TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 4

South Frequent Transit Network Assessment of Transport Effects

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Version 1.0

WAKA KOTAHI
NZ TRANSPORT AGENCY

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Glossary of Defined Terms and Acronyms

We note that 'Takaanini' (with double vowels is used throughout the Report Acknowledging the ongoing kōrero and guidance from Manawhenua on the cultural landscape. 'Takanini' is used where reference is made to a specific and existing named place (e.g., Takanini Road, Takanini Town Centre etc.). Manawhenua is also used throughout the Report as while gifting the programme name as Te Tupu Ngātahi, Manawhenua confirmed this was an appropriate spelling (capital 'M' and one word). Notwithstanding this, the term is spelled as two words in other fora and the proposed designation conditions – Mana Whenua.

Acronym/Term	Description
AEE	Assessment of Effects on the Environment report
AFC	Auckland Forecasting Centre
AMC	Active Mode Corridor
AT	Auckland Transport
ATAP	Auckland Transport Alignment Project
AUP:OP	Auckland Unitary Plan: Operative in Part
CAS	Crash Analysis System
CFAF	Corridor Form and Function
CoPTTM	Code of Practice for Temporary Traffic Management
Council	Auckland Council
CRL	City Rail Link
CTMP	Construction Traffic Management Plan
DBC	Detailed Business Case
DSI	Death or Serious Injury
FDS	Future Development Strategy
FTN	Frequent Transit Network
FULSS	Future Urban Land Supply Strategy
FUZ	Future Urban Zone
GPS	Government Policy Statement
IBC	Indicative Business Case
KiwiRail	KiwiRail Holdings Limited
LCSIA	Level Crossing Safety Impact Assessment
LDS	Latter-day Saints
LOS	Level of Service
MDRS	Medium Density Residential Standards

Acronym/Term	Description
MSM	Macro Strategic Model (regional multi-modal model)
NIMT	North Island Main Trunk rail line
NPS	National Policy Statement
NPS-UD	National Policy Statement on Urban Development
NoR	Notice of Requirement
NoR 1	Notice of Requirement 1: Great South Road FTN Upgrade
NoR 2	Notice of Requirement 2: Great South Road Upgrade (Drury section)
NoR 3	Notice of Requirement 3: Takaanini FTN – Weymouth Road, Alfriston Road and Great South Road Upgrades
NoR 4	Notice of Requirement 4: Takaanini FTN - Porchester Road and Popes Road Upgrades
NZ	New Zealand
NZUP	New Zealand Upgrade Programme
PBC	Programme Business Case
PC78	Plan Change 78
PT	Public transport
RASF	Roads and Streets Framework
RMA	Resource Management Act 1991
RTN	Rapid Transit Network
SAMM	Strategic Active Mode Model
SATURN	Simulation and Assignment of Traffic to Urban Road Networks model
SH1	State Highway 1
SIDRA	Signalised/ unsignalised Intersection Design and Research Aid model
SME	Subject matter experts
SSCTMP	Site-Specific CTMP
SSTMP	Site-Specific Traffic Management Plan
TERP	Transport Emissions Reduction Pathway
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
TDM	AT's Transport Design Manual
TLC	Takaanini Level Crossings Project
VKT	Vehicle Kilometres Travelled
vpd	Vehicles per day
vph	Vehicles per hour

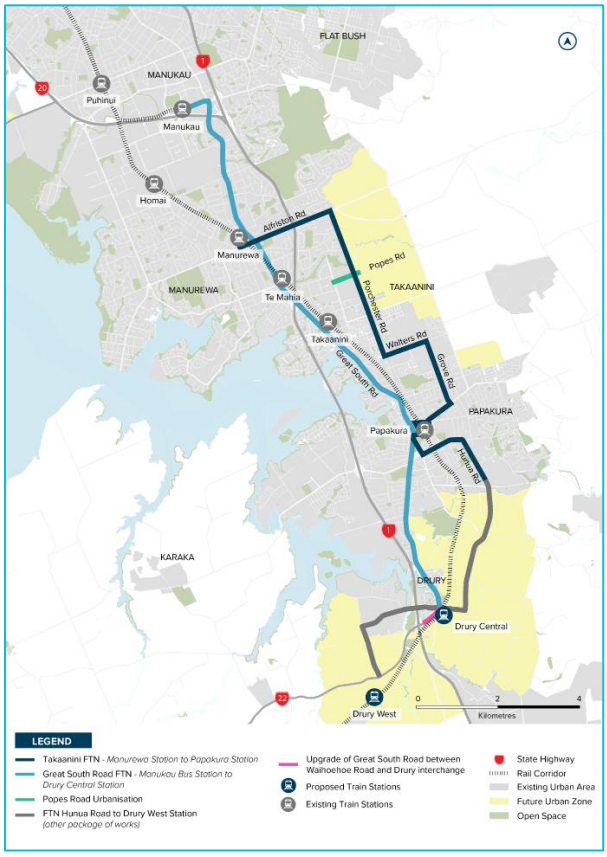
Acronym/Term	Description
Waka Kotahi	Waka Kotahi New Zealand Transport Agency
Zero Carbon Act	Climate Change Response (Zero Carbon) Amendment Act 2018

Executive Summary

Overview

This Assessment of Transport Effects report (this Report) has been prepared to inform the Assessment of Effects on the Environment Report (**AEE**) for the four Notices of Requirement (**NoRs**) being sought by Auckland Transport for the South FTN (the **Project**) under the Resource Management Act 1991 (**RMA**). The notices are to designate land for future arterial corridors to enable the future construction, operation, and maintenance of transport infrastructure in South Auckland including Takaanini, Papakura and Drury. Specifically, this report considers the actual and potential effects associated with the construction and operation of the Project 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.

The Project proposes upgrades to enable the operation of high-quality Frequent Transit Network (**FTN**) bus services along two routes: Great South Road FTN and the Takaanini FTN (see figure below). In addition to this FTN function, the Project also proposes active mode (walking and cycling) improvements along both routes. Alongside the FTN upgrades, the Project also incorporates the urbanisation of key connections in the South transport network – Popes Road and the Drury section of Great South Road.



South FTN - overall extent

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 demands and network performance; and
- Alignment with policy documents.

An assessment of each key element of the transport system has been undertaken including effects on safety, different modes, parking, and property access.

As this Project is not funded for immediate delivery, the assessment has been undertaken considering the likely future receiving environment that includes planned or expected changes to the existing land use and transport environment. Specifically, this includes urban growth as indicated in the Auckland Unitary Plan. To define this future transport environment and identify the changes resulting from the Project, a range of different transport modelling tools have been used to undertake quantitative assessment of the transport system as a whole. The impacts of the Project on the future transport

environment are assessed using forecasting transport models, owned by the Auckland Forecasting Centre (**AFC**)[1].

The main assessment of transport operational effects is based on a 2048 forecast year horizon. This aligns with the available regional models and represents the long-term future environment, providing a better understanding of the intergenerational nature of the infrastructure investment.

Approach to Assessment of Construction Effects

Based on the indicative construction methodology, an assessment of construction effects has been completed for the Project sufficient to support each NoR. This assessment considers:

- Potential impacts to traffic, public transport, pedestrians and cyclists and property access; and
- Potential conflict areas with vulnerable road users that will need specific mitigation.

The impact of any temporary traffic management measures implemented to undertake the Project will be re-assessed to validate this assessment in the future, prior to construction, when a greater level of detail is available in terms of the specific construction methodology, the surrounding land use and the prevailing traffic environment.

The construction effects are based on a 2038 forecast year horizon that aligns with the likely timeframe of construction of the Project.

Existing Transport Environment

The existing public transport service is limited especially for areas not within close proximity to rail. In addition, the current FTN service along Great South Road already experiences poor reliability and travel time due to traffic congestion, leading to poor customer experience. Further, current cycling facilities are in most parts either missing or deficient and footpaths are often deficient. This leads to limited opportunity to accommodate growth in a safe and sustainable manner.

Furthermore, the existing Hingaia stream has insufficient vertical clearance for a 1 in 100-year flood event, and thus is prone to flooding in a heavy rainfall event.

Future Receiving Transport Environment (without the Project)

South Auckland is anticipated to undergo significant urban growth and with the recent policy changes,[2] further growth and intensification can happen. There are a number of key future transport projects planned, including additional rail capacity between Pukekohe and Papakura, higher train frequencies post-City Rail Link (**CRL**) implementation, removal and upgrade of the Takaanini level crossings and upgrade of the Mill Road corridor. These are inadequate to provide for the planned growth especially for areas not serviced by the rail.

Thus, the future environment is not fit for purpose and the planned growth will only exacerbate the existing issues further. This includes:

[1] The AFC is jointly owned and operated between Auckland Council, Auckland Transport and Waka Kotahi.
[2] These include Medium Density Residential Standards (**MDRS**) and Plan Change 78 (**PC 78**) which enables higher density developments within walking distance of centres and rapid transit stations.

- Poor public transport reliability and accessibility especially along existing frequent transit routes (i.e. Great South Road) leading to a continued over-reliance on private vehicles for local travel and restricting access to the rail network;
- Continued lack of transport choices including that of active modes, further fueling private vehicle use inconsistent with mode shift goals. This will also consequentially result in transport emissions and missed opportunities to provide for healthier communities and sustainable travel as growth occurs;
- Lack of high-quality public transport for existing and new urban areas, resulting in deteriorating accessibility to economic and social opportunities;
- Increased safety risk as growth occurs leading to increased death and serious injuries (**DSIs**) including that for vulnerable road users. This further discourages active mode uptake as it remains unattractive and unsafe; and
- Flood risk at existing stream bridges (i.e. the Hingaia Stream bridge, Slippery Creek Bridge) that has the potential to result in bridge damage, subsequently causing traffic disruptions.

Summary of Assessment of Effects and Recommendations

Overall, the assessment notes the Project will have significant positive effects especially for public transport and active modes and the potential adverse operational and construction effects can be managed appropriately. The following provides a summary of the effects.

Summary of Positive Effects

Table below provides summary of the positive effects for the Project.

Summary of positive effects

Positive Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridor resulting in improved protection for vulnerable road users. Consequentially, reduction in DSIs. • Improved integration with existing and planned facilities on the network resulting in improved connectivity. • Environmental and health benefits due to the uptake of active modes. • Removal of several left turn slip lanes across the corridor improving safety for walking and cycling. • Support growth in a sustainable manner. • Improved choice of travel modes, both to local destinations and to the public transport network. • Improved road crossing facilities due to traffic signal control at key intersections.
Public Transport	• Better quality, frequency and reliability for PT along the FTN routes improving its attractiveness. • Better access to the wider PT (rail) network. • Improved access to employment and social amenities via public transport. • Increase in public transport choice and resilience for the community especially in the event the rail line is full or closed. • Support growth in a sustainable manner.
General Traffic	• The provision of the project supports wider network outcomes. In particular, improved public transport provisions and reduced VKT.

Positive Effects	
	• Improved driver safety with the conversion of priority-controlled intersections to either roundabout or signals. • Provision of more effective and reliable travel on GSR near the Drury interchange due to provision of additional lanes between adjacent traffic signals. • Increased flood resilience of stream bridges as they are upgraded to 1 in 100-year flood resilience, thereby minimising traffic disruptions in the event bridges are damaged in a flooding event.
Freight	• Improved operations along Popes Road, a key freight route servicing the Takaanini industrial area and on Great South Road, Drury with the proposed intersection upgrade and additional lanes on Great South Road.

Summary of Operational and Construction Effects and Recommendations

Table below provides a summary of potential operational and construction effects identified and recommendations.

Summary of Assessment of Effects and Recommendations

NoR	Effect	Assessment	Recommendation
Operational Effects			
Project wide	Existing property access arrangements are impacted by the Project	There are a number of existing accesses that will be impacted as part of the Project. The intention is to continue to provide property access, however due to the uncertainty of specific design detail and the adjacent land use at the time of implementation, it is not currently possible to determine the appropriate treatments. The best time will be during detailed design and prior to construction.	For each of the designations, a condition is included to demonstrate (in the Outline Plan) how safe access will be provided for each existing access that is altered by the Project.
Construction Effects			
1	Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Slippery Creek bridge closed during construction. This will impact the existing 365 bus route which services the community between Settlement Road and Sutton Road. A detour will require buses to bypass this section entirely, reducing accessibility to public transport. Other parts of the future bus network could also be temporarily impacted by construction activities.	The required development of the Construction Traffic Management Plan (**CTMP**) prior to construction needs to : • Consider how public transport will be maintained for the community if the Slippery Creek bridge is to be closed for construction. This may include providing for additional or altering services to serve the affected communities. This requirement also applies to other bus routes that could
1	Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Slippery Creek bridge closed during construction. The detour will	

NoR	Effect	Assessment	Recommendation
		be 7km which is over an hour via walking. This is considered to be significant.	be impacted by construction activity. • Consider how active mode connectivity is maintained across Slippery Creek during construction. • Consider maintaining connectivity across Slippery Creek Road during construction if Mill Road and/or Opaheke N-S arterial is not yet in the network. If one or more is in the network, whether the connection is required should be reviewed at the time.
1	Network resilience impacts	Great South Road is a key north south corridor through this section and is a key alternative to SH1. With limited north-south corridors available, network resilience will be compromised if the Slippery Creek bridge is closed during construction. However, noting that construction will be in the future, its role on the network may change and will be dependent on whether the likes of Mill Road and / or Opaheke N-S arterial are in the network.	
3	Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Alfriston Road bridge closed. This will impact the existing bus route which services the community. It is also noted this is a key bus route into the Manurewa bus and train interchange.	The development of the CTMP prior to construction needs to consider how a connection may be maintained for all modes across Alfriston Road bridge.
3	Wider network impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. The likely detour route is likely to constrain existing corridors and have a flow on effect on the wider network. Further, Alfriston Road is a key east-west connection on the network.	
3	Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. As this is a key link into the Town Centre and is a 'Major' cycle route, connectivity is recommended to be maintained.	

In summary, all adverse operational and construction effects can be managed appropriately.

1 Introduction

1.1 Purpose and scope of this report

This report has been prepared to inform the Assessment of Environmental Effects (**AEE**) for Notices of Requirement (**NoR**) being sought by Auckland Transport (**AT**) for the South Frequent Transit Network (**South FTN**) under the Resource Management Act 1991 (**RMA**). Four NoRs are proposed to authorise transport upgrades along key sections of roads which fall within the South FTN network.

Specifically, this report considers the actual and potential effects associated with the construction and operation of the Project and NoRs 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.

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

1.2 Report Structure

In order to provide a clear assessment of the NoR, this report follows as appropriate, the structure set out in the AEE. This report contains an assessment of the actual and potential effects of the localised areas within the wider extent and for the four NoRs. Where appropriate, measures to avoid, remedy or mitigate effects are recommended. The sections of this report are arranged accordingly. **Table** 1-1 below provides an overview of the report structure and where the description of effects can be found in this report.

The report follows a nested structure:

- Part A covers assessment of the Project as a whole; and
- Part B covers assessment of each of the four proposed NoRs; this covers items specific to each NoR that are not already addressed in Part A.

Table 1-1: Report Structure

Report Part #	Report Section #	Extent Assessed (Route and/or NoR)
A	4	Whole of Project
B	5	NoR 1: Great South Road FTN Upgrade
	6	NoR 2: Great South Road Upgrade (Drury section)
	7	NoR 3: Takaanini FTN – Weymouth Road, Alfriston Road, and Great South Road Upgrades
	8	NoR 4: Takaanini FTN – Porchester Road and Popes Road Upgrades

2 Project Description

2.1 Context – South FTN network

As described further in the AEE, the South FTN is one of the transport works packages proposed for South Auckland between Manukau and Drury as part of Te Tupu Ngātahi Supporting Growth's (**Te Tupu Ngātahi**) programme[3]. The South FTN is in turn part of a wider planned multi-modal transport network intended to support growth and enable mode shift in South Auckland.

The South FTN comprises a range of road upgrades including bus priority measures, new and upgraded active mode facilities, and intersection improvements along existing arterial road corridors in South Auckland. In particular, the proposed road upgrades provide for:

- Operation of high-quality FTN[4] bus services along Great South Road between Manukau and Drury (the Great South Road FTN route);
- Operation of high-quality FTN bus services along existing roads between Manurewa, Takaanini, and Papakura (the Takaanini FTN route); and
- Urbanisation of adjoining key connections to FTN routes – Popes Road West, and the Drury section of Great South Road between Waihoehoe Road and State Highway 1 (**SH1**).

The total extent of the South FTN network is shown in Figure 2-1.

[3] The Programme is a collaboration between Auckland Transport (**AT**) and Waka Kotahi NZ Transport Agency (**Waka Kotahi**) to investigate, plan, and undertake route protection for the strategic transport networks needed to support Auckland's growth over the next 30 years.
[4] FTN services are defined in AT's Regional Public Transport Plan (**RPTP**) as bus routes operating at least every 15 minutes between 7am-7pm, 7 days-a-week, often supported by priority measures such as bus or transit lanes.

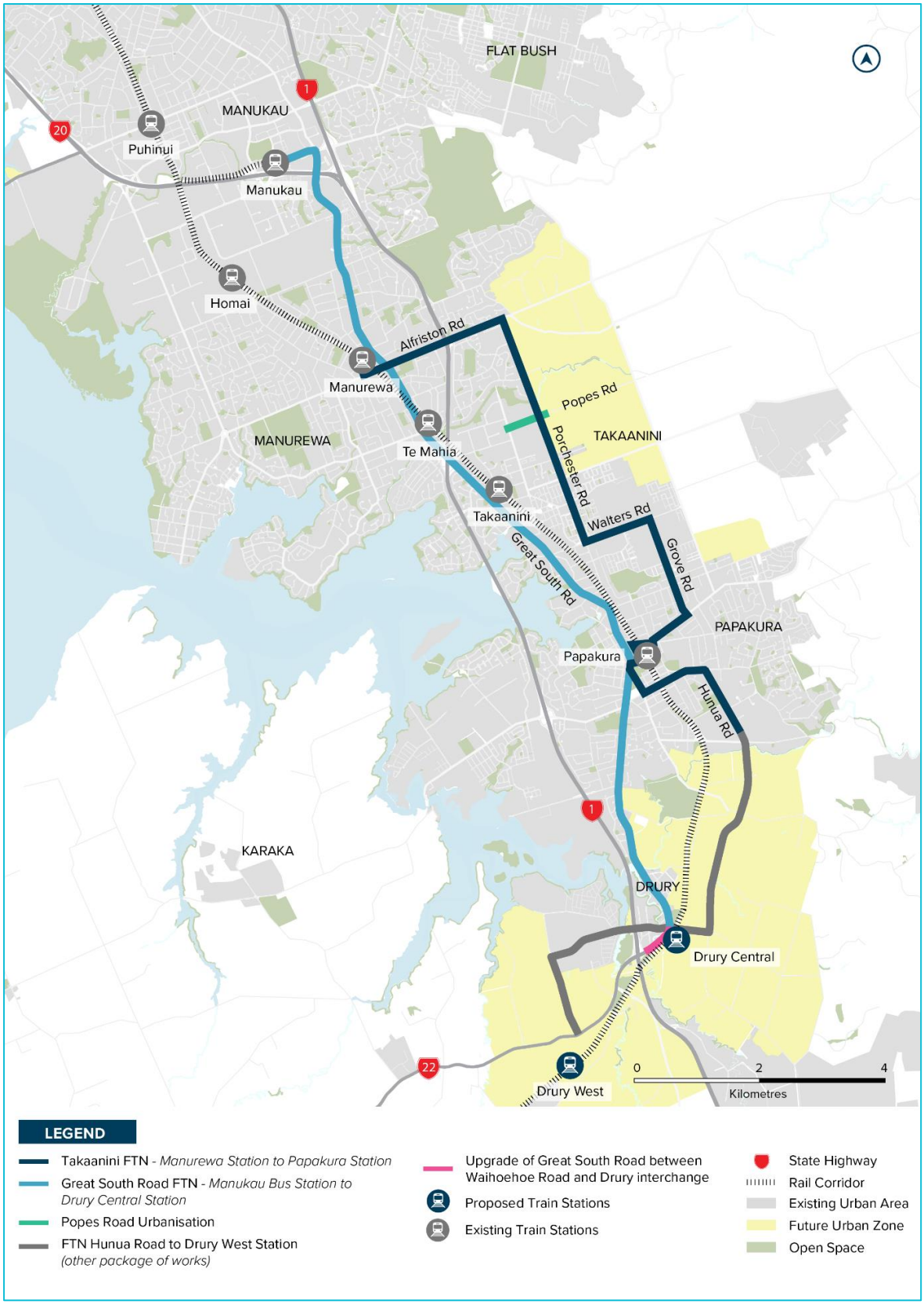


Figure 2-1: South FTN – overall project extent

2.2 The NoRs – proposed spatial extent

Of the full South FTN network extent shown in Figure 2-1, only a portion falls within the NoRs (see Figure 2-2). This is because the proposed corridor upgrades do not always require additional land take, can be undertaken within the existing road reserve, and therefore do not require new designations[5].

Accordingly, this assessment is focussed on the activities proposed to be authorised by the four NoRs. The NoRs seek generally to provide for road widening to accommodate bus priority measures, walking, and cycling facilities, key intersection upgrades, replacement of existing bridges and other associated works. These are described in more detail in Table 2-1, and the extents are shown in Figure 2-2**.**

Further detail on the proposed activities and works in each NoR are provided in the AEE.

Table 2-1: Summary of the proposed Project

NoR reference	Project component	Description
NoR 1	Great South Road FTN Upgrade	• Road upgrades and transport upgrades providing for the Great South Road FTN route along Great South Road between Manukau and Drury. • NoR comprises eight separate areas along Great South Road (Figure 2-2) providing for bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of the existing Otūwairoa / Slippery Creek bridge, and stormwater management devices.
NoR 2	Great South Road Upgrade (Drury section)	• Road upgrades and transport upgrades providing for upgrade of a 520m section of Great South Road in Drury between Waihoehoe Road and the SH1 Drury Interchange. • NoR enables road widening to provide for four lanes, active mode facilities, replacement of the existing Hingaia Stream bridge, and stormwater management devices.
NoR 3	Takaanini FTN – Alfriston Road Upgrade	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Weymouth and Alfriston Roads between Selwyn Road and Saralee Drive; and for an adjoining section of the Great South Road FTN route between Halver Road and Myers Road. • NoR enables road widening to accommodate bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of existing bridges along Weymouth Road over the North Island Main Trunk (**NIMT**) and Alfriston Road over SH1, and stormwater management devices.
NoR 4	Takaanini FTN – Porchester Road and	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Porchester Road generally between Alfriston Road and Walters Road; and for the urbanisation of Popes Road generally between Takanini School Road and Porchester Road.

[5] Some limited additional third-party land may be required in the future to provide for intersection upgrades between Takaanini and Ōpaheke. The relative cost-benefit assessment of these areas did not favour route protection at this time given the projected time scale for future urban growth in this area.

NoR reference	Project component	Description
	Popes Road Upgrades	• NoRs provide for urbanisation of both corridors – two traffic lanes, walking and cycling facilities, key intersection upgrades, and stormwater management devices.

Figure 2-2: South FTN – proposed NoRs

3 Assessment methodology and parameters

3.1 Preparation for this report

A series of business cases and public engagement activities have been undertaken for Te Tupu Ngātahi Supporting Growth Alliance (**Te Tupu Ngātahi**), in South Auckland, including these FTNs and key connections. This package of works has been developed over several years as part of a wider programme of transport initiatives needed to support the growth in this southern part of Auckland. These include:

- Transport for Future Urban Growth Programme Business Case (2016) (**PBC**);
- South Indicative Business Case (2018) (**IBC**);
- South FTN and Key Connections Detailed Business Case (2023) (**DBC),** which sets out the case for route projection for the Project (which is the subject of this assessment); and
- Takaanini Level Crossings Detailed Business Case (2022) (**TLC DBC**), which was undertaken in parallel to the South FTN and Key Connections DBC.

A detailed description of how the Project was developed is provided in the main AEE (and alternatives assessment).

Several resources were used to support the Assessment of Transport Effects, including:

- Modelling inputs for operational effects (which are discussed in **Section 3.2.3.2** below);
- A Construction Method Statement provided for the Project (summarised in the AEE), which was used to assess the actual and potential transport effects of the construction of the Project; and
- Crash data (Waka Kotahi Crash Analysis System).

In addition, site visits have been undertaken through the development of the DBC and for this report. Workshops with other relevant technical specialists were undertaken through the process.

3.2 Methodology

3.2.1 Overview

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

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

The assessment of transport effects has two elements:

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

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

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

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

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

3.2.2 Assessment Parameters

3.2.2.1 Assessment years

The implementation timeframe and phasing for the project is currently unknown at this stage and the timing and extent of future urban development is similarly uncertain (due to uncertainty of funding availability). Implementation could be in 10 or even 15 years' time and as such the following horizons for construction and operational effects have been adopted for assessment purposes:

- **Construction effects** of the Project are assessed in the context of the land use and transport environment as it is assumed to exist in 2038. A 2038 assessment scenario is considered the likeliest time for construction to occur (from the available scenarios), and ensures that some future contextual changes are accounted for; and
- **Operational effects** of the Project are assessed in the context of the land use and transport environment as it is assumed to exist in 2048+. This longer-term scenario has been adopted to ensure that the maximum extent of impacts are assessed for a period beyond initial implementation, as well as to capture the inherently longer-term positive effects associated with large-scale infrastructure.

These model years have been assessed under scenarios where the Project is included in the network, and where it is excluded.

3.2.2.2 Scope of Project Assessed

As noted in Section 2 above, designations are only sought for some sections along the route of the proposed transport projects where additional property is required. The transport projects have been developed as route treatments, including physical works within the existing road reserve where additional property is not required and the proposed works are generally already permitted (and where no designations are therefore sought). The operational transport effects have been assessed

for the whole route treatments, not just for the isolated sections where NoRs are sought. This is because the outcomes sought for improved public transport, walking and cycling routes would not be realised if implemented solely within those NoR sections. While some elements of the Project could be implemented within the existing road reserve without the NoRs, the Project objectives would not be realised and the outcomes are expected to be significantly lower, due to inconsistent and incomplete bus, walking and cycling routes. Travel patterns and outcomes from a transport intervention can occur across a much wider area than just the physical extent of the intervention, such as diversion of traffic within the wider network. Elements with these potential wider-network impacts have been assessed from a network-perspective, not isolated to the NoR sections. This approach of assessing the whole-route intervention from a network-wide perspective is therefore considered appropriate to assess the transport outcomes that will be enabled by these NoRs.

3.2.2.3 Assessment detail and context

The assessment is intended to support long-term route protection, rather than imminent implementation. The following stages would need to be undertaken prior to implementation:

- Business Case for implementation, including any concept design review / update to contemporary information or standards;
- Updated transport modelling;
- Detailed design;
- Consent applications; and
- Construction planning and approvals.

Given the above, the NoRs are based on concept-level designs only and rely on outline plans of work, conditions, and future management plans to confirm design detail and manage local effects. As such, the NoRs:

- Make greater use of generic cross-sections and design standards;
- Focus more on desired outcomes and full-build footprints;
- Take a longer-term view, with its inherent uncertainties; and
- Assume more use of recommended management plans and planning processes rather than specific design details to manage the potential effects.

3.2.3 Approach to assessment of operational transport effects

Potential operational transport effects are assessed by:

- Testing alignment with policy documents (see section 3.2.3.1);
- Transport planning assessment of expected outcomes and effects; and,
- Transport modelling to inform demands and network performance (see section 3.2.3.2).

3.2.3.1 Transport guidance and documents

Assessment of the Project against the relevant objectives and policies of the Auckland Unitary Plan: Operative in Part 2016 (**AUP:OP**) is contained within the AEE. Within this Report, the Project has also been considered against the outcomes and objectives of applicable transport design guidance and policy directives including:

- AT's Transport Design Manual[6] (**TDM**), which sets out outcomes, engineering design and construction requirements for the Project;
- AT's Vision Zero, and the Waka Kotahi Road to Zero policy, which adopt a "Safe System" approach to focus on road safety for all road users;
- AT's Auckland Network Operating Plan[7] which sets out how the transport network should be operated at different times of day for the different transport modes;
- AT's Roads and Streets Framework (**RASF**) which was used to qualitatively assesses the typology (movement and place value) and modal priority for each corridor; and
- Government Policy Statement (**GPS**) on land transport policy priorities.[8]

3.2.3.2 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 tools inform decisions about planning the transport network, corridors, and intersections. These, or similar, tools were used in the DBC to develop the recommended Project, with further refinement of the project design and the tools undertaken for this AEE.

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

- The regional multi-modal model (**MSM**). This 2-hour model 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 per recent Auckland Transport Alignment Programme (**ATAP**) planning, with project-specific inputs in the study area;
- A local traffic model (Simulation and Assignment of Traffic to Urban Road Networks (**SATURN**))**.** This 1-hour model uses the traffic demands from MSM on a more detailed representation of the road network. This model is the main tool used to estimate potential changes in traffic flows and road network performance because of the Project;
- A strategic active modes (walk/cycling) model (**SAMM**). This tool gives strategic-level estimates of walking and cycling demands, including those expected to be induced because of the Project, at a daily level; and
- Intersection models (Signalised/ unsignalised Intersection Design and Research Aid model (**SIDRA**)) at key locations. These 1-hour models were used to check concept designs and report the expected intersection performance at key locations. SIDRA models use expected traffic flows at key locations from the SATURN model. In addition to modelling software, Crash Analysis System (**CAS**) data has also been extracted to determine crash rates over the past five years on existing corridors. The purpose of extracting this data was to assess trends in the existing environment and signify the importance of change required to mitigate any existing patterns.

The assessment of operational effects is informed by modelled estimates of travel and network performance for a future full build-out scenario. Each of the models used (except the small, localised SIDRA models), have been subject to a review process, in relation to general model function.

[6] Auckland Transport, Transport Design Manual, 2021 update: Transport Design Manual (at.govt.nz).
[7] Auckland Transport, Auckland Network Operating Plan, version 3, 2020.
[8] Te Manatū waka (**MoT**), Government Policy Statement on land transport 2021, (published September 2020).

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

Land use forecasts have inherent uncertainty, in terms of the specific rate of new growth in particular areas. Currently, there is additional uncertainty around the likely outcomes and rate and location of higher-density development sought through central Government policies such as the National Policy Statement on Urban Development (**NPS-UD**), which directs councils to enable higher density development within walking distance of centres and rapid transit stations (via policy 3c); as well as widespread medium density development through implementing the Medium Density Residential Standards (**MDRS**). The specific planning response to those policies is currently being progressed by Council through proposed Plan Change 78 (**PC78**). A possible corollary of PC78 is the possible reprioritisation of future development areas by the Council through its Future Development Strategy (**FDS**), which is in draft at the time of preparing this report.

Revised land use forecasts reflecting any expected changes from PC78 and the FDS were not available at the time of preparing this assessment. However, it is generally considered that the Project is not inconsistent with such policy direction, regarding supporting higher density urban development in the existing brownfields, particularly around the NIMT. Given this context, the use of those available I11.6 forecasts is considered acceptable for this assessment.

The potential for the Project to generate diversion of traffic to other routes or corridors was primarily assessed via the traffic models, albeit augmented by local knowledge of the area and data on existing behaviour and network issues. Although the transport models include detailed assessment of three weekday peak periods (morning and evening commuter peaks plus the interpeak), the assessment has focused on predicted change in daily[9] flow to better reflect sustained change, rather than impacts that could be more fleeting during peak periods. Daily flows can be a useful measure of a range of traffic effects, including noise, amenity, safety, and likely congestion. The assessment of effect on potential network delay did consider each peak period.

For traffic modelling analysis at key intersections, level of service (**LOS**) metrics were used to quantify the potential change in system efficiency (for vehicles) because of the Project. LOS is a qualitative measure used to explain the quality of motor vehicle traffic service. LOS is used to analyse roads and intersections by categorising traffic flow and assigning quality levels to traffic based on a performance measure ranging from A to F. These are summarised as follows:

- **LOS A:** free flow. Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes;
- **LOS B:** reasonably free flow. LOS A speeds are maintained, manoeuvrability within the traffic stream is slightly restricted;
- **LOS C:** stable flow, at or near free flow. Ability to manoeuvre through lanes is noticeably restricted and lane changes require more driver awareness;
- **LOS D:** approaching unstable flow. Speeds slightly decrease as traffic volumes slightly increase. Freedom to manoeuvre within the traffic stream is much more limited and driver comfort levels decrease;

[9] Weekday daily traffic flows were estimated as a weighted aggregation of the three peak periods.

- **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; and
- **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.

It is important to note that the transport modelling is used to inform, rather than act as a pure basis for, decisions on the design and planning of the transport network, corridors, and intersections.

