REGIONAL FREIGHT HUB
INTEGRATED TRANSPORT ASSESSMENT

PREPARED FOR KIWIRAIL

23 October 2020

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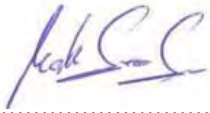
Mark Georgeson		23/10/2020
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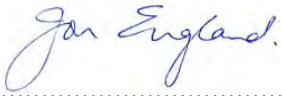
Jon England		23/10/2020

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Executive Summary

KiwiRail Holdings Ltd (KiwiRail) is planning to establish a new freight hub (referred to as the Regional Freight Hub (RFH) throughout this document) within Palmerston North and has identified a site that partly overlaps a portion of the existing North East Industrial Zone (NEIZ). The existing KiwiRail freight hub on Tremaine Avenue (referred to as 'existing freight yard') will be disestablished.

Stantec has been commissioned by KiwiRail to undertake an integrated transportation assessment to evaluate the transportation needs of the proposed RFH and the impacts it will have on the surrounding communities and transport network.

Traffic and Road Upgrades

- The RFH site will be approximately 177.7ha for which an indicative staging plan has been developed. The initial stage and the full buildout have been assessed in this study as these stages present the start and end impacts on the surrounding road network.
- For the purposes of this report, it is anticipated that the RFH will begin generating traffic in approximately 2031, when freight operations at the existing freight yard will shift to the RFH, referred to as the 'initial stage'. This initial stage will cater for the existing operation traffic plus a component of additional traffic demand expected to be generated by the RFH at this stage. It is anticipated that the RFH will be fully operational, generating the ultimate traffic demand, by approximately 2051, referred to as the 'full build out' stage.
- It is assessed that RFH will generate a traffic demand of 5,800vpd in the initial stage and 12,000vpd at full build-out.
- Prior studies show that the NEIZ extension is expected to generate 13,500vpd. It has been calculated that the RFH will displace 37.5% of the NEIZ extension. This implies that the RFH will displace 37.5% of the traffic expected to be generated by NEIZ, equating to approximately 5,100vpd. Since the NEIZ extension traffic demand has already been assumed as future additions on the road network, it is assessed that the RFH will increase traffic demand on the network by 6900vpd, as shown below.

Developments	Full build out Traffic demand (vpd)
Regional Freight Hub	12,000
NEIZ Extension (displaced by RFH)	(5,100)
Additional traffic on network	6,900

- A calibrated light to heavy vehicle split of 60%/40% has been applied to the RFH. These heavy vehicles will comprise of more than 70% rigid trucks, with the smaller balance of heavy vehicle traffic involving larger (articulated) trucks. Heavy vehicles will travel already utilised routes.
- Five scenarios have been analysed as part of this study, including the existing conditions and four future scenarios: two 'without RFH' scenarios and two 'with RFH' scenarios.
- Palmerston North City Council (PNCC), Waka Kotahi NZ Transport Agency (Waka Kotahi) and other authorities have several infrastructure upgrades within the study area (and surrounding) that have been allocated funding over the next 10-year period. It is expected that these planned improvements will be implemented within the committed timeframes and have therefore been assumed in the 'without RFH' scenarios. These upgrades are referred to as the Do Minimum Road Network and are:
  - Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3
  - Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line
  - Kairanga Bunnythorpe Road bridge strengthening and renewal (Jacks Creek and Mangaone Stream)
  - Campbell Road - Bridge Renewal
  - NEIZ – Richardsons Line upgrade: Richardsons Line - Road widening between Milson Line and Roberts Line, and the Roberts Line to Railway Road (this section will be closed and displaced by the RFH)

- NEIZ – Richardsons Line/Roberts Line intersection upgrade (roundabout)
- NEIZ - Alderson Drive to Richardsons Line: New link to NEIZ off Richardsons Line and an access into existing NEIZ
- Stoney Creek Road Safety Upgrade

In addition to these funded projects there are other documented do minimum upgrades that are expected to be in place before the RFH becomes operational, as listed below:

- Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line (based on the District Plan)
- El Prado Drive/Railway Road roundabout

From analysis of the future 'without RFH' scenarios through to 2041, further mitigations have been identified within the study area, as listed below:

- Upgrade of SH54/Waughs Road intersection from a priority control to a roundabout
- Upgrade of SH3/Flygers Line intersection from a priority control to a roundabout
- Upgrade of Tremaine Avenue/Milson Line intersection to include additional through lanes on each approach

- The RFH development will trigger upgrades due to the location and size of the site. These upgrades will be funded by KiwiRail and have been referred to as the RFH Road Network. This network was assumed for the 'with RFH' scenarios, while timing and implementation of strategic infrastructure improvements being planned by PNCC and Waka Kotahi are being finalised. That is, the assumed roading changes and improvements will be coordinated with strategic roading plans to come together in the form of a Roading Network Integration Plan, to be delivered by all three parties. The RFH road network involves:
  - Termination of the existing Railway Road from Roberts Line to approximately 50m south of Maple Street
  - Construction of a perimeter road extending approximately 2.6km along the western side of the RFH between Maple Street and Roberts Line. This perimeter road is required to provide access to the RFH from the north and west. It will also provide alternative public access once Railway Road is closed.
  - Two RFH accesses via the perimeter road on the northern and western boundaries
  - Railway Road converted to a continuous curve into Roberts Line
  - New Intersection at Roberts Line with the perimeter road
  - A posted speed limit of 80km/h for the perimeter road. A posted speed limit reduction to 80km/h is also envisaged for Roberts Line between Railway Road and perimeter road.
  - Closure of Roberts Line east of current Railway Road and associated closure of the level crossing
  - Richardsons Line north of the Roberts Line/Richardsons Line intersection converted to a RFH access
  - Closure of Clevely Line approximately 450m from the Roberts Line/Clevely Line intersection
  - Closure of Te Ngaio Road approximately 250m from the Clevely Line/ Te Ngaio Road intersection
  - Closure of two-level crossings along Sangsters Road: Richardsons Line and Clevely Line
  - Sangsters Road improvements to Roberts Line to provide driveway access to existing properties
  - Rerouting the Feilding-Palmerston North bus line and relocating the Bunnythorpe stop

Different perimeter road alignment options were considered, such as a northern link to Kairanga Bunnythorpe Road, but have not been carried forward at this stage as there are uncertainties around the locations of strategic network improvements, in particular the position of a bypass route to the west of Bunnythorpe. The perimeter road alternatives and current positioning is discussed in the Design, Construction and Operation report prepared by Stantec.

In light of the above, the perimeter road alignment between Railway Road and Roberts Line was selected. This alignment does not foreclose future links onto Kairanga Bunnythorpe Road and/or the southern bypass of Bunnythorpe. In addition, this alignment will provide the shortest alternative to the existing alignment, while causing minimal disruptions to the existing road network, as the perimeter road will utilise existing roading infrastructure.

In addition, the following will be required:

- Level Crossing Safety Impact Assessments (LCSIA) at the Campbell Road/ Kairanga Bunnythorpe Road and the Waughs Road/Campbell Road level crossings. This is a more thorough analysis and is in line with best practises.
- Improvements to existing NEIZ accesses along Roberts Line, as required
- A Construction Traffic Management Plan (CTMP) once details around the RFH construction become clear.

- Lastly, the responsibility of the following mitigation will lie across agencies:
  - Safety improvements in the form of protection of non-frangible roadside hazards along Roberts Line
  - Intersection upgrade at Campbell Road/Kairanga Bunnythorpe Road
  - Intersection upgrade at Railway Road/ Kairanga Bunnythorpe Road possibly involving priority reversal in favour of Railway Road

- Road Network

  It is recommended that KiwiRail consult with PNCC as the relevant road controlling authority and Waka Kotahi to prepare a Roading Network Integration Plan that details for the development and coordination of the roading network.

  Three future road network layouts around the RFH site are expected:

  1. Do Minimum Road Network – the do-minimum road network will include all planned and funded road network upgrades by PNCC and Waka Kotahi and is expected to be in place within the documented timeframes (before the RFH initial stage).
  2. RFH Road Network – the roading improvements triggered by the RFH as the minimum roading required to support the traffic demand before the strategic infrastructure improvements are finalised and implemented.
  3. Ultimate Road Network – ultimate road network surrounding the RFH will include the Western and Southern bypasses planned by Waka Kotahi, along with other strategic upgrades, such as the ring road.

Impacts

- Seven groupings of impacts have been assessed as part of this study. The impacts assessment revealed the following:

- Network Traffic Impacts:
  - The RFH will increase the net traffic demand on the road network by 6,900vpd, at full build-out. Most links and intersections on the road network are shown to perform at the same LOS with and without the RFH. However, it is acknowledged that future network issues will impact the safety and efficiency of traffic travelling to the RFH. Therefore, KiwiRail will coordinate with the relevant authorities to better the performance of the road network in Palmerston North.
  - Overall, the traffic shift caused by the RFH will be localised, with the predominant shift occurring around the RFH. The heavy traffic generated by the RFH will use established heavy routes.
  - The key traffic shift will be from the existing Railway Road to the perimeter road. The perimeter road will be designed to adequately cater for heavy vehicle traffic, safely.
  - The route between Feilding and Palmerston North will experience an increase in traffic volume, due to the more northerly location of the RFH compared with the existing freight yard. The RFH

position will make Campbell Road and Waughs Road more attractive to heavy traffic. Both roads can accommodate additional heavy vehicles, with existing traffic constraints needing attention irrespective of the RFH.

- Stoney Creek Road, Ashhurst Road, and the southern portion of Railway Road will also see an increase in traffic demand due to infrastructure changes and the RFH.
- Roberts Line, between Railway Road and Kelvin Grove Road, will experience a decrease in traffic demand, due to the Roberts Line level crossing closure.
- SH3, Kairanga Bunnythorpe Road, Ashhurst Road, and Railway Road (south of Roberts Line) will also see an increase in heavy traffic demand due to infrastructure changes and the RFH.
- The Palmerston North Area Traffic Model (PNATM) also shows there will be an increase in heavy vehicle usages along Richardsons Line (between Milson Line and Roberts Line). It is assumed that Richardsons Line will be designed to accommodate heavy traffic since this road will service the NEIZ.

- Travel Time Effects
  - The Roberts Line level crossing closure will impact users currently using this crossing to access Railway Road. It is calculated that this closure will have a four minute increase in travel time between Kelvin Grove and Bunnythorpe, with traffic instead needing to use Stoney Creek Road.
  - Two properties currently gain access via the Richardsons Line level crossing. Sangsters Road will be formed to Roberts Line to provide the primary access to these properties. The largest impact to travel time is around 6 minutes, for the trips expected between the Bunnythorpe area and these properties, with traffic instead needing to use Stoney Creek Road via Roberts Line and Kelvin Grove Road.
  - Travel time impacts due to increased train lengths were analysed based on a train speed ranging between 30-80km/h. The results show that the longer trains (1,500m) could cause an increase in travel times ranging from less than 30 seconds to just over one minute for the first vehicle at the level crossing.
  - The results showed that on average, increases in travel times of just 30 and 45 seconds can be expected in initial stage and full build-out, respectively
- Level Crossing Closures Effects
  - Based on the Australian Level Crossing Assessment Model (ALCAM) scores the existing Clevely Line, Richardsons Line and Roberts Line are high risk crossings. The risk will be removed once these crossings are closed.
  - Based on the ALCAM score only, the Change in Use (change in train length and traffic volumes) at Kairanga Bunnythorpe shows the level crossing will remain as a Criterion 1.
  - The level crossing closures will cause a redistribution of traffic throughout the network and will result in reduced traffic on the PNGL level crossings between Roberts Line and Stoney Creek Road.
- Safety Risk
  - The safety risk will reduce on the following roads due to the RFH
    - Railway Road Closure
    - Perimeter road compared to existing Railway Road between Kairanga Bunnythorpe Road and Roberts Line)
    - Richardsons Line
    - Roberts Line
    - Stoney Creek Road
  - The safety risk will increase on the following roads due to the RFH
    - SH54

        - Railway Road (between Roberts Line and Airport Drive)
        - Campbell Road
        - Waughs Road
    - Intersections
        - Other than the Flygers Line/SH3 and SH54/Waughs Road intersections which are shown to perform poorly even without the RFH, none of the intersections analysed show that the level of service is expected decline materially.
        - The Kairanga Bunnythorpe node (including the Campbell Road/ Kairanga Bunnythorpe Road intersection, Railway Road/ Kairanga Bunnythorpe Road intersection and the Kairanga Bunnythorpe level crossing) needs to be investigated further to determine the current safety risk, the possible future risk and appropriate mitigation required.

- Public Transport
    - The bus route connecting Bunnythorpe and Feilding to Palmerston North will be disrupted by the RFH. The alternative route, along the perimeter road, will be roughly 200m longer than the existing route, and will result in an increase in travel time of less than 15 seconds between the Roberts Line/Railway Road intersection to the Kimbolton roundabout in Feilding. This redirected route will trigger the relocation of the Bunnythorpe stop on Dutton Street.
    - The rerouted bus line will provide PNCC with the opportunity to include stops at the NEIZ and RFH, ensuring safer and efficient access to two large workforces. The perimeter road can be designed to accommodate stops safely along the route at strategic locations to be identified by PNCC.
- Walking and Cycling
    - The RFH will provide the opportunity for the existing Te Araroa Trail to be improved within the Designation Extent, as well as an opportunity for additional recreational areas around the RFH. The RFH is not expected to disrupt any existing or planned walking and cycling routes.
    - The design of the perimeter road will include provision for walking and cycling
- Parking
    - All parking requirements for the RFH will be accommodated on site.
- Summary of Impacts
    - Overall, it is assessed that the RFH will have a minor negative impact on the community.

Effects	Measure	Measure Rating
Network Traffic	Traffic Demand Increase	Negative Minor
	Traffic Distribution	Negative Minor
	Network Performance	Negative Minor
Travel Times	Travel Times Impacts due to infrastructure closures	Negative Minor
	Travel Times Impacts due to increased Train Lengths	Negative Minor
	Route Travel times	Negative Minor
Level Crossing Closures	ALCAM Safety Risk assessment	Positive Moderate
Safety	Safety Risk	Neutral
Public Transport	Bus route	Positive Minor
Walking and Cycling	Impact on walking cycling facilities	Positive Minor
Parking	Onsite parking	Positive Minor
Overall Performance		Negative Minor

Abbreviations

Abbreviation	Term
ADT	Annual Daily Traffic
ALCAM	Australian Level Crossing Assessment Model
CAS	Crash Analysis System
CT	Container Terminal
CTMP	Construction Traffic Management Plan
ha	Hectares
HRC	Horizons Regional Council
IRR	Infrastructure Risk Rating
km	Kilometres
km/h	Kilometres per hour
KR	KiwiRail Holdings Ltd
LCSIA	Level Crossing Safety Impact Assessment
LCSS	Level Crossing Safety Score
LOS	Level of Service
m	Metres
NEIZ	North Eastern Industrial Zone
NIMT	North Island Main Trunk
NoR	Notice of Requirement
ONRC	One Network Road Classification
PNATM	Palmerston North Area Traffic Model
PNCC	Palmerston North City Council
PNGL	Palmerston North Gisborne Line
RFH	Regional Freight Hub
RLTP	Regional Land Transport Plan
TEU	Twenty-foot equivalent container units
Vpd	Vehicles per day
Waka Kotahi	Waka Kotahi NZ Transport Agency

Glossary

Term	Meaning
Average Daily Traffic	Vehicles per day, based on a traffic count survey for a fixed period not adjusted for seasonal and daily variations
Classification/hierarchy	Road classification is a system that ranks roads based on form and ability to carry traffic. For this study, the Waka Kotahi One Network Road Classification was used. It is expected that the PNCC will update the road hierarchy currently included in the District Plan to reflect the nationally recognised ONRC.
Commodities Forecasts	Commodities forecast percentages used in this study are based on the Ministry of Transport - National Freight Demand Study, dated March 2014
Designated Extent	Area required to accommodate the RFH, comprising 177.7 hectares
Do Minimum Road Network	The minimum upgrades required to address known network shortcomings. These upgrades have been planned and allocated funding by PNCC and Waka in the PNCC 10-year plan, and the Waka Kotahi National Land Transport Program
Existing Freight yard	KiwiRail's existing freight yard at Tremaine Avenue in Palmerston North
Full build out	Ultimate RFH buildout with full operations and traffic demand generation
Heavy Vehicle Traffic	Heavy vehicles range from smaller delivery to larger articulated truck. For the RFH more than 70% of trucks generated are rigid trucks, with the smaller balance of heavy vehicle traffic involving articulated trucks
Initial Stage	The first year of RFH operations. This stage will cater for the traffic generated at the existing rail year plus an estimated traffic demand uplift
Joint Responsibility	It is expected that a joint mechanism will be developed between KiwiRail, PNCC, Waka Kotahi and any other road owning authorities to establish appropriate and fair allocation of mitigations in order to deliver a holistic roading network to the Palmerston North community
Level of Service	Intersection and link performance based on volume to capacity ratio and delays, respectively. For this study, an: 1. Acceptable LOS is between LOS A (free flow) and LOS D (approaching unstable flow) 2. Unacceptable LOS is between LOS E (Unstable flow) and LOS F (Forced flow)
Light Vehicle Traffic	All other vehicles excluding heavy vehicles
North Eastern Industrial Zone	Industrial zoning applied by PNCC to land in close proximity to Palmerston North Airport well-suited to industrial development, readily accessed by road and rail.
North Island Main Trunk	The main railway line running between Wellington and Auckland
Perimeter Road	The perimeter road, a proposed new road, is required to provide critical access to the RFH from the north and west. It will also serve the function of providing an alternative transport connection once Railway Road has been stopped
PNATM	The PNATM is a traditional three stage transport model. The base year of the model is 2013, while the forecasts currently available are for the years 2021, 2031, and 2041. The 2031 model was used to analyse the RFH initial stage, while the 2041 was used to analyse the RFH full build out

Regional Freight Hub (RFH)	An intermodal freight facility that connects the rail network with the road transport system
RFH Road Network	Roading improvements triggered by the RFH as the minimum roading required to support the traffic demand before the implementation of strategic infrastructure improvements
Strategic Infrastructure Improvements	Documented upgrades including western and southern bypasses of Bunnythorpe, the ring road, reclassification of key arterial roads
Study area	The traffic study area considers an area immediately surrounding the RFH and the anticipated routes. The area immediately surrounding the site lies between Bunnythorpe in the north, the NEIZ site in the south, the existing Railway Road in the east and the perimeter road in the west. The routes focus on the main arterial and highway corridors to the south, west, north, and east of the RFH
Traffic Demand	The RFH estimated traffic demand was determined using calculated trip generation rates and expected RFH traffic generating area or commodities forecasts
Traffic Distribution	Traffic distribution patterns are based on the distribution profile established within the PNATM, which have been calibrated for the RFH traffic using past reports highlighting heavy vehicle route choice Priority routes for HCV to and from Palmerston North have been identified by other recent studies and adopted for this study
Trip Generation Rate	To estimate the demand at the RFH, trip generation rates were developed based on available data such as existing traffic counts, areas, and site throughput, at the existing freight yard
Twenty-foot equivalent units	Term used for containers that are usually 20 or 40-foot-long boxes
Ultimate Road Network	It is expected that the road network surrounding the RFH will ultimately include the documented strategic infrastructure improvements planned by PNCC and Waka Kotahi

Regional Freight Hub

Integrated Transport Assessment

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1. Introduction

1.1 Purpose

KiwiRail is planning to establish a new RFH within Palmerston North and has identified a site that overlaps part of the NEIZ. The new RFH will provide for KiwiRail's existing freight hub operations to be relocated from the existing Tremaine Avenue site and anticipated freight growth through at least the next 30 years. The need for the new RFH and its identified location are set out in the Assessment of Environmental Effects and other supporting technical documentation[1], which should be read in conjunction with this report.

Stantec has been commissioned by KiwiRail to undertake an integrated transportation assessment to evaluate the transportation needs of the proposed RFH and the impacts its traffic will have on the surrounding communities and transport network. This transportation assessment and related modelling assesses:

- The existing environment of the proposed RFH
- The existing traffic demands and generation of the existing freight yard along Tremaine Avenue
- Planned roading and land use changes
- The traffic generation, distribution and roading needs of the RFH
- The impacts of the RFH on the transport network
- Proposed mitigation

A key part of the assessment is the relationship between the RFH, and the other future land uses and roading improvements to be progressed by other authorities. Of relevance, the RFH displaces part of the of NEIZ for which future traffic growth and roading improvements are already anticipated, such that the traffic and roading needs and effects of the RFH will not be wholly additional to the planned future situation.

In bringing together the various planned future roading improvements, it is significant that KiwiRail, Waka Kotahi and PNCC will work together in developing and delivering a coordinated future roading plan through a Roading Network Integration Plan.

1.2 Project Description

1.2.1 Overview

The project involves the development of approximately 177.7 ha of land to enable the construction and operation of the RFH. The RFH is an intermodal freight facility that connects the rail network with the road transport system.

KiwiRail's objectives in developing a rail freight hub in or near Palmerston North on the North Island Main Trunk (NIMT) line are to:

increase its operational capacity to efficiently accommodate projected regional and national freight growth and support wider regional development.

enable rail to be integrated with, and connected to, other transport modes and networks; and

improve the resilience of the regional and national freight transport system over time.

KiwiRail is seeking to designate the land required for the RFH. The proposed extent of the designation for the RFH (Designation Extent) is shown in Figure 1-1. The RFH has been developed to a concept design stage. The design will be further developed through future stages of the project. Relevant required resource consents are not being sought concurrently with the Notice of Requirement (NoR) and will be applied at a future stage.

[1] Multi Criteria Analysis report and supporting documents; Design, Construction and Operation report prepared by Stantec

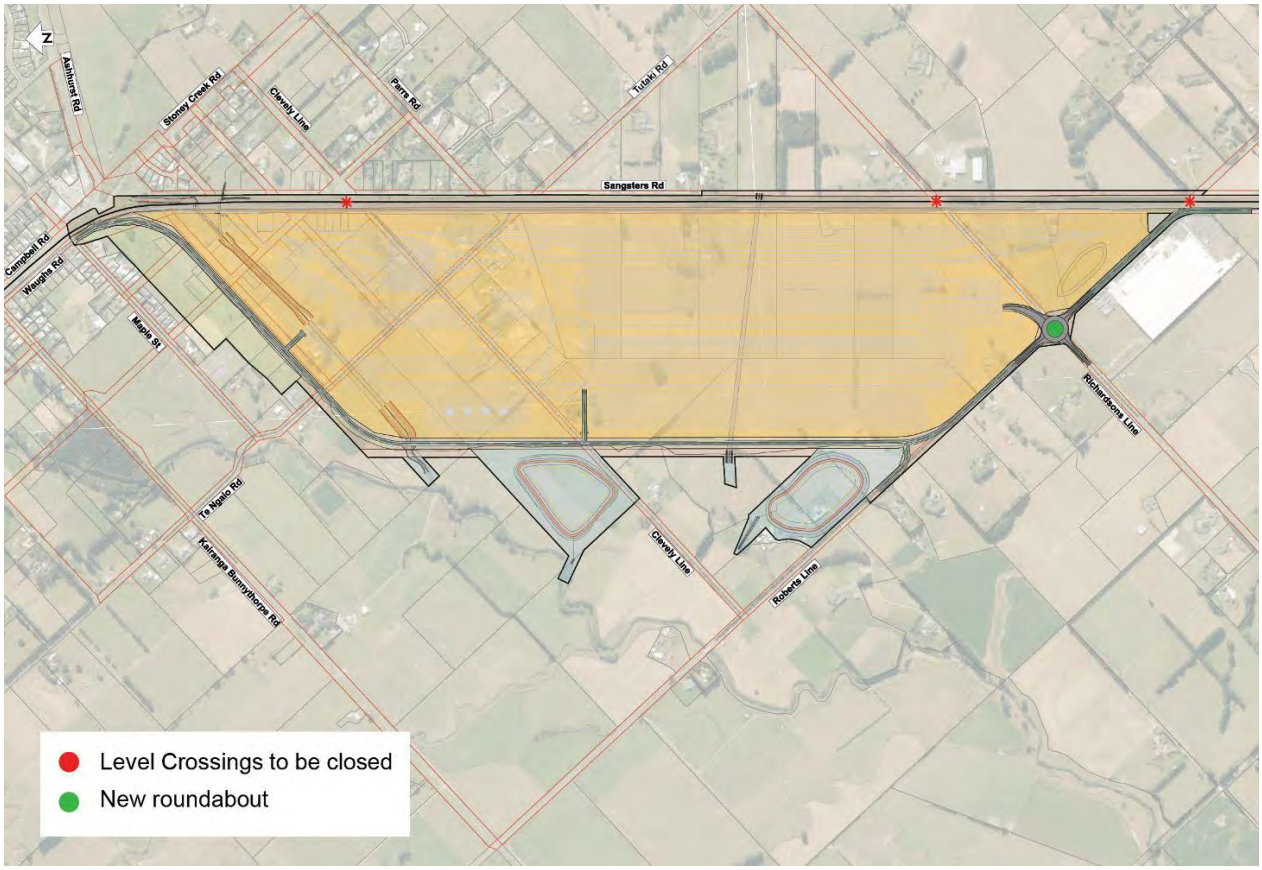


Figure 1-1: Designation Extent

1.2.2 Key operational features

The RFH will include the following key elements:

marshalling yards including arrival and departure tracks to accommodate trains up to 1,500m in length, signals, overhead line equipment and other associated track assets including safety lighting (low level, street and tower)

- container terminal
- wagon storage
- maintenance and network services facilities
- freight forwarding facilities
- log handling
- bulk liquid storage
- train control and rail operation centre and administrative office buildings and associated carparking
- staff facilities including car parking
- stormwater management areas with associated planting
- noise management areas with associated planting
- access roads
- buildings and other activities ancillary to the RFH

KiwiRail has an existing freight yard at Tremaine Avenue in Palmerston North (existing freight yard). With the development of the RFH, it is proposed that the existing marshalling activities, log handling and freight forwarding operations, network services and maintenance facilities will be relocated from the existing

freight yard to the RFH. The passenger terminal and the network communications centre at the Tremaine Avenue existing freight yard will remain at their existing location at the western end of the site.

The RFH is expected to operate 24 hours a day and seven days a week. Lighting will be installed within the rail operational areas.

1.2.3 Transport network

To enable the development and operation of the RFH, a number of formed roads will need to be stopped, including:

- the section of Railway Road between Roberts Line and south of Maple Street
- part of Clevely Line
- part of Te Ngaio Road

In addition, a number of unnamed paper roads, discussed in Section 5.3.1.17, will need to be stopped.

The closure of the section of Railway Road will be accompanied by the following roading changes:

- Closure of the Roberts Line level closing and Railway Road converted to a continuous curve into Roberts Line
- Closure of two-level crossings along Sangsters Road: Richardsons Line and Clevely Line
- Sangsters Road link improvements to Roberts Line (to enable access for two properties to Roberts Line)
- The level crossing closures are identified by red dots in Figure 1-1.

A new road, referred to as the perimeter road throughout this document, will be constructed and will connect to Roberts Line west of Richardsons Line and back onto Railway Road at the northern end of the RFH site (south of Maple Street). The perimeter road is required to provide access to the RFH from the north and west. It will also serve the function of providing an alternative transport connection once Railway Road has been stopped.

In order to provide a suitable connection into the RFH, the intersection at Richardsons Line and Roberts Line will be upgraded to an appropriately sized roundabout to enable operational efficiency as well as accommodate through traffic safely. This roundabout is shown by the green dot in Figure 1-1

The Te Araroa Trail is currently shown as following Sangsters Road to the southern side of Roberts Line and then crosses to the western side of Railway Road. The works required to Sangsters Road will not foreclose the ongoing use of this route and there will be an opportunity for the Trail to continue along the eastern side of Railway Road.

1.3 Assumptions

The RFH will not be fully operational when the project is initially established. Rather it is anticipated that it will be developed over time. Accordingly, for the purposes of this assessment, indicative staging has been developed so as to inform the potential effects on the transport network and identify when upgrades may be required.

It has been assumed that the RFH will be developed in the following three stages: initial establishment (initial stage), a middle stage and the ultimate end operating state (full build out). It is assumed that the initial stage will be operational in approximately 2031 and will include the traffic generated at the existing freight yard (Tremaine Avenue site) plus a component of additional traffic demand expected for the initial stage. The full build out is expected in approximately 2051 and will cater for the full RFH development. The initial and full build-out stages have been the focus of the assessment presented here. The initial stage was analysed to determine the impact of the operational shift (and components of additional demand) and the proposed infrastructure changes triggered by the RFH. The ultimate stage was analysed to evaluate the proposed road network for the expected traffic demand in the future.

The available PNATM was provided to Stantec by PNCC and has been used to inform the transport assessment. This strategic model was used to assess link and intersection performance, traffic demand shift on the network for all traffic and heavy vehicles.

Planned road infrastructure improvements documented by PNCC[2] and Waka Kotahi[3] (referred to in Section 7.1.1of this report) have been assigned as Do Minimum infrastructure improvements. Do-minimum road network was used to test future traffic demand scenarios excluding the RFH. The traffic demand generated by the RFH has been modelled on the Do Minimum infrastructure improvements plus the RFH triggered infrastructure changes, to test the sufficiency of the road network with the traffic additions of the RFH.

The table below summaries the key assumptions made in progressing the transport assessment of the proposed RFH. An earlier summary of assumptions was shared with PNCC and Waka Kotahi in May 2020 noting that both have roles as road controlling authorities in the region, with the updated summary below incorporating feedback from both authorities. They have been carried forward as the accepted assumptions.

Table 1-1: Key Transportation Assumptions

No.	Assumption	Comments
1.	The traffic study area considers an area immediately surrounding the RFH and the anticipated routes	Each is discussed in Section 3
2.	The PNATM will be used for traffic assessment	The forecast models for 2021, 2031 and 2041 will be applied, noting that 2051 models are not available. The 2021, 2031 and 2041 models will be used to test scenarios set out in Section 8.2 Land uses for the RFH (detailed in Section 9.2) and the NEIZ (detailed in Section 7.2.1) will be updated for the purposes of this modelling
3.	Once the RFH is established, the level of traffic generated at the existing site will remain	Since replacement land use types at the existing Tremaine Avenue site are uncertain, existing traffic volumes for this zone will remain in the traffic model (with an adjusted heavy split) as a proxy for future conditions
4.	Available surveyed traffic count data will be used to undertake the analysis. Additional traffic counts surveys have not been undertaken to inform this study.	Due to the Covid-19 situation, which continues to influence traffic patterns and behaviours, traffic count surveys will not be undertaken. It is anticipated that traffic demand will remain unstable for the duration of the assessment period leading up to NoR lodgement
5.	Only the PM peak hour will be reported as part of this assessment	The existing accesses of the Tremaine Avenue site show a steady peak throughout the day and the network has higher and more sustained flows for the PM peak
6.	Trip generation rates for the RFH will be informed from existing site traffic volumes and associated component areas. Note: Log traffic surveyed was low at the time of the counts	Existing site traffic counts will be scaled to the average month, based on 2018 yearly rail volumes The log volumes will be factored upwards based on 2018 Freight rail commodities for Palmerston North
7.	Trip generation for the NEIZ Extension will be adopted from past reports	NEIZ Extension trip generation to be taken from the October 2014 Intersection Report submitted with the original Plan Change application

[2] https://www.pncc.govt.nz/media/3131028/10-year-plan-2018-28.pdf

[3] https://www.nzta.govt.nz/planning-and-investment/national-land-transport-programme/2018-21-nltp/regional-summaries/manawatu-whanganui-region/manawatu-whanganui-2018-summary/

No.	Assumption	Comments
8.	The RFH will displace 37.5% of the 120-hectare NEIZ Extension	The NEIZ Extension will be reduced by 37.5%, with corresponding traffic forecasts displacing traffic generated from the NEIZ to the RFH

2. Alignment with Policies

2.1 PNCC District Plan – Section 20 (Transportation)

Three objectives are outlined in the PNCC District Plan[4], Section 20, which relate to the transport system:

1. Objective 1: The City's land transport networks are maintained and developed to ensure that people and goods move safely and efficiently through and within the City
2. Objective 2: The land transport network is safe, convenient, and efficient while avoiding, remedying or mitigating adverse effects in a way that maintains the health and safety of people and communities, and the amenity values and character of the City's environment
3. Objective 3: The safety and efficiency of the land transport network is protected from the adverse effects of land use, development, and subdivision activities

The RFH and associated road improvements will be designed in accordance with the objectives outlined above and can comply with all policy requirements. A summary of compliance with these objectives is described in Appendix A.

2.2 PNCC Strategic Transport Plan

The purpose of the Strategic Transport Plan[5] is to enable growth and a transport system that links people and opportunities, and provides amenity, safety, interconnectivity, accessibility, resilience, and reliability. Key outcomes of this strategy, relating to transportation, are:

1. A transport system that provides a choice of intermodal transport connections and integration of modes of transport that safely and efficiently gets freight, services, and people where they need to be.
2. An adequate supply of parking to meet the needs of businesses, industry and economic growth, and for encouraging a strong culture of walking, cycling and public transport use.
3. There is resilient and reliable interconnected intermodal transportation of goods, services, and people.
4. Reliable road - rail links for industry.
5. Resilient rail and road infrastructure and interconnectivity form a key part of freight, distribution, and logistics activities in the north-east industrial zone and Longburn.
6. Minimal traffic travelling unnecessarily through the city centre.
7. There are good relationships between the Council and KiwiRail, Palmerston North Airport, Waka Kotahi, Transport advocates and lobby groups and the Regional Transport Committee and other Territorial Authorities

The RFH will align with the outcomes outlined in this plan. A summary of compliance with these outcomes is described in Appendix A.

2.3 PNCC Active and Public Transport Plan

The purpose of the Active and Public Transport Plan[6] is to have a safe, efficient, and effective public transport system and the most active community in New Zealand. Key outcomes of this strategy are:

1. There is a resilient shared pathway around the city linking to Ashhurst, Railway Road to Bunnythorpe-Feilding, Linton and Longburn with interconnections to the road network.
2. Good passenger rail services to other centres around New Zealand e.g. Wellington, Hamilton and Auckland.

[4] https://www.pncc.govt.nz/media/3131460/section-20-land-transportv7.pdf
[5] https://www.pncc.govt.nz/media/3130983/strategic-transport-plan-2018.pdf
[6] https://www.pncc.govt.nz/media/3130993/active-and-public-transport-plan-2018.pdf

3. Improved existing bus stop infrastructure with redesigns to accommodate buses with larger capacity.
4. An investigation into a more efficient bus network including exploring options for a faster 'rapid bus' network at peak times with dedicated lanes, technology options to assist bus safety, and better influence or control of urban bus services.

The RFH will provide opportunities for new pathways and the existing passenger rail service will remain in its existing location.

2.4 PNCC Safe Community Plan[7]

The PNCC Safe Community Plan focuses on achieving a connected and safe community. Key outcomes of this plan relating to this study are:

1. Palmerston North City is re-accredited as a Safe Community
2. Council provides support to community organisations in injury and crime prevention initiatives.
3. All individuals, households and communities feel they are prepared and know what to do before, during, and after a civil defence and emergency situation.
4. CPTED principles are applied to the design of all public spaces.

KiwiRail will work with PNCC to assist in achieving the above objectives, by training their own staff appropriately, and applying relevant principles in the design of the RFH.

2.5 Road to Zero - **New Zealand's Road Safety Strategy 2020**-2030[8]

The Road to Zero vision of 'A New Zealand where no one is killed or seriously injured in road crashes' is supported by the following seven principles:

1. We promote good choices but plan for mistakes
2. We design for human vulnerability
3. We strengthen all parts of the road transport system
4. We have a shared responsibility for improving road safety
5. Our actions are grounded in evidence and evaluated
6. Our road safety actions support health, wellbeing, and liveable places
7. We make safety a critical decision-making priority.

KiwiRail will ensure infrastructure is designed to meet the appropriate safety standards and tie back to Safe Systems Assessment Framework to ensure that future infrastructure related the RFH will create a safe environment for all road users.

[7] https://www.pncc.govt.nz/media/3131038/safe-community-plan-2018.pdf
[8] https://www.transport.govt.nz/assets/Import/Uploads/Our-Work/Documents/Road-to-Zero-strategy_final.pdf

3. Study Area

The RFH is proposed to be located north of the existing Tremaine Avenue site. The study area adopted for the purposes of this transportation assessment is defined in two parts, an area immediately surrounding the RFH site and routes anticipated to service the RFH.

The area immediately surrounding the site extends between Bunnythorpe in the north, NEIZ site in the south, the existing Railway Road in the east and the perimeter road in the west and is shown in blue in Figure 3-1. The anticipated routes are indicated in red and focus on the main arterial and highway corridors to the south, west, north and east of the RFH.

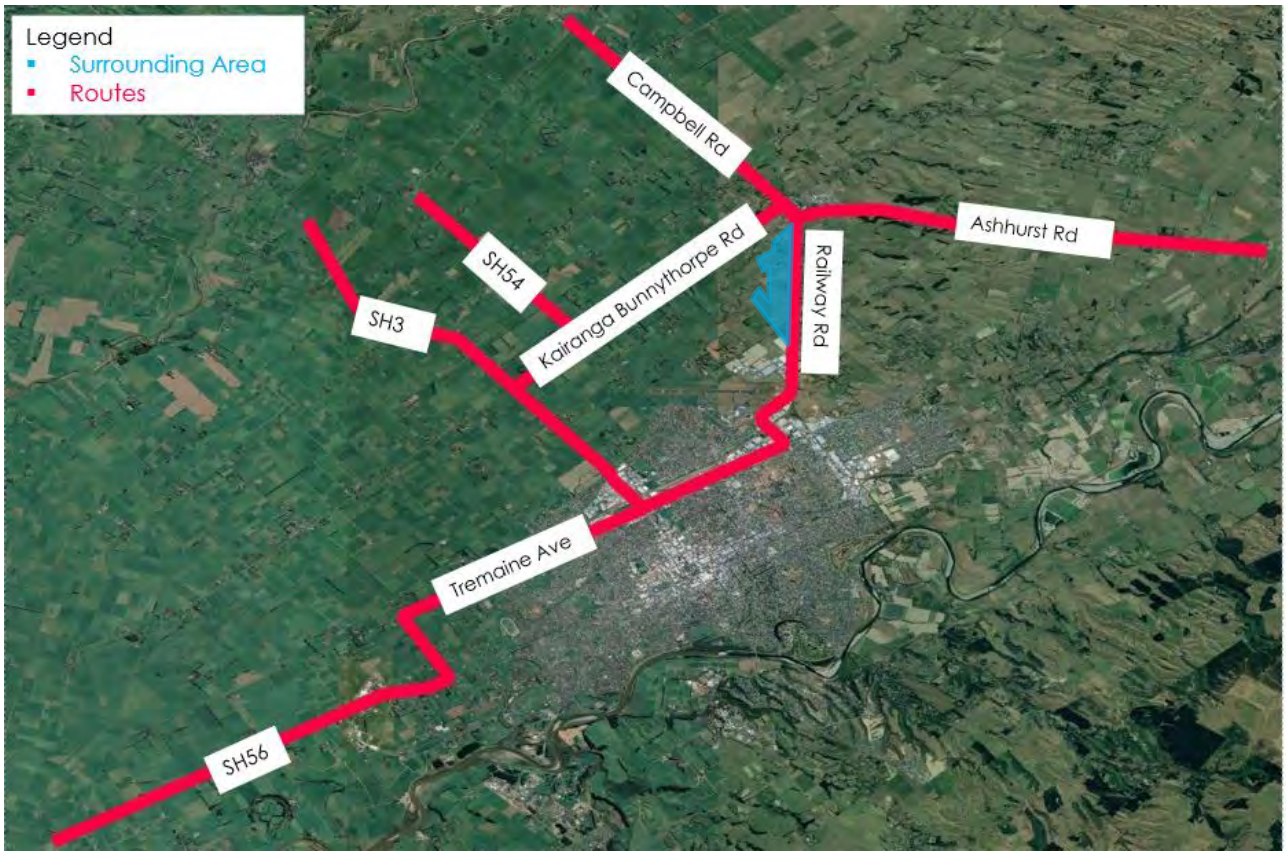


Figure 3-1: Study Area

4. Assessment Methodology

The assessment methodology applied when assessing the impact of the traffic activity of the proposed RFH on the surrounding road network is discussed below. Seven categories have been evaluated and rated according to the system shown in Table 4-1 as a means of determining the overall impact of the RFH.

Table 4-1: Impact Rating

Overall impact	Severity
Positive	Significant
	Moderate
	Minor
Negative	Minor
	Moderate
	Significant

4.1 Network Traffic Effects

Traffic effects have been assessed by considering the road and intersection performances with and without the RFH. Model outputs for key route travel times and total travel time for the network during the PM peak hour were used to determine this effects category.

4.2 Effects on Travel Times

Travel time effects have been assessed in three parts. The first is the impact on key Origin-Destinations due to infrastructure closure, comparing the impact on travel times using current preferred routes verse the approximated new route. The second is the impact on travel times due to longer train lengths, and the last in the impact on travel times determined by the model to key travel routes throughput the network.

4.3 Level Crossing Closure Effects

The ALCAM is a risk assessment tool that considers unique crossing infrastructure, user exposure (train and vehicle/pedestrian volumes) and the consequence of an incident to determine a comparative crossing risk score[9] as well as identify some of the key risks at the crossing.

Travel time implications due to these level crossing closures have been assessed using the PNATM to determine travel time impacts on key origin and destinations.

4.4 Road Safety Effects

Road safety effects have been assessed by comparing the actual and predicted crash risk, using the Waka Kotahi Mega Maps tool to determine the relative safety risk and effects on the road network, using expected traffic volume changes to road infrastructure to determine the future road safety risk. The Collective Risk and Infrastructure Risk Ratings will be used as the assessment criteria.

4.5 Effects on Public Transport Users

Public transport effects have been assessed by considering the potential benefits or dis-benefits to public transport routes and users impacted by the RFH.

4.6 Effects on Walking and Cycling Routes

Effects on vulnerable users as a result of existing and planned infrastructure (pedestrian and cyclists) have been assessed by considering the impacts and opportunities associated with the existing and proposed walking and cycling infrastructure as a result of the RFH.

4.7 Parking Effects

The effects on capacity and network efficiency caused by parking requirements for the RFH were also assessed.

[9] The risk data is relative to other crossings within New Zealand.

Table 4-2 lists the seven effect categories that were assessed to determine the overall performance of the transport network and implications of the RFH. It also shows the different measures used to analyse these categories and the defined measure for severity.

