Eastern Busway
EB2 and EB3 Residential

Integrated Transport Assessment

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Eastern Busway

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Terms and Definitions

Table 1: Terms and definitions

Abbreviation and Definitions	Description
AADT	Average Annual Daily Traffic
AEE	Assessment of Effects on the Environment
AFC	Auckland Forecasting Centre
AMETI	Auckland-Manukau Eastern Transport Initiative
AC	Auckland Council
AT	Auckland Transport
A2B	Airport to Botany
AUP(OP)	Auckland Unitary Plan (Operative in part) 2016
BPO	Best practicable option
CAS	Crash Analysis System
CEMP	Construction Environmental Management Plan
CMA	Coastal Marine Area
CoPTTM	Code of Practice for Temporary Traffic Management
CTMP	Construction Traffic Management Plan
DOS	Degree of Saturation
EB1	Eastern Busway 1 (Panmure to Pakuranga)
EB2	Eastern Busway 2 (Pakuranga Town Centre)
EB3 Commercial/ EB3C	Eastern Busway 3 (Pakuranga Creek to Botany)
EB3 Residential/ EB3R	Eastern Busway 3 (SEART to Pakuranga Creek)
EB4	Eastern Busway 4 (Botany Town Centre Station)
EBA	Eastern Busway Alliance
HNZPT	Heritage New Zealand Pouhere Taonga
HNZPTA	Heritage New Zealand Pouhere Taonga Act 2014
ITA	Integrated Transport Assessment
km	Kilometre(s)
km/h	Kilometres per hour
LOS	Level of Service
m	Metre(s)
m^2	Square Metre(s)
m^3	Cubic Metre(s)
MCA	Multi Criteria Analysis
MSM	Macro Strategic Model
NES - CS	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
NES - FW	Resource Management (National Environmental Standards for Freshwater) Regulations 2020
NPS - FM	National Policy Statement for Freshwater Management 2020

NPS - UD	National Policy Statement for Urban Development 2020
NoR	Notice of Requirement
NSAAT	No Stopping at All Time
NZCPS	New Zealand Coastal Policy Statement 2010
NZGTTM	New Zealand Guide to Temporary Traffic Management
OD and OW	Over-Dimension and Over-Weight
PWA	Public Works Act 1981
RAMM	Road Assessment and Maintenance Management
RASF	Roads and Street Framework
RTN	Rapid Transit Network
RRF	Reeves Road Flyover
RMA	Resource Management Act 1991
SSA	Safe System Assessment
TCQSM	Transit Capacity and Quality Service Manual
tcu	Through car equivalent units or passenger car units
v/c	Volume over capacity ratio
WRRE	William Roberts Road Extension

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Purpose

The purpose of this Integrated Transport Assessment (ITA) is to evaluate the temporary and permanent transport effects of the EB2 and EB3 Residential (EB3R) components of the overall Eastern Busway Project (the Project) and to recommend mitigation measures as appropriate. This report will form part of the Assessment of Environmental Effects (AEE) supporting the Notice of Requirement (NoR) and resource consent applications of EB2 and EB3R.

The Need for the Project

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[1]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads.

With regard to transport issues in EB2 and EB3R, it has been identified that the area experiences heavy congestion. Recent population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. Furthermore, projected population growth from both established and new suburbs is expected to exacerbate this issue.

Lastly, congestion due to the growth in commercial activity is also anticipated. Ti Rakau Drive and SEART are important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

Without intervention, demand for public transport, walking and cycling will remain low, the heavy reliance on car travel will continue and the road network will experience significantly increased congestion. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region both in terms of the quality of life for residents and the economic wellbeing of businesses. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

Benefits of the Project

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

[1] SNZ Census 2018

EB2 and EB3R will help alleviate congestion, principally through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the Reeves Road Flyover (RRF). This diversion will reduce the volumes of through-traffic within the Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project, is improved accessibility.

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

Assessment of Effects

Overall, through AIMSUN and SIDRA modelling assessments, EB2 and EB3R are expected to lead to acceptable intersection operations across the network. Importantly, bus movements are predicted to operate at LOS C and with spare capacity. The RRF is expected to relieve congestion around the Pakuranga Town Centre, and significant improvements in travel times are expected overall, especially between Botany in the east and Pakuranga and SEART in the west.

EB2 and EB3R are predicted to significantly increase public transport patronage in the future. As such, bus station platforms and loading areas have been designed to provide appropriate levels of service and capacity to support this uptake. Furthermore, bus service headways will be improved, and travel times are predicted to decrease overall, leading to faster and more reliable public transport trips. The combination of these public transport upgrades and improvements is expected to significantly increase public transport mode share, which in turn will reduce congestion and greenhouse gas emissions.

Dedicated footpaths and cycleways will improve pedestrian and cyclist amenity and safety which will provide users with a more attractive mode of travel and supports the uptake of cycling. Furthermore, the cycleways will improve accessibility to the bus stations, resulting in increased catchment and mode shift to public transport.

Lastly, through a Safe System Assessment (SSA), EB2 and EB3R are expected to provide an overall safer transport system for all modes of transport through the project areas with the aim to reduce fatal and serious injury crashes.

Mitigation

Overall, the temporary effects of construction in the project areas will be mitigated appropriately and are considered to be negligible or very low. Workforce Travel Management Plans will be developed to reduce private vehicle trips and to increase worksite accessibility through more travel options. Construction Traffic Management Plans (CTMPs) will be developed to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this. Hours of operation will be controlled in part by the Project's consent conditions and management plans, including the Construction Noise and Vibration Management Plan (CNVMP).

Conclusions

With the proposed mitigation measures in place, the potential adverse effects during construction and upon completion of EB2 and EB3R are considered to be negligible or very low. Furthermore, the proposed design is predicted to result in significant improvements and a range of benefits overall.

1 Introduction

1.1 Project Background

The Auckland Manukau Eastern Transport Initiative (AMETI) programme was initiated in 2006 and has become the responsibility of Auckland Transport (AT) following the amalgamation of Auckland's previous local authorities in October 2010. The Eastern Busway Project (the Project)[2] is a flagship project for Auckland and will form a key part of the region's Rapid Transport Network (RTN). It will create dedicated bus lanes to connect people from Botany, Pakuranga, and the surrounding suburbs, to the rail network in Panmure. The Project includes cycling and walking paths, roading and safety improvements and a new Reeves Road Flyover (RRF) to ensure better journey reliability for all modes.

The Panmure to Pakuranga section of the busway (EB1) opened in late 2021. The Eastern Busway Alliance (EBA) has been formed to design and consent the Pakuranga to Botany sections of the Project (EB2,3,4), progressing towards construction, which is expected to start in 2022. The Project will provide a busway from Pakuranga Town Centre in the west to Botany Town Centre in the east. The busway will be approximately 5km long and will be running at grade primarily on Ti Rakau Drive. A median busway (Online Busway) is proposed along Ti Rakau Drive from Pakuranga Road to Gossamer Drive, while a separated busway (Offline Busway) is proposed between Gossamer Drive and Botany Station.

There will be one major interchange station at Pakuranga Town Centre, one major interchange station at Botany Town Centre, and three intermediate stations along Ti Rakau Drive. A separate cycleway and pedestrian footpath are also proposed along the length of Ti Rakau Drive. The proposed busway will serve the major employment areas of East Tāmaki, Botany and Panmure, as well as Botany and Pakuranga Town Centres. The proposed busway will also connect with major interchanges at Botany, including local bus services and Airport to Botany (A2B) RTN services, and at Panmure for suburban rail services.

1.1.1 Strategic Context

Auckland's eastern suburbs have one of the highest levels of journey to work trips by car and lowest use of public transport in Auckland[3]. This is due to a combination of lower density land uses and relatively unattractive bus services, lack of cycle facilities and low urban amenity on main roads. Without intervention, demand for public transport, walking and cycling will remain low and the heavy reliance on car travel will continue. This will further impede the efficient movement of people and goods within the area, lead to detrimental environmental outcomes and exacerbate the area's limited access to opportunities compared to the rest of the region. It will also limit the area's potential to sustainably accommodate further residential and employment growth.

The Eastern Busway programme presents an opportunity to address these problems by extending the rapid transit, high frequency busway between Panmure and Pakuranga, through to Botany Town Centre. The Project will include new walking and cycling connections, placemaking, urban renewal initiatives and improvements for general traffic. The end result will see customers being able to travel between Botany and Britomart by bus and train in less than 40 minutes, which is 20 minutes quicker than the current journey times.

[2] Formally known as AMETI.
[3] SNZ Census 2018

1.1.2 Project Objectives

The Project has a set of clear objectives and are outlined below:

1. Provide transport infrastructure that improves linkages, journey time and reliability of the public transport network

2. Provide a multimodal transport corridor that connects Pakuranga and Botany to the wider network and increases choice of transport options

3. Safeguard future transport infrastructure required at (or in vicinity of) Botany Town Centre to support the development of a strategic public transport connection to South Auckland

4. Provide transport infrastructure that integrates with existing land use and supports a quality, compact urban form

5. Contribute to accessibility and place shaping by providing better transport connections between, within and to the town centres

6. Provide transport infrastructure that is safe for everyone

1.1.3 Benefits of the Project as a Whole

With the Panmure to Pakuranga (EB1) section of the Project completed, once delivered the next stage between Pakuranga and Botany (EB2, 3 and 4) will provide:

- Better connections and sustainable travel options for pedestrians, cyclists, motorists, bus and train customers
- A reliable 40-minute bus and train trip between Botany Town Centre and Britomart (saving 20-minutes)
- Increase in public transport trips from 3,700 to 18,000 per day by 2028
- Increase in public transport mode share from 7% to 25% by 2028
- Reduce carbon emissions by 9,292 kg per day by 2028
- 24,000 more people with access to a rapid transit bus station within 1 km from home
- 5 km of busway between Pakuranga and Botany fully separated from other traffic
- 5 new bus stations with quality facilities
- 12 km of safe and separated walking and cycling infrastructure
- Reeves Road flyover to reduce vehicle congestion around Pakuranga Town Centre
- Encourage and support development of a more sustainable urban form and improve urban amenity
- Accommodates electric buses, a key part of AT's low-emission vehicle fleet by 2040

1.1.4 EB2 and EB3R Project Benefits

The Project will deliver significant benefits to the communities of southeast Auckland and the wider Auckland Region. The Project has been developed in response to transport issues within southeast Auckland, to meet projected population growth, reduce regional greenhouse gas emissions and to achieve modal shift goals.

With regard to the Project area's transport issues, it was previously identified that the Howick Local Board area experiences heavy congestion, with 90,000 vpd using the Panmure and Waipuna Bridges. Recent rapid population growth and a heavy dependence on private vehicles has put significant strain on the existing road network. EB2 and EB3R will help alleviate this congestion. This will principally be achieved through the diversion of traffic from the Ti Rakau Drive / Pakuranga Road intersection and onto the RRF. This diversion will reduce the volumes of through-traffic within Pakuranga Town Centre and local roads. As such, EB2 and EB3R's contribution to congestion reductions will improve travel times, supporting the rapid movement of freight and people.

In addition, the development of the Project has been driven by both previous and projected population growth within southeast Auckland. Pakuranga Town Centre is a major transport hub for southeast Auckland, with traffic flows coming from both established and new suburbs. Ti Rakau Drive and SEART are also important for the efficient movement of freight and goods vehicles, connecting the commercial areas of East Tāmaki, Highbrook, Botany, Pakuranga and Highland Park to the wider region.

The established suburbs, such as Howick and Highland Park are experiencing high levels of redevelopment, through both infill housing and wholesale redevelopment of sites. This redevelopment will only grow in intensity through the new medium density residential standards introduced in late 2021 by the New Zealand Government. Traffic flows from the Auckland Isthmus are also expected to increase given population growth from brownfield developments like the Tāmaki regeneration programme[4]. Large growth is also being generated by greenfield developments like Flat Bush, where 1700 ha of land is being urbanised for a population of 40,000 people. Lastly, congestion due to the growth in commercial activity is also anticipated.

Without the construction of the Project and the provision of improved transport choices (i.e., public and active transport modes), southeast Auckland's road network would experience significantly increased congestion. This would in-turn, impact both the quality of life for residents and the economic wellbeing of Auckland's businesses. The Project will alleviate, in part, increases in road congestion.

The Project will also provide increased transport choices for residents and visitors. The dedicated bus lanes and stations will improve the public transport experience for passengers and make it more attractive to current private vehicle users. Increased uptake of public transport will also ease congestion and reduce greenhouse gas emissions. Similarly, the Project's walking and cycling investments make those transport modes safer and more attractive to users. Lastly, an additional positive effect associated with EB2/EB3R, and the wider Project is improved accessibility.

Therefore, reduced congestion, better public transport, safer walking and new cycling infrastructure will improve the ability for both local residents and visitors to access jobs, education, recreation, housing and healthcare. Given the above, EB2 and EB3R will have significant positive effects for Auckland.

[4] Tāmaki regeneration programme will deliver 10,500 new homes over the next 20 years.

1.2 Scope and Purpose of Report

The assessment and consenting phases of the proposed alignment of the Project has been divided into three 'packages'. The rationale is to aid in obtaining relevant RMA approvals for sections of the Project without potential undue delay to the Project as a whole.

This Integrated Transport Assessment (ITA) assesses the traffic and transportation effects during construction and upon completion of the EB2 and EB3 Residential (EB3R) sections of the Project.

Assessment of the William Roberts Road Extension (WRRE), which will precede EB2 and EB3R, has been provided for in the Early Works resource consent package, but has been taken into account in this assessment as part of the existing environment. Assessment of the EB3 Commercial (EB3C) and EB4 sections of the Project, which will follow after this ITA, will be addressed in a separate report.

The full extent and location of the Project is shown in **Figure 1** below.

Figure 1: Full project extent and location[5]

The main elements of EB2 and EB3R include the construction of the RRF, the busway along Ti Rakau Drive from Pakuranga Road to Reeves Road (EB2) and Reeves Road to Gossamer Drive (EB3R) as well as three new bus stations. The general extent and location of these sections of the Project are shown in **Figure 2** below.

[5] https://at.govt.nz/projects-roadworks/eastern-busway/

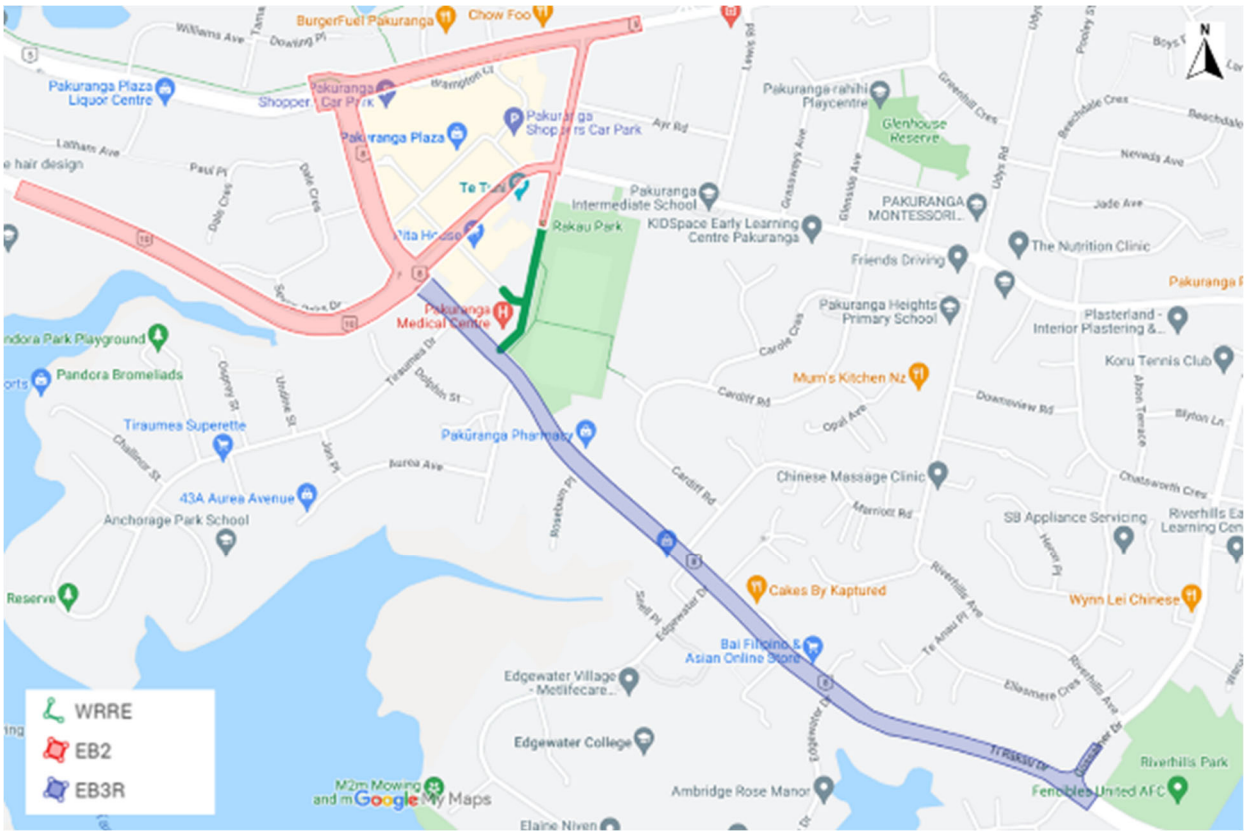

Figure 2: EB2 and EB3R general extent and location

The purpose of this report is to:

1. Identify and describe the existing transport environment, including the key issues that the environment faces
2. Describe the potential positive and adverse transport effects of EB2 and EB3R during its construction, in order to highlight the benefits of the Project and to develop mitigation measures as needed
3. Recommend measures (including any conditions/ management plans required); as appropriate to avoid, remedy or mitigate potential traffic and transportation effects including as these relate to effects from construction traffic
4. Present an overall conclusion of the level of potential transport effects of EB2 and EB3R after the recommended measures are implemented

1.3 Report Structure

This ITA has been structured as follows:

Section 2 describes the methodology used to assess the effects of EB2 and EB3R on the transport environment. This includes EB1, WRRE and other enabling works that will form part of the baseline traffic environment, traffic modelling methodology, public transport, walking and cycling, property access and parking, safety performance and freight traffic.

Section 3 provides a description of the existing transport environment including land use zoning, the transport network, traffic volumes, travel times, road characteristics, bus services and facilities, walking and cycling facilities, parking, crash environment, over-dimension and over-weight (OD and OW) routes, and changes to the baseline traffic environment for modelling.

Section 4 provides an overview of the proposed design and construction of EB2 and EB3R.

Section 5 provides an assessment of the temporary effects of EB2 and EB3R during construction, including construction effects, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 6 provides an assessment of the permanent effects of EB2 and EB3R upon completion, including a description of the future transport network, general traffic, bus services and facilities, pedestrians and cyclists, property access and parking, and safety performance.

Section 7 provides a summary of the mitigation measures proposed in this ITA.

Section 8 provides the conclusions from this ITA.

2 Assessment Methodology

2.1 Introduction

This section describes the methodology used to assess the effects of EB2 and EB3R on the transport environment including:

- A description of the transport environment for assessment (which includes EB1 (Panmure to Pakuranga), WRRE works, and other enabling works)
- Traffic modelling methodology
- Public transport
- Walking and cycling
- Property access and parking
- Safety performance
- Freight traffic

2.2 Guidance and Scope

The preparation of this ITA has taken into account the guidance set out in the Auckland Transport (AT) document "*Integrated Transport Assessment Guidelines*" (January 2015) and the Waka Kotahi NZ Transport Agency (Waka Kotahi) document "*Integrated Transport Assessment Guidelines*" (November 2010). This assessment has considered the operational effects of the following areas in the system:

- Road network – general traffic flows and travel time
- Public transport network
- Walking and cycling network
- Property access
- Parking
- Safety performance
- Heavy vehicle routes

2.3 Transport Environment for Traffic Modelling Assessment

Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically effected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Assessment of the Project against the existing environment was therefore not considered appropriate.

Instead, a more conservative approach was followed whereby a future year scenario was used to compare a 'without Project' and a 'with Project' scenario. Throughout this assessment, the 'without Project' scenario is also referred to as the 'Do-Minimum' scenario, whilst the 'with Project' scenario is also referred to as the 'EB2/EB3R' scenario. The transport models used to simulate the effects of the future year scenarios are listed below:

- Do-Minimum – 2028
- EB2 and EB3R – 2028

Notable major changes to the existing transport network, that were included in the modelling assessments, are detailed below.

2.3.1 Eastern Busway 1 (EB1)

EB1 is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. EB1 was completed near the end of 2021 and was included in all 'future year' scenarios.

2.3.2 WRRE Works

This assessment has considered the effects of the WRRE to be undertaken prior to EB2 and EB3R construction. The WRRE includes the extension of William Roberts Road south to Ti Rakau Drive and the completion of the Cortina Place link between William Roberts Road and Reeves Road. WRRE was included in all future year scenarios.

2.3.3 Other EB2 and EB3R Enabling Works

This assessment has also considered the effects of other enabling works to be undertaken during the initial phases of the EB2 and EB3R construction programme, to enable the temporary closure of Reeves Road. The enabling works include geometric and traffic signal timing plan amendments at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive / Gossamer Drive intersections. These enabling works will form part of the EB2 and EB3R consent packages.

2.4 Traffic Modelling Methodology

Traffic modelling undertaken of the proposed design of the Project used data cascaded from a number of higher-order, more strategic models provided by the Auckland Forecasting Centre (AFC).

Macro Strategic Model (MSM) Auckland Regional Transport Models (EMME) – These models forecast demands based on Auckland Council's Scenario I Modified Version 11.5 demographic and land use data. The outputs of these models include general traffic demand and public transport demand.

AMETI Regional Traffic Models (EMME) – The outputs of the MSM models were used as inputs into the Regional Traffic Models to generate traffic demands across the region. The outputs of the regional models were then fed into project specific AIMSUN models to allow for a more detailed assessment of traffic effects.

Operational Microsimulation Models (AIMSUN) – These models provide information regarding travel times along different routes within the project area as well as turn movements and traffic demand along roads within the project area. The turning movement outputs from these models were used as inputs into the SIDRA models.

Intersection Models (SIDRA) – These models were used to determine the performance of intersections using traffic movement data from the AIMSUN models. The key outputs include Degree of Saturation (DOS or v/c ratio), delay in seconds, Level of Service (LOS) and queue lengths in metres.

2.4.1 Supplied Models

The AIMSUN 2018 Base Model was subjected to various calibration and validation checks to assess the accuracy and suitability of the model. These checks were undertaken with reference to criteria for Category C: Urban Area NZTA Model Development Guidelines (Criteria) on individual link flows, turn flows and travel time for each hour between 07:00 – 09:00 and 16:00-18:00 and is considered acceptably calibrated and validated for the purposes of Eastern Busway design work[6].

Turning movement volumes from the AIMSUN models were used in the SIDRA models to assess intersection performance.

2.4.2 Model Outputs

As above, traffic flow outputs (in vehicles per hour) from the AIMSUN models were used as inputs in the SIDRA models to assess intersection performance. AIMSUN models simulate several hours of the network operation during the AM and PM peak periods. The highest 1-hour, in terms of traffic flows, was selected from each period to represent the AM and PM peak hours, respectively.

Traffic flows from these peak hours, produced by AIMSUN, were used to assess intersection performance in SIDRA. As a result, the specific 1-hour period selected for assessment in the various scenarios may differ slightly.

Another key AIMSUN model output considered during this ITA was travel time. Route travel times were determined along various routes through the Project areas for the Do-Minimum and EB2/EB3R scenarios. The effects of EB2 and EB3R were determined by comparing these scenarios in each direction, for the AM and PM peak periods.

Key SIDRA outputs considered during this ITA included Level of Service (LOS), Degree of Saturation (DOS) or v/c ratio, and delay in seconds.

2.4.3 Traffic Demand

The traffic demand data, cascaded down from the various models as detailed above and used in the SIDRA models, represent an average weekday's traffic demand in the AM and PM peak hours. Interpeak periods and weekends were determined to generally have lower traffic activity and congestion compared to weekdays, so explicitly modelling these periods was not considered necessary to understand the effects and outcomes of the Project.

[6] Eastern Busway – Base 2018 Model Update Report, BECA, February 2019

2.4.4 Assumptions

Below are the key assumptions used in the modelled transport environments.

2.4.4.1 MSM Assumptions

- Auckland Council's Scenario I Modified Version 11.5
- All relevant projects that have been identified in the ATAP plan delivery 2021 – 2031 were included in the MSM version 11.5. Notable projects that may influence the demand of the movement of people around the Project include:
    - Airport to Botany interim bus improvements
    - Sylvia Park bus improvements
    - Connected Communities (Pakuranga Road)
    - City Rail Link
- Eastern Busway 1 Panmure to Pakuranga was included in the future Do-Minimum, 2028 and 2048 scenarios

2.4.4.2 AIMSUN Assumptions

- Similarly, relevant and notable projects were included in the AIMSUN models

2.4.4.3 SIDRA Assumptions

- Where turning movement volumes were <10 veh/h, a minimum of 10 veh/h was adopted
- Rather than being random, bus arrivals at intersections were set to Arrival Type 6 on all busway lanes. This means a high percentage of arrivals occur during the green phases, which was used to simulate Traffic Signal Priority for buses
- Free flow speeds along Ti Rakau Drive were assumed from the free-flow speeds provided by the MSM modelling. The following speeds were assumed for the various other streets:
    - Side streets – 50 km/h
    - William Roberts Road - 30km/h
    - Entrances (i.e., to the mall) – 20 km/h
    - Along busways – 50 km/h
- Saturation flow rate was left at the SIDRA default Basic Saturation Flow of 1950 tcu/h per lane
- Where the approach/ intersection was modified, lanes widths for general vehicle lanes and bus lanes were taken as 3.2 m and 3.5 m, respectively

2.5 Public Transport, Walking and Cycling

2.5.1 Public Transport

The effects on the public transport network focused on the following aspects:

- Direct effects on bus routes and bus stops
- Effects on travel times of buses through the Project area

2.5.2 Walking and Cycling

The assessment considered the potential effects of EB2 and EB3R on pedestrians and cyclists. This was primarily via a qualitative assessment of changes in the type and quality of connections and facilities provided.

2.6 Property Access and Parking

2.6.1 Property Access

The assessment considered the potential effects of changes in property access. Local access effects were assessed in terms of extra travel time and distance as well as safety.

2.6.2 Parking

This included assessment of the potential physical effect of reducing properties' on-site parking spaces, as well as any on-street parking that may be affected by the proposed design.

2.7 Safety Performance

A Safe System Assessment (SSA) was undertaken for the Project, which provides a comprehensive assessment of the existing crash environment and the potential future environment.

The safety performance assessment considered the effects of the proposed design on existing roads, new roads and vulnerable users.

2.8 Freight Traffic

It is recognised that cars and trucks generally have the same travel times in congested urban networks and therefore the same methodology described in **Section 2.4.2** was used to assess the effect of the Project on freight traffic and direct effects to heavy vehicle routes.

3 Existing Transport Environment

This section provides a description of the existing transport environment, including the following:

- A description of the existing problems and challenges
- Land use zoning
- Existing transport network
- Traffic volumes
- Travel times
- Road characteristics
- Bus services and facilities
- Walking and cycling facilities
- Parking
- Crash environment
- Over-dimension and over-weight (OD and OW) routes
- Changes to the baseline traffic environment

3.1 Description of the Existing Problems and Challenges

In 2016, AT, Waka Kotahi and Auckland Council agreed the following key problems in the AMETI Project area for the AMETI programme, including the Eastern Busway, to address:

- **Problem 1** – Lack of connections in the transport network creates congestion and unreliable travel times for people accessing employment and other destinations

- **Problem 2** – Lack of travel choices and reliance on private cars is resulting in congestion, lack of access to opportunities and poor environmental outcomes

- **Problem 3** – Provision of transport capacity and options has not kept pace with land use development resulting in congestion and inefficient use of transport corridors

- **Problem 4** – Poorly integrated land use and transport design is limiting accessibility, creating poor places and discouraging economic development

- **Problem 5** – Development and operation of the road network has prioritised the efficient movement of vehicles ahead of safety resulting in too many people dying or being seriously injures, especially vulnerable users

The Project will seek to address these problems through a range of improvements to existing infrastructure as well as new infrastructure.

3.2 Land Use Zoning

The Project area is located in East Auckland and bordered by Pakuranga Town Centre in the northwest and Botany Town Centre in the southeast. Major industrial and commercial areas in East Tāmaki are situated to the west and south which play an important role in providing employment opportunities to the residents in the vicinity of the Project. These employment zones include Panmure, Mt Wellington, Penrose/ Onehunga and Highbrook/ East Tāmaki.

The local land uses comprise of medium density/ single dwelling residential lots with retail-based town centres, local shops, commercial activities and industrial blocks. These areas are currently connected to the Project area by either direct property access or near-direct access via side roads. The Project will also have a through-function and will serve movements between and beyond the fringes of the project area, including links to Panmure, Mt Wellington, Flat Bush and Manukau.

Notable features of the existing land use and environment include:

Business Land Uses of Interest:

- Pakuranga Plaza
- GAS Pakuranga Road service station
- Gull Reeves Road service station
- Tai Ping Supermarket
- Eastside Pups Dog Grooming and Daycare
- Edgewater Shops

Residential and Community Land Uses of Interest:

- Pakuranga Library and Citizens Advice Bureau
- Te Tuhi Art Gallery
- Pakuranga Mosque
- Ti Rakau Park
- Pakuranga Leisure Centre
- Dementia Auckland
- Pakuranga Medical Centre
- Pakuranga Counselling Centre
- Pakuranga Baptist Church
- River Hills Park (Fencibles United Football Club)

Schools and Education Land Uses of Interest:

- Saint Kentigern College
- Barnardos Early Learning Centre
- Pakuranga Intermediate School
- KIDSpace Early Learning Centre Pakuranga
- Pakuranga Kindergarten
- Edgewater College
- Pakuranga Baptist Church and Kindergarten

Figure 3 shows the surrounding area zoning of EB2 and EB3R in the Auckland Unitary Plan (Operative in Part) (AUP(OP)), in the existing environment.

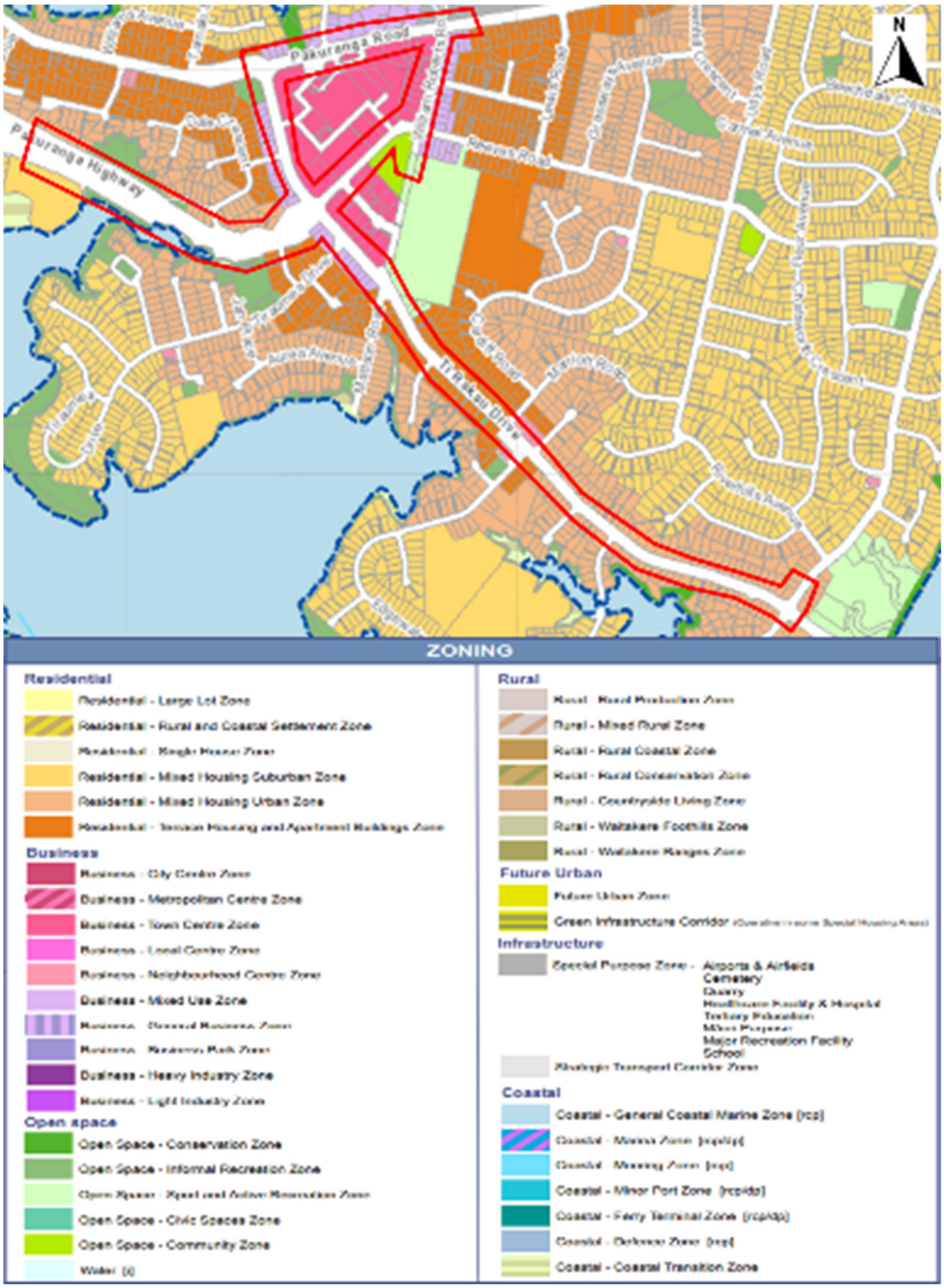

Figure 3: Existing EB2 and EB3R zoning (source: Auckland Council GIS)

3.3 Existing Transport Network

In order to align with AT's and Auckland Council's desire to consistently identify the different functions of roads and streets in Auckland, the EBA has adopted the Roads and Streets Framework (RASF) by using concepts of 'Place' and 'Movement' to reflect the strategic role of streets.

