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15 June 2022

Quentin Duthie
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Tēnā koe Quentin

Request for Information – Local Government Official Information and Meetings Act (LGOIMA) 1987

We refer to your official information request dated 17 May 2022 for

> *Please send me a copy of any report on the Esplanade Transport Study, which I believe was undertaken in recent years. Please also advise if the findings of this Study have been reported to Council or the Petone Community Board.*

A copy of the Esplanade Transport Study is enclosed.

This subject was reported to the Petone Community Board at its 11 April 2022 meeting, with this excerpt being attached to this letter. A copy of the full meeting documents for this meeting are available on the Hutt City Council's website at:
http://infocouncil.huttcity.govt.nz/Open/2022/04/PCB_11042022_AGN_3026_AT.htm

You have the right to seek an investigation and review by the Ombudsman of this response. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Please note that this letter may be published on the Council's website.

Nāku noa, nā

Susan Sales
Senior Advisor, Official Information and Privacy

Encl:
Esplanade Transport Study
Report to Petone Community Board, meeting of 11 April 2022

TO: **Chair and Members**
Petone Community Board

FROM: **Bob Hu**

DATE: **23 March 2022**

SUBJECT: **PETONE TRANSPORT PROJECTS UPDATES**

Recommendation

That the Board receives and notes this memorandum.

Purpose of Memorandum

1. To provide members information regarding to the planned transport projects in Petone area.

Background

2. The previous Esplanade Optimisation Study were developed with valuable inputs from the members in mid-2021.

3. The study investigated transport related problems and opportunities on the corridor along the Esplanade between the Hutt Road roundabout and Waione Street roundabout as well as its connections.

4. The study recommended a program of interventions including school/workplace travel plans, intersection treatment, bus service improvements, and walking and cycling connections.

5. Following the study, Council is now progressing further with a number interventions' planning and designs, and these are briefly discussed below.

6. Jackson Street Walking and Cycling connections, the project is aiming to provide improved walking and cycling connections between Jackson Street and The Esplanade, and it will be delivered under the Low Cost Low Risk program with confirmed funding. It is currently under the optioneering and design phase, and the first design workshop is planned for next week. The construction is planned for 2023.

7. The Esplanade Walking and Cycling connections, the project is aiming to provide improved walking and cycling connections between Te Ara Tupua (Ngauranga to Petone Cycleway) and Tupua Horo Nuku (Eastern Bays Shared Path), and it will be delivered under the Cross Valley Link stage 1 program. It is currently under Single Stage Business Case for funding application and design, and the first design workshop is planned in late April 2022.

8. School Travel Plans, the Transport Safety Coordinator (replacement for Aileen Campbell) has been appointed, and the travel plan programs will be delivered as part of the Business as Usual for the new person.

9. Station Accessibility, the project is aiming to provide improved accessibility for three train stations including Petone Station, Ava Station and Woburn Station. This work will be delivered under the Cross Valley Link stage 1 program. Council officers are working closely with Greater Wellington Regional Council's public transport and mode shift team developing options and designs. The interventions are planned to be implemented within the current 3 years.

10. Jackson Street bus stop improvements, the work is led by Great Wellington Regional Council with Hutt City Council's inputs. Council officers will ensure the improved bus stops will align and add value to other transport projects in the vicinity. The interventions are planned to be implemented early 2023.

Appendices

There are no appendices for this report.

Author: Bob Hu
Traffic Engineering Manager

Approved By: Jon Kingsbury
Head of Transport

The Esplanade Corridor Optimisation Study

IA256700-1000-CT-RPT-0001

August 6, 2021

Hutt City Council

The Esplanade Corridor Optimisation Study

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0.1	27/04/2021	Draft structure	VA			
0.2	07/07/2021	Draft report	AM	VA		
0.3	05/08/2021	Final draft report issue for internal review	VA	LJ	LJ	
0.4	06/08/2021	Final draft report clean version	VA	LJ	LJ	
1.0	06/08/2021	Final draft report issue to client	VA	LJ	LJ	AP

Contents

Glossary of Terms and Abbreviations

Abbreviation	Definition
HCC	Hutt City Council
LoS	Level of Service
HAM	Hutt City AIMSUN model
MCA	Multi Criteria Analysis
ADT	Average Daily Traffic
LoS	Level of Service
HCV	Heavy commercial vehicles
LILO	Left in/ left out
BCR	Benefit to Cost Ratio
VMS	Variable Message Sign
St	Street
Rd	Road
VOC	Vehicle Operating Costs
V/C	Volume to Capacity Ratio
PT	Public transport

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to inform the development of a programme of works for The Esplanade, Petone, Lower Hutt in accordance with the scope of services set out in the contract between Jacobs and Hutt City Council ('the Client'). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report,

Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

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1. Introduction

1.1 Project Overview

The Esplanade is a significant transport corridor in Petone, Lower Hutt, providing a key connection between southern Hutt City suburbs (e.g. Petone, Seaview, Wainuiomata etc.) and Wellington City via State Highway 2 (SH2). The Esplanade supports a variety of transport modes and serves multiple functions both as an arterial road (i.e. transport function) as well as the city's waterfront (i.e. place function). A number of major transport infrastructure projects are expected to significantly change the transport network in the area.

Considering the changing transport network and competing demands, Jacobs was commissioned by Hutt City Council (HCC) to undertake an optimisation study for The Esplanade Corridor.

The purpose of the optimisation study is to better understand the transport problems on the corridor and develop a programme of works to address these issues. This included using evidence based data to inform the development of a range of high level treatment options for optimising The Esplanade Corridor before any major transport infrastructure (such as the Cross Valley Link) is constructed in the vicinity.

1.2 Project Study Area

The study area includes The Esplanade between the Hutt Rd roundabout and Waione roundabout (inclusively) as shown in Figure 1-1 below. The transportation impacts on and from the local access roads and its parallel route (i.e. Jackson Street) have been taken account in this study.

It is understood that the Petone Interchange and Cross Valley Link will be assessed by other possible work streams, therefore, these are not included in the current study area.

Figure 1-1 Project area

The Esplanade serves multiple functions both as an arterial road (i.e. transport function) as well as the city's waterfront (i.e. place function). As one of the key transport corridors in the Hutt City area The Esplanade carries about 27,000 Average Daily Traffic (ADT) connecting Wellington City and the southern Hutt City suburbs (e.g. Petone, Seaview, Wainuiomata etc.) via State Highway 2 (SH2). The two-lane carriageway includes a wide centre median with a periodical westbound bus-only lane from Victoria Street to Te Puni Street. The Esplanade's

position between the Petone waterfront and township contributes to a high level of active mode demand near the vicinity of the corridor.

Anecdotally, the corridor is observed to have several transport related issues at the moment, as listed below:

- Congestion through the day during both weekday and weekend, with the worst performing period occurring westbound in the weekday morning peak;
- Traffic capacity constraints at both Hutt Rd roundabout and Waione bridge;
- Rat running through the town centre via Jackson Street and side access roads;
- Safety concerns for the vehicles turning in and out of side access roads;
- Multiple purpose of the corridor that creates multi modal conflicts among general traffic, public transport and active modes;
- Lack of provision for commuter cyclists especially with the linkage to the Te Ara Tupua once its implemented;
- Safety concerns for multilane pedestrian crossings; and
- Inefficient public transport priority measures.

1.3 Scope of Activities

Despite this study not being a Business Case, a similar process was adopted to provide a framework for objective and robust analysis, to enable HCC to make informed decisions. Therefore, it was necessary to engage with a number of stakeholders that can actively take part in the decision making process. The stakeholders involved in this study represent HCC (divisions of Traffic Planning and Engineering and Road and Safety), Petone Community Board, Jackson Street Programme and Seaview Business Association. A detailed list of the stakeholders is reported in Appendix A.

The methodology and stakeholder engagement activities undertaken are listed as follows:

1. Identify problem statements through data analysis. Discuss findings and confirm with the stakeholders in Workshop #1 - 7 May 2021.

2. Develop a long list of options and explain the assessment framework (Multi Criteria Analysis) in Workshop #2 - 28 May 2021.

3. Seek feedback from the stakeholders for the MCA.

4. Present the MCA results and shortlist the options with the help of the stakeholders in Workshop #3 - 18 June 2021. Develop draft programmes and confirm with the stakeholders which one to take forward.

5. Assess the preferred programme and discuss next steps in Workshop #4 - 23 July 2021.

6. Document the process in the current report.

1.4 Strategic Context

Wider projects such as Riverlink Programme and Cross Valley Transport Connections will contribute to significant transport outcomes in the region. In Lower Hutt itself, there are eight transport projects being investigated by

HCC, all within a 15km radius of the Petone Foreshore. These projects, such as the Melling Interchange and Petone to Grenada (P2G) Link Road (if progressed as the preferred solution), would directly influence the movement of transporting goods and people across the Hutt Valley, including along The Esplanade.

Some of the related programmes and projects are detailed below.

Riverlink Programme

RiverLink is a partnership project, involving Waka Kotahi NZ Transport Agency, HCC and Greater Wellington Regional Council.

Beyond flood protection and city upgrades to enable urban growth, RiverLink aims to make Lower Hutt more connected by improving transport links. This includes building a safer grade-separated State Highway 2 Melling interchange (a diamond interchange connecting directly to Queens Drive), a new Melling Bridge over Te Awakairangi Hutt River, and improving walking, cycling and public transport options in the area.

The new overbridge and river bridge, connecting directly to Queens Drive are expected to positively impact the travel patterns into and around the Hutt CBD and will help improve access during peak travel times. This transport project, aims to provide safer journeys for all road users and pedestrians, provide more efficient and reliable travel in peak periods and on weekends, improve travel choice including access public transport and making it easier to walk and cycle to and from Lower Hutt city centre.

Figure 1-2 OpenDay Sketch of Proposed Melling Bridge[1]

Cross Valley Transport Connections

Although The Esplanade sits in a strategically valuable location, it is believed that the current route is not providing the required level of service and will continue to underperform into the future. Hence, HCC has been working on a more resilient, higher capacity, multi-use east-to-west connection for many years.

[1] Source: https://www.riverlink.co.nz/

The Cross Valley Transport Connections (previously known, in part, as the Cross Valley Link) intends to divert through-traffic away from the Petone foreshore with a better connection between SH2 and Seaview/Gracefield, Petone parts of Lower Hutt, Eastern Bays and Wainuiomata.

When the project is complete, it is expected that there will be improved travel time reliability on the key arterial roads for buses, heavy commercial vehicles and general traffic which is likely to further support economic development in Lower Hutt, and encourage increased use of bus services. In addition, there will be more transport choices including the reduction of travel obstacles that some people may experience, alongside a numerous other economic, social and safety benefits.

Petone to Grenada (P2G) Link Road

The P2G Link Road is expected to make peak morning journeys between the Hutt Valley and northern Wellington about 10 minutes faster and 7 kilometres shorter.

Figure 1-3 Petone to Grenada

It will provide another route to and from the Hutt Valley when SH2 has reached capacity or Wellington city when SH1 has reached capacity. It will also open up future residential or business growth opportunities by making Porirua, Wellington and the Hutt Valley better connected.

It will also allow for a direct public transport line from the western suburbs to the Hutt Valley. However, this project is currently on hold and a re-evaluation recommended that construction of an east-west connection be considered for funding from 2028.

2. Problem Identification

2.1 Problem Statements

As specified in the scope of activities, the first step was to investigate the key transport issues along The Esplanade. As a result the three key problems were identified to be addressed on The Esplanade. These are:

1) Road Hierarchy - Rat running is resulting in higher traffic volumes on Jackson Street and increased traffic congestion from merging vehicles.
2) Active Mode Quality - Low quality cycling facilities is resulting in low cycling uptake and safety issues for people cycling.
3) Public Transport Priority - Unbalanced intersections are resulting in delay for public transport vehicles and safety issues for turning vehicles.

During Workshop #1 stakeholders were asked to score the three problem statements with 1 for high, 2 for medium and 3 for low priority. The results indicated that road hierarchy should be considered of high priority, with active mode quality being medium and public transport priority low. The workshop feedback was noted and is used later as a sensitivity test for the assessment (MCA).

The problem statements are an aggregation of various issues that derive from the summary of issues as seen in Table 2-1.

Table 2-1 Summary of Issues by mode

Cars and Trucks	Pedestrians	Cyclists	Public Transport
High volumes of local trips	Delays in signalised crossings	Inconsistent facilities on The Esplanade/ Waione Street	Jackson has high bus volumes, but not the bus priority
Congestion & rat running	Several minor and severe injury crashes in Jackson Street	Low quality of facilities across the Hutt River	The Esplanade has the bus priority but not the demand
Parallel routes & rat running	Narrow shared path which is shared with cyclists	Lack of cycling connections to Jackson Street, schools and Petone Station	Wainuiomata has low public transport ridership, due to not being served with high frequent buses
Safety: Side road & Congestion related	Close proximity between pedestrians and heavy vehicles	Safety for people on bike particularly at intersections	Limited bus services between Wainuiomata and Gracefield/ Petone
Intersections: Te Puni, Victoria, Cuba, Buick, Jessie		Lack of formal cycle crossings along The Esplanade	Limited bus services between Lower Hutt and Wellington
HCV delay impact on economics			

2.2 Problem Evidence

A range of data was collected and analysed to understand the unique transport issues along The Esplanade. This section presents the data analysis linked to the problem identification.

2.2.1 Data Gathering

Site Visit

The project team carried out a site visit of the study area during the daylight hours on 20 April 2021. The site visit allowed the team to conduct an 'on the ground' check of the corridor and have a clear understanding of the site.

Data collection during the site visit included timing the signalised pedestrian crossings across the corridor to estimate the maximum time pedestrians had to wait to cross.

Figure 2-1 Picture of The Esplanade taken during site visit

Modelling

The HAM base model (2017) is a detailed transport model and replicates the observed traffic flows in Lower Hutt. The HAM forecast model (2027), currently being operated by the Greater Wellington Regional Council, takes the census data, forecasts it to different years and generates and allots the future trips to different zones in the regions.

The HAM base model was used to understand existing transport trends (traffic volumes, travel times, route choices, LoS and heavy vehicle percentages) while the HAM forecast model helped in understanding the future demands.

The data was collected from these transport models and analysed to identify the issues in the area and assess the likely changes in the traffic network of potential options.

Other Data

Other useful data gathered for the purposes of this study include:

- SCATS data for the signalized intersections (including signalised pedestrian crossings) on The Esplanade and Jackson Street from Wellington Traffic Operating Centre;
- Crash data from the Waka Kotahi Crash Analysis System (CAS) for years 2010-2020;
- Network Operating Framework maps (NOF) provided by HCC;
- Relevant reports and documentations such as The Cross Valley Link Program Business Case Report, Petone 2040 and the District Plan;
- Public transport information obtained from Metlink (2019) and Google maps;
- Pedestrian and cyclist counts from Petone Foreshore counter (2019-2021) provided by Waka Kotahi;
- E-scooter data (2021) provided by Lime;
- Travel time data from Lower Hutt Travle Times Data report prepared by Stantec (2020); and
- Parking utilisation information from Hutt Parking Report prepared by Cardno (2021).

2.2.2 Data Analysis

A series of metrics were retrieved from all the aforementioned sources and are detailed in Appendix B. A summary of the key findings is presented in Table 2-2.