Table 4-2: Effects Rating Severity Definitions

Effects	Measure	Severity Definition		
		Minor	Moderate	Significant
1. Network Traffic Effects	Traffic Demand Increase	<10%	10% -50%	>50%
	Traffic Distribution	Demand shift of <25%	Demand shift of 25-50%	Demand shift of >50%
	Network Performance	< LOS D	LOS D - LOS E	> LOS E
2. Travel Times	Origin-Destination	<2.5minutes	2.5-5 minutes	>5minutes
	Train Lengths	<1 minute	1-3 minutes	>3 minutes
	Route	<5minutes	5-10 minutes	>10minutes
3. Level Crossing Closures	ALCAM Safety Risk assessment	Impact 1 level crossing	Impact 3 level crossings	Impact 5 level crossings
4. Safety	Safety Risk	No change to IRR	IRR score degrades improves to medium risk	IRR score degrades /improves to high risk
5. Public Transport	Bus route	No change to stops and patronage numbers for the Feilding service	Increase in stops and patronage for the Feilding service	Extension of other services to the RFH
6. Walking and Cycling	Impact on walking cycling facilities	Impact a single existing active mode route	Impact additional existing active mode routes	Impact existing and planned active mode routes
7. Parking	Onsite parking	100%	100%-80%	<80%

5. Existing Environment

5.1 Existing Freight Yard

The Existing Freight Yard at Tremaine Avenue in Palmerston North is shown in red in Figure 5-1 below and includes the existing freight hub and passenger station. It has a total area of approximately 40 hectares.

The site runs from the Mangaone Stream in the west to Railway Road in the east and is located along the NIMT, west of the Palmerston North Gisborne Line (PNGL), and with road frontage to Tremaine Avenue. The KiwiRail land is zoned industrial and designated for railway purposes.

The location of the RFH is shown in blue in the same figure, incorporating the designation extent of some 177.7 hectares.

Figure 5-1: Location of KiwiRail Land (existing and proposed)

The existing freight yard gains road access at four locations along Tremaine Avenue. Tremaine Avenue is classified as an arterial, as shown in

Table 5-1, and carries 12,500 vehicles per day with 10% of traffic consisting of a mix of heavy vehicles.

Two road over bridges cross the KiwiRail land - Milson Line at the eastern end and Rangitikei Street to the east of Coronation Park and the passenger rail station.

The passenger rail station located at the end of Mathews Avenue will remain in this location once the RFH is developed and operational, while the freight and other activities will move to the RFH site.

5.2 Rail Network

The NIMT is located on the eastern edge of the RFH. The NIMT corridor is occupied by a single track with overhead line equipment. The NIMT corridor in this location was vested in 1878 and was originally 300 links or 3 chains[10] (approx. 60m) wide. Sometime in the late 1890s it appears that two 60 link wide sections were laid off for what is now Railway Road and Sangsters Road. This left a balance between the Clevely Line level crossing and the Roberts Line Intersection of around 180 links (approximately 36m) for the rail corridor.

This line is used for freight. The existing single NIMT track will be moved approximately 20m west from the current location and re-laid within the RFH site. The PNGL branch line is to the south of the NIMT.

5.3 Road Network

The road network surrounding the RFH comprises multiple road types and hierarchies, which have been identified using the Waka Kotahi One Network Road Classification(ONRC)[11] shown in Figure 5-2. Details relating to the road network within the study area is highlighted in the table below, arranged in order of hierarchy importance, with a brief summary of each included after the table.

The ONCR has been referred to rather than the PNCC District Plan road classification, as it is expected that PNCC will update the District Plan to adopt the ONRC in due course, in common with the standardised approach of this nationally recognised classification.

[10] There are 100 links in a chain and a chain is 22 yards or 66 feet or just over 20m

[11] One Network Road Classification: https://nzta.maps.arcgis.com/apps/webappviewer/index.html?id=95fad5204ad243c39d84c37701f614b0

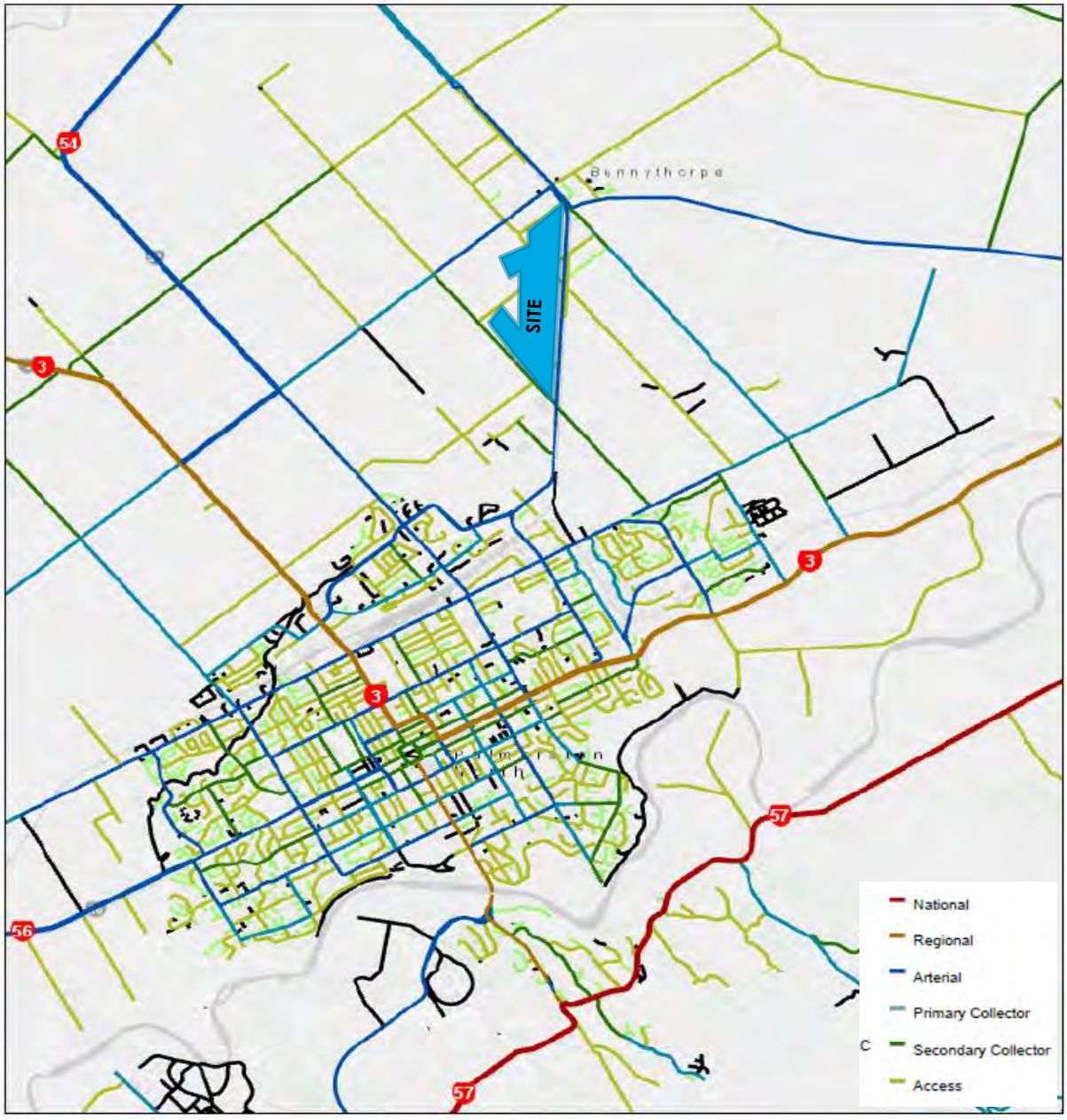


Figure 5-2: One Network Road Classification for the Palmerston North network

Table 5-1: Road Network Characteristics

Name	Road Section	Hierarchy[11]	Posted Speed[12] (km/h)	Volume[13] (vehicles per day)
SH3	Kairanga Bunnythorpe Road - Tremaine Ave	Regional	80	11,500[14]
SH54	Campbell Road - Kairanga Bunnythorpe Road	Arterial	80	7,500
SH56	SH 57 – Tiakitahuna Road	Arterial	80	5000
Railway Road	Kairanga Bunnythorpe Road – Roberts Line	Arterial	50-100	6,500
Kairanga Bunnythorpe Road	Campbell Road – SH54 (Primary Collector between Roberts Line and Milson Line)	Arterial	100	1,750
Campbell Road	Waughs Road - Railway Road	Arterial	100	8,000
Ashhurst Road	Campbell Road – Raymond Street	Arterial	100	2,000
Tremaine Avenue	SH3 – McLeavey Drive	Arterial	50	12,500
Stoney Creek Road	Campbell Road – Kelvin Grove Road -	Primary Collector	80-100	1,300
Waughs Road	SH54 – Ruffs Road	Primary Collector	100	6,250
El Prado Drive	Railway Road – Alderson Drive	Secondary Collector	50	1,800
Roberts Line	Kairanga Bunnythorpe Road – Richardsons Line -	Secondary Collector	100	1,250
Richardsons Line	Milson Line – Roberts Line	Access	100	800
Clevely Line	Te Ngaio Road – Railway Road	Access	100	150
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	Access	100	500

5.3.1.1 State Highway 3 (SH3)

In the study area, State Highway 3 is classified as a regional road that provides a key connection to State Highway 1 to the north. As a regional route, it has priority over intersecting side roads.

5.3.1.2 State Highway 54 (SH54)

State Highway 54 is classified as an arterial road, which runs parallel to SH3 within the study area. It provides connection between the areas to the north, typically Feilding and surrounding area, and Palmerston North. This road becomes Milson Line closer to Palmerston North.

5.3.1.3 State Highway 56 (SH56)

State Highway 56 is classified as an arterial road, connecting Palmerston North south towards Shannon and Levin. SH56 becomes Pioneer Highway at the urban edge of Palmerston North.

5.3.1.4 Railway Road

Railway Road is classified as an arterial, with the section of legal road reserve between Roberts Line and Clevely Line approximately 12m wide. Railway Road extends southwards from Bunnythorpe at a priority T-Intersection with Kairanga Bunnythorpe Road, to a signalised cross intersection with Tremaine Avenue and Vogel Street.

Within the study area it provides access to three level crossings, discussed in Section 0, comprising two KiwiRail owned and operated (Roberts Line and Clevely Line) and one privately owned and operated

[12] Palmerston_north_speed_limits_bylaw_2013_schedule_1_map_2_dec_2013
[13] ADT and Road width taken from Mobile Roads, https://mobileroad.org/desktop.html
[14] ADT taken from the NZTA Traffic Monitoring System - https://tms.nzta.govt.nz/

(Richardsons Line) level crossings of the NIMT. This road has multiple intersections providing access to rural, residential, commercial, and industrial areas. The change in land use is reflected in its changing speed limits. Closer to Airport Drive as the road has a 50km/h speed limit, while closer to Bunnythorpe the posted speed limit is 100km/h.

Within the primary study area, this road intersects Maple Street, Clevely Line, Richardsons Line, Roberts Line and El Prado Drive, listed north to south.

5.3.1.5 Kairanga Bunnythorpe Road

Kairanga Bunnythorpe Road is classified mostly as an arterial and lies west of the RFH, and as a primary collector between Roberts Line and Milson Line. The road runs in a north-south direction, from the Campbell Road/ Kairanga Bunnythorpe Road roundabout and terminating at the give way T-Intersection with Lockwood Road, approximately 3.5km outside the Palmerston North urban area. The road is rural, with narrow lanes and no shoulders. It has a level crossing at its eastern end at Bunnythorpe. There are two weight restricted bridges along the length of the road, preventing the movement of heavy vehicles over 4,500kg, between Te Ngaio Road and Campbell Road.

5.3.1.6 Campbell Road

Campbell Road is an arterial that connects between Feilding and Bunnythorpe township. There is a level crossing at the extension of Campbell Road northwards at Waughs Road. It serves a key commuter route and also provides a portion of the Te Araroa Trail route between Feilding and Palmerston North.

5.3.1.7 Ashhurst Road

Ashhurst Road is classified as an arterial connecting between Ashhurst and Bunnythorpe. This road terminates at a T-intersection with Stoney Creek Road and Campbell Road. The road has no shoulders.

5.3.1.8 Tremaine Avenue

Tremaine Avenue is classified as an arterial. From the south, the road continues as an extension of No 1 Line through to Midhurst Street in the Kelvin Grove area. The primary land use surrounding this road is commercial and industrial.

Tremaine Avenue provides access to the existing freight yard at four locations. This portion of the road is urban, with one lane in each direction and a flush median for most of its length. This road has shoulders, on street parking and widened intersections, some of which are signalised.

5.3.1.9 Stoney Creek Road

Stoney Creek Road is a primary collector that extends eastwards from Campbell Road at a priority T-Intersection, to a priority T-Intersection with SH3. A portion of this road forms the Te Araroa Trail route between Ashhurst Road and Clevely Line. The road is narrow, with no shoulders.

5.3.1.10 Waughs Road

Waughs Road extends west from Campbell Road as a primary collector that connects Feilding and Bunnythorpe. Closer to Feilding, Waughs Road becomes SH54. There is a level crossing along this road.

5.3.1.11 El Prado Drive

El Prado Drive is a secondary collector. The road provides the primary access to the NEIZ and forms a T-intersection with Railway Road.

5.3.1.12 Roberts Line

Roberts Line is classified as a secondary collector, running from Newbury Line in the west to Kelvin Grove Road. There is a level closing just to the south of Railway Road. To the west of Railway Road, Roberts Line provides access into parts of the NEIZ, after which it takes a rural form.

5.3.1.13 Richardsons Line

Richardsons Line is classified as an access road, which runs north-south past the NEIZ, along the boundary of the airport from Milson Line to Railway Road. The privately owned and operated level crossing on the eastern side of Railway Road provides access to two residential properties. Currently, there are no access points into the NEIZ from Richardsons Line.

5.3.1.14 Clevely Line

Clevely Line also has the function of an access road and runs north-south. The road services residential (lifestyle blocks) areas in its length between Stoney Creek Road and Roberts Line, with a level crossing at Railway Road.

5.3.1.15 Te Ngaio Road

Te Ngaio Road is an access road. The road runs in an east-west direction, from Newbury Line to a T-Intersection at Railway Road. The road is predominantly used to access local properties. There is a bridge along this road that lies in a flood plain.

5.3.1.16 Sangsters Road

Sangsters Road is an access road which runs north-south on the opposite (eastern) side of Railway Road. It is formed between Clevely Line and Tutaki Road, with an unformed section (paper road) south of Tutaki Road. Sangsters Road has a legal road reserve of approximately 12m wide between Roberts Line and Clevely Line. The route also forms a part of the Te Araroa Trail.

5.3.1.17 Unformed Roads

In addition, there are several roads that are unformed as shown in the PNCC District Plan[15]. These are coloured in grey in Figure 5-3. Effects on these roads have not been analysed, as it is assumed, they will be stopped to facilitate the construction and operation of the RFH.

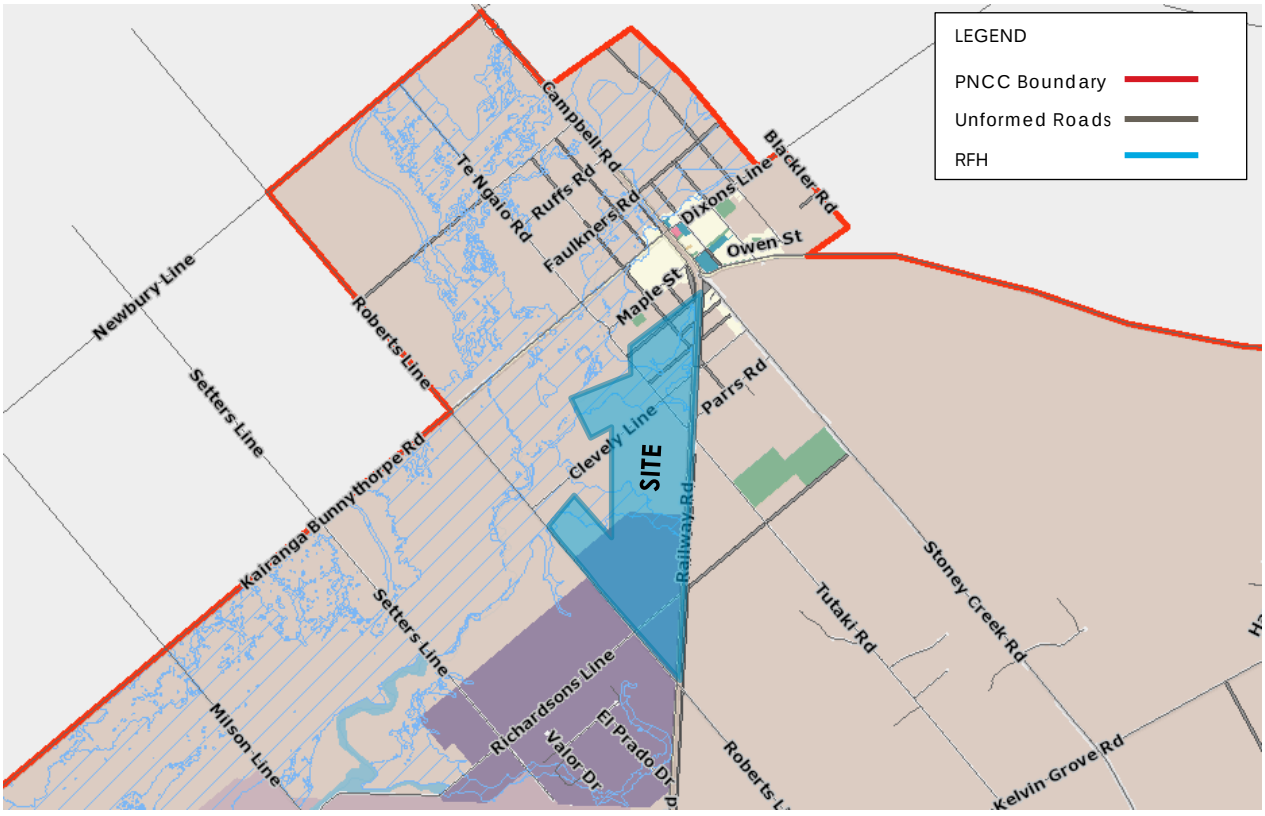


Figure 5-3: PNCC District Plan map showing unformed roads

5.4 Existing Public Transport Network

Public Transport services provided to, from and within Palmerston North include:

- Urban and Massey bus services operating Monday to Sunday
- School bus route Monday to Friday

[15] PNCC District Plan Maps - https://geosite.pncc.govt.nz/MapViewer/?map=8c372cd395c34ff5bd5b8038503bef36

- Feilding to Palmerston North bus service, operating Monday to Saturday
- Other services from regional centres to Palmerston North, including from Whanganui, Levin, Marton and Taihape
- A passenger rail commuting service operating with one service daily between Palmerston North and Wellington (Capital Connection rail service)[16].

There is a single bus route which runs along Railway Road between Feilding and Palmerston North, which includes a school bus route. This route crosses the Clevely Line level crossing travelling towards the Bunnythorpe area, before travelling along Campbell Road towards Feilding. Currently, the only stop for this area is along Campbell Road, at Dutton Street (it is assumed this is also the school bus stop). Figure 5-4 shows the Feilding to Palmerston North route, with the insert showing the four stops along this route. There is no stop at the existing NEIZ.

The closure of the Clevely Line level crossing as a result of the RFH will cause a disruption to the current bus route and will make the Dutton Street bus stop redundant. This stop is to be relocated to match the adjusted bus route, to a location confirmed in consultation with PNCC and HRC

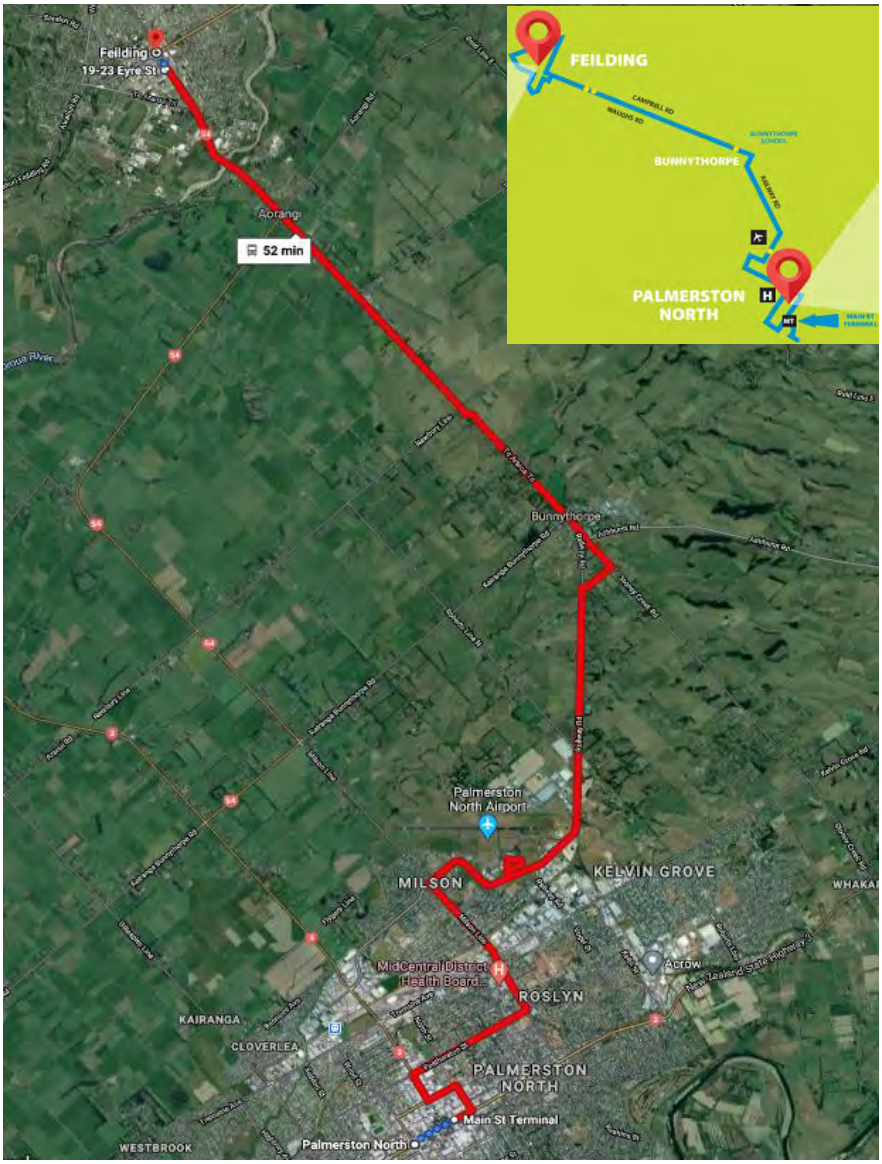


Figure 5-4: Bus route between Palmerston North and Feilding (Source: Google Maps, Insert: Horizons Regional Council Bus Routes[17])

[16] https://www.greatjourneysofnz.co.nz/northern-explorer/book/other-services/capital-connection/

[17] http://www.horizons.govt.nz/buses-transport/bus-routes-transport

Table 5-2 below provides a summary of bus activity on the Feilding to Palmerston North route; a detailed timetable indicating arrival times and stops can be found on the HRC website[18]. There is one bus that operates in the morning from Feilding to the girl's high school and one to the boy's high school. There is a return bus for each during the afternoon.

Table 5-2: Summary of Palmerston North to Feilding Bus Services

Route	Peak	Times	Number of scheduled buses
Feilding to Palmerston North	AM (weekday)	06:00 – 11:00	7
	PM (weekday)	12:00 – 19:00	9
	AM (weekends/Public Holidays)	10:00	1
	PM (weekends/Public Holidays)	12:00 – 17:00	3
Palmerston North to Feilding	AM (weekday)	07:00 – 10:30	5
	PM (weekday)	12:00 – 15:00	9
	AM (weekends/Public Holidays)	09:30 – 11:00	2
	PM (weekends/Public Holidays)	14:30 – 16:30	2

Once the RFH is established, these services can follow the perimeter road. It is also anticipated that this will provide an opportunity for other stops to be included in the area of the RFH and NEIZ as activity levels increase. The design of the perimeter road will provide an ability to incorporate new stops.

Figure 5-5 shows recent trends in bus patronage, showing a decline since 2012. In response, PNCC and HRC developed a program of improvements with several trials and improvements undertaken since 2016. The HRC is currently reviewing the existing bus services to refine existing trials and identify other potential improvements, anticipated to be completed by the end of 2020[19]. As above, this review can consider future needs and demands including at key planned employment generators, like the NEIZ and the proposed RFH.

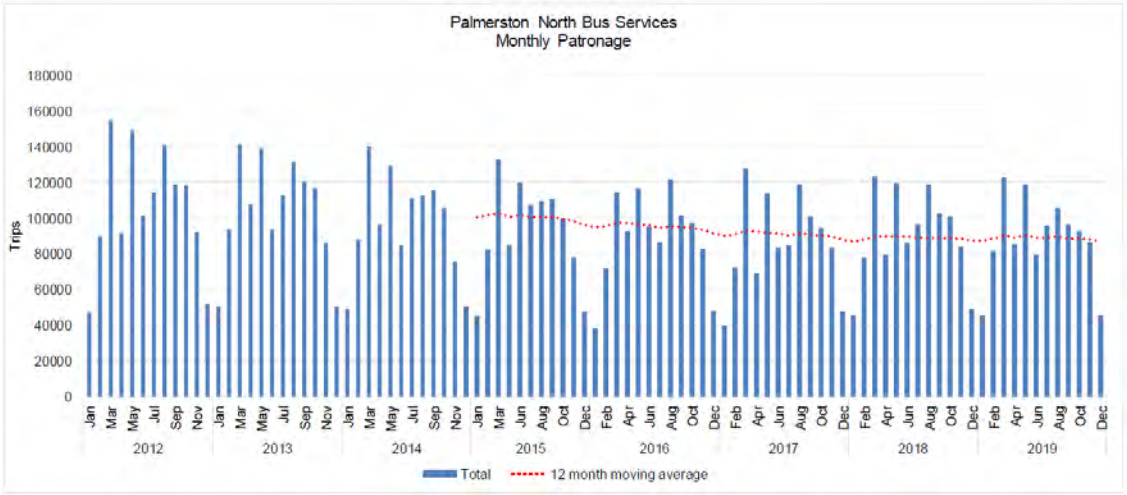


Figure 5-5: Palmerston North Bus Patronage 2012-2019 (Source: Horizons, Public Transport Services Report)

The existing freight yard, along Tremaine Avenue, includes the only passenger train station serving Palmerston North and surrounding areas. This train station links Palmerston North with seven major destinations, including Auckland in the north and Wellington in the south[20]. KiwiRail has no plans to relocate the passenger hub and it will remain at the current site.

[18] https://www.horizons.govt.nz/HRC/media/Media/Bus-Route-Timetable/Feilding-Bus-Timetable-22072019.pdf?ext=.pdf
[19] Horizons, Public Transport Services Report. https://www.horizons.govt.nz/HRC/media/Media/Agenda-Reports/Passenger-Transport-Committee-2020-18 02/2007%20Annex%20A%20Public%20Transport%20Services%20Report.pdf
[20] https://railnewzealand.com/train-services/local-trains

5.5 Existing Walking and Cycling Facilities

Palmerston North has an extensive network of shared pathways[21], making it easier and safer for people on bikes to get around the city. Figure 5-6 shows that there is a distinct lack of cyclist facilities surrounding the RFH. A portion on the existing cycleway does lie along Railway Road south of Roberts Line. The RFH will provide an opportunity to investigate an extension of this cycleway link along the perimeter road.

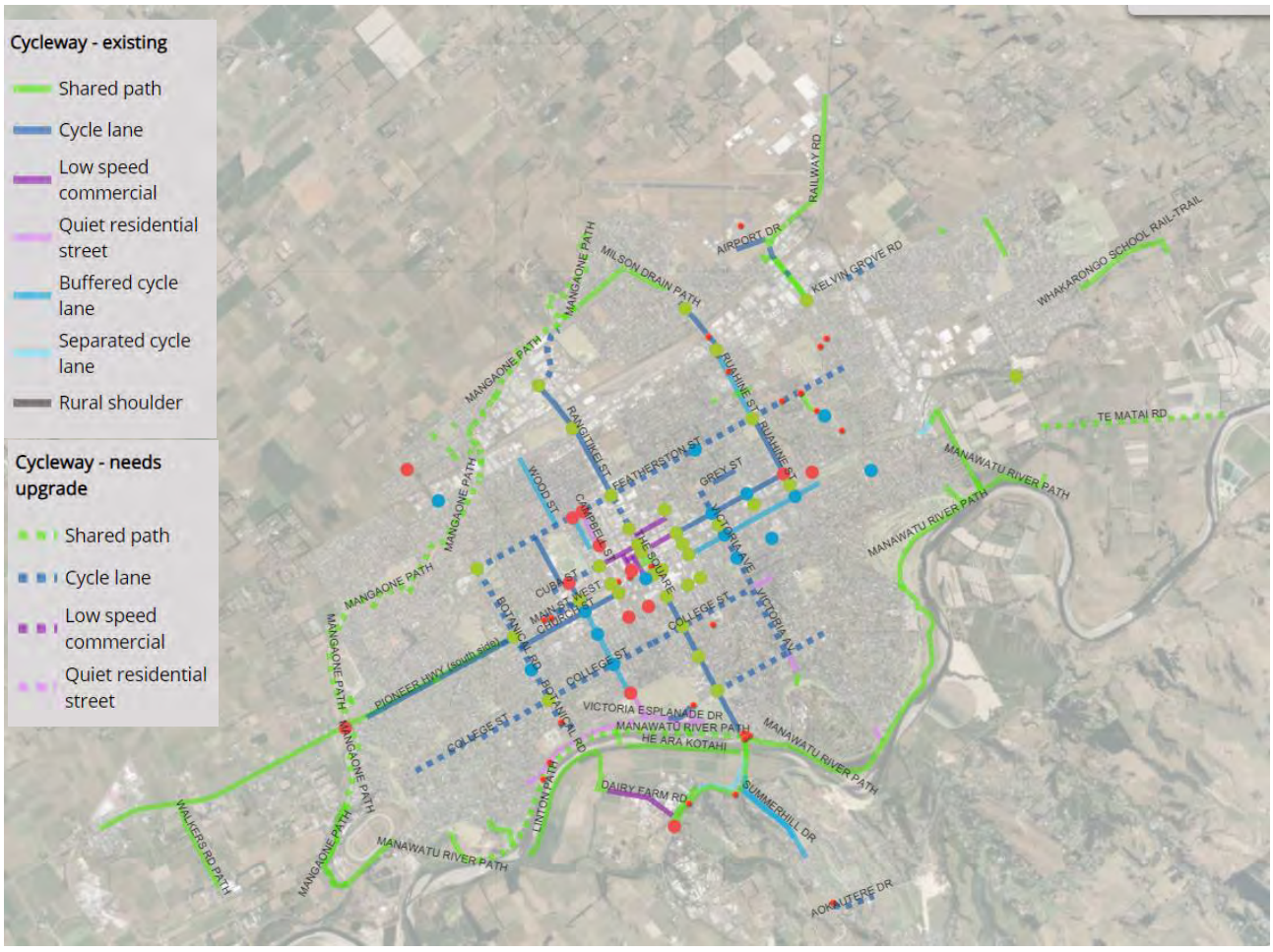


Figure 5-6. Existing and planned cycleway and shared paths in Palmerston North

There are no pedestrian facilities provided on the road network surrounding the proposed RFH site. The road network surrounding the site typically has no shoulders, footpaths or other mobility facilities, such a pedestrian ramp.

The Te Araroa New Zealand Trail[22] runs between Feilding and Palmerston North. From Feilding, this route follows Campbell Road, switching to Waughs Road at the level crossing[23] , accessing Stoney Creek Road via Bunnythorpe, then traverses Sangsters Road before joining the shared path along Railway Road south of the Roberts Line intersection. The trail is shown by the red line in Figure 5-7. In addition, the traffic route alongside this route is indicated in yellow, showing a shift in traffic route from Waughs Road onto Campbell Road, while the trail route transfers from Campbell Road to Waughs Road, indicating the clear difference in independent road user routes.

In addition, as part of the proposed Palmerston North to Feilding active mode connectivity project[24] the preferred option (Route 1A-Route 2C-Route 3A, shown in Appendix B) details on and off-road walking and

[21] https://www.pncc.govt.nz/services/transport/bike-palmy/online-bike-maps/cycle-routes/
[22] https://www.teararoa.org.nz/manawatu/palmerston-north/
[23] https://www.teararoa.org.nz/userfiles/file/tracknotes/Manawatu.pdf
[24] Active Mode Connectivity Palmerston North to Feilding Single Stage Business Case Report, Beca Limited, 15 August 2019

cycling routes, and is planned to follow the Te Araroa New Zealand Trail, therefore it is anticipated that the RFH will have little impact on this proposed connectivity project.

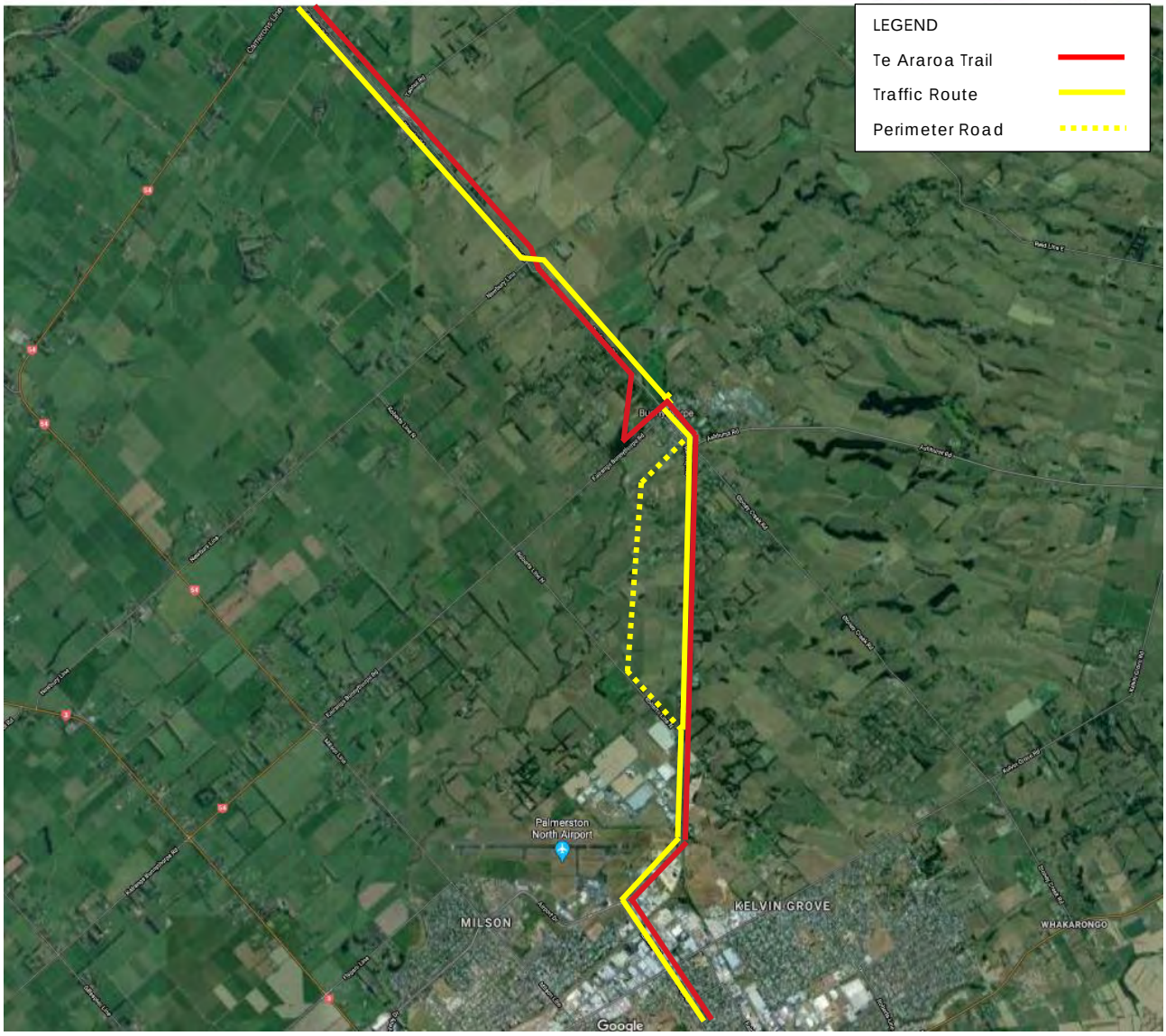


Figure 5-7: Te Araroa Trail

It is expected that the RFH will provide opportunities for improvements to the Te Araroa Trail since the expected traffic increase on the road network as a result of the RFH will not overlap the Te Araroa trail, considering the separated trail and traffic routes discussed earlier.

5.6 Road Safety Analysis

5.6.1 Road Safety Risk

The Waka Kotahi Mega Maps[25] tool was used to investigate the existing road safety risk for the network surrounding the RFH. Two risk profiles were checked for the existing road network:

- the Collective Risk; and
- the Infrastructure Risk Rating (IRR).

[25] MegaMaps - https://megamaps.abley.com/Maps/

Collective Risk[26] is a measure of the total number of fatal and serious injury crashes per kilometre over a section of road, highlighting which road links have a high number of these crash types. This is used to help determine where the greatest road safety gains can be made from investment. The study area was assessed for the existing conditions and the results are shown in Table 5-3.

The IRR assessment presents the proactive risk rating of road segments. IRR is based on nine variables that have a significant influence on determining road safety risk. It is determined independently of crash history and represents the underlying risk inherent to the road based on the engineering features of the road. The IRR has been assessed for the existing infrastructure and is also shown in Table 5-3.

Table 5-3: Collective Risk and IRR for key roads in the study area under existing conditions

Road	Section Impacted	Collective Risk	Traffic brackets (ADT)	Infrastructure Risk Rating
SH3	Newbury Line - Tremaine Ave	High	6000-12000	Medium
SH54	Kairanga Bunnythorpe Road - Waughs Road	Medium High	6000-12000	Medium
SH56	Longburn Rongotea Road – Amberley Avenue	Medium	6000-12000	Medium
Railway Road	Kairanga Bunnythorpe Road - El Prado Drive	Medium High	1000-6000	Medium High
Kairanga Bunnythorpe Road	SH3 - Campbell Road	Medium High	1000-6000	Medium High
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	Medium	6000-12000	Medium High
Ashhurst Road	Campbell Road – Raymond Street	Low	1000-6000	Medium High
Tremaine Avenue	SH3 – McLeavey Drive	Medium	6000-12000	Medium
Stoney Creek Road	Campbell Road – Kelvin Grove Road	Low Medium	1000-6000	Medium
Waughs Road	SH54 – to Feilding	Medium	1000-6000	Medium
El Prado Drive	Railway Road – Alderson Drive	Low	1000-6000	Low
Roberts Line	Railway Road - Kairanga Bunnythorpe Road	Medium	<1000	Medium
Richardsons Line	Milson Line – Roberts Line	Medium	<1000	Medium High
Clevely Line	Te Ngaio Road – Railway Road	Low	<1000	Medium High
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	Low	<1000	High

Where a road has two different collective risk and infrastructure risk ratings in the Mega Maps Tool (due to the road being composed of multiple sections), the worst rating has been reported in Table 5-3.

The existing infrastructure issues on portions of Railway Road, Kairanga Bunnythorpe Road, Ashhurst Road, Richardsons Line and Clevely Line are due to their rural road formations, with typically narrow lanes without shoulders and unprotected power poles and other infrastructure along the length of these roads. The high-risk rating on Te Ngaio Road is due to the number of intersections along the road, narrow lanes without shoulders and unprotected power poles and one lane bridge. There are planned upgrades for some of these roads, as discussed in more detail in Section 10.4.

Campbell Road has wider lanes, also without shoulders, and no edge barriers to protect traffic against the roadside hazards. This, together with the higher heavy vehicle numbers travelling this road are factors causing the medium-high rating.

Excerpts from Waka Kotahi MegaMaps tool highlighting the collective risk and infrastructure risk rating are shown in Figure 5-8 and Figure 5-9 respectively.

[26]http://www.kiwirap.org.nz/measures_risk.html#:~:text=Collective%20Risk%20is%20a%20measure,described%20as%20the%20Crash%20Density).

