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LGWM Programme

Short List Options Report

MRT and SHI team

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Glossary of Abbreviations

Items	Descriptions
BRT	Bus Rapid Transit
CBD	Central Business District
GWRC	Greater Wellington Regional Council
HOV	High Occupancy Vehicle
IBC	Indicative Business Case
ICP	Initial Corridor Plan
IP	Indicative Package
KPIs	Key Performance Indicators
LGWM	Let's Get Wellington Moving
LoS	Level of Service
LRT	Light Rail Transit
MCA	Multi-Criteria Analysis
Mode	Combination of vehicle type and how/ where that vehicle is operated
MRT	Mass Rapid Transit
PBC	Programme Business Case
Programme Partners	Greater Wellington Regional Council, Waka Kotahi NZ Transport Agency, Wellington City Council
RPI	Recommended Programme of Investment
SHI	Strategic Highway Improvements
SSBC	Single Stage Business Case
TDM	Travel Demand Management
TPG	The Property Group
TQHR	Thorndon Quay and Hutt Road
Waka Kotahi	Waka Kotahi NZ Transport Agency
WAU	Wellington Analytics Unit
WCC	Wellington City Council

Executive Summary

Overview

Let's Get Wellington Moving (LGWM) is working with the people of Wellington to develop a transport system that supports aspirations for how the city looks, feels, and functions.

A Programme Business Case¹ (PBC), released in June 2019, documented a package of network-wide transport programmes for Wellington. The PBC outlined a Recommended Programme of Investment (RPI) with a strong focus on people and the desire to enable improved quality of life.

After consideration of the RPI by Ministers, the Ministry of Transport and Treasury, an Indicative Package, consisting of the majority of the projects in the RPI, was developed. The final Indicative Package endorsed by the Government attempts to balance delivering a step change in transport in Wellington, while complementing transport investments for the wider Wellington region and remaining achievable within funding constraints.

A number of investigations into elements of the Indicative Package were subsequently progressed in 2020 including:

1. State Highway Improvements (SHI)
2. Mass Rapid Transit (MRT)
3. City Streets
4. Travel Demand Management
5. Golden Mile
6. Thorndon Quay Hutt Road
7. Central City Pedestrian Improvements.

These investigations have identified that some of the elements within the RPI and IP are not optimal in terms of delivering benefits. They also identified that the cost is likely to be greater than that envisaged by the PBC. Furthermore, since the completion of the PBC, other significant factors have arisen, each with potential to reshape the LGWM programme:

- Greater emphasis on climate change commitments
- Increased focus on addressing housing and development challenges for the city and the wider region. There was also an update to the population projections including increased levels of intensification of land use and residents as a result of improvements related to the LGWM investment
- COVID-19.

In light of these factors, programme partners reviewed and updated the programme objectives. As a result of the updated objectives, the changes in the individual elements and the new external factors, the programme team decided to check that the Indicative Package

¹ <https://lgwm.nz/assets/Documents/Programme-Business-Case/LGWM-PBC-Report-21-June-2019-Draft.pdf>

still represented the best way forward for Wellington. This was to be done by testing the Indicative Package against a number of alternative programmes.

This assessment of alternative programmes was undertaken by the MRT and SHI team for the purpose of identifying the technically best-performing programme that can be used as a starting point for the further investigations of the MRT and SHI options. This would enable options to be consistent with the long term transport network for Wellington.

Programme Long List Option Development

The MRT and SHI investigations formed the starting point for the development of the LGWM programme long list as they are the largest components and have the most variability in terms of the options within the packages. Each programme long list option has also been supplemented by elements from the wider LGWM packages. The long list of options was developed to:

- Compare and assess any new options against the original PBC recommendations
- Include the outcomes of the package investigations in 2020
- Consider the possibility of a long tunnel from the Urban Motorway to Kilbirnie as an alternative to upgrading the existing SH1 through the central city
- Assess the benefits of an option which invests to the north rather than the east
- Consider an option with no improvements to private vehicle capacity, in order to respond to climate change outcomes
- Evaluate lower cost options, should funding become constrained.

The options considered included the Recommended Programme of Investment (RPI), Indicative Package (IP), updated RPI and IP options based on dual MRT routes and greater focus on active modes (RPI V1 and RPI V1A), and other alternative versions of the RPI (RPI V2, RPI V1B, RPI V3 and RPI V3A).

Several assumptions were applied to limit the variations of options and focus on the key differentiating factors noted above that fulfilled the Programme objectives. At the request of LGWM, options were also considered with and without congestion charging to understand the impact this has on the performance of each long list option.

The programme long list to short list assessment is outlined in Figure 1.

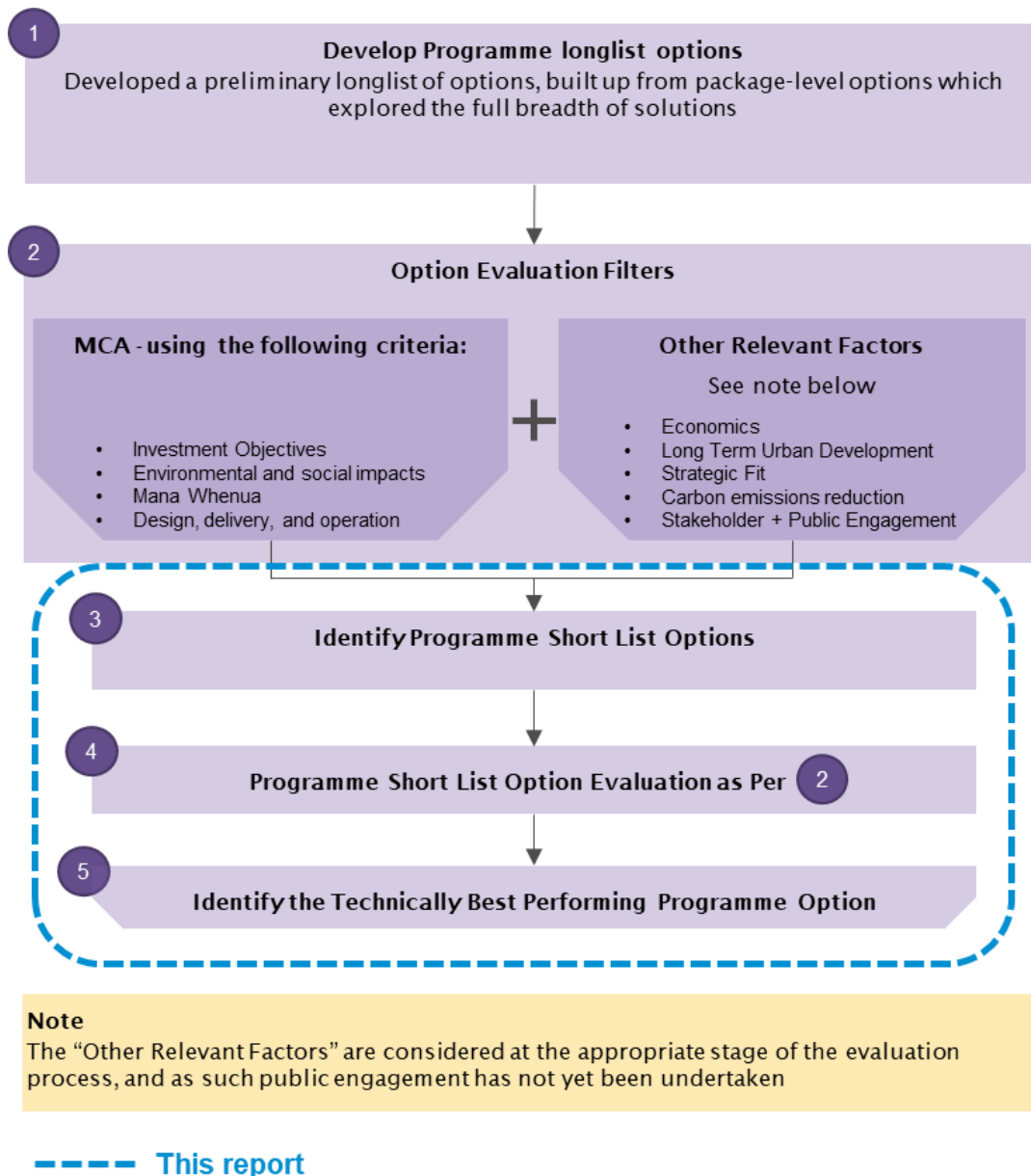


Figure 1: Programme long list to short list process

Programme Long List Assessment

Technical specialists scored each of the 16 long list programme options against the LGWM programme objectives, environmental and social impacts and design, delivery, and operational criterion. This was undertaken using the using Multi-Criteria Analysis (MCA) process outlined in the MRT and SHI Multi Criteria Analysis Framework Report² and based on their understanding of the options and likely impacts.

The technical specialists worked alongside Partner representatives to determine a score for each of the programme options. Two workshops were held to discuss and moderate the scores and to determine the programme short list for further detailed investigation.


























² LGWM, 2021

Once the programme long list MCA scores were agreed, different investment objective, environmental and social impacts, and design, delivery and operational weighting scenarios were applied to the raw scores. Based on the MCA scoring and sensitivity test with weighting scenarios, the workshop participants agreed to not progress with the following options:

- The RPI and the IP. The original PBC options did not perform as well as the other long list programme options. In particular they scored lower against the programme objectives, and the single MRT route was shown to have less benefits, when compared to a dual route system through the 2020 MRT investigations.
- RPI V1B. This option did not score as well as RPI V1A, when assessed against the programme objectives due to the inclusion of Te Aro and Terrace Tunnel duplication with no new tunnel at Mt Victoria, and does not support MRT to the east. Therefore, this programme option was discounted from further consideration.

Programme Short List Options

In total, five programme options were short listed for further technical analysis and consideration as shown in Figure 2. The short list programme options were selected as they best align to the programme objectives and MCA long list outcomes.

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI V1	Island Bay 	Miramar 		 	 	
RPI V1A	Island Bay 	Miramar 		 		
RPI V2	Island Bay 	Miramar 				
RPI V3	Island Bay 	Miramar 				
RPI V3A	Island Bay 	Miramar 				

Key:










-  - Mass Rapid Transit
-  - Enhanced bus services
-  - Grade separation
-  - At grade improvements
-  - General traffic tunnel
-  - Shared MRT/general traffic tunnel
-  - Active modes tunnel
-  - Covered general traffic trench with active modes above
-  - General traffic tunnel

Figure 2: LGWM programme short list

Programme Short List Assessment

The programme short list options were assessed against the full spectrum of the LGWM programme objectives, environmental and social impacts, and design, delivery, and operation criteria. Technical specialists worked alongside Partner representatives for each criterion and scored each of the five short list programme options, based on their understanding of the options and likely impacts.

Emerging Technically Best Performing Option³

The MCA assessments indicated that programme short list option RPI V1A aligns more favourably with the LGWM programme objectives compared to the other programme short list options RPI V1, V2, V3 and V3A. Further work will be undertaken through the combined package option development and assessment process to identify the potential MRT extent, SH improvements and active mode connections. The combined package IBC will seek to identify the more detailed solutions and mitigations for any adverse effects. Following the package assessment and staging assessment, further refinements to the technically best performing option (option V1A) may be made.

The application of congestion charging was shown to not materially impact the ranking of the programme options. The congestion charge when applied to all options was deemed to have a high positive impact and should be considered in any implementation.

It is noted that the MCA assessment is not intended to address wider considerations such as staging, costs or affordability, or stakeholder and public feedback. These are important considerations in determining the preferred programme to fund but are outside the purpose of this current assessment but will need to be undertaken before a preferred programme is adopted.

In parallel, it is recommended that the MRT and SHI team progress with optioneering and evaluation processes for the combined package options that align with the technically best-performing programme option RPI V1A.

However, as the preferred programme has not been confirmed it will be important for the MRT and SHI team to also consider the other programme options. To this end it is recommended that the MRT and SHI package associated with RPI V2 is also considered as a comparator in the package assessment. This is an important comparator as it offers an alternative longer-term set of outcomes with significantly reduced social and environmental effects which may also be desirable, and important to consider in an RMA sense⁴.

RPI V3 and V3A can also be included as they are subsets of RPI V1A. These can be assessed as part of the staging assessment of the package options. These are particularly important to consider from a cost and affordability perspective.

Next Steps

The technically best-performing programme (RPI V1A) was confirmed by the LGWM Programme and the project team have since progressed with the long-list assessment for the various RPI V1A package elements as agreed with TAG at the workshop on 3 June 2021. RPI V2 was retained as an alternative scored option given the reduced social and environmental effects it offers, and RPI V3 and V3A will be considered through the staging analysis as interim options (or more affordable long-term options).

³ The Technically Best Performing Option is based on MCA scoring by technical specialists. It is recognised that broader factors such as affordability, staging and consultation feedback will also be taken into consideration before the preferred option can be confirmed.

⁴ Fourth Schedule (Clause 6 Assessment of Effects) of the Resource Management Act 1991 requires that consideration is given to alternatives (location, sites, route or methods) in relation to any significant adverse effect on the environment and where the requiring authority does not have an interest in the land sufficient for undertaking the work.

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1 Introduction

1.1 Overview

Let's Get Wellington Moving (LGWM) is working with the people of Wellington to develop a transport system that supports aspirations for how the city looks, feels, and functions. The LGWM vision for Wellington is a great harbour city, accessible to all, with attractive places, shared streets, and efficient local and regional journeys. To realise the vision the transport system needs to move more people with fewer vehicles.

A Programme Business Case⁵ (PBC), released in June 2019, documented a package of network-wide transport programmes for Wellington. The PBC outlined a Recommended Programme of Investment (RPI) with a strong focus on people and the desire to enable improved quality of life.

After consideration of the RPI by Ministers, the Ministry of Transport and Treasury, an Indicative Package, consisting of the majority of the projects in the RPI, was developed. The final Indicative Package endorsed by the Government attempts to balance delivering a step change in transport in Wellington, while complementing transport investments for the wider Wellington region and remaining achievable within funding constraints. A number of investigations into elements of the Indicative Package were subsequently progressed in 2020 including:

1. State Highway Improvements (SHI)
2. Mass Rapid Transit (MRT)
3. City Streets
4. Travel Demand Management
5. Golden Mile
6. Thorndon Quay Hutt Road
7. Central City Pedestrian Improvements.

These investigations have identified that some of the elements within the RPI and IP are not optimal in terms of delivering benefits. They also identified that the cost is likely to be greater than that envisaged by the PBC. Furthermore, since the completion of the PBC, other significant factors have arisen, each with potential to reshape the LGWM programme:

- Greater emphasis on climate change commitments
- Increased focus on addressing housing and development challenges for the city and the wider region. There was also an update to the population projections including increased levels of intensification of land use and residents as a result of improvements related to the LGWM investment
- COVID-19.

In light of these factors, programme partners reviewed and updated the programme objectives. As a result of the updated objectives, the changes in the individual elements and the new external factors, the programme team decided to check that the Indicative Package still represented the best way forward for

⁵ <https://lgwm.nz/assets/Documents/Programme-Business-Case/LGWM-PBC-Report-21-June-2019-Draft.pdf>

Wellington. This was to be done by testing the Indicative Package against a number of alternative programmes.

1.2 Purpose

The purpose of this report is to identify and review the programme short list options to identify a technically best-performing programme as assessed against the LGWM objectives and effects.

This assessment of alternative programmes was undertaken by the MRT and SHI team for the purpose of identifying the best-performing programme that can be used as a starting point for the further investigations of the MRT and SHI options. For the purposes of this report, all other LGWM workstreams are assumed to be the same across all options. This would enable consistency between options and the long term transport network for Wellington.

The remainder of this report is structured as follows:

- **Section two** provides a summary of work completed to date
- **Section three** describes the programme short list development and assessment
- **Section four** details the evaluation methodology applied to assess the programme short list
- **Section five** presents the programme short list MCA assessment and sensitivity tests on weighting
- **Section six** outlines the technically best-performing programme
- **Section seven** outlines the next steps.

2 Work Completed to Date

A summary of the work completed to date, including investigations into each element of the Indicative Package are summarised in this section.

2.1 Programme Business Case

The LGWM PBC was approved in June 2019 and identifies a package of network wide transport programmes for Wellington. This includes the RPI, which documents several improvements including:

- Better public transport with high-capacity MRT so people have more travel choices, and buses and trains are more reliable and attractive. MRT from the railway station to the airport via a new waterfront spine, Taranaki Street, the hospital, Newtown, Kilbirnie, and Miramar
- Multimodal State Highway improvements to relocate cars out of the central city and enable better public transport, walking and cycling, and so people can get to key destinations, such as the hospital and airport, more reliably⁶:
 - Basin Reserve improvements
 - Extra Mt Victoria tunnel and widening Ruahine Street/Wellington Road
 - Reconfiguring State Highway 1 (SH1) into a tunnel under a new city park in Te Aro*
 - Extra Terrace Tunnel*

⁶ * Not included in the indicative package agreed by Cabinet

- SH1 Southbound widening between Ngauranga and Aotea Quay*

Other integrated interventions that made up the RPI were:

- High-quality walking and cycling so that streets are safer and better places for people
- Urban development and land-use changes integrated with transport, so people have better travel options where they live and work
- Smarter transport network so people and goods make better use of the transport system without more cars.

