for work travel purpose is $23.85/hr and for other non-work travel purpose is $6.90/hr. The update factor for Year 2019, of 1.54 is applied to the VOT.

4.3.8 Wider Economic Benefits (WEBs)

Given the scale of the proposed improvements and its impact on the future urban mobility in the area, it was deemed likely that that there would be significant WEBs. The WEBs were initially assessed using the EEM procedures from the 2048+ MSM Transport Model. After consideration of the results, a method was adopted that involved a fixed uplift in the conventional transport benefits.

The analysis is done for three principal type of WEBs:

- Agglomeration Impacts
- Imperfect Competition Impacts
- Labour supply impact and more productive jobs impacts

The total WEBs are evaluated to be $34 m for the modelled year 2048, among which the agglomeration impact is dominating. The calculated benefits for each type are shown in Table 4-15.

The agglomeration impact benefit occurs predominantly in the Drury Area reflecting that these are likely to see significant increase in productivity per worker. Imperfect competition benefits are calculated through a simple multiplication of business user benefits by an uplift factor proportional to the level of imperfect competition in the economy. Business user benefits will be worth $12.17m per year in 2048+. The imperfect benefit parameter for New Zealand has been estimated at 0.107 meaning that imperfect competition benefits will be equal to $1.3m in 2048+. There is a reduction in commuting cost for the residents of Drury local area, overall, the Drury local projects reduce the commuting cost of $1.5 m in Year 2048+. The labour supply impact is also calculated to determine the

increase in the tax income base. Overall, the wider economic impact from increased labour supply is likely to lead to an increased tax take of $0.55m per year in 2048+.

The WEBs percentage of the conventional benefits is calculated to be 42% uplift for the modelled year 2048+, which would equate to 30% of the total combined benefits over the evaluation period. This value was considered higher than would normally be expected, however this could reflect the scale of land use growth that the networks are supporting. Examination of the detail of the agglomeration benefits shows that these are very much focused in the Drury area although the improvement of conditions for longer distance traffic shows that there are also benefits for movements to the areas further north especially the isthmus and to a lesser extent to the more distant CBD. The WEBs calculations are based on a weighted-average of the change in car and PT generalised costs of travel. Tests showed that the PT improvements generated the largest uplift. Additionally, the greenfield nature of growth in this area may mean that the agglomeration uplift would not be at the full level for some time.

Table 4-15: WEBs Benefits by Type

Item	Benefits (NZ$, million)
Agglomeration Impact	30.85
Imperfect Competition impact	1.3
Labour Market Impact	2.05
Total WEBs	34.2

Various methods were used of applying the WEBs, as indicated in Figure 4-3. This included using either fixed uplift across the analysis period, or a variable uplift starting from 0% in the first year, and capping at the specified value in 2048.

From this assessment a fixed 30% uplift on conventional benefits was adopted as a reasonable, value for the total Drury package, albeit possiblly conservative.

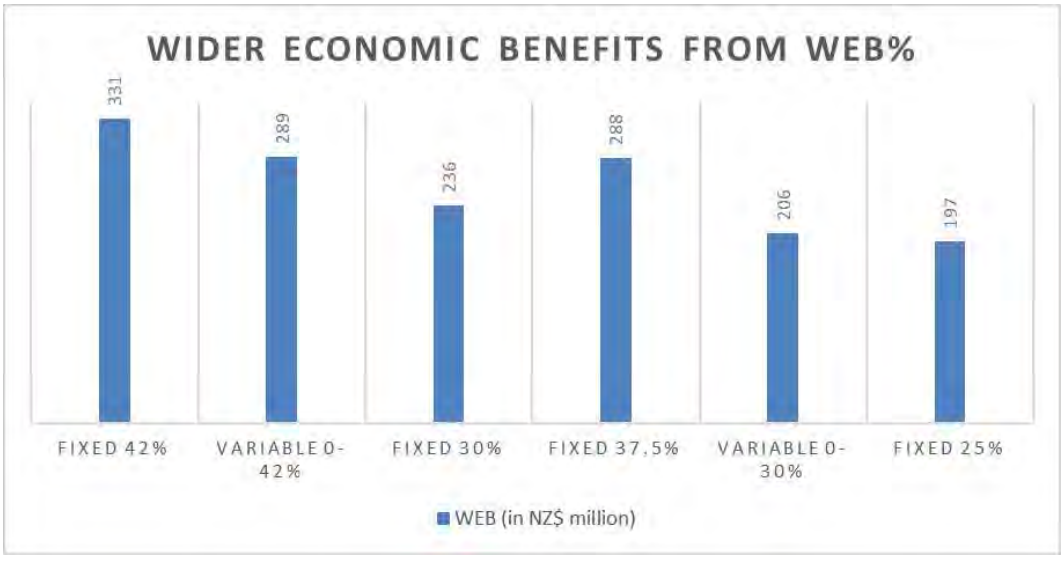


Figure 4-3: WEBs% range tests

4.4 Project Costs

4.4.1 Capital Cost

The following summarises the cost estimate for each individual project.

For the BCR calculations the expected cost (P50) was used.

[redacted]

4.4.2 Operation and Maintenance Costs

Operating and maintenance cost associated with each project were assessed as follows:

[redacted]

4.5 Benefits-Cost ratio (BCR)

4.5.1 Core BCR

As stated previously in **Section 4.1.2**, a range of BCRs is considered suitable for projects like these with uncertainty on key analysis factors. However, based on core assumptions the BCR generated for each of the individual project and the total Drury Local package is tabulated in Table 4-20.

Table 4-20: National and Government BCRs per Project

Projects	PV total benefits, $M PV	PV total net costs, $M PV	PV Fare Revenue, $M PV	National BCR	Government BCR
BJW	382	470	60.6	0.8	0.9
SH22	80	154	0	0.5	0.5
NS	498	312	3.3	1.6	1.6
OP	86	120	0	0.7	0.7
Drury Local Package	**1046**	**1057**	**64**	**1.0**	**1.1**

4.5.2 Range of BCR estimation

The BCR range estimation is split into analysis framework and parameter sensitivity tests. The Analysis framework includes different Time Zero, Discount rate and Analysis period and Parameter sensitivity include %WEBs, special crash reduction rate and % benefit allocation to the individual project.

4.5.3 Analysis Framework

Analysis Framework include the Time Zero and Discount Rate and Analysis Year Sensitivity:

Time Zero Year Sensitivity

	BJW	SH22	NS	Opa-Pon
Time Zero 1	2028	2028	2042	2042
Time Zero 2	2033	2033	2037	2037

Discount Rate and Analysis Period

Range of Discount rate considered is 3%, 4%, 6%, 8% and the Analysis Period used for estimation is 40 years and 60 years.

The Table 4-21 and Table 4-22 shows the BCR range for the above analysis parameters and the blue box shows the BCR with the core assumption.

Table 4-21: BCR range – Different Discount rate and Analysis Period-Time Zero 1

	Discount rate	Analysis Period	BCR				
			BJW	SH22	NS	Opa-Pon	Total
Time Zero 1	4%	40 year	1.1	0.7	2.3	1	**1.4**
	6%		0.8	0.5	1.6	0.7	**1.0**
	8%		0.6	0.4	1.2	0.5	**0.7**
	3%	60 year	1.8	1.2	3.7	1.5	**2.2**
	4%		1.5	0.9	2.8	1.2	**1.7**
	6%		1.0	0.6	1.8	0.8	**1.1**

Table 4-22: BCR range – Different Discount rate and Analysis Period-Time Zero 2

	Discount rate	Analysis Period	BCR				
			BJW	SH22	NS	Opa-Pon	Total
Time Zero 2	4%	40 year	1.4	0.9	1.9	0.9	**1.4**
	6%		1.1	0.6	1.3	0.6	**1.0**
	8%		0.8	0.5	0.9	0.5	**0.7**
	3%	60 year	2.1	1.4	3.2	1.4	**2.2**
	4%		1.8	1.1	2.4	1.1	**1.8**
	6%		1.2	0.7	1.5	0.7	**1.2**

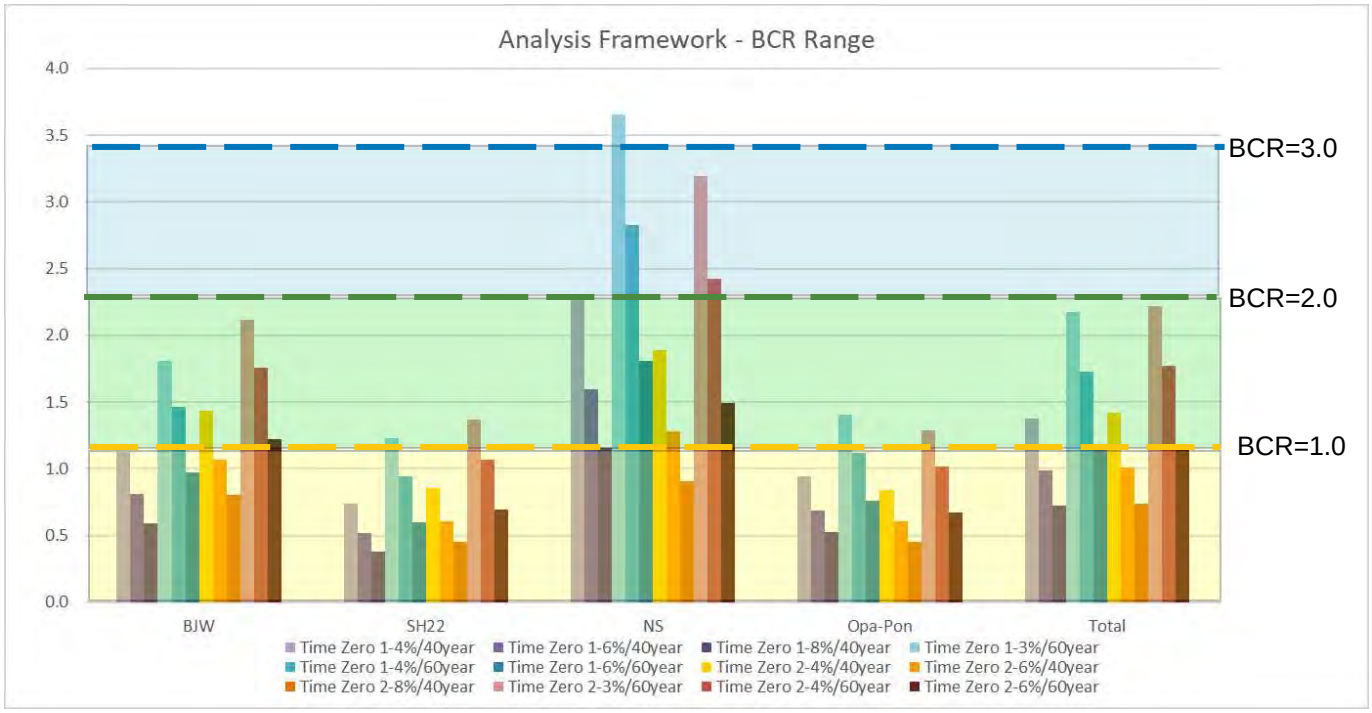


Figure 4-4: Analysis Framework - BCR range for the Drury Local Project

4.5.4 Parameter Sensitivity tests

The parameter sensitivity tests were carried out on the following parameters:

- Wider Economic Benefit Percentage- 15%, 25%, 30%, 40% and 50%
- Crash Reduction Percentage – 0% and 20%

- Benefits Allocation Percentage to Individual Projects
- PT Reliability Percentage – 50%, 70% and 100%
- Active mode benefits variability - +/- 25%

The Drury Local package have several sub-elements and hence the above parameters have been tested over the core assumptions only, altering one parameter at a time.

Wider Economic Benefit Percentage

The Table 4-23 shows the BCR range vary between 0.9-1.1 for the WEBs% ranging between 15%-50% compared with a central estimate of 30%. This gives a range of -50%/+66% for the WEBs

Table 4-23: BCR variation with WEBs Percentage

WEBs%	BCR				
	BJW	SH22	NS	Opa-Pon	Total
15%	0.7	0.5	1.4	0.6	**0.9**
25%	0.8	0.5	1.5	0.7	**0.9**
30%	0.8	0.5	1.6	0.7	**1.0**
40%	0.9	0.6	1.7	0.8	**1.1**
50%	0.9	0.6	1.8	0.8	**1.1**

Over the range of alternative scenarios tested the effects are relatively limited with the full BCR lying in the range from 0.9 to 1.1

Crash Reduction Percentage

The crash reduction percentage is a special parameter which have been introduced for the new improved Roads. The core assumption of 20% reduction of the standard crash rate in **Section 4.5.1** yields a BCR of 1.0. The Table 4-24 shows that there is no noticeable change in the BCR with the removal of special crash rate reduction parameter.

Table 4-24: BCR variation with Crash reduction Percentage

Crash reduction%	BCR				
	BJW	SH22	NS	Opa-Pon	Total
0%	0.8	0.5	1.5	0.7	**1.0**
20%	0.8	0.5	1.6	0.7	**1.0**

Benefits Allocation Percentage

As have been discussed in the **Section 4.1.7**, that the scenarios modelled for economic assessment are:

- Option Model
- Two Do-min Model
    - DM Model which excludes all the project elements of Drury Local Package
    - DM Model which excludes only the Opaheke North South Arterial

For other individual projects an allocation % have been adopted as shown in

Table 4-4. Since, the majority portion of benefit comes from traffic benefit and PT Benefits, tests have been carried out with these allocation percentages to understand the effect of BCR for traffic and PT benefits along with Active mode benefits which comes from the SAMM Model.

Altering the Allocation Percentage to each individual project typically has no impact on the NS Arterial, the other individual projects have a small-scale fluctuation as seen below**.**

Table 4-25: BCR variation with Project Allocation Percentage Adjustment

Allocation %	BCR				
	BJW	SH22	NS	Opa-Pon	Total
Core %	0.8	0.5	1.6	0.7	1.0
Travel Time % Adjustment	0.8	0.5	1.6	0.7	1.0
PT% Adjustment	0.7	0.8	1.6	0.7	1.0
Active Mode% Adjustment	0.8	0.6	1.6	0.6	1.0

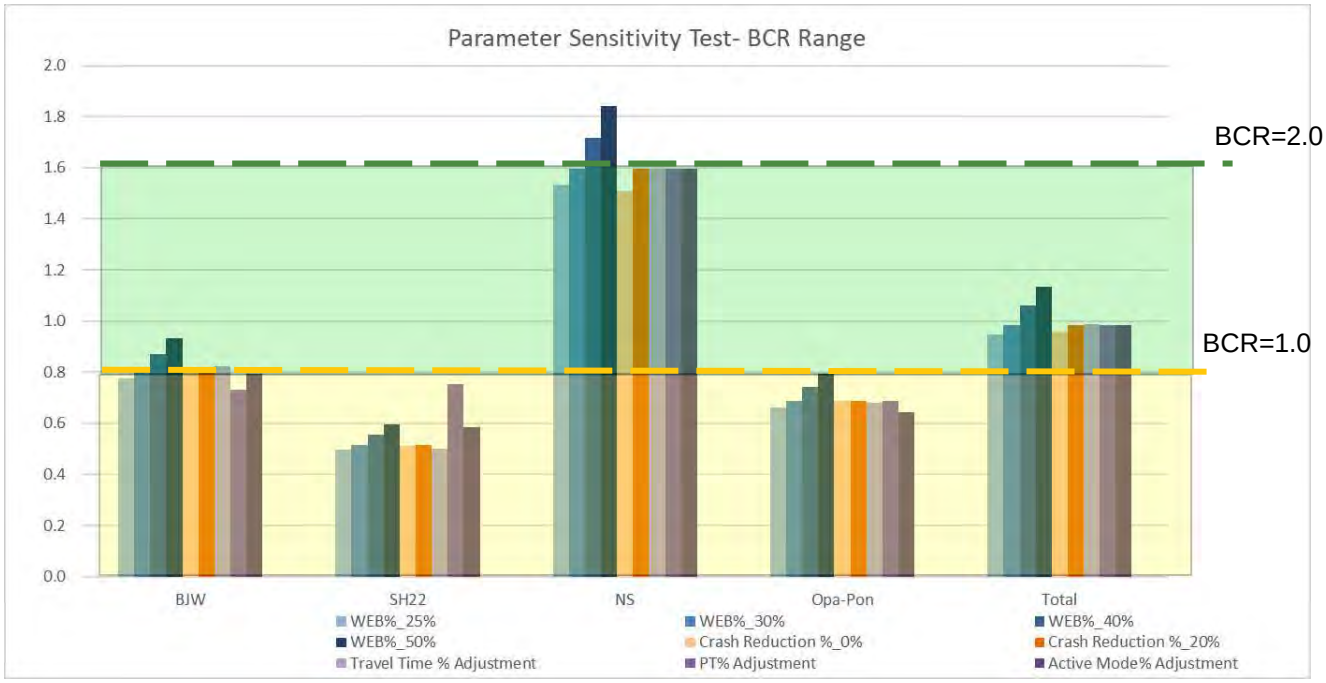


Figure 4-5: Parameter Sensitivity - BCR range for the Drury Local Project

4.5.5 Further Sensitivity tests

Further, some more sensitivity tests were carried out during the peer review process – PT reliability and Active mode benefits as described below:

PT Reliability Percentage

In discussion with Peer reviewer, it has been agreed to sensitivity test the PT reliability Percentage and determine its effect on the BCR. The core assumption of 70% based on the evaluation shown in **Section 4.3.3** yield a BCR of 1.0. The table below shows that there is no noticeable change in BCR for all the individual projects and overall package on dropping the PT reliability to 40%. There is a small rise in BCR for BJW with increase in PT reliability %, apart from that the BCR for the project seems quite stable with +/-30% variability from the evaluated value.

Table 4-26: BCR variation with PT reliability Percentage

PT Reliability %	BCR				
	BJW	SH22	NS	Opa-Pon	Total
40%	0.8	0.5	1.6	0.7	**1.0**
70% (base case)	0.8	0.5	1.6	0.7	**1.0**
100%	0.9	0.5	1.6	0.7	**1.0**

Active Mode benefits Sensitivity test

As part of the peer reviewer process, extensive modelling methodology checks were carried out to understand better the Walk benefits predicted by the model, especially for the “Other’ trip purpose. These were found to align with expected daily travel by each mode and purpose. However, the greenfield nature of the location and the extensive future population make it more difficult to independently check the scale of benefits. It was therefore agreed to test with +/-25% active mode benefits. The BCR for the package seems unaffected with +/-25% of active mode benefits.

Table 4-27: BCR variation with Active Mode benefits change

Active Mode benefit %	BCR				
	BJW	SH22	NS	Opa-Pon	Total
-25%	0.8	0.5	1.6	0.7	**1.0**
0%	0.8	0.5	1.6	0.7	**1.0**
25%	0.8	0.5	1.6	0.8	**1.0**

4.6 Summary

From the Analysis factor sensitivity the BCR range varies between 0.7-2.2 for the Total Drury Package. The parameter sensitivity tests show less impact on the BCR range, while the start date of the projects and the discount rate have a significant impact on the BCR.

- Switching to the new evaluation rules (4% and 60 years) would make a substantial difference to the scheme, raising the National BCR from 1.0 to 1.7.
- Changing the timing of development would alter the balance between the BCRs for the different scheme components but would leave the overall benefits unchanged. Hence, it is very essential to commence the projects at appropriate timing when the land use growth occurs
- All the other parameter sensitivity tests have indicated that their impacts are small, and the findings are robust is relation to changes in these.

4.6.1 Key Findings

- Postponing the Project by 5 years for the Bremner-Jesmond-Waihoehoe and the North South Opaheke Arterial yields generous amount benefits but have less impact on SH22 and Opaheke-Ponga Road
- By postponing the BJW and SH22 by 5 years and preponing the NS and Opa-Ponga Project by 5 years from the core Time Zero assumption yields same BCR as the core Time Zero
- It does not matter much on the Parameter assumptions as they have less impact on the Total BCR.
- Further for the robustness of the work, sensitivity tests with the PT reliability % and the Active mode benefits were carried out and it shows that they have no significant effect on the overall reported BCR.

Table 4-28: Summary of BCR Range for the Projects

	BJW	SH22	NS	Opa-Pon	Total
Analysis Framework	0.6-2.1	0.4-1.4	0.9-3.7	0.5-1.4	0.7-2.2
Parameter Sensitivity	0.7-0.9	0.6-0.8	1.5-1.6	0.6-0.9	0.9-1.1

Overall, the analysis has demonstrated that the Drury Package has a BCR of around 1.0 under the assumptions adopted although with the revised evaluation assumptions coming into force with a lower discount rate and longer evaluation period this would increase to 1.7. It was found to only be below 1 (0.7) under a test with the higher 8% discount rate or with WEBs lower than calculated. The BCR was found to be greater than 1 with a 4% discount rate or where projects were slightly delayed. This indicates that the Package is likely to be an investment with a BCR greater than 1, although this will depend on the timing of elements being optimised to match the land use growth.

The appraisal has not considered 3rd party funding (such as developer contributions), nor of more detailed staging scenarios in line with the growing travel demand (e.g. construction of initial 2-lane corridors expanded to 4 lanes at a later date when needed). Both of these opportunities would significantly increase the likely BCRs. The progressive development of this area over the next 30+ years suggests there would likely to significant opportunities for such strategies.

4.6.2 Covid 19 Scenario

The Land use growth might slow down due to Covid or any other unknown reasons in long term and hence the project start date might need to be delayed to meet the changed transport needs. We recognise such situation to arise but believe it will not have any significant impact on the economic returns from the project as the costs and benefits timestreams will be shifted with the project start.

5 Risk, Opportunities and Recommendations

This section describes the key risks, uncertainties and opportunities associated with the planned future growth and the wider interdependencies between projects and the wider transport network.

5.1 Risks and uncertainties

There are several risks and uncertainties to be noted, with respect to the planned future growth and associated transport network planning and transport operations. Table 5-1 provide a summary of several potential risks and provide a description of the associated uncertainty influencing each risk.

Table 5-1: Risks and uncertainties

Risk Type	Description of Uncertainty
Planned Growth Pressures	The transport networks within this area is highly influenced by the proposed release of FUZ area by Council through Plan Changes. The Council's proposed sequencing of land release is identified in the FULSS. The FULSS, however is a broad rather than granular strategy. There are known growth pressures from landowners and developers for accelerated growth in some areas which may result in a different timing and sequencing of land release than is indicated in the FULSS. The recently released National Policy Statement on Urban Development includes a policy directive for 'responsive planning', which indicates the need to consider out-of-sequence' plan changes. This means additional uncertainty to when urban development may occur, but strengthens the case for early protection of identified transport corridors
Wider Growth Pressures	The growth in the Structure Plan areas are significant but is occurring in the context of strong growth in adjacent areas including existing urban areas to the north, and the Waikato to the south. This means that transport demands are influenced by regional and inter-regional growth for the strategic networks, not just growth in the Structure Plan areas.
Transport and land use integration	Given the relative uncertainty regarding the timing and form of specific land use activities, precise analysis of specific land use activities and Plan Changes staged over three decades cannot be done at this point of the process. This would simply reflect the limited current knowledge of land use activities. However, the

	extensive, and ongoing coordination between land use and transport agencies and supporting local and central Government policy direction for urban development should reduce the risk of undesired or un-planned outcomes.
Land Use Density	To achieve optimum transport and land use integration, high urban density surrounding centres, public transport corridors and hubs are critical to deliver the desired transport and land use outcomes. Any land use change that reduce urban density could have detrimental effects on resource management, viability and sustainability of active modes and public transport facilities/operations and lead to poor transport and land use integration outcomes. Economic, market and commercial drivers will influence the urban densities. Policy direction and commercial drivers could however sustain appetite for delivering the desired high density.
Network Classification	The Unitary Plan has special access controls for roads identified as Arterials. All the proposed Drury package projects are proposed to be future arterial roads. Jesmond Rd, Bremner Rd, Waihoehoe Rd, Ponga Rd and parts of Opaheke Rd are not currently classified as arterial roads. Therefore, there is a risk that the interim Plan changes are approved based on the current road classification and inconsistent with future network classification and standards.
Network Staging	Each project has interdependencies with other projects in the southern growth area (as shown in Appendix 3). There is a risk that if projects are staged in an uncoordinated way, undesired safety, transport and land use integration outcomes could occur.
Funding Constraints	The IBC and DBC's have identified the need for significant transport infrastructure to support the next 30+ years of growth in South Auckland and wider regional growth. The cost of these transport infrastructure required is significant and limited funding could either limit the planned growth or result in undesired transport and land use integration outcomes.
Short versus Long-Term outcomes	This business case has focussed on the corridors needed to be protected for the long-term, fully-

	developed growth scenario. Because the land use itself will take many decades to be fully realised, there is a risk that the over-investment in ultimate solutions too early could result in rejection of unaffordable solutions. Alternatively, a focus only on interim staging solutions could result in higher risks that long-term outcomes cannot be obtained.

5.2 Opportunities and Recommendations

There are several opportunities with regards to ongoing management and controls to minimise risks and maximise opportunities to achieve optimum transport and land use outcomes.

The following is a summary of the potential opportunities and recommendations to minimise risks:

- Use a high level and principle-based approaches (including triggers on system performance and planned and wider growth pressures) to guide decisions on staging required for transport infrastructure and services
- Encourage and support controls in land use development that explicitly reflect the desired long-term outcomes and the need to integrate the provision of transport upgrades with land use development
- Prepare regular and continuous controls to ensure optimum transport and land use integration are achieved in the short and long-term planning timeframes
- Encourage and support land use controls that maintain or increase planned urban density through regional and national policy initiatives. The proposed new railway stations in Drury present a significant opportunity for implementing higher densities surrounding it
- To ensure the network transitions in the short and long-term planning timeframes achieve optimum transport and land use integration, it's important that the proposed road classification of all road in the Drury Package to be classified as Arterial imminently
- To plan and manage the likely funding constraints, it's recommended that a Transport Infrastructure Programme for South Auckland and wider regional growth to be developed between Government and Auckland Council to determine the timing, staging, funding and sequencing of the delivery of the preferred transport network for South Auckland.

6 Staging

The IBC and DBC have identified the need for significant transport infrastructure to support the next 30+ years of growth in South Auckland and wider regional growth. The scale of growth is significant, and projects will have extended delivery timeframes staged over three decades.

The growth in the relevant Structure Plan areas (specifically Drury-Opāheke, and more broadly Pukekohe-Paerata) is occurring in the context of strong growth in adjacent areas including existing urban areas to the north, and the Waikato to the south. This means that transport demands (and therefore staging considerations) are influenced by regional and inter-regional growth for the strategic networks, not just growth in the Structure Plan areas.

The staging of transport networks within the Southern growth areas is highly influenced by the proposed release of FUZ area by Council through Plan Changes. The Council's proposed sequencing of land release is identified in the FULSS.

There are known growth pressures from land owners and developers for accelerated growth in some areas which may result in a different timing and sequencing of land release than is indicated in the FULSS.

This section includes details about key drivers, parallel workstreams, and the transport infrastructure approach to staging outlining the range of potential staging scenarios. The focus of this business case is on route protection, with separate Programme Management processes to assess and inform implementation decisions. In this context, and with the significant uncertainties in the timing of the urban development, this assessment has focussed on broad strategy and principles for staging, rather than detailed project sequencing recommendations.

6.1 Key Drivers

The network staging assessment below covers a range of different considerations and parallel workstreams. There are various influencers that can shape how network staging will be delivered over the next three decades, these include:

- The Future Urban Land Supply Strategy (FULSS)
- Changes in land use planning and growth context
- Drury Transport Infrastructure Programme (DTIP)
- Auckland Regional Land Transport Plan (RLTP)
- New Zealand Upgrade Programme (NZUP)

The section below briefly describes these key drivers and their relationship to staging considerations.

The Future Urban Land Supply Strategy (FULSS)

The Future Urban Land Supply Strategy (FULSS)[7] identifies a programme to sequence the release of FUZ land for urbanisation over the next 30 years according to the planned staging of bulk

[7] https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/topic-based-plans-strategies/housing-plans/Documents/future-urban-land-supply-strategy.pdf

infrastructure development. Figure 6-1 set out the planned staging and indicative yields as set out in the FULSS for the Southern Structure Plan areas.

For full context, it should be noted that there are a number of areas in the areas adjacent to the Structure Plan areas with existing live urban zoning, and accordingly are already considered 'development ready'.

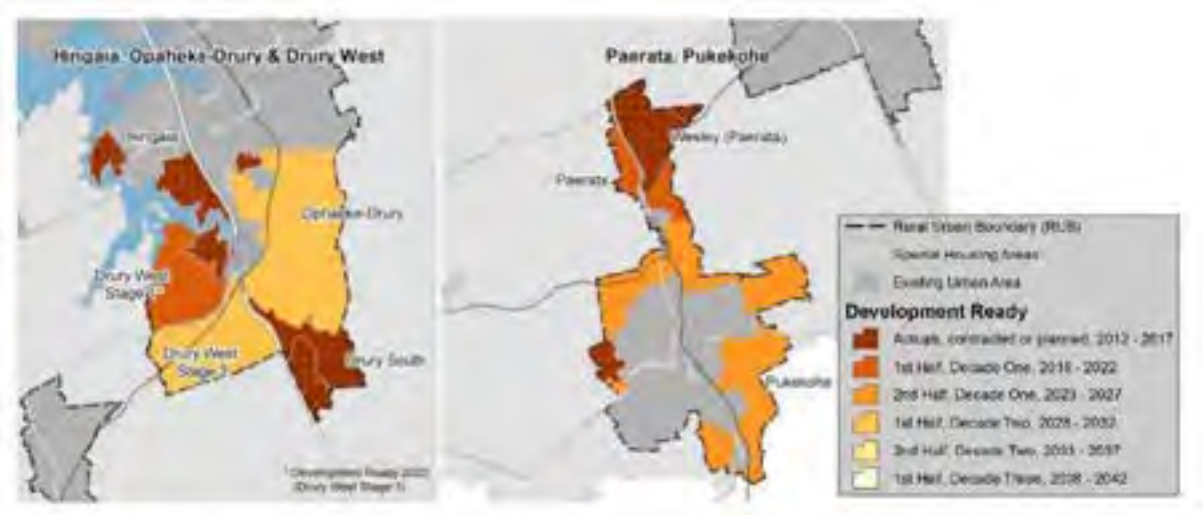


Figure 6-1: FULSS maps for the Southern Structure Plan areas

Changes in land use planning and growth context

As per the Auckland Unitary Plan requirements for urbanising FUZ land, Auckland Council has completed Structure Plans for the Opāheke-Drury[8] and Pukekohe-Paerata[9] areas (see Draft Structure Plans – Drury -Opāheke and Pukekohe Paerata for extents). The Structure Plans were subject to a public engagement process in April 2019, and was finalised and formally endorsed by the Auckland Council Planning Committee in August 2019. Following the approval, the finalised Structure Plans will form the basis of any Council-initiated Plan Changes to 'live zone' land in the area for development.

The Structure Plans provide the most advanced ideas to date on the general land use pattern for the Opāheke-Drury and Pukekohe-Paerata areas, including:

- The indicative locations of centres, residential and industrial areas, environmentally sensitive areas (e.g. streams), parks, and other physical and social infrastructure;
- Indicative development yields estimated at over 35,000 dwellings, 17,000 jobs, and a population of over 96,000 between the two Structure Plan areas (Note: The IBC considered a range of possible figures, including the 2017 FULSS estimates at the lower end, and an upper bound estimate known as '2048+'.

[8] Draft Opāheke-Drury Structure Plan – Auckland Council, April 2019.
[9] Draft Pukekohe-Paerata Structure Plan – Auckland Council, April 2019.

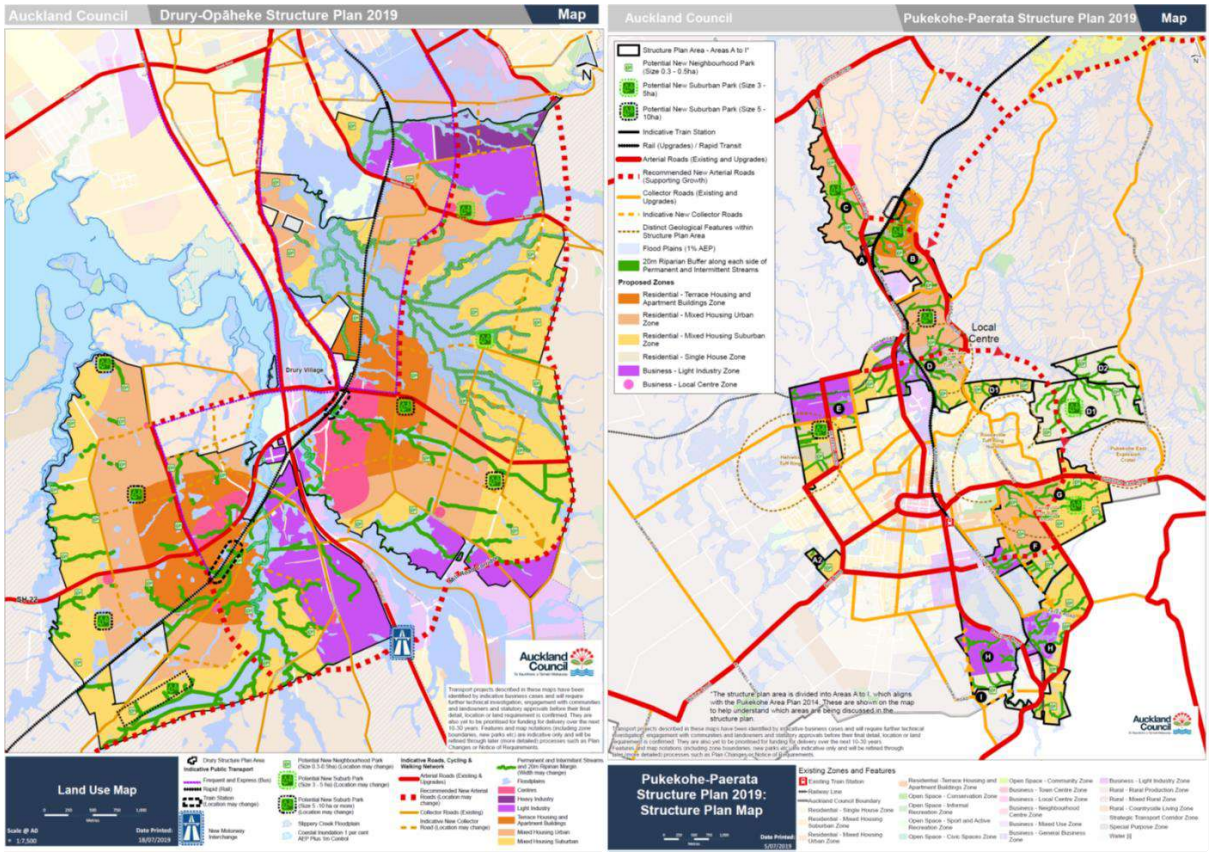


Figure 6-2 Draft Structure Plans – Drury -Opāheke and Pukekohe Paerata

Drury Transport Infrastructure Programme (DTIP)

The DTIP (Drury Transport Infrastructure Programme) is a parallel workstream between Government and Auckland Council to determine the timing, staging, funding and sequencing of the delivery of the preferred transport network for Drury.

Its purpose as outlined in the Terms of Reference (ToR) dated June 2019 is as follows:

- To provide expert advice and recommendations on the optimal timing, staging and sequencing to deliver the preferred transport network projects. The preferred network projects must fulfil three primary criteria:
    - To resolve existing significant capacity and safety issues in the transport system which services Drury and surrounding areas
    - Support existing enabled development capacity in Drury West
    - Enable the urbanization of specific Decade 2 landholdings in Drury East
- To provide expert advice on options to fund these projects

The programme's primary objective is to define the projects identified in the ToR and SGA South IBC for Route Protection which best satisfy one of the three criteria above, promote a sustainable long-term modal shift to Public Transport and that collectively deliver cohesive transport networks delivered to enable projected growth whilst providing network reliability and integrity during the course of the programmes delivery life cycle. The DTIP work package has been formulated in parallel to the SGA workstream to accelerate key decision for a wider Transport Infrastructure Programme for South

Auckland. It is likely that this DTIP recommended staging will continue to evolve to reflect plan changes and commercial or funding constraints.

Auckland Regional Land Transport Plan (RLTP)

The Regional Land Transport Plan (RLTP) is a parallel workstream, with a 10-year investment programme for transport in Auckland, developed by Auckland Transport (AT) together with the New Zealand Transport Agency (NZTA) and KiwiRail to respond to growth and challenges facing Auckland over the next decade.

The RLTP acknowledges Auckland's challenges linked to accommodate rapid population growth that requires accelerating the construction of housing and business development including the Drury/ Pukekohe/Paerata areas. The RLTP includes an investment programmes staged between 2018–2028.

New Zealand Upgrade Programme (NZUP)

The New Zealand Upgrade Programme is a parallel workstream that reflects the Government's balanced transport policy with $6.8 billion being invested across road, rail, public transport and walking and cycling infrastructure across New Zealand. The upgrade programme includes transport infrastructure in six main growth areas – Auckland, Waikato, Bay of Plenty, Wellington, Canterbury and Queenstown.

The package provides for more frequent and better public transport and building safe, new walking and cycling paths. The committed planned transport networks relevant to south Auckland can be summarised as follows:

- Proposed rail stations in Drury West and Drury Central. These rail stations are included in the New Zealand Upgrade Programme (NZUP) and construction is planned to start in 2023 and be completed by late 2024
- Rail upgrade from Papakura to Pukekohe, including electrification and further long term capacity upgrades
- SH 1 Papakura-to-Bombay Upgrade providing more north-south regional capacity
- Mill Road Corridor – a new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH 1 in Drury South The New Zealand Upgrade Programme[10] indicates that the construction of the Mill Road corridor will likely start in late 2022 and be completed in stages between 2025 to 2030.

The New Zealand Upgrade Programme will trigger a range of different considerations linked to growth. More notable, accelerating the 'development ready' status of the future planned urban zones.

[10] https://www.nzta.govt.nz/planning-and-investment/nz-upgrade/auckland-package/mill-road/

6.2 Staging Principles

Due to the uncertainty regarding the timing and form of specific land use activities, a principle-based approach is regarded as the best way to manage and deliver the desired transport and land use outcomes consistently. This recognises that staging in many cases will either be determined by regional, inter-regional and local priorities, which heavily rely on the scale and rate of growth.

A set of principles is therefore developed, which links staging decisions to broader strategic goals regarding travel demand management and modal shift.

Key principles for staging have been developed that seek to assist in delivering the desired transport and land use outcomes. These principles include supporting the following outcomes:

- Immediate shift to more sustainable travel choices
- Manage adverse impacts of development on the wider system
- Support the desired urban form, particular high density, quality urban environments
- Recognise the need to support both place and movement function
- Provide affordable staging plans that match development staging
- Protect for longer-term needs.

The suggested principles for staging include:

- Programming public transport and active-mode facilities and services from the outset of urban development to support a shift to more sustainable travel
- Prioritise PT and active-mode facilities that support attractive access to the rail stations
- Considering staging of elements of a project to match likely development stages and system needs, whilst also considering pathways to achieve the full-build elements
- Consider the needs to support place-function, not solely movement function
- Provide safe travel by all modes
- Staging that can respond to the timing, scale and form of urban development

6.3 Potential Staging Scenarios

There are multiple potential combinations of how the staging of projects could be implemented to respond to the timing, scale and form of urban development. There are inherent uncertainties linked to how projects will be staged cross-sectionally and longitudinally over the next three decades.

This section provides a summary of potential staging considerations, including:

- Interdependencies with other projects
- Longitudinal Staging
- Cross-Sectional Staging

6.3.1 Interdependencies with other projects

Given the scale transport infrastructure to be delivered in the next 30+ years of growth in South Auckland and wider regional growth. The Drury Package has a number interdependencies with other projects, particularly functional overlaps and staging considerations that influence effectiveness of transport and land use integration (individual projects and cumulative delivery)

The following tables provide an overview of the interdependencies and relationships between Drury Projects and other Te Tupu Ngātahi (Table 6-1) and AT / NZ Transport Agency Projects (Table 6-2) to provide clarity about short and long term integrated project planning.

Table 6-1: Interdependencies with Te Tupu Ngātahi Projects

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
Additional rail capacity between Pukekohe and Papakura (and associated grade separations at road/rail crossings)	A road rail bridge is proposed on Ōpāheke Road to cross the NIMT Rail line. The bridge is included in the Rail DBC.								✓
New rail stations at Drury Central, Drury West and Paerata	The Jesmond Road and SH 22 upgrade projects are located adjacent to and are being coordinated with the project for a proposed new rail station at Drury West. The Bremner Road FTN and Waihoehoe Road West FTN upgrade projects are located adjacent to and are being coordinated with the project for a proposed new rail station at Drury Central to maximise access to the station.	✓	✓	✓	✓	✓			
Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH 1 and NIMT	Walking and cycling paths along the road upgrade projects in the Drury Local package will connect to this more strategic cycling route. Together these projects will help support a transformational mode shift towards walking and cycling in the South.	✓	✓	✓	✓	✓	✓	✓	✓
Mill Road Corridor – a new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH 1 in Drury South	The Waihoehoe Road upgrade projects, Ponga/ Ōpāheke Road upgrade and the new N-S arterial through Ōpāheke are being coordinated with and will connect to the proposed Mill Road corridor project in this South Strategic package.				✓	✓	✓	✓	✓
New Pukekohe Expressway – alternative route to SH 22 between SH 1 (east of proposed Drury South	This proposed Expressway is proposed as a long-term alternative to SH 22 and hence has a direct interrelationship with the SH 22 upgrade project proposed under the Drury Local package. The Expressway is intended to provide for	✓							

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
interchange) and Pukekohe (to the north-eastern connection to Pukekohe Ring Road)	the long-term demands for transport movements between Drury and Pukekohe, that are currently carried on SH 22.								
New arterial connections to the Proposed Pukekohe Expressway	The Jesmond Road FTN upgrade project is being coordinated with and will connect to the most northern connection to the proposed Pukekohe Expressway		✓						
FTN on Porchester / Mahia / Roscommon Roads and Great South Road from Drury to Manukau	The FTN network upgrades proposed on Jesmond, Bremner and Waihoehoe will connect into this broader FTN network		✓	✓	✓				

Table 6-2: Interdependencies with other Transport Projects

Project	Relationship and influences	SH 22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West	Waihoehoe Road East	Ōpāheke N-S	Ponga Road	Ōpāheke Road
SH 1 Papakura-to-Bombay	Stage 1 of the P2B project includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the SH 22 upgrade project. The Interchange upgrade will also need to provide for proposed rail upgrades (see Table 1-3). There is also a direct inter-relationship with the Bremner Upgrade/FTN project, as P2B will necessitate an upgrade/replacement of the existing Bremner Road crossing of SH 1.	✓		✓					
SH 22 Drury-to-Paerata (Safe Network Programme)	The Safe Network Programme is in the funding application process for short-term safety improvements in the SH 22 area. Parts of this programme are being prioritised including a roundabout at the intersection of SH 22 and Glenbrook Road, and the recently completed right-turn bay into Jesmond Road. Longer term upgrades on SH 22 between SH 1 and Oira Road are being looked at by SGA as part of this Drury Local package. These upgrades are proposed to improve safety, amenity and capacity along the route to enable urbanisation of the area and are envisaged to ultimately be supplemented by a new route in the long term (the proposed Pukekohe Expressway).	✓							

6.3.2 Potential Scenarios

This approach is intended to identify potential options and scenarios for staging by decade, using the assumed sequencing of land release and incorporating different scenarios. It identifies different potential longitudinal staging scenarios and undertake a comparative analysis of each scenario to highlight the strengths and weaknesses of each.

In the identification of the transport system to support the next 30+ years of growth, there is inherent uncertainty in relation to the recommended network and the proposed staging strategy. To understand the potential implications, several scenarios were considered:

- **Scenario 1:** Land use certainty with ample funding
- **Scenario 2:** Mode shift & emissions reduction led scenario
- **Scenario 3:** Land use uncertainty with limited funding

Each scenario is discussed below in greater detail, including assumptions its associated drivers and potential timeframes by decade.

Scenario 1: DTIP NZUP + FULSS

This scenario assumes that the development ready timeframes identified in FULSS materialise and the associated projects to support the growth occur concurrently. It also assumes optimal DTIP sequencing goes ahead, taking into account NZUP and related projects.

The principles and triggers identified above result in majority of the package to be implemented within the first decade to support the imminent growth expected from Auranga Precinct development, and Private Plan Changes currently lodged in Drury West/ Drury East. Also, it integrates well with the planned new centres and rail stations in Drury. Table 6-3 outlines the proposed Staging Strategy for Scenario 1

Table 6-3 Recommended Staging Strategy for Scenario 1 (Optimal)

Project	Decades			Triggers
	1	2	3	
Jesmond Road FTN Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West & connect to Drury West station.
Bremner Road FTN Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West /Drury East & connect to Drury Central station.
SH22 Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West & connect to Drury West station.
Waihoehoe Road FTN Upgrade				Drury East growth acceleration: Private Plan Change by • Oyster Capital, • Fulton Hogan and • Kiwi Property

Opaheke North-South Arterial FTN				• FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.
Opaheke Road - Ponga Road Upgrade				• FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.

Scenario 2: Mode Shift & Emissions Reduction led (PT Led)

For this scenario mode shift and emission reduction projects were prioritised. It assumes NZUP committed schemes scheduled as per government programmes (generally Decade 1), it brings all Public transport projects forwards into Decade 1 unless otherwise stated (with rationale).

As shown in **Error! Reference source not found.**, this scenario results in the following differences from Scenario 1 (Optimal):

- SH22 pushed back to 2nd decade as PT elements of the corridor is expected to be implemented after Pukekohe Expressway is operational
- Opaheke North-South Arterial FTN project pulled forward to 1st decade

Table 6-4 Staging Strategy for Scenario 2

Project	Decades 1	2	3	Triggers for Recommended Staging Scenario
Jesmond Road FTN Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West & connect to Drury West station.
Bremner Road FTN Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West /Drury East & connect to Drury Central station.
SH22 Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West & connect to Drury West station
Waihoehoe Road FTN Upgrade				Drury East growth acceleration: Private Plan Change by • Oyster Capital, • Fulton Hogan and • Kiwi Property
Opaheke North-South Arterial FTN				• FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.
Opaheke Road - Ponga Road Upgrade				• FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.

Legend	
Scenario 2	
Recommended Staging (Scenario 1)	

The implications of this scenario are as follows:

- Delaying SH22 upgrade would negatively impact both existing and future (Auranga development and Drury West) communities

- Whilst accelerating Opaheke North-South Arterial FTN would provide some positive mode shift outcomes, the increase is public transport and active mode patronage could potentially be quite low as the Opaheke area is not stated for development until the 2nd Decade

As a result of the above, the recommended programme would likely be impacted by this scenario as follows:

- Poor accessibility and safety outcomes for existing and future communities in Drury West
- Questionable value for money proposition if Opaheke North-South Arterial FTN is implemented before Future Land release in Opaheke

Scenario 3: COMMITTED SCHEMES (NZUP + RLTP)

This scenario assumes that the development ready timeframes identified in FULSS materialise, committed schemes (including NZUP) occur in Decade 1 and the rest of the projects are scheduled in Decades 2 and 3

To understand the implications of this scenario, projects not committed in the first decade were scheduled for Decades 2 and 3. As shown in Table 6-5, this scenario results in no Drury Arterial projects being implemented during Decade 1.

Table 6-5 Staging Strategy for Scenario 3

Project	Decades			Triggers for Recommended Staging Scenario
	1	2	3	
Jesmond Road FTN Upgrade				• FULSS land release - 1st Decade Support development of Auranga Precinct/Drury West & connect to Drury West station.
Bremner Road FTN Upgrade				• FULSS land release - 1st Decade Support development of Auranga Precinct/Drury West /Drury East & connect to Drury Central station.
SH22 Upgrade				• FULSS land release - 1st Decade • Support development of Auranga Precinct/Drury West & connect to Drury West station.
Waihoehoe Road FTN Upgrade				Drury East growth acceleration: Private Plan Change by • Oyster Capital, • Fulton Hogan and • Kiwi Property
Opaheke North-South Arterial FTN				FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.
Opaheke Road - Ponga Road Upgrade				FULSS land release - 2nd Decade. Great South Road to be sequenced first and progressively upgraded over time.
Legend				
Scenario 3				
Recommended Staging (Scenario 1)				

Auranga Precinct development is expected to grow 2,650 new dwellings in Drury West. In addition to this, with increased emphasis on prioritising growth in Drury, more growth is expected in Drury Central if the Private Plan Changes are accepted and development is pulled forward to the 1st decade. The

existing transport infrastructure will be inadequate for this substantial growth in travel demand. Some of the key implications of this alternative staging scenario are:

- Safety: the current corridor form and function is inappropriate to safely accommodate future transport demand
- Access to jobs: lack of investment in walking and cycling, and public transport connections will increase reliance on currently congested corridors such as SH1, SH22 and Great South Road, and therefore potentially resulting in very poor accessibility from Drury
- Reliance on cars and emissions: similar to above, the lack of investment in the 1st decade will result in much greater reliance on single occupant vehicle usage

Overall this scenario has the lowest early investment cost is not fit for purpose to support the planned future urban growth. There are significant adverse effects expected if future growth materialises and existing transport infrastructure remains the same. The adverse effects would compromise safety, wellbeing, liveability and lead to several unwanted outcomes.

Table 6-6 outline the summary of each scenarios and its different considerations and parallel workstreams assumed.

Table 6-6: Summary of Scenarios

Scenario 1: DTIP NZUP + FULSS	Scenario 2: PT LED	Scenario 3: COMMITTED SCHEMES (NZUP + RLTP)
• Builds on DTIP Option 1: Base Scheme Optimal. • Assumes optimal DTIP sequencing goes ahead, taking into account NZUP and related projects. • Includes known committed schemes. Where no DTIP/NZUP impacts exist, FULSS is used to inform sequencing assumptions	• Assumes NZUP, essential related projects and known committed schemes scheduled as per government programmes (generally Decade 1). • Brings all PT forwards into Decade 1 unless otherwise stated (with rationale). • Balance of projects scheduled in Decades 2 and 3.	• Assumes NZUP and committed schemes occur in Decade 1. • Balance of projects scheduled out in Decades 2 and 3.

To understand how each scenario differs, a high-level comparative analysis was undertaken to assess scenarios using a scoring framework (against a set of criteria). The criteria include urgency, value for money, long term vision, and other non-scored considerations. Table 6-7 provides a summary of the assessment criteria used to score each scenario.

Table 6-7: Assessment Criteria

Criteria	Criteria Breakdown
Urgency	• safety • access to economic and social opportunities (local and wider context) • access regarding transport choice

	• access regarding resilience
Value for Money	• Optimised cash flow: characterised by consistent levels of spending • Economic efficiency: based on calculated benefit cost ratios (BCRs) • Enabling development of housing and employment in accordance with FULSS.
Long Term Vision	• Ability to influence desired urban form • Contribution to transformation mode shift
Non-Scored Considerations	• Consistency with stakeholder/ customer expectations • Environmental opportunities: based on timing of projects as timing affects environmental opportunities and environmental impacts. Environmental opportunities are evident where there is the opportunity to reduce greenhouse gas emissions. • Affordability: assesses whether funding is accessible • Risk and uncertainty: the main concerning risk is if land use does not occur as planned.

The sections below summarise the outcomes of the staging assessment using the scoring framework to assess each scenario. Table 6-8 provides a summary of the scoring undertaken and context of how well it aligns with each criteria, ranking from low to high.

Given the relative uncertainty regarding the timing and form of specific land use activities and the range of key influences, this only provides an overview of the strengths and weaknesses of each scenario.

Table 6-8: Staging Scoring Assessment

Criteria		Implementation Options Considered		
		1 - DTIP NZUP + FULSS	2 - PT LED	3 - COMMITTED SCHEMES (NZUP+RLTP)
Urgency (based on GPS)	Safety	HIGH	MEDIUM	LOW
	Access – to economic and social opportunities	HIGH	MEDIUM	MEDIUM
	Access – to transport choice	MEDIUM	HIGH	LOW
	Access – Resilience	HIGH	MEDIUM	MEDIUM
Value for Money	Optimised cash flow	MEDIUM	MEDIUM	LOW
	Economic efficiency	LOW	LOW	MEDIUM
	Enabling development of housing and employment in accordance with FULSS	HIGH	MEDIUM	LOW
Long term Vision	Ability to influence desired urban form	HIGH	MEDIUM	LOW
	Contribution to transformational mode shift	MEDIUM	HIGH	LOW
Non scored considerations	Consistent with stakeholder / customer expectations	HIGH	LOW	HIGH
	Environmental opportunities	MEDIUM	HIGH	LOW

	Affordability	LOW	LOW	MEDIUM
	Risk and uncertainty	Relies on land use (Pukekohe) envisioned in FULLS	Relies on land use envisioned in FULLS (Opaheke)	Growth is expected to occur. Difficult to build infrastructure after growth

Legend
Low
Medium
High

Whilst this assessment of each scenario shows different outcomes for each potential package, it's likely that some individual projects within each package will be accelerated or delivered in sub-stages. Therefore, to guide the staging decision making given the relative uncertainty about timing and how it might translate to scenarios, stages and sub-stages. It is recommended to follow the staging principles set out below.

6.3.3 Cross-Sectional Staging

The cross-sectional staging is intended to illustrate opportunities how the principles-based approach could translate to lateral change over time, particularly to account for how projects could potentially be staged cross-sectionally. The lateral change reflects the corridor cross-sectional changes in stage 1(interim) and stage 2 (full build out).

Table 6-9 provide context about how each project included in the Drury Package could potentially be staged cross-sectionally, using the staging principles to respond to the timing, scale and form of urban development.

Table 6-9: Potential Cross-Sectional Staging

Road Section	Stage 1 (Interim)	Stage 2
SH22 Upgrade	**2/4-lane with walking and cycling (high east-west movement):** - dedicated footpaths and cycle lanes on both sides - safe intersection crossing facilities for active modes, general traffic and public transport - additional east-west capacity (T2, T3 and bus Priority) - reduce speed to 50kph - east-west traffic along SH 22 would operate near or at capacity along SH22 until Pukekohe Expressway is complete	**4-lane with walking and cycling (med east-west movement):** - strategic east-west traffic along SH 22 to reroute to Pukekohe Expressway when complete
Jesmond Road, Bremner Road, Waihoehoe Road West Upgrade	**2-lane urban standard with walking and cycling (including new section):** - 2 lanes for general traffic and buses - dedicated footpaths and cycle lanes on both sides	**Upgrade to 4-lane urban standard with walking, cycling and FTN facilities** - 2 lane FTN route for priority vehicles, 2 lanes for general traffic

	- reduce speed to 50kph - New 2 lanes corridor along Bremner Road-Norrie Road - Complete 2-lane urban arterial standard from SH22/Jesmond intersection to Waihoehoe/Fitzgerald Road	- dedicated footpaths and cycle lanes on both sides - reduce speed to 50kph - Complete 4-lane urban arterial standard from SH22/Jesmond intersection to Waihoehoe/Fitzgerald Road
Waihoehoe Road East Upgrade	Mill Road NZUP Complete and tie-ins with Waihoehoe Road	**2-lane urban standard with walking and cycling):** - 2 lanes for general traffic and buses - dedicated footpaths and cycle lanes on both sides - reduce speed to 50kph - Complete 2-lane urban arterial standard from Waihoehoe/Fitzgerald Road to future Mill Road
Opaheke N-S Arterial Road	**New 2-lane urban standard with walking and cycling** - 2 lanes for general traffic and buses - dedicated footpaths and cycle lanes on both sides - posted speed of 50kph - Complete 2-lane urban arterial standard from Waihoehoe Road intersection to Hunua/Boundary Road in north	**Upgrade to 4-lane urban standard with walking, cycling and FTN facilities** - 2 lane FTN route for priority vehicles, 2 lanes for general traffic - dedicated footpaths and cycle lanes on both sides - posted speed of 50kph - Complete 4-lane urban arterial standard from Waihoehoe Road intersection to Hunua/Boundary Road in north
Opaheke, Ponga Road Upgrade	Mill Road NZUP Complete and tie-ins with Ponga Road	**2-lane urban standard with walking and cycling):** - 2 lanes for general traffic and buses - dedicated footpaths and cycle lanes on both sides - reduce speed to 50kph Complete 2-lane urban arterial standard from Waihoehoe/Fitzgerald Road to future Mill Road

Therefore, to guide the staging decision making given the relative uncertainty about timing and how it might translate to scenarios, stages and sub-stages. It is recommended to follow the staging principles set out below.

6.4 Summary

In summary, there are a range of different drivers, parallel workstreams and triggers that will influence how network staging will be delivered over the next three decades.

Due to the uncertainty regarding the timing and form of specific land use activities, it is not feasible to develop a detailed stage-by-stage implementation plan. Further, this is not required for this Business Case given its focus on identifying preferred long-term corridors, which will be subject to separate implementation decisions. Therefore, a principle-based approach is regarded as the best way to manage and deliver the desired transport and land use outcomes consistently.

There are multiple potential combinations of how the staging of projects could be implemented to respond to the timing, scale and form of urban development, so this assessment can only be considered as illustrative of the kind of staging that could be considered.

Although this section provides a summary of potential staging considerations, it simply reflects the limited current knowledge of land use activities. Therefore, the inherent nuances linked to interdependencies with other projects, cross-sectional staging, longitudinal staging and land use activities should frequently be evaluated (with every Plan Change) to ensure that optimum transport and land use integration is achieved in the short, medium and long term. This analysis does demonstrate that:

- there are a multitude of ways the urban development of this area could be staged
- that active monitoring and management of implementation decisions will need to be dynamic, pro-active in its response to a range of inputs, including land use planning, land use outcomes and system performance

7 Conclusion

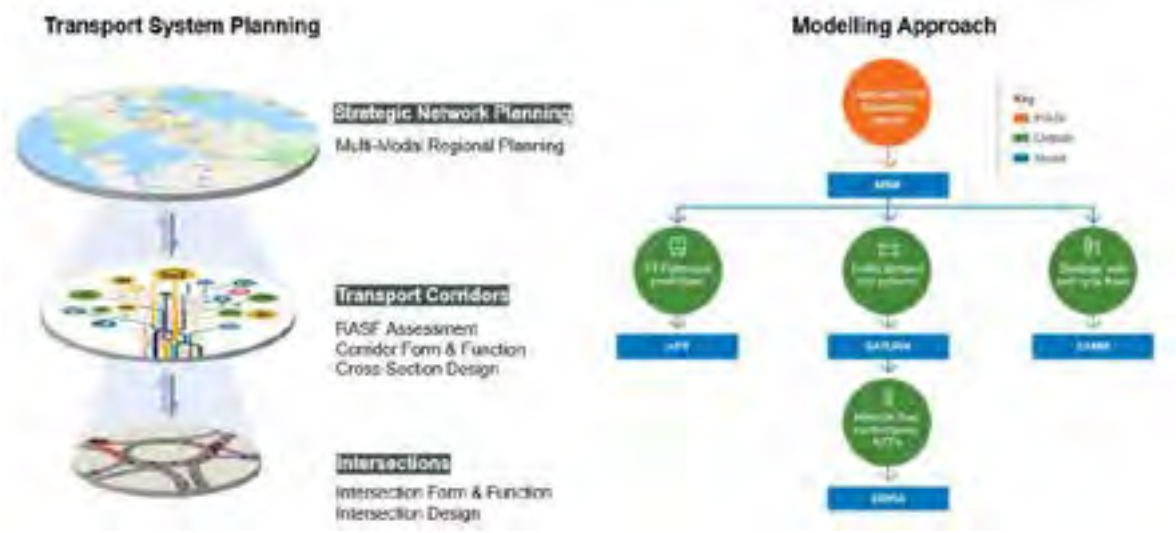
The purpose of this transport and economic assessment report is to summarise the assessment undertaken to support the Drury Local DBC. This includes the assessment process and transportation evidence to reach the recommended network. It also details how the recommended network influence investment objectives and concurrently how it translates to economic value.

Recommended Network

The Transport System Planning for the Supporting Growth Programme was developed as part of network planning for the wider area and concurrently with the Structure Planning undertaken by Auckland Council.

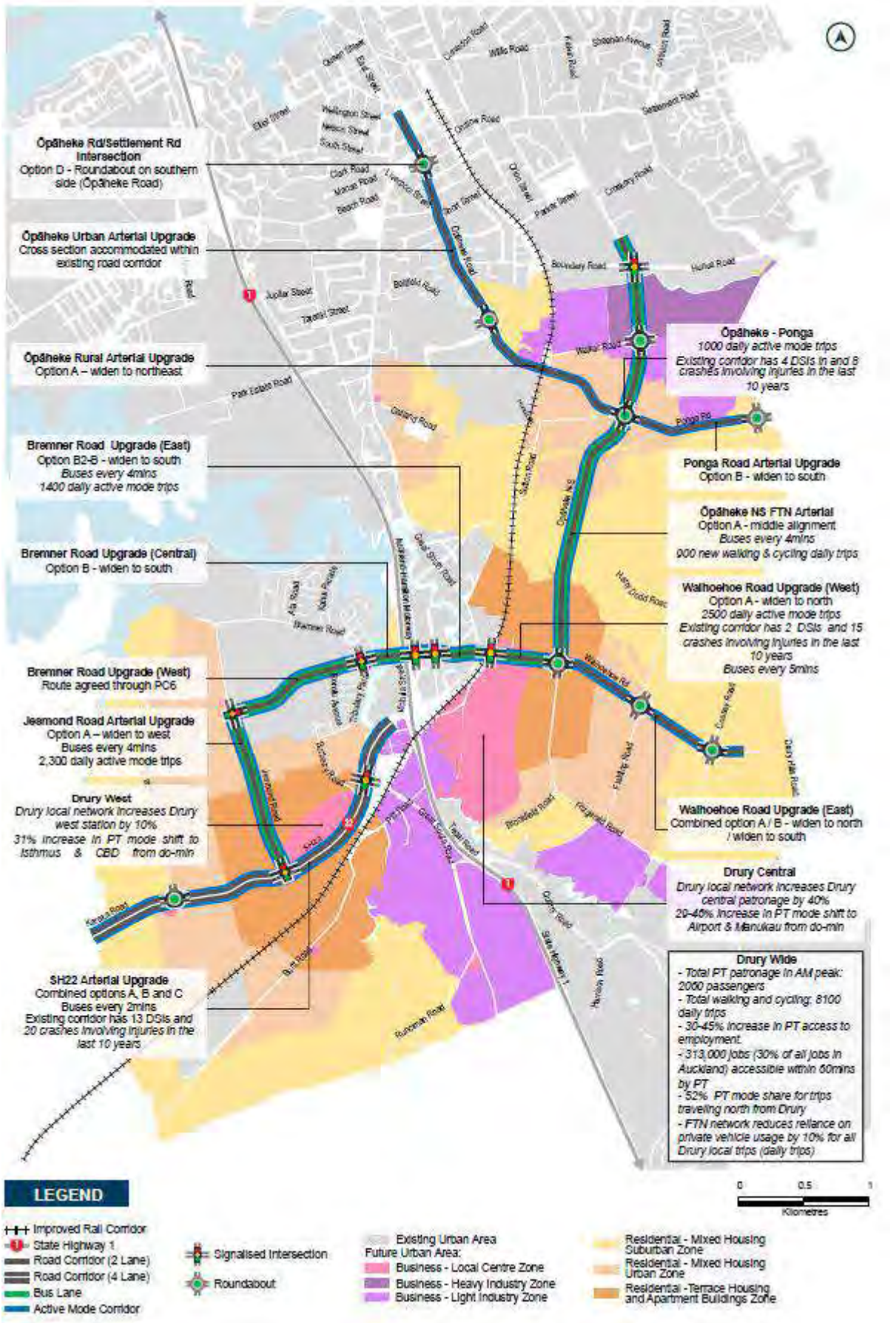
The Drury Package was developed as part of a wider programme of transport initiatives needed to support the growth in the southern part of Auckland. The Drury Package projects have been designed to be complementary and operate as an integrated network with the wider programme, which includes projects such as the Drury and Paerata train stations, and the Pukekohe Expressway and Mill Road corridors.

An overview of the transport network planning process is shown below, highlighting how each network planning element translates to strategic, corridor and intersection assessments and the respective tools used.



Outcomes of Recommended Network

At a high level, the Drury Local Package delivers well against the investment themes with sound improvement in the provision of quality public transport and active mode networks/facilities, contributing to positive safety and mode share outcome.


Ōpāheke Rd/Settlement Rd Intersection
Option D - Roundabout on southern side (Ōpāheke Road)
Ōpāheke Urban Arterial Upgrade
Cross section accommodated within existing road corridor
Ōpāheke Rural Arterial Upgrade
Option A – widen to northeast
Bremner Road Upgrade (East)
Option B2-B - widen to south
Buses every 4mins
1400 daily active mode trips
Bremner Road Upgrade (Central)
Option B - widen to south
Bremner Road Upgrade (West)
Route agreed through PC6
Jesmond Road Arterial Upgrade
Option A – widen to west
Buses every 4mins
2,300 daily active mode trips
Drury West
Drury local network increases Drury west station by 10%
31% increase in PT mode shift to Isthmus & CBD from do-min
SH22 Arterial Upgrade
Combined options A, B and C
Buses every 2mins
Existing corridor has 13 DSIs and 20 crashes involving injuries in the last 10 years
Ōpāheke - Ponga
1000 daily active mode trips
Existing corridor has 4 DSIs in and 8 crashes involving injuries in the last 10 years
Ponga Road Arterial Upgrade
Option B - widen to south
Ōpāheke NS FTN Arterial
Option A - middle alignment
Buses every 4mins
900 new walking & cycling daily trips
Walhoehoe Road Upgrade (West)
Option A - widen to north
2500 daily active mode trips
Existing corridor has 2 DSIs and 15 crashes involving injuries in the last 10 years
Buses every 5mins
Walhoehoe Road Upgrade (East)
Combined option A / B - widen to north / widen to south
Drury Central
Drury local network increases Drury central patronage by 40%
20-40% increase in PT mode shift to Airport & Manukau from do-min
Drury Wide
- Total PT patronage in AM peak: 2000 passengers
- Total walking and cycling: 8100 daily trips
- 30-45% increase in PT access to employment
- 313,000 jobs (30% of all jobs in Auckland) accessible within 60mins by PT
- 52% PT mode share for trips travelling north from Drury
- FTN network reduces reliance on private vehicle usage by 10% for all Drury local trips (daily trips)
LEGEND
Improved Rail Corridor
State Highway 1
Road Corridor (2 Lane)
Road Corridor (4 Lane)
Bus Lane
Active Mode Corridor
Signalised Intersection
Roundabout
Existing Urban Area
Future Urban Area:
Business - Local Centre Zone
Business - Heavy Industry Zone
Business - Light Industry Zone
Residential - Mixed Housing Suburban Zone
Residential - Mixed Housing Urban Zone
Residential - Terrace Housing and Apartment Buildings Zone
0
0.5
1
Kilometres

Key outcomes include:

- Jesmond Road, Bremner Road, Waihoehoe Road FTN upgrade results in a total of eight minutes journey time savings along the corridor (AM peak) compared to the do-minimum.
- Opāheke N-S Arterial reduces PT journey times by four minutes (AM peak).
- Reduced time spent in congestion: percentage of hours spent in severe congestion (volume/capacity >0.9) by PT vehicles in AM peak is 0.5% in Preferred Option compared to 11.8% in the do-minimum.
- For local trips, active mode share increases to 32% (1% cycle and 31% walk) for Drury.
- For regional trips, increase to 52% overall mode share for PT trips travelling north from Drury.
- Traffic volumes on Drury local roads reduce by 10% (5,300 daily trips)
- 107,400 jobs (or 10% of all jobs in Auckland in 2048+) are accessible within 45 minutes by PT (23,200 jobs or 28% increase compared to the do-minimum)
- 313,000 jobs (or 30% of all jobs in Auckland in 2048+) are accessible within 60 minutes by PT (94,500 jobs or 43% increase compared to the do-minimum)
- Reduced emissions and improved air quality as a result of mode shift
- Increase mode choice and accessibility with opportunity to integrate with rail stations at Drury West and Drury Central will improve social opportunities and reduce isolation.
- Impacts on local streams, significant ecological areas, flood zones and overland flow paths have been avoided where possible or mitigated through design. Opportunities to enhance riparian habitats, and the preservation of mature trees that may support ‘Threatened’ bats, have been identified, and selected wherever possible.
- All projects support safer walking and cycling through segregated routes, providing greater and more attractive transport choice and encouraging healthier and more active lifestyles

Economic Appraisal

The Drury Package Detailed Business Case (DBC) is for the purposes of route protection, rather than imminent implementation. The appraisal has therefore been targeted at this decision (to progress to route protection), rather than at the more detailed assessment that could be expected for an implementation decision.

The appraisal has also been undertaken in the context of the following:

- Estimates of the type, scale, sequencing and rate of growth have been made for the DBC, however the resulting growth is highly subjective to other regulatory processes such as Structure Plans, Plan Changes, sub-division consents and economic demand
- The SGA Programme, via its owners and partners, will make decisions on the implementation of specific projects based on separate prioritisation and decision processes over the next 30+ years
- The SGA business cases have focused on the transport elements and footprints to support the long-term, full build-out of the area. The actual land use development is likely to occur progressively in stages, which allow more detailed sequencing and staging decisions (e.g. some corridors could be improved with initial upgrades that are expanded in later years)

- The SGA Programme identified a whole network of improvements to support the growth with the desired outcomes for this area. The Drury Package comprises only a sub-set of that wider network, which means that the appraisal of each element is inter-dependent on the assumptions made about the timing of the other elements in the network

To assess the economic value of the Drury Package. Each project has been assessed against a 'Reference' Do Minimum scenario (that includes an assumed sequencing of adjacent projects), rather than a 'true' Do Minimum that includes only committed projects. This is to avoid the potential for double counting of common benefits that would be assigned to whichever project is assumed to be implemented first.

The core economic benefits below show how each sub-element underpinning the main benefits are split.

Items	NPV Benefits ($m)				
	BJW	SH22	NS	OPa-Pon	Package
Traffic Travel Time	5.4	10.2	186.4	0.4	202.4
Traffic Congestion	2.5	4.5	39.5	1.4	47.9
Traffic Reliability	0.4	0.8	14.9	0.0	16.2
Vehicle Operating Costs	3.1	5.1	47.1	2.3	57.6
Active Mode	36.3	2.7	33.7	20.8	93.4
Crash Savings	9.5	9.8	16.6	9.9	45.8
PT Benefits	236.5	28.1	42.7	31.4	338.7
CO_2	0.2	0.3	2.4	0.1	2.9
PV Total Net Benefits	293.9	61.4	383.2	66.4	804.9
WEBs %	30%	30%	30%	30%	30%
Total WEBs Benefits	88.2	18.4	115.0	19.9	241.5
PV Benefits Including WEBs	**382.1**	**79.8**	**498.2**	**86.3**	**1046.3**

The summary table below provides a range of BCR's for each project.

	BJW	SH22	NS	Opa-Pon	Total
Analysis Framework	0.6-2.1	0.4-1.4	0.9-3.7	0.5-1.4	0.7-2.2
Parameter Sensitivity	0.7-0.9	0.6-0.8	1.5-1.6	0.6-0.9	0.9-1.1

Overall, the analysis has demonstrated that the Drury Package has a BCR of around 1.0 under the assumptions adopted although with the revised evaluation assumptions coming into force with a lower discount rate and longer evaluation period this would increase to 1.7.

It was found to only be below 1 (0.7) under a test with the higher 8% discount rate or with WEBs lower than calculated. The BCR was found to be greater than 1 with a 4% discount rate or where projects

were slightly delayed. This indicates that the Package is likely to be an investment with a BCR greater than 1, although this will depend on the timing of elements being optimised to match the land use growth.

The appraisal has not considered 3rd party funding (such as developer contributions), nor of more detailed staging scenarios in line with the growing travel demand (e.g. construction of initial 2-lane corridors expanded to 4 lanes at a later date when needed). Both of these opportunities would significantly increase the likely BCRs. The progressive development of this area over the next 30+ years suggests there would likely to significant opportunities for such strategies.

Appendix 1. Transport Modelling Specifications

MSM

The Macro Strategic Model (MSM) is a region-wide model which analyses the forecast land use and informs trip generation, trip distribution and mode choice at regional level. The MSM model responds to the network assumptions, forecasted land use and regional economic policy inputs to reflect regional traffic patterns and PT patronages. The outputs from the MSM model are used as:

- demand inputs for the traffic simulation model SATURN, which analyses them at a mesoscopic level
- PT Patronage inputs for the mPT model, which analyses these at a strategic level
- Active mode inputs for the SAMM model, which analyses these at a mesoscopic level

The MSM is operated by AFC[11] and is implemented in the Equilibre Multimodal/ Multimodal Equilibrium (EMME) software, which is a well-used and proven platform for this kind of analysis. An important feature of the model is representation of crowding in the PT assignment, whereby the perceived in-vehicle time is increased if patronage approaches the capacity of the PT vehicle. This means that more attention is needed of the assumed vehicle type and frequency as well as greater analysis of the effect of crowding on PT demand.

The MSM is a four-step multi-modal model. This model was originally developed based on extensive data collected in 2006. Using observed data, and a full model validation exercise it was recently updated to reflect 2016 inputs and data. The MSM produces demands for five periods of the day, and separate assignment models exist for the morning (AM) and evening (PM) peak and weekday inter-peak (IP) periods.

The model itself comprises of the following key modules:

- Trip generation. This is where the number of person-trips are estimated as a function of the land use data (population, employment, school roll etc.)
- Mode Choice. This is where the choice of preferred travel mode is determined, based on the relative costs of the various modes. The MSM modes for mode choice are car (driver and passenger combined) and passenger transport. Trips by car are converted into vehicle trips

[11] AFC = Auckland Forecasting Centre, which is a collaboration between Auckland Council, Auckland Transport and the NZ Transport Agency

later in the model. The model also estimates the number of active mode trips, such as walking and cycling, although these are not fully modelled through to link flows.

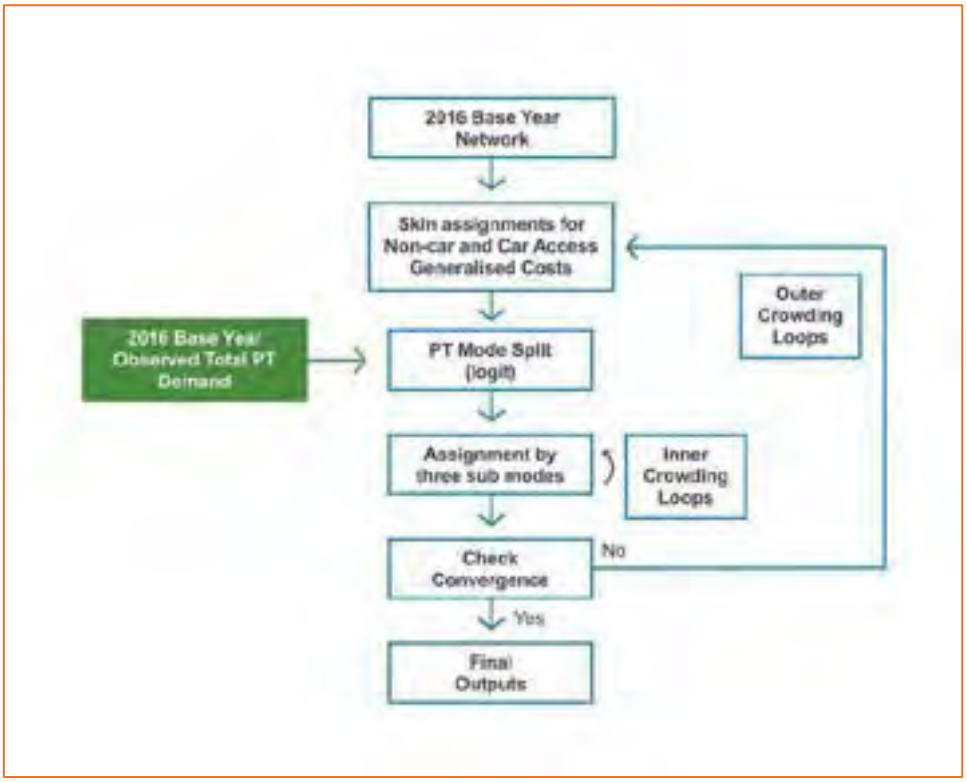
- Trip Distribution. This is where the trips produced in each zone (generally by households), are matched to a preferred destination. This distribution is predicted as a function of the relative attractiveness for each destination zone and the travel costs to reach each destination.
- Time of Day. This is where the proportion of daily trip making occurring in each period is calculated. These proportions change in response to changes in travel costs to represent peak spreading.
- Trip Assignment. This is where the resulting travel demand, in the form of origin to destination trip tables, are loaded to the road and public transport networks. For the road assignment, an iterative process is used to firstly identify the lowest-cost route between each origin and destination followed by an estimation of the speeds and delays on each route between origin and destination, followed by an estimation of speeds and delays on each route associated with the predicted traffic flows on the route.

Base Year Model 2016

In the base year only parts of the full model processes are run, as illustrated in the base year networks are set up,

- the observed 2016 PT trip matrix is imported,
- generalised costs by mode are generated,
- the observed matrix is split into trip matrices by mode with the mode split model,
- the PT matrices by mode are assigned,
- the crowding model with iterations as indicated until convergence (optional),
- outputs are produced.

Figure 7-1: MPTM Structure in the Base Year



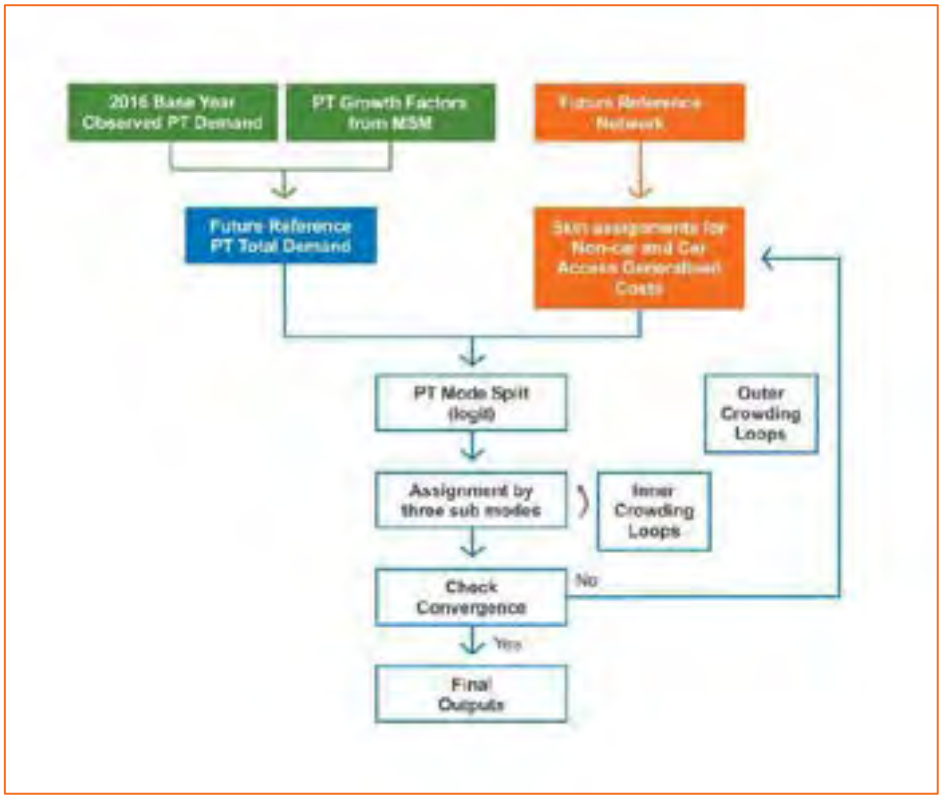
Forecasting

There are two main steps in forecasting: firstly, the model is run in “base” mode to create a future base/reference scenario, and secondly the model is run in “option” mode in which the changes in cost due to the project are incorporated via the pivot model.

Base Mode steps, shown in Figure 7-2, are:

- the future reference network is set up
- the future demographic effects are incorporated by way of growth factoring
- generalised costs are created
- base PT composite costs are generated for use in the pivot model in option mode
- school bus trips are imported (not presently used in model)
- mode split is undertaken to produce trips by PT mode
- each PT mode is assigned
- outputs are produced

Figure 7-2: MPTM Structure in Forecasting, Base Model



Option Mode steps are:

- the future project network is set up
- generalised costs are created
- PT and car composite costs are created for the use in the pivot option to incorporate the network effects in forecasting
- school bus trips are imported
- mode split is undertaken to produce trips by PT mode
- each PT mode is assigned
- convergence is checked and if not achieved a further iteration is carried out when convergence is achieved outputs are produced

General Network Assumptions

The following general network assumption have been made in the MSM model:

- All committed developments and respective infrastructure upgrades planned as outlined in the ATAP (Auckland Transport Alignment Project) 2.0 and RLTP (Regional Land Transport Plan) have been coded in the future MSM model. This included the Southern BC area, the northern section of Mill Road and bus shoulder lanes on State Highway 1 (SH1);
- The access points (MSM zone connectors) for each model option scenarios in the business case areas were reviewed and refined accordingly to reflect the future infrastructure upgrades;

- The future local bus services for each model option scenarios, were updated based on inputs from the AT Metro, and reflect the following assumptions:
    - Routes
    - Frequencies
    - Bus Capacities
    - Bus Speeds
- The future rail services for each of the model option scenarios were updated based on inputs from AT, and reflect the following assumptions:
    - Stop pattern
    - Service headways
    - Service Types
    - Train Capacities

MSM Outputs

There are a number of outputs from the transport modelling, including:

- Demand patterns (Origin-Destination travel) and facility usage (flows)
- Network performance
- Travel times and costs (real and perceived) for economic analysis
- Delays, queues and Level of Service (LoS) for design and assessment
- Aggregate travel statistics on travel such as Vehicle Kilometres Travelled (VKT), Passenger Kilometres Travelled (PKT) and total travel costs
- Flow and performance for environmental analysis
- Inputs to vehicle emissions models
- Inputs to noise analysis

MPT

The MPT (Macro Public Transport Model) is a regional PT model based upon an observed base year PT matrix plus requires data from the MSM and is capable of providing a matrix of PT trips diverted from car back to the MSM. The MPT has the same network as MSM, and the PT trips services and demand comes from MSM.

MPT model specifications and details

The transport network of MPT is identical to MSM network. After the import of network from MSM, only zone connectors are required to be coded in the MPT. The following are the basic inputs from MSM to MPT but not limited to the below list

- PT Patronage

- Mode split
- Link speed, capacity

MPT Base model preparation

The following sections outline the structure and operation of the MPTM in the base year, 2016, and in forecasting, both base mode and option mode.

SATURN

SATURN is a mesoscopic traffic simulation and assignment model used to undertake a variety of area wide strategic assessments through to more detailed local area assessments. It can be used as a conventional model for the analysis of traffic-management schemes over localised networks as well as for major investment improvements at a regional level. The SATURN model ensures factual representation of vehicle flow patterns and congestion on midblock sections and intersections in the form of 'arrival' flows rather than 'demand' flows. Additionally, it is used as a high-level junction simulation model that evaluates the traffic flow behaviour on junctions.

It represents 'congested assignment' of multiple user classes modelled separately, including bus priority and high occupancy vehicle lanes. Figure 7-3 provides an overview of the SATURN model is used and its interdependencies with other models, showing the modelling hierarchy.

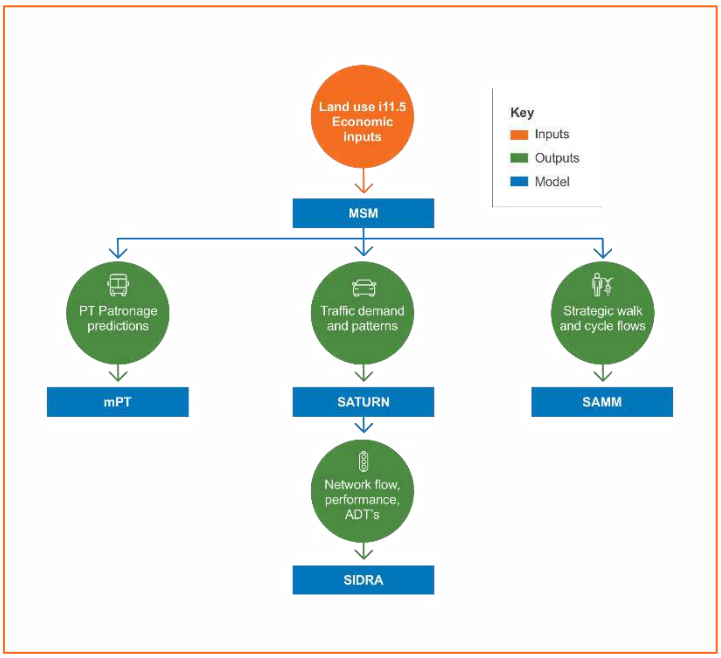


Figure 7-3: Modelling hierarchy and associated outputs

SATURN Base and Future Model

This overview note describes the key facts relating to the Southern Sector SATURN Model (S3M) base year and information about its use in future scenarios.

The base model has been calibrated to a **base** of 2011[12], another update in 2014[13] and then refined and re-validated again in for a 2016 base[14]. Matrix estimation procedure was applied separately to light and heavy vehicles in the 2011 Base for both turns and links. The re-validation exercise in 2016 only validated for links counts and the travel time data along SH1.

The modelled **time periods** are as follows:

- Morning Peak (AM) – average hour between 7am and 9am;
- Inter-peak (IP) – average hour between 9am and 4pm; and
- Evening peak (PM) – average hour between 4pm and 6pm.

The model has **two user classes** factored to PCUs as follows:

- Light Vehicles (LCV) – PCU Factor 1
- Heavy Vehicles (HCV) – PCU Factor 2

All the time periods use a **PASSQ assignments** (pre-peak) prior to each modelled time period. The SATURN version used in the latest version of the base year is **version 11.4.7**.

The model includes a **knobs file** (environmental factors[15]) which is read into the network file during SATNET. It contains a list of the links in the network which allocate penalties to links based on their priority in the network. The environmental factors for each simulation link are calculated based on its speed flow curve and length, therefore the knobs file should be updated if a network change has been applied to the model.

To **forecasts** future demand on top of the existing base model, the MSM model were used to determine the appropriate demand responds using the latest network and demand planning assumptions.

[12] Refer to '20111222 NZ1-5361492-Southern Sector SATURN Model Validation Report (0).pdf''in documentation folder.
[13] Refer to '20140725 Appendix F Project Model Report.pdf' in documentation folder.
[14] Refer to '20170501 R2A170531_S3M Base Model_Issued.pdf' in documentation folder.
[15] Refer to '20140725 Appendix F Project Model Report.pdf' in section 5.4 Environmental Factors for documentation

Figure 7-4: South Auckland SGA SATURN Network



SATURN Outputs

There are a number of outputs from the SATURN model, including:

- Vehicular flow pattern -Actual flow, Demand flow, Queued flow
- Network performance- Link and Node delays, Queue Statistics, V/C Ratios
- Mid-block capacities and speeds
- Aggregate travel statistics on travel such as Total Travel Time(hrs), Distance Travelled (kms)

SAMM

The Strategic Active Mode Model (SAMM) has been developed to fit within the existing suite of regional travel demand models operated by the Auckland Forecasting Centre (AFC). It derives land use and network data directly from the Macro Strategic Model (MSM) whilst using the same refined zone system as used in the Macro PT Model (MPT). The model has a strong interface with MSM to provide key inputs but can be operated independently to assess specific changes to the active mode network.

Both the walk and cycle models adopt a fairly traditional '4-step' demand model structure including trip generation, distribution, mode shift and assignment

The purpose of the model was identified by the AFC as follows:

- To enable an objective measure of walk and cycle responses to infrastructure changes, demographic changes and to changes in other modes at a regional level.

The scope of travel represented in the model is as follows:

- It only represents active travel where walking or cycling are the primary mode used. Multi-modal trips using active modes and either PT or car modes remain represented via the MSM and MPT models, and are generally not included in SAMM (with the exception of active trips that use a Ferry to cross the harbour)
- A trip based model that represents movement via Origin-to-Destination trip matrices
- Represents typical weekday, daily trips (based on March data)
- Represents travel done for transportation reasons, rather than recreational or sport. However, it does estimate additional 'recreational' flows on key high-amenity coastal cycle routes
- It covers the whole Auckland Region, consistent with the MSM and MPT models

The model is targeted as a 'strategic demand' model, with a focus on estimating active-mode travel from demographic and network inputs, rather than via the direct use of observed travel patterns. This requirement means it is focussed more on developing a robust process to estimate overall demand patterns, rather than detailed calibration to count data. This approach means it is also suitable for use in greenfield areas where existing activity and data would not reflect the planned future state. The model provides a suitable platform for localised refinement and calibration as may be required for assessment of specific projects.

SAMM model specifications and details

The model built of SAMM requires export of network and trip data from MSM. After the network import the local or regional cycle network are coded in SAMM, the links are made less/more attractive for the active mode trips by specifying an added attribute termed as 'cycle facility'. The following inputs are imported from MSM:

- Landuse data
- Active trip ends by purpose
- Network
- Link speed
- Auxiliary volumes
- Home based Work Car and PT generalised cost and daily person matrix

After the import from MSM the following refinement is done in SAMM for assignment of Active Modes

- Coding of cycle and walk links
- Assigning cycle facility type to the cycle network

- Hilliness factor and amenity factor
- Refinement of zone connectors

The trip generation, distribution, mode shift and assignment models all attempt to replicate travel choices using 'perceived' travel costs. These costs are equivalent to the 'Generalised' costs used in the MSM multi-modal model and are based on actual travel times with adjustments to account for user perceptions. For cyclists this includes perceptions of facility provided, the type of road it operates on and the amenity and hilliness of the route. The walk model uses a similar approach but with fixed walk speed and without differentiation by facility or road type. Use of such costs mean that the cycle demands will respond to changes in the speed, quality, amenity and hilliness of each section, while walking will respond to amenity and hilliness.

Station Access Modelling

SGA uses the Auckland Forecasting Centre's Strategic Active Mode Model (SAMM) to estimate volumes of walking and cycling trips on the future networks. That model only includes where walking and cycling is the main mode. Public transport trips are estimated using the Macro Strategic Model (MSM), which uses simple functions to represent access to stations. Access to stations is represented in MSM as:

- Direct walk-up trips
- Transfer trips from other PT services, such as local buses
- Auto-access trips, representing kiss-and-ride and park-and-ride. This access mode is only represented at major stations with formal Park and Ride facilities

The approach to this work is to develop a new tool that estimates the potential walk and cycle trips accessing major stations. The primary tool for estimating PT trips remains the MSM. For economic analysis purposes, the station-access tools are ignored, as station access is included in PT benefits extracted from MSM.

The total trips accessing stations from MSM is retained, with the station access tool effectively only reallocating them between sub-modes. The walk and cycle station-access trips are then passed to the SAMM model (as origin-destination matrices). This concept is indicated in Figure 7-5 below.

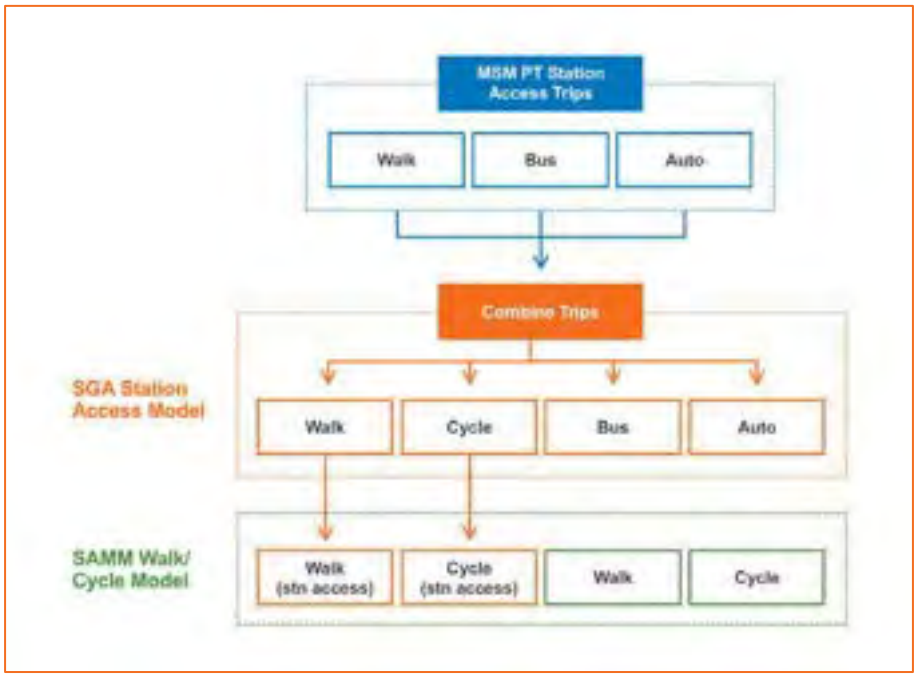


Figure 7-5 Structure of Station-Access Model

The MSM and SAMM models are operated by the AFC and have been through detailed review processes. The SGA Station-access tool is only used to provide estimates of cycle/walk demand near major stations specific to SGA areas. As such, it is not part of the formal AFC-owned models and it has not been independently reviewed.

The key steps in its operation are as follows:

- Obtain station access trips from MSM peak-period models. Including from direct walk-up and auto-access links)
- Combine to daily estimates (SAMM operates only at a daily level)
- Obtain car and bus travel times from MSM
- Get walk and cycle perceived travel costs from SAMM
- Create generalised costs for each mode, by applying assumed modal constants
- Allow for impact of electric bikes as a sub-mode of cycling
- Apply a logit choice model that re-estimates the split between the four access modes
- Extract car and cycle station access trips and assign in SAMM to get link flows

SIDRA

The Signalised (and unsignalized) Intersection Design and Research Aid (SIDRA) is a micro-analytical tool used for evaluating the intersection performance. It has a comprehensive, lane-based network modelling approach applicable to all types on intersections-signal, priority or sign control and roundabouts. SIDRA allows the modelling of various movement classes (Light vehicle, Heavy vehicle, Buses, Bicycle, Large Trucks, Light Rail/ Trams) with distinctive vehicle features to be assigned to designated lanes, segments and signal phases.

The SGA SIDRA model is used to analyse the form and function of proposed intersections along strategic corridors. Based on the demand flow outputs from the SATURN Model, the intersection turning flows are determined. The performance measures of the intersection in terms of capacity, delay, Level of Service (LOS), queue length on approach lanes and optimum vehicle-pedestrian signal phasing is calculated.

SIDRA model specifications and details

The SIDRA framework used in the SGA is adapted from an existing guidance document developed by Main Roads, Western Australia (WA), in 2015. This existing guidance addresses the key design principles highlighted during the planning process. The SGA SIDRA framework document recommends that along with operational performance, a number of factors also needs to be considered:

- Safety
- Road environment- form and function
- Different road users

The practitioners need to consider the changes in design features and ensure that the intersection meets the needs of different users safely and responds to the concerned site-specific factors.

The type of intersection control, operational analyses require the traffic volume, the mix of traffic (e.g. percentage and type of heavy vehicles) and different type of road users (e.g. vulnerable road users) that access the intersection during the anticipated peak period. The traffic flows from SATURN are used as forecasted peak hour traffic volumes and turning movements for intersection modelling.

Capacity Analysis

The capacity of an intersection to operate satisfactorily depends on the volumes of turning traffic and the distribution of traffic on the various approach legs at the intersection. The key output measures which determine the operational performance of an intersection are as follows:

a. LOS- The Level of Service measures ‘control delay’ on intersections in seconds. For satisfactory intersection performance the LOS for major movement should be lower than ‘D’ and for minor movement LOS should be lower than ‘E’. The LOS definition (Highway Capacity Manual 2010) used are given below:

Level of Service	Control delay per vehicle in seconds (d) including geometric delay	
	Signalised Intersections	Priority Controlled and Roundabouts
A	$d \leq 10$	$d \leq 10$
B	$10 < d < 20$	$10 < d < 15$
C	$20 < d < 35$	$15 < d < 25$
D	$35 < d < 55$	$25 < d < 35$
E	$55 < d \leq 80$	$35 < d \leq 50$
F	$d > 80$	$d > 50$

b. DOS- The Degree of Saturation is the ratio of demand flow to capacity. The movement DOS is the largest DOS for any lane of the movement. The desirable degree of saturation for Signalised Intersection should be less than 0.9 and for Roundabouts it should be less than 0.85
c. Queue Length- It is used to determine the length of auxiliary through lanes or storage in turn lanes.

Table 7-1.1: Suitability of types of traffic control to different road types based on operational and Safe Systems objectives[16]

Corridor type	Arterial (80kph)	Arterial (50kph)	Collector	Local
Roundabouts				
Arterial (80kph)	L	L	M	U
Arterial (50kph)	L	L	L	U
Collector	M	L	L	M
Local	U	U	M	M
Signalised				
Arterial (80kph)	M	M	M	U
Arterial (50kph)	M	M	M	U
Collector	M	M	U	U
Local	U	U	U	U
Stop signs or give way signs				
Arterial (80kph)	U	U	M*	L*
Arterial (50kph)	U	U	M	L
Collector	M*	M	L	L
Local	L*	L	L	L

Legend:

L = Likely to be an appropriate treatment

M = May be an appropriate treatment

U = Unlikely to be an appropriate treatment

Inside bold area = intersections considered in Supporting Growth network

*Likely to be controlled right turns

[16] Source: Adapted from WA, Roundabout and Traffic Signals: Guidelines for the Selection of Intersection Control, 2015

Table 4.3 below is designed as a "quick reference" guide and should not be treated as definitive. For example, any proposed signalised intersection in a rural area will be labelled as "unlikely" to be an appropriate type of treatment. This does not automatically preclude it as a possible treatment since most issues can be "engineered out", albeit at a cost.

Table 4.3: Site specific factors and form of control choice[17]

Site specific factors	Roundabouts	Signals
Physical Controls		
Number of intersection legs	M – Up to maximum of 6	M – Up to maximum 4
Number of through/ circulating lanes if roundabout (use SIDRA to determine number of lanes needed to achieve desired LOS. Does 1 lane work?)	L – 1 M – 2 U – 3 – subject to design	L – Up to 3 (if was roundabout)
Space available (work with designer to determine suitability using SIDRA layout and standard intersection design)	M/U – subject to design (may be difficult in existing urban areas)	M – subject to design
Site topography (work with designer to determine suitability using SIDRA layout and standard intersection design)	M/U – subject to design (may be difficult in hilly terrains)	M – subject to design
Access to adjacent properties	M – subject to design (can assist with allowing u-turns)	M – subject to design
Road Environment		
Land Use: • **Rural area** • **Urban – Low density** • **Urban – Med/ High density**	 L L L	 U (M – if 3-leg) M L
Gateway area (e.g. rural/ urban transition, approach to town centre, amenity features)	L	M
High speed approaching traffic	L - with design features to control approach speed	U (M – if 3-leg, may consider with 80 km/h speed limit & warning signs /flashing lights & other design features)

Legend:

L = Likely to be an appropriate treatment

M = May be an appropriate treatment

U = Unlikely to be an appropriate treatment

[17] Source: Adapted from WA, Roundabout and Traffic Signals: Guidelines for the Selection of Intersection Control, 2015

Road Users	Roundabouts	Signals
Pedestrian needs: • **Vulnerable users** • **High pedestrian flows**	M – single lane and raised pedestrian crossing facility (may need pedestrian signals for vulnerable users) U – multi-lane unless grade separated or signalised pedestrian crossing (*see below for criteria to determine if either option appropriate)	M – single lane L – multi-lane
People on bikes • **Vulnerable users** • **On primary/ secondary cycle network** • **Recreational route – either high use or designated**	L – single lane with low speed design & off-road raised crossing option U – multi-lane unless grade-separated* or signalised cyclist crossing** *Consider grade-separation active modes where: • Higher speed environment • Rural/ semi-rural area • High movement function & low place function • High ped movements & significant land use e.g. train station • Topography & space available is suitable **AT considers that signalised ped/cyclist crossings are more desirable and only consider grade-separation by exception	M – single lane as long as cyclist protection provided L – multi-lane as long as cyclist protection provided
Needs of large vehicles	M – may be difficult with high volumes & high % heavies, but could help minimise braking	L- subject to design for turning and conflict with cyclists

Legend:

L = Likely to be an appropriate treatment

M = May be an appropriate treatment

U = Unlikely to be an appropriate treatment

Traffic Management	Roundabouts	Signals
Route or area strategies:		
• **Adjacent to linked signals**	U	L
• **Isolated locations**	L	M
• **Adjacent sites controlled with roundabouts**	L	M
• **Control of traffic through a local area e.g. to reduce rat-running, allow for gaps in traffic, manage traffic flow**	U	L
Traffic volumes and capacity		
• **Balanced flows**	L	M
• **Unbalanced flows**	M – with metering signals	M
• **Significant turning volumes**	L	M – with adequate turn lane capacity
• **Minimising off-peak delays**	L	U
Public transport		
• **(Light Rail) Trams**	U	L
• **Bus lane/ priority lanes on corridor**	M – if LOS acceptable for 2-lane circulating roundabout (terminate bus/ priority lane in advance of roundabout)	L
• **Bus priority needed on intersection approach**	U	L
• **Adjacent to a railway level crossing**	U	L

Legend:

L = Likely to be an appropriate treatment

M = May be an appropriate treatment

U = Unlikely to be an appropriate treatment

Appendix 2. Land Use Scenarios

Land Use Forecast

The regional and economic policy assumptions used in the model are outlined in this section. The I-11 forecast was agreed by NZTA, AT and AC and includes an interpretation of the Future Urban Land Release Strategy (FULSS). Inputs include Stats NZ Medium growth population forecasts. The forecast details include detailed demographic trends, via 64 person-categories, 8 household categories, 6 employment types and 3 educational roll categories.

The Auckland Forecasting Centre (AFC)[18] created the forecast and have made some specific forecasting data for SGA. These include the 2046+ (used in the IBC) and 2048+ (used in the DBC) datasets that include the full build-out in growth areas.

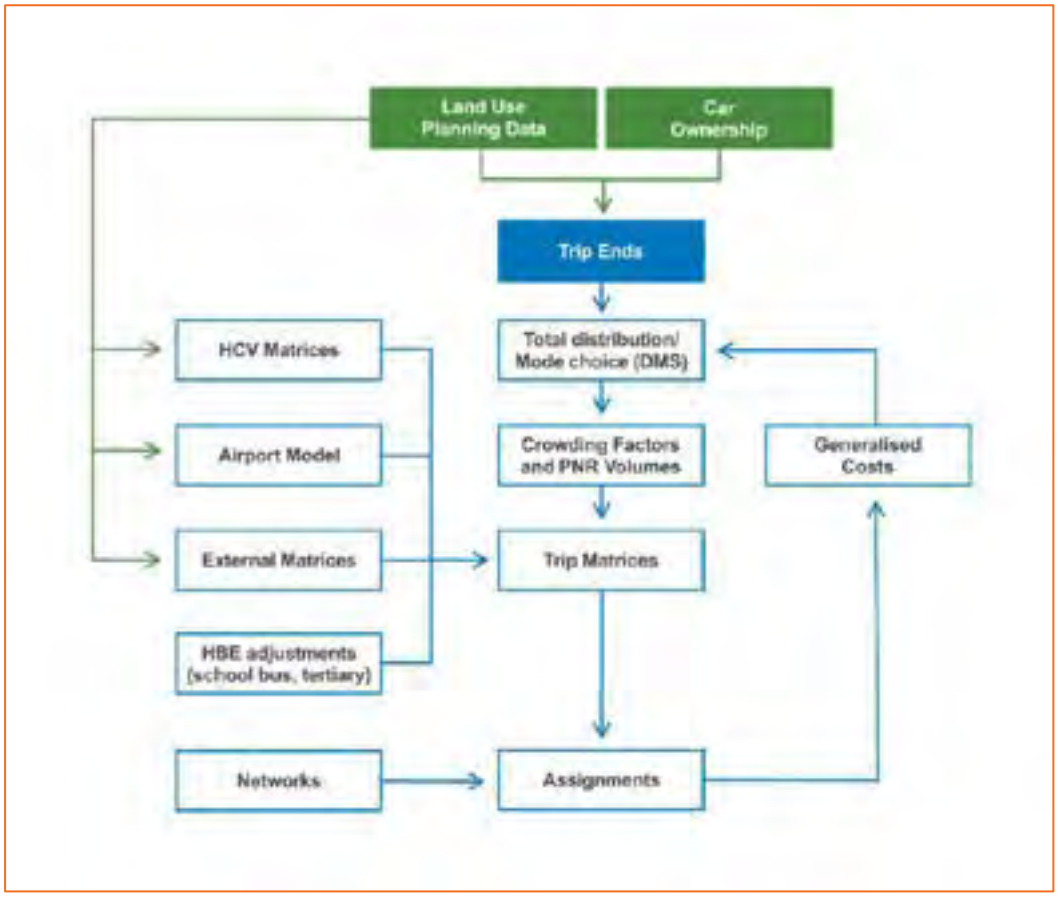


Figure 7-6: MSM flow chart

[18] AFC = Auckland Forecasting Centre, which is a collaboration between Auckland Council, Auckland Transport and the NZ Transport Agency

Appendix 3. Economic Assessment Further Details

Sector-Sector Traffic Benefits

The sector system considered for the benefit analysis is shown below, it comprises of all the regions in Auckland as in MSM model

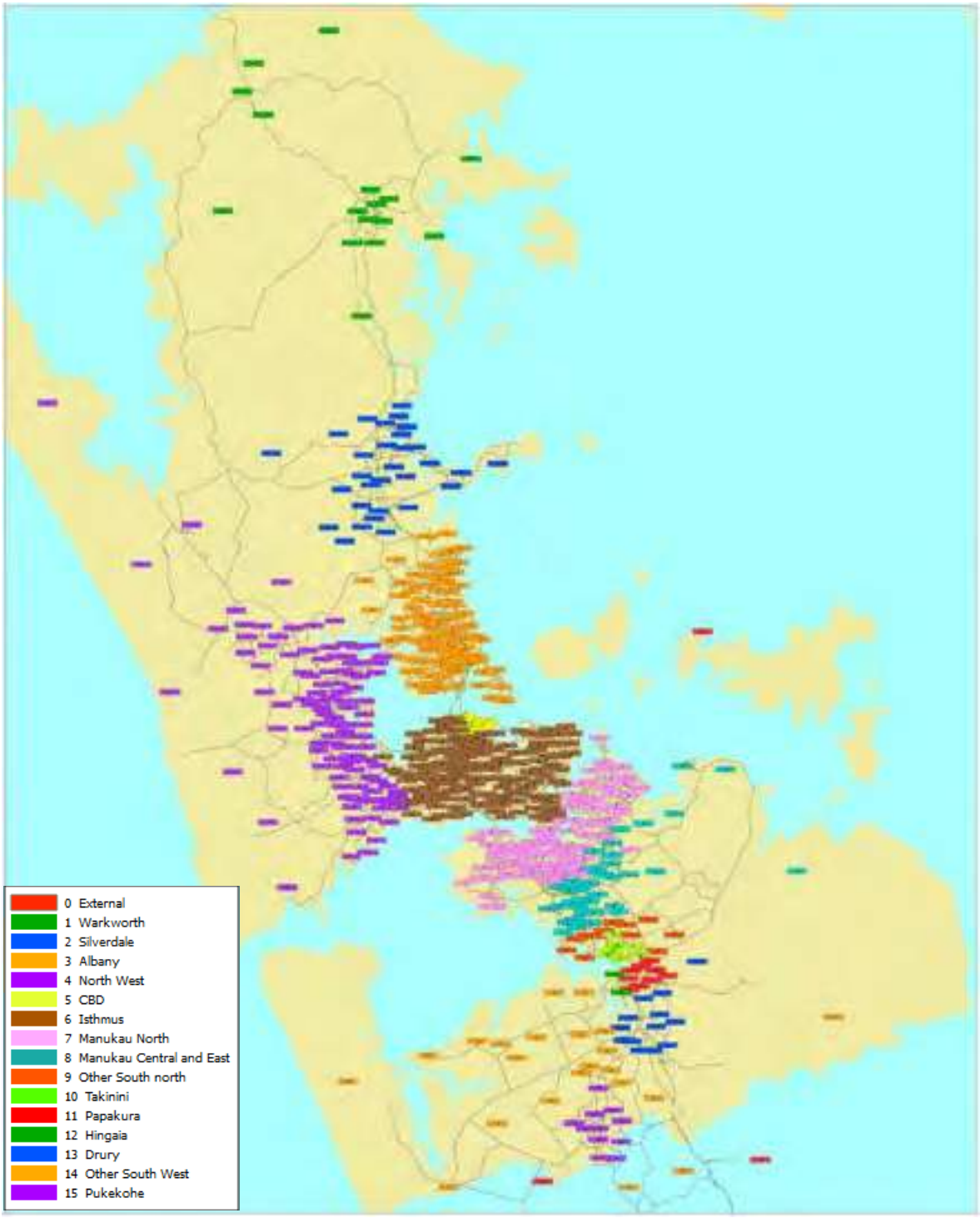


Figure 7-7: Economics Sector Map

The Saturn Traffic model comprises of region from Manukau to the Pukekohe. The cordon volume from MSM is transferred into Saturn and all the zones north of Manukau covering from Warkworth to Isthmus are treated as external North Zone. The below figure shows the Saturn network with the blue triangles indicating the traffic model boundary. The Sector- Sector Analysis of traffic benefits derived from Saturn is shown in **Table** below.



Figure 7-8: Saturn Network

Table 7-2: Sector-Sector Traffic benefit Analysis – Year 2048+ AM Peak

Sector	External Zones_North	Manukau North	Manukau Central and East	Other South North	Takanini	Papakura	Hingaia	Drury	Other South West	Pukekohe	External Zones_South	Total
External Zones_North	21	0	6	1	-2	0	0	1	0	-1	0	26
Manukau North	0	0	0	0	0	0	0	0	0	0	0	-1
Manukau Central and East	-8	0	-1	-1	-2	0	0	0	0	0	0	-13
Other South North	-6	0	-1	-1	-2	0	0	0	0	0	0	-11
Takanini	-15	0	-5	-4	-7	-1	0	0	0	0	0	-33
Papakura	-33	-1	-10	-7	-17	-2	-1	-1	-1	0	0	-74
Hingaia	-10	0	-2	-1	-3	0	0	0	0	0	0	-16
Drury	125	3	33	15	40	98	24	58	12	1	1	411
Other South West	94	1	18	7	21	33	10	33	106	11	3	339
Pukekohe	42	1	11	4	16	19	3	11	2	1	0	110
External Zones_South	113	0	8	3	9	8	6	2	0	0	0	148
Total	323	3	56	17	51	155	43	103	118	12	4	885

The calculation for the Travel Time cost is also calculated from the traffic sector-sector benefits. The 13% (113/885) benefits due to trips between External zones North (zones north of Manukau) and External Zones South are considered as rural strategic.

Discussions with Peer Reviewer – related to Saturn Sector benefit Analysis

In calculating the traffic benefits from the Saturn model, a 'hybrid' fixed trip/variable trip matrix method was used. The SATURN models (DM and Option) were run with their respective DM and Option demands from MSM to capture the effect of the network change and mode shift.

The travel time matrices were then extracted for each scenario. In the economic analysis, those travel times were multiplied by a fixed DM demand matrix. This method of using fixed demands was adopted because the SATURN model does not capture the full journey of trips north of Manukau and also to address the bottleneck effects where the Option can release more traffic than the DO Minimum (i.e. the Do Minimum will have less vehicles completing their journeys due to greater over-capacity queueing). This method also allows much simpler calculations that are easier to review.

The sector-to-sector analysis of traffic benefits from the AM SATURN model are below (i.e. change in veh-hours). Reduced veh-hours are shown as positive benefits in this table. This shows benefits for the expected movements to/from Drury and immediate surrounds (Other SW and Pukekohe). Disbenefits are shown from and to areas further north, such as Papakura/Takanini and

Manukau. Those dis-benefits are expected to be due to the increase in flows through Papakura, released by the new North-South arterial and reduced demands.

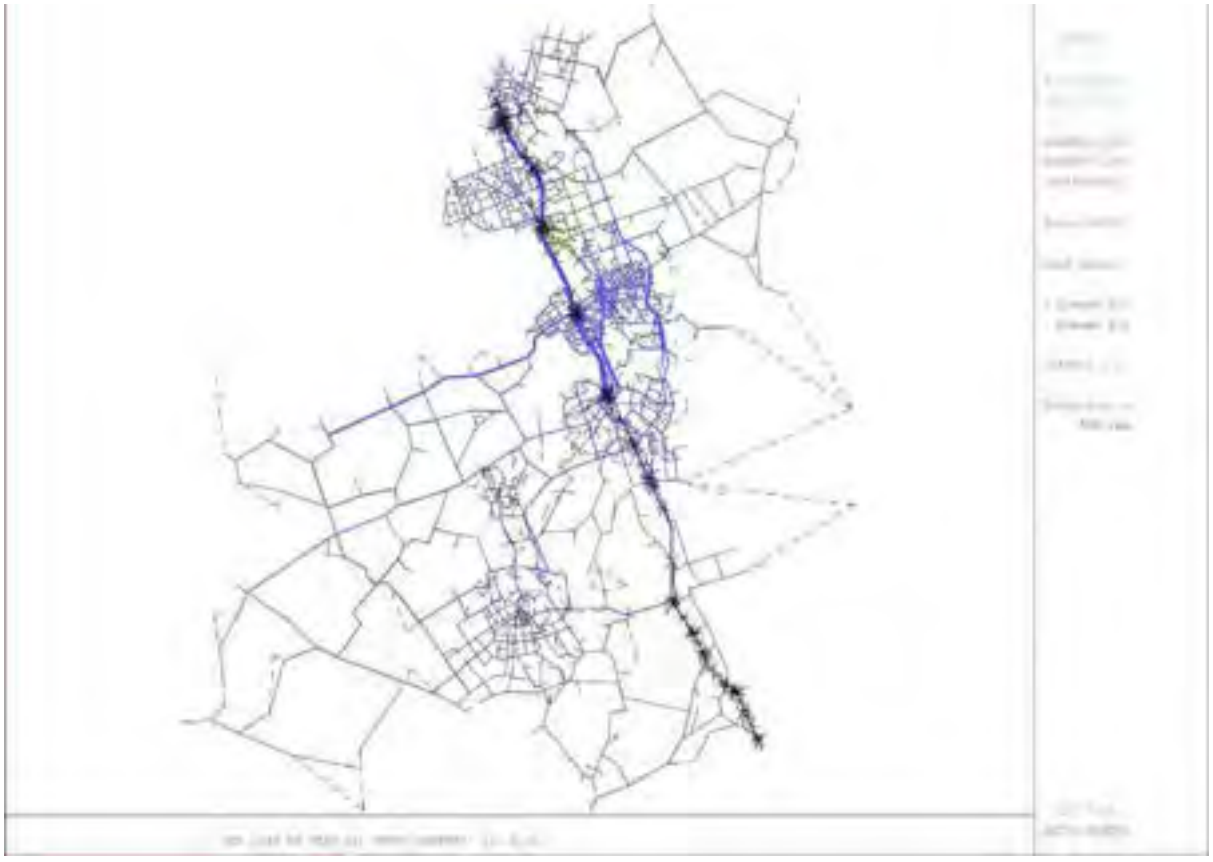
The locations of the change in demands, queues and delays are shown in the attached slides:

- The first slide indicates the change in Demand flows due to the project and its shift to PT. Overall reductions in north-south flows are noticed, due to the overall mode shift. Flow reductions on routes such as Hingaia Road would also be due to re-routing to the increased capacity on parallel routes such as SH22.
- The second plot shows the change in Actual flows. This shows smaller reductions than the Demand Flows, and in some cases (such as SH1), these are now increases. This appears to be due to the release of queued flow. This also results in a net increase in traffic through Papakura
- The third plot shows the change in queued flow (queued flow being the difference between demand and actual flows). This confirms released traffic from side-roads joining Hingaiaa Road, as well as entering SH1 and arriving in Papakura
- The last slide shows the change in delay. Here the reduced delays accessing Hingaia Road are evident, as are the increased delays in Papakura

Overall, these patterns of changes in flow and delays appear plausible, as do the benefits by movement.









Sector-Sector PT Benefits

The Sector-Sector PT Benefits is examined for sense check on the same sectors as in **Figure 8.** The PT sector benefits and trips are shown in Table below and pertinent discussion with Peer reviewer is documented below

Table 7-3: Sector-Sector PT Total benefit Analysis – Year 2048+ AM Peak

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other Sou	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	0	0	0	1	0	-19	2	1	-2	0	0	4	0	44	0	0	**32**
Warkworth	0	0	1	2	1	-3	2	0	0	0	0	1	0	11	0	0	**16**
Silverdale	0	0	4	15	16	-14	16	2	-7	-1	0	11	0	152	3	3	**201**
Albany	0	0	6	71	29	16	71	8	-19	-1	0	38	0	509	9	4	**741**
North West	0	0	5	35	95	-107	34	3	-7	-1	-1	59	1	706	14	8	**843**
CBD	-2	0	-1	-2	0	-21	-19	-7	-10	-3	-1	62	-3	1162	23	-10	**1,168**
Isthmus	0	0	1	-14	-18	-677	-114	-110	-20	-6	0	189	2	2658	51	23	**1,964**
Manukau North	0	0	-3	-41	-19	-436	-137	-198	-247	-7	1	264	3	3075	65	22	**2,342**
Manukau Central ar	0	0	-3	-42	-49	-345	-162	-312	-135	-4	1	399	3	3036	53	16	**2,455**
Other South North	0	0	-5	-50	-23	-318	-115	-137	-55	1	11	252	1	1691	8	9	**1,270**
Takanini	0	0	-4	-46	-28	-355	-101	-92	-41	5	4	397	-17	1683	-7	7	**1,404**
Papakura	0	0	-7	-81	-40	-616	-117	18	274	65	268	475	17	3228	41	39	**3,563**
Hingaia	0	0	-2	-30	-13	-242	-52	38	45	7	-140	159	0	1925	20	13	**1,728**
Drury	11	15	287	3759	1981	28518	14992	13767	9552	1061	4664	5636	840	17339	1669	2216	**106,308**
Other South West	0	-1	-19	-264	-110	-2135	-681	-502	-91	-2	-124	383	5	6897	167	29	**3,552**
Pukekohe	0	-1	-17	-206	-99	-1439	-440	-327	-110	-4	-21	207	1	4071	90	128	**1,832**
Σ	**7**	**13**	**242**	**3,108**	**1,725**	**21,807**	**13,177**	**12,151**	**9,126**	**1,108**	**4,663**	**8,537**	**853**	**48,187**	**2,207**	**2,507**	**129,419**

Discussions with Peer Reviewer – related to PT Sector benefit Analysis

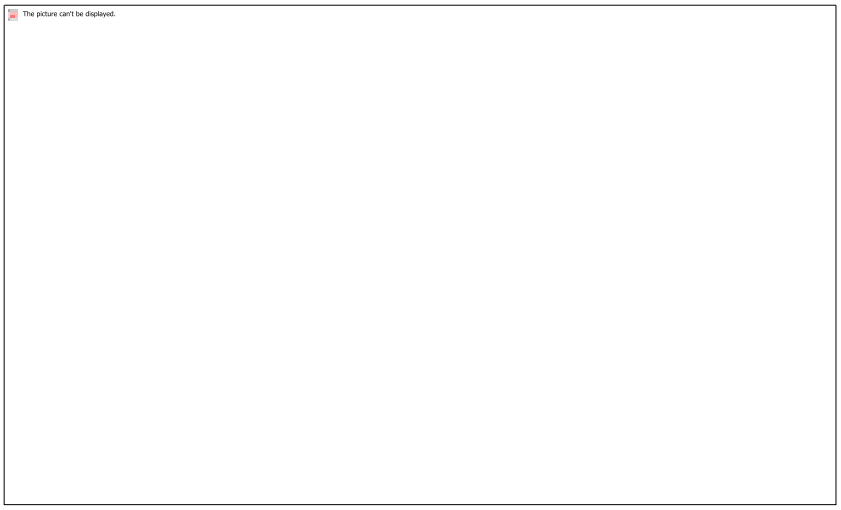
To assess the reasonableness of the PT benefits we analysed the pattern of assessed benefits via a sector-sector analysis of the AM peak PT benefits.

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other Sou	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	0	0	0	0	0	-1	0	0	0	0	0	0	0	1	0	0	**0**
Warkwort	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silverdale	0	0	0	0	0	-6	0	0	0	0	0	0	0	3	0	0	**-1**
Albany	0	0	0	1	0	-18	2	0	0	0	0	0	0	8	0	0	**-5**
North We	0	0	0	0	1	-23	-1	0	0	0	0	1	0	12	0	0	**-9**
CBD	0	0	0	0	0	-4	-1	-1	0	0	0	0	0	10	-1	-1	**1**
Isthmus	0	0	0	0	0	-67	-2	-3	-2	0	0	3	0	48	1	1	**-22**
Manukau	0	0	0	-1	0	-22	-7	-11	-6	0	0	4	0	58	1	1	**16**
Manukau	0	0	0	-1	0	-13	-5	-9	-8	0	0	6	0	59	1	1	**31**
Other Sou	0	0	0	-2	-1	-14	-3	-3	-4	0	0	4	0	34	0	1	**13**
Takanini	0	0	0	-1	-1	-10	-4	-2	-1	0	1	6	0	35	0	1	**23**
Papakura	0	0	0	-2	-1	-21	-6	-3	3	1	5	6	0	64	1	1	**48**
Hingaia	0	0	0	-1	0	-11	-5	-5	-6	0	-4	1	0	40	0	0	**9**
Drury	0	0	3	46	21	394	230	213	165	20	95	114	15	327	30	43	**1,715**
Other Sou	0	0	0	-8	-3	-74	-26	-20	-11	-1	-5	3	0	121	-2	0	**-25**
Pukekohe	0	0	0	-5	-2	-46	-16	-13	-7	0	-2	2	0	75	2	3	**-9**
Σ	**0**	**0**	**2**	**26**	**14**	**63**	**158**	**143**	**122**	**18**	**90**	**150**	**15**	**895**	**34**	**53**	**1,783**

This shows some sector-movements with disbenefits, but with the vast majority of benefits accruing to movements to or from the Drury Sector. Significant benefits were assessed both within Drury, as well as between Drury and the CBD. These results seem plausible given the improved access to the rail stations and the FTN route between Drury and Papakura. The disbenefits assessed are small (10% of the net benefit), and are mostly between other areas and the CBD.

There are two causes of these disbenefits:

1. An increase in crowding on the rail services due to the increased passengers from Drury. For example, this is shown in the Crowding Factor for one of the rail services. This crowding factor is applied to the rail in vehicle-time. A small increase in the crowding factor is evident, however this is applied to all passengers on those links.



2. A reduction in trips due to trip re-distribution. For example, if more trips are distributed to the CBD from Drury, less trips are distributed there form some other locations. The sector to sector PT trip analysis shows exactly this that there has been a drop in the demand going to CBD as a response to trip distribution. (Attached spreadsheet shows the PT Demand Sector-Sector Analysis)

Overall, the pattern of PT benefits appears plausible and in-line with what could be expected for the proposed projects. The possible extent of overcrowding on the rail links to the north of the SGA possibly point to the need to provide additional capacity on these to meeting the potential demand.

Sector-Sector Active Mode Benefits

The Sector-Sector benefits due to the Active mode trips have been calculated to understand the reasonability of the benefits. The benefits obtained is considered acceptable in terms of spatial distribution. The Sectors considered are shown in **Figure 8**.

Table 7-4: Sector-Sector Cycle-HBW benefit Analysis – Year 2048+ Daily

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other South No	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Warkwort	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silverdale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Albany	0	0	0	-1	0	0	-1	0	0	0	0	0	0	0	0	0	**-2**
North We	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
CBD	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	**-2**
Isthmus	0	0	0	0	0	-1	-1	0	0	0	0	0	0	5	0	0	**1**
Manukau I	0	0	0	0	0	0	0	0	0	0	0	-1	0	17	-1	-1	**13**
Manukau (	0	0	0	0	0	0	0	0	0	0	0	-1	0	23	-1	-1	**20**
Other Sou	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	**9**
Takanini	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	**13**
Papakura	0	0	0	0	0	0	0	-1	-1	0	0	0	0	44	3	4	**48**
Hingaia	0	0	0	0	0	0	0	-1	0	0	0	0	0	5	0	0	**3**
Drury	0	0	0	0	0	0	5	15	22	9	13	44	5	73	12	20	**218**
Other Sou	0	0	0	0	0	0	-1	-1	-1	0	-1	2	0	12	0	0	**10**
Pukekohe	0	0	0	0	0	0	0	-1	-1	0	0	4	0	20	0	0	**21**
Σ	**0**	**0**	**0**	**-1**	**-1**	**-2**	**0**	**11**	**19**	**9**	**11**	**47**	**3**	**221**	**12**	**21**	**351**

Table 7-5: Sector-Sector Cycle-Others benefit Analysis – Year 2048+ Daily

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other South No	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Warkwort	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Silverdale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Albany	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	**-1**
North We	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
CBD	0	0	0	-1	0	0	4	2	0	0	0	0	0	0	0	0	**4**
Isthmus	0	0	0	0	0	4	7	8	0	0	0	0	0	0	0	0	**19**
Manukau I	0	0	0	0	0	2	8	3	1	1	0	2	1	12	0	0	**30**
Manukau (	0	0	0	0	0	0	0	1	-2	1	-1	3	0	19	-2	-1	**19**
Other Sou	0	0	0	0	0	0	0	1	0	-1	0	1	0	16	-1	0	**15**
Takanini	0	0	0	0	0	0	0	0	-1	0	0	3	0	14	-1	0	**15**
Papakura	0	0	0	0	0	0	0	2	3	1	3	-2	1	151	0	0	**158**
Hingaia	0	0	0	0	0	0	0	1	0	-1	0	1	0	13	-1	0	**13**
Drury	0	0	0	0	0	0	0	11	17	14	13	150	12	500	24	33	**774**
Other Sou	0	0	0	0	0	0	0	0	-2	-1	-1	0	-1	24	0	2	**22**
Pukekohe	0	0	0	0	0	0	0	0	-1	0	0	0	0	33	2	0	**34**
Σ	**0**	**0**	**0**	**-1**	**1**	**4**	**19**	**28**	**17**	**13**	**13**	**157**	**13**	**783**	**22**	**34**	**1,104**

Table 7-6: Sector-Sector Walk-HBW benefit Analysis – Year 2048+ Daily

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other South No	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Warkwort	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Silverdale	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
Albany	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	**10**
North We	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	**9**
CBD	0	0	0	0	0	14	6	0	0	0	0	0	0	0	0	0	**21**
Isthmus	0	0	0	0	0	6	21	0	0	0	0	0	0	0	0	0	**27**
Manukau I	0	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	**6**
Manukau (	0	0	0	0	0	0	0	1	2	-1	1	0	0	0	0	0	**3**
Other Sou	0	0	0	0	0	0	0	0	-1	0	6	-1	0	0	0	0	**4**
Takanini	0	0	0	0	0	0	0	0	1	6	2	-11	-8	0	0	0	**-11**
Papakura	0	0	0	0	0	0	0	0	0	-1	-11	-10	10	234	0	0	**222**
Hingaia	0	0	0	0	0	0	0	0	0	0	-8	9	0	2	-1	0	**3**
Drury	0	0	0	0	0	0	0	0	0	0	0	237	2	1,474	2	0	**1,715**
Other Sou	0	0	0	0	0	0	0	0	0	0	0	0	-1	2	-27	0	**-26**
Pukekohe	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**2**
Σ	**0**	**1**	**4**	**10**	**9**	**20**	**27**	**6**	**3**	**4**	**-12**	**224**	**3**	**1,713**	**-26**	**2**	**1,988**

Table 7-7: Sector-Sector Walk-Others benefit Analysis – Year 2048+ Daily

	External	Warkwort	Silverdale	Albany	North We	CBD	Isthmus	Manukau	Manukau	Other South No	Takanini	Papakura	Hingaia	Drury	Other Sou	Pukekohe	Σ
External	3	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	**10**
Warkwort	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**
Silverdale	0	0	74	1	0	0	0	0	0	0	0	0	0	0	0	0	**75**
Albany	0	0	1	143	0	6	0	0	0	0	0	0	0	0	0	0	**149**
North We	0	0	0	0	138	0	4	0	0	0	0	0	0	0	0	0	**142**
CBD	7	0	0	6	0	103	85	0	1	0	0	0	0	0	0	0	**202**
Isthmus	0	0	0	0	4	84	392	5	0	0	0	0	0	0	0	0	**485**
Manukau	0	0	0	0	0	0	5	112	8	0	0	0	0	0	0	0	**125**
Manukau	0	0	0	0	0	3	0	7	46	2	2	0	0	-1	0	0	**59**
Other Sou	0	0	0	0	0	0	0	0	2	5	33	1	0	-27	0	0	**14**
Takanini	0	0	0	0	0	0	0	0	2	33	-6	21	-105	29	0	0	**-26**
Papakura	0	0	0	0	0	0	0	0	0	1	21	-156	95	9,399	-1	0	**9,360**
Hingaia	0	0	0	0	0	0	0	0	0	0	-106	95	-34	33	0	0	**-13**
Drury	0	0	0	0	0	0	0	0	-1	-27	27	9,494	27	58,776	-46	2	**68,252**
Other Sou	0	0	0	0	0	0	0	0	0	0	0	-1	0	-47	-429	43	**-434**
Pukekohe	0	0	0	0	0	0	0	0	0	0	0	0	0	2	47	3	**51**
Σ	**10**	**10**	**75**	**150**	**142**	**203**	**486**	**124**	**58**	**14**	**-29**	**9,455**	**-17**	**68,164**	**-429**	**48**	**78,463**

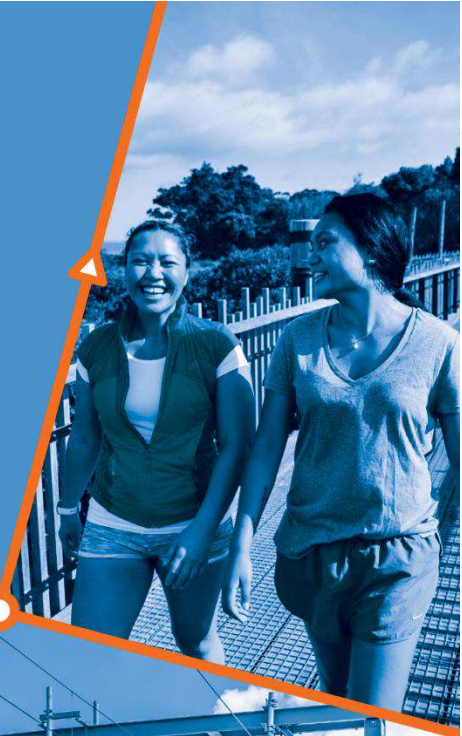
Supporting Growth

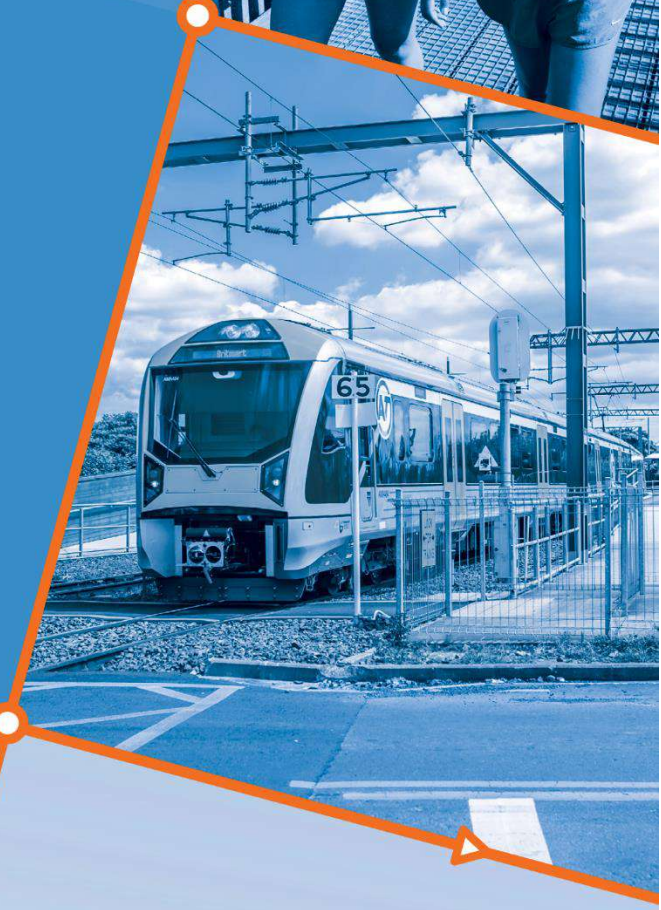
Detailed Business Case - Drury

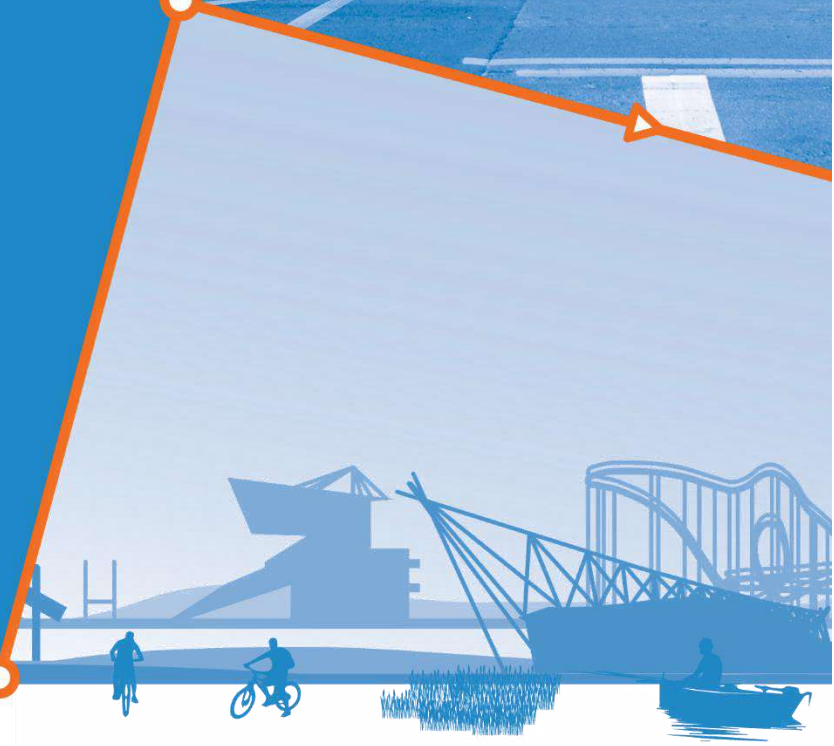
Appendix C

Drury Cost Estimate Report

Version 1.1
2 November 2020







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Document Status

Responsibility	Name
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1.0	28th August 2020	Business Case Issue
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Disclaimer

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

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Glossary of Terms

Acronym/Term	Description
AADT	Annual Average Daily Traffic
AC	Auckland Council
AEE	Assessment of Effects on the Environment
AEP	Annual Exceedance Probability
AGRD	Austroads Guide to Road Design
ARI	Annual Recurrence Interval
ASD	Approach Sight Distance
AT	Auckland Transport
ATCOP	Auckland Transport Code of Practice
AUP	Auckland Unitary Plan
CH	Chainage
DBC	Detailed Business Case
DJV	Design Joint Venture
DPS	Design Philosophy Statement
FTN	Future Transport Network
GIR	Geotechnical Interpretive Report
HAIL	Hazardous Activities and Industries List
HV	High Voltage
IBC	Indicative Business Case
ITS	Intelligent Transport System
FoS	Factor of Safety
LIDAR	Light Detection and Ranging
LV	Low Voltage
MOTSAM	Manual of Traffic Signs and Markings
MSE	Mechanically stabilised earth
NIMT	Northern Island Main Trunk (Rail)
NoR	Notice of Requirement
NZGD	New Zealand Geotechnical Database
NZTA	Waka Kotahi New Zealand Transport Agency
NZTM	New Zealand Transverse Mercator 2000
PWV	Permanent Water Volume
RAMM	Road Asset and Maintenance Management
RCRRJ	Reinforced concrete rubber ring jointed (pipes)

RMA	Resource Management Act
RSA	Road Safety Audit
RT	Reaction Time
SAT	Safety Audit Team
SAVF	South Auckland Volcanic Field
SCATS	Sydney Coordinated Adaptive Traffic System
SGA	Supporting Growth Alliance
SH1	State Highway 1
SH22	State Highway 22
SMAF	Stormwater Management Area Flow
SSD	Stopping Sight Distance
TDM	Transport Design Manual
TP10	Auckland Council Technical Publication #10 – Stormwater Management Devices Design Guideline Manual
UDA	Urban Design Assessment
WQ	Water Quality

1. Introduction

The Supporting Growth Alliance (SGA) (Te Tupu Ngātahi) has been established to identify the transport requirements to support the predicted level of growth forecast to occur in Auckland beyond a 30-year time frame. As such, the Detailed Business Case has been developed for route protection only, and these projects are not expected to be constructed for a number of years. Therefore, the cost estimate will need to be revised and reconfirmed at that time in order to reflect any changes in standards, planning conditions, network demands, and/or any other construction related matters.

Figure 1Error! Reference source not found. shows the recommended network for the Drury area. The estimates have been prepared to reflect the following projects:

- State Highway 22 Upgrade;
- Jesmond Road FTN Upgrade
- Bremner Road FTN Upgrade
- Waihoehoe Road West FTN Upgrade
- Waihoehoe Road East Upgrade
- Ōpāheke North-South FTN Arterial
- Ponga Road Upgrade
- Ōpāheke Road Rural Upgrade
- Ōpāheke Road Urban Upgrade.

This document should be read in conjunction with the Drury design report and appended drawings.

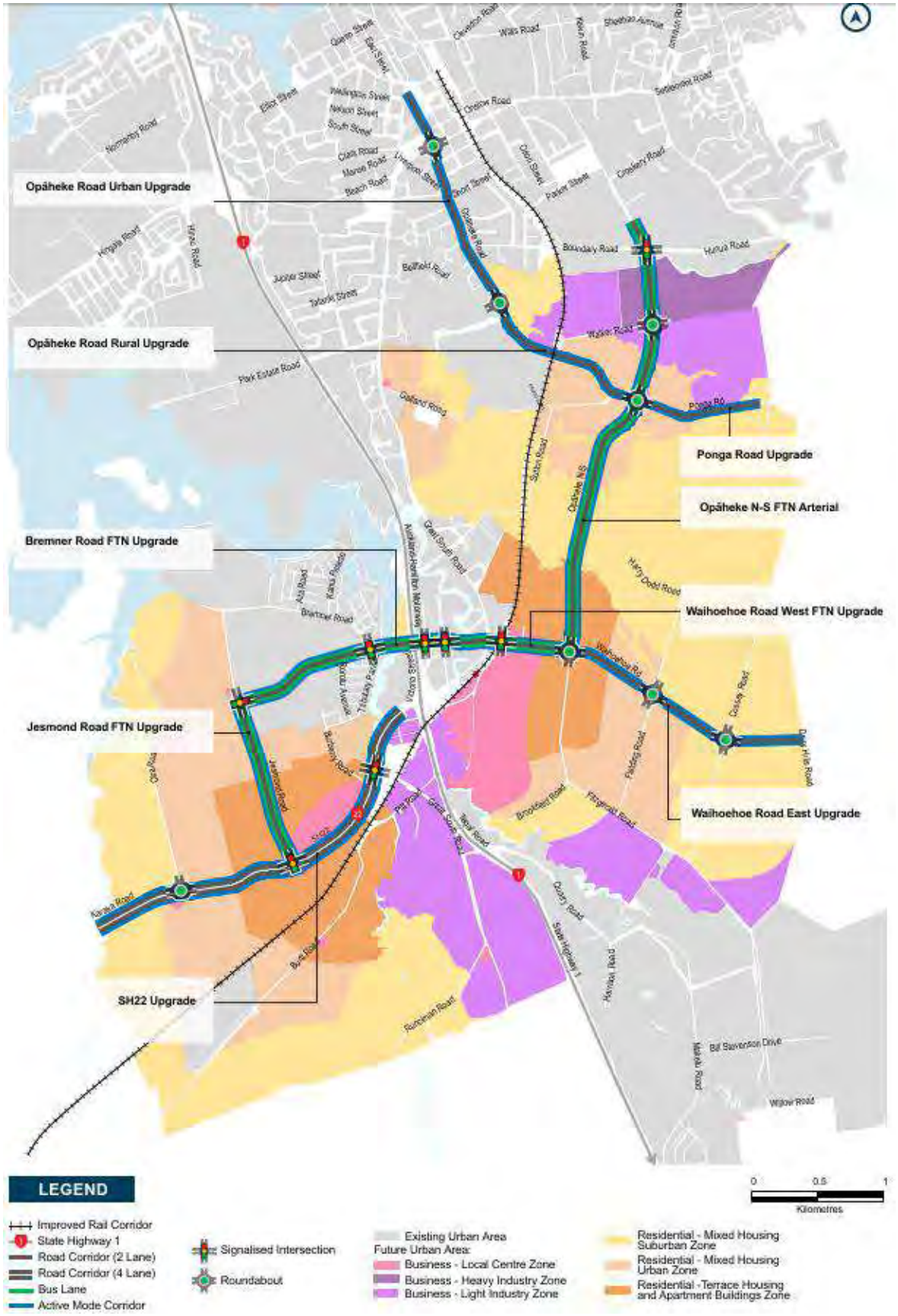


Figure 1: Drury Arterial Transport Network

2. Approach to Cost Estimation

This estimate has been prepared to provide an indication of costs for future budget forecasting and for inclusion in the economic analysis.

The costing of the works has been based primarily on the revision A set of the design drawings, alongside the generic assumptions outlined in Appendix 2. Significant changes to the design since Revision A have been captured in the costs also.

2.1. Property

The cost of land forms a significant part of the estimate. Property cost estimates have been undertaken by the Auckland Transport property team on behalf of SGA. These cost estimates have been prepared based on the land requirement (both temporary and permanent) represented by the proposed Designation boundary in the drawing set issued “For Approval”. The assumptions associated with the Property cost estimates are attached in Appendix 3.

Where it was found that a property requirement was on the boundary between two costing segments (refer to Appendix 4), an assessment has been made as to which segment this cost should best be attributed to. It is for partly this reason that the property cost estimates per “project corridor” in the Property cost memorandums supplied do not necessarily align with those in Table 4.

The nett project property cost includes costs pertaining to both the temporary and permanent land requirement. The memorandums of Appendix 3 include the temporary occupation cost portion calculated on the basis of a one year occupation duration. These temporary occupation costs have since been adjusted to reflect the assumed construction duration set out in the Construction Method Statement for each project as detailed in Table 2 below, with a 15% contingency then applied to the associated cost for the P50 estimate.

Table 2: Assumed temporary occupation by project corridor

Project Corridor	Expected Construction Duration (years)	Assumed Duration for Temporary Occupation (years)
Bremner Rd FTN Upgrade	3-3.5	3
Jesmond Rd FTN Upgrade	1-1.5	1
Opaheke N-S FTN Arterial	3.5-4	3.5
Opaheke Road Upgrade	2-2.5	2
Ponga Road Upgrade	1-1.5	1
SH22 Upgrade	2-2.5	2
Waihoehoe Rd East Upgrade	2-2.5	2
Waihoehoe Rd West FTN Upgrade	2-2.5	2

2.2. Integration with Development

Where land development is currently progressing, and the transport network will need to be constructed in conjunction with the development works, there is likely to be a negotiation with the Developer to agree the extent of Developer contribution. While this is likely to be different in each case, the process of agreeing what the Developer is required to construct will be important in determining the scope and cost of the AT/ Waka Kotahi works.

An example is where a Developer will be required to construct a Collector Road, although there is a future requirement of an increased level of service (e.g. Arterial). In this case, the cost of construction over and above the Collector Road will need to be determined.

The costs prepared for the DBC have not considered these opportunities and have been based on full project construction costs. The opportunities to leverage off developments has been addressed in the Financial Case.

2.3. Verification

A Business Case of this scale would normally involve preparation of a parallel estimate by an independent estimator. However, as this Business Case is primarily focussed on route protection and a subsequent stage will be undertaken to seek funding for implementation, the level of cost estimation accuracy is considered to be less than a typical DBC. Therefore, it has been agreed with the IQA team from both Auckland Transport and Waka Kotahi that the costs will be peer reviewed through 'cross verification' by a separate team within SGA who were independent of the initial estimate preparation. To provide a level of independence, the peer review was undertaken by a different home organisation (i.e. Beca or Aecom).

With the focus of this Business Case being on route protection, there comes a financial risk associated with Property. Therefore, a greater focus will be put on review of the Property Cost estimates. This will involve the following:

- Undertake a review of the methodology used for pricing
- Undertake a review of the rates used for different property types
- Internal review with AT and Waka Kotahi on property estimates

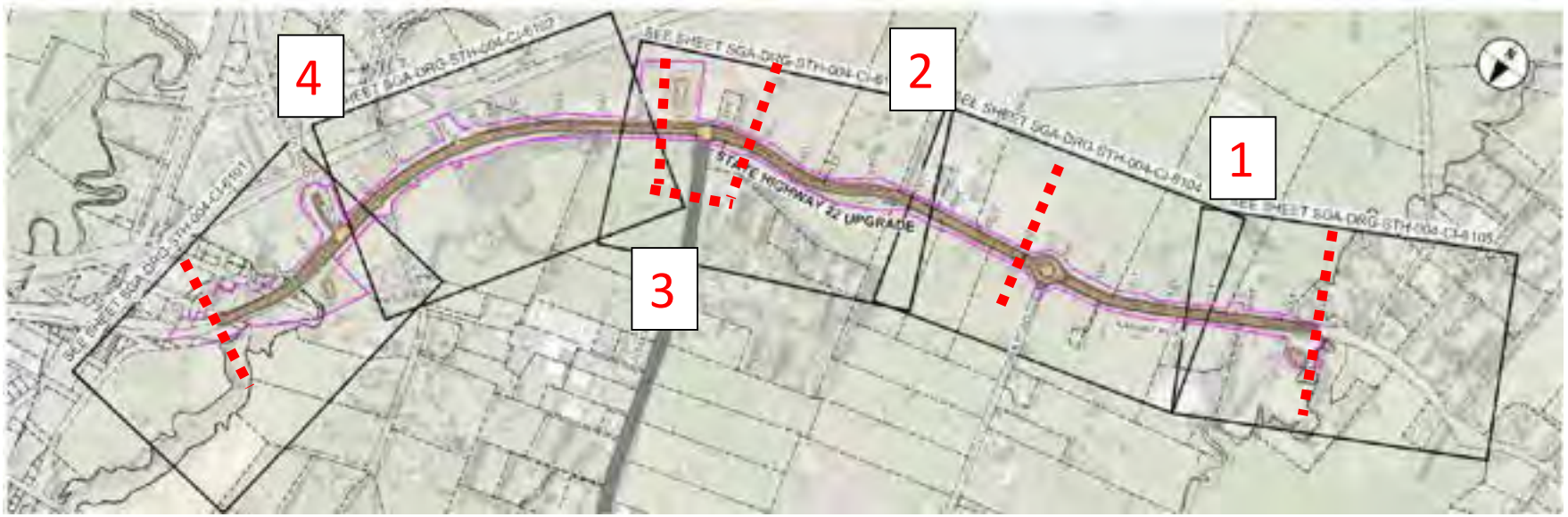
Appendix 1: Cost Estimate Summary Forms (DBE)

Appendix 2: Physical Works Assumption Schedules

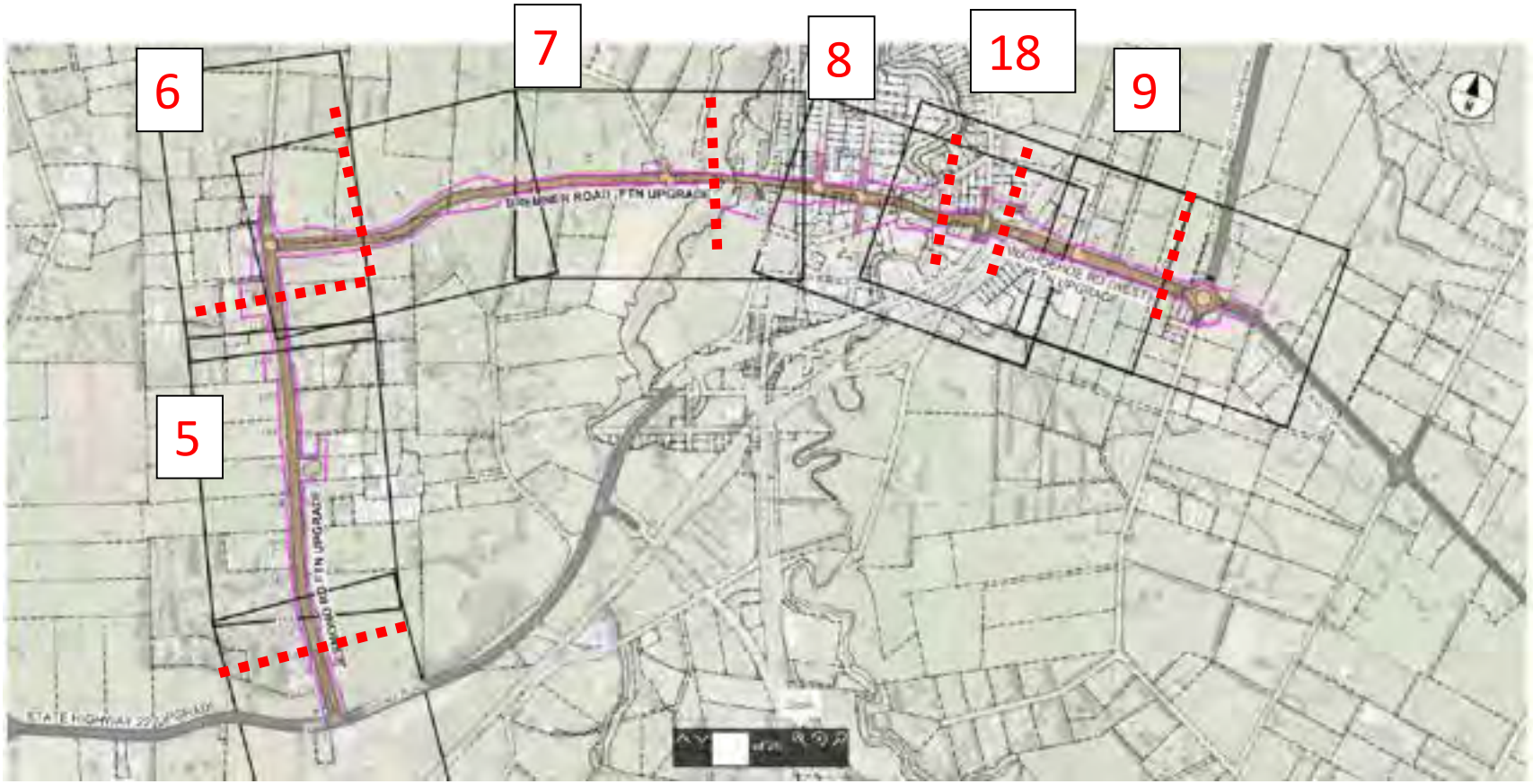
Appendix 3: Property Cost Estimate Memorandums

Appendix 4: Project Costing Segments

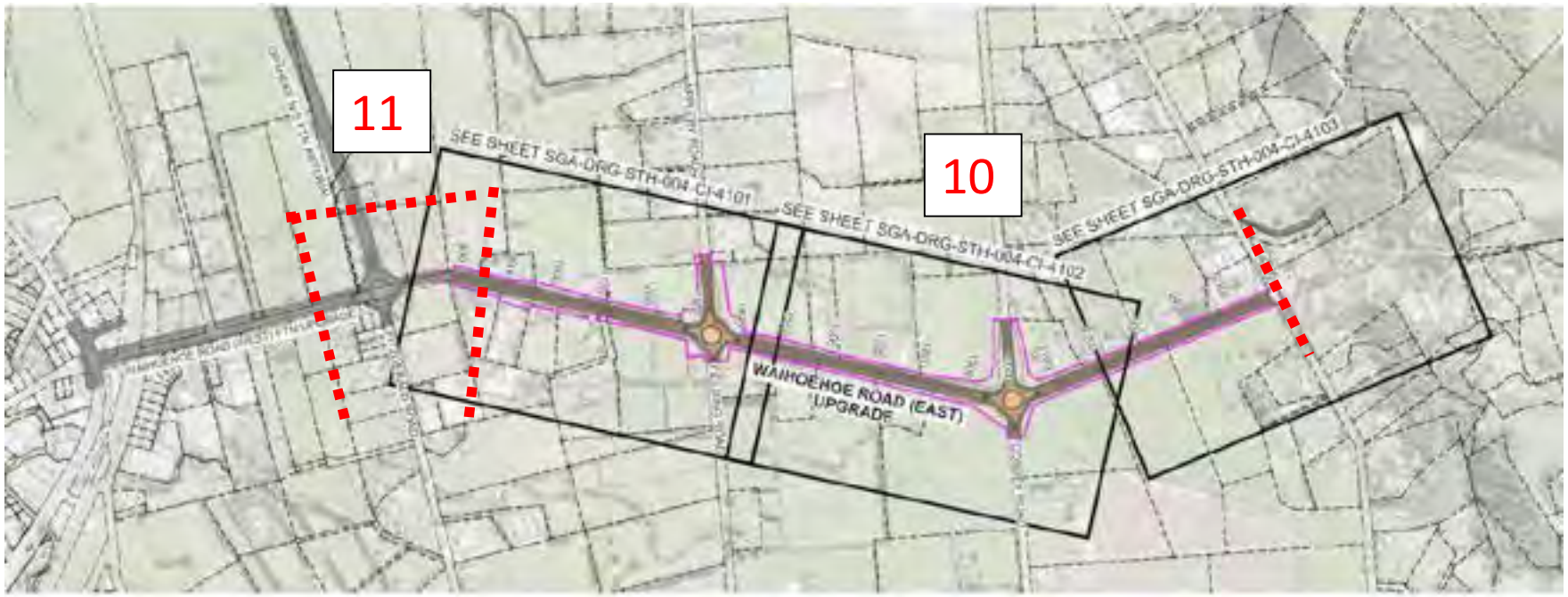
Extent of Scope for Cost Estimation:



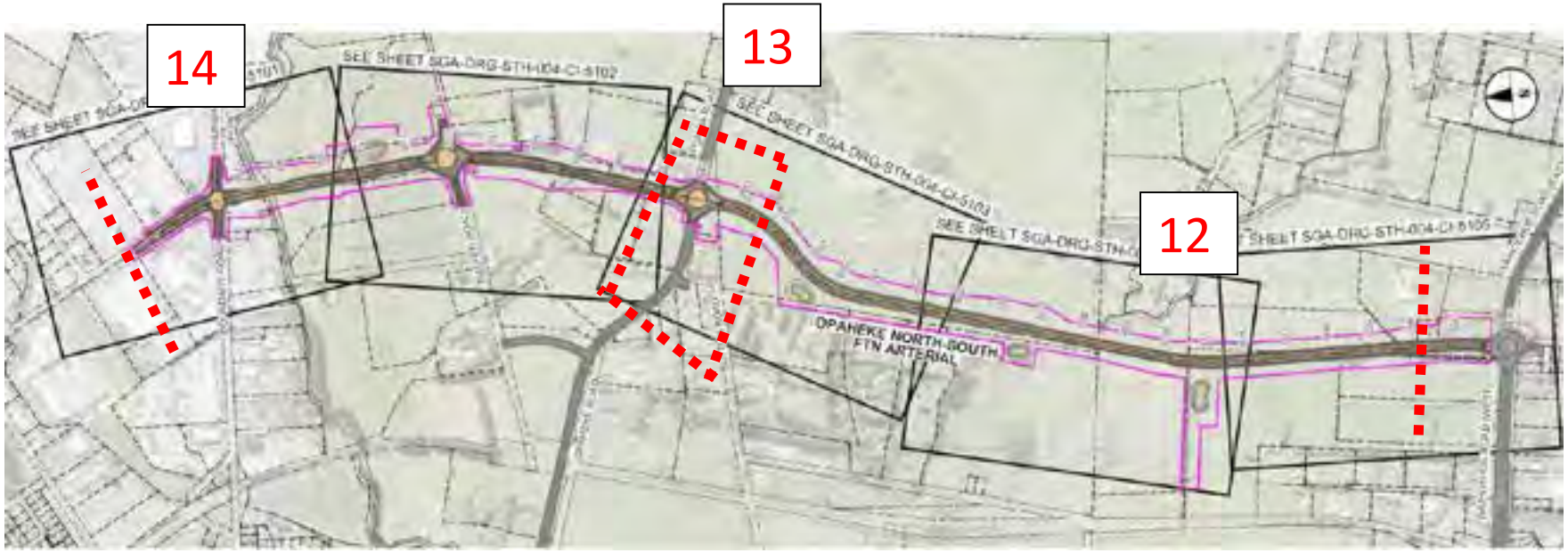
1	SH22/OIRA RD ROUNDABOUT	4576	3800
2	SH22 MID-BLOCK	3800	3050
3	SH22/JESMOND RD INTERSECTION	3050	2850
4	SH22 MID-BLOCK	2850	1600



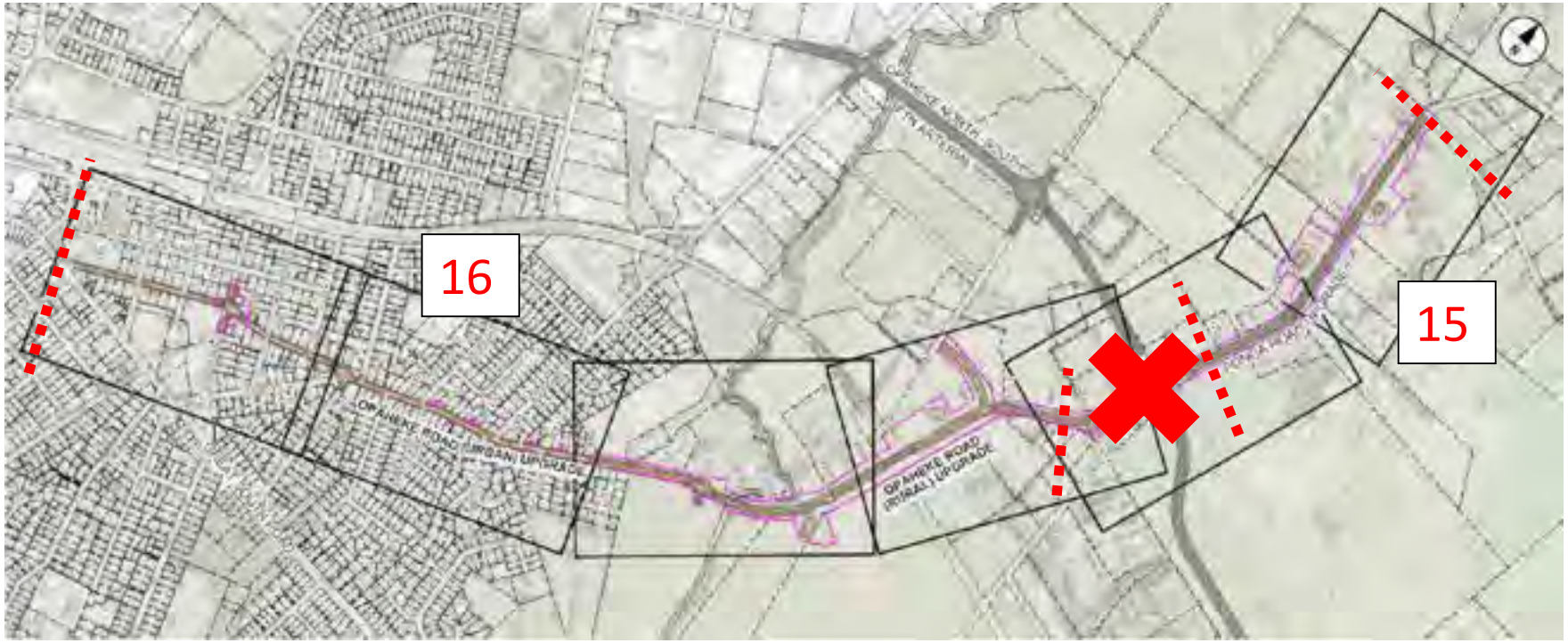
5	JESMOND RD MID-BLOCK	2200	3150
6	JESMOND RD/BREMNER INTERSECTION	3150	3480
7	JESMOND TO BREMNER LINK MID-BLOCK	280	1260
8	BREMNER RD - GSR MID-BLOCK	1260	1900
9	WAIHOEHOE RD WEST - OPAHEKE N-S MID-BLOCK	50	500
18	GREAT SOUTH ROAD INTERSECTION	-	-



10	WAIHOEHOE RD EAST MID-BLOCK	800	2580
11	OPAHEKE N-S/WAIHOEHOE RD INTERSECTION	500	800



12	OPAHEKE N-S MID-BLOCK	3630	1960
13	OPAHEKE N-S/PONGA INTERSECTION	1960	1700
14	OPAHEKE N-S MID-BLOCK (NORTH OF PONGA)	1700	400



15	PONGA RD	1150	2020
16	OPAHEKE RD UPGRADE	0	2820

Memorandum

To:	Drury Local Project Team
From:	[redacted]
Date:	October 2020
Subject	Drury Local – Design Framework Review
File/Ref No.	Final

This urban design evaluation has been prepared for the Drury detailed business case based on the guidance and principles established in the programme wide document - Te Tupu Ngātahi Design Framework (Design Framework).

The Design Framework takes a systems-based approach as the basis on which urban areas are organised and understood and pulls these apart as a series of layers; environment, social, built form, movement and land use, with cultural and sustainability values underpinning and spanning across these. In this way transport networks are not seen in isolation rather in terms of how they can contribute to the urban system as a whole.

The Design Framework provides measurable guidance for outcomes-based decisions throughout each phase of the programme delivery including:

- Option development,
- option evaluation,
- detailed business case preparation, and
- the corridor protection and consenting process.

The record below notes where an option is supportive of each of the design principles or where the option is assessed as being 'neutral'; requiring further design detail, or as an 'opportunity for development'; requiring further consideration and development in future detailed design stages.

The intention of this interim evaluation is to provide a high level urban design overview that considers the current corridor arrangement and alignment at a concept stage and to identify design opportunities and refinements that should be considered at subsequent stages of the design.

A final assessment will be undertaken as part of the Urban Design Evaluation and Framework, this will provide urban design focused commentary on the design detail of the final concept design of each project (corridor) as well as recommendations for how and where further urban design outcomes and opportunities should be considered in future design stages. These recommendations will form the basis of urban design specific consent conditions as part of the assessment of environmental effects.

SH22 ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridor

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure
- Facilitate an appropriate interface between place and movement

Movement

- Connect nodes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure
- Support legible corridor function

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the use of in-corridor stormwater management systems such as swales and raingardens for areas of higher density to minimise the use of developable land, this should be reviewed in future stages particularly for the Jesmond wetland 1 and SH22 wetland.
- **Social cohesion** - Relationship to the future neighbourhood centre south of Oira road (as per the Drury – Opāheke Structure Plan) requires further resolution and coordination to ensure future local access and connectivity can be achieved.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones. particularly in areas of higher density, to the proposed local centre and the Western centre. For example, mid-block connection opportunities and future bus stops are not currently identified in the corridor design but should be developed through the subsequent project stages.
- **Prioritise active modes and public transport -** Details of active mode priority at intersections and multi-lane roundabouts are not fully resolved at this stage and should be developed through subsequent project stages. In particular, the Oira road roundabout

crossing should be developed at subsequent project stages to ensure cross corridor connectivity.

The following principles were identified as requiring further development and resolution:

- **Connect modes –** Further design detail will need to be developed to demonstrate corridor arrangement allows for safe active mode connections for multi lane roundabouts, particularly in regards to accessibility and connectivity to the future neighbourhood centre south of Oira road intersection (as per the Drury – Opāheke Structure Plan).

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

JESMOND ROAD FTN ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure
- Facilitate an appropriate interface between place and movement

Movement

- Connect nodes
- Connect modes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support and enhance ecological corridors and biodiversity -** Details of the ecological management strategy of the corridor is not fully resolved and should be reviewed for

integration opportunities with local stream protection and restoration plans in future stages**.** Further investigation of existing stream networks is recommended to support ecological connections where possible and minimise the number of new culverts required.

- **Support water conservation and enhance water quality in a watershed -** Investigate the use of in-corridor stormwater management systems such as swales and raingardens for areas of higher density to minimise the use of developable land, this should be reviewed in future stages particularly for the Jesmond wetlands 1, 2 and 3.
- **Social cohesion** –
    - Relationship to the proposed Western Centre in Drury West and neighbourhood centre at the intersection of Bremner road (as per the Drury – Opāheke Structure Plan) requires further resolution and coordination to ensure future local access and connectivity can be achieved.
    - Relationship to the grain of adjacent land uses requires resolution and coordination with adjacent landowners in future stages to ensure local access and connectivity can be achieved, particularly in areas of high density.
- **Prioritise active modes and public transport -** Details of active mode priority at intersections is not fully resolved at this stage and should be developed through subsequent project stages.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities and future bus stops are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

BREMNER ROAD FTN ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure

Movement

- Connect nodes
- Connect modes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support and enhance ecological corridors and biodiversity -** Details of the ecological management strategy of the corridor is not fully resolved and should be reviewed for integration opportunities with local stream protection and restoration plans in future stages**.** Further investigation of existing stream networks is recommended to support ecological connections where possible and minimise the number of new culverts required.
- **Social cohesion** - Relationship to the grain of adjacent land uses requires resolution and coordination with adjacent landowners in future stages to ensure local access and connectivity can be achieved, particularly in areas of high density.
- **Facilitate an appropriate interface between place and movement -** There are currently 2 areas of the corridor with significant cut batter of up to 6m and fill batters up to 4m which is not conducive to seamless integration with the likely scale of future built form. An integration strategy should be developed in future stages to address interface issues to enable a desirable interface with high density residential land uses along the corridor.
- **Prioritise active modes and public transport -** Details of active mode priority at intersections is not fully resolved at this stage and should be developed through subsequent project stages.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities and future bus stops are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

WAIHOEHOE ROAD WEST FTN ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure

Movement

- Connect nodes
- Connect modes
- Support access to employment and industry
- Prioritise active modes and public transport
- Support inter-regional connections and strategic infrastructure

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the opportunity for in-corridor stormwater management systems such as swales and raingardens to integrate with local stream protection and restoration plans in future stages**.**
- **Social cohesion -** Relationship to the grain of adjacent high density land uses (THAB zoned) requires resolution and coordination with adjacent landowners in future stages to ensure future local access and connectivity can be achieved.
- **Facilitate an appropriate interface between place and movement –** Future integration with the proposed Main Centre in Drury Central (as per the Drury – Opāheke Structure Plan) is recommended to improve potential for active edge permeability and an appropriate interface.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities and future bus stops are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

WAIHOEHOE ROAD EAST ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density

Movement

- Connect nodes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the opportunity for in-corridor stormwater management systems such as swales and raingardens to integrate with the protection and restoration plans of the Hingaia stream and tributaries in future stages**.**
- **Social cohesion –**
    - Relationship to the proposed open space located at the intersection of the Waihoehoe and Cossey Road (as per the Drury – Opāheke Structure Plan) requires further resolution and coordination to ensure future local access and connectivity can be achieved.
    - Relationship to the grain of adjacent high density land uses (THAB zoned) requires resolution and coordination with adjacent landowners in future stages to ensure future local access and connectivity can be achieved.
- **Corridor scaled to the surrounding context and urban structure -** The corridor will require further development to demonstrate that interfaces at Appleby road and Cossey road is flexible to future built form. The corridor has been designed in advance of confirmed plans for the scale and form of future development from adjacent landowners.
  As such, corridor edges are largely designed with significant cut and fill batters which are not conducive to seamless integration with the likely scale of future built form. An integration strategy should be developed in future stages to address mitigation and integration issues.

- **Facilitate an appropriate interface between place and movement –** Integration with the proposed open space reserve at the intersection of the Waihoehoe and Cossey Road (as per the Drury – Opāheke Structure Plan) is recommended to improve potential for active edge permeability and an appropriate interface.
- **Prioritise active modes and public transport** - Details of active mode priority and crossings at intersections are not fully resolved at this stage and should be developed through subsequent project stages.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Respect culturally significant sites and landscapes – none noted
  Strategic corridors as urban edges

OPĀHEKE NORTH SOUTH FTN ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Support water conservation and enhance water quality in a watershed
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure

Movement

- Connect nodes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure
- Support legible corridor function

Land Use

- Public transport directed and integrated into centres

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the use of in-corridor stormwater management systems such as swales and raingardens for areas of higher density to minimise the use of developable land, this should be reviewed in future stages particularly for the wetland located within the mixed housing urban zone.
- **Social cohesion** - Relationship to the future neighbourhood centre and open space reserve located at the intersection of Opāheke and Ponga road (as per the Drury – Opāheke Structure Plan) requires further resolution and coordination to ensure future local access and connectivity can be achieved.
- **Corridor scaled to the surrounding context and urban structure -** Significant fill embankments in the following areas appear to be disconnected to the adjacent medium and high density housing;
    - at the Ponga road intersection
    - north of the Waihoehoe road intersection

  An integration strategy should be developed in future stages to address mitigation and integration issues and to demonstrate an appropriate interface to future built form.
- **Facilitate an appropriate interface between place and movement –**
    - Integration with the future neighbourhood centre and open space reserve located at the intersection of Opāheke and Ponga road (as per the Drury – Opāheke Structure Plan) is recommended to improve potential for active edge permeability and an appropriate interface.
    - Future vertical integration with the Waihoehoe stream bridge and Waipokapū Stream bridge is recommended to improve potential for active edge permeability and an appropriate interface with adjacent residential land uses.
- **Prioritise active modes and public transport -** Details of active mode priority and crossings at intersections is not resolved at this stage and should be developed through subsequent project stages.
- **Support legible corridor function -** Definition of detailed modal crossings is recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities and future bus stops are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as requiring further development and resolution:

- **Connect modes –** Further design detail will need to be developed to demonstrate corridor arrangement allows for safe active modes connections for multi lane roundabouts, particularly in regards to accessibility and connectivity to the future neighbourhood centres, open space reserves and areas of high density;
    - intersection of Opāheke and Ponga road
    - intersection of Opāheke and Waihoehoe road

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

PONGA ROAD ARTERIAL PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Respect culturally significant sites and landscapes
- Adaptive corridors
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure

Movement

- Connect nodes
- Connect modes
- Support access to employment and industry
- Prioritise active modes and public transport
- Support inter-regional connections and strategic infrastructure

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the opportunity for in-corridor stormwater management systems such as swales and raingardens for areas of higher density to minimise the use of developable land.
- **Social cohesion** – Relationship to the future neighbourhood centre and open space at the intersection to Opāheke N-S FTN Arterial (as per the Drury – Opāheke Structure Plan) requires further resolution and coordination to ensure local access and connectivity can be achieved.
- **Facilitate an appropriate interface between place and movement -** Future vertical integration with the Mangapū Stream bridge is recommended to improve potential for active edge permeability and an appropriate interface with adjacent residential land uses.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Strategic corridors as urban edges

OPĀHEKE ARTERIAL RURAL & URBAN UPGRADE PREFERRED OPTION

The proposed corridor alignment is supportive of the following Design Framework principles:

Environment

- Support and enhance ecological corridors and biodiversity
- Minimise land disturbance, conserve resources and materials
- Adapt to a changing climate and respond to the microclimatic factors of each area

Social

- Identity and place
- Adaptive corridors
- Social cohesion
- Safe corridors

Built Form

- Align corridors with density
- Corridor scaled to the surrounding context and urban structure

Movement

- Connect nodes
- Connect modes
- Support access to employment and industry
- Support inter-regional connections and strategic infrastructure

Land Use

- Public transport directed and integrated into centres
- Strategic corridors as urban edges

The principles that scored neutral in their support include:

- **Support water conservation and enhance water quality in a watershed -** Investigate the opportunity for in-corridor stormwater management systems such as swales and raingardens to minimise the use of developable land for Opāheke wetland 2 which is in an area of high density THAB zoning. Investigate integration opportunities for the Opāheke wetland 1 to appropriately interface with the Opāheke Reserve.
- **Facilitate an appropriate interface between place and movement** –
    - Integration with the proposed neighbourhood centre adjacent to the Ponga and Opāheke Road intersection is recommended to improve potential for active edge permeability and an appropriate interface.
    - An integration strategy should be developed to address interface issues and areas of localized cut and full through the urbanized areas of this corridor. This will enable efficient integration and provide a more desirable interface to the existing built form along this corridor.
    - Future consideration will be required to provide an appropriate landscape interface between the corridor and the Papakura cemetery.

