TE TUPU NGĀTAHI
SUPPORTING GROWTH

North West Strategic Assessment of Transport Effects

December 2022

Version 1

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

Document Status

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Abbreviations

Acronym/Term	Description
AEE	Assessment of Effects on the Environment
ASH	Alternative State Highway
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
AUP:OP	Auckland Unitary Plan Operative in Part
BCI	Brigham Creek Interchange
CC2W	City Centre to Westgate
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
DSI	Death and Serious Injury
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
LOS	Level of Service
IBC	Indicative Business Case
NAL	North Auckland Line
NoR	Notice of Requirement (under the Resource Management Act 1991)
PT	Public Transport
RASF	Auckland Transport Roads and Streets Framework
RMA	Resource Management Act 1991
RTC	Rapid Transit Corridor
RTN	Rapid Transit Network
RAMC	Regional Active Mode Corridor
RUB	Rural Urban Boundary
SH16	State Highway 16

Acronym/Term	Description
SH18	State Highway 18
SSTMP	Site-Specific Traffic Management Plan
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth Alliance
The Council	Auckland Council
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Executive Summary

1.1 Overview

This transport assessment has been prepared as part of the Assessment of Environmental Effects for the package of Notices of Requirement being lodged by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport (**AT**) in Northwest Auckland. It comprises both the North West Strategic Projects and Kumeū Huapai Local Arterials elements (together being the "**Strategic Assessment Package**").

The NoRs are to designate land for future strategic and local arterial transport corridors to support the planned growth in the North West area of Auckland, as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**), to enable the construction, operation and maintenance of transport infrastructure.

The Strategic Assessment Package comprises six separate projects, which together form the North West Strategic Assessment Package. These form part of an overall network of corridors identified by Te Tupu Ngātahi for the North West, which are complemented by other projects that are being progressed through separate processes (such as State Highway 16 to State Highway 18 Connections project and the North West Rapid Transit Corridor Full Implementation.

Table 1-1 and Figure 1-1 below summarise these projects. The Assessment of Environmental Effects report provides a more detailed project description.

Table 1-1: North West Strategic Assessment Package – Notices of Requirement and Projects

Notice	Project
NoR S1	Alternative State Highway
NoR S2	SH16 Main Road
NoR S3	Rapid Transit Corridor
NoR KS	Kumeū Rapid Transit Corridor Station
NoR HS	Huapai Rapid Transit Corridor Station
NoR S4	Access Road

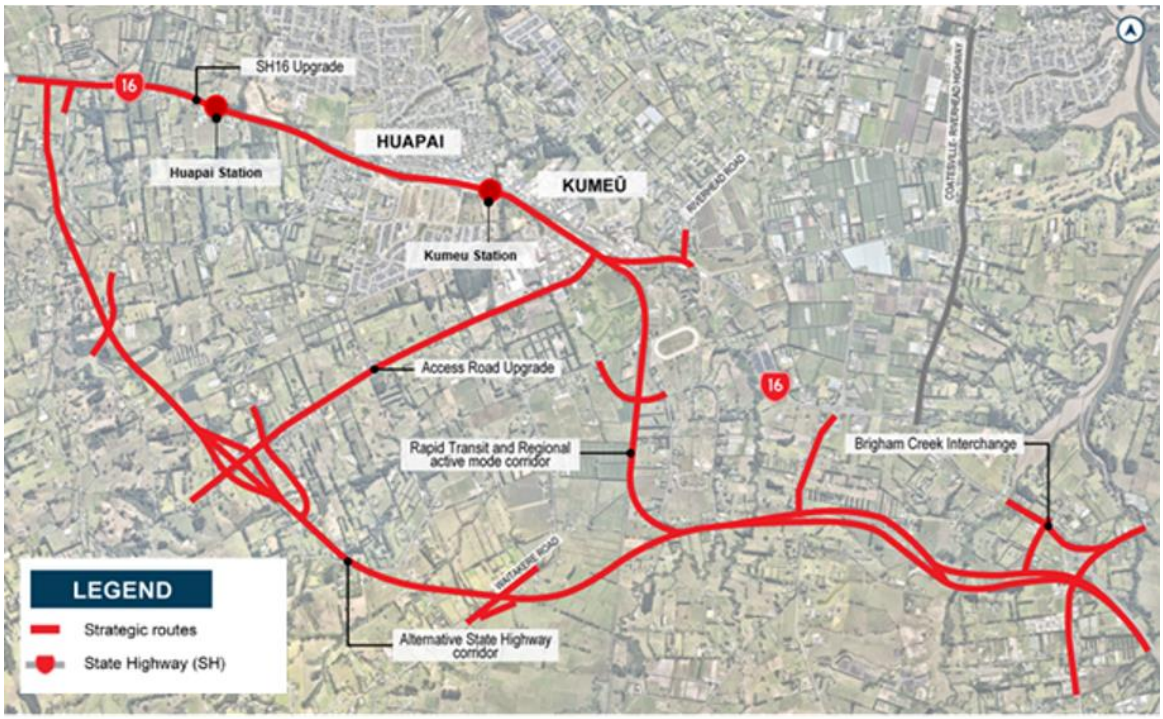


Figure 1-1: North West Strategic Assessment Package – overview

1.2 Methodology

The assessment of the North West Strategic Assessment Package considers both the operational transport effects of the projects, when completed, as well as potential temporary effects of constructing the projects.

Each of the projects were developed as part of network planning for the wider North West area. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider long-term integrated network planned for the area, but can generally be delivered separately, and therefore assessed separately.

1.2.1 Approach to Assessment of Operational Transport Effects

Potential operational transport effects are assessed using: ·

- Transport planning assessment of expected outcomes and effects
- Transport modelling to inform future demands and network performance
- Alignment with various policy documents.

An assessment of the overall positive effects of the Strategic Assessment Package of Notices of Requirements is provided, together with consideration of the broader outcomes of the wider North West package of projects.

In respect to each individual Notice of Requirement, a separate effects assessment has been undertaken that considers both the positive and potential adverse effects of the following and how each project contributes to the future network as a whole:

- Each mode of transport
- Access for existing properties
- Existing on-street and public parking.

The assessment methodology is summarised in Table 1-2 below.

Table 1-2: Summary of Assessment Methodology

Network Component	Information Source	Assessment Method
Safety	Crash Analysis System Database Project design drawings	Assessment to determine alignment with Vision Zero standards and design compliance with Transport Design Manual.
Walking and Cycling	Walking and Cycling Network Plans Proposed Cross Sections	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual.
Public Transport	Transport Modelling tools Te Tupu Ngātahi Remix File[1]	Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual.
General Traffic , including freight movement	Transport Model tools Project design drawings	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections.
Access	Engineering Standards	Assessment identifying where there is a potential effect on access in the existing environment.
On-street and public parking	Regional Parking Strategy and associated policies Engineering Standards	Assessment identifying where there is a potential effect on parking provision, including in terms of providing parking to required standard in the existing environment.
Note: A Road Safety Audit and Safe System Assessment will be done as part of the implementation business case/detailed design stage prior to implementation.		

[1] Te Tupu Ngātahi Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

1.2.2 Approach to Assessment of Construction Transport Effects

Given the long-term nature of the proposed projects, it is considered appropriate to use an indicative construction methodology to assess the temporary construction effects for the Package, sufficient to support each of the Notices of Requirements. A package of management plans will be provided to address predicted adverse effects, which will be informed by this assessment.

The assessment considers:

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

The project specific construction effects will be managed via a Construction Traffic Management Plan and/or Site-Specific Traffic Management Plans, which will be developed immediately prior to implementation when the greatest certainty is available.

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

1.3 Alternative State Highway, including Brigham Creek Interchange

1.3.1 Transport Environment Overview

Currently, the State Highway 16 corridor is the only existing strategic corridor that connects Kumeū, Huapai, Riverhead and the broader North West rural area to the metropolitan centre at Westgate and rest of the region beyond. The State Highway 16 corridor is already congested, in both weekday commuter peak and other periods, as well as at weekends and during the summer period, due to its current capacity and lack of resilience, which results from the interactions at existing intersections and direct driveway access.

The current lack of capacity of State Highway 16, means that existing rural roads are currently used as alternatives, particularly during the periods of congestion on State Highway 16, as these rural roads can provide a quicker and more attractive option. However, many of these higher speed roads are not suited to the current volumes of traffic using these corridors and this also leads to safety issues.

Waka Kotahi is separately progressing the State Highway 16 Improvements project, which will provide investment to address existing safety and capacity issues along the corridor. Whilst that project will address some of the interim capacity and safety issues, it will not be able to support the longer-term growth with the development of the Future Urban Zone in Kumeū, Huapai and Riverhead. In particular, the State Highway 16 Improvements project does not include any upgrade to the existing Brigham Creek roundabout.

The planned growth in Kumeū-Huapai is expected to include 10,700 dwellings with an estimated population of 24,700 by full build out – a significant increase on the population of 1,200 (in 2016). In addition, the number of employment opportunities in Kumeū-Huapai is expected to increase by approximately 3,300 jobs over the same period.

Travel patterns are largely expected to remain similar, however, the employment growth in Westgate and Whenuapai are expected to significantly increase – resulting in a potentially much higher level of demand within the North West to access jobs. The trip demands of all Kumeū-Huapai urban trips in the weekday morning peak with full build-out (beyond 2048) show that approximately 37% stay in the North West area. Both the Alternative State Highway and the Rapid Transit Corridor will therefore provide an important strategic role in connecting Kumeū-Huapai with those employments opportunities and broader opportunities within the metropolitan centre at Westgate.

Structure planning is not yet complete in Kumeū-Huapai, Riverhead and Redhills North and is not expected to start until closer to land release, which is beyond 2028. This results in less land use certainty for these areas, but also provides significant opportunities to use transport to shape placemaking. This would enable the future land use and transport networks to work together to support growth, as identified in Auckland Council's Spatial Land Use Strategy (adopted in May 2021), in advance of structure planning.

1.3.2 Project Overview

The Project proposes the construction of a new corridor with a cross-section of approximately 50m to accommodate a four-lane, dual carriageway road with separated cycle facility and footpath.

The western parts of this corridor have integrated walk/cycle facilities, however, the eastern segment (segment 1 below) is adjacent to the Rapid Transit Corridor, so the separated walk/cycle facilities are included via the Regional Active Mode Corridor.

The form and function for the Alternative State Highway (shown on Figure 1-2 below) is summarised in Table 1-3 below. The typical cross section includes an active mode corridor, as well as central and side barriers for the road carriageway. The allocation of the proposed four lanes on Alternative State Highway will be decided upon implementation, but the additional capacity could also be used for managed lanes or interim public transport facilities.

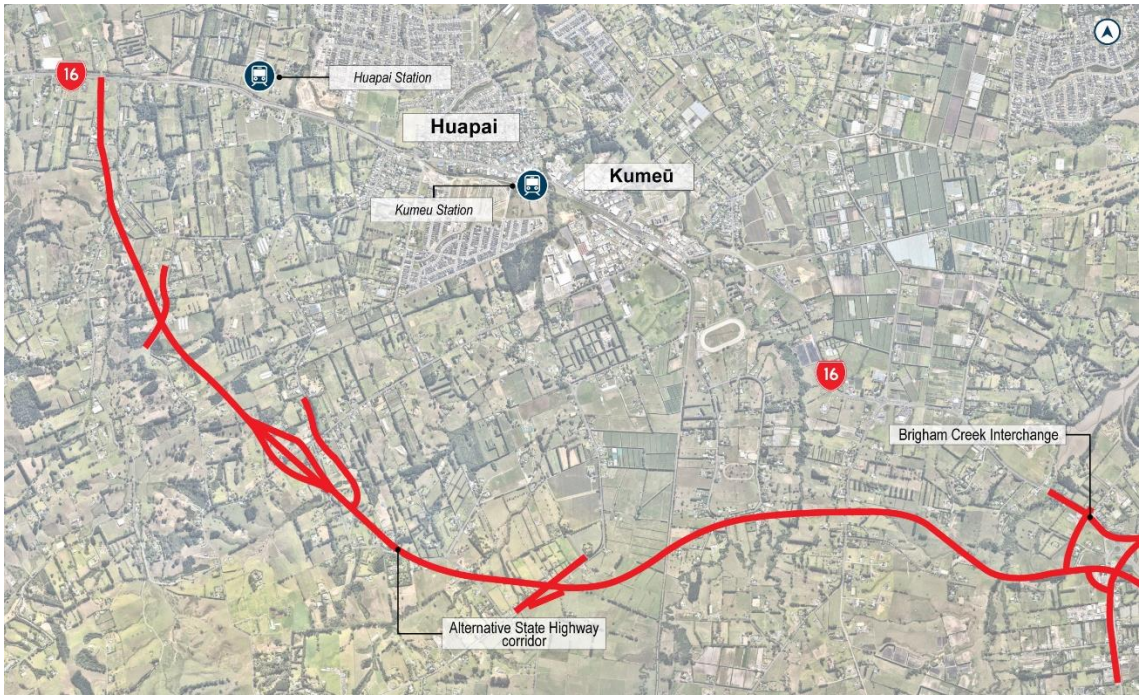


Figure 1-2: Indicative Alternative State Highway alignment

Table 1-3: Alternative State Highway – form and function

Segment Number	Comments
Brigham Creek Connection	• Grade separated interchange. • Separating higher speed state highway trips from local trips, including active modes and public transport. • Grade separation of state highway from Rapid Transit Corridor and Regional Active Modes Corridor. • Supporting safe access to residential and employment opportunities in Whenuapai and Redhills North growth areas.
Brigham Creek to North Auckland Line **North Auckland Line to Tawa Road**	• The design consists of a 4-lane dual carriageway with central and side barrier systems. • All local roads will be grade separated. • Under the ONRC Class 1 with no direct access and grade separation at all local roads / intersections, Safe and Appropriate Speed is 110 km/hr. • No at-grade access.
Tawa Road Connection	• Grade separated interchange • Separating higher speed state highway trips from local trips, including active modes • Grade separation of state highway from Rapid Transit Corridor and Regional Active Modes Corridor. • Supporting safe access to current and future employment growth along Access Road, as well as residential growth in the Kumeū and Huapai areas.
Tawa Road to SH16 existing	• Design consists of a 4-lane dual carriageway with central barrier systems and side barrier systems.

Segment Number	Comments
	• Opportunity for a 2-lane 'expressway' option for this section in the medium term to be investigated further. • Safe and Appropriate Speed is 110 km/hr. • No at-grade access.
State Highway 16 Main Road Connection	• Dual lane roundabout. • Transition from rural state highway to future Huapai urban environment • Supporting safe access to residential growth opportunities in Huapai growth area.

The form and function of the Brigham Creek and Tawa Road Interchanges and the western connection with State Highway 16 provide strategic connections at key locations to support the future growth areas and provide high quality outcomes for active modes and public transport, where necessary.

1.3.3 Overall Conclusion

Overall, the Alternative State Highway corridor project provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic (including freight) effects, as summarised below:

- **Safety**
  - A new state highway corridor which meets current standards and has minimal intersections reducing the number of conflict points.
  - Reduced use of less safe, high speed rural roads not designed for or suited to increasing traffic demands.
  - Enabling a significantly improved environment on State Highway 16 Main Road for pedestrians and cyclists, commensurate with an urbanised environment that will provide a safer more accessible environment for people accessing the existing and future Town and Local Centres.
- **Walking and Cycling**
  - Significantly reduced likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area.
  - Improved integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.
  - Environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
  - Serving as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Whenuapai / Westgate.
- **Public Transport**
  - Reduced vehicle volumes on State Highway 16, when compared to without the project, improving the capacity and reliability of this corridor for all modes including bus services.
  - The Brigham Creek Interchange upgrade will help provide opportunity for better reliability through the interchange for bus services.

  - If necessary, the additional capacity could provide the opportunity for managed lanes or interim public transport facilities in advance of the RTC / RAMC project being implemented.
- **General Traffic (including Freight)**
  - Providing an alternative strategic route for longer distance intra-regional and inter-regional connections, reducing reliance on State Highway 16 and improving resilience of the strategic network. As well as enabling future intensification along the existing State Highway 16 Main Road corridor, particularly around the future centres and Rapid Transit Corridor stations.
  - Providing sufficient corridor and intersection capacity to cater for growth on existing and Future Urban Zone growth.
  - Significantly improved journey times and reliability for existing and future local, inter- and intra-regional freight trips.
  - Direct connection for freight via the Access Road Upgrade to the future employment area in Kumeū-Huapai.

Potential adverse effects on locals roads crossing the Alternative State Highway corridor have been addressed by grade separation of the Alternative State Highway corridor and, where necessary, realignment of local roads. This enables access along public roads to be maintained.

Whilst recognising there is this uncertainty / risk with the long-term timeframe for the ASH Corridor, it is considered that the Waka Kotahi and Auckland Transport's statutory requirements and other internal processes (such as the requirement for an Implementation Business Case) will enable the above effects to be considered and addressed prior to implementation. This will allow the inter-relationships of the ASH Corridor, as it relates to the other projects and the operation and management of the transport network, to be considered and managed prior to the implementation of the corridor.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the Construction Traffic Management Plan prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

It is considered that, whilst temporary disruption to typical travel patterns will be inevitable during construction, the predominantly offline construction of the Alternative State Highway will manage the potential adverse effects, such that they will occur at these identified interfaces with the surrounding network and, where they would be able to be appropriately managed through a Construction Traffic Management Plan.

1.4 State Highway 16 Main Road Upgrade

1.4.1 Transport Environment Overview

The existing corridor is surrounded by a range of land uses including industrial, residential and greenfield land with both urban and rural sections of state highway corridor.

The corridor is generally comprised of one vehicle lane in each direction, other than between Access Road and Harikoa Street (two lanes in each direction). Within the existing urban area along the corridor, there is inconsistent provision of kerb and channel and footpath provision, whilst there are also limited cycling facilities, with cyclists only able to use the road shoulders in some urban sections. Through the current rural road sections, there is an 80kph speed limit with no kerb and channel on either side of the corridor and no footpaths.

The corridor currently passes through the Kumeū and Huapai centres, where higher levels of active mode safety and amenity would be expected. However, as the corridor currently forms part of the state highway network, it is therefore subject to high volumes of local, intra- and inter-regional vehicle trips, including freight traffic, which are not consistent to good access and safety outcomes for people moving within these urban / centre environments.

The likely future environment, with the urbanisation alongside the corridor, and wider growth within Kumeū and Huapai will further deteriorate the urban environment in providing for safe access for people within and to these centres. This will require upgrades to walking and cycling facilities to support safe access for actives modes, particularly around the future Kumeū town centre and Huapai local centre, where the Kumeū and Huapai stations will also provide access to Rapid Transit Corridor. As such, the transport features will need to include a consistent corridor form with kerb and channel on both sides and active modes facilities, including separated cycle paths, plus facilities to improve public transport access.

1.4.2 Project Overview

This Project proposes that the function of State Highway 16 Main Road will change from an existing two-lane road (which is semi-rural at the east and west extents) to a low-speed urban two-lane arterial with components for vehicles, public transport, active modes. The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents.

State Highway 16 Main Road is part of the current state highway network and is currently managed by Waka Kotahi. Waka Kotahi will manage the corridor until the Alternative State Highway is in place, at which time it is anticipated that the state highway classification will be revoked. As part of this project, if not completed as part of the Rapid Transit Corridor project, Station Road will be realigned to form a new signalised intersection with State Highway and Tapu Road.

The proposed design includes a typical 24m cross section with two traffic lanes, as well as new facilities for walking and cycling as shown in Figure 1-3 and Figure 1-4. As shown below, along the segment immediately adjacent to the Rapid Transit Corridor (between Access Road and 156 Main Road, Segment 2) the proposed corridor is 18.5m with active mode facilities along the active frontage only (north side). Additionally, given the current corridor designation, a 600m section (in Segment 3) of active mode only upgrade (south side) is proposed between Oraha Road and Station Road / Tapu Road.[2]

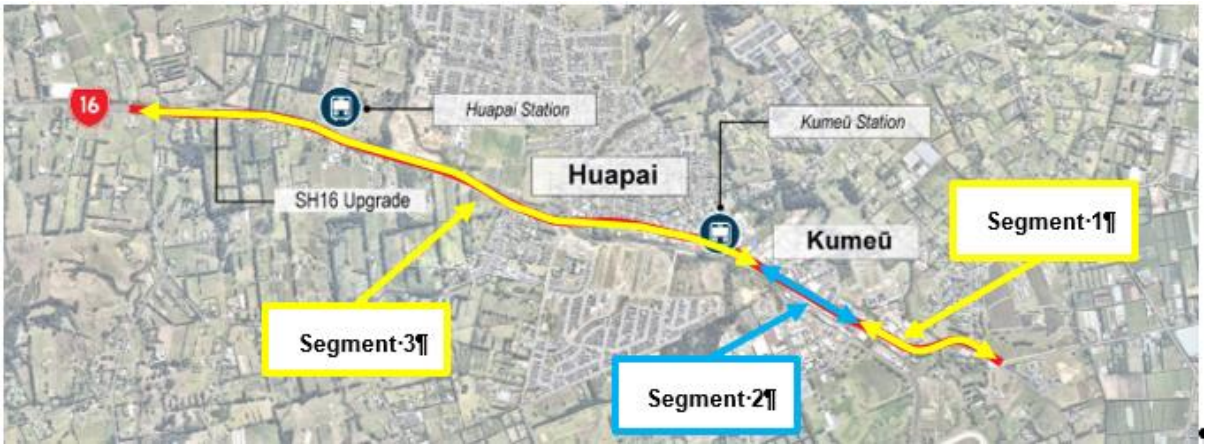
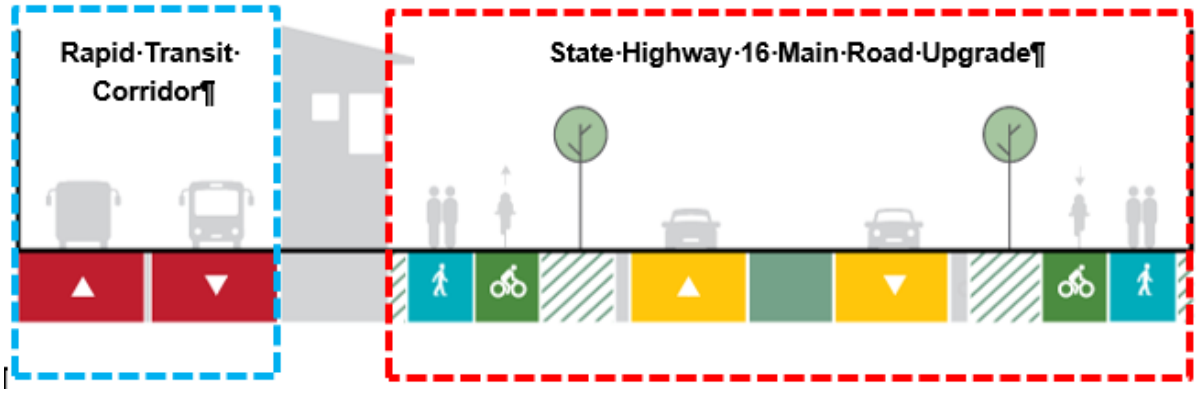


Figure 1-3: SH16 Main Road Upgrade – segments

Segments 1 and 3



[2] Active modes facilities on the north side in this section can be provided within the current road reserve, using the service lane

Segment 2

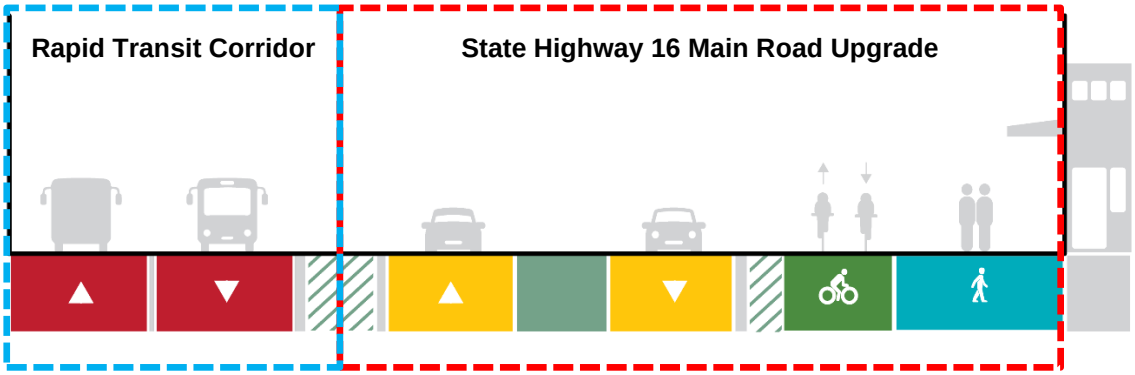


Figure 1-4: Indicative future SH16 Main Road Upgrade cross sections

1.4.3 Overall Conclusion

Overall, the State Highway 16 Main Road Upgrade provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic effects, as summarised below:

- **Safety**
  - Significantly improved, and new, walking and cycling facilities along State Highway 16 Main Road (including separation), resulting in improved protection for vulnerable road users.
  - Significantly improved, and new, walking and cycling crossing facilities (crossing SH16 Main Road) at intersections, resulting in a significantly safer environment for all road users.
  - A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h or less around centres) with enhanced place function and consequential reductions in the risk of deaths and serious injuries.
- **Walking and Cycling**
  - Supports a potential reduction in road hierarchy to an arterial function to de-tune State Highway 16 Main Road and support improved permeability (including north south connections over the rail line).
  - Provides high quality cycle facilities for a network to connect the residential catchments to key Town Centre, Local Centre and other destinations, as well as the Regional Active Mode Corridor.
  - Supports growth surrounding State Highway 16 Main Road and significantly improved safety and access to employment and social amenities.
  - Reduces speed environment and space for midblock crossings.
  - Focuses on active modes to shift trips away from private vehicle use and link land use to the Rapid Transit Corridor.

- **Public Transport**
  - Reduced delays and improved reliability for future bus services on State Highway 16 Main Road and the wider network.
  - Improved integration with the future public transport network (including the Rapid Transit Corridor stations) and improved east-west and north-south connectivity, as well as improved access to employment and social amenities.
  - Increased attractiveness and uptake of public transport trips, which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.
- **General Traffic**
  - The proposed two-lane corridor can efficiently accommodate the anticipated long-term demand and the intersections along the State Highway 16 Main Road corridor have been assessed and shown to provide sufficient capacity.
  - Complementary implementation of the Alternative State Highway, as part of the long-term network is predicted to result in a significant reduction in local, intra- and inter-regional freight using the State Highway 16 Main Road Upgrade corridor.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the Construction Traffic Management Plan prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

It is acknowledged that temporary disruption to typical travel patterns will be inevitable, as part of a significant strategic project of this nature and scale. Taking on board the specific matters discussed in this report, particularly the provision of two-way movement with one lane in each direction along the corridor, it is considered that the temporary effects on the surrounding network will be appropriately managed through a Construction Traffic Management Plan. These effects would be substantially reduced, should the Alternative State Highway be implemented in advance of this project, removing a significant volume of traffic from the existing State Highway 16 Main Road corridor through Kumeū and Huapai.

During construction of the SH16 Main Road Upgrade, it is anticipated that there will need to be temporary removal of some on-street car parking within the road reserve, primarily along the section of SH16 Main Road between Weza Lane and Access Road intersections. The extent to which parking will need to be temporarily removed, rearranged or relocated will depend on the more detailed construction methodology / approach at the time of implementation. As such, the need to temporarily remove car parking and any temporary mitigation is better considered at that later stage, particularly as the use of these spaces will change over the period of the proposed lapse dates.

1.5 Rapid Transit Corridor, including the Regional Active Modes Corridor, Kumeū Station and Huapai Station

1.5.1 Transport Environment Overview

The existing public transport network in the wider North West is heavily reliant on SH16 and several key arterials including Don Buck Road, Hobsonville Road and Fred Taylor Drive, whilst the existing public transport services for Kumeū-Huapai only offer an hourly frequency. In terms of heavy rail, while there is a single track that travels through Kumeū, this line does not currently offer passenger services beyond Swanson. For residents in Kumeū-Huapai, utilising this service means driving to the park and ride at Swanson.

As such, there is limited public transport access for Kumeū-Huapai residents, and little choice but to travel by private car in order to access wider economic and social opportunities.

Overall, the current public transport offerings connecting Kumeū to Westgate beyond provide a poor transport choice for existing and future residents. The current public transport network has high variability in travel time, poor levels of priority resulting in long travel times commensurate (or in some instances longer) with travelling by car, and services offer low frequencies. As a combined public transport offering this creates a choice that is unattractive and time expensive for commuters, and in its current form is unlikely to encourage any form of significant mode shift from private vehicles.

With the predicted increase in demand, additional buses are unlikely to be sufficient to cope with the additional pressure using the existing infrastructure, leading to bus bunching, and bus congestion on the network. A significant infrastructure change will be needed to support the transformational step change required in the North West. This will require a rapid transit solution that provides a high quality, frequent and reliable frequent service that connects Kumeū-Huapai with employment and social opportunities in Westgate and Whenuapai and also enables wider connectivity to the Auckland region, including Auckland city centre and the North Shore.

Should no dedicated strategic cycle facility be provided there will be a lack of safe and attractive facilities for the future communities. This will have two likely results, travellers will choose to continue to travel by car, increasing reliance on private vehicles or people will travel by foot or cycle on corridors with high safety risks.

1.5.2 Project Overview

The proposed Rapid Transit Corridor is a new corridor which aims to complete a safe and frequent rapid transit system connecting Kumeū-Huapai with Westgate, Auckland City Centre and the North Shore. The Rapid Transit Corridor will extend the proposed North West Rapid Transit Corridor Full Implementation project (a non-Te Tupu Ngātahi project) from the proposed Brigham Creek station to near the western edge of Kumeū-Huapai growth area.

The Rapid Transit Corridor predominately traverses rural land outside of the Future Urban Zone for around 6km of its total length of approximately 9.5km, with the last 3.5km being within the existing or Future Urban Zone areas. Refer to Figure 1-5. The Rapid Transit Corridor will operate in an uninterrupted free flowing manner with all road crossings grade separated along its length. The Rapid Transit Corridor will be at grade, except at key sections to pass over local and arterial roads, as well as the Alternative State Highway. The Rapid Transit Corridor is co-located and integrated with the Regional Active Modes Corridor and both projects are proposed to be route-protected as a single Notice of Requirement.

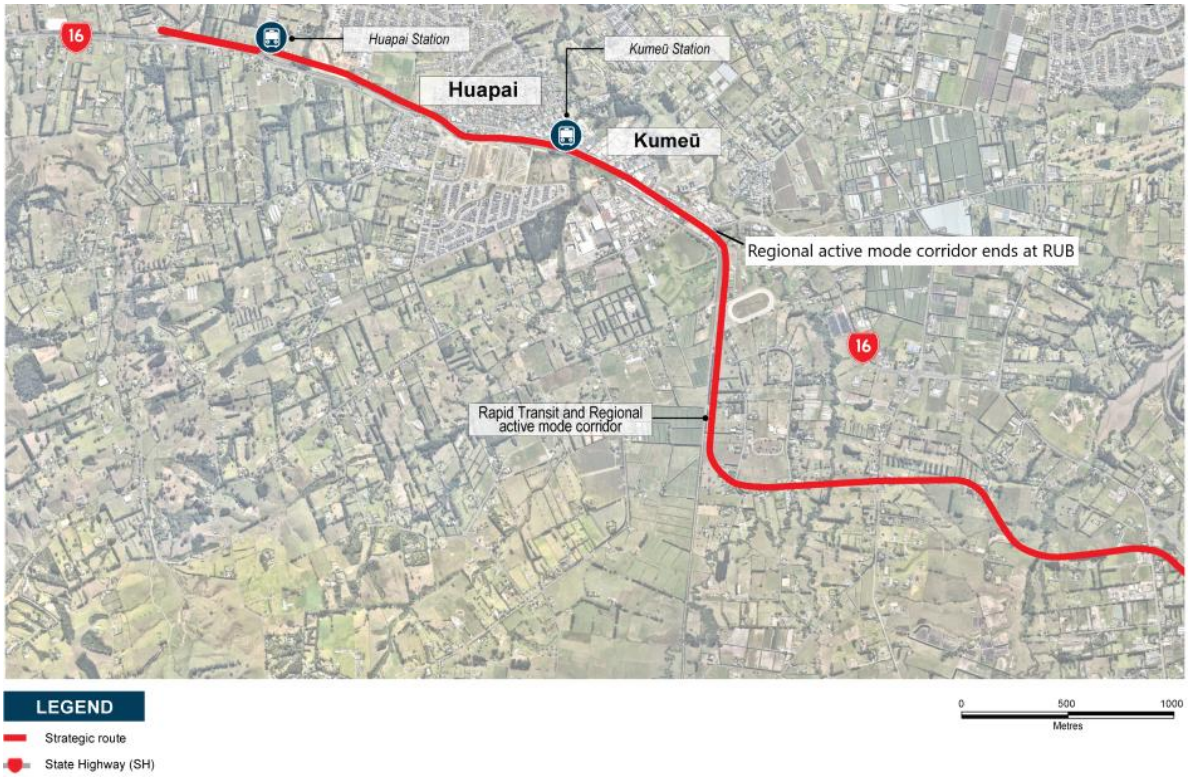


Figure 1-5: Indicative Rapid Transit Corridor and Regional Active Modes Corridor alignment

The Regional Active Modes Corridor is a segregated walking and cycling corridor that is located adjacent to the Rapid Transit Corridor alignment from the Brigham Creek Interchange to the western edge of Kumeū-Huapai, terminating at the signalised intersection of SH16 Main Road and Weza Lane. The segregated corridor provides the opportunity for long-term amenity as a key cycling corridor, while connecting to the wider North Western Cycleway and ultimately to the Auckland City Centre network.

In order to serve the existing urban and Future Urban Zone areas in Kumeū-Huapai, the Rapid Transit Corridor / Regional Active Modes Corridor is supported by Kumeū Rapid Transit Corridor Station and Huapai Rapid Transit Corridor Station. The proposed station locations are illustrated on Figure 1-5.

Within the rural section, the Rapid Transit Corridor is completely segregated with a cross-section width of 20m, including the Regional Active Mode Corridor. There are two lanes (one in each direction) and it is designed to accommodate a high-speed rapid transit system, with speeds up to around 80kph. The Regional Active Mode Corridor will have access where it crosses key local roads, including Taupaki Road, which provides connection to the State Highway 16 shared path (delivered through the State Highway 16 Improvements project). Rapid Transit Corridor stations/stops are not provided in the rural section to maintain the high-speed environment and there is grade separation at local rural roads. The indicative cross section of the Rapid Transit Corridor rural section is shown in Figure 1-6.

Figure 1-6: RTC Indicative Cross-Section – Rural Section

Within the urban section, the corridor is separated from the SH16 Main Road Upgrade corridor and is grade separated at road crossings to improve the safety, efficiency and reliability of the Rapid Transit Corridor. Generally, the corridors are separated by the adjacent land use activities or the North Auckland heavy rail line and therefore have adopted the cross section in Figure 1-4. This includes a two lane urban corridor cross section for SH16 Main Road (as described previously), with the Rapid Transit Corridor in its own separate corridor.

However, for a section of SH16 Main Road Upgrade to the west of Access Road, the two corridors run adjacent, to minimise the extent of designation required. In this section a more bespoke approach has been taken to the cross section, as shown in Figure 1-4.

The form and function for Kumeū and Huapai Stations has been subject to extensive discussion with Waka Kotahi and AT to determine the appropriate footprint for connecting transport modes interchanging for access to and from the Rapid Transit Corridor.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents.