As noted in the Overview, consideration of funding availability and affordability resulted in the development of the Indicative Package (IP), which includes the majority of the projects in the RPI. The IP was endorsed and supported by central and local government partners and is outlined in Table 1.

Table 1: LGWM Indicative Package⁷

Component	Description	Objectives
A walkable city	Accessibility and amenity improvements, setting safer speeds for vehicles, and walking improvements	A city that is safe and attractive to walk around
Connected cycleways	Cycleways on Featherston Street, Thorndon Quay, Courtenay Place, Dixon Street, Taranaki Street, Willis Street, Victoria Street, Kent/Cambridge terraces and Bowen Street	A connected and safe city centre cycleway network integrated with the wider cycleway network
Public transport (city and north)	Dual public transport spine through the city centre on the Golden Mile and waterfront quays, rail network improvements and bus priority on Thorndon Quay and Hutt Road	A reliable public transport system that enables Wellington to grow and encourages public transport mode shift, better public transport choices to the north and enables a 30 percent increase in rail peak patronage
Smarter transport network	Full integrated ticketing, transition to integrated transport network operating systems, travel demand management measures including Mobility as a Service, parking policy improvements and education and engagement	A well-managed transport system that makes best use of infrastructure and helps smooth transition through implementation of the Indicative Package
Mass Rapid Transit	Provide MRT as part of the wider public transport network from the Wellington Railway Station to Newtown, and Newtown to the airport	Improves travel choice through the city with an attractive public transport option to the hospital and airport and creates an opportunity to share a more compact and sustainable Wellington City

⁷ MoT, 2020. Let's Get Wellington Moving. Retrieved 25 May 2020, from <https://www.transport.govt.nz/land/lgwm/>

Component	Description	Objectives
Unblocking the Basin Reserve	Package of minor at-grade changes to improve reliable access for all modes, Basin Reserve grade separation between north-south movements, east-west movements, and any rapid-transit corridors	Reduces conflict between different movements and modes creating more reliable access for all modes
Extra Mt Victoria tunnel and widening of Ruahine Street	Extra Mt Victoria tunnel and widening of Ruahine Street / Wellington Road to improve access for buses and dedicated walking and cycling facilities	Improves access, reliability and travel choice from the east for all modes, relocates through traffic from Evans Bay route and Constable Street, onto state highway, and enables network to function while rapid transit constructed (Newtown)

One of the key differences between the Indicative Package and the RPI is that the Indicative Package does not include substantive improvements on SH1 between Ngauranga Gorge and the Basin Reserve. The RPI included additional capacity at the Terrace Tunnel and along Karo Drive with the objective of removing traffic from the central city and Waterfront to allow road space to be reallocated to public transport and active modes.

Each investigation area of the Indicative Package is discussed in the following sections. Figure 3 provides an overview of the indicative process undertaken to determine a short list for each of the six areas of investigation.

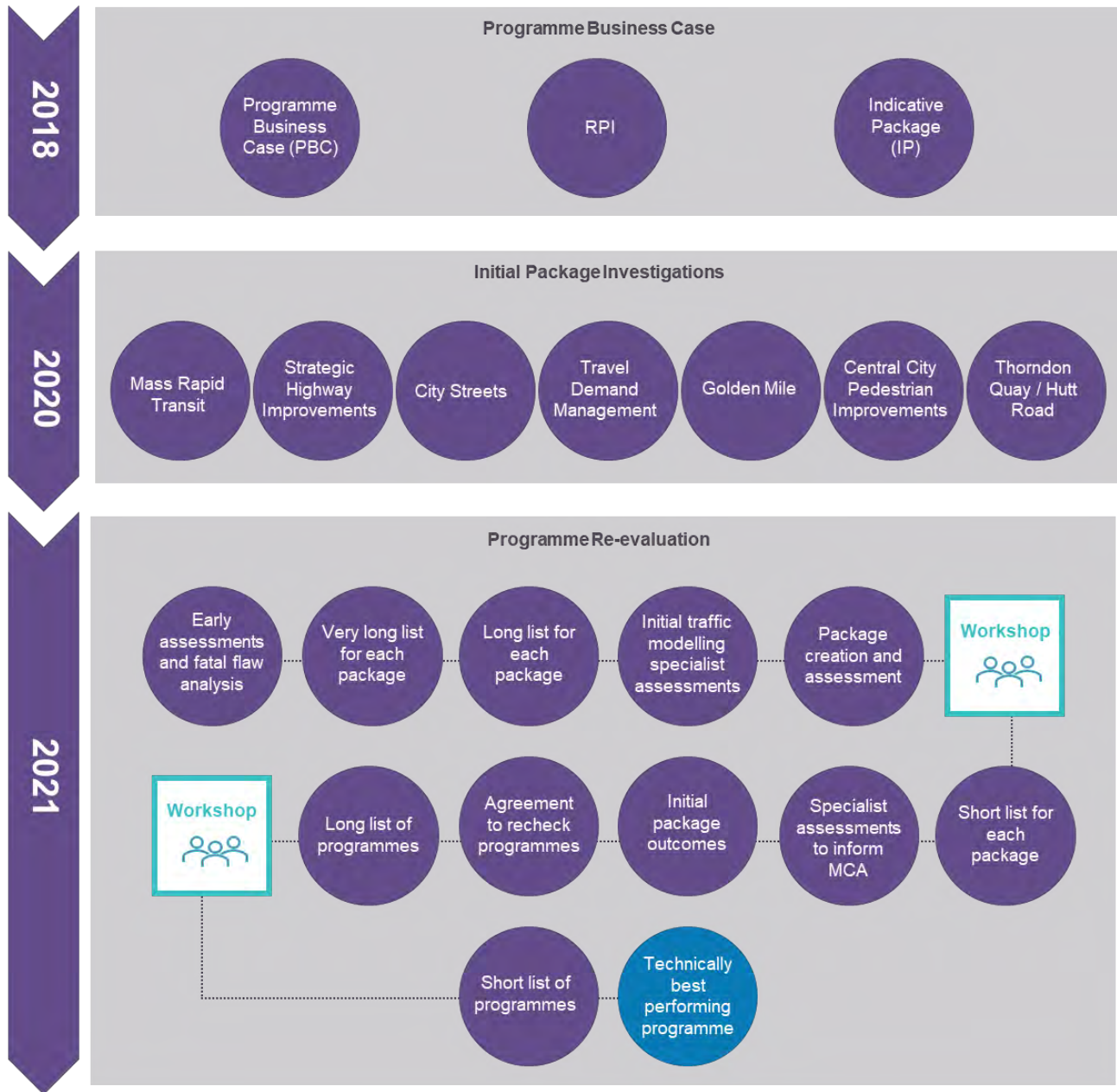


Figure 3: Indicative programme option development and assessment process

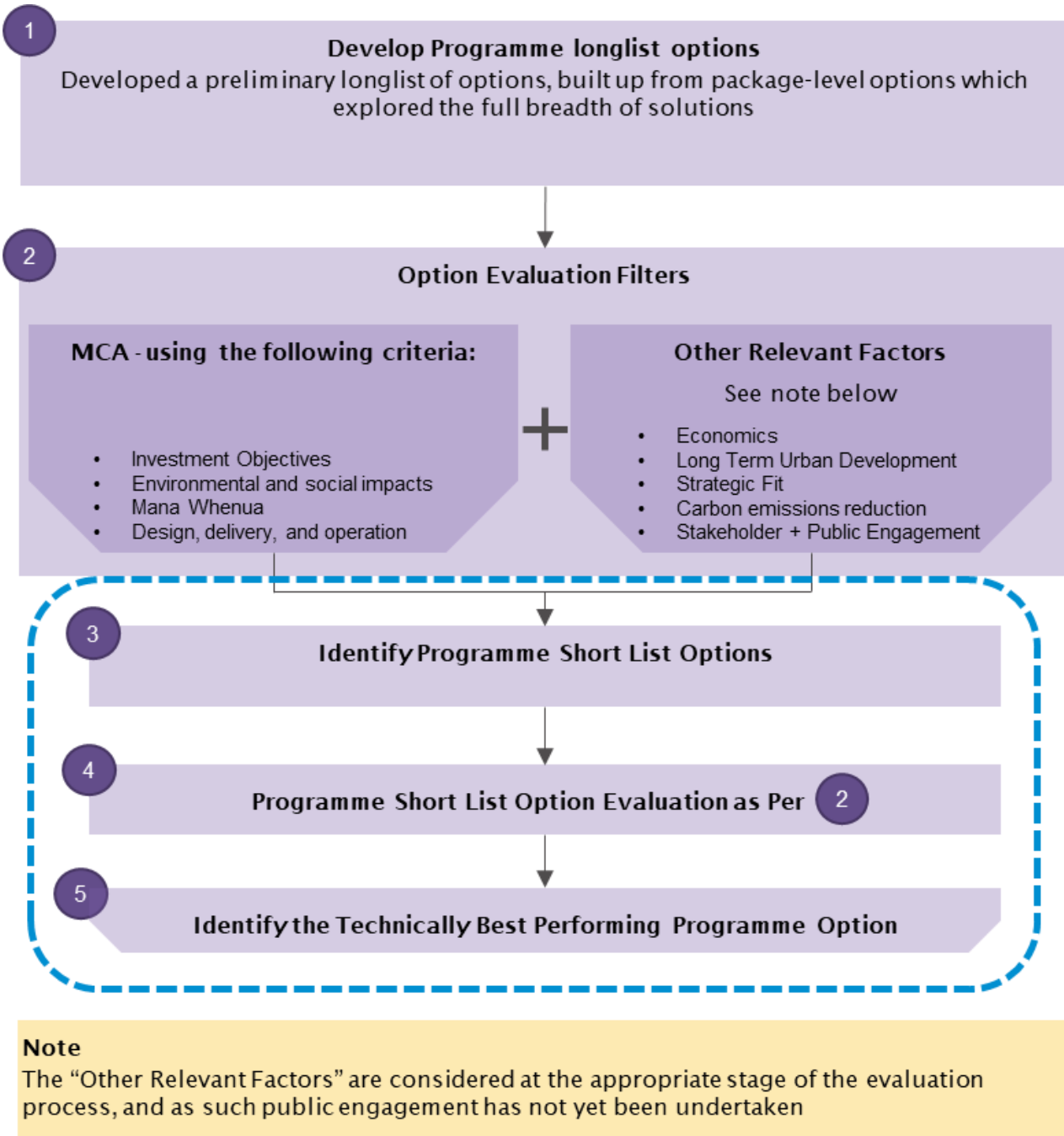
2.2 Package Investigations in 2020

A summary of the investigations progressed in 2020 is provided in the Programme Long List Report, which is included in the appendix. This includes:

1. State Highway Improvements (SHI)
2. Mass Rapid Transit (MRT)
3. City Streets
4. Travel Demand Management
5. Golden Mile
6. Thorndon Quay Hutt Road.

2.3 Programme Long List Option Development

The programme long list to short list process is shown in Figure 4, with the long list option development and assessment steps outlined in the top two boxes (boxes 1 and 2). The short list programme option development and assessment as outlined in boxes 3, 4 and 5 form the remainder of this report.



----- This report

Figure 4: Programme long list to short list process

The MRT and SHI investigations formed the starting point for the development of the LGWM programme long list as they are the largest components and have the most variability in terms of the remaining options. Each programme long list option was supplemented by elements from the wider LGWM packages, and this was generally the same across all programmes. The long list of LGWM programme options was developed to:

- Compare and assess any new options against the original PBC recommendations
- Include the outcomes of the package investigations in 2020
- Consider the possibility of a long tunnel from the Urban Motorway to Kilbirnie as an alternative to upgrading the existing SH1 through the central city
- Assess the benefits of an option which invests to the north rather than the east
- Consider an option with no improvements to private vehicle capacity, in order to respond to climate change outcomes
- Evaluate lower cost options, should funding become constrained.

As a result, the long list of programme options included the Recommended Programme of Investment (RPI), Indicative Package (IP), updated RPI and IP options based on dual MRT routes and greater focus on active modes (RPI V1 and RPI V1A), and other alternative versions of the RPI (RPI V2, RPI V1B, RPI V3 and RPI V3A). Several assumptions were applied to limit the variations within options and to consider the key factors noted above. Options were also considered both with and without congestion charging.

LGWM Programme Long List

All options to be considered with and without congestion charging, shows key differences only
Items in blue have not been developed to same level of detail under IBC process to date

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI	Airport via Newtown					
IP	Airport via Newtown					
RPI V1	Island Bay	Miramar				
RPI V1A	Island Bay	Miramar				
RPI V1B	Island Bay	Miramar				
RPI V2	Island Bay	Miramar				
RPI V3	Island Bay	Miramar				
RPI V3A	Island Bay	Miramar				

Key:	- Enhanced bus services	- At grade improvements	- Shared MRT/general traffic tunnel	- Active modes tunnel	- Covered general traffic trench with active modes above
- Mass Rapid Transit	- Grade separation	- General traffic tunnel			- General traffic tunnel

Figure 5: LGWM programme long list

The key differences between the programmes include:

- RPI: As per the PBC with **MRT to the airport via Newtown**, a **grade separation** solution at the Basin Reserve, new **general traffic tunnel at Mt Victoria and upgraded for active travel**, **new MRT tunnel** between Newtown and Kilbirnie, and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel
- IP: As per the PBC with **MRT to the airport via Newtown**, a **grade separation** solution at the Basin Reserve, new **general traffic tunnel at Mt Victoria and upgraded for active travel**, **new MRT tunnel** between Newtown and Kilbirnie
- RPI V1: **MRT to the south and east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel** and a new **tunnel for general traffic and MRT at Mt Victoria** and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel
- RPI V1A: **MRT to the south and east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel** and a new **tunnel for general traffic and MRT at Mt Victoria**
- RPI V1B: **MRT route to the south, enhanced bus services to the east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel at Mt Victoria**, and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel
- RPI V2: **MRT route to the south, enhanced bus services to the east**, an **at grade** solution at the Basin Reserve, with an **active mode tunnel at Mt Victoria**, and a **Long Tunnel** bypassing the city
- RPI V3: **MRT route to the south, enhanced bus services to the east**, an **at grade** solution at the Basin Reserve, and an **active mode tunnel at Mt Victoria**
- RPI V3A: **MRT route to the south, enhanced bus services to the east**, a **grade separation** solution at the Basin Reserve and an **active mode tunnel at Mt Victoria**.

2.4 Programme Long List Assessment

As part of a Multi-Criteria Analysis (MCA) process, technical specialists investigated each of the eight long list programme options against the LGWM programme objectives, environmental and social impacts and design, delivery, and operational criterion) based on their understanding of the options and likely impacts.

The technical specialists worked alongside Partner representatives to determine a score for each of the programme options using agreed methodologies (outlined in the respective specialist assessment reports provided in the appendices). Two workshops were then held with the specialists and Partners to discuss and moderate the scores and to determine the programme short list.

Once the programme long list MCA scores were agreed, different investment objective, environmental and social impacts, and design, delivery and operational weighting scenarios were applied to the raw scores. Based on the raw scores and sensitivity tests with weighting scenarios the workshop participants agreed to not progress with the following options:




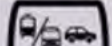




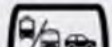













- The RPI and the IP. The original PBC options do not perform as well as the other long list programme options. In particular they score lower against the programme investment objectives, and

the single MRT route was shown to have less benefits, when compared to a dual route system through the MRT Route Review Report⁸.

- RPI V1B. This option did not score as well as RPI V1A, when assessed against the investment objectives due to the inclusion of Te Aro and Terrace Tunnel duplication with no new tunnel at Mt Victoria and does not support MRT to the east. Therefore, this programme option has been discounted from further consideration.

3 Programme Short List Option Development

In total, five programme options were short listed for further technical analysis and consideration as shown in Figure 6 and outlined in the section below. The short list programme options were selected as they best align to the programme investment objectives and MCA outcomes.

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI V1	Island Bay 	Miramar 				
RPI V1A	Island Bay 	Miramar 				
RPI V2	Island Bay 	Miramar 				
RPI V3	Island Bay 	Miramar 				
RPI V3A	Island Bay 	Miramar 				










Key:	 - Mass Rapid Transit	 - Enhanced bus services	 - Grade separation	 - At grade improvements	 - General traffic tunnel	 - Shared MRT/ general traffic tunnel	 - Active modes tunnel	 - Covered general traffic trench with active modes above	 - General traffic tunnel
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Figure 6: Programme Short List

The following sections provides an overview schematic of the key MRT and SHI components that is captured under each of the short-listed programme options. Wider LGWM programme components such as the short-term package investments (i.e. Golden Mile, Thorndon Quay and Hutt Road, Cobham Drive safety improvements, Safer central city speeds and pedestrian improvements, and City Streets) are assumed to be common to all options and is assumed to be completed before the long term investment of MRT and SHI.

⁸ LGWM, 2020

RPI Variant 1

This option incorporates MRT to the south and east, a grade separation solution at the Basin Reserve, an active mode tunnel and a new tunnel for general traffic and MRT at Mt Victoria and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel, as shown in Figure 7.