  - Future vertical integration with the rail bridge is recommended to improve potential for active edge permeability and an appropriate interface with adjacent medium density residential land uses to the east.
- **Prioritise active modes and public transport -** Details of active mode priority and crossings at intersections and driveways is not fully resolved at this stage and should be developed through subsequent project stages.
- **Support legible corridor function -** Definition of detailed modal crossings are recommended to demonstrate connectivity across the corridor between future urban zones, particularly in areas of higher density. For example, mid-block connection opportunities are not currently identified in the corridor design but should be developed through the subsequent project stages.

The following principles were identified as not relevant to the corridor:

- Respect culturally significant sites and landscapes – none noted
- Strategic corridors as urban edges

5.2 Measurable Design Criteria

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	1.3	Minimise land disturbance, conserve resources and materials	☒	☐	☐	☐
	1.4	Adapt to a changing climate and respond to the microclimatic factors of each area	☒	☐	☐	☐
Social	2.1	Identity and place	☒	☐	☐	☐
	2.2	Respect culturally significant sites and landscapes	☒	☐	☐	☐
	2.3	Adaptive corridors	☒	☐	☐	☐
	2.4	Social cohesion	☒	☐	☐	☐
	2.5	Safe corridors	☒	☐	☐	☐
Built form	3.1	Align corridors with density	☒	☐	☐	☐
	3.2	Corridor scaled to the surrounding context and urban structure	☒	☐	☐	☐
	3.3	Facilitate an appropriate interface between place and movement	☐	☐	☐	☐
Movement	4.1	Connect nodes	☒	☐	☐	☐
	4.2	Connect modes	☒	☐	☐	☐
	4.3	Support access to employment and industry	☒	☐	☐	☐
	4.4	Prioritise active modes and public transport	☐	☐	☐	☐
	4.5	Support inter-regional connections and strategic infrastructure	☒	☐	☐	☐
	4.6	Support legible corridor function	☐	☐	☐	☐
Landuse	5.1	Public transport directed and integrated into centres	☒	☐	☐	☐
	5.2	Strategic corridors as urban edges	☐	☐	☐	☒

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	1.3	Minimise land disturbance, conserve resources and materials	X			
	1.4	Adapt to a changing climate and respond to the microclimatic factors of each area	X			
Social	2.1	Identity and place	X			
	2.2	Respect culturally significant sites and landscapes				X
	2.3	Adaptive corridors	X			
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	4.4	Prioritise active modes and public transport				
	4.5	Support inter-regional connections and strategic infrastructure	X			
	4.6	Support legible corridor function				
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TABLE 3 - MEASURABLE DESIGN CRITERIA

Supporting Growth

Detailed Business Case

Drury Design Report



Version 1.1

2 November 2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Document Status

Responsibility	Name
Author	[redacted]
Reviewer	[redacted]
Approver	[redacted]

Revision Status

Version	Date	Reason for Issue
1.0	28 August 2020	Business Case Issue
1.1	2 November 2020	Final

Disclaimer

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

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Appendices

Appendix 1. **Preliminary Design Drawings**

Appendix 2. **South Region Preliminary Geotechnical Review**

Appendix 3. **Road Safety Audit Exemption**

Appendix 4. **Safety in Design Register**

Acronyms

Acronym/Term	Description
AADT	Annual Average Daily Traffic
AC	Auckland Council
AEE	Assessment of Effects on the Environment
AEP	Annual Exceedance Probability
AGRD	Austroads Guide to Road Design
ARI	Annual Recurrence Interval
ASD	Approach Sight Distance
AT	Auckland Transport
ATCOP	Auckland Transport Code of Practice
AUP	Auckland Unitary Plan
CH	Chainage
DBC	Detailed Business Case
DJV	Design Joint Venture
DPS	Design Philosophy Statement
FTN	Future Transport Network
GIR	Geotechnical Interpretive Report
HAIL	Hazardous Activities and Industries List
HV	High Voltage
IBC	Indicative Business Case
ITS	Intelligent Transport System
FoS	Factor of Safety
LIDAR	Light Detection and Ranging
LV	Low Voltage
MOTSAM	Manual of Traffic Signs and Markings
MSE	Mechanically stabilised earth
NIMT	Northern Island Main Trunk (Rail)
NoR	Notice of Requirement
NZGD	New Zealand Geotechnical Database
NZTA	Waka Kotahi New Zealand Transport Agency
NZTM	New Zealand Transverse Mercator 2000
PWV	Permanent Water Volume
RAMM	Road Asset and Maintenance Management
RCRRJ	Reinforced concrete rubber ring jointed (pipes)
RMA	Resource Management Act

RSA	Road Safety Audit
RT	Reaction Time
SAT	Safety Audit Team
SAVF	South Auckland Volcanic Field
SCATS	Sydney Coordinated Adaptive Traffic System
SGA	Supporting Growth Alliance
SH1	State Highway 1
SH22	State Highway 22
SMAF	Stormwater Management Area Flow
SSD	Stopping Sight Distance
TDM	Transport Design Manual
TP10	Auckland Council Technical Publication #10 – Stormwater Management Devices Design Guideline Manual
UDA	Urban Design Assessment
WQ	Water Quality

1 Introduction

1.1 Programme Overview

The Supporting Growth Programme is a collaboration between Auckland Transport (AT) and Waka Kotahi New Zealand Transport Agency (NZTA) to plan transport investment in Auckland's future urban zoned areas over the next 10 to 30 years. AT and the NZTA Board endorsed the Indicative Strategic Transport Network in 2019, which defined the alignment and location of key transport improvements.

Te Tupu Ngātahi – The Supporting Growth Alliance (SGA and/or the Alliance) has been established to identify the transport requirements to support the predicted level of growth forecast to occur in Auckland beyond a 30-year time frame. As such, most of the projects within the Alliance's full programme may not be constructed for several years. It is therefore anticipated that the preliminary designs contained in this Detailed Business Case (DBC) Design Report will need to be revised and reconfirmed at that time to reflect any changes in standards, planning conditions, network demands, and/or any other construction related matters.

1.2 Purpose of Design Report

In conjunction with the Alliance's overarching programme wide activities, this document has been prepared to confirm the engineering investigation and design undertaken of the emerging preferred option for designation and route protection in Drury.

The design has been developed based on several generic assumptions to identify a potential designation footprint and to inform an assessment of their likely transport, environmental and construction related effects.

1.3 Design Report Scope

The design has been prepared to support the Detailed Business Case (DBC) for the following corridors illustrated in **Figure 1** overleaf:

- State Highway 22 Upgrade;
- Jesmond Road FTN Upgrade
- Bremner Road FTN Upgrade
- Waihoehoe Road West FTN Upgrade
- Waihoehoe Road East Upgrade
- Ōpāheke North-South FTN Arterial
- Ponga Road Upgrade
- Ōpāheke Road Rural Upgrade
- Ōpāheke Road Urban Upgrade.

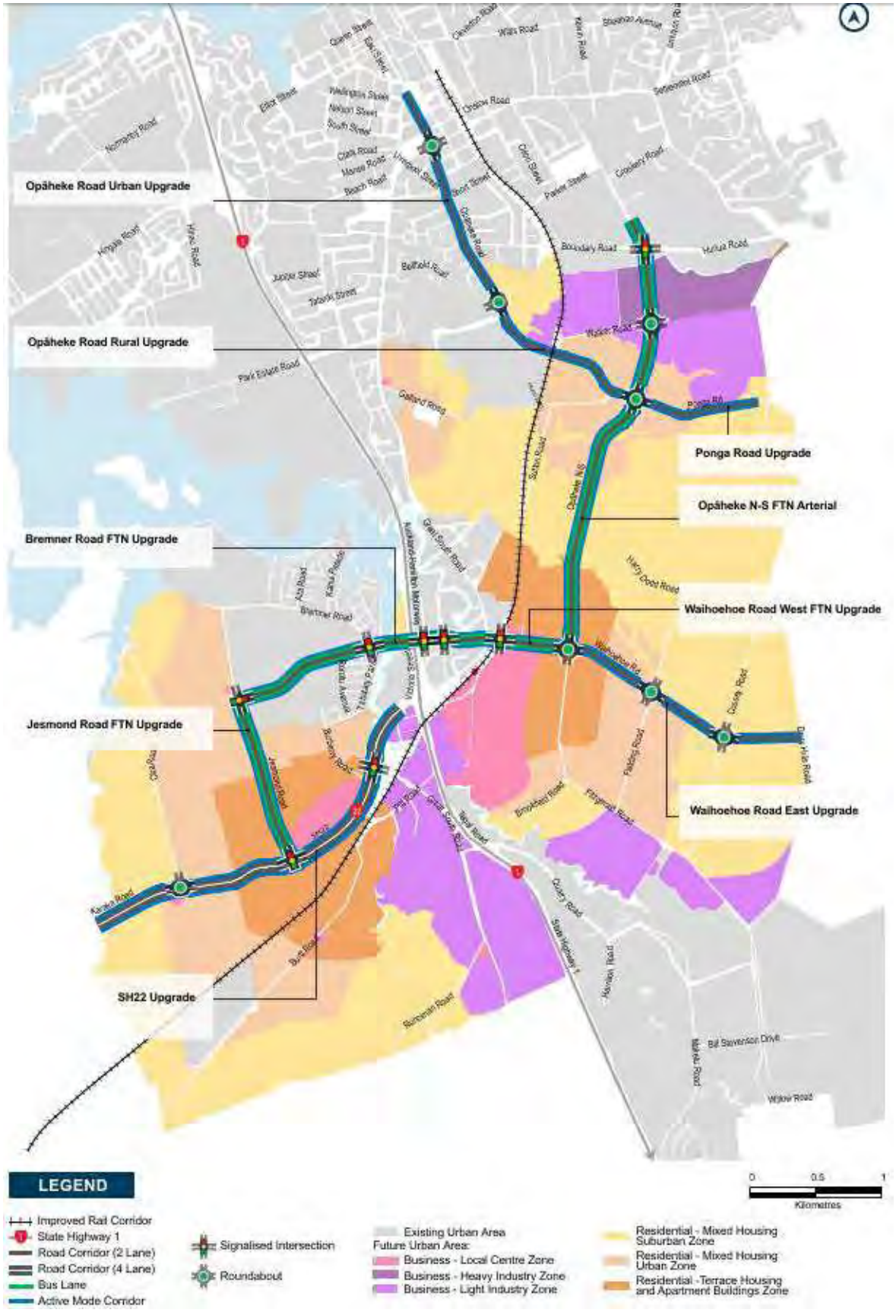

Figure 1: Drury Arterial Transport Network

Development of the design for the following elements has not been undertaken other than assumptions to inform the cost estimate:

- Pavement and surfacing;
- Signs and road markings;
- Landscaping;
- Road safety barriers;
- Utilities
- Lighting;
- Traffic signals.

1.4 Interfaces with Other Projects

1.4.1 SH1 Papakura to Bombay (P2B) Project

The P2B project interfaces with the Bremner Road FTN Upgrade and the State Highway 22 (SH22) Upgrade.

The Ngakoroa Stream and SH1 bridges on Bremner Road will be reconstructed as part of the P2B project scope. Construction of a 2-lane road is currently programmed for completion by 2024. The future design of the Bremner Road FTN Upgrade will require this section to be widened to 4-lanes.

The Drury/SH1 interchange forms part of the P2B project scope. The tie in at the eastern extent of the SH22 Upgrade is assumed to be at the eastern side of the Ngakoroa Stream Bridge.

1.4.2 Te Tupu Ngātahi: Mill Road NZ Upgrade Programme

There are two interfaces with the Mill Road project; Waihoehoe Road East Upgrade and Ponga Road Upgrade.

The Drury Arterial transport network has been developed so that the upgrade of Waihoehoe Road East and Ponga Road can integrate with the both the existing network and the future Mill Road connection.

1.4.3 Te Tupu Ngātahi: South Rail Project:

The Waihoehoe Road West FTN Upgrade includes the replacement of the Waihoehoe bridge over the widened North Island Main Trunk (NIMT) rail corridor. The proposed Drury Central station is located within close proximity to this bridge, and future access to the station is anticipated to be provided from Waihoehoe Road.

The Ōpāheke Road Rural Upgrade includes the provision of a bridge providing grade separation over the widened North Island Main Trunk (NIMT) rail corridor, replacing the current at-grade crossing.

1.4.4 Auranga Development

The Auranga Development is currently under construction and will provide a 2-lane connection from Jesmond Road to Bremner Road. The horizontal and vertical geometry for the Bremner Road FTN Upgrade is influenced by the Auranga Development, and the cross section requirements set out in Plan 6 Change.

2 Design Philosophy and Standards

The Supporting Growth programme includes provision for both high speed strategic corridors and lower speed urban corridors. The form and function of each corridor, including the proposed posted speed limit is set out in the Transport and Economics Report (DBC Appendix B). Within the Drury programme, all corridors are proposed to have a posted speed of 50km/h and a design speed of 60km/h, and any localised deviations from this are discussed in the corridor specific sections of this report.

In future, it may be appropriate to establish a speed environment less than this to better integrate with the land use. However, application of a design speed of 10km/h higher than the proposed posted speed provides flexibility for the actual posted speed and desirable speed environment to be determined once the future development is known.

The ultimate design of the transport network will be confirmed in subsequent design phases, although for the purpose of route protection, the following design criteria have been applied.

2.1 Design Standards

Where appropriate, the following design standards have been referenced when developing the design philosophy for the Drury Arterial transport network:

- Transport Design Manual (TDM) – Auckland Transport
  - Urban Street and Road Design Guide
  - Engineering Design Code – Urban and Rural Roadway Design
- Austroads Guide to Road Design (AGRD):
  - Part 3: Geometric Design (2016)
  - Part 4: Intersection & Crossings – General (2017)
  - Part 4A: Unsignalised and Signalised Intersections (2017)
  - Part 4B: Roundabouts (2015)
- State Highway Geometric Design Manual (SHGDM)
  - Part 2: Basic Design Criteria
  - Part 3: Horizontal Alignment
- Technical Memorandum (Waka Kotahi)
  - TM-2501: Superelevation Calculations
  - TM-2502: Preferred Method for Calculating Road Surface Water Run-off in New Zealand

Where additional design standards relevant to specific design disciplines have been utilised, they are referenced in the relevant Design Philosophy and Standards section of this report.

2.2 Sight Distance

Section 4.3 of the Engineering Design Code for Urban and Rural Road Design (section 2 of the TDM) sets out the sight distance requirements along AT roads. Three particular road user tasks need to be

assessed so that road infrastructure can be used safely by all: Safe Path, Safe to Go and Safe Avoidance.

Safe Path: This is required to confirm the ability to stop or give way to a priority user movement using approach sight distance (ASD).

Safe to Go: This includes minimum gap sight distance (MGSD), crossing sight distance (CSD), overtaking sight distance (OSD), and intermediate sight distance.

Safe Avoidance: the ability of a vehicle to react to hazards on or suddenly entering the road and is measured by safe stopping sight distance (SSD) and safe intersection sight distance (SISD).

AGRD Part 3 Section 5 parameters should be applied for checking the sight distance checks. The follow criteria are to be used:

- Object height – AGRD Part 3 Section 5.2.1 Table 5.1
- 0.20m for normal stopping sight distance (SSD) for cars and trucks to hazard on roadway
- 0.00m for approach sight distance (ASD) at intersections, ASD to taper at end of auxiliary lane, headlight sight distance in sags, horizontal curve perception distance and water surface at flood ways
- Driver eye height – AGRD Part 3 Section 5.2.1 Table 5.1
- 1.10m for all car sight distance models
- Driver perception reaction time (Rt) – AGRD Part 3 Section 5.2.2 Table 5.1
- 2.0s for high speed urban areas, few intersections, alerted driving situations in rural areas.
- Deceleration rate (d) – AGRD Part 3 Section 5.2.3 Table 5.3
- 0.36 desirable value for calculating minimum stopping sight distance for most urban and rural road types, and level crossings. Section 4.3 of the TDM states that d = 0.25 shall be used for Safe Path Design.

2.2.1 Stopping Sight Distance (SSD)

Stopping Sight Distance (SSD) is the distance to enable a normally alert driver, travelling at the design speed on wet pavement, to perceive, react and brake to a stop before reaching a hazard on the road ahead (AGRD Part 3 Section 5.3).

The philosophy is to provide stopping sight distance for both cars and trucks for all roads as per AGRD Part 3 Section 5.3 table 5.5.

2.2.2 Approach Sight Distance (ASD)

Approach Sight Distance (ASD) is the minimum distance to ensure the drivers are aware of the presence of an at grade intersection.

The philosophy is to provide ASD for all at grade intersections as per AGRD Part 4A Section 3.2.1 table 3.1. with an object height of 0.0m (to ensure the driver is able to see any line marking at the intersection)

2.2.3 Safe Intersection Sight Distance (SISD)

According to Austroads SISD is the minimum sight distance that should be provided on the major road at any intersection. AGRD Part 4A Section 3.2.2 table 3.2 shows the SISD values.

The philosophy is to adopt ASD for all the intersections. The SISD should be applicable as the minimum absolute desirable distance for a specific at grade intersection.

2.3 Horizontal Alignment

The horizontal alignment of a road is usually a series of straights (tangents) and circular curves that may or may not be connected by transition curves (AGRD Part 3 Section 7). The philosophy of the horizontal alignment is to be appropriately designed to best accommodate the corridor with the existing topography and future land use. Further specific information on the standards adopted is given under each section below.

2.3.1 Curvilinear alignment philosophy

A curvilinear alignment philosophy is suggested to be applied whenever it is possible. A curvilinear alignment is a series of long, flat curves and the use of long straights are minimised.

A road with curvilinear alignment is more pleasant to drive on than one with long straight tangents since it unfolds itself smoothly with no unexpected changes (AGRD Part 3 Section 7.10.2). A curvilinear alignment helps drivers to focus on the section of road ahead that is most relevant for decision making, rather than looking too far ahead, with associated restricted vision and driver fatigue.

At night, a curvilinear alignment reduces headlight glare between approaching vehicles. On long straights, headlights become visible from a long distance away and can be distracting. Where vehicles approach each other on curvilinear alignment, the glow of the approaching vehicle headlamps can be seen well before the lamps become visible, and the rate of approach of the vehicle can be assessed (AGRD Part 3 Section 7.10.2).

2.3.2 Circular curves

Horizontal curves are to be provided at each change in alignment direction. Refer to AGRD Part 3 Table 7.6 for the minimum horizontal curve length and section 2.4 for adverse crossfall parameters for each section of the road.

2.3.3 Compound curves

Compound curves are horizontal curves of different radii turning in the same direction with a common tangent point (AGRD Part 3 Section 7.5.1). It is not desirable to use compound curves since it may cause operational problems due to drivers not perceiving the change in curvature. The use of compound curves may also unnecessarily restrict future design options and therefore are avoided where possible.

2.3.4 Broken back curves

Broken back curves are horizontal curves turning in the same direction joined by a short length of straight or two relatively small unidirectional curves connected by a large radius curve (AGRD Part 3 Section 7.5.2). The use of broken back curves is to be avoided wherever possible, since the application of superelevation and grading of pavement edges is problematic.

2.3.5 Transition curves

Transition curves will be provided in all horizontal curves that require a change in superelevation. It is considered good practice to provide transition curves on all superelevated curves to smooth the travel of vehicles within the traffic lane and to facilitate the application of superelevation.

Transition curve lengths are based on superelevation development requirements, refer to AGRD Part 3 Section 7.7.

On reverse curves, transition curves will be connected back to back without a straight to provide a smooth curvilinear alignment and facilitate the application of superelevation.

2.3.6 Service Lanes

Service lanes will be provided in accordance with AGRD Part 3 Section 4.11 and AGRD Part 4 Section B.3.2. Service lanes will be provided to reduce congestion and improve safety on major arterials and locations where there are dense housing access requirements. Service lanes will begin and terminate as close as practically possible to intersections where there are access requirements.

2.4 Crossfall and Super elevation

2.4.1 Normal Crossfall

Normal crossfall of 3% will be provided on all roads in accordance with the TDM (section 6.2.1 of the Engineering Design Code for Urban and Rural Road design) and AGRD Part 3 Section 4.2.2.

2.4.2 Super elevation

Superelevation will be applied where the normal crossfall is not applicable due to a constrained horizontal alignment. Table 1 below shows the different superelevation approaches in relation to different corridor environments.

Table 1: Corridor environment and superelevation

Corridor environment	Posted Speed (km/h)	Design Speed (km.h)	Geometric Design Standards for Adverse Crossfall
State Highways – High Speed Corridor	100	110	SHGDM Section 2.8.4 TM-2501: Superelevation Calculations
	80	90	
State Highways – Urban Corridor	60	70	AGRD Part 3 Section 7.7 TM-2501: Superelevation Calculations
Local Roads – High Speed Corridor	100	110	ARGD Part 3 Section 7.7 (NB: the Waka Kotahi Technical Memorandum TM-2501 does not apply for Auckland Transport Roads).
	80	90	
Local Roads – Urban Corridor	60	70	Super-elevation is not permitted on local or collector roads and is unlikely to be required on arterial roads within urban areas. Adverse crossfall is to be applied for all urban arterial roads (TDM Engineering Design Code: Urban and Rural Road design, section 6.2.2).
	50	60	

Transition curves must be calculated as outlined in the Austroads Guide to Road Design – Part 3: Geometric Design.

The design philosophy on the project is to, where possible, avoid superelevation roll off on the approach to intersections or in an area of likely breaking e.g. for a design speed of 90km/h normal crossfall should be reinstated within 130m of an intersection.

2.5 Vertical Alignment

Vertical alignment is the longitudinal profile along the centreline of a road. It is made up of a series of grades and vertical curves (AGRD Part 3 Section 8). Grades are generally expressed as percentage and vertical curves are expressed as a K value.

The vertical alignment is influenced by several constraints along the corridors, namely:

- Minimise the height of the earthwork's embankment.
- Keep the road above flood levels and minimum freeboard (Refer to section 2.13 for Stormwater design philosophy)
- Achieve vertical clearance over local road and/or rail line.
- Achieve vertical clearance over stormwater cross culverts
- Achieve the minimum clearance requirements to underground services

2.5.1 Vertical Grades

Grades should generally follow the existing ground and be as flat as possible, consistent with the longitudinal drainage requirements. The adopted grades values are described in Table 2.

Table 2: Vertical grades

Corridor Environment	Minimum desirable* gradient (%)	Maximum desirable** gradient (%)
High Speed Corridor	0.5	5%
Urban Corridor	0.5	6%

* According to SHGDM Section 5 item 5.2.2 and AGRD Part 3 Table 8.5 the absolute minimum grade is 0.3% for roads with kerb and channel. The TDM Engineering Design: Road Drainage (section 3.0) states a minimum gradient of 0.5% is to be provided for local roads.

**SHGDM Section 5 item 5.2.4 suggests having grades up to 6% in rolling terrain with a design speed of 100 km/h and grades up to 9% with a 60km/h design speed. TDM Engineering Design: Urban and Rural Road Design (section 5.3) states a maximum gradient of 8% is acceptable, and with departure should not exceed 12.5%)

2.5.2 Sag Curves

Sag curves can be defined as every concave change in the vertical alignment. AGRD Part 3 Figure 8.9 shows the sag K values for different categories of roads using both comfort and headlight sight distance criteria over the posted speed.

2.5.3 Crest Curves

Crest curves can be defined as every convex change in the vertical alignment. In most cases the minimum K value is dictated by stopping sight distance requirements (refer to section 2.2.1). Comfort criteria is suggested to be applied as per AGRD Part 3 Section 8.6.3 Table 8.7 whenever stopping sight distance is not required for an intersection approach. Reaction time of 2.0 seconds and deceleration coefficient of 0.36 has been adopted for the design of the corridors.

2.6 Horizontal and Vertical alignment coordination

The principles described at AGRD Part 3 Section 6 will be applied. Wherever possible, horizontal curves and vertical curves have been either completely superimposed or completely separated. Vertical curves are contained within horizontal curves to provide horizontal curve perception. There are various benefits in achieving a coordinated alignment such as: safety benefits, more aesthetically pleasing than an uncoordinated alignment, better integrated into the surrounding topography and it helps to avoid the occurrence of aquaplaning and flooding on the carriageway.

2.7 At grade Intersections

At grade intersections will be designed in accordance with the AGRD Part 4 “Intersections and Crossings – General” where relevant to inform the designation footprint. Further design refinement is anticipated at subsequent design phases. Further specific details are described below.

2.7.1 Roundabouts

Parameters included in the AGRD Part 4 Part B Roundabouts will be applied to roundabouts. Table 3 below defines two different approaches to the roundabout design. The approach is determined by the number of turning lanes and the inscribed circle diameter (ICD), being the dimension across the outer

kerbs of the circulating carriageway at the roundabout, providing the footprint of the roundabout. Further design refinement is required at subsequent design phases to check the deflection criteria, controlling speeds through the roundabout, and any other parameters that may be necessary for roundabout design.

Table 3: Approach to roundabout design

Single Lane Roundabout	Dual Lane Roundabout
ICD range of 30-35m. To accommodate single turning vehicle of a 18m quad-axle semi. For the roundabout located in existing urbanised areas in low speed environments, known as "small roundabouts" the ICD range could be reduced to a range of 20-25m and a more appropriate design vehicle may be used.	ICD range of 40-50m. To accommodate dual turning design vehicles of a 18m quad-axle semi and 95%ile passenger vehicle.

2.7.2 Traffic Signals and Priority Intersections

The philosophy is to apply parameters established at AGRD Part 4 Intersections and Crossings General and AGRD Part 4 Part A Unsignalised and Signalised Intersections.

2.7.3 Locations of intersections

Intersections are to be located on straights where possible or large constant elements such as a single large horizontal radii curve (AGRD Part 4 Intersections and Crossings General – Table 4.2). Intersections on vertical curves will be located to achieve required approach sight distance requirements as outlined in section 2.2.

2.7.4 Intersection Angle

Intersection approach angles should be limited between 70° and 110° from the main alignment to provide an acceptable observation angle to approaching traffic (AGRD Part 4 Part A Unsignalised and Signalised Intersections Appendix C Commentary 1).

2.7.5 Intersection Layout

Intersection layouts take into consideration the input from traffic modelling data to inform the lane configuration. Additional intersection elements are discussed below:

- Lane Widths – Through lanes are to be maintained as per the endorsed cross section of each corridor, described in the Transport Report.
- Right Turn Widths – The width of right turn bays will depend on the tracking requirements for the design vehicle at each intersection. This will include consideration of the vehicle width plus a safety zone. The SGA approach will be to apply a 3.5m right turn pocket to provide flexibility for tracking requirements to be accommodated in future. No tracking is required at this stage for setting the designation as the lane widths and median widths will provide flexibility for the final design.

- Left Turn Widths – Where the development of a dedicated left turn lane takes place, the width is to be designed to equivalent to the adjacent through lane.
- Stacking Lengths – Vehicle stacking lengths for right turn and left turns is an input to the geometric design informed by traffic modelling data.
- Lane Development Tapers – Lane development tapers are to be developed to be 30m in all cases. This is in accordance with a 90km/h design speed from AGRD Part 4 Part A Unsignalised and Signalised Intersections – Table 5.1. Where intersection geometry is tight, and the design speed allows, a 20m taper could be used.
- Merge and Diverge Taper Lengths – The merge and diverge tapers shall be applied as set out in formulae in MOTSAM. For 2 lane exits at signalised intersections, a minimum length of 15m will be applied before the taper length begins
- Traffic Islands – Are to be designed and shaped in accordance with AGRD Part 4 Part A Unsignalised and Signalised Intersections – Section 6. This will provide flexibility to reduce the taper lengths or increase the length of multiple lanes existing an intersection.

2.7.6 Intersection Grading

Intersections are to be graded to match the road profile and longitudinal grade of the main through road. This typically means the joining side roads would match -3% crossfall of the main through road. In unique cases where an intersection was located on a superelevated curve, intersections are graded to match the grade of the main through road again and in accordance with AGRD Part 4 Part A Unsignalised and Signalised Intersections – section 2.2.4. Careful consideration is to be given to ensure adverse vector sum grade does not exceed -5%.

2.8 Local Roads and tie ins

The mainline corridor often interacts with the existing local road network e.g. a new mainline corridor in rural areas crossing existing local roads, a corridor widening requiring intersection design update, or a change to the vertical alignment due to the various constraints and road safety issues.

The philosophy is to tie in with the existing road cross section as close to the intersection as possible whist maintaining the safety of the road users. The term local road tie in includes:

- Local Road Realignment – An existing road that requires road realignment due to the main alignment.
- Local Road Extension – An existing road that requires road extension due to the main alignment
- Local Road tie in – The length required to transition from the proposed cross section width to its existing environment (horizontally and vertically).

Table 4 below outlines a general approach to the local road tie ins

Table 4: Local Road Corridor Environment and Posted Speed

Local Road Corridor environment	Posted Speed (km/h)	Design Speed (km/h)	Geometric Design Standards
High Speed Rural Local Road	80	90	State Highway Geometric Design Manual (SHGDM) Austroads Guide to Road Design (AGRD)
Urban and Future Urban Local Road	50	60	Austroads Guide to Road Design (AGRD) Transport Design Manual (TDM)

Vertically, the approach at the side road is to not exceed 8% of vertical gradient and a minimum of 0.5%. This will help to avoid unnecessary earthworks and minimise tie in lengths.

2.8.1 Approach to minor road geometry

Where possible side roads are to be designed with straight entry geometry. This is however not possible in all cases as tie in distances are limited by competing projects constraints. Where straight intersection approaches cannot be achieved a curved horizontal alignment is to be employed to attenuate the approaching vehicles speed, in accordance with AGRD Part 4 Intersections and Crossings General – section 4.4 and AGRD Part 4 Part A Unsignalised and Signalised Intersections – section 5.2.2. This approach is only applied where the approaching road is not the major route and vehicles would be expected to stop or give way.

Table 5: Minor Road Approach Speed Management

Design Elements		Parameters for Urban Corridor	Parameters for High Speed Corridor
Target Speed at Give way/Stop		20km/h	20km/h
First Curve speed drop Increment		20km/h	40km/h
Second Curve Speed drop Increment		20km/h	30km/h
Curve 1	Min. Length	30m	85m
	Min. Radius Adv	75Rm	120Rm
Curve 2	Min. Length	30m	30m
	Min. Radius Adv	30Rm	30Rm

The minimum curved radii are based on a vehicle completing the turn on an adverse cross fall of -3% in accordance with AGRD Part 3: Geometric Design – section 7. Adverse crossfall tables provided in AGRD Part 3: Geometric Design – section 7 do not account for speeds below 40km/h therefore parameters were calculated from first principles using equation 5, section 7.4.1.

2.9 Active Mode Crossings

The approach to active mode crossings has been developed in accordance with Waka Kotahi's Cycle Network Guidance and Auckland Transport's Transport Design Manual. Key crossing types are identified in the **Table 6** below.

Table 6: Approach to active modes crossing

Corridor environment	Posted Speed (km/h)	No. of Lanes	Crossing type
High Speed Corridor	100 / 80	4	Grade separated
	100 / 80	2	Grade separated
Urban Arterial Corridor	60 / 50	4	At grade at intersections or roundabouts
	50	2	At grade

2.10 Driveways

The Auckland Unitary Plan – E27 Transport guide is to be used whenever driveway checks are required.

2.11 Lighting

While it is expected that most of the network will have lighting provided, the geometric design requirements for an unlit road have been applied, providing a consistent and conservative approach.

2.12 Geotechnical Conditions

2.12.1 Design Standards

Design standards considered as part of this phase of design include:

- NZGS & MBIE, 2016b, "Earthquake geotechnical engineering practice. Module 3: Identification, assessment, and mitigation of liquefaction hazards"
- NZGS & MBIE, 2017b, "Earthquake geotechnical engineering practice. Module 6: Earthquake resistant retaining wall design"
- MBIE, 2017c, "Planning and engineering guidance for potentially liquefaction-prone land"
- Auckland Council, 2013, "Code of Practise for Land Development and Subdivision. Section 2: Earthworks and Geotechnical Requirements"

2.12.2 Slopes

1V:3H slopes have been adopted as the default batter for cut and fill slopes to meet maintenance requirements. Within the Auckland region, similar slopes have been widely utilised successfully in soils that do not have known slope instability issues.

Slopes that are designed to deviate from the default 1V:3H batter are discussed in the sections addressing the relevant project zone.

No specific assessment of slope stability has been carried out during this phase of design.

2.12.3 Bridge Abutments

1V:2H spill through slopes have been adopted as the default approach for abutments at bridge locations, radially transitioning to 1V:3H side batter slopes.

Where necessary due to geometric or topographic constraints, vertical abutment walls have been adopted - assumed to be constructed using mechanically stabilised earth walls.

No specific design of abutment walls or analysis of spill through slope stability has been carried out during this phase of design.

2.13 Stormwater

2.13.1 Stormwater Management Devices

The extent of the designation footprint depends upon the type of stormwater management devices chosen, which in turn depends upon the surrounding land-use, form of the transport route, road hierarchy and how connectivity to any adjacent properties is to be provided.

The choice between a piped and open channel system can make a significant difference in terms of land required. Both systems require an upslope diversion drain for clean water at the top of any cut batter. Both systems may require a diversion drain at the toe of a fill batter if the fill interface with the existing terrain causes a local ponding area or would form an overland flow path along the toe of the batter that would be subject to erosion or cause flooding.

A collector drain may be required at the base of cut batters, adjacent to the berm, to prevent cut batter runoff mixing with carriageway runoff.

2.13.2 Stream Crossings

New Crossings

At stream crossings, the choice between a bridge or culvert makes a significant difference to the extent of land required for the designation. Land required for a bridge is close to the width of the transport corridor plus allowance for construction method, while land required for a culvert at a stream is much wider as it needs to allow for geotechnically stable batters extending down to the stream invert.

Our philosophy is that any stream crossings could be either culverts or bridges, and that this will be confirmed during the subsequent detailed design and regional resource consent phase.

As an initial criterion, bridges are assumed to be used where the upstream catchment is approximately 80 ha or greater. This catchment size is an indicator of where bridges may be needed to improve resilience and manage flooding and/or ecological effects on the environment.

The span of new bridges has been initially set at about 40% of the flood plain width, except where the corridor vertical alignment requires a longer span. Flood modelling of the bridge and abutment layouts has been undertaken to identify the extent of changes to flood levels and to identify any mitigation requirements.

Existing Crossings

The approach to widening carriageways at existing bridges varies. In the first instance, the approach is to widen the carriageway on the existing vertical alignment by extending the bridge deck sideways or duplicating the existing bridge.

Where an existing bridge is in poor condition, or there is a lack of freeboard or overtopping, it may be more appropriate to replace the bridge. In these cases, a combination of factors are considered and an overall judgement call is made (in conjunction with the structural and geotechnical teams) as to whether a bridge should be replaced.

2.13.3 Design Objectives

The stormwater design has been developed for two reasons:

- To determine the extent of designation footprint required for stormwater management devices, drainage, and stream crossings.
- To provide sufficient detail for the future Assessment of Flooding Effects to support the NoR.

The stormwater management matters considered are:

- Stormwater quality management
- Stormwater quantity management (retention and detention)
- Stormwater quantity – flooding attenuation and management
- Primary flow (10-year ARI)
- Secondary flow (100-year ARI)

Flows have been assessed for maximum probable development and include climate change effects as per guidance from Ministry for the Environment (MFE): Adapting to Climate Change in New Zealand, 2008.

The resilience of the transport corridor to flooding also needs to be considered (i.e. the vertical alignment relative to adjoining flood plains).

The above considerations are discussed in the following sections.

2.13.3.1 Stormwater Quality

The Auckland Unitary Plan (Operative in Part) (AUPOIP), Chapter E9: Stormwater Quality – High contaminant generating car parks and high use roads, describes the controls to manage stormwater quality runoff from impervious areas.

The purpose of stormwater quality devices is to capture and remove contaminants from stormwater before it is discharged to receiving environments. Contaminants include litter and metals and hydrocarbons from pavement wear and vehicles (e.g. through tyre wear, brake dust, body rust).

The design philosophy is to enable the provision of stormwater quality treatment for all existing and proposed impervious areas. One exclusion from this philosophy is where a project only consists of a pedestrian or cycle path. This is because it does not fall under the definition of a high use road in the AUPOIP, the AUP permits discharge of up to 5000 m^2 of impervious area from within the road reserve and Auckland Council's Healthy Waters Network Discharge Consent permits the connection of

pedestrian and cycleway facilities to the public stormwater network without providing stormwater quality treatment. Generally, the indicative designs adopt treatment swales or wetlands, depending on which device best fits the local conditions and topography. In some more urban settings, raingardens may be used. These devices have been selected on the basis that they are proven good practice, green infrastructure methods, well suited to road corridors and the contaminants generated within them.

The AUPOIP contains clear direction that “high contaminant generating roads” are a target area for water quality outcomes. This includes all roads expected to carry more than 5,000 vehicles per day; it is assumed each of the corridors in the Drury Arterial transport network will exceed this number. In some circumstances, the AUPOIP allows treatment for the additional impervious area only, for example, a small road widening project where the additional area is below activity triggers and works don’t constitute “redevelopment” of the existing carriageway. Further, the AUPOIP objectives relating to stormwater management aim to progressively reduce adverse effects from stormwater discharges.

2.13.3.2 Stormwater Quantity – Retention and Detention

AUPOIP Chapter E10: Stormwater management area – Flow 1 and Flow 2 (SMAF 1 or SMAF 2) describes the controls to protect and enhance rivers, streams and aquatic biodiversity in urban areas by means of hydrology mitigation (retention and detention). Stormwater quantity retention and detention devices manage changes to site hydrology and reduce the volume and / or rate of runoff from a site in small or day-to-day rainfall events for the purpose of minimising changes to stream flow hydrology and hence stream health and stream bank erosion potential.

Retention and detention are required by the AUPOIP where sites are shown in a SMAF 1 or SMAF 2 area on the AUPOIP maps. However, retention and detention are also often applied outside AUPOIP SMAF 1 and 2 mapped areas, either triggered via other consenting requirements (e.g. Auckland Council’s regional network discharge consent or through other activity tables in the AUPOIP such as E8.6.4.1.3) or as a result of project specific effects assessments. For this reason, we have also allowed for retention and detention measures in all Future Urban Zoned / greenfield development areas discharging to freshwater streams. In these cases, SMAF 1 design criteria are applied on the basis that it is the more conservative approach to sizing devices.

For the purpose of this project, allowance was made for stream protection for all corridors except where a discharge is to a tidal zone.

It is assumed that there is space for retention and detention within the same footprint as stormwater quality devices or flood attenuation areas. As such, retention and detention requirements alone will not drive the area of land required.

Sizing criteria are taken from AUPOIP “Hydrology mitigation requirements” (Table E10.6.3.1.1), and are summarised in Table 7 below.

Table 7: Stormwater Management Flow Criteria

Stormwater Management – flow	Retention	Detention
SMAF 1	Provide retention (volume reduction) of at least 5mm runoff depth	Provide detention and a drain-down period of 24 hours for the difference between the pre- and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the 5mm retention.
SMAF 2	Provide retention (volume reduction) of at least 5mm runoff depth	Provide detention and a drain-down period of 24 hours for the difference between the pre- and post-development runoff volumes from the 90th percentile, 24-hour rainfall event minus the 5mm retention.

2.13.3.3 Stormwater Quantity – Flooding and Overland Flow

Under the AUPOIP Standards (Section E8.6) any development must ensure that the diversion and discharge of stormwater does not result in, or increase, the following:

- Flooding of other properties in rainfall events up to the 10 year ARI, or
- Inundation of buildings on other properties in rainfall events up to the 100 year ARI, but
- Detention of 10 year ARI and 100 year ARI rainfall events is not required for developments that are located within the lower half of the catchment or for which a validated flood modelling study has shown that the development does not increase downstream flooding

Flooding effects due to increases in impervious area are managed by providing attenuation storage to match the difference in pre-Project peak flows and post-Project peak flows for either, or both, the 10- and 100-year ARI rainfall events. The need for peak flow management is context specific and depends on the location of the corridor in the catchment, whether there are downstream flooding issues and how much development has already occurred in the catchment. The requirements for peak flow management are discussed further in each of the corridor specific report sections below.

Flooding effects may also occur where the corridor passes through an existing flood plain and takes up space that is already being used to attenuate or convey flow (e.g. bridge abutments). These effects are managed by diversions, providing compensatory flood storage and/or flood modelling to demonstrate the effects on the flood levels are minor. These effects are location specific to the geometry of the corridor and the flood plain and are therefore discussed in corridor specific report sections below.

A set of criteria for relative changes to flood levels has been established and these will be used in the flooding report as part of the Assessment of Effects on the Environment for the Notices of Requirement for the projects. This will identify upstream or downstream properties or buildings that may be subject to flooding effects.

Attenuation could be provided within quality devices (including wetlands, ponds, swales and in some instances rain gardens) to detain larger rainfall events.

2.13.3.4 Corridor Resilience to Flooding

Our general approach to resilience of the corridors to flooding is as follows:

1. For new (greenfield) corridors, setting the vertical alignment above the 100-year ARI flood plain
2. For existing corridors, using the existing resilience to flooding effects as the starting point for the level of acceptable effects
3. Where practicable, providing freeboard to bridges in accordance with the Waka Kotahi Bridge Manual requirements, with flooding assessed to the 100-year event as per SLS2 Criteria of Table 2.1.
4. Considering site specific constraints which may require a different approach.

2.13.4 Design Criteria

2.13.4.1 Design Standards

The design standards generally considered as part of this design phase include:

- Auckland Council Stormwater Code of Practice, Version 2, 2015;
- Guidelines for stormwater runoff modelling in the Auckland Region, TP108;
- Stormwater Management Devices in the Auckland Region, December 2017, Guideline Document Version 1 (GD2017/001); and
- Auckland Unitary Plan – Operative in Part.
- Waka Kotahi NZTA: Bridge manual, 3rd edition published, Revision 3

The following design criteria are generally considered for the stormwater design such that design objectives (and therefore compliance with the AUPOIP) can be generally achieved. The applicability of each method is dependent on location. Table 8 summarises what conditions determine the applicability of each method along with sizing and design criteria.

Table 8: Design criteria and application

Design parameter	Impervious area	Rainfall event	Indicative design volume	Design criteria	Applicability
Water quality					
Contaminant removal	All	90th percentile or 1/3 of 2yr	~25 mm/m^2	As per GD01, nominally 75%TSS removal	All
Water quantity					
Detention	All	90th or 95th percentile less retention achieved	15-35 mm/m^2	Capture for release over 24 hours	In SMAF overlay, future growth areas and discharging to freshwater.
Retention	All	5mm runoff	5 mm/m^2	Infiltrate to ground or reuse (if practical)	Part of detention volume where soils suitable (infiltration greater than 2mm/hr).
Peak flow attenuation					
Primary	Additional	10yr	50-100 mm/m^2	Match pre-development peak	Downstream network constrained or flood risk in 10yr.
Secondary	Additional	100yr	50-100 mm/m^2	Match pre-development peak	Downstream flood risk to habitable floor levels, extent of flood plain or key structures.

2.13.4.2 Hydrology

Rainfall

Guidelines for stormwater runoff modelling in the Auckland Region, TP108 is used to calculate the peak flows and volumes for the different annual exceedance probabilities. The rainfall depths without climate change are used to calculate the pre-development runoff, and rainfall depths with climate change are used to calculate the post-development runoff. The rainfall depths shown in the tables below were obtained using NIWA's High Intensity Rainfall Design System (HIRDS) tool which provides rainfall estimates from rainfall records extending up to 2017 for Auckland Region. This information has been used as it is more site specific compared to TP108's rainfall contour maps.

Table 9: Rainfall depths with and without climate change for Jesmond Road, Bremner Road, State Highway 22, Ōpāheke N-S Arterial and Waihoehoe Road

Annual Exceedance Probability (AEP)	Percentage increase in 24-hour design rainfall depth due to future climate change	Jesmond, Bremner Road, SH22		Ōpāheke N-S, Waihoehoe Road	
		24-hour rainfall depth from NIWA HIRDS Historical data (mm)	Adjusted rainfall depths for climate change (mm)	24-hour rainfall depth from NIWA HIRDS Historical data (mm)	Adjusted rainfall depths for climate change (mm)
50%	9.0%	65.5	71.5	66.1	72.0
10%	13.2%	101.0	114.3	102.0	115.5
2%	16.8%	141.0	164.7	142.0	165.9
1%	16.8%	160.0	186.9	161.0	188.0

Table 10: Rainfall depths with and without climate change for Ponga Road and Ōpāheke Road

Annual Exceedance Probability (AEP)	Percentage increase in 24-hour design rainfall depth due to future climate change	Ponga Road		Ōpāheke Road	
		24-hour rainfall depth from NIWA HIRDS Historical data (mm)	Adjusted rainfall depths for climate change (mm)	24-hour rainfall depth from NIWA HIRDS Historical data (mm)	Adjusted rainfall depths for climate change (mm)
50%	9.0%	79.3	86.4	66.3	72.3
10%	13.2%	122.0	138.1	103.0	116.6
2%	16.8%	169.0	197.4	143.0	167.0
1%	16.8%	191.0	223.1	162.0	189.2

Note: Percentage increase for 24-hour design rainfall for climate change of 2.1°C increase, as per Table 4.1 in Auckland Council Stormwater Code of Practice, Version 2, 2015

Table 11: Frequent rainfall events for all Drury corridor alignments

Frequent Rainfall events[1]	
90th rainfall	26mm
95th rainfall	35mm
Note: Interpolated based on Figure 5 and 6 from GD01.	

Site Geology

The Drury Arterial transport network lays within volcanic soil of the South Auckland Volcanic Field and Tauranga Group alluvium. Refer to Appendix 6 for further details of soil types.

For the purpose of design, curve numbers of 74 and 98 have been used for pervious and impervious areas, respectively, for the various transport corridors on this project. Further refinements of the curve numbers are recommended at the next stage of design.

2.13.4.3 Stream Crossings and Culverts

Bridge alignments and placement have been developed with high level structural and geotechnical input. Bridge spans are taken as a maximum of 35m wide at a maximum of 30 degrees skew to the corridor.

Culverts should be orientated perpendicular to the road centreline where practicable and minimised in length. The culvert should accommodate a 100-year ARI storm event with a minimum 500mm freeboard from the road edge line. However, it is assumed that existing culverts can be upgraded in size to manage any adverse effects and that new culverts can be sized to achieve freeboard requirements to the corridor carriageway. The effect of new culverts or existing culvert extensions on upstream ponding will be considered further at future design and regional consenting stages.

Culvert sizing has not considered fish passage or oversizing for ecological purposes and this will need to be considered at future design and regional consenting stages.

Provision of erosion protection should be incorporated both upstream and downstream of the culverts. The length of erosion protection is assumed to be less than 5m and it will therefore fit within the 6m construction allowance set from the toe of the batter.

When an existing corridor is upgraded the existing culvert will remain and only new extensions and headwalls will be added to maintain the same level of service as the existing culvert. No condition assessment of the culverts has been carried out.

Table 12: Freeboard Requirements for Bridges and Culverts

Waterway Structure	Situation	Freeboard (m)	
Bridge	Normal circumstances	From the predicted flood stage* to the underside of the superstructure	0.6
	Where the possibility that large trees may be carried down the waterway exists		1.2
Culvert	All situations	From the predicted flood stage* to the road surface	0.5

* Flood levels are based on the 100-year event as per SLS2 Criteria - Table 2.1 of the Waka Kotahi Bridge Manual.

2.13.4.4 Wetlands

The proposed location of wetlands has considered several factors. Where practicable, a wetland should be located outside of any flood plain, on relatively flat land or land that is gently sloped to minimize overall wetland footprint. It is also preferred to locate the wetland at the downstream end of any watercourse crossing points to avoid discharging treated or attenuated flow through any cross-drainage structures. Other factors such as land use and zoning also need to be taken into consideration, preferably placing wetlands in greenfields, rural and non FUZ land.

The following sizing rules have been developed from case studies for wetland treatment and attenuation in general accordance with GD01 and applied to identify the required land area for wetlands. Refer to technical note SGA-001-DBC-TNE-Stormwater Design Philosophy for details of how these were developed, and other typical wetland design details considered.

- Water surface area of PWV = 3% of catchment area
- Water surface area for 100 year ARI attenuation = 6% of catchment area
- Pond total area with access track = 10% of catchment area.

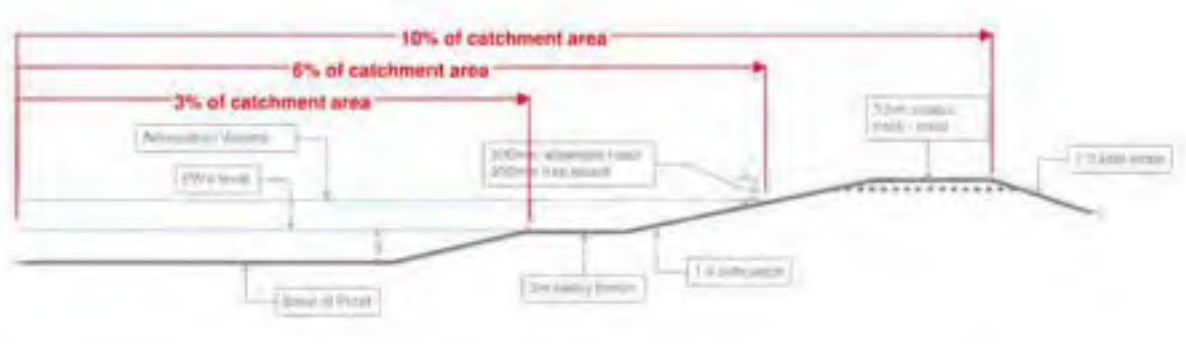

Figure 2 Wetland Sizing Rules

2.14 Structures

2.14.1 Design Standards

The following design standards have been referenced for this phase of design:

- Waka Kotahi NZTA: Bridge manual 3rd edition published, Revision 3
- Waka Kotahi NZTA: Highway structures design guide 1st edition
- Waka Kotahi NZTA Research Report 364: Standard precast concrete bridge beams
- KiwiRail Report W201 – Issue 6: Railway Bridge Design Brief

2.14.2 Bridge Form

Given the high-level nature of design input, the route protection philosophy is that no detailed design is undertaken for the structures, but the basic structural form (span, deck type and substructure configuration) are defined in order to ensure viability of the chosen alignment and designation. Abutment forms are designed as spill-through in fills and bench-type atop cut faces. Refer also to section 2.12.3 for embankment information at bridge abutments.

The philosophy with regards to bridge superstructure form is to utilise standard precast concrete girders with cast in-situ topping slabs. This is to ensure that the bridges can be designed and constructed using readily available building materials and standard forms.

Bridge skew angles are limited to a maximum of 30 degrees relative to the service being crossed. This is to ensure that no standard bridge design is precluded from future detailed design. Typically, girder type and box type bridge decks are only suitable up to skews of 30 degrees.

2.14.3 Vertical Clearance

The vertical clearances are as detailed in the NTZA Bridge manual and summarised as follows:

- Road over Road Bridges – 6.1m minimum for overdimension routes and 5.0 m minimum elsewhere.
- Road over Rail Bridges – 5.6 m minimum.
- River / stream Bridges – 0.6m or 1.2m freeboard to 1% EAP flood levels, refer to Table 12.

2.14.4 Span

The general philosophy is to provide equal spans for river bridges and where appropriate for road over road and road over rail bridges to have backspan to mainspan ratios of between 0.6 and 0.8. The chosen structural articulation is as follows:

- Single span bridges up to a maximum span of 35 m
- Multi-span bridges for spans in excess of 35 m, or as dictated by geometric constraints.

2.14.5 Retaining Walls

Given the limited geotechnical information available, retaining walls were detailed as typical with the most suitable wall types identified to inform the construction method statement. Final decisions around wall type will be undertaken during subsequent design phases.

3 Inputs to the Design

3.1 LiDAR data

Light detection and ranging (LiDAR) is an optical remote-sensing technique that uses laser light to densely sample the surface of the earth, producing highly accurate x, y, z measurements. LiDAR data was provided by Land Information New Zealand (LINZ) and has been used to develop the preliminary design for the road corridors part of this package.

The vertical datum in the Auckland region is main sea level – Auckland Vertical Datum 1946.

3.2 Aerial Photography

3.2.1 Auckland Council

Orthophotography of urbans areas within Auckland taken in the flying seasons (summer period) 2016-17. Imagery was captured for the 'Auckland Council' by AAM NZ Limited, 6 Ossian St, NAPIER, New Zealand. The data comprises of:

- 7,801 ortho-rectified RGB GeoTIFF images in NZTM projection, tiled into the LINZ Standard 1:1,000 tile layout.
- Tile layout in NZTM projection containing relevant information.
- Imagery supplied as 7.5cm pixel resolution (0.075m GSD), 3-band (RGB) uncompressed GeoTiFF. The final spatial accuracy is ± 0.15m at 90% confidence level.

3.2.2 Nearmap Ltd

Orthophotography flown over our project areas twice yearly, imagery at present is from 2019 /2020. Imagery supplied as 7.5cm pixel resolution – resampled to 10cm pixel resolution for download.

3.3 Flood Data

The Drury Arterial transport network is situated across three stormwater catchments; Ngakoroa Stream, Ōtūwairoa Stream (Slippery Creek) and Hingaia Stream. Ngakoroa Stream, Ōtūwairoa Stream and Hingaia Stream drain to the Drury Creek.

The modelling involved the assessment of relative flooding effects during the 10 and 100 year Annual Recurrence Interval (ARI) floods on the future environment (pre-project development) and on the likely future environment (post-project development). In both scenarios, the proposed imperviousness for the MPD land use was used. That is, any differences in model scenario results are due to the proposed transport corridor.

The following Auckland Council flood models and supporting information has informed the design:

- Ngakoroa/Oira Stream – Infoworks ICM RFHA
    - Model Build report – Auckland Council, Ngakoroa Stream Catchment Rapid Flood Hazard Assessment, 2018
- Ōtūwairoa Stream (Slippery Creek) – Infoworks ICM (RFHA)

    - Model Build report – Auckland Council, Slippery Creek Catchment Rapid Flood Hazard Assessment, 2018
- Hingaia Stream – DHI Mike model
    - Stormwater Management Plan – Tonkin & Taylor Ltd, Drury South Stormwater Management Plan, 2018

The Ngakoroa Stream, Ōtūwairoa Stream and Hingaia Stream models have been reviewed for flooding in the pre-project development and post-project development scenarios:

- Model the 10 year ARI rainfall event + CC event with future land-use
- Model the 100 year ARI rainfall event + CC event with future land-use

Note that the models used are Rapid Flood Hazard Assessment models and are considered suitable for assessing the relative level of flooding effects for this early stage in the design concept. It is expected that further flooding assessments would be carried out at future design stages to confirm the flood management and mitigation.

3.4 Utilities providers

The following utility providers have been engaged during the design development. Future coordination and design refinement will be required to ensure that potential utility impacts are provided for.

- Transpower;
- Watercare;
- First Gas Ltd;
- Counties Power;
- Vector Ltd;
- Chorus Ltd;

3.5 Transport Information

3.5.1 Form and Function

The Corridor Form Assessment Framework (CFAF) provides a consistent methodology to define the desired corridor form and function requirements. The key output is a route protection recommendation of either 2-lane or 4-lane cross section, and the elements that influence the corridor footprint. The CFAF results is an input for the design process

The typical cross sections were developed and agreed in conjunction with AT and Waka Kotahi to provide an effective and efficient solution in the future. Individual elements within these cross sections may change in future, and the footprint has been identified based on the overall corridor width.

The corridor form and function requirements are set out in the ‘Transport and Economics Report’ (Appendix B of the DBC) and a summary is shown in the figure below.

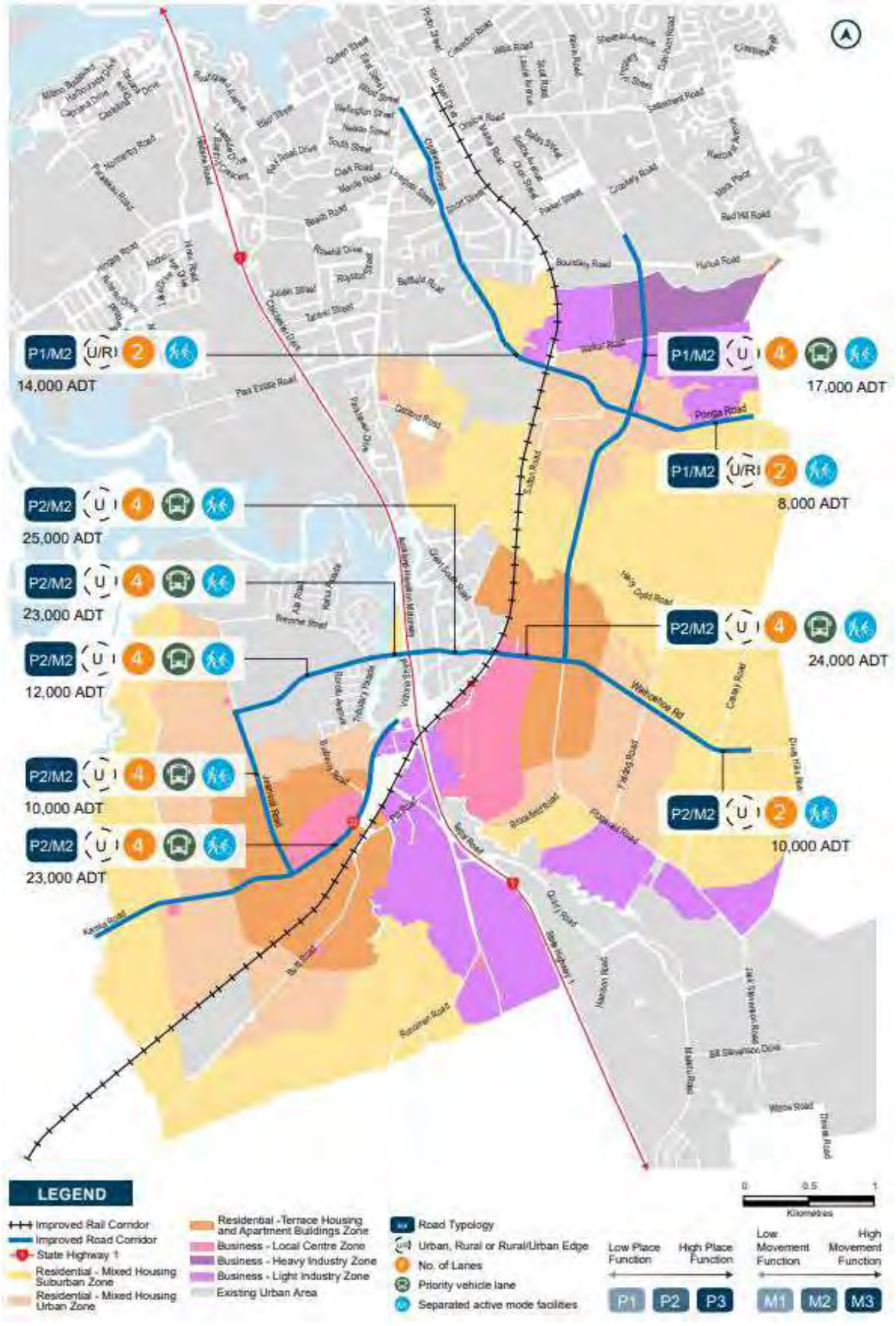

Figure 3: Drury form and function summary

3.5.2 Cross Section

A set of AT and Waka Kotahi approved cross-sections were developed for the wider programme. Based on the desired corridor form and function, an appropriate cross-section was chosen from this approved set to reflect modal priorities and the surrounding land use. The typical cross-sections for each corridor of the Drury Arterial transport network are included with the design plans in Appendix 1.

3.5.3 Active Modes

Segregated active mode facilities are provided along all Drury project corridors with planned or existing urban land use. Active mode crossings have been accommodated at intersections either through signalised crossings or grade-separation.

3.5.4 Overdimension Route (OD)

Sections of the existing SH22 and Bremner Road corridors form part of the existing Overdimension route. Whilst the future Overdimension and Overweight routes are likely to be further reviewed by Waka Kotahi and Auckland Transport in line with the proposed land use changes and the wider network upgrade, the proposed designation footprint will accommodate freight movements and overdimension or overweight movements.

3.6 Safe System Assessment

The following are key Auckland wide and national guidance documents linked to Vision Zero or Road to Zero:

- Vision Zero for Tāmaki-Makaurau Auckland (Auckland Transport (AT)
- Vision Zero for Tāmaki Makaurau Transport Safety Strategy and Action Plan to 2030 (Auckland Transport Guidance)
- Road to Zero: A New Road Safety Strategy for NZ (National Guidance)
- Roads and Streets Framework and the Transport Design Manual guidance, in particular the Urban Street and Road Design Guide (AT)

The Vision Zero approach builds on the ‘Safe System’ approach, which acknowledges that people make mistakes and that we all have a responsibility to create a safer and more forgiving transport system. The Vision Zero philosophy builds on this approach by committing to working towards eliminating all transport related deaths and serious injuries.

3.6.1 Integration of Vision Zero Principles

In the transport system design, the Supporting Growth programme has adopted the approach of avoid, shift and improve as shown below in Figure 4.

Figure 4: Transport System Design approach (source: AT)



The Supporting Growth programme has a high level of influence in particular on the 'avoid' and 'shift' components of the above approach. This is achieved through the strategic objectives and through transport network planning that reduces the need to travel and that promotes mode shift. At the design level, the aim of the Supporting Growth programme is to provide enough flexibility within the designation to incorporate safe system design features throughout the life cycle of a project. Further detail on how the Supporting Growth programme has contributed to the 'avoid', 'shift' and 'improve' components are provided below.

"Avoid"

The transport system design for the Supporting Growth programme is developed as part of network planning for the wider area and integrated with existing land use planning. For example, this may include Council structure planning where this has been undertaken, private plan changes where relevant, or Council aspirations for land use where no structure planning has occurred.

Consideration is given to the location of key land use activities, such as centres, schools, employment areas and residential catchments, and to provide safe and effective connections between the key land uses and also to strategic transport corridors.

This involves designing the future transport networks to support and enable more compact and less car-oriented land use. Consideration is also given to the timing of land use change and associated network staging. This includes identifying when new corridors or upgrades of existing corridors are required to respond to future urbanisation, and simultaneously to provide the transport infrastructure needed to embed the desired travel patterns.

The underlying premise is to design safe transport systems (for all road users) that can respond to the timing, scale and form of urban development triggers and the staging of future infrastructure corridors.

The AT Roads and Streets Framework (RASF) informs the design work so that land use and transport planning are integrated throughout the design process (including movement, place and intended modal priority) to avoid the need for trips and promote less vehicle use.

“Shift”

From a network planning perspective, safe and sustainable modes are prioritised to encourage more public transport, walking and cycling usage. The Supporting Growth programme has adopted aspirational targets for mode share for walking, cycling and public transport for the long-term (30 year plus) scenario. This is achieved through integrated transport and land use planning, developing comprehensive strategic walking and cycling networks, planning for new and upgraded Rapid Transit Corridors, protecting space for bus priority on arterials where required, and ensuring a high level of connectivity to public transport corridors and interchanges.

“Improve”

A Safe System design approach has been adopted to improve safety for all road users and to align with Vision Zero principles. This is primarily achieved through route protection that allows sufficient flexibility to implement safety measures and to incorporate the relevant guidance for safe corridor design. It also involves identifying the form and function of each corridor within the transport network and allowing for an appropriate cross-section and speed environment that aligns with the adjacent land use. For existing corridors and where relevant, the design responds to existing safety issues such as matching road geometry and speed to the environment and various road users, and to remove or protect people from high severity injury hazards and conflicts.

3.6.2 Cross Section Development

The cross-section design incorporates AT Urban Street and Road Design Guide and Vision Zero design features. The cross-section informs the footprint for route protection and allows flexibility for future design work prior to implementation. Key Vision Zero principles applied to the cross-section are as follows:

- To design corridor for all users, incorporate more provision for public transport, walking and cycling.
- To protect vulnerable road users along each corridor, provide protected lanes for walking and cycling where possible.
- Allowing flexibility within the footprint for implementing speed calming measures such as raised tables, narrow traffic lanes and side friction, and self-explaining roads to enable a safe and appropriate speed environment.
- To prevent cars from running into oncoming traffic and losing control by providing wire rope barriers to separate the two directions of traffic for corridors in a high speed rural context.

The generic cross-sections apply to the future place and movement functions. In subsequent design work, consideration will need to be given to interim options to respond appropriately to the environment, such as transitioning from a rural to a peri-urban corridor, or when a collector function is required prior to the arterial upgrade.

3.6.3 Intersection Design

As part of network planning, decision-making for selecting the safest intersection controls are carefully considered for each corridor on the Supporting Growth network. This includes movement and place principles, future land use, future modal priority, future network planning, design constraints, and safety considerations.

The assessment of intersection form adopts a Safe System approach by recommending well-designed roundabouts as the first choice for intersections due to the safety benefits for road users resulting from slowing down through traffic and reducing the number of conflict points. Intersections are assessed against a range of site-specific factors and considers changes/ design features to meet the needs of different users safely and effectively.

The design for route protection allows sufficient flexibility to design and implement safety measures consistent with Vision Zero principles in the future.

3.6.4 Safety audits

The design has been developed in order to identify the designation footprint that will be need to construct and operate the transport corridor. Construction timing is uncertain, and may not occur for some time, so this footprint provides flexibility for specific design elements to be amended in future as standards and requirements change. Therefore it is anticipated that further preliminary design will be needed to confirm implementation funding, and this will set out the specific design elements that will actually be built. A Stage 1 Road Safety Audit will be undertaken that time, and is not considered necessary for the route protection process.

A Road Safety Audit Exemption has been granted for this project and is included in Appendix 3.

3.7 Urban Design

3.7.1 Design guidance

Te Tupu Ngātahi Design Framework (Design Framework), issued as part of the IBC, is an over-arching programme wide document that takes a systems-based approach as the basis on which urban areas are organised and understood and pulls these apart as a series of layers; environment, social, built form, movement and land use, and cultural and sustainability values underpinning and spanning across these. There are twenty design principles that have been established within these layers to provide high level guidance on the attributes of responsive, resilient, sustainable, vibrant and high-quality urban environments.

The Design Framework sits within the context of a range of established strategic plans, policies and design guidance that guide urban development outcomes at the:

- National level (e.g. GPS on Land Transport, Waka Kotahi Bridging the Gap, Regional Land Transport Plan); and
- Local level (e.g. Auckland Plan 2050, ATAP, Auckland Transport Roads and Streets Framework, Transport Design Manual, Auckland Unitary Plan, AT Sustainability Framework, ATCOP).

The established strategic plans and guidance outlined above informed the development of the Design Framework content and they are referenced in general terms as they relate to the attributes that will contribute to healthy, connected and sustainable communities. In addition, the Auckland Plan 2050 sets the vision and direction for Auckland and the Design Framework directly references this plan. It illustrates how the outcomes of the Auckland Plan are linked to the design principles set out for the Supporting Growth Programme in the Framework.

The Design Framework and its principles are relevant across the Supporting Growth Programme as they contribute to the understanding of the route options in terms of place context, built form interfaces, movement functions and modal priorities. They also inform the design development of route options at each phase with specific urban design considerations including;

- Land use and corridor interface
- Connectivity and access
- Character and sense of place
- Integration with future development
- Response to topography

3.7.2 Design evaluation

Importantly the Design Framework provides measurable guidance for outcomes-based decisions throughout each phase of the programme delivery.

In Appendix D of the DBC, an interim urban design evaluation is provided of each of the corridors against the principles established in the Design Framework. The intention of this evaluation is to provide a high level urban design overview that considers the corridor arrangement and alignment at a concept stage and to identify design opportunities and refinements that should be considered at subsequent stages of the design.

A final evaluation will be undertaken as part of the Urban Design Framework for the Assessment of Effects on the Environment to support the Notices of Requirement for the projects. This will provide urban design focused commentary on the design detail of the final concept design as well as recommendations for how and where further urban design outcomes and opportunities should be considered in future design stages. These recommendations will form the basis of urban design specific designation conditions.

4 State Highway 22 Upgrade

The State Highway 22 (SH22) Upgrade extends from the western side of the Drury Interchange to Oira Creek, east of the intersection with Woodlyn Drive.

This section of SH22, also known as Karaka Road, is currently a two-lane rural regional state highway with wide centreline treatments and right turn bays at major intersections. The current posted speed is 60km/h west of the Drury Interchange through to Burberry Road, increasing to 80km/h for the remainder of the corridor.

SH22 will be upgraded to a four-lane arterial with walking and cycling facilities on both sides to provide an appropriate urban arterial connecting the growth areas of Drury West to the wider network and centres.

SH22 is currently included in the overdimension vehicle route network, and the proposed upgrade will continue to accommodate overdimension vehicles.

4.1 Geometric Design and Constraints

The mid-block cross section applied for the SH22 Upgrade is a 30m, four-lane arterial (included in Appendix 1). The design speed applied to the horizontal and vertical geometry is 60km/h.

The existing vertical and horizontal alignment is generally followed to the extent possible, with efforts made to minimise impacts on the site constraints. The current superelevation on the road would not be consistent with the future urban environment, and is expected that standard crossfall would be provided in the proposed arrangement.

The table below shows the constraints and considerations identified as part of the State Highway 22 upgrade that have influenced the preliminary design. The approach to the design has been to avoid these constraints as much as practicable.

Table 13: SH22 Upgrade Design Constraints and Considerations

Constraint	Location
Significant Ecological Area (SEA_T_530b)	Ngakoroa Stream
Stormwater Management Area Control (Ngakoroa Stream Flow 1)	Near Drury interchange
Coastal inundation 1% AEP (sea level rise)	Adjacent to Ngakoroa Stream
Ngakoroa Reserve (Auckland Council land)	Ngakoroa Reserve located on the eastern side of the corridor between Ngakoroa Stream and McPherson Road (~CH1800-2300)

4.1.1 Ngakoroa Stream SEA (SEA_T_530b)

The SH22 Ngakoroa Stream bridge is proposed to be replaced with a new structure extending to the south-east of the existing bridge to reduce impacts on the terrestrial SEA Ngakoroa Stream wetlands. This was identified through the alternatives assessment. However, construction area is required on either side of the bridge to provide for its reconstruction (for example, temporary staging). Effects on the SEA will be subject to regional resource consents in the future.

4.1.2 Ngakoroa Reserve

The design has resulted in fill slopes extending into the Ngakoroa Reserve. In the northern extent of the reserve, this is due to the need to raise the approach to the Ngakoroa Stream bridge to achieve required flood levels. Surrounding Great South Road and the southern half of the reserve to MacPherson Road, fill slopes into the reserve were required to provide for road widening and a tie into Great South Road, achieving the required horizontal curvature and reducing superelevation.

There may be an opportunity to avoid or reduce the impact on this site through a review of the horizontal alignment or the provision of retaining walls.

4.2 Stormwater Design

State Highway 22 is an upgrade of an existing road which runs through a rural area and is zoned largely Future Urban Zone, with Open Space Zoning at Ngakoroa Reserve and Drury Sports Complex. The road itself is zoned as a Strategic Transport Corridor. The existing road crosses several overland flow paths and the Ngakoroa Stream. The longitudinal drainage is achieved by pipes on both sides of the road.

The upgrade causes an increase in impervious area greater than 5000m² triggering the AUPOIP stormwater management requirements for stream protection and water quality. The 100-year flood plains from Auckland Council GIS indicate inundation of properties near McPherson Road which triggers the requirement to mitigate flooding by attenuating the increased surface runoff for the 10 and 100 year ARI for some catchments.

4.2.1 Catchment Delineation

To determine the stormwater surface runoff for pre- and post-development, catchment delineation is required. The alignment is divided into five catchments which drain to low points along the alignment.

Table 14: Impervious Areas – SH22 Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	56,808	24,336
Impervious Area (m^2)	36,792	69,264
Total (m^2)	93,600	93,600

Table 15: SH22 Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 1620-1740 (low point at CH1620)	1,512	2,088	2,664	936	Catchment drains to raingardens.
Catchment 2A: CH 1740-2900 (low point at CH2100)	14,616	20,184	25,752	9,048	Catchment drains to wetland 1. Discharge into Ngakoroa Stream at 15 Karaka Rd, Drury
Catchment 2B: CH 2900-3480 (low point at CH2100) plus Jesmond catchment between CH2000 -2360. (Low point in Jesmond Rd at CH2140)	2,160 + 7,056	8,640 + 15,744	8,820 +16,872	1,980 + 5,928	Catchment drains to wetland 2. Discharge into unnamed stream at 110 Karaka Rd, Drury
Catchment 3: CH 3480-4040 (low point at CH3980)	7,308	10,092	12,876	4,524	Catchment drains to wetland 3. Discharge into 435 Karaka Rd, Drury
Catchment 4: CH 4040-4540 (low point at CH4540)	6,300	8,700	11,100	3,900	Catchment drains to wetland 3. Discharge into 435 Karaka Rd, Drury

4.2.2 Stream Protection

A small portion of the SH22 upgrade lies within a SMAF 1 area located at the Southern Motorway interchange and within the Ngakoroa Reserve. For this corridor, detention and retention requirements, as set out in the AUPOIP, are met by means of raingardens and wetlands. Detention and 5mm retention are designed by attenuating the post-development minus the pre-development runoff from the 95th percentile 24-hour rainfall event, minus the retention with a drain-down period of 24-hours.

4.2.3 Water Quality Treatment

The existing swales on both sides of the road might provide some form of treatment but these would likely be partly filled in by the widened corridor, as such new drainage will be required. Water quality treatment, to manage the quality of surface runoff of the 90th percentile rainfall event for the entire pavement area (both existing and new impervious surface) will require larger, properly sized treatment devices.

Raingardens for catchment 1 and wetlands for catchments 2, 3 and 4 have been chosen as the preferred treatment device for water quality.

4.2.4 Flood Mitigation

The SH22 upgrade will result in a total increase in impervious surface from 36,792 m² to 69,264 m². Where discharge points are north of SH22, there are no existing flooding issues identified in either the Ngakoroa Stream or Oira Creek therefore, no flood attenuation is provided.

Where discharging to Ngakoroa Stream, upstream of the Ngakoroa Bridge, existing flooding issues may be present around McPherson Road and south of the NIMT. The increased surface runoff generated by the additional impervious surface of the wider transport corridor requires flood storage (using ponds/wetlands) to attenuate the post-project development volumes up to a 100 year ARI rainfall event, discharging at the 100 year ARI pre-project development peak flow.

The effect of attenuation has not been included in the flood modelling.

4.2.4.1 Wetlands

Wetlands have been indicatively designed as follows.

Table 16: Summary of SH22 Upgrade Indicative Wetland Design

Wetland	Catchment impervious area (m^2)	Catchment Chainage	Min. water surface area for PWV (m^2)	Min. water surface area for retention/ attenuation (m^2)
Wetland 1	25,752	1740-2900	806	1,035
Wetland 2[1]	25,692	2900-3480	802	1,500
Wetland 3	23,976	3480-4540	750	976

Note: Wetland 2 also includes part of Jesmond catchment (between chainage 2000-2360). This wetland has a bigger area because it provides a 100-year flood attenuation, while the other wetlands don't.

Wetland 1 is located in the north, upstream of the watercourse on a steep slope to avoid Town Centre and Terraced Housing and Apartment Building zones proposed in Auckland Council's Drury-Ōpāheke Structure Plan and the Ngakoroa Reserve. Utilisation of the existing pond to the north of the alignment was considered, however the discharge point invert level was not low enough to allow for adequate drainage of the catchment.

Wetland 2 includes a catchment from Jesmond Road and the proposed location avoids the natural wetland north west of the Jesmond/SH22 intersection and the Town Centre proposed in Auckland Council's Drury-Ōpāheke Structure Plan north east of the intersection. The high contours south west of the intersection do not allow for gravity drainage. Wetland 2 is in a deep cut to allow drainage from the Jesmond Road catchment and to avoid longitudinal pipes clashing with cross drainage structures along Jesmond Road.

Wetland 3 is proposed to the north of the alignment to avoid potential land instability to the south.

The considerations given to the current wetland locations are summarized in Table 17.

Table 17: Considerations given to the current SH22 Upgrade wetland locations

Wetland	Flood plain (In or Out)	Downstream or Upstream (DS or US)	Terrain (Flat or Steep)	Existing Zoning	Likely Future Zoning	Greenfield or Brownfield (GF or BF)	Comments
Wetland 1	In	DS	Steep	FUZ	Residential	GF	Partially in floodplain. Location considered to avoid town centre plans and the Ngakoroa Reserve
Wetland 2	Out	DS	Flat	FUZ	Residential	BF	Location considered to avoid natural wetland, Auranga developmen t plans and high contours.
Wetland 3	In	DS	Steep	Mixed Rural	Mixed Rural	GF	Partially in floodplain. Location considered north to avoid potential land instability.

4.2.5 Road Surface Drainage

The existing road drainage of the corridor includes swales on both sides of the road. The proposed drainage system for SH22 is an underground pipe system on both sides of the road that drains to the low points and discharges into the respective wetlands.

4.2.6 Stream Crossings

There are two locations where the corridor crosses culverts/overland flow paths. All existing culvert crossing locations will remain as existing. It is assumed that culverts will be upsized as required in future design and regional consenting stages to manage overland flow.

In addition, it is noted that the flood flows from the Ngakoroa Stream overtop the corridor near McPherson Road. It is assumed that future design stages will consider this further.

The Ngakoroa Stream bridge will be replaced with a new crossing, to provide improved freeboard between the 100-year flood level and the bridge beams . Bridge piers are to be placed outside the main stream channel and located to minimise adverse effects on the river banks.

4.3 Structural Design

One bridge structure is proposed on the SH22 Upgrade alignment crossing the Ngakoroa stream (approximate chainage 1660), replacing the existing structure. The proposed bridge has three spans, with a central 30m span over the main stream channel, with 15m back spans on either side. The design is governed by hydraulic requirements, and freeboard above the 100-year flood level is set at 1.2m for this bridge (to avoid the constraint of coastal inundation identified in Table 13).

4.4 Utilities Design

An underground First Gas pipeline crosses State Highway 22 east of the intersection with Jesmond Road (approx CH2900) in a north-south direction, also crossing the proposed Wetland 2. This pipeline is located within the proposed road designation, so any upgrade works to State Highway 22 will require approval from First Gas.

5 Jesmond Road to Waihoehoe Road West FTN Upgrade

This section describes three projects:

- Jesmond Road FTN Upgrade
- Bremner Road FTN Upgrade
- Waihoehoe Road West FTN Upgrade

Jesmond Road is currently a rural secondary collector, connecting SH22 in the south with Bremner Road in the north. Jesmond Road runs through a mostly rural environment, zoned mostly for future urban with the north eastern area zoned residential. The existing speed limit on Jesmond Road is 80km/h.

A new east-west FTN connection is proposed between Jesmond Road and Bremner Road (west of the Ngakaroa Stream). This corridor has recently been included in the Auckland Unitary Plan (AUP) in the Drury 1 Precinct.

The FTN corridor continues east across bridges over the Ngakoroa Stream and SH1 on the existing Bremner Road alignment (which is currently a primary/secondary collector) to the intersection with Firth Street, before connecting to Norrie Road via a new road and bridge over the Hingaia Stream, ending at the intersection with Great South Road.

Bremner road between Victoria Street and Firth Street is currently included in the overdimension vehicle route network, and the proposed upgrade will continue to accommodate overdimension vehicles.

Waihoehoe Road is currently a primary collector, which intersects with Great South Road in the west and Drury Hills Road in the east .The Waihoehoe Road West FTN Upgrade extends east from the intersection with Great South Road to the intersection with Fitzgerald road and the proposed Ōpāheke N-S FTN Arterial. It includes the reconfiguration of the Great South Road intersection with Norrie Road in the west, tie-ins with the approaches on Great South Road and realignment of Tui Street. The project also includes the replacement of the Waihoehoe bridge over the North Island Main Trunk (NIMT) rail corridor.

5.1 Geometric Design and Constraints

The mid-block cross section for the Jesmond Road Upgrade is a 30m, four lane FTN road corridor (included in Appendix 1). The existing horizontal and vertical geometry of Jesmond Road is generally maintained for the widened alignment, with a design speed of 60km/h, reflecting the future urban environment.

The alignment and mid-block cross section for the new connection between Jesmond Road and Bremner Road is guided by the Drury 1 Precinct and ties in to the Bremner Road/Auranga intersection in the east. This incorporates a 28m, four lane cross section (included in Appendix 1) and the design speed is 60km/h.

As this cross section continues eastward from the Auranga intersection with Bremner Road to Firth Street, the design speed applied to the horizontal and vertical geometry is generally 60km/h, except between the Ngakoroa Stream and SH1 as outlined in section 5.1.3 below.

Further east, the 28m cross section has been extended to Great South Road. The vertical alignment for this portion is governed by the need to achieve the desired vertical freeboard clearance over the Hingaia Stream, while tying in with the existing Firth St intersection and avoiding impact on St John's Church and cemetery at 9 Norrie Road which is a schedule Historic Heritage site in the AUP OIP. The geometry is compliant with a design speed of 60km/h, except for the lengths of the horizonal curves approaching the Hingaia Stream bridge, which are instead appropriate for a 50km/h design speed. This was necessitated to avoid impacts to St John's Church and Cemetery and to provide the tie-in at Firth Street.

At the Great South Road intersection, the property on the north-western corner will require a new driveway access to the west. The alignment was shifted southward to minimise incursion into the property such that vehicles can circulate and access the new driveway.

The mid-block cross section for Waihoehoe Road West a 30m, four lane FTN road corridor (included in Appendix 1). Over the western portion, the vertical alignment is dictated by the 5.5m clearance to the proposed bridge over the rail corridor, including the potential future four-tracking).

The table below shows the constraints and considerations identified as part of the Jesmond Road, Bremner Road and Waihoehoe Road West FTN corridors that have influenced the preliminary design.

Table 18: Jesmond Road, Bremner Road and Waihoehoe Road West FTN Design Constraints and Considerations

Constraint	Location
Jesmond Road	
Historic Heritage Overlay (HHEP 704) Aroha Cottage and a CHI site heritage building	201 Jesmond Road
New Jesmond to Bremner Link	
Drury 1 Precinct	Full Length from Jesmond Road to the new intersection at Bremner Road, to the west of the Ngakoroa Stream
Bremner Road/ Norrie Road	
Historic Heritage Overlay (HHEP 2173) Slippery Creek Wharf/Commissariat Redoubt wharf site R12_756	North side of Ngakoroa Stream bridge
Significant Ecological Areas (SEA-M1-29b and SEA_T_530b)	North and south side of Ngakoroa Stream bridge
Drury Sports Complex	20 Victoria Street
Transpower National Grid –	Ngakoroa Stream Bridge
Stormwater Management Area Flow 1	Bremner East including all of Drury Village
Coastal inundation 1% AEP (sea level rise), flood plain	Ngakoroa Stream
Heritage Extent of Place Overlay (HHEP 707) St. John's Church and Cemetery	9 Cameron Place
Cultural Heritage Inventory (CHI) historic heritage sites	A number of CHI sites in Drury village

Constraint	Location
Hingaia Stream – coastal inundation 1% AEP plus 1m and flood plain	Hingaia Stream
Waihoehoe Road West	
Waikato #1 watermain pipe	Across Waihoehoe Road, parallel to the rail track before the Waihoehoe bridge.
NIMT rail line	The rail corridor runs parallel to Great South Road on the eastern side, below Waihoehoe Road.

5.1.1 Historic Heritage Overlay (704) Aroha Cottage

In order to avoid impacts on this heritage site, the widening required for the Project has been provided on the western side of Jesmond Road at this location. However, provision of new footpaths and cycleways will result in some earthworks extending into the site, requiring the access to be regraded. Works on the site can be limited to the driveway and front boundary.

5.1.2 Drury 1 Precinct

This new link road has been incorporated into the Plan Change 6 agreements. This sets the horizontal position of the alignment.

To the west, at the Jesmond Road tie in, the new alignment encroaches on a future school site, and an agreement had been reached with the Ministry of Education (MoE) and adjoining landowners on the position of the alignment. The design has been developed to align with this agreement, with an additional construction area included in the designation as the timing for the development is unclear.

To the east, the transport corridor is currently under construction as part of the Auranga development, and an agreement has been made with Auckland Transport on the land required for the road corridor. The southern portion of the cross section will be constructed as part of the development and the road formation prepared for the full 28m cross section, as indicated in the figure below. This will enable the remaining works to be carried out within the 28m corridor provided.



Figure 5: Plan Change 6 Interim Road Cross Section

At the western end of the Auranga Development, a bridge crossing is provided over an unnamed stream, which necessitates raising the vertical alignment to provide sufficient freeboard. The designation has been increased beyond the 28m in this location to allow for future bridge construction works.

At the eastern end of the Auranga Development, a Childcare facility is proposed on the south-east corner of the new intersection with Bremner Road (Beststart Educare, 132 Bremner Road, Lot 200). The design has been developed to tie in with the Auranga development, although some minor encroachment into the childcare site may be necessary for construction works.

5.1.3 Papakura to Bombay (P2B) Project

The section of SH1 from Papakura to Drury is included in the NZ Upgrade Programme (NZUP) and is programmed for construction in the next 5 years. The design for this project is being developed to be consistent with the future 4 lane FTN project. The following assumptions are therefore made about the scope of works required:

- Minimal physical works will be required on the northern edge of the corridor, with any required reconfiguration of the road possible within the road reserve.
- The bridges over the Ngakoroa Stream and SH1 will be built in a future-proofed fashion such that widening can occur to the south.
- Access to the properties on the northern side between the Ngakoroa Stream and SH1 will be designed and delivered through the P2B project. As the full cross section is constructed, there will be provision made for connection to Victoria Street.

In order to tie in with the proposed P2B alignment, the resulting horizontal curvature between the Ngakoroa Stream Bridge and the SH1 bridge does not comply with the minimum horizontal curve length for a 60km/h design speed, but is compliant for a speed of 50km/h.

The vertical alignment of the corridor is constrained by the presence of the overhead Transpower lines (both 110kV and 220kV), and the need to provide flood conveyance beneath the bridge.

Therefore, a comprise on the vertical alignment is required. This is mitigated by providing additional flood capacity beneath the bridge through longer spans. It is expected that the design of bridge for the P2B project will be compatible with the future bridge, such that adverse effects on the stream can be mitigated.

5.1.4 St Johns Church and Cemetery (Scheduled Historic Heritage site in AUP OIP) and CHI building former Drury Cheese Factory

Through alternatives assessment, the St Johns Church and Cemetery was avoided. However, to avoid the St Johns Church and cemetery, a CHI building – the former Drury Cheese Factory will be impacted. The extent of impact will need to be ascertained at detailed design. However, it is likely it will need to be removed (there is potential for relocation of the built heritage value – to be determined at detailed design).

As noted in section 5.1, in order to avoid impacts to the St Johns Church and Cemetery, the design speed of the horizontal curvature has been locally compromised to 50km/h.

5.1.5 Significant Ecological Areas (SEA-M1-29b and SEA_T_530b)

The Ngakoroa Stream bridge is proposed to be replaced with a new structure, widening the cross section to the south to reduce impacts on the coastal marine area and the marine significant ecological area (SEA-M1-29b). This was identified through the alternatives assessment. However, widening to the south to avoid these constraints impacts upon the terrestrial significant ecological area to the south of the existing bridge (SEA_T_530b). Construction area is also required on the southern side of the bridge to provide for its widening (for example, temporary staging). Any effects on the SEAs will be subject to regional resource consents in the future.

5.1.6 Drury Sports Complex

Through the alternatives assessment, avoidance of the coastal marine area, SEA-M1-29b and the Historic Heritage Overlay (HHEP 2173) Slippery Creek Wharf/Commissariat Redoubt wharf site was made. In avoiding these items, the alignment was determined to be widened to the south, requiring widening into the Drury Sports Complex. However, the area of the Sports Complex affected by the alignment is a passive grassed recreation area and the sports facilities are not impacted.

5.2 Stormwater Design

5.2.1 Jesmond Road FTN Upgrade

The existing road crosses several overland flow paths or small streams which are conveyed by minor culvert crossings. Longitudinal drainage along Jesmond Road is achieved by swales on both sides of the corridor. The proposed upgrade will result in an increase in impervious are greater than 5000 m² triggering AUPOIP stormwater management requirements including stream protection and water quality.

The 100-year flood plains from Auckland Council GIS indicate flooding of properties on the downstream side of Jesmond Road and overland flows passing through the Auranga Development to the east of the alignment. Therefore, allowance has been made to mitigate flooding by attenuating the increased surface runoff for the 10 and 100 year ARI events. Further catchment wide flood assessment integrated with downstream development may alleviate the need for the attenuation in the future.

5.2.1.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment as shown in the table below. The road is divided into five catchments which drain to low points along the alignment.

Table 19: Impervious Areas – Jesmond Road FTN Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	35,520	8,140
Impervious Area (m^2)	8,880	36,260
Total (m^2)	44,400	44,400

Table 20: Jesmond Road FTN Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 2000-2360 (low point at CH2140) plus, SH 22 catchment between chainage 2900-3480	2,160 + 7,056	8,640 + 15,744	8,820 +16,872	1,980 + 5,928	Catchment drains to SH22 wetland 2. Discharge into unnamed stream at 110 Karaka Road, Drury
Catchment 2: CH 2360-2860 (low point at CH2680)	3,120	12,480	12,740	2,860	Catchment drains to wetland 1. Discharge into unnamed stream at 141 Jesmond Road, Drury
Catchment 3: CH 2860-3080 (low point at CH2980)	1,200	4,800	4,900	1,100	Catchment drains to wetland 1. Discharge into unnamed stream at 141 Jesmond Road, Drury
Catchment 4: CH 3080-3400 (low point at CH3160)	1,920	7,680	7,840	1,760	Catchment drains to wetland 2. Discharge into unnamed stream at 221 Jesmond Road, Drury
Catchment 5: CH 3400-3560 (low point at CH3560)	480	1,920	1,960	440	No attenuation. Discharge into existing swales at chainage 3560

5.2.1.2 Stream Protection

Jesmond Road is not identified within a SMAF area under the AUPOIP. However, SMAF 1 requirements are still considered as the runoff from Jesmond Road will discharge into streams. Detention and 5mm retention are designed to be treated in the wetlands by attenuating the post-development runoff minus the pre-development runoff from the 95th percentile 24-hour rainfall event, minus the retention, with a drain-down period of 24-hours. Stream protection was not considered for catchment 5 as the runoff is proposed to discharge into a short existing drain system and not directly into a stream.

Wetlands are proposed to mitigate the 10% AEP and 1% AEP flood which is also an effective treatment device for stream protection.

5.2.1.3 Water Quality Treatment

Wetlands are proposed for treatment to manage the quality of surface runoff for the 90th percentile rainfall event and can also provide flood attenuation.

Swales are selected for catchment 5 since the catchment is small, there is no evidence of downstream flooding and the drain is relatively short before it reaches the coast.

5.2.1.4 Flood mitigation

The Jesmond Road upgrade will result in a total increase in impervious surface from 8,880 m² to 36,260 m². Since the downstream environment is experiencing flooding and the existing drainage network discharges into a stream environment, the increase in surface runoff peak flow needs to be attenuated. Catchment 5 is not being attenuated as there is no evidence of flooding of properties downstream.

5.2.1.4.1 Wetlands

Wetlands have been designed for quality treatment, retention/detention and flood attenuation up to the 1% AEP event.

Table 21: Summary of Jesmond Road FTN Upgrade indicative wetland design

Wetland	Catchment impervious area (m²)	Catchment Chainage	Min. water surface area for PWV (m²)	Min. water surface area for attenuation (m²)
Wetland 1	17,640	2360-3080	560	1,155
Wetland 2	7,840	3080-3400	300	587

Wetland 2 is considered upstream of the watercourse to avoid live zoned land northeast of the corridor. The considerations given to the current wetland locations are summarized in Table 22.

Table 22: Considerations given to the current Jesmond Road FTN Upgrade wetland locations

Wetland	Flood plain (In or Out)	Downstream or Upstream (DS or US)	Terrain (Flat or Steep)	Existing Zoning	Likely Future Zoning	Greenfield or Brownfield (GF or BF)	Comments
Wetland 1	In	DS	Flat	FUZ	Residential	GF	Location chosen to avoid high contours and big cuts west of corridor.
Wetland 2	Out	US	Flat	FUZ	Residential	GF	Location chosen to avoid Auranga development

5.2.1.5 Road Surface Drainage

The existing road drainage includes swales on both sides of the road and four culvert crossings to allow cross drainage of streams. The proposed drainage system for the Jesmond Road upgrade includes pipes on both sides of the road between CH 2000 to 3080 and swales from CH 3080 to 3560.

5.2.1.6 Overland flow / Stream Crossings

The corridor crosses four culverts/overland flow paths. Overland flow paths need to be preserved as far as possible to maintain their functionality.

From the RAMM database only minor culvert crossings are present with a cross sectional area (i.e. culverts much smaller than 3.4m^2). These existing culvert crossings are shown in the general alignment plans.

Further work on the vertical alignment and/or upsizing culverts is required to maintain existing upstream flood levels. This will be undertaken in future design and regional consenting phases.

5.2.2 Bremner Road FTN Upgrade

The Bremner Road FTN upgrade consists of a new developed section within a greenfield area and a re-developed section within an industrial area. The greenfield area is zoned for mixed residential land use. The corridor crosses several overland flow paths, the Ngakoroa Stream and Hingaia Stream. Bridges are proposed for the unnamed stream crossing at CH 600, Ngakoroa Stream and Hingaia Stream. The existing road drains through an underground pipe system that discharges directly into streams.

A section of the corridor lies within a SMAF 1 area and the runoff is proposed to discharge directly into the nearby streams triggering detention and retention as per SMAF 1 area requirements. The proposed development causes an increase in impervious area greater than 5000 m² triggering AUPOIP requirements for water quality. The corridor lies within the lower third of the stormwater catchment and therefore no flood mitigation measures are required.

5.2.2.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment. Bremner Road is divided into four catchments which drains to the low points along the alignment.

Table 23: Impervious Areas – Bremner Road FTN Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	54,570	16,370
Impervious Area (m^2)	10,800	49,000
Total (m^2)	65,370	65,370

Table 24: Bremner Road FTN Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 0-800 (low point at CH360)	0	29,370	19,600	9,770	
Catchment 2: CH 800-1440 (low point at CH1120)	2,400	16,800	15,680	3,520	
Catchment 3: CH 1440-1760 (low point at CH1660)	5,040	4,560	7,840	1,760	
Catchment 4: CH 1760-2000 (low point at CH1860)	3,360	3,840	5,880	1,320	

5.2.2.2 Stream Protection

With reference to the AUPOIP, a section of the Bremner Road FTN upgrade lies within a SMAF 1 area. For this corridor, detention and retention requirements as set out in the AUPOIP are met by means of raingardens. Detention and 5mm retention are designed by attenuating the post-development runoff minus the pre-development runoff from the 95th percentile 24-hour rainfall event, minus the retention, with a drain-down period of 24-hours.

No allowance for retention and detention is required for catchments that discharge to tidal zones, however retention can be incorporated into raingardens if desired.

5.2.2.3 Water Quality Treatment

There is no existing treatment facility available for Bremner Road. Raingardens are proposed for retention and detention which also function as a treatment device to mitigate the quality of surface water for the 90th percentile rainfall event.

Raingardens are proposed along the entire corridor on both sides of the road, which are proposed to drain into the main primary pipe system and discharge into Ngakoroa or Hingaia Stream.

5.2.2.4 Flood mitigation

The corridor lies within the lower third of the stormwater catchment and therefore does not require any flood attenuation for the increases in impervious area. Water is proposed to discharge directly into the streams.

5.2.2.5 Road Surface Drainage

The existing road drainage of the corridor in the industrial area is an underground pipe system that discharges into Ngakoroa and Hingaia Stream. The proposed drainage system for the Bremner Road FTN upgrade includes a pipe system on both sides of the road that is proposed to discharge into the existing streams with an outlet structure and erosion protection.

5.2.2.6 Stream Crossings

The corridor crosses five overland flow paths in the greenfield area and three streams including an unnamed stream, Ngakoroa Stream and Hingaia Stream. No new culverts are proposed for the new alignment, though it is assumed that culverts between chainage 700 and 1100 will be designed and constructed to the full width of the future road, as part of the Auranga development.

The unnamed stream crossing at chainage 600m was assessed in the flood model as both a 3.0m diameter culvert and a bridge. The upstream catchment is some 115ha and the 3.0m diameter culvert increased upstream flood levels significantly, created a flood prone area which could limit upstream development and, at approximately 90m long would require extensive mitigation for ecological effects. A bridge is therefore proposed to manage these issues.

The Ngakoroa Stream bridge currently obstructs flow and is overtopped in the 100 year event. As well as widening to allow for the new FTN, the bridge alignment needs to be raised to interface with a new bridge required over State Highway 1 for the Papakura to Bombay project. However, the clearance required to the Transpower power lines overhead limits how much the bridge can be raised. A 40m span has been proposed by the Project team to avoid reclamation of the Ngakoroa Stream bed. Flood modelling has identified that the 40m bridge arrangement and the vertical alignment proposed by the P2B Project team (used to provide clearance to the overhead powerlines) will still overtop in the 100 year flood. The P2B project team are leading the design approach to the Ngakoroa Stream vertical alignment and have advised that they intend to seek a dispensation for flooding of the new bridge.

The new bridge over the Hingaia Stream will provide an improved flood freeboard to Hingaia Stream. Removal of the existing Norrie Road Bridge has a positive effect and allows upstream flood levels to decrease by up to 320mm. However, the existing floodplain at this point is some 250m wide and extends over the Firth Street / Bremner Road intersection. The reduction in flood levels is not enough to eliminate flooding at the Firth Street intersection and therefore some disruption to use of the corridor can be expected.

For details of the bridge crossings, refer to the structures design section of this report.

5.2.3 Waihoehoe Road West FTN Upgrade

The Waihoehoe Road West FTN Upgrade is an upgrade of an existing road extending from the Great South Road intersection to the east of the proposed Ōpāheke N-S FTN Arterial intersection. The Waihoehoe Road West FTN Upgrade corridor is zoned for light industrial, mixed use, local centre and future urban zoning. The existing longitudinal drainage is achieved by swales on both sides of the road. The proposed upgrade causes an increase in impervious area greater than 5000m² triggering the AUPOIP stormwater management requirements for water quality for high use roads. The alignment lies within the lower third of the stormwater catchment and therefore no flood mitigation is required.

5.2.3.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment as shown in the table below. The Waihoehoe Road West FTN corridor is divided into two catchments that drain to low points along the alignment. Discharge points will be confirmed in future design and regional consenting phases, preliminary design shows discharge points into an existing network and overland flow path.

Table 25: Impervious Areas – Waihoehoe Road West FTN Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	21,901	5,853
Impervious Area (m^2)	6,048	22,096
Total (m^2)	27,949	27,949

Table 26: Waihoehoe Road West FTN Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: chainage 0-100 (low point at chainage 0)	630	2,370	2,450	550	Discharge to Great South Road existing drainage network
Catchment 2: chainage 100-800 (low point at chainage 240), plus Waihoehoe East between chainage 800-960	4,410 + 1,008	16,590 + 2,941	17,150 + 2,496	3,850 + 1,453	Discharge location TBC at detailed design, requires to be integrated with future urban development

5.2.3.2 Stream Protection

With reference to the AUPOIP, a very small section of the corridor lies within a SMAF 1 area which drains to Great South Road. If detention and 5mm retention is required for the corridor a raingarden is proposed with a minimum required ponding area of 5% of the total impervious area, equal to 982m².

5.2.3.3 Water Quality Treatment

The existing swales on both sides of the road may act as a form of treatment for Waihoehoe Road however they are likely to be filled in by the widened corridor. The proposed options to be considered for treatment are:

- Swales within the berms on both sides of the corridor
- Swales on the northern side of the embankment toe
- Raingardens within the berms on both sides of the corridor

The minimum required ponding area for a raingarden for water quality treatment is 2% of the total impervious area, equal to 393m².

5.2.3.4 Flood Mitigation

The corridor discharges to the lower third of the Hingaia stormwater catchment and does not require any stormwater attenuation. If discharges were made to the north into the Ōtūwairoa catchment, flood attenuation would however be required. An attenuation swale will not fit within the designation boundary if it is required to discharge to the Ōtūwairoa catchment.

5.2.3.5 Road Surface Drainage

The existing road drainage includes an underground pipe system which discharges into existing open drains. The proposed drainage system similarly consists of a pipe system on both sides of the road that would discharge into an existing drain or future downstream pipe system. The downstream area to the south is expected to be developed for the Drury Central Rail Station and/or the Kiwi Properties development. It is therefore assumed that the road surface drainage can connect to a pipe system within these developments. Coordination with these developments in the future is required to confirm this approach.

5.2.3.6 Stream Crossings

The corridor lies on a watershed between the Ngakoroa and Hingaia catchments. No existing culvert crossings are present and nor are any proposed.

5.3 Structures Design

Five new bridge structures are proposed within the corridor, crossing streams, a road and the NIMT railway.

Table 27: Jesmond Road, Bremner Road and Waihoehoe Road West FTN Bridge Details

Bridge	CH	Length	Spans	Skew Crossing	Freeboard
Bremner Road FTN Upgrade					
Unnamed Stream Crossing	600	35m	Single	30 degrees	1200mm
Ngakoroa Stream*	1270	40m	2 Spans (1 x 10m and 1 x 30m)	-	TBC*
State Highway 1*	1400	61m	2 Spans (1 x 35m and 1 x 26m)	-	N/A
Hingaia Stream	1740	70m	2 x 35m	Varies	600mm
Waihoehoe Road West FTN Upgrade					
NIMT Rail Corridor	80	29m	Single	23 degrees	N/A

* The details of these bridges are still to be confirmed in consultation with the Papakura to Bombay project. It is assumed that the northern portions will be constructed by P2B and the future works will involve widening of the bridge to the south

A localised stream diversion is possibly required in the vicinity of the bridge over the unnamed stream so that bridge supports do not encroach into the stream causing obstruction to flow.

The Ngakoroa Stream Bridge is likely to be built with limited clearance to the overhead Transpower 220kV power lines, such that special girder erection techniques may be required

For the Hingaia Stream bridge, the freeboard to the 100 year flood is only 600 mm due to vertical alignment constraints with intersections and properties.

5.4 Utilities Design

There are existing overhead Transpower transmission lines (110kV and 220kV) that cross Bremner Road at the Ngakoroa Stream bridge. As discussed in section 5.1.3, the vertical alignment through this section follows the P2B design geometry, as this bridge will be constructed in the next 5 years.

The Waikato No.1 watermain pipe is a 1200mm diameter concrete lined steel pipe and runs under Great South Road and Waihoehoe Road, traversing across the western approach and parallel to the NIMT. It is intended that the watermain is realigned as part of this project as the bridge abutments from the NIMT bridge reconstruction will impact the watermain.

6 Waihoehoe Road East Upgrade

Waihoehoe Road is currently a primary collector. The Waihoehoe Road East Upgrade project extends from the Fitzgerald Road intersection to Drury Hills Road in the east. The proposed alignment runs through a rural environment, zoned for future urban. This project upgrades the existing road to a two-lane arterial with walking and cycling facilities on both sides. It includes the upgrade of intersections with Appleby/Fielding Road and Cossey Road to roundabouts.

6.1 Geometric Design and Constraints

The mid-block cross section for Waihoehoe Road (East) Upgrade is a 24m, two lane arterial road corridor (included in Appendix 1).

The existing horizontal and vertical geometry of Waihoehoe Road is generally maintained for the widened alignment. The vertical geometry is designed to avoid cutting over existing levels where the corridor is adjacent to the existing substation and crosses over the First Gas designation. The vertical alignments of Fielding Road and Appleby Road are revised to accommodate the roundabout tie-ins and vertical levels. The southbound approach to the intersection from Appleby has utilised a 50km/h design speed to reduce the extent of works and associated property impacts.

The table below shows the constraints and considerations identified as part of the Waihoehoe Road East upgrade that have influenced the preliminary design.

Table 28: Waihoehoe Road East Design Constraints and Considerations

Constraint	Location
Waihoehoe Road East Upgrade	
Designation 9104 – Pukekohe to East Tamaki Gas Pipeline and Substation, First Gas Limited	CH1100 along Waihoehoe Road

6.2 Stormwater Design

The Waihoehoe Road East alignment lies on top of a watershed boundary between the Ngakoroa and Hingaia catchments. The longitudinal drainage is achieved by swales on both sides of the road. The proposed re-development will result in an increase in impervious area greater than 5000m² triggering the AUPOIP stormwater management requirements for water quality for high use roads.

For discharges to the south into Hingaia Stream, the alignment lies within the lower third of the stormwater catchment and therefore no flood mitigation is required.

6.2.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment. Waihoehoe Road East is divided into four catchments which drain to the low points along the alignment. Catchment 1 drains towards the Waihoehoe Road West FTN catchment forming part of the Waihoehoe Road West FTN stormwater management design as described in Section 5.2.3.

Table 29: Impervious Areas – Waihoehoe Road East Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	32,695	22,464
Impervious Area (m^2)	9,072	19,303
Total (m^2)	41,767	41,767

Table 30: Waihoehoe Road East Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 800-960 (low point at CH800 and drains towards Waihoehoe Road West FTN system)	1,008	2,941	2,496	1,453	Drains toward Waihoehoe West catchment
Catchment 2: CH 960-1400 (low point at CH1140)	2,772	7,788	6,864	3,805	Treated by swales and discharge into Hingaia Stream tributary
Catchment 3: CH 1400-2040 (low point at CH1660)	4,032	11,328	9,984	8,056	Treated by swales and discharge into Hingaia Stream tributary
Catchment 4: Chainage 2040-2260 (low point at chainage 2000)	1,260	3,540	3,120	5,990	Treated by swales and discharge into Hingaia Stream tributary

6.2.2 Stream Protection

Waihoehoe Road East does not lie within a AUPOIP SMAF area. The proposed drainage system discharges into streams and if detention and 5mm retention was required it is assumed it would be built as a soakage trench under the invert of the swale or raingardens that fit within the berms on both sides of the road.

6.2.3 Water Quality Treatment

Swales are proposed on both sides of the road within the berms to provide water quality treatment for the water quality flow for the 90th percentile rainfall event.

6.2.4 Flood Mitigation

For discharges to the south to the Hingaia Stream, the corridor lies within the lower third of the stormwater catchment and does not require any flood attenuation measures.

If discharges were to the north, flood attenuation would be required.

6.2.5 Road Surface Drainage

The existing road drainage includes swales on both sides of the road.

The proposed drainage system for Waihoehoe Road East is an underground pipe system as the berms do not provide enough space to fit in swales to convey the 10% AEP peak flows. The discharge points will be confirmed at future design and regional consenting phases. Preliminary design indicated discharge could be to the nearby overland flow paths or streams of the Hingaia Stream catchment, or future pipe systems developed within the plan change areas. Coordination would be required with developers to facilitate this.

6.2.6 Stream Crossings

The corridor crosses the upper reaches of two overland flow paths with a catchment area of 3 hectares and above. Overland flow paths need to be preserved as far as possible to maintain functionality. The capacity of existing culverts may need to be upgraded as a mitigation measure if flood levels increase due to the increase in impervious area from the corridor upgrade.

6.3 Utilities Design

At the Appleby Road roundabout, an existing Counties Power medium voltage (MV) and high voltage (HV) line runs in the north-south direction along Appleby Road and Fielding Roads. Counties Power will need to be engaged with as the design development progresses, as it is expected that these lines will need to either be locally relocated or undergrounded as part of the road upgrade.

As highlighted in Section 6.1, there is an existing designated First Gas transmission line across Waihoehoe Road (approx. ch1100). The Gas transmission line runs in the north-south direction and is connected to the substation on the southern side of Waihoehoe Road at this location. The design has been developed so that widening occurs to the north to avoid the gas substation.

7 Ōpāheke North-South FTN Arterial

The Ōpāheke North-South FTN Arterial is a new transport corridor starting at the Hunua Road/Boundary Road intersection in the north, and extending to an intersection with Waihoehoe Road/Fitzgerald Road in the south. The proposed alignment runs through a mostly rural, greenfield environment, zoned for future urban with the northern extent at Hunua and Boundary Roads zoned heavy industrial. The new arterial is approximately 3.4km long and crosses a number of watercourses and a floodplain via a series of culverts and bridges. This new north-south corridor functions as a four-lane FTN route.

7.1 Geometric Design and Constraints

The mid-block cross section for the Ōpāheke North-South FTN is a 30m, four lane corridor (as indicated in Appendix 1). The design speed applied to the horizontal and vertical geometry of Ōpāheke N-S FTN is 60km/h.

The horizontal geometry is characterised by long straights and minimal curvature. The Waihoehoe Stream bridge south of Ponga Road has been positioned so as to minimise stream impacts whilst maintaining clearance to the Counties Power High Voltage power lines. At stream crossings, including the bridge crossing the Waihoehoe flood plain, the vertical alignment is dictated by freeboard requirements over the 100-year flood level. At the northern end of the Waihoehoe bridge crossing a minimum vertical clearance of 4.5m is provided underneath over a length of 40m to allow for vehicle cross passage for future developments.

The table below shows the constraints and considerations identified as part of the Ōpāheke N-S FTN Arterial that have influenced the preliminary design.

Table 31: Ōpāheke N-S FTN Design Constraints and Considerations

Constraint	Location
Ōpāheke N-S FTN Arterial	
Notable tree (2882) – Kahikateas adjoining Sutton Road	205 Sutton Road
Flood plain and stream crossings	Slippery Creek (Ōtūwairoa Stream) flood plain in the centre of the corridor to be crossed
Designation 3006 – Counties Power Ltd Ōpāheke Substation	9 Ponga Road
Proposed Watercare Booster Station	72 Hunua Road
Designation 9104 – Pukekohe to East Tamaki Gas Pipeline, First Gas Limited	The gas line runs in the north-south direction from the Hunua Road junction towards the Ponga Road intersection
Gas facility substation – First Gas Limited	101 Walker Road
HV overhead line – Counties Power	HV overhead line running from Waihoehoe Road/Fitzgerald intersection to the power station at 9 Ponga Road
CHI Historic Heritage Site – Utility Building	31 Ponga Road

7.1.1 Flood Plain and Stream Crossings

The crossing of streams and the floodplain is unavoidable in the constrained environment. However, through the alternatives assessment the number of streams crossed and the length of floodplain to be crossed was minimised.

7.1.2 CHI Site – Utility Building

The CHI listed Utility Building will likely be impacted and removed for construction purposes. However, the building has been assessed to have little heritage value based on the AUPOIP Regional Policy Statement values assessment. It is not protected by provisions of the Heritage New Zealand Pouhere Taonga Act.

7.2 Stormwater Design

The Ōpāheke N-S FTN Arterial is a new road corridor that runs through greenfield and is zoned future urban. The proposed development will result in an increase of impervious area greater than 5000m² triggering the AUPOIP requirements for water quality. The proposed corridor crosses several overland flow paths and streams including Waipokapū (Hays) Stream, Waipokapū Stream tributary and the Waihoehoe Stream.

The 100-year flood plains from Auckland Council GIS indicate flooding of properties downstream triggering the requirement to mitigate flooding by attenuating the increased surface runoff for the 10% AEP and 1% AEP.

The Waihoehoe floodplain is some 640m wide and the bridge span is expected to be about 265m. Therefore the bridge abutments will occupy part of the floodplain and divert flows, reducing available flood plain storage. This means that there are potential increases in flood levels upstream and dwellings within the floodplain which may be affected.

7.2.1 Catchment Delineation

To determine the stormwater surface runoff for pre- and post-development, catchment delineation is required. Ōpāheke N-S FTN is divided into seven catchments which drain to low points along the alignment.

Table 32: Impervious Areas – Ōpāheke N-S FTN Arterial

	Pre-development	Post-development
Pervious Area (m^2)	107,477	29,000
Impervious Area (m^2)	6,723	85,200
Total (m^2)	114,200	114,200

Table 33: Ōpāheke N-S FTN Arterial catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 400-720 (low point at CH400)	5,373	9,927	11,740	3,560	Limited space available for a wetland. A combination of treatment devices is required for stream protection, water quality and flood attenuation. Discharge into existing network
Catchment 2: CH 720-1760 (low point at CH960)	0	31,200	23,088	8,112	Catchment drains to wetland 1 and discharges into Waipokapū Stream tributary at 158 Walker Road, Drury
Catchment 3: CH 1760 - 2300 Also culvert at local low point at chainage 2220	1,350	17,750	14,408	4,692	Catchment drains to wetland 2 and discharges to Waihoehoe Stream tributary at 61 Ponga Road, Drury
Catchment 4: CH 2220 - 2520 Also culvert at local low point at chainage 2520	0	9,600	7,104	2,496	Catchment drains to wetland 3 and discharges to Waihoehoe Stream at 205 Sutton Road, Drury
Catchment 5: CH 2520 - 2680	0	4,800	3,552	1,248	Catchment drains to wetland 3 and discharges to Waihoehoe Stream at 205 Sutton Road, Drury
Catchment 6: CH 2680 - 3620 (low point at chainage 3120) Also culverts at local low points at chainage 3040 and 3530	0	28,200	20,868	7,332	Catchment drains to wetland 4 and discharge to Waihoehoe Stream tributary at 76A Waihoehoe Road, Drury
Catchment 7: CH 3620 - 3820m (low point at chainage 3700) Also culvert at local low point at chainage 3680	0	6,000	4,440	1,560	Drains to wetland 4 and discharges to Waihoehoe Stream tributary at 76A Waihoehoe Road, Drury

7.2.2 Stream Protection

Ōpāheke N-S FTN does not lie within a SMAF area under the AUPOIP, however the proposed drainage system discharges into streams and the corridor lies within a greenfield area therefore SMAF 1 requirements are applied.

For catchment 1, in the urban area, a raingarden is proposed for detention and retention requiring a minimum ponding area of 5% of the total impervious area, equating to 587m². Raingardens are proposed, with one located at the southern end of the alignment within the proposed construction compound and a series within berms to the north.

For catchments 2, 3 and 4, detention and retention requirements as set out in the AUPOIP are met by means of wetlands. Detention and 5mm retention are designed by attenuating the post-development runoff minus the pre-development runoff from the 95th percentile 24-hour rainfall event, minus retention, with a drain-down period of 24-hours.

Wetlands are proposed to mitigate the 10% AEP and 1% AEP flood which is also an effective treatment device for stream protection.

7.2.3 Water Quality Treatment

There is currently no treatment facility available for the proposed Ōpāheke N-S FTN.

Wetlands have been identified as the preferred treatment device for catchment 2, 3 and 4 to manage the quality of surface runoff for the 90th percentile rainfall event.

The Hunua Road corridor has limited space due to the presence of existing buildings and the wide form of the proposed intersection with Boundary Road occupying a large area. In addition, the fall is to the north of Boundary Road meaning that the whole of catchment 1 cannot be drained to the Waipokapū Stream.

It is assumed that land take for the purposes of stormwater management in the urban industrial area is not preferred and that solutions need to fit within the existing road reserve boundary and land proposed to be acquired for the intersection works.

Therefore, the options for treatment and attenuation include:

- Raingardens with as much flood attenuation as practicable – one at the southern end on the proposed construction yard and a series in the berms to the north
- Attenuation swales sited along the toe of the embankments north of the intersection
- A fully underground treatment and attenuation solution
- A combination option where, as much flow as practicable is piped south to a larger raingarden on the Site Compound area and the rest is managed through a raingarden or swale with attenuation which is sited along the toe of the embankments north of the intersection.

The required raingarden ponding area for water quality treatment is 2% of the total impervious area which equals to 235m². An attenuation swale for the 1% AEP requires an estimate top width of 4.55m and a length of 200m on both sides of the corridor. A combination of treatment devices is proposed for treatment in the urban section.

7.2.4 Flood Mitigation

The Ōpāheke N-S FTN upgrade will result in a total increase in impervious surface from 6,723 m² to 85,200 m². Since the downstream environment is experiencing flooding and the existing drainage network discharges into a stream environment, the increase in surface runoff peak flow needs to be attenuated.

7.2.4.1 Wetlands

A wetland pond area with access track is nominally 10% of the catchment area, equal to a footprint of 1500m² for catchment 1. Due to limited space in the urban area, a wetland was not considered for catchment 1. Wetlands are proposed for catchments 2-7 to accommodate flood attenuation for the 10% and 1% AEP event, post-development minus pre-development flows.

Table 34: Summary of Ōpāheke N-S FTN Arterial Indicative Wetland Design

Wetland	Catchment impervious area (m^2)	Catchment Chainage	Min. water surface area for PWV (m^2)	Min. water surface area for attenuation (m^2)
Wetland 1	23,088	720-1760	795	1,682
Wetland 2	14,408	1760-2300	450	947
Wetland 3	10,656	2220-2680	333	776
Wetland 4	25,308	2680-3820	793	1,588

The road corridor has a catchment between two high points at CH1760 and 3620 with a low point at CH3120. To decrease the flow draining from the north and crossing the viaduct via a pipe system, the catchment is divided into smaller catchments that discharge into Wetland 2 and 3. While wetland 3 is within the floodplain it is located behind the viaduct embankment and therefore avoids high flood flow velocities and deep flood levels. Wetland 4 is located further to the west to avoid existing overhead cables and pylons. The considerations given to the current wetland locations are summarized in Table 35.

Table 35: Considerations given to the current Ōpāheke N-S FTN Arterial wetland locations

Wetland	Flood plain (In or Out)	Downstream or Upstream (DS or US)	Terrain (Flat or Steep)	Existing Zoning	Likely Future Zoning	Greenfield or Brownfield (GF or BF)	Comments
Wetland 1	Out	US	Flat	FUZ	Industrial	GF	Location to avoid gas main pipeline west of corridor
Wetland 2	Out	DS	Steep	FUZ	Residential	GF	Wetland required to decrease flow conveyance across the viaduct.
Wetland 3	In	DS	Flat	FUZ	Residential	GF	Wetland required to decrease flow conveyance across the viaduct. Location to avoid deep flood levels and high flow velocities
Wetland 4	In	DS	Flat	FUZ	Residential	GF	Location to avoid existing overhead cables and pylons

7.2.5 Road Surface Drainage

The Ōpāheke N-S FTN Arterial is a new alignment and therefore there are no existing drainage systems in place. The proposed drainage system for Ōpāheke N-S FTN includes an underground pipe system on both sides of the road that drain to the low points along the alignment and then discharge to streams or land or the existing pipe network within urban Papakura.

7.2.6 Stream Crossings

The corridor crosses several overland flow paths and streams.

At culvert crossings a minimum freeboard of 0.5m on top of the 100-year flood level is proposed.

Two new bridge structures over the streams are proposed with sufficient freeboard of 1.2m between the 100-year flood level and bridge soffit. Several culvert openings are proposed along the approach embankments of the Waihoehoe Stream bridge crossing which form part of the flood modelling assessment. Bridge piers are placed outside of the main river channel where they don't adversely affect the river banks.

In future design phases, the length and arrangement of the Waihoehoe Stream bridge will require further optimisation in terms of flooding effects.

The alignment also crosses over an existing ornamental pond which will be filled in, with a new culvert crossing proposed. The pond currently dams an overland flow path and is permanently full, therefore there is no loss of flood storage when the pond is removed.

7.3 Structural Design

Two new bridge structures are proposed on the Ōpāheke North-South FTN alignment crossing Waipokapū Stream and Waihoehoe Stream.

Table 36: Ōpāheke North-South FTN Arterial Bridge Details

Bridge	CH	Length	Spans	Skew Crossing	Freeboard
Waipokapū Stream	700	120m	4 x 30m	-	1200mm
Waihoehoe Stream	2720	265m	8 x 33m	20 degrees	1200mm

For the Waipokapū Stream bridge, a clear span of 105m was required flood conveyance from preliminary flood assessment, but to enable the southern abutment to be founded on a relatively flat portion of ground and reduce expected ground improvements in the area, the bridge length was extended to 120m.

7.4 Utilities Design

At the northern extent of the project, a new bridge will be provided across the Waipokapū (Hays) Stream. This conflicts with a gas main located within an existing designation. As part of the works, the gas main will need to be relocated outside of the designation, which will require approval from First Gas as the Requiring Authority, as an alteration to the designation will be necessary.

The 1200mm diameter Watercare Waikato No. 1 watermain traverses through Boundary Road towards the Ōpāheke N-S FTN intersection and heads north up Hunua Road. During construction, measures will need to be implemented to prevent any disturbance to this asset. Watercare are also in the process of developing a booster pump station at the property at 72 Hunua Road. Access to this site will be sought from Hunua Road, and this has been considered in the design development.

An overhead Counties Power HV line traverses along the western side of the corridor (approx CH2200 to 3800). The alignment has been adjusted to avoid impacting this asset, but during construction particular clearance measures will likely be required due to the proximity of the lines to the base of the proposed batters.

8 Ponga Road, Ōpāheke Road Rural and Ōpāheke Road Urban Upgrades

This section describes three projects:

- Ponga Road Upgrade
- Ōpāheke Road Rural Upgrade
- Ōpāheke Road Urban Upgrade.

The urban section of Ōpāheke Road is currently a primary collector, which runs through an existing urban environment. It runs from the Great South Road intersection in the north and ends just north/west of the intersection with Lorelei Place in the south, where the Future Urban Zone begins. An active mode upgrade is proposed for this section of the corridor, with reconfiguration of the existing berms to include walking and cycling facilities on both sides of the road. The cross section for Ōpāheke Road Urban Upgrade is based on a 20m two lane arterial (included in Appendix 1), with the intention of retaining the existing kerblines, minimising construction cost. This means the grass berm width will vary to accommodate the active mode facility.

A new roundabout is proposed at the intersection with Settlement Road, and the existing roundabout with Butterworth Avenue will require reconfiguration. In order to provide a safe, compliant geometry at the roundabout, the closure of Liverpool Street is likely to be required. To accommodate the active modes facilities within the berm, nine driveways will need to be reconfigured.

The rural section of Ōpāheke Road to the east of Lorelei Place, and Ponga Road, are located within the FUZ and are currently rural secondary collector road. A 2-lane urbanised corridor of 24m width is proposed, incorporating active mode facilities (cross section provided in Appendix 1). At the western end, residential development is under construction through the Bellfield development, and a new roundabout is proposed to serve this development. Two new active mode bridges are proposed across Ōtūwairoa Stream (Slippery Creek), and an offline bridge provides grade separation over the NIMT rail corridor. A new road connection is also provided to maintain access to Walker Road. In the eastern portion of Ponga Road, a new bridge is proposed crossing the Mangapū stream, replacing an existing culvert.

8.1 Geometric Design and Constraints

The design speed applied to the horizontal and vertical geometry for the Ōpāheke Road/ Ponga Road Rural Upgrade is generally 60km/h, except for in isolated sections as outlined below.

The alignment of the rural section of Ōpāheke Road at the western end was governed by the assumption that the existing road bridge over Ōtūwairoa Stream (Slippery Creek) is to be retained, which retains the existing vertical and horizontal geometry. As a result, the lengths of the horizontal curves on the approaches to the bridge are compliant only with a design speed of 50km/h.

To the east, the vertical alignment is governed by the clearance required to the proposed bridge crossing the NIMT rail corridor and the existing connection with Walker Road. The horizontal alignment has been shifted northward over this portion to avoid impacts on the Waikato No.1 Watermain, to enable the new bridge to be built off-line, and to avoid impacts on the sports fields at Ōpāheke Reserve. In order to reduce property impacts and minimise the encroachment of the

embankments into the existing road carriageway, the batters have been locally steepened to 1V:2H, from CH2100-2700.

As the current intersection with Walker Road is to be severed by the proposed bridge, a new access road is provided to the east of the current intersection.

Adjacent to the intersection with Sutton Road, the new alignment has been developed to avoid impacts on the Counties Power Substation.

At the western end of Ponga Road, the horizontal curvature radii is appropriate for a 50km/h design speed, which was implemented to minimise the impacts to properties at 120 and 126 Ponga Rd.

To the east, the vertical alignment is governed by the required freeboard to the proposed bridge over the Mangapū Stream.

The table below shows the constraints and considerations identified as part of the Ponga Road and Ōpāheke Road corridors that have influenced the preliminary design.

Table 37: Ponga Road, and Ōpāheke Road corridors Design Constraints and Considerations

Constraint	Location
Ōpāheke Road (Urban)	
Papakura Cemetery	298 Great South Road
Historic Heritage Extent of Place (HHEP 2801) Papakura-Karaka War Memorial	278 Great South Road, corner of Great South Road/Ōpāheke Road
Ōpāheke Road (Rural)	
Flood plain	Slippery Creek
Watercare No.1 1200mm watermain	Walker Road
Ōpāheke 1 Precinct / Bellfield Estate	South of Lorelei Place (~CH1600-1900)
Counties Power Substation	Corner of Sutton Road and Ōpāheke Road
Existing Ōtūwairoa Stream (Slippery Creek) Bridge	CH1900
Ōpāheke Reserve	165 Ōpāheke Road
NIMT rail line	CH2300-2400
CHI historic heritage sites	Few sites adjacent to the alignment
Ponga Road	
Flood plain	Ponga Road – Mangapū (Symonds Stream)
Significant Ecological Area (SEA_T_77)	101 Ponga Road
Designation 9104 – Pukekohe to East Tamaki Gas Pipeline, First Gas Limited	~CH1100
CHI historic heritage sites	Few sites adjacent to the alignment

8.1.1 Ōpāheke Reserve and Waikato 1 Watermain

Through the alternatives assessment it was determined to widen to the north-east to minimise impacts on the Ōpāheke Reserve. In addition, the proposed bridge crossing the NIMT has been located offline to the north of the existing alignment to avoid impacts on the newly upgraded sports fields within Ōpāheke Reserve and the Watercare Waikato 1 Watermain. Land is required within the passive recreation area within the Ōpāheke Reserve to allow for embankments and construction, as well as the upgrade of an existing wetland.

8.1.2 Papakura Cemetery

Papakura Cemetery is located on the northwestern corner of the Ōpāheke Road/ Settlement Road intersection. The existing footpath and berm area already extends partially into this site, so any improvements to the active mode facilities will also impact on the site. Engagement with Auckland Council has determined that a minimum of 3m clearance from the body plots should be provided for maintenance. This can be accommodated along Ōpāheke Road, although further engagement with Auckland Council (and the Local Board) will be required prior to detailed design and construction.

8.2 Stormwater Design

8.2.1 Ōpāheke Road (Urban and Rural) Upgrade

The existing road drainage in the urban area includes an underground pipe system which connects to a downstream pipe network discharging into a nearby stream. Several overland flow path crossings are present. The road in the rural area drains by means of swales on both sides of the road, and several overland flow path crossings are present including the existing Ōtūwairoa (Slippery Creek) Stream bridge crossing.

The AUPOIP stormwater management requirements for water quality for high use roads have been triggered as the corridor upgrade causes an increase in impervious area greater than 5000m^2 and the water drains to Ōtūwairoa Stream. The 100-year flood plains from Auckland Council GIS indicate inundation of properties downstream at several locations along the alignment, triggering the requirement to mitigate flooding by attenuating the increased surface runoff for the 10% AEP and 1% AEP.

8.2.1.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment. The road is divided into four catchments which drain to low points along the alignment. The pre- and post-development catchment sizes for which are being designated are summarized in the table below.

Table 38: Impervious Areas – Ōpāheke Road (Urban and Rural) Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	28,462	13,619
Impervious Area (m^2)	17,218	27,941
Total (m^2)	41,560	41,560

Table 39: Ōpāheke Road Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Settlement Rd intersection	2,884	1,236	3,605	515	Discharge to a raingarden and connect to the existing network
Catchment 1: CH 1560-2360 (low point at CH2040)	6,314	12,886	12,480	6,720	Catchment drains to wetland 1 and discharge to Ōtūwairoa Stream at 156 Ōpāheke Road, Drury
Catchment 2: CH 2360-3040 (low point at CH2540)	4,760	11,560	10,608	5,712	Catchment drains to wetland 2 and discharge to Overland flow path at 202 Ōpāheke Road, Drury
Catchment 3: CH 3040-3120 (low point at CH3120)	560	1,360	1,248	672	Catchment drains to wetland 2 and discharge to Overland flow path at 202 Ōpāheke Road, Drury

8.2.1.2 Stream Protection

Ōpāheke Road is not within a SMAF area as identified in the AUPOIP maps. The catchment for the Settlement Road / Ōpāheke Road intersection can be treated for detention and retention with a raingarden located at the south eastern corner of the intersection. The required minimum ponding area for stream protection is 180m² which is 5% of the total impervious area.

The rural section of the corridor is proposed to discharge into streams, and detention and retention requirements as required in the AUPOIP are met by means of wetlands.

Detention and 5mm retention are designed by attenuating the post-development minus the pre-development runoff from the 95th percentile 24-hour rainfall event, minus the 5mm retention, with a drain-down period of 24-hours.

Wetlands are proposed to mitigate the 10% AEP and 1% AEP flood which is also an effective treatment device for stream protection.

8.2.1.3 Water Quality Treatment

There is currently no treatment facility available for Ōpāheke Road in the urban area whereas the swales in the rural area might act as some form of treatment. Water quality treatment for the entire impervious area will require a suitable treatment device to mitigate the surface water quality for the 90th percentile rainfall event.

A raingarden is identified as the preferred treatment device for the Settlement Road / Ōpāheke Road intersection and wetlands are preferred for catchments 1, 2 and 3. The required raingarden ponding area for water quality treatment is 2% of the total impervious area, equal to 72m². The raingarden can potentially be designed for some flood attenuation with a discharge pipe connecting to the existing 450 mm diameter pipe along King Edward Avenue.

8.2.1.4 Flood Mitigation

The Ōpāheke Road upgrade will result in a total increase in impervious surface from 17,218 m² to 27,941 m². Since the downstream environment is experiencing flooding and the existing drainage network discharges into a stream environment, the increase in surface runoff flow needs to be attenuated.

8.2.1.4.1 Wetlands

Wetlands have been designed to attenuate peak flow for the 10% and 1% AEP storm events such that the post-development discharge rates cannot exceed the pre-development discharge rates.

Table 40: Summary of Ōpāheke Road Upgrade Indicative Wetland Design

Wetland	Catchment impervious area (m²)	Catchment Chainage	Min. water surface area for PWV (m²)	Min. water surface area for attenuation (m²)
Wetland 1	12,480	1560-2360	389	728
Wetland 2	11,856	2360-3120	372	770

Wetland 1 is located upstream of the watercourse to integrate with the existing Ōpāheke Reserve wetland and Ōpāheke 1 Precinct (Bellfield Estate). Wetland 2 is located upstream to avoid high contours and because limited space is available downstream.

Table 41: Considerations given to the current Ōpāheke Road Upgrade wetland locations

Wetland	Flood plain (In or Out)	Downstream or Upstream (DS or US)	Terrain (Flat or Steep)	Existing Zoning	Likely Future Zoning	Greenfield or Brownfield (GF or BF)	Comments
Wetland 1	In	US	Flat	Public Open Space	Public Open Space	GF	Location to integrate with Drury Reserve wetland.
Wetland 2	In	US	Flat	FUZ	Residential	GF	Partially within flood plain.

8.2.1.5 Road Surface Drainage

The road drainage, also known as the primary system, is designed to convey the 10% AEP storm event. The proposed drainage system for Ōpāheke Road consists of a pipe system on both sides of the road that is proposed to drain to the low points of the catchment and discharge into wetlands.

8.2.1.6 Stream Crossings

In the urban area, the upgraded corridor follows the existing vertical alignment as far as possible to avoid any changes to the existing flood levels. Improved inlets are proposed north of the Settlement Road / Ōpāheke Road intersection to allow for overland flow to cross Settlement Road and not to increase the existing ponding and flood levels on the northern side of the road.

In the rural section, the vertical alignment is raised to cross over the NIMT rail line. There is a minor culvert crossing at CH2590 and a bridge crossing over Ōtūwairoa Stream at CH1900. The existing road bridge will remain intact with additional bridge crossings either side of the existing bridge to accommodate active modes.

An existing channel/overland flow path east of the rail line is blocked, but drains to a roadside open channel to the west. An existing overland flow path at 202 Ōpāheke Road is diverted around Wetland 2 to discharge into the roadside open channel.

8.2.2 Ponga Road Upgrade

The existing road crosses several overland flow paths or small streams which are conveyed by culvert crossings. The longitudinal drainage is achieved by swales on both sides of the road. The proposed upgrade of Ponga Road will result in an increase of impervious area which requires water quality treatment of the entire road corridor. The 100-year flood plains from Auckland Council GIS indicate inundation of properties downstream triggering the requirement to mitigate flooding by attenuating the increased surface runoff for the 10% AEP and 1% AEP.

8.2.2.1 Catchment Delineation

The stormwater surface runoff for pre- and post-development is determined by delineating catchments between the low and high points along the alignment. Ponga Road is divided into three catchments which drain to the low points along the alignment. The pre- and post-development catchments sizes are summarized in the tables below.

Table 42: Impervious Areas – Ponga Road Upgrade

	Pre-development	Post-development
Pervious Area (m^2)	17,680	8,736
Impervious Area (m^2)	7,280	16,224
Total (m^2)	24,960	24,960

Table 43: Ponga Road Upgrade catchment sizes

Catchment Name	Existing impervious area (m^2)	Existing pervious area (m^2)	New impervious area (m^2)	New pervious area (m^2)	Notes
Catchment 1: CH 1000-1200 (low point at CH1060)	1,400	3,400	3,120	1,680	Catchment drains to wetland 1 and discharge to an overland flow path towards Ōtūwairoa Stream at 94 Ponga Road, Drury
Catchment 2: CH 1200-1660 (low point at CH1440)	3.220	7.820	7.176	3,864	Catchment drains to wetland 1 and discharge to an overland flow path towards Ōtūwairoa Stream at 94 Ponga Road, Drury
Catchment 3: CH 1660-2040 (low point at CH1860)	2,660	6,460	5,928	3,192	Catchment drains to wetland 2 and discharge to Mangapū Stream at 215 Ponga Road, Drury

8.2.2.2 Stream Protection

Ponga Road does not lie within a SMAF area as identified in the AUPOIP. However due to the runoff being discharged into streams, SMAF 1 requirements are applied by means of wetlands. Detention and 5mm retention are designed by attenuating the post-development minus the pre-development runoff for the 95th percentile 24-hour rainfall event, minus the retention, with a drain-down period of 24-hours.

Wetlands are proposed to mitigate the 10% AEP and 1% AEP flood event which are also an effective treatment device for stream protection.

8.2.2.3 Water Quality Treatment

There is currently no treatment facility available for Ponga Road. Wetlands are proposed for flood mitigation and will also function as a treatment device to manage water quality for the 90th percentile rainfall event.

8.2.2.4 Flood Mitigation

The Ponga Road upgrade will result in a total increase of impervious surface from 7,280 m² to 16,224m². Since the downstream environment is experiencing flooding and the existing drainage network discharges into a stream environment, the increase in surface runoff flow and volume needs to be attenuated by a facility that is structurally sound, causes minimum impact to the environment and is sustainable for future development. Wetlands are proposed to attenuate the additional surface runoff volumes from catchments 1, 2 and 3.

8.2.2.4.1 Wetlands

Wetlands have been designed to attenuate peak flow for the 10% and 1% AEP storm events such that the post-development discharge rates cannot exceed the pre-development discharge rates.

Table 44: Summary of Ponga Road Upgrade Indicative Wetland Design

Wetland	Catchment impervious area (m^2)	Catchment Chainage	Min. water surface area for PWV (m^2)	Min. water surface area for attenuation (m^2)
Wetland 1	10,296	1000-1660	268	824
Wetland 2	5,928	1660-2040	154	406

Wetland 1 is located further north to avoid mature trees alongside the corridor. Wetland 2 is considered further west to avoid an existing overland flow path and deep flood levels. The considerations given to the current wetland locations are summarized in Table 45.

Table 45: Considerations given to the current Ponga Road Upgrade wetland locations

Wetland	Flood plain (In or Out)	Downstream or Upstream (DS or US)	Terrain (Flat or Steep)	Existing Zoning	Likely Future Zoning	Greenfield or Brownfield (GF or BF)	Comments
Wetland 1	Out	DS	Steep	FUZ	Industrial	GF	Location to avoid mature trees
Wetland 2	Out	DS	Steep	FUZ	Residential	GF	Location to avoid existing overland flow path and deep flood levels

8.2.2.5 Road Surface Drainage

The proposed drainage system for Ponga Road includes a pipe system on both sides of the road that is proposed to drain to the low points of the catchment and discharge into the wetlands.

8.2.2.6 Stream Crossings

Over the western portion of the corridor, the upgrade follows the existing vertical alignment as far as possible to avoid any changes to the existing flood levels and to keep the existing minor culvert crossing intact with minor alterations by adding culvert extensions and new headwall and wingwall structures on both ends. Over the eastern portion, the alignment is raised in order to provide the required freeboard over Mangapū Stream and increase flood resilience by replacing the current major culvert crossing with a bridge structure. The bridge span may need to be revised to maintain flood flow through the crossing and to prevent increasing upstream flood levels. Another culvert crossing west of the bridge will remain intact with minor alterations by adding culvert extensions, new headwalls and wingwall structures on both ends.

8.3 Structural Design

Four new bridge structures are proposed within the Ponga Road and Ōpāheke Road corridors, crossing two streams, a road and the NIMT railway.

Table 46: Ponga Road and Ōpāheke Road Upgrade Bridge Details

Bridge	CH	Length	Spans	Skew Crossing	Freeboard
Ōpāheke Road Rural Upgrade					
Ōtūwairoa Stream Active Mode Bridges - 2 No.	1900	25m	Single	-	0* (11.6m Bridge Soffit, 12.2m Flood Level)
NIMT Rail Corridor and Walker Road	2350	80m	3 Spans (2 x 30m and 1 x 20m)	-	N/A
Ponga Road Upgrade					
Mangapū Stream	1930	35m	Single	27 degrees	1200mm

*For the Ōtūwairoa Stream Active Mode Bridges, the freeboard to the 100 year flood is less than NZTA standards due to the retainment of the existing road bridge, the level of which is approximately matched by the proposed adjacent structures.

8.4 Utilities Design

Where Ōpāheke Road crosses the NIMT rail line, the Watercare Waikato No.1 pipeline traverses the eastern approach of the bridge and heads north along Walker Road. The new bridge over the rail line has been shifted north of the existing road to avoid impact to this asset. Watercare have also advised that they propose to locate a new 450mm watermain in the vicinity of the SGA alignment, likely to be in front of the western abutment.

An existing Counties Power substation is located east of the Sutton Road intersection with Ōpāheke Road. At this location, road widening is accommodated on the north side, avoiding significant impact on this site. However, some works will be required to regrade the access. Further coordination with Counties Power is required as there are significant cables positioned beneath the existing access. [redacted]. High Voltage power lines run on the southern side of the road from the substation to approximately CH1080 of Ponga Road, where they traverse south.

An underground First Gas pipeline crosses Ponga Road (approx CH100) in a north-south direction. This pipeline is located within the proposed road designation, so any upgrade works to Ponga Road will require approval from First Gas.

While utility providers have been engaged through the design development process, no formal decisions have been made regarding the relocation or protection of the utilities. The conflicts are expected to be manageable, and the designation conditions will be used to inform future integration works.

Appendix 1. Preliminary Design Drawings

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OPAHEKE ROAD (URBAN) UPGRADE

NIMT

OPAHEKE ROAD (RURAL) UPGRADE

PONGA ROAD UPGRADE

OPAHEKE NORTH-SOUTH FTN ARTERIAL

WAIHOEHOE ROAD (WEST) FTN UPGRADE

WAIHOEHOE ROAD (EAST) UPGRADE

BREMNER ROAD FTN UPGRADE

JESMOND ROAD FTN UPGRADE

STATE HIGHWAY 22 UPGRADE

PAPAKURA

OPAHEKE

DRURY WEST

DRURY EAST

DRURY SOUTH

OPAHEKE ROAD
BEACH ROAD
ROSEHILL DRIVE
BOUNDARY ROAD
HUNUA ROAD
DOMINION ROAD
HINGAIA ROAD
HINAU ROAD
HAYFIELD WAY
OAKLAND ROAD
KUHANUI DRIVE
CHICHESTER DRIVE
BELLFIELD ROAD
TATARIKI STREET
NGAKORO ROAD
PARK ESTATE ROAD
GATLAND ROAD
PARKHAVEN DRIVE
WALKER ROAD
SUTTON ROAD
PONGA ROAD
JACK PATERSON ROAD
KAURI VIEW ROAD
COAL MINE ROAD
KAHUI PTE
GREAT SOUTH ROAD
SOUTH
BREMNER ROAD
APPLEBY ROAD
ORPA ROAD
TRIBUTRARY PTE
VICTORIA STREET
JESMOND ROAD
BURBERRY ROAD
RUMAGAN ROAD
TARAIRE DRIVE
FIELDING ROAD
COSSEY ROAD
BROOKFIELD ROAD
FITZGERALD ROAD
PITT ROAD
DRURY HILLS ROAD
MACWHINNEY DRIVE
SH22
KARAKA ROAD
QUARRY ROAD

LEGEND

- NoR D1
- NoR D2
- NoR D3
- NoR D4
- NoR D5
- STATE HIGHWAY 1
- STATE HIGHWAY 22
- RAIL NETWORK (NIMT)

ORIGINAL IN COLOUR

DRURY ARTERIAL NETWORK - OVERALL LAYOUT PLAN

NTS

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	18.12.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	18.12.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

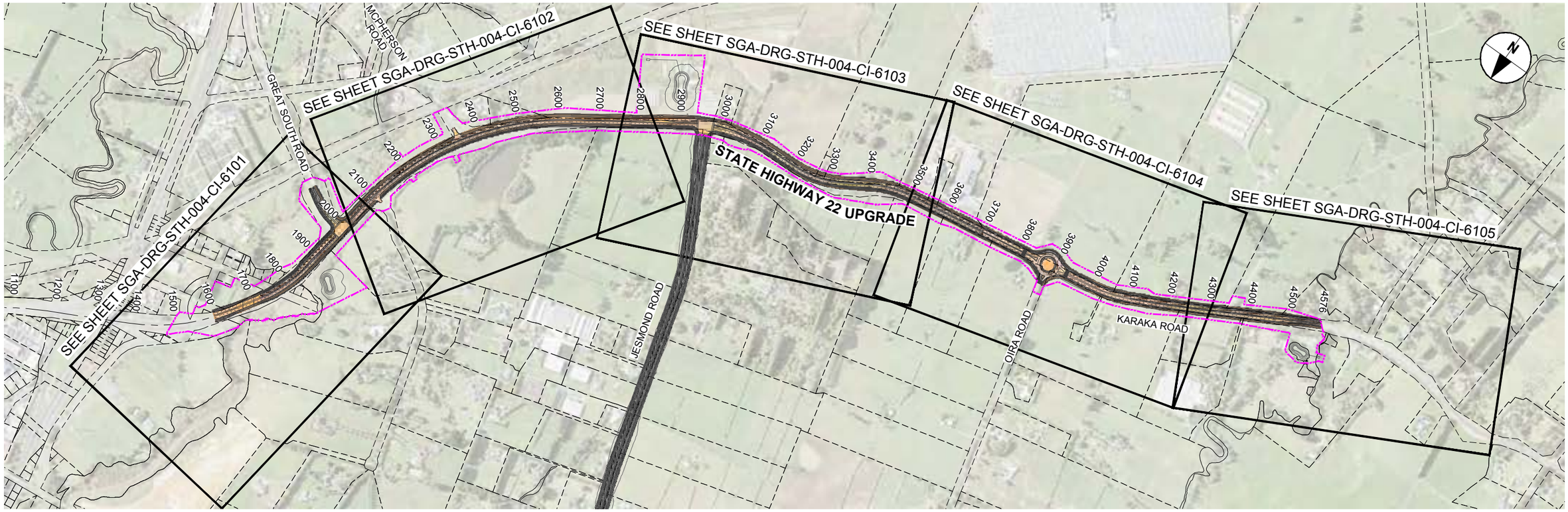
WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY ARTERIAL NETWORK

Drawing Title: OVERALL LAYOUT PLAN

Drawing Status: **FOR APPROVAL**
Drawing Date: 18.12.2019
A1 Scales: NTS | A3 Scales: NTS
Discipline:
Drawing No.: SGA-DRG-STH-004-GE-0001
Revision: D

ORIGINAL SIZE A1



STATE HIGHWAY 22 UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - STATE HIGHWAY 22 UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-6000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-6101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 5	D
SGA-DRG-STH-004-CI-6102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 5	D
SGA-DRG-STH-004-CI-6103	GENERAL ARRANGEMENT PLAN - SHEET 3 OF 5	D
SGA-DRG-STH-004-CI-6104	GENERAL ARRANGEMENT PLAN - SHEET 4 OF 5	D
SGA-DRG-STH-004-CI-6105	GENERAL ARRANGEMENT PLAN - SHEET 5 OF 5	D
SGA-DRG-STH-004-CI-6201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 5	D
SGA-DRG-STH-004-CI-6202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 5	D
SGA-DRG-STH-004-CI-6203	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 5	D
SGA-DRG-STH-004-CI-6204	PLAN & LONGITUDINAL SECTION - SHEET 4 OF 5	D
SGA-DRG-STH-004-CI-6205	PLAN & LONGITUDINAL SECTION - SHEET 5 OF 5	D
SGA-DRG-STH-004-CI-6301	TYPICAL CROSS SECTION	D
SGA-DRG-STH-004-ST-6720	FOUR LANE BRIDGE TYPICAL CROSS SECTION	D

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE..

2.2. WETLAND SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO:

- ATTENUATE THE 10% AEP AND 1% AEP; AND
- PROVIDE TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01.

2.3. WETLANDS DISCHARGE INTO EXISTING STREAMS OR OVERLAND FLOW PATHS AS SHOWN ON LAYOUT.

2.4. EXISTING CULVERTS TO BE MODIFIED WITH LENGTH EXTENSIONS AND NEW INLET AND OUTLET STRUCTURES.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

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NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
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SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: FOR APPROVAL

Drawing Date: 27.11.2019

A1 Scales 1:5000 | A3 Scales 1:10000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-GE-6000

Revision: D

ORIGINAL SIZE A1

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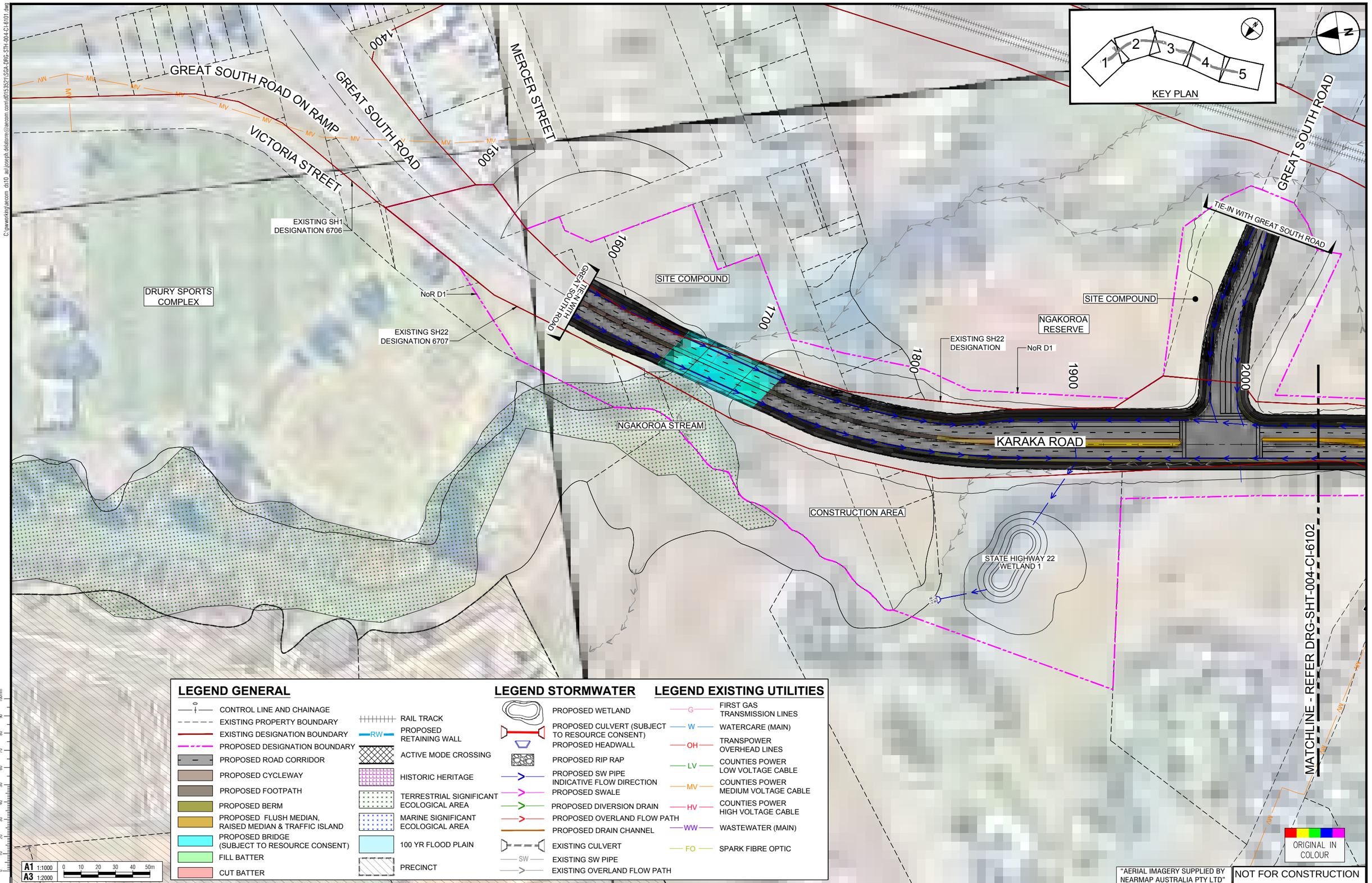

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE
- INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

A1 1:1000 / A3 1:2000 — 0 10 20 30 40 50m

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NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 27.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-6101
Revision: D

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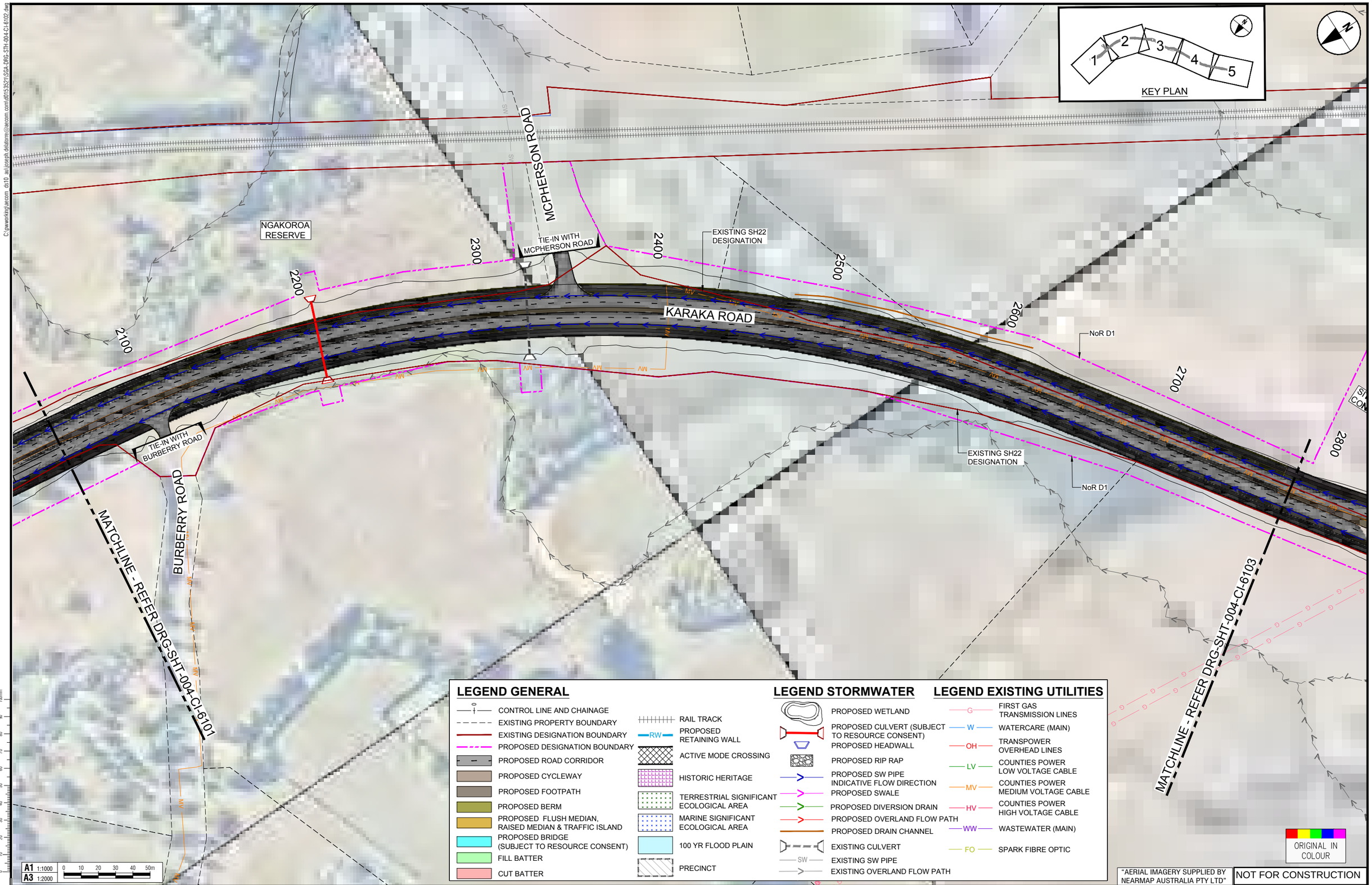

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE
- INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES
- WATERCARE (MAIN)
- TRANSPOWER OVERHEAD LINES
- COUNTIES POWER LOW VOLTAGE CABLE
- COUNTIES POWER MEDIUM VOLTAGE CABLE
- COUNTIES POWER HIGH VOLTAGE CABLE
- WASTEWATER (MAIN)
- SPARK FIBRE OPTIC

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

ORIGINAL SIZE A1

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 27.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-6102

Revision: D

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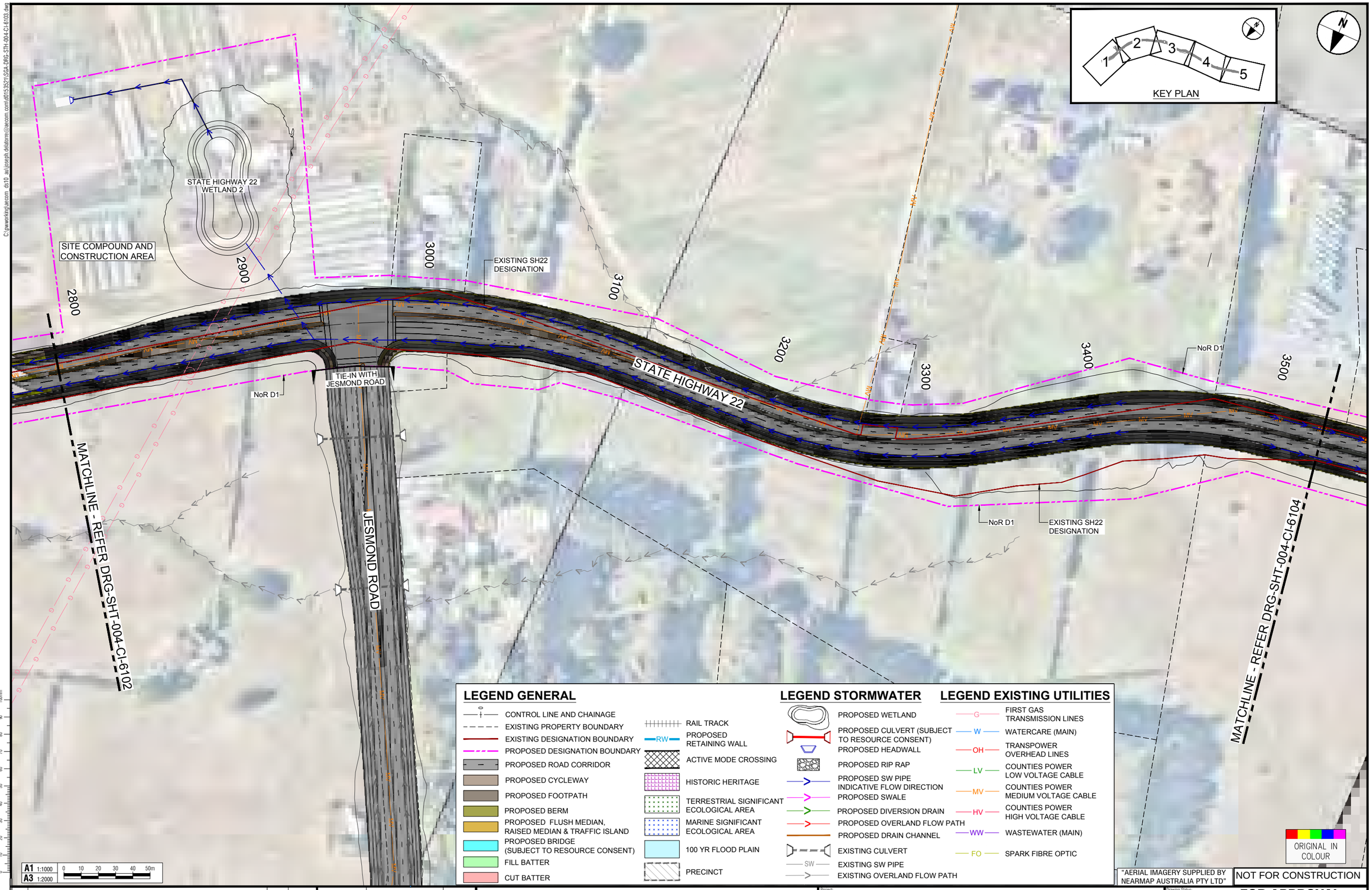

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 3 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 27.11.2019

A1 Scales	1:1000	A3 Scales	1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-6103

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3 4 5

N

MATCHLINE - REFER DRG-SHT-004-CI-6105

MATCHLINE - REFER DRG-SHT-004-CI-6103

EXISTING SH22 DESIGNATION

EXISTING SH22 DESIGNATION

KARAKA ROAD

OIRA ROAD

TIE-IN WITH OIRA ROAD

NoR D1

3500 3600 3700 3800 3900 4000 4100 4200 4300

A1 1:1000 A3 1:2000 0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 4 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 27.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-6104

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RURAL URBAN BOUNDARY
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3 4 5

N

4300 4400 4500 4576

WOODLYN DRIVE

KARAKA ROAD

TEMUWITH KARAKA ROAD

CONSTRUCTION AREA

STATE HIGHWAY 22 WETLAND 3

RURAL URBAN BOUNDARY

MATCHLINE - REFER DRG-SHT-004-CI-6104

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

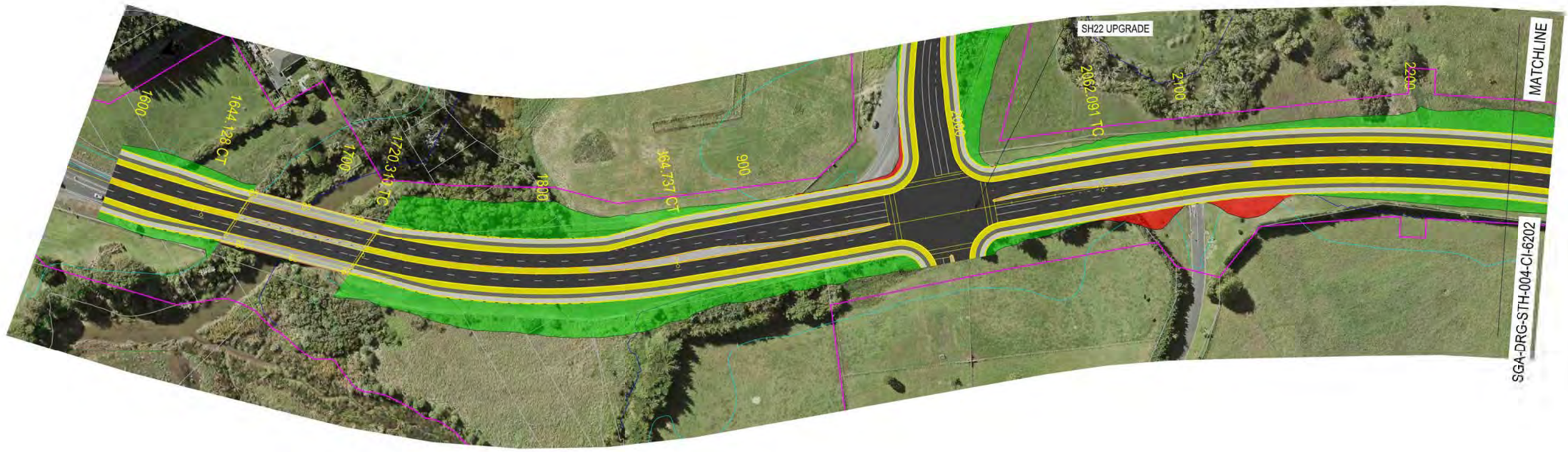
WAKA KOTAHI NZ TRANSPORT AGENCY

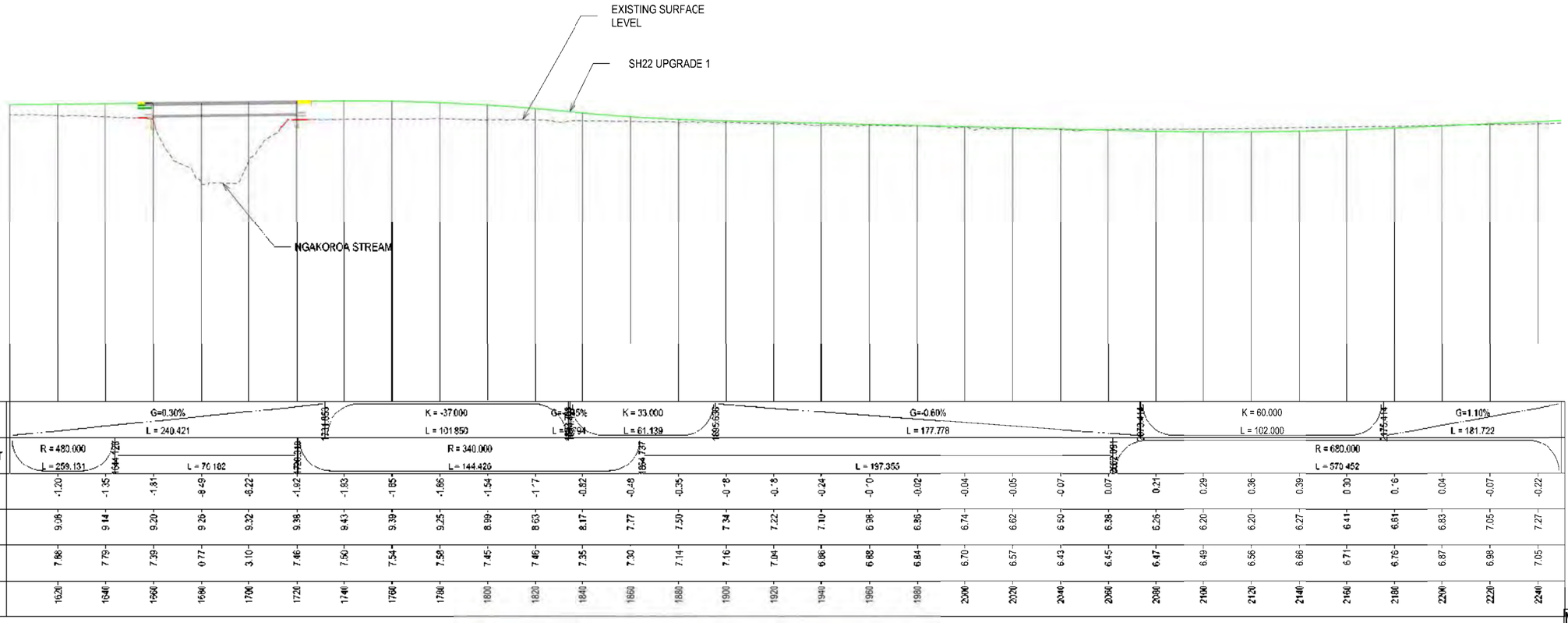
Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 5 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 27.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-6105
Revision: D

ORIGINAL SIZE A1





NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY LOCAL - SH22 UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 1 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Contact Number: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-6201
Revision: D

A1 ORIGINAL SIZE

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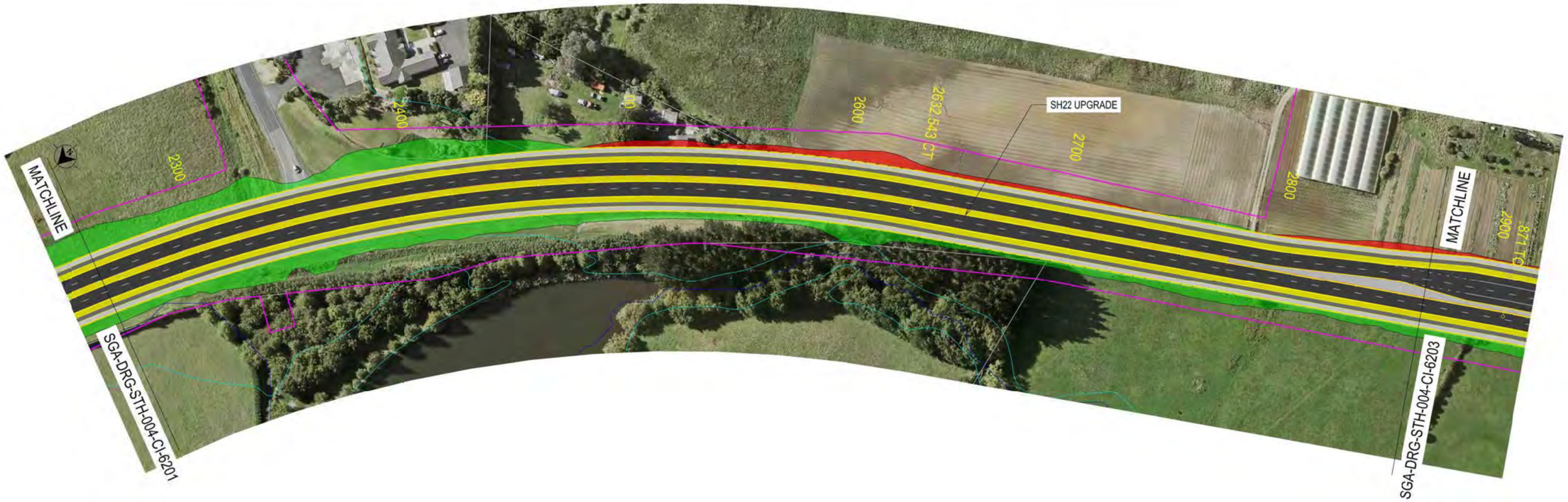

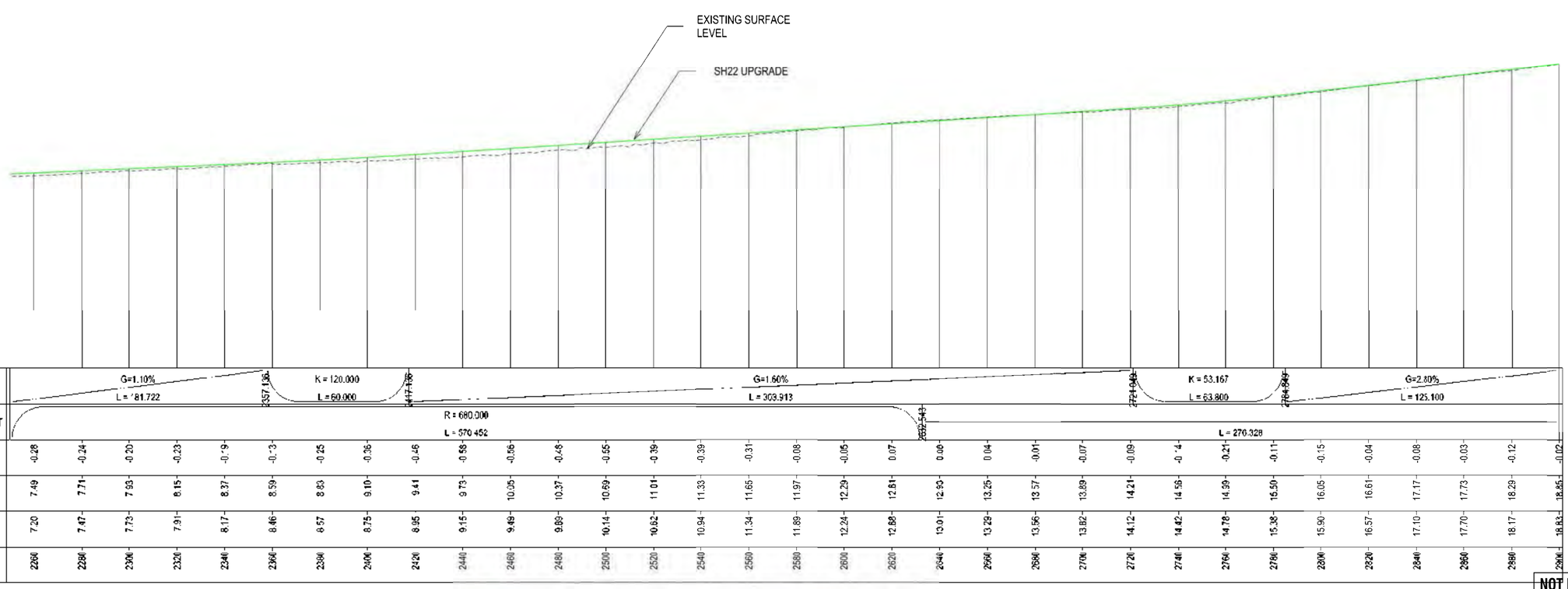

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY LOCAL - SH22 UPGRADE (PART OF NOR D5)

Drawing Title: PLAN AND LONGITUDINAL SECTION
SHEET 2 OF 5

Drawing Status: FOR APPROVAL
Drawing Date: 14.02.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Datum / Horizon: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-6202
Revision: D

ORIGINAL SIZE A1

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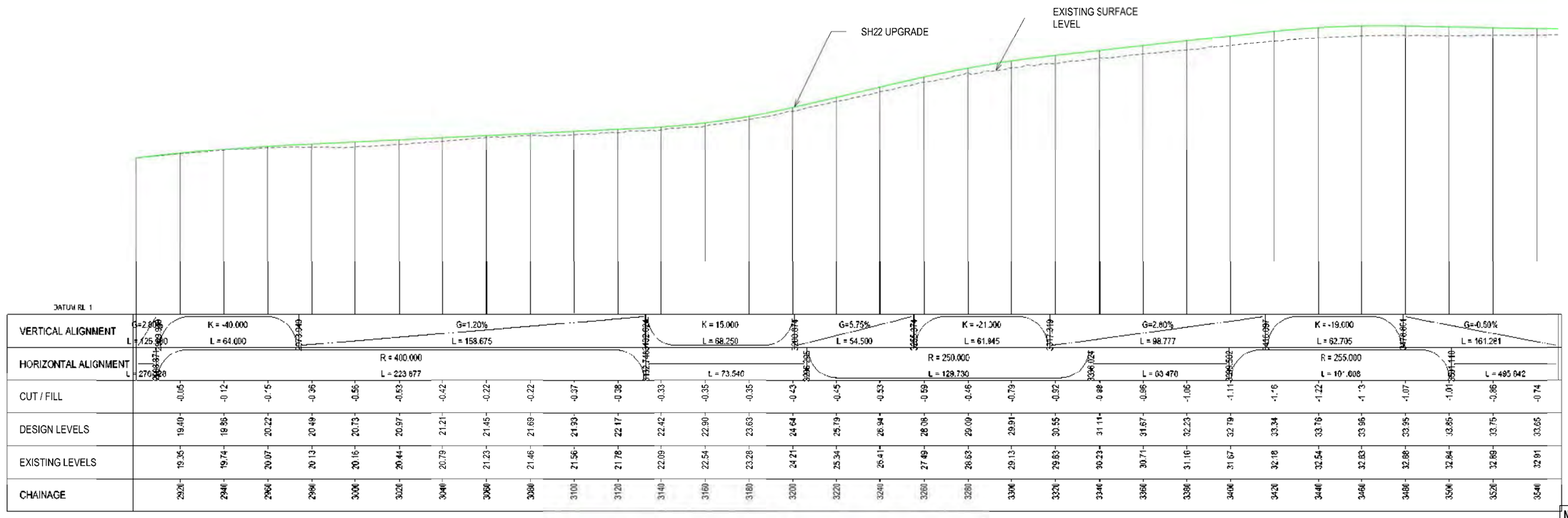

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	FB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	FB	01.10.19
DESIGN REVIEW	RJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY LOCAL - SH22 UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 3 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
Drawing Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Datum/Elevation: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-6203
Revision: D

ORIGINAL SIZE A1

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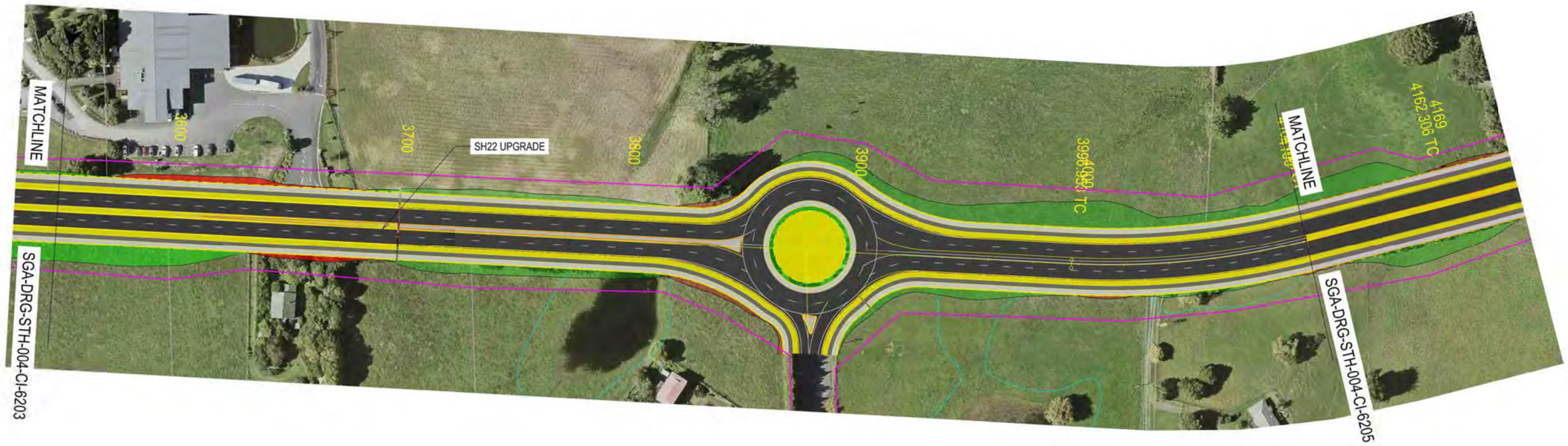

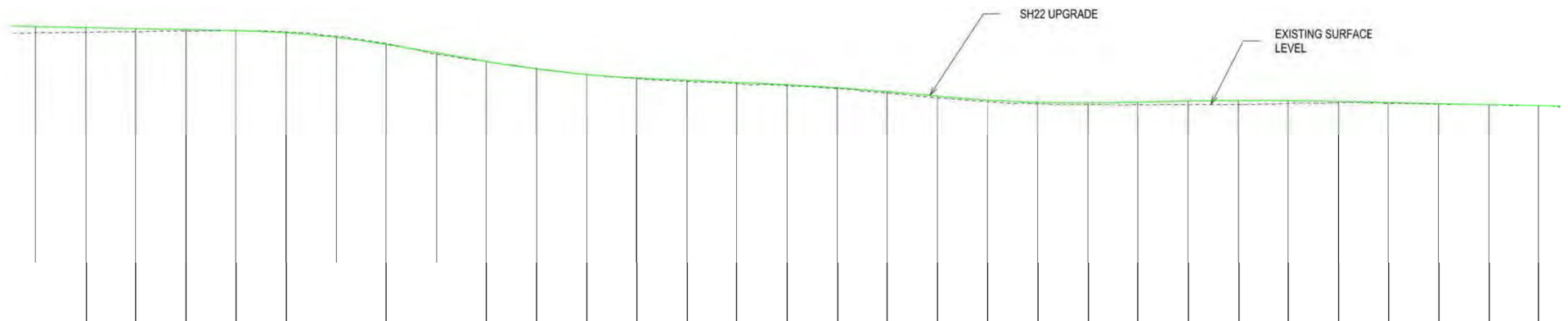

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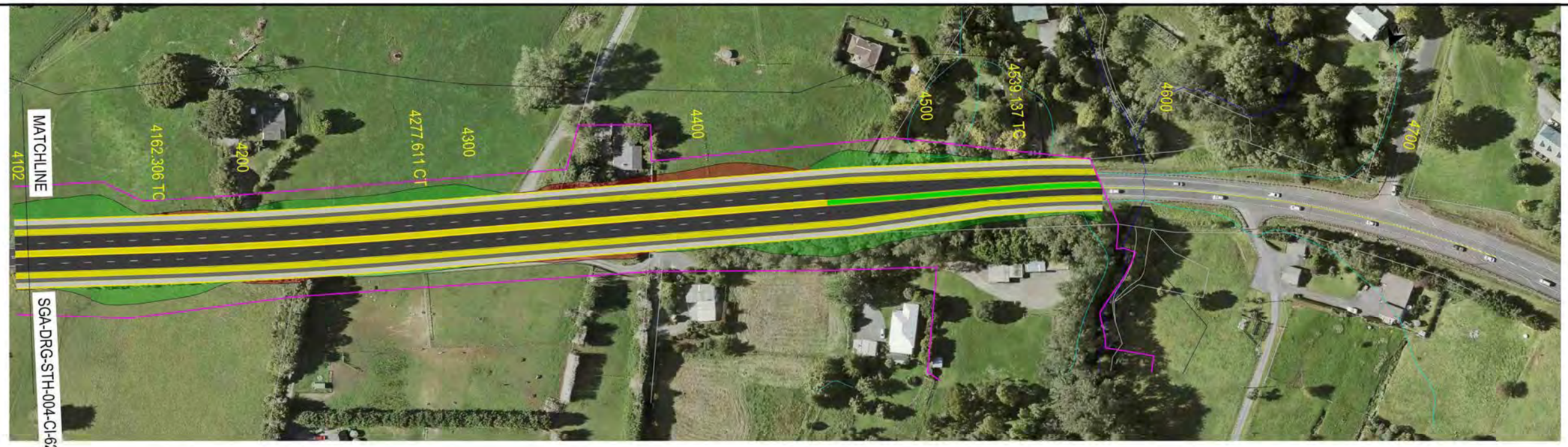

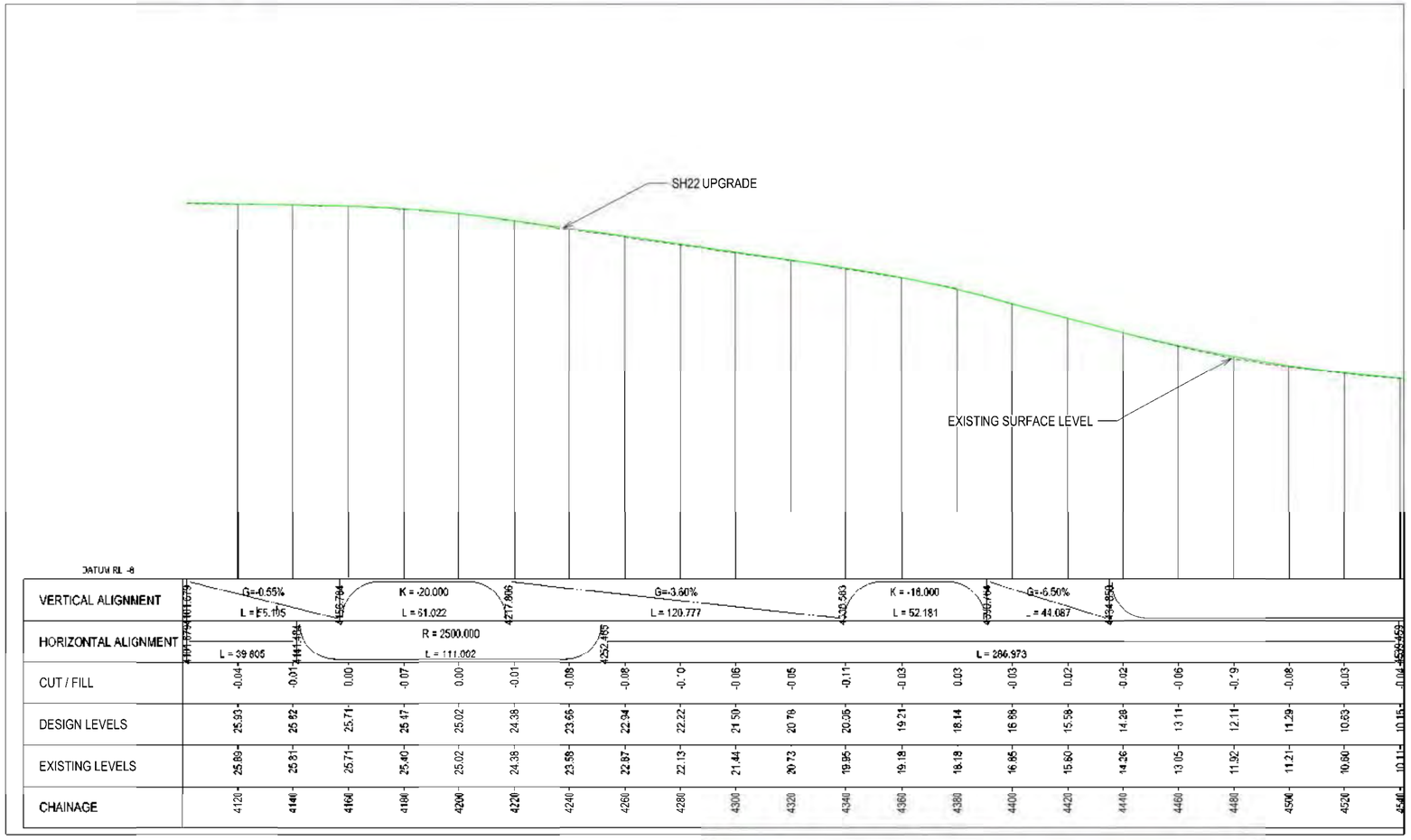

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
C	ISSUED FOR APPROVAL	DD	21.07.20
B	ISSUED FOR ENGAGEMENT	DD	15.05.20
A	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20

SURVEYED		
DRAWN	RB	26.02.20
DRAWING CHECK	NG	28.02.20
DESIGN	RB	26.02.20
DESIGN REVIEW		
APPROVED	RM	28.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - SH22 UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET - 5 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
A1 System: 1:1000H 1:250V | A3 System: 1:2000H 1:500V
Datum/Elevation: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-6205
Revision: C

ORIGINAL SIZE A1

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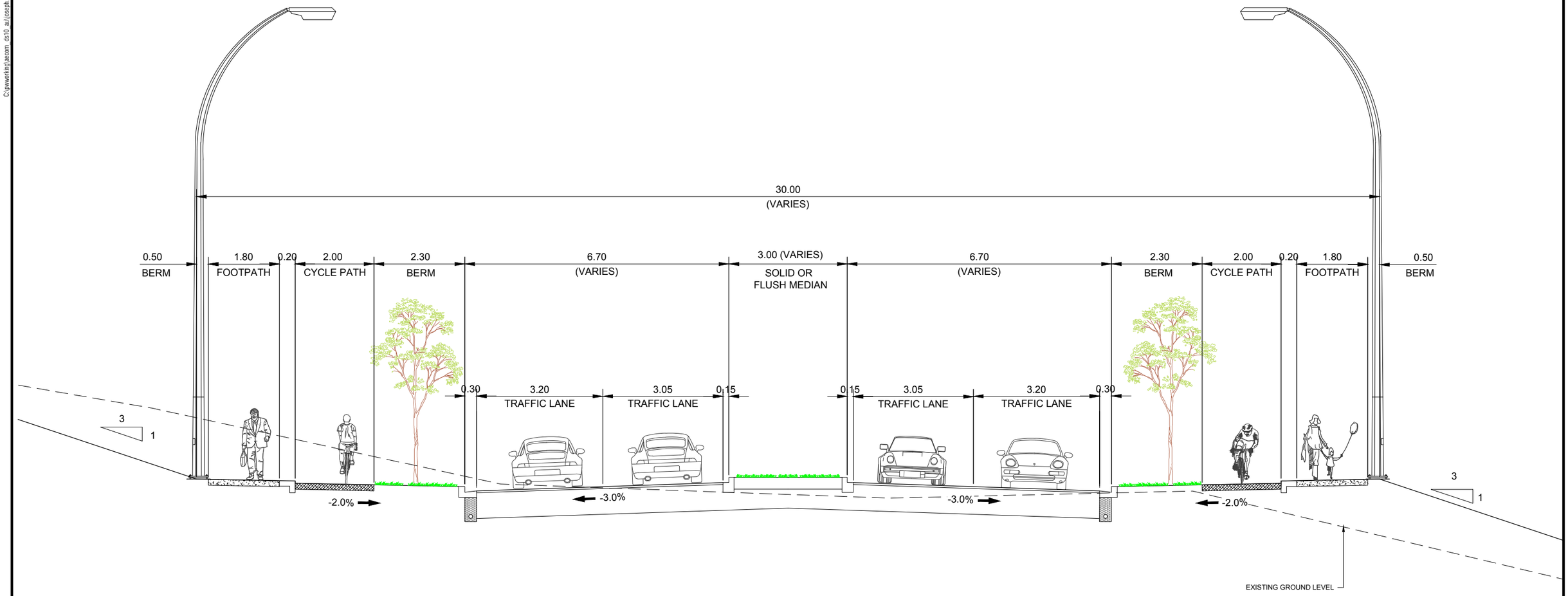

A | TYPCAL CROSS SECTION

Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50 | **A3** 1:100 — 0 — 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	25.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	25.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 25.11.2019

A1 Scales: 1:50 | A3 Scales: 1:100

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-6301

Revision: **D**

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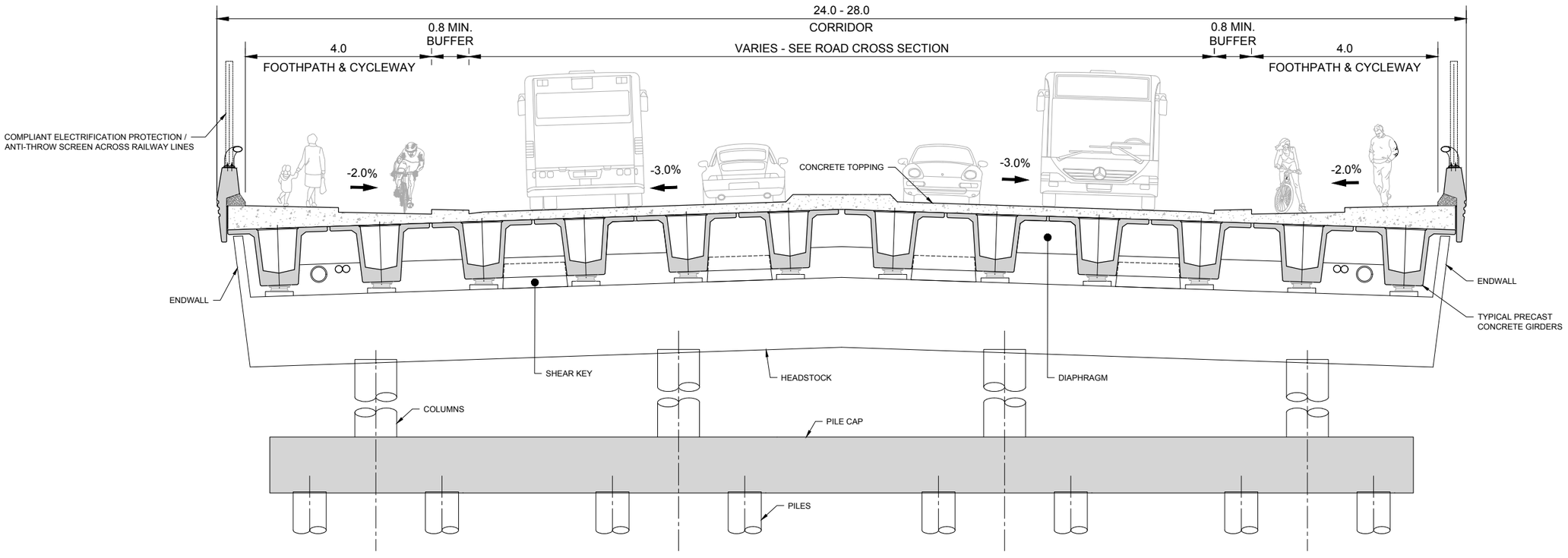
NOTES:

1. BRIDGE DESIGN IS INDICATIVE ONLY.
2. UNLESS NOTED OTHERWISE, UTILITIES SHOWN ARE INDICATIVE ONLY



TYPICAL CROSS SECTION - FOUR LANE BRIDGE

Scale : NTS

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	AG	21.07.2020
C	ISSUED FOR ENGAGEMENT	JT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	AG	28.02.2020
A	DRAFT ISSUE FOR REVIEW	AG	14.02.2020

SURVEYED		
DRAWN	A. GARCIA	14.01.20
DRAWING CHECK	J. DELA TORRE	14.01.20
DESIGN	A. REVELL	14.01.20
DESIGN REVIEW	K. CRAWFORD	14.01.20
APPROVED	R. MASON	14.01.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - STATE HIGHWAY 22 UPGRADE (NoR D1)

Drawing Title: FOUR LANE BRIDGE TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 14-01-2020
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURE
Drawing No.: SGA-DRG-STH-004-ST-6720
Revision: D

ORIGINAL SIZE A1

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NoR D2 LOCATION PLAN

SCALE 1:5000

GENERAL

1.1 NoR D2 INCLUDES THE FOLLOWING SECTIONS:

- JESMOND ROAD FTN UPGRADE
- BREMNER ROAD FTN UPGRADE
- WAIHOEHOE ROAD (WEST) FTN UPGRADE

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
B	REISSUED FOR APPROVAL	JDT	24.07.2020
A	ISSUED FOR APPRROVAL	JDT	21.07.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.07.2020
DRAWING CHECK	J. DELA TORRE	16.07.2020
DESIGN	R. BELTRAN	16.07.2020
DESIGN REVIEW	N. GUO	16.07.2020
APPROVED	R. MASON	16.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - NoR D2

Drawing Title: SUMMARY SHEET

Drawing Status: FOR APPROVAL

Drawing Date: 16.07.2020

A1 Scales 1:5000 | A3 Scales 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-0950

Revision: B

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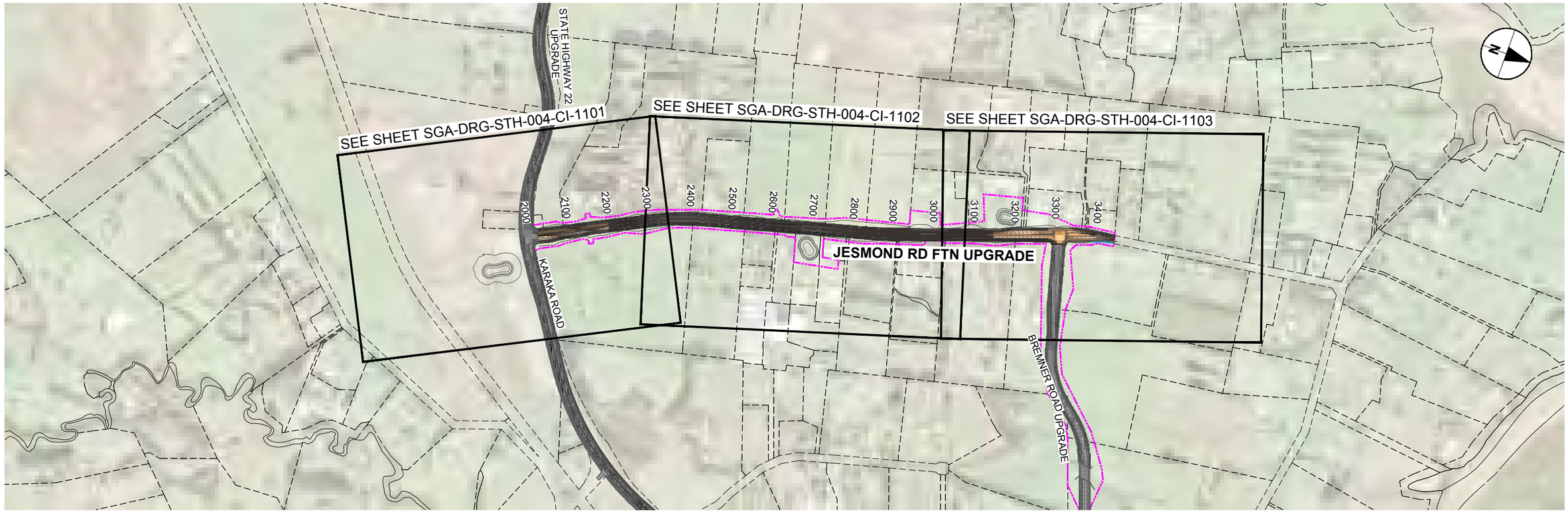

JESMOND ROAD FTN UPGRADE LOCATION PLAN
Scale 1:5000

DRAWING LIST - DRURY LOCAL - JESMOND ROAD FTN UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-1000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	E
SGA-DRG-STH-004-CI-1101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 3	E
SGA-DRG-STH-004-CI-1102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 3	E
SGA-DRG-STH-004-CI-1103	GENERAL ARRANGEMENT PLAN - SHEET 3 OF 3	E
SGA-DRG-STH-004-CI-1201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 3	E
SGA-DRG-STH-004-CI-1202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 3	E
SGA-DRG-STH-004-CI-1203	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 3	E
SGA-DRG-STH-004-CI-1301	TYPICAL CROSS SECTION	E

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS ARE INCLUDED IN THE GA's FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1. THE STORMWATER DESIGN IS INDICATIVE.