1.5.3 Overall Conclusion

Overall, the Rapid Transit Corridor / Regional Active Modes Corridor, Kumeū Station and Huapai Station provide considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic effects, as summarised below:

- **Safety**
  - Provides a new Rapid Transit Corridor and Regional Active Mode Corridor which meets current standards and minimises interfaces with the local transport network, except at key strategic connections to the local network.
  - The Rapid Transit Corridor / Regional Active Modes Corridor will reduce traffic demand on the existing SH16 corridor, improving mode choice for connections to Westgate / Whenuapai and reduce the risk that people will use inappropriate and less safe rural roads.
- **Walking and Cycling**
  - The Regional Active Modes Corridor provides a new corridor which meets current standards and achieves the following significant positive effects:
    - Significantly reduces the likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area.
    - Improves integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.
    - Leads to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
  - The Regional Active Modes Corridor serves as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Westgate.
  - The grade separated connections to the Rapid Transit Corridor Stations at Kumeū and Huapai will provide connections over the adjacent North Auckland Line to the stations and planned adjacent centres, which will significantly reduce walking and cycling journeys distances supporting direct, convenient and attractive access options for active mode users.
- **Public Transport**
  - The Rapid Transit Corridor will support transformational mode shift in Kumeū-Huapai through the provision of a safe, high-quality, frequent, and reliable public transport system that connects Kumeū-Huapai with Westgate, Auckland City Centre and North Shore.
  - The Rapid Transit Corridor will increase access to employment opportunities by public transport and make this a more attractive travel option, in comparison to the use of the private car.
  - The dedicated Rapid Transit Corridor will be grade separated from all local and strategic corridors providing reliable journey times
  - The Rapid Transit Corridor will support a key transport interchange at Westgate, as part of the North West the Rapid Transit Corridor Full Implementation project, as well as unlocking access to economic and social opportunities in the North West.
  - The Kumeū and Huapai Rapid Transit Corridor Stations will support transit-oriented development and will be integrated with surrounding bus, walking, and cycling networks to promote travel choice. This will provide the opportunity for urban intensification, as expected through the National Policy Statement for Urban Development, in locations that support the identified future Town Centre and Local Centre locations.
  - The Rapid Transit Corridor Stations include appropriate provision for access by local bus services that will support the local public transport system connecting the Kumeū-Huapai community and broader rural catchment with access to the Rapid Transit Corridor.
- **General Traffic**
  - The Rapid Transit Corridor and Regional Active Mode Corridor will contribute to reduced future traffic demand on the State Highway 16 corridor between Kumeū-Huapai and Westgate /

Whenuapai, which will improve the effectiveness and reliability of this corridor. Noting the full benefits for this corridor are realised with the completion of the Alternative State Highway.

- The Rapid Transit Corridor and Regional Active Mode Corridor have been designed to be grade separated over local roads, so whilst there will be some adverse effects during construction, access will be maintained along these local roads. With the realignment of Matua Road (West) and Station Road providing improved connections / access.
- The new access road at Boord Crescent will not significantly affect journey times, but will reduce the safety risks associated with the existing level crossing of the North Auckland Line.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the Construction Traffic Management Plan prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

Adverse effects on the Huapai Domain and the Kumeū fire station, which are important emergency services and community facilities can be addressed by viable mitigation solutions that with the agreement of FENZ and Auckland Council Parks can provide appropriate mitigation at the time of implementation.

The relative timing of the Rapid Transit Corridor, State Highway 16 Main Road Upgrade, and Alternative State Highway will be considered as part of later implementation business cases prior to implementation. The assessment has identified that depending on the timing of the Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the Alternative State Highway may be necessary in advance of this project to manage potential adverse effects on the urban areas. This can be considered and addressed at the time of implementation.

The delivery of the Rapid Transit Corridor through Kumeū-Huapai is also noted as being dependent on the completion of some segments of the SH16 Main Road Upgrade in advance. In terms of the proposed designation, each of these projects remain necessary in their own right, as part of the North West Strategic Package to support the anticipated long-term growth.

It is acknowledged that temporary disruption to typical travel patterns will be inevitable, as part of a significant strategic project of this nature and scale. However, it is considered that the predominantly offline construction of the Rapid Transit Corridor and Regional Active Mode Corridor will manage the potential temporary adverse effects, such that they will occur at these identified interfaces with the surrounding network, where they would be appropriately managed through a Construction Traffic Management Plan.

1.6 Access Road Upgrade

1.6.1 Transport Environment Overview

The existing Access Road corridor is predominantly surrounded by greenfield land, with the exception of the eastern end, which is located adjacent to the light industrial land and Kumeū Showgrounds. It comprises of one vehicle lane in each direction. The carriageway transitions from rural to urban (on both sides) near Wookey Lane.

There is a short segment of Access Road which includes a footpath on both sides, at the eastern end of the corridor, between SH16 Main Road and 21 Access Road. A footpath is then only provided along the northern side to 116 Access Road and there are no cycle facilities. South of 116 Access Road, the rural section has no footpaths or cycle facilities, and the rural speed limit is 80 kph . There are no existing bus services on Access Road.

In the likely future environment, there will be urban development along the western side of Access Road and Tawa Road to the interchange with Alternative State Highway. Access Road will therefore play a key role in connecting the existing and likely future urban area zones to both the Rapid Transit Corridor / Regional Active Mode Corridor, via the State Highway 16 Main Road Upgrade, and the Alternative State Highway. It will also provide for bus services connecting this Future Urban Zone area with the Kumeū Town Centre and Rapid Transit Corridor station.

1.6.2 Project Overview

It is proposed to widen the existing Access Road/Tawa Road corridor from its current width of 20m to accommodate a 30m wide four-lane cross-section, as shown in Figure 1-7 and Figure 1-8 below. The proposed cross-section of the corridor transitions from a rural edge cross-section to an urban cross-section at the Wookey Lane intersection.

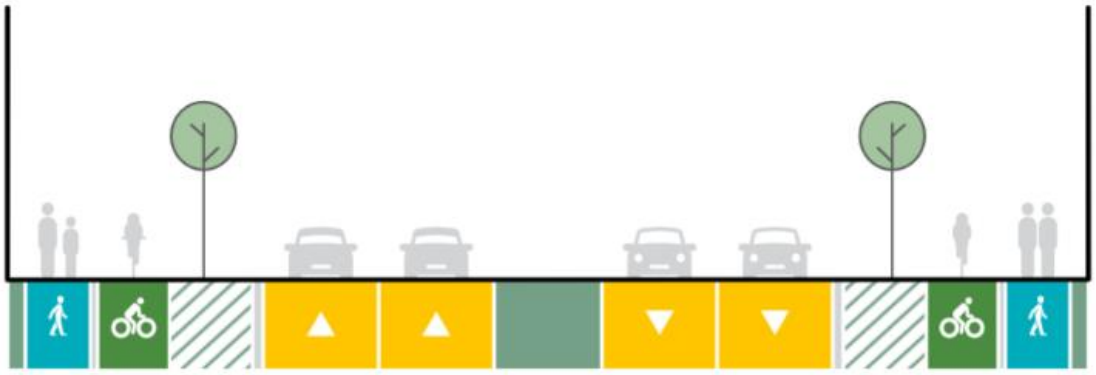


Figure 1-7: Indicative Access Road Upgrade cross section for urban section

Figure 1-8: Indicative Access Road Upgrade cross section for rural section

1.6.3 Overall Conclusion

Overall, the Access Road Upgrade provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic (including freight) effects, as summarised below:

- **Safety**
  - Significantly improved walking and cycling facilities along Access Road (including separation), resulting in improved protection for vulnerable road users.
  - Improved walking and cycling crossing facilities across the side roads intersecting with Access Road, where necessary, resulting in a safer environment for all road users.
  - A significantly improved speed environment by reducing speed limits to more appropriate urban speeds with enhanced place function and consequential reductions in the risk of deaths and serious injuries.

- **Walking and Cycling**
  - Significantly reducing the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and, where necessary, across Access Road.
  - Improved integration with the future walking and cycling network, resulting in improved north-south walking and cycling connectivity.
  - Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
  - Serve as a key enabler for greater use of active transport modes by providing a safe connector route between the development land and the future Kumeū centre.
  - Support growth surrounding Access Road and significantly improve safety and access to employment and social amenities.
- **Public Transport**
  - Reduced delays and improved reliability for the future bus network on Access Road and the wider network.
  - Improved integration with the future public transport network and improved north-south connectivity, as well as improved access to employment and social amenities.
  - Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.
- **General Traffic (including Freight)**
  - The proposed four-lane corridor can efficiently accommodate the anticipated long-term demand and the intersections along the Access Road Upgrade corridor have been assessed and shown to provide sufficient capacity.
  - Improved reliability for existing and future local freight, including access to the southern extension of the light industrial zone adjacent to Access Road
  - Flexibility to accommodate potential interim uncertainty relating to the timing of the Alternative State Highway Corridor, and therefore potentially higher traffic demands on the northern section of the Access Road Upgrade corridor.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the Construction Traffic Management Plan prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

Adverse effects on the Kumeū Showgrounds and Kumeū Community Centre, which are important community facilities can be addressed by potentially viable mitigation solutions that with the agreement of the Kumeū Showgrounds and Kumeū Community Centre can provide appropriate mitigation at the time of implementation, if necessary.

It is acknowledged that temporary disruption to typical travel patterns will be inevitable, as part of a strategic project of this nature and scale. However, taking into account the specific matters identified above, and the intention to maintain access along the corridor, it is considered that the temporary

adverse effects on the surrounding network will be appropriately managed through a Construction Traffic Management Plan.

It is noted that driveway access for several properties will be temporarily affected during the construction phase only. Temporary access arrangements will be required, as part of the construction phase for these properties. This can be satisfactorily provided for through the Construction Traffic Management Plan process. Once works are completed on Access Road, the driveways will be reinstated.

2 Introduction

This transport assessment has been prepared for as part of the Assessment of Environmental Effects (**AEE**) for the package of Notices of Requirement (**NORs**) being lodged by Waka Kotahi NZ Transport Agency (**Waka Kotahi**) and Auckland Transport (**AT**) in Northwest Auckland. It comprises both the North West Strategic Projects and Kumeū Huapai Local Arterials elements (together being the "**Strategic Assessment Package**").

The NoRs are to designate land for future strategic and local arterial transport corridors to support the planned growth in the North West area of Auckland, as part of Te Tupu Ngātahi Supporting Growth Programme (**Te Tupu Ngātahi**), to enable the construction, operation and maintenance of transport infrastructure. The Strategic Assessment Package will provide route protection for the strategic projects, which include:

- Alternative State Highway (**ASH**), including Brigham Creek Interchange (**BCI**)
- Rapid Transit Corridor (**RTC**), including the Regional Active Mode Corridor (**RAMC**)
- Kumeū Rapid Transit Station
- Huapai Rapid Transit Station
- State Highway 16 (**SH16**) Main Road Upgrade

It also includes the upgrade of Access Road, an existing local arterial corridor within Kumeū-Huapai.

This report assesses the transport effects of the North West Strategic Assessment Package identified Table 2-1 and in Figure 4-1 below. The AEE provides a more detailed project description.

Table 2-1: North West Strategic Assessment Package – Notices of Requirement and Projects

Notice	Project
NoR S1	Alternative State Highway (**ASH**)
NoR S2	SH16 Main Road
NoR S3	Rapid Transit Corridor (**RTC**)
NoR KS	Kumeū RTC Station
NoR HS	Huapai RTC Station
NoR S4	Access Road

2.1 Purpose and Scope of this Report

This assessment forms part of a suite of technical reports prepared to support the Assessment of Environmental Effects (**AEE**) for the Strategic Assessment Package. Its purpose is to identify and describe the potential effects of the package on the transport system.

This report considers the actual and potential effects associated with the construction, operation and maintenance of the Strategic Assessment Package on the existing and likely future environment as it relates to transport effects and recommends measures that may be implemented to avoid, remedy and/or mitigate these effects.

Given the long term nature of the designations being sought, this assessment does not assess the interim staging of individual projects and development staged over the next three decades. Instead, places a greater focus on the 'full build out' of the future urban area in 2048+ (refer to section 3.1.1) to support future communities.

The key matters addressed in this report are as follows:

a) Identify and describe the existing and likely future transport network of the Strategic Assessment Package area;
b) Identify and describe the actual and potential transport effects of each Project corridor within the Strategic Assessment Package;
c) Recommend measures as appropriate to avoid, remedy or mitigate actual and potential transport effects (including any conditions/management plan required) for each Project corridor within the Strategic Assessment Package; and
d) Present an overall conclusion of the level of actual and potential transport effects for each Project corridor within the Strategic Assessment Package after recommended measures are implemented.

2.2 Report Structure

The report is structured as follows:

a) Overview of the methodology used to undertake the assessment and identification of the assessment criteria and any relevant standards or guidelines;
b) Description of each Project corridor and project features within the Strategic Assessment Package as it relates to transport;
c) Identification and description of the existing and likely future transport environment;
d) Description of the actual and potential positive effects of the Project;
e) Description of the actual and potential adverse transport effects of operation of the Project;
f) Description of the actual and potential adverse transport effects of construction of the Project;
g) Recommended measures to avoid, remedy or mitigate potential adverse transport effects; and
h) Overall conclusion of the level of potential adverse transport effects of the Project after recommended measures are implemented.

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

2.3 Preparation for this Report

In preparation for this report, several resources were used to support the assessment of transport effects. An indicative construction methodology has been provided by construction (summarised in the AEE), which was used to assess the actual and potential transport effects of the construction of each project. In terms of operational effects, the inputs used for modelling purposes are discussed in greater detail in the assessment methodology.

A series of Business Cases and public engagement have been undertaken over the past four years as part of a wider programme of transport initiatives needed to support the growth in this north-western part of Auckland. These include:

- Transport for Future Urban Growth Programme Business Case (2016), which initially identified the transport network components required to support growth in the North West.
- Whenuapai Structure Plan (2016), which identified the planned land use activities and spatial framework for future urban development in Whenuapai.
- North West Indicative Business Case (IBC) (2018), which identified the preferred package of transport network components required to support growth in the North west.
- North West Detailed Business Case (DBC) (2021), which refined the alignments / location of the preferred package of transport network components required to support growth in the North west.
- Spatial Land Use Strategy - North West (Kumeū-Huapai, Riverhead, Redhills North) (2021), which provided a high-level identification of locations for future centres and business land that will be supported by the transport network.

3 Assessment Methodology

Given the long-term nature of the designations being sought, this assessment does not assess the interim staging of individual projects and development staged over the next three decades. Instead, it places a greater focus on the 'full build out' of the future urban area in 2048+ (refer to section 3.1.1) to support future communities.

Therefore, this assessment focusses on the likely future environment (the transport modelling is based upon a full build out by 2048+) and other wider infrastructure upgrades anticipated by that time. These include the SH16 to SH18 Connections project and the North West Rapid Transit Corridor (NW RTC) Full Implementation (i.e. a RTC from the City Centre to a Brigham Creek station), which are being progressed separately to the Te Tupu Ngātahi NoR packages.

The transport response to the planned future urban growth, in combination with existing urban growth in the North west, is a combination of these various physical projects (refer to Figure 3-1), as well as other broader regional programmes (safety, active modes, public transport, including buses and ferries) that will be implemented over time. This will be supported by non-physical interventions such as travel demand management, education, enforcement and other such transport-related programmes undertaken by Waka Kotahi and AT over time in a staged manner.

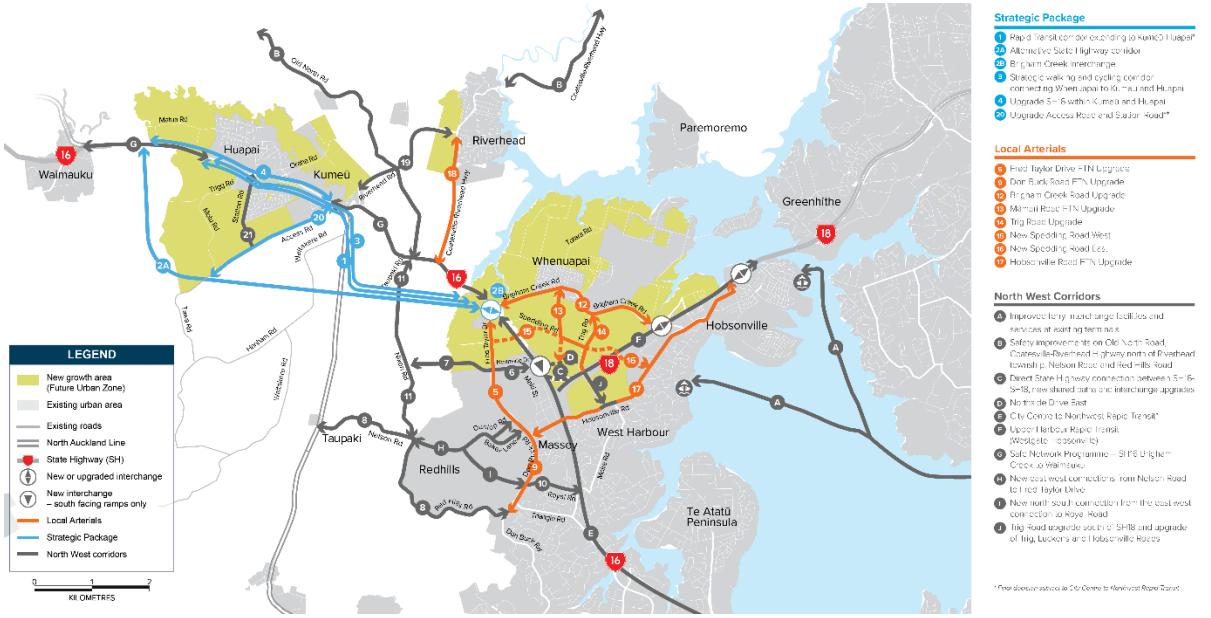


Figure 3-1: Overview of North west transport network projects

To ascertain the long-term effects of the projects, this assessment assesses the transport effects arising from each of the individual projects that comprise the Strategic Assessment Package in a future context. The approach considers that the other projects within the Strategic Assessment Package, as well as those projects being progressed separately to the Te Tupu Ngātahi NoR packages will also in place at that time. Where relevant commentary is provided relating to the potential effects of inter-relationships between these projects in the Strategic Assessment Package.

The methodology for the operational and temporary construction transport effects are applicable for each NoR specified within this document. Any NoR-specific nuances are specified throughout the assessment.

The Assessment of Transport Effects has two elements:

- Assessment of operational effects on the transport system, namely the affects when the facility is operational ·
- Assessment of temporary construction effects on the transport network, that is, impacts created by the construction of the project.

The construction effects typically have only a temporary, short-term duration, while operational affects are more long-lasting. In terms of this transportation package, many of those impacts on the transport system are deliberate and directly related to the purpose and objectives of the works.

This assessment is targeted at route protection, rather than imminent implementation. As such, the assessment:

- Makes greater use of generic cross-sections and design standards (rather than detailed designs)·
- Focuses more on desired outcomes and footprints
- Takes a longer-term view, noting that implementation may be staged over time
- Assumes more use of recommended management plans and planning processes rather than specific design details to manage potential effects.

A key element of the assessment is the definition of the 'existing / likely future environment', against which the effects are assessed. The proposed works are planned to support urban development and will be unlikely to occur without such development. Additionally, the source of the potential effects (such as people and vehicle movement), is generally (albeit not entirely) from that urban development itself, rather than from the planned infrastructure.

To isolate the effects of the planned works, the 'Existing Environment' includes the likely future urban development (and its associated transport demand), but does not include the planned projects for which designations are sought. The effects of the Projects are then the effects (positive or adverse) that result from the implementation of the project themselves.

Given the long-term perspective of the assessment, the analysis is based on the estimated 'full build out' for the future urban area. This is based on development yield estimates provided by Auckland Council, which in this case is based on scenario i11 (version 5) forecasts, extended to a full-build scenario in the greenfield growth areas.

3.1 Approach to Assessment of Operational Transport Effects

Potential operational transport effects are assessed using:

- Transport planning assessment of expected outcomes and effects
- Transport modelling to inform future demands and network performance
- Alignment with various policy documents.

An assessment of the positive effects of the Strategic Assessment Package of NoRs is provided at Section 4. In respect to each individual NoR a separate assessment has been undertaken that provides an assessment of the following and how each project contributes to the future network as a whole:

- Each mode of transport
- Access for existing properties
- Existing on-street and public parking.

This section will outline the methodology for these assessments.

3.1.1 Transport Modelling

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

The impacts of the Projects on the future transport environment are assessed using forecasting transport models, owned by the Auckland Forecasting Centre (AFC). The models include:

- The regional multi-modal transport model (the Macro Strategic Model (MSM)). This creates estimates of car, truck and public transport (PT) movements at a regional level based on land use, network and policy inputs. This model is the primary tool to estimate future PT usage. Generally, this model is run using regional assumptions as the per the most recent Auckland Transport Alignment Project (ATAP) planning, but with scenario-specific inputs in the growth areas.
- A local traffic model (SATURN). This uses the traffic demands from the regional MSM on a more detailed representation of the road network.
- A Strategic Active Mode[3] Model (SAMM) gives strategic-level estimates of walking and cycling demands.

The assessment of operational effects will therefore be informed by modelled estimates of travel and network performance for a future full-build-out scenario, i.e. the full-build out of the FUZ and other urban areas in the North West, based on the population and employment projections described below.

[3] walk/cycling

A SATURN (North West Area) and MSM (Regional) model with forecast year of '2048+' for the wider network was used. The '2048+' forecast includes the regional growth estimated for the year 2048, but with the addition of full build-out in the greenfield growth areas, which is currently anticipated at a time beyond 2048. The SATURN model uses the demand outputs from the regional MSM, which includes inputs of the latest land use provided by Auckland Council (in this case using scenario i11 (version 5)).

The modelling includes an overall network of infrastructure identified to support growth in the North West area. This means that the assessment assumes that all other North West Te Tupu Ngātahi Programme projects are implemented and the growth up to 2048+ will progress as planned. The approach and relevant transport projects assumed in the modelling are outlined in Appendix 1.

The regional MSM was used to inform assessment of the PT network components, such as the RTC and the associated rail stations within the Strategic Assessment Package. In addition to the SATURN modelling, SIDRA modelling has been undertaken to assess the operational outputs of key intersections along the project corridors. The SIDRA modelling takes the traffic movements identified in the SATURN model and provides a more detailed operational assessment of intersection performance.

In relation to the traffic modelling assessments, Level of service (LOS) metric are used throughout, and this refers to a qualitative measure used relating to the quality of motor vehicle traffic service. LOS is used to analyse roadways and intersections by categorising traffic flow and assigning quality levels of traffic based on performance measure ranging from A to F and can be summarised as follows:

- **LOS A: free flow**. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes.
- **LOS B: reasonably free flow**. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted. 31
- **LOS C: stable flow, at or near free flow.** Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness.
- **LOS D: approaching unstable flow**. Speeds slightly decrease as traffic volume slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease.
- **LOS E: unstable flow, operating at capacity**. Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to manoeuvre in the traffic stream and speeds rarely reach the posted limit.
- **LOS F: forced or breakdown flow.** Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity.

3.1.2 Transport Guidance and Documents

Assessment of the Projects against the relevant objectives and policies of the AUPOIP is contained in the AEE. Within this report, the Projects have also been considered against the outcomes and objectives of applicable transport design guidance and strategy / policy directives.

The following design guidance and planning documents are also relevant to all of the projects, including Access Road and SH16 Main Road Upgrades, as well as the ASH and BCI:

- Austroads Guide to Road Design (AGRD):
- Part 3: Geometric Design (2016).
- Part 4: Intersection & Crossings – General (2017).
- Part 4A: Unsignalised and Signalised Intersections (2017).
- Part 4B: Roundabouts (2015).
- Part 4C: Interchanges (2015).
- Austroads Guide to Traffic Management (AGTM):
- Part 6: Intersection, Interchanges and Crossings (2019).
- Auckland Unitary Plan Operative in part (updated 13 March 2020):
- Chapter E27 Transport, in relation to driveway access etc.

In addition to the documents applying to all project (as above), the following have been considered for the Access Road and SH16 Main Road Upgrades, the following:

- AT's Transport Design Manual (TDM), which sets out outcomes, engineering design and construction requirements for the Projects
- AT's Urban Street and Road Design Guide
- Engineering Design Code – Urban and Rural Roadway Design.
- Engineering Design Code – Cycling Infrastructure
- AT's Vision Zero, which adopts a "Safe System" approach to focus on road safety for all users
- AT's Roads and Streets Framework (RASF) was also used to qualitatively assess the typology (movement and place value) and modal priority for each corridor. A 'mandate' for each road corridor is developed and approved by the RASF Committee, comprising of senior officers from AT and AC.

In addition to the documents applying to all project (as above), in relation to the ASH and BCI, the following have been considered:

- State Highway Geometric Design Manual (SHGDM) Draft (2000):
- Traffic Control Devices (TCD) Manual:
- Part 10: Motorways and expressways, Section 2 Interchanges.

For the RTC, as this is currently being progressed as a bus-based design, the following sources of information have been considered:

- Waka Kotahi, Busway Planning and Design Manual (December 2002) by McCormick Rankin International.

3.1.3 Assessment Methodology – Transport Mode

Table 3-1 summarises how each mode/element of transport has been assessed in terms of operational effects as a result of the Projects.

Table 3-1: Summary of Assessment Methodology

Network Component	Information Source	Assessment Method
Safety	Crash Analysis System (CAS) Database Project design drawings	Assessment to determine alignment with Vision Zero standards and design compliance with Transport Design Manual.
Walking and Cycling	Walking and Cycling Network Plans Proposed Cross Sections	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual.
Public Transport	Transport Model tools (MSM, SATURN and SIDRA) Te Tupu Ngātahi Remix File[4]	Assessment to determine alignment with future network provisions and design compliance with the Transport Design Manual.
General Traffic	Transport Model tools (MSM, SATURN and SIDRA) Project design drawings	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection performance. Assessment of surrounding network connections.
Access	Engineering Standards	Assessment identifying where there is a potential effect on access in the existing environment.
On-street and public parking	Regional Parking Strategy and associated policies Engineering Standards	Assessment identifying where there is a potential effect on parking provision, including in terms of providing parking to required standard in the existing environment.
Note: A Road Safety Audit and Safe System Assessment will be done as part of the implementation business case/detailed design stage prior to implementation.		

[4] Te Tupu Ngātahi Remix file provided by Auckland Transport on the draft plan of the bus network to be implemented by 2048

3.1.4 Assessment of Project Objectives

Each project included in the Strategic Assessment Package has an identified set of project objectives. From a transport perspective, these objectives are focused predominantly on the themes of supporting growth, safety, urban form, mode shift/choice and connectivity. The assessment of these, and how they align with the Project Objectives are included in the AEE.

3.2 Approach to Assessment of Construction Effects

3.2.1 Construction Traffic Effects

In order to assess the potential construction traffic effects, an indicative construction methodology has been prepared. This can be found in the AEE.

Based on the indicative construction methodology an assessment of construction effects has been completed for the Package sufficient to support each of the NoRs. This assessment will consider:

- An overview of key considerations including speed, potential impacts to pedestrians and cyclists, residential, recreational and business property access, and on-street / public parking
- Identification of any works that should not occur at the same time
- Assessment of potential conflict areas that will need specific mitigation within a CTMP and / or SSTMP.

The project specific construction effects will be managed via a CTMP and/or Site-Specific Traffic Management Plans, which will be developed immediately prior to implementation when the greatest certainty is available.

3.2.2 Temporary Traffic Management

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

It is noted that there may be some nuances between projects delivered ‘online’ (NoR S2, NoR S3 (in part), NoR S4) and those delivered ‘offline’ (NoR S1, NoR S3 (in part), NoR KS, NoR HS). In particular, any future assessment should be required to consider potential road closures, any capacity reductions on key corridors through lane closures, and any other ancillary effects such as shoulder closures.

4 Strategic Assessment Package Overview

An overview of the Strategic Assessment Package is provided in Figure 4-1, with a brief summary of the Strategic Assessment Package projects provided in Table 4-1.

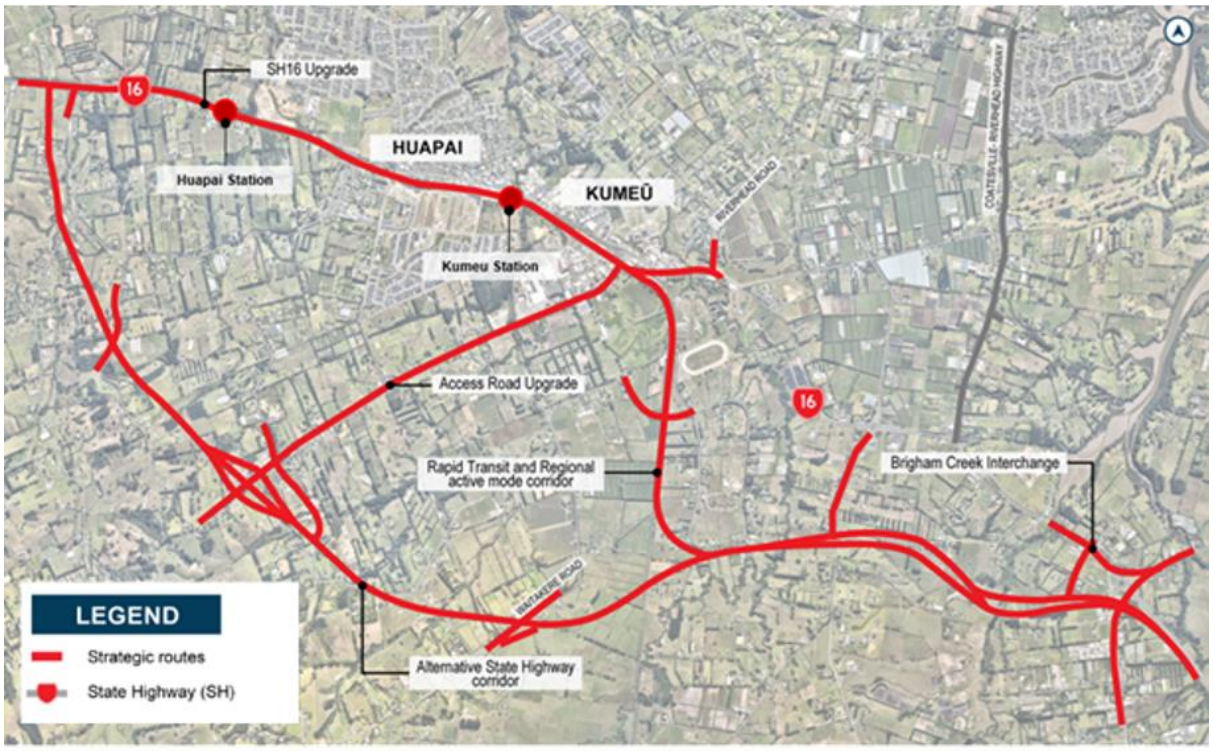


Figure 4-1: North West Strategic Assessment Package – overview of NoRs for assessment

Table 4-1: Strategic Assessment Package Project Summary

Corridor	NOR	Description	Requiring Authority
Alternative State Highway (ASH)	S1	A new four-laned dual carriageway motorway and the upgrade of Brigham Creek Interchange.	Waka Kotahi
SH16 Main Road	S2	Upgrade to urban corridor including active modes and realignment of Station Road intersection with SH16.	Waka Kotahi
Rapid Transit Corridor	S3	New RTC and active mode corridor in one co-located corridor.	Waka Kotahi
Kumeū RTC Station	KS	New rapid transit station, including transport interchange facilities and accessway.	Waka Kotahi
Huapai RTC Station	HS	New rapid transit station, including transport interchange facilities, park and ride and accessway.	Waka Kotahi
Access Road	S4	Upgrade of Access Road to a four-lane cross-section with separated cycle lanes and footpaths on both sides of the corridor.	Auckland Transport

The AEE provides further information on these projects, including a project description, key project features and the planning context.

The six NoRs identified in this Strategic Assessment Package contribute to providing a comprehensive transport solution for the North west growth areas that deliver:

- A safe, reliable transport system that supports North West growth and urbanisation.
- A transport network that supports the planned future growth, including facilitating mode shift from private vehicles to public transport and active modes.
- Improved access by all transport modes to employment and social amenities.
- RTC stations in Kumeū and Huapai that support intensification of adjacent land uses, particularly transit oriented development and high density housing, including the opportunity to maximise walk-up catchments for future RTC stations on the RTC corridor.
- Separation of the strategic trips from the local trips to support better placemaking in urbanised centres, such as Kumeū and Huapai, by getting the "right trips using the right corridors".
- Provide more reliable and efficient freight connections that avoid the urbanised centres.
- Increased resilience through new strategic corridors and urbanised alternative routes to improve safety on the North West rural roads.
- An area-wide focus on safety through a holistic set of measures including Road to Zero safety principles, shifting modes from private vehicles, fully separated cycling facilities, well designed intersections and sufficient space for all modes to interact safely.

The outcomes achieved by the projects identified in the Strategic Assessment Package include:

- A high quality, fast and reliable RTC connecting Kumeū-Huapai to Westgate, Whenuapai and the city centre, including the Kumeū and Huapai RTC stations that will support intensification of adjacent land uses and maximise walk-up catchments.
- The ASH that will remove strategic trips from within Kumeū-Huapai. This will improve amenity and access to the Kumeū town centre, support the implementation of the RTC and provide direct and efficient heavy vehicle access from the state highway to the future industrial area via Access Road.
- A reliable bus infrastructure network that connects both existing and new land uses to key destinations and RTC stations, along SH16 Main Road. It will support both collector and local bus services and provision for intersection bus priority at key locations in the network.
- Upgraded walking and cycling facilities to improve safety, attractiveness and connectivity within and between areas. This includes the RAMC adjacent to the RTC, and a strategic facility alongside the ASH, which both support separated, uninterrupted and higher speed cycling and micro-mobility. In addition, separated cycle lanes are provided on the SH16 Main Road and Access Road urban corridors.

