TE TUPU NGĀTAHI
SUPPORTING GROWTH

Takaanini Level Crossings
Appendix B - Climate Change Assessment

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Version 1.0

WAKA KOTAHI NZ TRANSPORT AGENCY

AT

New Zealand Government

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1 Introduction

New Zealand has made international commitments to reduce GHG emissions, which the Climate Change Response (Zero Carbon) Amendment Act 2019 directly respond to. These commitments (and the need for climate action) are driving changes to the social, political, and legislative environment. Transport emissions are a key focus of New Zealand's climate response and the legislation and policy on Greenhouse Gas (GHG) emissions and targets are continuing to evolve.

With a role in development of future infrastructure in Tamaki Makaurau, Te Tupu Ngātahi Supporting Growth has a role in influencing future vehicle kilometres travelled (VKT). Te Tupu Ngātahi is responding to the dual challenges of growth and VKT reduction by encouraging mode shift through each stage of its development processes.

1.1 Purpose

This report documents the climate change considerations made as a part of the preparation of the Takaanini Level Crossings Detailed Business Case (DBC). It reassesses the recommended option within the Indicative Business Case (IBC) undertaken in 2018 to respond to changes that have occurred since i.e. policy changes. It details where specific GHG reduction interventions or considerations have been made following the approach and methodology developed by Te Tupu Ngātahi. This includes:

- How the intervention framework (further detailed below) and methodology has been applied.
- Actions and recommendations identified from the initial climate change assessment.
- How the recommendations have been addressed by the DBC.
- Identification of considerations for future phases of the projects.

Following on from the DBC, Notice of Requirements (NoRs) will be lodged for route protection and a more detailed assessment of effects will be undertaken.

1.2 Scope of assessment

This DBC focuses on the level crossings identified as part of the IBC to be assessed for removal and/ or replacement as shown in **Figure** 1-1. Any pedestrian level crossings within the project area, i.e. at the Takaanini Station, are outside of the scope of the business case.

The recommendations from the IBC were:

- **Spartan Road** – closure of level crossing:

– This corridor predominantly serves the industrial traffic within the Takaanini industrial zone.
– It intersects with Great South Road at the Takaanini interchange with right turns out being prohibited due to the location of the intersection under the interchange.

- **Manuroa Road** – closure of level crossing:

- Corridor is situated within residential area and as such predominantly serves the surrounding residents. The corridor also provides access for industrial traffic wishing to turn right onto Great South Road, noting the right turn movement restriction at Spartan Road.
- It forms a full movement cross-intersection at Great South Road with Beaumaris Way and is close to the Takaanini train station.

- **Taka Street** – grade separation over the rail line:

- Corridor is situated within the residential area and as such predominantly serves the surrounding residents.
- It forms a full movement cross-intersection at Great South Road with Walter Stevens Drive and is close to the Takaanini train station.

- **Walters Road** – grade separation over the rail line:

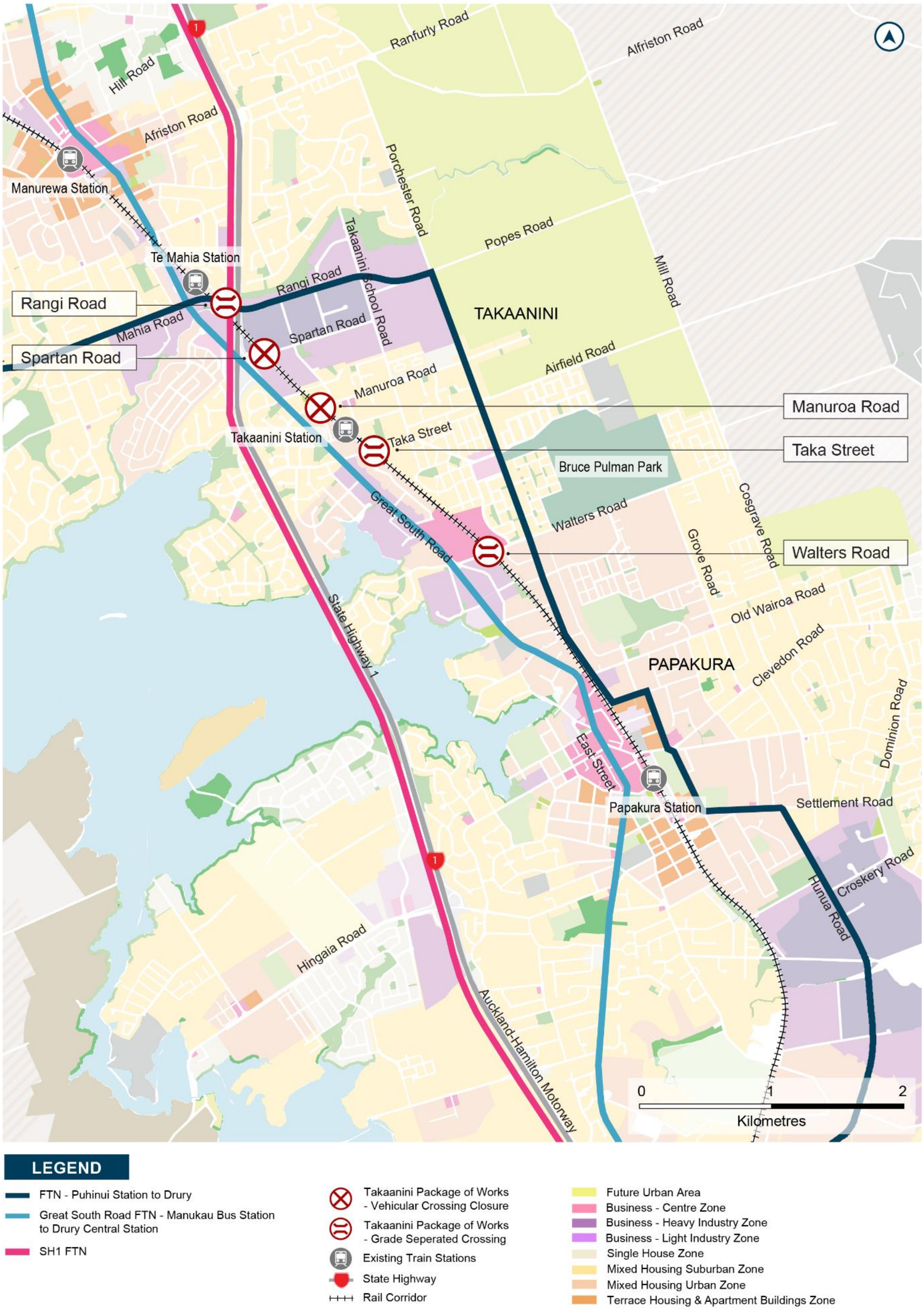
- Corridor predominantly serves residential traffic although noting that there is adjacent retail and nearby recreational activities.
- It forms a five-legged roundabout at Great South Road.

- **Rangi Road** – new viaduct proposed forming part of the IBC FTN route to Mahia Road and acting as a replacement for the closure of Spartan Road and Manuroa Road level crossings:

- Currently a cul-de-sac that serves the Takaanini industrial area

The upgrade or removal of the existing Takaanini level crossings could be considered as separate projects. However, given how closely spaced they are, the decision made at one will consequently impact the other. Thus, the climate change assessment considers the assessment from both a network level (the combination of removal and/or grade separation of the different crossings and its impact on the overall network) and individual corridors perspective (the localised climate change impacts)

Figure 1-1 : Takaanini Level Crossings IBC recommended option



2 Intervention Framework Methodology

Three broad categorisations of GHG emissions (”carbon”) are being considered in this assessment:

1. **Embodied carbon:** The quantum of carbon from the creation, movement and installation of construction materials. Construction carbon emissions can be measured using emissions factors which translate material quantities into tCO_2e, e.g. tonnes of concrete used into tonnes of carbon dioxide equivalent. The Waka Kotahi Beta Preliminary Emissions Estimation Tool (PEET) is being used to consider construction (including embodied) emissions through the DBC and Notices of Requirement (NoRs) processes.
2. **Enabled carbon:** The carbon released from the ongoing operation of the asset which in this case the use of the local and strategic transport network. Te Tupu Ngātahi uses the Waka Kotahi Vehicle Emissions Prediction Model (VEPM) modelling to consider enabled emissions through Vehicle Kilometres Travelled (VKT).
3. **Land use changes**: The GHG emissions arising from land use changes that impact the ability to sequester carbon, which is the long-term storage of carbon in oceans, soils and vegetations. Te Tupu Ngātahi can influence better land use through compact urban form and minimising impacts on soils and vegetation.