2.2 SWALES BETWEEN CH.3080 - CH.3400 DESIGNED TO CONVEY 10% AEP TO JESMOND WETLAND 3. SWALES FROM CH.3400 - END TO CONNECT TO EXISTING SWALES.

2.3 WETLAND SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO:

- ATTENUATE THE 10% AEP AND 1% AEP; AND
- PROVIDE TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01

2.4 WETLAND 1, 2, AND 3 DISCHARGE INTO NEARBY OVERLAND FLOW PATHS OR STREAMS

2.5 EXISTING CULVERTS TO BE MODIFIED WITH LENGTH EXTENSIONS AND NEW INLET AND OUTLET STRUCTURES.

2.6 CUT OFF DRAINS ALONG CUT AND FILL EMBANKMENTS.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	21.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	21.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:5000 | A3 Scales 1:10000
Discipline: GENERAL
Drawing No.: SGA-DRG-STH-004-GE-1000
Revision: E

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3

STATE HIGHWAY 22

2000 2100 2200 2300

MATCHLINE - REFER DRG-SHT-004-CI-1102

NoR D2

JESMOND ROAD

TIE-IN WITH STATE HIGHWAY 22

KIWI RAIL DESIGNATION 6302

NIMT

WAKA KOTAHI DESIGNATION 6707

A1 1:1000 | A3 1:2000 — 0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
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C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 2

Drawing Status: FOR APPROVAL

Drawing Date: 21.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No: SGA-DRG-STH-004-CI-1101

Revision: E

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3

2300 2400 2500 NoR D2 2600 2700 2800 2900 3000

MATCHLINE - REFER DRG-SHT-004-CI-1101

MATCHLINE - REFER DRG-SHT-004-CI-1103

JESMOND WETLAND 1

MV

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-1102
Revision: E

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3

CONSTRUCTION AREA

JESMOND WETLAND 2

SITE COMPOUND

3100 3200 3300 3400

TIE-IN WITH BREMNER ROAD FTN UPGRADE

TIE-IN WITH BREMNER ROAD

NoR D2

NoR D2

MATCHLINE - REFER DRG-SHT-004-CI-1102

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

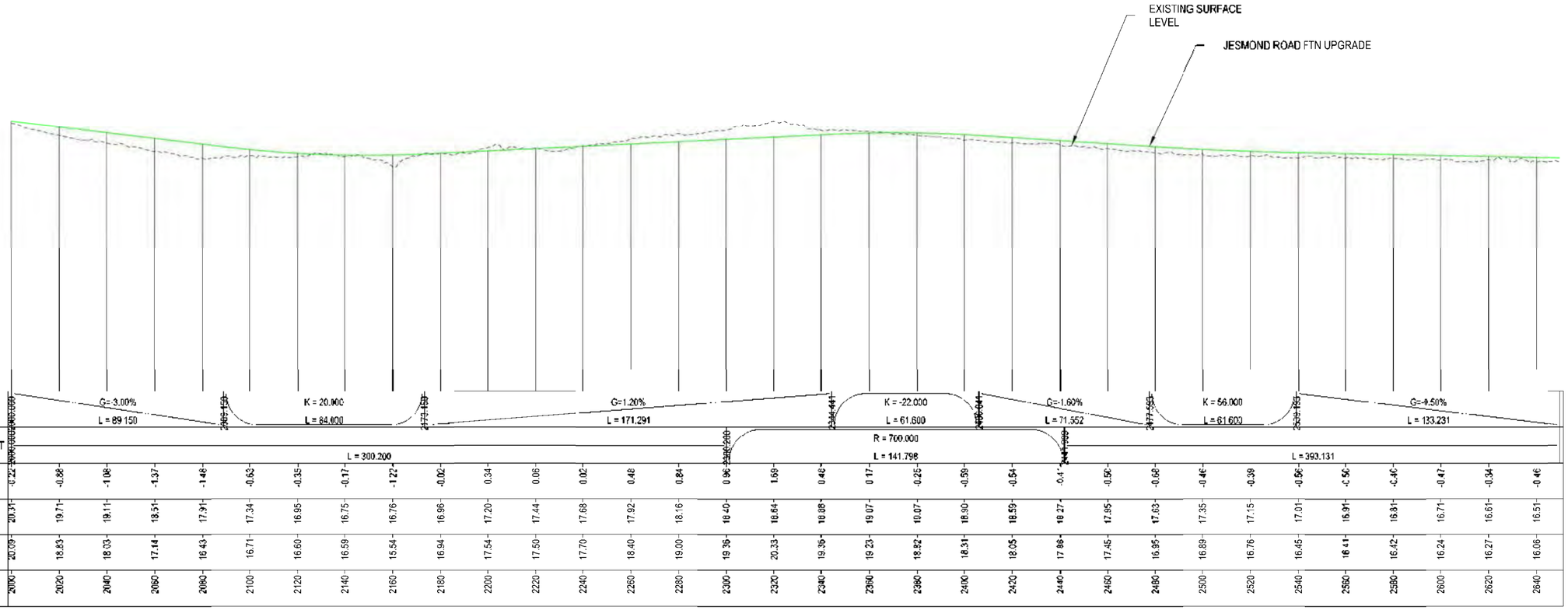
Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 3 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-1103
Revision: E

ORIGINAL SIZE A1





NOT FOR CONSTRUCTION

FOR APPROVAL

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	DD	24.07.20
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	26.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NC	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME

DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: PLAN AND LONGITUDINAL SECTION

SHEET 1 OF 3

Drawing Status: FOR APPROVAL

Drawing Date: 14.02.20

A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V

Datum / Elevation: C.00000.00 (AT)

Drawing No.: SGA-DRG-STH-004-CI-1201

Revision: E

ORIGINAL SIZE A1

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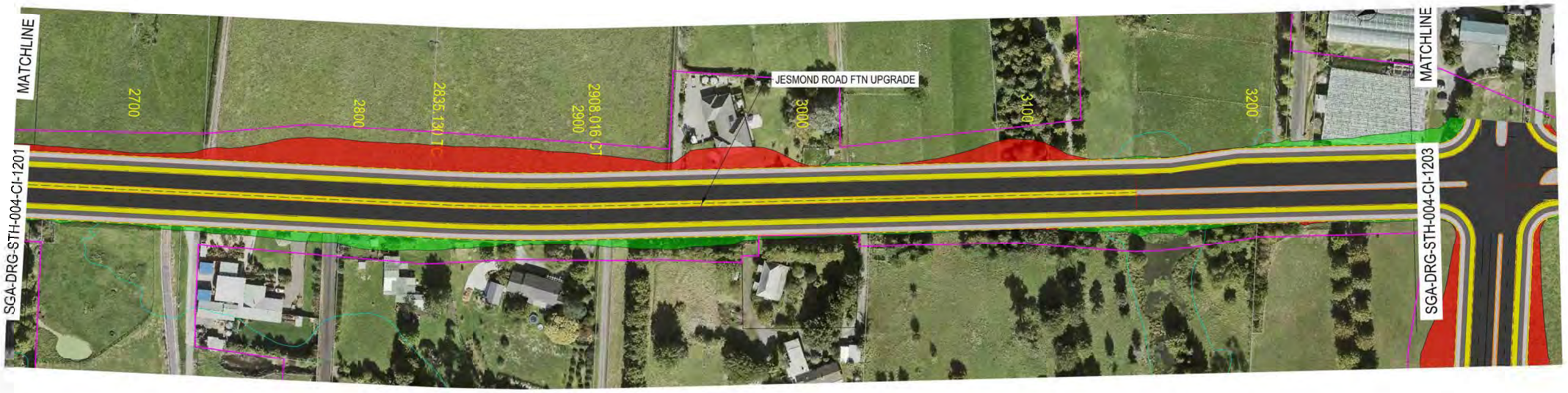

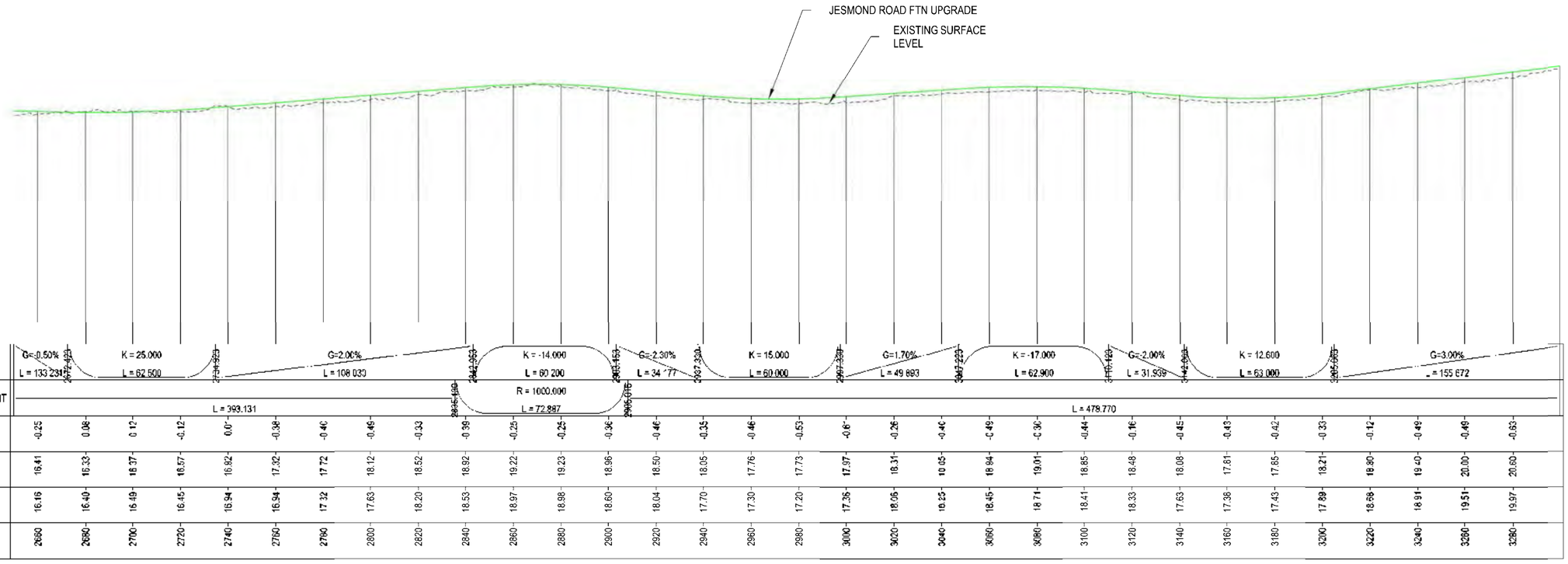

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	DD	24.07.20
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 2 OF 3

NOT FOR CONSTRUCTION
FOR APPROVAL

Drawing Date: 14.02.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Datum/Projection: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-1202
Revision: E

ORIGINAL SIZE A1

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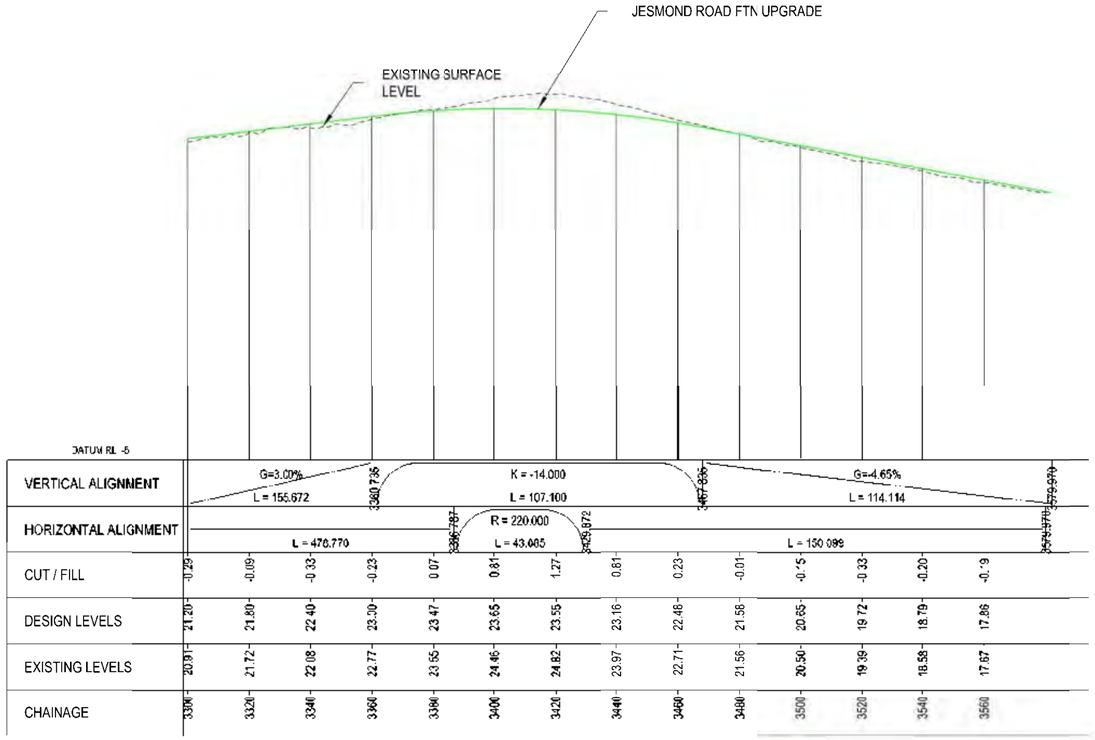

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR PRROVAL	DD	24.07.20
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	26.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	FB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	FB	01.10.19
DESIGN REVIEW	RJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 3 OF 3

NOT FOR CONSTRUCTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 14.02.20

A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V

Datum / Number: C.00000.00 (AT)

Drawing No.: SGA-DRG-STH-004-CI-1203

Revision: E

ORIGINAL SIZE A1

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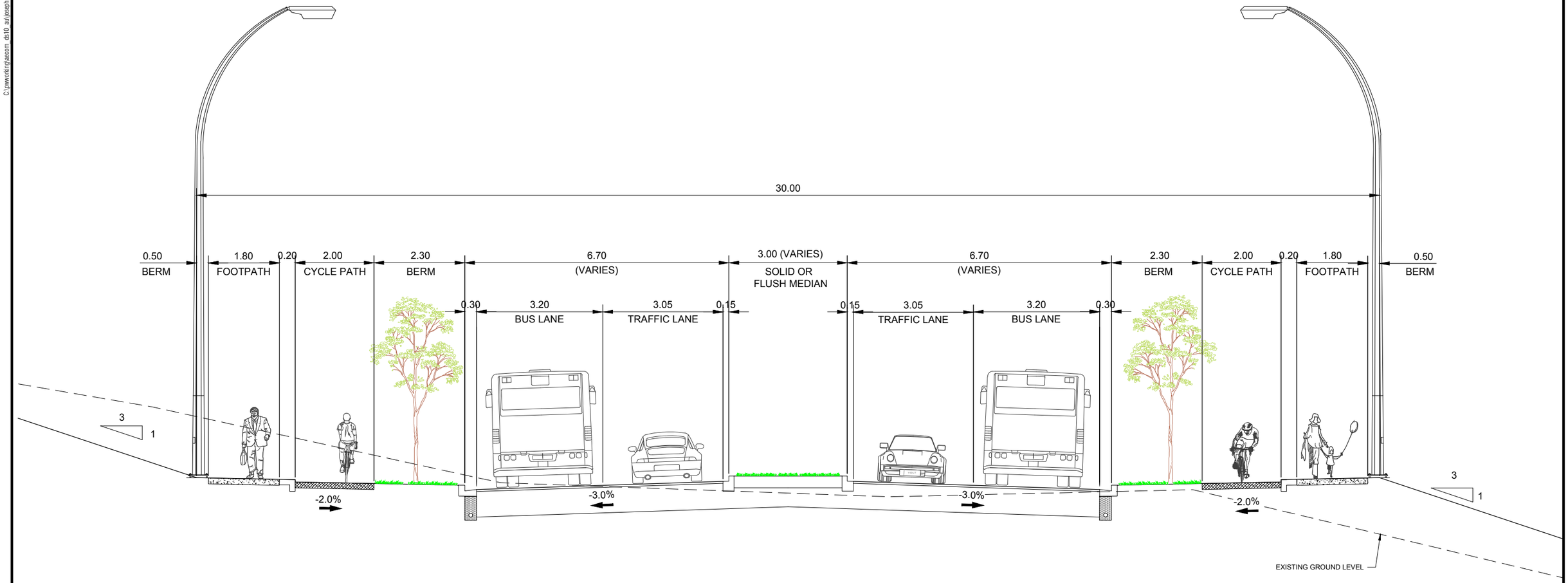

A | TYPCAL CROSS SECTION
Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50 | A3 1:100 — 0 — 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	21.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
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DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - JESMOND ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

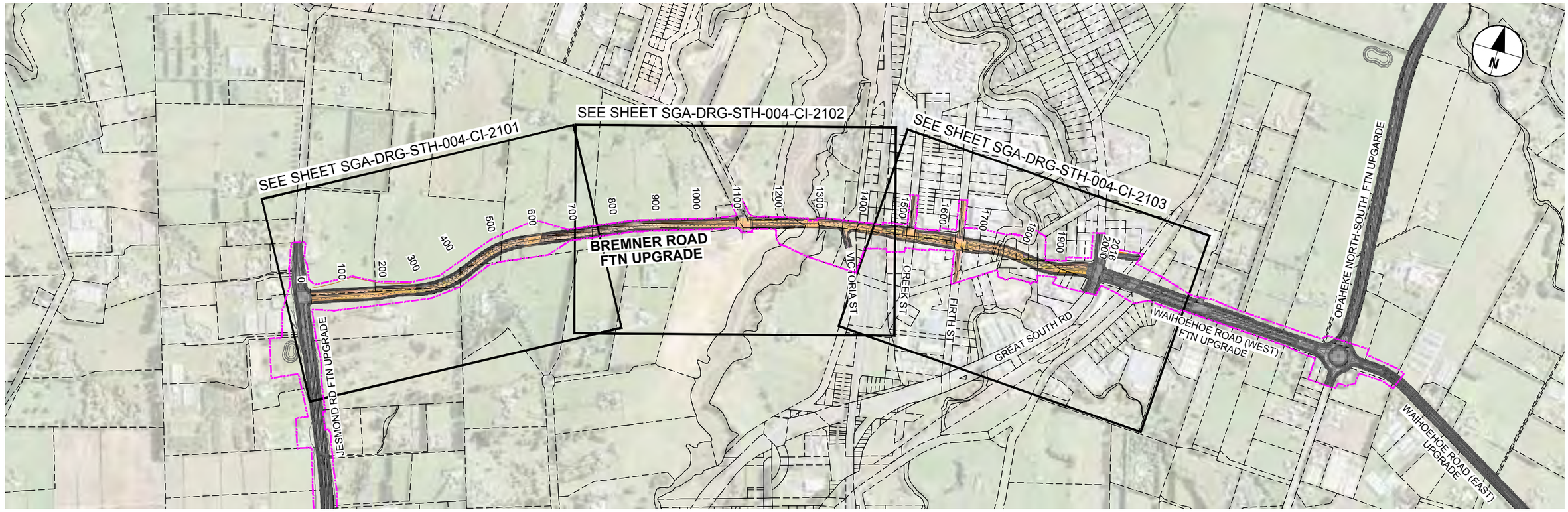
A1 Scales 1:50 | A3 Scales 1:100

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-1301

Revision: E

C:\pwworking\jacosm_ds10_ou\josephdelatorre@aecom.com\d0153529\SGA-DRG-STH-004-GE-2000.dwg



BREMNER ROAD FTN UPGRADE LOCATION PLAN

SCALE 1:5000

DRAWING LIST - DRURY LOCAL - BREMNER ROAD FTN UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-2000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	F
SGA-DRG-STH-004-CI-2101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 3	E
SGA-DRG-STH-004-CI-2102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 3	F
SGA-DRG-STH-004-CI-2103	GENERAL ARRANGEMENT PLAN - SHEET 3 OF 3	F
SGA-DRG-STH-004-CI-2201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 4	E
SGA-DRG-STH-004-CI-2202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 4	E
SGA-DRG-STH-004-CI-2203	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 4	E
SGA-DRG-STH-004-CI-2204	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 4	E
SGA-DRG-STH-004-CI-2301	TYPICAL CROSS SECTIONS	E
SGA-DRG-STH-004-ST-2720	FOUR LANE BRIDGE TYPICAL CROSS SECTIONS	D

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE.

2.2 THE DESIGN IS BASED ON THE UPGRADED ROAD HAVING:

- KERB AND CHANNEL WITH CATCHPITS PROVIDED ON BOTH SIDES OF THE ROAD AT AN AVERAGE OF 60m CENTRES.

2.3 RAINGARDENS ARE INDICATIVE ONLY AND PLACED ON BOTH SIDES OF THE ROAD AT AN AVERAGE OF 60m CENTRES. RAINGARDENS DESIGNED FOR RETENTION, DETENTION AND TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINES.

2.4 STORMWATER DISCHARGE LOCATIONS TBC AT DETAILED DESIGN OVER EXTENT OF SHEETS CI-2101 AND CI-2102.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
F	UPDATED CADASTRAL BOUNDARIES	JDT	30.07.2020
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	21.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	21.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

A1 Scales: 1:5000 | A3 Scales: 1:10000

Discipline: GEBERAL

Drawing No.: SGA-DRG-STH-004-GE-2000

Revision: F

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3

TIE-IN TO EXISTING ROAD

TIE-IN WITH JESMOND ROAD

JESMOND ROAD

0 100 200 300 400 500 600 700

NoR D2

NoR D2

AURANGA STAGE 8 ROAD DEVELOPMENT

MATCHLINE - REFER DRG-SHT-004-CI-2102

CONSTRUCTION AREA

POTENTIAL STREAM REALIGNMENT SUBJECT TO RESOURCE CONSENT

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.20.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 3

Drawing Status: FOR APPROVAL

Drawing Date: 16.12.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-2101

Revision: E

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- NOTABLE TREES
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

KEY PLAN

1 2 3

N

AURANGA STAGE 8 ROAD DEVELOPMENT

BREMNER ROAD

TIE-IN WITH BREMNER ROAD

TIE-IN TO EXISTING ROAD

BRIDGE CONSTRUCTION AREA

BRIDGE CONSTRUCTION AREA

TIE-IN WITH VICTORIA STREET

NoR D2

800 900 1000 1100 1200 1300 1400

MATCHLINE - REFER DRG-SHT-004-CI-2101

MATCHLINE - REFER DRG-SHT-004-CI-2103

NGAKAROA STREAM

DRURY SPORTS COMPLEX

VICTORIA STREET

SOUTHERN MOTORWAY

GREAT SOUTH ROAD OFF RAMP

ORIGINAL IN COLOUR

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
F	UPDATED CADASTRAL BOUNDARIES	JDT	30.07.2020
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.20.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 16.12.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-2102
Revision: F

ORIGINAL SIZE A1

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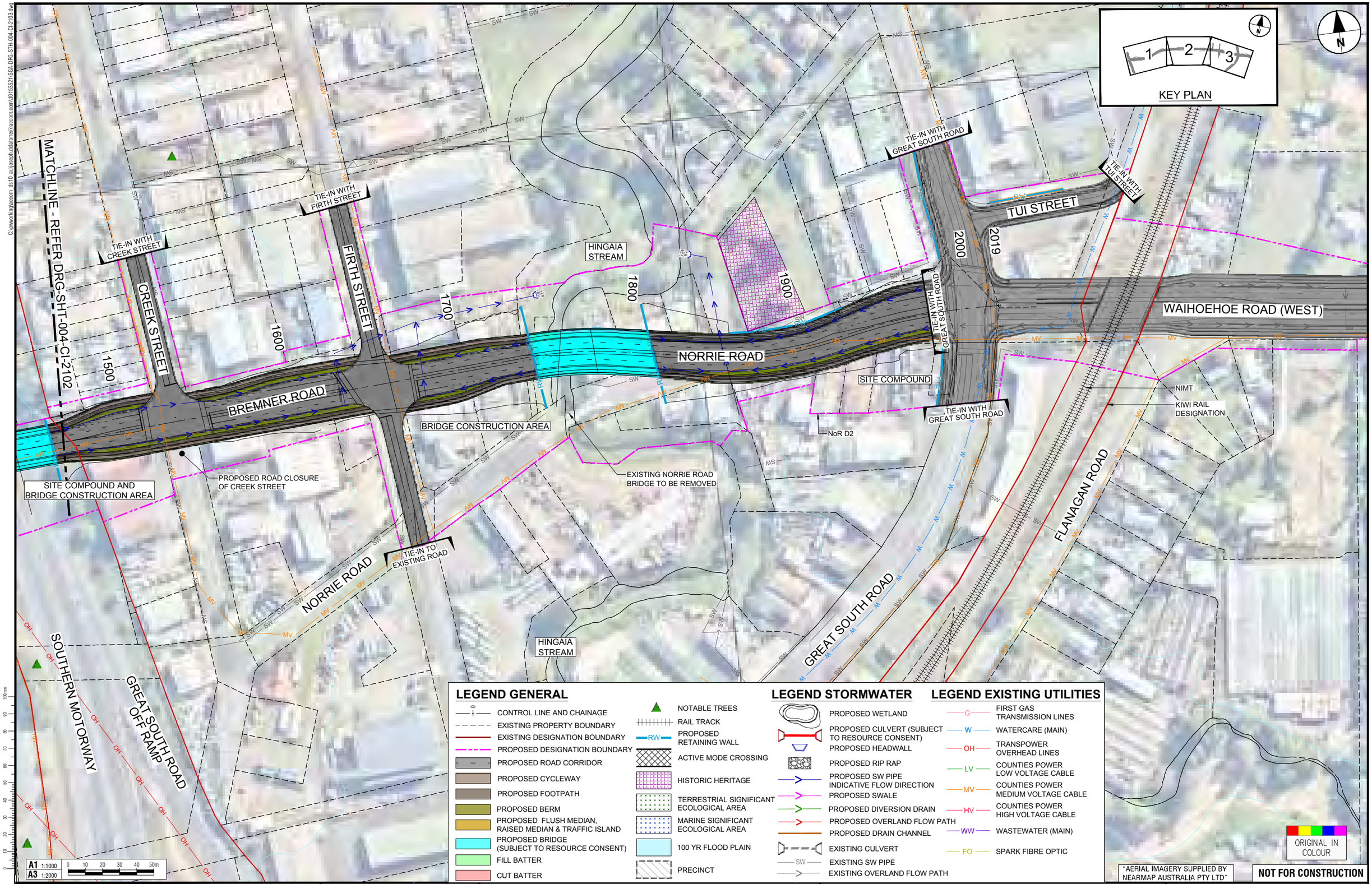

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
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- CUT BATTER
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- MARINE SIGNIFICANT ECOLOGICAL AREA
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- PRECINCT

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- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
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- PROPOSED RIP RAP
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- PROPOSED DRAIN CHANNEL
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- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

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- W — WATERCARE (MAIN)
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- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
F	UPDATED CADASTRAL BOUNDARIES	JDT	30.07.2020
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.20.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 3 OF 3

Drawing Status: **FOR APPROVAL**

Drawing Date: 16.12.2019

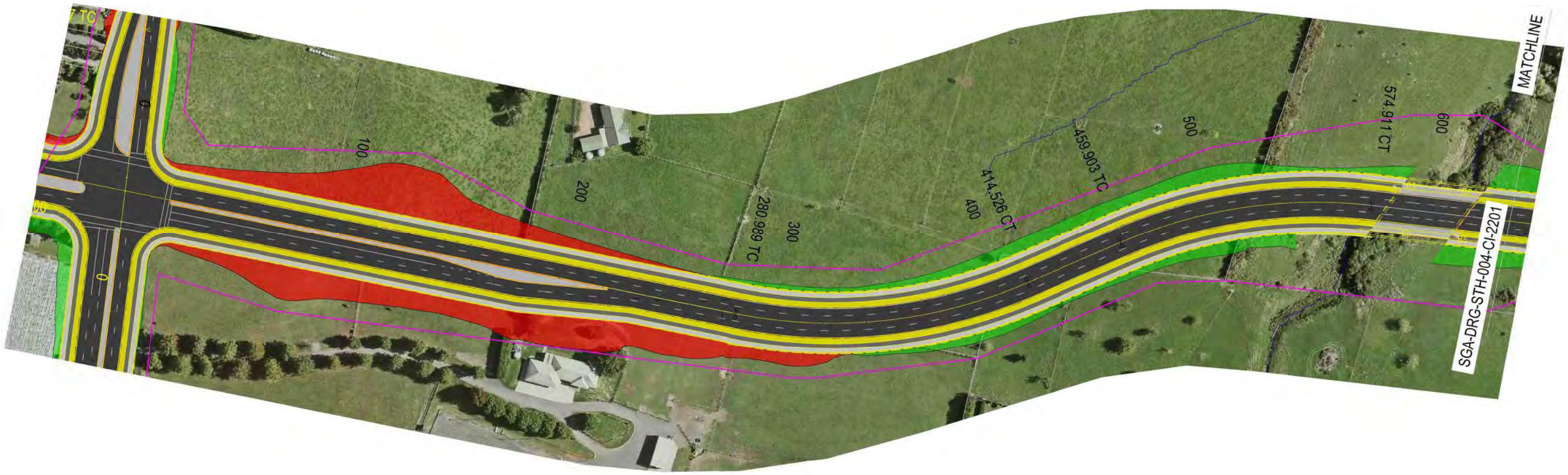
A1 Scales 1:1000 | A3 Scales 1:2000

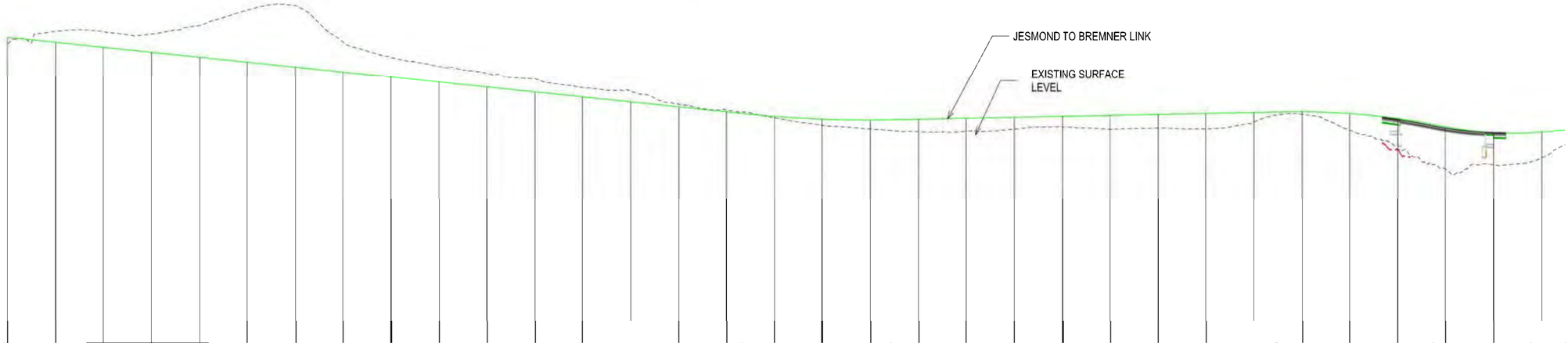
Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-2103

Revision: F

A1 ORIGINAL SIZE

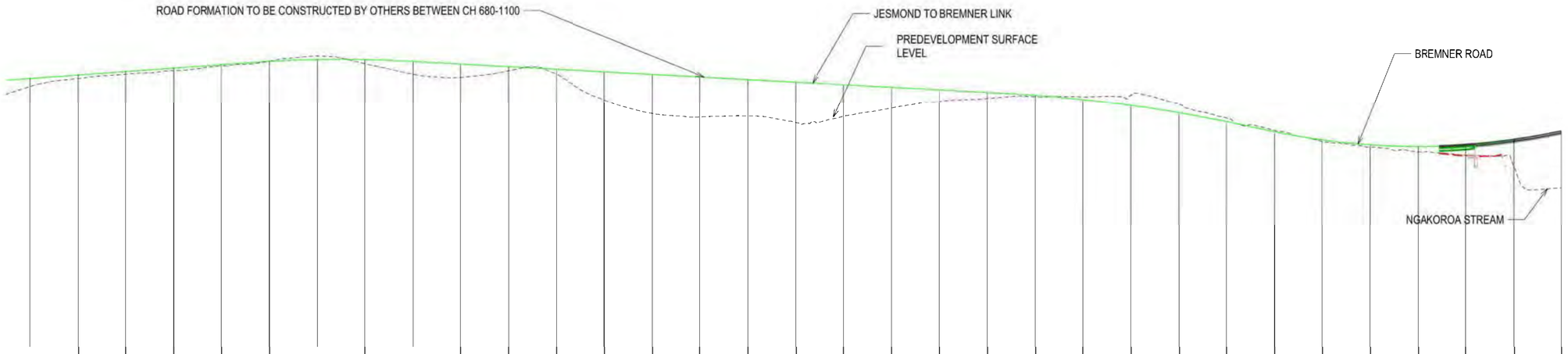

MATCHLINE
SGA-DRG-STH-004-CI-2201
100
200
280.989 TC
300
414.526 CT
400
459.903 TC
500
574.911 CT
600


JESMOND TO BREMNER LINK
EXISTING SURFACE LEVEL

DATUM RL -10

| | | |

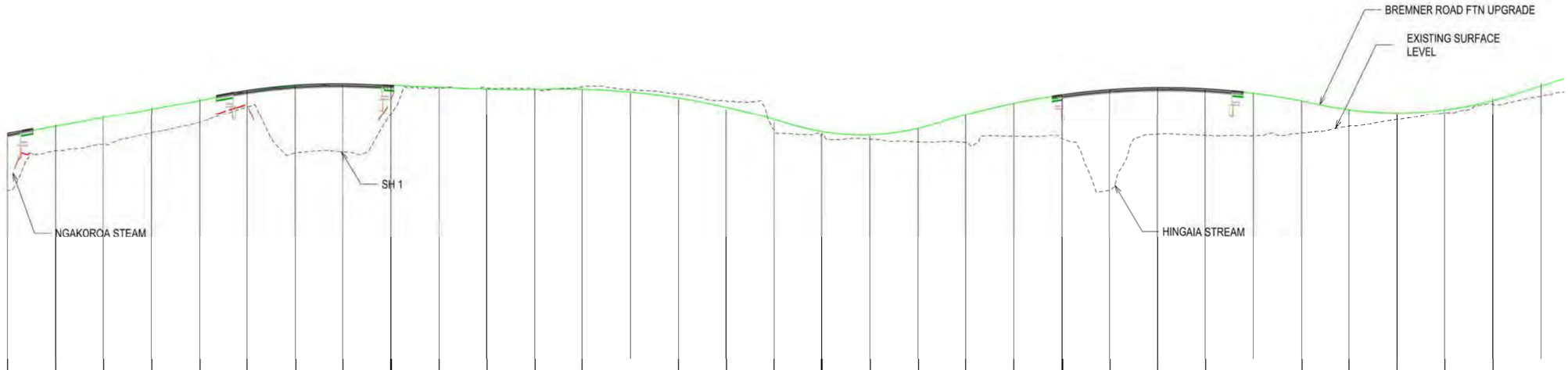

MATCHLINE
SGA-DRG-STH-004-CI-2201
JESMOND TO BREMNER LINK
829.858 TC
869.163 CT
1139.294 TC
1199.265 CT
205.448 CT
238.329 CT
SGA-DRG-STH-004-CI-2203
MATCHLINE


ROAD FORMATION TO BE CONSTRUCTED BY OTHERS BETWEEN CH 680-1100
JESMOND TO BREMNER LINK
PREDEVELOPMENT SURFACE LEVEL
BREMNER ROAD
NGAKOROA STREAM

DATUM RL -18

| | | |


ACCESS TO PROPERTIES AND CONNECTIONS TO ACTIVE MODE PATHS TO BE DEVELOPED IN COORDINATION WITH P28 PROJECT
MATCHLINE
SGA-DRG-STH-004-CI-2202
BREMNER ROAD
SGA-DRG-STH-004-CI-2204
MATCHLINE


BREMNER ROAD FTN UPGRADE
EXISTING SURFACE LEVEL
NGAKOROA STEAM
SH 1
HINGAIA STREAM

| | | |

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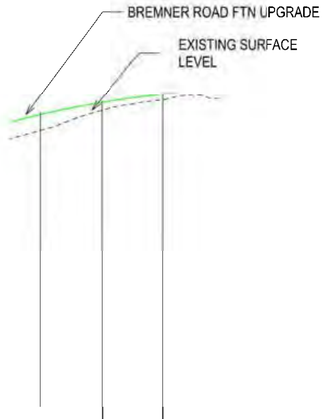

DATUM RL -13

VERTICAL ALIGNMENT	K = -12.000 L = 62.773		
HORIZONTAL ALIGNMENT	R = 320.000 L = 76.147		
CUT / FILL	-1.26	-0.56	-0.37
DESIGN LEVELS	13.32	14.26	14.91
EXISTING LEVELS	12.06	13.70	14.54
CHAINAGE	1960	1980	2000

NOT FOR CONSTRUCTION

FOR APPROVAL

REV	REASONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	DD	24.07.20
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	FJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY-BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 4 OF 4

Drawing Status: FOR APPROVAL
Drawing Date: 14.02.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-2204
Revision: E

ORIGINAL SIZE A1

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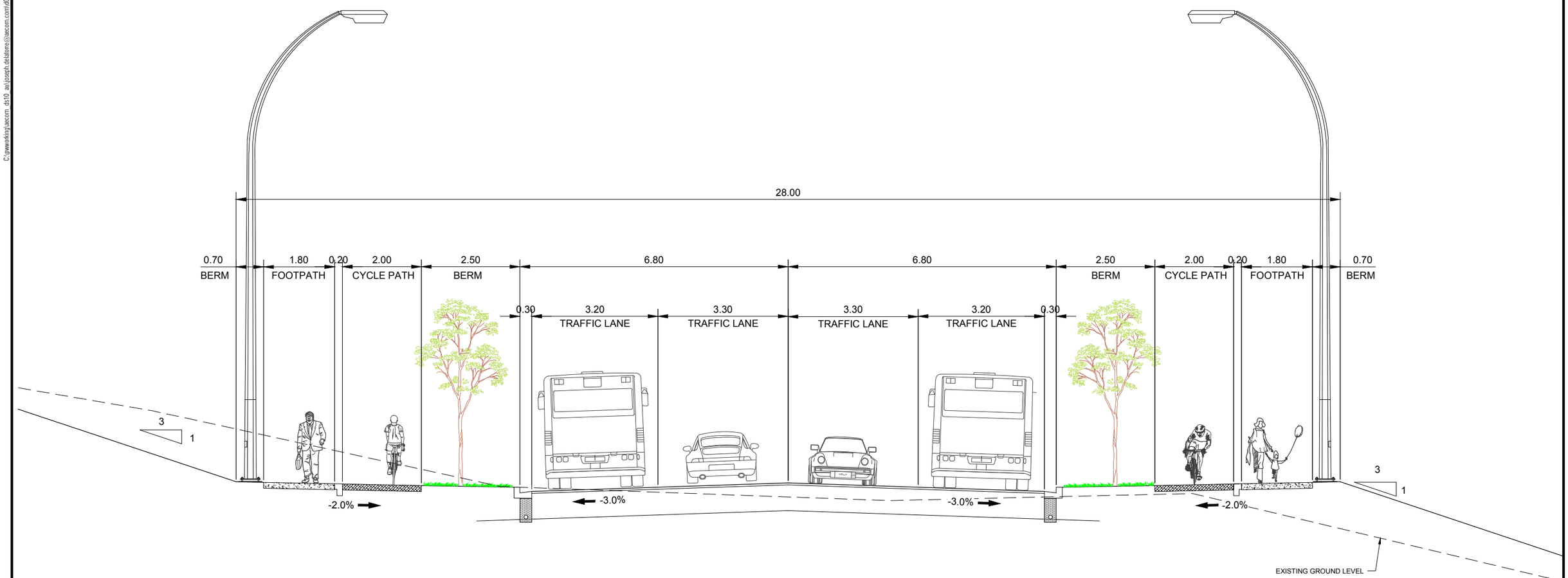

A | TYPCAL CROSS SECTION

Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50
A3 1:100
0 2m

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.12.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	16.12.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:50 | A3 Scales 1:100
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-2301
Revision: E

ORIGINAL SIZE A1

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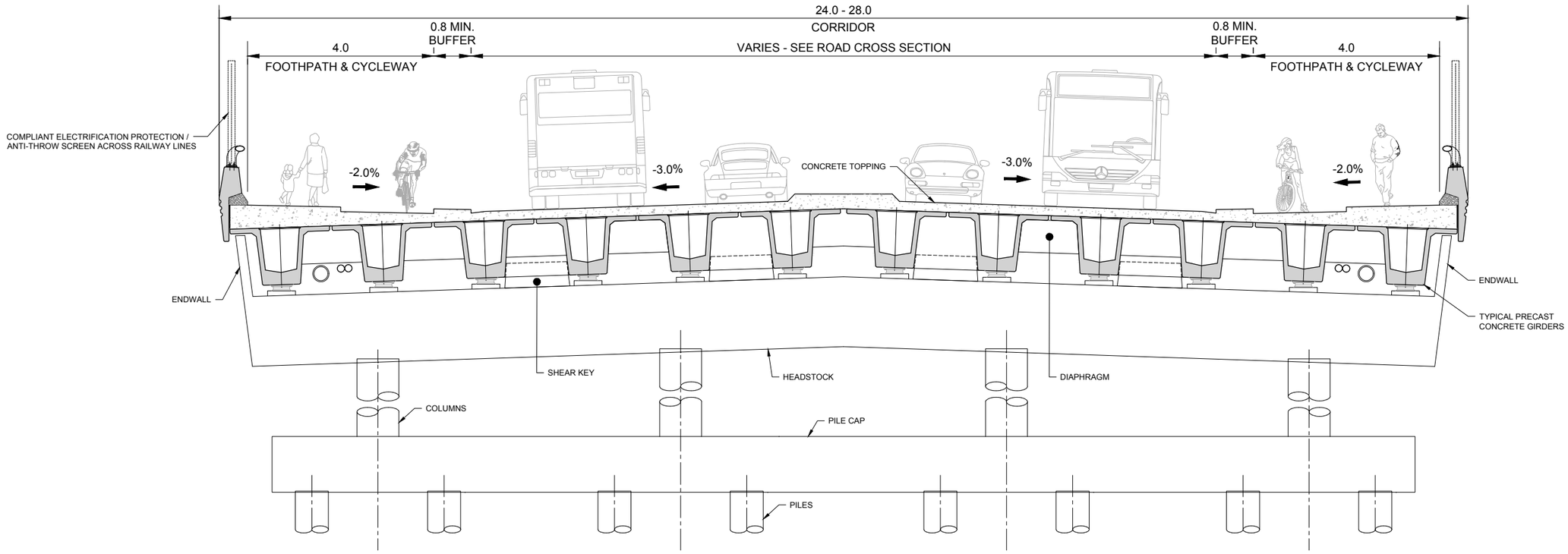
NOTES:

1. BRIDGE DESIGN IS INDICATIVE ONLY.
2. UNLESS NOTED OTHERWISE, UTILITIES SHOWN ARE INDICATIVE ONLY



TYPICAL CROSS SECTION - FOUR LANE BRIDGE

Scale : NTS

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	AG	21.07.2020
C	ISSUED FOR ENGAGEMENT	JT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	AG	28.02.2020
A	DRAFT ISSUE FOR REVIEW	AG	14.02.2020

SURVEYED		
DRAWN	A. GARCIA	14.01.20
DRAWING CHECK	J. DELA TORRE	14.01.20
DESIGN	A. REVELL	14.01.20
DESIGN REVIEW	K. CRAWFORD	14.01.20
APPROVED	R. MASON	14.01.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - BREMNER ROAD FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
FOUR LANE BRIDGE
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 07-01-2020
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURE
Drawing No.: SGA-DRG-STH-004-ST-2720
Revision: D

ORIGINAL SIZE A1

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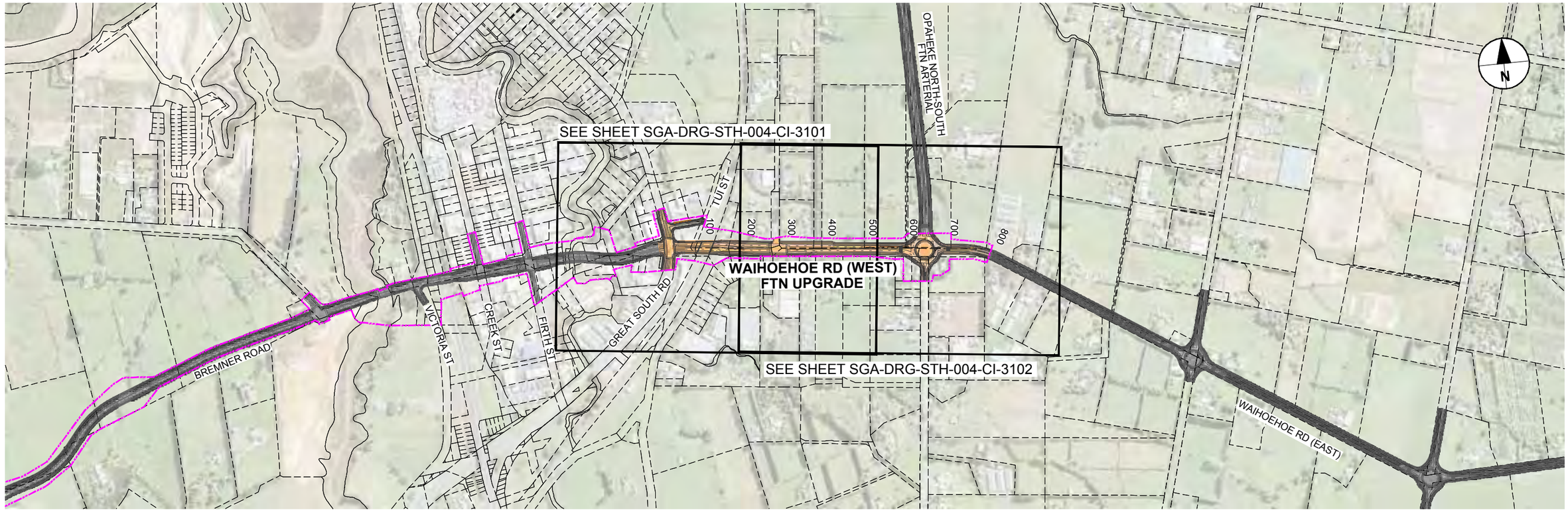

WAIHOEHOE ROAD (WEST) FTN UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - WAIHOEHOE ROAD FTN UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-3000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	F
SGA-DRG-STH-004-CI-3101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 2	F
SGA-DRG-STH-004-CI-3102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 2	E
SGA-DRG-STH-004-CI-3201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 2	E
SGA-DRG-STH-004-CI-3202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 2	B
SGA-DRG-STH-004-CI-3301	TYPICAL CROSS SECTIONS	E
SGA-DRG-STH-004-ST-3720	WAIHOEHOE ROAD OVER RAIL BRIDGE ABUTMENT CROSS SECTION	D

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS ARE INCLUDED IN THE GA'S FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
F	UPDATED CADASTRAL BOUNDARIES	JDT	30.07.2020
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	25.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	25.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: **FOR APPROVAL**

Drawing Date: 25.11.2019

A1 Scales 1:5000 | A3 Scales 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-3000

Revision: F

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

TIE-IN WITH GREAT SOUTH ROAD
TIE-IN WITH TUI STREET
TUI STREET
RELOCATION OF WAIKATO 1 WATERMAIN TBC
BRIDGE CONSTRUCTION AREA
SITE COMPOUND
KATH HENRY LANE
TIE-IN WITH KATH HENRY LANE
NoR D2
WAIHOEHOE ROAD (WEST)
TIE-IN WITH NORRIE ROAD
NORRIE ROAD
TIE-IN WITH GREAT SOUTH ROAD
CONNECTION WITH FLANAGAN ROAD TBC WITH FUTURE NZUP PROJECT
NIMT
KIWI RAIL DESIGNATION 6302
FLANAGAN ROAD
GREAT SOUTH ROAD
MATCHLINE - REFER DRG-SHT-004-CI-3102
0
100
200
300
400
500

A1 1:500
A3 1:1000
0 20m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
F	UPDATED CADASTRAL BOUNDARIES	JDT	30.07.2020
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-3101
Revision: F

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE
- INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

KEY PLAN

OPAHEKE NORTH-SOUTH FTN ARTERIAL

TIE-IN WITH PROPOSED OPĀHEKE NORTH-SOUTH FTN ARTERIAL

TIE-IN WITH KATH HENRY LANE

NoR D2

WAIHOEHOE ROAD (WEST) FTN UPGRADE

TIE-IN WITH WAIHOEHOE ROAD (EAST)

WAIHOEHOE ROAD (EAST)

TIE-IN WITH FITZGERALD ROAD

FITZGERALD RD

200 300 400 500 600 700 800 900

MATCHLINE - REFER DRG-SHT-004-CI-3101

A1 1:500 | A3 1:1000 — 0 — 20m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 2

Drawing Status: FOR APPROVAL
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-3102
Revision: E

ORIGINAL SIZE A1

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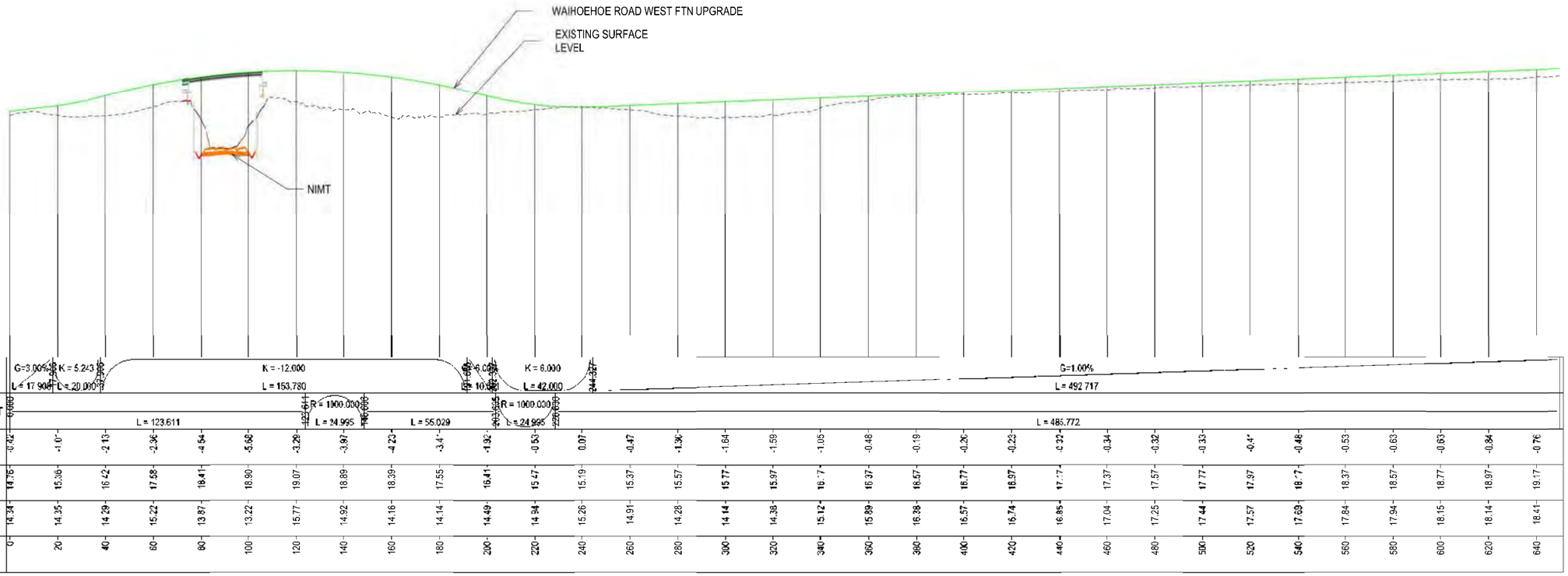

REV	REASONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	DD	24.07.20
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	13.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RB	30.01.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

NOT FOR CONSTRUCTION

FOR APPROVAL

Project: SUPPORTING GROWTH PROGRAMME

DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title: PLAN AND LONGITUDINAL SECTION
SHEET 1 OF 2

Drawing Date: 14.02.20

Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V

Contract Number: C.00000.00 (AT)

Drawing No: SGA-DRG-STH-004-CI-3201

Revision: E

ORIGINAL SIZE A1

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DATUM RL -5									
VERTICAL ALIGNMENT	G=1.00% L = 492.717							K = 40.000 L = 60.000	
HORIZONTAL ALIGNMENT	L = 485.772							R = 225.000 L = 100.264	
CUT / FILL	-0.84	-0.76	-0.72	-0.45	0.02	-0.06	-0.39	-0.53	-0.53
DESIGN LEVELS	18.97	19.17	19.37	19.57	19.77	19.97	20.17	20.31	20.34
EXISTING LEVELS	18.14	18.41	18.65	19.12	19.79	19.91	19.79	19.77	19.82
CHAINAGE	620	640	660	680	700	720	740	760	780

A1 ORIGINAL SIZE

REV	REVISIONS	DRAWN	DATE
B	REISSUED FOR APPROVAL	DD	24.07.20
A	ISSUED FOR APPROVAL	DD	21.07.20

SURVEYED		
DRAWN	UD	28.01.20
DRAWING CHECK	NG	13.02.20
DESIGN	FB	02.12.19
DESIGN REVIEW	FJB	31.01.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 2 OF 2

NOT FOR CONSTRUCTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 14.02.20

Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V

Datum / Projection: C.00000.00 (AT)

Drawing No.: SGA-DRG-STH-004-CI-3202

Revision: B

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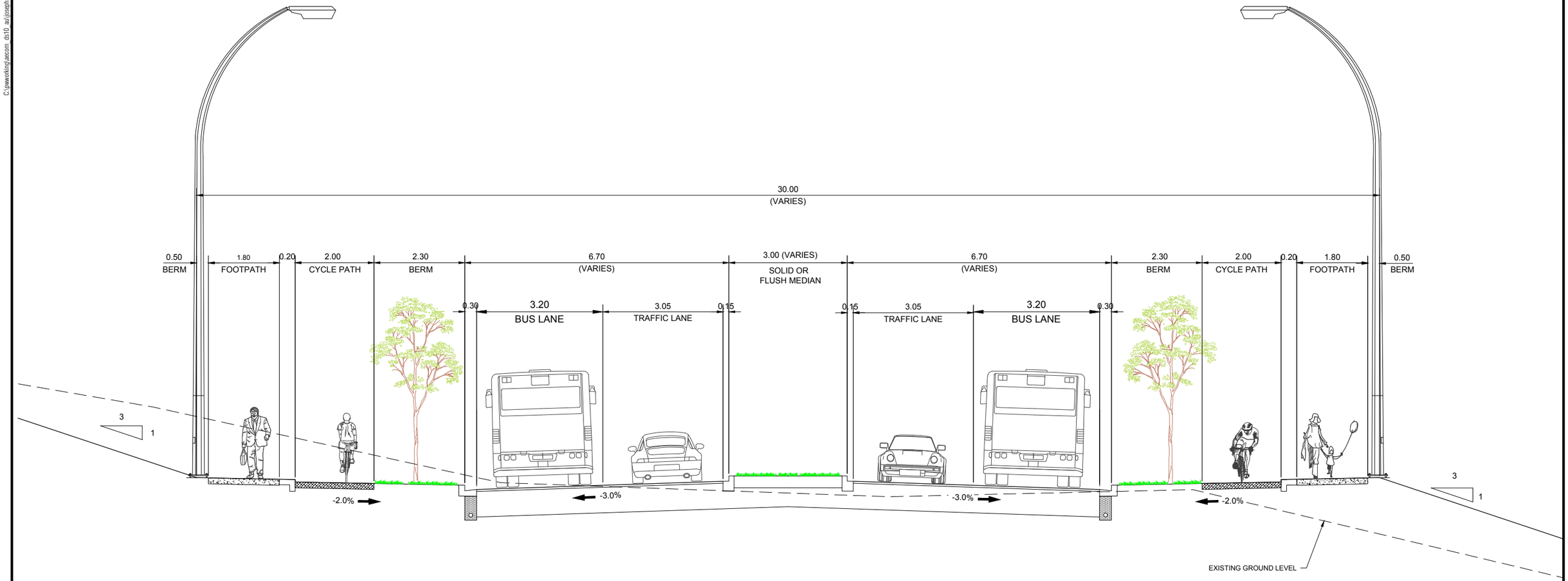

A | TYPCAL CROSS SECTION
Scale 1:50

A1 1:50 | A3 1:100 — 0 — 2m

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
E	REISSUED FOR APPROVAL	JDT	24.07.2020
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.12.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	16.12.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 16.12.2019
A1 Scales 1:50 | A3 Scales 1:100
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-3301
Revision: E

ORIGINAL SIZE A1

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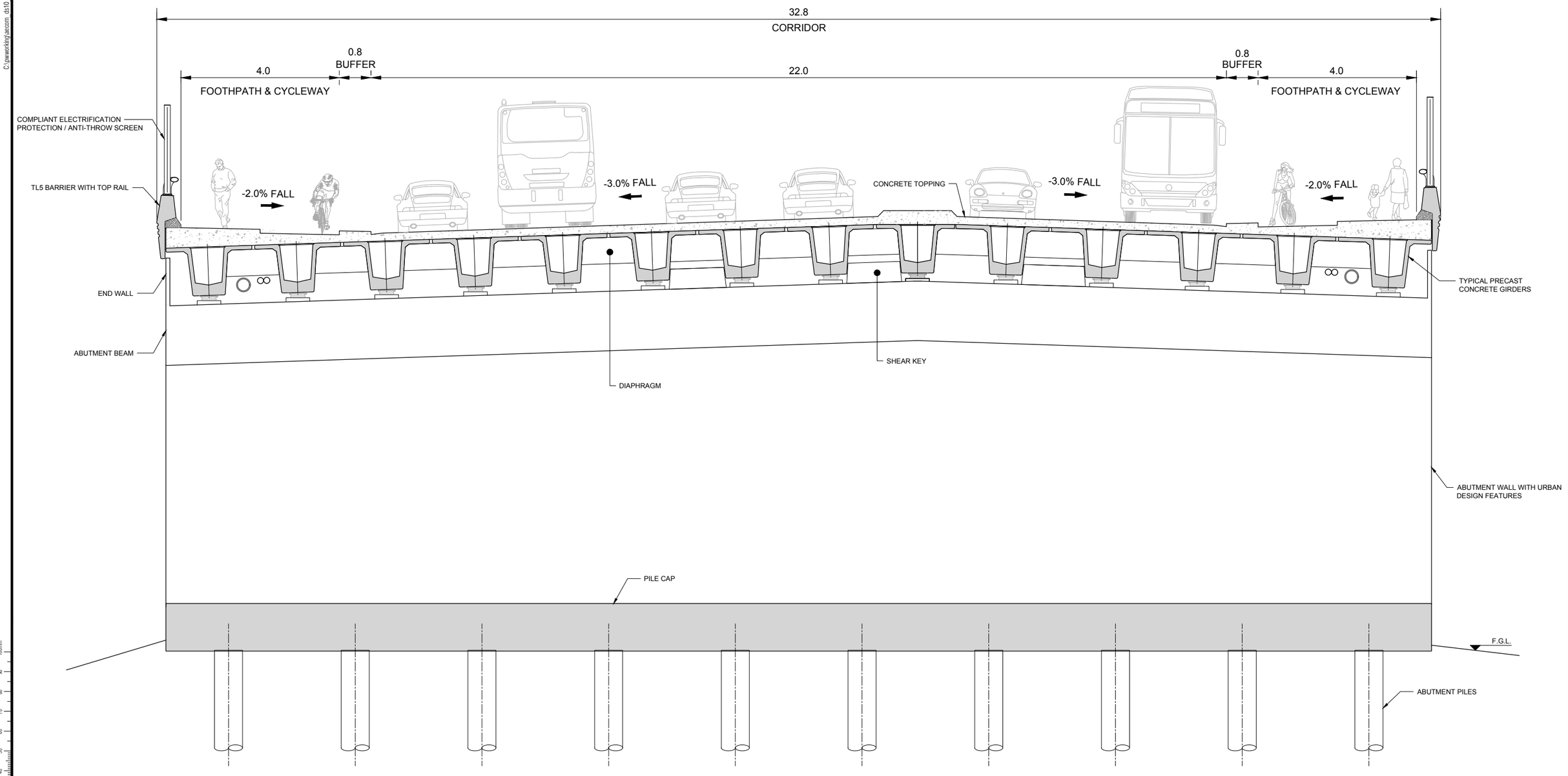
NOTES:

1. BRIDGE DESIGN IS INDICATIVE ONLY. KIWIRAIL IS TO BE CONSULTED DURING DESIGN DEVELOPMENT TO ENSURE COMPLIANCE WITH THEIR CONSTRUCTION AND OPERATIONAL REQUIREMENTS.
2. UNLESS NOTED OTHERWISE, UTILITIES SHOWN ARE INDICATIVE ONLY AND WILL BE DETERMINED AS PART OF FUTURE DESIGN STAGES.



ABUTMENT CROSS SECTION - SIX LANE BRIDGE

Scale : NTS

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	AG	21.07.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	AG	28.02.20
A	DRAFT ISSUE FOR REVIEW	AG	14.02.20

SURVEYED		
DRAWN	A. GARCIA	14.01.20
DRAWING CHECK	J. DELA TORRE	14.01.20
DESIGN	A. REVELL	14.01.20
DESIGN REVIEW	K. CRAWFORD	14.01.20
APPROVED	R. MASON	14.01.20

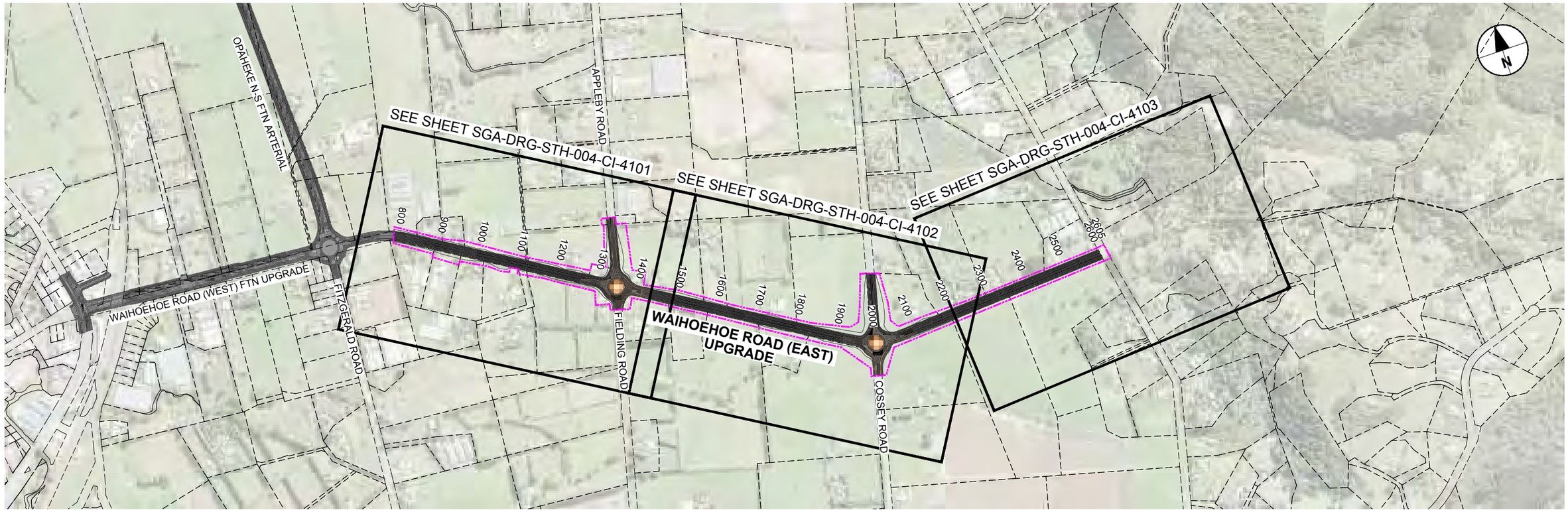
TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD (WEST) FTN UPGRADE (A SECTION OF NoR D2)

Drawing Title:
WAIHOEHOE ROAD OVER RAIL BRIDGE
ABUTMENT CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 2019-11-27
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURE
Drawing No.: SGA-DRG-STH-004-ST-3720
Revision: D



WAIHOEHOE ROAD (EAST) UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - WAIHOEHOE ROAD EAST		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-4000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-4101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 3	D
SGA-DRG-STH-004-CI-4102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 3	D
SGA-DRG-STH-004-CI-4103	GENERAL ARRANGEMENT PLAN - SHEET 3 OF 3	D
SGA-DRG-STH-004-CI-4201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 3	D
SGA-DRG-STH-004-CI-4202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 3	D
SGA-DRG-STH-004-CI-4203	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 3	D
SGA-DRG-STH-004-CI-4301	TYPICAL CROSS SECTION	D

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1. THE STORMWATER DESIGN IS INDICATIVE.

2.2. THE DESIGN IS BASED ON THE UPGRADED ROAD HAVING:

2.3. SWALE WITHIN DESIGNATED BERM (BETWEEN CH.3080 - CH. 4560)

2.4. SWALES HAVE BEEN DESIGNED TO CONVEY 10% AEP EVENT AND PROVIDE TREATMENT IN ACCORDANCE WITH D01AUCKLAND COUNCIL GUIDELINES.

2.5. STORMWATER DISCHARGE LOCATIONS TBC AT DETAILED DESIGN.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
B	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	25.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	25.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - WAIHOEHOE ROAD (EAST) UPGRADE (NoR D3)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: FOR APPROVAL

Drawing Date: 25.11.2019

A1 Scales: 1:5000 | A3 Scales: 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-4000

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

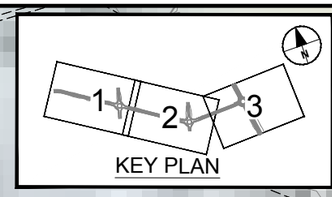
LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

KEY PLAN



APPLEBY ROAD

TIE-IN WITH APPLEBY ROAD

MATCHLINE - REFER DRG-SHT-004-CI-4102

800

900

1000

1100

1200

1300

1400

NoR D3

SITE COMPOUND

TIE-IN WITH WAIHOEHOE ROAD (WEST)

WAIHOEHOE ROAD (EAST)

GAS FACILITY

FIRST GAS DESIGNATION 9104

TIE-IN WITH FIELDING ROAD

FIELDING ROAD

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - WAIHOEHOE ROAD (EAST) UPGRADE (NoR D3)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 3

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-4101

Revision: D

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

KEY PLAN

1 2 3

COSSEY ROAD

TIE-IN WITH COSSEY ROAD

MATCHLINE - REFER DRG-SHT-004-CI-4103

2200

2100

2000

1500 1600 1700 1800 1900

NoR D3

WAIHOEHOE ROAD (EAST)

CONSTRUCTION AREA

TIE-IN WITH COSSEY ROAD

COSSEY ROAD

MATCHLINE - REFER DRG-SHT-004-CI-4101

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
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DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - WAIHOEHOE ROAD (EAST) UPGRADE (NoR D3)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-4102
Revision: D

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RURAL URBAN BOUNDARY
- RAIL TRACK
- PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3

N

DRURY HILLS ROAD

2300 2400 2500 2600 2605

TIE-IN WITH DRURY HILLS ROAD

WAIHOEHOE ROAD (EAST) UPGRADE

MATCHLINE - REFER DRG-SHT-004-CI-4102

RURAL URBAN BOUNDARY

A1 1:500
A3 1:1000
0 20m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

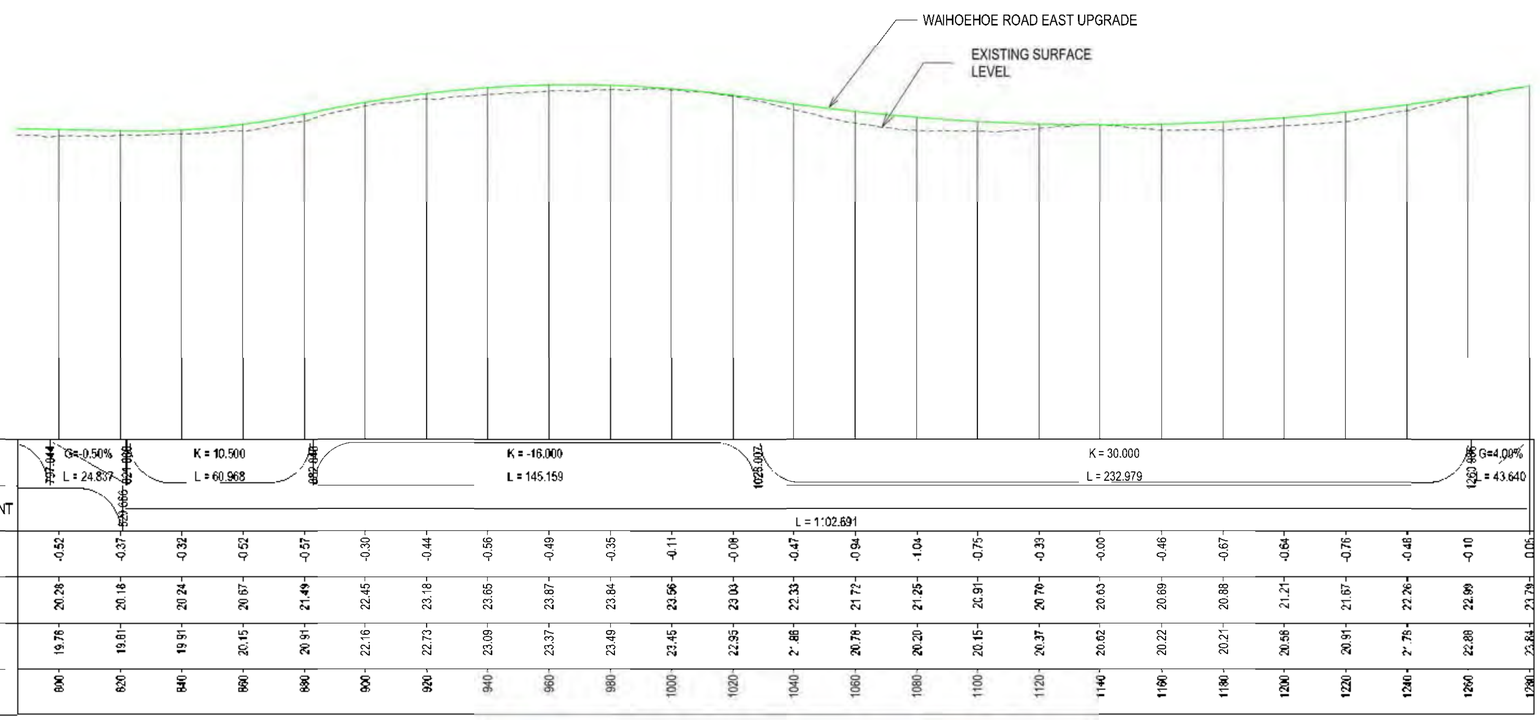
Project:
SUPPORTING GROWTH PROGRAMME
DRURY - WAIHOEHOE ROAD (EAST) UPGRADE (NoR D3)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 3 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-4103
Revision: D

ORIGINAL SIZE A1





NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.02.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	28.01.20
DRAWING CHECK	MG	13.02.20
DESIGN	RB	02.12.19
DESIGN REVIEW	FJB	31.01.20
APPROVED	FM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD EAST UPGRADE NOR D3

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 1 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-4201
Revision: D

ORIGINAL SIZE A1

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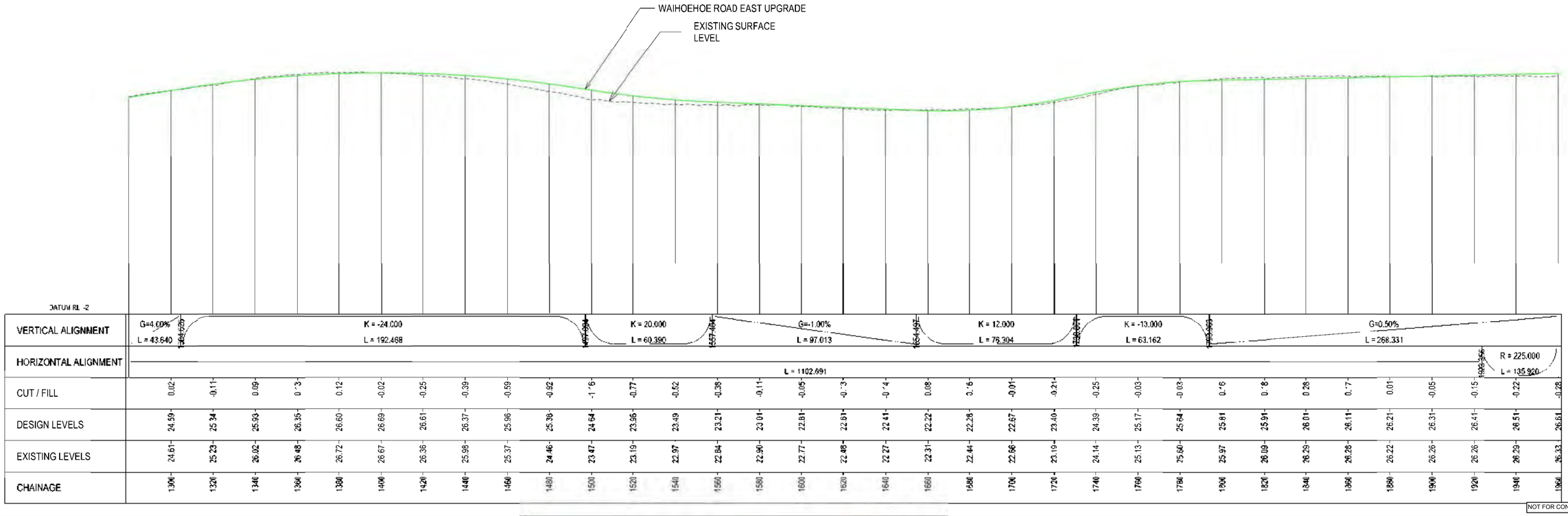


NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.02.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	FB	28.01.20
DRAWING CHECK	MG	13.02.20
DESIGN	FB	02.12.19
DESIGN REVIEW	FJB	31.01.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

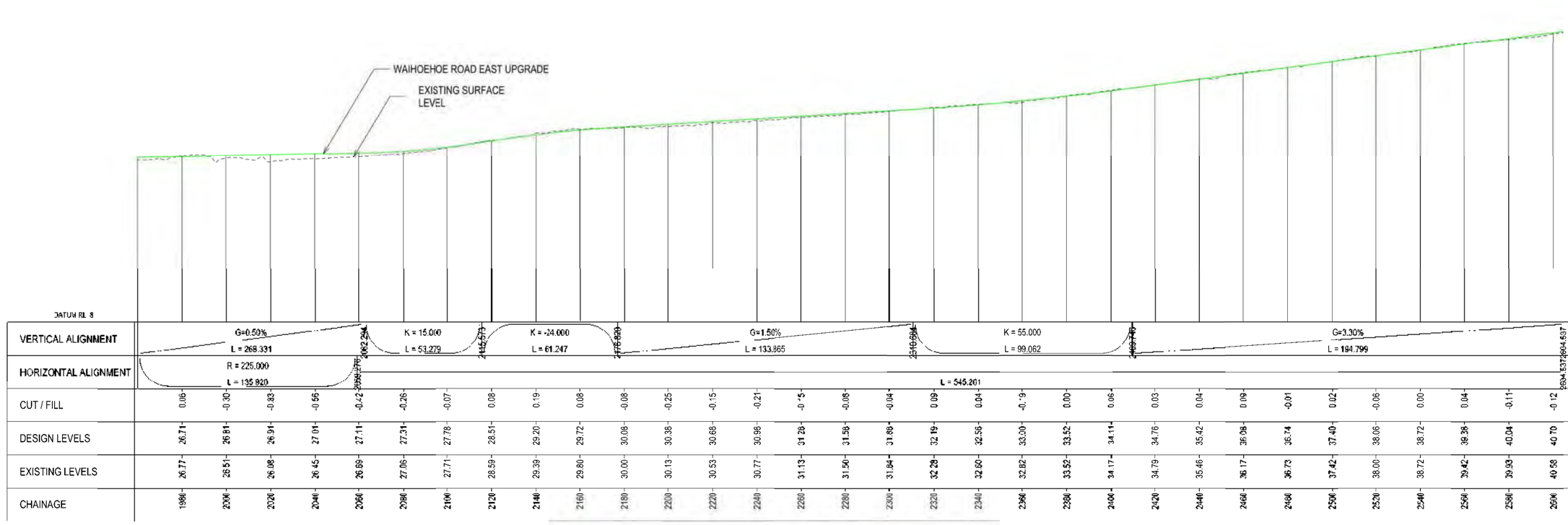
Project
SUPPORTING GROWTH PROGRAMME
DRURY-WAIHOEHOE ROAD EAST UPGRADE NOR D3

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 2 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-4202
Revision: D

ORIGINAL SIZE A1





NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	31.01.20

SURVEYED		
DRAWN	RB	28.01.20
DRAWING CHECK	MG	13.02.20
DESIGN	RB	02.12.19
DESIGN REVIEW	FJB	31.01.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**

DRURY-WAIHOEHOE ROAD EAST UPGRADE NOR D3

Drawing Title: PLAN AND LONGITUDINAL SECTION
SHEET 3 OF 3

Drawing Status: **FOR APPROVAL**

Drawing Date: 14.02.20

Original Size: A1 1:1000H 1:250V | A3 1:2000H 1:500V

Contract Number: C.00000.00 (AT)

Drawing No: SGA-DRG-STH-004-CI-4203

Revision: D

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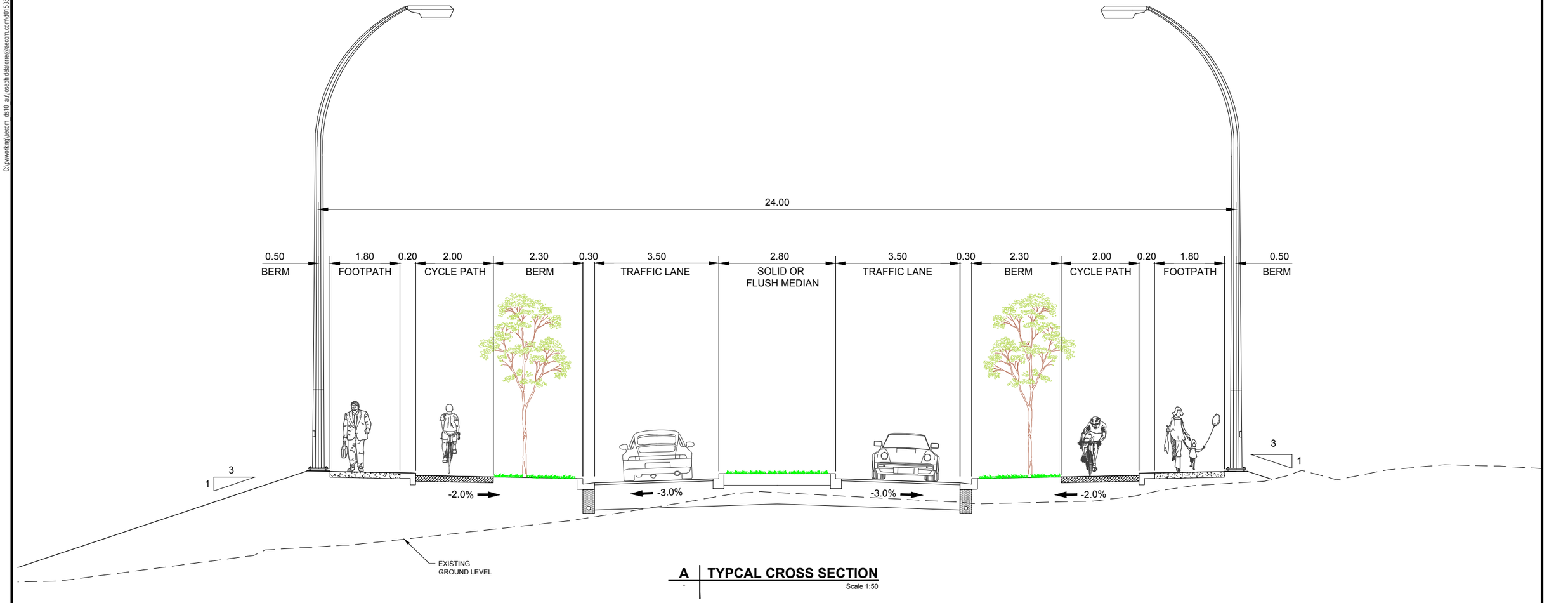

A | TYPCAL CROSS SECTION
Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50
A3 1:100
0 2m

ORIGINAL SIZE A1 100mm

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.12.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	16.12.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - WAIHOEHOE ROAD (EAST) UPGRADE (NoR D3)

Drawing Title:
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 16.12.2019
A1 Scales 1:50 | A3 Scales 1:100
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-4301
Revision: D

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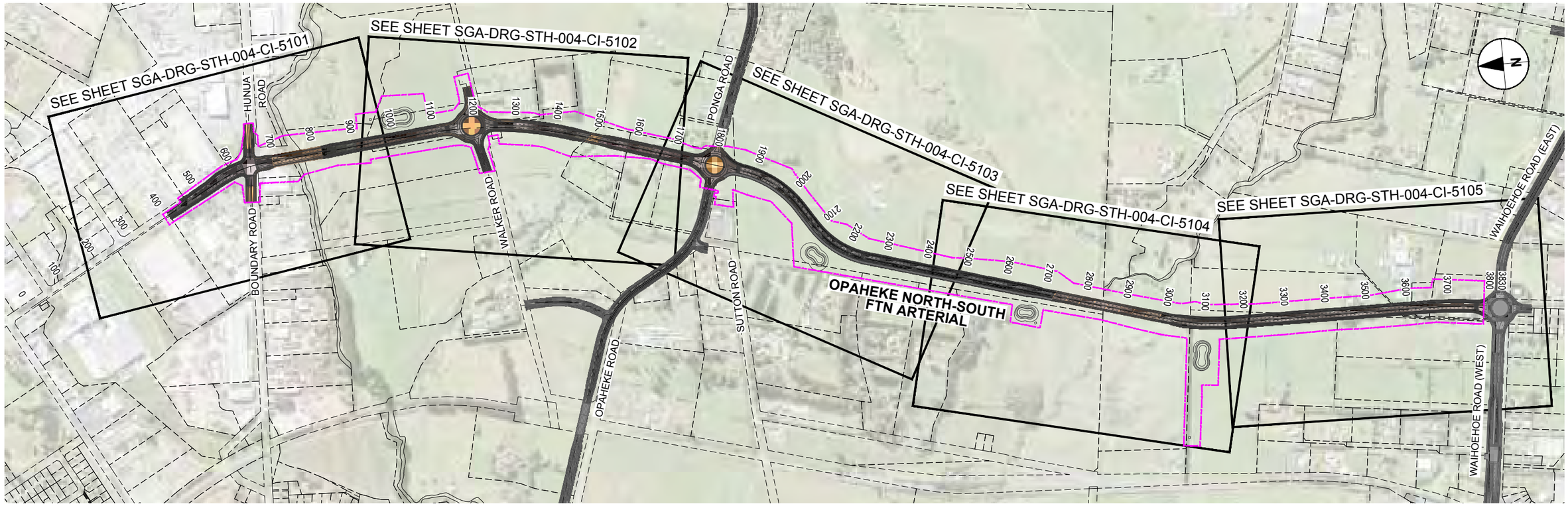

OPĀHEKE NORTH - SOUTH FTN ARTERIAL LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - OPĀHEKE NORTH-SOUTH ARTERIAL		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-5000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-5101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 5	D
SGA-DRG-STH-004-CI-5102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 5	D
SGA-DRG-STH-004-CI-5103	GENERAL ARRANGEMENT PLAN - SHEET 3 OF 5	D
SGA-DRG-STH-004-CI-5104	GENERAL ARRANGEMENT PLAN - SHEET 4 OF 5	D
SGA-DRG-STH-004-CI-5105	GENERAL ARRANGEMENT PLAN - SHEET 5 OF 5	D
SGA-DRG-STH-004-CI-5201	PLAN & LONGITUDINAL SECTION - SHEET 1 OF 6	D
SGA-DRG-STH-004-CI-5202	PLAN & LONGITUDINAL SECTION - SHEET 2 OF 6	D
SGA-DRG-STH-004-CI-5203	PLAN & LONGITUDINAL SECTION - SHEET 3 OF 6	D
SGA-DRG-STH-004-CI-5204	PLAN & LONGITUDINAL SECTION - SHEET 4 OF 6	D
SGA-DRG-STH-004-CI-5205	PLAN & LONGITUDINAL SECTION - SHEET 5 OF 6	D
SGA-DRG-STH-004-CI-5206	PLAN & LONGITUDINAL SECTION - SHEET 6 OF 6	D
SGA-DRG-STH-004-CI-5301	TYPICAL CROSS SECTION	D
SGA-DRG-STH-004-ST-5720	FOUR LANE BRIDGE TYPICAL CROSS SECTION D	

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE.

2.2. THE DESIGN IS BASED ON THE UPGRADED ROAD HAVING KERB AND CHANNEL WITH CATCHPITS PROVIDED ON BOTH SIDES OF THE ROAD.

2.3. UNDERGROUND STORAGE TANK SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO ATTENUATE THE 10% AEP AND 1% AEP.

2.4. STORM FILTERS HAVE BEEN DESIGNED AS A TREATMENT DEVICE IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01.

2.5. WETLAND SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO:

- ATTENUATE THE 10% AEP AND 1% AEP; AND
- PROVIDE TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01.

2.6 STORMWATER OUTLETS FROM UNDERGROUND STORAGE TANKS TO CONNECT WITH EXISTING PIPE NETWORKS.

2.7 STORMWATER OUTLETS FROM WETLANDS TO DISCHARGE INTO EXISTING OVERLAND FLOW PATHS.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

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A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: FOR APPROVAL

Drawing Date: 27.11.2019

A1 Scales 1:5000 | A3 Scales 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-5000

Revision: D

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
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- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
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- PROPOSED OVERLAND FLOW PATH
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- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN: 1 2 3 4 5

HUNUA ROAD
TIE-IN WITH HUNUA ROAD
WAIPOKAPU (HAYS) STREAM
BRIDGE CONSTRUCTION AREA
NoR D4
MATCHLINE - REFER DRG-SHT-004-CI-5102
SITE COMPOUND
FIRST GAS DESIGNATION 9104
TIE-IN WITH BOUNDARY ROAD
BOUNDARY ROAD
100 200 300 400 500 600 700 800 900

A1 1:1000 / A3 1:2000 — 0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

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SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-5101
Revision: D

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WALKER ROAD (EAST)

TIE-IN WITH WALKER ROAD (EAST)

NoR D4

1000 1100 1200 1300 1400 1500 1600 1700

SITE COMPOUND

OPAHEKE N-S FTN WETLAND 1

GAS FACILITY

NoR D4

FIRST GAS DESIGNATION 9104

MATCHLINE - REFER DRG-SHT-004-CI-5101

MATCHLINE - REFER DRG-SHT-004-CI-5103

TIE-IN WITH WALKER ROAD (WEST)

WALKER ROAD (WEST)

KEY PLAN

1 2 3 4 5

N

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-5102

Revision: D

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PONGA ROAD

FIRST GAS
DESIGNATION 9104

NoR D4

1800

1900

2000

2100

2200

2300

2400

1700

TIE-IN WITH
PONGA ROAD

MATCHLINE - REFER DRG-SHT-004-CI-5104

MATCHLINE - REFER DRG-SHT-004-CI-5102

TIE-IN WITH
OPĀHEKE ROAD

SITE
COMPOUND

OPĀHEKE ROAD

COUNTIES POWER
DESIGNATION 3006

TIE-IN WITH
SUTTON ROAD

OPĀHEKE N-S FTN
WETLAND 2

CONSTRUCTION AREA

KEY PLAN

1 2 3 4 5

N

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 3 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-5103

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- NOTABLE TREE
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2 3 4 5

MATCHLINE - REFER DRG-SHT-004-CI-5105

MATCHLINE - REFER DRG-SHT-004-CI-5103

2500 2600 2700 2800 2900 3000 3100 3200

NoR D4

BRIDGE CONSTRUCTION AREA

BRIDGE CONSTRUCTION AREA

OPAHEKE N-S FTN WETLAND 3

NoR D4

WAIHOEHOE STREAM

OPAHEKE N-S FTN WETLAND 4

CONSTRUCTION AREA

HV

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 4 OF 5

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-5104
Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

KEY PLAN

1 2 3 4 5

N

WAIHOEHOE ROAD (EAST)

3200 3300 3400 NoR D4 3500 3600 3700 3800 3830

TIE-IN WITH WAIHOEHOE ROAD (WEST)

TIE-IN WITH FITZGERALD ROAD

SITE COMPOUND

NoR D4

WAIHOEHOE ROAD (WEST) FTN UPGRADE

MATCHLINE - REFER DRG-SHT-004-CI-5104

A1 1:1000 / A3 1:2000 0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTD LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

ORIGINAL SIZE A1

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**

DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN SHEET 5 OF 5

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-5105

Revision: D

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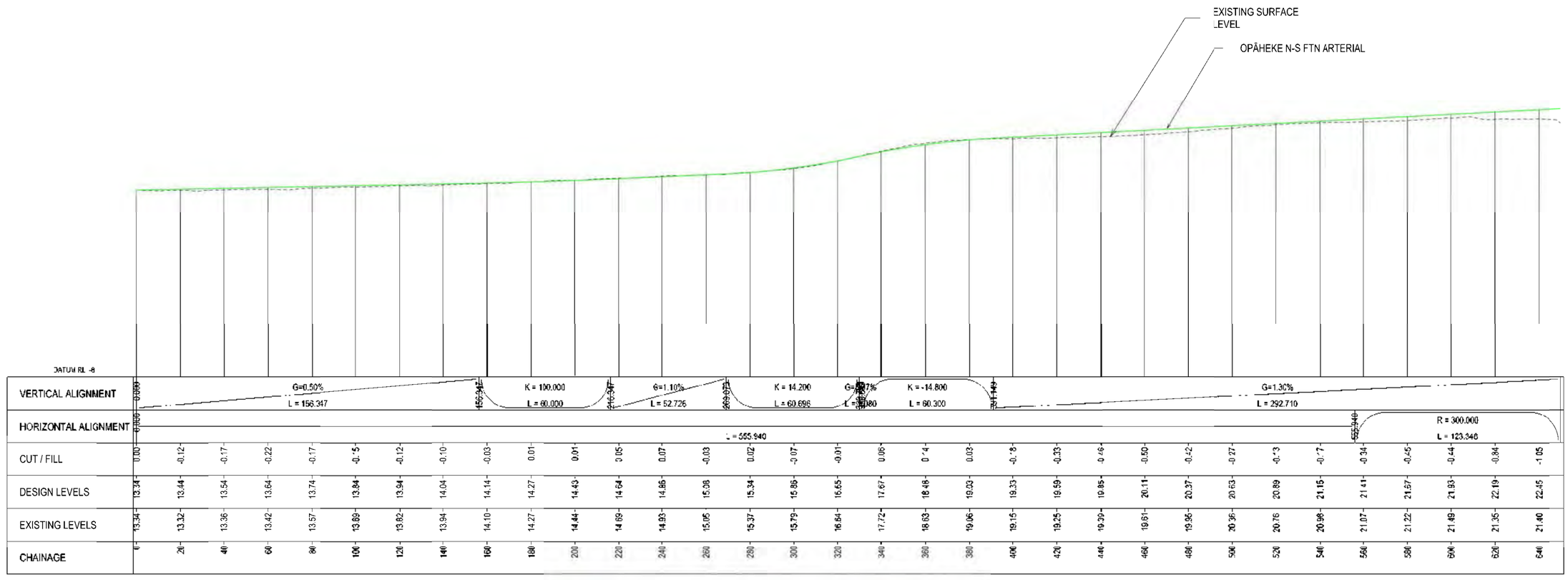


NOT FOR CONSTRUCTION

A1 ORIGINAL SIZE

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	PJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

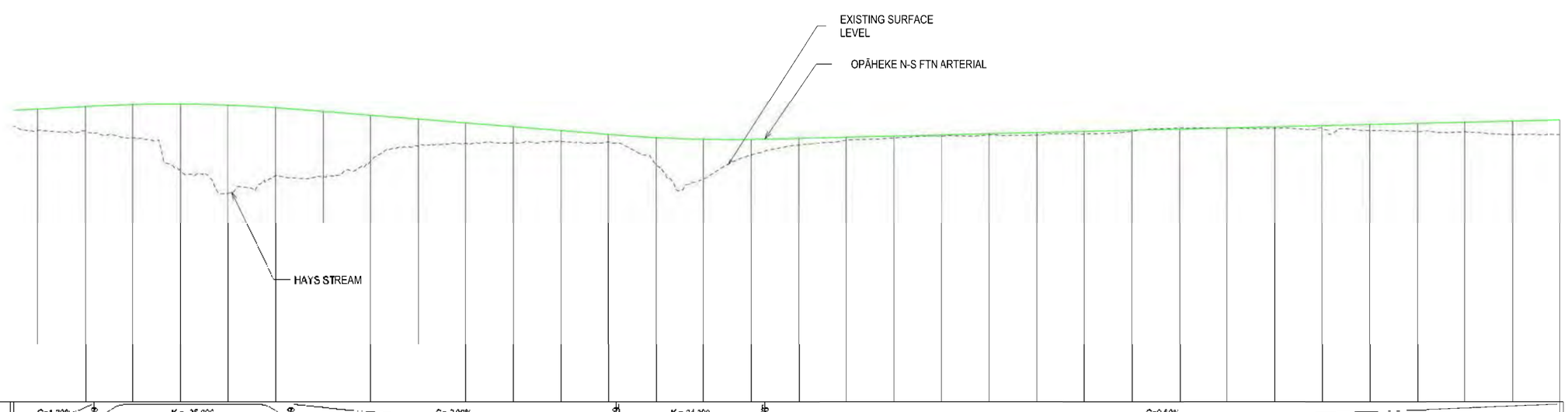
WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE N-S ARTERIAL NOR D4

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 1 OF 6

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Datum / Levels: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-5201
Revision: D

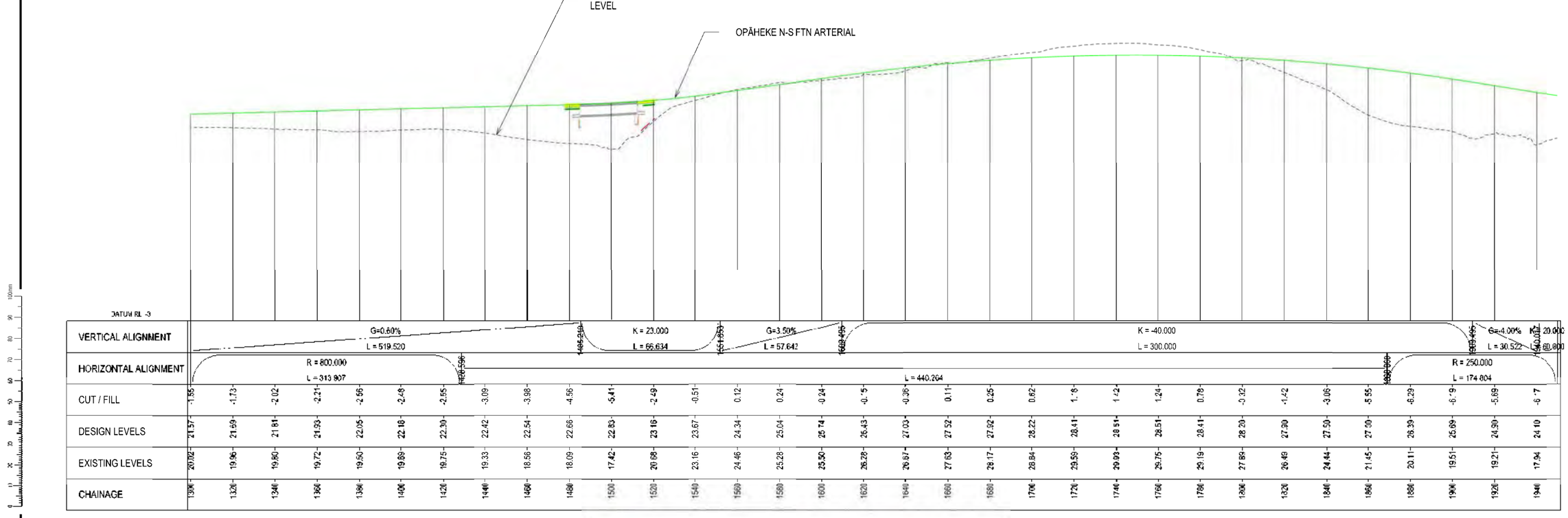

MATCHLINE
SGA-DRG-STH-004-CI-5201
OPAHEKE N-S FTN ARTERIAL
MATCHLINE
SGA-DRG-STH-004-CI-5203
700
800
900
1000
1100
1114.688 TC
1300


EXISTING SURFACE LEVEL
OPÄHEKE N-S FTN ARTERIAL
HAYS STREAM

DATUM RL -8

| | | |





NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	FJB	01.10.19
DESIGN REVIEW	FJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

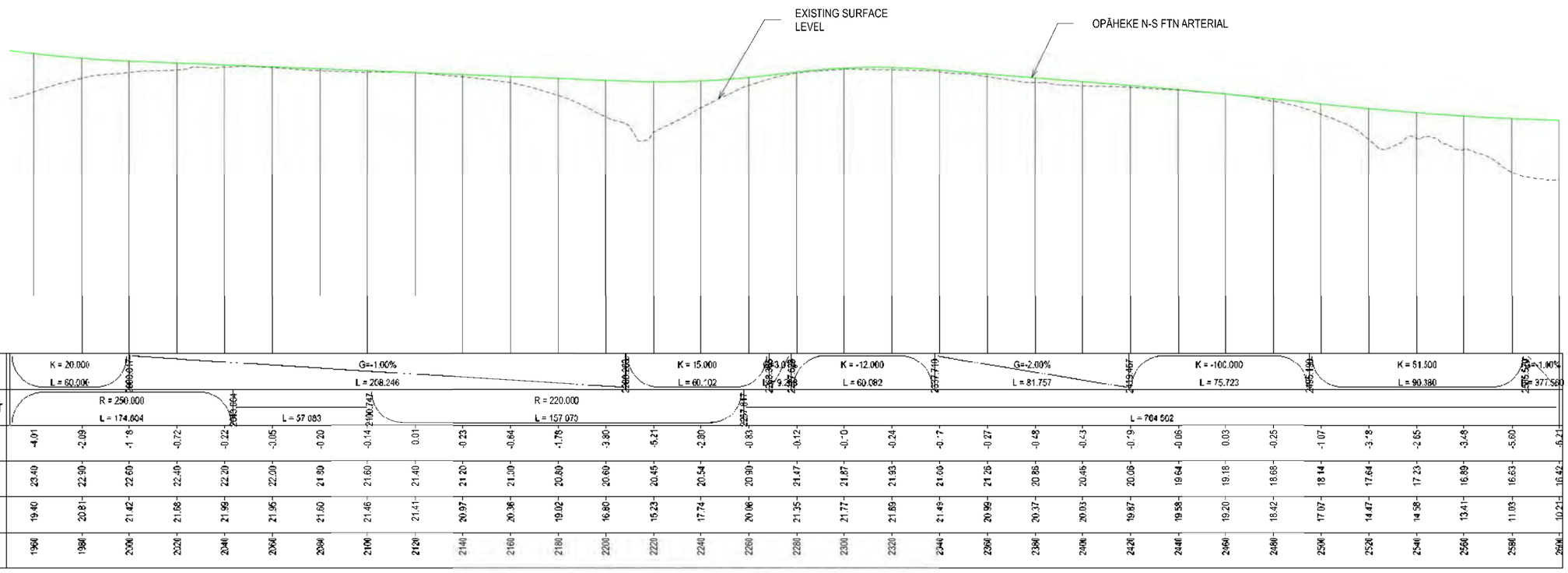
Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE N-S FTN ARTERIAL NOR D4

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 3 OF 6

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Datum: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-5203
Revision: D

ORIGINAL SIZE A1

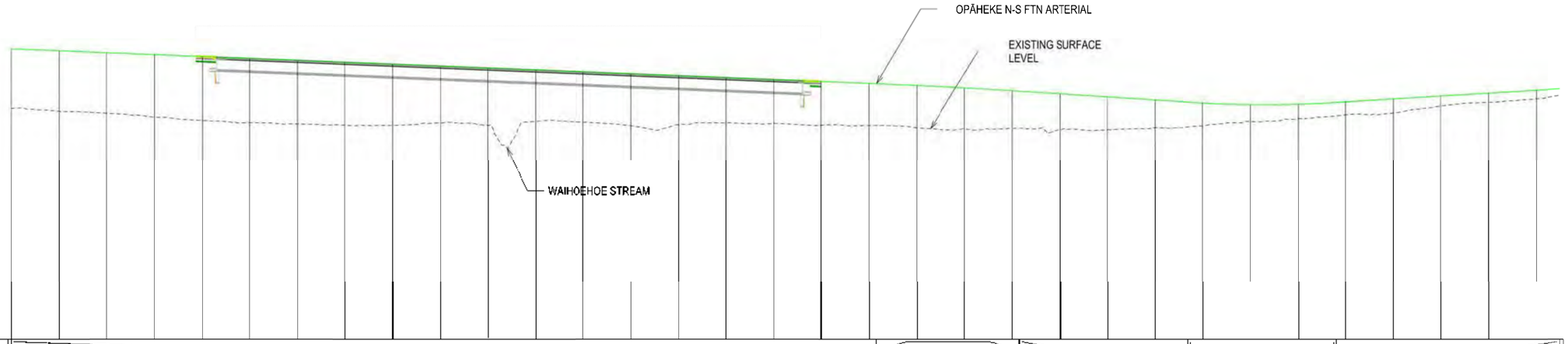

MATCHLINE
MATCHLINE
OPAHEKE N-S FTN ARTERIAL
SGA-DRG-STH-004-CI-5203
SGA-DRG-STH-004-CI-5205
2000
2200
2300
2400
2500
2600
2043.684 CT
2103.737 TC
2257.817 CT


EXISTING SURFACE LEVEL
OPÄHEKE N-S FTN ARTERIAL

DATUM RL -8

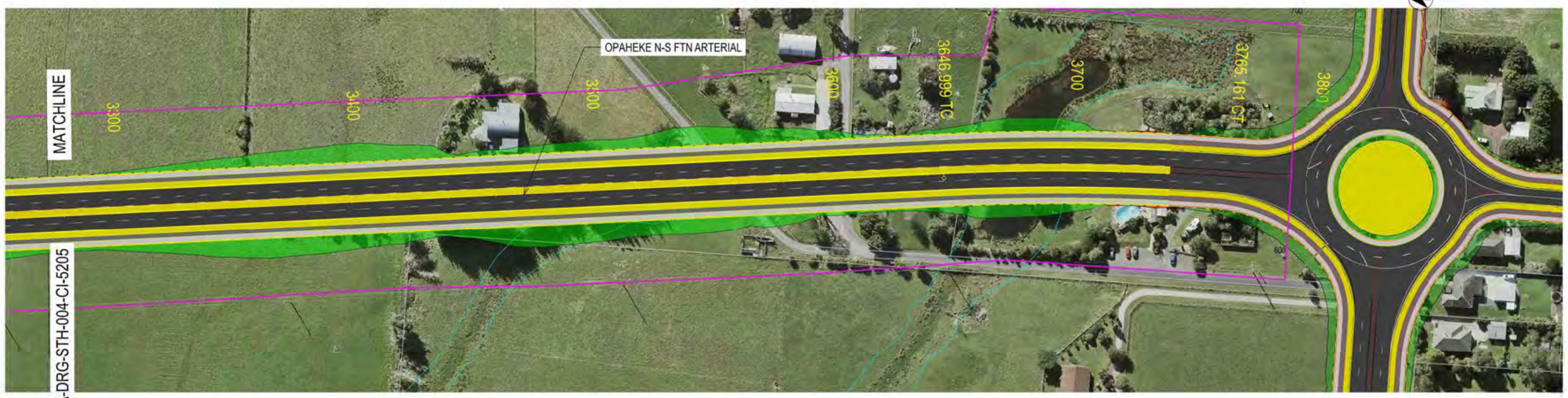
| | | |

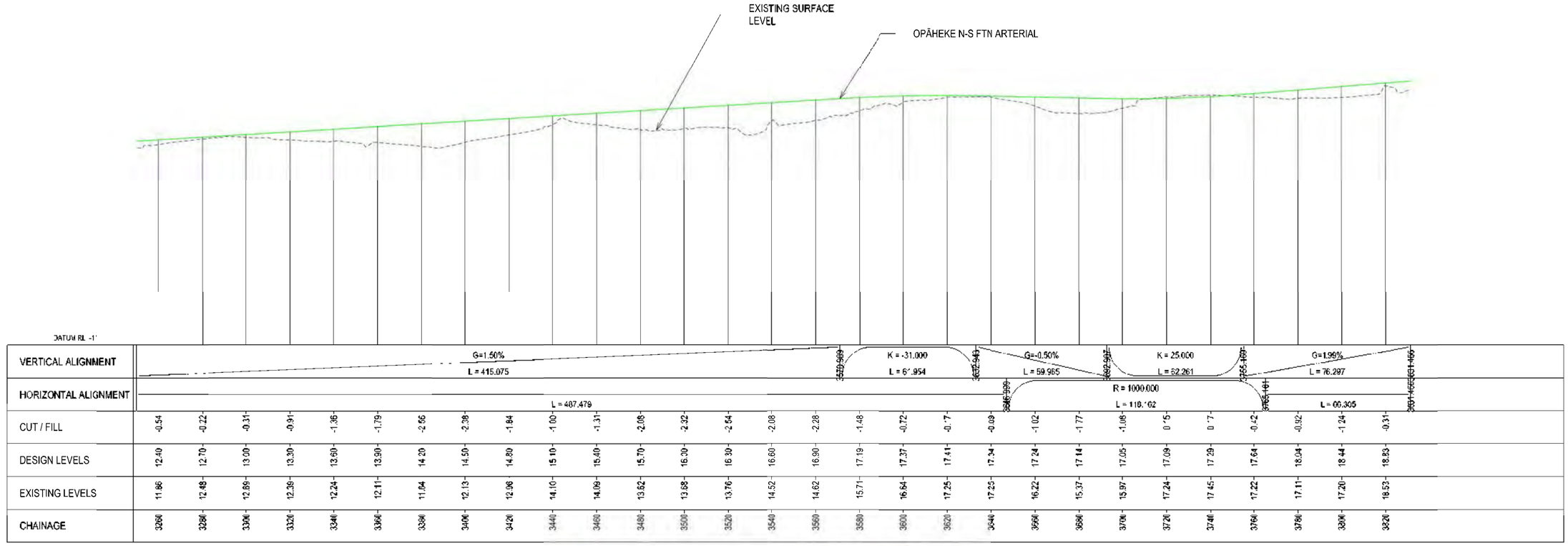

MATCHLINE
OPAHEKE N-S FTN ARTERIAL
MATCHLINE
SGA-DRG-STH-004-CI-5204
SGA-DRG-STH-004-CI-5206
2600
2700
2800
2900
3000
3022.379 TC
3100
3159.520 CT
3200
3300


OPÄHEKE N-S FTN ARTERIAL
EXISTING SURFACE LEVEL
WAIHOEHOE STREAM

DATUM RL -N

| | | |





NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	FJB	10.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE N-S FTN ARTERIAL NOR D4

Drawing Title
PLAN AND LONGITUDINAL SECTION
SHEET 6 OF 6

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-5206
Revision: D

ORIGINAL SIZE A1

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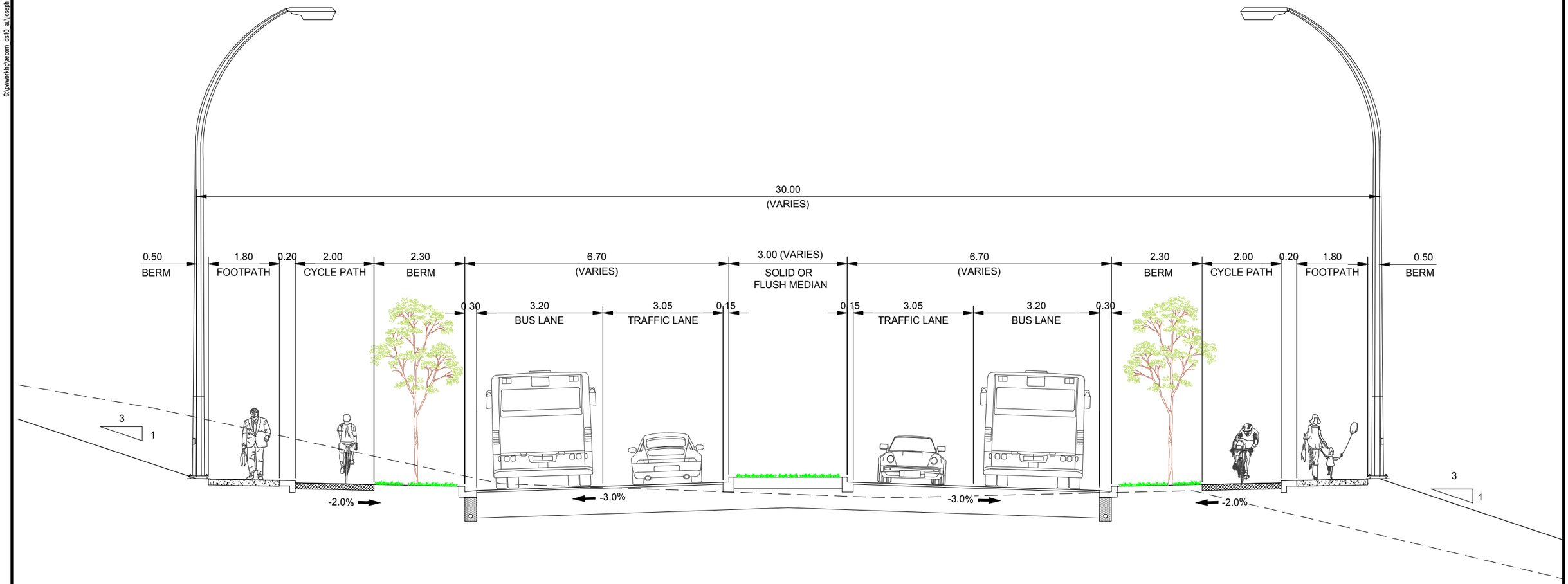


A | TYPCAL CROSS SECTION
Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50 | A3 1:100 — 0 — 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title: TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 27.11.2019

A1 Scales 1:50 | A3 Scales 1:100

Discipline: CIVIL

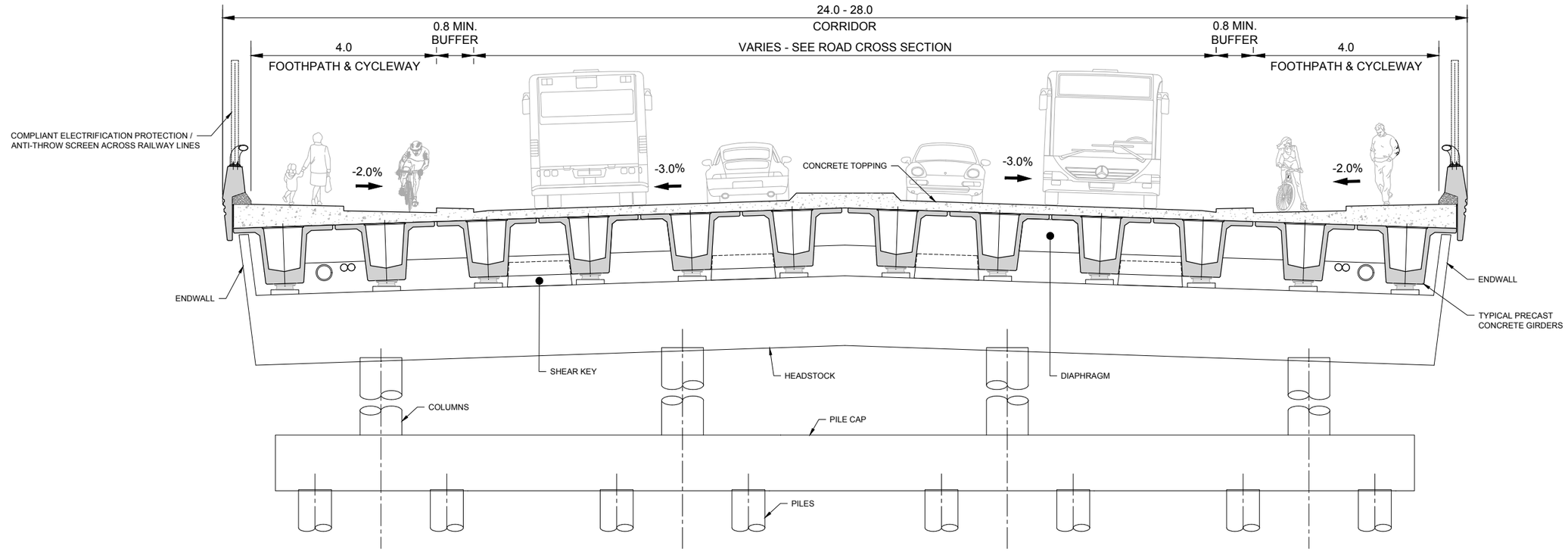
Drawing No.: SGA-DRG-STH-004-CI-5301

Revision: D

C:\pwworking\aecom_ds10_au\gpr176905\d0153527\SGA-DRG-STH-004-ST-5720.dwg

NOTES:

1. BRIDGE DESIGN IS INDICATIVE ONLY.
2. UNLESS NOTED OTHERWISE, UTILITIES SHOWN ARE INDICATIVE ONLY



TYPICAL CROSS SECTION - FOUR LANE BRIDGE

Scale : NTS

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	AG	21.07.2020
C	FOR ENGAGEMENT	AG	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	AG	28.02.2020
A	DRAFT ISSUE FOR REVIEW	AG	14.02.2020

SURVEYED		
DRAWN	A. GARCIA	15.05.20
DRAWING CHECK	J. DELA TORRE	15.05.20
DESIGN	A. REVELL	15.05.20
DESIGN REVIEW	K. CRAWFORD	15.05.20
APPROVED	R. MASON	15.05.20

TE TUPU NGĀTAHI Supporting Growth

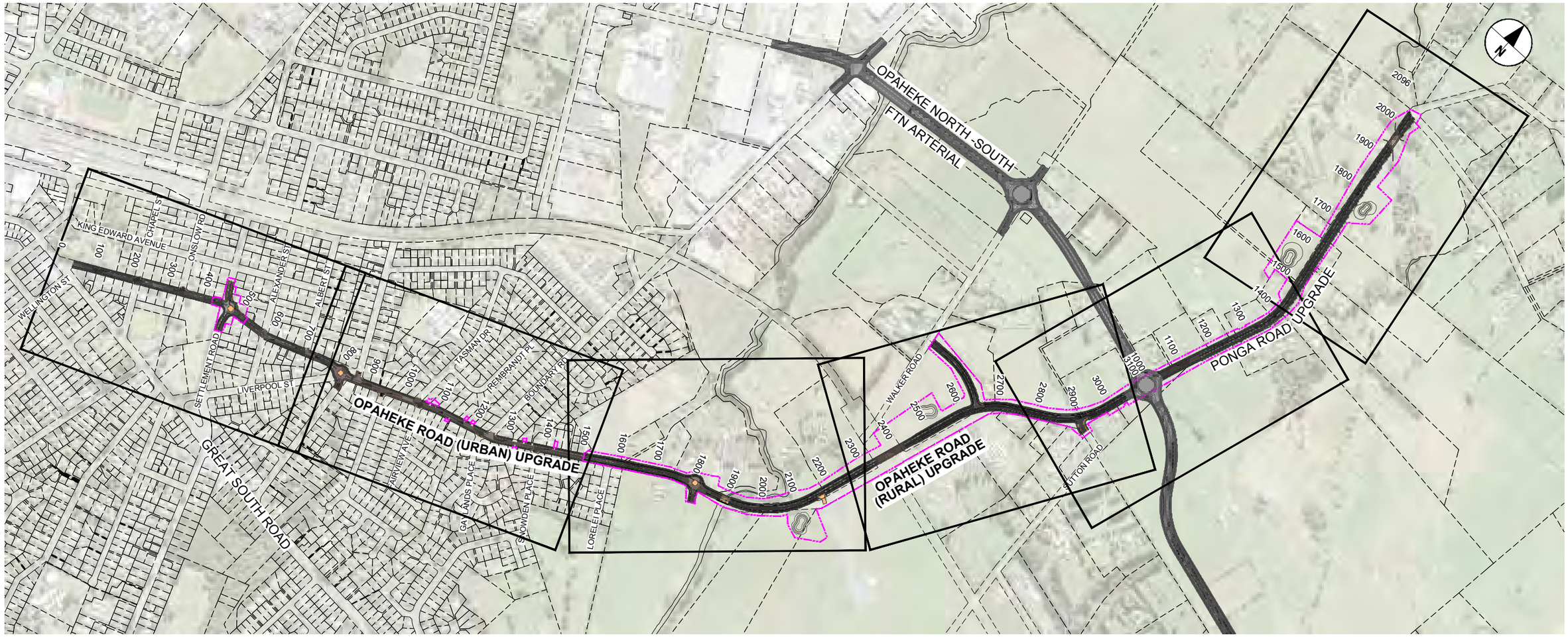
WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE NORTH-SOUTH FTN ARTERIAL (NoR D4)

Drawing Title:
FOUR LANE BRIDGE
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.01.2020
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURE
Drawing No.: SGA-DRG-STH-04-ST-5720
Revision: D

ORIGINAL SIZE A1



NoR D5 LOCATION PLAN

SCALE 1:5000

GENERAL

1.1 NoR D5 INCLUDES THE FOLLOWING SECTIONS:

- PONGA ROAD UPGRADE
- OPĀHEKE ROAD (RURAL) UPGRADE
- OPĀHEKE ROAD (URBAN) UPGRADE

A1 1:5000
A3 1:10000
0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
A	ISSUED FOR APPRROVAL	JDT	21.07.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.07.2020
DRAWING CHECK	J. DELA TORRE	16.07.2020
DESIGN	R. BELTRAN	16.07.2020
DESIGN REVIEW	N. GUO	16.07.2020
APPROVED	R. MASON	16.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - NoR D5

Drawing Title: SUMMARY SHEET

Drawing Status: FOR APPROVAL
Drawing Date: 16.07.2020
A1 Scales: 1:5000 | A3 Scales: 1:10000
Discipline: GENERAL
Drawing No.: SGA-DRG-STH-004-GE-7500
Revision: A

ORIGINAL SIZE A1

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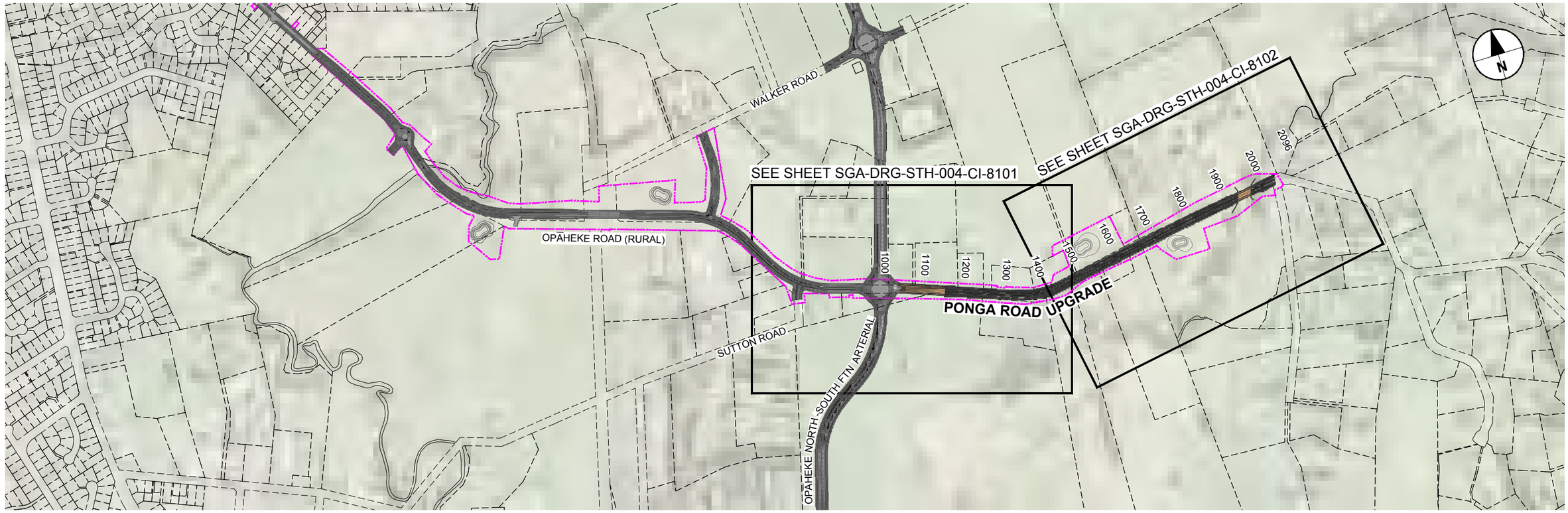
C:\pwworking\ascom ds10 aujljoseph.delatorre@aecom.com\d0153523\SGA-DRG-STH-004-GE-8000.dwg



PONGA ROAD UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - PONGA ROAD UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-8000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-8101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 2	D
SGA-DRG-STH-004-CI-8102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 2	D
SGA-DRG-STH-004-CI-8201	PLAN & LONGITUDINAL SECTION SHEET 1 OF 2	D
SGA-DRG-STH-004-CI-8202	PLAN & LONGITUDINAL SECTION SHEET 2 OF 2	D
SGA-DRG-STH-004-CI-8301	TYPICAL CROSS SECTIONS	D
SGA-DRG-STH-004-ST-8720	TWO LANE BRIDGE TYPICAL CROSS SECTIONS	D

GENERAL NOTES

GENERAL

1.1. THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2. THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1. THE STORMWATER DESIGN IS INDICATIVE.

2.2. WETLAND SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO:

- ATTENUATE THE 10% AEP AND 1% AEP; AND
- PROVIDE TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01

2.3. DISCHARGED PONGA WETLAND 1 AND PONGA WETLAND 2 INTO NEARBY OVERLAND FLOW PATHS OR STREAMS.

2.4. CROSS CULVERTS TO BE EXTENDED TO SUPPORT ROAD UPGRADE.

100mm

A1 1:5000 | A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	08.11.2019
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	08.11.2019
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - PONGA ROAD UPGRADE (A SECTION OF NoR D5)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: **FOR APPROVAL**

Drawing Date: 14.11.2019

A1 Scales: 1:5000 | A3 Scales: 1:10000

Discipline:

Drawing No.: SGA-DRG-STH-004-GE-8000

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

1 2

N

OPAHEKE ROAD

PONGA ROAD

NoR D5

NoR D5

TIE-IN WITH SUTTON ROAD

TIE-IN WITH OPAHEKE NORTH-SOUTH FTN ARTERIAL

OPAHEKE NORTH-SOUTH FTN ARTERIAL

1000

1100

1200

1300

1400

MATCHLINE - REFER DRG-SHT-004-CI-8102

FIRST GAS DESIGNATION 9104

COUNTIES POWER LTD. DESIGNATION 3006

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

ORIGINAL SIZE A1

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - PONGA ROAD UPGRADE (A SECTION OF NoR D5)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-8101
Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN

NoR D5
PONGA WETLAND 1
SITE COMPOUND
1500
1600
1700
1800
1900
2000
2096
MANGAPŪ (SYMONDS) STREAM
BRIDGE CONSTRUCTION AREA
PONGA ROAD
TIE-IN WITH PONGA ROAD
BRIDGE CONSTRUCTION AREA
PONGA WETLAND 2
CONSTRUCTION AREA
NoR D5
MATCHLINE - REFER DRG-SHT-004-CI-8101
JACK PATERSON ROAD
PONGA ROAD

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - PONGA ROAD UPGRADE (A SECTION OF NoR D5)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-8102
Revision: D

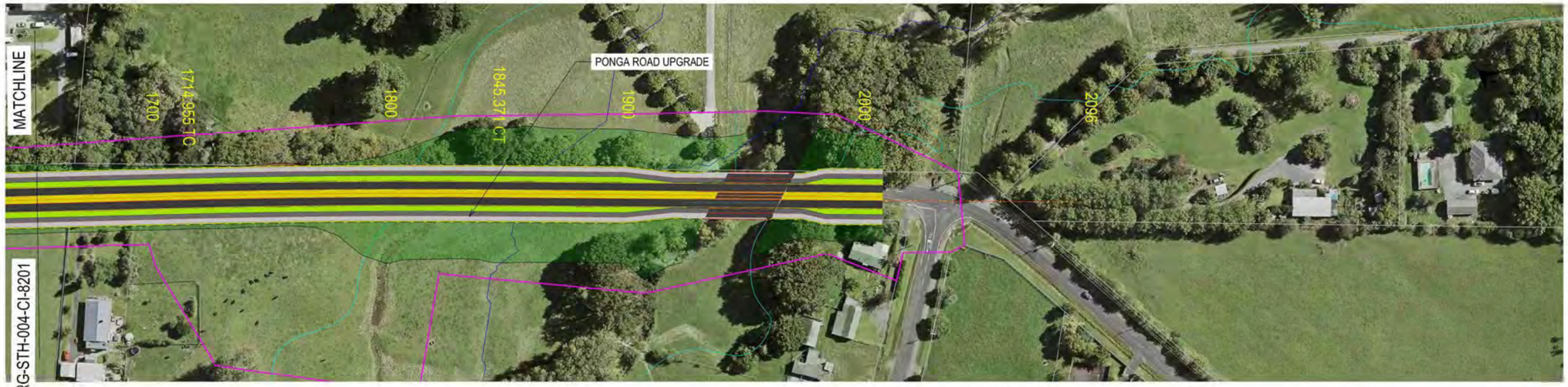
ORIGINAL SIZE A1

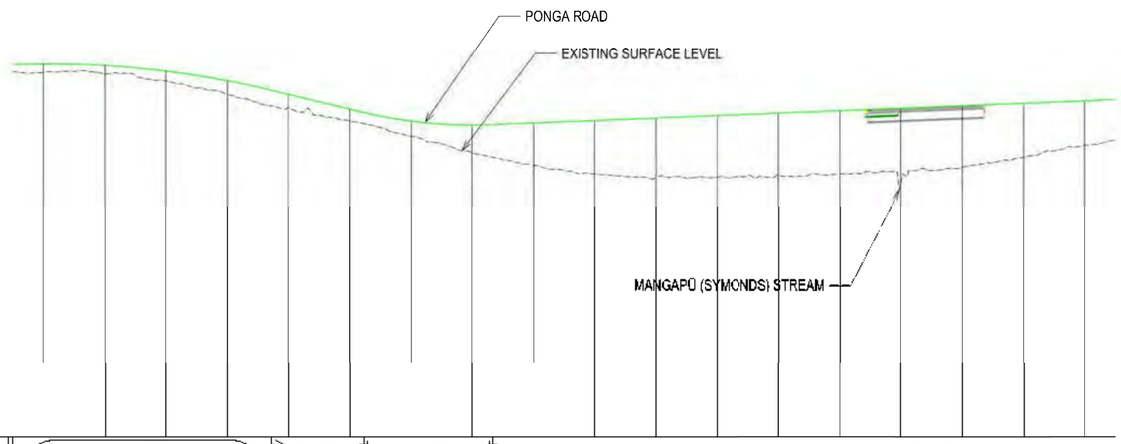

1021.809
1088.555 CT
1100
1200
PONGA ROAD UPGRADE
1300
1327.380 TC
1400
1445.553 CT
1500
1600
MATCHLINE
SGA-DRG-STH-004-CI-8202


EXISTING SURFACE LEVEL
PONGA ROAD

DATUM RL 4

| | | |





DATUM RL 4

VERTICAL ALIGNMENT	K = -12.000 L = 151.798			G=-8.00% L = 30.063		K = 5.000 L = 42.000			G=1.00% L = 288.972												
HORIZONTAL ALIGNMENT	L = 209.402			1714.955	R = 4000.000 L = 130.415				1845.371	L = 250.357											
CUT / FILL	-0.70	-0.73	-0.81	-1.12	-1.06	-0.97	-1.20	-2.18	-3.33	-4.26	-4.76	-4.82	-4.95	-5.07	-6.04	-4.95	-4.30	-3.54			
DESIGN LEVELS	34.42	34.30	33.84	33.05	31.94	30.74	29.74	29.38	29.55	29.75	29.95	30.15	30.35	30.55	30.75	30.95	31.15	31.35			
EXISTING LEVELS	33.72	33.57	33.03	31.93	30.88	29.77	28.53	27.21	26.21	25.48	25.18	25.32	25.39	25.48	24.71	26.00	26.84	27.81			
CHAINAGE	1660	1680	1700	1720	1740	1760	1780	1800	1820	1840	1860	1880	1900	1920	1940	1960	1980	2000			

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	DD	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	09.10.19
DRAWING CHECK	NC	13.02.20
DESIGN	RB	09.10.19
DESIGN REVIEW	RJB	31.01.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - PONGA ROAD UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONG SECTION
SHEET 2 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.02.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-8202
Revision: D

A1 ORIGINAL SIZE

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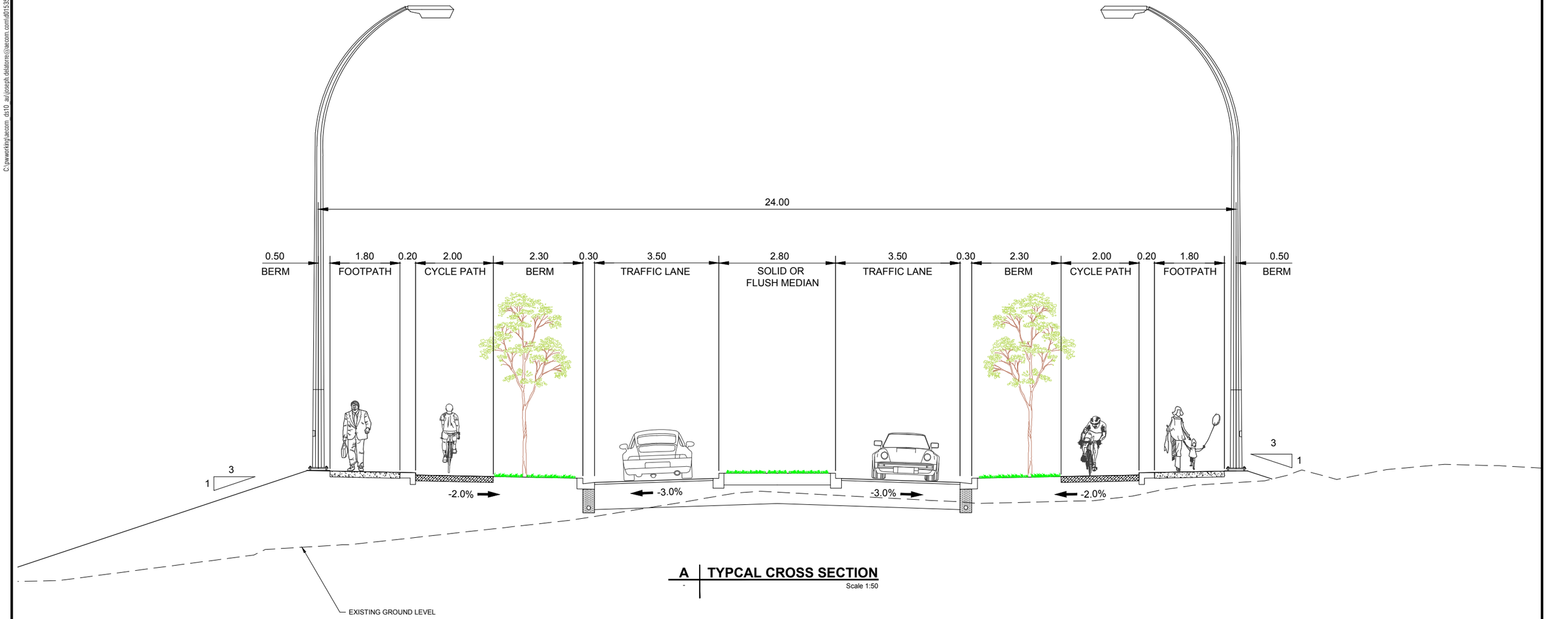

A | TYPCAL CROSS SECTION
Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50
A3 1:100
0 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	08.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	08.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - PONGA ROAD UPGRADE (A SECTION OF NoR D5)

Drawing Title: TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 14.11.2019
A1 Scales 1:50 | A3 Scales 1:100
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-8301
Revision: D

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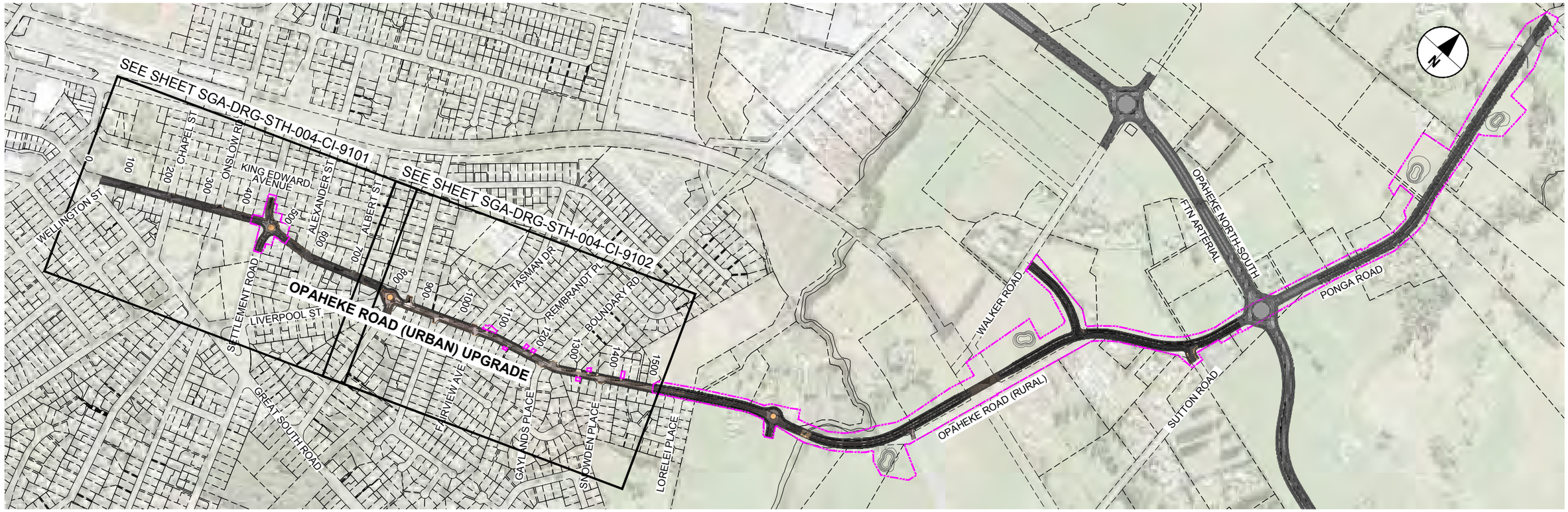

OPĀHEKE ROAD (URBAN) UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - OPĀHEKE ROAD (URBAN) UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-9000	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-9101	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 2	D
SGA-DRG-STH-004-CI-9102	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 2	D
SGA-DRG-STH-004-CI-9201	PLAN & LONGITUDINAL SECTION SHEET 1 OF 3	D
SGA-DRG-STH-004-CI-9202	PLAN & LONGITUDINAL SECTION SHEET 2 OF 3	D
SGA-DRG-STH-004-CI-9203	PLAN & LONGITUDINAL SECTION SHEET 3 OF 3	D
SGA-DRG-STH-004-CI-9302	TYPICAL CROSS SECTION	D

GENERAL NOTES

GENERAL

1.1 THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2 THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE.

2.2 THE DESIGN IS BASED ON THE UPGRADED ROAD HAVING KERB AND CHANNEL WITH CATCHPITS PROVIDED ON BOTH SIDES OF THE ROAD.

2.3 UNDERGROUND STORAGE TANK SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO ATTENUATE THE 10% AEP AND 1% AEP.

2.4 STORM FILTERS HAVE BEEN DESIGNED AS A TREATMENT DEVICE IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01.

2.5 STORMWATER OUTLETS FROM UNDERGROUND STORAGE TANKS TO CONNECT WITH EXISTING PIPE NETWORKS.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.19
DRAWING CHECK	J. DELA TORRE	15.05.20
DESIGN	R. BELTRAN	27.11.19
DESIGN REVIEW	N. GUO	15.05.20
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (URBAN) UPGRADE (A SECTION OF NoR D5)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: FOR APPROVAL

Drawing Date: 27.11.2019

A1 Scales 1:50000 | A3 Scales 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-9000

Revision: D

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- NOTABLE TREES
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

KEY PLAN: 1 | 2

SETTLEMENT ROAD
ALEXANDER STREET
ALBERT STREET
MATCHLINE - REFER DRG-SHT-004-CI-9102
WARD AVENUE
TIE-IN WITH SETTLEMENT ROAD
OPAHEKE ROAD
0
100
200
300
400
500
600
700
TIE-IN WITH GREAT SOUTH ROAD
PAPAKURA CEMETERY
TIE-IN WITH SETTLEMENT ROAD
WELLINGTON STREET
GREAT SOUTH ROAD
CHAPEL STREET
ONSLOW ROAD
SETTLEMENT ROAD
ALEXANDER STREET
NELSON STREET
EAST STREET
SOUTH STREET
LIVERPOOL STREET

A1 1:500 | A3 1:1000 — 0 — 20m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
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DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - OPĀHEKE ROAD (URBAN) UPGRADE (A SECTION OF NoR D5)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales: 1:1000 | A3 Scales: 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-9101
Revision: D

ORIGINAL SIZE A1

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- NOTABLE TREES
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- EXISTING SW PIPE (SW)
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- FIRST GAS TRANSMISSION LINES (G)
- WATERCARE (MAIN) (W)
- TRANSPOWER OVERHEAD LINES (OH)
- COUNTIES POWER LOW VOLTAGE CABLE (LV)
- COUNTIES POWER MEDIUM VOLTAGE CABLE (MV)
- COUNTIES POWER HIGH VOLTAGE CABLE (HV)
- WASTEWATER (MAIN) (WW)
- SPARK FIBRE OPTIC (FO)

NOTE:
THE PROPERTY ADDRESSES SHOWN INDICATE WHERE DRIVEWAYS ARE LIKELY TO REQUIRE REGRADING TO TIE INTO THE PROPOSED OPĀHEKE ROAD UPGRADE.

KEY PLAN: 1 | 2

SHORT STREET
COTTON PLACE
TASMAN DRIVE
REMBRANDT PLACE
BOUNDARY ROAD
800
900
1000
1100
1200
1300
1400
1500
56 OPĀHEKE RD
56A OPĀHEKE RD
54 OPĀHEKE RD
64 OPĀHEKE RD
66 OPĀHEKE RD
72 OPĀHEKE RD
80 OPĀHEKE RD
OPAHEKE ROAD
57 OPĀHEKE RD
77 OPĀHEKE RD
TIE-IN WITH SHORT STREET
MATCHLINE - REFER DRG-SHT-004-CI-9101
TIE-IN WITH BUTTERWORTH AVENUE
CLOSURE OF LIVERSPOOL STREET
BUTTERWORTH AVENUE
CALLIS AVENUE
FAIRVIEW AVENUE
ROSS PLACE
GAYLANDS PLACE
RHONDA PLACE
SNOWDEN PLACE

A1 1:500 | A3 1:1000 — 0 — 20m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	27.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (URBAN) UPGRADE (A SECTION OF NoR D5)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 2 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-9102
Revision: D

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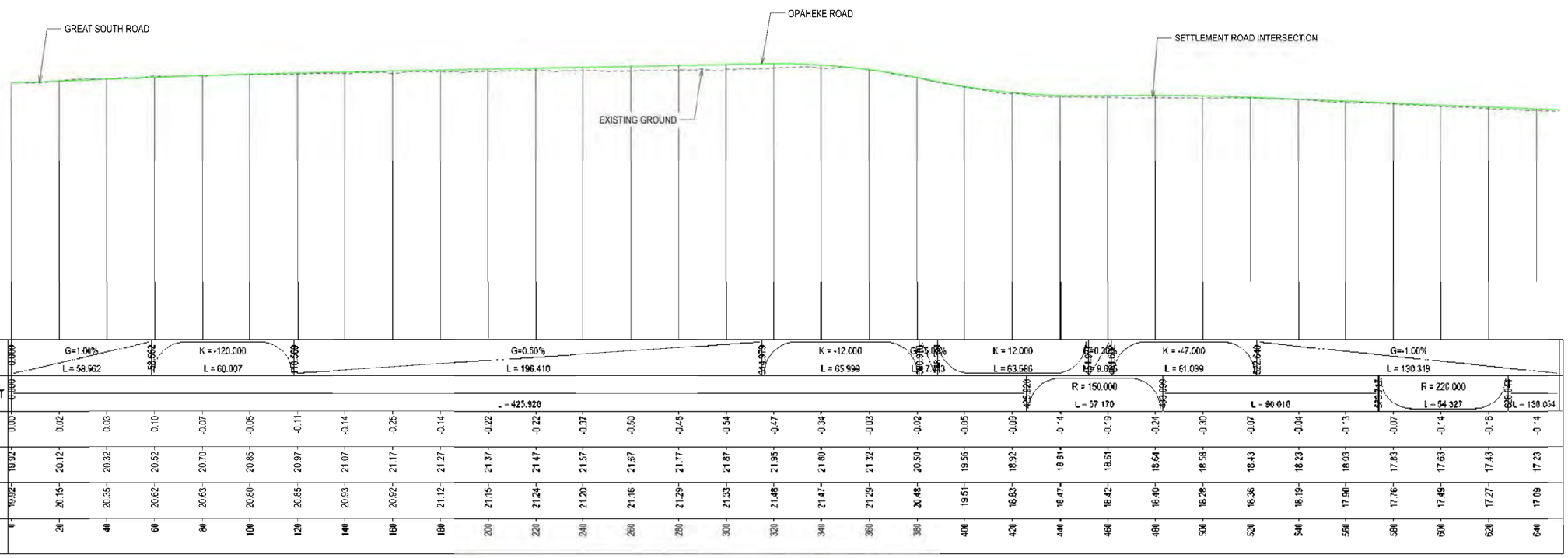

NOT FOR CONSTRUCTION

A1 ORIGINAL SIZE

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	KKS	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	FJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE ROAD (URBAN) UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONG SECTION
SHEET 1 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 15.05.20
A1 Scale: 1:1000H 1:250V | A3 Scale: 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-9201
Revision: D

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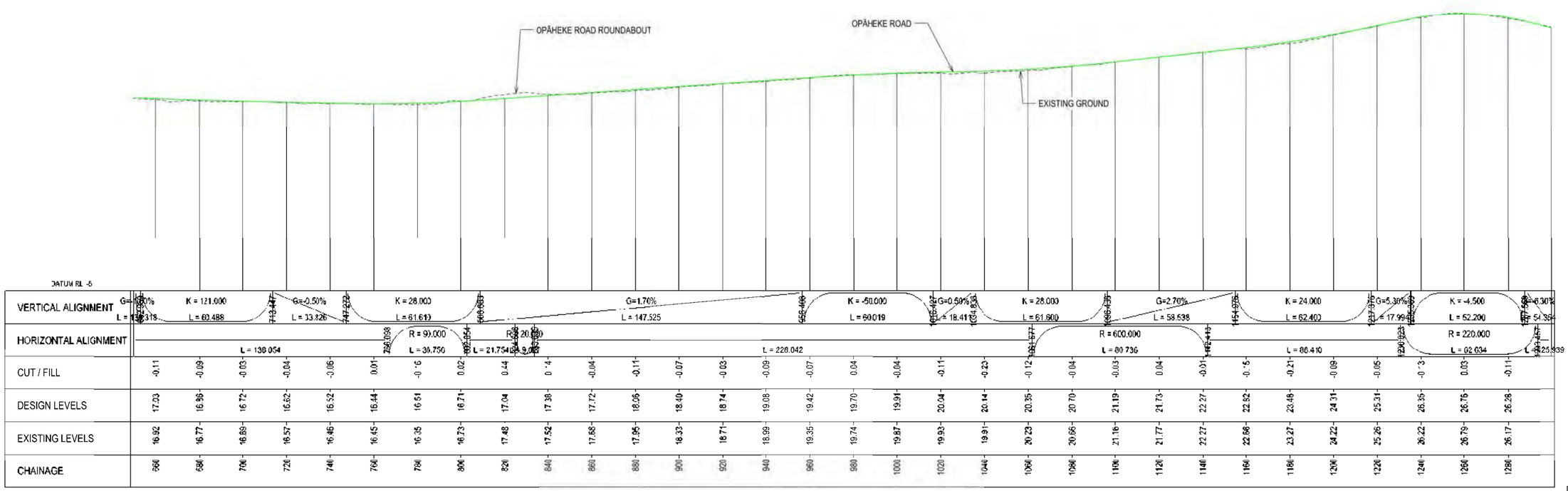

NOT FOR CONSTRUCTION

A1

ORIGINAL SIZE

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07.20
C	ISSUED FOR ENGAGEMENT	KKS	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	NG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	PJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE ROAD (URBAN) UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONG SECTION
SHEET 2 of 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 15.05.20
Scale: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Datum / Projection: C.00000.00 (AT)
Drawing No.: SGA-DRG-STH-004-CI-9202
Revision: D

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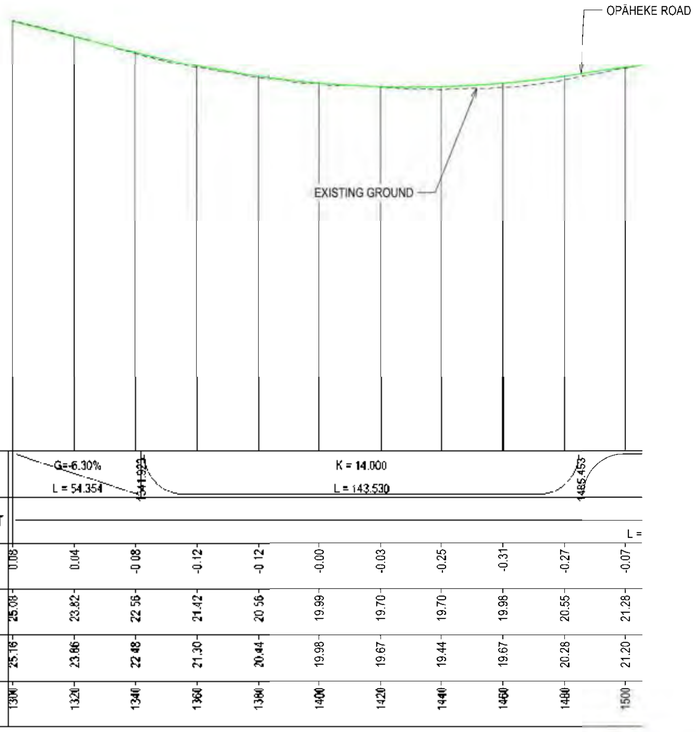

NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DO	21.07.20
C	ISSUED FOR ENGAGEMENT	KKS	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	RB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	RB	01.10.19
DESIGN REVIEW	RJB	05.02.20
APPROVED	RM	14.02.20

ORIGINAL SIZE A1

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE ROAD (URBAN) UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONG SECTION
SHEET 3 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 15.05.20
Scales: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-9203
Revision: D

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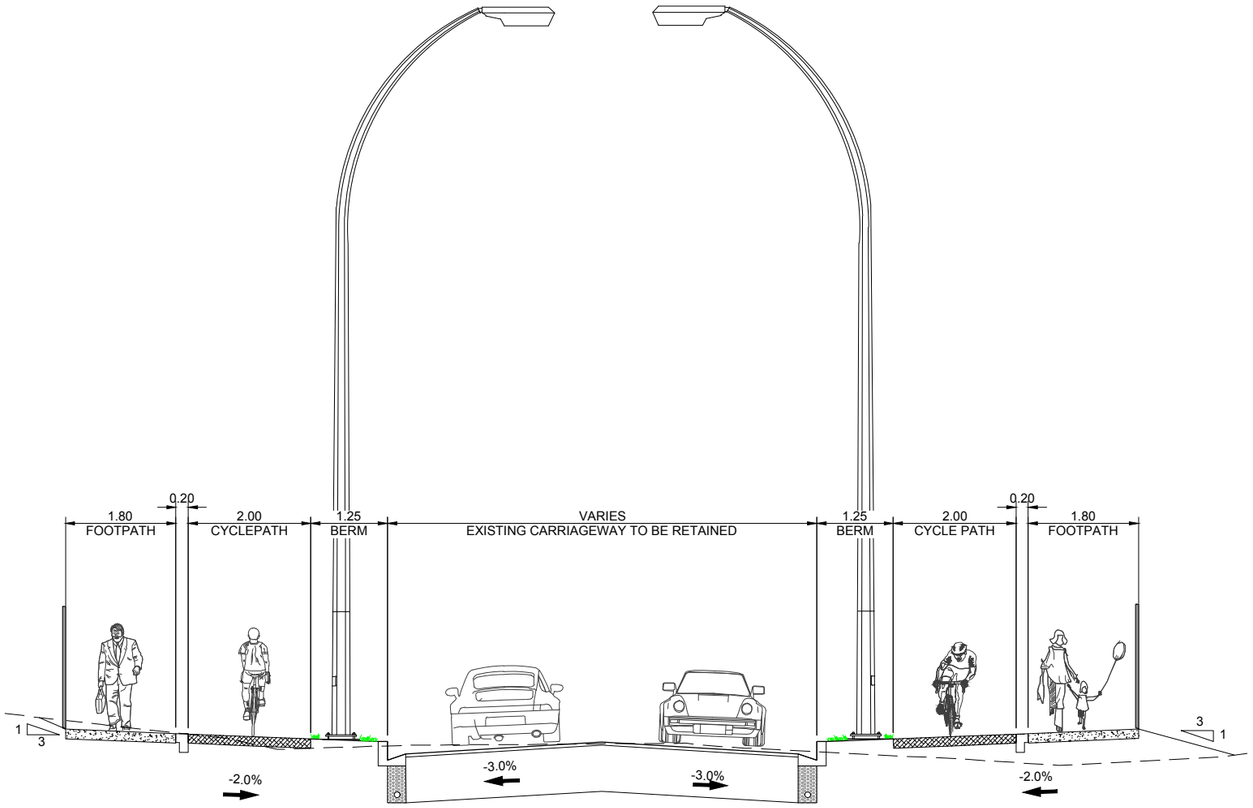

A | TYPICAL CROSS SECTION

Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50 | A3 1:100 — 0 — 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
A	ISSUED FOR APPROVAL	JDT	21.07.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	16.07.2020
DRAWING CHECK	J. DELA TORRE	16.07.2020
DESIGN	R. BELTRAN	16.07.2020
DESIGN REVIEW	N. GUO	16.07.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**
DRURY - OPĀHEKE ROAD (URBAN) UPGRADE (A SECTION OF NoR D5)

Drawing Title: TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**

Drawing Date: 16.07.2020

A1 Scales 1:50 | A3 Scales 1:100

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-9302

Revision: **A**

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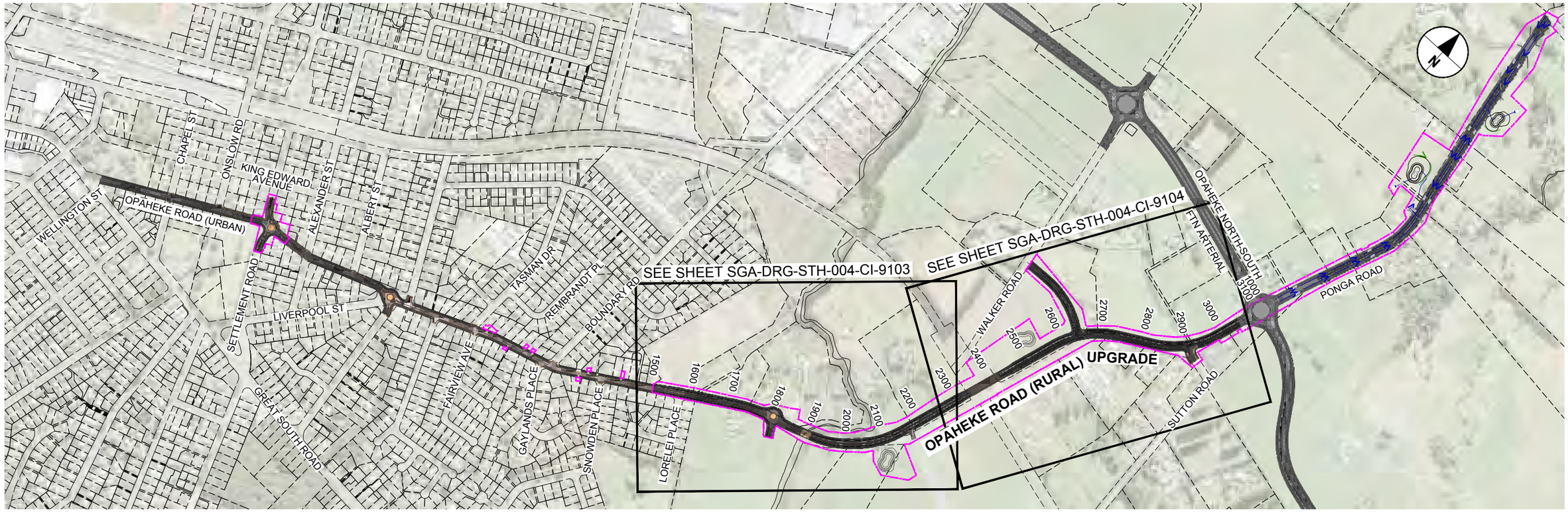

OPAHEKĒ ROAD (RURAL) UPGRADE LOCATION PLAN

Scale 1:5000

DRAWING LIST - DRURY LOCAL - OPĀHEKE ROAD (RURAL) UPGRADE		
DRAWING No.	DRAWING TITLE	REVISION
SGA-DRG-STH-004-GE-9001	LOCATION PLAN, GENERAL NOTES, DRAWING LIST	D
SGA-DRG-STH-004-CI-9103	GENERAL ARRANGEMENT PLAN - SHEET 1 OF 2	D
SGA-DRG-STH-004-CI-9104	GENERAL ARRANGEMENT PLAN - SHEET 2 OF 2	D
SGA-DRG-STH-004-CI-9204	PLAN & LONGITUDINAL SECTION SHEET 1 OF 3	D
SGA-DRG-STH-004-CI-9205	PLAN & LONGITUDINAL SECTION SHEET 2 OF 3	D
SGA-DRG-STH-004-CI-9206	PLAN & LONGITUDINAL SECTION SHEET 3 OF 3	D
SGA-DRG-STH-004-CI-9301	TYPICAL CROSS SECTION	D
SGA-DRG-STH-004-ST-9720	OPĀHEKE ROAD ACTIVE MODE BRIDGE SECTIONS	D
SGA-DRG-STH-004-ST-9721	TWO LANE BRIDGE TYPICAL CROSS SECTION	D

GENERAL NOTES

GENERAL

1.1 THE GENERAL ARRANGEMENT DRAWINGS (GA's) PROVIDE A PRELIMINARY / CONCEPT LEVEL OF DESIGN REQUIRED TO IDENTIFY THE DESIGNATION FOOTPRINT FOR CONSTRUCTION AND OPERATION OF THE PERMANENT WORKS.