The North West DBC identified that the combination of the Strategic Assessment Package and the other North west NoR packages would be predicted to result in outcomes in Figure 4-2:

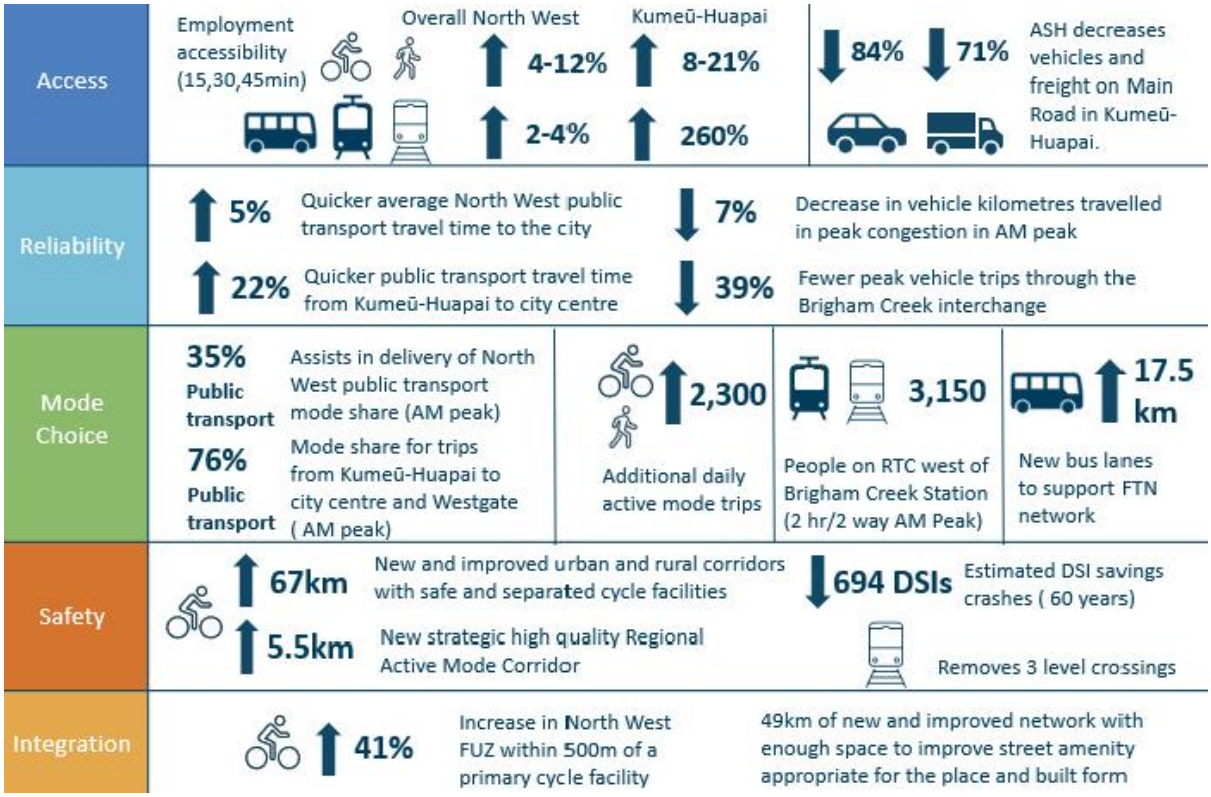


Figure 4-2: Transport network outcomes

5 NoR S1: Alternative State Highway

5.1 Project Corridor Features

The ASH extends from (and includes) the future BCI (north of Westgate) to a proposed new intersection with SH16 near Foster Road, between Huapai and Waimauku. This proposed state highway corridor will be approximately 11km long, travelling westward across rural farmlands and countryside living to the southwestern side of Kumeū and Huapai, with an additional interchange proposed at Tawa Road.

An overview of the proposed ASH (and BCI) design is provided in Figure 5-1.

Figure 5-1: Overview of the Alternative State Highway, including Brigham Creek Interchange

The proposed BCI is located in Redhills North, which is zoned FUZ. The interchange is the eastern connection of the ASH and has inter-relationships in terms of the transport and design of connections with the RTC / RAMC project, whilst also facilitating connection to Fred Taylor Drive and Brigham Creek Road. The proposed BCI currently sits within FUZ land and existing state highway designation. The existing SH16 / Fred Taylor Drive / Brigham Creek Road Roundabout will be replaced by a fully grade separated interchange with separate sets of east-facing and west-facing ramps (see Figure 5-2 below).

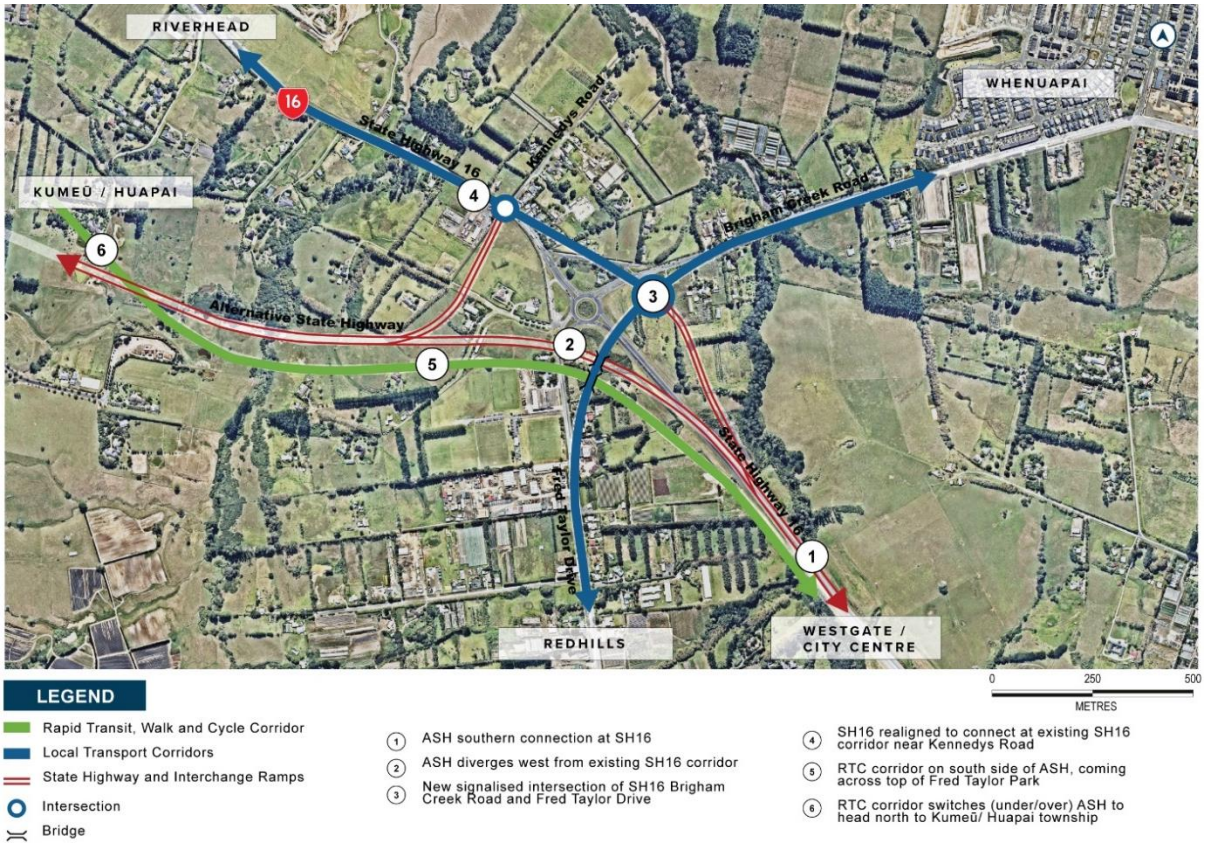


Figure 5-2: Indicative Brigham Creek Interchange arrangement

As part of the Waka Kotahi SH16 to SH18 Connections Project (not a Te Tupu Ngātahi project), SH16 (south of Brigham Creek Interchange) is expected to be widened to accommodate an extra lane in each direction. The North West RTC Full Implementation project will comprise a new City Centre to Westgate RTC and active mode facility, most likely on the southern side of SH16. The ASH / BCI project will tie in to the SH16 to SH18 Connections and North West RTC Full Implementation projects.

At the ASH interface with Tawa Road, a new grade separated interchange is proposed with both east and west facing ramps on the ASH. This will require the realignment of Pomona Road to tie into a new intersection with Motu Road (see Figure 5-3 below).

At the western termination of the ASH, there will be a new intersection on SH16, approximately 80m to the west of Foster Road. This is illustrated on Figure 5-4 below. Access between Foster Road and SH16 will be retained, but due to the proximity to the SH16 / ASH intersection, there may be restricted vehicle movements.

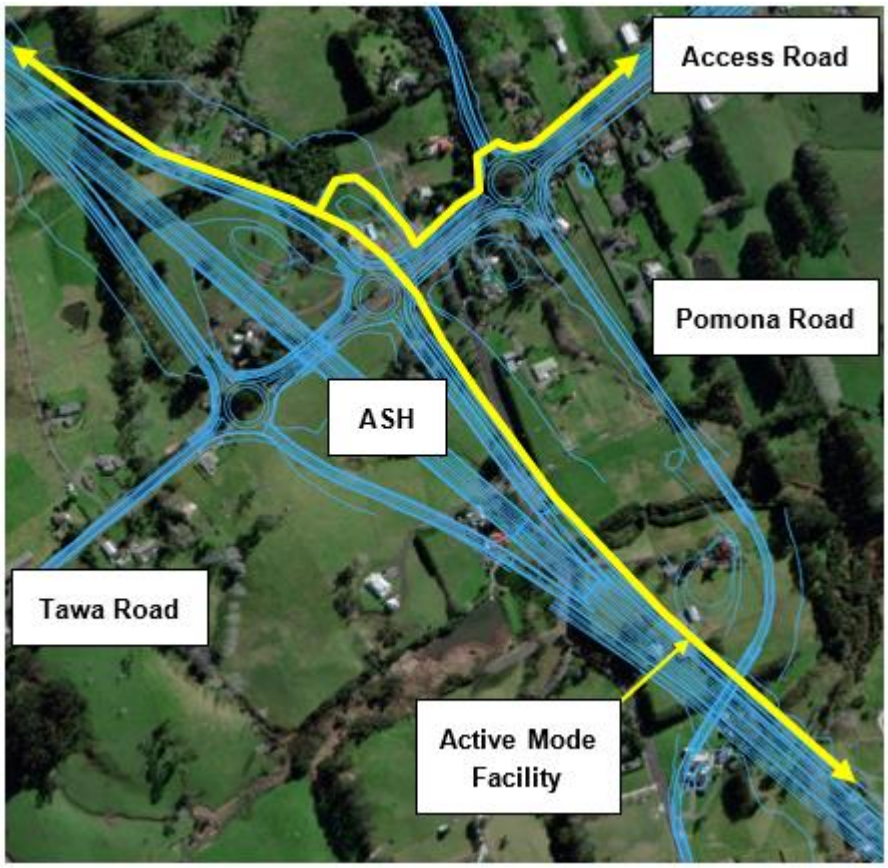


Figure 5-3: Tawa Road Interchange Overview

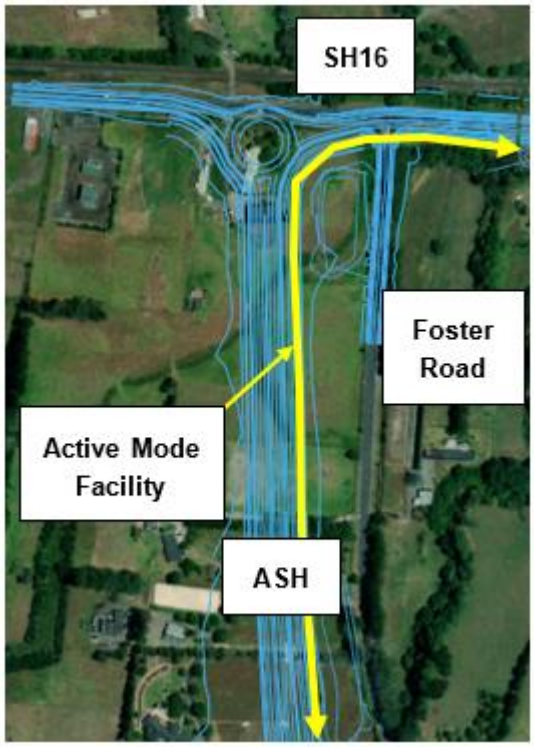


Figure 5-4: SH16 / ASH Intersection Overview

5.2 Network and Corridor Design

The Project was developed as part of network planning for the wider North West area. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider long-term integrated network planned for the area.

The Project proposes the construction of a new four-lane state highway corridor with a cross-section of approximately 50m to accommodate a dual carriageway and separated cycle facility and footpaths. The eastern segment is adjacent to the RTC / RAMC, between the BCI and the NAL, so on this segment the RAMC provides the separated cycle facility. Once the RTC / RAMC proceed north, adjacent to the NAL, then a cycle facility continues along the ASH.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 0. Key aspects of the network and corridor design are summarised below.

The form and function for the ASH is illustrated in Figure 5-5 and Table 5-1 below. The typical cross section includes an active mode corridor with central and side barriers (See Figure 5-6 to Figure 5-8 below). The allocation of the proposed four lanes on ASH will be decided upon implementation, but the additional capacity could also be used for managed lanes or interim public transport facilities.

Figure 5-5: Indicative Alternative State Highway alignment

Table 5-1: Alternative State Highway – form and function

Segment Number	Comments
Brigham Creek Connection	• Grade separated interchange. • Separating higher speed state highway trips from local trips, including active modes and public transport. • Grade separation of state highway from Rapid Transit Corridor and Regional Active Modes Corridor. • Supporting safe access to residential and employment opportunities in Whenuapai and Redhills North growth areas.
Brigham Creek to North Auckland Line **North Auckland Line to Tawa Road**	• The design consists of a 4-lane dual carriageway with central and side barrier systems. • All local roads will be grade separated. • Under the ONRC Class 1 with no direct access and grade separation at all local roads / intersections, Safe and Appropriate Speed is 110 km/hr. • No at-grade access.
Tawa Road Connection	• Grade separated interchange • Separating higher speed state highway trips from local trips, including active modes • Grade separation of state highway from Rapid Transit Corridor and Regional Active Modes Corridor. • Supporting safe access to current and future employment growth along Access Road, as well as residential growth in the Kumeū and Huapai areas.
Tawa Road to SH16 existing	• Design consists of a 4-lane dual carriageway with central barrier systems and side barrier systems. • Opportunity for a 2-lane ‘expressway’ option for this section in the medium term to be investigated further. • Safe and Appropriate Speed is 110 km/hr. • No at-grade access.
State Highway 16 Main Road Connection	• Dual lane roundabout. • Transition from rural state highway to future Huapai urban environment • Supporting safe access to residential growth opportunities in Huapai growth area.

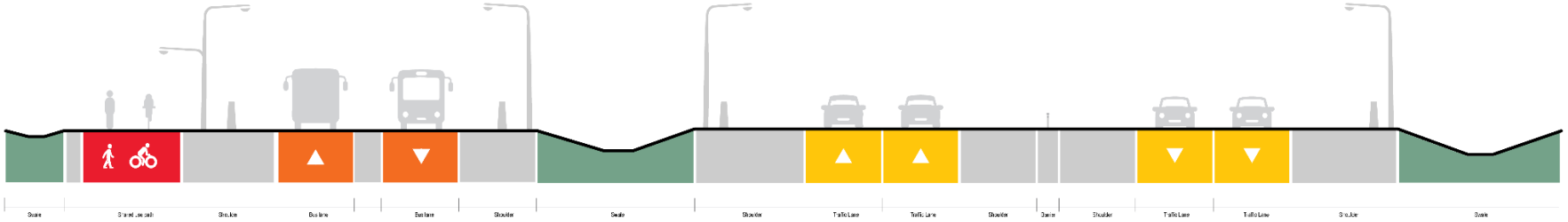


Figure 5-6: Indicative Alternative State Highway cross sections – West of Brigham Creek Interchange

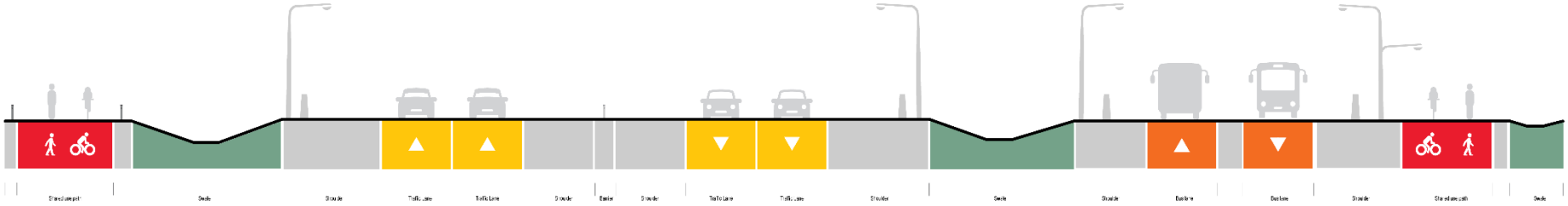


Figure 5-7: Indicative Alternative State Highway cross sections – West of Taupaki Road

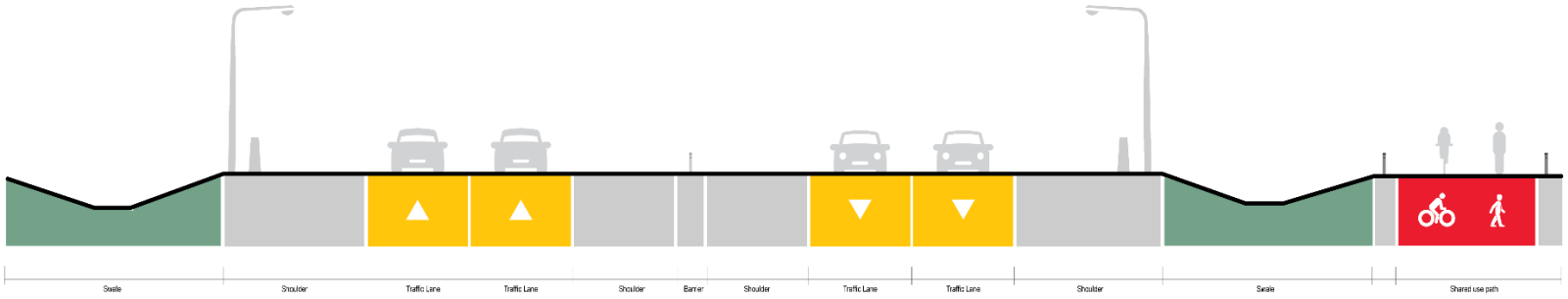


Figure 5-8: Indicative Alternative State Highway cross sections – West of North Auckland Line

In relation to the BCI, the form and function has been subject to extensive discussion with Waka Kotahi and Auckland Transport as part of the optioneering for the North West DBC. The identified form and location of the interchange has been selected for the following transport reasons:

- **BCI Form** – The purpose of the BCI is to provide reliable access and an efficient interface between the strategic and local network, as well as improved and safer access for active modes through the interchange. This has been achieved by:
  - Grade separation of the local and strategic people movement on the local and strategic corridors, enabling good quality people movement
  - Providing lower exposure / improved safety for active modes with fewer intersections and grade separation
  - Supporting mode shift for local trips between growth areas by enabling active mode and local PT connections in an efficient manner through the interchange.
- **Existing SH16 Integration** – Brigham Creek roundabout is the current termination of the North Western motorway. Connection at this location integrates with the existing state highway and makes best use of the existing motorway infrastructure.
- **SH16 / SH18 Connections Integration** – The SH16 / SH18 Connections project identified an interchange upgrade at Brigham Creek roundabout and the location provides an appropriate separation of some 1.3km from the Northside Drive Interchange east facing ramps.
- **North West Local DBC Integration** – The North West Local DBC recommended a new local arterial connection between Redhills / Westgate and Whenuapai at Spedding Road West. The separation of the Brigham Creek and Northside Drive also facilitates the provision of this local connection between these areas.
- **Strategic connections for Westgate and Whenuapai** – The overall transport demand in Westgate, Redhills and Whenuapai indicates that, in addition to the transport choices that are being provided, there is still demand to require two pairs of east-facing ramps at both the Northside Drive and Brigham Creek Interchanges.
- **Impact on Redhills / Whenuapai Urban Area** – The Brigham Creek Interchange is an important strategic connection for the Riverhead community. Around 25,000 vehicles per day are predicted to occur on the existing SH16 in the future, even with the ASH, primarily associated with Riverhead and the broader Coatesville-Riverhead Highway catchment. The location of the Brigham Creek Interchange minimises the need for these trips to pass through the Redhills / Whenuapai / Westgate urban area.

In relation to the Tawa Road Interchange, the North West DBC considered the form of the connection and identified the provision of a grade separated diamond interchange. The interchange form provides greater reliability for vehicles using the ASH and also separates strategic and local trips, including active mode trips along Tawa Road and the ASH.

The form and footprint identified provides for east and west facing ramps to enable access to the employment areas along Access Road. This enables trips from further west to avoid using other local roads from SH16. The form of the interchange includes facilities for active modes to provide connection between the Access Road Upgrade and the shared path along the northern side of the ASH. The shared path is currently proposed to pass under Access Road to the north of the eastbound ramps roundabout providing continuity of the shared path and avoiding conflicts with vehicle movements at the interchange.

5.3 Existing and Likely Future Environment

5.3.1 Planning context

The ASH corridor, including the interchanges / connection points, is largely rural and is proposed to traverse land zoned under the AUPOP as Rural – Countryside Living Zone, Rural – Mixed Rural Zone and Rural – Rural Production Zones.

The ASH corridor will also traverse two separate areas of FUZ in Redhills North and Kumeū-Huapai with the BCI also sitting within Redhills North and Whenuapai FUZ land and the existing Brigham Creek Interchange. Table 5-2 provides a summary of the existing and likely future environment as it relates to the ASH and BCI.

Table 5-2: Alternative State Highway and Brigham Creek Interchange Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[5]	Likely Future Environment[6]
Rural	Rural - Mixed Rural Zone, Rural - Countryside Living Zone Rural - Production Zone	Low	Rural
Undeveloped greenfield areas	Future Urban	**High**	Urban

5.3.2 Transport Environment

5.3.2.1 Existing

Currently, the SH16 corridor is the only existing strategic corridor that connects Kumeū, Huapai, Riverhead and the broader North West rural area to the metropolitan centre at Westgate and rest of the region beyond. This corridor is already congested, in both weekday commuter peak and other periods, as well as at weekends and during the summer period, due to its current capacity and lack of resilience, which results from the interactions at existing intersections and direct driveway access.

Waka Kotahi is separately progressing the SH16 Improvements project, which will provide investment to address existing safety and capacity issues along the corridor. This includes both safety and capacity improvements between the existing Brigham Creek roundabout and Taupaki Road, including provision of two traffic lanes in each direction, a new roundabout at the Coatesville-Riverhead Highway intersection, and safety upgrades along this section. To the west of Huapai, through to Waimauku, further safety improvements will soon be implemented.

[5] Based on AUP:OP zoning/policy direction
[6] Based on AUP:OP zoning/policy direction

The current lack of capacity of SH16, means that existing rural roads are currently used as alternatives, particularly during the periods of congestion on SH16, as these rural roads can provide a quicker and more attractive option. However, many of these higher speed roads are not suited to the current volumes of traffic using these corridors and this also leads to safety issues.

Whilst the SH16 Improvements project will address some of the interim capacity and safety issues, it will not be able to support the longer-term growth with the development of the FUZ in Kumeū, Huapai and Riverhead.

The SH16 Improvements project does not include any upgrade to the existing Brigham Creek roundabout. The roundabout has current capacity and resilience issues, particularly when incidents / crashes occur at this location, which adversely affect the surrounding local and strategic network. As discussed previously, this roundabout has previously been identified through the SH16 to SH18 Connections project for a future grade separated interchange.

5.3.2.2 Likely Future

Based on the Auckland Council Future Land Supply Strategy (FULSS), the future urban growth areas in Kumeū -Huapai and Riverhead are programmed to be released for urban development between 2028 and 2032. The planned growth in Kumeū-Huapai is expected to include 10,700 dwellings with an estimated population 24,700 by full build out – a significant increase on the existing population of 1,200 (in 2016). In addition, the number of employment opportunities in Kumeū-Huapai is expected to increase by approximately 3,300 jobs over the same period.

Travel patterns are largely expected to remain similar, however, the employment growth in Westgate and Whenuapai are expected to significantly increase – resulting in a potentially much higher level of demand within the North West to access jobs. The trip demands of all Kumeū-Huapai urban trips in the morning peak in 2048+ show that approximately 37% stay in the area. Both the ASH and the RTC / RAMC will therefore provide an important strategic role in connecting Kumeū-Huapai with those employments opportunities and broader opportunities within the metropolitan centre at Westgate.

Structure planning is not yet complete in Kumeū-Huapai, Riverhead and Redhills North and is not expected to start until closer to land release, which is beyond 2028. This results in less land use certainty for these areas, but also provides significant opportunities to use transport to shape placemaking. In the absence of Structure Plans and to ensure the future land use and transport networks work together to support growth, Auckland Council prepared a Spatial Land Use Strategy in 2020, which was adopted in May 2021.

The Strategy is a starting point for future structure plans and identifies potential locations for future centres and business land on FUZ land in Kumeū-Huapai, Riverhead and Redhills North and is shown in Figure 5-9 below. This is an iterative process and is expected to be revisited as strategy, policy and infrastructure planning progresses.

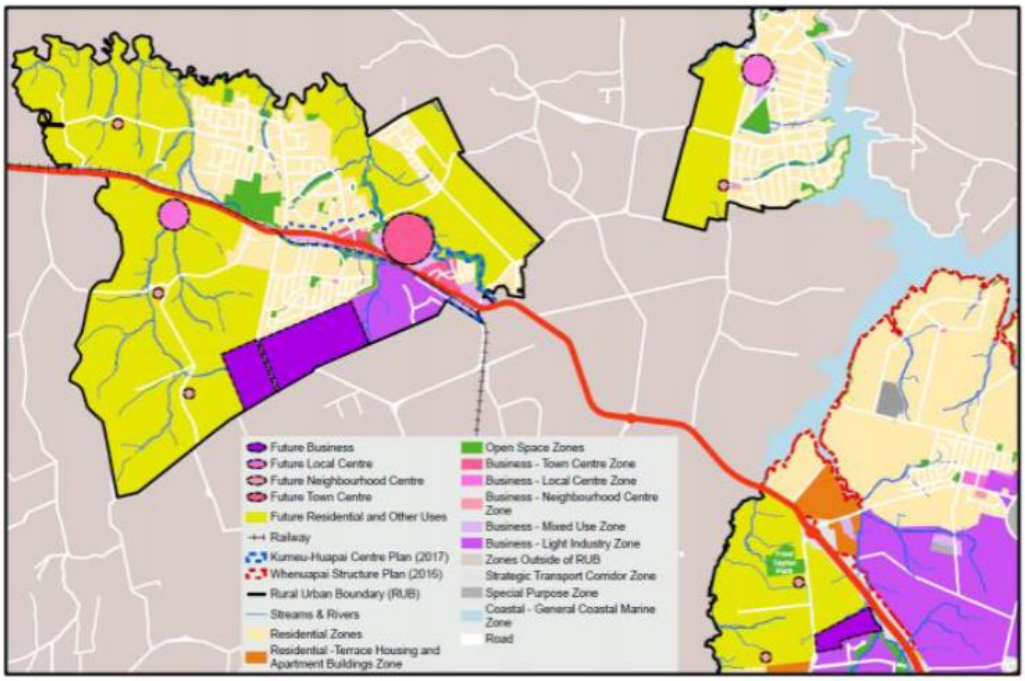


Figure 5-9: Auckland Council North West Spatial Land Use Strategy (May 2021)

5.4 Assessment of Operational Transport Effects

Overall, the key features and outcomes of the ASH, BCI and the associated connections to the local road network along the corridor include the following:

- The ASH enables the relocation of strategic trips, including freight trips, from the Kumeū town centre and through Kumeū-Huapai, improving local access options.
- The reduction in strategic trips and local trips along the existing SH16 Main Road corridor through Kumeū-Huapai will support implementation of the RTC and SH16 Main Road Upgrade. Depending on the implementation timing of the RTC and SH16 Main Road Upgrade, relative to further urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of those projects to manage potential adverse effects on the urban areas, which can be satisfactorily addressed at the implementation stage.
- The ASH will provide a second strategic transport corridor into Kumeū-Huapai improving reliability. It would allow freight to access existing and future industrial areas directly from the Tawa interchange, via Access Road, without having to traverse urban areas.
- The ASH will provide a route to remove strategic trips from unsuitable parallel rural roads.
- Provision of active modes on the ASH corridor, in combination with the RAMC, will provide safe alternative strategic cycling access.
- The ASH will support placemaking opportunities in Kumeū-Huapai townships by removing freight and other inter-regional trips from existing SH16 and enabling reallocation of space for walking and cycling.
- The ASH provides strategic connections to the FUZ areas in Kumeū-Huapai, where the majority of future growth will occur, while alleviating demand on the existing SH16 corridor to support the future growth of Riverhead.

- The strategic connections with the local road network focus on the main areas of future urban growth, whilst connections with the remainder of the local road network are grade separated to ensure local access on those corridors is retained.
- The ASH is part of collective strategic transport solution (including RTC / RAMC and SH16 Main Road upgrade). The role of the ASH is to remove strategic trips (including freight) from Kumeū-Huapai to allow existing SH16 to be downgraded to an arterial in the long-term to better support the operation of the RTC and encouraging walk-up and cycle-up catchment at stations.

As part of the North West network, the ASH project is expected to achieve:

- Improvement in accessibility to employment with the proportion of employment accessible by active modes increasing , such that within 15 minutes there is a 51% increase, in 30 minutes there is a 23% increase and in 45 minutes the increase is 8%, in the number of jobs accessible.
- The travel time for vehicles travelling between Brigham Creek to Waimauku improves in each of the weekday peak periods. In the AM peak, the travel time reduces by 46 minutes, in the inter peak there is a 12 minute reduction and in the PM peak there is 22 minute reduction.
- A predicted reduction in the future traffic volume on SH16 Main Road by 84% for general traffic and 71% for freight traffic.

5.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The entire length of the ASH has been designed to be a 5 star KiwiRAP dual-lane carriageway. There are several features that result in this rating such as the relatively straight alignment with good line marking, wide lanes, sealed shoulders, safe roadsides (central and side barrier systems) and occasional grade separated intersections.

The ASH is expected to result in positive effects on safety when compared to the existing network given the new corridor will be designed to current standards with minimal intersections. It will also result in a reduction in traffic through Kumeū-Huapai urban area improving safety and minimising severance. This creates a better urban outcome as the corridor carries more active mode and PT trips compared to vehicle trips. Therefore, creating a safer, more accessible environment for people using the corridor to access the growth along Main Road.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding Kumeū-Huapai, as well as the North West area in general, is developed. Given, the significant reduction in general and freight traffic, the exposure between motorists and vulnerable road users is anticipated to reduce.

Overall, the proposed design of the Project is well aligned with the transport safety principles from AT and Waka Kotahi. It will provide a much safer transport system which will likely reduce the number of Death and Serious Injury (**DSI**) crashes and result in positive effects for all road users. It is noted that the detailed design will be completed in the future to further detail measures to achieve the anticipated safety outcomes.

5.4.2 Walking and Cycling

The Project proposes a separated shared path for walking and cycling facility along the length of the ASH, provided by the RAMC between BCI and the NAL, enabling recreational opportunities by extending the network facilities for these modes. If the ASH were to be progressed in advance of the RAMC, then there is sufficient designation to facilitate an interim cycle facility between the BCI and the NAL, until this is later replaced by the RAMC in this segment.

Local connection points have been included in the ASH and RAMC, which connect with the expected future adjacent facilities at Brigham Creek Road / Fred Taylor Drive, Taupaki Road, Waitakere Road, Tawa Road and SH16 Main Road. The specific design of these connecting facilities will be developed further at detailed design prior to implementation. At the BCI and Tawa Interchange, the design provides for grade separation of the strategic cycle facility meaning there is a more reliable facility that will not need to interact with local movements to traverse the interchanges.

The proposed walking and cycling facilities along the corridor have been designed in accordance with relevant Waka Kotahi standards and policies discussed in Section 0. The exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided the same or future equivalent documents.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area.
- Improve integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.
- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Westgate.

5.4.3 Public Transport

No dedicated public transport facilities are currently proposed on the new corridor, with the intent of this corridor being to enable the opportunity for sustainable modes of travel on SH16 Main Road and other urban roads. The ASH will reduce the vehicle volumes on SH16 Main Road through Kumeū-Huapai, which will create a more urban corridor which can carry more active mode and PT trips.

It is also noted that the BCI upgrade will help provide opportunity for better PT reliability through the interchange with the proposed form of the interchange intended to minimise the interaction of key local PT services with strategic movements accessing SH16. This will benefit all modes of travel including public transport.

The allocation of the proposed four lanes on ASH will be decided upon implementation, but the additional capacity could also provide the opportunity for managed lanes or interim public transport facilities in advance of the RTC / RAMC project being implemented, if necessary.

5.4.4 General Traffic

A key function of the ASH is to provide an alternative strategic route for longer distance regional and sub-regional connections. This will reduce traffic along Main Road (SH16) providing an opportunity to support growth and improve land use integration in the Kumeū-Huapai town centre, as well as support the RTC, improve freight reliability, and improve resilience of the strategic network.

The ASH has been designed to accommodate the large traffic volumes expected along the corridor. Accordingly, there is enough capacity provided through the number of lanes to minimise congestion during the peak periods.

The ASH will consist of a dual-lane carriageway with central and side barrier systems. There will be no direct access onto the ASH from adjacent properties and the only vehicle connections will be the BCI, Tawa Road Interchange and the intersection at the termination point with SH16. As such, the ASH will be a more appropriate corridor in terms of the efficiency and reliability for inter-regional trips, as well as intra-regional to locations such as Waimauku and Hellensville. It will also address the existing situation in terms of reducing the reliance on existing unsuitable rural roads to accommodate future traffic demand, which are not designed for those volumes of traffic and will also lead to safety issues.

The intersections and interchanges along the ASH corridor have been assessed and shown to provide sufficient capacity to accommodate the anticipated future traffic demands with the growth in the existing and future urban areas in the longer-term. The traffic modelling results for the intersections associated with the ASH are provided in Appendix 2. There is the potential that upon completion of the corridor, there could initially be upstream or downstream delays at some locations, due to the improved operation along this route. However, it is expected that the overall traffic patterns would soon stabilise, as people adjusted their journeys to the overall network conditions.

5.4.5 Freight

The improved corridor capacity as a result of a new separated corridor designed for movement will result in improved journey times and reliability for existing and future freight. The corridor will be able to better accommodate freight movements with minimal interfaces with the local network, other than at key locations, improving freight reliability.

The ability of the ASH to accommodate local, inter- and intra-regional freight trips, with connection via the Access Road Upgrade to the future employment area in Kumeū-Huapai will reduce the freight using SH16 Main Road and other local roads. This will support growth and improve land use integration in Kumeū-Huapai, particularly along SH16 Main Road, near the future town and local centres.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future.

5.4.6 Access and Parking

The dual carriageway corridor will have no direct property access. Existing properties will therefore continue to be provided access from local roads, where they do not form part of the proposed designation.

It is noted that the design of the ASH has maintained access along all existing local roads along the route via grade separation of the ASH and local road corridors, plus in some cases, permanent realignment of those local roads (such as Pomona Road).

In terms of existing property access, the overarching design philosophy for the Project has been to maintain driveway access, where practicable, either re-grading existing access or relocating the driveway access. However, in some circumstances (as discussed below), it has been necessary to provide access to via new private roads.

The key areas where effects on property access have been identified are:

- In the vicinity of the intersections and interchanges between the ASH and local roads.
- Along the ASH corridor, where large rural lots are separated from existing road corridors.

Table 5-3 summarises the potential adverse effects on properties / activities along the ASH Corridor during the operational phase. Similar adverse effects would also occur and require mitigation during the construction phase through the CTMP. Where adverse effects are only expected during the construction phase, these are separately addressed in Section 9.