Table 2-2 Key findings by mode of transport

Mode	Data category	Metric	Findings
GENERAL VEHICLES (CARS AND TRUCKS)	Traffic demand	ADT OD pairs	▪ Petone and Seaview are key trip origins and destinations in both the AM and PM peaks as both have high demand and attractions. ▪ The Esplanade carries about 26,000 ADT. It is the main linkage between SH2 South and the surrounding areas such as Petone, Eastern Bays, Wainuiomata and Lower Hutt CBD. ▪ Local trips using The Esplanade is quite high.
	Travel route choices	Select link analysis on Waione bridge and traffic density	▪ AM peak: Majority of the trips come from Seaview and go to SH2. A noticeable amount of trips short cut (rat running) the Esplanade through Jackson St via Jessie St, Cuba St, Te Puni St and Hutt Rd. The key bottleneck is outside the study area on SH2. ▪ PM peak: There is hardly any rat running off The Esplanade. The main origin and destination is still between the SH2 and Seaview. There is a noticeable proportion of trips comes from Petone and Lower Hutt CBD. There is no clear evidence showing the Waione Bridge is reaching capacity.
	Intersection performances	LoS	▪ AM peak: Hutt Rd, Te Puni St, Victoria St and Cuba St are the worst performing intersections. ▪ PM peak: Intersection performance are significantly better than the AM Peak. However, Jessie St approach shows a LoS F.
	Vehicle travel times	Travel time	▪ AM peak: The Esplanade vehicle users are experiencing significant congestion as well as variability in travel time. Using the side streets (rat running) is faster compared to staying on The Esplanade. ▪ PM peak: Travel time is much faster compared to AM peak. Using the side streets (rat running) takes more time compared to staying on The Esplanade.
	Vehicle crashes	Number of crashes (2010-2020)	▪ Cluster of crashes in Hutt road and in The Esplanade. ▪ More crashes on The Esplanade rather than on Jackson St. ▪ Crashes are more concentrated at intersections.
PEDESTRIANS	Pedestrian crossings	Pedestrian crossing locations	▪ There are closely spaced pedestrian crossings along Jackson St with more widely spaced pedestrian crossings along The Esplanade and Waione St. ▪ At the western end of The Esplanade and Waione St is the widest spacing of pedestrian crossings with 0.8km to 1km between crossings.

Mode	Data category	Metric	Findings
	Pedestrian delays	Average pedestrian delays	▪ Zebra crossings have low pedestrian delay because pedestrians are given priority over vehicles. ▪ The highest pedestrian delay along The Esplanade Corridor is experienced on the signalised Cuba St intersection as the pedestrians had to wait longer times to their turn to cross, owing to the longer cycle times. ▪ The sections of The Esplanade and Waione St without crossing aids have longer average pedestrian delay because people need to wait for a gap in high volume traffic in order to cross.
	Pedestrian volumes	Volumes from Remutaka - Petone Foreshore counter (2019-2021)	▪ Pedestrian volumes in 2021 are lower than were observed in 2019. Summer months have higher pedestrian volumes, owing to the warmer and more settled weather. ▪ The period during the Covid-19 lockdown saw a sharp increase in walking.
	Pedestrian crashes	Number of crashes (2010-2020)	▪ Clusters of crashes in Jackson St (high volumes of cars, retail stores, parking and bus stops). ▪ Cluster in The Esplanade around Richmond St, close to Petone beach. ▪ There are not many crashes at the edges of The Esplanade.
CYCLISTS	Current and Future Cycling Infrastructure	N/A	▪ Current cycleways network within the study area and surrounding areas consists of The Esplanade shared path, Hutt River Trails, Waione St cycle lanes and William St low traffic route. ▪ Multiple projects to further develop shared walking and cycling routes around the Hutt are under progress. Committed cycleways are Hutt Valley to Wellington shared path, The Beltway and Eastern Bays shared path.
	Level of Service	LoS	▪ The width of The Esplanade shared path varies between approximately 2.5m to 3.8m which results in the cycling level of service varying from LoS C (fair) to E (bad). ▪ Main roads which do not have cycling infrastructure (Hutt Rd, Cuba St, Udy St) have LoS D due to high traffic volumes and speeds. ▪ Minor streets with traffic calming (William St, Nelson St, Bay St) have a LoS B.
	Current and Future Cycling Volumes	Volumes from Remutaka - Petone Foreshore counter (2019-2021)	▪ Increased cycling during lockdown period. ▪ Summer months have significantly more cyclists in comparison with cold and wet months. ▪ Jan – Mar 2021 has higher volumes compared to 2019 and 2020.
	Cyclist crashes	Number of crashes (2010-2020)	▪ Few crashes involving cyclists occurred on The Esplanade, with less on Jackson St. ▪ There were no fatal crashes recorded.

Mode	Data category	Metric	Findings
PUBLIC TRANSPORT	Bus passenger volumes	Boardings and alightings (Metlink)	▪ Jackson St, Waione St and Seaview Rd have the highest bus passenger volumes ranging from 240-390 passengers during 7am-8am in the AM Peak. ▪ A section on The Esplanade from Fitzherbert St to Jessie St has the least bus passenger volumes, owing to very few buses using this route. ▪ The section, between Hutt Road and Fitzherbert St has good bus ridership with approximately 200 people using bus.
	Mode share	Mode share for public transport (2018)	▪ Data (pre Covid-19) shows that public transport mode share in Petone is around 30% (residents using public transport as their main means of travel to work).
	Public transport delays	Average trip delay	▪ The traffic queue often extends beyond the bus lane, making it difficult for the buses to get into the bus lane and adds to the delay by 1-1.5 minutes. ▪ This is currently not posing a major problem as there are not many buses which use this section and hence does not significantly affect the public transport users.

3. Options Development

3.1 Long List of Options

Taking into account the study area's characteristics and problem statements derived from the data analysis, a long list of 22 options was developed. These options are not exclusive. The options were then categorised based on the Waka Kotahi Intervention Hierarchy[2] and presented in Table 3-1. The intervention hierarchy is ordered based on the approximate cost of each intervention. Therefore options with a low cost should be considered first while the most expensive should be considered last.

Table 3-1 Long list of options categorised by intervention hierarchy

Lower cost → Higher cost			
Integrated Planning	**Demand Management**	**Best Use of Existing System**	**New Infrastructure**
Option 1 - Intensification along transport corridors	Option 2 - Public transport service improvements	Option 11 - High occupancy vehicle lane	Option 20 - Additional bridge across Hutt River
	Option 3 - Park and Ride improvements	Option 12 - Flow metering	Option 21 - Additional traffic lanes
	Option 4 - New separated cycleway along The Esplanade	Option 13 - Consolidation of side streets	Option 22 - Dynamic lanes
	Option 5 - Widening existing shared path	Option 14 - Signalisation of give-way intersections	
	Option 6 - Lighting existing shared path	Option 15 - Signalisation of roundabouts	
	Option 7 - Signalisation of pedestrian crossings	Option 16 - Additional stacking space at existing intersection	
	Option 8 - Cycle Crossings to The Esplanade	Option 17 – Bus priority lanes	
	Option 9 - Big box retail walking network	Option 18 – Bus Queue jump at intersections	
	Option 10 - Workplace/ school travel plans	Option 19 - Variable message sign	

Based on the above, the long list of 22 options is described as follows:

Option 1 - Intensification along transport corridors

The only option mapped under the integrated planning is the intensification along transport corridors. This option is to intensify residential development around the train stations and frequent bus corridors. The current development around train stations is standalone houses around Ava Station and mixed commercial and retail around Petone Station. The closer the people live to public transport the more they tend to use public transport. HCC is currently reviewing the District Plan in light of the Government Policy Statement on Urban Development

[2] https://www.nzta.govt.nz/assets/resources/The-Business-Case-Approach/PBC-intervention-hierarchy.pdf

so this option would be part of the do minimum and is not considered further in the assessment of the long list of options.

Option 2 - Public Transport Improvements

This option is to increase the frequency of public transport services between Wainuiomata to Gracefield/ Petone and/or Queensgate to Wellington. This could replace the Wainuiomata commuter buses and the Airport Flyer which no longer operated. However, this option is not in direct control of HCC.

Option 3 - Park and Ride Improvements

This option is to increase park and ride provision to encourage people to switch from driving to using public transport. Petone Station has approximately 480 spaces and Ava Station has approximately 50 spaces. This could encourage more people to use Ava Station which compared to Petone Station is underutilised. Challenges for this option are the impact of Covid-19 on public transport usage.

Option 4 - Protected Cycleway along The Esplanade

This option is a new on road separated cycling facility along The Esplanade. This could be a two-way facility or one-way facility. A protected cycleway would provide separation between vehicles and people using bikes or pedestrians.

Option 5 – Widening Existing Shared Path

This option is to upgrade the existing shared path through widening and surface improvements. However, there are buildings and memorials along The Esplanade which means that it would not be possible to achieve the desired width for the whole length of the route.

Option 6 – Lighting Existing Shared Path

This option is to improve the existing shared path with lighting, as this will provide a safer environment to all active mode users.

Option 7 - Signalisation of Pedestrian Crossings

There are currently five give way pedestrian crossings and two signalised pedestrian crossings along The Esplanade. This option would involve signalising the give way crossings.

Option 8 - Cycle Crossings to The Esplanade

In addition to Option 7, this option is looking to convert the existing and proposed signalised crossings into pedestrian and cycle crossings.

Option 9 - Big Box Retail Walking Network

In the large retail area in Petone it is common for people to park at one store and then drive to the next store which might be close by. There are currently no footpaths between Warehouse and Pak n Save (see Figure 3-1) so people would need to walk through the car park. This option involves joining up the footpaths between retail stores. This option could manage internal vehicle circulation by requiring vehicles to use the streets instead of the car park.

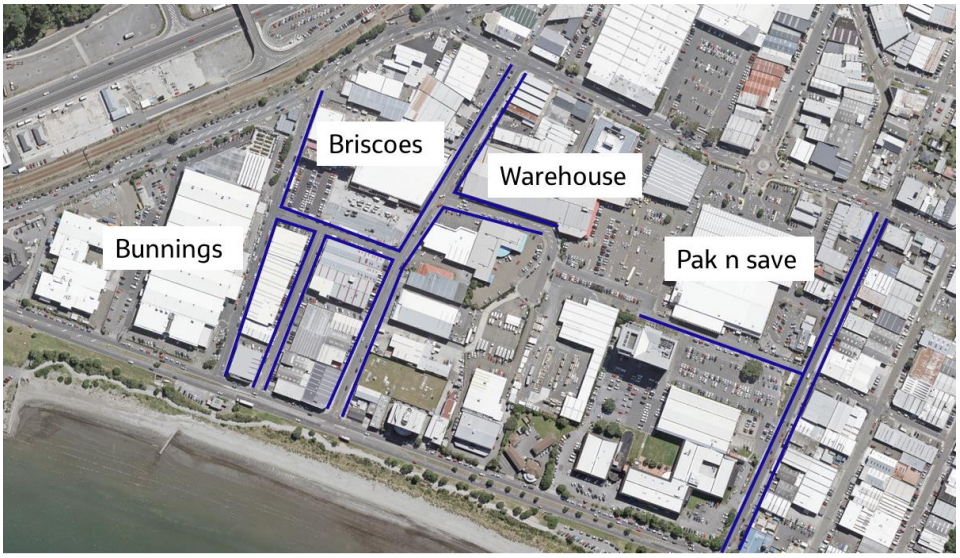


Figure 3-1 Current internal footpath network

Option 10 - Workplace Plans/ School Plans

Another option from the demand management category refers to workplace and/or school travel plans. This is something that HCC is already involved in so could be regarded as business as usual. Travel plans involve researching how people currently travel to work or school, identifying barriers to the use of active and sustainable modes and then implementing the plan. This option can also receive funding for end of trip facilities.

Option 11 - High Occupancy Vehicle (HOV) lane

This option involves converting existing road space into a high occupancy vehicle lane with the aim being to encourage carpooling and public transport use. This could be part time (e.g. during peak times only) or a full-time transit lane.

Option 12 - Flow Metering

This option involves using signals to control the merger between traffic lanes. The aim on flow metering is to manage the arrival rate of mergers and try to reduce traffic congestion.

Option 13 - Consolidation of Side Streets

Currently some residential side streets along The Esplanade are left in/ left out. Other side streets allow all turns and are located approximately every 200 to 300m. This option is to close some minor streets to right turning vehicles which consolidates these movements on the main streets. This could be combined with local traffic calming (e.g. gate way treatments, chicanes, speed tables) to further reinforce the road hierarchy.

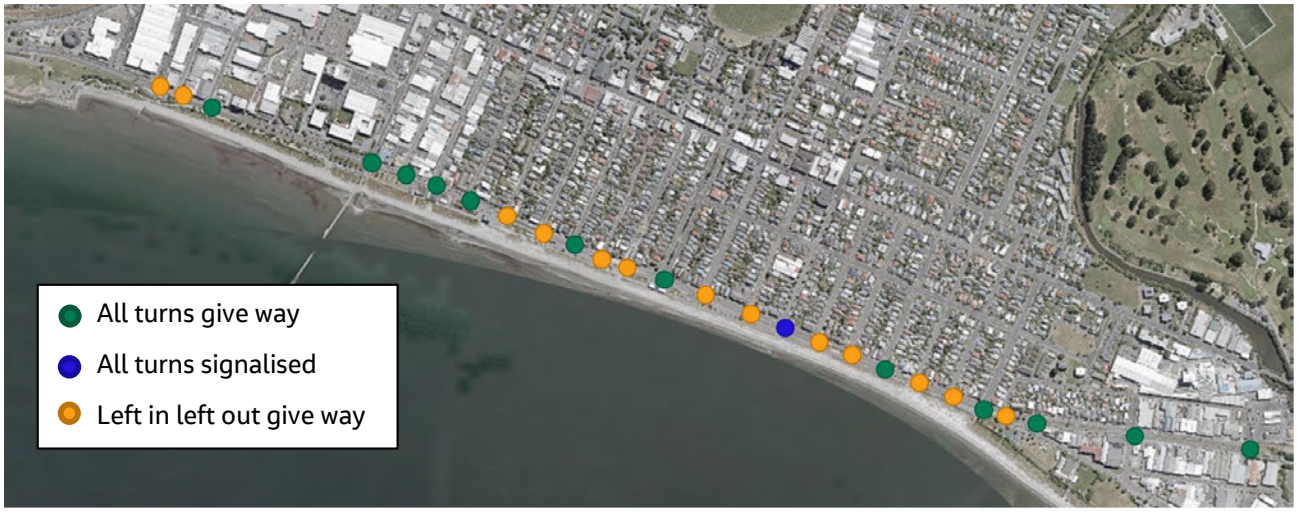


Figure 3-2 Existing types of intersections in The Esplanade

Option 14 - Signalisation of give-way Intersections

In addition to the consolidation of side streets, another option is the signalisation of give-way intersections. This would enable vehicles to turn right more easily and safely. If right turning movements are concentrated at fewer intersections then it is sensible for these to be signalised. This could also be linked to the pedestrian and cycle crossings. This option would seek agreement from the community for a change in road hierarchy.

Option 15 - Signalisation of roundabouts

The current Hutt Rd and Waione St roundabouts operate with give way control which means that vehicles circulating have priority over vehicles approaching the roundabout. Signalised roundabouts use traffic signals to control the flow of vehicles on each approach and circulating vehicles. The advantage of signalised roundabouts is balancing the roundabout if one approach is too high which reduces the overall delay. Signalised roundabouts are also easier to accommodate pedestrians/ cyclists (signalised crossings) and to provide public transport priority.

Option 16 - Additional Stacking Space

This option is to look at the layout and phasing of the current intersection of The Esplanade/ Cuba St to see if it could be optimised. This could include looking at whether there is sufficient stacking space for right turning vehicles.

Option 17 - Bus Priority Lanes along The Esplanade

This options includes bus priority lanes whether just at intersections or along the whole corridor.

Option 18 - Bus Queue Jump at intersections

Another public transport priority measure can include queue jumps where buses receive a “B” light whilst vehicles are held on a red light which allows buses to jump ahead of traffic.

Option 19 - Variable Message Signs (VMS) Route Choice

Variable message signs can be used to influence driver behaviour by providing information about traffic conditions or alternative modes.