1.2 THE GA's INDICATE HOW IT IS INTENDED THAT THE CORRIDOR TIES INTO THE EXISTING AND WIDER FUTURE TRANSPORT NETWORK. THE INTERSECTIONS OF TWO CORRIDORS IS INCLUDED FOR BOTH CORRIDORS AND THE EXTENT OF DESIGNATIONS MAY OVERLAP.

STORMWATER

2.1 THE STORMWATER DESIGN IS INDICATIVE.

2.2 THE DESIGN IS BASED ON THE UPGRADED ROAD HAVING KERB AND CHANNEL WITH CATCHPITS PROVIDED ON BOTH SIDES OF THE ROAD.

2.3 WETLAND SIZES ARE INDICATIVE AND HAVE BEEN DESIGNED TO:

- ATTENUATE THE 10% AEP AND 1% AEP; AND
- PROVIDE TREATMENT IN ACCORDANCE WITH AUCKLAND COUNCIL GUIDELINE GD01.

2.4 STORMWATER OUTLETS FROM WETLANDS TO DISCHARGE INTO EXISTING OVERLAND FLOW PATHS.

A1 1:5000 / A3 1:10000 — 0 100 200m

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPRROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	27.11.19
DRAWING CHECK	J. DELA TORRE	15.05.20
DESIGN	R. BELTRAN	27.11.19
DESIGN REVIEW	N. GUO	15.05.20
APPROVED	R. MASON	03.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title: COVER SHEET, GENERAL NOTES & DRAWING LIST

Drawing Status: FOR APPROVAL

Drawing Date: 27.11.2019

A1 Scales 1:50000 | A3 Scales 1:10000

Discipline: GENERAL

Drawing No.: SGA-DRG-STH-004-GE-9001

Revision: D

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LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
- PROPOSED CYCLEWAY
- PROPOSED FOOTPATH
- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- PROPOSED RETAINING WALL (RW)
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G FIRST GAS TRANSMISSION LINES
- W WATERCARE (MAIN)
- OH TRANSPOWER OVERHEAD LINES
- LV COUNTIES POWER LOW VOLTAGE CABLE
- MV COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV COUNTIES POWER HIGH VOLTAGE CABLE
- WW WASTEWATER (MAIN)
- FO SPARK FIBRE OPTIC

KEY PLAN

1500 1600 1700 1800 1900 2000 2100 2200 2300

MATCHLINE - REFER DRG-SHT-004-CI-9102

N6R D5

CONSTRUCTION AREA

LORELEI PLACE

OTUWAIROA (SLIPPERY) CREEK

TIE-IN WITH BELLFIELD DEVELOPMENT

OPAHEKE ROAD

TIE-IN WITH PARK ENTRANCE

BRIDGE CONSTRUCTION AREA

OPAHEKE 1 PRECINCT

OPAHEKE WETLAND 1

A1 1:1000
A3 1:2000
0 10 20 30 40 50m

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title:
GENERAL ARRANGEMENT LAYOUT PLAN
SHEET 1 OF 2

Drawing Status: **FOR APPROVAL**
Drawing Date: 21.11.2019
A1 Scales 1:1000 | A3 Scales 1:2000
Discipline: CIVIL
Drawing No: SGA-DRG-STH-004-CI-9103
Revision: D

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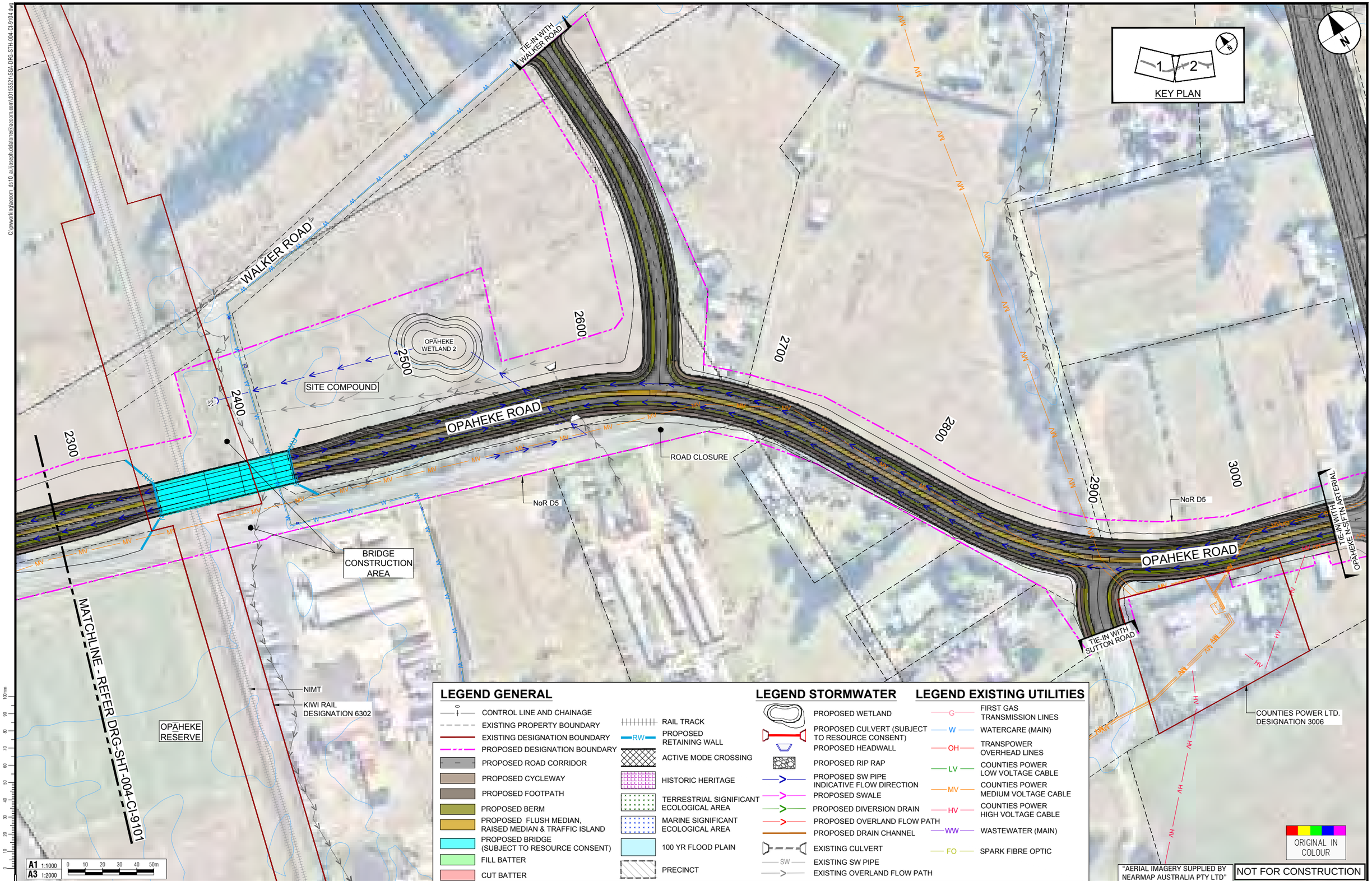

LEGEND GENERAL

- CONTROL LINE AND CHAINAGE
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- PROPOSED DESIGNATION BOUNDARY
- PROPOSED ROAD CORRIDOR
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- PROPOSED BERM
- PROPOSED FLUSH MEDIAN, RAISED MEDIAN & TRAFFIC ISLAND
- PROPOSED BRIDGE (SUBJECT TO RESOURCE CONSENT)
- FILL BATTER
- CUT BATTER
- RAIL TRACK
- RW — PROPOSED RETAINING WALL
- ACTIVE MODE CROSSING
- HISTORIC HERITAGE
- TERRESTRIAL SIGNIFICANT ECOLOGICAL AREA
- MARINE SIGNIFICANT ECOLOGICAL AREA
- 100 YR FLOOD PLAIN
- PRECINCT

LEGEND STORMWATER

- PROPOSED WETLAND
- PROPOSED CULVERT (SUBJECT TO RESOURCE CONSENT)
- PROPOSED HEADWALL
- PROPOSED RIP RAP
- PROPOSED SW PIPE INDICATIVE FLOW DIRECTION
- PROPOSED SWALE
- PROPOSED DIVERSION DRAIN
- PROPOSED OVERLAND FLOW PATH
- PROPOSED DRAIN CHANNEL
- EXISTING CULVERT
- SW — EXISTING SW PIPE
- EXISTING OVERLAND FLOW PATH

LEGEND EXISTING UTILITIES

- G — FIRST GAS TRANSMISSION LINES
- W — WATERCARE (MAIN)
- OH — TRANSPOWER OVERHEAD LINES
- LV — COUNTIES POWER LOW VOLTAGE CABLE
- MV — COUNTIES POWER MEDIUM VOLTAGE CABLE
- HV — COUNTIES POWER HIGH VOLTAGE CABLE
- WW — WASTEWATER (MAIN)
- FO — SPARK FIBRE OPTIC

ORIGINAL IN COLOUR

"AERIAL IMAGERY SUPPLIED BY NEARMAP AUSTRALIA PTY LTD"

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	JDT	28.02.2020
A	DRAFT ISSUE FOR REVIEW	JDT	14.02.2020

SURVEYED	N/A	
DRAWN	J. DELA TORRE	14.11.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	14.11.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

ORIGINAL SIZE A1

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project: **SUPPORTING GROWTH PROGRAMME**

DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title: GENERAL ARRANGEMENT LAYOUT PLAN SHEET 2 OF 2

Drawing Status: **FOR APPROVAL**

Drawing Date: 21.11.2019

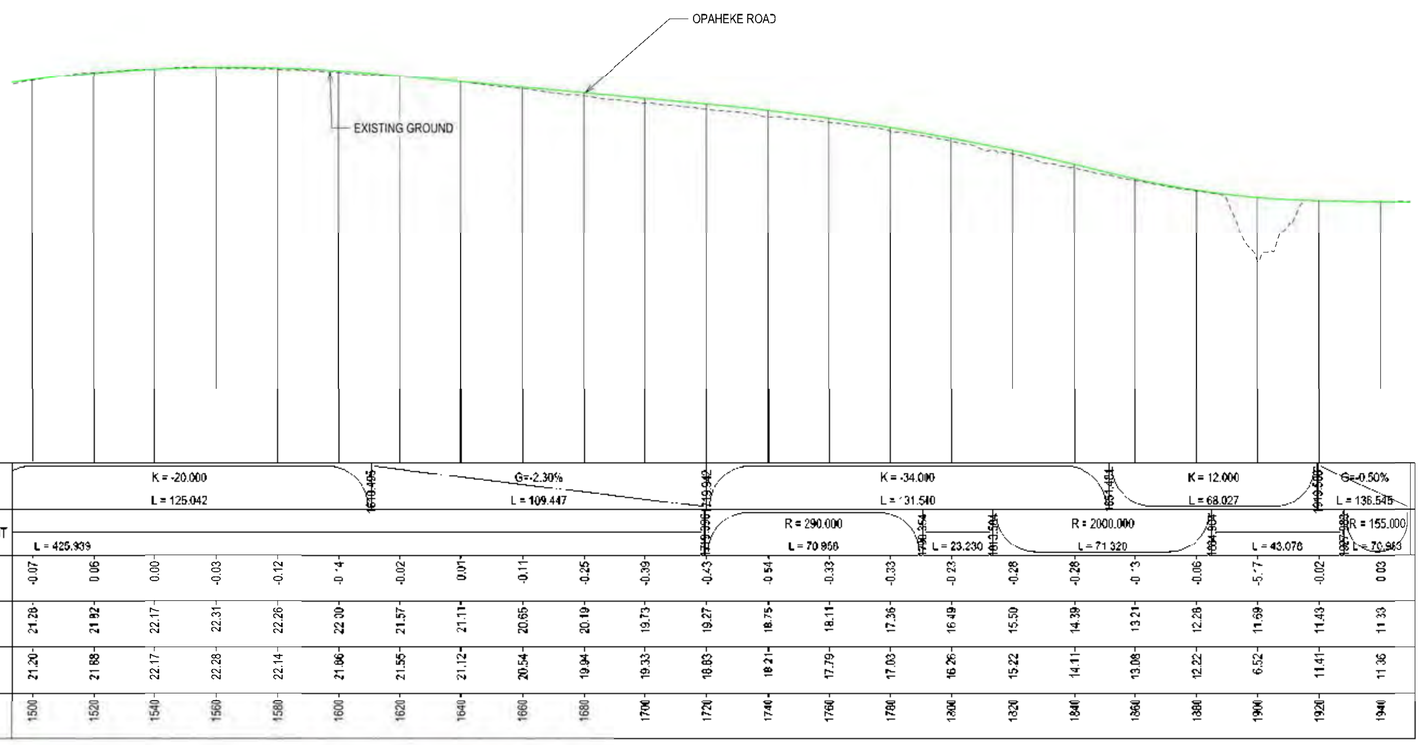
A1 Scales 1:1000 | A3 Scales 1:2000

Discipline: CIVIL

Drawing No.: SGA-DRG-STH-004-CI-9104

Revision: D





NOT FOR CONSTRUCTION

REV	REASONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	DD	21.07
C	ISSUED FOR ENGAGEMENT	KKS	15.05.20
B	ISSUED FOR ASSESSMENT OF EFFECTS ON ENVIRONMENT	RB	28.02.20
A	DRAFT ISSUE FOR REVIEW	RB	14.02.20

SURVEYED		
DRAWN	FB	01.11.19
DRAWING CHECK	MG	13.02.20
DESIGN	FB	01.10.19
DESIGN REVIEW	FJB	05.02.20
APPROVED	RM	14.02.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project
SUPPORTING GROWTH PROGRAMME
DRURY - OPAHEKE ROAD (RURAL) UPGRADE (PART OF NOR D5)

Drawing Title
PLAN AND LONG SECTION
SHEET 1 OF 3

Drawing Status: **FOR APPROVAL**
Drawing Date: 15.05.20
Scales: A1 1:1000H 1:250V | A3 1:2000H 1:500V
Contract Number: C.00000.00 (AT)
Drawing No: SGA-DRG-STH-004-CI-9204
Revision: D

ORIGINAL SIZE A1

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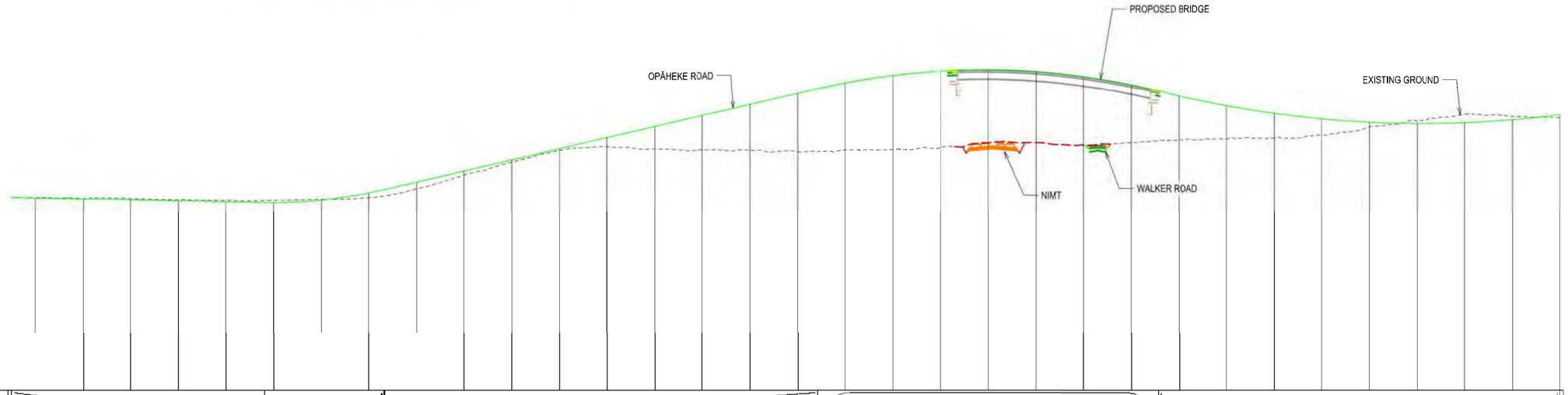

DATUM RL -0

| | | |


2600
2700
2740 999 CTC
2800
2907 074 CTC
2900
3000
3032
OPAHEKE ROAD


OPÄHEKE N-S FTN ARTERIAL
SUTTON ROAD INTERSECTION
OPÄHEKE ROAD
EXISTING GROUND

DATUM RL -2

| | | |

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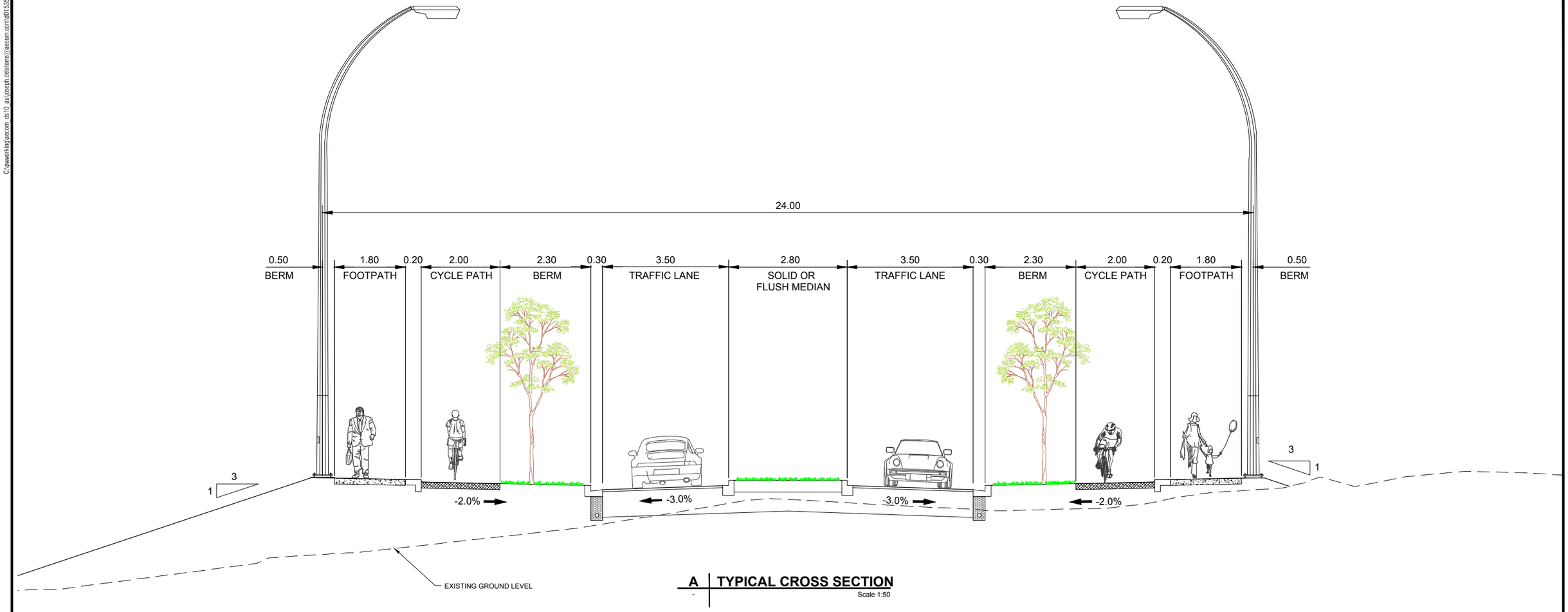

A | TYPICAL CROSS SECTION
Scale 1:50

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

A1 1:50
A3 1:100
0 2m

ORIGINAL SIZE A1

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	JDT	21.07.2020
C	ISSUED FOR ENGAGEMENT	JDT	15.05.2020
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SURVEYED	N/A	
DRAWN	J. DELA TORRE	17.12.19
DRAWING CHECK	J. DELA TORRE	15.05.2020
DESIGN	R. BELTRAN	17.12.19
DESIGN REVIEW	N. GUO	15.05.2020
APPROVED	R. MASON	21.07.2020

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title:
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 17.12.2019
A1 Scales 1:50 | A3 Scales 1:100
Discipline: CIVIL
Drawing No.: SGA-DRG-STH-004-CI-9301
Revision: D

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NOTES:

1. BRIDGE DESIGN IS INDICATIVE ONLY.
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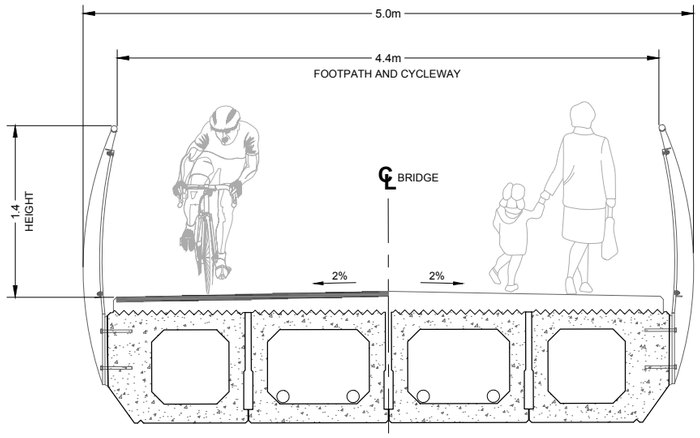

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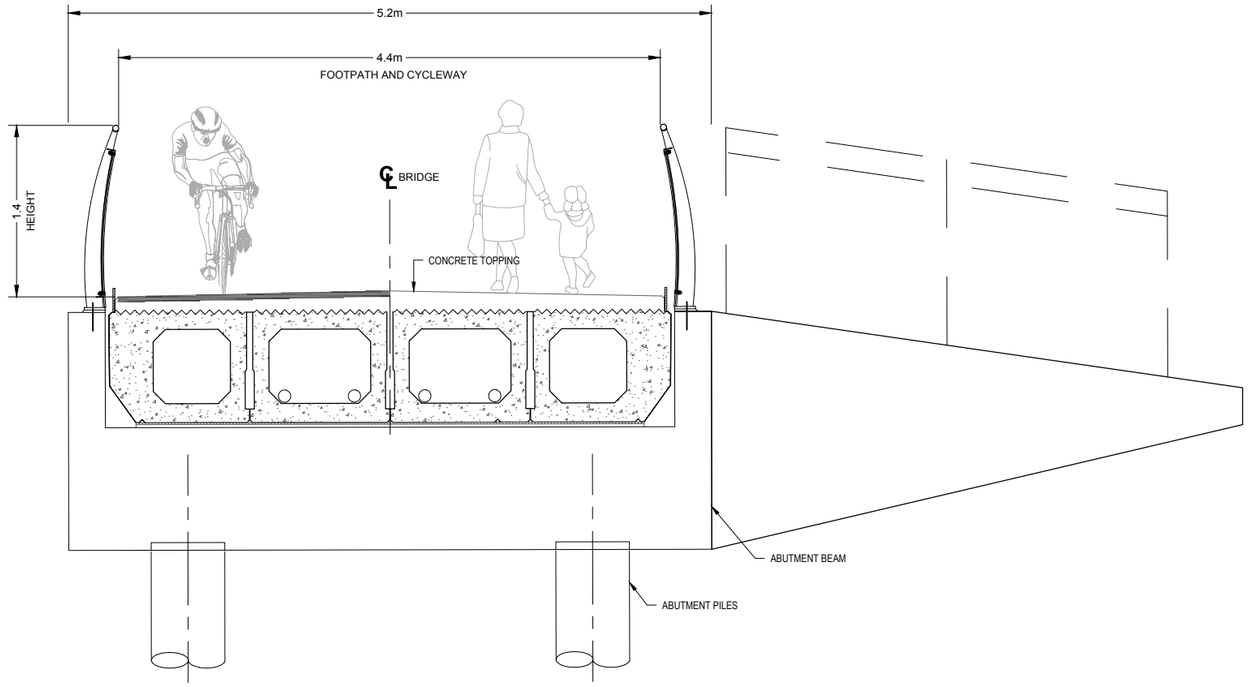

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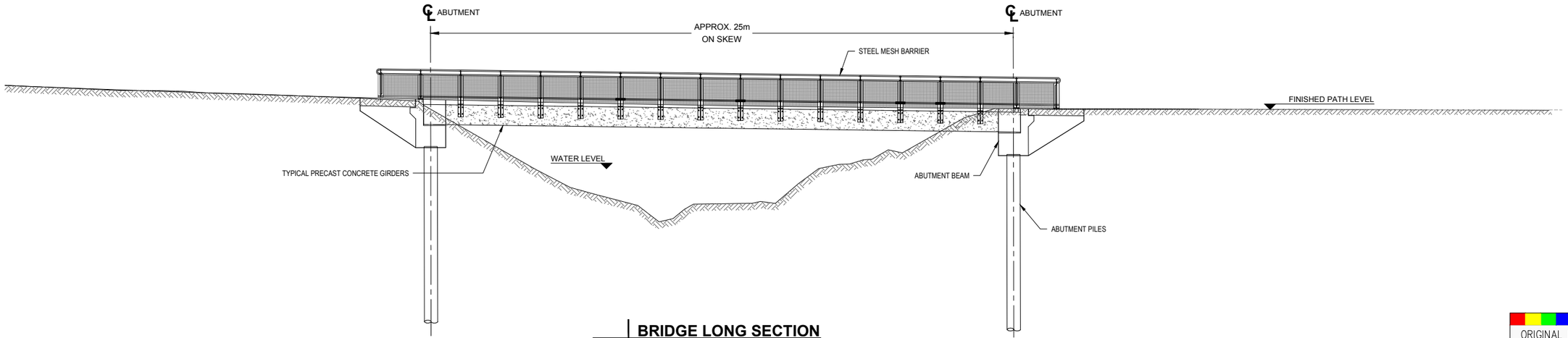

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ORIGINAL IN COLOUR

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REV	REVISIONS	DRAWN	DATE
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DRAWN	A. GARCIA	28.11.19
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DESIGN	A. REVELL	28.11.19
DESIGN REVIEW	K. CRAWFORD	28.11.19
APPROVED	R. MASON	28.11.19

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title:
OPĀHEKE ROAD ACTIVE MODE BRIDGES
SECTIONS

Drawing Status: **FOR APPROVAL**
Drawing Date: 28-11-2019
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURAL
Drawing No.: SGA-DRG-STH-004-ST-9720
Revision: D

ORIGINAL SIZE A1

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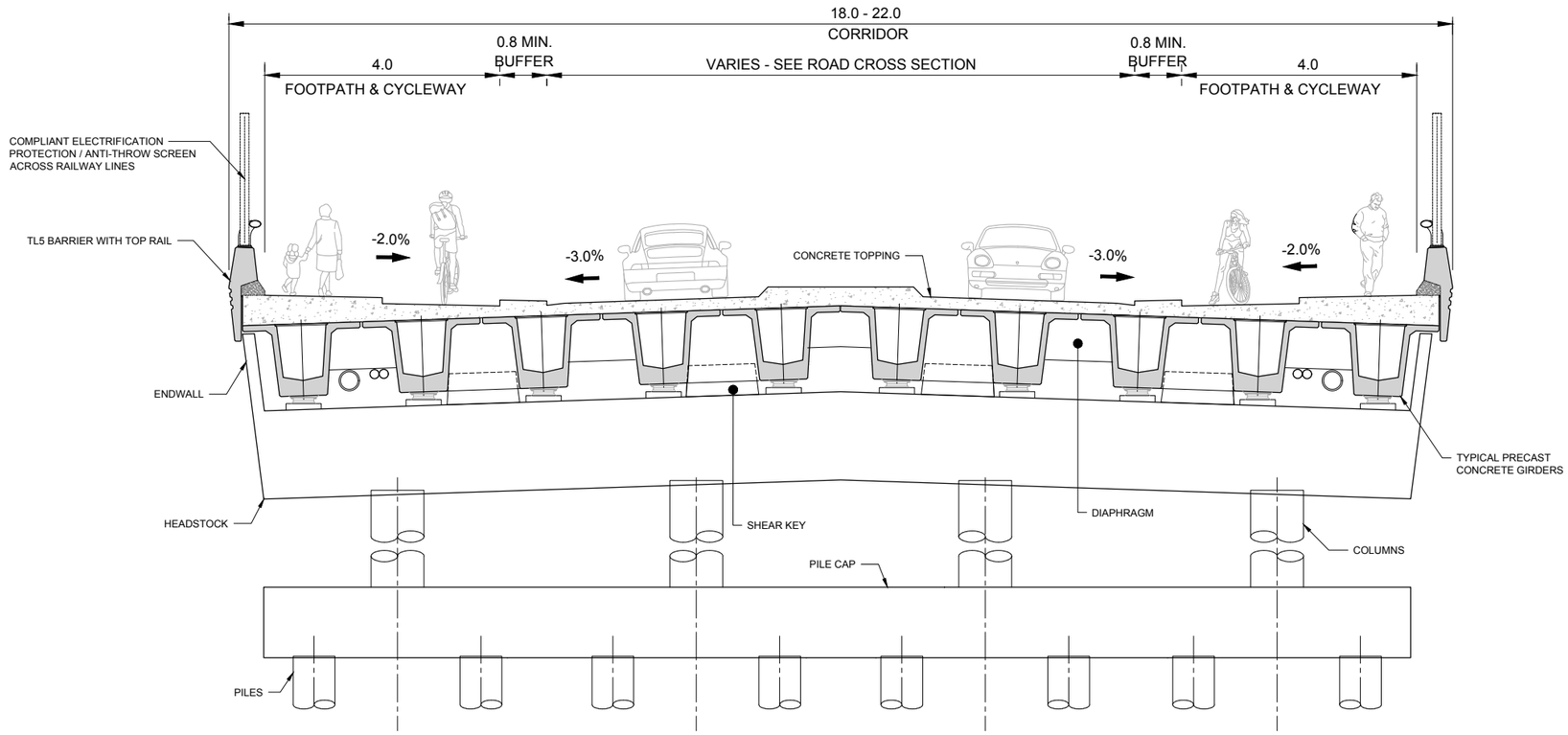

TYPICAL CROSS SECTION - TWO LANE BRIDGE

Scale : NTS

ORIGINAL IN COLOUR

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	DATE
D	ISSUED FOR APPROVAL	AG	21.07.2020
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DRAWN	A. GARCIA	15.05.20
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APPROVED	R. MASON	15.05.20

TE TUPU NGĀTAHI Supporting Growth

WAKA KOTAHI NZ TRANSPORT AGENCY

Project:
SUPPORTING GROWTH PROGRAMME
DRURY - OPĀHEKE ROAD (RURAL) UPGRADE (A SECTION OF NoR D5)

Drawing Title:
TWO LANE BRIDGE
TYPICAL CROSS SECTION

Drawing Status: **FOR APPROVAL**
Drawing Date: 15-05-2020
A1 Scales: NTS | A3 Scales: NTS
Discipline: STRUCTURE
Drawing No.: SGA-DRG-STH-004-ST-9721
Revision: D

ORIGINAL SIZE A1

Appendix 2. South Region Preliminary Geotechnical Review

Technical Note

Date Prepared: 25th September 2018

Prepared by: Rhys Garton

South Region Preliminary Geotechnical Review

Purpose

This memorandum presents the review of a desktop assessment of geotechnical conditions within the south region, including the Pukekohe-Paerata, Opaheke-Drury, and Takanini- Papakura areas. At the time of writing, alignments options are being assessed, and are not discussed in detail within this memorandum.

This memorandum is intended to provide an assessment of geological and geotechnical conditions for the purpose of providing assessment of alignment options only, and is not intended to provide detailed recommendations for detailed design or construction.

Background

1. References

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- Riley Consultants, 2017. Drury Structure Plan, Geotechnical and Coastal Erosion Assessment, Ref: 170275-C (Issue 2.0);
- Various AECOM and Beca reports from the Southern Region;
- Viljevac, J., Murphy, G., Smaill, A., Crowcroft, G., Bowden, D., 2002. South Auckland Groundwater, Kaawa Aquifer Recharge Study and Management of the Volcanic and Kaawa Aquifers. Auckland Council Technical Publication Number 133.

2. Subject sites

The south region of the Supporting Growth Alliance consists of three separate, irregularly shaped regions, named:

- Pukekohe-Paerata:
  - 40 km south of Auckland;
  - 81 km^2 total area
- Opaheke-Drury:
  - 50 km south-southwest of Auckland
  - 76 km^2 total area
- Takanini:
  - 25 km southwest of Auckland;
  - 56 km^2 total area.

The area consists of seven primary geological surficial units (adapted from Edbrooke, 2001):

- Anthropocene deposits (Q1nc): Anthropogenic deposits (0 to 200 years before present, BP). Including construction fill consisting of clay to gravel sized recompacted materials, possibly including demolition materials, mine waste, and urban refuse;
- Holocene peat deposits (Q1as): Holocene aged (0 to 14,000 years BP). Soft, dark brown to black, mud, muddy sand, muddy peat and peat. Locally extensive peat bogs;
- Tauranga Group (Q1a): Holocene aged (0 to 14,000 years BP). Alluvial, colluvial, estuarine, lacustrine, swamp and fan deposits;
- Puketoka Formation (Pup): Late Pliocene - Early Pleistocene aged (70,000 to 3.6 million years BP). Consisting of pumiceous mud, sand, and gravel, with muddy peat and lignite, rhyolite pumice, including non-welded ignimbrite, tephra, and alluvial pumice deposits, massive micaceous sand.
- South Auckland Volcanic Field: Early to late Pleistocene aged (0.5 to 1.6 million years BP). Including tuff, scoria, and basalt;
- Waitemata Group (East Coast Bays Formation): Miocene aged (16 to 24 million years BP). Alternating sandstone and mudstone with variable volcanic content and interbedded volcaniclastic grits;
- Te Kuiti Group (Waikato Coal Measures): Eocene aged (33 to 37 million years BP). Carbonaceous mudstone and claystone and coal seams, minor sandstone and occasional conglomerate; and
- Waipapa Group: Jurassic aged (142 to 227 million years BP). Massive to thinly bedded, lithic volcaniclastic sandstone and argillite, with tectonically enclosed spilite, chert, and red and green argillite.

At depth, the area is likely to consist of localised Puketoka Formation, along with widespread Waitemata Group (East Coast Bays Formation) and Waipapa Group rocks. Locally, it is likely that Kaawa Formation will be encountered, described below:

- Kaawa Formation: Pliocene aged (1.8 to 5.3 million years BP). Marine pumiceous, shelly, calcareous sandstone, overlain by pumiceous, carbonaceous sandstone with andesite and basalt pebbles, and organic clay interbeds.

Subject matter

3. Site layout

3.1 Geology

3.1.1 General

Drawings prepared using the 1:250,000 Q-Map series geological zones are included in Appendix A.

Site exists to south and east of Manukau Harbour, adjacent to Pahurehure Inlet and Drury Creek. Within inlets, locally thick (>20 m) deposits of recently deposited, soft, and variably organic alluvium are encountered.

The majority of the lowlands of the site consist of alluvial deposits of Tauranga Group recent alluvium, and older Puketoka Formation soils. These typically consist of fine grained (clay and silts) material, with variable pumiceous content (generally <20%), and peat. Extensive mapped peat deposits within eastern extents of Takanini region, with localised peat layers have been encountered within Tauranga Group alluvium.

Along the eastern edge of the Takanini and Opaheke-Drury regions, the Drury Fault runs approximately in an approximately north-south direction with a number of associated, unnamed, daughter faults. Beca (2005) studies within the area carried out on behalf of Auckland Council, indicate fault has been inactive for approximately 45,000 years, with an assessed slip rate of approximately 0.03 mm/year, and uplift rate of approximately 0.01 mm/year. The risk of fault rupture in this area regarded to be low risk.

South Auckland Volcanic Field deposits are encountered adjacent to the Drury Fault, and over the majority of the Pukekohe-Paerata Region consisting of variable basalt, scoria, and tuff, overlain by greater than 4 m of ash deposits. Recent alluvial and swamp deposits are frequently encountered within volcanic craters, consisting of redeposited ash and organic materials.

Waitemata Group, typically East Coast Bays Formation, is encountered to the north of Takanini and east of the Drury Fault, consisting of weathered rock, comprising sandy and clayey silts (typically <20 m thick) overlying very weak to weak bed rock.

Widespread basement Waipapa Group (moderately strong to very strong greywacke) and infrequent Te Kuiti group (coal deposits), are encountered to the east of the Drury Fault, generally consisting of variable thickness (5-20 m) weathered soils (sandy silts) and clays, overlying weak to moderately strong bed rock.

3.1.2 Regional faulting

Although relatively stable when compared to other areas of New Zealand, the Auckland region is known to experience low level seismic activity and has historically been subject to significant fault movement. Adjacent to the southern zone is the generally considered inactive Drury Fault, with the GNS active faults database identifying the Wairoa North and Kerepihi Faults as being located to the east of the area at distances of approximately 10 km and 35 km, respectively.

As result of the Canterbury sequence earthquakes and development in the Auckland area, several studies have been carried out to identify subsurface and concealed faults to better understand the geological structure and relationships with volcanic risk. Maps including the concealed and inferred faults are included as attachments to this memo.

Owing to the significant vertical displacement that has occurred along these faults historically (2700 m for the Drury Fault, ~100 m along the east-west trending faults) there is significant variation in bedrock level across the site, with Waitemata Group absent within typical construction depths (~30m) between the Karaka and Waiau Faults, and south of the Glenbrook Fault(Karaka/Papakura, and south of Drury/Pukekohe, respectively).

Conversely, as mentioned in section 3.1.1, east of the Drury Fault basement Waipapa Rock is encountered near surface.

Adjacent to the faults, within the Waitemata and Waipapa Groups (particularly the Drury Fault), significant alteration of the rock structure is anticipated due to movement. Within these areas it is likely that bedrock will be sheared and fractured, with increased depth of weathering. This is likely to result in decreased cut stability and foundation capacity, when compared to unaltered bedrock.

3.1.3 Kaawa Formation

The Kaawa Formation forms the base unit of the Kaihu Group, which locally overlies the Waitemata Group, consisting of shell beds and dark blue and green, fine to medium grained sandstone. The unit is subdivided into three horizons:

1. Shell beds form the lower horizon of the unit, with a maximum thickness of 3 m (carbonate gravel);
2. Medium grained sandstone, with a primarily shell matrix (likely conglomeratic calcirudite);
3. Volcanagenic sandstone with no macrofossils forms the upper horizon (likely calcareous conglomerate).

Owing to the shallow water deposition environment (assumed to be 10-30 m) and wide deposition period (Pliocene period, from 5.3 to 1.8 million years before present), the Kaawa Formation distribution and thickness are controlled by fault movements. The unit is bound by the Manukau, Drury, Waikato, and Glenbrook Faults (to the north, east, south, and west, respectively). Thicknesses are related to the upper surface of the Waitemata Group, with thick deposits in the south (up to 250 m along the St Stephens Fault/Pukekohe), and has lesser thickness along the northern extent (~ 5 to 50 m along the northern extent at Karaka/Drury).

Within the Takanini area Kaawa Formation has not been as widely investigated as Pukekohe/Paerata and Karaka/Drury. Review of NZGD borehole data indicates that limited, isolated Kaawa formation may be anticipated at the intersection of SH20 and SH1, and at depths of approximately 30 m beneath the peat deposits, however due to the geological complexity in this area it is not possible to verify without detailed geological investigation.

A plan showing the approximate upper surface level of the Kaawa formation (from Viljevac et. al) is presented as an appendix to this memorandum. It should be noted that the surface presented is based on very limited data, and is likely to vary significantly in reality.

3.1.4 Tauranga Group peat

In the Takanini and northern Opaheke-Drury area, peat deposits are encountered in the Tauranga Group alluvium deposits, commonly referred to as Papakura Peat. This material was deposited in swamp environment and consists of amorphous to fibrous peat, with occasional buried trees. Review of NZGD borehole records indicate the deposits vary significantly over relatively short distances, from isolated lenses <1 m thickness, to deposits of >10 m. The engineering properties of peat are highly variable, however are typically characterised by:

- Low strength;
- Highly compressibility;
- High moisture content;
- High organic content.

The extent of peat within the Takanini area has been mapped extensively for the purpose of stormwater management, with the mapped extent indicated on the geological plans attached.

3.2 Topography and geomorphology

Drawings showing surface slopes, created using LINZ LIDAR data, are presented in Appendix B.

Within the inlet are broad tidal estuarine flats, with locally deep incised streams. Close to the Pahurehure Inlet, alluvial deposits of the Tauranga Group are typically flat or gently rolling hills, with minor meandering streams and creeks throughout.

Within the South Auckland Volcanic Field, rolling hills are generally observed, with ash deposits typically expressing a depressed version of the underlying geology with moderately deep (typically <10 m thick) ash infilled valleys and shallow ridge ash deposits (typically <5 m thick). A number of remnant volcanic cones and craters can be observed, particularly within the southern parts of Pukekohe-Paerata and Opaheke-Drury, with indications of significant erosion channels, and potential localised slope instability. As discussed in section 3.2, the volcanic craters are generally infilled with lacustrine and swamp deposits.

Directly to the east of the Drury Fault, and north of the Takanini Region within the Waitemata Group deposits, the terrain consists of variably steep slopes, formed by a combination of eroded gullies and structurally controlled large scale instability.

4. Geotechnical risks

4.1 Seismic hazard

4.1.1 Seismic site classification

The majority of the site is anticipated to consist of seismic Class D (Deep or soft soil) within alluvium areas, or Class C (Shallow soil) within weathered rock sites and the South Auckland Volcanic Field.

Localised Class E sites are likely within the estuarine flats and some locations within the Takanini area, with localised zones of Class B on some rock slopes east of the Drury Fault.

4.1.2 Fault rupture

Although the Drury Fault crosses the site, the risk of fault rupture within the lifetime of the proposed infrastructure is considered very low.

The most significant known seismic risk to the site is considered to be the Wairoa Fault, located approximately 10 km east of the Drury Fault, or the Kerepihi Fault, located approximately 35 km east of the Drury Fault. Neither is considered likely to present a significant rupture risk to the subject regions.

To identify structure specific fault rupture risk it is recommended that the fault alignment is investigated during later project phases where critical structures are proposed to cross the feature, particularly:

- SR2J, Ararimu Road to Appleby Road (including intersection with AR11);
- AR9/MT21, Appleby Road to Hunua Road (including intersection with AR7 and MT20/AR8); and
- SR2K, at Kaipara Road and Papakura Clevedon Road/Heard Road intersection.

4.1.3 Liquefaction and seismic softening

In the event of a significant seismic event, any liquefaction or seismic softening within the site is anticipated to be limited to Quaternary aged deposits (specifically Q1al- Puketoka Formation, and Pup- Estuarine Tauranga group deposits), and within alluvium encountered in the steep gullies to the east of the Drury Fault, with a medium risk of liquefaction generally described.

Low to very low risk of liquefaction can be anticipated within the surface ash and tuff deposits owing to their age and typically being above the groundwater level.`

Low to very low risk of liquefaction is anticipated within the other alluvial deposits (Pup- Tauranga Group Holocene river deposits, and Q1as- Peat) due to their generally higher clay contents and plasticity, however limited seismic softening may occur.

Liquefaction within the weathered soils of the Waitemata Group, Waipapa Group, and Te Kuiti Group, is considered unlikely.

Where structures are anticipated to be over ground that may liquefy, mitigation could likely be appropriate structural design or ground improvement (for example stone columns or deep soil mixing).

4.2 Soft soils

Within the recent alluvial deposits (particularly Q1al- Puketoka Formation, Q1as- Peat, and Pup- Estuarine Tauranga Group) significant risk of soft soils exist.

Within the older alluvium (Pup- Tauranga Group, Holocene river deposits) localised risk of soft soil exists. In the South Auckland Volcanic Field deposits, Waitemata Group soils, and east of the Drury Fault, soft soils are only anticipated within gullies.

Sections of alignment likely to be underlain by soft soils include, but are not limited to:

- SR2G, SR2H, MT21/AR9, MT20/AR8, and AR12 at Harrison Road/Quarry Road (within Q1al: Puketoka Formation);
- MT16, at Ngakoroa Stream (within Pup: Tauranga Group);
- MT4G, at Slippery Creek (within Pup: Tauranga Group and Q1al: Puketoka Formation);
- MT21/AR9, SR2H, MT20a/AR8a, and AR121 at Drury Hills Road (within Q1al: Puketoka Formation);
- AR2, at Slippery Creek (within Q1al: Puketoka Formation);
- SR2J, at Davies Road and Ararimu Road (within Q1al: Puketoka Formation);
- SR2/MT22, from Phillip Road to Cargill Street (Within peat area);
- SR2K, from intersection with SR2/MT22 to Heard Road (Within peat area);
- EW9J/AR4, full alignment (Within peat area);
- EW9B, full alignment (Within peat area);
- EW91/EW9K, from Marphona Crescent/intersection with AR2 to intersection with SR2 (Within peat area);
- MT9B/MT9A, from Portrush Lane to Parker Street (Within peat area);
- MT4I/SR24, from intersection with EW9 to Parker Street (Within peat area);
- AR2, from Manuia Road to Bellfield Road (Within peat area);
- SR2A and SR2B, at Aspiring Avenue and Carrick Glen Avenue (within Q1al: Puketoka Formation);
- MT4G, from Kerrs Road to SH020 (within Q1al: Puketoka Formation);
- MT4G, at Puhinui Stream (within Q1al: Puketoka Formation);
- SR4F/MT10, SR19, from Tuhimata Road to Solitaire Lane (within Q1al: Puketoka Formation);
- EW6, AR26, AR36, MT15, and AR31, at Pukekohe Park (within Q1al: Puketoka Formation).

4.3 Slope instability

Areas of existing slope instability are discussed in Section 3.2, and typically exhibit as areas of high relief (orange and red) in the topography maps.

Within the southern regions, and within the northeast of Takanini, existing slope instability is likely to be locally encountered east of the Drury Fault within the Waitemata Group, Te Kuiti Group, and Waipapa Group deposits. Within the weathered soils, slopes of up to approximately 1V:3H are anticipated to meet stability criteria under long term conditions. Within the parent rock, cut slopes are likely to be structurally controlled.

Adjacent to the Drury Fault, and daughter faults, the rock structure is likely to be significantly fractured and sheared, with shallower slopes presenting higher slope instability risk.

Within the volcanic deposits, largescale natural slope instability is unlikely to present a significant risk, with slopes up to approximately 1V:3H likely to meet long term stability criteria.

Sections of alignment crossing areas of likely instability include, but are not limited to:

- AR46, near Logan Road;
- AR38, and AR38A, Between Pukekohe East Road and Gordon Francis Drive;
- SR2K, from intersection with SR2, to Papakura Clevedon Road;
- SR2, from Alfriston Road to Murphys Road.

4.4 Volcanic and geothermal hazard

The South Auckland Volcanic Field is understood to have not been active for approximately 24 thousand years, and presents an very low risk to the project. A mapped geothermal zone near the site is located in Whitford, approximately 10 km northeast of the Takanini Region, however this is considered unlikely to extend into the project area.

Greater volcanic risk is anticipated from the Auckland Volcanic Field north of the site, which is being actively studied by the Department of Nuclear and Geological Sciences as part of the Determining Volcanic Risk in Auckland (DEVORA) research project. Review of DEVORA publications and recommendations should be considered as part of this programme.

Conclusion/ Summary/ Recommendation ~~(as appropriate)~~

5. Alignment recommendations

It is recommended that preference is given to alignments that:

- Follow ridge lines; and
- Are constructed along Waipapa, Te Kuiti, and Waitemata Group rocks and soils, along with South Auckland Volcanic Group Basalt and Tuff deposits.

Where possible, it is recommended that alignments avoid:

- Running along the mapped Drury Fault, or daughter faults;
- Running along large landslide areas;
- Significant embankments crossing estuarine, swamp, or peat deposits; and
- Significant cuts or embankments parallel to steep gully alignments;

6. Preliminary design and construction considerations

6.1 Fill embankments

6.1.1 General

Construction of earth fill embankments <5 m in height is likely to be achievable using material sourced from cut excavations, where available. Higher embankments are likely to require inclusion of imported granular fill, which is typically available from a number of commercial quarries east of the Drury Fault.

It should be noted that estuarine, lacustrine, and swamp alluvium and peat deposits are unlikely to be suitable for reuse as construction fill owing to the high moisture and variable organic content.

6.1.2 Soft soils

Within soft soil areas, bridge abutments and embankments crossing culverts and utilities are likely to be subject to significant differential settlement which may adversely affect performance, and require design of suitable settlement tolerant structures or ground treatment.

Embankments >4 m high in soft soil areas (particularly peat) will likely require incorporation of significant embankment staging (where specified waiting periods are required between lifts), ground improvements (eg. excavation and replacement, surcharging, drainage, construction phasing, or soil reinforcement), or lightweight filling considered.

Where significant fill embankments are required on soft soils (Specifically Q1al and recent estuarine deposits, and peat areas), consideration should be given to early placement of non-engineered clean fill, or construction fill, as preload surcharge to reduce construction durations.

6.1.3 Reuse of volcanic soils as fill

A product of the weathering of volcanic ash a mineral known as allophane forms, which is known to present unique properties when used as construction fill. This is known to be present within the South Auckland Volcanic Field as a component of the tuff and overlying the majority of the basalt and scoria deposits, along as within the Tauranga Group and Puketoka Formation alluviums where redeposited volcanic soils formed part of the deposits.

Construction with allophanic materials is widely carried out; however consideration to the unusual characteristics of the soil should be considered, including:

- Compaction characteristic which are significantly influenced by laboratory test and construction methodology- Leading to earthworks which are required to be carried out during dry weather; and
- Mechanical sensitivity, where materials soften during compaction or cutting- leading to extended construction durations.

6.2 Cut Slopes

Where significant (>10 m) cut slopes are necessary to achieve alignments, it is recommended that early phase investigation is considered to assess bedrock structure and inform corridor requirements. Adjacent to fault zones, localised zones of highly fractured areas are anticipated. Within these areas, where cut slopes are required, early phase investigation should be considered.

Within the peat soils, cut slopes and significant excavations (>3 m) should be avoided due to instability and the settlement effects due to groundwater drawdown, however this is not anticipated to be a significant issue owing to the topography within peat areas.

Within the weathered soils, slopes of up to approximately 1V:3H are anticipated to meet stable criteria under long term conditions. Within the volcanic deposits, cut slope instability is unlikely to present a significant risk, with slopes up to approximately 1V:3H likely to meet long term stability criteria.

Significant cut slopes (>5 m) are not considered likely within the alluvium deposits (Puketoka and Tauranga Group deposits). Locally shallow slopes (1V:<4H) are anticipated to be necessary where deeper cuts are required.

Cuts or tunnelling in the Kaawa Formation should be avoided due to the loss of aquifer confinement and significant contamination risk.

Specific comments relating to cut slope batters are included in Section 4.3.

6.3 Structure foundations

6.3.1 General

Across most of the site, it is likely that bridge pier foundations will be feasible using conventional driven or bored piles. Bridge abutments are likely to be feasible with shallow foundations on mechanically stabilised earth, subject to evaluation of settlement performance.

Typical bored pile lengths from 20-40 m are anticipated in East Coast Bays Formation and Waipapa Group. Driven piles lengths within Tauranga Group and Puketoka Formation alluvium are likely to be governed by pile group design.

6.3.2 Foundations in Kaawa Formation

As the Kaawa formation is a regionally significant water source and taonga, it is necessary to prevent contamination or loss of aquifer performance. Experience in the area indicates that bored piles within the Kaawa formation soils are not recommended owing to the frequently saturated nature of the sands, resulting in frequent pile-hole collapse. As such, where structural foundations are required within the Kaawa formation, it is recommended that shallow foundation or closed-end (or solid section) driven piles are considered to limit loss of aquifer confinement and potential groundwater contamination.

Examination of existing upper surface levels of the Kaawa Formation indicate that there is a low risk of Kaawa formation being encountered as part of the proposed alignments, however it should be noted that the local information available on the Kaawa Formation is limited and is likely to vary significantly from the estimated levels.

6.3.3 Foundations in Peat

In peat deposits, it is likely that structural abutments will require piled foundations into the lower Waitemata Group or volcanic soils. Where bridge approach embankments of significant height and length are required (typ. >50m long, >4m high), potential may exist for shallow foundations on embankments, as discussed in section 6.1.2.

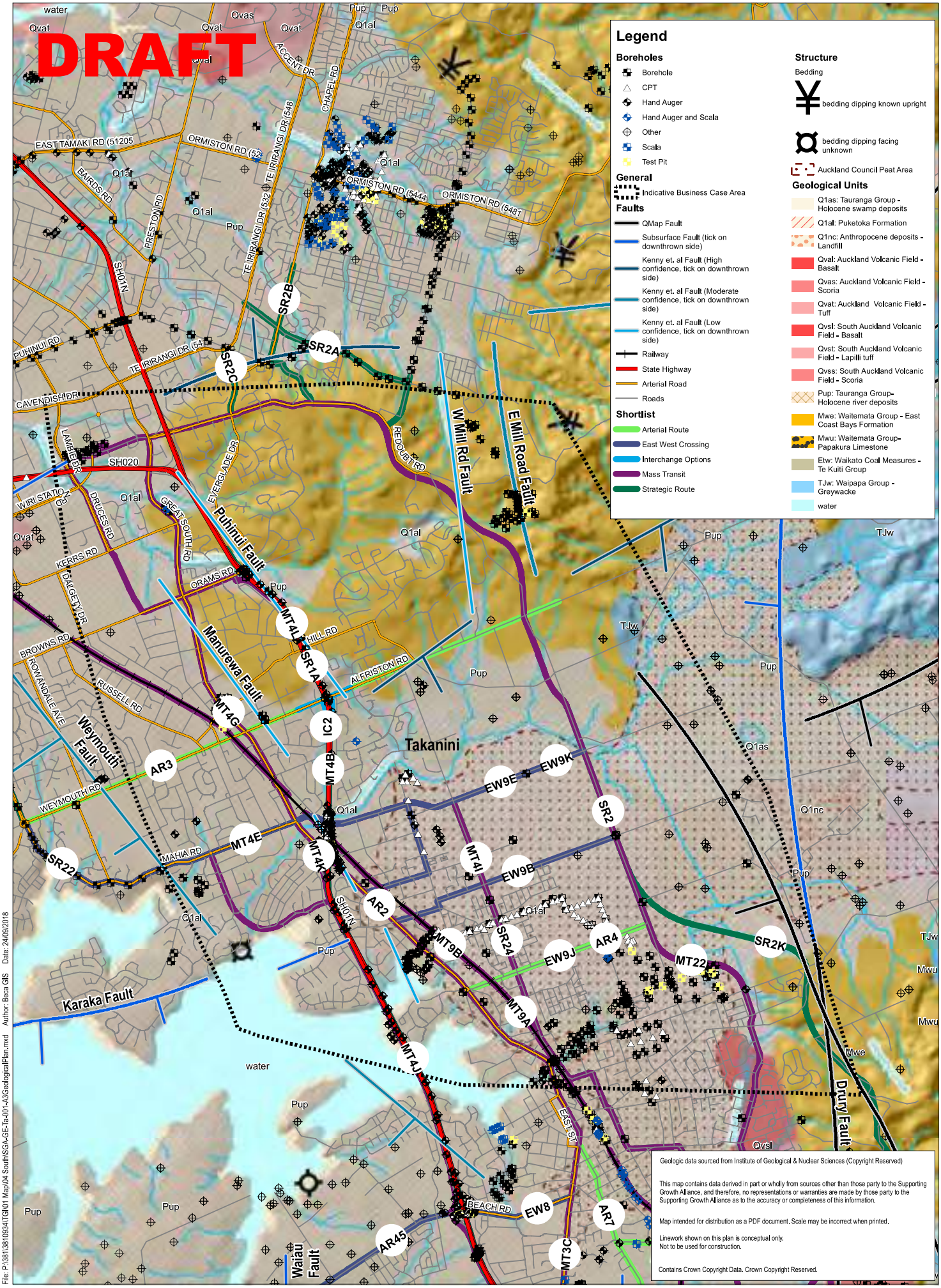
6.4 Anthropocene fill deposits

Within the south eastern extent of the Opaheke-Drury region, and east of the Takanini region, extensive fill deposits are mapped. As part of the preliminary investigation, is recommended that a review of the origin and nature of this fill is carried out to assess the likely influence of the deposits on future development and the alignment options.

Similarly, it is recommended that a review of the Auckland register of closed landfills is carried out to identify unmapped features.

6.5 Geotechnical database review

Within NZTA, Auckland Council, and New Zealand Geotechnical Database, significant resources are available to provide relevant geotechnical data. Following the identification of potential critical features and structures, a detailed review of available information should be carried out to provide an indication of existing conditions and identify detailed and localised geotechnical risks.



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4	BMM2	Draft	Draft	07/08/2018
3	BMM2	Draft	Draft	31/07/2018
2	BMM2	Draft	Draft	18/06/2018

Title: **Geotechnical Overview**
Takanini

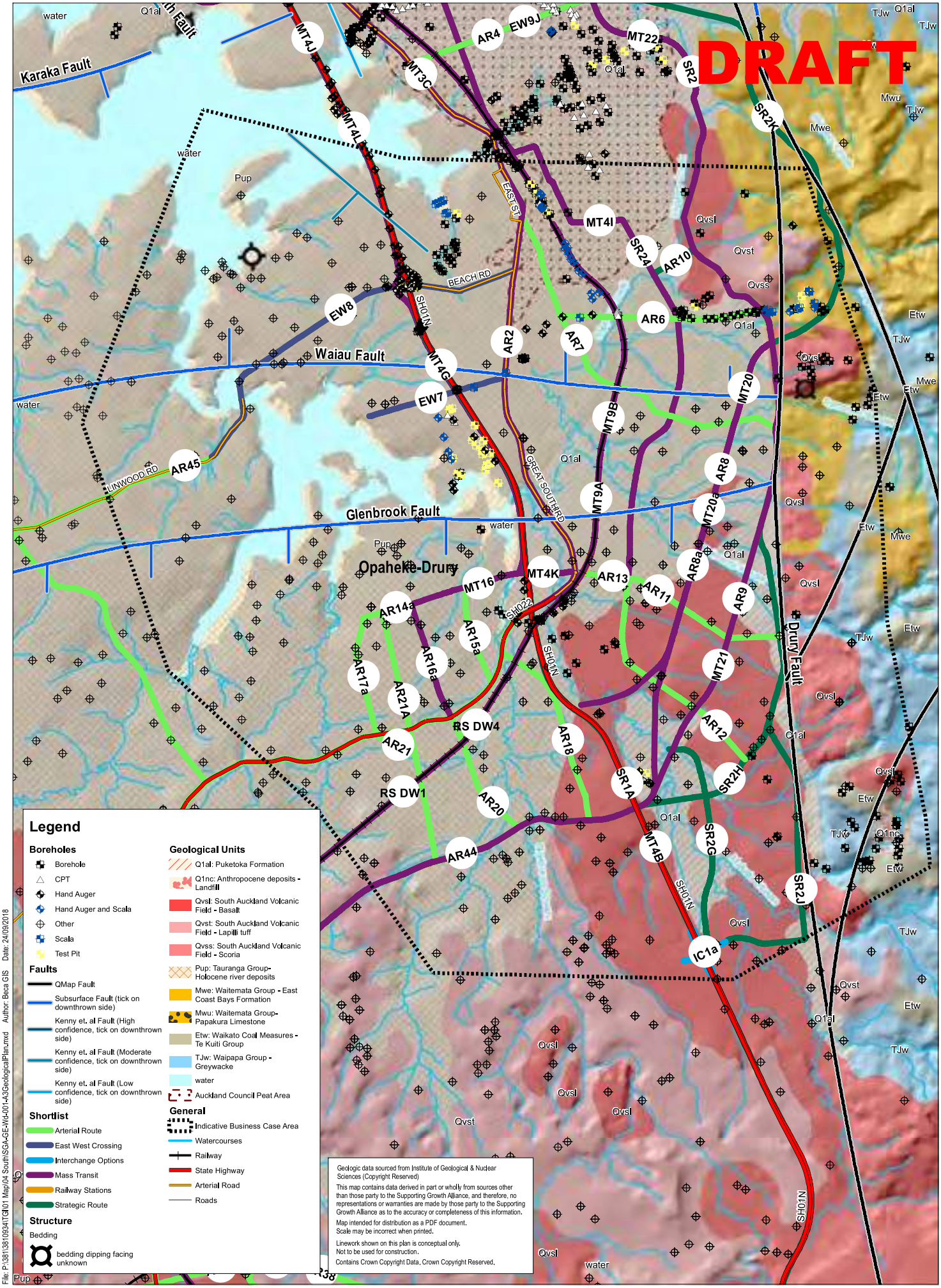
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GE-Ta-001



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5	BMM2	Draft	Draft	08/08/2018
4	BMM2	Draft	Draft	07/08/2018
3	BMM2	Draft	Draft	31/07/2018

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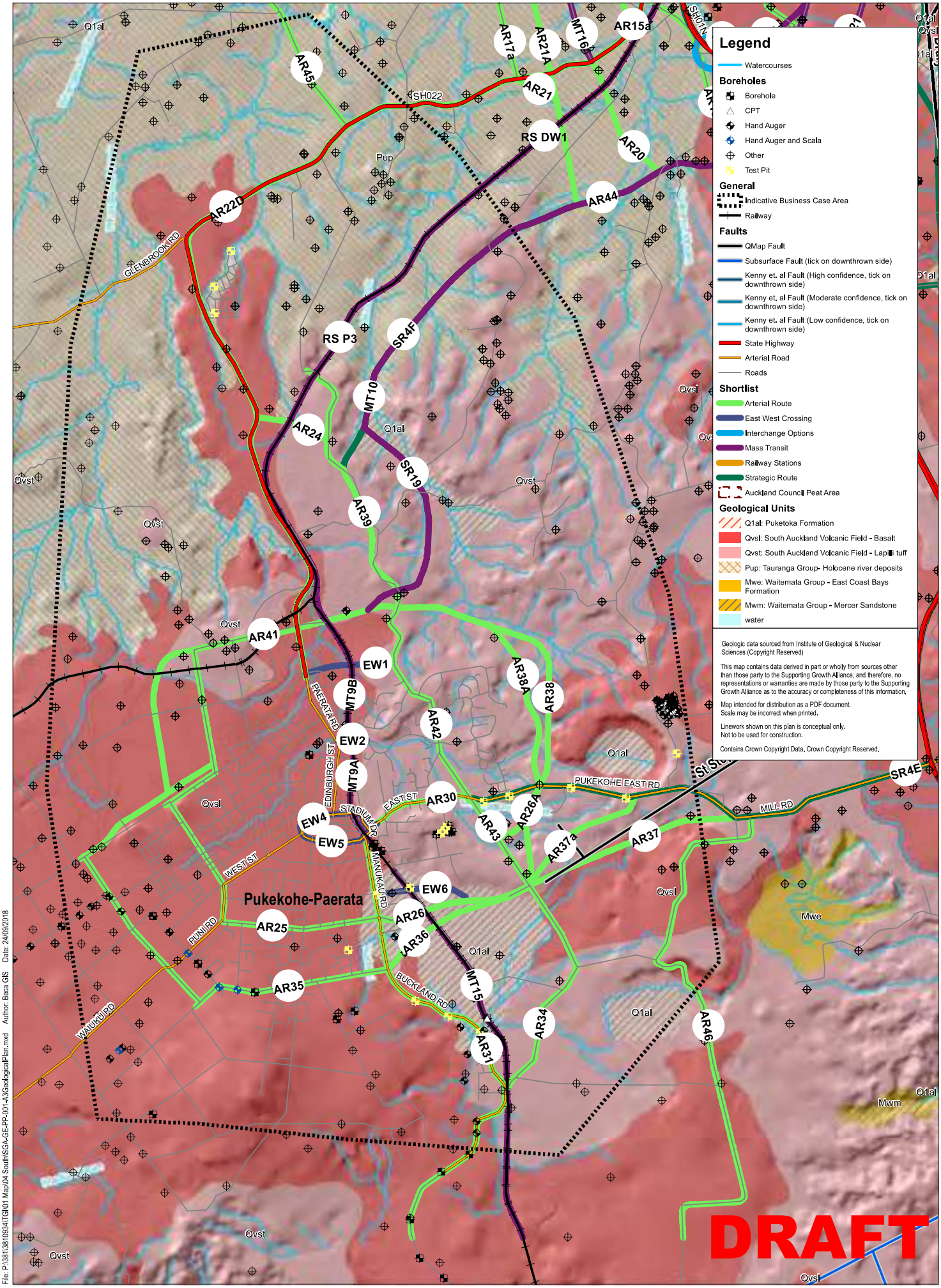
Opaheke-Drury

Client: Supporting Growth

Project: South

Discipline: GIS

Drawing No: SGA-GE-Wd-001



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	4	BMM2	Draft	Draft	07/08/2018
	3	BMM2	Draft	Draft	31/07/2018
	2	BMM2	Draft	Draft	18/06/2018

Title: **Geotechnical Overview**
Pukekohe - Paerata

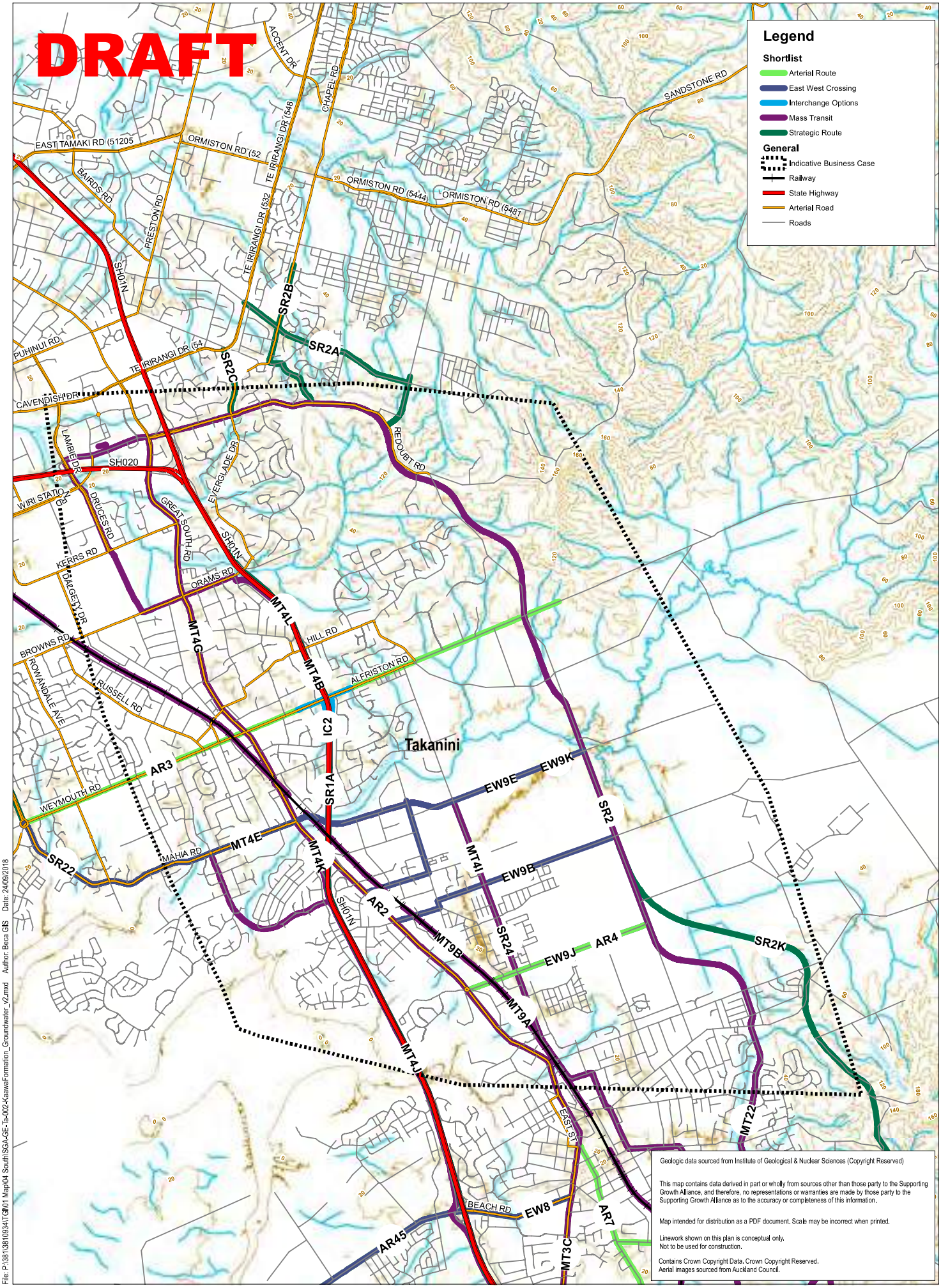
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GE-PP-001



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Map Scale @ A3: 1:40,000

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Revision	Author	Verified	Approved	Date
2	BMM2	Draft	Draft	24/09/2018
1	BMM2	Draft	Draft	10/08/2018

Title:

Geotechnical Overview
Kaawa Formation
Takanini

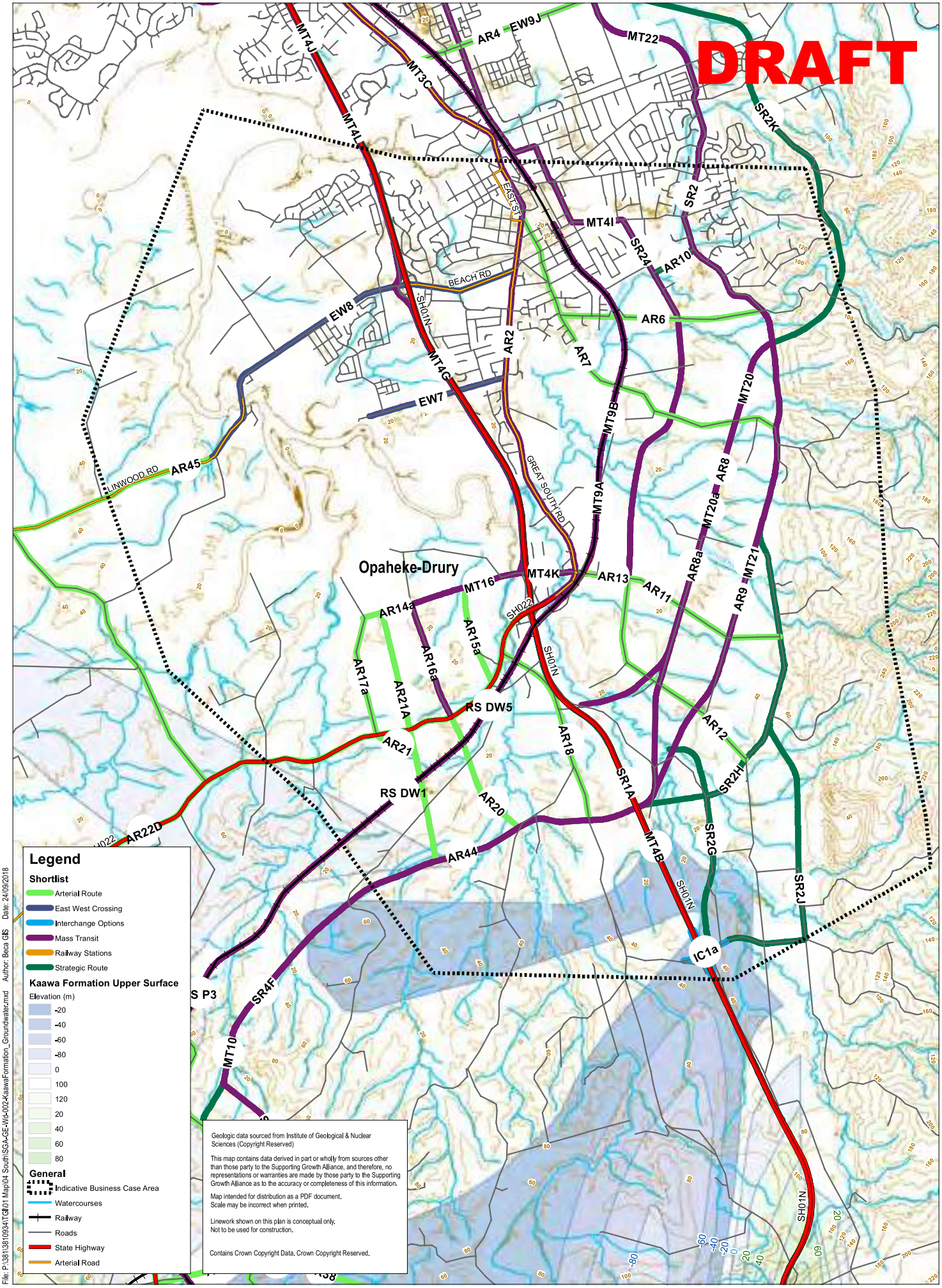
Client: Supporting Growth

N

Discipline: GIS

Project: South

Drawing No: SGA-GE-Ta-002



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Revision	Author	Verified	Approved	Date
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1	BMM2	Draft	Draft	10/08/2018

Title:

Geotechnical Overview
Kaawa Formation
Opaheke-Drury

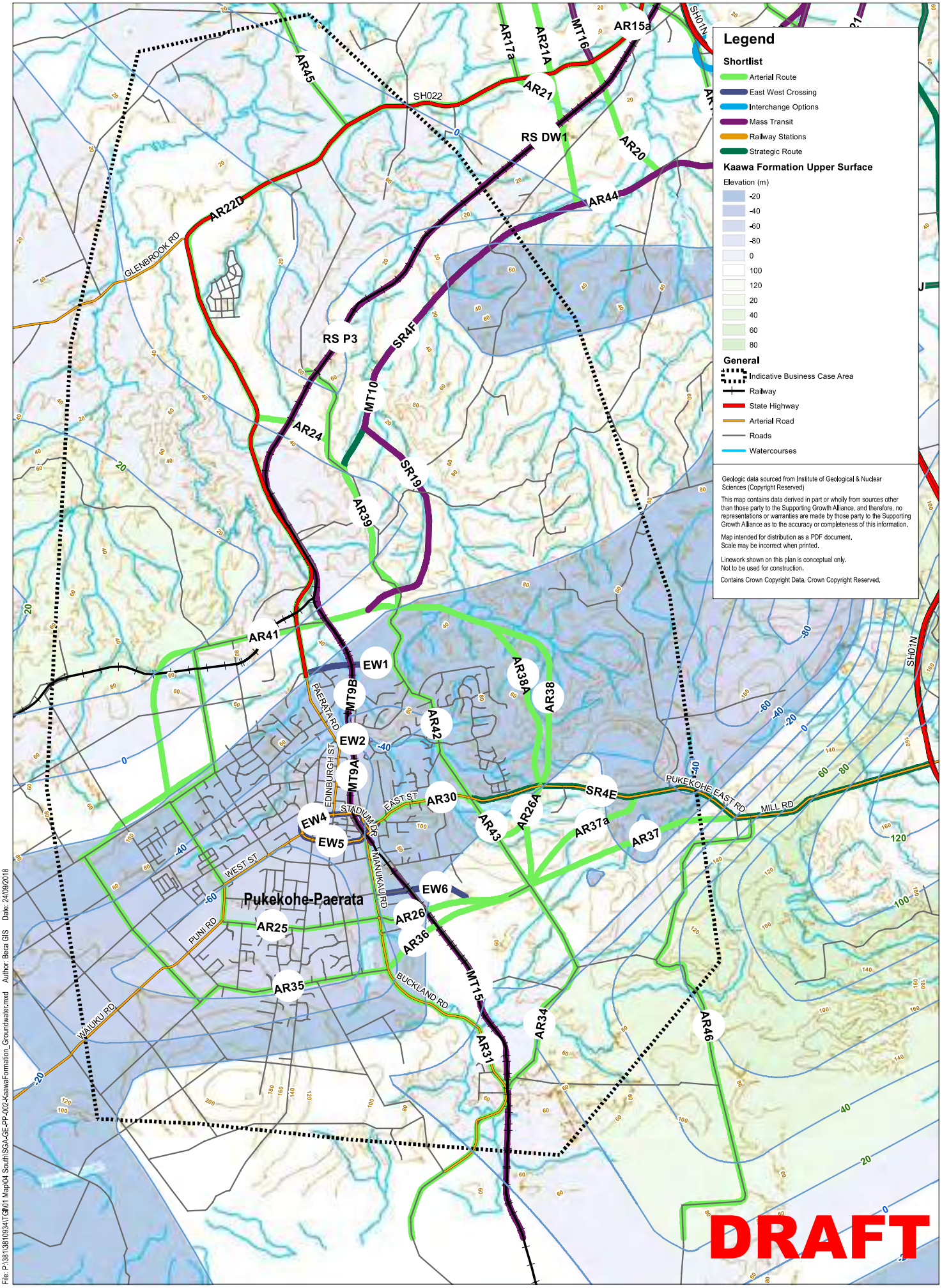
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GE-Wd-002



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Map Scale @ A3: 1:40,000

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Title:

Geotechnical Overview
Kaawa Formation
Pukekohe - Paerata

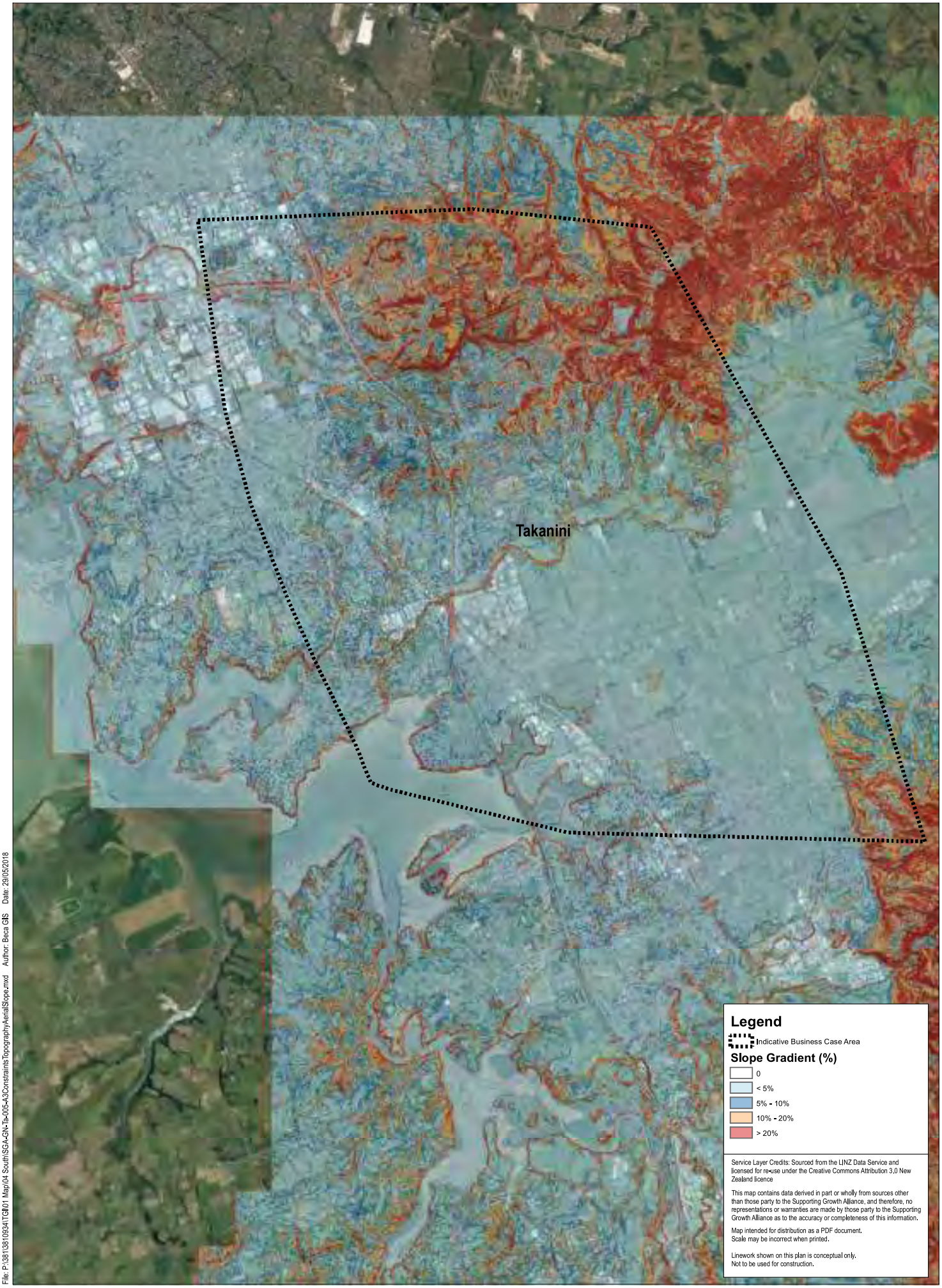
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GE-PP-002



Legend

Indicative Business Case Area

Slope Gradient (%)

- 0
- < 5%
- 5% - 10%
- 10% - 20%
- > 20%

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Revision	Author	Verified	Approved	Date
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Title:

Constraints & Context Mapping

Takanini - Topography

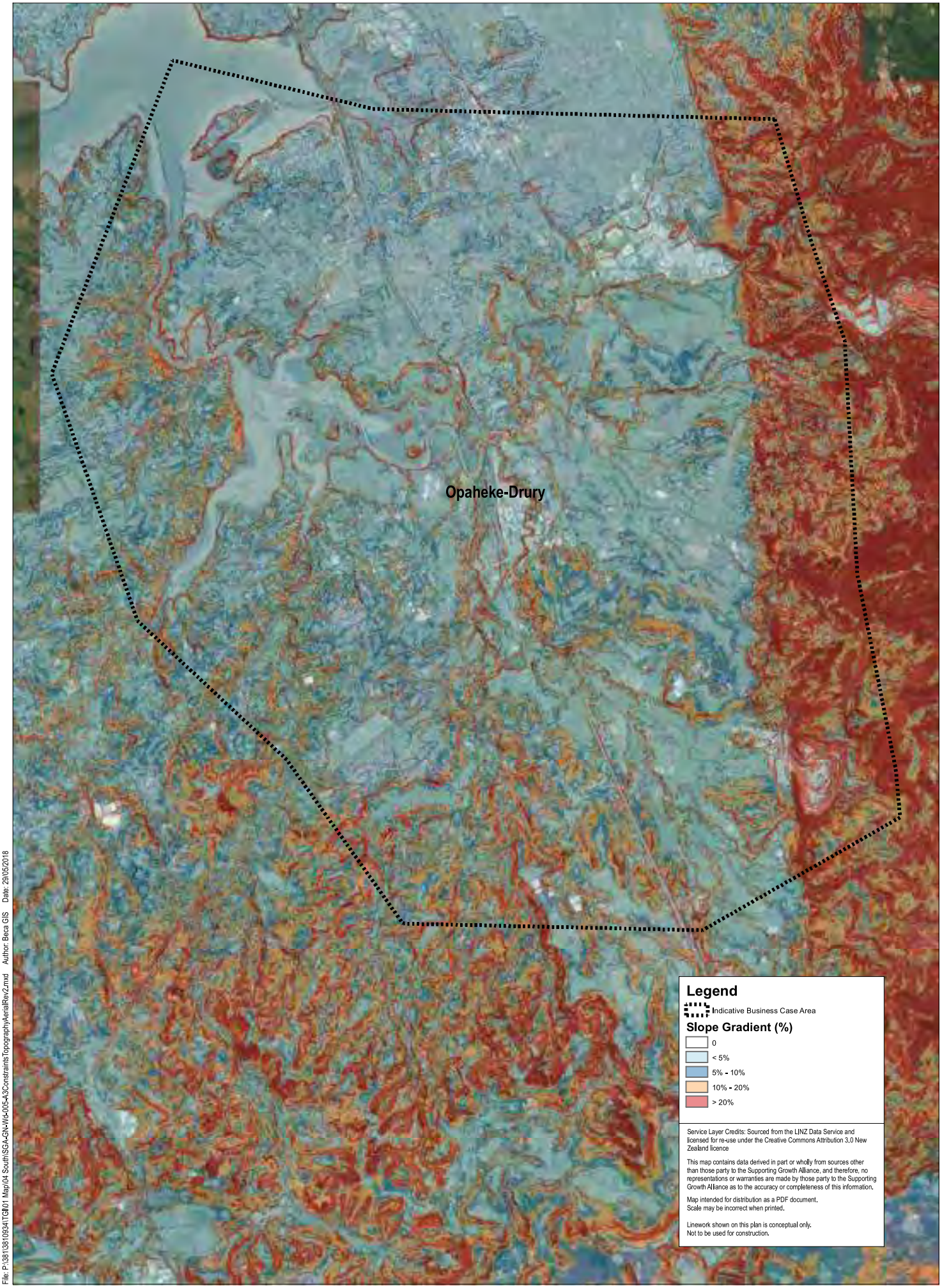
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GN-Ta-003



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Revision	Author	Verified	Approved	Date
1	BAP	RJL	HH	14/05/2018

Title:

Constraints & Context Mapping

Opaheke-Drury - Topography

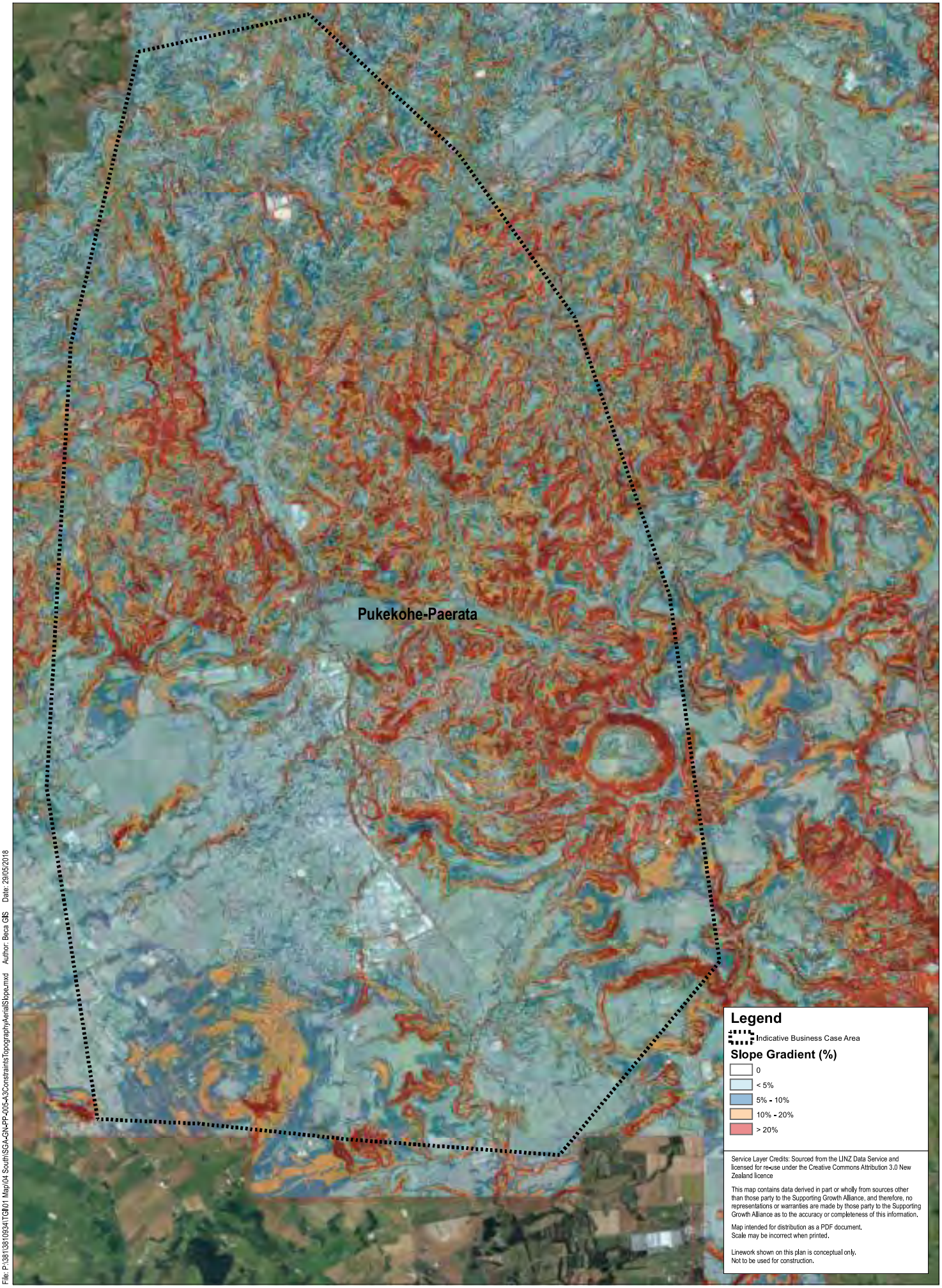
Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GN-Wd-003



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Map Scale @ A3: 1:40,000

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Kilometres

Revision	Author	Verified	Approved	Date
1	BAP	RJL	HH	14/05/2018

Title:

Constraints & Context Mapping

Pukekohe - Paerata - Topography

Client: Supporting Growth

Project: South

N

Discipline: GIS

Drawing No: SGA-GN-PP-003

Appendix 3. Road Safety Audit Exemption

Road Safety Audit Exemption Form

File reference	SGA-900-DBC-WPL-Road Safety Exemption Form
Project name	Supporting Growth Alliance (SGA)
Project stage	Detailed Business Case for Route Protection
RCA	Auckland Transport/ Waka Kotahi (NZ Transport Agency)

Brief project description and location:

The Supporting Growth Programme is a collaboration between Auckland Transport and Waka Kotahi NZ Transport Agency to plan transport investment in Auckland's future urban zoned areas over the next 10 to 30 years. The programme includes numerous transport corridors proposed within the Auckland Region over a 30+ year timeframe

The scope of the SGA programme where Safety Audit Exemption is sought includes all transport corridors where construction funding is **not** being sought (i.e. a route protection designation only).

Exemption rationale:

The Supporting Growth Business Cases are being developed to enable a designation footprint to be identified for future projects, and the design effort has been limited to that which will inform the designation footprint and Assessment of Environmental Effects for designation (i.e. the deliverable is the designation boundary rather than the design itself). The footprint will include sufficient land requirement to allow for construction and this will provide flexibility for design development to be made in future. It is expected that the future design will achieve a safe system outcome which will align with AT's Vision Zero for Tamaki Makaurau, Unitary Plan and Road and Street Framework.

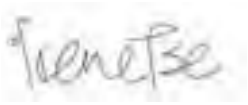
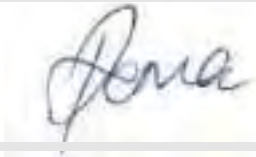
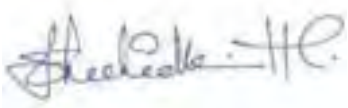
As pre-implementation and construction funding is not being sought from this business case, several typical design tasks (intersection tracking, drainage design, geotechnical investigation and topographical survey) are not being carried out at this stage. The primary objective of a road safety audit is to help ensure a project achieves an outcome consistent with Safer Journeys and the Safe System approach – that is, minimisation of death and serious injury. It is considered that there is insufficient development of the design to undertake a safety audit at this point in time. An 'Implementation Business Case' will subsequently be required at some time in the future when construction is imminent to identify and confirm funding. The design for this business case will incorporate the latest design principles and standards that are relevant at the time, and there is a high likelihood that these will differ from today's requirements. Therefore, a Concept (Stage 1) Safety Audit is not proposed for the current route protection process and will be deferred until the project is ready to progress to implementation. A Concept Safety Audit will be required at that time regardless of whether one is carried out now.

To adequately incorporate safety into our route protection business case, consultation with various AT's department to ensure adequate footprint is being secured. We will be applying the Safe System Assessment Framework to our programme and will also carry out a Safety in Design review during the pre-implementation design stage .

Declaration:

Having checked the above project with reference to the relevant procedures as laid down in Road Safety Audit Procedures for Projects - Guidelines, 2013, I consider that an independent road safety audit is not required for this stage subject to the following:

1. A Safety in Design Register is included in the Design Report
2. Safe System Principles to be applied to all design development and are documented in the design Report
3. A Concept (Stage 1) Safety Audit is undertaken for the subsequent Detailed Business Case required for implementation funding

Recommended by (Auckland Transport Owner Interface Manager):		**Endorsed by (Auckland Transport Safety Engineer):**	
Name	Alastair Lovell	Name	Irene Tse
Position	SGA Auckland Transport Owner Interface Manager	Position	Technical Lead Road Safety Engineering
Signature		Signature	
Date	28 August 2020	Date	28 August 2020
Recommended by (Waka Kotahi - NZ Transport Agency Owner Interface Manager):		**Endorsed by (Waka Kotahi -NZ Transport Agency Safety Engineer):**	
Name	Deepak Rama	Name	Shashi Lakshminarasimhaiah
Position	SGA Waka Kotahi Owner Interface Manager	Position	Senior Safety Engineer
Signature		Signature	
Date	28 August 2020	Date	17 August 2020

Appendix 4. Safety in Design Register

Safety in Design Risk Assessment Register

Author (Role): **Nick Guo (Drury Engineering Lead)**

Approved By: **Rob Mason (SGA Engineering Lead)** Date **28 August 2020**

Drury Local - Detailed Business Case Revision: **A** Project Name: **Drury Local Detailed Business Case** Stage of Design / Project: **Preliminary Design** (Note: minimum of 2 reviews per project)

RISKS ASSOCIATED WITH DESIGN ELEMENTS					Risk Matrix			PROPOSED & APPROVED MITIGATION MEASURES	Mitigated Risk & Resolution						RESIDUAL RISK	
Ref	Hazard (Guideword)	Cause & Outcome	Are Human Factors (HF) involved?	Existing controls, if any	L	C	LR	Proposed Control (1 Eliminate, 2 Substitute, 3 Reduce, 4 Control)	L	C	LR	Risk Owner	Client Approved	Design Status / Date	Risk Owner	Action Required
1 Construction Phase																
1.01	*Load / Force / Energy*	Proximity to existing Transpower Pylons and overhead cables - potential plant strike and electrification of workers. Potential EMF transfer to conductive materials within close proximity to Pylon.	Yes - plant operators working too close to HV power sources.	Transpower rules and regulations for safe work distances, Contractors Safe Work Methodology	2	5	H	Design road alignment to maximise clearances from pylon and overhead cables as far as practicable. Bridge design to consider size of plant and overhead clearance constraints. Choice of retaining wall and barrier materials to be considered for EMF discharge in proximity to Pylon. Not possible to relocate Pylon or overhead cables at this stage. Contractor to develop safe works methodology to address construction risk.	2	5	H	Detailed Designer / Construction Contractor		Open			
1.02	*Load / Force / Energy*	Damage to existing utility services (water, gas, power, comms, etc) during construction leading to potential gas leak / fire / electrocution / explosion.	Yes - inattentive plant operators	Utility company stand over procedures and Contractors safe work methodology.	3	5	E	Obtain as-builts, pot hole where necessary. Road design to minimise excavation close to underground services where possible. Contractor to develop work methodology and safe work procedures to minimise chance of accidental utility strike.	2	5	H	Detailed Designer / Construction Contractor		Open			
1.03	*Load / Force / Energy*	Injury to members of the public from construction plant / operations.	Yes - inattentive / irresponsible plant operators and members of public	N/A	3	4	H	Road widening will provide increased working room and offsets for traffic management / site operations. Crash barriers to be incorporated into design to protect errant vehicle from falling off headwalls and from striking existing pylon structures. Contractor to manage site operations with appropriate barriers/fencing to keep members of the public out of active construction site, and to protect construction workers from errant vehicles during construction.	1	3	M	Detailed Designer / Construction Contractor		Open			
1.04	*Position / Location*	Construction of new retaining walls leading to potential instability / settlement of adjacent structures and properties. Potential injuries if embankments were to collapse.	No	Design standards, site investigations to inform ground conditions	3	4	H	Detailed designer to design retaining walls and structures in accordance with relevant design standards, based on known ground conditions and loading conditions. Extent of batter slopes and location of structure to be optimised to minimise potential impacts to adjacent structures. Existing storm water outfalls and flow paths to be considered during design to minimise chance of scour and associated long term embankment stability issues.	2	4	H	Detailed Designer		Open			
1.05	*Hazardous Materials*	Contaminated land - potential Asbestos risk, and other potential contaminants. Illness / death as a result.	No	N/A	4	5	E	Site investigations to be undertaken to determine extent of contamination and concentrations of contaminants. Contamination management plans to be prepared with methodologies to remove dangerous contaminants. Contractors methodology to consider contamination risks, and appropriate procedures and PPE for works to be in place.	2	5	H	Detailed Designer / Construction Contractor / Client		Open			
1.06	*Heights / Depths*	Construction workers falling from height during bridge / retaining wall construction works, leading to potential injury / death.	Yes - inattentive construction workers	N/A	3	5	E	Detailed designer to minimise height of retaining structures where possible. Pre-casting of retaining panels to be considered to minimise exposure of workers at height. Contractor to implement appropriate safe works methods including providing barriers, fencing, fall arrest systems and staging as required to keep construction workers safe at all times.	1	3	M	Detailed Designer / Construction Contractor		Open			
1.07	*External safety interfaces*	Working in close proximity to the existing rail tracks - injury to construction workers/equipment as a result of working adjacent to the rail tracks	Yes - inattentive construction workers	N/A	3	4	H	Temporary crash barriers to be incorporated during construction phase to protect workers from trains passing by and from striking existing pylon structures. Contractor to manage site operations with appropriate barriers/fencing to keep members of the public out of active construction site, and to ensure that adequate space is available to conduct works around rail tracks.	1	3	M	Detailed Designer / Construction Contractor		Open			
2 Operation & Maintenance Phase																
2.01	*Egress / Access*	Berms and planted areas require regular maintenance works - increasing risk of maintenance related injuries.	Yes - maintenance workers taking risks	N/A	2	3	M	Landscape designer to consider maintenance needs when selecting planting and other treatments.	2	2	L	Detailed Designer		Open			
2.02	*Movement Direction*	Road users loss of control incidents resulting in vehicle leaving the road and either falling off edge of culvert bridge structure or crashing into Transpower Pylon - potential for injury / death.	Yes - drunk / speeding / inattentive drivers	Road rules	3	5	E	Detailed design to incorporate safety barriers as required to prevent vehicles from leaving the road. Consequence of incident reduced.	2	3	M	Detailed Designer		Open			
2.03	*External safety interfaces*	Pavement deterioration leading to premature maintenance works - potential for disruption to local traffic network and exposure of maintenance workers to incidents - potential injury. Also potential for differential settlement at edge of bridged structure leading to bump in road and hence additional maintenance needs.	Yes - inattentive drivers hitting maintenance worker	N/A	2	4	H	Pavement design to consider in situ subgrade conditions and traffic loadings. Robust pavement design to be provided to achieve design life. Settlement slab to be provided on approach and departures from bridge to reduce risk of differential settlement in the pavement.	1	4	M	Detailed Designer		Open			
2.04																
2.05																
3 Demolition Phase																
														Open		
3.01		Demolition of existing dwellings, sheds, minor structures, and live services leading to injury or death of construction worker.	Yes - inattentive / irresponsible plant operators and members of public		2	3	M	Contractor safe work methodology. Use experienced demolition contractors.	2	3	M			Open		

Key;

C= Consequence 1) Low 2) Moderate 3) Significant 4) Major 5) Critical

L= Likelihood 1) Rare 2) Unlikely 3) Possible 4) Likely 5) Almost Certain

LR = Level L) Low M) Moderate H) High E) Extreme

Notes: Hazards / risks considered are those that are project / site specific, non-standard / bespoke designs, special processes, high hazard risks (e.g. non 'business as usual' hazards) that have been identified at the time of the review(s). Other risks will continue to appear during the design life of the project and should be assessed and managed by appropriate parties.

Supporting Growth

Drury Local Detailed Business Case





Appendix F – Engagement Summary Report

23 October 2020

TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

Document Status

Responsibility	Name
Author	[redacted]
Reviewer	[redacted]
Approver	[redacted]

Revision Status

Version	Date	Reason for Issue
0.1		Draft for Discipline lead/OIM/legal review
0.2		Draft for AMT/AT/Waka Kotahi review
1.0	23 October 2020	Final
2.0		

Disclaimer

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

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Acronyms

Acronym/Term	Description
AA	The Automobile Association
AC	Auckland Council
AMT	Alliance Management Team
AT	Auckland Transport
AUP (OiP)	Auckland Unitary Plan Operative in part 2016
CCO	Council Controlled Organisation
DBC	Detailed Business Case
DOC	Department of Conservation
FENZ	Fire and Emergency New Zealand
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
IAP2	International Association for Public Participation
IBC	Indicative Business Case
NoR	Notice of Requirement
RC	Resource Consent
RMA	Resource Management Act 1991
SH22	State Highway 22
Waka Kotahi	Waka Kotahi NZ Transport Agency

Executive Summary

Over the next 30 years, around 60,000 people are expected to live in the Drury-Ōpāheke region of southern Auckland. It will grow from a small centre to a town with around 22,000 new houses. Hand in hand with this will be the creation of an estimated 12,000 jobs.

Te Tupu Ngātahi Supporting Growth is planning for this future town well in advance of the community taking shape. This partnership with Auckland Transport and Waka Kotahi NZ Transport Agency to ensure the land is earmarked for transport in the future, long before the first houses start appearing on the landscape.

At the heart of our planning are the views of the community, stakeholders and landowners. We actively engage communities to find out what people think of our plans; have conversations with landowners so we can discuss what our proposals may mean for their property and talk to stakeholders about their knowledge and ideas for the area.

Engagement to date

A broad-based conversation with the people of South Auckland

We've been in close contact with communities and stakeholders in southern Auckland since 2015 when we began canvassing people to get their views on our high-level transport network plan across southern Auckland. We have continued to stay in close contact as we moved to our draft preferred option. In 2018 we formally engaged with people to get feedback on our short-listed options for the indicative business case in southern Auckland.

Focusing on landowners and people directly impacted by our Drury local project plans

As the scope of our projects have narrowed, the nature of the engagement has become more targeted depending on the various stages of the project. For Drury local projects specifically, we have undertaken the following

- June 2019 – proactive engagement and an option for landowners to meet with us
- December 2019 – personalised letters to all property owners seeking feedback on our proposals
- May/June 2020 – personalised letters to all property owners inviting them to meet with us in order to share specific information about proposed property impacts and seek feedback
- July 2020 – post engagement follow up, personalised letters to property owners that we did not hear from during the May/June 2020 engagement period

In June and July 2019, we had meetings with 56 Drury Local landowners over a five-week period. After analysing this feedback and carrying out further technical investigations, we developed a preferred option and, between December 2019 and June 2020, returned to ask the community and landowners what they thought of our plans.

In December 2019 we wrote to 326 landowners within the Project area seeking their feedback on the following Drury local projects (Jesmond Road, Bremner Road, and Norrie Road (east) upgrades; State Highway 22 upgrade; Ōpāheke North-South connection and Waihoehoe Road (West) upgrade).

The letters also noted that future upgrades to Ōpāheke Road, Ponga Road and Waihoehoe Road East were also being investigated. We advised that we will have more information on these projects, including our preferred options in March or April 2020.

In May 2020, we wrote to landowners who were likely to be impacted by our projects (231 properties in total) inviting landowners to contact us and/or book a meeting with us. We had contact – either via

email, phonecall or formal meeting with the owners of 58 properties. At the end of the engagement period, we had not heard from or made contact with owners of approximately 173 properties.

To ensure that Te Tupu Ngātahi engaged with as many landowners as possible, proactive calls and emails were sent to landowners for whom we had contact information, and a second follow-up letter was sent to landowners who had not yet booked a meeting. These letters were sent on 30 July 2019 to encourage landowners to contact us.

This document summarises the key points and themes identified during our community and stakeholder engagement for the Drury Local detailed business case which sets out the route protection process to protect the land for future transport networks. As we narrowed down our approach, we made every effort to ensure we captured all landowners potentially affected by our plans.

What we asked communities

We asked communities for their views on our plans on the Drury Local projects. The projects are:

- upgrade State Highway 22
- build a new Ōpāheke North-South connection and upgrade to Waihoehoe Road (west)
- upgrade Jesmond Road, Auranga Road 1 and Bremner Road
- upgrade Bremner Road (east) and Norrie Road
- upgrade Ōpāheke Road, Ponga Road and Waihoehoe Road (east).

Who we engaged with

We engaged with landowners in the broad study area to update them on programme progress and with property owners potentially directly affected by projects in Drury and Ōpāheke.

We cast our net widely over the Drury area, working closely with key stakeholders across a wide range of interest groups.

We talked to stakeholders such as Transpower, Watercare and First Gas to make sure our plans aligned with any infrastructure planning; with the Ministry of Education to discuss potential new school locations; with Heritage NZ Pouhere Taonga to discuss the management of key sites. We talked to developers about their plans for urban growth.

We also canvassed the views of stakeholders such as Bike Auckland, Infrastructure NZ, Generation Zero, the AA, Fire and Emergency NZ and the Road Transport Forum.

As project partners, we have worked closely with Manawhenua.

We have closely aligned with Waka Kotahi, Auckland Council, Local Boards, and KiwiRail to ensure we are in the loop about their planned activities in the Drury region, an approach which is part of our ‘one community, one conversation’ approach.

What they told us (engagement themes)

The key themes raised by landowners related to property (acquisition/loss of value/access), alignment of the proposed new roads and impact to property boundaries. Timing for construction of the projects was raised frequently in relation to property impacts. Specifically queries regarding timing of property acquisition and ongoing tenure of property was a concern.

While no fundamental design changes to the projects were made, we were able to make some minor adjustments to the designation boundary and identify opportunities to address landscape and visual amenity at detailed design stage. The feedback for each Project and how we responded to it is outlined in section 6.4 of this report.

Next steps

The community will be informed about engagement outcomes, decisions and next steps following lodgement of the NoRs for the projects. Te Tupu Ngātahi will continue to engage on a regular basis during the public notification and hearings process. This engagement will be on an inform level, rather than consult (IAP2 spectrum of public participation) and will include a range of engagement methods.

1 Introduction

1.1 Purpose of this Report

The purpose of this report is to summarise the engagement that has been undertaken for the Drury Local Detailed Business Case (DBC) for route protection of the Drury Local projects between 2019 and 2020. This report has been prepared to support the DBC. This report is also intended to be a stand-alone document to summarise the themes and outcomes of the consultation and engagement.

1.2 The Supporting Growth Programme

The Programme is a joint strategic transport planning programme between Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi) set up to investigate and deliver the transport networks Auckland needs over the next 30 years to accommodate future urban growth.

In 2015-2016, AT, Waka Kotahi and Auckland Council formed the Programme[1] to investigate and develop a high-level preferred transport network plan, as part of the Supporting Growth Programme Business Case (PBC).

Workshops, meetings and events were held with Manawhenua as partners in the Programme, local boards, communities and a wide range of stakeholders to understand the issues, opportunities and community aspirations in each area.

The resulting Supporting Growth Preferred Transport Network Plans were then completed and published in late 2016 and substantiated the need for both new and improved/upgraded road corridors, new and improved public transport corridors and a complete cycle network to support accessibility in the new future urban areas. The high-level maps showed a range of indicative transport connections required to support the growth in each area.

The new future urban areas in the South included Takaanini, Ōpāheke, Drury, Paerata and Pukekohe.

Since the release of these transport plans, several Supporting Growth priority projects have already progressed and are moving through the business case and consenting phases. The Drury Local projects include:

- State Highway 22 (SH22) Upgrade
- Jesmond Road Frequent Transit Network (FTN) Upgrade
- Bremner Road FTN Upgrade
- Waihoehoe Road West FTN Upgrade
- Waihoehoe Road East Upgrade
- Ōpāheke North-South FTN Arterial
- Ponga Road Upgrade

[1] Formerly known as the Transport for Future Urban Growth programme or 'TfUG'.

- Ōpāheke Road (Rural) Upgrade
- Ōpāheke Road (Urban) Upgrade.

1.3 Te Tupu Ngātahi

Te Tupu Ngātahi (the Supporting Growth Alliance) is a collaboration between AT and Waka Kotahi to carry out the planning phase of the Programme.

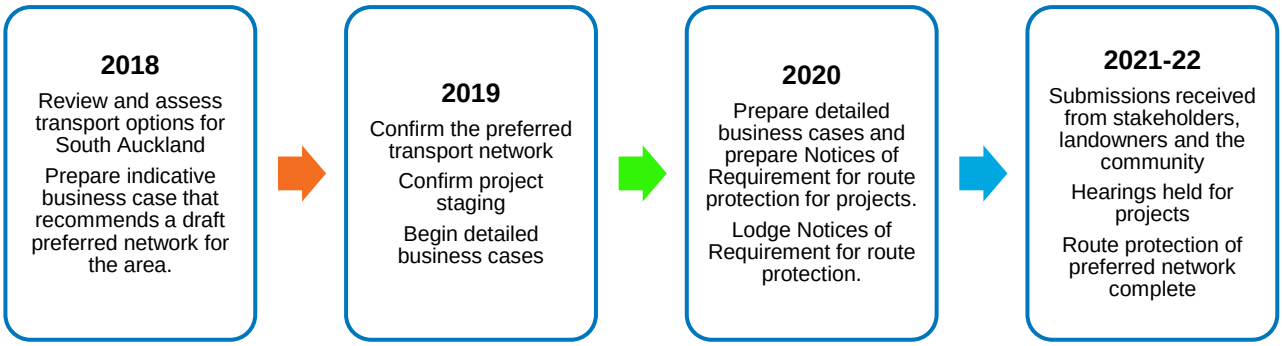
The Alliance comprises AT and Waka Kotahi as the owner participants, consultants AECOM and Beca, and legal providers Bell Gully and Buddle Findlay.

The project is being undertaken in collaboration with Auckland Council, Manawhenua and KiwiRail. The Alliance has also been engaging with key stakeholders such as businesses and communities at different stages as we move through the stages of project development.

1.3.1 Programme timeframes

A summary of the programme is shown in **Figure 1** below:

Figure 1: Supporting Growth five-year programme



1.4 The Drury Local Projects

The Drury Local DBC proposes an arterial network to support the expected future growth in Drury-Ōpāheke. The Drury Package comprises five separate projects which together form the strategic transport network. The network includes provision for general traffic, walking and cycling, and frequent public transport. Overall, the Drury Package aims to improve connectivity within and through the Drury-Ōpāheke area, providing high quality, safe and attractive transport environments.

Each Project within the Drury Package will be designated separately as follows:

- **NoR D1:** Alteration to Waka Kotahi designation 6707 - State Highway 22 (SH22) Urban Arterial Upgrade
- **NoR D2:** Jesmond to Waihoehoe West FTN Arterial Upgrade
- **NoR D3:** Waihoehoe Road East Arterial Upgrade
- **NoR D4:** Ōpāheke North-South FTN Arterial
- **NoR D5:** Ponga Road and Ōpāheke Road Arterial Upgrade

There are over 260 properties within the proposed designation areas of these projects.

2 Engagement Strategy

2.1 Communication and Engagement Management

The *Communications and Engagement Management Plan* (the "Management Plan") outlines resourcing levels, operational policies and procedures for managing the communications, stakeholder and community engagement workstream within Te Tupu Ngātahi.

The *Area Engagement Plan* was prepared to guide engagement planning and implementation for the South. Our engagement framework provided a structure for stakeholder engagement, mapping by impact and influence. This approach enabled focusing information detail to those with the most stake (interest) and potential influence on project outcomes. It informed the development and assessment of project options and consenting strategies commensurate with their interests and influence.

As we have moved through the various stages of the programme, and our planned new routes and alignments have become clearer, we have refreshed our overall communications and engagement strategy (March 2020) to ensure the needs of Aucklanders and the communities we are working in are at the centre of our approach. This refreshed approach is complementary to the Management Plan, and is supported by the IAP2 methodology, but also refocuses our efforts towards communities and landowners who will both benefit the most, but also be the most impacted – at least in the short term – by what we propose. The strategy emphasises the role communities and their elected leaders have in shaping our proposals and ensuring that we have the right tools and channels to support meaningful conversations. The implementation of the strategy is also supported by an engagement framework that puts those stakeholders at the heart of our processes, allowing for a 'virtuous cycle' of engagement. Our engagement outcomes include:

- The community know and support the programme and feel that they've been 'taken on the journey'
- Community leaders and stakeholders feel informed about the project and that they have influenced our thinking and outcomes
- Our engagement approach is meaningful and what we do reflects that we've heard and listened to the community – even if we don't do everything they ask
- We recognise that what we'll do will have disproportionate outcomes for some, and we work to mitigate and minimise wherever possible
- Our project partners, and our own people can tell a joined up and common story about our purpose and the future we're trying to create
- Our engagement is 'not one size fits all.' We tailor or adjust our engagement approach, and the programme priorities reflect that the needs of community and stakeholders have been taken into account.

Figure 2: Communications and Engagement strategy at a glance



2.2 Engagement Objectives

The objectives for the engagement for this Project are aligned to the overall Programme engagement objectives reflected in the *Te Tupu Ngātahi Communications and Engagement Management Plan* and the *Engagement Strategy*.

Further to the above and specific to the Projects, engagement was undertaken with the following objectives:

- All stakeholders, including landowners, developers and the general public, are informed in a collaborative and coordinated manner with other land-use, servicing, and transport-related projects in the South areas to avoid overloading and duplication of information/ engagement events
- Area specific sensitivities are acknowledged, taken on board, documented and responded to in a timely and appropriate manner
- The information and insight from stakeholders and customers assist to inform the identification of recommended options
- To find opportunities for integration and collaboration with developers to achieve alignment and route protection.

2.3 Engagement Framework

Our engagement framework provides a structure for stakeholder engagement, mapping by project and influence. This approach assists us in focusing information detail to those with the most stake (interest) and potential influence on project outcomes. It informs the development and assessment of project options and consenting strategies commensurate with their interests and influence.

2.3.1 IAP2 Level of Engagement

Engagement during each phase of the programme has been based on the principles and core values of the International Association for Public Participation (IAP2), which is the core tool at the heart of both Waka Kotahi and Auckland Transport's engagement guidelines.

IAP2 provides internationally recognised consultation best practice principles. The IAP2 public participation spectrum is based on the decisions to be made and the associated level of influence the community has on project decision making (see **Figure 3** and **Table 1** below).

Figure 3: IAP2 Public Participation Spectrum

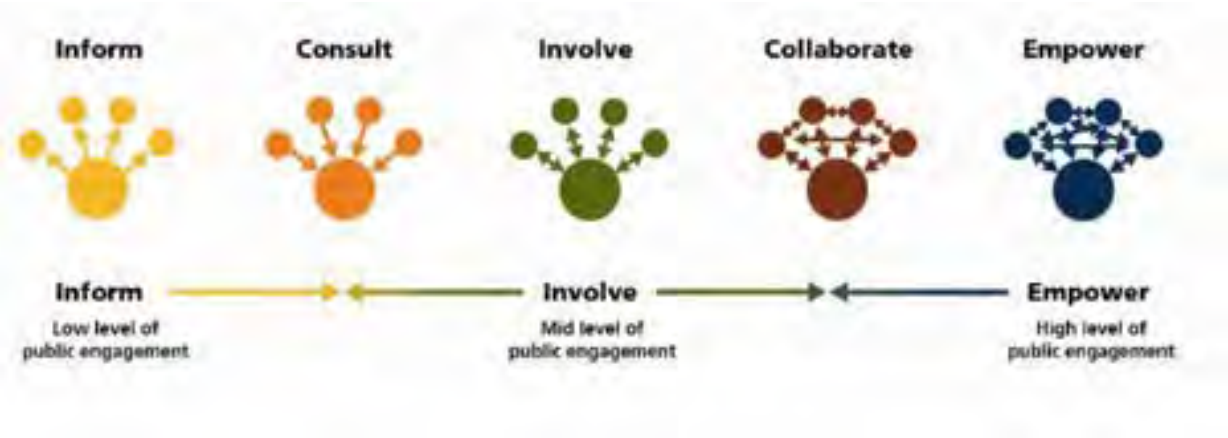


Table 1: Summary of IAP2 Spectrum Levels

Inform	Consult	Involve	Collaborate	Empower
Provide the audience with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	Obtain public/stakeholder feedback on analysis, alternatives and/or decisions.	Work directly with the public/stakeholder throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	Partner with the public/stakeholder in each aspect of the decision including the development of alternatives and identification of the preferred solution.	Place final decision-making in the hands of the public/stakeholder.

The IAP2 Spectrum has been used to guide the level of engagement with stakeholders, as outlined in Section 3 below.

A tiered engagement approach was undertaken as follows:

- Partners have been engaged at the 'involve-collaborate' level
- Key stakeholders have been engaged at the 'consult-involve' level
- Stakeholders have been engaged at the 'inform-consult' level
- Directly affected landowners and developers have been engaged at the 'inform-consult' level
- The wider community has been engaged at the 'inform-consult' level.

Section 2.4 below sets out the specific parties engaged during the Project and Section 3 outlines the engagement methods used for these parties.

2.4 Stakeholders

There are more than 80 stakeholders with a programme-wide interest, and a large number of area-specific stakeholders. For the purposes of guiding engagement with stakeholders, based on the Engagement Strategy, groups have been defined as follows:

- **Partners** - Auckland Transport, KiwiRail, Auckland Council, Manawhenua and Waka Kotahi

- **Political** – Members of Parliament (MPs) and councillors, Planning Committee, Local Boards
- **Key Stakeholders** - Kāinga Ora, Ministry of Education, Auckland Council, utility companies, Bike and Walk Auckland, Department of Conservation, Heritage NZ, MBIE, Forest and Bird, Greater Auckland, Generation Zero, accessibility groups, business associations, road user groups.
- **Developers**
- **Wider Community** – general community including affected landowners in Auckland's South particularly Drury and Ōpāheke.

2.5 Partners

Partners are defined as having a higher level of interest in and influence on the Programme. Partners are engaged with at the 'Collaborate' level on the IAP2 spectrum.

Our partners include KiwiRail and Manawhenua. They have been active at key milestones in the development of the DBC. This includes:

- Technical specialist attendance at business case stakeholder workshops.
- Individual meetings (as facilitated by Owner Interface Managers)
- Review and approval of public consultation material
- Review of technical work and frameworks.

2.5.1 Waka Kotahi

During South community engagement, other Waka Kotahi project teams relevant to the area attended the landowner meetings alongside Te Tupu Ngātahi, including the State Highway 1 (SH1) Papakura to Bombay (P2B), SH22 Safe Networks and Connected Communities teams.

2.5.2 KiwiRail

KiwiRail are a key partner for discussions relating to the rail network in the southern growth area, for integration and delivery of rail related elements of the recommend transport network given KiwiRail owns and manages the North Island Main Trunk Line.

Regular engagement has been undertaken with KiwiRail in relation to the South growth areas to discuss potential areas of change for KiwiRail. KiwiRail have been involved in hui with Manawhenua. They have been part of sharing our engagement story.

2.5.3 Auckland Council and Council-controlled Organisations (CCOs)

AC is a project partner in the Programme. There is close alignment between Te Tupu Ngātahi and AC which supports the Programme's desired outcome of integration of land use and transport. The Projects have been developed in line with the *AT Engagement Framework and Statement of Intent (2017 -2020)* which specifies AT's obligations regarding engagement with AC, including Local Boards, and other CCO's. The partnership between AT, AC and CCO's requires a commitment to collaboration, openness and transparency, adhering to a "no surprises" policy and engaging with other CCO's to ensure a coordinated approach.

Programme wide, Te Tupu Ngātahi has facilitated a regular Auckland Council Integration Forum to enable these commitments and actively manage and identify risks and opportunities that are inherent to the programme.

Engagement with AC in regard to the South has been closely aligned with the Structure Planning and Plan Change process for Pukekohe-Paerata and Drury-Ōpāheke.

Engagement with CCOs has included meetings with Watercare Services Limited (Watercare), Pānuku Development Auckland and Auckland Tourism Events and Economic Development (ATEED).

2.5.4 Ngā Manawhenua

Manawhenua are recognised as Treaty Partners by AT and Waka Kotahi and as such Te Tupu Ngātahi recognises the responsibilities and commitments in engagement with Manawhenua. AT and Waka Kotahi's partnerships provide the project with a framework for working with Māori. These frameworks set out a vision to build a strong relationship with Māori, moving towards a second generation of partnership focusing on co-management and co-governance.

Te Tupu Ngātahi maintains a Manawhenua forum (for operational and kaitiaki level interaction) and enables linkages with the wider governance level relationships of AT and Waka Kotahi via the Tāmaki Transport Table and AC's Kaitiaki Governance table. The focus of this group is programme-wide delivery, particularly seeking consistency across projects.

It is recognised that there will be rohe-specific discussions on sub-areas and projects. Specific Iwi attendance at each workshop and hui are summarised below.

2.6 Elected member engagement

A key element of our approach has been to ensure elected members had good visibility and knowledge of our programme, and to provide them with an opportunity to inform our plans – based on their local knowledge and insights – before we consulted more widely with their communities. We've done this by conducting regular presentations to Local boards and at other council forums, such as the Planning Committee, throughout DBC / NoR engagement.

- MPs and councillors, the AC Planning Committee, Local Boards (Franklin, Papakura and Manurewa)
- Auckland Council Planning Committee quarterly programme-wide update and briefing packs prior to community engagement.
- MPs, councillors and Planning Committee Chair – local briefing sessions and briefing packs prior to community engagement.
- Local Boards – meetings plus briefing packs prior to community engagement.
- Information packs (including FAQs, talking points etc).

2.7 Key Stakeholders

Engagement with stakeholders has been primarily at a Programme wide level. In 2018 a series of Stakeholder Reference Groups (SRG) for key stakeholders were set up (by invitation only), see Table 2 below. The purpose of these groups was to meet on a regular basis to hear information about the Programme and contribute feedback at key decision-making opportunities.

Table 2: Programme stakeholder reference groups and participants

Development/Freight/Road Users Group	Active Modes/Public Transport Advocacy Group	Environmental/Social Impact Group
• Auckland Business Forum • Auckland Chamber of Commerce • Auckland International Airport • Employers and Manufacturers Association • NZ Property Council (Auckland Branch) • Infrastructure NZ • Road Transport Forum • NZ Automobile Association (the AA) • Ports of Auckland	• Campaign for Better Transport • Bike Auckland • Walk Auckland/Living Streets • NZ Walking Access Commission • Greater Auckland • CCS Disability Action • Be. Accessible • Royal NZ Foundation for the Blind • Matakana Coast Trail Trust • Generation Zero	• Environmental Defence Society • Landcare Research • Forest and Bird • Horticulture NZ • Auckland Regional Public Health Service • Department of Conservation • Heritage NZ Pouhere Taonga • Pukekohe Vegetable Growers Association • Ministry of Education

Since these original SRG meetings, engagement methods/communication techniques have been tailored to each stakeholder or stakeholder group, so that the most appropriate method is employed in any situation. The preferred approach for engagement for the Project's was to have one-to-one meetings. It was considered appropriate that meetings occur face to face to ensure relationships were appropriately managed with key stakeholders and developers due to the start point for engagement being discussions on preferred alignments.

Stakeholder relationship management across the Te Tupu Ngātahi programme has been carried out in a coordinated way across all land holdings they own or have an interest in.

2.8 Developers

The Project team has engaged with active developers in the area from the Indicative Business Case stage in 2018/2019 through to the Detailed Business Case in 2019/2020. The project team has been kept informed on discussions with the developers that have submitted Plan Changes to the Auckland Unitary Plan.

2.9 Landowners

Engagement during the mid-DBC stage focused on obtaining feedback from the community, including landowners and developers, on the preferred option alignments.

Engagement during the late-DBC stage focused on one-to-one meetings with landowners and developers affected by the Projects and informing the community on the emerging preferred options, including via social media and website updates.

Further detail on this engagement is discussed in section 6.

2.10 Previous Engagement

The Projects have been through various phases of development and engagement. These development phases are set out in Table 3 below.

Table 3: Project development and engagement summary

Project Stage	Timing	Engagement summary
Programme Business Case (PBC)	2015 - 2016	• Engagement with stakeholders and potentially affected parties has been ongoing since the development of the PBC in 2015. The PBC stage included engagement with partners, including Manawhenua. • Workshops, meetings and events were held with Manawhenua, Local Boards, communities and a wide range of stakeholders, to understand the issues, opportunities and community aspirations in each area.
Indicative Business Case (IBC)	2018/19	• The purpose of IBC engagement was to build on the PBC and to receive feedback and input from partners, stakeholders and the general public on the short-listed options being considered for the four business case areas. • Engagement was undertaken via information days, workshops and meetings to develop an IBC for the entire South growth area.
Detailed Business Case (DBC) / Notice of Requirement (NoR)	2019 - 2020	• The engagement and communication in the DBC built on the engagement undertaken during the earlier PBC and IBC stages of the Project • Engagement with stakeholders, developers, and landowners was undertaken to prepare the DBC and NoRs. • Engagement was undertaken in two stages. An initial feedback stage that sought to share information and seek feedback via website content, letters, e-updates, emails, phone calls, information sheets and online community engagement platform i.e. Social Pinpoint. A further engagement stage was undertaken subsequent to this that focused on understanding property impacts and sharing our indicative designation areas with landowners.

2.10.1 DBC/NoR Engagement Objectives

The purpose of engagement during the DBC / NoR phase was to continue to build understanding of Te Tupu Ngātahi progress and the process of route protection, by clearly communicating the preferred network and next steps with partners, landowners within corridor study areas, stakeholders and the general public. This included:

- Meetings, website content, Social Pinpoint, information sheets, letters to landowners, e-updates, feedback forms, phone calls and emails and in the late stage also included one-to-one meetings with landowners
- Provide information on staging and timing for the preferred network, including specific opportunities for sequencing of urban development (e.g. meetings with utility providers regarding integration of utilities within the future transport corridor)
- Understand specific issues/ environmental effects and opportunities in the preferred network to identify potential design responses and environmental management / mitigation (for route protection documentation)
- Undertake one-to-one engagement with landowners / developers (e.g. meetings) regarding potential effects and opportunities for shared alignment in outcomes (e.g. through developer agreements) – particularly in areas where land is live zoned or is about to be developed through resource consents
- Inform stakeholders about the processes for route protection (e.g. via e-updates, online video meetings and website information) and other opportunities for participation (i.e. submission on the NOR or similar as appropriate)
- Identify opportunities for AT and Waka Kotahi property acquisition (e.g. willing buyer/willing seller arrangements, albeit leading these processes is outside the specific scope of work for Te Tupu Ngātahi)
- Enable Te Tupu Ngātahi to inform decision makers on the risks and opportunities of potential route protection mechanisms for the preferred network
- Ongoing workshops and communications with Programme-wide stakeholders and stakeholder groups e.g. KiwiRail, Kāinga Ora, Ministry of Education, Department of Conservation, Development/Freight/Road Users Group, Active Modes/Public Transport Advocacy Group and Environmental/Social Impact Group.

3 Engagement Methods

3.1 Overview

Engagement with known developers and potentially affected landowners within the Project areas was undertaken in two stages and became more focused during the final design stage of the DBC/NoR. All other stakeholders who appear across the Auckland region are part of the programme-wide engagement approach.

During the first stage of engagement in June-July 2019, we sent a letter to landowners to inform them an Indicative Strategic Transport Network for South Auckland had been identified and that their property was within the study area for a new transport corridor (refer to Appendix 1). We invited landowners to meet with us to discuss what the indicative corridor might mean for them.

In December 2019, we invited landowners that we had contacted in June-July 2019 to provide feedback on the draft preferred options identified for the Drury projects (refer to Appendix 2).

During the second stage of engagement in May-June 2020, the landowner engagement approach was to send letters and meet with landowners potentially impacted by the proposed corridors in the Project areas (refer to Appendix 3). The purpose of the landowner meetings was to obtain feedback from landowners on the use of their land and the potential impact of the project to help us refine the detail of these routes throughout the DBC and NoR phase. These conversations were held in the context of discussing route protection and designation lodgement processes for a longer-term timeframe.

All proactive landowner engagement was focused on the impact of the indicative corridors and the need for buffer areas for a draft designation area on land to establish future works. These areas were indicatively shown on the drawings that were shared with landowners.

Similarly, one-to-one meetings were held with developers and key stakeholders with landholdings in the Project areas. The purpose of this was to update our knowledge, to understand changes to the existing environment and to understand opportunities and risks as they arise.

3.2 Gathering Feedback during the DBC and NoR stages

During the DBC and NoR phases of the Projects, the following key mechanisms were used to gather feedback from key stakeholders, landowners and developers:

- Letters (refer to Appendix 3), emails, and phone calls
- Feedback forms
- Social Pinpoint
- One-to-one meetings, including via online videos and through phone calls

Information that was provided at the one-to-one meetings included individual landowner property maps and information sheets on route protection and property information (refer to Appendix 4). AT's 'Guide to the Notice of Requirement' (refer to Appendix 5) was also provided.

As illustrated in figure 4 below, the feedback from the community has been used to build our knowledge, to understand risk, and to refine the design of the Projects.

Figure 4: Engagement feedback loop



3.3 Stage 1 Engagement

3.3.1 December 2019 feedback

On 6 December 2019, we wrote to 326 landowners within the Project area seeking their feedback on the following projects:

- Jesmond Road, Bremner Road, and Norrie Road (east) upgrades
- State Highway 22 upgrade
- Ōpāheke North-South connection and Waihoehoe Road West upgrade

Together with the letters, we provided maps of the draft preferred options together with project information sheets, a route protection information sheet, and a feedback form with pre-paid self-addressed envelope. The letters also directed landowners to the Supporting Growth website where they could see the project maps and information and complete an online feedback form. We asked the following two questions on the feedback form:

- *Let us know if there is anything we might have missed or you think we should consider with regard to the draft preferred option,* and

- *Let us know if there is anything we should be considering about your property*.

The letters advised that we would review the feedback received and then undertake further technical investigations. We advised that we might be in contact separately to request access to their properties for environmental surveys. Following this, we would talk to landowners about potential property impacts and would be in contact with landowners when we have this information.

The letters also noted that future upgrades to Ōpāheke Road, Ponga Road and Waihoehoe Road East were also being investigated. We advised that we will have more information on these projects, including our preferred options in March or April 2020 (letters were sent out to these potentially affected landowners in May 2020 – see section 3.4.4). We also advised that we would be asking for community feedback on other projects in the south, including the proposed Drury Central and Drury West train stations in March or April 2020.

Copies of the project information and maps and feedback forms were also made available on the Supporting Growth website (refer to Appendix 6). The feedback period was open until 24 January 2020.

Emails were also sent out to our Drury Local distribution list (62 people) on 11 December 2019 providing a summary of the feedback we received from the June/July 2019 meetings and advising them that some projects are at a point where a draft preferred option has been identified and seeking their feedback on these. A follow up email was sent out on 20 January 2020 as a reminder that feedback was closing on 24 January 2020.

An email update was sent out to our Stakeholder distribution list (41 people/organisations) on 12 December 2019. The purpose of the email was to update them on the June/July 2019 meetings and advise we were writing to 1500 landowners within the broad 'corridor study area' to update them on programme progress and writing to property owners potentially affected by projects in Drury and Ōpāheke with an invitation to provide feedback. We advised that we anticipate engagement with affected landowners to be able to occur in March or April 2020.

A media release was distributed on 9 December 2019 however this was not picked up by local media. No advertising via social media was undertaken at this time as we were not undertaking public engagement.

Written feedback was received from 18 landowners and five developer groups across all three of the projects. A high-level summary of the feedback received included:

- Landowners appreciated being contacted at this stage in the process, when the preferred option is not set yet.
- Landowners would like to know what a future town centre would look like in Drury.
- Business owners in the area were keen to know exact details about the potential designation boundary. They wanted to know exactly how the proposal would impact on their property so they can plan for the future of their business site, especially on Bremner and Norrie Roads.
- Many landowners continue to request certainty regarding potential impacts.

This feedback was provided to the project team.

3.3.2 Access approvals

We wrote to landowners of 56 properties within the Project areas in February, March, May and July 2020 to seek approval to access the properties to undertake either ecological surveys, site walkovers, drone surveys, stormwater assessments and noise/vibration monitoring. Landowners were asked to provide permission by returning written approval forms. In addition to sending letters, we followed up with email, phone calls and door knocked owner occupied properties. We received written approvals for the team to access 45 of the properties (as at August 2020).

Following these assessments, the results were provided back to each of the landowners that requested a copy of the survey results (April to August 2020).

3.4 Stage 2 Engagement May-June 2020

3.4.1 Response to Covid-19

The timing of the second stage of the planned landowner engagement coincided with the Covid-19 pandemic. As a result of the pandemic, a national emergency was declared at 12.21pm on 25 March 2020 and expired at 12.21pm on Wednesday 13 May 2020.

The engagement methods undertaken were influenced by the 4-level Covid-19 Alert System which included increased or decreased limits on human contact, travel and business operations. As a result of the restrictions under Alert Level's 2 to 4, face to face engagement was not possible. Under Level 2 meetings could occur, however this level required measures of physical distancing of 1 metre and limits on the size of gatherings.

Four key mechanisms were used to gather feedback from key stakeholders and the community during the first stage of engagement:

1. Specific partner, industry and stakeholder briefings and meetings
2. Online video and telephone meetings with landowners
3. Providing feedback via the Social Pinpoint platform
4. Providing feedback via the Supporting Growth 'info@' e-mail address or 0800 phone line.

Further information on this is discussed below.

3.4.2 Social and Print Media

On 18 May 2020 we launched public engagement with our story 'Connecting southern Auckland's future communities' on the Auckland Council's news website Our Auckland (refer to Appendix 7).

The Franklin, Manurewa and Papakura Local Boards shared the story on their respective Facebook pages and there were a total of 21 shares and 41 reactions (likes, comments) to the post.

The Franklin Local Board Facebook page was the most active page with positive sentiment across all three Local Board pages and 21 community group pages.

Similarly, Auckland Transport, Waka Kotahi and KiwiRail all shared the Our Auckland story on their Facebook and/or Twitter pages.

The opportunity to provide feedback was advertised via online, print, radio advertising and e-newsletters to our database.

- Neighbourly online advertising ran from 18 – 28 May. This was viewed 15,844 times with a total of 40 click throughs to the website and 5 reactions (likes) to the post.
- Online advertising ran from 18 May – 18 June. We generated 552,668 impressions (this means the amount of times the ads appeared online) and 585 click-throughs to our website or the Social Pinpoint page.
- From 29 May – 4 June we ran 30 second radio campaigns on Radio 531pi, Humm FM and Radio Waatea to engage with our Pacific, Indian and Māori communities.
- We ran 9 print advertisements in the Papakura Courier, Manukau Courier News and Franklin County news.

E-newsletters were sent in the following order:

1. Email update sent to key stakeholders
2. E-newsletter sent to 'opt-in' subscribers
3. To the main South database (advertising events and asking for feedback (approx. 800 email subscribers)
4. To main database as a reminder that feedback was closing soon
5. A "close the loop" email which summarised the feedback we heard with information on the next steps of the Programme

Information on the Supporting Growth website: (http://www.supportinggrowth.govt.nz/have-your-say/south/) was online from 18 May 2020. During the five-week engagement period 3,793 people visited the website.

3.4.3 Social Pinpoint

Social Pinpoint is an online community engagement platform with customisable interactive tools such as surveys, interactive mapping, online collaboration used to gather feedback and information from communities.

During the consultation period we launched an interactive map on Social Pinpoint for road upgrades along Ōpāheke Road, Ponga Road and Waihoehoe Road East. We also asked for feedback on the proposed walking and cycling paths along Ōpāheke Road, Ponga Road and Waihoehoe Road with three questions. Some examples of the answers received are provided below:

- *Where would you like to travel to on these proposed walking and cycling paths?*

  "to a realistic work or commute node. Unlikely to use very much recreationally as no realistic attractive nearby destination".

"to rail station as an alternate to car. Otherwise an expensive piece of what might be under-utilised infrastructure. Plan does not connect with any realistic journey I'd like to undertake".

- *Do these new paths make walking and cycling a safer and more attractive transport choice for you?*

  "yes they will provide alternatives to the road that the Council and AT are making increasingly dangerous".

  "not by much – need to think about realistic journeys and destinations in sufficient mass to justify the amount of scarce money involved vs other options".

- *Do you have any other comments or feedback you'd like to provide?*

  "agree with protection the oak trees, they are beautiful and home to many animals".

  "the road speeds need lowering in this map area now, Drury has no footpaths are road works mean trucks and cars use this area more, and the high speed currently allowed makes walking very dangerous".

In total there were 269 unique users[2] to visit the site spending an average of 2.04 minutes. There were 14 comments and 6 survey responses. We found that the Social Pinpoint tool was most popular for the 33 – 44 age group and the least popular with the 65 – 74 age group.

3.4.4 Landowner Engagement

In May 2020, we wrote to landowners who were likely to be impacted by all Drury Local projects (including the Ponga Road, Ōpāheke Road and Waihoehoe Road (east) upgrades) (231 properties in total), inviting the landowners to contact us and/or book an online meeting to discuss what the proposed designation might mean for their property.

Due to COVID-19, in the letters we provided landowners with the option of talking with us at a future date. No landowners requested this.

The following information was included within each of the letter packs:

- information sheets on route protection and property information (refer to Appendix 4)
- Project maps and information sheets relevant to the property (refer to Appendix 6)

Once a landowner had booked a meeting, we emailed a copy of their individual property map, and a 'hatch' map to show how their property would potentially be impacted by the Notice of Requirement (NoR) designation process.

[2] The number of individual people who visited our pages

In August/September 2020, we wrote to landowners likely to be impacted by the Ōpāheke Road (Urban) Upgrade (16 properties in total), asking the landowners to contact us to discuss what the proposed designation might mean for their property.

4 Partner Engagement Summary

4.1 Auckland Transport & Waka Kotahi

The following section summarises engagement with partners including meetings/workshops held and key feedback received. The feedback from all these stakeholder groups has been used to build our knowledge, to understand risk, and to refine the design of the Projects.

Auckland Transport & Waka Kotahi are investors and partners to the programme and engagement has been undertaken with them through the development of the Projects. Regular meetings with both Auckland Transport and Waka Kotahi representatives have been undertaken to ensure that processes are followed, feedback is provided, and options are refined.

Wider groups within AT have been included in these discussions and have been engaging in the optioneering and workshops at each stage of the DBC development. These groups include Property, Planning Policy and Integration, Investment, Operations and Maintenance programmes, Urban Design, Cycle and Active Mode Networks, AT Metro and Engineering and Capital Project representation.

Te Tupu Ngātahi has consistently updated and sought input on each stage of the business case and NoR process driven through the role of the Owner Interface Manager (OIM). Inputs range from technical guidance and requirements, approvals and updates.

Through the engagement we were able to identify issues/opportunities in relation to the indicative strategic transport networks in the Project areas.

4.1.1 Project Level Feedback

Targeted meetings and workshops were held with both AT & Waka Kotahi specialists to obtain feedback throughout the option refinement process, shown in Table 4 below. The response and any actions taken are also noted within Table 4.

Table 4: Project Level Feedback

Project	Summary of Feedback Received	Project Team Response
State Highway 22 upgrade	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.	Feedback was considered in the design. Opportunities on Great South Road and Burberry Road were noted but not considered within the scope of this Project. The Project Team had a meeting with the Department of Conservation to discuss the Drury Local projects on 10th March 2020.

Jesmond Road	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 noted that the Ministry of Education site is not necessarily a constraint as the Ministry of Education may be open to provide land. Attendees identified a preference of widening to the west due to live zoned land on the east (Auranga Development).	Feedback on mature vegetation considered. An Assessment of Arboricultural Effects was undertaken and will form part of the notice of requirement. Preferred option was to widen to the west, in line with attendees preferences.
Bremner Road (Central)	Workshops were held with AT and Waka Kotahi 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 Local projects on 10th March 2020.	Options B was taken forward as the preferred option, in line with attendees preferences. The Project Team had a meeting with the Department of Conservation to discuss the Drury Local projects on 10th March 2020.
Bremner Road (East)	Two 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 Draft National Policy Statement for Freshwater Management was also discussed, and that there may be no more piping of streams (bridging only). 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	Following feedback requesting more information on flood effects and costs, further assessment was undertaken by the Project Team to inform decision making. Feedback received from attendees was considered in determining the preferred option. An Assessment of Flooding Effects and Assessment of Ecological Effects have been undertaken and form part of the notice of requirement.

	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 which is attractive. During the second 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.	
Waihoehoe Road (West)	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.	Access to the rail station is not within the scope of this Project. Widening to the north was preferred, in line with attendees' preferences.
Waihoehoe Road (East)	A 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 East arterial upgrade.	Noted no specific concerns or feedback received.
Ōpāheke North-South connection	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	Feedback and concerns were considered in determining the preferred option. Option A preferred.

	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.	
Ponga Road	A 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.	Feedback considered in determining a preferred option - option B, widen to the south was preferred.
Ōpāheke Road (Rural section)	A 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.	Feedback considered in determining the preferred option and in the design process. A tie-in roundabout has been provided within the project to tie into the Bellfield Development. An Assessment of Flooding Effects has been undertaken and will form part of the notice of requirement.

4.2 KiwiRail

Te Tupu Ngātahi has undertaken regular engagement with KiwiRail in relation to the South growth areas, between 2018 and 2020 to discuss potential areas of change for KiwiRail and issues/opportunities with the short-listed options. Both high level and area-based discussions with KiwiRail have been held.

Te Tupu Ngātahi met with KiwiRail on 23 January 2020 to align our engagement approaches and continued to work together.

Feedback from Kiwi Rail received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC/NoR phase.

4.3 Auckland Council

Auckland Council Integration Meetings are held regularly and have been ongoing since May 2018. The purpose of the meeting is to inform Auckland Council on progress of the programme and collaborate on key deliverables.
Key matters discussed at the meetings is summarised below:

- SGA and AC agreed to keep each party informed for upcoming meetings with individual landowners and developers in the South to ensure consistency in messaging
- Review of collateral/poster material for community engagement
- Confirm attendees at engagement events
- Update on structure plans and private plan changes

4.3.1 Drury-Ōpāheke Structure Plan

The AC Structure Plan for Drury-Ōpāheke has been approved and developers have progressed or are looking to progress their private plan changes including four Private Plan Changes covering a large area in Drury East/South. These PPC's have been accepted by AC. Te Tupu Ngātahi are continuing to work with these developers through Project Partner organisations.

4.3.2 Southern Local Boards

Te Tupu Ngātahi has provided regular presentations to the Franklin, Papakura and Manurewa Local Boards and to Councillors in the Project areas.

A presentation of the draft strategic transport network to the AC 'special' Planning Committee was held on 13 February 2019 and on 18 March 2020. These meetings covered the projects in the south and provided an opportunity for AC and Local Board representatives to ask questions and seek clarifications on the draft networks.

Workshops have been held with the individual Local Boards as follows:

- **Franklin** Local Board – 10 September 2019, 28 January 2020, 3 March 2020, 7 July 2020
- **Papakura** Local Board – 11 September 2019, 29 January 2020, 4 March 2020, 15 July 2020
- **Manurewa** Local Board – 13 February 2020, 9 July 2020

The purpose of these workshops was to provide an update to the Local Board members on the work undertaken in relation to the DBC/NoR, to share plans for the proposed landowner engagement for 2020 and share feedback received following the engagement. The workshops provided an opportunity to share an integrated story on infrastructure planning (transport, water, wastewater) for the Project area, respond to any Local Board queries and seek feedback from the Local Board on how we can reach a fair representation of the community through our engagement methods.

The three Local Boards were updated via email throughout 2020 as the Projects advanced and were provided with an information pack prior to the first stage of engagement.

Following our discussion with the local boards, the following points raised by the Local Boards regarding the Drury Local projects and the planned engagement activities are summarised below:

- There was general support for the planned projects, recognising the need for route protection of key linkages and provision of public transport, walking and cycling facilities in the Drury area provided a holistic view is taken of infrastructure, council assets, community facilities, and open space networks.
- The timing for the projects was important for the community to understand
- Locations for community open day / information events were identified such as the library, Drury School Hall
- Recommended the use of billboards and/or hoardings to direct community to the Supporting Growth website as an opportunity to build awareness

Local Board feedback has been considered as part of refinement of the Projects during the DBC/NoR phase.

It was initially planned to utilise the local board venue suggestions to host community / information open days. However, as referenced further in section 3.4.1 due to Covid-19, the planned engagement methods were modified.

4.3.2.1 Franklin Local Board feedback

The Franklin Local Board indicated support for the Drury local projects and recognised the need for route protection. They had queries regarding the walking and cycling connections, timing of the infrastructure development and integration of the projects with other road upgrade projects such as the Glenbrook Road roundabout to improve road safety on SH22.

The local board also provided suggestions on venues to host community / information days and in response to Covid19 suggested that an online Zoom session might be useful to update the community.

There were no particular concerns with the alignment of the road upgrades subsequently no changes have been made. However, their feedback on engagement was considered in the planning of activities.

4.3.2.2 Papakura Local Board feedback

The Papakura Local Board were generally supportive of the Drury Local projects. Key matters they raised during workshops was in relation to timing of the upgrades and the uncertainty it had created in the community as there were yet no timeframes for construction. Most people they said wanted to know when the projects would be constructed as they felt lives had been put ‘on hold’.

4.3.2.3 Manurewa Local Board feedback

The Manurewa Local Board did not have specific feedback on the Drury Local projects. Key matters of interest included exploring opportunities to create local job opportunities with the road upgrade projects, and they provided suggestions on the venues/events to host community / information days.

There were no particular concerns with the alignment of the road upgrades subsequently no changes have been made. However, their feedback on engagement was considered in the planning of activities.

4.4 Ngā Manawhenua

Across the Programme, there are fourteen Manawhenua (Ngāti Tamaoho, Te Ahiwaru, Ngāi Tai ki Tāmaki, Ngāti Manuhiri, Ngāti Maru, Ngāti Te Ata Waiohua, Ngāti Whanaunga, Te Runanga o Ngāti Whātua, Ngāti Whātua o Kaiparai, Te Ākitai Waiohua, Te Patukirikiri, Ngāti Pāoa Trust Board, and Te Kawerau ā Maki) that have been involved in the development of the indicative strategic transport networks.

Te Tupu Ngātahi maintains a Manawhenua Forum (for operational and kaitiaki level interaction). There are also opportunities for governance level relationships via the Tāmaki Transport Table and the existing connections with governance through the owner participants (AT and Waka Kotahi). The focus of the Manawhenua Forum is programme-wide delivery, particularly seeking consistency across projects.

During the development of the DBC and NoR, Te Tupu Ngātahi involved Manawhenua as partners in decision making and considered their views when identifying priorities for investment options. The following seven Manawhenua have been actively involved in the development of the DBC:

- Ngai Tai ki Tāmaki
- Ngāti Maru
- Ngāti Tamaoho
- Ngāti Te Ata Waiohua
- Te Ahiwaru
- Ngāti Whanaunga
- Te Ākitai Waiohua

Te Tupu Ngātahi have also held Hui with Manawhenua focused on the Drury Local DBC route refinement options assessment in 2019 and early 2020 as outlined in Table 5 below.

Table 5: Manawhenua DBC Engagement

What	Dates
Hui 1: Bremner Road, Jesmond Road, Waihoehoe Road West, Ōpāheke North-South (N-S) and SH22	30 August 2019
Hui 2: Bremner Road, Jesmond Road, Waihoehoe Road West, Ōpāheke N-S FTN Arterial & SH22	3 October 2019
Hui 3: Bremner Road East	7 November 2019
Hui 4: Waihoehoe Road East, Ponga Road and Ōpāheke Road	20 February 2020
Hui 5: Ōpāheke Urban section	2 July 2020

The purpose of these hui was to inform Manawhenua and enable Manawhenua to influence the preferred network options for the Projects. This was carried out alongside other specialists in the MCA assessment process during option evaluation. This was also an opportunity for Manawhenua to highlight any concerns or opportunities that were then fed back into the business case and design process.

The Project team has met with southern manawhenua at hui to discuss other aspects of the project such as approach to the NoRs, assessment of environmental effects, updates from project environmental specialists, discussion and approach to cultural impact assessments which could accompany the NoRs.

Ngāti Tamaoho, Ngāi Tai Ki Tamaki, Te Ākitai Waiohua and Ngāti Te Ata Waiohua confirmed intend to prepare a Cultural Impact Assessment (CIA) for inclusion NoR documentation, and a hui was held (23 April 2020) to discuss this.

A site visit was undertaken with manawhenua on 16 July 2019 with the Project team.

Te Tupu Ngātahi facilitated a workshop (29 January 2020) with Manawhenua to discuss draft condition set.

After the workshop, on 20 February 2020 a hui was held with the following Manawhenua to present options for Waihoehoe Road (east), Ponga Road and Ōpāheke Road.

4.4.1 Feedback from Manawhenua

Feedback received from Manawhenua fed into the identification of preferred alignments and development of the DBC. Table 6 below summarises the feedback.

Table 6: Manawhenua feedback summary

Project	Feedback	Action
State Highway 22 upgrade	[redacted]	[redacted]
Jesmond Road	Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. [redacted]	Opportunities for stream enhancement and stream works will be explored during detailed design and regional consenting phases.
Bremner Road (Central)	Feedback from manawhenua was received at two hui, on 30 August and 3 October 2019. [redacted]	Option B - widen to the south was confirmed as the preferred option, avoiding the coastal marine area.

	[redacted]	
Bremner Road (East)	Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. [redacted]	Manawhenua feedback was considered in determining the preferred option. Feedback on flooding was taken forward to design [redacted] Opportunities noted for future detailed design and regional resource consenting phases.
Waihoehoe Road (West)	Feedback from Manawhenua was received at two hui, on 30 August and 3 October 2019. Manawhenua did not identify a preference of any option. [redacted]	Project team noted no preference for options. [redacted]
Waihoehoe Road (East)	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.	Project team noted no concerns and no preference for options.
Ōpāheke North-South connection	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. [redacted]	Project team noted no concerns and no preference for options. Feedback on bridge length was taken into consideration in the design process. [redacted]
Ponga Road	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 mana whenua about the	Project team noted no concerns and no preference for options.

	options. [redacted]	
Ōpāheke Road (Rural section)	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.	Project team noted no concerns and no preference for options.

5 Stakeholder Engagement summary

5.1 Stakeholders

- **Auckland Council Parks** – to discuss issues/opportunities in relation to the Projects and their landholdings (including Ōpāheke Sports Park)
- **Auckland Council Heritage** – to discuss issues/opportunities in relation to the Projects and heritage sites
- **Heritage New Zealand Pouhere Taonga** – to discuss the potential impacts of the projects on historic heritage
- **Kāinga Ora** – to discuss Kāinga Ora sites, development plans and potential impacts of the projects on these sites and plans.
- **Department of Conservation (DoC)** – to discuss the potential impacts of the projects on conservation land
- **The Ministry of Education (MoE**) – to discuss potential new school locations Jesmond Road (Secondary school), Burberry Road (Primary school) and issues/opportunities in relation to the indicative strategic transport networks within the Project areas.

Network Utilities

- **Watercare** – to discuss issues/opportunities in relation to the indicative strategic transport networks and to align with Watercare planned infrastructure within the project areas. The Waikato #1 Watermain runs north to south through the extent of the site, interfacing with the project at several locations
- **Vector** – to discuss issues/opportunities in relation to the indicative strategic transport networks. A Vector gas line exists along Waihoehoe Road all the way down Great South Road. There are also gas pipelines on Karaka Road (SH22).
- **Transpower** – to discuss issues/opportunities in relation to Transpower assets including the Drury switching station and operational limitations on assets feeding NZ Steel at Glenbrook.
- **Counties Power** – to confirm interfaces, identify specific assets, and discuss issues/opportunities to align with planned new 110Kv feed from Drury to Paerata / Pukekohe with a new substation in the next five years. Counties Power also own property along Ōpāheke Road where substation is located – the site is designated.
- **First Gas** – to discuss the programme and potential impacts on First Gas' assets and their designations. First Gas have a designation for their gas network that runs from Waihoehoe at the southern end of the project, up to Hunua Road at the northern extent.

The engagement approach and timing utilised for these Key Stakeholders is identified in sections 2.4 and 2.7. Te Tupu Ngātahi undertook engagement of these parties at between 2018 to 2020.

Email notification, including a letter and drawings illustrating landholdings within the network, was sent to the following stakeholders within the south on 18 May 2020:

- Bike Auckland
- Pukekohe and Franklin Advocacy Group
- Residents Associations – South
- Environmental Defence Society
- Forest and Bird
- Landcare Research
- Horticulture NZ
- Auckland Regional Public Health Service
- Be. Accessible
- CCS Disability Action
- Royal NZ Foundation for the Blind
- Deaf Aotearoa
- Civil Contractors NZ
- Employment Manufacturers Association
- Infrastructure NZ
- NZ Property Council
- Campaign for Better Transport
- Generation Zero
- Greater Auckland
- Public Transport Users Association
- AA
- National Road Carriers
- NZ Heavy Haulage Association
- NZ Taxi Federation
- Road Transport Forum
- NZ Walking Access Commission
- Walk Auckland / Living Streets
- Auckland Business Forum
- Auckland Chamber of Commerce
- Auckland International Airport
- Business Associations – South
- Pukekohe Growers Association
- NZ Fire and Emergency
- NZ Police
- St Johns Ambulance
- Chorus
- Counties Power
- First Gas
- Spark
- Transpower
- Vector
- Vodafone
- Watercare

The letters advised that we would like to meet with them to explain both the study areas and our plans for further refining the network, and to explore opportunities to work together to minimise impacts and ensure great outcomes.

Email notification was sent to 746 stakeholders and the wider community to update on the progress of the Projects on 18 May 2020. The email update advised that the planning for the projects was moving ahead and that it is anticipated that the NoR to protect land for the Projects would be lodged with AC in early 2021. The information sheets (Appendix x) were provided to these stakeholders as part of this and we offered meetings with them to discuss further.

All interactions with stakeholders have been recorded and feedback received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC and NoR phase.

5.1.1 Auckland Council Parks

Te Tupu Ngātahi met with Auckland Council Customer & Community Services Directorate to discuss the Drury Local Network, areas where parks and reserves have been avoided through options assessment and any potential impacts of the Projects on parks and reserves. It also provided an opportunity for Auckland Council to share information on the future uses and upgrades planned for parks and reserves in the wider area, including proposed upgrades to the Drury Sports Complex and recent, and ongoing, upgrades to Ōpāheke Reserve.

This information was considered in design refinement and assessment. Following this advice the alignment of the Ōpāheke Rural Upgrade was shifted to the north of the existing road corridor to avoid impacts on the Waikato 1 Watermain and Ōpāheke Reserve Sports Fields. Impacts on the Drury Sports Complex sports fields was also avoided.

A second meeting to discuss the proposed designation boundary on parks land is currently being sought from Auckland Council.

5.1.2 Auckland Council Heritage

Te Tupu Ngātahi met with Auckland Council Heritage to discuss the Drury Local Network, areas where items of historic heritage have been avoided through options assessment and any potential impacts of the Projects on items of historic heritage. It also provided an opportunity for Auckland Council to share information on historic heritage in the area from their recent research for the Drury-Ōpāheke Structure Plan to help inform the design and assessments. Council acknowledged that some sites of historic heritage that are not protected are to be zoned for development (FUZ) and acknowledged they are not likely to be protected through development of the land. Auckland Council noted the impact on the former Drury Cheese factory (CHI Site) and that this site has the potential to be a significant historic heritage item. Future assessment of these values has been discussed with Council and is identified in the Assessment of Historic Heritage Effects.

Engagement, including a site visit, with the Auckland Council Heritage team has been ongoing throughout the preparation of the Assessment of Historic Heritage Effects which forms part of the notices of requirement.

Advice and information received was considered in the design development and assessment of environmental effects and development of draft conditions.

5.1.3 Heritage New Zealand Pouhere Taonga

Te Tupu Ngātahi met with Heritage New Zealand (HNZ) to discuss the Drury Local Network, areas where items of historic heritage have been avoided through options assessment and any potential impacts of the Projects on items of historic heritage. It also provided an opportunity for HNZ to share information on historic heritage in the area and raise opportunities or concerns around impacts on historic heritage from urban development and the Projects. It was noted that regional consents and HNZ authorities will be sought in the future.

Advice and information received was considered in the design development, assessment of environmental effects and development of draft conditions.

5.1.4 Kāinga Ora

Te Tupu Ngātahi met with Kāinga Ora to discuss the Drury Local Network and its relationship with Kāinga Ora assets / property. Kāinga Ora (KO) have three sites in Drury: Jesmond Road; top end of Burberry (in Auranga Development); and 1 East Street (north of Drury Domain). They also own a single dwelling at 8 Fitzgerald Road.

The Drury project team was particularly interested in KO's East Street Development as the Project proposes to modify Tui Street (off Waihoehoe Road to Great South Road with restricted turning movements (left in and left out). KO advised they have no immediate plans for the development of this site and designs are still at the concept stage with no planning assessment undertaken by KO for the site. KO are looking to progress this development further in 2021.

For the Jesmond Road site, turning lanes into the site off Jesmond Road were discussed. Drury team advise there would be sufficient width in the road corridor to provide this in the future. The Burberry Road site is not impacted by the Project.

Land plans with the proposed designation boundary for 8 Fitzgerald Road (single dwelling) were shown to KO, however the designation boundary has now been amended and no longer impacts the site.

Kāinga Ora's plans were noted however do not impose any constraints or raise any issues with the Projects.

5.1.5 Department of Conservation (DoC)

Te Tupu Ngātahi met with DoC to discuss the Drury Local Network and any potential impacts of the Projects on DoC land. It also provided an opportunity for DoC to share information conservation land in the area. DoC identified public conservation land north of Bremner Road which holds a pa site. They noted the tie-in with the Papakura to Bombay Project and that ground penetration studies had been undertaken.

Advice and information received was considered in the design development and assessment of environmental effects.

5.1.6 Ministry of Education (MoE)

Te Tupu Ngātahi met with MoE to discuss the Drury Local Network and any potential impacts on MoE land. These discussions with MoE occurred at a joint level with AT and Auckland Council. MoE identified plans to lodge a NoR for Jesmond Road school (Secondary school) due to open in 2025.

The Drury project team identified the preferred option for Jesmond road reduces impact on MoE land and maintains the area of land available at the sites for a future school.

5.1.7 Transpower

Engagement with Transpower has been ongoing since 2018. Te Tupu Ngātahi last met with Transpower on 3 August 2020.

Areas of interest for Transpower include:

- The Te Tupu Ngātahi overview / updates and information sharing
- Impacts arising from growth on network assets in Auckland and identification of risks to network
- Integration and network alignment with other infrastructure corridors, including the State Highway 1 Papakura to Drury project currently being developed by waka Kotahi as part of the NZ Upgrade Programme (NZUP)
- Timing of new infrastructure in the 10-20-year horizon is important
- Transpower network is generally considered enough for 20 years
- Land use challenges and expectations in greenfield areas
- Open to collaboration and sharing resource for similar outcomes
- Coordination of GIS information in terms of assets

Specific feedback in relation to the Projects includes:

- Transpower's interest in new and upgraded arterials under lines and land uses under the influence of the transmission corridor. For the Drury project, this is limited to the Upgrade of Bremner Road to the west of State Highway 1 where both the 110KV and 220kV overhead lines cross. The recommended option has incorporated feedback from Transpower on clearance requirements for these lines.
- Advised on AUP (OiP) provisions and corridor and National Standards
- Concerned about approvals and any pylon (asset) impacts through project work in specific to the Ngakoroa Stream crossing along Bremner Road
- Interested in timeframes and advised of process for approvals to relocate pylons and Transpower assets. Relocation of pylons is not anticipated for the Drury project.
- Would like to continue meeting on a regular basis.

Feedback from Transpower regarding the Bremner Road upgrade has been considered as part of the refinement of the project as follows:

- 220kV line passes over the Ngākaroa stream bridge. Vertical clearance is constrained by the transmission lines and the required stream flood levels. The Papakura to Bombay team have been developing an alignment that will provide adequate clearance, and we have reflected this clearance in our design. The intention for our project is that the bridge constructed as part of the P2B project will be widened in future to match the same levels.
- 110kV line passes over Bremner Road near the intersection with Victoria St. The P2B design will determine the new levels, and we understand that the 110kV towers may be relocated in conjunction with these works.

5.1.8 Watercare

An initial scoping meeting between Te Tupu Ngātahi and Watercare Engagement Leads was held on 13 February 2019. At this meeting, the following projects were discussed that relate to the Drury Local projects:

- Proposed developer plans for development south of Drury
- Location of the Waikato #1 Watermain
- Location of pump stations and aspirations for future water infrastructure

Following this, regular meetings between Te Tupu Ngātahi and Watercare have been undertaken. Key messaging around these Watercare projects were included in our FAQs to ensure we presented a coordinated approach for the Projects to the community.

The key feedback from Watercare has been in relation to the Waikato #1 watermain which Te Tupu Ngātahi has considered as part of refinement of the Projects. As a result of these discussions, agreement has been reached on relocation of the Waikato 1 watermain at the Waihoehoe Road/ Great South Road intersection, and also at the Hunua Road intersection. Following feedback from Watercare, the design of the Ōpāheke Road rail overbridge was revised to avoid impact on the watermain.

Engagement with Watercare has also focused on opportunities to integrate future planning, such as the proposed booster pump station adjacent to the Boundary Road, where a mutually agreeable solution has been developed.

5.1.9 Vector

Engagement with Vector has been ongoing since 2018. Te Tupu Ngātahi last met with Vector on 23 April 2020. There are no Vector electricity networks within the Drury project, so discussions have focused on their gas infrastructure.

Key areas of interest for Vector include:

- The Te Tupu Ngātahi overview / updates and information sharing
- Impacts arising from growth on network assets in Auckland and identification of risks to network
- Timing of new infrastructure
- Open to collaboration and sharing resource for similar outcomes
- Coordination of GIS information in terms of assets

Specific feedback in relation to the Projects includes the location of gas lines on Karaka Road (SH22), and existing network in Manurewa, Drury area.

Impacts on the Vector gas network are not significant, feedback from Vector received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC.

5.1.10 Counties Power

Te Tupu Ngātahi have been in discussion with Counties Power since September 2019 to confirm interfaces, identify specific assets, and discuss issues/opportunities to align with planned new 110Kv feed from Drury to Paerata / Pukekohe with a new substation in the next five years.

Key areas of interest for Counties Power included:

- Existing Medium Voltage overhead lines along sections of SH22

- [redacted]

Feedback from Counties Power received by Te Tupu Ngātahi has been considered and integrated as part of refinement of the Projects during the DBC.

5.1.11 First Gas

Te Tupu Ngātahi have been in discussion with First Gas since Sept 2019 to discuss issues/opportunities for managing and operation of high-pressure transmission pipelines through pipeline easement and designation corridors.

Key areas of interest for First Gas included:

- integration of their infrastructure with the proposed road upgrades
- existing designation that will be overlapped and/or altered to re-align their network
- shared list of conflicts between their infrastructure and proposed networks
- identified solutions to address the conflicts
- landholdings and easements

Feedback from First Gas has been considered as part of refinement of the projects including the following:

- NoR D1 State Highway 22: The existing gas main runs north-south beneath the existing state highway, to the east of Jesmond Road. We will be widening and upgrading SH22 to a 4-lane urban arterial. The gas main will be protected during these works.

- NoR D2 Jesmond to Bremner link: A new east west link is currently being constructed as part of the Auranga development which will traverse the existing gas main. In future, we will widen this corridor to a 4-lane urban arterial, and the gas main will be protected during the works.

- NoR D3 Waihoehoe Rd East: There is a designated corridor for the gas main that crosses Waihoehoe Road (near #211 Waihoehoe Road). We propose to widen and upgrade the existing corridor to a 2-lane urban arterial. Our designation will overlap the existing First Gas designation, and approval will need to be sought prior to any construction works taking place. There is also a gas valve site located at 211 Waihoehoe Road (adjacent to the designation) and we have provided our widening to the north, away from this infrastructure.

- NoR D4 Ponga Road: The designated corridor for the gas main crosses Ponga Road to the east of Sutton Road. We will be widening and upgrading Ponga Road to a 2-lane urban arterial. Our designation would overlap the First Gas designation, and approval will need to be sought prior to any construction works taking place.

- NoR D4 Ōpāheke North-South Arterial: We are proposing a new 4-lane urban arterial between Waihoehoe Road in the south and Hunua Road in the north. This crosses the existing First Gas designation in 2 locations:

    - Vicinity of Walker Road – we are proposing a new roundabout intersection at Walker Road. This roundabout and the approach roads will interface with the existing designation.

  - South of Hunua Road/ Boundary Road intersection – our new arterial will cross the First Gas designation to the south of this intersection. There is also an existing stream which will require bridging. The bridge abutments will conflict with the gas main, which will need to be relocated to the west.

- NoR D4 Hunua Road/ Boundary Road intersection: We are currently proposing to upgrade this intersection to traffic signals. The existing gas main (and designation 9104) passes beneath this intersection. Any relocation works here can be carried out in conjunction with the bridge

Discussions with First Gas are ongoing to continue working through a proposed programme towards alteration and potential realignment of the existing Frist Gas designation at Ōpāheke N-S arterial, crossing at SH22 and part of the future Drury town centre development area.

5.1.12 Fire and Emergency NZ (FENZ)

Te Tupu Ngātahi met with FENZ in November 2018 to discuss potential new fire station locations in Drury, Programme progress and seek feedback. The areas of interest for FENZ include:

- Ensuring adequate and rapid access to fire stations including any new/changes to heavy and/or light rail crossings.

A second meeting to discuss the proposed designation boundary for SH22 on land FENZ might be considering purchasing is currently being sought.

5.1.13 New Zealand Automobile Association (AA)

Te Tupu Ngātahi met with the AA as part of the Stakeholder Reference Group meetings in 2018. The areas of interest for the AA include:

- Generally, support proposed transport options
- Support to designate and protect land for future infrastructure now
- Decisions on number of lanes and types of lanes (i.e. general traffic, managed lanes) should be made closer to construction (therefore generous amount of land should be protected)
- Support for Park and Ride facilities, and consider small daily fee if cost is prohibitive.

5.1.14 Auckland Business Forum

Te Tupu Ngātahi met with the Auckland Business Forum as part of the Stakeholder Reference Group meetings in 2018. High level feedback received from the Auckland Business Forum included:

- Decisions on the transport network should be made at a wider regional level, and that assumptions across the network are consistent
- The importance of freight, and connections to main freight hubs
- That short-term improvements should be proposed to solve problems relating to recent growth (not just future improvements)
- More information needs to be provided in terms of funding options for these future transport projects
- Consultation should be transparent regarding what it can influence.

Feedback from the Auckland Business Forum received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC.

5.1.15 Stakeholder Reference Groups

Te Tupu Ngātahi Stakeholder Reference Groups were established in August 2018. The following stakeholder organisations were invited to participate in regular meetings from August to October 2018, to receive an update on Programme progress and provide feedback:

- Auckland Business Forum
- Automobile Association
- The New Zealand Property Council – Auckland Branch
- Greater Auckland
- NZ Walking Access Commission
- Auckland International Airport
- Campaign for Better Transport
- Walk Auckland/Living Streets

High-level feedback from these meetings that relate to the wider Programme included:

- Supporting Growth should be consulting with young people to help understand future customer needs/insights as residents of new growth areas will be from this next generation
- Overall support for a RT network extension to the growth areas, and proposed options for walking, cycling and other public transport connections. Support for objective of mode shift to active/public transport
- New transport connections should reflect current community aspirations – e.g. AC/Local Board greenways plans
- Corridors should be flexible to provide for future technology
- Acknowledgement that the Programme is looking at the strategic transport network but suggestion that we should be influencing the local transport network
- Importance of employment areas to support residential growth.

Feedback from the Stakeholder Reference Groups received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC.

5.1.16 Southern Infrastructure Forum

A Utility Infrastructure Alignment forum lead by Te Tupu Ngātahi in partnership with Watercare is held regularly. This forum provides an opportunity for integration between infrastructure/utilities projects in the South. The Southern Infrastructure Forum includes representation from:

- KiwiRail
- AC
- Watercare
- Vector
- Transpower
- Healthy Waters
- Chorus
- Housing NZ

- Crown Infrastructure Partners
- AT
- Waka Kotahi
- Auckland Motorway Alliance

Te Tupu Ngātahi delivered a presentation to the Southern Infrastructure Forum in August 2018. The purpose of this presentation was to introduce the Programme as a whole, discuss public feedback periods and the timeline of the Programme for the next five years. It was also an opportunity to receive updates from infrastructure providers on plans for the south.