Given the above, the assessment did not define minimum LOS standards to be met at intersections. Rather, the LOS measures were generally used to easily identify the likely performance of key intersections, and more importantly the potential change because of the Project.

3.2.3.3 Modelling uncertainties

As with any modelling, there are uncertainties that result from the assumptions made. These assumptions are based on the best information available at the time, however changes in the future may occur which will mean the assumptions made today may no longer be relevant. This could potentially result in an over or under estimation of the projected growth and demand. However, what is presented in this document is a snapshot based on the best current knowledge at hand. Sensitivity tests around the rate of growth were undertaken of the DBC assumptions.

3.2.4 Assessment methodology – transport elements

Table 3-1 summarises how the operational effects resulting from the Project have been assessed for each component of the transport network.

Table 3-1: Summary of assessment methodology

Network Component	Information Source	Assessment Method
Safety	CAS Database Project design drawings, modelled network-reduction in total vehicle travel	Assessment to determine alignment with Vision Zero and Road to Zero standards, design compliance with Transport Design Manual and network-wide estimate in reduced crashes from less vehicle travel.
Public Transport (PT)	Transport Model tools (**MSM**) SGA Remix File[10]	Quantification of expected change in accessibility, mode share and PT travel, including on other parts of the PT network.
Walking and Cycling	Walking and Cycling Network Plans Proposed cross sections Model forecasts of change in active model travel from Project	Assessment to determine alignment with walking and cycling strategic documents and design compliance with Transport Design Manual. Estimation of uplift in walk and cycle travel, including potential associated reductions in vehicle travel.
General Traffic	Transport Model tools: MSM (wider transport effects), SATURN (localised	Assessment using key model outputs including traffic volumes, levels of service for corridor midblock performance and intersection

[10] SGA Remix file provided by Auckland Transport, June 2022, showing draft bus network plan to be implemented by 2038

Network Component	Information Source	Assessment Method
	assessment) and SIDRA (changes in intersection efficiency at key locations) Project design drawings	performance. Assessment of surrounding network connections and the impact on the strategic network.
Property access	Engineering Standards Project design drawings	Assessment identifying where there is a potential effect on access in the existing environment.
Parking	Engineering Standards and existing on-street parking provisions	Assessment identifying where there is a potential effect on both on-street and on-site (private) parking in the existing environment. Alignment with the draft Auckland Parking Strategy[11].
Freight	Auckland Strategic Freight Network Plan, traffic models	Assessment to determine alignment with the Auckland Strategic Freight Plan and to identify any potential effect on the freight movements and over dimension/ overweight routes.
Note: A Road Safety Audit and Safe System assessment will be completed as part of the implementation business case / detailed design stage, prior to implementation, and have not been undertaken during this route protection phase.		

3.2.5 Approach to assessment of construction effects

3.2.6 Construction traffic effects

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

The impact of any temporary traffic management measures implemented to undertake the Project 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, land use context and prevailing traffic environment.

The assessment in the future should 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; and
- Assessment of potential conflict areas with vulnerable road users that will need specific mitigation within a Construction Traffic Management Plan (**CTMP**) and / or Site-Specific Traffic Management Plans (**SSTMP**).

The assessment within this report takes a high-level approach in considering the above to provide some guidance and understanding of the potential impacts. As noted, any impact will need to be refined in the future when greater detail is available, which will occur as part of the CTMP preparation.

[11] Auckland Parking Strategy, ' Room to Move', May 2023.

3.3 Existing and Future Land Use environment

The existing and anticipated future environment is further discussed in the accompanying AEE. In summary, the implementation timeframe for the Project has yet to be confirmed but is likely to be in approximately 10-15 years' time subject to funding availability. The assessment considers the effects of the Project at both the existing environment (as it exists today) and the likely future (planned) environment which consider potential urban development and intensification sought under PC78.

The Project will be constructed and will operate in the existing urban environment or planned environment (i.e. what can be built under the existing AUP:OP live zones):

a) **Existing environment:** The corridors are situated primarily within existing urban areas with live zoning including residential, commercial, and open space zones. There is some Future Urban Zone land in the wider area to the northeast/east. The existing activities within the area are generally reflective of the existing underlying zoning; and
b) **Planned environment:** The planned environment is anticipated to remain urban and comprised of similar activities as the existing environment. The density of residential development is however anticipated to change and increase in future. In particular, this includes in the residential zones around Te Mahia and Takaanini stations, in line with the implementation of the NPS-UD in the AUP:OP. The remaining residential areas will experience an uplift of density through the implementation of the MDRS through the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021. Plan Change 78 (notified at the time of assessment) seeks to give effect to the NPS-UD and incorporate the MDRS into residential zoning. It is noted that there are some areas of existing residential zoned land (particularly east of the NIMT) that have recently been intensified (i.e., new builds), as such are unlikely to change in the near future.

The likelihood and magnitude of land use change regarding the land use planning context has been identified in Table 3-1 below. This has been used to inform the assumptions made on the likely future environment.

Table 3-2: South FTN – existing and future environment

Land Use	Current AUP:OP Zoning	Likelihood of Change for the environment[12]	Magnitude of potential change	Likely Receiving Environment[13]
Residential[14]	Residential (Mixed Housing Suburban)	Low - Moderate[15]	Low - Moderate	Residential
	Residential (Mixed Housing Urban)	Low - Moderate[16]	Low - Moderate	Residential
	Residential (Mixed Housing Suburban and Urban) around train stations	Moderate	Moderate - High	Residential and Commercial/Retail[17]
Business	Business (Heavy Industry)	Low	Low	Business (Industrial)

[12] Based on AUP:OP zoning/policy direction.
[13] Based on AUP:OP zoning/policy direction.
[14] Based on the NPS-UD and MDRS, these residential areas are likely to experience increased density.
[15] There are areas of existing Residential Zone land that has recently been intensified (i.e. new build developments), as such is unlikely to change in the near future.
[16] There are areas of existing Residential Zone land that has recently been intensified (i.e. new build developments), as such is unlikely to change in the near future.
[17] Note that much of the commercial operations between Manuia Road and Taka Street occur on residentially zoned land.

Land Use	Current AUP:OP Zoning	Likelihood of Change for the environment[12]	Magnitude of potential change	Likely Receiving Environment[13]
	Business (Light Industry)	Low	Low	Business (Industrial)
	Business (Neighbourhood Centre)	Low	Low	Business (Neighbourhood Centre)
	Business (Town Centre)	Low	Low	Business (Town Centre)
Open Space	Informal Recreation	Low	Low	Informal Recreation
	Community	Low	Low	Community
Greenfield areas	Future Urban	Low - Moderate	High	Urban

Further discussion on the scale and uncertainty of future growth is provided in Section 3.6.1.

The existing and likely future transport environment relating to each of the proposed NoRs are discussed in the relevant sections below.

3.4 Existing and Future Receiving Transport Environment

This section describes the existing and future receiving transport environment without the Project. The existing and future land use is described above and is not repeated here. The subsequent sections describe the effects of the Project on that future receiving environment.

3.5 Existing Environment

3.5.1 General Traffic

The existing road network around the Project area is shown in Figure 3-1.

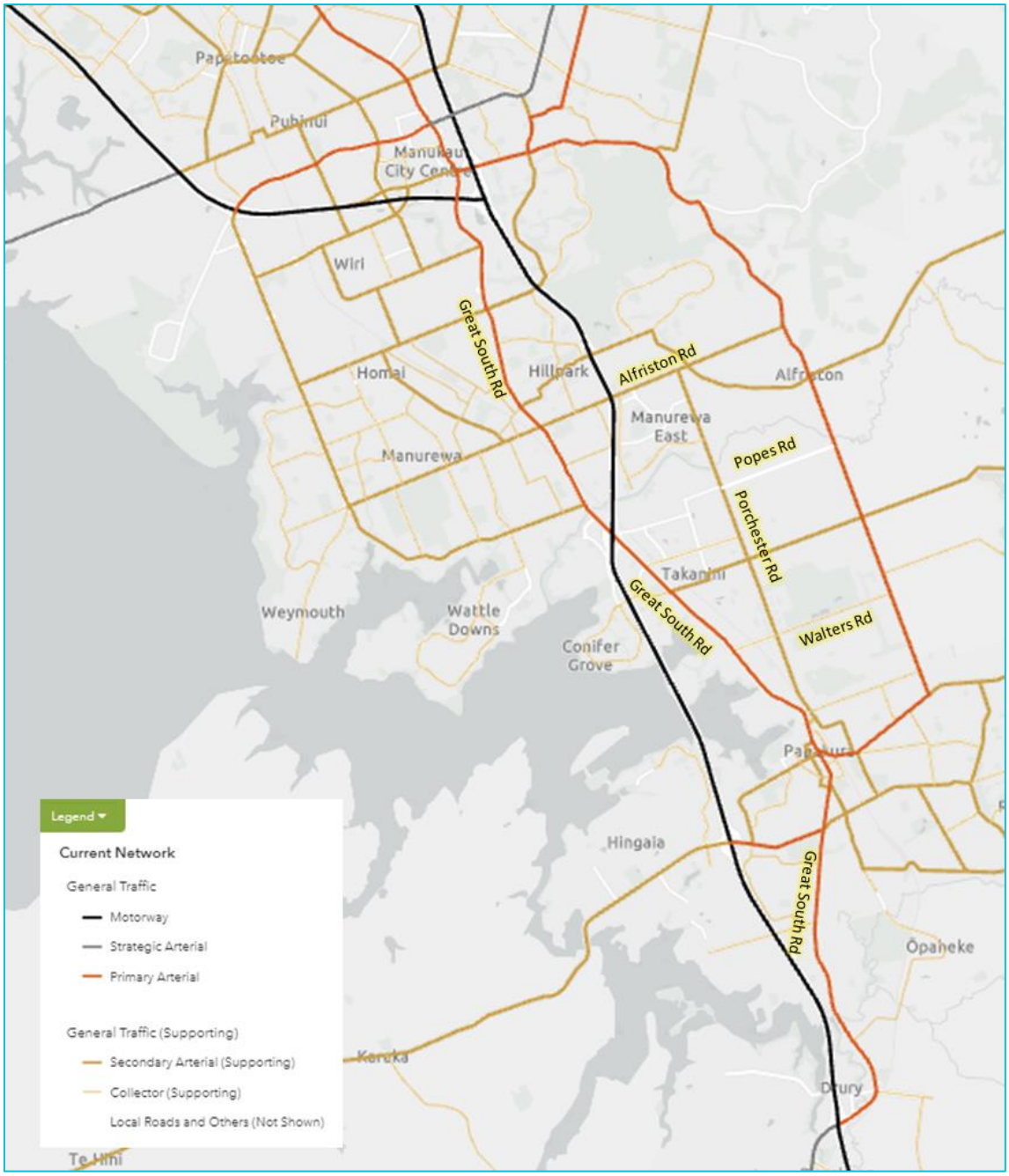


Figure 3-1: Existing Traffic Network (AT's Future Connect)

Key things of note:

- The key north-south routes are components of the existing transport network with Great South Road and Porchester Road running through existing developed Brownfield areas;
- SH1 and Mill Road serve as the primary inter-regional and suburban north-south travel corridors with high traffic volumes;
- This part of urban Auckland is also highly constrained, bounded to the west by the Pahurehure inlet and the east by the Hunua Ranges. This results in a relatively narrow corridor, dominated by north-south regional and national-level strategic transport corridors. The narrow overall corridor and dominance of the strategic transport infrastructure also results in constrained

east-west local movement, with resulting community severance and poor transport choices and accessibility; and

- There are limited east-west connections between Mill Road and Porchester Road for the Takaanini Future Urban Zone and the Takaanini Industrial Area. Popes Road is an existing link that will remain a key east-west connection for the area in the future.

Table 3-3 shows the traffic volumes for the corridors of interest in the Project area. These were obtained from Mobile Road in July 2023.

Table 3-3: Existing Traffic Data (Source: Mobile Road)

Corridor/ Section	Classification (Future Connect)	5 Day ADT[18]	%HCV [19]
Great South Road (GSR): Manukau Station Road to Browns Road	Primary Arterial	52,300	7%
GSR: Browns Road to Alfriston Road	Primary Arterial	15,400 -20,200	6%
GSR: Alfriston Road to Mahia Road	Primary Arterial	16,100 – 17,500	5%
GSR: Mahia Road to Manuroa Road	Primary Arterial	29,400 – 30,700	8%
GSR: Manuroa Road to Walters Road	Primary Arterial	25,900 – 28,800	7%
GSR: Walters Road to Coles Cres	Primary Arterial	21,200 – 25,600	7%
GSR: Coles Cres to Settlement Road	Primary Arterial	11,900 – 20,600	6%
GSR: Settlement Road to Waihoehoe Road	Primary Arterial	13,100 – 18,200	10%
Popes Road	Local Road	2,000	11%
Porchester Road: Alfriston Road to Popes Road	Secondary Arterial	15,800 - 18,200	6%
Porchester Road: Popes Road to Walters	Secondary Arterial	13,700 – 16,600	5%
Walters Road	Collector Road	8,500	5%
Clevedon Road	Primary Arterial	14,400	7%
Settlement Road	Secondary Arterial	16,700	13%
Hunua Road	Secondary Arterial	6,800	31%
Alfriston Road: GSR to Scotts Road	Secondary Arterial	20,200	3.5%
Alfriston Road: Scotts Road to Magic Way	Secondary Arterial	17,700	3.5%
Alfriston Road: Magic Way to Porchester Road	Secondary Arterial	15,000	3.5%

The above indicates:

- Traffic volumes vary greatly along Great South Road. This is expected given the length of the corridor and the varying land use;

[18] Average daily traffic (**ADT**).
[19] Heavy commercial vehicle (**HCV**).

- Great South Road is heavily trafficked especially through the Takaanini area which currently experiences congestion during the peak periods;
- Alfriston Road is heavily trafficked for a two-lane arterial and experiences congestion during the peak periods; and
- Popes Road is currently of a rural nature and does not serve a strategic function and as such has low traffic volume.

As noted above, the main north-south corridors are SH1 and Mill Road for inter-regional travel with SH1 dominating travel patterns. This is typically heavily congested during the peak periods and impacts the wider transport network with drives re-routing to avoid the congestion on SH1, leading to more demand on alternative routes such as Great South Road. In addition, queuing at entry points impacts the adjacent intersections, further adding pressure on the local road network. Hence the congestion on Great South Road and Alfriston Road during the peak periods.

3.5.2 Public Transport

Figure 3-2 shows the existing bus network as per AT's Future Connect and the existing bus services available. In addition to what is shown, there is also a local 'on-demand' service that runs in the Takaanini area.

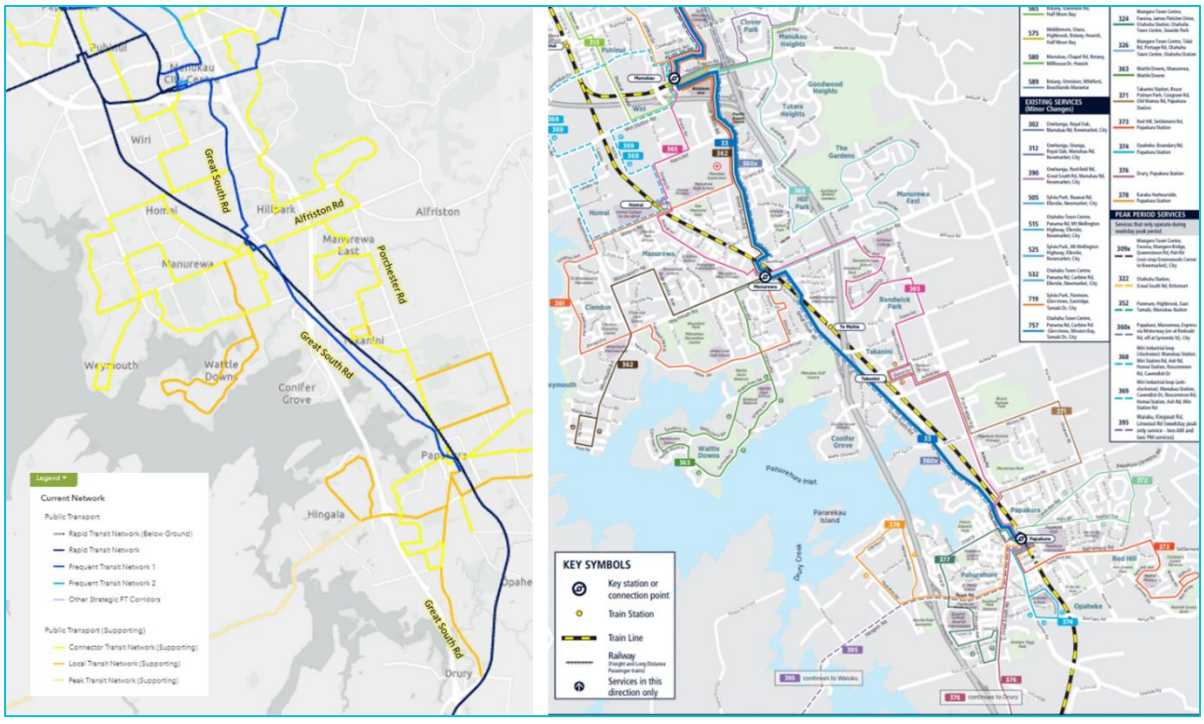


Figure 3-2: Existing bus network (left) and bus services (right)

As shown, there are limited public transport services in the area with the NIMT forming the rapid transit network (**RTN**) and is the main public transport into the City Centre. Great South Road is the only FTN in the area supporting the NIMT by providing access and local trips. Currently, the Route 33 frequent service ends at Papakura with connector service 376 running from Papakura through to Drury. Alfriston Road and Porchester Road currently service local connector bus services.

Figure 3-3 shows the existing transit lane/ bus priority measures within the Project area. As shown, there is currently limited bus priority measures, even along the existing frequent transit route. This

forces buses to merge and compete with other modes for road space and consequently leads to poor travel times and reliability. This is evident in **Figure** 3-4 where the existing LOS for travel time variability on sections of Great South Road is at E or F during the peak periods indicating unreliable services and a deficiency on the network leading to poor user experience.

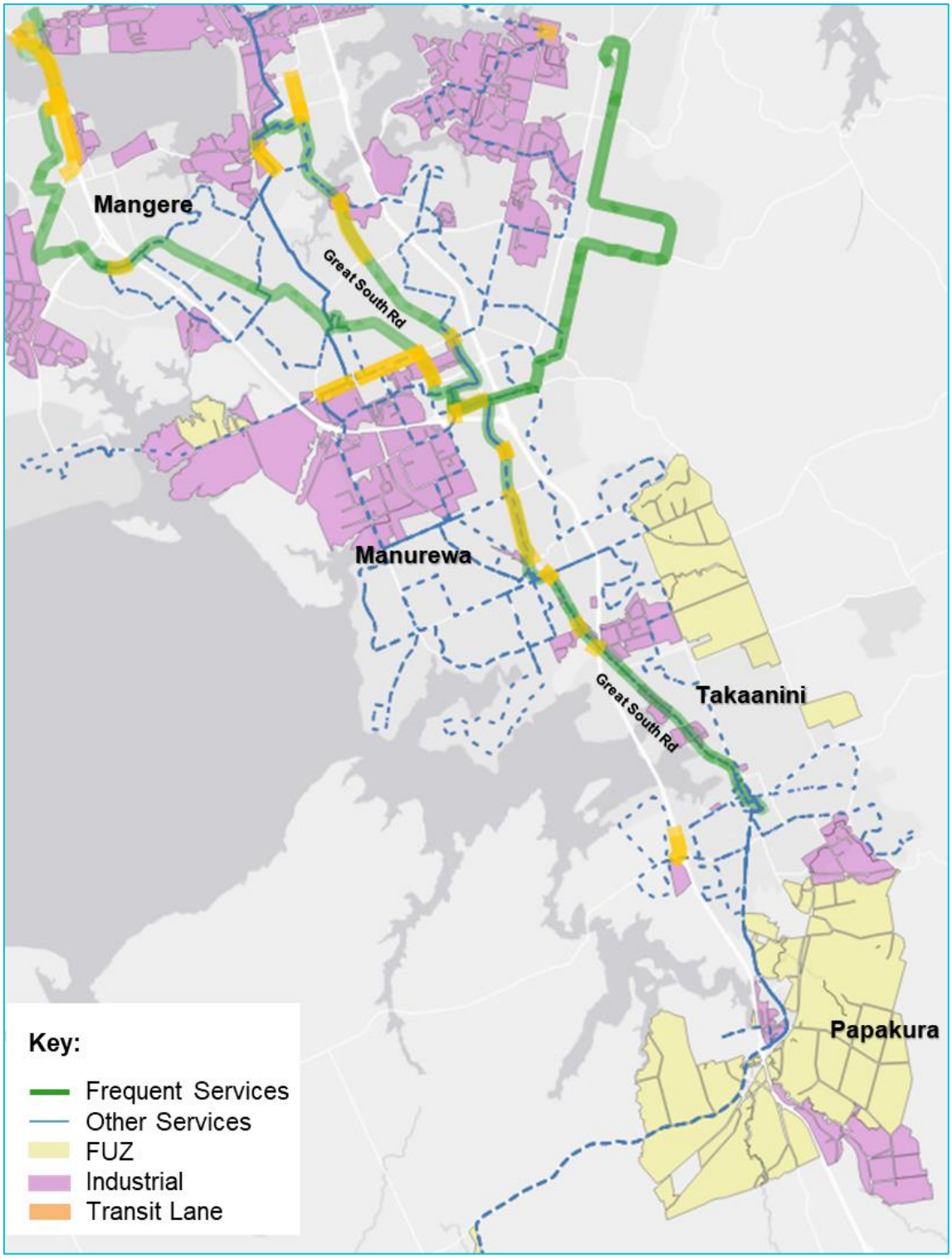


Figure 3-3: Existing Transit Lanes

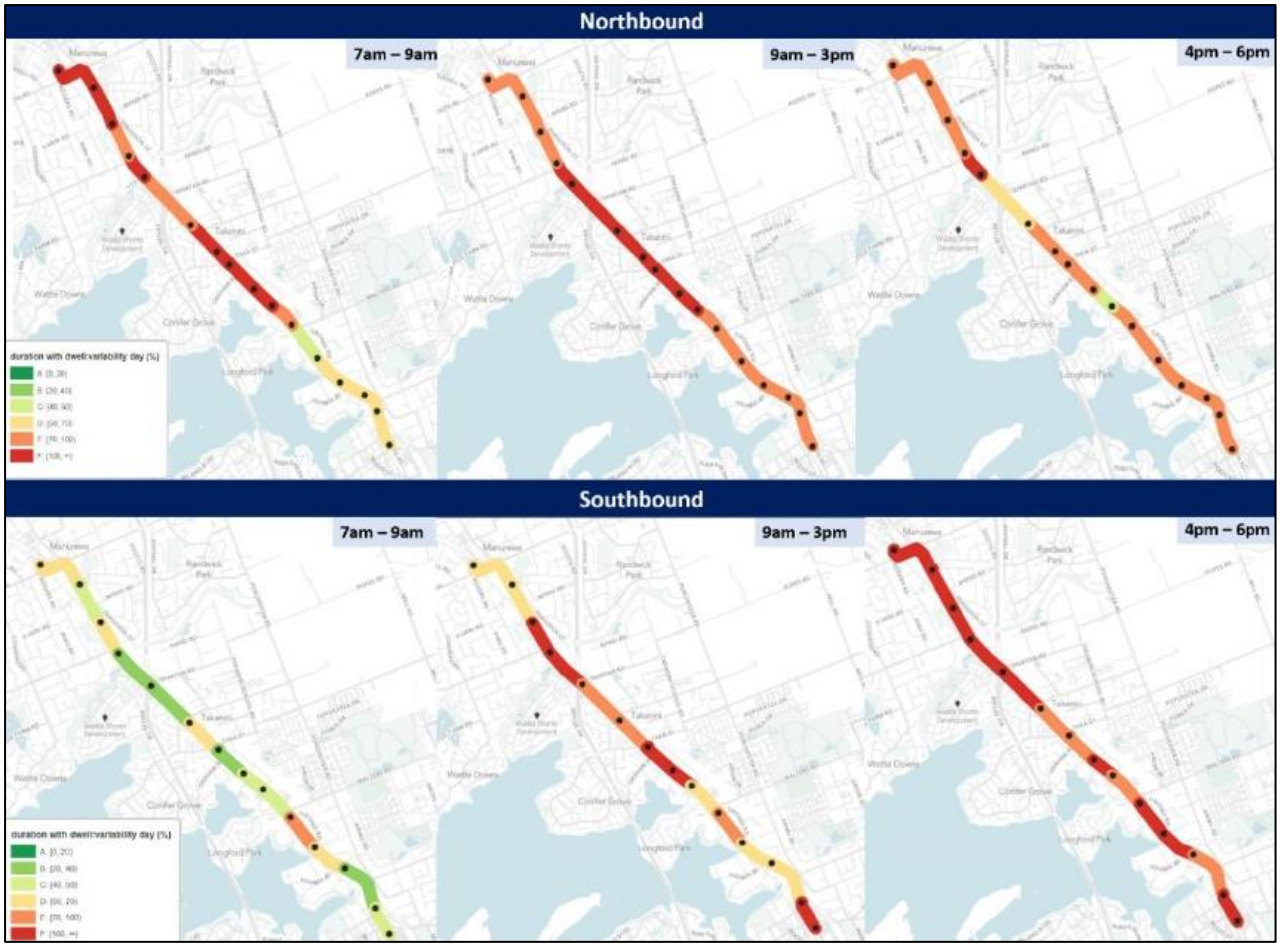


Figure 3-4: Great South Road Level of Service (*Source: GSR South Technical Report*)

3.5.3 Freight

The freight network definition as defined under Future connect is shown in Figure 3-5.

Strategic Network:

- **Rail Network and Level 1A**
  Transport corridors of the highest strategic value to freight movement, including Railways, the Motorways and most of the State Highways (typically the Waka Kotahi, NZ Transport Agency road network), and Arterials where efficient freight movements must be actively supported to maintain Levels of Service through active planning and design
- **Level 1B**
  Roads of the highest strategic value to freight movement being arterials where efficient freight movements must be actively supported to maintain Levels of Service, where competing modes and land uses require active management
- **Level 2**
  Local freight networks within strategic freight areas where there are no competing land use demands i.e. the land adjacent to these roads are primarily used for industrial / commercial purposes and free from sensitive community or other residential impacts. Planning and design should consider the efficiency of freight movements
- **Level 3**
  Freight networks connecting to / between strategic freight areas where planning and design should consider the efficient movement of freight, noting that land uses adjacent to the road are such that the impacts of freight movement requires active management

Supporting Network:

- **Access**
  Roads within strategic freight areas or industrial zones where access for freight must be maintained to support the adjacent land use. Access roads will generally be those that function as the first/last leg of a journey. Planning and design should support freight movement and access.
- **Other**
  Overdimension, Overweight and Ferry routes

Figure 3-5: Freight network definition as per Future Connect[20]

The existing freight network is shown in

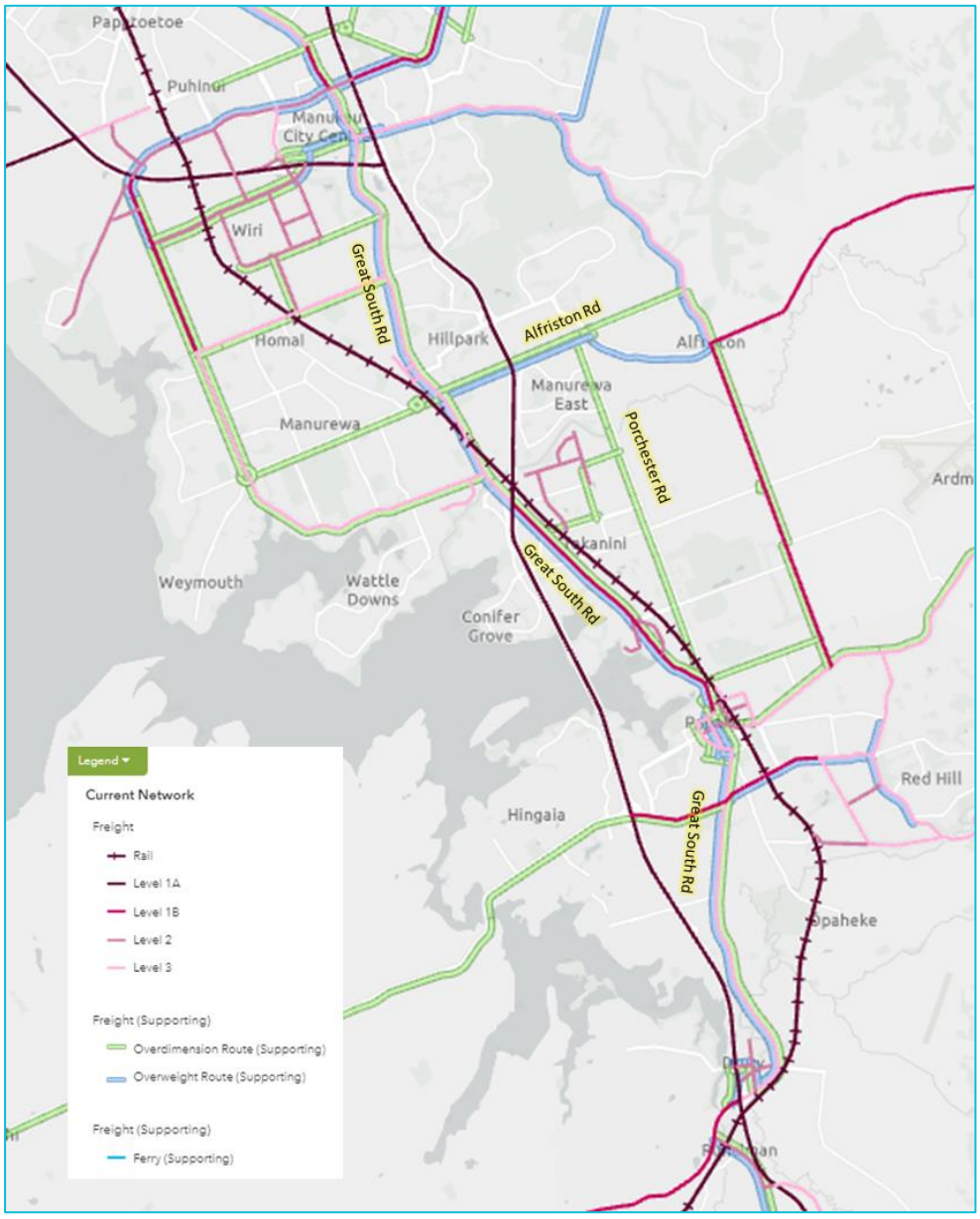


Figure 3-6. The main strategic freight route is SH1, which serves the main inter-regional trips. The wider freight network in the area provides access to SH1, and services the wider rural area including the Brookby Quarry to the east.

In particular, the corridors of interest in the Project have the following functions:

- **Great South Road** – Level 3 freight route except for the section between the Takaanini interchange and Papakura Town Centre which is Level 1B. This section services the Takaanini industrial area. It is also part of the over-dimension and overweight route;

[20]Source: https://at.govt.nz/media/u2kbse0i/fc_strategicnetworksreport_2023.pdf.

- **Porchester Road** – Part of the over-dimension route and services the Takaanini industrial area; and
- **Popes Road** – The section between Takanini School Road and Porchester Road is part of the over-dimension route.