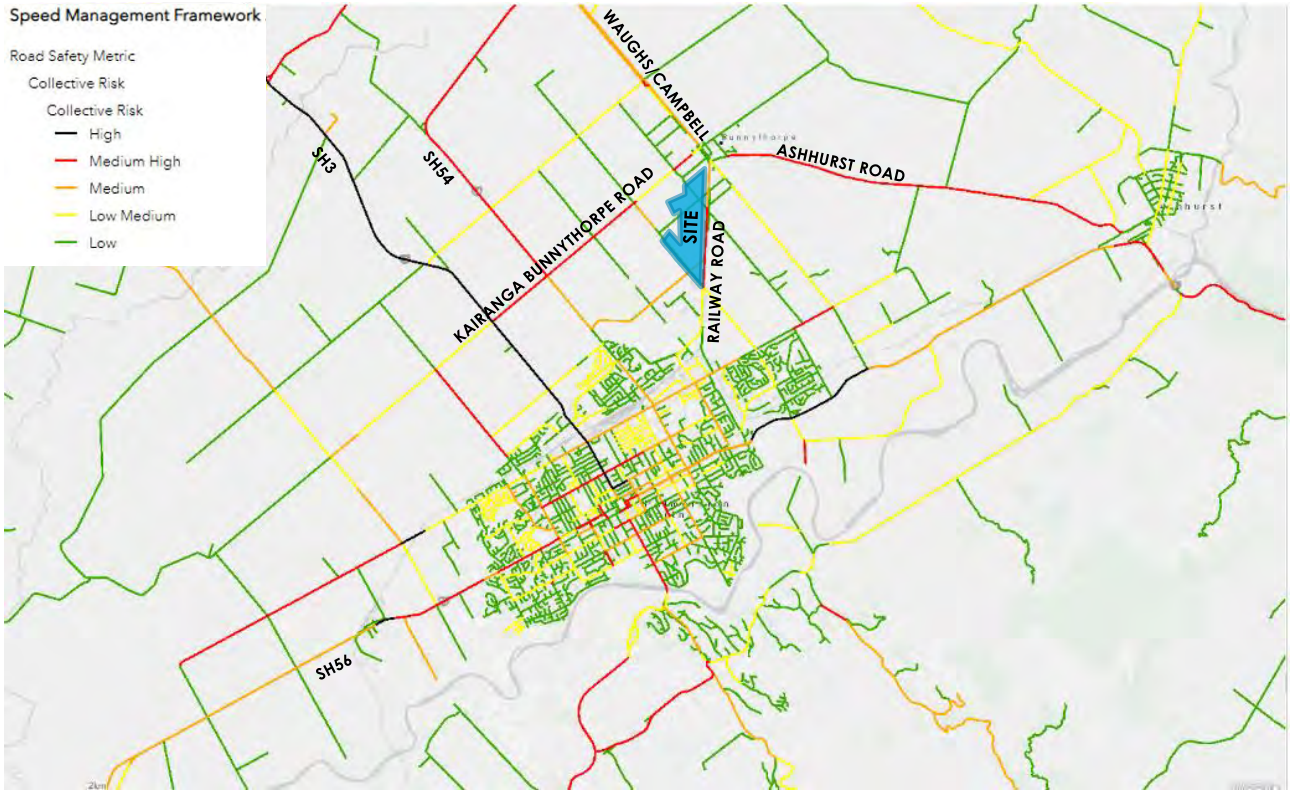


Figure 5-8: Existing Collective Risk for the Study Area

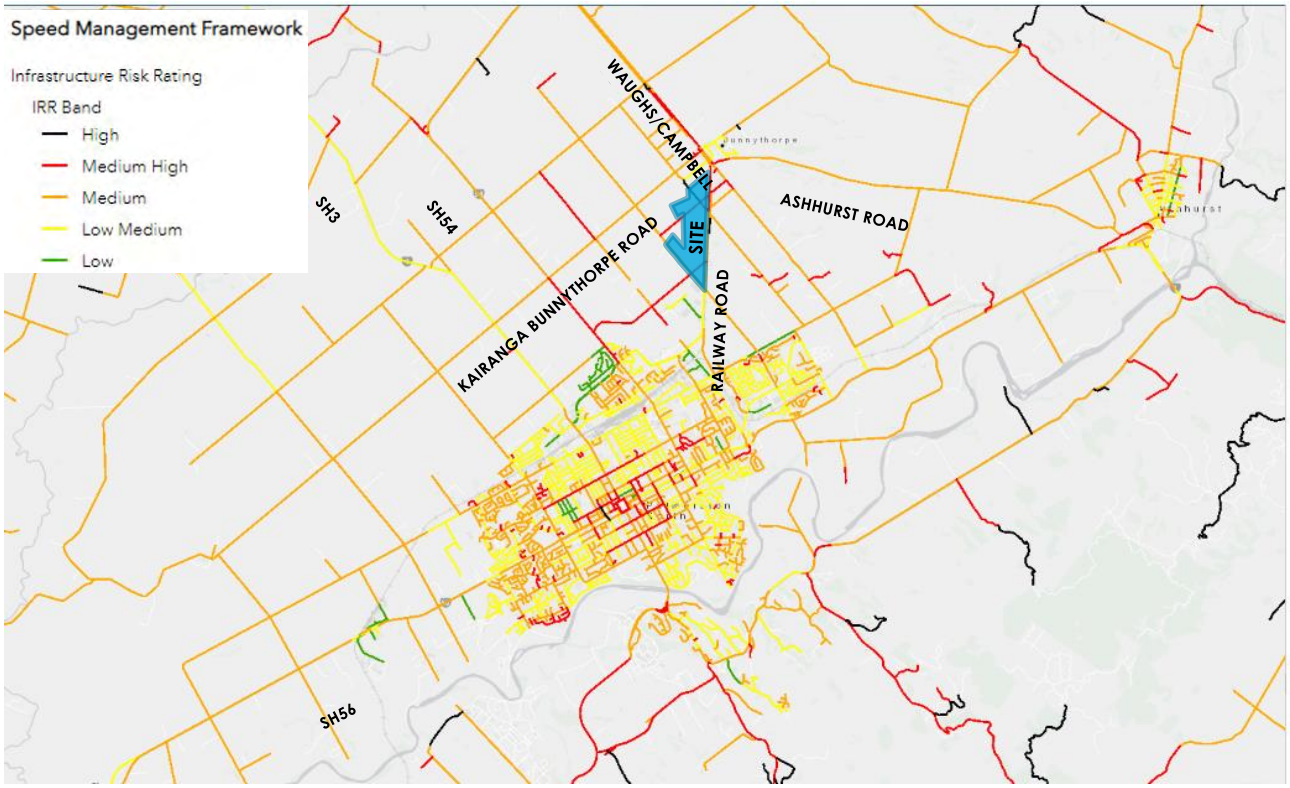


Figure 5-9: Existing Infrastructure Risk Rating (IRR) for the Study Area

Analysis of the MegaMaps tool shows that the risk around the RFH has a relatively low collective risk (in part due to lower traffic volumes in the area and the low number of fatal and serious injury crashes on them), but a higher infrastructure risk rating IRR, due to the rural nature of the surrounding road network. The low crash numbers indicate that there are no obvious faults with the existing road network in terms of safety risk, however the IRR highlights that the road network provides little protection should a crash occur.

In addition, a search for high risk intersections was completed using the MegaMaps tool. The search returned five high-risk intersections within the study area, shown in Figure 5-10.

Three of the five intersections lie along State Highway, which have high traffic volumes and priority-controlled intersections. Four of these intersections have been reported on throughout this study.

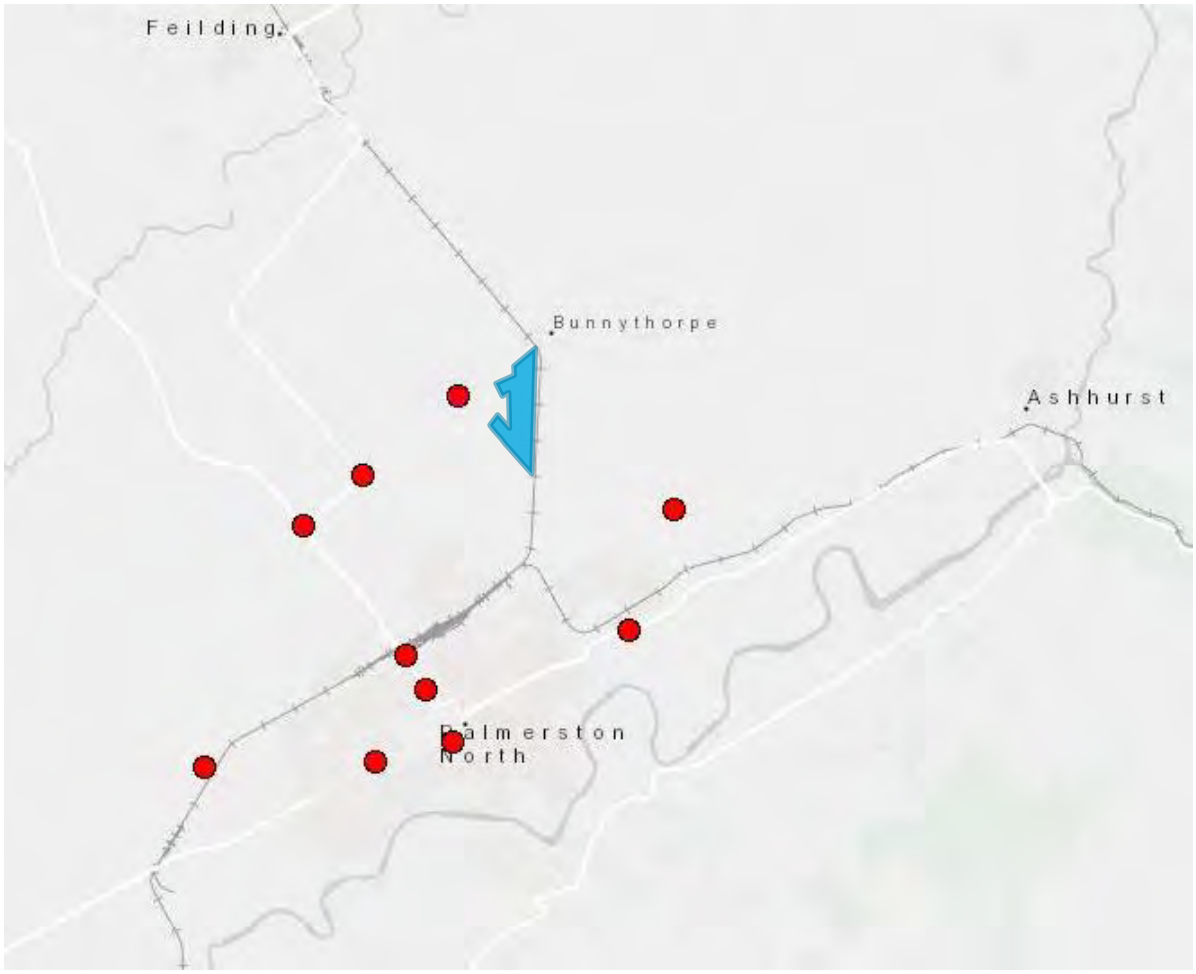


Figure 5-10: Existing High Risk Intersections

5.6.2 Crash Analysis System

A search of Waka Kotahi's Crash Analysis System (CAS) has been undertaken for the primary area within the study area. This area incorporates the key infrastructure that is expected to be impacted by the RFH. The assessment was undertaken to establish existing road safety patterns surrounding the proposed RFH site. Data for the 2015-2019 period (being the most recent full five-year period usually adopted for such safety reviews) identified a total of 80 reported crashes.

Key crash causes are reported as involving:

- drivers losing control and going off the roadway
- vehicle colliding at intersections
- cyclists, which were involved in two crashes in Bunnythorpe

The crash years and associated coding by severity are displayed in Table 5-4. Other than a low number of crashes in 2016, there is no clear crash trend over the past five years.

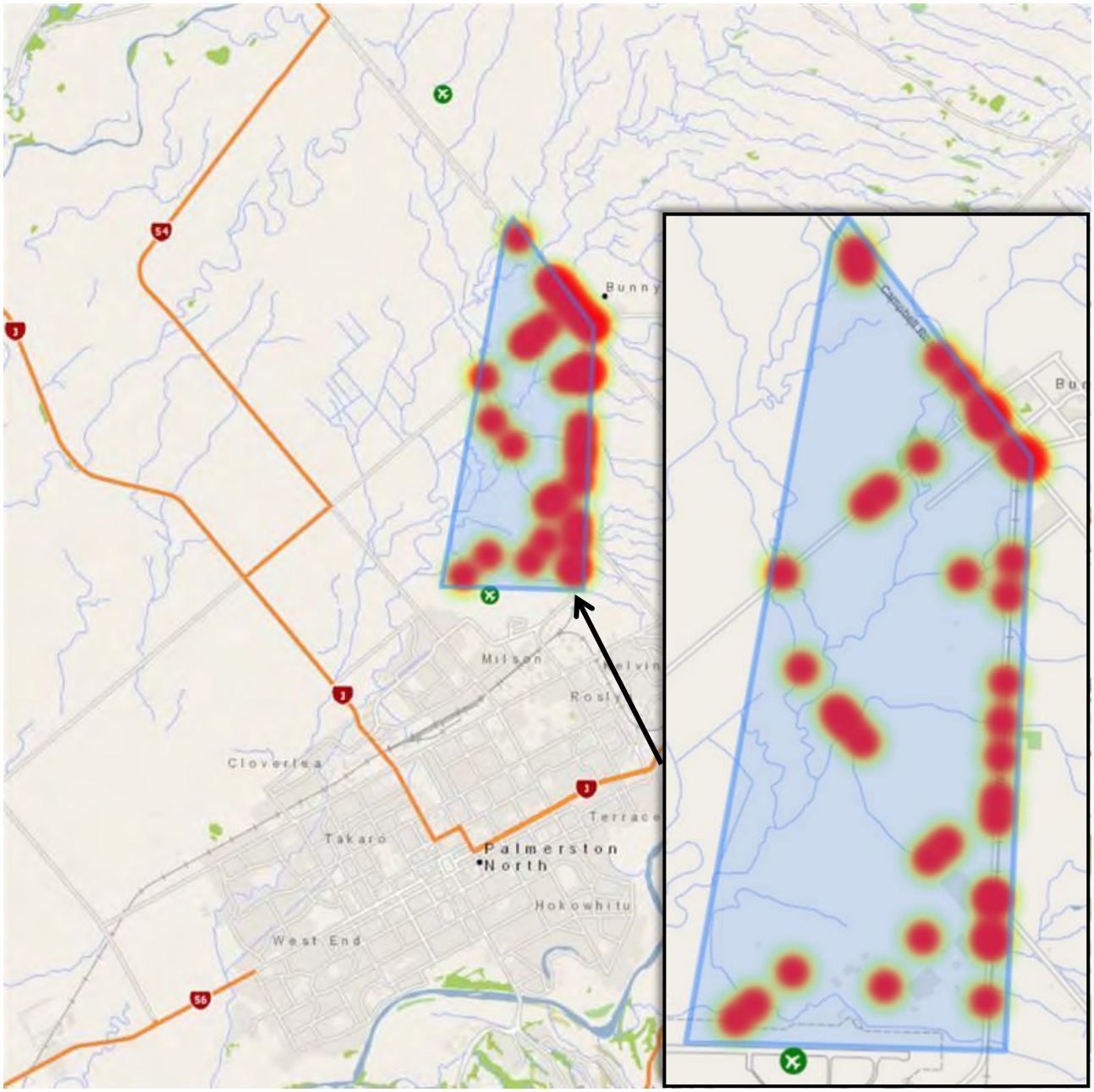


Figure 5-11: Crash location (2015-2019)

Table 5-4. Crash Severity between 2015 and 2019

Year	Severity				Total
	Non-injury	Minor	Serious	Fatal	
2015	10	1	0	0	11
2016	4	1	1	0	6
2017	16	3	4	1	24
2018	9	5	1	1	16
2019	17	5	1	0	23
Total	56	15	7	2	80

Considering the national focus on serious and fatal injury crashes, the nine serious and fatal injury crashes that occurred around the primary study area between 2015 and 2019 were investigated further. These crashes occurred on four roads:

Five crashes on Railway Road - all incidents occurred at intersections - two at the El Prado Drive intersection, and three at the Roberts Line intersection. While beyond the five-year safety review period, it is relevant to reference August 2020's double-fatal crash also at the Roberts Line intersection[27]. Upgrades are planned at both intersections and interim improvements have been undertaken by PNCC at the Robert Line intersection. More recently, in September, there was a school bus/train collision at the Clevely Line level crossing[28], which resulted in one fatality.

Two on Kairanga-Bunnythorpe Road - one occurred on a straight where the driver, suspected to be under the influence of drugs, failed to take a corner, and a loss of control crash.

One on Campbell Road – this incident was caused by a driver U-turning in front of other traffic.

One on Stoney Creek Road – this incident was caused by loss of control on a straight and involved a single vehicle.

Of the 80 crashes between 2015 and 2019, 10 involved trucks of these, seven occurred at intersections that carry a high percentage of heavy vehicles, listed below, with the remaining three being non-injury truck crashes elsewhere:

- Campbell Road/Kairanga Bunnythorpe Road
- Railway Road/Cleverly Line

Railway Road/Roberts Line (north)

In addition to the reported truck crashes, three crashes involving buses were recorded. These occurred at the following intersections:

- Campbell Road/Kairanga Bunnythorpe Road
- Railway Road/Cleverly Line
- Railway Road/Kairanga Bunnythorpe Road.

Further safety risk assessments are included in Section 10.4

5.6.3 ALCAM and LCSIA Overview

This section of the report presents the scores for the existing and proposed level crossings. Within New Zealand, the ALCAM assessment forms part of the Level Crossing Safety Impact Assessment (LCSIA). The LCSIA is a comprehensive risk process which takes into account additional factors not captured by ALCAM, such as crash and incident data, the site-specific safety factors and both roading and locomotive engineer's risk scoring at these crossings. The LCSIA Level Crossing Safety Score (LCSS) is 60 points, of which 50% comprises the ALCAM score, with the remaining 50% provided by the other three components discussed above.

KiwiRail uses the LCSIA to support decision making for new crossings or a 'Change in Use' at existing level crossings, as well as identifying the treatment required to mitigate the crash risk at a new or existing crossing. KiwiRail requires new crossings to have a 'Low' (LCSS≤19) or 'Medium-Low' (LCSS 20≤x<30) risk score (also defined as *Criterion 1*[29]). Figure 5-12 below shows the LCSS risk bands. Where changes to an existing facility are proposed, the revised crossing must meet *Criterion 1*. To do so, mitigating safety improvements are required. Where the modifications required to meet *Criterion 1* are not reasonably practicable, then a documented risk assessment discussion with KiwiRail is undertaken to agree on the required crossing treatment.

[27] https://www.stuff.co.nz/manawatu-standard/news/300080048/two-die-in-palmerston-north-collision-between-truck-and-car
[28] https://www.stuff.co.nz/national/300108355/forty-children-treated-for-injuries-after-school-bus-crashes-into-train
[29] Refer to section 2.2 of the Level Crossing Risk Assessment Guidance (October 2018).

Figure 5-12: LCCS Risk Bands

A high-level ALCAM assessment has been undertaken to provide an indication of the likely risk at these crossings and to identify any issues for subsequent development phases.

Five level crossings have been assessed and are shown in Figure 5-13. The NIMT is owned and operated by KiwiRail. All assessments are based on current train and road traffic volumes.

Only the ALCAM and Crash / Incident data have been assessed, as assessment of the other two components requires on-site inspection and discussion with both KiwiRail / PNCC as part of the formal LCSIA process.

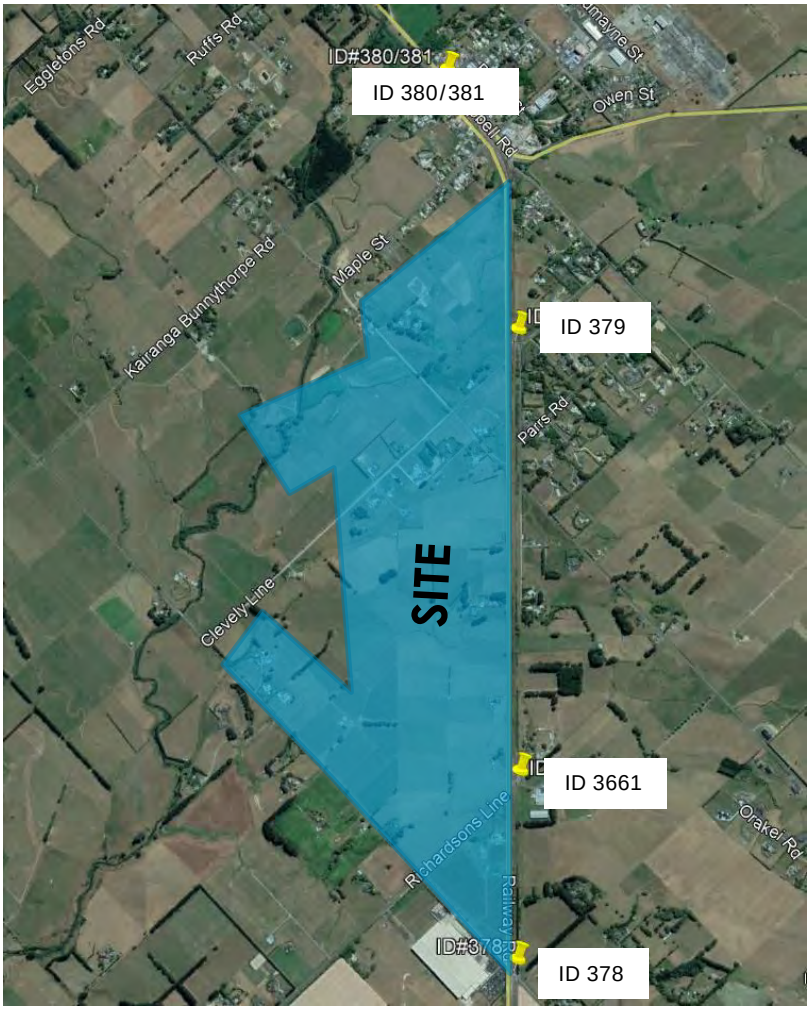


Figure 5-13: Level Crossing Locations

5.6.3.1 Kairanga – Bunnythorpe Road Crossing

ALCAM Road Crossing (ALCAM ID#380)

This level crossing is owned and operated by KiwiRail. The existing ALCAM risk band is High[30]. The predicted return fatal collision period is 147 years, meaning that during this period it is likely that a fatal collision will occur[31]. Factors contributing to the high ALCAM risk band and predicted fatality period include:

- High train speeds
- Train lengths
- Short stacking and queuing from the Kairanga-Bunnythorpe Road / Campbell Road intersection over the railway tracks
- High proportion of heavy vehicles
- Possible sun glare at crossing

The ALCAM score for this crossing equates to 26 points in the LCSS. A review of the KiwiRail incident recording database (IRIS) has identified one incident in the past 10-years at this level crossing. This was a near-miss incident with a heavy vehicle fouling the line. Such an incident would add a further three points

[30] A high-risk band means that the crossing falls in the 80+ percentile (i.e. highest 20%) group of crossings within New Zealand.
[31] The shorter a fatal return period, the more likely a fatal collision is to occur and hence the more high risk a crossing is.

to the LCSS – hence 29 points. If the other LCSIA components not assessed here were in fact included, the crossing would not meet Criterion 1 (LCSS<30), noting that although a LCSIA is required to confirm this (and should be undertaken once the scope of infrastructure works have been confirmed), given the high scoring of the ALCAM component. If the crossing does not meet Criterion 1, then the crossing treatment will have to be reviewed to determine whether it can be made safer.

ALCAM Pedestrian Crossing (ALCAM ID #381)

The existing ALCAM risk band is Medium-High[32]. The Pedestrian ALCAM model is un-dimensioned and does not provide the return on fatality period. Factors contributing to the medium-high ALCAM risk band include:

- High train speed at crossing
- Significant percentage of vulnerable road users

The ALCAM score in an LCSS assessment would equate to 21 points in an LCSIA, which is at the lower of the Medium-Low risk band. No incidents within the last 10 years were identified in the IRIS database for this crossing. However, the other components of the LCSS score not assessed here would have to be considered to determine whether the crossing remains in the 'Medium-Low' risk band i.e. meet Criterion 1.

5.6.3.2 Clevely Line Crossing

ALCAM Road Crossing (ALCAM ID#379)

This level crossing is owned and operated by KiwiRail. The ALCAM risk band is High and the predicted return period for fatal crashes is 76 years, which means this crossing is considered high risk. The ALCAM score in an LCSS assessment would equate to 28 points in an LCSIA. While only a single vehicle incident near-miss is reported IRIS there has been a very recent (mid-September 2020) fatal crash at this crossing. The fatal crash means the crossing would score the maximum 10 LCSS points for the incident assessment component. The combined score for the two assessed components is thus 38 points and fails to Criterion 1.

Factors contributing to the medium-high ALCAM risk band include:

- High train speeds
- Train length
- Queuing and short stacking
- Inadequate sightlines

This level crossing is proposed to be closed in response to the RFH development.

5.6.3.3 Richardsons Line

ALCAM Road Crossing (ALCAM ID#3661)

This level crossing is privately owned and operated. The ALCAM risk band is High and the predicted return period for fatal crashes is 209 years. The ALCAM score in an LCSS assessment would equate to 26 points in an LCSIA. No incidents relating to this crossing have been recorded in IRIS, nonetheless, based on the high ALCAM score it is unlikely that the crossing will meet Criterion 1. Factors contributing to the high ALCAM risk band include:

- High train speeds
- Train length
- Queuing and short stacking
- Inadequate sightlines
- Poor road condition
- Sun glare

This level crossing is proposed to be closed in response to the RFH development.

[32] A medium-high risk band means that the crossing falls in the top 60-80 percentile group of crossings within New Zealand.

5.6.3.4 Roberts Line Crossing

ALCAM Road Crossing (ALCAM ID#378)

This level crossing is owned and operated by KiwiRail, the ALCAM risk band is High and the predicted return period for fatal crashes is 80 years, which means this crossing is considered one of the riskiest in New Zealand and very high risk. The ALCAM score in an LCSS assessment would equate to 28 points in an LCSIA. The two incidents, one near-miss and one very near-miss, would add a further three points to the LCSS bringing the total from the two assessed components to 31 i.e. the crossing would not meet Criterion 1. I

- High train speeds
- Train length
- Queuing and short stacking
- Sun glare

This level crossing is proposed to be closed in response to the RFH development.

6. Existing Traffic Demand and Generation

Several activities are currently undertaken at the existing freight yard along Tremaine Avenue, accessed through separate gates along Tremaine Avenue. A list of activities and operational areas can be found in the Concept Design Report – Intermodal Freight Hub [33], with a summary of those activities and associated areas (used later to calculate trip generation rates)that are traffic generating shown in Table 6-1. The traffic generating activities have been categorised into four land use types:

1. Depots
2. Freight Forwarders
3. Container Terminal
4. Log

These categories cater for all operational activities anticipated at the RFH.

Table 6-1: Land Use Categorisation of existing traffic generating activities at the existing freight yard

Gate	Intersection Name	Land Use Category	Area at existing freight yard	Approx. Area (m^2)
Gate 1	Tremaine Avenue/Matthews Avenue	Depots	KiwiRail Network depot	19,440
Gate 2	Tremaine Avenue/Toll Access	Freight Forwarders	Toll	14,930
		Freight Forwarders	Hall	9,725
Gate 3	Tremaine Avenue/North Street	Container Terminal	KiwiRail Container terminal	14,040
		Freight Forwarders	Mainfreight	22,570
Gate 4	Tremaine Avenue/Log Access	Depots	KiwiRail Mechanical depot	36,200
		Depots	KiwiRail North of mech depot	9,890
		Logs	Logs	14,700

Other non-traffic generating areas including marshalling yards, storage and other surface and common areas comprise the balance of the 40-hectare site.

6.1 Existing Traffic Counts

A seven day, 24-hour, traffic count was undertaken at each of the four gate accesses listed in Table 6-1, in September 2019. A summary of the daily traffic volumes recorded at each gate is presented next in Figure 6-1.

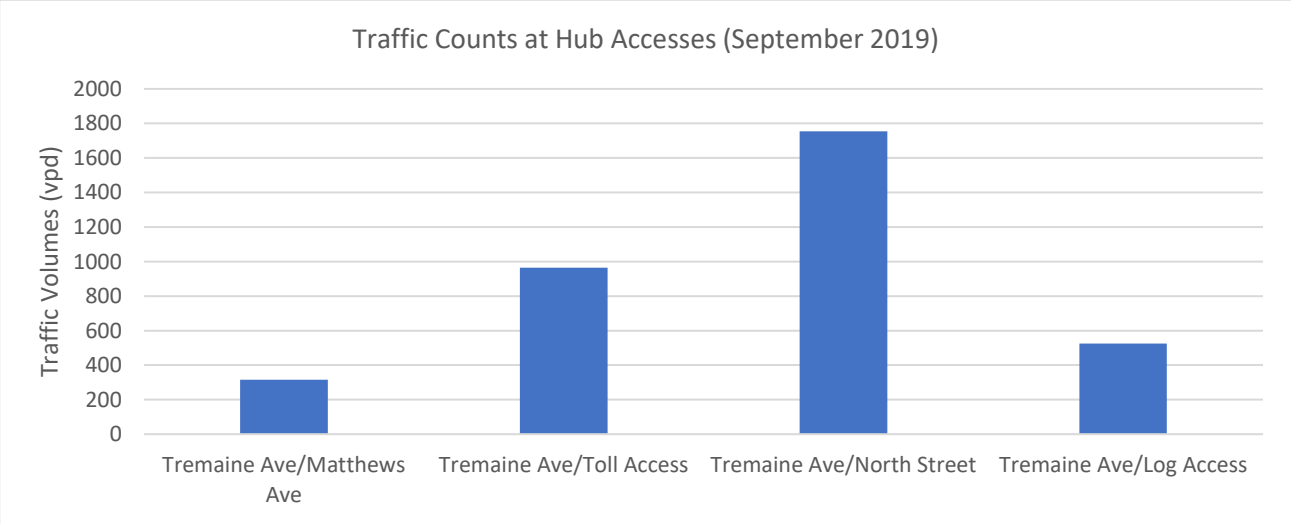


Figure 6-1: September 2019 Traffic Counts

[33] CONCEPT DESIGN REPORT – INTERMODAL FREIGHT HUB prepared for KiwiRail, Stantec, April 2020.

These counts have provided the primary source of information for this study in terms of the actual traffic demands at the existing site and potential traffic generating ability of the RFH. Due to Covid-19, which continues to influence travel behaviours and traffic demands, and appear to be unstable for the foreseeable future, additional traffic count surveys have not been undertaken. In light of this, a calibration was undertaken based on available commodity data and local knowledge to ensure these counts represent the best available data of traffic demand at the existing site on an annual basis. These calibrated traffic volumes are considered reasonable for the purposes of this assessment.

An analysis of the September 2019 traffic counts shows that traffic accessing the existing freight yard is reasonably consistent throughout the day, as displayed in Figure 6-2. Also included in the same figure is traffic travelling along Tremaine Avenue which experiences similar AM and PM peak flows, with the PM peak sustained for a longer period.

To better establish the peak hour, since it is acknowledged that the count presents only one week of data, traffic along State Highway 3 (north and west), State Highway 54 and State Highway 56 have also been assessed using the Waka Kotahi's Traffic Monitoring System. Like Tremaine Avenue, Figure 6-3 also shows that the PM peak hour is higher and longer sustained on the surrounding network. Therefore, only the PM peak has been adopted as the assessment period for this study.

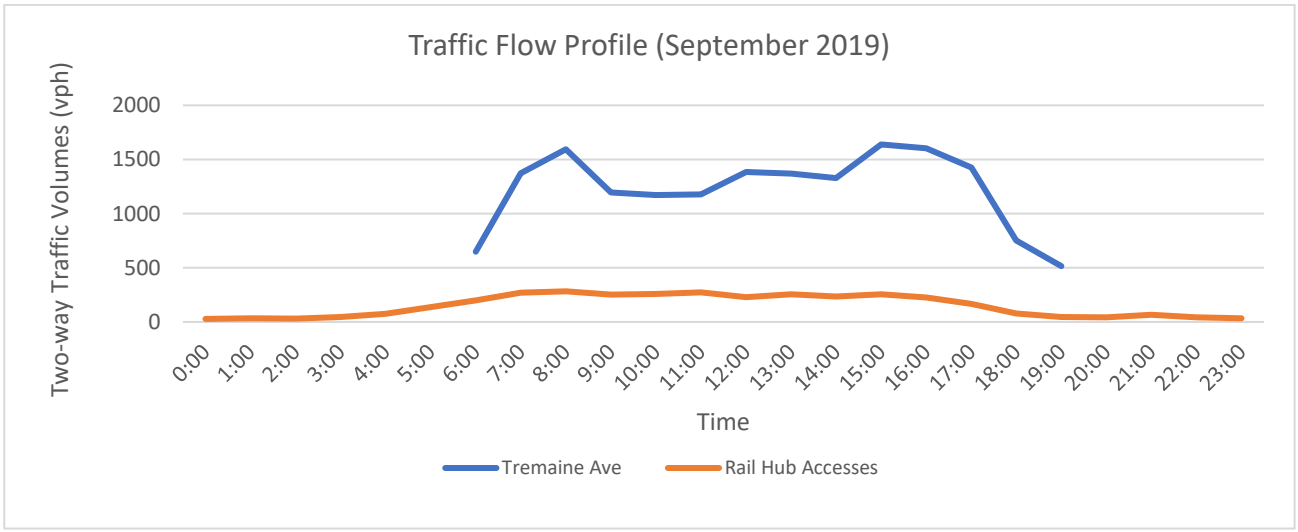


Figure 6-2: Traffic Profiles around the existing freight yard (September 2019)

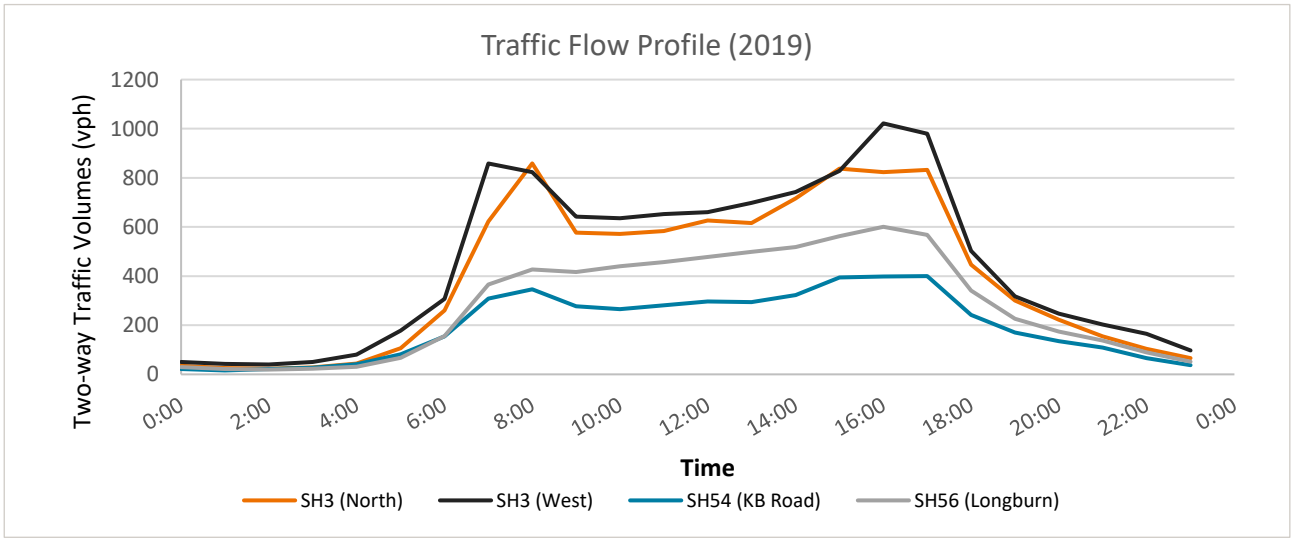


Figure 6-3: State Highway traffic profile (2019)

The September 2019 gate volumes do not show variations throughout the year due to the one-week duration of the traffic count. Therefore, rail freight commodities through Palmerston North for 2018 were used to calibrate the surveyed vehicle volumes, based on the assumption that the rail commodity throughput has a direct correlation with vehicle traffic demand.

The analysis showed that September was below the average month for freight throughput, representing 86% of the average month. Although it is understood that most of the freight does not leave the existing freight yard, this does indicate that in September the freight yard is less busy than an average month, demonstrating that the traffic generated in September will be lower than the average month.

Therefore, it was assumed that the September 2019 traffic counts represent 86% of average traffic through the site and the surveyed volumes were scaled to match the average month. Table 6-2 shows the surveyed and scaled traffic count volumes at the existing site.

Table 6-2: Traffic Demand at the existing freight yard by Land Use grouping

Land Use	Surveyed	Scaled
	Traffic Demand (vpd)	Traffic Demand (vpd)
Depots	750	850
Freight Forwarders	2,450	2,850
Container terminal	300	350
Logs	150	150
TOTAL	3,650	4,200

Similarly, the light/heavy vehicle split determined using the 2019 surveyed count data (80%/20%) had to be calibrated, since the data showed a low split of heavy vehicles for the log yard operation. The data showed that the log yard generated an 85%/15% light to heavy vehicle split, while the log yard operator indicated that the split was in-fact the reverse. Similar calibration of the light/heavy vehicle split was undertaken for the other land uses at the existing freight yard, although the variations were less pronounced. The light/heavy vehicle split applied to the traffic generated at the RFH is the calibrated 60%/40%. It must be noted that this 60%/40% light/heavy vehicle split relates to the RFH hub traffic only.

It is worth noting that heavy vehicles generated by the existing freight yard vary in size, from smaller delivery vehicles to articulated trucks. Table 6-3 shows that more than 70% of Heavy Commercial Vehicles (HCV) generated are rigid trucks, with the smaller balance of heavy vehicle traffic involving articulated trucks. This classification is taken from the Vehicle Classification Scheme (Waka Kotahi 2011)[34], table shown in Appendix C. This split in heavy vehicle size is also expected at the RFH.

Table 6-3: Current HCV Traffic at the existing freight yard

Heavy Class: C5 -C8	Heavy Class: C9-C13
HCV1 and HCV2 (3-5 Axles)	HCV2 (6-11 Axles)
74%	26%

6.2 Trip Generation

To estimate the demand at the RFH, trip generation rates were developed based on available information at the existing site (traffic counts and areas) as described in Section 6.1.

Since the container terminal operation has a shared gate (Gate 3) with freight forwarders, it was difficult to determine an accurate rate based on just the gate volumes[35] and areas. Therefore, the trip generation rate for the container terminal was determined using the estimated annual Twenty-foot Equivalent Units[36] (TEU). The annual TEUs moved at the terminal were divided equally between 20 and 40-foot containers to determine the traffic demand for this operation.

Table 6-4 shows the calculated trip generation rates for each land use.

Table 6-4: Calculated Trip Generation Rates by land use based on existing freight yard

Land use	Trip Generation Rates (per 100m^2)	
	PM Peak Hour	Daily
Depots	0.11	1.25

[34] https://www.nzta.govt.nz/assets/resources/traffic-monitoring-state-hways/docs/traffic-monitoring-state-highways.pdf
[35] Due to Covid 19 additional site surveys were not undertaken
[36] Palmerston North Regional Economic Hub Phase 1 – Master Planning: Intermodal Hub Planning and Design Criteria, Richard S. Lanyi, September 4, 2019

Freight Forwarders	0.34	5.50	
Container Terminal	0.13	2.50	
Logs	0.08	1.00	

6.3 Traffic Distribution

Traffic distribution patterns are included in the distribution profile established within the PNATM.

Priority routes for HCV[37] to and from Palmerston North have been identified by other recent studies and are shown in Figure 6-4. These routes have been verified using the NEIZ freight demand route study[38]. These sources all show SH3, SH56, Waughs Road/Campbell Road and Ashhurst Road as the primary truck routes to and from Palmerston North. These routes have been applied to the RFH, with the assumed percentage split by route, determined using TMS[14] data, shown in the same Figure 5-5.

Within the study areas, according to the PNCC District Plan: *The Council's approach to managing the road network in this area of the City is to promote Roberts Line, Kairanga-Bunnythorpe Road and Railway Road as a strategic route for freight movement*. Therefore, it is expected that these routes will also be utilised by RFH.

It has been assumed that the heavy vehicle traffic generated by the RFH will have a 25% external traffic attraction (external to the modelled area) and a 75% local attraction (within the current modelled area). External/internal splits for other heavy vehicles has been left unchanged in the model.

[37] Palmerston North and Feilding Network Operating Framework, prepared by Abley, 2019
[38] Freight Network Demand Study, prepared by Beca, 2018

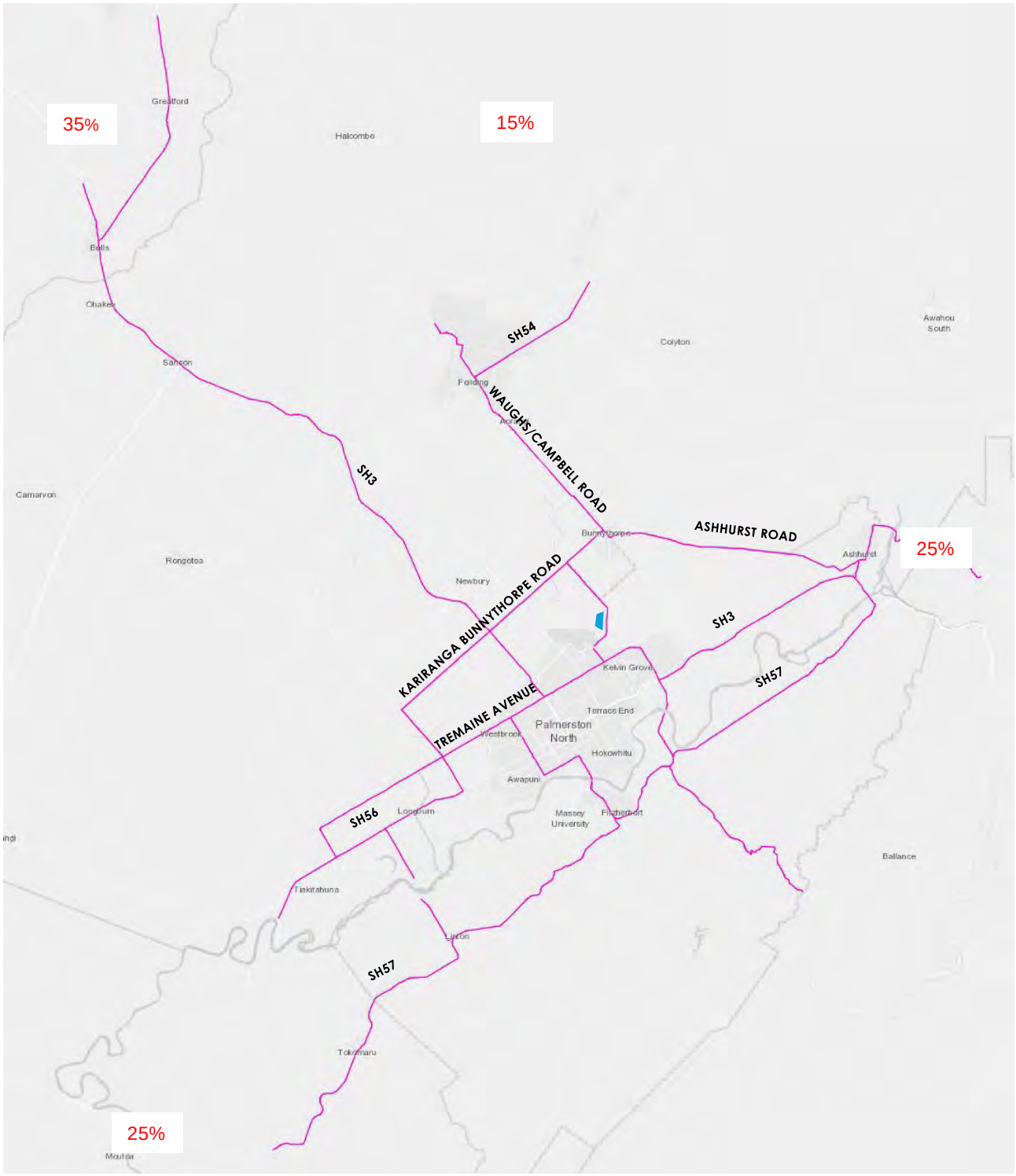


Figure 6-4: Typical Heavy vehicle strategic routes to Palmerston North

7. Roading and Land Use Analysis

This section of the report details the do minimum and planned road upgrades and approved developments around the RFH, also detailing potential development plans at the existing KiwiRail site.

7.1 Planned Infrastructure Upgrades

PNCC[39], Waka Kotahi[40] and other authorities have several infrastructure upgrades within the study area that have been allocated funding over the next 10-year period. Considering this, it is expected that these planned mitigations will be implemented within the committed timeframes to ensure the safe and efficient operation of the Palmerston North road network, regardless of planned development uptake (such as the RFH) in the area.

In light of the above, it considered a reasonable assumption that the Do-Minimum road network will be implemented before the RFH is operational and was therefore assumed in the future 'without RFH' and 'with RFH' scenarios.

7.1.1 Do Minimum Road Network

The following road upgrades have been identified in the PNCC 10-year plan[39] and Regional Land Transport Plan 2015 - 2025[41], and the Waka Kotahi National Land Transport Program[40] and form the do-minimum road network. These upgrades are anticipated to be completed through funding by PNCC and Waka Kotahi before operation of the RFH commences.