The RASF provides a systematic and consistent methodology for identifying the Place and Movement functions of roads and streets. In doing this, it reflects the needs and catchment of the adjoining land use as well as the movement of people, goods and services. A full RASF assessment was completed for the Project[7] and the section below summarises the key aspects of the existing transport network and modal priority in the EB2 and EB3R project areas.

Figure 4 shows the RASF typology matrix as a function of Movement and Place significance.

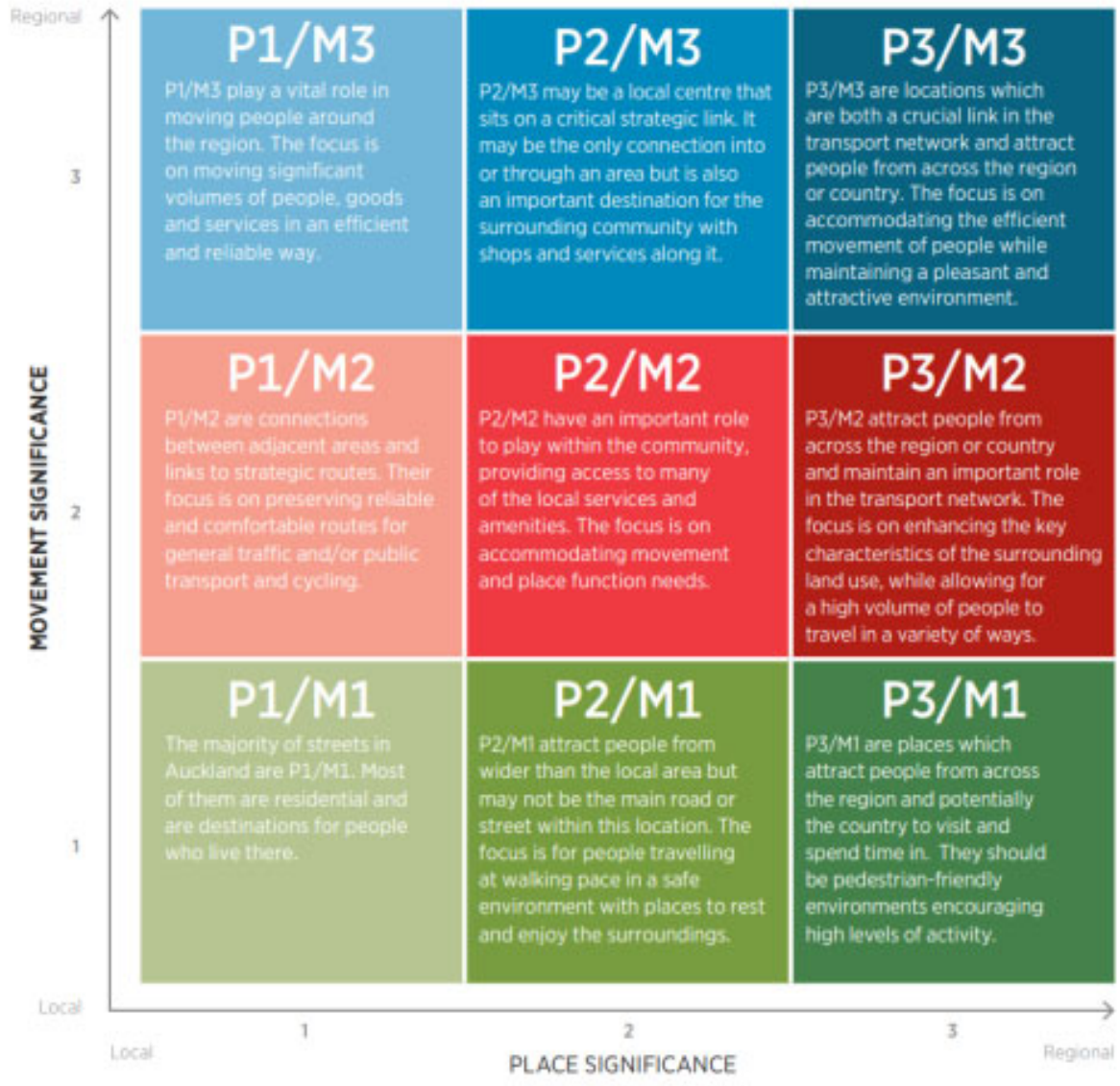

Figure 4: RASF typology matrix

Figure 5 outlines the current typology of the EB2 and EB3R project areas.

[7] EB234-1-TE-RP-Z0-A2-Roads and Street Framework

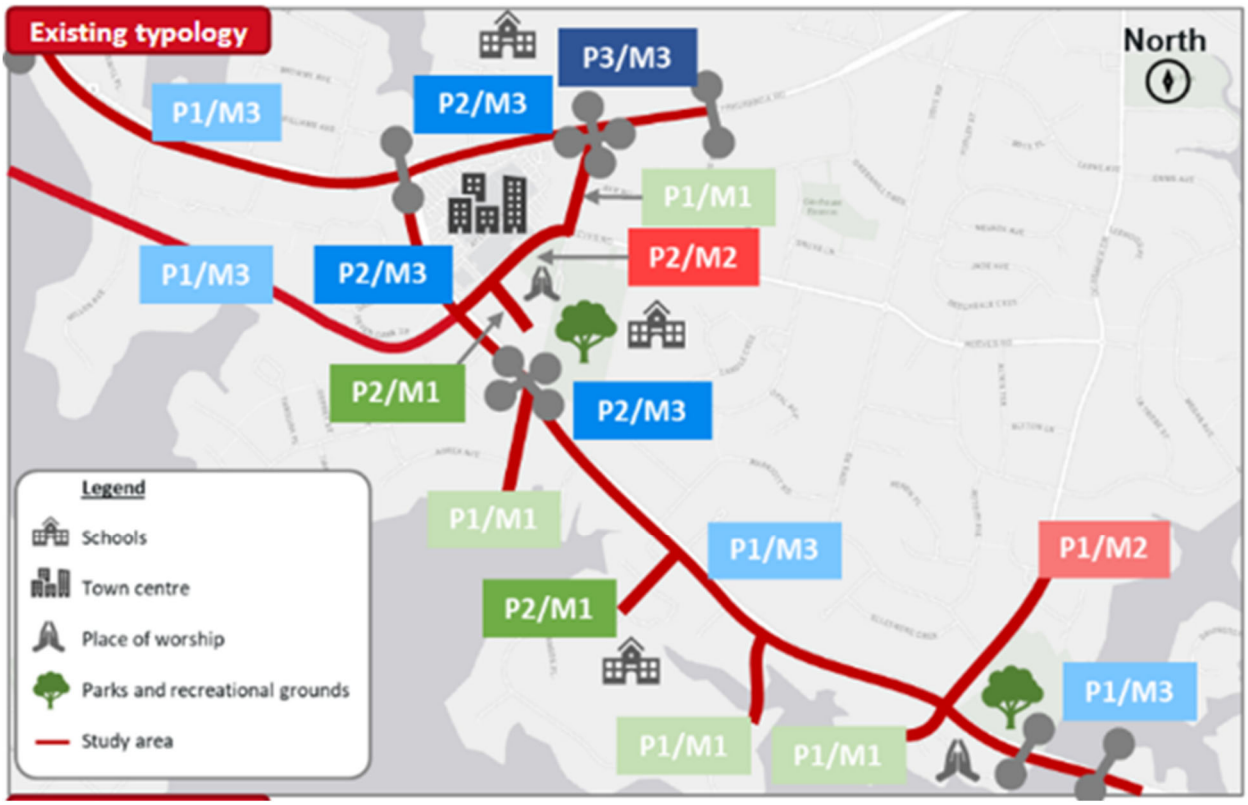

Figure 5: Existing EB2 and EB3R typology

Pakuranga Road is an east-west primary/ regional arterial, which connects Howick/Highland Park with Panmure via Pakuranga. It also intersects with Ti Rakau Drive, providing an arterial route towards Botany Town Centre and East Tāmaki. Pakuranga Road carries approximately 40,000 vehicles a day, as well as frequent bus services. The objective of this corridor is to move significant volumes of people, goods and services and as such, it has a typology of 'M3' classification.

The majority of land use along Pakuranga Road, west of the town centre, is residential. East of the town centre there are some retail properties along Pakuranga Road. However, these properties generally have a large setback between the footpath and the properties due to car parking spaces. As a result, the primary function of this corridor is Movement.

Ti Rakau Drive is a regionally significant corridor connecting Pakuranga with Botany. Along Ti Rakau Drive there are major employment sites such as Pakuranga Town Centre, Botany Town Centre, and East Tāmaki industrial zones. The section of Ti Rakau Drive east of SEART is a level 1B freight route. Frequent bus services also operate along this section. Given these factors, the primary function of this corridor is also Movement, and it also has a typology of 'M3' classification.

A trend is observed whereby Movement is largely prioritised over Place, especially along Ti Rakau Drive. The Project seeks to improve this, particularly at the proposed locations of the new bus stations.

3.4 Traffic Volumes, Travel Time and Road Characteristics

3.4.1 Traffic Volumes

The existing environment traffic volumes were determined predominantly using traffic data from 2017. In 2020/2021, COVID-19 dramatically affected the way people travelled and so these years would not accurately reflect the volumes of traffic expected on the road network. It was anticipated that data from 2019 would be the most accurate, however, it was determined that this data set was incomplete and would likely produce inaccurate results.

Data from 2017 was the most complete data set available from the previous life cycle of the AMETI EB2&3 specimen design. Although traffic volumes are expected to have grown marginally between 2017 and 2019, it is not expected that this growth would be significant, and the 2017 data is still considered relevant.

Table 2 shows the Average Annual Daily Traffic (AADT) volumes in the existing environment in the EB2 and EB3R project areas as well as the anticipated daily volumes for the 2028 and 2048 future years, without the Project. A conservative approach was followed to produce the 2028 and 2048 future year AADTs, by not including the effects of COVID-19. The purpose of this table is to provide context for a more detailed comparison of the future years.

Table 2: Existing[8] and future[9] AADT (without project)

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Ti Rakau Drive				
Pakuranga Rd – Reeves Rd	Westbound	19,400	20,700	20,700
	Eastbound	14,800	17,400	17,400
Reeves Rd – Tiraumea Dr	Westbound	19,500	18,000	18,700
	Eastbound	17,300	16,600	18,200
Tiraumea Dr – Mattson Rd	Westbound	21,300	17,300	18,000
	Eastbound	18,800	16,600	18,200
Mattson Rd – Marriot Rd	Westbound	21,100	17,400	18,100
	Eastbound	17,900	16,100	17,700
Marriot Rd – Edgewater Dr West	Westbound	20,000	17,800	18,400
	Eastbound	17,900	16,400	17,800
Edgewater Dr West – Edgewater Dr East	Westbound	19,800	16,900	17,600
	Eastbound	17,500	15,600	17,200
Edgewater Dr East – Gossamer Dr	Westbound	19,700	16,600	17,400
	Eastbound	18,000	15,300	17,200

[8] The majority of the existing volumes were sourced from 2017 SCATS data, however where this data was not available a mixture of RAMM, ONRC, and the most recent AT traffic counts have been reported.

[9] 2028 and 2048 future year demand was determined from the EMME models

Road Section	Direction	Existing AADT	2028 without project	2048 without project
Side Roads				
Pakuranga Rd	Westbound	17,900	18,500	17,600
	Eastbound	16,000	20,000	19,400
SEART	Off-Ramp	27,400	26,200	27,900
	On-Ramp	27,000	29,900	30,600
Tiraumea Dr[10]	Exit	1,230	2,800	2,830
	Enter	410	2,600	2,620
William Roberts Rd[11]	Northbound	380	550	540
	Southbound	2,410	5,700	5,700
Reeves Rd	Exit	6,700	9,500	10,000
	Enter	6,600	4,100	4,400
Mattson Rd[12]	Exit	1,000	1,700	1,600
	Enter	1,600	2,300	2,300
Marriot Rd[13]	Exit	1,160	840	840
	Enter	1,090	950	1,000
Edgewater Dr West	Exit	1,500	1,800	1,900
	Enter	1,200	1,900	2,000
Fremantle Pl	Exit	400	520	530
	Enter	400	480	480
Gossamer Dr	Exit	7,200	1,2200	12,800
	Enter	5,800	8,800	10,000

It should be noted that no data was available for Cortina Place. This table provides useful context, however a more detailed comparison of future years 'without and with the Project' is discussed in **Section 5** and **Section 6** of this report.

[10] 2018 RAMM data used.
[11] Assumed 50/50 Split of volumes enter and exit.
[12] 2018 RAMM data used.
[13] 2028 design volume ratios used to determine volumes in each direction.

Large increases in traffic demand are predicted on Ti Rakau Drive between Pakuranga Road and Reeves Road in the 2028 future year, with no increases by 2048. With this section of the corridor near or at full capacity, especially at the Ti Rakau Drive / Reeves Road / SEART intersection, a trend is observed where traffic demand on Ti Rakau Drive to the east of the intersection is expected to remain roughly unchanged or in some cases decrease. This is likely due to large increases in queues and delays, acting as a bottle neck for the rest of the corridor, forcing vehicles to reroute to less congested links.

This trend is also observed on Pakuranga Road. An increase in traffic demand is predicted by 2028, with a decrease by 2048. In the existing environment, motorists travel along Pakuranga Road and turn left onto Ti Rakau Drive to head towards SEART. With this section of Ti Rakau Drive at capacity, large increases in queues and delays are likely. This in turn is expected to lead to rerouting to occur to less congested links.

Figure 6 shows the AADT volumes in the existing environment in a network context.

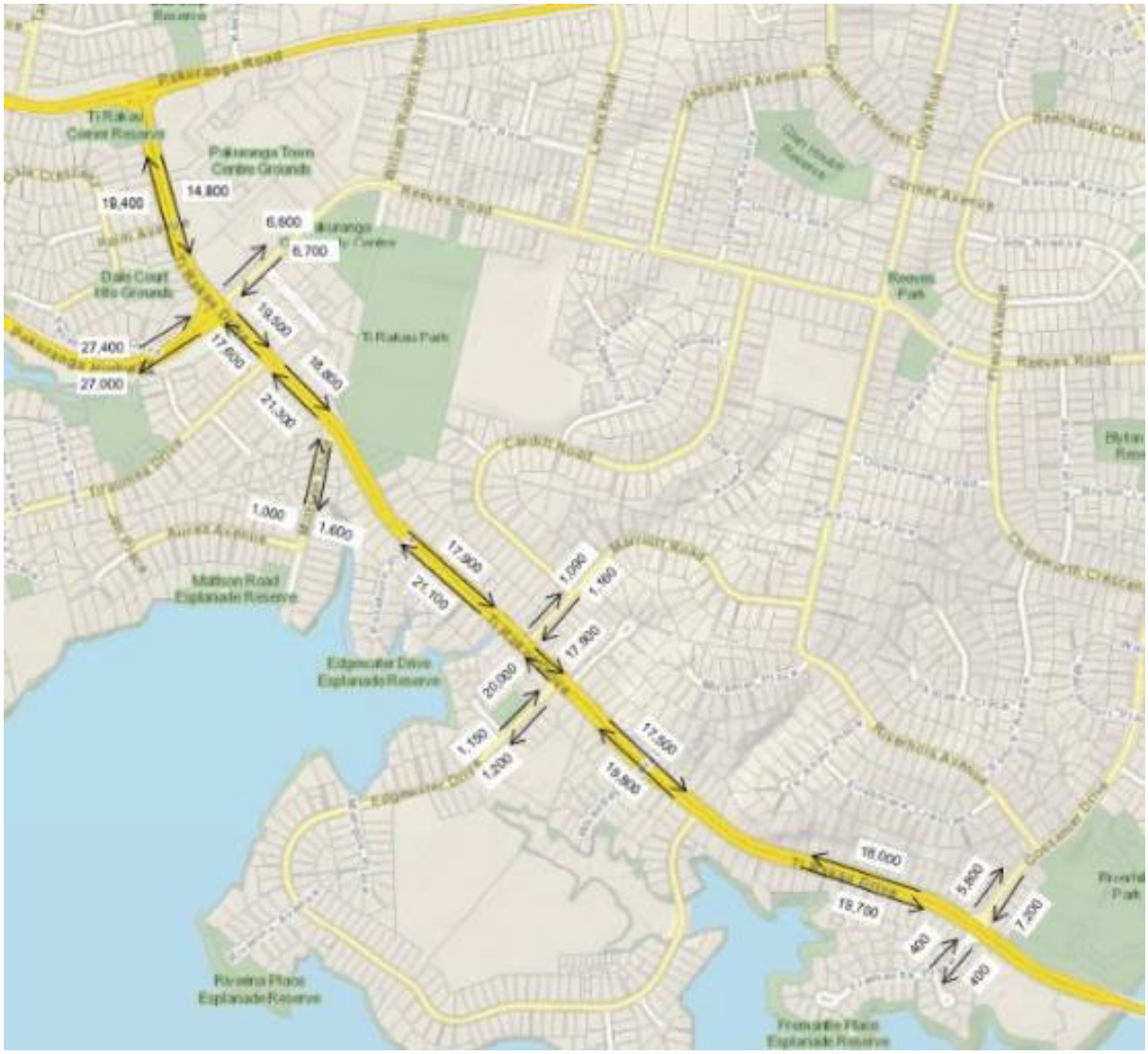

Figure 6: Existing environment AADT

3.4.2 Travel Time and Variability

Route travel times and variability in the existing environment were determined from the AIMSUN 2018 Base Model. The AM peak hour was recorded between 07:30-08:30 and the PM peak hour between 16:30-17:30. To maintain consistency across the different assessments already conducted and future ITAs, four routes were selected to determine the travel time of general traffic in the existing environment. These routes are outlined below, and the results are shown in **Table 3**:

- Botany to Pakuranga (Ti Rakau Drive / Chapel Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Botany to SEART (Ti Rakau Drive / Te Irirangi Drive intersection to the western abutment on Waipuna Bridge) – both directions
- Howick to Pakuranga (Pakuranga Road / Glenmore Road intersection to Pakuranga Road / Williams Avenue intersection) – both directions
- Howick to SEART (Pakuranga Road / Glenmore Road intersection to the western abutment on Waipuna Bridge) – both directions

Table 3: Base model (2018) general traffic travel times

AM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany - Pakuranga	17.4	2.0	-1.7	11.7	0.3	-0.4
Botany - SEART	10.7	1.6	-0.9	9.4	0.9	-0.7
Howick - Pakuranga	3.1	0.1	-0.1	3.3	0.2	-0.1
Howick - SEART	12.0	0.4	-0.5	6.9	0.5	-0.4
PM Peak						
	Westbound			Eastbound		
Route	Base Model 2018 [min]	Variability + [min]	Variability – [min]	Base Model 2018 [min]	Variability + [min]	Variability – [min]
Botany – Pakuranga	26.1	0.8	-1.1	16.0	0.8	-1.2
Botany - SEART	18.5	0.6	-0.9	9.3	0.6	-0.6
Howick - Pakuranga	2.9	0.1	-0.1	5.6	0.6	-0.5
Howick - SEART	4.5	0.1	-0.2	9.2	0.2	-0.1

In the AIMSUN model, the routes from Botany to Pakuranga and Botany to SEART travel along the same section of Ti Rakau Drive, up to Reeves Road. Therefore, these routes have the same travel time along this section of the corridor.

However, from the Ti Rakau Drive / Reeves Road / SEART intersection, the Botany to Pakuranga route heads towards the Williams Avenue intersection, a distance of roughly 780 m. Meanwhile, the Botany to SEART route extends up to the western abutment of the Waipuna Bridge, a distance of roughly 1.4 km.

Although the Botany to Pakuranga Road route passes through three more intersections compared to the Botany to SEART route, its travel time is significantly longer. This is particular evident in the peak directions, westbound in the AM peak period and eastbound in the PM peak period. This is likely due to congestion on Ti Rakau Drive between Pakuranga Road and Reeves Road, leading to large queues and delays.

This trend is also observed in the Howick to Pakuranga and Howick to SEART routes. The two routes from Howick travel along the same section of Pakuranga Road, from Glenmore Road up to Ti Rakau Drive and will have the same travel times along this section. However, a significant increase in travel time is expected in the Howick to SEART route. Although the distance from the Pakuranga Road / Ti Rakau Drive intersection to the Waipuna Bridge is further than the distance to the Williams Avenue intersection, it is likely that congestion on Ti Rakau Drive is contributing to the large travel times.

3.4.3 Road Characteristics

The traffic data for Ti Rakau Drive demonstrated a tidal flow characteristic where westbound traffic movements (citybound) are dominant in the morning period and eastbound traffic volumes (outbound) are dominant in the evening period.

Figure 7 shows the existing directional signage on Ti Rakau Drive, upstream of Reeves Road / SEART intersection, westbound and eastbound, respectively.

Figure 7: Existing directional signage on Ti Rakau Dr westbound and eastbound, respectively

A raised median on Ti Rakau Drive between Pakuranga Road and Reeves Road prevents right-turn movements, except at Palm Avenue. Aylesbury Street has two accesses points onto Ti Rakau Drive with

varying movement restrictions. A U-turn facility is provided on Ti Rakau Drive approximately 50 m south of the intersection with Pakuranga Road. This section of Ti Rakau Drive consists of three lanes in each direction.

A similar restriction currently exists on Ti Rakau Drive between Reeves Road and Mattson Road, preventing right-turn movements out of Tiraumea Drive and all properties fronting this section of Ti Rakau Drive. Three lanes westbound and two lanes eastbound are provided for the majority of this section.

The raised median continues from Mattson Road to Gossamer Drive, preventing right-turns out of properties fronting Ti Rakau Drive. However, full turning movements are provided at all intersections along this section of the corridor. Ti Rakau Drive has a 60 km/h posted speed limit in the existing environment.

3.5 Bus Services and Facilities

In December 2017, AT launched a new bus network for East Auckland. This launch included a new bus network, bus routes, route numbers, timetables and buses. The new East Auckland Bus Network philosophy was improved integration with other public transport networks for Auckland, such as buses connecting with trains at the Panmure and Otahuhu interchanges, as well as at the Middlemore, Papatoetoe and Manukau train stations. **Figure 8** outlines the existing bus routes operating in the EB2 and EB3R project areas.

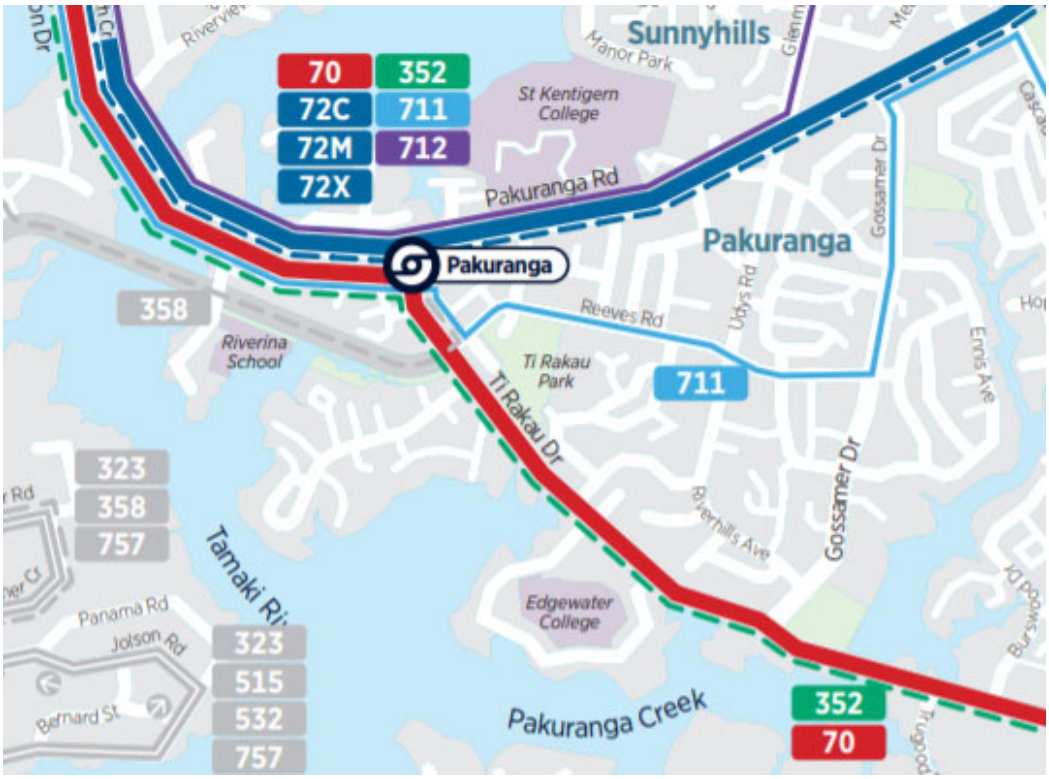

Figure 8: Existing bus network through EB2 and EB3R project areas[14]

[14] https://at.govt.nz/media/1974487/east-new-network-get-ready-poster-aug17-v30.pdf

There are a number of routes within the EB2 and EB3R project areas that currently operate on the proposed Eastern Busway corridor. These routes are the 70, 72C, 72M, 72X, 352, 711, 712. School bus services operating in the EB2 and EB3R project areas include the following:

- S415 – Pakuranga to Sacred Heart College
- S416 – Botany Downs to Sacred Heart College
- S440 – Bucklands Beach to Sancta Maria College
- S013 – Otara to Edgewater College
- S073 – Otahuhu to Edgewater College

Details of the general routes are outlined in **Table 4** below.

Table 4: Existing bus services through EB2 and EB3R project areas

Route Type	Route No	Frequency	Description
Frequent Services	70	Every 15 minutes	Botany, Pakuranga, Panmure, Ellerslie, Newmarket, City
	72C/M	Every 15 minutes	Howick, Pakuranga Rd, Pakuranga, Panmure
Connector Services	711	Varying	Howick, Cook St, Union Rd, Bradbury Rd, Cascades Rd, Reeves Rd, Panmure
	712	Varying	Bucklands Beach, Casuarina Rd, Glenmore Rd, Panmure
Peak Period Services	72X	Services operate weekdays only, during morning and afternoon peaks	Botany, Howick, Pakuranga, Panmure, Southern Motorway, City
	352	Services operate weekdays only, during morning and afternoon peaks	Panmure, Highbrook, East Tāmaki, Manukau

In the existing environment, the 70, 352 and 711 services travel along Ti Rakau Drive and the 72C, 72M, 72X and 712 services travel along Pakuranga Road in the kerbside lanes with general traffic. As such, buses have roughly the same travel times as general vehicles along these sections (excluding dwelling time at bus stops) and experience the same delays at intersections. Furthermore, without the Project, buses are expected to experience the same increases in delays in the future as a result of congestion and queueing on Ti Rakau Drive and Pakuranga Road.

There are approximately 18 bus stops within the EB2 and EB3R project areas, which include 10 on Ti Rakau Drive. **Figure 9** below shows the existing bus stop locations, the stops are mainly for public bus services.

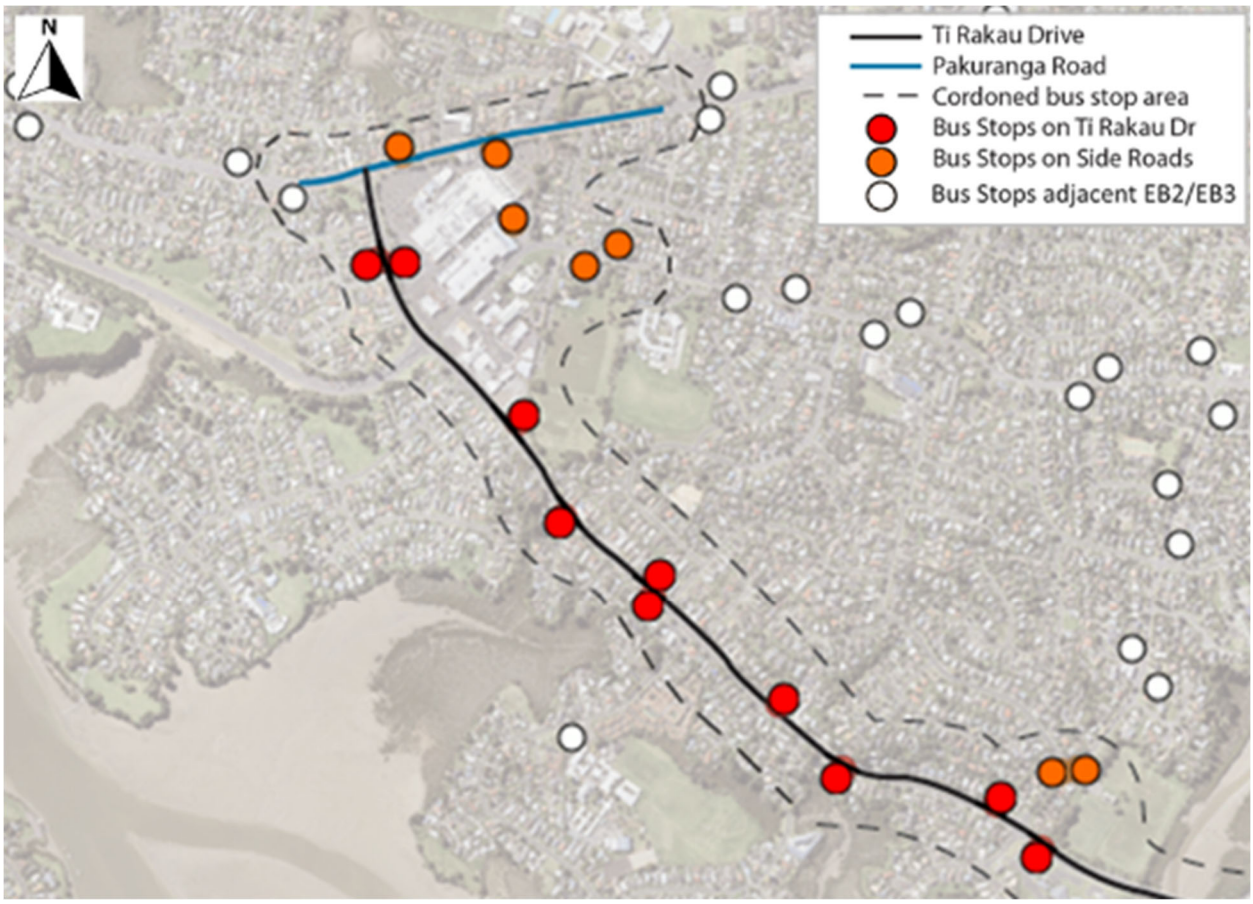

Figure 9: Existing bus stops within the EB2 and EB3R project areas

The spacing between bus stops varies between 200m and 1.5km with the average distance between stops being 500m. The walking catchments for these bus stops show that there are some significant gaps in the walking network over large areas, particularly along Ti Rakau Drive, based on a nominal 400m radius isochrone walking catchment.

