TE TUPU NGĀTAHI
SUPPORTING GROWTH

Pukekohe Transport Network Assessment of Transport Effects

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WAKA KOTAHI
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Glossary of Defined Terms and Acronyms

Acronym/Term	Description
AC	Auckland Council
ADT	Average Daily Traffic
AEE	Assessment of Effects on the Environment report
AFC	Auckland Forecasting Centre
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
AUP:OP	Auckland Unitary Plan: Operative in Part
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
DSI	Death and serious injuries
HCVs	Heavy commercial vehicles
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
KiwiRail	KiwiRail Holdings Limited
LCVs	Light commercial vehicles
LOS	Level of Service
NPS:UD	National Policy Statement on Urban Development
NIMT	North Island Main Trunk railway track
NoR	Notice of Requirement
NZUP	New Zealand Upgrade Programme
PT	Public transport
RMA	Resource Management Act 1991
SAMM	Strategic Active Mode Model
SH	State Highway
SSTMP	Site-Specific Traffic Management Plan
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
TDM	AT's Transport Design Manual: AT Engineering Design Codes – Transport Design Manual

Acronym/Term	Description
ULDMP	Urban and Landscape Design Management Plan
VKT	Vehicle kilometres travelled
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
WDC	Waikato District Council

Executive Summary

This Assessment of Transport Effects Report (the Report) has been prepared to inform the Assessment of Effects on the Environment Report (AEE) for the Pukekohe Transport Network, which is a network of planned transport infrastructure, with the purpose of responding to future growth in the Drury, Paerata and Pukekohe growth areas. The transport network includes nine Notices of Requirement (NoRs) for Auckland Transport (AT) and Waka Kotahi NZ Transport Agency (Waka Kotahi) as requiring authorities under the Resource Management Act 1991 (RMA). The notices are to designate land for future strategic transport and arterial corridors to enable the future construction, operation and maintenance of transport infrastructure in the Drury West, Paerata and Pukekohe areas.

The recommended network was developed as part of strategic network planning for the wider area and concurrently with the structure planning undertaken by Auckland Council to deliver the desired place and movement outcomes for existing and future communities. 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. It also included strong integration with various other South Auckland Planned projects to provide 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 some flexibility in the exact final form of the implemented projects.

This Report considers the planned place function of the Pukekohe Transport Network components and the associated movement effects on key elements of the transport system, including safety, walking and cycling, public transport, freight and property access. An assessment against objectives and policies of the Auckland Unitary Plan: Operative in Part (AUP:OP) (and other statutory documents) is covered in the AEE rather than in this Report. This Report is targeted at informing the route protection of the Pukekohe Transport Network. Interim staging of the individual projects (or parts of projects) in response to the potential timing of development is not addressed due to the inherent uncertainty of how this could occur in the future. The focus is on the full buildout of the future urban areas in 2048+ to support future communities.

There are other identified projects in the Southern areas of Auckland that form part of the overall transport network solution for the area. These projects are not specifically included in the Pukekohe Transport Network NoRs but interface with the projects. These interfaces are discussed in this Report.

Existing Environment

The existing transport corridors within Drury West, Paerata and Pukekohe servicing the Project Area are operating near or at capacity, with limited opportunity to accommodate growth. The local transport network in and surrounding Drury West, Paerata and Pukekohe is a mix of urban and rural environment with poor east-west and north-south connectivity and substandard facilities for an urban context. The current facilities consist of high-speed rural roads, with direct property access and non-existent or poor public transport and walking and cycling facilities.

Future Receiving Environment (without the Pukekohe Transport Network)

The wider Drury, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the AUP:OP and the Council approved Structure Plans (2019), and have recently received numerous private plan change requests to rezone future urban zoned areas for residential development.

The Drury-Ōpāheke Structure Plan area is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 over a 30-year period. The Pukekohe-Paerata Structure Plan is estimated to provide approximately 55,000 people added to the existing population of around 31,000. The new growth areas will also potentially provide approximately 9,000 additional jobs.

Some of the future transport projects with notable interface in Pukekohe, Paerata and Drury include:

- New rail stations at Drury Central, Drury West and Paerata and associated park and ride facilities;
- Additional rail capacity between Pukekohe and Papakura (4-tracking, electrification, and associated grade separations at road/rail crossings);
- Manukau to Takaanini Access and Safety Project – 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 SH1 in Drury South;
- Regional Active Mode Corridor – a north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH1 and North Island Main Trunk (NIMT) railway line; and
- SH1 Papakura to Bombay (P2B) project, which includes an upgrade to the existing Drury interchange, a new interchange in Drury South and additional general traffic lane capacity in each direction.

While these projects will help alleviate transport pressures in the wider south network, these projects alone are not sufficient to cater for the associated residual growth within the Project Area.

The future receiving transport environment (without the Projects) is not fit for purpose to support the planned future urban growth, with unattractive and unsafe travel by walking and cycling, inefficient and unreliable public transport services and unreliable and unsafe travel for general traffic and freight. These wider adverse transport system effects will also compromise access to employment, educational and social amenities for existing and future communities if future growth continues to progress and the existing infrastructure remains the same.

Assessment of Transport Effects (with the Pukekohe Transport Network)

The assessment of operational effects (post-construction) concludes that the Pukekohe Transport Network has significant positive transport effects. The Pukekohe Transport Network provides a safe and reliable transport network that supports growth in the wider Drury, Pukekohe and Paerata areas. It significantly improves travel choice for general traffic, freight, public transport and active modes, improves safety and improves access to employment, educational and social amenities.

The summary below provides an overview of the operational effects for each NoR within the Pukekohe Transport Network.

Project Contributions

NoR	Safety	Walking	Cycling	Public Transport	General Traffic	Freight	Access
Drury West Arterial (NoR 1)	√√√	√√√	√√√	√√√	√√	√√	√√
Drury to Pukekohe Link (NoR 2)	√√√*	√√√	√√√	√	√√√*	√√√*	√√
Paerata Connections (NoR 3)	√√√	√√√	√√√	√√√	√√	√√	√√
Pukekohe Northeast Arterial (NoR 4)	√√√	√√√	√√√	√√	√√√	√√√	√√
Pukekohe Southeast Arterial (NoR 5)	√√√	√√√	√√√	√√	√√√	√√√	√√
Pukekohe Southwest Arterial (NoR 6)	√√√	√√	√√√	√	√	-	–
Pukekohe Northwest Arterial (NoR 7)	√√√	√√√	√√√	√	√√√	√√√	√√
Mill Road and Pukekohe East Road Update (NoR 8 (AC and WDC))	√√√	√√√	√√√	-	√√√	√√√	√

Minor positive effect (√) Moderate positive effect (√ √) Significant positive effect (√ √ √) Regional effect (*)

In terms of construction effects, there are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit changes, vulnerable road users and property access). To remedy or mitigate potential adverse construction effects, it is proposed to manage these through the preparation and implementation of a Construction Traffic Management Plan (CTMP).

Overall, the assessment concludes that the Project will have significant positive operational effects and the potential adverse construction effects can be managed through conditions.

1 Introduction

1.1 Purpose and scope of this Report

This Assessment of Transport Effects Report (the Report) has been prepared for Te Tupu Ngātahi Supporting Growth Alliance (Te Tupu Ngātahi) to inform the Assessment of Effects on the Environment (AEE) for nine Notices of Requirement (NoRs) sought by Waka Kotahi NZ Transport Agency (Waka Kotahi) and Auckland Transport (AT) for the Pukekohe Transport Network under the Resource Management Act 1991 (RMA).

The NoRs (summarised in Section 4) are to designate land for future strategic transport corridors within Drury West, Paerata and Pukekohe areas to SH22. Specifically, this report considers the actual and potential transport effects associated with the construction and operation of the projects on the existing and likely future environment and recommends measures to avoid, remedy or mitigate these effects.

This report should be read alongside the AEE, which contains further details on the history and context of the Project. The AEE also contains a detailed description of works to be authorised within each NoR, and the typical construction methodologies that will be used to implement this work. These have been reviewed by the author of this report and have been considered as part of this assessment. As such, they are not repeated here. Where a description of an activity is necessary to understand the potential effects, it has been included in this report for clarity.

1.2 Report Structure

The table below sets out the structure of this Report.

Table 1-1: Report Structure

Section No.	Description
Section 1	**Introduction** • Report purpose • Structure • Project overview
Section 2	**Assessment Methodology** • Overview • Approach to assessment of operational and construction transport effects
Section 3	**Existing and Future Receiving Environment** • Description of the existing and future receiving environment and transport elements (without the Pukekohe Transport Network), including safety, walking and cycling, public transport, general traffic, freight and access.
Section 4	**Description of the Pukekohe Transport Network**

Section No.	Description
Section 5	**Assessment of Effects of the Pukekohe Transport Network** • Assessment of operational effects • Assessment of construction effects • Summary of effects
Section 6	**Conclusion**

1.3 Proposed Pukekohe Transport Network Overview

The Pukekohe Transport Network encompasses eight transport projects for the Pukekohe, Paerata and Drury West areas. AT has lodged six NoRs with Auckland Council and Waka Kotahi has lodged two NoRs with Auckland Council and one with Waikato District Council. The Pukekohe Transport Network includes provision for improved walking and cycling, public transport, and general traffic connections.

For the purposes of this assessment, Mill Road and Pukekohe East Road Upgrade (that includes works within Auckland Council and Waikato District Council) is referred to as one transport project, despite being submitted as two separate NoRs. The matters relevant to each jurisdictional area are addressed through this assessment.

An overview of the Pukekohe Transport Network is provided in Figure 1-1 below.

The Pukekohe Transport Network focuses on strategic corridors, which together form a cohesive transport response planned future growth. Also, future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised. The proposed network has also been developed considering the wider network and both existing and committed projects concurrently. Details of each NoR is summarised in Table 1-2 below.

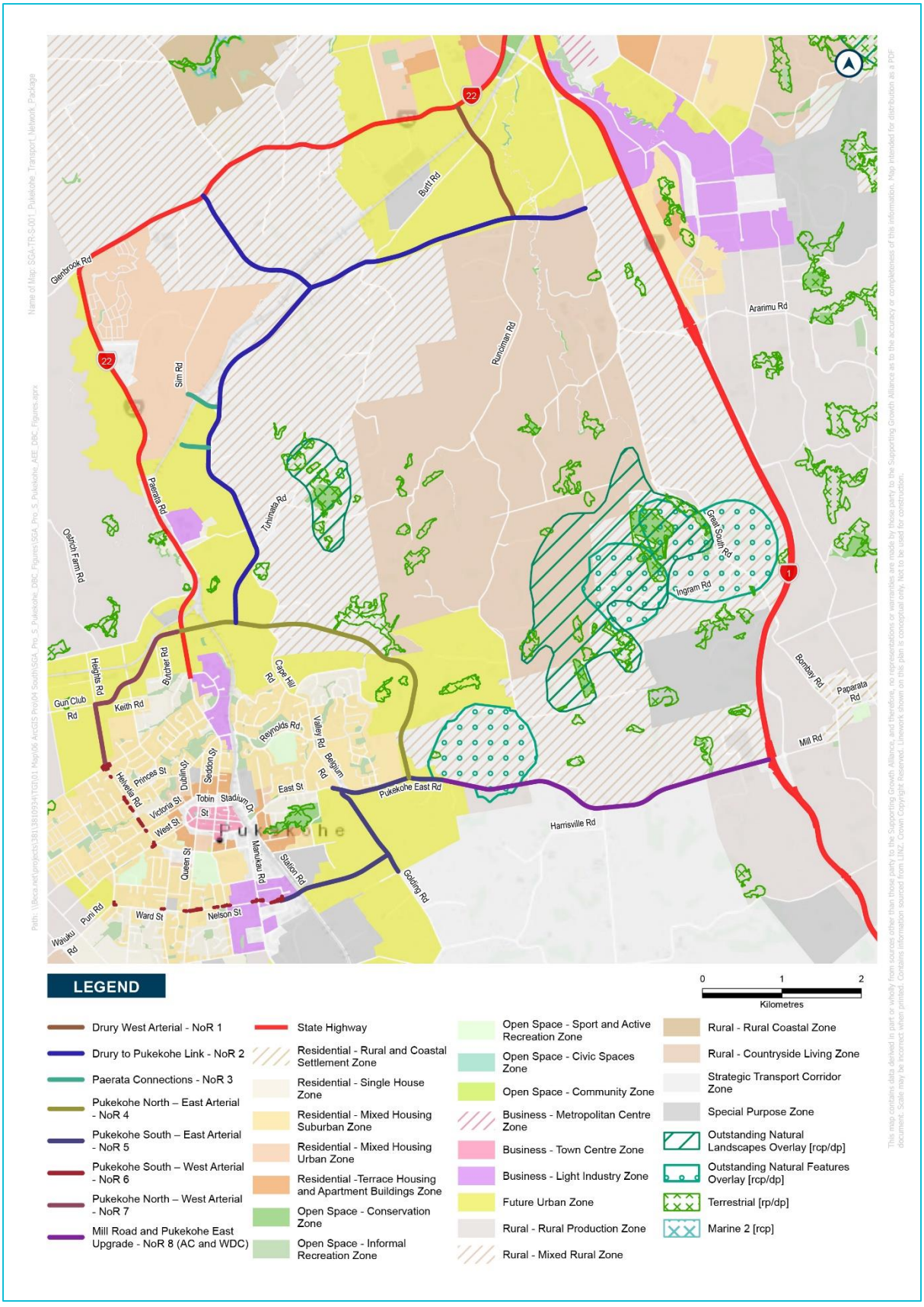


Figure 1-1: Pukekohe Proposed Transport Network

Table 1-2: Pukekohe Transport Network Summary

NoR	Project	Requiring Authority	Description	Purpose
NoR 1	Drury West Arterial	AT	A new transport corridor extending south from the intersection of SH22 and Jesmond Road to the proposed Drury to Pukekohe Link (NoR 2). The new transport corridor for four lanes from SH22 to Burtt Road to provide for public transport lanes, and two general vehicle lanes from Burtt Road to NoR 2. Active transport facilities are provided along the length of the corridor.	This link provides relief to the current Drury interchange and SH22 through Drury West as the Future Urban Zone land is developed. This will enable greater urbanisation of the SH22 corridor through Drury, with improved safety, access and transport-land use integration with multi-modal facilities for travel along and across the SH22 corridor and Drury West Areas. In addition, this new arterial link also provides direct access for all modes from Drury West to the proposed new train station including FTN services from Jesmond Road.
NoR 2	Drury-Pukekohe Link	Waka Kotahi	A new and partial upgrade of existing transport corridor from Great South Road, Drury in the North to NoR 4 in Pukekohe in the South. The transport corridor has two general traffic lanes and active mode facilities on one side of the corridor.	This link is to provide a new arterial corridor connecting existing and planned future communities between Drury and Pukekohe on the south side of the rail corridor. It also provides a fourth strategic access into Pukekohe, to support the existing SH22, rail and Mill Road/Pukekohe corridors (all of which also have planned or existing improvements underway).
NoR 3	Paerata Connections	AT	It includes two new transport corridors: • A new connection between Sim Road (south) to the Paerata Rail Station; and • A new connection between the two extents of Sim Road across the NIMT. The new transport corridors include two lanes for general traffic and active mode facilities on both sides of the corridors.	This link provides direct access for all modes from Paerata and Pukekohe to the proposed new train station, as well as increasing accessibility (and wider network resilience) between communities either side of the NIMT.
NoR 4	Pukekohe North-East Arterial	AT	A new transport corridor from SH22 in the north-west to Pukekohe East Road in the south east. It includes two	The functional intent of the north-east arterial is to increase accessibility to the future urban areas, provide connections

NoR	Project	Requiring Authority	Description	Purpose
			lanes for general traffic and active mode facilities on both sides of the corridor.	between Pukekohe and NoR 2 and provide strategic east-west connectivity between the areas west of SH22 and Pukekohe East Road.
NoR 5	Pukekohe South-East Arterial	AT	A new and upgraded transport corridor. It upgrades part of Pukekohe East Road, Golding Road and provides a new connection between Golding Road (from north of Royal Doulton Drive) and across Station Road and the NIMT to the existing industrial development on Crosbie Road to Svendsen Road. It includes two lanes for general traffic with active mode facilities on the southern side of the corridor on Pukekohe East Road and on both sides for the remainder of the corridor.	The role of the south-east arterial is to support adjacent urban development, connect current and future light industry zones in southern Pukekohe separated by the rail corridor and to provide improved connection between south-west parts of Pukekohe and the Pukekohe East corridor (which connects to SH1 at Bombay).
NoR 6	Pukekohe South-West Upgrade	AT	The upgrade of specific intersections and the regrade of specific driveways on Nelson Street, Ward Street, West Street and Helvetia Road for active mode facilities.	The purpose of NoR 6 is to provide for targeted intersection treatments that support safer active mode facilities.
NoR 7	Pukekohe North-West Arterial	AT	A new and upgrade of existing transport corridor between Helvetia Road in the south-west and SH22 in the north-east. It includes two lanes for general traffic and active mode facilities on both sides of the corridor.	The functional intent of the north-west arterial is to support adjacent urban development and provide an enhanced strategic connection around the north-west quadrant of Pukekohe and thereby into SH22 and NoR 4.
NoR 8 (AC) and NoR 8 (WDC)	Mill Road and Pukekohe East Road Upgrade	Waka Kotahi	An upgrade of Mill Road (Bombay) in the east and Pukekohe East Road in the west. The upgrade of Mill Road is for four lanes from SH1 in the east to Harrisville Road in the west with active mode facilities on the southern side of the corridor. The upgrade of Pukekohe East Road is for active mode facilities on the southern side of the corridor from Harrisville Road in the east to NoR 5 in the west.	The functional intent of NoR 8 is to provide increased safety, capacity and travel choices on this strategic access between Pukekohe and SH1.

2 Assessment Methodology

2.1 Overview

Given the long-term nature of the designations being sought by the NoRs, this assessment does not assess the interim staging of individual projects and development staged over the next three decades but instead places a greater focus on the 'full build out' of the future urban area in 2048+ to support future communities. Therefore, this assessment focuses on the likely future environment (full build out 2048+) and wider infrastructure upgrades.

The methodology for the operational and construction transport effects are applicable for every NoR. Any nuances are specified throughout the assessment.

The assessment of transport effects has two elements:

- Assessment of operational effects on the transport system; and
- Assessment of construction effects on the transport network.

The assessment is targeted at route protection, rather than imminent implementation. As such, it:

- Makes greater use of generic cross-sections and design standards;
- Focuses more on desired outcomes and footprints;
- Takes a longer-term view, with its inherent uncertainties; and
- Assumes more use of recommended management plans and planning processes rather than specific design details to manage potential effects.

A key element of the assessment is the definition of the 'existing/likely future environment', against which the effects are assessed. This is a complex issue as the proposed works are planned to support urban development and are unlikely to occur without such development. Additionally, the source of the potential effects (such as people and vehicle movements) is generally from urban development itself, rather than from the planned infrastructure.

To isolate the effects of the planned works, the 'existing environment' includes the likely future urban development but does not include the planned projects for which designations are sought. The effects of the projects are then assessed using the same land use assumptions. A description of the environment as it exists today is given for context. Given the long-term perspective of the assessment of effects, the analysis is based on the estimated 'full build out' for the future urban area. This is based on development yield estimates provided by Auckland Council through the Drury-Ōpāheke and Pukekohe-Paerata Structure Plans and the Auckland Forecasting Centre (AFC).

2.2 Approach to Assessment of Operational Transport Effects

The Pukekohe Transport Network has been designed as part of an overall integrated system, but in general the projects can be delivered separately. As such, this assessment considers the projects together with commentary on interdependencies where appropriate.

2.2.1 Transport Modelling Tools and Assumptions

A number of modelling forecast years have been used for this assessment. The year 2048+[1] has been used as the base to assess effects in the future environment. The anticipated urbanisation over time is summarised at a high-level in Figure 2-1.

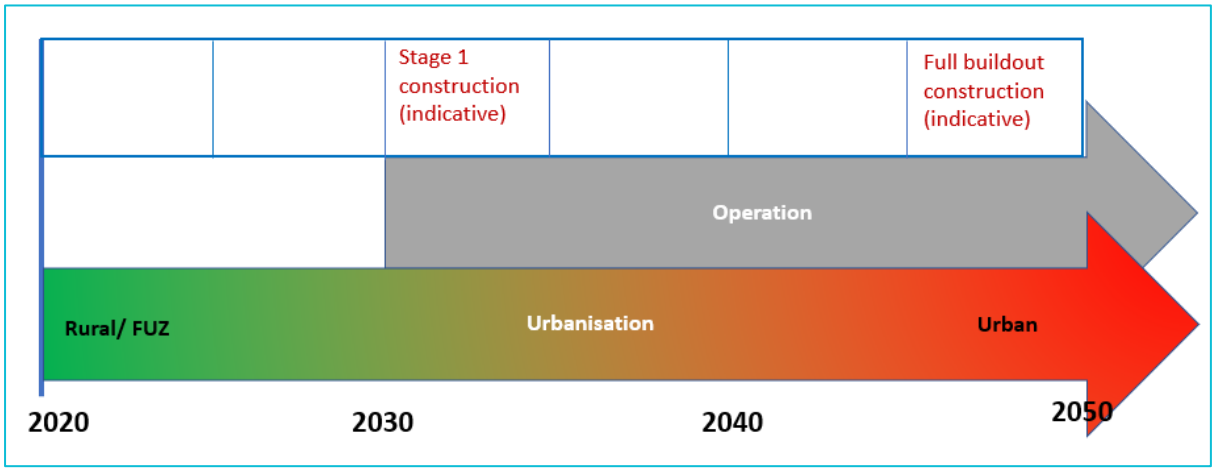


Figure 2-1: Urbanisation in the Pukekohe area

The transport assessment considers:

- The construction effects assessment considers the existing environment to be as per the future receiving environment, and therefore, uses forecast data.
- The positive effects assessment uses the 'full build out' of the future urbanised environment and a forecast year 2048+. This allows for a better understanding of the full benefits that the Pukekohe Transport Network delivers as this has an important long-term role.

Throughout the transport network analysis process, a range of different transport modelling tools have been used to undertake quantitative assessments of the transport system. These then inform recommendations about planning the transport network, corridors, and intersections.

The impacts of the projects on the future transport environment are assessed using forecasting transport models, owned by the AFC. The models include:

- The regional multi-modal model (MSM). This model creates estimates of car, truck and public transport movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future public transport usage. Generally, this model is run using regional assumptions, as per recent Auckland Transport Alignment project (ATAP) but with scenario-specific inputs in the growth areas.
- A local traffic model (SATURN). This uses the traffic demands from MSM on a more detailed representation of the road network.
- A strategic active mode (walk/cycling) model (SAMM). This tool gives strategic-level estimates of walking and cycling demands.

The assessment of operational effects is therefore informed by network performance for a future full-build-out scenario based on the Future Urban Land Supply Strategy (FULSS).

[1] The '2048+' forecast includes the regional growth estimated for the year 2048 but with the addition of full build-out in the greenfield growth areas

A key input to the models is regional land use forecasts, which influence the future quantum and location of travel. Regionally agreed land use forecasts are prepared by Auckland Council via the AFC, with the most recent available forecasts for the year 2048+ (at the time of this assessment), referred to as Scenario I11.6. Those forecasts are based on regional population forecasts from Statistics NZ, with spatial allocation to individual spatial areas based on the AFC's land use model and known detail around specific land use planning processes.

Land use forecasts have inherent uncertainty, in terms of the specific rate of new growth in specific areas. Currently, there is additional uncertainty around the likely outcomes and rate and location of higher-density development sought through central Government policies such as the National Policy Statement on Urban Development (NPS:UD) and Auckland Council's Plan Change 78. A key intent of those policies is to enable higher density development, especially around high-quality public transport systems. The specific planning response to those policies is currently being progressed by Auckland Council, and revised land use forecasts reflecting any expected changes were not available at the time of preparing this assessment. Generally, it is considered that the Pukekohe Transport Network is not inconsistent with such policy direction, regarding supporting higher density urban development via more sustainable travel modes. Given this context, the use of those available I11.6 forecasts is considered acceptable for this assessment. Also, at the time of preparing this document, Auckland Council is developing an updated Future Development Strategy which is currently draft and out for consultation. While there is no material change on the full build out within the Project Area, the document proposes a new timeframe of land development, which sequences land development later than originally proposed in the FULSS.

In addition to the SATURN modelling, SIDRA modelling has been undertaken to assess the operational outputs of key intersections along the project corridors. The regional model (MSM) was used to inform assessment of the public transport network components.

Regarding local traffic modelling analysis used in this report, a Level of Service (LOS) metric has been used. This refers to a qualitative measure used to assess the quality of motor vehicle traffic service. LOS is used to analyse road corridors and intersections by categorising traffic flow and assigning quality levels of traffic based on a performance measure ranging from A to F and can be summarised as follows:

- **LOS A**: free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.
- **LOS B**: reasonably free flow. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted.
- **LOS C**: stable flow, at or near free flow. Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness.
- **LOS D**: approaching unstable flow. Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease.
- **LOS E**: unstable flow, operating at capacity. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit.
- **LOS F**: forced or breakdown flow. Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity.

2.2.2 Transport Guidance and Documents

Within this report, the projects have also been considered against the outcomes and objectives of applicable transport design guidance and policy directives including:

- AT's Transport Design Manual, which sets out outcomes, engineering design and construction requirements for the projects;
- AT's Vision Zero, which adopts a "Safe System" approach to focus on road safety for all road users; and
- AT's Roads and Streets Framework (RASF)[2] was also used to qualitatively assesses the typology (movement and place value) and modal priority for each corridor. A 'mandate' for each road corridor is developed and approved by the Auckland Transport RASF Committee, comprising of senior officers from AT and Auckland Council. These are included in Appendix 1.

2.2.3 Transport Mode Assessment

Table 2-1 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the projects.

Table 2-1: Assessment Methodology for Transport Elements/Modes

Network Component	Information Source	Assessment Method
Safety	• Crash Analysis (CAS) Database • Project design drawings	Assessment to determine alignment with Vision Zero standards, as per Safe Systems approach
Walking and Cycling	• Walking and Cycling Network Plans • Proposed Cross Sections	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual
Public Transport	• Transport Model tools (MSM, SATURN and SIDRA) • SGA Remix File[3]	Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual
General Traffic	• Transport Model tools (MSM, SATURN and SIDRA) • Project design drawings	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections
Property Access	• Engineering Standards	Assessment identifying impacts on the access for existing and planned properties based on proposed corridor design

[2] https://at.govt.nz/about-us/transport-plans-strategies/roads-and-streets-framework/

[3] SGA Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

Network Component	Information Source	Assessment Method
Wider Network Effects	• Transport Model tools (MSM, SATURN and SIDRA)	Assessment to consider how the corridor interacts with the surrounding road network
Note: A Road Safety and Audit and Safe System assessment will be done as part of the implementation business case/detailed design stage prior to implementation.		

2.2.4 Assessment of Project Objectives

Each project in the Pukekohe Transport Network has an identified set of project objectives. From a transport perspective, these objectives are focused predominantly on the themes of supporting growth, safety, urban form, mode shift/choice and resilience. An assessment of these is included in the AEE.

2.3 Approach to Assessment of Construction Transport Effects

2.3.1 Construction Traffic Effects

Given the long-term nature of the projects, it is considered appropriate to use an indicative construction methodology to assess the temporary construction effects for the Pukekohe Transport Network, sufficient to support each of the NoRs.

The impact of any temporary traffic management measures implemented to undertake the projects will be re-assessed in the future, prior to construction, when a greater level of detail is available in terms of the specific construction methodology and traffic environment.

The assessment considers:

- An overview of key considerations including speed, potential impacts to pedestrians and cyclists, residential, recreational and business property access, and on-street / public parking;
- Identification of any works that should not occur at the same time; and
- Assessment of potential conflict areas with vulnerable road users that will need specific mitigation within a Construction Traffic Management Plan (CTMP) and / or Site-Specific Traffic Management Plans (SSTMP).

More detail on the assessment of construction effects is set out in Section 5.2.

3 Existing and Future Receiving Environment

This section describes the existing and future receiving environment without the Project. The subsequent section describes the effect of the Projects on that future receiving environment. Because the existing environment is expected to change significantly (i.e. urbanise), the key focus of this assessment is the future environment, with the existing environment described mostly for context.

3.1 Existing Environment

3.1.1 Land use and Transport Context

The Project Area described in this assessment is situated in the southernmost extent of the Auckland region. The northernmost part of the growth area (Drury West) is around 40km from the Auckland city centre, with the southernmost (Pukekohe south) a further 15km south adjacent to the Waikato boundary. Pukekohe has been identified as a satellite town in the Auckland Plan 2050, acting as a rural node that serves both the surrounding rural communities as well as connecting to urban Auckland.

