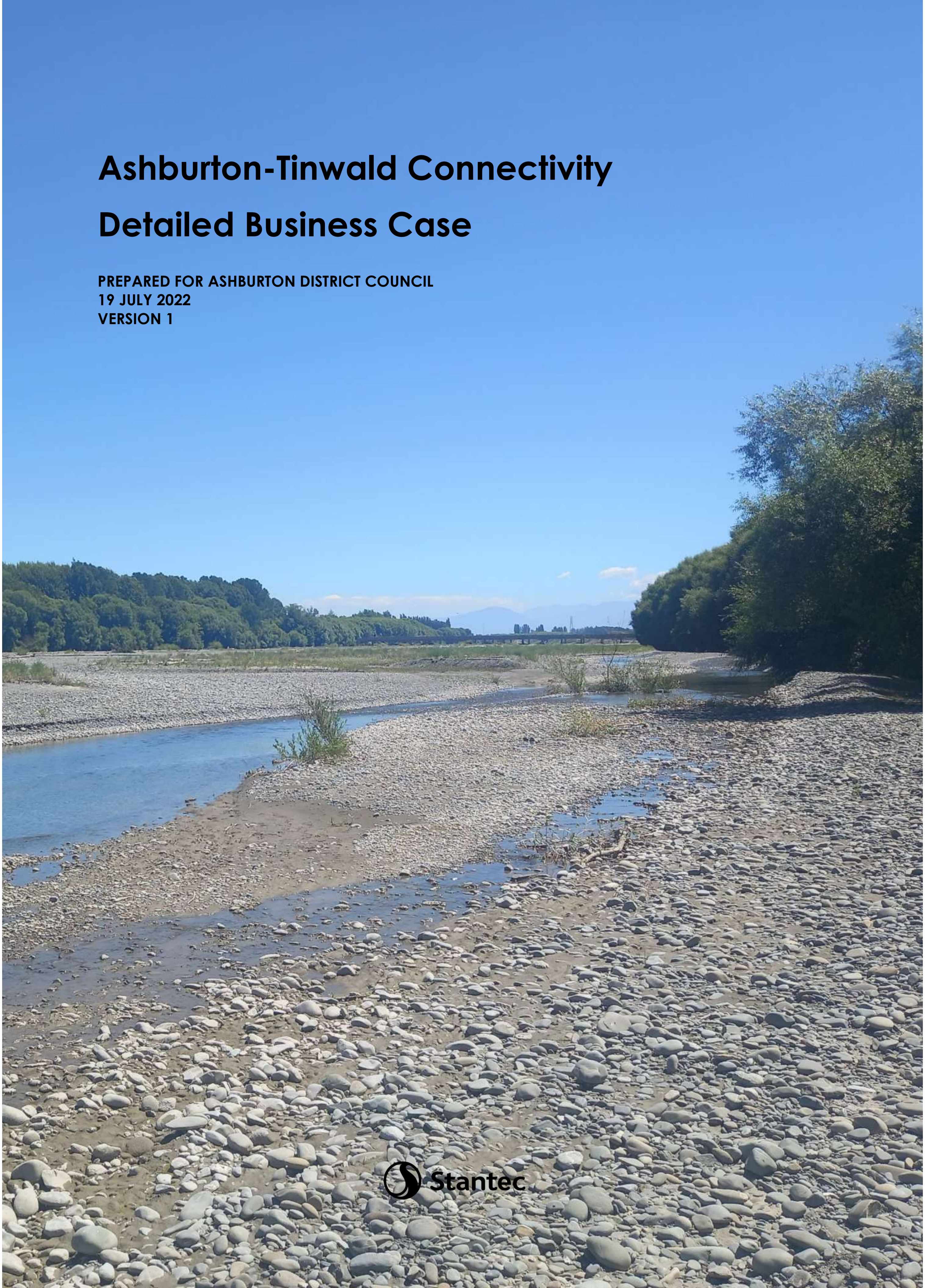
Ashburton-Tinwald Connectivity

Detailed Business Case

PREPARED FOR ASHBURTON DISTRICT COUNCIL
19 JULY 2022
VERSION 1



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EXECUTIVE SUMMARY

OVERVIEW

This Ashburton-Tinwald Connectivity (ATC) **Detailed Business Case** (DBC) demonstrates the need to invest in the Ashburton transport network in order to improve connectivity across Hakatere (Ashburton) River.

The business case demonstrates that the impacts of having only a single connection between Tinwald and Ashburton go beyond just traffic congestion issues. The wider effects on travel choice, resilience, community severance, safety and freight movement are also significant. The outcome is the following recommended programme of works:

Short term	• Upgrade to the South Street / SH1 intersection – extension of the southbound merge. • Clip-on passing bays, for cyclists, on the existing SH1 Bridge.

Medium term	• A new second river crossing that meets Chalmers Avenue in Ashburton.
	  – On the Tinwald side, a new road will connect the bridge through to Grahams Road.
	  – The bridge will include high-quality provisions for pedestrians and cyclists.

Council approval on the referred location for a second bridge

In October 2021, Ashburton District Council (ADC) endorsed the technically preferred programme and proposed location for the second bridge. Endorsement was also provided by Waka Kotahi following their review of Part A (Case for Change) and Part B (Alternatives and Options Assessment) of this business case.

The decision was then made to progress the 'medium term' programme (i.e. the Chalmers Avenue second bridge) to the 'DBC phase' – i.e. scheme design and cost estimate. The 'short term' programme (which focuses on SH1 improvements) would be independently delivered by Waka Kotahi - pending funding and approval.

Cost estimate and economics

ADC is seeking funding support from Waka Kotahi and the Ministry of Transport (MoT) towards the second bridge and new road to Grahams Road.

The cost estimates for the project have been based on a scheme level design which has been informed by a topographic survey, geotechnical survey and 2D hydrologic model. The following cost estimates for the full project length has been agreed with an independent cost estimator (via a parallel cost review):

- P50[1] (expected cost) = $93.0m.
- P95[2] (inc. funding contingency) = $113.6m.

The Benefit-Cost Ratio (BCR) for the project is **1.2** (excluding wider economic benefits)

Design

The concept design for the bridge and road is shown below, and includes new roundabouts at South Street, Wilkins Road and Grahams Road.

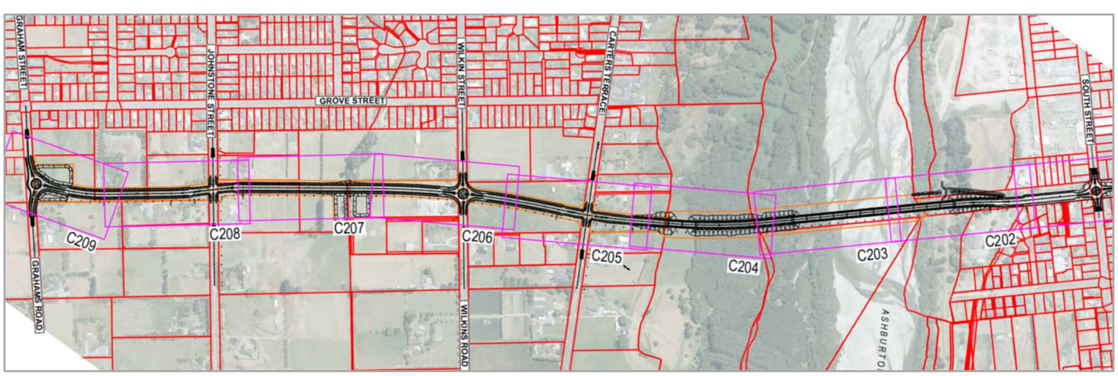

Figure 0-1: Concept design alignment

[1] P50 - The 50th percentile cost estimate. There is a 50% chance of the project being delivered within this amount.
[2] P95 – The 95th percentile cost estimate. There is a 95% chance of the project being delivered within this amount.

DBC Version

This is **Version 1 of the DBC** and will be used to inform Ashburton District Council's (ADC) decision around their funding contribution towards the project. Once confirmed, this information will be added into the Financial Case and Version 2 of the DBC will be presented to Waka Kotahi. There is an understanding that a funding gap will still remain, and hence it is likely that the DBC will then be presented to the Ministry of Transport (MoT) for consideration.

PROBLEMS

The problem statements, prepared with input from key stakeholders and agreed, are:

1. **Connectivity** – An absence of route choice contributes to more traffic on SH1. This discourages, or stops people being able to, make journeys they otherwise would, creating social disconnect and lack of a 'one community' feeling.
2. **Travel choice** – Limited (or poor quality) facilities for sustainable modes makes it difficult to achieve long-term environmental and liveability objectives.
3. **Safety** – High traffic volumes make it difficult for people to travel along, across, or onto SH1. This increases the likelihood of injury crashes and delays emergency services.
4. **Economic prosperity** – Increasing traffic and constrained capacity on SH1 results in worsening travel time reliability between Tinwald and Ashburton. This impacts freight connections and economic prosperity.

NETWORK RESILIENCE

There is currently only one practical connection between Tinwald and Ashburton, which is via the SH1 Bridge. This means that network resilience is very poor, and the *connectivity* and *economic prosperity* problems (in particular) would be significantly impacted by any event that either closes the SH1 Bridge or restricts vehicle movements.

May 2021 Flood Event

Although events such as earthquakes and floods have low probabilities, they have high consequences. The May 2021 flood event highlighted how susceptible the transport network and regional economy are to any event that either closes the SH1 Bridge (even for a short period of time) or restricts the types of vehicles that can use the bridge. The nearest alternative river crossing involves an 80km diversion along local rural roads. However, in the May 2021 event, this alternative route was also not open, being equally affected by the same flood event. This meant that either people took a detour that involved a trip via the west coast of the South Island, or in most cases, the trip simply did not take place[3].

If the SH1 Bridge was closed again for a significant amount of time (three days or more), the effects on the local community and wider South Island economy would be significant. The bridge represents a critical lifeline for the Tinwald community to key facilities on the Ashburton side such as health care, schools and supermarkets. It also is a critical link in the goods supply chain, with much of the South Island (including Dunedin) dependent on the connection remaining open. Any closure of the bridge also presents a risk that emergency services are unable to attend incidents in Tinwald in time.

The bridge is a nationally and locally important connection

As major weather events become more common (recognised by NIWA[4]), there will be an increased probability of bridge closures. As with many ageing bridges in the district, there will also be an increasing potential for a bridge failure. There are several bridges in the region, including the Rakaia River Bridge, that are of a similar age to the SH1 Hakatere (Ashburton) River Bridge and are equally important parts of the supply chain.

However, the scale of the resilience issue at Ashburton is greater than elsewhere in the region because:

- Ashburton and Tinwald function as a single community. The bridge not only facilitates regional through traffic, but also functions as the only practical connection between the two areas for social and economic activity. No other river between Christchurch and Dunedin severs a community in this way.

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[3] The actual economic cost of the May 2021 event is difficult to quantity as the cost of a trip not happening depends on several factors (e.g. how productive an employee is working from home).

[4] https://niwa.co.nz/sites/niwa.co.nz/files/ClimatechangeprojectionsfortheCanterburyRegionNIWA.PDF

- The bridge carries around 24,000 vehicles per day (vpd) which is 2.5 times more traffic than any other SH1 Bridge south of Christchurch (10,000 vpd cross the Rakaia River bridge). This alone means that the economic cost of any closure is higher at the Ashburton Bridge when compared to any other crossing.
- For an urban bridge, it has very poor existing walking and cycling provisions. This has created a situation where travel by motor vehicle is preferred, even for very short trips across the river.

The impact to the whole Ashburton community, plus the impact to freight and goods movement, is what differentiates the resilience issue at the Ashburton Bridge from any other bridge in the South Island. If the bridge were closed for more than three days for any reason, the impacts could be long term. The only available solution for ensuring that long-term and resilient connectivity between Ashburton and Tinwald is a second river crossing that would be designed to withstand major flood events[5].

There is a strong case, purely based on resilience, for a second river crossing to be constructed now.

OPTIONS

Assessment of alternatives

The identification and assessment of options was informed by the evidence base, an engineering review of options, and feedback from ADC and the wider stakeholder group. Multi-criteria analysis (MCA) was the primary tool used for evaluating the benefits and risks associated with each option. An initial sifting of the options resulted in an agreed short-list, shown in Figure 0-2.

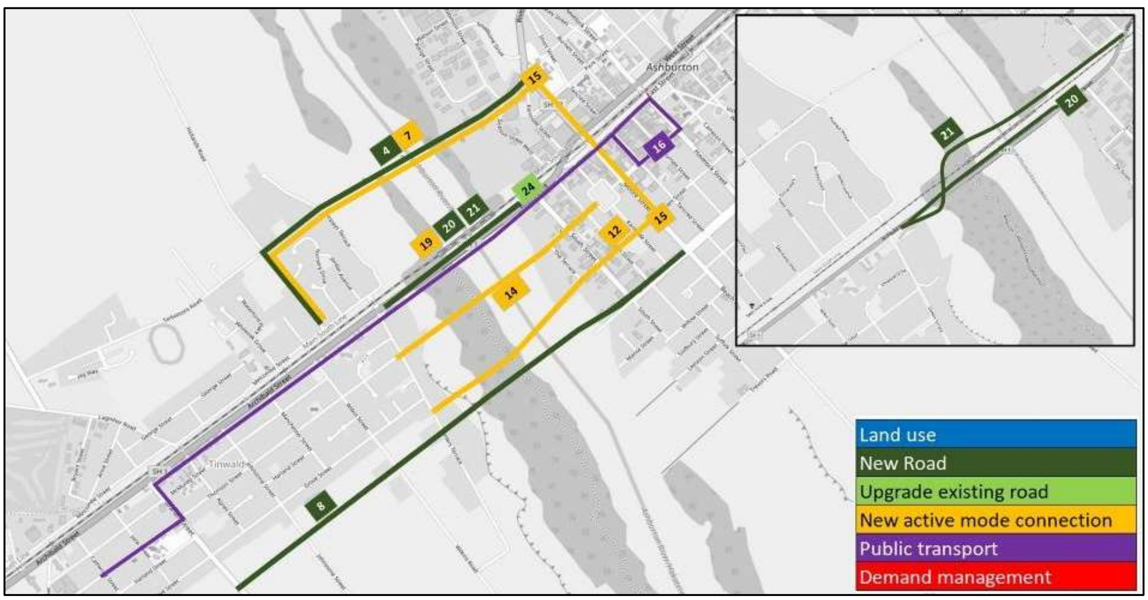


Figure 0-2: Short list of alternatives

The short list assessment established that:

- The **Chalmers Avenue** (ID:8) and **duplication of the SH1** (ID:20) all-mode bridges scored much better than alternatives. The Chalmers Avenue Bridge option scored better than the SH1 Bridge duplication option largely because of the technical difficulty involved in duplicating the SH1 Bridge. The Chalmers Avenue Bridge could largely be constructed offline with little impact to the transport network during construction.
- The **Tarbottons / Dobson active mode bridge** (ID:7) scores better than the alternative walking/cycling bridge options as it would provide better connectivity for multiple activities.
- Whilst not solving the problems independently, **improving the north and southbound merge at the South Street intersection** is a low-cost, low-risk option that would provide safety and travel time benefits.

Fundamentally, strongly delivering all the Investment Objectives is what the project is about. For this reason, a new all-modes bridge was agreed as being the vital component of a programme of investment.

[5] Supporting by the Waka Kotahi National Resilience Programme Business Case

Chalmers Avenue vs SH1 duplication

Both options would improve connectivity, improve resilience, deliver reliability for freight movement and provide better travel choices. However, a Chalmers Avenue alignment was preferred for the following key reasons:

- **Investment objectives** – the Chalmers Avenue option will more strongly deliver the Investment Objectives. At the core, this is why investment is being made.
- **Congestion and efficiency** – modelling indicates that the Chalmers Avenue Bridge will attract enough local traffic to keep the State Highway operating efficiently during all peak periods out to 2041 (and likely beyond).
- **Severance** – a Chalmers Avenue Bridge will reduce, rather than increase, the east-to-west severance issues.
- **Safety –** the Chalmers Avenue Bridge reduces the number of vehicles turning right onto the state highway, from stop-controlled intersections, in Tinwald and reduces the likeliness of turning related crashes.
- **Land use** – the Chalmers Avenue Bridge directly supports the council's future land use plan, with residential growth targeted for southeast Tinwald and employment growth in the Ashburton Business Estate.
- **Construction impact** – the Chalmers Avenue Bridge and new road through to Grahams Road can be largely constructed offline, with minimal impact to the community.
- **Complexity** – the Chalmers Avenue Bridge is technically less complicated to build, with fewer constraints (e.g. railway line) and limited property impacts. The SH1 option has potentially significant property and constructability challenges to overcome. Waka Kotahi have identified that it will be very difficult to build a new bridge on either the upstream or downstream sides of the existing bridge.
- **Consentability** – a designation for the Chalmers Avenue Bridge is already in place.

SUPPORTING CLIMATE CHANGE GOALS

The preferred programme seeks to reduce or offset carbon emissions by:

- Recommending a bridge alignment (Chalmers Avenue) that provides the highest benefits to CO2 emissions. Overall vehicle km and travel times are reduced when compared to a 'Do Minimum' or SH1 duplication.
- Providing new cycle and pedestrian paths along the new Chalmers Avenue corridor, connecting Ashburton to Tinwald and onto Lake Hood. This will make cycling into Ashburton a far safer and more appealing choice.
- Providing, as an interim measure, SH1 Bridge clip-on passing bays for cyclists.

As part of the design process, effort has been made to reduce the scale of embodied carbon emissions that would be generated by the project. Potential opportunities to reduce carbon have also been identified and will be explored during the Detailed Design stage.

CHALMERS AVENUE SECOND BRIDGE DESIGN

The design for the project has been informed with input from ADC, Waka Kotahi, key stakeholders, directly affected properties owners and councilors. The design has been subject to an external Road Safety Audit, value-engineering exercise, design challenge and 'safety in design review'. An Urban and Landscape Design Framework accompanies the design (provided within **Appendix O**).

The agreed cross-sections for the proposed road and bridge are presented below.

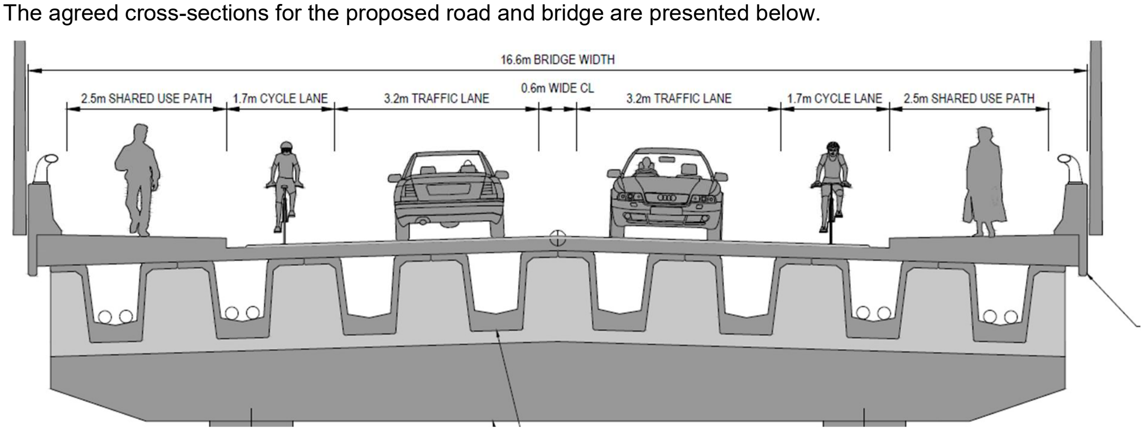


Figure 0-3: Proposed bridge cross section

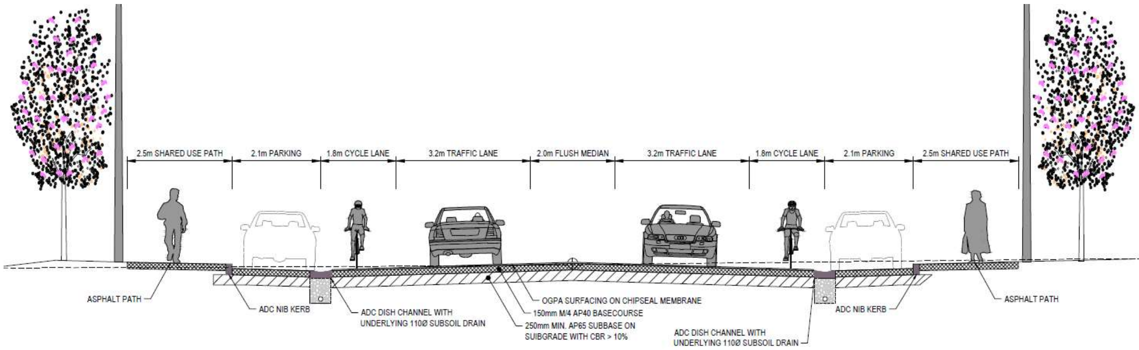


Figure 0-4: Proposed road cross section (where on street parking is provided)

PROVIDING VALUE FOR MONEY

Evaluation of reduced scope and staged options

Council and Waka Kotahi's current (July 2022) positions towards funding contributions for the project means that there is an identified funding gap that will need to be addressed by Waka Kotahi and the Ministry of Transport (refer to the Financial Case). A robust business case should also explore all reasonable options to ensure that value for money is being delivered to council, Waka Kotahi and the taxpayer (or ratepayer).

For this reason, the business case has evaluated the following alternative options:

'Building in one go'	South Street to Carters Terrace (only)	
	South Street to Wilkins Road (only)	
	South Street to Grahams Road (full project)	
'Building in two stages'	Option 1	Stage 1: South Street to Carters Terrace Stage 2: Carters Terrace to Wilkins Road
	Option 2	Stage 1: South Street to Wilkins Road Stage 2: Wilkins Road to Grahams Road

The economic analysis supports the recommendation for construction of the full project (to Grahams Road), and for this to be delivered in one stage. Key results of the analysis are:

- The project will deliver strong benefits (both traditional and Wider Economic Benefits (WEBs) and presents good value for money with a **BCR of 1.3** (inc. WEBs). This is a relatively consistent BCR for all the alternatives considered, aside from the option to only build the new road as far as Carters Terrace.
- Ending the project at Carters Terrace is a poor economic choice as it presents a BCR < 1 and does not strongly deliver the wider outcomes desired from investment.
- The scale of the outcomes and problems are such that it is important a second bridge is constructed as soon as possible. If the project were to be staged, **at the very least,** the section between South Street and Wilkins Road should be constructed in Stage 1.

Value engineering

A 'value engineering' workshop took place as part of the DBC between the project team, ADC and Waka Kotahi roading engineers. The purpose was to test the initial design and identify whether there were any opportunities to reduce project costs without notably reducing benefits (outcomes). A key refinement to the design was the reduction in the number of roundabouts (i.e. cross-roads at Johnstone Street and Carters Terrace).

INVESTMENT PROFILE

The project obtains a Government Policy Statement (GPS) priority rating of 'Very High' based on the anticipated freight outcomes. Based on the 2021 GPS results alignment rating, estimated BCR range (between 1-3) and scheduling assessment the corresponding NLTP priority order [6] is 3. This is makes the project a high priority.

[6] www.nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/202124-nltp/2021-24-nltp-investment-prioritisation-method/determining-the-priority-order-of-an-activity-or-combination-of-activities/

FUNDING

The economic evaluation, consideration of likely funding partners and an assessment of outcomes has resulted in a recommendation that **the full project through to Grahams Road** should be delivered. However, for funding decision purposes, the project has been split into two sections (South Street to Wilkins Road; and Wilkins Road to Grahams Road). This is because ADC may see it as suitable for a future developer to contribute to the Wilkins Road to Grahams Road section. Funding partners could also potentially decide to contribute different amounts to different sections of the project.

Figure 25-1 shows possible funding sources for the different parts of the corridor.

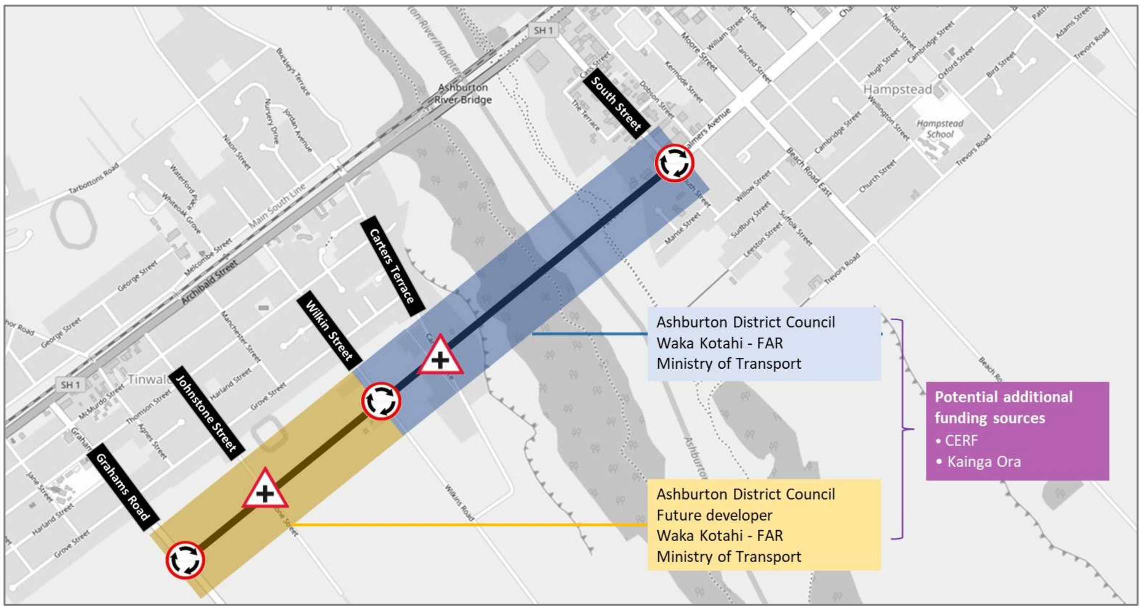


Figure 0-5: Funding sources for different parts of the corridor

Financial contributions

Council

Council will discuss and decide on the staging of the project and their funding contribution to the project following a council meeting on the 17 August 2022. Version 2 of the DBC will include this committed funding figure, and then be presented to Waka Kotahi for consideration.

Waka Kotahi

ADC are seeking a 62% Funding Assistance Rate (FAR) from Waka Kotahi.

The rationale is:

- 51% - contribution based on the standard FAR for ADC.
- An additional 7% contribution based on a reduced crash risk for the state highway. The economics has identified a $6.5m safety benefit for the state highway[7]. This represents 7% of the total project cost.
- An additional 4% contribution based on the wider GDP resilience benefits that a second bridge will provide.

Ministry of Transport

ADC will be seeking contribution from the Ministry of Transport to address any gap in the funding that is not covered by the combined contribution of ADC and Waka Kotahi.

Developer

ADC will decide around the approach to any future developer contributions.

[7] Note that these calculations have been checked by the economic peer reviewer.

ABBREVIATIONS

AADT	Annual Average Traffic Volume
ADC	Ashburton District Council
AMP	Asset Management Plan
ATC	Ashburton-Tinwald Connectivity
CBD	Central Business District
DBC	Detailed Business Case
GPS	Government Policy Statement
ILM	Investment Logic Map
LOS	Level of Service
NOR	Notice of Requirement
OGPA	Open Graded Porous Asphalt
PBC	Programme Business Case
SH1	State Highway 1
SIA	Social Impact Assessment
SMA	Stoen Mastic Asphalt
SSBC	Single Stage Business Case
vpd	Vehicle movements per day
vph	Vehicle movements per hour
WEB	Wider Economic Benefits

PART A: STRATEGIC CASE

1. INTRODUCTION

1.1 OVERVIEW

The Ashburton-Tinwald Connectivity (ATC) Detailed Business Case (DBC) demonstrates the need to invest in the Ashburton transport network in order to improve connectivity across Hakatere (Ashburton) River. This DBC has been developed on behalf of Ashburton District Council (ADC) and has been jointly funded by Waka Kotahi.

The outcome is a recommended programme of works, which has been endorsed by both ADC and Waka Kotahi. The programme includes:

- **Short term:** Minor upgrades to the existing State Highway 1 (SH1) bridge, capturing an extension of the southbound merge from South Street onto the bridge, and new bridge clip-on bypass lanes for cyclists.
- **Medium term:** A new second bridge and road that would connect Chalmers Avenue (in Ashburton) to Grahams Road (in Tinwald).

The DBC has sought to identify a value-engineered design for the second bridge and new road – i.e. one which delivers high benefits but minimises cost. The design has incorporated feedback from ADC, local hapu, Waka Kotahi, key stakeholders and immediately effected landowners.

1.2 PROJECT AREA

SH1 is a key strategic transport route for the South Island that links Picton in the north with Bluff in the south via all major towns and cities along the east coast. The town of Ashburton is located on the northern side of the SH1 Bridge over the Hakatere River, with Tinwald on the opposite (southern) side of the river.

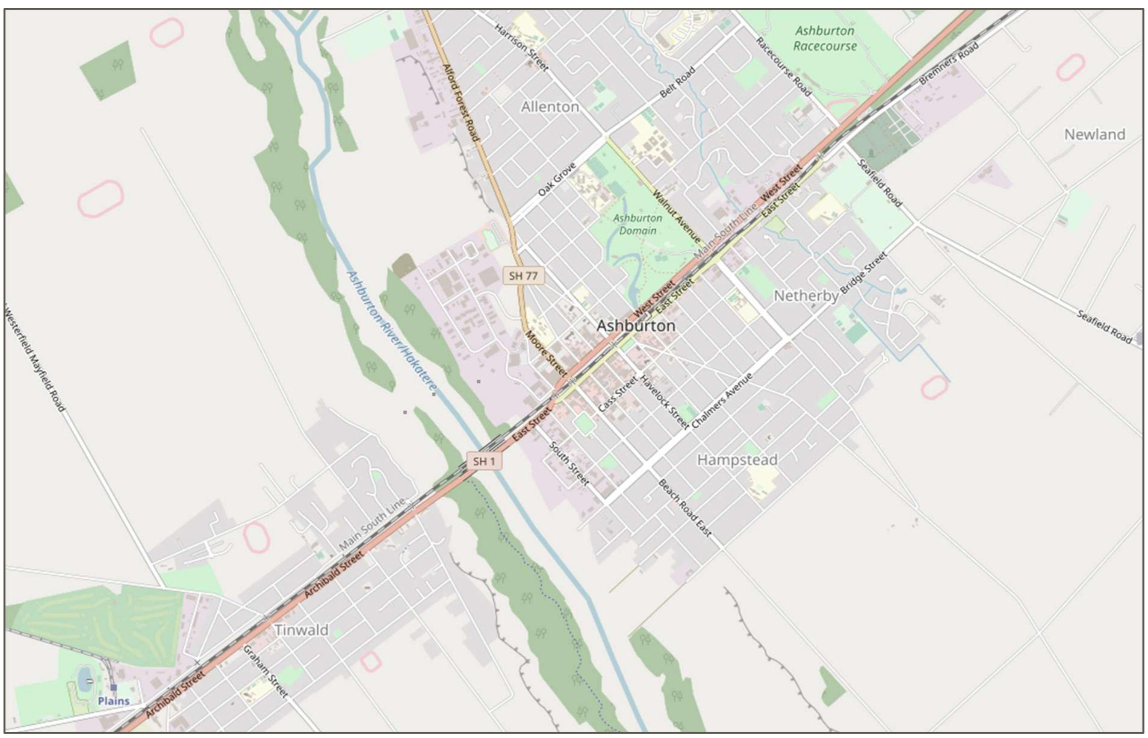


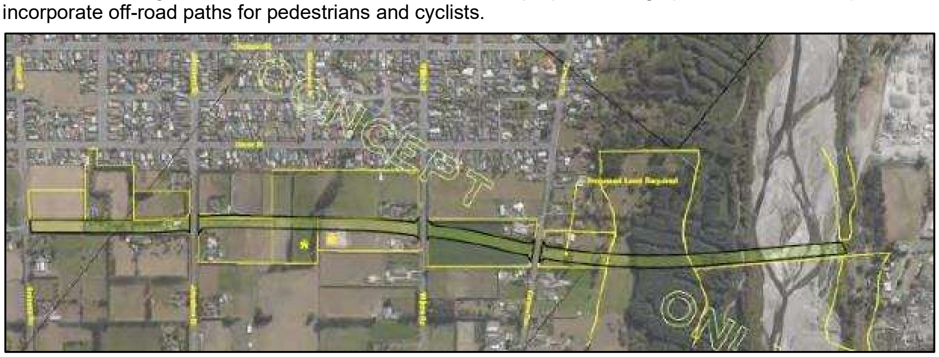
Figure 1-1: Project Area

The project area, which refers to the geographic extent to which potential interventions could be introduced, covers the towns of Ashburton and Tinwald. The area of influence of any future interventions within the project area could, however, be far wider, potentially extending out as far as Christchurch (to the north) and Timaru (to the south). From a resilience perspective, the area of influence covers the entire length of SH1 along the east coast of the South Island.

1.3 PREVIOUS INVESTIGATIONS

The transport network in both Ashburton and Tinwald has been the subject of several studies in recent years. The most relevant have been summarised in Table 1-1.

Table 1-1: Previous investigations

Study	Summary
Ashburton Transport Study (2006)	The Ashburton Transportation Study (ATS) was commissioned in 2006 by Waka Kotahi and ADC to identify the present and future transportation demands within the Ashburton urban area for the 20-year period through to 2026. The study also recommended measures to optimise the performance of the land transport system within Ashburton. The ATS concluded that: • A second river crossing would be more beneficial for local traffic than inter-district traffic because local traffic accounted for more than 70% of all movements on the SH1 Bridge. • There is a significant traffic pressure point at the SH1 Bridge during peak hours, which will worsen as the town continues to expand and traffic volumes grow. • A second bridge separated from the SH corridor reduces traffic impacts of severance and safety and provides an alternative route for resilience
Ashburton Second Bridge Issues and Options (2010)	In 2010, a study was undertaken to better understand the opportunities and risks associated with introducing a second bridge across the Hakatere River. The report provided an assessment of the existing SH1 Bridge, noting (in addition to issues raised in the ATS): • There are many crash hot spots at intersections along SH1 through Ashburton and Tinwald, highlighting the difficulty of gaining safe access to the state highway. • There are no viable alternative routes for this nationally strategic route, which presents a serious resilience risk. The existing bridge structure is also vulnerable to natural events (such as floods). In the event of a complete bridge closure, the shortest alternative route involves 80km trip which would be impractical by any active travel mode. The study evaluated 12 alternative options for a second river crossing using a multi-criteria analysis (MCA) process.
Ashburton Second Bridge Additional Investigations (2011)	Additional investigations for various bridge options were undertaken in 2011 in anticipation of ADC lodging an application for a Notice of Requirement (NoR). This focused on eight options and included a comparative assessment of the options on a wide range of criteria. The assessment concluded that bridge alignments that utilised Chalmers Avenue scored better than any other options. This reflected the premise that the majority of the traffic using the SH1 Bridge was local. This study still concluded that a new vehicle bridge on the Chalmers Avenue alignment represented the best solution. This study also examined the option of installing traffic signals in Tinwald.
Ashburton Second Bridge Social Impact Assessment (2013)	The conclusion of the social impact assessment was that the second bridge and access road on the Chalmers Avenue alignment would provide a positive contribution to the social wellbeing of the communities of Tinwald and Ashburton. A second bridge would provide a practical alternative route for many trips, allow the river to be crossed safely using active modes and improve access to a wide range of activities and facilities in Ashburton.
Notice of Requirement (NoR) (2014)	A NoR for the preferred second urban bridge option (linking Chalmers Avenue onto Grahams Road) was approved in 2014 following a public hearing. The NoR road alignment is shown below. The width of the proposed bridge provided sufficient space to incorporate off-road paths for pedestrians and cyclists. 

1.4 ONGOING PROJECTS

1.4.1 Tinwald Corridor Improvements

The Tinwald Corridor Improvements will reduce delays being experienced for side road traffic at most of the SH1 intersections within Tinwald, and the corresponding impact to safety. The improvements, which are being delivered as part of the NZ Upgrade Programme (NZUP), give effect to the network plan shown in Figure 1-2.

Figure 1-2: Proposed Tinwald Improvements

The potential impacts to the ATC DBC are:

- The influence of the Agnes Street traffic signals on the distribution of traffic. This could influence demands heading to any new proposed second vehicle crossings.
- Creating an integrated cycle network. Shared paths or cycle lanes through Tinwald will need to connect with a wider Ashburton cycle network, with safe crossing points. The interface between the two projects will need to be carefully considered.
- The proposed traffic signals only have a single through lane on the state highway due to the adjacent property constraints. This has implications to the longevity of the improvements through Tinwald.

Potential SH1 Bridge improvements – passing bays for cyclists

Waka Kotahi have also confirmed that they are currently investigating the opportunity to improve the current substandard active mode facility on the SH1 Bridge by introducing localised wider sections as passing bays for cyclists. The current preferred option is to introduce three passing bays, which will improve journey times across the river for cyclists. The estimated cost is approximately $700,000.

Note that this project is not yet funded or committed.

1.4.2 CBD Revitalisation Project

ADC has been actively working to create a more vibrant town centre that will attract businesses back to the commercial centre through the Ashburton CBD Revitalisation project. Good access to the CBD will be critical to promoting it as the primary commercial centre. The current primary access routes from the south and west are via East Street, Moore Street and Havelock Street. Key changes are:

- The creation of 30km/h speed limit zone in the area bound by East, Moore, Cass and Havelock Streets
- A pedestrian and cycle-friendly environment
- New lighting, street furniture (for example park benches and seating areas) and landscaping

2. STAKEHOLDER ENGAGEMENT

2.1 PARTNERS AND KEY STAKEHOLDERS

ADC's vision is to create "the *district of choice for lifestyle and opportunity*". They aim to grow and sustain Ashburton as a district that people choose for its high-quality lifestyle and strong business opportunities.

The DBC has also been developed with input (via workshops) from representatives from the AA, Mountain Bike Ashburton, NZ Police, NZ Road Transport Association, Tinwald Cycle Group, Tinwald School and St Johns Ambulance. Stakeholders representing all these groups either attended both workshops that informed this business case or were contacted directly for feedback if they were unable to attend.

2.1.1 Partners

This ATC business case has been developed for ADC with Waka Kotahi as an investment partner. Iwi are also a project partner and have been involved in the design process. The role of the project partners is outlined below.

Table 2-1: Project Partners

Partners	Knowledge/involvement
Ashburton District Council	• Agency responsible for developing this project. • Study area is within the ADC authority territory. • Investor in the ADC transport system. • Responsible for the operation of the local road network and strategic transport planning for the region.
Waka Kotahi	• The road controlling authority for the state highway network, funder of land transport activities and regulator of the land transport system. • Waka Kotahi's role is to work with a range of partners to plan, invest in, build, manage and operate the land transport system within the priorities and outcomes set in the GPS. The strategic priorities in the draft GPS 2021-24 are safety, improving freight connections, better travel options and climate change.
Iwi	• Regular huis and communication throughout the project. • Attendance at stakeholder workshop • Information updates distribution • Inputs into the design process

2.1.2 Key Stakeholders

A summary of key stakeholders who were engaged as part of the DBC is presented in Table 2-2.

Table 2-2: Key stakeholders to engage with throughout the project

Stakeholder	Timing and level of engagement
Road Transport Association	• Attendance at technical workshop • Information update distribution • Meetings and communication throughout project as required.
Tinwald Cycling Club	
Ashburton Mountain Biking Club	
NZ Police	
Fire and Emergency NZ	
AA	
Affected landowners and tenants[8]	• Regular meetings and communication throughout project as required • Information update distribution
Surrounding businesses and activities with potentially affected access	
Local community	• Information update (online)

[8] Properties along the proposed alignment and/or land to be acquired.

2.2 STAKEHOLDER ENGAGEMENT PLAN

A Stakeholder Engagement Plan has been developed for this project (see **Appendix A**), which outlines the purpose and objectives of engagement, the engagement methods and programme. The plan also defines the roles and responsibilities of key stakeholders. The Plan also aligns with council's *'Community Engagement Policy' (16 June 2021)'*.

Considering the Community and Engagement Policy, the IAP2 principles and the scope of the DBC, the following community and stakeholder engagement objectives have been identified:

- To build positive relationships with partners, key stakeholders, community organisations and groups, affected landowners and tenants that are potentially affected by the proposal and take their feedback into account on analysis, alternatives and/or decisions.
- For all stakeholders and members of the community to understand the purpose and stages of the project.
- Respond to stakeholders and members of the community in a timely manner.
- For members of the public and stakeholders to understand how the project will connect with other roading projects being constructed in Tinwald and the Ashburton district.
- To advise key stakeholders and members of the public what the outcome and design is and the next steps and timing of construction.

2.3 ENGAGEMENT

Engagement with council, Waka Kotahi, local hapū, immediately affected residents and the stakeholder group was undertaken at strategic points during the development of this DBC. As such, we consider that the preferred programme was co-designed with stakeholders and partners.

Specific engagement activities included:

- Huis with partners Te Rūnanga o Arowhenua and ADC
  - Introductions to the Project (14th February 2022)
  - Urban Design Considerations (4th April 2022)
- Wider stakeholder workshops
  - Road and bridge cross-section (22nd February 2022)
  - Design challenge (20th June 2022)
- Technical project team workshops:
  - Intersection treatments (21st March 2022)
  - Value engineering (2nd June 2022)
  - Commercial, management and financial cases (2nd June 2022)
  - Safety in Design review (27th June 2022)
  - Carbon reduction opportunities (29th June 2022)
- Updates to elected representatives (Councilors and Community Board Members)
  - Council Meeting (4th May 2022)
  - Design Challenge (20th June 2022)
- One-on-one meetings with immediately effected parties
  - Meeting with the Collegiate South Squash Club (20th June 2022)
  - Meeting with Mania-O-Roto Scouts (20th June 2022)

3. DRIVERS FOR CHANGE

The need for improving connectivity between Ashburton and Tinwald is being driven by:

- The need to support growth – especially residential / recreational areas to the east of Tinwald (including Lake Hood) and key employment areas (Ashburton Town Centre and Ashburton Business Estate).
- The need for a more resilient network.
- The need to provide locals with alternative travel modes to motor vehicles.
- The need to ensure that inter-regional freight can travel efficiently.
- The need to provide a transport network that is adaptable to climate change.

The drivers for change are discussed below.

3.1 NEED TO SUPPORT POPULATION GROWTH

More and more people are choosing to live in the local area. Over the last five years[9], Canterbury was the fourth fastest growing region in New Zealand with 1.8% growth per annum[10] (compared to 1.6% nationally). Locally, the number of Ashburton residents increased by around 1,750 people.

This population growth has been largely located north of the river, with 400 new homes constructed in Ashburton compared to just 100 in Tinwald between 2013 and 2018. The ADC land use forecasts indicate that over the next 25-30 years, an additional 2,100 homes are expected to be built north of the river, with a further 1,300 to the south. This will put significant pressure on the existing SH1 Bridge (which provides the only connection between Tinwald and Ashburton), especially if residents continue to rely on their car for all travel, even short journeys.

ADC's land zoning maps[11] (provided within **Appendix B**) identify where this growth could be located:

- Large residential areas (pink) to the east and west of SH1 (in Ashburton and Tinwald).
- Business zoned land (yellow) located close to SH1 near the Ashburton CBD, a large business park to the north, meat processing plant and a small light industrial area to the south of Tinwald.
- The Lake Hood Special Zone (west of the river) could increase from 200 to 500 dwellings.
- Immediately south of the river there is about 13.8 ha of largely undeveloped, residential zoned land south of the existing residential area. After allowing for roads and reserves, this area would be sufficient to allow for development of about 300 new dwellings[12].

As directed by Government's recently released National Policy Statement on Urban Development[13] (August 2020), councils need to ensure a well-functioning urban environment for all people, communities, and future generations. This means that any new development needs to be integrated with the transport network – noting that in the first instance, this typically means optimising existing infrastructure.

3.2 NEED FOR A RESILIENT NETWORK

3.2.1 National Resilience Programme

The resilience of the land transport network to natural hazards, including an increasing occurrence of more extreme weather events due to climate change, is a matter of national priority. The Waka Kotahi National Resilience Programme Business Case (NRPBC) sets out a preferred plan that involves establishing a methodology for identifying and prioritising resilience risks, developing resilience strategies and long-term investment planning. One key outcome of the programme is that communities would be better protected from impacts and outages in the land transport system as a result of natural hazards and would be more resilient when events do occur. Since extreme events will occur, and are expected to happen more frequently, it is essential that communities are better prepared to manage the effects of these events when they do occur.