Te Tupu Ngātahi attended the Southern Infrastructure Forum in June 2019 and October 2019.

Feedback from the Southern Infrastructure Forum received by Te Tupu Ngātahi has been considered as part of refinement of the Projects during the DBC.

5.2 Developers

Te Tupu Ngātahi undertook a more direct approach in our engagement with developers who may be impacted by the Project alignments. The purpose of this was to ensure we had a greater understanding of their land holdings and to establish relationships for ongoing engagement, noting that these discussions enabled agreement on road widths and locations.

Some developers with interests in the Projects area, rather than property directly impacted by the transport networks, have also been engaged with. This engagement is continuing at the time of writing this summary report.

Engagement with developers was led by developer 'relationship owners' from within Waka Kotahi and within the Te Tupu Ngātahi team. This focused on how their land is potentially impacted by the proposed alignments. Meetings have occurred with approximately 20 developers to date.

5.2.1 Plan changes and live-zoned areas under development in Drury

Development at different stages continues within the live-zoned Ōpāheke 1 (Bellfield), Drury 1 (Auranga), Drury South (Stevensons and Classic Homes), and Franklin 2 (Wesley) live-zoned Precincts. Since the IBC, Plan Change 6 (Auranga B1) has become operative in part, which has resulted in an expansion of the live-zoned area and boundaries of the Drury 1 Precinct. The Precinct now encompasses a 168ha area (up from 85ha) and is estimated to yield 2,600 dwellings (up from 1,300) and has necessitated changes to the Bremner Road alignment which are reflected in SGA's Drury Local DBC.

Several Private Plan Changes have also been received by Council in the time since the IBC, including during the development of the DBC.

A private plan change was lodged for Auranga B2 by Karaka and Drury Limited and Ma Development Enterprises (MADE) mid 2020. This plan change seeks to rezone 33ha of FUZ in Drury West, south of the existing development, to town centre and residential uses. At the time of writing this report the plan change has not been accepted by the Council and has no statutory weighting.

Four private plan changes covering a large area in Drury East/South were submitted to the Council by developers with interest in the area at the end of 2019. These Private Plan Change requests have

been accepted by AC and are currently undergoing through the public consultation and submissions process. The Plan Changes were requested by:

- Drury South Crossing – Stevensons (amending Drury South Industrial Precinct provisions)
- Drury Centre - Kiwi Property
- Waihoehoe - Oyster Capital; and
- Drury East - Fulton Hogan.

Additionally, two private plan changes have been submitted in Drury West:

- Auranga B2 (Karaka and Drury Limited)
- Waipupuke (Lomai Properties)

Kiwi Property, Oyster Capital and Fulton Hogan submitted their plan changes together as a package in Drury-east. All four plan changes were accepted by the Council and are anticipated to be notified in August 2020. Despite being accepted, at the time of writing this report, none of the proposed plan changes have any statutory weighting. Additionally, Proposed Plan Change 22 was notified in March 2019, and proposes the addition of two sites to Schedule 12 of the Plan (Sites and Places of Significance to Manawhenua) of relevance to the DBC: Ōpāheke – Headland (at the confluence of Hingaia Stream and Ngakoroa Stream to the South) and Te Pou a Rangiwhiwhi – Drury Creek Recreation Reserve.

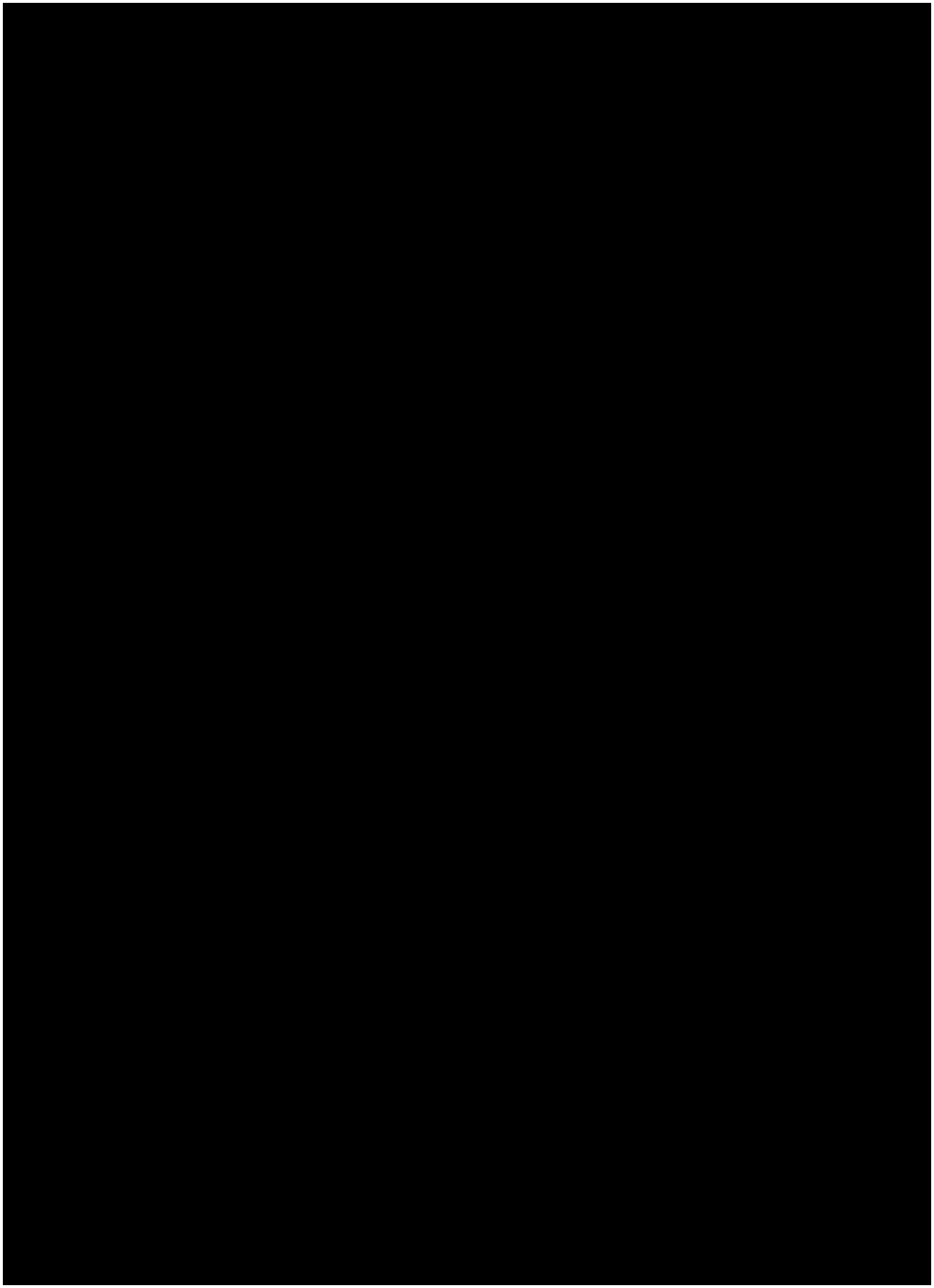
Figure 5 Private plan change requests in Drury-Ōpāheke



[redacted]

[redacted]

- [redacted]



5.2.3 Next Steps

Continue one-on-one engagement with landowners / developers (e.g. meetings) regarding potential effects and opportunities for shared alignment in outcomes (e.g. through developer agreements) – particularly in areas where land is live zoned or is about to be.

6 Community Engagement Summary

In June-July 2019 Supporting Growth were still engaging at the wider community level across the South.

6.1 June-July 2019

In June 2019, prior to the public release of the South Indicative Strategic Transport Network, the Supporting Growth team sent approximately 1,500 letters to property owners whose properties were within broad “corridor study areas” for some of the projects in the south. Landowners were invited to meet with members of the team to discuss what that might mean for them.

We then met with landowners individually to gain an understanding of local knowledge of the area, how they use their land, to talk through the indicative strategic transport networks and to understand any arising constraints, issues and opportunities. This was a collaborative effort between Te Tupu Ngātahi, AT and Waka Kotahi, although Te Tupu Ngātahi led all engagement meetings.

Meetings

As a result of the letters sent out to landowners within all South projects, the Te Tupu Ngātahi team conducted 38 engagement meetings with Drury Local landowners. These were held in Papakura and Pukekohe in June and July 2019.

6.1.1 Summary of Feedback June-July 2019

6.1.1.1 Meetings

- There were a total 38 meetings held in the south (23 at Papakura and 11 at Pukekohe) over a five-week period.
- Land use ranged from commercial premises, horticultural/agricultural lots, lifestyle blocks and residential premises. Histories with the land ranged from multi-generational to more recent acquisition.
- There was more demand for Papakura as a meeting location than Pukekohe and after work and Saturdays were popular.
- The majority were scheduled meetings, although there were walk-ins and those who have had meetings returning for more information. The general public also approached the co-ordinator desk with general questions about the project.
- People were generally seeking more information about how it could affect them and were open to hearing more.
- As more meetings were held neighbours began to share information (varied versions) this resulted in some landowners coming to meetings with false information or agitated in anticipation of effects to their property/lives.
- The project launched publicly in week three, many of the proceeding meetings were more challenging as landowners came more prepared having had interpreted the maps as definitive lines and transposed these onto their specific properties. This resulted in some attendees coming into the meetings more agitated, expecting more information than was currently available such as specifics on property effects, property values and timings.

- Concerns were raised about the impacts of the uncertainty including timeframes of construction beyond the designation of the proposed corridors and impacts of the designation on future development plans. Many arrived anxious and some upset at the potential of losing their property or impacting on future plans, although these fears were not necessarily allayed most were appreciative of the information and being met with personally.

The themes were dependent on the landowners' individual circumstances and future plans in relation to their properties. Responses ranged from support, ambivalence, acceptance that the area is changing, future opportunities to strong opposition.

- **Access**: questioning how this will be impacted, and how it will be restored;
- **Loss of Amenity**: Concerns with impacts on lifestyle if houses and living spaces are closer to upgraded or new roads that are significantly busier and alter the current rural lifestyle amenities;
- **Loss of Value**: Concerns of impacts on property value prior to designation, ability to sell prior to an unknown construction date with a designation, reliability of market value if land is acquired and value of property if a new road or busier road is closer to the house.
- **Site Acquisition/Land Development**: Response to potential land acquisition was varied some open to this whilst others vehemently opposed, most concerned about restrictions on future plans (development, value, saleability and lifestyle), most wanted to understand the process and potential timing.
- **Alignment Concerns**: Many landowners questioned the alignments, whether they were most suitable or had some concerns over it.
- **Change of sense of place**: Many particularly in the more rural areas have moved to the area for future retirement and or a quiet rural lifestyle, many have voiced concerns over the changes this project and zoning changes will have on their' vision of the future
- **Uncertainty**: Many expressed frustrations at the lack of detail and certainty of timing that we were able to provide and questioned why we were engaging with them when we didn't have any detail to share.

6.2 December 2019

In December 2019, we wrote to 326 landowners within the Drury Local project area seeking feedback on the draft preferred options identified for the SH22 upgrade, Jesmond Road, Bremner Road, Waihoehoe West FTN upgrades and Ōpāheke North-South FTN arterial projects. An email update was also sent on 12 December 2019 to stakeholders to advise them of the draft preferred options sent to landowners and share our plans for engaging with these potentially affected owners in 2020.

In response to the letters we received feedback from 14 landowners. We also received feedback from 10 stakeholders in response to the email update on the draft preferred options.

The feedback from landowners generally related to alignment concerns, loss of property, 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.

6.2.1 December 2019 engagement feedback

6.2.1.1 SH22 upgrade

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 property.

6.2.1.2 Jesmond Road

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.

6.2.1.3 Bremner Road

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.

6.2.1.4 Waihoehoe Road West FTN

Minimal specific feedback was received on the Waihoehoe Road West FTN Arterial corridor. 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.

6.2.1.5 Ōpāheke North South

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 North South 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.

6.3 May to June 2020

Te Tupu Ngātahi sent out letters in early May 2020 to 231 landowners proactively seeking a meeting with them to discuss the indicative designation boundaries for the NoRs. The projects were grouped as follows:

- State Highway 22 (SH22) Upgrade
- Jesmond Road, Bremner Road and Waihoehoe West FTN Upgrades
- Waihoehoe Road East l Upgrade
- Ōpāheke North-South FTN Arterial
- Ponga Road and Ōpāheke Road Upgrades

In the letters, landowners were encouraged to book a meeting with the team online at https://sgasouth.gettimely.com/book. Meeting times were available for a four-week period from 18 May 2020 to 12 June 2020, enabling landowners to choose the most appropriate time that suited them.

The meeting period was extended by a week such that meetings were held over a five-week period from 18 May until 19 June.

At the end of the five weeks, a total of 40 landowner meetings had been undertaken in relation to the following sections of the project (this excludes landholdings of AC, MOE, Waka Kotahi, Vector, and developers): Specifically, for each project:

- **State Highway 22 Upgrade** – 34 landowners were identified to be within the proposed designation boundary. We have met with 4 of these landowners at least once during 2020.
- **Jesmond Road, Bremner Road, and Waihoehoe West FTN Upgrades** – 104 landowners were identified to be within the indicative designation boundary. We have met with 22 of these landowners at least once during 2020.
- **Waihoehoe Road East Upgrade –** 36 landowners were identified to be within the designation boundary. We have met with 6 of these landowners at least once during 2020.
- **Ōpāheke North-South FTN Arterial** – 31 landowners were identified to be within the designation boundary. We have met with 3 of these landowners at least once during 2020.
- **Ponga Road Upgrade** and **Ōpāheke Road Arterial Upgrade –** 43 landowners within the designation boundary. We have met with 5 landowners at least once during.

However, up until the week ending June 26 2020, we had not heard from or made contact with owners of approximately 173 properties.

At the one-to-one meetings Te Tupu Ngātahi was able to introduce the project to the landowners, go over the wider network map, and discuss the indicative area of their properties that may potentially be affected by the route. This was shown by a hatched area on an aerial photograph of their site.

Te Tupu Ngātahi were able to share information about the Projects at these landowner meetings and were also able to obtain information about each property directly from the landowners.

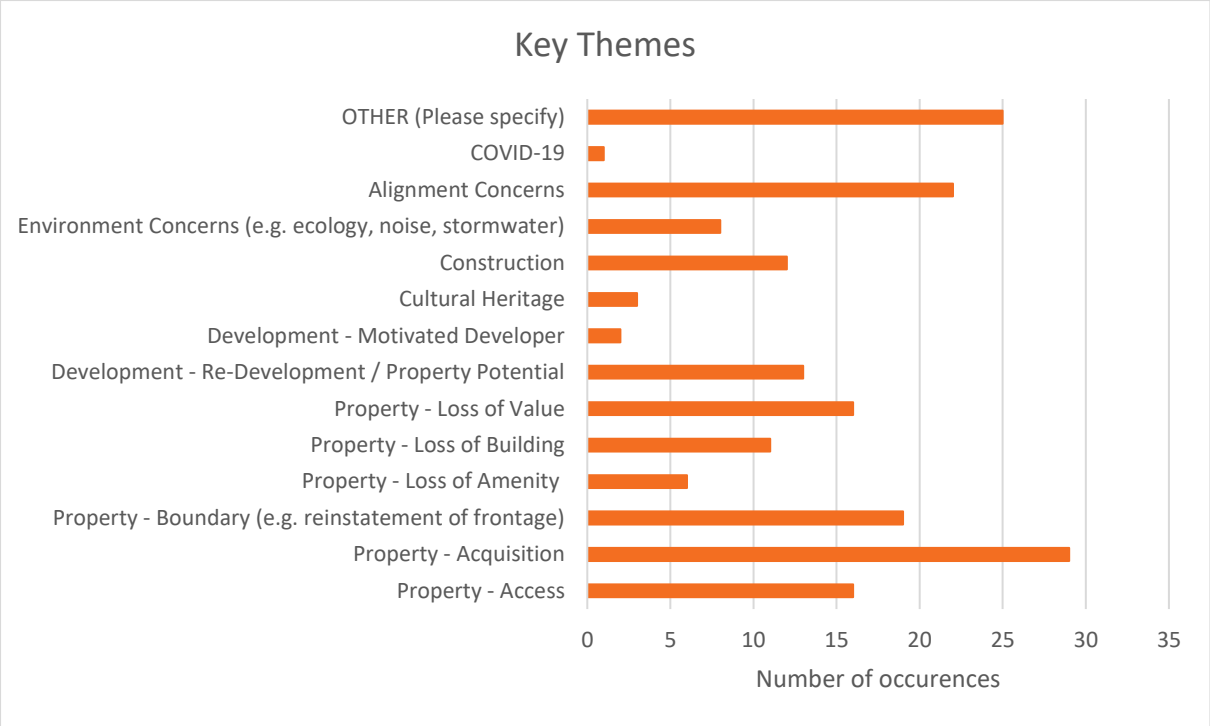
In relation to the Projects, we gathered information from landowners regarding:

- Highly valued trees
- Fencing and retaining
- House relocations, redevelopment
- Commercial use / tenancies / leases
- Topography

6.3.1 Summary of feedback

Figure 5 below summarises the key themes arising from the landowner engagement.

Figure 6 Key themes from landowner engagement



The key themes raised by landowners related to property (acquisition/loss of value/access), alignment of the proposed new roads and impact to property boundaries. Timing for construction of the projects was raised frequently in relation to property impacts. Specifically queries regarding timing of property acquisition and ongoing tenure of property was a concern.

In response to landowner feedback on these key themes, we provided the following responses:

Themes	Our response
Alignment	• Rationale on the design and layout of the proposed road upgrades were discussed.
Property	• The Auckland Transport "Guide to the Notice of Requirement" (Appendix 5) was provided and discussed with landowners. It was highlighted during the

	discussion that each landowner would be able to provide a submission as part of the NoR decision making process once notified by Auckland Council
Timing	• Timeframes for NoR lodgement and potential start of construction was discussed with each landowner. • A copy of the Auckland Council Future Urban Land Supply Strategy (FULSS) was provided and discussed with landowners. The FULSS outlines the expected timing (by decade) for release of developable land in the south (refer to Appendix 8).

6.4 May-June 2020 Engagement Outcomes

A workshop was held with the Project team to discuss the outcomes from the landowner engagement. The team discussed the feedback received from the landowners in relation to the design of the projects.

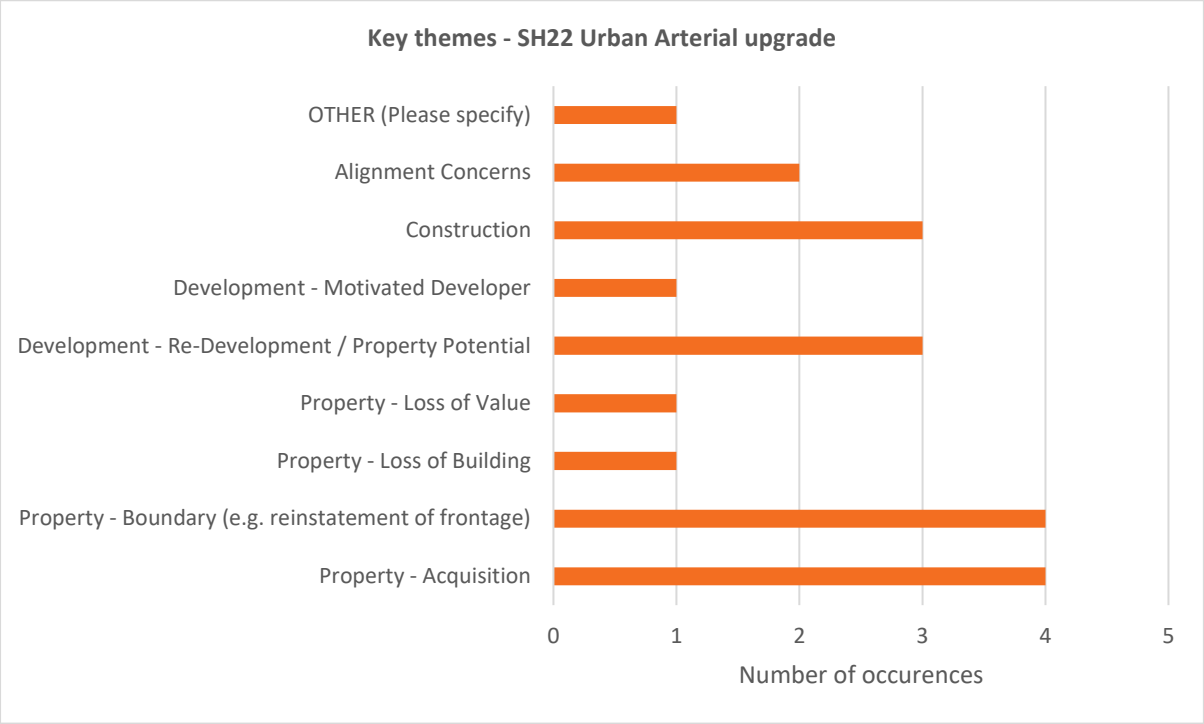
While no fundamental design changes to the projects were made, we were able to identify opportunities to address landscape and visual amenity at detailed design stage. The feedback for each Project and how we responded to it is outlined below.

6.4.1 SH22 Upgrade Feedback

Of the 34 landowners identified to be within the proposed designation boundary for the SH22 upgrade project, four landowners responded to an invitation to discuss the project.

Figure 6 below provides a snapshot of the key themes from these landowner meetings and the number of occurrences per theme.

Figure 7 Key Themes - SH22 Urban Arterial Upgrade



The main issues raised related to property boundary, acquisition, construction and potential for re-development of the property. We also received feedback on the road alignment, in particular one landowner queried whether the designation could move to the north side of the road.

The rationale for the road alignment was discussed with the landowner, in particular noting the alignment shown is preferred as it has considered various impacts on houses, land acquisition, constructability, environment and future cost. The project team did however consider the feedback to shift the alignment north but concluded no further changes to the proposed alignment should be made.

Regarding property boundary, landowners wanted to know if the indicative area for the designation as shown on the aerial photograph of their site would be temporary or permanent, what compensation would be provided if land was required and what impact this would have on any plans for future re-development. It was noted that the indicative area for the designation shown on the map included both temporary areas required during construction and in some instances included a permanent area for the new road alignment. Landowners were informed that details of the temporary and permanent areas would be more clearly identified when the NoR plans are submitted to Auckland Council.

A few of the landowners were interested what impact partial land acquisition (if required) would have on their ability to redevelop or develop their properties in the future. The project team advised that the designation boundary shown was indicative only and advised if the landowner had any plans to develop or redevelop their site to discuss their plans with Auckland Transport to enable the best outcome.

One landowner also raised the practicality of the use of the land for a proposed stormwater wetland as they considered the area to be quite steep particularly in relation to the neighbouring property. The

proposed location of the wetland was explained by noting earthworks would be required on the elevated area and the pond would discharge to a low point.

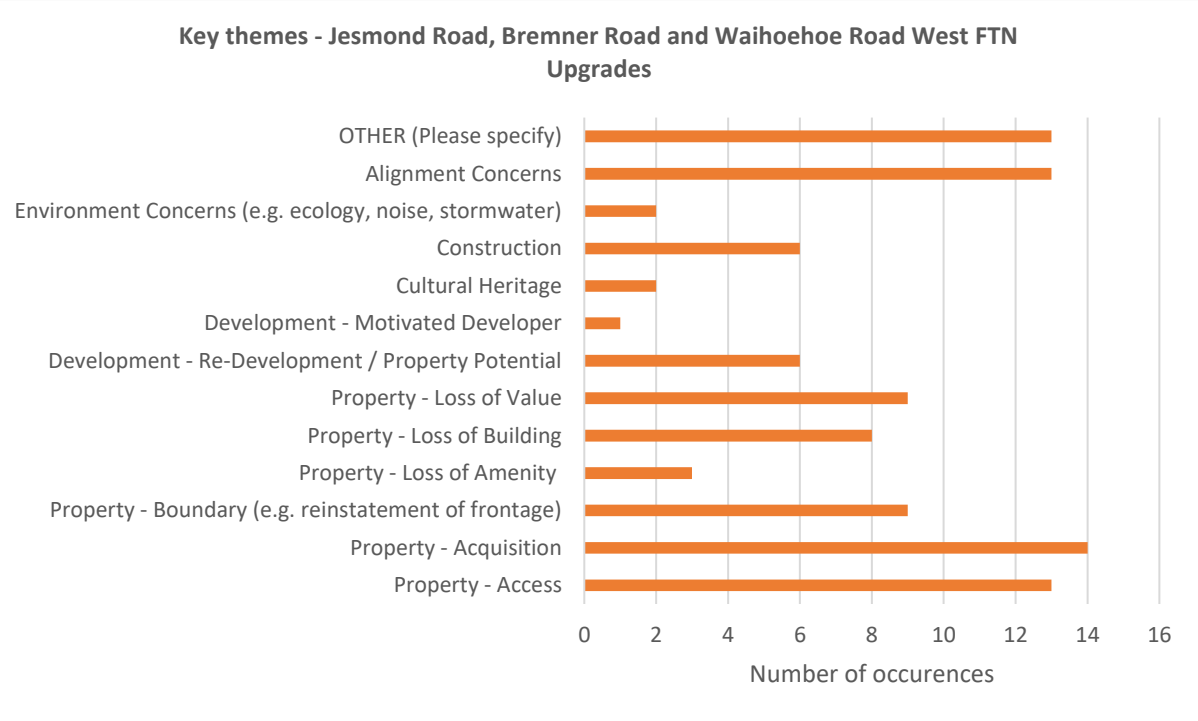
No changes to the proposed designation boundary were made as a result of this engagement.

6.4.2 Jesmond Road, Bremner Road and Waihoehoe West FTN Upgrades Feedback

Of the 104 landowners identified to be within the proposed designation boundary for the Jesmond Road, Bremner Road and Waihoehoe West FTN upgrades, 22 landowners responded to an invitation to discuss the project.

Figure 7 below provides a snapshot of the key themes from these landowner meetings and the number of occurrences per theme.

Figure 8 Key themes - Jesmond Road, Bremner Road and Waihoehoe Road West FTN upgrades



The main issues raised during these landowner meetings related to timing for construction, property acquisition and alignment. We received a number of other comments and queries in relation to project funding, private plan changes, and project integration in particular people wanted to know how the project integrated with the new train stations at Drury.

Landowners were keen to retain trees they considered significant to the existing Drury village area landscape, namely the Phoenix Palms and Oak trees adjacent to Waihoehoe Road, and mature trees adjacent to Jesmond Road. They felt these trees to be significant landscape features in the area. The project team noted the trees were located within the landowner's property and any effects would be assessed in the landscape and visual assessment.

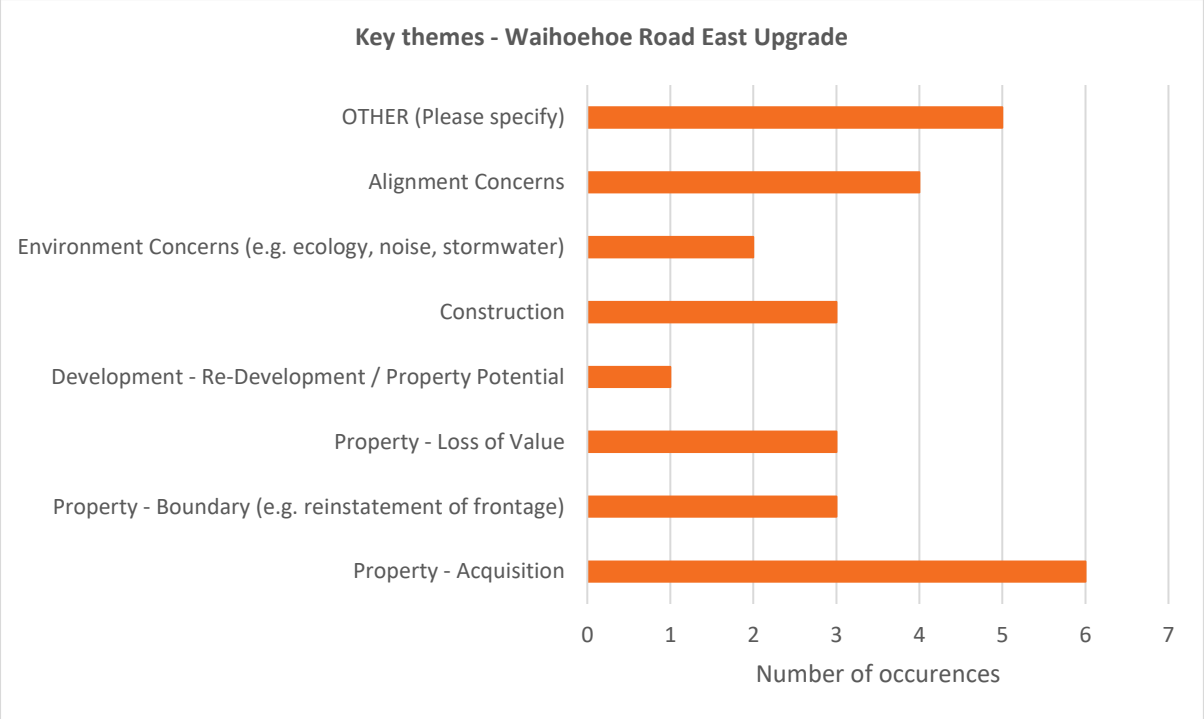
One landowner on Norrie Road wanted to know if alternative access to their site could be provided if the traffic movements in and out of the site was modified. The project team noted the need to mitigate the effects from the proposed road upgrade and if this was to require an alternative access, it would not be constructed until the proposed upgrade is implemented.

A few landowners wanted to know if the alignment of the road widening designation along Waihoehoe, Norrie and Bremner could be changed as any reduction in land area would impact their business. It was noted that the draft designation boundary shown was indicative only and also included land for temporary occupation during construction.

Notwithstanding this, the project team made some minor adjustments to the proposed designation boundary were made as a result of this engagement.

6.4.3 Waihoehoe Road East Upgrade Feedback

Of the 36 landowners identified to be within the proposed designation boundary for the Waihoehoe Road East Upgrade, 6 landowners responded to an invitation to discuss the project.



The main issues raised during the landowner meetings related to timing for property acquisition, alignment and construction. We received a number of other comments and queries in relation to project funding, private plan changes, and project integration.

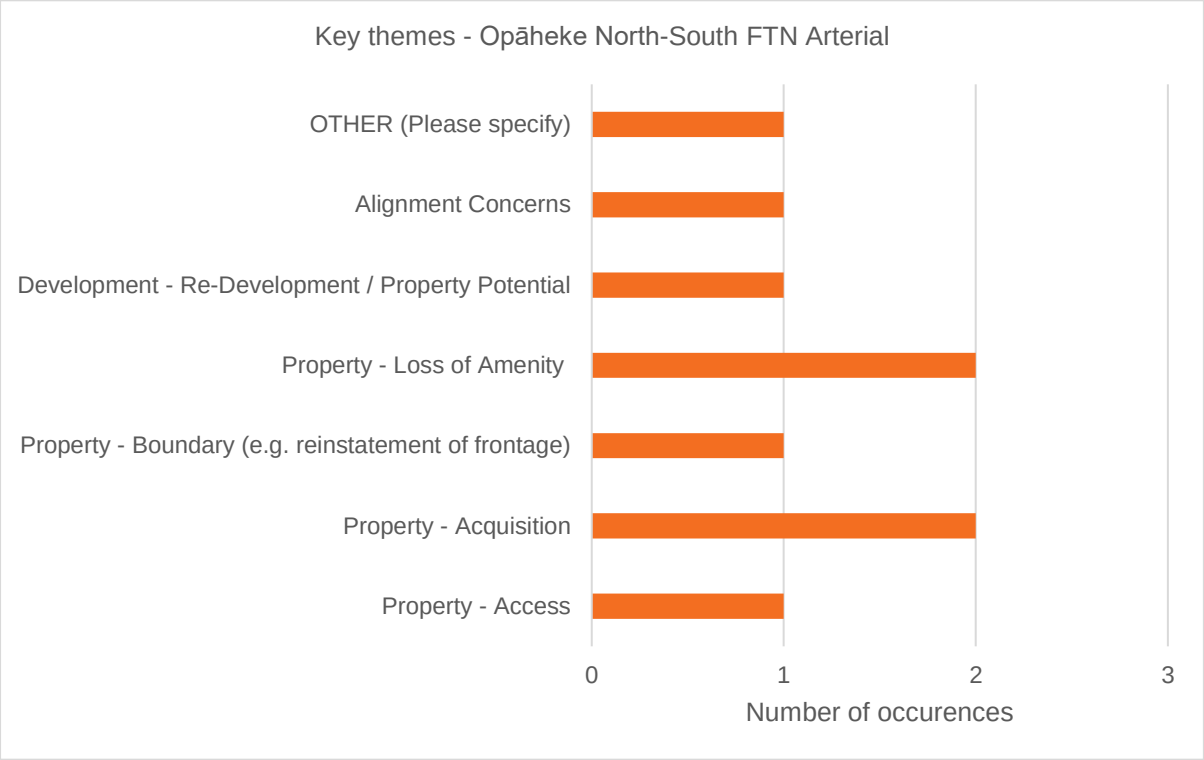
A few landowners wanted information on the proposed road width and space required to construct the widening. Most were concerned with the project timelines for construction of the road and how the project integrated with the other road upgrades in the Drury area.

All landowners were keen to understand when property acquisition would take place and what the process was. For these queries, it was noted that a separate property team would make contact about 3 years prior to construction to begin any discussions for land requirement.

No changes to the proposed designation boundary were made as a result of this engagement.

6.4.4 Ōpāheke North-South FTN Arterial Feedback

Of the 31 landowners identified to be within the proposed designation boundary for the SH22 upgrade project, three landowners responded to an invitation to discuss the project.



The main issues raised during the landowner meetings related to property acquisition and loss of amenity.

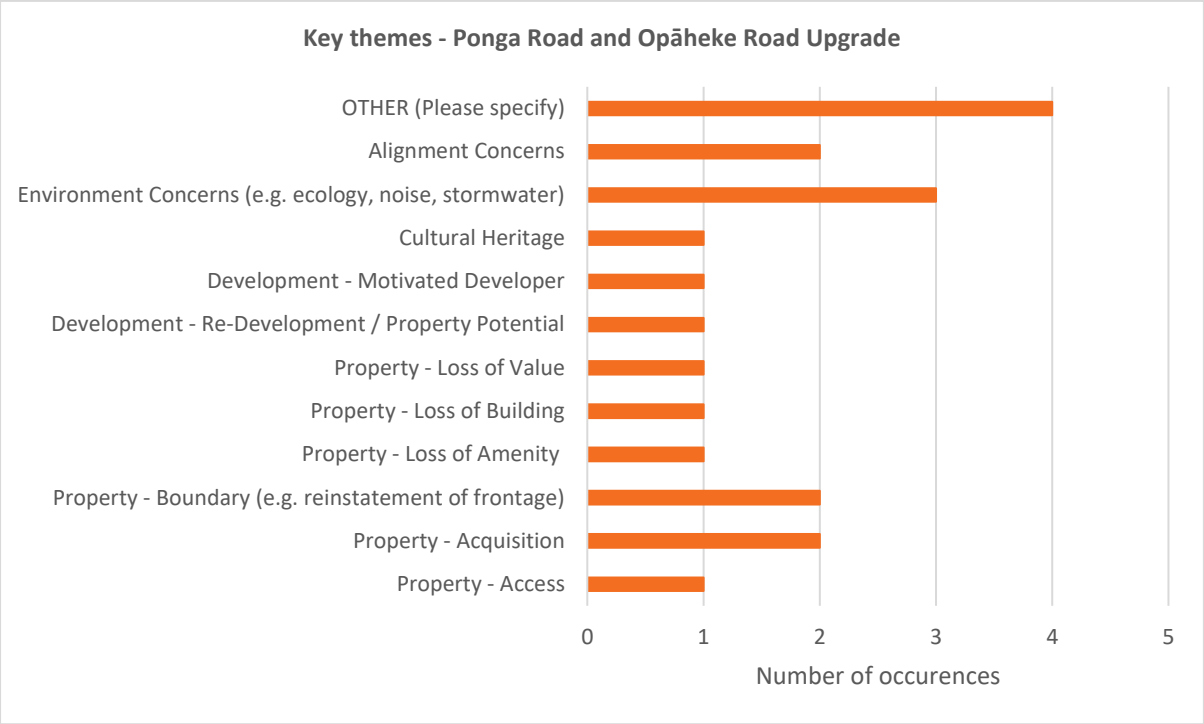
One landowner noted they were looking to sell their land in the next few years and was concerned that the changing character and noise may impact on the property, they considered that screening with trees would be a way to mitigate this loss of amenity. The project team noted that the road upgrade would be a residential collector road instead of a main highway and that the property was located within the future urban zone in the Auckland Unitary Plan.

All landowners were keen to understand when property acquisition would take place and what the process was. For these queries, it was noted that a separate property team would make contact about 3 years prior to construction to begin any discussions for land requirement.

No changes to the proposed designation boundary were made as a result of this engagement.

6.4.5 Ponga Road and Ōpāheke Road Upgrade Feedback

Of the 43 landowners identified to be within the proposed designation boundary for the Ponga Road and Ōpāheke Road Arterial Upgrade projects, five landowners responded to an invitation to discuss the project.



The main issues raised during the landowner meetings related to timing for construction, property acquisition and alignment.

A number of landowners raised the potential of construction impacts on trees in the area, in particular Kahikatea trees on the property or established trees that have been on the property for 40 years. The project team were able to note the location of these valued trees in the within the landowner's property and where possible will explore opportunities for retaining these trees during the detailed design stage.

All landowners were keen to understand when property acquisition would take place and what the process was. For these queries, it was noted that a separate property team would make contact about 3 years prior to construction to begin any discussions for land requirement.

One landowner was particularly concerned what impact the proposed designation boundary would have on their ability to relocate a dwelling onto the property. They noted the property had some challenging features with a stream and was prone to flood in certain areas. They identified an area on the property to relocate a dwelling however the proposed designation boundary was shown to be over this proposed building footprint. The project team noted that consent for the dwelling relocation was still to be obtained and encouraged the landowner to contact AT prior to submitting a resource consent to discuss their plans to enable the best outcome.

No changes to the proposed designation boundary were made as a result of this engagement.

7 Post engagement follow-up

Following the close of the extended engagement period. We noted that the overall take-up of our offer to engage with potentially impacted landowners was lower than expected (less than 20 per cent). We consider there to be potentially a number of explanations for this:

- **Prior engagement** – the landowner may have had contact with the programme during an earlier stage of engagement and may be broadly satisfied that they've understand the likely impact and do not require additional information.
- **Low owner occupancy** – property records (based on landowner 'address for service' information as opposed to the physical address of the property) suggests that as many as 70 per cent of properties impacted are not owner-occupied therefore are likely tenanted.
- **Covid-19** – initial communication about the engagement took place during Level 3 lockdown, while actual engagement – largely by phone, email or video conference – took place during either Level 2 or Level 1. While Covid has only been rarely referenced by members of the community as a potential barrier to engagement or overarching concern, it may be a factor in the overall low take up.
- **Developer private plan changes** – in the Drury area there are a number of private plan changes which have been submitted by developers to Council and proposed private plan changes are anticipated in the near future in addition to those already lodged. Developer interest covers a large area in Drury east/west including areas adjacent to Drury Local projects on Waihoehoe Road and part of Ōpāheke North South Arterial. While developers do not own the majority of the land they are seeking rezoning for (through the plan changes), it's likely they have some arrangement with private landowners. These landowners may be less inclined to follow up with Te Tupu Ngātahi on the basis that a developer plans to buy their property if the plan changes are approved.

Given the low level of engagement take-up, we proposed to undertake the following actions with affected landowners ahead of the Council notified hearing process.

- Proactively phoning and emailing landowners.
- Sending a follow up letter to those landowners we have not heard from, and do not have contact information for, other than a mailing address, approximately 120 properties. The follow up letter included a 'hatch' map which shows how the property will potentially be impacted by the Notice of Requirement (NoR) designation process (consistent with what we provided landowners as part of our engagement meetings). Landowners encouraged to contact us if they have any questions, or if they wish to meet to discuss what is proposed.
- Outbound calling - proactively phone all landowners we have not currently heard from. On the basis we receive this contact information by mid-July, we would expect to have completed outbound calling by the end of July.
- Prior to lodgement, we propose to send a further email (where we have this contact information) to landowners outlining the next steps in the process, particularly the likely timing and stages of the council hearing process.

To ensure that Te Tupu Ngātahi engaged with as many landowners as possible, proactive calls and emails were sent to landowners for whom we had contact information, and a second follow-up letter was sent to landowners who had not yet booked a meeting. These letters were sent on 30 July 2019 to encourage landowners to contact us.

At the time of writing this summary report, we have met with 41 landowners that were proactively contacted by either email or letter.

8 Next Steps

The directly affected landowners will be informed prior to the lodgement of the Notices of Requirement for the projects.

The community will be informed about engagement outcomes, decisions and next steps following lodgement of the NoRs for the Projects. Te Tupu Ngātahi will continue to engage on a regular basis during the public notification and hearings process. This engagement will be on an inform level, rather than consult (IAP2 spectrum of public participation) and will include a range of engagement methods.

Appendix 1. Landowner Letters June-July 2019

SUPPORTING GROWTH PROGRAMME

S35;S18;S23;S16;S34;S01;S29;S21;S25

Te Tupu Ngātahi
PO Box 105 218
Auckland 1143

17 June 2019

[redacted]

Dear [redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

The Supporting Growth Programme, a collaboration between Auckland Transport and the NZ Transport Agency, is planning new transport networks needed over the next 30 years to support future urban growth in Warkworth, North Auckland, North West Auckland and South Auckland.

Our Programme is planning ahead and protecting the land required for future transport projects, however construction of these transport projects is not planned for another 10 to 20 years, in line with the anticipated rezoning of the land by Auckland Council.

Following community consultation in 2018 and technical investigations, we have now identified an indicative strategic transport network for **South Auckland**, which includes new or upgraded public transport connections, walking and cycling links and roads which could be built over the next few decades.

Some of these connections include study areas for new transport corridors. These corridors will be further refined within the study areas and therefore are much wider than the final corridors will be. We are writing to you because your property/properties [redacted] is within the study area for a proposed new indicative corridor(s), known as **Upgrade Waihoehoe Road**

This does not necessarily mean your property will be affected. The current study area is much wider than the final requirements for that of a new transport route. The exact location of the corridor will be refined through further technical and environmental investigations, and discussions with yourselves as landowners, and other stakeholders. Until the location of the corridor is further refined, we can't confirm what impact, if any, it may have on your property.

Waihoehoe Road

Waihoehoe Road is one of several existing roads in Drury proposed to be upgraded to bring them up to urban standards and provide for future population growth. The upgrade will provide for a variety of transport modes including walking and cycling, public transport and private vehicles to support current and future residents of the Drury growth areas.

We would like to meet with you

We would like to meet with you in the coming weeks to discuss the indicative corridor and begin to understand what this might mean for you. We would like to know how you use your property and any specific issues you think we need to be aware of, so we have a better understanding of the area. This is an opportunity to go over initial plans, timelines for the next stage of our investigations, and find out more about the route protection process we will be undertaking from here. Members of our project team will be present to help answer your questions.

To make an appointment, please visit our online booking system at https://sgasouth.gettimely.com/book to confirm a suitable time. Please provide your SG Reference Number as noted above when completing your booking.

A range of times between **Saturday 22 July and Saturday 13 July** are available at either the **Edmund Hillary Library (Papakura) OR the Franklin Centre (Pukekohe Library).** More information on the venues is attached.

Each appointment will last around 40 minutes, however if you would like more time, please let us know.

If you are unable to attend during these times, we may be able to find an alternative time that suits you. Please also let us know if you are unable to access the online system or attend in person and we will be happy to speak to you on the phone – our details are below.

Rented properties

We will not be contacting any tenants as part of these meetings unless you would like them to be involved. However, tenants will likely become aware of the project via public communications of the preferred network in the coming weeks.

If you would like us to contact your tenants directly, please let us know.

Public engagement

We will be launching this transport network to the public in late June/early July 2019. At this time, all information about this transport network and what the route protection process means for property owners will be available on the Supporting Growth website - supportinggrowth.govt.nz

Contact details

For further information about these projects, please contact the Supporting Growth Team via email at info@supportinggrowth.nz or call our freephone number 0800 GROW AKL (0800 4769 255). Information can also be found at supportinggrowth.govt.nz

Yours sincerely

[redacted]

[redacted]
[redacted]
[redacted]y

[redacted]
[redacted]
[redacted]
[redacted]
[redacted]

SUPPORTING GROWTH PROGRAMME

S29;S21;S25

Te Tupu Ngātahi
PO Box 105 218
Auckland 1143

17 June 2019

[redacted]

[redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

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Some of these connections include study areas for new transport corridors. These corridors will be further refined within the study areas and therefore are much wider than the final corridors will be. We are writing to you because your property/properties at [redacted] is within the study area for a proposed new indicative corridor(s), known as **SH22 upgrade Oira to SH1; Upgrade Bremner Road**

This does not necessarily mean your property will be affected. The current study area is much wider than the final requirements for that of a new transport route. The exact location of the corridor will be refined through further technical and environmental investigations, and discussions with yourselves as landowners, and other stakeholders. Until the location of the corridor is further refined, we can't confirm what impact, if any, it may have on your property.

SH22

The Safe Network Programme is in the funding application process for short term safety improvements in the SH22 area. Parts of this programme are being prioritised including a roundabout at the intersection of SH22 and Glenbrook Road. Longer term safety upgrades are being looked at as part of the wider Supporting Growth Programme.

Bremner Road

Bremner Road is one of several existing roads in Drury proposed to be upgraded to bring them up to urban standards and provide for future population growth. The upgrade will provide for a variety of transport modes including walking and cycling, public transport and private vehicles to support current and future residents of the Drury growth areas.

We would like to meet with you

We would like to meet with you in the coming weeks to discuss the indicative corridor and begin to understand what this might mean for you. We would like to know how you use your property and any specific issues you think we need to be aware of, so we have a better understanding of the area. This is an opportunity to go over initial plans, timelines for the next stage of our investigations, and find out more about the route protection process we will be undertaking from here. Members of our project team will be present to help answer your questions.

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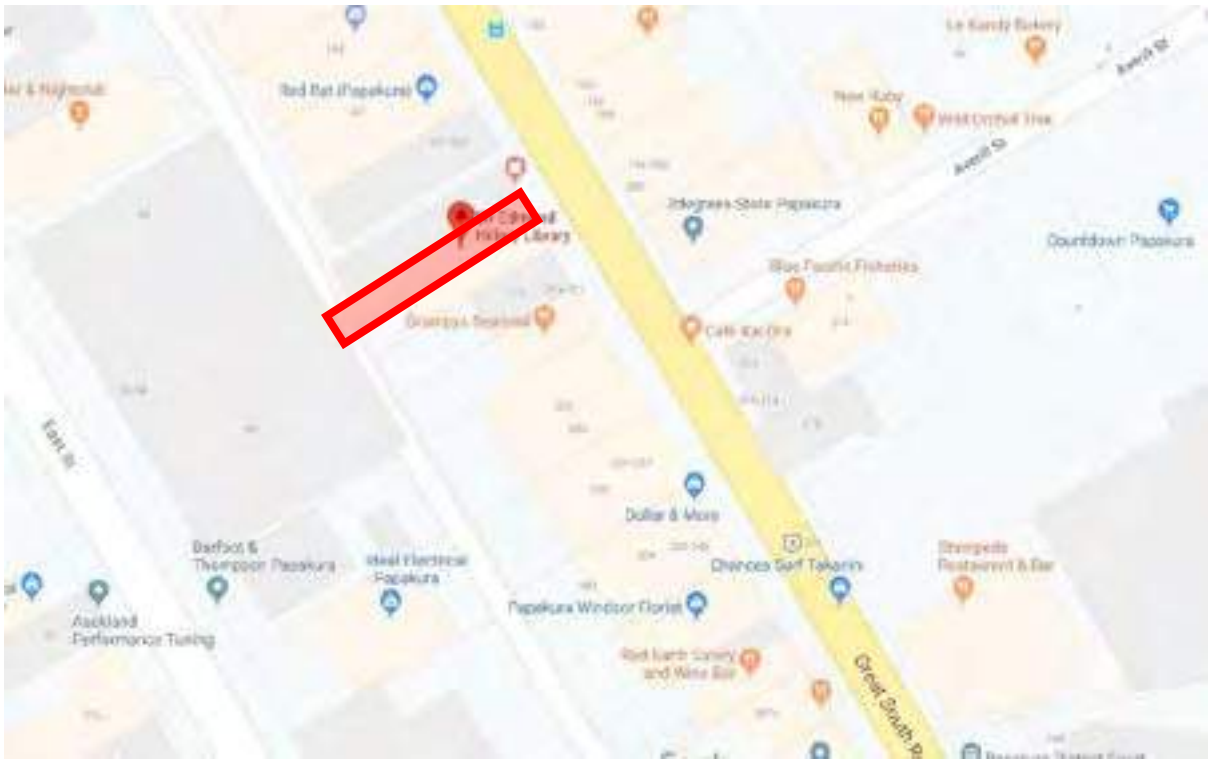
Yours sincerely



OPTION 1: The Sir Edmund Hillary Library (Papakura Library) – Location Details

209 Great South Road, Papakura, 2110



Transport

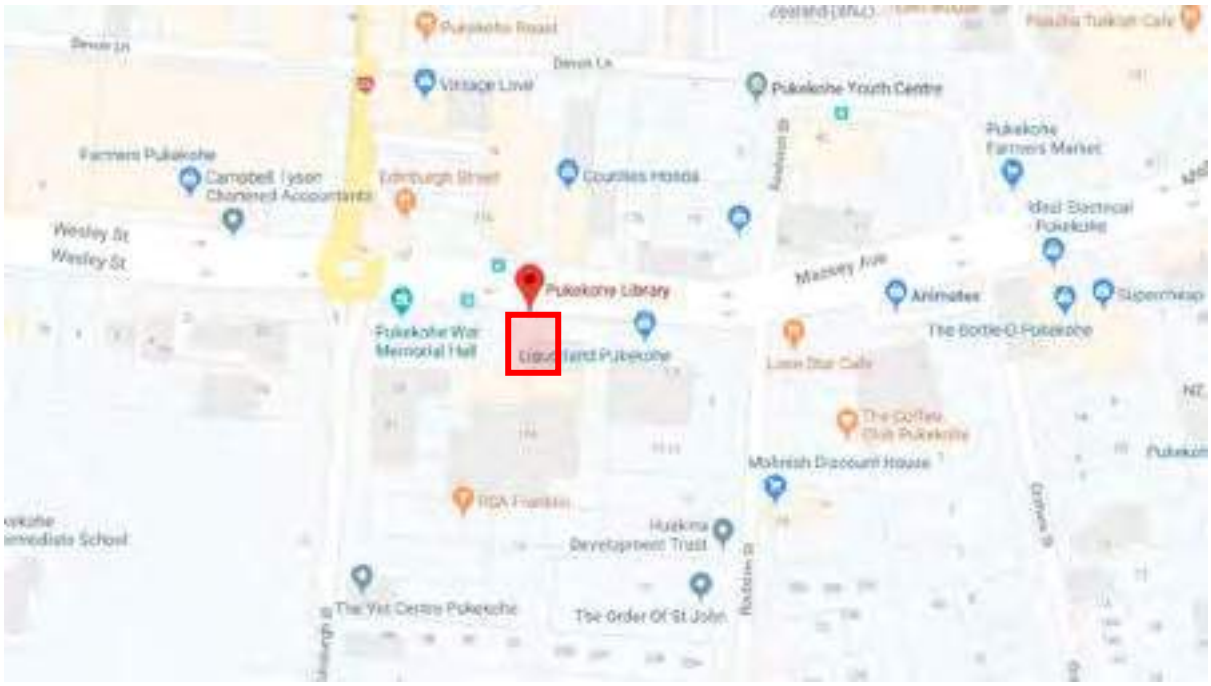
- Undercover parking available from East Street entrance. There is free, covered parking underneath Papakura Museum which can be accessed via 28 East Street, Papakura. Level 1 has free all-day parking and Level 2 has free parking for up to 3 hours. Take lift to Level 3 to access the library.
- On street parking available on Great South Road and surrounding side streets.
- The library is a 5 minute walk from the Papakura Train Station

Meetings will be held in Meeting Rooms 1 & 2 on Level 3 of the Library.

There will be signs to direct you to the meeting rooms once inside the buildings and the front desk staff would be happy to direct you if you have any trouble finding the meeting rooms.

OPTION 2: The Franklin Centre (Pukekohe Library) – Location Details

12 Massey Ave, Pukekohe, Auckland 2120



Transport

- There is some street parking available on Massey Ave and parking at the back of the Pukekohe Library
- The library is a 10 minute walk from the Pukekohe Train Station

Meetings will be held in the Allan Wilson Room and Edmund Hillary Room in the Franklin: The Centre Building, which is right next to (and shares the same entrance as) the Pukekohe Library.

The meeting rooms are up the stairs

There will be signs to direct you to the meeting rooms once inside the building and the front desk staff would be happy to direct you if you have any trouble finding the meeting rooms.

SUPPORTING GROWTH PROGRAMME

S23;S25;S21;S35

Te Tupu Ngātahi
PO Box 105 218
Auckland 1143

17 June 2019

[redacted]

Dear [redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

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This does not necessarily mean your property will be affected. The current study area is much wider than the final requirements for that of a new transport route. The exact location of the corridor will be refined through further technical and environmental investigations, and discussions with yourselves as landowners, and other stakeholders. Until the location of the corridor is further refined, we can't confirm what impact, if any, it may have on your property.

Bremner Road

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We would like to meet with you

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SUPPORTING GROWTH PROGRAMME

S21;S25

Te Tupu Ngātahi
PO Box 105 218
Auckland 1143

17 June 2019

[redacted]

Dear [redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

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[redacted]



Appendix 2. Landowner Letters December 2019

Supporting Growth Programme
PO Box 105218
Auckland 1143

6 December 2019

[redacted]

Dear [redacted],

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

Planning safer and more accessible transport connections for southern Auckland

As you know, the South is growing fast with new urban areas planned for Takaanini, Opāheke, Drury, Paerata and Pukekohe. Significant new infrastructure, including transport, will be needed to support this growth.

The Supporting Growth Programme is in the process of identifying and protecting the land that will be needed for future transport connections in these areas. The programme is a collaboration between Waka Kotahi NZ Transport Agency and Auckland Transport.

Following community consultation in 2018 and technical investigations, we identified an Indicative Strategic Transport Network for southern Auckland which includes new or upgraded public transport connections, walking and cycling links and roads which could be built over the next few decades.

In June 2019, we wrote to landowners about the release of an Indicative Strategic Transport Network for southern Auckland who identified within a corridor study area for a proposed project/s. In the weeks that followed we met with over 300 property owners in your area, where we were able to discuss what being in a corridor study area means, and get information on how properties in the area.

Since then, we have identified your property is also within the wider area of investigation for the **Upgrade Opaheke Road and Ponga Road.** For more information on this, see the attached '**Property owner information sheet'**. This does not necessarily mean that your property will be affected, but we're sending you this letter so you are aware of the work we are doing and to give you an opportunity to give us feedback if you want to do so.

We appreciate that you've not had an opportunity to engage with us before now. Once you've had a chance to read the information, if you have any more questions ahead of providing feedback, please feel free to call the team on our freephone number 0800 GROW AKL (0800 4769 255).

The Supporting Growth team has reviewed the insights and information from previous consultation and completed further technical work to progress the planning for projects within the Drury and Opāheke areas. This means that some projects are now at a point where a draft preferred option has been identified. **As landowners and community members, we would like your valuable feedback**

[redacted]

Have your say

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There are a couple of ways to have your say:

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2. Visit our website supportinggrowth.govt.nz. From there you will be able to view the options and submit an online feedback form.

You'll have the opportunity to get your feedback through to us by **Friday 24 January 2020.**

Where to next

The first step will be to review the feedback we receive from property owners before undertaking further technical investigations. It will be at this point where we'll be in a position to talk about potential property impacts and will be in contact with property owners when we have this information. We will also be asking for community feedback on other projects in the south, including the Proposed Drury Central or Drury West Train Stations (which are shown as 'areas of investigation' on the enclosed map/s). We expect this will be **March or April 2020.**

We'll then start the route protection process (e.g. designation) to protect the land needed for each project. For more information on this, see the attached '**Route protection information sheet**' or contact us at the details included below.

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We look forward to receiving your feedback and hearing what you have to say on the future of southern Auckland's transport connections.

[redacted]



[redacted]

[redacted]

Supporting Growth Programme
PO Box 105218
Auckland 1143

6 December 2019

[redacted]

[redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

Planning safer and more accessible transport connections for southern Auckland

As you know, the South is growing fast with new urban areas planned for Takaanini, Opāheke, Drury, Paerata and Pukekohe. Significant new infrastructure, including transport, will be needed to support this growth.

The Supporting Growth Programme is in the process of identifying and protecting the land that will be needed for future transport connections in these areas. The programme is a collaboration between Waka Kotahi NZ Transport Agency and Auckland Transport.

In June 2019, we wrote to you about the release of an Indicative Strategic Transport Network for southern Auckland. In this letter, we advised that your property is in a corridor study area for the proposed project **Upgrading State Highway 22 (SH22); Upgrade Bremner Road** and we offered to meet with you. For more information on this, see the attached '**Property owner information sheet**'.

In the weeks that followed we met with over 300 property owners in your area, where we were able to discuss what being in a corridor study area means. We appreciate the valuable feedback about issues and opportunities in the study area that was shared by property owners during these meetings – thank you.

Here's a summary of some of the feedback you gave us about the southern transport network:

- Most people were aware of the current and planned growth in these areas, and agreed improvements to the transport network are needed to support this
- You wanted more certainty around the process including the timing for route protection
- You wanted to understand what the proposed connections might mean for your property (including property access) and how potential construction impacts are to be managed
- There was overall general support for walking and cycling and more frequent public transport connections in the area (including support for rail upgrades)
- Some of you identified possible route options for us to consider
- People raised the issue of balancing the needs of the existing (largely rural) community and

[redacted]

The Supporting Growth team has reviewed the insights and information you provided us in June and July and completed further technical work to progress the planning for projects within the Drury and Opāheke areas. This means that some projects are now at a point where a draft preferred option has been identified. **As landowners and community members, we would like your valuable feedback on these.**

About the Upgrading State Highway 22 (SH22;) Upgrade Bremner Road Project/s

We're proposing to upgrade part of State Highway 22 (SH22) in the future to connect current and new communities and make travel within this area easier. In the long term, the section of SH22 between the Drury Interchange and just west of Oira Road at the edge of the Future Urban Zone is planned to be upgraded to four lanes. This will mean it's better suited to a growing urban area and can provide increased transport choice and support more people who walk, cycle, and use public transport.

In addition, Waka Kotahi's Safe Network Programme (SNP) is looking to make the intersection of Glenbrook Road and SH22 safer by installing a roundabout. Speed limits along SH22 between Drury Interchange and Paerata are also being reviewed.

To connect current and future communities and make travel within this area easier, we're proposing a future upgrade and extension to Bremner and Norrie Road (east) to Great South Road in the future.

We've considered four options for extending and upgrading Bremner and Norrie Road to make them four lanes.

Have your say

We'd like your thoughts on the draft preferred option shown on the enclosed map and described on the information sheet. Your feedback will help us check we haven't missed anything important and inform the option selection process.

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Where to next

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We'll then start the route protection process (e.g. designation) to protect the land needed for each project. For more information on this see the attached '**Route protection information sheet**' or contact us at the details included below.

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[redacted]

Supporting Growth Programme
PO Box 105218
Auckland 1143

6 December 2019

[redacted]

Dear [redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

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As you know, the South is growing fast with new urban areas planned for Takaanini, Opāheke, Drury, Paerata and Pukekohe. Significant new infrastructure, including transport, will be needed to support this growth.

The Supporting Growth Programme is in the process of identifying and protecting the land that will be needed for future transport connections in these areas. The programme is a collaboration between Waka Kotahi NZ Transport Agency and Auckland Transport.

In June 2019, we wrote to you about the release of an Indicative Strategic Transport Network for southern Auckland. In this letter, we advised that your property is in a corridor study area for the proposed project **New Opāheke North-South Connection** and we offered to meet with you. For more information on this, see the attached '**Property owner information sheet**'.

In the weeks that followed we met with over 300 property owners in your area, where we were able to discuss what being in a corridor study area means. We appreciate the valuable feedback about issues and opportunities in the study area that was shared by property owners during these meetings – thank you.

Here's a summary of some of the feedback you gave us about the southern transport network:

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About the New Opāheke North-South Connection Project/s

We're proposing two future projects that will connect current and future communities and make travel within this area easier:

1 .A new north-south connection from Hunua Road to Waihoehoe Road, which will provide a future link between the Opāheke industrial area and Drury East (previously referred to in our previous letter to you as the 'New arterial between Papakura industrial area to Waihoehoe Road')

2. An upgrade to the section of Waihoehoe Road between the Drury Town Centre and the proposed Opāheke north-south connection.

We are also investigating future upgrades to Opāheke Road, Ponga Road and Waihoehoe Road (east). We will have more information on these sections, including what our preferred option is in March or April 2020.

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We look forward to receiving your feedback and hearing what you have to say on the future of southern Auckland's transport connections.

[redacted]

[redacted]



[redacted]

[redacted]



NZ TRANSPORT AGENCY

New Zealand Government

Appendix 3. Landowner Letters May-June 2020

SUPPORTING GROWTH PROGRAMME

6 May 2020

Supporting Growth Programme
PO Box 105218
Auckland 1143

[redacted]

Dear [redacted]

Property Address: [redacted]
Record of Title number: [redacted]
SG Reference Number: [redacted]

Planning southern Auckland's transport connections – next steps

We hope this letter finds you safe and well as we learn to adjust to new ways of living to reduce the risk of Covid-19. We acknowledge that this is a difficult and uncertain time for you and your families.

The current situation with Covid-19 is unprecedented and we appreciate that the priority for everyone is to stay safe and take care of each other. We're also aware that we said in our last letter to you that we'd update you on the status of **Jesmond to Waihoehoe East FTN Arterial (previously named 'Upgrade Jesmond Road', 'Upgrade Bremner Road', and 'Upgrade Waihoehoe Road')** project by April 2020.

We have carefully considered when and how best to proceed with engaging with the community and landowners during this time and have decided to continue in line with the government's direction to proceed with transport projects. Not only will it help with the country's economic recovery, it will address the legitimate transport needs that have to be addressed both for now and in the future. We also hope to provide as much certainty as possible about what it might mean for you and your property.

We can't effectively proceed without input from the community and landowners, and we really appreciate you taking the time and effort to provide feedback. While we can't meet face-to-face, we have done everything we can to make it as easy as possible for people to tell us what they think or to get in touch with us for a conversation. We've set out how you can do this below. We completely understand that you may prefer to delay talking with us until a future date and we have also advised below how you can let us know if this is your preference.

In December 2019, we provided an update on the **Jesmond to Waihoehoe East FTN Arterial (previously named 'Upgrade Jesmond Road', 'Upgrade Bremner Road', and 'Upgrade Waihoehoe Road')** project and asked for your feedback on our preferred option. Over the next few weeks, we'd like to talk with you to discuss what the draft designation could mean for your property.

Here's a summary of some of the feedback:

- Landowners appreciated being contacted at this stage in the process when the preferred option is not set yet.

- Landowners would like to know what a future town centre would look like in Drury.

- Business owners in the area are very keen for exact details about the potential designation boundary. They want to know exactly how the proposal will impact on their property so they can plan for the future of their business site, especially on Bremner and Norrie Roads.

- Many landowners continue to request certainty regarding potential impacts.

We've attached relevant information and a map to explain how we arrived at our preferred option.

What this means for your property
Following feedback from the community and further technical investigations, we're writing to advise you that a draft designation boundary has now been identified for the Jesmond to Waihoehoe East FTN Arterial (previously named 'Upgrade Jesmond Road', 'Upgrade Bremner Road', and 'Upgrade Waihoehoe Road') project and based on this, ***your property at*** [redacted] ***remains within the boundary.***

Next steps - book a call with us
We'd like to talk with you to discuss the draft designation boundary and what this potentially means for your property. This is an opportunity to go over timelines for the next stage of the work, ask any questions and to find out more about the route protection process before it gets underway.

Contacting us during Covid-19
We completely understand that you may prefer to delay talking with us until a future date. If that's the case, please let us know by calling one of our Engagement Managers [redacted]

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Find out more about the other transport projects in southern Auckland
To find out more about the other transport proposals in the south and to have your say:

supportinggrowth.govt.nz

Supporting Growth Programme, PO Box 105218, Auckland 1143

info@supportinggrowth.nz

0800 GROW AKL (4769 255)

You can have your say from 13 May until 12 June 2020.

A thank you from us

Landowner engagement and community feedback is important to us to help refine our preferred options and other investigations before we progress to route protection. We understand these are extraordinary times for New Zealand, and we thank you for taking the time to provide feedback to help us plan necessary future infrastructure for the country. We'll continue to update you as we progress and will get back to you to close the loop on your feedback.

Stay safe and we look forward to hearing from you.



6 May 2020

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[redacted]

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Stay safe and we look forward to hearing from you.



Appendix 4. Property owner information and route protection information sheets

Property owner information sheet

The Supporting Growth Programme is planning the transport networks needed over the next 30 years in Auckland's future urban growth areas of Warkworth, North, North West and South Auckland.

In 2018, we undertook technical assessments and consulted widely with communities, local groups, local boards and stakeholders on a range of transport options for each of these areas.

Since then we have developed an indicative strategic transport network, which is an overall plan showing all of the strategic projects needed, including safety upgrades, new or upgraded public transport connections, walking and cycling links, and roads or state highways.

At the moment the programme only has indicative (potential) locations identified for all of these future transport projects.

Over the next few years we will be undertaking more detailed investigations, including collaborating with Auckland Council as they develop Structure Plans that guide future land use patterns and rezoning time-frames.

We will refine the potential locations of future transport projects through this work, and begin to progress route protection applications in a staged way across all the growth areas (see the related '*Route Protection information sheet*').

What does this mean for my property?

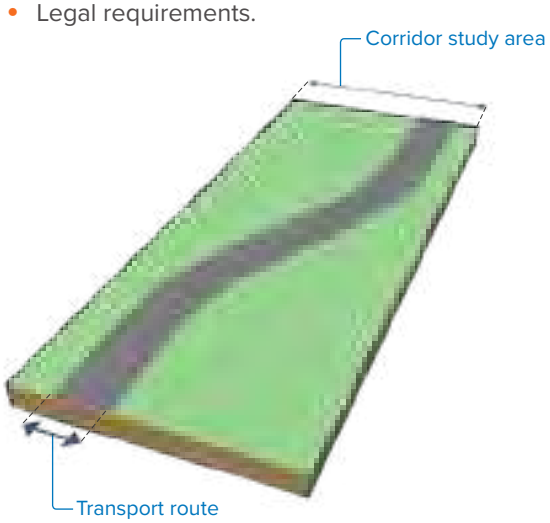
The plans for these projects are still at an early stage and there is still a lot of work to do to understand exactly what locations and properties will be affected. Currently, we have identified which existing roads or paths will be investigated for future upgrades, and the broad corridor study areas within which new transport routes could be located. These study areas are much wider than the final requirements for that of a new transport route.

We need to undertake detailed investigations and further refine what an upgrade might include, and/or narrow down study areas, before we can understand the final impacts on any individual properties. Part of these investigations include meeting with property owners to understand how you use your property and any specific issues you think we need to be aware of.

Corridor Study Areas

The study areas currently identified are much wider than the final new transport routes are likely to be. It is expected that the new routes will be located somewhere within the study area, unless detailed investigations, including geotechnical and design, necessitate minor changes. Factors that will be considered when locating the transport route include:

- Environment (*e.g. significant ecological areas, watercourses and wetlands*)
- Topography
- Stormwater treatment
- Connections to existing transport network
- Road geometry and transport corridor facilities
- Land ownership
- Legal requirements.



It also includes understanding environmental effects such as possible ecological, noise or visual impacts, and considering how these can be avoided, minimised or mitigated. We may need to undertake non-intrusive site walkovers to do this and will seek your permission to access your property if this is the case.

What happens next?

We will refine our transport routes, and begin to progress route protection processes in a staged way across all growth areas in the next few years. In the majority of cases, this will involve lodging a Notice of Requirement (NoR) to designate land for transport purposes under the Resource Management Act (RMA) 1991.

A designation is a provision in the Auckland Unitary Plan that allows a requiring authority (such as the NZ Transport Agency or Auckland Transport) to use the land for specified public works. It is effectively a form of zoning over a site or route indicating where and how the land is likely to be used in the future, along with any restrictions or conditions that may apply.

Once a designation is in place, property owners can continue to use, own, buy or sell their designated land for many years, right up until the requiring authority needs the land for construction. At that point the requiring authority will contact property owners to begin purchase negotiations under the Public Works Act 1981. The majority of the Supporting Growth Programme's designations are for projects that will not have funding for construction for another 10 to 30 years. The timeline for purchasing the land required is usually within a few years of the expected construction date.



In the interim, property owners with land with a designation in place may receive interest from developers looking to sub-divide or redevelop the land when Auckland Council's future re-zoning from rural to urban takes place. Other owners may wish to buy or sell privately, depending on whether they want to be part of a new developing urban area. Selling land is fine as long as the designation is discussed with the purchaser.

While the designation signals the future use of land for a public work, in the meantime property owners can continue to use the land in the manner they were before the NoR was lodged, including maintenance or grazing. If a property owner wishes to change the use of their land, or to build or develop on land that is subject to a designation, they need to discuss such proposals with the requiring authority, in this case it will be AT or NZTA. This is to make sure that the future construction of the project is not hindered.

Anyone facing a change of circumstances or having difficulties selling their property should contact the requiring authority to ascertain what processes and criteria apply in these circumstances.

When will things be built?

Eventual construction of the programme's approved future transport projects is expected to align with Auckland Council's long term release of land suitable for urban development over the next 10, 20 and 30 years.

Contact us

If you have any specific questions relating to your property, please get in touch with the Supporting Growth team:

0800 4769 255 (GROW AKL) info@supportinggrowth.nz supportinggrowth.govt.nz

Route protection information sheet

The Supporting Growth Programme, a collaboration between Auckland Transport and the NZ Transport Agency, is planning new transport networks needed over the next 30 years to support future urban growth in Warkworth, North Auckland, North West Auckland and South Auckland.

Following community consultation and technical investigations in 2018, we have identified a preferred long-term strategic transport network, which includes indicative locations for new or upgraded public transport connections, walking and cycling links and roads or state highways.

A key part of our planning is to identify and protect the land required for these transport projects.

What is route protection?

Route protection is the identification and protection of land for a future public work, such as a transport project. It occurs early in the life of the project.

Route protection is not intended to finalise the exact detail of the future transport project – this is refined during future stages. Usually an indicative design is developed and assessed to inform the "footprint" or space that requires legal protection. To enable as much flexibility as possible, the protected route will provide for a range of transport solutions including road, public transport and walking and cycling.

Once route protection is secured, future project stages include concept design, resource consent approvals, procurement, detailed design and construction. For some projects, the time between route protection and construction is short, but in other projects it can be some years before construction begins.

In the Supporting Growth Programme, routes are being protected for transport connections that will be required over the next 10 to 30 years. Only a few of these projects have confirmed funding for taking the next step into construction this decade through the Auckland Regional Land Transport Plan (RLTP 2018-2028) and the National Land Transport Plan (NLTP 2018-2021). The rest of the projects will need to secure funding for construction at a later date.

Route protection provides long term planning certainty

Route protection provides property owners, businesses and the community with certainty on where transport routes will be in the future, which can help people make informed decisions about their own land and the development of that land.

Route protection gives developers a clear direction on future transport services in residential and business areas, so they can plan around it – e.g. where walk up catchments will be to rapid transit stations. It guides future location choices for other essential community services such as schools and hospitals.

It can also enable new and establishing communities to plan with more certainty - they can move to an area knowing there will be public transport travel options for them in the future. This process means that decisions on the position of new transport connections can be done at the same time as the planning for new housing, employment, recreational facilities and other services.

How does route protection work?

Route protection is generally achieved either by formal statutory processes (e.g. a designation, or by changing zoning on land), or by direct agreements with landowners or developers to set aside part of their land.

In most cases for the Supporting Growth Programme, it is expected that route protection will be ultimately secured by way of a designation, although interim route protection may occur by other planning processes in the short term.

A designation is a provision in the Auckland Unitary Plan that allows a requiring authority (such as the NZ Transport Agency or Auckland Transport) to use the land for specified public works. It is effectively a form of zoning over a site or route indicating where and how the land is likely to be used in the future, along with any restrictions or conditions that may apply.

To secure a designation, either the NZ Transport Agency or Auckland Transport will submit a Notice of Requirement (NoR) to designate land under the Resource Management Act (RMA) 1991.

Once confirmed through this process, the designation is included in the Auckland Unitary Plan.

Preparing a Notice of Requirement (NoR)

- Submitting a NoR is similar to applying for resource consent. It is a statutory process under the RMA and is how the Supporting Growth Programme will notify Auckland Council that it is seeking to designate land. Until a designation has been confirmed and included in the Auckland Unitary Plan, a designation is referred to as a NoR.
- In preparing a NoR, the Supporting Growth Programme will:
  - Investigate the strategic need for a project
  - Consult with the community and affected property owners
  - Assess options and alternatives before selecting a preferred option
  - Commission specialist assessments and assess the environmental effects of the project and how they can be avoided, managed or mitigated.

Consultation during a NoR's development

- An important part of developing a project or a NoR is consulting with those potentially affected – the community, Manawhenua, businesses, government and community organisations.
- This involvement will help the Supporting Growth Programme consider everyone's views and potential issues and effects of a project. It is an important part of assessing the optimal way to avoid, remedy or mitigate any effects.
- It is also an important step in establishing ongoing trust and engagement between people affected by a designation once it's approved. Once a designation is in place, property owners can continue to use, own, buy or sell their designated land for many years to come, right up until the requiring authority (Auckland Transport/NZ Transport Agency) needs the land for construction. Ongoing communication between parties during this time is important for everyone.

Participating in the formal NoR process

- The NoR is prepared and lodged with the authority overseeing the application, usually the Council.
- This authority decides whether the designation should be publicly or limited notified.
- If it is publicly notified, people and groups are able to lodge submissions with the authority.
- If the NoR is notified, a public hearing is held where the requiring authority (Auckland Transport and the NZ Transport Agency) and all submitters are able to be heard.
- The authority overseeing the application recommends to the requiring authority whether it thinks the designation should be confirmed in the Auckland Unitary Plan (with or without modification to the extent of the designation or the conditions) or be withdrawn.
- The requiring authority decides whether to confirm or withdraw the notice (in other words, to accept or reject the recommendation in part or full).
- The opportunity exists for the Council or any submitter to appeal the decision of the requiring authority (the appeal is lodged with the Environment Court).

Property owners and designations

- All affected property owners will be consulted with through the development of the NoR to look for ways to reduce or mitigate impacts or concerns, or look for opportunities.
- If a formal designation process is planned, we will keep you updated on how that process is progressing and when you will have the chance to make submissions if you would like to. Submitting is voluntary, and means you can be heard by an independent person/group such as Council appointed commissioners.
- Once a designation is approved and in place, property owners can continue to use, own, buy or sell their designated land for many years, right up until the requiring authority needs the land for construction. The timeline for purchasing the land required is usually within a few years of the expected construction date. At that point the requiring authority would contact property owners to begin purchase negotiations under the Public Works Act 1981. The majority of the Supporting Growth Programme's designations are for projects that will not have funding for construction for another 10 to 30 years.
- In the interim, property owners with land with a designation in place may receive interest from developers looking to sub-divide or redevelop the land when Auckland Council's future rezoning from rural to urban takes place. Other owners may wish to buy or sell privately, depending on whether they want to be part of a new developing urban area. Selling land is fine as long as the designation is discussed with the purchaser.
- While the designation signals the future use of land for a public work, in the meantime property owners can continue to use the land in the manner they were before the NoR was lodged, including maintenance or grazing. If a property owner wishes to change the use of their land, or to build or develop on land that is subject to a designation, they need to discuss such proposals with the requiring authority. This is to make sure that the future construction of the project is not hindered.
- Anyone facing a change of circumstances or having difficulties selling their property should contact the requiring authority to ascertain what processes and criteria apply in these circumstances.
- Ongoing communication between parties during this time is important for everyone – see the related 'Property owner information sheet' for more information.

Contact us

If you have any specific questions relating to your property, please get in touch with the Supporting Growth team:

0800 4769 255 (GROW AKL)

info@supportinggrowth.nz

supportinggrowth.govt.nz

Appendix 5. Guide to the Notice of Requirement

A Guide to the Notice of Requirement

This guide is designed to provide you with information on the Notice of Requirement and designation process for Auckland Transport projects. It is not intended to be a comprehensive description of the process. For more information go to mfe.govt.nz/rma

The Resource Management Act 1991 (RMA) allows requiring authorities to designate areas of land for public infrastructure such as roads, rail, telecommunications, schools and hospitals. Auckland Transport is a Requiring Authority under the RMA, in relation to the Auckland transport system.

What is a Designation?

A designation is effectively a form of zoning over a site or route. The designation provides for:

- The long-term approval of the work intended to be carried out
- Certainty for the community and affected landowners about location and the nature of the works
- Protection of the land from activities that may compromise the proposed public work.

Designations are the preferred consenting approach of Auckland Transport as they provide the ability to identify and secure the land required to undertake construction, operation and maintenance of Auckland's transport infrastructure.

For Auckland Transport, the process for designating land is undertaken through a Notice of Requirement process lodged with Auckland Council.

Notice of Requirement

A Notice of Requirement process is similar to applying for resource consent. It is a statutory process in the RMA and is how Auckland Transport notifies Auckland Council that it is seeking to designate land. Until a designation has been confirmed and included in a district plan, a designation is referred to as a Notice of Requirement (NoR).

In preparing a NoR, Auckland Transport will:

- Investigate the strategic need for a project
- Consult with the community and affected landowners
- Assess options and alternatives before selecting a preferred option
- Commission specialist assessments on project and environmental effects and how they can be avoided, managed or mitigated.

Consultation

An important part of developing a project is consulting with those potentially affected – the community, mana whenua, businesses, government and community organisations. This involvement will help ensure Auckland Transport considers everyone's views, potential issues and effects of a project on the community. It is an important part of assessing the optimal way to avoid, remedy or mitigate any issues.

This feedback is used to develop a project and is considered when the NoR is prepared and also when decisions are made regarding the proposed works.

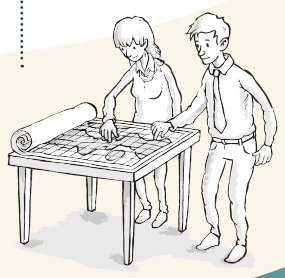
The NoR process

- The NoR is prepared and lodged with the Auckland Council
- The Council decides if the designation should be publicly or limited notified
- If it is publicly notified, people and groups are able to lodge submissions with the Council
- If the NoR is notified, a public hearing is held where the requiring authority (Auckland Transport) and all submitters are able to be heard
- The Council recommends to the requiring authority whether it thinks the designation should be confirmed in the district plan (with or without modification to the conditions) or be withdrawn
- The requiring authority decides whether to confirm or withdraw the notice (in other words, to accept or reject the Council's recommendation in part or full)
- The opportunity exists for the Council or any submitter to appeal the decision of the requiring authority (the appeal is lodged with the Environment Court).

The diagram overleaf provides an overview of the process.

Notice of Requirement Process

DISTRICT PLANS
UNITARY PLANS
STRATEGIC DOCUMENTS



IDENTIFY

Auckland Transport identifies a problem which needs to be addressed and sets the project objectives.



INVESTIGATIONS/ONGOING CONSULTATIONS

Auckland Transport undertakes investigations and analysis of various route options. It consults with stakeholders including the public, directly affected landowners, iwi, local boards and other organisations. The consultation process is ongoing throughout the process.



EVALUATE

A preferred route is selected through a rigorous options evaluation process.



ASSESSMENTS

Further design and technical assessments, including cultural assessments are completed.



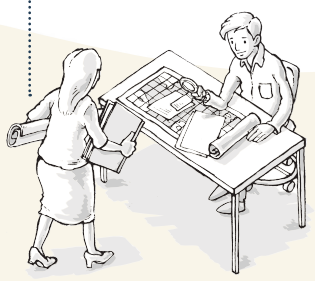
LODGEMENT

Auckland Transport lodges Notice of Requirement and assessment of environment effects with Auckland Council.



REVIEW

Auckland Council reviews application and may request additional information.



NOTIFY

Public notification by Auckland Council (if required).



PUBLIC SUBMISSION





DECISION

Auckland Council notifies decision of Auckland Transport to submitters and affected landowners/occupiers.





OPERATIVE

New designation becomes operative in District Plan/ Unitary Plan.



HEARING

Public hearing.





RECOMMENDATION

Auckland Council makes recommendation to Auckland Transport.



AUCKLAND TRANSPORT ISSUES A DECISION

Auckland Transport accepts recommendation; Accepts recommendation in part; Rejects recommendation.



APPEAL PROCESS

- Submitters can appeal to the Environment Court (15 working days).
- Environment Court hearing.
- Environment Court issues decision.

Auckland Transport

An Auckland Council Organisation

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Appendix 6. Project Information and Maps (2020)

Drury

New Opāheke North-South Connection and upgrade to Waihoehoe Road

We're proposing two projects that will connect current and future communities and make travel within this area easier:

- A new north-south connection from Hunua Road in the north to Waihoehoe Road in the south, which will provide a link between the Opāheke industrial area and Drury East (Opāheke north-south connection).
- An upgrade to the section of Waihoehoe Road between the Drury Town Centre and the proposed Opāheke north-south connection (Waihoehoe Road upgrade).

This new north-south connection and road upgrade will support a growing population in the area and their travel choices in the future. It will enable better movement of people within the area by providing access to employment, residential areas, town centres and a proposed train station. It'll also give the community better access to public transport, walking and cycling networks.

We are also investigating future upgrades to Opāheke Road, Ponga Road and Waihoehoe Road (east). We will have more information on these sections, including what our preferred option is in March or April 2020. We considered widening on the north, south or both sides of the road. We believe widening on the northern side is the preferred option as it better supports the proposed train station and future rail upgrades and reduces the impact on properties and homes.

These projects are part of the transport network proposed to support the population growth of Auckland's south. More information on this network is available at ***supportinggrowth.govt.nz.***

What we've done to date

In 2018 we asked for your feedback on two options for a new north-south connection:

- A new road from Waihoehoe Road north to Opāheke Road and upgrading part of Opāheke Road.
- A new road through the proposed industrial area connecting with Hunua Road.

We also asked for your feedback on options to upgrade existing east-west connections, including Waihoehoe Road, Ponga Road and Fitzgerald Road.

We considered this feedback alongside further technical investigations by the Supporting Growth team. In July 2019 we released the South Indicative Strategic Transport Network which showed a new Opāheke North-South Connection from Hunua Road to connect with Waihoehoe Road as well as an upgrade to Waihoehoe Road. At this time, we spoke with a number of property owners within the study area of these projects.

What you said

You supported the north-south connection and the need to provide frequent and efficient public transport, walking and cycling options.

Some property owners expressed uncertainty about the need for both this new north-south connection and the proposed Mill Road Corridor. We consider both projects (along with other projects across the transport network) are needed to support the planned urban growth of this area.

There was strong sentiment both for and against the potential upgrades to Waihoehoe Road.







What we're proposing

New North-South Connection (the Opāheke North-South Connection)

We're looking to provide for frequent public transport, vehicles, walking and cycling through a four-lane corridor.

We've considered three ways in which the north-south connection could extend from Hunua Road to Waihoehoe Road.

Option A (A new north-south connection from Hunua Road to Waihoehoe Road) is our draft preferred option at this stage. This is because it:

- Improves public transport access in future residential areas
- Crosses the floodplain at the narrowest point meaning fewer bridges are required, so it's more resilient and better value for money
- Reduces impact on land that could be developed for houses and industry
- Connects to the proposed local centre on Ponga Road so better aligns with Auckland Council's future growth plans
- Reduces the impacts on network utilities

Upgrade to Waihoehoe Road

Widening and urbanising Waihoehoe Road will provide a four-lane east-west connection between the Drury Town Centre and the proposed Opāheke north-south connection. This means a proposed train station at Drury Central can be connected to new communities to the east, providing public transport, walking and cycling facilities.

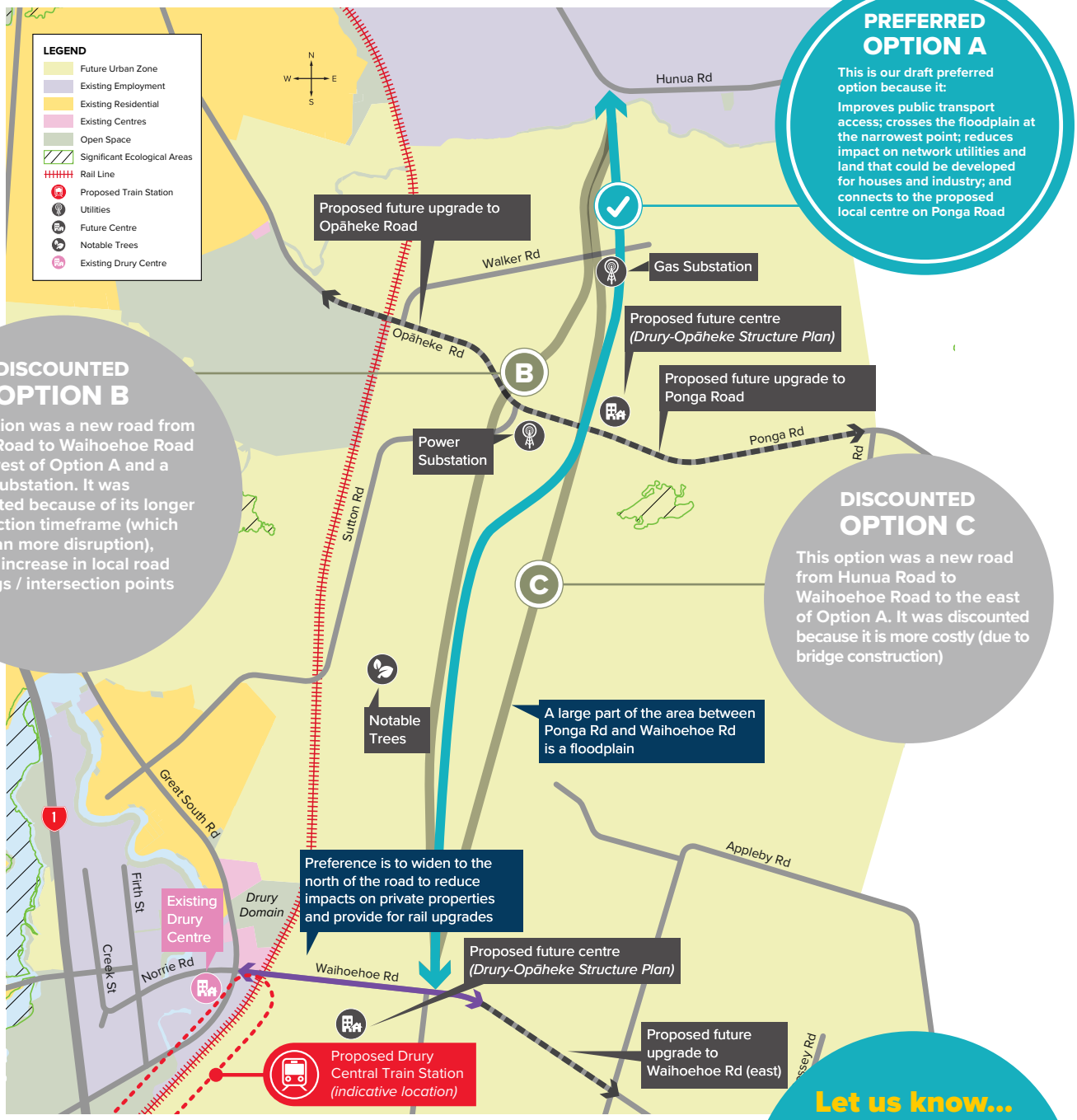
We considered widening on the north, south or both sides of Waihoehoe road. We believe widening predominantly on the northern side is the draft preferred option as it better supports the proposed train station and future rail upgrades and reduces the impact on properties and homes.

Upgrade to Opāheke Road, Ponga Road and Waihoehoe Road

We are in the early stages of considering how we might upgrade these three roads in the future. We do not have information about a draft preferred option at this stage, but will be able to share more information with the community, and what it might mean for properties, in March or April 2020.

Drury

New Opāheke North-South Connection and upgrade to Waihoehoe Road



PREFERRED OPTION A

This is our draft preferred option because it:

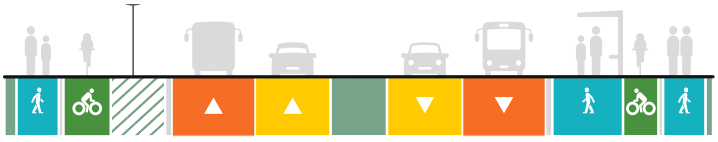
Improves public transport access; crosses the floodplain at the narrowest point; reduces impact on network utilities and land that could be developed for houses and industry; and connects to the proposed local centre on Ponga Road

DISCOUNTED OPTION B

This option was a new road from Hunua Road to Waihoehoe Road to the west of Option A and a power substation. It was discounted because of its longer construction timeframe (which can mean more disruption), and the increase in local road crossings / intersection points

DISCOUNTED OPTION C

This option was a new road from Hunua Road to Waihoehoe Road to the east of Option A. It was discounted because it is more costly (due to bridge construction)



What a new or upgraded 4-lane road could look like

The project shown on this map has been identified by an indicative business case and will require further technical investigation and engagement before its final detail, location or land requirement is confirmed. It is also yet to be prioritised for funding for delivery over the next 10-30 years.

Let us know...

As a community member, your feedback is important to us. We use it to check we haven't missed anything important. Use the enclosed feedback form to have your say on the preferred option and share anything you think we should consider.

To find out more visit **supportinggrowth.govt.nz**

Road Upgrades

Opāheke Road, Ponga Road and Waihoehoe Road (east)

MAY **2020**

We're proposing safe, separated walking and cycling paths along Opāheke Road, Ponga Road and Waihoehoe Road.

These upgrades will give people more active transport choices, allowing them to walk or cycle to public transport and connect to where they live, work, study, shop and play.

Opāheke Road

Widening generally on the north-eastern side is our preferred option because it:

- reduces impacts on live-zoned property, reducing impact on immediate housing supply (does not decrease the footprint for development)
- has less impact on the Opāheke Reserve and conservation-zoned land
- reduces impacts on utilities.

Ponga Road

Widening generally on the southern side is our preferred option because it:

- reduces property impacts
- reduces the impact on mature trees on the northern side of the road corridor which contribute to ecological, heritage and amenity values.

Waihoehoe Road (east)

Widening generally on the northern side is our preferred option because it reduces property impacts.

Have a look at the map to see our preferred option.

Next steps

We would like to talk to landowners to discuss the draft designation boundary and what this potentially means for properties.

We'd like to know your thoughts. Use the feedback form or visit **supportinggrowth.govt.nz** to tell us what you think.







supportinggrowth.govt.nz

Road Upgrades

Opāheke Road, Ponga Road and Waihoehoe Road (east)

MAY 2020



The project shown on this map has been identified by an indicative business case and will require further technical investigation before its final detail, location or land requirement are confirmed. It is also yet to be prioritised for funding for delivery over the next 10-30 years.

supportinggrowth.govt.nz

Drury

Upgrading Bremner and Norrie Road (east)

To connect current and future communities and make travel within this area easier, we're proposing to upgrade and extend Bremner and Norrie Road (east) to Great South Road in the future.

These road upgrades will support a growing population in the area and their travel choices in the future. It will enable better movement of people within the area by providing access to employment, residential areas, town centres and a proposed train station. It'll also give the community better access to public transport, walking and cycling networks.

This project is one part of the transport network proposed to support the population growth of Auckland's south. More information on this network is available at *supportinggrowth.govt.nz.*

What we've done to date

In 2018 we asked for your feedback on an option for a new link through the proposed industrial area connecting with Hunua Road.

We considered this feedback alongside further technical investigations. In July 2019 we released the South Indicative Strategic Transport Network which showed an upgrade to Bremner Road to the east and spoke with a number of property owners.

What you said

We heard you supported Bremner Road and Norrie Road being extended to the east, because there'll be better connections for people living and working in east and west Drury.

A number of property owners told us about existing traffic issues at the Bremner Road and Firth Street intersection and how this affects local businesses.

What we're proposing

We considered four options for extending and upgrading Bremner Road through the industrial area.

Option A is our draft preferred option at this stage. This option includes an upgrade to Bremner Road and Norrie Road (east) with a new bridge over Hingaia Stream, new intersections at Creek Street and Firth Street and a closure to Norrie Road (west).
This option:

- Provides a public transport connection between Drury East and Drury West
- Will be a more direct route for walking and cycling through the existing industrial area.







Let us know...

As a community member, your feedback is important to us. We use it to check we haven't missed anything important. Use the enclosed feedback form to have your say on the preferred option and share anything you think we should consider.

To find out more visit **supportinggrowth.govt.nz**

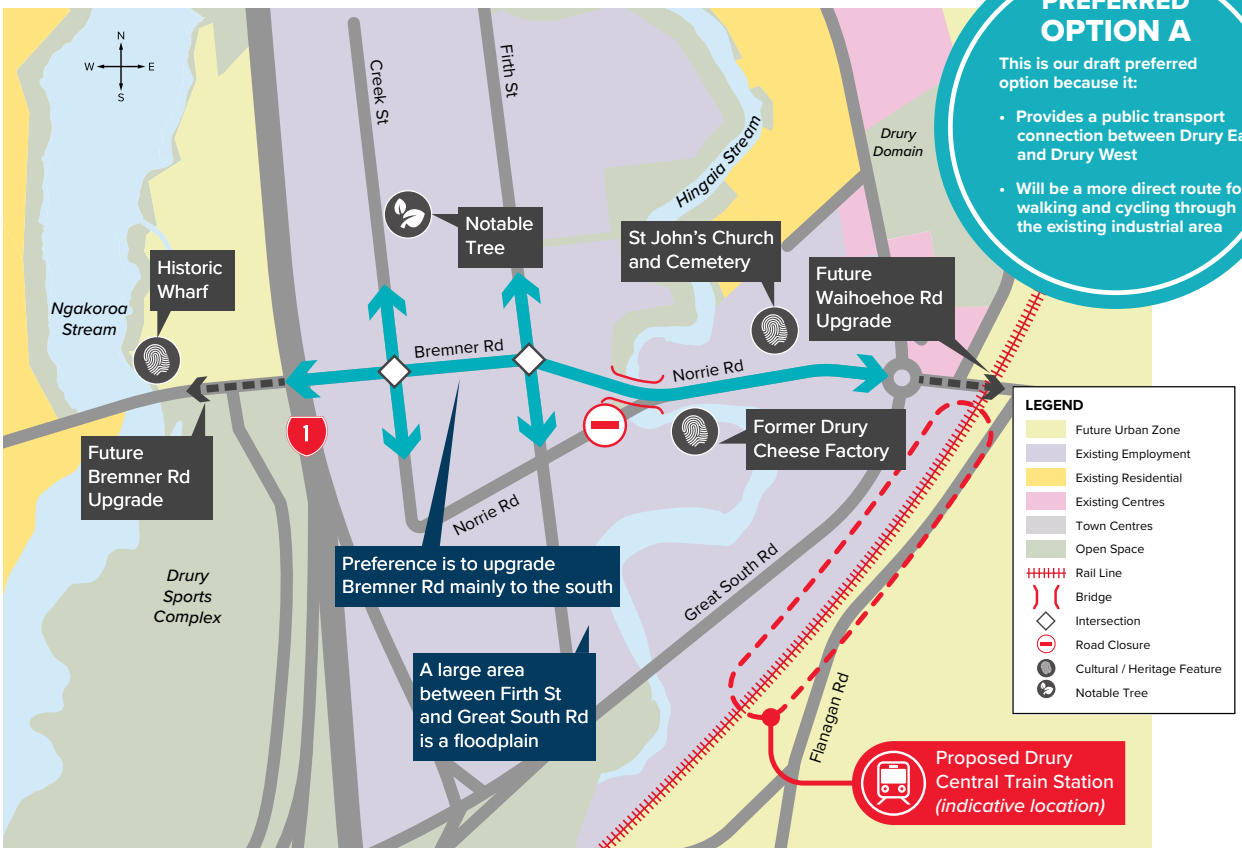
Drury

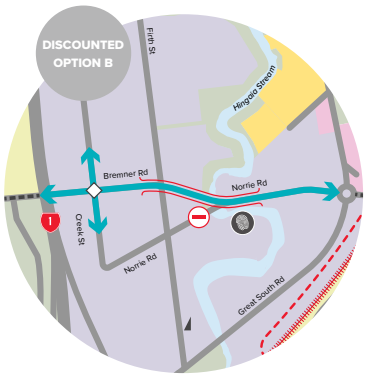
Upgrading Bremner and Norrie Road (east)

PREFERRED OPTION A

This is our draft preferred option because it:

- Provides a public transport connection between Drury East and Drury West
- Will be a more direct route for walking and cycling through the existing industrial area





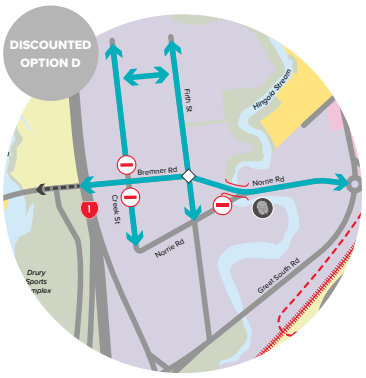
We looked at an upgrade to Bremner Road and Norrie Road (east) with a large new bridge over Firth Street and Hingaia Stream and a closure to Norrie Road (west). Firth Street would still operate under the bridge (but with no access to or from the bridge). This option was discounted because:

- It is more costly due to the construction of the bridge
- Reduces access on Norrie Road



This option keeps the existing road layout, upgrading Bremner Road with new intersections at Creek Street, Firth Street and Norrie Road. Norrie Road is also upgraded, including a new bridge over the Hingaia Stream. We discounted this option because:

- It impacts on the reliability of public transport
- Potential disruption if the area is flooded



This option closes Creek Street and includes a new connection between Creek Street and Firth Street. We discounted this option because:

- Potential disruption if area is flooded
- Biggest change to local traffic movement as it requires three road closures – two onto Bremner Road and one onto Norrie Road

The project shown on this map has been identified by an indicative business case and will require further technical investigation and engagement before its final detail, location or land requirement is confirmed. It is also yet to be prioritised for funding for delivery over the next 10-30 years.



What a new or upgraded 4-lane road could look like

To find out more visit **supportinggrowth.govt.nz**

Drury

Upgrading Jesmond Road, Auranga Road 1 and Bremner Road

We're proposing to upgrade Jesmond Road, Auranga Road 1 and Bremner Road to connect new communities and make travel within this area easier.

These road upgrades will support a growing population in the area and their travel choices in the future. It will enable better movement of people within the area by providing access to employment, residential areas, town centres and a proposed train station. It'll also give the community better access to public transport, walking and cycling networks.

This project is one part of the transport network proposed to support the population growth of Auckland's south. More information on this network is available at *supportinggrowth.govt.nz*.

What we've done to date

In 2018 we asked for your feedback on two options for Jesmond Road:

- Keep the existing Jesmond Road and add a new corridor parallel to Jesmond Road, prioritising public transport, or
- Upgrade Jesmond Road to provide for public transport, walking and cycling, and private vehicles.

We also asked for your feedback on a new east-west connection between Bremner Road and Jesmond Road.

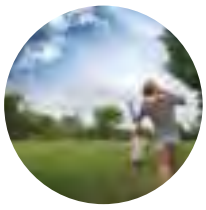
We considered this feedback alongside further technical investigations. In July 2019, we released the South Indicative Strategic Transport Network which showed an upgrade to Jesmond Road, Auranga Road 1 and the existing Bremner Road to the east, and spoke with a number of property owners.

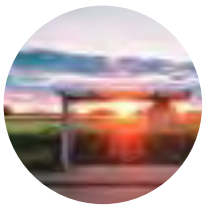
What you said

We heard you supported Bremner Road being upgraded so that it better connects with Drury East and Drury West.

You also told us you support Jesmond Road being improved so that it can become the main route for Drury West and provide an important connection with the proposed new train station.







What we're proposing

Jesmond Road

We're looking at making Jesmond Road four lanes so it is better suited to a growing urban area and can support more people who walk, cycle, use public transport or drive. To provide for this space, we've looked at three options:

- Widening the western side of the road
- Widening the eastern side of the road
- Widening both sides of the road.

Our draft preferred option is to predominantly widen the **western side** of Jesmond Road as we consider this will have the least impact on properties.

Auranga Road 1

We'll protect the land that is currently under construction for Auranga Road 1 so there is enough space for public transport, walking, cycling and other vehicles in the future.

Bremner Road

We looked at three options for an upgrade to Bremner Road, between Ngakoroa Stream and State Highway 1 (SH1).

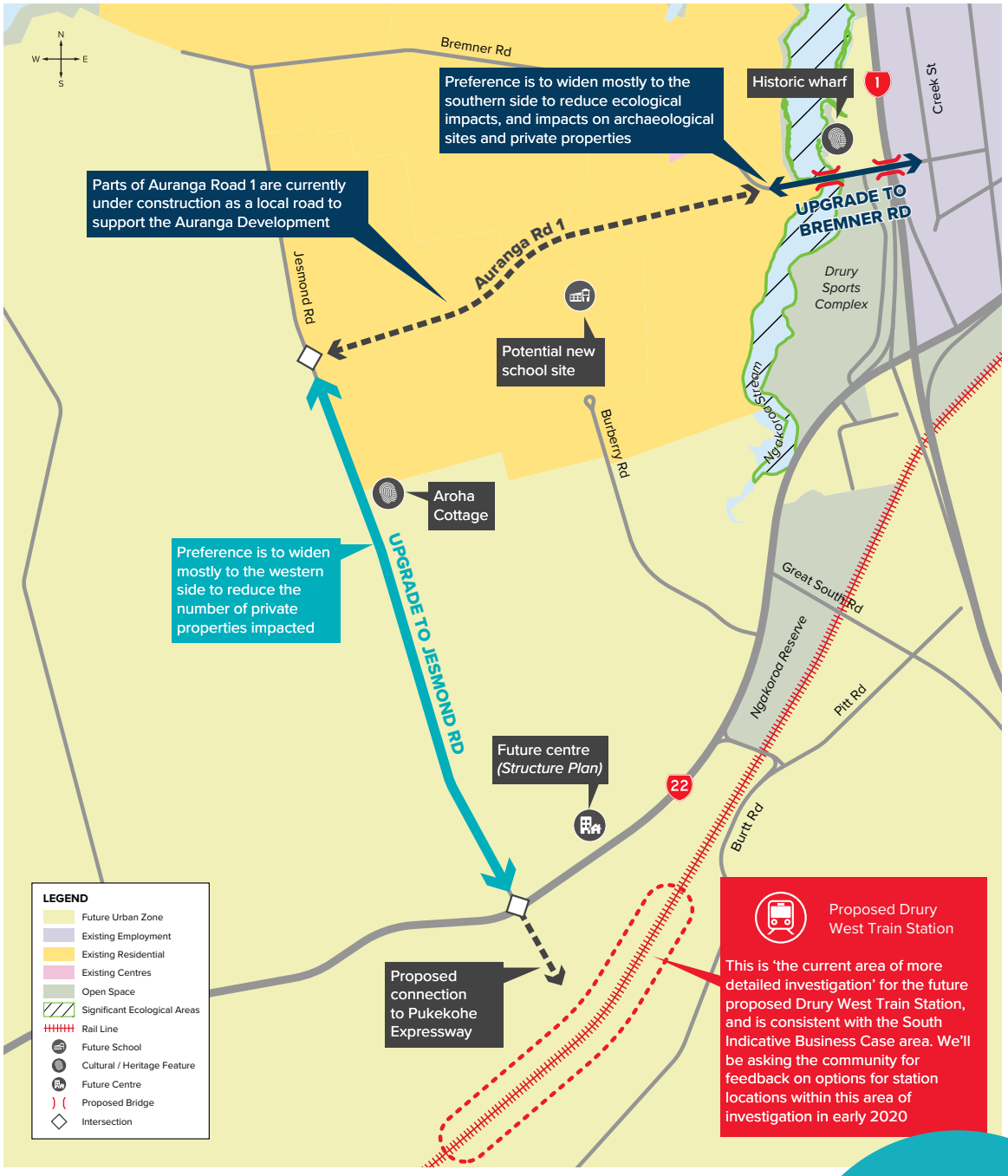
- Widening the northern side of the road
- Widening the southern side of the road
- Widening both sides of the road.

We think predominantly widening the **southern side** is the draft preferred option because it will have less impact on marine ecological habitats, archaeological sites, and on properties in the area.

To find out more visit **supportinggrowth.govt.nz**

Drury

Upgrading Jesmond Road, Auranga Road 1 and Bremner Road





What a new or upgraded 4-lane road could look like

The project shown on this map has been identified by an indicative business case and will require further technical investigation and engagement before its final detail, location or land requirement is confirmed. It is also yet to be prioritised for funding for delivery over the next 10-30 years.

Let us know...

As a community member, your feedback is important to us. We use it to check we haven't missed anything important. Use the enclosed feedback form to have your say on the preferred option and share anything you think we should consider.

To find out more visit **supportinggrowth.govt.nz**

Drury

Upgrading State Highway 22 (SH22)

We're proposing to upgrade part of State Highway 22 (SH22) in the future to connect current and new communities and make travel within this area easier.

In the long term, the section of SH22 between the Drury Interchange and just west of Oira Road at the edge of the Future Urban Zone is planned to be upgraded to four lanes. This will mean it's better suited to a growing urban area and can provide increased transport choice and support more people who walk, cycle, and use public transport.

In addition, Waka Kotahi's Safe Network Programme (SNP) is looking to make the intersection of Glenbrook Road and SH22 safer by installing a roundabout. Speed limits along SH22 between Drury Interchange and Paerata are also being reviewed.

This project is one part of the transport network proposed to support the population growth of Auckland's south. More information on this network is available at *supportinggrowth.govt.nz.*

What we've done to date

In 2018, we asked for your feedback on future upgrades to SH22 between Oira Road and SH1 Drury Interchange and the related Pukekohe Expressway (which will provide an alternative to SH22). Between 2017 and 2018, Waka Kotahi NZ Transport Agency also asked for your feedback on speed limits and safety improvements along the whole SH22 corridor.

We considered this feedback alongside further technical investigations. In July 2019, we released the South Indicative Strategic Transport Network which showed an upgrade to SH22 between Oira Road and SH1 and spoke with a number of property owners.

What you said

You told us that:

- Speed was an issue along SH22 especially at high-risk intersections
- You supported intersection improvements at Great South Road
- You supported a right turn bay at Jesmond Road
- You considered other intersection improvements were more important than Oira Road
- You thought more could be done to improve traffic flows in this section.

What we're proposing

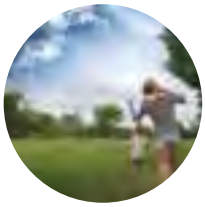
Waka Kotahi's Safe Network Programme is looking to make SH22 safer by working on designs for a roundabout at the intersection of Glenbrook Road and SH22, safety improvements along SH22 between Drury interchange and Paerata, as well as reviewing the speed limits.

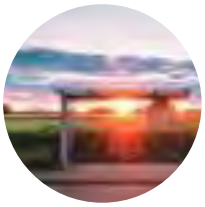
In the long term, we're looking at making a part of SH22 four lanes so it's better suited to a growing urban area and can support more people who walk, cycle, use public transport or drive. To provide for this space, we've looked at three options:

- Widening to the northern side of the road
- Widening to the southern side of the road
- Widening both sides of the road.

We think the draft preferred option is to **widen different sections of the road to the north and south** so that it reduces the impacts on wildlife, streams and the Ngakoroa Reserve.







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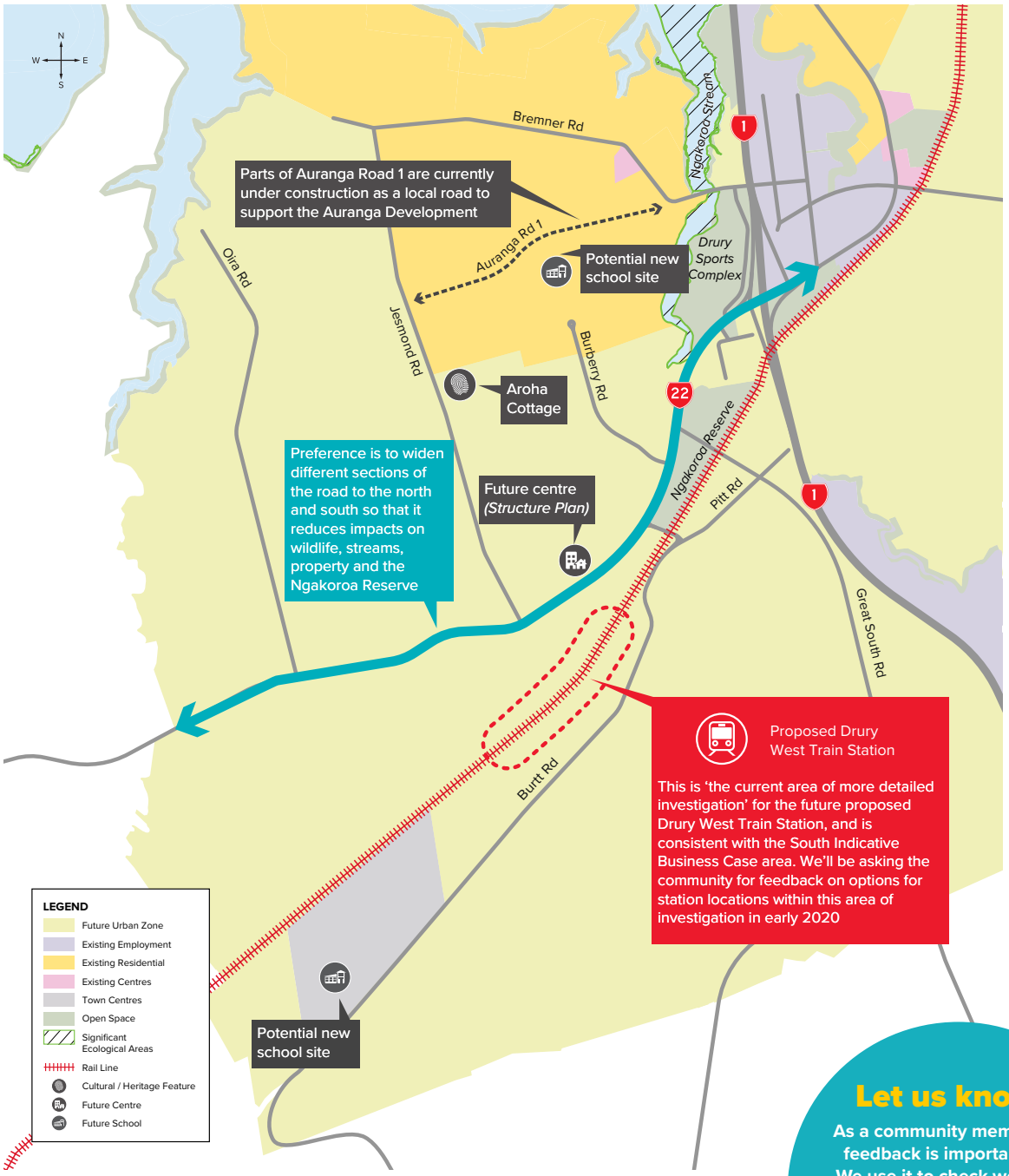
Drury

Upgrading State Highway 22 (SH22)





What a new or upgraded 4-lane road could look like

Let us know...

As a community member, your feedback is important to us. We use it to check we haven't missed anything important. Use the enclosed feedback form to have your say on the preferred option and share anything you think we should consider.

The project shown on this map has been identified by an indicative business case and will require further technical investigation and engagement before its final detail, location or land requirement is confirmed. It is also yet to be prioritised for funding for delivery over the next 10-30 years.

To find out more visit **supportinggrowth.govt.nz**

Appendix 7. OurAuckland

Connecting southern Auckland's future communities

Have your say on southern transport transformation

Published: 18 May 2020



Aucklanders are invited to have their say on a series of future projects that will improve access and travel choices, connect communities and support growth in southern Auckland.

Waka Kotahi NZ Transport Agency and Auckland Transport are seeking community feedback on a range of proposals for public transport, rail upgrades, road improvements, and new walking and cycling networks.

In partnership with Auckland Council, Waka Kotahi NZ Transport Agency and Auckland Transport are continuing to progress future transport projects as

infrastructure will play a critical role in the economic recovery of New Zealand.



Deputy Mayor Cashmore says the $2.4 billion injection from the government's **NZ Upgrade Programme** announced in January has helped bring forward some projects to unlock growth in southern Auckland.

> "Projects like the Mill Road corridor from Manukau to Drury, rail upgrades and new train stations, and improvements to State Highway 1 between Papakura and Drury will provide much-needed infrastructure to assist economic recovery," he says.

"Drury is a significant growth area and the government's infrastructure package recognises this. It will progress the catch-up legacy work required and build in the futureproofing necessary to enable a connected development in all mobility forms.

"We recognise that the way people move around their communities and across our city needs to change. Extending public transport networks and offering travel choices is at the heart of these projects and will help us take action on climate change.

"Transport was identified as needing the most significant change in our recent **Te Tāruke-ā-Tāwhiri: Auckland's Climate Action Framework** public consultation. These proposals have the potential to see an increase in public transport usage by 35 per cent from southern communities. That is significant.

"Through this public engagement process, it's vital we hear from the community and property owners in these growth areas," Mr Cashmore says.

A major step forward in transport planning

The **Supporting Growth Programme**, a collaboration between Waka Kotahi NZ Transport Agency, Auckland Transport, KiwiRail and mana whenua, is leading the planning process and is now identifying and protecting the land that will be needed for these future projects.



The Transport Agency's Director of Regional Relationships, Steve Mutton says the area is an important gateway from the south to the airport and to the city centre and the Upper North Island.

"Today's proposals are a major step forward in transport planning for southern Auckland. The south is growing fast and over the next 30 years, an additional 120,000 people are expected to live in future communities in Takaanini, Opāheke, Drury, Paerata and Pukekohe. We want to provide residents with more accessible and sustainable travel choices.

"The proposals include input from local boards, mana whenua, key stakeholders and communities, and are a great example of working together to resolve transport challenges for the future," Mr Mutton says.

Encouraging a significant shift to public transport and active modes

Auckland Transport Chief Executive Shane Ellison says he's delighted the proposals prioritise new public transport networks as well as road improvements to make roads safer and to ease congestion. He says community feedback will help shape these exciting projects.

> "We're working together with the community to deliver safe, innovative, and sustainable transport for southern Auckland.

"The community has already told us they're looking for more public transport, walking and cycling connections so that's a big part of what we're planning.

"Your views are very important to the project. We encourage you to look at the projects online and have your say. We value your contribution and will carefully consider the feedback you provide," says Mr Ellison.

Find out more and have your say

Create the future with us – we're planning the future transport solutions for the south of Auckland and we need your help.

Community feedback is open from 18 May to 12 June 2020 for these projects:

- **Mill Road – Takaanini, Papakura and Drury sections**
- **Pukekohe Expressway and connections to State Highway 22**
- **Pukekohe urban arterial (north-east section)**
- **Rail upgrades and new proposed train stations at Drury Central, Drury West and Paerata**
- Drury local road upgrades including safe, separated walking and cycling paths.

Tell us what you think online at **Supporting Growth** or join the conversation on our **Social Pinpoint page**.

Share

Read more: Plans & projects Transport

RELATED



Applications now open for Hibiscus and Bays projects...



Busway bridge launched over Tamaki River...

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Appendix 8. Auckland Council Future Urban Land Supply Strategy

Auckland Future Urban Land Supply Strategy

July 2017



Auckland Council
Te Kaunihera o Tāmaki Makaurau

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1. Introduction

Auckland is projected to reach a population of more than 2.4 million by 2047. Currently, it is anticipated that capacity for up to 400,000 new dwellings and 277,000 additional jobs will be needed.

The Auckland Plan sets Auckland Council's (the council's) strategic direction on how this growth will be accommodated. As part of a quality compact approach to growth, the Auckland Plan anticipates that up to 70 per cent of new dwellings will be built within the existing urban area and up to 40 per cent outside of this. The Auckland Plan also stresses the importance of providing a pipeline of land supply in both brownfields and greenfields.[1]

The Auckland Unitary Plan identifies approximately 15,000 hectares of rural land for future urbanisation with the potential to accommodate approximately 137,000 dwellings and 67,000 jobs (see Map 1). Future urban land forms an important component of the overall strategy for enabling Auckland's growth (Figure 1).

In line with Auckland Plan guidance, the future urban land identified also includes approximately 1,400 hectares for new business land.

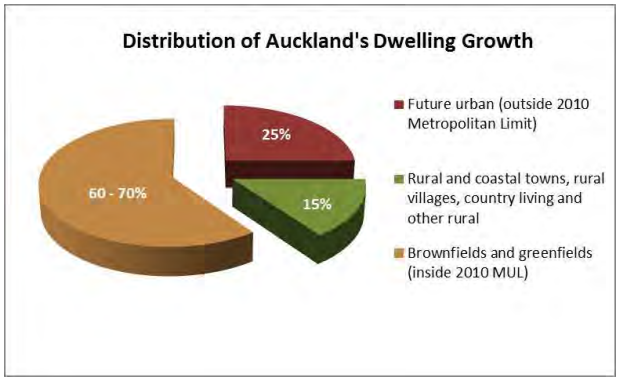


Figure 1: Distribution of growth anticipated from the Auckland Plan

This strategy identifies a programme to sequence future urban land over 30 years and will assist with the ongoing supply of greenfield land for development[2]. It has been updated to reflect recent changes to the Unitary Plan, new demand for development and further technical work undertaken by Council to gain a greater understanding of the requirements for development (e.g. Supporting Growth and Whenuapai Structure Plan).

The strategy is a long-term and proactive approach to delivering land that is 'ready to go' in these future urban areas (see Figure 4). As this land is predominantly rural and has not previously been identified for urbanisation, bulk infrastructure has to be provided. This programme will help provide greater clarity and certainty to landowners, iwi, developers, infrastructure providers and council about when future urban land will have bulk infrastructure in place and be ready for urban development.

The primary purpose of the Future Urban Land Supply Strategy is to identify the sequencing and timing of future urban land for development readiness over 30 years. It does not determine the location of the Rural Urban Boundary or future urban zoned land. This is identified in the Unitary Plan. The strategy has been amended to reflect the recent changes to the Operative Unitary Plan.

[1] The Auckland Plan is being updated during 2017 - 2018

[2] This strategy deals exclusively with greenfield land, which is identified as future urban zone in the Unitary Plan or is rural land that has a live urban zone in the Unitary Plan. Future urban areas identified in Rural Settlements are included in this strategy.

The programme specifically helps to inform:

- council's infrastructure asset planning and management and its infrastructure funding priorities and sequencing that inform the council's future Long-term Plans and the Annual Plans
- central government, such as the Ministry of Education, with medium to long-term projections, location and investment decisions
- private sector infrastructure providers with forward planning and investment decisions.

Other council documents such as the Auckland Plan, the Auckland Unitary Plan, and the 30-year Infrastructure Strategy have close links with this strategy. The strategy informs the greenfield element of the Auckland Plan Development Strategy which makes up a portion of the overall growth anticipated over the next 30 years.

There are also links with relevant transport documents such as the National Land Transport Programme, Integrated Transport Programme, Regional Land Transport Plan, Auckland Transport Alignment Project and Supporting Growth.

This strategy also addresses the council's obligations under The National Policy Statement on Urban Development Capacity which requires the council to ensure there is greater focus on enabling urban development and that there is sufficient capacity for housing and businesses. This strategy is a live document and will be reviewed as part of an overall monitoring strategy.

Section 7 of this strategy outlines how the council will monitor the supply and uptake of capacity.

The following diagram illustrates the relationship between relevant council documents and the strategy.

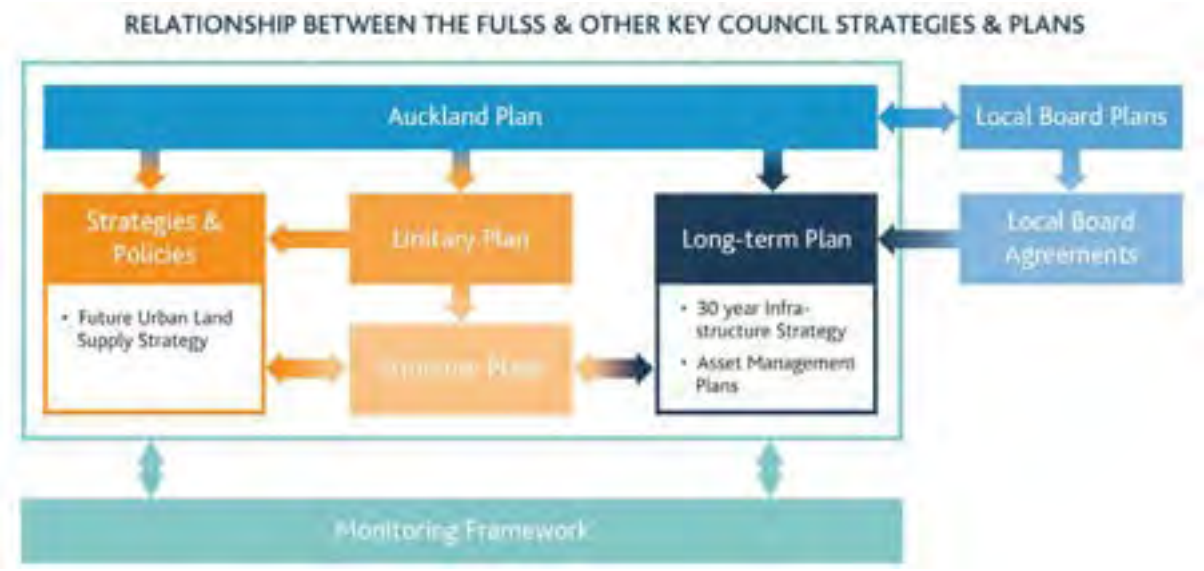
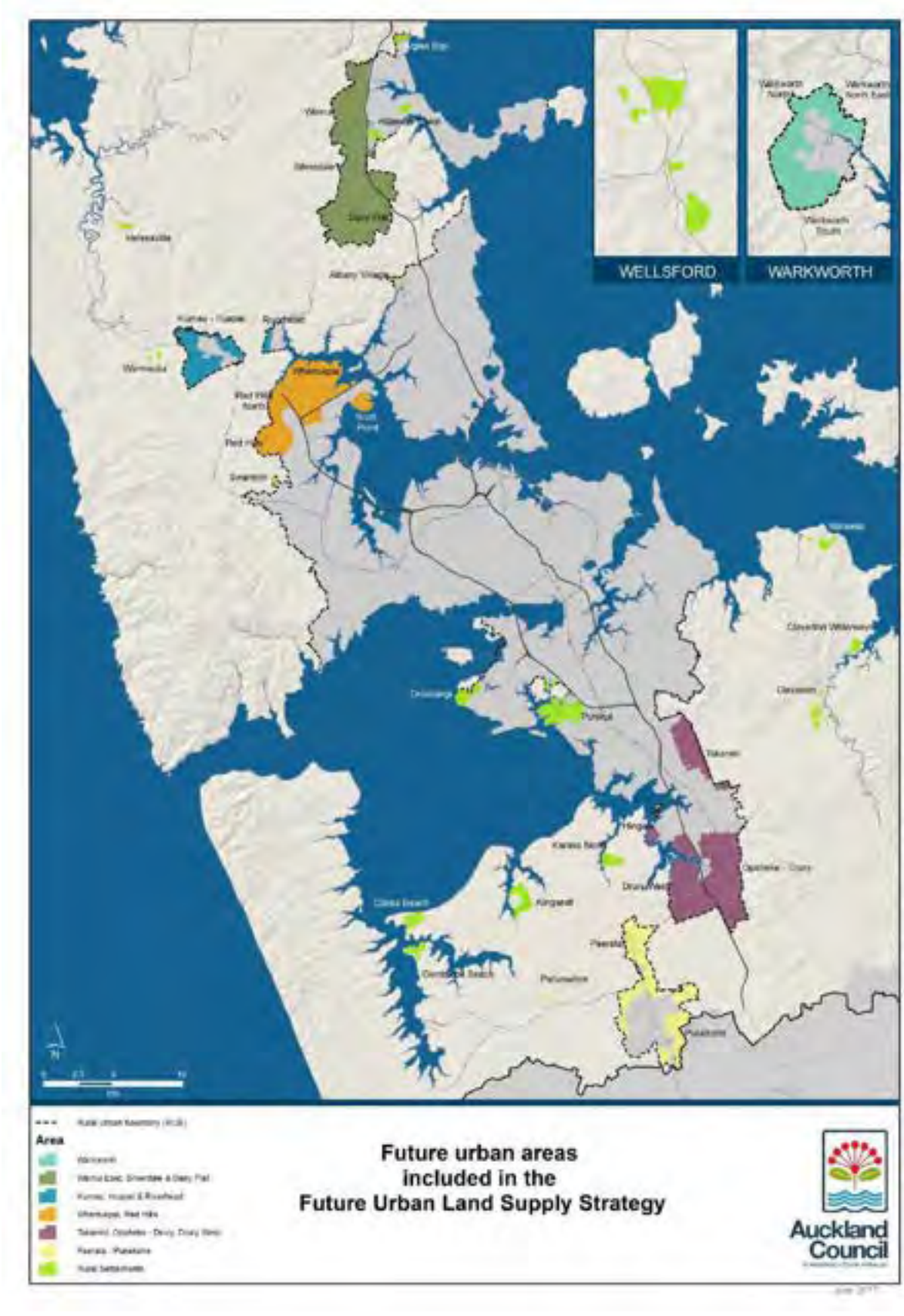


Figure 2: Relationship between the Future Urban Land Supply Strategy and other council documents



Map 1: Location of future urban areas (Auckland Unitary Plan)

2. Scale and context

The scale of the planned rezoning (from rural to urban) over the next thirty years is significant and will make an important contribution to accommodating Auckland's growth.

The urban area of Hamilton provides a useful comparison to understand the scale of growth anticipated within Auckland's future urban areas. The 15,000 hectares of future urban land is equivalent to approximately two times the urban area of Hamilton. The type of development anticipated for the future urban areas will vary depending on location and context, but will generally be based around a network of centres with a mix of various urban developments such as housing, marae, shops, parks, employment areas, schools, hospitals and other community facilities. Housing will include a range of types and densities from apartments and attached town houses to detached single family homes. Figure 3 below provides some examples of the range of urban developments anticipated in the future urban areas.

Apartments and attached housing – medium to high density





Attached and detached - medium density





Detached - medium to low density





Town and local centres, parks, open space and employment





Figure 3: Examples of urban development anticipated in future urban areas

The infrastructure investment required in these areas includes transport facilities (public transport including rail and bus, roads, cycle facilities and footpaths), water, wastewater, stormwater and community infrastructure. This is of such magnitude that any ad-hoc or out of sequence approach to development will have major funding implications for all providers, affect the ability to coordinate delivery and is likely to have major implications on the ability to service other areas. This in turn may have significant consequences on the ability to provide sufficient development capacity across Auckland.

The analysis done for this strategy is of sufficient scale and specificity to broadly determine bulk infrastructure requirements. As Figure 4 shows, more detailed planning of these areas through structure planning, and bulk infrastructure planning and build, are two parallel and inter-dependent processes to get land ready for development. This is the approach taken to determine the programme of sequencing and timing. The design, consenting and build of infrastructure of this scale takes time and, together with funding considerations, have been main determinants of the programme.



Figure 4: An integrated planning approach - coordinating planning and infrastructure processes

3. Structure planning

This strategy determines sequencing and timing for when future urban areas will be ready for development to commence which requires necessary underpinning zoning and bulk infrastructure to be in place.

The Unitary Plan requires that before any future urban zone is zoned as being ready for urban development, a structure plan will be completed.

Structure plans are an important method for establishing the pattern of land use and the transport and services network within a defined area. They can provide a detailed examination of the opportunities and constraints relating to the land including its suitability for various activities, infrastructure provision, geotechnical issues and natural hazards. They should identify, investigate and address the potential effects of urbanisation and development on natural and physical resources in the structure plan area and in neighbouring areas, particularly those that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.

Structure plans should explain how future development will give effect to the regional policy statement and how any adverse effects of land use and development are to be avoided, remedied or mitigated by proposed plan provisions. This will ensure that all the effects of development are addressed in advance of development occurring. A structure plan is an appropriate foundation for the plan change process required to rezone land.

The Unitary Plan requires a structure plan to identify, investigate and address the following matters[3]:

- **urban growth** (e.g, future supply and projected demand for residential and business land, phases and timing for the staged release of land in coordination with infrastructure, the location, type and form of the urban edge, linkages and integration with existing urban-zoned and/or rural-zoned land adjoining the structure plan area and, opportunities to improve access to landlocked parcels, including Māori land)
- **natural Resources** (e.g, the protection, maintenance and enhancement of natural resources, integration of green networks with open space and pedestrian and cycle networks, measure to manage natural hazards and contamination and the location of mineral resources)
- **natural and built heritage** (The existence of natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character)
- **use and activity** (e.g, contribution to a compact urban form and the efficient use of land)
- **urban development** (e.g, a desirable urban form at the neighbourhood scale)
- **transport networks** (e.g, integration of land use and development with the local and strategic transport network)
- **infrastructure** (e.g, location and protection of existing and planned infrastructure)
- **feedback from stakeholders.**

Figure 5 illustrates how a structure plan might look.

[3] Refer to Appendix 1 of the Auckland Unitary Plan (Structure Plan Guidelines) for a complete list of matters to be identified, investigated and addressed in a structure plan. The matters included here provide an indication only and are not intended to be a full and complete list.



Figure 5: Example of a structure plan

As part of preparing future urban areas to be ready for development, structure planning will generally commence approximately three years prior to the timeframe that has been identified in this strategy. Where this strategy has identified different timeframes within a large future urban area (e.g. Warkworth and Drury West/Opaheke Drury) and the area would benefit from comprehensive planning (e.g. environmental and urban form outcomes), a structure plan may be prepared for the whole area.

Due to the large scale of the future urban areas, structure plans will determine the appropriate staging and timeframes of subsequent plan changes to 'live zone' areas within the structure plan area to ensure the efficient and logical roll out of local infrastructure to these areas. Staging of areas for plan changes will generally follow the sequence and timeframes identified in the Future Urban Land Supply Strategy, unless an alternative staging is considered appropriate through the structure planning process.

The plan change process to ‘live zone’ the first stage identified in the structure plan will follow immediately after the structure plan is complete so that development is able to commence within the timeframes specified in this strategy for that area.

Due to the large scale of areas sequenced, council will lead (or work in partnership with others) the structure planning process. This is the stage of the process where local boards, mana whenua and communities will be involved in the detailed planning of these areas.



4. The Programme - sequencing of the future urban areas

The programme of sequencing the future urban areas spans over 30 years from 2017 – 2047. The timeframe is split into three decades and each decade into five year intervals. Distributing the live zoning of future urban areas over this timeframe enables them to be proactively planned in an orderly and cost efficient way, ensuring the areas are 'ready to go' with the required bulk infrastructure and able to deliver the quality urban outcomes anticipated in the Auckland Plan and Unitary Plan. Development capacity provided through this strategy needs to be considered in context with the overall development capacity provided across Auckland. The agreed sequencing of the future urban areas has therefore taken into account the feasible development capacity provided in the existing urban area.

A suite of principles (Appendix 1) were developed to help underpin the sequencing rationale. However, the principles were not applied to the areas prioritised between 2012 and 2017 as these priorities were determined through separate Special Housing Area and Unitary Plan processes.

Table 1 identifies the sequencing and timing of the large future urban areas and Table 2 identifies the sequencing and timing of the rural settlement future urban areas. Special Housing Areas and live urban zones under the Unitary Plan play a significant role in the first five years of the sequencing and are part of the transition to longer-term, proactive planning by the second and third decades.

A brief overview of the areas and a description of key considerations behind the sequencing is provided in Appendix 2.

Proposed timing – Development ready (Large future urban areas)	Area^
Actuals, contracted or planned 2012 - 2017	Live Zoned Areas and Special Housing Areas **Warkworth North** **Wainui East** **Whenuapai** **Scott Point** **Red Hills** **Kumeu Huapai** **Puhinui** **Hingaia** **Takanini (Walters Rd)** **Bellfield Rd (Opaheke)** **Drury South** **Bremner Rd (Drury West)** **Wesley (Paerata)** **Belmont (Pukekohe)**
Decade One 1st half 2018 – 2022	**Warkworth North*** **Silverdale - Dairy Flat (business)** **Whenuapai Stage 1** **Drury West Stage 1*** **Paerata (remainder)**
Decade One 2nd half 2023 - 2027	**Pukekohe** **Cosgrave Rd (Takanini)**
Decade Two 1st half 2028 - 2032	**Warkworth South** **Whenuapai Stage 2** **Red Hills North** **Kumeu Huapai Riverhead** **Puhinui (remainder)** **Opaheke Drury** **Drury West Stage 2**
Decade Two 2nd half 2033 - 2037	**Warkworth North East** **Wainui East (remainder)** **Silverdale Dairy Flat (remainder)**
Decade Three 1st half 2038 – 2042	
Decade Three 2nd half 2043 - 2047	**Takanini[#]** **Yet to be determined – new growth areas**

*Warkworth North and Drury West Stage 1 development ready from 2022

^Refer sequencing maps for location of areas

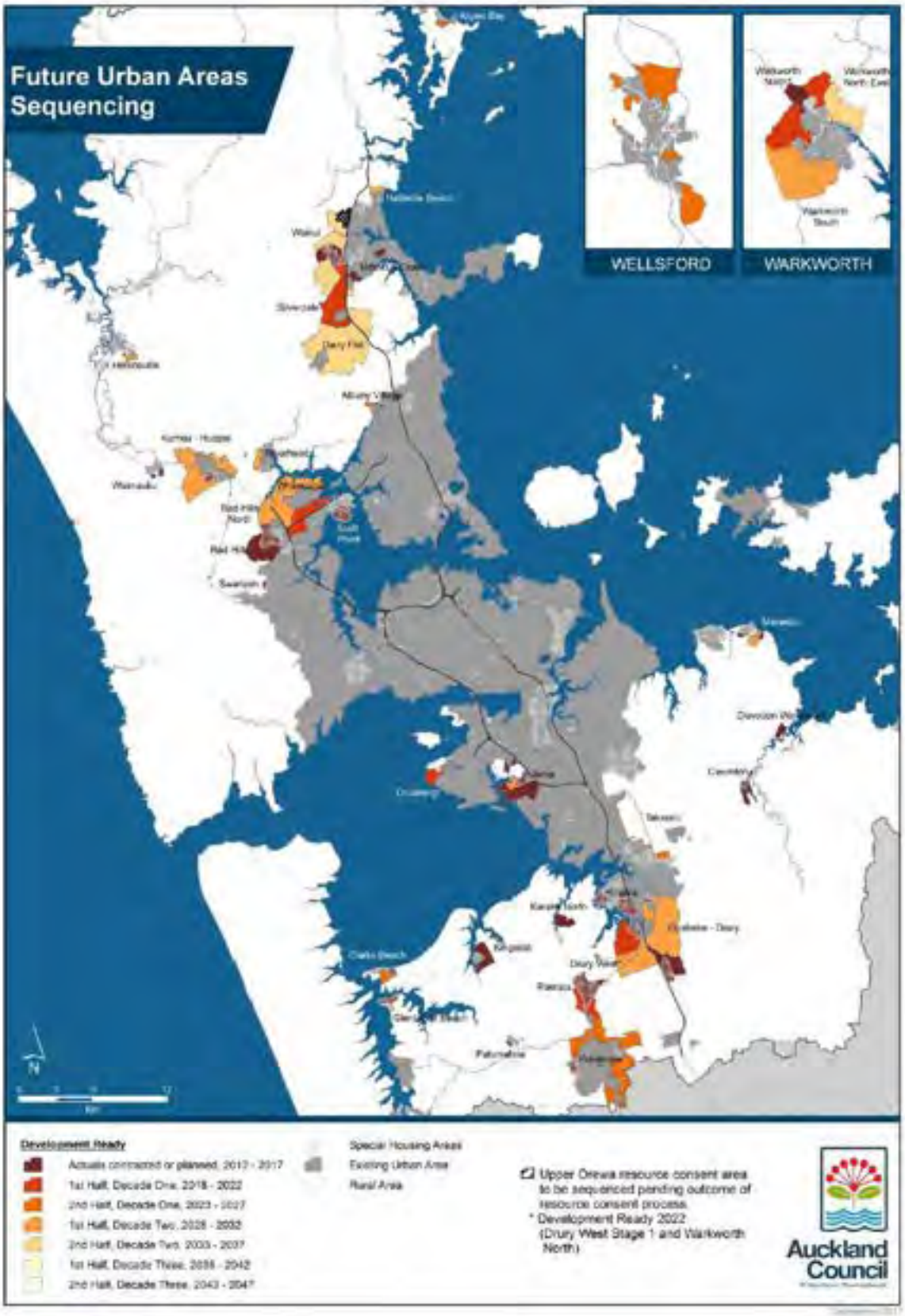
[#]Significant flooding and geotech constraints - further technical investigations required

Table 1: The sequencing and timing of the large future urban areas

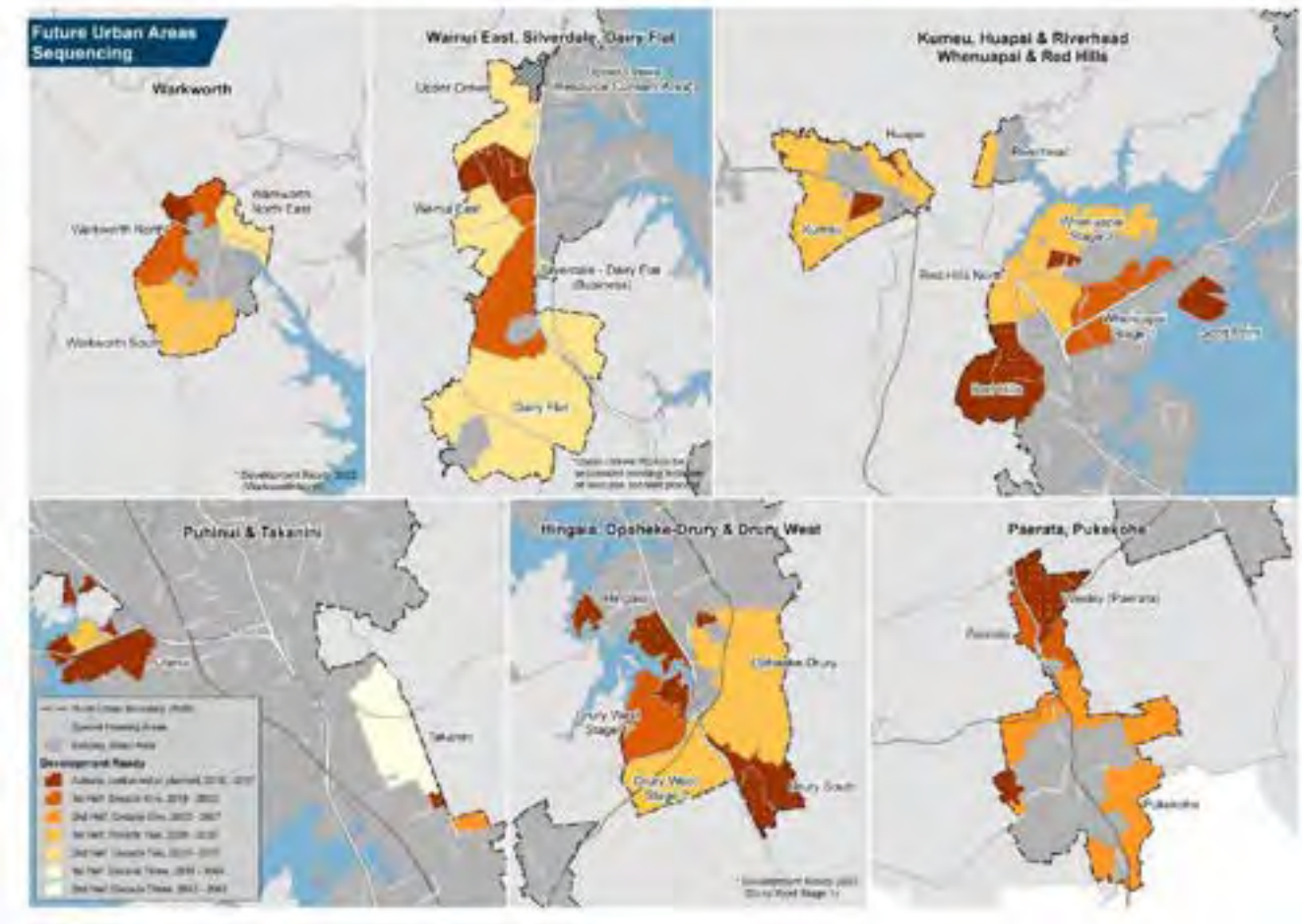
Proposed timing – Development ready (Rural Settlement future urban areas)	Area^
Actuals, contracted or planned 2012 - 2017	Live Zoned Areas and Special Housing Areas **Hibiscus Coast (Silverdale)** **Hibiscus Coast (Red Beach)** **Hatfields Beach 1** **Albany Village 1** **Waimauku** **Swanson** **Maraetai 1** **Oruarangi 1** **Clevedon Waterways** **Clevedon** **Karaka North** **Kingseat** **Clarks Beach 1** **Glenbrook Beach 1** **Patumahoe**
Decade One 1st half 2018 – 2022	**Oruarangi 2**
Decade One 2nd half 2023 - 2027	**Wellsford** **Algies Bay** **Albany Village 2** **Helensville 1** **Clarks Beach 2** **Glenbrook Beach 2**
Decade Two 1st half 2028 - 2032	**Helensville 2** **Hatfields Beach 2** **Maraetai 2**
Decade Two 2nd half 2033 - 2037	
Decade Three 1st half 2038 – 2042	
Decade Three 2nd half 2043 - 2047	

^Refer sequencing maps for location of areas

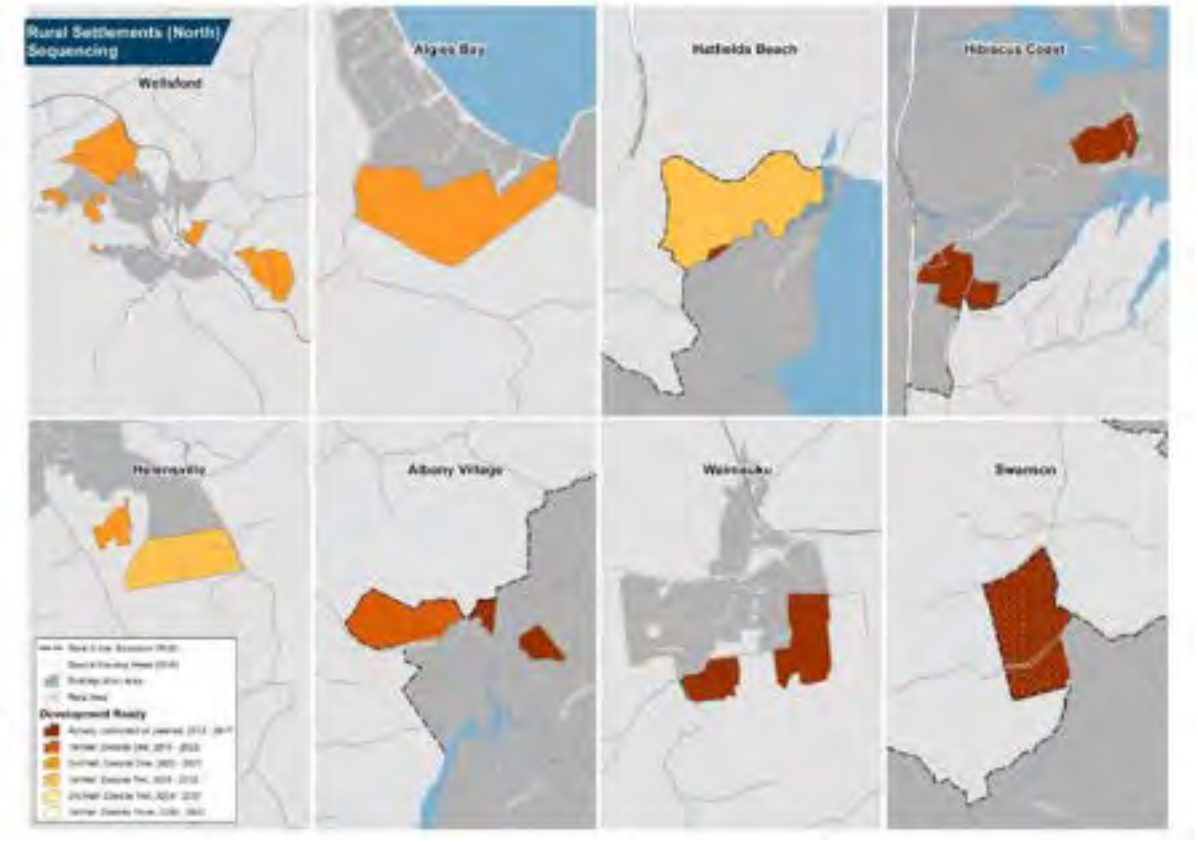
Table 2: The sequencing and timing of the Rural Settlement future urban areas



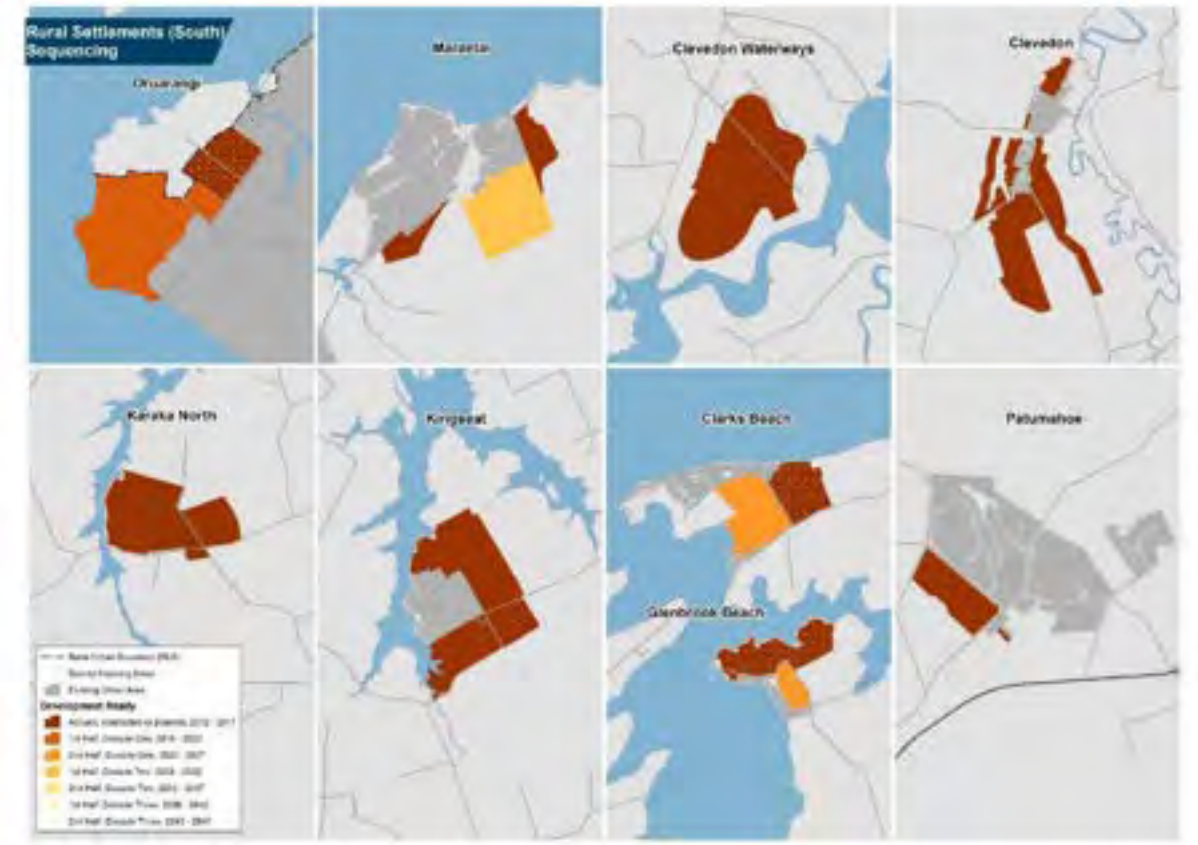
Map 2: Regional Sequencing and timing



Map 3: Large future urban areas sequencing and timing



Map 4: Rural Settlement (north and west) sequencing and timing



Map 5: Rural settlements (south) sequencing and timing

5. Anticipated dwelling and employment capacities for future urban areas

The tables below provide the anticipated dwelling and employment capacities for the future urban areas.

Proposed timing – development ready	Area^	Anticipated dwelling capacity for each area (approx.)	Anticipated dwelling capacity subtotals (approx.)	Anticipated Employment (jobs) (approx.)#
Actuals, contracted or planned 2012 - 2017	**Live zoned areas and SHAs**		31,590	15,350
	Warkworth North	Business		
	Wainui East	4,500		
	Whenuapai	1,150		
	Scott Point	2,600		
	Red Hills	3,600 (SHA) + 7,050 (live zone)		
	Puhinui	Business		
	Kumeu Huapai	1,400		
	Hingaia	3,070		
	Wesley (Paerata)	4,550		
	Belmont (Pukekohe)	720		
	Drury South	1,000		
	Bremner Rd (Drury West)	1,350		
	Bellfield Rd (Opaheke)	300		
	Walters Rd (Takanini)	300		
Decade One 1st half 2018 – 2022	**Warkworth North***	2,300	14,300	27,250
	Paerata (remainder)	1,800		
	Whenuapai (Stage 1)	6,000		
	Silverdale West / Dairy Flat (business land)	Business		
	Drury West Stage 1*	4,200		
Decade One 2nd half 2023 – 2027	**Pukekohe**	7,200	7,700	
	Cosgrave Rd, Takanini	500		
Decade Two 1st half 2028 - 2032	**Kumeu Huapai Riverhead**	6,600	36,900	21,350
	Warkworth South	3,700		
	Whenuapai (Stage 2)	11,600		
	Drury West (Stage 2)	5,700		
	Opaheke Drury	7,900		
	Red Hills North	1,400		
	Puhinui	Business		
Decade Two 2nd half 2033 – 2037	**Silverdale Dairy Flat (remainder)**	20,400	29,400	
	Wainui East (remainder)	7,400		
	Warkworth North East	1,600		
Decade Three 1st half 2038 – 2042				50
Decade Three 2nd half 2043 – 2047	**Takanini+ Yet to be determined new growth areas**	4,500	4,500	
Total		124,390		64,000

^**Refer sequencing maps for staging/areas**
*** Drury West (Stage 1) and Warkworth North development ready from 2022**
 # Anticipated employment figures do not include anticipated employment in centres
+Significant flooding and geotech constraints – further technical investigations required

Table 3: Large future urban areas anticipated dwelling and employment capacities

Proposed timing – development ready	Area	Anticipated dwelling capacity for each area (approx.)	Anticipated dwelling capacity subtotals (approx.)	Anticipated Employment (jobs) (approx.)
Actuals, contracted or planned 2017	**Live zoned areas and SHAs**		8,236	1,000
	Hatfields Beach 1	9		
	Hibiscus Coast (Silverdale)	963		
	Hibiscus Coast (Red Beach)	570		
	Albany Village 1	4		
	Waimauku	231		
	Swanson	290		
	Maraetai 1	110		
	Oruarangi 1	480		
	Clevedon Waterways	350		
	Clevedon	1041		
	Karaka North	744		
	Kingseat	1,842		
	Clarks Beach 1	650		
	Glenbrook Beach 1	843		
	Patumahoe	109		
Decade One 1st half 2018 – 2022	**Oruarangi 2**	258	258	2,100
Decade One 2nd half 2023 – 2027	**Wellsford**	832	2,717	
	Algies Bay	455		
	Albany Village 2	450		
	Helensville 1	72		
	Clarks Beach 2	701		
	Glenbrook Beach 2	207		
Decade Two 1st half 2028 – 2032	**Hatfields Beach 2**	671	1,250	0
	Helensville 2	362		
	Maraetai 2	217		
Decade Two 2nd half 2033 – 2037				
Decade Three 1st half 2038 – 2042				
Decade Three 2nd half 2043 – 2047				
Total		12,461		3,100

^**Refer sequencing maps for staging/areas**

Table 4: Rural Settlement future urban areas anticipated dwelling and employment capacities

6. Anticipated cost of the infrastructure network for future urban areas

The timing and sequencing outlined in this strategy will require significant investment in bulk infrastructure. Table 5 below provides high-level, indicative and inflated capital estimates for the future urban area bulk infrastructure costs.

The estimated costs include projects within, or strongly related to, enabling development of the future urban areas. These costs are included in the strategy for the purpose of providing an indication of the scale of investment in bulk infrastructure required for the greenfield areas, however they do not represent the entire cost of servicing these areas and are not intended to be used for any other purpose. This is because:

- some projects also benefit existing communities, and therefore not all the costs are attributable to growth in the future urban areas
- the share of costs to increase capacity in some infrastructure networks to meet regional demand are excluded, such as upgrades to regional treatment plants
- the costs to provide local networks in the future urban areas, such as local streets and small stormwater treatment devices, are excluded.

Funding of the council investment in bulk infrastructure for future urban areas will be confirmed through future Long-term Plans.

High-level bulk infrastructure costs *Indicative, inflated capital costs prior to any detailed design. Note that for areas to be development ready in any given decade, some infrastructure costs will be incurred in the previous decade. Costs per decade are therefore not directly correlated to the number of houses provided in each decade.*					
Decade 1 2018 - 2028		**Decade 2 2029 - 2038**		**Decade 3 2039 - 2048**	
$20 billion					
$6.7 billion		**$9.3 billion**		**$3.9 billion**	
Transport	**$3,000m**	**Transport**	**$6,500m**	**Transport**	**$1,800m**
Water / Wastewater	**$2,400m**	**Water / Wastewater**	**$1,000m**	**Water / Wastewater**	**$100m**
Stormwater	**$200m**	**Stormwater**	**$300m**	**Stormwater**	**$1200m**
Parks & Community	**$1,200m**	**Parks & Community**	**$1,500m**	**Parks & Community**	**$800m**
Costs by sub-region					
North	**$6.7 billion**				
North-west	**$5.8 billion**				
South	**$7.4 billion**				

Notes

1. Due to the smaller scale of growth anticipated in Rural Settlements, infrastructure needs are generally of a local scale which are not included in the indicative bulk infrastructure costs.
2. Transport costs include NZTA and Kiwi Rail investment as per Supporting Growth programme.

Table 5: High-level bulk infrastructure costs

7. Monitoring and Review

To ensure responsiveness and the ability to deliver an adequate supply of development-ready land in the right location and at the right time, specific monitoring will be undertaken on the strategy as part of a wider monitoring framework.

The National Policy Statement for Urban Development Capacity 2016 sets monitoring and information requirements for the council. The intention of these is to ensure that planning decisions in urban environments are well-informed, timely and responsive to changing population growth demands, market conditions and infrastructure delivery.

The strategy will be monitored as part of the Auckland Plan Development Strategy Annual Implementation Update. This update will report on the number of new dwellings consented across the region against actual and projected population growth. It will be expected to cover a comprehensive set of key indicators on growth drivers, growth management, and the spatial distribution of growth.

The focus for monitoring across the region will include:

- patterns and composition of population change and growth
- balance of growth inside and outside the existing urban area
- shifts in housing preferences, including location and typology
- key bulk infrastructure delivery and funding availability
- changes in strategic direction and/or priorities.

For each of the future urban areas identified in the strategy, the annual update will track the delivery of land for new communities in seven steps:

1. Future urban zoned land in the Unitary Plan	Planning phase
2. Structure planning completed	
3. Land rezoned for urban uses	
4. Bulk infrastructure provision	Infrastructure phase
5. New parcels created (subdivision)	Development phase
6. New dwellings consented	
7. New dwellings completed	

This analysis will include the area (hectares) identified for future development in the planning phase and the development capacity (potential dwellings and employment) in the development phase. Supporting commentary will provide context and detail to the quantitative reporting.

The infrastructure phase will be a qualitative tracking measure of lead infrastructure planning and delivery against development ready timeframes. While bulk infrastructure provision is

shown as step four, in practice infrastructure planning and delivery will occur concurrently, throughout all steps of the planning and development phases.

At the completion of steps one to four the area will be considered development ready.

Progress will be measured against the anticipated growth patterns and targets identified by the Auckland Plan Development Strategy, as well as the indicative timeframes for structure planning and infrastructure provision set out in this strategy.

Changes in the growth pattern reported in the Annual Implementation Update will help understand the strategy's contribution to the objectives of the Auckland Plan Development Strategy. This may trigger a review process to ensure the strategy is responsive and keeps pace with the changing development context and trends over the medium to long-term.

A review will be based on evidence, including monitoring data, observed over time and the overall assessed impact these factors might have on future development.

The reporting timeframe will be annually and be from July to June, consistent with the Auckland Plan Development Strategy Annual Implementation Update.





APPENDIX 1 - The principles applied to underpin sequencing decisions

This strategy has been underpinned by a suite of principles to assist with understanding which areas will achieve the greatest benefits for Auckland over the short, medium and long term timeframes of the strategy. These principles were not applied to the areas prioritised between 2012 and 2017 as these priorities were determined through separate Special Housing Area and Unitary Plan processes.

The principles are as follows:

1. Optimise the outcomes from investment
2. Supply land on time
3. Support uplifting Māori social, environmental, economic and cultural wellbeing
4. Create good quality places
5. Work collaboratively in partnership

1. Optimising the outcomes from investment will be achieved by:

- selecting areas that are adjacent to the existing metropolitan urban areas because it is often the most cost effective when extending infrastructure networks
- leveraging existing investment in the Auckland Council spatial priority areas and other key projects such as Special Housing Areas where focused investment is currently occurring
- undertaking integrated planning and infrastructure decision making to distribute significant costs of bulk infrastructure projects over time
- encouraging efficient and cost effective infrastructure solutions, investment and delivery.

2. Providing the supply of land on time will be achieved by:

- maintaining a development pipeline with sufficient supply of land to be re-zoned as urban at the right time, e.g. the areas have bulk infrastructure in place and are ready to be developed
- selecting areas that are market attractive will assist with take-up of this land
- starting with areas that have fewer known and costly constraints as they are easier to develop and have more reliable development timeframes. Areas with significant constraints (e.g. flooding and geotechnical issues) may, in time, benefit from technology advances which will improve the yields and development outcomes.

3. Supporting lifting Maori social, economic, environmental and cultural wellbeing which will be achieved by:

- recognising the principles of the Treaty of Waitangi under section 4 of the Local Government Act 2002 and the obligations of the council under Part 2 of the Resource Management Act 1991
- engaging with mana whenua on a case-by-case basis to discuss options for the future use and development of Treaty of Waitangi settlement land

- encouraging the use of appropriate design, materials and techniques in the provision of infrastructure in areas of known historic settlement and occupation patterns
- offering support for Māori development aspirations by providing clarity about when land will be bulk-serviced and ready for development.

4. Creating good quality places will be achieved by:

- selecting areas that connect new communities in close proximity to existing social infrastructure and services to provide an opportunity for these areas to leverage off and maximise use of this existing infrastructure
- delivering economies of scale as larger areas can be more readily planned with a full range of land use that a community needs, including a range of dwelling types, jobs and social infrastructure and provide better overall development yield for the required infrastructure investment
- safeguarding enough business land to support and balance residential supply. The Auckland Plan requires at least 1400 hectares of additional greenfield land for business activities. This includes approximately 1,000 hectares of industrial land with specific requirements. A further 400 hectares of land will be required for commercial activities.

5. Working collaboratively in partnership by:

- working on a regular basis with key stakeholders including neighbouring local authorities (Waikato Regional Council, Waikato District Council, Northland Regional Council, Hamilton City Council, Kaipara District Council, Whangarei District Council), central government (e.g. Kiwi Rail), developers and other infrastructure providers
- recognising cross boundary infrastructure requirements and funding implications.

APPENDIX 2 - A brief overview of the areas considered

The future urban land addressed in this strategy is predominantly located in three geographic areas: the north, the north-west; and the south. The total gross area of the future urban land is approximately 15,000 hectares including future urban land in rural settlements.

The adoption of the Unitary Plan resulted in live zoning approximately 26 per cent of future urban land included in the strategy, and has determined the initial sequencing and the council's priorities for infrastructure servicing. The sequencing of other areas has, in part, been influenced by the quantum of land live zoned (i.e. available development capacity through live zoning) and ability to provide infrastructure. A brief summary of the key rationale for timing and sequencing in the strategy is provided below. This summary informs the sequencing table and maps.

Rural settlements and other 'standalone' areas have been sequenced according to the anticipated availability of bulk infrastructure services and anticipated timing of structure planning and plan change processes.

Additional information about the anticipated scale of development is also provided for each area including:

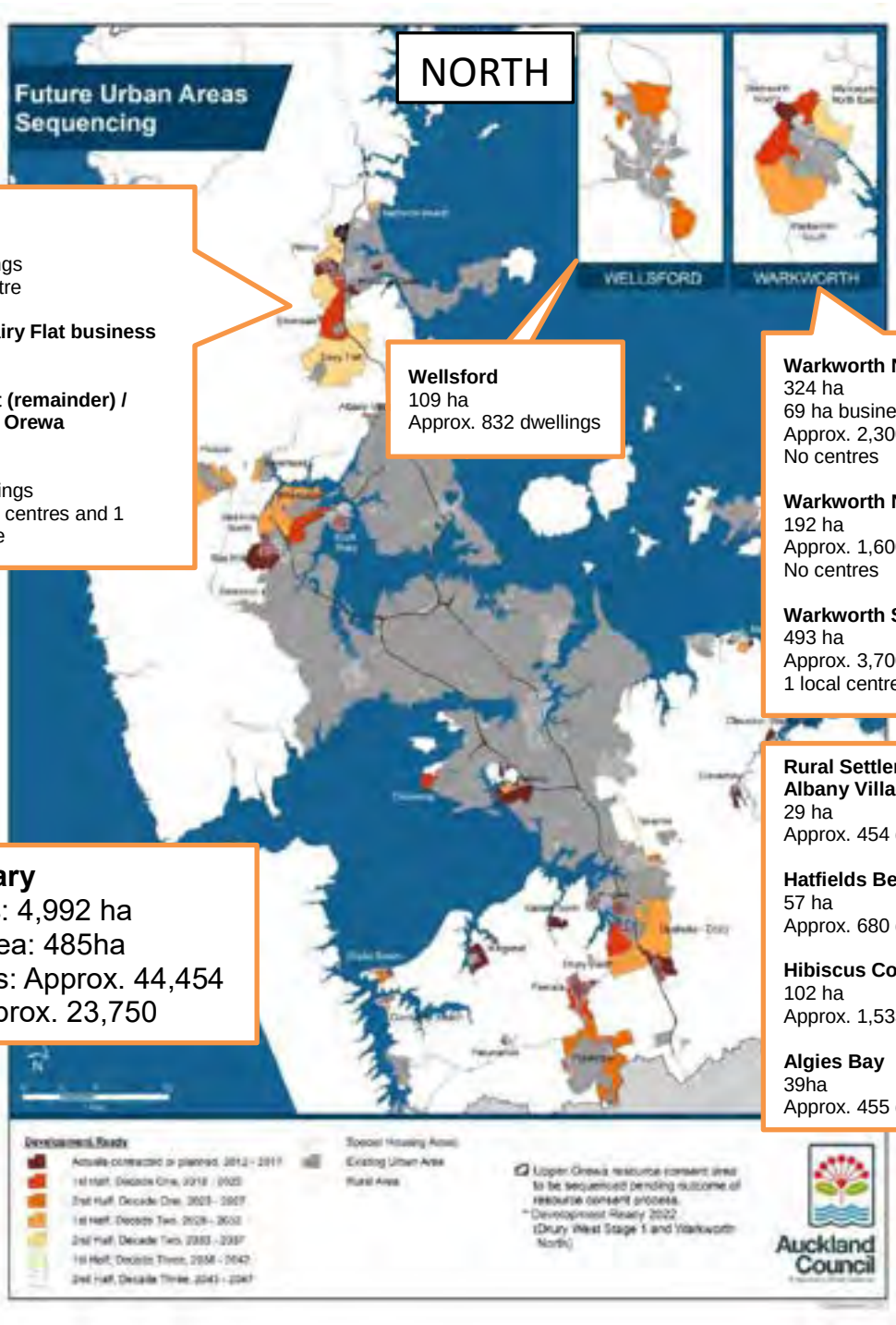
- the total gross hectares
- anticipated new dwellings
- the approximate number of anticipated new jobs
- the number and type of anticipated new centres.





The North

The North includes the large future urban areas of Warkworth, Wainui and Silverdale-Dairy Flat as well as future urban land in the existing urban area of Hibiscus Coast. It also includes the rural settlement areas of Wellsford, Algies Bay, Hatfields Beach and Albany Village. Together they comprise a land area of 4,992 hectares. The majority of the northern future urban area had not previously been considered for urban development although legacy planning had been undertaken for Warkworth and the Silverdale West "triangle". Special Housing Areas and subsequent live zoning through the Unitary Plan feature strongly in the Wainui area in the first year of sequencing. The areas are characterised by predominantly rural activities with some countryside living around the Dairy Flat area.



Wainui East
306 ha
Approx. 4,500 dwellings
1 neighbourhood centre

Silverdale West / Dairy Flat business
617 ha

Silverdale Dairy Flat (remainder) / Wainui East / Upper Orewa (remainder)
2,800 ha
Approx. 28,400 dwellings
1 town centre, 3 local centres and 1 neighbourhood centre

Wellsford
109 ha
Approx. 832 dwellings

Warkworth North
324 ha
69 ha business (live zone)
Approx. 2,300 dwellings
No centres

Warkworth North East
192 ha
Approx. 1,600 dwellings
No centres

Warkworth South
493 ha
Approx. 3,700 dwellings
1 local centre

Rural Settlements
Albany Village
29 ha
Approx. 454 dwellings

Hatfields Beach
57 ha
Approx. 680 dwellings

Hibiscus Coast
102 ha
Approx. 1,533 dwellings

Algies Bay
39ha
Approx. 455 dwellings

North summary
Total hectares: 4,992 ha
Live zoned area: 485ha
Total dwellings: Approx. 44,454
Total jobs: Approx. 23,750

Key considerations for the North

Warkworth

The Unitary Plan identifies 69 hectares of live zoned business land in the north of Warkworth which results in this being sequenced for 2017.

A new wastewater treatment plant at Snells Beach, along with an associated new pipeline from Warkworth and upgraded outfall, is required to service development in the rest of Warkworth North. This work is currently being consented, and expected to be implemented over the next five to six years. The Ara Tūhona Pūhoi to Warkworth Road of National Significance is expected to be completed in 2021, and associated upgrades to the local roading network align with the sequencing of Warkworth North.

The later sequencing of Warkworth South provides for the efficient staging of wastewater infrastructure. Warkworth North East is sequenced later to enable connections to the town centre to be adequately addressed.

Wainui East, Silverdale and Dairy Flat

A Special Housing Area was confirmed in 2016 for an area of land in Wainui East. The Unitary Plan now identifies a live zone for this area and an additional area to the west so that the total area of live zoning in Wainui East is now 306 hectares. This area is therefore sequenced for 2017. Interim water and wastewater solutions can provide capacity in the short term to service this live zoned area at Wainui East. There is currently a cap of 2,000 dwellings applying to the Special Housing Area.

Sequencing of the remaining areas reflects the need for significant new bulk water and wastewater infrastructure, including a new water main from Albany and additional wastewater conveyance and treatment capacity at Army Bay. The proposed business area in Silverdale – Dairy Flat is sequenced early to provide local employment opportunities and address demand on transport infrastructure. It is likely that structure planning for this business area will need to occur soon to enable some business land to be live zoned as required in the short-term.

Rural Settlements

Wellsford: Further geotech testing will be required due to ground instability in some areas. A new water source will be required to service the future urban zone areas. These areas will also require an upgrade to the wastewater plant, which is likely to take until the early 2020's.

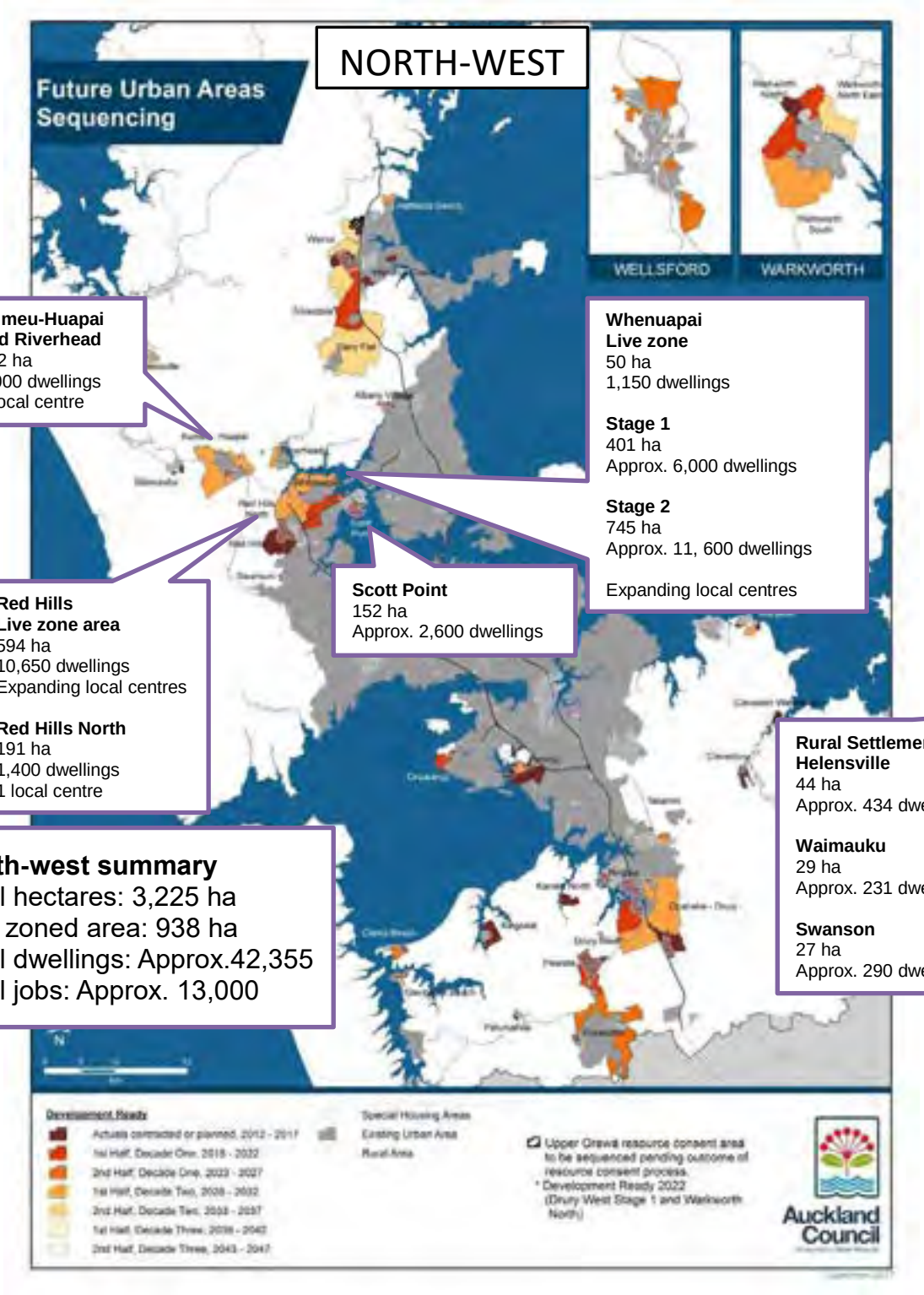
Algies Bay: Upgrades to the wastewater outfall pipe will be necessary to service new connections outside the existing service area.