Option 20 - Additional Bridge across Hutt River

This option involves constructing a new bridge across the Hutt River in addition to the existing Waione St bridge. From the previous workshop we found that Waione St was not a capacity issue due to the bottleneck being at the roundabouts. Therefore, the extra capacity from an additional bridge would probably only be needed if the roundabouts where signalised which increases the intersection capacity. This would be one of the more expensive options on the long list and therefore affordability and implementability need to be considered.

Option 21 - Additional Traffic Lanes

Another option of the long list is adding additional vehicle lanes through the removal of the median. The additional lanes could be used for general traffic, high occupancy vehicles or buses. This would likely be an expensive option due the large amount of work required to remove the median, resealing the road and redesign of intersections to accommodate extra traffic lanes.

Option 22 - Dynamic Lanes

Dynamic lanes are a different way on allocating road space where overhead signs and lights in the road tell drivers what the middle lane is used for which can be a directional traffic lane or a flush median. The advantage of dynamic lanes is that they can fit in narrowed road corridors as they need 3 traffic lanes instead of 4 with permanent lanes. The disadvantages of dynamic lanes is accommodating running movements and crossing pedestrians. Dynamic lanes are still uncommon in New Zealand, so may confuse unfamiliar road users.

3.2 Options Assessment

Analysis of the long list options and scoring against the assessment criteria was used to determine a short list of options.

3.2.1 Multi Criteria Analysis Framework

The Multi Criteria Analysis (MCA) tool was selected to assess the various options. The MCA framework was based on three main categories covering the Government Policy Statement on land transport (GPS) investment priorities[3], the problem statements as identified and detailed in Section 2.1, and the project specific requirements (Figure 3-3).

[3] https://www.transport.govt.nz//assets/Uploads/Paper/GPS2021.pdf

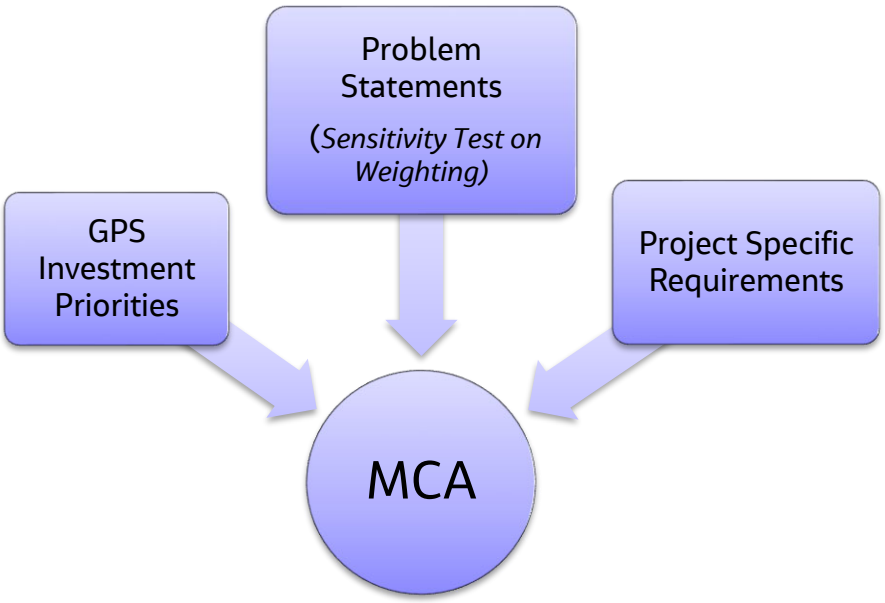


Figure 3-3 MCA framework

Each of these categories were divided into subcategories which constitute of the assessment criteria. The twelve criteria along with the scoring system are presented in Table 3-2. The rating scale aligns with the 7-point scale from -3 to +3, as reported in the Multi-Criteria Analysis: user guidance by Waka Kotahi[4].

[4] https://www.nzta.govt.nz/assets/resources/planning-policy-manual/docs/multi-criteria-assessment-user-guidance.pdf

Table 3-2 Assessment criteria, methodology and scaling

Category	Criteria	-3 Significant Adverse	-2 Moderate Adverse	-1 Minor Adverse	0 Neutral	+1 Minor Positive	+2 Moderate Positive	+3 Significant Positive
GPS	**Inclusive Access***	>6% Worsen to Economic & Social Centres	4%-5% Worsen to Economic & Social Centres	0%-3% Worsen to Economic & Social Centres	0%-3% Improve to Economic & Social Centres	4%-5% Improve to Economic & Social Centres	6%-7% Improve to Economic & Social Centres	> 8% Improve to Economic & Social Centres
	Economic Prosperity*	Freight Worsen >4%	Freight Worsen 2%-3%	Freight Worsen 0%-1%	Freight Improve 0%-1%	Freight Improve 2%-3%	Freight Improve 4%-5%	Freight Improve >6%
	Health and Safe People*	Serious injuries Increase > 15%	Serious injuries increase 6% to 14%	Serious injuries increase 0% to 5%	Serious injuries reduce 0% to 14%	Serious injuries reduce 15% to 24%	Serious injuries reduce 25% to 39%	Serious injuries reduce >40%
	Environmental Sustainability*	Vehicle km travelled Increase >7%	Vehicle km travelled increase 3%-6%	Vehicle km travelled increase 0%-2%	Vehicle km travelled reduce 0%-2%	Vehicle km travelled reduce 3%-4%	Vehicle km travelled reduce 5%-6%	Vehicle km travelled reduce >7%
	Resilience and Security*	Car Mode Increase >4%	Car Mode Increase 2%-3%	Car Mode Increase 0%-1%	Car Mode Decrease 0%-1%	Car Mode Decrease 2%-3%	Car Mode Decrease 4%-5%	Car Mode Decrease >6%
Problem Statements	**Road Hierarchy**	Rat running increase >25%	Rat running increase 10%-24%	Rat running increase <10%	Rat running reduce <10%	Rat running reduce 10%-24%	Rat running reduce 25%-49%	Rat running reduce >50%
	Active Mode Quality	LoS -3	LoS -2	LoS -1	LoS Unchanged	LoS +1	LoS +2	LoS +3
	Public Transport Priority*	Public transport patronage worsens > 7%	Public transport patronage worsens 4%-6%	Public transport patronage worsens 0%-3%	Public transport patronage improves 0%-3%	Public transport patronage improves 4%-6%	Public transport patronage improves 7%-9%	Public transport patronage improves >10%
Project Specific	**Value for Money***	BCR < -1.1	BCR -1.0 to -0.1	BCR 0.0 to 1.0	BCR 1.0 to 1.9	BCR 2.0 to 3.9	BCR 4.0 to 6.9	BCR > 7.0
	Scheduling	> 10yrs	8yrs to 10yrs	6yrs to 8yrs	4yrs to 6yrs	2yrs to 4yrs	1yr to 2yrs	< 1yr
	Affordability	> $50M	$10M to $50M	$5M to $10M	$2M to $5M	$1M to $2M	$500k to $1M	< $500k
	Achievability Risk	Very High	High	Uncertain	Manageable	Low	Very Low	No

*Criteria aligns with the Waka Kotahi Investment Priority Method

3.2.2 MCA Assessment

Each option of the long list was assessed against each MCA criteria and received a score between -3 and 3, with -3 meaning large negative magnitude and +3 large positive. The criteria scores were then added together to form a total score for each option.

The MCA results are summarised in Table 3-3 and sorted according to their total score received from all the criteria. The detailed scoring is located in Appendix C.

Table 3-3 MCA results for long list options

Rank – Total Score	Total Score	Long list of options
1	18	Consolidation of Side Streets
1	18	Signalisation of Roundabouts
3	14	Big Box Retail Walking Network
4	13	Signalisation of Pedestrian Crossings
5	12	Cycle Crossings to The Esplanade
5	12	VMS Route Choice
5	12	Additional Stacking Space
5	12	Signalisation of Give-Way Intersections
9	11	Bus Queue Jump at Intersections
9	11	Workplace Plans/ School Plans
9	11	Flow Metering
12	9	Public Transport Improvements
12	9	Protected Cycleway along The Esplanade
14	8	Lighting Shared Path
14	8	Widening Shared Path
16	7	HOV lane
17	6	Park and Ride Improvements
18	0	Additional traffic lanes
19	-3	Bus Priority Lanes along The Esplanade
20	-5	Additional Bridge across Hutt River
20	-5	Dynamic lanes

3.2.3 Sensitivity Test

As noted, during Workshop #1 the stakeholders prioritised the problem statements. Therefore, a sensitivity test was performed to understand the impact of the total score with the inclusion of these priorities.

All the criteria received a weighting of 1, while the problem statements' criteria were weighted as below:

- Road Hierarchy = 3
- Active Mode Quality = 2
- Public Transport Priority = 1

The total score using the weighted criteria is presented in Table 3-4. The results of the sensitivity test indicate a small change in the options' ranking, but overall the outcome is similar when comparing with Table 3-3.

Table 3-4 MCA results for sensitivity test

Rank - Weighted Score	Total Weighted Score	Long list of options
1	26	Consolidation of Side Streets
2	25	Signalisation of Roundabouts
3	20	Big Box Retail Walking Network
4	17	Signalisation of Give-Way Intersections
5	15	Signalisation of Pedestrian Crossings
6	14	VMS Route Choice
7	13	Cycle Crossings to The Esplanade
7	13	Flow Metering
9	12	Protected Cycleway along The Esplanade
9	12	Additional Stacking Space
11	11	Bus Queue Jump at Intersections
11	11	Workplace Plans/ School Plans
13	10	Lighting Shared Path
14	9	Public Transport Improvements
14	9	Widening Shared Path
16	8	Park and Ride Improvements
17	7	HOV lane
18	4	Additional traffic lanes
19	-3	Additional Bridge across Hutt River
20	-5	Dynamic lanes
21	-7	Bus Priority Lanes along The Esplanade

3.3 Workshop Feedback

The MCA results were presented to the stakeholders in Workshop #2. Following this, a copy of the draft MCA scoring was distributed to all stakeholders so that workshop participants were prepared to short list the options at the following workshop.

Workshop #3 comprised of the options assessment (presenting results from the model run) and the programmes' development including the long list of options, as reported in the following section.

4. Programmes Development

4.1 Options Dependencies

In order to group options into programmes, the options dependencies had to be checked. Table 4-1 shows how the options interconnect with one other. Based on the dependencies, the following three programmes were drafted and presented in Workshop #3 in order to seek feedback from the stakeholders:

- Programme 1 – Manage rat running
- Programme 2 – Mode shift
- Programme 3 – High investment.

Table 4-1 Options dependencies

Options	Dependencies on other options	Reason
Consolidation of Side Streets (Option 13)	Signalisation of give-way intersections	Increased right turns at fewer intersections
Signalisation of Roundabouts (Option 15)	No dependencies	NA
Big Box Retail Walking Network (Option 9)	No dependencies	NA
Signalisation of Pedestrian Crossings (Option 7)	Cycle Crossings to The Esplanade (Option 8)	It is sensible to have signalised cycle/ pedestrian crossings built at the same time
VMS Route Choice (Option 19)	No dependencies	NA
Additional Stacking Space (Option 16)	No dependencies	NA
Signalisation of Give-Way Intersections (Option 14)	No dependencies	NA
Bus Queue Jump at Intersections (Option 18)	Signalisation of give-way intersections (Option 14)	Queue jumps require traffic signals to hold traffic on red whilst bus receives a head start
Workplace Plans/ School Plans (Option 10)	No dependencies	NA
Flow Metering (Option 12)	HOV lanes (Option 11)	Manages merge between HOV lane and general traffic lane
Public Transport Improvements (Option 2)	No dependencies	NA
Protected Cycleway along The Esplanade (Option 4)	Cycle crossings (Option 8)	People will need to cross The Esplanade to access the cycleway
Lighting Shared Path (Option 6)	Widening shared path (Option 5)	Provide space to locate lighting poles outside of cycle/ pedestrian paths
Widening Shared Path (Option 5)	No dependencies	NA
HOV lane (Option 11)	No dependencies	NA
Park and Ride Improvements (Option 3)	No dependencies	NA
Additional traffic lanes (Option 21)	Signalisation of pedestrian/ cycle crossings (Options 7 and 8)	Give-way pedestrian crossings generally not suitable for roads with 2 lanes in each direction

Options	Dependencies on other options	Reason
Bus Priority Lanes along The Esplanade (Option 17)	Signalisation of pedestrian/ cycle crossings (Options 7 and 8)	Give-way pedestrian crossings generally not suitable for roads with 2 lanes in each direction
Additional Bridge across Hutt River (Option 20)	No dependencies	NA
Dynamic lanes (Option 22)	Signalisation of pedestrian/ cycle crossings (Options 7 and 8)	Give-way pedestrian crossings generally not suitable for roads with 2 lanes in each direction

4.2 Programme 1 – Manage rat running

Programme 1 (see Figure 4-1) is themed around rat running and includes consolidation of right turns at fewer intersections along The Esplanade. Intersections with right turns would be signalised to enable vehicles to make right turns safely and to discourage through traffic from using side streets. Pedestrian and cycle crossings of The Esplanade would be provided at signalised intersections. Hutt Rd and Waione St roundabouts would be signalised to balance the approaches and to increase overall vehicle throughput.

Expected outcomes from Programme 1 include:

- Encourage through traffic to use The Esplanade
- Lower traffic volume on Jackson St and side streets
- More balanced intersection delays.

Figure 4-1 Programme 1

4.3 Programme 2 – Mode shift

Programme 2 (see Figure 4-2) includes a new protected cycleway along The Esplanade with signalised and pedestrian crossings at the current crossing points. The programme also includes a high frequency bus service through Petone, and expanded park 'n' ride at Petone Station and Ava Station.

Expected results include but not limited to:

- Higher public transport, walking and cycling uptake
- Improved safety for people walking and cycling
- Lower light vehicle volumes.

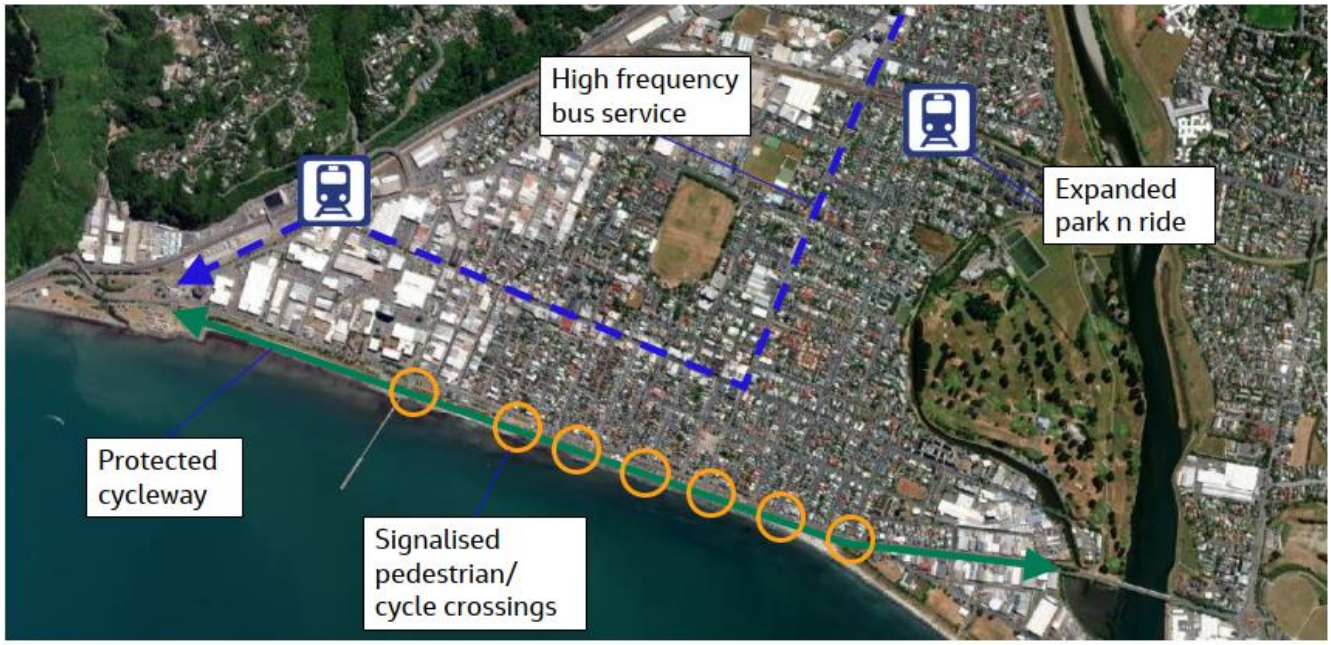


Figure 4-2 Programme 2

4.4 Programme 3 – High investment

Programme 3 (see Figure 4-3) is using elements from Programmes 1 and 2, with additional measures to improve vehicle travel times. This includes a high occupancy vehicle lane and an additional bridge across Hutt River. The consolidation of side streets and signalisation of main intersections is included to manage rat running. Higher frequency bus service and expanded park and ride is included to try to encourage a mode shift towards public transport. Similarly, a protected cycleway along The Esplanade and safe cycle crossings are included to encourage people to use active modes. This programme aims to achieve multiple objectives but has the downside of requiring a high level of investment and having a longer timeframe for implementation.