2.2 Te Tupu Ngātahi Intervention Framework

Te Tupu Ngātahi has developed an intervention framework (mechanisms & tools) for considering climate change at different stages of the route protection process. The intervention framework forms the basis to interrogate and evaluate the planned networks to identify opportunities for emissions reduction – primarily at the route protection stage that is the focus of the Te Tupu Ngātahi programme. It is a best practice approach to develop confidence that opportunities have been maximised to reduce GHG emissions for whole of life emissions (which include emissions associated with the construction of the infrastructure, and with its use, and eventual disposal).

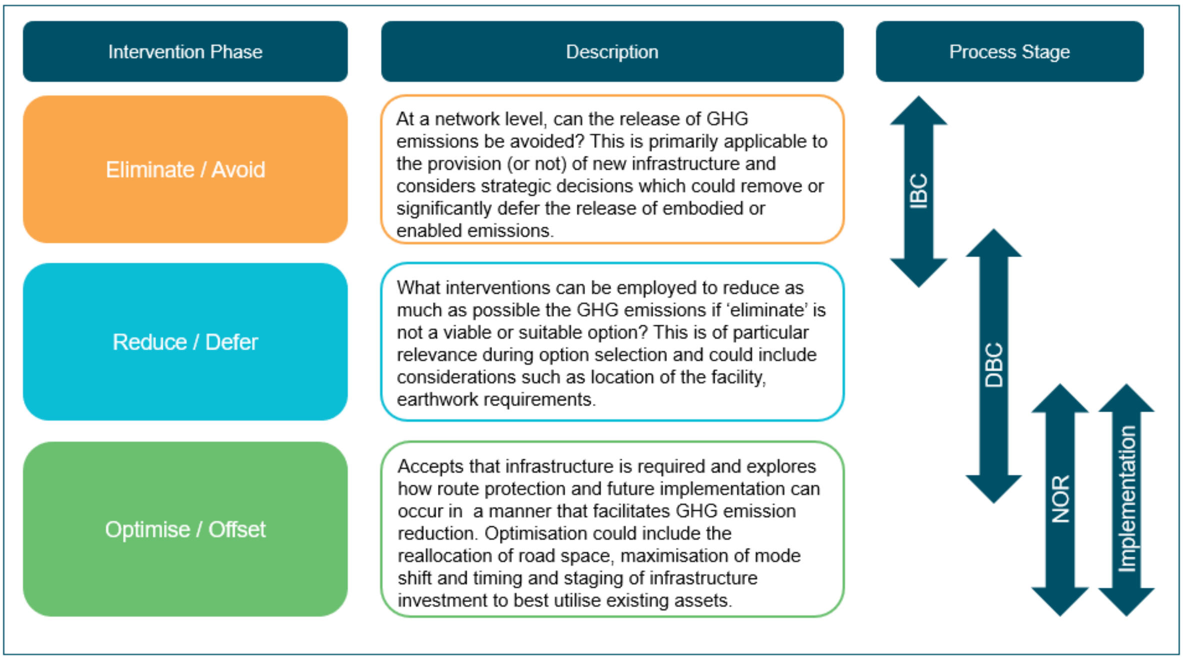
Our intervention approach for considering and responding to climate change at different stages of the business case and route protection process is focused on an ***Eliminate – Reduce – Optimise*** intervention framework as shown in **Figure** 2-1.

This framework is a hierarchical approach that increases in detail and focus as the programme progresses. It aligns with the Avoid – Shift – Improve (ASI) methodology regularly used in transportation planning[1] and in global carbon management specifications such as PAS 2080:2016[2].

The ability to influence carbon emissions changes as projects move from Indicative Business Case (IBC) to Detailed Business Case (DBC) and Notice of Requirement (NoR) or Implementation design. As such, the assessment is reconsidered at each stage to ensure climate change aspects and perspectives are covered.