The current land use surrounding the Project Area primarily consists of low-density residential, industrial, agricultural, and greenfield land. The majority of the land-use in Drury is rural or low-density residential development with some light industrial businesses located in the area. The land-use in Paerata is largely rural future urban zoned land with some live-zoned areas such as Paerata Rise. Pukekohe is a satellite town with a mix of residential, commercial, industrial, and agricultural land. The agricultural sector is a major contributor to the local economy in Pukekohe.

Figure 3-1 shows an image of the current land use environment of the Project Area.

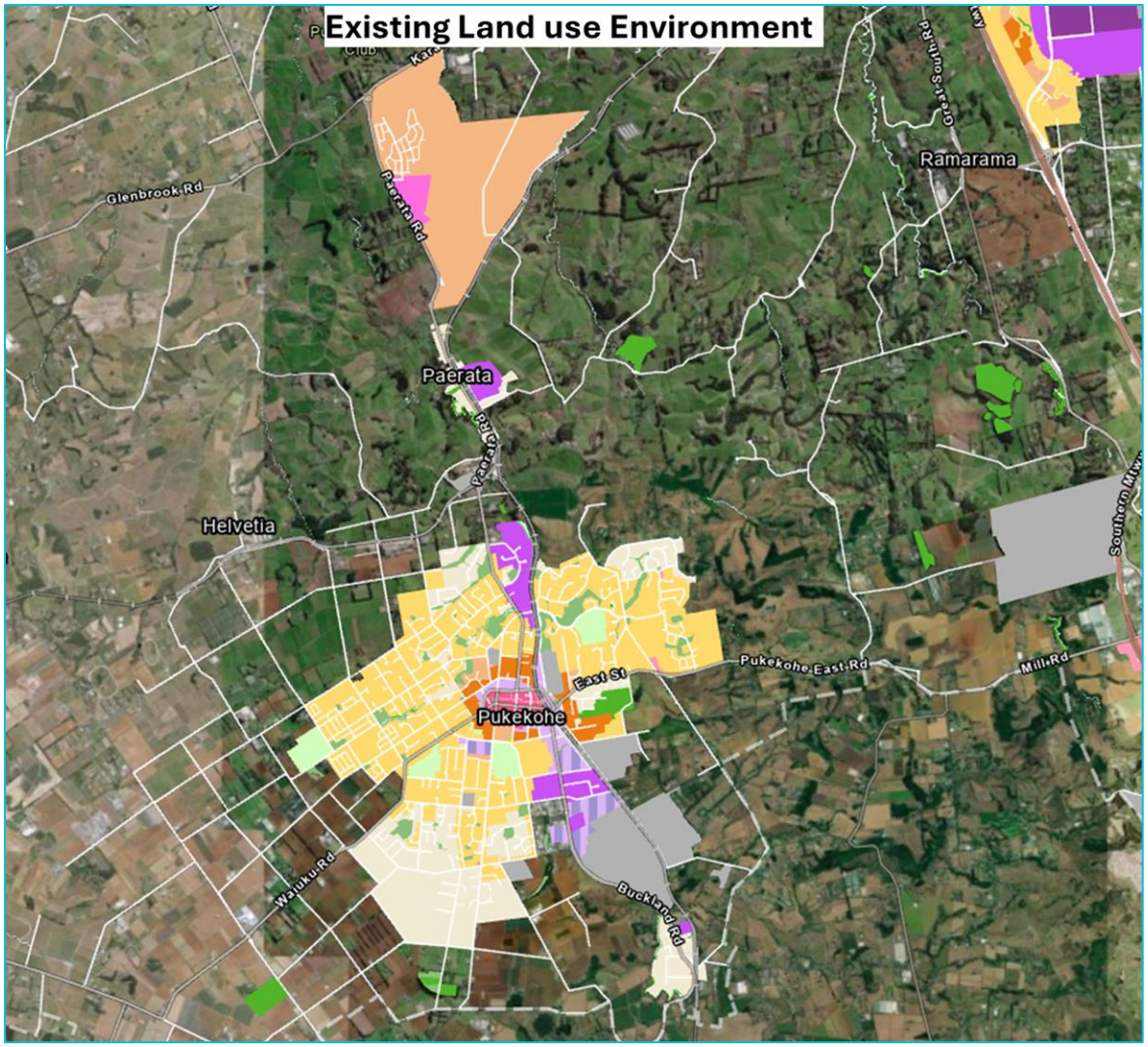


Figure 3-1: Existing land-use in the Project Area

The existing road network in and around the Project Area is shown below in Figure 3-2. The area comprises of strategic, urban and rural corridors, which serve different functions within the wider network.

The strategic corridors are SH1, SH22, Mill Road (Bombay) and Pukekohe East Road. Whilst SH1 and SH22 provide the primary north-south connection, Mill Road (Bombay) and Pukekohe East Road traverse east-west with key interfaces with the North Waikato boundary and provide access to SH1 and the wider North Waikato. These are high-volume inter-regional corridors with higher speed limit of 75-100kph. They disperse traffic on to arterial and collector roads via interchange connections and have a high general traffic and freight function. Most of these corridors have limited walking, cycling and public transport facilities.

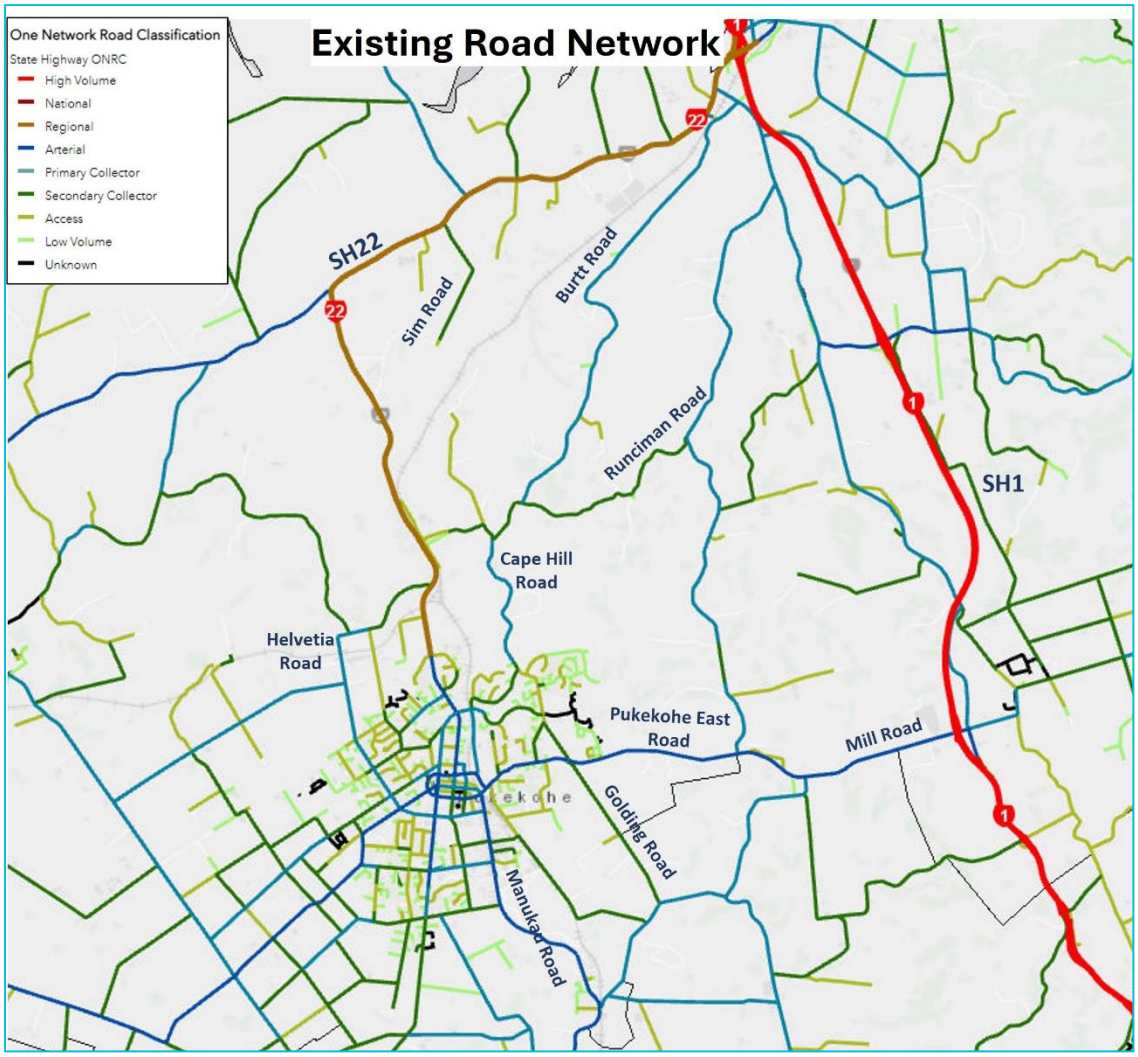


Figure 3-2: Existing Road Network in the Project Area

The urban areas of Pukekohe are served by a number of arterial roads such as Manukau Road, Queens Street, Puni Road, and West Street which have speed limits of 40-60kph and serve the local centres and key destinations in urban areas. They have a multi-modal function with some serviced by bus routes. Walking and cycling facilities are present on some sections, but not necessarily of adequate standards. The primary collectors such as Cape Hill Road, Helvetia Road and Nelson Street serve as secondary order networks connecting neighbourhoods to commercial centres. Some of these routes are overweight and over-dimension to support the access of freight delivery trucks around Pukekohe.

The rural corridors consist of primary and secondary collectors such as Burtt Road, Runciman Road, Great South Road, Sim Road and Cape Hill Road. Given the rural environment adjacent to the corridors, they have high speeds of 60-80kph, primarily without road markings or sealed shoulders. These corridors have a general traffic and occasional freight function.

3.1.2 Road Safety

The crash history of the Project Area has been obtained from CAS to provide a high-level understanding of crash patterns and safety concerns on the existing networks. The crash data has been extracted for a ten-year period from January 2012 to December 2022 (inclusive) on a selection

of routes which are deemed to have a large area of influence in the Drury, Paerata and Pukekohe Area and connect similar areas to those of the proposed network. This crash data has been obtained and analysed on selected routes to set a scene by providing insight into the existing safety conditions, as well as providing qualitative evidence to support the need for change. Figure 3-3 below shows the indicative crash location of fatal and serious injury crashes during this time period.

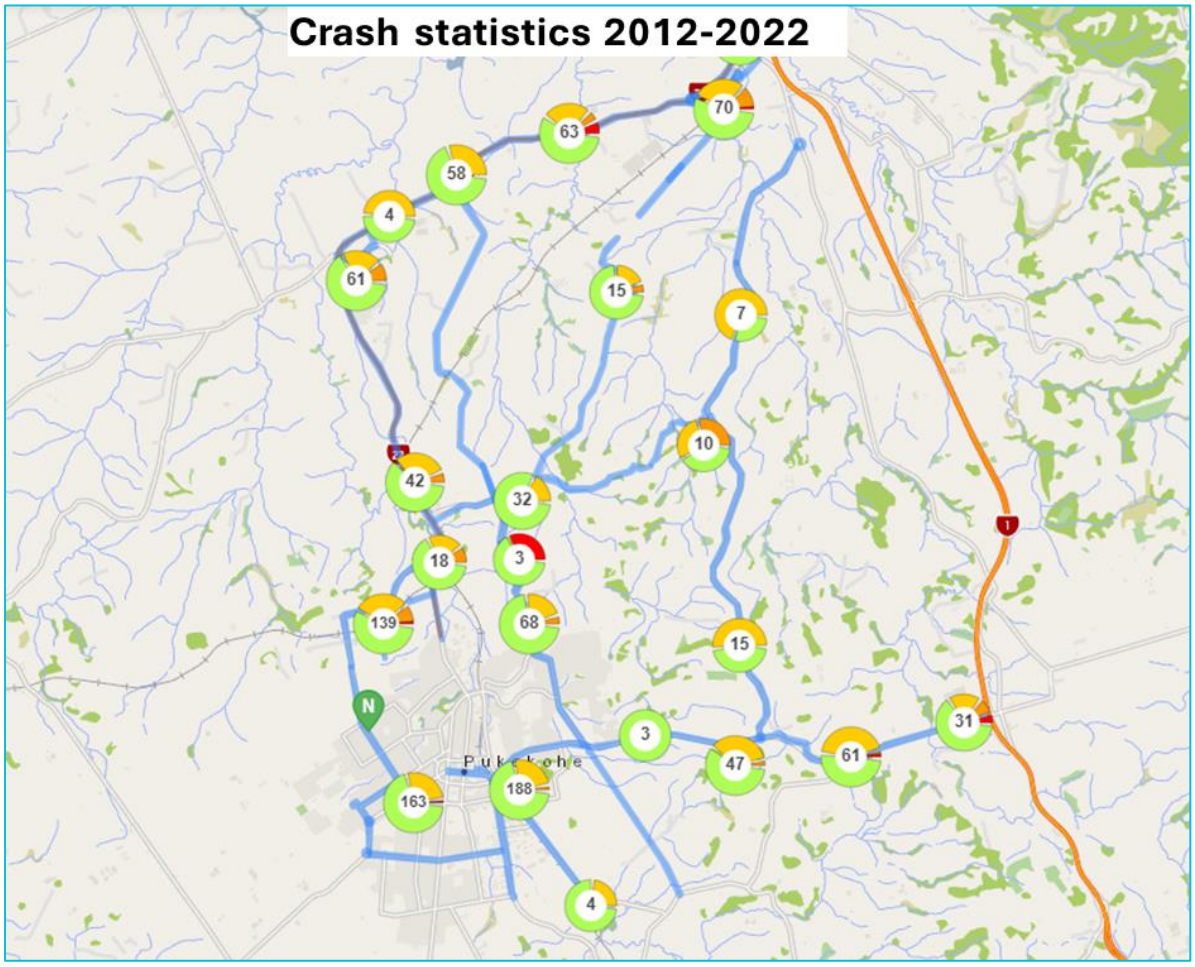


Figure 3-3 Crash locations within the Project Area

The crash history shows a total of 83 fatal and serious injury crashes in the ten-year period (between 2012-2022), which is approximately 7% of the total crashes. Vulnerable road user (i.e., pedestrian, cyclists and motorcycle) crashes amount to approximately 6% of the total crashes within the area. The crash statistics are summarised in Table 3-1 and Table 3-2.

Table 3-1: Total Crash Statistics (2012 - 2022)

Crash Statistics in the Project Area (period 2012-2022) by Severity	
Fatal	14
Serious	69
Minor-injury	319
Non-injury	723

Crash Statistics in the Project Area (period 2012-2022) by Severity	
Total	**1125**

Table 3-2: Crash Statistics Road User Type (2012 - 2022)

Vulnerable road user Crash Statistics in the Project Area (period 2012-2022)	
Cyclist crashes	8
Pedestrian crashes	27
Motorcycle crashes	33
All other crashes	1061
Total	**1125**

In addition, Figure 3-4 below also shows that various corridors within the Drury-West, Paerata and Pukekohe areas have been identified in AT's Future Connect, a the long-term network plan for Auckland's transport system that identifies the most important parts of the transport network, as well as the most critical issues and opportunities. As seen below, these corridors have been categorised as medium to high-risk corridors in AT Future Connect Safety Deficiency indicators which includes Urban KiwiRAP collective risk, active road user aggregated corridor risk and the difference between posted and safe speed. These corridors have a range of deficiencies, with infrastructure insufficient to meet the expected growth and demand.

While the crash statistics sample used (period 2012-2022) is deemed representative, it should be noted that Auckland Transport and Waka Kotahi have reduced speed limits on many roads in the area over the 2020-2023 period. Speed limit reduction has a notable reduction on crash severity and frequency, therefore these sample may not be fully recognising the reduction in collisions as a result of this programme.

It should also be noted that the performance of safety presented above does not represent a future context, however as the planned future growth will increase trips significantly across the Project Area, it is inevitable that without intervention, this will have a negative impact on safety. Details on the future context for safety are detailed in Section 3.2.2 (future receiving environment, without Project) and Section 5.1.1 (assessment of operational effects, with Project).

The lack of safe rail crossings within the Project Area inherently poses a safety risk for all road users. The existing unsafe level crossings at Crown Road, Tuhimata Road and Heights Road do not meet current design standards and have a history of crashes, therefore limiting access to the communities, resulting in unsafe and poor integration outcomes.

The level crossing crashes are generally low in frequency, given the semi-rural environment adjacent to them, but have severe consequences, therefore the potential risk should not just be assessed based on recorded incidents.

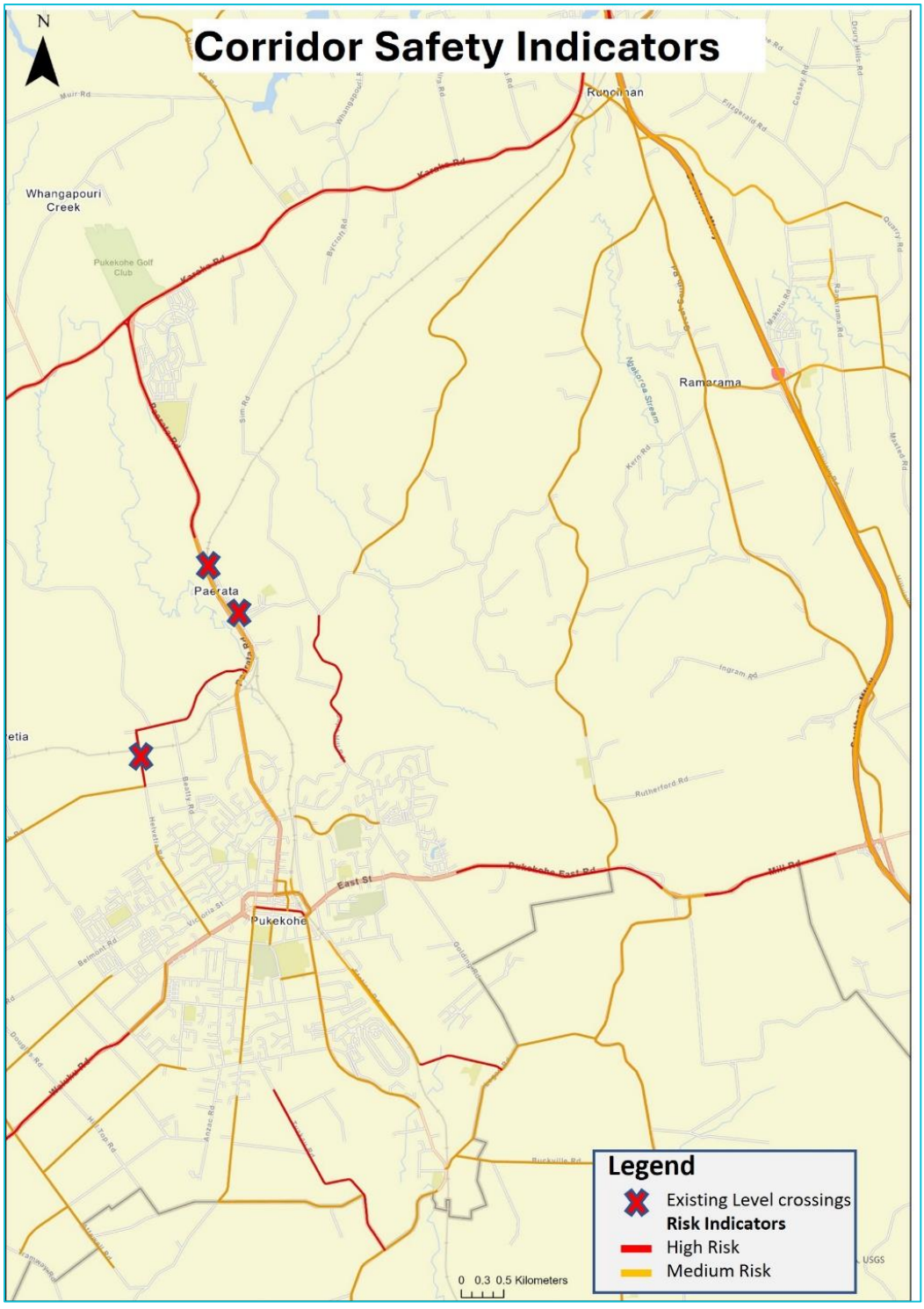


Figure 3-4: Corridor Deficiency and Safety Indicators (AT Future Connect)

Figure 3-5 below shows the current speed limits on the existing roads within the Project Area. Apart from a few urban roads in the Pukekohe area, most of the roads have a speed of 60-80kph. The AT's safe speeds programme is initiating speed reduction in most of Auckland's urban areas, including high-risk urban and rural roads. This is being implemented in three phases from 2020-2023, primarily around schools and active communities.

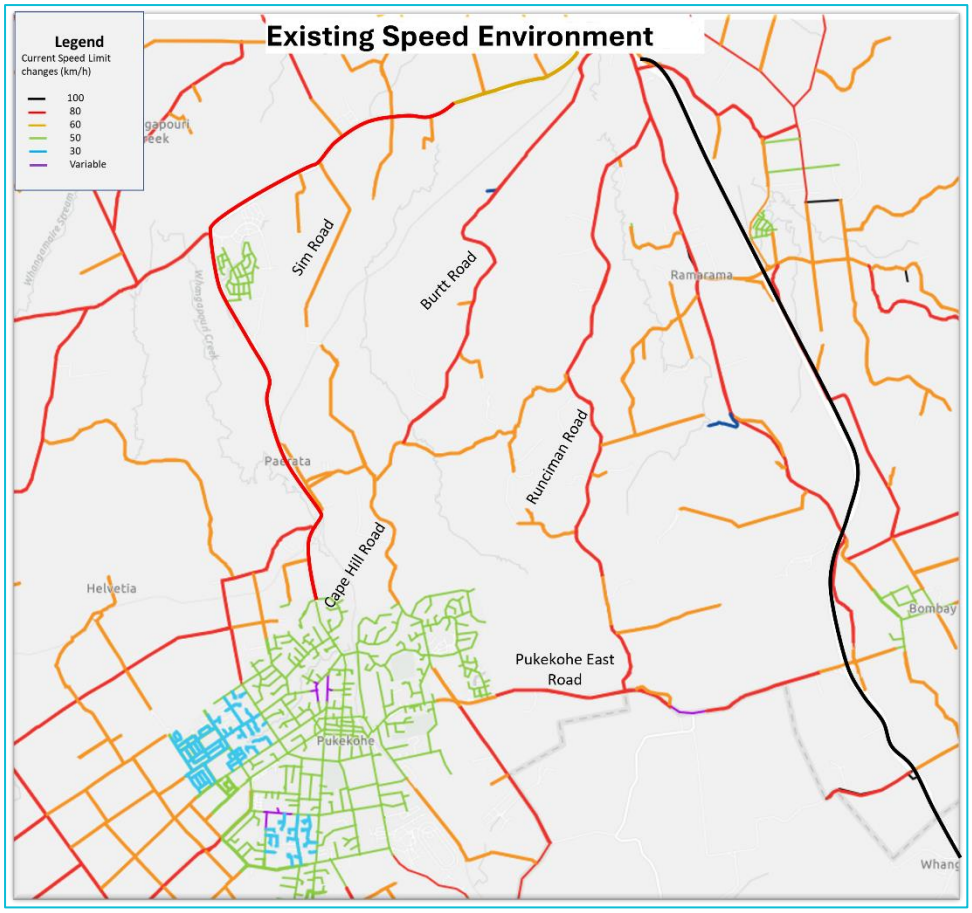


Figure 3-5: Existing Speed Environment (Source: Auckland Transport GIS Data)

Safety risks on the strategic roads are largely due to high speed and high volume of through traffic, the lack of separation of oncoming traffic, turning movements and the absence of protection for more vulnerable road users such as pedestrians and cyclists.

Table 3-3 below details the crash causes, showing that over a third of crashes occurred on bends with vehicles head-on colliding or losing control, while crossings and turnings accounted for a further quarter of crashes.

Table 3-3: Collision Causes

Crash Cause	Crash Numbers	% All Crashes
Bend – lost control / head on	415	36.89%
Crossing / turning	280	24.89%
Read end / obstruction	216	19.2%
Straight road lost control / head on	138	12.27%
Overtaking	45	4%
Pedestrian	24	2.13%
Miscellaneous	7	0.62%
Total	1,125	100%

The urban roads which have a lower speed environment conversely have more multi-modal conflicts between users along corridors and at intersections.

The existing rural roads are majorly windy with high-speed which presents an increased risk of crashes for all road users. Although roads in the greenfield areas have a low volume of traffic and a low demand for active modes, the severity of the crashes can be significant due to limited visibility, uncontrolled intersection types, absence of facilities for vulnerable road users and substandard geometry. Also, when the strategic networks are congested these corridors are often used as alternative routes which further increases risk.

In summary, the existing transport environment in the Project Area has a significant amount of safety deficiencies across the strategic, urban and rural corridors.

3.1.3 Walking and Cycling

The existing walking facilities in the Project area are shown below in Figure 3-6 (left). The walking facilities are mostly in the built-up areas in Pukekohe and Paerata Rise with limited to no walking facilities in Drury. In addition, where walking facilities exist, these often are insufficient to support future growth and the associated pedestrian demand. Figure 3-6 shows the gaps in the walking network, which will inhibit future active trips as the area develops.

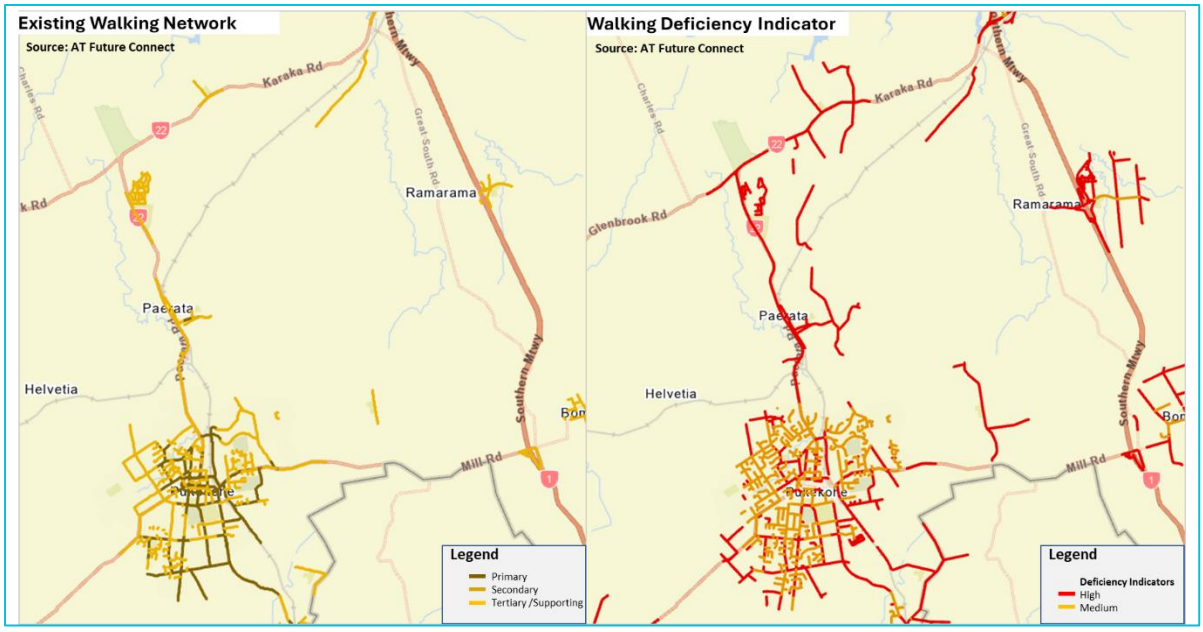


Figure 3-6: Existing Walking Network and Deficiency Indicators (Source: AT Future Connect)

The existing cycling facilities in Pukekohe, Paerata and Drury West are shown below in Figure 3-7. Although most of the walking infrastructure in the Project Area is concentrated around built-up areas, there are limited to no safe cycling facilities. The lack of a safe and connected cycleway network across Pukekohe, Paerata and Drury West creates an unsafe and hostile environment for active mode users and motorists sharing the corridor.