Outcomes expected from Programme 3 include:

- Encourage through traffic to use The Esplanade
- Lower traffic volume on Jackson St and side streets
- More balanced intersection delays
- Higher public transport, walking and cycling uptake

- Improved safety for people walking and cycling
- Encourage car pooling.

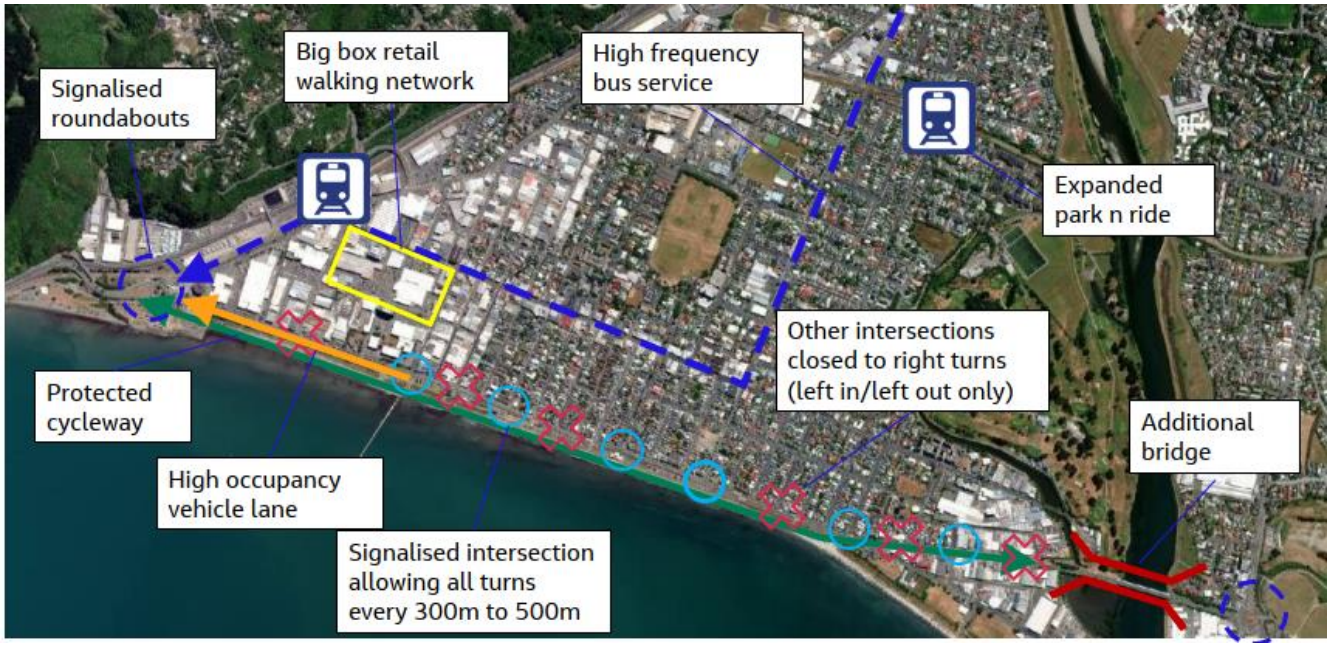


Figure 4-3 Programme 3

4.5 Workshop Feedback

4.5.1 Short List of Options

During Workshop #3 stakeholders agreed on scores for each option using a simplified scoring system taking into account the positive/neutral/negative impact in each category. The agreed scoring of each option against the key assessment criteria categories is shown in Table 4-2.

Table 4-2 Options assessment

Options	GPS	Problem statement	Project specific
Public Transport Improvements	↑	↑	–
Protected Cycleway along The Esplanade	↑	↑	–
Park and Ride Improvements	–	–	–
Bus Queue Jump at Intersections	–	↑	↑
Cycle Crossings to The Esplanade	–	↑	↑

Options	GPS	Problem statement	Project specific
Signalisation of Pedestrian Crossings	–	↑	↑
Big Box Retail Walking Network	–	↑	↑
Workplace Plans/ School Plans	–	–	↑
VMS Route Choice	–	–	↑
Lighting Shared Path	–	–	↑
Widening Shared Path	–	–	↑
Flow Metering	–	↑	↑
Consolidation of Side Streets	↑	–	↑
HOV lane	↑	↑	–
Signalisation of Roundabouts	↑	↑	–
Additional Stacking Space	–	–	↑
Signalisation of Give-Way Intersections	↑	↑	↑
Additional Bridge across Hutt River	–	↑	↓
Additional traffic lanes	↓	↑	–
Dynamic lanes	↓	↓	↓
Bus Priority Lanes along The Esplanade	–	↓	↓

The following options were not carried forward to the short list because they are either expected to have a negative impact on one or more of the key criteria, or expected to provide marginal improvements to the study area.

- Signalisation of Roundabouts
- Big Box Retail Walking Network
- Widening Shared Path

- Park and Ride Improvements
- Additional traffic lanes
- Bus Priority Lanes along The Esplanade
- Dynamic lanes.

The remaining options form the short list of options. It was also agreed to substitute the signalised roundabouts in Waione St and Hutt Rd with roundabout metering signals. This option will help balancing the traffic flows, by reducing the queues on the downstream approaches.

4.6 Programme 4 – Hybrid

The main outcome of Workshop #3 was the stakeholder's preference for Programme 3, with the excluded options as mentioned above. Consequently, a new programme (Figure 4-4) was developed that groups together all the short list of options, with the additional bridge being assessed separately as feasibility test. The short list of options included in Programme 4 are as follows:

- Consolidation of Side Streets
- Metering of Roundabouts
- Signalisation of Pedestrian Crossings
- Cycle Crossings to The Esplanade
- Variable Message Signs (VMS) Route Choice
- Additional Stacking Space
- Signalisation of Give-Way Intersections
- Bus Queue Jump at Intersections
- Workplace Plans/ School Plans
- Flow Metering
- Public Transport Improvements
- Protected Cycleway along The Esplanade
- Lighting Shared Path
- High Occupancy Vehicle (HOV) lane
- Additional Bridge across Hutt River (test feasibility)

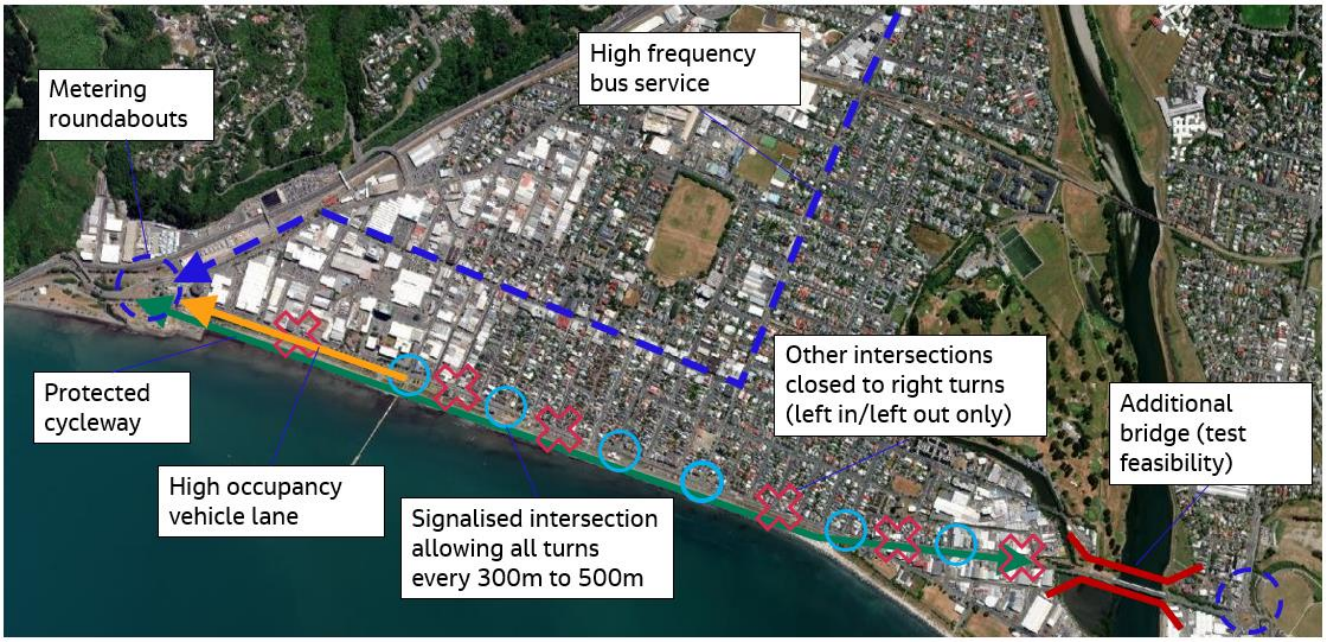


Figure 4-4 Programme 4

5. Preferred Programme

This section captures the assessment of Programme 4, which is referred as the Preferred Programme. The assessment, as presented in Workshop #4, includes modelling elements and economic evaluation in order to determine the MCA scoring in a programme level.

5.1 Modelling

5.1.1 Assumptions

The modelling was carried out using the HAM (Aimsun version 8.4.0). The main assumptions that govern the modelling are presented in Table 5-1.

Table 5-1 Modelling assumptions

Item	Assumptions
Modelled years	Base Year 2017
	Forecast Year 2027
Modelled periods	AM Period (4 hours), 6:00 to 10:00
	PM Period (4 hours), 15:00 to 19:00
Scenarios	Do Minimum (as per existing network)
	Preferred Programme (Programme 4 – Hybrid)
Network characteristics for Programme 4	Left in/ left out (LILO) streets: Aurora St, Oriental St, William St, Patrick St, Collins St, Queens St, King St, Beach St, Bay St, Nelson St, Sydney St, Tory St, Bolton St
	Signalised intersections: Jessie St, Kirkcaldy St, Cuba St, Buick St, Richmond St
	One-way system: Fitzherbert St, Victoria St, Union St
	Roundabout Metering: Waione St, Hutt Rd
	Metering General Vehicles, Protected Cycleway, HOV Lane, VMS, Travel Plans, Local Road Reprioritization and Existing Waione St Bridge

It should be noted that the proposed signalised intersections are indicative for the purpose of assessment and the exact locations for the signalised intersections will be decided by HCC.

5.1.2 Results

The modelling has been used to inform the MCA for the GPS and Problem Statements criteria. Outputs are as follows:

Inclusive Access
An indicative trip with origin Seaview and destination Wellington CBD shows a reduced travel time of 3-5min. This increases the accessibility to economic and social centres by +2%.

Economic Prosperity
With the assumption that the truck demand is the same for Do Minimum and Preferred Programme for year 2027, there is an overall improvement in freight movements that varies from 6% to 30% (see Table 5-2).

Table 5-2 Truck metrics

2027 Truck metrics (AM period)	Do Minimum		Preferred Programme		Difference	
	Average	StD.	Average	StD.	Average	StD.
Trucks Demand (veh/h)	813.0	N/A	813.0	N/A	0%	N/A
Total Distance Travelled (km)	11,607.0	N/A	11,596.0	N/A	0%	N/A
Total Travel Time (hr)	473.0	N/A	404.0	N/A	-15%	N/A
Average Speed (km/hr)	32.2	15.8	34.1	13.6	6%	-14%
Average travel time per trip (min)	8.7	N/A	7.5	N/A	-15%	N/A
Delay Time (sec/km)	92.0	126.8	66.3	114.3	-28%	-10%
Mean Queue (veh)	50.7	N/A	35.3	N/A	-30%	N/A

Health and Safe People
Observing the predicted crashes, it is noticed a 15% reduction in serious injury crashes. The reduction refers to an average between the type of crashes (intersection, pedestrian and cyclist).

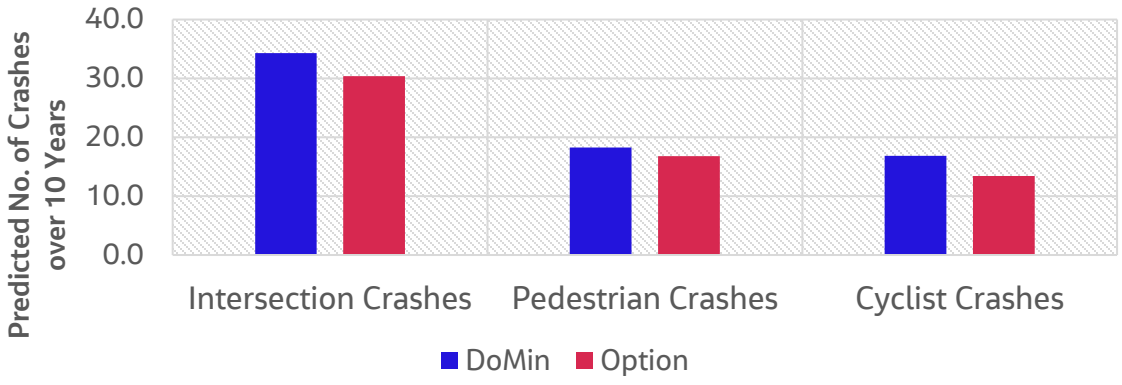


Figure 5-1 Predicted crashes

Environmental Sustainability
Regarding the vehicle kilometre travelled, there were marginal changes when comparing the two scenarios for the modelled years. Hence, this criteria is scored as neutral.

Resilience and Security
The Preferred Programme achieved a 5% reduction in car users based on the mode split. The 5% is allocated to public transport and active mode by 4% and 1% respectively.

Road Hierarchy
The network changes (LILO and one-way system) indicated a reduction in rat running of 50%, which gives to road hierarchy a significant positive score.

Active Mode Quality
The protected cycleway improved the cyclists LoS from E to C. This increase is categorized as moderate positive.

Public Transport Priority
The travel time reduction and the increased bus frequency shows an improvement in public transport. Furthermore, the patronage time has been decreased by 28%, which indicates an improvement higher than 10% and hence this criteria is scored with a significant positive magnitude.