Table 5-3: ASH Project – Potential Adverse Transport Effects on Access – Operational Phase

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
Adverse impacts on property access driveway	✓	16 Brigham Creek Rd (entirely within designation for construction only, but new driveway required for operational phase) 15 and 21 Brigham Creek Rd 171 SH16 218A-220 SH16 143 Fred Taylor Drive 176, 178, 180, 182 Fred Taylor Drive 375, 377 Taupaki Rd 384, 400 Taupaki Rd 691 Waitakere Rd (north of ASH) 191 Pomona Rd (driveway access can be	Re-grade existing or re-form new driveway access off public road for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		provided with adequate space to bridge structure and adequate sightlines) 83 Tawa Rd (new driveway access can be provided through the designation off Tawa Rd) 86 Tawa Rd (new driveway access can be provided through the designation off Motu Rd) 137 Tawa Rd 37, 41, 47, 69 Puke Rd 185 Trigg Rd (off Puke Rd) 78 Puke Rd (driveway access can be provided through the designation) 726 SH16	
Existing private access road or driveway will no longer be viable	✓	2, 4, 6, 8 Brigham Creek Rd (connection to new driveway for 171 SH16) 208 and 210 Fred Taylor Dr (new access road can be provided through the designation) 184 (Fred Taylor Park) (new access road can be provided through the designation off Fred Taylor Dr) 196, 198, 200 Fred Taylor Drive (new access road can be provided through the designation off Fred Taylor Dr) 660, 670, 682 Waitakere Rd (new access road can be provided through the designation off Waitakere Rd)	Utilise alternative private access or construct new private access road or driveway for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		679 and 691 Waitakere Rd (new access road can be provided through the designation off Waitakere Rd) 144, 138 and 130 Pomona Rd (new access road can be provided through the designation off Pomona Rd) 28, 48, 66 and 68 Pomona Rd (new access road can be provided through the designation off Pomona Rd) 121A, 121B, 121C and 123 Pomona Rd (new access road can be provided through the designation off Pomona Rd) 150 and 164 Motu Rd (new access road can be provided through the designation off Motu Rd) 122 Tawa Rd (new access road can be provided through the designation off Motu Rd) 727 SH16 (new access road via 733 SH16 with an access agreement)	

With only the ASH Corridor (i.e. without the RTC / RAMC), it is noted that existing access to the properties at 120, 122, 124, 124A, 130 Boord Crescent will be retained. These properties are included in the designation for the RTC / RAMC.

The proposed new private access roads and realignment of existing roads to maintain local access have been incorporated into the proposed designation boundary for the ASH and further details will be developed at later design stages and as part of the Outline Plan of Works.

Given the nature of the interfaces of the ASH and BCI with the local road network, no adverse effects have been identified in relation for on-street or public parking resulting from the Project.

5.5 Project Interdependencies

The ASH Corridor has been designed to integrate with the rest of the North West Strategic Package, but is equally able to be progressed without being dependent on those other projects. The relationships and interdependencies between the North West Strategic Package projects and other projects are discussed below.

5.5.1 SH16 to SH18 Connections

This project will deliver motorway to motorway connections and new local connections at existing and new interchanges on SH16 and SH18 that will support the growth of the existing and future growth areas around Whenuapai, Redhills and Westgate.

Many of the positive benefits for the Kumeū-Huapai and Riverhead communities, as well as wider North West rural community, would be delivered with the implementation of the ASH corridor. However, the overall benefits for the overall North West growth area will be realised with the delivery of the complementary SH16 to SH18 Connections project. There is also the potential for adverse effects resulting from the implementation of the ASH without the SH16 to SH18 Connections project.

Without those connections, the less constrained and increasing traffic demand associated with the ASH is expected to result in people continuing to utilise existing local road alternatives to the state highways, such Brigham Creek Road, Trig Road, and Fred Taylor Drive / Don Buck Road. This could result in adverse effects on these corridors, particularly should identified future upgrades to these corridors not be in place at that time. However, even with those local road upgrades, it would not be desirable for people to divert to these corridors, as this would result in intra-regional trips travelling through or near the identified centres in Whenuapai and Westgate. However, there is the ability to satisfactorily address this at the time of implementation, as discussed in Section 0.

5.5.2 SH16 Main Road Upgrade

As has been discussed throughout this section, the ASH corridor has an inter-dependency with the SH16 Main Road Corridor Upgrade. The completion of the ASH corridor will reduce strategic trips and local trips along the existing SH16 Main Road corridor through Kumeū-Huapai, thus supporting implementation of the RTC and SH16 Main Road Upgrade.

Depending on the implementation timing of the RTC and Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of those projects to manage potential adverse effects on the urban areas. However, should those projects be delivered earlier in the staging of future growth in Kumeū-Huapai (when there is less overall transport demand), then the ASH may not be necessary in advance.

5.5.3 Rapid Transit Corridor (and RAMC)

In terms of the operation of the two corridors, the ASH will be laterally and, where necessary, grade separated from the RTC / RAMC, such that neither corridor affects the performance of the other corridor, where they run parallel to each other.

The delivery of the RTC through Kumeū-Huapai is dependent on the completion of some segments of the SH16 Main Road Upgrade in advance of the RTC. Hence, similarly to the SH16 Main Road Upgrade above, depending on the relative staging of these projects (as future growth occurs), the ASH may or may not be required in advance of the RTC / RAMC project.

The relative timing of the RTC / RAMC is not confirmed and that corridor itself will have inter-relationships with both the North West Short Term Bus Improvements project and the full implementation of the City Centre to Westgate Rapid Transit Corridor. The North West Short Term Bus Improvements project will enable a connection between the RTC, should the RTC be built and operational in advance of the City Centre to Westgate RTC.

A coordinated and integrated approach with the interdependent projects to optimise the identified significant mode shift for the existing and future community in Kumeu-Huapai will be required, particularly for medium to longer distance trips, to avoid a reliance on vehicles being reinforced. This would result in greater than predicted traffic demand and adverse effects in terms of reducing accessibility to jobs and other activities within the North West and beyond. Coupled with the SH16 to SH18 Connections project, there is potential for increased adverse effects on local roads within Whenuapai and Westgate. However, there is the ability to satisfactorily address this at the time of implementation, as discussed in Section 0.

5.5.4 Access Road Upgrade

The ASH corridor interchange at Tawa Road provides connection to Access Road. The Access Road corridor complements the ASH by providing a multi-modal connection between the future residential and employment growth areas in the southern part of Kumeū-Huapai and the ASH corridor.

Whilst the NW Strategic Package has been designed as complementary components, as part of long-term network planning, the design of Access Road (as discussed in Section 8) also provides for the uncertainty regarding the funding and timing of the ASH. The route protection sought for Access Road enables the provision of an efficient and reliable connection for active modes and PT connecting with SH16 Main Road to the north, which could provide for future transport demand, in the event that the ASH corridor is not progressed until sometime after the Access Road Upgrade.

5.5.5 Implementation Considerations

Both Auckland Transport and Waka Kotahi have a statutory requirement to contribute to *an effective, efficient, and safe (Auckland) land transport system in the public interest*[7][8]. This requirement will extend to the integration of the ASH with the surrounding transport network, with or without the implementation of the identified strategic projects above.

The specific effects in relation to the operation and management of the SH16, SH18 and the ASH should also be reviewed nearer to the time of implementation to better understand the form and management that may be required in relation to the ASH to align with city-wide policy and strategy in relation to demand management.

As such, whilst recognising there is this uncertainty / risk with the long-term timeframe for the ASH Corridor, it is considered that these statutory requirements and other internal processes (such as the requirement for an Implementation Business Case) that apply to Waka Kotahi will enable the above effects to be considered and addressed prior to implementation. This will allow the inter-relationships of the ASH Corridor, as it relates to the above matters, to be considered and managed prior to the implementation of the corridor.

5.6 Summary of Operational Transport Effects (NoR S1)

The Project provides significant positive effects and there are no operational adverse effects to mitigate, given the effects on local roads and property access have been addressed through the design of the Project and hence provided for by the designation (such as through the proposed local road realignments and the grade separation of the ASH project from local roads).

The assessment of transport effects for the Project is summarised in Table 5-4 below.

Table 5-4: Assessment of Operational Effects Summary for NoR S1 (ASH)

Operational Transport Effects	
Safety	In summary, the effects of the Project on safety are: • Provide a new State Highway corridor which meets current standards and has minimal intersections reducing the number of conflict points. • Significantly improve speed environment and reduced vehicle volumes on SH16 through Kumeū-Huapai creating a safer more accessible environment for people using the corridor to access the growth along Main Road near the existing and future Town and Local Centres. • Significantly improve environment on SH16 Main Road for pedestrians and cyclists, commensurate with an urbanised environment.
Walking and Cycling	In summary, the effects of the Project on walking and cycling are:

[7] https://www.legislation.govt.nz/act/public/2003/0118/latest/DLM226236.html

[8] https://www.legislation.govt.nz/act/public/2009/0032/latest/DLM2322355.html

Operational Transport Effects	
	• Significantly reduce the likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area. • Improve integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity. • Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips. • Serve as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Westgate.
Public Transport	In summary, the effects of the Project on public transport are: • Result in reduced vehicle volumes on SH16, when compared to without the project, improving the capacity and reliability of this corridor for all modes including PT. • The BCI upgrade will help provide opportunity for better reliability through the interchange for PT. • If necessary, additional capacity could provide the opportunity for managed lanes or interim public transport facilities in advance of the RTC / RAMC project being implemented.
General Traffic	In summary, the effects of the Project on general transport are: • Provide an alternative strategic route for longer distance intra-regional and inter-regional connections, reducing reliance on SH16 and improving resilience of the strategic network. • Reduce reliance on existing unsuitable rural roads to accommodate future traffic demand. • Provide sufficient corridor and intersection capacity to cater for growth on existing and FUZ growth.
Freight	In summary, the effects of the Project on freight are: • Significantly improved journey times and reliability for existing and future local, inter- and intra-regional freight trips. • Direct connection via the Access Road Upgrade to the future employment area in Kumeū-Huapai.
Access and Parking	In summary, the effects of the Project on access and on-street / public parking are: • Potential adverse effects on locals roads crossing the ASH corridor have been addressed by grade separation of the ASH corridor and, where necessary, realignment of local roads. • Potential adverse effects on property access can be addressed through the later design stages / Outline Plan of Works by provision of new private access roads and re-forming / re-grading property driveways. • No identified adverse effects for on-street / public parking.

5.7 Conclusions

Overall, the ASH Corridor provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic (including freight) effects.

Potential adverse effects on locals roads crossing the ASH corridor have been addressed by grade separation of the ASH corridor and, where necessary, realignment of local roads. This enables access along public roads to be maintained.

Whilst recognising there is this uncertainty / risk with the long-term timeframe for the ASH Corridor, it is considered that the statutory requirements and other internal processes (such as the requirement for an Implementation Business Case) that apply to Waka Kotahi will enable the above effects to be considered and addressed prior to implementation. This will allow the inter-relationships of the ASH Corridor, as it relates to the matters identified above, to be considered and managed prior to the implementation of the corridor.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the CTMP prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

6 NoR S2: SH16 Main Road Upgrade

6.1 Project Corridor Features

The SH16 Main Road Upgrade extends approximately 4.5km between Old Railway Road, east of Kumeū to Foster Road, west of Huapai. The SH16 Main Road is currently a 20m wide two-lane urban arterial with no active mode facilities on either side of the corridor.

SH16 Main Road is proposed to be upgraded to a 24m urban corridor connecting the well-established retail, commercial and residential environs. The corridor generally follows the existing SH16 Main Road alignment. As part of this project, if not completed as part of the RTC project, Station Road will be realigned to form a new signalised intersection with SH16 and Tapu Road.

An overview of the proposed design is provided in Figure 6-1.

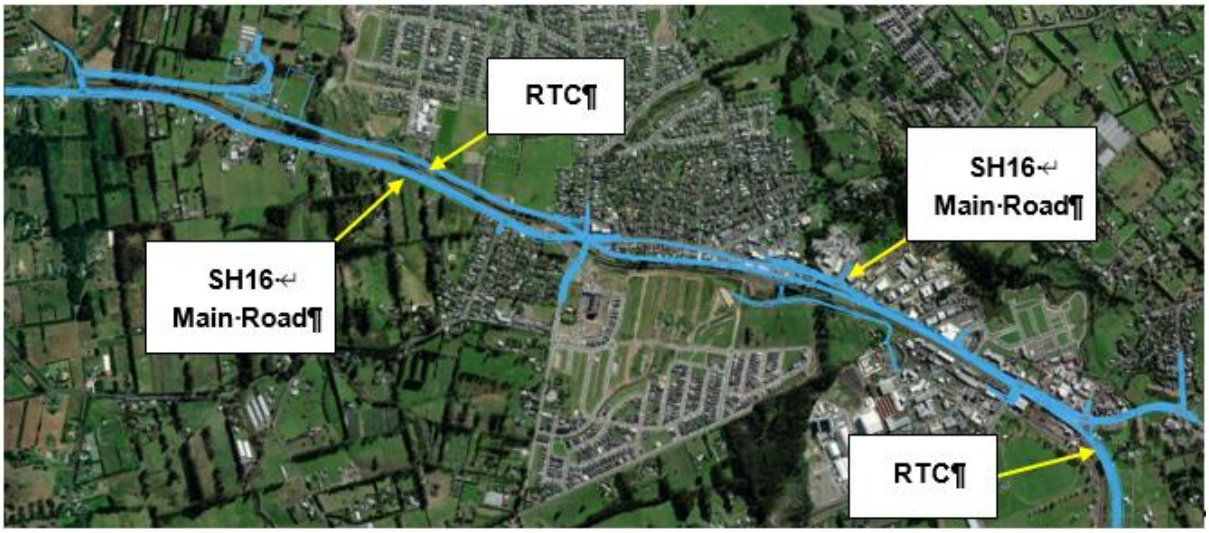


Figure 6-1: Overview of the SH16 Main Road Upgrade

6.2 Network and Corridor Design

The Project was developed as part of network planning for the wider north west area. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider long-term integrated network planned for the area..

The Project proposes that the function of SH16 Main Road will change from an existing two-lane road to a low-speed urban two-lane arterial (using AT standards appropriate for the intended future environment) with mixed components for vehicles, PT, active modes.

SH16 Main Road is part of the current State Highway network the corridor is currently managed by Waka Kotahi. Waka Kotahi will manage the corridor until the ASH is in place, at which time it is anticipated that the corridor classification will be revoked.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 0. Key aspects of the network and corridor design are summarised below.

The proposed design includes a typical 24m cross section with two traffic lanes, as well as new facilities for walking and cycling as shown in Figure 6-2 and Figure 6-3. As shown below, along the segment immediately adjacent to the Rapid Transit Corridor (between Access Road and 156 Main Road, Segment 2) the proposed corridor is 18.5m with active mode facilities along the active frontage only (north side). Additionally, given the current corridor designation, a 600m section (in Segment 3) of active mode only upgrade (south side) is proposed between Oraha Road and Station Road / Tapu Road.[9]

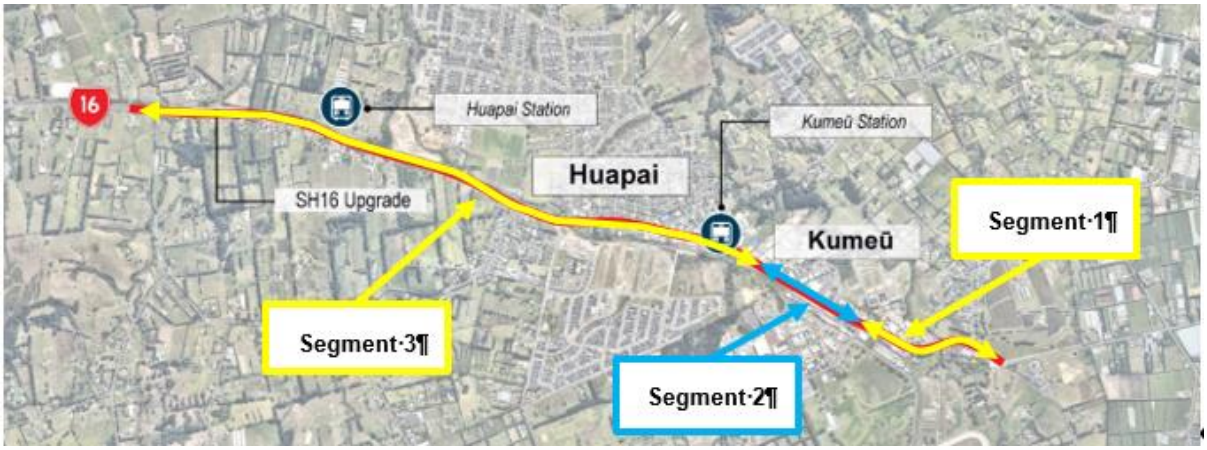
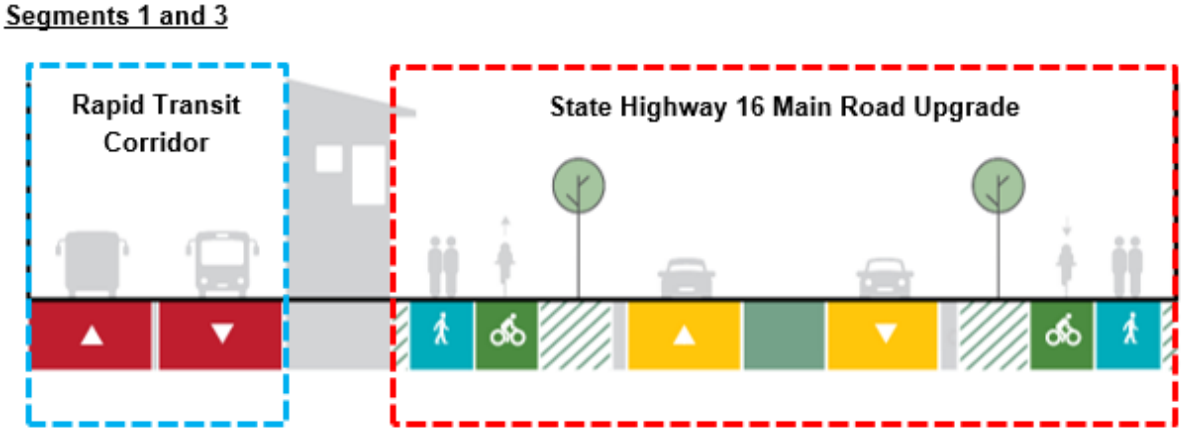


Figure 6-2: SH16 Main Road Upgrade – segments



[9] Active modes facilities on the north side in this section can be provided within the current road reserve, using the service lane

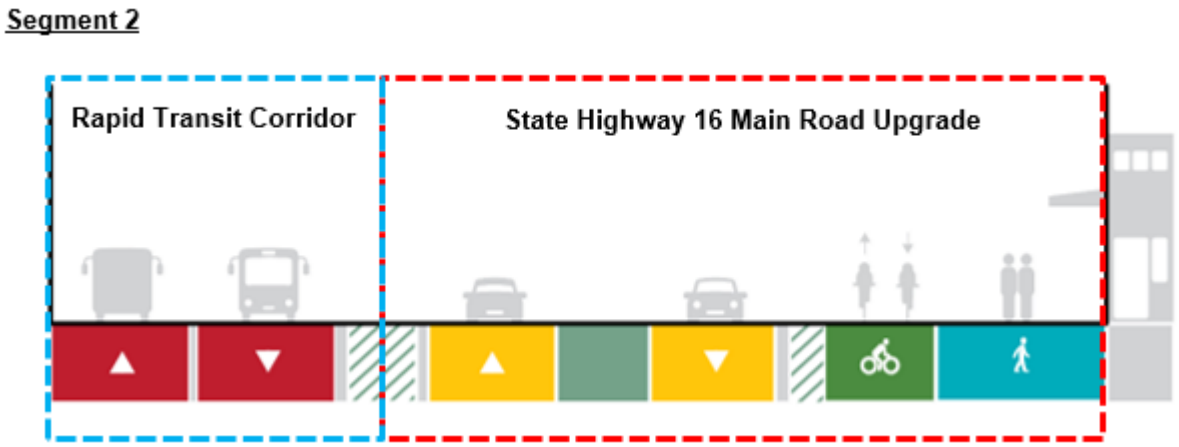


Figure 6-3: Indicative future SH16 Main Road Upgrade cross sections

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

The framework itself does not directly dictate a specific corridor design, but provides context and guidance regarding the intended function of the corridor that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

The corridor is assessed to have the following RASF typology:

- Place function – P3 (high)
- Movement function - M3 (high)

The following Figure 6-4 indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to more sustainable modes of travel.

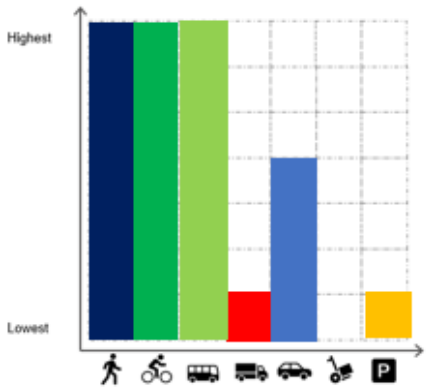


Figure 6-4: Future modal priority in 2048+ for SH16 Main Road[10]

6.3 Existing and Likely Future Environment

6.3.1 Planning context

SH16 Main Road is proposed to be upgraded to a 24m urban corridor along the urban extent of SH16 connecting well-established retail, commercial and residential environs through Kumeū-Huapai.

This corridor contains a range of business, residential and open space and rural land uses under the AUP:OP (see zoning column in Table 8-1) between the eastern extent of the Kumeū-Huapai township and the western extent of the upgraded corridor (the intersection with the proposed ASH).

Table 6-1 provides a summary of the existing and likely future environment as it relates to the SH16 Main Road Upgrade.

Table 6-1: SH16 Main Road Upgrade Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[11]	Likely Future Environment[12]
Rural	Rural Mixed Rural Zone, Rural Countryside Living Zone	Low	Rural
Business	Business (Industrial)	Low	Urban
	Business (Local Centre)	Low	Urban
	Business (Mixed Use)	Low	Urban
Residential	Residential	Low	Urban

[10] RASF symbols represent; walking, cycling, buses, heavy vehicles, cars, loading and parking
[11] Based on AUP:OP zoning/policy direction
[12] Based on AUP:OP zoning/policy direction

Environment today	Zoning	Likelihood of Change for the environment[11]	Likely Future Environment[12]
Open Space	Open Space – Sport and Active Recreation	Low	Open Space
Undeveloped greenfield areas	Future Urban	High	Urban

6.3.2 Transport Environment

6.3.2.1 Existing

The existing corridor is surrounded by a range of land uses including industrial, residential and greenfield land with both urban and rural sections of state highway corridor and is shown in Figure 6-5. It is generally comprised of one vehicle lane in each direction, other than between Access Road and Harikoa Street (two lanes in each direction). It currently forms part of the state highway network with local, intra- and inter-regional freight traffic using the corridor.

Figure 6-5: Aerial of Existing SH16 Main Road Corridor

Table 6-2 summarises the existing transport features of the SH16 Main Road corridor.

Table 6-2: SH16 Main Road: Existing Transport Features

	Existing SH16 Main Road Transport Features
Corridor Characteristics	• Town Centre and adjacent to development • Has a 50 and 60kph speed limits • Semi-urban character with two vehicle lanes (one in each direction)

	Existing SH16 Main Road Transport Features
	• Corridor form is inconsistent with formal kerb and channel along some sections • Continuous footpath on the northern side. • Rural Sections • Has an 80kph speed limit from 260m north-west of Trigg Road • Rural character with two vehicle lanes (one in each direction) • Corridor form is consistent, with no kerb and channel on either side of the corridor and no footpaths.
Traffic Volume	The latest traffic data for SH16 Main Road shows a 5 Day Average Daily Traffic of approximately around 15,000 to 20,000 vehicles per day (vpd).
Key Road Network / General Traffic	• SH16 Main Road / Riverhead Road give-way control • SH16 Main Road / Access Road signals • SH16 Main Road / Matua Road stop control • SH16 Main Road / Tapu Road stop control • SH16 Main Road / Station Road stop control • SH16 Main Road / Trigg Road stop control • SH16 Main Road / Matua Road (West) stop control • SH16 Main Road / Foster Road give-way control
Walking and Cycling	A range of footpaths are provided in some sections through the centres which are approximately 1.2-1.8 m wide. Through the rural sections there are generally no footpaths provided. There are limited cycling facilities, with cyclists only able to use the road shoulders in some urban sections.
Public Transport	Current bus services on SH16 Main Road: • Bus service 122 between Huapai, Kumeū, and Westgate. Every 2 hours 7 days a week. • Bus service 125 between Helensville, Waimauku, Huapai, Kumeū, and Westgate. Every 2 hours 7 days a week. • Bus service 125X between Helensville, Waimauku, Huapai, Kumeū, Westgate, Northwestern Motorway, and City. Services that only operate during weekday peak period.

6.3.2.2 Likely Future

Table 6-3 summarises the likely future transport features of the SH16 Main Road corridor.

Table 6-3: SH16 Main Road: Likely Future Transport Features

	Likely Future SH16 Main Road Transport Features
Corridor Characteristics	• Adjacent to the RTC • 50kph speed limit. • Urban character with two vehicle lanes (one in each direction). • Consistent corridor form with kerb and channels on both sides and a bi-directional cycle path and footpath on the opposite ride of the road to the transit corridor, next to the active edge.

	Likely Future SH16 Main Road Transport Features
	• Separated from the RTN • 50kph speed limit. • Urban character with two vehicle lanes (two in each direction). • Consistent corridor form with kerb and channels and continuous footpaths and cycle facilities on both sides. • Generic two-lane arterial with a 24m designation.
Traffic Volume	The forecast Average Daily Traffic (**ADT**) on SH16 Main Road in 2048 is 8,400 vehicles.
Key Road Network / General Traffic	• SH16 Main Road / Riverhead Road signals • SH16 Main Road / Access Road signals • SH16 Main Road / Matua Road signals • SH16 Main Road / Station Road signals (including Tapu Road) • SH16 Main Road / Trigg Road signals • SH16 Main Road / Matua Road (West) signals • SH16 Main Road / Foster Road give0-way control
Walking and Cycling	Separated 2.0m cycle lanes and 1.8m footpaths on both sides. Or 3m bi-directional cycle facility separated from 4.7m footpath and active frontage.
Public Transport	The indicative 2048 AT bus network forecasts 5 buses per hour on SH16 Main Road, or approximately 1 bus every 10-15 minutes.

6.4 Assessment of Operational Transport Effects

Overall, the key features and outcomes of the SH16 Main Road Upgrade include the following:

- Focus on connecting local land use to the transport network and distributing efficiently to the strategic network (RTC / RAMC or ASH) and key destinations within Kumeū-Huapai.
- Support a potential reduction in road hierarchy to an arterial function to de-tune SH16 Main Road and support improved permeability (including north south connections over the rail line).
- Providing around 4km of high quality cycle facilities for a network to connect the residential catchments to key Town Centre, Local Centre and other destinations, as well as the RAMC.
- Reduced speed environment and space for midblock crossings.
- Focuses on active modes to shift trips away from private vehicle use and link land use to the RTC stations.
- Bespoke widening to integrate with RTC, which is focussed on improving active mode access and placemaking opportunities, including:
  - The widening of the existing 20m wide two-lane urban arterial to a 24m wide corridor with walking and cycling facilities on both sides of the corridor.
  - The realignment of Station Road to form a new signalised intersection with SH16 and Tapu Road, improving north-south connections in Kumeū-Huapai.
  - The realignment of Matua Road (West) and grade separation over the NAL, improving north-south connections in Huapai.

6.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of SH16 Main Road is expected to result in positive effects on safety when compared to the existing corridor, and these consist of:

- Significantly improved, and new, walking and cycling facilities along SH16 Main Road (including separation), resulting in improved protection for vulnerable road users.
- Significantly improved, and new, walking and cycling crossing facilities (crossing SH16 Main Road) at Riverhead Road, Weza Lane (connecting to RAMC), Matua Road, Station / Tapu Roads, Trigg Road, Matua Road (West), resulting in a significantly safer environment for all road users.
- A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h or less around centres) with enhanced place function and consequential reductions in the risk of DSIs.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding SH16 Main Road is developed. The traffic volumes on SH16 Main Road will likely also increase over time, prior to implementation of the RTC and ASH projects (discussed further in Section 6.5), and therefore the exposure between motorists and vulnerable road users will be higher than the existing road environment. However, the Project proposes to lower the speed limit to 50km/h and provide segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

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

6.4.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of SH16 Main Road. It also includes dedicated new pedestrian and cycle crossing facilities at Riverhead Road, Weza Lane (connecting to RAMC), Matua Road, Station / Tapu Roads, Trigg Road, Matua Road (West), which connect with expected future adjacent facilities.

These will support local connections with the surrounding existing and future urban areas, which are expected to have a network of local facilities appropriate to those local corridors' form and function. The specific design of these connecting facilities will be developed further at detailed design prior to implementation.

The proposed walking and cycling facilities along the corridor have been designed in accordance with relevant Auckland Transport standards and policies discussed in Section 0. The exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided the same or future equivalent documents.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Reduce the current state highway road hierarchy to an arterial function to de-tune SH16 Main Road and support improved permeability (including north south connections over the rail line).
- Provide high quality cycle facilities for a network to connect the residential catchments to key Town Centre, Local Centre and other destinations, as well as the RAMC.
- Support growth surrounding SH16 Main Road and significantly improve safety and access to employment and social amenities.
- Reduce speed environment and space for midblock crossings.
- Focus on active modes to shift trips away from private vehicle use and link land use to the RTC stations.

6.4.3 Public Transport

Public transport services will share the general vehicles lanes on the SH16 Main Road Upgrade corridor. For future public transport services, there are two core proposed PT (bus) services, which will use SH16 Main Road. One service will connect Helensville (and Waimauku) to Kumeū-Huapai, while the second service will be a Kumeū-Huapai circuit or series of routes. A total of five buses per hour are anticipated on SH16 Main Road under the indicative 2048 AT bus network. These are part of the network of services that support the RTC and provide access to the Kumeū and Huapai Stations.

The cross-section will provide adequate spacing to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the Project. Dedicated facilities are provided for interchange at the Kumeū and Huapai Station, which is incorporated in NoR-KS and NoR-HS. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e., around centres and schools for example.

The Project's potential operational effects on public transport are:

- Reduced delays and improved reliability for future PT network on SH16 Main Road and the wider network.
- Improved integration with the future public transport network (including the RTC stations) and improved east-west and north-south connectivity, as well as improved access to employment and social amenities.
- Increased attractiveness and uptake of public transport trips, which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.

6.4.4 General Traffic

As identified above, the 2048 ADT for SH16 Main Road is 8,400 vehicles per day. Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 840 vehicles. A two-lane corridor can efficiently accommodate 840 vehicles and therefore the proposed corridor design meets the forecasted needs, with the additional lane provision to accommodate greater bus priority.

The key intersections along the SH16 Main Road Upgrade corridor have been assessed and shown to provide sufficient capacity to accommodate the anticipated future traffic demands with the growth in the existing and future urban areas in the longer-term. The traffic modelling results for the key intersections associated with the SH16 Main Road Upgrade are provided in Appendix 2.

6.4.5 Freight

As discussed previously, the complementary implementation of the ASH is predicted to result in a significant reduction in local, intra- and inter-regional freight using the SH16 Main Road Upgrade corridor.

Similar to general traffic, the improved corridor capacity as a result of the Project will result in improved journey times and reliability for existing and future local freight. The corridor will be able to accommodate local freight movements along the mid-block and through the intersections.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future.

6.4.6 Access and Parking

As a future arterial corridor, SH16 Main Road (both the current urban and rural sections) is expected to transition to be a limited access corridor. As the area develops, it is expected that future access to the network will be facilitated by other local road networks within the urbanised area to the north and south of SH16 Main Road with intersections onto the corridor. That network will likely be planned as developers progress these corridors through the plan change process, following structure planning by the Council.

Potential adverse effects of direct property access along an arterial road corridor is currently managed through the AUP(OP). However, it is recognised that many properties along the SH16 Main Road Upgrade corridor currently have direct property access. The design approach for the corridor, in combination with the proposed RTC corridor, has been to continue to facilitate direct vehicle access to existing properties, where necessary, through the inclusion of the median between the traffic lanes.

It is noted that the design of the SH16 Main Road Upgrade has maintained access via all existing local roads to this corridor, and such as in the case of Matua Road (West) provided enhancement through grade separation of this connection from the NAL.

In terms of existing property access, the overarching design philosophy for the Project has been to maintain driveway access, where practicable, either re-grading existing access or relocating the driveway access. However, in some circumstances (as discussed below), it has been necessary to provide access to via new private roads.

The key area where effects on property access and parking have been identified is:

- Along the SH16 Main Road Upgrade corridor, where it runs adjacent to the RTC, between the Access Road intersection and 156 Main Road.
- In the vicinity of the intersections and interchanges between SH16 Main Road Upgrade and local roads.

Table 6-4 summarises the potential adverse effects on properties / activities along the SH16 Main Road Upgrade corridor during the operational phase. Similar adverse effects would also occur and require mitigation during the construction phase through the CTMP. Where adverse effects are only expected during the construction phase, these are separately addressed in Section 9. Further details will be developed at later design stages and as part of the Outline Plan of Works.

Table 6-4: SH16 Main Road Upgrade Project – Potential Adverse Transport Effects on Access – Operational Phase

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
Adverse impacts on property access driveway	✓	549 SH16, Kumeū (20 Riverhead Rd, Kumeū) 550 SH16, Kumeū (incl. 43 Old Railway Rd and 2-12 Main Rd, Kumeū) 21A Riverhead Rd, Kumeū 22 and 24 Riverhead Rd, Kumeū 84, 86A-F, 88A-D, 90A-D, and 92 Main Road, Kumeū 106 Main Road, Kumeū 108, 110 Main Road (New World), Kumeū 132, 134, 154 and 156A-F Main Road, Kumeū 190 Main Road, Kumeū 248 Main Road, Kumeū 250, 250A-F Main Road, Kumeū 290, 292 Main Road, Kumeū 296, 300 (Kumeū Library) 302 to 320 Main Road, Kumeū (noting driveway / lane is in existing road reserve) 345, 347, 351, 353, 355 and 357 Main Road, Kumeū	Re-grade existing or re-form new driveway access off public road for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		4, 6, 8, 10, 12, 14, 20, 22, 24, 25, 26, 28, 30, 32, 34, 36, 38, Station Rd, Huapai 23 Vintry Dr (off Station Rd) (Huapai Triangle development), Huapai 1, 1A, 2, 3, 4, 6, 8 Tapu Rd, Huapai Huapai Domain, Huapai (driveway access off Tapu Rd) 395, 397 Main Road, Huapai 399 Main Road (Secret Garden Pre-School), Huapai 401 Main Road, Huapai 405, 407/407A Main Road, Huapai 529 SH16, Huapai 551 SH16, Huapai 573 SH16, Huapai 583, 587, 601 SH16, Huapai 609 Main Road, Huapai 623 SH16, Huapai 631 SH16, Huapai 665 SH16, Huapai 677 SH16, Huapai 411 Matua Road (West), Huapai	
Existing private access road or driveway will no longer be viable	✓	1/1 to 1/10 Putaki Drive, Kumeū (existing alternative access off Harikoa St will continue to provide access) 2 Putaki Drive, Kumeū (provide new driveway access off Putaki Dr or Papatupu Way) 156G Main Road, Kumeū (alternative access driveway to be provided off 156A-F driveway for residual lot)	Utilise alternative private access or construct new private access road or driveway for identified properties

There are several properties, where on-site parking has been identified to be affected by the proposed designation. The properties are sufficiently sized to potentially remain viable for activities within the current (or future) zoning. Moreover, the actual activity / use may change over the timeframes of the lapse dates sought. As such, these properties have not been included in the designation and mitigation has not been identified, as this matter can be addressed via the Public Works Act at the time of implementation. The identified properties are:

- 40 Main Road, Kumeū
- 86A-F, 88A-D, 90A-D, and 92 Main Road, Kumeū
- 1/1 to 1/10 Putaki Drive, Kumeū
- 106 Main Road, Kumeū
- 156G Main Road, Kumeū
- 190 Main Road, Kumeū
- 399 Main Road (Secret Garden Pre-School), Huapai
- 609 SH16, Huapai

Along SH16 Main Road, there is an existing area of on-street parking (around 41 car parking spaces) within the road reserve between Access Road and 92 Main Road, Kumeū. The long-term form and function identified for the corridor (Figure 6-4) has on-street parking as a low priority. This is consistent with the current AT Parking Strategy (2015), particularly as this relates to Parking on Arterial Roads (Policy 4A), which states AT will manage parking on arterial roads by extending clearways or removing parking where it:

- Inhibits the capacity of the road to carry more people (& goods) particularly in the peak periods, and/or
- Causes significant delays to the speed and reliability of public transport on the FTN, and/or
- Causes safety risks for cyclists or impedes quality improvements on the Auckland Cycle Network.