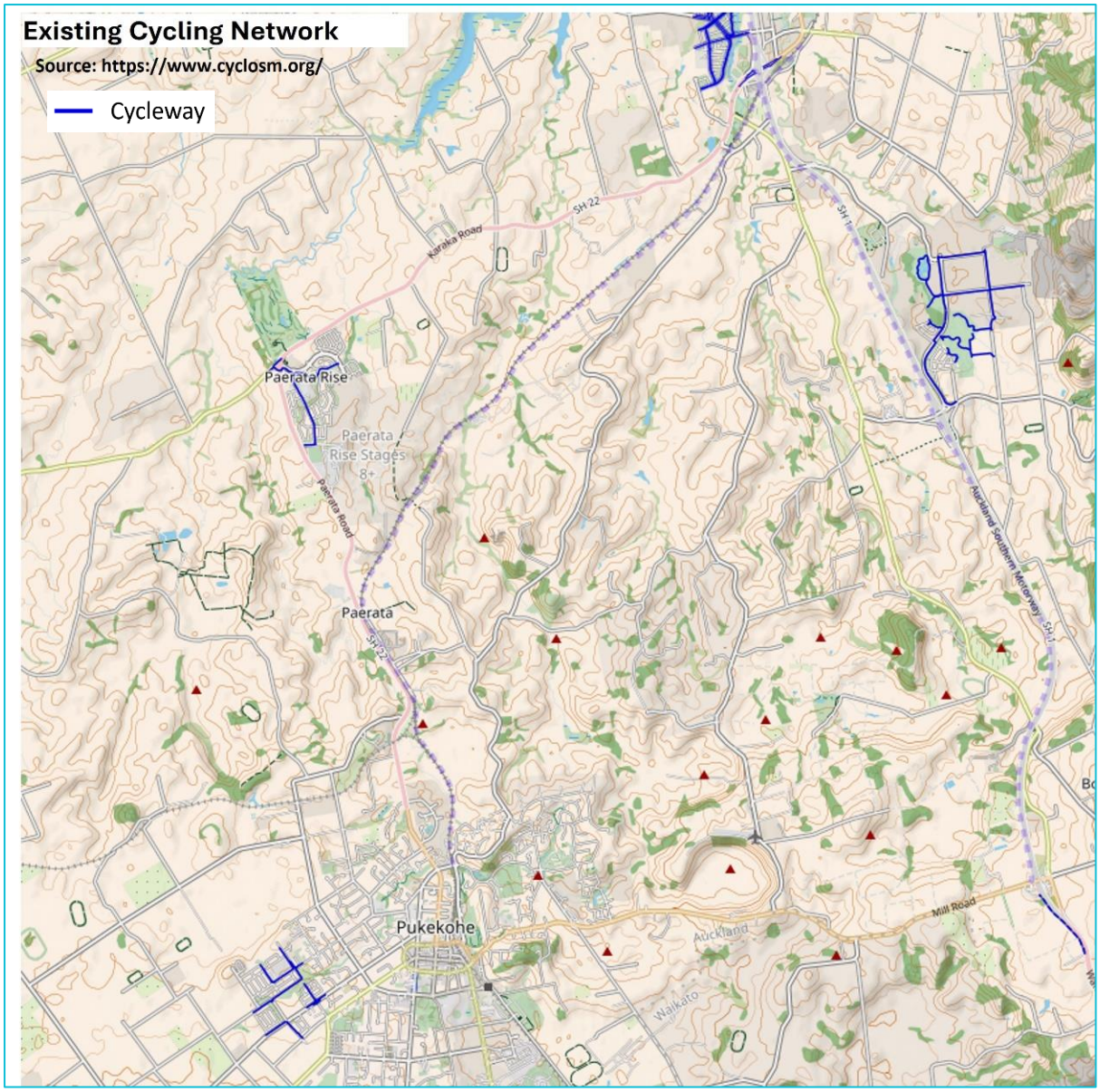


Figure 3-7: Terrain Map showing Existing Cycling Network

In summary, the existing environment already has significant walking and cycling deficiencies across Pukekohe, Paerata and Drury West. There is a notable lack of infrastructure within existing urban areas that restricts access to social and employment opportunities and contributes to the lack of transport choice and over-reliance on motor vehicles.

3.1.4 Public Transport

There are limited public transport options in Pukekohe, Paerata and Drury West. The majority of services are in Pukekohe with some connections to Paerata as shown in Figure 3-8.

The public transport options currently servicing the study area include a commuter railway station in Pukekohe connecting to Auckland CBD and several bus services which are detailed in Table 3-4.

Table 3-4: Bus Services Operational

Service	Route	Classification	Days of Operation	Frequency
394	Pukekohe – Paerata – Glenbrook	Local	Everyday	15-20 mins
391	Loop around Pukekohe town areas	Local	Everyday	20-30 mins
392		Local	Everyday	20-30 mins
393		Local	Everyday	20-30 mins
396	Pukekohe – Patumahoe	Local	Everyday	4 per day
399	Pukekohe – Tuakau – Buckland	Local	Thursdays only	2 per day
21	Pukekohe – Hamilton	Regional	Monday – Friday	1 per day
44	Pukekohe - Pokeno	Regional	Everyday	1 per hour (weekdays), 1 every 2 hours (weekends)

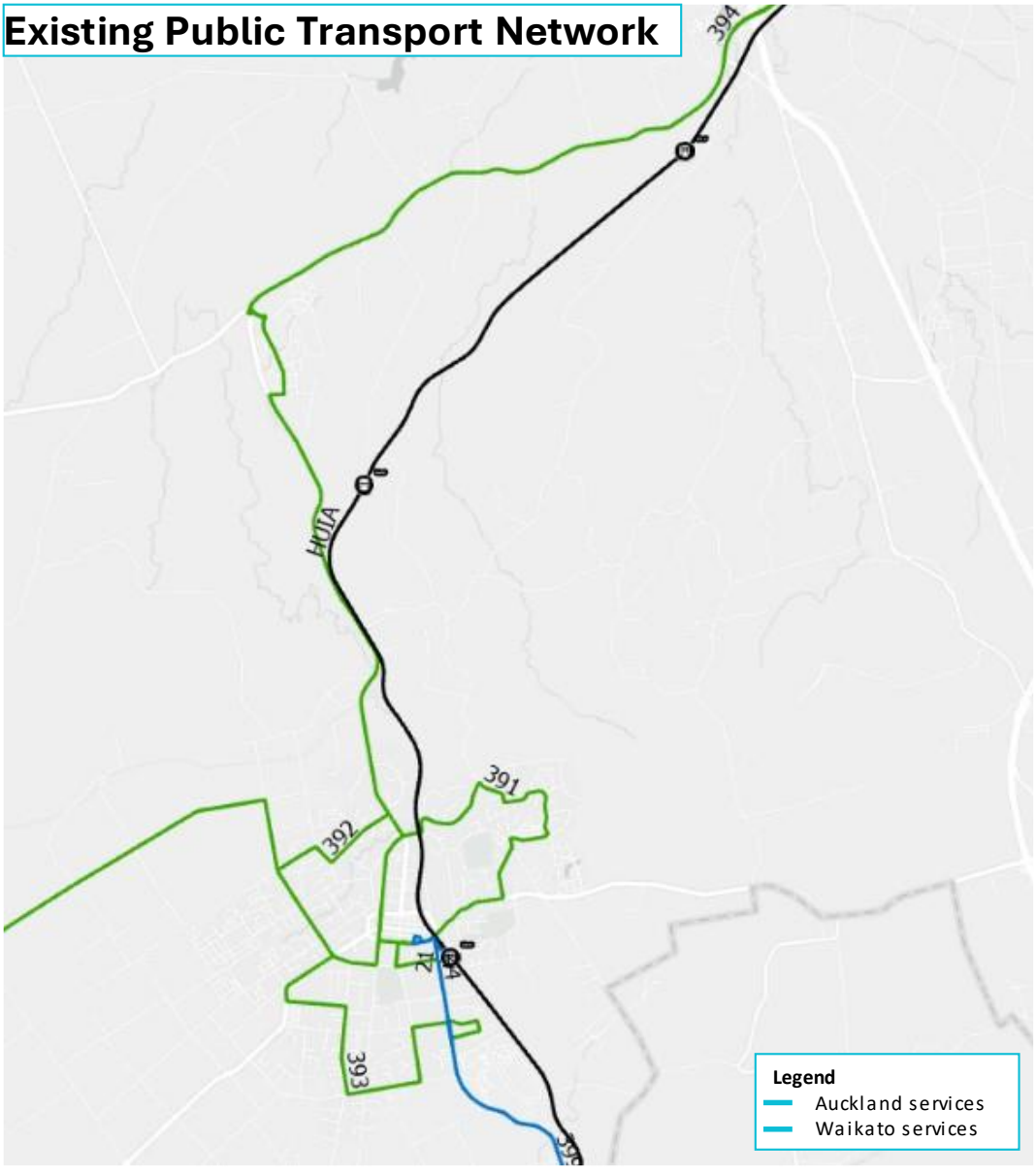


Figure 3-8: Existing Public Transport Network in the Project Area

Most existing roads and roadside facilities in Drury West, Paerata and Pukekohe have limited public transport facilities and services. Some carriageway widths are not suitable to service public transport adequately. Currently, there is only one commuter railway station in Pukekohe servicing the entire region.

3.1.5 General Traffic and Freight

The current Drury West, Paerata and Pukekohe road network is largely rural in nature beyond suburban Pukekohe. The traffic on the strategic corridors is on the higher scale during commuter peaks. It often leads to traffic delays, shifting traffic on to unsafe rural roads. The SH22 to SH1 at Drury Interchange is a 2-lane high speed rural highway with no median and limited verge width. It is the only strategic corridor connecting Drury West, Paerata and Pukekohe. Pukekohe East Road and Mill Road provide the southern connection to SH1 at Bombay. This connection is another high-speed rural road connecting Pukekohe and nearby local centres.

As shown in the table below, traffic volumes from these roads were obtained from Mobile Road in April 2023, using the latest data available at the time of this assessment. The volumes are collected from the State Highway New Zealand database and Auckland Council databases. Table 3-5 summarises current road classifications, average daily traffic (ADT) and percentage of heavy vehicles on each road.

Table 3-5: Existing Traffic Data

Road Name	Classification	Count Year	5 Day ADT	%HCV
SH1	High Volume State Highway	2021	45,500	14
SH22	Regional State Highway	2021	24,400	6
Pukekohe East Road and Mill Road	Arterial	2023	15,000-20,000	9-13
Manukau Road	Arterial	2023	15,000	11
Queen Street	Arterial	2023	8,000	5
Puni/West Road	Arterial	2023	8,500	9
Burtt Road	Primary Collector	2023	2,400	11
Runciman Road	Primary Collector	2023	1,400	16
Great South Road	Primary Collector	2023	2,500	13
Cape Hill Road	Primary Collector	2023	4,600	11
Nelson Street	Primary Collector	2023	5,000	8
Helvetia Road	Primary Collector	2023	5,600	7
Sim Road	Secondary Collector	2023	800	10
Golding Road	Secondary Collector	2023	200	13

Overall, the following conclusions can be made regarding the existing general traffic conditions:

Strategic Corridors:

- SH1 is a key 4-lane north-south regional corridor which operates at higher speeds. Given the significant extent of the corridor, it transports inter- and intra-regional traffic, operating at capacity in peak hours, often with extensive delays.
- SH22 is a 2-lane high-speed rural highway with no median and limited verge width. It supports traffic from Northern Pukekohe, Paerata and western regions such as Glenbrook and Waiuku to access Drury and further north. Given the adjacent rural environment and the limited alternative options, the SH22 corridor experiences lengths of congested sections during commuter peaks and uninterrupted flows during off-peaks. It also serves as major freight connection to rural centres in and around Pukekohe.
- The Pukekohe East Road and Mill Road provide the rural-urban connection from SH1 to Pukekohe and hinterland. It is a high-speed arterial road with some congested lengths near the Bombay Interchange ramps and towards the Pukekohe town centres where it meets the traffic from the north via SH22 and Cape Hill Road.

Urban Corridors:

- The Project Area has predominantly rural transport networks with scarce walking and cycling facilities and high-speed environments. However, the built-up areas of Pukekohe have urban corridors with kerb shoulders and walking facilities on limited sections. The speed conditions of 30-50kph are commensurate with the surrounding land use.
- The arterial roads such as Manukau Road, Queens Street, Puni/West Road are primary north-south corridors that serve local centres and key destinations. They are moderately congested during peak periods and often shift the traffic onto collectors.
- The existing traffic volumes on primary collectors such as Cape Hill Road and Helvetia Road are relatively low, except for some intersection delays during peak traffic. Most intersections on these corridors are uncontrolled thereby not supporting active mode users' safety.
- The primary collectors on Nelson Street and Ward Street provide the major east-west connectivity and have high existing volumes. They service inter-regional corridors such as Puni Road from south-west and Buckland Road from south-east Pukekohe areas.

Rural Corridors:

- Burtt Road, Runciman Road and Great South Road are 2-lane primary collectors, with unsealed shoulders and a posted speed of 80kph. Although they operate at lower demands, when the strategic corridors get too congested traffic shifts onto these rural corridors given that it is the only alternative north-south options. Most of the rural intersections are uncontrolled across most of the Project area.
- The Sim Road is a 2-lane secondary collector to Paerata Rise (live-zoned development). They currently operate at lower demands due to the absence of a through function across the rail line.
- Cape Hill Road is a 2-lane primary collector with unsealed shoulders and 60kph posted speed. They operate at low demands and are relatively uncongested.

Freight

Freight is a key enabler of economic activity, responsible for the movement of goods and services that are produced, purchased, consumed, exported, imported or discarded. Freight vehicles include heavy

commercial vehicles (HCVs) and light commercial vehicles (LCVs). Freight infrastructure in the study area comprises both roads and rail.

AT's Regional Freight Network identifies key freight attracting/generating areas, and key road freight routes region-wide. The wider study area contains a number of areas classified as minor freight generating/attracting areas (including future areas) such as Drury Quarry, Glenbrook Steel Mill, Bombay Quarry, Drury South Industrial area, Waiuku and future Pukekohe Industrial areas.

The key freight routes in South Auckland include:

- SH1 Southern Motorway (classified as a level 1A route);
- SH22 Karaka Road and Paerata Road (classified as a level 1B route);
- Pukekohe East Road (classified as a level 1B route);
- Glenbrook Road (classified as a level 1B route);
- Quarry Road (classified as a level 2 route); and
- Great South Road between Papakura and Drury (classified as a level 3 route).

Boundary Road and Hunua Road (classified as a level 3 route). Over-Dimension Routes include the following routes:

- SH1 between Drury and Bombay;
- Great South Road;
- SH22 Karaka Road and Paerata Road;
- Glenbrook Road;
- Nelson Street/Ward Street;
- Queen Street; and
- Waiuku Road.

Freight moves primarily on state highways, motorways and arterial networks; this is true for the Pukekohe area where SH1 and SH22 act as key freight routes for existing industrial areas and local growers. However, freight movements also make up a substantial proportion of travel on local roads, especially true for trade and delivery services.

Apart from these strategic routes, there are rural freight networks which serve the local growers and warehouses in the southern, western and south-western areas of Pukekohe, very close to the Waikato boundary. **Error! Reference source not found.** below shows the observed volume of trucks (where the circle size is proportional to the number of trucks counted) and indicates the existing freight pattern in the wider Pukekohe area. The rural freight routes are critical to connecting local growers to commercial centres and shopping centres. They enable freight delivery trucks without relying on strategic corridors. Some of the common routes include:

- Buckland and Tuakau Road serving the southern areas of Pukekohe;
- West Street and Waiuku Road from south-west area of Puni; and
- Patumahoe Road and Gun Club Road serving western regions of Manukau and Patumahoe.

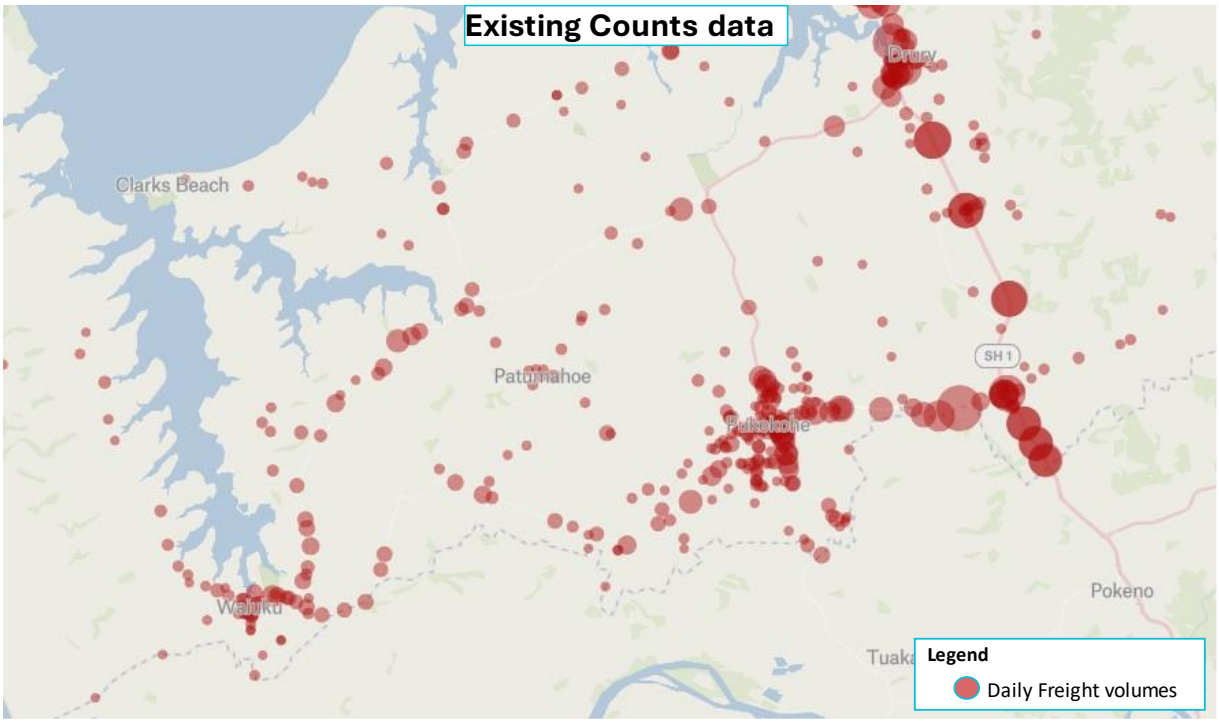


Figure 3-9: Existing Freight Volumes in and around Pukekohe

The existing freight routes such as SH22, SH1 and Pukekohe East Road carry the majority of freight movements due to their strategic connectivity to higher order networks, as well as their design along midblocks and intersections providing for safe freight access. As per AT Future Connect, transport corridors of higher freight movement (Level 2 and above) should not have high conflicting land uses (i.e., urban environment). See **Error! Reference source not found.** below for the existing freight routes around Pukekohe.

Additionally, there are some Overweight and Over-Dimension freight routes which act as supporting freight connections to the existing routes. In general, network impacts from freight movements can be summarised as follows:

- During commuter peaks, freight trucks tend to use local or collector roads to avoid congestion. This will lead to additional pressure on local roads and trigger safety concerns.
- Loading zones in urban areas have a high occupancy and often lead to delayed deliveries, forcing them to use surrounding roads, causing disruption and safety issues for other road users.
- Most of the roads in urban areas have competing demands, creating conflicts for freight which require specific design and space consideration.

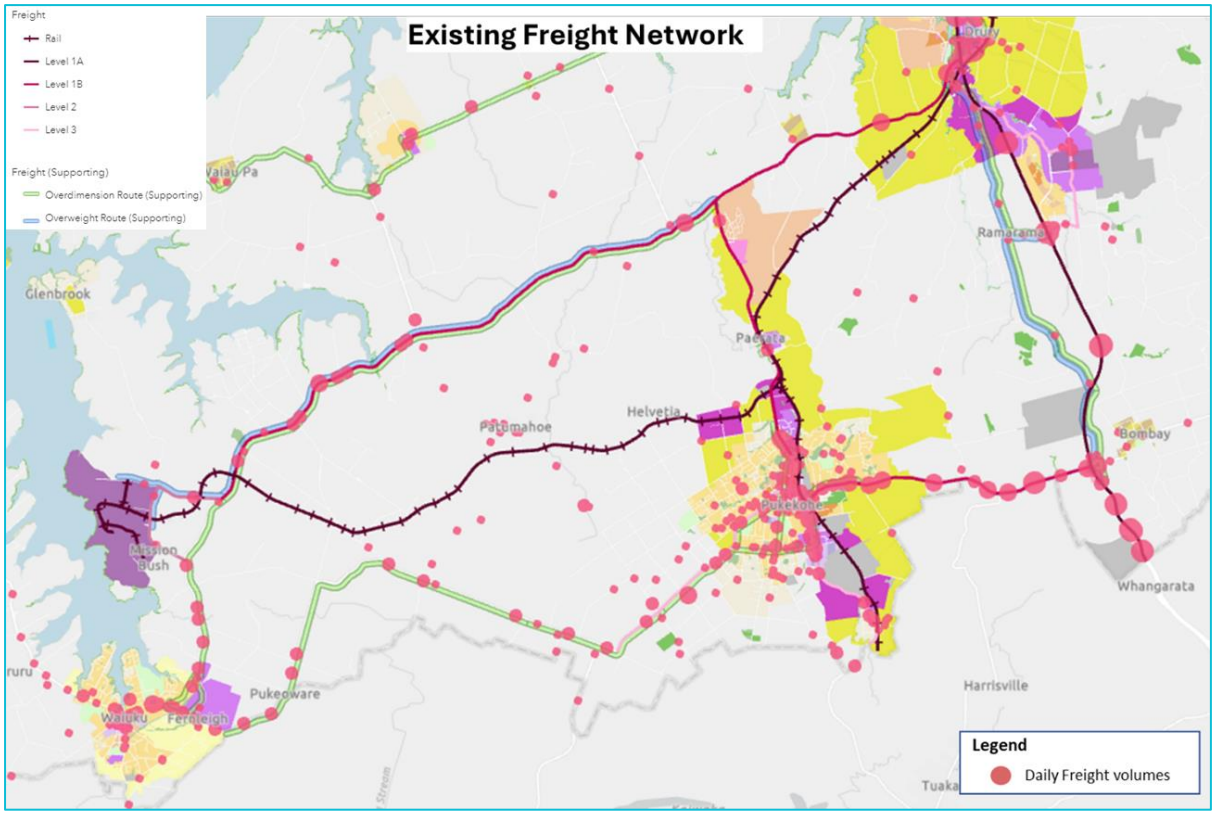


Figure 3-10: Existing Freight Network and Volumes

Road freight routes are organised according to a tiered hierarchy. These are as follows:

- **Level 1A:** Transport corridors of the highest strategic value to freight movement, including Railways, Motorways and most State Highways, and Arterials where efficient freight movements must be actively supported to maintain Levels of Service through active planning and design.
- **Level 1B:** Roads of the highest strategic value to freight movement being arterials where efficient freight movements must be actively supported to maintain Levels of Service, where completing modes and land uses require active management.
- **Level 2:** Local freight networks within strategic freight areas where there are no competing land-use demands. Planning and design should consider the efficiency of freight movements.
- **Level 3:** Freight networks connecting to / between strategic freight areas where planning and design should consider the efficient movement of freight, noting that land uses adjacent to the road are such that the impacts of freight movement require active management.

3.1.6 Property Access

Existing properties adjacent to the Project area have direct access to the road network via driveways, accessways or unsignalised intersections. Given the current low-density land use and the low traffic environment, property access/egress turn exposure is expected to be low. However, the high-speed environment on corridors does present a safety concern to existing properties with direct access.

3.2 Future Receiving Environment (without the Pukekohe Transport Network)

This section describes the future receiving environment with the expected planned growth and development, but without the proposed Pukekohe Transport Network in place.

3.2.1 Land use and Transport Context

The wider Drury, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the Auckland Unitary Plan: Operative in Part (AUP:OP) and the Council approved Structure Plans (2019) and recent private plan changes to live-zone these areas for residential development.

The Drury-Ōpāheke structure plan area shown in Figure 3-11 is estimated to provide approximately 22,000 houses and 12,000 jobs with a population growth of approximately 60,000 over a 30-year period.

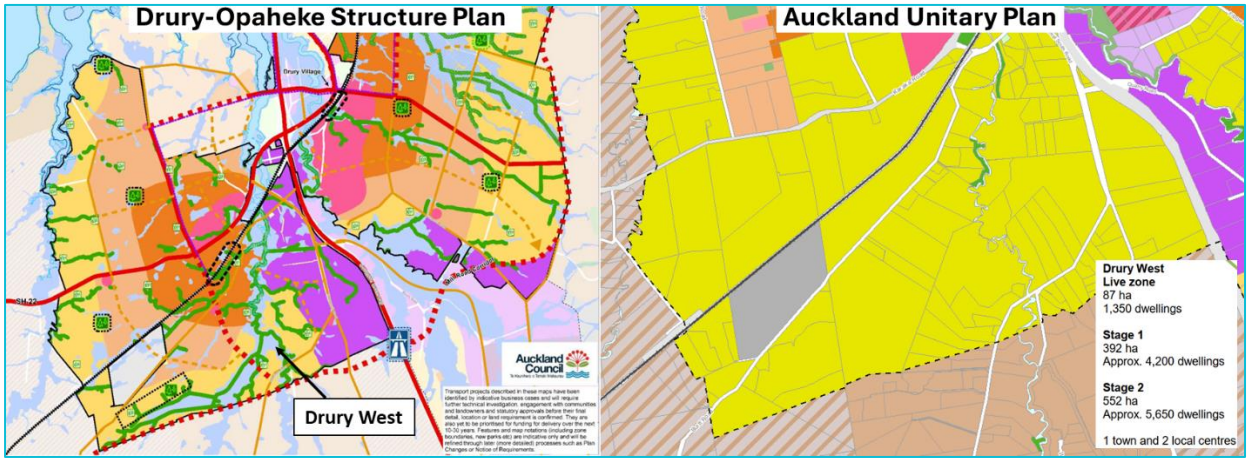


Figure 3-11: Future Land-use context Drury West

The Pukekohe-Paerata structure plan shown in Figure 3-12 is estimated to provide for approximately 55,000 additional people to the existing population of around 31,000. The new growth areas will also potentially provide approximately 9,000 additional jobs.

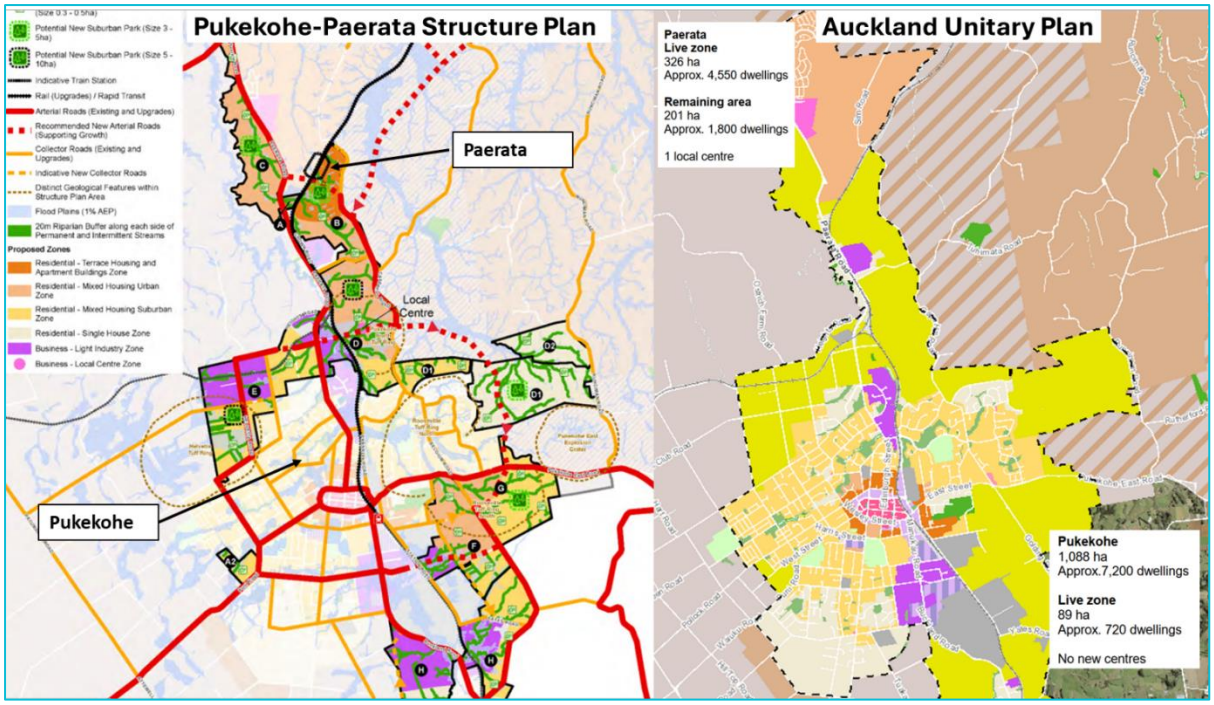


Figure 3-12: Future Land-use context Paerata Pukekohe

The proposed future urban areas in Pukekohe, Paerata and Drury have been signalled to transition from rural to urban including a proposed a town centre in Drury, terraced housing and apartment buildings (in particular around proposed rail stations), mixed urban housing, single house zoning, mixed suburban housing and light industry. A number of developers are seeking private plan changes to rezone the land within the project area. The proposed land use sought by developers is generally consistent with that of the Structure Plans.