Table 5-3 Public transport metrics

2027 Public transport metrics	Do Minimum	Preferred Programme	Difference
Travel Time (mins/bus)	3.4	2.8	-18%
Frequency (no. buses)	35	56	62%
Patronage Time (mins/person)	7	5	-28%

5.2 Economic evaluation

5.2.1 Assumptions

An indicative economic evaluation for the preferred programme was undertaken using the assumptions below:

- Evaluation period of 40 years
- Discount rate 4%
- Year 0 is 2021
- Costs assumed to occur in 2023
- Construction and operating costs are indicative and are not based on schedule of quantities
- Travel time, VOC, CO_2 and public transport benefits are counted only for weekdays for conservative purposes (245 days)
- Benefits commencing in 2023
- Travel time, VOC and CO_2 are based on modelling outputs (model runs as described in Section 5.1)
- Value of travel time in $/hour is aligned with the Waka Kotahi Monetised Benefits and Costs Manual[5] (MBCM)
- Value of VOC (cents/km) is aligned with the VOC lookup tables from MBCM
- Cost and revenue elements related to public transport improvements (additional buses for peak period) is not included in the economic evaluation
- Growth rates for pedestrians and cyclists have not been included
- Crash reduction is calculated based on the Crash Estimation Compendium[6] for urban roads

[5] https://www.nzta.govt.nz/resources/monetised-benefits-and-costs-manual/
[6] https://www.nzta.govt.nz/assets/resources/monetised-benefits-and-costs-manual/crash-risk-factors-guidelines-compendium.pdf

5.2.2 Benefits

Based on the assumptions listed above, the Preferred Programme when compared to Do Minimum generates the benefits shown in Table 5-4. The largest benefit is anticipated to come from travel time savings totalling $64.9m.

Table 5-4 Discounted benefits

Benefit stream	$2020 prices
Travel Time Savings	$64.9m
Vehicle Operating Costs	$3.2m
Carbon Dioxide	$0.1m
Crash Reduction	$2.5m
Active Mode	$10.5m
Public Transport	$7.5m
Total Benefits	**$88.7m**

5.2.3 Costs

Indicative construction costs (net present value, $2020 prices) are presented in Figure 5-2, with an approximate total cost of $15.9m. This could result, to Affordability criteria with a score of -2 (moderate adverse magnitude) but considering that few options could be partially funded by Waka Kotahi and the costs for HCC will be decreased, it is more sensible to score this criteria with -1 (minor adverse).

On another note, the construction costs also include widening of Waione St as this part of signalising Jessie and Kirkcaldy St to allow for the right turning bays.

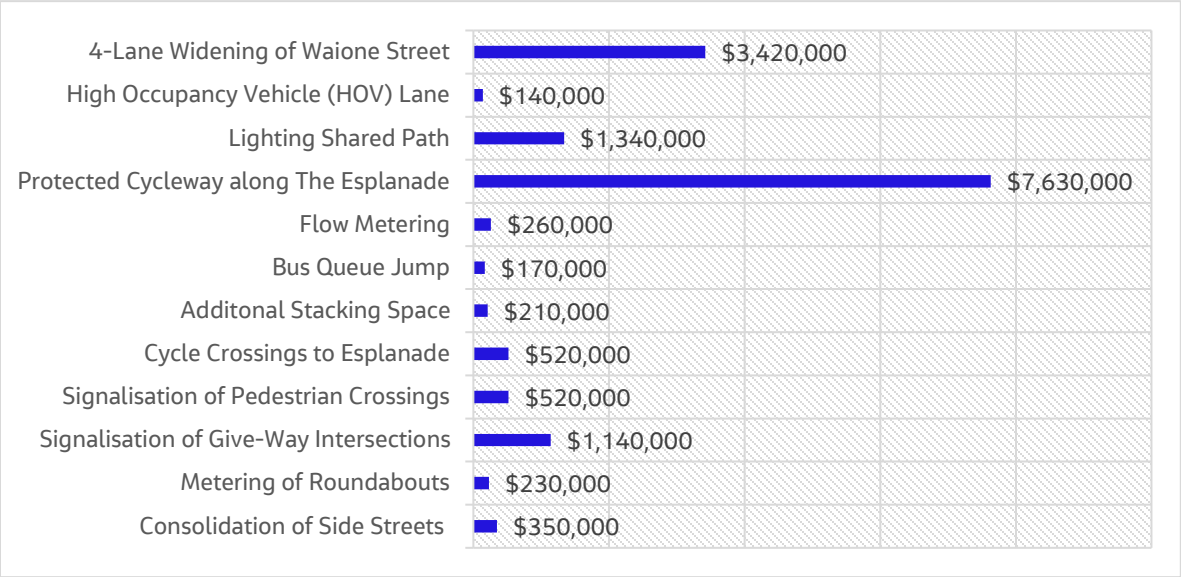


Figure 5-2 Capital cost estimates

Discounted construction and operating costs used in the economic evaluation are shown in Table 5-5.

Table 5-5 Discounted costs

Cost stream	$2020 prices
Construction Costs	$14.7m
Operating Costs	$2.1m
Total Costs	**$16.8m**

5.2.4 Benefit to Cost Ratio

Based on the benefits and costs presented above, the BCR has a value of 5.3 (see Table 5-6). With a BCR between 4.0 and 6.9 the Value for Money criteria is classified as moderate positive (+2).

Table 5-6 BCR

Benefits/Costs	$2020 prices
Discounted Benefits	$88.7m
Discounted Costs	$16.8m
BCR	**5.3**

With regards the criteria of Scheduling, the construction period is expected to be 24 months which results to MCA score of moderate positive. Lastly, based on the intervention type of the shortlisted options the Achievability Risk is considered Low and therefore scored with a +2 (minor positive magnitude).

5.2.5 Sensitivity Tests

Six sensitivity tests were undertaken to determine the impact on BCR when changing some of the dependent variables (duration of evaluation period, costs, new users). The impact in BCR for the sensitivities is as follows:

Table 5-7 Sensitivity tests

Sensitivity test	BCR	Comparison with base case (BCR=5.3)
10-year evaluation period	2.0	**-61%**
20% costs increase	4.4	**-17%**
100% costs increase	2.6	**-50%**
10% costs decrease	5.9	**11%**
50% decrease in new public transport users	5.2	**-1%**
50% decrease in new cyclists	5.0	**-6%**

It can be seen that claiming benefits for 40 years over 10 years has a great impact in BCR. Similarly, doubling the costs can decrease the BCR by 50%. On the other hand, changes in benefits with regards the new users has marginal changes to benefits, and consequently the BCR. In summary, as anticipated BCR is very sensitive to

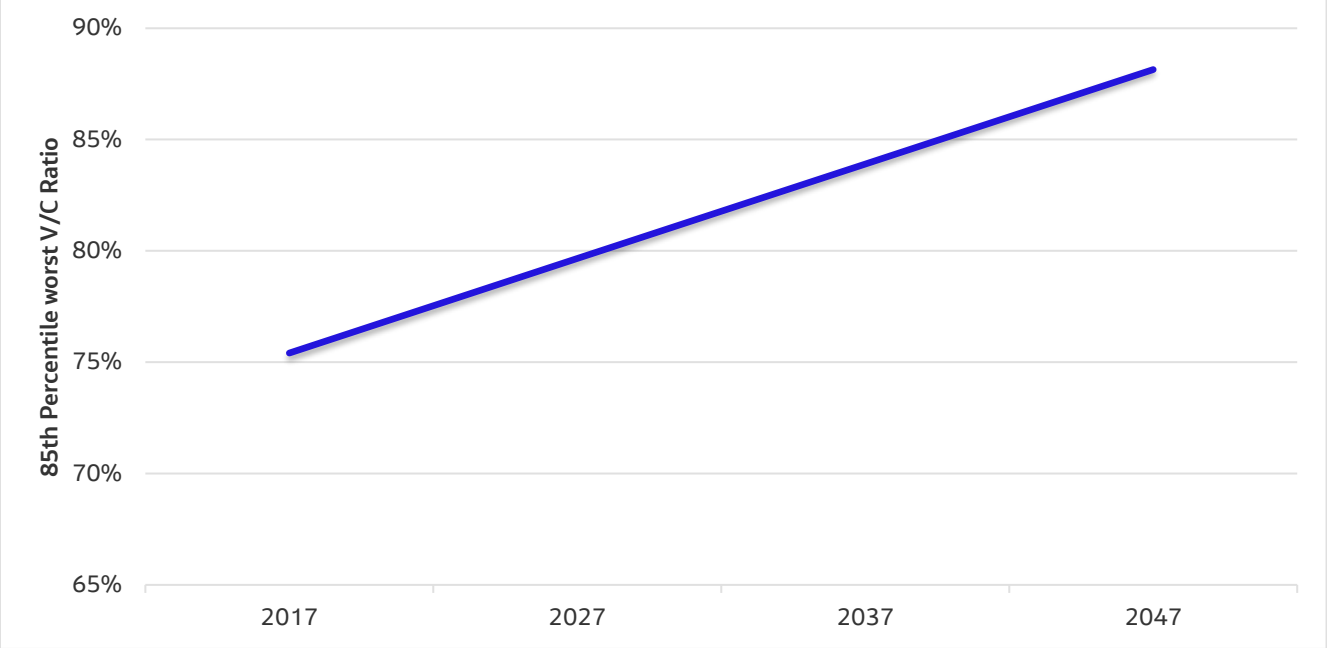
costs and therefore it is highly recommended that a detailed cost estimate needs to be undertaken at the later stage of the detailed design.

5.3 Additional Bridge Investigation

As discussed in Workshop #3, it was requested by the stakeholders to investigate further if an additional bridge over Hutt River adds value to the programme of works.

The metric Volume to Capacity ratio (V/C) was used to identify if and when the existing bridge will reach its capacity. As can be seen in Figure 5-3, the Waione Bridge will likely reach capacity between 2027 and 2037. A high level assessment indicates that the additional bridge will increase BCR by only 0.2. Therefore, it is recommended that this option will not be included in the Preferred Programme, as agreed with the stakeholders in Workshop #4.

Figure 5-3 Volume to Capacity Ratio at Waione Bridge



5.4 MCA Summary

Based on the MCA framework, modelling results and economic evaluation, the MCA scoring for the Preferred Programme is presented below. Combining the shortlisted options in one programme, results to an overall positive MCA. A positive MCA means that the programme of works contributes to the desired outcomes, as it is expected to address the problems identified.

Table 5-8 MCA results for Preferred Programme

Category	Criteria	Magnitude	Score
GPS	Inclusive Access	Neutral	0
	Economic Prosperity	Significant positive	+3
	Health and Safe People	Moderate Positive	+2
	Environmental Sustainability	Neutral	0
	Resilience and Security	Moderate Positive	+2
Problem Statements	Road Hierarchy	Significant Positive	+3
	Active Mode Quality	Moderate Positive	+2
	PT Priority	Significant Positive	+3
Project Specific	Value for Money	Moderate Positive	+2
	Scheduling	Moderate Positive	+2
	Affordability	Minor Adverse	-1
	Achievability Risk	Minor Positive	+1

6. Recommendations

This report recommends that investment in projects to address the problems identified for The Esplanade proceed and seeks approval for HCC to progress with Programme 4 as the Preferred Programme, on the basis that HCC considers appropriate path for funding. This recommendation is based on the outcomes of the series of workshops with the stakeholders, culminating in the development of the Preferred Programme (group of the shortlisted options). The Preferred Programme is expected to deliver value for money. This is reflected in the project Benefit Cost Ratio of 5.3 meaning for every dollar invested, $5.30 of economic benefit is expected to be generated. The most significant economic benefits quantified in the analysis are from travel time savings.

The Preferred Programme is expected to address the problem statements and focus on improvements related to all the users of the transport system with less rat running, improved active mode facilities and prioritised public transport through high frequency bus services.

To achieve the aforementioned programme objectives, it is recommended the various interventions are delivered in two stages: Short term and Medium term. The recommended staging is based on interdependencies between the options, cost, complexity and other projects such as Te Ara Tupua/ Ngauranga to Petone and Cross Valley Transport Connections.

Short Term 1-3 years

For the short term period, it is recommended to consolidate the streets and signalise the intersections (interconnected options). Metering the roundabouts would also help to manage rat running. Options to be considered in the first 3 years include:

- Variable messaging signs and school/workplace travel plans
- Metering roundabouts
- Signalised intersections allowing all turns every 300m to 500m
- Other intersections closed to right turns (left in/left out only)

Medium Term 3-5 years

As the protected cycleway is linked to Te Ara Tupua/ Ngauranga to Petone cycling project, this option can be implemented in a later stage. Also, changes to bus services (including purchase of new bus fleet) can lead to increased implementation time due to procurement. Therefore, the options below are considered for the medium term:

- High frequency bus service
- High occupancy vehicle lane
- Protected cycleway

7. List of Appendices

Appendix A. Workshops

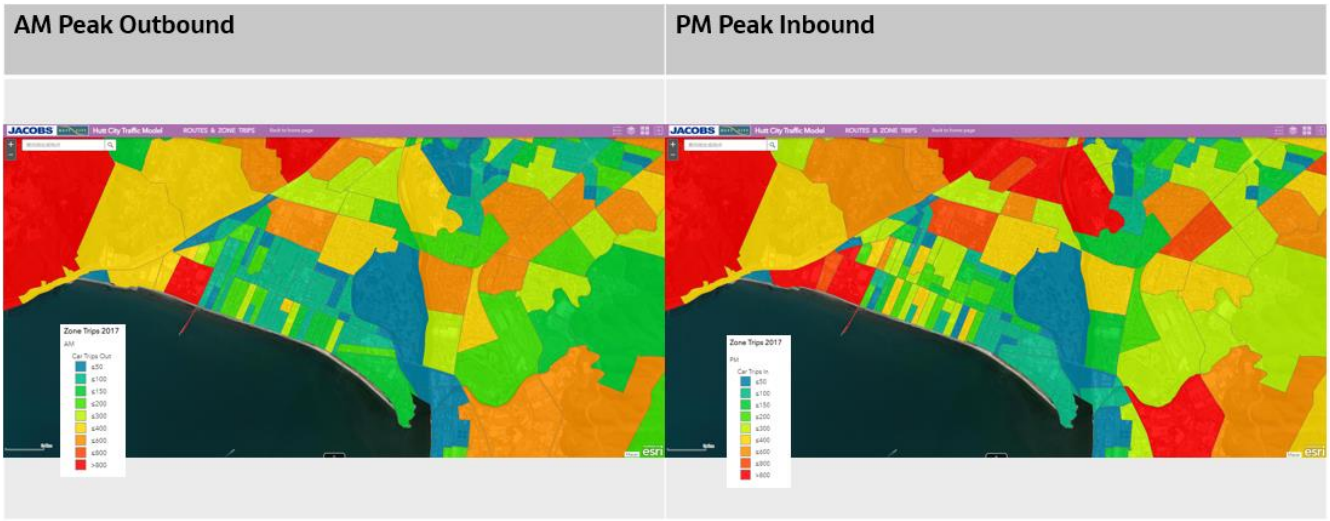
Workshop No.	*Theme*	*Date*	*Attendees*
Workshop #1	Issues Identification	7 May 2021	Charles Agate, John Gloag, Aileen Campbell, Hellen Swales, Mike Henderson, Pam Hanna, Bob Hu, Chris Groom, Vasso Agathangelou
Workshop #2	Optioneering	28 May 2021	Charles Agate, John Gloag, Aileen Campbell, Aaron Marsh, Hellen Swales, Mike Henderson, Pam Hanna, Bob Hu, Chris Groom, Vasso Agathangelou
Workshop #3	Programmes	18 June 2021	Charles Agate, John Gloag, Aileen Campbell, Hellen Swales, Mike Henderson, Bob Hu, Chris Groom, Vasso Agathangelou
Workshop #4	Preferred Programme	23 July 2021	Charles Agate, John Gloag, Aileen Campbell, Hellen Swales, Mike Henderson, Alex Voutratzis, Bob Hu, Chris Groom, Vasso Agathangelou

Appendix B. Data analysis

Cars and Trucks

Traffic Demand

Figure 1 shows the desired travel origins and destinations in the Hutt City Area. It is observed that Petone and Seaview are main origins as well as key destinations in both the AM and PM peaks as both have high demand and attractions.