[9] Comparison of the 2013 and 2018 census
[10] https://www.stats.govt.nz/information-releases/subnational-population-estimates-at-30-june-2019-provisional
[11] Canterbury Maps
[12] Based on the minimum lot size set out in the District Plan (360sqm)
[13] https://www.mfe.govt.nz/about-national-policy-statement-urban-development

Figure 3-1 shows the natural hazard risk rating map for North Canterbury from the NRPBC. The SH1 Bridges over the Rakaia and te Hakatere (Ashburton) River are identified as presenting a major risk of a closure following a significant weather event (Ashburton Bridge) or flood event (Rakaia Bridges). Table 3-1 provides a summary of the bridge resilience issues identified in the NRPBC for the Ashburton Bridge and its suggested solution.

Table 3-1: Bridge Resilience Issues (NRPBC)

Location	Hazard Description	Suggested Solution
Ashburton Bridge	Hazard: Extreme Weather SH1 at the Ashburton Bridge is subject to extreme weather events. This is a significant pinch point on the network and has a limited detour with resilience and capacity issues. KiwiRail and electricity lines also follow parallel to the road and are likely to be subject to the same risk.	Duplicate Bridge

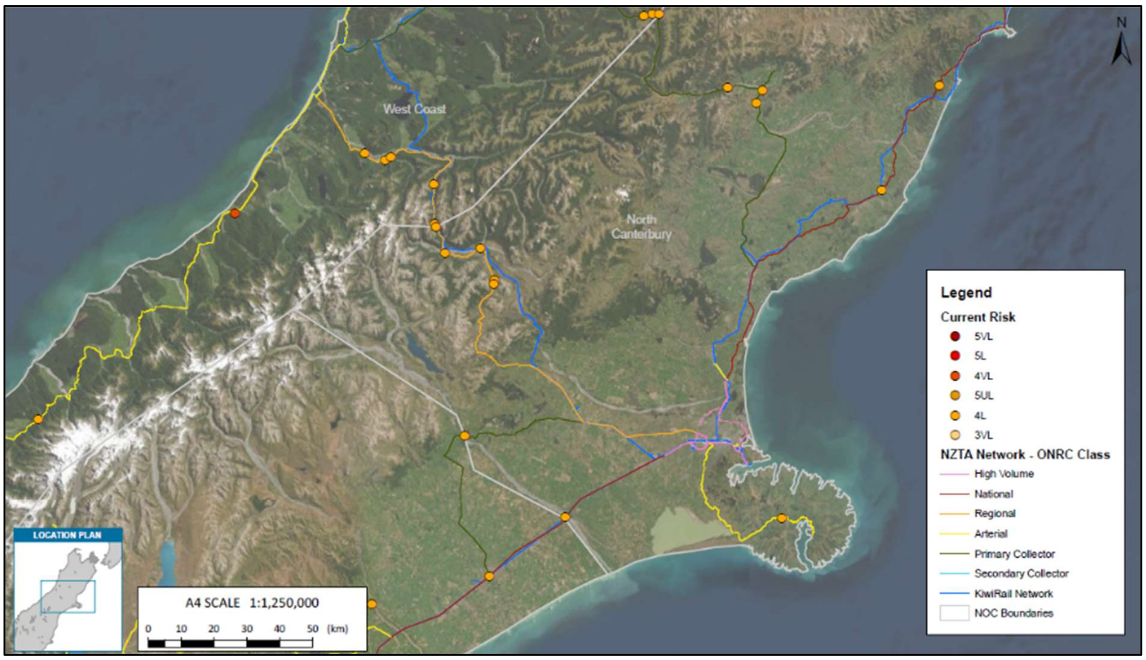


Figure 3-1: Natural Hazard Risk Ratings for North Canterbury[14]

3.2.2 Effects of Bridge Closure

This resilience issue at the SH1 Ashburton Bridge is not new. Over the last 20-30 years, there has been wide acknowledgment that a major event such as an earthquake or flooding could potentially result in the closure or decommissioning of key infrastructure such as the Rakaia River and Hakatere (Ashburton) river bridges.

One of the effects of climate change appears to be an increasing frequency of severe weather and major flooding events. Recent events on the South Island include the storms in February 2019 that washed out the SH6 bridge at Franz Josef and in December 2019 when the Rangitata bridge was closed. As major weather events become more common, there will be an increased probability of bridge closures and potential bridge failure.

Ashburton plays a vitally important role for both the local and national economy by facilitating through movement of regional trips to key facilities such as hospitals, ports, and the Christchurch Airport. There will always be a need to maintain the efficiency of through trips on SH1, particularly from an economic perspective because there are no reasonable viable alternative routes for regional traffic.

Ashburton District's road network generally has poor network resilience against flooding events. This is particularly noticeable in the Ashburton-Tinwald urban area because all local movement between the centres is focused on the state highway bridge. This was highlighted on the 31st May 2021 when a large flood event caused the closure of not only the SH1 Bridge, but other alternative upstream bridges. The extent of the flood effects was

[14] Source: NRPBC

widespread with road closures throughout the river basin area as far inland as Mount Somers, Staveley and Methven even four days after the event as shown in Figure 3-2.

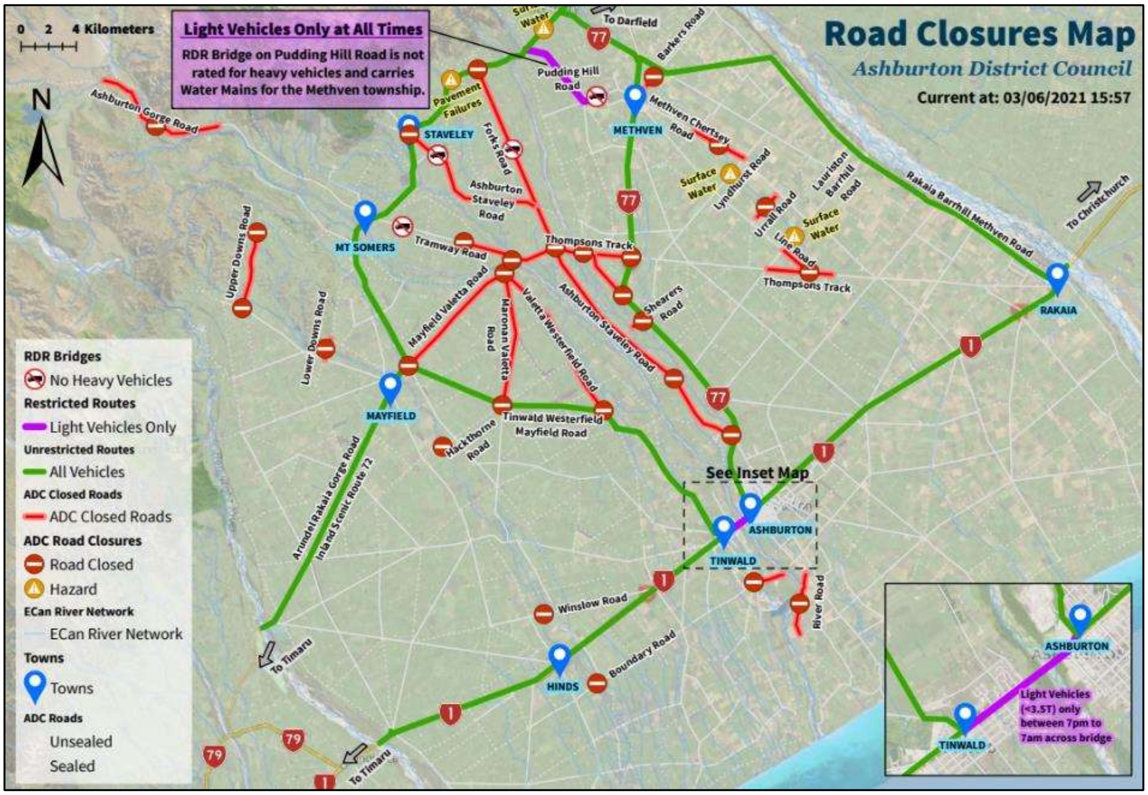


Figure 3-2: ADC Road Closures – 3rd June 2021

This event created the following consequences which had notable impact at both a local and national level:

- For one day, no travel was possible along SH1 through Ashburton, and all alternative routes were closed. This meant that regional freight movement (as far as Dunedin) was restricted during this time.
- The bridge was closed to heavy vehicles from 7:00am on 1st June to 10:00am on 3rd June and then every night until 10th June.
- No over-dimension or over-weight vehicles were permitted on the bridge from the initial closure on 1st June until 21st June.
- A temporary speed limit was in place for about three weeks. This created slow moving queues of traffic through Ashburton and resulted in rat-running by locals trying to avoid the queues or avoid right turn movements.

Figure 3-3 provides an indication of how traffic volumes on the bridge were affected by the bridge closure and weight restrictions following the flood. Since no count information was available immediately following the flood event, reference has been made to traffic count volumes from 2020[15] for the equivalent weeks to show how volumes changed from the week before the flood through the week after. In the week following the initial closure, hourly traffic volumes on the bridge have been estimated to be 300-500 vehicles per hour lower than during the preceding week. **Broadly, this suggests a 20% reduction in social and economic activity.**

[15] 2020 volumes were slightly lower than typical due to the effects of Covid-19. The difference in traffic volumes is therefore likely even higher than those stated.

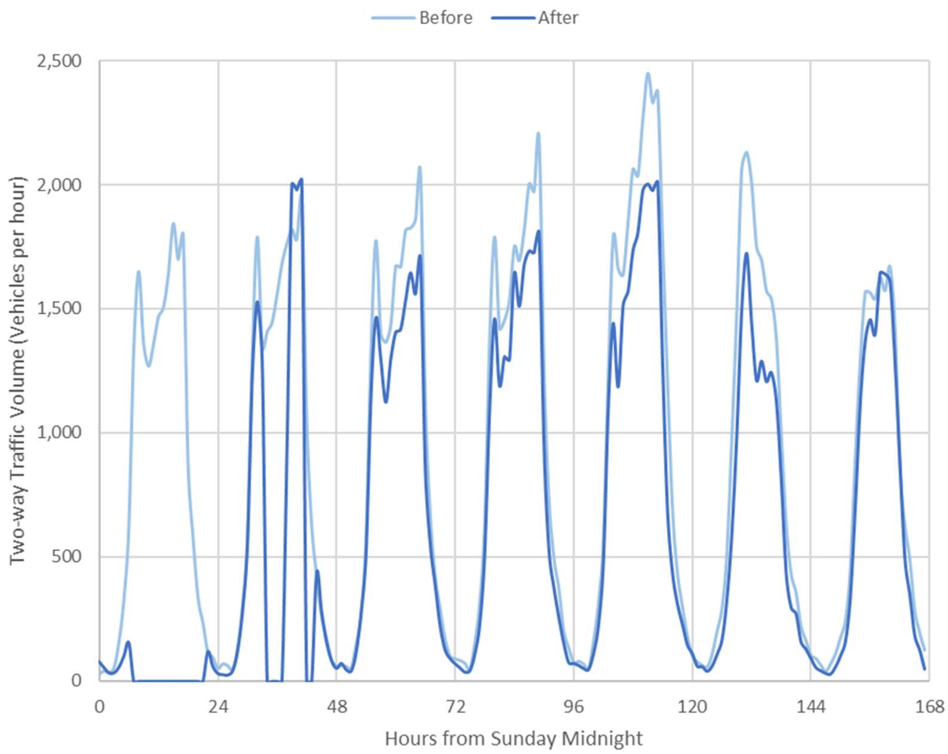


Figure 3-3: Indicative Change in Traffic Flows following the 31st May 2021 Flood

It has not been possible to accurately quantify all effects of the bridge closures in monetary terms because the effects on businesses were not just felt in Ashburton or Tinwald but also across the wider South Island. Some costs would have been *direct* because of additional travel along diversion routes, whilst other costs were *indirect* because travel did not occur, and businesses could not operate as normal. Some examples are provided below:

- While not a direct effect of the bridge closure, damage to the district road network because of the flooding was estimated to have cost over $5M for repair work (source: Waka Kotahi). Of this cost, $1.3m is directly attributed to the cost of bridge repairs.
- Many Council staff living south of the river were unable to travel to their workplace and had to work from home. Some staff who are part the Civil Defense team had to make journeys of 1.5 hours to reach the Emergency Operations Centre.
- The Council's Environmental Monitoring Team were unable to carry out their normal tasks in relation to activities such as animal control, food safety and public health because staff were unable to cross the river. Essential travel was affected because journey times via the available detour routes involved much greater travel distances and times.
- Talleys, a major local employer, was fortunate not to be seriously affected by the closures because the factory was closed at the time for annual boiler maintenance. They reported that some of the staff and contractors that were due to be working were unable to get to the factory because of the closures. They have indicated that if the bridge closure had occurred at another time, the effects could have been significant for several reasons including: staff not being able to get to the factory; impractical to keep all production lines operational; and potential effects on transport of fresh produce to the factory for processing.
- Pearsons is a local transport company that operates school bus services in Mid Canterbury area. The weight restrictions on the bridge in the week following the initial closure and the times that the bridge was open meant that it was not practical to operate the normal bus services. This would have affected about 1,100 students in the week following the initial closure.
- Pearsons have also indicated that they were unable to meet multiple bus charters because of the bridge closures which resulted in a loss of revenue for their business.
- The main effect of the closures of national supermarkets was the inability to maintain their normal supply chain. In the days following the initial closure, this meant some empty shelves in supermarkets across South Canterbury and Dunedin as the supermarkets were reliant on deliveries from their main distribution centres in Christchurch.

- Foodstuffs have highlighted the fact that the alternate route was not suitable for the types of heavy vehicle that they use for delivery and that the route does not include suitable facilities for driver breaks, truck laybys or truck refueling. Over the ten days following the closure, the route diversions added 13,600km of travel to their servicing routes. This increased their normal operating costs.
- Some local businesses were unable to operate as normal because employees were unable to travel to their workplace.
- The majority of schools and early learning centres were closed in the days following the flood.
- The closure of the bridge also affected the ability of people to complete long distance travel as planned, for example, between Queenstown or Wanaka and Christchurch. This typically required them to stay longer than planned. Locally, the closures effectively stranded people and they needed to find temporary accommodation.

These examples clearly demonstrate the importance of the Ashburton Bridge for travel both locally and across the region and South Island.

3.2.3 National Significance of Ashburton Bridge

There are other bridges in the Canterbury region including the Rakaia River Bridge that are of a similar age to the Ashburton Bridge and are equally important parts of the supply chain. It is also acknowledged that the Government has limited funding as New Zealand recovers from effects of the Covid-19 pandemic, and there is a political risk of setting a precedent for bridge replacements should funding be allocated with a primary purpose of addressing the Ashburton Bridge resilience risks.

This section highlights why the resilience issue at the Ashburton Bridge is far more significant than other bridges in the region. Table 3-2 provides a summary of the minimum detour distances and travel times associated with closures of bridges on SH1 between Christchurch and Dunedin. Cells highlighted in red or orange show where factors (e.g. AADT or detour distances) which are notably or moderately higher than alternative bridges.

Table 3-2: Impact of SH1 closures – Christchurch to Dunedin

River	Urban area	SH1 AADT	Nearest town	Alternative route	Detour distance	Detour time
Selwyn River	No	13,000	Rolleston	Selwyn Road	<5km	10-20 mins
Rakaia River	No	13,000	Rakaia	Hororata Dunsandeldale Road, Dunsandeldale Road, Rockwood Road, Leaches Road, SH77	100km	90-150 mins
Hakatere (Ashburton) River	Yes	24,000	Ashburton / Tinwald	SH77, Thompsons Track, Valetta Westerfield Road, Tinwald Westerfield Mayfield Road, Lagmhor Road	80km	60-90 mins
Hinds River	No	9,000	Hinds	Longbeach Road, Surveyors Road (Light vehicles only) or Poplar Road, Isleworth Road	14km	15 mins
Rangitata River	No	8,000	Ealing	Delamaine Street, Hinds-Arundel Road, Route 72, SH79	35km	60-90 mins
Orari River	No	7,000	Orari	Rangitata Orari Bridge Highway, Main North Road, Orari Station Road	12km	10-20 mins
Temuka River	Semi	10,000	Temuka	Waitohi Temuka Road, Waitohi Pleasant Point Road, Halstead Road, SH8	23km	10-20 mins
Pareora River	No	9,000	Pareora	Beaconsfield Road, Holme Station Road, Pareora River Road	23km	20-40 mins
Otaio River	No	7,000	Saint Andrews	Pareora River Road, Pleasant Valley Road, Talbot Road, Greys Crossing, Otaio River Road	14km	20-40 mins
Makikihi River	No	6,000	-	SH1, SH 83, SH82, SH1	305km	>3.5 hours
Waihao River	No	4,000	-	McNamaras Road, SH82, Ikaiwai Middle Road, Glenavy Tawai Road	43km	40-60 mins
Waitaki River	Semi	5,000	Waitaki	Glenavy Tawai Road, Ikawai Middle Road, SH82, Kurow, SH83	113km	90-150 mins
Kakanui River	No	5,000	Maheno	Maheno-Kakanui Road, Beach Road	5km	20-30 mins

River	Urban area	SH1 AADT	Nearest town	Alternative route	Detour distance	Detour time
Waianakarua River	No	5,000	-	SH85 SH8, SH82	280km	> 3 hours
Shag River	No	4,000	Palmerston	Horse Range Road	2km	10 mins
Waikouati River	No	5,000	Waikouaiti	McGrath Road	5km	10-20 mins

The scale of the resilience issue at Ashburton is greater than elsewhere in the region because:

- An event that closes this SH1 Bridge is likely to have also closed bridges on alternative routes.
- Ashburton and Tinwald function as a single community. The bridge not only facilitates regional through traffic, but also functions as the only practical local connection between the towns for social and economic activity. No other river between Christchurch and Dunedin severs a community in this way.
- The bridge carries around 24,000 vpd which is nearly double the traffic volume on bridges north of Ashburton (13,000 vpd cross the Rakaia River bridge). South of Ashburton, the traffic volumes on the SH1 Bridges are less than 10,000vpd. This alone means that the economic cost of any closure is far higher at the Ashburton Bridge when compared to any other crossing.
- For an urban bridge, where around 80% of traffic relates to local journeys, it has very poor existing walking and cycling provisions which discourages travel by active modes between Tinwald and Ashburton. This has created a situation where travel by motor vehicle is preferred for personal safety reasons even for very short trips across the river.
- The flood risks in the Canterbury region are notably higher than elsewhere in South Island.
- There are four bridges where the shortest diversion route is greater than 100km long. The diversion route for the Ashburton Bridge is about 80km long. While this is not the longest diversion route, it affects the greatest volume of traffic because of the high demand for local travel between Ashburton and Tinwald.

Table 3-3 provides a comparison of diversion travel costs where the diversion route is greater than for the Ashburton Hakatere River based on average daily volumes. It shows that while the diversion travel costs associated with closure of the Ashburton Bridge are lower than at the other bridges, the higher volumes of traffic using the bridge results in higher overall potential costs.

Table 3-3: Comparison of Diversion Costs[16]

River	Diversion Trip Cost ($/vehicle)	AADT	Indicative Daily Cost ($)
Rakaia	$96	13,000	$1.3m
Hakatere / Ashburton	$65	24,000	$1.6m
Makikihi	$239	6,000	$1.4m
Waitaki	$102	5,000	$0.5m
Waianakurua	$228	5,000	$1.1m

In practice, the length of the detour routes associated with any potential closure of the Makikihi River Bridge or the Waianakarua River Bridge means that these are unlikely to be used unless a closure was likely to be in place for more than a few hours. In terms of relative risk, the above analysis has suggested the Ashburton Bridge carries the highest resilience risk of any bridge between Christchurch and Dunedin. The Makikihi and Rakaia Bridges could be argued as being joint second.

Structural condition of the SH1 Bridge

Waka Kotahi have stated that, from a structural perspective, the current SH1 Bridge has 20-30 years of expected life remaining. The bridge is included on Waka Kotahi's scour protection list, and the scour protection generally held up well during the May 2021 flood event – despite one pier dropping slightly (now repaired).

The bridge is not deemed to have any seismic deficiencies.

[16] This table is provided for comparison purposes only and assumes all trips need to be made. In reality some trips would not take place, but these represent missed economic and social opportunities.

3.2.4 Significant Impact to Local Connectivity

High Probability, Low Impact Events

An analysis of crashes on SH1 between South Street and Carters Terrace identified 23 crashes including seven injury crashes over the 20 year period 2000-2020. Although the crash reports do not indicate whether or not it was necessary to close the bridge, it is likely that a temporary closure of at least one lane would have been necessary for any crash that caused injury. This suggests that movement on the bridge would have been affected by crashes about once every three years on average. The duration of any restrictions following a crash would depend upon injury severity but is likely to be in the range 1-3 hours. These types of events are more likely to create delay for travel rather than extensive, diversionary travel.

Generally, along the corridor the highest risk of crashes occurs at stop-controlled intersections with the state highway. Increasing traffic volumes increases the likeliness of conflict occurring, particularly for right turn movements.

Low Probability, High Impact Events

Waka Kotahi's state highway resilience maps indicate that the SH1 Bridge has a moderate risk of disruption in the event of a large earthquake (1 in 1,000-year event), during which time it could be closed for up to two weeks. Following this type of event, the bridge would unlikely be operating at its usual capacity until structural checks and repairs were completed.

The bridge is also identified as having a 'medium' risk of damage in a 1 in 100-year storm event and to have poor availability following an event. This effect was indeed the case following the 31 May 2021 flood event when the bridge was closed for one day and only allowed restricted movements in the following two weeks.

Generally, whilst the likeliness of full closure remains low, the scale of the impact is very high. The length of the diversion route and the purpose of any travel will affect whether people choose to travel.

3.2.5 Need to adapt to climate change

> *Canterbury's climate is changing, and these changes are highly likely to continue for the foreseeable future. It is internationally accepted that human greenhouse gas emissions are the dominant cause of recent global climate change, and that further changes will result from increasing amounts of greenhouse gases in the atmosphere. The rate of future climate change depends on how fast greenhouse gas concentrations increase.*
>
> ***Climate change projections for the Canterbury Region, February 2020, NIWA***

Environment Canterbury commissioned NIWA to analyse projected climate changes for the Canterbury Region out to 2100. The key findings of this report were:

- Floods are expected to become larger for many parts of Canterbury, with some increases exceeding 100%.
- Flood design standards for significant infrastructure are usually made based on events with annual exceedance probabilities much smaller than that represented by MAF.

The report is therefore clear that weather events will become larger in scale and more regular. The Government's Climate Change commission and Waka Kotahi recognise the need to mitigate and adapt to climate change. This means a transport network that seeks to reduce overall carbon emissions and provide a network that is more resilient to effects of large events.

The projected future differences in the mean annual flood (MAF; the mean of the series of each year's highest daily mean flow) for RCP4.5 and RCP8.5 are provided in Figure 3-4. Note:

- RCPs (**Representative Concentration Pathway**) are predictions of how concentrations of greenhouse gases in the atmosphere will change in future because of human activities.
- RCP 4.5 is an intermediate scenario where emissions peak around 2040, then decline.
- RCP 8.5 is a scenario where emissions continue to rise throughout the 21st century.

Under both scenarios, the area around Ashburton is identified as a location where flood discharge is expected to rise up to 50-100% between 2036 and 2056. This provides evidence that the Hakatere (Ashburton) River has a known climate change adaptation issue that is forecast to occur by 2040[17].

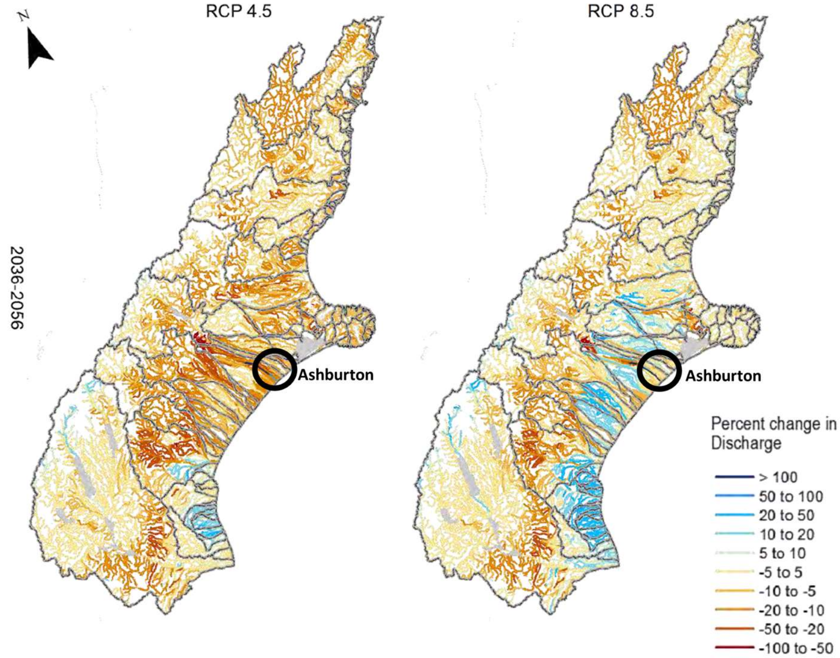


Figure 3-4: Mean Annual Flood Changes – 2036-2056

3.3 PROVIDING ALTERNATIVES TO THE CAR

A key priority of the 2021 GPS for Land Transport is "*providing people with better travel options to access social and economic opportunities*." This is also reflected in ADC's Draft Walking and Cycling Strategy (2020) which sets out a vision of "*more people, more active, more often*" and its supporting objectives of:

- A coherent, safe, and connected urban walking and cycling environment.
- A quality fit for purpose recreational walking and cycling network that connects to key destinations.
- Ensuring the urban and rural active mode networks integrate to create an accessible district.
- A District that is committed to walking and cycling for health, well-being, safety, environmental and economic reasons.

The current active mode facilities provided on the SH1 Bridge and generally across the local road network provide people with poor alternative travel options as facilities are sparsely available or do not meet desirable design standards. Along with poor active mode provisions there are currently no public transport services (aside from school buses) in Ashburton. This is reflected in the census travel mode information which shows that travel by private or company vehicle accounts for the greater mode share by far compared with other modes.

There is a need to provide better travel choice to enable ADC to meet overarching mode share and national climate change objectives[18].

[17] The 2040 timeframe is identified within Waka Kotahi's Investment Prioritisation Method for the 2021-24 National Land Transport Programme. This is referenced later in the report as part of the assessment of the technically preferred programme.
[18] www.mfe.govt.nz/climate-change/climate-change-and-government/emissions-reduction-targets/about-our-emissions

3.4 MOVING FREIGHT EFFICIENTLY

The SH1 Bridge carries approximately 24,000 vpd[19]. This high volume is attributed to the fact that it is the only river crossing in the immediate area, which means that local and regional traffic is channeled onto this single corridor. At certain times of the day, the SH1 Bridge is operating at the limits of its capacity.

An urban highway can typically accommodate about 1,200 vehicles per hour (vph) per lane[20], and as shown in Figure 3-5, southbound traffic volumes currently exceed this level for one to two hours of the day.

While the northbound hourly volumes are lower, they will exceed 1,200 vph on busier weekdays. When this volume is exceeded, travel times become increasing long and less reliable. Traffic volumes greater than 1,000vph per lane also occur on weekends. The limited amount of capacity on the SH1 Bridge means that long queues and delay occur through Ashburton. This is reflected in the fact that Ashburton is recognised as one of the national congestion hotspots[21].

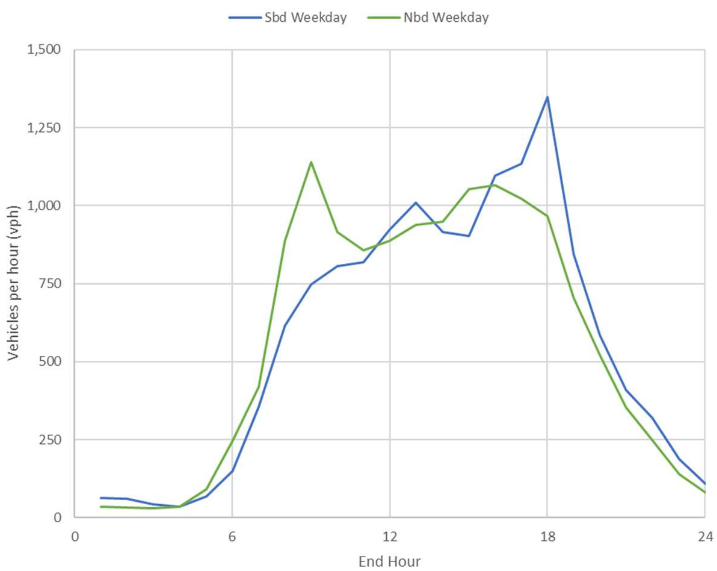


Figure 3-5: Weekday traffic volumes by direction (90th percentile week[22])

Over the last 15-20 years, the local economy has been driven to a large extent by the farming sector, which now represents approximately 35% of the district's GDP. Going forward there is an expectation this will continue[23], with the local economy forecast to grow by another third (2% p.a.)[24] over the next 15 years[25].

Growth in agriculture also brings opportunity to grow industries that provide support services (such as machinery and equipment manufacturing). However, this industry is dependent upon reliable inter-regional travel times and connections to ports in Timaru and Christchurch. Around 2,000 trucks per day pass over the SH1 Bridge[26], which reflects the importance of SH1 as the primary freight route for the South Island.

The 'Friday Effect'

Traffic volumes on the state highway through Ashburton show a wide range of variation both from day to day and exhibit some seasonal variation across the year. Traffic volumes on a Friday are known to be notably higher than during Monday-to-Thursdays, with demand anecdotally driven by 'weekend holiday traffic', an increase in regional workers (e.g. from farms) coming into town and people finishing work earlier on a Friday.

[19] This is roughly equivalent to the volume of traffic to that being carried on SH6 through Richmond and Nelson.
[20] Dependent on the influence of spacing between signalised intersections and lengths of merge lanes. For example - the merge area south of the East Street / South Street signals is short and is likely to reduce the road capacity below this level for southbound travel.
[21] www.nzta.govt.nz/assets/traffic/Holiday-Hotspots/Easter-2018-Hotspots.pdf
[22] This represents traffic volumes that would only be exceeded in the five busiest weeks of the year which typically occur in late December and early January.
[23] The three largest sectors (dairy cattle farming, meat and meat product manufacturing and sheep, beef cattle and grain farming) generate more than a third (34.6%) of the economic value in the district.
[24] Ashburton District Council - Economic Development Strategy and Action Plan (2017)
[25] Forecast prior to the Covid-19 pandemic
[26] RAMM database

Figure 3-6 shows the daily two-way traffic volumes recorded on SH1 (Archibald Street) south of the Ashburton Bridge in 2019. The data shows:

- Weekday traffic volumes have a seasonal variation, with higher flows during the summer.
- Traffic volumes on Fridays are approximately 10% higher than Monday-Thursday flows. This increase is not limited to just the afternoon peak, but throughout the day the traffic volumes are higher.
- The SH1 corridor is likely to be operating beyond capacity during Friday peak periods.

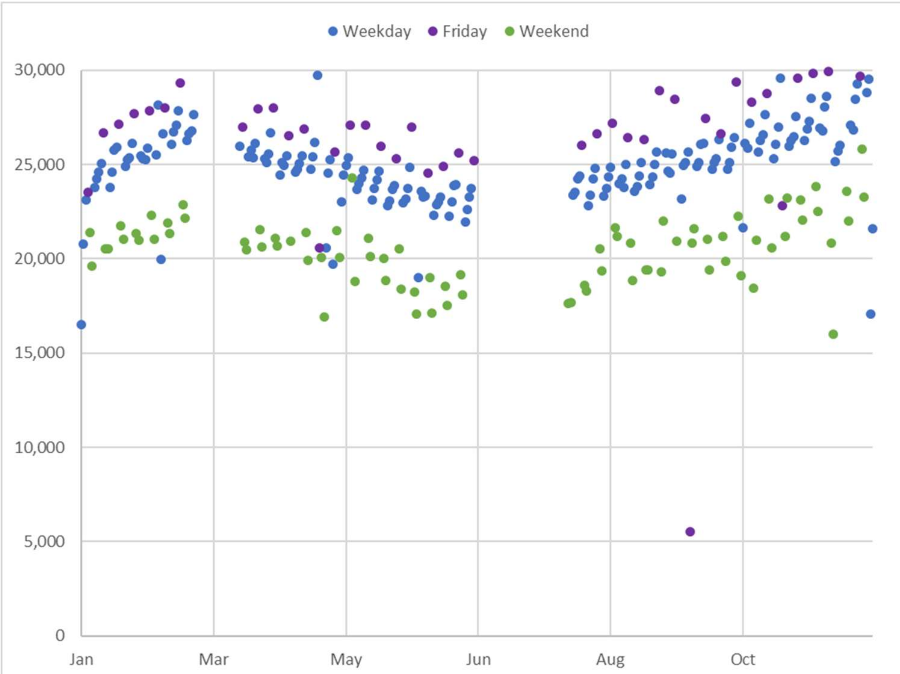


Figure 3-6: Daily Two-Way Traffic Volumes on Archibald St, 2019

Impact of Covid-19

One effect of the Covid-19 pandemic has been the removal of trips by international tourists. However, there is evidence to suggest that a subsequent increase in domestic tourism is offsetting this impact.

Traffic counts on SH1, provided in **Appendix C**, show that 2020 volumes in the latter part of the year were roughly equivalent to those in 2019[27]. Indeed, post the Level 4 lockdown (April 2020), traffic volumes quickly recovered back to those recorded one year earlier. Council expects that growth will quickly recover in line with the pre-Covid 19 expectations.

If indeed there were any short-term slowdown in growth, this could present an opportunity to be proactive - allowing council and Waka Kotahi the time to set in place the necessary infrastructure or travel demand mechanisms. Investment in the short-term would also help provide jobs and stimulate the local economy.

Overall, the impact of Covid-19 has not influenced the problems or benefits identified as part of this strategic case. It also has not impacted the timing for when investment is needed.

[27] Waka Kotahi TMS database

4. THE NEED FOR INVESTMENT

4.1 OUTCOME STATEMENT

A facilitated ILM workshop was held on 5th August 2020 to confirm the case for change. The workshop was attended by a wide range of stakeholders including the partner organisations and community representatives from the Tinwald school, emergency services, cycle advocate groups, and the heavy haulage industry. The minutes of the ILM workshop are provided in **Appendix D**.

A draft outcome statement was developed beforehand, which was intended to set the scene around what the business case seeks to achieve. This was presented to stakeholders and revised based on their feedback. The agreed outcome statement is:

"Delivering safe access to key social and economic opportunities across the Ashburton District."

4.2 UNDERSTANDING THE ISSUES

An interactive session was undertaken to understand the key issues. During this session four key problem themes emerged – 'connectivity', 'travel choice', 'safety' and 'economy'.

Stakeholders then reorganised the issues into the various problem themes and discussed inherent causes and consequences, which are set out in **Appendix E**. The evidence for underlying causes for each problem theme is presented within the following sections of this report.

Problem Statements

Following the workshop, draft problem statements were formed based around the themes and identified causes and consequences. ADC agreed that it was appropriate to separate connectivity and economy – as the economic benefits are quite distinct to the social ones. The weightings were agreed by the stakeholder group.

1. **Connectivity (40%):** An absence of route choice contributes to more traffic on SH1. This discourages, or stops people being able to, make journeys they otherwise would, creating social disconnect and lack of a 'one community' feeling.
2. **Travel choice (30%):** Limited (or poor quality) facilities for active modes makes it difficult to achieve long-term environmental and liveability objectives.
3. **Safety (20%):** High traffic volumes make it difficult for people to travel along, across, or onto SH1. This increases the likelihood of injury crashes and delays emergency services.
4. **Economic prosperity (10%):** Increasing traffic and constrained capacity on SH1 results in worsening travel time reliability between Tinwald and Ashburton. This impacts freight connections and economic prosperity.

"Connectivity" relates to a need to ensure that local education, health care, employment, recreation and shopping trips can always be made, even in extreme weather conditions or if there was a crash on the state highway. "Resilience" also ties into this problem statement, as does "severance". Not only is there difficulty travelling north to south across the river, but also east to west across the state highway. The 40% weighting reflects the fact that approx. 80% of trips across the Hakatere (Ashburton) River are local journeys, and so good connectivity is vital.

"Travel choice" is about giving people options. Currently there is only one realistic way to travel between Ashburton and Tinwald – by car; and there is only one possible route – via the SH1 Bridge. As above, most of the customers are locals, and therefore the potential for achieving mode shift is high. High traffic volumes on roads also makes walking and cycling less comfortable.

"Safety" is weighted lower at 20%, in reflection of how currently the number of injury crashes on the network is comparatively low when compared to other locations. However, traffic growth is making it increasingly difficult to turn onto or get across the state highway – and therefore, it will become a worsening issue.

"Economic Prosperity" is about delivering reliable journeys for traffic and freight that is passing through Ashburton and Tinwald. The 10% weighting again reflects the customer base, with only 20% of traffic across the bridge relating to those longer distance trips.

5. PROBLEM 1: CONNECTIVITY (40%)

5.1 CAUSES

5.1.1 Lack of route choice

There is only one road bridge across the Hakatere River within the Ashburton urban area. If the bridge was closed for any reason (e.g. crash, breakdown, maintenance, flooding, or earthquake) then the nearest alternative road bridge across the river is located on the Mayfield Valetta Road. This involves a detour of over 70 km. The May 2021 flood event has highlighted the fact this represents the minimum detour distance and is reliant on surrounding roads being navigable which was not the case following that event.

It has been noted that the shortest detour route has not been designed to state highway standards, in particular:

- It uses part of SH77, with the rest on rural roads.
- Not all vehicles could use this route as there is a 50Max weight restriction.
- There are no rest areas or other heavy vehicle specific facilities along the detour route.
- There are sections that have seal widths of less than 6.5m which will increase the potential for crashes with high volumes of vehicles using the road in the event of a closure of SH1.

The lack of practical, alternate route choices for travel between Ashburton and Tinwald (combined with high demand between the two centres) means that a high proportion of vehicle movements on the bridge are associated with local travel. Number plate surveys were undertaken in 2006 and 2012 to determine what proportion of the movements on the bridge were regional vs local. The results of those surveys indicated around 20% of all movements were regional. While this appears to be a very low proportion, it does reflect the traffic volumes recorded by Waka Kotahi on SH1 to the north and south of Ashburton, outside of the study area[28]. Surveys undertaken in June 2021 found the volume of regional traffic movements on the bridge accounted for less than 20% of all movements.

5.1.2 Regional Traffic Volumes

Figure 5-1 shows the Annual Average Daily Traffic volumes (AADT) recorded at four locations on SH1 from north of Ashburton to south of Tinwald.

For each site, traffic volumes have risen steadily since 2008. The highest volume of movements occurs in central Ashburton with the lowest volumes occurring south of Tinwald. North of Ashburton, there has been a more rapid increase in traffic volumes which is likely due to the development of the Ashburton Business Estate. The growth rates in the AADT have varied from 1.1% to 3.0%.

Recent traffic survey data (June 2021) has revealed that only about 20% of traffic using the SH1 Ashburton Bridge relates to vehicles travelling straight through Ashburton.

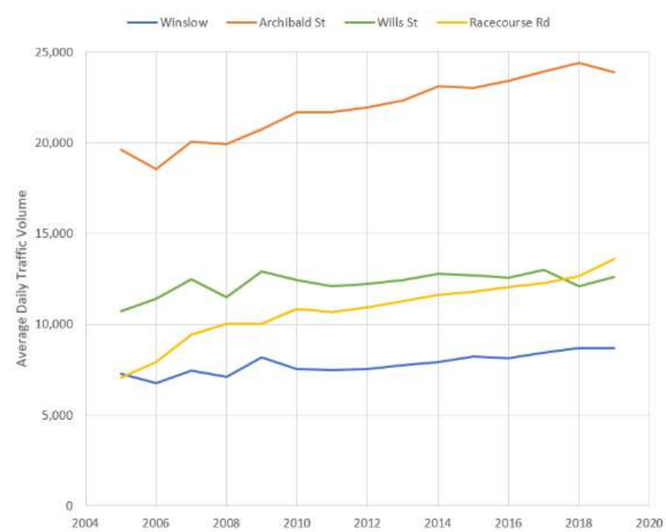


Figure 5-1: SH1 Annual Average Daily Traffic Volumes

28 Traffic volumes recorded immediately to the south of the bridge at site 01S00431 will comprise both regional and local traffic. The volumes recorded at the count sites to the north (01S00428) and south of Ashburton (01S00440) will be predominantly regional traffic movements but will include movements to or from Ashburton. The traffic volume recorded to the south of Ashburton represents about 30% of the volume recorded at the bridge and represents an upper limit to the volume of regional traffic in Ashburton. This is consistent with the number plate survey results which suggested that regional traffic movements at the bridge accounted for < 30% of all movements.

5.1.3 Capacity of the SH1 corridor

Observations of vehicle movement through Ashburton indicate that the Walnut Avenue roundabout represents the most significant source of delay for northbound movement on SH1 – although **this intersection is now being upgraded to traffic signals, which is expected to reduce delays at this location**.

Analysis of traffic data from 2019, which is unaffected by any effects attributable to the COVID-19 pandemic, identified that southbound traffic volumes along SH1 (south of the bridge) exceeded 1,200vph on 60% of the days for which information was available. This represents about 200 days of the year. Volumes of over 1,300vph were recorded on 25% of the days. While northbound volumes measured south of the bridge were lower than the southbound volumes, they still regularly exceed 1,000 vph. This suggests that congestion could be expected on about 90 days of the year. The anticipated growth in traffic volumes means that congestion and delay will become an increasing obstacle to travel on SH1 in the future.

Journey time reliability

To better understand travel time and journey reliability between Tinwald and Ashburton, analysis of TomTom data was undertaken. Figure 5-2 shows travel time versus distance travelled along the SH1 Ashburton corridor for southbound travel in the afternoon during the June/July period in 2021. While the average rate of progression along the corridor shows little delay, the 85th percentile data which typically reflects days with higher travel demands indicates that the Walnut Avenue roundabout generates delays and then the Moore Street signals. The data indicates smaller increases in delay at the South Street signals and no delays being generated at the bridge.

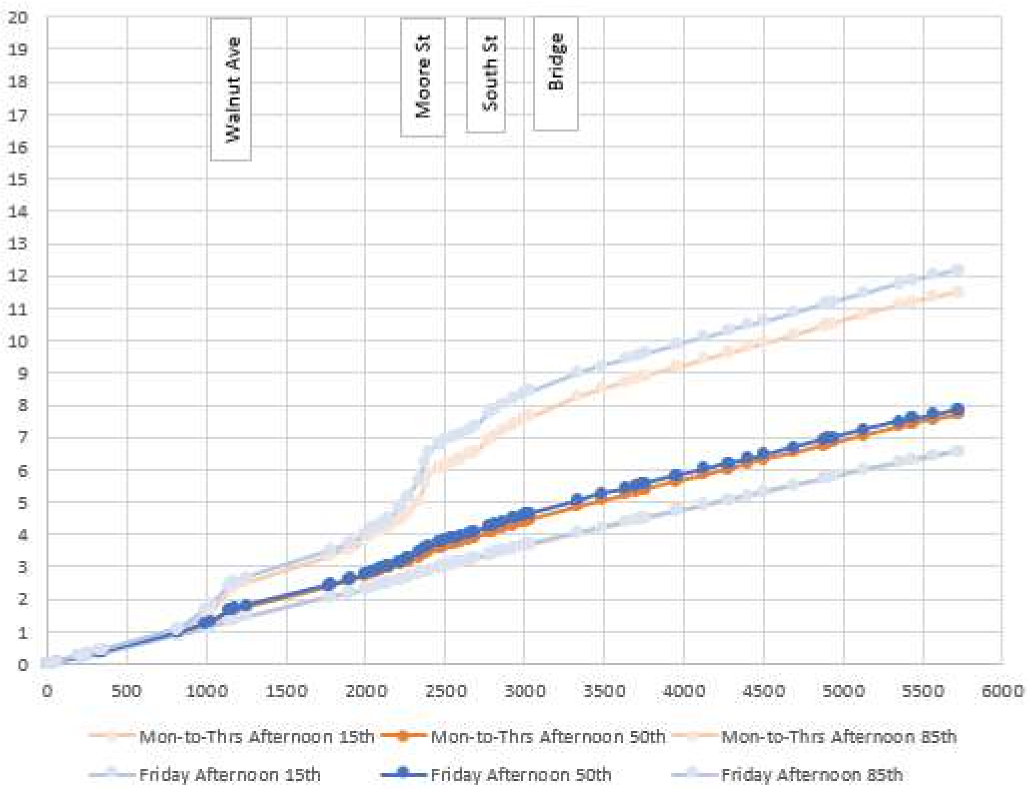


Figure 5-2: Time vs Distance – Southbound (2021)

Figure 5-3 shows similar information for northbound travel in the evening peak period. This suggests that on a typical day, the Moore Street signals and Walnut Avenue roundabout are the main sources of delay for northbound movements on the corridor. The 85th data reflects days with high travel demands and indicates that travel speeds start to reduce in Tinwald and that there are delays being generated at each of the major intersections north of the bridge.