Within current residential zones and land adjacent to rapid transit stops, greater intensification is anticipated in line recent policy changes including the introduction of the National Policy Statement for Urban Development (NPS:UD) and Medium Density Residential Standards (MDRS). The intention of the MDRS is to enable housing choice in main urban areas. Auckland Council has actioned this through Plan Change 78 (PC78). We note that the purpose of the NoRs is advanced route protection, and not to address all safety issues on the existing network. As such this information is provided for the purpose of setting the scene for the existing transport environment. For the Pukekohe Town Centre, much of the residential zoned land is proposed to change from Mixed Housing – Suburban zone to Mixed Housing – Urban zone, with residential sites located closest to the Pukekohe Train Station being changed from Mixed Housing – Urban and Mixed Housing – Suburban to Terrace Housing and Apartment Building zone as part of the proposed changes as per PC78 are shown below in Figure 3-13.

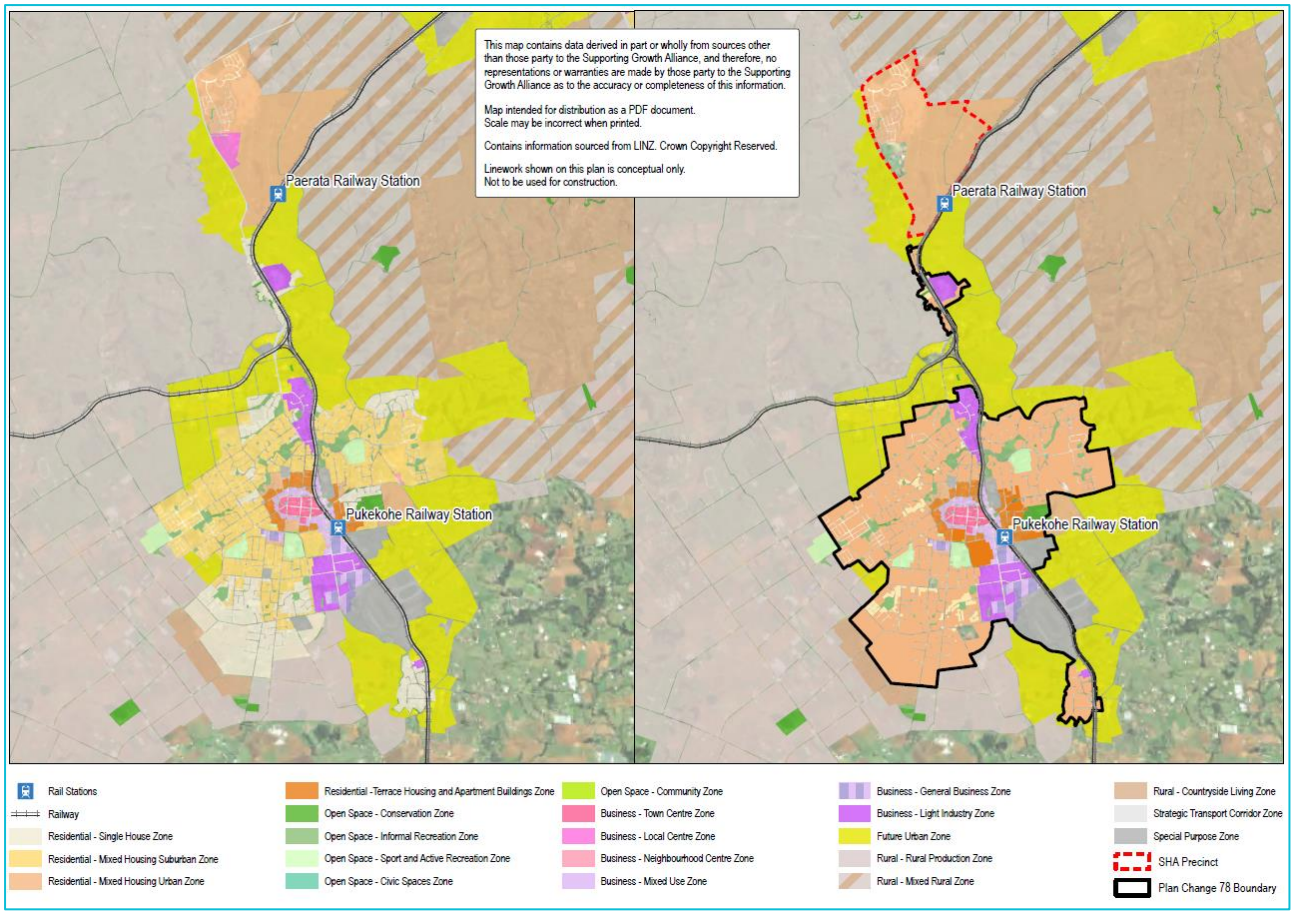


Figure 3-13: PC 78 - Changes to zoning

At the time of preparing this document, Auckland Council is developing an updated Future Development Strategy which is currently draft and out for consultation. While there is no material change on the full build out within the Project Area, the document proposes a new timeframe of land development, which sequences land development later than originally proposed in the FULSS. If the land development pattern follows the Future Development Strategy or later, it is likely that projects will be deferred until urbanisation occurs. Conversely, if land development accelerates earlier than anticipated in FULSS the projects will be needed earlier. The Future Development Strategy is expected to be finalised and adopted by Auckland Council in late 2023.

From a transport investment perspective, there are also a range of different future transport projects proposed in the southern growth areas as shown in Figure 3-14 to support the wider southern Auckland region.

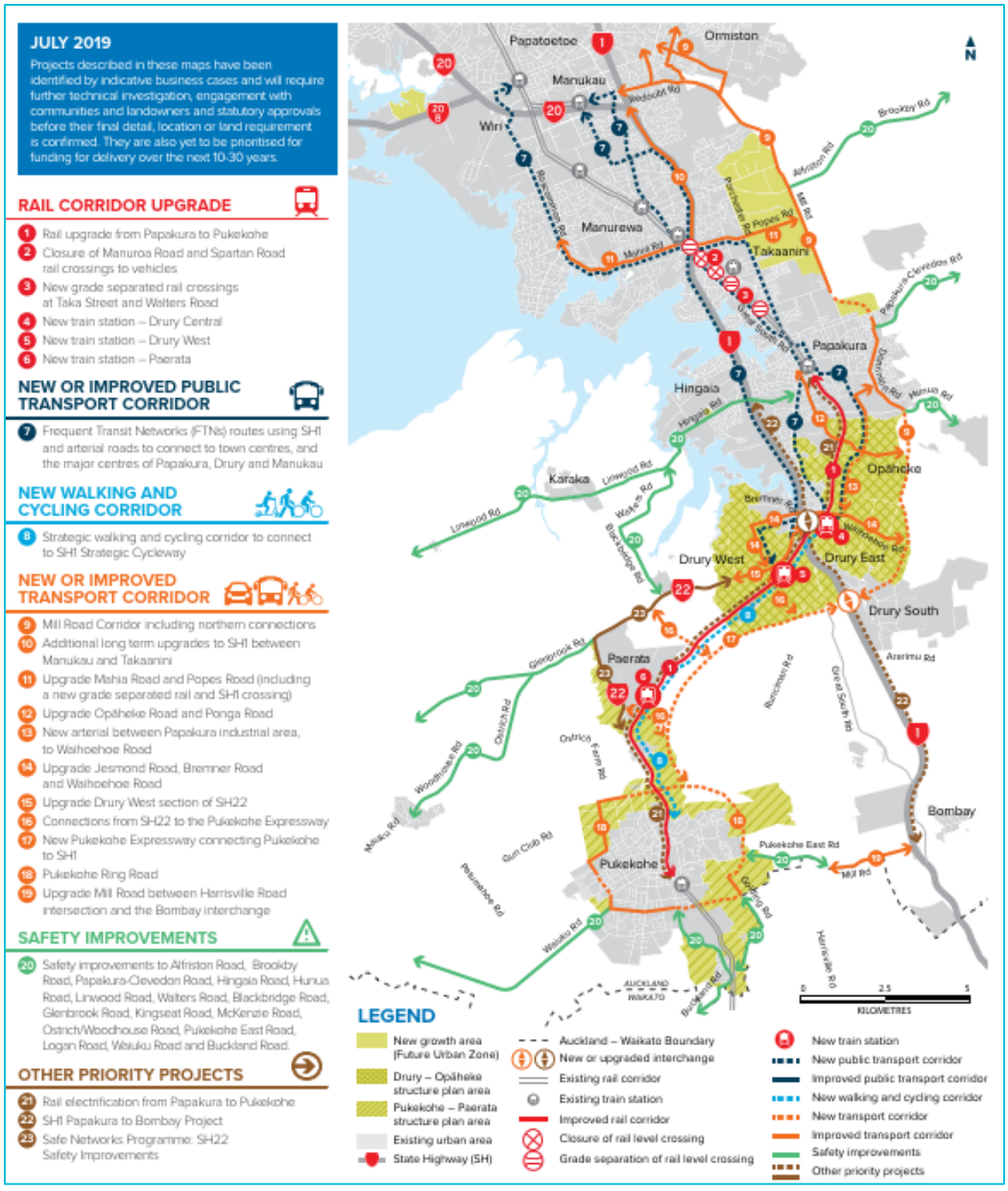


Figure 3-14: South Indicative Business Case Indicative Strategic Transport Network

The transport projects with a notable interface with the Pukekohe, Paerata and Drury are:

- New rail stations at Drury Central, Drury West and Paerata and associated park and ride facilities. As per the Rail DBC, these rail upgrades are anticipated to increase rail mode share to 22% (all South AM peak trips northbound) and active mode share to 16%*
- Additional rail capacity between Pukekohe and Papakura (4-tracking, electrification, and associated grade separations at road/rail crossings)**
- Manukau to Takaanini Access and Safety Project – 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 SH1 in Drury South**
- Regional Active Mode Corridor – a north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH1 and NIMT***
- The SH1 Papakura to Bombay project, which includes an upgrade to the existing Drury interchange, constructing and new interchange in Drury South, and upgrade of the existing

Bombay Interchange, adding additional general traffic lane capacity in each direction and an active mode facility**

- The Safe Network Programme is in the funding application process for short-term safety improvements on SH22***
- Upgrades on SH22 between SH1 and Jesmond Road (four-laning and dedicated signalised intersection at both Great South Road/SH22 and Jesmond Road/SH22 intersections) funded by the New Zealand Upgrade Programme (NZUP). These upgrades are proposed to improve safety, amenity and capacity along part of SH22 to support urbanisation*
- Drury Arterial Network including the rest of SH22 in the Future Urban Zone (FUZ) (Jesmond Road to west of Oira Road), Jesmond to Waihoehoe West Frequent Transit Network (FTN), a new transport corridor between Ōpāheke and Papakura (Ōpāheke North South FTN Arterial) and upgrades to Ponga, Ōpāheke and Waihoehoe Road East**
- The future collector roads indicated in the Structure Plan are expected to develop through developer contributions as areas get urbanised***
- Safe Speeds Programme, Auckland**

* funding approved

** funding partially approved

*** subject to funding and planning approvals (at the date of this report)

3.2.2 Road Safety

As identified in Section 3.1.2, the existing roads within the Project area already have existing safety issues. Although some improvements are planned in the Project area, the future receiving environment is still not fit for purpose to support the planned future growth. The figure below indicates the approximate scale of increase of network usage in 2048+. The total travel time and the distance travelled will significantly increase as a result of growth. The scale of future north-south traffic growth is expected to increase by 131%. If future growth progresses, without the adequate safety measures in place the safety related risks will compound for all road users.

There are significant safety-related adverse effects expected if future growth progresses and the existing transport environment remains the same. These include:

- Even with the committed NZUP projects and planned wider network upgrades, the road network will not have sufficient additional capacity to cater for demand from future growth. This will lead to strategic traffic rerouting to existing unsafe high-speed rural roads (Burtt Road, Runciman Road, Tuhimata Road, Sim Road and Cape Hill Road) and will significantly increase the risk for death and serious injuries (DSI's).
- The lack of safe intersection controls for all users in and around the growth areas will significantly increase the risk for DSI's.
- The form of various rural collectors (Sim Road, Tuhimata Road, Cape Hill Road, Golding Road, Heights Road and Helvetia Road) within or adjacent to future urban zones are not fit for purpose to support the planned future growth. Without appropriate speeds and safe facilities for all users within Pukekohe, Paerata and Drury, the risk for DSI's will significantly increase.
- The existing crash history indicates that there are significant safety issues associated with protection of vulnerable road users and the future growth anticipated will significantly increase crash exposure.

- Despite some safety interventions on SH22, as traffic increases the safety issues will be more prevalent, especially on rural roads. These roads provide the shortest alternate north-south connection (to SH22) and will continue to attract strategic through movements, resulting in higher risk and unsafe travel conditions. Additionally, these roads do not have any walking and cycling facilities which imposes increased risk to active mode users.
- Across the Project area, there are limited rail crossing facilities for all users and where they exist, they are considered unsafe. Given that a significant amount of planned growth in the future urban areas are located on both sides of the NIMT line and there are limited rail crossing facilities, future communities on either side would need to rely on the unsafe crossings which will increase the risk for DSI's. Furthermore, KiwiRail requires an LCSIA (Level crossing safety impact assessment) completed for all level crossings that are modified/upgraded or impacted by development. The provision of new level crossings is strongly discouraged (TCDM Part 9, NZTA 2012) or designed with Low/Medium-Low LCSS (Level crossing safety score) risk from the outset.

3.2.3 Walking and Cycling

Providing a primary east-west and north-south active mode connectivity is essential to provide existing and future communities with a sustainable means of accessing social, educational and employment opportunities in Drury West, Paerata and Pukekohe. The majority of these opportunities are within suitable walking and cycling distances, therefore the lack of adequate facilities will limit access without the availability of a private vehicle.

Walking and cycling will become key components of the future transport environment to support the growth areas. There are several key attractors which mean that walking and cycling will significantly increase as growth progresses, these include:

- The rail stations at Drury West and Paerata are proposed to be built and connections to these public transport nodes will become critical for active travel.
- The proposed future land use zoning in Drury-West, Paerata and Pukekohe are business – town centre, residential (including terraced housing and apartment buildings, mixed urban, mixed suburban, and single houses), and light industry. This high-density development and attractors anticipate a mixture of modal movements ranging from local to strategic.
- Social, educational and employment opportunities in both existing and likely future growth areas.

In the longer term, additional new walking and cycling facilities (not part of the Pukekohe Transport Network) are proposed to support the southern growth areas in Drury West, Paerata and Pukekohe. Related projects include:

- Station access connections from SH22 to Drury West and Paerata stations;
- The Regional Active Mode Corridor (AMC) connecting SH1, Drury to Pukekohe via a high-quality cycling facility;
- A regional facility proposed on SH1, which is anticipated to be in place as a part of the SH1 upgrades between Papakura to Bombay;
- Upgrades on SH22 between SH1 and Jesmond Road (4-laning and dedicated signalised intersection at both Great South Road/SH22 and Jesmond Road/SH22 intersections) funded by the New Zealand Upgrade Programme (NZUP);
- Additionally, as areas urbanise over time in Drury, Paerata Rise and Pukekohe, additional local walking and cycling connections will be delivered as areas develop; and

- Future walking and cycling facilities shown in AT's Future Connect network.

The longer-term receiving walking and cycling environment (without the Pukekohe Transport Network) are shown below in Figure 3-15. The red arrows below show the future urban growth areas that are not well connected or have facilities that are not fit for purpose.

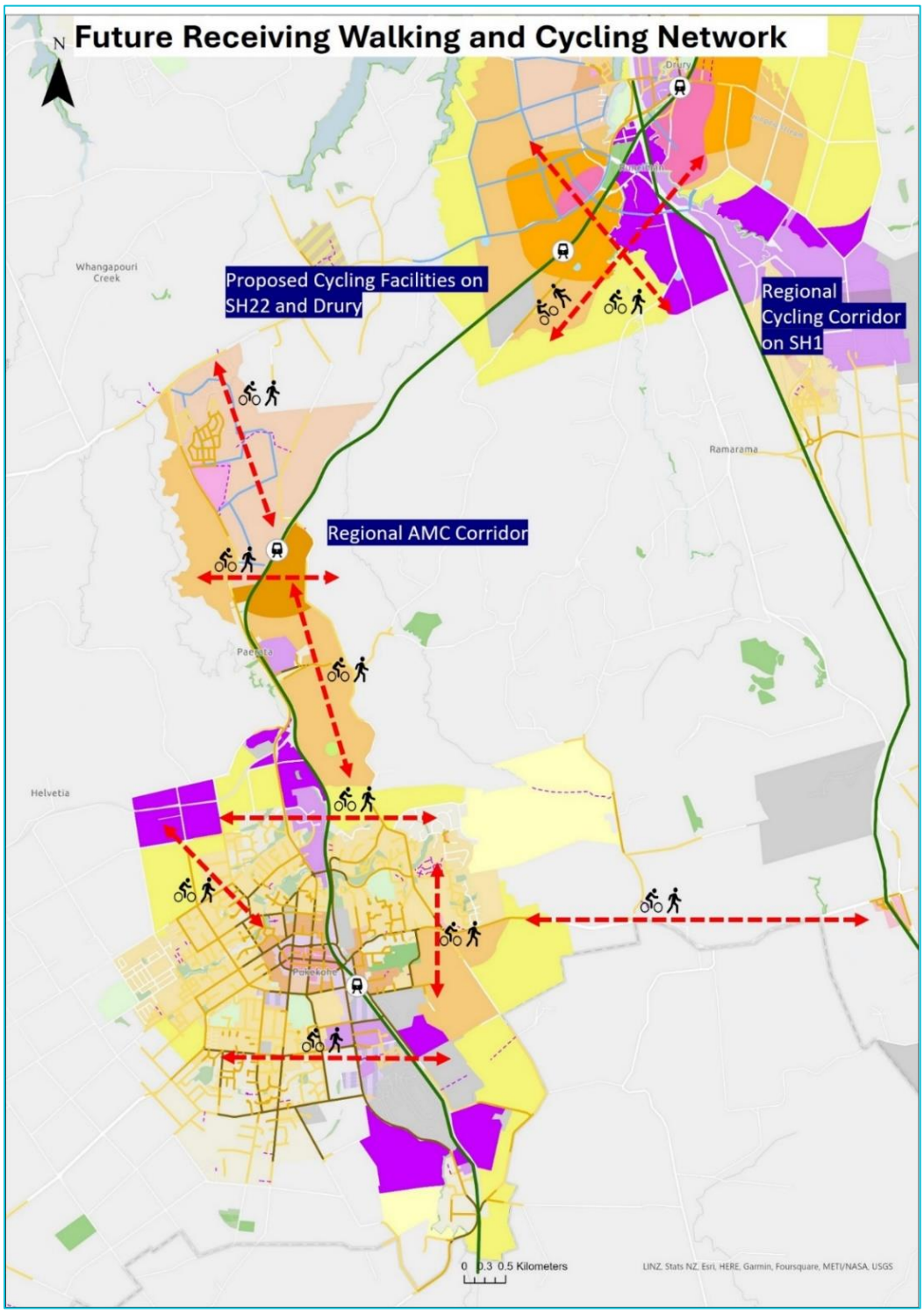


Figure 3-15: Future Walking and Cycling Movements[4]

[4] Red arrows indicate the future urban growth areas that are not well connected or have facilities that are not fit for purpose

Even with longer term projects, a significant part of the network in the growth areas will not meet the predicted demand or future needs such as the network's inability to provide for dedicated pedestrian or cycle facilities for large portions of the Drury, Paerata and Pukekohe growth areas. Additionally, the network does not provide enough protection for vulnerable users for both east-west and north-south movements (shown in red) in Figure 3-15.

The following undesired outcomes are expected if the Drury, Paerata and Pukekohe growth areas are not upgraded with adequate walking and cycling facilities:

- Access to employment, educational and social amenities will be compromised, especially for immediately adjacent land uses;
- Walking and cycling network severance with land use on both sides of NIMT and limited access to safe crossing facilities;
- Poor active mode accessibility with the existing and future land use, which will also result in increased emissions from car-based travel and lead to adverse environmental and health effects;
- Poor integration with the existing and future rapid transit network in Pukekohe, Drury and Paerata and the wider planned public transport networks, particularly for first/last mile trips;
- Poor integration with the proposed wider walking and cycling network (SH1 cycleway, the AMC cycleway along rail corridor and key trip attractors);
- Existing safety-related issues and crash exposure to vulnerable road users will increase significantly as demand for walking and cycling facilities increases alongside the growth in the area;
- The ability to contribute to sustainable mode shift will be compromised if additional provision for sustainable travel choices is not provided. Limited mode choice will result in increased emissions from continuation of car-based travel and lead to adverse environmental and health effects;
- The congested, unreliable traffic conditions without walking/cycling facilities will constrain access to the proposed key public transport nodes for all road users, undermining the effectiveness of the stations and desired mode shift outcomes; and
- The high-speed, high-volume traffic environment and absence of safe facilities along many roads in and around the growth areas and the lack of intersection controls will significantly increase DSI risk for vulnerable users.

3.2.4 Public Transport

In the longer term, the Drury, Paerata and Pukekohe growth areas will have several public transport facilities and services such as new rail stations and additional bus routes. These facilities are proposed to connect the growth areas interregionally to places such as the Auckland City Centre, Manukau and Auckland Airport, and local links to the existing and future town centres. Related projects include:

- Proposed rail stations in Paerata, Drury West and Drury Central. These rail stations are included in NZUP;
- Additional bus routes, including services proposed by AT to support future urban development within Drury, Paerata and Pukekohe area;
- Public transport routes to connect the Drury-Ōpāheke-Papakura area to wider southern Auckland and to the Drury West and Drury Central stations; and
- FTN routes connecting to the wider Drury-Opaheke areas.

The AT Future Public Transport network is shown in the Figure 3-16 below.

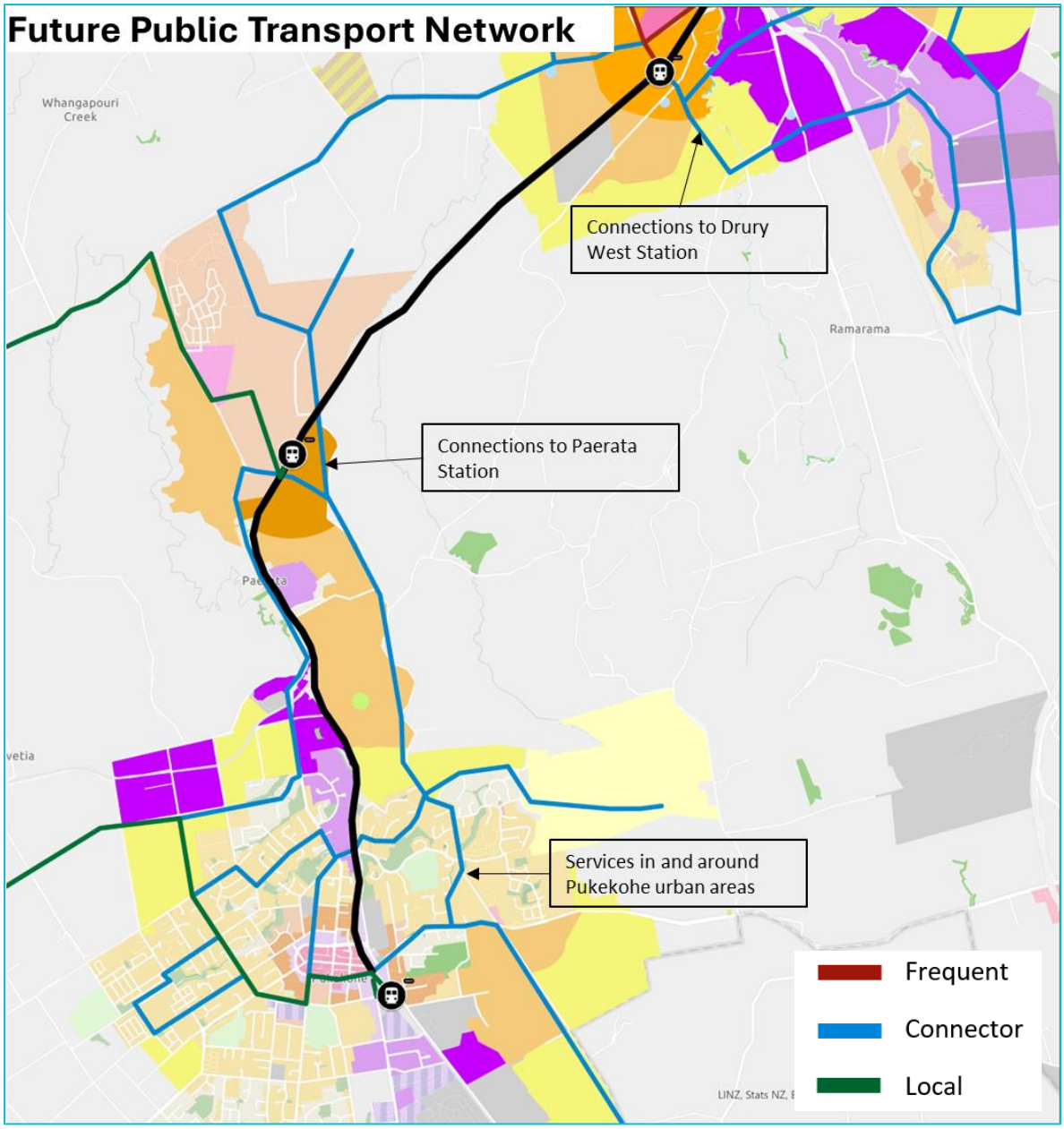


Figure 3-16: AT Future Public Transport Network for the Project Area

The committed and planned public transport projects is expected to significantly improve in the project area. The increase rail frequency, 4 tracking, new stations and future bus network will improve public transport for existing and future communities. Figure 3-17 provide context of the scale of interventions expected for the proposed new stations.

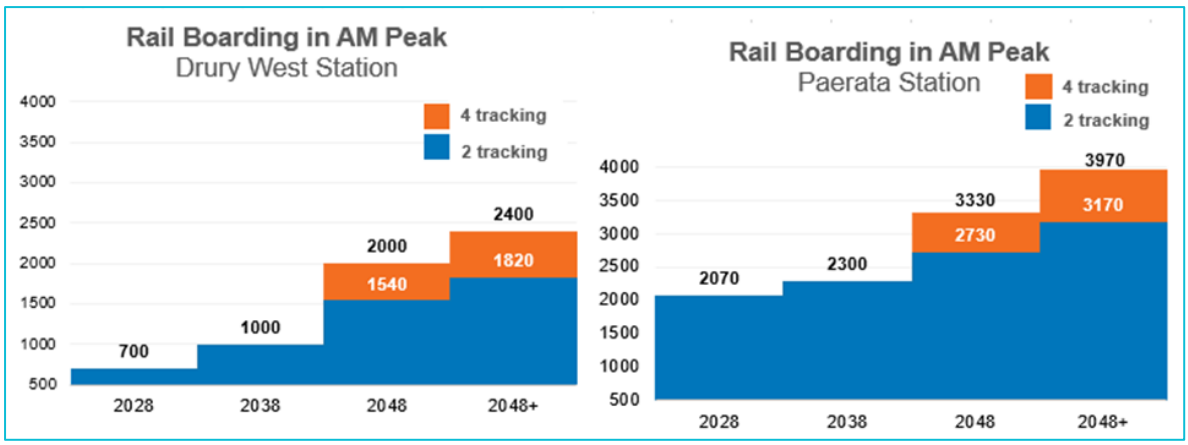


Figure 3-17: Rail Boarding in AM Peak at Drury West and Paerata Station

The current road infrastructure relies on a subset of rural roads, collector roads and limited arterial roads surrounding the growth areas to supply capacity for freight, general traffic and bus services. Even with investment in public transport stations and future services, the existing roads and public transport roadside facilities in Drury-West, Paerata, and Pukekohe are not fit for purpose to support the planned future growth.

The following undesired outcomes are expected if the Drury, Paerata and Pukekohe growth areas are not upgraded:

- Access to employment, educational and social amenities will be compromised by traffic congestion impacting the effectiveness, reliability and attractiveness of bus services within and through Drury West, Paerata, and Pukekohe;
- The ability to contribute to sustainable mode shift will be compromised if additional reliable public transport services are not provided, leading to reduced ridership or inability to operate on some routes;
- The existing network does not have sufficient capacity to cater for demand from future growth, which means existing and future bus services will experience extensive delays given that freight, general traffic and bus services would need to share the existing substandard roading infrastructure;
- Future bus routes will be constrained to a limited number of existing roads or new collectors, which will lead to limiting the catchment of where local bus services can operate or reach;
- Poor integration with the proposed rail stations in Paerata, Drury West and Drury Central; and
- With the absence of walking and cycling facilities connected to the existing and future stations, access to rapid transit will be compromised and limit patronage growth and will result in increased emissions from car-based travel and lead to adverse environmental and health effects.

3.2.5 General Traffic and Freight

For general traffic, the wider roading network in Drury, Paerata and Pukekohe growth area forms an integral part of the general traffic and freight movements, providing a primary east-west and north-south strategic roads linking to major centres such as Manukau and Auckland City Centre and other districts such as Hamilton and the wider Waikato.