In addition, the draft AT Parking Strategy (2022) includes principles guiding the role of the road corridor, and the role of parking within the road corridor. This identifies that to align with Government and Council direction parking should be managed to encourage travel by sustainable and efficient transport modes such as PT and cycle and micro-mobility, prioritise trips by modes other than private motor vehicles and enable kerbside space to be utilised for more beneficial activities. In this regard, the principles identify kerbside space will typically be allocated in a priority order with parking (and particularly general vehicle parking), as the lowest priority. This is consistent with the approach in the long-term form and function identified for the corridor.

The draft Strategy identifies both Strategic Networks and three 'tiers' of readiness for change to parking strategy, which is based on the 2031 environment. The SH16 Main Road corridor and Kumeū / Huapai are not currently identified. However, within the longer-term timeframes of this project, it is considered that this part of the SH16 Main Road would be on the Strategic Network and be at least a Tier 2 location (with the nearby Kumeū town centre and Kumeū RTC Station). In this regard, the draft Strategy identifies that on the Strategic Network *"the principles for the management and supply of parking direct that all forms of kerbside parking is repurposed as necessary to accommodate projects on the Strategic Transport Network – unless exceptional circumstances are identified during consultation"*. In Tier 2 areas, there is a focus on reducing private vehicle use for commuter trips and managing parking through time limited/short stay parking, as well as reallocation to improve travel choices other than private car.

As such, given the anticipated future land use and transport context, it is considered that the identified loss of on-street parking can be satisfactorily managed in combination with broader parking strategies that will complement the locations proximity to the Kumeū town centre and Kumeū RTC Station.

Notwithstanding the above, the current AT Parking Strategy identifies that, if there is a significant loss of on-street parking on an arterial road, AT will complete a parking assessment. This would evaluate the loss of parking in the context of the broader on-street and off-street provision, as well as the land use and transport environment at that time, and identify potential parking mitigation measures, where necessary. This is a matter that can therefore be appropriately addressed at the time of implementation.

6.5 Project Interdependencies

6.5.1 Alternative State Highway and Rapid Transit Corridor

As has been discussed previously, the ASH corridor has a strong interdependency with the SH16 Main Road Corridor Upgrade. The completion of the ASH corridor will reduce strategic trips and local trips along the existing SH16 Main Road corridor through Kumeū-Huapai, thus supporting implementation of the RTC and SH16 Main Road Upgrade.

Depending on the implementation timing of the RTC and Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of those projects to manage potential adverse effects on the urban areas. However, should those projects be delivered earlier in the staging of future growth in Kumeū-Huapai, then the ASH may not be necessary in advance.

As discussed previously, the delivery of the RTC through Kumeū-Huapai is dependent on the completion of some segments of the SH16 Main Road Upgrade in advance of the RTC.

6.5.2 Access Road Upgrade

The SH16 Main Road Upgrade and the Access Road Upgrade are considered to be independent of each other, i.e. the NoR S2 project is not dependent on the completion of the Access Road Upgrade or vice versa. However, the proposed designation and design of each project complements the other and both are considered to be necessary with the long-term growth.

6.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are no operational adverse effects to mitigate, given the effects on property access have been addressed through the design of the Project and hence provided for by the designation.

Whilst there are potential adverse effects on on-street and off-street parking, it is considered that this will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future on-street and off-street parking policy and strategy, given the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

The relative timing of the SH16 Main Road Upgrade, RTC and ASH will be considered as part of later implementation business cases prior to implementation. The assessment has identified that depending on the timing of the Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of this project to manage potential adverse effects on the urban areas. The delivery of the RTC through Kumeū-Huapai is also noted as being dependent on the completion of some segments of the SH16 Main Road Upgrade in advance. In terms of the proposed designation, each of these projects remain necessary in their own right, as part of the North West Strategic Package to support the anticipated long-term growth.

6.7 Summary of Operational Transport Effects (NoR S2)

The assessment of transport effects for the Project is summarised in Table 6-5 below.

Table 6-5: Assessment of Operational Effects Summary for NoR S2 (SH16 Main Road Upgrade)

Operational Transport Effects	
Safety	In summary, the effects of the Project on safety are: • Significantly improved, and new, walking and cycling facilities along SH16 Main Road (including separation), resulting in improved protection for vulnerable road users. • Significantly improved, and new, walking and cycling crossing facilities (crossing SH16 Main Road) at intersections, resulting in a significantly safer environment for all road users. • A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 50km/h or less around centres) with enhanced place function and consequential reductions in the risk of DSIs.
Walking and Cycling	In summary, the effects of the Project on walking and cycling are: • Support a potential reduction in road hierarchy to an arterial function to de-tune SH16 Main Road and support improved permeability (including north south connections over the rail line). • Provides high quality cycle facilities for a network to connect the residential catchments to key Town Centre, Local Centre and other destinations, as well as the RAMC. • Supports growth surrounding SH16 Main Road and significantly improve safety and access to employment and social amenities. • Reduces speed environment and space for midblock crossings. • Focuses on active modes to shift trips away from private vehicle use and link land use to the RTC.
Public Transport	In summary, the effects of the Project on public transport are: • Reduces delays and improved reliability for future PT network on SH16 Main Road and the wider network. • Improves integration with the future public transport network (including the RTC stations) and improved east-west and north-south connectivity, as well as improved access to employment and social amenities. • Increases attractiveness and uptake of public transport trips, which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.
General Traffic / Freight	In summary, the effects of the Project on general traffic / freight are: • The proposed two-lane corridor can efficiently accommodate the anticipated long-term demand and the intersections along the SH16 Main Road Upgrade corridor have been assessed and shown to provide sufficient capacity. • Complementary implementation of the ASH, as part of the long-term network is predicted to result in a significant reduction in local, intra- and inter-regional freight using the SH16 Main Road Upgrade corridor.
Access and Parking	In summary, the effects of the Project on access and parking are: • Potential adverse effects on property access can be addressed through the later design stages / Outline Plan of Works by re-forming / re-grading property driveways or providing new access driveways.

Operational Transport Effects	
	• Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

6.8 Conclusions

Overall, the NoR S2: SH16 Main Road Upgrade provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic effects.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the CTMP prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

7 NoR S3: Rapid Transit Corridor; NoR KS: Kumeū RTC Station and NoR HS: Huapai RTC Station

7.1 Project Corridor Features

7.1.1 Project Overview

The proposed RTC is a new corridor which aims to complete a safe and frequent rapid transit system connecting Kumeū-Huapai with Westgate, Auckland City Centre and the North Shore. The RTC will extend the proposed North West RTC Full Implementation project (a non-Te Tupu Ngātahi project) from the proposed Brigham Creek station to near the western edge of Kumeū-Huapai growth area.

The RTC predominately traverses rural land outside of the FUZ for around 6km of its total length of approximately 9.5km, with the last 3.5km being within the existing or FUZ areas. The RTC will operate in an uninterrupted free flowing manner with all road crossings grade separated along its length.

It is proposed to route protect the RTC corridor for bus rapid transit. The NoR is therefore be sought for a RTC form in terms of the design requirements (width, horizontal and vertical alignment) that would provide for bus rapid transit. The RTC corridor will be at grade, except at key sections to pass over local and arterial roads, as well as the ASH. An overview of the proposed design is provided in Figure 7-1 below.

The RAMC is a segregated walking and cycling corridor that is located adjacent to the RTC alignment from the Brigham Creek Interchange to the western edge of Kumeū-Huapai, terminating at the signalised intersection of SH16 Main Road and Weza Lane. The corridor is co-located and integrated with the RTC and both projects are proposed to be route-protected as a single NoR. The segregated corridor provides the opportunity for long-term amenity as a key cycling corridor, while connecting to the wider North western Cycleway and ultimately to the Auckland city centre network.

In order to serve the existing urban and FUZ areas in Kumeū-Huapai, the NoR S3 (RTC/RAMC) is supported by NoR KS (Kumeū RTC Station) and NoR HS (Huapai RTC Station). The proposed station locations are illustrated on Figure 7-2 below.

The Kumeū Station will be accessed by active modes and feeder bus services and aligned with the future town centre, hence a Park and Ride facility is not considered appropriate at this station. The Huapai Station forms the terminus of the RTC corridor and will include Park and Ride facilities with allowance currently enabled for up to 500 car parking spaces. Both stations will also be supported by active modes and local PT access, with the proposed designation providing space for bus interchange and active mode facilities. In both cases, active mode connections are provided by bridges over the NAL to the adjacent urban catchment.

As shown in Figure 7-2 below, the Kumeū station is well aligned with Council's Spatial Land Use Strategy – North West in relation to the anticipated development of a future Town Centre location, whilst the Huapai Station provides the opportunity to integrate with an anticipated new Local Centre in the Huapai western FUZ area.

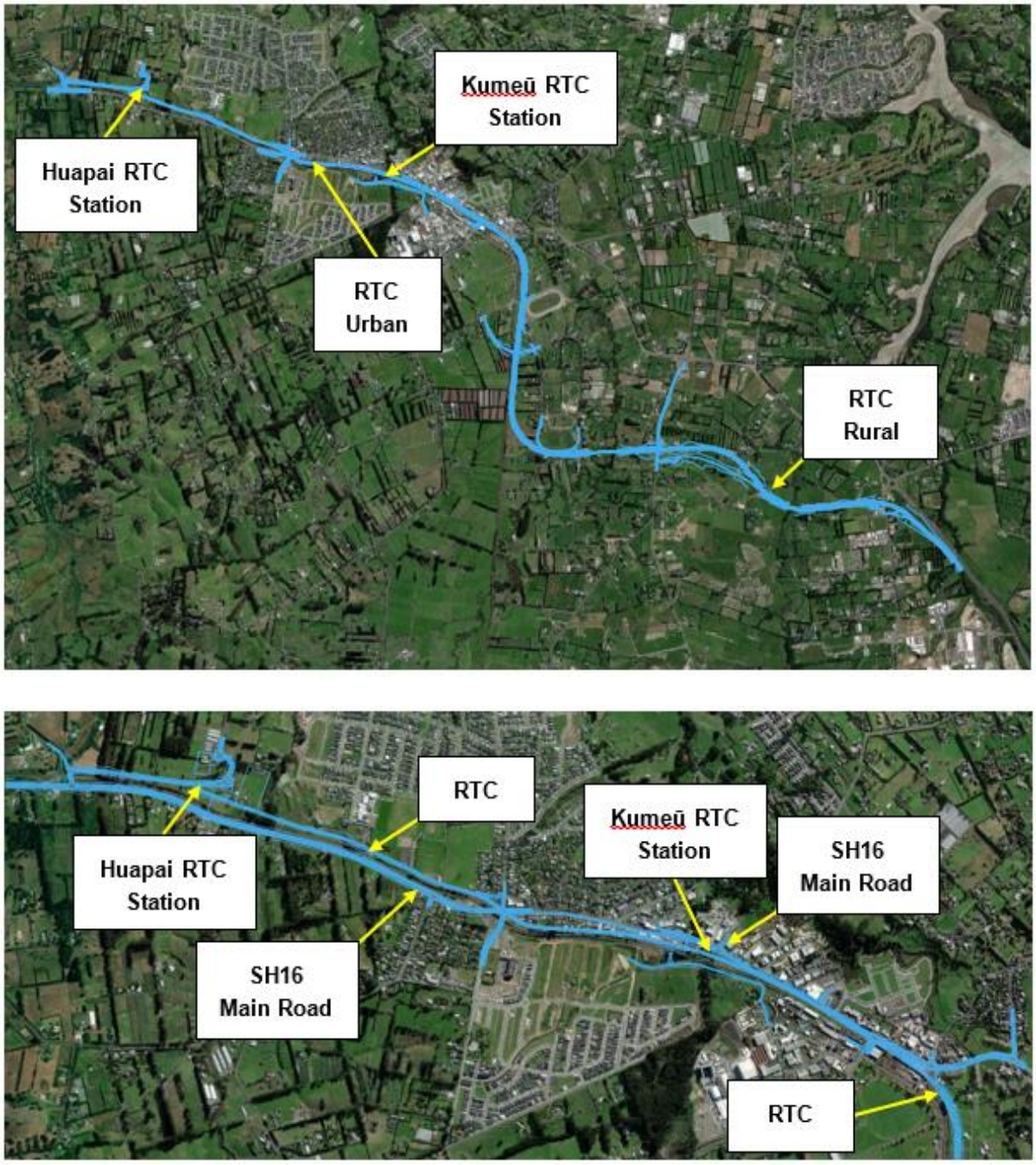


Figure 7-1: RTC and RAMC

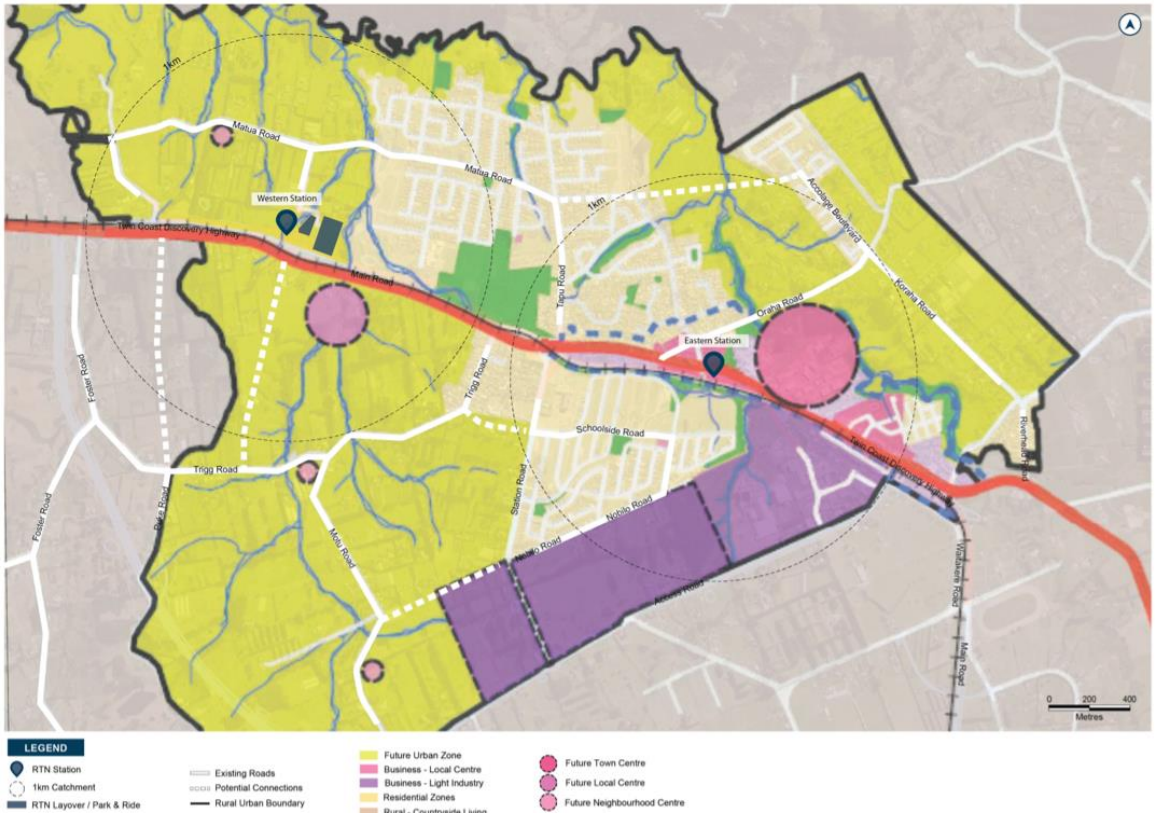


Figure 7-2: RTC Stations Overview and Council's Spatial Land Use Strategy – North West

7.2 Network and Corridor Design

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

The North West DBC identified a RTC option that will provide for bus rapid transit. De-coupling the RTC from the SH16 Main Road Upgrade and enabling grade separation from local roads, not only significantly improves the efficiency and reliability of the RTC, but also provides safer and more efficient local active mode and bus connections at those locations, such as Access Road and Station Road.

In addition, the de-coupling of the RTC benefits access for adjacent land use along the SH16 Main Road Upgrade, allowing that project to better integrate with that adjacent land use by enabling local access. The RTC then forms a combined corridor with the NAL that already provides severance through the Kumeū / Huapai urban area.

Feeder bus services are critical to supporting the RTC as part of an overall public transport system. Te Tupu Ngātahi have worked closely with AT specialists to understand how feeder services can be configured to support the RTC, albeit this will be subject to future network planning at the time of implementation.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 0. Key aspects of the network and corridor design are summarised below.

Within the rural section, the RTC is completely segregated with a cross-section width of 20m, including the RAMC. There are two lanes (one in each direction) and it has high-speed characteristics, with speeds up to around 80kph. The RAMC corridor will have limited access points and almost no interaction with the surrounding land use. RTC stations/stops are not provided in the rural section to maintain the high-speed environment and there is grade separation at local rural roads. The indicative cross section of the rural section is shown in Figure 7-3.

Figure 7-3: RTC Potential Cross-Section – Rural Section

Within the urban section, the corridor is separated from the SH16 Main Road Upgrade corridor and is grade separated at road crossings to improve the efficiency and reliability of the RTC. Generally, the corridors are separated by the adjacent land use activities or the NAL and therefore have adopted the cross section in the top image in Figure 7-4. This includes the Te Tupu Ngātahi standard two lane urban corridor cross section for SH16 Main Road, as described previously, with the RTC in its own separate corridor.

However, for a section of SH16 Main Road Upgrade to the west of Access Road, the two corridors run parallel, so to minimise the extent of designation required. In this section a more bespoke approach has been taken to the parallel cross sections, as shown in the bottom image in Figure 7-4, which still achieves the necessary corridor requirements for both the RTC and SH16 Main Road Upgrade.

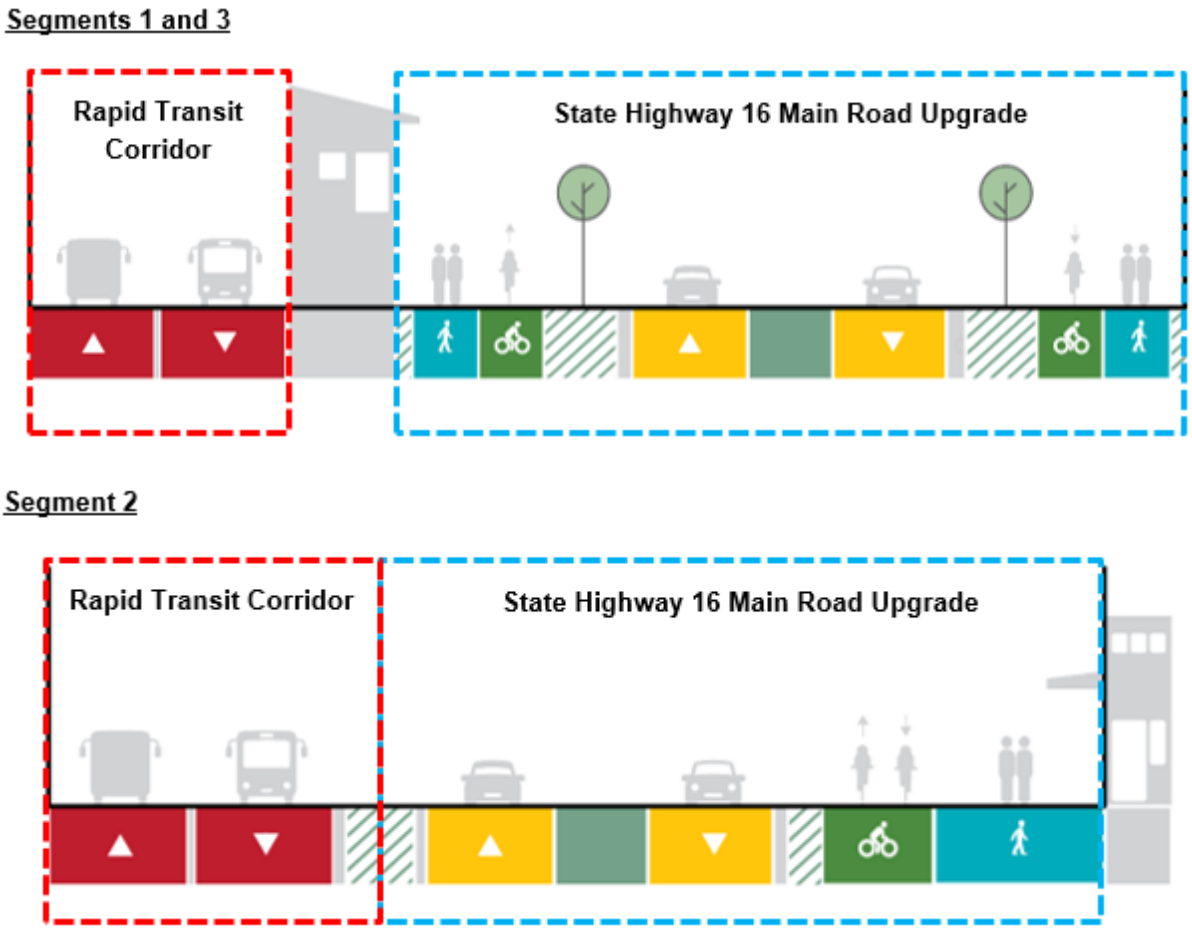


Figure 7-4: Indicative RTC cross-sections – Urban Section (Separated and Combined)

Segment 2

The form and function for NoR KS and NoR HS has been subject to extensive discussion with Waka Kotahi and AT to determine the appropriate footprint to provide for RT mode flexibility. In this regard , the following provisions have been included for each station.

- Kumeū RTC Station
  - Station building with associated station facilities
  - Overbridge connecting SH16 Main Road, station platforms and residential / employment catchments to south (over NAL), with associated stairs and lift towers. A pedestrian bridge is currently being built for the Huapai Triangle development, but this may need to be replaced, in particular, to provide more direct connectivity to future RTC station platforms
  - Cycle and shared mobility device parking provision
  - Local bus bay provision and turnaround facilities
  - Taxi and Ride Share drop-off facilities.

- Huapai RTC Station
  - Station building with associated station facilities
  - Overbridge connecting station platforms with SH16 Main Road and residential / employment catchments to south (over NAL), with associated stairs and lift towers
  - Cycle and shared mobility device parking provision
  - Local bus bay provision and turnaround facilities
  - Layover facilities for bus-based RTC mode
  - Taxi and Ride Share drop-off facilities
  - Park and Ride facility (up to 500 car parking spaces)
  - New access road connecting to Matua Road (West), plus connection to Meryl Avenue.

7.3 Existing and Likely Future Environment

7.3.1 Planning context

The RTC and RAMC form a single, integrated corridor with the RAMC only extending to the eastern entrance to Kumeū. This corridor predominately traverses rural land outside of the FUZ, however for assessment purposes it can be split into two sections:

- The **rural section** of the RTC runs from the Brigham Creek Interchange to the entry to Kumeū-Huapai township and is co-located with the RAMC along this section. This rural section traverses land zoned under the AUP:OP as Rural – Countryside Living Zone, with an area zoned as FUZ in Redhills North.
- The **urban section** of the RTC runs from northern end of Waitakere Road to Matua Road (West) and is co-located with the proposed SH16 Main Road upgrade[13] along this section. This urban section contains a range of land uses zoned under the AUP:OP as a mix of business zonings between the eastern extent of the Kumeū-Huapai township and Station Road.

Table 7-1 provides a summary of the North West existing and likely future environment as it relates to the RTC and the RAMC.

Table 7-1: RTC and RAMC Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[14]	Likely Future Environment[15]
Rural	Rural	Low	Rural
Future Urban Zone / Undeveloped greenfield areas	Future Urban	High	Urban
Business	Business (Industrial)	Low	Urban

[13] Another North West Strategic project – refer to Section 6 of this report
[14] Based on AUP:OP zoning/policy direction
[15] Based on AUP:OP zoning/policy direction

Environment today	Zoning	Likelihood of Change for the environment[14]	Likely Future Environment[15]
	Business (Local Centre)	Low	Urban
	Business (Town Centre)	Low	Urban
Residential	Residential	Low	Urban
Open Space	Open Space – Informal Recreation Open Space – Sport and Active Recreation	Low	Open Space

The RTC stations (NoR KS and NoR HS) are located in the urban section of the RTC corridors. The existing and future environment around these are discussed and summarised in Table 7-2 and Table 7-3 below.

Kumeū Station is proposed to be located on land at 299 and 301 Main Road on the western side of a Kumeū River tributary. The land is zoned under the AUP:OP as Business - Town Centre Zone. An active modes overbridge is proposed across the NAL with active mode connections to:

- the Huapai Triangle crossing land zoned in the AUP:OP as Green Infrastructure Corridor and Residential - Mixed Housing Suburban Zone; and
- Wookey Lane crossing land zoned in the AUP:OP as Green Infrastructure Corridor and Residential - Mixed Housing Suburban Zone; and Business - Light Industry Zone.

Table 7-2: Kumeū RTC Station – Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[16]	Likely Future Environment[17]
Business	Business (Industrial)	Low	Urban
	Business (Town Centre)	Low	Urban
Residential	Residential - Mixed Housing Suburban Zone	Low	Urban
Open Space (located to the north of the proposed station location)	Open Space – Informal Recreation Open Space – Sport and Active Recreation	Low	Open Space

[16] Based on AUP:OP zoning/policy direction
[17] Based on AUP:OP zoning/policy direction

Huapai Station is proposed to be located on land at 29 and 31 Meryl Avenue on the western side of the Ahukuramu stream. The land is zoned under the AUP:OP as Future Urban Zone. An active modes overbridge is proposed across the NAL and SH16 to FUZ land. Future connections will be determined as part of structure plan process.

Table 7-3: Huapai RTC Station – Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[18]	Likely Future Environment[19]
Residential (located to the east of the proposed station location)	Residential – Single House Zone	Low	Urban
Future Urban Zone / Undeveloped greenfield areas	Future Urban	High	Urban

7.3.2 Transport Environment

7.3.2.1 Existing

The existing public transport network in the wider North West is shown below in Figure 7-5 below. As shown, the routes are heavily reliant on SH16 and several key arterials including Don Buck Road, Hobsonville Road and Fred Taylor Drive.

The existing public transport routes in Kumeū-Huapai include a service connecting Helensville to Westgate via Kumeū, and a local route service that travels to Kumeū – starting and terminating in Kumeū. These services combined offer an hourly service. An additional service connects Riverhead to Albany and Westgate and also operates at an hourly frequency. This service is currently funded from Rodney Local Board Targeted Rates.

In terms of access to the Auckland City Centre direct services are offered in the peak commuter periods, with all other time periods requiring a transfer at Westgate. These offerings are consistent with local services as defined in the Regional Public Transport Plan, which cater for rural townships. These service levels will need significant upgrades to reach the connector service levels of every 20 minutes in the peak periods, or frequent service levels of every 10 minutes in the peak periods.

In terms of heavy rail, while there is a single track that travels through Kumeū, this line does not currently offer passenger services beyond Swanson. For residents in Kumeū-Huapai, utilising this service means driving to the park and ride at Swanson, which currently has 136 parking spaces.

[18] Based on AUP:OP zoning/policy direction
[19] Based on AUP:OP zoning/policy direction

Figure 7-5: Existing Public Transport in the North West

Current travel times according to AT bus timetabling for a resident of Kumeū to access Westgate and beyond in the morning peak period by bus are shown below in Table 7-3.

Table 7-4: Huapai bus travel times based on existing timetables.

Boarding Location	Alighting Location	Travel time
Huapai	Westgate	20mins
Huapai	Hobson Street	1 hour 10 mins

Based on the lack of public transport priority and current levels of congestion experienced on SH16, these travel times are considered to occur only in optimal travel conditions with limited congestion or in incident free conditions. In reality, travel times by bus can, and often do, exceed these times.

The SH16 corridor currently experiences a high level of journey time variability, with the journey from Huapai to Westgate by car varying between 16 minutes and over 30 minutes in the peak morning period,[20] and often longer in reality , particularly when incidents occur. Given that buses currently and have no priority and travel within the general traffic lanes, buses will experience these same delays and variability with additional journey time likely for boarding/alighting passengers. Figure 7-6 demonstrates the distance a current resident of Kumeū-Huapai can travel by a public transport within 45 minutes in the morning peak – leaving Kumeū at 8am.

These figures clearly demonstrate that within an hour – there is limited public transport access for Kumeū-Huapai residents, and that there is little choice but to travel by private car in order to access wider economic and social opportunities.

A lack of segregation between public transport and general vehicles results in network resilience issues for public transport services. When an incident occurs on the network (i.e. break down or crash etc), public transport services are subject to the resultant congestion and delays.

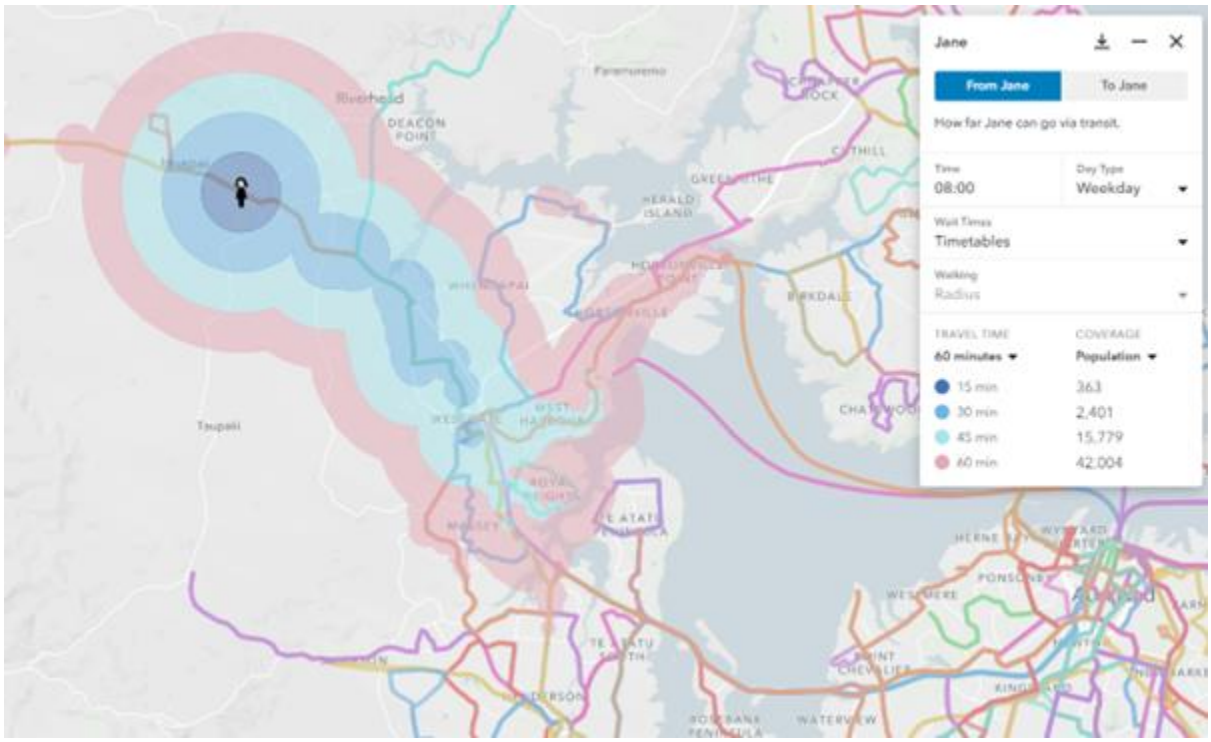


Figure 7-6: Current Public Transport accessibility in 45 minutes from Kumeū-Huapai

[20] Based on google maps travel time predictions utilising the same route as bus service 122

Another component of reliability is the susceptibility of the network to incidents. To understand this further an analysis of the TRIES database from Waka Kotahi for SH16 between Brigham Creek Road and Waimauku was undertaken. This investigation identifies that over the last five years there have been 52 events that have caused significant delays to the State Highway network. For an event that impacts the SH16 corridor, this results in an average delay of three hour to travellers on the network.

These delays are compounded by the lack of alternative routes in and around the Kumeū area and local trips using the State Highway network to undertake shorter duration trips. Currently, with all public transport services utilising this corridor, these services are subject to the same delays as general traffic.

Currently the North West has a limited provision of high quality, accessible and competitive public transport. This has resulted in a very high proportion of residents that choose to drive to employment. Census results from 2018 show that in the Kumeū- Huapai area, 87% of commuters are either accessing employment or education by private vehicles.

Buses are currently the primary provision for public transport. Given that there is limited provision for public transport on any of the key corridors in the North West, currently these buses are held up in existing traffic congestion. Current travel times for a bus to travel from Kumeū to Westgate is at least 20 minutes in the peak period, and 70 minutes from Kumeū to the Hobson Street in Auckland CBD. These times, however, do not allow for unexpected events such as breakdowns and high levels of congestion and travel times regularly exceed these times.

In addition to the travel times, current frequencies from Kumeū-Huapai to Westgate are approximately every hour. Frequencies such as this require passengers to use timetables to ensure that a bus is there at arrival on the stop. To provide an attractive public transport frequency that enables passengers to ‘turn up and go’, frequencies are recommended to be at least every 10 minutes.

There is also a distinct lack of strategic walking and cycling infrastructure and, in particular, there is a lack of safe and convenient connections linking Kumeū/Huapai to key destination such as Westgate and further afield. The North West benefits from two significant strategic cycling connections:

- The north-western cycleway parallel to SH16 – extending from the City Centre to Westgate.
- The SH18 shared use path – extending from Squadron Drive to Greenhithe, where the facility transitions to on road buffered cycle lanes on Upper Harbour Road.

In addition to these strategic links, the SH16 Improvements project includes the provision of a shared user path on SH16 from north of the Brigham Creek Roundabout to the urban edge of the Kumeū township (extents of the SH16 Improvements Project).

As such, the current planned strategic cycle connections end at Westgate, limiting accessibility for active modes between Westgate and Brigham Creek and through the Brigham Creek Roundabout. The shared user path, while a significant improvement on the existing lack of facilities, will still interface with intersections and driveways and follows the existing road corridor gradients.

In terms of cycling, the current cycling network as shown in the Auckland Cycleway Map[21] on Figure 7-7 below is extremely limited, and with the anticipated future growth in the North West – this level of service does not provide any incentive for future residents to choose to cycle to work, education or social events.

Currently, along the section of SH16 from Brigham Creek Road to Matua Road in Huapai, there are sub-standard pedestrian and cyclist facilities through the town centre and an almost absence of active mode facilities in the rural sections.

The lack of suitable active mode facilities has resulted in the predominant mode choice from Kumeū/Huapai being private vehicles. The lack of suitable alternatives has resulted in the continuity of this mode of travel being the preferred mode choice for residents.