1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3
2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line
3. Kairanga Bunnythorpe Road bridge strengthening and renewal (Jacks Creek and Mangaone Stream)
4. Campbell Road - Bridge Renewal
5. Industrial Growth – NEIZ – Richardsons Line upgrade: Richardsons Line - Road widening between Milson Line and Roberts Line, and the Roberts Line to Railway Road (this section will be closed and displaced by the RFH)
6. Industrial Growth – NEIZ – Richardsons Line/Roberts Line intersection upgrade (roundabout)
7. Industrial Growth - NEIZ - Alderson Drive to Richardsons Line: New link to NEIZ off Richardsons Line and an access into existing NEIZ
8. Stoney Creek Road Safety Upgrade

In addition to these document projects that have been allocated funding, there are other upgrades that are expected as do minimum and anticipated to be in place before the RFH and are listed below

9. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line (based on District Plan detailed below)
10. El Prado Drive/Railway Road roundabout

The PNCC District Plan, Section 12A (2018)[42] states that *'The Council's approach to managing the road network in this area of the City is to promote Roberts Line, Kairanga-Bunnythorpe Road and Railway Road as a strategic route for freight movement. The road layout shown in the North East Industrial Zone Structure Plan promotes access to the south-eastern part of the Extension Area via Roberts Line and Richardson Line for this reason.'* Since the development of the NEIZ is well progressed, it is expected that these planned road improvements will be a do minimum, with Kairanga Bunnythorpe Road and Roberts Line upgraded to the PNCC Engineering Standards.

[39] https://www.pncc.govt.nz/media/3131028/10-year-plan-2018-28.pdf
[40] https://www.nzta.govt.nz/planning-and-investment/national-land-transport-programme/2018-21-nltp/regional-summaries/manawatu-whanganui-region/manawatu-whanganui-2018-summary/
[41] https://www.horizons.govt.nz/HRC/media/Media/Bus-Route-Timetable/Final-RLTP-2015-25.pdf?ext=.pdf
[42] PNCC District Plan Section 12A: https://www.pncc.govt.nz/media/3131361/section-12a-north-east-industrial-zonev6.pdf

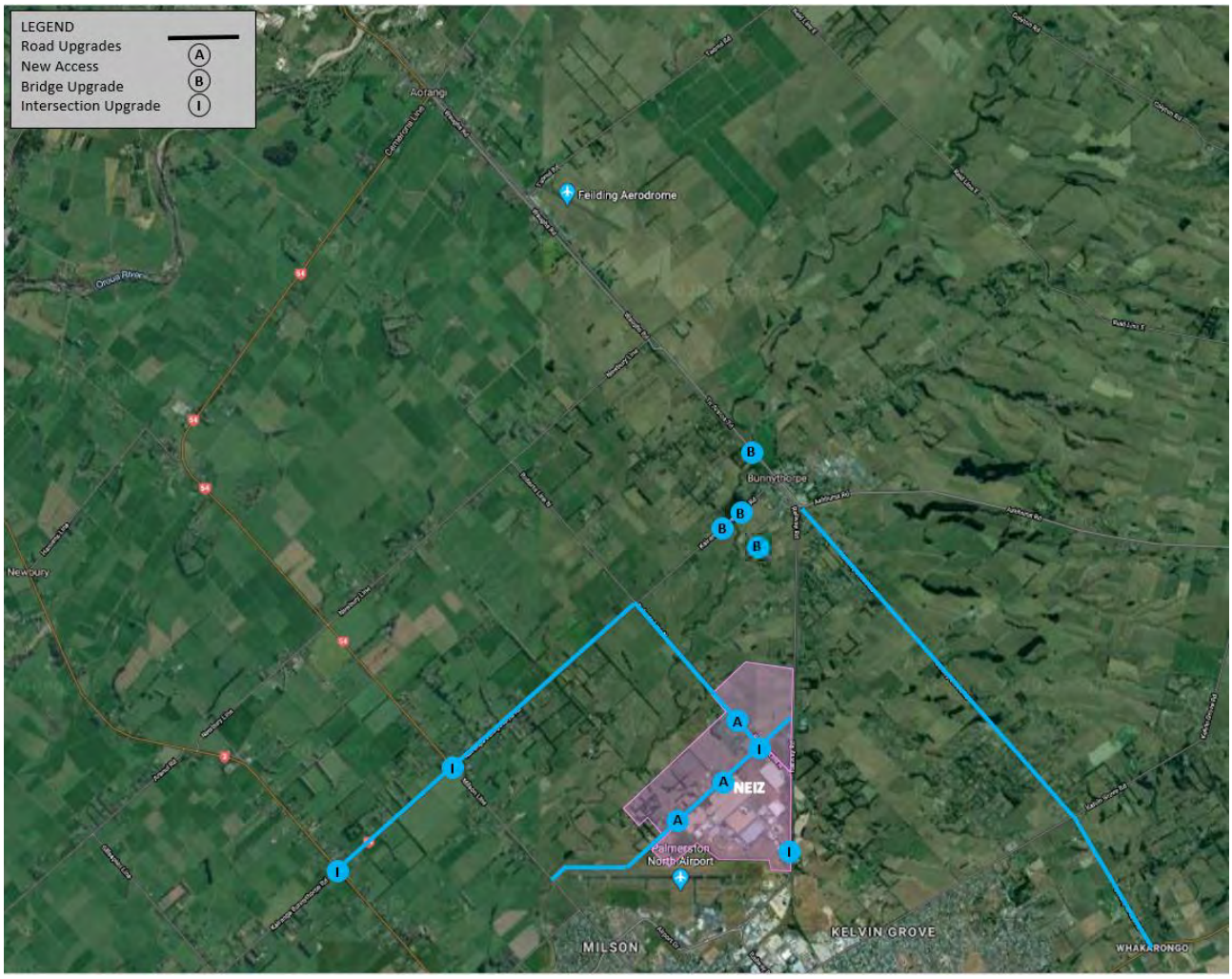


Figure 7-1: Do-minimum road network Upgrades

7.1.2 Additional Planned Infrastructure Upgrades

There are several additional road and safety upgrades planned for the study area, for which details are publicly available within PNCC's 10-Year Plan and the Regional Land Transport Plan (RLTP), which have not been tested as do-minimum but are expected to be implemented within the next 10 years. Planned projects within the study areas are listed in Table 7-1 below, noting the overlap between the 10-Year Plan and the RLTP. It is acknowledged that upgrades listed below may become redundant as a result of the RFH and future roading plans. Opportunities for the coordination of future upgrades can be addressed through the Roading Network Integration Plan

Table 7-1: Planned infrastructure upgrades

Strategic Plan	Proposed Upgrade
PNCC 10 Year Plan 2018-28[39]	Longburn Rongotea Road/No. 1 Line Intersection - Safety Upgrade
	Roberts/Railway Road North Intersection Safety Realignment
	Napier Road (SH3)/Roberts Line - Intersection Safety Upgrade
	Palmerston North to Bunnythorpe - Cycle/ Pedestrian Pathway
	Te Ngaio Road Bridge Renewal

Strategic Plan	Proposed Upgrade
	Flygers Line - Replacement of One Lane Bridge
	Railway Road - Culvert Renewal
	Upgraded Strategic Routes to HPMV Standard
	Rangitikei Street (SH3) / Featherston Street - Intersection Widening
RLTP 2015-2025[41]	Rongotea Road No 1 Line Intersection Safety Improvements
Strategic Transport Plan Palmerston North Te Kaunihera Papaioea Palmerston North City Council, Small City Benefits, Big City Ambition[43]	Milson Line Mangaone Stream Bridge

Other documented[44] strategic infrastructure improvements planned within the study areas continue to be investigated and it is understood Waka Kotahi will announce proposals for developing a strategic roading network in the near future, based largely on the upgrades included in Figure 7-2 below, which include:

1. A western bypass of Bunnythorpe – Connecting Kairanga Bunnythorpe Road to Waughs Road
2. A southern bypass of Bunnythorpe – Connecting Ashhurst Road to Kairanga Bunnythorpe Road
3. A full ring road - A regional ring road, with downstream bridge connection
4. Reclassifying Ashhurst Road from Arterial to Inter-Regional and associated road upgrades
5. Reclassifying Kairanga Bunnythorpe Road from Arterial to Inter-Regional and associated road upgrades

It is expected that these upgrades will form the ultimate road network. As details of these planned upgrades are not yet available, for the purposes of this assessment, the road network analysis was carried out without these proposed upgrades as a starting point. It is noted that the Roading Network Integration Plan, which is to be prepared, will provide that basis for a coordinated approach to the required improvements with PNCC and Waka Kotahi.

[43] https://www.pncc.govt.nz/media/3130983/strategic-transport-plan-2018.pdf
[44] Palmerston North-Manawatu Strategic Transport Study, Phase 2 Report, TDG, June 2010

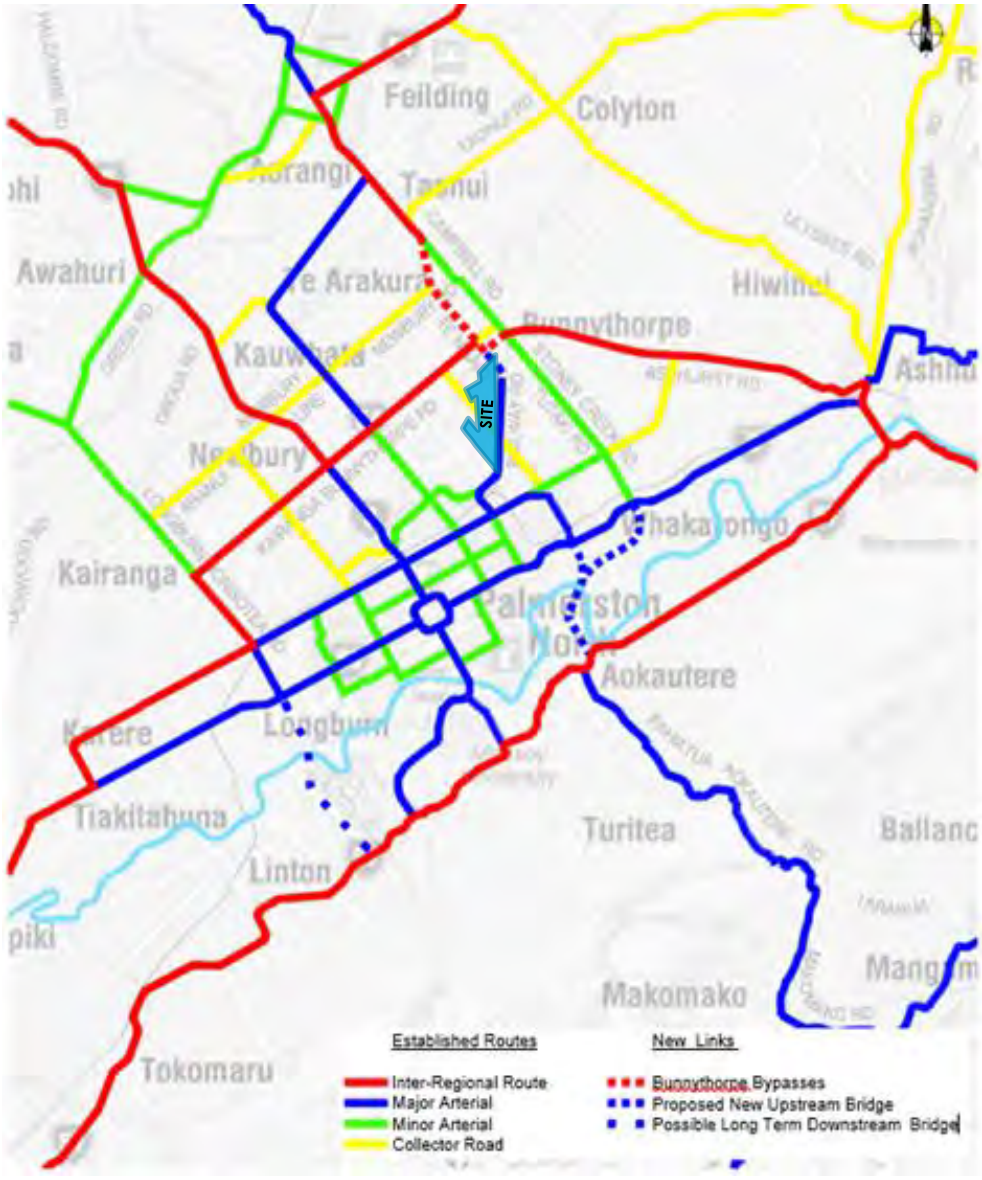


Figure 7-2: Future Planned Strategic Road Network[45]

7.2 Future Land Use

7.2.1 North East Industrial Zone

In addition to infrastructure upgrades, full development of the NEIZ[46] shown in Figure 7-3 is expected to have a significant traffic influence in the area. The PNCC District Plan, Section 12A: North East Industrial Zone, describes the zone as follows:

'A number of additions have been made to the North East Industrial Zone over the last 10 years. The original North East Industrial Zone involved rezoning 95 hectares of rural land to industrial in 2004. The Scheduled North East Industrial Zone Sites provided an additional 12 hectares of land in 2010, and the North East Industrial Zone Extension introduced 126 hectares of land in 2015.' [42]

The NEIZ zone has been applied to approximately 240ha of land. Around 36 hectares has been developed, accessed mostly via El Prado Drive with further land between Richardsons Line and El Prado Drive currently being developed.

[45] https://www.horizons.govt.nz/HRC/media/Media/Bus-Route-Timetable/Final-RLTP-2015-25.pdf?ext=.pdf
[46] Palmerston North City Council, Plan Change 15E: North East Industrial Zone Extension, Intersections Assessment Report, TDG, October 2014

The future traffic demand for the NEIZ and NEIZ extension is shown in Table 7-2 , taken from the October 2014 Intersections Assessment Report for Plan Change 15E[47]. The plan change anticipated that the total NEIZ could be fully developed by 2044, approximately six years before the full RFH development will be complete (2051).

Table 7-2: NEIZ Traffic Demand

Developments[47]	Daily traffic demand (vpd)	PM peak hour traffic demand (vph)
NEIZ to be developed (4,100vpd/13,500vpd already developed)	9,400	940
NEIZ Extension (13,500vpd)	13,500	1,350
TOTAL	22,900	2,290

Figure 7-3: North East Industrial Zone (NEIZ)

Part of the NEIZ (the NEIZ extension) was the subject of a plan change in 2015 and a portion of the RFH is planned on the land allocated to this extended area, shown as the overlap area in Figure 7-4. As a result, this assessment has utilised some of the work done for that plan change to inform this assessment.

It is calculated that 37.5% of the NEIZ extension area will be displaced by the RFH. Since traffic demand has been estimated based on area, it is assumed that 37.5% of the traffic generated by the NEIZ extension will be displaced by the RFH, and will be approximately 5,100vpd as indicated on Figure 7-4.

[47] Palmerston North City Council, Plan Change 15E: North East Industrial Zone Extension, Intersections Assessment Report, TDG, October 2014

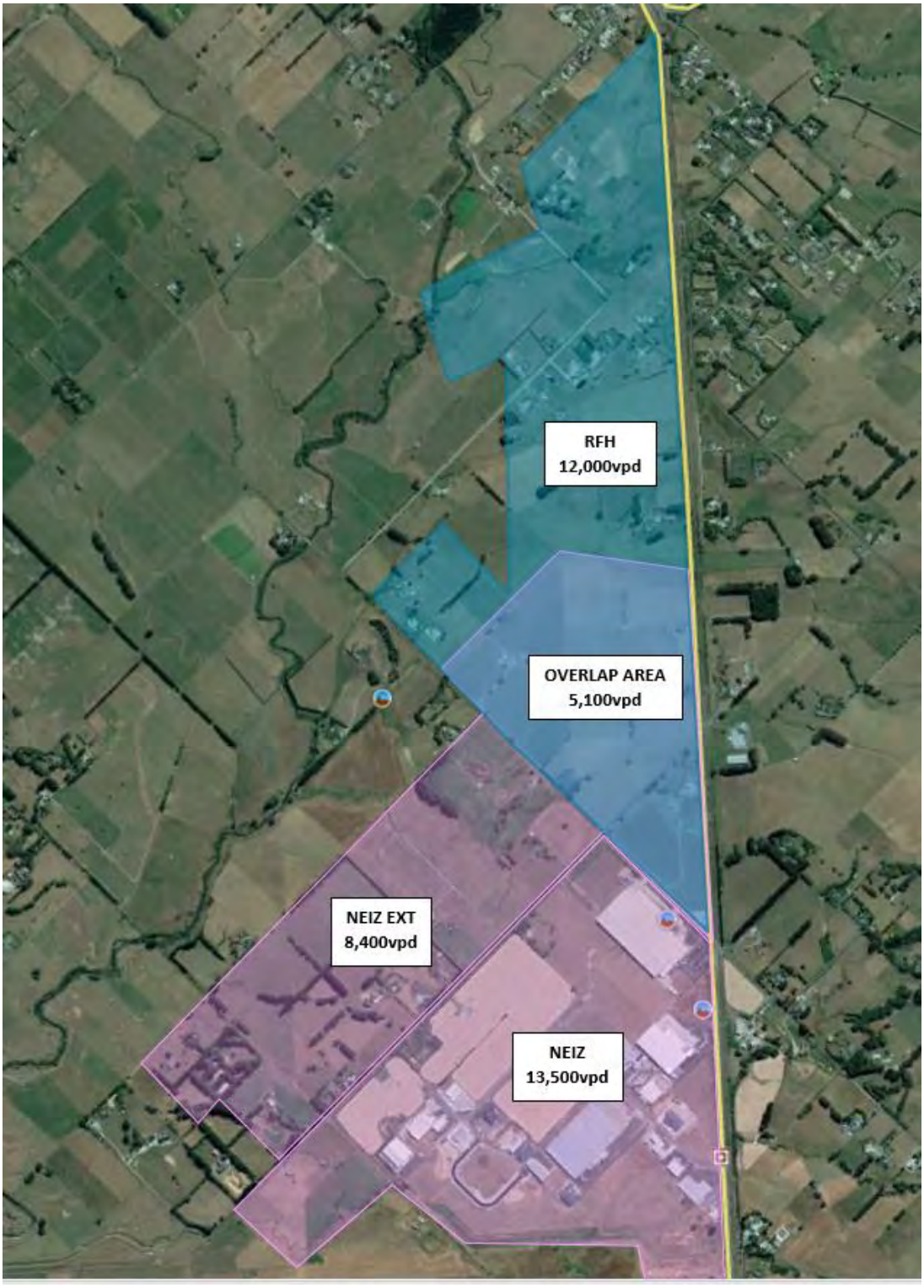


Figure 7-4: Regional Freight Hub Site Overlap on the North East Industrial Zone Extension Area

7.2.2 Existing KiwiRail Tremaine Avenue Site

In the absence of any land use studies to date, it is unclear what type of land uses will replace the existing freight yard once existing operations move to the proposed RFH.

For the purpose of allowing for a range of activities at the existing site, the existing traffic demand was left unchanged in the strategic model. Only the light and heavy vehicle split was altered, to better match a possible mixed-use development of the site.

8. Network Analysis

The network analysis assessed existing and future road conditions without the RFH. This analysis was used to from the baseline for the future road network performance. The network analysis was undertaken using the PNATM.

8.1 Strategic Model

The existing strategic traffic model, the PNATM, has been applied for this assessment.

The available PNATM was provided to Stantec by PNCC and has been used to inform the transport assessment. Any updates/changes made to the forecast models relate to the RFH alone and no changes have been made to the generation/distribution for other land uses within the model. The following updates, relating to the RFH only, were implemented to facilitate scenario testing:

1. Light vehicle/ heavy vehicle split was adjusted from the existing freight yard split shown in the model for the RFH to 60%/40%.
2. Adjustment of the external/internal distribution for heavy vehicles related to the RFH from the existing 85%/15% to the new 75%-25%.
3. Heavy vehicle portions at the existing freight yard were adjusted downwards, from 20% to 14%, for the 'with RFH' scenarios, to represent future mixed land uses.

8.1.1 Model Overview

The PNATM is a traditional three stage model. These types of model convert input land use (population, households and employment) and a representation of the road network to output future year estimates of vehicle movements. Light and heavy vehicles are forecast separately. The model includes daily trip generation (how many trips will be made), daily trip distribution (where vehicles will travel), followed by three peak period assignments (AM, interpeak and PM) where route choice is estimated. Daily travel matrices are produced which are factored to the three peak periods (using separate factors by trip purpose) for assignment to the road network. The assigned peak hour light and heavy vehicle traffic flows are then multiplied by the following factors to produce an estimate of daily traffic. The peak factors used (AM & PM = 2 and IP = 9.3combine to determine daily volumes.

A three-stage model assumes vehicle trip rates by purpose remain constant over time, with no consideration of modal choice. This is appropriate for Palmerston North, where the majority of travel is by vehicle. The model determines the number of trips generated to and from a zone based on the input land use (population, households and employment). The trips are then distributed to the network based on the ease in which they can access other activities, road network and surrounding land use. Changes in the land use and road network will therefore affect the distribution of trips within the network, with the proportion of trips to and from the RFH varying between scenarios.

External trips (trips from outside the modelled area, shown in Figure 8-1, to inside the modelled area and vice versa) are calculated by applying specified growth rates to observed initial stage traffic counts. This external growth is an integral part of the trip generation stage of the model, including in relation to truck movements for which this study has identified that 25% of truck trips to and from the RFH will be external trips, as set out at Section 6.3 of this report.

The PNATM also includes an error correction step, which applies a small change to forecast initial stage travel patterns to improve the representation with observed. The error adjustment is calculated using matrix estimation techniques.

The base year of the model is 2013. The model development is documented in "Palmerston North Area Traffic Model - Model Development and Validation Report", prepared by Beca Ltd dated 15 August 2014. The model was validated, by Beca, using link counts, turning movement counts, and travel times. The validation of the road assignment, by comparing modelled flows with observed, exceeded the criteria specified in the Economic Evaluation Manual (EEM), meaning that the validation results exceeded prescribed targets. The validation was also checked against the criteria in the Waka Kotahi Model Development Guidelines (Guidelines), which are progressively replacing the EEM for model validation targets. Based on model type "B" (Strategic Network), the PNATM exceeded the criteria in the Guidelines as well, meaning when comparing modelled flows with observed, the standard metrics produced by the

model are better than the targets specified in the published Model Development Guidelines[48]. With this good level of validation achieved, the PNATM is considered an appropriate tool for assessing the impact of the RFH, at the level appropriate for the Notice of Requirement.

Forecasts are currently available for the years 2021, 2031, and 2041.

Figure 8-1: PNATM Road Network

8.1.2 Adjustments to the Model

Comparing the base year (2013 PNATM) modelled daily flows with traffic counts (2019) at the Existing Freight Yard, it revealed that the PNATM significantly underestimated traffic, with modelled volumes about one third of observed. This was rectified for the purposes of this assessment by increasing the industrial employment (multiplied by 3.5) such that the daily volumes across the model more closely replicated observed 2019 traffic across the network.

[48] https://www.nzta.govt.nz/assets/resources/transport-model-development-guidelines/docs/tmd.pdf

For the proposed RFH, the model was modified to incorporate trip rates applied to input square meterage of various land use categories. The categories that were included in the model are Depot, Freight Forwarders, Container Terminal, and Logs, as documented in Section 6.2 of this report.

The PNATM has a fixed number of external light and heavy vehicle movements (based on trend growth applied to observed volumes) and so did not respond appropriately by producing the expected increase in inter-regional heavy vehicle movements that the RFH will generate. To correct this, heavy vehicle trips to and from the RFH were manually adjusted, as the magnitude of change of activity at the new site is significantly greater and the model does not automatically increase the proportion of external traffic. The proportion of external trips was increased (from 15% to 25%) with a corresponding reduction in internal traffic to maintain the same number of trips in/out of the RFH. The proportion of heavy vehicles to/from the RFH travelling north, south, west and east was also altered to reflect light/heavy vehicle percentage split discussed in Section 6.1. In all other instances, the heavy/light vehicle split was not changed.

No changes were made to the distribution of heavy vehicle trips associated with other land uses (sites), apart from the RFH, in the modelled area, and no changes were made to the model for light vehicle trip distribution.

The Manawatu Gorge route has been modelled using the existing alignment for all scenarios (this model was developed in 2013 and does not consider the Gorge closure in the current or forecast models), since the future Gorge is proposed to tie back into the network from the north at the same intersection point in the model, acknowledging the alignment of the Gorge will change as described in the Te Ahu a Turanga; Manawatu Tararua Highway NOR[49].

8.1.3 Level of Service Definition

The definition used in the PNATM to calculate intersection level of service uses a weighted average delay over all approach road for signals and roundabouts, and the worst delay on a minor road at the intersection is used to define the level of service (LOS) for priority intersections. The LOS ranges are shown in Table 8-1. It is noted that the calculation for level of service at priority intersections in PNATM was changed to correct the reported shortcoming and produce a more realistic assessment based on engineering principles. The Beca model used a weighted average delay to determine Level of Service at priorities, which does not align with international guidance. This shortcoming was corrected, and the Level of Service calculated based on the worst delay experienced on a minor road (without priority).

For the purposes of this report, a LOS A-D is considered acceptable, while a LOS E or F for both links or intersection, regardless of road hierarchy is considered unacceptable.

Table 8-1: Intersection Level of Service Definition

LOS	Delay Threshold (seconds)	
	Signals and Roundabouts	Priority Intersections
A	<= 10	<= 10
B	<=20	<=15
C	<=35	<=25
D	<=55	<=35
E	<=80	<=50
F	>80	>50

The procedures in the model to calculate road (link) level of service were adopted for reporting in this instance, based on volume to capacity ratio. The thresholds are shown in Table 8-2.

[49] Manawatu Gorge_NZTA-NOR-Volume-3.1-Transport: Te Ahu a Turanga; Manawatu Tararua Highway NOR, undertaken for Waka Kotahi by WSP Opus, 2018

Table 8-2: Link Level of Service Definition

LOS	Volume to Capacity Threshold	
	State Highways	Urban Roads
A	<= 0.05	<= 0.26
B	<=0.17	<=0.43
C	<=0.33	<=0.62
D	<=0.58	<=0.82
E	<=1	<=1
F	>1	>1

8.2 Scenario Testing

Table 8-3 Five scenarios were analysed using the PNATM. Three **'without** RFH' scenarios, excluding the proposed RFH, have been tested to establish a baseline, detailed in Table 8-3. Two further 'with RFH' scenarios, which includes the RFH, detailed in Table 8-4, one includes the initial stage and the other the full build out of the RFH development.

The RFH initial stage traffic demand was analysed on the 2031 model, while the RFH full build-out traffic demand was tested on the 2041 model (since it is the farthest future year forecast available in the PNATM). The Do Minimum infrastructure upgrades by PNCC and Waka Kotahi are recorded in the table below. The table also shows infrastructure upgrades triggered by the RFH, which will be the responsibility of KiwiRail.

The analysis showed that the RFH will not cause the road network to perform to a level any worse than the without RFH scenario failures.

Table 8-3: Traffic Model – Principal 'without RFH' Scenarios

Principal Scenarios			
Scenario		Additional Land use	Do Minimum Road Improvements
'without RFH'	Existing	1. Existing NEIZ– 4,100 vpd	None
	Initial Stage	1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension– 4,500 vpd	Detailed in Section 7.1.1
	Full build-out	1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension– 13,500 vpd	Detailed in Section 7.1.1

Table 8-4: Traffic Model – Principal 'with RFH' Scenarios

Principal Scenarios				
Scenario		Additional Land use	Do Minimum Road Improvements	RFH Road Improvements
'with RFH'	Initial stage	1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension– 4,500 vpd 3. Traffic at the existing freight yard remains – 4,700 vpd 4. Initial Stage RFH dev - 5,800 vpd	Detailed in Section 7.1.1	Detailed in Table 9-3
	Full build-out	1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension (less 37.5%) – 8,400 vpd 3. Traffic at the existing freight yard remains – 4,700 vpd 4. Full build-out RFH dev - 12,000 vpd	Detailed in Section 7.1.1	Detailed in Table 9-6

8.3 Existing Conditions

The 2021 PNATM has been adopted to represent existing conditions. It has been applied as provided by PNCC, with the exception of an update to represent existing activity of the NEIZ, involving a developed area of 36/120 hectares, generating 4,100vpd. The trip generation for the existing freight yard was kept constant in the model, at 4,700vpd higher than the 4,200vpd estimated using available traffic counts, representing a conservative approach.

The PM peak hour has been adopted as the critical period for traffic analysis since this was found to be the longer sustained peak, having a greater impact on the road network. For this peak hour, the model demonstrates that the road network around the proposed RFH operates at an acceptable LOS (LOS A – LOS D) under existing conditions. The LOS along these road corridors varies, based on the modelled volume/capacity ratio along each road. Table 8-5 shows the worst performing link LOS along each road, identified earlier in Table 5-1 and Table 8-6 shows key intersection LOS within the study area.

Table 8-5: Existing Link LOS

Name	SECTION	LOS
SH3	Kairanga Bunnythorpe Road - Tremaine Ave	D
SH54	SH54-Waughs Road	D
SH56	Longburn Rongotea Road – Amberley Avenue	D
Railway Road	Roberts Line - El Prado Drive	D
Kairanga Bunnythorpe Road	SH3 – SH54	C
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	D
Ashhurst Road	Campbell Road – Raymond Street	B
Tremaine Avenue	SH3 – McLeavey Drive	D
Stoney Creek Road	Campbell Road – Kelvin Grove Road	B
Waughs Road	SH54 – to Feilding	E
El Prado Drive	Railway Road – Alderson Drive	B
Roberts Line	Kairanga Bunnythorpe Road – Richardsons Line	B
Richardsons Line	Milson Line – Roberts Line	B
Clevely Line	Te Ngaio Road – Railway Road	A
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	A

Table 8-6: Existing Intersection LOS

Name	LOS
Campbell Road/Kairanga Bunnythorpe Road	A
Railway Road/Kairanga Bunnythorpe Road	D
Roberts Line/Kairanga Bunnythorpe Road	A
SH54/Kairanga Bunnythorpe Road	C
SH3/Kairanga Bunnythorpe Road	C
SH54/Waughs Road	D
Railway Road/ Roberts Line	A
Railway Road/ El Prado Drive	B
Railway Road/ Airport Drive	A
Railway Road/ Tremaine Avenue	E
Richardsons Line/ Roberts Line	A
Kelvin Grove Road/ Roberts Line	A
Stoney Creek Road/ Kelvin Grove Road	A
Tremaine Avenue/Milson Line	D
Tremaine Avenue/SH3	D
Flygers Line/SH3	B
Flygers Line/Milson Line	A
Milson Line/ Richardsons Line	A

From these outputs showing existing conditions, it can be observed that:
Waughs Road close to Feilding operates at LOS E

- The following road corridors have link sections at a LOS D:
  - SH3
  - SH54
  - SH56
  - Railway Road
  - Campbell Road - SIDRA
  - Tremaine Avenue
- Railway Road/Tremaine Avenue intersection operates at LOS E
- The following intersections operate at a LOS D:
  - Railway Road/Kairanga Bunnythorpe Road
  - SH54/Waughs Road
  - Tremaine Avenue/Milson Line
  - Tremaine Avenue/SH3

Overall, Figure 8-2 shows the strategic links round Palmerston North are operating adequately for this 2021 scenario, however as above, there are links that are nearing capacity and operate at either LOS D or E, indicating increasing constraints on traffic flow. The road network surrounding the RFH operates acceptably with link LOS A or B.

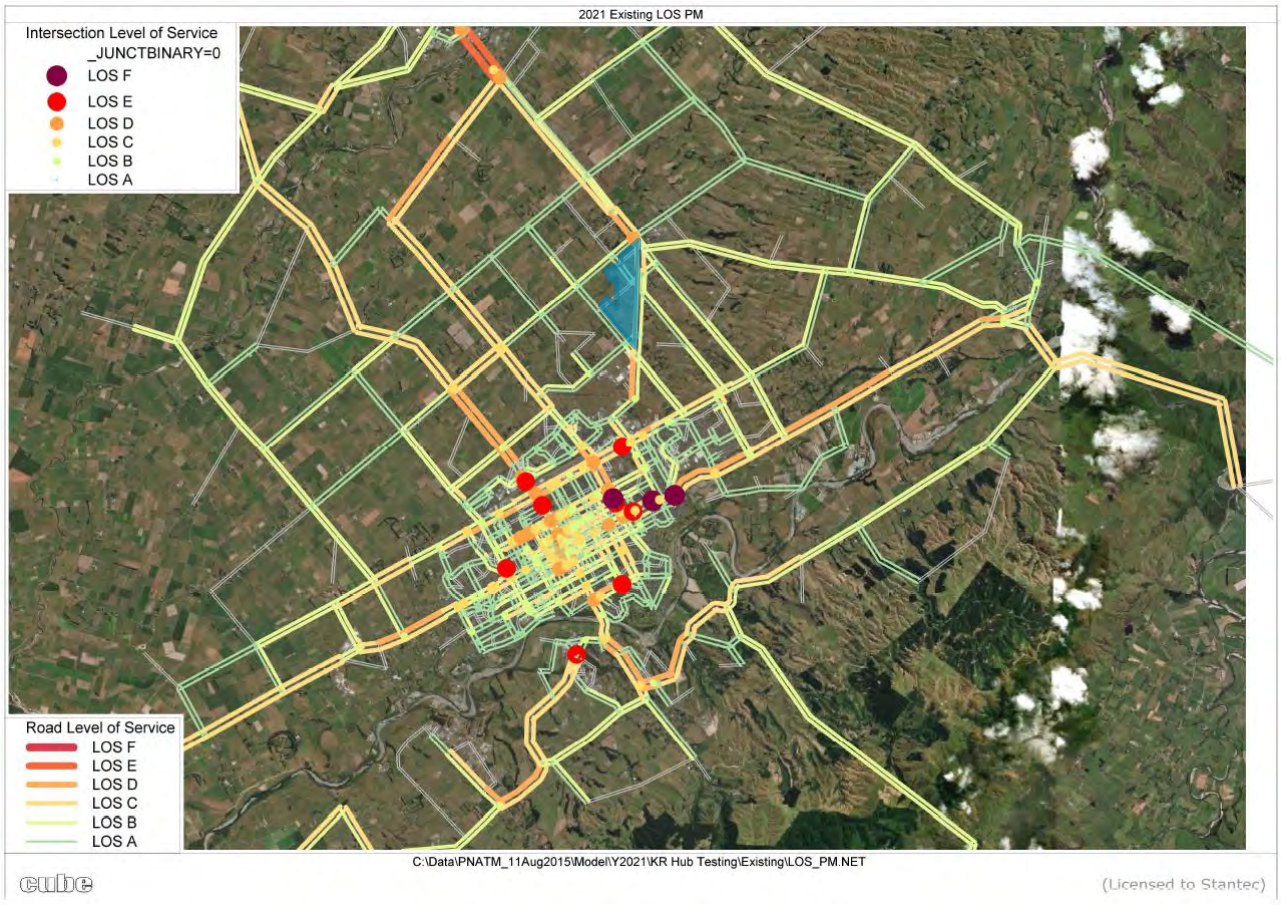


Figure 8-2: LOS for the Existing Scenario

8.4 'Without RFH' – Initial Stage (2031)

The assumptions on land use and infrastructure improvements applied to the PNATM for the 2031 scenario 'without RFH' are detailed in Table 8-7. The 2031 model has been used for this scenario testing. This scenario was analysed using the do-minimum road network.

Table 8-7: 2031 'without RFH' Scenario Conditions

Additional Land uses	Do Minimum Road Improvements
1. Existing NEIZ– 13,500 vpd Assumed Full development 2. NEIZ Extension– 4,500 vpd Assumed 33% development	1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3
	2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line
	3. Kairanga Bunnythorpe Road, Campbell Street and Te Ngaio Road bridge strengthening and renewal
	4. Richardsons Line - Road widening between Milson Line and Roberts Line to Railway Road (Railway Road section which will be closed and displaced as a result of the RFH)
	5. Richardsons Line/Roberts Line roundabout
	6. New link to NEIZ off Richardsons Line and an access into existing NEIZ
	7. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line
	8. El Prado Drive/Railway Road roundabout

The LOS outputs for the PM peak hour analysis for the 2031 'without RFH' scenario are shown in Table 8-8, again for the roads identified in Table 5 1, while Table 8-9 shows the intersection LOS.

Table 8-8: 2031 'without RFH' Scenario (PM peak) Link LOS

Name	SECTION	LOS
SH3	Newbury Line - Tremaine Ave	D
SH54	Kairanga Bunnythorpe Road -Waughs Road	D
SH56	Longburn Rongotea Road – Amberley Avenue	D
Railway Road	Kairanga Bunnythorpe Road - El Prado Drive	D
Kairanga Bunnythorpe Road	SH3 – SH54	D
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	D
Ashhurst Road	Campbell Road – Raymond Street	C
Tremaine Avenue	SH3 – McLeavey Drive	D
Stoney Creek	Campbell Road – Kelvin Grove Road	B
Waughs Road	SH54 – to Feilding	E
El Prado Drive	Railway Road – Alderson Drive	B
Roberts Line	Railway Road – Kelvin Grove Road	C
Richardsons Line	Milson Line – Roberts Line	C
Clevely Line	Te Ngaio Road – Railway Road	A
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	A

Table 8-9: 2031 stage 'without RFH' Scenario (PM peak) Intersection LOS

Name	LOS
Campbell Road/Kairanga Bunnythorpe Road	A
Railway Road/Kairanga Bunnythorpe Road	F
Roberts Line/Kairanga Bunnythorpe Road	A
SH54/Kairanga Bunnythorpe Road	A
SH3/Kairanga Bunnythorpe Road	A
SH54/Waughs Road	F
Railway Road/ Roberts Line	C
Railway Road/ El Prado Drive	B
Railway Road/ Airport Drive	A
Railway Road/ Tremaine Avenue	E
Richardsons Line/ Roberts Line	A
Kelvin Grove Road/ Roberts Line	A
Stoney Creek Road/ Kelvin Grove Road	A
Tremaine Avenue/Milson Line	E
Tremaine Avenue/SH3	D
Flygers Line/SH3	B
Flygers Line/Milson Line	A
Milson Line/Richardsons Line	A

From these tables it is observed that:

- Waughs Road close to Feilding will continue to operate at LOS E between SH54 and the eastern end of Feilding.
- Campbell Road will perform at a LOS DSIDRA
- 7/15 links will perform at a LOS D
- The following intersections will operate at a LOS F, indicating a deterioration in intersection performance from LOS D to LOS F:
    - Railway Road/Kairanga Bunnythorpe Road
    - SH54/Waughs Road
- The Tremaine Avenue/Milson Line and Railway Road/Tremaine Avenue intersections will operate at LOS E
- The Tremaine Avenue/SH3 intersection will operate at a LOS D, like existing conditions

The results listed above show that the increase in background traffic (relating to 2031) and added NEIZ traffic demand will cause key links (Table 8-8) and intersections (Table 8-9) of the wider study to operate at an unacceptable LOS E or F. This highlights the need for improvements along these links and intersections. Most links around the RFH site will continue to operate at an acceptable LOS, while key intersections leading to the RFH will start to perform at an unacceptable LOS F. The specific link section and intersection performances for the initial stage 'without RFH' scenario can be seen in Figure 8-3.

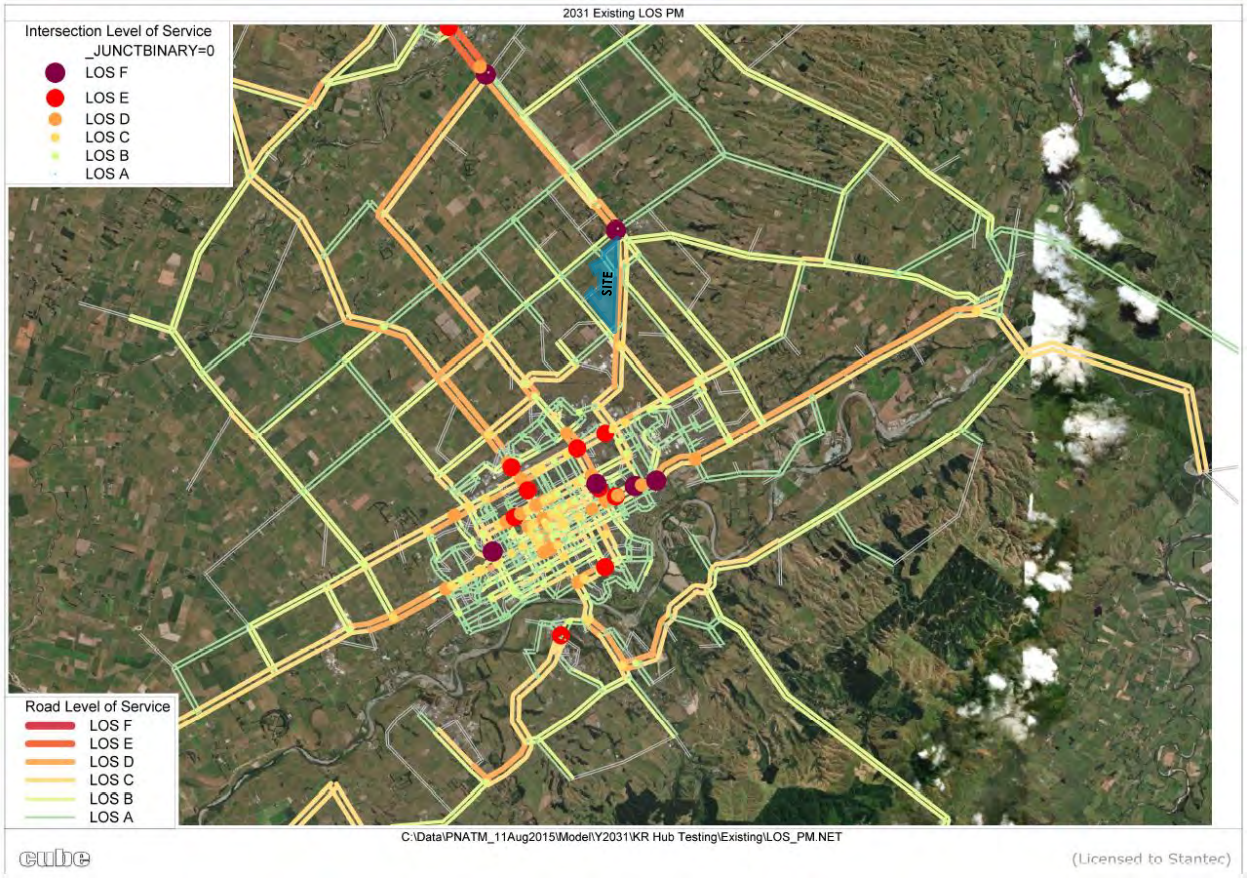


Figure 8-3: LOS for the 2031 'without RFH' Scenario (PM peak)

8.5 'Without RFH' – Full Build Out (2041)

The following assumptions have been applied to the PNATM for the ultimate end state, represented using the 2041 model. With the exception of an assumed full build-out of the NEIZ Extension, all Do Minimum road improvements remain the same as in the 2031 scenario, as recorded in Table 8-10, and therefore this scenario was analysed using the do-minimum road network.

Table 8-10: 2041 'without RFH' Scenario Conditions

Additional Land uses	Do Minimum Road Improvements
1. Existing NEIZ– 13,500 vpd - Assumed full development 2. NEIZ Extension– 13,500 vpd - Assumed full development	1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3
	2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line
	3. Kairanga Bunnythorpe Road, Campbell Street and Te Ngaio Road bridge strengthening and renewal
	4. Richardsons Line - Road widening between Milson Line and Roberts Line to Railway Road (Railway Road section which will be closed and displaced as a result of the RFH)
	5. Richardsons Line/Roberts Line roundabout
	6. New link to NEIZ off Richardsons Line and an access into existing NEIZ

Additional Land uses	Do Minimum Road Improvements
	7. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line
	8. El Prado Drive/Railway Road roundabout

The PM peak hour analysis for the 2041 'without RFH' scenario is shown in. Table 8-11 showing the worst performing link LOS and Table 8-12showing the intersection LOS, based on the same links and intersections as previously.