As identified in Section 3.1.2 the existing road network in Drury West, Paerata, and Pukekohe is already experiencing congestion on strategic corridors (SH1, SH22, Pukekohe East Road/ Mill Road), urban corridors and occasionally on rural corridors.

In the longer term, additional new roading upgrades are proposed to support the southern growth areas in Drury-West, Paerata and Pukekohe. Related projects include:

- The SH1 Papakura to Bombay project, which includes an upgrade to the existing Drury interchange, constructing and new interchange in Drury South, and upgrade of the existing Bombay Interchange, adding additional general traffic lane capacity in each direction and an active mode facility;
- The Safe Network Programme with short-term safety improvements along SH22;
- Upgrades on SH22 between SH1 and Jesmond Road funded by NZUP. These upgrades are proposed to improve safety, amenity and capacity along the route to enable urbanisation of the area; and
- The Drury Arterial Network including Jesmond to Waihoehoe West FTN and upgrades to Ponga, Ōpāheke and Waihoehoe Road East.

Even with these longer-term projects, the network does not have sufficient capacity to cater for demand from future growth. The Table 3-6 below provides a summary of the daily additional volumes in 2016 and in 2048+ without the Pukekohe Transport Network to provide context of the scale of growth and its network wide impacts on strategic, urban and rural corridors.

Table 3-6: Modelled 2016 and 2048+ volumes

Road Name	Configuration	2016 ADT Volumes	2048+ ADT Volumes without Project
SH1	4/6-Lane	45,500	118,000
SH22 (Drury)	2/4-Lane	22,295	28,400
Mill Road (Bombay)	2-Lane	18,465	25,300
Pukekohe East Road (east of Golding)	2-Lane	9,513	19,900
East Road	2-Lane	9,825	27,900
Cape Hill Road	2-Lane	2,029	15,500
Helvetia Road South	2-Lane	3,926	9,300
Burtt Road (Drury)	2-Lane	1,242	7,100
Burtt Road (Rural)	2-Lane	1,348	6,700
Runciman Road	2-Lane	2,255	5,200

Table 3-7 below provides context and scale of the existing and likely future north-south traffic growth predictions as a result of the future growth. The scale of future north-south traffic growth is expected to increase by 131%.

Table 3-7: Likely north-south traffic count growth

Year	Total Daily North-South Traffic (ADT)*
2016	39,000
2048+	90,000 (131% increase)

**Includes SH22, Burtt Road, Pukekohe East Road, Cape Hill Road and Runciman Road*

If future growth progresses and existing infrastructure remains the same, the following undesirable outcomes are predicted to occur for general traffic:

- Strategic corridors like SH1, SH22 and Pukekohe East Road and Mill Road will operate at capacity, and this will lead to strategic traffic rerouting to existing unsafe high-speed rural roads (Burtt Road, Runciman Road, Tuhimata Road, Sim Road and Cape Hill Road).
- Congestion will increase and lead to unpredictable and unreliable travel times on the strategic, urban and collector roads. This will have a significant adverse effect for both general traffic.
- Access to employment, educational and social amenities will be compromised by excessive traffic congestion impacting the effectiveness, reliability and attractiveness within and through Drury-West, Paerata, and Pukekohe.
- Given the safety rating of the current network (corridors and intersections), the expected growth will be compromising safety for all road users.
- There will be poor east-west and north-south local arterial connectivity between the Drury-West, Paerata, and Pukekohe growth areas, which will force traffic to travel longer distances and increase vehicle kilometres travelled (VKT).
- Given that a significant amount of planned growth in the future urban areas are located on both sides of the NIMT line and the limited rail crossing facilities, future communities on either side would need to rely on the unsafe crossings which will increase the risk for DSI's, limit travel choices and create significant severance between communities.
- The lack of safe intersection controls for all users in and around the growth areas will significantly increase the risk for DSI's.
- The form of various of the rural collectors (Sim Road, Tuhimata Road, Cape Hill Road, Golding Road, Heights Road and Helvetia Road) internal to or adjacent to future urban zones are not fit for purpose to support the planned future growth. Without appropriate speeds and safe facilities for all users within Pukekohe, Paerata and Drury, this will significantly compromise safety, mode shift and liveability.

Freight

Additionally, the future growth in freight demand is also expected to increase significantly due to proposed new industrial areas and the localised freight generated to serve the future planned growth areas. The Figure 3-18 below indicates the predicted scale of daily truck volumes on the existing networks.

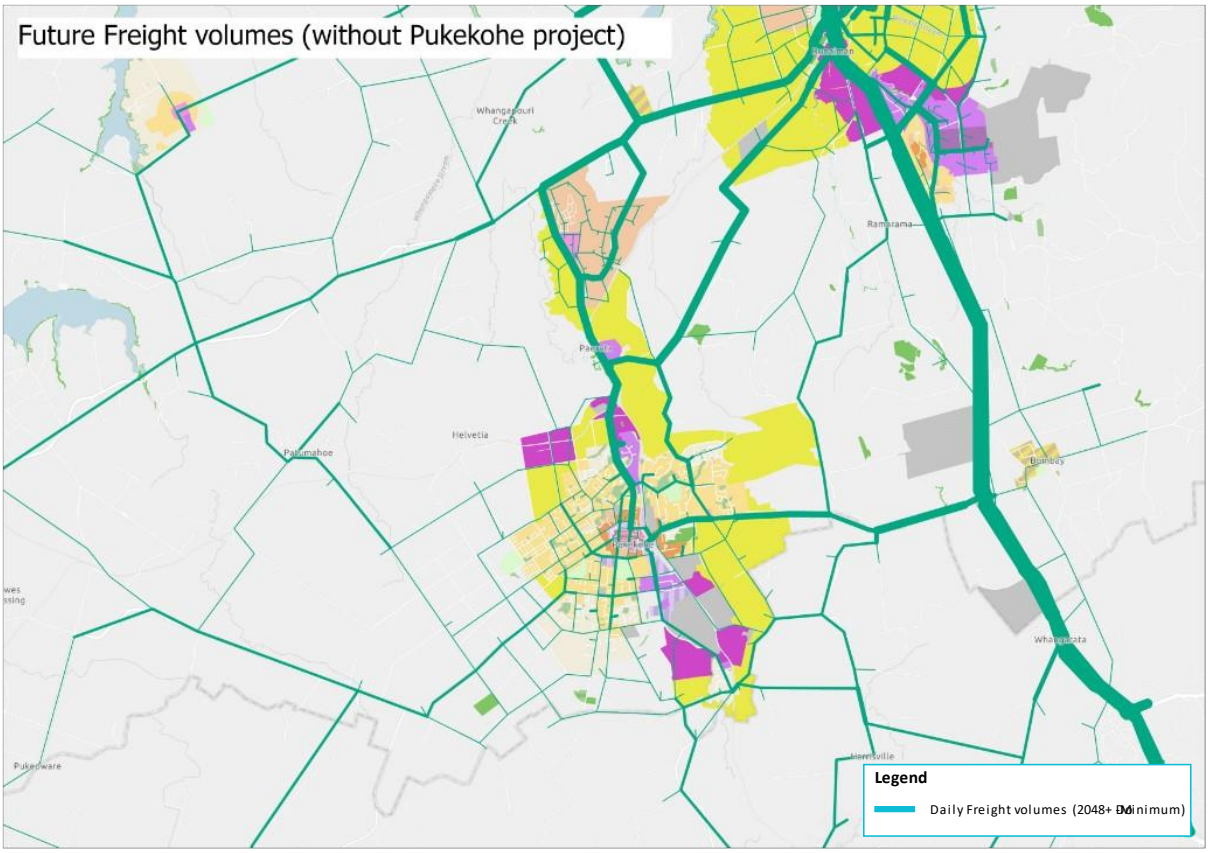


Figure 3-18: Future Freight Volumes without Pukekohe Project

As identified in Section 3.1.5, the existing strategic, urban and rural freight routes around the study area are already heavily constrained in terms of options and connectivity. The rural freight routes are critical to connecting local growers to commercial centres and shopping centres, given Pukekohe's unique rural freight which serve the local growers and warehouses south, west and south-west areas of Pukekohe, very close to the Waikato boundary. Even with the planned upgrades on SH1 and SH22 mentioned above, the transport network is still not fit for purpose to support the planned future growth for general traffic and freight.

From a freight network perspective there is a need for various east-west and north-south local arterial connections between and in Drury West, Paerata, and Pukekohe growth areas to support the existing and future freight community as shown below in Figure 3-19. It is essential to connect growth areas with the strategic networks and not rely on local neighbour and town centre collectors to become strategic freight networks.

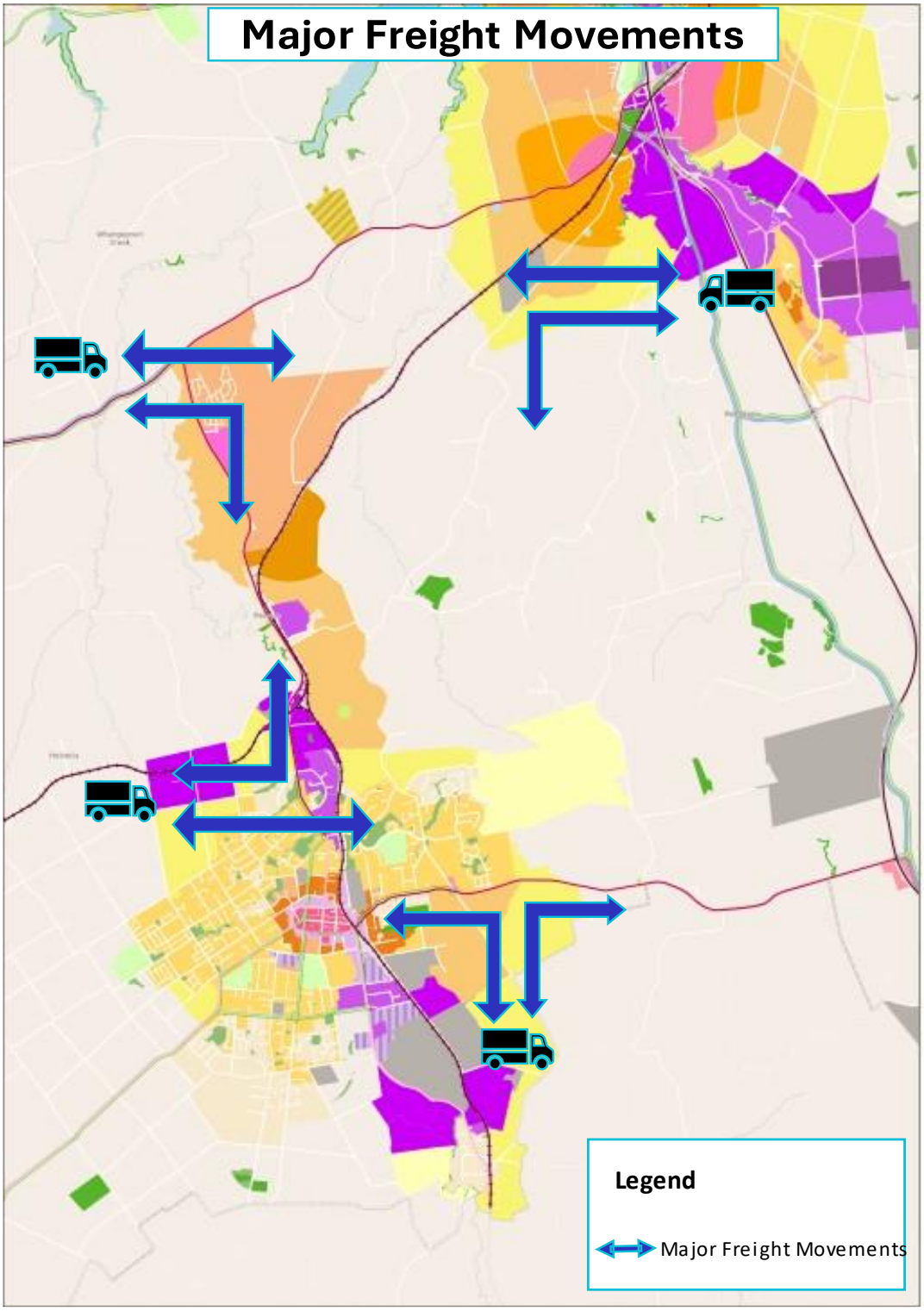


Figure 3-19: Future Freight Growth Areas

If future growth progresses and existing infrastructure remains the same, the following undesirable outcomes are predicted to occur for freight:

- Freight will experience excessive delays impacting light industry, community freight and the local economy in Pukekohe and the project area.

- The urbanisation of SH22 will result in lower speed along the Drury West local centre, which will reduce freight efficiency of the corridor. An alternate freight route will be required to maintain the quality and safety of the urbanised corridor.
- In the absence of a strategic north-south corridor, the rural roads which will increase with additional general traffic freight demand. This will cause undesirable environment for rural neighbourhoods and encourage rat-running on local roads.
- The access for freight in and out of Pukekohe will be limited. For e.g., it will be difficult for freight from Gun Club Road to access to SH1 or SH22, unless they traverse the urban areas.
- The freight from Southeast industrial areas or North Waikato industrial areas will not have a direct access to Pukekohe East/ Mill Road.
- In the absence of adequate rail crossings, freight will rely on existing arterials such as Manukau Road, Cape Hill Road and Wesley Road thereby exacerbating congestion within the central Pukekohe areas.
- Incremental growth in wider industrial areas such as Waiuku, Glenbrook, Kingseat and Drury South will influence overall freight movements through Pukekohe in future.

3.2.6 Property Access

The following undesirable outcomes relating to access are predicted to occur if future growth progresses and existing access arrangements are retained:

- The growth in traffic on existing high-speed roads will significantly increase the crash exposure for a number of properties with direct access;
- The planned surrounding future growth will also increase crash exposure between driveways, general traffic and active modes of local and collector roads; and
- Retaining direct property access to existing roads will increase the risk and exposure to risk of DSI's (undermining Vision Zero outcomes to achieve a safe land transport system with no DSI's involving road traffic).

4 Pukekohe Transport Network Overview

This section provides an overview of the proposed Pukekohe Transport Network. Te Tupu Ngātahi has identified a network that provides a comprehensive transport response to planned growth in the Pukekohe, Paerata and Drury West areas. This network is the foundation for the NoRs identified in this Report. It is also noted that this assessment considers these projects as a network, and has an overall focus on the outcomes for the Pukekohe, Paerata and Drury West area. Notwithstanding this, the NoRs are all proposed as separate projects to enable progressive or staged implementation in coordination with land use development.

The Pukekohe Transport Network was developed as part of network planning for the wider area and concurrently with the structure planning undertaken by Auckland Council. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address identified problems. As such, the Pukekohe Transport Network is part of a wider integrated network planned for the area.

The network includes provision for general traffic, walking and cycling, public transport and freight. It aims to improve connectivity within and through the Drury, Paerata, and Pukekohe area to achieve optimum transport and land use outcomes, providing high quality, safe and attractive transport environments.

The Pukekohe Transport Network is comprised of eight separate transport projects (NoR 1 to NoR 8 (AC and WDC)). Figure 4-1 sets out the form and function for each corridor, while Figure 4-2 shows how each NoR has been segmented and Figure 4-3 highlights the Auckland and Waikato boundary.

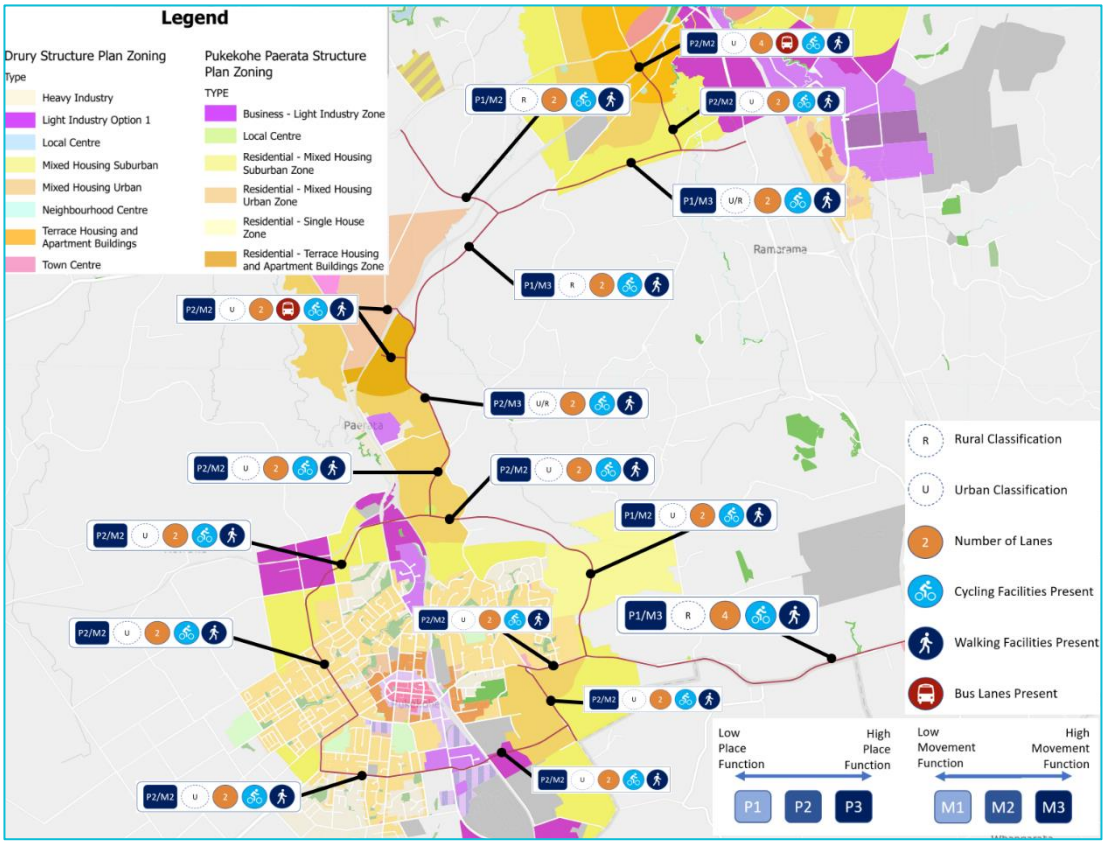


Figure 4-1: Pukekohe Transport Network form and function

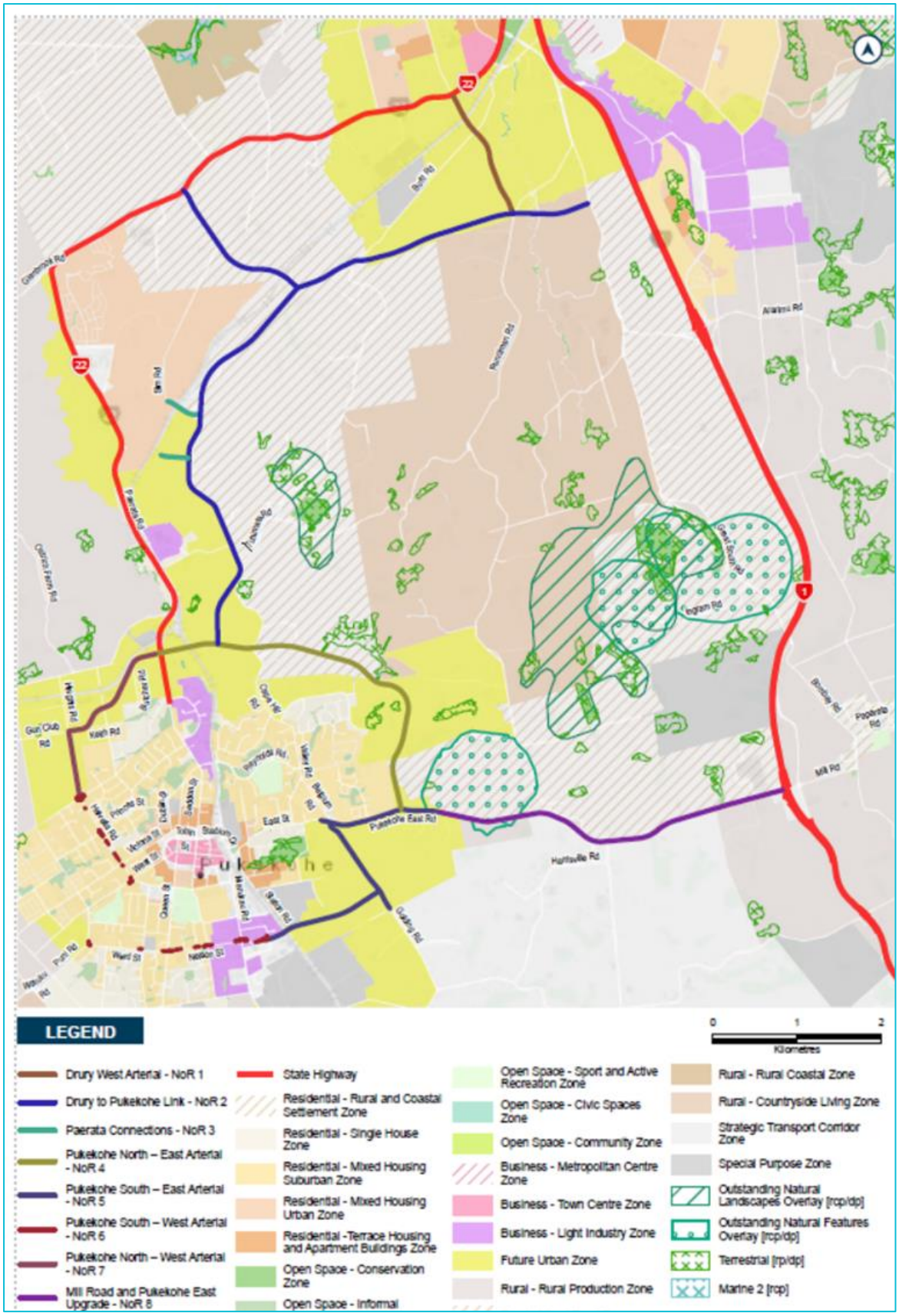


Figure 4-2: Pukekohe Transport Network

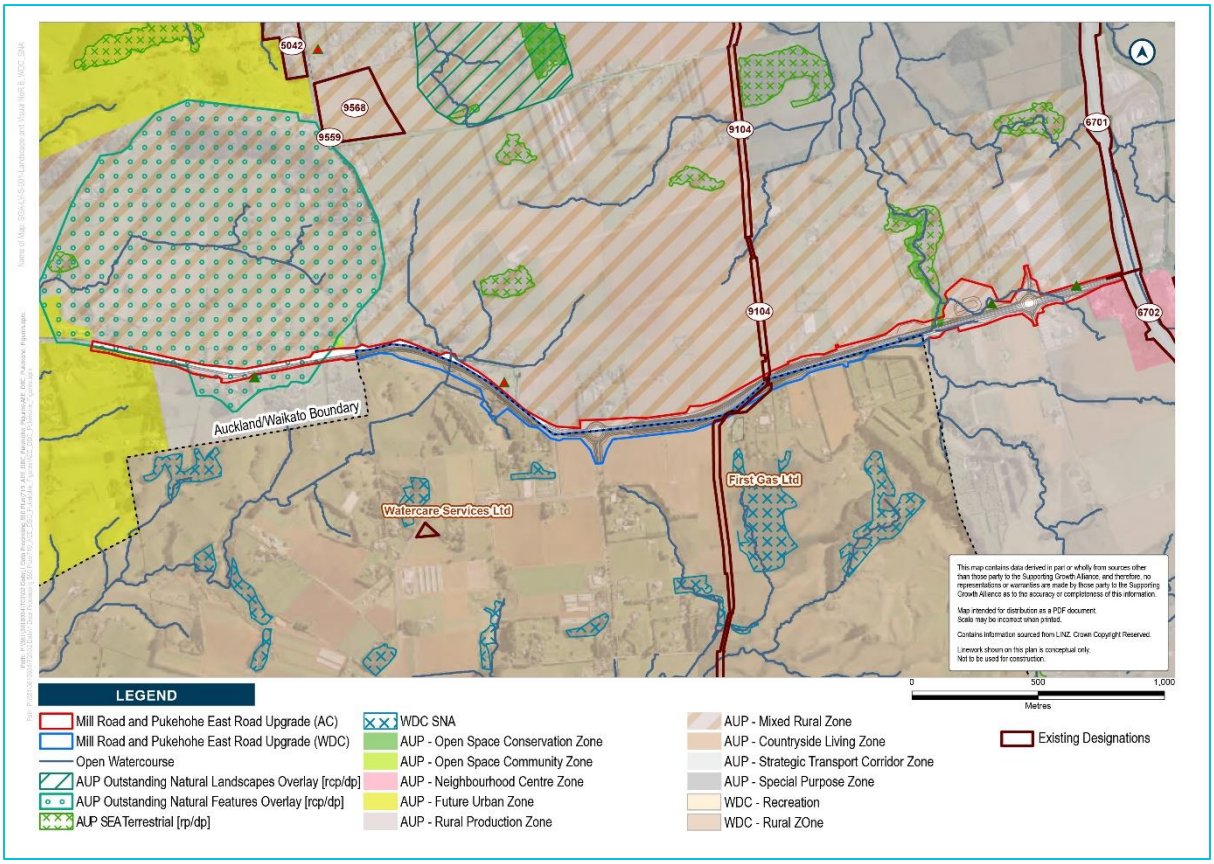


Figure 4-3: Auckland/Waikato boundary plan

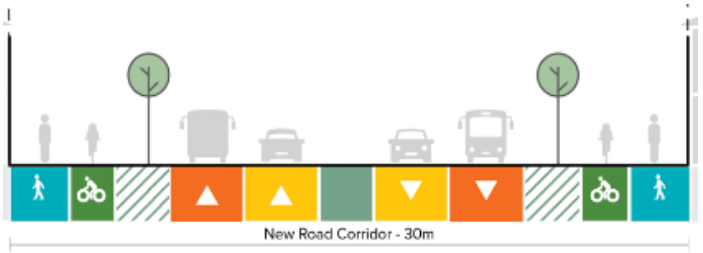
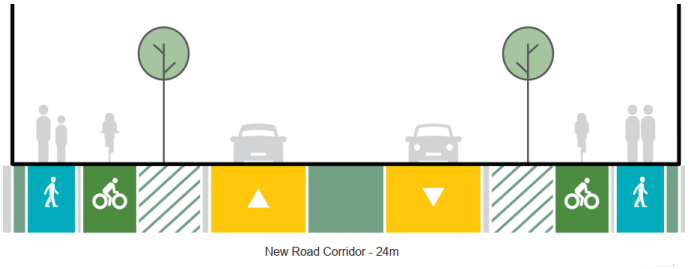
Given the scale of the Pukekohe Transport Network, the complete package of NoRs has been assessed as a combined package, rather than investigating each NoR as a stand-alone project. The Pukekohe Transport Network has several interdependencies between the NoRs, particularly in relation to functional overlaps and staging considerations that influence the effectiveness of transport and land-use integration. However, it is acknowledged that these elements are largely reliant on surrounding growth being implemented and funding availability, and therefore there is a possibility that some of these projects many be implemented years apart. A more detailed analysis of the associated impacts of these projects on an individual basis will be undertaken prior to implementation. Table 4-1 below provides a summary the transport interdependencies between the Pukekohe Project NoRs. The detailed breakdown of Interdependencies with other projects are shown in Appendix 1.

Table 4-1: Project Interdependencies

NoR	Project Interdependencies
NoR 1	NoR 1 could proceed as a stand-alone project to support early urban development in Drury West, with connection into Runciman. However, the main benefits of the corridor would not be realised until the eastern part of NoR 2 are in place (and full benefits with Drury South interchange and link across to Drury East).
NoR 2	The north of NoR 2 (east of and including Sim-SH22 link) could proceed as an interim stage, however the southern part (South of NoR 3) would be best implemented with (or after) NoR 3 and NoR 4 to provide suitable connections. The central part between Sim-SH22 link and NoR 3 is proposed to be staged last in the programme to provide optimum mode shift outcomes.

NoR	Project Interdependencies
NoR 3	NoR 3 could proceed as a stand-alone project to support early urban development of Paerata growth area (east of the NIMT) to increase accessibility to the proposed Paerata station and connectivity between Paerata growth area and Paerata Rise.
NoR 4	This project could be implemented as a stand-alone to support growth in the Northeast Pukekohe area and to provide alternative route between SH22 and Pukekohe East Road. However, the benefits of this project, particularly for freight and general traffic will be seen when combined with NoR 2, NoR 5 and NoR 7.
NoR 5	This project could be implemented as a stand-alone to support growth in Southeast Pukekohe area and to provide alternative route between the south of Pukekohe and Pukekohe East Road that avoids the town centre, increasing accessibility to SH1. This connection will also provide an additional crossing over the NIMT and increase accessibility in Pukekohe.
NoR 6	This project could be implemented as a stand-alone project to improve walking and cycling accessibility in Southwest Pukekohe.
NoR 7	This project could be implemented as a stand-alone project to support growth in Northwest Pukekohe and provide a more efficient means of accessing SH22, however the full benefits of this project will be seen when Nor 2 and NoR 4 is in place.
NoR 8	This project could be implemented as a stand-alone project to accommodate future volumes of traffic that are anticipated as a result of urban growth in Pukekohe and wider Waikato growth. However, the full benefits of this project will be seen when NoR 4 and NoR 5 are in place and significant amount of growth occurs.