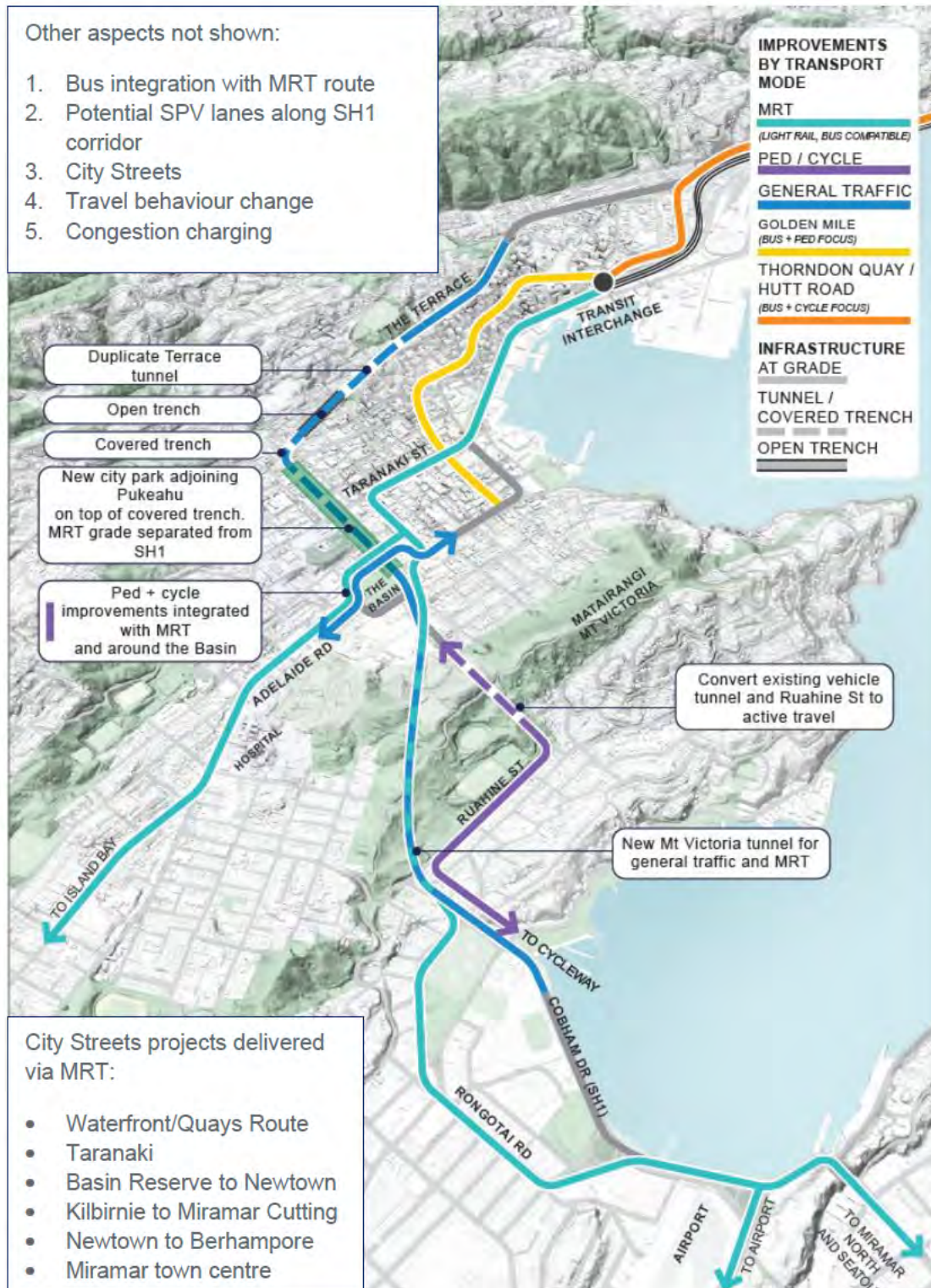


Figure 7: RPI Variant 1

RPI Variant 1A

This option includes a MRT to the south and east, a grade separation solution at the Basin Reserve, an active mode tunnel and a new tunnel for general traffic and MRT at Mt Victoria, as shown in Figure 8. In comparison to RPI V1, this option does not include the duplicate Terrace Tunnel or the Te Aro trench and city park.

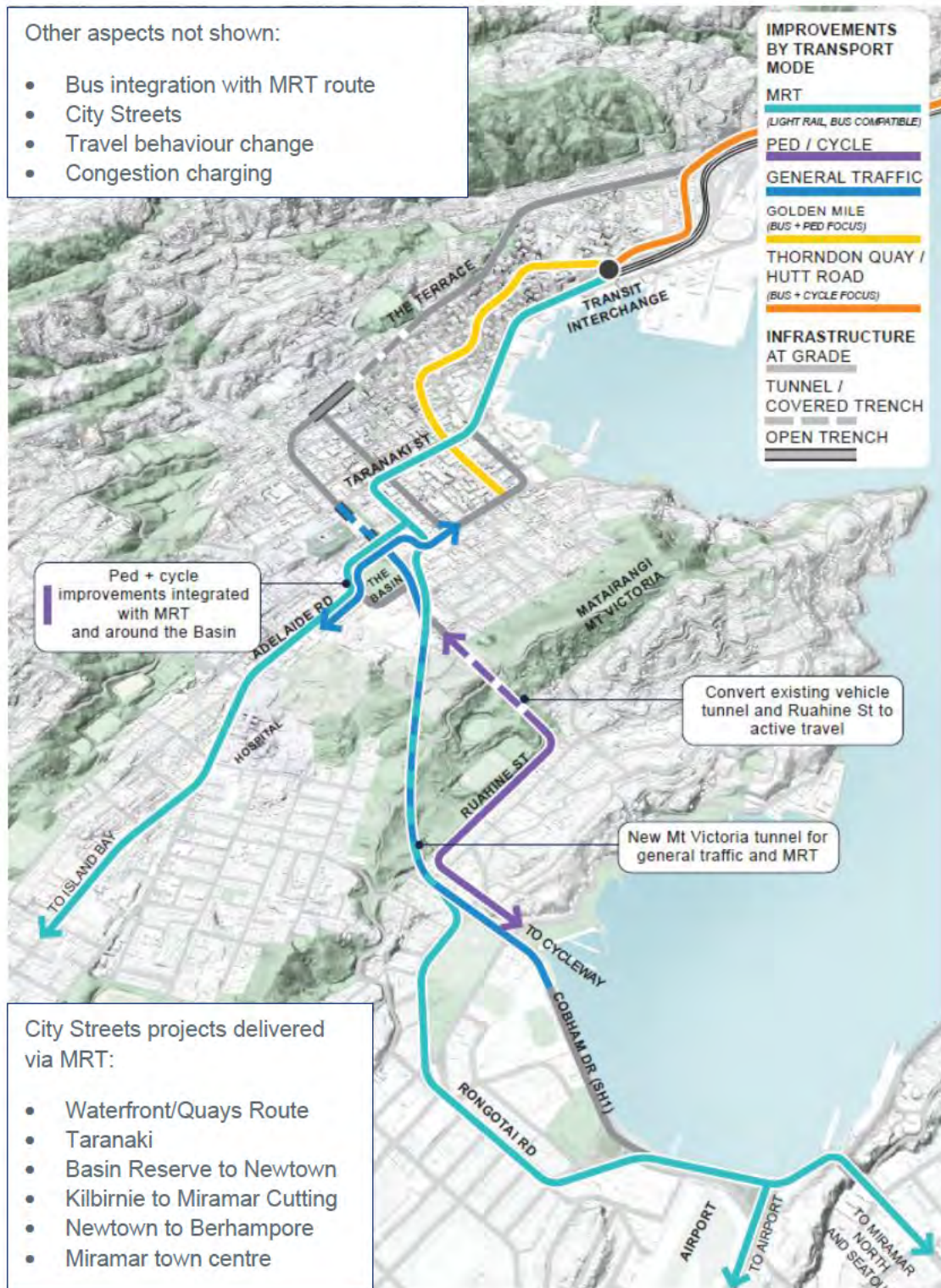


Figure 8: RPI Variant 1A

RPI Variant 2

RPI Variant 2 includes an MRT route to the south, enhanced bus services to the east, an at grade solution at the Basin Reserve, with an active mode tunnel at Mt Victoria, and a Long Tunnel bypassing the city, shown in Figure 9.

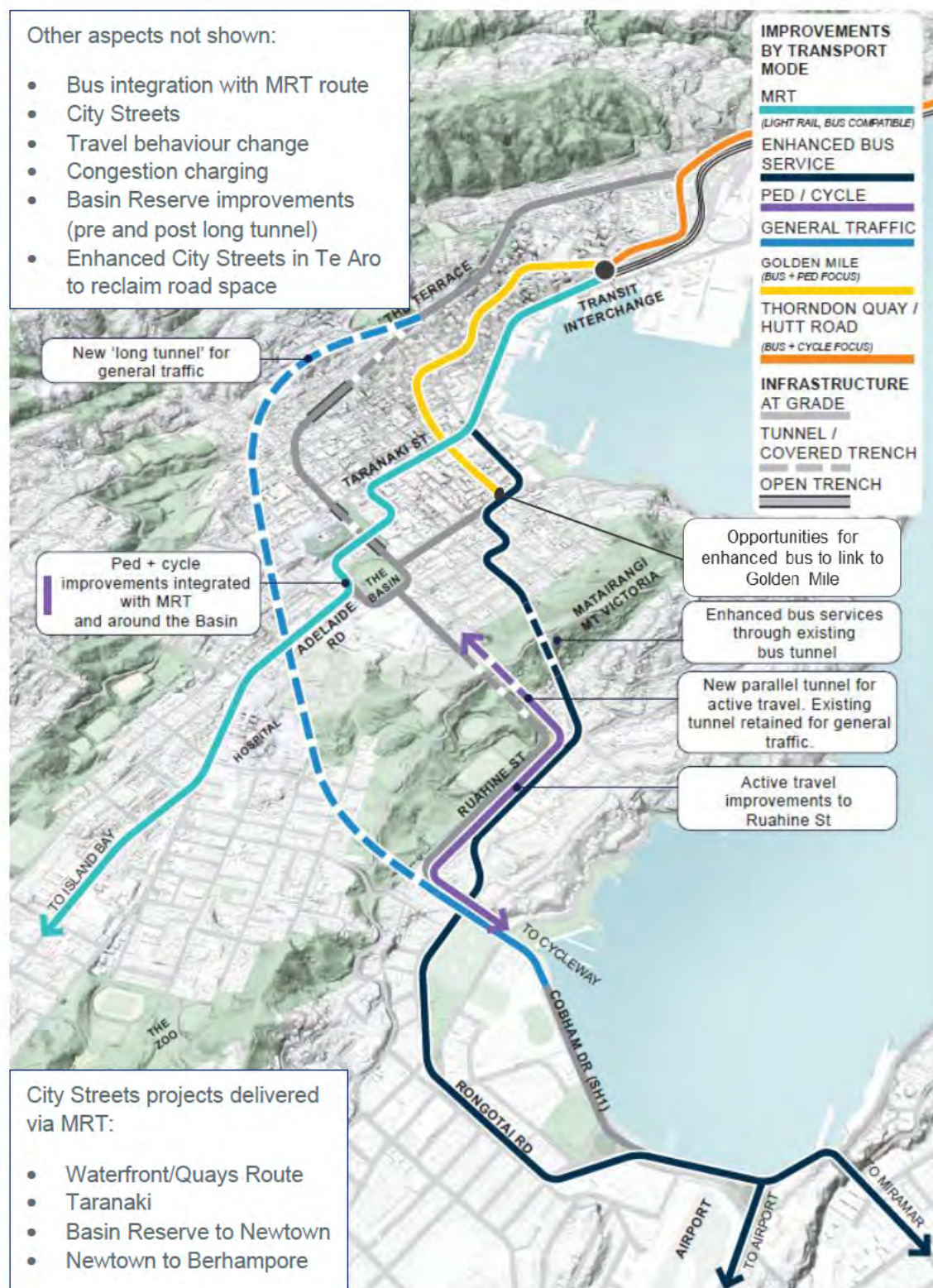


Figure 9: RPI Variant 2

RPI Variant 3

RPI Variant 3 includes an MRT route to the south, enhanced bus services to the east, an at grade solution at the Basin Reserve, and an active mode tunnel at Mt Victoria, as shown in Figure 10.

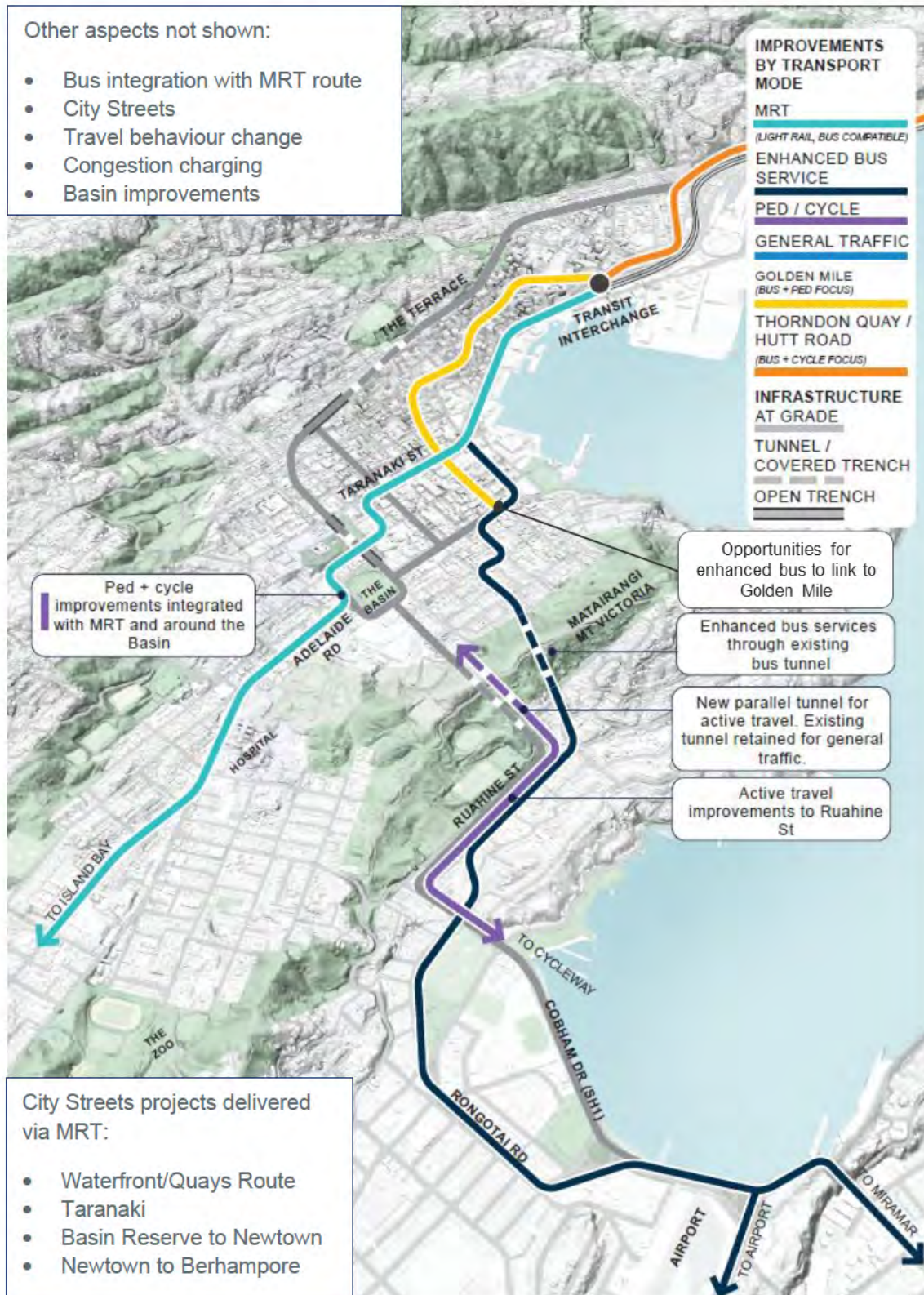


Figure 10: RPI Variant 3

RPI Variant 3A

RPI Variant 3A includes an MRT route to the south, enhanced bus services to the east, grade separation solution at the Basin Reserve and an active mode tunnel at Mt Victoria, as shown in Figure 11.