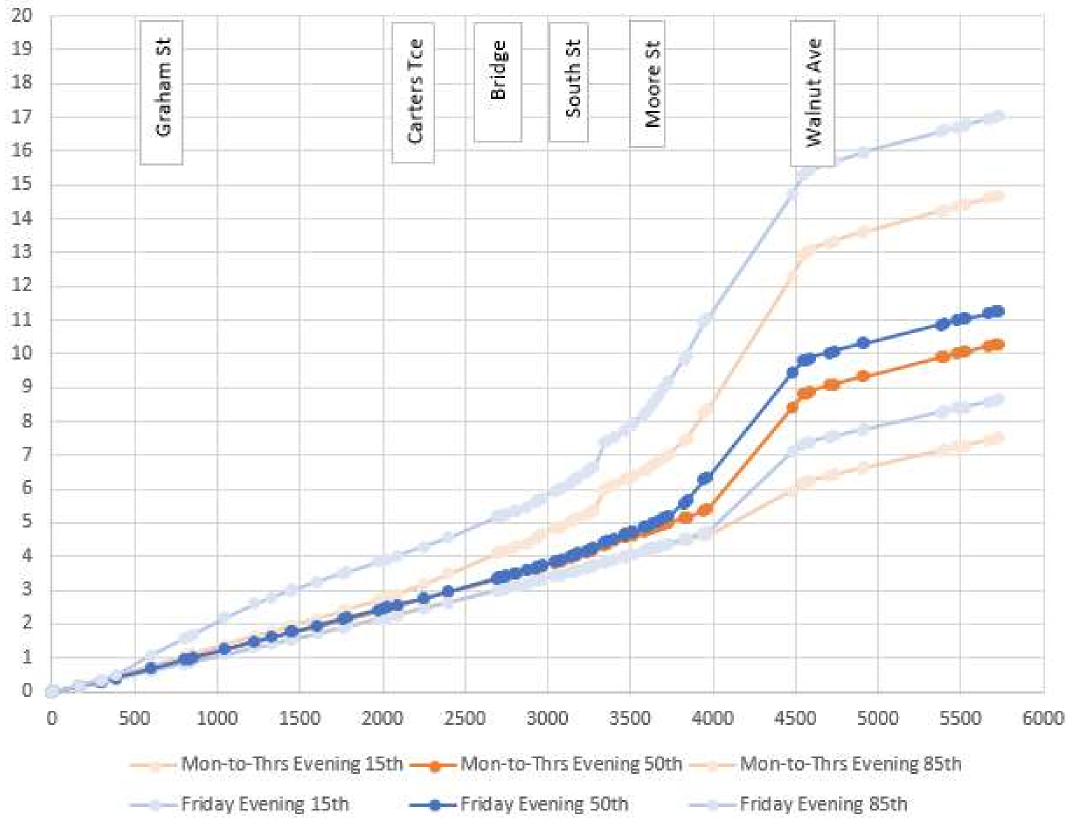


Figure 5-3: Time vs Distance – Northbound (2021)

This analysis indicates that currently, the primary sources of delays for vehicle movement along SH1 are capacity constraints at the major intersections. Should traffic volumes along the state highway increase, these delays would be expected to notably increase. Delays can be mitigated through either increased capacity of the state highway, a reduction in demand or encouraging traffic to use alternative routes.

Volume vs delay

Figure 5-4 provides a graph of forecast travel time delays on SH1 against the traffic volume (vehicles per hour). The data points have been extracted from the traffic model simulations for the 2021, 2031 and 2041 future year for a scenario which reflects no additional investment in the transport network.

The graph shows that delays along SH1 start to increase rapidly once traffic volumes increase above 1,200 vph (one direction). Average delays are expected to increase from about 2 minutes to about 4 minutes when traffic volumes increase to 1,300 vph. Delays of around 5 minutes or more, which are currently being experienced on Fridays, occur when traffic reaches about 1,350 vph.

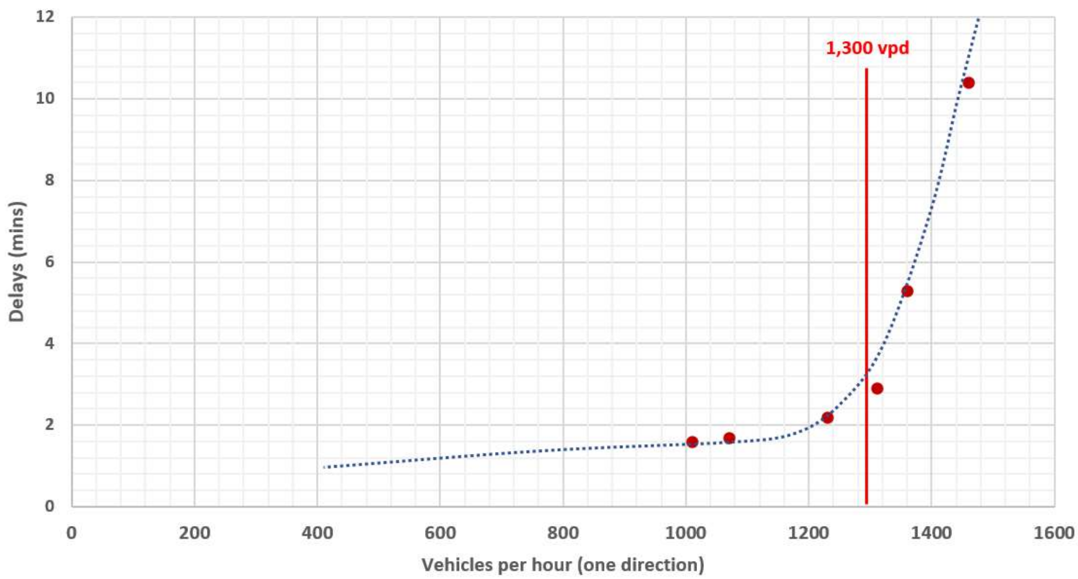


Figure 5-4: Volume vs delay

5.1.4 Location of Key Community Facilities

Figure 5-5 shows the distribution of key community facilities including schools, early childhood centres, health care, shopping areas, recreation, and places of worship. The map highlights that:

- Most of the community facilities are on the northern side of town.
- The Tinwald Medical Centre is the only health facility south of the river.
- Community facilities such as churches, schools and the library are located on the northern side of the river.
- Lake Hood is the only major recreational area south of the river. Its popularity means that it attracts residents who live in the north of town, as well as others from across the wider region.
- There is only one school (Tinwald School) located south of the river. The majority of Early Learning Centres are in Ashburton, with only two located in Tinwald.
- Since Tinwald School only caters for Years 1-6, older students living south of the river must cross the river to continue their education. Although some students can use the school buses, many are transported by private vehicle.
- The Terrace View Retirement Village has been established on Carters Terrace north of Grove Street since the release of the NOR. This effectively precludes any future road connection from Grove Street north across the river.

The map also demonstrates how within Ashburton the state highway separates the two halves of the town. On the western side, there are several schools and recreational areas, whilst the town centre and key employment areas (such as the Ashburton Business Estate) are to the east.

Increasing traffic volumes on the state highway will worsen the effect of severance. This influences road safety (both actual and perceived), discourages people from walking and cycling even for short journeys between the town centre and residential areas, and creates a feeling of social disconnect.

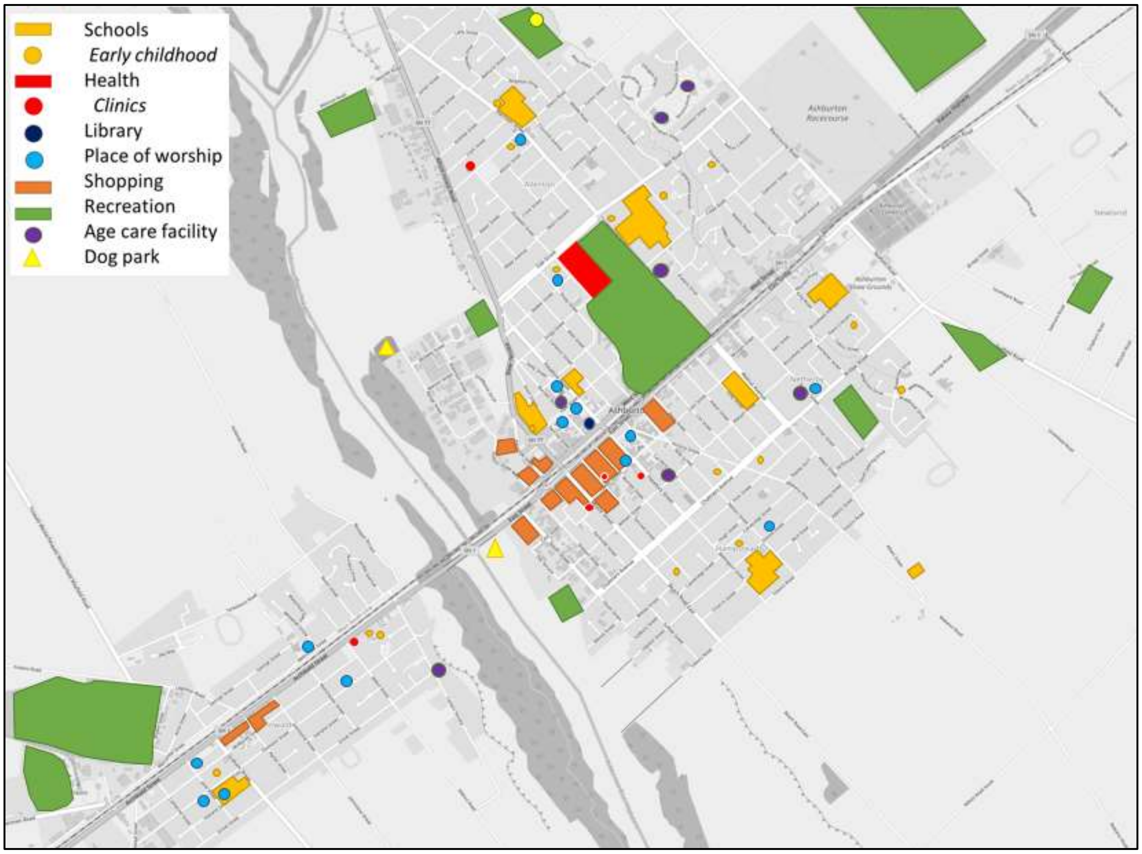


Figure 5-5: Location of key community facilities

5.2 CONSEQUENCES

5.2.1 Longer Journey Times

The Ashburton transport model has been used to investigate how weekday (Monday to Thursday) travel times through Ashburton are likely to change in response to the increased travel demands associated with the forecast changes in land use. Table 5-1 shows the expected increases in the travel time along SH1 through Ashburton during the weekday morning, midday and evening peak periods compared with free-flow travel.

Table 5-1: Forecast Changes in Travel Time Delays on SH1 – Weekday (Mon-Thu)

Year	North to South Travel Time Delay (minutes)			South to North Travel Time Delay (minutes)		
	AM	IP	PM	AM	IP	PM
2021	1.4	1.8	1.7	1.2	1.5	1.6
2031	1.7	2.3	2.9	1.4	1.7	2.2
2041	2.0	3.4	10.4	1.4	2.4	5.3

The model results show that:

- During the morning and midday periods, travel times could increase by about one minute by 2041. This reflects the relatively low traffic volumes using SH1 at those times.
- The travel demands on SH1 are significantly higher during the evening peak period and with the forecast growth, travel time delays are expected to by about five minutes for northbound travel and over ten minutes for southbound travel.
- The large increase in travel time delays in the evening peak period between 2031 and 2041 suggests that the forecast travel demands along the SH1 corridor will exceed the capacity of SH1 without further intervention.

Since travel demands on Fridays are typically up to 10% higher than on other weekdays, the travel time delays experienced on a Friday will be greater than those that occur earlier in the week.

The analysis suggests that to address typical Monday to Thursday delays, improvements to the transport network will be required sometime after 2031. To address congestion issues on a Friday, improvements are likely to be required prior to 2031.

5.2.2 Unreliable Journey Times

The analysis of TomTom data shown in Figure 5-2 and Figure 5-3 indicates that the average travel times along the SH1 Ashburton corridor are only marginally greater than the 15th percentile travel times which will reflect typical free-flow travel. The large differences between the 85th percentile travel times compared with the average travel times is likely to reflect the fact that the travel demands are close to or exceed the capacity of the corridor which generates congestion and rapid increases in delay.

Since travel demands are forecast to increase in the future, there will be a greater number of days where the travel demand is close to or exceeds the corridor capacity and hence a greater number of days with congestion and unreliable travel times through the towns.

5.2.3 Severance – both along and across the state highway

Severance can be created when a road acts as, or feels like, a barrier to movement due to increasing traffic volumes. This tends to be because people feel unsafe or uncomfortable crossing the road (which could be on foot, on bike or car) which means people do not make a trip they would otherwise want to. If people do not make journeys they would like to, this has negative consequences at both social and economic levels.

Difficulty in traveling along the state highway

Increasing travel demands, and consequently increasing delays along the state highway, will also influence people's decisions on travel between Ashburton and Tinwald (and beyond) from taking place.

Table 5-2 shows the forecast changes in travel time delays for local travel to and from the town centre on a typical weekday (Monday to Thursday) during the interpeak period and the evening peak period. These represent the times of day when there are the highest travel demand to or from the town centre.

Table 5-2: Forecast Changes in Local Travel Time Delays – Weekday (Mon-Thu)

Route	**Interpeak** Travel Time Delay (Minutes)			**Evening Peak** Travel Time Delay (Minutes)		
	2021	2031	2041	2021	2031	2041
Tinwald to Town Centre	0.8	1.1	1.7	1.1	2.5	7.8
Town Centre to Tinwald	0.9	1.3	2.8	1.0	2.2	9.6
Northern Residential to Town Centre	0.4	0.5	0.6	0.7	1.0	5.1
Town Centre to Northern Residential	0.4	0.5	0.8	0.7	1.0	5.2
North to Town Centre	1.1	1.1	1.3	0.6	0.7	6.0
Town Centre to North	1.4	1.5	1.7	0.8	1.1	4.0

During the interpeak period, the increases in travel time are generally less than one minute by 2041. However, during the evening peak period, there are significant increases in travel time delay forecast in the 2031-2041 period. As travel times increase, this will influence people's decisions to travel because the delays are seen as barriers to travel.

Difficulty in getting across the state highway

Severance impacts are not limited to just journeys along the state highway, but also across. Increasing traffic on a corridor which splits two halves of a town such as Ashburton creates both a physical (fewer safe gaps to cross) and psychological barrier (effects such as noise, air pollution and safety perception created from traffic and resultant queues). The connection between traffic volumes and community cohesion is widely recognised, with the impacts of high volumes of traffic found to reduce community liveability and wellbeing (Appleyard,1980)[29].

[29] Appleyard, D (1980). 'Liveable streets: Protected neighbourhoods?' Annals of the American Academy of Political and Social Science, 451 (1), 106-117.

Table 5-3 shows the forecast traffic volumes on the state highway up to 2041.

Table 5-3: Forecast traffic volumes on SH1

Section of SH1	AM Peak Two-way traffic volumes			PM Peak Two-way traffic volumes		
	2021	2031	2041	2021	2031	2041
SH1 Bridge	1,860	2,210	2,460	2,170	2,650	2,930
SH1 North (Racecourse Road)	920	1,090	1,270	1,250	1,520	1,770
SH1 South (Maronan Road)	820	1,010	1,220	1,070	1,390	1,670

The results show that over the next 20 years the traffic volumes across the bridge, and then through the town, are expected to increase by approximately another third (33%). This translates to increased delays getting onto and across the state highway at all intersections. The likely effect at signalised intersections is that, in order to try and accommodate this demand, signal cycle times will need to increase – this means pedestrians will need to wait longer to cross the road safely. At mid-block locations (between intersections) the risk of a collision between a crossing pedestrian and a vehicle will rapidly increase.

Influence of land use

Figure 5-5 above shows Ashburton's Town Centre is to the south of the SH1 whilst many of the schools and businesses and majority of the residential population is on the northern side. High traffic volumes on SH1 creates an environment where people are making very short journeys by car (across the state highway) to access (geographically) very close facilities.

Furthermore, one of the growth areas identified by ADC is to the south and east of Tinwald (including Lake Hood). Future new residential activity in these areas represents one source of the increased demand for travel across the river to access the town centre.

6. PROBLEM 2: TRAVEL CHOICE (30%)

"Limited (or poor quality) facilities for sustainable modes makes it difficult to achieve long-term environmental and liveability objectives"

6.1 CAUSES

6.1.1 Poor Quality Active Travel Facilities

The existing bridge is approximately 340m long and incorporates a combined pedestrian and cycle path on the eastern side of the bridge, and a cycle path on the western side. The effective width of the shared path is less than one metre wide which is far below the minimum recommended width for a shared path of 2.5m. This makes it impossible to pass other users without dismounting, and people report feeling very uncomfortable on the bridge paths. This could be either because of large vehicles passing close by, or people feeling more vulnerable to potential crime (a lack of an escape route)[30].

Figure 6-1 provides photos which highlight the poor quality of the shared path, that is, narrow, uneven, poorly maintained and generally unattractive.

Figure 6-1: Poor quality of existing footpath on the SH1 Bridge

The poor walking and cycling facilities on the SH1 Bridge represents a barrier to the uptake of walking and cycling between Tinwald and Ashburton. This evidence base could be supported further with new walking/cycling counts across the bridge.

6.1.2 Limited Active mode Provisions on Local Roads

Across the local road network there is limited provision for active mode users. South of the bridge, cycling facilities on SH1 are currently limited to 1.5m wide, on-road cycle lanes adjacent to parking lanes, which are generally not suitable for children and less confident cyclists because of the high volume of trucks using the road, and the close proximity of parked vehicles.

ADCs walking and cycling strategy is being used as a mechanism to better understand where investment in active modes should be targeted, and what the investment should be. In general terms, a lack of physical separation between cyclists and traffic on SH1 means that currently the road network is only used by experienced and confident cyclists. Feedback from the mountain bike community indicates that cyclists will

[30] Abley, *DRAFT Ashburton District Walking and Cycling Strategy* (2020), pg. 13.

actively avoid riding on the bridge and would rather drive over the bridge to the opposite side to access the tracks.

Improvements to the cycling network will however be made as part of the Tinwald Improvements NZUP project. The proposals include a new cycle route along Melcombe Street and new signals at SH1 / Agnes Street. This will provide a safe alternative route for cyclists for travel between the Tinwald township and the bridge. As referenced earlier, the project could potentially also end up delivering cycling passing bays on the SH1 Bridge.

6.1.3 Lack of Public Transport services

There are no public transport services in Ashburton or Tinwald aside from the school bus services. There are also no on-demand services (such as Uber). This lack of public transport further limits travel choice for residents.

6.1.4 Poor access to recreational routes

Figure 6-2 shows the Ashburton walking and cycle trail map.

Figure 6-2: Ashburton Cycle Trail Network

The Ashburton Hakatere Trail starts at the Ashburton Bridge and follows the true left bank (Ashburton side) of the river to the river mouth at Hakatere (approx. 18km east of the bridge). The Lake Hood trail starts on the south side of the bridge and follows the south side of the river before turning towards Lake Hood. There is also a network of recreational bike tracks running alongside the Hakatere River (Tinwald side of the bridge).

There is poor or limited access to these recreational routes as the existing cycle network is limited and lacks connectivity making it challenging to access these trails.

6.2 CONSEQUENCES

6.2.1 Reliance on the Private Vehicles

Figure 6-3 provides a breakdown of the journey to work data for the travel mode split for rural and urban areas recorded in the 2018 census. The census journey to work data shows that:

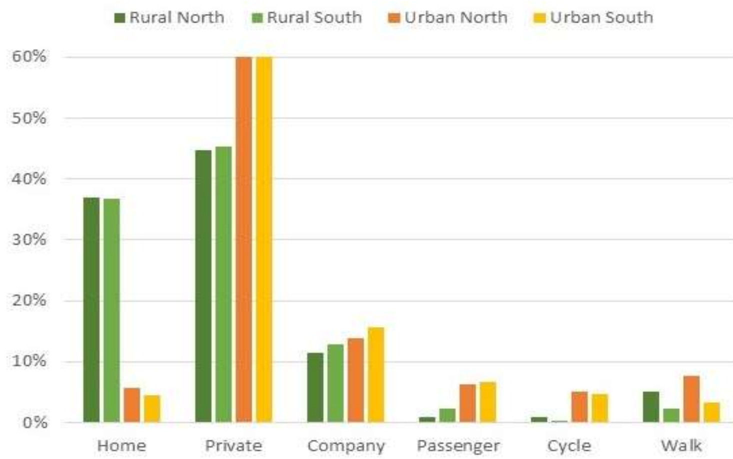


Figure 6-3: Journey to Work Travel Mode Share

- Travel by a private or company vehicle was the most common mode of travel in both rural and urban area, about 50% and 70% respectively. The difference reflects a greater proportion of people working from home in rural areas.
- Walking and cycling accounted for less than 5% of all modes in rural areas compared with 12% in Ashburton and 7% in Tinwald. Nationally, around 8% of people walked or cycled to work[31]. The distance between the two centres is less than 3km – a cycle ride of around 10 minutes.
- Public transport is not an option for journeys to work

Figure 6-4 shows the mode share for education travel and shows that:

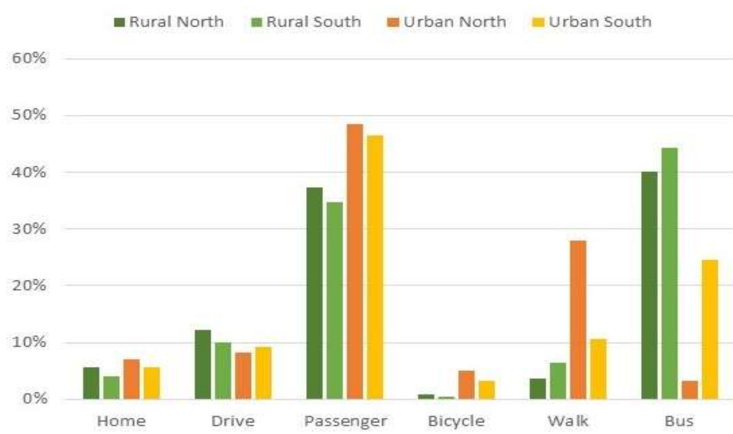


Figure 6-4: Journey to Education Travel Mode Share

- Travel as a passenger account for the greatest mode share for urban areas.
- In rural areas, the availability of school buses means that this represents the highest mode share but there is still a very high proportion of students travelling as passengers.
- Active travel modes account for 30% of all education-based trips in Ashburton but less than 15% in Tinwald. This reflects the fact that most schools are located north of the river.

A consequence of poor active mode provisions is that it becomes more difficult to change attitudes to using active modes. This is particularly true for younger people. Without providing high quality active mode provisions now (with safe crossing points), there is a risk that a car-centric mindset (even for short journeys) is created. This then makes it difficult to achieve local and national goals for increased active mode share, health, and reduced carbon emissions.

6.2.2 Limiting the potential of recreational trails

The only cross-river facility is the poor-quality, shared path (which is not practical for many cyclists) on the SH1 Bridge, which means that recreational cyclists will tend to ride only along one side of the river. As such, the full potential of the trails is not being realised. Effectively there are two separate and disconnected trails (the Hakatere River Trail and the Lake Hood Trail).

[31] Excluding those who worked at home, and did not work – 2.2% cycle, 5.9% walk.

7. PROBLEM 3: SAFETY (20%)

"High traffic volumes make it difficult for people to travel along, across, or onto SH1. This increases the likelihood of injury crashes and delays emergency services"

7.1 CAUSES

7.1.1 High volume of vehicles and trucks

A high volume of trucks on SH1 contributes to the actual and perceived safety problem. Trucks need longer to brake, other road users often misjudge their speed, and they need longer gaps in the traffic if they are to safely enter the state highway. An increase in the number of vehicles on the road creates more possible points of conflict; particularly with vehicles looking to access SH1 from the side roads.

7.1.2 Oversized vehicles and agricultural machinery

Stakeholders have confirmed that oversize vehicles typically associated with the transport of agricultural machinery sometimes travel along SH1 during peak times. These are generally slow moving and on occasions require a pilot vehicle.

The slow movement of these vehicles contributes to congestion when high traffic volumes are present and generates frustration for following vehicles which in turn increases the temptation for unsafe overtaking manoeuvres. The relatively high volumes of traffic during the day makes it difficult for oversize vehicles and any necessary pilot vehicles to access the highway.

7.1.3 SH1 / South Street southbound merge

The southbound merge area south of the SH1 / South Street signals is very short and would not meet current, best practice design standards. The length of dual lanes on the southbound departure side is less than 30m long compared with a recommended minimum of 58m. The subsequent merge is less than 70m long compared with a minimum recommended length of 140m.

The short space provided for the downstream merge affects lane usage at the signals and does not allow drivers to merge smoothly. This is a contributing factor to the congestion in that area and also increases the potential for crashes. Waka Kotahi have also raised concerns with the northbound merge area at the signals which is also shorter than would be desirable.

7.1.4 Lack of controlled safe access points onto SH1

The safety issues associated with gaining access onto the state highway are well recognised by both ADC and Waka Kotahi. This is one of the key drivers for progressing with the Tinwald SSBC, and for detailed evidence, reference should be made to the Tinwald Corridor PBC.

Notwithstanding, in general terms there are eight priority-controlled T-intersections and two priority controlled cross intersections in the urban area of Tinwald. To understand the kinds of risk that are being presented, reference has been made to Waka Kotahi's High-Risk Intersection guide[32], which provides an overview of the typical composition of death and serious injury (DSI) crashes by intersection form in urban speed environments.

Given the high traffic volume on SH1 and the demand for crossing and turning movements at crossroads and T-intersections, there will be an ongoing (and likely growing) safety risk associated with 'crossing turning' movements. The effects of the increasingly difficult gap selection are two-fold, both of which are likely to be compounded by any future traffic growth:

- Increasing delays and variability.
- Increased crash risk. Resulting from drivers accepting unsafe gaps in opposing traffic streams because of driver frustration.

[32] https://www.nzta.govt.nz/resources/high-risk-intersections-guide/

7.2 CONSEQUENCES

7.2.1 Increased likelihood of crashes and DSIs

Figure 7-1 shows the collective risk ratings for all roads within the project area[34]. It shows that the collective risk for the majority of SH1 is Medium. The primary reason for this is because traffic is being concentrated onto one route. Whilst it could be argued that the crash record (in terms of DSIs) is better than other towns, this is partly a consequence of a slow speed environment caused by high traffic volumes. These high volumes are partly caused by a perception of poor safety for travel by active modes, meaning people use their car even for short journeys.

Figure 7-1: Collective Risk[33]

Figure 7-2 shows the locations, number, and severity of reported crashes in central Ashburton. It shows that crashes typically occur at intersections and that these are generally clustered along the state highway corridor. Most crashes result in no injury or minor injuries only.

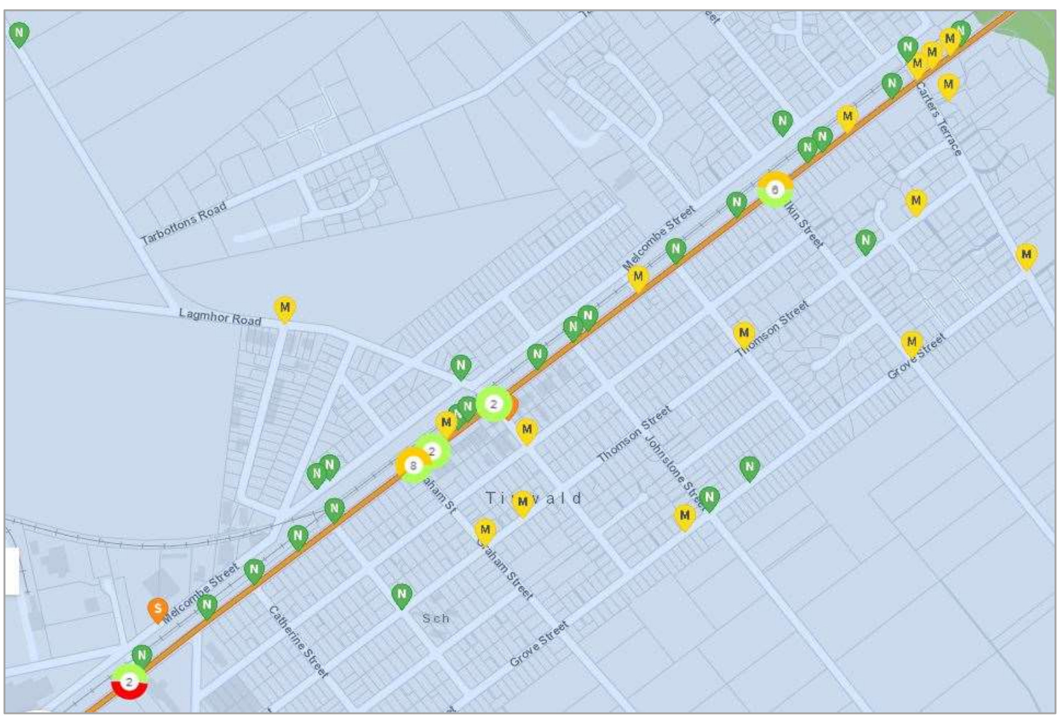


Figure 7-2: Tinwald Crash Locations and Severity (2015-19)

[33] megamaps.abley.com/Maps/
[34] Risk density measured as the number of fatal and serious casualties over a distance – e.g., DSIs per kilometre or within a set distance of an intersection.

There have been clusters of crashes at the SH1 / Graham Street, SH1 / Lagmhor Road and SH1 / Wilkins Road intersections. Crashes have also been reported all along SH1 through Tinwald. One crash resulted in a fatality when a motorcyclist hit a truck that was turning from a side road. This occurred at the southern end of Tinwald.

Seven of the reported crashes involved rear-end collisions in queued traffic with five crashes involving manoeuvres. Three crashes occurred at intersections. The only serious injury crash on this section of the road involved a single vehicle only and occurred when the driver left the road.

7.2.2 Unsafe environment for vulnerable users

A LOS C rating for on-road cycle facilities mean that any people who choose (perhaps out of necessity) to cycle, are cycling in a ‘medium to high-risk road environment’. Others are put off cycling altogether. Real and perceived safety also has a large bearing on how a place feels, that is, whether people want to visit and spend time.

As noted previously, use of the bridge for pedestrians also brings significant CPTED[35] concerns, with people feeling more vulnerable to crime because of a lack of an escape route.

7.2.3 Emergency services are vulnerable to delay

Arriving promptly at emergencies can often be crucial to the outcome of an event. However, the emergency services expressed (via the ILM workshop) that they are highly vulnerable to delay because:

- Emergency services are all located on the north side of the river.
- Potential congestion on the only connection (the bridge) between Tinwald and Ashburton.
- A lack of alternative routes
- A constrained cross-section on the bridge which means that people have no place to pull over to allow emergency services to pass.

[35] Crime prevention through Environmental Design

8. PROBLEM 4: ECONOMIC PROSPERITY (10%)

"Increasing traffic and constrained capacity on SH1 results in worsening travel time reliability between Tinwald and Ashburton. This impacts freight connections and economic prosperity."

8.1 CAUSES

8.1.1 Employment focused on the northern side of the river

Table 8-1 provides the households and employment data for Ashburton and Tinwald based on the 2018 census.

Table 8-1: Census Household and Employment Data

Area	Households	Jobs
Ashburton	6,700	7,300
Tinwald	1,500	800
Total	8,200	8,100

The table shows 90% of jobs are in Ashburton. This generates some tidal demand from Tinwald for workplace trips, where people head into Ashburton in the morning, and return south in the afternoon. Economically it is important that people can access jobs easily and are not deterred from working in either Ashburton or Tinwald because of travel time issues.

8.2 CONSEQUENCES

8.2.1 Reduction in Economic Productivity

Without increases to road capacity across the river (potentially through a second bridge) or a reduction in demand (obtained through modal shift), delays will continue to increase which could impact upon economic productivity and limit the potential to which Ashburton can grow. Whilst the scale of the issues could be considered as moderate, the previous evidence has shown that the state highway is at a tipping point where a small increase in traffic would exponentially increase the level of delays for freight.

The spoilable nature of the produce means that the use of rail freight is often not a viable alternative, which means industries are reliant on road freight. There is also risk that any significant delays being encountered could impact upon the ability for freight operators to make connections (e.g. with the port or airport).

8.2.2 Impact to Tinwald Land Values

Stakeholders noted that the cumulative effects of worsening traffic congestion and increased severance could lead to a situation where people see it as more desirable to live in Ashburton than Tinwald which will increase the pressure for residential development to the north, east and west. In the future, this could affect land value in Tinwald. Any future improved cross-river connections would also have an impact on land values. The Social Impact Assessment provided a brief discussion in this respect, noting that any new road which provides good levels of accessibility to Ashburton is likely to attract residential buyers.

8.2.3 Economic Impact of Poor Network Resilience

If the bridge was closed for any reason, using the nearest alternative road bridge involves a minimum detour trip of about 80km and could increase the travel time by at least 60 minutes. The additional travel costs of a detour of that length could reach $1.6m per day. In practice, this represents an oversimplification and underestimation of likely costs associated with the bridge closure. In the May 2021 event the nearest available detour route was also closed.

Some costs were also *indirect* because travel did not occur, and businesses could not operate as normal. The real cost of the bridge closures during the flood event could therefore far exceed the above $1.6m cost per day (which is based purely on travel time costs). The social connectivity costs also cannot be quantified.

During the flood event the bridge was fully closed for a day and partially closed for several days, with heavy vehicle weight restrictions in place for the following two weeks. This meant that some freight vehicles needed to use the detour route for this duration. Other freight simply waited for the SH1 Bridge to reopen, which added a risk to goods being spoiled.

Refer to Section 2 for further information regarding the flood event.

SH1 Bridge closures

TREIS data provided by Waka Kotahi has indicated over the last ten years the SH1 Bridge has been closed partially (i.e. stop-go with one lane open) a total of five times, and closed fully once (the 2021 flood event). The partial closures all related to bridge repair or maintenance work.

The impact of partial closures were delays to general traffic of up to 20 minutes – noting the impact of the delays were minimised as all repair work took place overnight (i.e. 21:00 to 05:30).

For the rest of the SH1 corridor, between Maronan Road (Tinwald) and Racecourse Road (Ashburton) there were a total of 35 closures which lasted more than two hours between 2011-2021. The vast majority of these related to road maintenance works. The impact of all these events was minimised as the grid-like nature of the Ashburton / Tinwald road network enables multiple alternative routes for traffic.

9. BENEFITS OF INVESTMENT

9.1 INVESTMENT DECISION MAKING FRAMEWORK

This business case has referred to the Benefits Framework outlined in Waka Kotahi's recently published Investment Decision Making Framework (IDMF). This new benefits framework is aligned with the five outcomes in the Ministry of Transport's Transport Outcomes Framework (TOF)[36].

The problem statements align strongly with all five of the TOF outcomes. The new IDMF benefit framework was then applied to help determine the range of potential monetised and non-monetised benefits of solving each of the problems. These are outlined within Table 9-1 along with an overview of which of the outcomes are captured by which problem statement.

Table 9-1: Benefits of investment

Problem Statement	Transport Outcome					Benefits
	Inclusive access	Economic prosperity	Healthy & safe people	Resilience & security	Environmental sustainability	
Connectivity An absence of route choice contributes to more traffic on SH1. This discourages people from making journeys they otherwise would, creating social disconnect and lack of a 'one community' feeling.	✓			✓		Non-Monetised • Improved mental health • Availability of viable alternative routes between Tinwald and Ashburton (covers resilience) • Improved feeling of social connectiveness • Better access to key facilities such as health care • Reduced severance created by high traffic volumes on the state highway
Safety High traffic volumes make it difficult for people to travel along, across, or onto SH1. This increases the likelihood of injury crashes and delays emergency services.			✓			Monetised • Lower likeliness of DSIs and number of crashes Non-Monetised • Improved infrastructure risk rating • Improved safety perceptions - via surveys • Improved personal and collective risks
Travel choice Limited (or poor quality) facilities for sustainable modes makes it difficult to achieve long-term environmental and liveability objectives.	✓		✓		✓	Monetised • Physical walking and health benefits Non-Monetised • Improved air quality • Reduced road noise • More enjoyable walking and cycling journeys. • Meeting mode share goals of ADC
Economy Increasing traffic and constrained capacity on SH1 results in worsening travel time reliability between Tinwald and Ashburton. This impacts freight connections and economic prosperity.		✓		✓		Monetised • Improved journey times for locals • Improved journey time reliability for freight • Land values in Tinwald

[36] www.nzta.govt.nz/assets/planning-and-investment/docs/benefits-framework-june-2020.pdf

9.2 INVESTMENT OBJECTIVES

The investment objectives are:

1. **Connectivity and severance**
   - Ensure residents of Tinwald can always easily access key community facilities in Ashburton by a variety of modes, even during a major event (such as a flood) by 2031.
   - Improve travel time reliability for journeys within Ashburton and Tinwald so that weekday peak-hour journey times do not exceed off-peak journey times by more than 4 minutes.
2. **Travel choice**
   - Increase the number of peak hour active mode journeys across the river to 50 per hour by 2026.
3. **Safety**
   - Improve the safety level of service (LOS) for cyclists crossing the Hakatere (Ashburton) River from LOS C to LOS B or better by 2026.
   - Reduce the risk of crashes at intersections by reducing the demand for right turn demands by 2031.
4. **Economic prosperity**
   - Improve travel time reliability for journeys along SH1 through Ashburton and Tinwald so that weekday peak-hour journey times do not exceed off-peak journey times by more than four minutes by 2031[37].

9.3 INVESTMENT LOGIC MAP

The Investment Logic Map (ILM) is provided Figure 9-1.

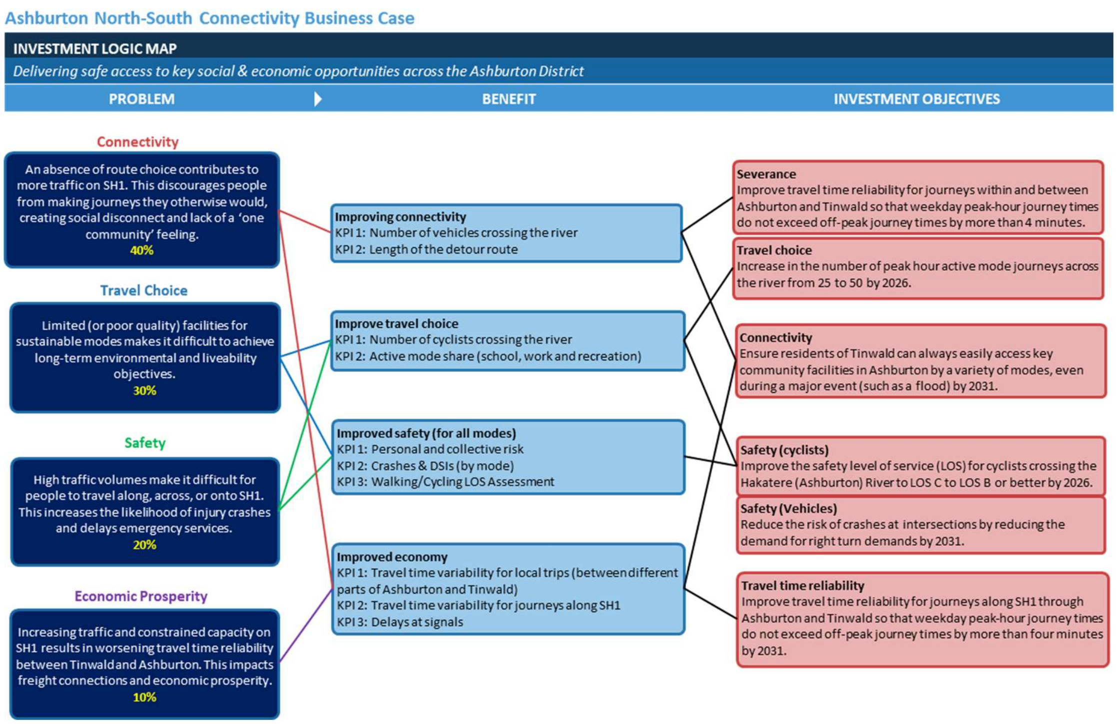


Figure 9-1: Investment Logic Map

[37] Between just north of Walnut Avenue and south of Lagmhor Road

9.4 KEY PERFORMANCE INDICATORS

The Key Performance Indicators (KPIs) are outlined in Table 9-2. The purpose is to provide clarity around what benefits investment would provide, and how, in real terms, these benefits could be identified.

Table 9-2: Benefits, associated key performance indicators, baselines, and targets

Benefit	KPI	Baseline	Target
Improving the feeling of connectivity	River Crossing Capacity	2,500 vehicles / hour	3,000 vehicles / hour
	Length of SH1 detour route (resilience)	80km	< 10km
Providing better travel choice	Active mode counts across the Hakatere (Ashburton) River	25 people per hour (peak hour)	50 people per hour (peak hour)
	Active mode share for journeys to work and school	14% for walking and cycling	20% walking and cycling
Improved safety for all modes	Walking and cycling LOS assessment	LOS C for cyclists	LOS B for cyclists
	Collective and Personal Risk on SH1	Medium	Medium-Low
	Crashes and DSIs on SH1	DSI: 1.0 / annum Injury: 7.0 / annum	DSI: 0.5 / annum Injury: 5.0 / annum
Efficient movement of people and goods across the Hakatere (Ashburton) River	Travel time variability – Local Travel	Weekday peak hour travel time through Ashburton are typically more than two minutes longer than at off-peak times.	Improve travel time reliability for journeys within and between Ashburton and Tinwald so that weekday peak-hour journey times do not exceed off-peak journey times by more than 2 minutes
	Travel time variability – SH1	Weekday peak hour travel time through Ashburton are typically more than two minutes longer than at off-peak times.	Improve travel time reliability for journeys along SH1 through Ashburton and Tinwald so that weekday peak-hour journey times do not exceed off-peak journey times by more than 4 minutes.
	Delays encountered at the SH1 / South Street signals	Congestion generated by southbound merge	Safe and efficient southbound merge with no congestion

9.5 STRATEGIC CONTEXT

Appendix F sets out how the case of change aligns with relevant national, regional, and local strategies.

10. CASE FOR CHANGE

SH1 is a key strategic transport route for the South Island that links Picton in the north with Bluff in the south via all major towns and cities along the east coast. The town of Ashburton is located on the northern side of the SH1 Bridge over the Hakatere River, with Tinwald on the opposite side (southern) side of the river.

Population and regional industrial growth over recent years has resulted in higher traffic volumes using SH1 and increasing level of congestion and severance through Ashburton. Contributing factors are the capacity of the SH1 Bridge and adjacent intersections, the growth and spread of land use either side of the river, a lack of practical route choice, and poor quality active and public transport provisions.

Poor network resilience, increasing SH traffic volumes and the knock-on effects of worsening congestion and severance that are creating the major problems, which remain relevant even considering the effects of Covid-19:

- Social and economic connectivity. Increased traffic means it is becoming more difficult to get onto and across the road. This is creating community severance – both north to south (across the river) and east to west (across SH1). Access to important community facilities, of which most are in Ashburton, is increasingly challenging (particularly during peak times).
- Travel choice. People who would like to walk or cycle feel unsafe using roads where priority is given to traffic and on shared paths which are uncomfortable and of poor quality, and high traffic volumes make it difficult to get across the road increasing the severance issues. The car then ends up being used even for short journeys, which is exaggerated by an absence of any public transport services.
- Safety. There is a cycle occurring where increasing traffic and turning movement conflicts adversely affects road safety, which in turn is encouraging more people to travel by car.
- Economic prosperity. Increasing levels of congestion contribute to less reliable travel times which means it takes longer for freight to move across the region. For local employees, it also makes living in Ashburton more appealing than living in Tinwald.

The resilience issues are embedded into the *connectivity* and *economic prosperity* problems (in particular) as these issues would be significantly exacerbated by any event that closes the SH1 Bridge. The recent flood event has highlighted the potential social and economic cost that even a short temporary closure of the bridge has.

Whilst the issues currently being experienced are generally focused on peak times, the SH1 Bridge is unable to accommodate many more vehicles. Even small increases in travel demands on the bridge will, without intervention, cause the existing issues to worsen and be experienced for longer periods of the day and on many more days of the year.

The May 2021 flood event highlighted the importance of the Ashburton Bridge within the strategic network and also its importance for local movement between Ashburton and Tinwald. The bridge closures and vehicle weight restrictions in the weeks following the flood affected movement both regionally and locally which in turn increased travel costs and prevented local businesses from operating at their normal level.

It has been concluded that it is now appropriate to set a plan in place to invest in measures that will address the core problems; the most serious of which are **poor connectivity (capturing network resilience and severance)** and **limited travel choices**.