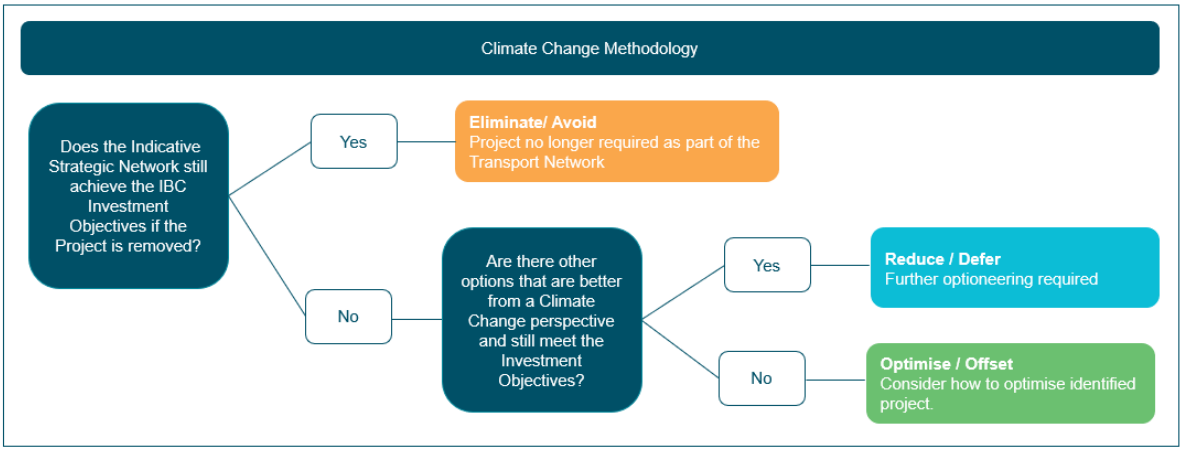
[1] Example: Waka Kotahi Whakarāpopoto a Aotearoa (national summary), page 10.
[2] PAS 2080:2016 Carbon Management in Infrastructure (UK).

Figure 2-1 Eliminate - Reduce - Optimise Intervention Framework



The intervention framework requires considering embodied and enabled carbon in both an integrated and sequential way. The assessment explores the practical interventions as they apply to the whole of life emissions at each stage of infrastructure development decisions from both a network and project view. The decision-making process is shown in **Figure** 2-2 below.

Figure 2-2 Decision making process



The following steps have been taken to consider climate change in this DBC:

- DBC addressed the outcomes of the climate change assessment in the development of the recommended transport network.
- Identification of climate change interventions to be considered further during future implementation stages.

3 Summary of Climate Change Response

The existing Takaanini level crossings are within close proximity to each other and as such have been developed and assessed as a package to account for the network response to closures and replacements. Hereafter, they are referred to as 'the project'.

The project was considered against all three elements of the Eliminate – Reduce- Optimise framework and a summary of the resulting applicable investigations for the level crossing are shown in Error! Reference source not found..

Project	Consider Elimination?	Consider Reduction?	Consider Optimisation?
Takaanini Level Crossings		✓	✓

A full summary of climate change considerations is included in the following sections.

4 Interventions, Recommendations and Actions

The DBC considered climate change impact throughout the optioneering process which is discussed in the following sections. Refer to the DBC for more information about the detailed optioneering process.

4.1.1 Can the project be eliminated?

The South is experiencing several key growth-based challenges including, mismatched population growth, localised skill availability and local job opportunities (increasing demand for commuter travel outside of the South area), limited mode choice, strategic network resilience risks, poorly integrated land use (liveability, quality, urban environment) and limited growth potential for the area. Thus, improvements at the level crossings in the Takaanini area have been identified as part of the solution to support the south transport network in influencing mode shift and to reduce vehicle emissions.

If the level crossings remain as is:

- **Actual and perceived safety risks** will be exacerbated as growth occurs and the railway corridor is four-tracked. This may act as a deterrent for active mode users, further fuelling private vehicle use.
- **Increasing train frequency will cause increased barrier downtime**, reducing east-west connectivity and levels of service for all modes. This results in:

  1. Increased congestion and therefore increased enabled emissions with longer trip times as vehicles spend longer time idling or reroute to avoid the crossings.
  2. Increased delays cause variability in travel time creating inefficient bus services that are unreliable and unattractive. Thus, impact on the mode shift outcomes.
  3. Reduced attractiveness of walking and cycling as delays become a greater proportion of their overall trip, discouraging mode shift. This will also hinder public transport uptake with decreased accessibility to bus stops and rail stations.