Source: Hutt City Aimsun Model 2017

Figure 1 Desired Travel Origins and Destinations

Figure 2 shows the existing and future Average Daily Traffic (ADT) in the study area. The Esplanade carries about 26,000 ADT with a high proportion of Heavy Commercial Vehicles. It is forecasted to have further growth of 5% over the next 5-10 years. It creates a key road linkage between the Industry area in Seaview, the Social and Economics Centre in Petone and the SH2 making it a critical corridor that serves multi-purpose trips.

From the current ADTs, it has been identified that the local trips using The Esplanade are quite high.

Figure 2 Average Daily Traffic, Growth and Heavy Vehicle Percentages

Figure 3 shows the proportions of the vehicle users using The Esplanade coming from different surrounding areas and going to SH2.

On an average, the Esplanade carries about 26,000 ADT. It is the main linkage between SH2 South and the surrounding areas such as Petone, Eastern Bays, Wainuiomata and Lower Hutt CBD.

The key ODs using the Esplanade are Eastern Bays and Petone local trip which combine over 80%. Petone is expected to experience a high growth in the future and that will add additional trips from that area. Over 10% of the ADT on The Esplanade comprises of Heavy Commercial Vehicles (HCV) going to and coming from Eastern Bays.

Figure 3 Key Origins and Destinations using The Esplanade

Travel Route Choices

Select Link Analysis is a modelling tool to understand the route choices for users on a specific section of the road. The peak direction on Waione Bridge Westbound is analysed in the Morning Peak period. Majority of the trips come from Seaview and go to SH2 as expected. A noticeable number of trips short cut the Esplanade through Jackson St via Jess, Cuba, Te Puni and Hutt Rd.

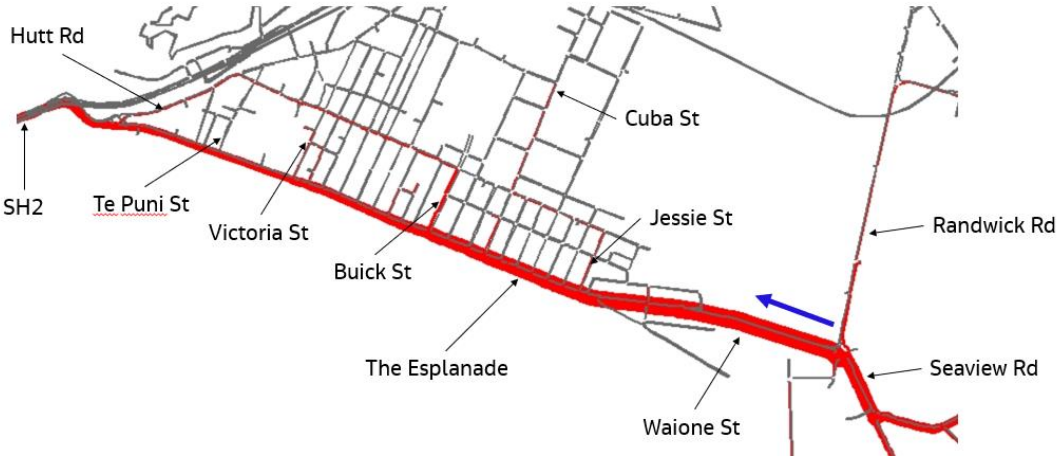


Figure 4 Select Link Analysis on Waione Bridge Westbound (AM Peak)

Furthermore,

presents the results of select link analysis in the form of a schematic drawing. It shows that:

- 75% trips using Waione Bridge come from Seaview Rd;
- almost 50% trips are using the local access road to short cut the Esplanade; and
- 10% HCVs stay on the Esplanade as expected.

The problems identified are listed below:

- Significant congestion causing vehicles rat running;
- Large number of parallel routes encourage rat running further; and
- Rat running is causing even more congestion on the Esplanade.

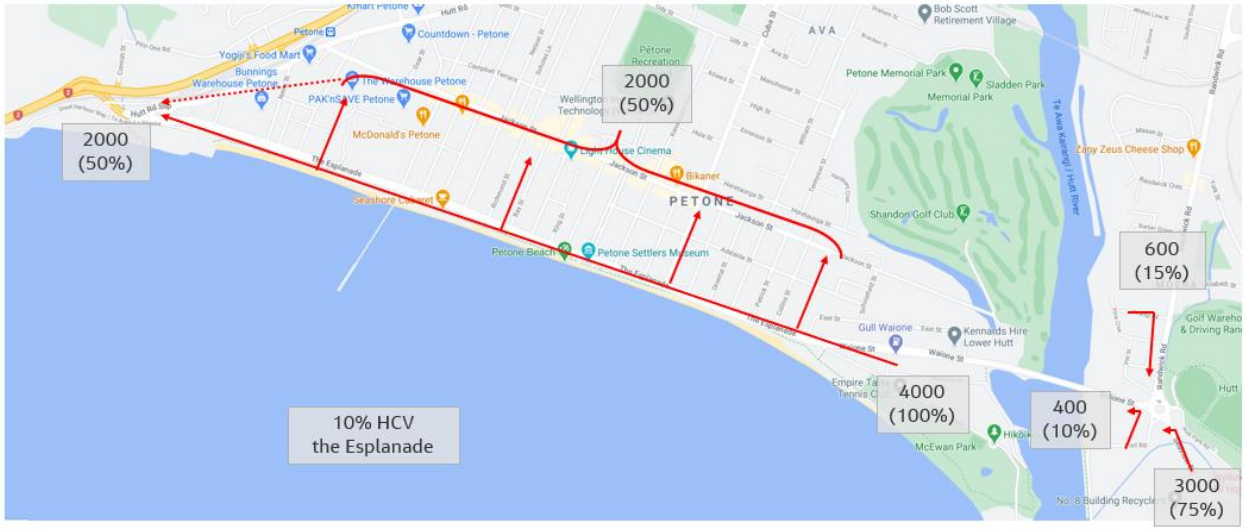


Figure 5 Results of Select Link Analysis – Schematic Presentation (AM Peak)

Select Link Analysis in the PM peak directions show a bit different pattern on the Waione Bridge Eastbound Traffic.

- There is hardly any “rat running” off the Esplanade;
- The main origin and destination are still between the SH2 and Seaview;

There is also a noticeable proportion of trips that come from Petone and Lower Hutt CBD.

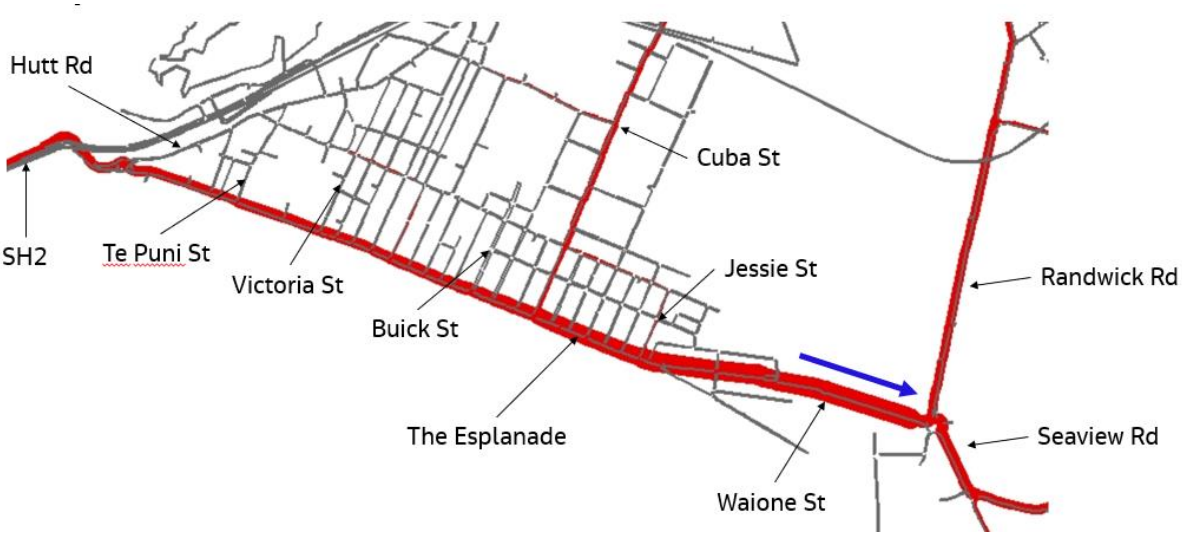


Figure 6 Select Link Analysis on Waione Bridge Westbound (PM Peak)

Figure 7 presents the results of select link analysis in the form of a schematic drawing. It shows that:

- Only 60% trips using Waione Bridge come from SH2 and 40% come from Petone and Lower Hutt;
- Only over half the trips go to Seaview, and the other half go towards Randwick Rd; and
- 10% HCVs stay on the Esplanade as expected.

The problems identified are listed below:

- PM peak has a significant different traffic pattern comparing to AM;
- There is hardly any “rat running” trips;

However, there is a high demand to use the Esplanade and Waione bridge to cross the Hutt River.

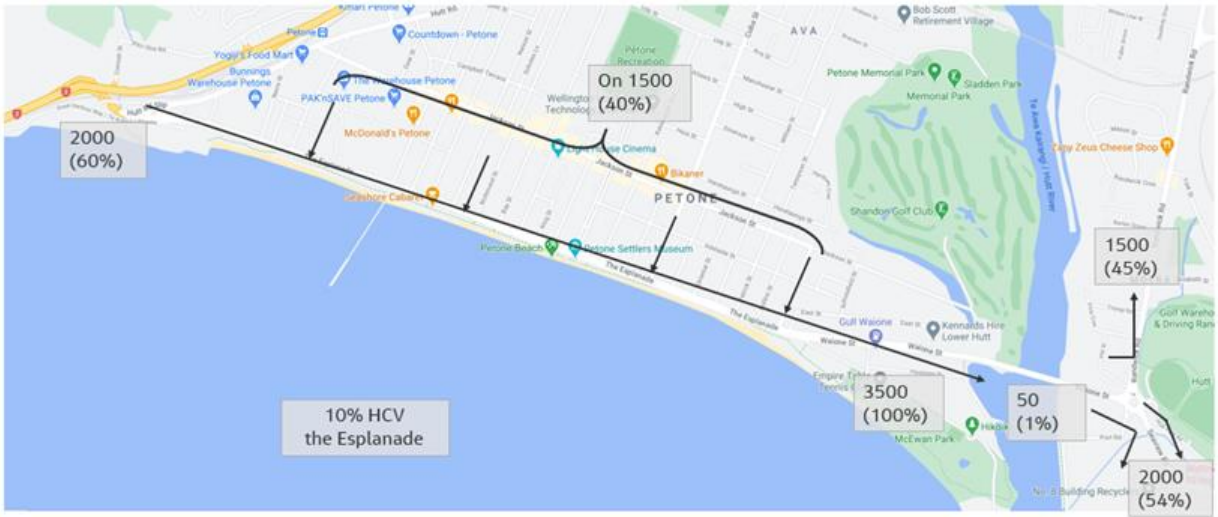


Figure 7 Results of Select Link Analysis – Schematic Presentation (PM Peak)

Figure 8 presents a traffic density plot that shows the traffic congestion during the AM peak. It can be seen that the drivers experience a significant congestion on The Esplanade westbound, Hutt Rd westbound and SH2 southbound. The key bottleneck is however outside the study area on SH2.

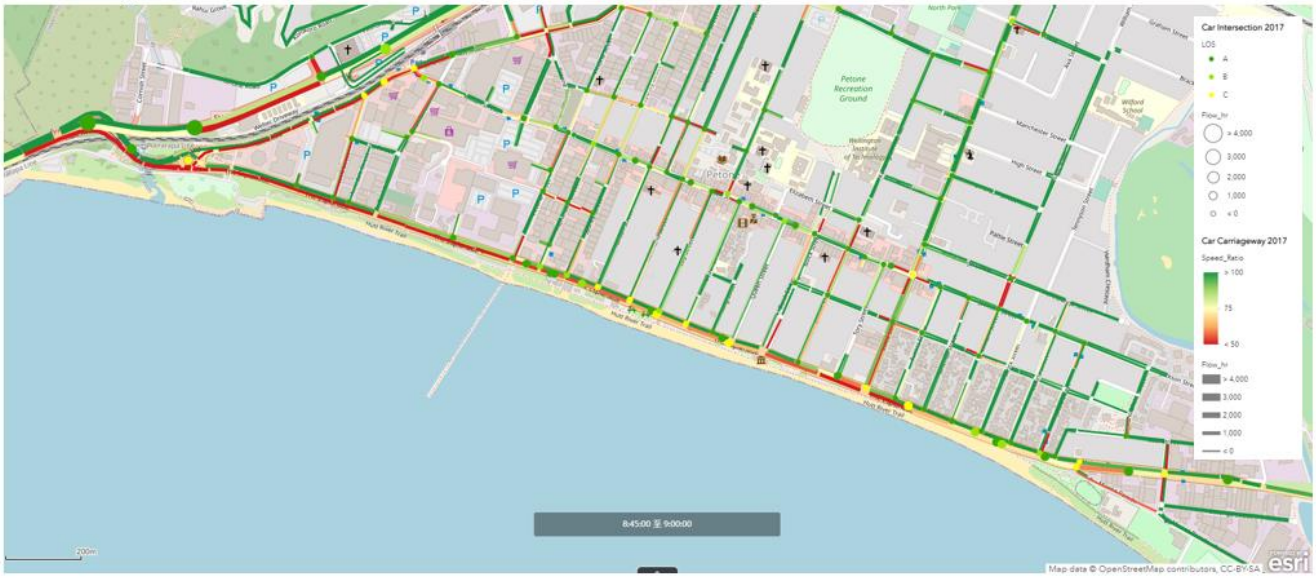


Figure 8 Traffic Density Plot of the Study Area (2017 AM Peak)

Similarly for the afternoon peak Figure 9 shows the traffic density plot that presents the traffic congestion during the PM peak. It can be seen that the Esplanade congestion is moderate; however, Jackson St users experience relatively severe congestion. This may be resulting from the high demand township trips.

Additionally, there is no clear evidence showing the Waione Bridge is reaching capacity in the PM peak, this could be because the upstream and downstream have more significant bottlenecks than the bridge itself.

Figure 9 Traffic Density Plot of the Study Area (2017 PM Peak)

Intersection Performances

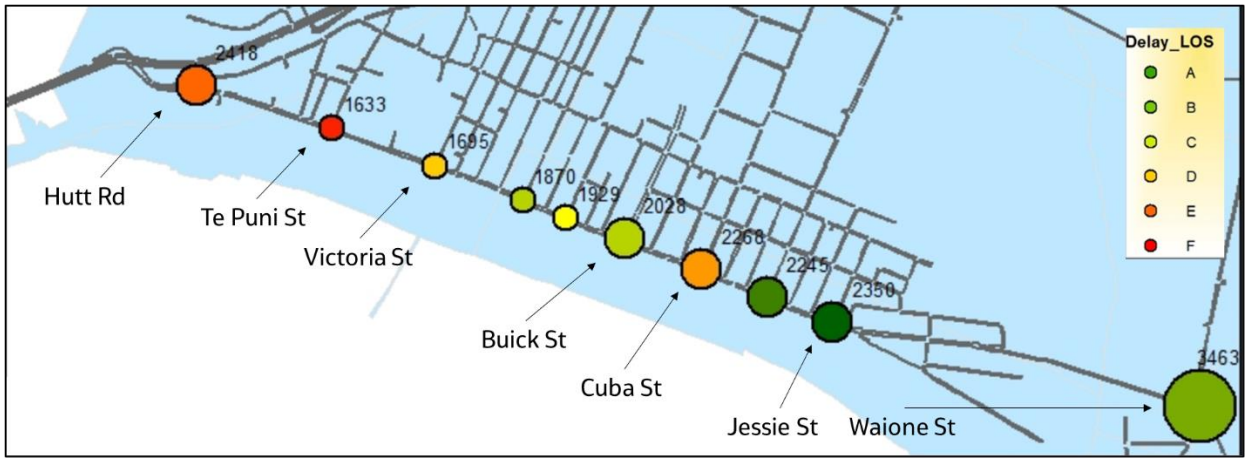


Figure 10 Intersection Performance (AM Peak)

The intersection performances were analysed using the Hutt City AIMSUN Model. The AM peak results showed that Hutt Rd, Te Puni St, Victoria St and Cuba St are the worst performing intersections in the morning peak.