The focus of investment should be on how to better move people (not just motor vehicles) and goods between Tinwald and Ashburton. Land use planning and the provision of local services could also play a role in how a better transport network is delivered.

PART B1: OPTIONS AND ALTERNATIVES

11. LONG LIST

11.1 APPROACH TO OPTIONEERING AND MCA

This section of the report focuses on how a long list of options was identified and then narrowed down through multi-criteria assessments (MCA). The identification and assessment of options was informed by the evidence base, an engineering review of bridge options, and feedback from ADC and the wider stakeholder group (gathered through workshops and meetings).

The process for assessing the options was:

- Identification of a long list of options – based on previous studies and feedback from stakeholders.
- Application of Waka Kotahi's *Early Assessment Sifting Tool* (EAST) to inform an initial coarse screen of options to help reduce the number of options in the long list. The tool focuses on how well each intervention would deliver each of the Investment Objectives and any clear fatal flaws. Previous studies were used to inform some aspects of the assessment to ensure a consistent approach was taken. It also provided an opportunity to test previous assumptions around the feasibility of various alternatives.
- A meeting with ADC to discuss the initial options assessment and agree a short-list. The MCA scores were then reviewed by Ashburton District Council's (ADC) project team and updated as necessary
- Detailed multi-criteria assessment of the short-listed options against the investment objectives and other key criteria (agreed with ADC). Initial scoring undertaken by technical specialists within Stantec, covering bridge engineering, active modes, safety and network operations.
- A meeting with ADC to discuss the findings of the MCA process. MCA scores updated as necessary.
- A meeting with the Tinwald Improvements Single Stage Business Case (SSBC) team to establish what level of alignment existed between the two emerging preferred programmes.
- The MCA was then presented to the wider stakeholder group at a workshop on the 15 April 2021, with focus given on key risks and the criteria where there was notable differentiation between options. Following the workshop, the MCA scores were updated once more. Minutes from this workshop are provided within **Appendix D**.

The optioneering process taken is shown as a flow diagram in Figure 11-1.

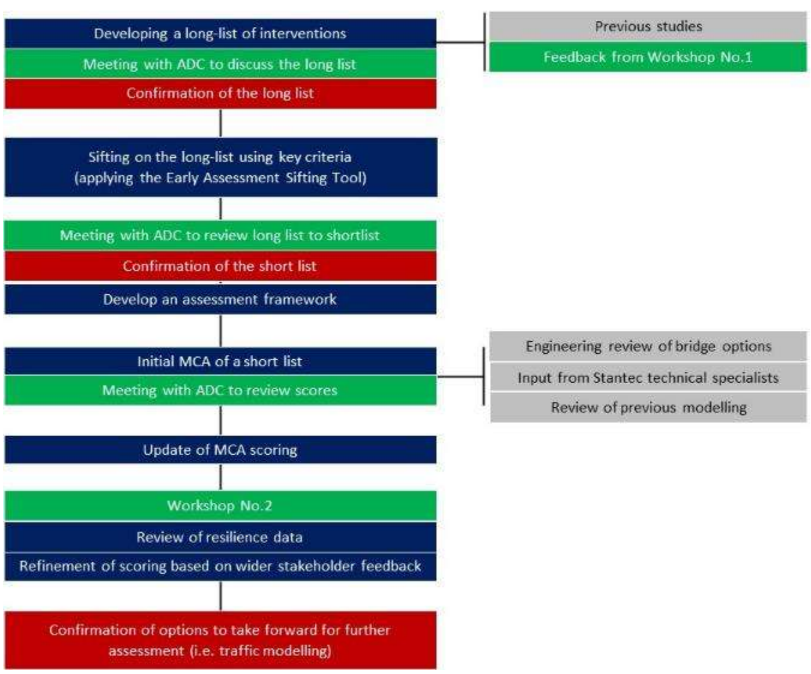


Figure 11-1: Optioneering process

Purpose of MCA

The purpose of the MCA was to narrow down the field of alternatives, and it is important to recognise that it is only one tool for helping to establish an emerging preferred programme. Traffic modelling, detailed in Part B2, has been used to quantify the effects of interventions (namely second vehicle bridge) in the case where the MCA could not definitively establish a clear preferred option.

Giving effect to what we're trying to achieve

Interventions identified in the long list are those which fundamentally look to give effect to the investment objectives. Essentially this means options that to some degree would help reduce severance (both across the river and across the state highway), improve safety, improve network resilience, improve the efficiency of freight movement, or make walking and cycling more appealing.

11.2 LONG-LIST IDENTIFICATION

A long list of potential interventions was identified using the following inputs:

- Feedback from the first stakeholder workshop.
- Review of previous studies and investigations.
- Site investigation.
- Desktop review of possible interventions, including consideration of non-infrastructure measures.
- Meeting with ADC to discuss the draft long-list.

The options have been categorised by the following themes: 'bypass', 'new bridge', 'upgrading existing assets' and 'non-infrastructure' options. The long list also identifies:

- Options that were previously assessed (through MCA), as part of the 2014 Notice of Requirement (NoR).
- Options that have interdependencies with any upgrades proposed for the SH1 Tinwald Corridor.

11.3 LONG LIST

11.3.1 Bypasses

Table 11-1 presents the range of 'bypass' options that have been considered as part of the long list. None of the options have significant interdependency with the Tinwald Corridor Upgrades.

Table 11-1: Long List – Bypass Options

ID	Name	Assessed in the 2014 NoR	Description
1	Western Bypass	Yes (Option K)	Western bypass broadly from Fairton to South of Tinwald
2A	Eastern Bypass (inner)	Yes (Option A)	Seafield Road to Laings Road
2B	Eastern Bypass (outer)		Rural bypass east of airport following existing road alignments where possible

The indicative bypass alignments are shown graphically in Figure 11-2.

Option 1 is an indicative western bypass route which would create a new link from north of Fairton to south of Tinwald. This option assumes the state highway designation would be moved to the bypass and the existing SH1 connection becoming a council-owned arterial road.

Option 2 covers two variations of an eastern bypass route. These alignments are broadly aligned with existing road corridors. As with the western bypass option, it is intended that the state highway designation would be moved to the bypass.

All bypass options would require a second vehicle bridge. The new bridges would be designed primarily for motor vehicles because their location outside of the urban areas is unlikely to attract a high demand for active mode use.

Figure 11-2: Bypass Options

11.3.2 New bridges

The 'new bridge' options are presented in Figure 11-3 and described in Table 11-2. All options have some interdependency with the preferred programme for the Tinwald Improvements SSBC.

Separate options have been included for bridges that would provide connections for all modes, and bridges which would be only for pedestrians and cyclists (active mode only bridges). It is assumed that active mode bridges would be designed to enable access for emergency vehicles (e.g. drop down bollards).

Table 11-2: Long list – new bridges

ID	Name	Assessed in the 2014 NoR	Description
All modes			
3	Oak Grove Bridge	Yes (Option J)	New road and bridge connecting Oak Grove to West Tinwald
4	Tarbottons Road Bridge	Yes (Option I)	New road and bridge connecting Tarbottons Road with Dobson Street
5	Trevors Road Bridge	Yes (Option B)	Trevors Road to Wilkins Road
6	Leeston Street Bridge	Yes (Option C)	Leeston Street to Wilkins Road or Carters Terrace
8	Chalmers Ave (NoR)	Yes (Option D)	Chalmers Avenue to Grahams Road as per NoR. **This was the identified preferred option in the NOR[38].**
10	Chalmers / Grove	Yes (Option D/E)	Chalmers Avenue to Grove Street
11	Williams / Grove	Yes (Option E)	New vehicle bridge connecting Williams Street with Grove Street
13	Cass / Thompson	Yes (Option F)	New bridge connecting Cass Street with Thompson Street
18	Four-lane bridge	Yes (Option G)	Widen existing bridge to four lanes plus active modes
20	Duplicate Bridge	No	Construct two-lane northbound only bridge with active mode facilities adjacent to existing bridge, broadly South Street to Carters Terrace. The existing SH1 Bridge would become southbound only.
21	West / Carters	No	Construct two-lane northbound only bridge with active mode facilities to connect West Street with Hinds Highway near Carters Terrace with grade

[38] This option was originally identified within the Ashburton Transport Strategy. The intent was to help create arterial ring routes in Ashburton, providing an alternative route so people do not have to access the state highway.

ID	Name	Assessed in the 2014 NoR	Description
All modes			
			separated railway crossing. The existing SH1 Bridge would become southbound only.
22	West / Melcombe	Yes (Option H)	Construct two-lane northbound only bridge with active mode facilities to connect West Street with Melcombe Street. Connection to Hinds Highway north of Lagmhor Road intersection
Walking and cycling only			
7	Tarbottons Road Active Mode	No	New active mode connection from Tarbottons Road to SH77 / Smallbone Drive
9	Chalmers Avenue Active mode	No	Chalmers Avenue to Carters Terrace connection for active modes
12	Williams / Carters Active	No	New active mode bridge connecting Williams Street with Carters Terrace
14	Cass / Carters	No	Active mode connection from Cass Street to Carters Terrace
15	Dual active mode bridges	No	Two active mode bridges to create a network: • Tarbottons Road to Smallbone Drive • Williams Street to Carters Terrace

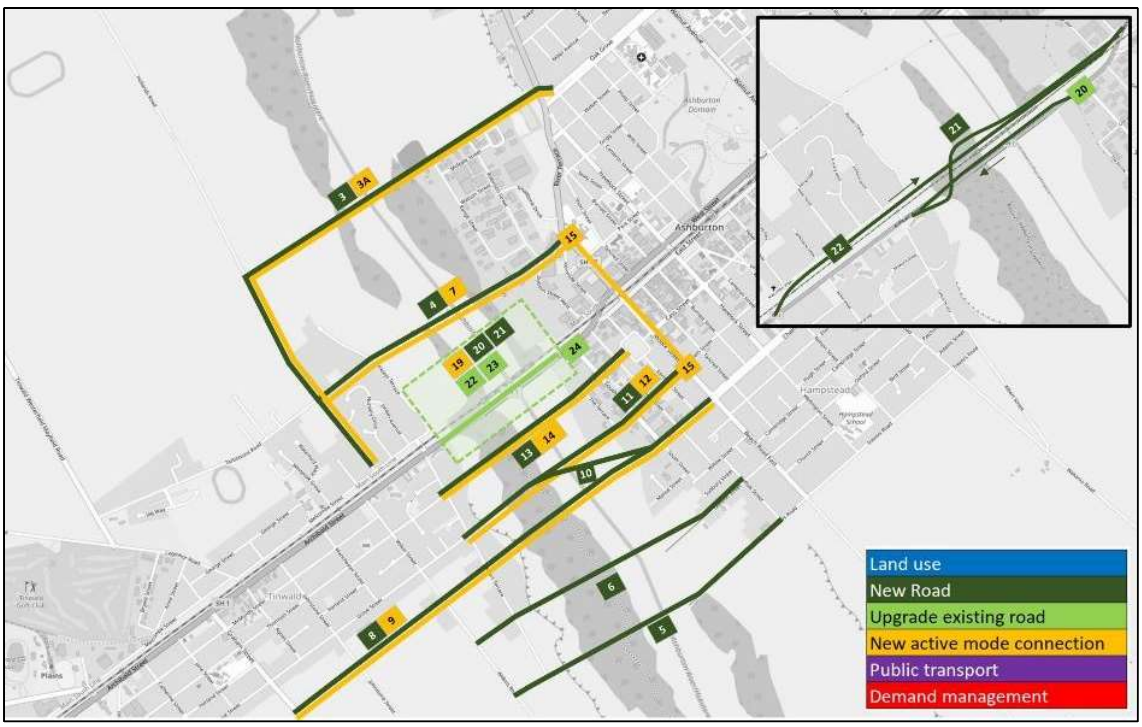


Figure 11-3: Bridge Options

11.3.3 Upgrading existing assets

There is also opportunity to meet the project investment objectives by upgrading or optimising existing infrastructure. The identified options are identified in Table 11-3.

Table 11-3: Long List – Upgrading existing assets

ID	Name	Assessed in the 2014 NoR	Description	Interdependency with Tinwald SSBC
19	Clip-ons	No	Widen existing clip-ons to improve active mode facilities on each side of the bridge	Yes
23	Four-lane SH1	Yes (2010 Study – Option 8)	Four-lane SH1 from Walnut Avenue to Maronan Road (NOTE: This represents more extensive works than proposed under Option 18)	Yes
24	South Street intersection upgrade	No	Improve southbound merge south of South Street (signalised intersection immediately north of the river bridge).	No
25	Railway Bridge Clip-ons	No	Add active mode clip-ons to railway bridge	No

Adding clip-on passing bays on the SH1 Bridge for cyclists is considered as being the Do Minimum improvements for active modes. This intervention is currently being investigated as part of the Tinwald Improvements project.

11.3.4 Non-infrastructure options

The non-infrastructure options that have been considered are summarised in Table 11-4. Some of these options could not be implemented as standalone interventions but could be incorporated into packages of programmes.

Table 11-4: Long List – Other options

ID	Name	Assessed in the 2014 NoR	Description	Interdependency with Tinwald SSBC
Public transport				
16	Bus	No	Establish bus based public transport network	No
17	Rail	No	Establish rail based public transport network	No
Land use				
26	Planning controls	No	Establish stricter land-use controls on development in Tinwald to reduce the demand for peak hour travel	Possible
27	Tinwald Community Facilities	No	Establish more community facilities in Tinwald	Possible
Other				
28	Congestion Charging	No	Establish congestion charge zones to reduce peak hour traffic	No
29	HOV / Freight Restrictions	No	Establish HOV / Freight restrictions at peak times	No
30	Freight Rail Hub	No	Establish a freight rail hub in Ashburton	No
31	E-scooter	No	Establish alternate active mode network such as electric scooters	No

12. LONG LIST ASSESSMENT

This section provides a summary of the assessment of the long list of options.

The assessment of options, both the long and short list stage, has taken into consideration the composition of customers that travel between Ashburton and Tinwald. Surveys on the SH1 Bridge established that only around 20% of traffic along the SH1 corridor are vehicles that pass through the town. A further 20% relates to regional traffic going to/from town, with the remaining 60% being local trips between Ashburton and Tinwald. The merits of options that provide improved connectivity to social and business activities are therefore higher than options that only support the movement of through traffic.

The full long list assessment is provided as **Appendix G**.

12.1.1 Bypasses

Options progressed

None of the bypass options progressed to the short list, for the reasons stated below.

Options discounted

The bypass options (No.1 & 2) were discounted at the long-list stage due to the following serious or fatal flaws:

- High number of properties to be acquired (and subsequent cost)
- Benefits only through traffic, which accounts for only 20-30% of the demand on the existing SH1 Bridge. As such, a high risk that the bypass would carry a relatively low volume of traffic and would not solve the inherent problems.
- Alignment is too far from the town centre to provide effective mode choice for residents and reduced benefits for regional traffic.
- They do not strongly deliver the Investment Objectives.
- Does not align with local and national strategies to encourage mode shift.
- Unlikely to be affordable.

Bypass options generally only serve the longer distance trips which support only a relatively small amount (20%) of the customer base that is currently using the bridge. Whilst the options aligns well with addressing the 'Economic Prosperity' problem, the weighting of this problem is only 10% when compared to other problems.

12.1.2 Vehicle bridges

Options progressed

The initial screening of the long list identified four vehicle bridge options that should be brought through to the short list assessment. All these bridges provide strong connectivity benefits for a wide range of customers, covering local journeys (80% of current demand), long distance freight journeys and for all modes of transport. The short-listed vehicle bridge options were:

- Option 4 (Tarbottons Road bridge – all modes)
  - This bridge would be located upstream of the existing SH1 Bridge broadly aligned with Tarbottons Road to the south and connecting with Park Street to the north.
  - The 2014 NoR assessment rejected this option because of the need to acquire business land, connectivity to town centre and inconsistency with road hierarchy. However, it has been progressed to the short list because, whilst it does not provide direct access to the town, it does improve access to education/recreation/health facilities on the north-western side of Ashburton.
- Option 8 (Chalmers Avenue Bridge as per the approved NoR)
  - The option strongly supports the delivery of the Investment Objectives and, depending on the amount of local traffic that would be attracted to the route, could provide long term congestion relief for the SH1 corridor.
- Option 20 (SH1 duplicate bridge)
  - This would be a new two-lane, northbound bridge adjacent to the existing bridge with the existing bridge being used for southbound travel.

  - Would strongly deliver upon the Investment Objectives; however, additional mitigation may be required to resolve potential severance (getting across the state highway) issues.
- Option 21 (a new, longer two-lane northbound bridge with grade separation)
  - This option was progressed on the basis that it would strongly deliver the project Investment Objectives.
  - Acknowledged that the option has a high degree of engineering difficulty and was previously opposed by KiwiRail. Assessment of such factors are undertaken in the short-list stage.

The evaluation of these options cannot be completed in isolation of decisions on improvement options for the Tinwald Corridor. For instance:

- Should a Chalmers Avenue option be progressed, consideration will need to be given as to how it connects back to SH1 in Tinwald. Waka Kotahi have confirmed through the Tinwald Improvements project that access onto SH1 at Graham Street will be improved by introducing signals at Agnes Street. Platooning effects created by the new signals will increased the number of gaps in southbound traffic and make it easier for traffic to turn right out of Graham Street.
- Duplication of the existing bridge would likely require upgrades to existing signalised intersections along the SH1 corridor through Ashburton – e.g. South Street, Moore Street and Havelock Street. It could also generate a need for additional signals in Tinwald.
- Construction of a northbound bridge broadly from Carters Terrace to West Street could potentially include grade separation of northbound vehicle movements from the railway and would still be dependent upon Tinwald Corridor improvements. This would be a very challenging and expensive option.

Options discounted

The key rationale for discounting options at the long list stage were:

- Option 18 (four-laning the existing SH1 Bridge)
  - An initial assessment of the structure has indicated that the bridge is not strong enough to even support wider clip-on shared path extensions. Essentially, four laning the existing bridge would require the construction of a new bridge structure next to the current one. This essentially becomes Option 20.
  - Any construction on the existing bridge could result in significant traffic effects due to the need for partial closure (stop-go at either end of the bridge with only one lane open) of the bridge. This would create long delays and have significant economic cost.
  - Widening the bridge may not solve the resilience issue. The bridge would still function as the only viable route between Tinwald and Ashburton during a major event.
  - Potentially could worsen severance issues for movement across the state highway.
- Option 3 (Oak Grove bridge)
  - Unlikely to function as an effective urban link as the bridge would be too far from Tinwald West development and town centre.
- Option 5 (Trevors Road bridge)
  - Urban fringe alignment means that it is unlikely to help resolve capacity issues on SH1 and does not connect to the main commercial or employment centres.
- Option 6 (Leeston Street bridge)
  - Southern connection is largely rural so may not attract sufficient usage to provide benefits to SH1 corridor. Northern connection is not close to key activity centres and so does not promote its use.
- Option 10 (Chalmers Avenue to Grove Street)
  - Impractical to implement now because of the retirement village north of Grove Street that has been constructed since the 2014 NoR.
- Option 11 (William Street to Grove Street)
  - Impractical to implement now because of the retirement village north of Grove Street that has been constructed since the 2014 NoR.
- Option 13 (Cass Street to Thompson Street)
  - Does not link naturally with the existing road hierarchy which could adversely affect road safety but does use existing road alignments. Hence Chalmers Avenue options preferred over Cass-Thompson.

12.1.3 Active Mode Bridges

Options progressed

Four active modes only options were considered. Each of which would help promote mode shift by expanding the walking and cycling mode network, improving safety for vulnerable users and help reduce vehicle travel demands on the bridge. All options would go some way to delivering all the Investment Objectives, with the main benefit being delivering 'improved travel choice'. Therefore, no options were discounted at this stage.

Key points of differentiation were:

- **Option 19 (improving the clip-ons)** is the simplest option. The Tinwald Improvements project has identified that the current bridge structure could only support widening for a small number of cycle passing bays.
  - The benefits would be a reduction in travel time for existing cyclists. However, a new high-quality connection would be needed to realistically generate notable mode shift.
  - This option aligns with Waka Kotahi's Intervention Hierarchy and an approach to optimise existing assets as much as possible before investing in new infrastructure.
- **Option 7 (Tarbottons Road)** would connect to the industrial area and provide potential onward connections to the recreational centre, education facilities and also the town centre.
- Option 12 (William Street to Carters Terrace) and Option 14 (Cass Street to Carters Terrace) would improve links to the town centre.

As with the vehicle bridge options, these options should be evaluated in the context of the improvements anticipated on the Tinwald Corridor. The preferred option will also be influenced by the location of any new vehicle bridge and the type of active mode facilities that are provided with the bridge.

Options discounted

No active mode bridge options were discounted at the long list stage.

12.1.4 Other Options

Options progressed

Congestion generated by the merge south of the South Street signals was identified by the stakeholder group as a contributing factor to the travel time delays through Ashburton. Addressing the deficiencies in the design would improve its efficiency and contribute to better travel time reliability and reduce crash rates in that area.

Option 24 is a low-cost, low-risk, intervention which would see the existing merge length prior to the bridge (approx. 20m) extended as a means of improving the throughput of the South Street / SH1 signals. This intervention had previously been considered by Waka Kotahi, with a concept design prepared (see **Appendix H**). The initial assessment of this option has established that, whilst on its own would not strongly deliver all the investment objectives, it could form a small package of works that would provide short to medium term benefits to the transport network.

Option 16 (bus service) would help deliver some mode shift and provides alternative options to travel. Benefits could however take a long time to come through, as they would be dependent on the level of patronage. Progression of this option forward should use data from the Timaru on-demand bus service as a reference for potential success.

Options discounted

The following options were discounted at the long list stage:

- Option 17 (rail service)
  - This option would require introduction of a localised rail shuttle between two stations. Operating this with sufficient frequency to make it attractive to users is unlikely to be cost effective
- Option 26 (planning and land use control)
  - The intent of this option is to reduce residential development on the Tinwald side, and by nature limit the number of future trips across the bridge to Ashburton (where most local amenities are located). Existing land zoning would need to be changed to prevent residential development by right, which would likely see strong opposition.
- Option 28 (congestion charging)
  - Unlikely to be practical to implement. Does not increase route choice or mode choice.

- Option 29 (HOV / freight restrictions)
  - The location of Ashburton within the strategic network makes restricting freight movements at peak times impractical without creating large freight parking areas which then affects freight transport costs. This option goes directly against the ‘economy’ problem statement.
- Option 30 (freight rail hub)
  - This option would not necessarily reduce freight volumes on the SH1 Bridge as goods would need to be transported to the hub for the next stage of travel.
- Option 31 (e-scooters)
  - Travel across the bridge via an alternative motorised mode – e.g. e-bike or scooter would involve sharing the traffic lanes and is not considered safe with the high volumes of traffic on the bridge. With improved active mode connections, the uptake of alternative modes such as e-bikes is likely to occur naturally.

12.2 SHORT LIST

The short-list of alternatives that was presented for stakeholder feedback during a workshop on the 14 April 2021 is presented within Table 12-1, and shown diagrammatically as Figure 12-1.

Table 12-1: Short-List

<table>
<tr><th>ID</th><th>Type</th><th>Name</th><th>Description</th></tr>
<tr><td>4</td><td rowspan="4">All modes bridge</td><td>Tarbottons / Park</td><td>All modes bridge connecting Tarbottons Road with Dobson Street and link to Smallbone Drive</td></tr>
<tr><td>8</td><td>Chalmers NoR</td><td>All modes bridge connecting Chalmers Avenue with Tinwald East (Grahams Road)</td></tr>
<tr><td>20</td><td>Duplicate SH1 Bridge</td><td>Duplicate existing bridge with active mode facilities on the new bridge – South Street to Carters Terrace. New bridge would be for northbound movement and existing bridge for southbound movement</td></tr>
<tr><td>21</td><td>West / Carters</td><td>All modes bridge connecting West Street to Carters Terrace with grade separated railway crossing</td></tr>
<tr><td>7</td><td rowspan="4">Active modes</td><td>Tarbottons / Park</td><td>Active mode bridge connecting Tarbottons Road with Dobson Street and connection to Smallbone Drive</td></tr>
<tr><td>12</td><td>Williams / Carters</td><td>Active mode bridge connecting Williams Street with Carters Terrace</td></tr>
<tr><td>14</td><td>Cass / Carters</td><td>Active mode bridge connecting Cass Street with Carters Terrace</td></tr>
<tr><td>19</td><td>Clip-ons</td><td>Widen shared path clip-ons on existing bridge. This would essentially need to be a new adjoining bridge, given the constraints of the current bridge structure.</td></tr>
<tr><td>24</td><td>Other</td><td>SH1 / South Street</td><td>SH1 widening to improve southbound and northbound merge.</td></tr>
<tr><td>16</td><td>Bus</td><td>Timaru-style bus service</td><td>Establish bus based public transport network</td></tr>
<tr><td colspan="4">Composite options</td></tr>
<tr><td>32</td><td colspan="2">Option 19 & 24</td><td>Short to medium term improvements. Could be further improved by including Option 16.</td></tr>
<tr><td>15</td><td colspan="2">Option 7 & 14</td><td>Extend active mode network to include bridges aligned with Tarbottons Road and with Cass Street to promote mode shift.</td></tr>
</table>

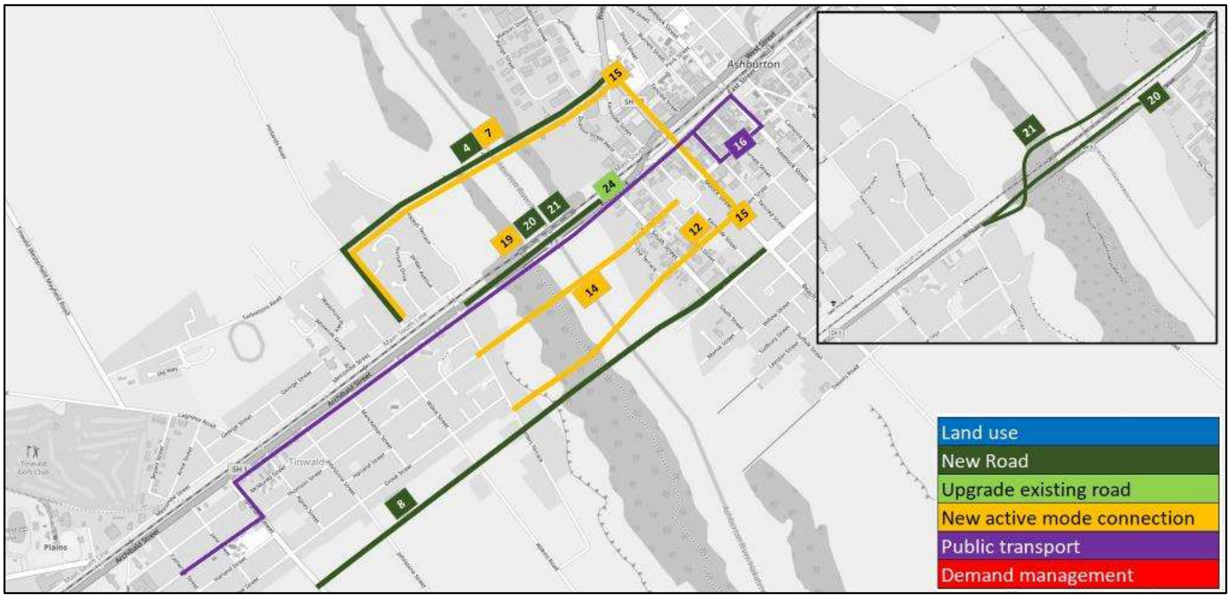


Figure 12-1: Short list of alternatives

13. SHORT LIST ASSESSMENT

The short list was presented to the wider stakeholder group alongside the evaluation of each option. The feedback received was then used to inform an updated assessment. It is important to recognise that the MCA is only one tool for helping to establish a preferred option or programme. It does however help provide further differentiation between alternatives and helps narrow down the field of alternatives further through an assessment against a variety of outcome and risk factors.

13.1 ASSESSMENT FRAMEWORK

The MCA has been broken down into two parts. The first part of the MCA provides an assessment against themes of the **Investment Objectives**. These are outlined below along with the agreed baseline weightings (in line with problem weightings):

- Connectivity – 40%
- Travel Choice – 30%
- Safety – 20%
- Economic Prosperity – 10%

The second part of the MCA assesses options against the wider set of criteria set out in the Waka Kotahi Investment Decision Making Framework (IDMF). Table 13-1 shows the baseline weighting applied to the different criteria prior to any sensitivity investigations. For the baseline evaluation, these have all been equally weighted.

Table 13-1: IDMF Criteria Scoring Baseline Weighting Values

Group	Criteria	Weighting	
Opportunities and Effects	Environmental effects	100%	25%
	Social impacts		Covered under the Investment Objectives
	Climate Change mitigation		25%
	Climate change adaptation		25%
	Cumulative impacts		Covered elsewhere
	Impacts on Te Ao Māori and culture		Captured as part of the design
	Property impacts		25%
Other criteria	Technical Difficulty (inc. buildability)	100%	20%
	Safety and Design		20%
	Consenting		20%
	Scheduling		20%
	Cost		20%

The social impacts of various alternatives have been captured largely by the project objectives, and as such have not been distinctly assessed to avoid potential double counting of these effects.

For the MCA, a set of finer grained attributes for each objective was then developed for each criterion – for instance, the impact of an option on *safety* may be different for cyclists when compared to motorists. **Appendix I** provides a framework for how options have been scored against the various criteria.

The scoring for each criterion was based on a +3 to -3 scale, with +3 indicating significant benefits and -3 indicating significant disbenefits.

13.2 MCA RESULTS

13.2.1 Stage 1: Assessment vs Investment Objectives

The scoring assessment for each Investment Objective was based on a weighted score against a range of attributes as shown in Table 13-2.

Table 13-2: Investment Objectives Assessment Criteria

Connectivity	Safety	Travel Choice	Economy
Access to Education	Pedestrians	Pedestrian Facilities	Journey Time Reliability
Access to Health	Cyclists	Cycle Facilities	SH1 Average Speed
Access to Retail (town centre)	Light Vehicles	Public Transport	Side Road Delays
Access to Recreation	Heavy Vehicles	Emergency Access	Network Resilience
Access to Employment	-	-	-

The combined assessment score for each option was then calculated using the agreed weighting for the individual investment criteria. Table 13-3 provides a summary table of the scoring for the Investment Objectives. The full scoring assessment tables are included as **Appendix J**.

The option scoring generally forms four clusters in line with the option type:

- Cluster 1: Second vehicle bridges (No. 4, 8, 20 and 21), including active mode provisions.
- Cluster 2: Active modes only bridges (No. 7, 12 and 14).
- Cluster 3: Upgrading existing assets or public transport (No.16, 19 and 24).
- Cluster 4: Composite options.

Table 13-3: Scoring Summary for Investment Objectives

	0	4	8	20	21	7	12	14	19	24	16	32	15
Investment Objective	Do Nothing	All modes bridge - Tarbottons / Dobson	All modes bridge - Chalmers NoR option	All modes bridge - Duplicate South / Carters	All modes Bridge - West / Carters	Active mode bridge - Tarbottons / Dobson	Active mode bridge - Williams / Carters	Active mode bridge - Cass / Carters	Shared path clip-on to existing bridge	Improve north and south bound merge	Establish Public Transport Service	Composite Option 19&24	Composite option 7&14
Connectivity	-2.00	1.80	2.20	2.20	1.80	1.20	1.00	1.00	1.00	0.80	0.60	1.20	2.00
Safety	-2.00	2.20	2.80	2.30	2.80	1.80	1.80	1.80	1.20	0.40	0.00	1.60	1.80
Travel Choice	-0.20	1.80	2.00	2.30	1.90	2.20	2.20	2.20	0.60	0.10	0.50	0.80	2.00
Economy	-1.80	1.50	2.00	1.90	1.90	-0.40	-0.40	-0.40	-1.50	0.20	-1.20	-1.20	-0.40
Total	**-1.44**	**1.85**	**2.24**	**2.22**	**2.04**	**1.46**	**1.38**	**1.38**	**0.67**	**0.45**	**0.27**	**0.92**	**1.72**
Rank	13	4	1	2	3	6	7	7	10	11	12	9	5

Do Nothing

A 'Do Nothing' is an unacceptable option because it would see existing issues (inc. resilience, safety, severance, appeal of active modes, route efficiency) worsen as traffic and the population of the town grows.

Cluster 1: Second vehicle (all modes) bridges

The 'all modes bridge' options all score very well against the Investment Objectives. The SH1 duplication option and the Chalmers Avenue options score relatively evenly. The Chalmers Avenue option provides better connectivity across the state highway (reduces severance), whilst the SH1 duplication option provides marginally better connectivity to health care services.

The 'all modes' bridges would go notably further to addressing the Investment Objectives than the alternative options. From a connectivity and resilience perspective, these are the only options that resolve the connectivity issue for motorised transport – which is essential from economic and social connectivity perspectives.

Cluster 2: Active mode only bridges

The highest active mode bridge was the alignment between Tarbottons Road (in Tinwald) with Dobson Street or Smallbone Drive. This connection scored higher because it would provide better connectivity to schools, recreation, and health facilities. The option of combining this link with a second active mode bridge further downstream, to form a more complete network with connections to the town centre (Option 15) also scored well.

The active modes bridges scored poorly against the 'economic prosperity' and 'connectivity' for people who need (or want) to travel by car. On their own, they do not go far enough to address long-term congestion issues (which are inherent to all Investment Objectives). Active mode only bridges are unlikely to bring about the level of mode shift required to ensure efficient travel along SH1 in the long term.

To achieve behavioral change (mode shift), any future active bridge would need to form part of a wider walking/cycle network that provides end-to-end safe journeys. An active mode bridge would likely need to be accompanied by new cycle facilities on local roads (in line with ADC's Walking and Cycling Strategy 2020-2030)[39] to link schools and recreation facilities in Ashburton to residential areas in Tinwald. Opportunities should be explored to link in with cycling improvements proposed as part of the NZUP for the Tinwald Improvements (refer to the Strategic Case).

Cluster 3: Upgrading existing assets or public transport

In isolation, the following options were assessed to only contribute moderately to Investment Objectives:

- Option 24 to improve the merge on SH1 north of the bridge; and
- Option 19 to improve the clip-on structures.

However, when considered as a package these options had similar scores to the active mode bridge options, as they provide some benefits to both motor vehicles and active modes. These options would still contribute to the overarching objectives, and they have a lower risk profile and cost when compared with a new vehicle bridge.

Option 16 (bus service) progressed to the next stage of the MCA assessment as (if it achieved good patronage) would reduce vehicle travel demands across the river. It would also increase social connectivity by providing a connection to the town centre for those who do not have driving as an option.

13.2.2 Is an active-mode clip-on to the existing bridge viable?

To inform the assessment of the short-list, a review of potential 'clip-on' options to the existing SH1 Bridge was undertaken. Generally – there are two potential approaches to widening the active mode links on the existing bridge. One option would involve simply widening the structures, but it is likely that this would restrict the width that could be provided to less than 2m because of the increase in loading on the existing structure. Although this may attract more usage by confident riders, it would not be sufficient to allow for two-way movement of cycles and is unlikely to be considered an attractive route for pedestrians.

The alternative approach would be to construct a wider, light-weight bridge adjacent to the vehicle bridge with capacity to accommodate two-way movement. This would allow the additional loading to be managed

[39] https://www.ashburtondc.govt.nz/__data/assets/pdf_file/0011/33401/14699-Finalise-Walking-and-Cycling-Strategy-for-publish-compressed.pdf

independently of the existing bridge piles. The increased separation from motorised traffic would also make this more attractive for all users.

13.2.3 Stage 2: Assessment vs IDMF Criteria (Key Risks)

Table 13-4 provides a summary of the option scoring against the IDMF criteria **combined** with the scoring against the Investment Objectives. The combined scores were calculated using weightings of 50% for the Investment Objectives, 25% for the Opportunities and 25% for Other Criteria. The full scoring is provided within **Appendix J**.

Table 13-4: MCA – Investment Objectives + IDMF

	4	8	20	21	7	12	14	19	24	16	32	15
	All modes bridge - Tarbottons / Dobson	All modes bridge - Chalmers NoR option	All modes bridge - Duplicate South / Carters	All modes Bridge - West / Carters	Active mode bridge - Tarbottons / Dobson	Active mode bridge - Williams / Carters	Active mode bridge - Cass / Carters	Shared path clip-on to existing bridge[40]	Improve north and south bound merge	Establish Public Transport Service	Composite Opt 19 & 24	Composite option 7 & 14
Investment Objectives	1.85	2.24	2.22	2.04	1.46	1.38	1.38	0.67	0.45	0.27	0.92	1.72
Opportunities / effects	0.75	0.00	0.00	0.25	1.50	1.50	1.50	2.25	1.75	2.00	2.25	1.25
Other Criteria	-1.40	0.20	-1.00	-1.60	0.80	0.60	0.60	1.60	2.20	1.80	1.60	0.60
Total	0.76	1.17	0.86	0.68	1.31	1.22	1.22	1.30	1.21	1.09	1.42	1.32

The MCA identified that:

- The two composite options **(Option 32 and Option 15)** score well by providing greater benefits but are accompanied by greater costs.
- The two best scoring vehicle bridge options were **duplication of the SH1 Bridge** and the **Chalmers Avenue Bridge**. The Chalmers Avenue Bridge option scored better than the SH1 Bridge duplication option largely because of the technical difficulty involved in duplicating the SH1 Bridge. The Chalmers Avenue Bridge could largely be constructed offline with little impact to the transport network during construction.
- **Option 7 (Tarbottons Road)** scored marginally higher than **Option 12 (Williams/Carters)** and **Option 14 (Cass/Carters)** because it has potential to provide better access to a wider range of activities such as education, health care and recreation whereas Option 12 and Option 14 are more focused on access to the town centre.

The vehicle bridge options provide the best alignment when assessed against the Investment Objectives and would deliver the highest benefits. These options score lower overall because of factors which influence cost, technical difficulty and consentability (inc. environment).

The active mode bridge options scored well overall because they were low cost, more technically simple, easy to implement in the short term and would provide benefits for active mode travel in the short to medium term. The active mode options score better against climate change adaption as they do not support car-based trips. However, the return against the Investment Objectives is far lower than when compared to 'all modes' bridges.

Fundamentally, strongly delivering all the Investment Objectives is what the project is about. For this reason, a new all-modes bridge is considered to be an essential component of a programme of investment.

Discounted options

Based on this assessment, the following options were discounted at the short list MCA stage:

- **Option 4 (all modes bridge on the Tarbottons Road alignment)** - scores notably worse than the SH1 duplication and Chalmers Avenue alternatives. It is likely to have greater technical challenges in connecting to the wider road network and would involve more land purchase.

[40] Option reflects that the clip-on would essentially require a new bridge structure.

- **Option 21 (all modes bridge for West/Carters)** - the main benefit of this option was the potential to remove a railway crossing from the transport network. However, achieving this creates a much more complex bridge design and would involve much greater costs. This option has been discounted for these reasons.
- **Options 12 and 14 (active mode only bridge from Williams Street or either Cass Street or Carters Terrace)** - travel demand on these connections could be met by the construction of an all-modes bridge, either with a SH1 Bridge duplication or the Chalmers Avenue option.
- **Option 15 (Composite Options 7 & 14)** - discounted because Option 14 has been discounted. However, the concept of having two active mode connections across the river would still be beneficial in the long term but could be achieved in different ways - for example, Option 7 and Option 20 or Option 19 and Option 8.

13.2.4 Sensitivity analysis

The MCA has been structured so that the sensitivity of the results to changes in the weighting applied to each attribute can be evaluated. The sensitivity tests are shown in Figure 13-1.

		8	20	7	19	24	16	32
		All modes bridge - Chalmers NOR option	All modes bridge - Duplicate South / Carters	Active mode bridge - Tarbottons / Dobson	Improve existing clip-on structures	Improve north and south bound merge	Establish Public Transport Service	Composite Option 19&24
Investment Objectives	40%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	30%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	30%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	0.96	0.59	1.27	1.42	1.37	1.25	1.52
	Rank	6	7	4	2	3	5	1
Investment Objectives	50%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	25%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	25%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	1.17	0.86	1.31	1.30	1.21	1.09	1.42
	Rank	5	7	2	3	4	6	1
Investment Objectives	60%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	20%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	20%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	1.38	1.13	1.34	1.17	1.06	0.92	1.32
	Rank	1	5	2	4	6	7	3
Investment Objectives	70%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	15%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	15%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	1.60	1.40	1.37	1.05	0.91	0.76	1.22
	Rank	1	2	3	5	6	7	4
Investment Objectives	20%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	70%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	10%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	0.47	0.34	1.42	1.87	1.54	1.63	1.92
	Rank	6	7	5	2	4	3	1
Investment Objectives	20%	2.24	2.22	1.46	0.67	0.45	0.27	0.92
Opportunities and Effects	10%	0.00	0.00	1.50	2.25	1.75	2.00	2.25
Other Criteria	70%	0.20	-1.00	0.80	1.60	2.20	1.80	1.60
	Score	0.59	-0.26	1.00	1.48	1.81	1.51	1.53
	Rank	6	7	5	4	1	3	2

Figure 13-1: Sensitivity Analysis

Key findings of the analysis were:

- The greater the bias towards the Investment Objectives, the higher ranking the 'all-modes' bridge options become. The 'tipping point' for these options becoming the best ranking is when the Investment Objectives are given a weighting of around 60% or above. Active mode bridge options also continue to rank well under all the scenarios.
- Providing clip-ons for active modes on the existing bridge and establishing a bus service score well when 'opportunities and effects' are heavily weighted (70%). This reflects the low cost, but lower impact (e.g. to the environment) nature of the alternatives.
- When 'other criteria' (covering technical difficulty, cost and consentability) is heavily weighted at 70%, again the low-cost interventions begin to rank highest. The best scoring option under this scenario is the option to address the SH1 / South Street merge.

13.3 SUMMARY

13.3.1 Conclusions of short list assessment

The MCA has acted as a useful tool for understanding the best options under each of the 'all modes bridge', 'active modes only bridge' and 'other' categories. It has shown that:

- The **Chalmers Avenue (Option 8)** and duplication of the **SH1 (Option 20)** bridges score relatively evenly, but notably better than alternatives. Both options have therefore been taken forward for more a detailed assessment (using traffic modelling) to understand the relative benefits of each option.
- Previous consultation undertaken by ADC in relation to future second bridges has indicated that opinions within the local community are currently divided around which option should be taken forward. Since the MCA process is largely subjective, transport modelling provides more objective assessment information to inform the decision on any preferred option.
- The **Tarbottons / Dobson active mode bridge (Option 7)** scores better than the alternative locations because it has the potential to provide better connectivity for multiple activities, whereas the other locations would only benefit the town centre. This option would strongly deliver upon the project investment objectives for non-vehicle modes, plus providing some resilience benefits (e.g. allowing access to emergency vehicles).
- **Improving the north and southbound merge at the South Street intersection (Option 24)** is a low-cost, low-risk option that would provide safety benefits. On its own, it would not strongly deliver upon the Investment Objectives. However, it would be a short-term intervention that should form part of an overall programme of works.
- A **bus service** that would operate with flexible routing, similar to the current Timaru services, should still be considered. Further investigation would be required to establish the benefits of this option. This can only be undertaken once the patronage and general success of the Timaru bus trial has been established.

The MCA process established a narrowed down short list, which includes a new 'all modes' bridge, an active modes bridge, the upgrade of the South Street intersection and a potential bus service.

13.3.2 Establishing a preferred programme

The next section of the report provides a summary of the traffic analysis which has been used to answer the following questions:

1. Which alignment for the 'all modes bridge' is the most suitable? The Chalmers Avenue alignment or duplication of the SH1 Bridge?
2. What does the traffic growth and travel time profiles look like over time? And when do peak hour impacts become unacceptable?
    - Consideration needs to be given to journey times on typical Monday-to-Thursday, but also during Fridays when volumes throughout the day increase by around 10%.

Along with the traffic modelling, the recommendation of the preferred programme has considered the following:

- How ADC and Waka Kotahi want their future road network to function. Is there a desire to 'keep traffic on the state highway' and focus capacity improvements to just this corridor?
- Opportunities to facilitate future growth in the desired areas – i.e. residential areas to the east of Ashburton and Tinwald, and expansion of the Ashburton Business Estate.
- Whether focusing investment into walking and cycling alone can realistically bring about significant changes to mode shift. Since Ashburton is a rural service town, it means that a high proportion of trips into town (20%) are from rural areas (>10km), and driving is the only viable option. At least 20% of trips across the river are long-distance regional trips where again active modes would not be an option.

14. TRAFFIC MODELLING OF BRIDGE OPTIONS

14.1 OVERVIEW

The section of the report presents the following information, derived from a traffic modelling exercise:

- 'Do Minimum' effects. What level of congestion and queuing would be expected up until 2041 if only Do Minimum interventions are introduced?
- The traffic effects of the 'Chalmers Avenue' and 'SH1 duplication' options.

The traffic modelling report is provided as **Appendix K**.