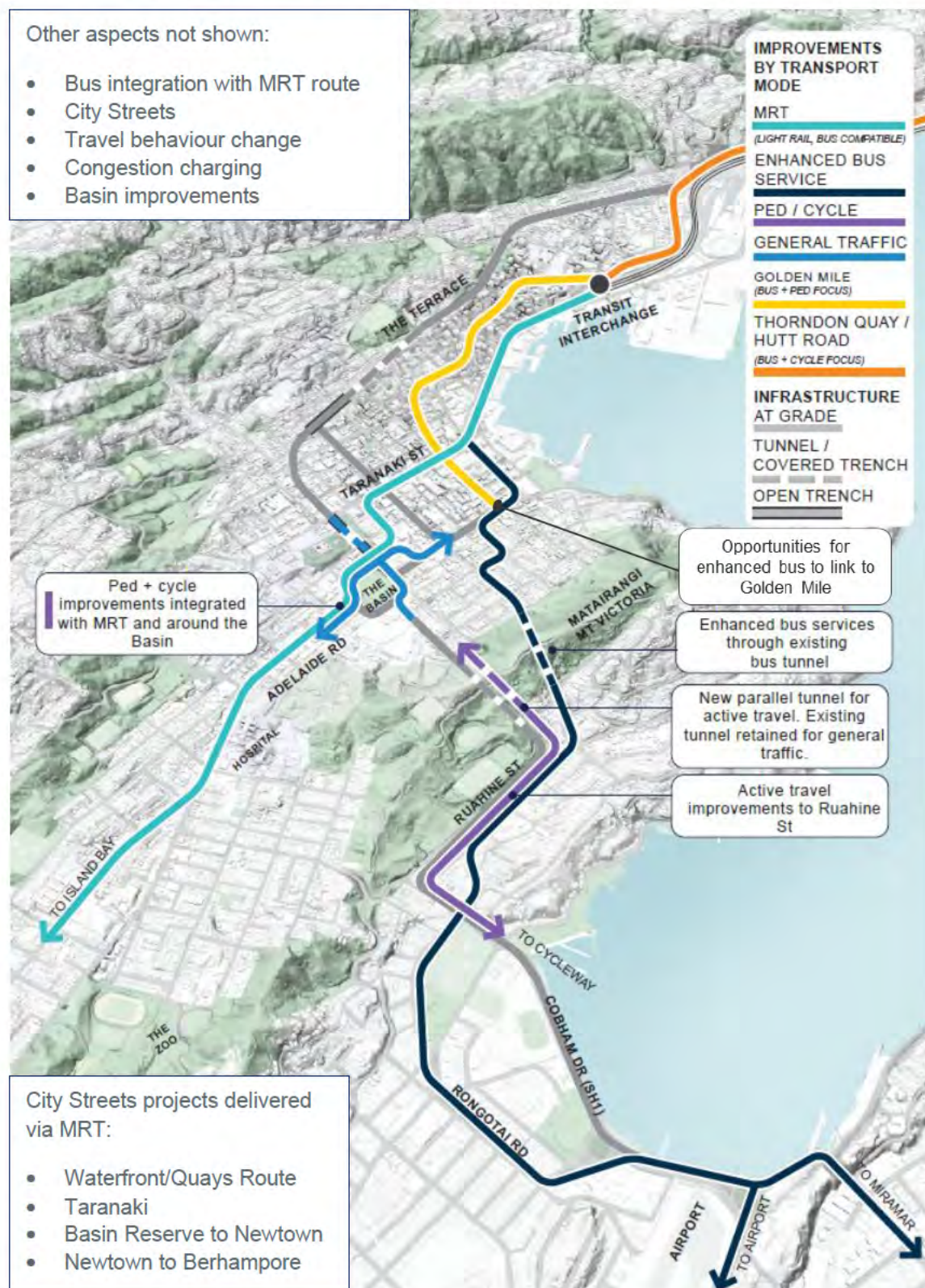


Figure 11: RPI Variant 3A

4 Evaluation Methodology

This section outlines the evaluation methodology that has been applied to assess the LGWM programme short list options. The methodology is outlined in the MRT / SHI Multi Criteria Framework (August 2021) and is consistent with the LGWM Proposed MCA Framework (May 2020).

As with the programme long list MCA, a series of workshops were held with partner representatives in June and July 2021 to score the programme short list options and establish a technically best-performing programme. The workshop series provided attendees with an opportunity to review the MCA assessment criteria and weightings.

Assessment Criteria

As shown in Figure 12, the programme short list options were assessed against the LGWM programme objectives, environmental and social impacts, and design, delivery, and operation criteria. All KPIs under each of the programme objectives were individually scored by technical specialist and reviewed by Partner representatives.

Programme Objectives	Mana Whenua	Design, Delivery and Operation
1) A transport system that enhances urban amenity and enables urban development outcomes	Mana Whenua	Engineering Difficulty
2) A transport system that provides more efficient and reliable access for users		Property Difficulty
3) A transport system that reduces carbon emissions and increases mode shift by reducing reliance on private vehicles	Environmental and Social Impacts	Scalability of network and services, and fit with other public transport services (MRT only)
4) A transport system that improves safety for all users	Noise and vibration	
5) A transport system that is adaptable to disruptions and future uncertainty	Heritage and archaeology	
	Social	
	Business disruption and outcomes	
	Landscape and visual	
	Contaminated land	

Figure 12: MCA short list assessment criteria

5 Programme Short List Assessment

5.1 Technical Assessment

Specialists for each of the criterion were identified, based on work previously undertaken for the packages and programme. These specialists were tasked with working with Partner representatives to determine a score for each of the five short list programme options, against the 2036 Do minimum scenario. Unlike the long list assessment, for the investment objectives, the scoring was based on more detailed consideration of each of the KPIs. The scoring was undertaken using the 11-point scale as shown in Table 2.

Options can, and have been, scored as fatally flawed in previous assessments (refer to the LGWM route review and ICP reports). A score of -5 is not fatally flawed but does need to be carefully considered in relation to potential mitigations and balanced with the benefits of the intervention. Two workshops were held to discuss and moderate the scores and to determine the programme short list. During the first workshop, each technical specialist presented their assessment methodology, outlined key considerations, including the level of detail, and provided proposed scores.

Following the workshop and participant feedback, each technical specialist was asked to re-evaluate their MCA scores, in consultation with partner representatives. During the second workshop the technical specialists presented the updated scores shown in Table 3.

Table 2: Scoring guide

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / performance benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, low cost or minor impacts on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impacts on resources/values and/or long term/permanent

Detailed assessments from the technical specialists are provided as an appendix to this report.

Table 3: Programme short list scores

Programme	Programme Objectives					Mana Whenua	Environmental and Social Impacts						Design, Delivery and Operation		
	Liveability	Access	Carbon Emissions and Mode Shift	Safety	Resilience	Mana Whenua	Heritage and archaeology	Social	Business disruption and outcomes	Landscape and Visual	Noise and Vibration	Contaminated Land	Engineering Difficulty	Property Difficulty	Scalability of Network and Services
2036 Do Min	0	-1	-1	-1	-2	-2	0	1	-1	0	0	0	0	0	0
RPI V1	-1	3	1	4	4	2	-5	-4	2	-5	2	-4	-5	-5	1
RPI V1 (C)	-1	3	1	4	4	3	-5	-4	3	-5	2	-4	-5	-5	1
RPI V1 A	2	3	3	2	2	1	-4	-3	1	-4	2	-3	-4	-5	1
RPI V1 A (C)	3	3	3	2	2	2	-4	-3	2	-4	2	-3	-4	-5	1
RPI V2	2	2	0	3	2	2	-2	-2	1	-3	3	-3	-3	-5	2
RPI V2 (C)	2	3	1	3	2	3	-2	-2	2	-3	3	-3	-2	-5	2
RPI V3	1	1	2	2	-1	1	-3	-2	0	-1	0	-2	-3	-4	2
RPI V3 (C)	2	2	3	2	-1	2	-3	-2	1	-1	0	-2	-2	-4	2
RPI V3A	1	1	2	2	0	2	-4	-2	0	-2	1	-3	-4	-5	2
RPI V3A (C)	2	2	3	2	0	3	-4	-2	1	-2	1	-3	-3	-5	2

(C) denotes the option including congestion charging

5.2 Multi Criteria Analysis Scoring Discussion

This section provides a summary of the scoring and related commentary of the short list options related to the investment objectives, environmental and social effects, and design, delivery, and operational considerations.

While the overall programme objectives remained the same between the programme long list and programme short list, it was decided through discussion with Partners that some KPI from investment objective 3 (Reduced PMV Reliance) better related to investment objective 1 (Liveability) and investment objective 2 (access). As a result, KPIs were transferred from Investment objective 3 as outlined below, for the programme short list scoring:

- Pedestrian level of service: transferred to investment objective 2 (Access), KPI 2.5
- Public transport delay: transferred to investment objective 2 (Access), KPI 2.6
- The quality of cycling facilities: transferred to investment objective 2 (Access), KPI 2.7
- Attracting traffic off city streets: transferred to investment objective 1 (Liveability), KPI 1.3.

A more detailed write up of the scores, and in particular a description of the outcomes for each of the KPIs, are provided in the appendices.

Investment Objective 1 - Liveability

The liveability investment objective assessment considers urban amenity and urban development. The individual scores for the urban amenity and urban development KPIs are summarised below, followed by the overall scores for the liveability objective.

Through partner discussion the KPI that pertains to removing vehicles off city streets (which was previously within another Investment Objective) was transferred to Liveability on the basis that the outcome of this removal benefits the urban amenity of the city.

Urban Amenity KPI 1.1

The urban amenity scores are based on qualitative assessments that consider the four contributing attributes to urban amenity in Wellington City: comfort, composition, connectedness and activation.

RPI V2 is the highest scoring programme option for KPI 1.1, without congestion charging. The long tunnel enables amenity benefits for the city centre from reduced traffic volumes and the associated effects on amenity.

A significant influence to urban amenity from RPI V2 comes from the contingent investment in city streets to relocate existing street space/residual capacity to lock in benefits to the public realm for 'dwelling', trees, widened footpaths and the like. At the programme level the City Streets investment part of the LGWM programme was included to deliver on these benefits, albeit that the extent and quality of this relocated street space is yet to be determined.

The City Streets programme as currently proposed only goes some way towards amenity outcomes in part because of reach, but also as it has more of a movement focus than a place outcome focus. MRT (which improves streets along the way) to the south and enhanced bus services to the east are positive.

Enhanced bus services may have amenity issues through Mt Victoria and not have the same amenity as options with dual MRT routes and services.

Congestion charging improved the scores for this KPI for options RPI V1A (C), RPI V3 (C) and RPI V3A (C) due to an expected reduction in vehicle movements through the city centre, improving comfort, street connections and enabling activation.

Urban amenity KPI scoring for each short list programme option is shown in Figure 13.

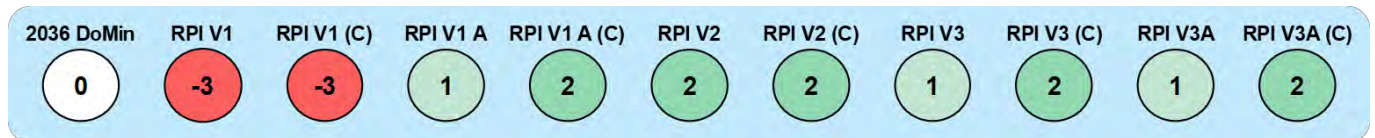


Figure 13: Urban amenity KPI scoring

Urban Development KPI 1.2

Urban development for the purposes of LGWM is defined as the market led intensification of land and building utilisation in response to the creation of new infrastructure.

The urban development assessment measured the potential land development that would result from the programme options and includes consideration of:

- Land value change where the MRT infrastructure is located, which encourages the market to respond by repurposing or removing existing buildings and intensified utilisation (responding to the new opportunities presented by the enablement within the Wellington City Spatial Plan)
- Land that has had buildings removed to accommodate transport infrastructure, where residual land (after construction) can be presented to the market to respond with new building development.

Further refinement of the urban development potential is proposed to be investigated / determined during the Detailed Business Case where an assessment of the likely development outcome can be estimated when the route, mode and MRT stations are confirmed. The current assessment is based on potential development (estimated additional GFA resulting from the programmes investment) around indicative station locations rather than expected or probable development that may permeate beyond the programme corridor investment.

The assessment results for KPI 1.2 show that RPI V1A scores the highest. The Haining Precinct comprehensive redevelopment area presents urban development opportunities in the CBD/Te Aro and MRT south to Island Bay and east results in greater development potential for this option than those with enhanced bus services to the east.

Congestion charging did not change the scores for this KPI. The reduced number of vehicles is not believed to make significant enough change to the attractiveness of the area to warrant an increase in scores.

Urban development KPI scoring for each short list programme option is shown in Figure 14.

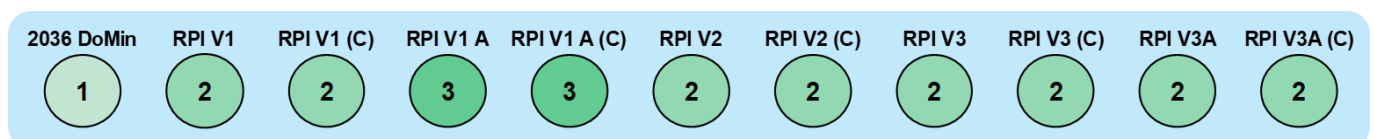


Figure 14: Urban development KPI scoring

Liveability Objective

The combined KPI results show that RPI V1A has the greatest accumulation of positive differentiators and has the positive score to match (MRT route east and south with consequent urban development benefits, grade separation at Basin Reserve and Haining Precinct both which enable urban redevelopment and at the Basin Reserve better east west active mode connectedness).

RPI V1A benefits from the positive influences of MRT and Haining Street Comprehensive Development Area (CDA), which is considered to be more modest in scale than the Te Aro Trench effect. This option also includes the active mode tunnel and benefits of the proposed Basin Reserve grade separation for urban amenity. There are some negative aspects associated with a diagonal tunnel and its interfaces both at Mt Victoria and Kilbirnie. Urban development scores well given the MRT reach and Haining CDA. The score has been 'averaged' to reflect that although there are likely to be some negative amenity aspects, the level of conflict is not considered to be as significant as in RPI V1.

RPI V2 has less of the positive differentiators in terms of MRT (south only with enhanced bus east) but brings urban development benefits to the east and was understood to result in reduced traffic in the city's streets with the consequent ability to reallocate surplus city street capacity to benefit urban amenity. A need to invest in the securing of this surplus street capacity as public realm is implicated in the benefit.

The proposed long tunnel in option RPI V2 scored positively due to its ability to reduce traffic volumes on some of the key east-west city centre streets such as Vivian Street (acknowledging that it increases traffic across the network as a whole), and because it enables urban development to the east. The retention of the benefits does implicate a need to configure city streets to prevent the additional capacity from being re-consumed by private vehicles over time. There may also be induced private vehicle movements in areas of the city to the east as a result of the long tunnel. The technical specialists also identified some issues with portal design and tunnel integration at the Kilbirnie interface.

RPI V3 has less of the positive differentiators with (like RPI V2) MRT to the south and enhanced bus to the east. It has the Haining Precinct, but not the grade separated Basin.

RPI V1 has a negative score, and this is different to previous assessments in this area. This is in response to updated information from the design team showing the scale of demolition required to construct and enable work through Te Aro, which could take decades to recover.

There are negative aspects associated with new tunnels in all the options and at the interface with Wellington Road. The new active mode tunnel option has effects too on 9(2)(b)(ii), 9(2)(j) at Mt Victoria. There are various negative effects in all the options for the amenity in complexity in street layout (particularly around the Basin Reserve) which will require additional design work to address. All of the scores for Liveability have remained relatively conservative to respond to (at the time) uncertainty about delivery mechanisms for quality urban development and the effects on options within the public realm of city streets which, at this Programme level, are as yet unclear. Therefore, no changes to the programme scoring is required.

When congestion charging was included, programme option RPI V1 A (C) outscored all of the programme options for this investment objective. It was assumed that congestion charging would have a meaningful impact on liveability from traffic reduction and changes to street layouts. Congestion charging also resulted in increased scores for RPI V3 (C) and RPI V3A (C).

Liveability scoring for each short list programme option is shown in Figure 15.

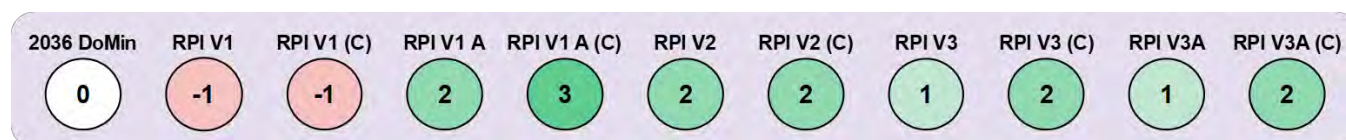


Figure 15: Liveability scoring

Investment Objective 2 - Access

Scores for this investment objective were based on an assessment of access and level of service for all modes within the study area, as documented in the specialist report. All programme options received a positive score reflecting the proposed investment in public transport and active mode infrastructure and resulting improved access.

RPI V1 and RPI V1A are the two highest scoring programme options for this investment objective, without congestion charging. Both of these programme options benefit from higher levels of public transport priority, with both south and east MRT routes, which also improves public transport reliability.

RPI V1 delivers a good positive performance improvement in terms of access. Investment in public transport via MRT, City Streets, Thorndon Quay/ Hutt Road and the Golden Mile, coupled with improvements to the active travel network improves multi-modal access. This option also has the greatest investment in the road network, with the Terrace Tunnel and Te Aro trench and city park, which will also improve accessibility and travel time reliability for motorists.