Other problems identified are:

- A number of intersections are not performing at an acceptable level;
- The high demand or congestion intersections also indicated that these streets have higher “rat runner” demand.

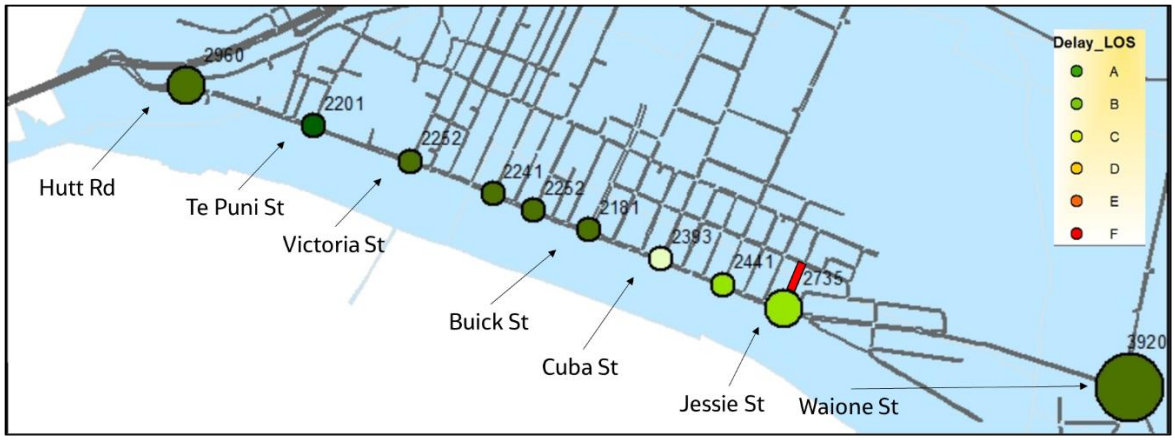


Figure 11 Intersection Performance (PM Peak)

Intersection performances in the PM peak are significantly better in comparison to the AM Peak. It is worth noting that Jessie St approach shows a LoS F which it is not at an acceptable level. The overall intersection does not pose an issue as the overall LoS is blended in by the high main street demand.

Hence the problem that is identified from the results is that the delays are not balanced on Jessie St intersection and it is critical to address this as it is an important access road especially it is on the PT corridor.

Vehicle Travel Times

Three alternative travel time routes are analyzed using the Hutt City AIMSUN Model:

- The Esplanade (HCV route)
- The Esplanade via Jessie St and Te Puni St
- The Esplanade via Cuba and Hutt Rd

Figure 12 Studied Travel Time Routes

In the AM Peak, the problems identified were:

- The Esplanade vehicle users are experiencing significant congestion as well as variability;
- It is faster to “rat run” through side road, which it is not ideal.

In the PM Peak, however, the travel times are much faster and stable on all three routes, hence, no issues are identified.

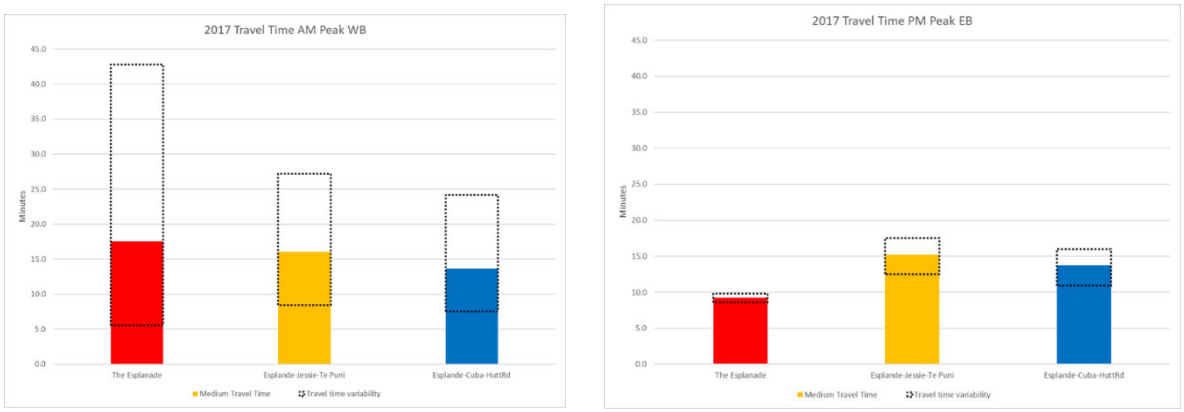


Figure 13 Median Travel Times and Travel Time Variabilities (AM Peak WB on the left and PM Peak EB on the right)

Vehicle Crashes

From the analysis of crash data from Waka Kotahi's Crash Analysis System (CAS), it was observed that there is a cluster of crashes on both Hutt road and on The Esplanade as shown in

Figure 14.

Crashes on The Esplanade are higher relative to those on the parallel Jackson Street. Additionally, crashes are seen to be more concentrated at intersections than at the mid-blocks between the intersections.

Figure 14 Crash Analysis Results (2010-2020)

Pedestrians

Pedestrian Crossings

There are various different types of pedestrian crossings along The Esplanade corridor and in the surrounding study area ranging from zebra crossings, signalised crossings, underpasses etc. as shown in Figure 15.

Figure 15 Types of Pedestrian Crossings in the Study Area

There are closely spaced pedestrian crossings along Jackson Street with more widely spaced pedestrian crossings along The Esplanade and Waione Street. At the western end of The Esplanade and Waione Street is the widest spacing of pedestrian crossings with 0.8-1km between crossings.

Pedestrian Delays

Give-way (Zebra) crossings have low pedestrian delay because pedestrians are given priority over vehicles.

The highest pedestrian delay along The Esplanade Corridor is experienced on the signalised Cuba Street intersection as the pedestrians had to wait longer times to their turn to cross, owing to the longer cycle times.

The sections of The Esplanade and Waione Street without crossing aids have longer average pedestrian delay because people need to wait for a gap in high volume traffic in order to cross.

Figure 16 Pedestrian Delays in the Study Area

Pedestrian Volumes

Pedestrian volumes in 2021 are lower than were observed in 2019. Summer months have higher pedestrian volumes, owing to the warmer and more settled weather. The period during the COVID-19 lockdown saw a sharp increase in walking as shown in Figure 17.

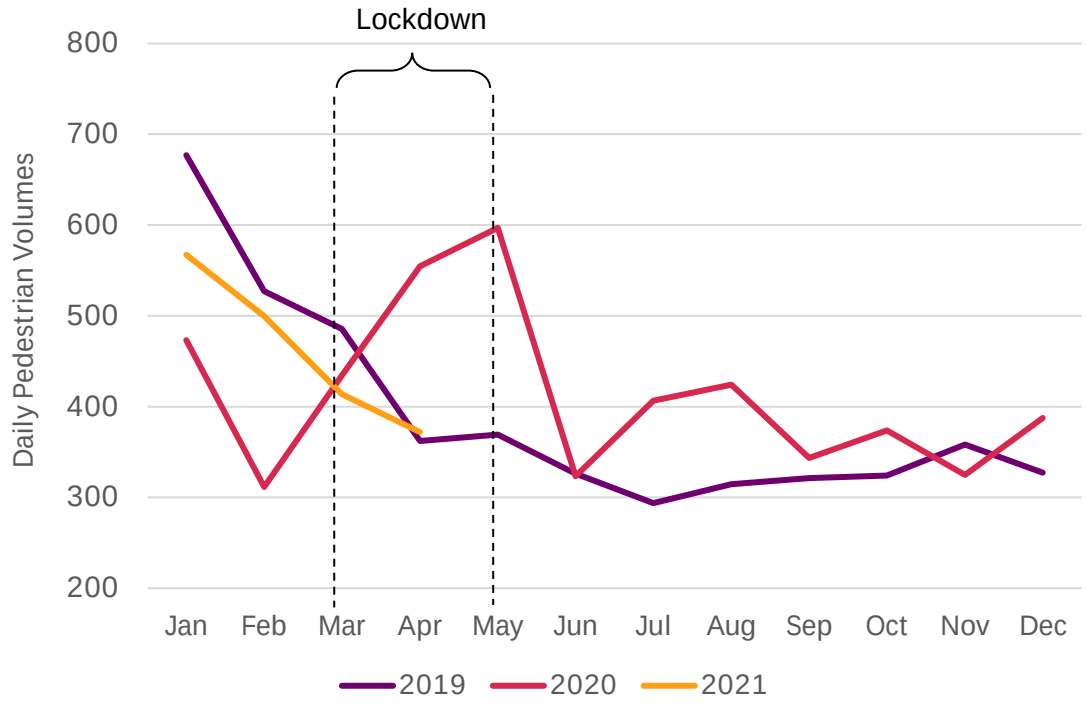


Figure 17 Pedestrian Volumes on Remutaka in 2019, 2020 and 2021

Pedestrian Crashes

A 10-year analysis of pedestrian crashes indicate few clusters in Jackson St. This result is sensible as Jackson St has high volumes of cars, retail stores, parking and bus stops.

There is also a small cluster in Esplanade around Richmond St, close to Petone beach, but there are not many crashes at the edges of Esplanade.

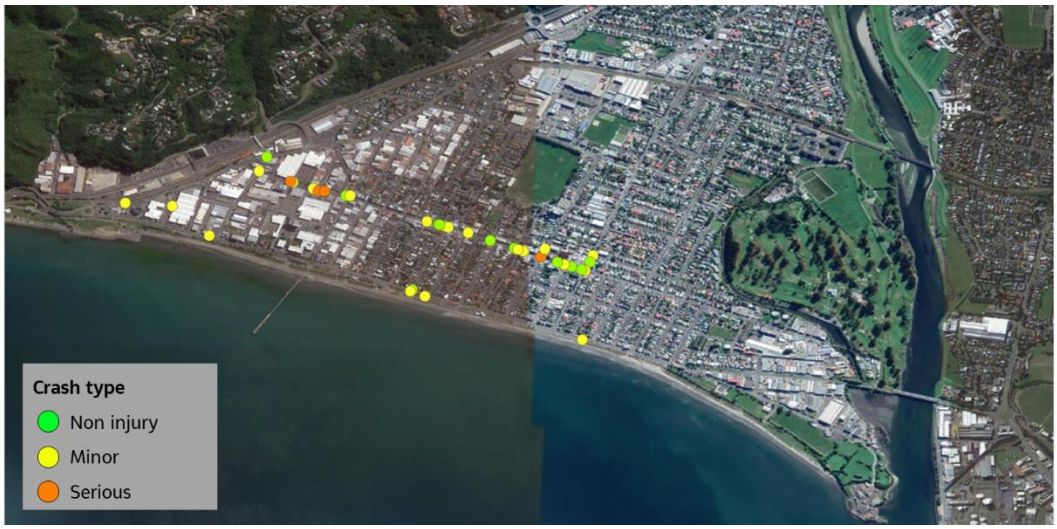


Figure 18 Crashes involving pedestrians (CAS 2010-2020)

Cyclists

Current and Future Cycling Infrastructure

Current cycleways network within the study area and surrounding areas consists of The Esplanade shared path, Hutt River Trails, Waione St cycle lanes and William Street low traffic route.

The 29km Hutt River Trail is an easy scenic walk and cycle path, running alongside the Hutt River from Petone to Upper Hutt. It also allows access to the river for swimming, fishing and kayaking. The Esplanade shared pathway is shared between pedestrians and cyclists and runs across from Hutt Road till Waione Street along the foreshore.

Multiple projects to further develop shared walking and cycling routes around the Hutt are under progress. Committed cycleways are Hutt Valley to Wellington shared path, The Beltway and Eastern Bays shared path (not shown on Figure 19).

Hutt Valley to Wellington shared path (Te Ara Tupua) is walking and cycling route between Wellington and Lower Hutt, enabling a step change in the number of people choosing to walk or ride between the two cities.

The Beltway Cycleway, when completed, will eventually run from Taita to Seaview along High Street and Oxford Terrace adjacent to the Hutt Rail Line and, over time, will provide additional links to form a connected Lower Hutt cycling network between residential areas, workplaces, the hospital, schools and recreation areas.

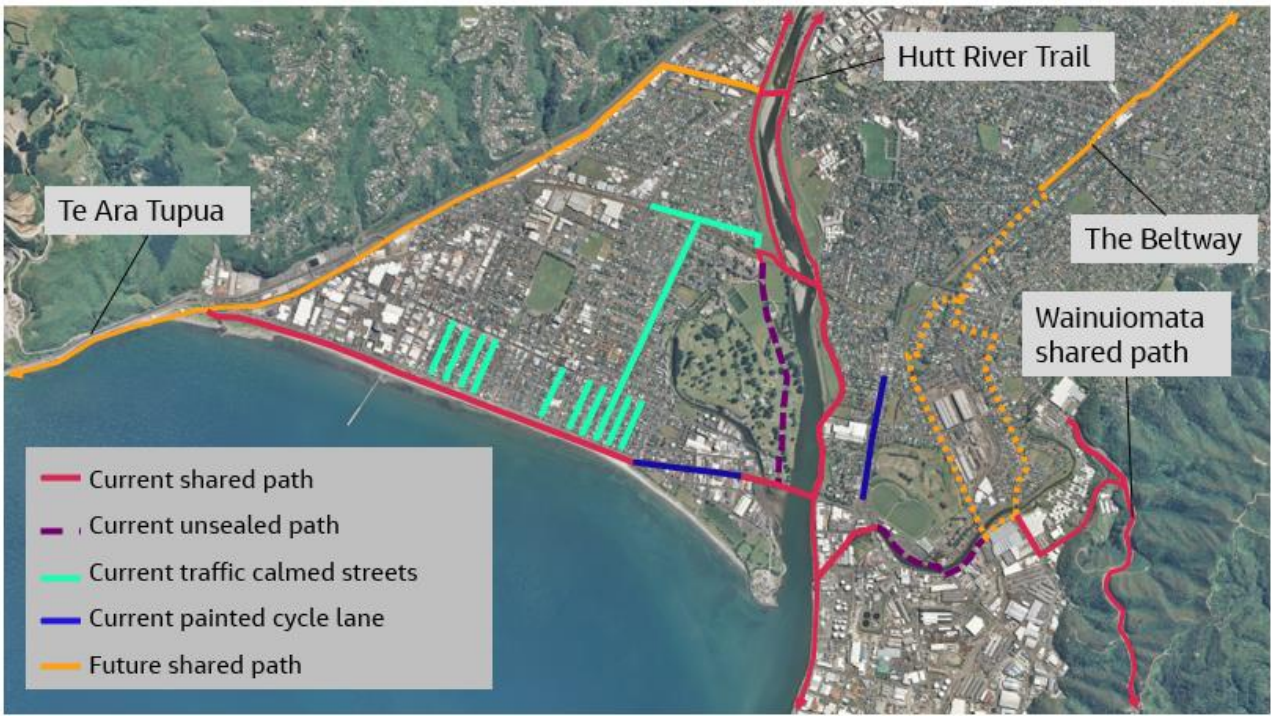


Figure 19 Current and Future Cycling Infrastructure

Level of Service for Cyclists

The width of The Esplanade shared path varies between approximately 2.5m to 3.8m which results in the cycling level of service varying from LoS C (fair) to E (bad). Main roads which do not have cycling infrastructure (Hutt Rd, Cuba St, Udy Street) have LoS D due to high traffic volumes and speeds. Minor Streets with traffic calming (William St, Nelson St, Bay St) have a LoS B.