There are also locations of considerable overlap in the bus stop catchments suggesting that stop locations may not be optimised. All existing bus stops are on-street, with the exception of off-street stops at Pakuranga Town Centre. The majority of the existing bus stops on Ti Rakau Drive and Pakuranga Road do not provide seating and sheltered cover. No bicycle parking is provided in the existing environment.

3.6 Walking and Cycling Facilities

3.6.1 Walking Facilities

Overall, pedestrian footpaths are provided along both sides of the majority of roads within the Project area in the existing environment. However, there is an absence of pedestrian facilities particularly along William Roberts Road south, and some slip lanes do not provide signalised pedestrian crossings. Various side roads intersecting Ti Rakau Drive do not have crossings facilities currently.

3.6.1.1 EB2 – Ti Rakau Drive (Pakuranga Road to Reeves Road)

- A pedestrian footpath is available on both sides of the road, approximately 1.5 m wide and separated from the live lane by a 1.0 m grass berm
- The only crossing facilities are at the two signalised intersections of Pakuranga Road / Ti Rakau Drive and Ti Rakau Drive / Reeves Road
- No mid-block crossing is available between the two intersections. The road is also separated by a median grass berm. From observation, pedestrians are finding gaps in traffic and utilise the median as a refuge area, waiting for a gap to cross to Pakuranga Plaza

3.6.1.2 EB2 – Pakuranga Road (Ti Rakau Drive to William Roberts Road)

- A pedestrian footpath is provided on both sides of the corridor, approximately 1.2 m wide on the northern side with a 1.5 m grass berm (no grass berm to the east of the Brampton Court access to the Pakuranga Plaza). The footpath is approximately 1.7 m wide on the southern side with a 0.6 m grass berm
- Crossing facilities are only provided at the Pakuranga Road / Ti Rakau Drive intersection and the signalised mid-block crossing near the Pepler Street exit at the Pakuranga Plaza. The westbound and eastbound carriageways are separated by a 3.0 m flush median
- A pedestrian refuge island is provided across William Roberts Road at its intersection with Pakuranga Road, however, no crossing facility is provided across Pakuranga Road at this location

3.6.1.3 EB2 – Reeves Road

- Footpaths are currently provided along both sides of Reeves Road, approximately 1.5m in width and separated from the live lanes by a 1.2 m grass berm
- Crossing facilities are provided at the Ti Rakau Drive / Reeves Road / SEART intersection and at the mid-block pedestrian crossing. A pedestrian refuge island is provided across William Roberts Road north at its intersection with Reeves Road, however, no crossing facility across Reeves Road is provided at this intersection

3.6.1.4 EB2 – William Roberts Road

- Currently, footpaths are available on both sides of William Roberts Road north (approximately 1.5 m wide), however, a grass berm of approximately 1.2 m width is only provided on the eastern side
- Pedestrian refuge islands are provided at the north end at Pakuranga Road and at the southern end at Reeves Road
- William Roberts Road south currently has no pedestrian footpaths on either side of the carriageway, except for a short section on the western side near the Pakuranga Community Centre
- No pedestrian facilities are currently provided to cross William Roberts Road south

3.6.1.5 Cortina Place

- Footpaths are currently provided on both sides of Cortina Place, approximately 1.7 m wide and no grass berm
- A pedestrian refuge island is provided near the intersection with Reeves Road, and 2.9 m grass median is provided along the majority of the road

3.6.1.6 EB3R – Ti Rakau Drive (Reeves Road to Gossamer Drive)

- On average, the footpath width is 1.5 m and is separated from the road carriageway and high volumes of fast-moving traffic by a 1.0 m grass berm
- Patches of the pedestrian path is encroached with tree branches, leaves and shrubs from the property side of the footpath reducing the width of the footpath, but generally the path itself is in good physical condition
- The Ti Rakau Drive residential area supports low to medium density housing with a number of cul-de-sacs, as well as local schools and parks. Footpath facilities enable pedestrian movements along Ti Rakau Drive, but there are no additional links between cul-de-sacs
- There is one access into Ti Rakau Park from Ti Rakau Drive itself, near the intersection with Mattson Road. Limited links and connections indicate poor pedestrian connectivity and access to the parks and schools in the surrounding area
- There are four crossing facilities to accommodate crossing the corridor in the residential section, located at the four signalised intersections:
    - Ti Rakau Drive / Reeves Road
    - Ti Rakau Drive / Mattson Road
    - Ti Rakau Drive / Edgewater Drive
    - Ti Rakau Drive / Gossamer Drive
- The intersections are of similar design along the route, which consist of left-turn slip lanes for vehicle efficiency and crossing facilities provided across the side street and one leg of the corridor. Pedestrians must cross the slip lanes, unprotected, to the refuge island before arriving at the push button to cross the road. Additionally, pedestrians can only cross at one side of the intersections on Ti Rakau Drive, reducing the pedestrian amenity and efficiency

3.6.2 Cycling Facilities

There is an absence of cycle facilities along the vast majority of Ti Rakau Drive. Neither on-road nor off-road cycle facilities are provided to encourage movement along Ti Rakau Drive, except at the Ti Rakau Drive / Gossamer Drive intersection.

Cyclists within the EB2 and EB3R project areas must currently share an on-road lane with high-volume, high-speed traffic, as well as with heavy vehicles (e.g., buses). Crossing facilities are limited to those at signalised intersections. More experienced and confident cyclists who mix with general traffic have the choice to cross at intersections from right turning bays, but must still cross multiple lanes of traffic to do so. Furthermore, cyclists must navigate numerous driveways along the corridor.

In the wider Pakuranga area, there are sections of short cycle routes, outlined in **Figure 10**. Reeves Road is suggested as a road with space for cyclists, albeit with high traffic demand. AT recently developed recreational cycle facilities in the eastern cycle network, such as the Cascades shared path that connects Pakuranga College, Burswood Drive and Meadowlands. AT has also developed the Pakuranga Rotary shared path that tracks the coastline of the Tāmaki River. Additional recreational cycle routes provide connection to and from Half Moon Bay Ferry Terminal, Farm Cove, Sunny Hills, and Pakuranga Plaza. With the completion of EB1, a bi-directional cycleway and shared path is located on the northern side of Pakuranga Road from Ireland Road to Ti Rakau Drive.

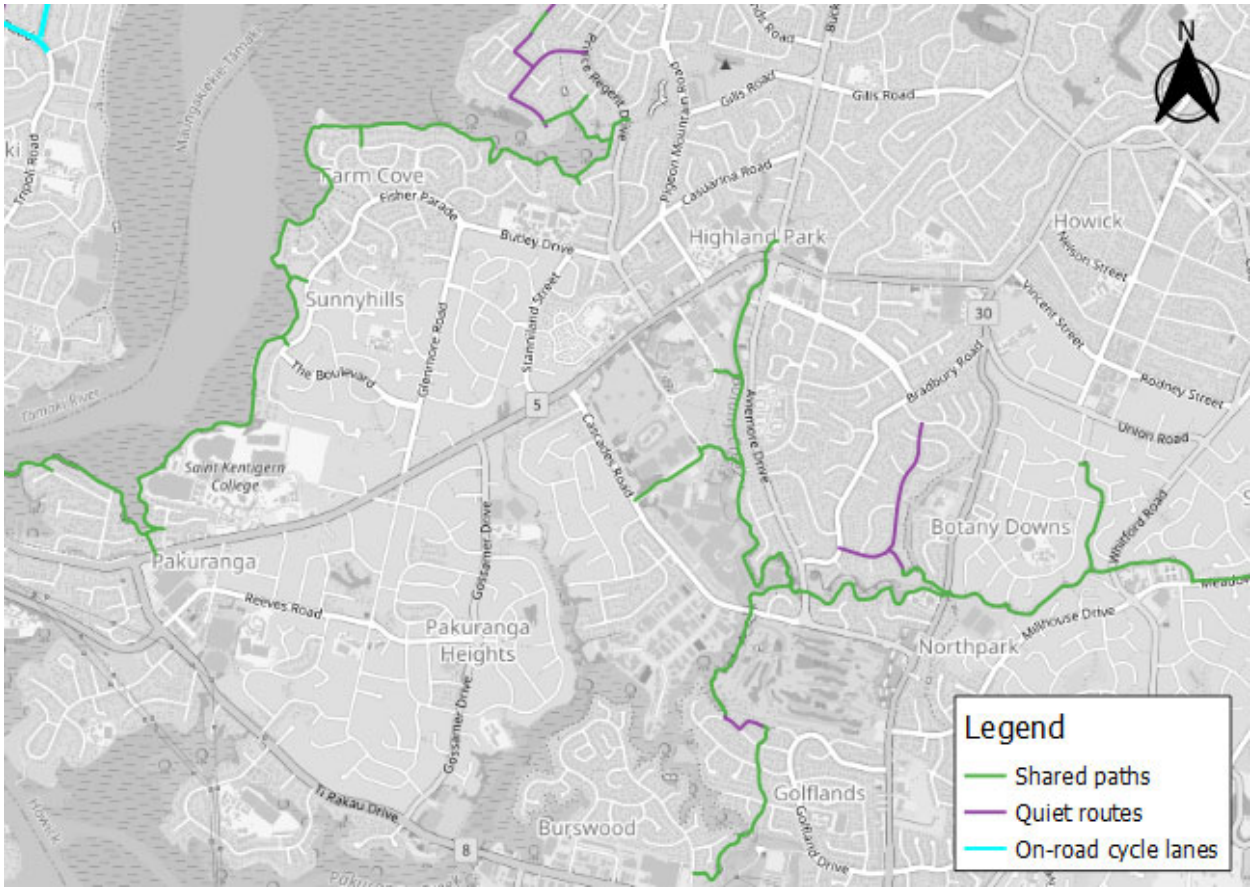

Figure 10: Existing cycle routes and facilities in the wider Pakuranga area

3.7 Parking

Within the EB2 and EB3R project areas there are a number of locations that offer parking, both on-street and off-street. The key locations in the EB2 and EB3R project areas are:

- Pakuranga Plaza
- Te Tuhi
- Ti Rakau Park
- Cortina Place
- William Roberts Road
- Ti Rakau Drive
- Edgewater shops
- Side roads

Currently, Pakuranga Plaza is classified as a Business Town Centre Zone. Under the AUP(OP), there are generally no upper limits on the amount of parking retail, office, education facilities, hospitals and commercial services can provide.

Parking surveys were conducted to determine the utilisation of the existing on-street and off-street parking demand and utilisation in the EB2 and EB3R project areas. **Figure 11** shows the surveyed areas, which were surveyed on Thursday 5 July 2018 and Saturday 7 July 2018. At the time of data collection, these survey dates were selected to represent typical weekday and weekend periods of parking utilisation at the selected sites. These data sets exclude the effects of COVID-19 on travel behaviour and are considered to represent the existing environment before EB2 and EB3R construction.

Figure 11: Parking survey locations

3.7.1 Pakuranga Plaza

Pakuranga Plaza currently supports 1,355 parking spaces on site. The utilisation of 840 of these parks was captured in the parking survey in the areas outlined in **Figure 12**.

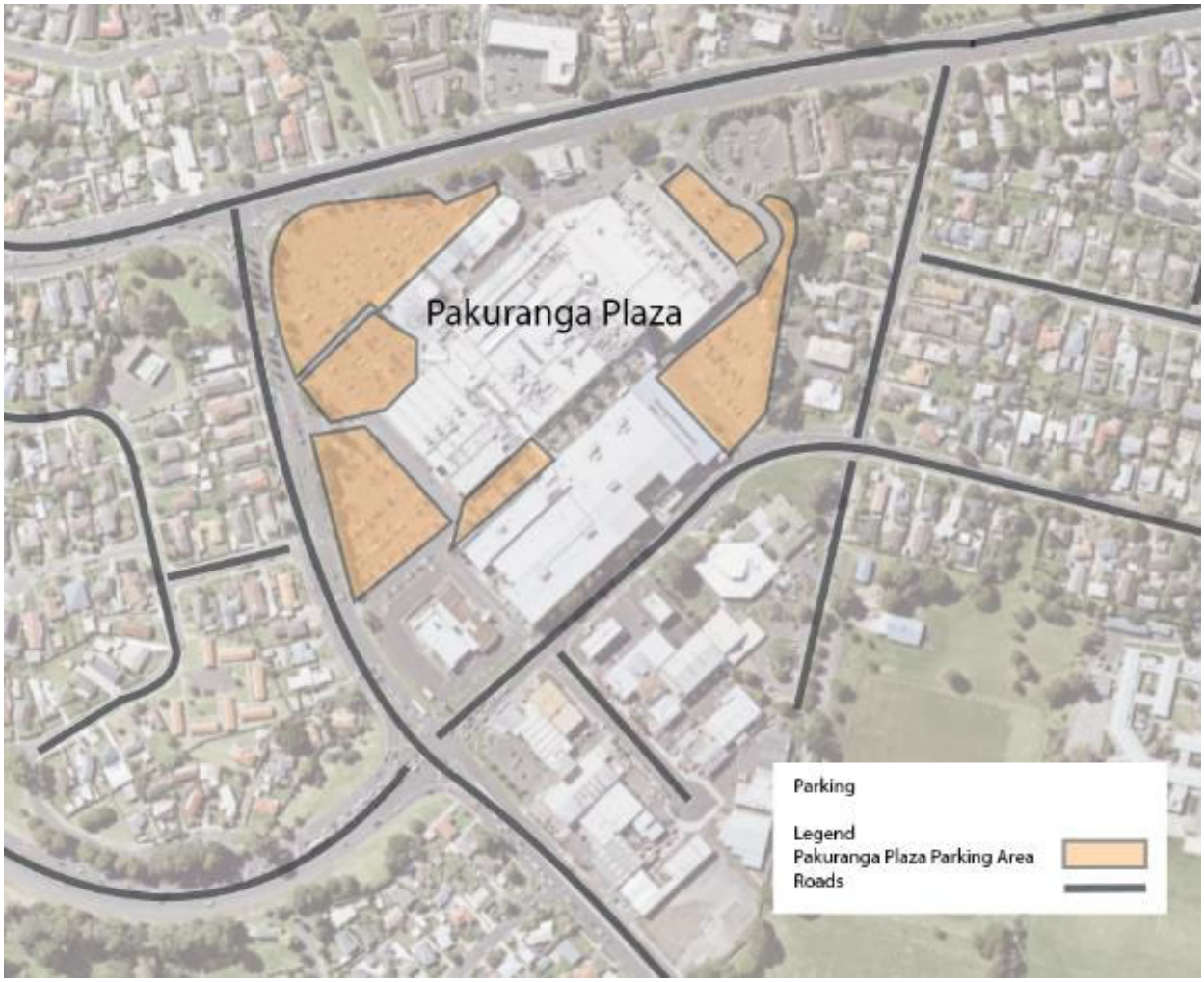

Figure 12: Surveyed parking areas of Pakuranga Plaza

Table 5 outlines the findings of the surveys and **Figure 13** below illustrates the daily utilisation profile. The table and the graph indicate the Pakuranga Plaza parking is underutilized and does not exceed 60% capacity on a typical weekday or weekend.

Table 5: Pakuranga Plaza parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.4	1.5
Maximum Parking (Utilisation)	418 (51%)	471 (57%)
Minimum Parking (Utilisation)	52 (6%)	306 (37%)
Average Parking (Utilisation)	301 (37%)	392 (48%)

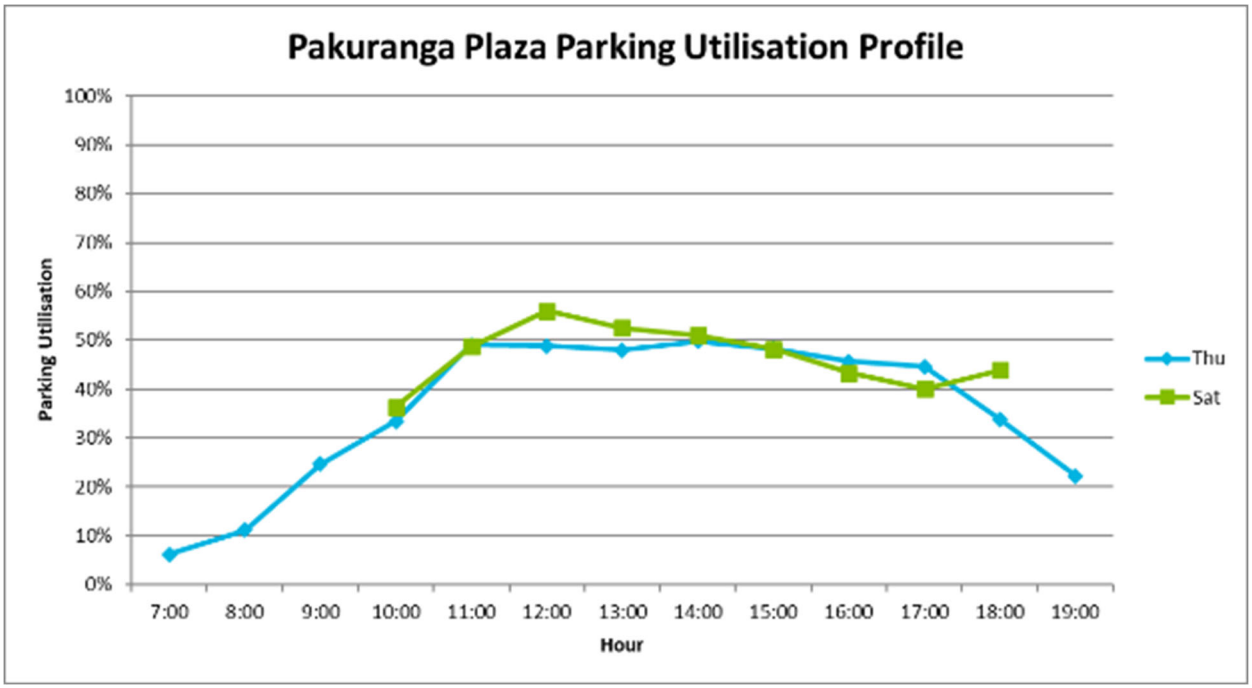

Figure 13: Pakuranga Plaza parking utilisation profile

3.7.2 Cortina Place

Cortina Place is a local cul-de-sac intersecting Reeves Road and provides access to a small commercial area. Overall, there are 25 on-street spaces available, with an average utilisation of 64% during weekdays and 71% during weekends. Full utilisation of the parking spaces occurs on weekend mornings for a short duration. The long duration of the average stay indicate that shop-owners and staff are likely using the spaces. **Table 6** outlines the findings of the survey and **Figure 14** below illustrates the parking utilisation profile across the days.

Table 6: Cortina Pl parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9
Minimum Stay [hours]	1	2
Average Stay [hours]	5.7	5.5
Maximum Parking (Utilisation)	21 (84%)	25 (100%)
Minimum Parking (Utilisation)	8 (32%)	15 (60%)
Average Parking (Utilisation)	16 (64%)	18 (71%)

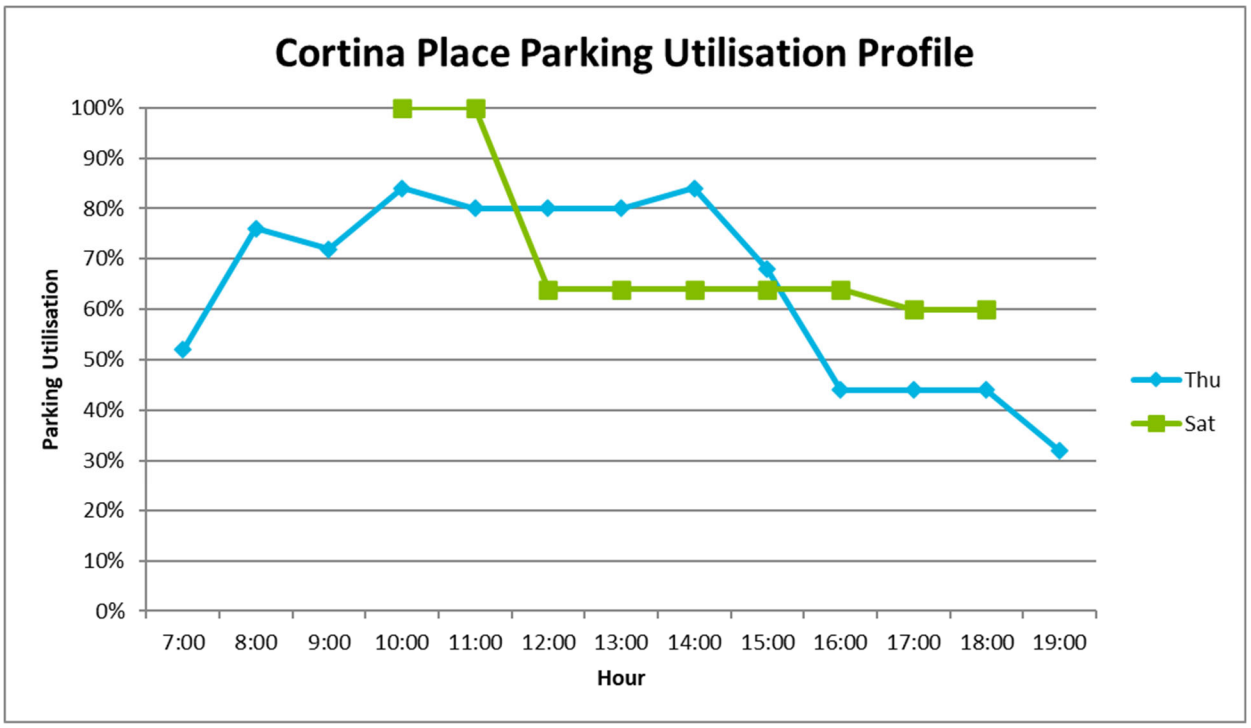

Figure 14: Cortina Pl parking utilisation profile

3.7.3 William Roberts Road

William Roberts Road connects Pakuranga Road to Reeves Road at its northern end and provides access to the Pakuranga Leisure Centre and Ti Rakau Park at its southern end. Overall, there are 127 parking spaces available, with an average utilisation of 49% on weekdays and 33% on weekends. There are 40 additional parks for the Ti Rakau Park which were considered off-street parking and were not surveyed. **Figure 15** outlines the area included in the parking survey of William Roberts Road.

Figure 15: Surveyed area of William Roberts Rd

Table 7 outlines the findings of the survey and **Figure 16** illustrates the parking utilisation profile across the days.

Table 7: William Roberts Rd parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay (hours)	13	9
Minimum Stay (hours)	1	1
Average Stay (hours)	3.7	2.8
Maximum Parking (Utilisation)	105 (83%)	113 (89%)
Minimum Parking (Utilisation)	25 (20%)	35 (28%)
Average Parking (Utilisation)	62 (49%)	42 (33%)

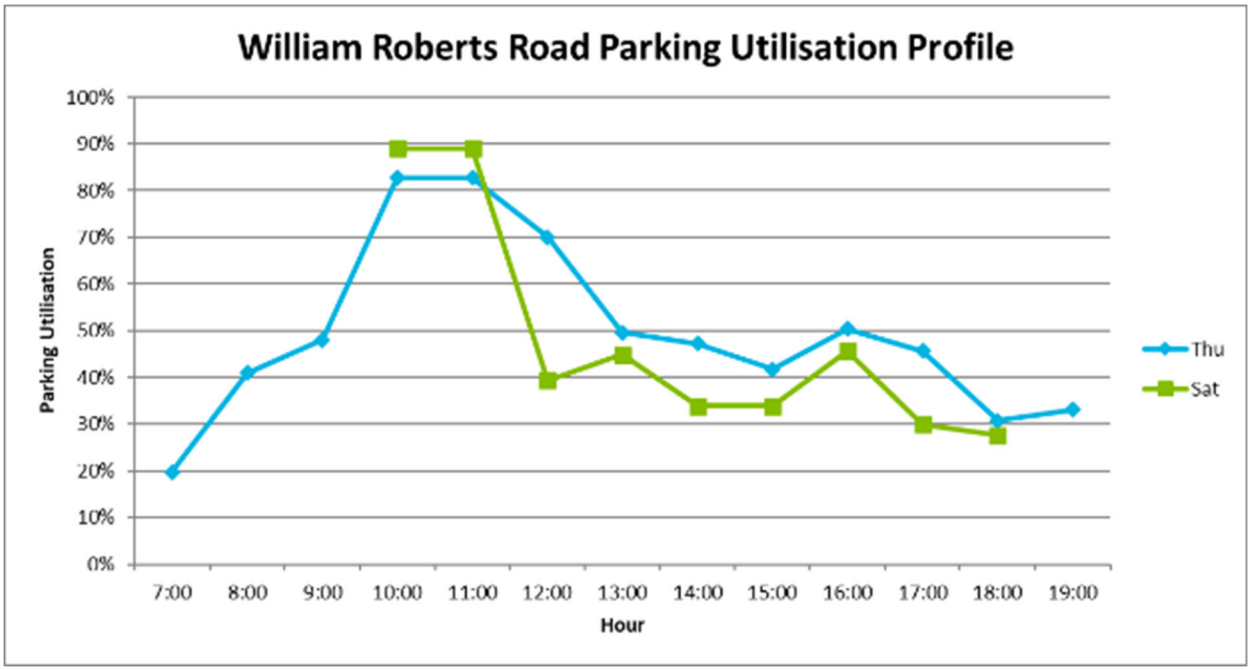

Figure 16: William Roberts Rd parking utilisation profile

Where the utilisation is around 90% for William Roberts Road and Cortina Place it is likely due to activities at the Pakuranga Leisure Centre or the Ti Rakau Park, such as Saturday morning sports. Additionally, the maximum stay for both Cortina Place and William Roberts Road was 13 hours, which is equivalent to the length of the parking survey. This indicates that a number of these parks are likely to be occupied by owners/ staff of the surrounding properties.

3.7.4 Ti Rakau Drive

Ti Rakau Drive is a major corridor connecting Pakuranga to East Tāmaki and Botany Town Centre in the southeast. The survey was conducted from the Roseburn Place intersection down to the Gossamer Drive intersection. Overall, there are 180 on-street parking spaces provided along Ti Rakau Drive, which are currently poorly utilised. **Table 8** below outlines the findings of the survey and **Figure 17** below illustrates the parking utilisation profile across the days.

Table 8: Ti Rakau Dr parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	13	9

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Minimum Stay [hours]	1	1
Average Stay [hours]	3.0	2.7
Maximum Parking (Utilisation)	10 (5%)	28 (15%)
Minimum Parking (Utilisation)	3 (2%)	9 (5%)
Average Parking (Utilisation)	5 (3%)	15 (8%)

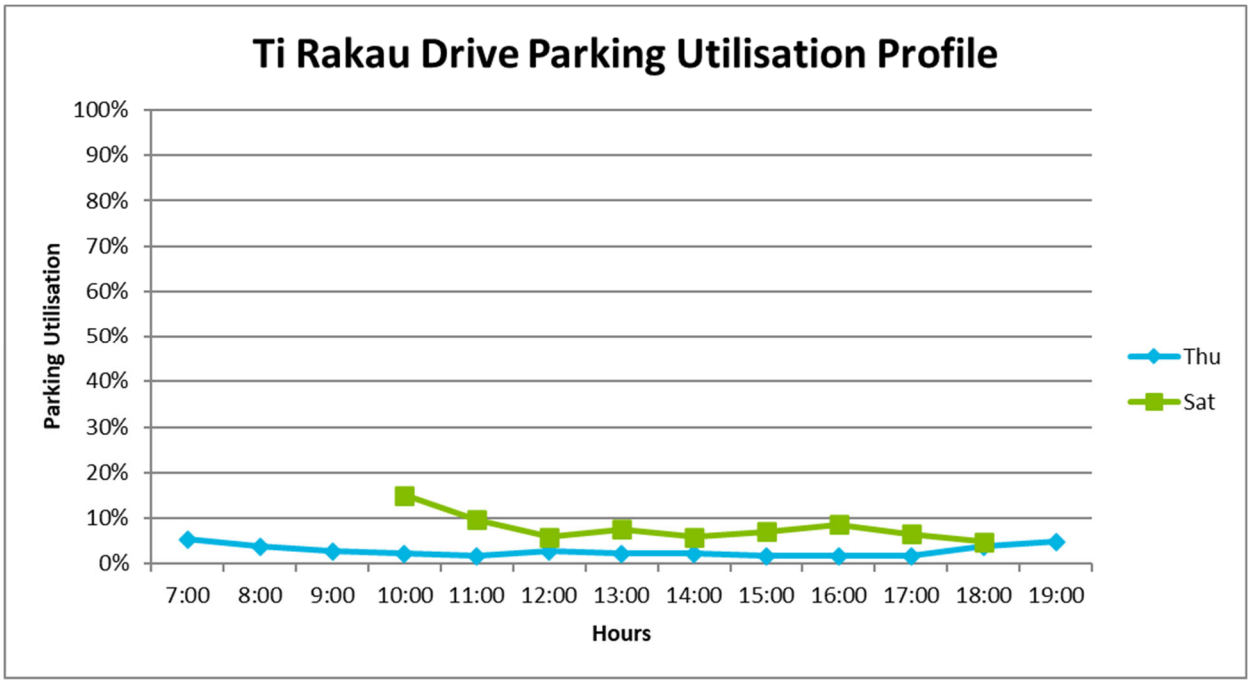

Figure 17: Ti Rakau Dr parking utilisation profile

The results shown are not unexpected. It is likely that the high traffic volume environment on Ti Rakau Drive does not create an appealing location to park vehicles given a perceived risk of accidents. Furthermore, this section of Ti Rakau Drive is surrounded by residential properties, and it would not be unreasonable to assume that properties have ample individual off-street parking due to the general size of these free-standing properties.

3.7.5 Edgewater Shops

The Edgewater Shops is a block of local shops located at the Ti Rakau Drive / Edgewater Drive intersection. Currently there are 30 parking spaces provided within an off-street parking area that serves the various commercial properties. The survey determined that the carpark is not fully utilised. **Table 9** outlines the findings of the survey and **Figure 18** illustrates the parking utilisation profile across the days.

Table 9: Edgewater Shops parking utilisation summary

Parking Utilisation	Thursday 5 July (7am – 7pm)	Saturday 7 July (10am – 6pm)
Maximum Stay [hours]	11	9
Minimum Stay [hours]	1	1
Average Stay [hours]	2.5	1.8
Maximum Parking (Utilisation)	18 (60%)	12 (40%)
Minimum Parking (Utilisation)	1 (4%)	3 (10%)
Average Parking (Utilisation)	11 (37%)	8 (27%)

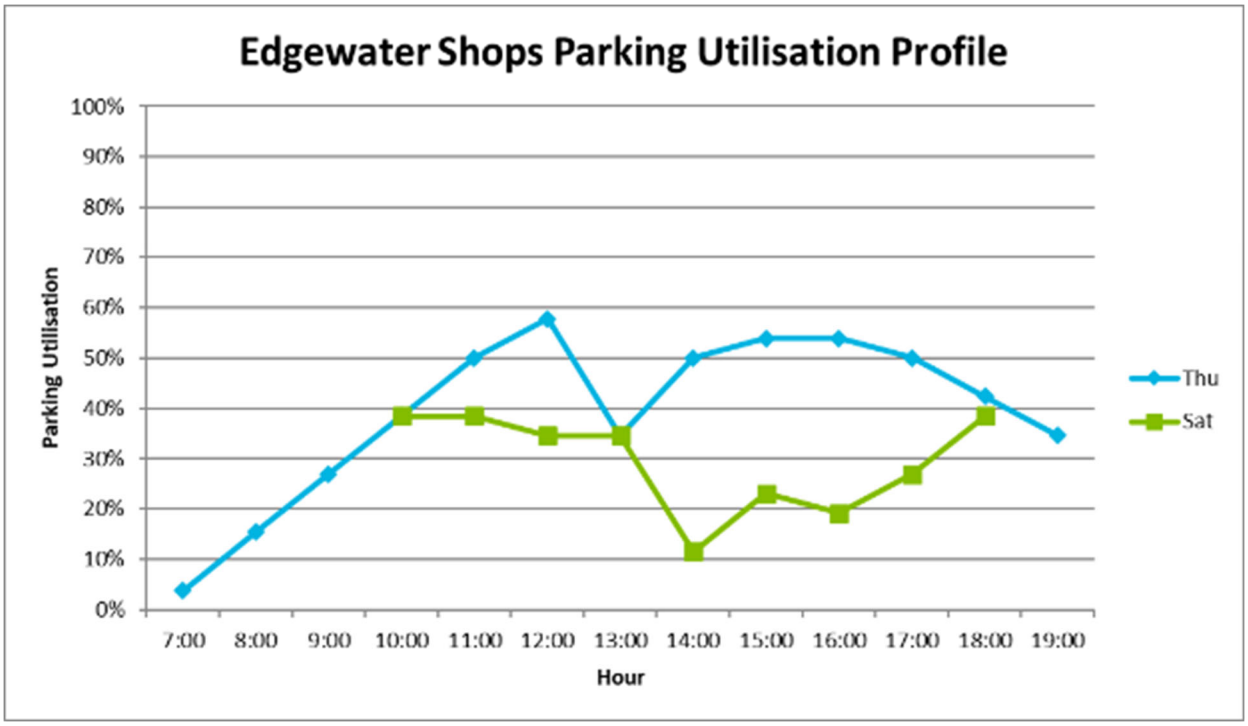

Figure 18: Edgewater Shops parking utilisation profile

Further analysis of the parking survey data shows that generally most vehicles are parked for short periods (one-hour survey intervals), with a minority of vehicles parked for longer periods (likely staff and shop owners). This is in line with what would be expected at these commercial properties. Parking utilisation is not expected to exceed 60% on a typical weekday or weekend.