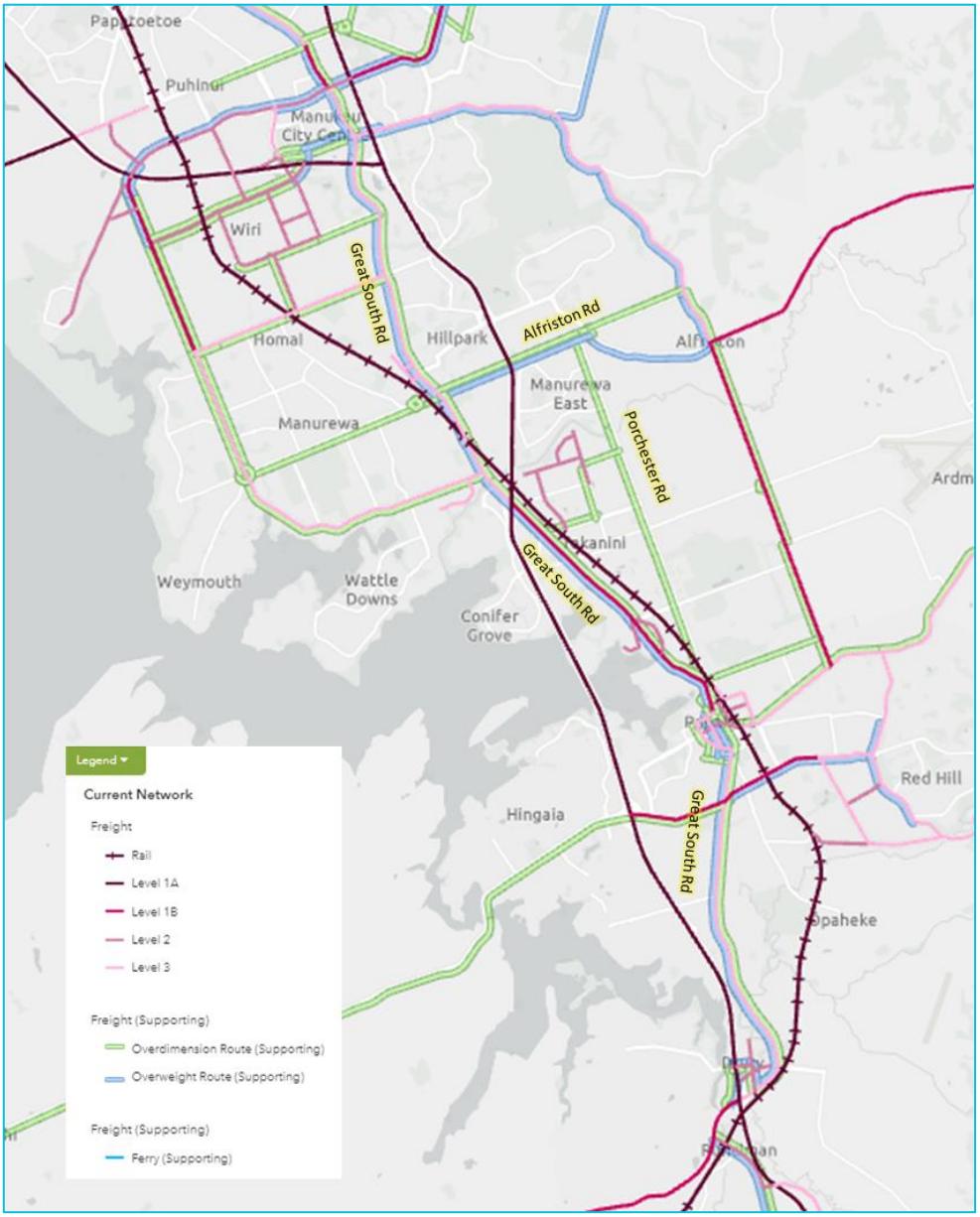


Figure 3-6: Existing Freight Network *(Source: Future Connect)*

3.5.4 Walking and Cycling

The existing cycle network and cycling facilities in the Project area are shown in **Figure** 3-7. This shows there is either a lack of cycling facility or it is fragmented on strategic cycle routes i.e. on Popes Road and Great South Road.

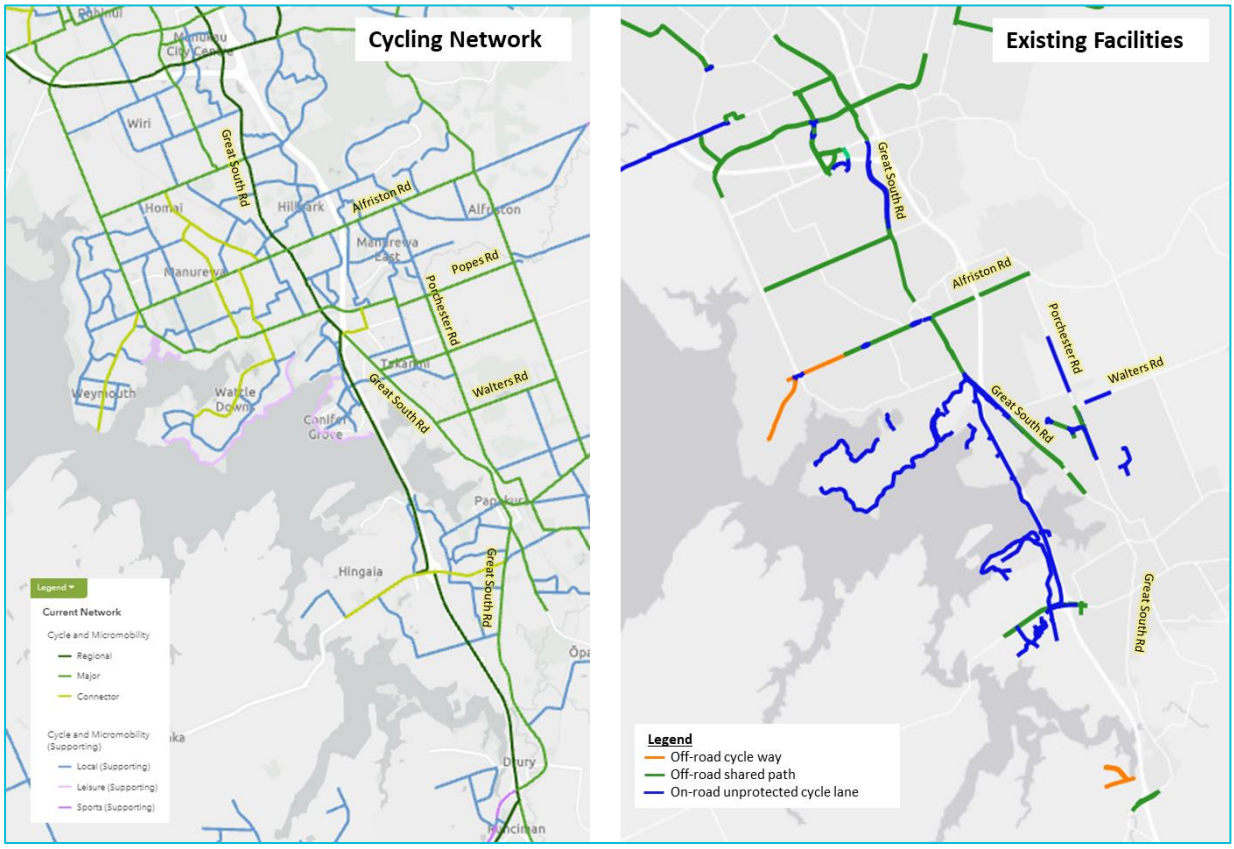


Figure 3-7: Existing cycle network and cycle facilities[21]

Figure 3-8 shows an example of the existing Great South Road and Popes Road corridors. As shown, there is a lack of facility on Popes Road and substandard facilities along Great South Road.

Figure 3-8: Existing Great South Road and Popes Road Corridor

Figure 3-9 shows the existing walking network and deficiencies as per Future Connect. This shows the existing walking facilities available in the brownfields. It also indicates the current facilities are

[21] Existing network obtained from Future Connect. Existing facilities extracted from AT Open GIS Data : https://data-atgis.opendata.arcgis.com/datasets/ATgis::cycle-facility-network/explore?location=-37.015236%2C174.876871%2C10.4.

deficient either because there is inadequate footpath width or there is severance. This limits access to social and economic opportunities via walking and cycling in a safe manner.

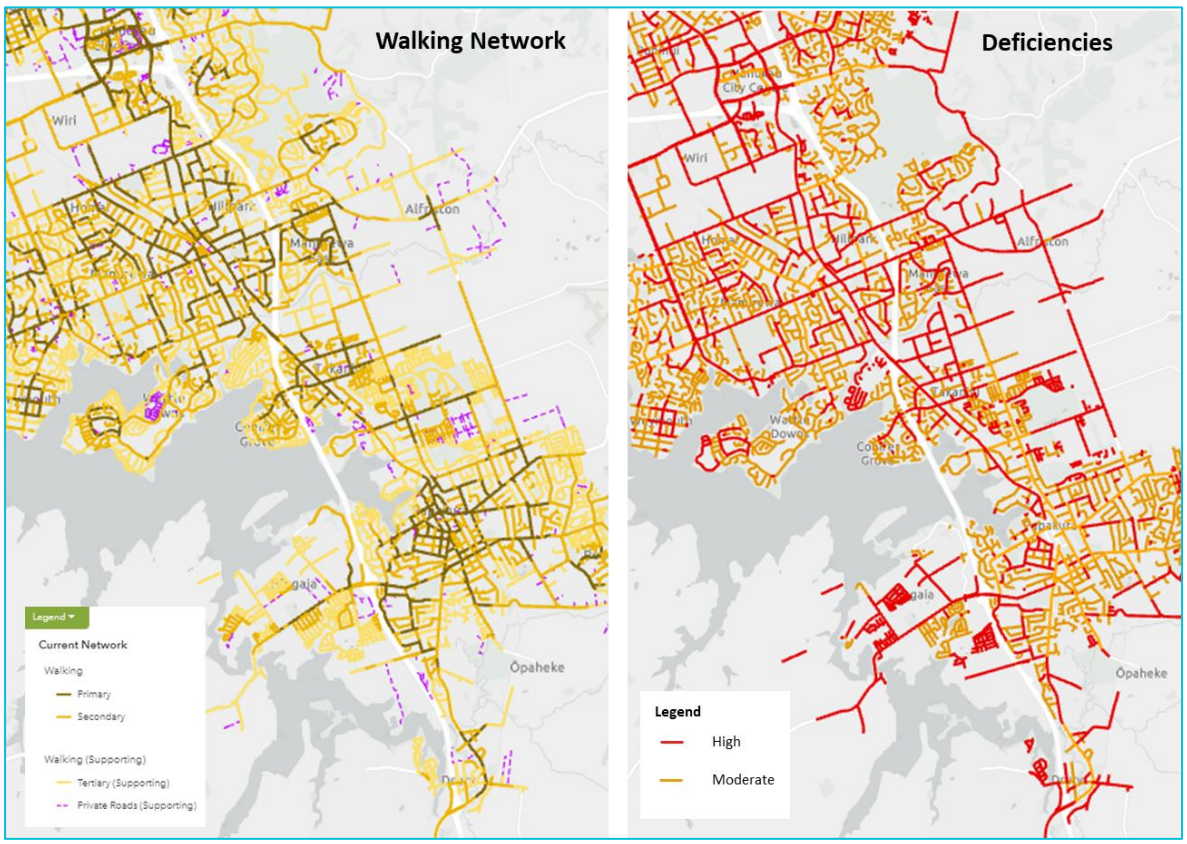


Figure 3-9: Existing walking network and deficiencies (*Source: Future Connect)*

In general, there are currently significant walking and cycling deficiencies on the network contributing to the lack of transport choice and restricts access via sustainable modes.

3.5.5 Road Safety

The Waka Kotahi CAS database was used to extract all reported crashes occurring along the Project corridors for the five-year period from 2018 to 2022.

Overall, there has been a total of 1,305 crashes (7 fatal, 53 serious, 299 minor-injury and 946 non-injury crashes) within the Project area between 2018 to 2022. Table 3-4 breaks this down by the different Project corridors.

Table 3-4: Crashes for 2018 to 2022

Corridor	Fatal	Serious	Minor	Non-Injury	Total
GSR FTN	3	33	207	693	**936**
Takaanini FTN	3	18	88	243	**352**
Popes Road	1	0	2	6	**9**
GSR, Drury	0	2	2	4	**8**

Corridor	Fatal	Serious	Minor	Non-Injury	Total
Total	**7**	**53**	**299**	**946**	**1,305**

Figure 3-10 shows the locations of these crashes and Table 3-5 shows a breakdown of the crash types. This indicates the majority (80%) of crashes are rear end and crossing/turning type crashes with 67% of all crashes happening at intersections which is typical for a developed urban area. Whilst pedestrian crashes are low at 2%, they involve vulnerable road users and generally results in higher crash severity.

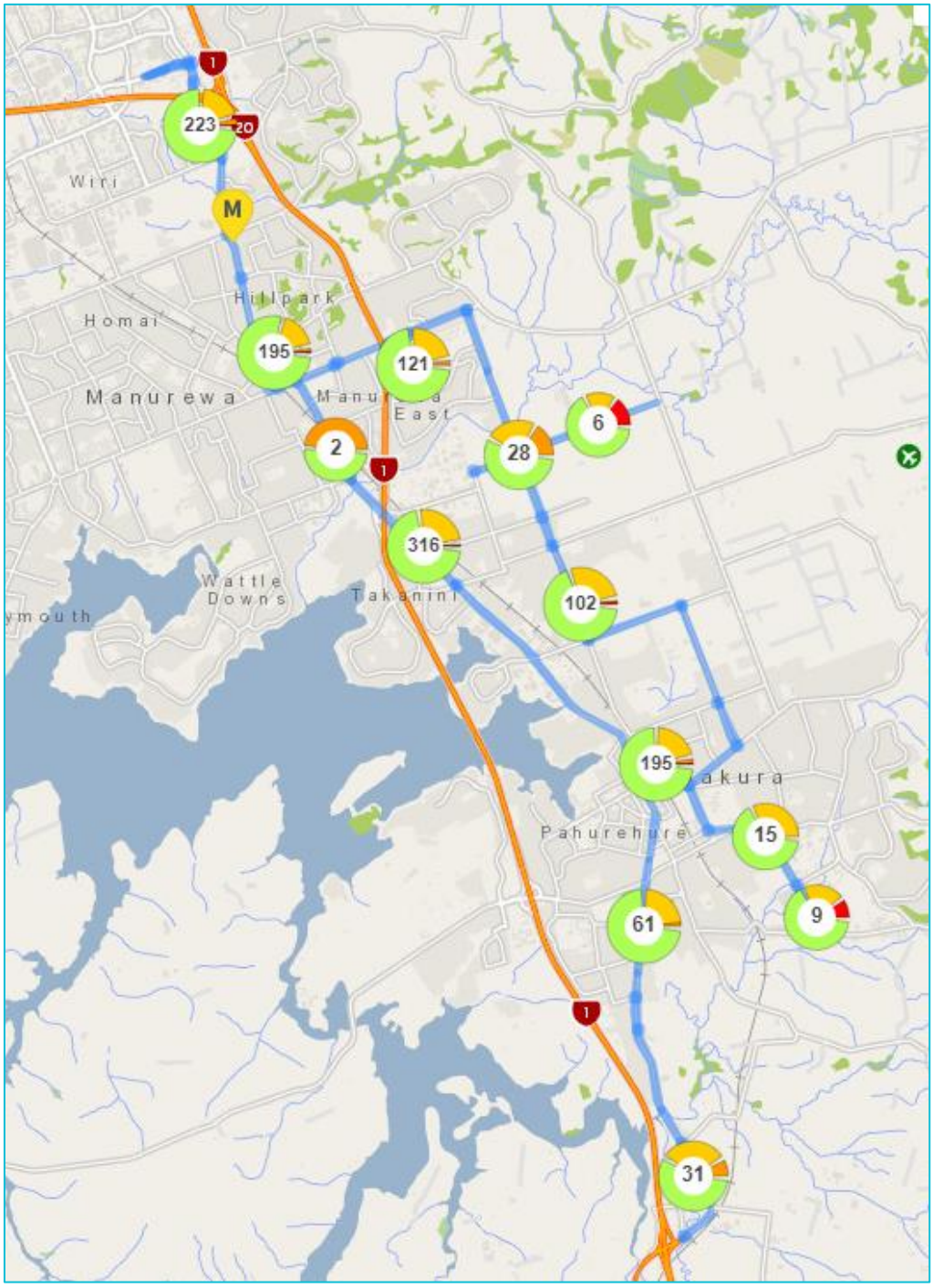


Figure 3-10: Location of crashes

Table 3-5: Crash Types

Crash type	Crash numbers	% All crashes
Overtaking crashes	116	9
Straight road lost control/ head on	132	10
Bend – lost control/head on	106	8
Rear end/obstruction	523	40
Crossing/turning	394	30
Pedestrian crashes	31	2
Miscellaneous	3	0
Total	**1,305**	**100**

Figure 3-11 shows areas of 'high' and 'medium-high' collective risks which is an indicator of the 'crash density' over a road segment. Those classified as 'high' or 'medium-high' indicates there is a higher risk of deaths and serious injury crashes over the road segment. As shown, there are parts of the Project corridors that have 'high' or 'medium-high' collective risks indicating likely safety deficiencies. It is also worth noting that the intersection of Popes Road and Porchester Road had been previously identified as a high-risk intersection as per Mega Maps historic data. Under the Waka Kotahi High-Risk Intersection Guide, this would suggest the intersection requires transformational works.

It is noted that the existing safety performance is not a reflection of the future context; however, as growth occurs, trips will increase which in turn will increase exposure and risk. Thus, without intervention, the safety risks will only be exacerbated further.

Figure 3-11: Existing safety deficiency (*Source: Future Connect)*[22]

[22] High-risk intersection extracted from Mega Maps, accessed on July 2023.

3.5.6 Property Access

Existing properties adjacent to the Project area have direct access to the road network via driveways, accessways or unsignalised intersections. The high-speed environment of Popes Road does present a safety concern to existing properties with direct access, however there is currently a low incident of crashes due to the rural nature of land use.

3.6 Future Receiving Environment (without the Project)

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

3.6.1 Strategic Context

The South makes up the largest proportion of future growth areas in Auckland (45%). The area includes large future growth areas of Takaanini, Opaheke Drury, Drury West, Pukekohe-Paerata and Clarks Beach. The bulk of the growth is expected to occur in Opaheke-Drury, which will grow from a current population of just over 3,300 to a population of around 64,000 by 2046.

On top of this, the North Waikato is anticipated to grow significantly over the same period impacting the Southern growth area as a large portion of the working age population in these communities is expected to travel to the Auckland region to pursue work opportunities.

In addition, the recent PC78 and MDRS mean more intensification may occur in existing brownfield areas, further contributing to growth (Figure 3-12).

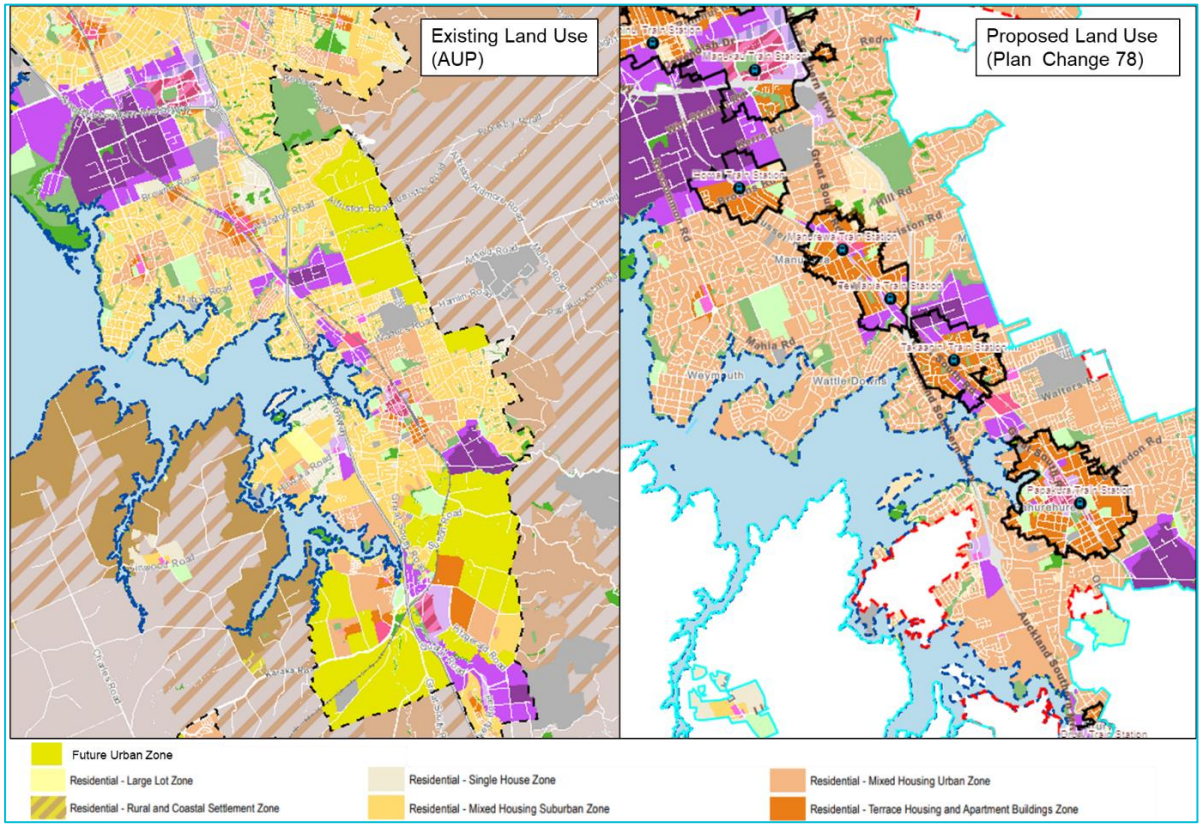


Figure 3-12: Existing Land Use and Proposed Land Use

The FDS has removed the southern portion of the Takaanini FUZ and partial removal of the Ōpaheke-Drury FUZ. This has very little impact on the Projects as they serve existing developments and seek to resolve both existing and future issues.

From a transport investment perspective, there are also a range of different transport projects proposed in the South (refer to Figure 3-13) to support the growth.

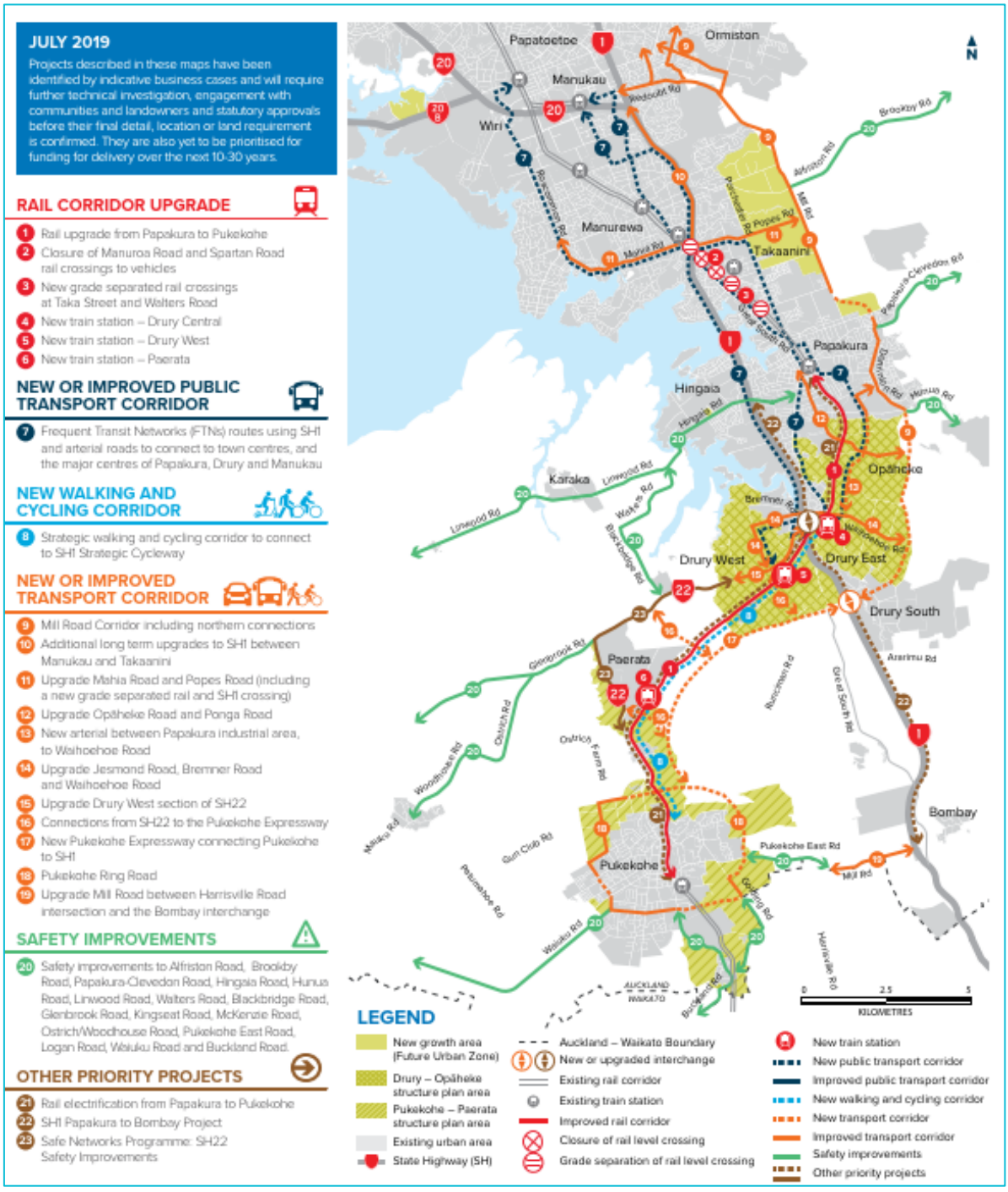


Figure 3-13: Indicative South Transport Network (ISTN)

Transport projects that interface with the Project include:

- Removal and upgrade of the Takaanini Crossings;
- Additional rail capacity between Pukekohe and Papakura; and
- Mill Road Corridor – a new and upgraded strategic transport corridor from Manukau to Drury, including upgrades to Redoubt Road, Mill Road and Dominion Road and a new section connecting to SH1 in Drury South.

3.6.2 General Traffic and Freight

As noted previously, the area already experiences congestion especially along Great South Road. In the longer term, additional roading projects such as those within the Indicative South Transport Network ISTN i.e. Mill Road are proposed to support the South. Table 3-6 shows the modelled 2016 and 2048+ volumes without the Project to provide context of the growth. As shown, Great South Road will remain a highly trafficked corridor and thus will continue to experience congestion and impact the public transport level of service.

Table 3-6: Two-way traffic flow for Project corridors (modelled 2016 and 2048+ volumes)

Corridor/ Section	2016 ADT volumes	2048+ ADT without project	Difference (%)
GSR: Manukau Station Road to Browns Road	20,500 - 24,300	27,200 - 32,200	33%
GSR: Browns Road and Alfriston Road	11,900 - 15,700	12,200 - 18,000	2% - 15%
GSR: Alfriston Road and Mahia Road	12,500 - 17,100	15,500 - 18,500	8% - 24%
GSR: Mahia Road and Manuroa Road	37,800 - 42,200	31,200 - 51,700	-18% - 23%
GSR: Manuroa Road and Walters Road	26,300 - 28,900	21,700 - 27,500	-18% - -5%
GSR: Walters Road and Coles Crescent	20,800 - 26,000	23,400 - 29,400	13%
GSR: Coles Crescent and Settlement Road	10,600 - 14,900	11,400 - 16,800	7% - 13%
GSR: Settlement Road and Waihoehoe Road	14,200 - 19,900	18,100 - 22,900	15% - 27%
Popes Road	3,000 - 6,500	5,400 - 9,900	53% - 79%
Porchester Road: Alfriston Road to Popes Road	12,400 - 13,300	18,900 - 23,300	53% - 75%
Porchester Road: Popes Road to Walters Road	13,600	19,400	43%
Walters Road	8,000	9,000	13%
Clevedon Road	10,700	13,500	26%
Settlement Road	10,800	16,000	48%
Hunua Road	3,300 - 6,600	14,800 - 17,500	165% - 348%

The above indicates that the predicted growth across existing urban roads (i.e. Great South Road) is in the order of 10% to 20% with some sections experiencing more growth than others. The greatest

growth is seen along corridors that are adjacent to growth areas, namely Popes Road and Porchester Road. These corridors are anticipated to experience growth of over 70%.

Additionally, freight demand is anticipated to increase due to the proposed growth in the Takaanini industrial area. Further, flood risk at existing stream bridges (i.e. Hingaia Stream bridge, Slippery Creek Bridge) has the potential to result in bridge damage, subsequently causing traffic disruptions.

3.6.3 Public Transport

The committed and planned public transport projects in the Project area includes:

- Rail stations in Paerata, Drury West and Drury Central. With the exception of Drury West Station, these rail stations are consented and funded;
- Increased rail frequency resulting from CRL and four tracking; and
- Additional bus services to support future urban development within Drury.

The indicative bus network in the future is shown in Figure 3-14. Note that this could potentially change in the future and has based off the latest AT's Remix.

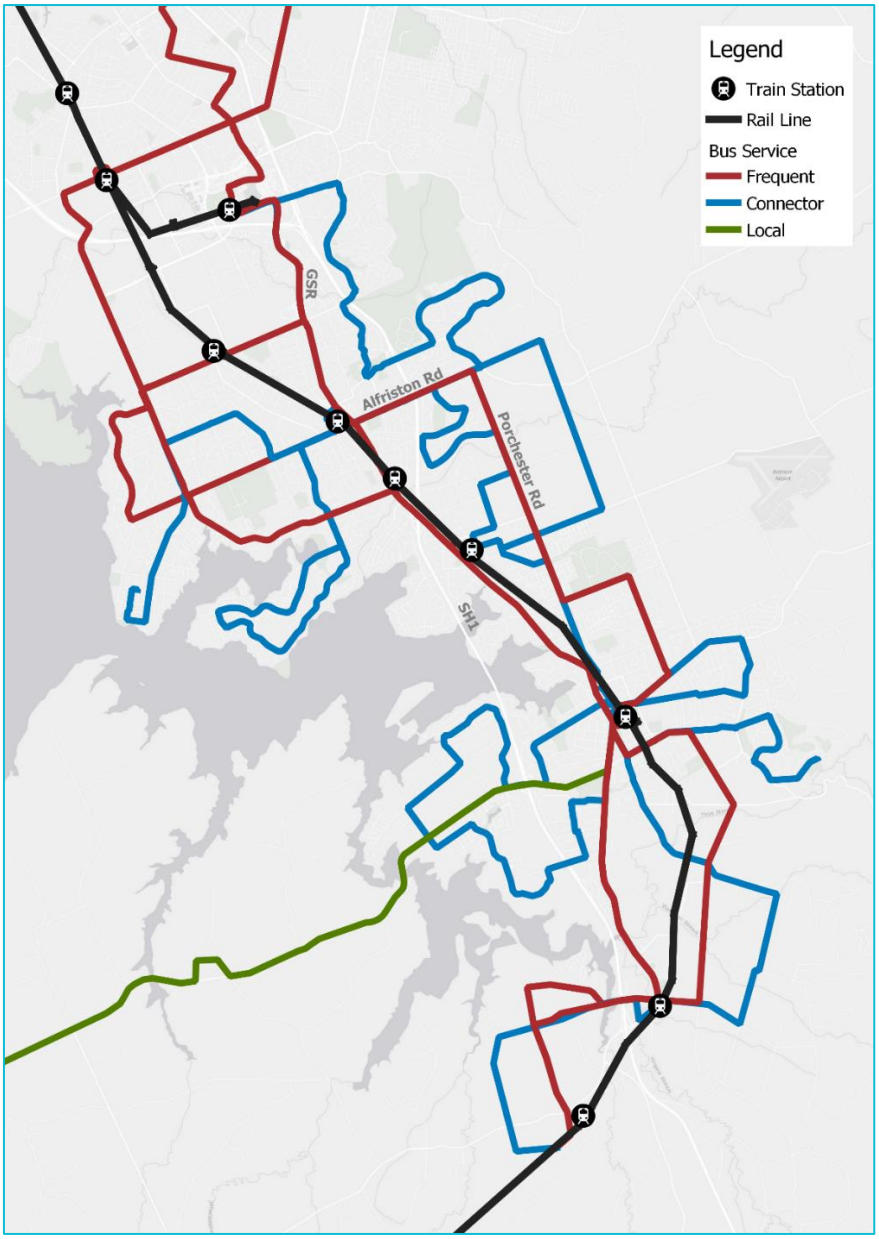


Figure 3-14: Indicative Future Bus Network (Source: AT's Remix)

The committed and planned public transport projects will partly provide for the existing and future communities. The rail upgrades are anticipated to provide the most significant benefits for public transport travel especially for longer trips. Figure 3-15 provides context of the scale of interventions expected for the proposed new stations.

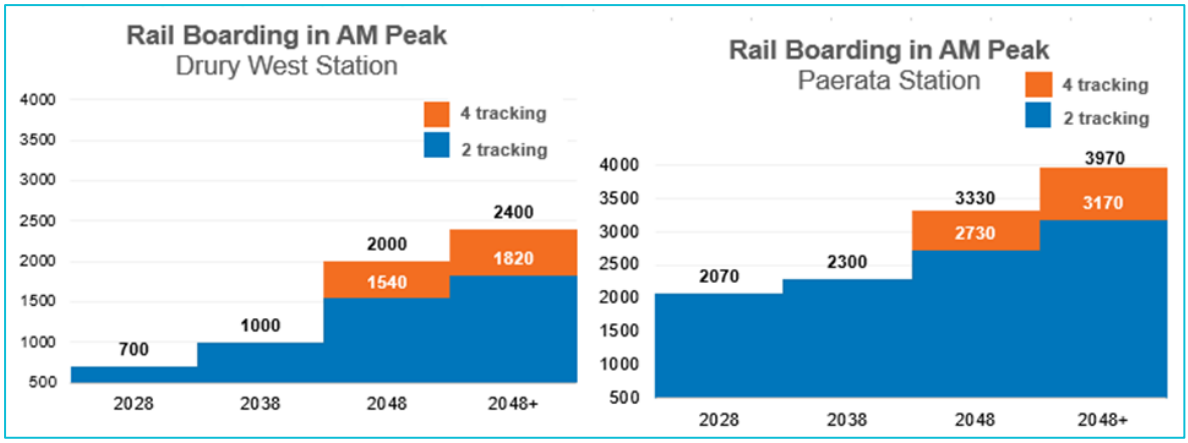


Figure 3-15: Scale of interventions expected for the proposed new stations

Despite these proposals, the existing infrastructure is inadequate to provide for the planned growth especially for areas not serviced by rail. It will also support the rail network through:

- Providing better access to rail stations especially for those outside of the walking catchments; and
- Supporting local and short trips where rail may not be appropriate or available.