Table 8-11: 2041 'without RFH' scenario (PM peak) Link LOS

Name	SECTION	LOS
SH3	Newbury Line - Tremaine Ave	D
SH54	Kairanga Bunnythorpe Road -Waughs Road	D
SH56	Longburn Rongotea Road – Amberley Avenue	D
Railway Road	Kairanga Bunnythorpe Road - El Prado Drive	D
Kairanga Bunnythorpe Road	SH3 – SH54	D
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	D
Ashhurst Road	Campbell Road – Raymond Street	C
Tremaine Avenue	SH3 – McLeavey Drive	D
Stoney Creek	Campbell Road – Kelvin Grove Road	B
Waughs Road	SH54 – to Feilding	E
El Prado Drive	Railway Road – Alderson Drive	B
Roberts Line	Railway Road – Kelvin Grove Road	C
Richardsons Line	Milson Line – Roberts Line	D
Clevely Line	Te Ngaio Road – Railway Road	A
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	A

Table 8-12: 2041'without RFH' scenario (PM peak) Intersection LOS

Name	LOS
Campbell Road/Kairanga Bunnythorpe Road	A
Railway Road/Kairanga Bunnythorpe Road	F
Roberts Line/Kairanga Bunnythorpe Road	A
SH54/Kairanga Bunnythorpe Road	A
SH3/Kairanga Bunnythorpe Road	B
SH54/Waughs Road	F
Railway Road/ Roberts Line	E
Railway Road/ El Prado Drive	B
Railway Road/ Airport Drive	B
Railway Road/ Tremaine Avenue	F
Richardsons Line/ Roberts Line	A
Kelvin Grove Road/ Roberts Line	C
Stoney Creek Road/ Kelvin Grove Road	A
Tremaine Avenue/Milson Line	E
Tremaine Avenue/SH3	D
Flygers Line/SH3	D
Flygers Line/Milson Line	C
Milson Line/Richardsons Line	C

The following observations can be made:

- Waughs Road close to Feilding will continue to operate at LOS E between Camerons Line and the eastern end of Feilding.

- 8/15 links will perform at a LOS D. Richardsons Line closer to Milson Line will also perform at a LOS D (from a LOS C) in this scenario
    - The following intersections will operate at a LOS F:
        - Railway Road/Kairanga Bunnythorpe Road
        - SH54/Waughs Road
        - Railway Road/Tremaine Avenue (deteriorating intersection performance from LOS E to LOS F)
- The following intersections will operate at a LOS E
        - Railway Road/ Roberts Line (deterioration from a LOS C to LOS E – likely due to the full buildout of the NEIZ)
        - Tremaine Avenue/Milson Line (deterioration from a LOS D to LOS E)

This analysis reveals there will be a deterioration in road network performance in this 2041 scenario, with additional links and intersections performing at an unacceptable LOS E and F. The specific link section and intersection performances for the 2041 'without RFH' scenario can be seen in Figure 8-4.

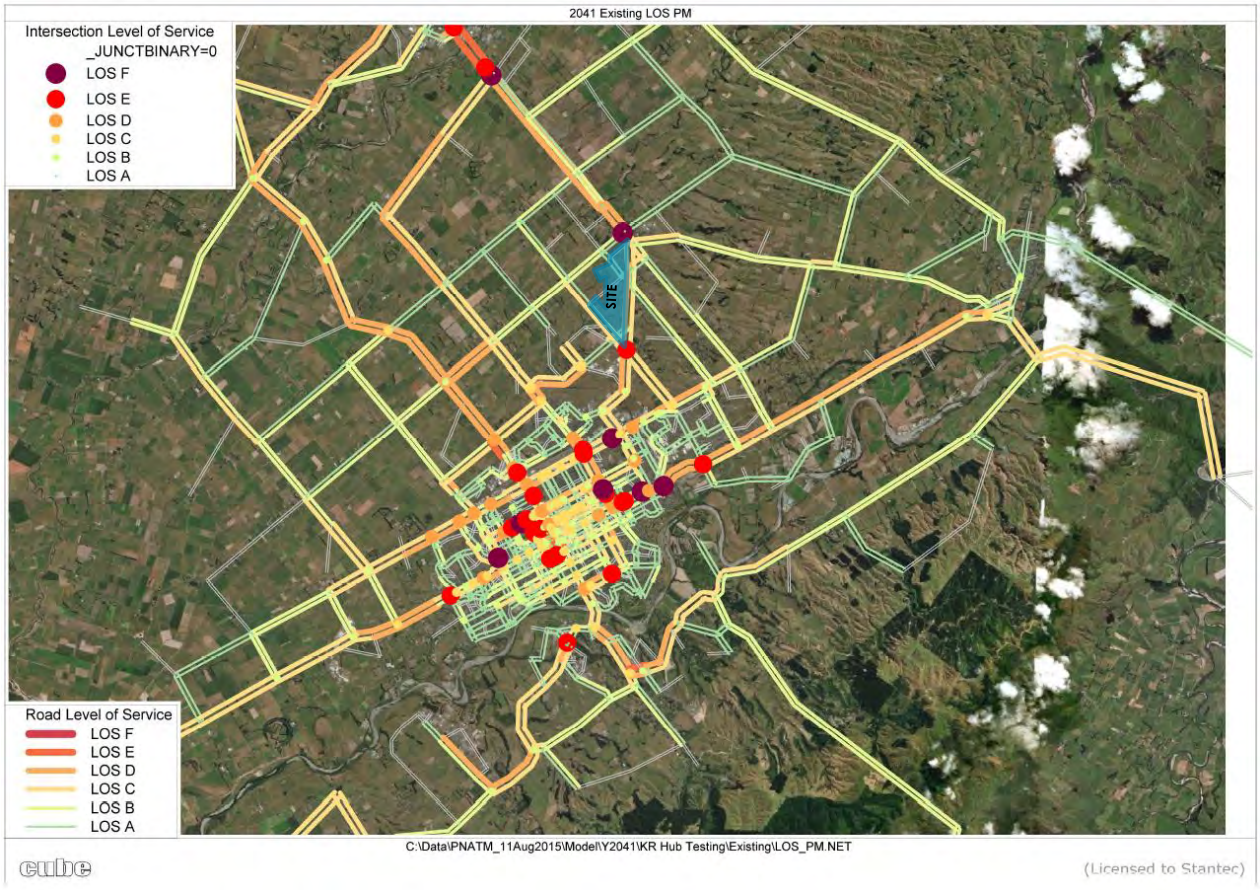


Figure 8-4: LOS for 2041 'without RFH' scenario (PM Peak)

9. RFH Analysis

As outlined in Section 1.2, the proposed RFH will be established over 177.7 hectares, approximately four times the size of the existing freight yard and will house several similar activities. The main changes are the size of the marshalling yard, number and length of tracks in it and the container terminal and number and size of the freight forwarders at full build out. The layout of the RFH is shown by the various plans included with the application. A reduced scale drawing is shown in Figure 9-1.

The location of the RFH and realignment of the NIMT will trigger a need to close the existing alignment of Railway Road (between Maple Street and Roberts Line). As previously discussed in Section 1.2.3 the new perimeter road is required to provide access to the RFH. The perimeter road will also serve as providing alternative public access once Railway Road is closed.

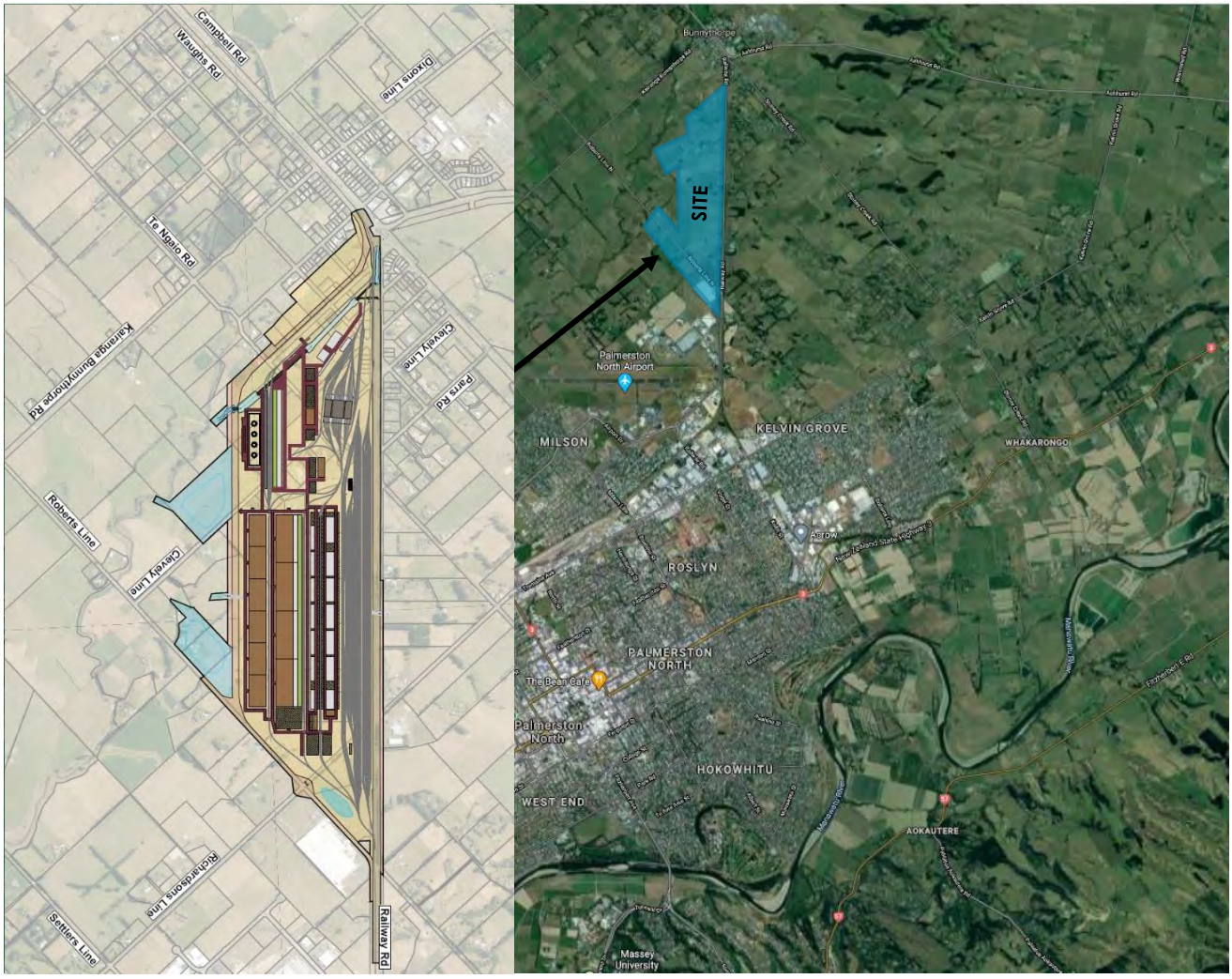


Figure 9-1: Proposed RFH Site Area

9.1 RFH Road Network

The proposed RFH will trigger the road network changes listed below. These changes are shown in Figure 9-2:

1. Termination of the existing Railway Road from Roberts Line to approximately 50m south of Maple Street
2. Construction of a perimeter road extending approximately 2.6km along the western side of the RFH between Maple Street and Roberts Line. This perimeter road is required to replace Railway Road and to provide access to the RFH from the north and west.
3. Two RFH accesses via the perimeter road on the northern and western boundaries

4. Closure of the Roberts Line level closing and Railway Road to be converted to a continuous curve into Roberts Line
5. New Intersection at Roberts Line with the perimeter road
6. A posted speed limit of 80km/h for the perimeter road. A posted speed limit reduction to 80km/h is also envisaged for Roberts Line between Railway Road and perimeter road.
7. Closure of Roberts Line east of current Railway Road due to closure of the level crossing
8. Richardsons Line north of the Roberts Line/Richardsons Line intersection converted to a RFH access
9. Closure of Clevely Line approximately 450m from the Roberts Line/Clevely Line intersection
10. Closure of Te Ngaio Road approximately 250m from the Clevely Line/ Te Ngaio Road intersection
11. Closure of two-level crossings along Sangsters Road: Richardsons Line and Clevely Line
12. Sangsters Road link improvements to Roberts Line
13. Rerouting the Feilding-Palmerston North bus line and relocating the Bunnythorpe stop

The road network that was used to test the RFH scenarios is shown in Figure 9-2. This figure shows the do-minimum plus infrastructure changes listed above. The Railway Road closure, indicated by the red dotted line, will result in the closure of three level crossings (Clevely Line, Richardsons Line and Roberts Line). The closure of Railway Road will need to be undertaken before the NIMT can be relocated.

The perimeter road is shown by the red line in Figure 9-2. The perimeter road is required to provide critical access to the RFH from the north and west. It will also serve the function of providing an alternative transport connection once Railway Road has been stopped.

Different perimeter road alignment options were considered, such as a northern link to Kairanga Bunnythorpe Road, but have not been carried forward at this stage as there are still uncertainties around the locations of strategic network improvements, in particular the position of a bypass route to the west of Bunnythorpe. The perimeter road alternatives and proposed alignment is discussed further in the Design, Construction and Operation report prepared by Stantec.

In light of the above, the perimeter road alignment between Railway Road and Roberts Line was selected. This alignment does not foreclose future links onto Kairanga Bunnythorpe Road and/or a future southern bypass of Bunnythorpe. In addition, this alignment will provide the shortest alternative to the existing alignment, while causing minimal disruptions to the existing road network, as the perimeter road will utilise existing roading infrastructure.

This network was used to analyse the 'with RFH' Scenarios, noting that further coordination assessments of the ultimate road network will be undertaken in response to the Roading Network Integration Plan as it is developed in consultation with PNCC and Waka Kotahi.

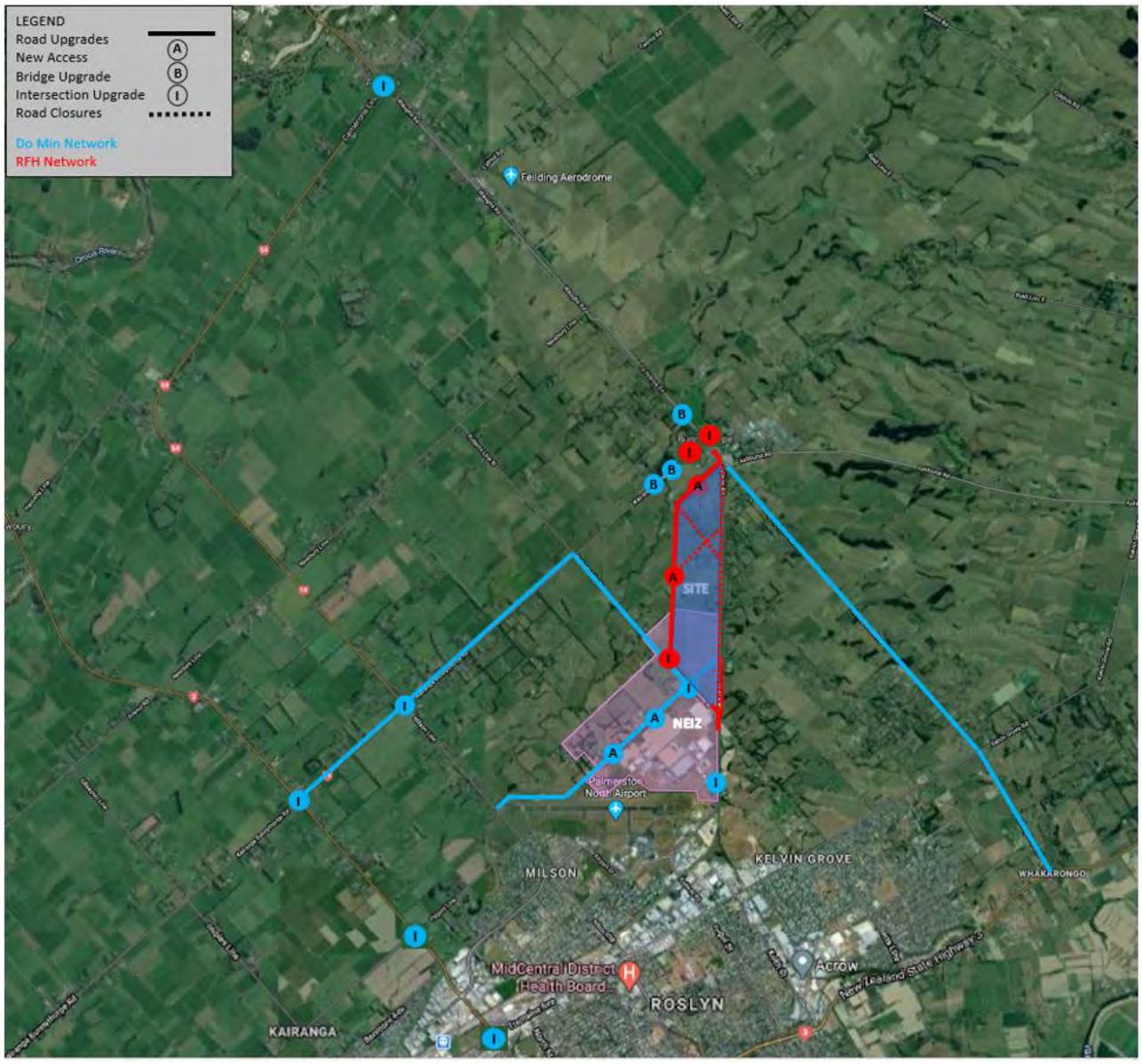


Figure 9-2: Proposed Network Changes

9.2 Indicative Staging for Assessment Purposes

As mentioned in Section 1.3, for the purposes of this assessment, indicative staging has been developed to assist with determining the potential effects on the transport network and identify when upgrades may be required. For the purposes of this assessment, development at the initial stage and full build out were assessed.

The components of the initial stage and full build-out are currently envisaged as including those listed in Table 9-1.

Table 9-1: RFH Staging Plan (Source: KiwiRail, Date: 28 February 2020)

AREA	Initial Stage (2031)	Full Build-Out (2051)
Arrival/Departure Yard	2 Tracks (1500m trains); no pull backs required	8 tracks
Marshalling Yard	12 Tracks	15 tracks

AREA	Initial Stage (2031)	Full Build-Out (2051)
Wagon Storage Yard	50% - as per concept design connection rail roads from marshalling area can be used	2 tracks
Container Terminal	Full development. Refrigerated containers included. 3 Pad Tracks. Office, Truck and Car Parking.	8000 TEUs / 180 refrigerated
Maintenance Facilities: 1. Wagons, Locomotives 2. Network work Equipment	1. Main maintenance Building + 50% supporting buildings (storage) 2. 75% supporting buildings and shed areas	100%
Network Services Maintenance Depot and Terminal Operations	100%	Depot and terminal building
- Prime Facilities	50% (Prime Freight Forwarding)	4 Warehouses
- Secondary Facilities	33% (secondary Freight Forwarding)	6 Warehouses
Log Loadings	1 track (50%)	2 tracks
Tanks	0 Tanks	4 tanks Diam=20x5m

9.3 RFH Traffic Demand

The staging plan included above in Table 9-1 and calculated trip generation rates included earlier in Table 6-4 were used to determine the traffic demand at the RFH. The following principles were adopted when determining the traffic generation:

1. Depots – forecast commodity throughput was used to determine the increased maintenance and depot facilities required at the RFH. The forecast commodities throughput increased by 60%, therefore the traffic generating area was also increased by approximately 60%[33]
2. Freight Forwarders – The ambition of the RFH is to increase the freight forwarders offering at the RFH, therefore the full area allocated to freight forwarders, in the Staging Plan, was considered traffic generating
3. Container terminal – The area allocated to the container terminal in the staging plan is more than 13 times the existing area and includes a greater proportion for container storage which is not traffic generating. Approximately half (80 000m^2) of this area was used to represent the traffic demand for the container operation.
4. Logs - A forecast approximately 30% increase in log commodity throughput was used to determine the increased log operations and associated traffic demand at the RFH [33].

The commodities forecast percentages outlined above have been based on the Ministry of Transport - National Freight Demand Study, dated March 2014[50]. It is acknowledged that this forecast has recently been updated and reflects a lower forecast growth for rail due to several factors. The forecast percentages used to estimate the RFH traffic demand has not been adjusted to reflect these updated growth rates, as they represent a conservative approach and provides provision for forecast growth rates to rebound.

[50] National-Freight-Demand-Study-Mar-2014.pdf

Table 9-2: Estimated Daily Traffic Demand for the RFH

Land use	Traffic Generating Area (m^2)		Daily Traffic Demand (vpd)	
	Initial Stage	Full build-out	Initial Stage	Full build-out
Depots	67,000	105,000	850	1,300
Freight	50,000	150,000	2,800	8,500
Container Terminal	80,000	80,000	2,000	2,000
Logs	15,000	20,000	150	200
Total	212,000	355,000	5,800	12,000

The relationship between the freight forwarders and container terminal is important since at present at the existing freight yard there is a portion of the traffic generated between these two sites that currently use Tremaine Avenue. The portion of these trips is assumed to range between 5%-25% of the total traffic demand.

These trips will be internalised at the proposed RFH and will therefore have a reduced impact on the external road network. However, given the difficulty in quantifying this external trip-making, a reduction in trips has not been applied, representing a conservative analysis of the Do Minimum road network.

A comparison of the daily traffic numbers shows that the 37.5% of NEIZ extension equating to 5,100vpd as in Table 7-2 will be displaced by the RFH. Traffic associated with development of the NEIZ has already been assumed as future additions on the road network, such that the resulting additional RFH traffic demands at full buildout will be 6,900vpd (12,000vpd – 5,100vpd).

Overall, the RFH will cause an increase in traffic demand on the PNATM network of approximately 1.5% in the initial stage and 3% in the full build-out.

9.4 'with RFH' – Initial stage

The following assumptions have been applied to the PNATM for the initial stage 'with RFH' scenario using the 2031 model and the do-minimum road network plus RFH road network. The traffic estimated for the RFH initial stage (5,800vpd), transfer from the existing freight yard plus an additional traffic demand uplift.

Table 9-3: Initial stage 'with RFH' Scenario Conditions

Additional Land uses	Do Minimum Road Improvements	RFH Road Improvements
1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension– 4,500 vpd 3. Traffic at the existing freight yard remains – 4,700 vpd 4. Initial Stage RFH - 5,800 vpd	1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3	1. Perimeter road
	2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line	2. Existing Railway Road termination - from Roberts Line to 50m south of Maple Street
	3. Kairanga Bunnythorpe Road, Campbell Street and Te Ngaio Street bridge strengthening and renewals	3. Railway Road/Roberts Line - Roberts Line closure east of intersection and intersection change (due to level crossing closure)
	4. Richardsons Line - Road widening between Milson Line and Roberts Line and Railway Road (Railway Road section which will be closed and displaced by the RFH)	4. Richardsons Line north of the Roberts Line/Richardsons Line intersection becomes in a RFH access
		5. Closure of Clevely Line approximately 450m from Roberts Line/Clevely Line intersection
	5. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line	6. Closure of Te Ngaio Road approximately 250m from Clevely Line/ Te Ngaio Road intersection
	6. El Prado Drive/Railway Road roundabout	7. New T-Intersection with realigned Railway Road and Roberts Line

Additional Land uses	Do Minimum Road Improvements	RFH Road Improvements
	7. Richardsons Line/Roberts Line roundabout	8. Two new RFH access via Railway Road - Northern Access and Western Access
	8. New link to NEIZ off Richardsons Line and an access into existing NEIZ	9. Sangster Road - Links to Roberts Line (due to Richardsons Line level crossing closure)
		10. Clevely Line level crossing closure

The analysis of the initial stage 'with RFH' scenario shows the road links around the RFH will operate at an acceptable LOS, again based on the same roads and intersections as for the 'without RFH' analysis. Table 9-4 shows the worst performing link LOS and Table 9-5 shows the intersection LOS.

Table 9-4: Initial stage 'with RFH' scenario (PM peak) Link LOS

Name	SECTION	LOS
SH3	Newbury Line - Tremaine Ave	D
SH54	Kairanga Bunnythorpe Road -Waughs Road	D
SH56	Longburn Rongotea Road – Amberley Avenue	D
Railway Road/Perimeter Road	Kairanga Bunnythorpe Road - El Prado Drive	D
Kairanga Bunnythorpe Road	SH3 – SH54	D
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	D
Ashhurst Road	Campbell Road – Raymond Street	C
Tremaine Avenue	SH3 – McLeavey Drive	D
Stoney Creek	Campbell Road – Kelvin Grove Road	B
Waughs Road	SH54 – to Feilding	E
El Prado Drive	Railway Road – Alderson Drive	B
Roberts Line	Railway Road – Kelvin Grove Road	D
Richardsons Line	Milson Line – Roberts Line	C
Clevely Line	Te Ngaio Road – Railway Road	A
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	A

Table 9-5: Initial stage 'with RFH' scenario (PM peak) Intersection LOS

Name	LOS
Campbell Road/Kairanga Bunnythorpe Road	A
Railway Road/Kairanga Bunnythorpe Road	F
Roberts Line/Kairanga Bunnythorpe Road	A
SH54/Kairanga Bunnythorpe Road	A
SH3/Kairanga Bunnythorpe Road	A
SH54/Waughs Road	F
Perimeter road/ Roberts Line	B
Railway Road/ El Prado Drive	B
Railway Road/ Airport Drive	A
Railway Road/ Tremaine Avenue	E
Richardsons Line/ Roberts Line	A
Kelvin Grove Road/ Roberts Line	A
Stoney Creek Road/ Kelvin Grove Road	A
Tremaine Avenue/Milson Line	E
Tremaine Avenue/SH3	D
Flygers Line/SH3	C
Flygers Line/Milson Line	B
Milson Line/Richardsons Line	B

Key observations are that:

- Waughs Road close to Feilding will continue to operate at LOS E between Camerons Line and the eastern end of Feilding
- Campbell Road will perform at a LOS D SIDRA
- The following intersections will operate at a LOS F, the same as the 'without RFH' initial stage scenario:
  - Railway Road/Kairanga Bunnythorpe Road
  - SH54/Waughs Road
- Tremaine Avenue/Milson Line and Railway Road/Tremaine Avenue intersections will operate at LOS E
- Tremaine Avenue/SH3, will operate at a LOS D, same as the existing conditions.

These key observations show that links and intersections on the road network will continue to operate under strained conditions. Railway Road and the perimeter road will perform at a LOS D, due to the additional RFH traffic, however most links surrounding the RFH will operate at an acceptable LOS (LOS A-D), similar to the 'without RFH' conditions, illustrating that the RFH initial stage will not cause a minor disruption to the surrounding network. The specific link section and intersection performances for the initial stage 'with RFH' scenario can be seen in Figure 9-3.

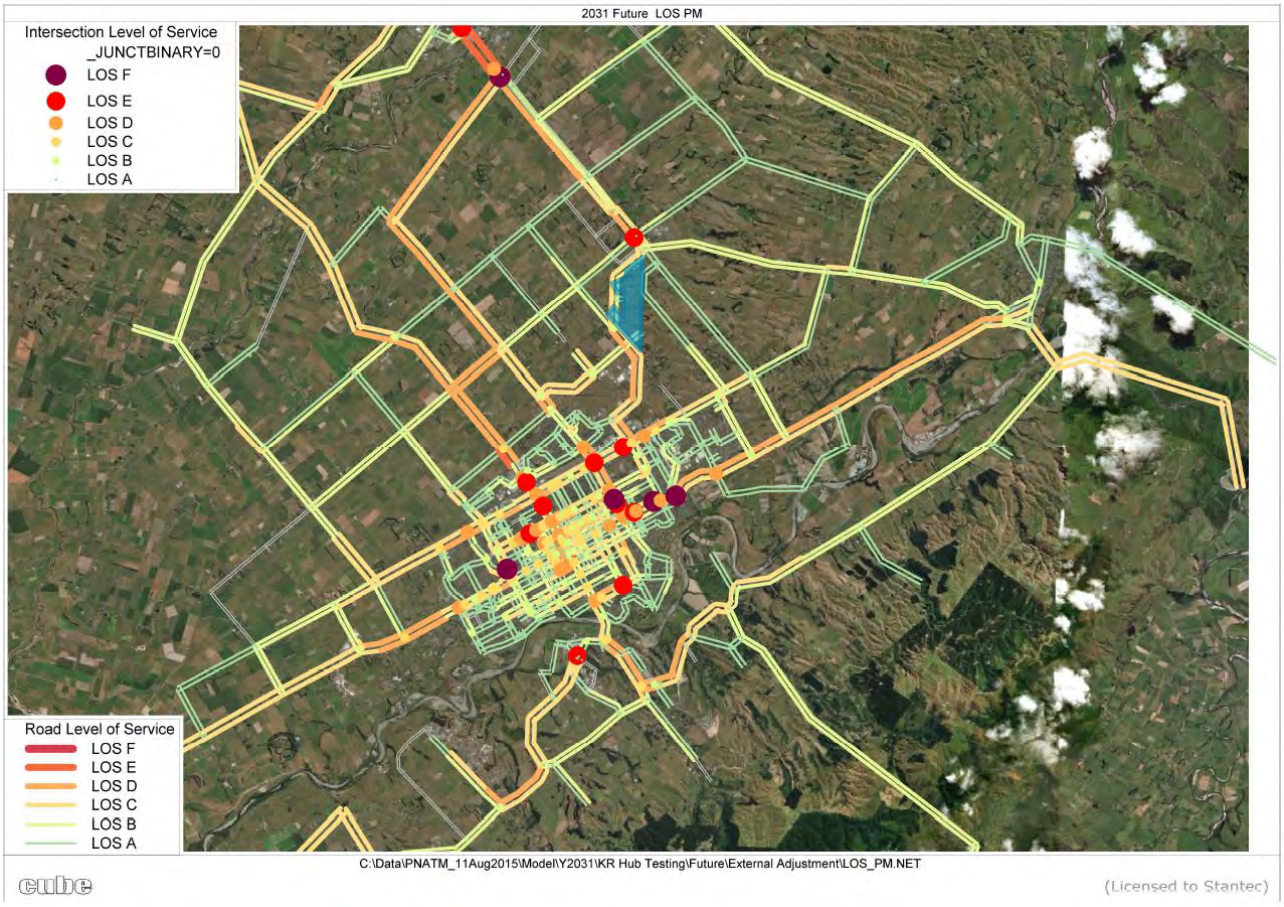


Figure 9-3: LOS for the Initial stage 'with RFH' scenario (PM peak)

Heavy vehicles attracted to the RFH are expected to travel along existing popular freight routes like, SH3, SH54, SH56, Campbell Road and Kairanga Bunnythorpe Road, detailed in Section 6.3. Figure 9-4 shows the heavy vehicle distribution derived by the PNATM for traffic generated by the RFH during the PM peak hour in the initial stage, demonstrating the attraction to each route.

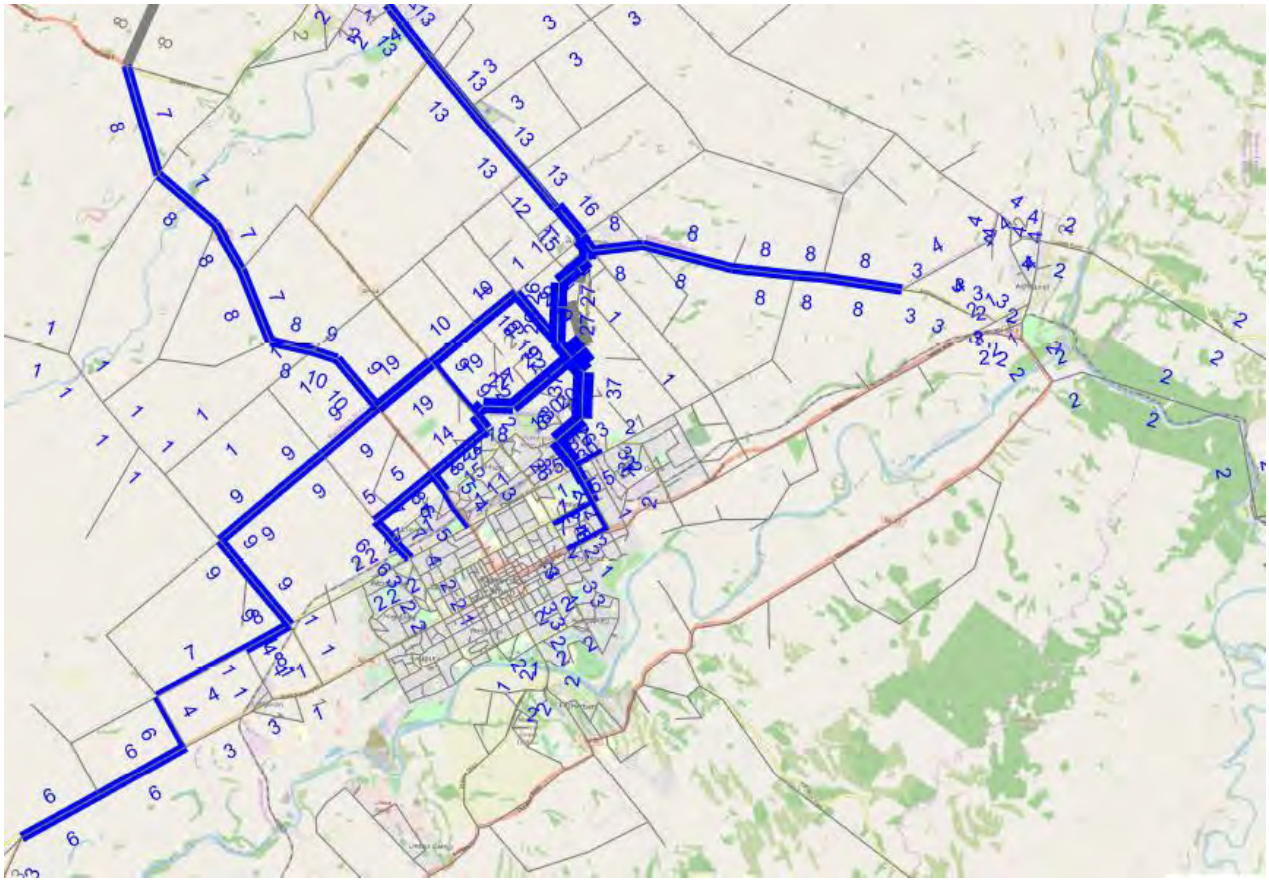


Figure 9-4: Initial stage Heavy Vehicle Traffic Distribution for the PM Peak Hour

The biggest increase in heavy vehicle traffic will be along Waughs Road and Campbell Road with an increase of approximately 15 vehicles in each direction during the PM Peak hour.

9.5 'With RFH' – Full build-out

The following assumptions have been applied to the PNATM for the full build out with RFH scenario and have been tested using the 2041 model, with the Do minimum plus RFH road network.

Table 9-6: Full build-out 'with RFH' Scenario Conditions

Additional Land uses	Do Minimum Road Improvements	RFH Road Improvements
1. Existing NEIZ– 13,500 vpd 2. NEIZ Extension (13,500 vpd less 37.5%) – 8,400 vpd 3. Traffic at the existing freight yard remains – 4,700 vpd 4. Full Buildout RFH - 12,000 vpd	1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3	1. Perimeter road
	2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line	2. Existing Railway Road termination - from Roberts Line to 50m south of Maple Street
	3. Kairanga Bunnythorpe Road, Campbell Street and Te Ngaio Street bridge strengthening and renewals	3. Railway Road/Roberts Line - Roberts Line closure east of intersection and intersection change (due to level crossing closure)
	4. Richardsons Line - Road widening between Milson Line and Roberts Line and Railway Road (Railway Road section which will be closed and displaced by the RFH)	4. Richardsons Line north of the Roberts Line/Richardsons Line intersection becomes in a RFH access
		5. Closure of Clevely Line approximately 450m from Roberts Line/Clevely Line intersection

Additional Land uses	Do Minimum Road Improvements	RFH Road Improvements
	5. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line	6. Closure of Te Ngaio Road approximately 250m from Clevely Line/ Te Ngaio Road intersection
	6. El Prado Drive/Railway Road roundabout	7. New T-Intersection with realigned Railway Road and Roberts Line
	7. Richardsons Line/Roberts Line roundabout	8. Two new RFH access via Railway Road - Northern Access and Western Access
	8. New link to NEIZ off Richardsons Line and an access into existing NEIZ	9. Sangsters Road - Links to Roberts Line (due to Richardsons Line level crossing closure)
		10. Clevely Line level crossing closure

The analysis of the full build-out with full activity of the RFH shows the road links around the RFH will operate at an acceptable LOS. The road network will have sufficient capacity, apart from Waughs Road between Feilding and SH54 (which is an existing limitation), to accommodate the traffic demand from both the RFH and the full development of the remaining NEIZ.

Table 9-7 shows the link LOS, while Table 9-8 shows the intersection LOS for the same links and intersections as previously.

Table 9-7: Full build-out 'with RFH' scenario (PM peak) Link LOS

Name	SECTION	LOS
SH3	Newbury Line - Tremaine Ave	D
SH54	Kairanga Bunnythorpe Road -Waughs Road	D
SH56	Longburn Rongotea Road – Amberley Avenue	D
Railway Road/ Perimeter Road	Kairanga Bunnythorpe Road - El Prado Drive	D
Kairanga Bunnythorpe Road	SH3 – SH54	D
Campbell Road	Newbury Line - Kairanga Bunnythorpe Road	D
Ashhurst Road	Campbell Road – Raymond Street	C
Tremaine Avenue	SH3 – McLeavey Drive	D
Stoney Creek	Campbell Road – Kelvin Grove Road	B
Waughs Road	SH54 – to Feilding	E
El Prado Drive	Railway Road – Alderson Drive	B
Roberts Line	Railway Road – Kelvin Grove Road	D
Richardsons Line	Milson Line – Roberts Line	D
Clevely Line	Te Ngaio Road – Railway Road	A
Te Ngaio Road	Kairanga Bunnythorpe Road – Newbury Line	A

Table 9-8: Full build-out 'with RFH' scenario (PM peak) Intersection LOS

Name	LOS
Campbell Road/Kairanga Bunnythorpe Road	A
Railway Road/Kairanga Bunnythorpe Road	F
Roberts Line/Kairanga Bunnythorpe Road	A
SH54/Kairanga Bunnythorpe Road	A
SH3/Kairanga Bunnythorpe Road	B
SH54/Waughs Road	F
Perimeter road/ Roberts Line (future scenario)	B
Railway Road/ El Prado	B
Railway Road/ Airport Drive	B
Railway Road/ Tremaine Avenue	E
Richardsons Line/ Roberts Line	A

Name	LOS
Kelvin Grove Road/ Roberts Line	A
Stoney Creek Road/ Kelvin Grove Road	A
Tremaine Avenue/Milson Line	E
Tremaine Avenue/SH3	D
Flygers Line/SH3	E
Flygers Line/Milson Line	C
Milson Line/Richardsons Line	C

Several observations can be made from these tables, as follows:

- Waughs Road close to Feilding will continue to operate at LOS E between Camerons Line and the eastern end of Feilding
- Campbell Road will perform at a LOS DSIDRA
- 9/15 intersections will perform at a LOS D. Roberts Line between Perimeter road and existing Railway Road will perform at a LOS D (from LOS C 'without RFH')
- The following intersections will operate at a LOS F, like the 'without RFH' full build-out scenario:
  - Railway Road/Kairanga Bunnythorpe Road
  - SH54/Waughs Road
- The following intersections will operate at a LOS E
  - Tremaine Avenue/Milson Line
  - Railway Road/Tremaine Avenue
  - Flygers Line/SH3
- Tremaine Avenue/SH3, will operate at a LOS D, the same as existing conditions

The analysis of the road network as a result of the full buildout of the RFH and NEIZ shows a similar result to the 'without RFH' scenario. The results show that Roberts Line will be the only link to perform differently in the 'with RFH' scenario when compared to the 'without RFH' scenario, caused by the realignment of Railway Road. The results also show that the Flygers Line/SH3 intersection will have a reduced LOS due to the RFH. It is observed in this regard that the PNATM shows increased truck traffic using Flygers Line, whereas in practise it will likely follow existing parallel roads already used as heavy vehicle routes. The specific link section and intersection performances for the full build-out 'with RFH' scenario can be seen in Figure 9-5.

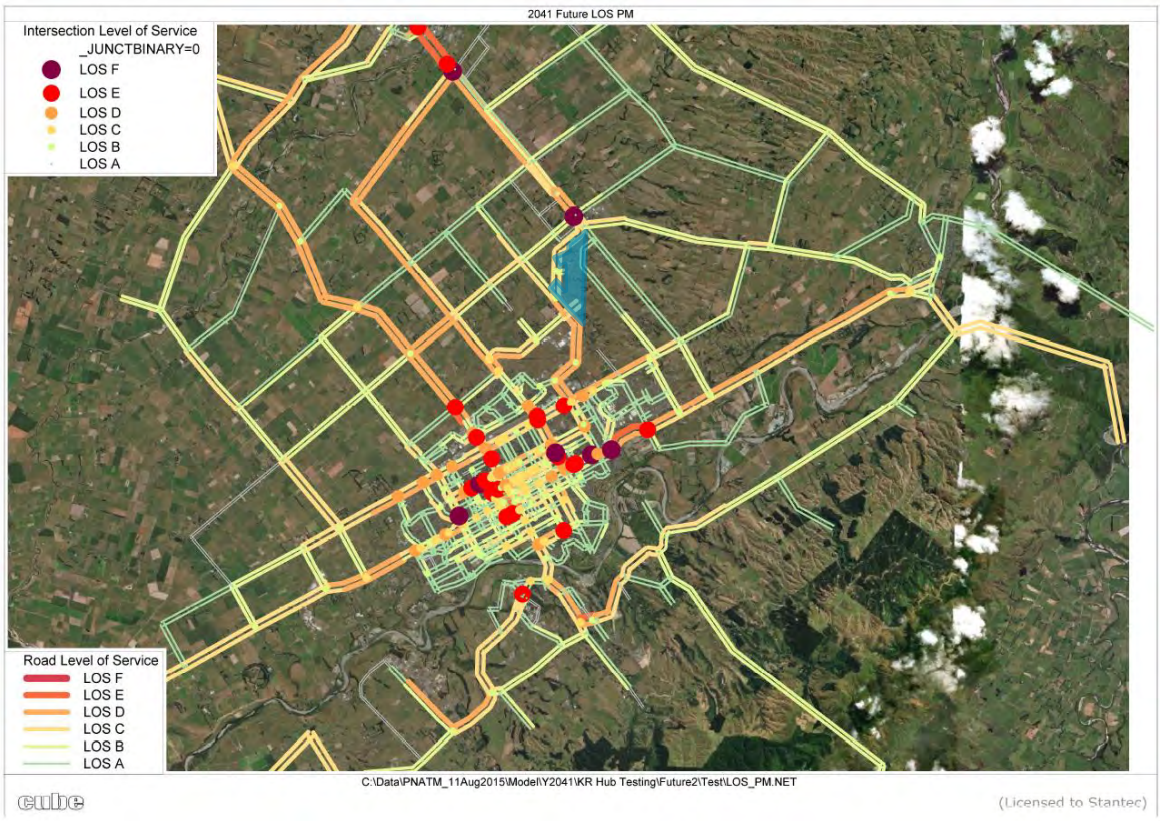


Figure 9-5: LOS for the Full build-out with RFH' Scenario

Figure 9-6 shows the distribution of heavy vehicle traffic generated by the RFH for the PM peak hour in the full build-out and demonstrates the attraction on each heavy vehicle route.