- **The existing level crossings limit North-South rail capacity,** affecting access to economic and social opportunities and rail freight efficiency. This will in turn limit travel choice and impact on mode shift.

More details on the key problems are detailed in the **Strategic Case of the DBC.**

While retaining the level crossings may have a benefit from avoided embodied and construction emissions, it is considered the network would not function effectively leading to an increase in enabled carbon and the opportunity for transformational mode shift towards low carbon modes would be lost.

The embodied carbon investment anticipated with the upgrades i.e grade separation to provide east-west crossings across the rail line is for the direct benefit of achieving mode shift and in reducing enabled carbon emissions.

Therefore, the project is critical in supporting overall mode shift and climate change response and <u>cannot be eliminated</u>.

4.1.2 Can GHG emissions be reduced?

The main opportunities to reduce GHG emissions were identified as further considering the location (including which crossing should be removed/ grade separated) and the number of east-west crossing required, with the view to avoid:

- **Unnecessary induced traffic**, as the more road capacity provided the more traffic there will be.
- **Construction and embodied emissions** i.e., reduction of major structures, earth works and construction complexity.

These have primarily been addressed through the optioneering process in the DBC. The specific opportunities and DBC responses are included in **Table** 4-1.

Table 4-1 : Identified GHG Reduction Opportunities

Reduction opportunity	DBC Response
Is there an alternative solution?	• The IBC recommended option included a large Rangi Road viaduct structure which will have significant embodied carbon. The optioneering process therefore investigated further options for crossings that may have lesser effects for similar or greater benefits.
Number of east-west crossings required Providing the optimum number of east-west crossings to maintain network connectivity to support the growth. This means not providing more than that required as additional road capacity will induce more traffic and increased enabled carbon. In addition, additional structures results in additional embodied carbon.	• The transport assessment undertaken as part of the DBC identified that the Takaanini road network will require a minimum of four east-west crossings including that of Alfriston Road (existing). At least one was needed for the industrial area. This was accounted for during the optioneering process with Manuia Road crossing identified as the industrial access (replacing the Rangi Road option from the IBC). Taka Street and Walters Road will be grade-

Reduction opportunity	DBC Response
	separated and Manuroa Road and Spartan Road level crossings will be removed. Thus, 4 overall crossings.
Location chosen to reduce construction and embodied carbon Location attributes considered to reduce major structures, earthworks, and construction complexity.	• The MCA considered the PEET analysis to understand the magnitude of embodied and construction emissions of the different east-west crossings. It indicated Rangi Road is expected to have the greatest likely emissions. Thus, does not form the preferred option from a carbon perspective. • Assessment of the different grade separation options were undertaken and indicated rail trenching/ tunnel and road tunnel had significant construction complexities. Hence, greater embodied and construction carbon than a bridge (road over rail) option. • Additional route refinement consideration was made to minimise impacts before the preferred was selected such as minimising footprint where possible • Guidance provided in the DBC for staging considered minimising the effects on the transport network and thus, the enabled carbon associated with construction. However, it is acknowledged the Auckland Networkwide Level Crossings SSBC will determine the final staging.
Maximise walk up catchments through land use integration The Takaanini industrial area is adjacent to the Rapid Transit Network (RTN) as well as the Great South Road Frequent Transit Network (FTN). Changing its land use to the likes of residential will better integrate with the surrounding environment. This will also maximise public transport catchment therefore positively impacting enabled emissions.	• As part of the DBC, meetings were held with Council to understand whether there were any opportunities or considerations in the future to change the industrial land use. However, indication is that there are no plans currently to change this.
Optimised locations to enable mode shift and minimise embodied carbon The increase in delays at the level crossings decreases accessibility to public transport facilities as well as key destinations i.e. Town Centre. As such, the location of the east-west crossings is crucial as it affects active mode catchment and accessibility thus, impacting mode share.	• Investment Objective Two of the DBC is focussed on travel choice and increasing low carbon active mode share. • Through the MCA process, assessment against this investment objective scored options more favourably if they enable a greater mode shift. This is of importance especially given Plan Change 78 which will allow greater intensification within 800m catchment of an RTN. Facilitating and increasing accessibility to and within the area will positively contribute towards mode share. • The east-west crossings provided will have dedicated pedestrian and cycling facilities.