As such, a high-quality FTN has a critical role to play within the public transport network.

As noted in section 3.5.2, there is a lack of bus priority on the existing frequent transit route on Great South Road leading to poor reliability and travel time. This is expected to worsen in the future where the projected travel time by public transport between Drury and Manukau is estimated to increase by up to 7 minutes or by 14% (see Figure 3-16) 2048+. This further contributes to the lack of attractiveness of buses as a viable mode choice.

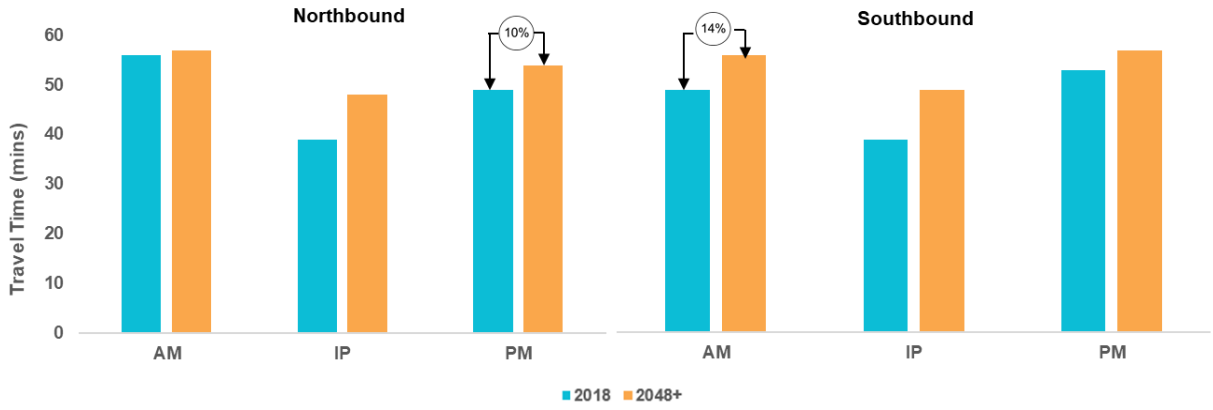


Figure 3-16: MSM Modelled PT travel time data on Great South Road between Drury and Manukau (without Project)

The following undesired outcomes are expected if the Project does not occur:

- Buses will continue to experience poor reliability and travel time due to increased congestion, further discouraging its uptake;
- Deteriorating accessibility to economic and social opportunities for the community; and
- Continued reliance on private vehicles, which is counter-intuitive to climate change goals.

3.6.4 Walking and Cycling

Walking and cycling will become key components of the future transport network to support the growth in a sustainable way. As noted in section 3.5.4, current cycling/micromobility facilities are missing or deficient and although footpaths are available on existing urban corridors, they are often deficient.

In the longer term, additional walking and cycling facilities beyond those as part of this Project are proposed to support the South. These include:

- Station access connections from SH22 to Drury West and Paerata stations;
- The Regional Active Mode Corridor (**AMC**) connecting SH1, Drury to Pukekohe via a high-quality cycling facility;
- A regional facility proposed on SH1, which is anticipated to be in place as a part of the SH1 upgrades between Papakura to Bombay; and
- Upgrades on SH22 between SH1 and Jesmond Road (four-laning and dedicated signalised intersection at both GSR/SH22 and Jesmond Road/SH22 intersections) funded by the New Zealand Upgrade Programme (**NZUP**).

Even with these longer-term projects, the existing deficiencies on the network remain and will be inadequate to accommodate the future intensification that is planned to occur. Thus, without intervention:

- Existing safety-related issues and crash exposure to vulnerable road users will increase as growth occurs;
- Access to social and employment opportunities will be compromised; and
- Travel by active modes will continue to be unattractive, further encouraging travel by private vehicles. This will lead to increased emissions and therefore adverse environmental and health effects.

3.6.5 Road Safety

As discussed in Section 3.5.5 there are existing safety issues along the NoR corridors. At the time of writing, there are no known safety improvements planned. The safety issues will only exacerbate as growth occurs if no interventions are put in place.

If the future receiving environment remains as is:

- The lack of safe and dedicated facilities for active modes will increase the risk of deaths and serious injuries (DSIs) as pedestrians and cyclists travel along a hostile environment. This is especially the case for Popes Road which is currently rural in nature. As growth occurs, growth in traffic will occur (as noted in Section 3.6.2); for example along Porchester Road, this is expected to see a 17% increase. This in turn increases exposure and safety risk.
- The lack of safe intersection controls as growth occurs will increase the safety risks and increase death and serious injuries.

3.6.6 Summary

In general, the future transport environment is inadequate for the planned growth and the existing issues are expected to be exacerbated without additional intervention. These issues include:

- Poor public transport reliability and accessibility especially along existing frequent transit routes (i.e. Great South Road) leading to a continued over-reliance on private vehicles for local travel and restricted access to the rail network;
- Continued lack of transport choices including that of active modes, further fueling private vehicle use inconsistent with mode shift goals. This will also consequentially result in transport emissions and missed opportunities to provide for healthier communities and sustainable travel as growth occurs.
- Lack of high-quality public transport for existing and new urban areas results in deteriorating accessibility to economic and social opportunities.
- Increased safety risk as growth occurs leading to increased DSIs, including that for vulnerable road users. This will further discourage active mode uptake as it remains unattractive and unsafe.
- Flood risk at existing stream bridges (i.e. the Hingaia Stream bridge, Slippery Creek Bridge) which have the potential to result in bridge damage, subsequently causing traffic disruptions.

PART A: PROJECT-WIDE ASSESSMENT

4 Project-Wide Assessment

This section assesses common or general transport matters across the entire Project. This section also recommends measures to avoid, remedy, or mitigate actual or potential adverse effects identified as a result of the Project as a whole. NoR-specific matters or more localised matters are further discussed in Part B of this report.

4.1 Assessment of Operational Effects

The following sections consider the operational effects of the Project in the likely future environment, against a baseline scenario where the Project does not exist. The baseline scenario assumes the same growth scenarios and all other planned transport investments in the wider network.

4.1.1 Public Transport

4.1.1.1 Customer Experience and Accessibility

The Project will connect Drury Central, Manukau, Takaanini and its surrounding employment areas with three major urban centres and/or industrial zones (Manukau, Takaanini and Papakura).

The FTN has been specifically designed to contribute to an integrated and reliable PT network, support growth and offer sustainable travel choice and access to economic and social opportunities in South Auckland. The Project is expected to offer an attractive customer experience and improve accessibility as follows:

- The provision of bus lanes provides better PT accessibility and enables frequent transit services; the frequent transit services are expected to support the rail network;
- The Project improves PT travel times, decreasing the travel time to key employment centres and increasing the number of jobs accessible by PT from Manurewa, Takaanini and Papakura;
- The FTN route alignment ties in with key stations and centres (Manukau, Manurewa, Te Mahia, Takaanini, Papakura, and Drury Central), enabling better connections between train stations and through the metropolitan and town centres in South Auckland; and
- The improvements on Alfriston Road improve the reliability of existing and future PT services travelling to and from Manurewa Station.

Figure 4-1 shows the predicted change in PT travel times in the AM and PM peaks along the Great South Road FTN and Takaanini FTN routes due to the Project. The travel time savings reflect the provision for bus priority which enables more frequent, reliable bus services. The graph shows that in the peak periods, the Project is expected to enable PT travel time savings of up to 11 minutes on the GSR FTN route, and up to 8 minutes on the Takaanini FTN route.

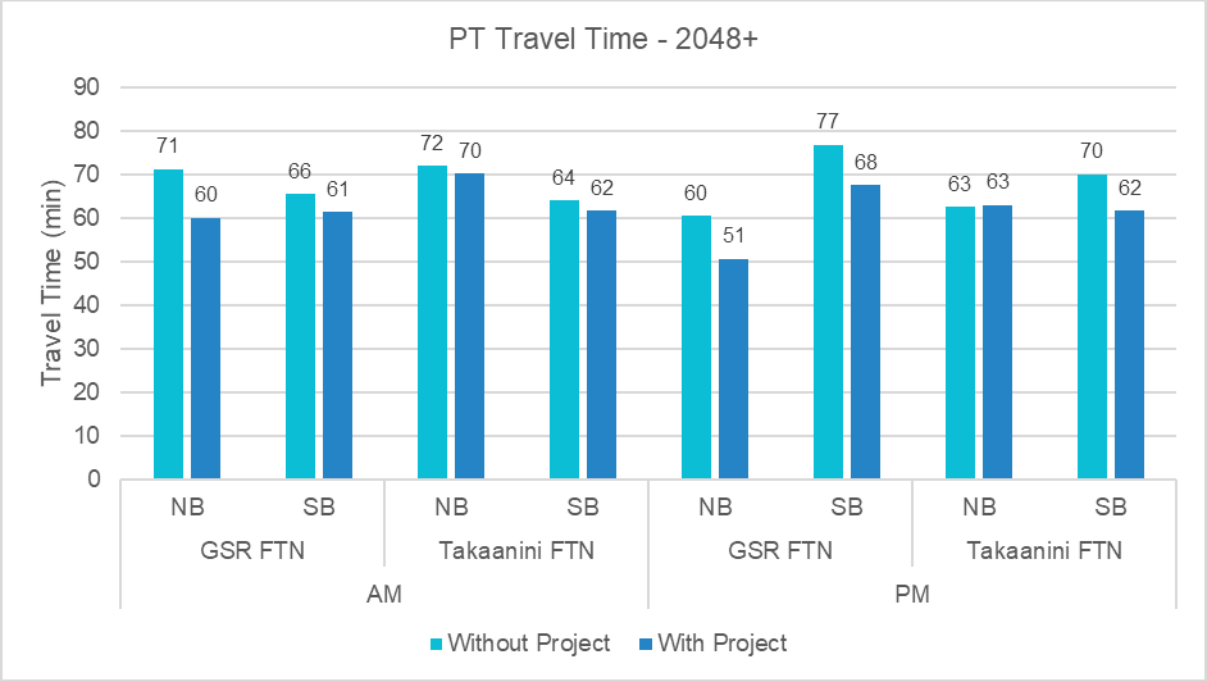


Figure 4-1: AM and PM peak PT travel time on FTN routes – Year 2048+

A breakdown of these PT travel time services by locations is provided in Figure 4-2 and Figure 4-3 for the AM and PM peak, respectively.

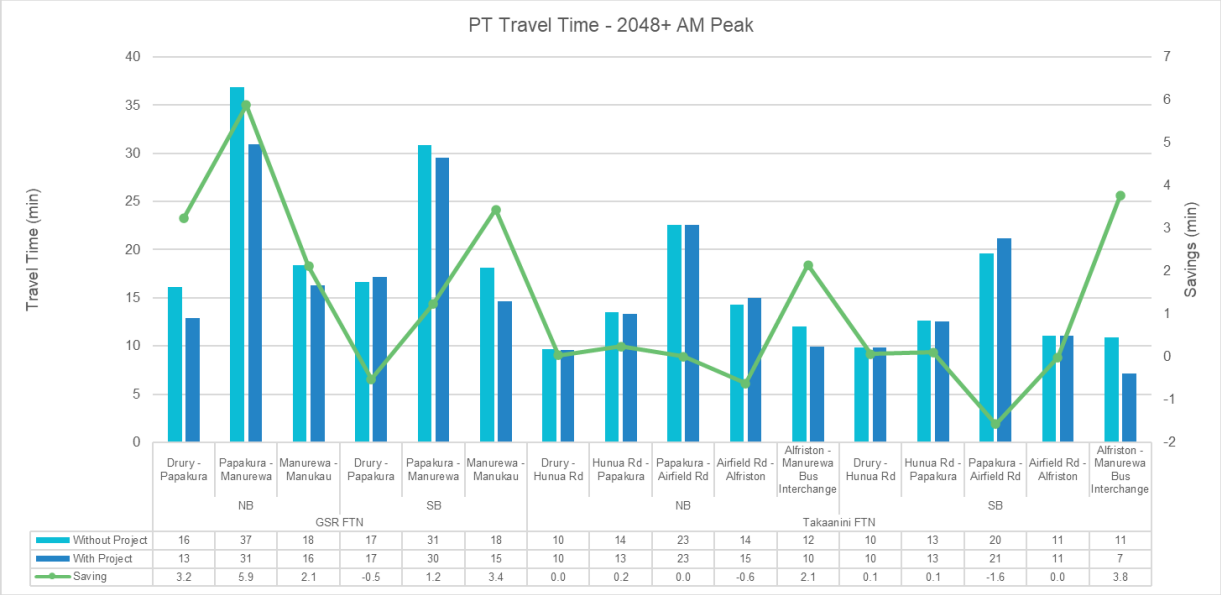


Figure 4-2: AM peak PT travel time on FTN routes – Year 2048+

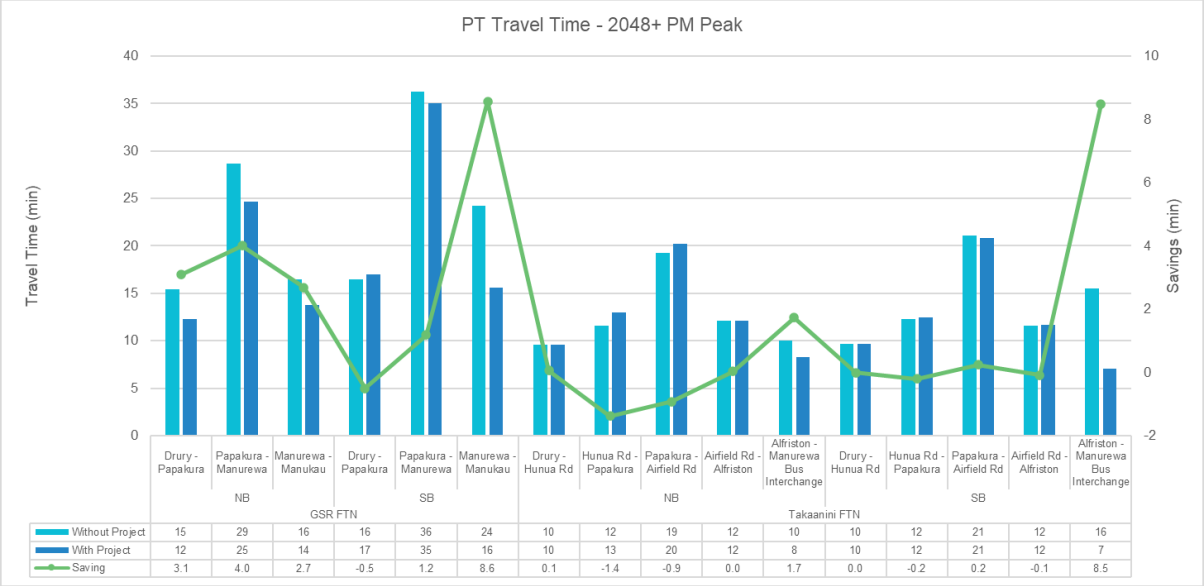


Figure 4-3: PM peak PT travel time on FTN routes – Year 2048+

In the AM peak, the Project is predicted to save approximately 6 minutes of PT travel time from Papakura to Manurewa and 2 to 3 minutes (4%) of PT travel time in either direction between Manukau and Manurewa via the GSR FTN route. In the PM peak, the Project is predicted to save approximately 9 minutes (12%) of PT travel time from Manukau to Manurewa via the GSR FTN route.

Along the Takaanini FTN route in the AM peak, the Project is predicted to save approximately 4 minutes (6%) of PT travel time between Porchester Road and the Manurewa Bus Interchange via Alfriston Road. Similarly for the PM peak, the Project is predicted to save approximately 8 minutes (12%) of PT travel time from the Manurewa Bus Interchange to Porchester Road via Alfriston Road.

One of the key factors that determines the attractiveness of buses are their reliability. As traffic models only predict averages, it is difficult to quantify this. However, most unreliability in buses is due to traffic congestion and delays at intersections. With the 19km of new bus priority lanes proposed, it is expected to reduce travel time variability as buses will no longer be competing with general traffic. Hence, more reliable services will occur as a result.

Overall, this indicates that the Project improves accessibility by PT, particularly to and from key locations such as Manurewa and Manukau, which are served by several PT services via Great South Road and Alfriston Road.

As mentioned in Section 3.4, the NIMT does the majority of the heavy lifting in terms of public transport for the South community and there are currently limited alternative high-quality public transport choices. In the event the rail line is full or closed, the Project provides additional capacity, resilience and choice for the community.

The Project is effective in improving access to opportunities for people in South Auckland and increasing labour and customer catchments for businesses. Specifically, in 2048+, an additional:

- 3,100 (4% increase) jobs are predicted to be accessible within 30 minutes PT travel time from Manurewa;
- 4,400 (12% increase) jobs are predicted to be accessible within 30 minutes PT travel time from Takaanini; and

- 600 (1% increase) jobs are predicted to be accessible within 30 minutes PT travel time from Papakura.

Overall, this shows that accessibility to key employment locations by PT is improved, and the improvements extend beyond just movements along the FTN routes themselves.

4.1.1.2 Estimated PT Demand

MSM predicts that the Project will positively increase PT usage in the area. The following graphs summarises the predicted changes with and without the Project:

- Change in regional (Auckland-wide) vehicle and PT passenger kilometres travelled;
- Change in northbound and southbound patronage, people movements, and PT share across screenlines[23] along the FTN routes. Screenline locations are shown in Figure 4-4; and
- Change in bus patronage along the FTN routes (i.e. Great South Road and Takaanini FTN).

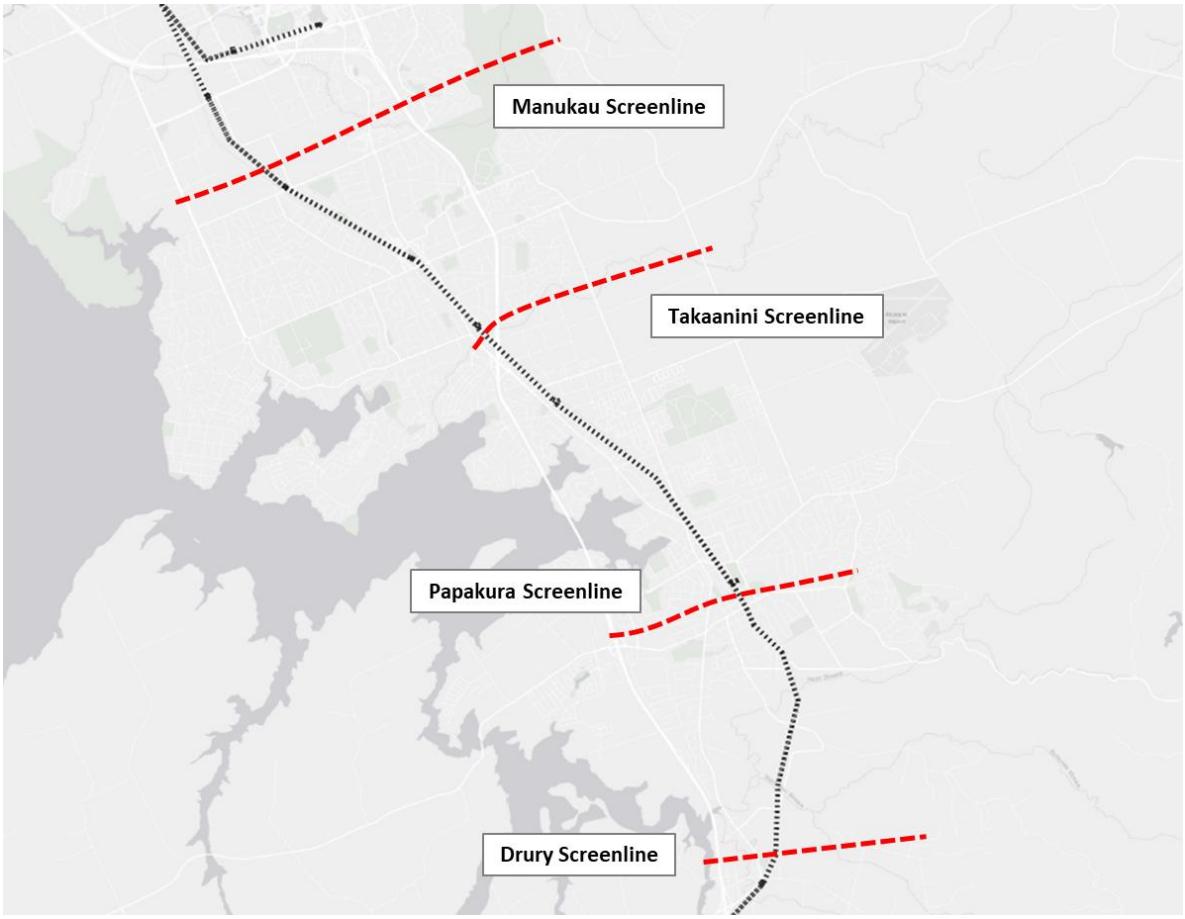


Figure 4-4: Screenline locations

Figure 4-5 shows the change in total regional travel (i.e. across the entire modelled network) with the implementation of the Project for each modelled 2-hour weekday period, as well as the estimated daily totals. This shows that the anticipated passenger kilometres travelled by PT increases by 72,500km per day whilst travel by private vehicle reduces by approximately 63,500km per day. This

[23] Screenlines are 'virtual' lines drawing that captures all vehicles moving through it much like a fence/cordon. It allows an understanding of the amount of traffic moving through a certain area and how trips are made.

reduced vehicle travel is expected to reduce a range of total system costs or externalities, such as road crashes and will also contribute positively towards reducing carbon vehicle emissions.

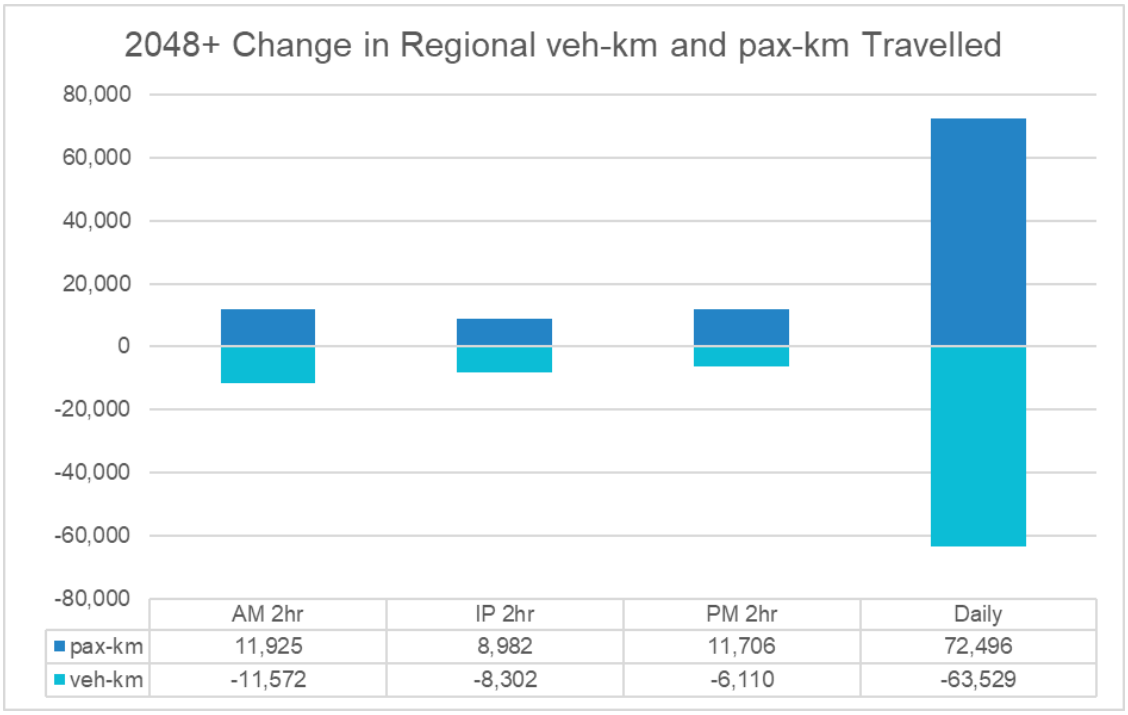


Figure 4-5: Change in regional vehicle-km (veh-km) and passenger-km (pax-km) travelled with the Project – Year 2048+

Figure 4-6 indicates the daily increase in regional PT usage (i.e. across the entire modelled network), showing an increase in both bus usage (as could be expected) and rail usage with the Project. This indicates that the FTNs are well integrated and complementary to the rail services rather than in competition.

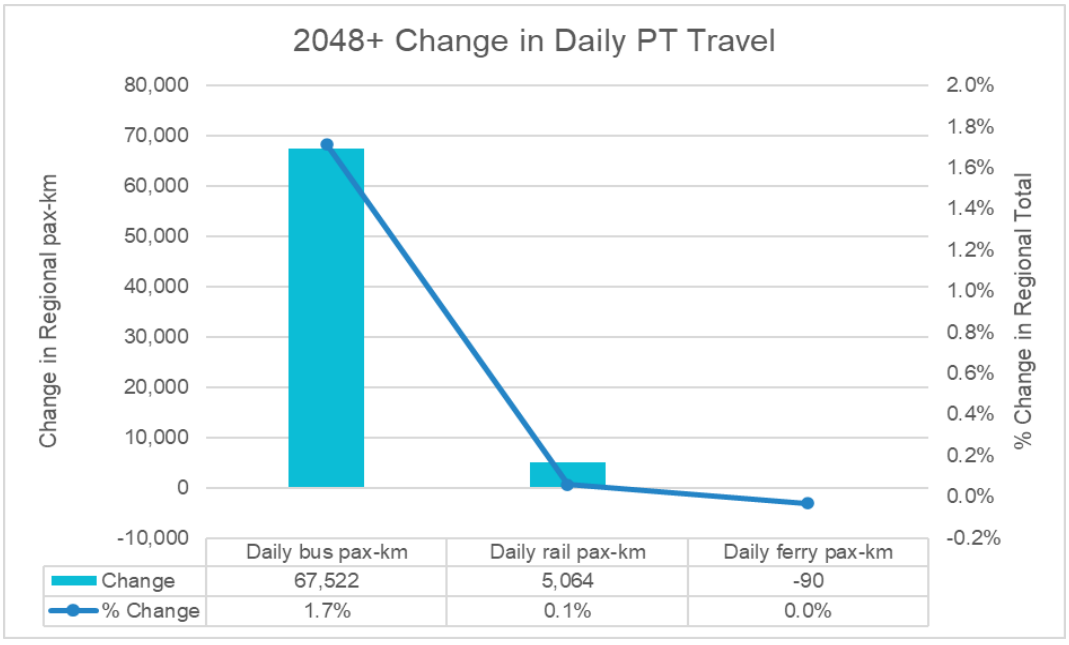


Figure 4-6: Change in daily PT travel with the Project – Year 2048+

Figure 4-7 shows the locations of the predicted increase in PT patronage due to the Project. The predicted change in patronage (relative to the network without the Project) is indicated by the width of the band, with increases shown in red and decreases shown in green. This shows a strong increase in patronage along the Great South Road FTN and Takaanini FTN routes, with small decreases in some parallel or alternative local bus services and the southern rail line.

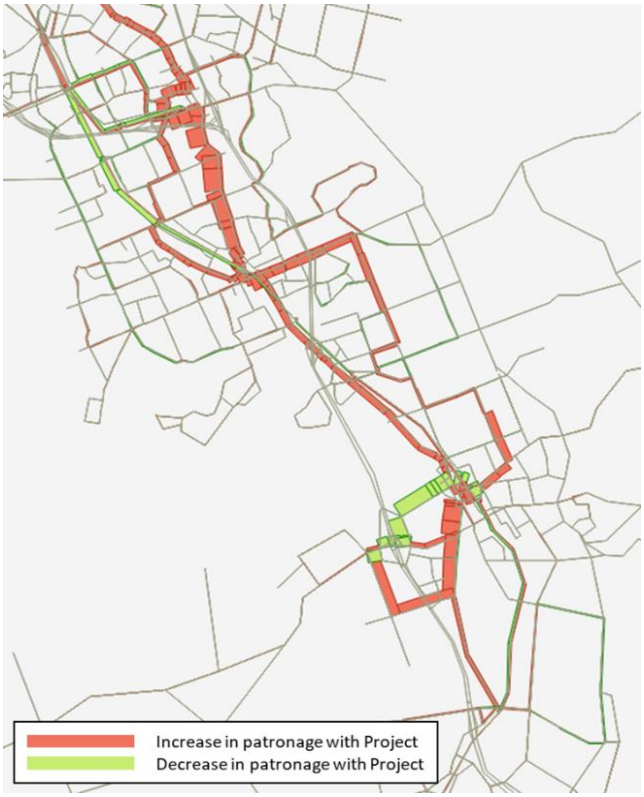
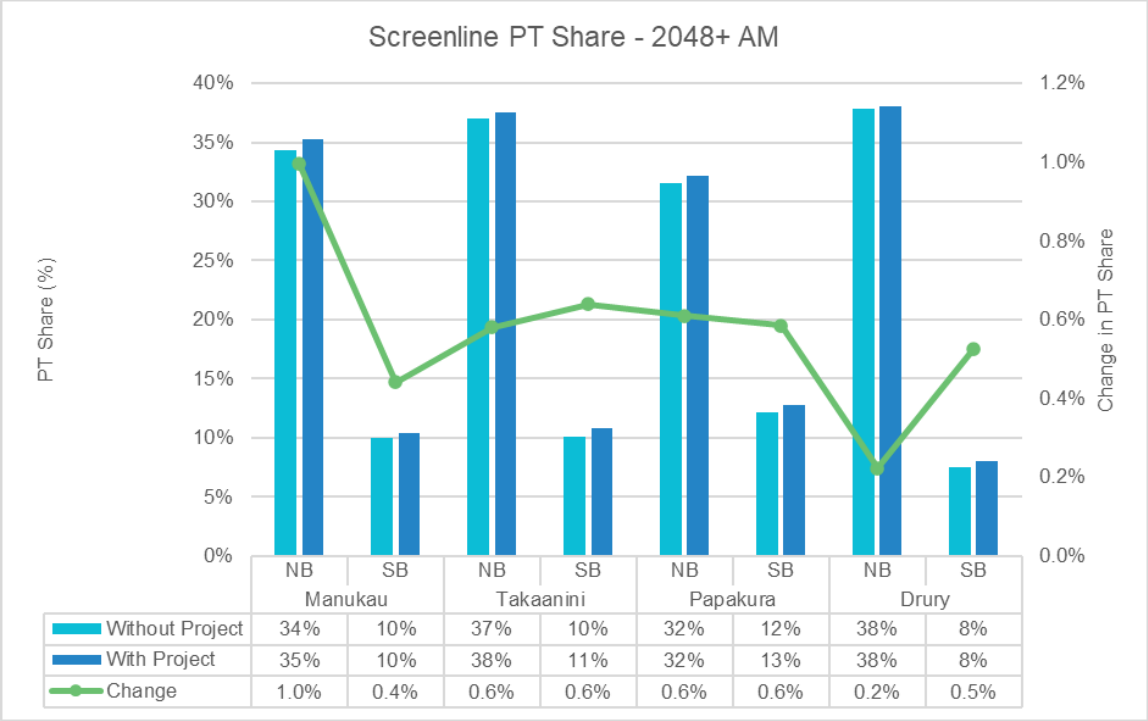


Figure 4-7: Change in 2048+ AM peak patronage

A screenline assessment has also been undertaken at the locations crossing the FTN routes as shown in Figure 4-4 to understand the change in PT mode share from a wider corridor perspective. Figure 4-8 shows the change in PT mode share on screenline totals.[24] The models indicate minor increases in PT mode share across all screenlines due to the Project. This is expected given the Project targets local gaps in the network and improves local access and travel choices, with rail providing the transformational mode shift.

[24] The mode share here includes the share of people movement between vehicles and PT, and does not include active mode travel.