Albany Village: Full buildout of the future urban areas will require new water services capacity (North Harbour watermain) and road upgrading.

Hatfields Beach: Wastewater upgrades are necessary to service new development and are likely to take until the early 2020's. With limited water supply, large scale development will require new transmission lines from Albany, which is likely to take ten years following commencement of design.

The North-west

The North-west includes the large future urban areas of Whenuapai, Scott Point, Red Hills, Kumeu-Huapai and Riverhead and the rural settlements of Helensville, Waimauku and Swanson. These areas total 3,225 hectares including 938 hectares of live zoned land in Redhills, Kumeu and Whenuapai and the rural settlements. A structure plan for Whenuapai was adopted in 2016 and a plan change is currently being prepared which will enable 401 hectares to be developed as the first stage of the wider area including some business land.



Key considerations for the North-west

Kumeu-Huapai, Riverhead, Whenuapai, Scott Point and Red Hills

The sequencing of the north-west is dependent on completion of the Northern Interceptor in 2025, which is needed to provide bulk wastewater capacity to this area. Interim solutions can provide wastewater for initial development in the live zoned area of Red Hills and first stage of Whenuapai until the Northern Interceptor is completed.

Kumeu, Huapai and Riverhead are sequenced later to align with the timing of transport improvements needed to address safety and capacity issues on State Highway 16, and the completion of the Northern Interceptor.

Rural Settlements

Helensville (Stages 1 and 2): Further geotechnical investigation is likely to be necessary to manage slope stability issues and ensure effective drainage to overland flow paths and streams. The Helensville wastewater plant has recently been upgraded and can accommodate approximately 6,000 people. This provides sufficient capacity for the existing urban zoned areas, and part of the future urban zoned area. The Helensville stage 1 area is the closest future urban zone area to the wastewater plant. Watercare will monitor growth and review additional upgrade options when population nears the treatment plant capacity.



The South

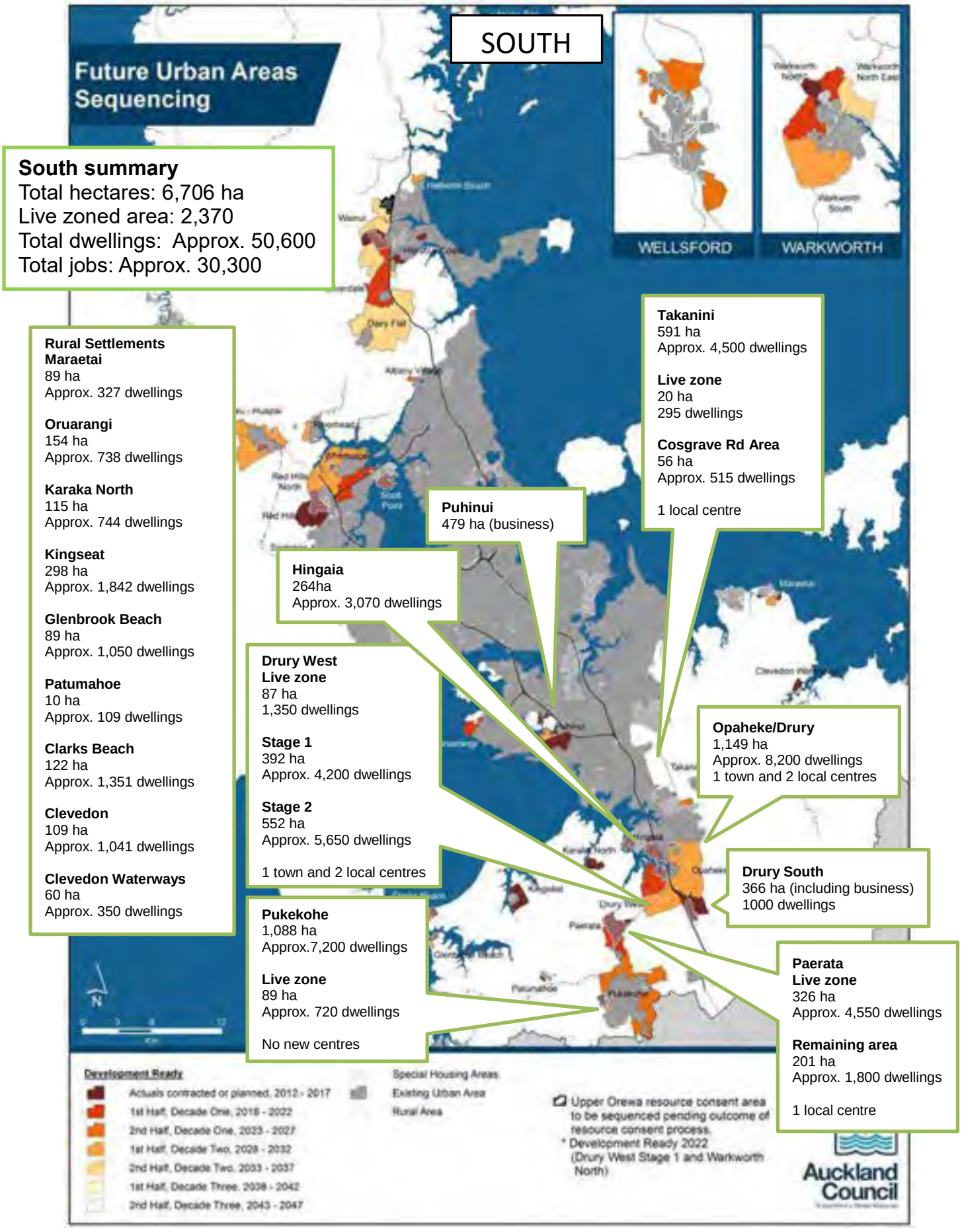
The South includes the large future urban areas of Puhinui, Takanini, Hingaia, Opaheke-Drury, Drury West and Pukekohe-Paerata. The rural settlements in the south include Oruarangi, Maraetai, Clevedon, Clevedon Waterways, Karaka North, Kingseat, Clarks Beach, Glenbrook Beach and Patumahoe. Together, they comprise a large land area of approximately 6,706 hectares with an anticipated dwelling capacity of 50,600 and an anticipated employment capacity of 30,300.

The south makes up the largest proportion of future urban areas in Auckland (45 percent). Of the total future urban land area in the south, Opaheke-Drury and Drury West comprise 2,180 hectares and Paerata and Pukekohe comprise 1,704 hectares. Special Housing Areas and subsequent live zoning through the Unitary Plan feature strongly in the first year of sequencing in the south including at Hingaia, Paerata, Pukekohe, Drury West and Drury South.

The amount of land identified in the Unitary Plan for future urbanisation in the Rural Settlements significantly contributes to the overall supply of land in the south. Together these areas total 1,046 hectares and will contribute approximately 7,550 dwellings. Much of this land is already live zoned (781 hectares).

While the areas in the south present significant opportunities for development, areas such as Takanini and Opaheke are significantly constrained by flooding and geotechnical issues and will require further investigation to identify comprehensive solutions before development can commence. The south also requires significant investment in transport and wastewater infrastructure.




SOUTH
Future Urban Areas Sequencing
WELLSFORD
WARKWORTH
South summary
Total hectares: 6,706 ha
Live zoned area: 2,370
Total dwellings: Approx. 50,600
Total jobs: Approx. 30,300
Rural Settlements
Maraetai
89 ha
Approx. 327 dwellings
Oruarangi
154 ha
Approx. 738 dwellings
Karaka North
115 ha
Approx. 744 dwellings
Kingseat
298 ha
Approx. 1,842 dwellings
Glenbrook Beach
89 ha
Approx. 1,050 dwellings
Patumahoe
10 ha
Approx. 109 dwellings
Clarks Beach
122 ha
Approx. 1,351 dwellings
Clevedon
109 ha
Approx. 1,041 dwellings
Clevedon Waterways
60 ha
Approx. 350 dwellings
Takanini
591 ha
Approx. 4,500 dwellings
Live zone
20 ha
295 dwellings
Cosgrave Rd Area
56 ha
Approx. 515 dwellings
1 local centre
Puhinui
479 ha (business)
Hingaia
264ha
Approx. 3,070 dwellings
Drury West
Live zone
87 ha
1,350 dwellings
Stage 1
392 ha
Approx. 4,200 dwellings
Stage 2
552 ha
Approx. 5,650 dwellings
1 town and 2 local centres
Opaheke/Drury
1,149 ha
Approx. 8,200 dwellings
1 town and 2 local centres
Drury South
366 ha (including business)
1000 dwellings
Pukekohe
1,088 ha
Approx.7,200 dwellings
Live zone
89 ha
Approx. 720 dwellings
No new centres
Paerata
Live zone
326 ha
Approx. 4,550 dwellings
Remaining area
201 ha
Approx. 1,800 dwellings
1 local centre
Development Ready
Actuals contracted or planned, 2012 - 2017
1st Half, Decade One, 2018 - 2022
2nd Half, Decade One, 2023 - 2027
1st Half, Decade Two, 2028 - 2032
2nd Half, Decade Two, 2033 - 2037
1st Half, Decade Three, 2038 - 2042
2nd Half, Decade Three, 2043 - 2047
Special Housing Areas
Existing Urban Area
Rural Area
Upper Orewa resource consent area to be sequenced pending outcome of resource consent process.
* Development Ready 2022 (Drury West Stage 1 and Warkworth North)
Auckland Council

Key considerations for the South

Takanini

The future urban zone in Takanini is located within the large Papakura Stream catchment and the majority of the area is low lying and subject to significant flooding hazards. Much of the area is also subject to significant geotechnical constraints due to peat soils.

Initial cost estimates to provide a comprehensive stormwater solution to the area were considered to be high with a relatively low to moderate dwelling yield. This was considered to make development possible in the medium to longer term. Since the adoption of the Future Urban Land Supply Strategy in 2015, further analysis of recent stormwater project costs in the Takanini area have been undertaken. The results of this analysis indicate that stormwater costs for the future urban zone remain high and further work is required to understand the viability of development in this area in the medium to long term. The Takanini future urban area has therefore been sequenced in the second half of the third decade (2043 – 2047). However, the future urban area at Cosgrave Road, Takanini, comprising 56 hectares, has been sequenced earlier as it is able to be serviced by the Cascades Road conveyance channel. A 2023 – 2027 timeframe for this area also enables transport solutions to be developed.

Hingaia, Opaheke-Drury and Drury West

Proposed interim solutions provide wastewater capacity for initial development in the live zoned areas of Hingaia, Drury West and Drury South as well as Drury West Stage 1 from 2022.

In the longer term, augmentation of the South and Southwestern Interceptors is required to provide wastewater capacity for the full build-out of Drury West Stage 2 and Opaheke-Drury which are sequenced between 2028 and 2032. Complex inter-catchment floodplain interactions require that all four affected stormwater catchments are considered together to ensure that early development in one area does not preclude the remainder of the future urban zone. A comprehensive catchment-wide and potentially cross-catchment solution for the flooding constraints in Opaheke-Drury, in combination with the completion of the final wastewater infrastructure, is required before development can occur in this area.

The later sequencing of Drury West Stage 2 also allows for the provision of a new expressway between Drury, Paerata and Pukekohe, which is required to alleviate capacity and safety issues on State Highway 22.

Pukekohe and Paerata

Paerata includes a 328 hectare Special Housing Area at Wesley which is expected to provide around 4,550 dwellings over the next 25 years. A further 1,800 dwellings, outside the Special Housing Area, are expected to be provided in the wider Paerata area. Pukekohe has had comprehensive legacy planning and is expected to provide around 8,000 dwellings and a number of employment opportunities, leveraging off the existing town.

Upgrades to water, wastewater and stormwater are required to enable large scale development to proceed. Construction of additional water reservoir capacity is planned as well as upgrades to the Pukekohe wastewater treatment plant and expanded wastewater networks to service growth in the area. Pukekohe and Paerata require less stormwater investment compared to Takanini, Opaheke and Drury.

The transport network has not been designed for the anticipated growth but this being addressed through Auckland Transport's Supporting Growth project. The existing rail network connects Pukekohe with the rest of Auckland. The network will be strengthened by the extension of electric trains to Pukekohe and by the addition of extra rail capacity. A new train station at Paerata will improve access to trains through the southern corridor. A new

expressway between Pukekohe, Paerata and Drury will link to State Highway 1. Planned safety improvements and upgrades on State Highway 22 will improve travel between Drury and Paerata and a bypass will be constructed south of Pukekohe Town Centre for trucks and other traffic.

The Wesley Special Housing Area has been live zoned through the Unitary Plan process and is therefore has the appropriate zoning in place. The remainder of the Paerata area has been sequenced in the first half of decade one as the second phase of growth at Paerata.

Pukekohe is sequenced in the second half of decade one (2023 – 2027), excluding most of Belmont (Pukekohe) which is already live zoned. The early sequencing of Pukekohe will allow for the development of a comprehensive structure plan for the entire future urban area. A structure plan for the whole of Pukekohe will enable efficient and integrated land use and infrastructurere solutions to be found.

Rural Settlements

Maraetai: the wastewater treatment plant will be upgraded as required in order to maintain discharge compliance and to accommodate growth.

Oruarangi: The area has sufficient water and wastewater bulk capacity. Structure planning will need to take cultural heritage and landscape values into account, consistent with the Mangere Gateway Precinct.

Puhinui: The remaining future urban zone is not anticipated to be development ready until 2030 due to transport constraints and anticipated market readiness.

Clarks Beach: A new wastewater outfall at Clarks Beach will be required to service new development, subject to a sub-regional wastewater discharge consent which has currently been applied for.

Glenbrook Beach: New development will depend on the new Clarks Beach wastewater outfall, and structure planning for the new area to be developed as a gateway to, and logical extension of, the existing village.



APPENDIX 3 - Glossary[4]

Brownfield
Urbanised land able to be redeveloped, often for more intensive or different land use.

Business
Commercial and industrial activities, excluding centres and activities in centre zones.

Community and social infrastructure
The following definition of community infrastructure has been taken from the Unitary Plan: Facilities for the well-being of a community, generally on a not for profit basis.

Includes:
- arts and cultural centres (including art galleries and museums);
- places of worship
- community centres
- halls
- libraries
- marae
- Citizens Advice Bureaux
- justice facilities.

Excludes:
- entertainment facilities
- care centres
- healthcare facilities.

However, for the purposes of this strategy, community and social infrastructure also includes:
- hospitals and healthcare facilities
- education facilities and early childhood learning services.

Future urban zone
The future urban zone is applied to greenfield land that has been identified as suitable for urbanisation. The future urban zone is a transitional zone and will remain in place until a structure plan and concurrent plan change re-zones the land to the appropriate urban zone (e.g. residential or business). Land may be used for a range of general rural activities but cannot be used for urban activities until the site is re-zoned for urban purposes.

Greenfield
Rural land identified or used for urban development (eg. residential, business or industrial) that has not been previously developed.

Infrastructure
The facilities, services and installations that enables a community to function, comprising of:

- airports
- airport approach surfaces
- water supply and wastewater (including storage and treatment facilities)
- broadcasting
- defence
- electricity generation, transmission and distribution

[4] Where the same terms have been defined in the Unitary Plan, the Unitary Plan definitions have been used for the purposes of consistency.

- irrigation
- transmission, distribution and storage of gas liquid fuels or geothermal energy
- motorways and roads
- walkways and cycleways
- ports
- public transport
- railways
- solid waste disposal
- existing class 1 regional landfills
- stormwater
- telecommunication and radio communication
- air quality and meteorological services
- anything described as a network utility operation in regulations made for the purposes of the definition of network utility operator in section 166 of the RMA.

Live zoned
Land that was previously zoned future urban under the Auckland Proposed Unitary Plan and now has an urban zone (residential or business) in the Operative Unitary Plan. In a small number of cases, a live zone (residential or business) has been allocated to land that was previously zoned rural.

Open Space
Land zoned to provide for public use and access, for both recreational and passive activities. Open space also includes general infrastructure located in Open Space zones to support management of, and access to open space.

Rural Urban Boundary
The Rural Urban Boundary identifies land potentially suitable for urban development. The location of the Rural Urban Boundary is a district plan land use rule pursuant to section 9(3) of the Resource Management Act 1991.

Satellite towns
Towns in the region which function semi-independently from the Auckland metropolitan area, providing a full range of services and employment opportunities to the surrounding rural areas. It applies to the towns of Pukekohe and Warkworth.

Structure Plan
Structure plans establish the spatial development pattern of land use and the transport and services network within a defined area. A detailed examination of the opportunities and constraints relating to the land is required and will ensure the effects of development are addressed in advance of development occurring. Appendix 1 of the Unitary Plan provides guidance on the preparation of structure plans.



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TE TUPU NGĀTAHI
SUPPORTING GROWTH

Drury Local Route Protection Property Strategy

October 2020

Updated Version for DBC

WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

Document Status

Responsibility	Name
Author	[redacted]
Reviewer	[redacted]
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0.4	15.10.20	FINAL Version for Approval

Disclaimer

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

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1 Executive Summary

1.1 Context

This Property Strategy has been developed to outline the property requirements for the Drury Local DBC. It is important to note that whilst the Property Strategy has been developed for the DBC, the Drury Local DBC is for **route protection purposes.**

There will be a subsequent Implementation Detailed Business Case to seek approval for implementation funding of individual projects, which will include more detailed analysis of the property issues.

The Drury Local DBC also forms part of the wider Supporting Growth Alliance (SGA) programme of works that has developed an SGA Programme Wide Property Strategy and outlines the principles for property acquisition for the entire programme. These will guide the development of the property approach for Drury Local with the key points being:

- The programme is about long-term affordability and property will be generally acquired closer to implementation.
- There will be a contingent property liability as soon as the NoR is lodged for each project.
- The Requiring Authority will take the lead on property negotiations for that specific project, utilising the current processes of that organisation (Auckland Transport (AT) or Waka Kotahi – the Agencies). For this DBC, this is generally AT, with Waka Kotahi only the requiring authority on SH22.
- AT's Early Acquisition Guideline and Waka Kotahi's Advance Purchase Policy processes will apply.
- Where there is opportunity for strategically important properties to be acquired, these should be taken.
- Opportunities for resultant value capture from residual land will be considered as part of the land use integration.

[redacted]. This Property Strategy outlines the analysis and approach to providing as much certainty as possible to what this contingent liability could be into the future.

This Property Strategy is a living document developed for the route protection detailed business case phase. Given the long-term timeframes envisaged for this route protection, the Property Strategy will need to be revisited, reviewed and updated each decade and more frequently in the lead up to project implementation. The acquisition programme is dependent on detailed design and land requirement plans being completed.

A total of 270 property interests have been identified for acquisition as outlined in Table 1-1.

Table 1-1 : Property Acquisition Summary

Package Projects	Total Property Interest	Full	Partial	Temporary	Partial & Temporary Occupation
Jesmond Road	33	0	3	7	23
Bremner Road	46	12	7	12	15
Waihoehoe Road (West) FTN	20	4	0	4	12
Waihoehoe Road (East)	31	1	0	10	20
Opaheke North-South	34	3	1	4	26
Opaheke Road	46	3	9	13	21
Ponga Road	18	0	0	2	16
SH22	42	1	2	12	27
Total	**270**	**24**	**22**	**64**	**160**

This shows that the majority of property purchase costs are either partial acquisitions and/ or temporary occupations, with less than 10% full acquisitions.

Future Urban Zone is the largest zoning by acquisition type. The type of property required by land use zoning is summarised as follows:

- Approximately 65% is currently within the future urban zone;
- The remainder is either live zoned or future open space as follows:
    - 15% live zoned industrial
    - 17% live zoned residential
    - 3% other (such as open space).

1.2 Compensation

The likely compensation has been developed through consideration of:

- the base property estimate, refer Section 4.2;

- plus an estimated allowance for Stage Two Public Works Act 1981 (PWA) compulsory acquisition processes and Land Valuation Tribunal (LVT) costs, refer Section 4.3;
- then application of various risk profiles to identify expected P50 and P95 estimates, refer Section 4.4.



Given the long-term nature of the proposed route protection, a range of potential property appreciation rates have been used to recognise how values may change in the long term, in this area of significant growth. The three annual compounding rates of appreciation used are 5, 10 and 15%.



Various other cost elements, that are a cost to the physical works budget have also been identified, refer Section 10. The cost of mitigation on a property by property basis and temporary occupation during construction is an example of costs to the project, as part of the physical works construction cost.

1.3 Key Risks

1.3.1 Risks

There are a number of risks and uncertainties from a property perspective due to the long-term nature of the route protection approach proposed. These include:

These risks have been considered when developing the Property Strategy.

1.4 Key Initiatives to Manage risks

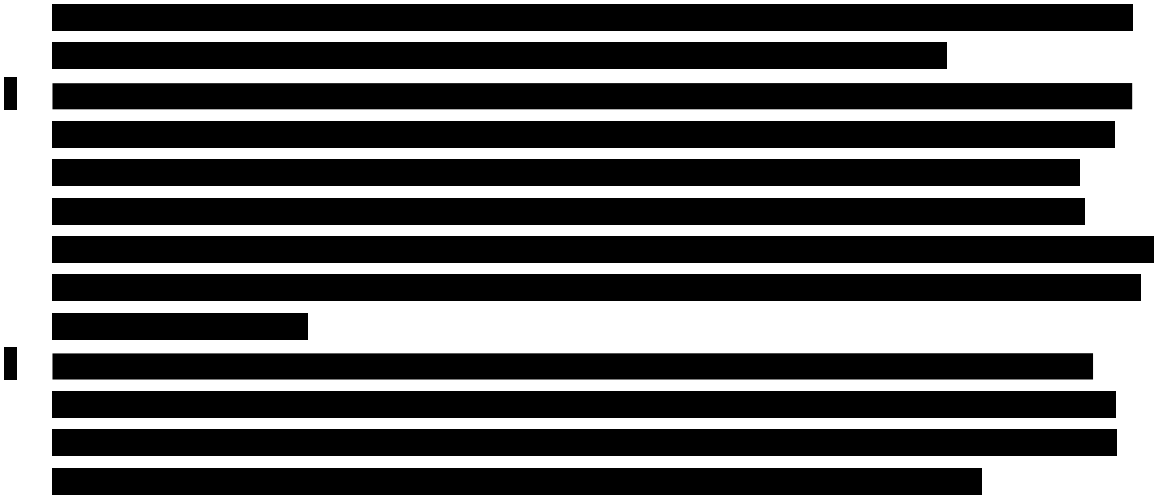
1.4.1 General

There is considerable uncertainty around the property costs given the size of this programme (and the wider SGA programme) and therefore to best manage this uncertainty and minimise the contingent liability expenditure as much as possible until projects are implemented the following is proposed:

- **Joint governance:** – It is recommended that a joint approach to property be taken at a governance level to ensure consistency of policies and priorities.
- **Appropriate resourcing** – This is a large programme of works over an extended period of time and appropriate resourcing will ensure best for programme outcomes are achieved.
- **Developer Agreement** – Focussing on getting alignment of various plan changes will assist in identifying infrastructure priorities. This will clarify the need for early and comprehensive developer agreements to assist an acquisition programme and cashflow phasing.

1.5 Wider Supporting Growth Property Management

[redacted]



1.6 Property Strategy Recommendations

This programme is focussed on route protection. Uncertainty therefore remains as to the exact timing of the property acquisition needs of the projects until implementation is confirmed. There is therefore risk and uncertainty associated with the scale and timing of future property appreciation and the early acquisition property liability of this programme.

To appropriately and proactively manage this risk and uncertainty it is recommended that during the projects development the following occurs:

- The Implementation DBC reconfirm the property cost and requirements as design confidence is further developed.
- Any changes in design avoid the need for minor land requirements.
- Value engineering is undertaken to minimise the land required for projects.
- Detailed property valuations are undertaken closer to implementation.
- Agreements with developers are progressed and 'locked in' as soon as possible to try and reduce the total property costs of the programme. This requires the commitment of funding to enable agreements to be advanced.

2 Introduction

2.1 Context for this report

The purpose of this DBC is to identify a transport system that will support Auckland's planned greenfield growth over the next 30 years and develop a case for route protecting corridors within the Drury-Ōpāheke growth area. Route protection is important as it provides property owners, businesses and the community with increased certainty on where infrastructure will be in the future, so people can make informed decisions about their land.

The Southern growth area is approximately 20km south of Auckland's central city and is approximately 30 km in length. It includes the large future urban areas of Ōpāheke-Drury and Drury West where there are live-zoned areas currently under development.

Growth in the overall south area is expected to cater for a population of 356,000 people by 2048+, in comparison to 193,000 in 2016[1].The bulk of the South's growth is anticipated to occur within the Drury-Ōpāheke growth area, increasing from a current population of just over 3,300 to a population of around 62,000 by 2048+. Provision of employment opportunities is expected to rise from 2000 in 2016 to 11,300 in 2048+.

This Property Strategy has been developed to outline the property requirements for the Drury Local DBC. It is important to note that whilst this Property Strategy has been developed for the DBC, the Drury Local DBC is for **route protection purposes.** There will be a subsequent Implementation Detailed Business Case to seek approval for implementation of individual projects, which will include more detailed analysis of the property issues.

The Drury Local DBC also forms part of the wider SGA programme of works that has developed a SGA Programme Wide Property Strategy and outlines the principles for property acquisition for the entire programme. These will guide the development of the property approach for Drury with the key points being:

- The programme is about long-term affordability and property will be generally acquired closer to implementation.
- There will be a contingent property liability as soon as the NoR is lodged for each project.
- The Requiring Authority will take the lead on property negotiations for that specific project, utilising the current processes of that organisation. For this DBC, this is generally AT, with Waka Kotahi only the requiring authority on SH22.
- AT's Early Acquisition Guideline and Waka Kotahi's Advance Purchase Policy processes will apply.
- Where there is opportunity for strategically important properties to be acquired, these should be taken.
- Opportunities for resultant value capture from residual land will be considered as part of the land use integration opportunities of the programme.

[1] MSM Model I11.5

Future property appreciation and early acquisition property liability are critical issues once the identified projects are route protected. This Property Strategy outlines the analysis and approach to providing as much certainty as possible to what this contingent liability could be into the future.

This Property Strategy is a living document developed for the route protection detailed business case phase. Given the long-term timeframes envisaged for this route protection, the Property Strategy will need to be revisited, reviewed and updated each decade and more frequently in the lead up to project implementation. The acquisition programme is dependent on detailed design and land requirement plans being completed.

This Property Strategy is intended to sit alongside the Consenting Strategy and a strategy to commence a dialogue with developers at resource consent subdivision pre application stage to secure additional arterial road widths.

2.2 Project Summary

The Drury Local package of projects includes a number of different projects as outlined in the main body of the DBC, including:

- Waihoehoe Road
- Bremner Road
- SH22
- Jesmond Road
- Opaheke North South Link
- Opaheke Road
- Ponga Road

2.3 The Drury Local Package

The preferred option for each of the package projects is summarised briefly in Figure 2-1 below.

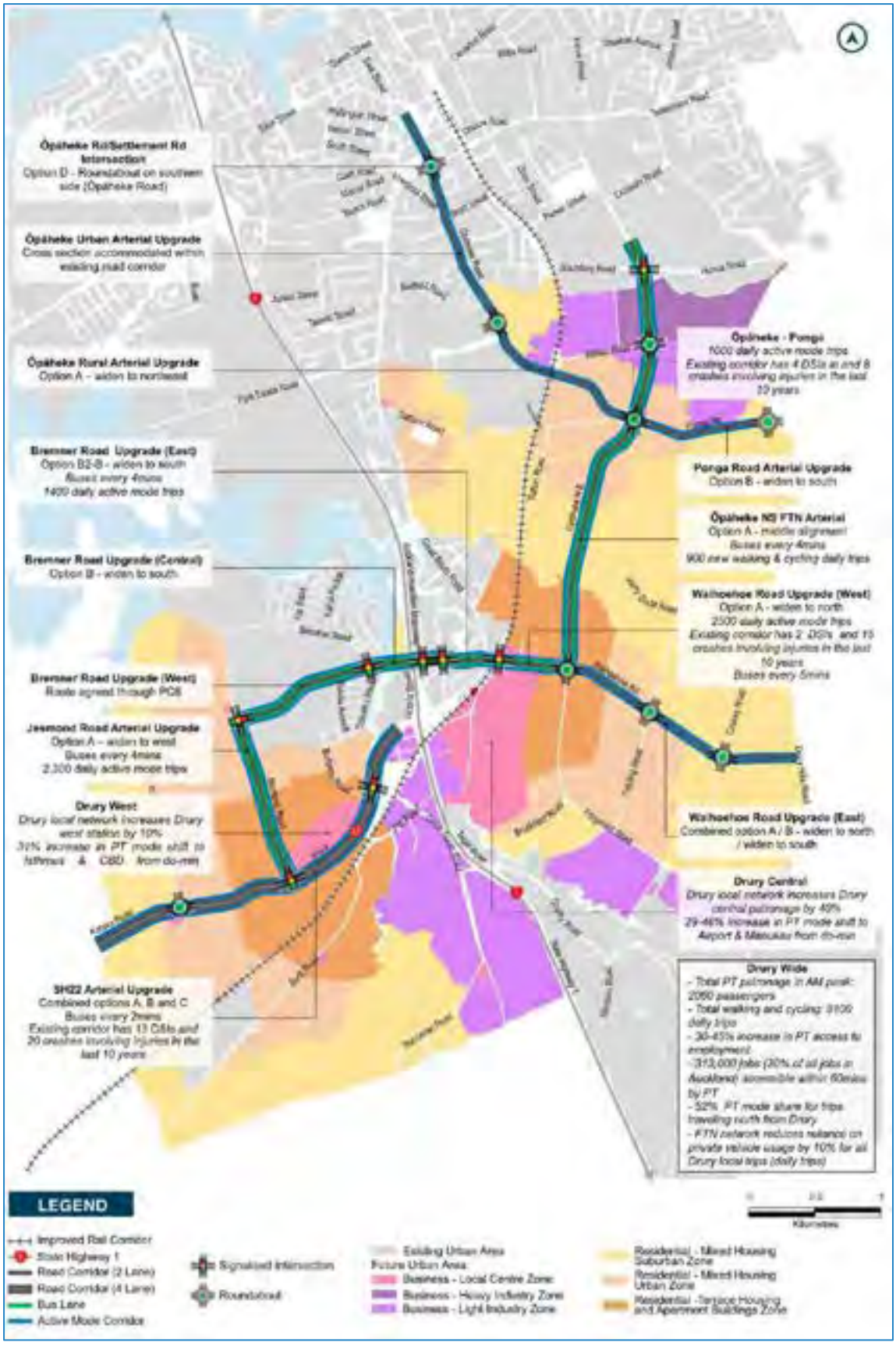


Figure 2-1 Package outcome summary

2.3.1 Package Timing

The projects in this package have different dates for planned implementation. These dates are heavily reliant on funding availability and development triggers. Importantly as this DBC has focussed on route protection, a further 'Implementation DBC' is to be completed prior to implementation to secure implementation funding. A much more detailed project specific property assessment will be undertaken at that time. Figure 2-2 sets out the current forecast programme.

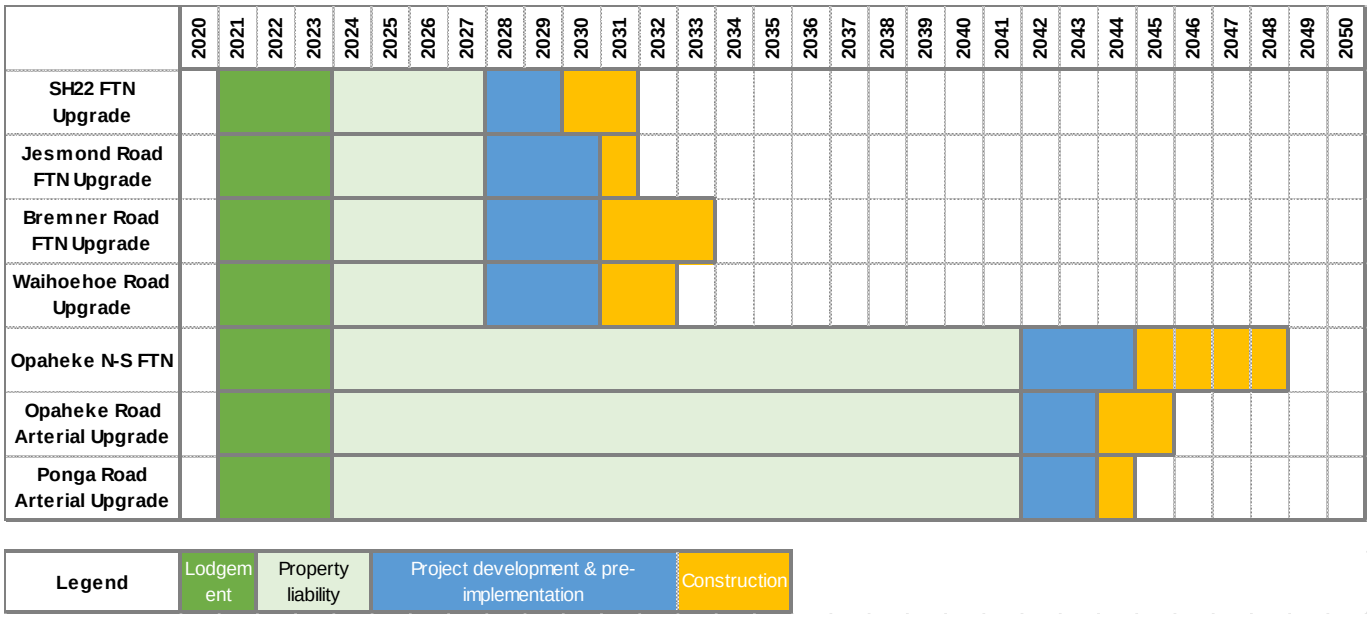


Figure 2-2 : Project timeframes

2.4 Individual Projects

The Drury Package proposes an arterial network to support the expected future growth in Drury-Ōpāheke. The Drury Package comprises seven separate projects which together form the strategic transport network. The network includes provision for general traffic, walking and cycling, and frequent PT. Overall, the Drury Package aims to improve connectivity within and through the Drury-Ōpāheke area, providing high quality, safe and attractive transport environments.

This section describes the extent and intent of each project as well as the desired outcomes for the Drury Local package. A summary of each project is provided in the following sections.

2.4.1 Jesmond Road project

The general location and extent of the Jesmond Road Upgrade/FTN project is shown in Figure 2-3 below (highlighted in blue).

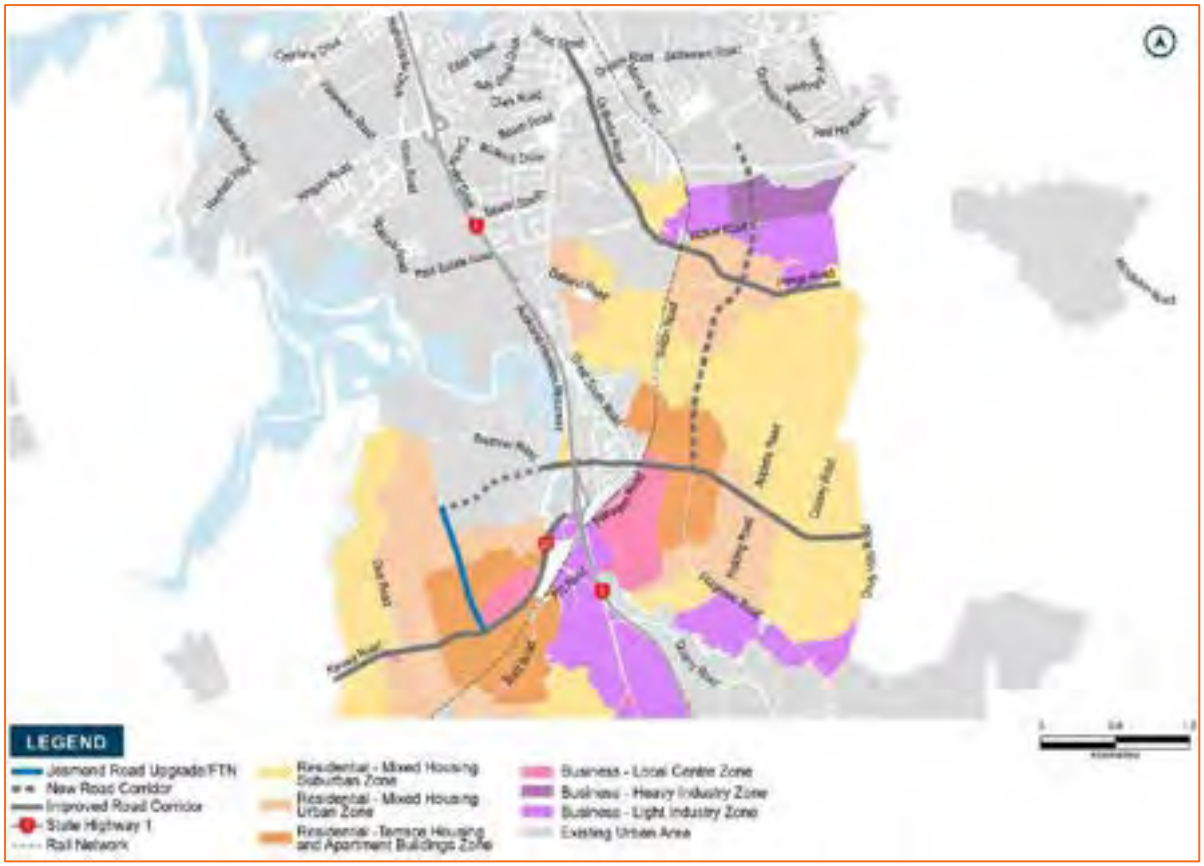


Figure 2-3 Location of Jesmond Road Upgrade/FTN project within the Drury Local Package

The Jesmond Road Upgrade/FTN project reflects an option identified as part of the IBC:

- Upgrade of the existing Jesmond Road between the existing SH22 intersection and the connection to the realigned Bremner Road

The functional intent of the project is to provide north-south connectivity through the centre of the Drury West future urban area, and to form part of the Southern FTN connecting to the rail network at Drury West Station. The extent of Jesmond Road upgrade is between SH22 and the realigned Bremner Road, with the southern extension to Drury West station incorporated as part of the Pukekohe DBC, as shown in Figure 2-3.

The intent of the upgraded arterial connection is to support current and future residents of the Drury growth areas through improved multimodal transport provision including walking and cycling, PT and private vehicles. A key problem identified for the existing corridor was the suitability of the form of the Jesmond Road with imminent urbanisation. Figure 2-3 shows the expected land-use as per the Drury-Ōpāheke Structure plan. In its current form, the rural condition of Jesmond Road is inadequate to service the land use and scale of growth anticipated along this corridor, namely the lack of PT and active mode infrastructure.

Additionally, the ITA prepared by SGA in support of the Draft Drury-Ōpāheke Structure Plan articulated the same general purpose for the project, with importance ascribed to the PT role of the corridor both as an FTN and as a connection/access to the proposed Drury West rail station.

2.4.2 Bremner Road project

The general location and extent of the Bremner Road upgrade/FTN project is shown below in Figure 2-4 .

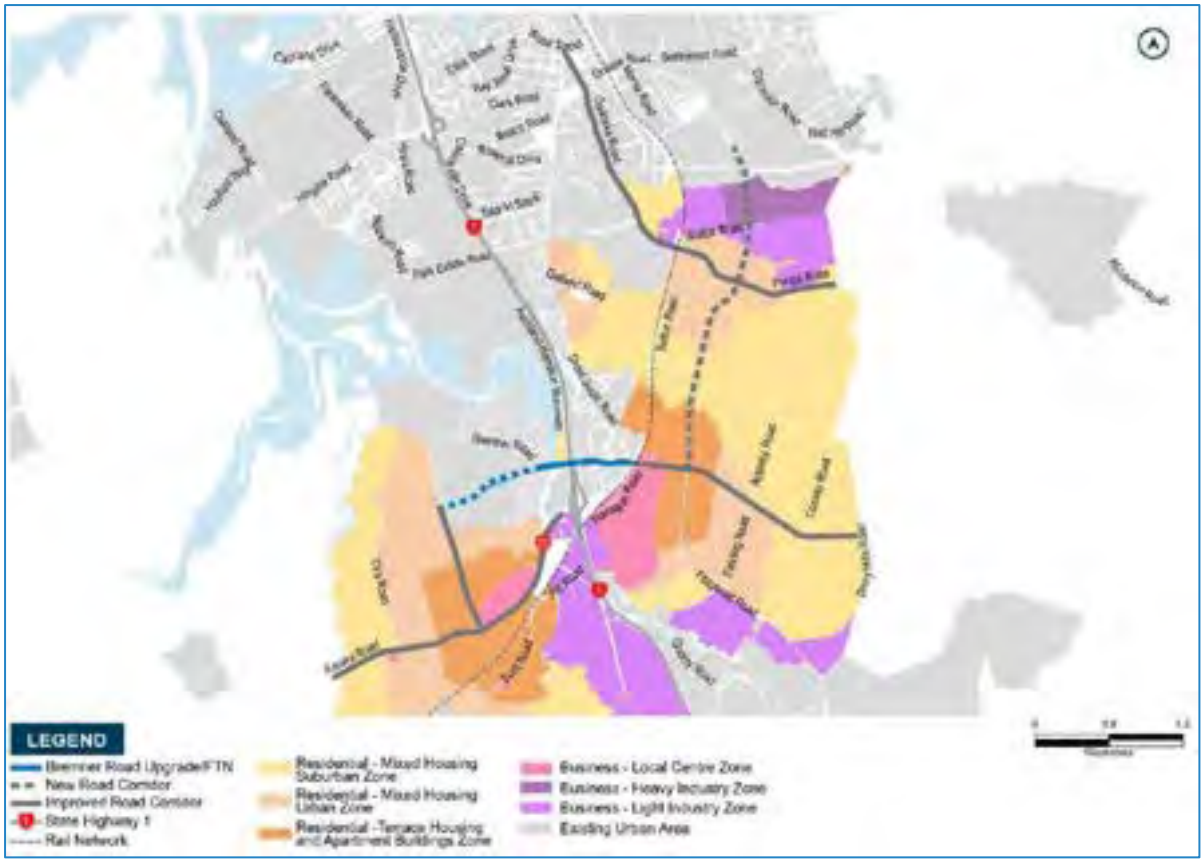


Figure 2-4 Location of Bremner Road Upgrade/FTN project within the Drury Local Package

The Bremner Road upgrade/FTN project advances the corresponding option identified in the IBC - an east-west connection between Jesmond Road and the Waihoehoe Road/Great South Road intersection. The IBC indicative option included:

- A realigned western section of Bremner Road traversing the Plan Change 6 (Auranga) development area, with the alignment dependent on landowner/developer agreements negotiated through the Plan Change 6 process.
- Upgrade of the existing section of Bremner Road approximately between the Ngakoroa Stream and Firth Street;
- A new or upgraded section between the Bremner/Firth Street intersection to the Waihoehoe Road/Great South Road intersection; and
- New/upgraded crossings of the Ngakoroa Stream (being provided through Plan Change 6), SH1 (a key interface with the SH1 Papakura-to-Bombay project), and the Hingaia Stream (currently a one-way bridge on Norrie Road).

The functional intent of this option is to provide more direct east-west connectivity across the Drury area to link areas of residential development with the existing and planned centres, the Drury Central Rail station and local employment opportunities, and to form part of the southern FTN. The intent of the upgraded arterial connection is to support current and future residents of the Drury growth areas through improved multimodal transport provision including walking and cycling, PT and private vehicles. A key problem identified for the existing Bremner Road was the suitability of the form of the corridor with imminent urbanisation. In its current form, the rural condition and current alignment (to the north) of Bremner Road is inadequate to properly service the land use anticipated in the area, namely the indirect connection and lack of PT and active mode infrastructure.

2.4.3 Waihoehoe Road project

The general location and extent of the Waihoehoe Road Upgrade/FTN project is shown below in Figure 2-5.

The Waihoehoe Road Upgrade/FTN project advances the option of upgrading Waihoehoe Road identified in the IBC. The functional intent for the project as outlined in the IBC is to provide linkages to the Drury Town Centre, residential areas, and connections to local employment.

The westernmost section of the Waihoehoe Upgrade (west of the proposed North-South arterial) is also proposed to form part of the FTN linking to the Southern Line of Auckland's rail network. The intent of this upgraded arterial connection is to support current and future residents of the Drury growth areas through improved multimodal transport provision including walking and cycling, PT and private vehicles. A key problem identified for the existing corridor was that the current form and function of Waihoehoe Road is inadequate for the scale of growth anticipated along this corridor. Figure 2-5 shows the expected land-use as per the Drury-Ōpāheke Structure plan. In its current form, the rural condition of Waihoehoe Road is inadequate to service the land use and scale of growth anticipated along this corridor, namely the lack of PT and active mode infrastructure.

The ITA by SGA in support of the Draft Drury-Ōpāheke Structure Plan articulates the same purpose for the project.

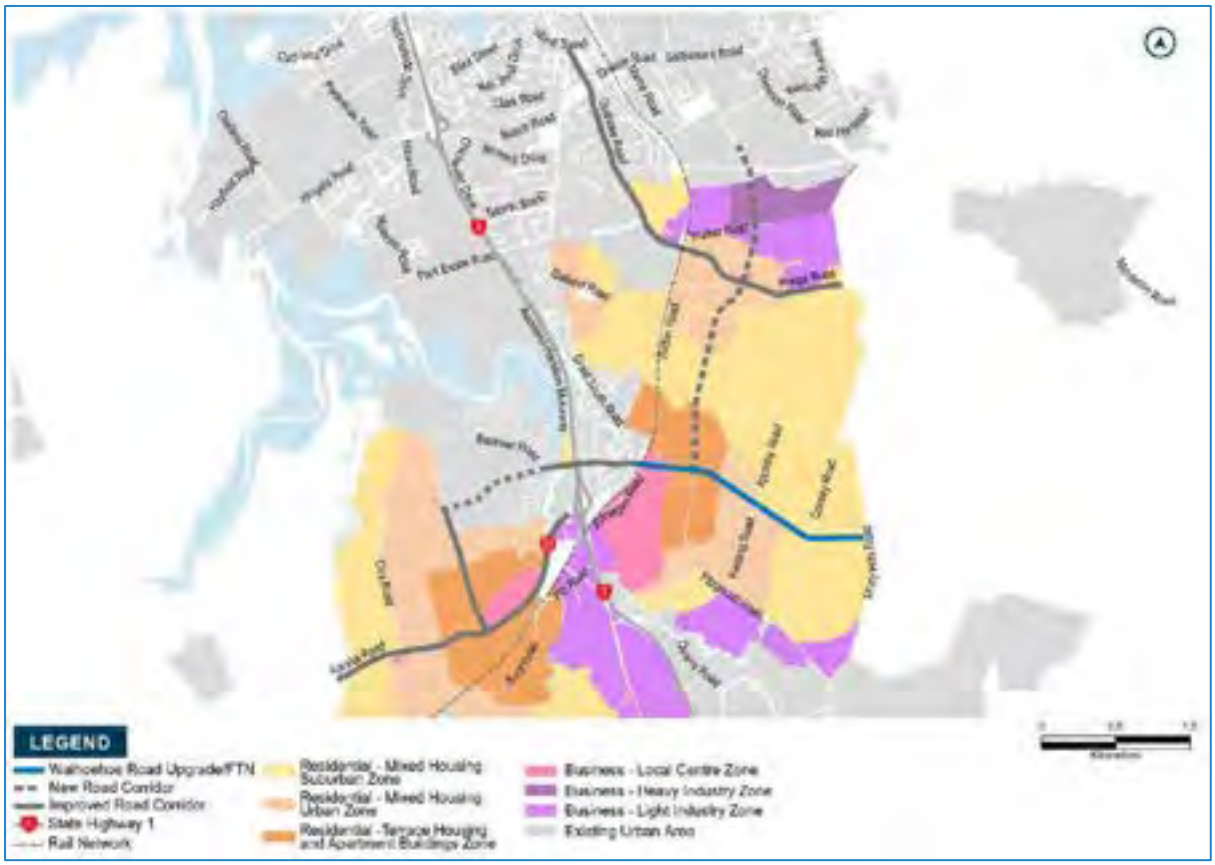


Figure 2-5 Location of Waihoehoe Road Upgrade/FTN project within the Drury Local Package

2.4.4 Ōpāheke Rural / Ponga Road Project

The general location and extent of the upgrade of the Ōpāheke/Ponga Road corridor is indicated in the Figure 2-6 below.

The Ōpāheke and Ponga Road Upgrades reflect the option identified as option AR7 in the IBC:

- *Upgrade Ōpāheke and Ponga Road – Great South Road to Mill Road.*
- *Grade-separation of the rail line on Ōpāheke Road*

The functional intent of the project as outlined in the IBC is a multimodal corridor that provides access to the proposed Mill Road corridor, FUZ in Papakura and employment areas to the north. It connects a town centre (northern end), neighbourhood centre and industrial area (southern end), with residential throughout.

The Ōpāheke / Ponga Road corridor is not identified as a part of an FTN corridor in the IBC's recommended FTN options, but the IBC does note the importance of rail grade-separation to more efficiently and support PT.

The ITA prepared by SGA[2] in support of the Draft Drury-Ōpāheke Structure Plan articulated the same general purpose for the project as noted in the IBC.

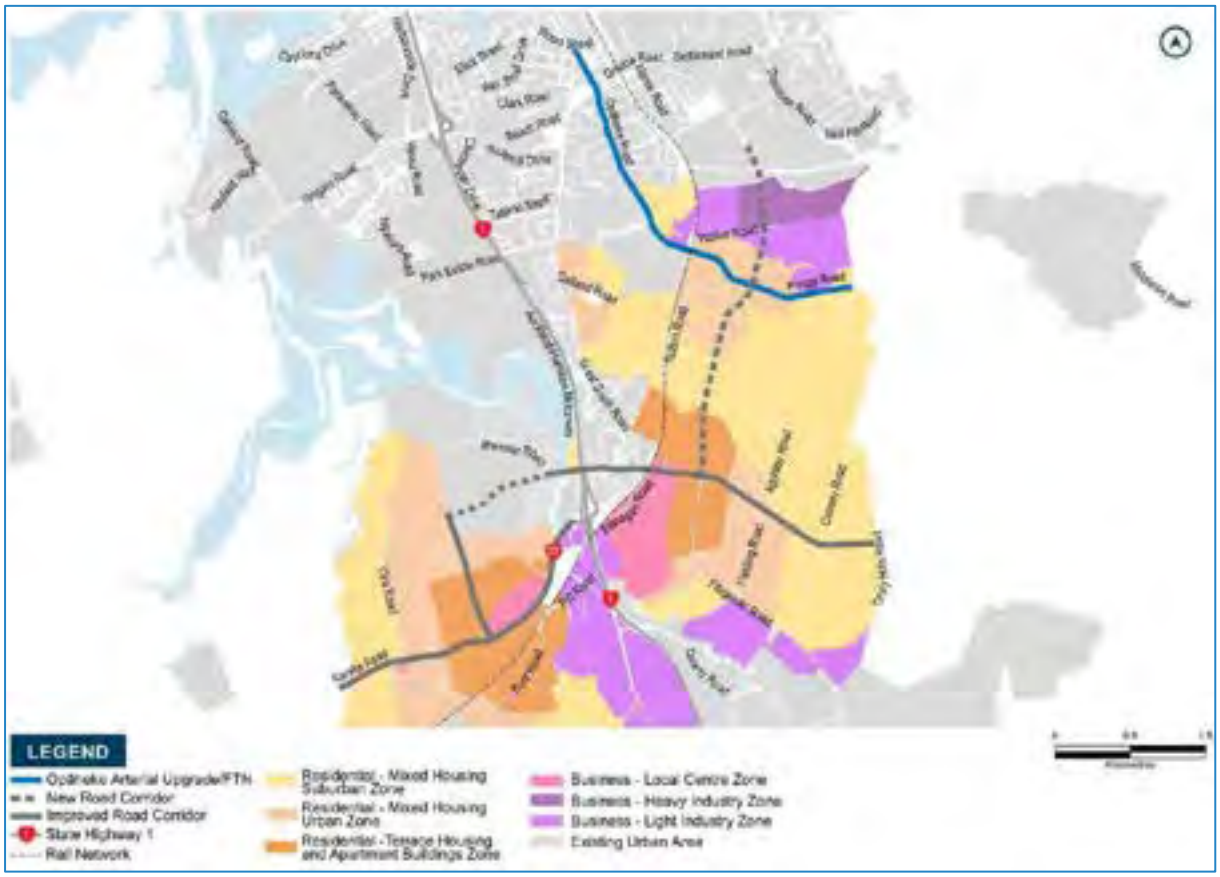


Figure 2-6 Location of Ōpāheke/Ponga Road Upgrade project within the Drury Local Package

2.4.5 New North-South arterial through Ōpāheke.

The general location and extent of the proposed new north-south (N-S) arterial road through Ōpāheke is indicated in Figure 2-7 below. This project advances the corresponding option identified as part of the IBC recommended network. The recommended IBC option comprised a new north-south road running between Waihoehoe Road and Hunua Road.

[2] Drury-Opaheke and Pukekohe-Paerata Structure Plan – Integrated Transport Assessment and Addendum 2019

The functional intent of this project as documented in the IBC is as follows:

- Provide a north-south link through the development area and, provide connections to the Papakura industrial area to the north and the planned Drury town centre to the south;
- The connection is proposed to form part of the FTN, enabling frequent PT routes to efficiently service the development area and connect to the rail network;
- By providing an additional north-south corridor, the project also enables Great South Road to accommodate an FTN route as there will no longer be reliance on a single north-south arterial to provide for all modes; and
- It should also be noted that the functional intent distinguishes this link from the proposed Mill Road corridor to the east. The Mill Road corridor is intended to provide a north-south strategic (i.e. higher capacity/speed, limited access and intersections) connection around rather than through the development area to provide network resilience by supplementing SH1 between Manukau and Drury.

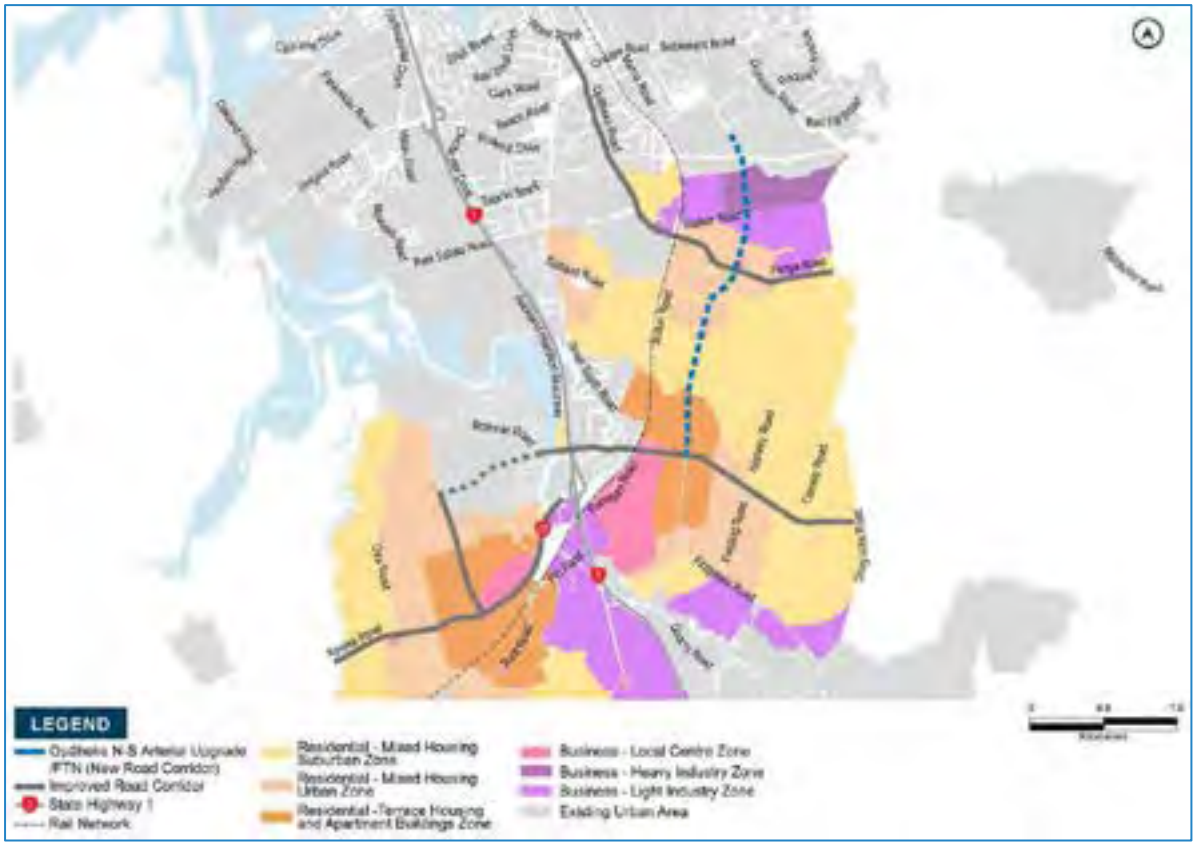


Figure 2-7 Location of Ōpāheke N-S Arterial FTN project within the Drury Local Package

This new arterial connection will provide for a variety of transport modes including walking and cycling, PT and private vehicles to support current and future residents of the Drury growth areas. As it stands, there lacks a more local focussed north-south connection for the Drury growth area, meaning without investment, and as growth occurs, added demand and stress is put on other north-south corridors, such as Great South Road (GSR), Mill Road and SH1.

2.4.6 SH22 between Drury Interchange and FUZ edge (Drury West)

The general location and extent of the upgrade of the SH22 project is indicated in the Figure 2-8 below.

The projects that make up the Drury Local package are all new projects, with the exception of this proposed upgrade to the Drury West section of SH22 (between Oira Road and the SH1 Drury interchange). Over the past few years, Waka Kotahi has been investigating improvements along that corridor through the Safe Network Programme, including consultation with the community. This identified that a range of improvements are needed along the corridor, which should be delivered in a staged way to support both short-term and long-term growth. As a result, the Safe Network Programme is currently in the funding application process for short-term safety improvements including a roundabout at the intersection of SH22 and Glenbrook Road. Meanwhile, in 2018 as part of the South IBC process, the community was engaged to gain feedback on longer-term options for urban upgrades and the related Pukekohe Expressway (providing an alternative to SH22). Following analysis of feedback and technical investigations, an indicative study area for long-term upgrades in the urban section of SH22 was approved mid-2019 and now comprises the proposed upgrade to the Drury west section of SH22 (between Oira Road and the SH1 Drury interchange).

Therefore, the SH22 project advances the corresponding option identified as part of the IBC recommended network. That option recognised the need for capacity and safety improvements on the SH22 corridor to the east of Oira Road, as well as the need for the corridor to provide for the urbanisation of the Drury West area.

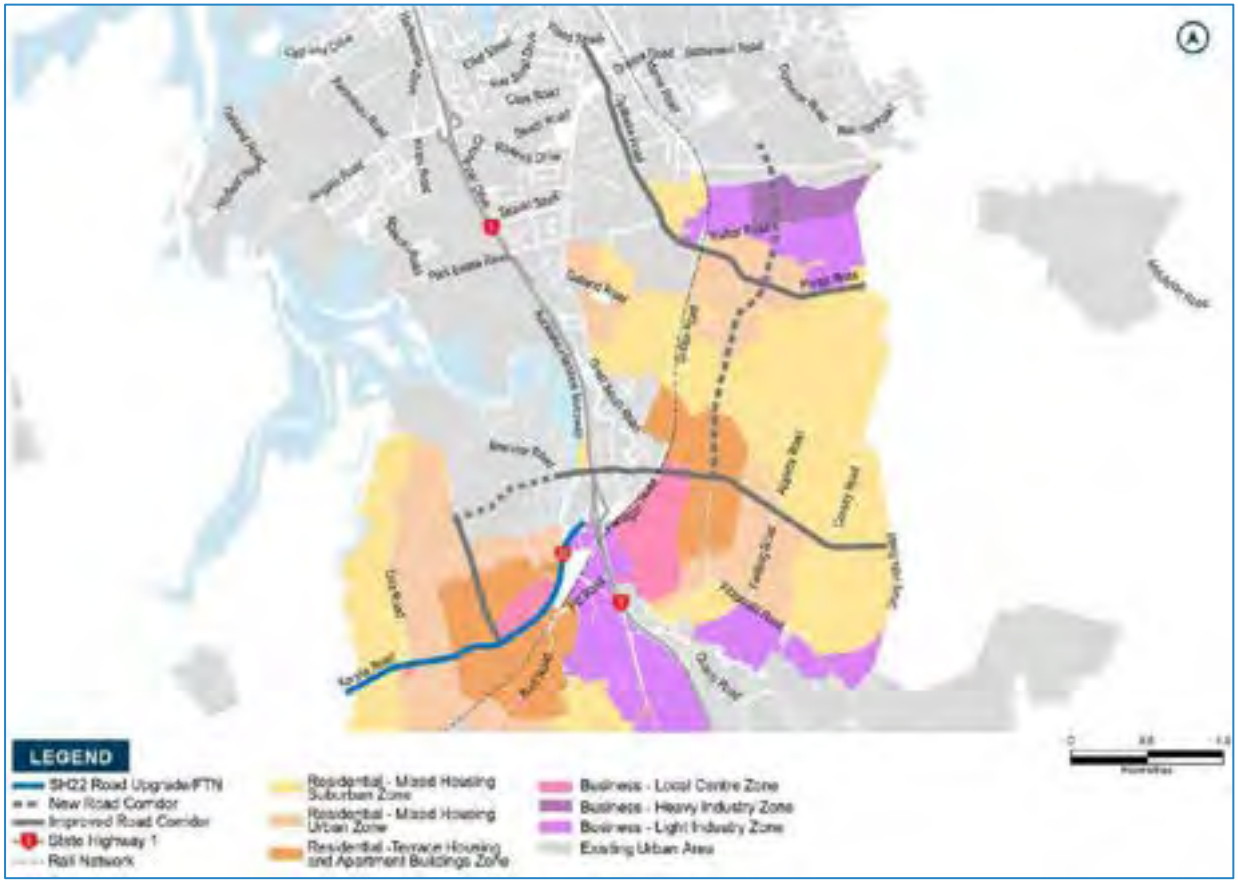


Figure 2-8 Location of SH22 Upgrade project within the Drury Local Package

The project includes upgrades to the existing SH22 corridor between Woodlyn Drive and the Drury Interchange, where the FUZ area has been zoned by the Council to include a Drury West township. The form and function of the existing road is deemed to be inappropriate for this urban context, both in terms of safety and the infrastructure provided, e.g. no active mode facilities. This upgrade will

provide walking and cycling connections and better accommodate freight and general traffic to support current and future residents.

The ITA further underlined the importance of this section of the SH22 corridor in the context of the urbanisation of the surrounding area, and the proposed rail upgrades and new rail stations. Both documents identify the proposed Pukekohe Expressway as a project required to fulfil future strategic functions and enable the urbanisation of SH22 in the long term.

This project overlaps with the SH22 Safe Networks Programme which is seeking to identify and implement short-term safety upgrades along the SH22 corridor between SH1 and Paerata.

3 Affected Properties

3.1 Indicative Land Requirements

This programme is fundamentally about providing route protection to support the growth aspirations in the Drury Local area. A detailed analysis of the number of properties and what type of resultant property purchase would be required (full, partial, partial and temporary or temporary) has been undertaken for the area.

A total of 270 property interests have been identified for acquisition as outlined in Table 3-1.

Table 3-1 : Property Acquisition Summary

Package Projects	Total Property Interest	Full	Partial	Temporary	Partial & Temporary Occupation
Jesmond Road	33	0	3	7	23
Bremner Road	46	12	7	12	15
Waihoehoe Road (West) FTN	20	4	0	4	12
Waihoehoe Road (East)	31	1	0	10	20
Opaheke North-South	34	3	1	4	26
Opaheke Road	46	3	9	13	21
Ponga Road	18	0	0	2	16
SH22	42	1	2	12	27
Total	**270**	**24**	**22**	**64**	**160**

This shows that the majority of property purchase costs are either partial acquisitions and/ or temporary occupations, with less than 10% full acquisitions.

Future Urban Zone is the largest zoning by acquisition type. The type of property required by land use zoning is summarised as follows:

- Approximately 65% is currently within the future urban zone;
- The remainder is either live zoned or future open space as follows:

- 15% live zoned industrial
- 17%% live zoned residential

  3% other (such as open space).

This confirms the broader context for this business case, which is a mixture of future growth land as well as the existing (predominantly industrial) land in the Drury township area.

Appendix A includes a breakdown of each property in more detail, including the identification and rationale for each full acquisition.

[redacted]

The proposed projects will enable the future development proposed in this area of Auckland to be

[redacted]

3.1.1 Plan changes and live-zoned areas under development in Drury

Another important context for this business case is the large number of plan changes currently being processed by the Council in this area. This has the potential to change several the underlying zoning assumptions in these property calculations (and costing).

Development at different stages continues within the live-zoned Ōpāheke 1 (Bellfield), Drury 1 (Auranga), Drury South (Stevensons and Classic Homes), and Franklin 2 (Wesley) live-zoned Precincts. Since the IBC, Plan Change 6 (Auranga B1) has become operative in part, which has

resulted in an expansion of the live-zoned area and boundaries of the Drury 1 Precinct. The Precinct now encompasses a 168ha area (up from 85ha) and is estimated to yield 2,600 dwellings (up from 1,300) and has necessitated changes to the Bremner Road alignment which are reflected in SGA's Drury Local DBC.

Several Private Plan Changes have also been received by Council in the time since the IBC, including during the development of the DBC.

A private plan change was lodged for Auranga B2 by Karaka and Drury Limited and Ma Development Enterprises (MADE) mid 2020. This plan change seeks to rezone 33ha of FUZ in Drury West, south of the existing development, to town centre and residential uses. At the time of writing this report the plan change has not been accepted by the Council and has no statutory weighting.

Four private plan changes covering a large area in Drury East/South were submitted to the Council by developers with interest in the area at the end of 2019. These Private Plan Change requests have been accepted by AC and are currently undergoing through the public consultation and submissions process. The Plan Changes were requested by (see Figure 3-2):

- Drury South Crossing – Stevensons (amending Drury South Industrial Precinct provisions)
- Drury Centre - Kiwi Property
- Waihoehoe - Oyster Capital; and
- Drury East - Fulton Hogan.

Additionally, two private plan changes have been submitted in Drury West:

- Auranga B2 (Karaka and Drury Limited)
- Waipupuke (Lomai Properties)

Kiwi Property, Oyster Capital and Fulton Hogan submitted their plan changes together as a package in Drury-east. Despite being accepted, at the time of writing this report, none of the proposed plan changes have any statutory weighting. Additionally, Proposed Plan Change 22 was notified in March 2019, and proposes the addition of two sites to Schedule 12 of the Plan (Sites and Places of Significance to Manawhenua) of relevance to the DBC: Ōpāheke – Headland (at the confluence of Hingaia Stream and Ngakoroa Stream to the South) and Te Pou a Rangiwhiwhi – Drury Creek Recreation Reserve.

The prospect of an area being structure planned or planned changed and the timing of such processes relative to any route protection is a key property cost consideration. Recent LVT decisions have introduced a second 'after' valuation consideration being the prospect of zoning changes. Relating this to the four private plan changes, a valuer would need to consider the likelihood of these zone changes occurring.



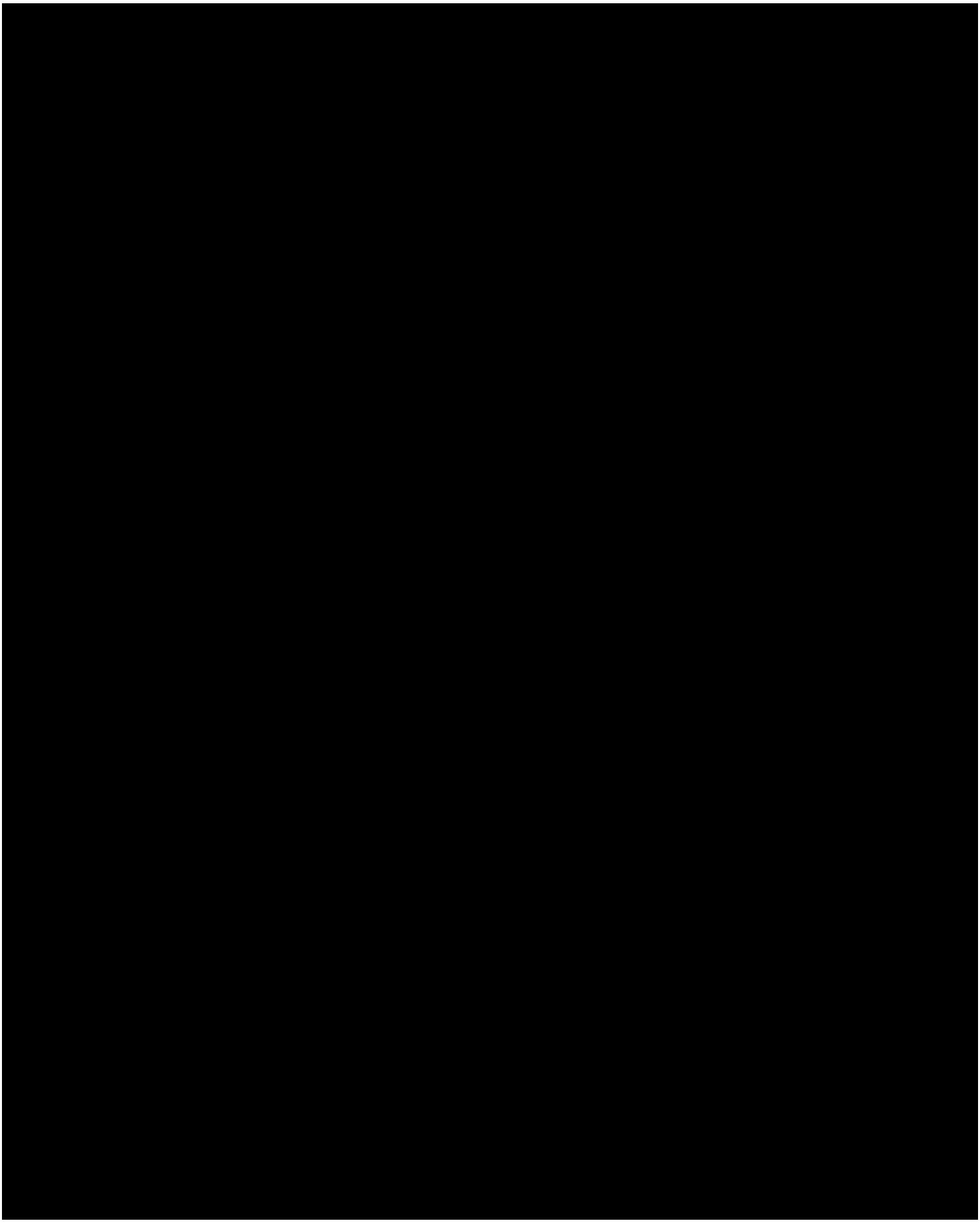
Figure 3-2 Private plan change requests in Drury-Ōpāheke

3.2 Acquisition Issues and Risks

An assessment of the key risks at a project and programme level has been undertaken. A three-tiered risk assessment scale has been used, being:

- **High** – Significant risk that will require sustained and active management
- **Medium** – Moderate risk that will require active mitigation
- **Low** – Minimum risk that can be appropriately managed

[redacted]



[redacted]. An allowance for this appreciation has been made in the property estimates, refer Section 6.4.

[redacted]

[redacted]

A recent example of the increasing land values in Auckland can be seen with the interventions planned for Redhills. These corridors are located within land zoned through the Auckland Unitary Plan (AUP) process. Auckland Council data on land value changes in 2017 confirms that the Redhills area has experienced an increase in land values of around 100% after the rezoning of the land to live zone and future urban zone. [redacted]

This critical issue is discussed in more detail in Section 6 of this report.

[3] Assumes 2019 prices on indictive parcels of land in the greater Drury area

3.3 Access

All properties will retain access to the transport system. A number of properties will require their access to be modified during the acquisition process. The detail of this will be worked through in the detailed design phase of the project.

The land identified for acquisition has taken this into account and if substantial works are considered likely to retain access this has informed the scale of the land required.

For some of the properties identified temporary access will be required for investigations during the project development phases in the future. These properties will be identified in the next phase of the projects development (design).

It is recommended that this temporary investigative access be obtained as early as possible for any property identified for future acquisition.

3.4 Land Tenure Issues

This assessment has not been undertaken at this time due to the route protection nature of this DBC.

4 Compensation

4.1 Base Price Methodology

The AT property team have undertaken the base property cost estimate for eight package projects on behalf of SGA. This section of the Property Strategy outlines the methodology adopted by the AT property team in developing the base property cost estimate.

The level of information provided by SGA to AT to inform the base cost estimate is commensurate with the business case, which is for NoR route protection purposes. Unlike traditional detailed business cases, the implementation dates for the Drury Local programme of works are within the next 10-30 years.

The inputs provided by SGA to AT, consisted of maps showing indicative permanent and temporary land requirements for the eight package projects and supporting data identifying the affected properties on a property by property basis. The inputs provided by SGA at this stage did not include detailed investigation of property impacts, for example, topographical and geotechnical impacts.

Informing the base cost estimate are the following assumptions:

- New arterial roads are planned as well as widening of existing roads to form arterial standard roads. For arterial road corridors, the full arterial road width has been included, notwithstanding the land acquisition programme may be developer led with developers providing the local corridor width at no cost. This reflects the need for the full arterial road corridor width to be within the proposed NoR boundary. There are limited exceptions within the base cost estimate. One where AT has already acquired the additional arterial road corridor width and it is excluded from the base property cost estimate. Two properties, where AT has included the full arterial width, but noted the need for adjustment as the additional arterial width has already been acquired.

- It is assumed the land acquisition programme will be developer led within the Future Urban Zone (FUZ). Generally, given the long-term route protection, the majority of the batters have been included within the temporary occupation area rather than the permanent acquisition area, within the FUZ, as it is expected development will be built up to the road boundary.

- The prospect of zoning changes and specifically future urban land being structure planned or planned change and the timing of these processes relative to any route protection forms part of the additional analysis undertaken by SGA.

Figure 4-1 shows the type of property acquisition by individual project. This confirms the majority of acquisitions are either partial or temporary, with very few full acquisitions envisaged.

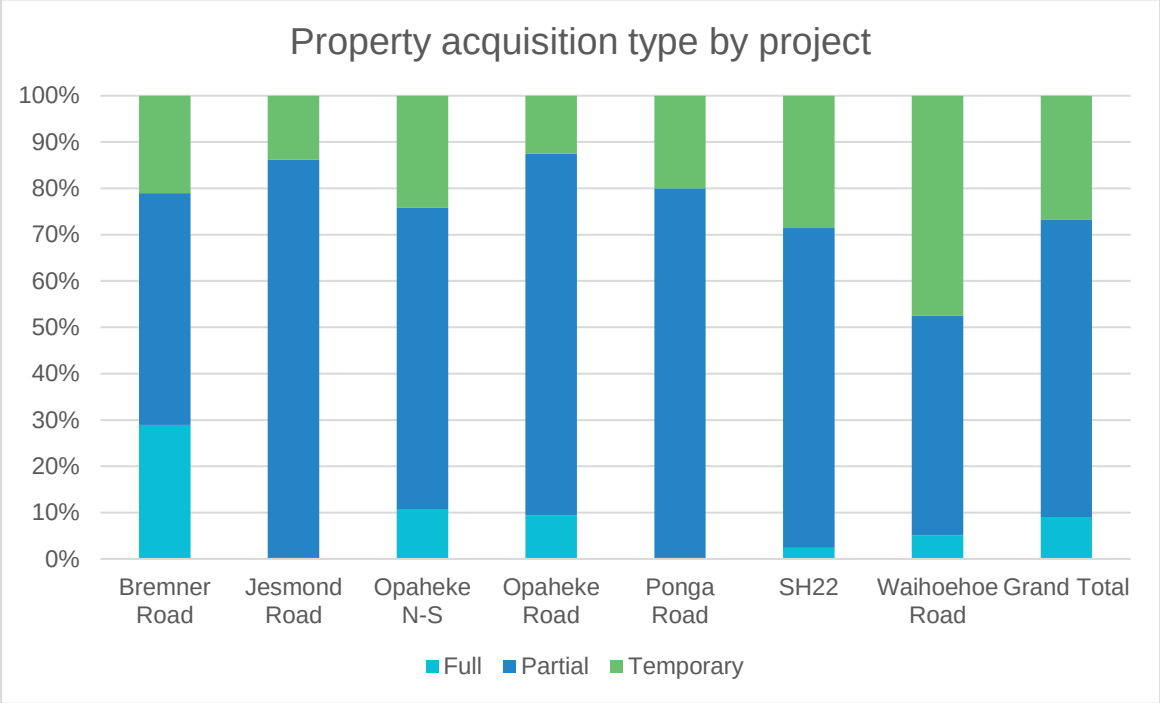
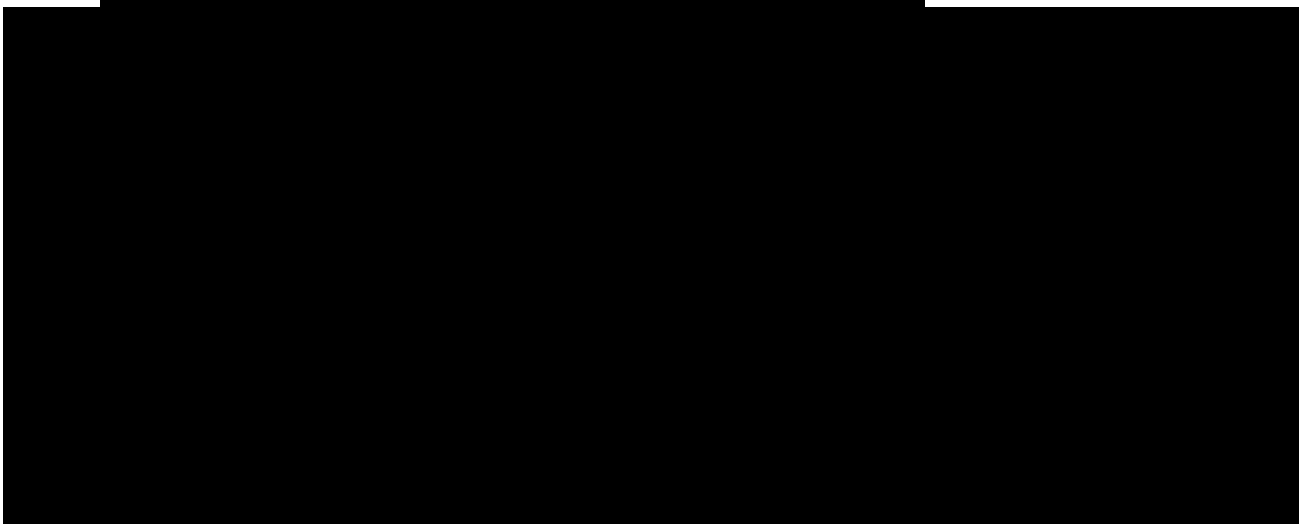


Figure 4-1 Property acquisition type by individual project

[redacted]

[redacted]



- PWA cost estimates have been assessed and included on a property by property basis. These include:
    - section 72 PWA costs.
    - section 66 PWA costs allowing for the issue of section 18 PWA Notices of Desire, if required.
    - costs of acquisition including legal and valuation costs and staff time. This also allows for the issue of section 18 PWA Notices of Desire, if required. The base cost estimate does not include the cost of using external acquisition service providers.
    - The upper end of the section 66 PWA and estimated costs of acquisition has been adopted for each acquisition type. Across the whole land acquisition programme, the methodology adopted is reasonable for the required level of input.
    - The original base cost estimate provided to SGA excluded costs associated with stage two of the PWA compulsory acquisition process and LVT proceedings.
    - A subsequent assessment of the overall programme, estimated an allowance for stage two PWA compulsory acquisition and LVT proceeding costs on an aggregate basis based on the following assumptions:
        - That PWA compulsory acquisition processes will be part of the Land Acquisition Strategy approved at the implementation stage.

[redacted]

- An assessment has been undertaken to determine the appropriate contingency to apply to the PWA cost component of the base cost estimate. Taking into account historical averages overtime and potential variability, the contingency applied to the PWA cost components has been assessed at 15%.
- At the request of the AT property team a contingency of 15% has been added to the Stage Two PWA and LVT cost component by SGA.

- The base cost estimate excludes existing legal road areas that are already in AT/Council ownership.
- Where properties are included in more than one package project, this has been specifically noted and only counted once.
- Various other cost elements, that are a cost to the physical works budget have also been identified. These form part of the contingent project liability addressed at Section 10. [redacted]

4.2 Base Property Estimate

The total property interests and base property estimates provided to SGA by the AT property team for the eight package projects listed is [redacted] including a 15% contingency.

SGA has removed the contingency figure and is relying upon the P50 estimate, which reintroduces this contingency. [redacted]



The total base property estimate, using the methodology outlined above, as at present dollar value for the eight package projects provided to AT by SGA is [redacted] excluding land cost contingency and PWA cost contingencies and annual temporary occupation rental. The temporary occupation costs are shown separately as annual costs.

As noted earlier, the original base cost estimate provided to SGA excluded costs associated with stage two of the PWA compulsory acquisition process and LVT proceedings.

4.3 Stage Two PWA and LVT Cost Estimate

To the base property estimate above, AT then added an allowance of $6.695 million to the overall acquisition programme for the estimated section 23 and 26 PWA and LVT proceeding costs and prorated this figure between the projects, refer table 4.3.

4.4 Expected and P95 Property Costs

To the resultant increase in the base estimate figure from [redacted], a contingency based on the assessed risk profile is added. This is done in two parts, a contingency to identify the expected estimate, or P50 and then a further contingency to identify the P95 cost.

4.4.1 Expected (P50) Costs

An assessment was undertaken by the AT property team of the likely property risk. This resulted in a 15% contingency being added firstly, to the land cost component of the base estimate, and secondly, to the PWA cost component of the base estimates for all projects, as summarised in Table 4-1. In addition to this, a 15% contingency has been added on the Stage Two PWA and LVT cost estimate, which the AT property team provided to SGA after the original base estimate.

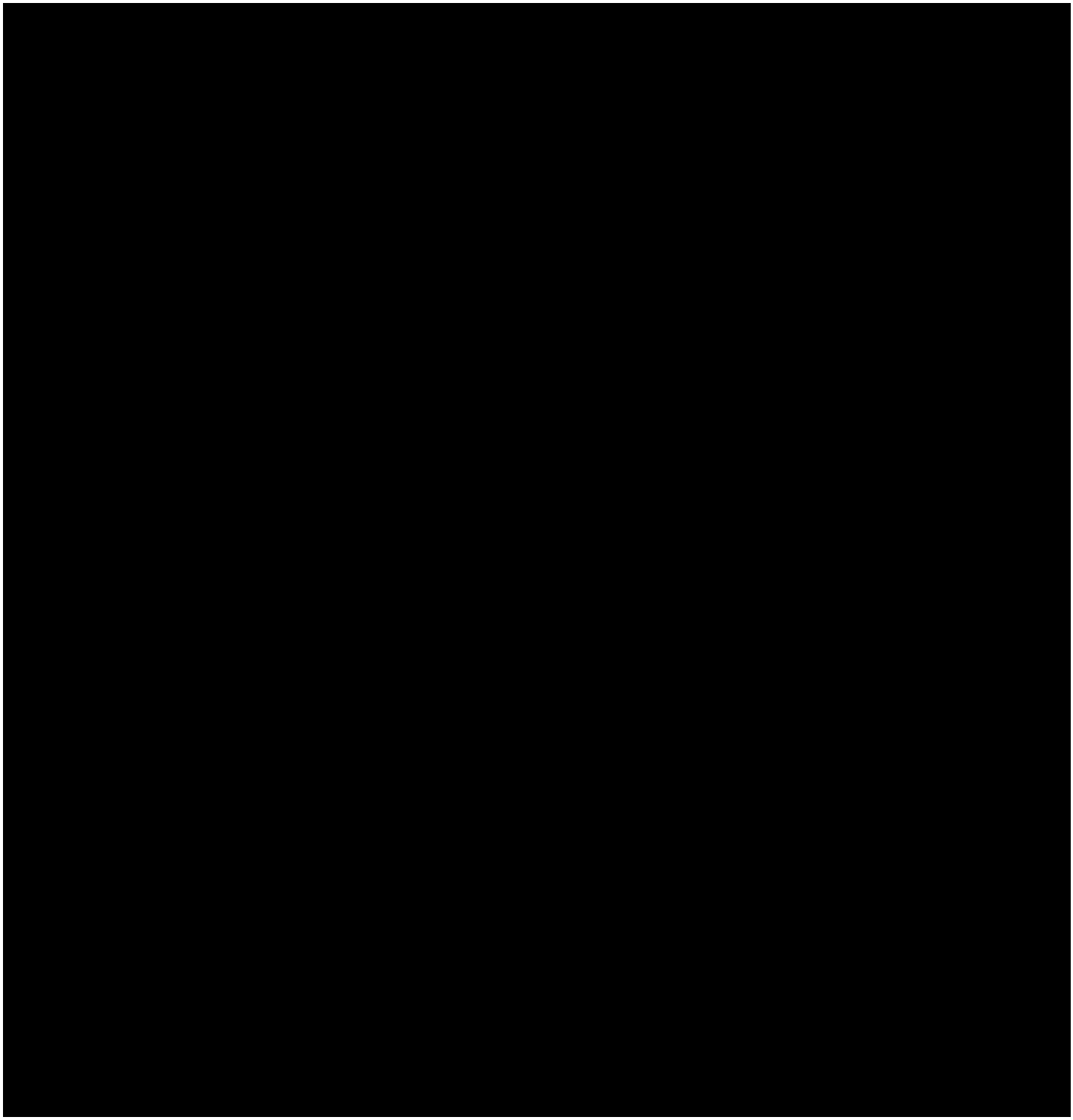
Risk	Percentage	Rationale
Base land cost estimation	0% - 30%	Injurious affection assessment as per the risk matrix in Table 4.1
Land cost estimation contingency	15%	Makes allowance for the lack of investigations (eg topographical and geotech), high-level design, and the depth of market and level of available sales evidence.
PWA costs (S66 Disturbance, S72 and acquisition costs)	15%	Allowance above historical averages for individual and future variability.
Stage Two PWA and LVT cost estimate contingency	15%	Allowance above historical averages for individual and future variability.
Annual Temporary Occupation Rental	15%	Makes allowance for current level of analysis into the level of temporary occupation required.

Table 4-1 : Expected estimate (P50) risk breakdown

4.4.2 P95 Contingency

For the P95 contingency a further 20% has been added to the Expected Estimate (P50) contingency. This is based upon the detailed risk modelling (consistent with SM014) undertaken for the capital costs of each project in the programme and takes into account the risk profile accordingly. This approach is considered appropriate as it takes into account the increased risk profile of the projects to get to a P95 and is consistent with the CAPEX costs and approach.

4.4.3 Summary



5 Package property acquisition approach

5.1 NoR with Contemporaneous Purchase

[redacted]

5.2 NoR with Future Purchase

[redacted]

6 Future Property Appreciation

6.1 Challenges of appreciation in long term growth areas

Unlike contemporaneous purchase, the NoR does not freeze all the land value inflation of the underlying land. Once the NoR is lodged, the Requiring Authority has 'control' over what happens within the land the NoR overlays, so that nothing is done within that area to prevent or hinder the public work.

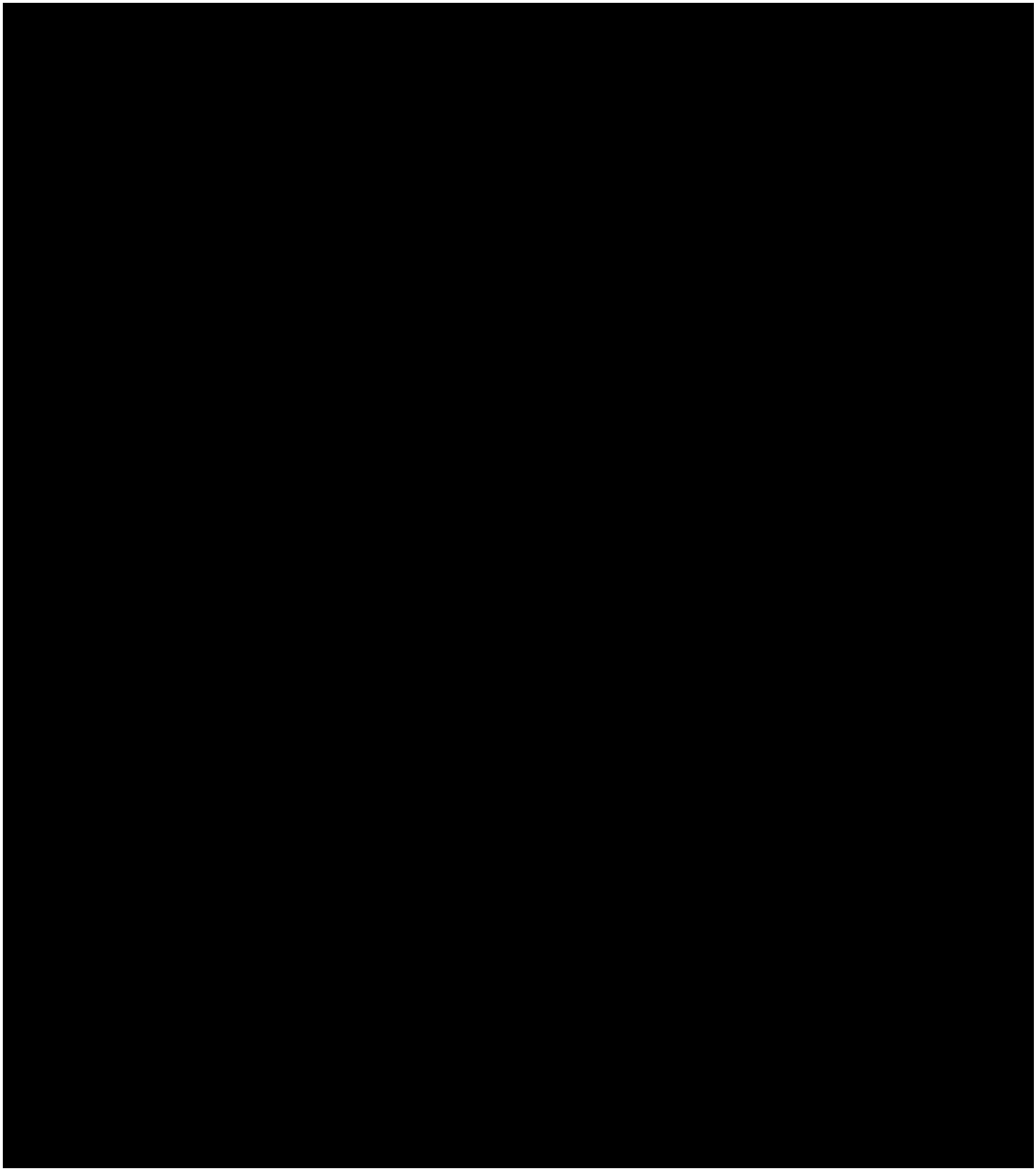
While the NoR does prevent physical/capital development of the land the NoR overlays, and therefore any inflation arising from that, it does not completely freeze the value uplift. From a PWA perspective, the value of compensation paid is assessed as at the date it is purchased and is evaluated with reference to surrounding comparable land values.

6.2 Risk Profile

At a macro level the dynamism of the surrounding land-use changes will have an impact as this will result in land value appreciation. Route protection will occur over a range of land zonings, each with different potential for land value inflation.

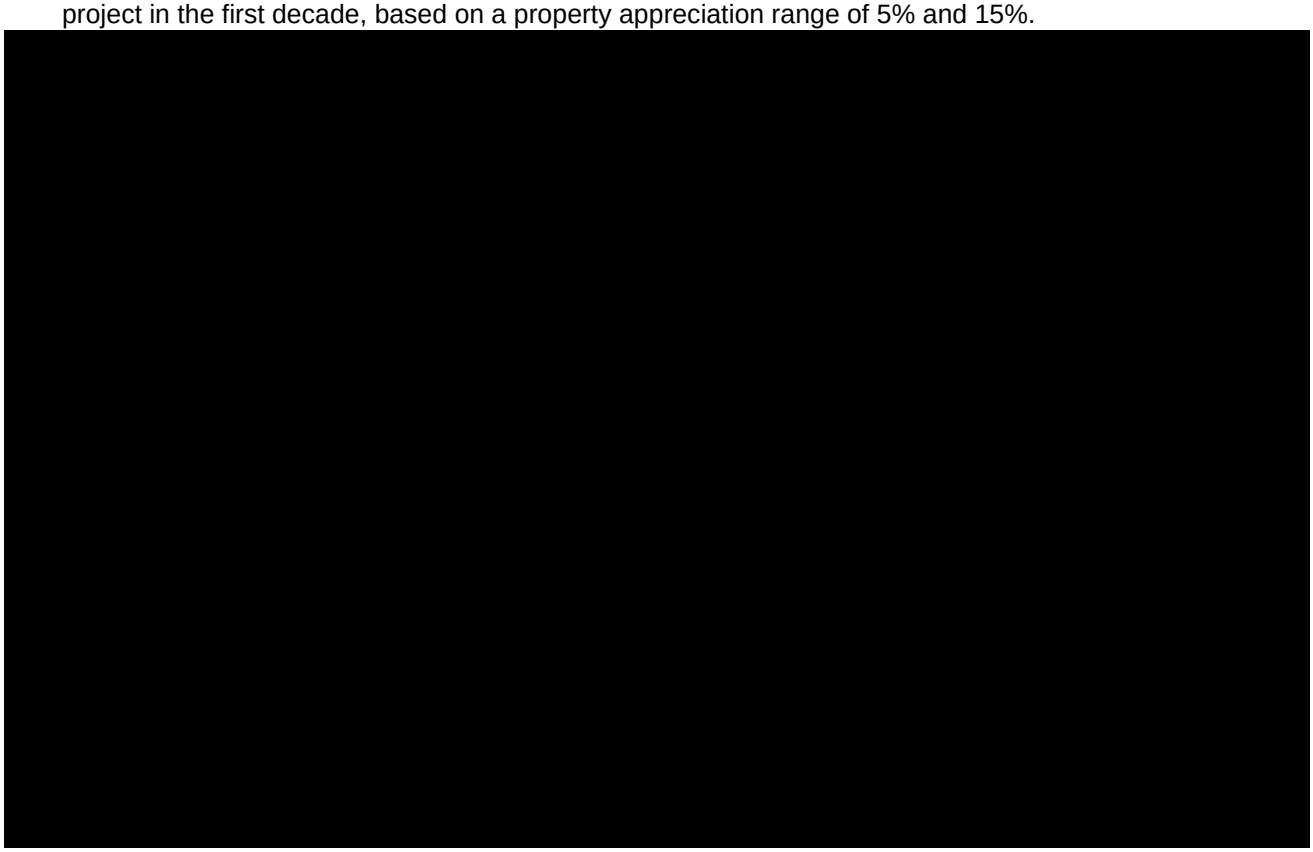
Areas that have the least potential for change to a more intensive zoning will have the least potential for land value inflation. For example, those with a current urban or rural zoning that will remain the same or similar over the project period will only be subject to inflation at the rate standard for that land-use class.

6.3 Risk Analysis



[4] Compounded year on year rate

Error! Reference source not found. below summarises the range of estimated property liability by project in the first decade, based on a property appreciation range of 5% and 15%.



We acknowledge this approach is simplistic. We have therefore sense checked this approach by looking at individual property types and understanding from the AT property team, what their experience has been in similar situation. This consideration identified that the appreciation rates applied would be appropriate over time, however when land use zoning actually changes, there would be a noticeable spike in land prices in the 1-3 year period after this zoning change.

However, over the 30-year time horizon of this long-term route protection approach, the more simplistic approach is considered appropriate. This has given us confidence that the medium scenario gives an appropriate estimate of likely appreciation and the high scenario adequately catches a potential upper bound.



These are significant costs and represent the total property acquisition costs.

There is an opportunity to work with the developers in the area to reduce these costs (as has been done elsewhere in the Supporting Growth programme) through property being provided as part of wider infrastructure agreements (such as funding agreement of actual infrastructure). To enable this opportunity to be maximised, having a designation in place facilitates these discussions occurring and increasing the chance of the opportunity being realised.

SGA has estimated these potential savings in the order of 12% of the total property cost, or [redacted] for the medium appreciation figures (for the 95th percentile numbers). This 12% figure was developed by SGA based on the likely contribution to the collector road component of a full arterial alignment resting with the developer.

7 Early Acquisition Liability

In addition to the future property appreciation risk, implementing a route protection strategy that aligns implementation of the property acquisition programme with future project delivery that is programmed in future decades, creates:

- the need for the Requiring Authority to respond to demand for early property acquisition;
- an obligation to acquire the protected land in some instances under section 185 of the RMA.

[redacted]

7.1 Demand for Purchase of land with NoR in place

The timing of the demand for early purchase of land within the protected route will be driven by both the individual landowners' various land-use decisions and the anticipated construction date. This assumes the NoR is in place.

To a significant degree the proposed network is located within the RUB, either areas that already have a FUZ or an urban zoning.

The majority of the land that will be subject to any NoR protection is not expected to generate a high level of demand for early purchase acquisition (i.e. substantially prior to the normal purchase timeframes leading up to project implementation). Some strategically important sites have been identified.

These owners have now had over 5 years (the draft AUP was first notified for comment in March 2013) to adjust their expectations of urbanisation in this area.

[redacted]

Over the life of the route protection (NoR) at various points individual land-owners will want to change the land use, or for business or lifestyle reasons, want to dispose of the land.

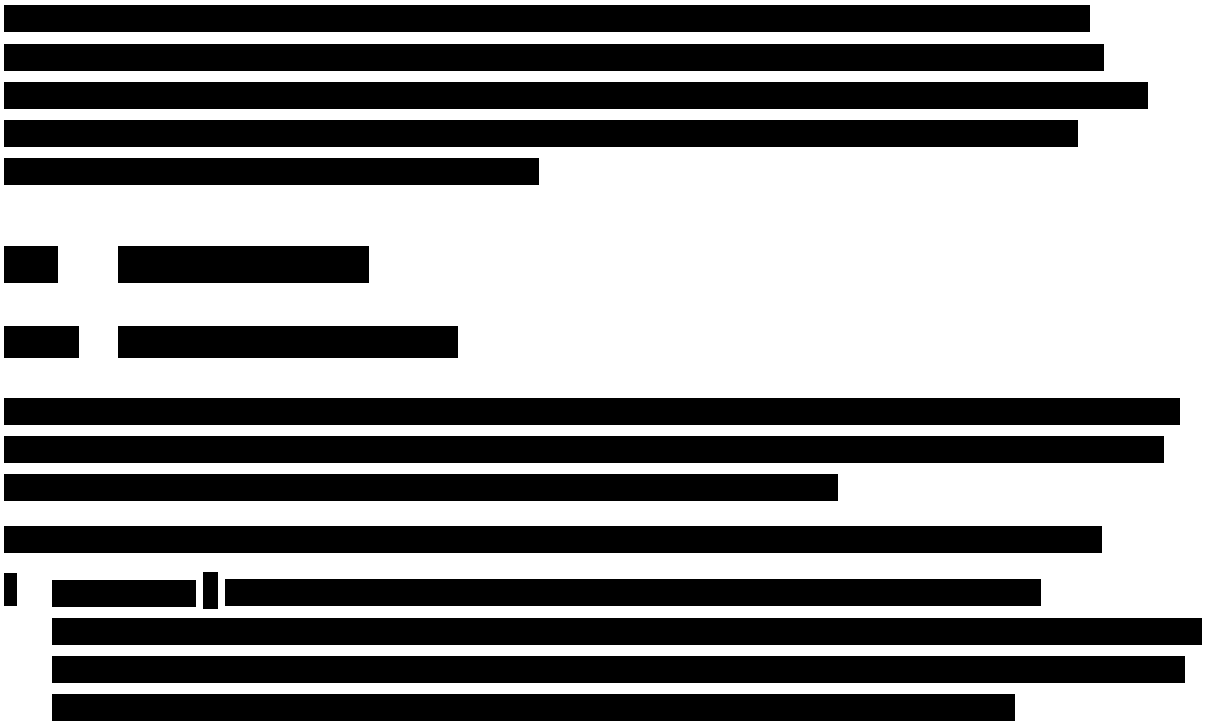
[redacted]

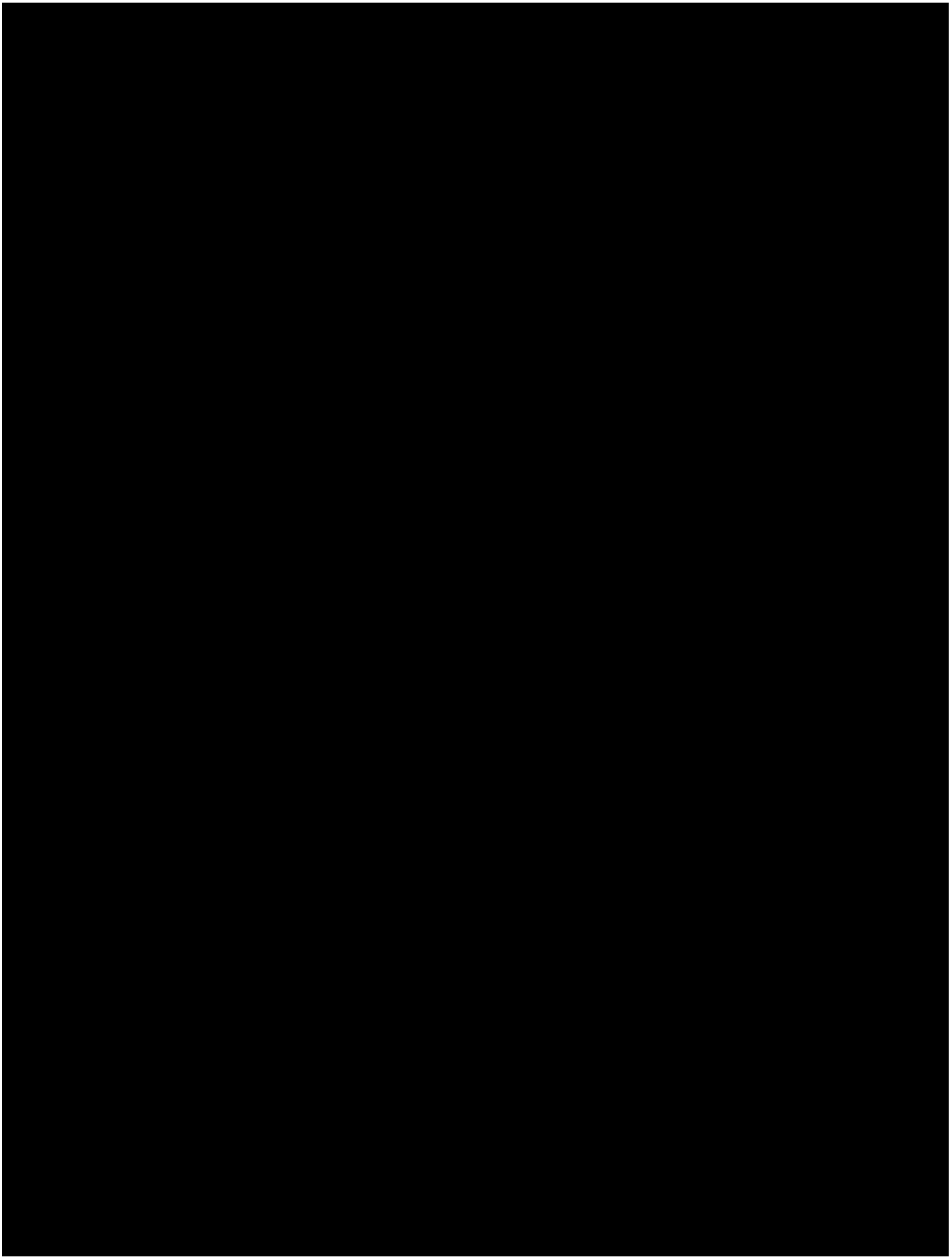
[redacted]

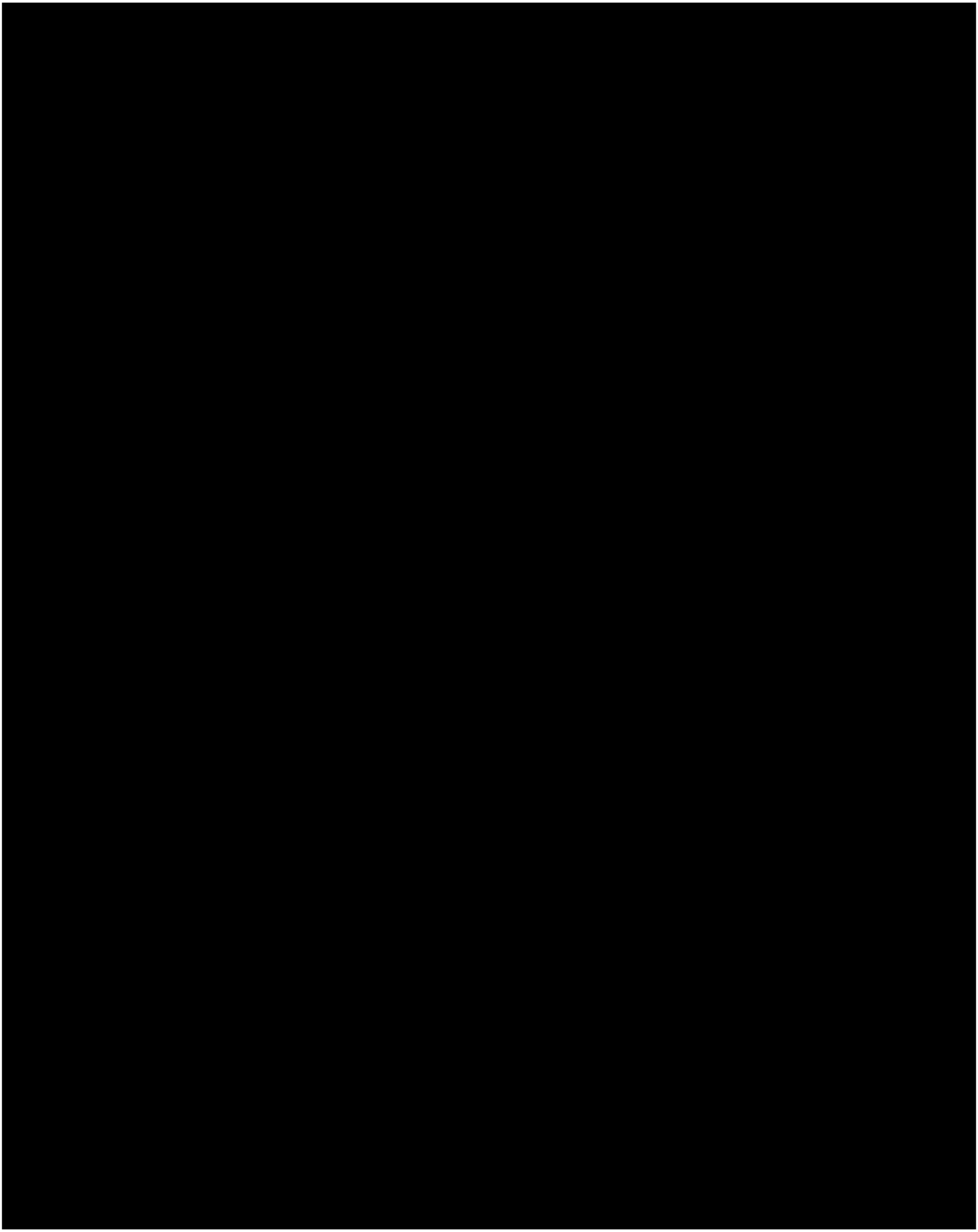
Again, we note the majority of properties in this programme are partial purchases.

7.2 Section 185 RMA Purchase Obligation

Requiring Authorities can be compelled to purchase route protected land pursuant to s185 RMA. Section 185 allows an owner to apply for an order obliging the Requiring Authority to purchase the land in certain circumstances. The Environment Court is empowered to make such orders, where the owner establishes that they have been unable to sell their property at the same value they could have if the property was not subject to the NoR. If the landowner was not the owner when the NoR was placed on the property, they also have to establish the NoR prevents their reasonable use of the land.







7.4 Early Acquisition Approach

Both Agencies have guidelines for managing early acquisition of property in advance of the project implementation phase, and in particular clarify the criteria and outline decision making processes for assessing each early acquisition on a case by case basis.

These guidelines anticipate the s185 process but are a less formal negotiated process. The process takes into account personal circumstances and recognises the NoR may have a blighting impact on property.

[redacted]

[redacted]

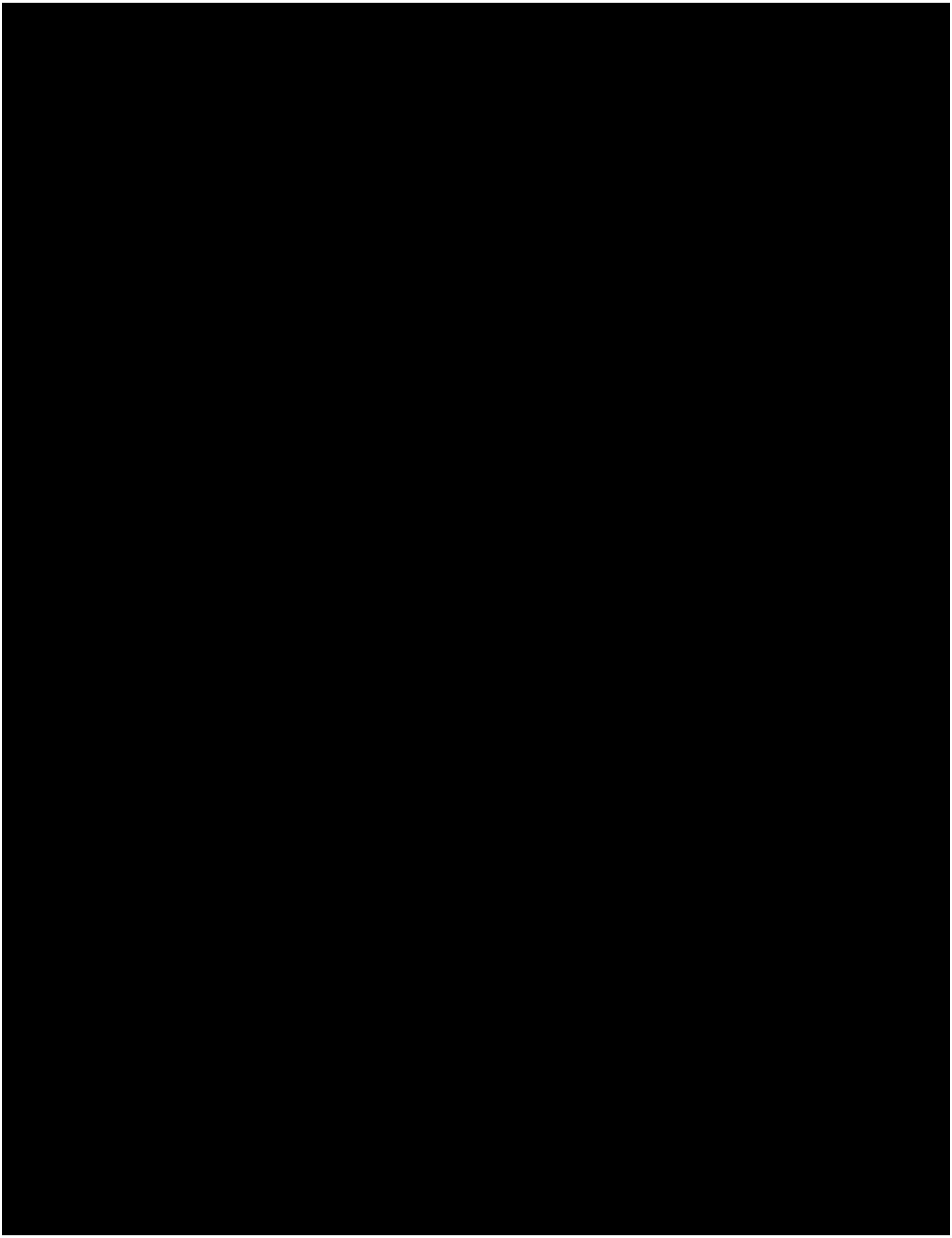


[redacted]

8 Potential Implications on Acquisition Cashflow

The section outlines the estimated annual property cashflow forecast between commencing the RMA designation processes and when the future project is programmed for delivery.

[redacted]



9 Ongoing management

9.1 Ongoing property management

Both Agencies have comprehensive processes and teams dedicated to the ongoing management of properties once purchased. It is assumed that these existing processes will be used to manage properties, where required. With only 5% of the total acquisition plan being full purchases the ongoing management is somewhat reduced.

[redacted]

As well as the above issues, where applicable, there are the standard issues that will require attention, including:

- Healthy Homes – There will likely be a need to comply with the latest legislative requirements for rental properties, including insulation, heating and draft (windows) management
- Asbestos – There maybe asbestos in some of the properties that will require removal.

The standard approach of the Agencies in the testing, implementation and ongoing management of these issues (and any others) would be used.

[redacted]

9.2 Disposal

As no significant acquisition plan is forecast in the short term, this has not been addressed in this document and will need to be addressed closer to implementation and as part of the Implementation DBC and resultant property approach.

10 Contingent Project Liability

Various other cost elements, that are a cost to the physical works budget have also been identified including:

- [redacted]
- An annual temporary occupation rental, subject to adjustment by the project team to reflect the assumed construction duration;
- The risk of potential business relocation and business loss PWA claims. [redacted]
- Cost of reinstatement works;
- [redacted]
- Demolition and relocation of improvements to enable the works construction. Where applicable, estimated QV Costbuilder rates have been provided;
- Mitigation, where possible, of the potential effects of road construction, noise, dust and privacy issues etc.

11 Key Initiatives

11.1 General

There is considerable uncertainty around the property costs given the size of this programme (and the wider SGA programme) and therefore to best manage this uncertainty and minimise the contingent liability expenditure as much as possible until projects are implemented the following is proposed:

- Joint governance
- Appropriate resourcing
- Developer Agreement

11.2 Governance

It is recommended that a joint property focussed decision making group be set up with a representative from each partner organisation. The purpose of this is that whilst individual property acquisitions will be managed on a day to day basis by the appropriate road controlling authority, overall joint governance is required to ensure that consistency of approach and priorities is maintained.

This joined up approach will provide increased certainty of outcome for all and a consistent approach across the programme.

11.3 Resourcing

There needs to be dedicated resource of at least one person from each partner organisation who are focussed on the identification, acquisition and enhancement of strategic properties. There is a real risk that without this dedicated resourcing that a property specific approach in isolation is taken rather than an all of programme view. This will ensure that there is consistency in approach and issues will be addressed early and hopefully this will result in acquisitions only occurring when absolutely necessary.

The wider SGA programme is also seeking a dedicated resource form each organisation and this role (for Drury Local) would be part of this overall programme resourcing rather than additional.

11.4 Developer Agreements

Focussing on getting alignment of various plan changes will assist in identifying infrastructure priorities. This will clarify the need for early and comprehensive developer agreements, particularly with the significant developers in the area, to assist an acquisition programme and cashflow phasing.

11.5 Wider Supporting Growth Property Management

It is also important to outline that the SGA Programme Wide Property Strategy sets out a number of initiatives to effectively manage the significant acquisition programme of the route protection approach. These are currently being considered and this Property Strategy is consistent with the

aspirations of these wider approaches if successful.

12 Resource Consent and Public Consultation

12.1 Engagement

As part of this DBC's development, engagement on options (and the recommended option) has been undertaken with the community and affected property owners. The property owners are aware their project is likely to be impacted. A summary of the outcomes of this engagement can be found in the engagement section of the DBC.

The next stage is for the designation to be sought for these projects. This will require further community engagement, and in particular, discussion and engagement with affected property owners.

12.2 Consents

Route protection for this package will be sought through the application of a designation for the new roads and widening identified. This is due to be lodged in early 2021. Resource consents will not be sought at this time, with these currently proposed to be obtained on an individual project basis closer to the time of implementation.

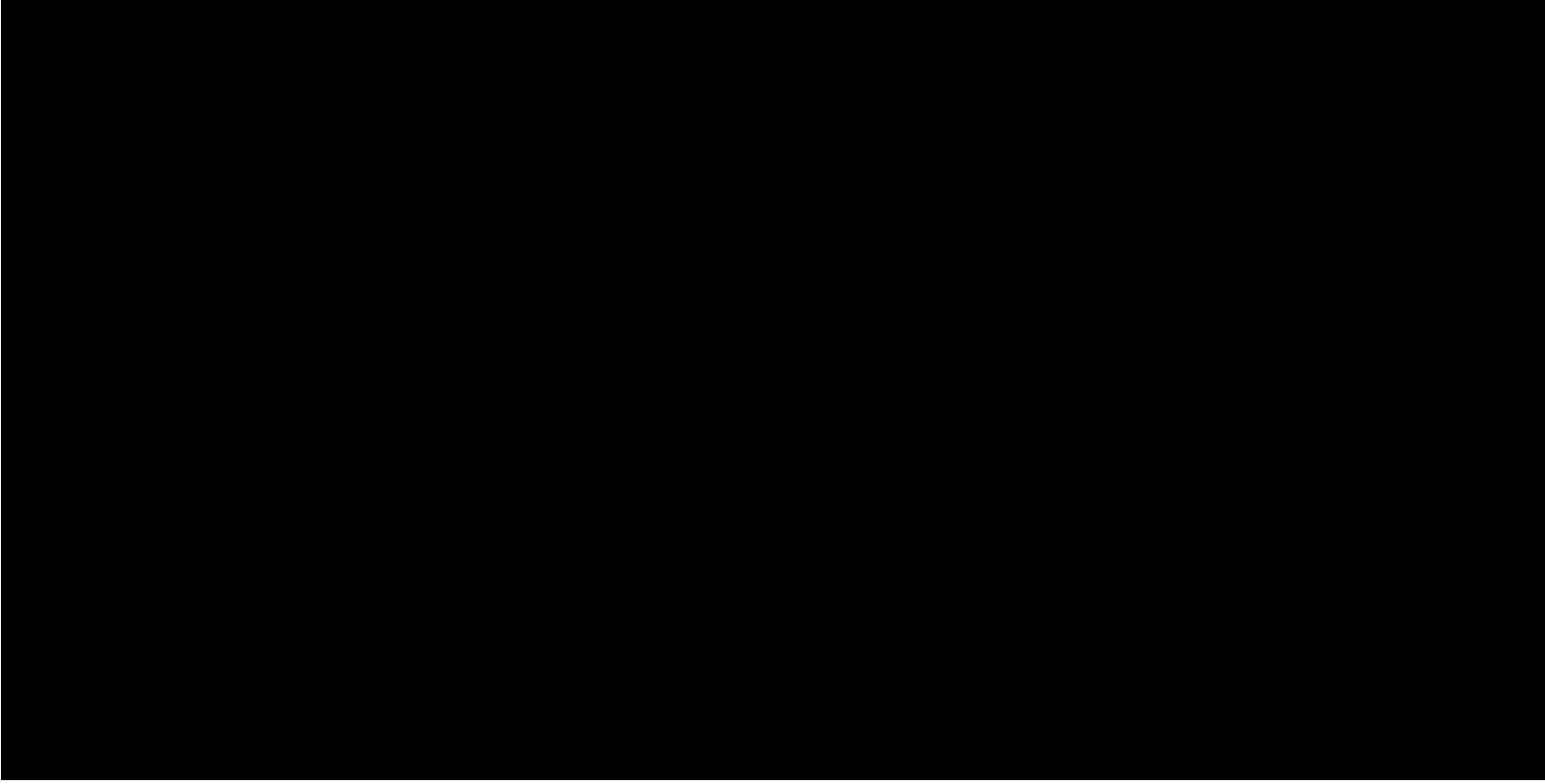
13 Recommendations

This programme is focussed on route protection. Uncertainty therefore remains as to the exact timing of the property acquisition needs of the projects until implementation is confirmed.

[redacted]. To appropriately and proactively manage this risk and uncertainty, it is recommended that during the projects development the following occurs:

- The Implementation DBC reconfirm the property cost and requirements as design confidence is further developed.
- Any changes in design avoid the need for minor land requirements.
- Value engineering is undertaken to minimise the land required for projects.
- Detailed property valuations are undertaken closer to implementation.
- Agreements with developers are progressed and ‘locked in’ as soon as possible to try and reduce the total property costs of the programme. This requires the commitment of funding to enable agreements to be advanced.

Appendix A – Original Base Property Cost Details



Appendix B: Assumed Acquisition Profiles

[redacted]

[redacted]



[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]



[redacted]

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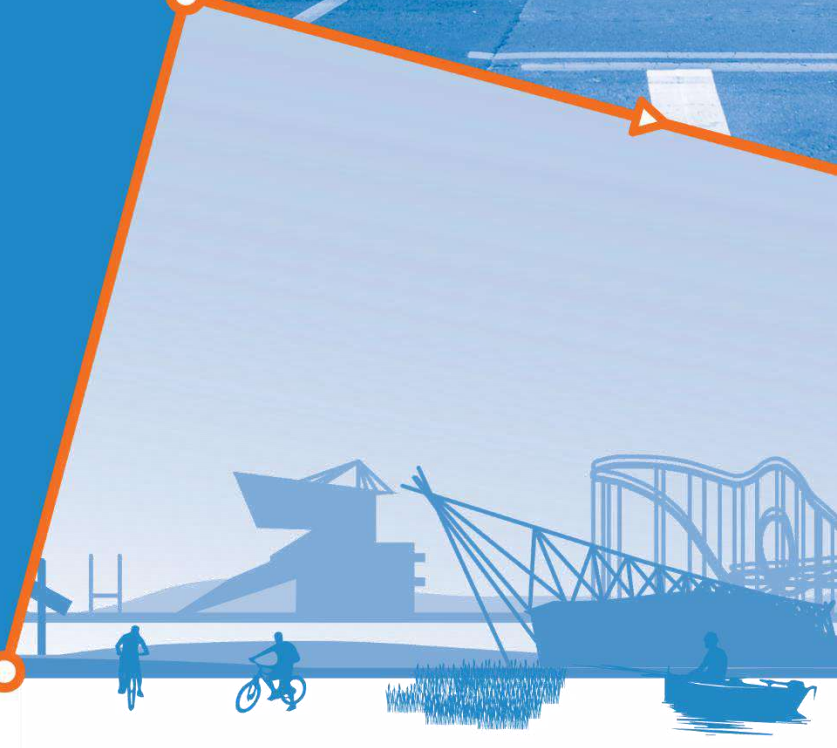
Supporting Growth

Drury Local DBC Route Protection Strategy







Version 4.0

July 2020

TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

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3.0	07 July 2020	Final Draft for review
4.0	31 July 2020	Final

Disclaimer

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

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Appendices

Appendix 1. Programme Wide Technical Guidance Note – Route Protection Strategy

Acronyms

Acronym/Term	Description
AT	Auckland Transport
AUPOIP	Auckland Unitary Plan Operative in Part 2016
DBC	Detailed Business Case
DoC	Department of Conservation
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
IBC	Indicative Business Case
IFA	Infrastructure Funding Agreement
MoE	Ministry of Education
NIMT	North Island Main Trunk
NoR	Notice of Requirement
N-S	North-South
NZUP	New Zealand Upgrade Programme
PWTG – RPS	Programme Wide Technical Guidance Note – Route Protection Strategy
RMA	Resource Management Act 1991
SH1	State Highway 1
SH22	State Highway 22
SHA	Special Housing Area
THAB	Residential - Terraced Housing and Apartment Buildings Zone
The Act	COVID-19 Recovery (Fast-track Consenting) Act 2020
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

This document provides recommendations as to prioritisation, packaging and preferred planning mechanism to achieve route protection for all components of the recommended transport network for the Drury Local Detailed Business Case (DBC) as part of the Supporting Growth Programme. The agencies responsible for the programme are Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi). This route protection strategy has been prepared in accordance with the methodology set out in the '*Programme Wide Technical Guidance Note – Route Protection Strategy*' (PWTG – RPS) which is attached as Appendix 1 of this report.

The recommended transport network for the Drury Local DBC includes the following Projects:

- State Highway 22 (SH22) Arterial Upgrade
- Jesmond Road Frequent Transit Network (FTN) Arterial Upgrade
- Bremner Road FTN Arterial Upgrade
- Waihoehoe Road West FTN Arterial
- Waihoehoe Road East Arterial Upgrade
- Opāheke North-South (N-S) FTN Arterial
- Ponga Road Arterial Upgrade
- Opāheke Road Arterial Upgrade (rural)
- Opāheke Road Arterial Upgrade (urban).

The structure of this report is as follows:

Section 2 – Methodology: How the programme wide route protection methodology has been applied to the Drury Local DBC.

Section 3 – Corridors for Route Protection: An overview of each project including its planning context.

Section 4 – Route Protection Evaluation: Evaluation of the route protection mechanisms which are being considered taking into account the planning context, known risks and opportunities and other relevant considerations for each of the recommended options.

Section 5 – Packaging and implementation: Recommendations for the delivery of the recommended route protection strategy.

Section 6 – Conclusion: Overview of the key recommendations of the route protection strategy.

2 Methodology

The Drury Local DBC team has developed a route protection strategy for the Recommended Transport Network by applying the methodology in the PWTG – RPS. This route protection strategy should be read in conjunction with the PWTG – RPS. Where appropriate reference is made to the Auckland Unitary Plan Operative in Part (AUP OIP) as the relevant plan for the area under the Resource Management Act 1991 (RMA).

2.1 Route Protection Mechanisms

The integrated transport system to support Auckland's urban growth relies on a broad suite of interventions that will be delivered by different national and local agencies. One component of effective delivery of the system is the identification of physical corridors within future urban growth areas. Initial confirmation of these transport corridors is important for a number of reasons, including the contribution this can make to urban form and the certainty this can provide for infrastructure investment in the future.

As a summary, the different 'layers' or stages of corridor identification provide different levels and opportunities for 'route protection', ranging from the provision of transparency in the form of identified corridors, to the shaping of planning provisions that recognise these corridors and ultimately to acquisition or designation of corridors for construction purposes (Figure 2-1).

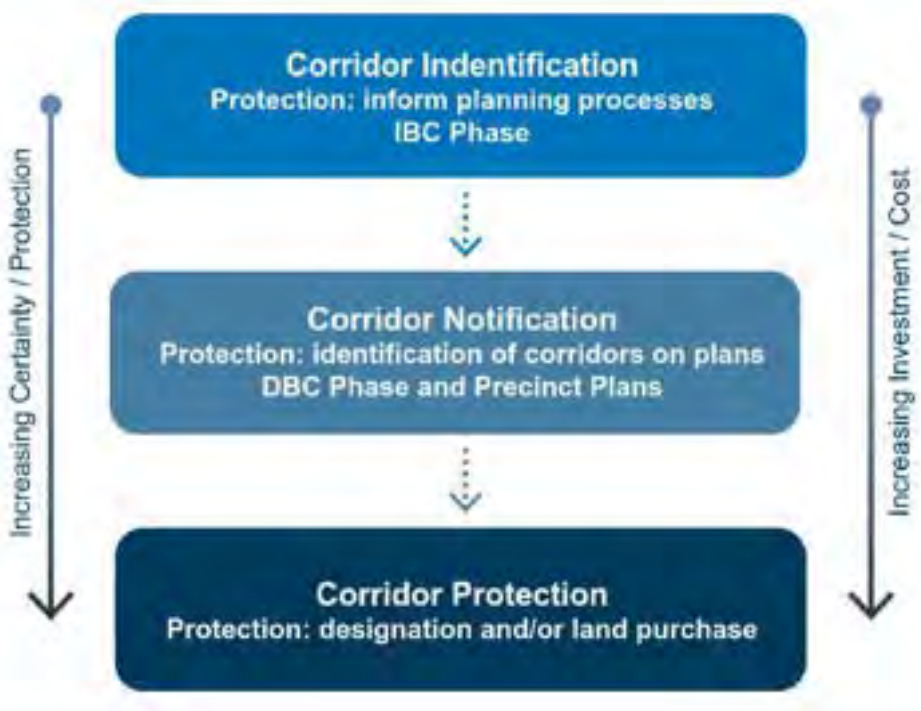


Figure 2-1 The stages of corridor identification and route protection

While all the phases of corridor development provide some level of 'route protection' it is important to recognise that the later stage (corridor protection) results in the highest form of statutory protection. Furthermore, while some instruments such as Precinct or Zone provisions may provide a level of corridor identification (which can assist in the protection of corridors but is always vulnerable to

adverse resource consent decisions), only a designation will enable potential construction and operation of the corridor.

The PWTG – RPS provides an overview of the route protection mechanisms which are being considered by the Supporting Growth Programme. Whilst route protection is a key next step for much of the recommended programme, not all components within the recommended network require route protection. Projects with no requirement for route protection will follow typical project development pathways and given the scope of the Supporting Growth Programme will likely be progressed by owner organisations. For projects requiring route protection, layers of protection (described above) may mean that some projects may derive significant benefit from the earlier indicative levels of corridor protection. As such, other delivery mechanisms may be appropriate to deliver a number of components in the recommended network.

Strengths and weaknesses of route protection mechanisms (identified in Figure 2-2) were assessed as part of the PWTG – RPS. With specific reference to the Drury context, the strengths and weaknesses are summarised below in Table 2-1.



Figure 2-2 Route Protection Mechanisms

Table 2-1: Possible route protection and consenting mechanisms

Mechanism	Summary of strengths and weaknesses within local context	Considered
Designation	A Notice of Requirement (NoR) to designate land for a public work under the RMA provides a strong level of route protection particularly where development pressure is anticipated along the corridor. A NoR has interim effect as soon as the notice is lodged with Council. In accordance with s176 of the RMA, a designation, once confirmed in a district plan, prevents activities which would hinder the purpose of the designation (without prior written consent of the requiring authority). A designation also provides the authorisation to undertake the works in accordance with the designated purpose as they relate to s9(3) of the RMA. A designation is appropriate to protect land for the designated purpose. The designation may result in the need to purchase properties earlier than anticipated (in advance of construction) pursuant to section 185 of the RMA exposing Requiring Authorities to financial cost from lodgement. The Drury Local transport network impacts a high number of properties and multiple developers are active in the area.	

Mechanism	Summary of strengths and weaknesses within local context	Considered
	For the purpose of this route protection strategy, two "types" of designations have been considered dependent on the level of detail and certainty available at the time of preparing a NoR: **Designation for route protection:** This is intended to provide immediate protection of proposed corridors while maintaining design flexibility. This is achieved through designation conditions which require additional assessment and design be provided prior to any works commencing. This may be appropriate for the Drury projects as construction of the Drury Local transport network is not anticipated in the near future (due to lack of funding and timing uncertainty) and detailed design will not be available during the preparation of the NoR. Using this approach to designating land, there is risk that Council/Court could be uncomfortable with the level of uncertainty and of information provided to support route protection approach. An 'envelope of effects' is common in these circumstances to provide more certainty whilst retaining some flexibility. **Construction Ready Designation**: A higher level of assessment and design detail is anticipated to be provided as part of the NoR to enable a more streamlined approval process. This is however generally at the cost of less design flexibility following the NoR process. Regional resource consents would likely also be obtained in parallel to enable the construction of the project once the designation is confirmed and resource consents granted. Given the Drury Local transport network is not anticipated to be constructed immediately in the future due to unconfirmed funding for the projects, flexibility in the design is preferred as the expected construction timeframe has yet to be determined.	**Yes –** Designation for route protection **No –** Construction Ready Designation
Alteration to existing designations	Where existing transport designations are available these may be altered under the RMA to provide for the recommended network. As SH22 is the only corridor within the Drury Local transport network that has an existing transport designation, there are limited opportunities to rely on this mechanism. Strengths and risks are similar to those of designations above. However, an alteration to designation only looks at effects of what is being proposed above and beyond the existing designation, therefore the effects assessment is generally limited to the changes proposed.	**Yes** – SH22 only
Landowner/ developer negotiation	Infrastructure Funding Agreements (IFA) are the preferred form of landowner/ developer agreement to enable the delivery of transport infrastructure. IFAs can provide route protection where a developer is able to agree to design and implementation of a project. Where there are numerous landowners and/or developers, IFAs may be problematic as a route protection mechanism due to the added complexity of negotiating with numerous parties, who may have differing timeframes, expectations and priorities. Additionally, it is also not compulsory for developers to enter into IFAs if sought by infrastructure providers. Developers in the Drury area are actively seeking plan changes to bring forward the development of the future urban zone (FUZ). There is opportunity to enter IFA's with developers therefore, this mechanism is assessed further in this document. This opportunity only exists for some portions of the Drury Transport Network where developers are active. These areas include Drury East and Drury West.	**Yes**

Mechanism	Summary of strengths and weaknesses within local context	Considered
Plan Change/ Structure Planning Process	Small areas of the Drury Local transport network area are zoned for development in the AUPOIP including on Bremner Road, Jesmond Road and Opāheke Road. The Drury 1 Precinct and Opāheke 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 zoned Future Urban Zone (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-Opāheke Structure Plan was completed by Auckland Council in August 2019. This covers the majority of the Drury Local transport network. The Structure Plan shows the Indicative Strategic Transport Network from the South Indicative Business Case (IBC). The Drury Local transport network generally aligns with the network shown in the Structure Plan. While this signals the intent of the transport network in Drury, the Structure Plan has no formal statutory weight. The Structure Plan will inform private and Council initiated plan changes to change the zoning of the FUZ. If Council advances plan changes, there may be opportunities to work with Council to provide a level of protection of the corridors. Private plan changes are starting to be 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, there may be opportunities to negotiate with developers through the plan change process to identify corridors in those plan changes. Further to private plan changes that have been lodged, developers are actively looking to progress further private plan changes which provide opportunity for negotiations.	**Yes –** FUZ areas only
Legislation/ Statutory document change	The local scale, level of complexity and uncertain timing of the Drury recommended network is not likely to justify legislative intervention at this time. This mechanism has not been considered further in the strategy.	**No**
Unitary Plan 'Corridor Overlay'	The PWTG – RPS identified AUPOIP overlays as the least likely option to achieve route protection. Although it would provide certainty to the community, it would require a plan change to include the overlay and the Council may not accept the approach. Additionally, it would be inconsistent with the approach of the AUPOIP overlays which are focussed on RMA Section 6, 7 and some 5 matters. Therefore progressing a new 'Corridor Overlay' within the AUPOIP has not been considered as a viable route protection mechanism for the Drury network.	**No**
Resource Consents	A resource consent, if granted, is not shown in a district plan and does not provide a mechanism to protect the land not already under the ownership of Waka Kotahi NZ Transport Agency (Waka Kotahi) or Auckland Transport (AT). However, it can be advantageous to also seek resource consents (particularly for construction activities) under the RMA alongside other route protection mechanisms in instances where projects are likely to proceed to construction once route protection is secured. None of the Projects within the Drury Local transport network are funded or planned to be implemented once route protection is secured, therefore resource consents have not been considered.	**No**

2.2 Route Protection Evaluation

Section 4 of this route protection strategy provides recommendations as to the most appropriate form of route protection for the recommended transport corridors. The methodology for undertaking this evaluation is:

1. Review the planning context to identify any constraints or opportunities for route protection.
2. Identify the key risks and considerations which may influence the preferred route protection mechanism.
3. Evaluate the available route protection mechanisms taking into account the planning environment and identified risks and considerations.
4. Provide recommendations for route protection.

Components of the recommended network have been grouped into a route protection package and assigned an urgency of route protection classification. The reasons for grouping components, and for assigning the relevant urgency of route protection to the packages, are discussed in Section 5.

3 Corridors for Route Protection

The following section provides an overview of the corridors for route protection and their planning context.

3.1 State Highway 22 Arterial Upgrade

SH22 will be upgraded to a four-lane arterial standard between the State Highway 1 (SH1) Drury Interchange and the extent of the FUZ between Woodlyn Drive and just past Oira Road. The intersections at Jesmond Road and Great South Road are proposed to be signalised and a roundabout is proposed at Oira Road.

The present day SH22 has a sub-regional and strategic function serving as a key state highway connection between Drury, Glenbrook and Paerata and onto Pukekohe. As the area surrounding the Project urbanises, the future function will become district level as local trips increase and proposed alternate strategic connections (such as the proposed Pukekohe Expressway) replace SH22's strategic function once implemented. It is anticipated in the future the corridor will be transferred from the management of Waka Kotahi to AT.

It is proposed to widen the SH 22 corridor from its current general width of 20m to accommodate a 30m wide four-lane cross-section with separated walking and cycling facilities. Reconstruction of the Ngakoroa Bridge and new and extended culverts is required.

Figure 3-1 identifies the location of SH22 within the context of the AUPOIP zoning.

The project will generally require an additional 10m width for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. The location of widening varies along the alignment (to the north east, south west or widening both sides) to minimise impacts on identified environmental constraints.

Table 3-1 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-1.

Key elements of the planning context which were considered are as follows:

- Waka Kotahi is the requiring authority for Designation 6707, SH 22 along the corridor.
- The existing corridor of SH 22 is generally 20m wide and zoned 'Strategic Transport Corridor' under the AUPOIP.
- Zoning adjacent to the road is:
    - Future Urban Zone
    - Open Space – Informal Recreation Zone
    - Open Space – Sport and Active Recreation Zone
    - Open Space – Conservation Zone



Figure 3-1: SH22 Recommended Option

Table 3-1 AUPOIP Planning Context: SH22

AUPOIP Planning Context: SH22	
Zoning	Open Space – Informal Recreation Zone Open Space – Sport and Active Recreation Zone Open Space – Conservation Zone Strategic Transport Corridor Zone Future Urban Zone
Existing and Likely future environment	For existing open space: low likelihood of change. For the Future Urban Zone: high likelihood of change.
Precincts	Nil
Overlays	Natural Resources: High-Use Stream Management Areas Overlay [rp] Natural Resources: Significant Ecological Area Overlay – SEA_T_530b, Terrestrial [rp/dp]
Controls	Arterial Roads Stormwater Management Area Control Flow 1 [rp] Macroinvertebrate Community Index Coastal Inundation 1 per cent AEP Plus 1m Control Vehicle Access Restriction Control
Transport Designations (existing)	Designations: Designation – 6706, State Highway 1 – Takaanini to Drury, Designations, New Zealand Transport Agency (adjacent to proposed upgrade) Designations: Designation – 6707, State Highway 22: To undertake maintenance, operation, use and improvement to the State Highway network, Designations, New Zealand Transport Agency (the designation proposed to be altered)
Other existing Designations	Nil
Non-Statutory and other Features	Ngakoroa Stream Flood Plains Flood Prone Areas Overland Flow Paths First Gas Transmission Line
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Auranga B2, lodged, not yet accepted by Council • Proposed plan change in Drury West, not yet lodged Te Tupu Ngātahi are not aware of any existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.2 Jesmond Road FTN Arterial Upgrade

Jesmond Road will be upgraded to a four-lane FTN arterial standard between SH22 and the new Jesmond to Bremner Link intersection. The intersections with SH22 and the Jesmond to Bremner link (Auranga Road 1) are proposed to be signalised.

It is proposed to widen Jesmond Road from its current general width of 20m to accommodate a 30m wide four-lane cross-section with dedicated bus/transit lanes and separated walking and cycling facilities. New and extended culverts will be required. Figure 3-2 identifies the location of Jesmond Road within the context of the AUPOIP zoning.

The project will generally require an additional 10m width for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the western side of the road, moving towards the east at the SH22 intersection.

Table 3-2 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-2.

Key elements of the planning context which were considered are as follows:

- The existing Jesmond Road corridor is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the road is ‘Residential – Mixed Housing Urban’ in the north eastern extent (Auranga Development - The Drury 1 Precinct) and ‘Future Urban Zone’ under the AUPOIP to the west and south east of the existing road;
- Construction (earthworks) within Drury Precinct 1 (Auranga Development) has commenced. The Drury Precinct 1 was recently extended through Private Plan Change 6 (Auranga B1) to Jesmond Road.
- There are no existing designations along the length of the road corridor.

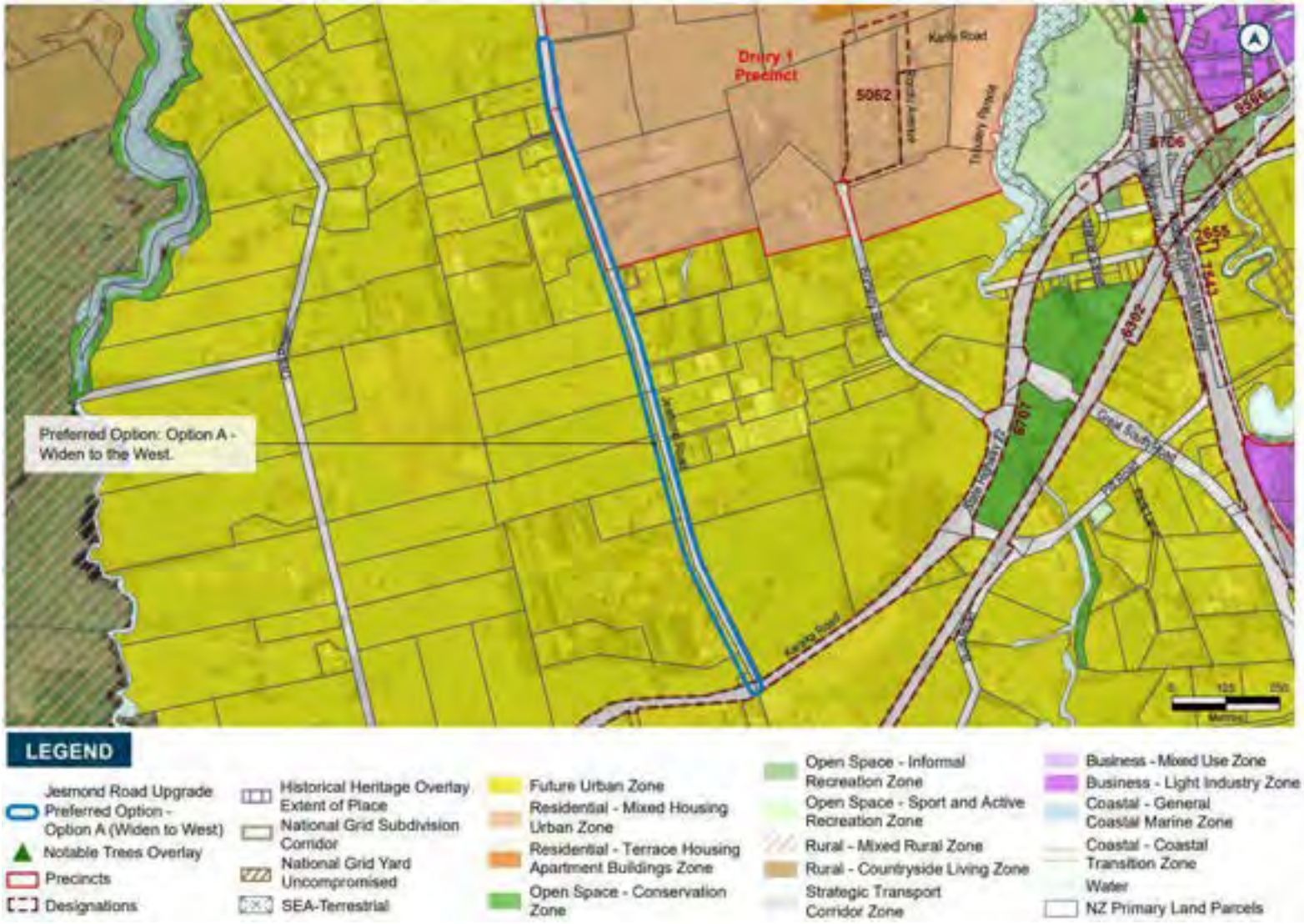


Figure 3-2: Jesmond Recommended Option

Table 3-2: AUPOIP Planning Context: Jesmond Road

AUPOIP Planning Context: Jesmond Road	
Zones	Future Urban Zone Residential – Mixed Housing Urban Zone
Likely future receiving environment	Future Urban Zone: high likelihood of change. Residential – Mixed Housing: low likelihood of change.
Precincts	Drury 1 Precinct adjacent to north east of existing road corridor
Overlays	High-Use Stream Management Areas Overlay [rp] Historic Heritage and Special Character: Historic Heritage Overlay Extent of Place [rcp/dp] - 704, Aroha Cottage
Controls	Macroinvertebrate Community Index
Transport Designations (existing)	Nil
Other existing Designations	Nil
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths Tributary of Ngakoroa Stream Other unnamed streams Cultural Heritage Inventory items
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Private Plan Change 6 (Auranga B1) was made operative in February 2020 • Auranga B2, lodged, not yet accepted by Council • Proposed plan change in Drury West, not yet lodged There are a number of resource consents being sought or have been granted within the Auranga Development for subdivision, residential and associated development however this development is not adjacent to Jesmond Road. Te Tupu Ngātahi are not aware of any other existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.3 Bremner Road FTN Arterial Upgrade

Bremner Road and Norrie Road will be upgraded and constructed new, an alignment from Jesmond Road to Bremner Road through the Auranga Development.

The proposed Bremner Road corridor is a four-lane FTN arterial standard between Jesmond Road in the west and Great South Road in the east. The intersections with Jesmond Road, existing Bremner Road, Creek Street, Firth Street and Great South Road are proposed to be signalised. The intersections with Jesmond Road and Great South Road are not included in this section extent.

It is proposed to widen Bremner Road and Norrie Road from their current general widths of 20m to accommodate a 30m wide four-lane cross-section with dedicated bus/transit lanes and separated walking and cycling facilities. The new link between Jesmond Road and Bremner Road will be 28m wide as agreed through Drury 1 Precinct proceedings and with affected landowners through the recent Plan Change 6 (Auranga B1) proceedings. This section is called the Jesmond to Bremner link. A new bridge is proposed over the Hingaia Stream. Reconstruction of the bridges over Ngakoroa Stream and SH1 and new culverts are required. Figure 3-3 identifies the location of the Bremner Road corridor within the context of the AUPOIP zoning.

The project requires an additional 10m width for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the southern side of the existing roads.

Table 3-3 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-3. Key elements of the planning context which were considered are as follows:

- The existing corridor for Bremner Road and Norrie Road is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the road is: ‘Residential – Terraced Housing and Apartment’, ‘Residential - Mixed Housing Urban’, ‘Business – Light Industry’, ‘Open Space – Informal Recreation Zone’ and ‘Open Space – Sport and Active Recreation Zone’ under the AUPOIP;
- The Drury 1 Precinct is located east of the Ngakoroa Stream;
- Plan Change 6 (Auranga B1) is operative which has resulted in an expansion of the live-zoned area and boundaries of the Drury 1 Precinct;
- Within the Drury 1 Precinct, a 28m corridor has been set aside by developers to enable the upgrade of the proposed local road (Auranga Road 1) to the proposed future FTN arterial upgrade;
- There is no existing roading designation along the length of the road corridor;
- The Jesmond to Bremner Link extends slightly into the existing Minister of Education designation, which provides for Drury West Primary School (off Burberry Road) to allow for construction of a culvert; and
- The Bremner Road upgrade crosses over the Waka Kotahi SH1 designation (Designation 6706) to allow for bridge reconstruction.

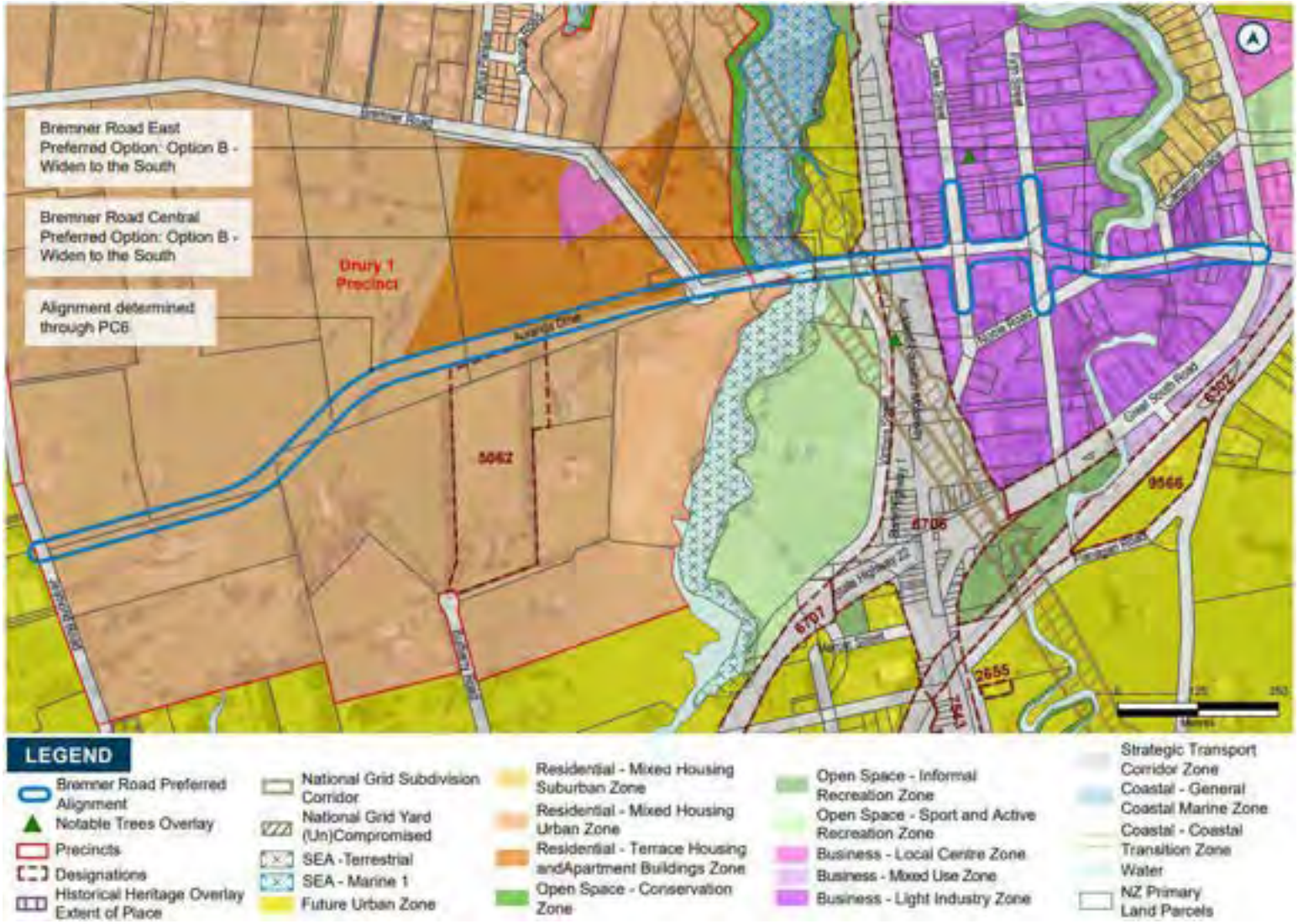


Figure 3-3: Bremner Road Recommended Option

Table 3-3: AUPOIP Planning Context: Bremner Road

AUPOIP Planning Context: Bremner Road and Norrie Road (from Jesmond Road to the end of Norrie Road)	
Zones	Strategic Transport Corridor Zone Future Urban Zone Residential – Terraced Housing and Apartments Zone Residential – Mixed Housing Urban Zone Business – Light Industry Zone Open Space – Conservation Zone Open Space – Informal Recreation Zone Open Space – Sport and Active Recreation Zone
Existing and Likely Future Environment	Future Urban Zone: high likelihood of change. Drury 1 Precinct (Auranga Development): high likelihood of change from existing rural landscape. Development assumed to match precinct plan. Business zone (light industrial): low likelihood of change. Open Space (Drury Sports Complex): low likelihood of change.
Precincts	Drury 1 Precinct
Overlays	High-Use Stream Management Areas Overlay [rp] National Grid Corridor Overlay Significant Ecological Area – Terrestrial Significant Ecological Area – Coastal Historic Heritage Extent of Place
Controls	Macroinvertebrate Community Index Coastal Inundation 1 per cent AEP Plus 1m Control Stormwater Management Area Control – Flow 1
Transport Designations (existing)	Designations: Designation – 6706, State Highway 1 – Takaanini to Drury, Designations, New Zealand Transport Agency
Other existing designations	Designations: Designations - 5062, Drury West Primary School, Designations, Minister of Education
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths Ngakoroa Stream Other unnamed streams Cultural Heritage Inventory items First Gas Transmission Line
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Private Plan Change 6 (Auranga B1) was made operative in February 2020 • Auranga B2, lodged, not yet accepted by Council There are a number of resource consents being sought or have been granted within the Auranga Development for subdivision, residential and associated development (for example, a childcare centre) within close proximity to the recommended option which have been considered in Section 4.

3.4 Waihoehoe Road West FTN Arterial Upgrade

Waihoehoe Road west will be upgraded to a four-lane FTN arterial standard including the intersection at Great South Road in the west to Fitzgerald Road / Opāheke N-S in the east, including tie ins on Great South Road and Fitzgerald Road. The intersection with Great South Road is proposed to be signalised and a roundabout is proposed at Fitzgerald Road / Opāheke N-S.

The project includes widening of the Waihoehoe Road West corridor from its current general width of 20m to accommodate a 30m wide four-lane cross-section with dedicated bus/transit lanes and separated walking and cycling facilities. Reconstruction of the bridge across the North Island Main Trunk (NIMT) rail line is proposed. Figure 3-4 identifies the location of Waihoehoe Road West within the context of the AUPOIP zoning.

The project requires an additional 10m width for the transport corridor additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the northern side of the road.

Table 3-4 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-4. Key elements of the planning context which were considered are as follows:

- The existing corridor for Bremner Road and Norrie Road is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the road is: ‘Future Urban Zone’, ‘Business – Town Centre Zone’, Business – Mixed Use Zone’ and ‘Business – Light Industry Zone’ under the AUPOIP;
- There is no existing roading designation along the length of the road corridor; and
- The Waihoehoe West upgrade crosses over the existing KiwiRail designation (Designation 6302) to reconstruct the rail bridge, which provides for the NIMT Railway Line.



Figure 3-4: Waihoehoe Road West Recommended Option

Table 3-4: AUPOIP Planning Context: Waihoehe Road West

AUPOIP Planning Context: Waihoehe Road West	
Zones	Future Urban Zone Strategic Transport Corridor Zone Business – Local Centre Zone Business – Mixed Use Zone Business – Light Industrial
Existing and Likely Future Environment	Future Urban Zone: high likelihood of change. Business zoned areas (surrounding intersection with Great South Road): Low likelihood of change.
Precincts	Nil
Overlays	High-Use Aquifer Management Areas Overlay [rp] Quality-Sensitive Aquifer Management Areas Overlay [rp]
Controls	Macroinvertebrate Community Index Stormwater Management Area Control Flow 1 [rp]
Transport Designations (existing)	Designations: Designations - 6302, North Island Main Trunk Railway Line, Designations, KiwiRail
Other existing Designations	Nil
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths Cultural Heritage Inventory items Watercare Waikato 1 watermain
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Oyster Capital, Waihoehe Plan Change. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Land subject to the plan change is within the proposed corridor. • Kiwi Property, Drury Centre, Lodged and accepted by Auckland Council. Notification expected end of August 2020. Adjacent to proposed corridor. • Fulton Hogan, Drury East. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Near proposed corridor. Te Tupu Ngātahi are not aware of any existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.5 Waihoehoe Road East Arterial Upgrade

Waihoehoe Road East will be upgraded to a two-lane arterial standard from west of the proposed intersection with Opāheke North-South Arterial in the east, to just east of Cossey Road in the east to tie into the future Mill Road corridor. The intersection with Opāheke N-S is proposed to be a roundabout as part of the Waihoehoe Road West upgrade. The intersections with existing Appleby Road and Cossey Road are proposed to be roundabouts.

The project includes widening of the Waihoehoe Road East corridor from its current general width of 20m to accommodate a 24m wide two-lane cross-section with separated walking and cycling facilities. Figure 3-5 identifies the location of Waihoehoe Road East within the context of the AUPOIP zoning.

The project requires an additional 4m width for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the northern side of the road.

Table 3-5 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-5. Key elements of the planning context which were considered are as follows:

- The existing corridor for Waihoehoe Road West is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the road is zoned ‘Future Urban Zone’ under the AUPOIP;
- There is no existing roading designation along the length of the road corridor; and
- First Gas Limited is the requiring authority for an existing designation (Designation 9104), which bisects the corridor, and provides for a gas transmission line.



Figure 3-5 Waihoehoe Road East Recommended Option

Table 3-5: AUPOIP Planning Context: Waihoehoe Road East

AUPOIP Planning Context: Waihoehoe Road East	
Zones	Future Urban Zone
Existing and Likely Future Environment	Future Urban Zone: high likelihood of change. Assume rural environment for construction and an urban environment for operation.
Precincts	Nil
Overlays	High-Use Aquifer Management Areas Overlay [rp] Quality-Sensitive Aquifer Management Areas Overlay [rp]
Controls	Macroinvertebrate Community Index
Transport Designations (existing)	Nil
Other existing Designations	Designations: Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths First Gas Transmission Line
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Oyster Capital, Waihoehoe Plan Change. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Near proposed corridor. • Kiwi Property, Drury Centre, Lodged and accepted by Auckland Council. Notification expected end of August 2020. Near proposed corridor. • Fulton Hogan, Drury East. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Adjacent to proposed corridor. Te Tupu Ngātahi are not aware of any existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.6 Opāheke North-South FTN Arterial

A new Opāheke North-South FTN Arterial will be constructed which will be a four-lane FTN arterial standard between Hunua Road in the north and Waihoehoe Road in the south. The road traverses greenfields, crossing approximately seven streams (or tributaries of streams) and large areas of flood plain, providing a new north-south connection between Drury and Papakura. The intersection with and Hunua Road / Boundary Road is proposed to be signalised. The intersections at Waihoehoe Road, Opāheke/Ponga Roads and Walker Road are proposed to be roundabouts.

The project includes a new 30m wide four-lane cross-section with dedicated bus/transit lanes and separated walking and cycling facilities. Three new bridges and new culverts are required. Figure 3-6 identifies the location of Opāheke N-S FTN Arterial within the context of the AUPOIP zoning.

The project requires a 30m width for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas.

Table 3-6 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-6. Key elements of the planning context which were considered are as follows:

- Zoning in is the area is: ‘Future Urban Zone’, ‘Business – Heavy Industry’ and ‘Open Space – Conservation Zone’ under the AUPOIP; and
- First Gas Limited is the requiring authority for an existing designation (Designation 9104), which bisects the corridor, which provides for a gas transmission line.

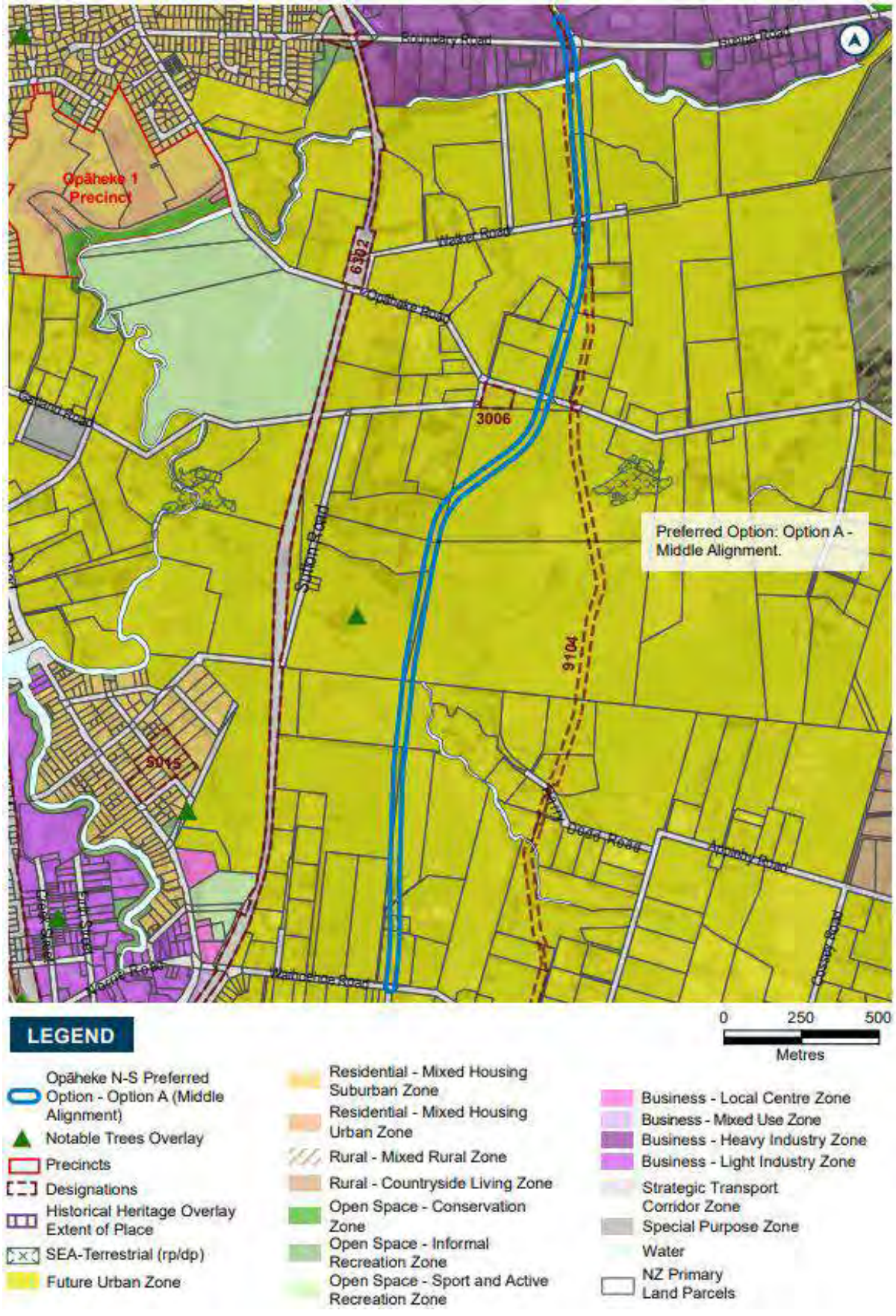


Figure 3-6 Opāheke North-South Arterial Recommended Option

Table 3-6: AUPOIP Planning Context: Opāheke North-South Arterial

AUPOIP Planning Context: Opāheke North-South FTN Arterial	
Zones	Future Urban Zone Business – Heavy Industry Zone Open Space – Conservation Zone
Existing and Likely Future Environment	Future Urban Zone: high likelihood of change. Business zoned areas (Hunua / Boundary Road): low likelihood of change. Open Space (esplanade reserve): low likelihood of change.
Precincts	Nil
Overlays	High-Use Stream Management Areas Overlay [rp] High-Use Aquifer Management Areas Overlay [rp] Quality-Sensitive Aquifer Management Areas Overlay [rp]
Controls	Macroinvertebrate Community Index
Transport Designations (existing)	Nil
Other existing Designations	Designations: Airspace Restriction Designations - ID 200, Ardmore Airport - Height Restrictions, Ardmore Airport Ltd Designations: Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
Non-Statutory and other Features	Waipokapū Stream Mangapū Stream Unnamed streams Overland Flow Paths Flood Prone Area Flood Plains First Gas Transmission Line
Private Plan Changes and Resource Consents	Details of plan changes are further detailed in section 4.1.1. Plan changes in the Project area include: • Oyster Capital, Waihoehoe Plan Change. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Land subject to the plan change is within the proposed corridor. • Kiwi Property, Drury Centre, Lodged and accepted by Auckland Council. Notification expected end of August 2020. Adjacent to proposed corridor. • Fulton Hogan, Drury East. Lodged and accepted by Auckland Council. Notification expected end of August 2020. Adjacent to proposed corridor. Te Tupu Ngātahi are not aware of any existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.7 Ponga Road Arterial Upgrade

Ponga Road will be upgraded to a two-lane arterial standard from the proposed intersection with Opāheke N-S Arterial in the west, to near Jack Paterson Road east, tying into the future Mill Road corridor. The intersection with Opāheke N-S is not included in this corridor.

The project includes widening of the Ponga Road corridor from its current general width of 20m to accommodate a 24m wide two-lane cross-section with separated walking and cycling facilities. Extensions of existing culverts is also required. Figure 3-7 identifies the location Ponga Road within the context of the AUPOIP zoning.

The project requires an additional 4m width for the transport corridor additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the southern side of the road.

Table 3-7 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-7. Key elements of the planning context which were considered are as follows:

- The existing corridor for Ponga Road is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the Road corridor is ‘Future Urban’ under the AUPOIP;
- First Gas Limited is the requiring authority for an existing designation which provides for the Pukekohe to East Tamaki Gas Pipeline which traverses the corridor near 48 Ponga Road;
- There is no existing roading designation along the length of the road corridor; and
- Counties Power Ltd. is the requiring authority for an existing designation (Designation 9104), which provides for electricity supply purposes (substation) at 9 Ponga Road adjacent to the corridor.



Figure 3-7: Ponga Road Recommended Option

Table 3-7: AUPOIP Planning Context: Ponga Road

AUPOIP Planning Context: Ponga Road	
Zones	Future Urban Zone
Existing and Likely Future Environment	Future Urban Zone: high likelihood of change.
Precincts	Nil
Overlays	High-Use Stream Management Areas Overlay [rp]
Controls	Macroinvertebrate Community Index
Transport Designations (existing)	Nil
Other existing Designations	Designations: Airspace Restriction Designations - ID 200, Ardmore Airport - Height Restrictions, Ardmore Airport Ltd Designations: Designations - 9104, Pukekohe to East Tamaki Gas Pipeline, Designations, First Gas Limited
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths Mangapū Stream Cultural Heritage Inventory Items First Gas Transmission Line
Private Plan Changes and Resource Consents	No lodged or known proposed private plan changes apply to the Ponga Road corridor. Te Tupu Ngātahi are not aware of any existing resource consents or applications for resource consent within close proximity to the recommended option which are likely to materially influence the route protection strategy.

3.8 Opāheke Road (rural section) Arterial Upgrade

Opāheke Road rural will be upgraded to a two-lane arterial standard from the proposed intersection with Opāheke N-S Arterial in the southeast, to the extent of the FUZ near Lorelei Place in the northwest. The intersections with Opāheke N-S and the Bellfield Estate development are roundabouts.

The project includes widening of the Opāheke Road rural corridor from its current general width of 20m to accommodate a 24m wide two-lane cross-section with separated walking and cycling facilities. Two parallel active mode bridges adjacent to the existing bridge over Otūwairoa Stream are proposed as well as a grade separated bridge over the NIMT rail line and a new culvert. Figure 3-8 identifies the location of Opāheke Road rural within the context of the AUPOIP zoning.

The project requires an additional 4m width of for the transport corridor and additional land for tie ins, stormwater infrastructure, batter slopes and retaining and for other construction related activities including the re-grade of driveways, construction traffic manoeuvring and construction laydown areas. The width of the corridor varies along the alignment to accommodate these areas. Widening is generally to the north eastern side of the road. However, in some discreet locations widening is occurring on both sides of the road.

Table 3-8 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-8. Key elements of the planning context which were considered are as follows:

- The existing corridor for Opāheke Road is generally 20m wide and is identified as ‘Road’ under the AUPOIP;
- Zoning adjacent to the road is: ‘Future Urban’, ‘Open Space – Sport and Active Recreation Zone’, ‘Residential - Mixed Housing Urban’, ‘Residential - Mixed Housing Suburban’ and ‘Business – Neighbourhood Centre Zone’ under the AUPOIP;
- There is no existing roading designation along the length of the road corridor;
- Counties Power Ltd. is the requiring authority for an existing designation (Designation 3006) which provides for electricity supply purposes (substation) at 9 Ponga Road adjacent to the corridor; and
- KiwiRail is the requiring authority for an existing designation which provides for the NIMT Railway Line (Designation 6302). It is proposed to grade separate the rail crossing near 174 Opāheke Road.



Figure 3-8: Opāheke Road rural Recommended Option

Table 3-8: AUPOIP Planning Context: Opāheke Road Rural

<table>
<tr><th colspan="3">AUPOIP Planning Context: Opāheke Road Rural</th></tr>
<tr><td>Zones</td><td colspan="2">Future Urban Zone
Strategic Transport Corridor Zone
Open Space – Sport and Active Recreation Zone
Open Space – Conservation Zone
Open Space – Informal Recreation Zone
Business – Neighbourhood Centre Zone
Residential – Mixed Housing Urban Zone
Residential – Mixed Housing Suburban Zone</td></tr>
<tr><td>Existing and Likely Future Environment</td><td colspan="2">Future Urban Zone: high likelihood of change.
Open Space Zones: low likelihood of change.
Opāheke 1 Precinct (Business and Residential Zones): high likelihood of change from existing greenfields to precinct development.</td></tr>
<tr><td>Precincts</td><td colspan="2">Opāheke 1, Precinct (see Table 3-10 below)</td></tr>
<tr><td>Overlays</td><td colspan="2">High-Use Stream Management Areas Overlay [rp]</td></tr>
<tr><td>Controls</td><td colspan="2">Macroinvertebrate Community Index
Vehicle Access Restricted Control – Adjacent to Level Crossing</td></tr>
<tr><td>Transport Designations (existing)</td><td colspan="2">Designations: Designations - 6302, North Island Main Trunk Railway Line, Designations, KiwiRail</td></tr>
<tr><td>Other existing Designations</td><td colspan="2">Designations: Airspace Restriction Designations - ID 200, Ardmore Airport - Height Restrictions, Ardmore Airport Ltd
Designations: Designations - 3006, Electricity supply purposes - substation, Designations, Counties Power Ltd</td></tr>
<tr><td>Non-Statutory and other Features</td><td>Flood Plains
Flood Prone Areas
Overland Flow Paths</td><td>Otūwairoa Stream
Cultural Heritage Inventory Items
Watercare Waikato 1 watermain</td></tr>
<tr><td>Private Plan Changes and Resource Consents</td><td colspan="2">No lodged or known proposed private plan changes apply to the Opāheke Road Rural corridor.
There are a number of resource consents being sought or have been granted within Bellfield Estate for subdivision, residential and associated development within close proximity to the recommended option (see Table 3-9).

Table 3-9: Planning Context: Opāheke Road Rural
<table><tr><th>Developer/ Land Owner</th><th>Relevant Addresses</th><th>Development Overview</th></tr><tr><td>Bellfield Estate</td><td>• 117, 131 & 137 Opāheke Road
• 219 & 60 Bellfield Road
• 8 Keryn Place</td><td><u>Opāheke 1 Precinct Special Housing Area (SHA)</u>
Bellfield Estate is a 22ha SHA which when complete will have over 500 dwellings including a mix of two and three bedroom townhouses and three and four bedroom detached dwellings.
Earthworks have begun and the first few buildings have been constructed in Stage 1 of Bellfield Estate. Stage 1 borders the corridor to the west.</td></tr></table></td></tr>
</table>

3.9 Opāheke Road (urban section) Arterial Upgrade

Opāheke Road (urban) will be upgraded to a 20m two-lane arterial standard with separated walking and cycling facilities from near Lorelei Place in the south to Great South Road in the north. A roundabout are proposed at the intersection of Opāheke Road with Short Street, Liverpool Street and Butterworth Avenue. Another roundabout is proposed at the intersection of Opāheke Road with Settlement Road.

Figure 3-9 identifies the location of Opāheke Road (urban) within the context of the AUPOIP zoning.

Table 3-10 details the relevant planning context as specified by the AUPOIP and Auckland Council GeoMaps. The applicable AUPOIP zoning, and selected overlays and controls are shown in Figure 3-9. Key elements of the planning context which were considered for the Route Protection Strategy are as follows:

- The proposed upgrade can be undertaken within the existing road reserve. However, works will be required on private property for:
    - Regrading of nine driveways. This requires construction works within the identified properties to tie in the driveways with the upgraded road. No partial or full property acquisition is required for these works.
    - A new roundabout at the Opāheke Road intersection with Settlement Road. This will require the acquisition of one full property and two partial acquisitions of properties.
- Zoning adjacent to the road is:
    - Open Space – Community Zone
    - Open Space – Informal Recreation Zone
    - Business – Neighbourhood Centre Zone
    - Residential – Mixed Housing Urban Zone
    - Residential – Mixed Housing Suburban Zone
    - Residential – Terraced Housing and Apartment Zone
    - Special Purpose Zone – Cemetery
- There are no existing designations along the length of the road corridor.