RPI V1A delivers many of the benefits of RPI V1. Although it doesn't include the full benefits to general traffic, the weighting assigned to the public transport relative Key Performance Indicators meant that it received an equally good score overall.

RPI V2 was also awarded a good positive score overall. Although it contains most of the positive elements of RPI V1, it has a less extensive MRT network and includes a more targeted road network investment that delivers significant benefit to north-east movements, but lower levels of benefit to other movements. Therefore, the overall score is slightly lower. The congestion charge has a positive effect, providing improved levels of accessibility (particularly for traffic) and it was therefore awarded a slightly higher positive score.

Congestion charging results in programme option RPI V1 (C), RPI V1A (C) and RPI V2 (C) scoring the same as programme options RPI V1 and RPI V1A. The congestion charge has a positive effect, providing improved levels of accessibility (particularly for traffic).

Scoring of access for each short list programme option is shown in Figure 16.

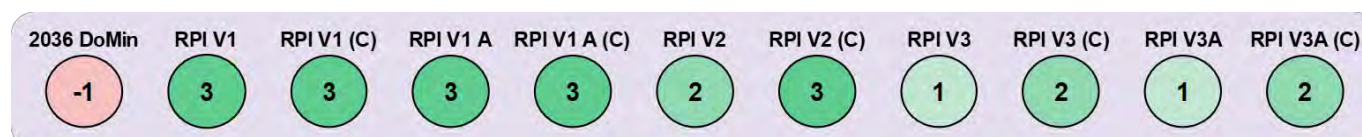


Figure 16: Access scoring

Investment Objective 3 – Carbon Emissions and Mode Shift⁹

The two key aspects of the carbon emissions and mode shift investment objective that were assessed by the technical specialists are mode share and carbon (emissions and embodied). The programmes with MRT to both south and east (RPI V1A and RPI V1) are estimated to result in an increase in public

⁹ It is noted that this investment objective is referred to as "Reduced Private Motor Vehicle Reliance" in the remaining sections of this report and supporting appendices.

transport demand to the east by 29-32 percent, while those with MRT only to south (with a lower level of investment to the east) are estimated to increase public transport demand by 16-19 percent (compared against the Do Minimum).

RPI V1A is the best performing programme option without congestion charging. This option also has high climate positive spend, resulting in a high positive score in relation to the carbon emissions assessment. Climate positive investment in the public transport due to MRT, City Streets, Thorndon Quay/ Hutt Road and the Golden Mile, coupled with improvements to the active travel network will encourage mode shift.

RPI V2 was awarded a neutral score overall. It has a less extensive MRT network and includes a significant piece of climate negative road infrastructure (the long tunnel) that induces additional longer road trips. The congestion charge goes some way to mitigate these disbenefits. If delivered effectively, a congestion charge could mean that RPI V2 is able to reduce reliance on private motor vehicles and it was therefore awarded a low positive score.

Programmes RPI V3 and RPI V3A are very similar and were awarded the same score as each other. Both have reduced MRT networks compared to RPI V1 or RPI V1A but don't have many climate negative investments in the road network. They were therefore awarded a positive score against this KPI. The lack of MRT to the east means that the potential to maximise mode share to/from this part of the city is reduced relative to V1A. Analysis of VKT reduction shows very similar levels for V3, V3A and V1A.

Congestion charging was shown to have a positive effect on mitigating congestion. Therefore, the options with congestion charging were awarded an additional point.

Scoring of carbon emissions and mode shift for each short list programme option is shown in Figure 17.

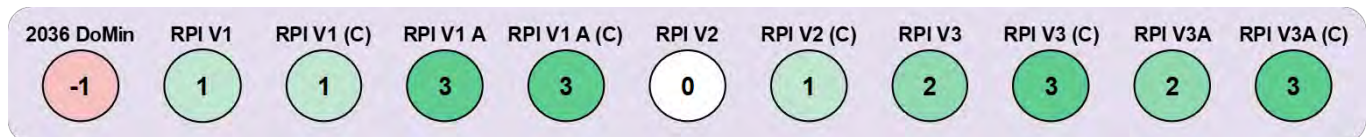


Figure 17: Carbon emissions and mode shift scoring

Investment Objective 4 - Safety

RPI V1 is expected to provide the most safety benefits of all the options. The improvements along the SH1 corridor are expected to reduce vehicle traffic on high conflict routes improving safety for all users. The improvements will also provide separation of vehicles in each direction and enable the removal of some uncontrolled intersections.

Congestion charging did not change the scores. Congestion charging is likely to reduce the level of vehicular traffic, however this may result in a higher operating speed of vehicles, which could result in more serious injuries. Whilst mitigation measures could address these negative impacts, these were not assumed for this criterion.

Scoring of safety for each short list programme option is shown in Figure 18.

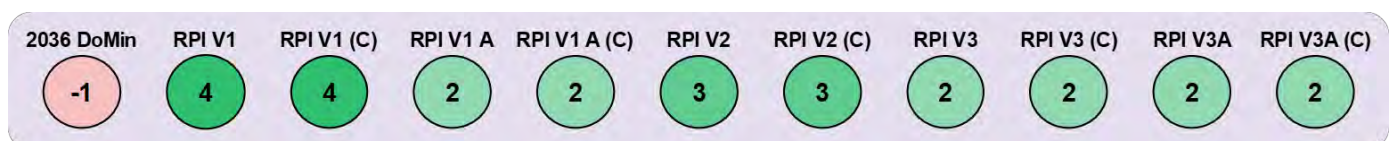


Figure 18: Safety scoring

Investment Objective 5 - Resilience

This investment objective was scored based on three sub-criteria:

- The ability of a programme option to enhance the resilience of land transport access to critical facilities and within the city (operational resilience)
- Resilience to high impact, low probability events and contribution to access for communities
- The ability of a programme option to enhance resilience of access, and to provide socio-economic functionality in low impact, high probability events as well as during unplanned events (redundancy).

A higher weighting was applied to operational resilience and redundancy. RPI V1 scored best, as it improves resilience in high impact, low probability events due to the addition of a Mt Victoria diagonal tunnel, Te Aro tunnel and Terrace Tunnels, grade separation at Basin Reserve and MRT at the waterfront.

Congestion charging had little to no impact on the results.

Scoring of resilience for each short list programme option is shown in Figure 19.

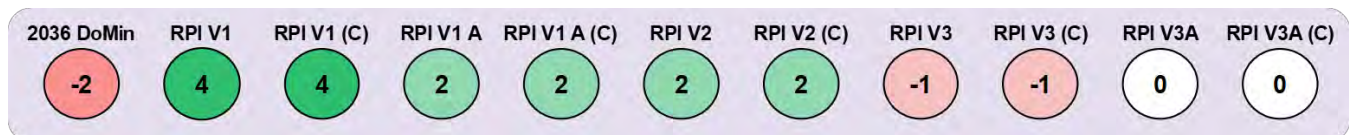


Figure 19: Resilience scores

Mana Whenua

The short list programme options were all scored against a set of Mana Whenua values developed by iwi partners' representatives, with the authority of the iwi partner organisations Taranaki Whanui and Ngāti Toa. These values are:

1. Whakapapa - A sense of place
2. Wai-ora - Respect the role of water
3. Pūngao-ora – Energy
4. Hau-ora – Optimising health and wellbeing
5. Whakamahitanga - Use of materials
6. Manaakitanga – Support a just and equitable society
7. Whakāhuatanga - Celebrate beauty in design.

All of the short list programme options were assessed to have a positive impact. Three options all score equal highest for this criterion:

- RPI V1 scored well as it created opportunities through Te Aro and in the Karo Drive area. Although it is the most intrusive of the options, the large swathe across Te Aro that the Te Aro trench construction will unlock land for development, and the Mana Whenua view is much more long term than the other criteria. The scoring is higher if the trench is covered with a park than without.

- RPI V2 as the Long Tunnel was considered by the technical specialists to be “an innovative solution to the blight that affects the Karo Drive area”.
- RPI V3A as the Basin Reserve grade separation allows for an attractive extension of the Arras Tunnel to the west. This is a sensitive area given the history of the levelling of Mt Cook and construction of the prison by men from Parihaka.

All of the programme options scored higher with congestion charging.

Scoring of mana whenua for each short list programme option is shown in Figure 20.

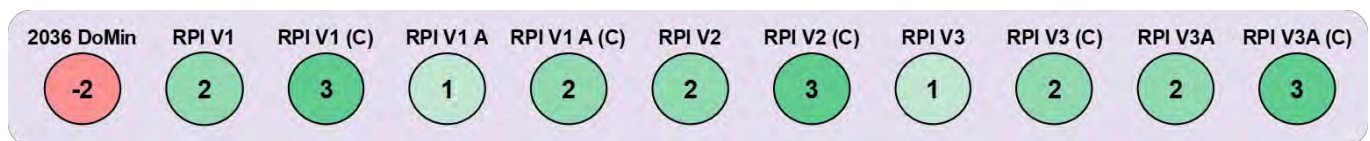


Figure 20: Mana Whenua scores

Effects – Environmental and Social: Heritage and archaeology

The effects of the programme options on heritage and archaeology were scored by technical specialists based on the likely impacts on character areas, scheduled heritage building(s) and the Town Belt. In particular, the assessment considered:

- Impact of a new Mt Victoria tunnel on the adjacent character areas
- Impacts of widening around Basin on existing pre-1900 area of development and on connectivity between places with heritage value
- Impact of Te Aro trenching through the area of the city with a high number of heritage areas, buildings and archaeological sites
- Impact of duplicate Terrace Tunnel below the area of the city with a high number of heritage areas, buildings and archaeological sites.

Based on these key considerations RPI V2 scored highest, although it still has a negative impact. Due to the long tunnel, this programme option removes state highway traffic from the CBD, and largely avoids the impacts that the state highway improvements proposed in other options will have on heritage. However, traffic modelling indicates that this does not result in a significant net reduction in traffic in the CBD, and there are few other benefits for heritage. RPI V2 still requires properties in character and heritage areas, giving an overall negative effect on heritage and archaeology.

Although congestion charging has a positive effect by reducing traffic in the central city, it was not considered sufficient to warrant a change in score.

Scoring of heritage and archaeology for each short list programme option is shown in Figure 21.

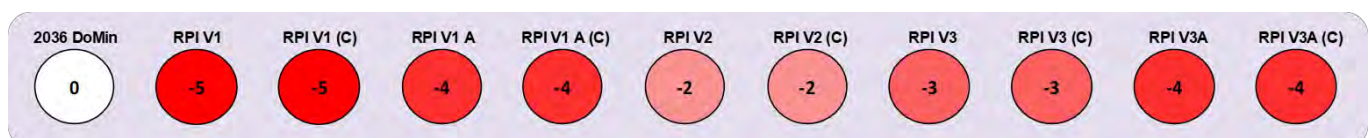


Figure 21: Heritage and archaeology scores

Effects – Environmental and Social: Social

The assessment of the programme options primarily considered negative impacts such as noise, dust, community amenity effects and property acquisition during construction. These impacts were assessed for the following:

- Community facilities and infrastructure such as museums, recreation grounds, parks, libraries, schools, and churches
- Major facilities such as Wellington Airport, Wellington Regional Aquatic Centre and Wellington Regional Hospital
- Commercial and residential areas (including identification of where there was a good catchment of population served, but assuming that transport criteria would address increased trips/catchment in a more quantitative method).
- Private property and parking
- Businesses providing a social service and parking.

Whilst positive elements were also identified, less weighting was given to these elements as they were considered to be assessed separately in the business disruption and outcomes and Access criteria.

Three options all score equal highest for this criterion: RPI V2, RPI V3, and RPI V3A.

Congestion charging had little to no impact on the results.

Social scoring for each short list programme option is shown in Figure 22.

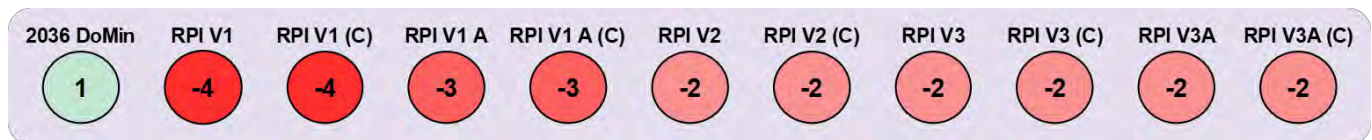


Figure 22: Social scoring

Effects –Business Disruption and Outcomes

This assessment criterion aims to identify the expected impact arising from disruption on local businesses and commerce during the construction period as well as the positive impacts once the infrastructure is provided. The assessment methodology has been defined to reflect differentiation for short-term and long-term impacts, as follows:

- Short term (construction): density of affected commercial and industrial properties along frontage, 100m and 200m catchments. A buffer zone (100m and 200m used) of businesses near the Programme investments was used to reflect where potential changes in accessway / loss of visibility may be introduced during construction.
- Long term (post-construction): improved accessibility (change in effective density) and the long run impacts it has on businesses. This largely reflects the potential long term economic impacts that commercial and industrial properties may experience once the full build-out of Programme investments have been undertaken.

Based on this methodology, RPI V1 scored best. Whilst it is recognised that it will have an adverse short term impact from affected commercial plots (in particular, the scale on the Te Aro trench and Terrace

tunnel footprint), it has been assessed to provide high improvement to accessibility to/from the southern and eastern suburbs due to the dual MRT corridor and within CBD.

All of the programme options scored higher with congestion charging.

Business disruption and outcomes scoring for each short list programme option is shown in Figure 23.

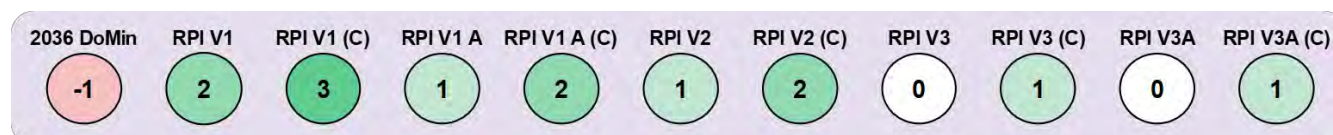


Figure 23: Business disruption and outcomes scoring

Effects – Environmental and Social: Landscape and Visual

Scores for this effect were primarily based on visual impacts. They considered potential adverse effects of new and duplicate tunnels, Basin Reserve grade separation and localised impacts anticipated for MRT grading and streetscape effects along the proposed routes.

RPI V3 is expected to have the least adverse effects as it proposes the least infrastructure.

Congestion charging had little to no impact on the results.

Landscape and visual scoring for each short list programme option is shown in Figure 24.

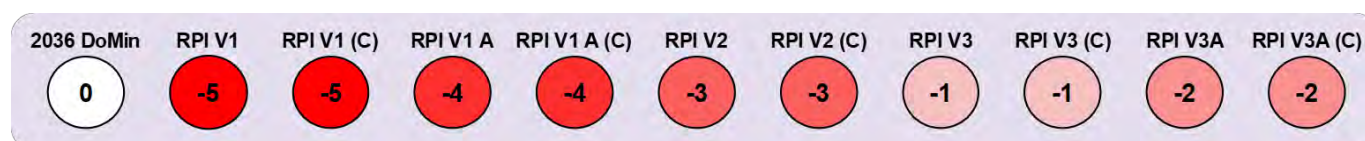


Figure 24: Landscape and visual scoring

Effects – Environmental and Social: Noise and Vibration

A high-level, desktop assessment of noise and vibration was undertaken to consider the benefits of each of the short list programme options, as well as the negative effects. Whereas benefits can be directly realised, negative effects must be able to be appropriately managed. The MCA scoring for each option was driven mainly by the overall noise and vibration benefit/impact of the project, on a city-wide scale.

RPI V2 was assessed as the best option. This option is expected to remove a large volume of surface traffic resulting in improved noise and vibration environments in Karo Drive, Vivian Street and Ruahine Street.

However, negatives are construction effects associated with new long and active mode tunnels, especially transport of tunnel spoil, in particular the LRT route around the Basin Reserve and increased noise levels in proximity of the northern portal of the long tunnel during construction and operation. These increased noise levels will be difficult to mitigate due to proximity of the elevated roadways to nearby buildings.

Congestion charging had little to no impact on the results.

Scoring of noise and vibration for each of the short list programme options is shown in Figure 25.

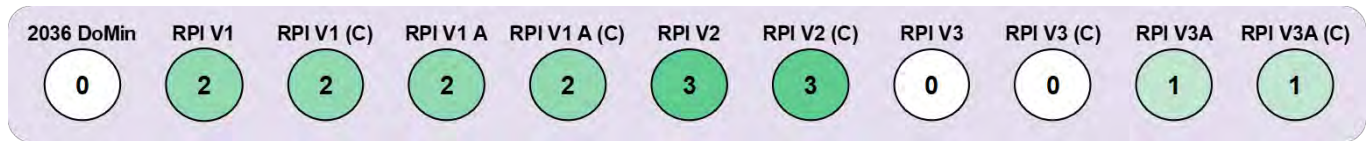


Figure 25: Noise and vibration scoring

Effects – Environmental and Social: Contaminated Land

Contaminated land has been considered in terms of earthworks volumes and therefore disposal/handling/costs. It was not possible at this stage of the project to put a monetary value on the earthworks portion of the project, however there will likely be a significant cost incurred for any option.