Table 4-2: Network Features

Network Features	
NoR 1 Drury West Arterial • 1.6km new transport corridor extending south from the intersection of SH22 and Jesmond Road to the proposed Drury to Pukekohe Link (NoR 2). • Connects Drury West Town Centre, Drury West Rail Station and provides access to the strategic transport network including SH1 and SH22. It connects with Burtt Road and to Runciman Road in the south. • This new transport corridor improves local connectivity in Drury West and the wider area to centres, employment and rail stations. • Between SH22 and Burtt Road, the proposed cross section is a four-lane arterial 30m wide. This includes two lanes for public transport and walking and cycling facilities on both sides of the corridor. • South of Burtt Road a two-lane arterial with a 24m wide cross section is proposed with two lanes for general traffic and walking and cycling facilities on both sides of the corridor. • Three new bridges are proposed over the existing NIMT rail line, and two tributaries of the Ngakoroa Stream. • Three new stormwater wetlands are proposed and new culverts and swales. • 50kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	**30m four lane arterial (uni-directional cycle facilities)**  **24m two lane arterial (uni-directional cycle facilities)** 
NoR 2 Drury to Pukekohe Link • NoR 2 provides a north south strategic corridor with two general traffic lanes proposed and active transport facilities on one side of the corridor. The total length of the NoR is 10.6km. NoR 2 is split into the following four segments:	

Network Features

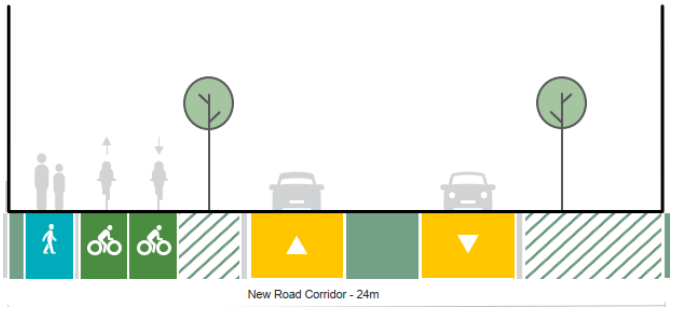
South Drury Connection segment

- The South Drury Connection segment provides a new connection extending from Great South Road in the east at the proposed SH1 Drury South Interchange (a proposed Waka Kotahi SH1 project). The alignment is along the edge of the FUZ to Burtt Road in the west.
- It provides a strategic connection improving local access in Drury West, provides resilience in the transport network supporting SH22 and SH1, provides direct connectivity to the proposed Drury South Interchange and supports the proposed strategic active modes corridor.
- A 24m wide cross section is proposed with two lanes for general traffic, with walking and cycling on one side of the corridor.
- Three new bridges are proposed over tributaries of the Ngakoroa Stream.
- Three stormwater wetlands are proposed and new culverts and swales.
- 60kph to 80kph speed limit.
- Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design

SH22 Connection segment

- Connecting with the South Drury Connection and Drury-Paerata Link segments, this connection provides a strategic connection between State Highway 1 and SH22.
- It improves access between Drury West and Paerata, provides resilience in the transport network supporting SH22 and SH1, provides direct connectivity to the proposed Drury South Interchange and supports the proposed strategic active modes corridor.
- It includes new transport corridor and a partial upgrade of Sim Road (north).
- A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one side of the corridor.
- Two new bridges are proposed over the Oria Creek and NIMT.
- Two stormwater wetlands are proposed and new culverts and swales.
- 80kph speed limit
- Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design

24m two lane arterial (bi-directional cycle facilities)



24m two lane arterial (uni-directional cycle facilities)

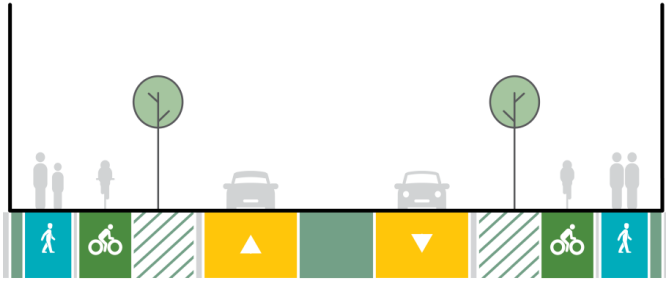
Network Features	
Drury-Paerata Link segment • The Drury-Paerata Link segment is a new corridor connecting the segments of South Drury Connection, SH22 Connection and Paerata Arterial. This segment extends from an intersection with Burtt Road in the north, to the Paerata Arterial segment in the south. • It provides connectivity between Drury and Paerata providing a strategic connection between two areas of future urban development. • A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one side of the corridor. • Two bridges are proposed over tributaries of the Oira Creek. • Three stormwater wetlands are proposed and new culverts and swales. • 60-80kph speed limit • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design *Paerata Arterial segment* • Paerata Arterial segment is located along the eastern edge of Paerata FUZ. It connects with Paerata Connections NoR 3 at the northern extent and to the proposed Pukekohe North-East Arterial NoR 4 at its southern extent. • It includes an upgrade of part of Sim Road (south), Tuhimata Road and a new section of transport corridor. • It increases connectivity to Paerata FUZ, Paerata Rail Station and Pukekohe Town Centre. • A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on one or both sides of the corridor. No bridges are proposed. • Six stormwater wetlands are proposed wetlands (one shared with NoR 4 and one shared with NoR 3) and new culverts. • 50kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	

Network Features

NoR 3 Paerata Connections

- The Paerata Connections provide two connections from the existing Sim Road (south) proposed to be upgraded by NoR 2 to the Paerata Rail Station and Paerata Rise development.
- The connections provide the primary east-west connections for all modes in Paerata.
- NoR 3 has includes two segments:
    - **Sim to Sim Connection segment** provides a new connection of approximately 400m between the two extents of Sim Road over the railway (NIMT).
    - **Paerata Rail Station Connection segment** provides a new transport corridor approximately 330m in length between the Paerata Rail Station (KiwiRail designation 6311 currently under construction) and NoR 2.
- A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on both sides of the corridor.
- One bridge is proposed over the NIMT to connect the two extents of Sim Road for the Sim to Sim Connection segment.
- One new stormwater wetland is proposed that is shared with NoR 2 and a new culvert.
- 50kph speed limit.
- Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design

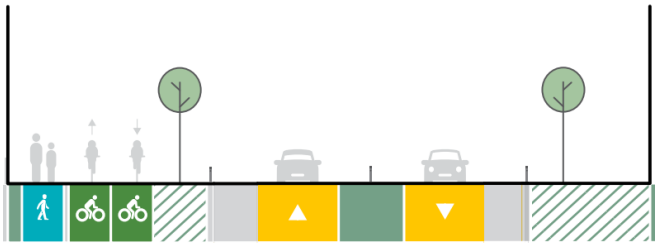
24m two lane arterial (uni-directional cycle facilities)

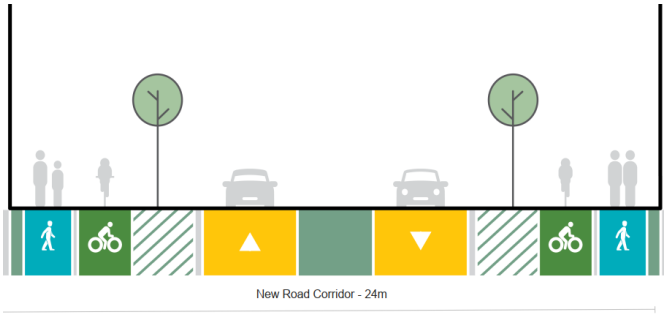
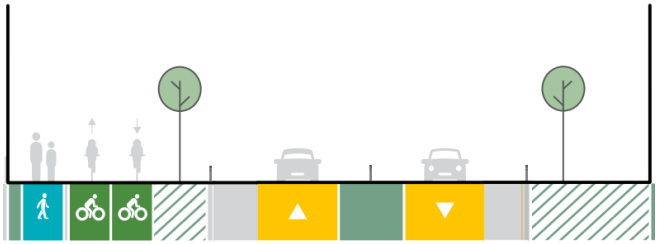
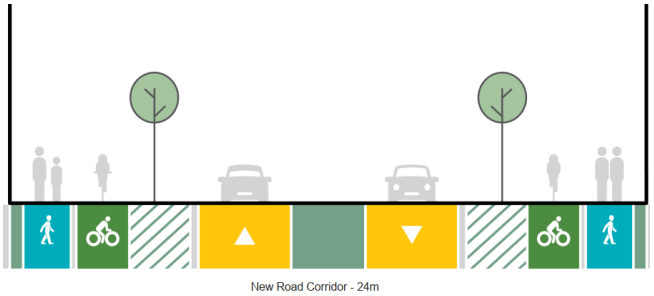


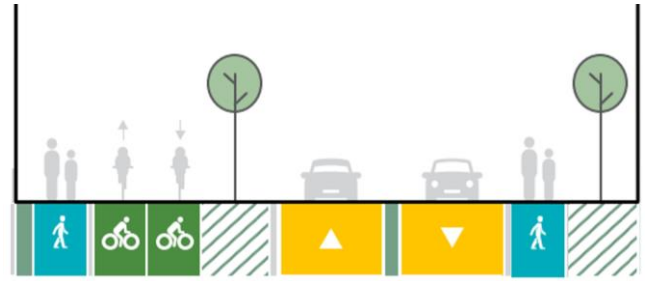
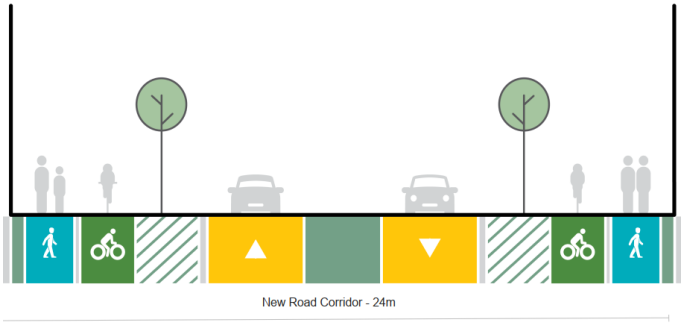
NoR 4 Pukekohe North-East Arterial

- The Pukekohe North-East Arterial is an approximately 4km new transport corridor from SH22 in the northwest connecting to Pukekohe East Road in the south east.
- It connects the strategic corridors at SH22 (at the northern extent of the Pukekohe North-West Arterial NoR 7), the Drury to Pukekohe Link NoR 2 and Pukekohe East Road proposed to be upgraded by NoR 5 and NoR 8.
- Its primary function is for general traffic, freight, an active mode links between future neighbourhoods and alleviating traffic on existing roads at Cape Hill Road and Valley Road.
- A 24m wide cross section is proposed with 2 lanes for general traffic and walking and cycling proposed on both or one side of the corridor.

24m two lane arterial (bi-directional cycle facilities)

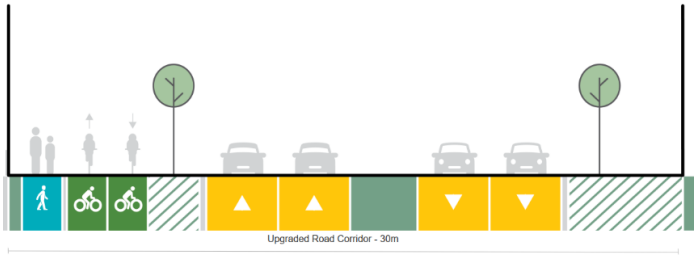


Network Features	
• Seven bridges are proposed over the Whangapouri Creek, the NIMT, and other unnamed streams and tributaries. • Six new stormwater wetlands are proposed and new culverts. • 50-70kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	**24m two lane arterial (uni-directional cycle facilities)** 
NoR 5 Pukekohe East Arterial • The Pukekohe South-East Arterial upgrades part of Pukekohe East Road, Golding Road and provides a new connection between Golding Road (from north of Royal Doulton Drive) and across Station Road and the NIMT to the existing industrial development on Crosbie Road to Svendsen Road. • It is a primary east-west connection to assist in redirecting general traffic and freight away from the Pukekohe town centre to provide additional resilience to the wider network. • A 24m wide cross section is proposed with two lanes for general traffic with walking and cycling on the southern side of the corridor on Pukekohe East Road and on both sides for the remainder of the corridor. • One bridge is proposed crossing Station Road and the NIMT. • Five new stormwater wetlands are proposed and new and upgraded culverts. • 50kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	**24m two lane arterial (bi-directional cycle facilities)**  **24m two lane arterial (uni-directional cycle facilities)** 

Network Features	
NoR 6 Pukekohe South-West Upgrade • Pukekohe South-West Upgrade involves the re-allocation of road space within the existing road corridor for a bi-directional cycle way and footpath upgrade. The designation is limited to specific intersections and driveways to safely accommodate active mode facilities. The existing road reserve is to be utilised where possible retaining a 20m wide cross section with 2 lane general traffic, walking on both sides and a bi-directional cycleway on one side of the corridor. • No bridges or stormwater wetlands are proposed. • 50kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	**20m two lane arterial** 
NoR 7: Pukekohe North-West Arterial • Pukekohe North-West Arterial provides a connection between Helvetia Road in the southwest and SH22 in the northeast. It upgrades part of Helvetia Road, utilises part of Keith Road (a paper road), and forms a new connection between Beatty Road and Butcher Road to SH22 – connecting to the Pukekohe Northeast Arterial NoR 4. • It provides an alternative connection for all modes travelling north to south in west Pukekohe assisting in redirection of general traffic away from the town centre and provides additional resilience to the wider network. • A 24m wide cross section is proposed with two lanes for general traffic and walking and cycling on both sides of the corridor. • No bridges are proposed. • Two new stormwater wetlands are proposed and new and upgraded culverts. • 50kph speed limit. • Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design	**24m two lane arterial (uni-directional cycle facilities)** 
NoR 8 (AC and WDC): Mill Road and Pukekohe East Road Upgrade • NoR 8 upgrades Mill Road (Bombay) in the east and Pukekohe East Road in the west.	**30m four lane arterial (bi-directional cycle facilities)**

Network Features

- It provides an important strategic connection between Auckland and Waikato and from SH1 to Pukekohe urban areas for traffic and freight, with a major rural active mode connection. Harrisville Road plays a significant role in distributing traffic from further south into Waikato.
- Mill Road is proposed to be upgraded to four lanes (2.1 kms) from SH1 in the east to Harrisville Road in the west. It has a 30m wide cross section with four lanes for general traffic, with walking and cycling on the southern side.
- Pukekohe East Road is proposed to be upgraded (3.4 kms) for walking and cycling facilities on the southern side from Harrisville Road in the east to NoR 5 in the west.
- One new stormwater wetland is proposed, swales and new and upgraded culverts.
- 80kph speed limit.
- Median may be raised or include a barrier to improve safety outcomes. Flush medians may be used in some locations. This will be determined at detailed design



5 Assessment of Transport Effects and Measures to Avoid, Remedy or Mitigate Actual or Potential Adverse Effects

This section assesses the transport effects of the overall Pukekohe Transport Network on the future transport and urban environment, including planned growth (movement and place patterns). This section also recommends measures to avoid, remedy, or mitigate actual or potential adverse construction and operational effects for the overall Network.

5.1 Assessment of Operational Effects (All NoRs)

This section describes the effects of the Pukekohe Transport Network on the receiving future transport and urban environment, including planned growth (movement and place patterns). The assessment is undertaken for each mode/element of the transport system. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

5.1.1 Safety

The design of all projects has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. Safety has been considered at all stages of corridor design to ensure that the new corridor will improve safety for all road users. This includes 50.6 km of new active mode facility and new arterial corridors. It was estimated that the crash benefits of the Pukekohe Transport Network amount to $23 million for a full built out scenario of new and upgraded existing roads (proposed NoRs). These crash benefits are calculated from VKT reduction of general traffic.

The upgrade is expected to result in significant positive effects on safety when compared to the existing and future receiving environment without the projects, and these consist of:

- Enhanced walking and cycling facilities in and between Drury, Paerata and Pukekohe, resulting in improved protection for vulnerable road users;
- Upgraded walking and cycling crossing facilities across Drury, Paerata and Pukekohe, resulting in a significantly safer environment for all road users;
- An improved speed environment by reducing speed limits to more appropriate urban speeds with enhanced place function and consequential reductions in the risk of DSI's;
- Significantly reduced likelihood of head-on crashes by providing raised medians to separate the two directions of traffic;
- Increased network-wide capacity to avoid strategic traffic rerouting to existing unsafe high-speed rural roads (Burtt Road, Runciman Road, Tuhimata Road, Sim Road and Cape Hill Road) which will significantly reduce the risk for DSI's;
- Improved rail crossing facilities for all users in Drury, Paerata and Pukekohe by adding five grade-separated crossings over the NIMT which will reduce the risk for DSI's, see Figure 5-1. No explicit recommendation for closure of existing rail crossings has been proposed as a part of the NoRs but it is assumed to be in place as per the TCDM, Part 9 level crossings; and
- Improved intersection controls to support the growth, by adding 41 new or upgraded intersections (as shown below), resulting in a safer environment for all road users.

Overall, the design of the Pukekohe Transport Network is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of DSI's and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

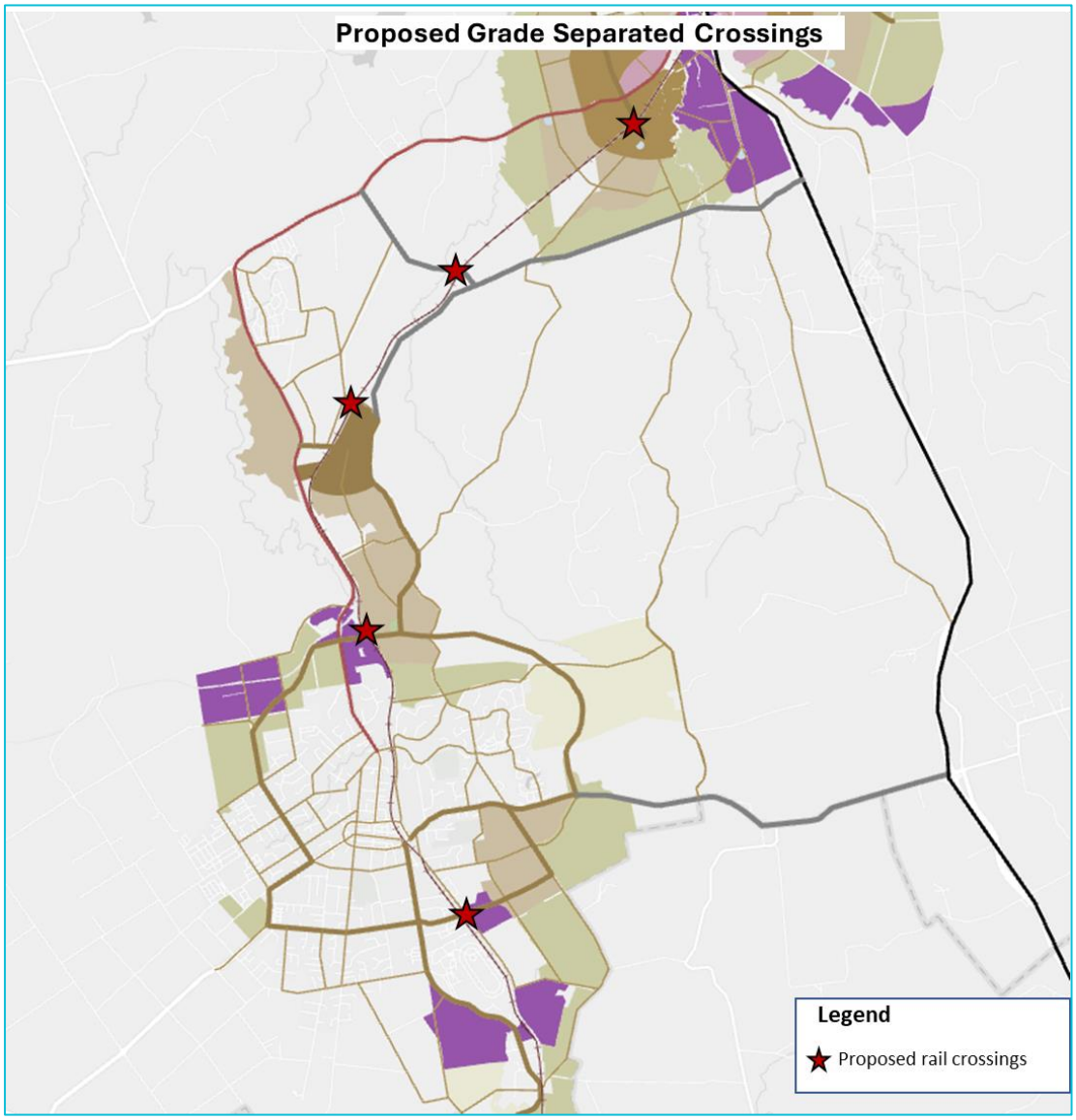


Figure 5-1: Grade Separated crossing

5.1.2 Walking and Cycling

The Network proposes separated walking and cycling facilities across Drury, Paerata and Pukekohe for all NoRs. It includes 26.2km new walking facilities, 30.6km of new cycle network, several grade-separated active crossings over the NIMT and dedicated pedestrian and cycle crossing facilities. The proposed improved walking and cycling environment is shown below in red in Figure 5-3.

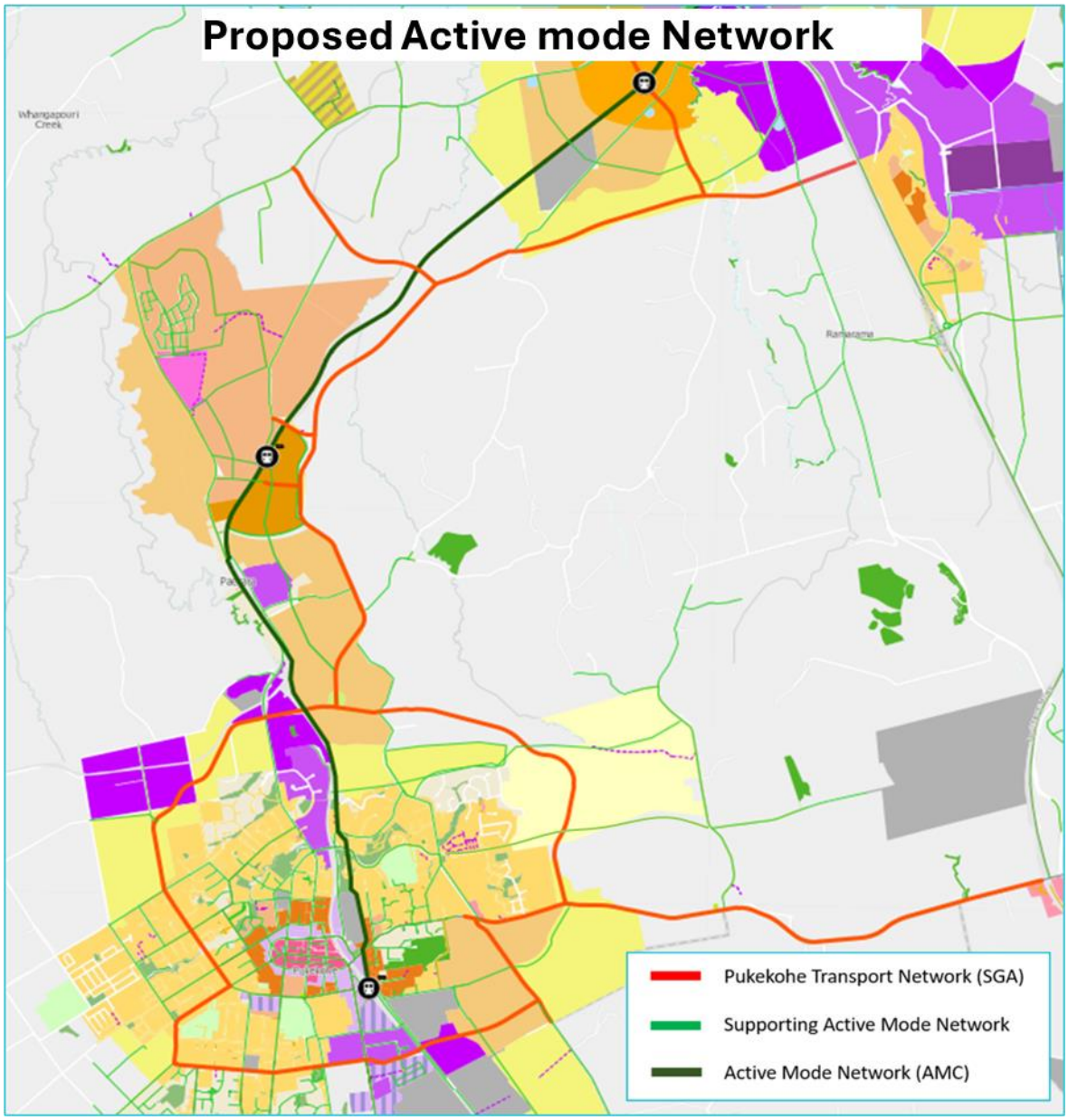


Figure 5-2: Proposed Active Mode Network

Figure 5-2: Proposed Active Mode Network

The proposed facilities differ between NoRs depending on the surrounding land use. Where alignments travel through the FUZ, facilities are proposed on both sides of the carriageway, however, where alignments run along a FUZ boundary, facilities are proposed on the FUZ side of the carriageway. Whether facilities will be shared or separated will be determined at the detailed design stage.

The proposed walking and cycling facilities have been designed in accordance with relevant AT standards and policies as summarised in Table 5-1 below.

Table 5-1: Walking and Cycling AT Standards and Policies

Policy/Standard	Network Component	Assessment
Auckland Transport Vision Zero[9] (Vision Zero)	Segregated walking and cycling facilities	Segregated walking and cycling facilities are proposed to provide a safe modal choice in the future environment. Vision Zero specifies that indicative proposed designs should feature separated cycling facilities for arterial corridors in excess of 30km/hr. The traffic speeds on the arterial corridors are proposed to be 50km/hr, therefore the indicative proposed design of the walking and cycling facilities is considered to be appropriate for these standards.
AT Transport Design Manual[10] (AT TDM)	Segregated walking and cycling facilities	A 1.8m footpath is has been allowed for on all corridors and a 2.0m cycle path. The total width of 6.8m is provided from carriageway to road boundary. This is in accordance with the AT TDM requirements.
	Shared path	Some sections are proposed to include a shared path that is indicatively 4.0m wide. This complies with the AT TDM requirements.
	Bidirectional cycle facilities	Some sections are indicatively proposed to have bidirectional cycle facilities. This are indicatively shown as approximately 3.6 wide. This complies with the AT TDM requirements.

The exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided by Vision Zero guidance.

The Pukekohe Transport Network projects are expected to result in significant positive effects on walking and cycling when compared to the existing and receiving environment, and these consist of:

- Notably reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along all NoRs and at intersections;
- Better integration with the future walking and cycling network, resulting in improved east-west and north-south walking and cycling connectivity;
- Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips;
- Serve as a key enabler for greater use of public transport modes by providing safe connector route between urban areas and the proposed Drury West and Paerata Stations;
- Support various growth areas adjacent to the corridors and improve access to employment, education and social amenities;
- Improved, walking and cycling network connectivity with land use on both sides of NIMT and safer rail crossing facilities;
- Enhanced integration with the proposed wider walking and cycling network (SH1 cycleway, the AMC cycleway along rail corridor and key trip attractors); and
- Strengthen the effectiveness of the stations and desired mode shift outcomes.

5.1.3 Public Transport

The Pukekohe Transport Network forms an integral part of the future public transport network, providing a primary east-west and north-south function for future planned services and serves as a gateway to key destinations in Drury, Paerata and Pukekohe (including new planned rail stations, centres and the strategic north-south public transport network).

The Network includes the provision of dedicated bus lanes for a section of the Drury West Arterial (NoR 1) where it connects to the proposed Drury West Rail Station. New and upgraded arterials provide space for future bus stops and enable local buses to access key destinations and public transport stations.

The effects of the Network on public transport are:

- The improved network-wide capacity will enable strategic traffic to use arterials and decongest various local bus routes;
- Significant improvement to east-west and north-south public transport connectivity, which will significantly improve access to employment and social amenities;
- Dedicated FTN facilities in Drury West will increase capacity and resilience, resulting in improved journey time performance and consistency for public transport users;
- Better integration with the future public transport network and services, resulting in improved access to public transport; and
- Enhanced integration with Pukekohe, Drury West and Paerata Stations, and serve as a key enabler to achieve mode shift targets.