Figure 7-7: Existing Local Cycle Network in the North West on Local Roads

[21] Auckland Cycleway Map, Auckland Transport
https://maps.at.govt.nz/arcgis/apps/webappviewer/index.html?id=88a582e934f6473dba32cb3ab909890a

Table 7-5: Total Vulnerable Road Users Brigham Creek

Road Corridor	Total Vulnerable Road Users per year					
	2015	2016	2017	2018	2019	Total
SH16 (Old Railway Rd to Matua Rd)	1	3	6	9	1	20

Table 7-6: Crash Severity Vulnerable Road Users SH16 (Crash Severity (2015 - 2019))

Vulnerable Road User	Fatal	Serious	Minor	Non-injury	Total
Pedestrian	0	1	1	0	2
Cyclist	0	0	1	0	1
Motorcyclist	0	4	8	5	17
Total	0	5	10	5	20

A crash analysis for the three key vulnerable road users (i.e., pedestrians, cyclists and motorcyclists) for the section of SH16 from Brigham Creek Road to Matua Road was conducted for the five-year period 2015 to 2019. The tables above illustrate that of the total 20 vulnerable road user crashes, including three involving either a pedestrian or cyclist. This includes one serious injury pedestrian crash, a minor injury pedestrian crash and a minor injury cyclist crash.

While the crash history indicates that there is some risk for active mode users, the adoption of safe system thinking which acknowledges that road users are fallible challenges this. The adoption of safe system thinking encourages the provision of active mode facilities that are safe and separated by acknowledging the inherent risk for these users that the lack of these facilities creates.

7.3.2.2 Likely Future

Based on the Auckland Council Future Land Supply Strategy (FULSS), the future urban growth areas in Kumeū -Huapai and Riverhead are programmed to be released for urban development between 2028 and 2032. The planned growth in Kumeū-Huapai is expected to include 10,700 dwellings with an estimated population 24,700 by full build out – a significant increase on the existing population of 1,200 (in 2016). In addition, the number of employment opportunities in Kumeū-Huapai is expected to increase by approximately 3,300 jobs over the same period.

Future travel destinations are largely expected to remain similar, however, the employment growth in Westgate and Whenuapai are expected to significantly increase – resulting in a potentially much higher level of demand within the North West to access jobs. The trip demands of all Kumeū-Huapai urban trips in the morning peak in 2048+ show that approximately 37% stay in the area. The RTC / RAMC will therefore provide an important strategic role in connecting Kumeū-Huapai with those employments opportunities and broader opportunities within the metropolitan centre at Westgate.

Structure planning is not yet complete in Kumeū-Huapai, Riverhead and Redhills North and is not expected to start until closer to land release, which is expected beyond 2028. This results in less land use certainty for these areas, but also provides significant opportunities to use transport to shape placemaking. In the absence of Structure Plans and to ensure the future land use and transport networks work together to support growth, Auckland Council prepared a Spatial Land Use Strategy in 2020, which was adopted in May 2021, as discussed previously.

Travel demand has been extracted from the Macro Strategic Model (MSM) for the North West growth area. This model is a macro transport demand model that is integrated with land use scenarios and can consider the significant urban growth in the Kumeū-Huapai and Riverhead areas. The MSM model data considers both vehicle travel and public transport use based on the forecast population and employment numbers.

Existing and forecast 2048+ (assuming full-build out of the FUZ growth areas) travel demands across the following three screenlines (in Figure 7-8 below) have been used to illustrate the demand for travel to and from the North West. This includes a screenline which measures the total people travelling along several corridors at a certain location. Screenlines have been included on SH16 and associated rural corridors connecting with Kumeū-Huapai and Riverhead.

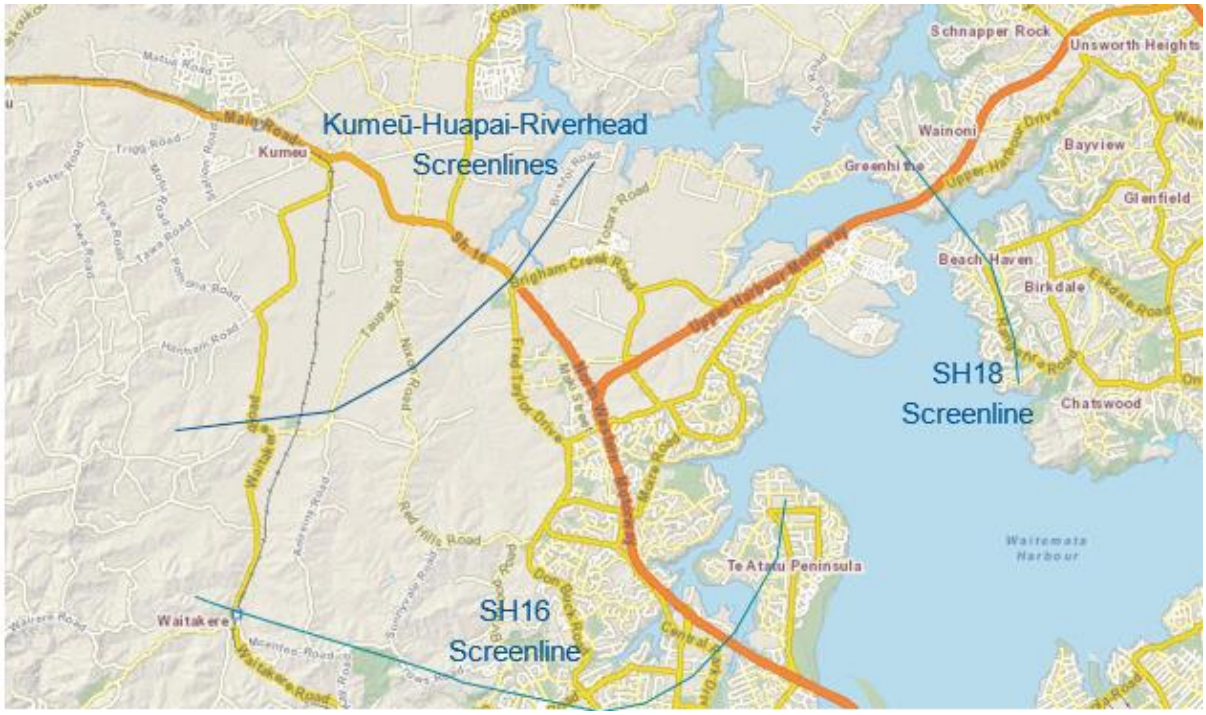


Figure 7-8: North West screenline locations

Figure 7-9 shows the volume of vehicles and public transport users travelling eastbound across the screenline, over the two-hour morning peak period for 2016 and 2048+ in the do minimum scenarios, i.e. without the NW Strategic Package projects.

The following key observations are noted for the Kumeū-Huapai-Riverhead screenline:

- Traffic demand doubles to around 9,000 vehicles in the two morning peak period.
- A lack of frequent PT services means PT demand remains very low at around 250 people.

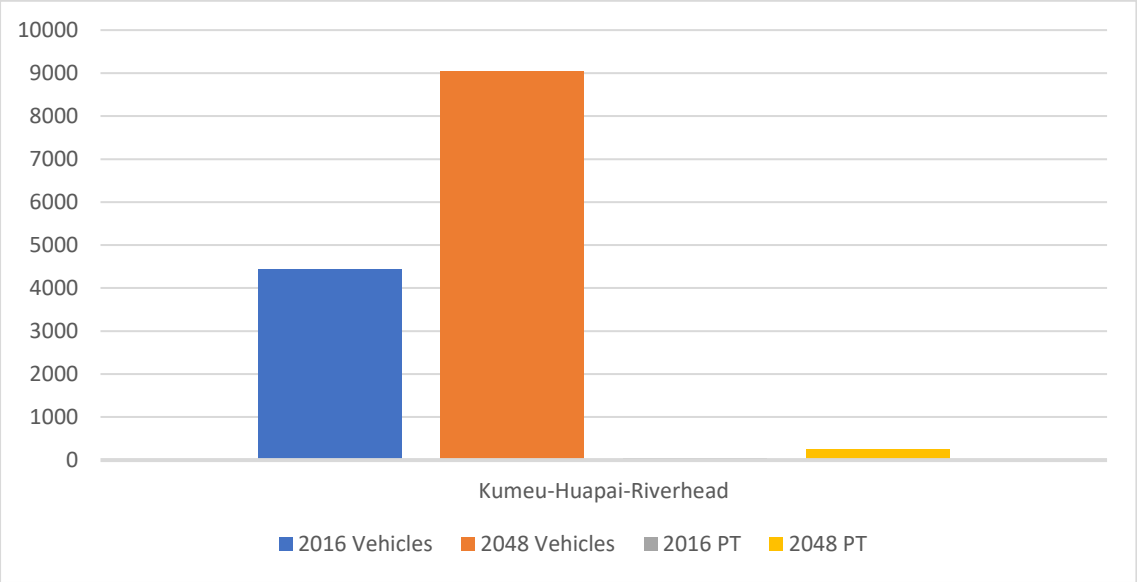


Figure 7-9: Two hour morning peak period trips across the North West screenlines

In the future, traffic modelling indicates a significant increase in journey times to the city centre by car in 2048, as significant flows of up to 48,000 vehicles per day south of Kumeū-Huapai on SH16 and associated congestion and queues are expected without any of the NW Strategic Package projects. With no segregated facilities these deteriorating travel times will also be experienced by all public transport on the road network.

Without the RTC and associated Strategic Package projects, and with the full build-out of the FUZ areas, the journey time from Waimauku to Westgate is expected to increase to 53 minutes. This is compared to 21 minutes in the interpeak. This shows significant variability of travel time experienced during the day, which is an indicator of travel time reliability. Travel time reliability is important to users / customers of the transport network, as they plan their daily activities and make life decisions about living in this area.

Should no segregated public transport facility be provided for the future residents in this community, improved frequency and reliability will be increasingly difficult to achieve. This will result in stagnating patronage levels on the PT network, and commuters choosing to travel by private vehicles. This has significant effects on the environment, as it simply increases the future communities reliance on private vehicles, as well as the liveability of these future communities.

Significant travel demand increases are therefore expected in the North West – both in vehicles and in public transport patronage. Demands for a rapid transit solution from Kumeū-Huapai in 2048 are

expected to be in the region of 1,300 boarding and alighting passengers in the peak 2-hour period from Kumeū and 2,600 boarding and alighting at Huapai station (including a park and ride).

A rapid transit solution generally needs to be able to accommodate 60% of the demand in the peak hour (i.e. 2,000 people in the peak hour), have sufficient capacity to ensure that people should not have to stand more than 20 minutes and provide a minimum service level on the FTN and RTN of a service at least every 10 minutes (6am to midnight). With demand at this level, and with these requirements this would require a double decker bus every two to three minutes, articulated buses or bus rapid transit (at a lower frequency), as highlighted in Figure 7-10.

Mode	Sub-mode	Indicative configuration	Pax. per vehicle	Absolute Min	Lower ideal	Upper ideal	Absolute max
				4 vph (15 min)	12 vph (5 min)	20 vph (3 min)	30 vph (2 min)
Bus	Standard bus	12.5m rigid triple axle	55	176	528	880	1,320
	Double decker	13.5m double decker	100	320	960	1,600	2,400
	Single Artic	18m single-articulated	105	336	1,008	1,680	2,520
	Double Artic	24m double-articulated	150	480	1,440	2,400	3,600
	Advanced BRT	31m metro style 'trambus'	200	640	1,920	3,200	4,800
Light Rail	Single LRV	33m single unit LRV	225	720	2,160	4,320	5,400
	Double LRV	66m LRV (2x 33m coupled)	450	1,440	4,320	8,640	10,800
	Triple LRV	99m LRV (3x 33m coupled)	650	2,080	6,240	12,480	15,600
Heavy Rail	Single EMU	75m three-car train	375	1,200	3,600	6,000	9,000
	Double EMU	150m six-car train	750	2,400	7,200	12,000	18,000
	Triple EMU	225m nine-car train	1,125	3,600	10,800	18,000	27,000

Figure 7-10: Functional peak capacity by mode and service frequency @ 80% occupancy (passengers per hour per direction)

Overall, the current public transport offerings connecting Kumeū to Westgate beyond provide a poor transport choice for existing and future residents. The current PT network has high variability in travel time, poor levels of priority resulting in long travel times commensurate (or in some instances longer) with travelling by car, and services offer low frequencies. As a combined public transport offering this creates a choice that is unattractive and time expensive for commuters, and it its current form is unlikely to encourage any form of significant mode shift from private vehicles. With the predicted increase in demand, additional buses are unlikely to be sufficient to cope with the additional pressure using the existing infrastructure, leading to bus bunching, and bus congestion on the network.

A significant infrastructure change will be needed to support the transformational step change required in the North West. This will require a rapid transit solution that provides a high quality, frequent and reliable frequent service that connects Kumeū-Huapai with employment and social opportunities in Westgate and Whenuapai and also enables wider connectivity to the Auckland region, including Auckland city centre and the North Shore.

Should no dedicated strategic cycle facility be provided there will be a lack of safe and attractive facilities for the future communities. This will have two likely results, travellers will choose to continue to travel by car, increasing reliance on private vehicles or people will travel by foot or cycle on corridors with high safety risks.

Increasing numbers of private vehicles will require investment in vehicle capacity infrastructure and could also have a corresponding reduction in utilisation of public transport facilities as people cannot get to stations or bus stops without a car. This would be a missed opportunity to provide excellent access to the rapid transit network proposed for SH16, employment opportunities at Westgate and Whenuapai, and connectivity to existing strategic cycle links on SH18 and SH16.

As mentioned above, with the current growth projection in this area, this will place increasing pressure on the local road corridors to perform key strategic movement functions for cyclists and these corridors do not provide a safe and appropriate environment. As these rural corridors are not equipped to support walking and cycling there is likely to be a lower response for a mode shift to active modes. Based on the current mode choice from Kumeū-Huapai, if nothing is done to upgrade the existing active mode facilities then it is expected that there will be a continued use of private vehicles as the predominate travel mode.

As previously identified in Section 5.1, an integrated transport response to the over-reliance on the existing SH16 corridor is needed to provide a comprehensive solution that integrates land use and transport to maximise outcomes.

7.4 Assessment of Operational Transport Effects

Overall, the key features and outcomes of the RTC / RAMC and the associated Kumeū and Huapai RTC Stations, include the following:

- RTC / RAMC
  - The RTC supports transformational mode shift in Kumeū-Huapai through the provision of a safe, high-quality, frequent, and reliable public transport system that connects Kumeū-Huapai with Westgate, Auckland city centre and North Shore.
  - With the RTC there is predicted to be increased access to employment by PT within 15, 30 and 45 for the Kumeū-Huapai growth area in the weekday AM peak period. The proportion of jobs accessible by PT increases in each of these time intervals is predicted to increase by 11% within 15 minutes and over 100% in within 30 and 45 minutes with the NW RTC Full Implementation project.
  - The RTC is predicted to reduce the average PT journey time in weekday AM peak period to City Centre from Kumeū-Huapai from around 78 minutes to 61 minutes with the NW RTC Full Implementation project.
  - The RTC is predicted to increase the proportion of PT trips for all non-local trips (outside North West) in the weekday AM peak period from 19 to 31% (equating to 708 additional PT trips outside of the North West) with the NW RTC Full Implementation project.

  - The RTC operates within a dedicated, separated corridor that will be grade separated from all local and strategic corridors, which provides for reliable journey times on both the RTC and those other local and strategic corridors.
  - The RTC balances the transport and urban development potential of the system to support land and transport integration.
  - The RTC enables a mode shift by providing alternatives to private vehicles.
  - The RTC supports a key transport interchange at Westgate, as well as unlocking access to economic and social opportunities in the North West.
  - The RAMC provides a key strategic corridor for walking and cycling that connects Westgate to Kumeū-Huapai.
  - The RAMC provides a segregated facility that maximises safety for active modes and provides a direct link with limited vehicle conflicts.
  - The RAMC will link to the North Western cycleway and ultimately the Auckland CBD.
- Kumeū and Huapai RTC Stations
  - Support transit-oriented development around the RTC stations and will be integrated with bus, walking, and cycling networks to promote travel choice.
  - The RTC patronage for the Kumeū-Huapai stations results in a total of 3,250 passengers that travel between those stations and the future Brigham Creek RTC station. With those stations enabling passengers to board within close proximity to their place of residence, rather than having to travel to Westgate to access the RTC.
- The Kumeū RTC Station more specifically:
  - Enables access to employment in Kumeū-Huapai, within town centre and employment area to south of the NAL along Access Road.
  - Supports access for broader eastern catchment in Kumeū-Huapai, including FUZ north and south of the RTC, via local bus services and active modes using the identified active modes network.
  - Enables co-location with existing and / or future town centre areas, which is aligned with opportunity for intensification and integration, as identified in the National Policy Statement: Urban Development (NPS:UD).
- The Huapai RTC Station more specifically:
  - Supports access for the western catchment in Huapai, including FUZ north and south of the RTC, which could be enhanced by local connections north of NAL via future structure planning processes.
  - With a grade separated active modes crossing of the NAL supports access by local bus services and active modes from the southern FUZ catchment. using the identified active modes network.
  - Enables access for Park and Ride for the broader North West rural catchment, including Waimauku and Helensville, via connection from Matua Road (West).
  - Supports opportunity for co-location with local centre supporting NPS:UD.

7.4.1 Safety

The design of the RTC / RAMC and associated stations have been undertaken with consideration of the latest safety guidance. Whilst these facilities are generally in off-line alignments and incorporate grade separation along the RTC / RAMC alignment, where the projects interface with the existing transport network, such as key connection points the design has considered AT's Vision Zero and Waka Kotahi's Road to Zero.

The entire length of the RAMC is separated from other transport corridors. Where there is an interface with the local network at Taupaki Road, the RAMC alignment has been designed, so that people cycling along the corridor will not need to cross Taupaki Road, instead cycling along the eastern side between cycle ramps. The facility also includes a connection along Taupaki Road to SH16, connecting to the proposed shared path along that corridor.

The RTC / RAMC is expected to result in positive effects on safety, given the corridor will reduce traffic demand on the existing SH16 corridor, improve mode choice for connections to Westgate / Whenuapai and reduce the risk that people will use inappropriate and less safe rural roads. It also removes the existing road level crossings of the NAL at Boord Crescent and Matua Road (West).

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

7.4.2 Walking and Cycling

The RAMC proposes a separated shared path for walking and cycling facility between Kumeū-Huapai and Whenuapai and provides recreational opportunities by extending the network facilities for these modes.

Local connection points have been included in the RAMC, which connect with the expected future adjacent facilities at Brigham Creek Road / Fred Taylor Drive, Taupaki Road (including connection to the shared path on SH16), and SH16 Main Road. The specific design of these connecting facilities will be developed further at detailed design prior to implementation.

The proposed walking and cycling facilities along the corridor have been designed in accordance with relevant Waka Kotahi standards and policies discussed in Section 0. The exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided the same or future equivalent documents.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area.
- Improve integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.

- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Westgate.

The RTC Stations at Kumeū and Huapai will attract patronage from the surrounding existing and future residential urban areas, with people also accessing jobs in the planned industrial land, as well as in the identified existing and / or future Town and Local Centres identified by the Council. The indicative walking catchments for the two RTC stations is illustrated on Figure 7-11.

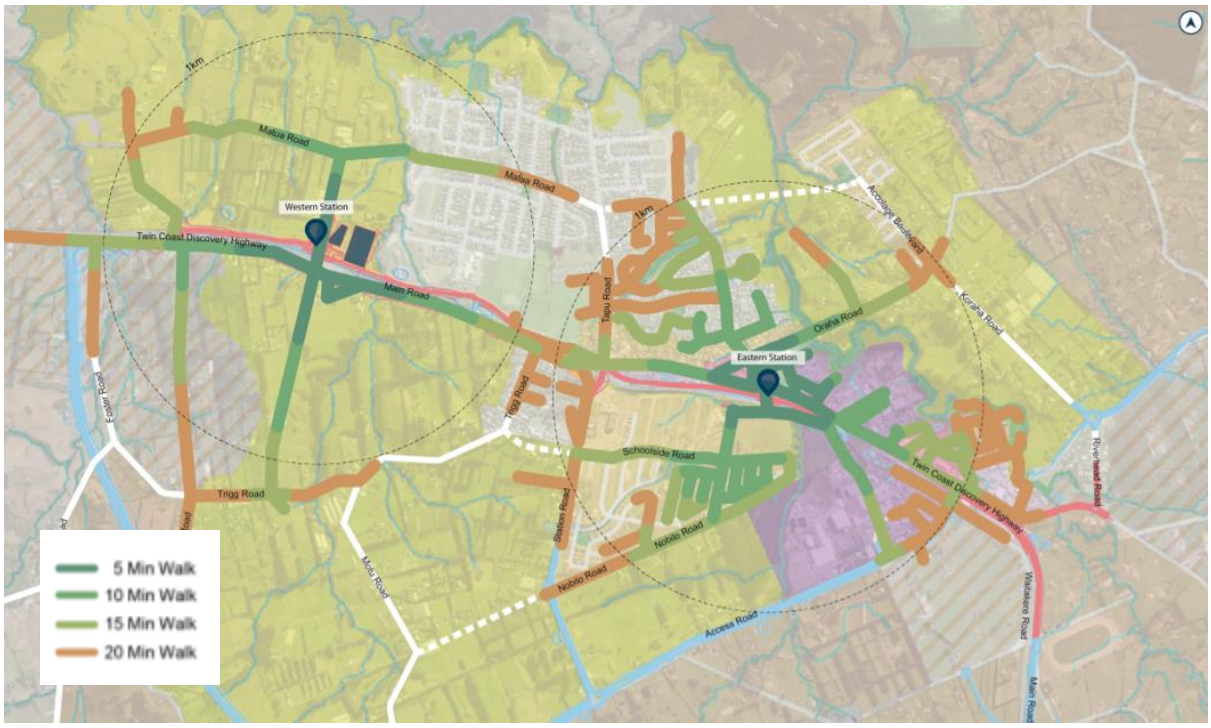


Figure 7-11: Indicative Pedestrian Catchments for Kumeū and Huapai RTC Stations

Without direct connections over the adjacent NAL, the walking and cycling catchments for these stations would be significantly reduced, with people having to take longer journeys to access the stations otherwise. The provision of the grade separated pedestrian and cycle bridges within the design therefore supports more direct, convenient and attractive routes to access the stations across the NAL.

7.4.3 Public Transport

The RTC will support transformational mode shift in Kumeū-Huapai through the provision of a safe, high-quality, frequent, and reliable public transport system that connects Kumeū-Huapai with Westgate, Auckland city centre and North shore.

It will increase access to employment opportunities by PT and make this a more attractive travel option, in comparison to the use of the private car. The RTC is predicted to reduce the average PT journey time in weekday AM peak period to City Centre from Kumeū-Huapai from around 78 minutes to 61 minutes. Whilst it is predicted to increase the proportion of PT trips for all non-local trips (outside North West) in the weekday AM peak period from 19 to 31% (equating to 708 additional PT trips outside of the North West).

The RTC operates within a dedicated, separated corridor that will be grade separated from all local and strategic corridors, which provides for reliable journey times on both the RTC and those other local and strategic corridors. It will support a key transport interchange at Westgate, as part of the NW RTC Full Implementation project, as well as unlocking access to economic and social opportunities in the North West.

The RTC Stations will support transit-oriented development and will be integrated with surrounding bus, walking, and cycling networks to promote travel choice. The stations provide the opportunity for urban intensification, as expected through the NPS:UD, in locations that support the identified future Town Centre and Local Centre locations identified by the Council in its Spatial Land Use Strategy - North West.

The RTC Stations include appropriate provision for access by local bus services that will support the broader PT system, by connecting the Kumeū-Huapai community (particularly those outside of a reasonable walk or cycle to the stations) with access to the RTC. This includes via the planned future bus services operating between Kumeū-Huapai and Waimauku / Helensville.

7.4.4 General Traffic and Freight

The RTC and RAMC will contribute to reducing the future traffic demand on the SH16 corridor between Kumeū-Huapai and Westgate / Whenuapai, which will improve the effectiveness and reliability of this corridor. However, the full benefits for the SH16 corridor are realised with the completion of the ASH, which enables intra- and inter-regional trips, including freight traffic to avoid passing along SH16 between Kumeū-Huapai and the Brigham Creek Interchange at Whenuapai.

The RTC and RAMC have been designed to be grade separated over local roads, such that whilst there will be some adverse effects during construction (refer to Section 9.2.3), with the completion of the Project, access will be maintained along these local roads. In the case of the realignment of Matua Road (West) and Station Road, this will provide for improved grade separated connection across the NAL and an improved more direct access to SH16 Main Road respectively.

At Boord Crescent, a new access road will need to be constructed to connect with Waitakere Road. However, this is not anticipated to significantly impact journey times for residents / tenants of properties on Boord Crescent, once the new road is in place and operating. Indeed, the new road will be grade separated over the NAL, meaning that the existing level crossing will no longer need to be used, reducing the safety risks associated with that existing facility. Whilst there will be some adverse effects during construction (refer to Section 9), with the completion of the Project, access will be maintained along the southern section of Boord Crescent.

The Huapai RTC Station, including its associated Park and Ride facilities will require connection to the existing road network, both for car access and local PT service connections. The proposed designation therefore includes provision of a dedicated access road, connecting with Matua Road (West). As noted above, to provide grade separation from the NAL, Matua Road (West) will therefore be realigned to connect with SH16 Main Road. This will enable a dedicated access road to be provided to the Park and Ride facility, separate to any future roads within the structure plan for the Huapai FUZ north of the NAL. This would reduce the effects of the Park and Ride users accessing the facility on those future urban areas and enable this key connection to be provided for those people in the broader North West rural catchments to reach the RTC.

Connection is also anticipated between the Huapai RTC Station and Meryl Avenue. As illustrated in Figure 7-12, Meryl Avenue is currently a single lane rural road corridor with no kerb and channel, footpath provision or street lighting. In its current form Meryl Avenue would not provide appropriate access for pedestrians, cyclists and PT users to the Huapai RTC Station.

Figure 7-12: Meryl Avenue – Existing Form (View North at 29 Meryl Avenue)

However, over time, the adjacent areas (within the Huapai FUZ) will be structure planned and developed and the form and function of Meryl Avenue will be expected to change to an urban corridor that would more appropriately provide for local access to the station. As such, in advance of the station implementation, it may be necessary for adjacent future developments to provide upgrades to Meryl Avenue. Otherwise, in the event that the station implementation occurred prior to surrounding urbanisation, then this would result in an upgrade to provide access for the nearby catchments for the RTC or for local PT services, in combination with the Matua Road (West) connection.

The current road reserve along Meryl Avenue is approximately 20m wide, which it is considered would be more than sufficient to provide for the necessary transport provision to access the station, namely, two lanes (one each direction), plus walking and cycling facilities. An example of the indicative cross section that could be enabled within the 20m corridor is shown in Figure 7-13. On this basis, it is considered that Meryl Avenue does not need to be included in the proposed designation for NoR HS.

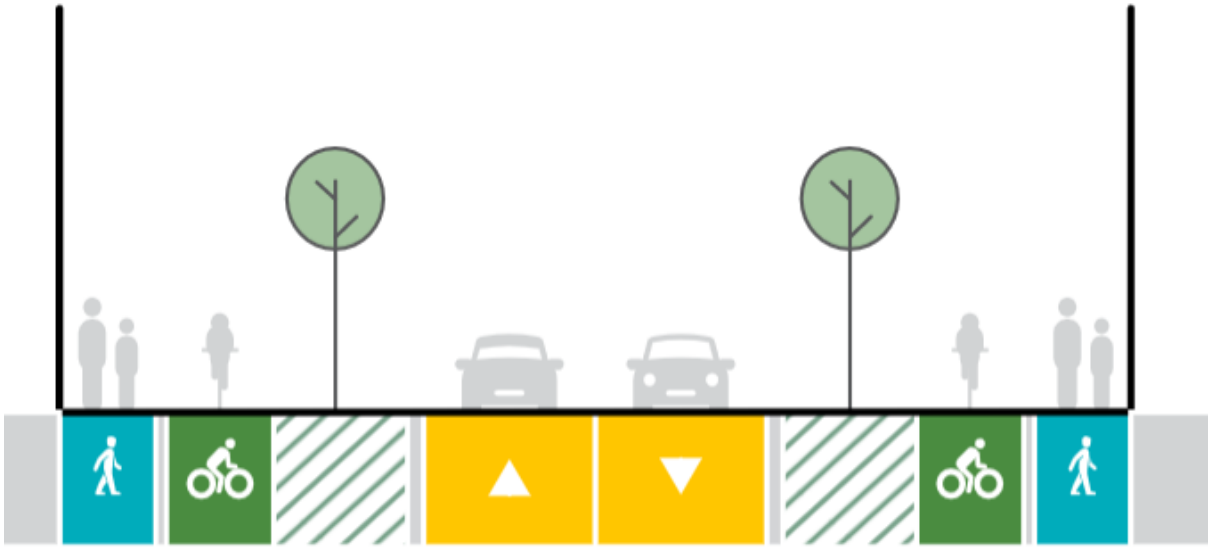


Figure 7-13: Indicative 20m Road Corridor Cross Section – Meryl Avenue

The key intersections associated with the RTC corridor and RTC Stations have been assessed and shown to provide sufficient capacity to accommodate the anticipated future traffic demands with the growth in the existing and future urban areas in the longer-term. The traffic modelling results for the key intersections associated with these projects are provided in Appendix 2.

7.4.5 Access and Parking

The design of the RTC / RAMC and RTC Stations has maintained access along all existing local roads along the route via grade separation of the ASH and local road corridors, plus in some cases, permanent realignment of those local roads (such as the new connection to Boord Crescent off Waitakere Road).

In terms of existing property access, the overarching design philosophy for the Project has been to maintain driveway access, where practicable, either re-grading existing access or relocating the driveway access. However, in some circumstances (as discussed below), it has been necessary to provide access to via new private roads.

The key areas where effects on property access have been identified are:

- In the vicinity of the intersections and interchanges between the RTC / RAMC and local roads.
- Along the RTC / RAMC corridor, where large rural lots are separated from existing road corridors.
- Where the RTC traverses the Huapai Domain (46 Tapu Road, Huapai).

Table 7-6 below summarises the potential adverse effects on properties / activities along the RTC / RAMC and in relation to the RTC Station during the operational phase. Similar adverse effects would also occur and require mitigation during the construction phase through the CTMP. Unless otherwise stated this relates to the effects of the RTC / RAMC, but where associated with the RTC Station instead, this is specifically identified. Where adverse effects are only expected during the construction phase, these are separately addressed in Section 9.

Table 7-7: RTC / RAMC, Kumeū RTC Station and Huapai RTC Station Projects – Potential Adverse Transport Effects on Access – Operational Phase

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
Adverse impacts on property access driveway	✓	375, 377 Taupaki Rd, Taupaki 384, 400 Taupaki Rd, Taupaki 190 Boord Crescent, Kumeū Lot 3 DP 495742 Boord Crescent, Kumeū 113 Boord Crescent, Kumeū 108 Boord Crescent, Kumeū 42 Boord Crescent, Kumeū (split by new Waitakere Rd link into 2 lots) 51 Boord Crescent, Kumeū 23 Boord Crescent, Kumeū 903 Waitakere Road, Kumeū (split by new Waitakere Rd link) 7 Main Rd, Kumeū 84, 86A-F, 88A-D, 90A-D, and 92 Main Road, Kumeū 106 Main Road, Kumeū 108, 110 Main Road (New World), Kumeū 132, 134, 154 and 156A-F Main Road, Kumeū 190 Main Road, Kumeū 248 Main Road, Kumeū	Re-grade existing or re-form new driveway access off public road for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		43 Wookey Lane (associated with Kumeū RTC Station) 4, 6, 8, 10, 12, 14, 20, 22, 24, 25, 26, 28, 30, 32, 34, 36, 38, Station Rd, Huapai 23 Vintry Dr (off Station Rd) (Huapai Triangle development), Huapai 1, 1A, 2, 3, 4, 6, 8 Tapu Rd, Huapai 395, 397 Main Road, Huapai 399 Main Road (Secret Garden Pre-School), Huapai 401 Main Road, Huapai 30, 32 Meryl Avenue, Huapai 665 and 677 SH16, Huapai (associated with Huapai RTC Station) 411 Matua Road (West), Huapai (associated with Huapai RTC Station) 405, 411, 419, 427, 443 and 449 Taupaki Rd, Taupaki (associated with active modes facility between RAMC and SH16)	
Existing private access road or driveway will no longer be viable	✓	184 (Fred Taylor Park) (new access road can be provided through the designation off Fred Taylor Dr) 196, 198, 200 Fred Taylor Drive (new access road can be provided through the designation off Fred Taylor Dr) 272 SH16, Taupaki (new access road can be provided through the	Utilise alternative private access or construct new private access road or driveway for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		designation off existing driveway) 186 Boord Crescent (new access road can be provided through the designation off realigned Boord Cr) 9, 13, 15 (Trotting Club), 17, 29 and 35 Trotting Club Dr, Kumeū (realignment of Boord Cr can be provided through the designation to Trotting Club Dr) 156G Main Road, Kumeū (alternative access driveway to be provided off 156A-F driveway for residual lot) 223 Main Road, Kumeū (associated with Kumeū RTC Station) (new access road can be provided through the designation off Wookey La or via existing paper road from Nobilo Drive) Huapai Domain, Huapai (driveway access off Tapu Rd) – refer to discussion below	

The proposed new private access roads and realignment of existing roads to maintain local access have been incorporated into the proposed designation boundary for the RTC / RAMC and further details will be developed at later design stages and as part of the Outline Plan of Works.

The existing Kumeū fire station (331 Main Road, Huapai) has been identified to be affected by the RTC alignment. With the implementation of the RTC, there will be insufficient manoeuvring space (and parking) within the site to accommodate the operational requirements of Fire and Emergency New Zealand (FENZ). The entire property has been included in the designation.

As this is an essential emergency service, it will be necessary to provide mitigation in order that FENZ can continue to operate its services at time the RTC is implemented (and during construction). It is understood that there is the ability to expand the existing site or identify a new site (within reasonable proximity) within parts of the designation that would in any event be required for construction purposes. As such, it is considered that with the agreement of FENZ, an appropriate site can be identified at the time of implementation.

The Huapai Domain has been identified to be affected by the RTC alignment. Parts of the Domain have been identified to be included in the designation, which with the implementation of the RTC will affect parking within the Domain and access to that parking from Tapu Road, as well as several buildings. The location of the parking affected on the southern side of the Domain, as shown in Figure 7-14.

Figure 7-14: Affected parking in Huapai Domain

As the Domain is an important community facility for Auckland Council Parks, it will be necessary to provide retain access and parking when the RTC is implemented (and during construction). There is the ability to continue to provide access off Tapu Road and replace parking by utilising parts of the designation that would in any event be required for construction purposes and within the existing Domain site. As such, it is considered that with the agreement of Auckland Council Parks, an appropriate site arrangement can be identified at the time of implementation.