14.2 MODELLING METHODOLOGY

14.2.1 Overview

The traffic modelling assessment has been undertaken in two stages.

The first stage involved the development of a wide area, strategic transport model using the TRACKS software. The model is based off a zone structure that aligns with the 2018 Census statistic areas and uses census data such as numbers of household and jobs to establish the local area travel demands within and between Ashburton and Tinwald. Traffic survey data, including number plate matching, was then used to estimate the wide area movement patterns through the towns, which were calibrated using recent traffic survey information.

The forecast changes in land use provided by ADC has then been used to estimate how travel demands would be expected to evolve in the future. An overview of the expected increase in household numbers across the area is summarised in Table 14-1. It shows that Lake Hood, Tinwald-Plains, Netherby and Fairton-Ashburton Northwest are the areas where the highest number of new homes are planned.

Table 14-1: Land use projections (households)

Area	2021	2026	2031	2036	2021-2041 growth	
					Percentage	Absolute
Allenton East	1871	1936	1987	2089	1%	218
Allenton West	879	902	924	963	0%	84
Ashburton Central	1413	1457	1501	1588	1%	175
Chertsey	1059	1089	1124	1193	1%	134
Fairton-Ashburton Northwest	735	844	939	1123	3%	388
Hampstead	1237	1261	1285	1335	0%	98
Hinds North	1043	1004	957	986	0%	-57
Lake Hood	234	334	434	500	6%	266
Netherby	874	949	1014	1140	2%	266
Tinwald-Plains Railway	1680	1751	1815	1943	1%	263
Total	11,025	11,527	11,980	12,860	1%	1835

Since the TRACKS model network is based on a relatively coarse road network, the second stage of modelling involved the development of a more detailed road network model using Paramics micro-simulation software. This software assesses the interaction between individual vehicles and provides a robust assessment of the effects of interactions between closely spaced intersections such as those along the SH1 corridor and within the urban area generally. Paramics uses the travel demand information from the TRACKS model as an input and has been used to evaluate the road network performance under the following scenarios:

- Do Minimum – this includes the existing road network and planned improvements.
- Chalmers Avenue Bridge and associated new roads in Tinwald.
- Duplication of the SH1 Bridge.

The road network performance has been evaluated in the morning, evening and inter-peak periods with travel demands for 2021, 2031 and 2041.

14.2.2 Do Minimum

From a traffic modelling perspective, the Do Minimum includes the new signals at Walnut Avenue / SH1 and Lagmhor Road / Agnes Street / SH1.

14.2.3 Assumptions

Key assumptions that have informed the options assessment are:

- Chalmers Avenue
  - The following roads would function at higher level in road hierarchy, to connect to/from the Chalmers Bridge and Chalmers Avenue extension (through to Grahams Road):
    - Graham Street / Grahams Road
    - Wilkins Road / Wilkins Road
    - South Street
- SH1 duplication
    - Four lanes from south of bridge through to north of SH1 / Moore. This includes:
    - SH1 / Moore through lane capacity increased (left slip to SH77 removed)
    - Left-in / Left-out at Dobson / SH1
    - East Street / SH1 – allowing for the right turn in (as the identified queue is manageable)
    - Left-in / Left-out at Kermode St / SH1

14.3 DO MINIMUM

14.3.1 When does congestion trigger the need for more road capacity?

Impacts to local journeys

Most journeys across the existing SH1 Bridge are local journeys between Tinwald and Ashburton. Since the majority of community facilities are located within Ashburton, this has the effect of increasing traffic volumes on SH1 not just at the bridge but also further north. The higher volumes on SH1 within Ashburton not only affects travel times along SH1 but also local movement across SH1.

Table 14-2 shows the baseline free-flow travel times for local travel to and from the town centre as well as travel along the urban section of SH1. Figure 14-1 shows the sectors for the analysis.

Table 14-2: Freeflow Travel Times (minutes)

Route	Baseline Travel Time – Free flow (Minutes)
North to South	14.0
South to North	14.0
Tinwald to Town Centre	5.0
Town Centre to Tinwald	5.0
Northern Residential to Town Centre	4.0
Town Centre to Northern Residential	4.0
North to Town Centre	6.0
Town Centre to North	6.0

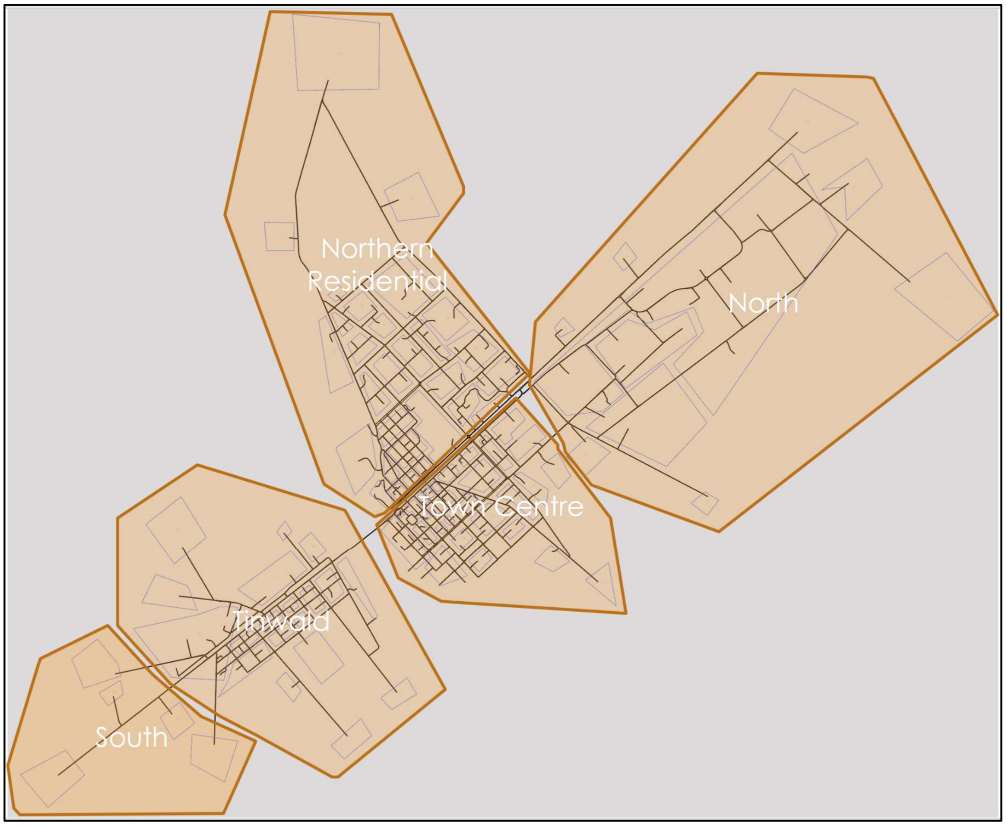


Figure 14-1: Sectors for Threshold Analysis

Table 14-3 shows the forecast changes in travel time delays for local travel to and from the town centre on a typical weekday (Monday to Thursday) during the interpeak (IP) period and the evening (PM) peak period. These represent the times of day with the highest travel demands to or from the town centre. Cells highlighted in red relate to delays greater than four minutes[41] with cells highlighted in orange having delays of more than two minutes.

Table 14-3: Forecast Changes in Local Travel Time Delays – Weekday (Mon-Thu)

Route	**Inter peak** Travel Time Delay (Minutes)			**Evening Peak** Travel Time Delay (Minutes)		
	2021	2031	2041	2021	2031	2041
Tinwald to Town Centre	0.76	1.10	1.64	1.08	2.72	5.32
Town Centre to Tinwald	0.81	1.18	2.05	0.96	1.89	5.08
Northern Residential to Town Centre	0.32	0.44	0.72	0.66	1.09	2.67
Town Centre to Northern Residential	0.39	0.52	0.78	0.73	1.09	2.70
North to Town Centre	1.07	1.02	1.08	0.57	0.75	2.71
Town Centre to North	1.30	1.48	1.66	0.81	1.15	2.05

During the inter-peak, the increases in travel time are 1-2 minutes by 2041. However, during the evening peak period there are significant increases in travel time delay forecast in the 2031-2041 period - generally more than five minutes. As travel times increase, this will influence people's decisions to travel because the delays are seen as barriers to travel.

[41] This threshold ties back to the Investment Objectives and KPIs

Impacts to journeys along the state highway with Ashburton and Tinwald

SH1 also plays a vital part in supporting inter-regional travel and ensuring reliable journey times is vitally important for the transportation of freight (particularly spoilable goods).

Table 14-4 shows the expected increases in the travel time along SH1 through Ashburton for the Monday-Thursday AM, IP and PM peak periods compared with free-flow travel. The model results show that:

- During the AM and IP periods, travel times could increase by about one minute by 2041. This reflects the relatively low traffic volumes using SH1 compared with the evening peak period.
- The travel demands on SH1 are significantly higher during the evening peak period and with the forecast growth, travel time delays are expected to be about five minutes for northbound travel and over ten minutes for southbound travel.
- The large increase in travel time delays in the evening peak period between 2031 and 2041 suggests that the forecast travel demands along the SH1 corridor will exceed the capacity of SH1 without further intervention.

Table 14-4: Forecast Changes in Travel Time Delays on SH1 – Weekday (Mon-Thu)

Year	North to South Travel Time Delay (Min)			South to North Travel Time Delay (Min)		
	2021	2031	2041	2021	2031	2041
AM	1.41	1.64	1.91	1.05	1.38	1.63
IP	1.84	2.24	2.99	1.39	1.72	2.11
PM	1.64	2.41	6.71	1.50	2.09	3.39

The 'Friday effect'

Figure 14-2 shows the hourly traffic volumes recorded on SH1 south of the bridge in June 2021.

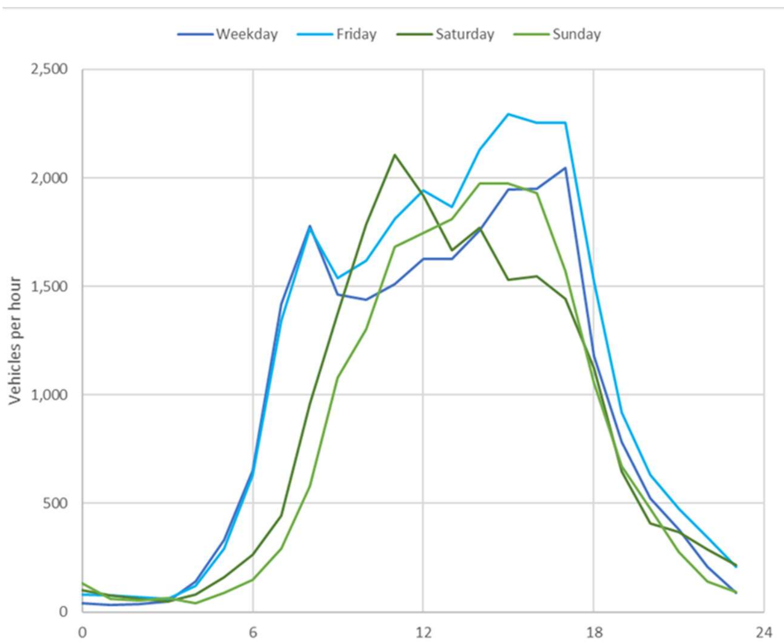


Figure 14-2: Hourly Traffic Volumes South of SH1 Bridge – June 2021

The data indicates that the Friday volumes were generally about 10% higher than on a weekday throughout the day and exceeded the weekday evening peak hour volumes for about five hours. Traffic volumes at the weekend were also comparable to the evening peak hour volume for part of each day.

Since travel demands on Fridays are higher than on other weekdays, the travel time delays experienced on a Friday will be greater than those that occur earlier in the week.

Summary

Overall, the model results suggests that to address typical Monday to Thursday delays, improvements to the transport network will be required sometime after 2031. However, to address congestion issues on a Friday, improvements will be required prior to 2031.

The timing will be dependent upon the growth in traffic volumes over the 2021-31 period.

14.4 SH1 DUPLICATION VS CHALMERS AVENUE

14.4.1 Overall transport network performance

Table 14-5 shows the forecast average travel times for all trips within the model network for the AM, IP and PM peak periods in 2021, 2031 and 2041. Key differences between the SH1 duplication and Chalmers Avenue options are highlighted, noting that both options provide travel time benefits over the 'Do Minimum' option.

Table 14-5: Average Travel Times within Model Network (minutes) – Light Vehicles

Period	2021			2031			2041		
	Do-Minimum	Chalmers Av Bridge	SH1 Duplication	Do-Minimum	Chalmers Av Bridge	SH1 Duplication	Do-Minimum	Chalmers Av Bridge	SH1 Duplication
AM	5.3	5.2	5.3	5.5	5.4	5.5	5.8	5.6	5.7
IP	5.3	5.3	5.3	5.7	5.6	5.6	6.0	5.9	5.9
PM	5.4	5.4	5.4	5.9	5.7	5.9	7.0	6.3	6.6

While the differences in travel times are small, in each case, the Chalmers Avenue Bridge option reduces the average travel times compared with the Do-Minimum and SH1 Duplication option.

Figure 14-3 shows graphically the variation in travel times during the afternoon in 2041. The model shows a small increase in travels in the mid-afternoon which is likely to be related to school travel and a larger increase after 17:00. **The results clearly show that by 2041, the Chalmers Avenue Bridge option provides significant travel time benefits compared with the Do-Minimum and SH1 Bridge duplication options**.

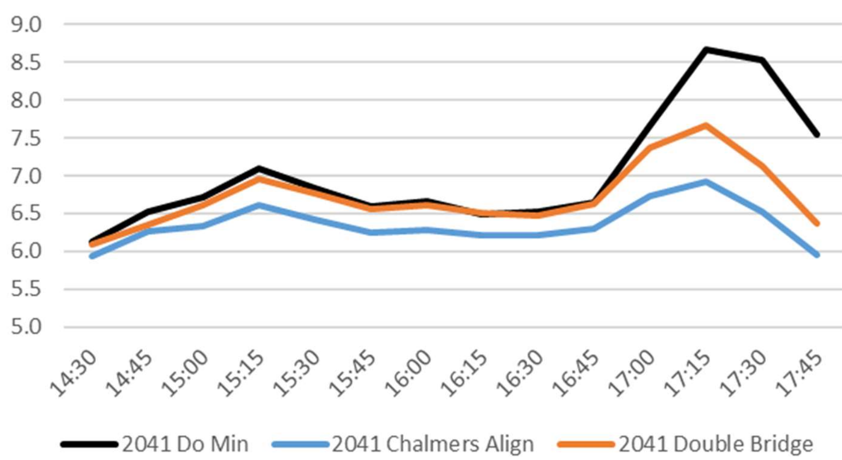


Figure 14-3: Average Travel Times - 2041 PM

14.4.2 Travel time variability – local movements

Travel time delays for local trips in the morning and inter-peak periods are forecast to be less than 1 minute for most trips. The main exception to this is for trips between Tinwald and Ashburton which have a forecast delay of 1-2 minutes with the SH1 Bridge duplication option.

Table 14-6 shows the forecast changes in travel time delays for local trips during the more critical weekday evening peak period under the Do-Minimum, Chalmers Avenue Bridge and SH1 Duplication scenarios.

Table 14-6: Travel Time Delays for Local Travel (minutes) – Weekday Evening Peak

From / To	2021			2031			2041		
	Do Minimum	Chalmers Av Bridge	SH1 Duplication	Do Minimum	Chalmers Av Bridge	SH1 Duplication	Do Minimum	Chalmers Av Bridge	SH1 Duplication
Tinwald to Town Centre	1.08	0.21	0.95	2.72	0.41	1.74	5.32	0.66	3.60
Town Centre to Tinwald	0.96	0.45	1.09	1.89	0.78	1.88	5.08	1.50	3.20
Northern Residential to Town Centre	0.66	0.79	0.77	1.09	1.21	1.14	2.67	1.63	1.45
Town Centre to Northern Residential	0.73	0.74	0.77	1.09	0.96	1.01	2.70	1.54	1.46
North to Town Centre	0.57	0.56	0.59	0.75	0.69	0.64	2.71	2.43	3.14
Town Centre to North	0.81	0.82	0.88	1.15	1.07	1.12	2.05	1.71	1.74

Delay saving compared to the Do Minimum

> 1 minute	30 to 60 seconds	10 to 20 seconds	+10 to -10 seconds	-10 to -30 seconds

Overall, the Chalmers Avenue Bridge option provides greater reduction in travel time delays for local travel compared with the SH1 Bridge duplication. This means that it more directly addresses the severance issues – a key objective for the project.

Where the SH1 Bridge Duplication does provide lower forecast delays, the differences compared with the Chalmers Avenue Bridge are small, less than 10 seconds. By comparison, where the Chalmers Avenue Bridge shows lower travel time delays, the differences are generally greater than 30 seconds. The Chalmers Avenue Bridge removes most of the delay for travel between Tinwald and the Ashburton Town Centre – with delays in the 2041 down from 5 minutes (for the Do Minimum) to less than 1 minute.

14.4.3 Travel Time Variability – State Highway Movement

Time vs. distance graphs for travel on SH1 through Ashburton are shown in the graphs provided within the modelling report (**Appendix K** – Section 9.4 of the report). for each modelled year.

The graphs indicate that there are consistent reliability improvements in the northbound direction for both Bridge options, but particularly with the Chalmers Alignment in 2041 and again in the PM period. In the southbound direction there is little difference between the Do Minimum and options until 2041 where both options begin to show reliability improvements, with the Chalmers Alignment again showing greater improvement.

Overall, **as the travel demands increase the Chalmers Avenue option provides a better network outcome with lower travel time delays along SH1.**

14.4.4 Traffic Volumes

Table 14-7 shows the forecast traffic volumes on the SH1 and Chalmers Avenue Bridge under the two bridge alignment options that have been evaluated. With the Chalmers Avenue Bridge in place, it is expected to carry a two-way volume of about 500 vph in 2031 during the weekday evening peak and about 600 vph by 2041. Higher volumes could be expected on Fridays or during very high travel demand periods at the weekend. The traffic volumes on SH1 remain at or below current weekday volumes.

Based on the peak hour volume being about 10% of the average daily traffic volume on a road, this suggests that the Chalmers Avenue Bridge could be carrying about 5,000 vpd in 2031 and about 6,000 vpd in 2041. These volumes are lower than was forecast in the modelling work that was completed for the NOR. Despite this, there appears to be sufficient transfer of movement to the new bridge to allow the existing SH1 Bridge and SH1 corridor to operate effectively without the need for significant investment in the corridor.

Table 14-7: Forecast Traffic Volumes on Bridges

Year / Period		Northbound					Southbound				
		Do-Min	Chalmers Bridge Alignment			SH1 Bridge	Do-Min	Chalmers Bridge Alignment			SH1 Bridge
			SH1	CBA	Total			SH1	CBA	Total	
2021	AM	750	630	140	760	770	450	380	80	450	470
	IP	820	740	140	890	850	900	750	170	920	920
	PM	1,010	830	190	1,020	990	1,070	820	210	1,030	1,030
2031	AM	920	750	170	920	930	560	450	100	550	540
	IP	1,040	860	180	1,040	1,050	1,110	890	210	1,100	1,120
	PM	1,230	1,000	230	1,230	1,230	1,310	1,030	260	1,290	1,280
2041	AM	1,050	830	190	1,010	1,030	620	490	90	580	610
	IP	1,210	990	220	1,210	1,180	1,250	1,010	250	1,260	1,300
	PM	1,360	1,130	250	1,390	1,340	1,460	1,150	340	1,490	1,490

14.4.5 Effects on Intersection Safety

The Chalmers Avenue Bridge option is expected to provide some network wide safety benefits by reducing the demand for right turns from Tinwald East onto the state highway. This manoeuvre is subject to long delays at peak times because of the high volumes of traffic on the state highway.

Table 14-8 provides a comparison of right turn demands at two intersections in Tinwald in 2041. It shows that the Chalmers Avenue Bridge option reduces the demand for right turns which will contribute to less risk-taking behaviour by drivers and would reduce the potential for crashes.

Table 14-8: Comparison of Right Turn Demands onto SH1 in Tinwald

Location	Time Period	Do Minimum	SH1 Duplication	Chalmers Avenue Bridge	Difference
Grahams Road	AM	155	147	89	(57)
	PM	83	79	50	(29)
Agnes Street	AM	97	95	93	(2)
	PM	94	92	88	(4)

14.4.6 Assessment against the Investment Objectives

Table 14-9 provides an assessment against the Investment Objectives. In line with the approach to the MCA the strength of each option in delivering each Investment Objectives has been ranked according to a -3 to +3 scale.

Table 14-9: Evaluation of vehicle bridge options vs the Investment Objectives

Investment Objective			Commentary	Strength of alignment	
				Chalmers Ave	SH1 Duplication
Connectivity and severance	40%	Ensure residents of Tinwald can always easily access key community facilities in Ashburton by a variety of modes, even during a major event (such as a flood) by 2031.	Both options will increase the river crossing capacity and would reduce the length of any detour route to less than 10 km in the event that a single bridge was closed.	3	3
		Improve travel time reliability for journeys within and between Ashburton and Tinwald so that weekday peak-hour journey times do	Overall, the Chalmers Avenue Bridge option provides greater reduction in travel time delays for local travel compared with the SH1 Bridge duplication.	3	2

Investment Objective			Commentary	Strength of alignment	
				Chalmers Ave	SH1 Duplication
		not exceed off-peak journey times by more than 2 minutes.			
Travel choice	30%	Increase the number of peak hour active mode journeys across the river to 50 per hour by 2026.	It is anticipated that a high quality, separated facility for pedestrians and cyclists would be provided on any new bridge. This would create travel mode choice and would be expected to contribute to promoting active modes. The lower traffic volumes on Chalmers Avenue would make this a more attractive route than SH1 but could require less direct travel for many trips such as between Tinwald and the town centre which could reduce its attractiveness.	2	3
Safety	20%	Improve the safety level of service (LOS) for cyclists crossing the Hakatere (Ashburton) River from LOS C to LOS B or better by 2026.	Both bridge options will provide a safe route for walking and cycling. Since the Chalmers Avenue Bridge reduces traffic volumes on SH1 and reduces the demand for right turns onto SH1 in Tinwald, it is expected to reduce the potential for crashes at intersections and along the highway. This will contribute to greater reductions in collective and personal risk compared with the SH1 Duplication option.	3	2
		Reduce the risk of crashes at intersections by reducing the demand for right turn demands by 2031.	The Chalmers Avenue option encourages traffic onto alternative routes which do not require the more dangerous right turn onto the state highway.	3	1
Economic prosperity	10%	Improve travel time reliability for journeys along SH1 through Ashburton and Tinwald so that weekday peak-hour journey times do not exceed off-peak journey times by more than four minutes by 2031.	The analysis of the forecast travel time delays on the road network compared with free-flow travel times both locally and along SH1 demonstrates that the Chalmers Avenue Bridge provides greater benefits than the SH1 Duplication option. Average delays of less than 2 minutes will be achieved for local travel during the weekday evening peak period and that average delays for movement along the SH1 corridor will be less than 4 minutes.	3	2
Weighted final score				2.7	2.4

Overall, the Chalmers Avenue Bridge option provides the best alignment with the Investment Objectives.

14.5 PREFERRED VEHICLE BRIDGE ALIGNMENT

The traffic modelling and MCA results have established a clear preference for a Chalmers Avenue Bridge over the SH1 duplication option.

14.5.1 Why is Chalmers Avenue preferred?

The key reasons are:

- **Investment objectives** – the Chalmers Avenue option will more strongly deliver the Investment Objectives. At the core, this is why investment is being made.
- **Congestion and efficiency** - the modelling indicates that the Chalmers Avenue Bridge will attract up to 500 vehicles per hour by 2041. This level of traffic diversion is enough to keep the state highway operating efficiently during all peak periods out to 2041 (and likely beyond).
- **Severance** - the Chalmers Avenue Bridge reduces traffic on the state highway, whilst the SH1 duplication encourages more traffic through this single corridor. A Chalmers Avenue Bridge will reduce, rather than increase, the east-to-west severance issues which are already an issue.
- **Safety –** the Chalmers Avenue Bridge reduces the number of vehicles turning right onto the state highway from give-way controlled intersections in Tinwald and reduces the likeliness of turning related crashes. Some

people might also choose to take a longer route via Chalmers Avenue because it would be a safer route rather than take additional risks by trying to turn onto the state highway from give-way intersections.

- **Land use** – directly supports the council's future land use plan, with residential growth targeted for east Tinwald/Lake Hood and employment growth in the Ashburton Business Estate. The option will help to better the shape the town – i.e. away from bring one that is long, thin, and follows the state highway corridor.
- **Construction impact** – the Chalmers Avenue Bridge and new road through to Grahams Road can be constructed almost entirely offline, with minimal impact to the community. A SH1 Bridge duplication would require some periods of temporary speed restrictions and active temporary traffic management along the existing state highway.
- **Complexity** – the Chalmers Avenue Bridge is technically less complicated to build, with fewer constraints (e.g. railway line) and limited property impacts. The SH1 Bridge duplication option has potentially significant property and constructability challenges to overcome. Waka Kotahi have identified that it will be very difficult to build a new bridge on either the upstream or downstream sides of the existing bridge.
- **Consentability** – Since a designation for the Chalmers Avenue Bridge alignment is already in place, this will ease the process of property acquisition. The earlier work also means that some information on potential adverse effects is already available for the resource consent application.
- **Alignment to strategies** – a Chalmers Avenue Bridge is aligned with the Council's future cycling network.
- **Climate change** – the modelling has identified that the Chalmers Avenue Bridge will help bring about an overall network reduction in vehicle km traveled and travel times. Both factors help reduce carbon emissions.
- **Recreation** – the location of the bridge means that recreational users of the river mountain bike trails no longer need to 'choose one side or the other' – the bridge will connect the two sides and create a new cycling route between Ashburton and Lake Hood.
- Creates new opportunities – these include:
- Encouraging tourists to stop in, rather than pass through, the town. The Chalmers Avenue option opens the opportunity to make better use of the valuable natural asset that Ashburton possesses – the river. Potentially parking near the bridge and new linkages to the recreational trails can encourage more visitors and wider commercial opportunities.
- It also opens the opportunity to work with developers to introduce amenities such as a small supermarket or pharmacy as part of new Tinwald developments.

Notwithstanding the above, both options would deliver much improved connectivity, address the resilience issue, improve reliability for freight movement and provide better travel choices. Whilst the preferred option is the Chalmers Avenue alignment, the SH1 duplication is a suitable back-up option.

14.5.2 How does the Chalmers Avenue option benefit the state highway?

The Chalmers Avenue option provides the following direct benefits to the state highway corridor:

- It redistributes enough traffic away from SH1 to keep that corridor operating efficiently for the next 30 years without the need for further investment in the state highway.
- A reduction in traffic accessing the state highway from Tinwald strengthens the outcomes (safety and efficiency) that are being sought through the Tinwald Corridor Improvements SSBC.
- Improves safety by reducing turning movements between the state highway and side roads in Tinwald.
- Reduces the effects of severance being created by high traffic volumes on the state highway.

14.6 TIMING

The timing for when the Chalmers Avenue Bridge could, and should, be built needs to consider several factors:

- Timeframes required to take the project through the DBC, design, consenting and construction phases.
- The year congestion reaches unacceptable levels during Monday-Thursday, and also Fridays.
- The urgent need to construct the bridge for resilience reasons.
- The economic case for constructing both a 'all modes' bridge at Chalmers Avenue and walking/cycling bridge at Tarbottons Road during the medium term.

Figure 14-4 presents the decision-making process for establishing a recommended timeframe for the bridge.

When is the earliest date the Chalmers Avenue bridge could be constructed?

2026-27

Timeframes required to get the project 'shovel ready' and constructed

DBC *- start of 2022 to mid 2023*
DBC funding approval *- mid 2023-end 2023*
Detailed design and consenting *- start 2024 to mid 2025*
Procurement *- mid 2025 to end 2025*
Bridge construction *- 2025 to 2026 (potentially 2027)*

↓

To address the congestion issues - when is the Chalmers Avenue bridge required?

2030-31

Monday to Thursday congestion - *a signficant issue every weekday sometime between 2031 and 2041.*

Friday congestion - *likely to be a signficant issue every Friday before 2031*

Taking a balance between resolving congestion issues for 1 day of the week vs 5 days of the week. It is reasonable to conclude that resolving the 'Friday effect' brings forward the timeframe by 1-2 years.

Note - the new signals at Agnes Street and Walnut Avenue will improve travel times in the short term

↓

So, why not wait until 2030?

The resilience and active mode issues being experianced are critically poor

Resilience - there is a need from a resilience point of view to have a second bridge now (2021). However, as above - the earliest a second bridge could realistically be opened is 2026/27.

Poor quality active travel provisions - The quality of the facilities for pedestrians and cyclists on the existing SH1 bridge is very poor. There is a clear government direction that investment should be made to encourage more people to walk and cycle.

Should Council and Waka Kotahi 'live with' the significant resilience and active travel issues for the next 10 years?

No, for the reasons above. This then leaves open two options

1) Bring forward a walking/cycling bridge at Tarbottons Road

This would provide excellent benefits only for pedestrians and cyclists (plus potentially emergency vehicles). This option would not resolve the resilience issues for vehicles - which currently accounts for near 99% of the users of the bridge.

2) Bring forward the construction of the Chalmers Avenue bridge

The bridge will resolve both the active modes and resilience issues.

Which option makes most sense?

Bring forward the construction of the Chalmers Street bridge

Value for money
Knowing that a second vehicle bridge is required for congestion reasons by approximately 2030, it is likely to be far more economical to bring forward the construction of the Chalmers Avenue bridge than invest in two separate bridges during the same 10 year timeframe.

The customer base
We need investment to benefit the largest possible number of customers and resolve the core issue - which is poor connectivity. Ashburton's catchment is very large, and for many people walking, cycling and public transport will never be options. Freight operaters are also important customers and ensuring they can reliability transport goods along the state highway is a key government priority.

Responding to growth strategies
East Tinwald, Hampstead and Lake Hood are key growth residential areas which would directly benefit from a Chalmers Avenue bridge.

↓

What is the indicative timeframe for the Chalmers Avenue Bridge?

2026

Deliver all the pre-implementation work during the next NLTP funding period of 2025-27. The timeframe for bridge construction is dependant on when funding is allocated, which is unknown at this stage.

Figure 14-4: Decision process for establish timing for the Chalmers Avenue Bridge

15. PREFERRED OPTION

15.1 OVERVIEW

The outcome of the options assessment process is the following technically preferred programme of works:

Short term (2022-2024)

- Minor upgrade to the South Street / SH1 intersection to extend the southbound merge.
- The northbound and southbound merge areas either side of the SH1 / South Street signals are shorter than recommended in current design standards. This contributes to inefficient approach lane use and does not allow drivers to merge smoothly on the departure. This creates delay by slowing vehicles and contributes to congestion.
- Investigations by Waka Kotahi indicate that there is sufficient space between the bridge and railway crossing to extend the merge zones. It is recommended that this project is implemented in the short term to improve the operation of the merge zones which will contribute to reducing congestion and the potential for crashes. This project could progress into detailed engineering design for tender.
- Clip-on passing bays, for cyclists, on the existing SH1 Bridge.
- Waka Kotahi are currently undertaking a feasibility study for this intervention – however, no funding commitment has yet been made.

Medium term (2025-2030)

- Construct a new second bridge which will connect to Chalmers Avenue in Ashburton. A new road will connect the bridge through to Grahams Road in Tinwald. The bridge will include high-quality provisions (physical separation) for pedestrians and cyclists (2026-2027).

Appraisal Summary Tables (ASTs) are provided within **Appendix L**.

15.2 APPROVAL TO COMPLETE THE BUSINESS CASE

The technically preferred programme was presented to Council in October 2021, where councilors voted to progress with the ‘medium term’ recommendations – i.e. a new second bridge that follows the Chalmers Avenue alignment. The short-term interventions (South Street / SH1 upgrade and clip on cycling passing bays) can be progressed by Waka Kotahi through to design and tender. As such, Council confirmed that these did not need to form part of the scope for the DBC.

The final stage of the DBC therefore focuses around refining the design and cost estimate **only for the Chalmers Avenue second bridge.** The following sections detail:

- The proposed design for the new bridge.
- The proposed design for a new road that would connect the bridge through to Grahams Road.
- The economic case for the project.
- The commercial, management and financial cases.

PART B2: PREFERRED OPTION (CHALMERS AVENUE BRIDGE)

16. BRIDGE DESIGN

The overall concept design for the project is provided as **Appendix M.** The design of the bridge and new road has been informed by input from key stakeholders and ADC roading engineers. The design for the whole project has been through a road safety audit process, with final sign-off from ADC.

The design of the bridge crossing for this project is presented and discussed in detail in the document *ATC – Preliminary Structure Options Report,* provided within **Appendix N**.

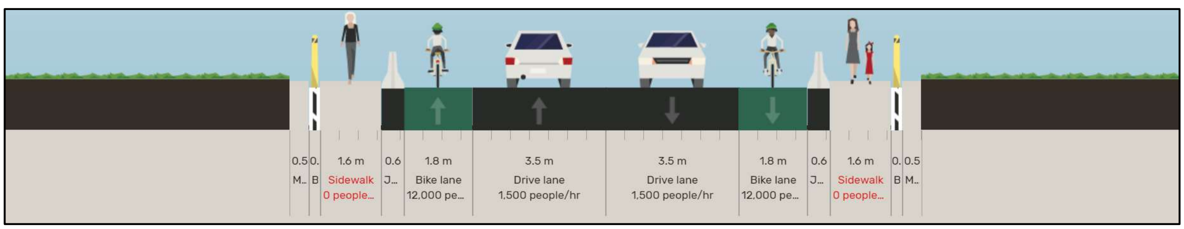
16.1 BRIDGE DIMENSIONS

The proposed bridge crosses the Hakatere River approximately 0.8km downstream of the existing SH1 crossing. The total crossing length from stop bank to stop bank is around 650m. The proposed crossing will comprise:

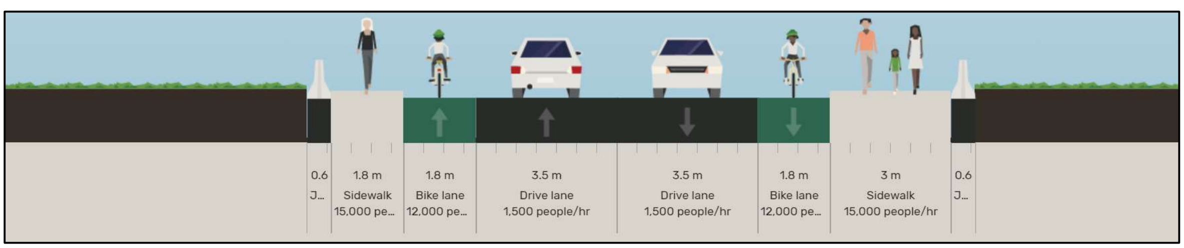
- A primary bridge crossing the main river channel (approximately 360m in length).
- A secondary bridge providing drainage of the true left flood plain (approximately 60m in length).
- Earth fill approaches at each stop bank and within the heavy vegetation on the right bank

16.1.1 Cross-section

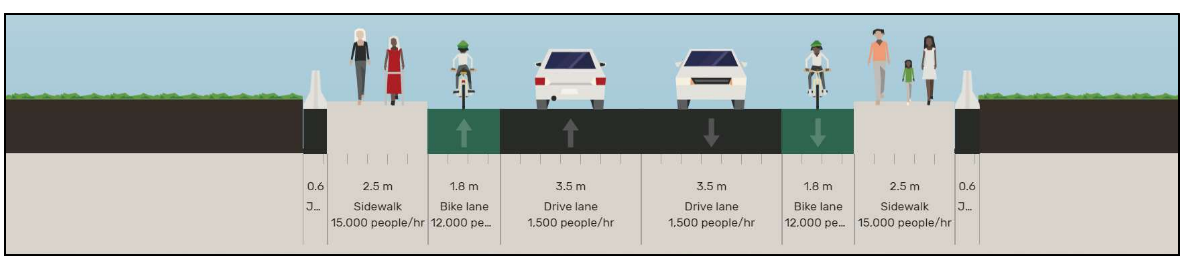
Several bridge carriageway configurations were considered and worked through with stakeholders. The three main options considered as presented within Figure 16-1.



Option 1 - NoR design (2013)



Option 2 - Single Shared Path



Option 3 – Dual Shared Paths

Figure 16-1: Bridge cross-section options

Option 3 (dual shared paths) was agreed by ADC and Waka Kotahi as the preferred cross-section for the bridge for the following reasons:

- There was agreement that the **cross-section of the bridge should not be compromised** by having only one shared path or attempting to minimise the available carriageway width. The existing SH1 is evidence of the need to futureproof for a structure that is intended to have a lifespan of over 100 years. There would be significant difficulty in coming back in later years to widen or add clip-ons.
- The cross-section strongly delivers on the project Investment Objectives, which has a strong focus around providing a high-quality active mode infrastructure.
- As a means of managing the speeds of vehicles a narrow vehicle lane with wide centreline treatment was developed, to provide some visual constriction, without removing the physical road space for larger vehicles.
- 2.5m shared paths provide a facility for less confident and vulnerable users to cross the river. The on-road cycle lanes provide a facility for more confident users who, as evidenced by how they use the SH1 Bridge, would most likely ride within the traffic lane rather than the shared path. The two types of facility are targeted at two distinctly different user types.
- One barrier is used on each side, rather than two (as per Option 1). This presents better aesthetics and improves the passive surveillance of people using the footpath.

The bridge carriageway configuration and is shown in Figure 16-2.

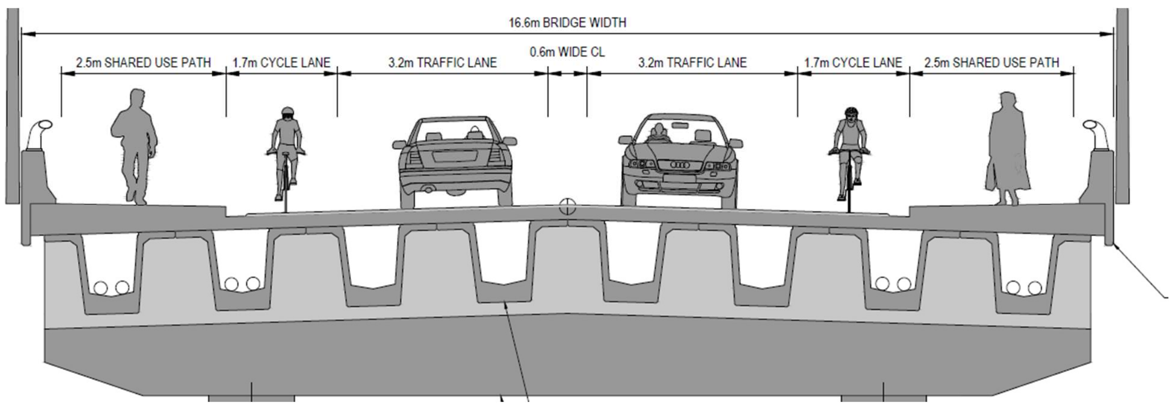


Figure 16-2: Proposed bridge cross section

16.2 SPEED

The design has been based on a posted speed limit of 50kph for both the bridge and new road.

16.3 HYDROLOGY

Flood flows have been adopted from Environment Canterbury (ECAN's) recently updated flood estimation, which include the flood event from May 2021). Stantec have adopted ECAN's assessment with an added allowance for climate change, resulting in the following table of design flood events.

Table 16-1: ECAN 2021 flood frequency estimate for Ashburton at SH1

Design Event AEP	Design flood (m^3/s)	Including climate change adjustment RCP 6.0[42] (m^3/s)	Including climate change adjustment RCP 8.5 (m^3/s)
SLS1 (25yr)	750	927	1014
SLS2 (100yr)	1275	1576	1723
ECAN (200yr)	1656	n/a	2238
ULS (2500yr)	3100	3831	4189

[42] The Waka Kotahi bridge manual recommends RCP 6.0

16.4 HYDRAULICS

A hydraulic assessment of the bridge crossing has included:

- 1D and 2D modelling of flood event
- Consideration of surveyed flood water levels
- Local landowner observations from the May 2021 flood event

One of the key observations from the survey data is that the Tinwald flood plain has flood water levels (FWLs) that are significantly lower than those in the main channel of the Hakatere River. The conclusion from this is that the heavily vegetated block of trees on the south side of the river is acting as a hydraulic separation between the main channel and the flood plain. The flood plain is in effect providing a drainage path to remove any flow pushing through the tree block. The flood plain will therefore require adequate flow capacity through the new approach formation in order to avoid damming of this flow on the flood plain.

The assessment has determined that two bridges (along the same Chalmers Avenue NoR alignment) will be required, comprising of:

- A 360m bridge crossing the main channel; and
- A 60m bridge crossing the Tinwald flood plain

A more detailed 2D hydraulic assessment is proposed to refine the adopted bridge lengths above and provide a more accurate assessment of localised backwater effects on adjacent properties.

16.5 FOUNDATIONS

A geotechnical investigation has been carried out consisting of:

- A borehole on each side of the main river channel to 20m below bed level
- Multiple test pits on the approach road alignment
- SPTs (standard penetration tests) at each borehole

Generally, the investigation has found:

- Very hard, well compacted Canterbury river-gravels from bed level to founding level (10-15m below bed level)
- Minimal/no risk of liquefaction
- Minimal/no risk of lateral spread

The foundation conditions are deemed to be relatively straight forward and low risk and would suit either multiple driven piles or a simpler bored caisson configuration. For the purposes of this assessment, we have adopted bored caissons as our preferred foundation type.

16.6 STRUCTURE TYPE

For a bridge with simple alignment and low risk foundations the typical configurations will comprise:

- Extensive use of reinforced concrete as a low-maintenance long-life material
- Insitu concrete pile caps supporting the superstructure
- Superstructure comprising precast concrete beams of 20-30m span, typical options including:
    - Super T beams with insitu concrete topping
    - Precast hollow core beams (no insitu topping required)
- For the purposes of this assessment, we have adopted:
    - 1.5m diameter bored caissons founded 15m below bed level, 2 per pier
    - Reinforced concrete pile caps (beam supports)
    - Precast Super T concrete beams and precast topping, 30m spans
    - Insitu concrete footpath overlay and rigid traffic barriers both sides of the carriageway

17. ROAD DESIGN

17.1 DESIGN PHILOSOPHY

17.1.1 Overview

The project aims to address a major resilience issue across the Hakatere River whilst at the same time improving connectivity, safety and travel choice. The project will benefit not only locals, but by reducing traffic on the state highway, will provide wider benefits for regional freight movement and tourism.

The underlying design principles are:

- The bridge must be able to remain operational even during a 1 in 250 year storm event.
- We need to provide better travel choice, and we are setting in place the infrastructure that would encourage modal shift. We are not simply building our way out of congestion.
- We want to minimise disruption to the community during construction.
- We want to minimise property purchase. Taking land where it is not essential disrupts the lives of landowners, increases project costs, and increases the project timeframe / consenting process. The design is being contained within either the current designation or council owned property.
- We want to support the future development of Tinwald.
- We want to provide certainty to the community around how the state highway and road network is going to look for the next 30 years. We also want to provide this certainty to prospective developers.
- The design is intended to promote safe travel speeds, and a 50kph environment.

17.1.2 Safe System

A safe system approach has been used throughout all aspects of the design, which is based on:

- **People make mistakes.** People make mistakes and some crashes are inevitable.
- **People are vulnerable.** Our bodies have a limited ability to withstand crash forces without being seriously injured or killed.
- **We need to share responsibility.** System designers and people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury.
- **We need to strengthen all parts of the system.** We need to improve the safety of all parts of the systems – roads and roadsides, speeds, vehicles, and road use so that if one part fails, other parts will still protect the people involved.

The following principles of the Safe System have been applied into the design approach:

- Roundabouts at South Street, Wilkins Road and Grahams Road.
  - This helps slow traffic down and allow for safe turning movements from side roads.
  - The design also allows for safe crossings by pedestrians and cyclists.
- Providing a shared path for less confident cyclists, along with on-road cycle lanes (targeted at confident riders). These would then link with local road connections that would enable access to schools.
- Providing a flush median to allow for turning movements and create a feel of a slower speed road.
- Utilising narrower vehicle lanes to promote a lower speed environment, due to little adjacent development initially.
- Providing parking only along sections where it is needed.

17.2 CROSS SECTION

A key decision in the design process was confirming the appropriate cross-section for the new road and bridge. The process taken captured:

1. Identification of a **long list** of cross-section options
2. Workshop with Ashburton District Council (ADC), Waka Kotahi and key stakeholders
   a. 'Live' cross-sections were developed by the group
   b. Discussion around key elements – inc. parking, median
   c. Identification of **'emerging preferred'** cross-sections
3. Post workshop feedback from project partners regarding the 'emerging preferred' cross-sections.
4. Update of cross-section post feedback, or response to key feedback.
5. Agreement on a preferred option.