3.7.6 Side roads

Due to the low utilisation of on-street parking along the side roads of Ti Rakau Drive, no further detailed analysis is presented. **Table 10** provides a summary of the parking surveys conducted on the side roads in EB2 and EB3R project areas.

Table 10: EB2 and EB3R side roads parking utilisation summary

Side Road	Parking Utilisation Comments
Ayr Rd	Ayr Road is a local road providing access to residential houses with 70 on-street spaces available. However, it is a poorly utilised road, with the maximum utilisation on Thursday being 12% and 6% on Saturday.
Roseburn Pl	Roseburn Place is a cul-de-sac joining to Ti Rakau Drive, providing access to residential properties. There are 45 on-street spaces available. However, it is poorly utilised with the maximum utilisation on Thursday being 9% and 10% on Saturday. The low utilisation could be attributed to residents having ample parking within their properties and visitors parking on the street.
Mattson Rd	Similar to Roseburn Place, Mattson Road is a cul-de-sac off Ti Rakau Drive with 80 on-street spaces. Again, it is poorly utilised with the maximum utilisation on Thursday being 4% and 8% on Saturday.
Marriott Rd	Marriott Road connects Ti Rakau Drive to Udys Road with 175 on-street parking spaces available. It is a poorly utilised road with a maximum of six parked vehicles.
Chevis Pl	Chevis Place is a cul-de-sac off Ti Rakau Drive providing access to residential properties to the east. There are 45 on-street parking spaces available. However, these spaces are poorly utilised with a maximum utilisation of 4% on Thursday and 16% on Saturday. The low utilisation could be attributed to most residents having ample parking within their properties.
Edgewater Dr	Edgewater Drive is a collector with a crescent shape that connects to Ti Rakau Drive at two locations. It provides access to residential properties, Edgewater College and Pakuranga Retirement Village. There are 500 on-street parking spaces available along the length of the road. It would be expected to see high utilisation of on-street parking during school peak periods; however, this is not the case, with a maximum weekday utilisation of five parked vehicles. A similar trend was observed on Saturday with a maximum of six vehicles parked within an hour.
Wheatley Ave	Wheatley Avenue is a small cul-de-sac off Ti Rakau Drive between the two sections of Edgewater Drive. It serves a small residential community and provides 30 on-street parking spaces. It is poorly utilised during weekdays with the maximum utilisation being 10%. This was observed to increase to 20% during the weekend.

3.8 Crash Environment

3.8.1 Crash Analysis System Data

All reported crashes within the EB2 and EB3R project area were extracted from the Crash Analysis System (CAS) for a five-year period from 2015 to 2019. Data from 2020 was not used as not all the data was available. This was due to a lag in uploading crash data and the impacts of COVID-19. For this assessment, the focus on the extracted data was in the area shown in **Figure 19**.

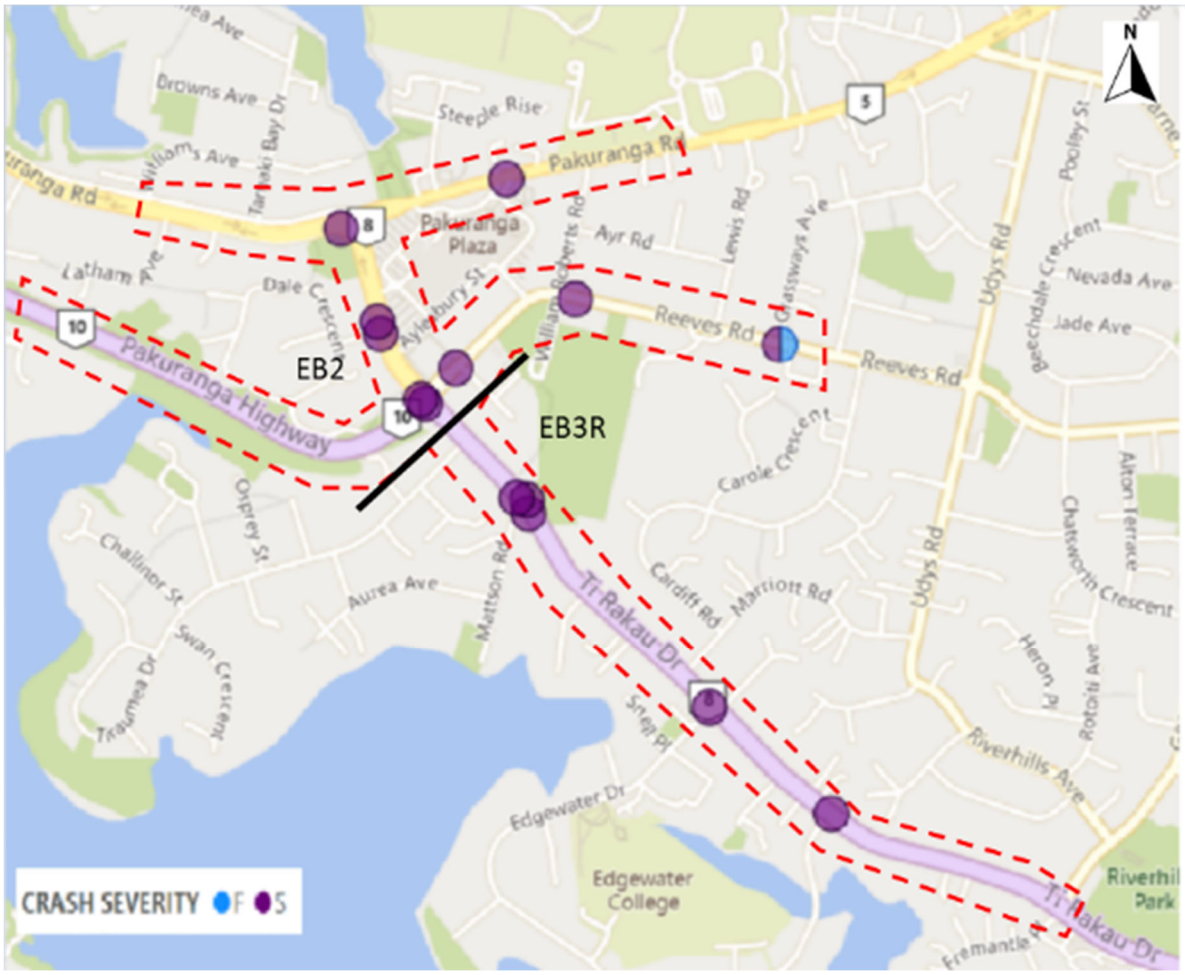

Figure 19: Extent of extracted CAS data for EB2 and EB3R project areas

There was 1 fatal crash and 14 serious injury crashes in the 2015 – 2019 time period:

- **Fatal:** Motorcycle collision with a vehicle which failed to give way turning right out of a side street or driveway
- **Serious Injury:** 6 pedestrian crashes
- **Serious Injury:** 4 instances where a right turning vehicle fails to give way to oncoming traffic (one general vehicle vs general vehicle, one general vehicle turns in front of a moped, one general vehicle turns in front of motorcycle, one general vehicle turns in front of a truck)
- **Serious Injury:** 1 loss of control whilst cornering, serious injury crash with a general vehicle
- **Serious Injury:** 1 crash involving a van door being opened on a cyclist
- **Serious Injury:** 2 instances of rear ends at the Reeves Road intersection (one general vehicle vs general vehicle crash, one general vehicle vs motorcycle crash)

3.8.2 Safe System Assessment

A Safe System Assessment (SSA) was undertaken for the entire Project area[15]. The SSA was conducted in accordance with the Auckland Transport Safe System Assessment Guidelines which are based on the Austroads 2016, Research Report AP-R509-16, Safe System Assessment Framework. A summary of the SSA is provided below.

The SSA assessed a total of ten crash types as described below:

1. Run-off-road (R-O-R): Involving one or more vehicle(s) losing control on a curve or straight
2. Head-on (H-O): Crashes involving two or more vehicles travelling in opposite directions
3. Intersection (INT): Crashes involving two or more vehicles travelling in adjacent directions
4. Other: Includes manoeuvring, overtaking, parking and miscellaneous crashes
5. Motorcycle (M/C): Any crash type above involving a motorcycle
6. P1: Any crash involving a pedestrian and a vehicle turning at an intersection
7. P2: Any crash involving a pedestrian and vehicle travelling straight (midblock crossing)
8. P3: Any crash involving a pedestrian and vehicle travelling straight through an intersection
9. C1: Any crash involving a cyclist being struck by a vehicle travelling in the same direction
10. C2: Any Crash involving a cyclist being struck by a vehicle at an intersection (turning or straight)

Each crash type is scored based on exposure, likelihood and severity with a value between 0 and 4. A lower score corresponds with a safer system. A score of 0 for exposure, likelihood or severity means that a particular crash type is not applicable to the location being considered and will result in a product score of 0. **Table 11** and **Table 12** outline the safe system score of the existing environment in the EB2 and EB3R project areas. Location A in EB2 and locations F and H in EB3R indicate station locations on completion of the full Eastern Busway Project.

Table 11: EB2 existing environment safe systems assessment

ZONE EB2 ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) PAKURANGA EB STATION	16	16	32	16	64	24	48	0	36	36	288
B) TI RAKAU DR / PALM AVE	16	16	32	16	48	24	0	48	36	36	272
C) TI RAKAU DR / REEVES RD	16	16	24	16	48	18	0	24	36	27	225
D) TI RAKAU DR / TIRAUMEA DR	8	16	16	24	48	24	48	0	31.5	27	242.5
E) TI RAKAU DR / MATTSON RD	16	16	24	24	48	18	48	36	31.5	27	288.5
F) PAKURANGA RD / TI RAKAU DR	16	16	24	16	48	12	0	24	36	36	228
G) PAKURANGA RD / REEVES RD	16	24	32	16	64	18	0	48	36	36	290

Table 12: EB3R existing environment safe systems assessment

ZONE EB3R ASSESSMENT SUMMARY											
EXISTING LAYOUT	R-O-R	H-O	INT	OTHER	M/C	P1	P2	P3	C1	C2	TOTAL
A) ROSEBURN PL	8	16	32	24	64	24	48	0	27	36	279
B) MARRIOTT RD	8	16	32	24	64	24	48	0	27	36	279
C) EDGEWATER DR / CHEVIS PL	8	16	16	24	48	24	48	24	27	27	262
D) WHEATLY AVE	8	16	32	24	64	24	36	0	27	36	267
E) EDGEWATER DR	8	0	32	24	64	24	0	0	27	36	215
F) GOSSAMER STATION WB	8	0	0	24	32	0	0	0	27	18	109
G) GOSSAMER DR INTERSECTION	24	24	24	24	48	18	0	36	36	18	252
H) GOSSAMER STASTION EB	8	16	0	8	16	0	32	0	36	0	116

[15] EB234-1-TE-RP-Z0_000003

Motorcycle crashes were identified as the highest risk in the existing layout due to a maximum score of 4 for both exposure and severity.

3.9 Over-Dimension and Over-Weight (OD and OW) Routes

Within the Project area there are a number of roads that have been defined by Waka Kotahi as strategic Over-Dimensional (OD) routes[16]. These support the large commercial and industrial areas in and around Burswood and East Tāmaki which are the key generators of freight and OD loads. The OD routes relevant to the EB2 and EB3R project areas are listed below and shown in **Figure 20**:

- Pakuranga Road – Ti Rakau Drive to Howick
- Pakuranga Highway – Ti Rakau Drive to Waipuna Road
- Ti Rakau Drive – Pakuranga Road to Te Irirangi Drive

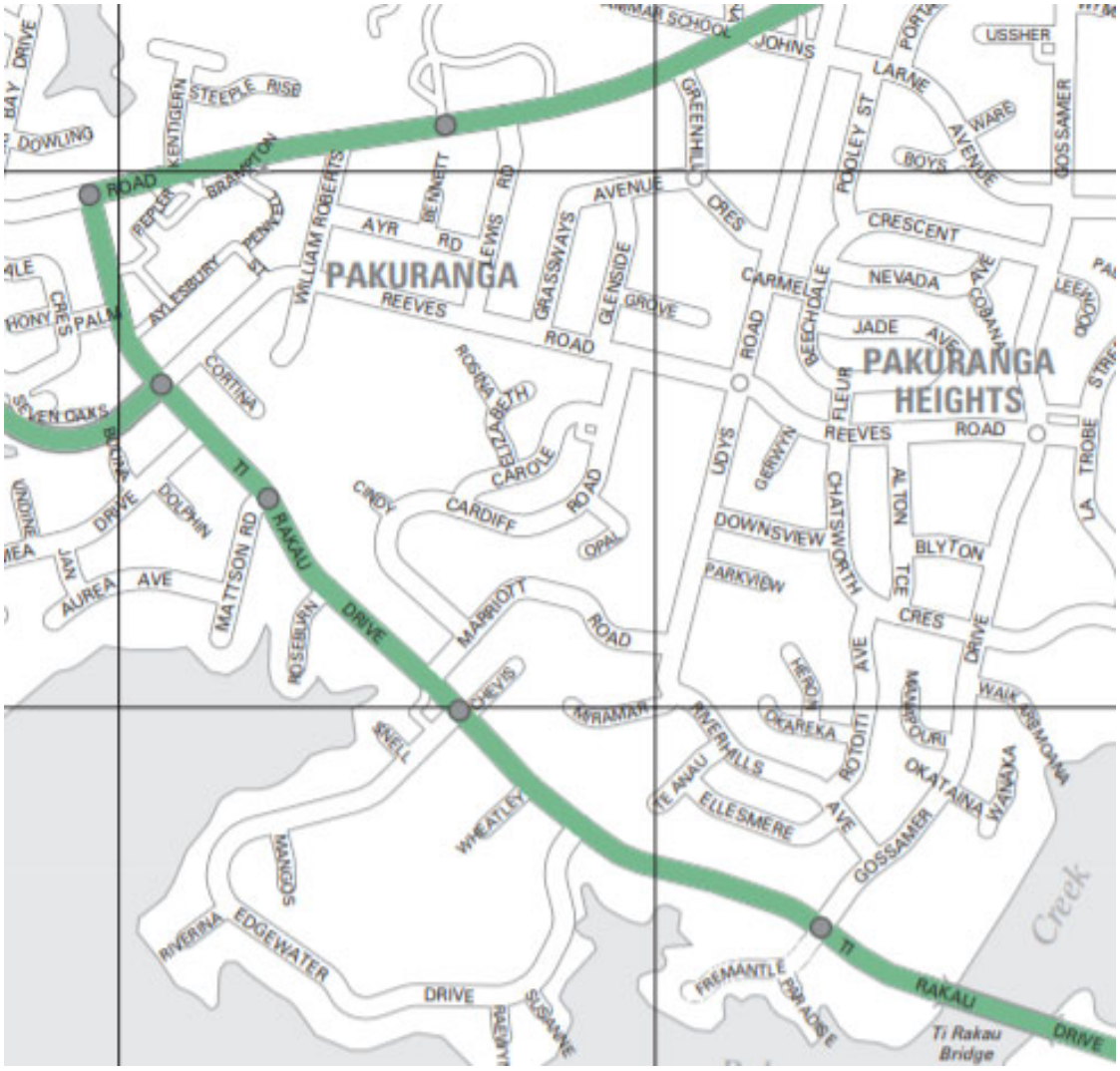

Figure 20: Over-dimensional vehicle routes

It is worth noting that no roads within the EB2 and EB3R project areas are designated as Over-Weight (OW) routes. The nearest OW route is Te Irirangi Drive further southeast, from State Highway 1 up to Botany Town Centre.

[16] http://nzta1.cwp.govt.nz/assets/resources/overdimen-veh-route-maps/4-auckland/docs/OD_4-35%20Auckland

Table 13 below shows the current heavy commercial vehicle (HCV) percentage of traffic that travel through the EB2 and EB3R project areas. HCV data were sourced through a combination of AT traffic counts and RAMM data.

Table 13: Existing HCV percentage

Roads	HCV Percentage
Pakuranga Rd (east of Ti Rakau Dr)	6%
Pakuranga Rd (west of Ti Rakau Dr)	7%
Ti Rakau Dr (Pakuranga Rd – SEART)	7% westbound, 8% eastbound
Ti Rakau Dr (SEART – Edgewater Dr (west))	8%
Ti Rakau Dr (Edgewater Dr, west to east)	9% westbound, 8% eastbound
SEART	3%
William Roberts Rd	4%
Edgewater Dr	3%

3.10 Changes to the Baseline Traffic Environment

This section provides an overview of the changes to the baseline traffic environment that were included in the traffic modelling assessments conducted in this ITA.

3.10.1 EB1

Included in the modelling scenarios was EB1, which is a key component of the overall Project. It is the segregated busway connection from Panmure train station to Pakuranga Town Centre. The eastern terminus of EB1 is located beside the western boundary of the EB2 project area, at the Pakuranga Road / Ti Rakau Drive intersection and is shown in **Figure 21**.

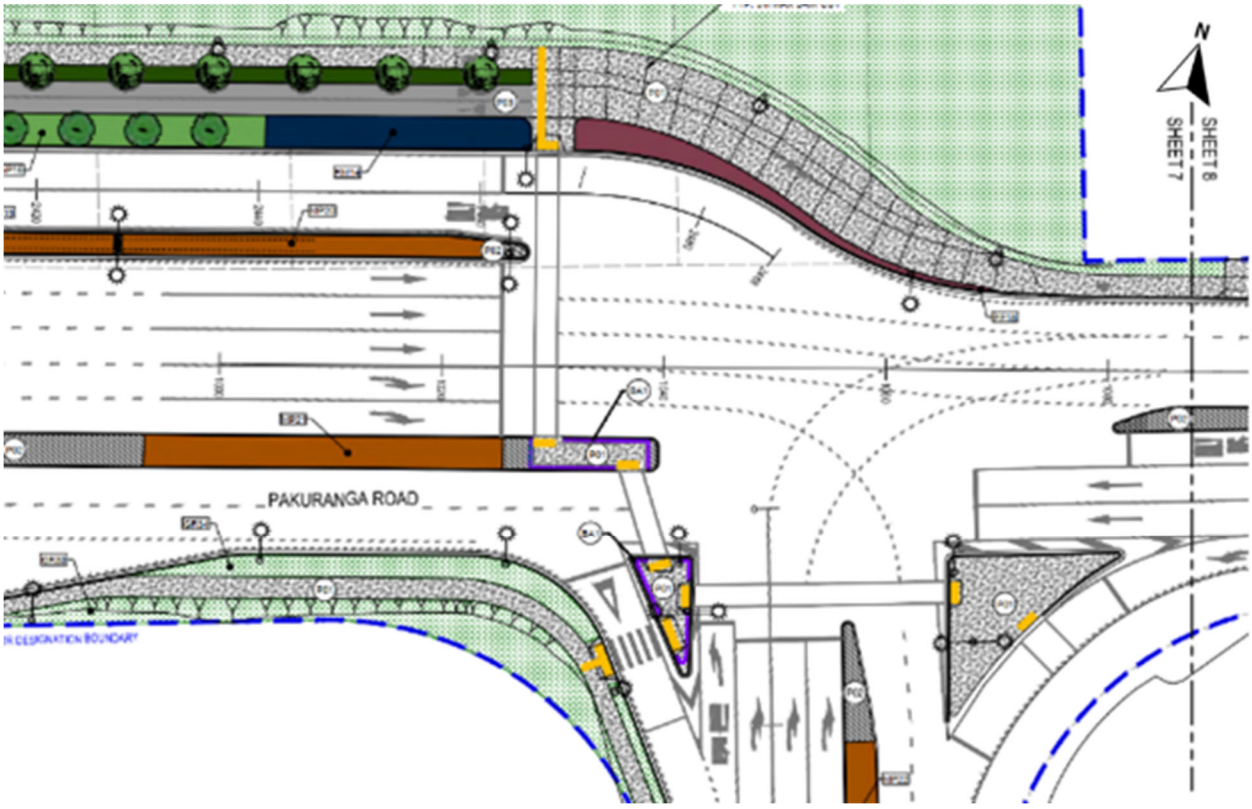

Figure 21: EB1 tie-in at Pakuranga Rd / Ti Rakau Dr intersection

3.10.2 WRRE Works

The WRRE construction will precede EB2 and EB3R, and is anticipated to have a duration of approximately eight months, from November 2022 to June 2023. The WRRE[17] will consist of:

- The extension of William Roberts Road further south to Ti Rakau Drive
- A new priority-controlled, left-in left-out (LILO) only intersection with Ti Rakau Drive at the southern end of William Roberts Road. The kerbside lane of Ti Rakau Drive eastbound will be a shared through and left-turn lane. It should be noted that a second lane at the northern approach will also be constructed during the WRRE but will not be operational until later stages of the overall construction of the Project (EB2)
- The extension of Cortina Place further east to connect to William Roberts Road. A new raised priority-controlled intersection with William Roberts Road at the eastern end of Cortina Place. All approaches to the intersection will provide one approach lane and one exit lane
- Five parallel on-street parking spaces will be provided on the eastern side of William Roberts Road and 11 angled parking spaces on the western side. A new raised pedestrian crossing will also be provided on William Roberts Road at Ti Rakau Park. The posted speed limit of this section of William Roberts Road will be 30 km/h

Figure 22 shows the layout of the William Roberts Road and Cortina Place extensions upon completion.

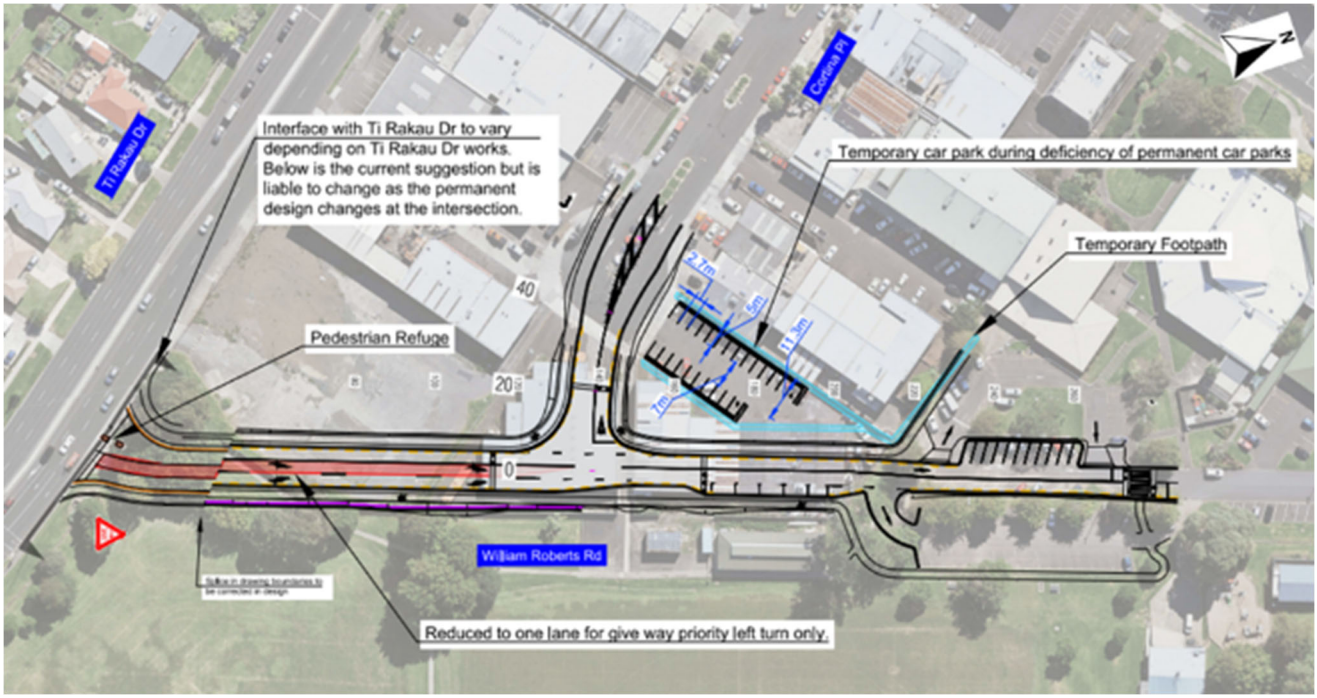

Figure 22: WRRE layout

[17] EB234-1-TE-RP-Z2-0001-A1-William Roberts Rd Extension ITA

3.10.3 Other EB2 and EB3R Enabling Works

An assessment was undertaken to understand the potential traffic redistribution that could occur on the network due to the closure of Reeves Road, which is required for the construction of the RRF during EB2. Furthermore, the assessment was aimed at identifying other potential enabling works that may be required to mitigate the effects of the resulting traffic redistribution. These enabling works will form part of the EB2 and EB3R consent package. Considering the construction programme, these enabling works will follow the WRRE and will precede the closure of Reeves Road during EB2 and EB3R construction.

The full results of the assessment are presented in the Technical Advice Memorandum provided in **Appendix A**, hereafter referred to as the 'Reeves Road Detour Assessment'. A summary of the results, and the enabling works required before the closure of Reeves Road, is presented below. **Figure 23** shows the proposed detour route during the Reeves Road closure.

Figure 23: Proposed detour route during Reeves Rd closure

The detour route along William Roberts Road north, westbound along Pakuranga Road and eastbound along Ti Rakau Drive towards SEART was determined to be less attractive than expected. Overall, only a small percentage of traffic could be expected to route along the proposed detour, likely due to the already congested nature of the Pakuranga Road / William Roberts Road intersection.

It was determined that inbound (citybound) traffic, during the AM peak, could be expected to detour via Gossamer Road to Ti Rakau Drive. Traffic in the outbound direction, during the PM peak, could be expected to return via Pakuranga Road and via SEART turning right onto Ti Rakau Drive.

It should be noted that the Reeves Road Detour Assessment followed a similar methodology as the WRRE ITA of assessing a 'future Do-Minimum' scenario in comparison to a 'future with detour' scenario. This approach allowed for the inclusion of known changes to the network that are expected to be completed before the Reeves Road closure and the associated traffic distribution on the network, such as the WRRE.

This assessment indicated that mitigation works would be required at the Ti Rakau Drive / Reeves Road and Ti Rakau Drive/ Gossamer Drive intersections.

3.10.3.1 Ti Rakau Drive / Reeves Road Intersection

Intersection performance is expected to be poor (LOS F) during both the AM and PM peaks in the Do-Minimum scenario. The Reeves Road Detour AM peak intersection performance could be expected to be slightly improved (LOS E), however the PM peak would still be LOS F.

The SEART off-ramp right-turn lanes into Ti Rakau Drive are expected to operate at LOS F during the PM peak. The increase in traffic volumes, due to Reeves Road closure, would result in delay increasing from around 50 sec to 215 sec (3.6 min), which would require mitigation.

Various mitigation measures were tested, however only the preferred option (Mitigation 1) is presented below. Mitigation 1 consists of converting the through lane to a right-turn lane at the off-ramp from SEART to Ti Rakau Drive as well as an additional exit lane on Ti Rakau Drive eastbound between Reeves Road and William Roberts Road. **Table 14** provides a summary of the Ti Rakau Drive / Reeves Road intersection performance.

Table 14: Reeves Rd Detour Assessment – Ti Rakau Dr / Reeves Rd intersection performance summary[18]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	F	F	0.90	1.13	178	83
Reeves Rd Detour	E	E	0.91	1.02	60	75
Mitigation 1	D	E	0.89	0.96	53	57

Mitigation 1 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[18] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

3.10.3.2 Ti Rakau Drive / Gossamer Drive Intersection

The right-turn traffic volume from Gossamer Drive into Ti Rakau Drive is expected to increase by 160 veh/h in the AM peak during the Reeves Road closure. The resultant intersection performance is expected to be poor (LOS F), compared to the LOS E of the Do-Minimum scenario. This would require mitigation. The intersection is expected to experience little change during the Reeves Road closure in the PM peak and will remain at LOS D.

Again, various mitigation measures were tested, however only the preferred option (Mitigation 2) is presented below. Mitigation 2 consists of the following changes to the northern Gossamer Drive approach to the intersection; converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full length left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the short kerbside exit lane (see **Figure 24**).

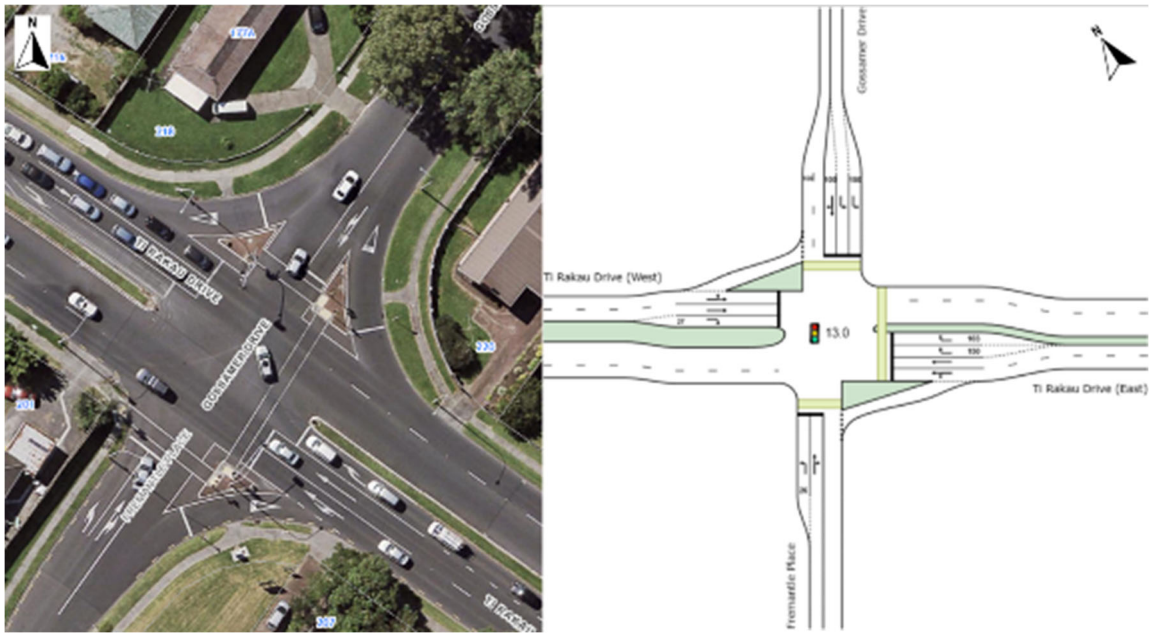

Figure 24: Ti Rakau Dr / Gossamer Dr intersection layout (left = current, right = enabling works)

Table 15 provides a summary of the Ti Rakau Drive / Gossamer Drive intersection performance.

Table 15: Reeves Rd Detour Assessment – Ti Rakau Dr / Gossamer Dr intersection performance summary[19]

Scenario	Level-of-Service (LOS)		Degree of Saturation (DOS)		Average Delay [sec]	
	AM	PM	AM	PM	AM	PM
Do-Minimum	D	D	1.02	0.90	48	45
Reeves Rd Detour	F	D	1.25	0.88	168	43
Mitigation 2	D	D	0.89	0.86	37	37

Mitigation 2 is expected to lead to improved intersection performance during both the AM and PM peaks compared to the Do-Minimum and the Reeves Road Detour scenarios.

[19] SIDRA analysis carried out based on traffic volumes for a 2028 horizon year.