Figure 20 Level of Service for cyclists

Current and Future Cycling Volumes

Summer and autumn months have significantly more cyclists in comparison with cold and wet months, as the weather is warmer and more settled. January to March 2021 have seen higher volumes of cyclists as compared to similar periods in 2019 and 2020. Additionally, similar to the trend observed for pedestrians, cycling was increased during the COVID-19 lockdown period.

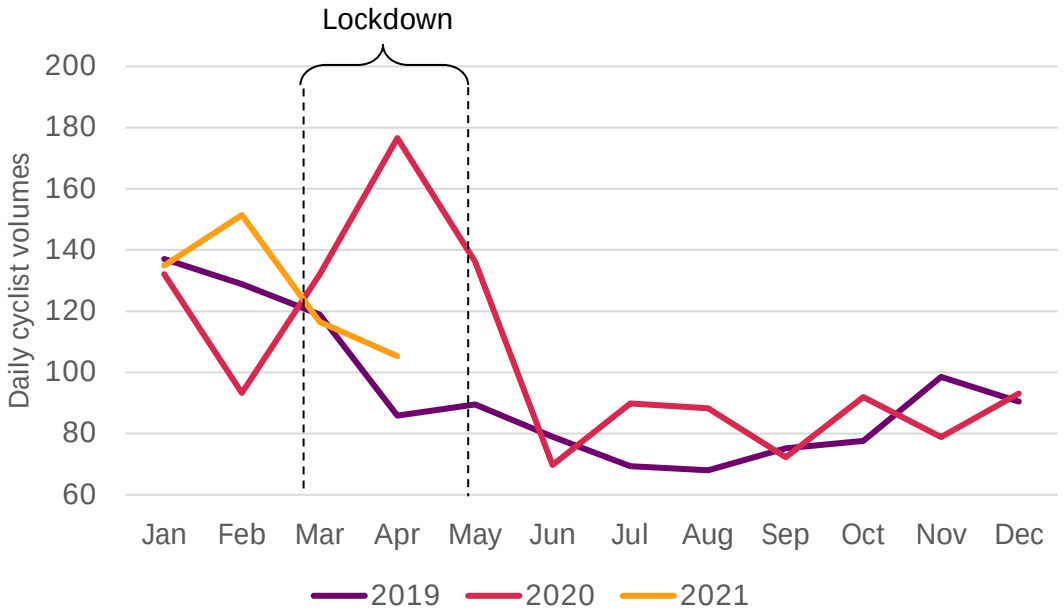


Figure 21 Cyclist Volumes on Remutaka in 2019, 2020 and 2021

Cyclist Crashes

As seen in Figure 22 few cycle crashes occurred on The Esplanade from 2010 to 2020 without any fatal crashes. Jackson Street also has few crashes. Most of the cycle crashes occurred at intersection with 78% at intersections and 22% at mid block.

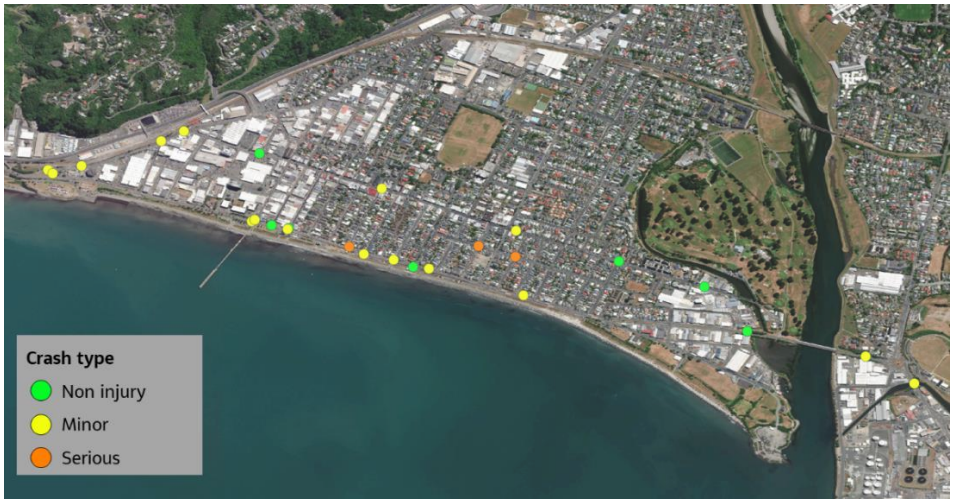


Figure 22 Crashes involving cyclists (CAS 2010-2020)

Public Transport

Bus Passenger Volumes

Bus data from Metlink was analysed to understand the current bus volumes in the study area. As shown in Figure 23, Jackson Street, Waione Street and Seaview Road have the highest bus passenger volumes in the study area ranging from 243-389 passengers during 7am-8am in the AM Peak . A section on The Esplanade from Fitzherbert St to Jessie St has the least bus passenger volumes, owing to very few buses using this route. However, The Esplanade corridor from Hutt Road to Fitzherbert St has good bus ridership with 208 people using the buses in the AM Peak from 7am-8am.

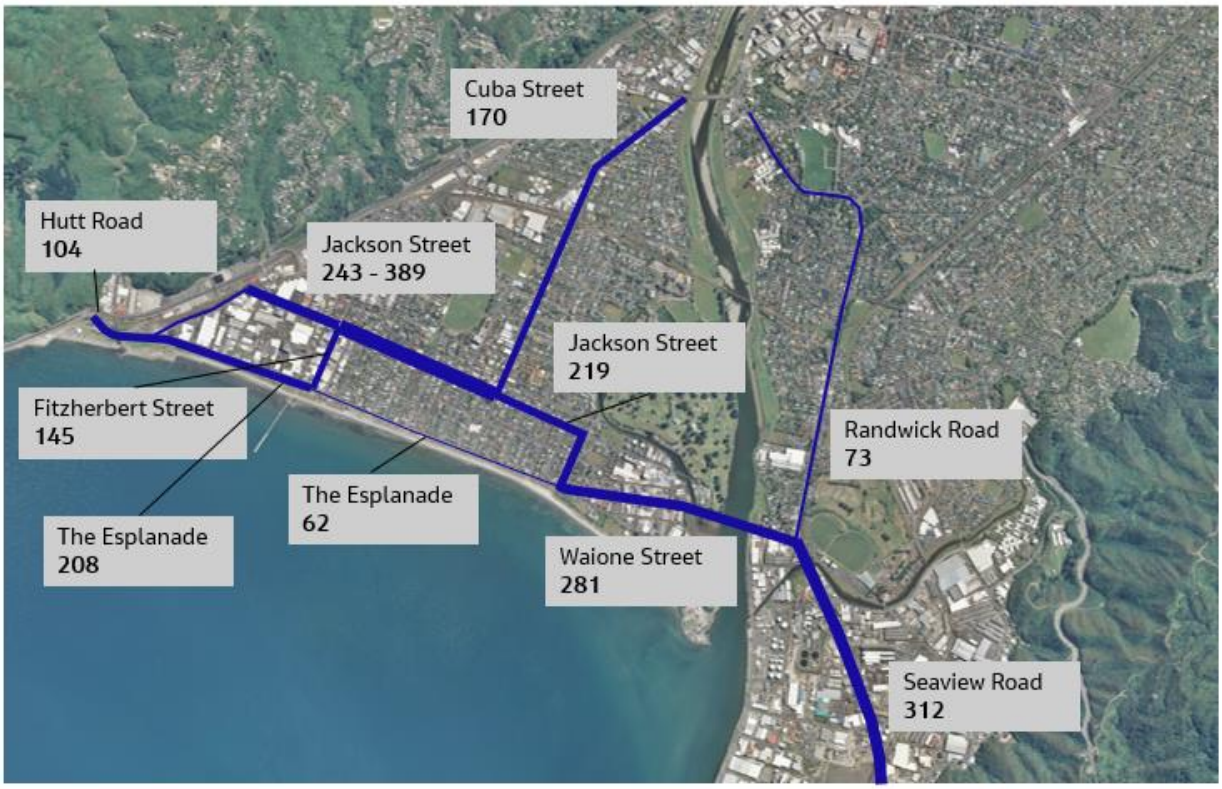


Figure 23 Bus Passenger Volumes

Public Transport Mode Share

Figure 24 shows public transport mode share (bus, rail and ferry) for the suburbs in Hutt City South. The PT mode share in Petone is comparatively high which 27 to 33% of residents using public transport as their main means of travel to work. The baseline public transport usage in Hutt City South is high with up to 1 in 3 commutes being made by public transport.

PT mode share goes down further away from the rail lines and frequency bus routes with Wainuiomata having a PT mode share of between 13 to 17%. This compares to Eastbourne with a PT mode share of 24 to 27%.

All the data is obtained from pre-COVID statistics.

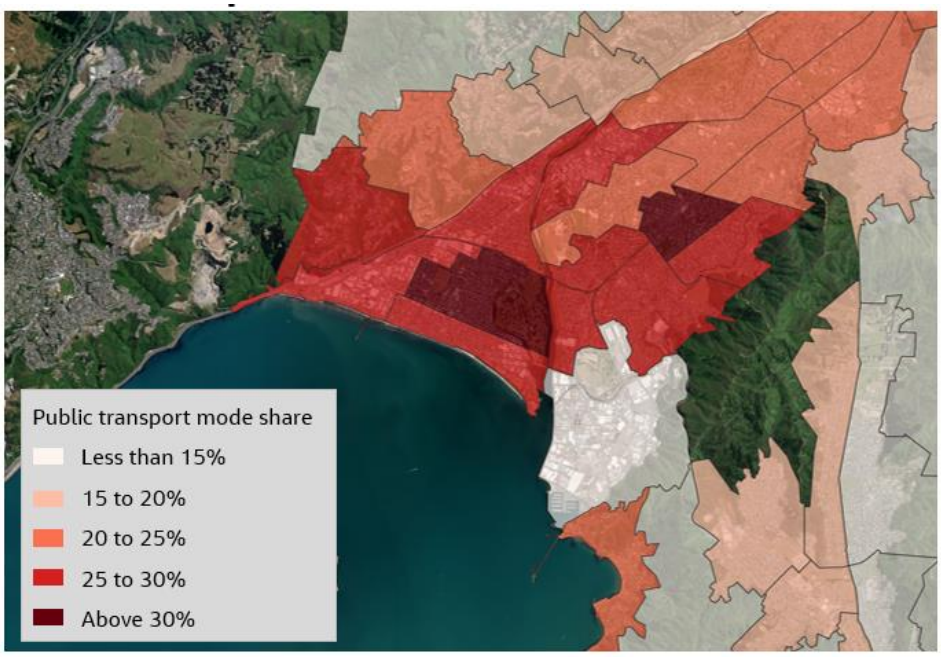


Figure 24 Travel to work by public transport (Census 2018)

Public Transport Delays

The existing bus-only-lane on The Esplanade corridor, which is effective 7am-9am on weekday mornings, gives buses priority on the road and makes some key bus routes using the corridor more reliable. Currently, the bus lane is performing reasonably well and saves about 4.5 minutes of travel time compared to the adjacent general traffic lane.

Figure 25 Existing Bus Priority Lane on The Esplanade

However, the traffic queue often extends beyond the bus lane, making it difficult for the buses to get into the bus lane and adds to the delay by another 1-1.5 minutes. This is currently not posing a major problem as there are not many buses which use this section and hence does not significantly affect the public transport users.

The Esplanade bus priority lane improves public transport journey times but does not serve the area with the highest bus volumes, i.e. Jackson Street.

Jackson Street is the most popular route for buses in the Hutt City. Owing to this, there is some public transport delay, but there is not much scope to provide bus priority as it is meant to be a more people and retail-focused street and hence the layout does not allow to do so.

Interestingly, Jessie street has a 2-min delay for buses turning out and there are quite a few buses making this turn. In the rest of the study area, delay for public transport services is most common in the morning peak in the western half of Petone. Additionally, Hutt Road does not have a bus priority and there is around 4.5min delay for buses along Hutt Road in the morning peak. However, this is again not a major issue since it is not the busiest part of the study area. Hutt Road is also congested during the weekend, based on the traffic data studied. Wainuiomata has low public transport ridership compared to other suburbs, due to not being served with high frequent buses. There are limited bus services between Wainuiomata and Gracefield/Petone. A similar issue is observed between Lower Hutt and Wellington.

To summarise, there is a delay for public transport users on The Esplanade, however, there would be diminishing returns for extending the existing bus lane further. Jackson Street, that has the most buses; does not currently have any bus priority. It is difficult to provide bus priority owing to the layout and its function as a busy retail and commercial area.

Hence, the best place to improve the public transport priority is at individual intersections such as Jessie Street. Providing targeted bus priority would have more scope than extending the existing bus lane or building a new one.

Appendix C. MCA scoring

Intervention Hierarchy	Options	GPS					Problem Statements			Project Specific			
		Inclusive Access	Economic Prosperity	Health and Safe People	Environmental Sustainability	Resilience and Security	Road Hierarchy	Active Mode Quality	PT Priority	Value for Money	Scheduling	Affordability	Achievability Risk
Demand Management	Public Transport Improvements	1	0	0	1	2	0	0	3	1	2	1	-2
	Protected Cycleway along The Esplanade	1	0	1	1	2	0	3	0	2	0	-1	0
	Park and Ride Improvements	0	0	0	1	1	1	0	1	1	1	1	-1
	Bus Queue Jump at Intersections	0	0	0	1	1	0	0	1	0	3	3	2
	Cycle Crossings to The Esplanade	1	0	1	-1	0	0	1	0	2	3	3	2
	Signalisation of Pedestrian Crossings	0	0	1	-1	0	0	2	0	3	3	3	2
	Big Box Retail Walking Network	1	0	0	-1	1	2	2	0	3	3	3	0
	Workplace Plans/ School Plans	0	0	0	0	0	0	0	0	2	3	3	3
	VMS Route Choice	0	0	0	1	0	1	0	0	3	3	3	1
	Lighting Shared Path	1	0	0	0	0	0	2	0	1	2	1	1
	Widening Shared Path	0	0	1	0	0	0	1	0	2	2	1	1

Intervention Hierarchy	Options	GPS					Problem Statements			Project Specific			
		Inclusive Access	Economic Prosperity	Health and Safe People	Environmental Sustainability	Resilience and Security	Road Hierarchy	Active Mode Quality	PT Priority	Value for Money	Scheduling	Affordability	Achievability Risk
Best Use of Existing Network	Flow Metering	0	2	-1	0	0	1	0	0	3	2	3	1
	Consolidation of Side Streets	0	1	1	2	0	3	2	0	1	3	3	2
	HOV lane	1	3	-1	0	0	1	-2	0	3	1	1	0
	Signalisation of Roundabouts	1	0	2	2	0	3	1	1	3	2	3	0
	Additional Stacking Space	0	0	1	0	0	0	0	0	3	3	3	2
	Signalisation of Give-Way Intersections	0	0	1	2	0	2	1	0	-1	3	2	2
New Infrastructure	Additional Bridge across Hutt River	1	1	0	-1	-1	0	2	0	-1	-1	-2	-3
	Additional traffic lanes	1	1	0	-1	-1	2	0	0	0	0	-2	0
	Dynamic lanes	1	1	-2	-1	-1	1	-2	0	1	1	-2	-2
	Bus Priority Lanes along The Esplanade	0	0	0	0	0	-2	0	1	-1	1	-2	0