	NB	SB	NB	SB	NB	SB	NB	SB
	Manukau		Takaanini		Papakura		Drury	
Without Project	34%	10%	37%	10%	32%	12%	38%	8%
With Project	35%	10%	38%	11%	32%	13%	38%	8%
Change	1.0%	0.4%	0.6%	0.6%	0.6%	0.6%	0.2%	0.5%

Figure 4-8: AM peak PT share across screenlines – Year 2048+

Figure 4-9 shows the estimated peak hour patronage on the Great South Road and Takaanini FTNs with and without the Project in 2048+.

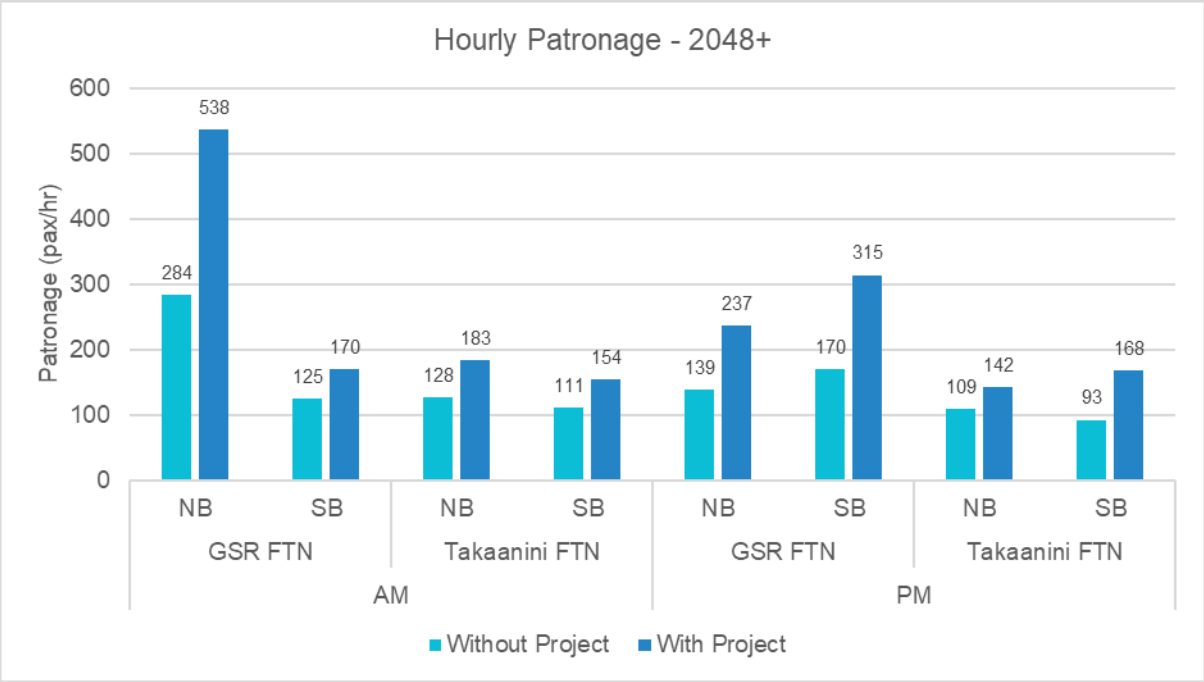


Figure 4-9: AM and PM peak hourly FTN patronage – Year 2048+

Figure 4-10: Typical active mode facility cross-section

4.1.2 Walking and Cycling

The Project includes 27km of separated walking and cycling facilities along the corridors being upgraded except through the Takaanini interchange where the existing shared use path is to be retained. It is noted that for the majority of the Project, there are existing footpaths albeit in many instances they are deficient.

Figure 4-10 illustrates the proposed cross-section for the active mode facilities. Generally, a 1.8m – 2.0m wide footpath and a 2.0m wide cycle path have been allowed for across the corridors which meets the width outlined in AT 's Transport Design Manual. The width of the berm varies depending on the available space.

The Project's focus is on long-term route protection, with the NoRs focused on providing sufficient space for separate walking and cycling within the corridors. The exact provision will be confirmed at the detailed design stage noting that there may be localised areas where shared use paths or reduced widths will be necessary for a short stretch. However, as a whole, we consider the Project will have significant improvements for active modes.

SAMM was used to estimate the change in active mode usage with and without the Project. It should be noted that the active mode travel reported here only relates to those making single-mode trips by walk or cycling. It does not include those accessing the FTN bus stops or the RTN stations. The change in total, daily regional cycle and pedestrian travel is presented in Table 4-1. This shows that there is an uplift of 300 daily cycle trips and 9,400 daily walk trips, resulting in an uplift of 2,900 walk-km and 1,400 cycle-km at a daily level in the Auckland region with the Project. The contribution of

these uplifts that is due to the local impacts of the Project are illustrated by the cycle and walk flow difference (with versus without the Project**) – see** Figure 4-11 and Figure 4-12, respectively.

Table 4-1: Daily regional active mode travel – Year 2048+

Scenario	Cycle		Pedestrians	
	Daily Trips	Daily Travel (km)	Daily Trips	Daily Travel (km)
Without Project	80,100	323,400	1,678,600	1,600,800
With Project	80,400	324,800	1,688,000	1,603,700
Change	300	1,400	9,400	2,900

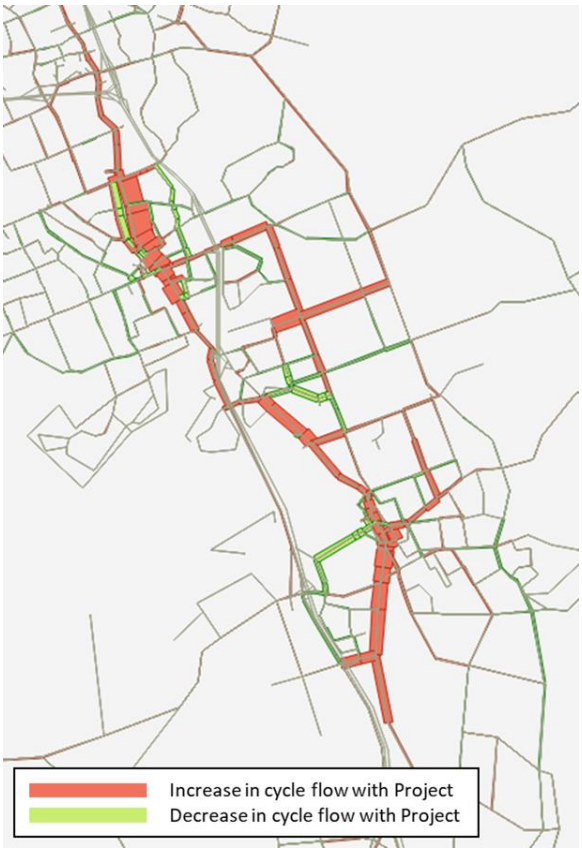


Figure 4-11: Change in 2048+ daily cycle flows

Figure 4-12: Change in 2048+ daily walk flows

The above shows that a large increase in pedestrian movements is predicted to and from the Takaanini industrial zones via Porchester Road and Popes Road with the Project. This indicates that the Project's impact on walking is primarily local to the Takaanini area, where the most significant improvement for walking is proposed due to the current lack of facilities along Popes Road.

In terms of cycle movements, the above shows a predicted increase along GSR and on Porchester Road. This indicates that the Project's proposal for separated cycle lanes increases the attractiveness of cycling in South Auckland.

Overall, the Project will:

- Have relatively modest positive effects for walking, as footpaths already exist on both sides of the corridor through the brownfield areas;
- Significantly improve cycling as there is either a lack of facility (i.e. along the majority of the Takaanini FTN), unprotected on-road cycle paths (along sections of Great South Road) or shared paths. The separated facility proposed as part of the Project separates cyclists from traffic as well as pedestrians, thereby improving safety for both and ultimately improving the attractiveness of these modes;
- Lead to environmental and health benefits as a result of increased active mode trips and reduced reliance on vehicle trips; and
- Support growth adjacent to the corridors in a sustainable manner by improving east-west and north-south active mode connectivity.

4.1.3 Road Safety

The design of the Project has been undertaken with consideration of the latest safety guidance. This includes AT's Vision Zero and the Waka Kotahi Road to Zero. Safety has been considered at all stages of corridor design to ensure that the Project will improve safety for all road users. This includes 27 km of new active mode facility. It was estimated that the safety benefits of the Project amount to $31 million.[25]

The Project in some instances has reallocated road space and removed existing flush medians along Great South Road. The removal of existing flush medians has the potential to increase rear-end type crashes which are typically lower in crash severity, however, they do have the potential to encouraging higher speeds due to the perception of more available road space for vehicles. In addition, its removal has been for the provision of separated active mode facilities (and bus lanes) to enable safer walking and cycling. Mode shift to public transport or active modes can also contribute to system-wide reduction in vehicle travel, and subsequent crash frequency. In this context, the elevated risk of rear-end vehicle crashes is considered to be minor.

While it is acknowledged that some localised safety improvements may be able to be delivered on the Project corridors without the NoRs, it is considered that those are likely to be ad-hoc treatment of only historic crash locations and constrained by existing road form. With the NoRs, the Projects would provide a consistent and comprehensive corridor treatment. The Project is therefore expected to result in overall positive effects on safety when compared to the existing corridors, as summarised below.

Table 4-2: Summary of safety improvements

Crash History	Relevant safety improvements and comments
Vulnerable user related crashes	• Separated walking and cycling facilities along 27km of the Project corridors, providing a safe and attractive environment for pedestrians and cyclists. • Removal of priority controlled left turn slip lanes across several key intersections along Great South Road resulting in improved safety for vulnerable road users.

[25] As per that stated within the South FTN and Key Connections DBC calculated in line with Waka Kotahi guidance.

Crash History	Relevant safety improvements and comments
Intersection related crashes	• As per the crash statistics, the majority of crashes have occurred at intersections (67% of all crashes). • The Project proposes to upgrade a number of existing intersections along the Project corridors. The upgrades typically include the removal of free left turn slip lanes or conversion of priority-controlled intersections to signals or roundabouts. • Overall, these intersection upgrades will contribute to reducing the risk of crashes, especially with regards to the removal of potential conflict between opposing movements as movements become controlled.
Other safety improvements	• The Project provides for 19km of dedicated bus lanes, reducing bus and vehicle conflicts through reduced lane changes.

4.1.4 General Traffic

In general, the Project retains all traffic movements along the Project corridors; exceptions are discussed within each of the NoR sections. Intersection performances are also assessed as part of the individual NoRs and are presented in their respective sections in the report.

In general, changes to traffic capacity are expected from the following Project elements:

- Removal of free left turns at signalised intersections;
- Reallocation of general traffic lane to bus lanes;
- Widening of the road corridor from two lanes to four lanes for the Great South Road Drury upgrade; and
- Additional approach lanes at intersections increasing intersection capacity.

Figure 4-13 and Figure 4-14 show the change in traffic flow/ traffic rerouting along the network as a result of the Project. This suggests that the Project has the potential to reroute traffic with the proposed intersection upgrades along the two FTNs and proposed bus lanes on Great South Road. Table 4-3 shows the key changes in traffic flows in 2048+ as a result of the Project.

Figure 4-13: Change in 2048+ AM traffic flows

Figure 4-14: Change in 2048+ PM traffic flows

Table 4-3: 2048+ peak hour traffic flows (two-way) with and without the Project[26]

Corridor	Without Project		With Project		Difference	
	AM	PM	AM	PM	AM	PM
SH1 between Beach Road and Takaanini interchange	11,900	11,900	11,700	11,900	-200	0
Beach Road	1,000	1,400	1,100	1,500	100	100
Great South Road between Walters Road and Airfield Road	2,000	1,800	2,000	1,900	0	100
Walters Road between Porchester Road and Great South Road	800	900	600	300	-200	-600
Airfield Road	800	700	900	900	100	200
Mill Road between Walters Road and Airfield Road	2,800	2,900	2,900	3,000	100	100
Porchester Road between Walters Road and Airfield Road	2,100	2,200	1,900	1,900	-200	-300
Great South Road between Browns Road and Kerrs Road	2,200	1,500	1,600	1,400	-600	-100

[26] These traffic flows and the corresponding plots shown in **Figure** 4-13 and **Figure** 4-14 are based on MSM.

The below shows the travel time along the two FTN routes for general traffic in 2048+. It indicates that there are some travel time disbenefits for general traffic resulting from the Project. However, for the majority of the route, this change is minimal at less than one minute or less than 1% change. The greatest effect can be seen between Manurewa to Manukau along Great South Road where the increase in travel time is expected to increase to just under two minutes with the Project which is considered to be minor. Given the focus on climate change and vehicle kilometres reduction, the estimated daily decrease of 54,800 vehicle kilometres travelled (**VKT**) in 2048+ is mainly attributed to the increase in mode share in public transport and active modes for local trips. Thus, this is not considered to be a significant adverse effect.

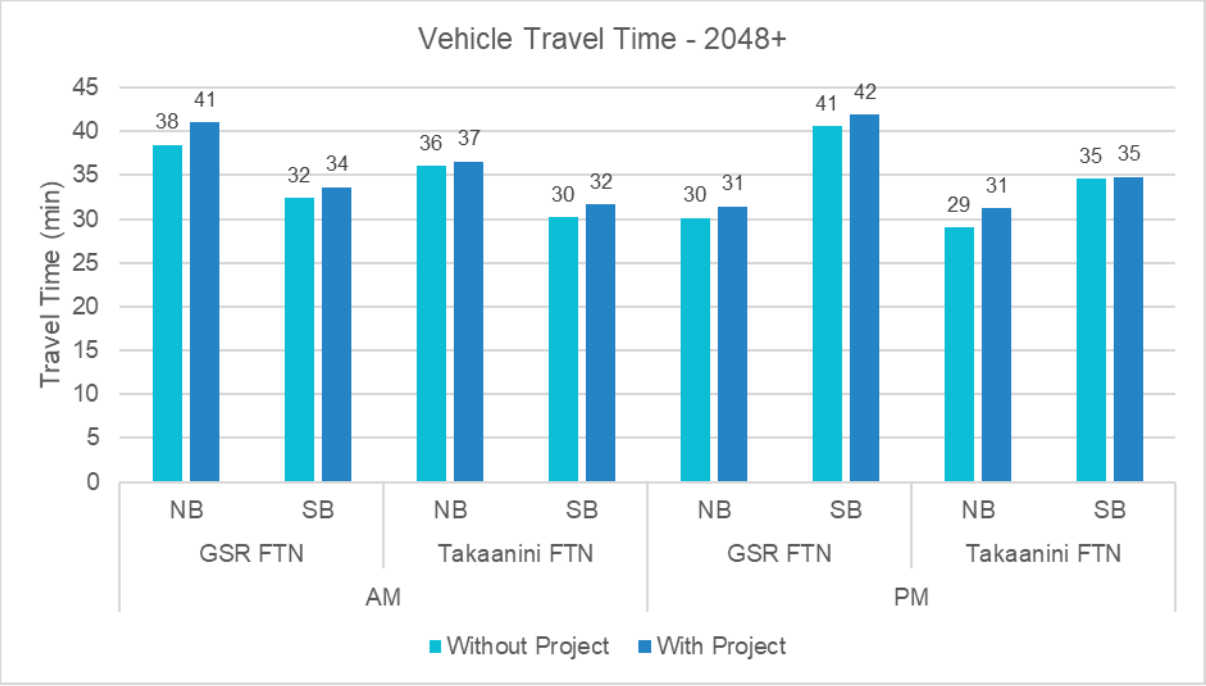


Figure 4-15: AM and PM peak vehicle travel time on FTN routes – Year 2048+

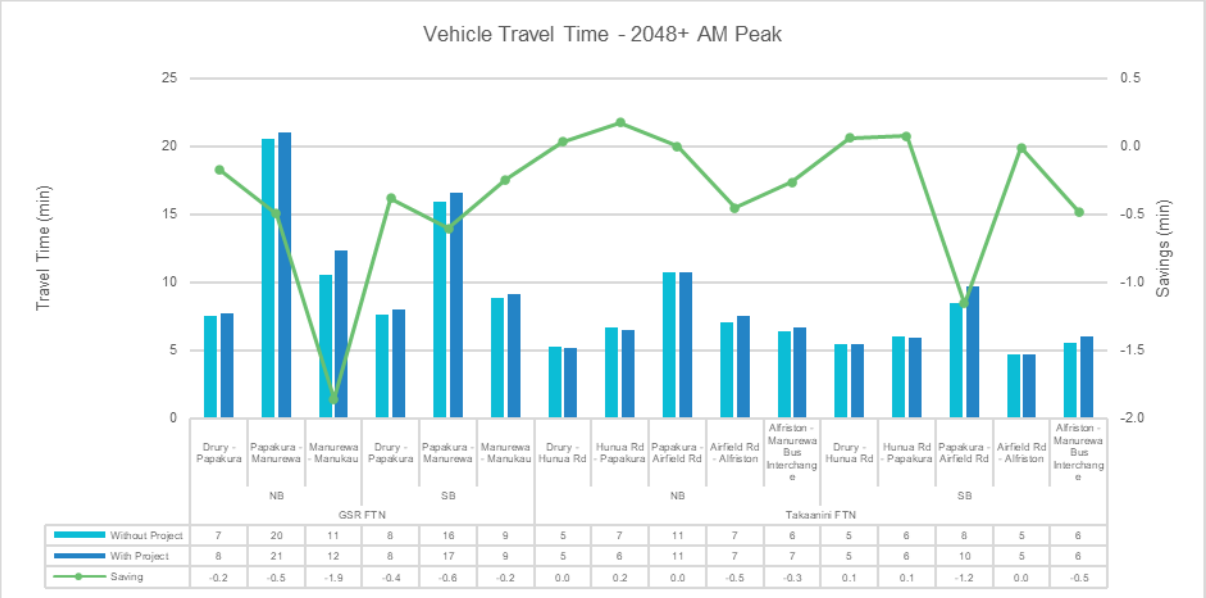


Figure 4-16: AM peak vehicle travel time on FTN routes – Year 2048+

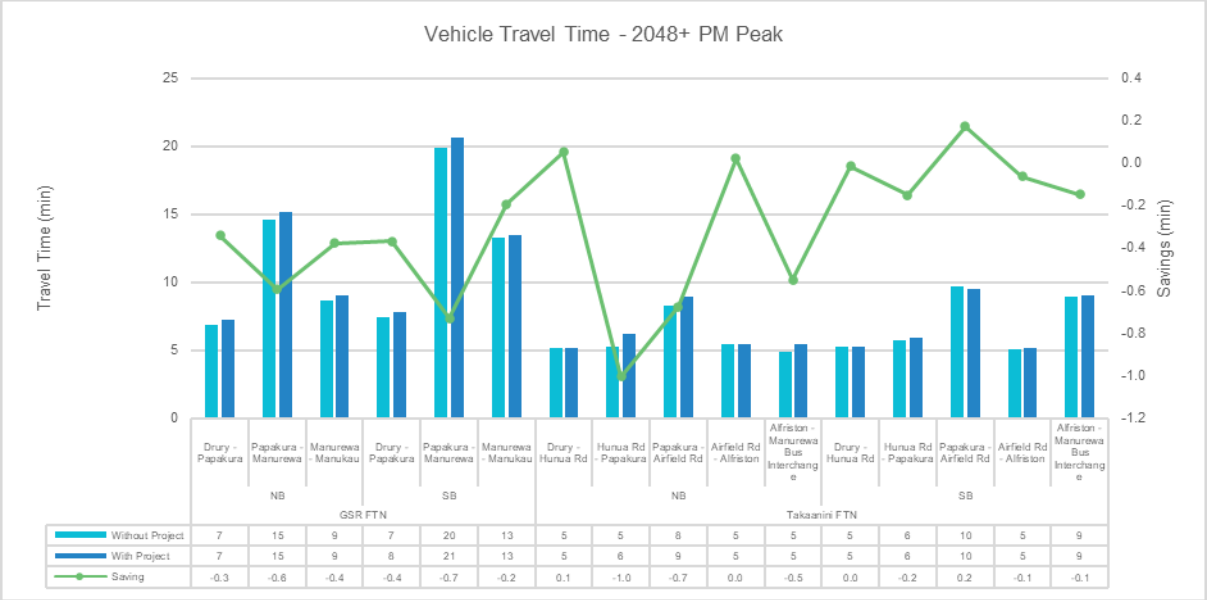


Figure 4-17: PM peak vehicle travel time on FTN routes – Year 2048+

In general, there are some predicted localised increases of delay at some locations as a result from changes to intersection forms i.e. from priority to signals. Although traffic signals increase delays at intersections, especially during non-peak periods, they could reduce delays for minor movements as drivers are less reliant on finding a gap in high volume traffic flow. In addition, they provide operators the opportunity to manage traffic flow and demand.

Overall, there are considered to be no significant adverse effects or delays for general traffic. The Project is predicted to have positive benefits on vehicle kilometres travelled and mode share shift towards public transport and active modes.

4.1.5 Freight

The Project corridor runs through and adjacent to the Takaanini and Drury industrial areas. It is anticipated to have similar operational effects as general traffic. It is noted that there is an opportunity to use the proposed bus lanes as freight lanes during the off-peak periods to further enhance freight movement in the area.

4.1.6 Property Access

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

For existing properties, our design philosophy for the Projects has been to retain existing access and movement wherever feasible. Unless it has been identified that a solid median/ traffic island is required for safety or operational reasons, the assessment has assumed a flush median. For

development accesses, direct property access onto arterial corridors is not advised where possible to better align with future arterial access requirements.

In situations where NoR impacts access (such as the need for realignment or regrading), these specifics will be confirmed during the detailed design phase, in coordination with the landowner, and as part of property discussions under the Public Works Act 1981 (**PWA**) where appropriate.

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

Subsequent sections in Part B provide more detailed assessments of where existing accesses are impacted.

4.1.7 Parking

On-street parking

The Project will remove all existing on-street parking along the Project corridors (i.e. across all NoRs). We consider this effect to be minor given there are still opportunities for parking on surrounding side roads especially along Great South Road. Although this will inconvenience some motorists as alternative parking needs to be sought, this has been considered in the context of the improved PT and active travel proposed by the Project which will minimise the need for car travel and parking. In addition, the removal of on-street parking is a consequence of intensification and is anticipated and encouraged by Auckland Transport's policy direction regarding on-street parking on arterial roads. In this regard, the removal of on-street parking along the Project corridors is in accordance with the Auckland Parking strategy.

It is also noted that there is an opportunity to use the kerbside lanes as parking during the off-peak hours. However, this should be assessed in the future.

Specific effects for each of the NoRs are discussed in more detail in Part B.

On-site parking

The Project will impact on-site parking, typically along site frontages. Given the long-term nature of the Project, the assessment does not attempt to undertake a comprehensive assessment of the impacts on operations given that the future context may change. The final details will be confirmed through the future detailed design phase, in coordination with the landowner, under requirements of the designation Conditions. Where final designs could impact on property value or operations, these would be addressed as part of property discussions under the PWA. The assessment undertaken in Part B instead determines the quantum of the parking impacted for each of the NoRs as an indication of the impact that may be anticipated.

It is worth noting that the NPS-UD specifically removes all parking minimum requirements from the Auckland Unitary Plan. In this regard, the removal of on-site parking spaces because of the Project does not infringe any relevant standards.

4.1.8 Project Interdependencies

4.1.8.1 Interdependencies within the Project and NoRs

The proposed upgrades within the Project and the NoRs are within existing corridors. The upgrades are anticipated to happen progressively over time as funding becomes available. It is not anticipated that implementation of parts of the Project will adversely impact the network given:

- The upgrades along Popes Road and Porchester Road are for the most part for walking and cycling;
- Alfriston Road will be widened to four lanes to accommodate bus lanes;
- The proposed upgrade of Great South Road in Drury is for a short section only and is anticipated to relieve a potential bottleneck at the Drury interchange;
- Buses will still be able to use their planned routes; and
- Upgrades along Great South Road are either intersection upgrades or bus lanes. Noting that some general traffic lanes are reallocated for bus lanes, which when implemented is not anticipated to have significant adverse impacts on the network as noted in Section 4.1.4.

4.1.8.2 Interdependencies with other Projects

It is not anticipated that the Project or NoRs have specific interdependencies with other Projects being proposed in the South for similar reasons as noted above. However, the following is noted:

- Completion of Mill Road and Opaheke N-S arterial and four tracking would relieve pressure on the network, especially along Great South Road. However, the Great South Road upgrades are anticipated to address existing and future public transport reliability issues and as such are not contingent on these projects happening;
- Prioritise areas of the FTN network that will alleviate deficiencies for buses and around key stations to encourage modal shift; and
- Upgrade to Alfriston Road to be timed with new bus services being proposed.

4.2 Recommended measures to avoid, remedy, or mitigate operational effects

Overall, the Project will provide positive benefits, with some potential adverse operational effects identified. In terms of recommended measures to mitigate these potential effects, these include a proposed designation condition, which requires AT to demonstrate (in the Outline Plan) how safe access will be provided for each existing access that is altered by the Project.

Further, although on-street and on-site parking are impacted as a result of the Project, in terms of the transport system, these are considered a minor effect given there are still opportunities for parking on side roads. Although, this may inconvenience some motorists, this has been considered in the context of the improved public transport and active travel enabled by the Project which will minimise the need for car travel and parking. In addition, this effect is in line with AT's Parking Strategy (which provides policy direction to enable re-prioritize the use of public road space for public good) and the NPS-UD's removal of parking minimum requirements.

4.3 Assessment of construction effects

This section covers a general assessment of construction effects of the Project. NoR specific assessments are covered in Part B of this report.

It is anticipated that the majority of construction work required for this Project will likely be adjacent to or in the live carriageway, which 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 closures for nights or weekends may be required for some specific activities, such as road surfacing, traffic switches, bridges and gas relocation. Other activities may require stop/go or contraflow traffic management, such as drainage, utility relocation, survey and investigation work.

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

The construction of the Project will likely require earthworks. 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 volumes on construction routes used during the construction period.

4.3.1 Traffic Routes

Given the construction timing and staging of the Project and NoRs has yet to be determined, there is a degree of uncertainty associated with the 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; and
- The exact location and extent of compound sites/lay down areas has yet to be determined.

Notwithstanding this, it is considered that with available connectivity to the strategic network and available capacity in the network, construction traffic will be able to be readily accommodated. Where construction may require road closures (e.g. for bridge replacements), these are assessed and discussed later in the report within the relevant NoR sections.

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 routes and time restrictions will need to be updated and refined as part of the CTMP process. It is anticipated that routes for construction traffic will likely be limited to arterial corridors, the adjacent state highway network (SH1) and intersections with the provision of adequate vehicle tracking.

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 are discussed below, such as speed limits, pedestrians and cyclists, property access and parking, as well as on-street and public parking.

Specific considerations for each of the NoRs that will need to be further considered in the CTMP are discussed in the latter parts of this report.

4.3.2 Speed Limits

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 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.

4.3.3 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 further development occurs prior to construction, but the existing network of parallel collector roads, mostly with footpaths on both sides of the road, and off-road walking and cycling facilities will remain available and could also be used as alternative routes during construction. Hence, overall effects are likely to be avoided by temporary alternatives. Specific considerations are discussed in Part B. Effects should be assessed again when a greater level of detail is available about demand and adjacent development, prior to construction. It is recommended that residents and stakeholders (such as Bike Auckland and cycling clubs) be kept informed of construction times and progress. General observations of pedestrian and cyclist activity should be used to inform appropriate traffic management measures in the CTMP.

4.3.4 Property access for residents and businesses

During construction, temporary traffic management controls such as temporary concrete or steel barriers will be required along the corridors. Existing driveways that are required to remain operational during construction will require temporary access provision. It is anticipated that the contractor would undertake a property-specific assessment of any affected driveways and provide temporary access arrangements if required. Temporary access should ensure the ability for residents to safely access and exit their properties. These requirements should be captured in the CTMP or Site-Specific CTMP (**SSCTMP**).

4.3.5 Temporary Traffic Management Effects Assessment

It is considered that temporary effects from the construction activities on network can be adequately managed through the implementation of a CTMP during the construction phase of each NoR. The purpose of the CTMP is to ensure the construction of each NoR 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 residential properties and local activities. If required, SSTMP(s) should be developed to manage constraints on access to affected properties.

We note the following will aid in minimising construction disruptions but are not strictly required for the construction of the Project:

- Completion of Mill Road upgrade, Opaheke N-S arterial and four tracking prior to the construction of Great South Road FTN would help alleviate construction disruption along a major key arterial;
- Timing the upgrade of Great South Road in Drury with construction of the Drury Central Station; and
- Prioritising areas of the FTN that will alleviate deficiencies for buses and around key stations to help with modal shift. This will also enable greater travel choice during construction.

4.4 Recommended measures to avoid, remedy, or mitigate construction effects

It is considered that the potential construction traffic effects can be accommodated and managed appropriately via a CTMP. Based on the assessment of transport construction effects, it is recommended:

1) A CTMP be prepared prior to the Start of Construction for a Stage of Work. Any potential construction traffic effects shall be reassessed prior to construction, considering the specific construction methodology and traffic environment at the time of construction.
2) The objective of the CTMP should be to avoid, remedy or mitigate, as far as practicable, adverse construction traffic effects. To achieve this objective, the CTMP shall include:
   a) Methods to manage the effects of temporary traffic management activities on traffic;
   b) Measures to ensure the safety of all transport users;
   c) The estimated numbers, frequencies, routes, and timing of traffic movements, including any specific non-working or non-movement hours to manage vehicular and pedestrian traffic near schools or to manage traffic congestion;
   d) Size access routes and access points for all construction vehicles, the size and location of parking areas for plant, construction vehicles, and the vehicles of workers and visitors;
   e) Identification of detour routes and other methods to ensure the safe management and maintenance of traffic flows, including pedestrians and cyclists, on existing roads;
   f) Methods to maintain vehicle access to property and/or private roads where practicable, or to provide alternative access arrangements when it will not be;
   g) The management approach to loads on heavy construction vehicles, including covering loads of fine material, the use of wheel-wash facilities at site exit points and the timely removal of any material deposited or spilled on public roads; and
   h) Methods that will be undertaken to communicate traffic management measures to affected road users (e.g., businesses, residents, public, stakeholders, emergency services).
3) Auditing, monitoring, and reporting requirements relating to traffic management activities shall be undertaken in accordance with Waka Kotahi's Code of Practice for Temporary Traffic Management.

4.5 Summary of Project-Wide effects

4.5.1 Summary of positive effects

Table 4-4 below provides a summary of the positive Project-wide effects.

Table 4-4: Summary of positive effects

Positive Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridors resulting in improved protection for vulnerable road users. Consequentially, reduction in DSIs. • Improved integration with existing and planned facilities on the network resulting in improved connectivity. • Environmental and health benefits due to the uptake of active modes. • Removal of several left turn slip lanes across the corridors, improving safety for walking and cycling. • Supporting growth in a sustainable manner. • Improved choice of travel modes, both to local destinations and to the public transport network. • Improved road crossing facilities due to traffic signal control at key intersections.
Public Transport	• Better quality, frequency and reliability for PT along the FTN routes, improving its attractiveness. • Better access to the wider PT (rail) network. • Improved access to employment and social amenities via public transport. • Increase in public transport choice and resilience for the community especially in the event the rail line is full or closed. • Reduced conflicts between buses and cars with provision of bus lanes. • Supporting growth in a sustainable manner.
General Traffic	• Supporting wider network outcomes. In particular, improved public transport provisions and reduced VKT. • Improved driver safety with the conversion of priority-controlled intersections to either roundabout or signals. .
Freight	• Improved operations along Popes Road, a key freight route servicing the Takaanini industrial area and on Great South Road, Drury, with the proposed intersection upgrade and additional lanes on Great South Road.

4.5.2 Summary of construction and operational effects

Table 4-5 provides a summary of the Project-wide adverse construction and operational effects and mitigation.

Table 4-5: Project wide operational and construction effects

Effect	Assessment	Recommendation
Operational Effects		
Existing access arrangements are impacted by the Project	There are a number of existing accesses that will be impacted as part of the Project. Due to the complexity of evaluating access arrangements over time, it is not currently possible to determine the appropriate	For each of the designations, a condition is included to demonstrate (in the Outline Plan) how safe access will be provided for each existing

Effect	Assessment	Recommendation
	treatments. The best time will be during detailed design and prior to construction.	access that is altered by the Project.
On-street and on-site parking is impacted	All on street parking will be removed as part of the Project. This is in line with AT's Parking Strategy and thus considered acceptable. Due to the long-term nature of the Project, it is difficult to ascertain the operational impacts of on-site parking removal. It is worth noting that the NPS-UD specifically removes all parking minimum requirements from the Auckland Unitary Plan. In this regard, the removal of on-site parking spaces because of the Project will not infringe any relevant standards and we consider this to have minor effect.	No additional recommendation.
Construction Effects		
• We consider the construction effects can be accommodated and managed appropriately via a CTMP including any detour that may be required. • Specific considerations for each of the NoRs are discussed in the relevant sections.		