4 EB2 and EB3R Design and Construction

4.1 EB2 and EB3R Overview

As stated in **Section 3.4.1**, without the Project, traffic volumes are predicted to increase on Pakuranga Road and Ti Rakau Drive (between Pakuranga Road and Reeves Road), reaching the capacity of the corridors by 2028. It is likely that large queues and delays on these sections will act as a bottle neck for the rest of the network. This issue is also highlighted in **Section 3.4.2**, with large travel times on these specific sections of the network in the existing environment.

The Project seeks to improve congestion and travel times across the transport network, and particularly in the area around the Pakuranga Town Centre. This will be achieved through the construction of the RRF, which will provide a direct and faster link between Pakuranga Road and SEART, as well as dedicated bus lanes for bus services.

Bus travel times will be improved primarily through the construction of dedicated bus lanes. Buses will also have priority at intersections by way of 'call-ahead' features and advance loops to extend the traffic signal green time when a bus is within approach distance of an intersection. Furthermore, the buses will in future laydown at new bus stations with improved efficiency and merge back into dedicated bus lanes, instead of general traffic lanes, further improving travel times as well as safety.

The Project will also seek to improve the catchment areas of public transport via improved bus stations and improved walking and cycling infrastructure. In the future, all bus stations in the EB2 and EB3R project area will provide seating and sheltered cover as well as bicycle and scooter parking for passengers. Separated walkways and cycleways will improve safety, amenity and travel time for an all-around improved trip to/from the bus stations.

Pedestrian and cyclist safety and amenity will be improved through the construction of separated footpaths and cycleways. Raised tables will be provided across all approaches on the southern side of Ti Rakau Drive as well as both intersections along Cortina Place. Additional signalised pedestrian crossings will be provided across Pakuranga Road, Ti Rakau Drive, Reeves Road, Aylesbury Street and William Roberts Road. A raised pedestrian crossing will also be provided on William Roberts Road near the Ti Rakau Park.

Lastly, the Project will seek an all-around improvement in safety to all users through the use of relevant TDM design standards. Improved pedestrian crossing facilities will be provided to discourage jaywalking and to improve amenity. All unprotected left-turn slip lanes will be removed and the movements will be signalised.

4.2 EB2 and EB3R Design and Construction Works

The sections below provide details, split between the EB2 and EB3R project areas, of the proposed design and construction works. Details are also provided to highlight when in the construction programme these works will occur as this is important to understand the development of the modelling scenarios presented in **Section 5.2.2** and **Section 6.3.2**.

4.2.1 EB2 – Design and Construction Works

The general extent of the EB2 project area encompasses the following roads (see **Figure 25**, dark purple):

- Ti Rakau Drive from Pakuranga Road to Reeves Road
- SEART from the eastern Waipuna Bridge abutment to Ti Rakau Drive
- Reeves Road from Ti Rakau Drive to William Roberts Road
- Pakuranga Road from Ti Rakau Drive to William Roberts Road
- Specific sections of Palm Avenue, Aylesbury Street, Seven Oaks Drive, Cortina Place, and William Roberts Road

Figure 25: EB2 general extent (dark purple)

EB2 will be a complex area with multiple work zones occurring simultaneously against different time scales. Below are sections of geographical works roughly in sequential order, however significant overlap will occur between some of these sections of work. A full set of EB2 layout drawings is provided in **Appendix B**. The EB2 construction works are anticipated to occur over a period of approximately four years.

4.2.1.1 Reeves Road and the Flyover

Reeves Road between Ti Rakau Drive and William Roberts Road will consist of one lane per direction, similar to the existing environment. However, unlike the existing environment, Reeves Road will not serve as a through route from SEART to Pakuranga Heights. In the future, it will serve buses between Ti Rakau Drive and Pakuranga Road, and will provide access to the Pakuranga Plaza and businesses on Cortina Place.

The lower section of Reeves Road between Ti Rakau Drive and Cortina Place as well the new Reeves Road 'ramps' connecting to the RRF tie-in at Pakuranga Road will be bus only lanes to improve bus travel times between Ti Rakau Drive and Pakuranga Road. Reeves Road between Cortina Place and William Roberts Road will be mixed traffic with access to Pakuranga Plaza at Aylesbury Street and the private access road. Movements out from Cortina Place and the private access road will be northbound only onto Reeves Road. The intersections with Aylesbury Street and William Roberts Road will be signalised upon completion of the RRF to avoid midblock queues blocking the bus lane ramps.

The RRF will in future provide a direct and faster link between Pakuranga Road and SEART, by eliminating the need to travel along Ti Rakau Drive. The RRF will consist of four lanes, two lanes per direction. Adjacent to the Pakuranga Plaza, the alignment of the RRF will be directly above Reeves Road.

Raised tables will be provided across the western and eastern approaches at the Reeves Road / Cortina Place intersection. Signalised pedestrian crossings will be provided across the southern, western and northern approaches at the Reeves Road / Aylesbury Street intersection and all approaches at the William Roberts Road / Reeves Road intersection. The existing midblock pedestrian crossing will be removed to avoid potential sightline issues. As the columns of the RRF will be located along the centre of Reeves Road, the view of pedestrians may be obstructed to vehicles.

Figure 26 shows the proposed layout of Reeves Road underneath the RRF.

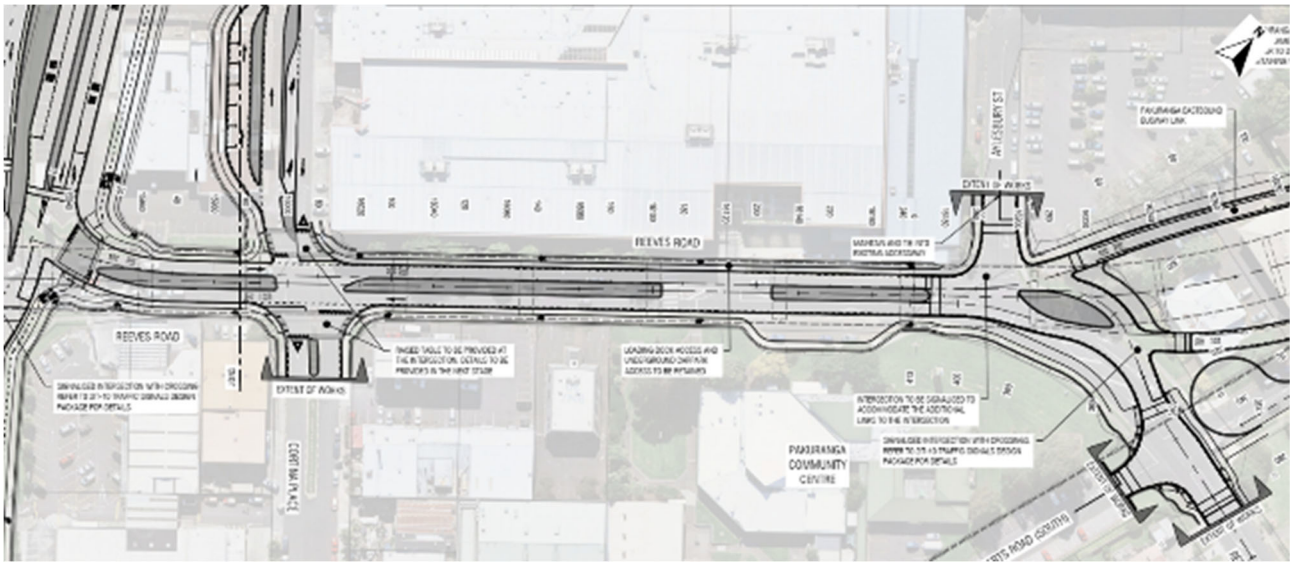

Figure 26: Reeves Rd (underneath RRF)

Figure 27 shows the proposed layout of the RRF itself.

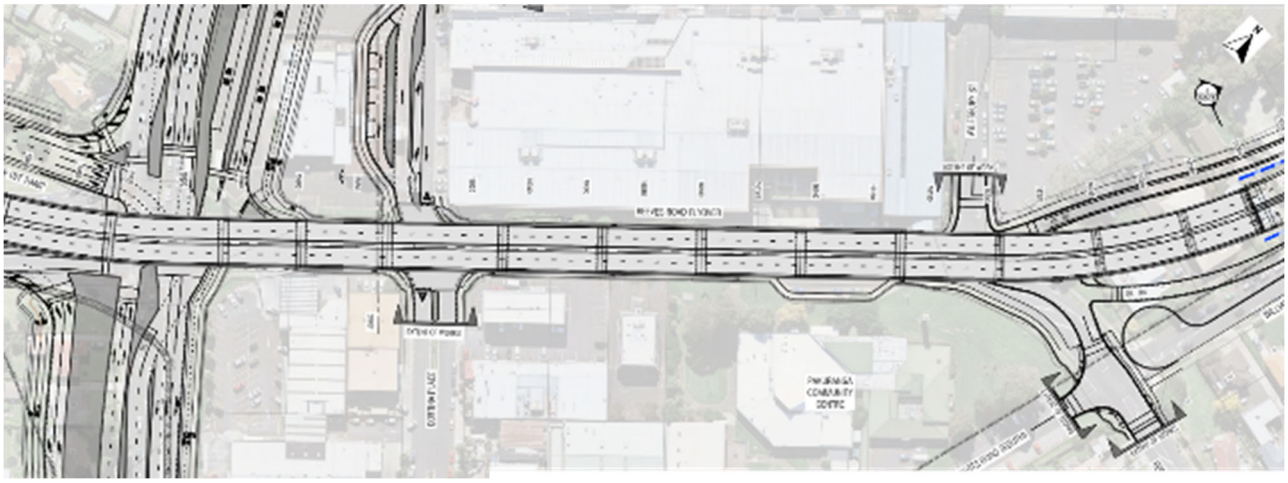

Figure 27: RRF

The works on Reeves Road will be extensive and will encompass offline works heading north along William Roberts Road. Reeves Road will be closed to enable these works and will not fully reopen until all works associated with the RRF and the remaining environment below the RRF have been completed.

Figure 28 shows the indicative work zones associated with Reeves Road and the RRF. The works associated with the RRF, and Reeves Road underneath are anticipated to have a duration of approximately three years.

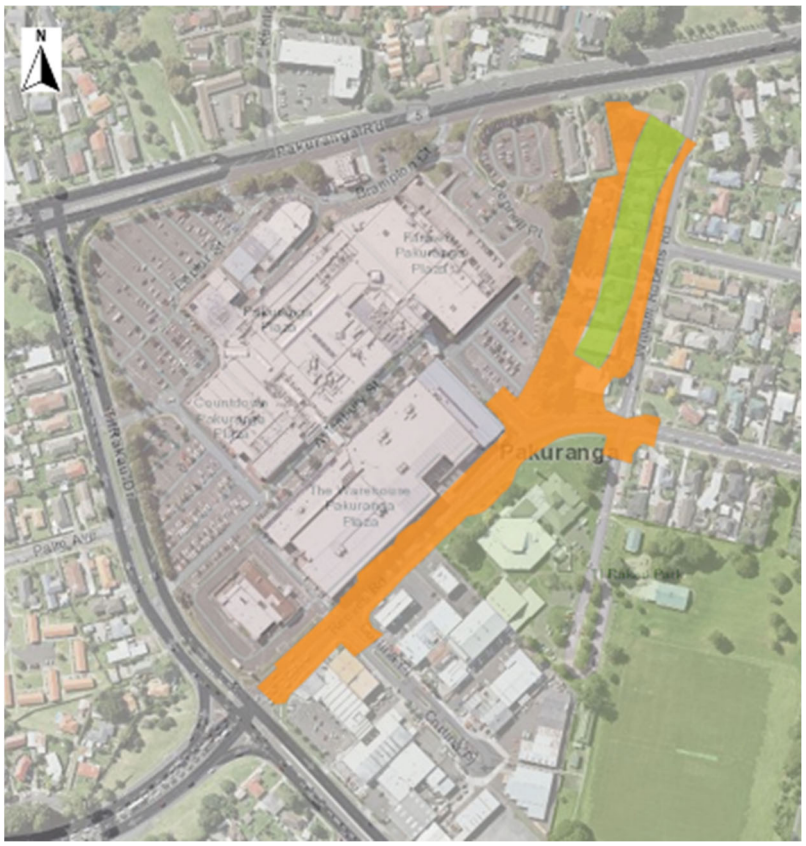

Figure 28: Indicative work zones – Reeves Rd and RRF

The existing alternate routes, during the Reeves Road closure, are at capacity and additional traffic loading will result in increased delays. This means that to enable the closure of Reeves Road without

significant effects, three works must be completed prior to the closure to accommodate the displaced traffic volumes:

1. William Roberts Road extension. Effects of these works have been assessed in the WRRE ITA, see **Section 3.10.2**.
2. Ti Rakau Drive enabling works. To close Reeves Road the through lane from SEART must be converted into a right-turn lane, requiring a third exit lane on Ti Rakau Drive eastbound between Reeves Road and William Roberts Road to accommodate the eastbound traffic flows through the intersection (see **Section 3.10.3.1**). The existing median will need to be removed and replaced with median delineators.
3. Gossamer Drive enabling works. During the Reeves Road closure, citybound traffic is expected to find an alternate route, via Gossamer Drive then proceeding along Ti Rakau Drive. As stated in **Section 3.10.3.2**, the enabling works at Gossamer Drive will include converting the short left-turn slip lane to pass through the intersection, converting the centre lane to a full left-turn lane, providing an additional short lane for the shared through and right-turn movements, and increasing the length of the kerbside exit lane.

The traffic modelling undertaken for EB2 and EB3R assumes that these three works have been completed and so form part of the baseline traffic environment discussed in **Section 3.10**.

4.2.1.2 William Roberts Road North

In the future, William Roberts Road north will no longer function as a through route between Reeves Road and Pakuranga Road, but rather as a local road to the surrounding residential properties. William Roberts Road north will be closed off once works are completed at the new Ti Rakau Drive / William Roberts Road intersection further south.

During this phase of construction, each end of William Roberts Road will be converted to a cul-de-sac with access off Ayr Road only. This in turn will remove the southern approach at the Pakuranga Road / William Roberts Road intersection, resulting in a no stop intersection until the RRF is built. The northern approach at the William Roberts Road / Reeves Road intersection will also be removed, resulting in a T-junction arrangement.

The majority of the existing footpath on the eastern side of William Roberts Road will be retained. **Figure 29** below shows the proposed layout of William Roberts Road north.

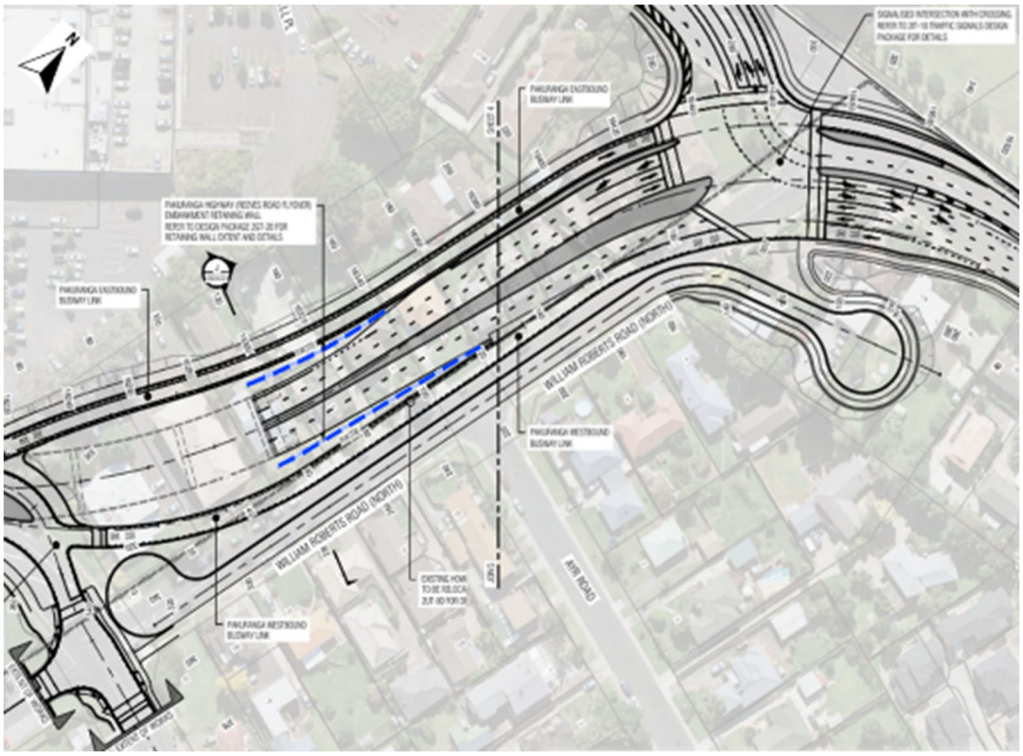

Figure 29: William Roberts Rd north

Figure 30 shows the indicative work zone of William Roberts Road north. The construction of William Roberts Road north is anticipated to have a duration of approximately six months.

Figure 30: Indicative work zones – William Roberts Rd north

4.2.1.3 Pakuranga Road Tie-In

The RRF will tie into Pakuranga Road with two through lanes per direction in addition to the dedicated bus lanes from Reeves Road. The Pakuranga Road western approach will tie into the intersection in a T-arrangement, providing two full length left-turn lanes for this major movement and one short right-turn lane onto the RRF.

The eastern approach will consist of a short bus lane, two full length through lanes, one full length right-turn lane and an additional short right-turn lane. The southern RRF approach will consist of a bus lane from Reeves Road, a short left-turn lane, and two full length through lanes. Signalised pedestrian crossings will be provided across all approaches. **Figure 31** shows the proposed layout of the Pakuranga Road / RRF tie-in.

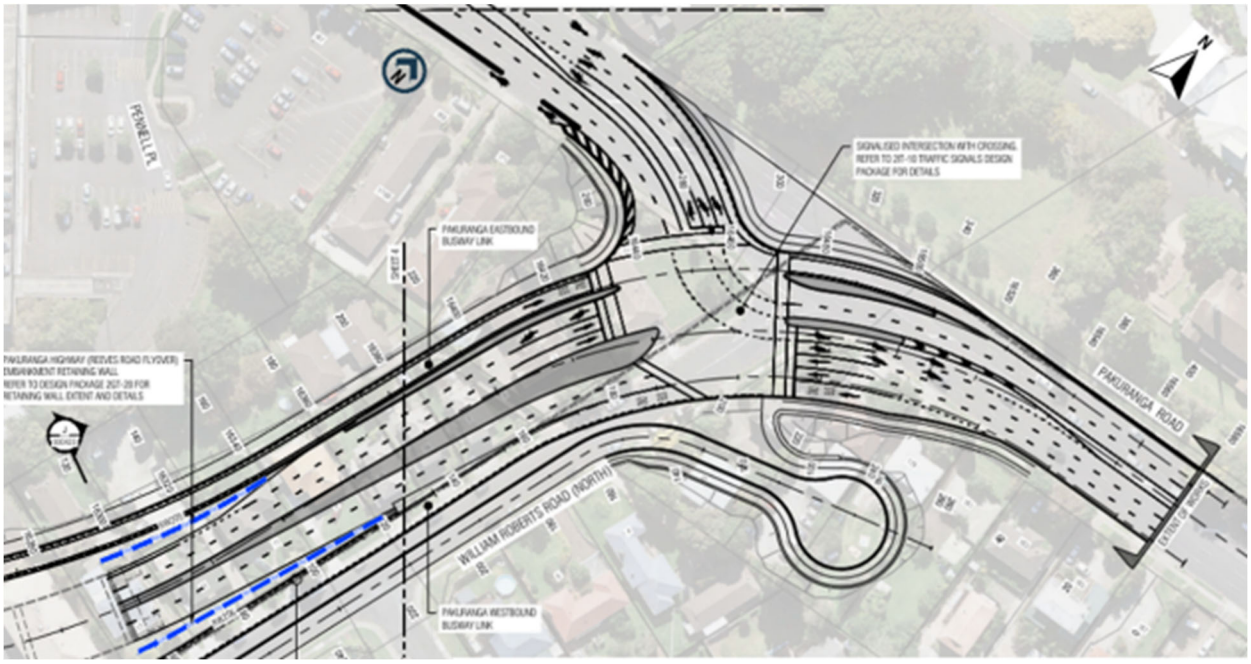

Figure 31: Pakuranga Rd / RRF tie-in

The tie-in of the RRF with Pakuranga Road will occur over four phases, maintaining five lanes of the Pakuranga Road carriageway at all times. Three lanes will be provided for the critical direction of traffic flow during the AM and PM peaks and two lanes for the opposite direction. This will be enabled by a dynamic lane arrangement. An example of the operation of dynamic lanes is shown in **Figure 32** below. It should be noted that this does not reflect the actual number of lanes on Pakuranga Road during construction.

Figure 32: Example of dynamic lane operations

Figure 33 shows the indicative work zone of the Pakuranga Road tie-in works. The construction of the tie-in is anticipated to have a duration of approximately six months.

Figure 33: Indicative work zone – Pakuranga Rd tie-in

4.2.1.4 SEART

In the future, the SEART off-ramp will consist of one short left-turn lane onto Ti Rakau Drive westbound, one short right-turn lane and two full length right-turn lanes onto Ti Rakau Drive eastbound. The SEART on-ramp will consist of two lanes to cater for the double left-turn from Ti Rakau Drive westbound.

Figure 34 below shows the proposed layout of the SEART on-ramp and off-ramp at Ti Rakau Drive. The works along SEART will be divided into three phases.

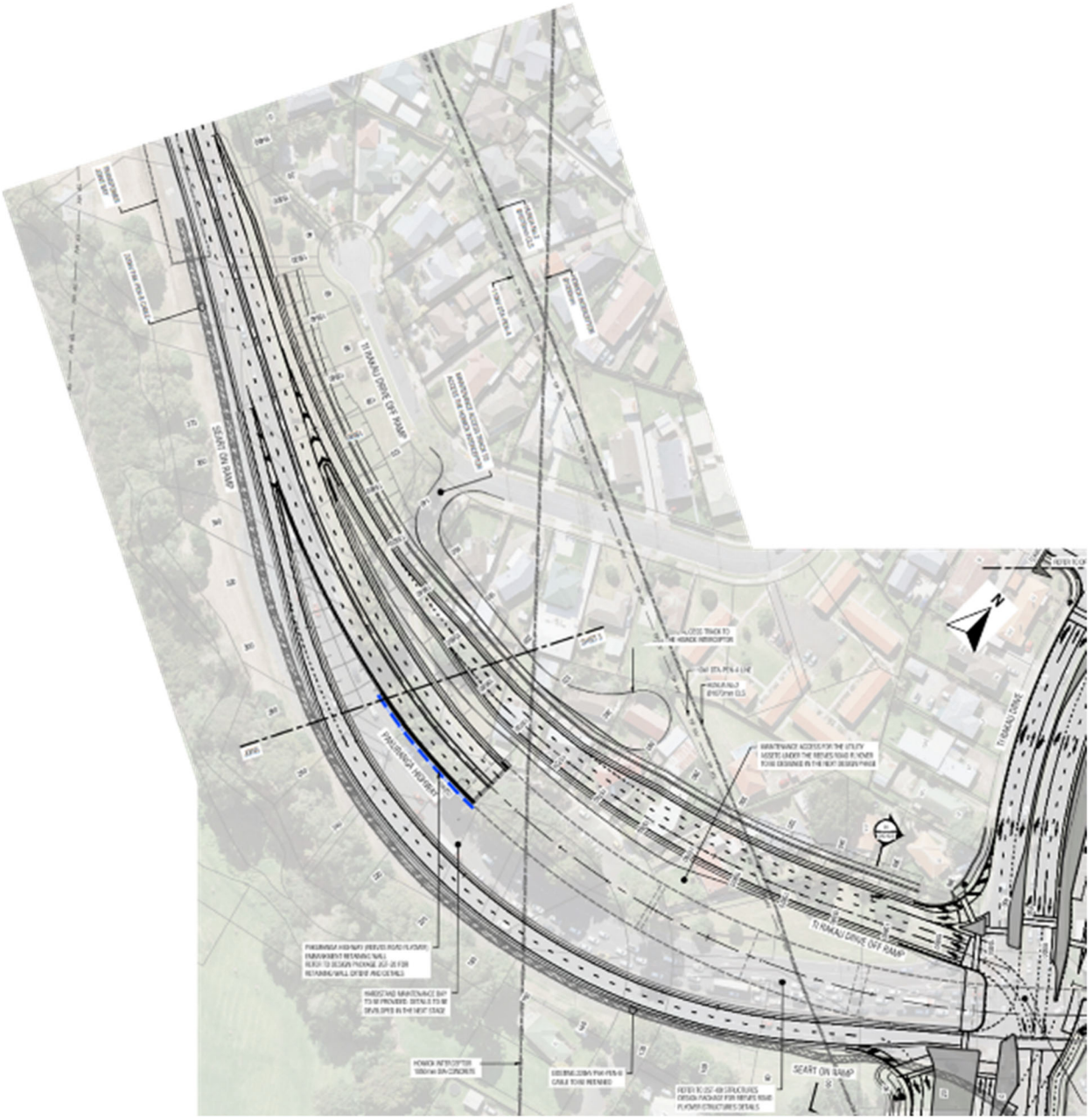

Figure 34: SEART on-ramp and off-ramp at Ti Rakau Dr

Phase 1 – Eastbound Carriageway:

The work associated with the eastbound carriageway will be offline between Ti Rakau Drive and Dale Crescent, on the northern side of SEART. Barrier protection will be installed along the existing shoulder up to the intersection with Ti Rakau Drive. To maintain the two left-turn lanes on the off-ramp, removal of the traffic island and temporary pavement will be required. Seven Oaks Drive will be reinstated further north of its current alignment.

Phase 2 – Westbound Carriageway:

During this phase the eastbound traffic will be moved to the new off-ramp. Westbound traffic will be transitioned to the existing eastbound lanes at the Ti Rakau Drive / Reeves Road intersection. This will allow for drainage works, permanent barrier removal and pavement construction on the existing westbound lanes. This phase of works will also consist of drainage works further west on SEART, which will be completed over night works with discrete closures.

Phase 3 – Centre of Carriageway:

Eastbound traffic will remain on the new off-ramp lanes from the preceding phases. Westbound traffic will be pushed to the southern edge of seal, maintaining the number of lanes as per the existing environment. A mixture of permanent and temporary barriers will protect the workspace.

A key component of this phase is construction of the falsework for the pier head above the Ti Rakau Drive right-turn lanes into SEART. Removal of the existing traffic island, including a streetlight and traffic signal pole, and construction of temporary pavement will be required to maintain the number of lanes as per the existing environment.

Figure 35 below shows the indicative work zones for SEART. The works along SEART are anticipated to have a duration of approximately three years.

Figure 35: Indicative work zones – SEART

4.2.1.5 Ti Rakau Drive

The works along Ti Rakau Drive in the EB2 project area have been divided into two sections to provide a clear and concise description of the proposed design and construction methodology.

Pakuranga Road to Reeves Road Section:

Ti Rakau Drive between Pakuranga Road and Reeves Road will in future consist of two through lanes per direction and offline bus lanes on the northern side of the carriageway. The eastern approach of Ti Rakau Drive at the intersection with Pakuranga Road will consist of two full length left-turn lanes and one short right-turn lane.

The two intersections with Aylesbury Street will be combined into one crossroads intersection with Palm Avenue, providing for all movements in and out of the side roads and will be signalised. The western approach on Ti Rakau Drive will consist of a short left-turn lane, two full length through lanes and a short right-turn lane, while the eastern approach will consist of full length shared through and left-turn lane, a full length through lane and a short right-turn lane. The northern approach on Aylesbury Street will consist of left-turn lane and a shared through and right-turn lane. The southern Palm Avenue approach will remain as per the existing environment.

A bus station will be provided between Aylesbury Street and Reeves Road, while a 'Kiss-and-Ride' facility will be provided on the private access road off Aylesbury Street that will consist of six parking spaces. A bidirectional cycleway will also be provided on the northern side of Ti Rakau Drive which will tie into the existing bidirectional cycleway on Pakuranga Road west (part of EB1) and the new unidirectional cycleways on Pakuranga Road east.

A signalised shared pedestrian and cyclist crossing will be provided across the northern approach at the Pakuranga Road / Ti Rakau Drive intersection, with signalised pedestrian crossings on all other approaches. A raised table will be provided across the southern approach at the Ti Rakau Drive / Aylesbury Street / Palm Avenue intersection, a signalised shared pedestrian and cyclist crossing on the northern approach and signalised pedestrian crossings on all other approaches. At the Ti Rakau Drive / Reeves Road / SEART intersection a raised table will be provided across the northern approach, a signalised shared pedestrian and cyclist crossing on the eastern approach and signalised pedestrian crossings on the southern and western approaches. **Figure 36** below shows the proposed layout of Ti Rakau Drive between Pakuranga Road and Reeves Road.

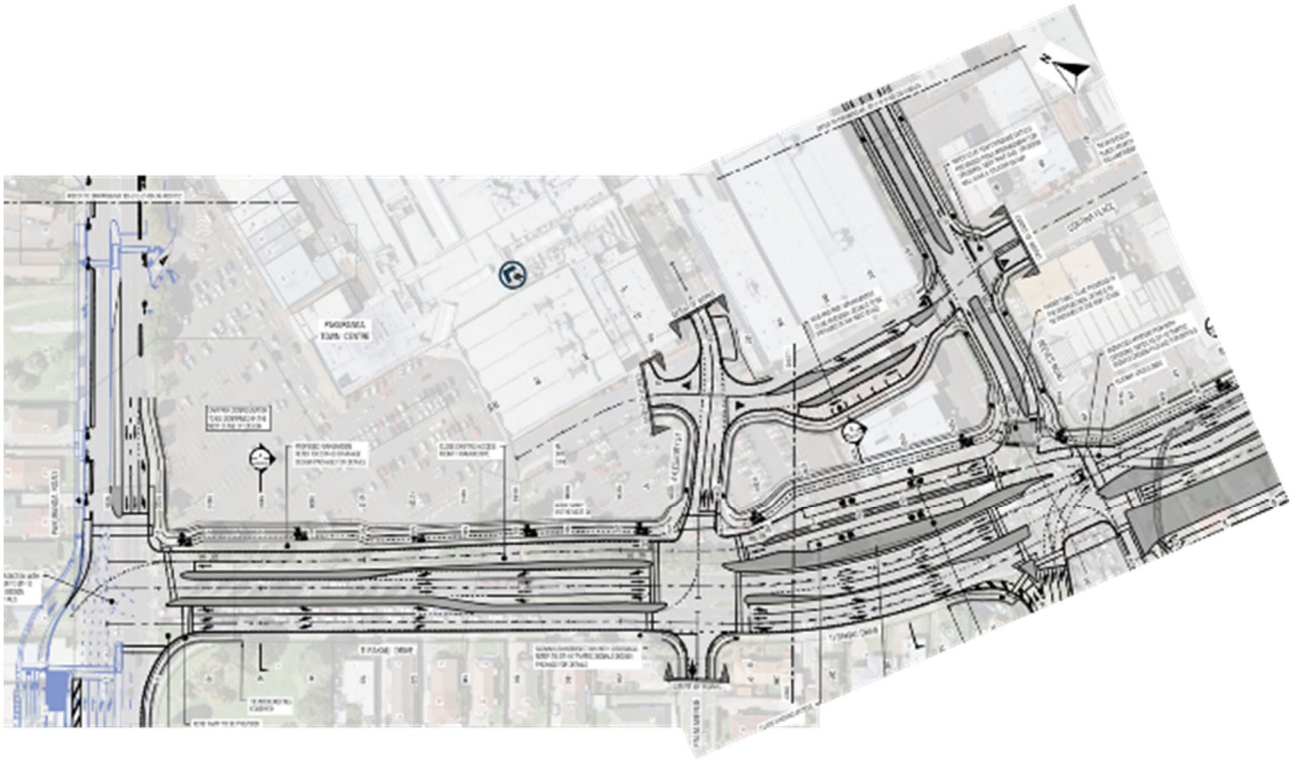

Figure 36: Ti Rakau Dr from Pakuranga Rd to Reeves Rd

The construction of Ti Rakau Drive between Pakuranga Road and Reeves Road will be divided into three sub-phases. In Phase 1, the new bus lanes are to be built largely offline concurrent with the RRF construction, and will include barrier protection, removal of the centre median and shifting lanes. Once the RRF is completed and traffic volumes have reduced on Ti Rakau Drive, the eastbound traffic will be transferred to the new bus lanes, reducing the available eastbound lanes to two lanes.

In Phase 2, works will commence in the centre of the carriageway to construct the new eastbound lanes. It is anticipated that insufficient width will be available to fully construct the median between the westbound and eastbound lanes in a single phase. Therefore, the northern section of the median will be constructed with the new eastbound lanes and the southern median section will be constructed with the westbound lanes.