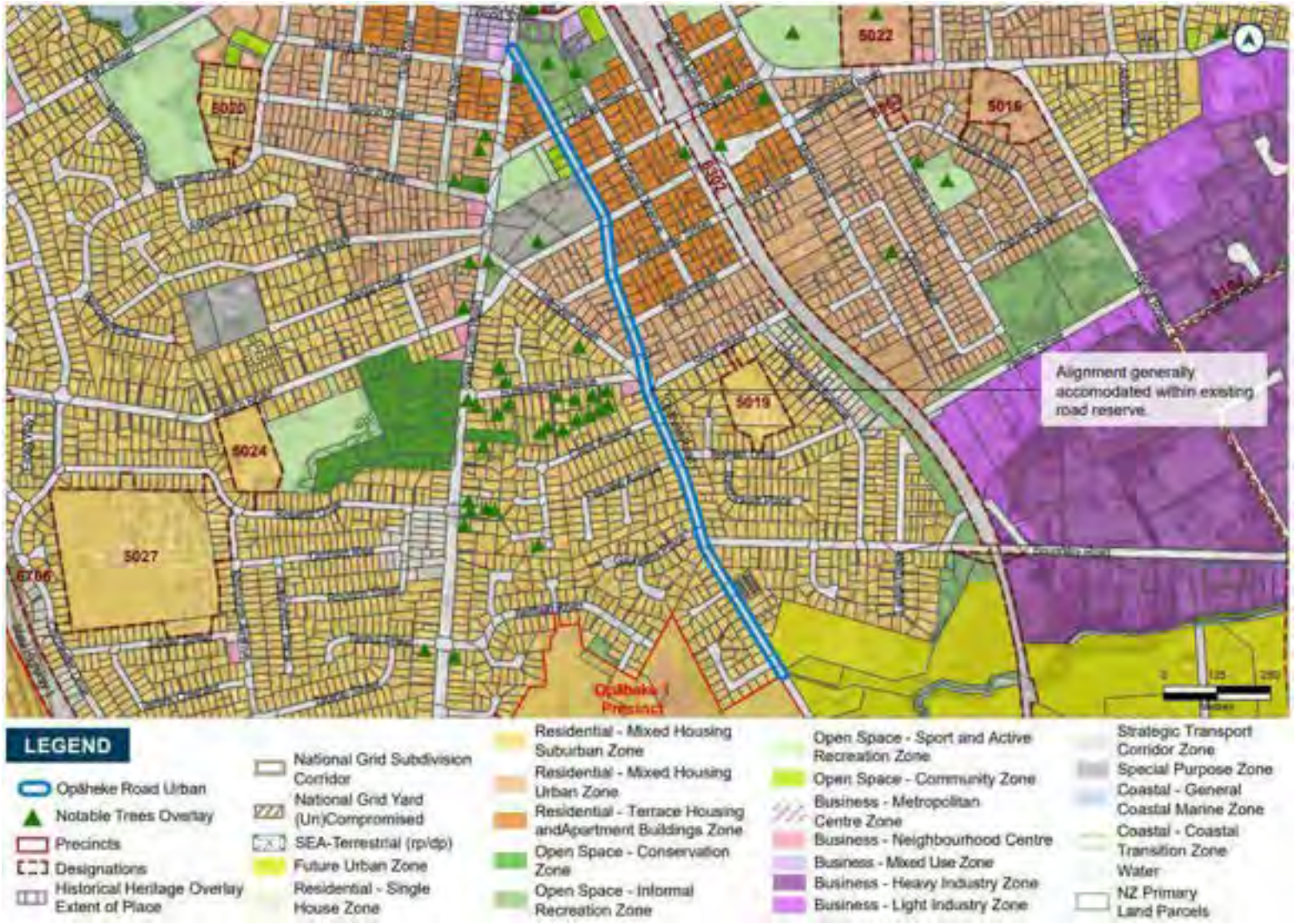


Figure 3-9: Opāheke Road Urban Alignment

Table 3-10: AUPOIP Planning Context: Opāheke Road Urban

AUPOIP Planning Context: Opāheke Road Urban	
Zones	Open Space – Community Zone Open Space – Informal Recreation Zone Business – Neighbourhood Centre Zone Residential – Mixed Housing Urban Zone Residential – Mixed Housing Suburban Zone Residential – Terraced Housing and Apartment Zone Special Purpose Zone – Cemetery
Existing and Likely Future Environment	Residential zones (except THAB): low likelihood of significant change. Some intensification likely. Residential THAB: a higher likelihood of intensification.
Precincts	Nil
Overlays	Historic Heritage Overlay Extent of Place (War Memorial) Notable Tree (various)
Controls	Arterial Road Macroinvertebrate Community Index
Transport Designations (existing)	Nil
Other existing Designations	Nil
Non-Statutory and other Features	Flood Plains Flood Prone Areas Overland Flow Paths Cultural Heritage Inventory Items
Private Plan Changes and Resource Consents	No lodged or known proposed private plan changes apply to the Opāheke Road Urban corridor. There are a number of new terraced housing developments along Opāheke Road indicating more intensive residential development in the area which have been considered in Section 4.

4 Route Protection Evaluation

4.1 Key Risks and Considerations

Table 4-1 provides an overview of the key risks and considerations of each corridor when determining the preferred method of route protection. Where possible, similar risks and considerations are grouped to avoid repetition. Critical to considering the route protection of all corridors in the Drury Local transport network is the recent pressure for urban development, including housing and transport infrastructure, from developers, local and central government. The following sections provide an overview of these pressures.

4.1.1 Drury-Opāheke Structure Plan and Private Plan Changes

Approval of the Drury-Opāheke Structure Plan by Auckland Council outlines the Council's anticipated growth and land use patterns in the FUZ. Pockets of land in Drury have been recently live zoned through developer led plan changes (e.g. Plan Change 6) and are rapidly urbanizing. Additionally, developers have progressed, and are actively looking to progress, their private plan changes. The Supporting Growth Programme is aware of further impending developer led plan changes indicating that development in the FUZ is imminent. Through the Supporting Growth Programme, AT and Waka Kotahi have a continuing programme of engagement with landowners and developers along and around the recommended alignments of the Drury Local DBC

Private Plan Change 6 (Auranga B1) was made operative in February 2020, which has increased the live-zoned area and boundaries of the Drury 1 Precinct, now expanding to Jesmond Road in its northern half. The Precinct now encompasses a 168ha area (up from 85ha) and is estimated to yield ~2,650 dwellings[1] (up from ~1,300). Construction within Auranga has commenced with the reopening of the existing Bremner Road in July 2019 and the first titles.

The location of a new section of road within Auranga Development ("Road 1") between Bremner Road and Jesmond Road which forms part of the Bremner Road FTN Arterial Upgrade was agreed through an appeal on the plan change by AT and affected landowners. The indicative location of Road 1 is shown in the precinct plan and provisions within the precinct provide for a future upgrade by AT. The developers are proposing to construct a two lane local road with AT to upgrade to four-lanes (to provide for the frequent bus network) in the future.

A private plan change was lodged for Auranga B2 by Karaka and Drury Limited and Ma Development Enterprises (MADE) mid 2020. This plan change seeks to rezone 33ha of FUZ in Drury West, south of the existing development, to town centre and residential uses. At the time of writing this report the plan change has not been accepted by Auckland Council and has no statutory weighting.

Four private plan changes covering a large area in Drury East/South were submitted to Auckland Council by developers with interest in the area at the end of 2019. These were by:

- Drury South Crossing (Stevensons)
- Drury Centre (Kiwi Property)
- Waihoehoe (Oyster Capital); and

[1] https://www.auranga.co.nz/masterplan/

- Drury East (Fulton Hogan).

Kiwi Property, Oyster Capital and Fulton Hogan submitted their plan changes together as a package in Drury-east. All four plan changes were accepted by Auckland Council and are anticipated to be notified in August 2020. Despite being accepted, at the time of writing this report, none of the proposed plan changes have any statutory weighting.

The proposed plan changes give real and sustained pressure to Council to allow out of sequence growth in Drury. The acceptance of these plan changes by Council indicates their willingness to allow this acceleration of growth. It is anticipated the lodgement and acceptance of further private plan changes will follow, seeking expedited live-zoning of FUZ land in the area. Te Tupu Ngātahi must respond and enable the protection of transport corridors in line with this expedited growth.

4.1.2 New Zealand Upgrade Programme

In January 2020, the New Zealand Government announced the New Zealand Upgrade Programme (NZUP) which will invest $6.8 Action across road, rail, public transport and walking and cycling infrastructure to get New Zealand cities moving, improve safety and boost productivity. NZUP is investing $3.48 Action on a range of projects to support the transformation of Auckland's transport system to manage growth. A number of these projects are within South Auckland and the Drury area, signalling the governments' focus on providing for, and accelerating growth in South Auckland. These include:

- Mill Road - new connection from Manukau to Drury South
- SH1 Papakura to Drury South improvements - improvements to support growth
- Papakura to Pukekohe rail line electrification - supporting urban and economic growth
- Drury Rail Stations – two new rail stations, park and ride facilities as well as a bus and rail interchange supporting urban and economic growth.

4.1.3 COVID-19 Recovery (Fast-track Consenting) Act

In addition to NZUP, in response to the COVID-19 pandemic the COVID-19 Recovery (Fast-track Consenting) Act (the Act) was enacted. The Act is intended to fast-track resource consenting and designation processes for eligible projects that are already planned and ready to go, accelerate the beginning of work on a range of different sized and located projects and support certainty of ongoing employment and investment across New Zealand. Both the Papakura to Pukekohe rail line electrification and SH1 Papakura to Drury South improvements are included within the Act.

4.1.4 Summary

The direction from local and central government on the acceleration of growth in Drury and the active interest of multiple developers emphasises the importance and urgency of the need to provide transport infrastructure in Drury to support urban growth. Drury is increasingly becoming a “hot-spot” for urban development, which underpins the necessity of route protecting the projects proposed within the Drury Local transport network.

Table 4-1 Key Risks and Considerations for Route Protection of the Recommended Drury Strategic Transport Network

Risk / Consideration	SH22 Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West FTN Waihoehoe Road East	Opāheke N-S FTN	Ponga Road	Opāheke Road rural	Opāheke Road urban
Existing Development, Zoning & Fragmented Land Ownership	For the recommended SH22 and Jesmond Road options, the existing corridors are largely adjacent to rural lifestyle blocks and farms. Urbanisation of the FUZ is very likely in the near future and the environment will change. Land will be required from a number of parcels, the majority of which are under individual ownership. The fragmented nature of these land holdings suggests that there is a low likelihood that recommended works on SH22 and Jesmond Road could be incorporated into a wider land development project and that route protection of a high number of properties is required.	The entire Bremner Road alignment is surrounded by existing and planned development as follows: • The Jesmond to Bremner link is proposed through land zoned for residential development as part of the Auranga Development (see *Precincts and Plan Changes* below). A number of resource consents have been granted for this area. • The Bremner Central section is also constrained by existing residential and open space zoning. • The Bremner East section is constrained by existing development and businesses in the Business – Light Industry Zone. While options assessment processes have looked at minimising property impact, across the entire Bremner Road corridor land will be required from a number of parcels, including full acquisitions, the majority of which are under individual ownership. The well-established and fragmented nature of land holdings in the Bremner Central and East sections suggests that there is a low likelihood that upgrading Bremner Road and Norrie Road at this location could be incorporated into a wider land development project and that protection of a high number of properties is required.	For the recommended Waihoehoe Road West and East options, the existing corridor is largely adjacent to rural lifestyle blocks and farms. Urbanisation of the FUZ is very likely in the near future and the environment will change. Land will be required from a number of parcels , the majority of which are under individual ownership. A number of developers have submitted private plan changes in this area. However, it is unlikely that they own all of the land in these areas. There is potential to negotiate with developers, but the timing is uncertain.	The recommended Opāheke N-S corridor is proposed through greenfields, largely occupied by rural lifestyle blocks and farms. Urbanisation of the FUZ is very likely in the near future in the southern section (although less uncertain in the middle section due to floodplain issues) and the environment will change over time. A private plan change has been submitted by a developer in the southern section of the alignment which provides opportunity to negotiate the alignment. However, it is unlikely the developers own all of the land within their proposed plan change area and the timing of future development is uncertain. Land will be required from a number of parcels , the majority of which are under individual ownership. The fragmented nature of these land holdings and uncertainty on the timing of development of some of the land due to the extent of floodplain, suggests that there is a low likelihood that the full extent of the Opāheke N-S corridor could be incorporated into a wider land development project and that protection of a high number of properties is required.	The existing Ponga Road corridor is largely adjacent to rural lifestyle blocks and farms. Urbanisation of the FUZ is likely in the future and the environment will change. Land will be required from a number of parcels, the majority of which are under individual ownership. Additionally, there are no known plans for development along Ponga Road. The fragmented nature of these land holdings and seeming absence of development plans suggests that there is a low likelihood that upgrading Ponga Road could be incorporated into a wider land development project and that protection of a high number of properties is required.	The existing Opāheke Road rural corridor is largely adjacent to rural lifestyle blocks and open space. The corridor will become increasingly constrained by the existing and planned sports fields in Opāheke Reserve and ongoing development within Bellfield Estate. Land will be required from a number of parcels, the majority of which are under individual ownership. The fragmented nature of these land holdings suggests that there is a low likelihood that upgrading Opāheke Road rural could be incorporated into a wider land development project and that protection of a high number of properties is therefore required.	The existing Opāheke Road urban corridor is constrained by existing development. The entire corridor is an established residential community with low to medium density housing and local facilities. The area has a lower likelihood of change in urban form as an established community. However, some intensification in the area has begun and is likely in the future, particularly within the north eastern extent zoned Terrace Housing and Apartment Buildings (THAB) in the AUPOIP. However, it is not known if there are any active developers in this area with larger plans. The proposed cross section fits largely within the existing road corridor however, some works on private property will be required outside of the existing road reserve for regrading of driveways. The full acquisition of one property and partial acquisition of two properties is required for a new roundabout at Opāheke/Settlement Road intersection. There is a low likelihood that the upgrading Opāheke Road urban corridor could be incorporated into a wider land development project as the proposed works on private properties are distributed at various points along the alignment. Also, the majority of the properties along the corridor are under individual land ownership.
Drury-Opāheke Structure Plan 2019	Each of the proposed corridors are identified in the Drury-Opāheke Structure Plan. Although providing direction to landowners and developers, the structure plan provides no statutory protection of the corridors.						

Risk / Consideration	SH22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West FTN	Waihoehoe Road East	Opāheke N-S FTN	Ponga Road	Opāheke Road rural	Opāheke Road urban
Existing Designations	Waka Kotahi have an existing designation for the construction, operation and maintenance of SH22. The designation does not cover the full extent of the recommended option however it does provide protection of the existing road reserve. Consideration has been made to utilise this designation for the proposed upgrade. In addition, it is proposed a NoR will be lodged for the Waka Kotahi Papakura to Drury South (Drury Interchange) Project in 2021. Coordination between the programmes is required.	There are no existing designations for this corridor.	The proposed corridor will traverse land that is subject to an existing designation where it crosses State Highway 1 (6706, NZTA). As implementation of the recommended option is likely to be led by AT (being an arterial road corridor), AT will need written consent from Waka Kotahi (in accordance with either section 176 or 177 of the RMA) where works will occur within the State Highway 1 designation. In addition, it is proposed a NoR will be lodged for the Waka Kotahi Papakura to Bombay SH1 Project in 2021. Coordination between the programmes is required.	The proposed corridor will traverse land that is subject to an existing designation where it crosses the NIMT rail line (6302, KiwiRail). As implementation of the recommended option is likely to be led by AT (being an arterial road corridor), AT will need written consent from KiwiRail (in accordance with either section 176 or 177 of the RMA) where works will occur within the NIMT designation.	The proposed Waihoehoe Road East, Opāheke N-S and Ponga Road corridors will traverse land that is subject to an existing designation where they cross the First Gas Transmission Line (9104, First Gas). As implementation of the recommended options are likely to be led by AT (being an arterial road corridor), AT will need written consent from First Gas (in accordance with either section 176 or 177 of the RMA) where works will occur within the First Gas designation. The recommended Ponga Road corridor also encroaches into the Counties power Substation designation (3006, Counties Power). AT will need written consent from Counties Power (in accordance with either section 176 or 177 of the RMA) for this portion of the Ponga Road upgrade.			The proposed corridor will traverse land that is subject to an existing designation where it crosses the NIMT rail line (6302, KiwiRail). As implementation of the recommended option is likely to be led by AT (being an arterial road corridor), AT will need written consent from KiwiRail (in accordance with either section 176 or 177 of the RMA) where works will occur within the NIMT designation.	There are no existing designations within this corridor.
Construction Programme	The recommended SH22, Jesmond Road, Bremner Road and Waihoehoe Road East and West corridors are expected to be implemented in the first decade of development in Drury, by 2028. This date was recommended through the IBC, Future Urban Land Supply Strategy (FULSS) and recent DBC modelling. It is anticipated that the corridors will be constructed to align with the development of the Drury 1 Precinct and expected plan changes. However, the recommended options do not have secured funding for construction, therefore immediate implementation of the corridors is not a key driver of the route protection strategy.					The recommended Opāheke N-S, Ponga Road and Opāheke Road rural and urban corridors are expected to be implemented in the second decade of development in Drury, by 2038. This date was recommended through the IBC, FULSS and recent DBC modelling. The corridors do not have secured funding for construction therefore, immediate implementation of the project is not a key driver of the route protection strategy.			
Precincts and Plan Changes	A private plan change was submitted to Auckland Council by Ma Development Enterprises in early 2020 covering land adjoining the northern side of the SH22 near Burberry Road. This plan change has not yet been accepted by Council and has no statutory weighting, but it further indicates the intent of developers to accelerate the growth in Drury West.	Drury 1 Precinct is adjacent to Bremner Road and Jesmond Road and the proposed Jesmond to Bremner link is within the precinct. The recent Plan Change 6 has extended Drury 1 Precinct to Jesmond Road. The Drury 1 Precinct is zoned for largely residential development, as such development in this area has started in discrete areas and is likely expand throughout the precinct in the near future. Land in this zoned area along both Jesmond Road and Bremner Road corridors will need to be protected where required for construction. The eastern section of the Jesmond to Bremner link will be constructed as a two lane local road by the Auranga Development, as provided for within the Precinct Plan provisions in the AUPOIP. AT has purchased additional land to upgrade the Auranga local road to a 28m corridor in the future for the Jesmond to Bremner link which forms part of the Bremner Road Corridor . AT does not own the land required for the western section of the proposed Jesmond to Bremner link through the Plan Change 6 area.		Four private plan changes in Drury East were submitted to Auckland Council at the end of 2019 and three were accepted in July 2020. These plan changes have no formal statutory weighting and are still sitting with Council, but they indicate the intent of developers to accelerate the growth in Drury, particularly on land relating directly to the recommended Waihoehoe Road West, Waihoehoe Road East and Opāheke N-S corridors. There may be opportunities to negotiate with developers on these plan changes and future development however the timing is uncertain.		N/A	Opāheke 1 Precinct adjoins the Opāheke Road rural corridor to the west. Because the recommended option widens to the northeast of the existing road corridor and development within the precinct has already commenced, the corridor is not able to be route protected through a plan change or this precinct.	N/A

Risk / Consideration	SH22	Jesmond Road FTN	Bremner Road FTN	Waihoehoe Road West FTN	Waihoehoe Road East	Opāheke N-S FTN	Ponga Road	Opāheke Road rural	Opāheke Road urban
Environment	Key environmental constraints to consider include the crossing of Ngakoroa Stream and potential impacts on terrestrial significant ecological areas (Ngakoroa Stream).	No features or environmental constraints of note within/adjacent to the Jesmond Road corridor.	Key environmental constraints to consider include crossings of the Ngakoroa and Hingaia Streams, potential impacts on heritage sites and significant ecological areas. The Drury Sports Complex is a frequently used community facility. Businesses are also likely to be impacted.	Limited environmental constraints. Some businesses likely to be affected at the western end on Great South Road.	No features or environmental constraints of note.	This route spans a large area of floodplain. A number of streams are required to be crossed. Risks associated with stormwater and flooding.	Contains mature trees with bat roost potential and requires the crossing of Mangapū Stream.	Key environmental constraints to consider include the crossing of Waipokapū Stream and floodplains in the area.	Corridor has limited environmental constraints as it is an urbanised corridor. Potential impact on historic heritage but the Papakura Cemetery has been avoided.
Stakeholder Interest	• Auckland Council Parks with regard to impacts on Ngakoroa Reserve and Drury Sports Complex. • Developers	• Ministry for Education • Auranga Developers • Kainga ora (as a landowner) • MoE (as a landowner) • Local businesses have expressed interest in the project through previous consultation.	• Auranga Developers • Ministry of Education (MoE) - as landowner and requiring authority • Auckland Council Parks with regard to Drury Sports Complex and esplanade reserve. • Department of Conservation (DoC) because of access to DoC land/ SEAs • Watercare (Waikato 1) • Heritage NZ • Transpower	• KiwiRail (NIMT) • First Gas (as requiring authority and asset owner) • Developers • Kainga Ora (future development plans nearby on Great South Road) • Heritage NZ.	• First Gas (as requiring authority and asset owner) • Developers	• First Gas (as requiring authority and asset owner) • Developers	• First Gas (as requiring authority and asset owner) • Counties Power (as requiring authority and asset owner)	• Auckland Council with regard to impacts on Opāheke Reserve and Esplanade reserve. • Bellfield Estate developers. • Watercare (Waikato 1) • KiwiRail (NIMT)	• Auckland Council Community Facilities / Parks • Heritage NZ
Public Awareness / Interest	Public and landowners generally aware of future upgrades to SH22 through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement. Community are active regarding safety concerns on SH22 (Safe Networks Programme)	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement. Community are already seeing the environment change (Auranga Development).	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement. The close knit business community will have interest in proposed changes. Landowners are aware of the Jesmond to Bremner Link upgrade through Plan Change 6 proceedings and the public is also aware through the implementation of the Drury 1 Precinct Plan.	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement.	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement.	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement.	Public and landowners generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement.	Public generally aware of proposed changes through the Drury-Opāheke Structure Plan engagement and IBC and DBC engagement

4.2 Consideration of Route Protection Mechanisms

As demonstrated by the analysis in Section 4.1, there are a number of common risks and considerations that apply across the corridors that make up the Drury Local network. The following discussion provides a general assessment of the route protection mechanisms across the network identifying where specific mechanisms are suitable for route protection of the network or specific sections of the network.

4.2.1 Designation

Lodging a NoR and designating specific corridors provides interim and permanent route protection as soon as the notice is lodged with Council, by protecting the land for the designated purpose and providing approval through its inclusion in the district plan (negating the need for additional land use consents under the rules of the plan). 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-Opāheke. Developers have submitted private plan changes to Auckland Council (with more likely to follow soon) indicating developers' intents to expedite growth in the area. A designation, if confirmed, protects the proposed corridor from incompatible development, authorises the activity (in accordance with the designated purpose) and is included in the relevant district plan. This provides certainty and visibility to the public about the intended land use, enabling informed development decisions.

Although the indicative alignment for the Jesmond to Bremner Link was decided through Plan Change 6 proceedings and is included in the precinct plan, a designation would provide certainty for landowners and negate the need for additional land use consents to implement the works. If confirmed, a designation would allow a consistent route protection approach along the corridor and will enable an upgrade of the local road when required in the future and provide for future operation and maintenance requirements.

As the proposed cross section for Opāheke Road urban fits largely within the existing road corridor, 'route protection', and therefore a designation, of the full corridor is not required. However, where the proposed upgrade requires additional land at discrete locations including to the east of the Opāheke Road / Settlement Road roundabout, and for a number of driveways to be regraded, a designation will manage risk of incompatible development and intensification within these areas that may hinder the proposed work in the future and will provide certainty to landowners.

4.2.2 Alteration to Designation

Lodging a NoR for the alteration of an existing designation has the same strengths and potential risks as identified for a new designation. However, the requirement for an alteration only looks at effects of what is being proposed above and beyond the existing designation, therefore the effects assessment is more limited. However, 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). It is anticipated in the future the corridor will be transferred from the management of Waka Kotahi to AT however this does not influence the recommended route protection method.

4.2.3 Landowner / Developer Negotiations

Timing is a key issue when looking to enter into developer and/or landowner agreements. Additionally, each of the recommended corridors traverse a large number of individual properties with individual landowners.

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-Opāheke 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 little or no development plans and that aren't part of an agreement with a larger developer are unlikely to have an appetite to negotiate.

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. Additionally, it is not compulsory for landowners or developers to enter into agreements, significantly reducing the use of this mechanism for route protection purposes.

It is noted that the eastern section of the Jesmond to Bremner Link (part of the Bremner Road FTN Upgrade) has been route protected to some extent through the Drury 1 Precinct Plan, its provisions and Plan Change 6 agreements, providing a two-lane road and allowing for a 28m corridor for future upgrading by Auckland Transport. However, for the western section of the road, the developer has no plans to construct the road as the majority of landowners surrounding this section have no development plans (were not part of the Auranga group). Further route protection to allow for the construction of this section should be investigated to ensure consistency across the Drury network and to assist with future landowner negotiations (under the Public Works Act) .

4.2.4 Plan Change / Structure Plan

The recommended network aligns with the Drury-Opāheke Structure Plan. In the Drury context, the Structure Plan is not considered an appropriate mechanism for route protection as it does not provide enough certainty in protection of privately-owned land and has no formal statutory weighting.

Similarly, a new plan change is not considered an appropriate mechanism to implement the network because the land surrounding portions of the network (including Jesmond Road, Bremner Road and Opāheke 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.

The Fulton Hogan, Kiwi Property and Oyster Capital private plan changes present an opportunity for integration and a form of route protection on Waihoehoe Road West, Waihoehoe Road East and a section of Opāheke N-S through the identification of routes on precinct plans and suitable precinct provisions. The level of protection provided by this is not as strong as that provided by other mechanisms such as designation which requires approval from the requiring authority for any works within the designation. The private plan changes were accepted by Auckland Council in July 2020 and at the time of writing this report, outcomes and timing of the plan changes are uncertain. Opportunities should be explored as the plan changes are progressed.

Given the upgrade for Opāheke Road urban can generally be contained within the existing road reserve, a structure planning and plan change process would not provide any more certainty to the community than what is already shown in the AUPOIP.

4.2.5 Suitability of Route Protection Mechanisms and Recommendations

Based on the above considerations and assessments, the following table presents the level of suitability of each route protection mechanism for each section of the network. The recommended route protection mechanism for each section of the network is outlined below. Some route protection mechanisms have not been assessed in detail since they were ruled out for further consideration (refer discussion in Section 2.1).

Table 4-2: Strength of Route Protection Mechanisms for Recommended Drury Strategic Transport Network

Mechanism	SH22	Jesmond Road	Bremner Road	Waihoehoe Road West	Waihoehoe Road East	Opāheke N-S	Ponga Road	Opāheke Road rural	Opāheke Road urban
Designation									
Alteration to Designation									
Landowner / developer negotiations									
Plan Change / Structure Plan									

KEY: STRONG MEDIUM WEAK NOT APPLICABLE

An alteration to designation is the recommended route protection mechanism for the SH22 corridor. A designation is the most efficient and effective mechanism for providing route protection and providing certainty to all parties, given the number of landowners who will be impacted by the recommended option. It also provides for an efficient use of an existing corridor reducing private property impacts and consequently may reduce alternatives and effects assessment requirements.

A designation is the recommended route protection mechanism for the Jesmond Road, Bremner Road, Waihoehoe Road East and West, Opāheke N-S, Ponga Road and Opāheke Road rural transport corridors. Although route protection of the entire Opāheke Road urban corridor is not required as it can be generally provided for within the existing road corridor, a designation is recommended to protect the discrete areas of private land required for driveway regrading and the Opāheke Road / Settlement Road roundabout. As previously identified, a designation is the most efficient and effective mechanism for providing route protection in a changing urban environment and providing certainty to the community and to affected landowners.

4.3 Urgency of Route Protection

Table 4-3 provides an assessment of the urgency of route protection, or implementation of the designations, for each of the corridors taking into account the considerations outlined in Section 4.1.

Table 4-3 Urgency of Route Protection

Corridor	Urgency	Comment
SH22	**HIGH**	Although the future implementation of the SH22 Upgrade is unconfirmed, due to lack of current funding and uncertainty of construction timing, route protection of the corridor is of high urgency as there is a high likelihood of urban development in the near future indicated by the recently lodged Auranga B2 plan change and proposed private plan changes in Drury West. The acceptance of plan changes by Auckland Council and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. A number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Jesmond Road	**HIGH**	Although the future implementation of the Jesmond Road FTN Upgrade is unconfirmed, due to lack of current funding and uncertainty of timing, route protection of the corridor is of high urgency as there is a high likelihood of urban development in the near future indicated by Plan Change 6, the recently lodged Auranga B2 plan change and proposed private plan changes in Drury West Development within the Drury 1 Precinct has commenced and will continue to intensify. The acceptance of plan changes by Auckland Council, and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. Although developer interest looks to accelerate growth in Drury, the timing of upgrades to Jesmond Road may be staged. For example, walking and cycling may be implemented first and then the FTN function (bus lanes) implemented later in the future as the area continues to urbanise. It is important to route protect the future full width of the corridor ahead of development so the full form can be implemented in the future when required.

		A number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Bremner Road	**HIGH**	Although the future implementation of the Bremner Road FTN Upgrade is unconfirmed, due to lack of current funding, route protection of the corridor is of high urgency as development within the Drury 1 Precinct has commenced and will continue to intensify. Auckland Council Parks have also indicated plans for park development within Drury Sports Complex. The acceptance of plan changes by Auckland Council, and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. Protecting the alignment through the existing industrial area is also important as the areas on either side of this are urbanising and the industrial area is likely to begin to change also. Protecting the alignment will provide certainty for landowners and protect AT's interests. Full land parcels and a number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners and Auckland Council Parks is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Waihoehoe Road West	**HIGH**	Although the future implementation of the Waihoehoe Road West FTN Upgrade is unconfirmed, due to lack of current funding and uncertainty of construction timing, route protection of the corridor is of high urgency as there is a high likelihood of urban development in the near future indicated by private plan changes. The acceptance of three of these plan changes by Auckland Council in July 2020, and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. Although developer interest looks to accelerate growth in Drury, the timing of upgrades to Waihoehoe Road West may be staged. For example, walking and cycling and intersection upgrades may be implemented first and then the FTN function (bus lanes) implemented later in the future as the area continues to urbanise. It is important to route protect the future full width of the corridor ahead of development so the full form can be implemented in the future when required. A number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important.

		It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Waihoehoe Road East	**HIGH**	Although the future implementation of the Waihoehoe Road East Upgrade is unconfirmed, due to lack of current funding and construction timing uncertainty, route protection of the corridor is of high urgency as there is a high likelihood of urban development in the near future indicated by private plan changes. The acceptance of plan changes by Auckland Council, and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. A number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Opāheke N-S FTN Arterial	**HIGH**	Although the future implementation of the Opāheke N-S FTN Arterial is unconfirmed, due to lack of current funding and uncertainty of construction timing, route protection of the corridor is of high urgency as there is a high likelihood of urban development in the near future indicated by private plan changes. The acceptance of plan changes by Auckland Council, and the recent NZUP and COVID-19 Recovery (Fast-track Consenting) Act (which have accelerated a number of South Auckland and Drury transport projects) illustrates that development pressure in the Drury area is significant and route protection is required with high urgency. Full parcels and a number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. Although developer interest looks to accelerate growth in Drury, Opaheke North South FTN Arterial may be staged. For example, developer may construct part of the new road and the FTN function (bus lanes) implemented later in the future as the area continues to urbanise. It is important to route protect the future full width and full length of the corridor ahead of development so the full form and length can be implemented in the future when required. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Ponga Road	**MED**	Although the future implementation of the Ponga Road Upgrade is unconfirmed, due to lack of current funding and uncertainty of construction timing, route protection of the corridor is of medium urgency there is a likelihood of urban development in the near future indicated by private plan changes lodged in Drury South and West. Although no private plan changes have been lodged immediately surrounding the corridor, it is anticipated plan changes will continue

		to progress in the Drury-Opāheke Area. A number of partial, but significant, land parcels are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Opāheke Road rural	**MED**	Although the future implementation of the Opāheke Road Rural Upgrade is unconfirmed, due to lack of current funding and construction uncertainty, route protection of the corridor is of medium urgency as there is a likelihood of urban development in the near future indicated by private plan changes lodged in Drury South and West. Although no private plan changes have been lodged immediately surrounding the corridor, it is anticipated plan changes will continue to progress in the Drury-Opāheke Area. Additionally, development within the Opāheke 1 Precinct has commenced and will continue to intensify. Auckland Council Parks have also indicated plans for park development within Opāheke Reserve. A number of partial, but significant, parcels of land are required to accommodate the final road form, stormwater infrastructure and construction area. Providing certainty to landowners is therefore important. It is recommended this corridor be designated as soon as possible to protect the land required for the corridor and ancillary infrastructure, as well as providing certainty to landowners, stakeholders and developers.
Opāheke Road urban	**MED**	The proposed cross section fits largely within the existing road corridor. Property requirements are limited to a new roundabout on Opāheke and Settlement Roads (one full, two partial acquisitions). Works on private properties are required for the regrading of nine driveways. Land requirements are limited compared to the other corridors within the Drury Local Package. Although the future implementation of the Opāheke Road Urban Upgrade is unconfirmed, due to lack of current funding and uncertainty of construction timing, route protection of the corridor is of medium urgency as although development in the area is unlikely to significantly change in the near future and an established community is already developed, some intensification in the area has begun and is likely in the future, particularly within the THAB zone in the north-east. Although more intense residential development is occurring in the area, there are no known larger plans for development. Because intensification in the area is occurring and can occur as of right in the residential zones, protecting these discrete areas and providing certainty to landowners is important. Therefore, it is recommended the discrete areas required outside the road corridor be designated in the near future to protect the land for the future upgrade and to provide certainty to landowners.

5 NoR Grouping and Packaging

5.1 Grouping and Packaging Considerations

NoRs for designations are the recommended route protection mechanisms for all of the recommended options, except the SH22 corridor, where an alteration to the existing designation is recommended. There may be opportunities to group multiple recommended options into a single NoR (i.e. one NoR covering multiple corridors) and/or package multiple NoRs into a single application. The grouping and packaging of NoRs provides an opportunity to improve efficiencies in the NoR process, streamlining statutory timeframes and avoiding unnecessary duplication. However, this must be balanced with the potential for increased planning risk and added complications of grouping issues/corridors together.

In determining whether it may be appropriate to group options and/or package NoRs, the following criteria have been considered:

1. **Project context and transport outcomes** – A shared contextual basis (such as similar business case foundations, investment objectives, requiring authority, geographic context and project drivers) allows for efficiencies in base information which will be provided to support the NoR package/bundle.

2. **Planning risk** – A similar level planning risk (such as notification risk, likelihood of appeal, complexity of planning approval requirements) limits the potential that projects are unnecessarily exposed to delays and added planning complexity, noting projects also need to be credible and be able to stand alone if required.

3. **Urgency/timing** – Similar programme timing (including design, assessment, project drivers) provides consistency in provision of information requirements, key deadlines and delivery targets. Also similar urgency for route protection.

4. **Project complexity** – A similar level of project complexity (such as design complexity and scale) provides consistency in provision of information requirements and limits the potential that projects are unnecessarily exposed to added complexity.

Table 5-1 provides commentary on how the above criteria relate to each of the recommended corridors and the appropriateness of option grouping and/or NoR packaging based on these criteria.

Table 5-1: Drury NoR Grouping Considerations

NoR Analysis (Requiring Authority)	Project Context	Transport outcomes (DBC problems, benefits and investment objectives)	Planning risk	Project timing, according to FULSS, IBC and DBC modelling	Urgency (see Table 4-3)	Project complexity
SH22 (Waka Kotahi)	• Located in Drury west. • Transitioning from a state highway to an urban arterial, in conjunction with Pukekohe Expressway as an alternative route. • The recommended option is a four-lane arterial, although it is not specifically part of the FTN. • Currently designated by Waka Kotahi. The only Waka Kotahi element as part of the Drury Local transport network	• Improving road safety for all road users • Providing connectivity and accessibility to support growth along the corridor • Support a sustainable and high quality urban form that responds to urban development • Provides for modal choice	Generally low planning risk as: • It is proposed to alter an existing designation • The public is generally aware of the project through the Auckland Council Drury-Opāheke Structure Plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement – heightened awareness of safety issues on SH22 • General interest from stakeholders including landowners, Auckland Council Parks and developers. • Environmental constraints including terrestrial SEA at Ngakoroa Stream have been considered and impacts to be managed • Generally partial lot land requirements	Decade 1, by 2028	High urgency	Widening existing road. Reconstruction of one bridge.
Jesmond Road FTN Arterial (AT)	• Located in Drury west. • Part of the FTN connecting Drury east and west with centres and stations. • The recommended option is a four-lane arterial, including a bus lane in each direction.	• Jesmond Road, Bremner Road and Waihoehoe Road West and East have similar problems and investment objectives. • Jesmond Road, Bremner Road and Waihoehoe Road West have the same transport function (FTN) and will produce similar benefits. • The focus for all corridors is to support growth and a more sustainable quality urban form by improving connectivity through Drury. • Also a focus of all corridors is to achieve a transformational mode shift by providing high quality safe and attractive public transport and active mode facilities.	Generally low to moderate planning risk as: • The public is generally aware of the project through the Auckland Council Drury-Opāheke Structure Plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Some public opposition to change in the area indicating risk of submissions and appeal • There are no significant environmental constraints, impacts were considered during alternatives assessment process • Consultation with developers is ongoing • General interest of stakeholders and landowners along the alignment • Generally partial lot land requirements	Decade 1, by 2028	High urgency	Widening existing road.
Bremner Road FTN Arterial (AT) **Split into Jesmond to Bremner Link, central section and east section for Planning Risk**	• Located in Drury west and the eastern section located in Drury central (existing industrial area) • Part of the FTN connecting Drury east and west with centres and stations. • The recommended option is a four-lane arteria, including a bus lane in each direction.		Generally low planning risk along the Jesmond to Bremner Link as: • Landowners aware of the upgrade through Plan Change 6 proceedings – therefore there should be limited submissions or appeals from landowners • The public is generally aware of the project through the Drury 1 Precinct Plan, Auckland Council Drury-Opāheke Structure Plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • There are no significant environmental constraints • Ongoing engagement with Auranga Developers • General interest from landowners and stakeholders including the Ministry of Education (MoE) • Generally partial lot land requirements Generally moderate planning risk within the Bremner Central Section as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Although there are environmental constraints including the crossing of Ngakoroa Stream, scheduled and recorded heritage sites, Transpower pylons and Significant Ecological Areas (terrestrial and marine), impacts can be mitigated. • Stakeholder interest from landowners, Auckland Council Parks and the community due to potential impacts on Drury Sports Complex and esplanade reserve • Stakeholder interest from DoC and Manawhenua as access to DoC land [redacted] • Approval for works within the Waka Kotahi designation is required. As a Project Partner, this poses minimal risk • Generally partial lot land requirements Generally moderate planning risk within the Bremner East Section as: • The public is generally aware of the project through the Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement	Decade 1, by 2028	High urgency	Upgrading existing roads, bridge widening over Ngakoroa Stream and SH1, and one new bridge over Hingaia Stream.

NoR Analysis (Requiring Authority)	Project Context	Transport outcomes (DBC problems, benefits and investment objectives)	Planning risk	Project timing, according to FULSS, IBC and DBC modelling	Urgency (see Table 4-3)	Project complexity
			• Full and partial lot land requirements • Interest from impacted businesses – there is a close knit business community in the area that have opposed AT changes in the past • Environmental constraints include the crossing of Hingaia Stream, flooding, scheduled and other heritage sites. Environmental constraints were considered and impacts minimised where possible through the options assessment. • General stakeholder interest including landowners, Auckland Council Parks (esplanade reserve) and Heritage NZ.			
Waihoehoe Road West FTN Arterial (AT)	• Located in Drury central (or Drury east) • Part of the FTN connecting Drury east and west with centres and stations • The recommended option is a four-lane arterial, including a bus lane in each direction.		Generally low planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Involves a short section of upgrading with limited environmental constraints which have been considered and minimised where possible through the options assessment • Interest from some impacted businesses on Great South Road • Generally partial lot land requirements • Approval for works within KiwiRail designation is required. As a Project Partner this poses minimal risk • General stakeholder interest including landowners, Housing NZ and developers • Developers are likely to support the project in order to facilitate their development plans	Decade 1, by 2028	High urgency	Widening existing road. Lengthening and widening of Waihoehoe bridge.
Waihoehoe Road East Arterial (AT)	• Located in Drury east. • The recommended option is a two-lane arterial and is not a part of the FTN.		Generally low planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Involves a short section of upgrading with limited environmental constraints which have been considered • Generally partial lot land requirements • General stakeholder interest including landowners and developers	Decade 1, by 2028	High urgency	Widening existing road.
Opāheke N-S Arteria (AT)I	• Located in Drury east (and Opāheke) • Part of the FTN connecting Drury east and west with centres and stations. This also provides an additional connection to Papakura for Drury. • The recommended option is a four-lane arterial, including a bus lane in each direction.	• Focus on provision of a north south connection between Papakura and Drury and enabling quality urbanisation of Drury-Opāheke. • Improve transport choice and network resilience	Generally moderate planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Full and partial lot land requirements through greenfields areas • Environmental constraints include multiple stream crossings and floodplains. These were considered and impacts minimised where possible through the options assessment • Utility stakeholder interest including from First Gas and Counties Power. Approval is required for works within First Gas' designation. • General interest from developers who are likely to support the project in order to facilitate their development plans	Decade 2, by 2038	High urgency	Approximately 3,150m of new road through greenfields. Multiple stream crossings and flood plain requiring large lengths of bridges and culverts.
Ponga Road Arterial (AT)	• Ponga Road and Opāheke Road (urban and rural) form one linear corridor and are located in Opāheke, with Opāheke Road urban reaching into Papakura. • All options are two-lane arterials and are not a part of the FTN, however Opāheke Road urban is a 20m corridor (opposed to 24m) and can be accommodated largely within the existing road reserve.	• Ponga Road and Opāheke Road (rural and urban) have similar problems, benefits and investment objectives as Jesmond Road, Bremner Road and Waihoehoe Road. However they do not have the same transport function as the FTN corridors. • The focus for the corridors is to support growth and a more sustainable quality	Generally low planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Utility stakeholder interest including from First Gas, approval required for works within their designation • A short section of upgrade with limited environmental constraints which have been considered during options assessment • Generally partial lot land requirements • General stakeholder interest including landowners and developers	Decade 2, by 2038	Medium urgency	Widening existing road.
Opāheke Road Arterial rural (AT)			Generally low to moderate planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Generally partial lot land requirements	Decade 2, by 2038	Medium urgency	Widening existing road.

NoR Analysis (Requiring Authority)	Project Context	Transport outcomes (DBC problems, benefits and investment objectives)	Planning risk	Project timing, according to FULSS, IBC and DBC modelling	Urgency (see Table 4-3)	Project complexity
		urban form by improving connectivity through Drury-Opāheke. • Also a focus of the corridors is to achieve a transformation mode shift by providing high quality safe and attractive public transport and active mode facilities.	• Utilities stakeholder interest including from Counties Power, approval required for works within their designation • Approval for works within the KiwiRail designation is required. KiwiRail is a Project Partner so this poses minimal risk • Environmental constraints include Waipokapū Stream and Mangapū Stream crossing and flooding impacts. Impacts were considered and minimised where possible through the options assessment • Stakeholder and community interest including from Auckland Council Parks for works within Opāheke Reserve and esplanade reserve			Two new active mode bridges.
Opāheke Road Arterial urban (AT)			Generally low planning risk as: • The public is generally aware of the project through Auckland Council structure plan and engagement on the South Indicative Strategic Transport Network and DBC Engagement • Land requirement is limited as the corridor largely fits within the existing road reserve, and property impacts are limited to the regrading of nine driveways and land to the east of the Opāheke Road / Settlement Road roundabout. • Environmental constraints are limited • General stakeholder and community interest including from Auckland Council Parks and Heritage NZ.	Decade 2, by 2038	Medium urgency	Upgrade of existing road (no widening of road corridor)

Summary	• SH22 has similar transport outcomes as other corridors however has a focus on safety and "downgrading" its function to an urban arterial providing centre connections between Drury and Pukekohe (4-lane, not part of the FTN). SH22 is the only project with Waka Kotahi as the requiring authority.
	• Jesmond Road, Bremner Road and Waihoehoe Road West have the same transport outcomes and transport function (4-lane FTN and centre connections within Drury)
	• Opāheke N-S also shares the themes above (4-lane FTN and centre connections) plus has an additional Papakura to Drury function. Opāheke N-S stretches north-south from Drury through Opāheke to Papakura, whereas the others are generally east-west within the Drury area.
	• Opāheke Road rural and urban, Ponga Road and Waihoehoe Road West have similar transport outcomes as above but without the FTN function (2-lane). Waihoehoe Road East is in a different geographic location to Opāheke Road (rural and urban) and Ponga Road.
	• Opāheke Road has a similar transport outcome as above and is a 20m corridor which generally fits within the existing road reserve.
			• No significant planning risk:
			  • Jesmond to Bremner Link
			• Low planning risk:
			  • SH22
			  • Jesmond Road
			  • Waihoehoe Road West
			  • Waihoehoe Road East
			  • Ponga Road
			  • Opāheke Road urban
			• Low to moderate planning risk:
			  • Opāheke Road rural
			• Moderate planning risk:
			  • Bremner Road East
			  • Bremner Road Central
			  • Opāheke N-S
				Decade 1, by 2028:
				• SH22
				• Jesmond Road
				• Bremner Road
				• Waihoehoe Road West
				• Waihoehoe Road East
				Decade 2, by 2038
				• Opāheke N-S
				• Ponga Road
				• Opāheke Road rural
				• Opāheke Road urban
					All corridors have a high urgency for route protection apart from Opāheke Road rural and urban and Ponga Road which have medium urgency.	Not overly complicated projects. Most options are road widening apart from Opāheke N-S and the Jesmond to Bremner Link which are greenfield and Opāheke Road urban which does generally not include widening of the overall corridor.

5.2 NoR Grouping Recommendations

One Notice of Requirement (**NoR D1**) to alter the existing SH22 designation will be submitted by Waka Kotahi, because:

- It is not appropriate for any other corridor to be grouped with SH22, as it is a state highway corridor and the responsibility of Waka Kotahi as requiring authority;
- Although having similar transport outcomes and timing (decade 1, by 2028) as other recommended options, the transport function is different (road widening and an active mode upgrade) and is not part of the FTN network

The FTN road widening upgrades (Jesmond Road, Bremner Road and Waihoehoe Road West) will be grouped together in one notice of requirement **(NoR D2**), served by AT, because:

- They are all in the Drury area;
- Each of the corridors have the same transport outcomes and transport function (FTN);
- Similar level of complexity and planning risk;
- Route protection of each of these corridors is of high urgency; and
- Implementation of each of these corridors is expected in the first decade of development by 2028.

Waihoehoe Road East will be designated through its own notice of requirement (**NoR D3)**, served by AT for the following reasons:

- It is one of few corridors without an FTN function located in Drury East;
- Although having similar transport outcomes and timing (decade 1, by 2028) as other recommended options, the transport function is different (an active mode upgrade) and is not part of the FTN network; and
- It has a lower level of planning risk than the FTN network.

The new Opāheke N-S FTN arterial will be designated through its own notice of requirement **(NoR D4),** served by AT, because:

- The location of the project spreads across Drury and Opāheke to Papakura;
- Although, having similar transport outcomes as the rest of the FTN network, this FTN route serves a north-south function, connecting Papakura and Drury centres, slightly different to the local east-west connection to stations and between Drury centres;
- The greenfield project is a slightly more complex project in terms of planning constraints, construction, flood plain and multiple stream crossings (but not high risk); and
- Implementation of the corridor is expected in the second decade by 2038, ten years later than the rest of the Drury FTN network.

Ponga Road, Opāheke Road rural and Opāheke Road urban (discrete areas for protection) will be grouped into one notice of requirement **(NoR D5)** served by AT, because:

- All three corridors are located in Opāheke along one linear corridor;
- Although having similar transport outcomes as other recommended options, the transport function includes active mode upgrades and none of the corridors are part of the FTN network;
- All of the corridors have a similar level of planning risk;

- Route protection of each of these corridors is of medium urgency; and
- All corridors are proposed for implementation in the second decade, by 2038.

5.3 Packaging and Implementation

As discussed in Section 4.3, route protection for most of the corridors (route protection of discrete areas only for Opāheke Road urban), and therefore lodging the relevant NoR, is generally of high priority in order to protect the land required for the proposed network, while providing certainty to landowners, businesses, stakeholders and the community. This is particularly important in the Drury-Opāheke area where zoned land areas are being increasingly developed, FUZ land is being live zoned and/or a number of private plan changes have been lodged with and accepted by the Council, indicating expedited growth of the FUZ by developers.

As such, it is proposed that NoRs D1 to D5, as outlined in Section 5.2, be lodged with the Council as one package, with high urgency. This package should be supported by, and share, one Assessment of Environmental Effects (AEE) to gain efficiencies with respect to common elements of the Projects. It is anticipated that the technical assessments below will be required to support the AEE and NoR to enable the nature and scale of effects and any mitigation to be understood:

- Cultural Impact Assessment
- Transport Assessment
- Landscape and Visual Effects Assessment
- Historic Heritage Effects Assessment
- Noise and Vibration Effects Assessment
- Ecological Impact Assessment
- Flooding Effects Assessment
- Arboricultural Effects Assessment
- Urban Design Framework

Table 5-2 and Figure 5-1 provides an overview of the Drury NoR grouping and packaging recommendations.

Table 5-2: Drury Overall NoR Grouping and Packaging Recommendations

Drury Strategic Transport Network NoR Package 1 – high urgency	
Project	**Notice (and requiring authority)**
State Highway 22 (SH22) Urban Arterial	NoR D1 (Waka Kotahi) – alteration to designation 6707
Jesmond Road FTN Arterial Upgrade	NoR D2 (AT)
Bremner Road FTN Arterial Upgrade	
Waihoehoe Road West FTN Arterial Upgrade	
Waihoehoe Road East Arterial Upgrade	NoR D3 (AT)
New Opāheke North-South FTN Arterial	NoR D4 (AT)
Ponga Road Arterial Upgrade	NoR D5 (AT)
Opāheke Road (rural) Arterial Upgrade	
Opāheke Road (urban) Arterial Upgrade *Designating discrete areas outside the existing road corridor only*	

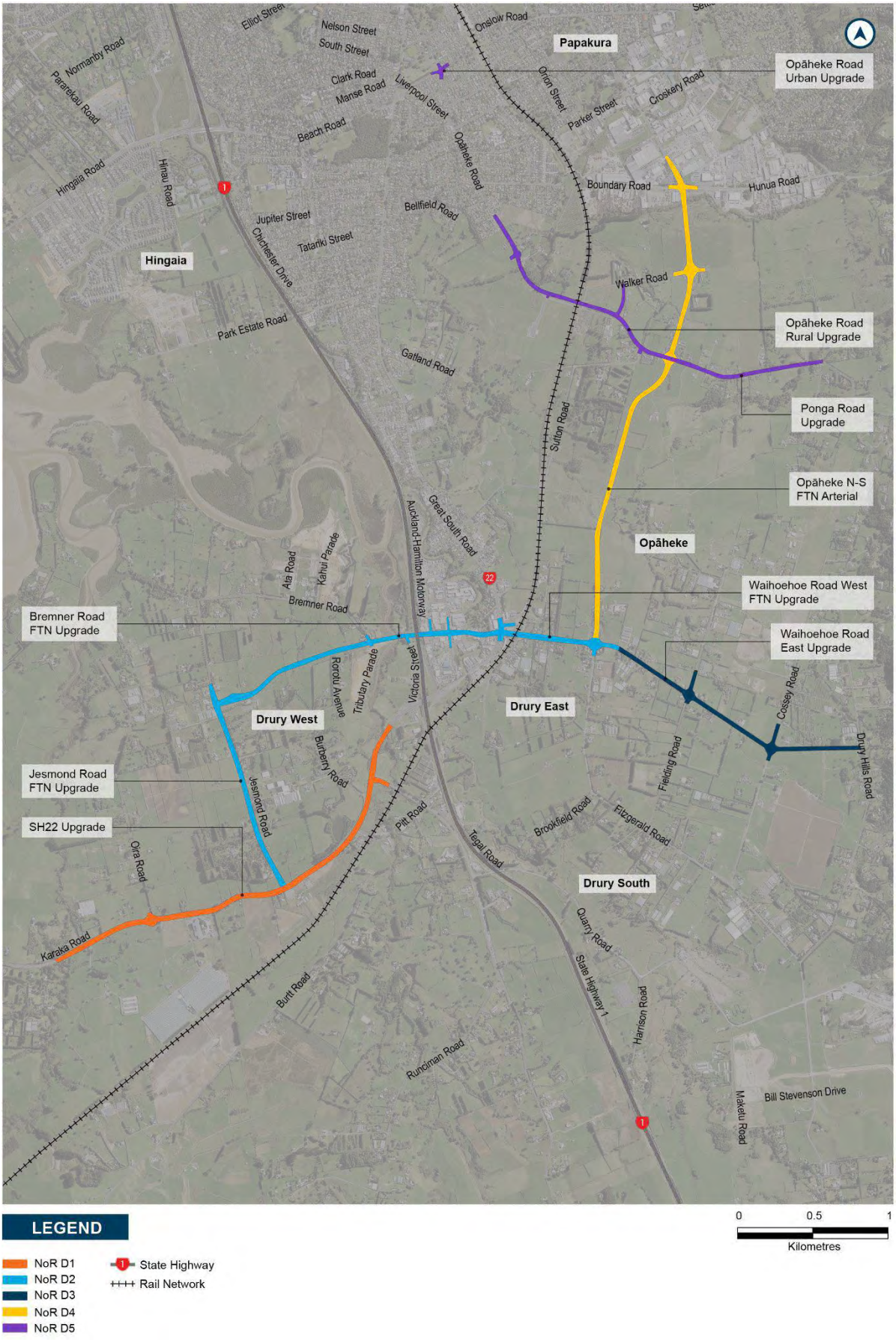


Figure 5-1: Overall NoR Bundle and Packaging Recommendations

5.4 Lapse Recommendations

This section makes recommendations on the lapse periods for each of the notices. A lapse period is not required for NoR D1 because the designation being altered has already been given effect to. The purpose of Te Tupu Ngātahi is to route protect land for future implementation of the required strategic transport corridors and infrastructure. Therefore, there is a need for long term route protection to enable integration with land use as it changes, to provide certainty and access, and to protect the corridor from inappropriate development until such time as the transport corridors are required to support and facilitate planned urban growth. Although developer interest looks to accelerate growth in Drury, funding of the Drury Local projects is uncertain at this time and construction staging and timing still has a level of uncertainty, the proposed transport corridors need to be protected so that can be implemented in the future when required.

The need for route protection of corridors is urgent in order to protect the land as development occurs, particularly given the number of proposed private plan changes in the Drury area. The proposed plan changes give real and sustained pressure to Council to allow out of sequence growth in Drury. The acceptance of these plan changes by Council indicates their willingness to allow this acceleration of growth and the need for Te Tupu Ngātahi to respond and route protect the transport corridors. The use of a long lapse period provides greater certainty on the following matters:

- It protects the corridor from inappropriate development and enables effective transport and land use integration as future urban land is urbanised and developed overtime;
- It provides certainty to everyone that the projects can be constructed and operated when required, responding to growth;
- It provides adequate time to undertake property negotiations and processes, including access negotiations and acquisitions as necessary;
- It provides adequate time to complete further site investigations and design (preliminary, detailed and construction) of all aspects of a project;
- It provides adequate time to secure project funding; and
- It provides adequate time to complete construction procurement and tendering processes.

Based on the matters above, longer lapse periods are recommended for NoR D1 to D5. The specific length of these lapse periods is determined largely by the proposed project timing according to FULSS, and IBC and DBC modelling.

NoR D2 and D3 are recommended to have a lapse period of 10 years as they are predicted to be implemented within the first decade of development, by 2028. NoR D4 and D5 are recommended to have a lapse period of 20 years as they are predicted to be implemented within the second decade of development, by 2038. Additionally, a comprehensive catchment-wide solution for flooding constraints, in combination with wastewater infrastructure, is needed in Drury-Opāheke before development can occur in this area. A summary of lapse periods for each of the NoRs is provided in Table 5-3 below.

Table 5-3 Summary of Recommended Lapse Periods

Notice	Lapse Period
NoR D1	Not applicable as existing designation has already been given effect to
NoR D2, NoR D3	10 years
NoR D4, NoR D5	20 years

6 Conclusion

This route protection strategy recommends that route protection for the Drury Local DBC corridors is achieved through five NoRs in one package. The NoRs are shown in Figure 5-1.

Private plan changes in Drury East have recently been accepted by Auckland Council and these present opportunities for Waihoehoe Road West, Waihoehoe Road East and a section of Opāheke N-S FTN Arterial and these opportunities should be explored through the plan change proceedings. However, the developers do not own all of the land adjacent to the projects, resulting in a reliance on individual property owners to enter into agreements. 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 the projects. Additionally, it is not compulsory for landowners or developers to enter into agreements.

The NoR process is the preferred mechanism for route protection as it will provide the strongest level of protection for the proposed corridors, as well as providing certainty to landowners and developers. This is particularly important given some areas in Drury are recently zoned for development, rapidly urbanizing and the private plan changes indicating that development in the FUZ is imminent.

NoR D1 is an alteration to the existing Waka Kotahi SH22 designation This is the most efficient planning mechanism to protect the corridor. This corridor is not grouped with any another recommended options as it is currently designated, has a slightly different transport function and is a state highway. Urgency for route protection of this corridor is high and a lapse period is not required because the designation being altered has already been given effect to.

NoR D2 comprises the recommended options for the Jesmond Road, Bremner Road and Waihoehoe Road West FTN Arterial Upgrades. A designation is the most efficient and effective mechanism to protect these corridors. These corridors were grouped together because of their high urgency, similar transport outcomes and FTN function, project timing, location and similar level of planning risk. A lapse period of 10 years is recommended.

NoR D3 comprises the recommended option for the Waihoehoe Road East Arterial Upgrade. A designation is the most efficient and effective mechanism to protect this corridor. This corridor is not grouped with other corridors as it has a different transport form and function to the other corridors it ties into (Waihoehoe Road West and Opāheke N-S), which provide a four-lane FTN. Corridors on Opāheke Road and Ponga Road provide the same form and function as Waihoehoe Road East. However, the location of these corridors is different, and Waihoehoe Road East is proposed for development 10 years prior. Urgency for route protection of this corridor is high and a lapse period of 10 years is recommended.

NoR D4 comprises the recommended option for the new Opāheke N-S FTN Arterial. A designation is the most efficient and effective pathway to protect this corridor. This corridor is not grouped with the FTN network as it is proposed for implementation in the second decade and has added project complexity being a new road with additional planning risks. Urgency for route protection of this corridor is high and a longer lapse period of 20 years is recommended.

NoR D5 comprises the recommended options for the Ponga Road and Opāheke Road rural Arterial Upgrades as well as discrete areas required to accommodate the Opāheke Road urban Arterial Upgrade. A designation is the most efficient and effective pathway to protect these corridors. These corridors were grouped together as they have the same level of urgency and provide the same transport outcomes, form and function. Together they form one linear corridor and are planned for implementation in the second decade. A longer lapse period of 20 years is recommended.

It is recommended that NoRs D1 to D5 are packaged into a single application for lodgement since the urgency of route protection of the corridors is generally high. The packaging of NoRs provides an opportunity to improve efficiencies in the NoR process, streamlining statutory timeframes and avoiding unnecessary duplication.

Appendix 1. Programme Wide Technical Guidance Note – Route Protection Strategy

Programme Wide Technical Guidance Note – Consenting Strategy

Consenting Strategy Task Team

Updated 27 September 2018

Prepared by Jennifer Caldwell, with input from Andrea Rickard, Belinda Petersen, Sonya McCall, Nita Chhagan, Gavin Smith

Technical Guidance for Business Case Teams:

Developing consenting strategy recommendations for Business Case appendix

1. Overview

1. One of the key tasks of the SGA Programme-Wide workstream is preparation of a programme-wide consenting strategy for delivery to the Boards of AT and NZTA along with the four final area-based Indicative Business Cases.

2. The programme-wide consenting strategy will act as an overarching **framework**, within which each business case team will prepare its own high level consenting recommendations that will form an appendix to each business case document. Preliminary recommendations need to be developed by the Business Case teams as to the indicative **priority**, **packaging and preferred mechanism** to achieve route protection for all components of the preferred network articulated in each business case. We will then apply a programme-wide lens to confirm or adjust those recommendations having regard to wider strategic considerations across all business cases and then complete the programme-wide document.

3. The final programme-wide consenting strategy (comprising the framework document and the individual consenting strategy appendices attached to each business case) will be subject to an IQA and internal approval process with both AT and NZTA and will be approved by the PAB before the business cases are delivered to the Boards in February-March 2019.

4. The purpose of this technical guidance note is to outline the recommended **methodology** for developing preliminary consenting and route protection recommendations.

2. Context – Route Protection

5. The principal task of Te Tupu Ngātahi is to achieve route protection of a preferred network to support Auckland's projected growth over the next 3 decades. While Notices of Requirement (NoRs) may be the logical choice of route protection mechanism for the majority of the preferred network components, there are a range of other mechanisms available to achieve some degree of route protection that may be valid alternatives to NoRs. In some cases, NoRs may need to be supplemented by the use of other mechanisms including: resource consents (where network components may be scheduled for early construction), plan changes (initiated or submitted on), structure plans and traditional property acquisition. In other cases, where developer plans are well advanced and there is alignment on the preferred network, there may be opportunities to negotiate developer agreements to potentially avoid the need for NoRs (or avoid the need for notification of a NoR). Route protection for some preferred network components will need to be delivered by other partners, including KiwiRail and Auckland Council.

6. The full range of route protection mechanisms, together with a discussion of their advantages and disadvantages, is set out in Appendix 1 to this document. The programme-wide component of the indicative business cases will also include a section on the case for (or benefits of) route protection (cost and non-cost related).

7. The process of determining an optimal consenting strategy for each preferred network component will require **qualitative assessment** of a range of factors that can be grouped into the following three categories:

    1. Strategic importance – which components represent anchor projects that provide early opportunities to deliver on liveability objectives?

2. Urgency – which preferred network components need to be advanced as a matter of priority and why?

3. Complexity/risk profile – how difficult/straightforward will it be to achieve route protection?

8. These factors are set out in the attached checklist/worksheet and need to be assessed for their relevance and importance when developing a recommended consenting strategy. The recommended approach to the assessment process is discussed in section 4 below.

3. Preferred mechanism & process - NoRs

9. The current phase of the Supporting Growth Alliance programme involves preparation of indicative business cases. The next phase will involve completion of the detailed business cases concurrently with pre-lodgement work to prepare AEEs and NoRs (or to advance other route protection mechanisms such as developer agreements).

10. The final phase is the post-lodgement phase. Earlier internal discussions on this phase focused on two alternative statutory pathways for NoRs:

4. A traditional two-stage notified process with a hearing by Council then potential appeals to Environment Court. The two stage process will potentially take longer but provides greater scope for community involvement, can flush out minor issues and potentially resolve more substantive issues prior to appeal;

5. Application to Council seeking direct referral to the Environment Court. Cost is higher, timeframe is shorter, and any appeal must be on points of law. This is an attractive option if opposition is limited, submitters are likely to be supported by expert witnesses and the issues are focused.

11. Those earlier discussions did not make provision for an EPA Board of Inquiry, but it remains an available process choice particularly where a large number of projects can be aggregated and require urgency (subject to consideration of cost and wellbeing of personnel).

12. While business case teams need to select a recommended route protection mechanism, they do **not need to select a statutory pathway** for any NoR option. That will be done at a programme-wide level having regard to overall priority of projects and will involve discussion with Auckland Council and

potentially other parties. However, business case teams should ideally indicate those factors that might point towards one NoR process over another, for example:

6. A large number of individual affected land owners and lower priority in terms of timing – this may indicate a preference for a two stage process, in order to flush out and resolve issues prior to appeal stage;

7. A high level of community interest or opposition – any indication that issues cannot be resolved by conditions or that appeal is likely, may suggest direct referral, particularly if timing is an issue;

8. High priority, and limited parties with expert witnesses and legal representation – this may indicate a preference for direct referral as the best option.

4. Methodology

13. Each business case area team should undertake a consenting strategy session prior to Workshop #3 to develop preliminary views and a further session post-Workshop #3 to capture additional information and refine those views to the point where they can be documented for the relevant business case appendix.

14. At the initial consenting strategy session:

9. Discussion should be facilitated by the planning and legal leads but the whole team and OIMs in particular have a valuable role to play in contributing information;

10. The emerging preferred network should be broken down into individual components and named as individual "projects" down the left hand column of the checklist worksheet document (Project A, Project B etc). There will be an opportunity to bundle/aggregate projects together later;

11. For each component, starting with the larger/anchor components, summarise key known features in terms of existing land use, land ownership/number of directly affected landowners, proximity of developers and known timing of development and any known environmental or

cultural constraints (this should focus on matters directly relevant to consideration of route protection mechanism and does not need to be exhaustive);

12. Develop a **quick consensus** on **most obvious choice** of route protection mechanism, including consideration of staged implementation of that mechanism (eg NoR but preceded by interim step of a precinct plan/zoning);

13. Test consensus by reviewing all factors in the worksheet and rating them as neutral or positive. This means that a factor that has an obvious impact on consenting **priority, packaging, or pathway** will be positive; those factors that are not relevant will be neutral;

14. Identify **key drivers** and assess their **relative importance**. If timing or availability of funding is a key driver, that needs to be flagged as it will heavily influence strategy;

15. Identify what further information might be required before finalising preliminary view and determine process for obtaining that information;

16. Where all relevant information is available, confirm or adjust preliminary view for each component;

17. Once all components are assessed, consider which ones could be efficiently grouped together, having regard to geographic proximity, linkages between components, priority, choice of mechanism and other common factors. Early discussions about potential work packages should be put to one side for this purpose. Projects previously identified as having lower priority may now need to be promoted to a higher priority considering new information.

15. Business case teams should be prepared to discuss their preliminary views with stakeholders at Workshop 3 and confirm as part of their post-Workshop 3 documentation. Final views should be tested when the final recommended preferred network is endorsed by TST following Workshop 3.

16. Legal and planning leads should be available for ongoing discussion to refine recommendations.

5. Resourcing/capacity

17. The following issues will be relevant at the programme-wide level to confirming the final consenting strategy, but are **not directly relevant** to individual business case recommendations:

    18. Availability of Council resources at multiple levels; officer level on the regulatory side (processing NoRs), external expert consultants, Democracy Services hearing commissioners. This will be the subject of discussions with the Council integration team;

    19. Manawhenua capacity to respond/have input into multiple notified/contentious processes simultaneously or sequentially in a compressed timeframe;

    20. Submitter/community stakeholder capacity for participation eg would it be preferable to advance all area projects at the same time or via one large process or break them into smaller pieces spread across several years?

    21. SGA budget constraints – some route protection mechanisms will be more expensive than others or may better align with cashflow constraints.

18. Another factor that will be relevant to the programme-wide perspective is land use integration and land use certainty, including potential for subsequent changes through statutory processes to impact on the preferred corridor alignment.

6. Documenting recommendations

19. Discussion and outputs from each area-wide consenting strategy session should be documented in summary form, including the results of the checklist worksheet exercise. This should form the basis of each business case consenting (or route protection) strategy appendix, with the recommendations in a form that can be pulled as an executive summary into the main body of the business case report.

20. Recommendations can be made contingent on confirmation of specific information not yet known, and can also be the subject of back up recommendations. If, for example, the preferred option for one preferred network component is a negotiated developer agreement but the developer's position or willingness is not yet fully known, the recommendation can specify a date by which engagement should have reached a point where the developer's position can be fully understood. If an agreement is not certain at that point, the secondary recommendation could be to proceed with a NoR.

21. The recommendations package should therefore include:

    22. A recommended route protection mechanism for each component of the preferred network with a bullet point summary of the risk/opportunities;

    23. Recommendations as to which components are sufficiently interdependent that they should be advanced as a package, or whether other components should be packaged for other reasons (eg strategic importance, similar timing issues or developer readiness issues);

    24. Indications as to the priority of each component/package in relation to the others.

7. Discussion of specific factors – flexibility vs certainty

22. Two key drivers (under Complexity/Risk Profile) in the checklist worksheet are:

    25. The level of certainty available now for a specific network component (eg mode, width of corridor, levels of growth) and, related to that;

    26. What level of flexibility is required for appropriate protection of the route in light of the level of uncertainty and what is the best means of achieving that flexibility?

23. Many NoRs are supported by detailed information as to design and effects on the environment because they are intended to facilitate construction in the short to medium term (and may also be accompanied by regional resource consent applications). In some cases, the level of information provided enables the requiring authority to seek waiver of the outline plan process because the level of certainty is so high.

24. By contrast, designations with a primary focus on route protection are used in situations where construction is not imminent and may be some decades away. The level of design detail may be modest, requiring specific care when assessing effects and addressing the statutory tests. Recent examples include the Southern Links network of long-term infrastructure to accommodate growth in and around Hamilton City. In that case, the intended start of construction for many of the corridors protected was at least 20 years away.

25. There is extensive case law regarding the tension between certainty and flexibility. In summary:

27. Route protection designations are contemplated by the RMA and remain an appropriate planning mechanism, on the basis that the outline plan process is available to provide greater detail when the requiring authority is in a position to fund, design and construct the work;

28. However, all NoRs must be supported by information that is **sufficiently detailed to enable the nature and scale of effects to be understood by both the court/decision maker and submitters**;

29. There may be **circumstances**, such as sensitive receiving environments, where a **greater level of detail and potentially greater route specificity** is required;

30. A decision maker is likely to impose **conditions that constrain the proposed activity to the envelope of effects that are contemplated** in the NoR and are considered acceptable to the decision maker. The Outline Plan process does not permit a requiring authority to extend the effects beyond those considered when the NoR was approved.

26. Where business case preferred networks require high levels of flexibility for specific components, that should be signalled in the consenting /route protection strategy recommendations, along with some indications as to how that might be achieved in the specific circumstances.

27. There are tools to achieve greater flexibility for route protection NoRs, including:

31. Agreeing relevant information levels with the Council in advance of NoR lodgement;

32. Placing some NoRs on hold following lodgement to enable further assessment of effects or development of "spot design" to address concerns of specific landowners;

33. Developing proposed conditions in collaboration with Council to address concerns about effects that may not be sufficiently certain at the outset (ie by applying performance standards as opposed to a fixed methodology);

34. Seeking extended lapse dates and agreeing property use protocols with affected landowners that apply during an extended lapse period; and

35. Developing a responsive yet cost-effective property acquisition strategy.

28. These tools will be explored in detail in the programme-wide consenting strategy document and will also be scheduled for discussion with the Council integration team.

Appendix 1: Route protection mechanisms – strengths and weaknesses

Approach	Description	Strengths	Weaknesses	Commentary
Designation	Notice of Requirement to designate land for a public work.	• Has interim effect on lodgement • Enables compulsory acquisition, under the PWA. • Provides opportunity for the community to be involved in the process – if notified. • Would provide certainty to the community e.g. by being visible in the Unitary Plan. • Provides for necessary statutory protection through sections 176 and 178 of the RMA. • Provides compensatory process for affected landowners through section 185 of the RMA. • Requiring Authority has much greater control over conditions approach, structure and content. • Requiring Authority is the decision maker (or Environment Court if appealed). • NOR package can be prepared in a manner which maximises flexibility for future implementation. • Potential for a non-notified process in some instances. • Is a readily visible protection mechanism in the Unitary Plan,	• May need to purchase properties well in advance of construction and potentially much earlier than planned – i.e. exposes Requiring Authority to financial cost from lodgement. This is also an opportunity – if land is purchased well in advance, then less impact of property escalation costs etc. • If a requiring authority's decision is appealed to the Environment Court and the appeal(s) has a narrow focus, there is a risk that the Court becomes focussed on detail and not the wider context of the project and its benefits. (Albeit, this point could apply to most mechanisms). Risk that Council/Court are uncomfortable with level of uncertainty and of information provided to support route protection approach	It is anticipated designations (Notices of Requirement) will be a more common route protection mechanism chosen for the Programme for a number of reasons including: • It is a statutory process whereby the Transport Agency/AT retain the decision-making role, unless determined by a Board of Inquiry or appealed to the Environment Court. • The Transport Agency / AT propose conditions as part of the NOR and therefore have strong influence on outcomes. • It is a well-recognised and understood tool for route protection which also enables land acquisition processes through link to the PWA (links to usual practice

		and also on property files (e.g. if LIM requested).		of lodging NoR first, then negotiating purchase with landowner(s)). • A high level of time certainty (duration of statutory process as well as lapse).
Alteration to Existing designation	Alter an existing designation to provide for the future works. Likely to be most suitable where linking in to an existing designated corridor or alongside (e.g. adding land to an existing corridor).	• As above for new designation • Potential perception of the works being authorised having a lesser impact. • Potentially less complex alternatives process required.	• As above for new designation. • Potential perception of the works being authorised as having a lesser impact. • Limited application for a new route/corridor.	As above for new designations.
Resource consent	Land use consent for works on land etc. Coastal permits where an option may have significant works in the coastal marine area requiring consent for occupation to achieve the route protection outcome. Note: Would need to seek and secure very long lapse and expiry dates.	• Provides opportunity for the community to be involved in the process – if notified. • Whilst a coastal permit is not a protection mechanism *per se*, having a coastal permit could provide greater certainty that a route could be implemented under RMA.	• May not provide required statutory protection. • Not currently within Alliance scope • Does not enable compulsory acquisition of land (and if coastal permit for occupation, ca not compulsorily acquires coastal marine area). • Does not provide a compensatory process for blighting effect. • There is potential for a more detailed level of design to be	Use of consents to protect routes is unlikely, but it is possible that some consents may need to be sought alongside other route protection mechanisms in instances where projects are likely to proceed to construction within 5-10 years.

			expected in order to accurately identify and assess effects. • Comprehensive conditions may be imposed on the consents granted.	There are some instances where resource consents may be necessary to achieve route certainty – an obvious example being in the coastal marine area where designation is not an option.
Land owner/developer negotiation	For example: • purchasing a corridor of land and vesting as road. • purchase of whole blocks of land. • Development Agreement whereby Developer agrees to "set aside land for future transport corridor" and/or construction at a future point eg HIF Redhills town centre link combination.	• Would provide certainty to individual landowners and tie into individual development plans. • Potentially cost effective without the need for a more formal route protection process, and potentially avoids or reduces wide public engagement, submissions and hearing processes. • Potential for early purchase of land to avoid value uplift from presence of new corridor. • Effective coordination/collaboration with developers as stakeholders	• Relies on willing buyer / willing seller arrangement. • Potentially increases landowner leverage if negotiation undertaken in absence of NoR. • AT / NZTA may need to purchase land well ahead of intended implementation timeframe – cost implications • If adjoining landowners do not agree, could end up with discontinuous corridors, or less desirable alignment.	This is more likely to be pursued where developer aspirations and timing are aligned with Alliance priorities. Development agreements will require acceptance of the required timeframes for delivery and of the relevant corridor to required specification.
Plan Change / Structure Planning Process	Provide for the Supporting Growth programme through a series of structure plans and plan changes (assumed to be included in the Unitary Plan), or by participation in processes initiated by	• Would provide certainty to the community, and for the community to be involved in the process. • Transport and land use are directly aligned. • Rules incorporated within plan change would be outcome focused, not relying on	• Has no interim effect. • Unlikely to provide required statutory protection. e.g. parties wanting to develop in the corridor would not require any s176 RMA approvals. • Does not enable compulsory acquisition of land.	Supporting Growth Alliance not likely to pursue plan changes independently but may seek to align with processes initiated by Council or developers as a form of interim protection

	Council or private plan changes initiated by developers after structure plan processes. .	development detail which may otherwise be expected in a resource consent process? • No lapse and expiry dates. • Early zoning of land for transport purposes may reduce the impact of property escalation costs. • Recent legislation changes provide more process opportunity e.g. streamlined planning processes, limited notification of plan changes. • Could work proactively with developers to secure transport corridor as part of private plan change proposals (e.g. North Warkworth private plan change area. • Early indicative transport corridors well ahead of development or live zoning in the area may reduce future impact of property escalation costs	• Does not provide a compensatory process for blighting effect. • Council is the decision maker (or Environment Court if appealed). • Zoning could be changed again at next plan review. • Could be watered down through submission process.	pending NoRs or developer agreements.
Legislation / Statutory document change	For example: • Enabling legislation (see examples below) • Housing and Urban Development Authority proposal • National Policy Statement and / or National Environmental	• Could provide greater flexibility and certainty for works required particularly in the third decade with the use of a statute or standard that provides for the required transport activity. • Could result in a more efficient process.	• Unlikely to be achievable in the required timeframes. • Uncertainty regarding the final form of the changes and whether they will achieve the outcomes sought. • Reputational risk e.g. AT / NZTA could be seen as trying to force through a project via legislative change	Most likely option appears to be the government's HUDA proposal but uncertain powers and regulatory functions at this stage pending legislation. SGA should consider opportunities when proposal is more advanced.

	Standard that provides for transport corridors This approach has been used before in New Zealand – however in situations involving an emergency/crisis or urgency around timeframes – and all instances of national significance. For example: • Canterbury Earthquake Recovery Act 2011 • Hurunui/Kaikōura Earthquakes Recovery Act 2016 • National War Memorial Park (Pukeahu) Empowering Act – Wellington War Memorial for 100 year anniversary of ANZAC Day It is understood that there have been other urgent or particularly unique proposals where special legislation has been considered.		• Potential to adversely impact relationships with community if rushed and with limited engagement. • Less direct influence / control on the process – e.g. project team unlikely to have the same level of access to the decision makers compared to a designation or resource consent process. • Could make it more difficult to get community buy in / support if bypassing normal engagement and submissions processes. • SGA is a 30 year programme, so there may be limited urgency to justify special legislation.	

Unitary Plan Overlays	Inclusion of a Corridor Overlay in the Unitary Plan. Provides option to protect alternative corridors in partnership with other agencies – for example aerial transportation (drone corridor) with the Civil Aviation Authority.	• Would provide certainty to the community through inclusion in the Unitary Plan. • Provides opportunity for the community to be involved in the process. • No lapse and expiry dates.	• Would require a plan change to include the overlay and Council may not accept the approach. • Does not provide a compensatory process for blighting effect. • Would be inconsistent with approach of Unitary Plan Overlays which are focused on RMA section 6, 7 (outstanding natural landscapes etc.) and some 5 (e.g. public health) matters. (Although there is an infrastructure related overlay for the National Grid in the Unitary Plan) • Council is the decision maker (or Environment Court if appealed). • Overlays could be changed again at next plan review. • No interim effect • Would need consistent application across region, providing limited opportunity for area-specific provisions • Opportunity for landowners and developers to seek specific provision/exceptions to meet/protect their own interests	Considered least likely option to achieve route protection.

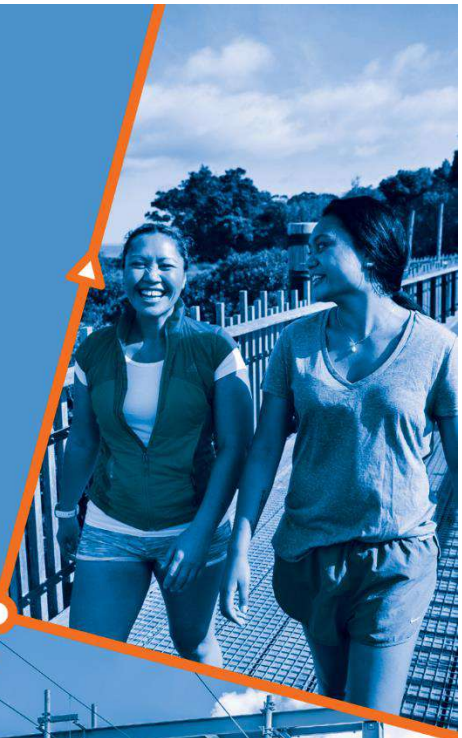
Supporting Growth

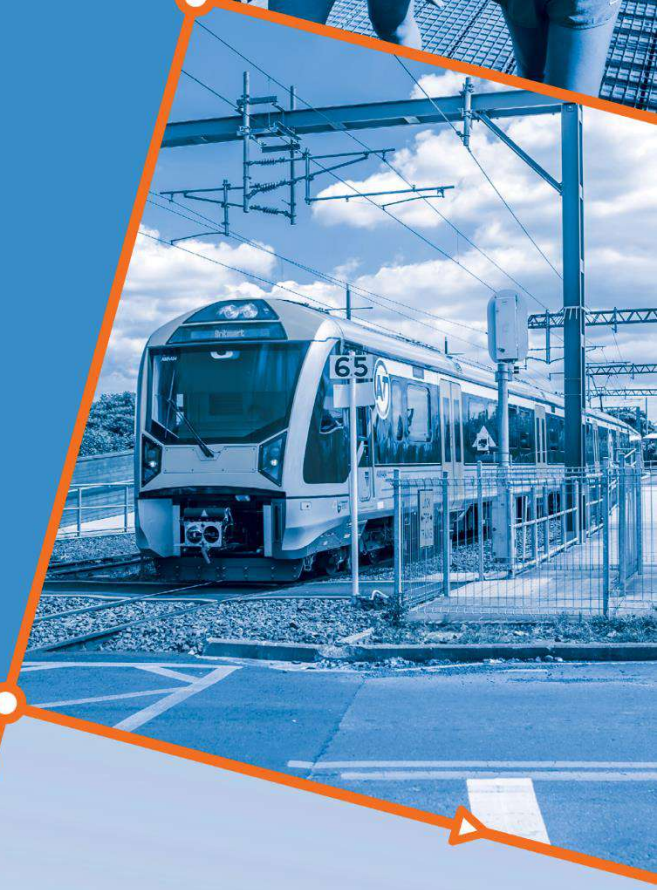
Drury Detailed Business Case

Appendix L

Risk Register

Version 1.0
06 Nov 2020







TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

Document Status

Responsibility	Name
Author	[redacted]
Reviewer	[redacted]
Approver	[redacted]

Revision Status

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Disclaimer

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

Supporting Growth

Drury Local package

APPENDIX J: PROJECT EVIDENCE





Version 0.2

8 December 2020

TE TUPU NGĀTAHI Supporting Growth

NZ TRANSPORT AGENCY WAKA KOTAHI

Document Status

Responsibility	Name
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Disclaimer

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

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Acronyms

Acronym/Term	Description
AA	New Zealand Automobile Association
ADT	Average Daily Traffic
AT	Auckland Transport
ATAP	Auckland Transport Alignment Plan
AUPOIP	Auckland Unitary Plan - Operative in Part
CFAF	Corridor Form and Function
DA	Developer Agreement
DBC	Detailed Business Case
Development ready	Bulk infrastructure is in place to service development, including three waters, transport, and social infrastructure
DSIs	Deaths and serious injuries
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GHG	Greenhouse gases
ha	hectare
IBC	Indicative Business Case
IOs	Investment Objectives
ITA	Integrated Transport Assessment
LOV	Low occupancy vehicle
NIMT	North Island Main Trunk Line
NoR	Notice of Requirement
N-S	North-South
Partners	Collectively refers to Auckland Transport, Waka Kotahi NZ Transport Agency, manawhenua and Auckland Council
PBC	Programme Business Case
PBIOs	Problems, benefits and investment objectives
PT	Public transport
SGA	Supporting Growth Alliance
SH1	State Highway 1
SH22	State Highway 22
TDM	Travel Demand Management
Te Tupu Ngātahi	Supporting Growth Alliance
Waka Kotahi	Waka Kotahi New Zealand Transport Agency

1 Introduction

This appendix examines the evidence for the case for investment at an individual project level for the Drury Local corridors. It also considers the evolution of the problems initially identified in the IBC.

It has been prepared to support the Drury Local Detailed Business Case (DBC) which also considers the case for investment in, and refinement of options for the following projects that make up the Drury Local Package:

- Jesmond Road upgrade/FTN project
- Bremner Road Upgrade/FTN project
- Waihoehoe Road upgrade/FTN project
- Ōpāheke / Ponga Road upgrade Project
- Upgrade of Drury West section of SH22 project
- New North-South arterial through Ōpāheke.

This document has been organised in a way that presents the evidence for each project individually, so the investment story of each individual project can be considered in isolation if required. This however does lead to a high level of repetition across the document as the projects have been grouped into the Drury Local package due to their similarities including common problems, causes and consequences.

1.1 Drury Local

The projects that make-up the Drury Local Package are illustrated in Figure 1-1 which identifies the geographic location of each project.

Table 1-1 details the intention of each project, showing the high-level similarities between the individual projects encompassed within this package.

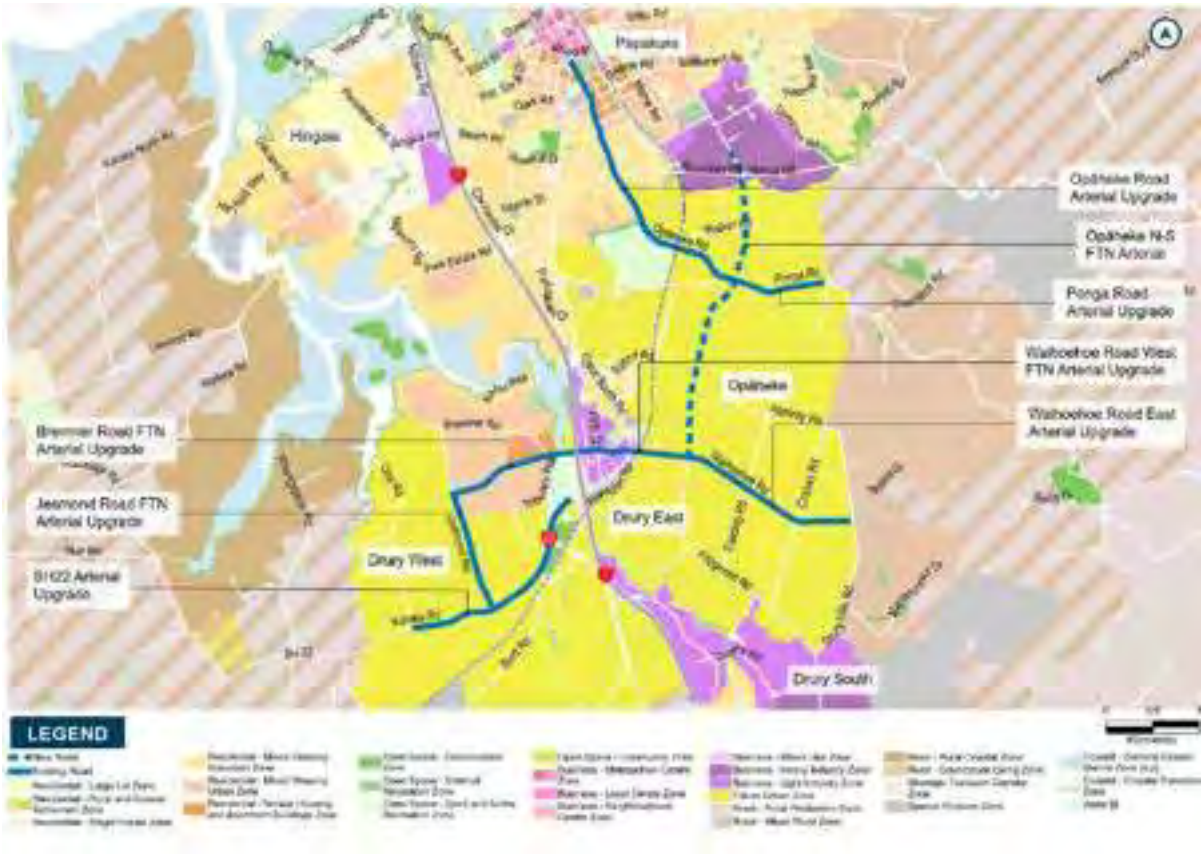


Figure 1-1 Drury Local Package

Table 1-1 Drury Local Projects

Project	Description	Existing Road Upgrade	FTN	New Road Corridor
Jesmond	Upgrade of the existing Jesmond Road to provide north-south connectivity through the centre of the Drury West future urban area, and to form part of the frequent transit (bus) network (FTN)	✓	✓	
Bremner	Bremner Road will provide east-west connectivity across the Drury area to link areas of residential development with the existing and planned centres and local employment opportunities. The connection is proposed to form part of the FTN. This includes: • Realignment of Bremner West traversing the Plan Change 6 (Auranga) development area; and • Upgrades of the existing section between the Ngakoroa Stream and Waihoehoe Road/Great South Road intersection	✓	✓	
Waihoehoe	Upgrade of the existing Waihoehoe Road provide east-west connectivity across the Drury area, with the westernmost section of the Waihoehoe Upgrade forming part of the frequent transit (bus) network	✓	✓	
Ōpāheke/ Ponga	The Ōpāheke Rural and Ponga Road corridor consists of the widening of the existing Road alignment to enable a two-lane arterial connecting the Future Urban Zone in the northwest to the future Mill Road corridor, with the Ōpāheke N-S Arterial bisecting the corridor, providing greater access for the Ōpāheke area.	✓		
SH22	Upgrades to the existing SH22 corridor between Oira Road and the Drury Interchange, to provide walking and cycling connections and better accommodate freight and general traffic to support current and future residents. Any provision for public transport along this corridor is yet to be determined.	✓		
Ōpāheke N-S Arterial	Provide a north-south link through the development area and, to provide connections to the Papakura industrial area to the north and the planned Drury town centre to the south forming part of the FTN		✓	✓

At the IBC phase, problem statements, benefits, and investment objectives (PBIOs) were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed Drury Local Projects. The summary of the project specific problems is explained in Table 1-1 highlighting which projects they relate to.

Table 1-2 Drury Local Package Problems

Problems	Description	Jesmond	Bremner	Waihoehoe	Opāheke/ Ponga	SH22	Opāheke N-S
Form and Function	The current form and function of the existing road corridor will **not support the imminent urbanisation** of the Drury East area, **resulting in poor connectivity and urban form outcomes.**	✓	✓	✓	✓	✓	
Lack of Multi-modal accessibility	The **lack of safe and attractive multi-modal access** to the proposed Drury town centres and strategic public transport network will **limit access to economic and social opportunities** for those living and/or working in the Drury area	✓	✓	✓	✓		
Safety	Urbanisation of the Drury Local area combined with high speeds, a high number of accesses and increasing volumes on **SH22**, will lead to an **increased risk of deaths and serious injuries (DSIs) and intersection crashes**					✓	
Land use & transport integration	Failure to integrate the removal of the State Highway function of **SH22** with the timing and form of urban development will result in **a compromised urban form and movement function**					✓	
Lack of Connectivity	The **lack of N-S arterial connections** through the Drury-Opāheke growth area will limit connectivity of communities to existing and proposed centres and employment areas						✓
Lack of Transport Choice	Rapid growth and **lack of attractive north-south transport choices** in the Ōpāheke/Drury East area will limit access to Economic and social opportunities						✓

These were extrapolated out into problem statements specific to each project as summarised in Table 1-3.These are discussed and evidenced below in each of the project sections.

Table 1-3 Project specific problem statements

Project	Problems
Existing roads to be upgraded/FTN - Jesmond Road, Bremner Road, Waihoehoe Road and Opāheke/Ponga Road	**PS1:** The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Opāheke/ Ponga Road will not support the imminent urbanisation of the Drury Local area, resulting in poor access and urban form outcomes
	PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area
SH22 upgrade from Oira Road to Drury interchange Note: Long-term capacity issue will be solved by Pukekohe Expressway project	**PS1:** The current form and function of SH22 will not support the imminent urbanisation of the Drury Local area (incl. the town centre), resulting in poor accessibility and urban form outcomes
	PS2: Urbanisation of the Drury local area combined with high speeds, a high number of accesses and increasing traffic volumes on this section of SH22 will lead to an increased risk of DSIs and intersection crashes
	PS3: Failure to integrate the removal of the SH function with the timing and form of urban development will result in a compromised urban form and movement function
New Opāheke N-S FTN/ Arterial – between Drury and Papakura	**PS1:** The lack of north-south arterial connections through the Drury-Opāheke growth area will limit connectivity of communities with existing and proposed centres and employment areas
	PS2: Rapid growth and the lack of attractive N-S travel choices in the Drury-Opāheke area will limit access to economic and social opportunities

2 Jesmond Road

2.1 Investment story – problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed Jesmond Road upgrade/FTN project.

Figure 2-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed Jesmond Road upgrade/FTN project.

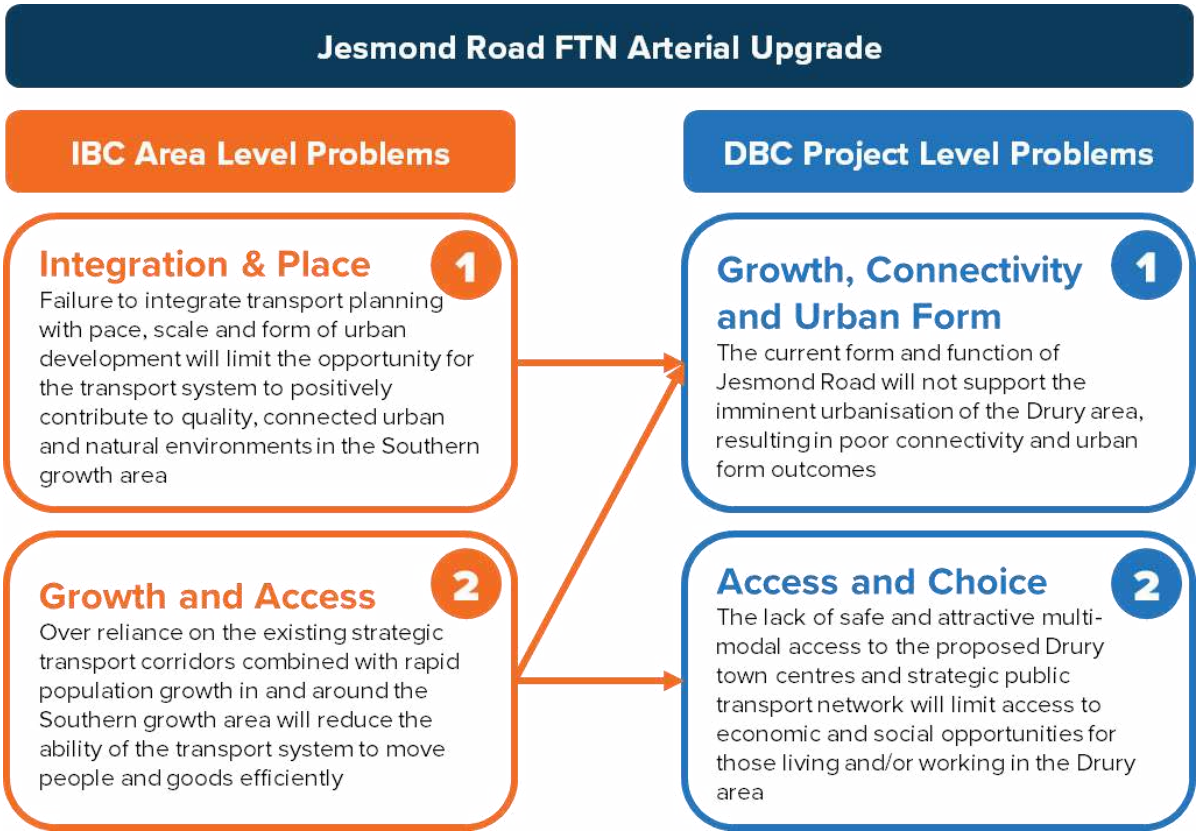


Figure 2-1 Relationship of IBC area problems to DBC project problems

Figure 2-2 and Figure 2-3below summarise the line of sight between the IBC and DBC problem statements.

IBC Problem 1 Integration & Place	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 Southern growth area

DBC Problem 1: Failure to integrate the form and function of **Jesmond Road** with the proposed rapid urbanisation will result in poor urban form outcomes.

Figure 2-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 2 Growth and Access	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

DBC Problem 1: In the context of growth and the current form and function of **Jesmond Road** connectivity outcomes will be compromised, including connections to rail stations, town centres and between communities.

DBC Problem 2: A lack of attractive modal choice in the context of growth along **Jesmond Road,** will further overload existing strategic corridors (for local trips?), limiting access to economic and social opportunities.

Figure 2-3 IBC Problem 2 alignment with DBC Problems

The next section outlines the two problem statements developed for this project, and the evidence supporting these statements.

2.1.1 Problem 1 – Form and function

PS1 The current form and function of the Jesmond Road corridor will not support the imminent urbanisation of the Drury West area, resulting in poor connectivity and urban form outcomes.

The form and function of the Jesmond Road corridor is generally commensurate with a rural land use condition, such that it does not provide for active modes or public transport, it has one traffic lane per direction, an ~80km/h speed environment, limited lighting and swale drainage (Figure 2-4). These characteristics are broadly suitable in the current rural environment where total transport demand is relatively low, and settlement is highly dispersed.



Figure 2-4 Existing condition of Jesmond Road - rural condition (Google Streetview, accessed March 2020)

Problem one highlights that the form and function of Jesmond Road will no longer be appropriate as the Drury West area urbanises. Quality urban form outcomes in urbanised corridors require lower speeds, higher amenity, better conditions for pedestrians and cyclists, and urban drainage and stormwater solutions. Moreover, an urbanised context generates higher and more diverse transport demands, which drive the need to provide for mode shift through public transport and active mode provision.

2.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following two root causes of the problem:

- **Cause 1** – Imminent/forthcoming urbanisation of the Drury West area; and
- **Cause 2** – Transport demands associated with the urbanisation of the Drury West area.

Cause 1 – Imminent/forthcoming urbanisation of the Drury Local study area

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares (ha) earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Drury area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area, within which the Jesmond Road corridor is located, is an area of approximately 1,900 hectares, and is estimated by Auckland Council to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000.

The proposed Structure Plan and other land use contextual changes present both risks and opportunities. The Jesmond Road corridor traverses what is planned as an area of medium-to-high density residential development, with its own local centre and train station at the southern end of the road. The proposed Drury West station comprises another coordinated Supporting Growth project, as

explained in the Drury Local Package DBC. This transition from rural land use to a highly urbanised condition is clearly a root cause of the identified form and function problem.

Enhancing connectivity along the Jesmond Road alignment is strategically important in the context of the future land use, given the proposed locations of residential development and significant destinations along the corridor (this point is further underlined in the evidence supporting problem two).

The proposed development timeframes compound the form and function problem. Approximately 170 ha to the immediate north of the project is 'live zoned' land under development as part of the Auranga development under the Auckland Unitary Plan Operative in Part (AUPOIP).

Additionally, at the time of writing this report, several Private Plan Changes have also been received by Council, emphasising the continuous developer interest in seeking expedited live-zoning of FUZ land in the area. Figure 2-5 shows one plan change directly adjacent to the Jesmond Road corridor.



Figure 2-5 Private plan change requests in Drury-Ōpāheke

The remainder of the Drury West area north of SH22 falls within the first decade of Council's intended timeframes for rezoning 'development-ready' land (2018-2022 in the current Future Urban Land Supply Strategy (FULSS)). The area to the south of SH22 is not scheduled to be released until the 2028-2032 period.

Cause 2 – Transport demands associated with urbanisation

The scale of growth outlined above will result in significant increases in outbound transport demands, as well as increased demand for transport within the Drury area. The need to move more people around associated with urbanisation also results in a diversification of transport demand – i.e. an increased need to provide for public transport, walking and cycling in transport corridors.

At a macro level, the potential increase in outbound transport demands by both low occupancy vehicles (LOVs) and public transport to key regional destinations is shown in Figure 2-6. The Jesmond Road corridor forms part of the network linking into the future strategic road and public transport networks which accommodate these outbound trips (both as an FTN route and as an access to the proposed Drury West train station), and accordingly will need to provide for additional people-moving capacity. 2016 Average Daily Traffic (ADT) levels along Jesmond Road are 1000. Traffic modelling undertaken for the [redacted]) has indicated that Jesmond Road could carry daily general traffic volumes of ~10,000 Average Daily Traffic (ADT), in addition to performing an important role as a frequent public transport route. [redacted]

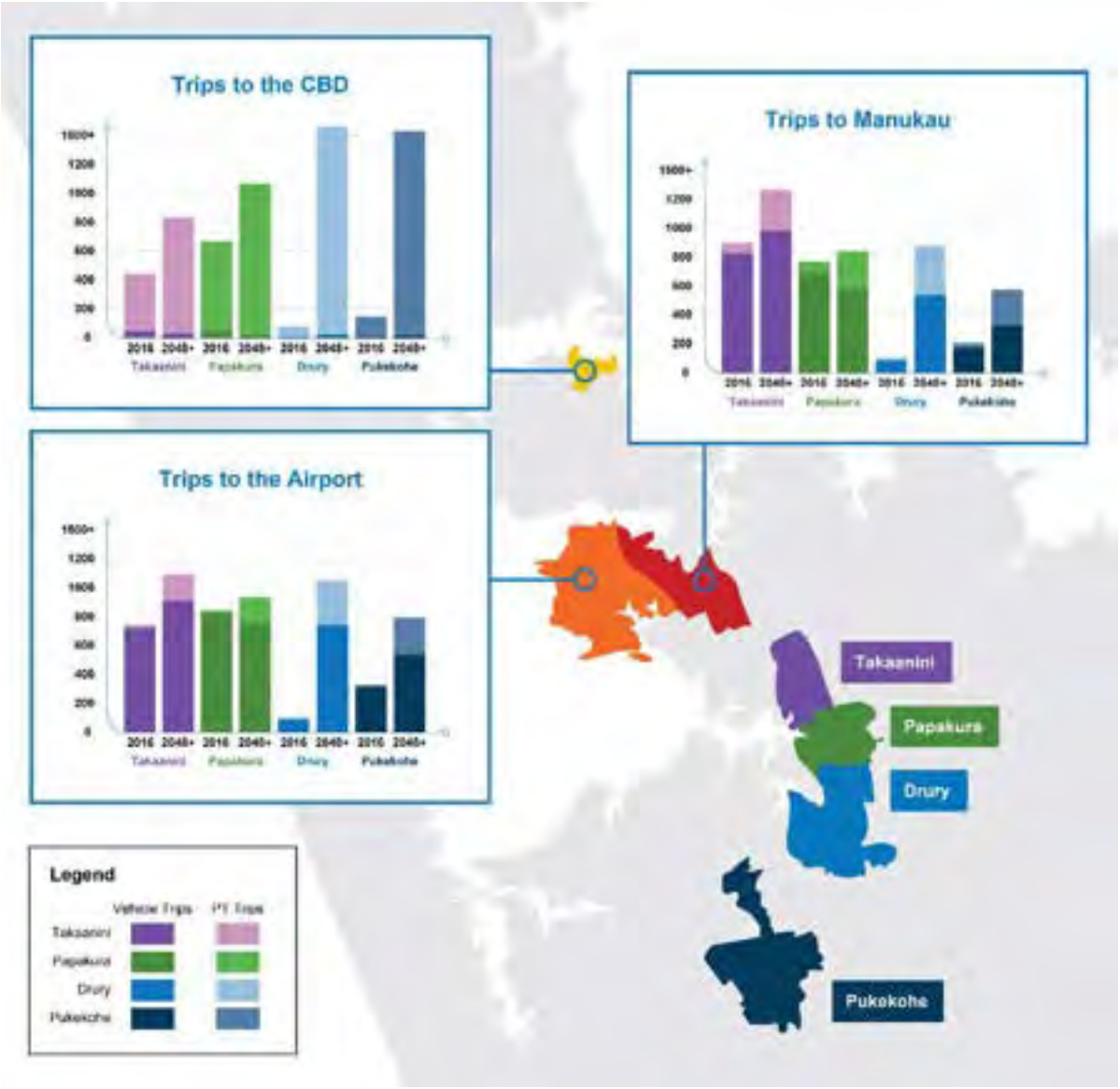


Figure 2-6 Increase in outbound transport demands from Drury (blue) to key regional destinations

At a more detailed level, urbanisation and growth will result in a significant range of new transport demands which will further underline the strategic importance of the Jesmond Road corridor. The corridor traverses areas of planned residential development and provides direct links to planned local destinations (such as the planned Drury West Centre), and wider regional destinations. In particular, the corridor provides opportunities to:

- Connect planned residential development directly with the planned Drury town centre and future schools by all transport modes, particularly public transport via frequent buses and active modes;
- Provide multi-modal connections to the wider rapid transit network, in particular the planned Drury West rail station, and;
- Enable short, local trips to be undertaken by active modes.

2.1.1.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem one are set out below:

Consequence 1 - Poor transport outcomes

Transport infrastructure fundamentally influences urban form. Maintaining the status quo on Jesmond Road will reinforce current land use patterns, which will preclude the compact, high quality and more sustainable urban form sought by Council for this and other future urban environments.

In particular:

- High vehicle speeds and a lack of provision for pedestrians and cyclists will result in an unsafe and unattractive street environment, which in turn will preclude/deter the establishment of compact, walkable urban development; and
- Car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC section 7.1.3.

Consequence 2 – Insufficient provision for multi-modal capacity and car reliance

As noted above urbanisation and growth in Drury will result in a significant increase in multi-modal transport demands. Maintaining the status quo on Jesmond Road will limit the capacity of the corridor to accommodate trips by public transport or active modes. This in turn will result in a greater reliance on LOVs, less modal choice and subsequent increases in LOV trips/congestion along Jesmond Road and greenhouse gas emissions.

Consequence 3 – Safety implications

Increased transport demands from an urbanising area are likely to exacerbate existing safety issues if not managed with corresponding changes to the road environment. Maintaining the status quo on Jesmond Road is likely to result in increased safety risk in a context of urban development with increased traffic volumes, numbers of vulnerable road users and access points. Conversely, improvements to the road corridor (for example through provision of separated active mode facilities) will result in a safer route with less conflicts between vehicles and vulnerable road users.

2.1.2 Problem 2 – Lack of multi-modal accessibility

The lack of safe and attractive multi-modal access to the proposed Drury West centre and strategic public transport network will limit access to economic and social opportunities for those living and/or working in the Drury West area.

Problem two recognises that the Jesmond Road corridor forms a strategically important connection in the context of the land use patterns indicated in the Drury-Ōpāheke Structure Plan. The corridor is an FTN route which enables frequent buses to serve a range of planned destinations and will also function as an access to proposed rail stations, and potentially to the proposed bus shoulder lanes on SH1 for express services via Bremner Road.

Given the range of destinations served, the lack of safe and attractive provision for public transport and active modes along Jesmond Road will limit access to both local and regional (by virtue of

connections to the rail network) economic and social opportunities. It will also limit the ability to achieve a transformational mode shift away from LOV use in the Drury Local area, as outlined in the general investment themes in the Drury Local package DBC.

The Jesmond Road corridor has previously been identified as having strategic significance as a future public transport corridor. Given the scale of residential catchment to serve to the west of SH1, the planned location of centres, and the planned rapid transit services, the following high-level opportunities have been identified which utilise/pertain to Jesmond Road:

- FTN route serving both Drury West and Ōpāheke/Drury East future residential areas, and connecting them with the planned new town centres en-route at Drury Central and West, and their corresponding rail stations to provide access to rapid transit;
- Other connector and local level services serving the Drury West development area.

2.1.2.1 Evidence to demonstrate cause

Evidence has been investigated based on the following three 'root' causes of the multi-modal access problem:

- **Cause 1** – Lack of provision for public transport and active modes on Jesmond Road;
- **Cause 2** – Planned locations of centres and rail stations; and
- **Cause 3** – Mismatch between the number and type of jobs in the area to the people living in the area.

Cause 1 – Lack of provision for public transport and active modes on Jesmond Road

As discussed in problem one, the Jesmond Road corridor is a rural road which does not make specific provision for public transport or active modes (Figure 2-4). There are no bus services on Jesmond Road at present, and accordingly there has been no need to specifically provide for bus stops or bus priority measures. There are also no footpaths or cycle lanes.

This current lack of provision for public transport and active modes, along with dispersed rural land use patterns, result in current travel patterns which are heavily car-reliant. Across the whole Southern growth area, approximately 92 per cent of trips to work occur by car.[1]

[1] 2013 Census Journey to Work Data.

Cause 2 – Planned locations of centres and rail stations

The strategic importance of the Jesmond Road corridor in the context of planned future urbanisation is linked to Auckland Council's land use planning, and the planned rail station locations (see Figure 2-7). In particular:

- A proposed local/town centre located near the intersection of Jesmond Road and SH22;
- The Drury West train station, proposed to the immediate south of Jesmond Road and the proposed centre;
- A proposed school at the northern end of the study corridor; and
- Areas of planned medium-to-high density residential development.

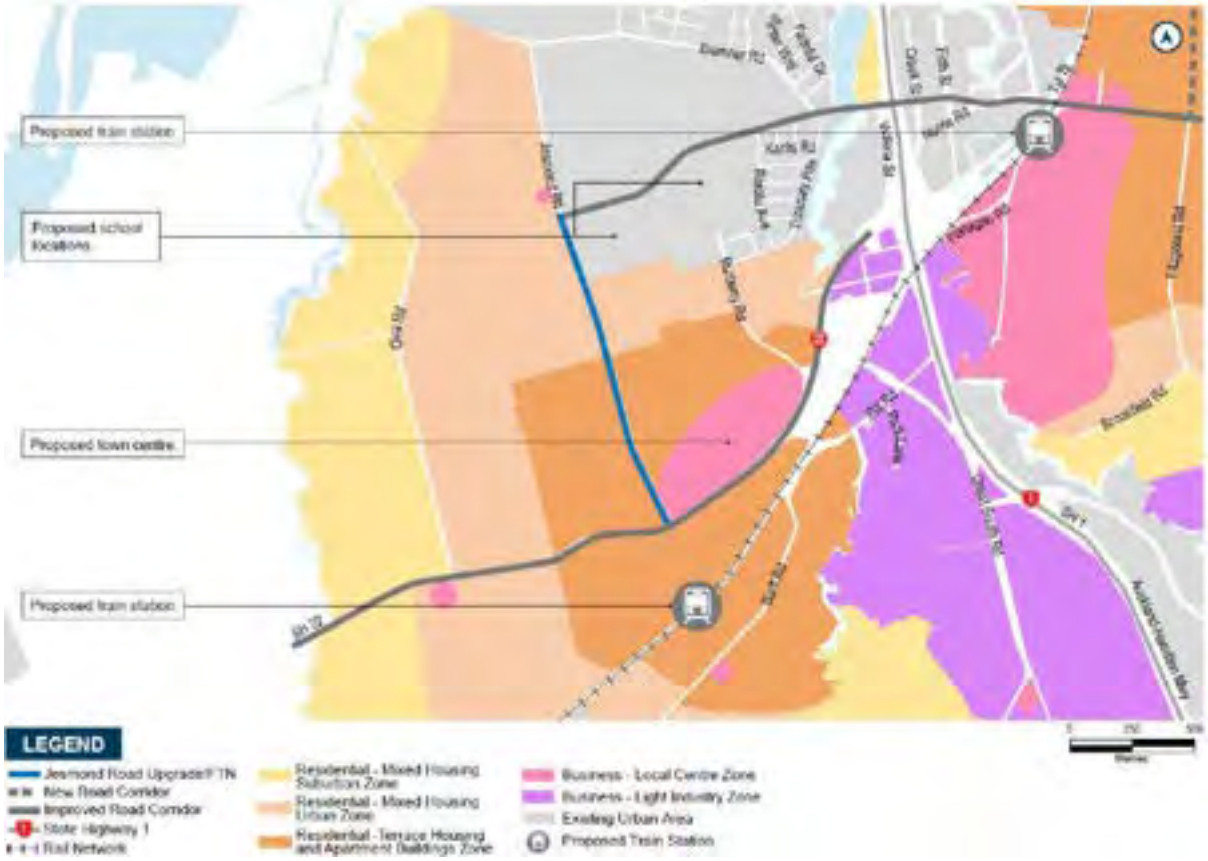


Figure 2-7 Jesmond Road corridor within the context of the Drury-Ōpāheke structure plan

Given the above, the Jesmond Road corridor will have strategic importance both for local destinations which will be served by the proposed FTN, and as access to the wider rapid transit network (both the rail network, and the planned SH1 express bus services). The lack of safe and attractive provision for public transport and active modes along these specific routes will therefore limit access to both local and regional economic and social opportunities.

Cause 3 – Mismatch between the number and type of jobs in the area to the people living in the area

The Drury-Ōpāheke Structure Plan provides for only 0.5 new jobs for each additional household. Experience in recent development areas such as Silverdale and Hingaia shows that a relative lack of local employment opportunities results in a higher incidence of long-distance commuting to the central city. This may reflect the nature of employment sought by those moving to new development areas, with a higher emphasis on white collar jobs typically found in central areas (see Figure 2-8).



Figure 2-8 Relativity of job type to location

The result of this is a high predicted demand for commuter trips from Drury by rail. The modelling undertaken for the Structure Plan ITA indicated two-way passenger flows of over 10,000 trips in the two hour morning peak, including over 1,500 boardings at each of the two proposed Drury stations. The need for multi-modal access to the rail stations via key corridors including Jesmond Road is therefore largely driven by the need for significant numbers of residents to commute to work.

Given the above, it is not feasible or economic to plan for unconstrained LOV demand undertaking lengthy commutes. Travel demand management (TDM) is therefore critical, both through further optimisation of land use through local employment, and through the provision of quality public transport and active mode transport options to provide transport choice for access to local destinations.

2.1.2.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem two are set out below:

Consequence 1 - **Poor access to economic and social opportunities**

A failure to provide multi-modal access to the proposed centre and rail station along Jesmond Road will adversely affect access to both local destinations, and the wider region via the rail network. Failure to resolve problem two therefore limits access to economic and social opportunities at both a local and regional level. A consequence of this is that poor access will reduce the viability of centre development, which in turn will reduce the role of local employment and activity in reducing/managing travel demand.

Initial transport modelling in the IBC identified the effect of the recommended network (including interventions on Jesmond Road) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in Figure 2-9 shows that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve problem two will be a failure to improve access to economic and social opportunities for communities in the area.

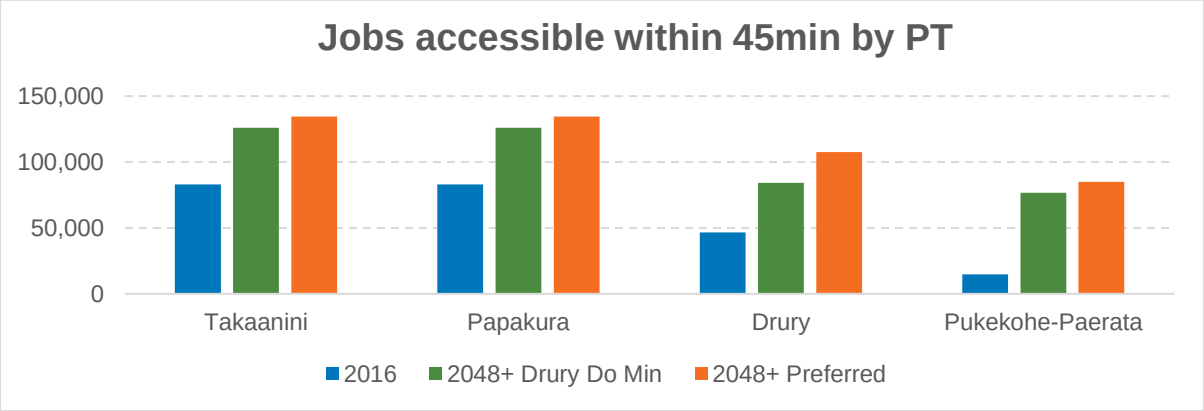


Figure 2-9 Jobs accessible within 45min by PT for the South

Furthermore, Figure 2-10 compares the network over the different years, examining the jobs accessible at different time intervals. Notably, a comparison of the do-min with the preferred network shows an increase in job accessibility via public transport with the implementation of the preferred Drury network. Figure 2-11 shows this information spatially, showing the key destinations that can be reached from Drury at different travel times. Again, these figures emphasise that a consequence of failing to resolve problem two will be limited access to social and economic opportunities for the Drury/Ōpāheke communities.

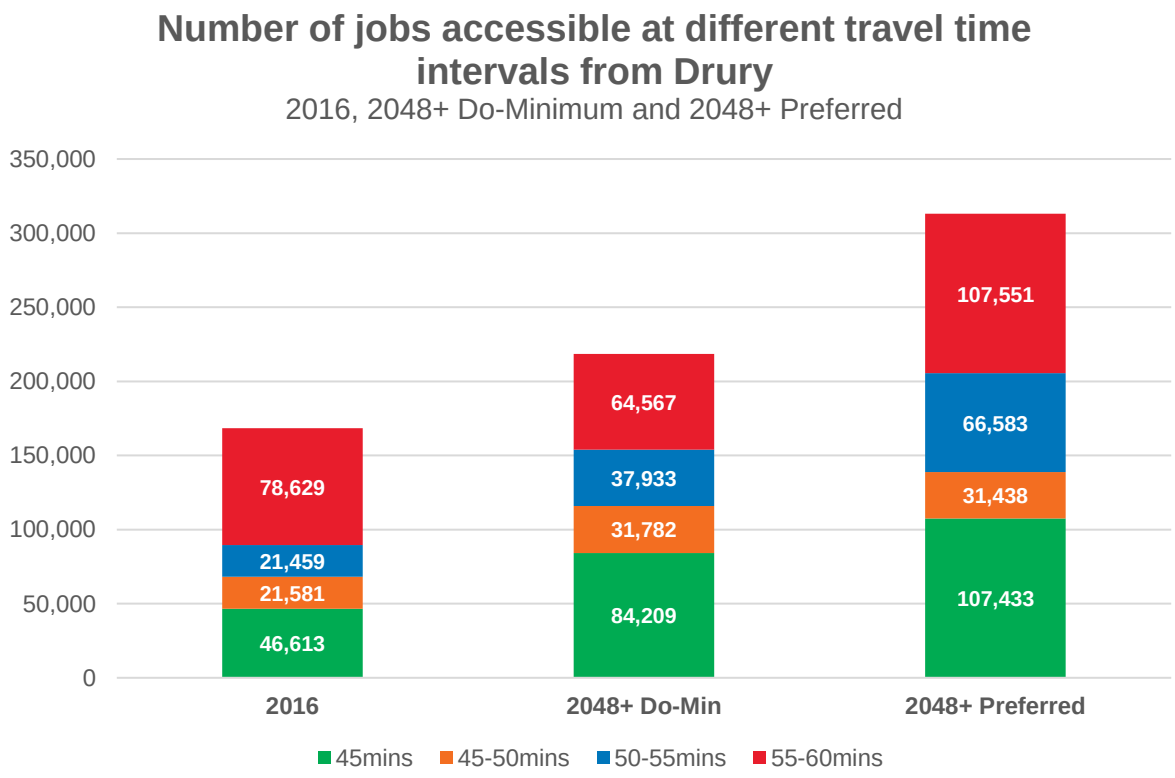


Figure 2-10 Number of jobs accessible at different time intervals from Drury

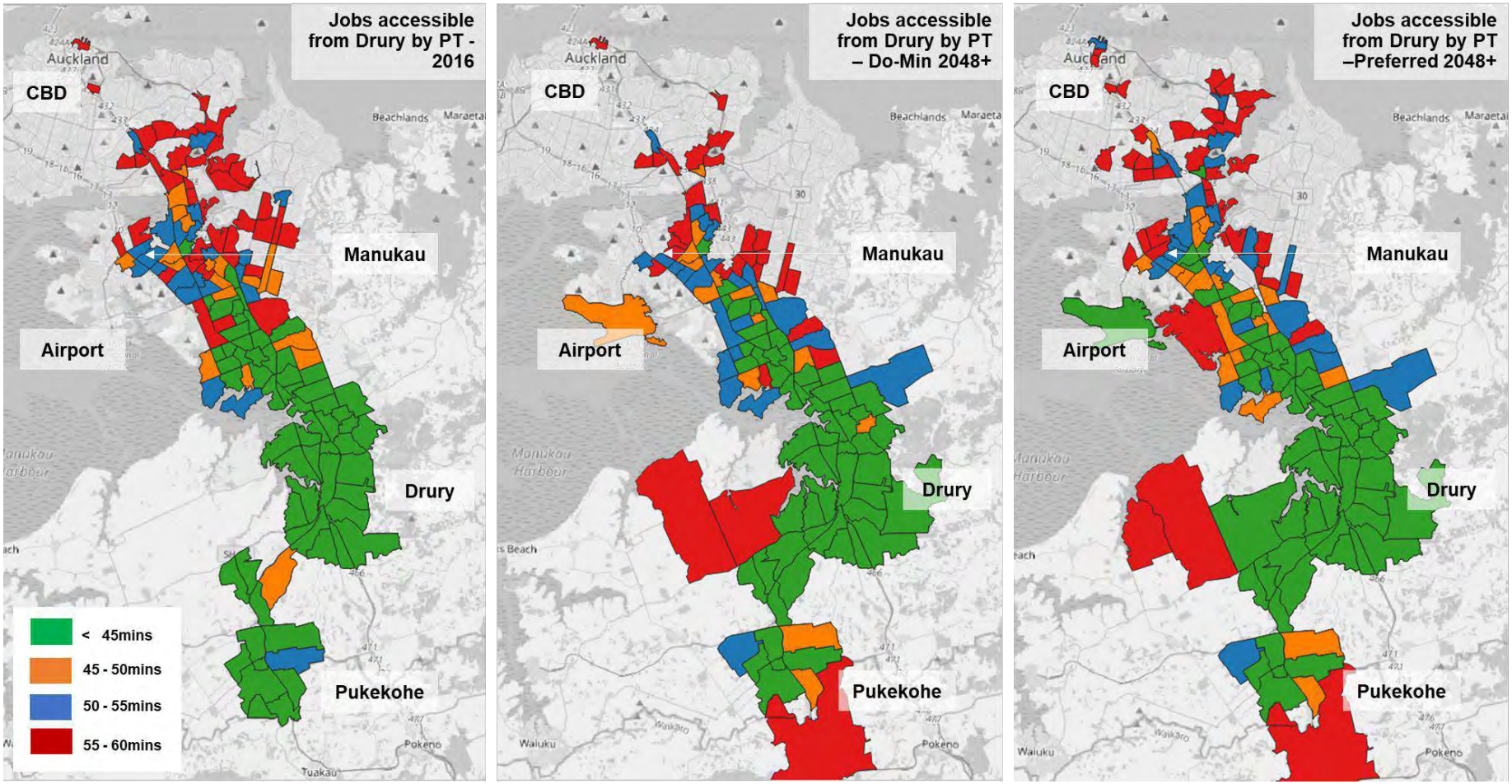


Figure 2-11 Key destinations and jobs that can be reached from Drury by PT at different time intervals: 2016, Do-min 2048+ and Preferred 2048+

Consequence 2 – Lack of modal choice / over-reliance on LOVs

Failure to provide for multi-modal access along the Jesmond Road corridor to local destinations and the proposed rail station will:

- Entrench the existing degree of private vehicle LOV reliance (92 per cent across the Southern growth area for work trips in the 2013 Census) for trips to these destinations, resulting in increased local traffic volumes;
- Limit accessibility of the proposed Drury West station, resulting in higher traffic volumes on the strategic road network for long distance commuting trips. Modelling undertaken for the Structure Plan ITA indicates that the stations at their assumed level of accessibility would result in rail patronage accounting for almost half of trips bound for the Central City. Reducing access to the stations (and therefore patronage) will affect the performance of the strategic road network, which remains relatively congested even with significant mode shift assumed.
- Increase the reliance on park-and-ride facilities for access to the rail stations, which again will limit the ability to achieve a transformational mode shift in the Drury area. High-level modelling undertaken for the Structure Plan ITA indicates a significant proportion of boardings attributable to park-and-ride access. This may become an 'over-reliance' if enhanced public transport and active mode connections to the stations are not made.

2.2 Project specific benefits and investment objectives

PBIOs have been developed for the Jesmond Road Upgrade/FTN project and draw on the problem statements documented above. (as summarised in Figure 2-12 below). The figure also demonstrates the alignment of the investment objectives with relevant package-level investment themes, which also generally apply across the whole Southern growth area.

The benefits identified for this project recognise that if these two problems are solved, the community in this growth area will benefit through improved connectivity and accessibility for the Drury Local area; improved quality of the urban environment; improved safety for all transport modes; plus better transport choice and reduced reliance on LOVs. The reduced reliance on LOVs will in turn have benefits for health and wellbeing and the environment, including GHG savings.

The benefits and problems were considered together to develop the project-specific investment objectives (IOs) listed in Figure 2-3. IO1 seeks to solve the form and function problem and support growth and a more sustainable, quality urban form by improving connectivity to/through the Drury area. IO2 seeks to address the problem of lack of safe and attractive travel choices, and deliver the benefits for transport choice, safety and connectivity/accessibility by providing high quality, safe and attractive PT and active mode facilities on the Jesmond Road connection.

Figure 2-12 Jesmond project-specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
Existing roads to be upgraded/FTN - Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/Ponga Road	**PS1:** The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/ Ponga Road will not support the imminent urbanisation of the Drury Local area, resulting in poor access and urban form outcomes	Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	**IO1:** Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Ōpāheke area	✓	✓		✓	✓
		Improved quality of the urban environment						
	PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area	Improved connectivity and accessibility for the Drury Local area	**IO2:** 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 **Jesmond Road**		✓	✓		✓
		Improved safety for all transport modes						

3 Bremner Road project

3.1 Investment story – problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed Bremner Road upgrade/FTN project. The process of the problem statement development through internal workshops is described in further detail in the main Drury Local DBC.

Figure 3-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed Bremner Road upgrade/FTN project.

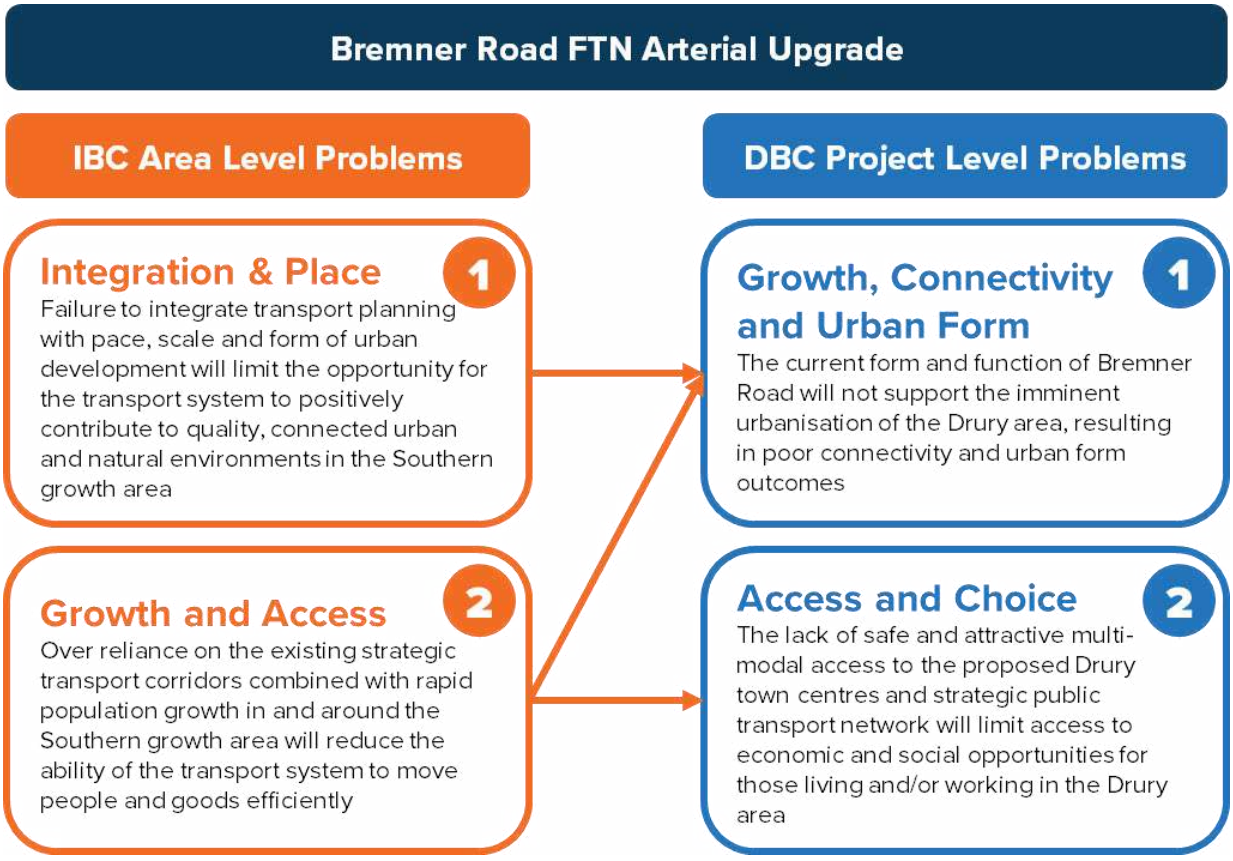


Figure 3-1 Relationship of IBC area problems to DBC project problems

Figure 3-2 and Figure 3-3 below summarises the line of sight between the IBC and DBC problem statements.

IBC Problem 1 Integration & Place	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 Southern growth area

DBC Problem 2: Failure to integrate the form and function of **Bremner Road** with the proposed rapid urbanisation will result in poor urban form outcomes.

Figure 3-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 2 Growth and Access	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

DBC Problem 1: In the context of growth and the current form and function of **Bremner Road** connectivity outcomes will be compromised, including connections to rail stations, town centres and between communities.

DBC Problem 2: A lack of attractive modal choice in the context of growth along **Bremner Road**, will further overload existing strategic corridors (for local trips?), limiting access to economic and social opportunities.

Figure 3-3 IBC Problem 2 alignment with DBC Problems

The next section outlines the two problem statements developed for this project, and the evidence supporting these statements.

3.1.1 Problem 1 – Form and function

The current form and function of Bremner Road (and other east-west roads in the project area) will not support the imminent urbanisation of the Drury area, resulting in poor connectivity and urban form outcomes.

The existing east-west connections between Jesmond Road and the Waihoehoe Road/Great South Road intersection can be divided into three general sections:

- The western section of Bremner Road (~1.3km) between Jesmond Road and the Ngakoroa Stream. As noted above, this section is being upgraded to an urban condition as part of the Auranga development (Plan Change 6), and as such is not addressed in any detail in this DBC;
- The central section of Bremner Road (~320m) between the Ngakoroa Stream and SH1. The condition of this section is generally commensurate with a rural land use condition, such that it

provides one lane per direction, an 80km/h speed limit, limited lighting, and does not provide for active modes or public transport; and

- The eastern section (~640m) between SH1 and the Waihoehoe Road/Great South Road intersection, incorporating sections of Bremner Road, Firth Street, and Norrie Road. This section traverses an existing light industrial area, and provides one lane per direction, a 50km/h speed limit, intermittent footpaths and kerb/channel drainage, and no provision for cycling or public transport. This section also incorporates an existing one-way bridge on Firth Street crossing the Hingaia Stream.

The central and eastern sections are generally commensurate with their current rural and light industrial land use contexts respectively. Problem one highlights that the form and function of the central and eastern sections outlined above will no longer be appropriate as the Drury area urbanises. Quality urban form outcomes in urbanised corridors require lower speeds, higher amenity, better conditions for pedestrian, and urban drainage and stormwater solutions. 2016 ADT levels along the existing Bremner Road alignment are 1000. Traffic modelling undertaken for the Structure Plan ITA indicates that Bremner Road could carry daily general traffic volumes of over 12,000 ADT.

Moreover, an urbanised context generates higher and more diverse transport demands, which drive the need to provide for transformational mode shift through public transport and active mode provision.

3.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following two root causes of the problem:

- **Cause 1** – Imminent/forthcoming urbanisation of the Drury area; and
- **Cause 2** – Transport demands associated with the urbanisation of the Drury area.

Cause 1 – Imminent/forthcoming urbanisation of the Drury Local study area

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares (ha) earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Drury area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area is an area of approximately 1,900 hectares, and is estimated by Auckland Council to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000. The Bremner Road project area is largely located outside the Structure Plan area, but transport demands along it are linked to it given that the Structure Plan does cover areas to the immediate east and west (see Figure 3-4).

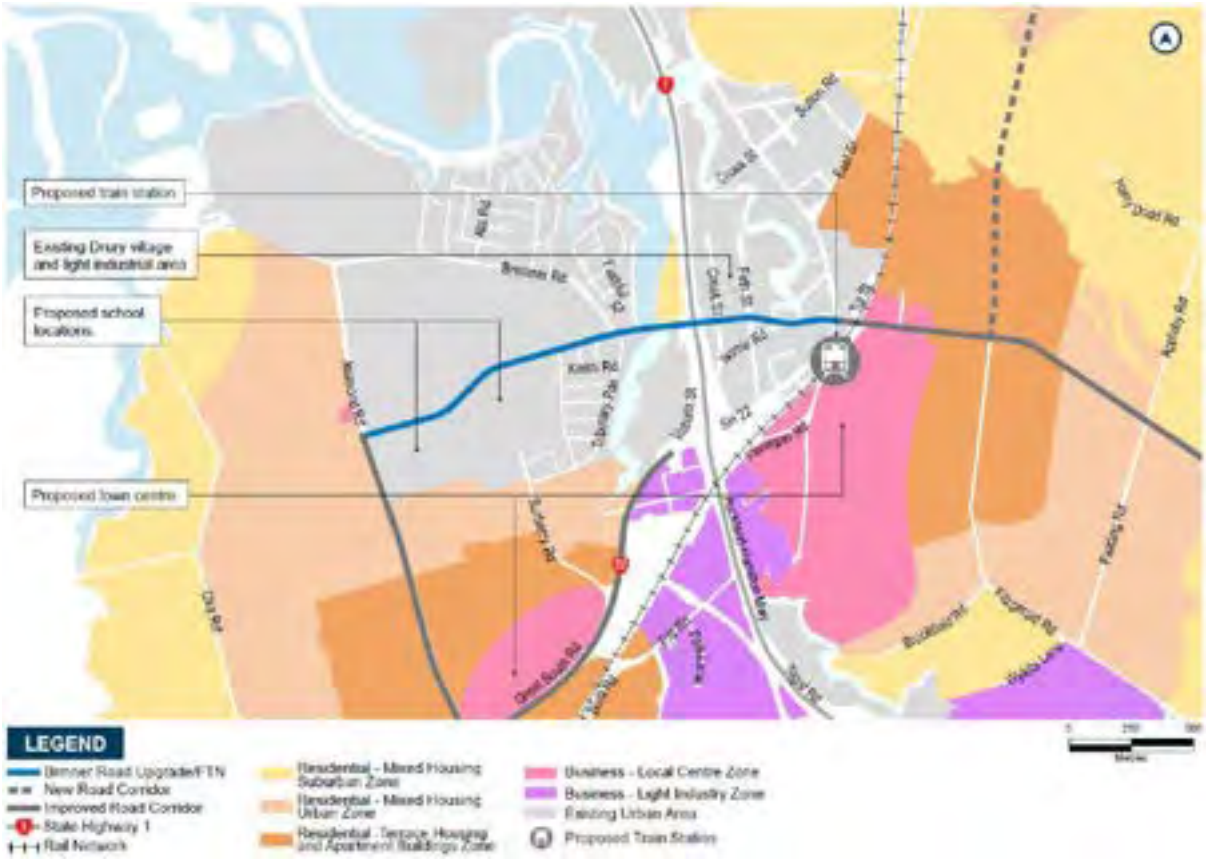


Figure 3-4 Bremner Road corridor within the context of the Drury-Ōpāheke structure plan

The proposed Structure Plan and other land use contextual changes present both risks and opportunities. The Bremner Road project area traverses and serves areas that are either already zoned for or are planned to be zoned as medium-to-high density residential development, with a large town centre and rail station planned to the immediate east of the corridor. The proposed Drury West station comprises another coordinated Supporting Growth project, as explained in the Drury Local Package DBC. Moreover, while the existing Drury light industrial area on the east side of SH1 is not within the Structure Plan extent, there is potential for that area to transition to a higher density land use in future given its proximity to the planned town centre and high-density residential development. This transition from rural and light industrial land use to a highly urbanised condition is clearly a root cause of the identified form and function problem.

Achieving east-west connectivity in this location is strategically important in the context of the aforementioned future land use given the proposed locations of residential development and significant destinations to be located along the corridor (this point is further underlined in the evidence supporting Problem two). The existing routes lack the directness and amenity required to support the desired level of public transport, walking and cycling connectivity in an urban context (see Figure 3-5), in particular the existing bridges (crossings of the Ngakaroa and Hingaia Streams) and ‘dog-leg’ intersections at Bremner, Firth and Norrie Roads.

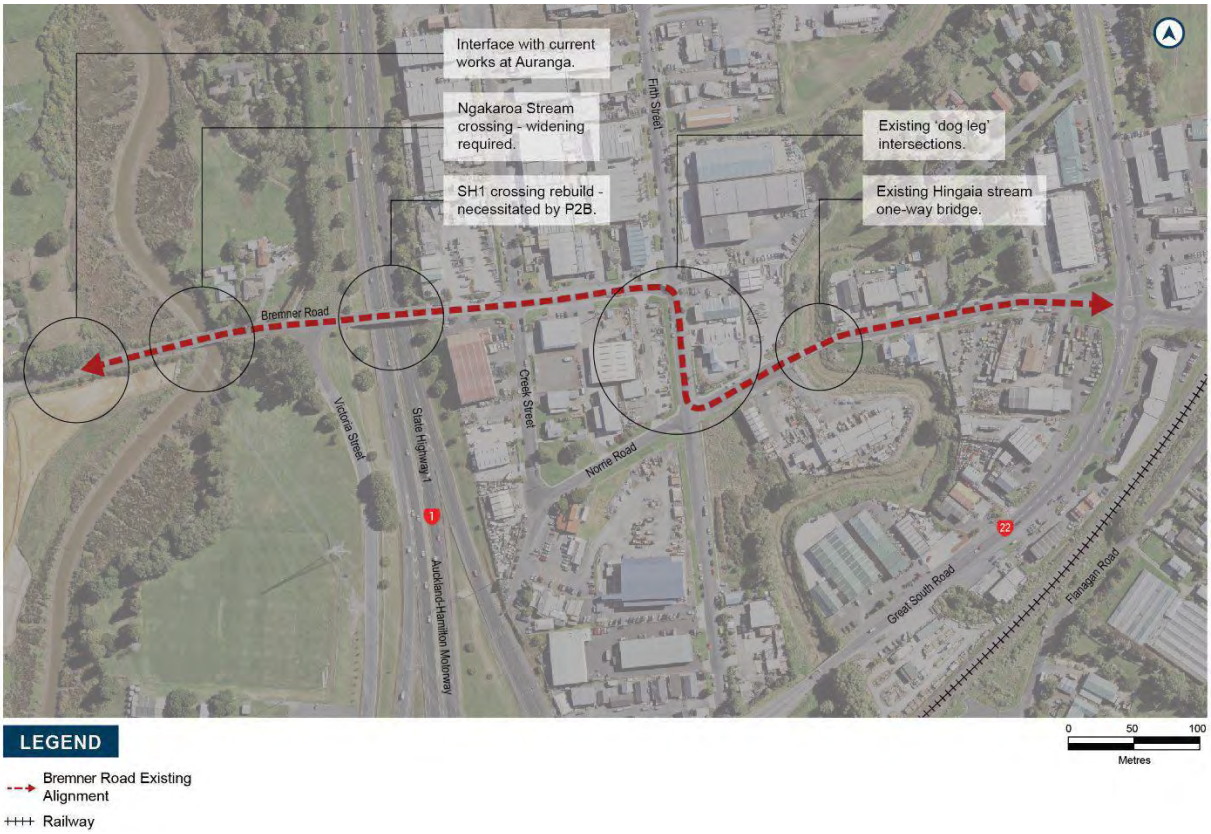


Figure 3-5 Existing local issues in the eastern section of the study corridor

The proposed development timeframes compound the form and function problem. Approximately 170 ha through which the western end of the project traverses is 'live zoned' land under development as part of the Auranga development under the AUPIOP.

Additionally, at the time of writing this report, several Private Plan Changes have also been received by Council, emphasising the continuous developer interest in seeking expedited live-zoning of FUZ land in the area Figure 3-6.



Figure 3-6 Private plan change requests in Drury-Ōpāheke

The remainder of the Drury West area north of SH22 falls within the first decade of Council's intended timeframes for rezoning 'development-ready' land (2018-2022 in the current Future Urban Land Supply Strategy (FULSS)). The area to the east of Great South Road not included in any of the private plan change requests is not scheduled to be released until the 2028-2032 period in the FULSS.

Cause 2 – Transport demands associated with urbanisation

The scale of growth outlined above will result in significant increases in outbound transport demands, as well as increased demand for transport within the Drury area. The need to move more people around associated with urbanisation also results in a diversification of transport demand – i.e. an increased need to provide for public transport, walking and cycling in transport corridors.

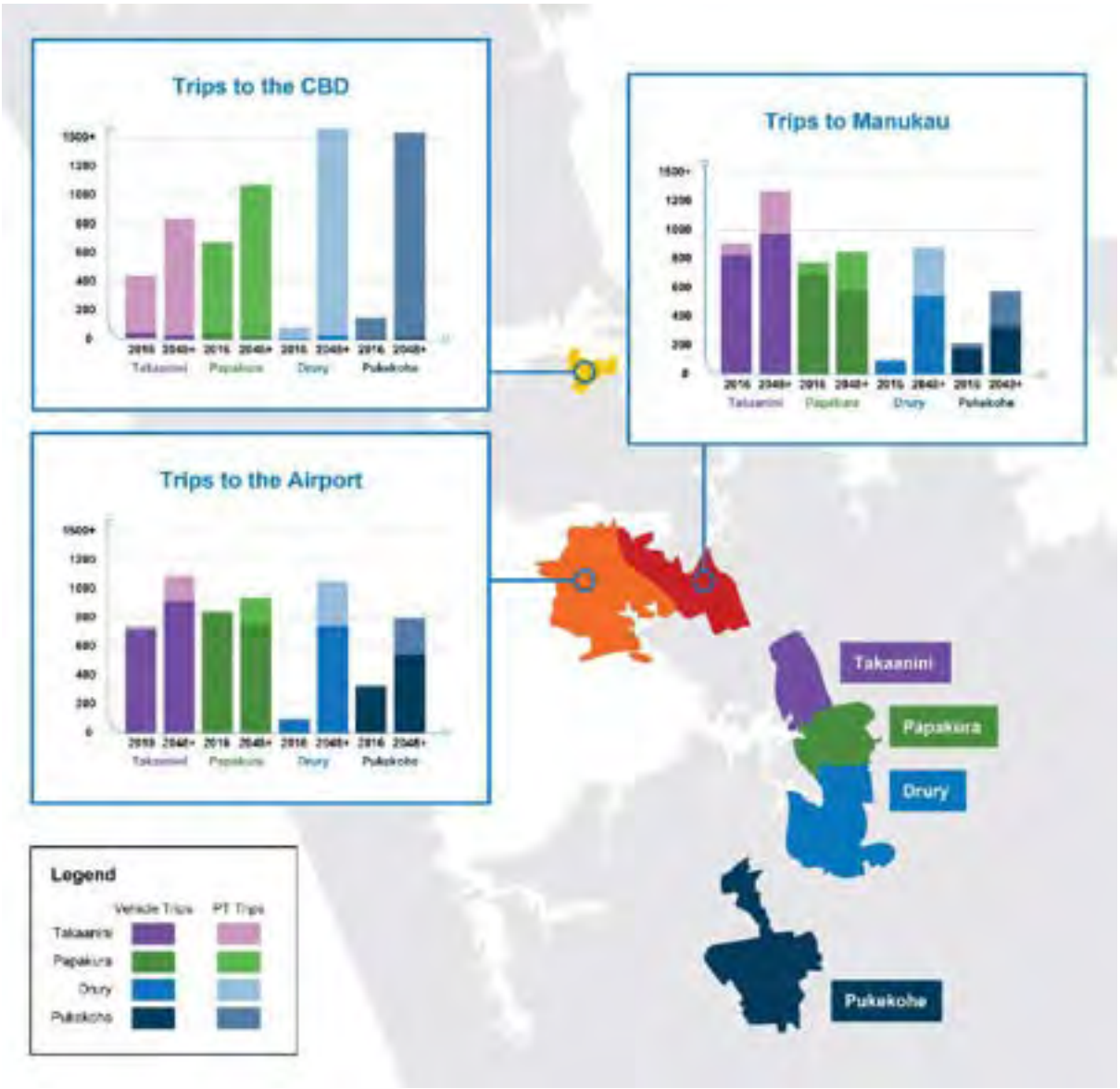


Figure 3-7 Increase in outbound transport demands from Drury (blue) to key regional destinations

At a macro level, the potential increase in outbound transport demands by both LOVs and public transport to key regional destinations is shown in Figure 3-7. The Bremner Road project area forms part of the arterial road and future public transport network which accommodate these outbound trips (both as a frequent bus route and as an access to the proposed Drury Central train station), and accordingly will need to provide for additional people-moving capacity. 2016 ADT levels along the existing Bremner Road alignment are 1000. Traffic modelling undertaken for the Structure Plan ITA has indicated that Bremner Road could carry daily general traffic volumes of over 12,000 Average

Daily Traffic (ADT), in addition to performing an important role as part the frequent public transport network. This was a capture of information at this point and time, establishing a base line for further investigation, including initial corridor form and function assessments (CFAF). Since then, modelling yields have advanced to using I11.5 data, which are used throughout the main DBC and Transport Report. However, these show relatively similar outputs.

At a more detailed level, urbanisation and growth will result in a significant range of new transport demands which will further underline the strategic importance of the Bremner Road corridor. The corridor traverses areas of planned residential development and provides direct links (or opportunities for direct links) to planned local destinations (such as the planned Drury town centre), as well as wider regional destinations. In particular, the corridor provides opportunities to:

- Connect planned residential development directly with the planned Drury town centre and future schools by all transport modes, particularly public transport via frequent buses, and active modes
- Provide multi-modal connections to the wider rapid transit network, in particular the planned Drury Central rail station, and potential express bus services on SH1, and
- Enable short, local trips to be undertaken by active modes.

3.1.1.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem one are set out below:

Consequence 1 –Poor urban form outcomes

Transport infrastructure fundamentally influences urban form. Maintaining the status quo on Bremner Road and the other roads in the project area will reinforce current land use patterns, which will preclude the compact, high quality and more sustainable urban form sought by Council for this and other future urban environments.

In particular:

- High vehicle speeds and a lack of provision for pedestrians and cyclists in the western section will result in an unsafe and unattractive street environment, which in turn will preclude/deter the establishment of compact, walkable urban development.
- Maintaining the existing indirect, low-amenity street environment (in particular the ‘dog-leg’ intersections connecting Bremner, Firth and Norrie Roads; and the one-way bridge over the Hingaia Stream) through the existing Drury light industrial area will compromise the attractiveness of connections through to the large town centre and rail station envisaged to the east.
- Car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC.
- Reliance on SH22 as the sole east-west public transport corridor to service the Drury West area would result in a lack of service coverage, a relatively larger footprint increasing severance impact along SH22, increased exposure of services to congestion at the SH1

Drury Interchange reducing the reliability of services, and a less attractive environment for active modes.

Consequence 2 – Insufficient provision for multi-modal capacity and car reliance

As noted above, urbanisation and growth in Drury will result in a significant increase in multi-modal transport demands. Maintaining the status quo on Bremner Road will limit the capacity of the corridor to accommodate trips by public transport or active modes. This in turn will result in a greater reliance on LOVs, less modal choice and subsequent increases in LOV trips/congestion along Bremner Road and greenhouse gas emissions.

Consequence 3 – Safety implications

Increased transport demands from an urbanising area are likely to exacerbate existing safety issues if not managed with corresponding changes to the road environment. Maintaining the status quo on Bremner Road and other roads in the project area is likely to result in increased safety risk in a context of urban development with increased traffic volumes, numbers of vulnerable road users and access points. Conversely, improvements to the road corridor (for example through provision of separated active mode facilities and rationalisation of 'dog-leg' intersections and accesses) will result in a safer route with less conflicts between vehicles and vulnerable road users.

3.1.2 Problem 2 – Lack of multi-modal accessibility

The lack of safe and attractive multi-modal access to the proposed Drury town centres and strategic public transport network will limit access to economic and social opportunities for those living and/or working in the Drury area.

Problem two recognises that the Bremner Road project area forms a strategically important connection in the context of the land use patterns indicated in the Drury-Ōpāheke Structure Plan, and the proposed locations of rail stations which will form points of access to the rapid transit network. Moreover, the Bremner Road corridor is also part of the FTN and may provide access to future SH1 bus shoulder lanes. Given the range of destinations served, the lack of safe and attractive provision for public transport and active modes through the Bremner Road study area will limit access to both local and regional (by virtue of connections to the rail network and its status as part of the FTN) economic and social opportunities. It will also limit the ability to achieve a transformational mode shift away from LOV use in the Drury Local area, as outlined in the general investment themes in the Drury Local package DBC.

The Bremner Road corridor has previously been identified as having strategic significance as a future public transport corridor. Given the scale of residential catchment to serve to the west of SH1, the planned location of centres, and the planned rapid transit services, the following high-level opportunities have been identified which utilise/pertain to Bremner Road:

- FTN route serving both Drury West and Opāheke/Drury East future residential areas, and connecting them with the planned new town centres en route at Drury Central and West, and their corresponding rail stations to provide access to rapid transit.
- Potential opportunity to access from Bremner Road to SH1 for Express services to the north to avoid the need to use the SH1 Drury Interchange.
- Other connector and local level services serving the Drury West development area.

3.1.2.1 Evidence to demonstrate cause

Evidence has been investigated based on the following three 'root' causes of the multi-modal access problem:

- **Cause 1** – Lack of provision for public transport and active modes on Bremner Road and other east-west roads in the project area;
- **Cause 2** – Planned locations of centres and rail stations; and
- **Cause 3** – Mismatch between the number and type of jobs in the area to the people living in the area.

Cause 1 – Lack of provision for public transport and active modes on Bremner Road and other east-west connections

As discussed in Problem one, the Bremner Road study area traverses a range of land use conditions. Figure 3-8 and Figure 3-9 show the current condition in the rural and light industrial sections of the existing road.



Figure 3-8 Existing condition of Bremner Road - rural condition (Google Streetview, accessed July 2019)



Figure 3-9 Existing condition of Bremner Road - light industrial condition (Google Streetview, accessed July 2019)

No bus services traverse the area at present, and accordingly there has been no need to specifically provide for bus stops or bus priority measures. There are no cycle lanes, and only isolated sections of footpath are provided in the light industrial area.

This current lack of provision for public transport and active modes, along with dispersed rural land use patterns, result in current travel patterns which are heavily car-reliant. Across the whole Southern growth area, approximately 92 per cent of trips to work occur by car.[2]

Cause 2 – Planned locations of centres and rail stations

The strategic importance of the Bremner Road project area in the context of planned future urbanisation is linked to Auckland Council's land use planning, and the planned rail station locations (see Figure 3-9). In particular:

- A proposed large town centre located to the immediate east of the Bremner Road project area, to the east of the existing Drury Village centre and light industrial centre.
- The proposed location of the Drury Central rail station to the south-east of the Waihoehoe Road/Great South Road intersection to the immediate east of the Bremner Road project area.
- Areas of planned medium-to-high density residential development in both Drury West and Drury East.
- Planned schools in Drury West.

[2] 2013 Census Journey to Work Data.

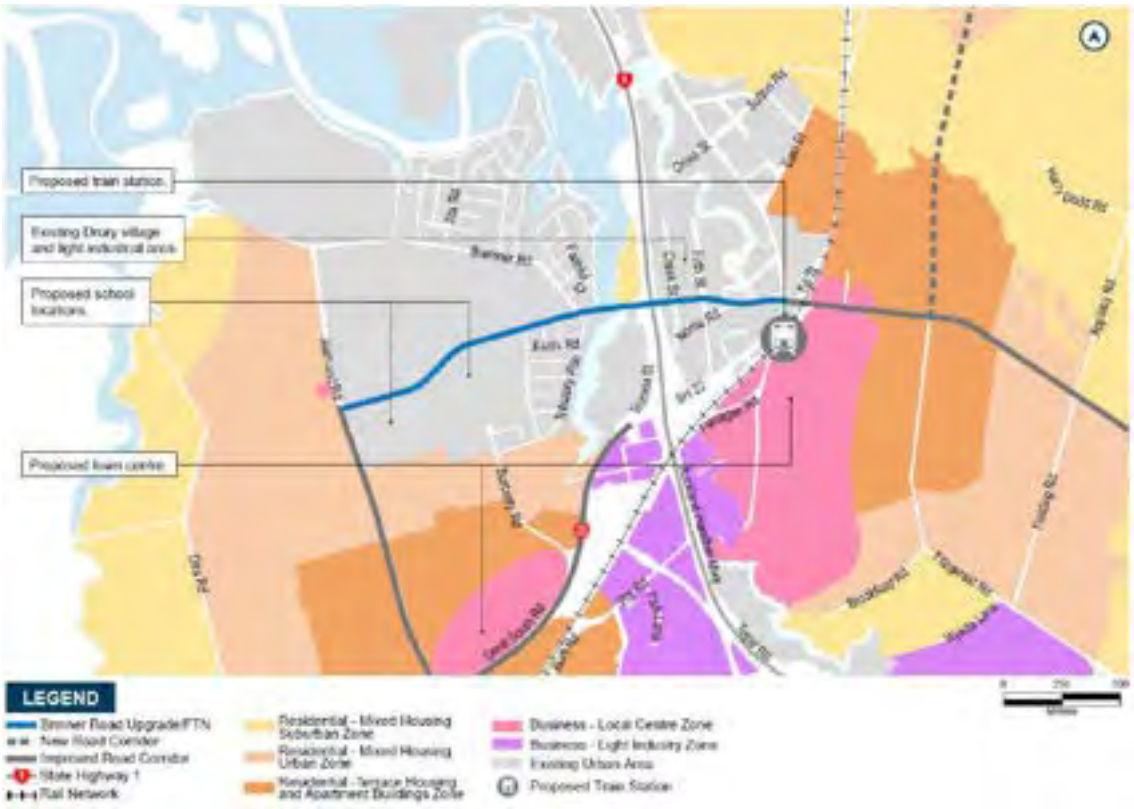


Figure 3-10 Key proposed destinations along Bremner Road Corridor

Given the above, the Bremner Road corridor will have strategic importance both for local destinations and as an access to the wider rapid transit network. The lack of safe and attractive provision for public transport and active modes along these specific routes will therefore limit access to both local and regional economic and social opportunities.

Cause 3 – Mismatch between the number and type of jobs in the area to the people living in the area

The Drury-Ōpāheke Structure Plan provides for only 0.5 new jobs for each additional household. Experience in recent development areas such as Silverdale and Hingaia shows that a relative lack of local employment opportunities results in a higher incidence of long-distance commuting to the central city. This may reflect the nature of employment sought by those moving to new development areas, with a higher emphasis on white collar jobs typically found in central areas (see Figure 3-11).

The result of this is a high predicted demand for commuter trips from Drury by rail. The modelling undertaken for the Structure Plan ITA indicated two-way passenger flows of over 10,000 trips in the two hour morning peak, including over 1,500 boardings at each of the two proposed Drury stations. The need for multi-modal access to the rail station via key corridors including Bremner Road is therefore largely driven by the need for significant numbers of residents to commute to work.

Given the above, it is not feasible or economic to plan for unconstrained LOV demand undertaking lengthy commutes. TDM is therefore critical, both through further optimisation of land use through local employment, and through the provision of quality public transport and active mode transport options to provide transport choice for access to local destinations.

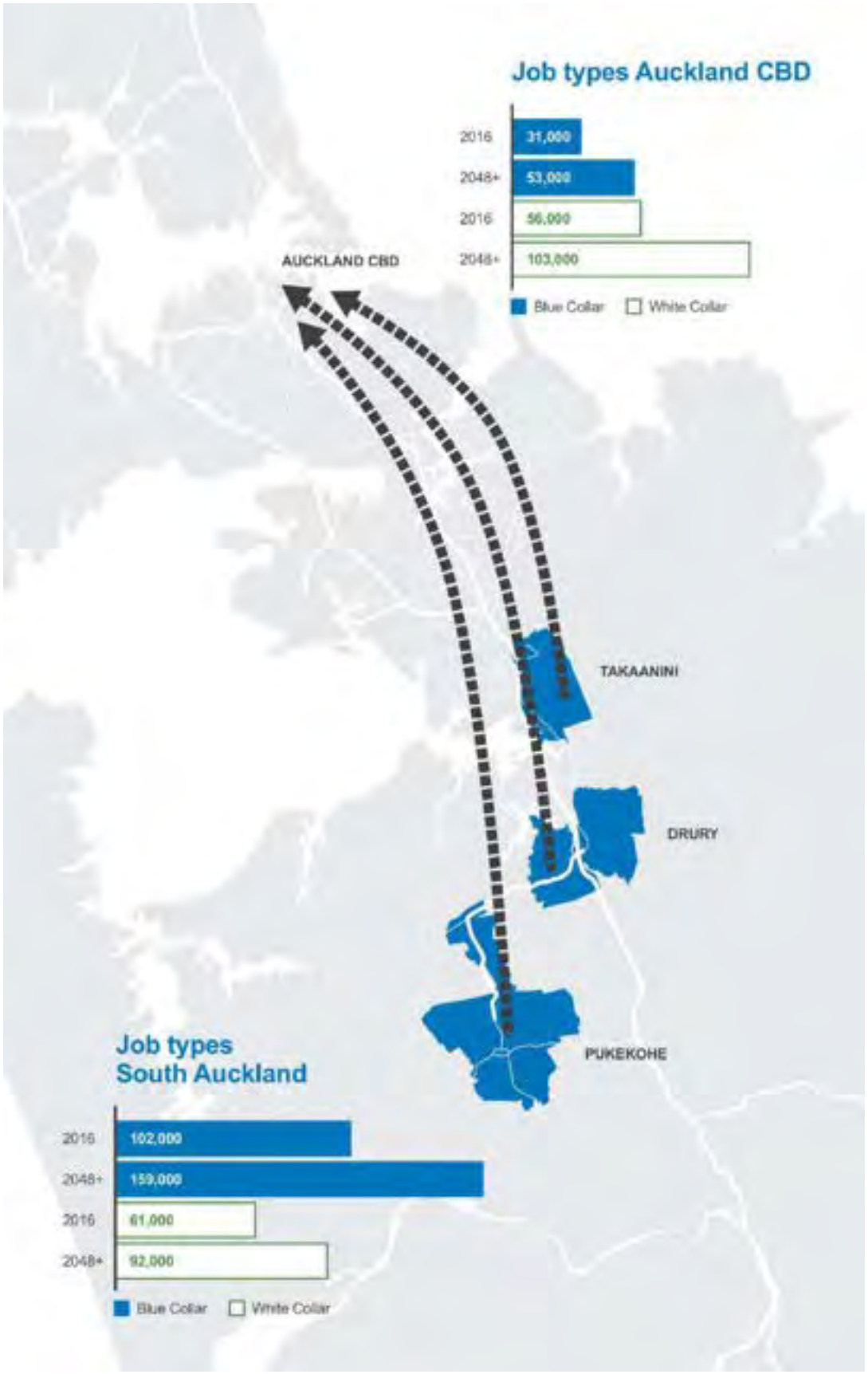


Figure 3-11 Relativity of job type to location

3.1.2.2 The consequences – What if we do nothing?

The consequences associated with a failure to address Problem two are set out below:

Consequence 1 –Poor access to economic and social opportunities

A failure to provide multi-modal access to the proposed centre and rail station along the Bremner Road will adversely affect access to both local destinations, and the wider region via the rail network (and as part of the FTN). Failure to resolve Problem two therefore limits access to economic and social opportunities at both a local and regional level. A corollary of this is that poor access will reduce the viability of centre development, which in turn will reduce the role of local employment and activity in reducing/managing travel demand.

Initial transport modelling in the IBC identified the effect of the recommended network (including interventions on the Bremner Road corridor) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in Figure 3-12 shows that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve problem two will be a failure to improve access to economic and social opportunities for the communities in the area.

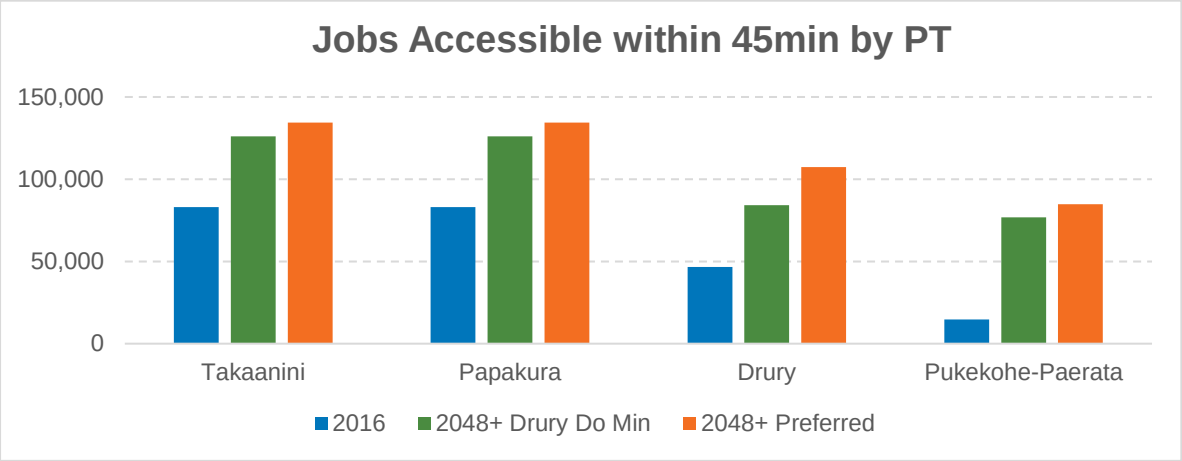


Figure 3-12 Jobs accessible within 45min for the South

Furthermore, Figure 3-13 compares the network over the different years, examining the jobs accessible at different time intervals. Notably, a comparison of the do-min with the preferred network shows an increase in job accessibility via public transport with the implementation of the preferred Drury Network. Figure 3-14 shows this information spatially, showing the key destinations that can be reached from Drury at different travel times. Again, these figures emphasise that a consequence of failing to resolve Problem two will limit access to social and economic opportunities for the Drury/Ōpāheke communities.

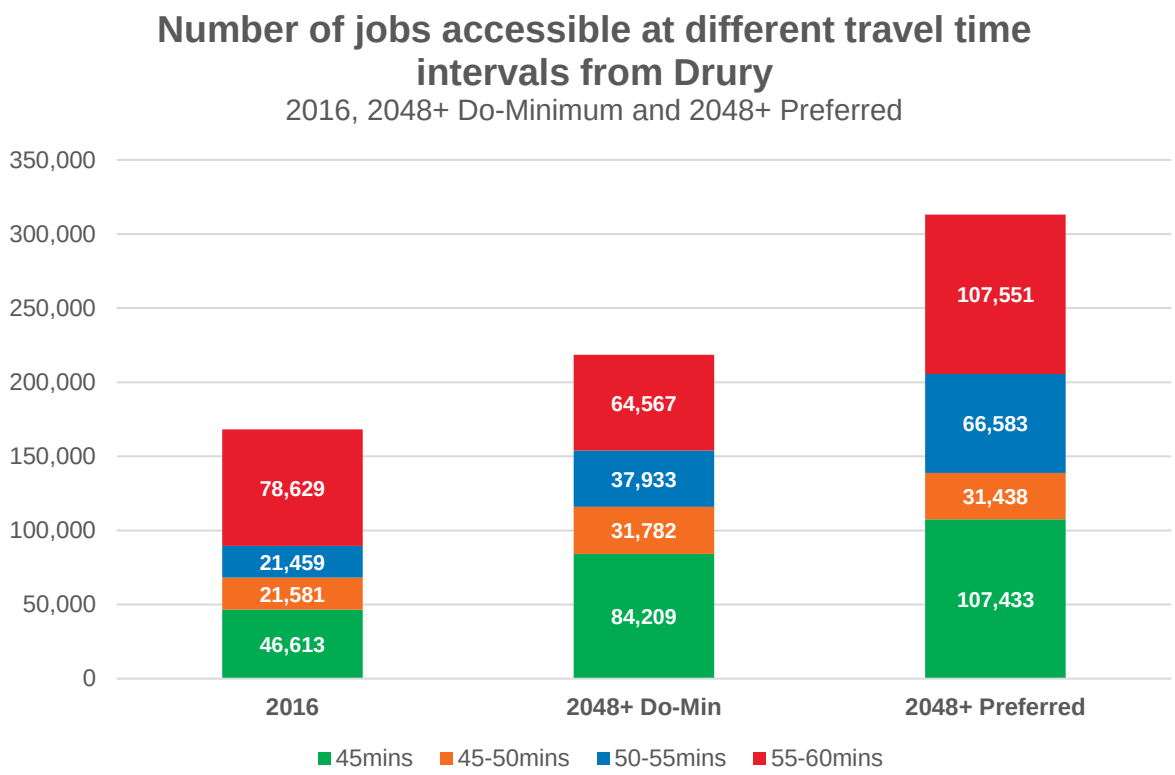


Figure 3-13 Number of jobs accessible at different time intervals from Drury

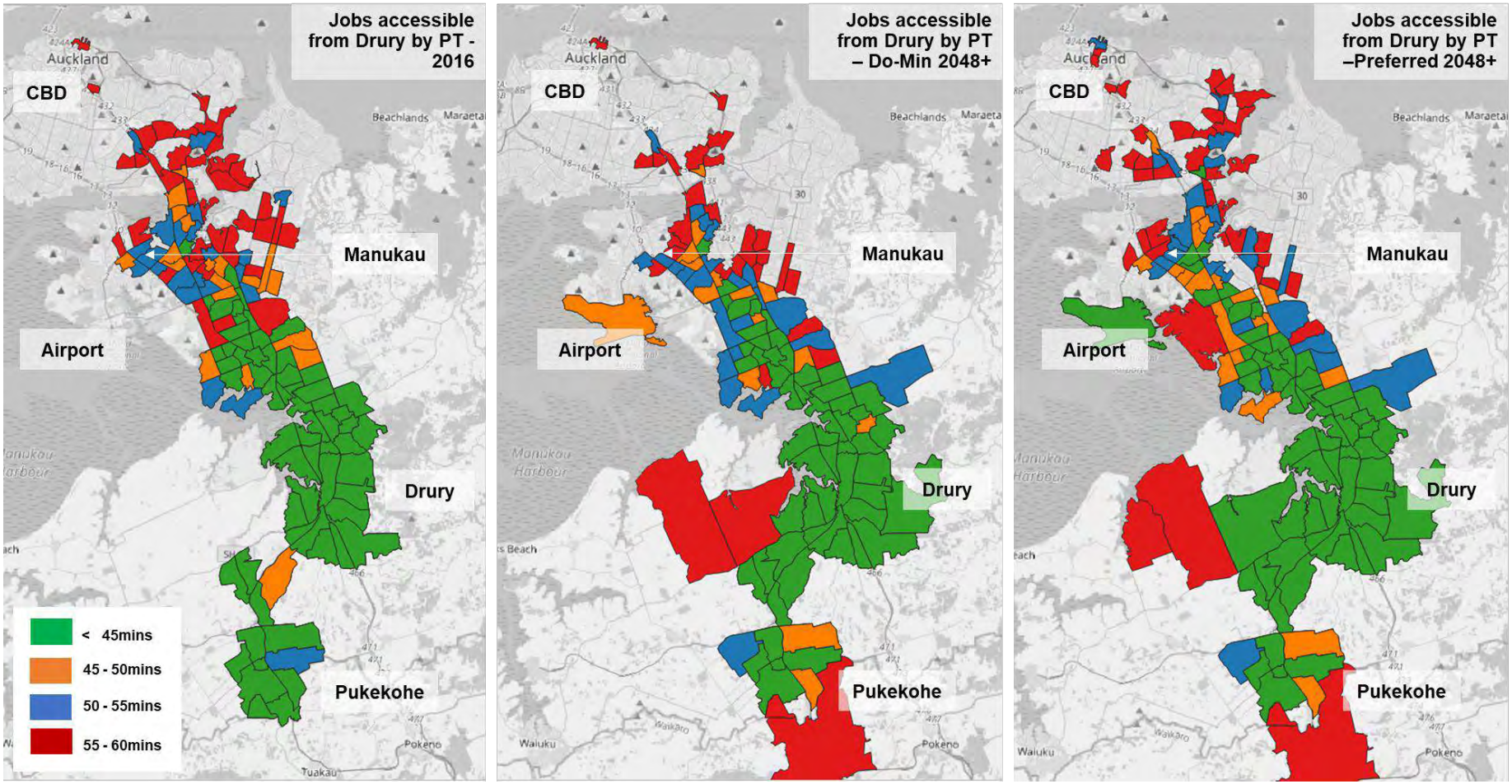


Figure 3-14 Key destinations and jobs that can be reached from Drury by PT at different time intervals: 2016, Do-min 2048+ and Preferred 2048+

Consequence 2 – Lack of modal choice / over-reliance on private cars

Failure to provide for multi-modal access along the Bremner Road corridor to local destinations and the proposed rail station will:

- Entrench the existing degree of LOV reliance (92 per cent across the Southern growth area for work trips in the 2013 Census) for trips to these destinations, resulting in increased local traffic volumes;
- Limit accessibility of the proposed Drury West station, resulting in higher traffic volumes on the strategic road network for long distance commuting trips. Modelling undertaken for the Structure Plan ITA indicates that the stations at their assumed level of accessibility would result in rail patronage accounting for almost half of trips bound for the Central City. Reducing access to the stations (and therefore patronage) will affect the performance of the strategic road network, which remains relatively congested even with significant mode shift assumed; and
- Increase the reliance of park-and-ride facilities for access to the rail stations, which again will limit the ability to achieve a transformational mode shift in the Drury area. High-level modelling undertaken for the Structure Plan ITA indicates a significant proportion of boardings attributable to park-and-ride access. This may become an 'over-reliance' if enhanced public transport and active mode connections to the stations are not made.

3.2 Project specific benefits and investment objectives

PBIOs have been developed for the Bremner Road upgrade /FTN project and draw on the problem statements documented above and summarised in Figure 3-15 below. The figure also demonstrates the alignment of the investment objectives with relevant programme-wide investment themes.

The benefits identified for this project recognise that if these two problems are solved, the communities in these growth areas will benefit through improved connectivity and accessibility for the Drury Local area; improved quality of the urban environment; improved safety for all transport modes; plus better transport choice and reduced reliance on LOVs. The reduced reliance on LOVs will in turn have benefits for health and wellbeing and the environment, including GHG savings.

The benefits and problems were considered together to develop the project-specific IOs listed in Figure 3-15 IO1 seeks to solve the form and function problem and support growth and a more sustainable, quality urban form by improving connectivity to/through the Drury area. IO2 seeks to address the problem of lack of safe and attractive travel choices, and deliver the benefits for transport choice, safety and connectivity/accessibility by providing high quality, safe and attractive PT and active mode facilities on the Bremner Road connection.

Figure 3-15 Bremner Road project specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
Existing roads to be upgraded/FTN - Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/Ponga Road	PS1: The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/ Ponga Road will not support the imminent urbanisation of the Drury Local area, resulting in poor access and urban form outcomes	Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	IO1: Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Ōpāheke area	✓	✓		✓	✓
	PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area	Improved quality of the urban environment	IO2: 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		✓	✓		✓
		Improved connectivity and accessibility for the Drury Local area						
		Improved safety for all transport modes						

4 The Waihoehoe project

4.1 Investment story – problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed Waihoehoe Road upgrade/FTN project. The process of the problem statement development through internal workshops is described in further detail in the main Drury Local DBC.

Figure 4-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed Waihoehoe Road upgrade/FTN project.