Reduction opportunity	DBC Response
	• The preferred option also proposes dedicated walking and cycling provisions at Manuroa Road and Spartan Road which will be cul-de-sacs. This will positively contribute towards mode share.

The main reduction opportunities are in realising carbon opportunities associated with the number and location of the east-west crossings. This has been addressed through the optioneering process in the DBC.

4.1.3 Can these projects be optimised?

The main opportunities identified for further optimisation were associated with maximising mode shift as detailed in **Table** 4-2.

Table 4-2 Optimisation actions identified

Optimisation action	Description and climate change outcomes
Enabling active mode uptake	• Consider active mode facility designs that are attractive and easy to use to encourage its uptake. Thus, positively impact on mode share.
Timing for implementation	• Currently, the exact timing of implementation is unclear and will be determined by the Auckland Networkwide Level Crossings SSBC. However, it is recognised there could be benefits in the interventions taking place prior to the opening of City Rail Link (CRL) to minimise the carbon emissions associated with longer travel time and idling vehicles due to prolonged delays at the level crossings. • The Spartan Road active mode connection could also be delayed until such a time that it is required when and if the industrial growth is realised. This could have a positive impact on construction and embodied emissions if lower carbon materials and fuels/plant becomes available later.
Urban design	• Design in greenspace and native planting in residual undevelopable land parcels. This will positively benefit amenity and provide minor sequestration benefits.

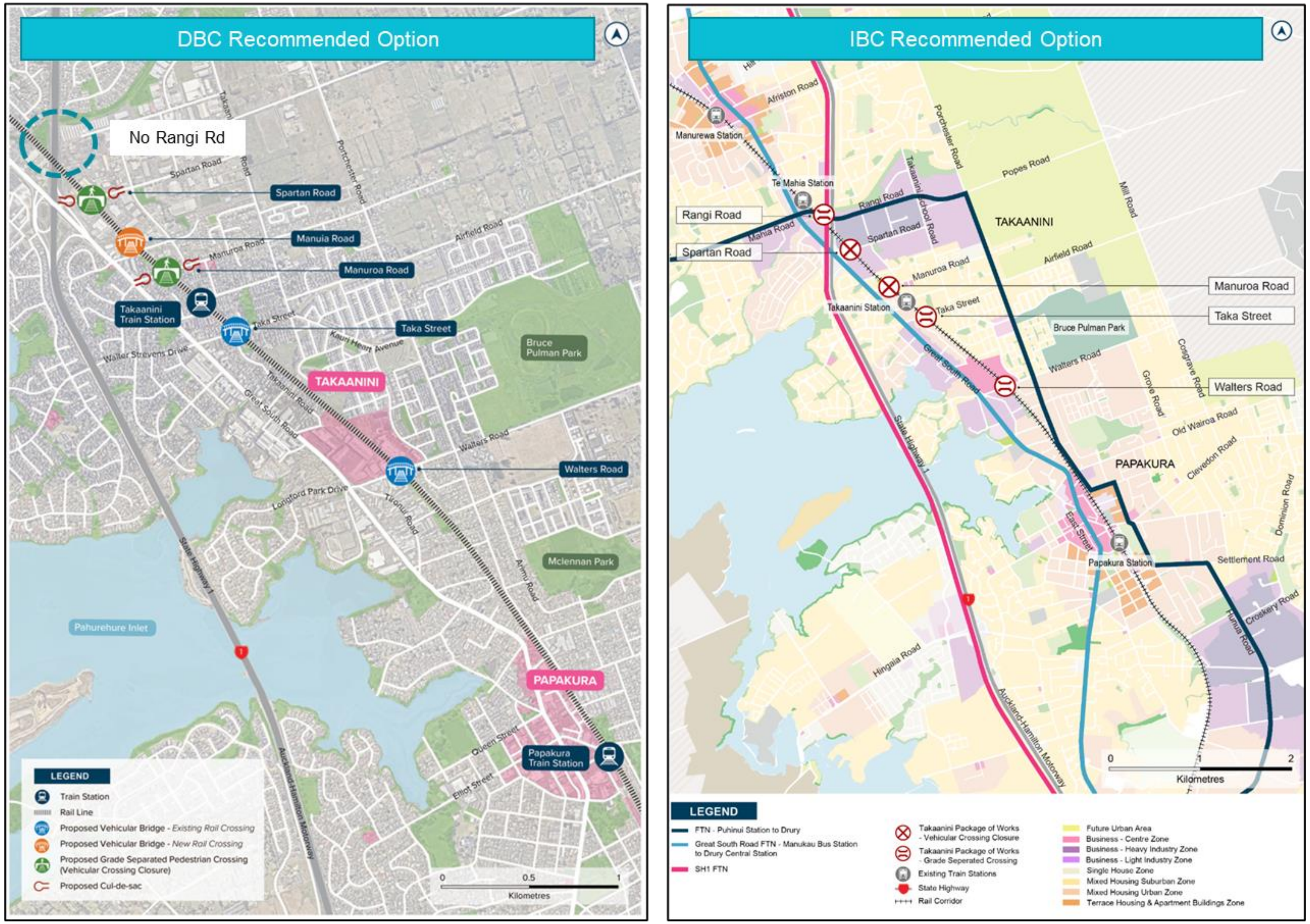
The main optimisation actions identified include the timing for implementation, further urban design and the design of attractive active mode facilities.