PART B: NOR LEVEL ASSESSMENT

Part B covers the assessment of each of the four proposed NoRs, covering items specific to each NoR that are not already addressed in Part A.

5 NoR 1: Great South Road FTN Upgrade

As outlined in the Project description (see Section 2), NoR 1 comprises a range of interventions providing for the Great South Road FTN route along Great South Road between Manukau and Drury. These include eight intersection upgrades, and the replacement of the Otūwairoa / Slippery Creek bridge. The wider corridor will provide for either three or four lanes in the midblock including bus lanes in one or both directions, and active mode facilities.

5.1 Existing Transport Environment

The existing transport environment is described in Section 3.5 above. The below provides a summary for NoR 1.

The existing corridor comprises two vehicle lanes in each direction with a painted median through the majority of the corridor. Land use varies along the corridor ranging from residential to commercial.

Table 5-1: Summary of existing transport features for NoR 1

	Existing Transport Feature
Speed Limit	50km/hr
Intersection	• Great South Road/ Browns Road – Signals • Great South Road/ Grand Vue Road – Signals • Great South Road/ Mahia Road – Signals • Great South Road/ Taka Street – Signals • Great South Road/ Subway Road – Signals • Great South Road/ Wood Street – Roundabout • Great South Road/ Settlement Road – Signals • Great South Road/ Park Estate Road - Priority
Walking and Cycling	• Regional cycle route between Browns Road and Takaanini interchange. Major cycle route between Takaanini interchange and Waihoehoe Road. • Footpaths are available on both sides of the corridor. • Unprotected on-road cycle ways available on parts of the corridor.

Public Transport	• Route 33 currently runs along Great South Road with 15-minute frequency.
	• Frequent Transit Network 1 under Future Connect
	• Northbound bus lane is available between Browns Road and Hill Road
	• Intersections with bus priority:
	  ○ Great South Road/ Alfriston Road/ Weymouth Road/
	  ○ Great South Road/ Mahia Road

	Existing Transport Feature

Freight	• Level 3 freight route between:
	  ○ Waihoehoe Road and Papakura town centre
	  ○ Takaanini Interchange and Browns Road
	• Level 1B freight route between Queen Street and Takaanini interchange

5.2 Assessment of operational effects

5.2.1 Public Transport

Great South Road is an existing FTN and will remain so in the future. The Project proposes dedicated bus lanes leading up to the intersections allowing buses to queue jump and consequently improve public transport travel time and reliability. As noted in Section 4.1.1, the proposed bus lanes are expected to improve travel time up to 6 minutes between Papakura and Manurewa in the AM Peak period and savings of up to 9 minutes between Manukau and Manurewa in the PM peak period.

Overall, there are positive benefits for public transport.

5.2.2 Walking and Cycling

The Project proposes separated walking and cycling facilities on both sides of the corridor including on the Slippery Creek bridge and at the intersections. As noted in Section 4.1.2**,** the proposed facilities meet the standards set out within AT Transport Design Manual and will encompass the positive effects previously mentioned.

5.2.3 Safety

The proposed separated active mode facilities along the corridor and at the intersections, as well as the removal of left turn slip lanes at intersections (Mahia Road/ Great South Road and Settlement Road/ Great South Road), will improve safety for vulnerable road users.

The proposed signalisation of Park Estate Road/ Great South Road and Grand Vue Road/ Great South Road will improve safety as movements become controlled, thereby minimising conflicts and reducing the likelihood of crashes.

5.2.4 General Traffic

The forecasted 2048+ traffic volume for the sections of corridor of interest within this NoR are shown in Table 5-2. The wider network impacts are discussed in Section 4.1.4.

Table 5-2: 2048+ traffic flows with and without the Project for NoR 1

Corridor	DIr	Without Project			With Project			Difference		
		AADT	AM	PM	AADT	AM	PM	AADT	AM	PM
	NB	9,150	1,150	500	8,400	950	500	-750	-200	0

Corridor	Dir	Without Project			With Project			Difference		
		AADT	AM	PM	AADT	AM	PM	AADT	AM	PM
Between Browns Road and Grand Vue Road	SB	6,750	350	750	7,050	450	600	300	100	-150
Slippery Creek Bridge	NB	10,050	950	800	9,750	950	800	-300	0	0
	SB	9,600	650	900	9,650	700	950	50	50	50

The above shows:

- The traffic volume in 2048+ is anticipated to remain relatively similar with and without the Project.
- There is a reduction in northbound traffic predicted on Great South Road as traffic is rerouted on to the wider network to go north due to the reallocation of kerbside traffic lanes north of Browns Road to bus lanes and the implementation of signals at the Super Clinic intersection.

As noted in Section 4.1.4, the Project has the potential to reroute a small amount of traffic to the wider network. Localised delays and increase in travel time for some drivers may be expected (refer to Section 4.1.4), these are not considered significant and is countered by the improved travel time for public transport along a key bus route.

5.2.4.1 Intersection Performance

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.

Table 5-3 provides a summary of the SIDRA analysis undertaken for the intersections within the NoR.

Appendix A provides details of the SIDRA.

Table 5-3: Intersection key performance summary for NoR 1 (2048+)

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
GSR / Browns Rd	**AM Peak**				
	With	F	1.072	453.1	87.4
	Without	F	1.158	522.4	145.5
	Difference	-	-0.086	-69.3	-58.1
	PM Peak				

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	With	F	1.087	408.7	89.6
	Without	F	1.259	876.3	136.8
	Difference	-	-0.172	-467.6	-47.2
GSR / Grand Vue Rd	**AM Peak**				
	With	B	0.746	114.6	18.2
	Without	NA	1.284	327.4	53.6
	Difference	-	-0.538	-212.8	-35.4
	PM Peak				
	With	B	0.701	99.8	19.5
	Without	NA	0.462	20.2	5.4
	Difference	-	0.239	79.6	14.1
GSR / Mahia Rd	**AM Peak**				
	With	C	0.809	145.5	21.7
	Without	B	0.644	92.1	15.6
	Difference	-	0.165	53.4	6.1
	PM Peak				
	With	B	0.504	64.4	15.6
	Without	C	0.869	134.6	25.3
	Difference	-	-0.365	-70.2	-9.7
GSR / Taka St	**AM Peak**				
	With	E	0.994	469.0	58.6
	Without	D	0.977	368.7	52.3
	Difference	-	0.017	100.3	6.3
	PM Peak				
	With	C	0.871	141.5	28.6
	Without	C	0.850	144.7	30.0

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	Difference	-	0.021	-3.2	-1.4
GSR / Subway Rd	**AM Peak**				
	With	C	0.857	148.7	21.8
	Without	C	0.900	94.8	22.0
	Difference	-	-0.043	53.9	-0.2
	PM Peak				
	With	C	0.779	100.9	23.2
	Without	C	0.871	103.1	25.6
	Difference	-	-0.092	-2.2	-2.4
GSR / Wellington St	**AM Peak**				
	With	B	0.581	37.8	10.3
	Without	A	0.402	25.7	7.2
	Difference	-	0.179	12.1	3.1
	PM Peak				
	With	B	0.848	86.0	13.8
	Without	A	0.680	76.7	9.1
	Difference	-	0.168	9.3	4.7
GSR / Beach Rd	**AM Peak**				
	With	E	0.995	231.3	59.6
	Without	D	0.965	210.7	50.2
	Difference	-	0.030	20.6	9.4
	PM Peak				
	With	E	1.036	294.1	70.1
	Without	F	1.181	442.7	119.8
	Difference	-	-0.145	-148.6	-49.7
GSR / Park	**AM Peak**				
	With	B	0.722	104.5	16.7

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	Without	NA	0.772	28.7	6.2
	Difference	-	-0.050	75.8	10.5
	PM Peak				
	With	B	0.821	204.2	18.2
	Without	NA	0.749	21.9	5.4
	Difference	-	0.072	182.3	12.8

The above indicates:

- The 'With Project' results indicate that the Project generally does not significantly worsen the intersection performance, with regards to LOS, and difference in average delay and queue length;
- Where there are noticeable increases in delay and queue length, this is as a result of converting an intersection from priority to signals i.e. in the case of Great South Road/ Park Estate Road and Great South Road/ Grand Vue Road. Conversion to a signalised intersection typically increases the delay but improves overall safety as movements becomes controlled, reducing the likelihood of crashes;
- Great South Road/ Browns Road performs at LOS F during both peak periods. However, there is an improvement in overall delay and queue length when compared with the 'Without' Project, due to traffic being rerouted resulting in a reduction in traffic volume at this intersection;
- Taka Street / Great South Road is expected to perform at LOS E during the AM peak, worse than 'Without' Project This is partly due to the removal of the left turn slip lane on Walter Stevens Drive and the addition of a pedestrian crossing on the south approach. These improvements improve pedestrian safety and decrease pedestrian delays at the intersection. Although, there is increase in delay, main bus movements are expected to perform at LOS B or C as there are bus lanes available allowing queue jumping; and
- Great South Road/ Beach Road intersection 'With' Project is expected to perform slightly worse than 'Without' Project during the AM peak period due to the signalisation of the left turn slip lane on the south approach which is proposed to improve pedestrian safety at the intersection. Main bus movements will still maintain a LOS C and have the ability to queue jump on the south approach during the AM peak.

Overall, the Project generally does not significantly worsen the performance of key intersections for general traffic. Any increase in delay resulting from the Project is generally due to the removal of left turn slip lanes or conversion of priority-controlled intersections to signalised intersections which improves the overall safety at these intersections.

5.2.5 Freight

Great South Road will continue to serve the freight network.

Similar to general traffic, there will be some operational impacts during the peak periods resulting from the intersection upgrades. However, the impacts are considered minimal. It is also noted freight is also important during the inter-peak period, and there is an opportunity to use the proposed bus lanes as special vehicle lanes in the future during the inter-peak.

As such, it is considered the proposed Project footprint provides a flexible corridor width to enable efficient freight movements.

5.2.6 Access and Parking

5.2.6.1 Access

The corridor and intersections are existing and their role on the network is not expected to change with the Project. Access to them will remain the same with the Project There is also no anticipated change to how users will access existing properties. As noted in Section 4.1.6, where existing accesses will be impacted, these will be evaluated closer to the time.

5.2.6.2 Parking

On-Street Parking

As noted in Section 4.1.7 all on-street parking will be removed by the Project. Figure 5-1 to Figure 5-4 provides details of the impacted on-street parking.

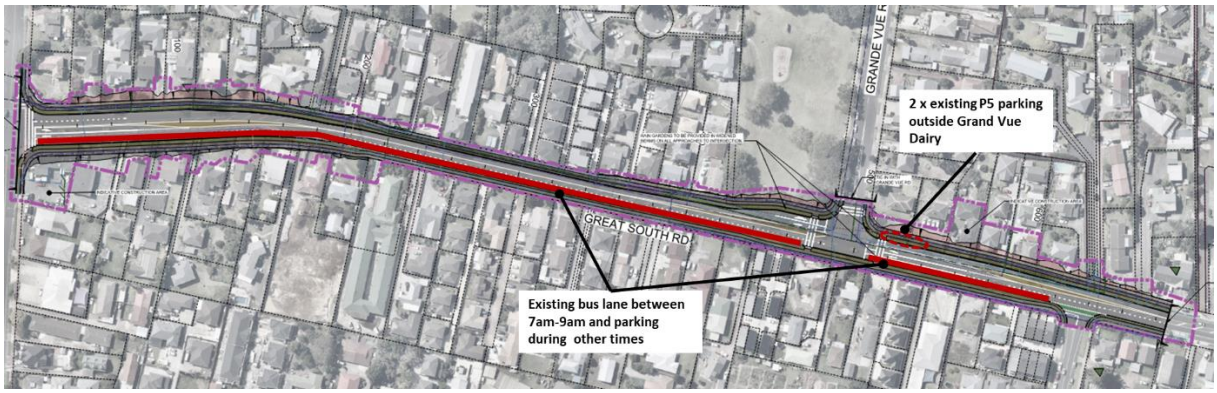


Figure 5-1: Affected on-street parking between Browns Road and Grand Vue Road

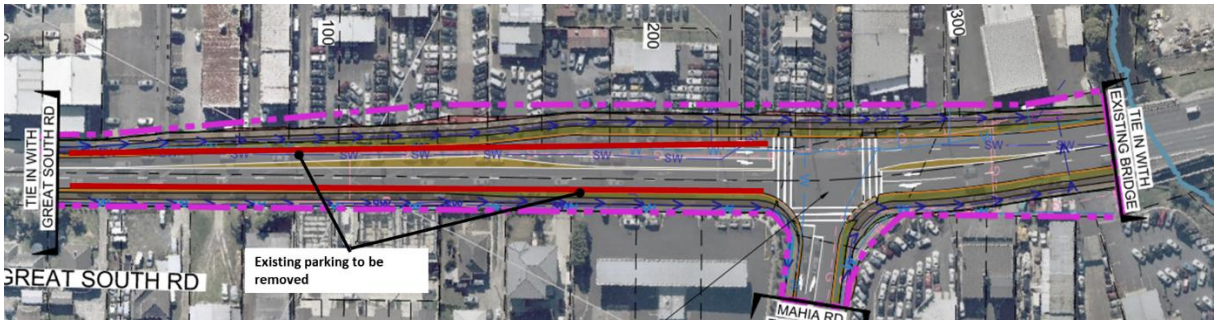


Figure 5-2: Affected on-street parking by Mahia Road intersection

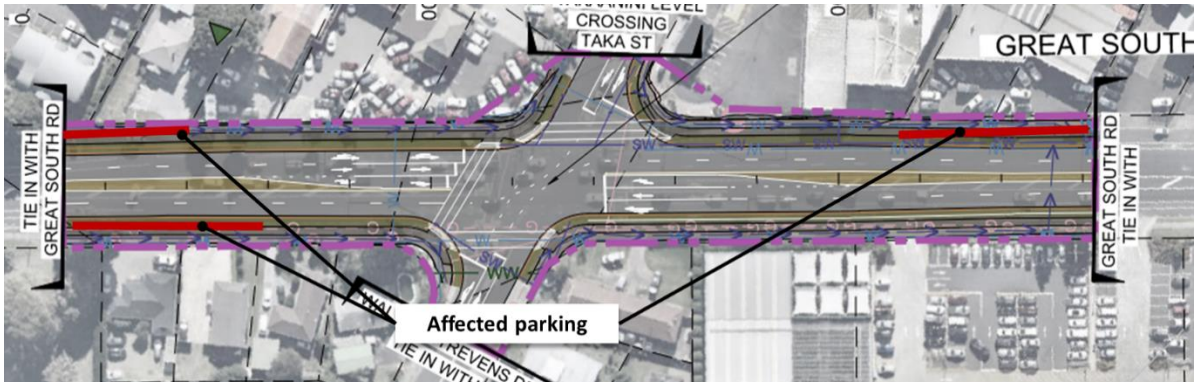


Figure 5-3: Affected on-street parking by Taka St intersection

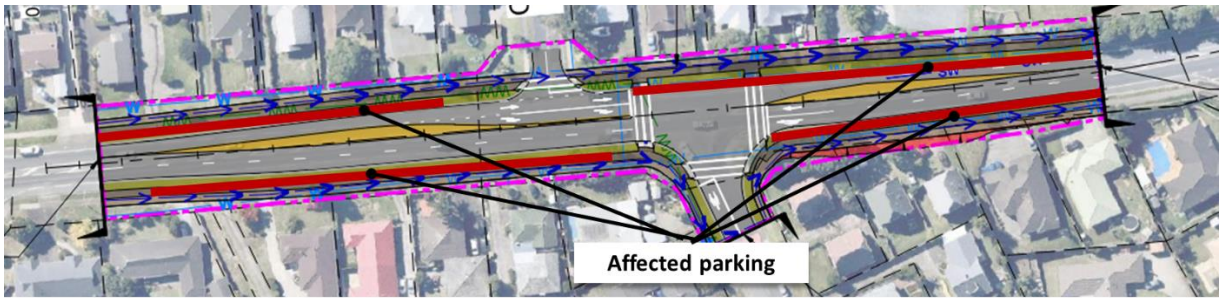


Figure 5-4: Affected on-street parking by Park Estate intersection

Key things to note:

- Although on-street parking is impacted along the section of Great South Road between Browns Road and Grand Vue Road, parking is already unavailable during the AM peak hour currently. The Project will not preclude the kerbside lane to be used as parking in the future in the off-peak period noting that this is something that could be decided later;
- Whilst the P5 parking outside the Grand Vue dairy will be removed, we consider this to have negligible impact given the Dairy will be acquired as part of this NoR; and
- On-street parking is removed as part of the intersection upgrades works; however, there are either opportunities to park on-site and/or on surrounding side streets. These include Beaumonts Way by Mahia Road intersection or Coulthard Terrace by Park Estate Road intersection.

In general, whilst the removal of on-street parking will be an inconvenience to some motorists, we consider the effects to be minor as this has been considered in the context of the improved public transport and active travel proposed by the Project, which will minimise the need for car travel and parking. In addition, the removal of on-street parking is in line with AT's policy direction where the removal of on-street parking on arterial roads is anticipated and encouraged by AT's Parking Strategy.[27]

On-Site Parking

The indicative number and location of affected on-site parking spaces is summarised in Table 5-4.

[27] Auckland Parking Strategy, 'Room to Move', May 2023

Table 5-4: Affected on-site parking for NoR 1[28]

Address	Activity	Parking spaces in designation	Parking spaces in cross-section
21 Great South Road	Commercial	9	6
288 Great South Road	Commercial	3	3
290 Great South Road	Commercial	5	3
2/292 Great South Road	Commercial	These properties are currently car dealers that have vehicles parked in various ways including double parked. The designation will impact on the number of vehicles able to park on the site.	
296 Great South Road	Commercial		
298 Great South Road	Commercial		
300 Great South Road	Commercial		
302 Great South Road	Commercial		
304 Great South Road	Commercial		
318 Great South Road	Commercial		

Approximately 17 car parks, excluding the car dealers identified above, are impacted by the designation. The car dealerships identified will have a number of their car parks impacted noting that the number is dependent on the layout of how they wish to park their cars. This will have impacts on the number of cars that may be displayed on site. However, we note there is still sufficient space for cars to be parked. It is noted that this assessment has considered impacts on the transport system, with any potential economic impacts on properties considered a property impact to be address under the PWA. In addition, the NPS-UD removes all minimum on-site parking requirements from the Unitary Plan; therefore this is considered a relatively minor effect as the Project does not infringe any relevant standards. Importantly, some parts of the designation will only be required temporarily for construction purposes and may be able to be returned to affected landowners for use as parking spaces once the works are complete.

5.3 Recommended measures to avoid, remedy, or mitigate operational effects

Overall, there are positive benefits and no specific adverse effects requiring mitigation have been identified. Project-wide measures are covered in Section 4.4.

5.4 Assessment of construction effects

Section 4.3 sets out the overall assessment of construction effects for the Project. This section focuses on specific details relating to NoR 1.

[28] The number of 'Parking spaces in designation' is everything impacted by the designation. The designation includes the proposed cross-section for the corridor as well as temporary construction space and space required for batters etc. Parking spaces in cross-section is a subset of the total number of parking spaces impacted. This number provides an indication of likely permanent spaces impacted whereas the remainder may only be temporary.

It is anticipated the majority of the corridor and intersection upgrade works can be completed without any road closures and vehicular access will be maintained. We consider any disruptions may be managed under a CTMP.

The below assessment considers the construction of the Slippery Creek bridge; noting however that the method and timeframe for constructing the bridge has not yet been determined. In these circumstances, the construction effect has been assessed based on the worst-case scenario of complete bridge closure.

5.4.1 Construction of Slippery Creek Bridge

5.4.1.1 Land use and Transport Context

This section of Great South Road is a key north-south corridor with limited parallel routes. It also provides the sole public transport service, route 376 through this section. There are a number of educational establishments to the south of the bridge that are likely to generate walking trips. This includes Wee Wisdom Motessori Preschool, Drury School and Young Petals, Early Learning Centre. In addition, the Slippery Creek Reserve is just south of the bridge which consists of a boat ramp with a kayak hiring shop adjacent to it.

5.4.1.2 General Traffic and Freight

Figure 5-5 shows the likely detour route for northbound and southbound traffic if the bridge is closed for construction. As shown, Great South Road is a key north-south corridor and there are limited parallel routes with Opaheke and Sutton Road being the likely detour route. This is a 7km detour for those adjacent to the bridge travelling southbound which is between approximately 9 minutes to 15 minutes of travel time for general traffic depending on the time of day. For others travelling southbound/northbound via Great South Road, this would be approximately an additional 1.8km of travel or approximately 3 to 9 minutes extra. Those coming via Park Estate Road, this will be approximately 2.9km and approximately an extra 5 to 11 minutes.

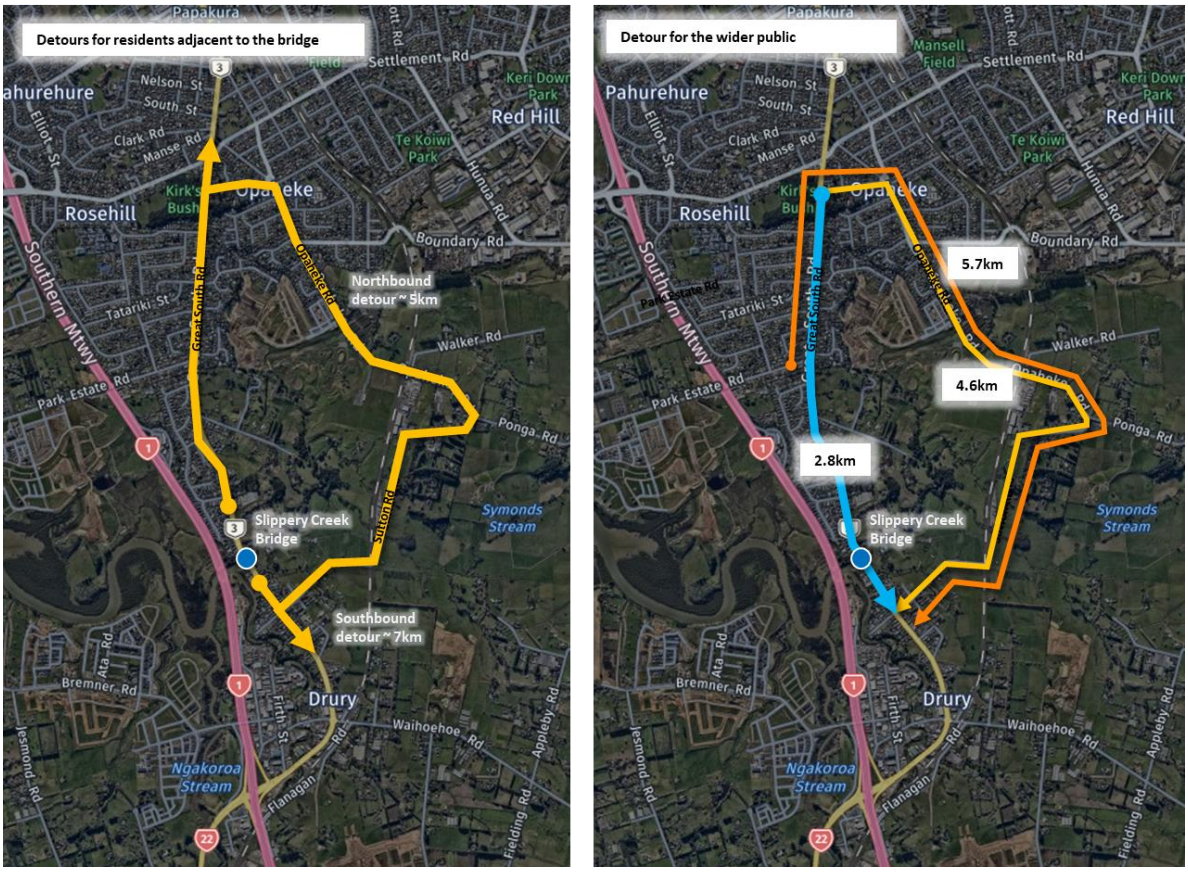


Figure 5-5: Likely detour route for NoR 1

Although a 9- to 15-minute detour could be a substantial increase in travel time depending on the length of the journey to be undertaken, this effect is only temporary, and the likely construction duration/ disruption will be around 1 year. In addition, this will only impact a small number of people who are adjacent to the bridge. For most motorists, the additional travel time will be between 3 to 11 minutes. Thus, we consider this effect could be managed under the CTMP.

The expected traffic volumes in 2038 are shown in Table 5-5 below. The TDM indicates an urban traffic lane can move 600 to 1,600 people an hour noting that this is dependent on corridor features such as intersections, crossings etc. Assuming an average occupancy of 1.2[29] , this will equate to approximately 500 veh/hr to 1,300 veh/hr. Given a large part of Opaheke Road and Sutton Road being rural with limited control features, we would expect the capacity to be greater than typical urban values. Even accounting for the two level crossings along the route, it is considered the capacity can be between 1,200 veh/hr to 1,300 veh/hr. If all the detoured traffic is diverted onto these roads, Opaheke Road will be close to capacity during the peak periods. However, it is likely that some of this traffic will use alternative routes such as Blackbridge Road and Linwood Road if they are going to and coming from the west. SH1 is also likely to be a key diversion route especially outside peak commuter directions. A range of potential diversion routes are available so it is considered that the effects of these works can be managed under a CTMP.

[29] Average occupancy rate used in Auckland Wide models.

Table 5-5: Summary of traffic volumes in 2038 (without Project) – NoR 1

Corridor	Direction	AADT (vpd)	AM (veh/hr)	IP (veh/hr)	PM (veh/hr)
Slippery Creek bridge	NB	9,300	900	600	750
	SB	9,000	650	600	850
Opaheke Road	NB	2,550	200	150	300
	SB	2,400	150	150	250
Sutton Road	EB	500	50	50	50
	WB	450	50	50	50

Regardless of the above, this section of Great South Road is key in providing for network resilience i.e. if an incident occurs on SH1, Great South Road becomes a key diversion route. However, noting that construction is in the future, Great South Road's role on the network may change and will be determined by whether Mill Road or the N-S Opaheke arterial are in the network at the time. With these in the network, there is greater network resilience and alternatives. If these are not in the network at the time, it is recommended connectivity across Slippery Creek bridge is maintained to support wider network resilience. However, if Mill Road and/or N-S Opaheke arterials are in the network, this could be reviewed.

5.4.1.3 Walking and cycling

Figure 5-6 shows there is an existing active modes bridge adjacent to the Slippery Creek bridge. If this cannot be maintained during construction, a similar detour to that of general traffic will be required for walking and cycling. This detour could be over an hour and is considered significant. Thus, it is recommended that active mode connectivity is maintained during construction. This could be achieved through providing for a temporary active modes bridge or through maintaining the existing bridge, if possible.

Figure 5-6: Existing Slippery Creek Bridge with separate active mode bridge

5.4.1.4 Public Transport

As noted, route 376 runs through this section of Great South Road and there are bus stops between Settlement Road and Sutton Road. If the service is rerouted similarly to that of general traffic, it will bypass this section of Great South Road entirely (see Figure 5-7). Thus, residents in this section will be impacted as there will be significant decrease in public transport accessibility and public transport accessibility should be maintained. There is a number of ways this could be managed and should be carefully considered as part of the CTMP:

- Maintain public transport connectivity is through construction on the bridge; and
- Additional services that serves this section or altering services to this area for the duration of construction.

Figure 5-7: Public Transport Detour

5.5 Recommended measures to avoid, remedy, or mitigate construction effects

In general, construction effects may be managed under a CTMP (refer to Section 4.4) with the following to be considered during its development:

- If the Slippery Creek bridge must be closed for construction, we recommend connection is maintained for general traffic given the importance of Great South Road in supporting network resilience. However, noting that construction is in the future, its role on the network may change shall other projects such as Mill Road and Opaheke N-S arterial is in the network. If these projects are in the network, this could be reviewed;
- Public transport service should be maintained during construction, through maintaining the connection or providing additional services to this area; and

- Likewise, walking and cycling connectivity should be maintained during construction of the Slippery Creek bridge.

5.6 Summary of effects for NoR 1

Table 5-6 provides a summary of the positive effects for NoR 1.

Table 5-6: Summary of positive effects for NoR 1

Operational Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridor resulting in improved protection for vulnerable road users. Consequentially, reduction in DSIs. • Removal of left turn slip lanes at a number of intersections improves safety. • Leads to environmental and health benefits due to the uptake of active modes.
Public Transport	• Dedicated bus lanes leading up to intersections allowing buses to queue jump improving travel time and reliability. • Conflicts between buses and cars are reduced with bus lanes improving safety.

Table 5-7 provides a summary of the operational and construction effects including recommended mitigation measures.

Table 5-7: Summary of operational and construction effects for NoR 1

Effect	Assessment	Recommendation
Operational Effects		
No adverse effects have been identified.		
Construction effects		
Network resilience impacts	Great South Road is a key north south corridor through this section and is a key alternative to SH1. With limited north-south corridors available, network resilience will be compromised if the Slippery Creek bridge is closed during construction. However, noting that construction will be in the future, its role on the network may change and will be dependent on whether the likes of Mill Road and / or Opaheke N-S arterial are in the network.	Maintain connectivity during construction if Mill Road and/or Opaheke N-S arterial is not yet in the network. If one or more is in the network, whether the connection is required should be reviewed at the time.
Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Slippery Creek bridge closed during construction. This will impact the existing 365 bus route which services the community between Settlement Road and Sutton Road. A detour will require buses to bypass this section entirely, reducing accessibility to public transport.	The development of the CTMP needs to consider how public transport will be maintained for the community if the Slippery Creek bridge is to be closed for construction. This may include providing for additional or altering services to serve the community or maintaining connection across the bridge.
Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Slippery Creek bridge closed during construction. The	Maintain active mode connectivity across Slippery Creek during construction.

Effect	Assessment	Recommendation
	detour will be 7km which is over an hour via walking. This is considered to be significant.	

6 NoR 2: Great South Road Upgrade (Drury section)

As outlined in the Project description (see section 2), NoR 2 comprises a range of interventions providing for the upgrade of Great South Road in Drury between Waihoehoe Road and the SH1 Drury Interchange. These include road widening to provide four lanes, active mode facilities, and the replacement of the Hingaia Stream bridge.

6.1 Existing Transport Environment

The existing transport environment is described in Section 3.5 above. The below provides a summary for NoR 2.

The existing corridor is predominantly surrounded by industrial and commercial development. Table 6-1 summarises the existing transport characteristics for the corridor.

Table 6-1: Existing transport characteristics for NoR 2

	Existing Transport Feature
Speed Limit	50km/hr
Traffic Volume	Traffic data obtained from Mobile Roads indicates a two-way ADT of 15,000.
Intersection	Firth Street/ Great South Road stop priority controlled
Walking and Cycling	• Footpaths are fragmented on both sides of the corridor. • No provision for cycling. • No midblock crossings available.
Public Transport	Not part of any existing bus route
Freight	Level 3 freight route

6.2 Assessment of operational effects

6.2.1 Public Transport

Figure 6-1 shows the currently proposed future bus network with services proposed along this section of Great South Road. Buses will right turn in and left turn out of Firth Street to access Bremner Road.

The proposed four lane cross-section provides an opportunity in the future for dedicated bus lanes to be implemented and enable greater reliability for buses. The cross-section will also provide adequate space for bus stops along this section.

Overall, the NoR will have positive effects for public transport.

Figure 6-1: AT Remix Future Bus Route

6.2.2 Walking and Cycling

The NoR proposes separated walking and cycling facilities on both sides of the corridor, which are included as part of the Hingaia bridge replacement. As noted in Section 4.1.2, the proposed facilities meet the standards set out within AT's Transport Design Manual and will encompass the positive effects previously mentioned. Specific to this NoR, the provisions will have the following positive effects:

- Provide continuous active mode connectivity from the Drury interchange to the upgrades at the Waihoehoe Road intersection;
- Provide the opportunity to integrate with the Drury Central Station encouraging uptake of a low carbon transport mode leading to environmental and health benefits; and
- Improve safety for active mode users through improved protection reducing the likelihood and exposure to potential crashes.

6.2.3 Safety

The proposed separated active mode facilities will improve safety for vulnerable road users by providing protection from the traffic.

The signalization of the Firth Street/ Great South Road intersection will reduce the likelihood of crossing/turning type crashes at the intersection as the corridor goes from two lanes to four lanes. As the corridor goes from two lanes to four lanes, there are increased safety risks at driveways and priority intersections as drivers will now have to cross additional traffic lanes and there is an increased risk of being struck by moving vehicles in an adjacent lane where drivers turn across a queued lane. The main safety risk will be at the intersection of Firth Street and Great South Road which is proposed to be signalized reducing the likelihood of crossing/turning type crashes. We consider the residual safety risk at driveways to be low and the effects minor.