17.2.1 Key considerations

Key considerations when establishing the cross-sections were:

- **Cost** – small increases to the width may result in significant increases to potential cost.
- **Safety** – Chalmers Avenue Extension will be a long, relatively straight road which initially will pass through a semi-rural road environment, with little adjacent development. As the area develops, it will function more as an urban road. The cross-section needs to deliver safe outcomes and deliver a 50kph speed environment.
- **Cycling** – a key outcome for the project is a high level of service for pedestrians and cyclists.
- **Parking** – the requirement for parking along the corridor, given its future function as an urban road which may (or may not) include a small neighbourhood centre. Key questions are:
  - Do we need parking the whole way along the corridor?
  - Do we need parking on both sides of the road?
- **Median treatment** – the choice of median treatment will have an influence on both safety (to reduce the likeliness of head-on collisions) and access (enabling turning movements to property or side roads). Key questions are:
  - Do we need a median?
  - Flush vs raised vs wide centreline

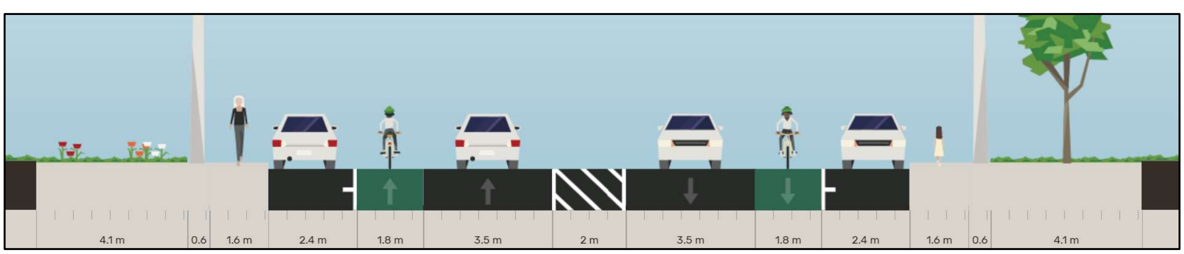
17.2.2 Guiding principles

To meet the objectives of the DBC, the new road must:

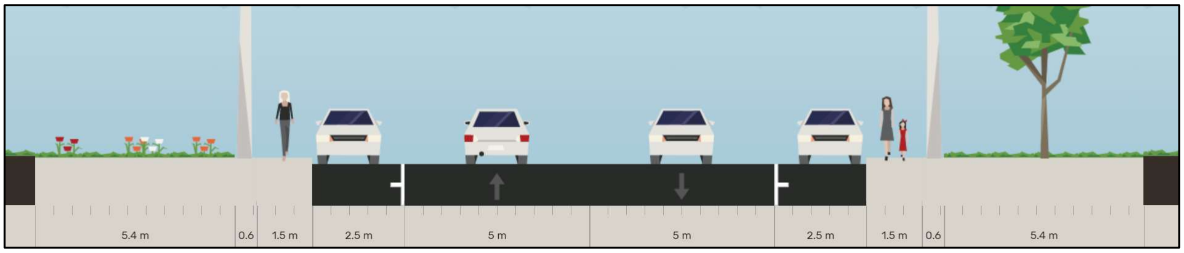
- Have one lane in each direction.
- Act as a resilience detour route for state highway traffic in the event of the SH1 Bridge closure, and therefore be able to support heavy vehicle movement.
- Provide high quality amenities for active modes, with safe connections to the wider cycle network and onto the riverside mountain bike trails.

17.2.3 Long List

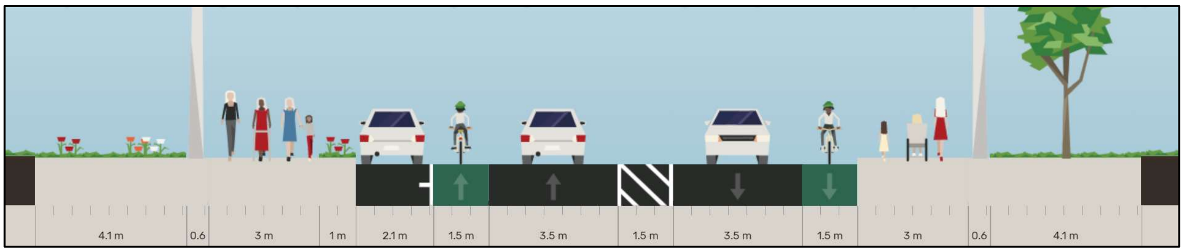
Each of the cross-sections within the long list was intended to have clear distinctions which would enable a clear comparison of benefits and disadvantages of options to be made. The long list is presented below.



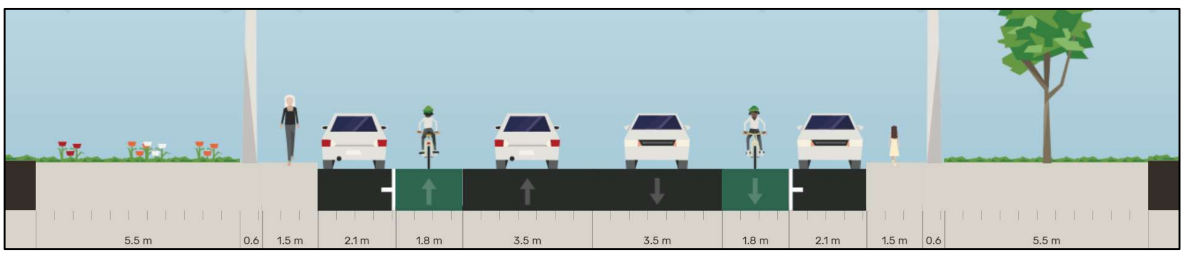
Option 1 - NoR design (2013)



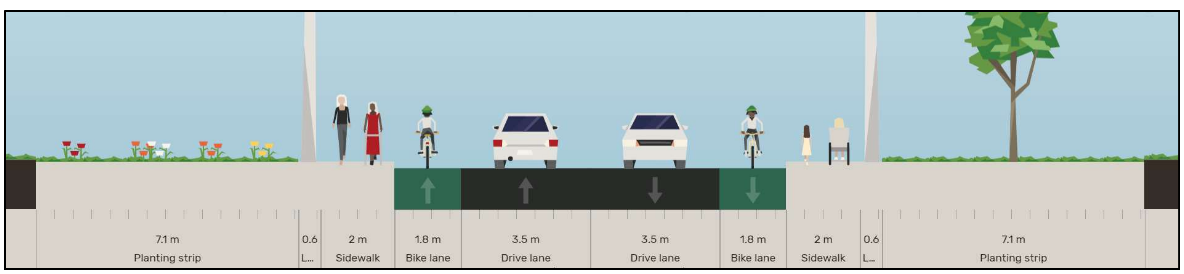
Option 2 - Do Minimum / District Plan



Option 3 – Single Parking / Dual Shared Paths



Option 4 – No Median



Option 5 – No Parking / No Median

The key points of agreement during the long-list exercise were:

- On road-cycle lanes need to be provided for confident cycles, who regardless of whether a shared path was provided, would still use the main road. Hence Option 2 was not suitable.
- A median treatment was required in order to provide some form of separation between opposing flows, to help present the feel of a slower speed environment, and to accommodate future turning movements. Hence Option 4 was not suitable.
- Parking needed to be provided, but not necessarily along the entire corridor. Parking provisions would also need to be provided on both sides to support future adjacent land development. Hence Option 5 was not suitable.

Following this discussion of the various disbenefits of each option, a group exercise was undertaken in which a 'stakeholder' cross-section was developed. This cross-section was essentially a hybrid of Option 1 and 3.

17.2.4 Agreed Cross-Section

The agreed cross-section for the road is shown as Figure 17-1 to Figure 17-3.

The key rationale behind adopting this cross-section was:

- Seeking to minimise the width of parking lanes and general traffic lanes. The intent is to create a narrower cross-section which helps to reduce travel speeds.
- Provide a high level of service for active modes – for both confident, and less confident users.
- Allow for turning movements and reduce crash risk by including a flush median.
- Provide parking which supports future development, but only where it is likely to be needed. For this reason, three typical cross-sections for the road have been provided. Where parking is not provided, this space will be replaced with a grass / planted berm.

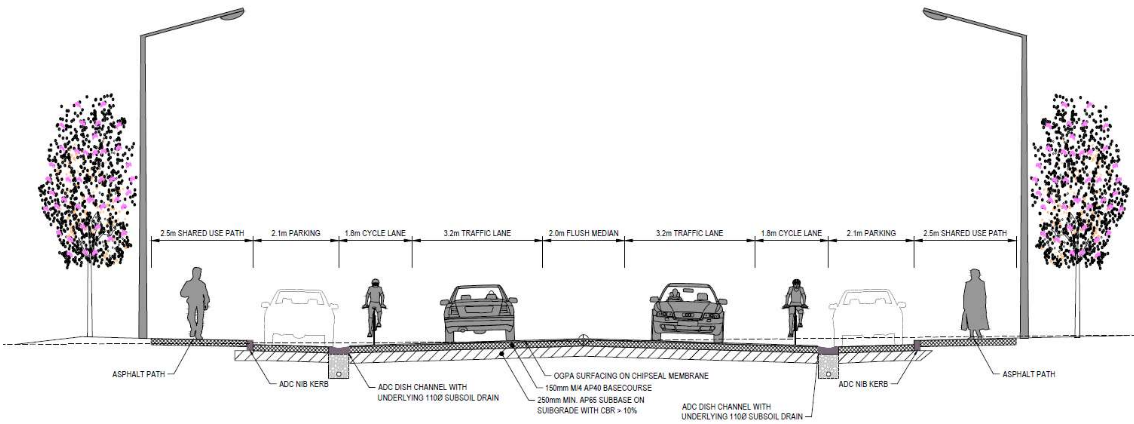


Figure 17-1: Agreed cross-section for the new road (where parking is provided)

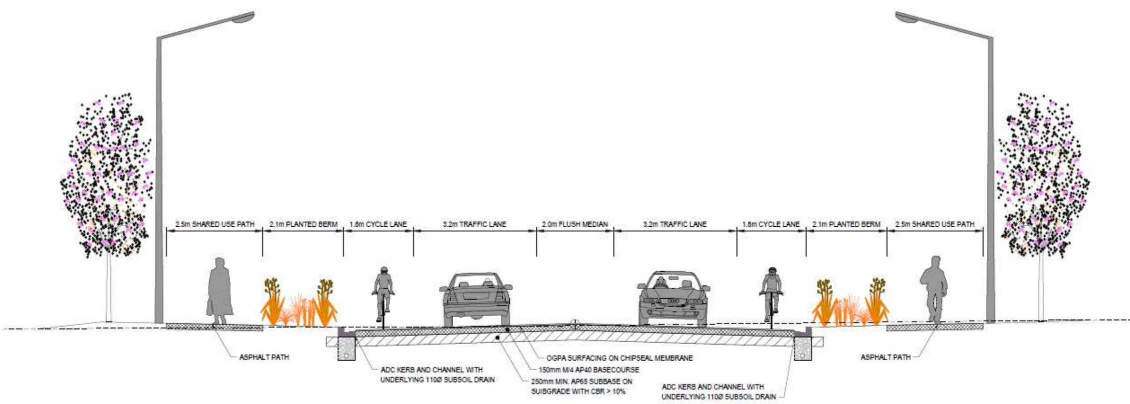


Figure 17-2: Agreed cross-section for the new road (where parking is not provided)

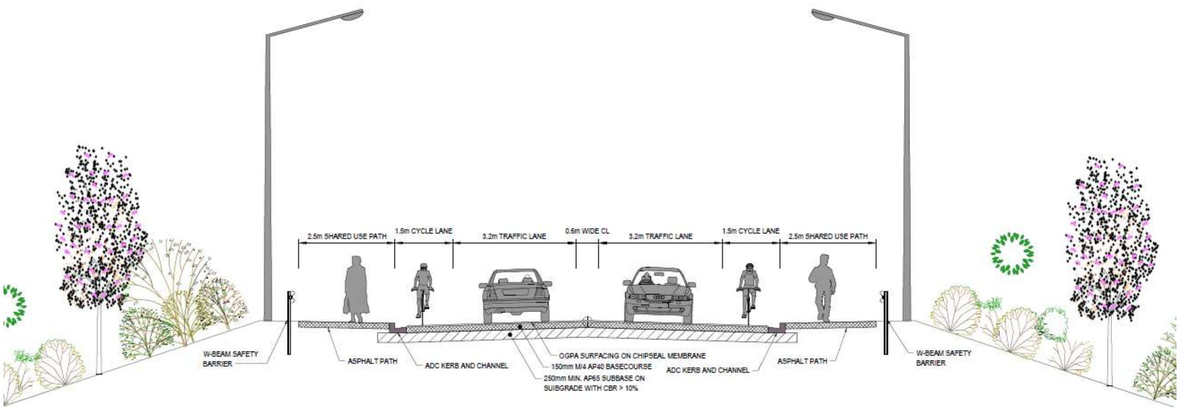


Figure 17-3: Agreed cross-section for the new road (approaches & between bridges)

17.3 INTERSECTIONS

The approach to intersection treatments was discussed during a project partner workshop held on the 21st March 2022. It was agreed that in the first instance the design team should adopt the principles of a 'safe system' and take a "top down, rather than bottom-up approach". This means initially considering the safest possible intersection treatment (i.e. a roundabout) and then evaluating whether there is strong justification for using a different intersection control type – such as traffic signals or give-way controlled crossroad.

It was agreed by all parties that the Grahams Road, Wilkins Road and South Street intersections should have roundabouts. The volume of movements across these three intersections could be relatively high, and any other control type would present higher crash risks that could otherwise be difficult to mitigate. The intersections at Carters Terrace and Johnstone Street are however proposed to be give-way controlled crossroads (this was an approach taken post a value-engineering exercise, described below). The modelled turning volumes onto, off and across the new road are expected to be very low at these locations, resulting in a lower risk profile than the other intersections. As such, it is not expected that the safety benefits of a roundabout would be notably better than a typical crossroads.

The proposed intersection control strategy would see a roundabout located at each end of the corridor, with another roundabout located roughly halfway. This will help slow speeds and adopts the principles of a 'safe system' without causing undue delays that could otherwise be created with roundabouts at all five intersections. As described below, this approach also presents better value for money.

17.4 VALUE ENGINEERING

A 'value engineering' workshop for the project took place on the 2nd June 2022 between the project team, ADC and Waka Kotahi. The purpose was to test the initial design and identify whether there were any opportunities to reduce project costs without notably reducing benefits (outcomes).

Table 17-1 provides a summary of the opportunities that were explored, the impact on outcomes and the design decision that was agreed by ADC. Cells highlighted in green refer to where design changes were made, whilst red cells refer to where the design was not changed post consideration of an alternative option.

Table 17-1: Value Engineering – Points of Discussion and Outcomes

Aspect	Opportunity	Impact to cost	Impact to benefit	Decision by ADC
Cross-section	Provide a shared path on only one side	Potential saving of around $300k, as a footpath would still need to be provided.	Reduced level of service for pedestrian and cyclists, and departure from a key objective of the project – to promote active travel. Impact to safety as cyclists potentially would ride on the footpath.	• Retain shared paths on both sides, and cost saving is relatively small in comparison to long term benefit – especially when surrounding land gets developed into a residential area.

Aspect	Opportunity	Impact to cost	Impact to benefit	Decision by ADC
				• ADC stated that a full shared path needs to be delivered, in line with the wider cycling strategy and again to provide higher benefit/amenity.
	Removal of the flush median	Would reduce cross-section width and remove the ability to use narrower than standard traffic lanes	• The proposed flush median enables turning movements, better presents a slower speed environment to drivers by reallocating road space, allowing slightly narrower than standard lane widths, and matches the future expected Collector Road hierarchy. • Impact to safety outcomes with increased risk of turning related crashes.	Retain the flush median.
Shared path construction	Potential to construct shared path using compacted gravel – similar to the current cycle path out to Lake Hood along Grahams Road	Cost saving of around $250k	• A gravel path in an urban environment needs to be remote from any areas where tracking of unsealed materials may cause an issue. This would result in a path which switches from unsealed to sealed and back again. • Notable impact to level of service and desired project outcomes	Construction material of the shared path to remain as asphalt.
Intersections	Reduce the number of roundabouts along the new road – specifically at Johnstone Street and Carters Terrace	Reduction in cost of around $700k per intersection by having give-way controlled crossroads when compared to roundabouts.	• Minimal impact to safety as turning volumes at Johnstone Street and Carters Terrace are very low – even in 2041. • Benefit for travel time. • A roundabout at Wilkins Road provides a means of slowing traffic and maintaining a 50kph speed environment. There are also higher predicted turning volumes at Wilkins Road.	• Removal of roundabouts at Johnstone Street and Carters Terrace. • Priority controlled intersections present higher risks, but these can largely be mitigated through design and signage. • Roundabouts could potentially be introduced in the future.
	Reduce the footprint of roundabouts	• The roundabouts have already been designed with generally the minimum footprint (to deliver cost efficiency and stay within the existing designation), whilst ensuring standard large vehicles (and limited over dimension vehicles) can safely and easily manoeuvre around the roundabouts. • Minimal opportunity to reduce footprint (or cost)		Retain current design and update as necessary in response to the Road Safety Audit and feedback from the wider stakeholder group.
Utilities	Reduce the scale of utilities provisions or futureproofing	There is roughly a $4M cost associated with utilities (power, telecoms), including streetlights. However, there is little opportunity to reduce this cost.		No change
Bridge length	Opportunity to reduce bridge length to a similar	• A reduction in bridge length would save costs associated with	• Assumption would be that no impact to benefits – bridge still to	• Look to reduce bridge length without removing

Aspect	Opportunity	Impact to cost	Impact to benefit	Decision by ADC
	length of the existing SH1 Bridge	piers and structure, but additional cost associated with increasing the length of the approach embankments and carriageway.	be designed to meet 1/250 year flood event.	any benefits of the integrity of the bridge. • A hydrologic model has been developed as part of the DBC to confirm the appropriate length of the bridge.
Bridge cross-section	Reduce the bridge cross-section by having a narrower footpath or shared path.	• Savings of \$3.2k per metre width per metre of bridge length. i.e 1m reduction in cross section on the full 420m long bridge would represent a saving of \$1.35M.	• Potential significant disbenefits, with high expense if ADC ever desire to widen in the future. • Bridge is designed for a 100-year lifespan.	ADC agreed to retain the current agreed cross-section and avoid making the bridge too narrow (and creating similar problems to that created by a narrow SH1 Bridge).

17.5 OVERVIEW OF THE DESIGN

17.5.1 Connections to the riverside mountain bike trails

The existing riverbanks of the Hakatere River have a number of walking and cycling trails, which provide recreation values; however, these are somewhat hampered by limited access options. The true left bank (Ashburton side) has more numerous developed trails, with the Ashburton MTB Loop and the Ashburton – Hakatere River Trail, notably Chalmers Avenue provides an existing access to these trails which will be modified as part of the proposed project. On the true right bank (Tinwald side) access to the Braided River / Lake Hood trail is mainly from the existing carpark area between the current road and rail bridges.

As part of the project, it is proposed to maintain the existing left bank trail connection by utilising a new unsealed gravel path between Chalmers Avenue and the river to the north of the alignment. This path will pass from a road crossing point located outside the Mania-O-Roto Scout Park, across the Chalmers Avenue stormwater channel, around the toe of the proposed bridge approach embankment, before passing over a new culvert through the ECAN stopbank. Some modification to the existing trails will be required to integrate the existing trails with the new, and to allow safe passage under the bridge structure.

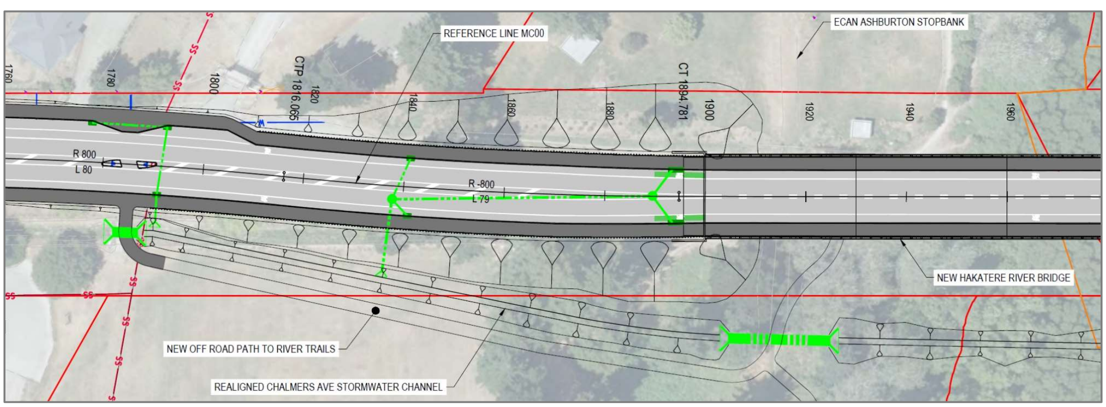


Figure 17-4: True Left Bank off road path to river trails

For the true right bank trails, no existing connection is present on the proposed road alignment, due to the presence of private property along Carters Terrace which effectively cuts off access between the SH1 and Boundary Road. A new off-road path is proposed to be located to the North of the proposed alignment, passing from approximately the Carters Terrace intersection, along the toe of the bridge embankments, through the forested area, then connecting to the existing trails and passing under the new bridge.

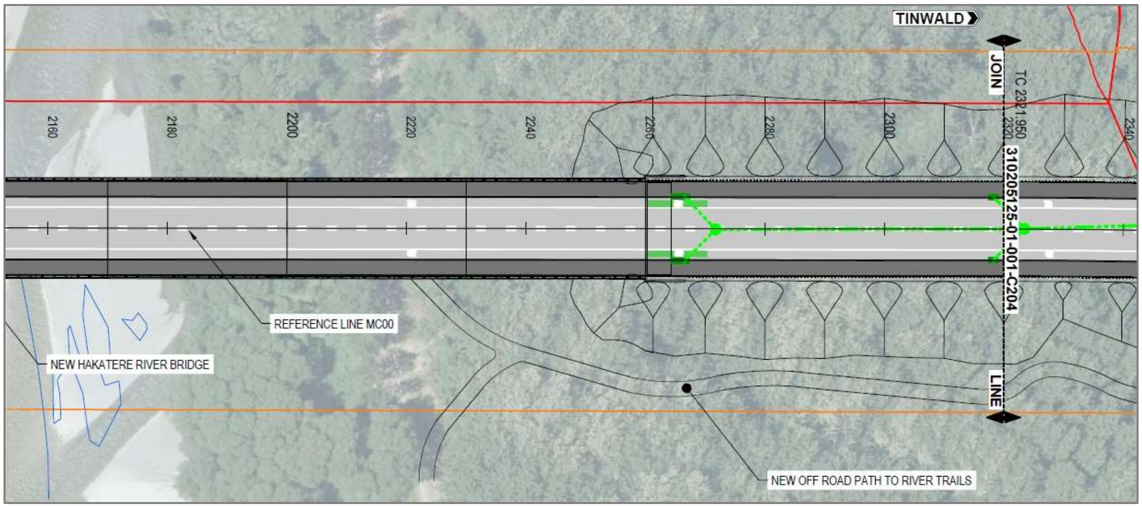


Figure 17-5: True Right Bank off road path to river trails

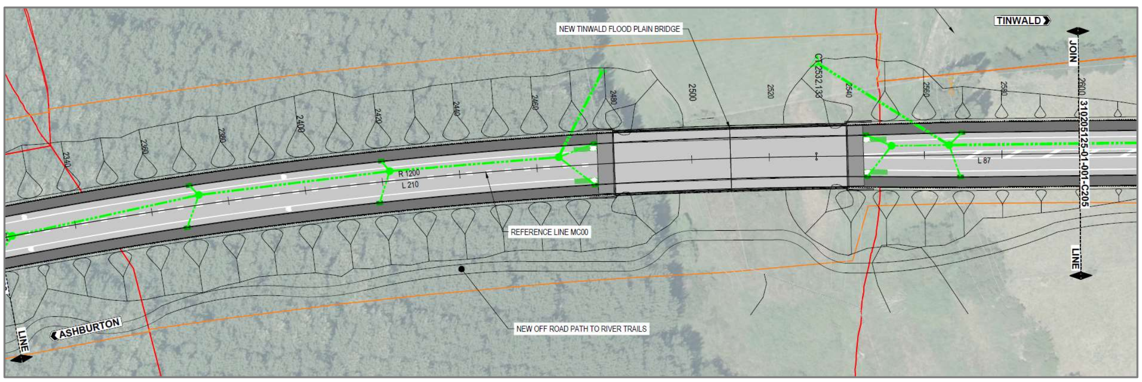


Figure 17-6: True Right Bank off road path to river trails

These paths have been arranged to maintain the existing connections and provide improved connection to the existing trails. These should encourage good active mode usage.

17.5.2 Stormwater

Stormwater management and disposal has been a key consideration of the design portion of the DBC. This is due to the lack of a significant formal stormwater network in the Tinwald area, with most stormwater being managed in kerb and channels through the urban streets, before ultimate discharge to a network of rural roadside swales and soakpits, and the sensitive receiving environment around Carters Creek. The existing roadside swales vary from shallow depressions to deeper engineered drainage channels. During rainfall events short term surface ponding is evident, which is normally gone within 1-2 days post event, having percolated through to the underlying water table.

On the Ashburton side a more formal existing stormwater network is present, with a network of sumps and underground pipes capturing surface flows. For this project, the main consideration is the Chalmers Ave Stormwater main, which collects a large portion of the Ashburton CBD stormwater runoff, is treated for gross pollutants, before discharge to the Hakatere (Ashburton) River via the large roadside drain.

Due to existing ground topography, for stormwater purposes, the design has been split into four distinct zones:

- Zone 1 North Bank (Chalmers Ave to Hakatere River)
- Zone 2 South Bank (Hakatere River to Carters Terrace)
- Zone 3 Carters Creek (Wilkins to before Johnstone)
- Zone 4 Grahams (Johnstone to Grahams)

Design values for rainfall have been sourced from the published HIRDS V4 data with the RCP 4.5 scenario[43] being utilised. This includes an allowance for climate change, but an assumption that the level of CO2 in the atmosphere stabilises due to interventions by around 2080. For a stormwater network, which is able to be relatively easily modified or changed, this is seen as a reasonable scenario to use, resulting in moderate conservatism in the sizing of devices to ensure they remain functioning over their expected 80-100 year life span.

The stormwater management proposed for each zone generally follows two approaches:

- Zone 1 by modifying / changing the existing formal system as required due to the new intersection layout at South Street and road cross-section. Retention of the existing discharge method to the Hakatere River, via a vegetated swale.
- Zone 2 by the introduction of a formal sump and pipe network on the alignment, with discharge to the Tinwald Flood plain. Ultimately discharging to the Hakatere River, after following the existing overland flow paths for treatment.
- Zone 3 stormwater is managed by a proposed new formal sump and pipe network, with discharge to ground via infiltration and treatment basins either side of Carters Creek. Due to the receiving environment during normal rainfall events, the basins will act as detention basins with any normal discharges to Carters Creek having to pass through the basin filtration media before being discharged at a slower rate via smaller diameter subsoil drainage. Larger secondary events will over top direct to Carters Creek, once the basins full capacity is reached. The basins are designed to have a dry invert the majority of time.
- Zone 4 stormwater management is similar to Zone 3, with treatment and infiltration achieved by basins adjacent to the Grahams Road intersection. A similar secondary event allowance of overtopping into the current stock water race / drainage channel on the South side of Grahams Road is allowed for.

As part of the Geotech test pitting two transient falling head tests were completed in the vicinity of the proposed Carters Creek and Grahams Road basins. These indicated a relatively free draining gravel/sand subgrade being present, below the overlying poorly infiltrating layer, with infiltration rates of between 290 mm/hr and 2,900mm/hr being observed at the expected design depths. These indicate that the use of infiltration as the primary discharge method is likely to be suitable.

17.5.3 Pavement

The previous designation put in place over the proposed alignment, contains some specific requirements for the pavement type which can be constructed. This is mainly in response to concerns over the level of traffic noise which the new alignment would generate, with a requirement to use a low noise surfacing. Utilising an asphalt surfacing will meet this requirement, with an Open Graded Porous Asphalt (OGPA) being the most likely surfacing type, however OGPA is not suitable for use everywhere, as it does not handle shear stress very well. In high stress areas (roundabouts, braking zones, etc.) it is proposed to use a Stone Mastic Asphalt (SMA). Both of these surfacing types have a lower noise production than an equivalent chipseal but have a higher associated direct cost due to the material costs, but also as the underlying pavement has to be constructed to a higher standard.

Based on the geotechnical testing information, it is expected that subgrade conditions are likely to consist of relatively competent gravels and sands, once the relatively thick overlying layer of organic topsoil and silt / clays are removed. As such a lower subgrade CBR of 5% has been used in the design, to allow for founding to be made on some of the weaker clay silts, which may be more economical that a dig out and replace methodology. This is to be refined during the detailed design phase.

Traffic volumes are expected to range from 4,000-6000 vpd (typical weekday, noting Fridays will likely be higher), with a 15% HCV content over the expected life of the pavement. As these volumes will build over time, there is a need to initially over build the pavement to ensure design lives are achieved, and minimize future major rehabilitation works. The design traffic volumes are expected to be in the order of 1.5 $^10^7$ Equivalent Standard Axles over the 25-year design life.

[43] https://niwa.co.nz/our-science/climate/information-and-resources/clivar/scenarios

25 year design traffic volume (ESAs)	Less than 5×10^6	Between 5×10^6 and 1×10^7	Between 1×10^7 to 5×10^7	Greater than 5×10^7
Continuously Reinforced Concrete Pavement	Unlikely to be economic	Unlikely to be economic	Unlikely to be economic	Low risk
Structural Asphalt	Unlikely to be economic	Unlikely to be economic	Low risk	Low risk
Modified aggregate overlay basecourse and bound subbase	Unlikely to be economic	Low risk	Low risk	Medium risk
Foamed bitumen basecourse	Low risk	Low risk	Low risk	Medium risk
Modified aggregate base only	Low risk	Low risk	Medium risk	High risk
Unbound aggregate overlay	Low risk	Medium risk	High risk	High risk

Figure 17-7: Pavement failure risk table (NZ Guide to pavement structural design)

Based on the above table it is expected that either a foam bitumen stabilised, or structural asphalt pavement will result in a low risk of failure over the pavements lifetime. Due to the way the pavement loadings are expected to increase over time up to the full design loading there is the opportunity to construct the mainline pavement initially as an unbound aggregate pavement, with a maintenance foam bitumen stabilisation treatment in 10-15 years' time, to coincide with the first reseal/wearing course replacement being expected.

For the roundabouts, a more robust structural asphalt is deemed to be the most economic approach. This is because the physical site constraints at roundabout sites mean that undertaking major pavement rehabilitations are more difficult without either effectively closing or rebuilding the roundabout. Major rehabilitation in the future could be avoided by using structural AC; effectively following a perpetual pavement approach – where only the surface wearing course is removed and replaced as a function of deteriorated surface utility, but the lower structural layers remain in service through multiple cycles.

17.6 URBAN DESIGN

The urban and landscape design for the project takes a *'whole corridor'* approach, with the intention to provide consistency along the corridor between Tinwald and Ashburton.

The bridge is the major intervention in the landscape, that when constructed will form a series of three crossings of the river, with the existing rail and SH1 road bridges. The tie in junction to South Street will rationalise the road space through residential and industrial businesses on the Ashburton side, whilst new roundabouts at Wilkins Road and Grahams Road will become new features in the landscape. The bridge and roundabouts are natural places for intervention to soften built form and assist in integration with the wider landscape.

There is also opportunity for ecological restoration not only to the banks of the Hakatere (Ashburton) River, but to Carters Creek that, which crosses the link road alignment between the Wilkins Street and Johnstone Street intersections. Carters Creek is a tributary of the Hakatere (Ashburton) River that runs through Tinwald and eastern farmlands connecting with Lake Hood.

Equitable access for people travelling by all modes should be the priority at all of the major features, with new connections to existing networks established to further reduce severance effects. At each major feature, at least one 'Focus Area or Stopping Place' is to be located, providing interest, opportunities for passive surveillance and for placemaking along the road corridor and under the bridge.

Engagement with Arowhenua has been already undertaken to identify opportunities to integrate cultural narrative into the landscape design, further building on local Hakatere places and stories, imagery and significant plant species. Indicative visualisations for the South Street roundabout are provided as Figure 17-8.

Crossing the South Street roundabout over the existing swale

Looking south

Figure 17-8: Indicative concepts for the South Street roundabout

The Urban and Landscape Design Framework for the project is provided as **Appendix O**.

18. CORRIDOR SECTIONS

18.1 OVERVIEW

Council and Waka Kotahi current position towards funding contributions for the project means that there is a funding gap that will need to be addressed by Waka Kotahi and the Ministry of Transport (refer to the Financial Case). A robust business case should also explore all reasonable options to ensure that value for money is being delivered to council, Waka Kotahi and the taxpayer (or ratepayer). As such, various options that reduce the project scope, or stage the upgrade, must be presented. Following discussion with ADC and Waka Kotahi (refer to minutes within **Appendix D**), it was agreed that the corridor would be split into the following sections:

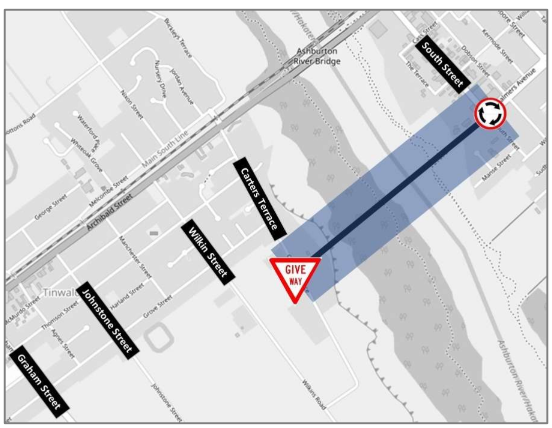
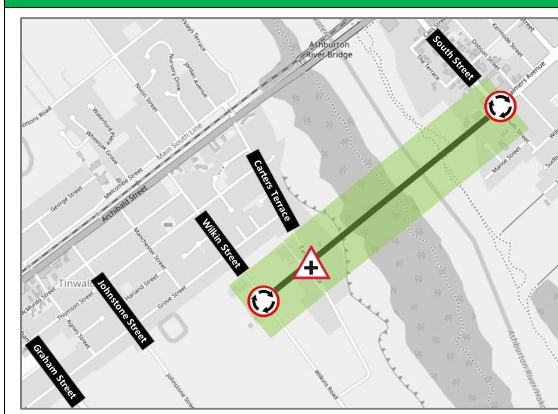
1. South Street to Carters Terrace (inc. the second bridge)
2. Carters Terrace to Wilkins Road
3. Wilkins Road to Grahams Road

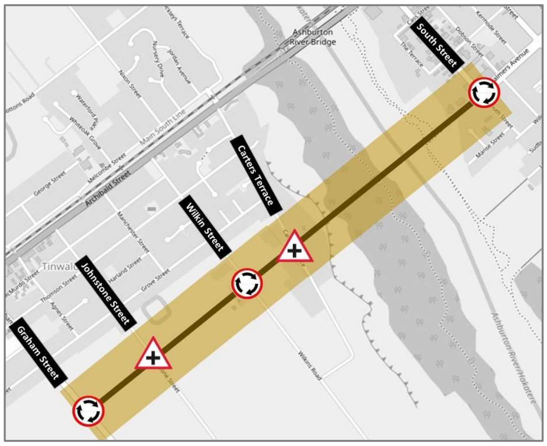
The sections are predominantly a reflection of the fact that different parties are likely to contribute different amounts to the construction of different sections. **Council is however seeking funding contributions towards the full project – i.e. the second bridge at Chalmers Avenue plus a new road connecting the bridge all the way through to Grahams Road.**

18.2 DESCRIPTION OF SECTIONS

An overview of each corridor section is provided within Table 18-1.

Table 18-1: Corridor sections

South Street to Carters Terrace	
	**Intersection treatments** • Roundabout at South Street • T-intersection at Carters Terrace • Reverse priorities for Agnes Street / McMurdo Street and Agnes Street / Thomson Street. The purpose is to promote the route from SH1 to the second bridge being via the new signals an SH1/Agnes Street and Grove Street. **Risks to outcomes** • Safety risk associated with additional traffic on Carters Terrace, which is not designed as a collector road. • Give-way control at the Carters Terrace may not be appropriate from a safety or capacity perspective. • Land development in Tinwald not being supported • Limited connectivity for active modes to Tinwald.
South Street to Wilkins Road	
	**Intersection treatments** • Roundabout at South Street • Give-way crossroads at Carters Terrace. – If a staged approach were taken, the upgrade from a T-intersection to crossroads would be relatively simple. • Roundabout (three-arm) at Wilkins Street. **Risks to outcomes** • Limited support for future development in Tinwald. • Impact to travel time from Lake Hood, although a relatively direct connection would be provided via Grove Farm Road.

South Street to Grahams Road	
	**Intersection treatments** • Roundabout at South Street • Crossroads at Carters Terrace • Roundabout at Wilkins Road • Crossroads at Johnstone Street

18.3 "MINIMUM VIABLE PRODUCT"

Construction of the bridge and a new road approach only as far as Carters Terrace would be the *'minimum viable product'*. This is simply because this would deliver a physical connection (for all modes) between the closest roads on either side of the Hakatere River – namely South Street (Ashburton) and Carters Terrace (Tinwald). This option would to some extent address the 'Connectivity' and 'Travel Choice' Investment Objectives but would arguably not support the 'Safety' or 'Economic Prosperity' objectives[44].

This 'minimum viable product' would not include any local road improvements on Carters Terrace, even though its current function is a local road (and not a collector, as would be most appropriate). The minimum in terms of intersection treatments would also be provided – i.e. a give-way intersection at the Carters Avenue/Chalmers Avenue Extension. The minimum intervention at the South Street/Chalmers Avenue intersection is still a roundabout because there is a significant safety risk in retaining its current configuration (a cross-roads with widely offset approaches) which if not addressed would likely see an increase in DSIs.

18.4 LOCAL ROAD MITIGATION

Adopting a potentially staged approach would trigger the need for wider local road mitigation to ensure that the entire journey to/from Tinwald and the new Chalmers Avenue Bridge is safe. The scale of the local road mitigation would vary according to whether the new road in Tinwald ends at Carters Terrace, Wilkins Road or Grahams Road. Table 18-2 presents the **minimum local road treatments** that would be required for each potential alternative for the new road. The costs of these mitigation measures have been considered as part of estimates that have been used in the economic and financial cases.

Table 18-2: Local road mitigation (minimum)

South to Carters (No Carters to Grahams)	South to Wilkins (No Wilkins to Grahams)	South to Grahams FULL PROJECT
• Upgrade to Carters Terrace / Wilkins Street • Upgrade to Wilkins Street / Grove Farm Road • Change priorities at Agnes Street / McMurdo Street • Change priorities at Agnes Street / Thomson Street • Wayfinding signage	• Upgrade to Wilkins Street / Grove Farm Road • Change priorities at Agnes Street / McMurdo Street • Change priorities at Agnes Street / Thomson Street • Wayfinding signage	• Wayfinding signage

[44] The route would not be attractive for heavy vehicles, and trucks would prefer the option to leave the state highway at the Agnes Street signals (rather than a dangerous right turn elsewhere and rat-run through local Tinwald streets).

19. COST ESTIMATE

The full cost estimates for the project are provided within **Appendix P**.

19.1 PROPERTY

In preparation for the project, Council have been acquiring property along the route of the designation since 2013. There are two remaining properties where some, but not all, of the land will need to be acquired – at 64 Wilkins Road and 77 Johnstone Street, plus one with disputed ownership – the river terrace. A summary of the property costs is presented within Table 19-1.

Table 19-1: Property costs

Address	Purchased	Purchase Cost (A)	(Less) Disposal Value (B)	Net Property Costs (A-B=C)	Property compensation costs (D)	Property owner accommodation works (E)	Net Property Cost (C+D+E=F)
Properties purchased 5 Grahams Road, 119 Grove Street, 68 Johnstone Street, 74 Wilkins Road, 58 Carters Terrace, 61 Carters Terrace	Yes	$4,060,000	$2,187,000	$1,873,000			$1,873,000
Properties not yet purchased 77 Johnstone Street, 64 Wilkins Road, River Terrace	No	$330,000		$330,000	$70,000	$70,000	$470,000
Base estimate							$2,343,000
Contingency							$351,600
Expected Estimate							$2,694,600
Funding Risk							$585,900
95th percentile estimate							$3,280,500

The property costs shown in Table 19-1 are costs estimates prepared solely for the purpose of this DBC and are based on the most recent information available. The final property costs will depend on the property acquisition process that each land purchase occurs under, the area of land acquired and any legislative requirements for the property acquisition

19.2 PROJECT COST ESTIMATE

The project cost estimate was a reconciliation of the project cost estimate (undertaken by the project team) and a parallel cost estimate undertaken by an independent party. The final costs have been reconciled and agreed between the project team and parallel cost reviewer.

Table 19-2 provides the expected (P50) and 95th percentile (P95) cost estimates for the full project length from South Street to Grahams Road. Note the P50 estimates include contingency, but not funding risk. The P95 estimates include both contingency and funding risk.

Table 19-2: 50th and 95th percentile cost estimates – full project

Phase	Expected Estimate (P50)	95th Percentile Estimate (P95)
Property	$2.7m	$3.3m
Pre-implementation (Design)	$6.8m	$8.3m
Implementation (Construction)	$83.5m	$102.0m
Total	$93.0m	$113.6m

19.3 COSTS FOR ALTERNATIVE OPTIONS

19.3.1 'Building in one go'

The costs for the following 'build in one go' options are presented within Table 19-3:

1. South Street to Carters Terrace (only)
2. South Street to Wilkins Road (only)
3. South Street to Grahams Road (full project)

Table 19-3: Expected (50th percentile) cost estimates

	South Street to Carters Terrace (ONLY)	South Street to Wilkins Road (ONLY)	South Street to Grahams Road (FULL PROJECT)
P50	$67.5m	$73.8m	$93.0m

19.3.2 'Building in two stages'

The following two-staged upgrades have been considered as part of the incremental economic assessments:

1. Staged to Wilkins Road
   - South Street to Carters Terrace (2026)
   - Carters Terrace to Wilkins Road (2036)
2. Staged to Grahams Road
   - South Street to Wilkins Road (2026)
   - Wilkins Road to Grahams Road (2036)

A staged approach would incur cost inefficiencies, with additional procurement, design standard changes, traffic management, and wider network mitigation improvements being required. Table 19-4 provides the expected estimated costs for 'delayed completion of Phase 2'.

Table 19-4: Phased approach – (50th percentile) cost estimates

Staged to Wilkins	
Phase 1 - South Street to Carters Terrace	$67.5m
Phase 2 - Carters Terrace to Wilkins Road	$7.3m
TOTAL	$74.8m
Staged to Grahams	
Phase 1 - South Street to Wilkins Road	$73.8m
Phase 2 - Wilkins Road to Grahams Road	$22.5m
TOTAL	$96.3m

Due to the cost inefficiencies and likely ongoing community disruption, a three staged approach is not recommended – i.e. South Street to Carters, an extension to Wilkins Road, and then a final extension to Grahams Road.

19.4 ASSUMPTIONS AND EXCLUSIONS

Key assumptions that have informed the cost estimate are:

- Standard procurement methods, to a single head Contractor, with elements of design build
- Alternative bridge designs allowed for within procurement
- Geotech conditions are consistent with the limited investigation completed at DBC stage
- Modelling is accurate for expected traffic volumes and expected route choice shift
- Utility services are generally located as shown on services plans and at standard depths
- Resource Consent conditions are unknown, standard level of conditions and clauses allowed for
- Designed elements are all "standard construction" placing the risk level at a normal level. i.e. no specialist contractors required for atypical construction types (suspension bridges, tunnels, etc.)

- Allowance of 50% earthworks as cut to waste, to mitigate potential earthworks risks
- On site stockpiling allowed on adjacent ADC properties at minimal cost
- Relatively short haul distances between site and gravel supply / clean fill disposal sites
- No significant retaining structures required
- TTM on the low end due to limited interaction with local operational roads, with majority of project able to be constructed offline.
- Project to only be opened to the public once fully finished i.e. no separable portions.

20. ECONOMIC EVALUATION

20.1 OVERVIEW

The economic evaluation has been carried out in accordance with the full procedures of the Monetised Benefits and Costs Manual (MBCM), with the recommended programme against the Do Minimum using a 60-year analysis period and a 4% discount rate. The economic benefit streams include travel time, vehicle operating costs (VOC), resilience and active modes. The microsimulation model developed for this project was the tool used to derive the travel time and VOC benefits, and it also provided an input into the safety benefit calculations.

An assessment of the Wider Economic Benefits (WEBs) has also been undertaken, which focuses on potential land value uplift that the new bridge and connecting road could generate.