4.1.4 DBC response to climate change

The DBC and IBC preferred option are shown in **Figure** 4-1. This reflects the climate change responses identified above, as follows:

- Four minimum east-west crossings including Alfriston Road were identified as required to maintain network connectivity and support the growth. Additional crossings may provide additional benefits; however, this will also result in increased embodied and construction carbon.. In addition, more road capacity will induce more traffic which is counterintuitive to the climate change outcome sought.
- Active mode crossings have been provided at Manuroa Road and Spartan Road where level crossing closures have been proposed. This will enable the mode shift outcomes sought.
- All east-west crossings will have dedicated walking and cycling facilities to provide accessibility to key public transport stations i.e., the RTN and FTN on Great South Road. This will positively contribute towards mode shift to low carbon modes.
- Although the staging of the level crossings will be determined by a separate Auckland Network Level Crossings SSBC, the Takaanini Level Crossings DBC recognises the importance of the removal and/ or replacement needs to take place in a timely manner before barrier down time has significant adverse impact on the network. This will aid in maximising public transport and active mode uptake as soon as possible and ensure that traffic delays are minimised which will in turn minimise enabled emissions.
- Through the optioneering process:
  - The Rangi Road viaduct identified within the IBC was assessed to likely have the greatest embodied and construction emission intensity using the PEET tool. Thus, an alternative less carbon intense crossing at Manuia Road was identified as the preferred industrial access crossing. Other effects were also relevant to this decision, these are discussed in the Option Assessment Report in Appendix C of the DBC.
  - Additional route refinement consideration was made to minimise impacts before the preferred was selected.
  - Investment Objective Two focussed on travel choice and as such assessed options that enabled positive mode share shift towards low carbon transport modes more favourably.

Figure 4-1 : DBC and IBC Recommended Option



4.1.5 Climate change matters for further consideration

A number of additional climate change matters have been identified for future stages of the projects:

- Consider design opportunities to integrate active modes connectivity to the Takaanini Train Station as part of the Masterplan works to be undertaken in the future. This will further encourage positive mode shift.
- Optimise and redevelop residual land parcels to provide key connections to amenities and encourage active mode uptake.
- Design in greenspace and native planting around infrastructure, this will impact amenity and provide minor sequestration benefits.
- Design opportunities to reduce less material waste on site and selecting materials with fewer emissions over their cycle.
- During construction, consider using alternative fuel sources in machinery, equipment, to and travel from site. This may include electrifying construction equipment where possible.
- Consider accelerating construction where possible to reduce traffic disturbances (i.e., detours and idling) and its associated emissions.