There are several properties, where on-site parking has been identified to be affected by the proposed designation. The properties are sufficiently sized to potentially remain viable for activities within the current (or future) zoning. Moreover, the actual activity / use may change over the timeframes of the lapse dates sought, particularly for sites within the FUZ. As such, these properties have not been included in the designation and mitigation has not been identified, as this matter can be addressed via the Public Works Act at the time of implementation. The identified properties are:

- 400 Taupaki Rd, Taupaki
- 993 Waitakere Road, Kumeū
- 86A-F, 88A-D, 90A-D, and 92 Main Road, Kumeū
- 1/1 to 1/10 Putaki Drive, Kumeū
- 106 Main Road, Kumeū
- 156G Main Road, Kumeū
- 190 Main Road, Kumeū
- 23 Wookey Lane, Kumeū (associated with Kumeū RTC Station)
- 321A Main Road, Kumeū (associated with Kumeū RTC Station)
- 399 Main Road (Secret Garden Pre-School), Huapai
- 30 and 32 Meryl Avenue, Huapai (associated with Huapai RTC Station)

Along SH16 Main Road, there is an existing area of on-street parking (around 41 car parking spaces) within the road reserve between Access Road and 92 Main Road, Kumeū. As discussed in Section 6.4.6, this is affected by the SH16 Main Road Upgrade and hence the RTC, as this section of SH16 Main Road needs to be realigned to facilitate the RTC. As previously discussed in Section 6.4.6, given the anticipated future land use and transport context, it is considered that the identified loss of on-street parking can be satisfactorily managed in combination with broader parking strategies that will complement the locations close proximity to the Kumeū town centre and Kumeū RTC Station.

Notwithstanding the above, the current AT Parking Strategy identifies that, if there is a significant loss of on-street parking on an arterial road, AT will complete a parking assessment at the time of implementation to identify any appropriate parking mitigation measures at the time, where necessary. This is a matter that can therefore be appropriately addressed at the time of implementation.

7.5 Project Interdependencies

The RTC / RAMC and RTC Station projects have been designed to integrate with each other and the rest of the North West Strategic Package, but are equally able to be progressed without being dependent on the other projects.

The relationships and interdependencies between the North West Strategic Package projects and other projects are discussed below.

7.5.1 NW RTC Full Implementation

The RTC project identifies and seeks designations for the route for the long-term rapid transit corridor between Redhills North and Kumeū-Huapai. The RTC will form part of the wider rapid transit network, as an extension of the NW RTC Full Implementation project from a future Brigham Creek station (that station is not part of this proposal and is associated with the NW RTC Full Implementation project).

While there is an inter-dependency between the NW RTC Full Implementation project, the RTC could be used by interim services prior to the NW RTC Full Implementation project being completed. This option is discussed further below. This potential interim use and any other possible interim uses would be considered further through an implementation business case for the RTC / RAMC.

In terms of an interim RTC that could be provided. This would be an extension of (or connect with) the soon to be completed NW Short Term Improvements project, utilising the RTC corridor from Redhills North and terminating at Access Road. There is sufficient room within the designation footprint to facilitate this connection.

The decision on the staging of both projects will be made by Waka Kotahi likely via separate implementation business cases. Key considerations associated with this interim option would be:

- Costs for investigation, design, and implementation of the RTC to Access Road
- Potential opportunity to implement Kumeū RTC Station early (NoR KS) to maximise land use intensification and integration around station
- Reliance on existing SH16 Main Road corridor and local PT service connections from Access Road to west through Kumeū-Huapai.

7.5.2 ASH and SH16 Main Road Upgrade

As has been discussed previously, the ASH corridor has a strong interdependency with the SH16 Main Road Corridor Upgrade. The completion of the ASH corridor will reduce strategic trips and local trips along the existing SH16 Main Road corridor through Kumeū-Huapai. As discussed previously, the delivery of the RTC through Kumeū-Huapai is dependent on the completion of some segments of the SH16 Main Road Upgrade in advance of the RTC (particularly the section immediately west of Access Road, where the corridors are separated, but adjacent).

Depending on the implementation timing of the RTC and Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of those projects to manage potential adverse effects on the urban areas. However, should those projects be delivered earlier in the staging of future growth in Kumeū-Huapai, then the ASH may not be necessary in advance.

7.5.3 Access Road Upgrade

The RTC / RAMC and the Access Road Upgrade are considered to be independent of each other, i.e. the NoR S3 project is not dependent on the completion of the Access Road Upgrade or vice versa. However, the proposed designation and design of each project complements the other and both are considered to be necessary with the long-term growth.

7.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on local roads and property access have been addressed through the design of the Project and hence provided for by the designation.

Whilst there are potential adverse effects on on-street and off-street parking, it is considered that this will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future on-street and off-street parking policy and strategy, given the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

However, adverse effects on the Huapai Domain and the Kumeū fire station have been identified, which are important emergency and community facilities. It will be necessary to continue to enable the operation of the Kumeū fire station and provide alternative access and parking for the Huapai Domain. There is the ability to provide viable mitigation within the existing sites and/or utilising parts of the designation that would in any event be required for construction purposes. As such, it is considered that, with the agreement of FENZ and Auckland Council Parks, appropriate mitigation can be provided at the time of implementation.

The relative timing of the RTC, SH16 Main Road Upgrade, and ASH will be considered as part of later implementation business cases prior to implementation. The assessment has identified that depending on the timing of the Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of this project to manage potential adverse effects on the urban areas. The delivery of the RTC through Kumeū-Huapai is also noted as being dependent on the completion of some segments of the SH16 Main Road Upgrade in advance. In terms of the proposed designation, each of these projects remain necessary in their own right, as part of the North West Strategic Package to support the anticipated long-term growth.

7.7 Summary of Operational Transport Effects (NoR S3, NoR KS and NoR HS)

The assessment of transport effects for the Project is summarised in Table 7-7 below.

Table 7-8: Assessment of Operational Effects Summary for NoR S3 (RTC / RAMC), NoR KS and NoR HS

Operational Transport Effects	
Safety	In summary, the effects of the Projects on safety are: • Provides a new RTC and RAMC which meets current standards and minimises interfaces with the local transport network, except at key strategic connections to the local network. • The RTC / RAMC will reduce traffic demand on the existing SH16 corridor, improving mode choice for connections to Westgate / Whenuapai and reduce the risk that people will use inappropriate and less safe rural roads.

Walking and Cycling	In summary, the effects of the Project on walking and cycling are:
	• The RAMC provides a new corridor which meets current standards and achieves the following significant positive effects:
	  • Significantly reduce the likelihood and exposure to potential crashes, as it will provide a new separated facility and enable safe movement for vulnerable road users through the area.
	  • Improves integration with the future walking and cycling network, resulting in improved east-west walking and cycling connectivity.
	  • Leads to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
	• Serves as a key enabler for greater use of active transport modes by providing a safe connector route between Kumeū-Huapai and Westgate.
	• The grade separated connections to the RTC Stations at Kumeū and Huapai will provide connections over the adjacent NAL to the stations and planned adjacent centres, which will significantly reduce walking and cycling journeys distances supporting direct, convenient and attractive access options for active mode users.

Public Transport	In summary, the effects of the Project on public transport are: • The RTC will support transformational mode shift in Kumeū-Huapai through the provision of a safe, high-quality, frequent, and reliable public transport system that connects Kumeū-Huapai with Westgate, Auckland city centre and North shore. • The RTC will increase access to employment opportunities by PT and make this a more attractive travel option, in comparison to the use of the private car. • The dedicated RTC corridor will be grade separated from all local and strategic corridors providing reliable journey times • The RTC will support a key transport interchange at Westgate, as part of the NW RTC Full Implementation project, as well as unlocking access to economic and social opportunities in the North West. • The Kumeū and Huapai RTC Stations will support transit-oriented development and will be integrated with surrounding bus, walking, and cycling

Operational Transport Effects	
	networks to promote travel choice. This will provide the opportunity for urban intensification, as expected through the NPS:UD, in locations that support the identified future Town Centre and Local Centre locations. • The RTC Stations include appropriate provision for access by local bus services that will support the local PT system connecting the Kumeū-Huapai community and broader rural catchment with access to the RTC.
General Traffic	In summary, the effects of the Project on general transport are: • The RTC and RAMC will contribute to reduced future traffic demand on the SH16 corridor between Kumeū-Huapai and Westgate / Whenuapai, which will improve the effectiveness and reliability of this corridor. Noting the full benefits for this corridor are realised with the completion of the ASH. • The RTC and RAMC have been designed to be grade separated over local roads, so whilst there will be some adverse effects during construction, access will be maintained along these local roads. With the realignment of Matua Road (West) and Station Road providing improved connections / access. • The new access road at Boord Crescent will not significantly affect journey times, but will reduce the safety risks associated with the existing level crossing of the NAL. • Provide sufficient corridor and intersection capacity to cater for growth on existing and FUZ growth.
Access and Parking	In summary, the effects of the Project on access and parking are: • Potential adverse effects on property access can be addressed through the later design stages / Outline Plan of Works by re-forming / re-grading property driveways or providing new access driveways. • Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support. • Adverse effects have been identified in relation to Huapai Domain and the Kumeū fire station, which are important emergency and community facilities. It is considered that there are viable mitigation solutions that with the agreement of FENZ and Auckland Council Parks can provide appropriate mitigation at the time of implementation.

The relative timing of the RTC, SH16 Main Road Upgrade, and ASH will be considered as part of later implementation business cases prior to implementation. The assessment has identified that depending on the timing of the Main Road Upgrade, relative to future urban growth occurring in Kumeū-Huapai, the implementation of the ASH may be necessary in advance of this project to manage potential adverse effects on the urban areas. The delivery of the RTC through Kumeū-Huapai is also noted as being dependent on the completion of some segments of the SH16 Main Road Upgrade in advance. In terms of the proposed designation, each of these projects remain necessary in their own right, as part of the North West Strategic Package to support the anticipated long-term growth.

7.8 Conclusions

Overall, the NoR S3 (RTC / RAMC), NoR KS and NoR HS provide considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic effects.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the CTMP prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

Adverse effects on the Huapai Domain and the Kumeū fire station, which are important emergency services and community facilities can be addressed by viable mitigation solutions that with the agreement of FENZ and Auckland Council Parks can provide appropriate mitigation at the time of implementation.

8 NoR S4: Access Road Upgrade

8.1 Project Corridor Features

8.1.1 Project Overview

Access Road/Tawa Road is an existing arterial corridor that runs along the eastern FUZ of Kumeū-Huapai. The proposed upgrade extends from the intersection of Access Road with SH16 in the east and continues into Tawa Road to its intersection with Puke Road in the west.

Access Road plays a key role in connecting the existing and likely future urban area zones to both the RTC / RAMC, via the SH16 Main Road Upgrade, and the ASH. As shown in Figure 8-1, it is aligned along the south eastern boundary of the southern FUZ, providing for an enhanced collector network within the FUZ to connect to this corridor, when the area is structure planed by the Council.

It is proposed to widen the existing Access Road/Tawa Road corridor from its current width of 20m to accommodate a 30m wide four-lane cross-section. The cross-section of the corridor transitions from a rural edge cross-section to an urban cross-section at the Wookey Lane intersection.

Figure 8-1: Overview of Access Road Upgrade

8.2 Network and Corridor Design

The Project was developed as part of network planning for the wider north west area. The wider networks were developed through the Business Case process that considered the key problems, benefits, outcomes and range of options to address the identified problems. As such, the Project is part of a wider long-term integrated network planned for the area.

The existing corridor includes two vehicle lanes, one per direction, and a small segment with footpaths at the eastern end. Outside of the existing urban area, the corridor has a high speed rural road environment.

The development of the strategic corridor design and its interfaces with the local road network has included the use of the relevant transport guidance and documents, as described in Section 0. Key aspects of the network and corridor design are summarised below.

The Project proposes that the function of Access Road will change from an existing rural two-lane road to a low-speed four-lane arterial (using AT standards) with mixed components for vehicles, and active modes.

- As shown in Figure 8-2, through the business and industrial area, a 30m urban corridor is provided, including walking and cycling infrastructure along both sides of this eastern section.
- As shown in Figure 8-3, along the western section of Access Road, which is a low-speed rural section, the corridor has a rural southern edge (swales, typically 9m wide top width) with walking and cycling facilities along its northern urban edge.

Figure 8-2: Indicative future Access Road corridor design for urban section

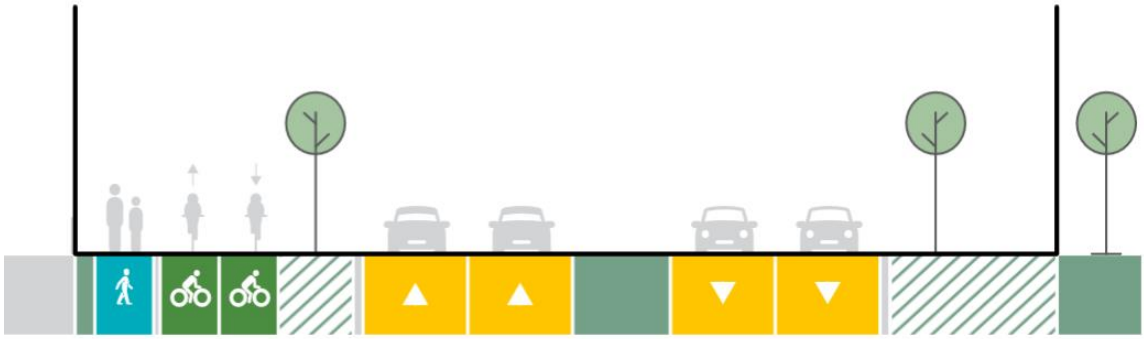


Figure 8-3: Indicative future Access Road corridor design for rural section

The development of the corridor design has included the use of AT's Roads and Streets Framework (RASF), which qualitatively assesses the typology (movement and place value) and modal priority. The intent of that framework is to classify the expected movement and place functions from a consistent regional context and identify the likely priority applied to each mode.

The framework itself does not directly dictate a specific corridor design but provides context and guidance regarding the intended function of the corridor that will be used to inform future development and operation of the corridor. For integrated land use and transport classification purposes, land use context uses Place Value (ranking from P1 'low' to P3 'high' importance) and for transport context uses Movement Value (ranking from M1 'low' to M3 'high' importance).

The corridor is assessed to have the following RASF typology:

- Place function – transitioning from P1 (low) to P2 (medium)
- Movement function – transitioning from M1 (low) to M2 (medium) long term

Figure 8-4 below indicates the likely long-term modal priorities for the corridor. Currently the mode split is heavily weighted to general traffic. As the corridor is upgraded and the area is developed, the mode split is anticipated to shift to more sustainable modes of travel as well as freight movement, the latter influenced by the access to the existing and future industrial area on Access Road.

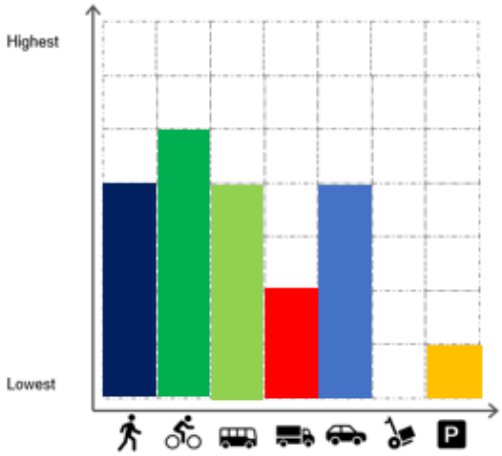


Figure 8-4: Future modal priority in 2048+ for Access Road

8.3 Existing and Likely Future Environment

8.3.1 Planning context

Access Road/Tawa Road is an existing arterial corridor that runs along the eastern RUB of Kumeū-Huapai. The northern side of Access Road is zoned under the AUP:OP as FUZ, with Business – Light Industry Zoning at the north-eastern section of Access Road. The southern side of Access Road is predominantly zoned under the AUP:OP as Rural – Countryside Living, with exception to the Kumeū Showgrounds which are zoned as Rural – Mixed Rural Zone are identified as a precinct (I517 Kumeū Showgrounds Precinct) in the AUP:OP. Table 8-1 below provides a summary of the existing and likely future environment as it relates to Access Road.

Table 8-1: Access Road Upgrade Existing and Likely Future Environment

Environment today	Zoning	Likelihood of Change for the environment[22]	Likely Future Environment[23]
Business	Business (Light Industrial) Zone	Low	Business (Light Industrial)
Rural	Rural – Countryside Living Zone Rural – Mixed Rural Zone	Low	Rural
Undeveloped greenfield areas (Future Urban Zone)	Future Urban	High	Urban

[22] Based on AUP:OP zoning/policy direction
[23] Based on AUP:OP zoning/policy direction

8.3.2 Transport Environment

8.3.2.1 Existing

The existing corridor is predominantly surrounded by greenfield land, with the exception of the eastern end, which is located adjacent to the light industrial land and Kumeū Showgrounds. It is comprises of one vehicle lane in each direction as shown in Figure 8-5. The carriageway transitions from rural to urban (on both sides) near Wookey Lane.

Figure 8-5: Existing Access Road Corridor (Rural Section)

Table 8-2 summarises the existing transport features of the Access Road corridor.

Table 8-2: Access Road: Existing Transport Features

	Existing Access Road Transport Features
Corridor Characteristics	• Western End (Rural Section) • Has a 70 or 80kph speed limit • Rural character with two vehicle lanes (one in each direction) • Corridor form is consistent, with no kerb and channel on either side of the corridor • Footpath on northern side only – north of 116 Access Road. • Eastern End (Urban Section) • Has an 50kph speed limit • Semi-rural character with two vehicle lanes (one in each direction) • Corridor form is inconsistent, with kerb and channel and footpaths providing in segmented sections on both sides of the corridor. • Corridor crosses the NAL at grade, just north of the proposed designation, which terminates at the Waitakere Road intersection.
Traffic Volume	The latest traffic data for Access Road was obtained from Auckland Transport[24].

[24] Auckland Transport Traffic Counts, July 2012 to March 2020, https://at.govt.nz/about-us/reports-publications/traffic-counts/

	Existing Access Road Transport Features
	The western tube count was recorded in June 2018 and shows Access Road (between Station Road and the urban/rural boundary) carried a 5 Day ADT of approximately 1,960 vehicles per day (vpd), and 210-230 vehicles per hour (vph) during the morning and afternoon peak hours. The eastern tube count was recorded in February 2019 and shows Access Road (between SH16 Main Road and the urban/rural boundary) carried a 5 Day ADT of approximately 4,130 vehicles per day (vpd), and 360-370 vehicles per hour (vph) during the morning and afternoon peak hours.
Key Road Network / General Traffic	• Access Road / SH16 Main Road signal • Access Road / Waitakere Road stop control • Access Road / Station Road give-way
Walking and Cycling	There is a short segment of road which includes a footpath on both sides, at the eastern end of the corridor, between SH16 Main Road and 21 Access Road.
Public Transport	There are no existing bus services on Access Road.

8.3.2.2 Likely Future

Table 8-3 below summarises the likely future transport features of the Access Road corridor, which connects the SH16 Main Road Upgrade with the ASH, including its strategic cycle facility.

Table 8-3: Access Road: Likely Future Transport Features

	Likely Future Access Road Transport Features
Corridor Characteristics	• Western End (Rural Section) • 60kph speed limit. • Rural character with four vehicle lanes (two in each direction) and a central median • Consistent corridor form with a swale on the southern side and a footpath and a bi-directional cycle path on the northern side adjacent to the land zoned FUZ. • Eastern End (Urban Section) • 60kph speed limit. • Generic four-lane arterial with a 30m designation. • Urban character with four vehicle lanes (two in each direction) and a central median. • Consistent corridor form with kerb and channels on both sides and continuous footpaths and cycle facilities on both sides.
Traffic Volume	The forecast Average Daily Traffic (**ADT**) in 2048 on Access Road is 7,000 vehicles north of Station Road, and 22,000 vehicles on the southern section of Access Road.
Key Road Network / General Traffic	• Access Road / SH16 Main Road signal • Access Road / Waitakere Road stop control • Access Road / Station Road roundabout
Walking and Cycling	• Western End (Rural Section)

	Likely Future Access Road Transport Features
	• Separated 3.5m bi-directional cycle lane and 1.8m footpath on northern side only • Eastern End (Urban Section) • Separated 2.0m cycle lanes and 1.8m footpaths on both sides
Public Transport	The indicative 2048 AT bus network forecasts 8 buses per hour on Access Road, or approximately 1 bus every 5-10 minutes.

8.4 Assessment of Operational Transport Effects

Overall, the key features and outcomes of the Access Road Upgrade include the following:

- Widens of Access Road from its current general width of 19m to an 30m wide four-lane cross section including separated cycle lanes and footpaths.
- Connects local land use to the transport network and distributing efficiently to the strategic network (RTC / RAMC, SH16 Main Road Upgrade or ASH) and to key destinations within Kumeū-Huapai.
- Provides around 8km of high quality cycle facilities for a network to connect the residential catchments to the Town Centre and other destinations, as well as the RAMC and ASH.
- Significantly reduces the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and, where necessary, across Access Road.
- Supports the long term Rodney Greenways Plan which identifies this route as a key cycle connection.
- Reduces speed environment and provides space for midblock crossings, where necessary, particularly within the urban section.
- Focuses on active modes to shift trips away from private vehicle use and link land use to the RTC and strategic cycle corridors.
- Supports freight by connecting industrial zoned land directly to the ASH.

8.4.1 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and Waka Kotahi's Road to Zero. The upgrade of Access Road is expected to result in positive effects on safety when compared to the existing corridor, and these consist of:

- Significantly improved walking and cycling facilities along Access Road (including separation), resulting in improved protection for vulnerable road users.
- Improved walking and cycling crossing facilities across the side roads intersecting with Access Road, resulting in a safer environment for all road users.
- A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 60km/h) with enhanced place function and consequential reductions in the risk of DSIs.

It is anticipated that the number of pedestrians and cyclists will increase significantly as the area surrounding Access Road is developed. The traffic volume on Access Road will likely also increase over time and therefore the exposure between motorists and vulnerable road users will be higher than the existing road environment. The Project proposes to lower the speed limit to 60km/h and provide segregated walking and cycling facilities to reduce the likelihood and severity in the event of a crash.

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

8.4.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of Access Road through the urban section (eastern end), and bi-directional facilities on the northern side (adjacent to the FUZ area) through the rural section (western end). It connects to the ASH (NoR S1) at the Tawa Road Interchange, connecting with the strategic cycle facility on that corridor. At the northern end, it connects with the SH16 Main Road Upgrade, which also provides connection to the nearby RAMC at the eastern edge of Kumeū.

The corridor will support local connections with the surrounding existing and future urban areas, which are expected to have a network of local facilities appropriate to those local corridors' form and function. The specific design of these connecting facilities will be developed further at detailed design prior to implementation and will also be informed by later structure planning by the Council for the FUZ area.

The proposed walking and cycling facilities along the corridor have been designed in accordance with relevant Auckland Transport standards and policies discussed in Section 0. The exact provision of walking and cycling crossing facilities will be confirmed at the detailed design stage and will be guided the same or future equivalent documents.

The Project will have a number of significant positive effects on walking and cycling as it will:

- Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and, where necessary, across Access Road.
- Improve integration with the future walking and cycling network, resulting in improved north-south walking and cycling connectivity.
- Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips.
- Serve as a key enabler for greater use of active transport modes by providing a safe connector route between the development land and the future Kumeū centre.
- Support growth surrounding Access Road and significantly improve safety and access to employment and social amenities.

8.4.3 Public Transport

Public transport services will share the general vehicles lanes on the Access Road. In terms of future public transport services, there is one proposed transport service which will use the eastern section of Access Road. A total of 8 buses per hour, or approximately 1 bus every 5-10 minutes, are anticipated Access Road under the indicative 2048 AT bus network.

The cross-section will provide adequate spacing to facilitate public transport and associated bus stops. The exact location of bus stops will be identified as part of detailed design for the Project. Once greater certainty is available on the location of key land use activities, more certainty on high demand locations for bus stops can be determined, i.e. around centres and schools for example.

The Project's potential positive operational effects on public transport are:

- Reduced delays and improved reliability for the future PT network on Access Road and the wider network.
- Improved integration with the future public transport network and improved north-south connectivity, as well as improved access to employment and social amenities.
- Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.

8.4.4 General Traffic and Freight

As identified above, the 2048 ADT for Access Road is between 7,000 and 22,000 vehicles per day, depending on the segment of the corridor considered. The higher daily traffic demands being south of Station Road, closer to the Tawa Road Interchange on the ASH.

Given that the peak hour volume is typically approximately 10% of the daily total, it is anticipated that the vehicle volume during the peak hours will be in the order of 700 to 2,200 vehicles per hour. A four-lane corridor with limited access can efficiently accommodate up to 22,000 vehicles per day and therefore the proposed corridor design meets the forecasted needs.

As discussed below (Section 8.5), there is some inter-dependency between the Access Road Upgrade and the implementation of the ASH. Whilst the long-term traffic demands on the northern section, with full implementation of the completed North West Strategic Package corridors are anticipated to be around or below 10,000 vehicles per day, the provision of four lanes has been identified.

Typically, this threshold for four vehicle lanes would be in the order of 15,000 vehicles per day or a greater frequency of bus services. However, depending on the timing of the ASH implementation in relation to the future growth in Kumeū-Huapai, there is the potential that traffic demands on the northern section of Access Road, connecting with the current SH16 corridor, could be notably higher. The proposed designation for four vehicles lanes, therefore provides some necessary flexibility to accommodate this outcome, acknowledging this inter-dependency with the ASH timing, particularly in relation to supporting the reliability of PT services in this interim period.

The intersections along the Access Road Upgrade corridor have been assessed and shown to provide sufficient capacity to accommodate the anticipated future traffic demands with the growth in the existing and future urban areas in the longer-term. The traffic modelling results for the key intersections associated with these projects are provided in Appendix 2.

Similar to general traffic, the improved corridor capacity as a result of the Project will result in improved journey times and reliability for existing and future local freight, including access to the southern extension of the light industrial zone adjacent to Access Road, as anticipated in the Council's Spatial Land Use Strategy - North West. The corridor will be able to accommodate freight movements along the mid-block and through the intersections.

Over-dimension and overweight routes are expected to be further reviewed by Waka Kotahi and relevant stakeholder groups in alignment with the realisation/ implementation of individual corridor upgrades in the future.

8.4.5 Access and Parking

As a future arterial corridor, Access Road (both the current urban and rural sections) is expected to transition to be a limited access corridor. As the area develops, it is expected that future access to the network will be facilitated by other local road networks within the urbanised area to the north of SH16 Main Road with intersections onto the corridor. That network will likely be planned as developers progress these corridors through the plan change process, following structure planning by the Council. However, access will need to be enabled for the rural areas on the southern side of the corridor, which are not planned to be subject to the same change.

Potential adverse effects of direct property access along an arterial road corridor is currently managed through the AUP(OP). However, it is recognised that many properties along the Access Road Upgrade corridor currently have direct property access. The design approach for the corridor has been to continue to facilitate direct vehicle access to existing properties, where necessary, through the inclusion of the median between the traffic lanes. It is noted that the design of the Access Road Upgrade has maintained access via all existing local roads to this corridor.

In terms of existing property access, the overarching design philosophy for the Project has been to maintain driveway access, where practicable, either re-grading existing access or relocating the

driveway access. However, in some circumstances (as discussed below), it has been necessary to provide access to via new private roads.

The key area where effects on property access and parking have been identified is:

- Along the southern / eastern side of the Access Road Upgrade corridor.

Table 8-4 summarises the potential adverse effects on properties / activities along the Access Road Upgrade corridor during the operational phase. Similar adverse effects would also occur and require mitigation during the construction phase through the CTMP. Where adverse effects are only expected during the construction phase, these are separately addressed in Section 9. Further details will be developed at later design stages and as part of the Outline Plan of Works.

Table 8-4: Access Road Upgrade Project – Potential Adverse Transport Effects on Access – Operational Phase

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
Adverse impacts on property access driveway	✓	76 Tawa Road, Kumeū 66 / 62 Tawa Road, Kumeū 63 Tawa Road, Kumeū 59 Tawa Road, Kumeū 56 Tawa Road, Kumeū 49 Tawa Road, Kumeū 48 Tawa Road, Kumeū Lot 27 DP 11870 Tawa Road, Kumeū 25 Tawa Road, Kumeū 24 Tawa Road, Kumeū 21 Tawa Road, Kumeū 17 Tawa Road, Kumeū 11 Tawa Road, Kumeū 166 Station Road, Kumeū 236 Access Road, Kumeū 218, 220 Access Road, Kumeū 211 Access Road, Kumeū 209 Access Road, Kumeū 199 Access Road, Kumeū 184 Access Road, Kumeū 181 Access Road, Kumeū 176 Access Road, Kumeū	Re-grade existing or re-form new driveway access off public road for identified properties

Potential Adverse Effects	Access Impacted	Properties Affected	Recommended Mitigation
		175 Access Road, Kumeū 174 Access Road, Kumeū 171 Access Road, Kumeū 165 Access Road, Kumeū 162 Access Road, Kumeū 161 Access Road, Kumeū 151 Access Road, Kumeū 40 Farrand Road, Kumeū 116 Access Road, Kumeū Lot 2 DP 72538 Access Road, Kumeū 95 Access Road, Kumeū 27 Access Road (Kumeū Showgrounds), Kumeū 35 Access Road (Kumeū Community Centre), Kumeū 24, 20A Access Road, Kumeū	
Existing private access road or driveway will no longer be viable	✓	121, 127A and 127B Access Road, Kumeū (new access road can be provided within designation off Access Rd)	Utilise alternative private access or construct new private access road or driveway for identified properties

The proposed new private access roads to maintain local access have been incorporated into the proposed designation boundary for the Access Road Upgrade and further details will be developed at later design stages and as part of the Outline Plan of Works.

The Kumeū Showgrounds and Kumeū Community Centre have both been identified to be affected by the Access Road Upgrade alignment. Parts of both sites have been identified to be included in the designation, which with the implementation of the Access Road Upgrade will affect access driveway (identified in Table 8-4) and parking within these sites. The location of the on-site parking affected on the sites is shown in Figure 8-6. Around 74 car parking spaces are affected at the Kumeū Showgrounds, whilst around 21 car parking spaces are affected at the Kumeū Community Centre (with 28 to 30 spaces retained).

Figure 8-6: Affected parking in Kumeū Showgrounds and Kumeū Community Centre

It is considered that the identified loss of on-site parking is unlikely to affect more regular / day-to-day activities at the Kumeū Showgrounds. However, when more occasional larger events (such as the annual Kumeū Show at the Showgrounds), it is considered that there are likely to be adverse effects of the identified reduction in parking on these sites, such as overspill parking onto Access Road. There is the potential, given the overall size of the Kumeū Showgrounds, that revised arrangements for more occasional high demand event parking could be managed within the existing site.

In terms of the Kumeū Community Centre, the site is considered to be sufficiently sized that alternative parking arrangements could be provided with re-arrangement of the site parking and access. Moreover, over time, the demand for parking for activities at the Kumeū Community Centre may change, depending on the timing of the Access Road Upgrade and other infrastructure, such as the Rapid Transit Corridor.

As such, it is considered that with the agreement of the Kumeū Showgrounds and Kumeū Community Centre, appropriate mitigation can be identified at the time of implementation, if necessary.

There are several properties, where on-site parking has been identified to be affected by the proposed designation. The properties are sufficiently sized to potentially remain viable for activities within the current (or future) zoning. Moreover, the actual activity / use may change over the timeframes of the lapse dates sought. As such, these properties have not been included in the designation and mitigation has not been identified, as this matter can be addressed via the Public Works Act at the time of implementation. The identified properties are:

- 24 Tawa Road, Kumeū
- 25 Tawa Road, Kumeū
- 166 Station Road, Kumeū
- 236 Access Road, Kumeū
- 218, 220 Access Road, Kumeū
- 24 Access Road, Kumeū

Given the nature of the Access Road Upgrade, no adverse effects have been identified in relation for on-street or public parking resulting from the Project.

8.5 Project Interdependencies

8.5.1 Alternative State Highway

The ASH will provide resilience to the transport network in the North West growth areas (particularly for Kumeū-Huapai and Riverhead), enabling intra- and inter-regional trips (including freight) to relocate from the existing SH16 corridor and supporting the growth along the SH16 Main Road Upgrade corridor through the Kumeū-Huapai growth area. The Access Road Upgrade corridor will provide a key connection between the ASH and the Kumeū-Huapai growth area, particularly the existing and future light industrial zoning along the northern side of Access Road.

As discussed above, depending on the timing of the ASH implementation in relation to the future growth in Kumeū-Huapai, there is the potential that traffic demands on the northern section of Access Road, connecting with the current SH16 corridor, could be notably higher than with the full implementation of the North West Strategic Package network. The proposed designation for four vehicles lanes, therefore provides some necessary flexibility to accommodate this outcome, particularly in relation to supporting the reliability of PT services in this interim period.

8.6 Recommended Measures to Avoid, Remedy or Mitigate Operational Effects

The Project provides significant positive effects and there are generally no operational adverse effects to mitigate, given the effects on property access have been addressed through the design of the Project and hence provided for by the designation.

Whilst there are potential adverse effects on off-street parking, it is considered that this will generally be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy, given the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

However, adverse effects on the Kumeū Showgrounds and Kumeū Community Centre have been identified, which are important community facilities. It will be necessary to continue to provide parking for these facilities to support more occasional larger-scale events. It is considered that there is the potential to provide viable mitigation within the existing sites, if necessary. As such, it is considered that, with the agreement of the Kumeū Showgrounds and Kumeū Community Centre, appropriate mitigation can be provided at the time of implementation.

The potential uncertainty relating to the timing of the ASH corridor, and therefore higher traffic demands on the northern section of the Access Road Upgrade corridor, is mitigated by the proposed designation for four vehicles lanes on this section, particularly in relation to supporting the reliability of PT services in any interim period prior to the implementation of the ASH.

8.7 Summary of Operational Transport Effects (NoR S4)

The assessment of transport effects for the Project is summarised in Table 8-5.

Table 8-5: Assessment of Operational Effects Summary for NoR S4 (Access Road)

Operational Transport Effects	
Safety	In summary, the effects of the Project on safety are: • Significantly improved walking and cycling facilities along Access Road (including separation), resulting in improved protection for vulnerable road users. • Improved walking and cycling crossing facilities across the side roads intersecting with Access Road, where necessary, resulting in a safer environment for all road users. • A significantly improved speed environment by reducing speed limits to more appropriate urban speeds (e.g. 60km/h) with enhanced place function and consequential reductions in the risk of DSIs.
Walking and Cycling	In summary, the effects of the Project on walking and cycling are: • Significantly reduce the likelihood and exposure to potential crashes as it will enable safe movement for vulnerable road users along and, where necessary, across Access Road. • Improve integration with the future walking and cycling network, resulting in improved north-south walking and cycling connectivity. • Lead to significant environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips. • Serve as a key enabler for greater use of active transport modes by providing a safe connector route between the development land and the future Kumeū centre. • Support growth surrounding Access Road and significantly improve safety and access to employment and social amenities.
Public Transport	In summary, the effects of the Project on public transport are:

Operational Transport Effects	
	• Reduced delays and improved reliability for the future PT network on Access Road and the wider network. • Improved integration with the future public transport network and improved north-south connectivity, as well as improved access to employment and social amenities. • Increased attractiveness and uptake of public transport trips which will reduce reliance on vehicle trips, resulting in positive environmental and health benefits.
General Traffic / Freight	In summary, the effects of the Project on general transport and freight are: • The proposed four-lane corridor can efficiently accommodate the anticipated long-term demand and the intersections along the Access Road Upgrade corridor have been assessed and shown to provide sufficient capacity. • Improved reliability for existing and future local freight, including access to the southern extension of the light industrial zone adjacent to Access Road • Flexibility to accommodate potential interim potential uncertainty relating to the timing of the ASH corridor, and therefore higher traffic demands on the northern section of the Access Road Upgrade corridor.
Access and Parking	In summary, the effects of the Project on access and parking are: • Potential adverse effects on property access can be addressed through the later design stages / Outline Plan of Works by re-forming / re-grading property driveways or providing new access driveways. • Effects on off-street and on-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support. • Adverse effects have been identified in relation to Kumeū Showgrounds and Kumeū Community Centre, which are important community facilities. It is considered that there are potentially viable mitigation solutions that with the agreement of the Kumeū Showgrounds and Kumeū Community Centre can provide appropriate mitigation at the time of implementation.