Options likely to result in a larger portion of 'contaminated' soil for disposal would score lower than options with less 'contaminated' soil. Options likely to encounter a larger number of known HAIL sites would be scored lower.

RPI V3 is expected to require the least quantity of earthworks overall and impact the least number of HAIL sites.

Congestion charging had little to no impact on the results.

Scoring of contaminated land for each of the short list programme options is shown in Figure 26.

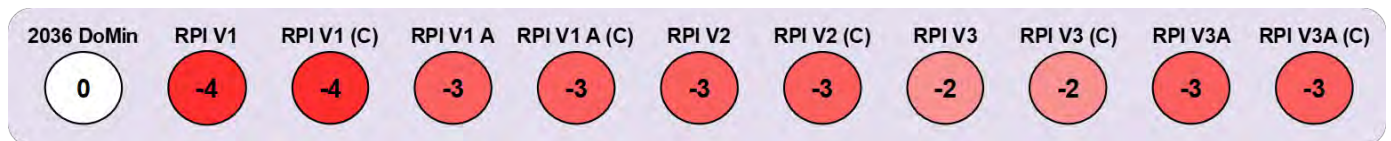


Figure 26: Contaminated land scoring

Design, Delivery and Operation – Engineering Difficulty

The assessment of engineering difficulty included consideration of:

- Construction disruption
- Overall construction duration
- Impact on utilities and groundwater.

In general, programmes with more investment in new infrastructure scored lower. The assessment noted that congestion charging could result in a positive step change by reducing the need for complex traffic management arrangements during the construction phase, which would also reduce disruption.

RPI V2 bucked the trend and scored highest, as it could be constructed with least disruption to the current network, and it was assumed that the long tunnel would be constructed first to reduce disruption during the MRT construction phase.

The sensitivity test on the effects of congestion charging was considered to improve several programme options. This is because engineering difficulty also considers the impact of temporary works during construction. For RPI V1 and V1A, the reduced car use as a result of a congestion charge is anticipated to result in increased public transport uptake and increased active travel demands, which will in turn need to be accommodated through diversions etc. to accommodate this mode shift, almost effectively 'cancelling out' the result of the congestion charge in consideration of the impact of temporary works. Therefore, there was no change in score for these two options. In contrast, RPI V2, V3 and V3A with congestion charging were score a point higher as there is more opportunity to accommodate the public

transport and active mode uptake via parallel routes for these options. The two highest scoring programmes with congestion charging are RPI V2 (C) and RPI V3 (C).

Engineering difficulty scoring for each short list programme option is shown in Figure 27.



Figure 27: Engineering difficulty scoring

Design, Delivery and Operation – Property Difficulty

The assessment of property difficulty included consideration of the following criteria:

- Number of sites that would need to be acquired for the route/stations
- Legislative constraints, e.g., Town Belt Act
- Land with multiple owners/multiple leases that may be difficult to negotiate with.

All of the programme short list options are expected to have a negative impact on property. RPI V3 is expected to have the least negative impact of all the options as it has the smallest footprint.

Congestion charging had little to no impact on the results.

Property difficulty scoring for each short list programme option is shown in Figure 28.

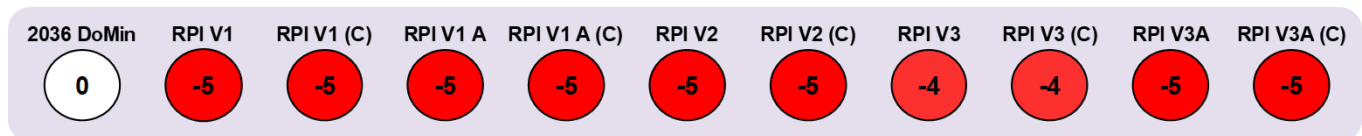


Figure 28: Property difficulty scoring

Design, Delivery and Operation – Scalability of Network and Services

Scores were based on the expected network fit/performance (once operational) and future scalability. Network fit is the degree to which the MRT route(s) would integrate with the wider public transport network on day one of implementation. Scalability is the degree to which the MRT route(s) could be extended to North and/or West Wellington on a date after MRT is operating.

Three options score equal highest for this criterion: RPI V2, RPI V3, and RPI V3A.

Network fit is considered to be very good across the three highest scoring options. However, scalability is considered to be very limited in the context of a rail-based vehicle mode both to the north and west without further significant investment. If a rubber-tired vehicle mode is chosen for MRT, extendibility of the PT service can be improved on, with a northern extension potentially feasible and as such the overall scores would increase above those shown in Figure 27. Further information on how shortlisted vehicle types affect the scoring of scalability can be found in the specialist report in the appendix.

The sensitivity of congestion charging had little to no impact on the results for scalability of network and services.

Scalability of network services scoring for each short list programme option is shown in Figure 29.

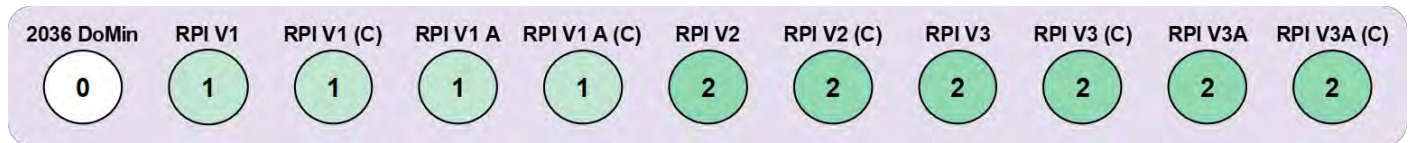


Figure 29: Scalability of network services scoring

5.3 Weighted Programme Objective Scores

The short list programmes have been evaluated initially based on just the LGWM Board approved programme objective weightings, which reflect the relative importance of the different objectives:

- Liveability - 20 percent
- Access - 15 percent
- Reduced private motor vehicle reliance including carbon - 40 percent
- Safety - 15 percent
- Resilience - 10 percent.

The results of the weighted programme objective scores, when applied to the final short list option scores are shown in Figure 30 (without congestion charging) and in Figure 31 (with congestion charging).

As shown in both Figure 30 and Figure 31 the Do-minimum results in poorer outcomes for Wellington futures.

RPI V1A has emerged as the option which best achieves the programme objectives at this stage of the assessment process.

When congestion charging is applied, short list programme option RPI V1A continues to outscore all of the other short list programme options and the score improves slightly compared to the option with no congestion charging. Other programme options also score better and the gap between the other options and RPI V1A isn't as large.

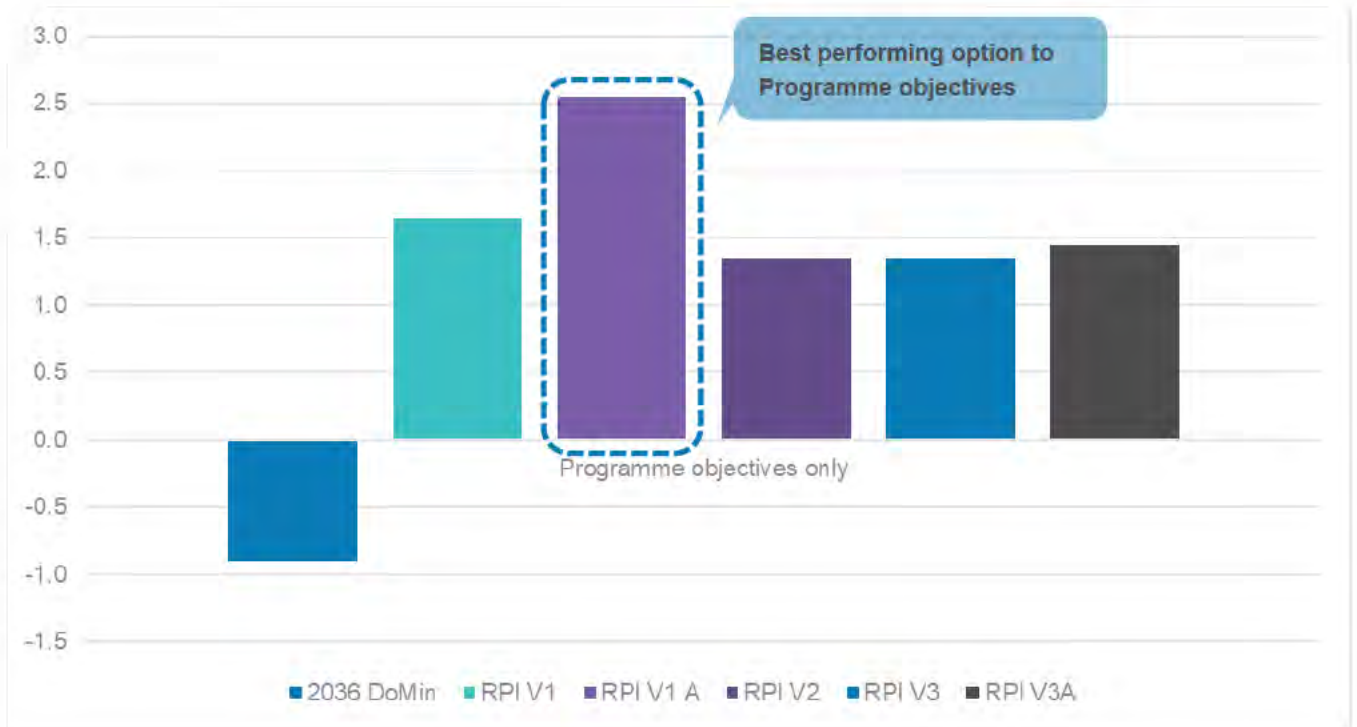


Figure 30: LGWM Board Investment Objective Weightings (no congestion charge)



Figure 31: LGWM Board Investment Objective Weightings (congestion charge)

5.4 Sensitivity Testing / Weightings

Once the programme short list MCA scores were agreed, all scores were subject to weighting scenarios to test the validity of the short list assessment results and the emerging technical option recommendation. A wide range of different weighting scenarios were applied to emphasise the relative importance of different investment objectives and criteria.

The weighting scenarios used to test the overall short list assessment scoring sensitivities and confirm the ranking of the Emerging Technical Option are shown in Table 4. Note, all of the weighting scenarios applied to the short list assessment scores were sourced from MRT or SHI investigations (2020).

The MRT weighting systems were developed to provide different lenses on the two key outcomes of MRT: mode shift and urban development. In addition, an overall base weighting system was developed as a balanced approach. The SHI weighting systems were developed for SHI package to test the sensitivity of the outcome to a range of different perspectives:

- **Project Objectives:** a weighting system that prioritises achievement of the investment objectives in line with the agreed weighting from the Project Partners. This is important to understand which options best achieve the desired outcomes.
- **RMA Part 2:** a weighting system that focusses on matters of interest under the Resource Management Act to ensure that we understand the effects of the options.
- **Quadruple bottom line matters:** four different weighting systems reflecting social, economic, cultural and environmental considerations to understand if the choice of preferred option would change under different lenses.

This programme analysis adopted both sets of systems as they are complementary and provide a wide range of considerations to assist decision makers.

Table 4: Weighting scenarios applied to Programme Short List MCA scores¹⁰

Weighting Scenario	Liveability	Access	Carbon Emissions and Mode Shift	Safety	Resilience	Mana Whenua	Heritage and Archaeology	Social	Business disruption and outcomes	Landscape and Visual	Noise and Vibration	Contaminated Land	Engineering Difficulty	Property Difficulty	Scalability of Network and Services
MRT Base weighted (adjusted with Mana Whenua and grouped effects)	9%	10%	22%	4%	4%	10%	5%	4%	5%	7%	4%	4%	4%	4%	4%
Urban Development	30%	8%	8%	4%	4%	8%	4%	4%	4%	6%	4%	4%	4%	4%	4%
Mode Share	8%	8%	32%	4%	4%	8%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Mana Whenua, Environmental and Social Impacts only						14%	14%	14%	14%	14%	14%	14%			
RMA Part 2	18%	3%	14%	3%	9%	10%	10%	10%	3%	10%	10%				
QBL: Social	18%	6%	8%	6%	6%	8%	5%	20%	2%	8%	8%			5%	
QBL: Economic	10%	25%	10%	7%	3%	3%		3%	9%			2%	15%	8%	5%
QBL: Cultural	10%	6%	12%	6%	6%	20%	10%	15%		10%	5%				
QBL: Environmental	10%		30%			20%	10%			10%	10%	10%			
Design, Delivery and Operation only													33%	33%	33%

¹⁰ QBL: Quadruple Bottom Line – decisions are made with the same amount of consideration on each of social, environmental, cultural and economic outcomes

The results of the weighting scenarios when applied to the short list option scores are described in the following sections.

Mana Whenua and Environmental and Social Effects Only

Figure 32 and Figure 33 present the Mana Whenua and environmental and social effect scores based on equal weightings of criteria within this category.

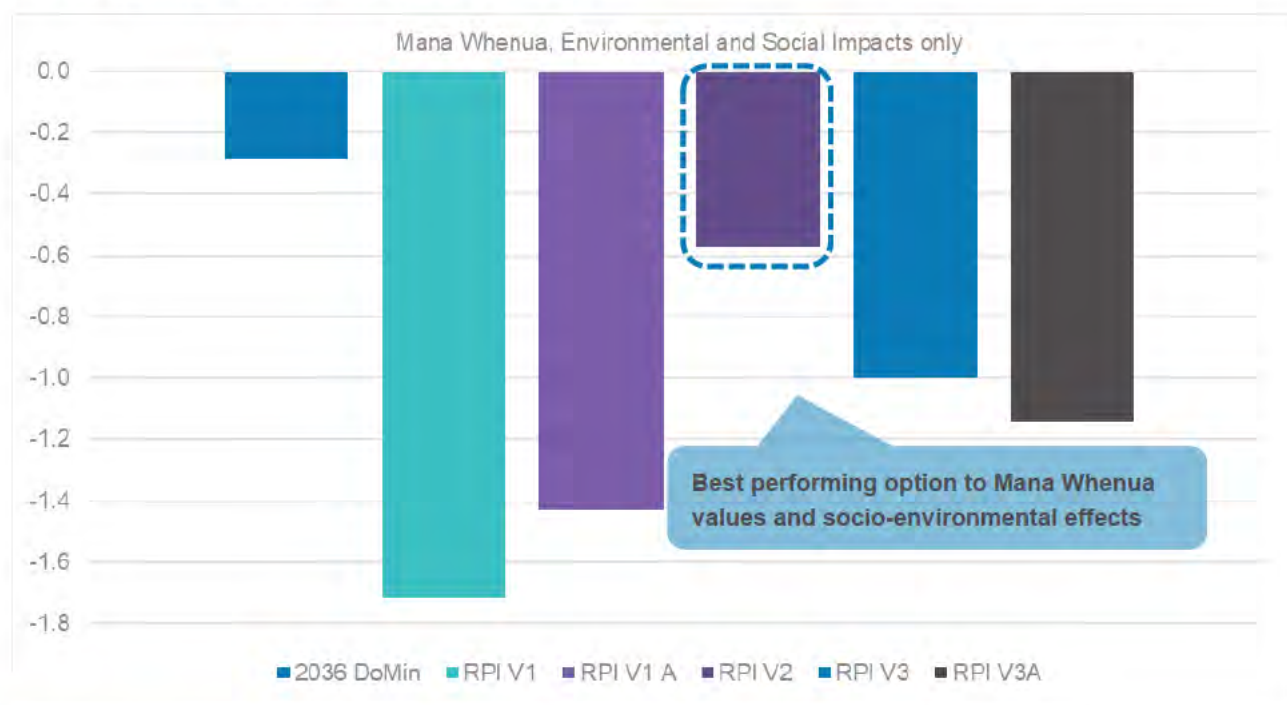


Figure 32: Mana Whenua and Environmental and Social Effects Only (no congestion charge)

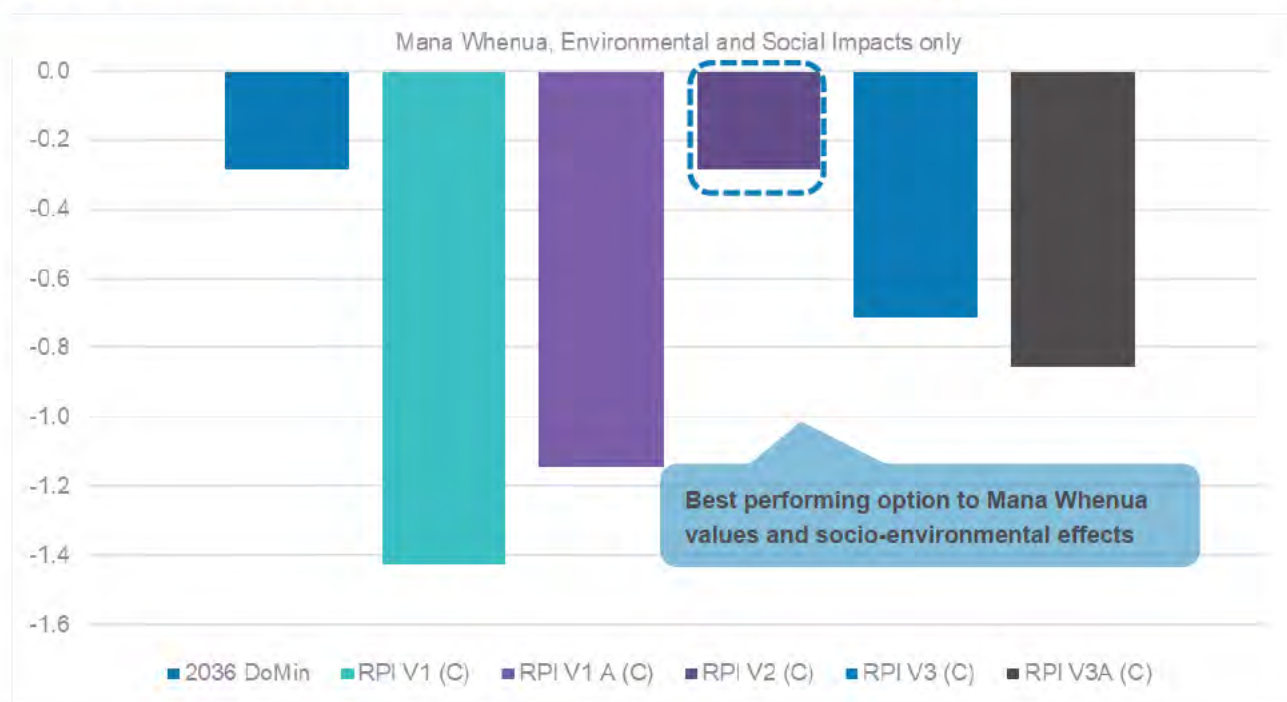


Figure 33: Mana Whenua and Environmental and Social Effects Only (congestion charge)

All of the programme short list options score positively in relation to Mana Whenua, business disruption and noise and vibration. All options also have negative impacts in terms of heritage and archaeology, social, landscape and visual and contaminated land.