Figure 4-1 Relationship of IBC area problems to DBC project problems

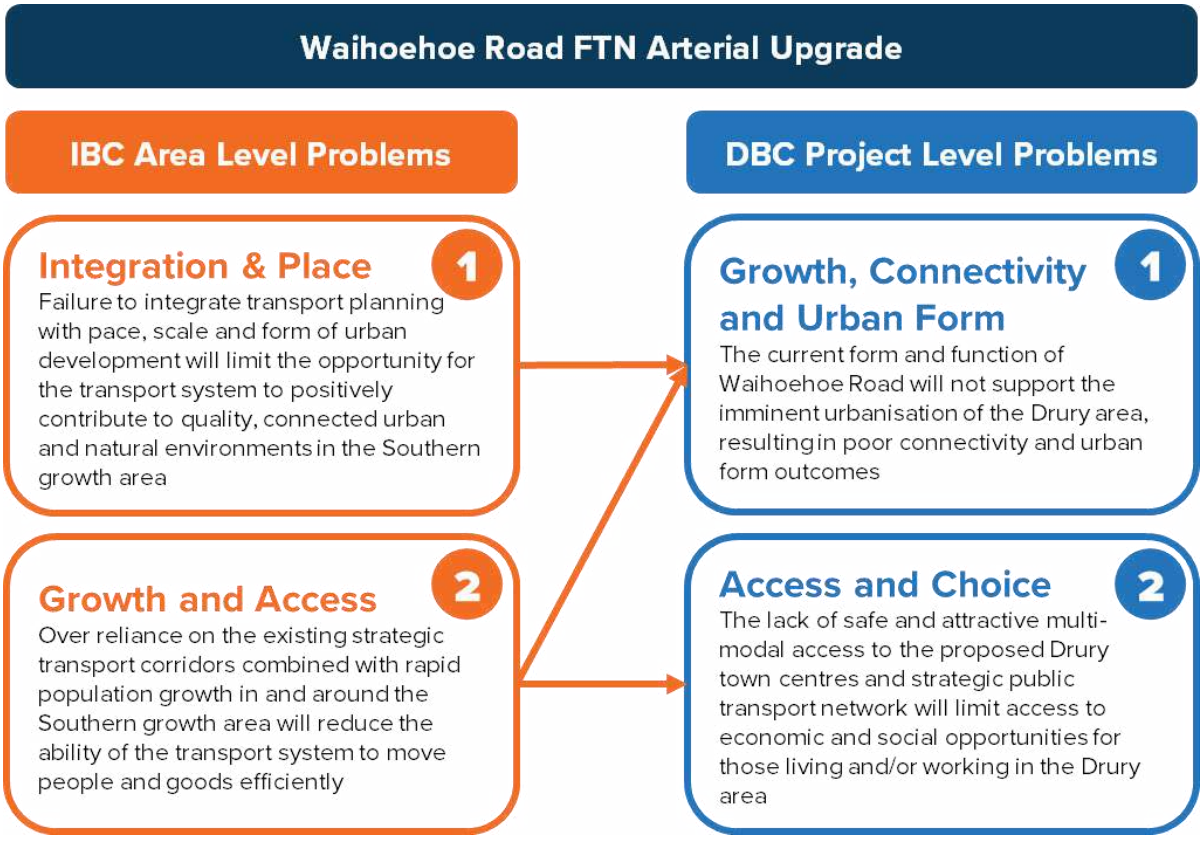


Figure 4-2 and Figure 4-3 below summarises the line of sight between the IBC and DBC problem statements.

Figure 4-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 1 Integration & Place	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 Southern growth area

DBC Problem 1: Failure to integrate the form and function of **Waihoehoe Road** with the proposed rapid urbanisation will result in poor urban form outcomes.

Figure 4-3 IBC Problem 2 alignment with DBC Problems

IBC Problem 2 Growth and Access	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

DBC Problem 1: In the context of growth and the current form and function of **Waihoehoe Road** connectivity outcomes will be compromised, including connections to rail stations, town centres and between communities.

DBC Problem 2: A lack of attractive modal choice in the context of growth along **Waihoehoe Road**, will further overload existing strategic corridors (for local trips?), limiting access to economic and social opportunities.

This section outlines the two problem statements developed for the Waihoehoe Road Upgrade/FTN project, and the evidence supporting these statements.

4.1.1 Problem 1 – Form and function

The current form and function of the Waihoehoe Road corridor will not support the imminent urbanisation of the Drury East area, resulting in poor connectivity and urban form outcomes.

The form and function of the Waihoehoe Road corridor is generally commensurate with a rural land use condition, such that it does not provide for active modes or public transport, it has one traffic per direction, an ~80km/h speed environment, limited lighting and swale drainage. These characteristics are broadly suitable in the current rural environment where total transport demand is relatively low, and settlement is highly dispersed.

Problem one highlights that the form and function of Waihoehoe Road will no longer be appropriate as the Drury East area urbanises. Quality urban form outcomes in urbanised corridors require lower speeds, higher amenity, better conditions for pedestrians and cyclists, and urban drainage and stormwater solutions. Moreover, an urbanised context generates higher and more diverse transport demands, which drive the need to provide for mode shift through public transport and active mode provision.

4.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following two root causes of the problem:

Cause 1 – Planned urbanisation of the Drury East area; and

Cause 2 – Transport demands associated with the urbanisation of the Drury East area.

Cause 1 – Imminent/forthcoming urbanisation of the Drury Local study area

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares (ha) earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Drury area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area, within which the Waihoehoe Road corridor is located, is an area of approximately 1,900 hectares, and is estimated by Auckland Council to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000.

Importantly, the Structure Plan envisages a compact urban form. The proposed Structure Plan and other land use contextual changes present both risks and opportunities. The Waihoehoe Road corridor traverses what is planned as an area of medium-to-high density residential development, with its own town centre and a rail station at the western end of the road. The proposed Drury Central station comprises another coordinated Supporting Growth project, as explained in the Drury Local Package DBC. This transition from rural land use to a highly urbanised condition is clearly a root cause of the identified form and function problem.

Achieving east-west connectivity in this location is strategically important in the context of the aforementioned future land use, given the proposed locations of residential development and significant destinations to be located along the corridor (this point is further underlined in the evidence supporting problem two).

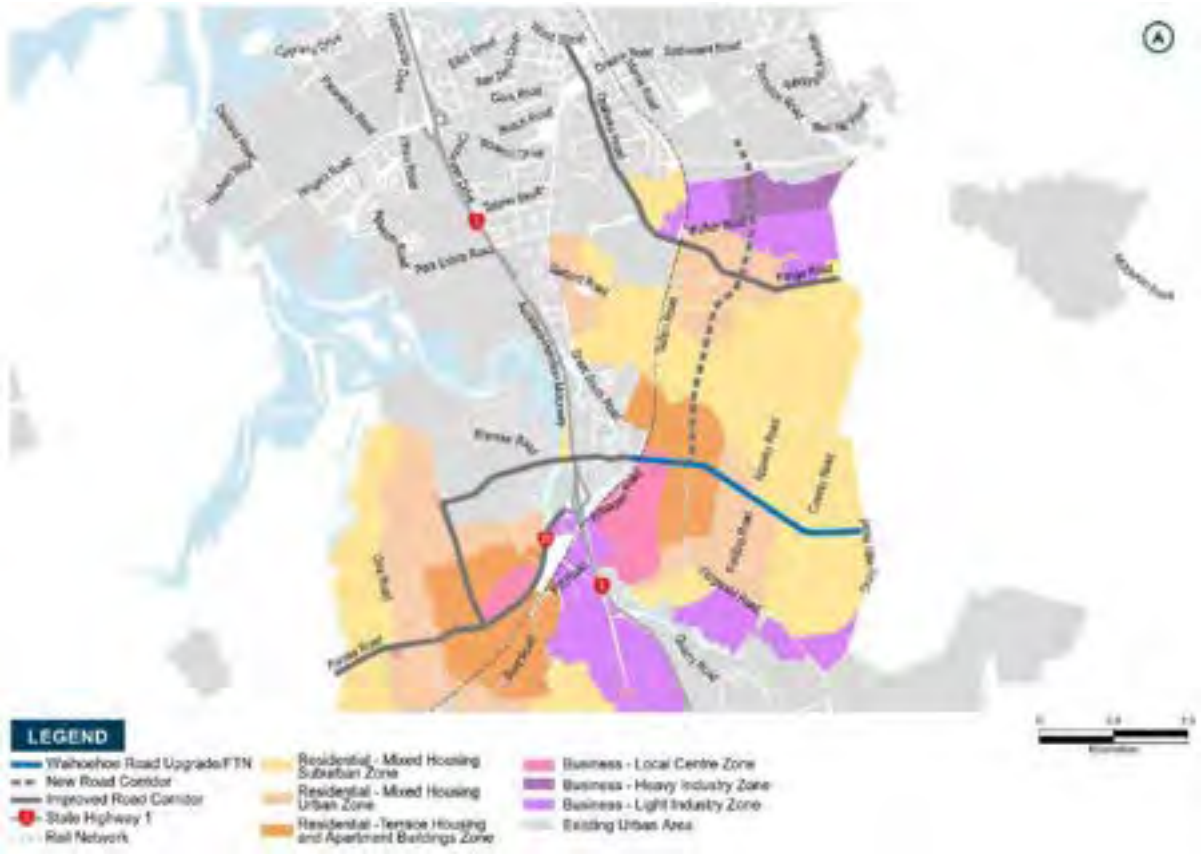


Figure 4-4 Waihoehoe Road corridor within the context of the Drury-Ōpāheke structure plan

The proposed development timeframes compound the form and function problem. At the time of writing this report, several Private Plan Changes have also been received by Council, emphasising the continuous developer interest in seeking expedited live-zoning of FUZ land in the area. A number of these requests lie directly adjacent to the Waihoehoe Road corridor. (Figure 4-5). However, under the Council's FULSS, the rest of the Drury East area is not proposed to be rezoned as 'development-ready' land until the 2028-2032 period.



Figure 4-5 Private plan change requests in Drury-Ōpāheke

Cause 2 – Transport demands associated with urbanisation

The scale of growth outlined above will result in significant increases in outbound transport demands, as well as increased demand for transport within the Drury area. The need to move more people around associated with urbanisation also results in a diversification of transport demand – i.e. an increased need to provide for public transport, walking and cycling in transport corridors.

At a macro level, the potential increase in outbound transport demands by both private vehicle Low Occupancy Vehicles (LOVs) and public transport to key regional destinations is shown in Figure 4-7.The Waihoehoe Road corridor forms part of the network linking into the future strategic road and public transport networks which accommodate these outbound trips (both as a frequent bus route at its western end and as an access to the proposed Drury Central train station), and accordingly will need to provide for additional people-moving capacity.

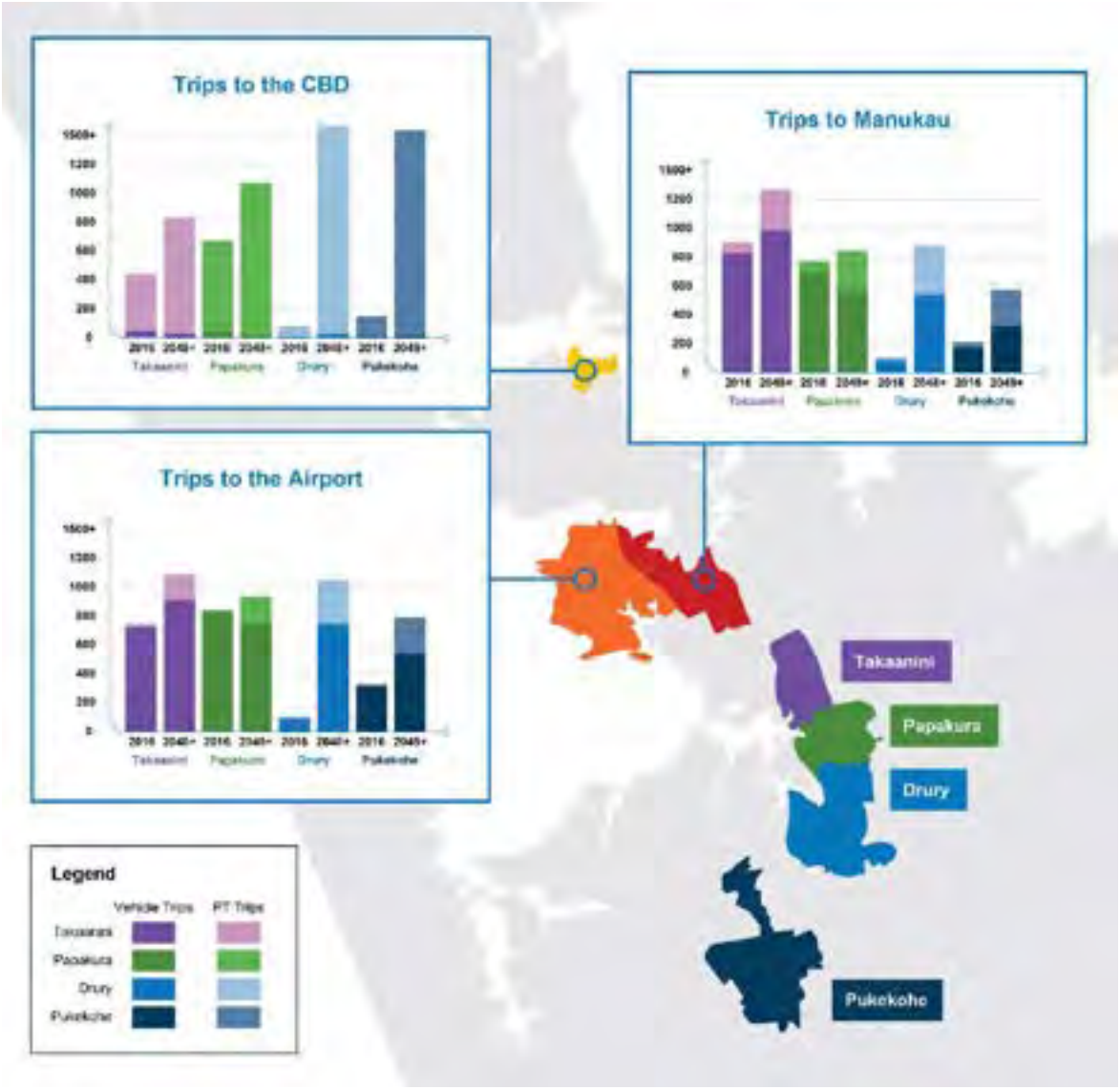


Figure 4-6 Increase in outbound transport demands from Drury (blue) to key regional destinations

2016 ADT levels along Waihoehoe Road West (GSR to Fitzgerald Road) are 6,000, and for the East section (Fitzgerald Road to Fielding Road) 3,000. Traffic modelling technical work undertaken for both the IBC and the Structure Plan ITA has indicated that Waihoehoe Road could:

- Carry daily general traffic volumes of ~12,000 Average Daily Traffic (ADT), with total volumes higher at the western end
- In addition to performing an important role as part of a frequent public transport route at its western end
- Provide an important east-west linkage for general traffic accessing SH1 and Great South Road at the western end, and the Mill Road corridor at its eastern end.

It should be noted that this was a capture of information at this point and time, establishing a base line for further investigation, including initial corridor form and function assessments (CFAF). Since then,

modelling yields have advanced to using I11.5 data, which are used throughout the main DBC and Transport Report. However, these show relatively similar outputs.

Within the Drury East area itself, urbanisation will result in significantly more local destinations (such as centres, local employment areas, schools, parks) which will increase the demand for short trips, many of which could be undertaken by active modes. Waihoehoe Road in its current rural condition does not provide for these modes.

4.1.1.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem one are set out below:

Consequence 1 – Poor urban form outcomes

Transport infrastructure fundamentally influences urban form. Maintaining the status quo on Waihoehoe Road will reinforce current land use patterns, which will preclude the compact, high quality and more sustainable urban form sought by Council for this and other future urban environments.

In particular:

- High vehicle speeds and a lack of provision for pedestrians and cyclists will result in an unsafe and unattractive street environment, which in turn will preclude/deter the establishment of compact, walkable urban development.
- Car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC section 7.1.3.
- Without provision of a direct east-west route to provide connectivity to the Mill Road corridor, high vehicular traffic volumes may use the collector and local network which will compromise the amenity of these future communities. In other words, provision of an east-west arterial enables higher amenity and active mode connectivity on the local transport network.

Consequence 2 – Insufficient provision for multi-modal capacity and car reliance network resilience

As noted above, urbanisation and growth in Drury will result in a significant increase in multi-modal transport demands. Maintaining the status quo on Waihoehoe Road will limit the capacity of the corridor to accommodate trips by public transport or active modes. This in turn will result in a greater reliance on private vehicles, less modal choice and subsequent increases in LOV trips/congestion along Waihoehoe Road and greenhouse gas emissions.

Consequence 3 – Safety implications

Increased transport demands from an urbanising area are likely to exacerbate existing safety issues if not managed with corresponding changes to the road environment. Maintaining the status quo on Waihoehoe Road is likely to result in increased safety risk in a context of urban development with increased traffic volumes, numbers of vulnerable road users and access points. Conversely, improvements to the road corridor (for example through provision of separated active mode facilities) will result in a safer route with less conflicts between vehicles and vulnerable road users.

4.1.2 Problem 2 – Lack of Multi-Modal Accessibility

The lack of safe and attractive multi-modal access to the proposed Drury town centre and strategic public transport network will limit access to economic and social opportunities for those living and/or working in the Drury East area.

Problem two recognises that the Waihoehoe Road corridor forms a strategically important connection in the context of the land use patterns indicated in the Drury-Ōpāheke Structure Plan, and the proposed locations of rail stations which will form points of access to the rapid transit network as well as forming part of the FTN. Given the range of destinations served, the lack of safe and attractive provision for public transport and active modes along Waihoehoe Road will limit access to both local and regional (by virtue of connections to the rail network) economic and social opportunities. It will also limit the ability to achieve a transformational mode shift away from private vehicle use in the Drury Local area, as outlined in the general investment themes in the Drury Local package DBC.

4.1.2.1 Evidence to demonstrate cause

Evidence has been investigated based on the following three 'root' causes of the multi-modal access problem:

Cause 1 – Lack of provision for public transport and active modes on Waihoehoe Road;

Cause 2 – Planned locations of centres and rail stations; and

Cause 3 – Mismatch of the number and type of jobs in the area to the people living in the area.

Cause 1 – Lack of provision for public transport and active modes on Waihoehoe Road



Figure 4-7 Existing condition of Waihoehoe Road (Google Streetview, accessed July 2019)

As discussed in Problem one, the Waihoehoe Road corridor is a rural road which does not make specific provision for public transport or active modes (see Figure 4-7). There are no bus services on

Waihoehoe Road at present, and accordingly there has been no need to specifically provide for bus stops or bus priority measures. There are also no footpaths or cycle lanes.

This current lack of provision for public transport and active modes, along with dispersed rural land use patterns, result in current travel patterns which are heavily car-reliant. Across the whole Southern growth area, approximately 92 per cent of trips to work occur by car[3].

The Waihoehoe Road corridor was identified in the IBC as having strategic significance for public transport, with the western section being indicatively shown as being utilised for a FTN routes connecting to the Drury town centre and Drury Central rail station, and Drury West via Bremner Road respectively. The road is also likely to be utilised for local and connector bus services serving the Drury East development area in future.

Cause 2 – Planned locations of centres and rail stations

The strategic importance of the Waihoehoe Road corridor in the context of planned future urbanisation is linked to Auckland Council's land use planning, and the planned rail station locations (see Figure 4-8). In particular:

- A proposed large town centre located south of Waihoehoe Road and west of Fitzgerald Road
- The Drury Central train station, proposed to the immediate south of Waihoehoe Road and west of Flanagan Road adjacent to the proposed town centre
- Access to the existing Drury Village centre and light industrial area
- Areas of planned medium-to-high density residential development.

Given the above, the Waihoehoe Road corridor will have strategic importance both for local destinations (which will be served in part by the planned FTN), and as access to the wider rapid transit network. The lack of safe and attractive provision for public transport and active modes along these specific routes will therefore limit access to both local and regional economic and social opportunities.

[3] 2013 Census Journey to Work Data.

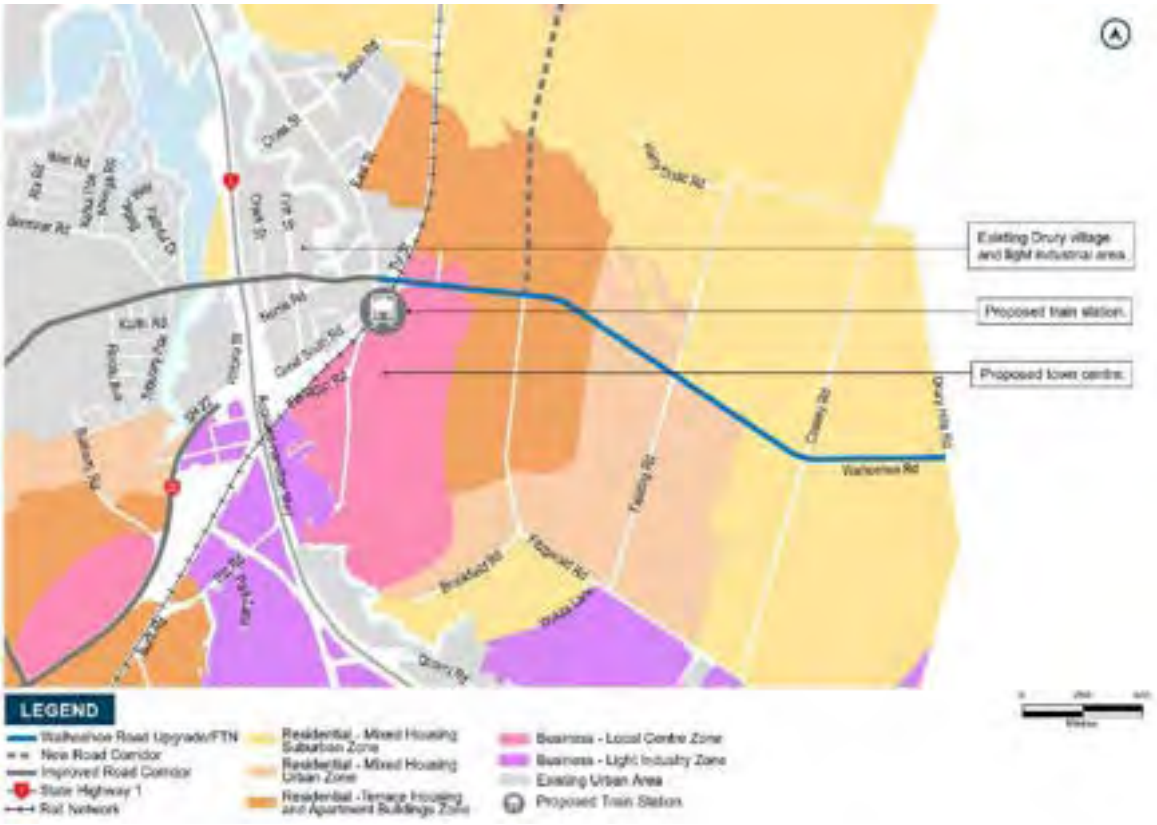


Figure 4-8 Key proposed destinations along Waihoehoe Road Corridor

Cause 3 – Mismatch between the number and type of jobs in the area to the people living in the area

The Drury-Ōpāheke Structure Plan provides for only 0.5 new jobs for each additional household. Experience in recent development areas such as Silverdale and Hingaia shows that a relative lack of local employment opportunities results in a higher incidence of long-distance commuting to the central city. This may reflect the nature of employment sought by those moving to new development areas, with a higher emphasis on white collar jobs typically found in central areas (see Figure 4-9)

The result of this is a high predicted demand for commuter trips from Drury by rail. The modelling undertaken for the Structure Plan ITA indicated two-way passenger flows of over 10,000 trips in the two-hour AM peak, including over 1,500 boardings at each of the two proposed Drury stations. The need for multi-modal access to the rail stations via key corridors including Waihoehoe Road is therefore largely driven by the need for significant numbers of residents to commute to work.

Given the above, it is clear that it is not feasible or economic to plan for unconstrained LOV demand undertaking lengthy commutes. Travel demand management (TDM) is therefore critical, both through further optimisation of land use through local employment, and through the provision of quality public transport and active mode transport options to provide transport choice for access to local destinations is therefore critical.

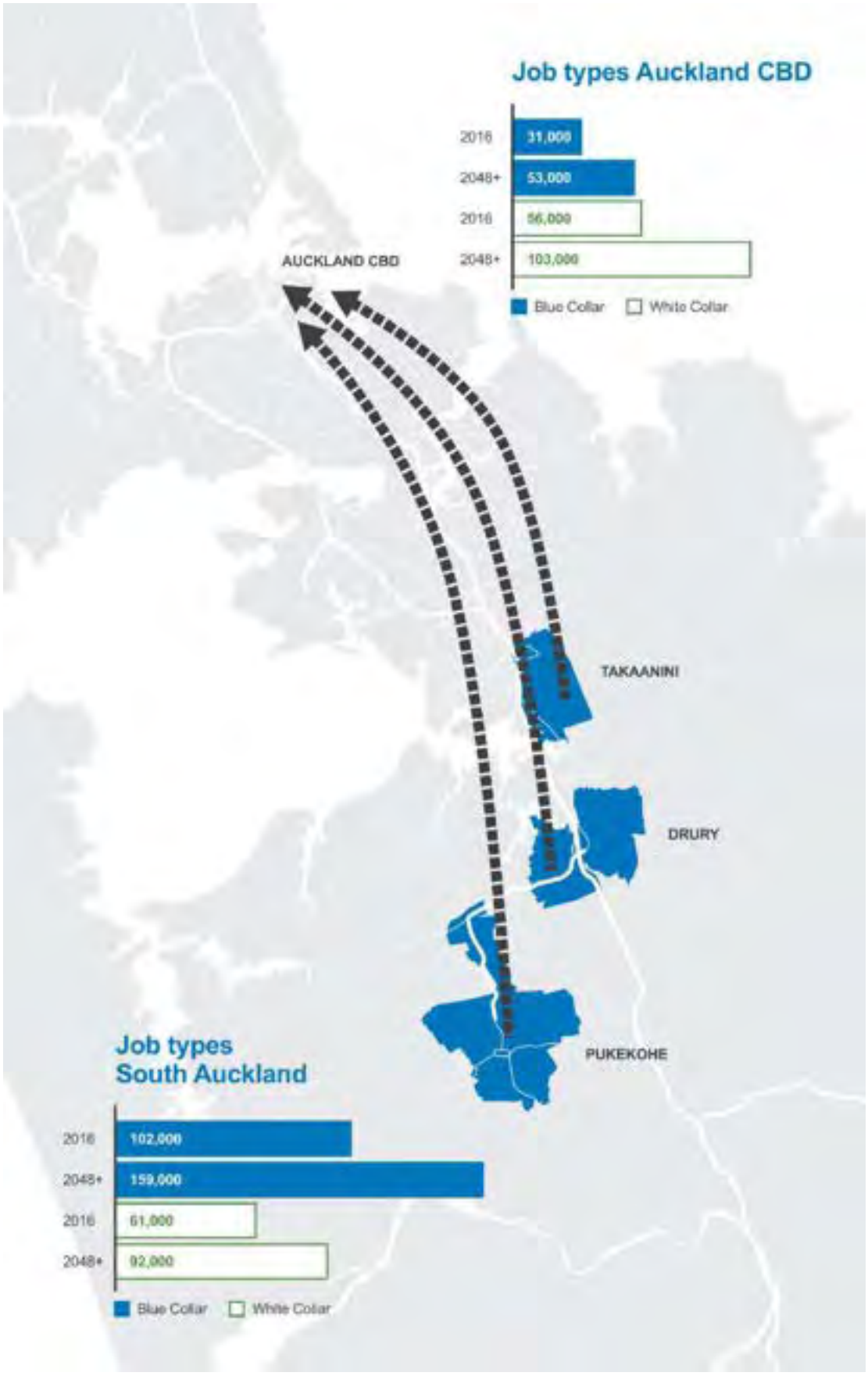


Figure 4-9 Relativity of job type to location

4.1.2.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem two are set out below:

Consequence 1 – Poor Limitation of multi-modal access to economic and social opportunities

A failure to provide multi-modal access to the proposed town centre and rail station along Waihoehoe Road will adversely affect access to both local destinations, and the wider region via the rail network. Failure to resolve Problem two therefore limits access to economic and social opportunities at both a local and regional level. A corollary of this is that poor access will reduce the viability of centre development, which in turn will reduce the role of local employment and activity in reducing/managing travel demand.

Initial transport modelling in the IBC identified the effect of the recommended network (including interventions on Waihoehoe Road) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in Figure 4-10 shows that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve Problem two will be a failure to improve access to economic and social opportunities for the communities in the area.

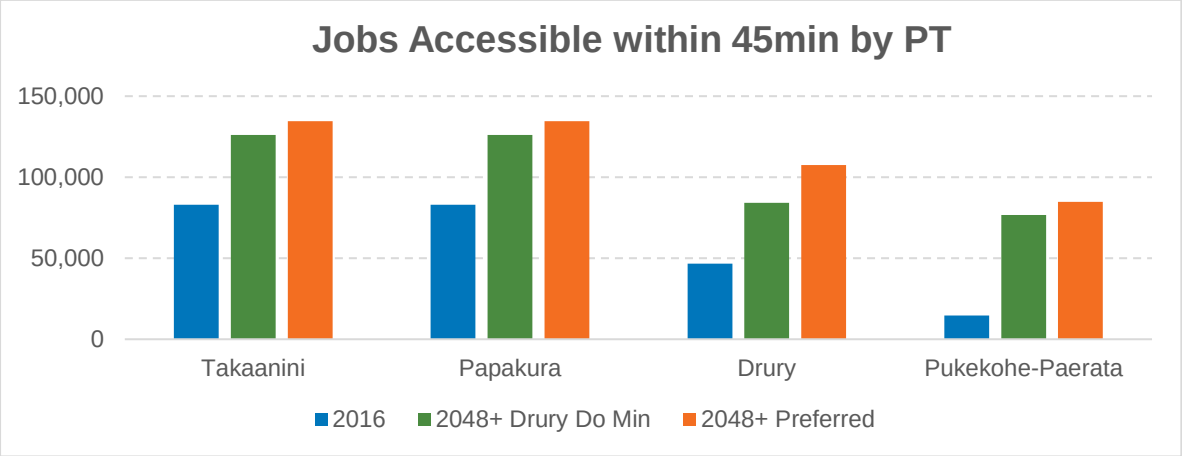


Figure 4-10 Jobs accessible within 45min by PT

Furthermore, Figure 4-11 compares the network over the different years, examining the jobs accessible at different time intervals. Notably, a comparison of the Do-Min with the Preferred network shows an increase in job accessibility via public transport with the implementation of the preferred Drury Network. Figure 4-12 shows this information spatially, showing the key destinations that can be reached from Drury at different travel times. Again, these figures emphasise that a consequence of failing to resolve problem two will be reduce the accessibility to social and economic opportunities for the Drury/Ōpāheke communities.

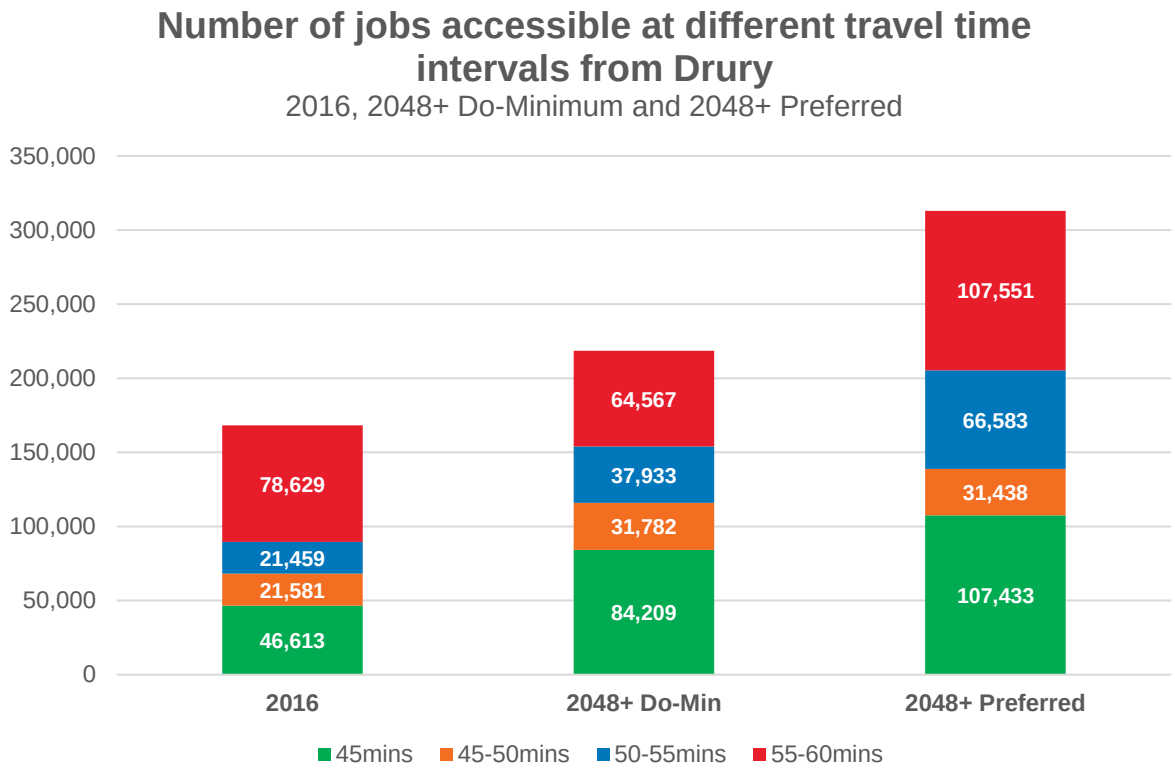


Figure 4-11 Number of jobs accessible at different time intervals from Drury

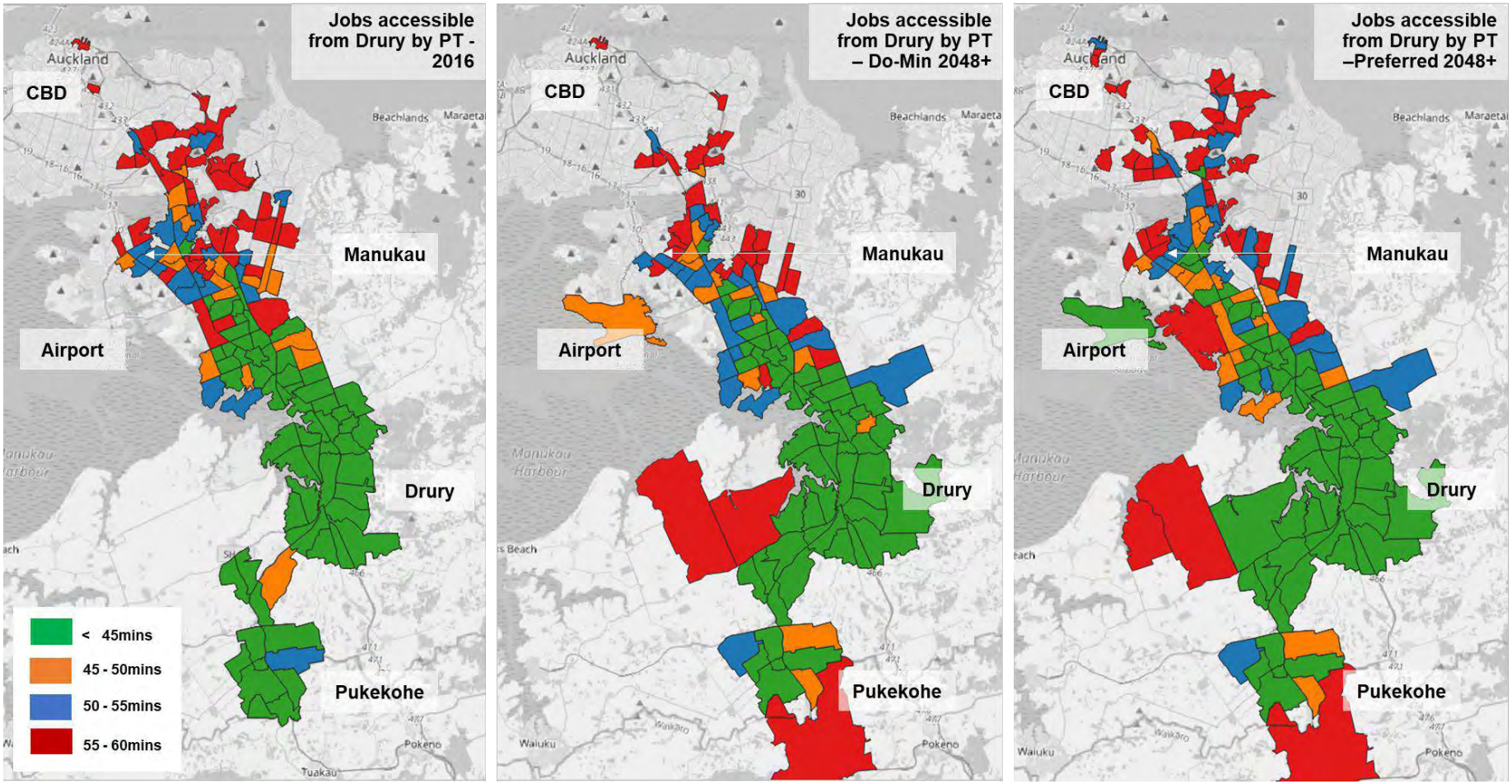


Figure 4-12 Key destinations and jobs that can be reached from Drury by PT at different time intervals: 2016, Do-min 2048+ and Preferred 2048+

Consequence 2 – Lack of modal choice / over-reliance on private cars

Failure to provide for multi-modal access along the Waihoehoe Road corridor to local destinations and the proposed rail station will:

Entrench the existing degree of private vehicle reliance (92 per cent across the Southern growth area for work trips in the 2013 Census) for trips to these destinations, resulting in increased local traffic volumes;

Limit accessibility of the proposed Drury Central station, resulting in higher traffic volumes on the strategic road network for long distance commuting trips. Modelling undertaken for the Structure Plan ITA indicates that the stations at their assumed level of accessibility would result in rail patronage accounting for almost half of trips bound for the Central City. Reducing access to the stations (and therefore patronage) will affect the performance of the strategic road network, which remains relatively congested even with significant mode shift assumed; and

Increase the reliance of park-and-ride facilities for accessibility to the rail stations, which again will limit the ability to achieve a transformational mode shift in the Drury area. High-level modelling undertaken for the Structure Plan ITA indicates a significant proportion of boardings attributable to Park-and-Ride access. This may become an 'over-reliance' if enhanced public transport and active mode connections to the stations are not made.

4.2 Project specific benefits and investment objectives

PBIOs have been developed for the Waihoehoe Road upgrade/FTN project, and draw on the problem statements documented in section 1.4 of this report (as summarised in Figure 4-13 below). The figure also demonstrates the alignment of the investment objectives with relevant package-level investment themes, which also generally apply across the whole Southern growth area.

The benefits identified for this project recognise that if these two problems are solved, the community in this growth area will benefit through improved connectivity and accessibility for the Drury Local area; improved quality of the urban environment; improved safety for all transport modes; plus better transport choice and reduced reliance on LOVs. The reduced reliance on LOVs will in turn have benefits for health and wellbeing and the environment, including GHG savings.

The benefits and problems were considered together to develop the project-specific IOs listed in Figure 4-13.

IO1 seeks to solve the form and function problem and support growth and a more sustainable, quality urban form by improving connectivity to/through the Drury area. IO2 seeks to address the problem of lack of safe and attractive travel choices, and deliver the benefits for transport choice, safety and connectivity/accessibility by providing high quality, safe and attractive PT and active mode facilities on the Waihoehoe Road connection.

Figure 4-13 Waihoehoe project specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
Existing roads to be upgraded/FTN - Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/Ponga Road	**PS1:** The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/ Ponga Road will not support the imminent urbanisation of the Drury Local area, resulting in poor access and urban form outcomes	Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	**IO1:** Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Ōpāheke area	✓	✓		✓	✓
		Improved quality of the urban environment						
	PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area	Improved connectivity and accessibility for the Drury Local area	**IO2:** 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**		✓	✓		✓
		Improved safety for all transport modes						

5 Ōpāheke Road / Ponga Road Project

5.1 Investment story - problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed Ōpāheke and Ponga Road Upgrade projects. The process of the problem statement development through internal workshops is described in further detail in the main Drury Local DBC.

Figure 5-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed Ōpāheke and Ponga Road Upgrade projects.

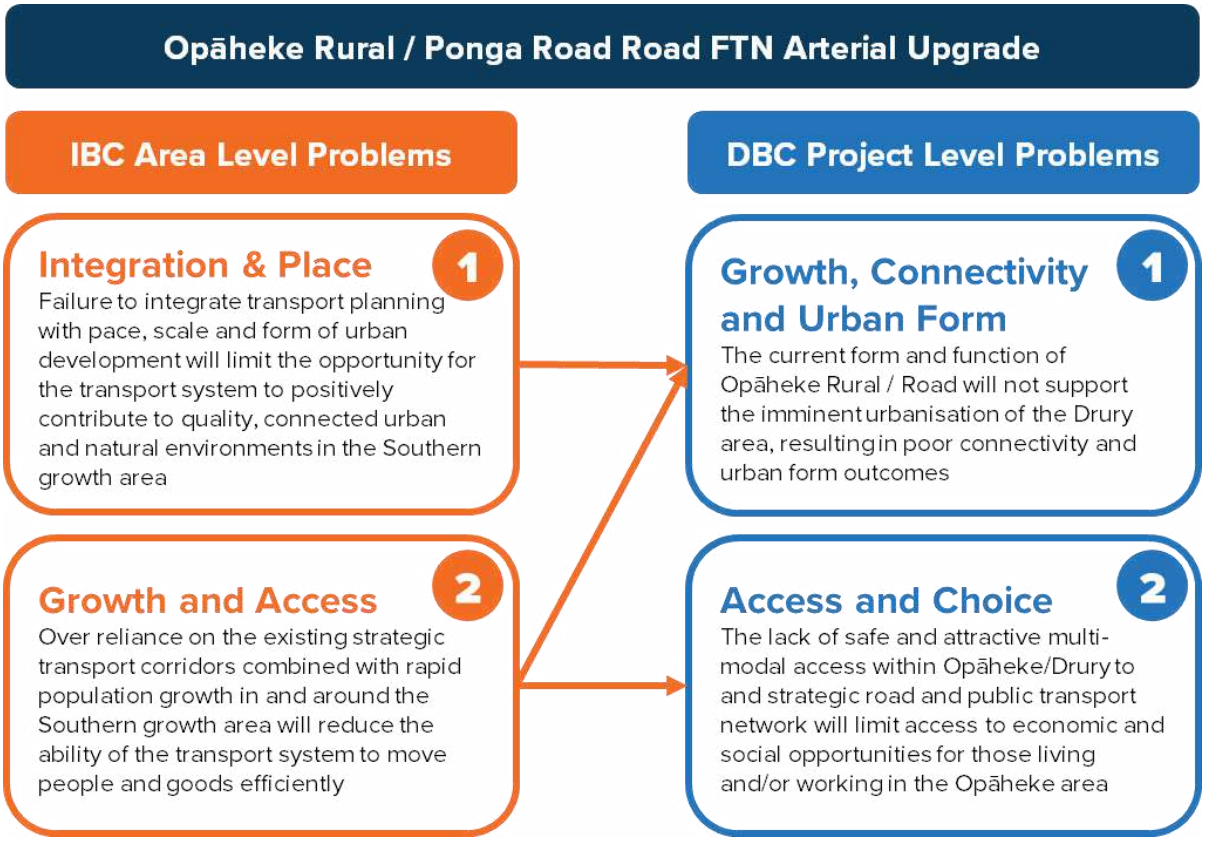


Figure 5-1 – Relationship of IBC area problems to DBC project problems

Figure 5-2 and Figure 5-3 below summarises the line of sight between the IBC and DBC problem statements.

IBC Problem 1 Integration & Place	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 Southern growth area

DBC Problem 1: Failure to integrate the form and function of **Opāheke Rural / Ponga Road** with the proposed rapid urbanisation will result in poor urban form outcomes.

Figure 5-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 2 Growth and Access	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

DBC Problem 1: In the context of growth and the current form and function of **Opāheke Rural / Ponga Road** connectivity outcomes will be compromised, including connections to rail stations, town centres and between communities.

DBC Problem 2: A lack of attractive modal choice in the context of growth along **Opāheke Rural / Ponga Road**, will further overload existing strategic corridors (for local trips?), limiting access to economic and social opportunities.

Figure 5-3 IBC Problem 2 alignment with DBC Problems

The next section outlines the two problem statements developed for this project, and the evidence supporting these statements.

5.1.1 Problem 1 – Form and Function

The current form and function of Ōpāheke / Ponga Roads will not support the future urbanisation of the Opāheke area, resulting in poor connectivity and urban form outcomes.

The current form and function of the Opāheke / Ponga Road corridor varies between urban and rural conditions along its length. The western (urban) section (~1.6km between Great South Road and Lorelei Place) is a two-lane urban road with pedestrian facilities, kerb-and-channel drainage, lighting and a 50km/h speed environment (Figure 5-4).



Figure 5-4 Ōpāheke Road Urban Section (Google Streetview, accessed August 2020)

The eastern section of the study corridor (~3km) runs along the remainder of Ōpāheke Road from Lorelai Place, crossing the NIMT (Figure 5-5) and continues along Ponga Road (Figure 5-6) until Jack Paterson Road. This section is in a condition commensurate with a rural land use condition, such that it does not provide for any active modes or public transport, has an 80km/h speed limit, limited lighting and swale drainage. These characteristics are broadly suitable in the current rural environment where total transport demand is relatively low, and settlement is dispersed.



Figure 5-5 Ōpāheke Road Rural Section and NIMT Crossing (Google Streetview, accessed August 2020)



Figure 5-6 Ponga Road (Google Streetview, accessed August 2020)

Problem one highlights that the form and function of the Opāheke / Ponga Road corridor, particularly its rural sections, will no longer be appropriate as the Opāheke area urbanises. Quality urban form outcomes in urbanised corridors require lower speeds, higher amenity, better conditions for pedestrians and cyclists, and urban drainage and stormwater solutions. Moreover, an urbanised context generates higher and more diverse transport demands, which drive the need for mode shift through public transport and active mode provision.

5.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following root causes of the problem:

- Planned future urbanisation of the Ōpāheke area
- Transport demands associated with the urbanisation of the Ōpāheke area.

Cause 1 – Planned future urbanisation of the Ōpāheke area

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares (ha) earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Ōpāheke area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area, within which the Ōpāheke / Ponga Road corridor is partially located, is an area of approximately 1,900 hectares, and is estimated by Auckland Council to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000.

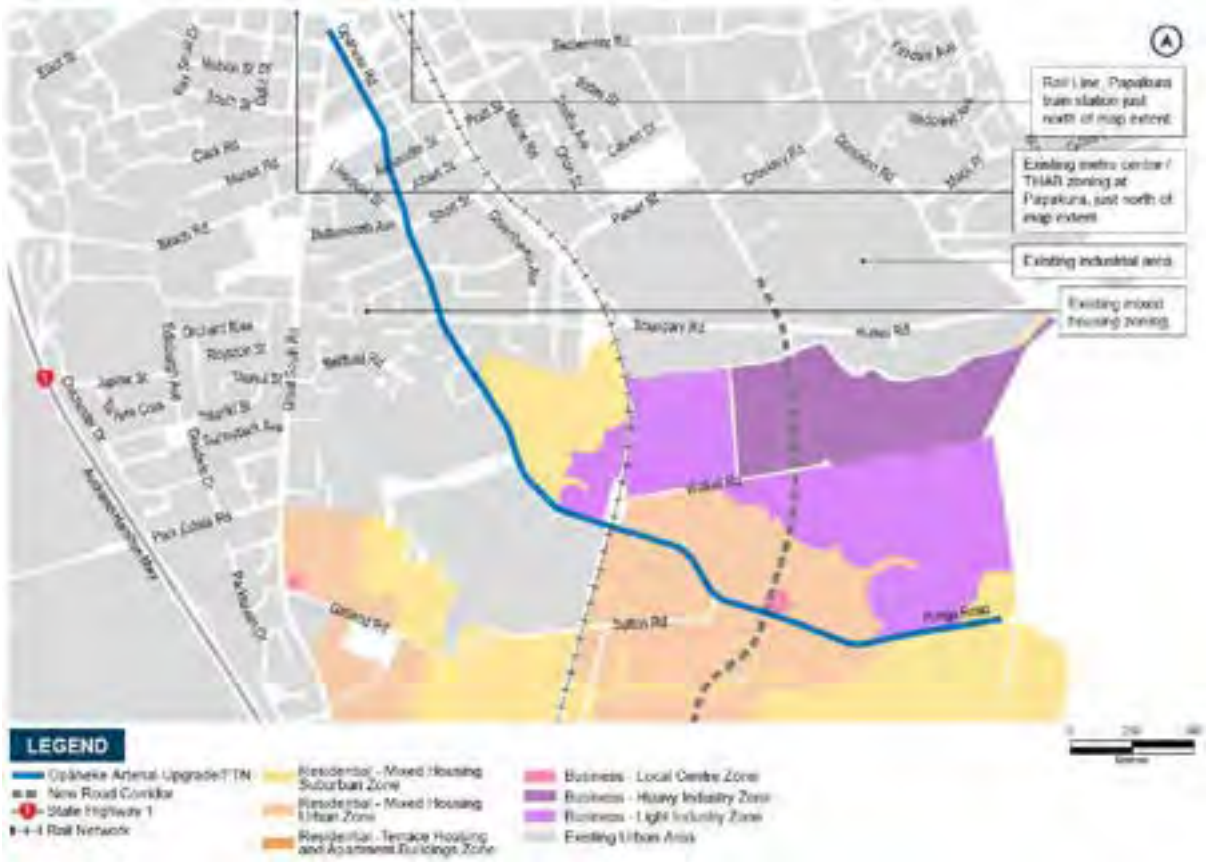


Figure 5-7 – Key existing / proposed land uses along and in proximity to Opāheke / Ponga Roads

Opāheke is not proposed to be released for urbanisation until 2028-2032 as per the Future Urban Land Supply Strategy (FULSS). However, Bellfield Estate is to the west of the corridor is 'live zoned' land under development under the Auckland Unitary Plan Operative in Part (AUP:OP).



Figure 5-8 Private plan change requests in Drury-Ōpāheke

Existing land use and development enabled under existing Unitary Plan zoning at the Papakura end of the corridor, as well as the land use vision for Opāheke identified in the Structure Plan, identify a range of urban land use conditions (see Figure 5-7) that will impact on the future form and function requirements of the Opāheke / Ponga Road corridor. In particular:

- Significant development potential is enabled through the application of metropolitan centre zoning for the Papakura centre, and high/medium density residential zones at western end of the corridor;
- The eastern part of the corridor subject to the proposed Structure Plan (currently Future Urban) traverses what is planned as areas of both medium density residential development and industrial development.

This transition from rural land use and low density urban land use to medium-and-high density urbanisation in the long term is the root cause of the identified form and function issue.

Achieving east-west connectivity in this location is strategically important in the context of the aforementioned future land use, given the proposed locations of residential development and destinations along the corridor. It is also strategically important for the number of perpendicular north-south corridors that form part of the strategic road and public transport networks (as discussed further in problem two).

Cause 2 – Transport demands associated with the urbanisation of the Ōpāheke area

The scale of growth outlined above will result in significant increases in outbound transport demands, as well as increased demand for transport within the Ōpāheke area. The need to move more people around associated with urbanisation will also result in a diversification of transport demand – i.e. an increased need to provide for public transport, walking and cycling in transport corridors.

At a macro level, the potential increase in outbound transport demands by both Low Occupancy Vehicles (LOVs) and public transport to key regional destinations from the South is shown in Figure 5-7. The Ōpāheke / Ponga Road corridor forms part of the network linking into the future strategic road and public transport networks which accommodate these outbound trips, and accordingly will need to provide for additional people-moving capacity. Technical work undertaken as part of the business case process and the Structure Plan ITA has indicated that the Opāheke / Ponga Road corridor could:

- Carry average daily traffic (ADT) volumes of between 8,000-14,000 by 2048 in the currently rural eastern sections (current ADT is ~1,900), and up to 19,000 in the currently urban western section (current ADT is ~6,400)
- Provide an important east-west linkage for all modes linking perpendicular north-south corridors including accessing the rail line at Papakura Station, bus FTN at Great South Road and on the new Ōpāheke north-south FTN Arterial, and the Mill Road Corridor.

This was a capture of information at this point and time, establishing a base line for further investigation, including initial corridor form and function assessments (CFAF). Since then, modelling yields have advanced to using I11.5 data, which are used throughout the main DBC and Transport Report. However, these show relatively similar outputs.

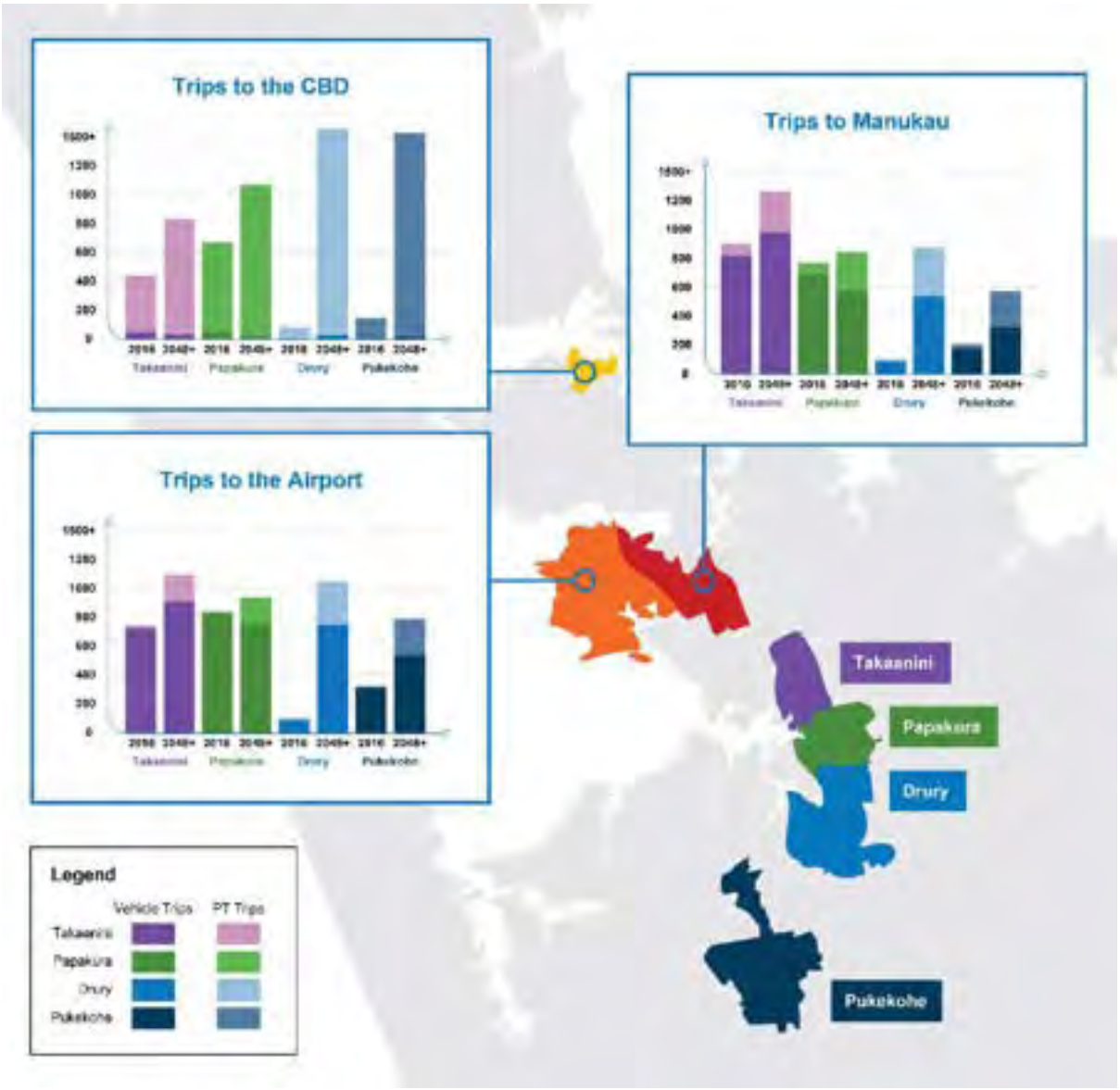


Figure 5-9 – Increase in outbound travel demands from the Drury-Opāheke area to key regional destinations

Within the Ōpāheke area itself, urbanisation will result in more local destinations, which in turn will increase the demand for short trips. Many of these could be undertaken by active modes. The Ōpāheke / Ponga Road corridor in its current condition does not provide for these modes.

5.1.1.2 Consequences – what if we do nothing?

The consequences associated with a failure to address problem one are as follows:

Consequence 1 – Poor urban form outcomes

Transport infrastructure fundamentally influences urban form. Maintaining the status quo on the Ōpāheke / Ponga Road corridor, particularly its rural section, will reinforce current land use patterns. This in turn will preclude the compact, high quality and more sustainable urban form sought by Council for this and other future urban environments.

In particular:

- High vehicle speeds and a lack of provision for pedestrians and cyclists will result in an unsafe and unattractive street environment, which in turn will preclude/deter the establishment of compact, walkable urban development.
- Car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC section 7.1.3.

Consequence 2 – Insufficient provision for multi-modal capacity and network resilience

As noted above, urbanisation and growth in Ōpāheke will result in a significant increase in multi-modal transport demands. Maintaining the status quo on the Ōpāheke / Ponga Road corridor will limit the capacity of the corridor to accommodate trips by active modes and public transport. This in turn will result in a greater reliance on private vehicles, less modal choice and subsequent increases in LOV trips/congestion along Ōpāheke / Ponga Roads and greenhouse gas emissions.

5.1.2 Problem 2 – Access and Choice

The lack of safe and attractive multi-modal access to the Papakura centre, future employment areas, and the strategic road and public transport networks, will limit economic and social opportunities for those living and/or working in the Opāheke area.

Problem two recognises that the Opāheke / Ponga Road corridor forms an important connection in the context of the land use patterns indicated in the Drury-Opāheke Structure Plan for the Opāheke area (which includes areas of residential and industrial development), and the existing urbanised area of Papakura. It also forms an important linkage between several north-south corridors (e.g. the rail network at Papakura Station, the Mill Road Corridor in the east, FTN routes on Great South Road and the new Opāheke North-South FTN Arterial) which provides multi-modal access to wider regional destinations.

Given these important relationships to key destinations and the wider transport network, the lack of safe and attractive provision for active modes and public transport will limit access to both local and regional economic and social opportunities. It will also limit the ability to achieve a transformational mode shift away from private vehicle use in the Ōpāheke area, as outlined in the general investment story in the Drury Local package DBC.

5.1.2.1 Evidence to demonstrate cause

Evidence has been set out below based on the following root causes of the problem:

- Lack of provision for active modes and public transport along the Ōpāheke / Ponga Road corridor
- Planned locations of land use activities and strategic north-south links
- Mismatch of the number and type of jobs in the area to the people living in the area.

Cause 1 – Lack of provision for active modes and public transport along the Opāheke / Ponga Road corridor

As discussed in problem one, the Ōpāheke / Ponga Road corridor varies between urban and rural conditions along its length. The western section is a two-lane urban road, while the eastern section is in a more rural condition. Neither section contains specific provision for public transport (i.e. bus stops or priority) or cycling (i.e. separated lanes). There are pedestrian facilities to the west of Lorelei Place, but not to the east.

This current lack of provision for public transport and active modes, along with dispersed rural land use patterns in much of the study area, result in current travel patterns which are heavily car-reliant.

Cause 2 – Planned locations of land use activities and strategic north-south links

The strategic importance of the Ōpāheke / Ponga Road corridor in the context of planned future urbanisation is linked both to Auckland Council's land use planning, and the location of perpendicular strategic road and public transport corridors (see Figure 5-10). In particular:

- Existing metropolitan centre zoning for the Papakura centre and high/medium density residential zones at the western end of the corridor
- Proposed areas of medium density residential and industrial development in the eastern part of the corridor as per the proposed Structure Plan
- Perpendicular north-south strategic transport corridors, including:
    - Great South Road / FTN at the western end;
    - Access to the rail corridor at Papakura station;
    - Access to the new north-south arterial / FTN; and
    - Access to the Mill Road corridor in the east.

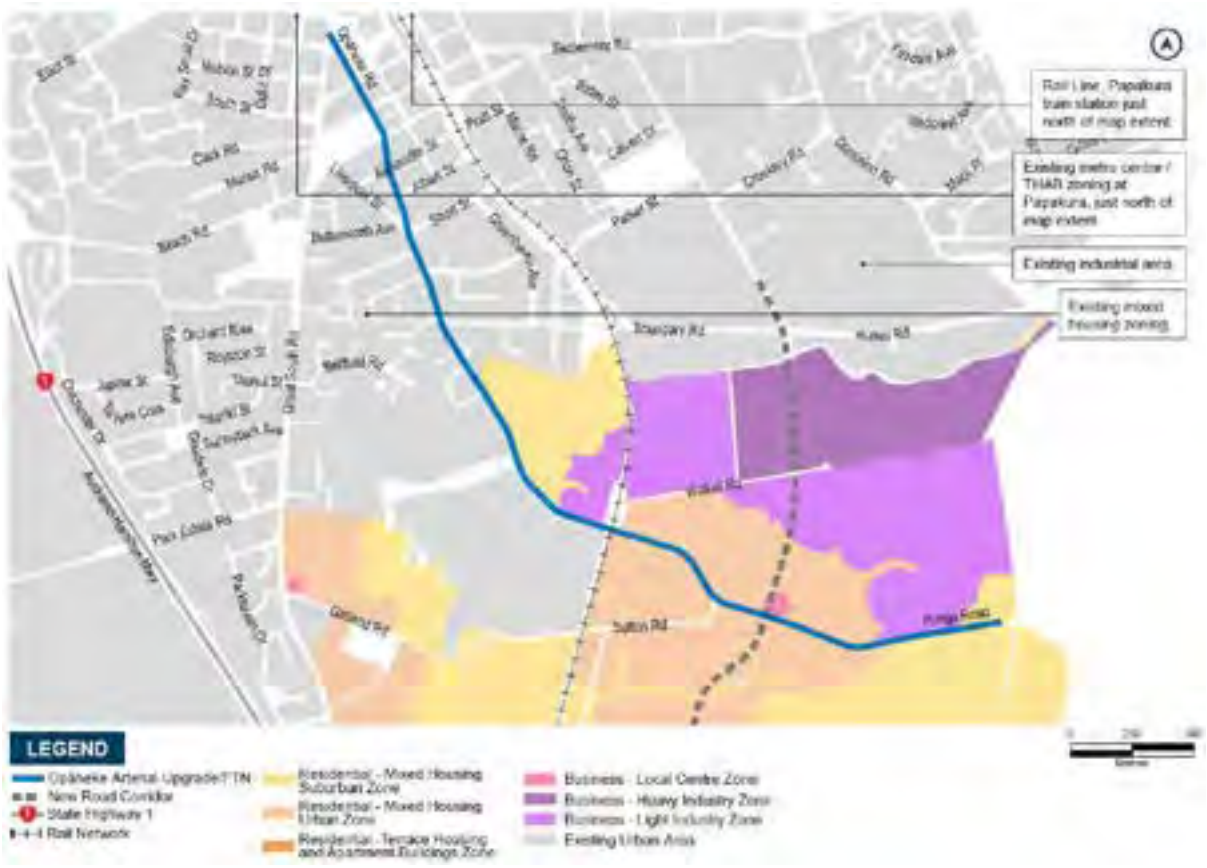


Figure 5-10 – Key land use and transport interactions along the Opāheke / Ponga Road corridor

Cause 3 – Mismatch between the number and types of jobs in the area to the people living in the area

The Drury-Ōpāheke Structure Plan provides for only 0.5 new jobs for each additional household. Experience in recent development areas such as Silverdale and Hingaia shows that a relative lack of local employment opportunities results in a higher incidence of long-distance commuting to the central city. This may reflect the nature of employment sought by those moving to new development areas, with a higher emphasis on white collar jobs typically found in central areas (see Figure 5-11).

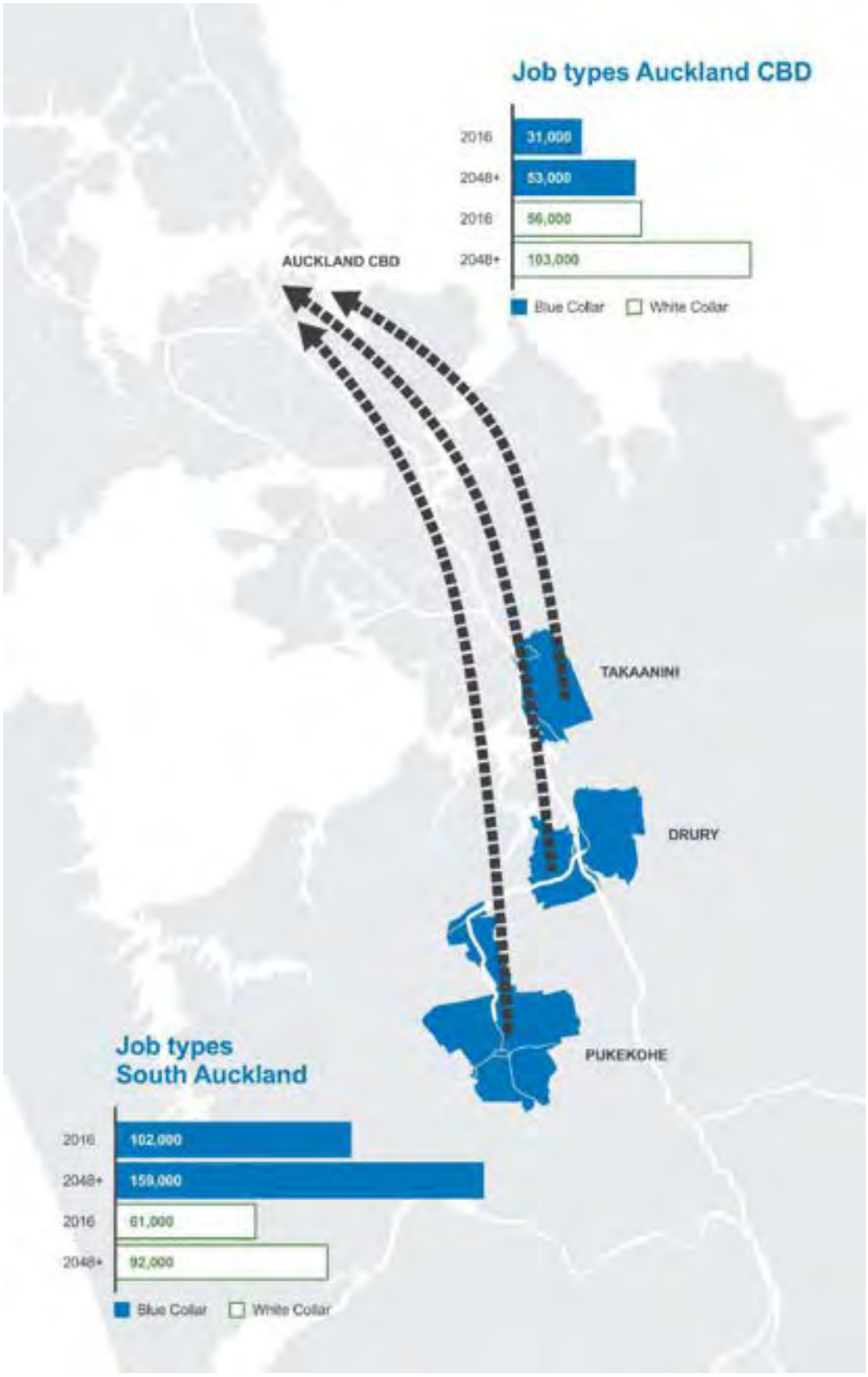


Figure 5-11 – Relativity of job type to location

The result of this is high predicted demand for commuter trips on both the rail network and the strategic road network. In this context, it is clear that the Ōpāheke / Ponga Road corridor plays an important strategic role in providing for these commuting trips by providing connectivity to key perpendicular north-south strategic networks, including the rail network at Papakura Station and the Mill Road Corridor in the east.

Notwithstanding the above, it is also clear that it is not feasible or economic to plan for unconstrained LOV demand in the form of lengthy commutes. TDM is therefore critical, both through further optimisation of land use through local employment (such as the industrial land proposed for Opāheke), and through the provision of quality public transport and active mode transport options to provide transport choice for access to local destinations.

5.1.2.2 Consequences – what if we do nothing?

The consequences associated with a failure to address problem two are as follows:

Consequence 1 – Poor access to economic and social opportunities

A failure to provide multi-modal access along the Opāheke / Ponga Road corridor will reduce accessibility to the Papakura metropolitan centre, local employment in the existing and proposed industrial areas, and to the wider region via the perpendicular strategic road and public transport networks. Failure to resolve problem two therefore limits access to economic and social opportunities at both a local and regional level. A corollary of this is that poor access will reduce the viability of employment land, which in turn will reduce the role of local employment and activity in reducing/managing travel demand.

Initial transport modelling in the IBC identified the effect of the recommended network (including interventions on Ōpāheke / Ponga Roads) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in Figure 5-12 shows that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve problem two will be a failure to improve access to economic and social opportunities for the communities in the area.

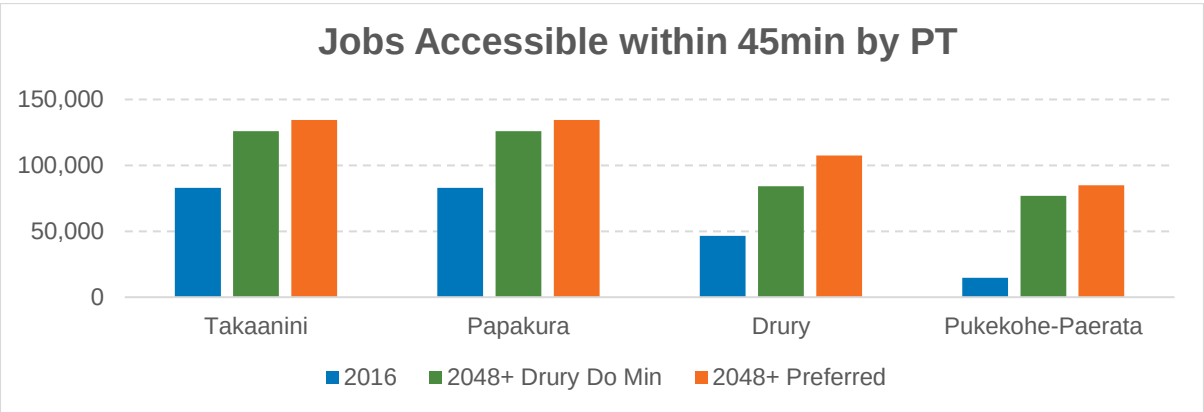


Figure 5-12 Jobs accessible within 45min by PT from the South

Furthermore, Figure 5-13 compares the network over the different years, examining the jobs accessible at different time intervals. Notably, a comparison of the do-min with the preferred network shows an increase in job accessibility via public transport with the implementation of the preferred Drury network. Figure 5-14 shows this information spatially, showing the key destinations that can be reached from Drury at different travel times. Again, these figures emphasise that a consequence of failing to resolve Problem two will be reduce the accessibility to social and economic opportunities for the Drury/Ōpāheke communities.

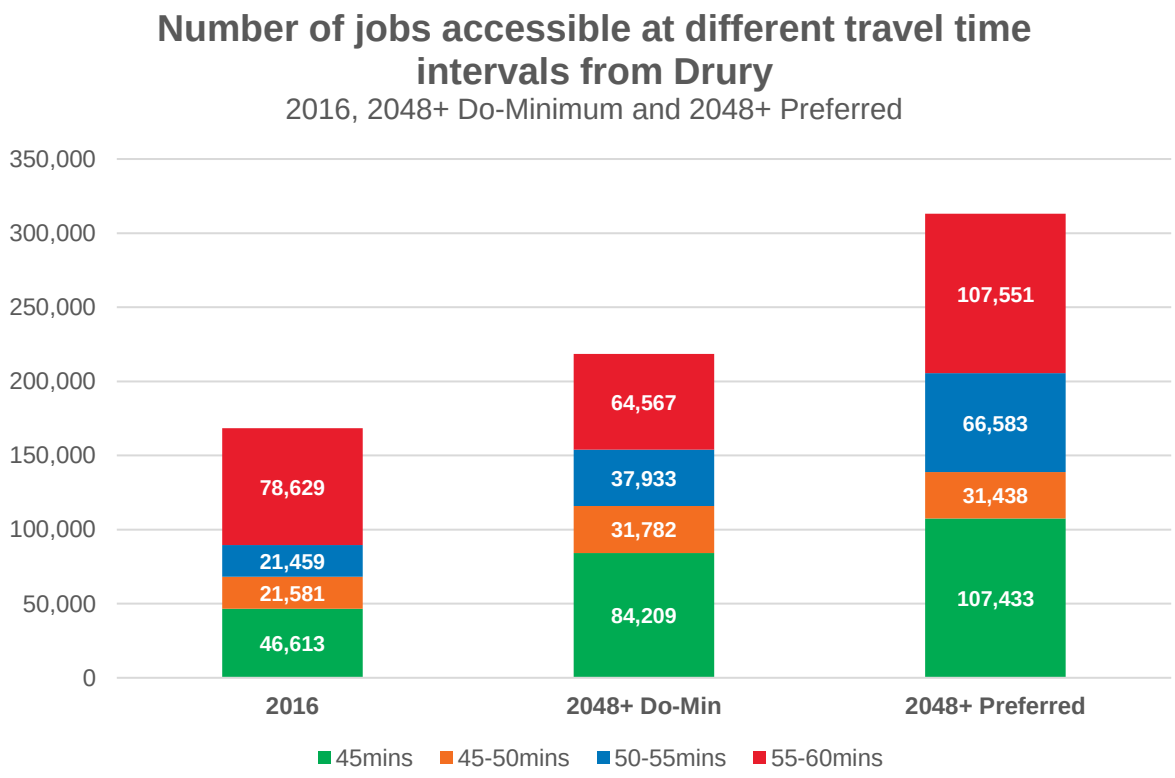


Figure 5-13 Number of jobs accessible at different time intervals from Drury

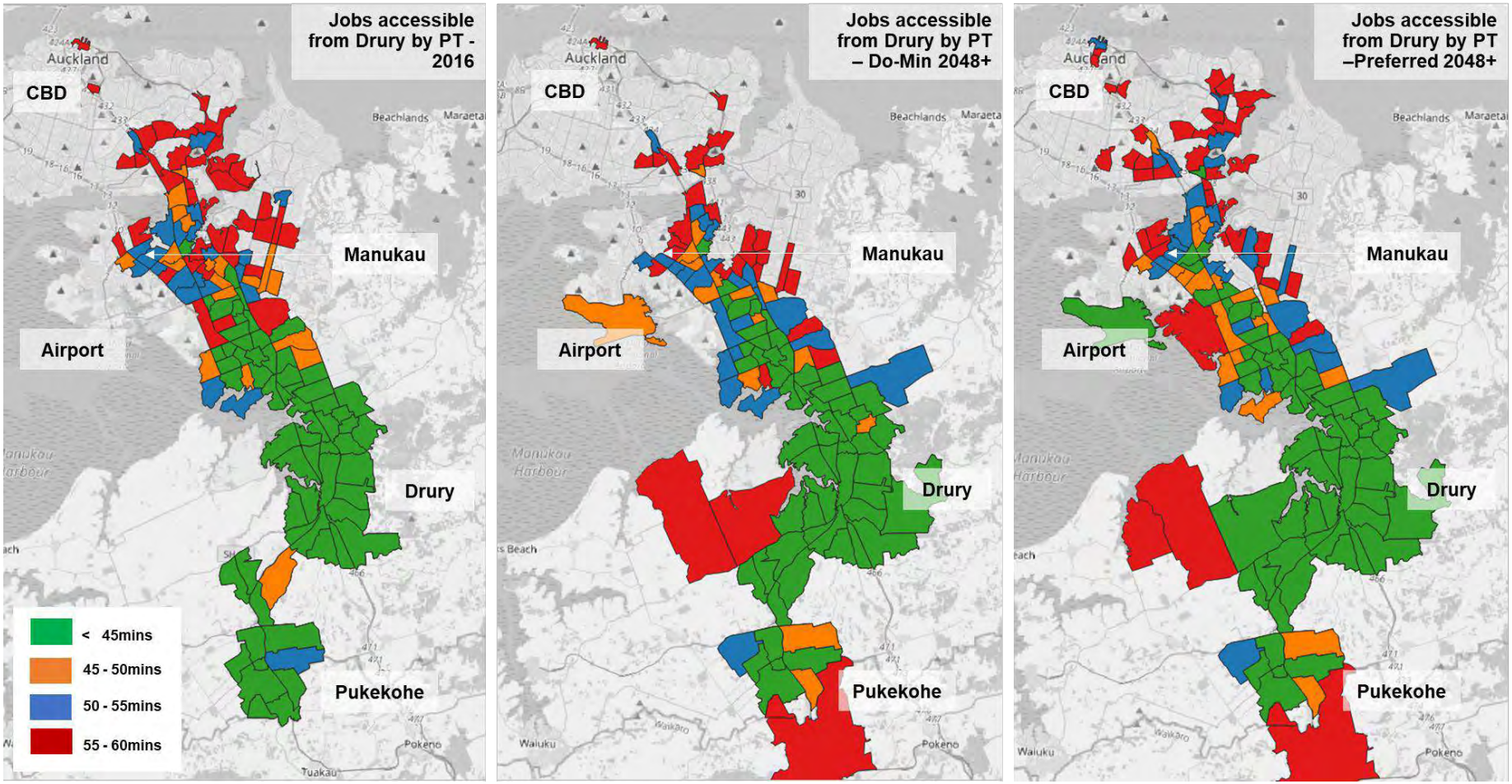


Figure 5-14 Key destinations and jobs that can be reached from Drury by PT at different time intervals: 2016, Do-min 2048+ and Preferred 2048+

Consequence 2 – Lack of modal choice / over-reliance on LOVs

Failure to provide for multi-modal access along the Opāheke / Ponga Road corridor to local destinations and the wider strategic transport networks will:

- Entrench the existing degree of private vehicle reliance (92 per cent across the Southern growth area for work trips in the 2013 Census) for trips to these destinations, resulting in increased local traffic volumes;
- Limit accessibility to the rail network at Papakura Station, the proposed FTN on Great South Road and the new Ōpāheke North-South FTN Arterial, which will result in higher traffic volumes on the strategic road network for long distance commuting trips; and
- Limit accessibility to the Mill Road Corridor, which in turn will exacerbate the existing over-reliance on SH1 for long-distance north-south trips.

5.2 Project specific problems, benefits and investment objectives

PBIOs have been developed for the Ōpāheke Rural / Ponga Road project and draw on the problem statements documented in section 5.2 of this report (as summarised in Figure 5-15). The figure also demonstrates the alignment of the investment objectives with relevant package-level investment themes, which also generally apply across the whole Southern growth area.

The benefits identified for this project recognise that if these two problems are solved, the community in this growth area will benefit through improved connectivity and accessibility for the Drury Local area; improved quality of the urban environment; improved safety for all transport modes; plus better transport choice and reduced reliance on LOVs. The reduced reliance on LOVs will in turn have benefits for health and wellbeing and the environment, including GHG savings.

The benefits and problems were considered together to develop the project-specific IOs listed in Figure 5-15. IO1 seeks to solve the form and function problem and support growth and a more sustainable, quality urban form by improving connectivity to/through the Drury area. IO2 seeks to address the problem of lack of safe and attractive travel choices, and deliver the benefits for transport choice, safety and connectivity/accessibility by providing high quality, safe and attractive PT and active mode facilities on the Ōpāheke / Ponga Road corridor.

Figure 5-15 Ōpāheke/Ponga project specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
Existing roads to be upgraded/FTN - Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/Ponga Road	**PS1:** The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke/ Ponga Road will not support the imminent urbanisation of the Drury Local area, resulting in poor access and urban form outcomes	Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	**IO1:** Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Ōpāheke area	✓	✓		✓	✓
		Improved quality of the urban environment						
	PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area	Improved connectivity and accessibility for the Drury Local area	**IO2:** 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 Ōpāheke/ Ponga Road		✓	✓		✓
		Improved safety for all transport modes						

6 The SH22 project

6.1 Investment story – problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed SH22 upgrade project. The process of the problem statement development through internal workshops is described in further detail in the main Drury Local DBC.

Figure 6-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed SH22 upgrade project.



Figure 6-1 Relationship of IBC area problems to DBC project problems

Figure 6-2 and Figure 6-3below summarises the line of sight between the IBC and DBC problem statements.

IBC Problem 1
Integration & Place

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 Southern growth area

DBC Problem 1: Failure to integrate the form and function of **SH22** with the proposed rapid urbanisation will result in poor urban form outcomes.

DBC Problem 3: Failure to integrate changes in the movement function of **SH22** with the timing and form of urban development will compromise both the urban form and movement outcomes.

Figure 6-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 2
Growth and Access

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

DBC Problem 1: In the context of growth and the current form and function of **SH22,** connectivity outcomes will be compromised, including connections to rail stations, town centres and between communities.

DBC Problem 2: Growth and urbanisation will lead to an increased safety risks along this section of the **SH22** corridor

Figure 6-3 IBC Problem 2 alignment with DBC Problems

The next section outlines the three problem statements developed for this project, and the evidence supporting these statements.

6.1.1 Problem 1 – Form and function

The current form and function of SH22 will not support the imminent urbanisation of the Drury Local area (including the proposed Drury West centre), resulting in poor connectivity and urban form outcomes.

SH22 takes the form and function of a rural state highway, such that it traverses a rural environment (generally comprised of rural residential and agricultural land), has a speed limit of either 70km/h or 100km/h, is an undivided two-lane highway with a wide centreline, and localised passing lanes. While the corridor has known safety issues (including out-of-context curves, roadside hazards, and unsafe intersections), the form and function of the corridor is broadly commensurate with a rural land use condition.

Problem one highlights that the form and function of SH22 in the Drury West area (a length of about 3km) will no longer be appropriate as the Drury Local study area urbanises. Quality urban form outcomes in urbanised corridors (particularly town centre environments) require lower speeds, higher amenity, better conditions for pedestrians and cyclists, and urban drainage and stormwater solutions. Moreover, urbanisation will generate higher and more diverse transport demands which will exceed the capacity of the SH22 corridor in its current form (until a replacement strategic corridor can be provided).

6.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following two root causes of the problem:

- **Cause 1** – Imminent/forthcoming urbanisation of the Drury Local study area; and
- **Cause 2** – Transport demands associated with the urbanisation of the Drury Local study area.

Cause 1 – Imminent/forthcoming urbanisation of the Drury Local study area

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares (ha) earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Drury area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area, within which the Drury West section of SH22 traverses, is an area of approximately 1,900 hectares, and is estimated to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000.

Importantly, the Structure Plan identifies a variety of urban land use conditions (see Figure 6-4) that will impact on the future form and function requirements of the SH22 corridor. In particular:

- The Drury West local/town centre is currently indicated to the immediate east of the Jesmond Road-SH22 intersection. In this position, it is shown as straddling both sides of SH22. Part of the rationale for this location is that it enables part of the centre to adjoin the current indicative position of the Drury West rail station to the south. Notwithstanding that, a centre on both sides of SH22 impacts on the form and function of the corridor, for example by creating the need for pedestrian crossing provision;
- Much of the remainder of this section of SH22 will be fronted by medium-to-high density residential development; and
- The section to the immediate south-west of the SH1 Drury Interchange will be fronted by light industrial land use.

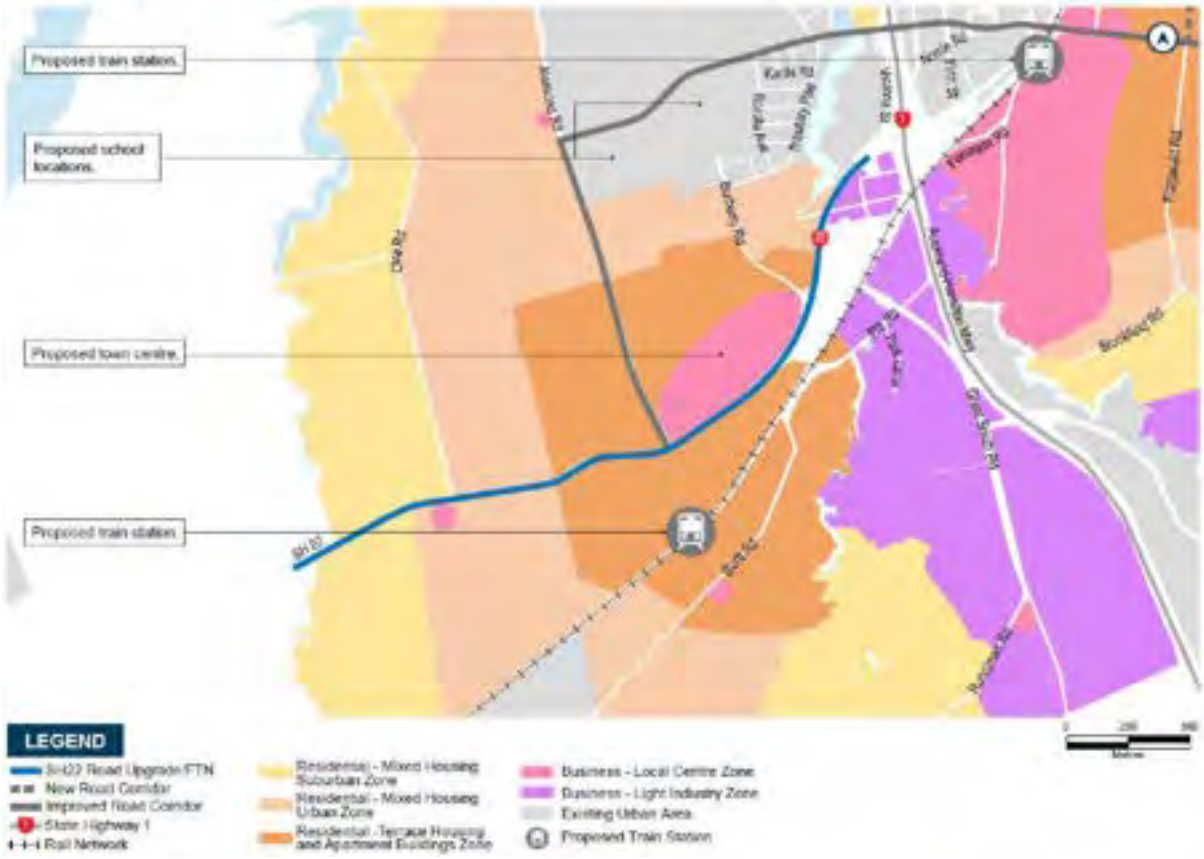


Figure 6-4 Key proposed destinations along Waihoehoe Road Corridor

The proposed development timeframes set out in the Council's FULSS compound the form and function issue. In the FULSS, SH22 is the boundary delineating land to be made development-ready imminently in the 2018-2022 period (north of SH22), from land that will not be made development-ready until the 2028-2032 period (south of SH22). Accordingly, the north side of SH22 could conceivably be urbanised in the next decade while the south side remains rural.

However, at the time of writing this report, several Private Plan Changes have also been received by Council, emphasising the continuous developer interest in seeking expedited live-zoning of FUZ land in the area. Figure 6-5 shows two plan changes directly adjacent to the SH22.



Figure 6-5 Private plan change requests in Drury-Ōpāheke

Cause 2 – Transport demands associated with the urbanisation of the Drury Local study area

The scale of growth outlined above will result in increased transport demands, both for outbound trips, and transport within the Drury area. The need to move more people around associated with urbanisation also results in a diversification of transport demand – i.e. an increased need to provide for public transport, walking and cycling in transport corridors.

At a macro level, the potential quantum increase in outbound transport demands from growth areas as a whole to key destinations is shown in Figure 6-6. SH22 is part of the strategic road network which will accommodate general traffic and freight trips, particularly trips bound for SH1. It may also have a role within the public transport network, particularly if SH1 Express services are to terminate at Drury West.

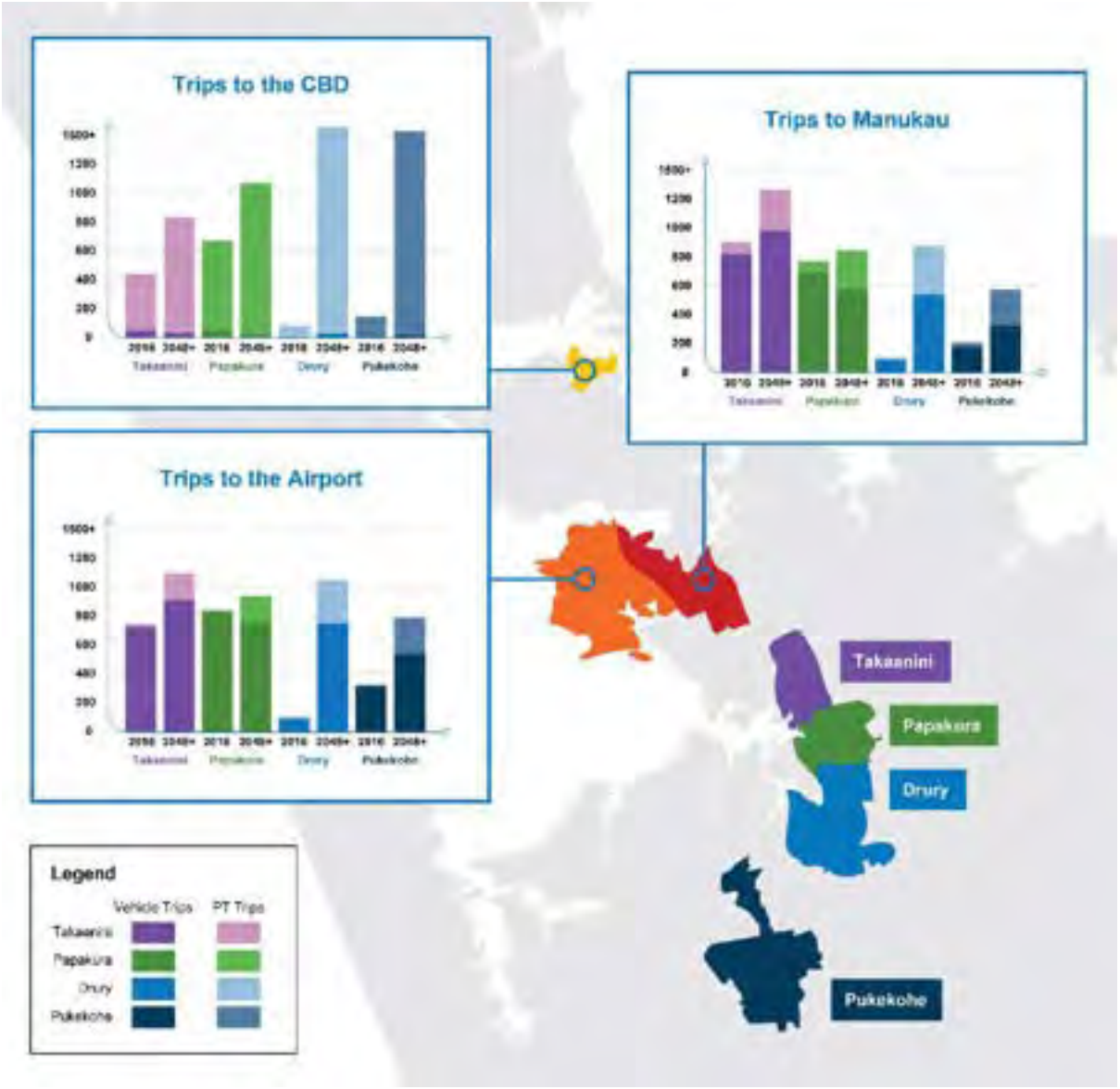


Figure 6-6 Increase in outbound transport demands from Drury (blue) to key regional destinations

More localised modelling suggests that the urbanisation of the Drury Local study area will add significantly to general traffic levels along this stretch of SH22. The traffic modelling undertaken for the SH22 Safe Roads project suggest that the current daily volumes of between 21,000-26,000 ADT. ADT in the Drury West section of SH22 will increase to between 36,000-39,000 ADT by 2026, before reducing in subsequent decades with the assumed construction of the proposed Pukekohe Expressway[4]. The traffic modelling undertaken for the Southern Structure Plans ITA predicted a somewhat more modest increase to between 23,000-26,000 by 2028, albeit with different underlying land use and transport network assumptions. This work similarly assumed traffic volumes would ultimately fall along SH22 as a result of the assumed construction of the Pukekohe Expressway. This was a capture of information at this point and time, establishing a base line for further investigation, including initial corridor form and function assessments (CFAF). Since

[4] SH22 Safe Roads Single Stage Business Case.

then, modelling yields have advanced to using I11.5 data, which are used throughout the main DBC and Transport Report. However, these show relatively similar outputs.

Within the Drury area itself, urbanisation will result in a higher density of development and an increased number of local destinations (e.g. centres, local employment areas, schools, parks) which will increase the demand for short trips which can be readily undertaken by active modes. SH22 in its current condition clearly does not provide for these modes.

6.1.1.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem one are set out below:

Consequence 1 - Poor urban form outcomes

Transport infrastructure fundamentally influences urban form. Maintaining the status quo of a rural state highway along SH22 will reinforce current land use patterns, which will preclude the high quality and more sustainable, compact urban form and walkable town centre sought in Council's Structure Planning.

In particular:

- High vehicle speeds and a lack of provision for pedestrians and cyclists 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; and
- Car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC section 7.1.3

Consequence 2 – Insufficient capacity to provide quality connections to the strategic road network

The IBC demonstrated that it is not feasible or economic to build transport infrastructure with a view of accommodating unconstrained general traffic demand. Accordingly, influencing travel demand by encouraging mode shift to public transport and active modes, and integration of land use and transport planning, is a core tenet of SGA's transport planning strategy.

Notwithstanding that, the existing traffic volumes (21,000-26,000 ADT) along this stretch of SH22 are such that further growth in volumes resulting from growth and urbanisation in the Drury Local study area will result in constrained capacity along the corridor, and therefore constrained access to the strategic road network (SH1). The relative effect of growth on the operation of SH22 will be influenced by the degree to which other SGA projects and packages enable the mode shift sought, in particular the implementation of the Pukekohe Expressway.

6.1.2 Problem 2 – Safety

Urbanisation of the Drury Local area combined with high speeds, a high number of accesses and increasing volumes on SH22, will lead to an increased risk of deaths and serious injuries (DSIs) and intersection crashes.

Problem two highlights the factors resulting in existing safety issues along SH22, and identifies the urbanisation of the Drury area as a significant risk factor in exacerbating/compounding these existing issues. Much of the evidence set out documenting this problem has been adapted from the SH22 Safe Roads Single Stage Business Case (SSBC), such that many of the same issues are covered.

6.1.2.1 Evidence to demonstrate cause

Evidence has been set out below based on the following four root causes of the problem:

- Urbanisation of the surrounding environment
- Number of access points and intersections
- Traffic volumes along the corridor and at intersections
- Traffic speeds.

Cause 1 – Urbanisation of the surrounding environment

As noted in the causes of problem one, the Drury-Ōpāheke Structure Plan envisages urbanisation to provide for growth at a significant scale, providing for an estimated 22,000 dwellings, 11,700 jobs and a population of over 60,000. This will result in a town/local centre, medium-to-high density residential development and limited light industrial development immediately adjacent to the SH22 corridor.

The additional transport demands that this planned urbanisation will place on the SH22 corridor will exacerbate/compound the existing factors contributing to current safety issues on SH22. These in turn are set out below.

Cause 2 – Number of access points and intersections

The SH22 Safe Roads SSBC documents the following access and intersection issues which contribute (in combination with high traffic volumes and speeds) to a relatively poor safety record:

- There are 14 at-grade intersections between SH1 and Paerata, including seven east of and including Oira Road.
- There are four major commercial property accesses between SH1 and Paerata, one of which (NZ Hot House) is located east of Oira Road.
- There is a total of 48 private residential accesses between SH1 and Paerata; including approximately eight to the east of Oira Road.

On the whole, this results in 66 accesses from SH22 between SH1 and Paerata; including 16 to the east of Oira Road. This equates to approximately 6-6.5 accesses per kilometre. This is a relatively high number of accesses for a state highway. The number of accesses becomes an issue in the context of the high traffic volumes and speeds (see below) and will be exacerbated/compounded by urbanisation which may result in an even higher number of accesses.

Cause 3 – Traffic volumes along the corridor and at intersections

As outlined in the causes of problem one, current traffic volumes along the Drury West section of SH22 are between 21,000-26,000 ADT. Heavy vehicles make up approximately 4-6 per cent of the ADT.

Table 6-1 notes the volumes and intersection form of each of the seven intersections along SH22 east of Oira Road. Notably, many of these intersections are either uncontrolled or do not provide for specific turning movements. In the context of a high-speed, high-volume corridor such as SH22, these intersection forms are a safety issue.

Table 6-1: Intersection volumes and forms along SH22 in the Drury West section

Intersection	Volumes	Intersection form
Victoria Street	390	Uncontrolled T-intersection with right-turn bay.
Victoria Crescent/Mercer Street	100	Stop-controlled T-intersection with right-turn bay.
Great South Road (Drury)	5,300	Give Way-controlled T-intersection with left-turn slip and right-turn bay.
Burberry Road	200	Give Way-controlled T-intersection. No right-turn bay.
McPherson Road	1,500	Give Way-controlled T-intersection with left-turn slip. No right-turns allowed in any direction.
Jesmond Road	300	Give Way-controlled T-intersection with right-turn slip (recently installed).
Oira Road	400	Give Way-controlled T-intersection. No right-turn bay.

Cause 4 – Traffic speeds

The speed limit along SH22 is currently 70km/h east of Burberry Road, and 100km/h to the west of Burberry Road. These speeds exacerbate the above issues, contributing to a relatively poor safety record (refer consequence discussion below). Moreover, these speeds are not appropriate in the context of future urbanisation discussed in cause one.

6.1.2.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem two are set out below:

Consequence 1 – Increased risk of fatal/serious injury (FSI) crashes and resultant DSI

The SH22 Safe Roads SSBC extensively documents the consequences of the existing corridor conditions from a safety perspective, including:

- 27 FSI crashes along the entire corridor between SH1 and Paerata in the 2007-2016 period, resulting in 48 DSIs. These figures equate to approximately two to three FSI and five DSI per annum.
- Intersection and head-on crashes are the most common crash types resulting in DSIs, with 10 FSIs for each type resulting in 14 and 23 DSIs respectively.
- The section of SH22 east of Oira Road is rated as having a Personal Risk (PR) (or crash rate) of 'medium-high', the worst PR rating in the context of the whole SH22 corridor. PR is a measure of high-severity (fatal and serious) crashes that have occurred per 100 million vehicle kilometres travelled (see Figure 6-7).

The increased transport demands associated with the urbanisation of this section of the SH22 corridor will likely exacerbate the factors leading to this poor safety performance, and accordingly are likely to exacerbate/compound safety risks (noting the Safe Networks programme will address short-term safety issues, and that the Pukekohe Expressway will ultimately reduce demand on SH22).



Figure 6-7 Personal risk rating along SH22. The Drury West section is outlined in black.

The SH22 Safe Roads SSBC identified a series of recommended safety interventions along SH22 between the Drury Interchange and Paerata, including sections of additional lanes and reconfigured passing lanes, upgraded medians, shoulders and side barriers, and intersection upgrades. The recommended package was estimated to result in a reduction of 22.9 DSI casualties (48% of DSIs) over ten years. The SSBC therefore demonstrates the potential for short-term interventions to have a significant impact on the crash rate and DSIs, and underline both the consequences of doing nothing and the benefits of investment from a safety perspective.

Consequence 2 – Increased risk to motorists and vulnerable road users as a result of urbanisation

Urbanising the area around SH22 without addressing problem two will further exacerbate the road safety consequences noted above. In particular:

- Urbanisation is likely to result in more accesses from SH22 which will increase the existing risk of intersection crashes.
- Urbanisation will increase the number of local destinations, and by extension will result in more short trips and a likely increased demand for trips by active modes. Maintaining the existing traffic speeds and corridor condition will either suppress this demand (which in turn will relatively increase general traffic volumes), or result in more vulnerable road users in a high-risk environment.

6.1.3 Problem 3 – Land use and transport integration

Failure to integrate the removal of the State Highway function of SH22 with the timing and form of urban development will result in a compromised urban form and movement function.

The Pukekohe Expressway has been proposed by SGA to supplement and ultimately replace the State Highway function of SH22 for strategic trips, thereby enabling the SH22 corridor to be urbanised and perform a 'place' role, which is critical in the context of planned urbanisation of the Drury Local study area.

The timing of implementation for the Pukekohe Expressway and the urbanisation of the SH22 area are two variables that will ultimately determine the extent to which the SH22 project can address competing 'movement' (increased demand to move through the area) and 'place' (that is, the pressure to develop adjacent land) functions over time. The ideal, integrated solution is that the need for further capacity and an urbanised SH22 are reached at the same time as the Pukekohe Expressway is built, thereby enabling the concurrent urbanisation of SH22. Notwithstanding that, the lack of certainty on both variables raises the potential for compromised movement and/or place functions along SH22, as explained further below.

6.1.3.1 Evidence to demonstrate cause

Evidence has been set out below based on the following four root causes of the problem:

- Cause 1 – The proposed staging of urbanisation in the Drury Local study area
- Cause 2 – The potential impact of the Pukekohe Expressway on SH22 traffic volumes.

Cause 1 – The proposed staging of urbanisation in the Drury Local area

As discussed under problem one, the development capacity of the Drury Local study area is such that urbanisation will add significantly to transport demands and, by extension, general traffic volumes in absolute terms. The traffic modelling undertaken for the SH22 SSBC suggests that the current daily volumes of between 21,000-26,000 ADT in the Drury West section of SH22 will increase to between 36,000-39,000 ADT by 2026. The traffic modelling undertaken for the Southern Structure Plans ITA predicted a more modest increase to between 23,000 and 26,000 by 2028, albeit with different underlying land use and transport network assumptions including a higher public transport uptake.

The Council's FULSS and Structure Plan use SH22 as the boundary delineating land to be made development-ready imminently in the 2018-2022 period (north of SH22), from land that will not be made development-ready until the 2028-2032 period (south of SH22). This proposed staging not only results in a potential form and function issue (with the possibility of urbanisation on one side of the road for a lengthy period), but also adds significant uncertainty as to when additional traffic demands from growth will justify further capacity. The timing of growth relative to the planned implementation of the Pukekohe Expressway in turn will inform the capacity needing to be provided on SH22.

Cause 2 – The potential impact of the Pukekohe Expressway on SH22 traffic volumes

A noted above, the SH22 Safe Roads SSBC traffic modelling shows general traffic volumes of 36,000-39,000 ADT in the Drury West section in 2026. By 2036 the corresponding range is 10,600-24,500 ADT, and by 2048 the range is 9,800-26,000 ADT. Similarly, the Southern Structure Plans ITA predicted general traffic volumes of 23,000-26,000 ADT by 2028 falling to 18,000-21,400 ADT by

2048. Conversely, the Pukekohe Expressway is predicted to be carrying daily volumes of over 48,000 ADT in 2048 in the same scenario.

While the differing land use and transport network assumptions result in significant variations, the reduction in volumes along SH22 in both datasets is directly attributable to the assumed completion of the Pukekohe Expressway in the 2030s. Accordingly, the timing for completing this corridor will be instructive in determining the extent to which Problem 3 can be addressed.

6.1.3.2 The consequences – What if we do nothing?

The potential consequences associated with a failure to address problem three are set out below.

Consequence 1 – Potentially insufficient or excessive general traffic capacity on SH22 (i.e. a compromised movement function)

The traffic modelling discussed above makes clear that there is potential for three potential consequences in respect of capacity to be provided on SH22, depending on the timing of the Pukekohe Expressway:

- The ideal situation, whereby the quantum of growth/urbanisation triggering the need for an urbanised SH22 is reached at the same time as the Pukekohe Expressway is built, enabling the concurrent urbanisation of SH22 without additional capacity.
- A situation where additional capacity is not provided on SH22, and the Pukekohe Expressway is not completed when required, resulting in insufficient capacity on SH22 and a compromised movement function; or
- A situation where additional capacity is provided on SH22 and the Pukekohe Expressway is built concurrently, thereby resulting in excessive general traffic capacity which will induce further demand for driving.

Consequence 2 – Potential preclusion of desired urban form

As noted under problem one, transport infrastructure fundamentally influences urban form. Maintaining the status quo of a rural state highway along SH22 will reinforce existing land use patterns, which will preclude the compact, quality and more sustainable urban form and walkable town centre sought in Council's Structure Planning. The relative timing of urbanisation and the implementation of the Pukekohe Expressway directly influences the extent to which SH22 can respond to its urbanising context in future, support the land use envisaged by Council.

6.2 Project specific problems, benefits and investment objectives

PBIOs have been developed for the SH22 project, and draw on the problem statements documented in section 2.1 of the report (as summarised in Figure 6-8). The figure also demonstrates the alignment of the investment objectives within the relevant package-level investment themes, which also generally apply across the whole Southern growth area.

The benefits identified for this project recognise that if these three problems are solved, the community in this growth area will benefit through improved connectivity and accessibility for the Drury Local area; improved quality of the urban environment; and a significantly reduced safety risk the SH22 connection.

The benefits and problems were considered together to develop the project-specific IOs listed in Figure 6-8. IO1 seeks to solve the form and function problem and support growth by improving connectivity and accessibility along this future urban section of SH22. IO2 seeks to address the safety problem on this section for LOVs and also provide a safe connection for active modes. IO3 seeks to solve the complex issue of integrating transport and land use along this section, and supporting a more sustainable, quality and connected urban form.

Figure 6-8 SH22 project specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
SH22 upgrade from Oira Road to Drury interchange *Note: Long-term capacity issue will be solved by Pukekohe Expressway project*	PS1: The current form and function of SH22 will not support the imminent urbanisation of the Drury Local area (incl. the town centre), resulting in poor accessibility and urban form outcomes	Improved connectivity and accessibility for the Drury Local area	IO1: To support imminent growth and the planned town centre in Drury by improving connectivity and accessibility along this section of SH22	✓	✓		✓	
	PS2: Urbanisation of the Drury local area combined with high speeds, a high number of accesses and increasing traffic volumes on this section of SH22 will lead to an increased risk of DSIs and intersection crashes	Significantly reduced risk of deaths and serious injuries and intersection crashes, and significantly improved safety for active modes	IO2: Significantly reduce the risk of DSIs from private vehicle crashes and to provide a safe connection for active modes along this section of SH22			✓		
	PS3: Failure to integrate the removal of the SH function with the timing and form of urban development will result in a compromised urban form and movement function	Improved quality of the urban environment	IO3: 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	✓	✓		✓	✓

7 Ōpāheke North South Link

7.1 Project investment story – problem statements and evidence

At the IBC phase, PBIOs were identified for the Southern growth area. The problem statements for this project were developed by considering how the wider IBC problems specifically relate to the proposed new North-South arterial corridor through Opāheke. The process of the problem statement development through internal workshops is described in further detail in the main Drury Local DBC.

Figure 7-1 shows the relationship between the IBC wider problem statements for the southern network and the DBC problem statements specific to the proposed new North-South arterial corridor through Opāheke.

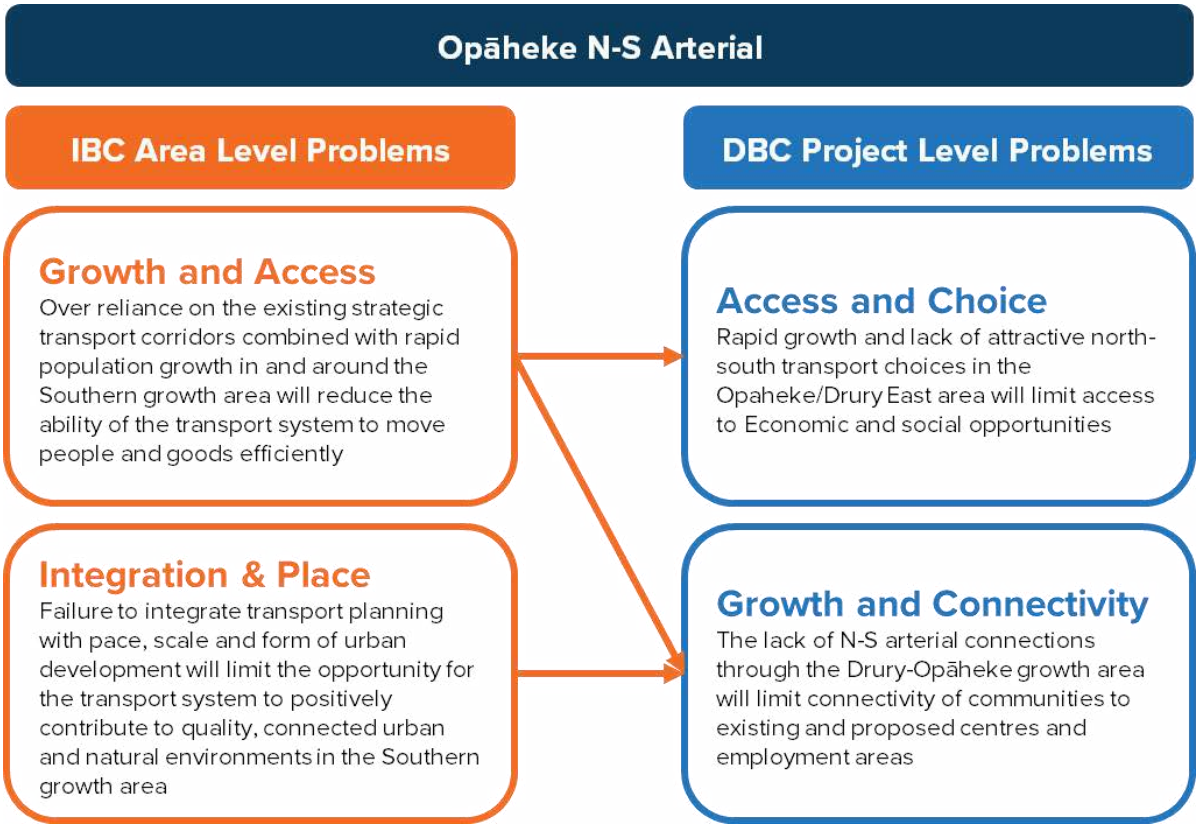


Figure 7-1: Relationship of IBC area problems to DBC project problems

Figure 7-2 and Figure 7-3 below summarises the line of sight between the IBC and DBC problem statements.

IBC Problem 1
Growth and Access

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

DBC Problem 1: Growth and lack of transport choice will limit access to economic and social opportunities.

DBC Problem 2: In the context of growth and a lack of a N-S arterial connection, the existing overreliance on SH1 will worsen and consequently affect the ability of the transport system to move people and goods efficiently.

Figure 7-2 IBC Problem 1 alignment with DBC Problems

IBC Problem 2
Integration & Place

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 Southern growth area

DBC Problem 2: If transport planning is not well integrated with planned urban development, including addressing the lack of N-S connections through the Drury-Opāheke growth area, this will limit connectivity of communities to centres and

Figure 7-3 IBC Problem 1 alignment with DBC Problems

The next section outlines the two problem statements developed for this the new north-south arterial project, and the evidence supporting these statements.

7.1.1 Problem 1 – Lack of connectivity

The lack of north-south arterial connections through the Drury-Opāheke growth area will limit connectivity of communities to existing and proposed centres and employment areas.

The Ōpāheke/Drury East growth area (the area of the Drury-Ōpāheke Structure Plan east of SH1) has been identified as a largely residential area in the Drury-Ōpāheke Structure Plan, with the Drury Centre located in the south and areas of light industry in the north and south (see Figure 7-4). Given the present rural context and presence of the Slippery Creek floodplain, there is currently no arterial route currently that traverses the area north-to-south. In the context of the planned quantum of residential growth in the centre of the growth area with major employment and activity centres to the north and south, this will be a clear gap in the transport network between the existing Great South Road corridor to the west, and the proposed Mill Road corridor to the east.

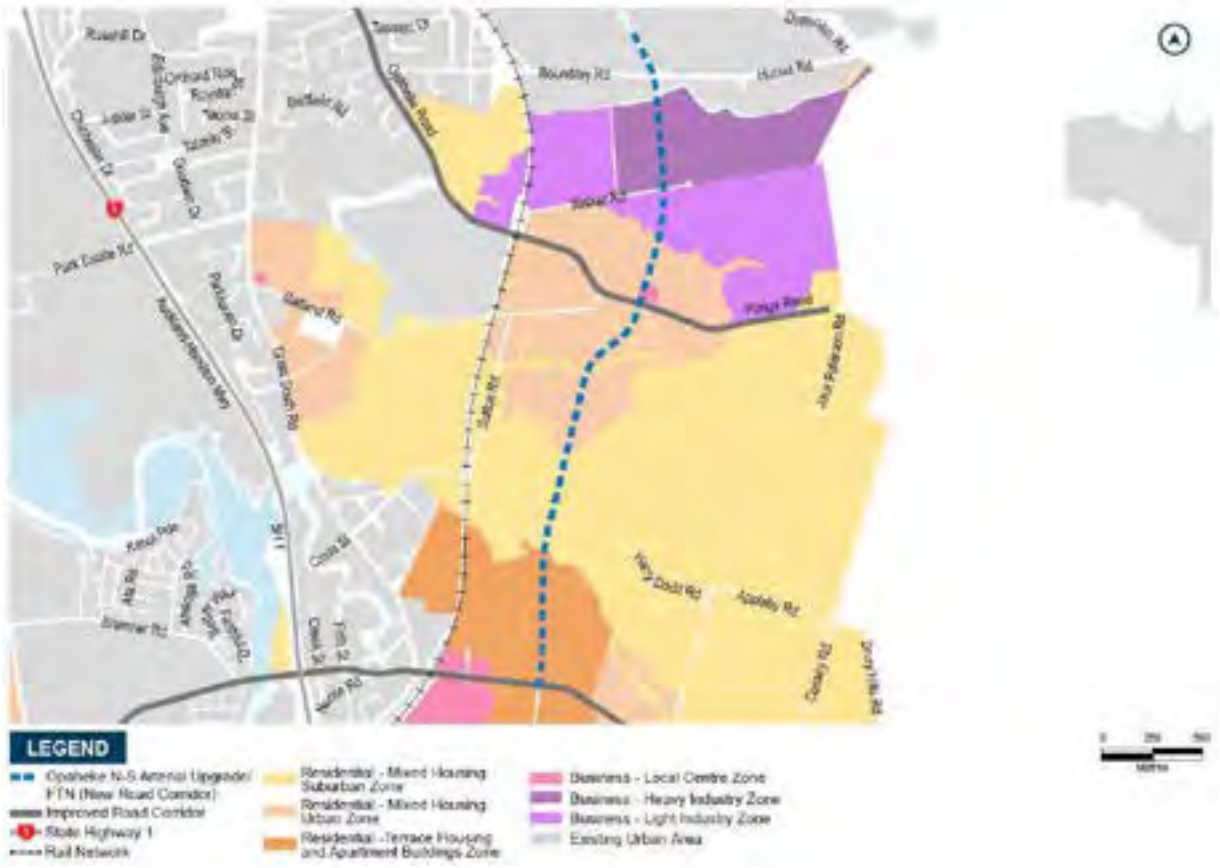


Figure 7-4 Ōpāheke NS Arterial within the context of the Drury-Ōpāheke structure plan

7.1.1.1 Evidence to demonstrate cause

Evidence has been set out below based on the following three root causes of the problem:

- **Cause 1** – The present lack of a north-south road traversing the study area
- **Cause 2** – Growth/urbanisation of the Opāheke/Drury East area
- **Cause 3** – The planned location of centres and employment areas in relation to the residential area and floodplain.

Cause 1 – The lack of a north-south arterial connection through the study area

The Opāheke/Drury East growth area is currently a rural area and is crossed by the Slippery Creek floodplain. Accordingly, no north-south arterial route traversing the area has been developed (see Figure 7-5). Great South Road to the west is the nearest north-south arterial, while Waihoehoe Road and Fitzgerald Road run generally east-to-west through the south of the area. A network of local rural roads (including Cossey Road, Appleby Road and Drury Hills Road) provide access to existing properties.



Figure 7-5 Aerial of the Ōpāheke/Drury East area with the existing road network

It should also be noted that the proposed Mill Road corridor does not serve the purpose of providing a connection through the proposed development area. Rather, the functional intent of the Mill Road corridor is to provide a north-south strategic connection around the development area, and accordingly is proposed to be located on the eastern edge of the development area.

Cause 2 – Growth/urbanisation of the Drury-Opāheke area and associated transport demands

The scale of growth envisaged for the Southern growth area is significant, with a total of 6,700 hectares earmarked for urbanisation, yielding over 50,000 dwellings and 30,000 jobs. Within that wider area, the Drury area represents a significant proportion of the overall growth. The Drury-Ōpāheke Structure Plan area is an area of approximately 1,900 hectares and is estimated by Auckland Council to yield some 22,000 dwellings, 11,700 jobs, and a total population of over 60,000. The Ōpāheke/Drury East area within the Structure Plan area is currently scheduled to be made development ready in the 2028-2032 period, which is the last stage of urbanisation for the wider growth area.

However, at the time of writing this report, several Private Plan Changes have also been received by Council, emphasising the continuous developer interest in seeking expedited live-zoning of FUZ land in the area (Figure 7-6). The proposed Ōpāheke NS Arterial traverses through one of these plan change requests, which may have implications on alignment if route protection of the corridor does not align with development timeframes.



Figure 7-6 Private plan change requests in Drury-Ōpāheke

Cause 3 – The planned location of centres, train stations and employment areas in relation to the residential area and the floodplain

As can be seen in the Figure 7-7, the key proposed land use and existing environmental features of the Ōpāheke/Drury East area are as follows:

- A town centre to the immediate south of Waihoehoe Road and east of SH1, estimated by Council to be approximately 80 hectares (ha) gross, supporting over 3,200 jobs, and housing approx. 900 residents in 330 dwellings. The centre will be supported by the proposed Drury Central train station, which comprises part of the South Rail DBC package.
- Light industrial areas in the north (to the north of Opāheke/Ponga Road) and south (south of Fitzgerald Road) adjoining the live-zoned Drury South Precinct.
- Residential zoning applying to the remainder of the developable land in the centre of the area, including significant areas of high-density housing around the town centre, and medium density in the wider area.

- The Slippery Creek floodplain crosses the area to in an east-west direction, and measures 1.3km in width at its widest point. This has the effect of fragmenting the developable areas.

These planned land use patterns result in the need for a north-south corridor to support this growth and connect the fragmented areas of residential land with the proposed/existing centres and areas of employment to the north and south. This is supported by traffic modelling undertaken for the Structure Plan ITA, which indicated daily volumes of over 17,000[5] ADT at 2048. This was a capture of information at this point and time, establishing a base line for further investigation, including initial corridor form and function assessments (CFAF). Since then, modelling yields have advanced to using I11.5 data, which are used throughout the main DBC and Transport Report. However, these show relatively similar outputs.

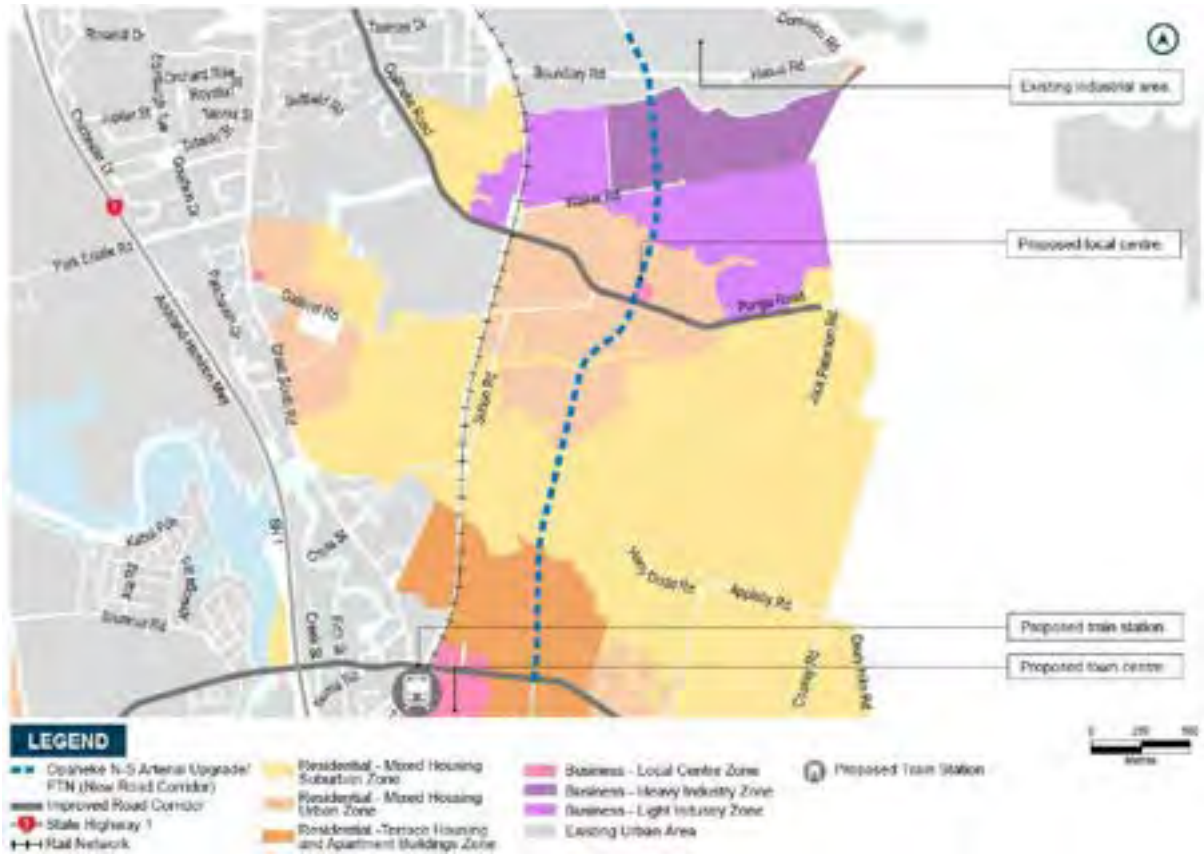


Figure 7-7 Drury/Ōpāheke structure plan

7.1.1.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem one are set out below:

Consequence 1 – Limited connectivity of communities to existing and proposed centres and employment areas

The consequence of failing to provide a north-south connection traversing the Ōpāheke/Drury East area is that communities/residential areas will not have a direct transport link to the town centre and areas of local employment. Piecemeal subdivision with disconnected street networks may

[5] Volumes modelled to immediate north of intersection with Waihoehoe Road.

result, which will provide access to residential sites, but not direct connections to the wider network. Generally, a less connected urban form will result in higher car dependence as explained in the Drury Local package DBC section 7.1.

A further consequence of limiting connectivity to local employment is that it may further exacerbate the imbalance of residential growth with local employment.

Consequence 2 - Poor urban form outcomes

Transport infrastructure fundamentally influences urban form. The consequence of failing to provide a multi-modal north-south connection traversing the Ōpāheke/Drury East area that connects with the other roads in the project area will reinforce current land use patterns, which will preclude the compact, high quality and more sustainable urban form sought by Council for this and other future urban environments. The existing north-south connections play a more strategic role, particularly for car movement, whereas the Ōpāheke NS Arterial caters for more local trips, whilst providing mode-choice. As discussed above, a less connected urban form will result in higher car dependence. Consequently car-reliant transport networks inherently reinforce dispersed, low-density development patterns by enabling longer travel distances and by virtue of vehicles consuming more physical space. Conversely, more spatially efficient transport networks promote more compact land use patterns, as described in the Drury Local Package DBC section 7.1.3.

7.1.2 Problem 2 – Lack of transport choice

Rapid growth and lack of attractive north-south transport choices in the Ōpāheke/Drury East area will limit access to economic and social opportunities.

Problem two recognises that there is a lack of north-south transport choices in the Ōpāheke/Drury East area, considering the planned growth and largely residential land use with a town centre and light industrial destinations to the north and south. Accordingly, failure to provide for multi-modal (public transport and active modes) transport demands on such a corridor will limit access to local economic and social opportunities. A failure to connect to the planned Drury Central train station will similarly limits access to regional economic and social opportunities.

7.1.2.1 Evidence to demonstrate cause

Evidence has been set out below based on the following two root causes of the problem:

- **Cause 1** – Lack of provision for public transport and active modes in the Opāheke/Drury East area;
- **Cause 2** – The planned location of centres, train stations and employment areas in relation to the planned residential area and the floodplain.

Cause 1 – Lack of provision for public transport and active modes in the Ōpāheke/Drury East area

As noted in problem one, there is no north-south connection across the entire Ōpāheke/Drury East area. While the current rural land use condition is the main reason for the current lack of public transport servicing the area directly, the lack of a suitable route through the area also precludes the efficient operation of a bus service. There are also no cycle lanes on any of the roads in the area, and only highly localised sections of footpath in the existing Drury Village.

This current lack of provision for public transport and active modes, along with dispersed rural land use patterns, result in current travel patterns which are heavily car-reliant. Across the whole Southern growth area, approximately 92 per cent of trips to work occur by car[6]. As summarised in the Drury Local Package DBC, a primary theme for investment in this package is to support a transformational mode shift away from private vehicles, to support growth and a compact, connected urban form and, improve accessibility for future communities.

Cause 2 – The planned location of centres, train stations and employment areas in relation to the residential area and the floodplain

As noted in problem one, the proposed land use patterns are such that there is likely to be demand for north-south public transport and active mode movements. The town centre to the immediate south of Waihoehoe Road and east of SH1, and its train station, are likely to be key destinations for local north-south trips by public transport and active modes.

7.1.2.2 The consequences – What if we do nothing?

The consequences associated with a failure to address problem two are set out below:

Consequence 1 – Limited access to economic and social opportunities

Providing a north-south multi-modal corridor (noting that this connection will form part of the wider FTN and active mode network) will enhance access to both local destinations in the form of planned centres and light industrial employment areas, and to the wider region via the proposed Drury Central train station. The new corridor also enables an FTN to run on Great South Road by providing reducing the dependence on a single arterial.

Initial transport modelling in the IBC identified the effect of the recommended network (including Ōpāheke NS Arterial) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in to Figure 7-10 that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by car and public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve problem two will therefore limits access to economic and social opportunities at both the local and regional level.

Initial transport modelling for the IBC identified the effect of the recommended network including Ōpāheke NS Arterial) on job accessibility from the South, and Southern household accessibility from key employment areas as a proxy for access to economic and social opportunities. Further to this, recent modelling exemplified in Figure 7-8 shows that comparing the base year (2016) network with the assumed 2048+ preferred network results in generally improved access to households in the South, and an increase in jobs accessible by public transport from Drury-Ōpāheke. To a significant extent, the increased public transport accessibility is attributable to the assumed accessibility of rail stations in the Drury area. Accordingly, a consequence of failing to resolve problem two will therefore limits access to economic and social opportunities at both the local and regional level.

[6] 2013 Census Journey to Work Data

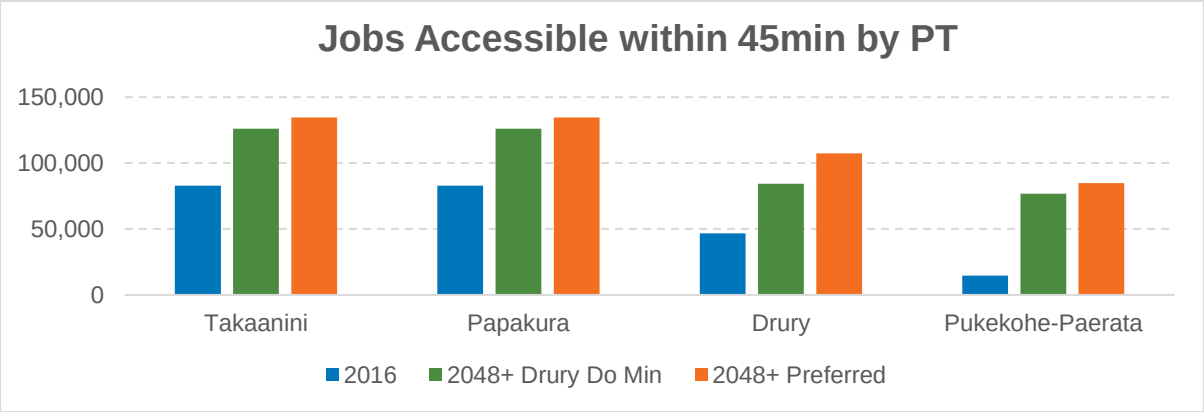


Figure 7-8 Jobs accessible within 45min by PT

Furthermore, Figure 7-9 compares the network over the different years, examining the jobs accessible at different time intervals. Notably, a comparison of the do-min with the preferred network shows an increase in job accessibility via public transport with the implementation of the preferred Drury Network. Figure 7-10 shows this information spatially, showing the key destinations that can be reached from Drury at different travel times. Again, these figures emphasise that a consequence of failing to resolve problem two will be reduce the accessibility to social and economic opportunities for the Drury/Ōpāheke communities.

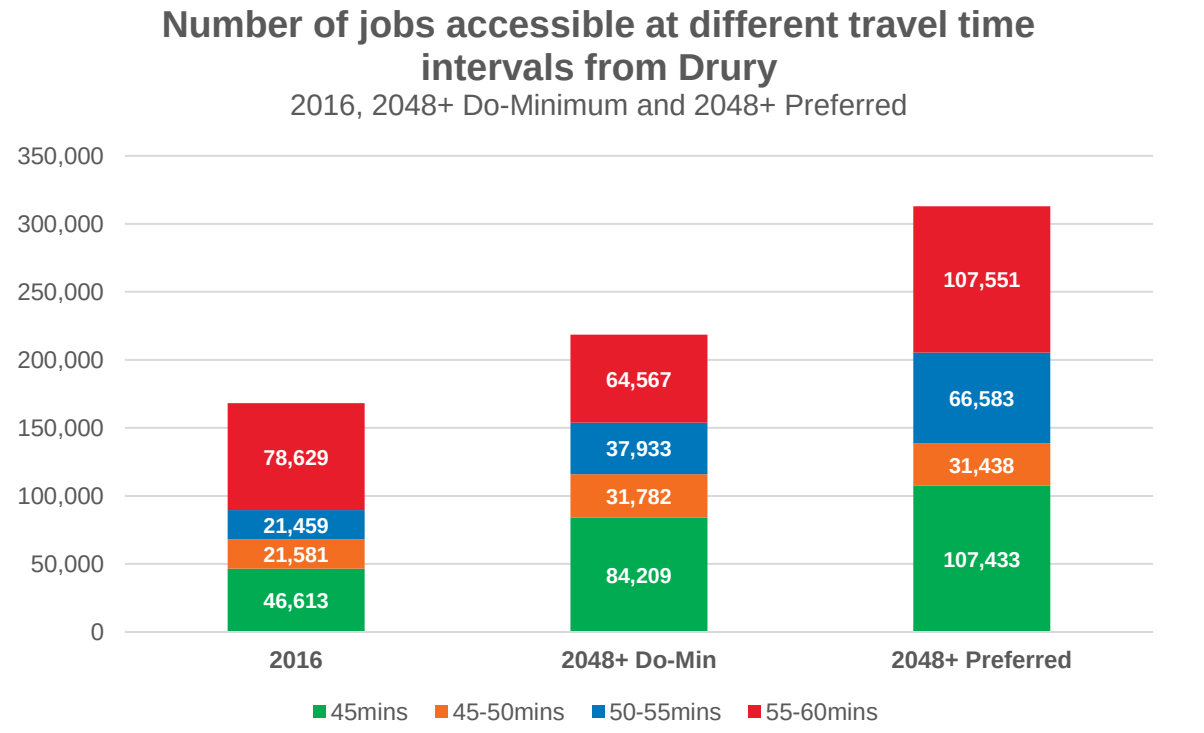


Figure 7-9 Number of jobs accessible at different time intervals from Drury

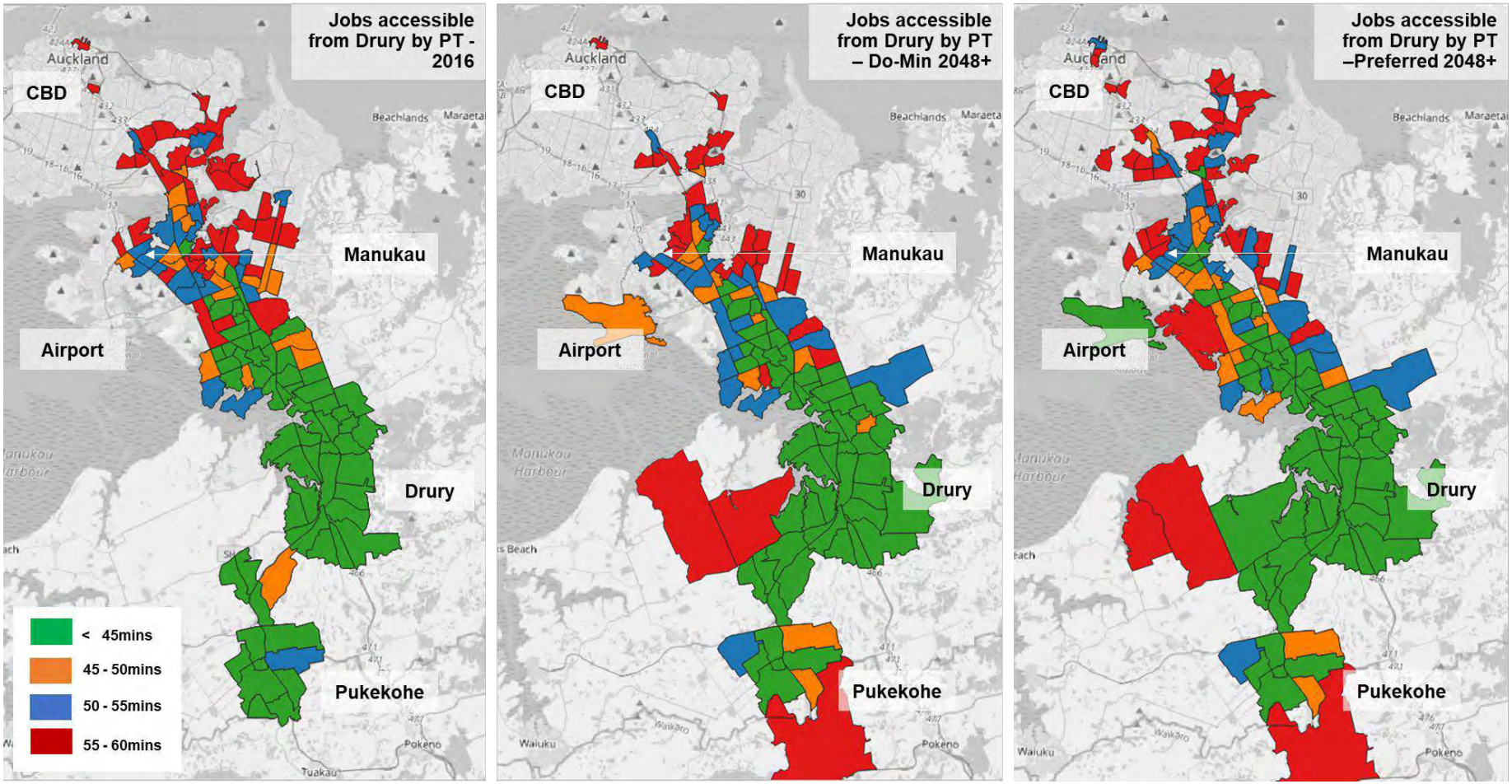


Figure 7-10 Key destinations and jobs that can be reached from Drury by PT at different time intervals: 2016, Do-min 2048+ and Preferred 2048+

Consequence 2 – Lack of modal choice / over-reliance on private cars

Failure to provide for north-south multi-modal access to the proposed centres and stations will:

- Entrench the existing degree of private vehicle reliance (92 per cent across the Southern growth area for work trips in the 2013 Census) for trips to these destinations, resulting in increased local traffic volumes.
- Limit accessibility of the proposed Drury Central station, resulting in higher traffic volumes on the strategic road network for long distance commuting trips. Modelling undertaken for the Structure Plan ITA indicates that the stations at their assumed level of accessibility would result in rail patronage accounting for almost half of trips bound for the central city. Reducing access to the stations (and therefore patronage) will affect the performance of the strategic road network, which remains relatively congested even with significant mode shift assumed.
- Increase the reliance of park-and-ride facilities for accessibility to the rail station. High-level modelling undertaken for the Structure Plan ITA indicates a significant proportion of boardings attributable to Park-and-Ride access. This may become an 'over-reliance' if enhanced public transport and active mode connections to the stations are not made.

7.2 Project specific problems, benefits and investment objectives

PBIOs have been developed for the project, and draw on the problem statements documented in section 7.1 of the report (as summarised in Figure 7-11). The figure also demonstrates the alignment of the investment objectives within the relevant package-level investment themes, which also generally apply across the whole Southern growth area.

The benefits identified for this project recognise that if these two problems are solved, the communities in these growth areas will benefit through improved connectivity and accessibility to proposed centres; improved resilience of the transport network (due to the addition of a new N-S connection to supplement the more strategic SH1 and the proposed Mill Road corridor connections); plus better transport choice and reduced reliance on LOVs. The reduced reliance on LOVs will in turn have benefits for health and wellbeing and the environment, including GHG savings.

The benefits and problems were considered together to develop the project-specific IOs listed in Figure 7-11. IO1 seeks to solve the N-S connectivity problem and enable quality urbanisation in the growth area by providing a new N-S arterial connection that connects proposed centres. IO2 seeks to address the problem of lack of attractive travel choices (in the context of rapid urbanisation) and deliver the benefits for transport choice and network resilience by providing a safe and attractive multi-modal connection between Drury and Papakura.

Figure 7-11 Ōpāheke N-S Arterial project specific benefits and investment objectives

Project	Problems	Benefits	Investment Objectives	Primary themes		Supporting package level themes		
				Support growth	Access	Safety	Land use integration	Environment
New Opaheke N-S FTN/ Arterial – between Drury and Papakura	PS1: The lack of north-south arterial connections through the Drury-Opāheke growth area will limit connectivity of communities with existing and proposed centres and employment areas	Improved connectivity and accessibility to activity centres	IO1: Enable quality urbanisation in the Drury-Opāheke growth area by improving N-S arterial connection between proposed centres	✓	✓		✓	
		Improved transport network resilience	IO2: Improve transport choice and network resilience by providing a safe and attractive multi-modal transport connection between Drury and Papakura		✓	✓		✓
	PS2: Rapid growth and the lack of attractive N-S travel choices in the Drury-Opāheke area will limit access to economic and social opportunities	Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)						

Drury Local Key Performance Indicators

Appendix K



28 August 2020

TE TUPU NGĀTAHI
Supporting Growth

JESMOND, BREMNER, WAIHOEHOE, ŌPĀHEKE AND PONGA

Problems	Investment Objectives	Benefits	KPI	Measure	Results
PS1: The current form and function of Jesmond Road, Bremner Road, Waihoehoe Road and Ōpāheke /Ponga will not support the imminent urbanisation of the Drury Local area, resulting in poor accessibility and urban form outcomes	**IO1:** Support growth and a more sustainable, quality urban form in Drury by improving connectivity to/through the Drury and Opāheke area	Improved quality of the urban environment *(This benefit also supports IO2)*	Active modes provision	KMs of new transport network with enough active mode crossings / corridor width appropriate to place / built form	10km
			Amenity of the street	KMs of new transport network with space for street furniture/ lighting and trees appropriate to place function and built form	13km
			Performance of critical connections	FTN reduces traffic volumes on urban strategic corridors	Reduces traffic volumes in Drury local roads by 10% (5,300 daily trips)
				% of vehicle kilometres travelled in AM peak congestion (>90% v/c)	11.6% in Preferred Option, compared to 22% in Do-min scenario
				FTN reduces delays on urban strategic corridors in AM peak	Reduces the delay on Jesmond Rd – Bremner Rd – Waihoehoe Rd route from 3mins (Do-min) to 1min 20s (Preferred Option)
				FTN reduces traffic volumes on urban strategic corridors	Reduces traffic volumes in Drury local roads by 10% (5,300 daily trips)
				Lane productivity on key corridors in BC area in AM peak	SH22 Eastbound (from Oira Rd to SH1 interchange) is at 40%-50% capacity in Pref Option compared to 60% - 100% in Do-min scenario.
			Change in human health and emissions	• Reduction of NO2 • Reduction of PM10 • Reduction of CO2 • Reduction of fuel consumption:	The FTN network improves human health by better air quality: • Reduction of NO2: 0.3 tonnes annually compared to the do-minimum • Reduction of PM10: 0.6 tonnes annually compared to the do-minimum • Reduction of CO2: 1,268 tonnes annually compared to the do-minimum • Reduction of fuel consumption: 575 tonnes annually compared to the do-min
		Improved connectivity and accessibility for the Drury Local area	Access to Jobs	Jobs within 30 and 45 mins by Car and PT in AM peak (% / No.)	% of jobs accessible compared to do-min: • 9% increase in jobs accessible within 30min by Car (91,200) • 28% increase in jobs accessible within 45min by PT (107,400) • 43% increase in jobs accessible within 60min by PT (313,000)
			Access to local town centre	Catchment within 800m walk and 3km cycle of Drury Local Town Centres (% / No.)	2,700 dwellings are within 800m walk and 43,000 dwellings (or 33% of South) are within 3km cycle of Drury Local Town Centre
PS2: The lack of safe and attractive multi-modal access to the proposed strategic PT network will limit access to economic and social opportunities for those living and/or working in the Drury area	**IO2**: 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 Jesmond Road, Bremner Road, Waihoehoe Road and Opāheke/ Ponga Road	Improved safety for all transport modes	Reduction in Deaths and Serious Injuries	- All modes DSIs	Potential to reduce the DSIs in the following corridors • Jesmond Road: 1 injury crash • Waihoehoe Road: 17 injury crashes • Ōpāheke / Ponga Road: 23 injury crashes • 6 DSi in the last 10 years - all modes
				- Active modes DSIs	1 DSi in the last 10 years - Active Modes only - excluding SH22
		Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	Provision of PT	KMs of new connector and FTN PT facilities	8 km in total – 4km of FTN and 4km of arterial upgrade with provision of PT
			Quality of PT network	% of passenger kms travelled in AM peak congestion (>90 v/c)	2.3% in 2016, reducing to only 0.04% for Preferred Option (2048+)
				PT travel time improvement	Jesmond Road, Bremner Road, Waihoehoe Road FTN upgrade results in a total of 8min journey time savings along the corridor
				% of hours spent in severe congestion (v/c >0,9) by PT vehicles	10.6% in 2016, 11.8% with Drury Local Do-min (2048+), and 0.5% for Preferred Option (2048+)
				% of hours spent in severe congestion (v/c >0.9) by PT vehicles	10.6% in 2016, 11.8% with Drury Local Do-min (2048+), and 0.5% for Preferred Option (2048+)
			Mode share (local and regional trips)	% Active mode share for trips in AM peak	32% - Drury area, 15% - for all South region
				% PT mode share for trips in AM peak	52% - Preferred or 44% - Do-min (going north) • Jesmond Road: 8% PT mode share • Bremner Road: 10% PT mode share • Waihoehoe Road: 24% PT mode share
			New PT users	Number of new PT boardings on rapid transit in BC area, AM peak	1,400 new PT(bus) boardings in the AM peak along these corridors
			New Cycle users	Number of new daily walking and cycling movements on key corridors in BC area	• Jesmond Road: 2300 trips • Bremner Road: 1400 trips • Waihoehoe Road: 2500 trips • Ōpāheke / Ponga Road: 1000 trips
			Access to PT network	Contribution to rail patronage	• Rail patronage to Drury West station increases by 10% • Rail patronage to Drury Central station increases by 40%
				Number of PT trips to City Centre, Isthmus & North, Manukau and Airport in AM peak period (2-hour period)	Preferred network PT trips from Drury % increase compared to do-min: 29% CBD (1,700 trips), 31% Isthmus (1,100 trips), 40% Manukau (350 trips), 45% Airport (300 trips)
			Access to active mode network	Catchment within 500m cycle of QoS1 & QoS2 / Regional cycle network (% / No.)	23% of all dwellings on the South (in 2048+) are within 500m of new/upgraded arterial routes, (or 30,000 dwellings)

SH22

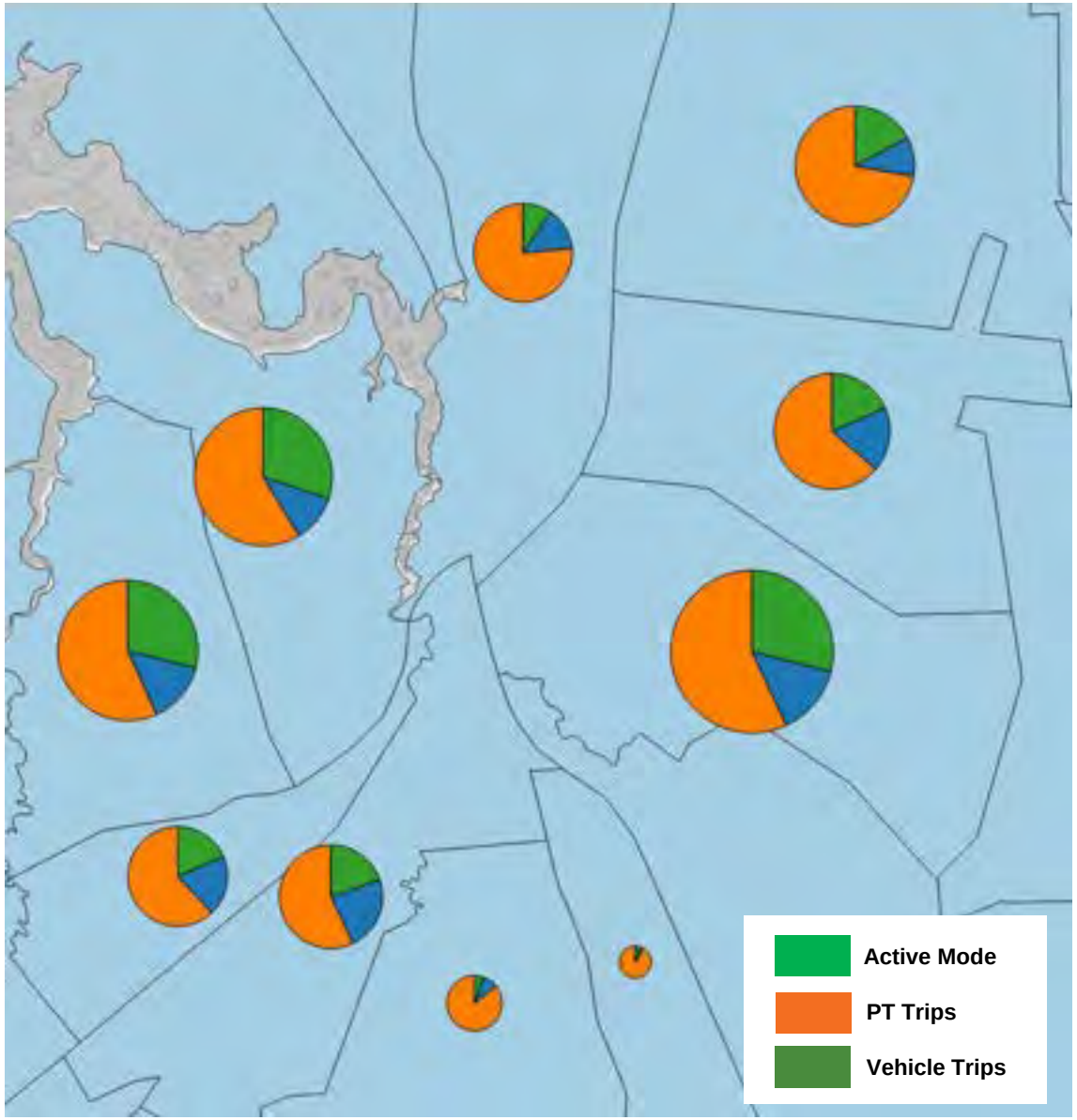
Problems	Investment Objectives	Benefits	KPI	Measure	Results
PS1: The current form and function of SH22 will not support the imminent urbanisation of the Drury Local area (incl. the town centre), resulting in poor accessibility and urban form outcomes	**IO1:** To support imminent growth and the planned town centre in Drury by improving connectivity and accessibility along this section of SH22	Improved connectivity and accessibility for the Drury Local area	Access to Jobs	Jobs within 30 and 45 mins by Car and PT in AM peak (% / No.)	% of jobs accessible compared to do-min: • 9% increase in jobs accessible within 30min by Car (91,200) • 28% increase in jobs accessible within 45min by PT (107,400) • 43% increase in jobs accessible within 60min by PT (313,000)
			Performance of critical connections	SH22 reduces delays in AM peak	SH22 Eastbound from Oaira Rd to SH1 interchange has 38s delay in Preferred Option, compared to 3mins34s delay if without SH22 Upgrade. That is an approx. of 2mins saving per vehicle in AM peak
PS2: Urbanisation of the Drury local area combined with high speeds, a high number of accesses and increasing traffic volumes on this section of SH22 will lead to an increased risk of DSIs and intersection crashes	**IO2:** Significantly reduce the risk of DSIs from private vehicle crashes and to provide a safe connection for active modes along this section of SH22	Significantly reduced risk of deaths and serious injuries and intersection crashes, and significantly improved safety for active modes	Reduction in Deaths and Serious Injuries	All modes DSIs	Potential to reduce the DSIs in the following corridors: • SH22: 33 injury crashes • 13 DSi in the last 10 years - all modes on SH22
				Active modes DSIs	1 DSi in the last 10 years - Active Modes on SH22
PS3: Failure to integrate the removal of the SH function with the timing and form of urban development will result in a compromised urban form and movement function	**IO3:** 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	Improved quality of the urban environment	Active modes provision	KMs of new and improved transport network with enough active mode crossings / corridor width appropriate to the known place function, built form and movement function	3km
			Amenity of the street	FTN reduces traffic volumes on urban strategic corridors	Reduces traffic volumes in Drury local roads by 10% (5,300 daily trips)
				KMs of new and improved transport network with enough space for street furniture/lighting and tree planting appropriate to the known place function and built form	3km

ŌPĀHEKE NORTH SOUTH ARTERIAL

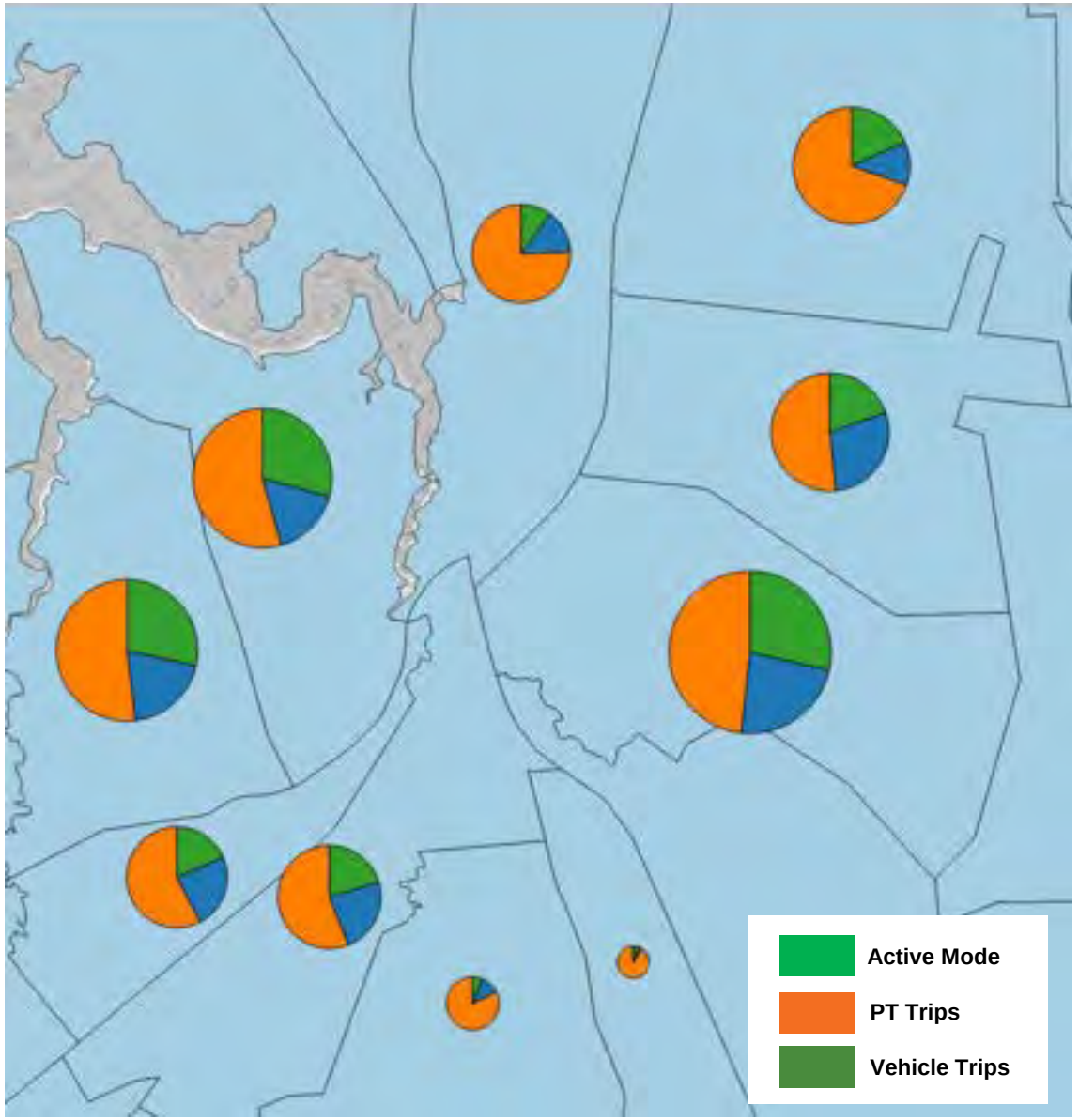
Problems	Investment Objectives	Benefits	KPI	Measure	Results
PS1: The lack of north-south arterial connections through the Drury-Ōpāheke growth area will limit connectivity of communities with existing and proposed centres and employment areas	**IO1:** Enable quality urbanisation in the Drury-Ōpāheke growth area by improving N-S arterial connection between proposed centres	Improved connectivity and accessibility to activity centres	Access to Jobs	Jobs within 30 and 45 mins by Car and PT in AM peak (% / No.)	• 45% increase in jobs accessible within 30min • 28% increase in jobs accessible within 45min • 42% increase in jobs accessible within 60min
			Change in human health and emissions	• Reduction of NO2 • Reduction of PM10 • Reduction of CO2 • Reduction of fuel consumption:	The FTN network improves human health by better air quality: • Reduction of NO2: 0.3 tonnes annually compared to the do-minimum • Reduction of PM10: 0.6 tonnes annually compared to the do-minimum • Reduction of CO2: 1,268 tonnes annually compared to the do-minimum • Reduction of fuel consumption: 575 tonnes annually compared to do-min
PS2: Rapid growth and the lack of attractive N-S travel choices in the Drury-Ōpāheke area will limit access to economic and social opportunities	**IO2:** Improve transport choice and network resilience by providing a safe and attractive multi-modal transport connection between Drury and Papakura	Improved transport network resilience	Availability of alternatives to strategic connection	Every strategic network connection has an appropriate alternative to key destinations	Provides an fit-for-purpose corridor for local trips. I.e. no need to use Mill Rd or SH1 for trips within Drury and Ōpāheke
			Performance of critical connections: Strategic road network	% of vehicle kilometres travelled in peak congestion (>90% v/c) in AM peak	• 3.1% - Base (2016) • 22% - Drury DM • 14.7% - No Ōpāheke • 11.6%- Preferred
				% of freight vehicle kilometres travelled in peak congestion (>90% v/c) in Inter peak	For Freight in AM Peak: • 6.7% - Base (2016) • 16.5% - Drury DM • 13.4% - No Ōpāheke • 13.1%- Preferred • For Freight in IP - no congestion shown in all scenarios
				Opāheke N-S reduces delays on key corridor(s) between Drury and Papakura in AM peak	Great South Road Northbound from Waihoehoe Rd to Beach Road has 5mins52s delay in Preferred Option, compared to 8mins34s delay if without Opāheke N-S. That is an approx. of 2min40s saving per vehicle in AM peak.
		Improved transport choice and reduced reliance on LOVs (health/wellbeing, social and environment benefits)	Provision of high-quality active modes network	% / KMs of new and improved cycle network achieving required QoS	3km
			Provision of PT	KMs of new connector and RTN PT services	3km
			Quality of PT network	PT travel time improvement	New corridor reduces PT travel time by 4min
				% of hours spent in severe congestion (v/c >0.9) by PT vehicles	10.6% in 2016, 11.8% with Drury Local Do-min (2048+), and 0.5% for Preferred Option (2048+)
				% of passenger kms travelled in peak congestion (>90 v/c) in AM peak	• 2.3%- Base (2016) • 0.3% - DM(48+) • 0.04%- Preferred (48+) for Drury
			Mode share (local and regional trips)	% Active mode share for trips in AM peak	7% cycling & 40% walking in Drury (Preferred) 1% cycling & 31% walking in Drury (No Ōpāheke)
				% PT mode share for trips in AM peak	32% - for all South region to North 52% overall mode share for PT from Drury (Pref) Ōpāheke N/S: 18% PT mode share Jesmond Road: 8% (vs. 6% No- Opāheke) Bremner Road: 10% (vs. 8% No- Opāheke) Waihoehoe Road: 24% (vs. 18% No- Opāheke)
			New PT users	Number of new PT boardings on rapid transit in BC area in AM peak	440 new PT (bus) boardings along corridor
			New Cycle users	Number of new daily walking and cycling movements on key corridors in BC area	900 new daily walking cycling trips
			Access to PT network	Contribution to rail patronage	• Rail patronage to Drury West station increases by 10% • Rail patronage to Drury Central station increases by 40%
				% of AM peak period trips to City Centre, Manukau & Isthmus by PT	Preferred vs. Do-min, PT increased by: 29% CBD, 31% Isthmus, 40% Manukau, 45% Airport
			Access to active mode network	Catchment within 500m cycle of QoS1 / Regional cycle network (% / No.)	30,000 dwellings, 82,000 population, and 13,000 jobs will be within the 500m of new footpath and cycle path as part of Drury local projects

Mode Share in Drury – All Modes – AM Peak 2048+

Do-min

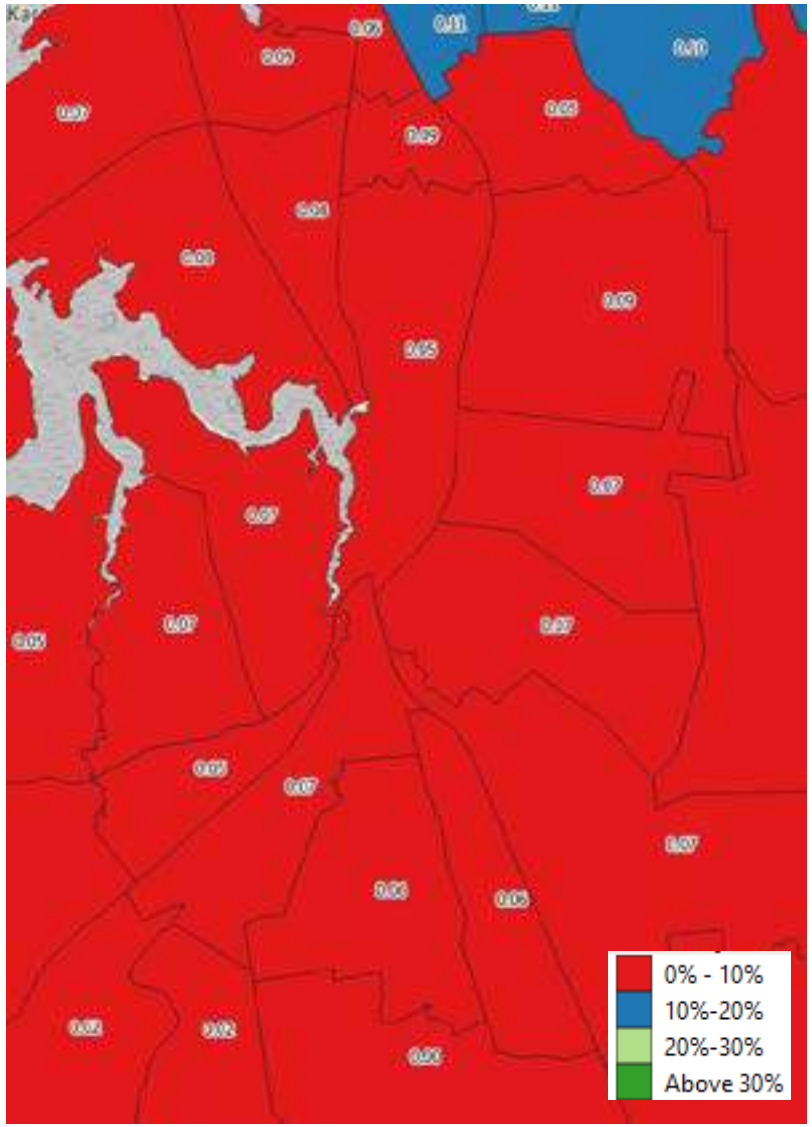


Preferred Option

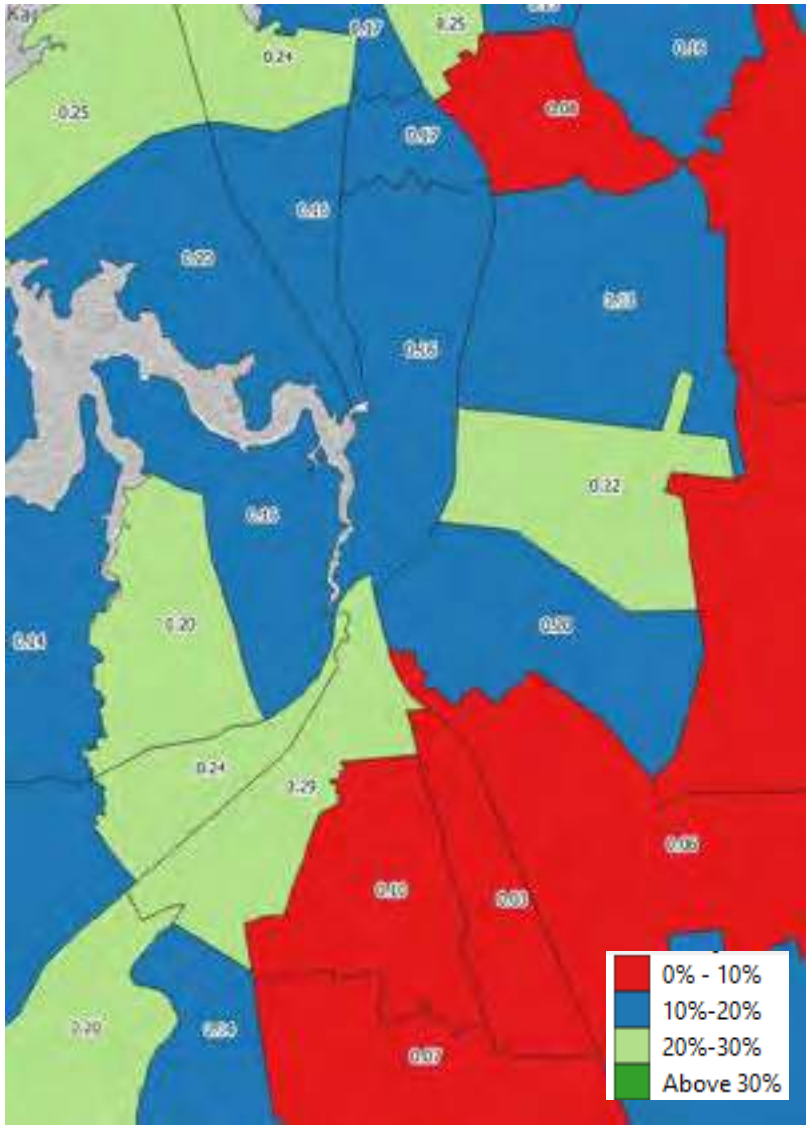


Proportion of PT to All Motorised Trips (to any destinations) – AM Peak

2016



Do-min



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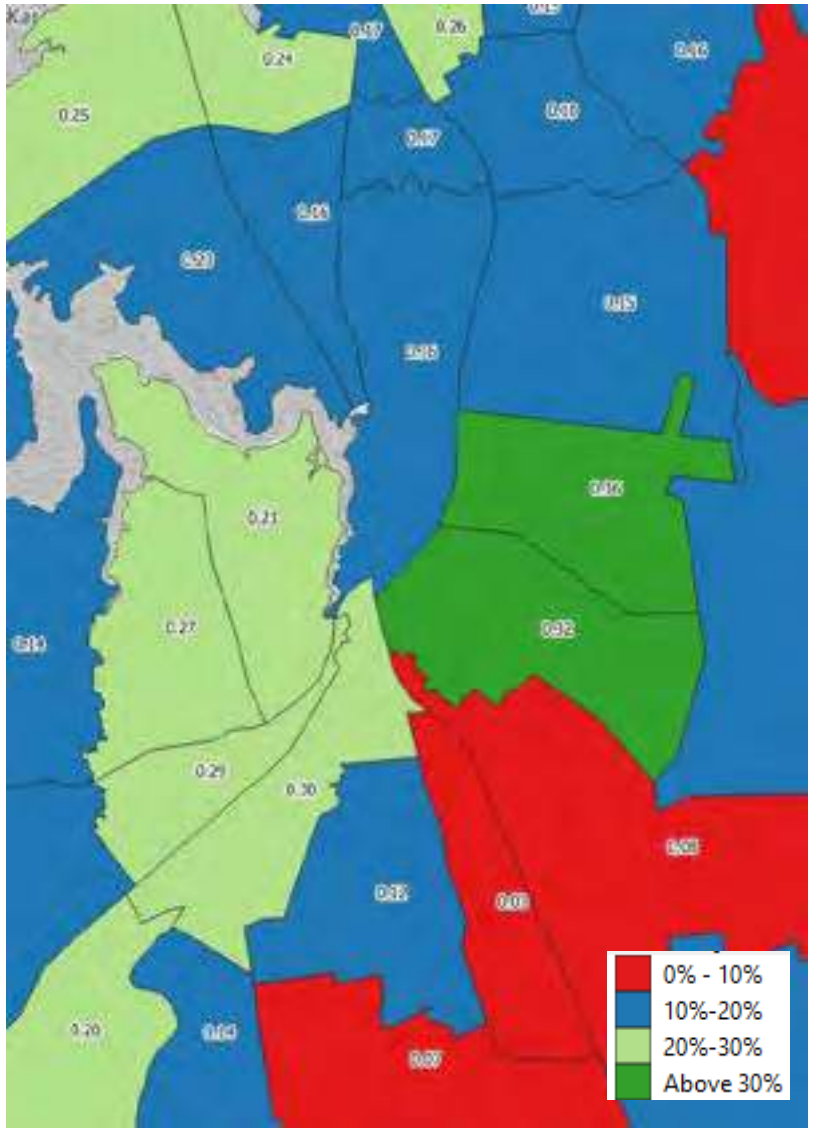
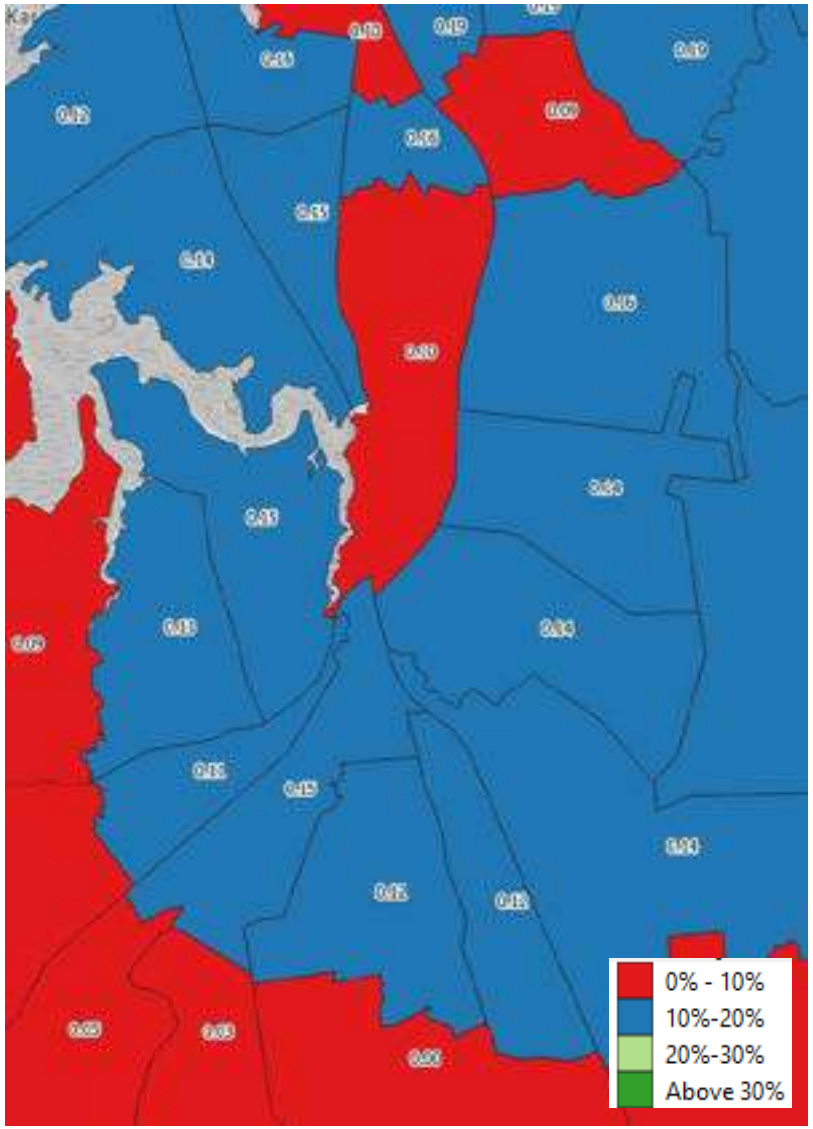
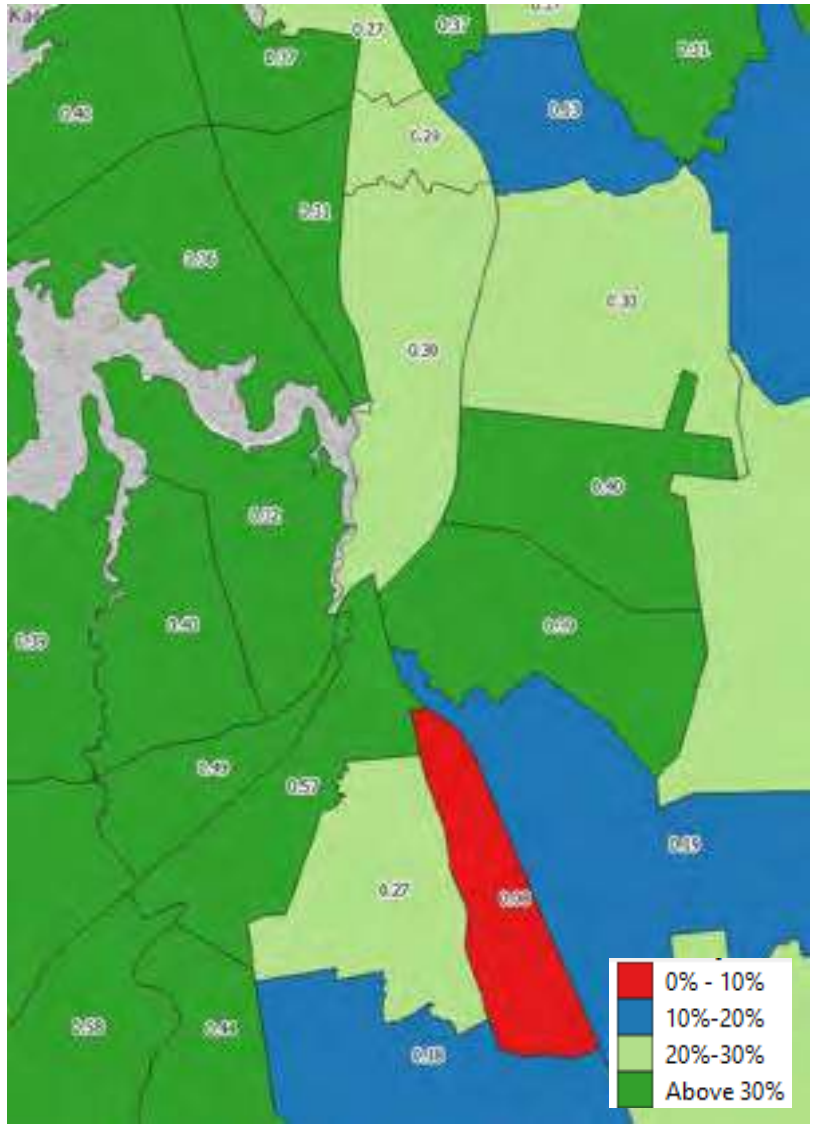


Proportion of PT to All Motorised Trips (to North region only) – AM Peak

2016



Do-min



Preferred Option