The economics has undergone an external peer review and been accepted as being robust and suitable for a DBC – refer to **Appendix Q**.

20.2 OPTIONS

For clarity, the following options have been presented as part of the economic evaluation:

'Building in one go'

- South Street to Carters Terrace (ONLY)
- South Street to Wilkins Road (ONLY)
- **South Street to Grahams Road (FULL PROJECT)**

'Building in two stages'

- Option 1:
  - South Street to Carters Terrace (2026)
  - Carters Terrace to Wilkins Street (assumed 2036)
- Option 2:
  - South Street to Wilkins Road (2026)
  - Wilkins Road to Grahams Road (assumed 2036)

20.3 PARAMETERS

20.3.1 Do Minimum and option

For clarity, the Do Minimum includes:

- New signals at Walnut Avenue / SH1 and Lagmhor Road / Agnes Street / SH1.
- Clip-on bypass bays for cyclists on the SH1 Bridge.

In terms of the proposed new Chalmers Avenue Bridge and connection to Grahams Road the following assumptions were applied to the modelling and economics:

- 50kph posted speed limit.
- Roundabouts at the intersections of South Street, Wilkins Road, and Grahams Road.
- Priority give-way intersections at Carters Terrace, and Johnstone Street.
- Cross-section as per the proposed design, which includes a flush median, shared path, on-road cycle lanes and indented parking for some (but not all) of the new road corridor.

20.3.2 Timeframes

The assumed project timeframes are outlined in Table 20-1.

Table 20-1: Assumed timeframes

Time Zero	Design and Pre-Implementation	Property Acquisition	Construction
2021	2023-2025	2023	2025

20.3.3 Economic approach

A conservative approach was taken to the calculation of benefits, which means that the **benefits are more likely to be understated rather than overstated**. This approach captured:

- Capping of the travel time and VOC benefits in 2051. Notwithstanding, modelling has established that the network has sufficient capacity (with the project) beyond 2051.
- Active mode benefits do not consider new recreational trips, which could be notable given the link the project would provide directly to mountain bike trails on either side of the river.
- The adopted outage period of the existing bridge during earthquakes and storms is one week and one day, respectively. The second bridge is assumed to stay open during either of these events.
- CO_2 emissions reflect will be 4% of vehicle operating cost estimated from the microsimulation model.

20.3.4 Analysis period

The Monetised Benefits and Cost Manual states that whilst the standard analysis period is 40 years, an increase to 60 years is permitted to *"ensure that whole-of-life costs and benefits for long-lived infrastructure activities are captured…and emphasis should be placed on developing a range of options…and reporting uncertainty".* Given that staged solutions are being considered for this major piece of infrastructure with a lifespan of 100+ years, it was agreed that adoption of a 60-year analysis period was the most suitable approach for this project.

It was agreed between the economics peer reviewer that a 60-year analysis period should be used as the basis for the BCR. A 40-year analysis period is reported as a sensitivity test.

20.4 NPV COST

20.4.1 Project cost

The construction cost estimates described in Section 19 have been applied directly into the economic analysis and have been captured as Net Present Values (NPV). The separate costs for design, property acquisition and construction have been applied separately to reflect how the project cost would be spread across several years (in line with Table 20-1).

Note that the costs identified in Section 19 refer to the design and construction costs (i.e. non-discounted).

20.4.2 Future maintenance

The following ongoing costs have also been applied, based on a review of historic local maintenance costs[45]:

- Additional $3,900 annual maintenance for the new road and bridge[46]
- Additional $47,000 periodic (every 10 years) maintenance for the new road and bridge.

[45] Maintenance savings for the state highway have also been captured
[46] Derived from historic RAMM data

20.5 BENEFITS

Table 20-2 provides an overview of the total 60-year NPV benefits (using a 4% discount rate) for the full project – i.e. South Street to Grahams Road.

Table 20-2: Traditional economic benefits

Benefit	60-year NPV	Percentage of total benefit
Walking and cycling	$8.1m	8%
Safety	$1.2m	1%
Travel time and VOC	$75.4m	77%
Resilience (ex. MERIT)	$13.4m	14%
Total	**$98.1m**	**100%**

20.6 COMMENTARY

20.6.1 General

The economic analysis has shown:

- Most of the benefits relate to travel time and VOC. Essentially these are a consequence of the state highway being congested for long periods of the day beyond 2031, and the new bridge providing the faster route for local traffic to get between Ashburton and Tinwald.
- Walking and cycling benefits are relatively strong, even though they do not consider that additional benefit that could be captured from new recreational users (e.g. runners or mountain bikers).
- Resilience benefits are high.
- Safety benefits are relatively low (discussed below).
- Estimates an additional 110 daily cyclists by 2026.

20.6.2 Why are the safety benefits relatively low?

The economics, which has been undertaken in accordance with the MCBM and accepted by peer review, has identified a relatively low safety benefit of only $1.2m over a 60-year period.

Given that improving safety is a key outcome of the business case, and the design philosophy has been founded around delivering a 'Safe System[47], this result may feel surprising – especially because key safety features of the project include:

- Providing an alternative lower volume, route between Tinwald and Ashburton. This means that fewer people have to make dangerous right turns onto SH1.
- Roundabouts at all intersections along the new road.
- 50kph posted speeds.
- Flush median to reduce the likeliness of turning-movement related crashes.
- Landscaping to help enhance the feeling of a slower speed environment.

However, the nature of (industry standard) economic methodology means that, if more roads and intersections are being built, then more conflict points are being created (even if the design is to the highest possible safety standard). Furthermore, whilst there have been several crashes along the state highway in recent years, the vast majority are of low severity.

A roundabout is a safer form of intersection control compared to most other types. As they are an effective method of reducing both the number and severity of injury crashes. This is due to the reduced number of conflict points, lower relative impact speeds and more favourable impact angles when compared with other layouts.

State highway vs local road benefit

Whilst overall the safety benefit for the project is relatively low, **the safety benefit for SH1 (and Waka Kotahi) is relatively high – at $6.5m**. This is due to a reduction in traffic (in particularly turning movements) onto SH1. However, this benefit is being offset by a $5.3m disbenefit on the local roads because some traffic is diverting away from SH1.

[47] www.nzta.govt.nz/assets/network/operating/safely/doc/safe-system-presentation.pdf

Why include roundabouts if they deliver a disbenefit?

From an economic perspective, roundabouts in a low traffic volume environment such as Tinwald deliver only marginal safety benefits when compared to other intersection types. Furthermore, they generate a disbenefit for travel time and VOC. This is because vehicles using the new road will need to slow down at each intersection, which increases the travel time for the journey between Tinwald and Ashburton. Roundabouts are also a more expensive intervention than typical cross-roads. The challenge around the economics of roundabouts have been widely recognised, with Waka Kotahi's Safety Intervention Toolkit (v8) identifying a 'typical BCR' for rural and urban roundabouts being less than 1.0.

However, the philosophy of the project is to "do what's right, and not chase economic benefits". For this reason, the project team and partners have agreed on a design which promotes safer speeds. This is the core reason why three roundabouts are proposed, even though they have a negative influence on the theoretical BCR.

20.7 WIDER ECONOMIC BENEFITS

20.7.1 Land value uplift

A bespoke economic model has been developed to assess the wider economic benefit (WEB) of the potential new second bridge and road. The model appraises Land Value Uplift (LVU), representing the net private benefits of development. The central assumption of land value uplift modelling is that changes in land values because of a change in land use reflect the economic efficiency benefits of converting land into more productive use. The value of land in its new use is derived from residual land valuation.

The analysis takes into consideration the 'counter factual' situation, acknowledging that if the Chalmers Avenue Bridge were not constructed that land development would still occur, but either at a slower rate or in a different part of town. Table 20-3 presents both the gross land value uplift of dependent development[48].

Table 20-3: Land value uplift

Site	Use Value		Land Value Uplift	
	New	Existing	Gross	NPV
(A) Core	$24.5m	$12.9m	$11.6m	$10.6m
(B) Counterfactual	$6.1m	$3.2m	$2.9m	$2.6m
Net LVU (A-B)			**$8.7m**	**$7.9m**

The WEB for the full project is therefore calculated as being $7.9m. A technical memo provided as **Appendix R** outlined the methodology and assumptions that have informed the WEBs assessment.

20.7.2 Wider resilience economic benefits – Merit tool

An additional appraisal of the resilience benefits of the second bridge was undertaken using Waka Kotahi's *'Measuring the Economics of Resilient Infrastructure Tool (MERIT)'*. The purpose of this tool is to help roading authorities assess the economic impact of outages on a road network – looking at the impact of 7, 14 and 28 day closures. The tool consists of two distinct stages:

1. Direct Impact Analysis (DIA) - impact of a road closure on the travel time and distance between defined census statistical areas, using a GIS-based network analysis.
2. MERIT Economic Model - the wider impacts of the road closure for New Zealand's economy.

Appendix S details the MERIT analysis. In summary:

- The overall impact of the closure of SH1 Ashburton Bridge is the additional direct transport costs faced by households plus the reduction in value-added GDP resulting from changes in economic behaviour resulting from changes in transport costs.
- The total impact is around $8.1m for a 7-day closure to around $29.2m for a 28-day closure. This is on the basis that other potential detour routes (such as Thompsons Track) remain open.

[48] Net Present Value (NPV) is applied at 4% per annum as guided in the MCBM.

What if detour routes are also closed?

If an event, for example a significant rainfall or flooding, results in the closure of the SH1 Hakatere (Ashburton) River Bridge there is a high chance that upstream crossings will also be affected. This is significant because the approved detour route includes three river crossings for rivers which all run into the Hakatere (Ashburton) River. In this case vehicle detours are much larger, routing via Mt Somers and Methven.

If these upstream bridges are also closed the economic impact for a 7-day closure increases to $12.2, and for a 28-day closure increases to $45.1m.

Economically, how does the resilience issue in Ashburton compare nationally?

The SH3 Manawatū Gorge had a long-standing resilience issue due to its high susceptibility to land slips. In 2011 a large slip closed the route for 183 days with ongoing restricted access for a further 8 months.

As part of the pilot study for the MERIT tool, the economic impacts of closure of this road were assessed. The key result was that if the road were closed for 3 months, the loss in national GDP would be $3.4m. But this loss of GDP is relatively small when compared to the SH1 Ashburton Bridge – where the loss in GDP would be roughly 10 times higher ($29.2m - $45.1m), and for a duration of one (rather than three) months.

Another major slip in April 2017 left SH3 through the Manawatū Gorge impassable, and a new road is to be built between Woodville and Ashhurst (opening at the end of 2024)[49]. Whilst the frequency of slippages along the SH3 Manawatū Gorge would likely be more frequent than major floods/earthquake at the SH1 Ashburton Bridge, the GDP effects of the closure in Ashburton are significantly greater.

Benefit for Waka Kotahi and GDP

To understand the wider benefit for Waka Kotahi (and New Zealand), an estimate for the GDP resilience benefit has been calculated based on the following **highly conservative assumptions**:

- 1 day closure of the bridge every 10 years
- During these events, all other local upstream bridges would also be closed (as occurred during the May 2021 event)

On this basis the wider GDP impact of each closure would be $1.6m. The 60-year NPV is $3.1m. This figure has been used to inform the recommended Financial Assistance Rate (FAR) from Waka Kotahi towards this project.

20.8 BCR

The project BCR is shown in Table 20-4.

Table 20-4: BCR - Baseline

	60 Year NPV		BCR	BCR inc. WEBS
	Benefit	Cost		
Chalmers Avenue Second Bridge and New Road • Full construction by 2026 • New road link between Chalmers Avenue through to Grahams Road	Traditional: $98.1m WEBS: $7.9m	$80.2m	1.2	1.3

20.9 INCREMENTAL ANALYSIS

20.9.1 Overview

A potential staged solution could be to focus on initially delivering a second physical connection between Ashburton and Tinwald as far as Carters Terrace or Wilkins Road. Phase 2 would be constructing the remaining part of the corridor to Grahams Road in response to future development.

Table 20-5 provides the incremental economic analysis for the various sections and staging options. The full project is highlight in red cells.

[49] https://www.nzta.govt.nz/projects/te-ahu-a-turanga/

Table 20-5: Incremental analysis

		60-year NPV				
		South to Carters (2026) (No Carters to Grahams)	South to Wilkins (2026) (No Wilkins to Grahams)	South to Grahams (2026)	Staged to Wilkins	Staged to Grahams
					Stage 1: South to Carters (2026) Stage 2a: Carters to Wilkins (2036)	Stage 1: South to Wilkins (2026) Stage 2b: Wilkins to Grahams (2036)
Benefit	Walking & cycling	$5.4m	$5.9m	$8.1m	$5.9m	$7.8m
	Safety	$4.4m	$4.3m	$1.2m	$4.3m	$4.3m
	Travel time / VOC	$26.2m	$57.5m	$75.4m	$54.4m	$70.1m
	Resilience	$13.4m	$13.4m	$13.4m	$13.4m	$13.4m
	Total	$49.4m	$81.1m	$98.1m	$78.0m	$95.6m
	WEBS	$0.3m	$1.0m	$7.9m	$1.3m	$7.9m
Cost (NPV)		**$58.0m**	**$63.5m**	**$80.2m**	**$62.5m**	**$77.2m**
BCR		0.9	1.3	1.2	1.2	1.2
BCR inc. WEBS		0.9	1.3	1.3	1.3	1.3

The incremental BCRs are presented within Table 20-6.

Table 20-6: Incremental BCR

Lowest Cost option	Comparison	Incremental Cost	Incremental benefit	Incremental BCR	Highest performing option
To Carters	To Wilkins	$5.5m	$31.7m	5.8	To Wilkins
To Wilkins	To Grahams	$16.6m	$17.0m	1.0	To Wilkins
To Carters	To Grahams	$22.1m	$48.7m	2.2	To Grahams

A presentation of the benefits is provided within Figure 20-1.

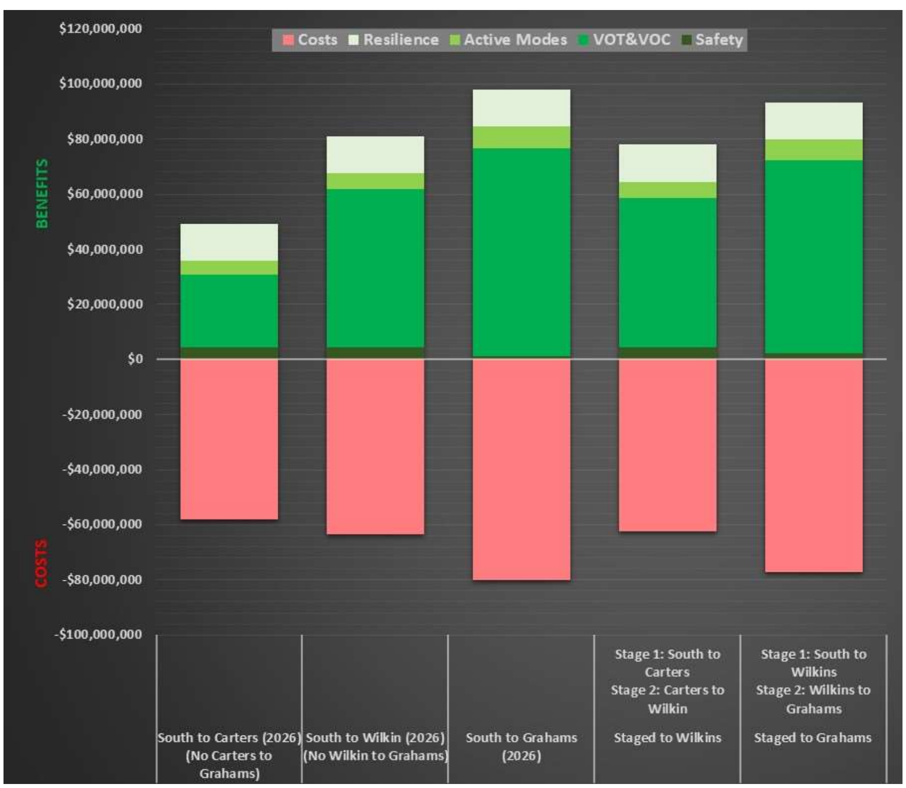


Figure 20-1: Economic benefits and costs

20.9.2 Commentary

Travel time benefits

The incremental analysis has shown that there are notable improvements in the travel time benefits when extending the new road to Wilkins Road or Grahams Road. A review of the modelling was undertaken in order to understand the key reasons why this is the case:

- Small changes in demand across the bridge can generate high benefits – i.e. even though volumes are low, the benefit is being gained for the whole day, 7 days a week, 365 days a year for up to 60 years.
- The grid-like nature of the road network in both Ashburton and Tinwald means that demand can be quite sensitive. This is because there are only small differences in travel times and distances between different routes.
- Carters Terrace vs. Wilkins Road
  - Carters Terrace angles slightly southward, which means it's a longer trip to go slightly backwards from SH1. The results in less volume on the Chalmers Bridge in this scenario – for the 2041 PM peak this equates to about 200 fewer vehicles per hour (combined two-way) when compared to the Wilkins Street option. Essentially this option picks up more Tinwald local traffic.
- Wilkins Road vs Grahams Road
  - Extending to Grahams Road attracts traffic coming from Lake Hood

Appendix T provides estimated volumes for the 2041 PM peak for each scenario.

Wider impacts of delaying any part of the project

The wider negative effects of delaying construction of any part of project would be:

- Act as a barrier to entry for prospective developers in East Tinwald.
- The need to upgrade additional intersections and local roads in East Tinwald. The diversion route from the state highway would need to be agreed, and the preferred route may require the upgrade of several intersections.
- Implications to walking and cycling connectivity from Tinwald to the new bridge (and onto Ashburton). Local routes would provide a lower level of service than the proposed for the new road.

20.10 SENSITIVITY ANALYSIS

Several sensitivity tests have been undertaken to provide a likely BCR range for the preferred programme (staging upgrade), focusing on the most influential factors:

- Discount rate – change to 6%
- Construction cost - changes in project cost by +/- 20%
- Travel time/VOC – capping benefits later than 2051
- Analysis period – 60 years rather than 40 years

Table 20-7: Economic sensitivity analysis

Sensitivity test	Upper	Base	Lower	BCR Range
Discount rate	4%	4%	6%	0.7 - 1.2
Analysis period	60 years	60 years	40 years	0.9 - 1.2
Travel time benefits	No cap	Cap at 2051	Cap at 2041	1.2 – 1.5
Walking/cycling recreational users	+100 pedestrians and +50 cyclists per day	0	0	1.2 – 1.2
Consider only state highway safety benefit	SH1 safety benefit only	All major roads and intersections considered	All major roads and intersections considered	1.2 – 1.3
Cost	+20%	0	-20%	1.0 - 1.6

20.11 SUMMARY

The economic evaluation has shown that:

- The project will deliver strong benefits (both traditional and WEBs) and presents good value for money with a BCR of 1.3 (inc. WEBS). This is a relatively consistent BCR for all alternatives evaluated, aside from the option to only build the new road as far as Carters Terrace.
- Ending the project at Carters Terrace is a poorer economic choice as it presents a BCR < 1 and does not strongly deliver the wider outcomes desired from investment (refer to the next chapter). Significant benefits can be gained by extending to the next block – i.e. Wilkins Road.
  - The incremental BCR for the Carters Terrace to Wilkins Road section is very high at 5.8.
- If the project were to finish at Wilkins Road, there would be little benefit in staging construction (i.e. coming back ten years later to build the Carters Terrace to Wilkins Road section). The saving in cost would be relatively small at $1m (NPV), but the loss in benefit would be over $3m (NPV). This approach would also stagnate potential land development in a location where a neighbourhood centre has been earmarked.
- This resulting positive BCR from the economics support an approach where the full project should be constructed.
- **At the very least** the South Street to Wilkins Road should be delivered as soon as possible.
  - The section between Wilkins Road and Grahams Road would provide high benefits, but it may be appropriate for a future developer, who would stand to gain most of the land value uplift, to contribute toward its funding.

21. COMPARISON OF ALTERNATIVES

21.1 SUMMARY OF ALTERNATIVES

Table 21-1 provides a simple comparison of alternatives for the second bridge, which follows a similar format of the Appraisal Summary Tables, which are provided within **Appendix L**.

Table 21-1: Summary of alternatives

	South to Carters (2026) (No Carters to Grahams)	South to Wilkins (2026) (No Wilkins to Grahams)	South Street to Grahams Road (2026) FULL PROJECT	Staged to Wilkins Stage 1: South to Carters (2026) Stage 2a: Carters to Wilkins (2036)	Staged to Grahams Stage 1: South to Wilkins (2026) Stage 2b: Wilkins to Grahams (2036)
Economic					
Capital cost	$67.5m	$73.8m	$93.0m	$74.8m	$96.3m
60 Year NPV cost[50]	$58.0m	$63.5m	$80.2m	$62.5m	$77.2m
60 Year Benefit (ex. WEBS)	$49.4m	$81.1m	$98.1m	$78.0m	$95.6m
BCR ex. WEBS	0.9	1.3	1.2	1.2	1.2
BCR inc. WEBS	0.9	1.3	1.3	1.3	1.3
Alignment with Investment Objectives					
Connectivity	Good	Strong	Very Strong	Good	Very Strong
Travel choice	Low	Good	Good	Low	Good
Safety	Good	Good	Good	Good	Good
Economy	Good	Strong	Strong	Good	Strong
Alignment with key strategies					
GPS	Strong	Strong	Very Strong	Strong	Very Strong
Transport outcomes					
Healthy & safe people[51]	Good	Strong	Strong	Good	Strong
Resilience & security[52]	Strong	Strong	Strong	Strong	Strong
Economic prosperity[53]	Strong	Strong	Strong	Strong	Strong
Inclusive access[54]	Low	Low	Low	Low	Low
Environmental sustainability[55]	Strong	Strong	Strong	Strong	Strong

21.2 RECOMMENDATION

The economic evaluation, consideration of likely funding partners and an assessment of outcomes has resulted in a recommendation that **the full project through to Grahams Road** should be delivered. The BCR for all alternatives (aside from building only as far as Carters Terrace) is good at either 1.2 or 1.3 for all options.

However, for funding decision purposes, the project has been split into two following sections. This is because ADC may see it as suitable for a future developer to contribute to the Wilkins Road to Grahams Road section.

1. South Street to Wilkins Road (inc. the new bridge)
   - Funded by ADC, Waka Kotahi and the MoT
2. Wilkins Road to Grahams Road
   - Funded by ADC, Waka Kotahi and the MoT

[50] Capturing annual and periodic maintenance costs also
[51] The system: (a) protects people from transport-related injuries and harmful pollution, and (b) makes physically active travel an attractive option.
[52] The transport system: (a) minimises and manages the risks from natural and human-made hazards; (b) anticipates and adapts to emerging threats; and (c) recovers effectively from disruptive events.
[53] Supports economic activity via local, regional, and international connections, with efficient movements of people and products.
[54] Inclusive access - enables all people to participate in society through access to social and economic opportunities.
[55] The transport system: (a) transitions to net zero carbon emissions, and (b) maintains or improves biodiversity, water quality and air quality.

  - Opportunity for a funding contribution from future developers

The recommended approach:

- Optimises value for money with a BCR (ex. WEBS) of 1.3.
- Most strongly delivers the Investment Objectives – the fundamental reason for investment.
- Provides assurance and clarity for future developers.
- Delivers the best community and transport outcomes, even if the project is staged.
- Minimises disruption to the community, with construction of the project in full and 'in one go'.
- Provides ADC the opportunity to sell land that has already been purchased. This could be used to partly finance council's contribution to the project.

The scale of the outcomes and problems are such that it is important that 'the project doesn't wait for a future developer', and that a second bridge is constructed as soon as possible. If the project were to be staged, **at the very least,** the section between South Street and Wilkins Road should be constructed in Stage 1.

21.3 WHY NOT THE 'MINIMUM VIABLE PRODUCT'?

Finishing Phase 1 of the project at Carters Terrace would be the lowest cost option.

However, this option is not recommended for the following reasons:

- This is the only option that presents a BCR less than 1.0.
- The option does not strongly meet all of the Investment Objectives.
- The incremental benefit of extending the new road a relatively short distance from Carters Terrace to Wilkins Road is significant – i.e. a $31.7m benefit for an additional $5.4m cost.
- Carters Terrace north of Grove Street is a local road[56] and does not fit into the wider road hierarchy. An upgrade of the entire road may be required in order for it to function as a Collector Road which is needed to ensure that the entire journey from home to destination is safe.
- Provides little in terms of wider economic benefit as very few houses (potentially zero) could be built off a corridor that ends at Carters Terrace. A neighbourhood centre, which would be a key local amenity (and reduces the need to travel into Ashburton) has been earmarked for the Wilkins Road to Carters Terrace section.

[56] www.ashburtondc.govt.nz/__data/assets/pdf_file/0018/5049/10-Transport.pdf

22. PREFERRED OPTION ASSESSMENT

22.1 BENEFITS OF INVESTMENT

Table 22-1 shows the strength to which project will address the core problems. This assessment also captures the short-term measures – i.e. the clip-on passing bays for cyclists on the SH1 Bridge and improvements to the SH1 / South Street merge.

Table 22-1: Assessment vs Problem Statements

Problem Statement	Preferred programme	Alignment
Connectivity. An absence of route choice contributes to more traffic on SH1. This discourages people from making journeys they otherwise would, creating social disconnect and lack of a 'one community' feeling.	**Short term** • Improvements to the merge areas at the SH1 / South Street intersection will contribute to reducing travel time delays on the road network and contribute to reducing the perception that the bridge represents an obstacle to travel between the two communities. **Medium term** • The increase in capacity that would be created by a second bridge will eliminate the river crossing as a constraint to travel between the Tinwald and Ashburton communities. Additional benefits would be gained with the additional construction of the Wilkins Road to Grahams Road section. • A reduction in traffic on the state highway will reduce severance.	Very Strong
Travel Choice. Limited (or poor quality) facilities for sustainable modes makes it difficult to achieve long-term environmental and liveability objectives.	**Short term** • Clip-on passing lanes for cyclists will improve journey times for existing cyclists, but unlikely to create notable mode shift. **Medium term** • A new bridge at Chalmers Avenue and new road will provide high quality facilities for active travel. The facility will provide an attractive alternative to the car for people living in Tinwald to travelling to the town centre. • The strength of the alignment is partly dependent on the timeframe for the new bridge – the earlier it is constructed the greater the strength, as the existing deficiencies in the quality of active travel infrastructure across the SH1 Bridge are significant and a barrier to achieving mode shift. The current approach is to construct the bridge at the earliest opportunity. • The Chalmers Avenue Bridge will enable cross-river recreational use. Currently mountain bike users generally keep to either one side of the river or the other, actively avoiding crossing the SH1 Bridge. The bridge unlocks potential new recreational users and encourages longer cycling journeys.	Good
Safety. As traffic volumes continue to grow, the likelihood of injury crashes and delays for emergency service responses will also increase.	• The second bridge will reduce traffic on the state highway and the number of vehicles looking to access from the side roads. This reduces the likeliness of both rear-end and turning movement related crashes. • Some disbenefit for the local roads is expected, but the project seeks to mitigate safety risks caused by re-routing local traffic. The design is such that it delivers a Safe System approach and a road that is as safe as possible. • Delays for emergency vehicles will reduce, and new route options are provided. • The programme supports the safety objectives of the Tinwald Corridor Improvements project.	Good
Economy. Increasing traffic and constrained capacity on SH1 results in worsening travel time reliability between Tinwald and Ashburton. This impacts freight connections and economic prosperity.	**Short term** • The extensions to the SH1 / South St downstream merge areas will contribute to reducing the congestion and delays and hence improving travel time reliability. **Medium term** • The additional capacity that would be created by a second bridge will reduce the potential for congestion and delays. This will improve travel time reliability reducing transport costs for freight. Long term benefits are expected with the delivery of the second bridge, even if construction is staged.	Strong

22.2 DELIVERING THE KPIS

Table 22-1 shows alignment of the preferred programme against the Key Performance Indicators (KPIs).

Table 22-2: Assessment vs Key Performance Indicators

KPI	Future target	Commentary	Alignment
River Crossing Capacity	3,000 vehicles / hour	A second bridge will effectively double the river crossing capacity.	Strong
Length of SH1 detour route	< 10km	Detour route would be less than 2km	Strong
Active mode counts across the river	50 people per hour (peak hour)	New bridge is expected is increase active mode use	Strong
Active mode share for journeys to work and school	20% walking and cycling	Bridge will create opportunity to increase mode share for travel to work from Tinwald. Bridge will not influence travel mode for most schools. Economics estimates an additional 110 cyclists by 2026.	Moderate
Walking and cycling LOS assessment	LOS B for cyclists	Bridge and road will provide a safe separated path plus on-road cycle lanes for confident users.	Strong
Collective and Personal Risk on SH1	Medium-Low	Reduced traffic volumes on SH1 is expected to reduce collective and personal risk.	Good
Travel time variability – Local Travel	Weekday peak-hour journey times do not exceed off-peak journey times by more than 2 mins	Modelling suggests that peak hour travel times will be subject to delays of 1-2 minutes compared with free flow travel	Strong
Travel time variability – SH1	Journeys along SH1 through Ashburton and Tinwald during weekday peak-hour do not exceed off-peak journey times by more than 4 mins.	Modelling suggests that peak hour travel time delays on SH1 will be less than 4 mins.	Strong
Delays at the SH1 / South Street signals	Safe and efficient southbound merge with no congestion	Extension of merge will allow for more efficient merge operation	Strong

22.3 ALIGNMENT VS KEY STRATEGIES

Table 22-3 provides an assessment of the preferred programme against key strategies.

Table 22-3: Programme alignment vs key strategies

Strategy	Preferred programme	Alignment
National strategies		
Draft Government Policy Statement (GPS) on Land Transport Funding (2021)	The focus of the project around delivering strong liveability, safety and freight efficiency objectives aligns very strong with GPS objectives. The project also supports key resilience outcomes and a need to mitigate the impacts of climate change.	Very Strong
Road to Zero	Each component of the proposed programme will contribute to increasing safety on the road network and is consistent with the “Road to Zero” vision and objectives. Key benefits of the programme are a reduction in right turning traffic onto the state highway and safer means of travel for pedestrians and cyclists.	Strong
Local strategies		
ADC Long Term Plan 2018-28	A second urban bridge is one of five major projects included in the Long-Term Plan.	Strong
Transportation Activity Management Plan (AMP) 2018-21	Congestion caused by the SH1 Bridge is identified as a key issue in ADC’s AMP. An alternative river crossing was identified as an option to address this.	Strong
District Plan (2014)	The District Plan includes a designation for a second bridge aligned with Chalmers Avenue.	Strong

Strategy	Preferred programme	Alignment
Sport and Recreation Strategy 2010	One objective of the strategy is ensuring people are actively involved in sport and recreation throughout their lives. The provision of river crossings with active mode facilities will form a critical input to the strategy.	Strong
Walking and Cycling Strategy (2021)	The vision of this strategy is "more people, more active, more often". The improvements to the active mode facilities for crossing the river provided by the programme are aligned with this vision.	Strong
Other business cases / projects		
Tinwald Corridor Improvements	The programme supports the Tinwald Improvements project as the congestion relief provided by a second bridge at Chalmers Avenue will reduce demands through the new Tinwald signals. This will ultimately extend the practical lifespan of those signals.	Strong

22.4 INVESTMENT ASSESSMENT FRAMEWORK

22.4.1 GPS alignment

An assessment has also been undertaken against the 2021 GPS, which introduces improved freight connections as a key strategic priority, as this is an important consideration of the recommended programme. Table 22-4 provides an assessment of the preferred programme using the Investment Prioritisation Method (IPM).

Table 22-4: Investment Prioritisation Assessment for the Preferred Programme

Priority	Benefit	GPS alignment	Comment
Safety	Impact on social cost and incidences of crashes	MEDIUM	
		Medium or greater collective risk corridors or intersections to achieve a death and serious injuries reduction of >15% over a five-year period.	• Safety improvements will be delivered through a reduction in right turning traffic onto the state highway and safety infrastructure for active travel. Medium alignment reflects that the corridor has medium collective risk and there are relatively few DSIs currently along the SH1 corridor – hence a significant DSI reduction from a low baseline cannot be achieved.
Improving Freight	Impact on network productivity and utilisation	VERY HIGH	
		High • 21-30% improvement in predictability (reduction in variability) of travel time on priority routes for freight. • Improving connections between nationally significant production and distribution points **Very high** • >31% reduction in duration of unplanned road closures/service disruptions of ≥2 hours	• The traffic model forecasts that in 2041 there will be a 30-40% reduction in travel time delays with the programme[57]. • SH1 is the primary route for road freight movement in the South Island, and the SH1 Bridge through Ashburton is located midway between the two biggest cities (Christchurch and Dunedin) and two major ports (Christchurch and Timaru). The May 2021 flood event demonstrated the high impact that any closure can have to supply chains through to Dunedin. • The second bridge will also significantly reduce the duration of unplanned road closures > 2 hours. A second bridge could mean that there are no longer any events that restrict travel across the Hakatere (Ashburton) River by more than 2 hours. The river crossing is the only 'pinch point', and for every other part of the network (within the study area) there are alternative routes – as Ashburton and Tinwald have 'grid-like' road networks. • **'VERY HIGH'** alignment reflects the fact that the bridge is the only part of the local network that provides no alternative route, and the preferred programme removes this constraint.
Climate change	Impact of GHG	HIGH	
		Addressing a known climate change adaptation issue that is forecast to occur by 2040.	Section 3.2.5 provided evidence that the Hakatere (Ashburton) River has a known climate change adaptation issue that is forecast to occur by 2040.
GPS 2021 Results Alignment Rating			VERY HIGH

[57] Taking the 'interpeak' travel time through the SH1 corridor as the baseline metric for 'expected journey time'

22.4.2 Scheduling

Scheduling indicates the criticality or interdependency of the proposed activity or combination of activities with other activities in a programme or package or as part of a network. The definitions are:

- **Criticality**: the significance of the activity or combination of activities' role as part of the network, and the degree of impact to users, particularly due to availability (or not) of alternatives.
- **Interdependency**: Degree to which the activity is necessary to unlock the benefits of another related or integrated investment (e.g. a major housing or industrial development).

Table 22-5: Scheduling assessment

Priority	Alignment	Comment
Interdependency	MEDIUM	
	• Non-delivery of proposed activity in the 2021 NLTP has a moderate impact on realising the estimated benefits of the programme - i.e. one or more benefits may not be achieved or may be reduced, or may be delayed for up to 3 years	• NZUP Investment in the Tinwald Improvements and Walnut Avenue signals will improve safety and travel times over the existing situation. The traffic modelling has indicated that congestion issues will start to arise again by the next NLTP period. Clip-on passing bays to the existing SH1 Bridge will also provide some benefit to existing cyclists, as will new cycle lanes being provided as part of the Tinwald Improvements. Delivery of that infrastructure offsets the need for immediate implementation (construction) of the programme. Benefits will therefore be provided to the community during the 2021-24 NLTP period. • However, planning and design of the second bridge will be critical during this next three-year period (21-24). Any delay of that pre-implementation work to the next NLTP period is likely to push back the construction timeframe of the second bridge.
Criticality	MEDIUM	
	• Significance of activity as part of the network, with risk of unplanned loss of service (≥2 hours) requires use of alternative routes or modes taking 1-2 hours extra travel time for most users.	• In the event of a SH1 Bridge closure the detour route (if open) requires an additional 80km travel distance and up to 90 mins travel time. There is no alternative route for customers who walk or cycle.

22.4.3 Assessment Profile

The preferred option obtains a GPS priority rating of 'Very High' based on the anticipated freight outcomes. Based on the 2021 GPS results alignment rating, estimated BCR range (between 1-3) and scheduling assessment the corresponding **NLTP priority order [58] is 3**. This ranks as a high priority.

22.5 SUPPORTING TRANSPORT AND LAND USE STRATEGIES

22.5.1 Transport vision

Figure 22-1 show how the technically preferred programme would help deliver a resilient network that aligns with council's vision for a future road network. The map shows how a Chalmers Avenue connection helps complete an eastern ring route for Tinwald and Ashburton. In the event of a closure on the state highway, the extended Chalmers Avenue will function as a safe and suitable alternative route. The new corridor provides a direct link between the primary residential (east Tinwald and Lake Hood) to the primary employment (Ashburton Business Estate) growth areas.

Figure 22-2 shows how together the Tinwald Corridor Improvements SSBC and ATC business case would significantly enhance the local walking and cycling network. New safe connections will be provided across the river and link to recreational paths along the river. Combined the projects would deliver a large proportion of council's desired long term active travel network.

[58] www.nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/202124-nltp/2021-24-nltp-investment-prioritisation-method/determining-the-priority-order-of-an-activity-or-combination-of-activities/

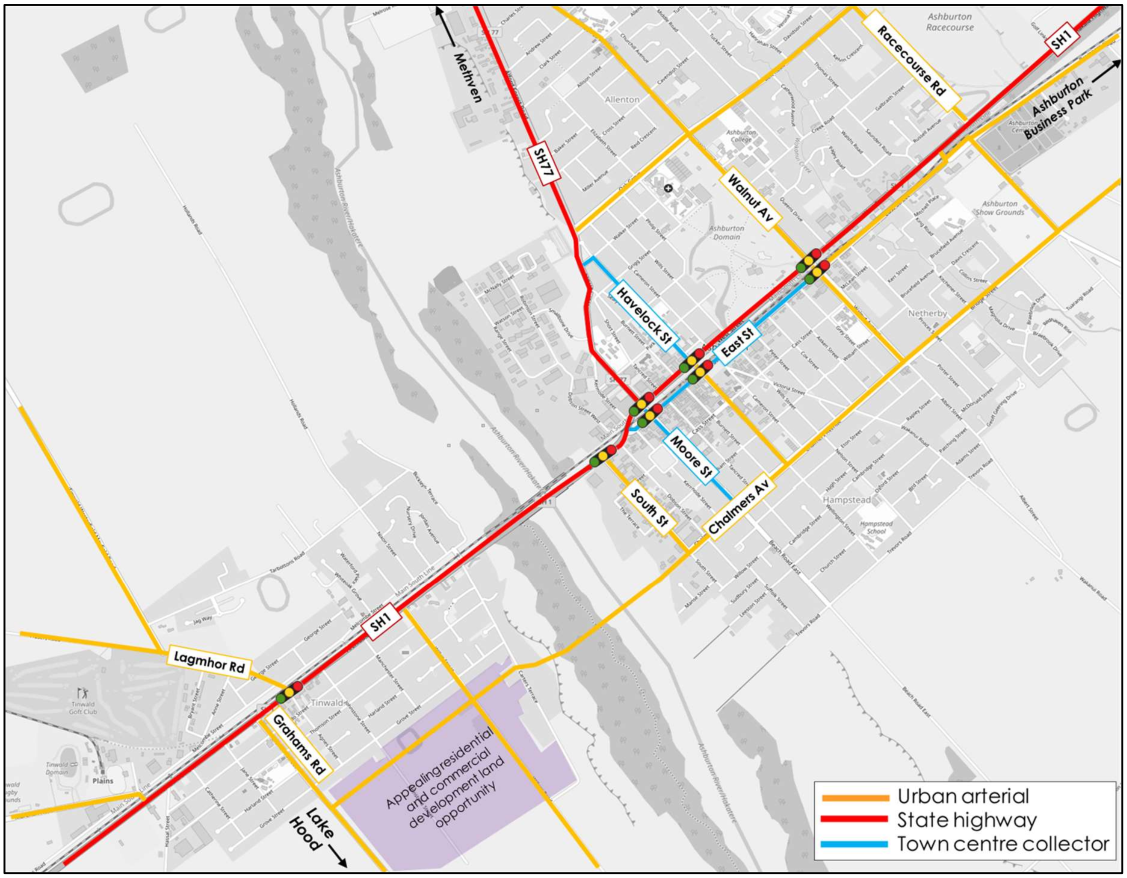


Figure 22-1: Preferred programme – delivering a resilient future transport network

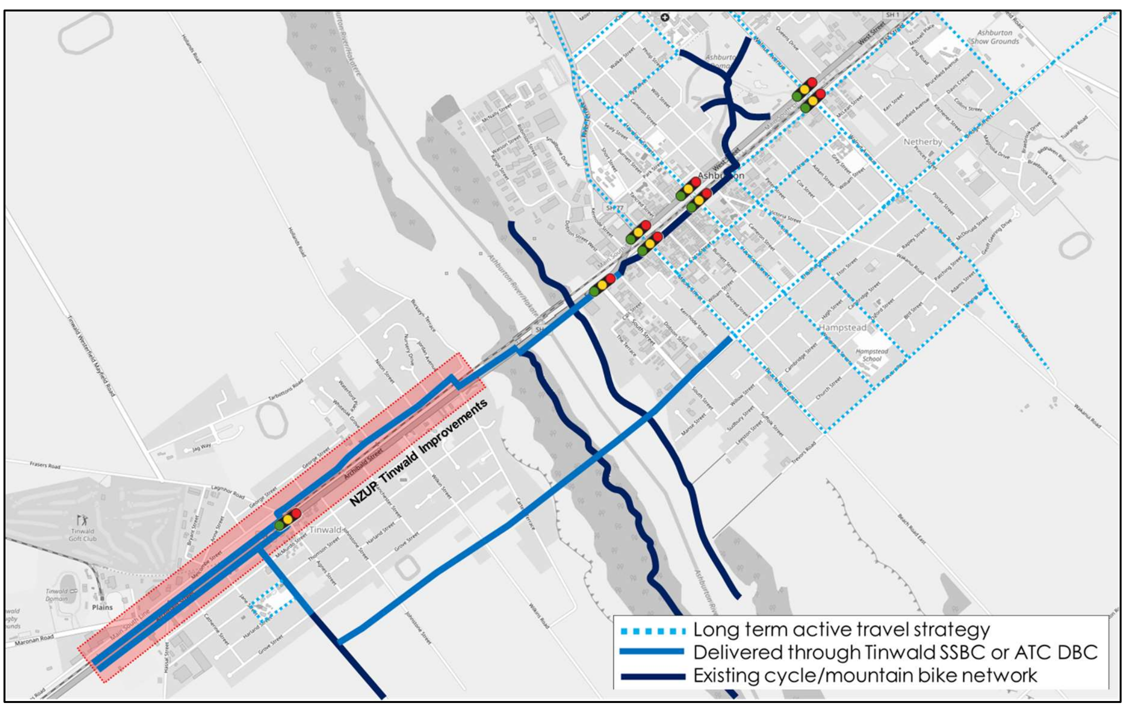


Figure 22-2: Preferred programme – potential future active travel network

22.5.2 Land use vision

Appendix B provides the Ashburton District Plan land use zoning map. It shows:

- New residential areas to the east of Tinwald, Lake Hood and Hampstead (Ashburton).
- The Lake Hood Special Zone could increase from 200 to 500 dwellings.
- Immediately south of the river there is about 13.8 ha of largely undeveloped land south of the existing residential area. After allowing for roads and reserves, this area would be sufficient to allow for development of about 300 new dwellings[59].
- Business zoned land (yellow) located close to SH1 near the Ashburton CBD, a large business estate to the north, meat processing plant and a small light industrial area to the south of Tinwald.

With a Chalmers Avenue Bridge, the appeal of developing these key growth areas becomes much stronger, and potentially the bridge will become a catalyst for bringing this growth forward. Going forward there is opportunity for council to work with developers and identify opportunities for providing some community amenities (such as a pharmacy, supermarket, health clinic etc.) within these new residential areas.

[59] Based on the minimum lot size set out in the District Plan (360sqm)

23. CARBON EMISSIONS

23.1 OVERVIEW

The Ministry of Transport Outcomes Framework[60] identifies five core outcomes for improving wellbeing and the liveability of places through the transport system:

- Inclusive access
- Healthy and safe people
- Economic prosperity
- Resilience and security
- Environmental Sustainability

The benefits of the project (described in the previous section and Table 9-1) map directly to all five outcomes. It is necessary to also consider the Environmental Sustainability outcome which is defined as *'transitioning to net zero carbon emissions, and maintaining or improving biodiversity, water quality and air quality'*. An important indicator for this outcome relevant to this project is greenhouse gases emitted from the transport system.

This section presents quantification of this outcome. Following consultation with Waka Kotahi, the scope of the assessment has been limited to only the embodied (construction) emissions of the current design. Emissions from construction or operational activities (e.g. energy and fuel used) will be assessed during the next phases when there is more certainty around the potential construction methodology for the bridge.

What is embodied carbon?

- Embodied carbon is defined as emissions from activities associated with a particular material or product e.g. production and transportation.
- Embodied carbon is assessed on a life-cycle basis therefore emissions from all points in the supply chain and over the lifetime of that material or product are considered.

Opportunities to reduce the level of embodied carbon during the next phase of the project (detailed design) have also been identified.