6.2.4 General Traffic

The daily flows in this section is predicted to stay relatively similar from 14,700vpd to 14,800vpd. It is noted that the volume in this section is dependent on other projects on the wider network such as Mill Road ,Opaheke N-S arterial, Drury South interchange. Without these projects in place, the flows on this section is expected to be higher. The increase in capacity from two lanes to four lanes along this section will:

- Increase queuing space for the motorway on-ramp minimising impact on the wider network and therefore increasing network resilience in the event of an incident;
- Improve local connectivity and access in particular on to the State Highway by relieving a potential bottleneck (Drury interchange) in the future; and
- Provide lane continuity between two large intersections, Waihoehoe Road intersection and the Drury interchange.

Further, increased flood resilience of the Hingaia Stream bridge (upgrade to be 1 in 100-year flood resilient) minimises the risk during an extreme weather event, which has the potential to cause bridge damage and subsequently traffic disruption.

6.2.4.1 Intersection Performance

Outputs from SATURN have been used to understand the performance of key intersections. SIDRA has also been used to understand isolated intersection performance with respect to capacity, predicted LOS and anticipated queue lengths.

The SIDRA analysis was undertaken for the signalised intersection of Firth Street/ Great South Road with the Project for the 2048+ design year. A summary of the key performance outputs is shown in Table 6-2. More detailed SIDRA analysis and the intersection layout is included in **Appendix A**.

Table 6-2: Intersection key performance summary for NoR 2 (2048+)

Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
AM Peak				
With	B	0.620	99.5	15.4
Without	NA	0.443	7.4	3.7
Difference	-	0.177	92.1	11.7
PM Peak				
With	B	0.759	102.7	17.6
Without	NA	0.286	5.9	3.8
Difference	-	0.473	96.8	13.8

The above indicates:

- Although the signalised intersection (with Project) is predicted to increase both the delay and queue length, it still performs at a satisfactory level during the peak periods in 2048+. The

increased delay and queue length results from the conversion of the intersection from a priority intersection to a signalised intersection. As noted above, signalisation will mitigate the safety risks associated with the increased risk exposure of the road being widened from two lanes to four lanes;

- The intersection is expected to have a 95% back of queue of 100m for both peak periods. It is noted that the distance from this intersection to the Drury interchange is approximately 105m. There is the potential for the GSR west approach to queue to back to the interchange and impact operations. However, we consider this may be managed through:
    - signal coordination between the two intersections to minimise this; or
    - altering signal timing at this intersection to minimise the queue length on the west approach, albeit this may increase delay on the other approaches.

Overall, the NoR will not result in adverse performance at this intersection.

6.2.5 Freight

This section of Great South Road forms part of the Level 3 freight route both now and in the future as specified under AT's Future Connect (refer to Figure 6-2). As with general traffic, the increase in capacity along this section will improve both accessibility and connectivity for freight especially in accessing the SH1 strategic freight network.

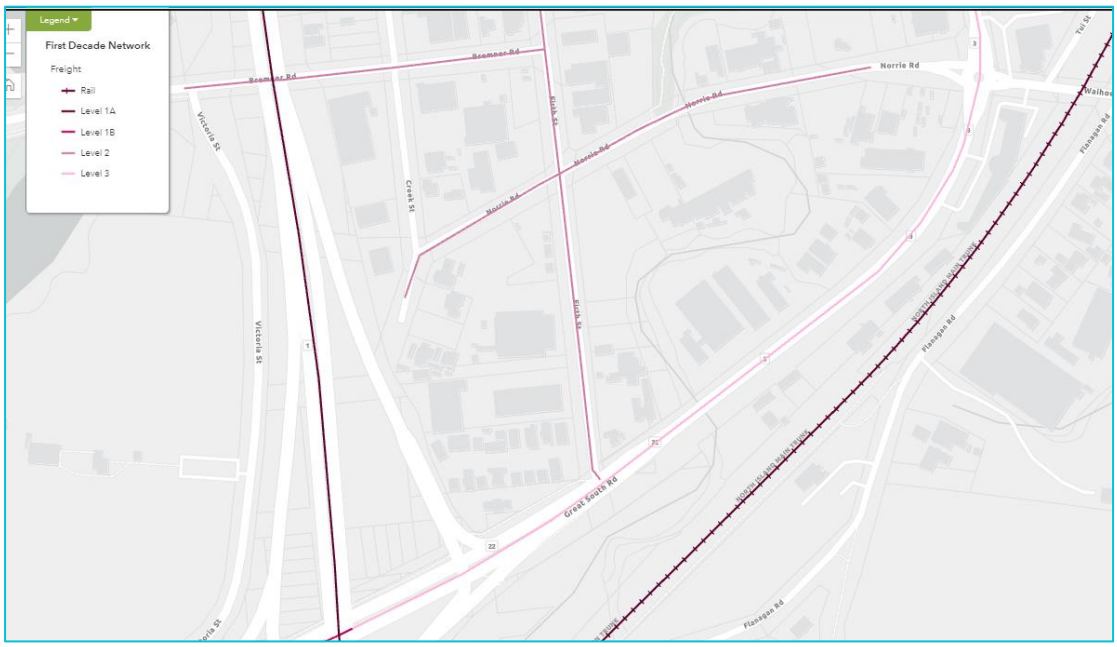


Figure 6-2: Freight Network as per Future Connect

6.2.6 Access and Parking

6.2.6.1 Access

The corridor is an existing urban corridor and its role on the network is not expected to change. Access to the corridor is via other strategic and collector roads and this will remain so with the NoR. There are no anticipated changes to how users will access existing properties with the NoR.

6.2.6.2 Parking

On-Street Parking

As noted in Section 4.1.7 all on-street parking will be removed by the NoR. Figure 6-3 shows the affected on-street parking for NoR 2.

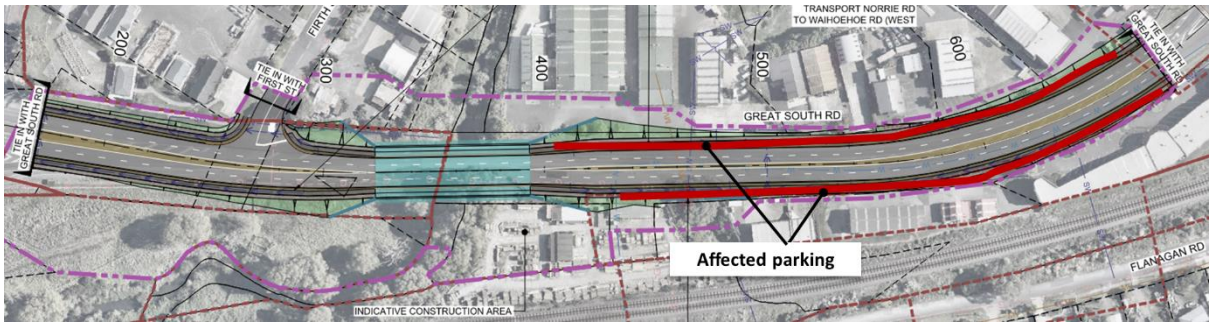


Figure 6-3: Affected on-street parking for NoR 2

Whilst the removal of on-street parking will be an inconvenience to some motorists, we consider the effects to be minor given there are opportunities to park on-site and/ or on nearby streets such as Firth Street. In addition, parking may still be provided along kerbside lanes during off peak hours in the future if the need arises. Further, the removal of on-street parking is in line with AT's policy direction where the removal of on-street parking on arterial roads is anticipated and encouraged by AT's Parking Strategy.[30]

On-Site Parking

The indicative number and location of affected on-site parking spaces is summarised in Table 6-3.

Table 6-3: Affected on-site parking for NoR 2[31]

Address	Activity	Parking spaces in designation	Parking spaces in cross-section
275,271,263,267 Great South Road	Commercial	24	0
257-261 Great South Road	Commercial	2	1

Approximately 26 on-site parking spaces will be affected along site frontages. As the NPS-UD removes all minimum on-site parking requirements from the AUP:OP, this is considered a relatively minor effect, as the NoR does not infringe any relevant standards. Importantly, some parts of the designation will only be required temporarily for construction purposes and may be able to be returned to affected landowners for use as parking spaces once the works are complete.

[30] Auckland Parking Strategy, 'Room to Move', May 2023.
[31] The number of 'Parking spaces in designation' is everything impacted by the designation. The designation includes the proposed cross-section for the corridor as well as temporary construction space and space required for batters etc. Parking spaces in cross-section is a subset of the total number of parking spaces impacted. This number provides an indication of likely permanent spaces impacted whereas the remainder may only be temporary.

6.3 Recommended measures to avoid, remedy, or mitigate operational effects

Overall, NoR 2 provides positive benefits and no adverse operational effects have been identified.

6.4 Assessment of construction effects

Section 4.3 sets out the overall assessment of construction effects. This section focuses on specific details relating to NoR 2.

It is anticipated that the majority of the work can be completed without any road closures, and vehicular access will be maintained throughout the corridor. Thus, any effects can be managed under a CTMP.

The below assessment considers the construction of the Hingaia Stream bridge. It is unknown at this stage how it will be constructed and for how long. Thus, the construction effect has been assessed based on the worst-case scenario of complete bridge closure.

6.4.1 Construction of Hingaia Stream Bridge

6.4.1.1 Land use and Transport Context

This section of Great South Road provides direct access on to the strategic network, SH1. The surrounding land use is industrial and there are no existing bus services currently. It is noted the planned Drury Central Station is planned adjacent to the east of this corridor.

6.4.1.2 General Traffic, Freight and Pedestrians

Figure 6-4 shows the likely detour route in the event a road closure is necessary. This shows this will be no more than 1 kilometre, or approximately 2 minutes for general traffic and 12 minutes for pedestrians. The additional 2 minutes of travel time for general traffic is considered negligible. Given the surrounding land use is industrial, pedestrian demand is expected to be low, therefore we consider the effect of the detour on pedestrians is acceptable.

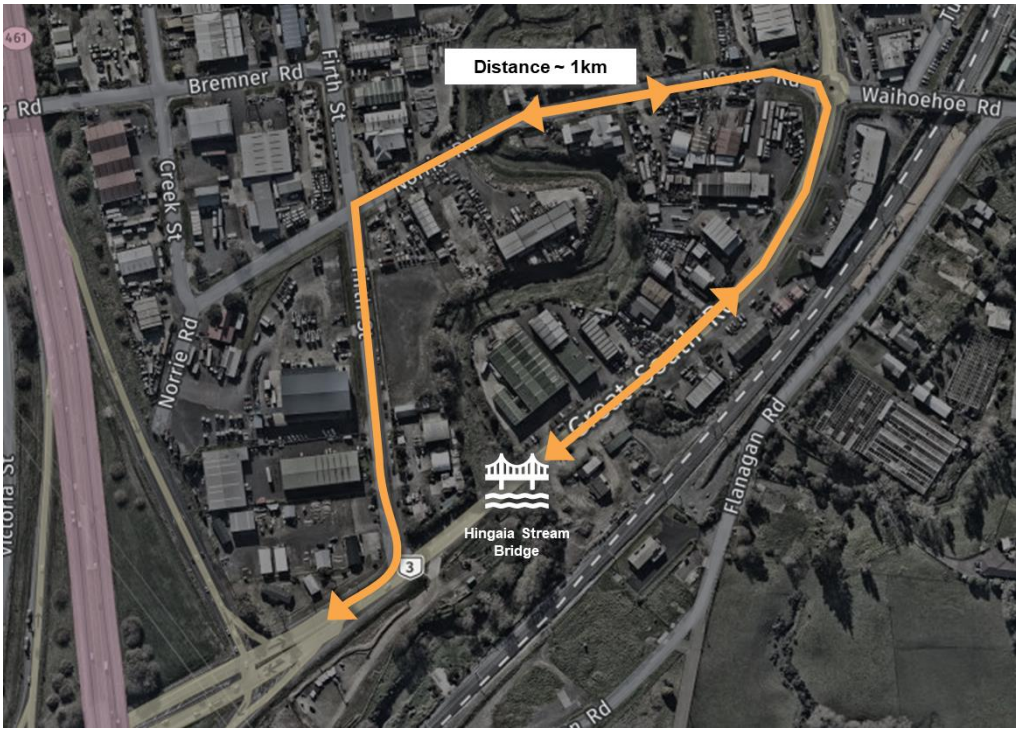


Figure 6-4: Likely detour route for NoR 2

The expected AADT and peak period volumes in 2038 are shown in Table 6-4 below. Firth Street is a two-lane road. Norrie Road is also a two-lane road but currently has a single lane bridge over the Hingaia Stream. The Norrie Road bridge is expected to be upgraded to a two-lane bridge by 2038 as part of wider South Auckland works. The TDM indicates an urban traffic lane can move 600 to 1,600 people an hour noting that this is dependent on corridor features such as intersections, crossings etc. Assuming an average occupancy of 1.2,[32] this will equate to approximately 500 veh/hr to 1,300 veh/hr. Given the nature of the corridors, we consider the capacity of the corridors in question will be in the upper bound of the range and will be able to accommodate the detoured traffic. However, if construction of the Hingaia Stream bridge occurs before the upgrade of the Norrie Road bridge, traffic diverted onto the existing single lane bridge is expected to exceed capacity. Although, it is understood that the current designation allows for construction of the bridge to be undertaken offline, thus traffic flow may be maintained. Hence, this may be managed under a CTMP.

Table 6-4: Summary of traffic volumes in 2038 (without Project) – NoR 2

Corridor	Direction	AADT (vpd)	AM Peak (veh/hr)	IP Peak (veh/hr)	PM Peak (veh/hr)
Hingaia Stream bridge	NB	3,350	300	200	300
	SB	8,000	550	550	900
Norrie Road	EB	7,750	850	500	650
	WB	6,950	300	450	950

[32] Average occupancy rate used in Auckland Wide models.

Corridor	Direction	AADT (vpd)	AM Peak (veh/hr)	IP Peak (veh/hr)	PM Peak (veh/hr)
Firth Street	NB	4,300	400	300	300
	SB	2,300	200	150	250

6.5 Recommended measures to avoid, remedy, or mitigate construction effects

Given the potential effects identified above, no specific mitigation measures have been identified in relation to construction impacts for this NoR.

However, with reference to the potential impacts identified above, the following elements should be considered when developing the CTMP:

- Maintaining safe pedestrian access to the Drury Central Station if the station is operational; and
- Maintaining vehicle accesses or providing alternatives for the surrounding commercial / industrial land use such that they may still operate.

6.6 Summary of effects for NoR 2

Table 6-5 provides a summary of the positive effects for NoR 2.

Table 6-5: Summary of positive effects for NoR 2

Operational Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridor resulting in improved protection for vulnerable road users. Consequentially, there may be a potential reduction in DSIs. • Improved integration with existing and planned facilities on the network resulting in improved connectivity. • Leads to environmental and health benefits due to the uptake of active modes.
General Traffic	• Increased capacity for vehicles leading to improved local connectivity and accessibility. • Provides additional network resilience especially in the event of an incident on SH1 where additional queuing space is available. • Proposed intersection upgrade is predicted to perform at a satisfactorily level.
Public Transport	• Opportunity to provide for dedicated bus lanes in the future to enable greater reliability and reduced travel time.
Freight	• The NoR will continue to support freight in the area with improved access and connectivity with the increased capacity.

Table 6-6 provides a summary of the operational and construction effects including recommended mitigation measures.

Table 6-6: Summary of operational and construction effects for NoR 2

Effect	Assessment	Recommendation
Operational Effects		
No adverse effects have been identified.		
Construction Effects		
• We consider the construction effects can be accommodated and managed appropriately via a CTMP including any detour that may be required. • Specific considerations to be considered as part of the CTMP include maintaining safe pedestrian access to Drury Central Station (if operational) and maintaining vehicle access for surrounding properties.		

7 NoR 3: Takaanini FTN – Weymouth Road, Alfriston Road, and Great South Road Upgrades

As outlined in the Project description (see Section 2), NoR 3 comprises a range of interventions providing for the Takaanini FTN route along Weymouth and Alfriston Roads generally between Selwyn Road and Alfriston Park; as well as for the Great South Road FTN route between Alfriston Road and Myers Road. These interventions include road widening to provide for four lanes (general traffic and bus lanes in both directions), active mode facilities, eight intersection upgrades, stormwater treatment wetlands, and replacements of bridges over the NIMT and SH1.

7.1 Existing Transport Environment

The existing transport environment is described in Section 3.5 above. The below provides a summary for NoR 3.

Table 7-1: Summary of Existing Transport Features NoR 3

	Existing Transport Feature
Speed Limit	50km/hr
Intersection	• Alfriston Road/ Great South Road – Signals • Great South Road/ McAnnalley Street – Signals • Alfriston Road/ Claude Road – Signals • Alfriston Road/ Scotts Road – Priority • Alfriston Road/ Magic Way – Signals
Walking and Cycling	• Regional cycle route on Great South Road and major cycle route on Alfriston Road. • Footpaths are available on both sides of the corridor. • No provision for cyclists
Public Transport	• Route 33 currently runs along Great South Road with 15-minute frequency. • Great South Road - Frequent Transit Network 1 under Future Connect • Weymouth Road and Alfriston Road – Connector Transit Network
Freight	• Weymouth Road – Overdimension route • Alfriston Road – Overdimension and overweight route • Great South Road – Level 3, overdimension and overweight route

7.2 Assessment of operational effects

7.2.1 Public Transport

Alfriston Road is an important public transport link as it provides access to the Manurewa Station which is both a rail and bus interchange with a number of services expected to converge along this corridor in the future (refer to Figure 7-1). This means a high number of buses, 12 to 16 are anticipated in the peak hour.

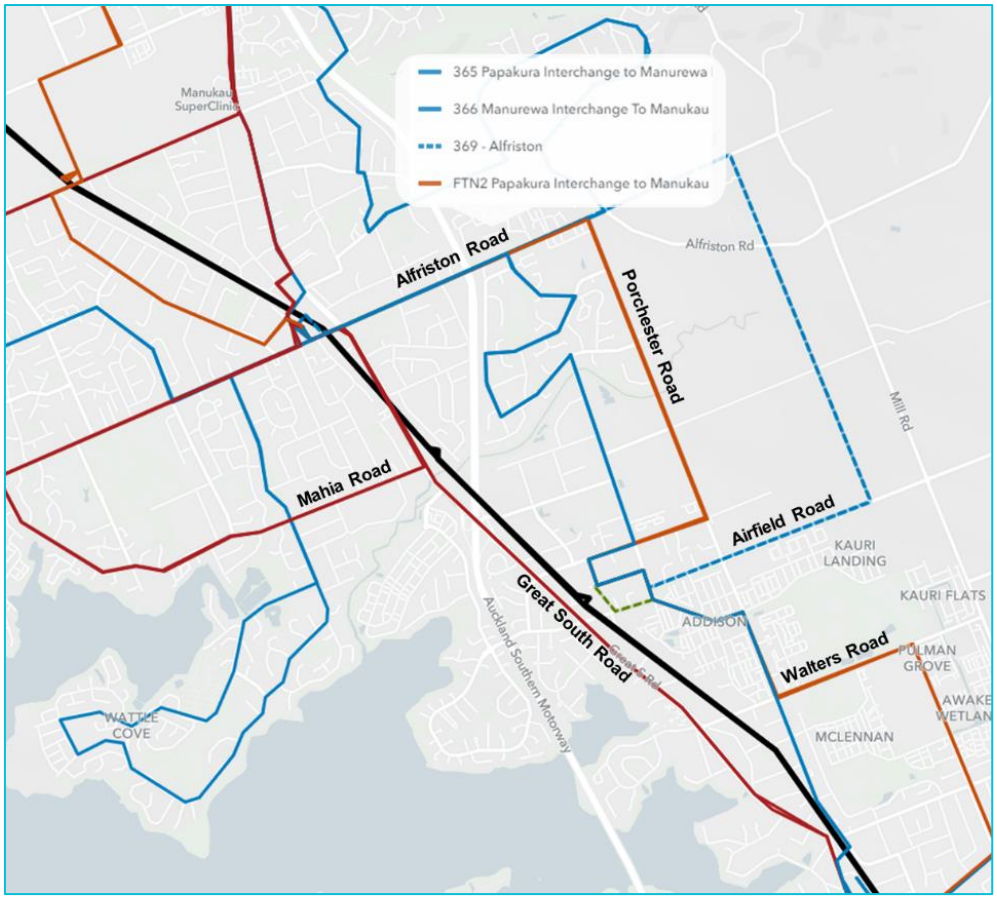


Figure 7-1: Bus Routes in 2048 (AT's Remix)

The proposed cross-section integrates well with the future public transport network, improving east-west connectivity and improved access to employment and social amenities. The dedicated bus lanes will improve reliability and travel time for public transport along the corridor. The bus lanes will also separate buses from general traffic minimising conflict and the need for lane change improving overall safety.

Overall, the Project will result in positive benefits for public transport.

7.2.2 Walking and Cycling

The NoR proposes separated walking and cycling facilities on both sides of the corridor at the intersections. As noted in Section 4.1.2**,** the proposed facilities meet the standards set out within AT Transport Design Manual and will encompass the positive effects previously mentioned.

Specific to this NoR, the proposed facilities improve accessibility and connectivity to the Manurewa Station for active mode users. This in turn improves access to economic and social opportunities.

7.2.3 Safety

The proposed separated active mode facilities will improve safety for vulnerable road users by providing protection from the traffic.

The signalisation of Alfriston Road/Scott Road and Great South Road/ McAnnalley Street will improve safety as movements become controlled.

As the corridor goes from two lanes to four lanes, there are increased safety risks at driveways and priority intersections as drivers will now have to cross additional traffic lanes. The main risk will be at priority intersections and the Project has proposed to signalise the Alfriston Road and Scott Road intersection. The risk at the Brough Road intersection will be low given this is a cul-de-sac. For the Fleming Street intersection, the existing configuration is similar to the Project albeit an extra westbound lane is proposed by the Project the risk considered low. At both these intersections, the proposed cross-section allows a solid median to be implemented in the future and does not preclude signalisations of the intersections if it is found to be a safety concern.

There is also an increased risk arising from driver turning across queued lanes and being struck by vehicles moving in an adjacent lane. We consider this to be minor given the outer lanes are bus lanes and buses are readily visible and unlikely to be missed. In addition, speed is likely to be low given the urban environment and the number of signals along the corridor. As noted above, the cross-section does not preclude a solid median to be implemented in the future if this is considered to be a safety concern.

In general, we consider the residual safety effects of widening the corridor to be minor.

7.2.4 General Traffic

The forecasted 2048+ traffic volume for the sections of corridor of interest within this NoR are shown in Table 7-2. The wider network impacts are discussed in Section 4.1.4.

Table 7-2: 2048+ peak hour flows (two-way) with and without the Project for NoR 3

Corridor	Direction	Without Project			With Project			Difference		
		AADT	AM	PM	AADT	AM	PM	AADT	AM	PM
Alfriston Road (GSR to Magic Way)	EB	8,850	600	850	8,250	500	850	-600	-100	0
	WB	8,200	900	500	8,500	800	700	300	-100	200
Alfriston Road (Magic Way to Porchester Road)	EB	7,250	600	550	6,450	550	600	-800	-50	50
	WB	5,350	350	200	5,900	350	550	550	0	350
Great South Road (Alfriston to McAnnalley)	NB	6,800	600	400	8,700	700	650	1,900	100	250
	SB	8,400	700	550	10,100	900	700	1,700	200	150
Weymouth Road	EB	9,700	750	750	8,800	650	900	-900	-100	150
	WB	8,750	600	450	8,900	700	650	150	100	200

The above shows there is anticipated increase in traffic volume with Project especially during the PM peak. This is due to traffic being rerouted to Alfriston Road and the section of Great South Road between Alfriston Road and Mcannalley Road as delays are decreased at the intersection of Alfriston

Road and Great South Road due to the increased capacity proposed by the NoR i.e. additional approach lanes.

Although there is an increase in traffic volume, it is considered that the proposed cross-section with two general traffic lanes would be sufficient to accommodate this volume. This is because the capacity along the corridor will be heavily influenced by the signals given its number along the corridor. Note that wider network effects are discussed in Section 4.1.4 and these are not considered significant given the improvement for public transport along key routes.

In addition, Alfriston Road is a key east-west connection in the transport network with the nearest east-west connection to the south being the proposed Manuia Road connection (as part of the Takaanini Level Crossings DBC), approximately 2.1km away. The corridor also provides access to the Hill Road/SH1 interchange via Claude Road. Although the proposal does not intend to increase general traffic capacity, the cross-section does provide additional network resilience for a vital part of the network such that the bus lanes may be used for general traffic when required i.e. during an incident.

7.2.4.1 Intersection Performance

The performance of the road network within the NoR 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.

Table 7-3 provides a summary of the SIDRA analysis undertaken for the intersections within the NoR.

Appendix A provides details of the SIDRA.

Table 7-3: Intersection key performance summary for NoR 3 (2048+)

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
GSR / Alfriston Rd	**AM Peak**				
	With	E	1.041	252.3	57.4
	Without	F	1.120	436.3	106.3
	Difference	-	-0.079	-184.0	-48.9
	PM Peak				
	With	E	1.042	280.2	80.0
	Without	F	1.136	548.0	126.0
	Difference	-	-0.094	-267.8	-46.0
GSR / Mcannalley	**AM Peak**				
	With	B	0.783	250.6	14.8
	Without	NA	0.742	79.7	4.2

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	Difference	-	0.041	170.9	10.6
	PM Peak				
	With	B	0.685	140.3	12.6
	Without	NA	0.682	63.0	3.5
	Difference	-	0.003	77.3	9.1
Alfriston Rd / Claude Rd	**AM Peak**				
	With	C	0.830	116.0	25.6
	Without	D	1.007	265.1	49.2
	Difference	-	-0.177	-149.1	-23.6
	PM Peak				
	With	B	0.728	129.2	17.7
	Without	C	0.810	161.3	20.1
	Difference	-	-0.082	-32.1	-2.4
Alfriston Rd / Scotts Rd	**AM Peak**				
	With	B	0.697	112.3	14.5
	Without	NA	0.516	9.6	2.8
	Difference	-	0.181	102.7	11.7
	PM Peak				
	With	B	0.803	281.8	17.0
	Without	NA	0.494	4.4	3.1
	Difference	-	0.309	277.4	13.9
Alfriston Rd / Magic Way	**AM Peak**				
	With	B	0.734	95.2	19.9
	Without	C	0.884	154.0	26.6
	Difference	-	-0.150	-58.8	-6.7
	PM Peak				
	With	C	0.949	245.8	32.2

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	Without	D	0.966	228.6	40.6
	Difference	-	-0.017	17.2	-8.4

Key points to note:

- In general, the intersections are predicted to perform at a satisfactory level in 2048+ during the peak periods with the Project;
- The intersection of Great South Road/ Alfriston Road is expected to perform at a LOS E during the PM peak period. However, this is still better than the 'Without Project' where queues and delays are expected to be much worse as additional approach lanes are provided on Alfriston Road increasing overall intersection capacity; and
- Where there is noticeable increase in delay and queue length, this is the result of conversion of priority intersections to signalised intersections which typically result in more delay. However, these intersections are still predicted to perform at a satisfactory level and provide additional safety benefits for all users including pedestrians.

Overall, the NoR generally does not significantly worsen performance at the intersections.

7.2.5 Freight

Alfriston Road is part of the Overdimension and Overweight Route and Weymouth Road is part of the Overdimension route. These corridors will continue to serve the freight network in the future.

Similar to general traffic, the Project will increase network resilience for a key connection of the network that will have positive network effects that will in turn benefit freight.

7.2.6 Access and Parking

7.2.6.1 Access

The corridor and intersections are existing and their role on the network is not expected to change with the Project. Access to them will remain the same with the Project. Access to the majority of existing properties will remain the same with the exception of properties at Beaumonts Way which is proposed to be cul-de-saced (Figure 7-2).

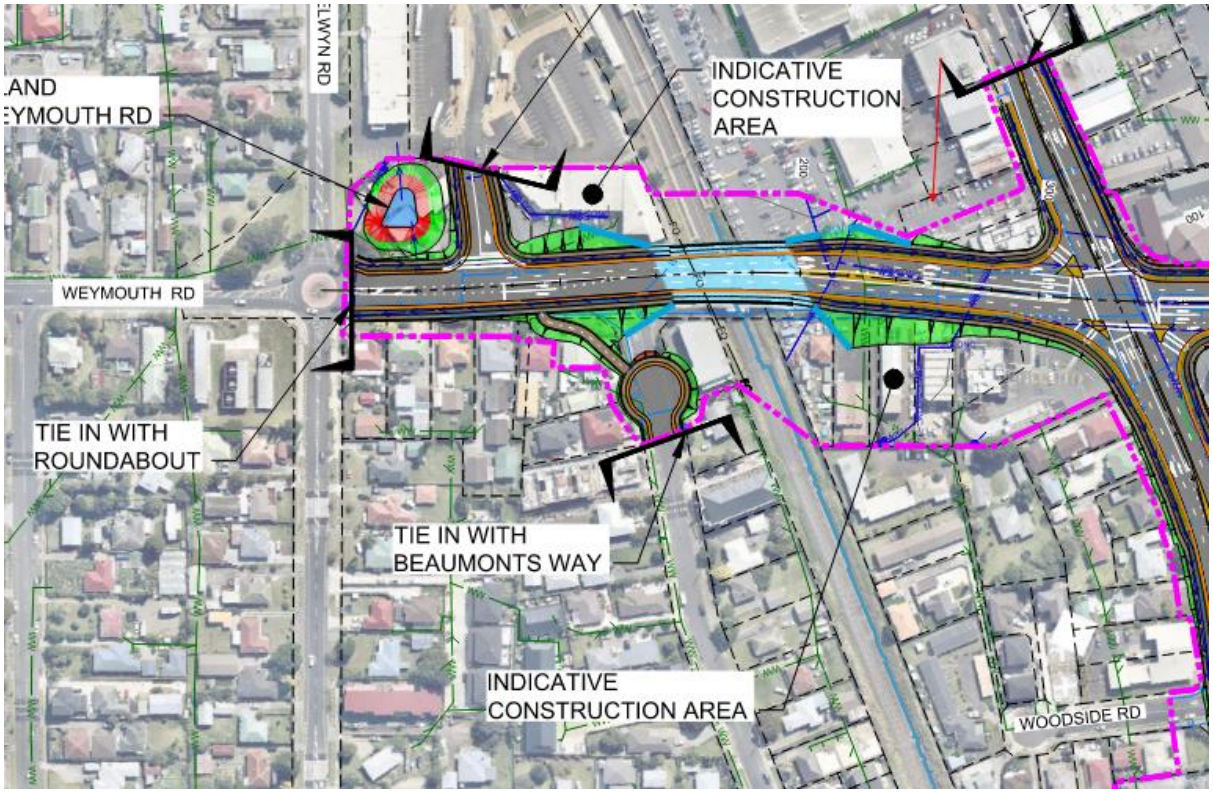


Figure 7-2: Cul-de-sac of Beaumonts Way

There is an existing right turn ban out of Beaumonts Way and as such eastbound vehicles from Beaumonts Way are not impacted. Figure 7-3 shows the detour for vehicles in and out of Beaumonts Way which utilises Rogers Road and Blossom Lane. This is less than a 1km detour which is approximately 2 - minutes of travel time noting this may vary throughout the day depending on traffic conditions, thus the effects are considered minor.

Figure 7-3: Detour in and out of Beaumonts Way

7.2.6.2 Parking

On-Street Parking

There is currently, no on-street parking provision along the extent of the corridor covered by this NoR with the exception of three indented parking bays by the Mcannalley Street intersection and another three just north of these are as shown below. There are parks available on-street along Mcannalley Street directly adjacent to the intersection and within close proximity of the affected car parks. Thus, we consider the effects minor given there are other opportunities for parking.