Once the centre lane work is completed, barriers will be installed at minimal deflection in the centre lane separating the workspace from the westbound traffic in Phase 3. The southern section of the median spanning from Palm Avenue to Reeves Road will be constructed under discrete night closures once all pavement works, including the intersection works discussed below, have been completed.

Figure 37 below shows the indicative work zones for Ti Rakau Drive from Pakuranga Road to Reeves Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately three years.

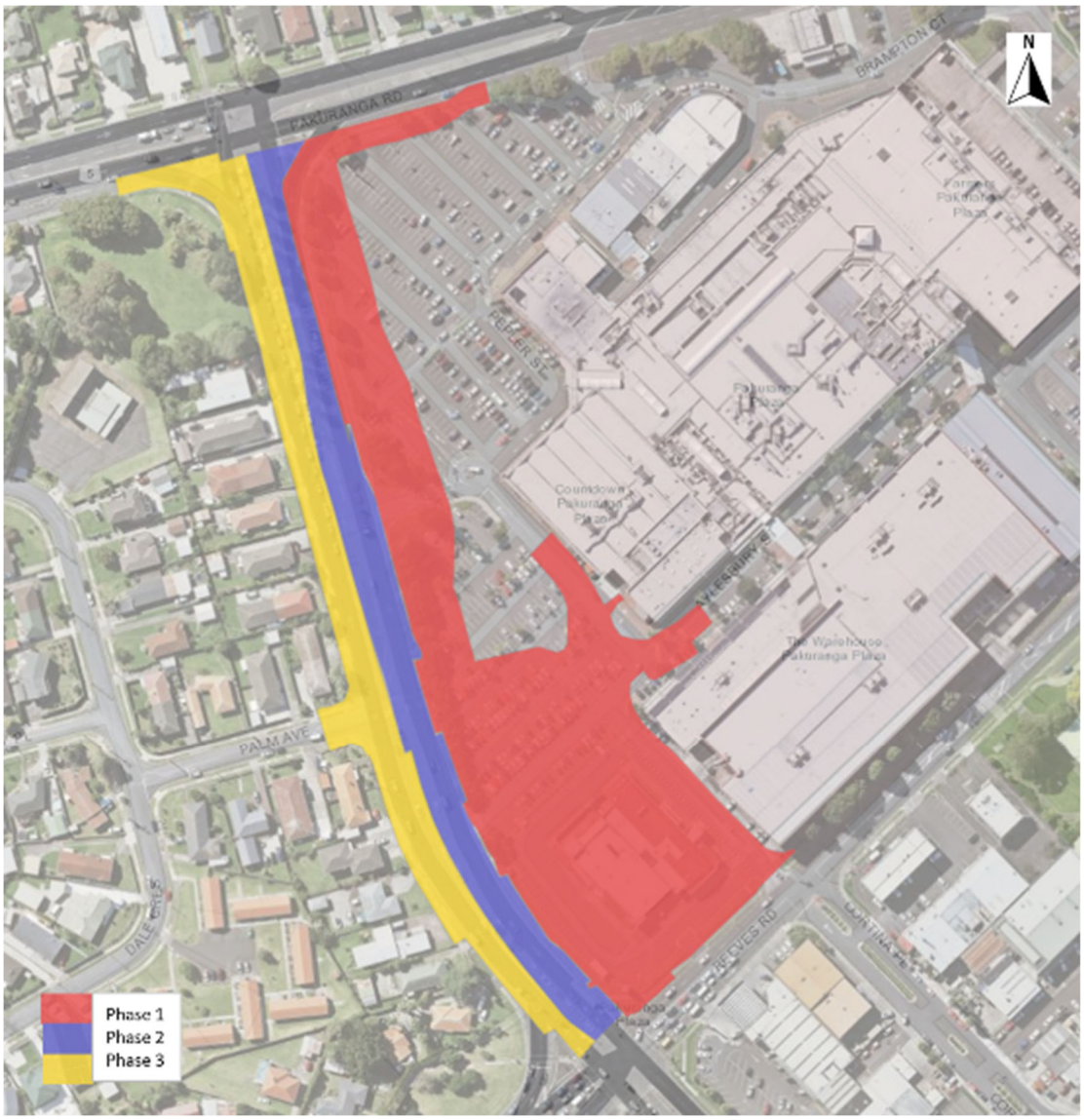

Figure 37: Indicative work zones – Ti Rakau Dr from Pakuranga Rd to Reeves Rd

Ti Rakau Drive / Reeves Road Intersection:

The Ti Rakau Drive / Reeves Road intersection will provide for the transition of offline bus lanes from the west to online or central running bus lanes to the east. The northern Reeves Road approach to the intersection will serve bus movements only up to Cortina Place, and will connect to the bus lanes to the west of the intersection. The western approach will provide two full length through lanes and one short right-turn lane. The eastern approach will provide one short left turn lane, one full length left-turn lane and two full length through lanes.

As stated in **Section 4.2.1.4**, the SEART off-ramp will consist of one left-turn lane and three right-turn lanes. The intersection will also provide for the transition of the bidirectional cycleway to unidirectional cycleways on both sides of Ti Rakau Drive to the east of the intersection. Again, a raised table will be provided across the northern approach, a signalised shared pedestrian and cyclist crossing on the eastern approach and signalised pedestrian crossings on the remaining approaches. **Figure 38** below shows the proposed layout of the Ti Rakau Drive / Reeves Road intersection underneath the RRF.

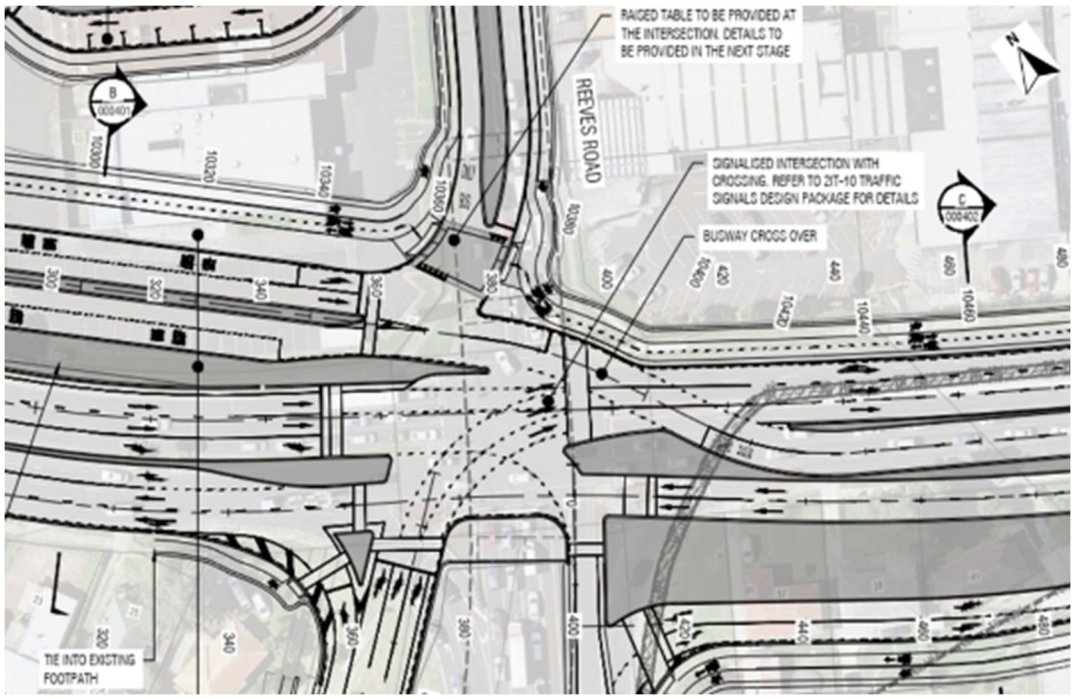

Figure 38: Ti Rakau Dr / Reeves Rd intersection

The construction of the Ti Rakau Drive / Reeves Road intersection will occur after Reeves Road and the RRF have been constructed. The intersection will be built in two sub-phases with Ti Rakau Drive being reduced to one lane each way for a short period (approximately one month). However, the works are also planned to occur during a 'low traffic period' (December to January) to mitigate the effects of the disruption.

Figure 39 shows the indicative work zone of the Ti Rakau Drive / Reeves Road intersection.

Figure 39: Indicative work zone – Ti Rakau Dr / Reeves Rd intersection

4.2.1.6 Pakuranga Road

Pakuranga Road between Ti Rakau Drive and the RRF will consist of four lanes (two lanes per direction) with unidirectional cycleways on each side. The eastern approach of Pakuranga Road at the intersection with Ti Rakau Drive will consist of a short left-turn lane and two full length through lanes. As stated in **Section 4.2.1.3**, the western Pakuranga Road approach at the intersection with the RRF will consist of two full length left-turn lanes and one short right-turn lane.

The works associated with Pakuranga Road will involve converting the existing kerbside lanes to cycleways while retaining the existing footpaths along both sides. The existing signalised midblock pedestrian crossing on Pakuranga Road, constructed as part of EB1, will remain. **Figure 40** below shows the proposed layout of Pakuranga Road from Ti Rakau Drive to the RRF tie-in.

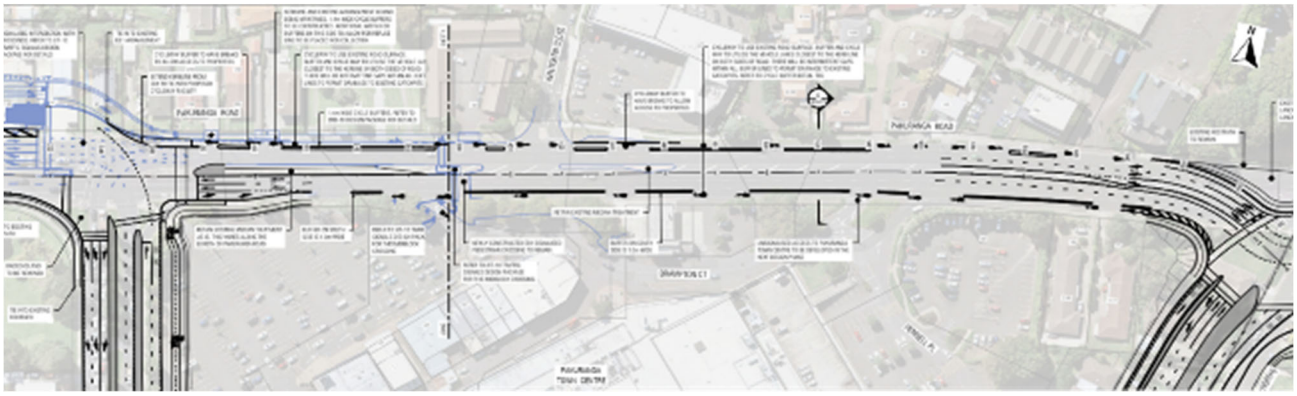

Figure 40: Pakuranga Rd from Ti Rakau Dr to the RRF

The initial stages of the Pakuranga Road construction will also include longitudinal and crossing drainage works. **Figure 41** shows the indicative work zone for Pakuranga Road. Construction works along Pakuranga Road are anticipated to have a duration of approximately six months.

Figure 41: Indicative work zone – Pakuranga Rd

4.2.2 EB3R – Design and Construction Works

The general extent of the EB3R project area encompasses the following roads (see **Figure 42**, yellow):

- Ti Rakau Drive from Reeves Road to the western Ti Rakau Bridge abutment
- Short sections of Tiraumea Drive, Mattson Road, Roseburn Place, Edgewater Drive west, Wheatley Avenue, Edgewater Drive east, Gossamer Drive and Freemantle Place

Figure 42: EB3R general extent (yellow)

Ti Rakau Drive in the EB3R section of the Project will largely consist of two lanes per direction, similar to the existing environment. Online bus lanes will be provided along the entire length of the corridor from Reeves Road to Gossamer Drive. For the purposes of this ITA the online bus lanes will terminate at the western approach of the Ti Rakau Drive / Gossamer Drive intersection. An intermediate bus station will be provided in the centre of the carriageway between Roseburn Place and Wheatley Avenue, and another intermediate bus station near the intersection with Gossamer Drive. A full set of EB3R layout drawings is provided in **Appendix C**.

4.2.2.1 Ti Rakau Drive – Reeves Road to Mattson Road

This section of Ti Rakau Drive, between Reeves Road and Mattson Road, will consist of three lanes per direction. The westbound carriageway will reduce to two lanes near the intersection with Tiraumea Drive and the eastbound carriageway will reduce to two lanes near the Mattson Road intersection. Bus lanes will also be provided along the centre of the carriageway.

The Tiraumea Drive intersection will remain left-in left-out only, however, vehicles exiting from Tiraumea Drive will not be able to continue along Ti Rakau Drive. Instead, a diverge will be provided east of the intersection with the kerbside lanes heading towards SEART. Vehicles intending to head east or west along Ti Rakau Drive will do so from Mattson Road.

The intersections with William Roberts Road and Mattson Road will be arranged in a staggered-T formation. Both the William Roberts Road and Mattson Road approaches will consist of two lanes, a short left-turn lane and a full length right-turn lane. Both Ti Rakau Drive approaches to these intersections will consist of one full length shared through and left-turn lane and two full length through lanes. Each of the midblock approaches will consist of three full length through lanes and one short right-turn lane.

Unidirectional cycleways will be provided on each side of Ti Rakau Drive from Reeves Road in the west to Gossamer Drive in the east, in the EB3R project area. A signalised shared pedestrian and cyclist crossing will be provided on the northern approach at the Ti Rakau Drive / William Roberts Road intersection and a signalised pedestrian crossing on the western approach. At the Ti Rakau Drive / Mattson Road intersection a signalised shared pedestrian and cyclist crossing will be provided on the southern approach, while a signalised pedestrian crossing will be provided on the eastern approach. A raised table will be provided across Tiraumea drive. **Figure 43** shows the proposed layout of Ti Rakau Drive from Reeves Road to Mattson Road.

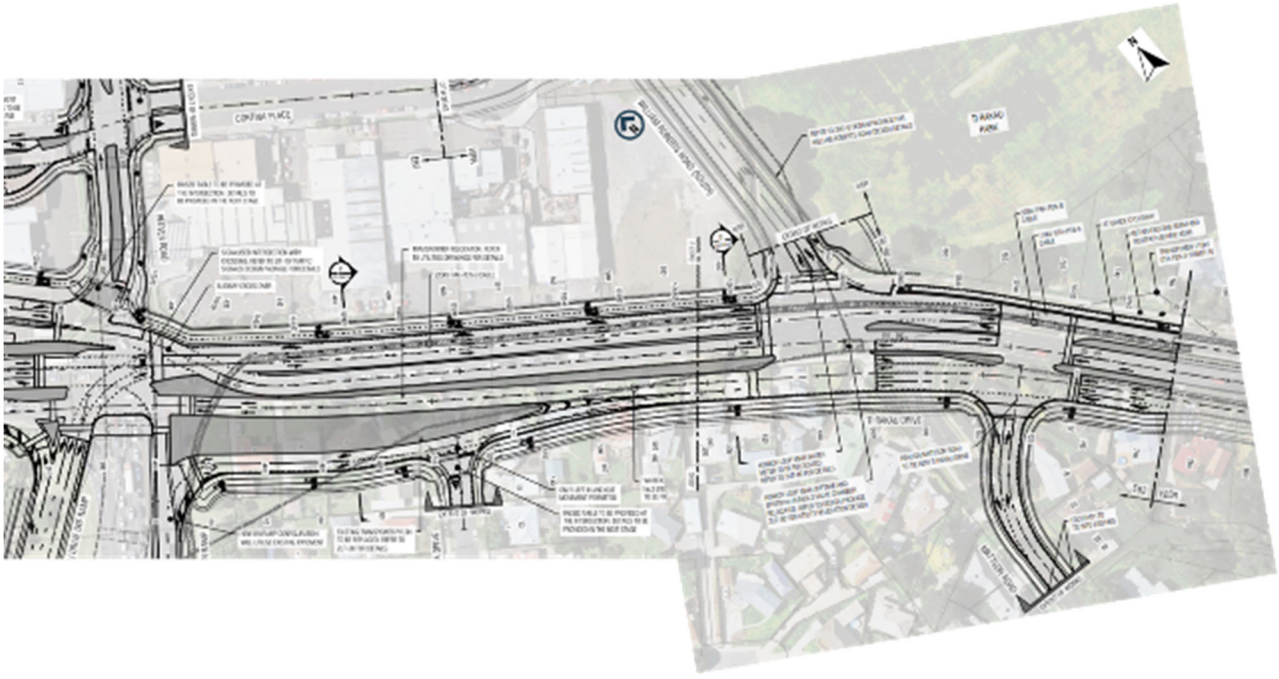

Figure 43: Ti Rakau Dr from Reeves Rd to Mattson Rd

The construction of this section of Ti Rakau Drive will be divided into six sub-phases and will for the majority of its duration occur during the Reeves Road closure. The first two phases will largely consist of

offline works to construct the new westbound lanes on the acquired properties on the southern side of the carriageway. In addition, Phase 1 will include the construction of the Mattson Road intersection and Phase 2 will include the construction of the Tiraumea Drive intersection.

The next two phases will consist of works in the centre of the carriageway to construct the new bus lanes. Phase 3 and Phase 4 will include works to the west and east of Mattson Road, respectively. Phase 4 is predicted to be the 'worst-case' of this construction activity with regards to potential lane closures and traffic disruption.

Phase 5 will include further works in the centre of the carriageway to the west of William Roberts Road as well as works in the existing eastbound lanes to the east of William Roberts Road. Finally, Phase 6 will include works in the existing eastbound lanes to the west of William Roberts Road.

Figure 44 shows the indicative works zones for Ti Rakau Drive from Reeves Road to Mattson Road. Construction of this section of Ti Rakau Drive is anticipated to have a duration of approximately one and a half years.

Figure 44: Indicative work zones – Ti Rakau Dr from Reeves Rd to Mattson Rd

4.2.2.2 Ti Rakau Drive – Mattson Road to Gossamer Drive

The intersections with Roseburn Place, Marriott Road, Edgewater Drive west and Chevis Place, Wheatley Avenue and Edgewater Drive east which currently provide for all movements in/out of the side roads, will be converted to LILO intersections. Two U-turn facilities will be provided along Ti Rakau Drive, one between Roseburn Place and Marriott Road for the westbound traffic and one between Edgewater Drive west and Wheatley Avenue for the eastbound traffic (see **Figure 45**).

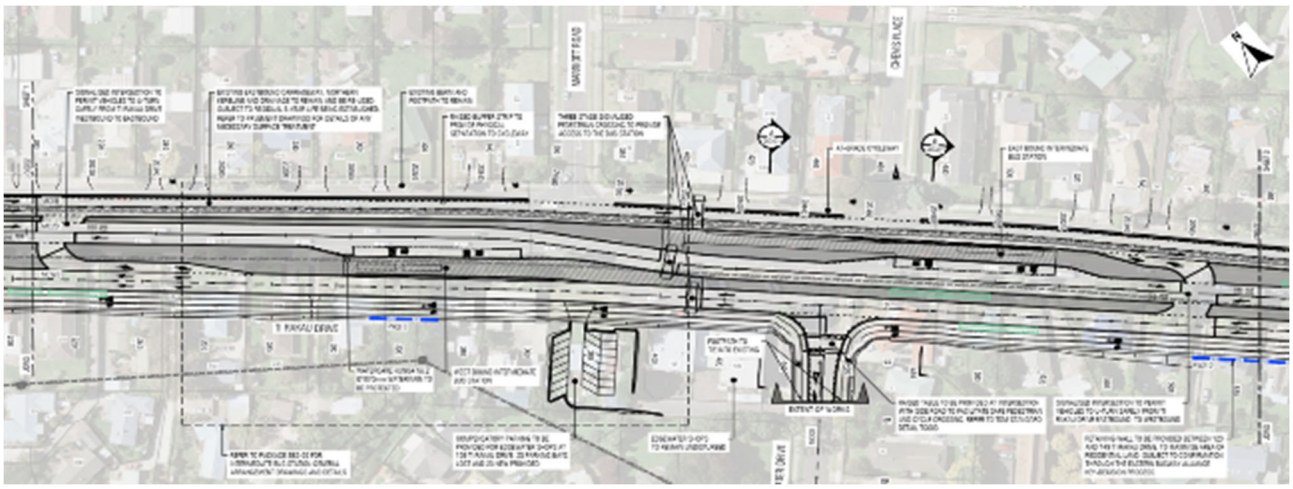

Figure 45: Ti Rakau Dr between Roseburn Pl and Wheatley Ave

Additionally, a U-turn manoeuvre will also be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. This is to provide access from Ti Rakau Drive eastbound into Edgewater Drive east, Wheatley Avenue and the properties on the southern side of Ti Rakau Drive between Edgewater Drive east and Freemantle Place.

A three-stage signalised pedestrian crossing will be provided, between Marriot Road and Edgewater Drive, to facilitate pedestrian access to the bus station from both sides of Ti Rakau Drive. Raised tables will be provided across Roseburn Place, Edgewater Drive west, Wheatley Avenue and Edgewater Drive east.

Figure 46 below shows the proposed layout of the Ti Rakau Drive / Gossamer Drive intersection. The western approach will consist of a short left-turn lane, two full length through lanes and one shared right-turn and U-turn short lane. The eastern approach will consist of one full length shared through and left-turn lane, one full length through lane, one short bus queue-jump lane and two short right-turn lanes.

The eastbound bus lane will transition to the northern side of Ti Rakau Drive to the proposed bus stop, and taper back into Ti Rakau Drive before the Ti Rakau Bridge. The southern Freemantle Place approach will consist of a short left-turn lane and a full length shared through and right-turn lane. The northern Gossamer Drive approach will consist of one short and one full length left-turn lane, and a shared through and right-turn short lane.

A signalised shared pedestrian and cyclist crossing will be provided on the western approach at the Ti Rakau Drive / Gossamer Drive intersection, with signalised pedestrian crossings on all other approaches.

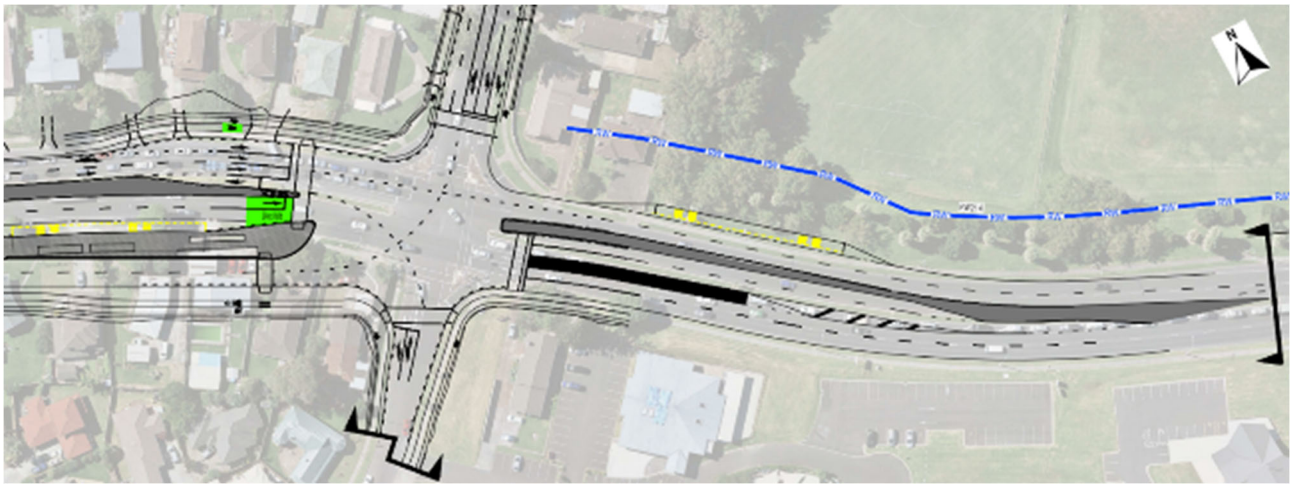

Figure 46: Ti Rakau Dr at Gossamer Dr

Throughout the construction of EB3R, the preferred methodology is to complete works offline to allow space to be provided for future lateral shifts of running lanes. The EB3R construction works between Mattson Road and Gossamer Drive are anticipated to occur over a period of approximately three years, and will be split into three main phases.

4.2.2.3 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 1)

Phase 1 will involve constructing the new westbound lanes offline in the acquired properties along the southern side of Ti Rakau Drive and rebuilding pavement at intersections where the new busway intersects. This phase will be divided into six sub-phases, a summary of which is provided in **Table 16**.

Table 16: EB3R Phase 1 construction summary

Sub-Phase	Summary of Activities
1a-b	Construction of Roseburn Place in two sub-phases.
1c	Edgewater Drive west in one sub-phase.
1d-e	Wheatley Avenue in two sub-phases.
1f	Edgewater Drive east in one sub-phase.

The new westbound carriageway will consist of two lanes, similar to the existing environment. Establishing works will also be able to commence on the north-east quadrant of the Ti Rakau Drive / Gossamer Drive intersection to enable construction of the eastbound Gossamer Drive bus station to commence at any time.

Figure 47 below shows the indicative work zones for Phase 1 of EB3R, and is anticipated to have a duration of approximately one year and three months.

Figure 47: Indicative work zones – EB3R Phase 1

The pavement type specified for design requires closures of specific roadway sections for periods of at least one week before being opened to general traffic. These roadway sections have been divided into two categories with varying Temporary Traffic Management (TTM) approaches.

Category 1 (Detour Loops) – Edgewater Drive west and east:

The preferred approach to construct pavement through these intersections is to close one intersection at a time. As Edgewater Drive is a loop with two accesses to Ti Rakau Drive, traffic will be detoured to one end of the loop enabling the other end to be closed and rebuilt. The full closures are anticipated to reduce the overall time TTM will be required.

As above, Phase 1c will consist of the construction of the Edgewater Drive west intersection. All traffic along Edgewater Drive will be diverted to the Ti Rakau Drive / Edgewater Drive east intersection. A temporary traffic signal will be provided at this intersection to aid vehicles turning right into and out of Edgewater Drive. Phase 1f will include the construction of the Edgewater Drive east intersection, and all traffic along this side road will be diverted to the existing traffic signal at Edgewater Drive west.

Category 2 (Cul-de-sac Roads) – Wheatley Avenue and Roseburn Place:

Two cul-de-sac roads are located along Ti Rakau Drive that enable residential property access. To maintain access through Wheatley Avenue and Roseburn Place intersections, the approaches will be constructed in halves with temporary traffic signals installed and set back from the works, creating a one-way system on the side roads. As above, these intersections will be constructed during sub-phases 1a-b and 1d-e, respectively.

To minimise disruption to the main road, vehicles entering the cul-de-sac will have right-of-way. Green phases for vehicles leaving the cul-de-sac roads will only be triggered on the basis of demand. Traffic volumes on the side roads are predicted to be low during both peak periods (see **Table 17**).

Table 17: Ti Rakau Dr side road traffic volumes (2028)[20]

Side Road	Movement Out	AM Peak	PM Peak
Roseburn Pl	Left	20	7
	Right	10	8
	Total	**30**	**15**
Wheatley Ave	Left	31	22
	Right	0	0
	Total	**31**	**22**

Approximately one vehicle every two minutes would require access onto Ti Rakau Drive from Roseburn Place and Wheatley Avenue during the peak periods. Improved performance is expected on the side roads as the temporary traffic signal control would improve the delay currently being experienced at the priority-controlled intersections.

4.2.2.4 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 2)

Phase 2 will consist of the construction of the bus lanes in the centre of Ti Rakau Drive and will be divided into two sub-phases. The new bus lanes will tie into the EB2 bus lanes to the west and will terminate at Gossamer Drive to the east. The new Edgewater Drive bus station, the new westbound Gossamer Drive bus station and new U-turn facilities will also be constructed during this phase.

Figure 48 below shows the indicative work zone for Phase 2 of EB3R (dark grey), and is expected to have a duration of approximately 11 months.

[20] Traffic volumes sourced from the WRRE AIMSUN model, with a 2028 horizon year.

Figure 48: Indicative work zone – EB3R Phase 2

Phase 2a:

During Phase 2a multiple right-turns across the workspace will require temporary removal, resulting in the intersections supporting LILO movements only. This will occur at Roseburn Place, Marriott Road, Wheatley Avenue and Edgewater Drive east.

The intersection at Edgewater Drive west and Chevis Place will remain open during Phase 2a. This intersection will also provide access into Roseburn Place to traffic travelling eastbound along Ti Rakau Drive via a new temporary U-turn movement on the western approach. Similarly, a new temporary U-turn movement will also be provided on the eastern approach for traffic exiting from Wheatley Avenue and Edgewater Drive east intending to head east on Ti Rakau Drive.

Access into Wheatley Avenue and Edgewater Drive east, while travelling eastbound on Ti Rakau Drive, will also be provided via a U-turn movement on the western approach at the Ti Rakau Drive / Gossamer Drive intersection. During Phase 2a this movement will be made permanent. Access to Marriott Road from Ti Rakau Drive westbound will be maintained via a detour route along Gossamer Drive and Riverhills Avenue.

Phase 2a will also include the construction of the permanent U-turn facilities on Ti Rakau Drive near Roseburn Place and Wheatley Avenue, as well as the bus station near Edgewater Drive (see **Figure 45** above) and the westbound bus station at Gossamer Drive (see **Figure 46** above).

Phase 2b:

During Phase 2b the Edgewater Drive west / Chevis Place intersection will be converted to a LILO intersection to enable construction of that part of the carriageway. The new permanent U-turn facilities will provide access to all side roads from both directions of travel along Ti Rakau Drive except to Wheatley Avenue and Edgewater Drive east. Access to these two side roads will be maintained via the U-turn movement at the Ti Rakau Drive / Gossamer Drive intersection.

4.2.2.5 Ti Rakau Drive – Mattson Road to Gossamer Drive (Phase 3)

Phase 3 will consist of works in the existing eastbound lanes and will have some temporal overlap with Phase 2 as some sections are completed. This is due to Phase 3 works being completed under night works with discrete closures.

There is a large number of properties with driveways on the northern side of Ti Rakau Drive, meaning long term access will be required to allow vehicles to traverse through the site. As the pavement only requires resurfacing and not major reconstruction, this work will be completed in sections, with the road being trafficable during the daytime.

Figure 49 shows the indicative work zones for Phase 3 of EB3R, and is anticipated to have a duration of approximately six months.

Figure 49: Indicative work zones – EB3R Phase 3

Phase 3 construction will also consist of works at the Ti Rakau Drive / Gossamer Drive intersection and will be divided into three sub-phases.

Phase 3a:

Phase 3a will include the construction of the western, northern and eastern approaches of the Ti Rakau Drive / Gossamer Drive intersection. The preferred construction method, without altering the pavement type or compromising on pavement quality, is a 'Blitz' approach. This approach will consist of closing access to Gossamer Drive, to enable the majority of the difficult to access areas to be completed.

Furthermore, Ti Rakau Drive will be reduced to one lane each way through the intersection. However, this approach has large programming risks and the effects to the traffic environment are dependent on the quality of communication with the public leading up to the closure. The works are also planned to occur during a 'low traffic period' (December to January) to mitigate the effects of the disruption.

For the purposes of this ITA, the construction of the Ti Rakau Drive / Gossamer Drive intersection was modelled as occurring simultaneously with the construction of the Ti Rakau Drive / Reeves Road intersection. These works will follow after the completion of Reeves Road and the RRF.

The southern Freemantle Place approach will be constructed under Phases 3b-c.

Phase 3b-c:

The southern Freemantle Place approach will be built in two sub-phases utilizing the 'Category 2 (Cul-de-sac Roads)' approach specified in Phase 1, see **Section 4.2.2.3**. Traffic volumes on the side road are predicted to be low during both peak periods (see **Table 18**).

Table 18: Freemantle Pl traffic volumes (2028)[21]

Side Road	Movement Out	AM Peak	PM Peak
Freemantle Pl	Left	23	12
	Through	9	2
	Right	18	18
	Total	**50**	**32**

Roughly one vehicle every minute would require access from Freemantle Place onto Ti Rakau Drive during the peak hours.

[21] Traffic volumes sourced from the WRRE AIMSUN model, with a 2028 horizon year.