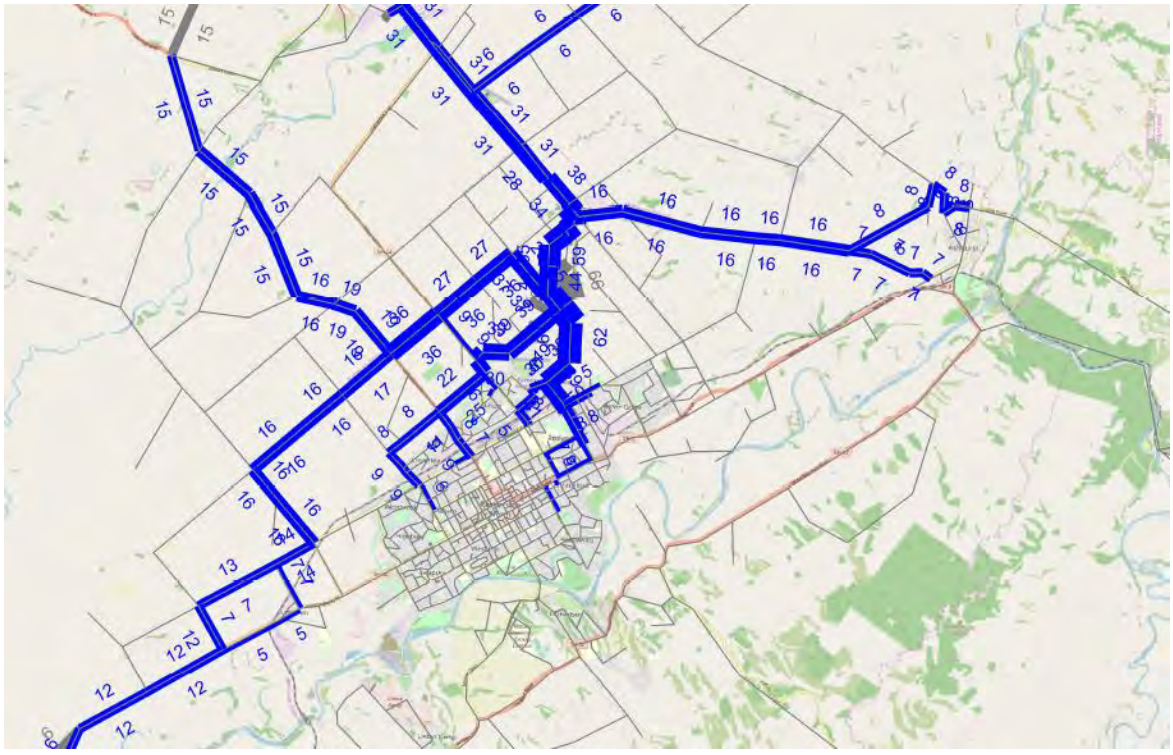


Figure 9-6: Full build-out Heavy Vehicle Traffic Distribution for the PM Peak Hour

Similar to the initial stage the added truck demands will travel common freight routes, with attraction to the primary northern, southern and eastern routes as shown.

10. Impacts of RFH on Transport Network

The following sections outline the assessment of transportation effects with regards to the operations of the RFH. As reported earlier in Section 4, the analysis assessed seven impact categories to determine the overall performance of the road network once the RFH is fully developed.

10.1 Network Traffic Effects

The additional traffic demand introduced to the road network due to the RFH will have a minor impact on the network, during the initial stage and full build out. The overall traffic demand for the RFH will be minor, accounting for roughly 3% of the total daily traffic on the PNATM network once the project has reached full build out.

Prior studies have assessed that the NEIZ extension is expected to generate 13,500vpd. It has been calculated that the RFH will displace 37.5% of the NEIZ extension. This implies that the RFH will displace 37.5% of the traffic expected to be generated by the NEIZ, equating to approximately 5,100vpd. Since the NEIZ extension traffic has already been assumed as future additions on the road network, the RFH will increase traffic demand on the network by only 6,900vpd, as summarised in Table 10-1.

Table 10-1: Full build-out Traffic increase to the road network due to the RFH

Developments	Full build-out Traffic demand (vpd)
RFH	12,000
NEIZ Extension (displaced by RFH)	(5,100)
Additional traffic on network	6,900

A light to heavy vehicle split of 60%/40% has been applied to the RFH. These heavy vehicles will comprise of more than 70% rigid trucks, with the smaller balance of heavy vehicle traffic involving articulated trucks, expected to travel already utilised routes.

It is assessed that this minor increase will have a negative-minor impact on the road network

10.1.1 Network Performance

The PNATM analysis revealed that the performance of the road network will remain primarily constant between the 'with' and 'without' RFH scenarios, as demonstrated by the link and intersection analyses set out next.

10.1.1.1 Link Performance

A summary of the performance of all links included earlier in this report is shown in Table 10-2. Performance has been evaluated using the Table 8-5 definition for LOS, using volume to capacity to measure the level of congestion on roadway links.

Table 10-2: Network Link Performance

NAME	EXISTING	'WITHOUT RFH'		'WITH RFH'	
	2021	2031	2041	Initial Stage	Full build-out
SH54	D	D	D	D	D
SH3	D	D	D	D	D
SH56	D	D	D	D	D
Railway Road 'without RFH'/ Perimeter Road 'with RFH'	D	D	D	D	D
Kairanga Bunnythorpe Road	C	D	D	D	D
Campbell Road	D	D	D	D	D
Ashhurst Road	B	C	C	C	C
Tremaine Avenue	D	D	D	D	D
Stoney Creek Road	B	B	B	B	B

NAME	EXISTING	'WITHOUT RFH'		'WITH RFH'	
	2021	2031	2041	Initial Stage	Full build-out
Waughs Road	E	E	E	E	E
El Prado Drive	B	B	B	B	B
Roberts Line	B	C	C	D	D
Richardsons Line	B	C	D	C	D
Clevely Line	A	A	A	A	A
Te Ngaio Road	A	A	A	A	A

Listed below are the key findings of the LOS changes (if any) between the 'without RFH' and 'with RFH' initial stage (and 2031) and full build-out (and 2041) scenarios:

- The existing Railway Road and the perimeter road will operate at a LOS D, the same as existing conditions. This road will be designed as an arterial, with a reduced speed from 100km/hr to 80km/hr
- Waughs Road closer to Feilding operates at a LOS E in all scenarios
- Campbell Road will perform at a LOS D in all future scenarios
- Roberts Line (west of Railway Road) will operate at a LOS C in the 'without RFH' scenarios and a LOS D in the 'with RFH' scenarios, caused by the traffic shift onto this road as a result of it essentially functioning as part of perimeter road
- Richardsons Line will have an increase in traffic due to the NEIZ and the RFH, performing at a LOS D in the full build-out scenarios
- Tremaine Avenue will consistently perform at a LOS D

10.1.1.2 Intersections Performance

A summary of intersection performances for the same local and arterial roads included earlier in this report, is shown in Table 10-3. The assessment of intersection performance was undertaken using delay to measure LOS, detailed in Table 8-6. .

Table 10-3: Network Intersection Performance

NAME	EXISTING	WITHOUT		WITH	
	2021	2031	2041	Initial Stage	Full build-out
Campbell Road/Kairanga Bunnythorpe Road	A	A	A	A	A
Railway Road/Kairanga Bunnythorpe Road	D	F	F	F	F
Roberts Line/Kairanga Bunnythorpe Road	A	A	A	A	A
SH54/Kairanga Bunnythorpe Road	C	A	A	A	A
SH3/Kairanga Bunnythorpe Road	C	A	B	A	B
SH54/Waughs Road	D	F	F	F	F
Railway Road/ Roberts Line	A	C	E	B	B
Railway Road/ El Prado Drive	B	B	B	B	B
Railway Road/ Airport Drive	A	A	B	A	B
Railway Road/ Tremaine Avenue	E	E	F	E	E
Richardsons Line/ Roberts Line	A	A	A	A	A
Kelvin Grove Road/ Roberts Line	A	A	C	A	A
Stoney Creek Road/ Kelvin Grove Road	A	A	A	A	A
Tremaine Avenue/Milson Line	D	E	E	E	E

NAME	EXISTING	WITHOUT		WITH	
	2021	2031	2041	Initial Stage	Full build-out
Tremaine Avenue/SH3	D	D	D	D	D
Flygers Line/SH3	B	B	D	C	E
Flygers Line/Milson Line	A	A	C	B	C
Milson Line/Richardsons Line	A	A	C	B	C

The output from the PNATM provided a basis to identify seven key intersections for further analysis, within this study, using SIDRA to analyse the PM peak hour for the full build-out with and 'without RFH' scenarios, for which the results are discussed below. These intersections are shown by the large red dots in the map included as Figure 10-1 and are listed below. SIDRA is regarded as an industry standard for understanding the performance of intersections at a detailed level not otherwise presented by the PNATM.

1. Railway Road – Kairanga Bunnythorpe Road
2. SH54 – Waughs Road
3. Railway Road-Tremaine Avenue
4. Tremaine Avenue-Milson Line
5. Flygers Line – SH3

The Railway Road- Roberts Line intersection was not modelled in SIDRA, since this intersection will be converted to a free flow operation once Railway Road is closed

The following intersections have not been triggered by the PNATM but have been analysed in SIDRA for reasons described below.

1. Campbell Road-Kairanga Bunnythorpe Road
2. Stoney Creek Road– Kelvin Grove Road

Although the PNATM did not show the Campbell Road-Kairanga Bunnythorpe Road intersection as required by the refined SIDRA analysis, this intersection was tested in SIDRA. Due to the proximity of three key components of infrastructure, all of which lie within a space of 30m:

- Campbell Road-Kairanga Bunnythorpe Road intersection,
- Kairanga Bunnythorpe Road level crossing and
- Railway Road-Kairanga Bunnythorpe Road intersection

Likewise, the PNATM did not show a LOS at the Stoney Creek Road– Kelvin Grove Road intersection that required SIDRA analysis; however, this intersection was modelled in SIDRA due to the high intersection safety risk, identified earlier.

Figure 10-1: Intersections analysed using SIDRA

The SIDRA results are summarised below in Table 10-4.

Table 10-4: Full build-out With and 'without RFH' SIDRA Results - PM Peak

Site	Worst Approach	**'without** RFH' LOS (2041)	**'with** RFH' LOS (Full Build Out)
Railway Road – Kairanga Bunnythorpe Road	Railway Road	B	C
SH54 – Waughs Road	SH54	F	F
Railway Road - Tremaine Avenue	Railway Road	C	D
Tremaine Avenue-Milson Line	All Approaches	F	F
SH3 – Flygers Line	Flygers Line SB	F	F
Campbell Road- Kairanga Bunnythorpe Road (all approaches give way)	Campbell Road	F	F
Stoney Creek Road – Kelvin Grove Road	Stoney Creek Road (NB Through)	A	A

The SIDRA results showed that SH54/Waughs Road, Tremaine Avenue/Milson Line, SH3/Flygers Line, and Campbell Road/ Kairanga Bunnythorpe Road intersections will perform poorly with or without the RFH. The Roading Network Integration Plan will provide a mechanism for a coordinated approach to addressing these identified future deficiencies.

The SH3/Flygers Line intersection and the SH54/Waughs Road intersection will perform at an unacceptable LOS F, with or without the RFH, due to the large delays experienced on the minor roads. Therefore, a

change in intersection form is considered warranted irrespective of the RFH. A proposed roundabout was simulated in each instance to understand the resulting improvement of performance. Table 10-5 shows that the roundabout will perform at an acceptable LOS.

The Tremaine Avenue/Milson Line intersection is also shown to perform at an unacceptable LOS F, due to the large through and right turning volumes on Milson Line. The intersection can be upgraded to include additional lanes (approach and departure). This potential solution was tested for both the with and 'without RFH' ultimate scenarios. Table 10-5 shows such an improvement will result in the intersection performing at an acceptable LOS C.

The Campbell Road/ Kairanga Bunnythorpe Road intersection was analysed as a four-leg give-way in SIDRA, to simulate on the ground conditions, since it does not function as a typical roundabout in practise. The results show that the Campbell Road west approach will operate at a LOS F, in the full build-out without and with the RFH. There are a few potential improvement options for the Campbell Road/ Kairanga Bunnythorpe Road intersection, ranging from improving roundabout definition, to changing priority in favour of Railway Road and to a co-ordinated traffic signal for the Campbell Road/ Kairanga Bunnythorpe Road intersection, Railway Road/ Kairanga Bunnythorpe Road, and Kairanga Bunnythorpe level crossing. Due to the proximity of the Railway Road/ Kairanga Bunnythorpe Road intersection and the Kairanga Bunnythorpe level crossing, potential changes must consider all three infrastructure components as a single node. Even then, it is acknowledged that an infrastructure upgrade at the Campbell Road/ Kairanga Bunnythorpe Road intersection will be nullified by the implementation of the western and southern bypasses, which will reduce traffic at this intersection. If these strategic infrastructure improvements are implemented before the ultimate RFH is realised, direct changes may not be required at the Campbell Road/ Kairanga Bunnythorpe Road intersection.

Table 10-5: Mitigation results at underperforming intersections

Site	**'without** RFH' LOS (2041)	**'with** RFH' LOS (Full Buildout)
SH54 – Waughs Road (roundabout)	C	C
SH3 – Flygers Line (roundabout)	C	C
Tremaine Avenue - Milson Line (increased lanes)	C	C
Campbell Road/ Kairanga Bunnythorpe Road (signal)	C	C

It is assessed that the traffic impact of the RFH on link and intersection performance will be negative-minor, since those links and intersection shown to be performing poorly in the 'with RFH' scenario are shown to also be performing poorly in the 'without RFH' scenario and in need of addressing by authorities other than KiwiRail.

The traffic generated by the RFH, (6,900vpd), alone will not trigger the improvements outlined in Section 7.1.2 (western and southern bypasses of Bunnythorpe and the ring road).

As above, the performances identified here exist irrespective of the RFH, such that the strategic infrastructure improvements to be advanced by Waka Kotahi and PNCC are not fundamental in terms of link performance for the Project. By way of the proposed Roading Network Integration Plan the authorities (Waka Kotahi, PNCC and KiwiRail) will work together in developing and delivering a coordinated transport network.

10.1.2 Traffic Distribution

The traffic redistribution caused by changes to the road network will be localised with the primary redistribution occurring around the RFH and secondary changes on the key corridors.

10.1.2.1 Total Traffic

Overall, the analysis shows that the general traffic shift will be localised, with the predominant shift occurring around the RFH. Figure 10-2 and Figure 10-3 show the daily traffic volumes for the 'without RFH' and the 'with RFH' full build-out scenarios. The comparative initial stage daily traffic plots are shown in Table 10-6.

This section focuses on the full build-out scenario, as this represents the worst case in terms of possible future mitigations required.

Table 10-6 provides a summary of the volume shift (traffic redistribution) on crucial routes within the study area as a result of the RFH position and infrastructure changes, by comparing the shift from existing routes used without the RFH to the expected traffic routes that will be used with the RFH.

Table 10-6: Volume shift for all vehicles for Full build-out

Road	Section	Traffic Shift (vpd)
SH3	Newbury Line – Kairanga Bunnythorpe Road	+300
SH54	Waughs Road - Kairanga Bunnythorpe Road	+500
Perimeter road	Perimeter road between Maple Street and Roberts Line	+10,000
Railway Road	Airport Drive - Tremaine Avenue	+3,500
Roberts Line	Railway Road – Kelvin Grove Road	-5,500
Roberts Line	Roberts Line/Railway Road – Roberts Line/Perimeter road	+2,500
Kairanga Bunnythorpe Road	SH3 – Campbell Road	+1,500
Campbell Road	Newbury Line – Kairanga Bunnythorpe Road	+900
Waughs Road	SH54 – to Feilding	+800
Stoney Creek Road	Campbell Road – Kelvin Grove Road	+1,200
Ashhurst Road	SH3 (north) – Campbell Road	+600
Tremaine Avenue	Averaged between Longburn Rongotea Road and Railway Road	-100
Richardsons Line	Roberts Line – Milson Line	+1,800

The key traffic shift will be from the existing Railway Road to the Perimeter road, with a volume shift of 10,000 vpd. The perimeter road will be designed to adequately cater for this traffic shift, which itself involves a combination of existing flows plus future traffic growth and increased volumes forecast for the likes of development in the NEIZ plus traffic associated with the RFH.

Stoney Creek Road, Ashhurst Road, and the southern portion of Railway Road will also see an increase in traffic demand due to the RFH. The traffic demand along Stoney Creek Road is forecast to increase by approximately 1,200 vpd, still well within the traffic carrying capacity of the road.

Level crossing closures will result in the biggest traffic reduction on Roberts Line, with a decrease of approximately 5,500 vpd. This reduction in traffic will lead to better living and operational conditions for residents and businesses along this route.

The Richardsons Line level crossing closure will trigger the partial formation of Sangsters Road north of Roberts Line to Richardson Line to provide access to the two residential blocks currently using the private level crossing onto Railway Road. It is envisaged that this formation will be within the paper road reserve, effectively as a driveway, while the portion of Sangsters Road north of Tutaki Road will remain unchanged.

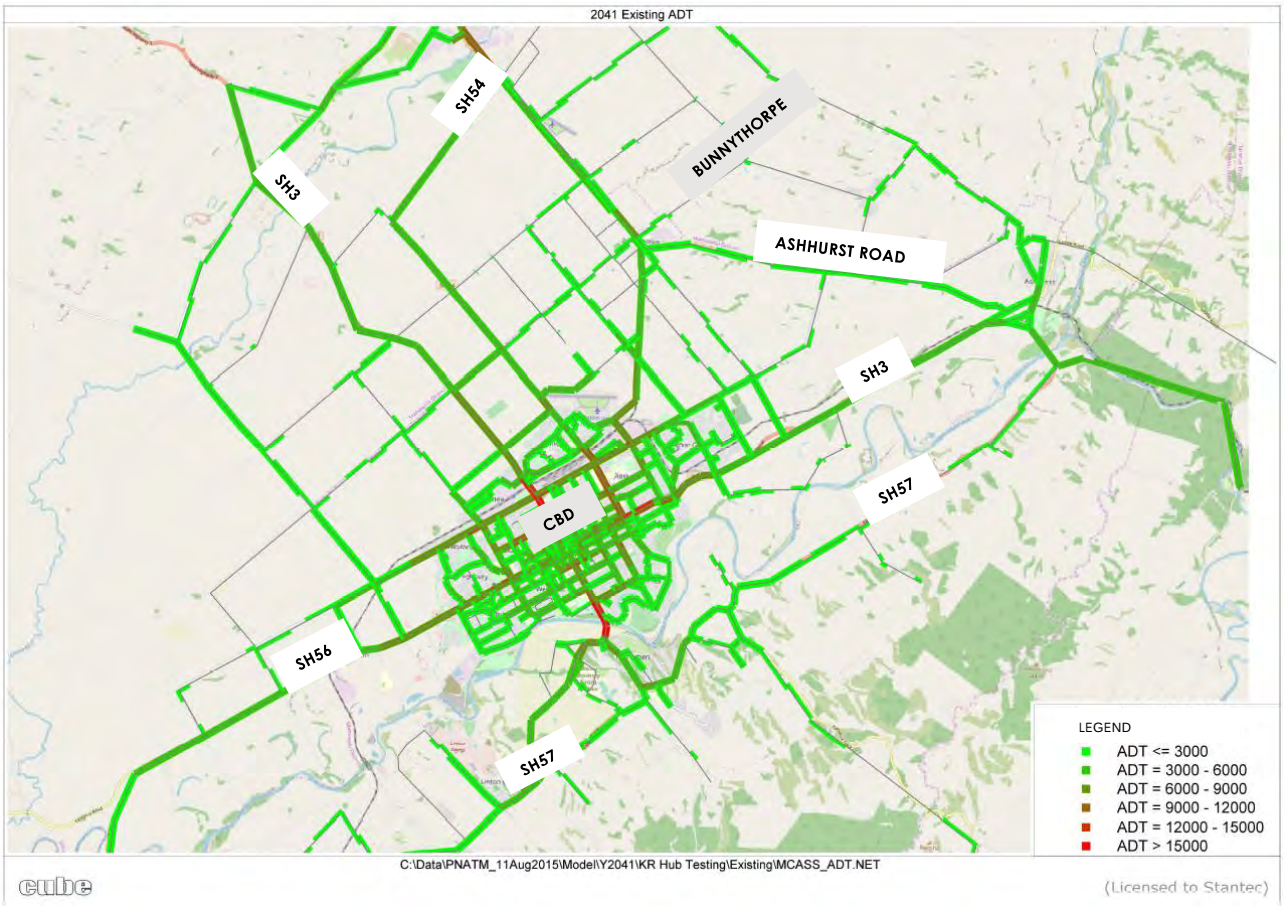


Figure 10-2: Full build-out ADT – 'without RFH' Scenario

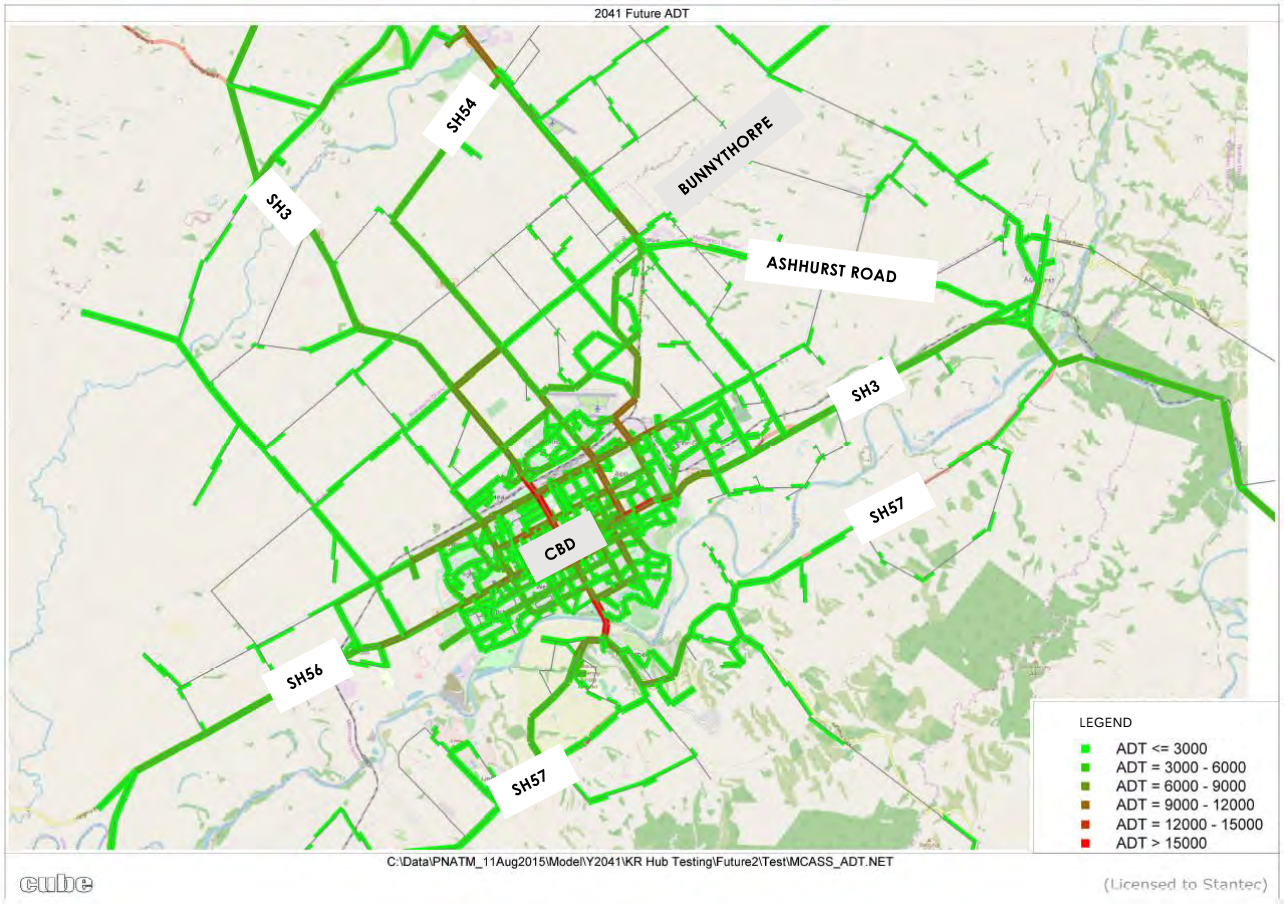


Figure 10-3: Full build-out ADT – 'with RFH' Scenario

10.1.2.2 Heavy Vehicle Traffic

Heavy vehicle traffic generated by the RFH was assigned in the model as described in Section 6.3 and will primarily use the key corridors currently used and planned for heavy vehicle movements. It is again noted that the distribution of heavy vehicle traffic described here predominantly involves rigid trucks, at approximately 70%, with the smaller balance being articulated trucks as described at Section 6.1.

As expected, the key heavy vehicle traffic shift will be from the existing Railway Road to the perimeter road, with a volume shift of 2,200 heavy vehicle (vpd). The perimeter road will be designed to adequately cater for heavy vehicle traffic, with the design of accesses and intersections having high capacities and good road geometry for trucks, including additional lanes for turning vehicles.

The PNATM shows a high volume of heavy vehicles will travel between Feilding and the RFH, due to the existing and proposed industrial developments in Feilding and connections beyond to SH1, with a volume shift of 400 heavy vehicles onto Campbell Road and Waughs Road, in each direction (redistributing from SH54). As an established arterial route, both roads are designed to accommodate these heavy vehicles, although Waughs Road will need improvement, since the SH54 to Feilding portion of the road and the SH54/Waughs Road intersection currently operates at a LOS E. The SIDRA analysis revealed that Campbell Road/Kairanga Bunnythorpe intersection currently operates at a LOS F and will also need future improvements.

As expected from their functions, SH3, Kairanga Bunnythorpe Road, Ashhurst Road, and Railway Road (south of Roberts Line) will also experience an increase in heavy vehicle traffic demand in response to the RFH. Beyond the upgrades to be progressed by other authorities, no further mitigation is shown to be necessary on these routes.

The PNATM also shows there will be an increase in heavy vehicle usages along Richardsons Line (between Milson Line and Roberts Line), 600vpd. This road has been identified as a do-minimum upgrade by PNCC due to the expected traffic from the NEIZ, beyond which no further upgrades are shown to be necessary. A portion of this traffic could reach Richardsons Line via Flygers Line and Milson Line under the development scenarios envisaged by both the NEIZ and the RFH. Design and management responses

may be needed by PNCC along Flygers Line to ensure trucks use the preferred parallel route of Kairanga Bunnythorpe Road.

Roberts Line (east of Railway Road) will have the most substantial decrease in heavy vehicle trips, with a 600 vpd reduction. This decrease will result in an improved living area for all residents along this route. Other reductions in heavy vehicle utilisation will be along Tremaine Avenue, directly attributable to shifting the rail freight operations to the RFH as proposed.

Table 10-7 below summarises the key heavy vehicle traffic shifts, while Figure 10-4 and Figure 10-5 traffic patterns for the 'without RFH' and the 'with RFH' scenarios respectively.

Table 10-7: Volume Shift for Heavy Vehicles

Road	Section Impacted	Traffic Shift (vpd)
SH3	Newbury Line – Kairanga Bunnythorpe Road	+300
SH54	Waughs Road - Kairanga Bunnythorpe Road	-50
Perimeter road	Maple Street – Roberts Line	+2,200
Railway Road	Airport Drive - Tremaine Avenue	+1,200
Roberts Line	Railway Road – Kelvin Grove Road	-600
Roberts Line	Roberts Line/Railway Road – Roberts Line/Perimeter road	+600
Kairanga Bunnythorpe Road	SH3 – Campbell Road	+800
Campbell Road	Newbury Line – Kairanga Bunnythorpe Road	+800
Waughs Road	SH54 – to Feilding	+500
Stoney Creek Road	Campbell Road – Kelvin Grove Road	+200
Ashhurst Road	SH3 (north) – Campbell Road	+400
Tremaine Avenue	Averaged between Longburn Rongotea Road and Railway Road	-300
Richardsons Line	Roberts Line – Milson Line	+600

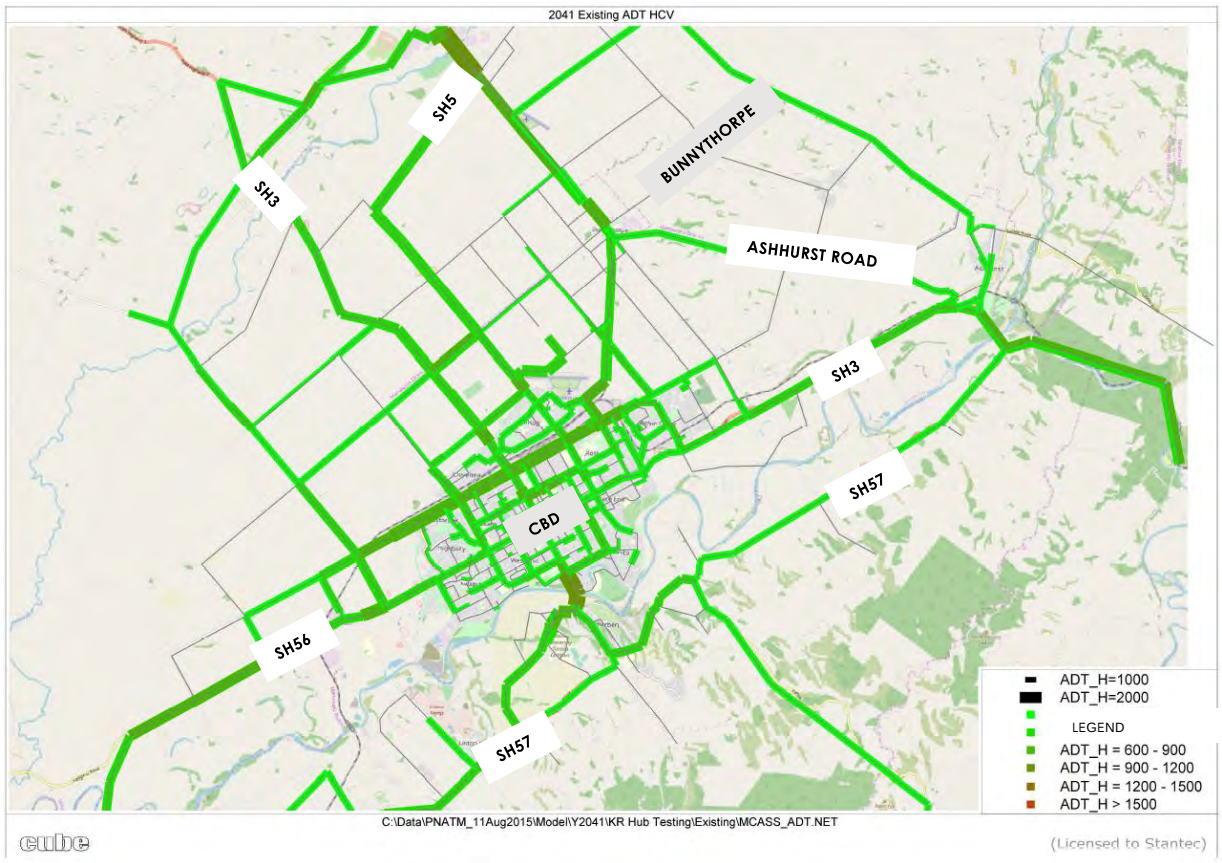


Figure 10-4: Full build-out Heavy Vehicle ADT – 'without RFH' Scenario

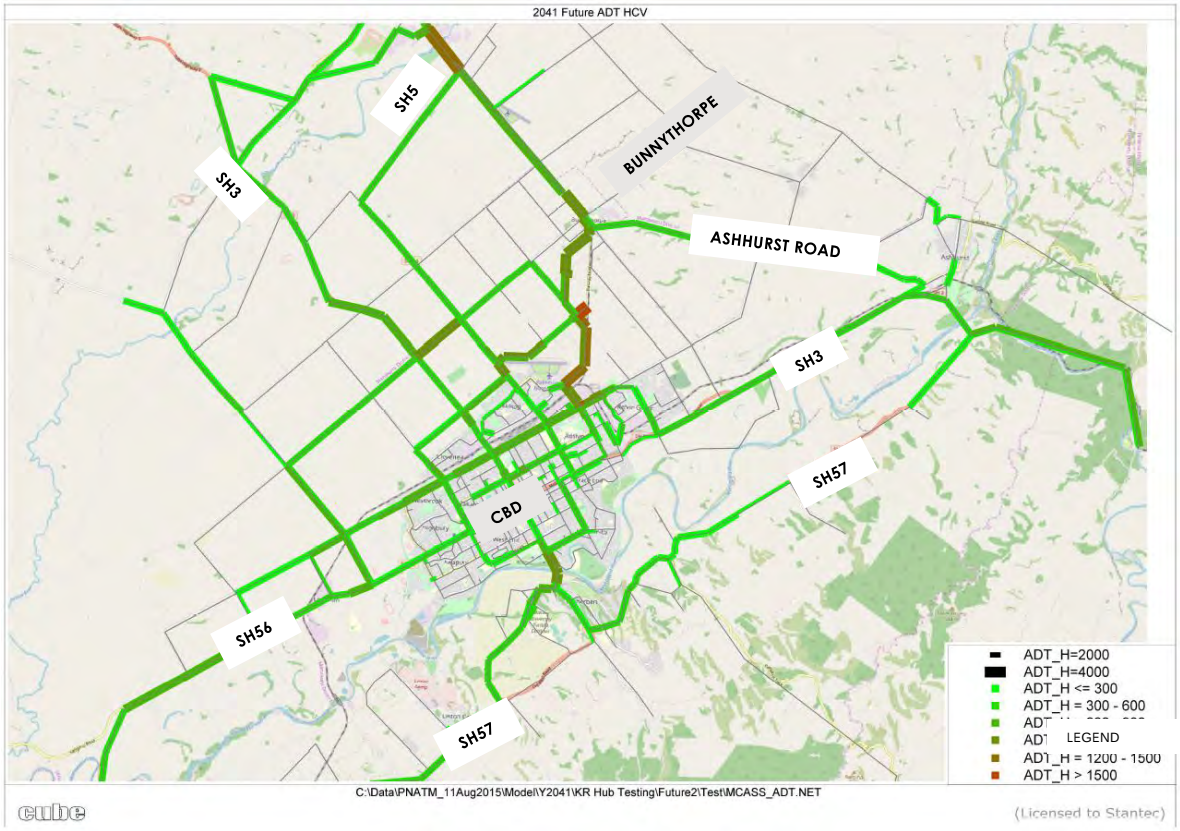


Figure 10-5: Full build-out Heavy Vehicle ADT – 'with RFH' Scenario

In the manner described, the redistributed traffic includes a range of traffic additions and subtractions in response to development of the RFH. Overall, it is assessed that the traffic redistribution will have a negative-minor impact on the road network.

10.1.3 Overall

The overall network performance was analysed using the change in Vehicle Kilometres Travelled and Vehicle Hour Travelled. The results showed that the increase in traffic will cause an increase of 1.3% and 1.4% respectively for the initial stage and 1.3% and 1.8% respectively during the full build-out.

Table 10-8: Network Performance

Year	Value	Daily Veh-kms	Daily Veh-hrs
Initial stage	without	2,791,385	55,697
	with	2,827,634	56,473
Full build-out	without	3,521,582	61,684
	with	3,565,776	62,783

The RFH will have a negative-minor impact on total traffic performance, based on the three assessment categories included in this section of the report.

10.2 Travel Time Effects

10.2.1 Travel Time Impacts due to Infrastructure Closures

Route choice between key origin-destinations will be impacted by the infrastructure changes triggered by the introduction of the RFH. The most dominant impact to route choice will be the implications to travel time due to these network changes.

The planned road and level crossing closures that will impact the network are:

1. Railway Road closure and construction of the perimeter road
2. Railway Road/Roberts Line level crossing closure (meaning no east-west travel over Railway Road)
3. Railway Road/Richardsons Line level crossing closure (currently serving two properties)
4. Railway Road/Clevely Line level crossing closure (meaning impact to bus and commuter routes utilising this level crossing to travel between Railway Road and other surrounding roads/areas)
5. Partial Clevely Line road closure (remaining proprieties will have to redistribute onto alternative routes)
6. Partial Te Ngaio Road closure (no direct access onto Railway Road)
7. Partial Richardsons Line road closure (no direct access onto Railway Road)

The perimeter road will have an implied impact on travel times, as this perimeter road, will be longer than the current Railway Road. The increase in travel times for traffic using this link will be less than 30 seconds.

The additional effect of the infrastructure changes on travel times is set out below.

10.2.1.1 Roberts Line level crossing closure

The Roberts Line level crossing closure will impact all traffic currently using this crossing to access Railway Road. It is expected this closure will have the biggest impact on the route between Kelvin Grove and Bunnythorpe. The road network offers adequate redundancy, with traffic likely to reroute onto Railway Road (via Tremaine Avenue) and Stoney Creek Road. The impact to this traffic will be an increase in travel time of approximately four minutes. It is acknowledged that this increase may be considered undesirable for some users, however, this travel time increase will be offset by the reduction in road safety risk as a result of the level crossing closure and removal of heavy truck movements along this road.

10.2.1.2 Richardsons Line level crossing closure

There are two properties currently gaining access to Railway Road via this level crossing at Richardsons Line. An upgrade of Sangsters Road, to Roberts Line is planned as the primary driveway access to these

properties. The largest impact to travel time is around six minutes for the assumed minor level of related traffic that will travel to Bunnythorpe.

Other property travel time implications due to the network changes are shown in Table 10-9.

10.2.1.3 Clevely Line level crossing closure

Properties around Clevely Line, Parrs Road and uses surrounding the Clevely Line level crossing. This traffic will redistribute to Stoney Creek Road and then the wider network.

10.2.1.4 Road closure at Clevely Line and Te Ngaio Road

These roads will no longer have direct access onto Railway Road and there are no plans for access onto perimeter road. Clevely Line will still have a connection onto Roberts Line and Te Ngaio Road will have a connection via Kairanga Bunnythorpe Road. Both alternatives provide adequate access to the wider road network.

Table 10-9: Key Origin-Destination Travel Time Implications in minutes

Property Access Along	Impact	Dixon Line/Raymond Street (Bunnythorpe)	Railway Road/ Tremaine Avenue	Roberts Line/ Mihaere Drive (Kelvin Grove)
		PM (minutes)	PM (minutes)	PM (minutes)
Roberts Line East	No direct access onto Railway Road	4	1	1
Richardsons Line West	No direct access onto Railway Road	6	1	0
Clevely Line	Road closure No direct access onto Railway Road	0	2	2
Te Ngaio Road	No direct access onto Railway road	0	2	4
Sangster Road (unformed)	No direct access onto Railway Road	0	4	0

The level crossing and road closures will result in increased travel times to property owners along the affected roads and therefore scores an overall negative-minor, for this category.

The existing and future route maps for affected Origin-Destinations are detailed in Appendix E.

10.2.2 Travel Time Impacts due to increased Train lengths

Train lengths at the RFH are expected to increase from the current 900m to a maximum length of 1,500m. This increase will result in increased delays to road users at level crossings. Since the relocation of Railway Road will result in the closure of three level crossings within the study area, the only level crossing that will be impacted by these train lengths will be the one on Kairanga Bunnythorpe Road.

Currently the 900m train lengths could cause a delay ranging between 41-108 seconds (for the first vehicle at the level crossing), based on speeds between 30 - 80 km/h, as taken from the Coupled In-Motion Weighing site nearby. This speed range is shown in Figure 10-6.

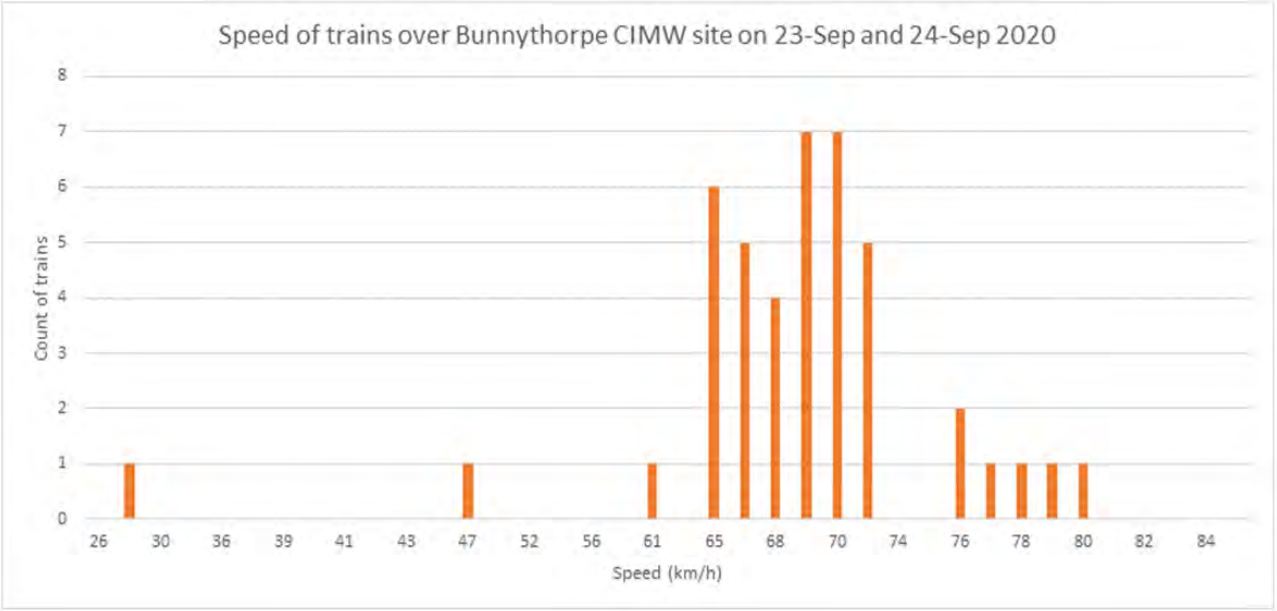


Figure 10-6: Train speeds at Coupled In-Motion Weighing (CIMW) approximately 1km north of 'kung fu corner'

No change in speed range is anticipated at this level crossing due to the proximity of the RFH, since two types of trains will traverse the Kairanga Bunnythorpe level crossing:

1. Trains destined for the RFH
2. Trains bypassing the RFH

Trains destined for the RFH will accelerate and decelerate in and out of the RFH, and will therefore operate within the lower speed range, while bypassing trains will travel at higher speeds past the site.