RPI V1 has the largest negative score due to impacts through Te Aro.

RPI V2 scores the least negative of all the options particularly in relation to heritage and archaeology and noise and vibration due to the construction of large portions of the programme, i.e. the long tunnel, can occur mostly offline.

Congestion charging reduces negative impacts of all options, with RPI V2 expected to perform better than in the Do Minimum scenario, but the ranking and relative difference between options is similar.

Design, Delivery and Operation Only

Figure 34 and Figure 35 present the design, delivery and operation impact scores based 33% weighting applied to engineering difficulty, property difficulty and scalability of network.

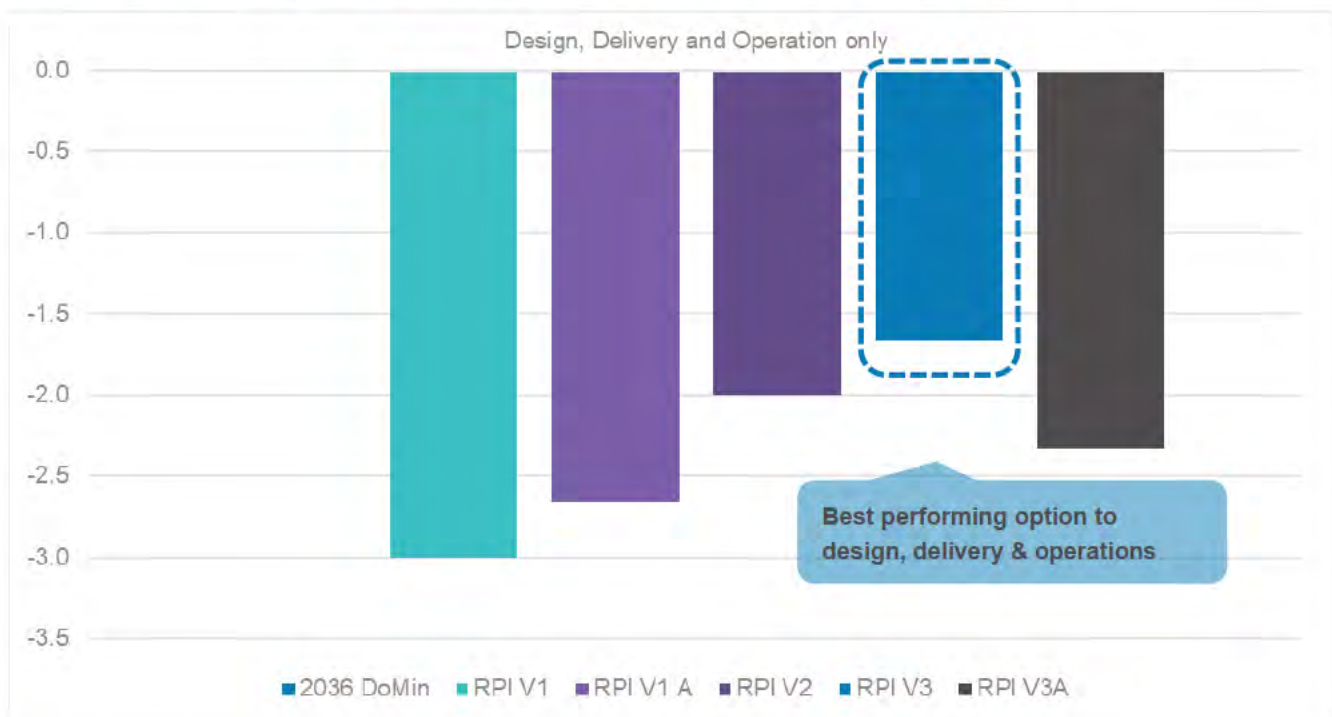


Figure 34: Design Delivery and Operations Only Weightings (no congestion charge)

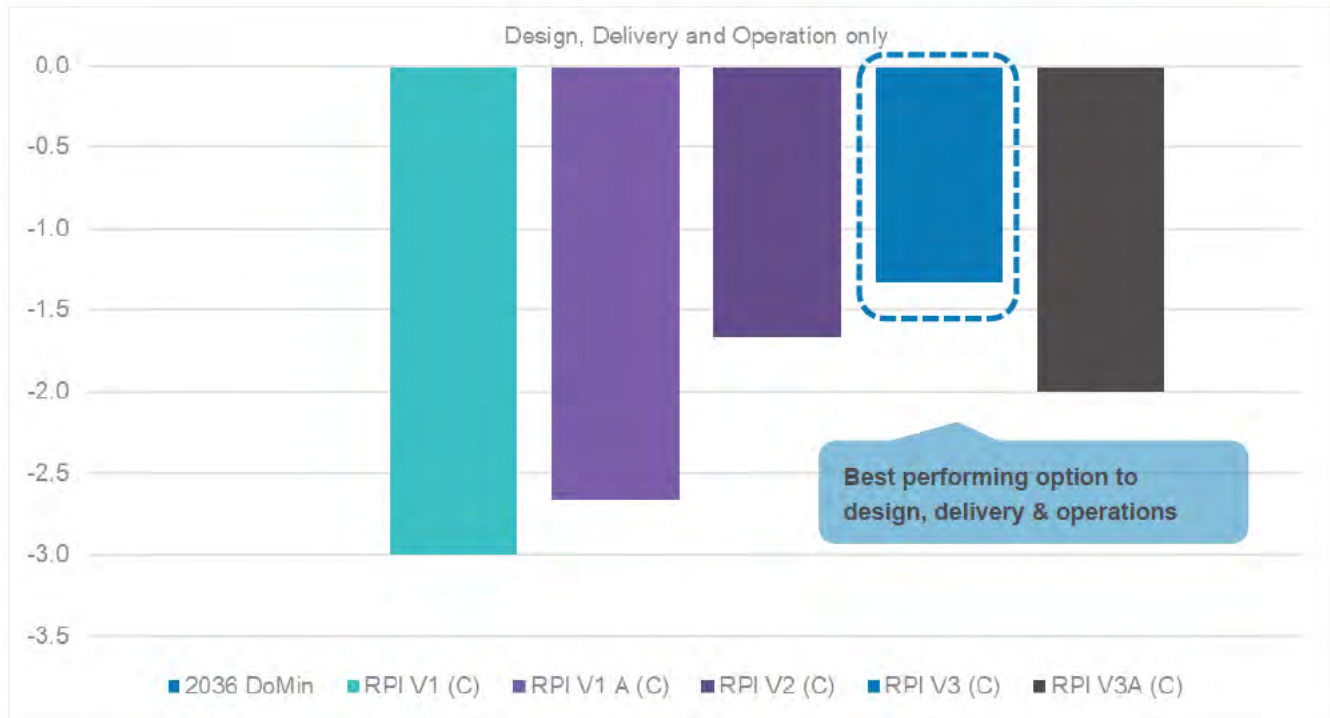


Figure 35: Design Delivery and Operations Only Weightings (congestion charge)

As shown in the graphs above, the smaller the programme option in terms of above ground infrastructure investment, the lower the score. RPI V2 scores better than RPI V1 and RPI V1A as the long tunnel can be constructed with less impact on the transport network, utilities, and potential contaminated land.

No changes to relativey are evident with the introduction of congestion charging.

MRT Base Weighted, Urban Development and Mode Share Sensitivity Scenarios

Figure 36 and Figure 37 present the overall short list option scores based on the base weighted, urban development and mode share scenarios previously developed as part of the MRT investigation in 2020.

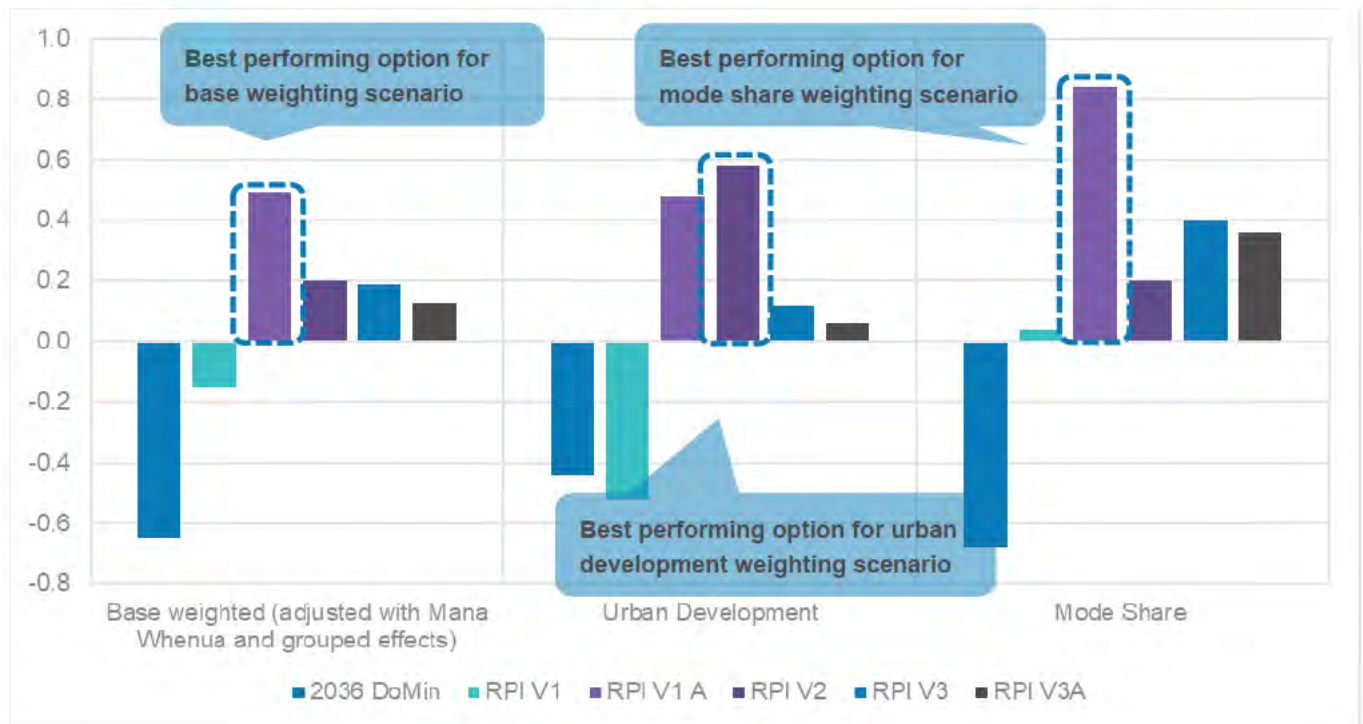


Figure 36: MRT Base Weighting Scenario Results (no congestion charge)

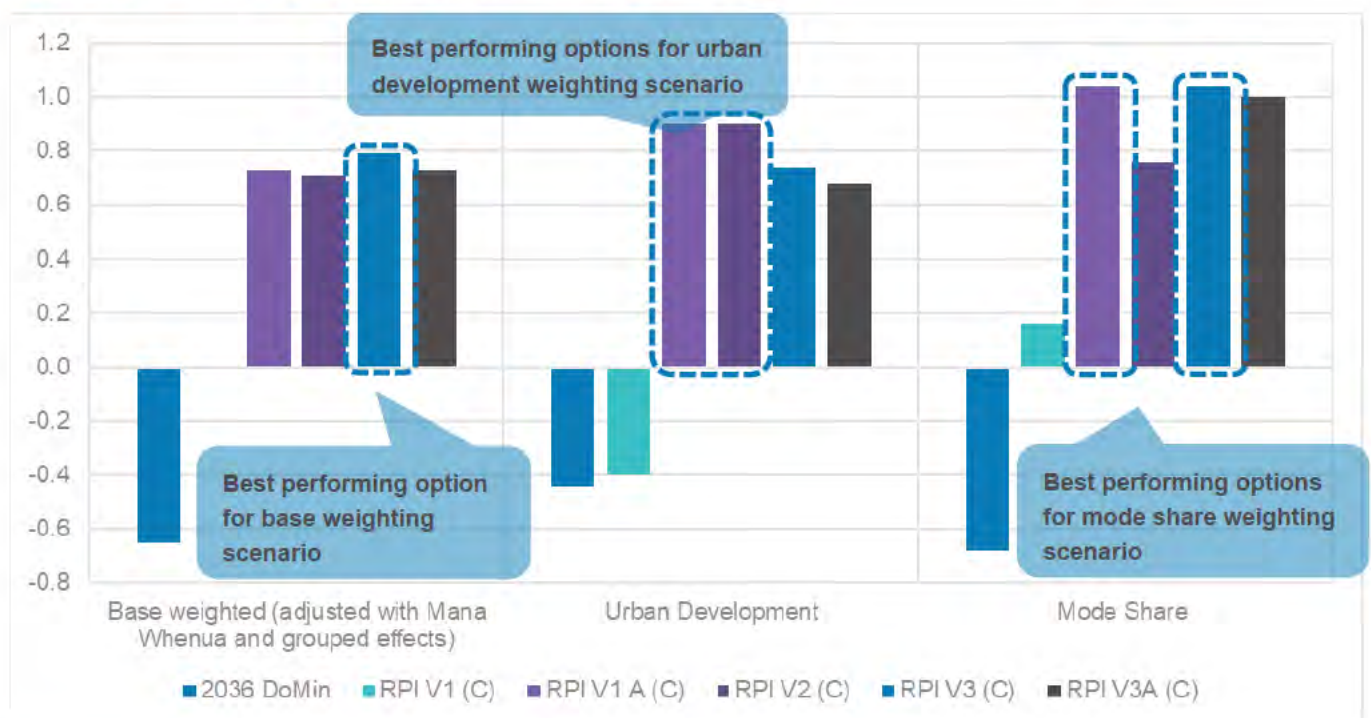


Figure 37: MRT Base Weighting Scenario Results (congestion charge)

These weighting scenarios demonstrate similar rankings to the core programme objective weighting results. The Do Minimum and RPI V1 short list options score the lowest under these sensitivity scenarios, while RPI V1A and RPI V2 score the highest. All options, but particularly RPI V2, RPI V3 and RPI V3A demonstrate improved performance when congestion charging is applied.

QBL Effects – Weighting Scenarios

Figure 38 and Figure 39 present the overall short list option scores based on the RMA Part 2, Social, Economic, Cultural and Environmental effect weighting scenarios. All five scenarios were previously developed as part of the SHI and MRT investigations in 2020 and apply higher percentage weightings against the effects based criteria.