5 Assessment of Temporary Effects during Construction

The sections below provide an assessment of the temporary effects during construction of EB2 and EB3R including:

- Construction effects
- General traffic effects
- Effects to bus services and facilities
- Effects to pedestrians and cyclists
- Effects to property access and parking
- Effects to safety performance

5.1 Construction Effects

5.1.1 Construction Support Areas and Site Access Points

Construction Support Areas (CSAs) and Site Access Points (SAPs) are anticipated to vary throughout the construction phases, shifting as sections of the roadway are completed. The sections below provide an overview of the effects of notable CSAs and SAPs within the EB2 and EB3R project areas.

5.1.1.1 EB2 – 2 Cortina Place and 5 Reeves Road Site Offices

The properties at 2 Cortina Place and 5 Reeves Road have been acquired by AT and will serve as site offices for the EB2 project area. Therefore, the current use of these properties will no longer exist in the future. It is envisaged that Site Office 1 at 5 Reeves Road will accommodate approximately 120 workstations and Site Office 2 at 2 Cortina Place will accommodate approximately 30 workstations at the peak of construction. Office hours for the site offices will be from 07:00 to 19:00. **Figure 50** shows the location of Site Office 1 and 2 in the EB2 project area.

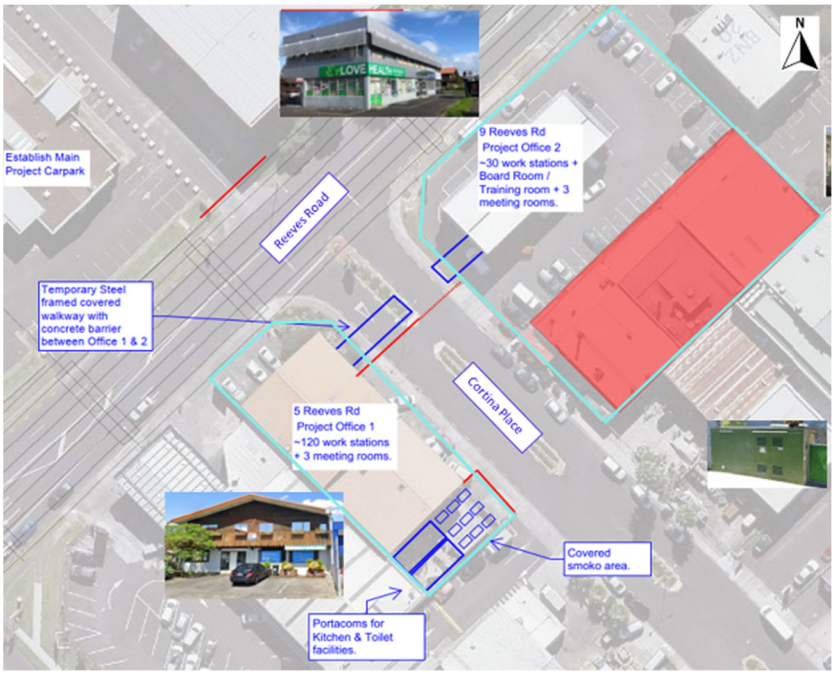

Figure 50: Site Office 1 and 2 locations

During the closure of Reeves Road, vehicle access to Site Office 1 from Reeves Road will not be maintained, although the property will still be accessible via Cortina Place. Pedestrian access to the property will be maintained at all times. Approximately 11 off-street parking spaces will be maintained on the eastern side of the property for visitors and deliveries.

The closure of Reeves Road will result in the loss of the access to Site Office 2 from the western frontage, however the property will still be accessible from Cortina Place. Pedestrian access to the property will be maintained at all times. The building in the centre of the property will be used as site office space, while the building along the eastern frontage of the property (red outline) will be demolished. Approximately five off-street parking spaces will be maintained on site and accessed from Cortina Place for material deliveries.

It is envisaged that, at least for the initial year of construction, site office staff will use public transport for commuter trips and will access the site offices on foot. Workforce Travel Management Plans will be developed to achieve this. The aim of the Workforce Travel Management Plans will be to reduce the number of private vehicles travelling to the worksites and to increase the accessibility of the worksites through more travel options. Therefore, the temporary traffic effects from the site offices in the first year are expected to be very low. Following the initial year and as construction activities ramp up, a staff carpark will be provided at 26 Ti Rakau Drive.

5.1.1.2 EB2 – 26 Ti Rakau Drive Staff Carpark

It is envisaged that the property at 26 Ti Rakau Drive will be acquired by AT and will serve partially as a site office staff parking area and partially as a work zone for the new Pakuranga Town Centre bus station during construction. The existing building and parking area on the property are not in use and therefore the Project will have no effects on the property from a transport perspective.

Once the existing infrastructure has been demolished and the work zone has been established, a temporary staff carpark will be established until the construction of the Kiss-and-Ride facility. For the purposes of this ITA it was assumed the staff carpark will provide 150 parking spaces, one parking space per workstation in Site Office 1 and 2. The property currently has no direct access from Ti Rakau Drive, and is accessed via Reeves Road and the internal road network inside the Pakuranga Plaza.

Figure 51 below shows the location of the CSA to be located at 26 Ti Rakau Drive.

Figure 51: 26 Ti Rakau Dr CSA location

In the existing environment, the Pakuranga Plaza has six access points allowing for both in and out movements, with a seventh at Pepler Street allowing for movements out onto Pakuranga Road only. Throughout the construction programme of EB2, the accesses to Pakuranga Plaza will undergo several changes, some of which will be closed temporarily. Further details of effects to property access at the Pakuranga Plaza are provided in **Section 5.5.5.3**.

For the purposes of assessing the effects of the staff carpark, the 'worst-case' has been considered here, which will be during the Reeves Road closure. During this closure, access to this carpark will be gained via the three remaining accesses at Aylesbury Street north and south and at Brampton Court. It should be noted that the Pepler Street exit will also be open during this time.

As stated in **Section 5.1.1.1**, office hours for the site offices will be from 07:00 to 19:00, meaning a large proportion of site office staff is expected to travel on the road network outside of the AM and PM peaks. For the purpose of this ITA, assumptions were made to consider the staff carpark fully utilised and 50% of staff would be arriving/departing during the AM and PM peak hours, respectively.

Therefore, 150 parked vehicles, which would translate to 75 veh/h added to the traffic network and these vehicles would be accessing the Pakuranga Plaza from three access points during the peak hours. **Figure 52** below shows the background traffic volumes for both the AM and PM peak hours at these access points (PM traffic volumes in brackets).

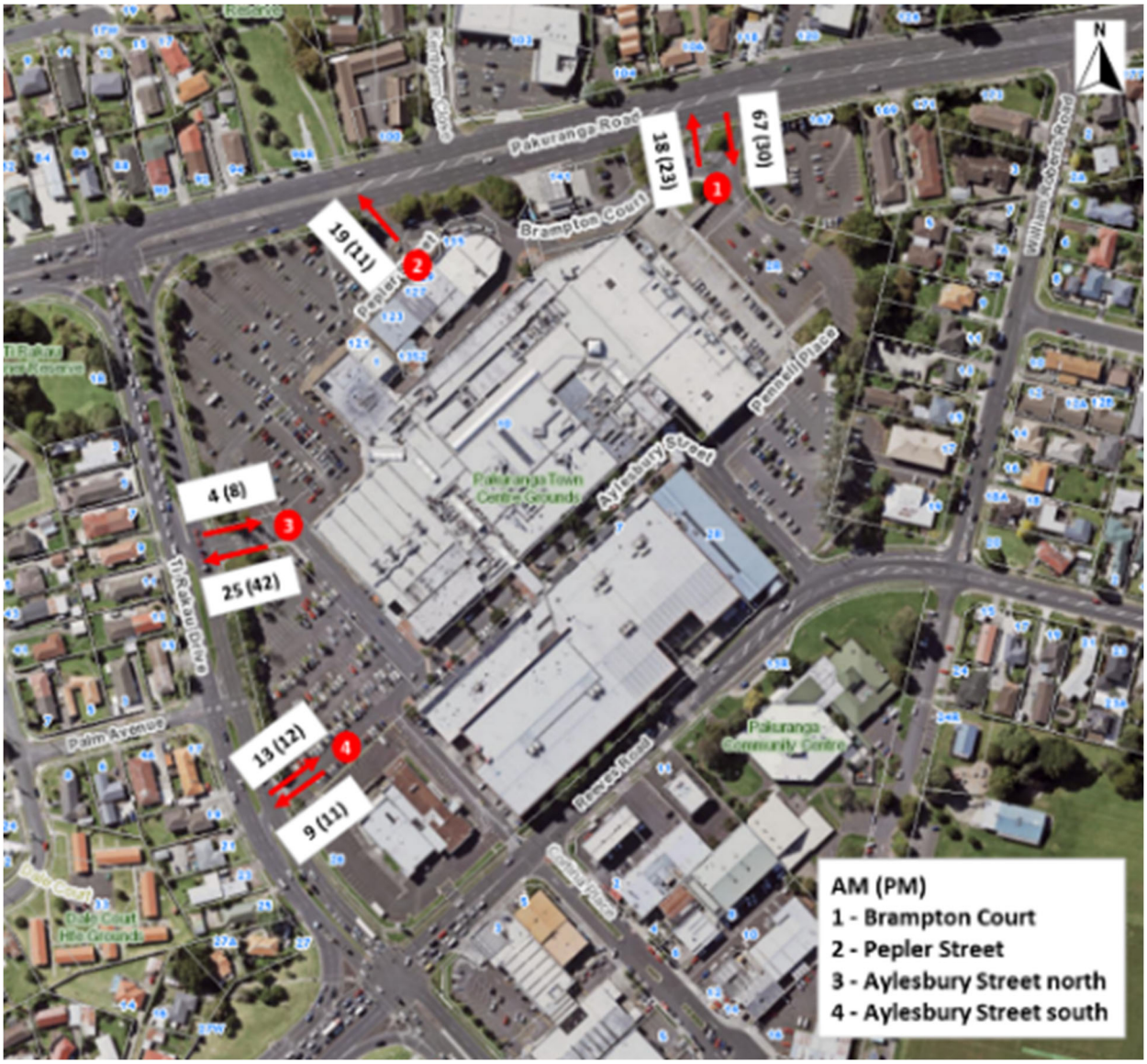

Figure 52: Pakuranga Plaza background traffic volumes[22]

The background traffic volumes on these access points are expected to be low during both the AM and PM peak hours. Furthermore, it would not be unreasonable to assume that the additional 75 veh/h would be distributed roughly evenly across these access points or to where the highest capacity is available. Therefore, the temporary effects of the staff carpark are expected to be very low.

[22] Traffic volumes sourced from the Do-Minimum AIMSUN model, with a 2028 horizon year.

5.1.1.3 EB2 – 2R Ti Rakau Drive Pennell Place CSA

During construction, the parking area off Pennell Place in the Pakuranga Plaza will be temporarily occupied and established as a CSA. **Figure 53** shows the location of the CSA.

Figure 53: Pennell Pl CSA location

The CSA will be used to support the construction of the RRF. In particular, it will be used to receive and pre-assemble the special Gantry (bespoke crane) to be used to lift and position the 'Super-T' beams. The CSA will also provide parking on site for specialist personnel and deliveries. The Pennell Place parking area will be occupied for approximately two years and two months.

Given the nature and operation of the CSA, general vehicle traffic volumes entering/exiting from the site are considered negligible. The operation and movement of the Gantry will be under strict construction traffic management control. Advance notice and appropriate public communication of such infrequent activities will be undertaken prior to these being initiated. This will be achieved through the Construction Traffic Management Plan (CTMP).

Therefore, the effects of the CSA on the transport network are expected to be very low. Effects to property access and parking at the Pakuranga Plaza due to the occupation are discussed in further detail in **Section 5.5.5.3**.

5.1.1.4 EB2 – William Roberts Road North Construction Yard

A CSA will be located on the south-western quadrant of the Pakuranga Road / William Roberts Road intersection and will serve as a laydown area of materials and aggregates. This construction yard is subject to a separate resource consent application[23], but is mentioned here for completeness.

It is proposed that the Pakuranga Road / William Roberts Road intersection will be signalised temporarily. This will improve the capacity of the right-turn movements into and out of William Roberts Road and improve safety of turning across three lanes of through traffic. Further details on intersection performance are provided in **Section 5.2.2.5**.

5.1.1.5 EB2 – 14 Seven Oaks Drive Site Office / Laydown Area

A site office / laydown area will be established at 14 Seven Oaks Drive for the construction of EB2. The property has been acquired by AT. As such, the current residential use of this property will no longer exist during construction or at completion, therefore the CSA will have no effects on this property.

Figure 54 shows the location of the CSA to be located at 14 Seven Oaks Drive.

Figure 54: 14 Seven Oaks Dr CSA location

Access will be maintained off Seven Oaks Drive, utilizing the existing driveway. The existing house will be utilised as the office until de-construction of the structure is required. The site will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of this contained site on the road network are expected to be negligible.

[23] LUCXXXX

5.1.1.6 EB3R – 12 Bolina Cr, 143 Ti Rakau Dr and 178 Gossamer Dr Site Offices / Laydown Areas

Site offices / laydown areas will be established at 12 Bolina Crescent, 143 Ti Rakau Drive and 178 Gossamer Drive for the construction of EB3R. The properties have been acquired by AT. As such, the use of these properties will no longer exist during construction or at completion, therefore the CSAs will have no effects on these properties.

Figure 55 shows the location of the CSA to be located at 12 Bolina Crescent.

Figure 55: 12 Bolina Cr CSA location

Figure 56 shows the location of the CSA to be located at 143 Ti Rakau Drive.

Figure 56: 143 Ti Rakau Dr CSA location

Figure 57 shows the location of the CSA to be located at 178 Gossamer Drive.

Figure 57: 178 Gossamer Dr CSA location

Access will be maintained off Bolina Crescent, Ti Rakau Drive and Gossamer Drive, utilizing the existing driveways. The existing houses will be utilised as offices until de-construction of the structures is required. The sites will be relatively small, and all parking requirements will be accommodated on site. The temporary effects of these contained sites on the road network are expected to be negligible.

5.1.2 Construction Vehicle Effects

The sections below provide details on the construction routes, construction traffic volumes, hours of operation and vehicle types. Thereafter, an assessment of construction vehicle effects is provided, split into sections of the EB2 and EB3R project areas.

5.1.2.1 Construction Routes and Construction Traffic

The construction routes in and around the EB2 and EB3R project areas are shown in **Figure 58.** At the time of writing, suppliers of construction materials had not been confirmed. Therefore, the most likely routes for construction vehicle movements to the project area from plant and material sites not in the immediate vicinity will be the main corridors of Ti Rakau Drive, Pakuranga Road and SEART (main external routes below). The figure also shows the construction yard at 169-173 Pakuranga Road and the 'internal material transfer routes' to be used by construction vehicles.

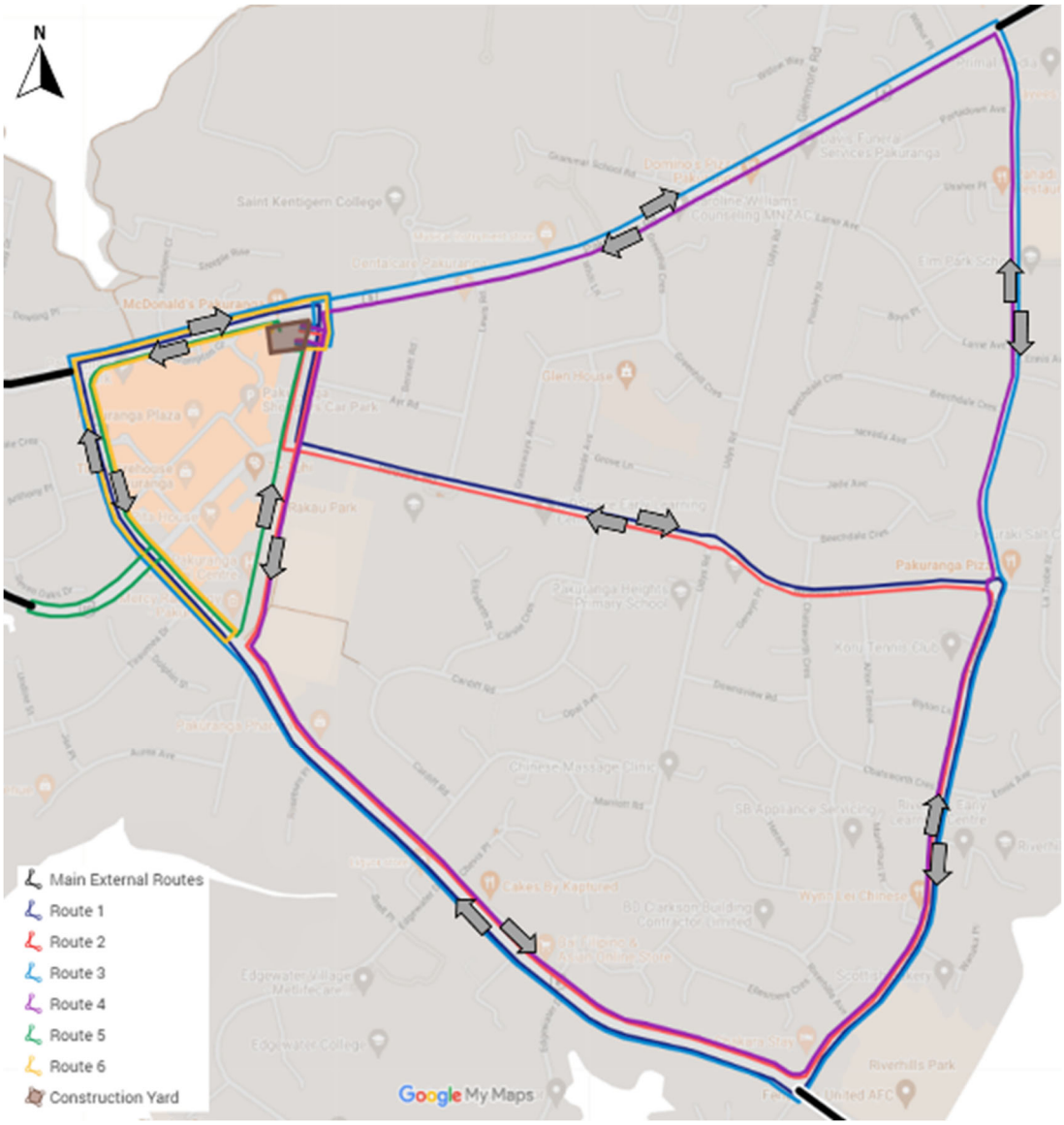

Figure 58: Construction vehicle routes

During EB2 and EB3R construction, roughly 50% of materials will be transported directly to the work zones from external supply yards as needed. The remaining 50% will be transported to the construction yard for storage until required. Construction material will be transported from the construction yard to the various work zones via six routes. **Table 19** below provides a description of each route as well as the anticipated number of vehicle movements. The number of vehicle movements also include the carting of demolition materials and excess spoil.

Table 19: Construction route description and movements

Route	Construction Activity	Description	Vehicle Movements [veh/h]
Route 1	EB3R Ti Rakau Dr westbound lanes (primary route)	Egress from the construction yard onto William Roberts Rd southbound, then Reeves Rd eastbound, Gossamer Dr southbound, Ti Rakau Drive westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	9
Route 2	EB3R Ti Rakau Dr eastbound lanes (primary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Drive northbound, Reeves Rd westbound, William Roberts Road northbound, return to construction yard.	10
Route 3	EB3R Ti Rakau Dr westbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd northbound, then Pakuranga Rd eastbound, Gossamer Dr southbound, Ti Rakau Dr westbound, Pakuranga Rd eastbound, William Roberts Rd southbound, return to construction yard.	8
Route 4	EB3R Ti Rakau Dr eastbound lanes (secondary route)	Egress from construction yard onto William Roberts Rd southbound, then Ti Rakau Dr eastbound, Gossamer Dr northbound, Pakuranga Rd westbound, William Roberts Road southbound, return to construction yard.	9
Route 5	EB2 SEART	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, SEART southbound, U-turn within work zone, SEART northbound, Ti Rakau Dr eastbound, William Roberts Rd northbound, return to construction yard.	10
Route 6	EB2 Ti Rakau Dr	Egress from construction yard onto Pakuranga Rd westbound, then Ti Rakau Dr eastbound, U-turn within work zone, Ti Rakau Drive westbound, Pakuranga Road eastbound, William Roberts Rd southbound, return to construction yard.	8

Route 1 will be the primary route for the construction of the Ti Rakau Drive westbound lanes with Route 3 as a secondary route in case of congestion or emergencies on Reeves Road. Similarly, Route 2 will be the primary route during the construction of the Ti Rakau Drive eastbound lanes, with Route 4 as a secondary route.

It should be noted that Route 1 and Route 3 will not be operating simultaneously with Route 2 and Route 4. This is due to the construction staging of Ti Rakau Drive in the EB3R project area. The new westbound lanes will be constructed first followed by the bus lanes in the centre and lastly the eastbound lanes.

5.1.2.2 Vehicle Types

It is anticipated that a range of vehicle sizes and types will be used for the construction activities within the EB2 and EB3R project areas. As stated above, roughly 50% of materials will be transported directly to the work zones as needed along the main external routes of Ti Rakau Drive, Pakuranga Road and SEART. The remaining 50% will be transported to the construction yard for storage until required. It is anticipated that 19m truck and trailers will be used for these activities. Materials from the construction yard will be transported to the various work zones via the six internal routes with smaller vehicles units such as 6-wheeler trucks.

Over-dimensional and over-weight deliveries are also expected; however, these will be infrequent, during low traffic periods such as night deliveries and will travel along appropriate routes such as arterial roads. The Ti Rakau Drive, Pakuranga Road and SEART corridors are well-suited to larger vehicles. Overall, the effects of these types of construction vehicles to the road network are expected to be negligible.

5.1.2.3 Hours of Operation

The vast majority of construction activities will be undertaken during 'typical weekdays' throughout the construction programme, as well as some weekends. Some construction activities will also be undertaken during lower traffic periods such as Easter and December holiday periods.

The general hours of operation for the construction activities and the construction routes will be from 07:00 to 18:00 on weekdays and 07:00 to 15:00 on Saturdays[24]. As such, construction vehicle movements will be balanced throughout the day, avoiding concentrations of construction traffic during the AM and PM peak hours. Therefore, the effects are expected to be very low.

It is anticipated that some night works will be undertaken to minimise the disruption to the public, businesses and traffic. Night works will be intermittent, and will not be continuous in a single location or activity for more than one month. These works will be controlled in part by the Project's consent conditions and management plans[25].

The sections below provide an assessment of construction vehicle effects on specific sections of the road network within the EB2 and EB3R project areas.

[24] It should be noted that staff will begin arriving at site prior to construction start times and leave after construction end times.
[25] These management plans include the Construction Noise and Vibration Management Plan (CNVMP).

5.1.2.4 EB2 – William Roberts Road North

This section provides an assessment of construction vehicle effects on William Roberts Road north, from Pakuranga Road to Reeves Road (see **Figure 59**).

Figure 59: William Roberts Rd north construction vehicle effects

The construction yard will be located on this section of roadway and will support the highest concentration of construction vehicles in the EB2 and EB3R project areas. At the peak of construction, William Roberts Road north is expected to carry an additional 20 veh/h northbound and 19 veh/h southbound. It should be noted that if Reeves Road is experiencing congestion or in case of an emergency, construction vehicles would be rerouted through Pakuranga Road, thereby reducing the construction vehicle traffic volumes on William Roberts Road.

In addition to the properties used by AT for the construction yard, all of the remaining properties on the western side of William Roberts Road north as well as 2 and 2A William Roberts Road on the eastern side have also been acquired and are flagged for demolition. Therefore, the demand for on-street parking along this section of road will be significantly reduced.

Pedestrian refuge islands are currently provided at both ends of William Roberts Road north to provide pedestrians with safe crossing opportunities.

Overall, the addition of the construction vehicles to William Roberts Road north will be roughly one vehicle every three minutes in each direction, on-street parking demand will be significantly reduced, and safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.5 EB2 – William Roberts Road South

This section includes William Roberts Road south, from Reeves Road to Ti Rakau Drive, once the WRRE is completed (see **Figure 60**).

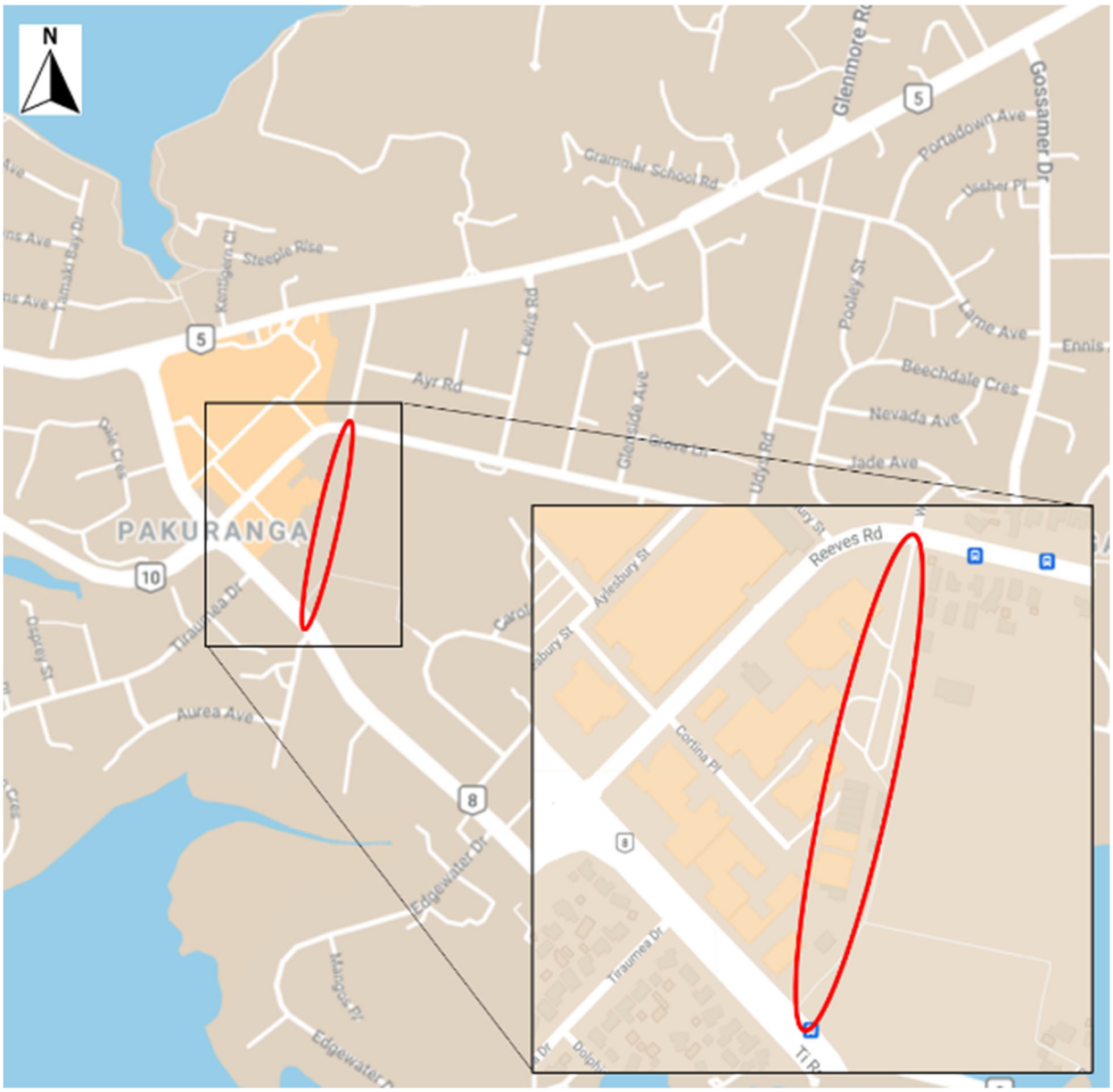

Figure 60: William Roberts Rd south construction vehicle effects

At the peak of construction, William Roberts Road south is expected to carry an additional 10 veh/h northbound and 10 veh/h southbound.

Some properties with vulnerable users such as the Pakuranga Leisure Centre, Barnardo's Early Learning Centre, Ti Rakau Park, and Dementia Auckland are located along this section of road. **Figure 61** below shows the location of these community and educational facilities.

Figure 61: William Roberts Rd south community and education facilities

However, once the William Roberts Road extension is completed, a low-speed environment will be created through a combination of the raised William Roberts Road / Cortina Place intersection, the raised pedestrian crossing near Ti Rakau Park and a 30 km/h posted speed limit. Furthermore, pedestrians will also be provided with safe crossing points at the Ti Rakau Drive / William Roberts Road and the William Roberts Road / Cortina Place intersections.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, William Roberts Road is expected to carry roughly one construction vehicle every six minutes northbound and southbound, and a combination of speed calming features will create a low-speed environment. Therefore, the effects are considered to be very low.

5.1.2.6 EB2 – Reeves Road

This section includes Reeves Road from William Roberts Road in the west to Gossamer Drive in the east (see **Figure 62**).

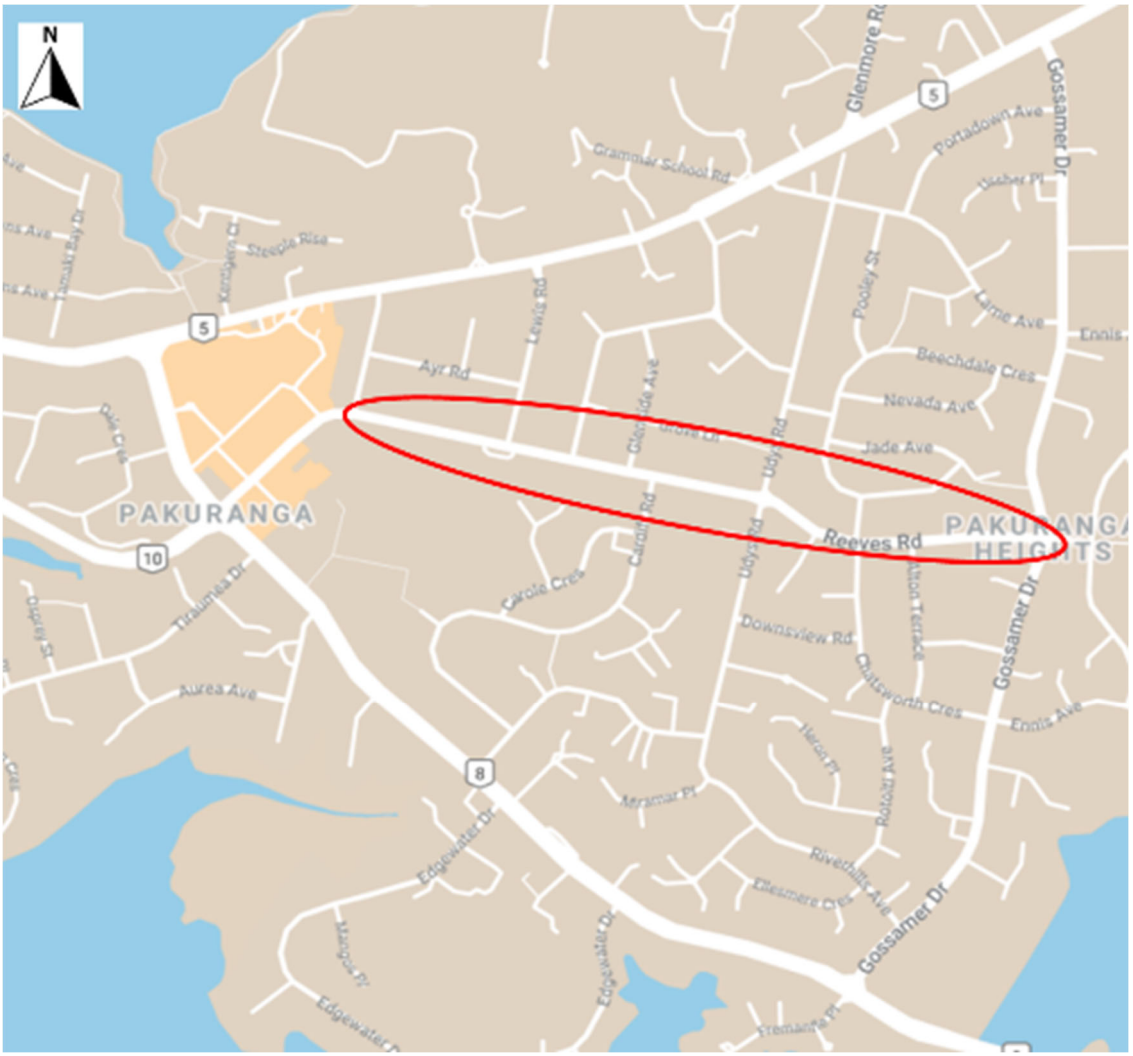

Figure 62: Reeves Rd construction vehicle effects

During construction of the Ti Rakau Drive westbound and eastbound lanes, Reeves Road will support an additional 9 veh/h in the eastbound direction and 10 veh/h in the westbound direction, respectively. It should be noted that these two construction phases will not occur simultaneously.