8.8 Conclusions

Overall, the NoR S4 (Access Road) provides considerable positive transport effects in particular improved safety, walking and cycling, public transport and general traffic (including freight) effects.

It is considered that property effects in relation to access driveways and private access roads can be specifically considered, as part of the further design prior to implementation, as well as part of the CTMP prior to implementation (as those effects occur during both operational and construction phases). This will enable these potential adverse effects to adequately addressed.

Effects on off-street parking will be able to be appropriately addressed, by mechanisms such as the Public Works Act and future parking policy and strategy direction, given the context of the significant change in the land use and transport environment that this and the other Strategic Package projects enable and support.

Adverse effects on the Kumeū Showgrounds and Kumeū Community Centre, which are important community facilities can be addressed by potentially viable mitigation solutions that with the agreement of the Kumeū Showgrounds and Kumeū Community Centre can provide appropriate mitigation at the time of implementation, if necessary.

9 Strategic Assessment Package Construction Effects

9.1 Approach to Managing Construction Effects

The works anticipated to be required for the Strategic Assessment Package is a mix of those delivered outside existing transport corridors (i.e, 'offline' or on new alignments) (NoR S1, NoR S3 (rural section), NoR KS, NoR HS) and those delivered on existing transport corridors (i.e. 'online') (NoR S2, NoR S3 (urban section), NoR S5).

Where each of the NoR projects are delivered 'online', i.e. adjacent to or on the live carriageway, this means that temporary traffic management will be required. The scale of temporary traffic management to delineate live traffic away from the construction zones is largely dependent on the various stages and requirements of the construction activities. It is expected that short term temporary road closure for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches and gas relocations. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work. These type of lane closures and traffic management occur throughout the region on a regular basis for activities such as general maintenance or installation of new utilities. Waka Kotahi and Auckland Transport already have well-established processes to manage the potential disruption.

Along SH16 Main Road corridor and where temporary diversion roads are provided as part of the construction phase for the ASH (particularly BCI) corridor, consideration should be given to maintaining two-way vehicle movements, when possible, to minimise the disruption to people movement along the current strategic corridors and adjacent corridors provided the effects on safety of construction workers and the public can be appropriately addressed.

The effect of temporary road closure or other traffic management methods associated with each of the NoRs for traffic and other road users on the specific corridor and adjacent road network will be assessed in the future as part of the CTMP. This will allow an assessment of construction effects of each project on the basis of the transport environment at the time of construction. This will take into account the level of growth and activities that has occurred in Kumeū and Huapai, the availability of the alternative routes, and any additional sensitive land use activities.

The construction of each of the Strategic Package NoR projects will likely require significant earthworks, particularly the ASH (including BCI) and RTC / RAMC projects. Final cut and fill volumes will be confirmed following detailed design prior to construction. The construction traffic movements to accommodate the earthworks will likely result in the increase of traffic volume on construction routes used during the construction period of each of the Projects.

Traffic Routing

Given the timing and staging of the construction of the Strategic Package corridors has yet to be determined, there is a degree of uncertainty associated with any predicted construction methodology and associated traffic routes.

This means:

- The routes that will be used by construction vehicles will depend on the location of quarries and disposal sites, which are not yet certain
- The exact configuration and extent of compound sites/lay down areas has yet to be determined
- The timing of construction of other projects could impact on likely construction vehicle routes, for example, if the ASH is in place prior to or after the SH16 Main Road or Access Road upgrade.

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

Details of the routes and time restrictions will need to be updated and refined as part of the CTMP process. It is anticipated that the routes for construction traffic will likely be limited to the state highway (SH16), as well as arterial corridors and intersections, where possible, with the provision of adequate vehicle tracking. However, for the 'offline' construction of the ASH and RTC / RAMC, other road corridors (including existing urban and rural roads) will need to be used to travel between the access the state highway and the sites. Although, in some cases, construction traffic could use the construction corridor as the offline works are progressed.

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

Other key considerations relating to the construction traffic and transport effects of the Strategic Package corridors are discussed below, such as speed limits, pedestrians and cyclists, property access and parking, on-street and public parking, as well as parallel construction of projects. The more specific implications for each of the corridors are then discussed in Section 9.2.

Speed Limits

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

Pedestrians and cyclists

The existing provision for pedestrian and cyclists is variable across the network. It is likely that the demand for these modes will increase, if urbanisation occurs prior to construction, but future parallel collectors could also be used as an alternative route. Therefore, effects should be re-assessed again

when a greater level of detail is available about surrounding facilities and land use activities prior to construction.

However, it is recommended that residents and stakeholders be kept informed of construction times and progress, and general observations of pedestrian and cyclist activity will be used to inform, and where necessary adjust, appropriate traffic management measures in the CTMP.

Property access and parking for residents and businesses

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

It is anticipated that the contractor will undertake a detailed property specific assessment of any affected driveways and provide temporary access, if required. The temporary access should ensure the ability for users to safely access and exit the property, including access to appropriate on-site parking and for servicing / deliveries. These requirements should be captured in the CTMP or SSCTMP, if required, and may include off-site mitigation of loss of parking.

On-street and public parking

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

Parallel construction of projects

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

There is the potential that some of the corridors may be constructed at the same time (depending on later implementation decisions), however, it is considered that this would most likely affect the amount of construction traffic on the transport network. Where necessary, it is considered that this could be adequately managed, through the later CTMPs and more detailed staging of construction works at that time through the well-established CTMP processes of Waka Kotahi and Auckland Transport.

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

Land use activities that will need further consideration in the CTMP

The following table provides a high-level summary of the key land use or activities that are located adjacent to the corridors and will need further consideration during the development of the CTMP.

This could include additional controls at key access locations, temporary diversions of local roads, restricted truck movements during school pick up and drop off, or mitigation relating to the effects on parking within the properties. The below is not a final or complete list, with land use changes likely prior to implementation of the NoRs, so this list will change over time.

Further detail is provided in relation to specific locations in Section 9.2 for each of the Strategic Package corridors, where effects have been identified at this stage that require later management. Once again, it is considered these can be adequately addressed through the usual CTMP processes of Waka Kotahi and Auckland Transport.

Table 9-1: Sites for Consideration within future CTMP

Corridor	NoR	Sites for Consideration
Alternative State Highway, including Brigham Creek Interchange	**NoR S1**	• Business premises located along the corridor • Fred Taylor Park • North Auckland Line (NAL) • Local public transport (bus) stops
SH16 Main Road	**NoR S2**	• Business premises located along the corridor • Kumeū Showgrounds • Huapai District School, Huapai • Tau Te Arohanoa Akoranga School, Huapai • Community facilities, including Kumeū Library • Emergency services • NAL • Local public transport (bus) stops
Rapid Transit Corridor and Regional Active Mode Corridor	**NoR S3**	• Business premises located along the corridor • Fred Taylor Park • Kumeū Showgrounds • Huapai Domain • Matua Ngaru School, Huapai • Emergency services • NAL • Local public transport (bus) stops
Kumeū and Huapai RTC Stations	**NoR KS, NoR HS**	• Business premises located along the corridor • Community facilities, including Kumeū Library • Emergency services • NAL
Access Road	**NoR S4**	• Business premises located along the corridor • Kumeū Showgrounds • Community facilities, including Kumeū Community Centre • Emergency services

9.2 Temporary Traffic Management Effects Assessment

It is considered that temporary effects from the construction activities on the network can be adequately managed through the implementation of a CTMP during the construction phase of each Project. The purpose of the CTMP is to ensure the construction of each Project is managed in such a way that enables safe and efficient movement of local traffic throughout the construction period and to minimise disruption to road users, particularly the adjacent properties and local activities. If required, SSTMP should be developed to manage constraints on access to affected properties.

Further detail of more specific effects identified at this time are provided for each Strategic Package corridor below. It is noted that, where it is considered that the transport (or other) effects (either construction or operational) on affected properties are unlikely to be adequately managed or mitigated, those properties have already been identified to be included within the project designation.

The outcomes of this assessment and later more detailed assessments, at the time these corridors proceed to implementation, will inform the development of detailed CTMPs. It is considered that a CTMP will appropriately manage potential traffic / transport effects at that time, acknowledging that projects on the scale of those within the Strategic Package will inevitably result in disruption and inconvenience for the public and road users, at their interfaces with existing strategic transport networks and local road corridors.

9.2.1 Alternative State Highway, including Brigham Creek Interchange

The ASH, including BCI, (NoR S1) will include the following key construction works, which will have effects on the existing SH16 and local roads at these interfaces:

- Completion of the BCI with new ramps accessing the ASH and realignment of SH16, Brigham Creek Road and Fred Taylor Drive on the approaches to the new grade separated interchange.
- The realigned Fred Taylor Drive and Brigham Creek Road is expected to be completed early with a new overbridge (over the ASH and RTC / RAMC), which can largely be constructed offline, reducing disruption to existing users of the Brigham Creek / SH16 roundabout. It is anticipated once this is completed, traffic could divert to this overbridge, whilst the ASH is constructed through the Interchange. A temporary diversion road will be required to maintain access along Brigham Creek Road during construction of a new bridge over the Totara Creek, which will affect access to adjacent properties, as discussed further below.
- The new east and west facing ramps at the interchange can also be constructed largely offline, reducing disruption to existing users of SH16 and the surrounding local roads.
- Construction of the following structures along the ASH alignment at interfaces with other local roads and the NAL. It is expected that two-way access will generally be maintained, with potential for one-way at certain key stages of construction under traffic controls, i.e. temporary stop/go signs or traffic lights:
    - New bridge for the ASH to pass under Taupaki Road. A temporary diversion of Taupaki Road will be necessary during the construction of the new bridge to maintain access along the road. The road will return to its current alignment following construction.
    - New bridge for the ASH to pass over NAL. Any potential temporary closures of the NAL for bridge installation will be coordinated and agreed with Kiwirail.

- New bridge for the ASH to pass under Waitakere Road. A temporary diversion of Waitakere Road will be necessary during the construction of the new bridge to maintain access along the road. The road will return to its current alignment following construction.
- Three new bridges for the ASH, two passing over and one to pass under Pomona Road. The Pomona Road bridge over the ASH will necessitate a temporary diversion of Pomona Road during the construction of the new bridge to maintain access along the road. As discussed in Section 5, Pomona Road is proposed to be permanently realigned on this section, so access is maintained between Waitakere Road and Tawa Road.
- For the Tawa Road Interchange, a new bridge for Tawa Road to pass over the ASH. If the ASH is constructed with a tunnel under Tawa Road, then no temporary diversion roads or permanent realignment of Tawa Road is expected for these works. However, with other construction methodologies, Tawa Road may need to be closed with temporary diversions of traffic accommodated via other local roads, such as a Puke Road / Trigg Road / Motu Road route and / or a Hanham Road / Waitakere Road route. The road will return to its current alignment following construction.
    - The temporary diversion routes would result in around an additional five to six minute journey time (or 5 to 6km) between a location just south of the proposed interchange and the Waitakere Road / Access Road intersection. It is considered with appropriate traffic management, and coordination with other construction works, the diversion routes would adequately accommodate diverted traffic during this temporary period. However, it is acknowledged this would result in temporary inconvenience, particularly for properties at around the southern end of Tawa Road. Following construction works at this location, the road will be re-opened, as part of the new interchange.
- New bridge for the ASH to pass under Puke Road. This will necessitate a temporary diversion of Puke Road during the construction of the new bridge to maintain access along the road. As discussed in Section 5, Puke Road is proposed to be permanently realigned, so access is maintained along the road.
- New bridge for the ASH to pass over Foster Road. No temporary diversion roads or permanent realignment of Foster Road is expected for these works.
- New roundabout on SH16. For the construction of the roundabout and the Ahukuramu Stream, a temporary diversion of SH16 will be necessary. The road will return to its current alignment following construction.

It is considered that, whilst disruption to typical travel patterns will be inevitable, the predominantly offline construction of the ASH will manage the potential adverse effects, such that they will occur at these identified interfaces with the surrounding network and, where they would be able to be appropriately managed through a CTMP.

The construction of the ASH (including BCI) will also have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (particularly where both construction and operational effects are identified), some properties have been identified to be included in the proposed designation.

For other properties, appropriate mitigation (during the construction and operational phases) has been identified, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads. Where properties are not included in the designation and these properties have been identified to be affected during the operational phase, discussion of these matters was previously addressed in Section 5.

In addition to those properties, it is noted that access to 12, 14 and 18 Brigham Creek Road will be temporarily affected during the construction phase. This is a result of the temporary realignment of Brigham Creek Road to construct a new bridge, as identified above. It has been identified that a temporary access road will be required, as part of the construction phase to maintain access to these properties. This can be satisfactorily provided for through the CTMP process. Once works are completed on Brigham Creek Road, new driveways would provide access in a similar manner to the current access driveways.

9.2.2 SH16 Main Road Upgrade

The construction of the section of the NoR S2 corridor between Access Road and Oraha Road will need to occur in advance of the construction of the RTC / RAMC (NoR S3). This is due to a combination of either the existing SH16 corridor needing to be relocated to facilitate the RTC / RAMC or the construction of the NoR S2 corridor requiring temporary diversion during construction utilising areas that form part of the proposed RTC / RAMC (NoR S3) designation. However, this is a matter to be considered in relation to the later implementation of the corridors and the proposed lapse times provide the flexibility to enable this to be achieved.

The SH16 Main Road Upgrade (NoR S2) will include the following key construction works, which will have effects on the existing SH16 and local roads at these interfaces:

- Construction of a new bridge on Riverhead Road over the Kumeū River, just north of its intersection with SH16 Main Road. No temporary diversion roads or permanent realignment of Riverhead Road is expected for these works.
- Construction of a new bridge on SH16 Main Road over the Kumeū River, just west of its intersection with Riverhead Road. A temporary diversion of SH16 will be necessary during the construction of the new bridge to maintain access along SH16, as a state highway corridor. The road will return to its current alignment following construction.
- A new signalised intersection with Access Road, generally in the same location as the existing signalised intersection. During the construction works, the interface with the level crossing of the NAL will need to be carefully managed through the CTMP in coordination with Kiwirail.
- Realignment of SH16 Main Road to the north, between Access Road and 156 SH16 Main Road with temporary effects on property access, on-site and public parking discussed further below.
- Construction of a new bridge on SH16 Main Road over the Kumeū River, near the Kumeū Library. A temporary diversion of SH16 will be necessary between 156 SH16 Main Road and Oraha Road

during the construction of the new bridge to maintain access along SH16, as a state highway corridor. The road will return to its current alignment following construction.

- Construction of a new bridge on the NAL and a new signalised intersection with Tapu Road and Station Road. A temporary diversion of SH16 will be necessary across the NAL during the construction of the new bridge to maintain access along SH16, as a state highway corridor. The road will return to its current alignment following construction.
- Construction of a new bridge on SH16 Main Road over the Kumeū River, near the No. 583 SH16 Main Road. A temporary diversion of SH16 will be necessary during the construction of the new bridge to maintain access along SH16, as a state highway corridor. The road will return to its current alignment following construction.
- Construction of a new bridge on Matua Road (West) over the NAL to a new intersection of SH16 Main Road. This will be a permanent realignment of Matua Road (West). No temporary diversion roads are expected for these works.

There is already congestion and queuing along SH16 Main Road, particularly in the weekday peak periods, but also outside these periods, particularly at weekends and in the summer months, when greater recreational use of the corridor occurs. Due to the expected duration of the SH16 Main Road Upgrade main works period (some 3½ years), there is limited ability to avoid the busiest days or months without substantially increasing the programme, which will only prolong the overall duration of the works required.

However, given the strategic significance of the SH16 Main Road corridor, as well as the current and increasing traffic demands, it is considered that maintaining two-way traffic with a minimum of one lane in each direction along the corridor (including adequate lane widths to accommodate heavy and more occasional over-dimensional vehicles) will be essential to minimise the potential adverse operational effects on this and surrounding corridors. Noting that outside the busier periods (say overnight), there would be the potential for one-way operation through ‘stop/go’ or traffic light control, where necessary for certain construction activities.

Moreover, the current indicative construction methodology and programme identifies a staged programme of works occurring progressively along the corridor from east to west, such that the effects of construction would be restricted to certain sections of SH16 Main Road at any time. This would have effects on immediately adjacent sections, due to lower vehicle speeds through the temporary works and potentially reduced capacity at intersections (during construction), but would reduce the geographical extent of effects to any section being worked on at a given time (i.e. by not having the whole corridor affected at the same time). This extends the duration of works / effects, so some hybrid of works at geographically separate locations simultaneously, could also manage the overall effects on the corridor, whilst expediting the overall duration of the programme.

Notwithstanding the above, it is acknowledged that disruption to typical travel patterns will be inevitable, as part of a significant strategic project of this nature and scale. Taking on board the specific matters identified above, particularly the provision of two-way movement with one lane in each direction along the corridor, it is considered that the effects on the surrounding network will be appropriately managed through a CTMP. These effects would be substantially reduced, should the ASH (NoR1) be implemented in advance of this project, removing a significant volume of traffic from the existing SH16 Main Road corridor through Kumeū and Huapai.

The construction of the NoR S2 corridor will also have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (particularly where both construction and operational effects are identified), some properties have been identified to be included in the proposed designation.

For other properties, appropriate mitigation (during the construction and operational phases) has been identified, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads, which can be implemented through a later CTMP. Where properties are not included in the designation and these properties have been identified to be affected during the operational phase, discussion of these matters was previously addressed in Section 6.

In addition to those properties, it is noted that parking at 1 and 2 Shamrock Drive will be temporarily affected during the construction phase. This is a result of the temporary works associated with the tie-in of the new SH16 Main Road Upgrade to Shamrock Drive. Temporary parking arrangements will be required, as part of the construction phase for these properties. This can be satisfactorily provided for through the CTMP process. Once works are completed on Access Road, the existing parking will be reinstated.

During construction of the SH16 Main Road Upgrade, it is anticipated that there will need to be temporary removal of some on-street car parking within the road reserve. This is primarily along the section of SH16 Main Road, on the north side, between Weza Lane and Access Road intersections. It is currently estimated that around 20 car parking spaces may be impacted during construction. The extent to which parking will need to be temporarily removed, rearranged or relocated will depend on the more detailed construction methodology / approach at the time of implementation. As such, the need to temporarily remove car parking and any temporary mitigation is better considered at that later stage, particularly as the use of these spaces will change over the period of the proposed lapse dates.

To the west of Access Road, on the north side, there is further on-street parking that will be impacted by both the construction and operational phases of the NoR S2 corridor. This has been previously addressed in Section 6.

9.2.3 Rapid Transit Corridor, Regional Active Mode Corridor, including the Kumeū and Huapai Stations

As discussed in Section 9.2.2, the construction of the section of the NoR S2 corridor between Access Road and Oraha Road will need to occur in advance of the construction of the RTC / RAMC (NoR S3) and the Kumeū Station (NoR KS).

The RTC / RAMC Corridor (NoR S3) and the Stations (NoRs KS and HS) will include the following key construction works, which will have effects on the existing SH16 and local roads at these interfaces. It is expected that two-way access will generally be maintained, with potential for one-way working at certain key stages of construction under traffic controls, i.e. temporary stop/go signs or traffic lights:

- If the RTC / RAMC is progressed in advance of the ASH, including BCI, construction of a new bridge on Fred Taylor Drive will be required to allow the RTC / RAMC to pass over the existing Fred Taylor Drive, just south of its intersection with SH16 and Brigham Creek Road. No temporary diversion roads or permanent realignment of Fred Taylor Drive is expected for these works. The road would only be diverted to a new alignment with the construction of the BCI (NoR S1).
- The southern end of Boord Crescent will be permanently realigned further to the north, so access will be maintained. There is the potential that the new alignment could be constructed in advance of closing the existing road, which would enable access to be maintained between the eastern and western parts of Boord Crescent during construction of the RTC / RAMC. This will depend on the more detailed construction methodology / approach at the time of implementation. Should this not be the case, any temporary closure would not noticeably impact travel times for properties on the western side of Boord Crescent and Waitakere Road.
- The northern section of Boord Crescent, just south of the existing NAL level crossing and Trotting Course Drive will be realigned slightly to the east to accommodate the RTC / RAMC. This will need to be constructed to maintain access to the properties on Trotting Course Drive, prior to closure of the level crossing. This was also addressed previously in Section 7, given it is required to maintain permanent access to those properties.
- Construction of the following structures along the RTC / RAMC alignment and at the Stations at interfaces with other local roads and the NAL. It is expected that two-way access will generally be maintained, with potential for one-way at certain key stages of construction under traffic controls, i.e. temporary stop/go signs or traffic lights:
    - New bridge for the RTC / RAMC to pass under Taupaki Road. A temporary diversion of Taupaki Road will be necessary during the construction of the new bridge to maintain access along the road. The road will return to its current alignment following construction.
    - New bridge to connect Boord Crescent with Waitakere Road over the NAL. This will be constructed to provide a new permanent alignment for this connection, avoiding people having to use the existing level crossing of the NAL. No temporary diversion roads are expected for these works.
    - New bridge for the RTC / RAMC to pass over Access Road. No temporary diversion roads or permanent realignment of Access Road is expected for these works.
    - Construction of a new bridge on the NAL and a new signalised intersection with Tapu Road and Station Road for the RTC / RAMC. A temporary diversion of SH16, as a state highway corridor, will be necessary across the NAL during the construction of the new bridge to maintain access along SH16. The road will return to its current alignment following construction. This will only be required, if the RTC / RAMC construction precedes the SH16 Main Road Upgrade, which would otherwise have completed those works.
    - Construction of a new bridge on Matua Road (West) over the NAL to a new intersection of SH16 Main Road will be associated with the Huapai Station (NoR HS) to enable the access road to the Station. This will be a permanent realignment of Matua Road (West). No temporary diversion roads are expected for these works. This will only be required for this project, if the Huapai Station construction precedes the SH16 Main Road Upgrade, which would otherwise have completed those works.

It is acknowledged that disruption to typical travel patterns will be inevitable, as part of a significant strategic project of this nature and scale. However, it is considered that the predominantly offline construction of the RTC / RAMC will manage the potential adverse effects, such that they will occur at these identified interfaces with the surrounding network, where they would be appropriately managed through a CTMP. Noting that as discussed in Section 9.2.2 and above, some segments of the SH16 Main Road Upgrade will actually need to be constructed in advance of, and in order to enable, the delivery of the RTC through Kumeū and Huapai. These are generally the aspects of the RTC that result in the most disruption.

Taking on board the specific matters identified above, and similarly to the NoR S2 corridor with the provision of two-way movement with one lane in each direction along the SH16 corridor, it is considered that the effects on the surrounding network will be appropriately managed through a CTMP. Noting that outside the busier periods (say overnight) on SH16, there would be the potential for one-way operation through 'stop/go' or traffic light control, where necessary for certain construction activities.

The construction of the RTC / RAMC will also have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (particularly where both construction and operational effects are identified), some properties have been identified to be included in the proposed designation.

For other properties, appropriate mitigation (during the construction and operational phases) has been identified, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads, which can be implemented through a later CTMP. Where properties are not included in the designation and these properties have been identified to be affected during the operational phase, discussion of these matters was previously addressed in Section 7.

In addition to those properties, it is noted that parking at 1 and 2 Shamrock Drive will be temporarily affected during the construction phase, as discussed in Section 9.2.2. This is a result of the temporary works associated with the tie-in of the new SH16 Main Road Upgrade to Shamrock Drive, which is required to enable the RTC. This can be satisfactorily provided for through the CTMP process.

The site at 51 Gilbransen Drive, Huapai, has been included in the designation to provide for a construction compound / laydown area for the RTC. Whilst the RTC designation corridor itself could be used for construction access to this site (from the either the east or west), there is the potential that Gilbransen Drive will be used by construction traffic, including heavy vehicles. As Gilbransen Drive is only around 5.5m wide and serves a residential area with the Matua Ngaru School at the southern end (adjacent to 51 Gilbransen Drive), any construction traffic using Gilbransen Drive will need to be carefully managed. It is considered that this could be satisfactorily managed through a later CTMP, through measures such as limiting the type, number, direction of travel and /or time of day / week construction vehicles use Gilbransen Drive.

9.2.4 Access Road Upgrade

The Access Road Upgrade (NoR S4) will include the following key construction works, which will have effects on the existing Access Road and local roads at these interfaces. It is expected that two-way access will generally be maintained, with potential for one-way at certain key stages of construction under traffic controls, i.e. temporary stop/go signs or traffic lights:

- Construction of a new roundabout at the intersection with Station Road. No temporary diversion roads or permanent realignment of Access Road or Station Road is expected for these works.
- Construction of a new bridge on Access Road near 151 Access Road. A temporary diversion of Access Road will be necessary during the construction of the new bridge to maintain access along Access Road. The road will return to its current alignment following construction.

It is acknowledged that disruption to typical travel patterns will be inevitable, as part of a strategic project of this nature and scale. However, taking into account the specific matters identified above, and the intention to maintain access along the corridor, it is considered that the effects on the surrounding network will be appropriately managed through a CTMP.

The construction of the Access Road Upgrade corridor will also have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (particularly where both construction and operational effects are identified), some properties have been identified to be included in the proposed designation.

For other properties, appropriate mitigation (during the construction and operational phases) has been identified, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads, which can be implemented through a later CTMP. Where properties are not included in the designation and these properties have been identified to be affected during the operational phase, discussion of these matters was previously addressed in Section 8.

In addition to those properties, it is noted that driveway access at the following properties will be temporarily affected during the construction phase:

- 79 Tawa Road, Kumeū
- 73 Tawa Road, Kumeū
- 45 Tawa Road, Kumeū
- 43 Tawa Road, Kumeū
- 233 Access Road, Kumeū
- 221 Access Road, Kumeū
- 50, 44, 40, 38, 26 Access Road, Kumeū
- 18 Access Road, Kumeū

This is a result of the temporary works associated with the Access Road Upgrade. Temporary access arrangements will be required, as part of the construction phase for these properties. This can be satisfactorily provided for through the CTMP process. Once works are completed on Access Road, the driveways will be reinstated.

9.3 Recommended Measures to Avoid, Remedy or Mitigate Construction Effects

Generally, it is recommended that the potential construction traffic effects can be accommodated and managed appropriately via a CTMP.

In particular, there are segments of the SH16 Main Road Upgrade that will need to be constructed prior to the RTC / RAMC projects (including the Kumeū and Huapai Stations) to facilitate the later implementation of those projects. Moreover, given the strategic significance of the SH16 Main Road corridor, as well as the current and increasing traffic demands, it is considered that maintaining two-way traffic with a minimum of one lane in each direction along the corridor (including adequate lane widths to accommodate heavy and more occasional over-dimensional vehicles) will be essential to minimise the potential adverse operational effects on this and surrounding corridors.

The construction of the corridors will also have more localised transport effects, such as access, for individual properties or activities. The potential transport effects have been reviewed and for these reasons (particularly where both construction and operational phase effects are identified), some properties have been identified to be included in the proposed designation. For other properties, appropriate mitigation (during the construction and operational phases) has been identified, such as re-grading existing driveways, re-forming / re-locating driveways or providing new private access roads, which can be implemented through a later CTMP.

The site at 51 Gilbransen Drive, Huapai, has been included in the designation to provide for a construction compound / laydown area for the RTC. Any construction traffic using Gilbransen Drive will need to be carefully managed and it is considered that this could be satisfactorily achieved through a later CTMP.

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

1 Appendix 1: Transport Modelling Approach

1.1 Macro Strategic Model

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

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

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

The model itself comprises of the following key modules:

- Trip generation: This is where the number of person-trips are estimated as a function of the land use data (population, employment, school roll etc.)
- Mode Choice: This is where the choice of recommended travel mode is determined, based on the relative costs of the various modes. The MSM modes for mode choice are car (driver and passenger combined) and passenger transport. Trips by car are converted into vehicle trips later in the model. The model also estimates the number of active mode trips, such as walking and cycling, although these are not fully modelled through to link flows.
- Trip Distribution: This is where the trips produced in each zone (generally by households), are matched to a recommended destination. This distribution is predicted as a function of the relative attractiveness for each destination zone and the travel costs to reach each destination.
- Time of Day: This is where the proportion of daily trip making occurring in each period is calculated. These proportions change in response to changes in travel costs to represent peak spreading.
- Trip Assignment: This is where the resulting travel demand, in the form of origin to destination trip tables, are loaded to the road and public transport networks. For the road assignment, an iterative process is used to firstly identify the lowest-cost route between each origin and destination followed by an estimation of the speeds and delays on each route between origin and destination, followed by an estimation of speeds and delays on each route associated with the predicted traffic flows on the route.

1.1.1 General Network Assumptions

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

- All committed developments and respective infrastructure upgrades planned as outlined in the ATAP (Auckland Transport Alignment Project) 2.0 and RLTP (Regional Land Transport Plan) have been coded in the future MSM model
- The access points (MSM zone connectors) for each model option scenarios in the North West Detailed business case areas were reviewed and refined accordingly to reflect the future infrastructure upgrades
- The future local bus services for each model option scenarios, were updated based on inputs from the AT Metro, specifically related to routes, frequencies, bus capacities and bus speeds.
- Following discussions with Waka Kotahi and Auckland Transport, the following strategic interventions have been included in the North West Do Minimum as shown in Figure A1.1.
- SH16 Brigham Creek to Waimauku project currently being delivered by Waka Kotahi.
- Full implementation of the NWRTN from the City Centre to a Brigham Creek station (City Centre to Westgate (CC2W) project). It was agreed with the owners to use the station locations identified in the North West Rapid Transit IBC.
- SH18 Rapid transit corridor between Westgate and Constellation.
- SH16 to SH18 Connections improvements.

Figure A1-1: Map showing Do Minimum projects for the North West DBC

The inclusion of these key inter-dependent strategic projects in the Do-minimum network is to account for the fact that those projects are being developed separately by Waka Kotahi/Auckland Transport, so are not included as part of the Te Tupu Ngātahi improvements package. They are however a key part of the future transport network for the North West so are part of the overall North West response. If these projects were not to occur, the likely impact is greater demands on the projects identified in this assessment. It is noted that the SH16 Brigham Creek to Waimauku project has funding and potential seed funding for the CC2W project has been included in the RLTP as part of the 10 year capital expenditure. All projects are subject to stand alone business case processes. To understand the overall North West response, it is therefore considered appropriate to include these projects in the modelling assessment.

1.1.2 MSM Outputs

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

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

1.2 SATURN

SATURN is a mesoscopic traffic simulation and assignment model used to undertake a variety of area wide strategic assessments through to more detailed local area assessments. It can be used as a conventional model for the analysis of traffic-management schemes over localised networks as well as for major investment improvements at a regional level. The SATURN model ensures factual representation of vehicle flow patterns and congestion on midblock sections and intersections in the form of ‘arrival’ flows rather than ‘demand’ flows. Additionally, it is used as a high-level junction simulation model that evaluates the traffic flow behaviour on junctions. It represents ‘congested assignment’ of multiple user classes modelled separately, including bus priority and high occupancy vehicle lanes. The SATURN model has been peer reviewed.

1.2.1 SATURN Outputs

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

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

1.3 SIDRA

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

The Te Tupu Ngātahi SIDRA model is used to analyse the form and function of proposed intersections along strategic corridors. Based on the demand flow outputs from the SATURN Model, the intersection turning flows are determined.

The performance measures of the intersection in terms of capacity, delay, Level of Service (LOS), queue length on approach lanes and optimum vehicle-pedestrian signal phasing is calculated.

It is noted that the SIDRA model is reliant on outputs from the SATURN model, with traffic distribution based on the network provided in SATURN. A finer grain network that includes all collectors and local roads is not provided in SATURN, and as such it can considered that intersection modelling in SIDRA results in a conservative assumption of performance.

2 Appendix 2: Intersection Modelling Summary

2.1 Alternative State Highway

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted Level of Service (LoS) and anticipated queue lengths. A summary of these key performance measures is shown below in Table A2-1.

A2-1: Summary of Key Intersection Performance 2048 – Alternative State Highway

Intersection (Intersection Control)	Weekday Peak Period	Overall Level of Service	Degree of Saturation	Average Delay (seconds)
Brigham Creek Interchange – East facing ramps (Traffic signals)	Morning Peak	E	0.98	72
	Evening Peak	E	0.98	73
Brigham Creek Interchange – West facing ramps (Traffic signals)	Morning Peak	D	0.91	50
	Evening Peak	D	0.89	53
Tawa I/C – Eastbound ramps (Roundabout)	Morning Peak	A	0.59	4
	Evening Peak	A	0.37	4
Tawa I/C – Westbound ramps (Roundabout)	Morning Peak	A	0.37	9
	Evening Peak	A	0.37	9
SH16 Main Road / ASH (Dual lane roundabout)	Morning Peak	A	0.45	6
	Evening Peak	B	0.84	13

2.2 SH16 Main Road Upgrade

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LoS and anticipated queue lengths. A

Table A2-2: Summary of Key Intersection Performance 2048 – SH16 Main Road Upgrade

Intersection (Intersection Control)	Weekday Peak Period	Overall Level of Service	Degree of Saturation	Average Delay (seconds)
SH16 Main Road / Foster Road (Priority Control)	Morning Peak	A*	0.40	1
	Evening Peak	A*	0.30	1
SH16 Main Road / Matua Road West (Traffic signals)	Morning Peak	C	0.84	28
	Evening Peak	B	0.68	19
SH16 Main Road / Trigg Road (Traffic signals)	Morning Peak	B	0.22	18
	Evening Peak	B	0.33	20
SH16 Main Road / Station Road (Traffic signals)	Morning Peak	D	0.56	40
	Evening Peak	D	0.63	41
SH16 Main Road / Matua Road (Traffic signals)	Morning Peak	C	0.41	22
	Evening Peak	C	0.54	22
SH16 Main Road / Access Road (Traffic signals)	Morning Peak	D	0.56	40
	Evening Peak	D	0.73	39
SH16 Main Road / Riverhead Road (Traffic signals)	Morning Peak	C	0.20	21
	Evening Peak	C	0.23	25

** Note – For priority controlled intersections, there is no overall intersection LoS reported, due to the free-flow traffic conditions along the main road approaches. The LoS for the Foster Road in both weekday peaks was predicted to be LoS A.*

2.3 Access Road Upgrade

The performance of the road network within the Project has been assessed using inputs from SATURN to understand intersection performance. SIDRA enables isolated intersection models to be performed to understand the network capacity, predicted LoS and anticipated queue lengths. A summary of these key performance measures is shown below in Table A2-3.

Table A2-3: Summary of Key Intersection Performance 2048 – Access Road Upgrade

Intersection (Intersection Control)	Weekday Peak Period	Overall Level of Service	Degree of Saturation	Average Delay (seconds)
SH16 Main Road / Access Road (Traffic signals)	Morning Peak	D	0.56	40
	Evening Peak	D	0.73	39
Waitakere Road / Access Road (Priority Control)	Morning Peak	A*	0.20	3
	Evening Peak	A*	0.18	5
Station Road / Access Road (Roundabout)	Morning Peak	A	0.51	7
	Evening Peak	A	0.32	5

** Note – For priority controlled intersections, there is no overall intersection LoS reported, due to the free-flow traffic conditions along the main road approaches. The LoS for the Waitakere Road in both weekday peaks was predicted to be LoS A, but will be influenced by the Access Road intersection.*