Using the same speed range, the delay for the longer 1500m trains can be estimated to be between 68 – 180 seconds (for the first vehicle at the level crossing). The results show that the longer trains could cause an increase in travel times ranging from less than 30 seconds to just over one minute for the first vehicle at the level crossing. This travel time delay will apply to all road users (including pedestrians and cyclists) utilising this level crossing in future.

Due to the longer train lengths it is likely that the number of trains traversing this crossing will reduce, reducing frequency of road users may need to stop at this level crossing.

With the increase in train length expected to result in a decrease in the number of trains passing this level crossing it is assessed that the impact will be negative-minor.

10.2.3 Route Travel times

A route travel time analysis was undertaken using the PNATM to determine the impacts on road users, using key routes that are expected be the most affected. Table 10-10 and Table 10-11 show the travel time implication for the initial stage and full buildout scenarios for the PM peak hour. The travel time is calculated using all utilised routes between each Origin-Destination.

Typically, these increases in travel times are acceptable, with an average increase of up to 30 and 45 seconds is modelled for the initial stage and full build-out, respectively.

Table 10-10: Initial stage With and 'without RFH' Route Travel Time Difference in minutes (PM Peak)

Initial stage (minutes)	Feilding	CBD	Bunnythorpe	Kelvin Grove	Ashhurst	NEIZ Existing	NEIZ Extension
Feilding		0.2	0.0	1.9	0.1	0.7	2.0
CBD	0.1		0.1	0.0	0.0	0.0	0.1
Bunnythorpe	0.0	0.0		1.2	0.0	0.7	2.0
Kelvin Grove	1.0	0.0	1.1		0.0	0.1	4.1
Ashhurst	0.0	0.0	0.0	0.0		0.5	2.2

Initial stage (minutes)	Feilding	CBD	Bunnythorpe	Kelvin Grove	Ashhurst	NEIZ Existing	NEIZ Extension
NEIZ Existing	0.3	0.1	1.0	0.4	2.0		0.0
NEIZ Extension	2.8	0.2	2.5	3.6	2.8	0.1	

Table 10-11: Full build-out With and 'without RFH' Route Travel Time Difference (PM Peak)

Full build-out (minutes)	Feilding	CBD	Bunnythorpe	Kelvin Grove	Ashhurst	NEIZ Existing	NEIZ Extension
Feilding		0.4	0.1	1.8	0.1	0.9	0.6
CBD	0.3		0.3	0.0	0.0	0.1	0.1
Bunnythorpe	0.0	0.1		1.1	0.0	0.7	0.5
Kelvin Grove	0.9	0.2	0.9		0.0	0.3	2.9
Ashhurst	0.0	0.0	0.0	0.0		0.5	0.7
NEIZ Existing	0.2	-0.1	1.1	0.6	2.1		0.0
NEIZ Extension	1.1	-0.1	1.1	1.8	1.3	-0.1	

The level crossing and road closures will result in increased travel times to key routes on the road network resulting in a negative-minor impact.

10.2.4 Overall

The RFH will have a negative-minor impact on access and route travel times.

10.3 Level Crossing Closures Effects

10.3.1.1 Kairanga – Bunnythorpe Crossing

ALCAM Road Crossing (ALCAM ID#380)

The proposed Change in Use involves the average train length increasing from 900m to 1,200m. An average train length of 1,200m was used for this analysis, as the train lengths utilising this level crossing would vary in length. In addition, the traffic volume will increase from approximately 7,500 vpd to 11,500 vpd, for the 'with RFH' scenario and from 7,500 vpd to 9,500 vpd for the 'without RFH' scenario. Therefore, the two future scenarios were tested separately for this level crossing.

1. 'Without RFH' scenario

In the Change in Use scenario the ALCAM risk band will remain High and the ALCAM risk score increases by 19% for the Change in Use scenario. The predicted return period for fatal crashes will reduce by 24 years to 123 years for the Change in Use scenario, meaning a fatal crash is more likely to occur due to the Change in Use.

The ALCAM score in an LCSS assessment would equate to 27 points in an LCSIA. If the other LCSIA components were considered the crossing would not likely meet Criterion 1 (LCSS<30). If it is confirmed that the crossing does not meet Criterion 1, then the crossing treatment will have to be reviewed to determine how it can be made safer.

2. 'With RFH' scenario

In the Change in Use scenario the ALCAM risk band will remain High and the ALCAM risk score increases by 31% for the Change in Use scenario. The predicted return period for fatal crashes will reduce by 34 years to 113 years for the Change in Use scenario, meaning a fatal crash is more likely to occur due to the Change in Use.

The ALCAM score in an LCSS assessment would equate to 27 points in an LCSIA. If the other LCSIA components were considered the crossing would not likely meet Criterion 1 (LCSS<30). If it is confirmed that the crossing does not meet Criterion 1, then the crossing treatment will have to be reviewed to determine how it can be made safer.

ALCAM Pedestrian Crossing (ALCAM ID #381)

The existing ALCAM risk band is Medium-High and remains Medium-High for the Change in Use. The ALCAM risk score increases by 0.5% in the Change in Use scenario. For the Pedestrian ALCAM model based on the risk scores, the risk slightly increases in the Change in Use scenario.

The ALCAM score in an LCSS assessment would equate to 21 points in an LCSIA, which falls in the Medium-Low risk band. However, the other components of the LCSS score would have to be considered to determine whether the crossing remains in the 'Medium-Low' risk band i.e. meet Criterion 1.

10.3.1.2 Clevely Line Crossing

ALCAM Road Crossing (ALCAM ID#379)

The existing crossing is proposed to be closed in the Change in Use scenario.

In the Change in Use scenario the crossing is closed, and crash risk removed, which is the best outcome for road users all things considered. If the crossing remained open, then an LCSIA would be required to determine the full LCSS and appropriate treatments to make it safer for motorists.

10.3.1.3 Richardsons Line

ALCAM Road Crossing (ALCAM ID#3661)

The existing crossing is proposed to be closed in the Change in Use scenario.

10.3.1.4 Roberts Line Crossing

ALCAM Road Crossing (ALCAM ID#378)

The existing crossing is proposed to be closed in the Change in Use scenario.

10.3.2 Overall

The RFH will have a positive-moderate impact for this category.

Based on the ALCAM score only, the Change in Use at Kairanga Bunnythorpe may result in the crossing not meeting KiwiRail's LCSIA Criterion 1. To determine this with certainty, a LCSIA is required to determine the full LCSS score as well as any mitigating measures required at each crossing to meet Criterion 1.

Based on the ALCAM scores the existing Clevely Line, Richardsons Line and Roberts Line are high risk crossings. The risk will be removed once these crossings are closed.

In addition, the level crossing closures will cause a redistribution of traffic throughout the network and will result in reduced traffic on the PNGL level crossings between Roberts Line and the Stoney Creek Road.

10.4 Safety Risk

An Infrastructure Risk Rating (IRR) assessment was undertaken for the key routes within the study area, using future traffic demand and infrastructure expected in the full build-out 'with RFH' scenario and the categories shown in Figure 10-7. Table 10-12, shows that the safety risk on the same key roads, shown in Table 5-3, will predominately remain the same even with the increase in traffic demand on the road network. There will be some roads with increased safety risk, however, not enough to move the road into the next risk category.

IRR Score	Rural	Urban
0 to <0.8	Low	Low
0.8 to <1.2	Low-Medium	Low
1.2 to <1.6	Medium	Low
1.6 to <2.0	Medium-High	Low-Medium
2.0 to <2.4	High	Medium
2.4 to <2.8	High	Medium-High
2.8+	High	High

Figure 10-7: Infrastructure Risk Rating scores[51]

[51] https://www.nzta.govt.nz/assets/Safety/docs/speed-management-resources/irr-manual-201607.pdf

Table 10-12: IRR for the Full build-out 'with RFH' Scenario

Road	Recalculated IRR	Future Traffic Bracket (vpd)	Future IRR	Proposed Changes
SH3	Medium	No change	Medium	No changes proposed
SH54	Medium	>12000	Medium (Score change from 1.3 -1.43)	Traffic between Feilding and SH54 will increase, however will not change safety risk
SH56	Medium	No change	Medium	No changes proposed
Railway Road	Medium High	6000-12000	Medium	Safety along the Perimeter road is expected to be better, with the use of updated standards for design including shoulders on road alignment, higher quality intersections elimination or protection of roadside hazards via barriers
Kairanga Bunnythorpe Road	Medium High	No change	Medium	No changes proposed
Campbell Road	Medium High	>12000	Medium High (Score change from 1.62-1.76)	In the event of the implementation of the Western Bunnythorpe Bypass traffic volumes on Campbell Road and the level crossing will reduce, improving future IRR Prior to the strategic improvements being realised, the Roading Network Integration Plan will provide a framework for KiwiRail to coordinate improvements with PNCC and Waka Kotahi
Ashhurst Road	Medium High	No change	Medium High	No changes proposed
Tremaine Avenue	Medium	No change	Medium	No changes proposed
Stoney Creek Road	Medium	No change	Medium	The do-minimum safety improvements planned by PNCC will improve the safety risk on this road. The traffic demand introduced to this road, in the full build-out scenario, will not cause a change in road safety risk
Waughs Road	Medium	6000-12000	Medium (Score change from 1.39 -1.59)	As per Campbell Road
El Prado Drive	Low	No change	Low	No changes proposed
Roberts Line	Medium	6000-12000	Medium	Traffic on this road between the perimeter road and existing Railway Road will increase Planned Infrastructure improvements will need to include shoulder widening between Richardsons Line and the perimeter road, and protection from roadside hazards throughout

Road	Recalculated IRR	Future Traffic Bracket (vpd)	Future IRR	Proposed Changes
				In addition, improvements to NEIZ accesses along Roberts Line as required.
Richardsons Line	Medium High	1000-6000	Medium	Do-minimum upgrades will improve safety along this road
Clevely Line	Medium High	No change	Medium High	This portion of road is taken by the RFH
Te Ngaio Road	High	No change	High	No changes proposed, as this road is expected to be shortened with the introduction of RFH and will service less than 10 properties

10.4.1 Overall

The RFH will have a neutral impact on road safety risk, based on the assessment outlined above.

10.5 Public Transport

There is a single bus route which runs along Railway Road and Campbell Road connecting Bunnythorpe and Feilding to Palmerston North (including a school bus route). This route currently utilises the Clevely Line level crossing, which will close due to the location of RFH. Therefore, the bus route will be redirected to follow the perimeter road. It is expected this alternative route will be roughly 200m longer than the existing route, shown in Figure 10-8 and will result in an increase in travel time of less than 15 seconds from the Roberts Line/Railway Road intersection to the Kimbolton roundabout in Feilding.

This redirected route will trigger the relocation of the Bunnythorpe stop on Dutton Street, indicated by the red circle on Figure 10-8, to an appropriate alternative location to be confirmed in consultation with PNCC and HRC.

This rerouting will also provide PNCC with the opportunity to investigate the inclusion of stops around the NEIZ and RFH, ensuring safer and efficient access to two large workforces.

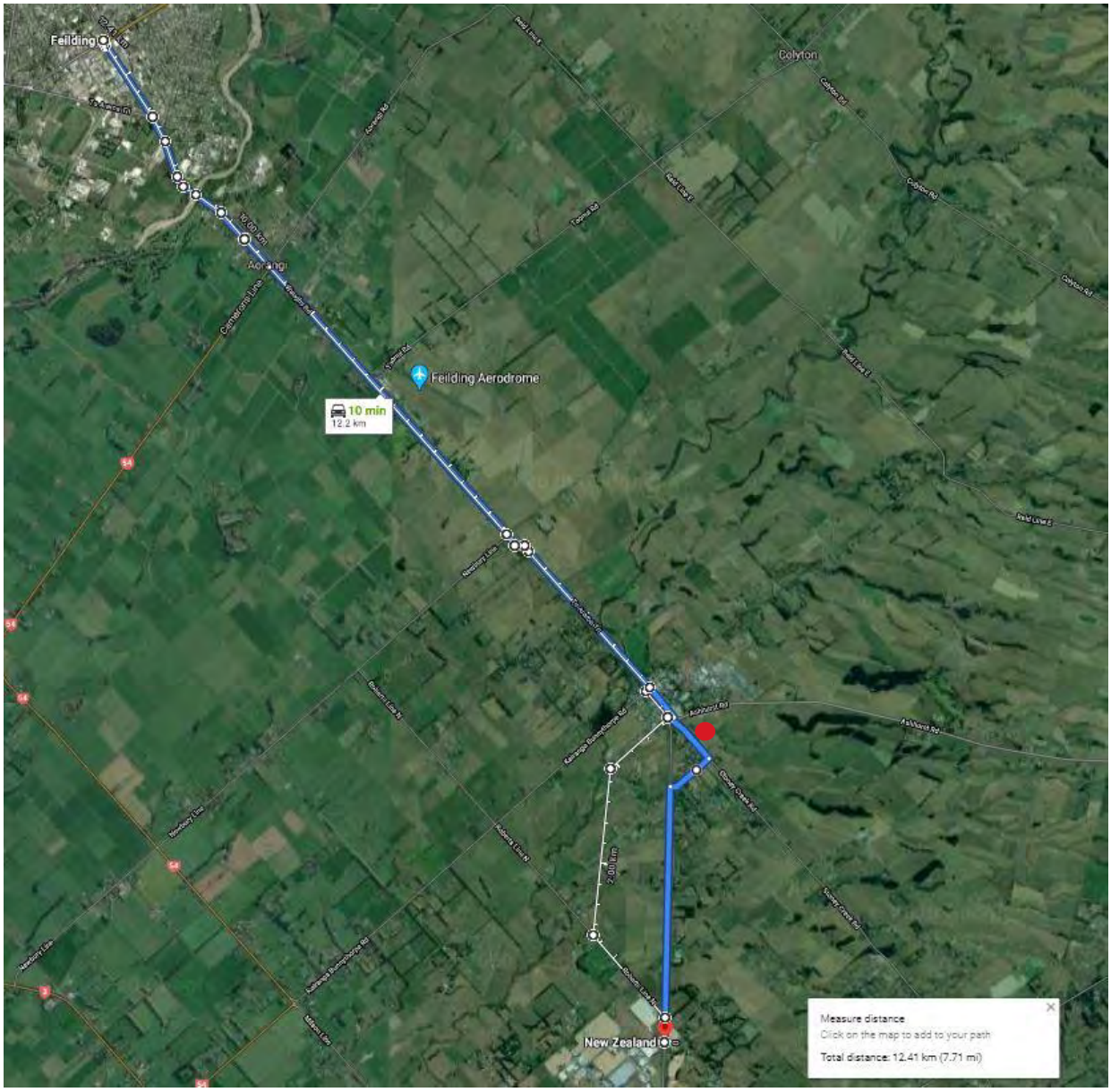


Figure 10-8: Existing vs Proposed Bus Route length Difference

10.5.1 Overall

The RFH will have a positive-minor impact on Public Transport, since the RFH will influence the bus route to Feilding, with the possibility of increased stops and patronage.

10.6 Walking and Cycling

The RFH provides an opportunity for additional recreational areas around the RFH, with the design of the perimeter road. There is also an opportunity for other recreational tracks, such as around the stormwater ponds. The RFH is not expected to disrupt any existing or planned walking and cycling routes (there are not many existing routes surrounding the Site).

In addition, the RFH will provide the opportunity for potential improvements along portions of the Te Araroa Trail, specifically along the eastern side of the site.

It is envisaged that the proposed Active Mode Connectivity Palmerston North to Feilding[52] will follow the current Te Araroa New Zealand Trail

10.6.1 Overall

The RFH will have a positive-minor impact on Walking and Cycling.

10.7 Parking

All parking requirements for the RFH will be accommodated onsite.

10.7.1 Overall

The RFH will have a positive-minor impact on parking.

[52] Active Mode Connectivity Palmerston North to Feilding, prepared for Palmerston North City Council and Manawatu District Council, Beca Limited 15 August 2019

11. Mitigation

Due to the increase in traffic demand of 6,900vpd, for the full build-out scenario, the traffic analysis results shown in Section 10.1 indicates that most of the network will operate with sufficient capacity, with portions requiring improvements, as follows:

11.1 KiwiRail

The following infrastructure upgrades will be triggered by the RFH and are the responsibility of KiwiRail.

1. Remedial action as a result of the existing Railway Road termination
2. Remedial action at Roberts Line as a result of Roberts Line level crossing closure
3. Remedial action as a result of the closure of Clevely Line
4. Remedial action as a result of the closure of Te Ngaio Road
5. Construction of a perimeter road extending approximately 2.6km along the western side of the RFH between Maple Street and Roberts Line
6. New T-Intersection of Roberts Line with the perimeter road
7. Proposed 80km/h speed limit on perimeter road and a proposed speed change on Roberts Line (between the perimeter road and existing Railway Road) to 80km/h.
8. Closure of Roberts Line east of current Railway Road resulting in closure of the level crossing
9. Richardsons Line north of the Roberts Line/Richardsons Line intersection converted to a RFH access
10. Two additional RFH accesses via the perimeter road on the northern and western boundaries
11. Closure of two-level crossings along Railway Road: Richardsons Line and Clevely Line
12. Sangsters Road link improvements to Roberts Line
13. Rerouting of the Feilding-Palmerston North bus line and relocation of Bunnythorpe stop

In addition, the following is required:

1. A LCSIA assessment at the Campbell Road/ Kairanga Bunnythorpe Road level crossing and the Waughs Road/Campbell Road level crossing, to determine the safety risks and need for safety improvements at these level crossings.
2. Improvements to existing NEIZ accesses along Roberts Line as required.
3. A Construction Traffic Management Plan (CTMP). It is recommended the CTMP be prepared once details around the RFH construction become clearer. The objective of the CTMP is to minimise adverse effects on property access, traffic safety and efficiency as a result of enabling construction works activities through the construction of all RFH stages. The construction of the RFH is expected to be undertaken over the many stages, with Works broadly including:
    - Enablement works
    - Earthworks
    - Retention ponds
    - Reconstruction of the NIMT railway line and private siding
    - Construction of the perimeter road and site accesses
    - Stopping of formed and unformed roads
    - Site construction
    - Site fit-out

    Construction traffic will principally comprise:

- trucks and rail involved with the earthworks and delivery of construction plant and materials. At this stage it is unclear where the material for the Site will be sourced from. It is expected that the onsite material (i.e. a cut-to-fill) will have to be supplemented by an outside source
- vehicles associated with suppliers and subcontractors; and
- worker vehicles

In line with common practice, a CTMP should be prepared by a suitably qualified and experienced person once a construction programme and methodology is available and construction activities are confirmed. Typically, a CTMP includes the following details:

- An outline plan for enabling works, including staging of works and identification of key activities during each work phase
- The numbers, frequencies, routes, and timing of enabling and construction works traffic movements
- Identification of site access routes, site access arrangements and access points for heavy vehicles in a manner consistent with the NZTA's Code of Practice for Temporary Traffic Management and measures to manage the movements of heavy vehicles during peak times
- Methods to manage local and network wide effects of the construction, including temporary traffic management measures, such as traffic detours and temporary speed limits
- Plan to limit the heavy vehicle construction traffic movements through key areas during night and peak times
- Provision for maintaining safe pedestrian and cyclist access movements in the vicinity of the site
- Allowable construction vehicle noise and requirements for effective noise suppression
- Provisions for on-going vehicle access to private and adjacent properties
- Provisions for new permanent accesses to be formed at the earliest opportunity to limit the adverse effects of construction and severance
- Management of fine material loads (e.g. covers) and the timely removal of any material deposited or spilled on public roads.
- Traffic management communications plan

As is usual practise, the CTMP will be developed in collaboration with the relevant road controlling authorities and to their approval.

11.2 Other Authorities

Several infrastructure upgrades within the study area have been allocated funding over the next 10-year period. It is considered a reasonable assumption that the Do-Minimum road network will be implemented before the RFH is operational. The Do-Minimum network improvements include:

1. Kairanga Bunnythorpe Road - Two Roundabouts with SH54 and SH3
2. Kairanga Bunnythorpe Road - Road widening between SH3 and Roberts Line
3. Kairanga Bunnythorpe Road bridge strengthening and renewal (Jacks Creek and Mangaone Stream)
4. Campbell Road - Bridge Renewal
5. NEIZ – Richardsons Line upgrade: Richardsons Line - Road widening between Milson Line and Roberts Line, and the Roberts Line to Railway Road (this section will be closed and displaced by the RFH)
6. NEIZ – Richardsons Line/Roberts Line intersection upgrade (roundabout)
7. NEIZ - Alderson Drive to Richardsons Line: New link to NEIZ off Richardsons Line and an access into existing NEIZ
8. Stoney Creek Road Safety Upgrade

In addition to these funded projects, there are other documented upgrades that have been considered as do minimum upgrades that are expected to be in place before the RFH, these are:

9. Roberts Line road widening between Kairanga Bunnythorpe Road and Richardsons Line (based on District Plan detailed below)
10. El Prado Drive/Railway Road roundabout

The following mitigations are recommended based on the analysis, and will not be triggered by the implementation of the RFH:

11. Upgrade of SH54/Waughs Road intersection from a priority control to a roundabout
12. Upgrade of SH3/Flygers Line intersection from a priority control to a roundabout
13. Upgrade of Tremaine Avenue/Milson Line intersection to include additional through lanes on each approach

11.3 Joint Responsibility

In addition, the assessment revealed the following upgrades will be required in the future regardless of the RFH, however it is noted that the RFH will impact safety and efficiency at these locations. Therefore, it is expected that this mitigation will be the responsibility of more than one organisation.

1. Safety improvements in the form of protection of non-frangible roadside hazards along Roberts Line
2. Intersection upgrade at Campbell Road/Kairanga Bunnythorpe Road
3. Intersection upgrade at the Railway Road/Kairanga Bunnythorpe Road possibly in the form of the priority being afforded to Railway Road

These will all be required for the safe and efficient operation of the road network. The responsibility of these mitigations will lie between authorities and can be addressed through the proposed Roading Network Integration Plan.

12. Roading Network

The road network around the RFH has several unknown land use and planned infrastructure timelines. Therefore, there are three potential future road networks reported on throughout this study, with varying complexity and stakeholder/shared responsibility. Therefore, it is recommended that KiwiRail consult with PNCC as the relevant road controlling authority and Waka Kotahi to prepare a Roading Network Integration Plan that provides details on:

the timing of the closure and / or stopping of railway Road closure, as well as other roads that the RFH will overlay

any proposed works at the interface between the RFH, State Highway and the local road network, including details on planned changes and improvements to:

- the intersection of Railway Road and Roberts Line
- the intersection of Roberts Line and Richardsons Line
- any other road or intersection improvements proposed

any new road connections or accesses that are required to service the Freight Hub, such as the perimeter road

changes to current public transport and school bus routes that use Railway Road including any new or relocated bus stops

detail addressing feedback provided by the Palmerston North City Council and Waka Kotahi and incorporation of such into the Roading Network Integration Plan

12.1 Do Minimum Road Network

The basic future network analysed, is the do-minimum. This road network has the minimum upgrades required to address known network shortcomings and is planned and funded by PNCC and Waka Kotahi over the next 10-year period, which are expected to be implemented within the committed timeframes by PNCC and Waka Kotahi .

Therefore, this do-minimum road network was used to test the 'without RFH' scenarios. The analysis showed further capacity constraints at three intersections, for which mitigation in the short term has been recommended, all do-minimums are shown by the blue circles in Figure 12-1.

This road network is seen as the network required in the short to medium term to be implemented regardless of the RFH, however, considering the planned timelines it is assumed to be implemented before the RFH initial stage. It should be noted that there are other infrastructure upgrades planned and documented that have not been discussed in this document as these lie outside the study area.

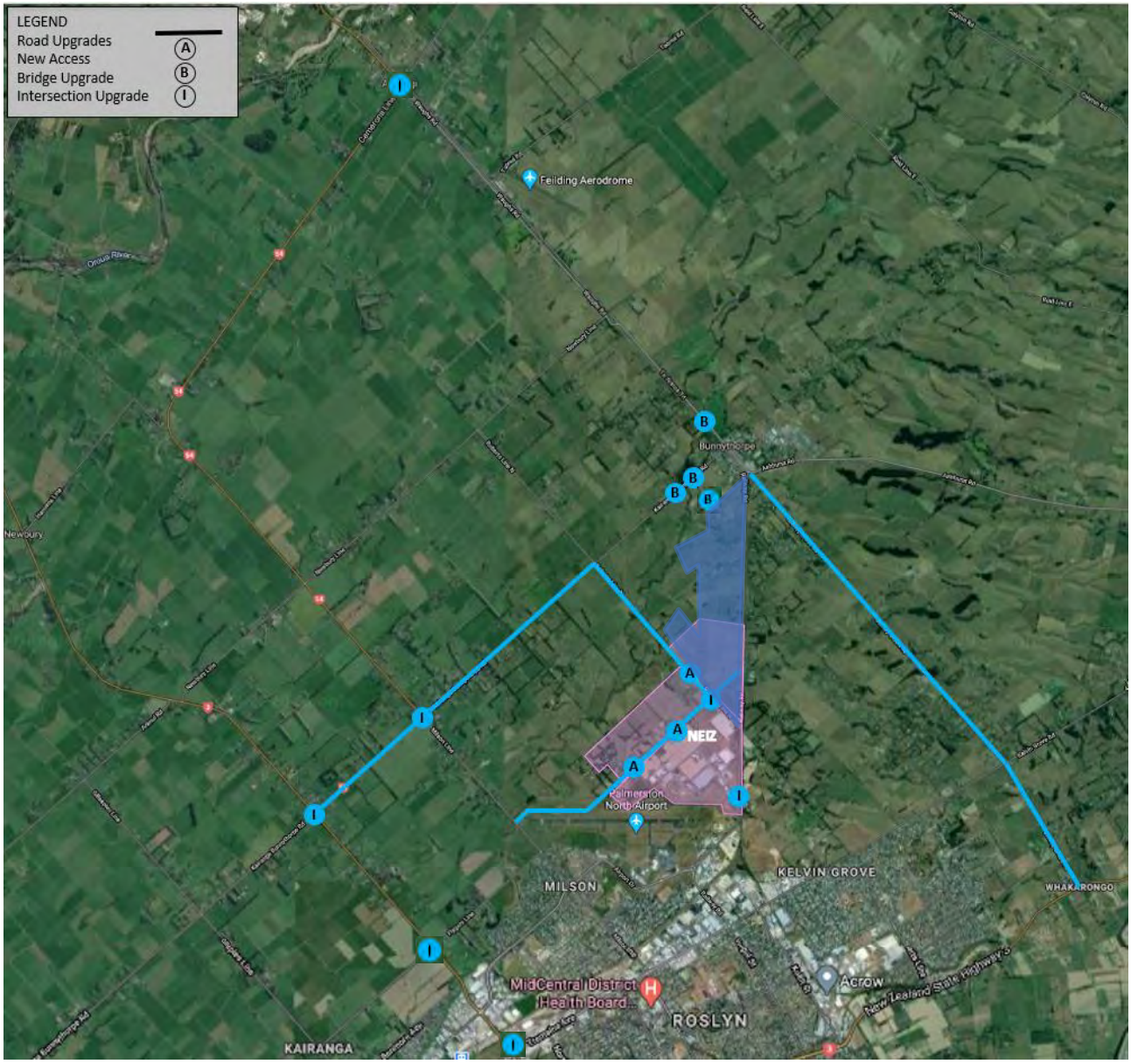


Figure 12-1: Do-Minimum Road Upgrade to be implemented before the initial stage

12.2 RFH Road Network

The RFH will trigger infrastructure changes, shown in red in Figure 12-2, which will be added to the do-minimum road network. These road and intersection upgrades, new RFH accesses and removal of level crossings will be the responsibility of KiwiRail. The 'with RFH' scenarios were tested on this road network to determine if these upgrades will allow the safe and efficient operations of the expected traffic demand. The analysis showed that further intersection mitigation will be required for these scenarios at the Campbell Street/Kairanga Bunnythorpe Road/Railway Road node, (as indicated by the red circles in Figure 12-2), to be evaluated further, in the context of other strategic roading network improvements planned by Waka Kotahi and PNCC.

It is not expected that this will be the ultimate road network for this area, but rather the roading improvements triggered by the RFH as the minimum roading required to support the traffic demand, before the strategic infrastructure improvements are finalised.

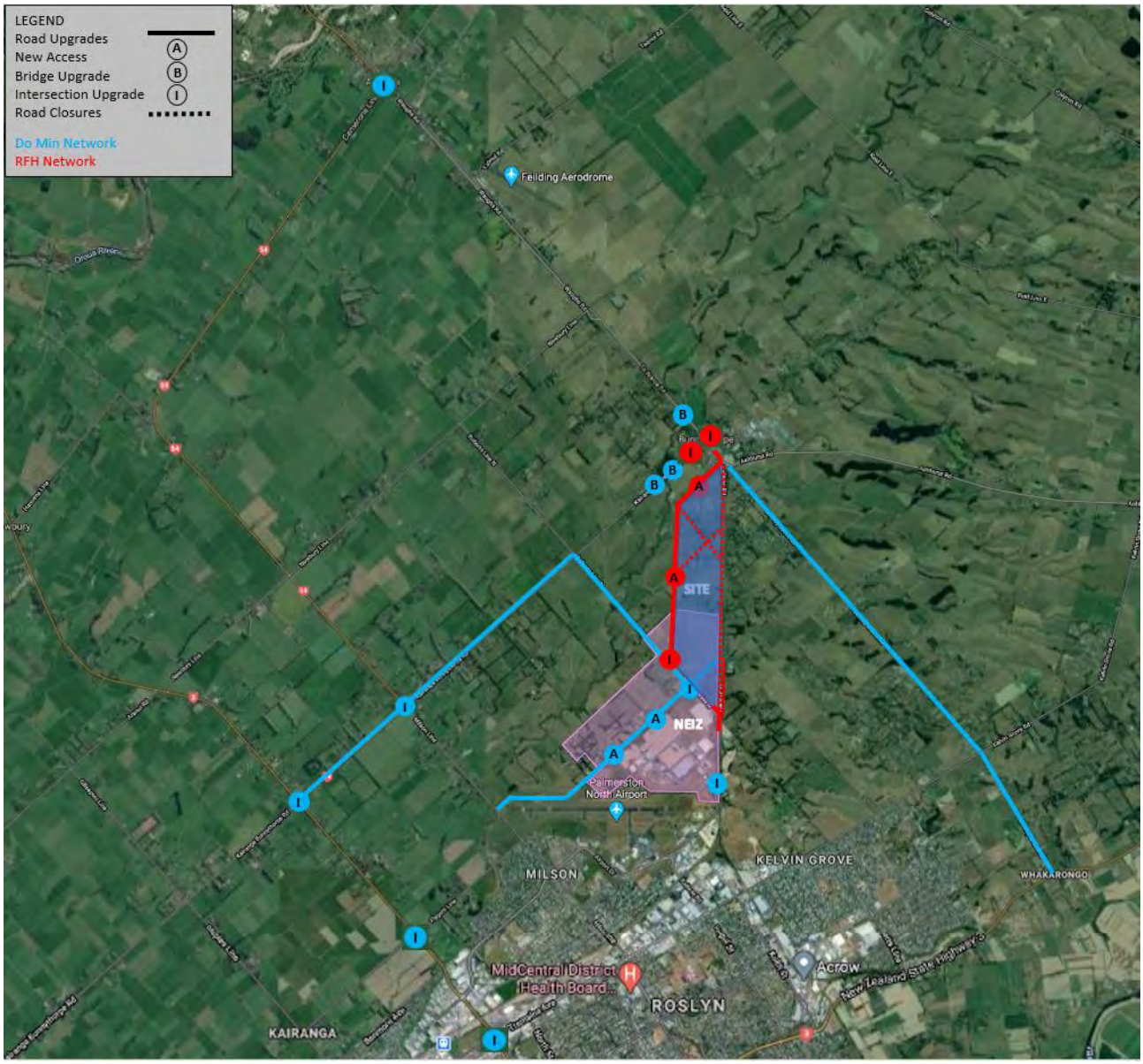


Figure 12-2: Do-Minimum plus RFH Triggered Road Upgrade

12.3 Ultimate Road Network

It is expected that the road network surrounding the RFH will ultimately include the Western and Southern bypasses and the wider road network around Palmerston North will include the ring road and other documented strategic infrastructure improvements. Figure 12-3 shows these bypasses as yellow dashed lines in the same positions shown in Figure 7-2. This road network will allow traffic, especially heavy vehicles to bypass the Bunnythorpe area. In addition to these bypasses there are other strategic infrastructure improvement plans detailed in section 7.1.2 which will also form part of the ultimate road network.

This network was not used for scenario testing and analysis as the route alignment and timelines remain unclear. Notwithstanding, the authorities (Waka Kotahi, PNCC and KiwiRail) accept that they will work together in developing and delivering a coordinated future transport plan to be developed through the Roading Network Integration Plan.

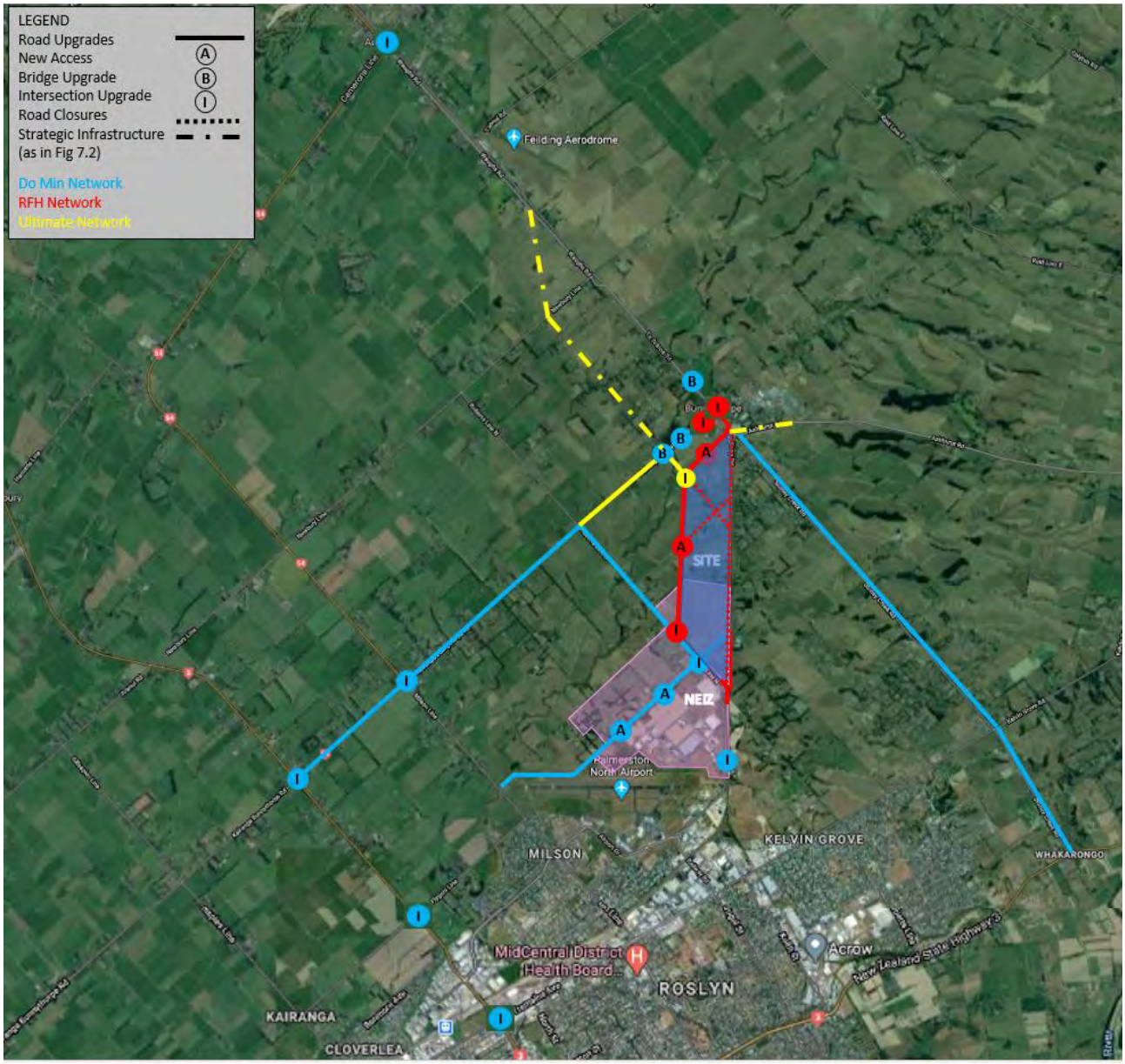


Figure 12-3: Ultimate Road Network - Do-Minimum plus RFH Triggered plus Strategic Infrastructure Improvements

13. Summary of Effects

Table 13-1 below summarises the impacts assessed for the RFH using the seven category assessment ratings introduced earlier at Section 4. In some cases, the RFH will impact the road network in a positive way by improving safety risk on the network, improving infrastructure in the Palmerston North area and providing opportunities to better accommodate public transport facilities. In other instances, the RFH development will have a negative impact, with increased traffic along key routes, impacts on walking and cycling road users and travel time impacts to key routes around Palmerston North.

Overall, and drawing together the analysis and mitigation presented in Chapters 10 and 11, it is assessed that the RFH will have a minor negative impact on the community.

Table 13-1: Summary of effects

Effects	Measure	Measure Rating
Network Traffic	Traffic Demand Increase	Negative Minor
	Traffic Distribution	Negative Minor
	Network Performance	Negative Minor
Travel Times	Travel Times Impacts due to infrastructure closures	Negative Minor
	Travel Times Impacts due to increased Train Lengths	Negative Minor
	Route Travel times	Negative Minor
Level Crossing Closures	ALCAM Safety Risk assessment	Positive Moderate
Safety	Safety Risk	Neutral
Public Transport	Bus route	Positive Minor
Walking and Cycling	Impact on walking cycling facilities	Positive Minor
Parking	Onsite parking	Positive Minor
Overall Performance		Negative Minor

14. Conclusion

The key findings of this Integrated Transport Assessment are:

Based on a seven-day traffic count undertaken in September 2019, and the 2018 Freight rail commodities, traffic demand at the existing freight yard was estimated at 4,200 vpd, but modelled at 4,700vpd.

The traffic at the RFH was calculated at 12,000vpd, using an estimated traffic generated area and trip generation rates (determined using the existing site).

Due to the location of the RFH, adjacent to the NEIZ, it was calculated that the RFH will displace 37.5% of the NEIZ extension area, and by extension the same percentage of traffic generated by the NEIZ extension. The NEIZ extension will generate 13,5000vpd, resulting in the RFH displacing approximately 5,100vpd. This traffic has already been assumed as future additions on the road network.

Therefore, the RFH will result in a net addition of 6,900vpd on the road network once fully developed.

The traffic count data showed a split between light and heavy vehicles of 80%/20%, however, this split was recalibrated to 60%/40% light to heavy vehicles for the traffic demand at the RFH.

Heavy vehicles will comprise more than 70% rigid vehicles, with the smaller balance of heavy vehicle traffic involving articulated trucks.

SH3, SH56, Waughs Road, Campbell Road and Ashhurst Road are the primary truck routes to and from Palmerston North and are expected to remain once RFH is developed.

The RFH will trigger the closure of Railway Road between Maple Street and Roberts Line. A new perimeter road will be designed as a replacement for Railway Road.

Different perimeter road alignment options were considered, such as a northern link to Kairanga Bunnythorpe Road, but have not been carried forward at this stage as there are still uncertainties around the locations of strategic network improvements, in particular the position of a bypass route to the west of Bunnythorpe that would tie in with such a road.

In light of the above, the perimeter road alignment between Railway Road and Roberts Line was selected. This alignment does not foreclose future links onto Kairanga Bunnythorpe Road and/or the southern bypass of Bunnythorpe. In addition, this alignment will provide the shortest alternative to the existing alignment, while causing minimal disruptions to the existing road network, as the perimeter road will utilise existing roading infrastructure where possible.

The RFH will also trigger level closing closures at Clevely Line, Richardsons Line and Roberts Line. These closures will improve safety in the area

PNCC, Waka Kotahi and other authorities have many infrastructure upgrades planned within the study area that have been allocated funding over the next 10-year period. It is expected that these planned mitigations will be implemented within the committed timeframes to ensure the safe and efficient operation of the Palmerston North road network, regardless of the RFH

The do-minimum road network and RFH road network (do minimum plus infrastructure changes triggered by the RFH) were assumed for the purposes of this traffic study. Other strategic infrastructure improvements such as the western and southern bypasses of Bunnythorpe are still being planned. The proposed Roading Network Integration Plan provides an opportunity for the relevant authorities to work together to develop a future integrated network.

Seven impact categories were analysed to determine the effects of the RFH of the road network and community.

The traffic performance analysis of the RFH road network showed that the road network will operate similarly in the initial stage and full build-out without and 'with RFH'. Links and intersections that will perform acceptably, will continue to do so regardless of the RFH, while those that perform unacceptably will remain in need of intervention. Traffic will largely redistribute locally as a result of the RFH.

The perimeter road will add a small travel time of less than 30 seconds due to the change in road length and speed. Road and level crossing closures will result in increased travel times for property accesses and key routes

The train lengths at the RFH are expected to increase from 900m to 1,500m, however it is expected that trains arriving or leaving the hub will have an average future length of 1,200m. Travel time impacts due to increased train lengths were analysed based on a train speed ranging between 30-80km/h. The results show that the longer trains could cause an increase in travel times ranging from less than 30 seconds to just over one minute for the first vehicle at the level crossing.

Further investigation, including an LCISA will be required at the Kairanga Bunnythorpe level crossing to determine additional mitigations as a result of the RFH. The closure of the Clevely Line, Richardsons Line and Roberts Line level crossings will result in improved safety in the area.

Safety risk will remain neutral as the RFH will have advantages (improve with level crossing closures, RFH mitigations and do minimum network upgrades) and disadvantages (increased traffic demand) to safety risk

The public transport route will have to be rerouted due to the Clevely Line level crossing closure and can follow the perimeter road. This relocation of the bus route provides an opportunity to include new stops at the NEIZ and RFH.

The RFH will provide the opportunity for the existing Te Araroa New Zealand Trail to be improved within the KiwiRail road reserve, as well as opportunities for additional recreational areas around the RFH. The RFH is not expected to disrupt any existing or planned walking and cycling routes.

All parking requirements by RFH will be accommodated on site

A CTMP can be prepared once details around the RFH construction become clearer.

It is envisaged that the RFH will provide Palmerston North with opportunities to strengthen the road network enabling a robust road network for all users, while improving the economy of the area. Overall, it is assessed that the RFH will have a minor negative impact on the road network. It is noted that the network has existing areas of concern that should be addressed before the RFH is developed. The responsibility of these upgrades will lie across authorities (Waka Kotahi, PNCC and KiwiRail) who will work together in developing and delivering a coordinated future roading plan to better service the travelling public and communities.