5.1.4 General Traffic and Freight

For general traffic and freight, the Pukekohe Transport Network will significantly increase north-south and east-west connectivity and capacity for existing and future communities in Drury, Paerata and Pukekohe. It is well connected with the existing and planned future network and provides an alternative more direct north-south connection for general traffic and freight.

It significantly improves access for localised trips (including rail stations, centre and north-south movements between Drury, Paerata and Pukekohe). It also significantly improves a wider roading network to support the growth and forms an integral part of the general traffic and freight movements, providing primary east-west and north-south strategic roads linking to major centres such as Manukau and Auckland City Centre and other districts such as Hamilton and the wider Waikato.

Figure 5-3 below shows the proposed network for Drury, Paerata and Pukekohe.

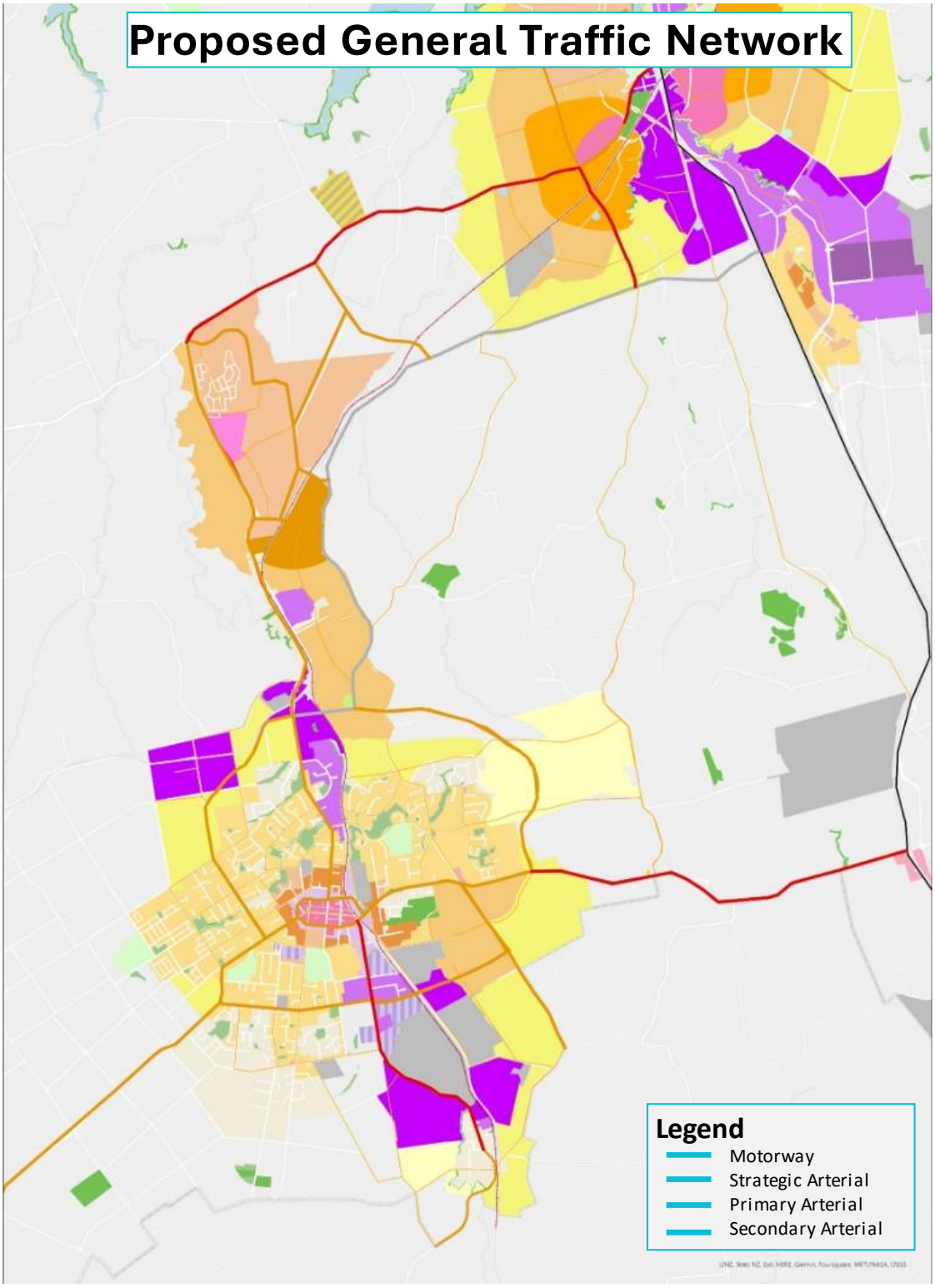


Figure 5-3: Proposed General Traffic Network

The modelling results suggest that the Pukekohe Transport Network has a network-wide impact on the strategic, urban and rural corridors in Drury, Paerata and Pukekohe. It significantly improves the distribution of traffic on the wider roading network. The increased north-south and east-west connectivity and capacity for existing and future communities also improved the wider network safety,

reliability and resilience by limiting the need for strategic traffic to use unsafe rural roads or congested urban roads.

The modelled ADTs are summarised below for each NoR in Table 5-2 and Table 5-3. It provides a summary of the expected traffic volumes on the transport network in 2048+ both without and with the NoRs / Projects, together with the effects of the overall NoRs of various roads.

Table 5-2: ADT and Peak Hour Volumes for each NoR

NOR	ADT both directions (vpd)	Peak hour volumes both directions
NoR 1 Drury West Arterial (new)	7,000-8,000	300-600
NoR 2 Drury to Pukekohe Link (new and upgraded)	7,000-25,000	900-2,100
NoR 3 Paerata Connections (new)	6,000-7,000	500-600
NoR 4 Pukekohe North-East Arterial (new)	5,000-15,000	400-1300
NoR 5 Pukekohe South-East Arterial (upgraded)	5,000-14,000	400-1200
NoR 6 Pukekohe South-West Upgrade (upgraded)	9,800	300-800
NoR 7 Pukekohe North-West Arterial (upgraded and new)	11,000	800-1000
NoR 8 (AC) and (WDC) Mill Road and Pukekohe East Road Upgrade (upgraded)	19,000-32,500	700-2700

Table 5-3: Expected Traffic Volumes with and without the Project

Road	ADT Volumes without Project	ADT Volumes with Project	Effects of the overall NoRs on Traffic Volumes
SH22 (Drury)	28,400	21,400	Notable benefit in reducing traffic volume
Mill Road	25,400	32,500	Provides capacity for increased traffic volumes but traffic rerouting benefit
Pukekohe East Road (east of Golding Road)	19,900	14,300	Benefit in reducing traffic volumes
East Road	27,900	20,000	Reduced traffic volume benefit
Cape Hill Road/Valley Road	15,000	4,900	Reduced traffic volume benefit
Helvetia Road South	9,300	9,800	Limited changes
Burtt Road (Drury West)	7,000	3,800	Moderate traffic volume reduction benefit but major safety benefit
Burtt Road (Rural)	6,700	700	Reduced traffic volume benefit and major safety benefit
Cape Hill Road	15,500	10,800	Reduced traffic volume benefit and major safety benefit

Road	ADT Volumes without Project	ADT Volumes with Project	Effects of the overall NoRs on Traffic Volumes
Blackbridge Road (North of SH22)	11,600	11,500	Limited changes
Linwood Road/ Hingaia Road	19,900	18,000	Limited changes
Quarry Road	8,900	10,800	Reduced traffic volume benefit
Gun Club Road	1,600	3,300	Minor increase of traffic from west
Waiuku Road	9,600	8,600	Reduced traffic volume benefit
Harrisville Road	6,500	14,100	Significant increase in traffic accessing strategic corridor
Buckland Road	9,500	8,000	Reduced traffic volume benefit

The modelling results shown in **Error! Reference source not found.**, were undertaken using a 2048+ forecast scenario to ascertain the likely daily rerouting effect that will occur as a result of the Project.

The modelling results suggest the Project will have a network wide effect on general traffic and freight, with a large proportion of traffic rerouting in Drury, Paerata and Pukekohe. The existing roads in Pukekohe South West will continue to perform their existing role in the network with limited rerouting. The proposed Pukekohe North West, North East and South East connections support the future growth and reroute traffic to the proposed more suitable arterial networks. The strategic north-south improvements in Paerata and Drury show that a large proportion of traffic reroute from rural, local and strategic corridors to the proposed arterial and strategic networks.

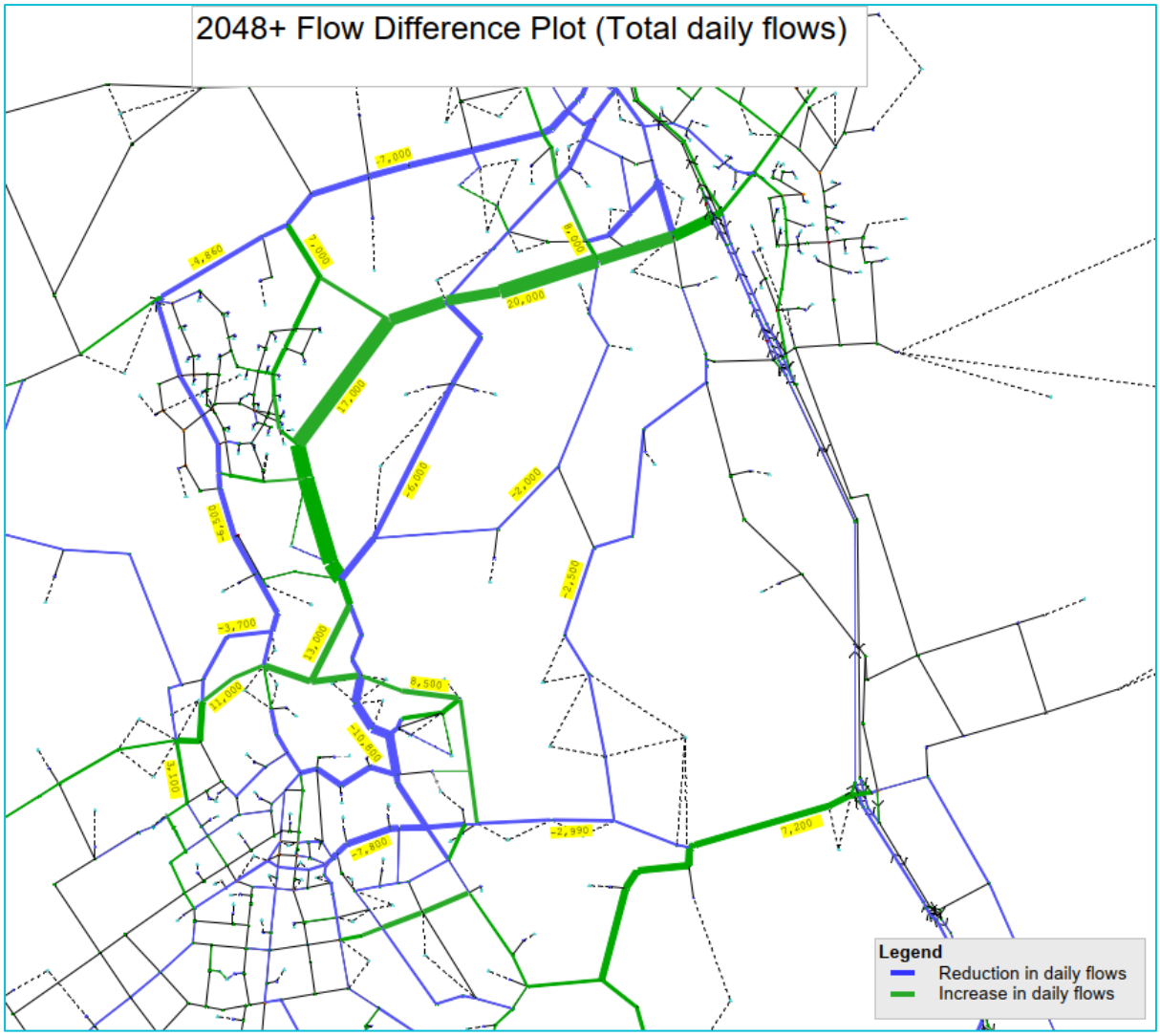


Figure 5-4: 2048+ Daily Rerouting Effect of Project for all traffic

Network Wide Performance

The Pukekohe Transport Network also significantly improves connectivity and will shorten the local connection between Drury, Paerata and Pukekohe by providing a new direct connection between the future communities. The Pukekohe Transport Network reduces 15.4 million vehicle kilometres travelled yearly, when compared with the existing and likely future network (without the Project). Further information on the modelling assumptions relating to the base scenario and likely future network are available within Appendix 1. This reduction in vehicle kilometres travelled will result in safety, positive environmental and health benefits. The modelling results also suggest that there is a 2,700-tonne yearly reduction in CO2 -eq/t emissions, when compared with the existing and likely future network (without the Project) which will also result in positive environmental and health benefits. Both the VKT and CO2 calculations are based on SATURN modelling outputs which considers general traffic impacts, excluding PT and active mode.

The enhanced corridor capacity will result in reduced journey times and reliability for existing and future freight. Table 5-4 and Figure 5-5 below shows the daily freight volume difference for some key corridors within the project area. From a network performance perspective, the modelling results also suggest that:

- The average travel time to SH1 Drury South interchange from the Industrial areas in North-West Pukekohe **reduces by 35%** for southbound traffic and **43% for northbound traffic** with the Pukekohe Transport Network in place. This improvement allows for efficient and effective means of freight vehicles accessing Pukekohe industrial areas; and
- The average travel time to SH1 Bombay interchange from the Industrial areas in South-East Pukekohe reduces by **15% for westbound** traffic and **30% for eastbound traffic** with the Pukekohe Transport Network in place.

Table 5-4: Average Travel time improvements for major freight routes

Route	Direction	Without the proposed projects	With the proposed projects
		Average Daily Travel time (Minutes)	Average Daily Travel time (Minutes)
SH1 Drury South interchange from the Industrial areas in North-West Pukekohe	NB	26	18
	SB	24	18
SH1 Bombay interchange from the Industrial areas in South-East Pukekohe	EB	24	19
	WB	23	20

The improved network will be able to accommodate more freight movements and improve choice by providing alternative options for both local and strategic freight.

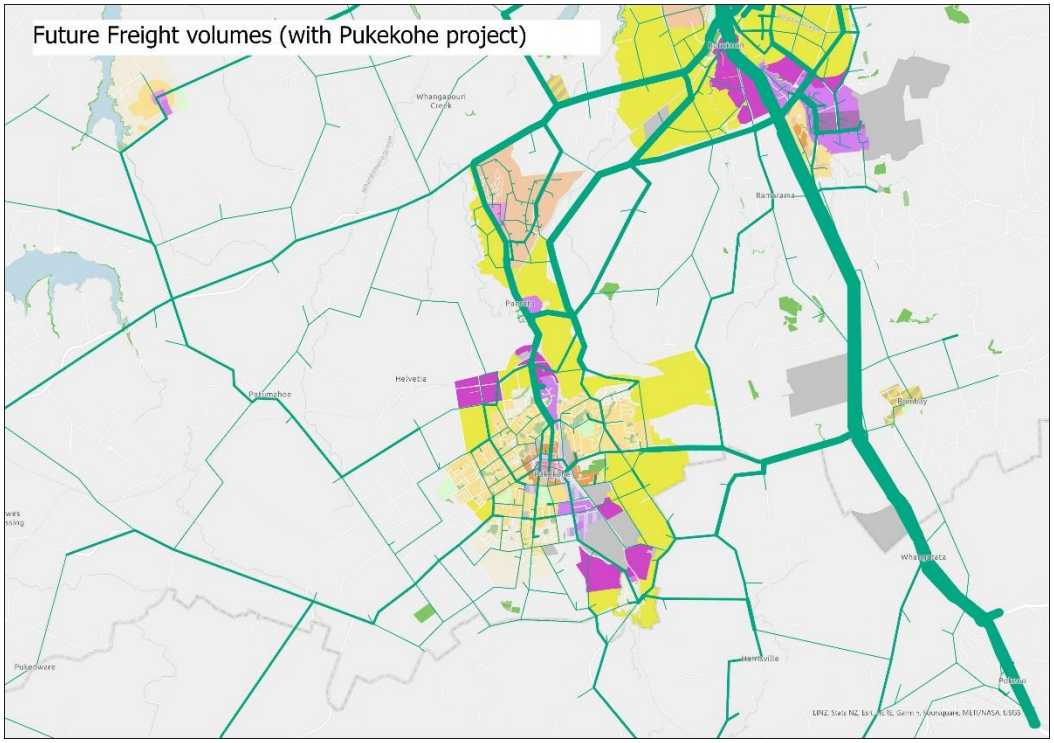


Figure 5-5: Freight Volumes with Pukekohe projects

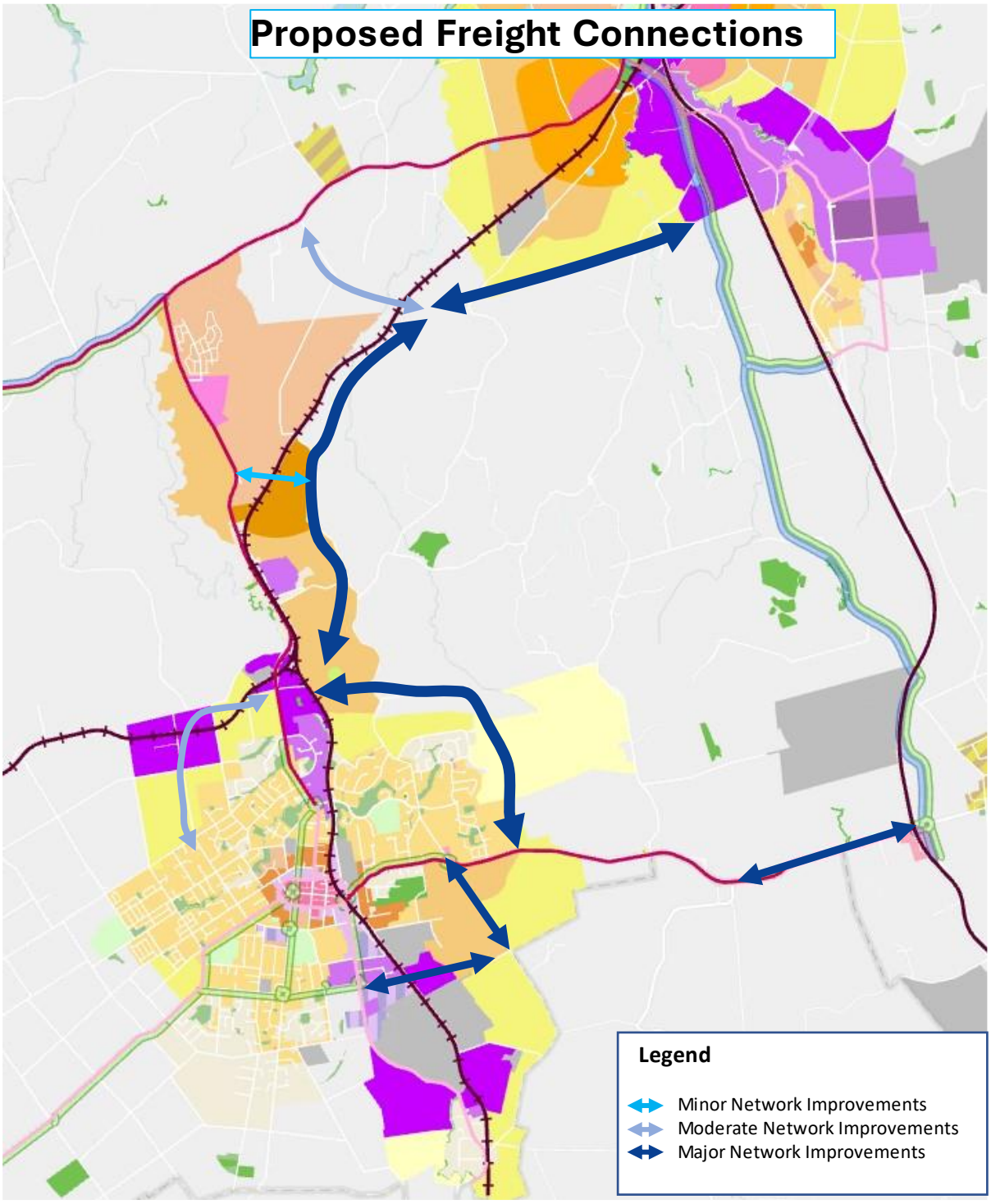


Figure 5-6: Freight Improvements

In addition to the operational effects of general traffic lanes, intersections along the route have also been analysed. The performance of the intersections is based on a 2048+ scenario, with the performance of the road network for each NoR (with intersections) being assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LOS and anticipated queue lengths. It should be noted that the final decision of the form and control of the intersections can be modified when further land use certainties are known at time of implementation. This is detailed in the Conditions, which confirms that intersection form will be confirmed as part of the Urban and

Landscape Design Management Plan (ULDMP). All proposed intersections include active modes facilities where relevant.

A summary of these key performance measures is shown below in Table 5-5.

Table 5-5: Intersection Performance for all NoRs

NOR		Intersection Type[5]	Peak period	Overall Level of Service	Degree Of Saturation (Worst movement)	95% back of queue (Worst movement m)
NoR 1	Drury West Station access	Signalised	AM	B	0.60	40
			PM	B	0.33	20
	Drury West Arterial / Burtt Road	Roundabout	AM	A	0.37	15
			PM	A	0.26	10
	Drury West Arterial / Runciman Road	Roundabout	AM	A	0.14	6
			PM	A	0.27	13
NoR 2	South Drury Arterial/Great South Road	Roundabout	AM	A	0.55	30
			PM	A	0.36	58
	South Drury Arterial/Drury West Arterial	Roundabout	AM	A	0.66	62
			PM	A	0.70	64
	South Drury Arterial/Burtt Road	Roundabout	AM	A	0.58	38
			PM	A	0.64	41
	Drury Paerata Link / SH22 Connection	Roundabout	AM	B	0.62	33
			PM	A	0.60	47
	SH22/ Sim Road North	Roundabout	AM	B	0.56	35
			PM	A	0.67	48
	SH22 Connection / Sim Road North	Roundabout	AM	A	0.44	20
			PM	A	0.29	12
	Drury-Paerata Link/ Sim Road South	Roundabout	AM	A	0.43	21
			PM	A	0.56	33
	Paerata Arterial / Station Access	Roundabout	AM	A	0.57	34
			PM	A	0.72	60
	Sim Road / Tuhimata Road	Roundabout	AM	B	0.90	107
			PM	A	0.73	53
	Paerata Arterial / Cape Hill Road	Roundabout	AM	A	0.63	56
			PM	A	0.78	103

[5] The final intersection form will be confirmed in the detail design phase prior to implementation.

NOR		Intersection Type[5]	Peak period	Overall Level of Service	Degree Of Saturation (Worst movement)	95% back of queue (Worst movement m)
NoR 4	NE Arterial / SH22 Paerata Road	Roundabout	AM	A	0.67	50
			PM	B	0.93	170
	NE Arterial / Paerata Arterial (new)	Roundabout	AM	A	0.34	10
			PM	A	0.45	20
	NE Arterial / Cape Hill Road	Roundabout	AM	A	0.37	16
			PM	A	0.46	20
	Pukekohe East Road / NE Arterial	Roundabout	AM	A	0.42	21
			PM	A	0.50	28
NoR 5	Pukekohe East Road / East St / Golding Road / Belgium Road	Roundabout	AM	A	0.57	36
			PM	A	0.59	40
	Golding Road / Royal Doulton Drive	Roundabout	AM	A	0.27	10
			PM	A	0.24	10
	Nelson Street / Svendsen Road	Roundabout	AM	B	0.75	76
			PM	B	0.80	93
NoR 7	Helvetia Road / Birdwood Road / Kauri Road	Roundabout	AM	A	0.32	15
			PM	A	0.40	20
	Pukekohe NW Arterial / Butcher Road	Roundabout	AM	A	0.30	13
			PM	A	0.36	18
	Pukekohe NW Arterial / Beatty Road	Roundabout	AM	A	0.26	10
			PM	A	0.36	15
	Pukekohe NW Arterial / Helvetia Road / Gun Club Road	Roundabout	AM	B	0.84	16
			PM	A	0.65	55
NoR 8	Mill Road/ BP access	Roundabout	AM	A	0.84	100
			PM	A	0.69	50
	Mill Road/ Harrisville Road	Roundabout	AM	B	0.85	120
			PM	A	0.65	55

Overall, the proposed intersections are predicted to perform at a satisfactory level during the peak periods under a 2048+ scenario.

The overall effects of the Project on general traffic and freight can be summarised as follows:

- Increased access to employment, educational and social amenities;

- Improved intersection capacity and safety to cater for future growth;
- Enhanced north-south and east-west connectivity between Drury, Paerata and Pukekohe by providing a reliable alternative that reduces vehicle kilometres travelled and travel time;
- Better north-south and east-west capacity and resilience, which will reduce strategic traffic rerouting to existing unsafe rural roads and collector roads;
- Improved east-west connectivity by adding four new safe NIMT rail crossings;
- Enhanced integration with Pukekohe Station and the proposed Drury West and Paerata Stations (including associated park and ride facilities) and the future urban areas surrounding the Project;
- Improved options, journey times and reliability for existing and future freight;
- Reduced emissions (2,700-tonne yearly), which will result in positive environmental and health benefits;
- Network-wide safety benefits by upgrading existing unsafe corridors and reducing strategic traffic rerouting to existing unsafe rural roads and collector roads; and
- Reduce 15,4 million vehicle kilometres travelled yearly, which will result in positive environmental and health benefits.

5.1.5 Property Access

The characteristics of each NoR change throughout the Project area due to varying factors such as unique access arrangements, speed limits, neighbouring land use, form and function. The common approach and guiding philosophy are detailed below, while the specific effects on each NoR are discussed separately in the following sections.

For existing properties, our design philosophy for the Projects has been to retain access wherever feasible. For new property accesses, direct property access is not advised to better align corridors with its future arterial access requirements.

As the area develops in Drury, Paerata and Pukekohe, current property accesses will be redirected as needed onto the collector road network, as outlined in the Drury-Ōpāheke and Pukekohe-Paerata Structure Plans. The collector network is expected to be confirmed by developers as they progress these connections through plan changes or resource consents.

In situations where a project impacts access (such as the need for realignment or regrading), these specifics will be confirmed during the detailed design phase, in coordination with the landowner, as part of property discussions under the Public Works Act.

Due to the complexity of evaluating access arrangements changing over time, it's not currently possible to confirm a precise treatment for all individual accesses, particularly in areas that is transitioning from rural to urban. These arrangements may undergo changes before the projects are carried out. Thus, the most suitable time to confirm these details is during the detailed design stage, prior to the onset of construction. It should be emphasised that the requirement for turning restrictions will be determined as part of the Outline Plan, at this stage the focus is on route protection. The draft conditions include a condition relating to existing property accesses, which will require the Outline Plan to demonstrate how safe alternative access will be provided to any property where vehicle accesses that exist at the time of the Outline Plan lodgement will be affected.

An assessment of property access has been undertaken to inform the designation boundary and concept design and to assess potential effects. However, as the area continues to develop, particularly in the FUZ areas, addressing access during future detailed design stages is recommended. In certain scenarios, restrictions on right-turn movements may be necessary for safety

reasons. The following assessment takes into account journey times affected by right-turn restrictions and suggests necessary mitigation measures.

5.1.5.1 NoR 1: Drury West Arterial

NoR 1 is planned to serve as a multi-modal arterial corridor linking the Drury West Town Centre, Drury West Rail Stations, and providing access to the strategic transport network, including SH1 and SH22. The section between SH22 and Burtt Road will also be upgraded to four lanes. It also facilitates connections to Burtt Road and Runciman Road in the south. Direct property access onto the Drury West Arterial is not advised due to potential safety concerns.

An assessment of property access has been undertaken to inform the designation boundary and concept design and to assess potential effects. There are limited existing properties that will require direct access given this is largely a new alignment and that its current land use function is largely rural. There are opportunities to realign access points to surrounding local roads such as Runciman Road and Burtt Road if required. As the Drury West area develops, the existing property accesses will be re-routed to the appropriate collector road network.

It is anticipated that a few properties (less than 3) will be restricted to left-in and left-out vehicle access, where right turning movements are restricted. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 2 minutes based on the farthest distance) due to the number of roundabouts located along the corridor and it is only for right turn movements not all turning movements.