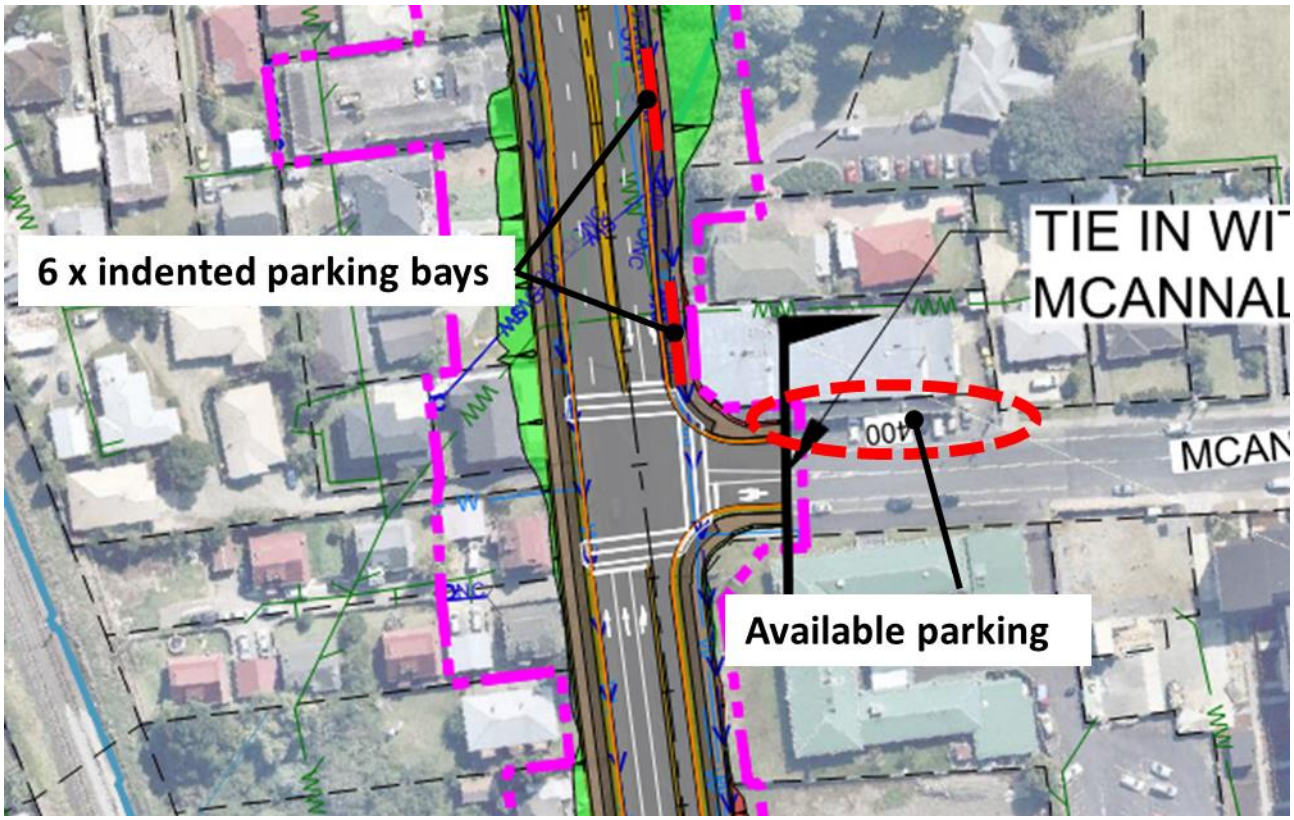


Figure 7-4: Affected on-street parking for NoR 3

On-Site Parking

The indicative number and location of affected on-site parking spaces is summarised in Table 7-4.

Table 7-4: Affected on-site parking for NoR 3

Address	Activity	Parking spaces in designation	Parking spaces in cross-section
Gallagher Park	Park	11	0
6 Alfriston Road	Commercial	4	0
2 Alfriston Road	Commercial	11	0
4 Weymouth Road	Commercial	5	2

Address	Activity	Parking spaces in designation	Parking spaces in cross-section
6 Weymouth Road	Commercial	4	0
10 Weymouth Road	Commercial	6	0
Park n Ride	-	44	10

Approximately 85 car parks are impacted by the designation. A total of 11 of these car parks are for Gallagher Park, but this is not anticipated to have any impact on the accessibility or operations of the park given there is a large number of car parks available. In addition, none of these parks are within the cross-section and the area is likely only required temporarily for construction purposes and may be returned when works are complete. Similarly for the impacted park and ride parks, the majority are likely to be reinstated after works are complete. It is also worth noting that four tracking is likely to alter this park and ride further.

Although a number of commercial properties are impacted, as noted in Section 4.1.7, the long-term nature of the Project makes it difficult to determine the impacts on operations, particularly given that the NPS-UD removes all minimum on-site parking requirements from the AUP:OP. However, in light of these considerations, we consider that overall, this is a relatively minor effect, as the Project does not infringe any relevant standards.

7.3 Recommended measures to avoid, remedy, or mitigate operational effects

In general, the Project provides positive effects and no specific adverse effects have been identified. On this basis, no mitigation measures are required in relation to this NoR for operational impacts.

7.4 Assessment of construction effects

Section 4.3 sets out the overall assessment of construction effects for the NoR. This section focuses on specific details relating to NoR 3.

It is anticipated the majority of the corridor and intersection upgrade works can be completed without any road closures and vehicular access will be maintained. We consider any disruptions can be managed under a CTMP.

The below assessment considers the construction of the Alfriston Road bridge, noting however that the method and timeframe for constructing the bridge has not yet been determined. In these circumstances, the construction effect has been assessed based on the worst-case scenario of complete bridge closure.

The construction of the Weymouth Road bridge has not been considered due to the rail upgrade works that may occur. It is considered that this bridge will be constructed at the same time as the rail upgrade and its effects managed as a whole.

7.4.1 Construction of Alfriston Road Bridge

7.4.1.1 Land use and Transport Context

As noted above, Alfriston Road is a key east-west connection in the transport network with the nearest east-west connection to the south being the proposed Manuia Road connection, approximately 2.1km away. It currently serves bus Route 366 and 365 and is a key connection to the Manurewa Station.

Land adjacent to the intersection of Great South Road / Alfriston Road/ Weymouth Road is zoned Town Centre with a number of commercial establishments.

7.4.1.2 General Traffic and Freight

Figure 7-5 shows the likely detour route if the Alfriston Road bridge is closed for construction. This is approximately a 3.5km detour for those adjacent to the bridge which is approximately 8- 18 minutes of travel time depending on the time of day.

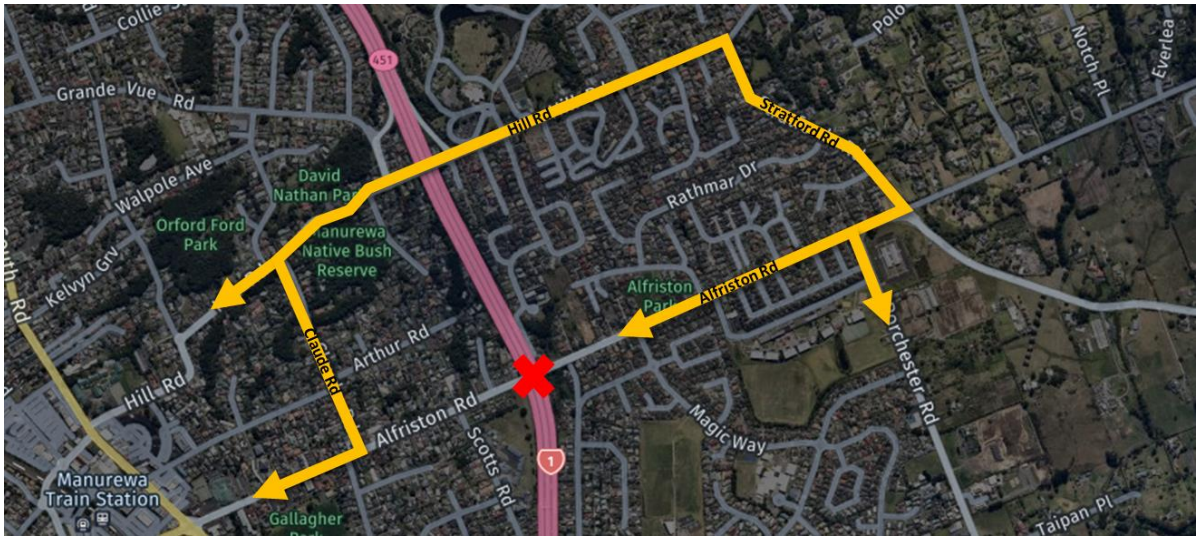


Figure 7-5: Likely detour Route for NoR 3

The expected two-way AADT and peak period volumes in 2038 are shown in Table 7-5 below. All corridors are currently two-lane corridors with Hill Road being highly trafficked given its an access onto SH1. If all the traffic that passes through Alfriston Road bridge is diverted on to Hill Road, we would expect to see a total of approximately 3,500 vehicles per hour during the PM peak.

The theoretical capacity lies between 1,500 to 2,400 vehicles per hour which means Hill Road will have a capacity of between 3,000 to 4,800 noting that this is for uninterrupted flows and could be lower given the urban context. The TDM indicates an urban traffic lane can move 600 to 1,600 people an hour noting that this is dependent on corridor features such as intersections, crossings etc. Assuming an average occupancy of 1.2[33] , this will equate to approximately 500 veh/hr to 1,300 veh/hr. Even using the higher assumptions, the total traffic on Hill Road (inclusive of the diverted) will result in the corridor reaching/ exceeding capacity.

[33] Average occupancy rate used in Auckland Wide models.

Table 7-5: Summary of traffic volumes in 2038 (without project) – NoR 3

Corridor	AADT (vpd)	AM Peak (veh/hr)	IP Peak (veh/hr)	PM Peak (veh/hr)
Alfriston Road Bridge	14,400	1,400	900	1,500
Hill Road (east of SH1)	23,400	2,000	1,700	2,000
Hill Road (west of SH1)	9,900	700	800	1,300
Stratford Road	20,400	1,700	1,400	1,800
Manuia Road	19,000	1,500	1,400	1,400

As noted, the next nearest east-west connection is approximately 2.1km to the south. Traffic could be diverted to this connection as well; however this is a much longer detour route and will require traffic to travel through the highly congested Great South Road. Thus, it is anticipated there will be operational impacts on the wider network if the Alfriston Road bridge was closed during construction.

It is recommended access is maintained during construction to reduce the impact on the wider network. This could be achieved through a temporary bridge which is understood to be possible within the existing designation.

7.4.1.3 Walking and Cycling

The same detour will apply for pedestrians and cyclists. Given this is a key route for the community to the Town Centre and is a Major cycle route under Future Connect, it is recommended that walking and cycling connectivity is maintained through construction.

7.4.1.4 Public Transport

As noted, there are existing bus services that runs through Alfriston Road and if the bridge is to close these routes will be impacted. In addition, this is a key route into the Manurewa bus and train interchange. Given, that it is recommended connectivity is maintained for general traffic, it is recommended bus connectivity is also maintained. Recommended measures to avoid, remedy, or mitigate construction effects

In general, construction effects may be managed under a CTMP with the following to be considered during its development:

- Maintaining access during construction to minimise impact on the wider network with the detoured traffic.;
- Maintaining walking and cycling connectivity; and
- Maintaining public transport connectivity.

7.5 Summary of effects for NoR 3

Table 7-6 provides a summary of the positive effects for NoR 3.

Table 7-6: Summary of positive effect for NoR 3

Operational Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridor resulting in improved protection for vulnerable road users. Consequentially, a potential reduction in DSIs. • Removal of left turn slip lanes at a number of intersections improves safety. • Signalisation of priority intersection provides safe crossings for vulnerable road users.
Public Transport	• Dedicated bus lanes leading up to intersections allowing buses to queue jump, improving travel time and reliability.
General Traffic and Freight	• Improved intersection performance at some intersections. • Improved network resilience as the cross-section provides the opportunity for bus lanes to be used for traffic if an incident occurs.

Table 7-7 provides a summary of the operational and construction effects including recommended mitigation measures.

Table 7-7: Summary of operational and construction effects for NoR 3

Effect	Assessment	Recommendation
Operational Effects		
No specific operation effects have been identified for NoR 3.		
Construction effects		
Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Alfriston Road bridge closed. This will impact the existing bus route which services the community.	Maintain access during construction
Wider network impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. The likely detour route is likely to constrain existing corridors and have a flow on effect on the wider network.	Maintain access during construction.
Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. As this is a key link into the Town Centre and is a 'Major' cycle route, connectivity is recommended to be maintained.	Maintain active mode connectivity across Alfriston Road bridge during construction.

8 NoR 4: Takaanini FTN – Porchester Road and Popes Road Upgrades

As outlined in the Project description (see Section 2), NoR 4 comprises a range of interventions providing for the Takaanini FTN route along Porchester Road generally between Alfriston Road and Walters Road; and for the urbanisation of Popes Road generally between Takanini School Road and Mill Road. These interventions provide for the urbanisation of both corridors, with two traffic lanes, widening for active mode facilities, seven intersection upgrades, and stormwater treatment wetlands.

8.1 Existing Transport Environment

The existing transport environment is described in Section 3.5 above. The below provides a summary for NoR 4.

Porchester Road is predominantly surrounded by residential development on the western side and is rural on the eastern side. The section between Popes Road and Manuroa Road is rural in nature with no kerb and channel.

The section of Popes Road between Porchester Road and Takanini School Road is within the industrial zone.

Both corridors comprise two vehicle lanes in each direction.

Table 8-1 summarises the existing transport characteristics for the corridor.

Table 8-1: Existing transport characteristics for NoR 4

	Existing Transport Feature
Speed Limit	Popes Road - 60km/hr Porchester Road – 60km/hr between Alfriston Road and Manuroa Road Porchester Road – 50km/hr between Manuroa Road and Airfield Road
Traffic Volume	Traffic data obtained from Mobile Roads indicates a two-way ADT of: • Popes Road – 2,034 • Porchester Road - 16,193 – 18,233
Intersection	• Alfriston Road/ Porchester Road - signals • Popes Road/ Porchester Road - priority • Manuroa Road/ Porchester Road – roundabout • Airfield Road/ Porchester Road - roundabout • Porchester Road/ Takanini School Road - priority
Walking and Cycling	• Popes Road - No provision for walking and cycling. • Porchester Road: ○ Footpath is available on the eastern (developed) side of the corridor between Alfriston Road and Popes Road. No cycling provisions on either side of the corridor.

	Existing Transport Feature
	○ Between Popes Road and Manuroa Road, there is signed pedestrian and cyclist facility (refer to Figure 8-1) on the western side of the corridor. There is no formalised kerb but there is a drop in grade between this facility and the traffic lane. ○ The remainder of Porchester Road has footpaths on both sides of the corridor. ○ There is an on-road cycle lane on the western side between Airfield Road and Walters Road and a cycle oath on the eastern side. • No midblock crossings available. • Porchester Road is part of the Te Araroa Trail.
Public Transport	• Route 365 current runs alongs Porchester Road between Popes Road and Hyperion Drive. • AT Local on-demand rideshare is available in the area.
Freight	• Porchester Road – Overdimension Route • Popes Road – Section between Takanini School Road and Porchester Road is part of the Overdimension Route

Figure 8-1: Signed Walking and Cycling Facility on Porchester Road

8.2 Assessment of operational effects

8.2.1 Public Transport

The proposed cross-section will provide adequate space for bus stops with shelters to be implemented. The proposed intersection upgrades will enable greater reliability and reduced travel time for buses when compared with 'Without' the Project as indicated in Section 4.1.1.

Thus, the Project will provide positive benefits for public transport.

8.2.2 Walking and Cycling

The proposed Project will provide for separated pedestrian and cycling facilities along the extent of the corridors. As per Section 4.1.2, these will meet the standards set out within the AT's Transport Design Manual and have the positive benefits set out.

The proposed separated active mode facilities will improve safety for vulnerable road users by providing protection from the traffic.

The latest crash data from CAS was extracted for the intersection of Popes Road and Porchester Road for the period of 2018 to 2022. This showed there has been 5 serious and 7 minor injury crashes over the five-year period. As per Waka Kotahi's High Risk intersection guide, this intersection would be classified as having 'High' collective risk. The personal risk is calculated to be greater than 32, thus would be classified as having high personal risk. With both high personal and collective risk will suggest a transformational change is warranted. Therefore, the proposed roundabout is in line with the Safety Systems approach and will greatly improve safety at this intersection by reducing speed and minimising conflict especially crossing/turning type movements. With the proposed dual lane roundabout, further safety enhancements such as raised safety platforms on the approach could be considered closer to the time of implementation to further increase safety for vulnerable road users.

Other positive effects include:

- Removal of left turn slip lane at the intersection of Alfriston Road/ Porchester Road improving safety for pedestrians and cyclists; and
- Transformation of the intersection of Takanini School Road and Popes Road from priority to roundabout. A roundabout is inherently safer than a priority intersection as traffic movements is controlled.

8.2.3 General Traffic

The forecasted 2048+ two-way peak hour flows with and without the Project are shown in Table 8-2.

Table 8-2: 2048+ traffic flows with and without the Project for NoR 4

Corridor	Dir	Without Project			With Project			Difference		
		AADT	AM	PM	AADT	AM	PM	AADT	AM	PM
Popes Road										

Corridor	Dir	Without Project			With Project			Difference		
		AADT	AM	PM	AADT	AM	PM	AADT	AM	PM
Porchester toTakaanini School Road	EB	3,150	150	150	4,450	150	800	1,300	0	650
	WB	5,750	650	250	6,800	700	500	1,050	50	250
Porchester Road										
Alfriston Road to Popes Road	NB	9,350	600	750	9,650	650	750	300	50	0
	SB	11,650	1,050	700	11,600	900	800	-50	-150	100
Popes Road to Manuroa Road	NB	9,300	700	1,000	8,300	650	700	-1,000	-50	-300
	SB	7,700	650	500	7,700	600	750	0	-50	250
Manuroa Road to Airfield Road	NB	10,200	950	900	10,050	1,000	750	-150	50	-150
	SB	7,400	700	500	7,850	700	650	450	0	150

The above indicates there are some sections of the corridors that are anticipated to see an increase in traffic volume especially along Popes Road. This is due to traffic rerouting as a result of the proposed roundabout at the intersection of Popes Road and Porchester Road. The existing priority intersection would have resulted in excessive delays on the Popes Road approaches with Porchester Road being the main movements. As a result, drivers took alternative routes instead. The introduction of the roundabout reduced the delays on Popes Road allowing greater use of this corridor

The TDM indicates an urban traffic lane can move 600 to 1,600 people an hour noting that this is dependent on corridor features such as intersections, crossings etc. Assuming an average occupancy of 1.2[34] , this will equate to approximately 500 veh/hr to 1,300 veh/hr. Given the nature of the corridors i.e limited controls, we can expect the capacity to be in the upper bound of this range i.e towards 1,300. Thus, we consider the proposed two lane cross-section meets the forecasted needs.

8.2.3.1 Intersection Performance

The performance of the road network within the NoR 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 8-3. Appendix A provides details of the SIDRA.

[34] Average occupancy rate used in Auckland Wide models.

Table 8-3: Intersection key performance summary for NoR 4 (2048+)

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
Alfriston Rd/ Porchester Rd	**AM Peak**				
	With	C	0.821	106.3	23.3
	Without	C	0.925	128.4	29.5
	Difference	-	-0.104	-22.1	-6.2
	PM Peak				
	With	C	0.920	123.6	30.1
	Without	C	0.816	97.5	25.6
	Difference	-	0.104	26.1	4.5
Popes Rd/ Porchester Rd	**AM Peak**				
	With	B	0.915	101.8	14.8
	Without	NA	1.513	335.3	66.9
	Difference	-	-0.598	-233.5	-52.1
	PM Peak				
	With	D	1.040	281.5	43.8
	Without	NA	1.521	273.4	59.2
	Difference	-	-0.481	8.1	-15.4
Manuroa Rd/ Porchester Rd	**AM Peak**				
	With	D	1.065	559.9	43.7
	Without	E	1.109	673.7	58.6
	Difference	-	-0.044	-113.8	-14.9
	PM Peak				
	With	B	0.816	105.2	11.5
	Without	F	1.356	815.4	98.6
	Difference	-	-0.540	-710.2	-87.1
Ai rfi	**AM Peak**				

	Peak Period	Overall Level of Service	Degree of Saturation (worst movement)	Maximum Queue Distance (m)	Avg Delay (s)
	With	E	1.101	514.2	54.1
	Without	F	1.312	1023.6	118.5
	Difference	-	-0.211	-509.4	-64.4
	PM Peak				
	With	B	0.908	164.4	17.8
	Without	F	1.313	663.7	88.4
	Difference	-	-0.405	-499.3	-70.6
Walters Road/Porchester Road	**AM Peak**				
	With	C	0.881	230.6	32.8
	Without	F	1.672	1653.1	256.3
	Difference	-	-0.791	-1422.5	-223.5
	PM Peak				
	With	E	0.980	498.9	65.2
	Without	F	1.561	1537.4	237.3
	Difference	-	-0.581	-1038.5	-172.1
Takanini School Rd/ Popes Rd	**AM Peak**				
	With	A	0.452	29.3	5.3
	Without	NA	0.517	23.7	5.4
	Difference	-	-0.065	5.6	-0.1
	PM Peak				
	With	A	0.538	33.8	6.2
	Without	NA	0.310	14.0	5.3
	Difference	-	0.228	19.8	0.9

The above indicates:

- The 'With' Project results indicate the Project does not significantly worsen the intersection performance in regard to increase in delay, LOS and queue length. There is notable improvement at a number of the intersections; and
- Walters Road/ Porchester Road is expected to perform at a LOS E during the PM peak period. Although this is generally considered unsatisfactory, it is significantly better than the 'Without' scenario. It is also noted the right turn from Walters Road east to Porchester Road, a bus movement, performs at a LOS F during the PM peak which means buses are anticipated to experience delays at this intersection. Signal timings could be altered to prioritise this, albeit other movements will be impacted as a result.

Overall, the Project generally does not significantly worsen the performance of key intersections.

8.2.4 Freight

Porchester Road and Popes Road's status on the freight network is not anticipated to change and will continue to support the freight connection in the area. The proposed conversion of the intersection of Popes Road and Porchester Road to a roundabout will improve operations for the Popes Road approaches. The SIDRA analysis for the 'With' and 'Without' Project is shown below and indicates the proposed upgrade performs better in terms of delay and queue length for Popes Road. Thus, there is likely improved performance for freight to the Takaanini industrial area.

Table 8-4: SIDRA Results for Popes Road approaches at the intersection of Popes Road/ Porchester Road

Approach	With			Without		
	LOS	Average Delay (s)	Maximum Queue	LOS	Average Delay (s)	Maximum Queue
AM Peak						
Popes Road East	B	16	45	F	389	253
Popes Road West	A	8	8	F	129	105
PM peak						
Popes Road East	E	66	188	F	385	189
Popes Road West	B	14	59	F	143	94

It is noted that there are a number of uncertainties that may elevate Popes Roads status on the freight network. This includes:

- **Mill Road project** – Popes Road will form part of the Level 3 freight network (indicates Popes Road is a connection between strategic freight areas) if Mill Road is completed; and
- **Alfriston Road Plan Change in the area north of Popes Road –** This is unconfirmed at this stage however, if this eventuates AT considers the existing Level 1B freight route (high freight

connection/ movement) on Alfriston Road will instead be Popes Road. This further elevates Popes Road's status on the freight network.

Even if the above uncertainties eventuate, it is not anticipated that the corridor will need to be widened to four lanes and as such the proposed cross-section will adequately provide for freight.

8.2.5 Access and Parking

8.2.5.1 Access

The corridor and intersections are existing and their role on the network is not expected to change with the NoR. Access to them will remain the same with the NoR. There is also no anticipated change to how users will access existing properties with the exception of 94 Takanini School Road.

The access for 94 Takanini School Road (see Figure 8-2) will now enter the proposed roundabout at the Takanini School Road/ Porchester Road intersection. Given that speed will be low as vehicles approach and there is sufficient sight distance, we consider the effects of this negligible.

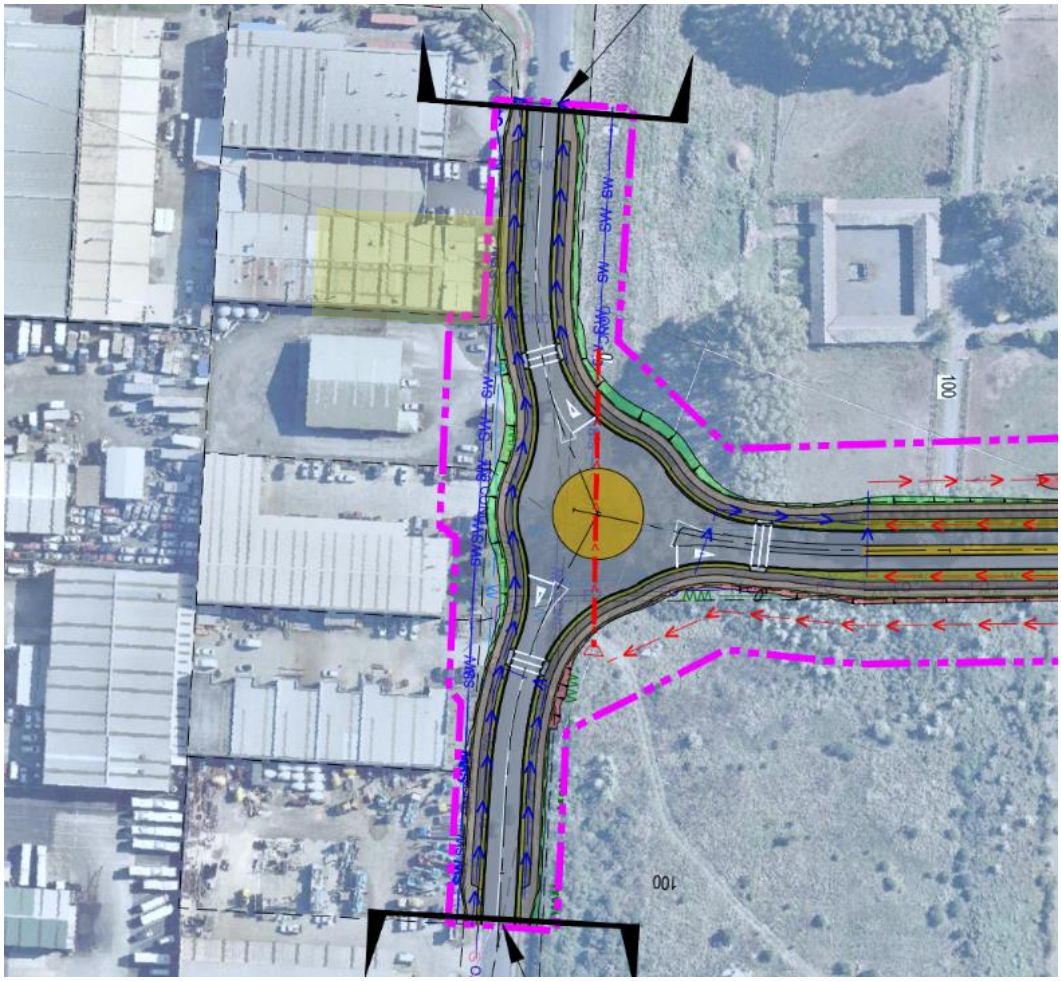


Figure 8-2: 94 Takanini School Road access

8.2.5.2 Parking

On-Street Parking

Currently, there is no on-street parking on the section of Alfriston Road within this NoR.

On-street parking is available along Porchester Road which will be removed as part of the Project . We consider the effect of this minor given there are opportunities to park on side streets, albeit this may be an inconvenience for some motorists. In addition, the Project proposes to improve public transport and active travel therefore minimising the need for car travel and parking.

Legally, there are no parking restrictions on Popes Road currently. Given its rural feel of the corridor, there is seldom parked vehicles and parking is typically available on-site. Thus, we consider the removal of car parking on Popes Road to be a minor effect.

Further to the above, the removal of on-street parking is in line with AT's policy direction where the removal of on-street parking on arterial roads is anticipated and encouraged by AT's Parking Strategy.[35]

On-Site Parking

The indicative number and location of affected on-site parking spaces is summarised in **Table** 8-5**.**

Table 8-5: Affected parking for NoR 4

Address	Activity	Parking spaces in designation	Parking spaces in cross-section
23 Popes Road	Commercial	24	0

Approximately 24 on-site parking spaces will be affected along site frontages. As the NPS-UD removes all minimum on-site parking requirements from the AUP:OP, this is considered a relatively minor effect, as the NoR does not infringe any relevant standards. Importantly, some parts of the designation will only be required temporarily for construction purposes and may be able to be returned to affected landowners for use as parking spaces once the works are complete.

8.3 Recommended measures to avoid, remedy, or mitigate operational effects

Overall, the NoR provides positive benefits, in particular improved safety and active mode improvements. There are no identified adverse operational effects.

8.3.1 Assessment of construction effects

It is anticipated that the majority of the work can be completed without any road closures, and vehicular access will be maintained throughout the corridor. As such, we consider the construction effects can be accommodated and managed appropriately via a CTMP.

[35] Auckland Parking Strategy, 'Room to Move', May 2023.

8.3.2 Recommended measures to avoid, remedy, or mitigate construction effects

No specific construction mitigation measures have been identified for this NoR.

The Church of Jesus Christ of Latter-day Saints (**LDS**) church on the corner of Alfriston Road and Porchester Road needs to be considered as part of the development of the future CTMP. Considerations could include maintaining safe pedestrian access and additional controls.

8.4 Summary of effects for NoR 4

Table 8-6 provides a summary of the positive effects for NoR 4.

Table 8-6: Summary of positive effects for NoR 4

Operational Effects	
Walking and cycling	• Improved walking and cycling facilities along the corridor resulting in improved protection for vulnerable road users. Consequentially, a potential reduction in DSIs. • Improved integration with existing and planned facilities on the network resulting in improved connectivity. • Lead to environmental and health benefits due to the uptake of active modes.
General Traffic	• There is improved performance across a number of the key intersections as part of the proposed upgrades.
Public Transport	• Improved travel time and reliability for public transport.
Freight	• Freight in the area will continue to be supported with improved access and connectivity especially along Popes Road.
Safety	• Improved safety with the conversation of priority intersections to roundabouts or signals improving safety.

No adverse operational effects have been identified and it is considered that construction effects may be managed under a CTMP.

9 Conclusion

Overall, the assessment notes the Project will have significant positive effects especially for public transport and active modes and the potential adverse operational and construction effects can be managed appropriately.

The below provides a summary of operational and construction effects and recommendations.

Table 9-1: Summary of Assessment of Effects and Recommendations

NoR	Effect	Assessment	Recommendation
Operational Effects			
Project wide	Existing property access arrangements are impacted by the Project	There are a number of existing accesses that will be impacted as part of the Project. The intention is to continue to provide property access, however due to the uncertainty of specific design detail and the adjacent land use at the time of implementation, it is not currently possible to determine the appropriate treatments. The best time will be during detailed design and prior to construction.	For each of the designations, a condition is included to demonstrate (in the Outline Plan) how safe access will be provided for each existing access that is altered by the Project.
2	Increased safety risk at the intersection of Firth Street and Great South Road.	Raising the Hingaia stream bridge reduces the intersection sight distance as there is now a vertical crest in the roadway. In addition, widening of the road increases the crossing distance and exposure leading to an increased likelihood of crossing/turning type crashes at the intersection.	Through the assessment process the intersection has been identified to be signalised. This will minimise the increased safety risks as traffic movements will be controlled.
Construction Effects			
1	Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Slippery Creek bridge closed during construction. This will impact the existing 365 bus route which services the community between Settlement Road and Sutton Road. A detour will require buses to bypass this section entirely, reducing accessibility to public transport. Other parts of the future bus network could also be temporarily impacted by construction activities.	The required development of the CTMP prior to construction needs to : • consider how public transport will be maintained for the community if the Slippery Creek bridge is to be closed for construction. This may include providing for additional or altering services to serve the affected communities. This requirement also applies to other bus routes that could be impacted by construction activity.
1	Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Slippery Creek bridge closed during construction. The detour will be 7km which is over an hour via	

NoR	Effect	Assessment	Recommendation
		walking. This is considered to be significant.	• Consider how active mode connectivity is maintained across Slippery Creek during construction. • Consider maintaining connectivity across Slippery Creek Road during construction if Mill Road and/or Opaheke N-S arterial is not yet in the network. If one or more is in the network, whether the connection is required should be reviewed at the time.
1	Network Resilience impacts	Great South Road is a key north south corridor through this section and is a key alternative to SH1. With limited north-south corridors available, network resilience will be compromised if the Slippery Creek bridge is closed during construction. However, noting that construction will be in the future, its role on the network may change and will be dependent on whether the likes of Mill Road and / or Opaheke N-S arterial are in the network.	
3	Public transport accessibility impacts	The assessment considers the worst-case scenario of having the Alfriston Road bridge closed. This will impact the existing bus route which services the community. It is also noted this is a key bus route into the Manurewa bus and train interchange.	The development of the CTMP prior to construction needs to consider how a connection may be maintained for all modes across Alfriston Road bridge.
3	Wider network impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. The likely detour route is likely to constrain existing corridors and have a flow on effect on the wider network. Further, Alfriston Road is a key east-west connection on the network.	
3	Walking and cycling connectivity impacts	The assessment also considers the worst-case scenario in having the Alfriston Road bridge closed during construction. As this is a key link into the Town Centre and is a 'Major' cycle route, connectivity is recommended to be maintained.	

1 Appendix A – SIDRA