23.2 EMISSIONS ESTIMATES

23.2.1 Methodology

Greenhouse gas emissions due to construction activities are an unavoidable consequence of any construction project for new infrastructure or replacement of structures due to end of life. The methodology used for deriving estimates for embodied carbon emissions is outlined in Figure 23-1.

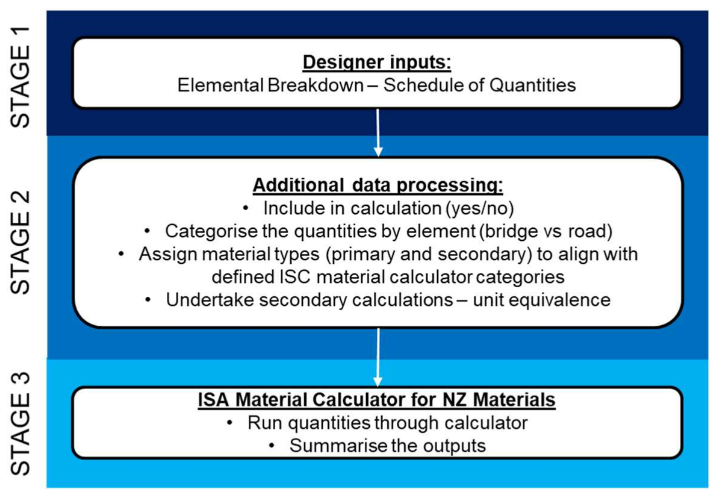


Figure 23-1: Methodology for calculating emissions

[60] https://www.transport.govt.nz/assets/Uploads/Paper/Transport-outcomes-framework.pdf

23.2.2 Estimates

The estimated construction emissions are based on the final DBC scheme design (provided within **Appendix M**). These have been broken down for the bridge and road, capturing embodied emissions associated with the production and construction material and transportation of each material type.

The bridge structure is the main contributor of embodied carbon emissions – accounting for 71% of the total (approximately 4,700 tonnes of CO_2). The road contributes approximately 1,900 tonnes of CO_2. Figure 23-2 and Figure 23-3 provide a breakdown of the emissions for the bridge and road, respectively.

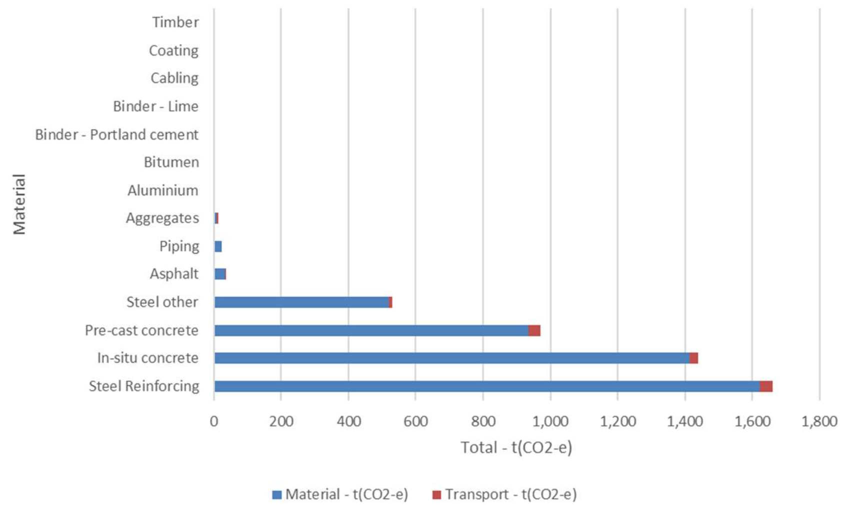


Figure 23-2: Emissions estimates for the bridge construction

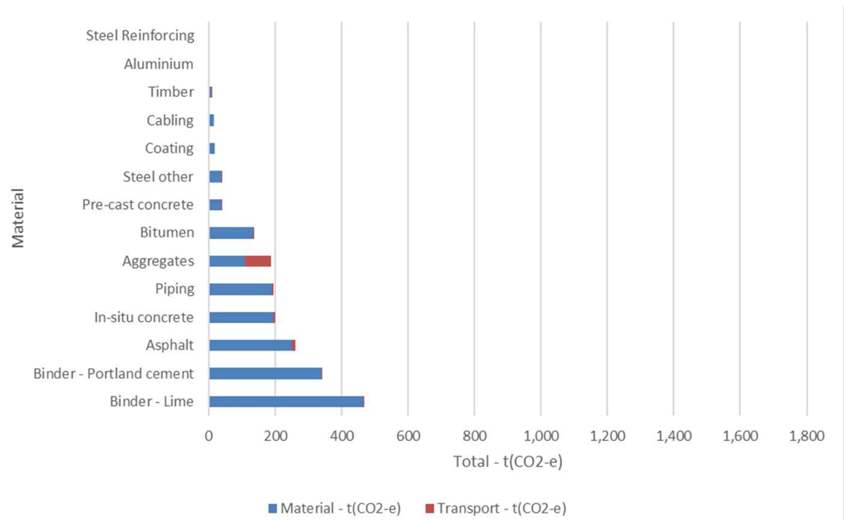


Figure 23-3: Emissions estimates for the road construction (to Grahams Road)

The most significant sources of embodied carbon for the bridge were:

- Steel - bridge reinforcements (36%)
- In-situ concrete – bridge reinforcements - e.g. deck, stems, barriers (31%)
- Pre-cast concrete – PC beams (21%)
- Steel (other) – caisson liner (11%)

The most significant sources of embodied carbon for the road were:

- Binder – Portland cement and lime (24% and 18% respectively)
- Asphalt – chipseal, basecourse etc. (14%)

- Concrete – kerb and channel (10%)
- Piping (includes precast concrete) (10%)

23.3 OPPORTUNITIES TO REDUCE EMISSIONS

Greenhouse gas emissions reduction opportunities for the project were identified through a series of interviews between various technical discipline leads (geometrics, drainage/stormwater, earthworks, pavement, structures) and the sustainable infrastructure experts. A workshop with the technical discipline leads was then held with project partners on the 29th June 2022 to discuss of potential opportunities to reduce embodied carbon (that wll be explored further during Detailed Design).

A total of 11 key opportunities were identified, as described in Table 23-1. Commentary is also provided around the implications of any option to the wider outcomes desired as part of the project. Some options have significant impacts on the desired outcomes of the project - e.g. reducing the width of the bridge or reducing levels of service for active modes.

This challenge introduces a healthy tension for the detailed design stage, but it should be noted that progressing any option that has significant impacts on the desired outcomes of the project represents a trade-off which should be explored, but which is not likely to be acceptable to the project owners.

Table 23-1: Opportunities to reduce embodied carbon emissions

Category	Opportunity	Further considerations	Carbon reduction potential	Risk to wider project outcomes
Structure	Reduce width of traffic lanes on bridge to 9.7m so design only needs to accommodate two live traffic lanes.	• Reduces weight – lighter beams, less foundations required. • Implications to future-proofing of the bridge and level of service for active modes (a key outcome for the project) • 9.7m carriageway does not support 2x on road cycle lanes plus 2 x normal size vehicle lanes	Medium	High – implications to walking and cycling level of service
	Reduce width of bridge e.g. by having shared used path (SUP) on only one side; narrower traffic lanes, remove cycle lanes and just have SUPs, or have narrower footpaths and on-road cycle lanes, not both, or not on both sides.	• The cross section has been designed to cater for future needs including growth in users of sustainable transport. It is expected that further development will occur to the south meaning demands will be on both sides of the road. Cycle lanes are for confident cyclists, SUPs for less confident. • Having an SUP on only one side could potentially alter the loading on the beams. This might require larger beam on the other side as the traffic will be close to the edge, increasing carbon.	Medium	
	Reduce weight of bridge by using precast hollowcore instead of Super T beams.	• Precast hollowcore is lighter and will reduce amount of steel, concrete as well as cost.	Medium	Low
	Replace steel/concrete with wood – whole of bridge	• Maintenance regimes will be different and need to be considered – wood shorter lifespan. • May be issues with drainage. • Concrete barrier will need to be on the inside of the SUP.	High	
	Construct both SUPs from wood		High	
Pavement	Use EME2 for roundabouts and approaches[61]	• EME2 less material required but higher upfront cost	Low	Low

[61] EME2 is a high modulus asphalt. It was created to build stronger, thinner, longer-lasting pavements.

Category	Opportunity	Further considerations	Carbon reduction potential	Risk to wider project outcomes
Procurement	Specify in tender documents requirement for low carbon footprint (explore incentives)	• Low carbon materials may cost more. • Could have low carbon as a non-price attribute in the tender evaluation. • Might need to ask contractor to estimate the carbon in their design – no standard methods, may not be able to do this. • Design/build process has an in-built cost/material saving component that could help with the carbon reductions. • Market transformation needed.	Medium	Low
Roading	Reduce width of new road e.g. through considering whether full extent of parking is needed, whether both SUPs and cycle lanes are needed, and whether these are needed on both sides.	• A narrower road could be constructed now to meet existing needs, and then it could be expanded later once development takes place in Lake Hood.	Low	Medium - implications to walking and cycling level of service.
Drainage	Smaller diameter pipes	Potential impact to flood protection	Low	Medium
	Change in material from concrete to PVC or PE pipes	Would need to be deeper and may have different maintenance requirements and/or lifespan.	Medium	Low
Lighting	Replace steel with low carbon lighting poles	Not sure if such lighting poles are available.	Low	Low

PART C: READINESS AND ASSURANCE

24. RISK MANAGEMENT

24.1 RISK MANAGEMENT STRATEGY

Table 24-1 provides a summary of key risks for the next stages of programme delivery.

Table 24-1: Project Risks

Risk Description	Risk Cause	Risk Rating		Risk Owner	Risk Mitigation	Consequence
		Impact	Likelihood			
Community acceptance of Chalmers Avenue option	There is split opinion in the community around where a future second bridge should be located	Low	Low	ADC	This business case presents strong rationale for why a Chalmers Avenue alignment is preferred. The evidence presented can be used in future communications with the community.	Community dissatisfaction and reputation risk.
Funding commitment to ensure delivery of a 2025-2027 construction timeframe	ADC and WK agree around the technically preferred programme and timeframes presented within this DBC. However, there is a funding gap (discussed in the Financial Case) that will require approval at a Ministerial Level to resolve.	High	Medium	ADC & Waka Kotahi	Presentation of this DBC to the MoT.	The project does not get the necessary funding and does not progress.
Chalmers Avenue Bridge option may not attract a large volume of traffic	• Modelling indicates that the Chalmers Avenue Bridge will attract enough traffic off SH1 to keep that corridor operating efficiently up till 2041. • There is a reputation risk if the bridge is not well used, with demand largely triggered (Mon-Thurs) by the speed of growth in east Tinwald and Lake Hood.	Low	Medium	ADC & Waka Kotahi	The modelling has provided an indication as to how much traffic the bridge will attract. Even though the forecast usage is low, it removes enough traffic from SH1 to allow the SH1 corridor to function more efficiently. How people travel in reality may potentially differ to that estimated by the model.	Reputational
Wider safety impacts of traffic using the Chalmers Avenue second bridge	Safety improvements would be expected on the state highway through travel reductions. However, a diversion of traffic onto the local road network could increase the safety risk on other parts of the network.	Low	Low	ADC & Waka Kotahi	• Safe design • Ongoing monitoring post construction. • Potential local road mitigation required – particularly if only part of the corridor through to Grahams Road is constructed.	Risk of injury on local roads.

Risk Description	Risk Cause	Risk Rating		Risk Owner	Risk Mitigation	Consequence
		Impact	Likelihood			
Effect of future land-use on SH1 Bridge travel demands	Growth not occurring as fast as expected, influencing usage of the bridge	Low	Medium	ADC	As above, the rationale behind a Chalmers Avenue Bridge goes beyond just providing congestion relief on the state highway.	Minimal reputational risk
Resolution of the 'River Terrace' land	There is an ongoing legal dispute regarding land along the riverside which will be needed for construction.	Medium	Medium	ADC	Ongoing negotiation required to achieve a resolution	Risk to delivery programme and costs (potential additional property)
Cost estimates increase during detailed design and construction tender phases	Ongoing material cost increases due to externalities, and ongoing inflationary pressures.	Medium	Medium	ADC / Waka Kotahi	• DBC has produced robust cost estimates informed by geotechnical and topographic surveys. 2D hydrologic modelling has also be undertaken. • A parallel cost estimate has been undertaken.	Risk of the project being delayed and need for additional contribution from local or national government.
Community expectations that the improvements will be delivered sooner than is realistic or affordable.	Media articles/interviews, or unclear communications	Medium	Medium		Clear communications, and regular updates to the community following submission of this DBC to Waka Kotahi and the MoT (if applicable).	Reputational
Planning - obtaining resource consents and mitigating potential ecological effects	Resource consents are required for the construction of the bridge within the riverbed (amongst other matters). While the designation for the Project has been secured this does not guarantee that the necessary resource consents will be approved. There is also a risk that the applications could be notified and/or appealed.	Medium	Low	ADC	• The recommendations of the desktop ecological assessment (generally for targeted field surveys) should be followed to better understand the potential adverse effects and to determine the mitigation that will likely be required. • A pre-application meeting with ECAN would provide an opportunity to obtain further data and discuss acceptable mitigation, prior to the resource consent application.	Risk of the project receiving resource consent and subsequent impact to the final construction date

Risk Description	Risk Cause	Risk Rating		Risk Owner	Risk Mitigation	Consequence
		Impact	Likelihood			
Ecology	There are very significant bird species, as well as significant fish species, and trout and salmon (not ecologically significant but valued by anglers) that could be majorly affected during construction and ongoing operation (disrupted river morphology etc.), if not carefully managed.	Medium	Medium	ADC and design consultant	Stringent construction methodology, timeframes, ongoing surveys and monitoring, offsetting (e.g. pest management or planting elsewhere)	Impact of the local environment, and risk to the project receiving resource consent
Supplier market	Lack of suppliers or tenderers for the project	High	Medium	ADC	Undertake market sounding, and alert potential suppliers to the projects. It is likely that the project will attract significant interest given its high profile and its relatively simple construction.	A low number of tenderers could increase the project cost. However, with market tension and competition, this may drive the construction price lower.
Delays in obtaining resources	Global supply issues in obtaining the necessary material	Medium	Medium	ADC	Undertake market research for availability and timeline of key material.	Extended construction timeframe or increased tender costs.

24.2 SAFETY IN DESIGN

A Safety in Design review has been undertaken for the design for the project, by means of a project team workshop. The purpose is to ensure that the design has been undertaken with the health and safety of people who use, construct, and maintain the infrastructure given priority.

Safety-in-Design is the integration of hazard identification and risk assessment methods early in the design process to eliminate or, if this is not reasonably practicable, minimise the risks to health and safety throughout the life of the structure being designed. It is a systematic process that aims to “design out" health and safety risks before they get constructed.

Appendix U provides the Safety in Design Register.

24.3 CONTAMINATED LAND

As part of this DBC, a desktop Preliminary Site Investigation (PSI) has been undertaken to identify the likelihood of encountering contaminated soil within the proposed project alignment. Risk is assessed under a framework under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS) and performed by a Suitably Qualified Environmental Practitioner. The assessment is of the potential risk of contaminants migrating to the project site in concentrations that may pose a risk to human health and the environment.

Of most concern was land between Carters Terrace and Johnstone Street on the Tinwald side, south of the Ashburton / Hakatere River, having previously been market gardens. This is where the new road is located on the Project. It is categorised as HAIL A10, with the main risks being ingestion of pesticide residue in the soil. This area is recommended for further detailed investigation during Detailed Design. The level of risk for the project is considered to be low.

The PSI is provided within **Appendix V**.

25. FINANCIAL CASE

The Financial, Management and Commercial Cases have been prepared on the basis that the project is split into two sections, which are likely to have different funding partners and potentially delivered at different times.

25.1 PROJECT DELIVERY COSTS

An outline of the project costs is provided within Chapter 19, and include a comprehensive, costed risk assessment and associated contingency (analysed and funding). These costs have been used to inform the economic analysis. A full parallel cost estimate was completed for the business case, and costs were reconciled and agreed between the project team and parallel cost estimator.

The P50 cost for the project ('building in one go') to Grahams Road is $93.0m.

For the purpose of the funding conversation, the split of that cost for the full project length between the 'South Street to Wilkins Road' and 'Wilkins Road to Grahams Road' sections are presented below. Note that if the project were staged, the cost for coming back to complete the 'Wilkins Road to Grahams Road' would be higher (an additional $3.3m).

Table 25-1: Continency and funding risk

	South Street to Wilkins Road	Wilkins Road to Grahams Road	Total
P50 Expected estimate, including contingency	$73.8m	$19.2m	$93.0m
P95 Including contingency and funding risk	$90.2m	$23.4m	$113.6m

25.2 AVAILABLE FUNDING AVENUES

It is recognised that there is likely to be a funding gap given the historically earmarked funding contributions from ADC. This funding gap will need to be addressed by Waka Kotahi and the Ministry of Transport.

Figure 25-1 summarises the funding sources for the different parts of the corridor.

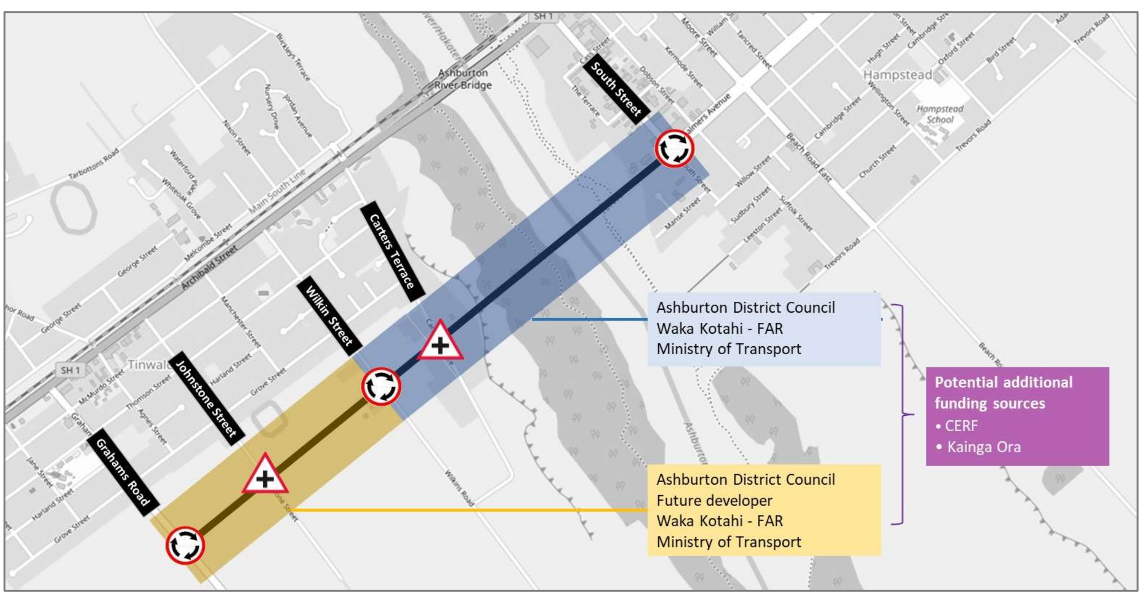


Figure 25-1: Likely funding sources for different parts of the corridor

25.3 COUNCIL CONTRIBUTION

Council will make a decision at the 17th August 2022 Council meeting in regard their contribution to the project. This will be undertaken following review of Version 1 of this DBC. Version 2 of the DBC will include this committed funding figure, and then be presented to Waka Kotahi.

Council will also confirm their specific contributions to both Section 1 and Section 2 of the corridor.

25.4 WAKA KOTAHI CONTRIBUTION

25.4.1 National Land Transport Fund (NLTF)

The NLTF is the primary mechanism for Crown investment in the New Zealand land transport system. The National Land Transport Programme (NLTP) is reviewed and updated every three years in line with the release of the Government Policy Statement on land transport (GPS), and identifies the projects to be funded by the NLTF. It is anticipated that financial contribution to this project from the NLTF for will come in the 2024-27 NLTP period.

ADC are seeking a 62% Funding Assistance Rate (FAR) from Waka Kotahi.

The rationale is:

- 51% - contribution based on the standard FAR for ADC.
- An additional 7% contribution based on a reduced crash risk for the state highway.
  - The economics has identified a $6.5m safety benefit for the state highway[62]. This represents 7% of the total project cost.
  - Whilst the proposed second bridge and new road has been designed to very high safety standards, council may need to invest further across the local road network to ensure a safe diversion route from the state highway to the second bridge.
- An additional 4% contribution based on the wider GDP resilience benefits that a second bridge will provide. This $3.1m benefit is based on highly conservative assumptions and the application of adopted Waka Kotahi resilience calculation tools (e.g. MERIT). Using less conservative assumptions of a two days closure every five years, the GDP impact would be $13.8m.

Note that the asset life of the SH1 Bridge is not expected to change due to a reduction in traffic. A reduction in maintenance on the state highway has been considered as part of the economic analysis, but as the value is relatively negligible, it has not informed the calculations for an enhanced targeted FAR. There are also significant benefits for Waka Kotahi by having a detour which would enable less disruption for heavy maintenance or a solution that helps to extend the practical life of the existing SH1 bridge.

Waka Kotahi have stated that they will not commit to funding until all other funding sources have been confirmed.

25.4.2 Contribution to already purchased property

Waka Kotahi have stated that they will contribute to property that has already been purchased at the final agreed FAR rate. They have also stated that they will contribute based on the cost that was paid when the property was purchased (outlined in Chapter 19.1 – i.e. what appeared on council's balance sheet, unadjusted for inflation).

25.4.3 Contribution to utilities

Waka Kotahi stated that they would not fund any extension of the three waters network, and effectively this aspect of the project would be subject to a 0% FAR. Modifications of the existing network due to the new road however would attract the agreed FAR.

25.5 MINISTRY OF TRANSPORT/CROWN REVENUE CONTRIBUTION

Meetings are ongoing between ADC and the MoT to explore central government opportunities.

[62] Note that these calculations have been checked by the economic peer reviewer.

25.6 DEVELOPER CONTRIBUTIONS

ADC will decide around the approach to any future developer contributions.

25.7 OPPORTUNITIES TO OFFSET OR REDUCE COSTS

25.7.1 Infrastructure Acceleration Fund

The Infrastructure Acceleration Fund (IAF) was a key component of the Government's $3.8 billion Housing Acceleration Fund announced in March 2021. The contestable fund of at least $1 billion was launched on 30 June 2021 with an invitation for expressions of interest from councils, iwi and developers.

The IAF will enable housing development in areas of need throughout Aotearoa New Zealand through the allocation of funds to new and upgraded eligible "enabling" infrastructure such as transport, three waters and flood management infrastructure.

New roading infrastructure, such as the new road between the second bridge and Grahams Road could potentially have been eligible for funding[63]. However, Expressions of Interest closed in August 2021, and there is no indication as to whether a second round of funding will occur.

As such, the IAF is not considered as a viable funding source at this time.

25.7.2 Climate Change Emergency Fund

In 2021, the Government announced the establishment of the CERF with an initial $4.5 billion 'down payment' for Aotearoa New Zealand's climate spending by recycling the proceeds of the Emissions Trading Scheme into a dedicated fund. At its establishment, the CERF was set up with funding equivalent to the available cash proceeds from the New Zealand Emissions Trading Scheme (ETS) over the period from 2022/23 to 2025/26. The Government has since decided that the CERF should be topped up proportionally, leaving $1.5 billion available in the fund after Budget 2022.

Council may have an opportunity to offset some of the costs of the project by applying for funding contribution towards the shared walking and cycling path component. In mid-2022, new guidance was issued to councils regarding potential applications, which would be a separate process to this business case.

25.7.3 Procurement model

Potentially there is opportunity to reduce cost via the procurement approach for the construction of the project.

This is because typically a bridge contractor may act as a sub-contractor to the main roading contract. To account for management and risk associated with use of a sub-contractor, the main contractor would often add a 10-15% margin. Potentially some saving can be achieved by managing two separate contracts – one for the bridge, and one for the road. The scale of any saving would be dependent on the final scope of the works and internal resourcing available to manage and co-ordinate two separate contacts.

25.8 PROJECT REVENUES

No revenue is expected to be generated from the delivery of transport infrastructure in any of the next phases of the project.

25.9 ON-GOING MAINTENANCE

The proposed works will result in new assets and therefore a corresponding change to the ongoing maintenance and operation. Most of the new on-going maintenance costs will be a result of the new widened paved areas, and drainage facilities. New associated signage and line markings may also require maintenance additional to what is already undertaken.

[63] This is because the road would deliver at least 30 (potentially over 300 in Tinwald) new houses in an area which is not a Tier-1 (e.g. Auckland) or Tier-2 (e.g. Queenstown) area.

26. COMMERICAL CASE

The Commercial Case focuses on minimising risks during pre-implementation to ensure that construction can commence within the desired timeframes. This will ultimately provide more assurance to the community and reduce potential cost uncertainties (due to price escalations).

26.1 IMPLEMENTATION STRATEGY

Once the DBC has been approved and funding has been sourced, the next stage is pre-implementation and detailed design. This phase will focus on (i) refining the design to avoid effects; and (ii) developing appropriate mitigation measures to manage any environmental effects.

The following considerations will shape and inform the final strategy:

- **Technical risks -** Issues that require further consideration during the technical investigations, concepts for and decisions about structural form, detailed design, consultation, and resource consent applications.
- **Procurement approach** - The recommended programme may influence the procurement approach adopted to deliver the detailed design.
- Process for acquiring the remaining properties.

26.2 CONSENTING STRATEGY

A Consenting Strategy has been prepared as part of this DBC and included as **Appendix W**. The purpose of the strategy is to identify the likely approvals that will be required under the Resource Management Act 1991 (RMA), the consenting risks and how they can be managed, and a potential approval pathway to support the development of the DBC and to inform future design decisions.

Investigations that have been undertaken as part of the DBC and informed the consenting strategy are:

- Desktop ecological investigation – see **Appendix X**.
- Preliminary Site Investigation (PSI) for potential land contamination – see **Appendix V**.

26.2.1 Consenting risk management

The key consenting risks that will need to be addressed in the next stage of the project are outlined in Table 26-1.

Table 26-1: Key consenting risks

Potential Risk	Explanation and proposed risk management
Community and stakeholder opposition	At this stage, most of the land required has already been acquired by ADC. However, adjacent landowners, other stakeholders and parts of the wider community may be opposed to the project. Implementing the Community & Stakeholder Engagement Plan prepared for the DBC may help to reduce the risk of community or stakeholder opposition affecting the RMA approval processes. There are other stakeholders not identified in the Community & Stakeholder Engagement Plan who may be involved through the RMA approval processes, such as the Department of Conservation, Forest and Bird, and Fish and Game given the interaction between the Project and the Hakatere (Ashburton) River. These stakeholders should also be engaged early.
Delays in progressing designs and technical assessments	Technical assessments will be required to support the resource consent applications, including (but not necessarily limited to): • Ecology • Hydrology and river stability • Stormwater management • Contaminated land (detailed site investigation) Various other designs and management plans are required in accordance with the conditions of the designation, including: • Lighting Design Plan • Landscape Design Plan • Construction Noise and Vibration Management Plan • Erosion, Sediment and Dust Control Management Plan • Hazardous Substances, Spills and Emergency Management Plan

Potential Risk	Explanation and proposed risk management
	• Social Impact Management Plan Some assessments and designs are contingent on others being completed, which could result in delays. Regular design update meetings should be established as soon as possible.
Effects on flood protection	If not properly considered in the design, the proposed bridge and associated infrastructure could compromise the flood protection stop banks and vegetation located along the river. As well as being addressed through the resource consent process, this will be a relevant matter for ECan to consider when asked for their approval under s177 of the RMA (as the requiring authority for an existing designation) and under the Flood Protection and Drainage Bylaw 2013. Early engagement with ECan is recommended to ensure these approvals can ultimately be obtained.
Ecological effects	The desktop ecological assessment found that there could be significant flora and fauna affected by the Project. The largest risks are likely to be: • The Hakatere (Ashburton) River in the vicinity of the Project is used by black billed gulls and other indigenous birds, such as terns and dotterels, for nesting. These birds are threatened or at risk to varying degrees according to the New Zealand Threat Classification System, and the river is known to be a significant habitat for these species. • The Hakatere (Ashburton) River supports indigenous fish that are identified as threatened or at risk. It is also regionally significant for recreational fishers (for trout and salmon). • Carters Creek and Keddies Stream have historic records of containing Canterbury mudfish, a Nationally Threatened wetland species. The presence of these threatened birds, fish and their habitats could raise a potentially significant project risk as resource consents for the bridge (construction and operation) and the works at Carters Creek and Keddies Stream may be very difficult to obtain if the Project's adverse effects on these species cannot be avoided or otherwise adequately mitigated. The recommendations of the desktop ecological assessment should be followed to better understand the potential adverse effects and to determine the mitigation that will likely be required.
ECan resource consents	While the designation for the Project has been secured this does not guarantee that the necessary resource consents will be approved. There is also a risk that the applications could be notified and/or appealed. As well as undertaking the recommendations listed above, a pre-application meeting should be held with ECan to gauge these risks. Delaying the preparation of the Outline Plan of Works (OPW) and the various other designs and management plans that are required by the conditions of the designation until after the resource consents are granted may also be appropriate.

26.2.2 Next steps

The following next steps are recommended, based on this consenting strategy:

- Engage with ECan to request their written consent under s177 of the RMA for works within Designation D22 and under the Flood Protection and Drainage Bylaw 2013.
- Undertake a Detailed Site Investigation which will inform the consent requirements under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).
- Undertake the recommendations set out in the desktop ecological assessment (which are generally for field surveys) to help inform the design and construction methods, and the technical assessments needed to support the resource consent applications.
- Develop the likely construction methodology to determine compliance with the conditions of the Land and Water Regional Plan (LWRP) and Canterbury Air Regional Plan (CARP) in relation to excavation, groundwater dewatering (if necessary), and dust management.
- Hold a pre-application meeting with ECan to discuss the resource consent application.
- Engage with other stakeholders not identified in the Community & Stakeholder Engagement Plan who may have a particular interest in the potential ecological effects such as the Department of Conservation, Forest and Bird, and Fish and Game.

All of the above actions could happen at the start of the next stage – i.e. Detailed Design.

26.2.3 Consenting Strategy

With a designation in place, the entire Project will require the following approvals under the RMA, set out in the order in which they are recommended to be sought:

1. Alteration of the designation - submit a NoR to ADC to alter the designation to adjust the boundaries for the Grahams Road roundabout, and for any other boundary or condition changes.
2. ECan flood protection approvals - seek s177 written consent from ECan as the requiring authority, for works within the boundary of Designation D22 in combination with an approval under the Flood Protection and Drainage Bylaw 2013.
3. Regional resource consents - apply to ECan for all resource consents required under regional plans such as the LWRP, and the NES-F.
4. OPW and land use consents - submit to ADC:
   - The OPW
   - The documents required by the conditions of the designation (e.g. Roading Design Plan, Landscape Design Plan, construction management plans), and
   - The application for land use consent under NESCS, if required.

The required RMA approvals could be sought and obtained for the entire Project, even if the construction is staged in geographic sections. However, there is also the ability to package the approvals into stages/geographic sections.

26.3 PROCUREMENT STRATEGY

26.3.1 Second bridge and new road

The second bridge would be a significant project for the region and is likely to attract significant interest. Council is unlikely to have the necessary internal resources available to manage the delivery of the pre-implementation and construction phases – particularly if separate contracts for the road and bridge are procured.

If they have the resources are available, Waka Kotahi have indicated a willingness to assist on the client side so that the project is delivered as an ADC-Waka Kotahi partnership. It is still likely that an external consultant would need to be brought in to directly manage the contract(s).

Procuring a local supplier through direct appointment who has experience working with ADC and the contracting industry is expected to deliver cost savings and better project solutions. It will also ensure the base data required to inform detailed design, and the enabling works can be procured early so the project can progress at speed.

A design consultant will be procured through traditional open PQM to:

- Complete the detailed design and associated documentation
- Mitigate project risks through good design
- Provide specialist advice to resolve construction issues
- Confirm the completed works comply with the design and consent documentation

General

Any procurement model applied for the project should align with both ADC's and Waka Kotahi's procurement models. Potentially the works for the bridge and road will be procured separately, and in doing so, there may be opportunity to reduce costs by managing separate contracts. However, this could incur other costs (relating to procurement) and other issues (such as ensuring a 'one project' and coordinated approach).

During pre-implementation and detailed design phases it is recommended that a contractor should be brought in to inform the design (particularly for the bridge). The contractor would not however be given any guarantees regarding being awarded the construction contract, which should be procured separately through the open PQM. ADC would ensure that the procurement approach is such that no parties have an unfair competitive advantage.

The final procurement strategy will be confirmed at the later stage and will include consideration of other approaches – such as Design & Construction.

26.3.2 Delivery of the short-term programme

ADC will work with Waka Kotahi to include the short-term work in the NLTP upon endorsement of the business case.

26.3.3 Delivery of other local road improvements, identified in the NoR

Improvements to Chalmers Avenue from South Street to Walnut Avenue/Bridge Street would include replacement of kerb and dish channel, intersection improvements, footpath improvements and carriageway improvements including an asphalt surface for noise reduction.

These improvements could be carried out under a variety of work activities such as low-cost low risk, drainage renewals, footpath renewals, sealed road resurfacing or as a standalone improvement project.

26.3.4 Contract Management

The contract for the detailed design is recommended to extend to lodgment of RMA applications and include provision for the successful consultancy team to then supply services and resources for the phases up to granting of consent. The RMA consenting phase will likely focus on maintaining levels of constructability and design flexibility to better enable subsequent procurement decision making.

26.4 PROPERTY STRATEGY

ADC confirmed that there is no requirement for a Property Strategy to be developed as part of this DBC. This is because council are already in the process of seeking to acquiring the remaining land parcels necessary to facilitate the project. The general approach that ADC are taking to acquire the remaining land is:

- An internal ADC report has been prepared which outlines the process to purchase the remaining land.
- For the two properties between Wilkins Road and Johnstone Street affected by the designation who have not contacted Council with respect to their purchase Council will follow the legislative procedures for acquisition of properties affected by a designation.
- ADC will follow the same legislative procedures for acquisition of the land located within the riverbed area (noted within Section 19.1).

ADC is yet to determine what will be done with any land that has been purchased, but not fully required for the construction of the road.

26.5 COMMUNICATIONS AND ENGAGEMENT

Communication and engagement with key stakeholders took place whilst the DBC was being developed and helped shape the preferred option and design. ADC considered that substantial public consultation around the bridge location had already been undertaken as part of the NoR.

Engagement with immediately affected parties, where accesses would be directly influenced by the project, were consulted during the DBC process – this includes the Collegiate Squash Club and Mania-O-Rota Scout Park Engagement during pre-implementation will focus on ensuring ongoing engagement with key stakeholders and providing regular updates to the community – but only if the project obtains the necessary funding.

Engagement during the next phase

Should the project obtain the necessary funding, engagement with project partners, key stakeholders, ADC elected representatives and directly affected landowners will be undertaken to present the proposed design of the bridge and explain next steps for the project, including the detailed design process and timeframes through to construction. Project partners such as Te Runanga o Arowhenua and Waka Kotahi will be regularly involved throughout the next phase of the project in a similar way as the DBC.

Key stakeholders and elected representatives should be informed and updated about the project regularly in a workshop / briefing style environment. Directly affected landowners should be met individually (or in small groups depending on circumstances) at key points of the project to discuss aspects of the project that are specific to them. Members of the local community and the public should be kept up to date with the project by regular updates at key milestones, informing them of the location and design of the project as well timing around key decisions, procurement and construction commencing.

Communication methods with the community and wider public are expected to be via Council's website and regular (weekly) Council Brief in both local newspapers. Hard copy updates could be made available at the Council offices, libraries and other community facilities. Given the high profile nature of this project, it is expected that a media release informing the wider public of the project funding will occur shortly after any announcement of funding. The timing of this announcement will need to be considered in relation to when project partners, key stakeholders and the wider public are informed and updated on the project.

26.6 RISK ALLOCATION

The key risk types that could delay the project are:

- **Technical risks** where effects either lead to significant design change or cause significant cost escalation (by introducing or increasing the scope of mitigation).
- **Programme risks** caused by, for example, discussions with affected parties and stakeholders, staff resourcing, or hearings and appeal processes.
- **Property effects** type issues which cause either design change or cost escalation (by introducing or increasing the scope of mitigation).
- **Reputation risks** caused by strong local opposition to project.

Table 26-2 outlines how these risks will be managed.

Table 26-2: Commercial Management Risk

Risk	Management approach
Technical	Robust technical reviews and robust submissions for statutory approvals
Programme	Careful programme management against realistic deliverables
Property	Early engagement with potentially affected landowners
Reputational	Ensure pro-active and regular stakeholders, treaty partners and public communications

27. MANAGEMENT CASE

27.1 PROJECT MANAGEMENT

An independent project manager will be directly appointed to:

- Develop and manage the project programme and finances.
- Work with ADC to co-ordinate design and construction activities.
- Procure suppliers to collect base (factual) data and site information.
- Manage detailed (intrusive) geotechnical investigation.
- Lead the procurement of:
  - Professional services to complete the design, document activities and obtain statutory approvals. Rather than managing the physical works phase, the design consultants would provide specialist advice to resolve specific design and construction issues
  - Enabling works packages to complete corridor works such as service relocation.
  - Physical works contractors to complete the major works such as the new bridge and road.
- Manage the design and construction phases.

Reporting requirements

The reporting requirements include:

- Monthly reporting on:
  - Project progress
  - Costs (actuals and forecasts)
  - Risks (including mitigations)
  - FTE (actual and forecasted)
  - Health and safety performance
- Quarterly reporting on:
  - Costs (actuals and forecasts)
  - Progress towards outcomes being delivered
  - Progress towards project completion dates set in the CIP Letter of Exchange
  - Media marketing and communications activities
- Post implementation reporting

27.2 PARTNERSHIP WITH IWI

Iwi will continue to be a project partner going forward to the end of the project. Discussions will take place at the start of the pre-implementation phase to confirm how iwi would like to be involved in future phases. Feedback received during regular hui undertaken during the DBC suggests this includes inputs into the detailed design (e.g. landscaping and design), helping provide cultural narratives (refer to the ULDF) and providing naming rights.

ADC should explore any opportunity for some of the physical works (during pre-implementation) to be delivered by local māori-owned companies if possible.

27.3 ASSURANCE AND ACCEPTANCE

As noted throughout this document, several peer reviews have been completed through the development of this DBC and have informed the recommended programme. External and internal peer reviews have been completed on the following aspects:

- Economics (**Appendix Q**)
- Cost estimates (**Appendix Q**)
- Road safety audit (**Appendix Y**)
- An independent review of the full business case (**Appendix Q**)

Further reviews are proposed for the detailed design phase as outlined in the following table.

Table 27-1: Independent reviews for the next stage

Item	Detail
Design review	• Lighting design peer review (if relevant); and • Road safety audit (for the scheme/detailed design).
Cost review	• The costs produced at the next stage will be reviewed against the cost estimates provided in this DBC. It is likely that a second parallel cost estimate will be undertaken during the pre-implementation phase.
Road Safety Audit	• An internal road safety audit will be completed on the detailed design.
Economics review	• An internal review against the project economics will be completed.
RMA and other statutory documentation	• As noted in the Consenting Strategy, the technical assessments to support consent applications will be confirmed in consultation with council's environment's team as part of the detailed design phase. Council's legal team will also review consenting applications and other statutory documentation to be produced during the next phase.
Physical works document review	• The project manager and council procurement expert will review the tender documentation to ensure completeness, accuracy and currency.

27.4 COST MANAGEMENT

The project design includes mitigation and design risk factors that are already allowed for in the current DBC-level project cost. The environment effects assessment being completed during pre-implementation will help provide certainty around the scope of any further mitigation needed.

The cost mitigation strategy is to develop a robust P95 during the pre-implementation phase. A parallel cost estimate will also be undertaken.

27.5 MAINTENANCE

Maintenance is a large and costly component for transport infrastructure and must be considered early on in the design of all projects. Low maintenance and good aesthetics can be achieved through early consideration and good design. Landscape maintenance needs to reflect ADC maintenance requirements.

The following recommendations for landscape of the Hakatere (Ashburton) River bridge and link road should be further developed in detailed design and seek to:

- Adopt a minimum two-year maintenance period for the contract.
- Continue engagement with ADC transport and parks maintenance teams to receive feedback on design and maintenance.
- Use local materials that are robust and durable.
- Use local planting and stone/rock which are appropriate for the context.
- Design to allow for easy and safe maintenance access where required, particularly under the bridge.
- Eco-source plant species. Species selected in the preliminary lists are long-lived and hardy. They are known to be present in the Ashburton district.
- Minimise opportunities for vandalism through CPTED measures. Graffiti deterrent will be using textured finishes on concrete structures. Early reporting and removal will reinforce stewardship and low tolerance of graffiti. Where required by ADC Graffiti Guard can be added.
- The number of highway furniture and street furniture elements are to be minimal and coordinated.
- Design and finishing for the bridge, culvert retaining walls and any other structures are precast concrete panel units ensuring uniformity and availability. Any patterns should be cut into, or sand blasted onto, materials for permanence.

27.6 ISSUES MANAGEMENT

Issues and risks are proposed to be managed through the project risk register. The project manager should update project issues and risks weekly with the top issues and risks to be reported to councils and Waka Kotahi's Infrastructure Managers.

27.7 BENEFITS REALISATION PLAN

The benefits realisation plan is summarised in Table 27-2

Table 27-2: Benefits Realisation Plan

KPI	Before the project	After the project	Data sources / plan	Monitoring
River Crossing Capacity	3,000 vehicles / hour	6,000 vehicles / hour	Traffic counts on both the SH1 and Chalmers Avenue Bridge.	Annual
Active mode counts across the river	25 people per hour (peak hour)	50 people per hour (peak hour)	Pedestrian and cyclist counts on the SH1 and Chalmers Avenue Bridges post implementation	Annual
Active mode share for journeys to work and school	14% for walking and cycling	20% walking and cycling	Census data with focus on east Tinwald or household travel surveys	Every census period
Safety	Medium	Medium-Low Collective Risk	Review of crash data along SH1	Annual / ongoing
Travel time variability – Local Travel	Weekday peak hour travel time through Ashburton are typically more than two minutes longer than at off-peak times.	Weekday peak-hour journey times do not exceed off-peak journey times by more than 2 mins	Google traffic or TomTom travel time data	Annual
Travel time variability – SH1	Weekday peak hour travel time through Ashburton are typically more than two minutes longer than at off-peak times.	Journeys along SH1 through Ashburton and Tinwald during weekday peak-hour do not exceed off-peak journey times by more than 4 mins.	Google traffic or TomTom travel time data	Annual
Delays at the SH1 / South Street signals	Congestion generated by southbound merge	Safe and efficient southbound merge with no congestion	Site inspections or traffic surveys	Annual

This benefits realisation plan will enable ADC to create a clear linkage between the problem statements and benefit, including the degree of shift required to support the desired future state and ensure the corridor functions at the target levels of service that have been identified.

27.8 POST IMPLEMENTATION MONITORING

Once the project is complete post implementation monitoring assessment / benefits realisation will be needed to ensure that the desired benefits, as outlined within the business case, have been achieved. This assessment will measure how well the project has delivered on its objectives and should be undertaken again after each of the future phases of the project are delivered.

ADC will be responsible for future monitoring.

27.9 ECOLOGICAL MANAGEMENT

A desktop ecological assessment that accompanies this DBC identified that the project could potentially result in some short-term construction impacts as well longer-term operational impacts to terrestrial and aquatic ecology. During the next phase (detailed design) it is recommended that further field surveys be conducted in order to more accurately determine baseline conditions and assess potential impacts of the project.

The following actions are recommended:

- Consultation with stakeholders including Department of Conservation and Forest and Bird to determine the spatial extent of the black-billed gull colony (noting that the extent varies annually), likely impacts of the bridge, and if the proposed project can facilitate restoration of the area as previously proposed (McArthur, 2016), such as by creating gravel islands, funding weed control, pest control, and restricting access for people and/or vehicles to the riverbed.
- Field surveys of the Hakatere (Ashburton) River, riparian vegetation, and wider project area for avifauna during the nesting season.
- Field surveys of for herpetofauna, particularly in riparian vegetation along the Hakatere (Ashburton) River and remnant habitats (if present) to the west.
- Aquatic ecology surveys, including potential Stream Ecological Valuation assessments (or similar) if piping or culverting of streams is proposed.
- Targeted mudfish surveys in Carters Creek and Keddies Stream.
- Assessment of the presence and extent of wetlands under the RMA and National Policy Statement for Freshwater Management (NPSFM).
- Ground truth and more accurately map areas of vegetation and habitat to be removed for the project.
- Update the ecological assessment based on the additional field surveys, including providing input into the detailed design and construction methodology to avoid, minimise and mitigate potential adverse effects.

The desktop ecological assessment is provided as **Appendix X**.

CREATING COMMUNITIES

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