Reeves Road, in the existing environment, serves as a through route between Pakuranga Town Centre and Pakuranga Heights. As such, the carriageway consists of 4.4 m wide lanes and a 1.8 m flush median along the entire length. It also serves as a bus route for the 711 service.

In the existing environment there are three educational facilities that front Reeves Road, which will experience an increase in heavy vehicle traffic volumes. The Pakuranga Intermediate School, KIDSpace Early Learning Centre Pakuranga, and the Pakuranga Kindergarten are educational facilities with vulnerable users, and all have direct access off Reeves Road in the existing environment. The locations of these facilities are shown in **Figure 63** below.

Figure 63: Reeves Rd education facilities

The users of the facilities are, however, currently provided with ample and safe crossing facilities. Pedestrians are provided with a signalised pedestrian crossing outside the Pakuranga Intermediate School, and a pedestrian crossing near Cardiff Road for users of the KIDSpace Early Learning Centre. An uncontrolled pedestrian crossing is located near Gerwyn Place outside the Pakuranga Kindergarten; however, a pedestrian refuge island is provided here to facilitate a staged crossing if required.

Nevertheless, appropriate community engagement will be undertaken to raise awareness of the increase in construction vehicles that will pass through the area. Construction vehicle drivers will also be briefed on these properties so that additional caution is employed when driving through the area. This will be achieved through the CTMP.

Overall, Reeves Road will carry roughly one construction vehicle every six minutes either in the westbound or eastbound directions at the peak of construction. Furthermore, Reeves Road consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be very low.

5.1.2.7 EB2 – Pakuranga Road

This section includes Pakuranga Road from Ti Rakau Drive in the west to William Roberts Road in the east (see **Figure 64**).

Figure 64: Pakuranga Rd construction vehicle effects

At the peak of construction Pakuranga Road is expected to carry an additional 17 veh/h eastbound and 18 veh/h westbound.

Pakuranga Road is an arterial road, and will for the majority of the construction period consist of three lanes per direction. Multiple bus services run along this road and as such Pakuranga Road is well-suited to larger sized vehicles. Signalised pedestrian crossings are also provided at the Ti Rakau Drive / Pakuranga Road intersection and the Pepler Street exit from Pakuranga Plaza.

Overall, Pakuranga Road will carry roughly one construction vehicle every three minutes eastbound and westbound at the peak of construction. Furthermore, Pakuranga Road is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.8 EB2 – SEART

This section includes SEART from Ti Rakau Drive to the southern abutment of the RRF, see **Figure 65**.

Figure 65: SEART construction vehicle effects

During construction of the RRF southern abutment, construction vehicles will enter onto SEART turning right from the western Ti Rakau Drive approach and will gain access to the work zone from the on-ramp. A 180˚ turn will be executed within the work zone, allowing construction vehicles to exit back onto the SEART off-ramp. Construction vehicles will head back to the construction yard by turning right onto Ti Rakau Drive.

At the peak of construction, the SEART on-ramp and off-ramp are expected to carry an additional 10 veh/h each, which translates to one construction vehicle every six minutes. Therefore, the effects are considered to be negligible.

5.1.2.9 EB2 and EB3R – Ti Rakau Drive

This section includes Ti Rakau Drive between Pakuranga Road to SEART (Section 1) and SEART to Gossamer Drive (Section 2), see **Figure 66**.

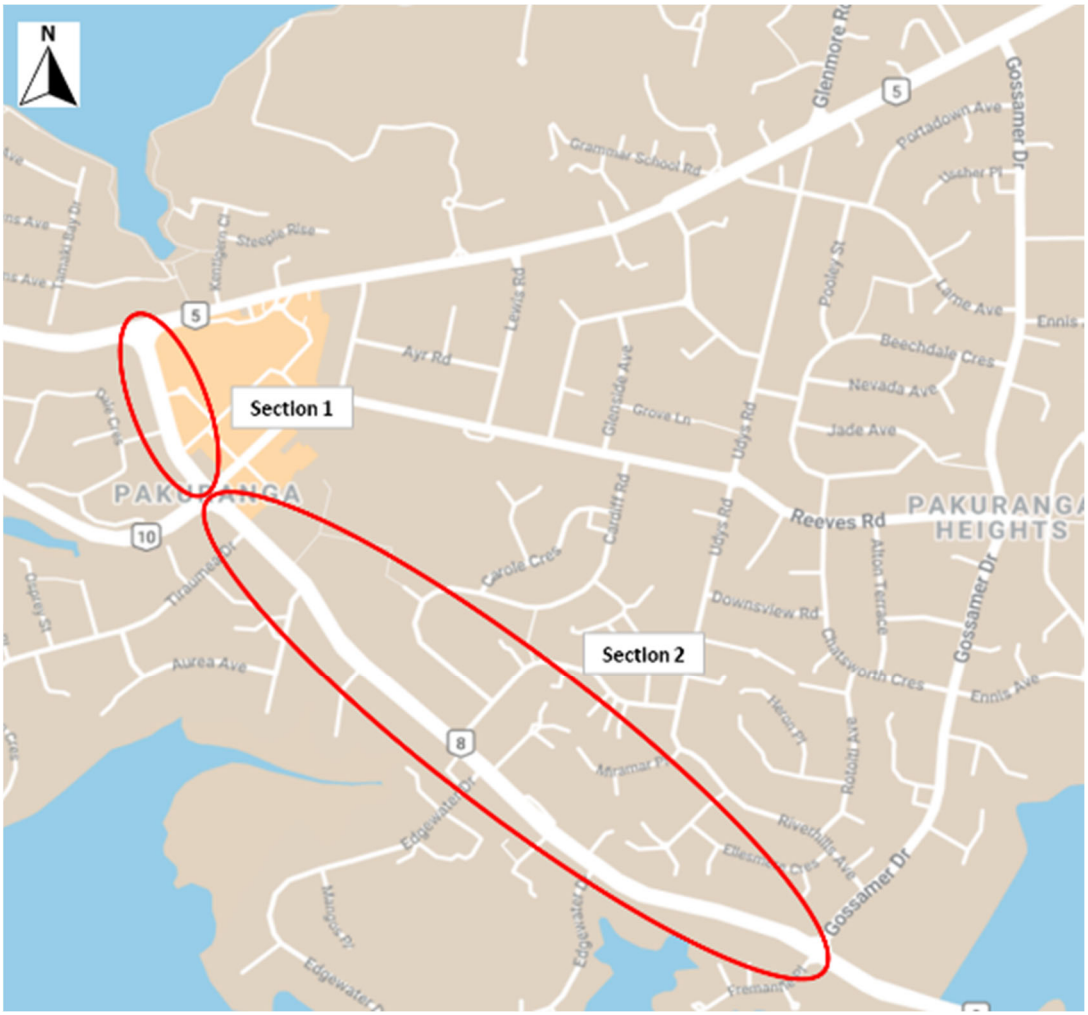

Figure 66: Ti Rakau Dr construction vehicle effects

Section 1 is expected to carry an additional 17 veh/h westbound and 18 veh/h eastbound at the peak of construction, while Section 2 is expected to carry an additional 9 veh/h westbound and 10 veh/h eastbound, respectively. It should be noted that the westbound and eastbound directions of Section 2 will not be loaded simultaneously as described above.

Ti Rakau Drive is an arterial road, and will for the majority of the construction period consist of two lanes per direction. Multiple bus services currently run along this road and as such is well-suited to larger sized vehicles. Signalised pedestrian crossings are provided at Pakuranga Road, Reeves Road, Mattson Road, Edgewater Drive west and Gossamer Drive.

Overall, Ti Rakau Drive will carry roughly one construction vehicle every three minutes westbound and eastbound at the peak of construction. Furthermore, Ti Rakau Drive is an arterial route supporting large vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.2.10 EB3R – Gossamer Drive

This section includes Gossamer Drive from Ti Rakau Drive in the south to Reeves Road in the north (see **Figure 67**).

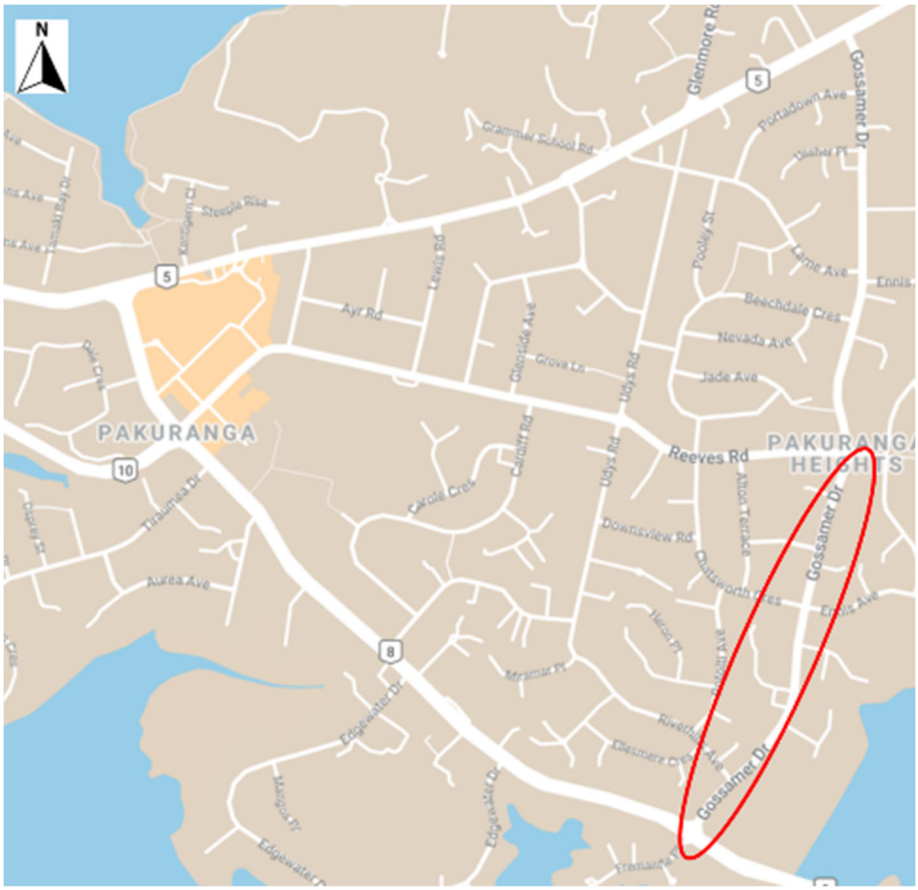

Figure 67: Gossamer Dr construction vehicle effects

During the construction of the Ti Rakau Drive westbound and eastbound lanes, Gossamer Drive will support an additional 9 veh/h southbound and 10 veh/h northbound, respectively. It should be noted that these two construction phases will not occur simultaneously.

Gossamer Drive, in the existing environment, serves as a through route between Ti Rakau Drive and Pakuranga Road. As such, the carriageway consists of 4.0 m wide lanes. Gossamer Drive is also a school bus route.

In the current environment, pedestrians are provided with a signalised pedestrian crossing at the Ti Rakau Drive / Gossamer Drive intersection and a pedestrian crossing near Chatsworth Crescent. In addition, all approaches to the Gossamer Drive / Reeves Road roundabout are provided with pedestrian refuge islands to facilitate a staged crossing if required.

Overall, Gossamer Drive will carry roughly one construction vehicle every six minutes either in the northbound or southbound directions at the peak of construction. Furthermore, Gossamer Drive consists of a wide carriageway which supports larger sized vehicles in the existing environment and multiple safe pedestrian crossing points are provided. Therefore, the effects are considered to be negligible.

5.1.3 Summary of Temporary Construction Effects

Overall, the temporary effects of the various CSAs that will be established as well as the construction traffic in the EB2 and EB3R project areas will be mitigated appropriately and are considered to be negligible or very low.

A Workforce Travel Management Plan will be developed to reduce the number of private vehicles travelling to the worksites and to increase accessibility of the worksites through more travel options.

CTMPs will be developed for the Project to avoid, remedy or mitigate the adverse effects of construction on transport, parking and property access so far as is reasonably practicable. The CTMPs will be developed in accordance with the conditions of consent and will include management strategies, controls and reporting protocols to achieve this.

Hours of operation, especially night works, will be controlled in part by the Project's consent conditions and management plans, including the CNVMP.

5.2 General Traffic Effects

The sections below provide an assessment of effects to general traffic during construction. General traffic effects refer to the movement of traffic across the road network as a whole. An assessment at a network-wide level, provides a better understanding as to the wider traffic effects of the Project and is based on the results from various AIMSUN and SIDRA traffic modelling assessments[26].

As stated in **Section 2.3**, Auckland's transport networks are constantly changing, undergoing improvements from new initiatives and being optimised. Furthermore, the global COVID-19 pandemic dramatically affected travel patterns and behaviours, and uncertainty remains that these effects would continue into the future. Given these factors, careful consideration was given to determine what formed the "existing environment".

For the purposes of the scenarios employed by the traffic modelling and this assessment, the existing environment was based on pre COVID-19 travel behaviours and a number of committed transport projects (including EB1 and WRRE Works) as well as the EB2/EB3R enabling works. Furthermore, a conservative approach was followed, whereby a 2028 future year was used to compare a Do-Minimum (without project) scenario and the EB2/EB3R scenarios. This approach allowed for the direct comparison between scenarios.

5.2.1 Construction Traffic

As stated in **Section 5.1.2**, the effects of the low estimated construction traffic volumes are expected to be negligible or very low and will be catered for within the existing road network. Therefore, a separate modelling assessment of the 'Do-Minimum' and 'Do-Minimum + Construction Traffic' scenarios on the entire network was not considered necessary.

5.2.2 Intersection Performance during Construction

5.2.2.1 Overview of Performance Criteria and Modelling Scenario Development

Intersection performance analyses were undertaken, using SIDRA, of the transport network comprised of selected intersections in the EB2 and EB3R project areas. The analyses consisted of a comparison between the Do-Minimum and EB2/EB3R scenarios for both the AM and PM peak hours. The performance criteria for the assessment were based on the Level of Service (LOS), degree of Saturation (DOS) or v/c ratio and delay in seconds. The LOS is a measure of the average delay at an intersection and is a function of the intersection control (see **Table 20** below).

[26] These assessments were undertaken in accordance with the methodology set out in **Section 2.4**.

Table 20: Level of Service for intersections

Level of Service	Control Delay (d) for Buses, Freight and General Traffic
	Signalised intersections
A	d < 10 sec
B	10 < d <= 20 sec
C	20 < d <= 35 sec
D	35 < d <= 55 sec
E	55 < d <= 80 sec
F	d > 80 sec

It should be noted that SIDRA cannot produce an overall intersection performance LOS for priority-controlled intersections. This is due to some approaches at priority-controlled intersections being uncontrolled, i.e., free flow, hence no control delay. As per the Transport Minimum Requirements guiding the design of the Project, overall intersection performance of LOS E or better for signalised intersections, with regards to general traffic, was considered acceptable throughout this ITA.

The DOS is a measure of utilisation of the capacity of the intersection between 0 and 1, based on the traffic load forecast for the intersection. In SIDRA, the DOS is reported by turn movements based on the traffic load divided by the calculated capacity. At signalised intersections, the calculated capacity considers the signal phase times and the effective green time for any particular turn movement. The overall intersection DOS metric is based on the maximum reported DOS for any movement within the intersection.

The traffic modelling undertaken in this ITA considered the 'worst-case' scenarios to determine the temporary effects during construction. The temporary effects were modelled in three separate construction scenarios to simulate the expected traffic distribution that could occur due to significant changes in the road network.

Figure 68 provides a simplified schematic of the construction activities that informed the development of the construction scenarios assessed in this ITA. It should be noted that activity duration should not be interpreted from this schematic.

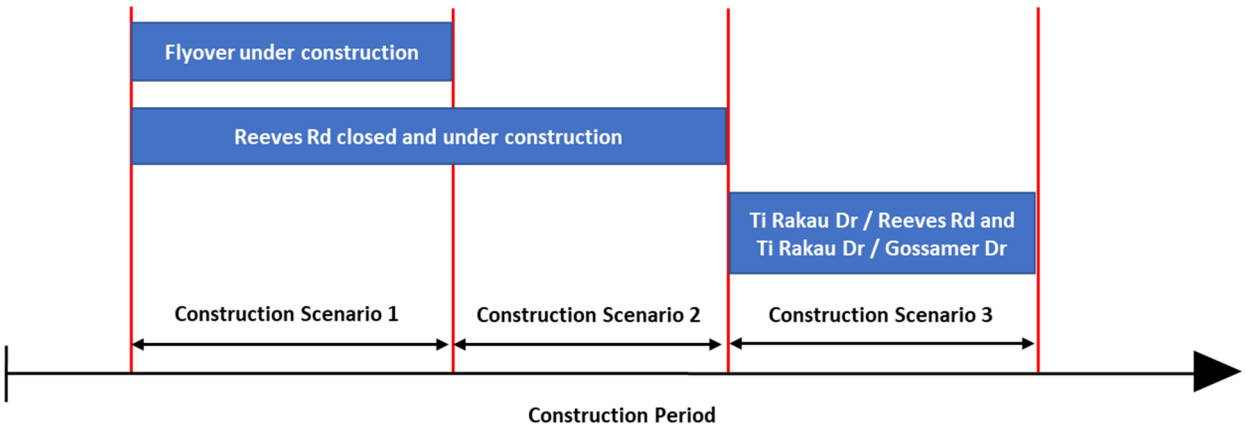

Figure 68: Construction modelling scenarios

Considering the construction programme, from a transport perspective, the closure of Reeves Road and the ongoing construction of the RRF is considered the first major change to the transport network in the EB2 and EB3R project areas. Construction Scenario 1 simulates these activities.

The next major change to the transport network is the completion of the RRF, while Reeves Road underneath the RRF remains closed. These changes are simulated in Construction Scenario 2.

The final major changes to the transport network are the construction of the Ti Rakau Drive / Reeves Road intersection (underneath the RRF) and the Ti Rakau Drive / Gossamer Drive intersection. These works will occur after Reeves Road and the RRF have been constructed and will occur during a low traffic period (December to January) to mitigate the effects of the disruption. These activities are simulated in Construction Scenario 3.

The sections below provide a description of each individual scenario, analysis of the scenario, followed by an assessment.

5.2.2.2 Construction Scenario 1

Construction Scenario 1 simulates the closure of Reeves Road and the construction of the RRF. Various other ongoing construction activities, with lesser expected effects, as well as sections of work already completed were also included under Construction Scenario 1. These include:

- Closure of William Roberts Road north between Pakuranga Road and Reeves Road. Removing the southern approach to the intersection with Pakuranga Road and the northern approach to the intersection with Reeves Road, see **Section 4.2.1.2**. This will in turn temporarily convert the Pakuranga Road / William Roberts Road intersection to a no stop intersection / free-flow conditions

- Ongoing Pakuranga Road / RRF tie-in works, consisting of reducing Pakuranga Road to five lanes. Three lanes will be provided for the critical direction of traffic flow during the AM and PM peak hours and two lanes for the opposite direction, see **Section 4.2.1.3**

- Ongoing construction of Phase 4 of the Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Mattson Road intersections. This phase of work is predicted to be the 'worst-case' during the construction of these intersections as it is anticipated to have the highest level of effect given the potential lane closures and associated traffic disruption, see **Section 4.2.2.1**

Intersection Performance:

The AM peak hour for intersections assessed in Construction Scenario 1 was between 08:00 – 09:00 and the PM peak hour was between 16:15 – 17:15. The horizon year for all intersection assessments was 2028. Traffic signal phasing diagrams per intersection are provided in **Appendix D** and lane performance summaries per intersection are provided in **Appendix E**.

Intersection performance analyses were undertaken at the following intersections under Construction Scenario 1:

- Pakuranga Road / Ti Rakau Drive
- Pakuranga Road / Brampton Court
- Reeves Road / Aylesbury Street
- William Roberts Road / Reeves Road
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street north
- Ti Rakau Drive / Aylesbury Street south

- Ti Rakau Drive / Reeves Road / SEART
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive / Mattson Road
- Ti Rakau Drive / Edgewater Drive west
- Ti Rakau Drive / Gossamer Drive

Table 21 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the AM peak, with a 2028 horizon year.

Table 21: Intersection performance – Do-Minimum vs Construction Scenario 1 (AM peak, 2028)

Intersection	Do-Minimum			Construction Scenario 1		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.85	33	C	0.90	33
Pakuranga Rd / Brampton Ct	N/A	0.42	1	N/A	0.39	1
Reeves Rd / Aylesbury St	N/A	0.27	1	N/A	0.03	3
William Roberts Rd / Reeves Rd	N/A	0.68	7	N/A	0.18	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.26	1
Ti Rakau Dr / Aylesbury St north	N/A	1.49	6	N/A	1.67	5
Ti Rakau Dr / Aylesbury St south	N/A	0.26	1	N/A	0.29	1
Ti Rakau Dr/ Reeves Rd / SEART	F	0.90	178	D	1.00	49
Ti Rakau Dr / William Roberts Rd	Built during WRRE			C	0.88	26
Ti Rakau Dr / Mattson Rd	B	0.79	16	A	0.78	10
Ti Rakau Dr / Edgewater Drive west	C	0.87	27	C	0.85	27
Ti Rakau Dr / Gossamer Dr	D	1.02	48	D	0.89	35

SIDRA analysis indicates that in the AM peak, overall Construction Scenario 1 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Ti Rakau Drive
- Pakuranga Road / Brampton Court
- Reeves Road / Aylesbury Street
- Ti Rakau Drive / Aylesbury Street north
- Ti Rakau Drive / Aylesbury Street south
- Ti Rakau Drive / Mattson Drive
- Ti Rakau Drive / Edgewater Drive west

Improvements in DOS and delay are predicted at the William Roberts Road / Reeves Road intersection and is expected to operate with spare capacity.

The new William Roberts Road / Cortina Place and Ti Rakau Drive / William Roberts Road intersections are expected to operate with spare capacity during the Reeves Road closure and construction of the RRF.

Although increases in DOS are predicted for the Ti Rakau Drive / Aylesbury Street north intersection, in practical terms, the intersection is at capacity in the Do-Minimum scenario and so the effects of Construction Scenario 1 are considered to be negligible.

Improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART and Ti Rakau Drive / Gossamer Drive intersections and are expected to operate with spare capacity (both LOS D).

Table 22 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 1 during the PM peak, with a 2028 horizon year.

Table 22: Intersection performance – Do-Minimum vs Construction Scenario 1 (PM Peak, 2028)

Intersection	Do-Minimum			Construction Scenario 1		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.91	47	C	0.88	32
Pakuranga Rd / Brampton Ct	N/A	0.53	1	N/A	0.42	1
Reeves Rd / Aylesbury St	N/A	0.38	1	N/A	0.04	2
William Roberts Rd / Reeves Rd	N/A	0.87	11	N/A	0.22	4
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.21	1
Ti Rakau Dr / Aylesbury St north	N/A	4.67	36	N/A	2.91	18
Ti Rakau Dr / Aylesbury St south	N/A	0.38	1	N/A	0.29	1
Ti Rakau Dr/ Reeves Rd / SEART	F	1.13	83	B	0.81	19
Ti Rakau Dr / William Roberts Rd	Built during WRRE			B	0.88	20
Ti Rakau Dr / Mattson Rd	B	0.66	12	D	0.90	36
Ti Rakau Dr / Edgewater Drive west	C	0.85	26	C	0.89	32
Ti Rakau Dr / Gossamer Dr	D	0.90	44	D	0.87	38

SIDRA analysis indicates that in the PM peak, Construction Scenario 1 is also expected to result in minimal adverse effects to intersection performance along the network overall. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Ti Rakau Drive
- Pakuranga Road / Brampton Court
- Reeves Road / Aylesbury Street
- Ti Rakau Drive / Aylesbury Street north
- Ti Rakau Drive / Aylesbury Street south
- Ti Rakau Drive / Edgewater Drive west
- Ti Rakau Drive / Gossamer Drive

Improvements in DOS and delay are predicted at the William Roberts Road / Reeves Road intersection and it is expected to operate with spare capacity.

During the closure of Reeves Road, the new William Roberts Road / Cortina Place and Ti Rakau Drive / William Roberts Road intersections are expected to operate with spare capacity during the PM peak.

Similar to the AM peak, the Ti Rakau Drive / Aylesbury Street north intersection is expected to perform poorly during the PM peak. However, the intersection is at capacity in the Do-Minimum scenario and so the effects of Construction Scenario 1 are considered to be negligible.

Significant improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART intersection and is expected to operate with spare capacity (LOS B).

An increase in DOS and delay is predicted at the Ti Rakau Drive / Mattson Road intersection during the PM peak, however the intersection is expected to operate at an acceptable LOS D.

5.2.2.3 Construction Scenario 2

Construction Scenario 2 simulates the completion of the RRF, while Reeves Road underneath remains closed. Various other ongoing construction activities, with lesser expected effects, as well as sections of work already completed were also included under Construction Scenario 2. These include:

- Completion of the William Roberts Road north closure works, see **Section 4.2.1.2**
- Completion of the Pakuranga Road / RRF tie-in works, see **Section 4.2.1.3**
- Completion of the SEART off-ramp and on-ramp works, during which the off-ramp left-turn lanes will be reduced to one lane, see **Section 4.2.1.4**
- Completion of the new bus lanes on Ti Rakau Drive between Pakuranga Road and Reeves Road as well as the crossroads intersection with Palm Avenue and Aylesbury Street. Ongoing construction of the new eastbound lanes in this section of Ti Rakau Drive, see **Section 4.2.1.5**
- The western approach to the Ti Rakau Drive / Reeves Road intersection will provide two through lanes only (no right-turn onto SEART). The eastern approach will provide two left-turn lanes onto SEART and two through lanes. The off-ramp will provide one left-turn lane and two right-turn lanes, see **Section 4.2.1.5**
- Completion of the Pakuranga Road works between Ti Rakau Drive and the RRF, see **Section 4.2.1.6**
- Completion of the Ti Rakau Drive / William Roberts Road and Ti Rakau Drive / Mattson Road intersection works, see **Section 4.2.2.1**
- Completion of Phases 1 and 2 of the Ti Rakau Drive works between Mattson Road and Gossamer Drive, see **Section 4.2.2.3** and **Section 4.2.2.4**

Intersection Performance:

The AM peak hour for intersections assessed in Construction Scenario 2 was between 07:45 – 08:45 and the PM peak hour was between 16:15 – 17:15. The horizon year for all intersection assessments was 2028. Traffic signal phasing diagrams per intersection are provided in **Appendix F** and lane performance summaries per intersection are provided in **Appendix G**.

Intersection performance analyses were undertaken at the following intersections under Construction Scenario 2:

- Pakuranga Road / Ti Rakau Drive
- Pakuranga Road / Brampton Court
- Pakuranga Road / RRF
- Reeves Road / Aylesbury Street
- William Roberts Road / Reeves Road
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue

- Ti Rakau Drive / Reeves Road / SEART
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive / Mattson Road
- Ti Rakau Drive western U-turn facility
- Ti Rakau Drive eastern U-turn facility
- Ti Rakau Drive / Gossamer Drive

Table 23 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the AM peak, with a 2028 horizon year.

Table 23: Intersection performance – Do-Minimum vs Construction Scenario 2 (AM peak, 2028)

Intersection	Do-Minimum			Construction Scenario 2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	C	0.85	33	D	0.84	46
Pakuranga Rd / Brampton Ct	N/A	0.42	1	N/A	0.37	1
Pakuranga Rd / RRF	Built during EB2			D	0.92	41
Reeves Rd / Aylesbury St	N/A	0.27	1	N/A	0.03	3
William Roberts Rd / Reeves Rd	N/A	0.68	7	N/A	0.16	5
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.15	1
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			C	0.78	33
Ti Rakau Dr/ Reeves Rd / SEART	F	0.90	178	C	0.86	22
Ti Rakau Dr / William Roberts Rd	Built during WRRE			B	0.86	14
Ti Rakau Dr / Mattson Rd	B	0.79	16	C	0.88	25
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.69	4
Ti Rakau Dr eastern U-turn facility	Built during EB3R			A	0.83	10
Ti Rakau Dr / Gossamer Dr	D	1.02	48	E	0.94	63

SIDRA analysis indicates that overall, in the AM peak, Construction Scenario 2 is expected to result in minimal adverse effects to intersection performance along the network. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Brampton Court
- Reeves Road / Aylesbury Street
- William Roberts Road / Reeves Road

Once constructed, the following new intersections are expected to operate with spare capacity during the AM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive western U-turn facility
- Ti Rakau Drive eastern U-turn facility

Increases in delay are expected at the Pakuranga Road / Ti Rakau Drive intersection during the AM peak hour, however the intersection is expected to operate at an acceptable LOS D.

Significant improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART intersection, and is expected to operate with spare capacity (LOS C).

Similar to Construction Scenario 1, a minor increase in DOS and delay is predicted at the Ti Rakau Drive / Mattson Road intersection during the AM peak under Construction Scenario 2. However, the intersection is expected to operate at an acceptable LOS C.

A minor increase in delay is predicted at the Ti Rakau Drive / Gossamer Drive intersection, from 48s to 63s under Construction Scenario 2. Regardless, the intersection is expected to operate with spare capacity (LOS E).

Table 24 provides a comparison of the intersection performance between the Do-Minimum and Construction Scenario 2 during the PM peak, with a 2028 horizon year.

Table 24: Intersection performance – Do-Minimum vs Construction Scenario 2 (PM Peak, 2028)

Intersection	Do-Minimum			Construction Scenario 2		
	LOS	**DOS (v/c)**	**Delay [s]**	**LOS**	**DOS (v/c)**	**Delay [s]**
Pakuranga Rd / Ti Rakau Dr	D	0.91	47	E	1.52	72
Pakuranga Rd / Brampton Ct	N/A	0.53	1	N/A	0.38	1
Pakuranga Rd / RRF	Built during EB2			E	1.02	65
Reeves Rd / Aylesbury St	N/A	0.38	1	N/A	0.08	3
William Roberts Rd / Reeves Rd	N/A	0.87	11	N/A	0.20	3
William Roberts Rd / Cortina Pl	Built during WRRE			N/A	0.33	6
Ti Rakau Dr / Aylesbury St / Palm Ave	Built during EB2			D	0.85	41
Ti Rakau Dr/ Reeves Rd / SEART	F	1.13	83	C	0.89	31
Ti Rakau Dr / William Roberts Rd	Built during WRRE			B	0.77	10
Ti Rakau Dr / Mattson Rd	B	0.66	12	B	0.81	13
Ti Rakau Dr western U-turn facility	Built during EB3R			A	0.67	4
Ti Rakau Dr eastern U-turn facility	Built during EB3R			A	0.81	9
Ti Rakau Dr / Gossamer Dr	D	0.90	44	E	1.02	73

SIDRA analysis indicates that in the PM peak, Construction Scenario 2 is also expected to result in minimal adverse effects to intersection performance along the network overall. Compared to the Do-Minimum scenario, similar intersection performance is expected at the following intersections:

- Pakuranga Road / Brampton Court
- Reeves Road/ Aylesbury Street
- Ti Rakau Drive / Mattson Road

Once constructed, the following new intersections are expected to operate with spare capacity during the PM peak under Construction Scenario 2, all with acceptable LOS and DOS:

- Pakuranga Road / RRF
- William Roberts Road / Cortina Place
- Ti Rakau Drive / Aylesbury Street / Palm Avenue
- Ti Rakau Drive / William Roberts Road
- Ti Rakau Drive western U-turn facility

- Ti Rakau Drive eastern U-turn facility

Increases in DOS and delay are predicted at the Pakuranga Road / Ti Rakau Drive intersection, and is predicted to operate near capacity in the PM peak under Construction Scenario 2. However, the LOS E is considered acceptable.

Improvements in DOS and delay are predicted at the William Roberts Road / Reeves Road intersection during the PM peak hour under Construction Scenario 2.

Significant improvements in DOS and delay are predicted at the Ti Rakau Drive / Reeves Road / SEART intersection, and it is expected to operate with spare capacity (LOS C).

An increase in DOS and delay is predicted at the Ti Rakau Drive / Gossamer Drive intersection under Construction Scenario 2. Regardless, the intersection is expected to operate at an acceptable LOS E.