Appendices

Appendix A : Planning Objectives

A.1 PNCC District Plan – Section 20 (Transportation)

Objectives	Requirements	Project
Objective 1 The City's land transport networks are maintained and developed to ensure that people and goods move safely and efficiently through and within the City.	Identify and apply the roading hierarchy to ensure the function of each road in the City is recognized and protected in the management of land use, development, and the subdivision of land.	Can Comply Perimeter road will be designed according to City standards
	All roads in the City have function and design characteristics consistent with their place in the roading hierarchy.	Can Comply Recommendation on the road hierarchy according to surrounding land use was recommended for the following effected roads: 1. Perimeter road 2. Richardsons Line 2. Roberts Line
	Maintain and upgrade the existing roads in the City and provide for new roads to meet the current and future needs of the City.	Can Comply Section 7.1 details the proposed upgrades to be undertaken by KiwiRail to ensure a safe and efficient road system
	Require all new public roads, private roads and vehicle accesses to be designed and constructed to meet performance standards relating to the safety and efficiency of vehicle movement, and to ensure the safe use of the road transport network for all users, particularly in respect of:	Can Comply All road infrastructure will be designed and constructed in line with performance standards
	(a) Road width and alignment which should be sufficient for two vehicle lanes except where traffic volumes are insufficient:	Can Comply Perimeter road will be designed according to City standards
	(b) The formation and surface sealing of all roads and vehicle accesses to standards appropriate to the volume of traffic expected to be carried;	Can Comply
	(c) Provision for necessary network utility facilities within roads; and	Can Comply
	(d) Safe design and construction of roads, road access points and intersections, including alignment, gradient, vehicle parking, maneuvering and turning requirements.	Can Comply
	Encourage the development of safe and accessible pedestrian paths and cycleways, as well as convenient and accessible cycle parking, to support the opportunity for people to use active	Can Comply

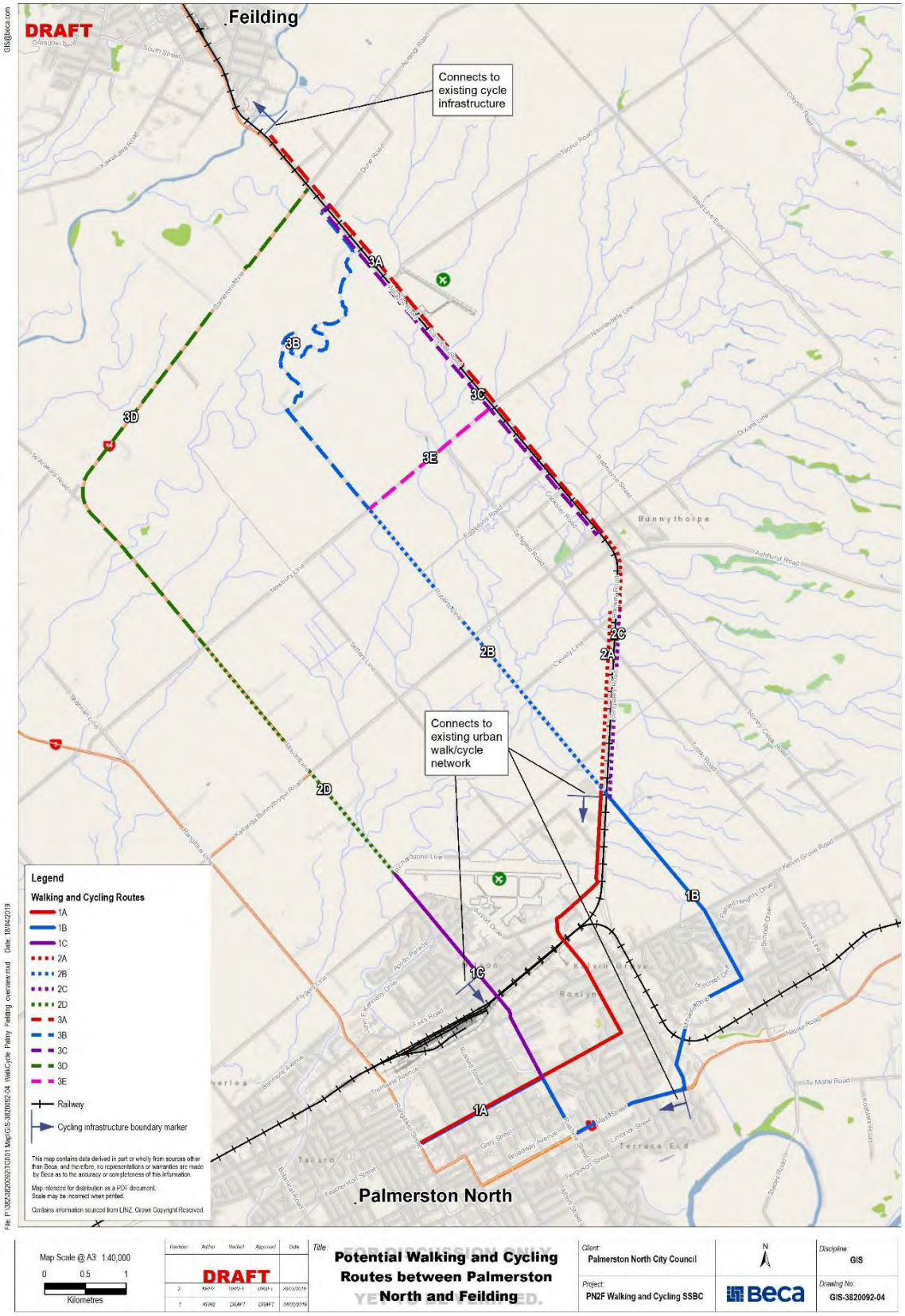
Objectives	Requirements	Project
	and non-vehicular modes of transport throughout the City.	
	To support and encourage the provision of public transport and its use throughout the City as an integral part of the transportation system.	Can Comply Recommended the PT route pass the RFH
	Convenient, safe and accessible car parking, loading and maneuvering facilities are available for residents, staff, visitors and customers for all activities without creating congestion or conflicts with moving vehicles, pedestrians or cyclists on adjacent roads.	Can Comply All parking. Loading and maneuvering will occur on site
Objective 2 The land transport network is safe, convenient and efficient while avoiding, remedying or mitigating adverse effects in a way that maintains the health and safety of people and communities, and the amenity values and character of the City's environment.	To restrict the through movement of traffic where the movement has adverse visual, noise and safety effects on adjoining areas by using the roading hierarchy to direct higher volume and heavy vehicle traffic movements on identified arterial routes and discouraging this traffic from other areas, such as residential areas.	Can Comply The assessment shows that traffic will primarily utilize routes already in use
	To avoid, remedy or mitigate the impact of roads and parking areas on visual amenity values of the community by requiring the provision of landscaping.	Can Comply All parking. Loading and maneuvering will occur on site
	Ensure that the adverse effects of long term and commuter parking associated with activities in the business and industrial areas on the amenity values of residential streets are mitigated.	Can Comply All parking. Loading and maneuvering will occur on site
	Avoid adverse effects on amenity and character by ensuring that new roads are well designed and visually complement the character of the surrounding areas.	Can Comply Perimeter road will be designed according to City standards
Objective 3 The safety and efficiency of the land transport network is protected from the adverse effects of land use, development and subdivision activities.	Avoid, remedy or mitigate the adverse effects of increased traffic or changes in traffic type, which would compromise the safe and efficient operation of any road or level crossing, or the safe and convenient movement of pedestrians and cyclists on roads or at level crossings.	Can Comply Mitigations have been recommended to counteract the effects of increased traffic
	Require vehicle crossing places and vehicle entrances from public roads to be located, constructed, and maintained to standards appropriate to the expected traffic volume, pedestrian movement, and speed environment of each road.	Can Comply All access points will be designed, constructed, and maintained in accordance to appropriate standards
	Ensure adequate on-site parking and maneuvering space is provided for each type of activity in a safe and visually attractive manner.	Can Comply All parking. Loading and maneuvering will occur on site

Objectives	Requirements	Project
	Control the location, design, and extent of advertising signs to ensure that they do not interfere with the safe and efficient use of land transport networks.	Can Comply

A.2 PNCC Strategic Transport Plan

Outcomes	Project
A transport system that provides a choice of intermodal transport connections and integration of modes of transport that safely and efficiently gets freight, services, and people where they need to be.	The RFH aims to be the central hub for freight commodities in New Zealand and will provide efficient and safe facilities for rail and road freight.
An adequate supply of parking to meet the needs of a business's/industry and economic growth, and for encouraging a strong culture of walking, cycling and public transport use.	All RFH parking requirements will be accommodated on site
There is resilient and reliable interconnected intermodal transportation of goods, services, and people.	RFH will provide an interconnected intermodal transportation of goods, services, and people, with safe and efficient equipment and facilities to comfortably accommodate goods, passengers, and services.
Reliable road - rail links for industry.	RFH will provide for a range of activities onsite
Resilient rail and road infrastructure and interconnectivity form a key part of freight, distribution, and logistics activities in the north-east industrial zone and Longburn.	RFH will provide resilient rail infrastructure for the freight, distribution, and logistics activities in the north-east industrial zone and Longburn
Minimal traffic travelling unnecessarily through the city centre.	The new position of the RFH will result in less traffic travelling through the Palmerston North CBD and more traffic using key routes
There are good relationships between the Council and KiwiRail, Palmerston North Airport, Waka Kotahi, Transport advocates and lobby groups and the Regional Transport Committee and other Territorial Authorities	RFH provides an opportunity to fortify these key relationships

Appendix B Active Mode Connectivity Palmerston North to Feilding



Appendix C Vehicle Classification Scheme (Waka Kotahi 2011)

Vehicle Classification Scheme (NZTA 2011)

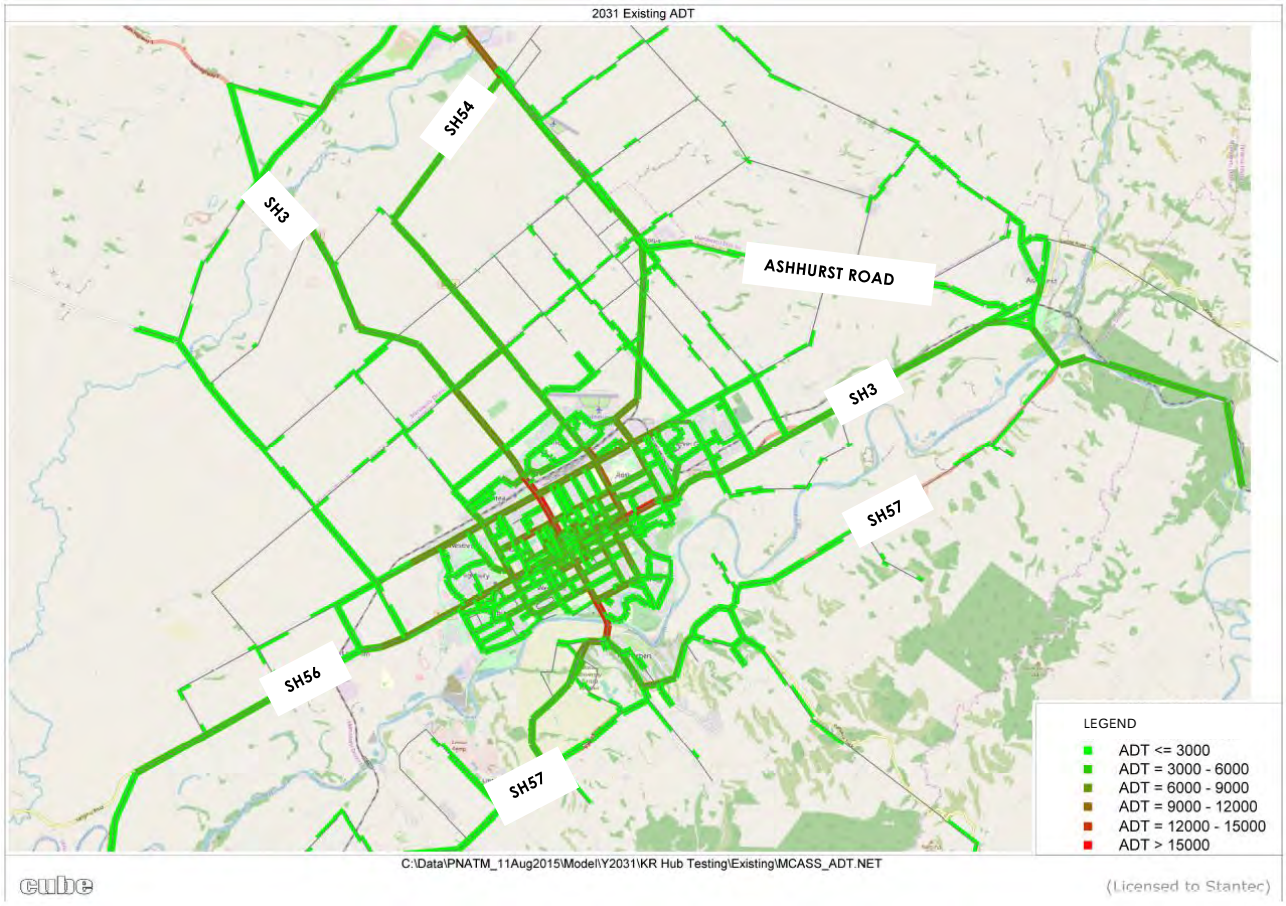
NZTA Axel Class	Vehicle Types in Class	Axles	Groups	Criteria	Maximum axle spacing < 10m			Length Range (WIM data)	NZTA EEM Class	Light or Heavy	NZTA Length Class	Austroads 1994 Class
					AS1-2	AS2-3	AS3-4					
1	oo (very short 2 ax veh = motorbike)	2	1	2 ax, AS 1 criterion	>=0.5, <1.75	-	-	>1.5 - 2.5	(PC)	Light	VS	1
2	o-o (short 2 axle vehicle = car)	2	2	2 ax, AS 1 criterion	>=1.75, < 3.2	-	-	2.5-5.5 (4-6)	PC & LCV	Light	S	1
3	o-o--o (car towing 1 axle trailer)	3	3	3 ax, AS 1,2 criteria	>2.1, < 3.2	>2.1	-	7 -11	PC & LCV	Light	M	2
	o-o--oo (car towing tandem trailer)	4	3	4 ax, AS 1,3 criteria	>2.1, < 3.2	>2.1	<=1.0	8 -13			M	2
	o-o--o-o (car towing car)	4	4	4 ax, AS 1,2,3 criteria	>2.1, < 3.2	>2.1	>2.1	10 -15			M	2
4	o----o (truck or bus)	2	2	2ax AS 1criterion	> =3.2m			5 - 12	Bus & MCV		M	3
	o--o--o (truck towing light trailer)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>2.1, <=6.8	-	8 -16			L	6
	o--o--oo (truck tow light 2 ax trailer)	4	3	4 ax, AS 1,3 criteria	>=3.2m	>2.1	<=1.0	9 -17			L	7
5	o--oo (truck or bus/coach)	3	2	3 axles, 2 groups	>=3.2m	<=2.1	-	7 -12	Bus & HCV1	Heavy	M	4
	o--oo (tractor without semi-trailer)	3	2	3 axles, 2 groups	>2.1, < 3.2	<=2.1	-	6 -8			M	4
	oo--o (twin steer truck)	3	2	3 axles, 2 groups	<=2.1	-	-	7 -12			M	4
	o--o------o (artic e.g. bread truck)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>6.8	-	11 -17			L	6
	o--oo---o (truck tow light 1 ax trailer)	4	3	4 ax, AS 1,2,3 criteria	>=3.2m	<=2.1	>2.1	10 -17			L	7
	oo--o---o (twin steer tow 1 ax trailer)	4	3	4 ax, AS 1,3 criteria	<=2.1	-	>2.1	10 -17			L	7
6	oo--oo (heavy truck)	4	2		<=2.1	-	>1.0, <=2.1	7 - 13	HCV1	Heavy	M	5
	o--ooo (heavy truck)	4	2	4,5 axles, 2 groups	>2.1	<=2.1	>1.0, <=2.1	7 -11			M	5
	oo--ooo (heavy truck)	5	2		-	-	-	8 -13			M	5
7	o--o--oo (artic A112)	4	3	4 ax, AS 1,2,3 criteria	>2.1	>2.1	>1.0, <=2.1	12 -18	HCV1	Heavy	L	7
	o--oo--o (artic A121)	4	3	4 ax, AS 1,2,3 criteria	>2.1,<3.2	<=2.1	>2.1	12 -18			L	7
	o--o--o--o (truck tow heavy trailer)	4	4	4 axles, 4 groups	>=3.2	>2.1	> 2.1	13 -17			VL	7
8	o--oo--oo (truck tow light trailer)	5	3		-	-	-	10-18	HCV2	Heavy	VL	8
	o--oo--oo (artic)	5	3	5 axles	-	-	-	12-17			L	8
	o--o-----ooo (artic)	5	3		-	-	-	12 -17			L	8
	o--oo--o--o (T+T)	5	4	3,4,5 groups	-	-	-	13 -18			VL	8
	o-o-o-o-o (mobile crane)	5	5		-	-	-	10 -13			L	8
9	o--oo--ooo (artic)	6	3			-	>2.2,<12.0	13 -18	HCV2	Heavy	L	9
	oo--oo--oo (artic)	6	3		-	-	-	13 -18			L	9
	o--ooo--ooo (artic)	7	3	6-8 axles	-	-	-	> 16			L	9
	o--oo--oooo (artic)	7	3	3 groups	-	-	-	> 17			L	9
	oo--oo--ooo (artic)	7	3		-	-	-				L	9
	oo--oo--oooo (artic)	8	3		-	-	-				L	9
	o--ooo--oooo (artic)	8	3		-	-	-				L	9
10	o--oo--o-oo (T+T)	6	4		-	-	-		HCV2	Heavy	VL	10
	oo--o--o-oo (T+T)	6	4		-	-	-				VL	10
	oo--oo--o--o (T+T)	6	4	6 axles	-	-	-				VL	10
	o--oo--o-o-o (T+T)	6	5	4,5 groups	-	-	-				VL	11
	o--o--oo--o-o (A train)	6	5		-	-	-				VL	11
	o--oo--o--o-o (A train)	6	5		-	-	-				VL	11
11	o--oo--oo-oo (T+T)	7	4		>2.2m	-	-		HCV2	Heavy	VL	10
	o--oo--oo--oo (B train)	7	4	7 axles, not twin steer	>2.2m	-	-				VL	10
	o--oo--oo--o-o (A train)	7	5	(AS 1 criterion)	>2.2m	-	-				VL	11

12	oo--oo--o-oo (T+T)	7	4		<=2.2m	-	-		HCV2	Heavy	VL	10
	oo--o--oo--oo (T+T)	7	4		<=2.2m						VL	10
	oo--oo--oo-oo (T+T)	8	4		<=2.2m	-	-				VL	10
	oo--oo--oo-ooo (T+T)	9	4	7-11 axles	<=2.2m	-	-				VL	10
	oo--oo--ooo-oo (T+T)	9	4	twin steer	<=2.2m	-	-				VL	10
	oo--oo--ooo-ooo (T+T)	10	4	(AS 1 criterion)	<=2.2m	-	-				VL	10
	oo--ooo--oo--ooo (T+T)	10	4		<=2.2m						VL	10
	oo--oo--ooo-oooo (T+T)	11	4		<=2.2m	-	-				VL	10
	various (twin steer A train)	7-11	5		<=2.2m	-	-				VL	11
13	o--oo--ooo-oo (B train)	8	4		>2.2m	-	-		HCV2	Heavy	VL	10
	o--oo--oo--ooo (B train)	8	4		>2.2m	-	-				VL	10
	o--oo--ooo-ooo (B train)	9	4		>2.2m	-	-				VL	10
	o--oo--ooo-oooo (B train)	10	4	8-11 axles	>2.2m	-	-				VL	10
	o--oo--oo--o-oo (A train)	8	5	not twin steer	>2.2m	-	-				VL	11
	o--oo--ooo--o-o (A train)	8	5	(AS 1 criterion)	>2.2m	-	-				VL	11
	o--oo--ooo--o-oo (A train)	8	5		>2.2m	-	-				VL	11
14		any	-	Everything else	-	-	-					

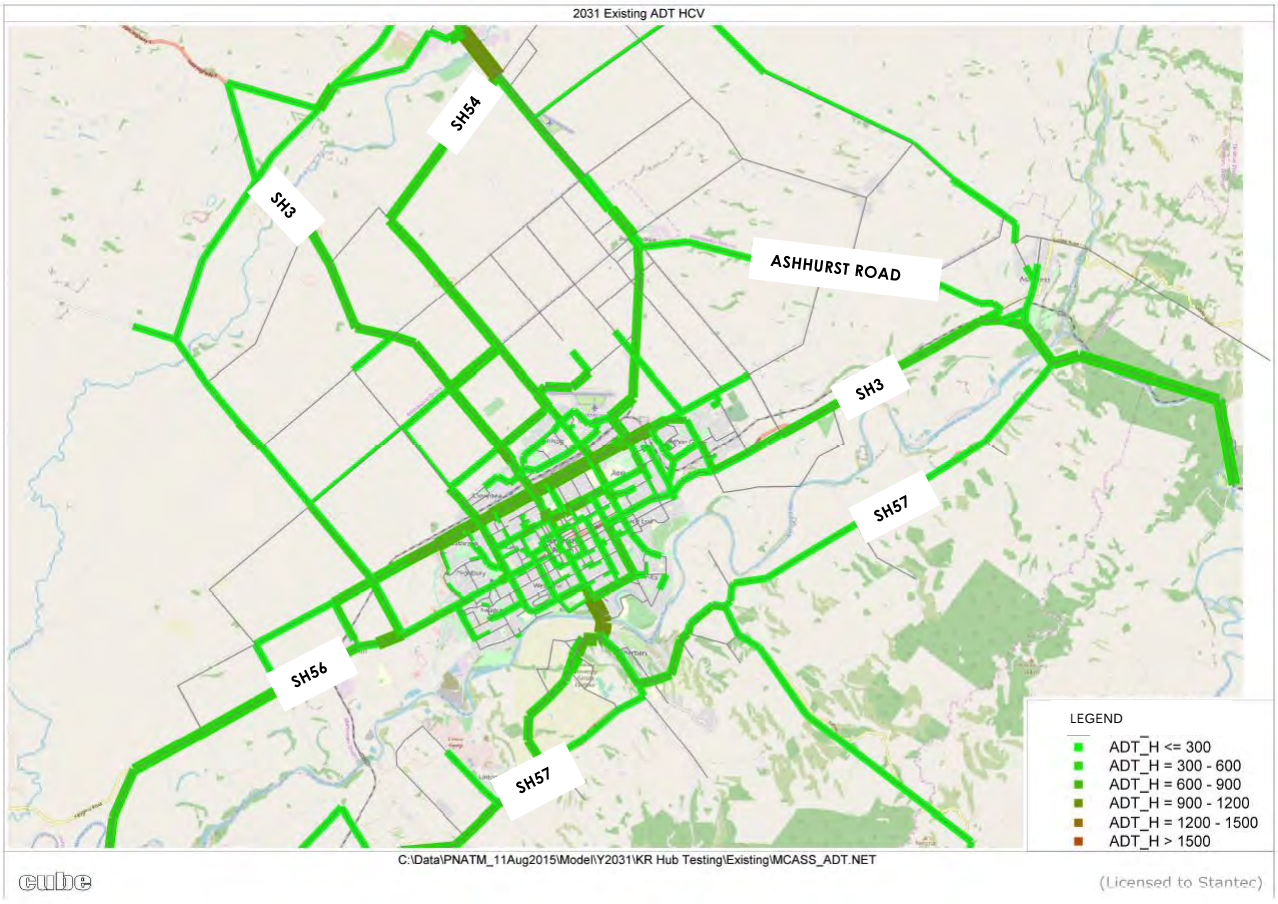
NZTA Length Class: VS= 0.5-2.0m S=2.0-5.5m M=5.5-11m L=11-17m VL>17m
Axles: Number of axles
Groups: Number of axle groups (an axle group is where axles are less then 2.1m apart.
AS1-2: Distance between first and second axle
AS2-3: Distance between second third axle
AS3-4: Distance between third and fourth axle

Appendix D Daily Traffic Volumes

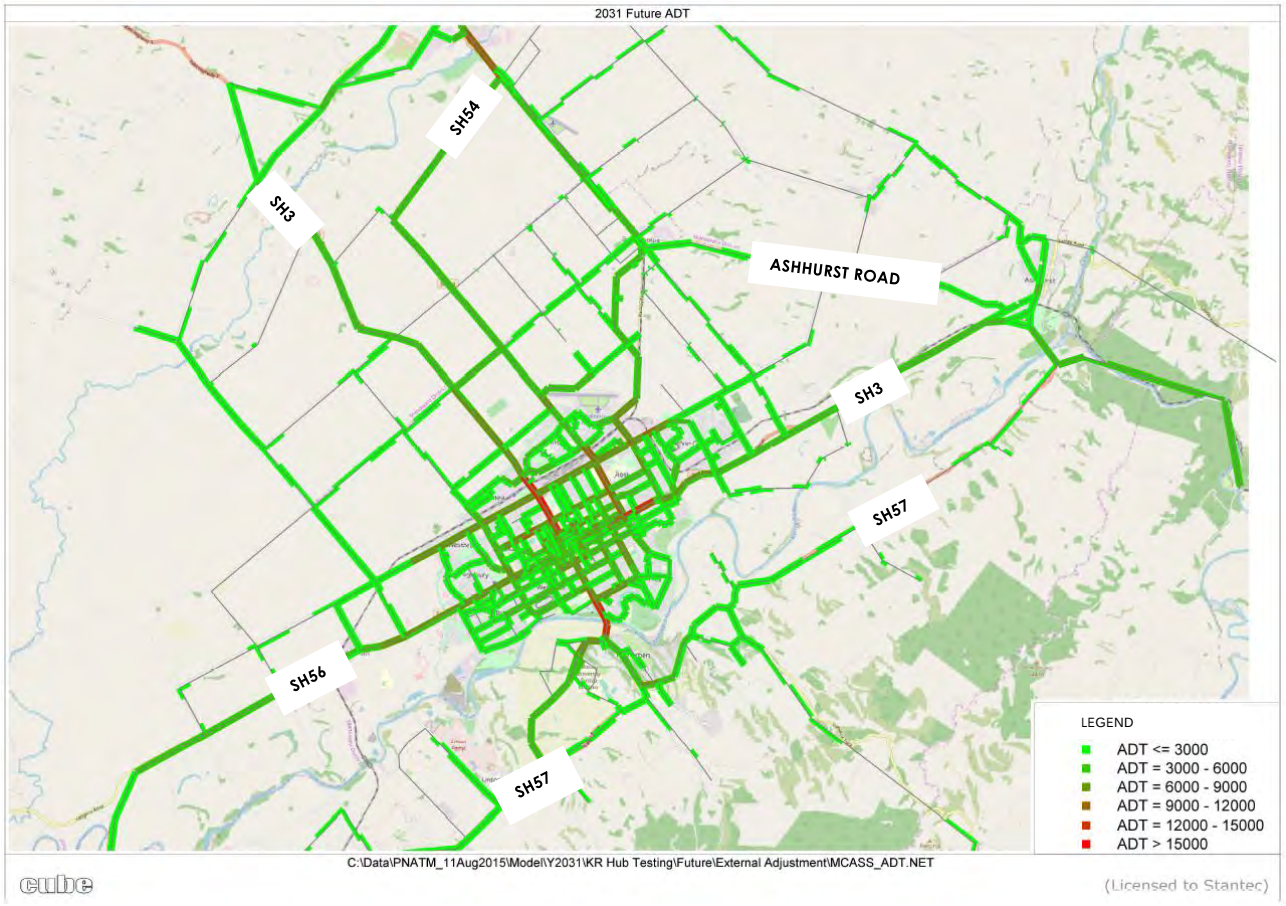
D.1 Initial stage '**without** RFH' – Daily Traffic Volumes



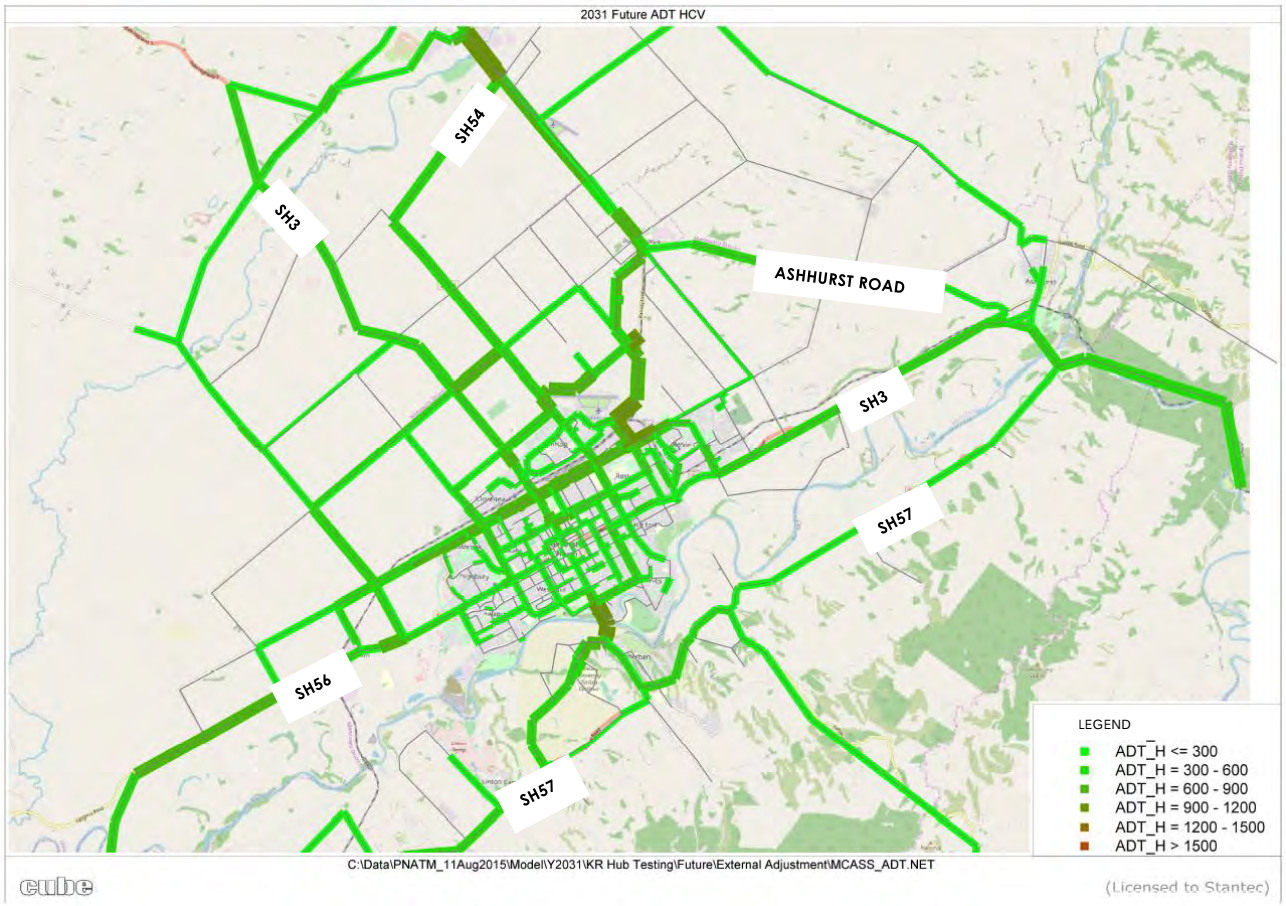
D.2 Initial stage **'without** RFH' - Heavy Vehicle Daily Traffic Volumes



D.3 Initial stage '**with** RFH' - Daily Traffic Volumes

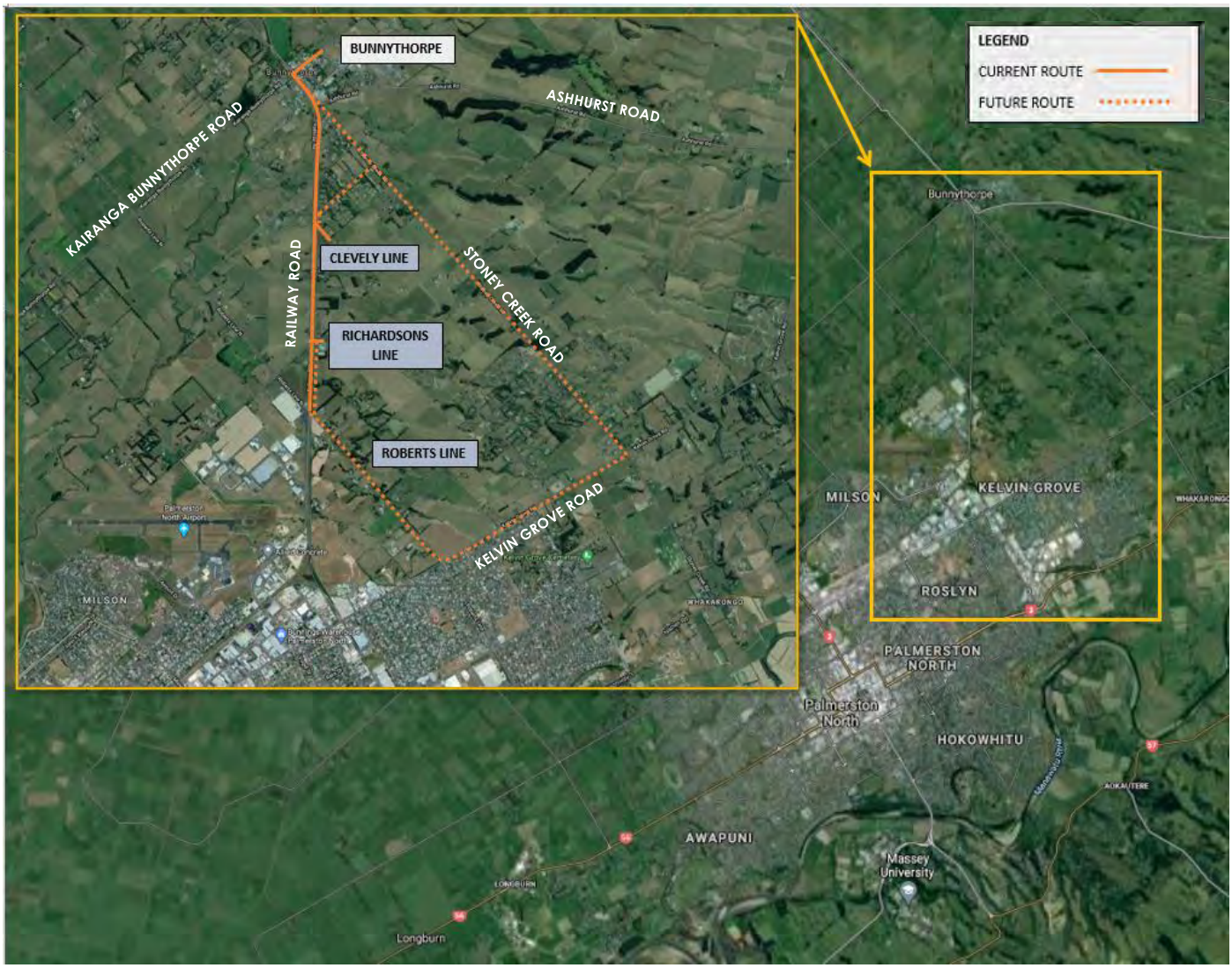


D.4 Initial stage '**with** RFH' - Heavy Vehicle Daily Traffic Volumes

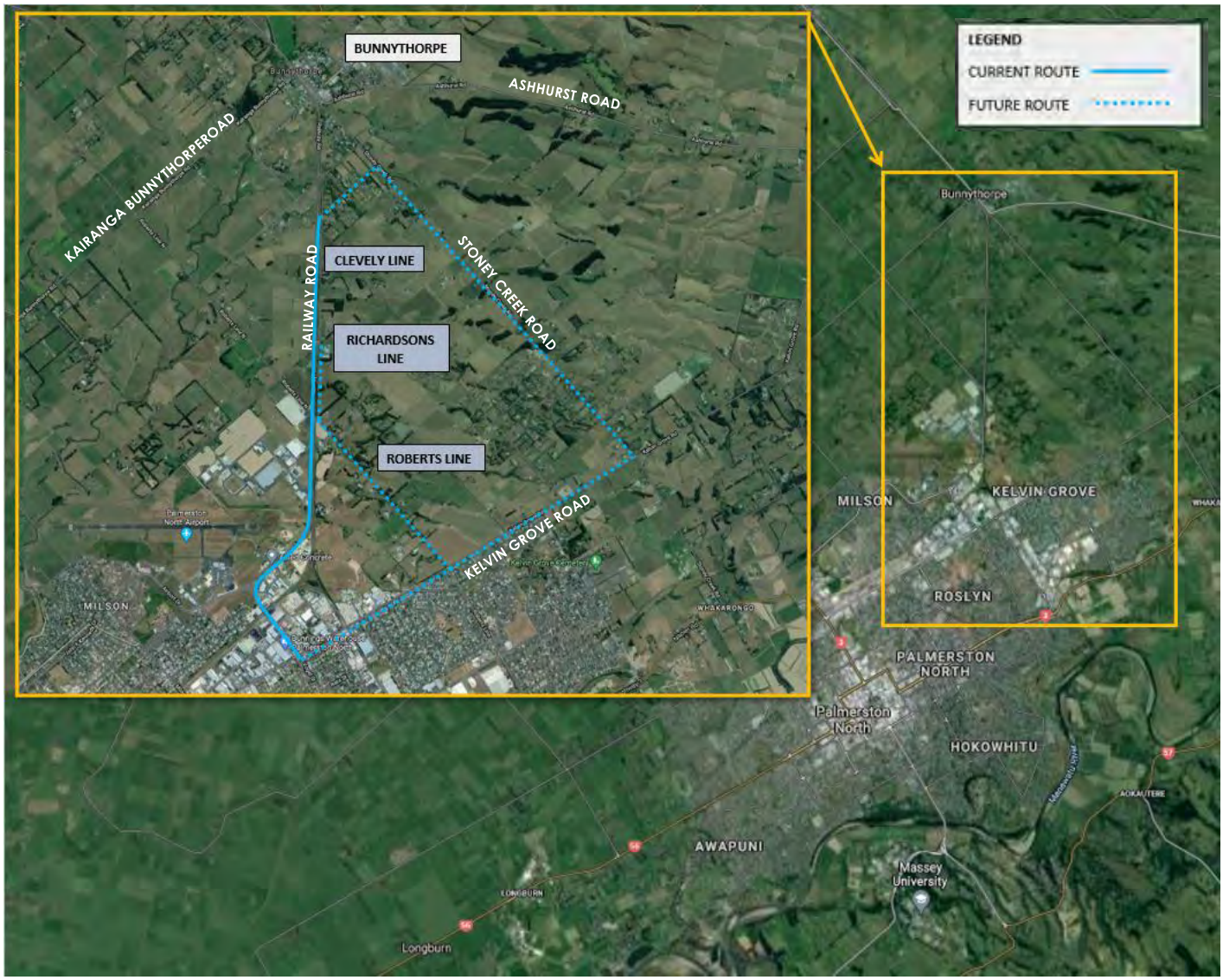


Appendix E Travel Time Routes

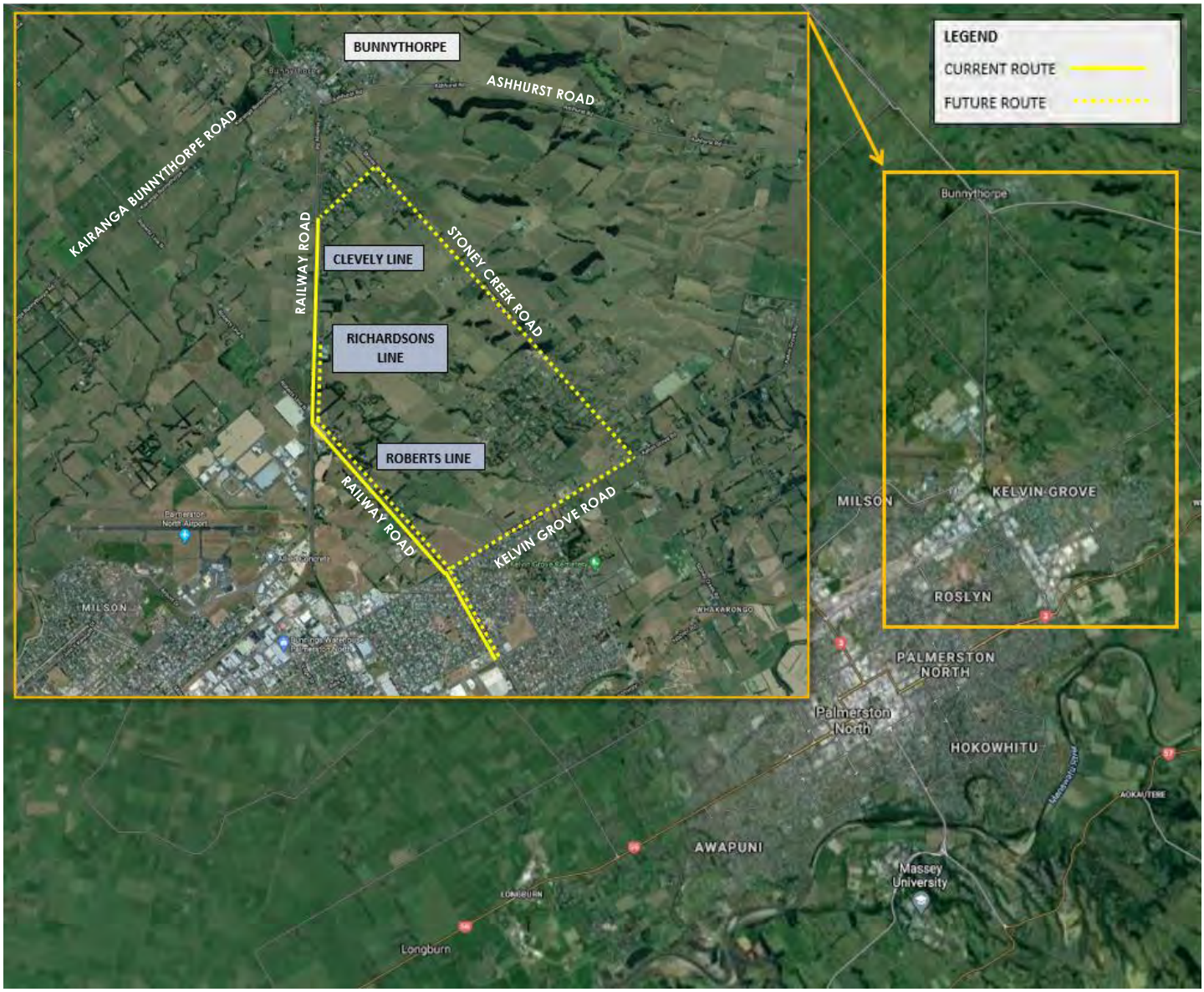
E.1 Roberts Line/Bunnythorpe, Richardsons Line/Bunnythorpe, Clevely Line/Bunnythorpe



E.2 Roberts Line/Tremaine Ave-Railway Road int, Richardsons Line/ Tremaine Ave-Railway Road int, Clevely Line/ Tremaine Ave-Railway Road int



E.3 Roberts Line/Kelvin Grove, Richardsons Line/ Kelvin Grove, Clevely Line/ Kelvin Grove



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