5.1.5.2 NoR 2: Drury-Pukekohe Link

NoR 2 is proposed as a new inter-regional strategic corridor connecting Drury, Paerata and Pukekohe. This link is a two-lane median divided state highway with a posted speed limit of 50km/h in urban areas (FUZ) and 80km/h in rural environments, with a bi-directional active mode facility on the FUZ side. Given the strategic nature, high speed and movement, direct property access onto the Drury-Pukekohe Link is not recommended given the negative safety implications. Also, the suitable access in rural and future urban areas are different. The section adjacent to the FUZ (Drury and Paerata) will have a rural urban boundary function with more frequent access and the rural section between Drury and Paerata will have limited access.

An assessment of property access has been undertaken to inform the designation boundary and concept design and to assess potential effects. As the route is largely a new alignment and the surrounding land use function is rural and on the boundary of the FUZ, there is not considered to be a significant impact on property access. Majority of the property accesses will be maintained with limited to no impact on property access. It is anticipated that a few properties (less than 10) will be restricted to left-in and left-out vehicle access, where right turning movements are restricted. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 3 minutes) due to the number of roundabouts located along the corridor.

5.1.5.3 NoR 3: Paerata Connections

NoR 3 provides two connections from the existing Sim Road (south) proposed to be upgraded by NoR 2 to the Paerata Rail Station and Paerata Rise development. These connections provide the primary east-west connections for all modes in Paerata with a 50kph speed limit. Direct property access onto Drury West Arterial is not recommended given the negative safety implications.

The Paerata Connections have little impact on property access, given the relatively small extent of the corridor and largely new alignment. The assessment of existing property accesses found that only few properties (less than 3) are affected, and it is viable to realign access to Sim Road. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 1 minute) due to the number of roundabouts located along the corridor and it is only for right turn movements not all turning movements.

5.1.5.4 NoR 4: Pukekohe North-East Arterial

The Pukekohe North-East Arterial is a new two-lane transport corridor with walking and cycling from SH22 in the northwest connecting to Pukekohe East Road in the southeast. As the route is largely a new alignment and the surrounding land use function is primarily rural, there is not considered to be a significant impact on existing property access.

Also given that the surrounding transport network is limited, the access changes and additional new intersections in future will largely be driven by land development adjacent to NoR 4.

Where properties have existing access along NoR 4, accesses will be retained where feasible. It is anticipated that a few properties (less than 3) will be restricted to left-in and left-out vehicle access, where right turning movements are restricted. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 2 minutes) and it is only for right turn movements not all turning movements.

5.1.5.5 NoR 5: Pukekohe South-East Arterial

The Pukekohe South-East Arterial upgrades part of Pukekohe East Road, Golding Road and provides a new connection between Golding Road (from north of Royal Doulton Drive) and across Station Road and the NIMT to the existing industrial development on Crosbie Road to Svendsen Road. Wrightson Way, Svendsen Road and Crosbie Road will be realigned slightly to tie-in with the new NIMT crossing and adjacent accesses will be realigned and regraded. Pukekohe South-East Arterial is a two-lane median divided arterial with walking and cycling facilities and a posted speed limit of 50km/h. Direct property access onto Pukekohe South-East Arterial is not recommended given the negative safety implications.

There are a few existing properties directly using the routes that are already part of a plan change area. Existing property accesses will be retained where feasible. In future, the collector network is expected to be confirmed by developers as they progress these connections through plan changes or resource consents.

Majority of the property accesses will be maintained with limited to no impact on property access. It is anticipated that a few properties (less than 5) will be restricted to left-in and left-out vehicle access, where right turning movements are restricted. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 2 minutes).

5.1.5.6 NoR 6: Pukekohe South-West Upgrade

The Pukekohe South-West Upgrade involves the re-allocation of road space within the existing road corridor for a bi-directional cycle way and footpath upgrade. The proposed designation is limited to specific intersections and driveways to safely accommodate active mode facilities. The existing road reserve is to be utilised where possible retaining a 20m wide cross section with 2 lane general traffic, walking on both sides and a bi-directional cycleway on one side of the corridor.

There are numerous existing accesses along NoR 6, however it is not considered that the road upgrades will have an impact on accesses, and it expected that all will be retained (with some associated regrading).

5.1.5.7 NoR 7: Pukekohe North-West Arterial

The Pukekohe North-West Arterial is a new 2 lane transport corridor with walking and cycling and has a 50kph posted speed limit that provides a connection between Helvetia Road in the southwest and SH22 in the northeast.

There are limited existing properties directly using the route given this is largely a new alignment. In future, the collector network is expected to be refined by Auckland Council during subsequent structure planning processes and these will then likely be refined and confirmed by developers as they progress these connections through plan changes or resource consents. Where existing accesses exists property access will be retained where feasible. The initial assessment of existing property access found that of those properties affected, it is viable to realign access or regrade access with minimal effects.

A notable number of property accesses will be maintained with limited to no impact on property access. It is anticipated that a few properties (less than 12) will be realigned or restricted to left-in and left-out vehicle access, where right turning movements are restricted. Through assessing the re-routing time, it has been determined that the additional journey time is minimal (less than 1 minute) due to the number of roundabouts located along the corridor and it is only for right turn movements not all turning movements.

5.1.5.8 NoR 8 (AC) and (WDC): Mill Road and Pukekohe East Road Upgrade

Mill Road is proposed to be upgraded to four lanes from SH1 in the east to Harrisville Road in the west. It has a 30m wide cross section with four lanes for general traffic, with walking and cycling on the southern side. The Pukekohe East Road is proposed to be upgraded for walking and cycling facilities on the southern side from Harrisville Road in the east to NoR 5 in the west.

For Pukekohe East Road section, there are numerous existing accesses along NoR 8, however it is not considered that the active mode upgrades will have an impact on accesses, and it is expected that all would be retained (with some associated regrading).

For the Mill Road section between SH1 in the east to Harrisville Road, given that the posted speed limit is 80kph, the proposed 4-laning and the significant amount of traffic growth expected, right turn property access is recommended to be restricted given the negative safety implications.

It is proposed that all accesses along this section to be changed to left-in and left-out on, with right turn movements prohibited. Given that this is a rural environment with no Structure Plan or any supporting networks planned, majority of the existing properties will face a diversion impact on the main network given that left-in and left-out only will be permitted.

As part of the design process, a new roundabout was added at 185 Mill Road to minimise the potential adverse effects caused by the restricted right turn movements. Including the additional turning facility, the diversion for the number of existing properties with direct access to NoR 8 will be around 3-4 minutes (only for right turn movements not all turning movements).

5.1.5.9 Summary of Property Access

For existing properties, our design philosophy for the Projects has been to retain access wherever feasible. For new property accesses, direct property access is not advised to better align corridors with its future arterial access requirements and corresponding Structure Plans.

In situations where a project impacts access (such as the need for realignment or regrading), these specifics will be confirmed during the detailed design phase, in coordination with the landowner, as part of property discussions under the Public Works Act. It is proposed for each of the designations to include a condition to demonstrate (in the Outline Plan) how safe access will be provided for each existing access that is altered by the projects.

While some properties may require longer routes for access (such as where right turn access is banned), these effects are expected to be offset by the more reliable and significant improvement to safety for all users. This balance between movement and safe access is considered acceptable for the future context and no further mitigation had been identified.

5.1.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

This section identifies measures to avoid, remedy or mitigate actual or potential adverse operational effects. The Pukekohe Transport Network provides significant positive effects and there are no operational adverse effects to mitigate.

Due to the complexity of access arrangements changing over time, it's not currently possible to confirm a precise treatment for all individual accesses, particularly in areas that are transitioning from rural to urban. These arrangements may undergo changes before the projects are carried out. Thus, the most suitable time to confirm these details is during the detailed design stage, prior to the onset of construction. Therefore, it is proposed for each of the designations to include a condition to demonstrate (in the Outline Plan) how safe access will be provided for each existing access that is altered by the projects.

A number of existing properties on the Pukekohe Transport Network will experience a minor detour as direct access will be altered due to restricted turning movements (left in, left out). The implementation of these restricted movements, such as the inclusion of a raised median or wire rope barrier, will enhance the network's efficiency and safety. These diversions, caused by the prohibition of right turns from existing accesses, are anticipated to be minor, adding a maximum of 1 - 4 minutes to journey times (only for restricted right turn movements). This will impact only a small subset of the existing properties. This is considered acceptable, and no further mitigation had been identified.

The mitigation measures embedded in the design are deemed necessary for NoR 8. A new roundabout has been included in the concept design to minimise adverse effects. This has been placed between the proposed roundabout at Harrisville Road, and the existing roundabout at the Bombay interchange at 185 Mill Road which decreases the impact of re-routing to an acceptable level. This is considered acceptable, and no further mitigation had been identified.

5.2 Assessment of Construction Effects (NoR 1 to NoR 8)

This section describes the effects of the Pukekohe Transport Network during construction of the NoRs. Measures to avoid, remedy or mitigate actual or potential adverse effects are also identified.

The Pukekohe Transport Network includes both new transport corridors and upgrades of existing corridors. For those projects adjacent to or in the live carriageway, temporary traffic management will be required. The scale of temporary traffic management to delineate live traffic away from the construction zones is largely dependent on the various stages and requirements of the construction activities. It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey, and investigation work.

The effect of temporary road closure or other traffic management methods to existing traffic on the specific corridor and adjacent road network should be confirmed in the future as part of the CTMP for each project based on the current traffic environment. This will consider the level of growth and activities that has occurred in the area, the availability of alternative routes, and any additional sensitive land use activities.

In particular, construction works in Pukekohe urban areas to provide for the arterial connections (including new and upgraded) will be disruptive to residents and users of the transport network around the area. This will require careful planning and implementation, but many similar construction works of this scale have been carried out across the Auckland region previously.

The construction of some projects will likely require significant earthworks. Final cut and fill volumes will be confirmed during detailed design prior to construction. This will likely result in an increase of traffic volumes on construction routes used during the construction period of each of these projects.

The following sections set out key considerations when assessing the construction traffic effects associated with the Pukekohe Transport Network.

5.2.1 Traffic Routing

Given the construction timing and staging of the projects has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated traffic routes. This means:

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites which are not yet certain;
- The exact location and extent of compound sites/lay down areas has yet to be determined; and
- The timing of construction of other projects could impact on likely construction vehicle routes.

Notwithstanding this, it is considered that with available connectivity to the strategic network and available capacity in the network, construction traffic will be able to be readily accommodated.

It is noted that the access to compound sites/laydown areas and construction zone for construction vehicles, plant and materials will be via site access points identified as part of future CTMPs.

Details of the routes and time restrictions will need to be updated and refined as part of the CTMP process. It is anticipated that the routes for construction traffic will likely be limited to arterial corridors and intersections with the provision of adequate vehicle tracking.

The CTMP will need to consider the suitability and effects prior to the use of those other road corridors and may require specific mitigation, such as restrictions on the number or time of day / week that construction vehicles could utilise those corridors.

5.2.2 Speed Limits

To maintain the safety of all road users, it is recommended that a safe and appropriate temporary speed limit is implemented during the construction period on the network within the extent of works, and along the construction routes if needed. This should be in accordance with the latest traffic management standards at the time of construction. These recommended measures and other measures highlighted in the CTMP are expected to reduce the potential safety risks that may be associated with construction traffic.

5.2.3 Pedestrians and Cyclists

The provision for pedestrian and cyclists is variable across the existing network. It is likely that the demand for these modes will increase if urbanisation occurs prior to construction, but future parallel collectors could also be used as alternative routes. Therefore, effects should be assessed again when a greater level of detail is available about surrounding facilities and land use activities prior to construction. It is recommended that residents and stakeholders be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity be used to inform appropriate traffic management measures in the CTMP.

5.2.4 Property Access for Residents and Businesses

During the time of construction, there will be temporary traffic management controls such as temporary concrete or steel barriers. Existing driveways that remain during construction will be required to have temporary access provision.

It is expected that the contractor will undertake a property specific assessment of any affected driveways and provide temporary access arrangements if required. The temporary access should ensure the ability for residents to safely access and exit the property. These requirements should be captured in the CTMP or SSTMP, if required. As such, confirmation of traffic management controls will be required prior to works to reflect the land use considerations at that time.

5.2.5 On-street and Public Parking

During the time of construction, the works or associated temporary traffic management controls may result in existing on-street parking or public parking not being available. It is anticipated that the contractor will undertake a detailed assessment of any affected parking and, if necessary, provide alternatives, particularly for mobility parking or loading spaces. The loss of any general public parking will need to consider the duration of effects and the impact on specific businesses. Where temporary alternatives are necessary, this should ensure the ability for the public to safely access these spaces. These requirements should be captured in the CTMP or SSCTMP, if required.

5.2.6 Parallel Construction of Projects

It has currently been assumed that each of the NoR corridors will be constructed separately, i.e., not constructed in parallel with each other. The extended lapse dates mean that there is the opportunity to provide separation between the construction of the corridors, whilst funding and implementation decisions are made.

There is the potential that some of the corridors may be constructed at the same time (depending on later implementation decisions), however, it is considered that this would most likely affect the amount of construction traffic on the transport network. Where necessary, it is considered that this could be

adequately managed, through the CTMPs and more detailed staging of construction works at that time through the well-established CTMP processes of Waka Kotahi and AT.

The construction of projects in parallel, could potentially also provide the opportunity for efficiencies in the construction process by enabling combined compound sites/laydown areas or reducing the transport of spoil (with further efficiencies in cut and fill transport across multiple sites).

5.2.7 Land Use Activities that will need Further Consideration in the CTMP

Table 5-6 provides a summary of the key land use or activities that are located adjacent to the corridors and will need specific consideration during the development of the CTMP. This could include restricted truck movements during school pick up and drop off, or additional controls at key access locations. The majority of the projects are within the FUZ and generally in a rural environment until urbanised in the future. Specific sites will be assessed through the CTMP based on land use and sites existing at the time of construction. The below list is based on the existing environment.

Table 5-6: Sites for Consideration within Future CTMP

NoR	Corridor	Sites for Specific Consideration
1	Drury West Arterial	Catholic school on Burtt Road and Drury West Station
2	Drury Pukekohe Link	No specific site identified
3	Paerata Connections	Paerata Station
4	Pukekohe North-East Arterial	No specific site identified
5	Pukekohe South-East Arterial	Maintain access to commercial area along Wrightson Way, Svendsen Road and Crosbie Road.
6	Pukekohe South-West Upgrade	Existing O-D routes
7	Pukekohe North-West Arterial	No specific site identified
8 (AC and WDC)	Mill Road and Pukekohe East Road Upgrade	Strategic high-volume general traffic and freight route with limited alternative route choices

5.2.8 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

The potential construction traffic effects can be accommodated and managed appropriately via a CTMP. The construction of the corridors will have more localised transport effects, such as access, for individual properties or activities. Appropriate mitigation during the construction phase can be provided, such as maintaining access through construction works, or providing an alternative access where access cannot be maintained, which can be developed through a CTMP at the time of construction.

It is recommended that a CTMP be prepared prior to the start of construction for each stage of work for each of the Pukekohe Transport Network projects. Any potential construction traffic effects will be assessed prior to construction taking into account the specific construction methodology and traffic / transport environment at the time of construction. It is considered that the objectives and associated conditions for the CTMP, identified in the AEE, will enable the adverse transport effects to be appropriately managed.

It is recommended the following is included in the CTMP proposed as a condition on the designations:

- Methods to manage the effects of temporary traffic management activities on traffic;
- Measures to ensure the safety of all transport users;
- The estimated numbers, frequencies, routes and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
- Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
- Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
- Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
- The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads; and
- Method that will be undertaken to communicate traffic management measures to affected road users (e.g. residents/public/stakeholders/emergency services).

6 Conclusion

Existing Environment

The existing transport corridors within Drury West, Paerata and Pukekohe servicing the Project Area are operating near or at capacity, with limited opportunity to accommodate growth. The local transport network in and surrounding Drury West, Paerata and Pukekohe is a mix of urban and rural environment with poor east-west and north-south connectivity and substandard facilities for an urban context. The current facilities consist of high-speed rural roads, with direct property access and non-existent or poor public transport, walking and cycling facilities.

It is evident from the analysis and findings presented in this document that there are significant adverse effects associated with the current state of the transport network. The adverse effects are increased safety risk for all users, hostile and unsafe environment for active modes, decreased reliability for general traffic and public transport and would lead to several undesirable transport and land use integration outcomes.

The increase in traffic as a result of the growth and lack of dedicated walking and cycling facilities will create a hostile environment for vulnerable road users. Issues identified in this report include:

- The crash history shows a total of 83 fatal and serious injury crashes in the ten-year period (between 2012-2022), which is approx. 7% of the total crashes. Various corridors within the Drury-West, Paerata and Pukekohe areas have been identified in AT's Future Connect as medium to high-risk corridors (KiwiRAP Safety Indicators).
- There are limited to no safe cycling facilities across on majority of the project area. The lack of a safe and connected cycleway network across Pukekohe, Paerata and Drury creates and unsafe and hostile environment for both motorists and active mode users.
- Most existing roads and roadside facilities in Drury-West, Paerata and Pukekohe have limited public transport facilities and services, with some carriageway widths are not suitable to service public transport adequately.
- Many of the strategic corridors are operating at capacity in peak hours, often with extensive delays. Although the rural corridors tend to operate at lower demands, when the strategic corridors get too congested, traffic shifts onto these rural corridors given that it is the only alternative route options.
- There are some overweight and over-dimension freight routes within the project area. During commuter peaks, freight trucks tend to use local or collector roads to avoid congestion which leads to additional pressure on local roads and trigger safety concerns.

The above information emphasises that the existing roads within Pukekohe are not fit for purpose and that the above issues will then lead to further undesirable transport and land use integration outcomes if growth progresses.

Future Receiving Environment (without the Pukekohe Transport Network)

The wider Drury, Pukekohe and Paerata areas in the south of Auckland have been signalled to undergo significant urban growth in the AUP:OP and the Council approved Structure Plan in 2019, and recently received private plan change to rezone these areas.

The Drury-Ōpāheke Structure Plan area is estimated to provide about 22,000 houses and about 12,000 jobs with a population growth of about 60,000 over a 30-year period. The Pukekohe-Paerata

Structure Plan is estimated to provide approximately 55,000 people added to the existing population of around 31,000. The new growth areas will also potentially provide about 9,000 additional jobs.

The future receiving transport environment (without the Projects) is not fit for purpose to support the planned future urban growth, with unattractive and unsafe travel by walking and cycling, inefficient and unreliable public transport services and unreliable and unsafe travel for general traffic and freight. There are wider adverse transport systems effects will also compromise access to employment, educational and social amenities for existing and future communities if future growth progresses and existing infrastructure remains the same.

There are significant adverse effects expected if future growth progresses and the existing transport environment remains the same. These include (but are not limited to):

- The scale of future north-south traffic growth is expected to increase by 131%. The existing network does not have sufficient additional capacity to cater for demand from future growth. This will lead to strategic traffic rerouting to existing unsafe high-speed rural roads (Burtt Road, Runciman Road, Tuhimata Road, Sim Road and Cape Hill Road) and will significantly increase the risk for DSI's.
- The form of various of the rural collectors (Sim Road, Tuhimata Road, Cape Hill Road, Golding Road, Heights Road and Helvetia Road) internal to or adjacent to future urban zones are not fit for purpose to support the planned future growth. Without appropriate speeds and safe facilities for all users within Pukekohe, Paerata and Drury, this will significantly increase the risk for DSI's.
- In relation to walking and cycling, a significant part of the network in the growth areas is not fit for purpose to serve the future growth areas. There are currently limited to no dedicated pedestrian or cycle facilities for large portions in and around Drury, Paerata and Pukekohe growth areas.
- Even with planned investment in public transport stations and future services, the existing roads and public transport roadside facilities in Drury-West, Paerata, and Pukekohe are not fit for purpose to support the planned future growth.
- As mentioned previously, the existing road network in Drury-West, Paerata, and Pukekohe is already experiencing congestion on strategic corridors (SH1, SH22, SH1, Pukekohe East Road/ Mill Road), urban corridors and occasionally on rural corridors. Even with these longer-term projects, the network does not have sufficient capacity to cater for demand from future growth.

The above information emphasises that even with the long-term planned projects, the future receiving environment is not fit for purpose to support the planned future urban growth. The adverse effects associated with the existing environment are increased safety risk and severance for all users, decreased journey time reliability for general traffic and public transport. All the above will then lead to further undesirable transport and land use integration outcomes.

Assessment of Transport Effects (with the Pukekohe Transport Network)

The assessment of operational effects (post-construction) concludes that the Pukekohe Transport Network has significant positive transport effects. The Pukekohe Transport Network provides a safe and reliable transport network that supports growth in the wider Drury, Pukekohe and Paerata areas. It significantly improves travel choice for general traffic, freight public transport and active modes, improves safety and improves access to employment, educational and social amenities.

It is anticipated that the expected growth in the Pukekohe will be supported by incremental improvements to the local and strategic road network, walking and cycling facilities, freight accessibility and public transport. This includes the provision of new arterial routes connecting key

destinations, a high-quality, connected walking and cycling network and prioritised bus movements. This improved network offering is necessary to support a shift to alternative modes and increase the attractiveness of active modes and public transport as a mode choice. The Pukekohe Transport Network will significantly improve corridor capacity, resulting in improved journey times, reduced congestion and delays on strategic networks such as SH1 and SH22, reduced volume on local roads and improved reliability for future general traffic, freight and public transport demand.

The Pukekohe Transport Network also significantly improves connectivity and will shorten the local connection between Drury, Paerata and Pukekohe by providing a new direct connection between the future communities. The Pukekohe Transport Network reduces 15.4 million vehicle kilometres travelled yearly, when compared with the existing and likely future network (without the Project). This reduction in vehicle kilometres travelled will result in safety, positive environmental and health benefits. The modelling results also suggest that there is a 2,700-tonne yearly reduction in CO2 -eq/t emissions, when compared with the existing and likely future network (without the Project) which will also result in positive environmental and health benefits.

The enhanced corridor capacity will result in reduced journey times and reliability for existing and future freight. From a network performance perspective, the modelling results also suggest that:

- The average travel time to SH1 Drury South interchange from the Industrial areas in North-West Pukekohe **reduces by 35%** for southbound traffic and **43% for northbound traffic** with the Pukekohe Transport Network in place. This improvement allows for efficient and effective means of freight vehicles accessing Pukekohe industrial areas; and
- The average travel time to SH1 Bombay interchange from the Industrial areas in South-East Pukekohe reduces by **15% for westbound** traffic and **30% for eastbound traffic** with the Pukekohe Transport Network in place.

Some existing properties will face a minor diversion impact on the main network given the proposed right turn restrictions for some properties. However, the diversions are expected to be small (up to a maximum of 3 - 4 minutes) and only affect a small number of existing properties. The diversions will enable the efficient and safe operation of the new network. While some properties may require longer routes for access (such as where right turn access is banned), these effects are expected to be offset by the more reliable and significant improvement to safety for all users.

In terms of construction effects, the are several potential adverse effects mainly linked to temporary traffic management (construction traffic routes, partial or full road closure, construction traffic, speed limit, vulnerable road users, driveways and property access). However, the effects can be appropriately mitigated. It is recommended the impact of any construction traffic effects is reassessed when a greater level of detail is available regarding the specific construction methodology and traffic environment at the time of construction.

The assessment overall concludes that the Pukekohe Transport Network has significant positive effects. The Network provides a safe and reliable arterial network that supports growth in the wider Drury, Pukekohe and Paerata. It significantly improved travel choice for freight, general traffic, public transport and active modes, combats safety concerns and improves access to employment, educational and social amenities.

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Appendix A
Modelling Assumptions

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

Project	Project(s)	Base (2016)	2048+ Without Pukekohe Network	2048+ Pukekohe Network
Rail DBC package	Additional rail capacity between Pukekohe and Papakura (and associated grade separations at road/rail crossings)	Excluded	Included	Included
	New rail stations at Drury Central, Drury West and Paerata and associated park and ride facilities	Excluded	Included	Included
	Regional north-south cycle route between Drury and Pukekohe, with grade-separated active mode crossings of SH1 and NIMT	Excluded	Included	Included
South Strategic DBC package	Manukau to Takaanini Access and Safety Project – 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 SH1 in Drury South	Excluded	Included	Included
SH1 Papakura-to-Bombay	The P2B project includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the SH22 upgrade project. The Interchange upgrade will also need to provide for proposed rail upgrades. 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.	Excluded	Included	Included
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. Parts of this programme have been recently completed, including a roundabout at the intersection of SH22 and Glenbrook Road, and the right-turn bay into Jesmond Road.	Excluded	Included	Included
	Longer term upgrades on SH22 between SH1 and Oira Road are being looked at by NZUP. 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.	Excluded	Included	Included
Drury Strategic Transport Network	Jesmond to Waihoehoe East FTN Arterial upgrade (NoR D2)	Excluded	Included	Included
	Waihoehoe Road East Arterial Upgrade (NoR D3)	Excluded	Included	Included

Project	Project(s)	Base (2016)	2048+ Without Pukekohe Network	2048+ Pukekohe Network
	Opāheke North-South FTN Arterial (NoR D4)	Excluded	Included	Included
	Ponga Road / Opāheke Road Arterial Upgrade (NoR D5)	Excluded	Included	Included
Takaanini DBC Package	Great South Road and Takaanini FTN, Level crossing upgrades, Wastney, Popes, Mahia Road upgrades, Takaanini Interchange upgrades, Croskery Road urbanisation	Excluded	Included	Included
Pukekohe General	Indicative New Collector Roads	Excluded	Included	Included
	Crown Road closure	Excluded	Included	Included
	Speed limit changes in Auckland (arcgis.com) (only for the Pukekohe study area)	Excluded	Included	Included
Pukekohe DBC Packages	All Pukekohe NoRs: NoR 1 - Drury West Arterial NoR 2 - Drury-Pukekohe Link NoR 3 - Paerata Connections NoR 4 - Pukekohe North-East Arterial NoR 5 - Pukekohe South-East Arterial NoR 6 - Pukekohe South-West Upgrade NoR 7 - Pukekohe North-West Arterial NoR 8 - Mill Road and Pukekohe East Road Upgrade	Excluded	Excluded	Included
Growth	Land Use Assumptions	up to 2016	up to 2048+	up to 2048+

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Appendix B
Interdependencies with other projects

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

Project	Relationship and Influences	NoR1	NoR2	NoR3	NoR4	NoR5	NoR6	NoR7	NoR8 (AC) and (WDC)
Additional rail capacity between Pukekohe and Papakura (and associated grade separations at road/rail crossings). Also includes crown road closure.	A road rail bridge is proposed on new arterials to cross the NIMT Rail line. The bridge in included in each NoR in the Pukekohe DBC	√	√	√	√	√			
New rail stations at Drury Central, Drury West and Paerata	The DW arterial and Paerata Arterial Connections are located adjacent to and are being coordinated with the project for a proposed new rail station at Drury West and Paerata respectively.	√		√					
Regional north-south cycle route (AMC) between Drury and Pukekohe, with grade-separated active mode crossings of SH1 and NIMT	Walking and cycling paths along the proposed arterials will connect to this more strategic cycling route. Together these projects will provide seamless transfer from collector and arterial cycling network to a regional network.	√	√	√	√	√			
Manukau to Takaanini Access and Safety Project – 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 SH1 in Drury South	The South Drury arterial corridor (part of NoR 2) will be coordinated with and will connect to the proposed Manukau to Takaanini Access and Safety Project from Great South Road roundabout.		√						
The P2B project includes an upgrade to the existing Drury interchange, which connects to and is interdependent with the SH22 upgrade project. The Interchange upgrade will also need to provide for proposed rail upgrades.	With the upgrade of the existing Drury Interchange, the strategic traffic and active modes from North of Drury can seamlessly transfer to Drury-Pukekohe link and Mill Road enabling a short and direct connection to Pukekohe.		√						√

Project	Relationship and Influences	NoR1	NoR2	NoR3	NoR4	NoR5	NoR6	NoR7	NoR8 (AC) and (WDC)
The Safe Network Programme is in the funding application process for short-term safety improvements in the SH22 area. Parts of this programme have been recently completed, including a roundabout at the intersection of SH22 and Glenbrook, and the right-turn bay into Jesmond Road.	With the speed upgrades along SH22 the semi-rural and urbanised sections will have safer intersections, and adequate walking cycling facilities. The upgrade will influence the form and function of the corridor and improve the efficiency to adjoining arterials.		√	√	√			√	
Upgrades on SH22 between SH1 and Oira Road funded by NZUP. These upgrades are proposed to improve safety, amenity and capacity along the route to enable urbanisation	This upgrade on SH22 will improve walking, cycling and public transport connectivity to Drury-West town centre and nearby developments. The proposed connection to Drury-West will be benefited from this connection.	√							
Indicative New Collector Roads	All the new and existing collector roads will support the strategic and arterial connections proposed in the Pukekohe Transport Network, enhancing the overall efficiency of the transport network.	√	√	√	√	√	√	√	√
Safe Speeds Programme, Auckland	The project will upgrade speed limits on most roads within the Project area, making it safer for all road users and reducing risk of DSIs from high-speed roads.	√	√	√	√	√	√	√	√