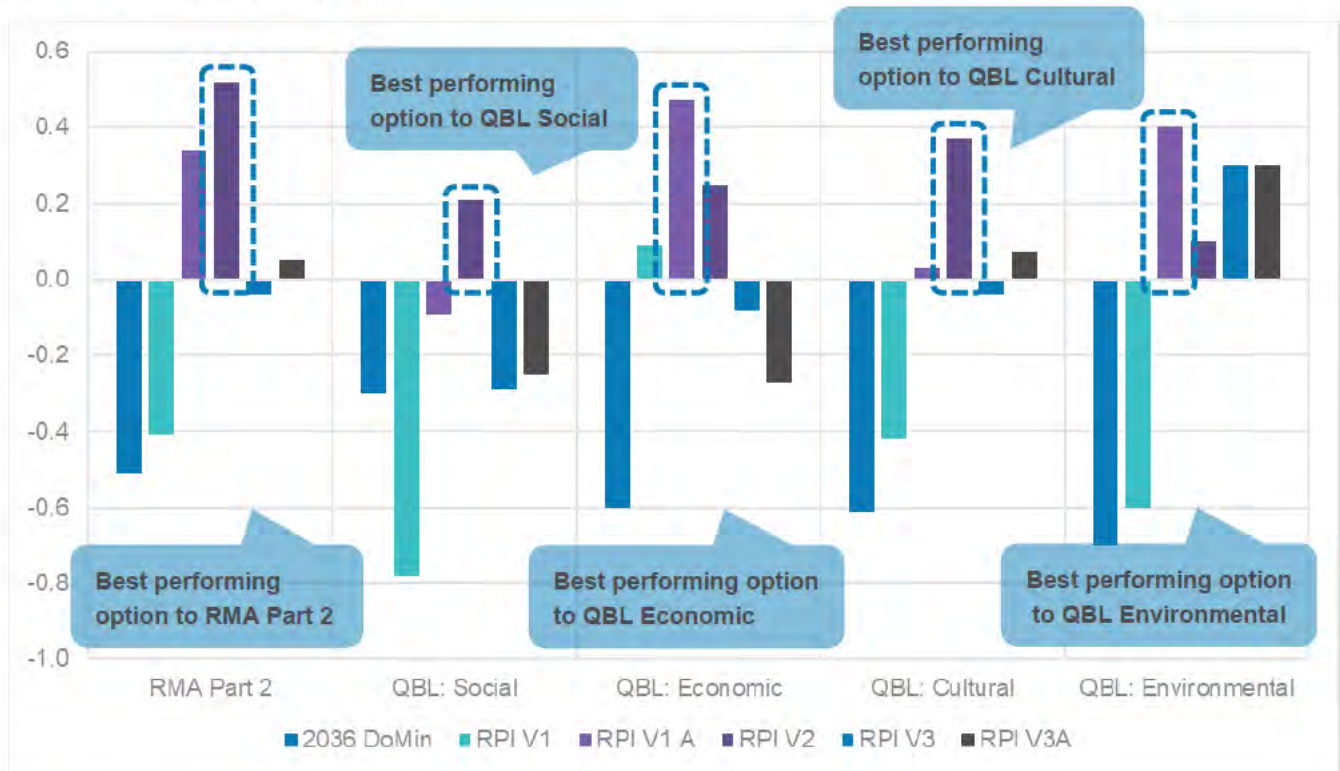


Figure 38: QBL Effects Weighting Scenario Results (no congestion charge)

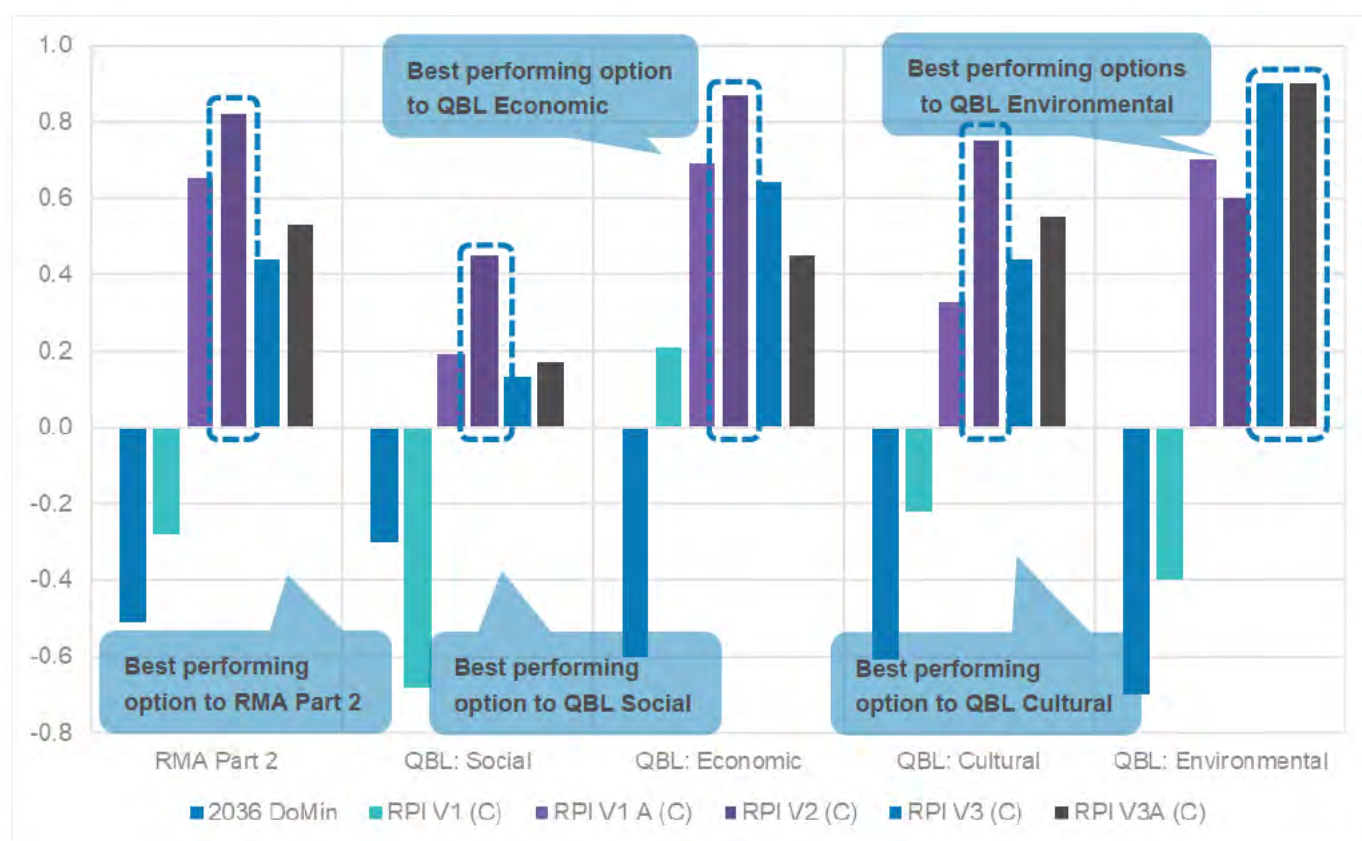


Figure 39: QBL Effects Weighting Scenario Results (congestion charge)

Figure 38 and Figure 39 show the Do Minimum and RPI V1 programme short list options consistently score the lowest across the five QBL effects weighting scenarios applied. These options are assessed as having the most significant negative social, cultural and environmental impacts of all the programme short list options.

RPI V2 scores the highest under the RMA Part 2 and QBL Cultural weighted scenarios due to the lesser impacts it has on sensitive and culturally significant areas. Generally, RPI V1A and RPI V2 score highest in each of the different effects weighting scenarios.

A similar pattern is observed when applying congestion charging to each of the short list options. However, programme short list options RPI V3 and RPI V3A are the exception as they score the highest against the criteria measuring impacts on the environment.

6 Technically Best-Performing Programme

The programme long list and short list investigation and assessments were undertaken by the combined MRT and SHI team for the purpose of identifying the best-performing programme that can be used as a starting point for the further investigations of the MRT and SHI options. This ensures that the package options are consistent with the potential long term transport network for Wellington.

The raw and weighted assessments indicate that programme short list option RPI V1A aligns more favourably with the LGWM programme objectives when compared to the other programme short list options RPI V1, V2, V3 and V3A.

However, RPI V1A has greater negative impacts when considering mana whenua, environmental and social effects, as well as design delivery and operational criteria. Accordingly, it was appropriate to look at the performance of the options when all criteria are considered together.

When considering the weighting schemes developed by the MRT team of “Base” and “Urban Development”, RPI V1A and RPI V2 outperform the other options by some margin. For the “Mode Share” weighting scheme, RPI V1A is clearly the best performing.

The “QBL Economic” and “QBL Environmental” weighting systems also show RPI V1A performing the best, but the RPI V2 performs the best for “RMA Part 2”, “QBL Social” and “QBL Cultural” weighting systems.

The application of congestion charging was shown to not materially impact the ranking of the programme options; RPI V1A still performs the best for the programme objectives and RPI V1A or RPI V2 still top all of the systems except “QBL: Environmental”, which is led by RPI V3 and RPI V3A together. The congestion charge when applied to all options was deemed to have a high positive impact and should be considered in any implementation. It is noted that relatively speaking, RPI V3 and V3A score closer to RPI V1A when congestion charging is included; in fact, these options tend to only score well when congestion charging is included in the programme.

It is noted that the MCA assessment is not intended to address wider considerations such as staging, costs or affordability, or stakeholder and public feedback. These are important considerations in determining the preferred programme to fund but are outside the purpose of this current assessment; however, they will need to be undertaken before a preferred programme is adopted.

In parallel with these other assessments, it is recommended that the MRT and SHI team progress with optioneering and evaluation processes for the combined package options that align with the technically best-performing programme option RPI V1A.

However, as the preferred programme has not been confirmed it will be important for the MRT and SHI team to consider the other programme options too. To this end it is recommended that the MRT and SHI package associated with RPI V2 is also considered as a comparator in the package assessment. This is an important comparator as it offers an alternative longer-term set of outcomes with significantly reduced social and environmental effects which may also be desirable, and important to consider in an RMA sense¹¹.

RPI V3 and V3A should also be included as they provide more affordable solutions that may be appropriate for the short or medium term (or potentially long term). These two programmes are sub-sets of RPI V1A and therefore can be assessed as part of the staging assessment of the package options. This should be done after the sub-options with of RPI V1A have been agreed through the package long list and short list assessment.

¹¹ Fourth Schedule (Clause 6 Assessment of Effects) of the Resource Management Act 1991 requires that consideration is given to alternatives (location, sites, route or methods) in relation to any significant adverse effect on the environment and where the requiring authority does not have an interest in the land sufficient for undertaking the work.

7 Next Steps

It is recommended that programme team proceed with the following actions:

- Include the programme optioneering and analysis reported in this document in the “Pre-Consultation Programme Report” (Deloitte, August 2021).
- Confirm the adoption of RPI V1A as the technically best-performing programme with the LGWM Programme and partners.
- Continue work on understanding the cost, affordability, economics and land use response of the programme options.
- Undertake stakeholder and public engagement on the shortlist of options.
- Once the above is undertaken, update the “Pre-Consultation Programme Report” (Deloitte, August 2021) and confirm the preferred programme with the LGWM Programme and partners.

In parallel, it is recommended that the package team proceed with the following actions:

- Undertake the long-list and short-list assessment for the various RPI V1A package elements as agreed with TAG at the workshop on 3 June 2021. This will help identify the potential MRT extent, SH improvements and active mode connections. The combined package work will seek to identify the more detailed solutions and mitigations for any adverse effects. Whilst undertaking the assessment on RPI V1A, RPI V2 should be retained as an alternative scored option given the reduced social and environmental effects it offers.
- After confirming the best-performing MRT and SHI option, the package elements of RPI V3 and V3A should be considered as part of the staging analysis as interim options (or more affordable long-term options).



Appendix

Appendix A – LGWM Programme Long List Options Report



October 2021

LGWM Programme

Long List Options Report

MRT and SHI team

Document control record

Document control						
Report title		LGWM Programme Long List Options Report				
SHI Document code		508869-0000-REP-KK-0002	SHI Project number		508869	
MRT Document code		IA234000-0000-REP-KK-0001	MRT Project number		IA234000	
File path		https://geodocs.sharepoint.com/sites/SHIMRT/Design/SHIMRT Combined/LGWM Programme Long List Report v0.1.docx?web=1				
Client		Let's Get Wellington Moving				
Client contact		Barry Watkins, Rowan Oliver, Simon Buxton	Client reference		2583 / 2584	
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver
0.1	09/07/2021	Draft for Programme and Partner comment	A. Smith	T. Eldridge P. Peet	-	K. Lam M. Flannery
0.2	08/10/2021	Revised draft for client review	A. Smith	T. Eldridge P. Peet	-	K. Lam M. Flannery
1.0	22/10/2021	Final Draft	G. Lee	A. Martindale K.Krievs	-	K. Lam M. Flannery
Current revision		1.0				

Glossary of Abbreviations

Items	Descriptions
BRT	Bus Rapid Transit
CBD	Central Business District
GWRC	Greater Wellington Regional Council
HOV	High Occupancy Vehicle
IBC	Indicative Business Case
ICP	Initial Corridor Plan
IP	Indicative Package
KPIs	Key Performance Indicators
LGWM	Let's Get Wellington Moving
LoS	Level of Service
LRT	Light Rail Transit
MCA	Multi-Criteria Analysis
Mode	Combination of vehicle type and how/ where that vehicle is operated
MRT	Mass Rapid Transit
PBC	Programme Business Case
Programme Partners	Greater Wellington Regional Council, Waka Kotahi NZ Transport Agency, Wellington City Council
RPI	Recommended Programme of Investment
SHI	Strategic Highway Improvements
SSBC	Single Stage Business Case
TDM	Travel Demand Management
TPG	The Property Group
TQHR	Thorndon Quay and Hutt Road
Waka Kotahi	Waka Kotahi NZ Transport Agency
WAU	Wellington Analytics Unit
WCC	Wellington City Council

Executive Summary

Overview

Let's Get Wellington Moving (LGWM) is working with the people of Wellington to develop a transport system that supports aspirations for how the city looks, feels, and functions. As part of the LGWM programme, a Programme Business Case (PBC) was released in June 2019 which documented a package of network-wide transport programmes for Wellington.

A number of investigations were subsequently progressed in 2020 to refine the programme including:

1. Strategic Highway Improvements (SHI)
2. Mass Rapid Transit (MRT)
3. City Streets
4. Travel Demand Management
5. Golden Mile
6. Thorndon Quay Hutt Road.

These investigations identified that some of the elements within the Recommended Programme of Investment (RPI) and Indicative Package (IP) are not optimal in terms of delivering benefits. They also identified that the cost is likely to be greater than that estimated at the time of completing the PBC.

Furthermore, since the completion of the PBC, other significant factors have arisen, each with potential to reshape the LGWM programme:

- Greater emphasis on climate change commitments
- Increased focus on addressing housing and development challenges for the city and the wider region. There was also an update to the population projections including increased levels of intensification of land use and residents as a result of improvements related to the LGWM investment
- COVID-19.

In light of these factors, programme partners reviewed and updated the programme objectives. As a result of the updated objectives, the changes in the individual elements and the new external factors, the programme team decided to check that the Indicative Package still represented the best way forward for Wellington.

The purpose of this report is to describe the process undertaken to develop and assess a long list of programme options to identify a programme short list that best aligns with the LGWM objectives.

Programme Long List Option Development

The MRT and SHI investigations formed the starting point for the development of the LGWM programme long list as they are the largest components and have the most variability in terms of the options. Each programme long list option was supplemented by elements from the wider LGWM programme.

The programme long list of options was developed to:

- Compare and assess any new options against the original PBC recommendations
- Include the outcomes of the investigations in 2020

- Consider the possibility of a long tunnel from the Urban Motorway to Kilbirnie as an alternative to upgrading the existing SH1 through the central city
- Assess the benefits of an option which invests to the north rather than the east
- Consider an option with no improvements to private vehicle capacity, in order to respond to climate change outcomes
- Evaluate lower cost options, should funding become constrained.




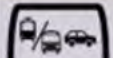




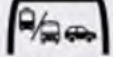













The Local Government Act requires identification of a range of options to be considered and assessed. The options considered included the Recommended Programme of Investment (RPI), Indicative Package (IP), updated RPI and IP options based on dual MRT routes and greater focus on active modes (RPI V1 and RPI V1A), and other alternative versions of the RPI (RPI V2, RPI V1B, RPI V3 and RPI V3A).

Several assumptions were applied to limit the variations of options and focus on the key differentiating factors that fulfilled the programme objectives. At the request of LGWM, options were also considered with and without congestion charging to understand the impact this has on the performance of each long list option.

Technical specialists scored each of the 16 long list programme options against the LGWM programme objectives, environmental and social impacts and design, delivery, and operational criterion. This was undertaken using the Multi-Criteria Analysis (MCA) process outlined in the MRT and SHI Multi Criteria Analysis Framework Report and based on their understanding of the options and likely impacts.

The technical specialists worked alongside partner representatives to determine a score for each of the programme options. Two workshops were held to discuss and moderate the scores and to determine the programme short list for further detailed investigation.

In total, five programme options were short listed for further technical analysis and consideration as shown in Figure 1. The five short list programme options were selected as they best align to the programme objectives and the outcomes sought for the LGWM programme.

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI V1	Island Bay 	Miramar 				
RPI V1A	Island Bay 	Miramar 				
RPI V2	Island Bay 	Miramar 				
RPI V3	Island Bay 	Miramar 				
RPI V3A	Island Bay 	Miramar 				










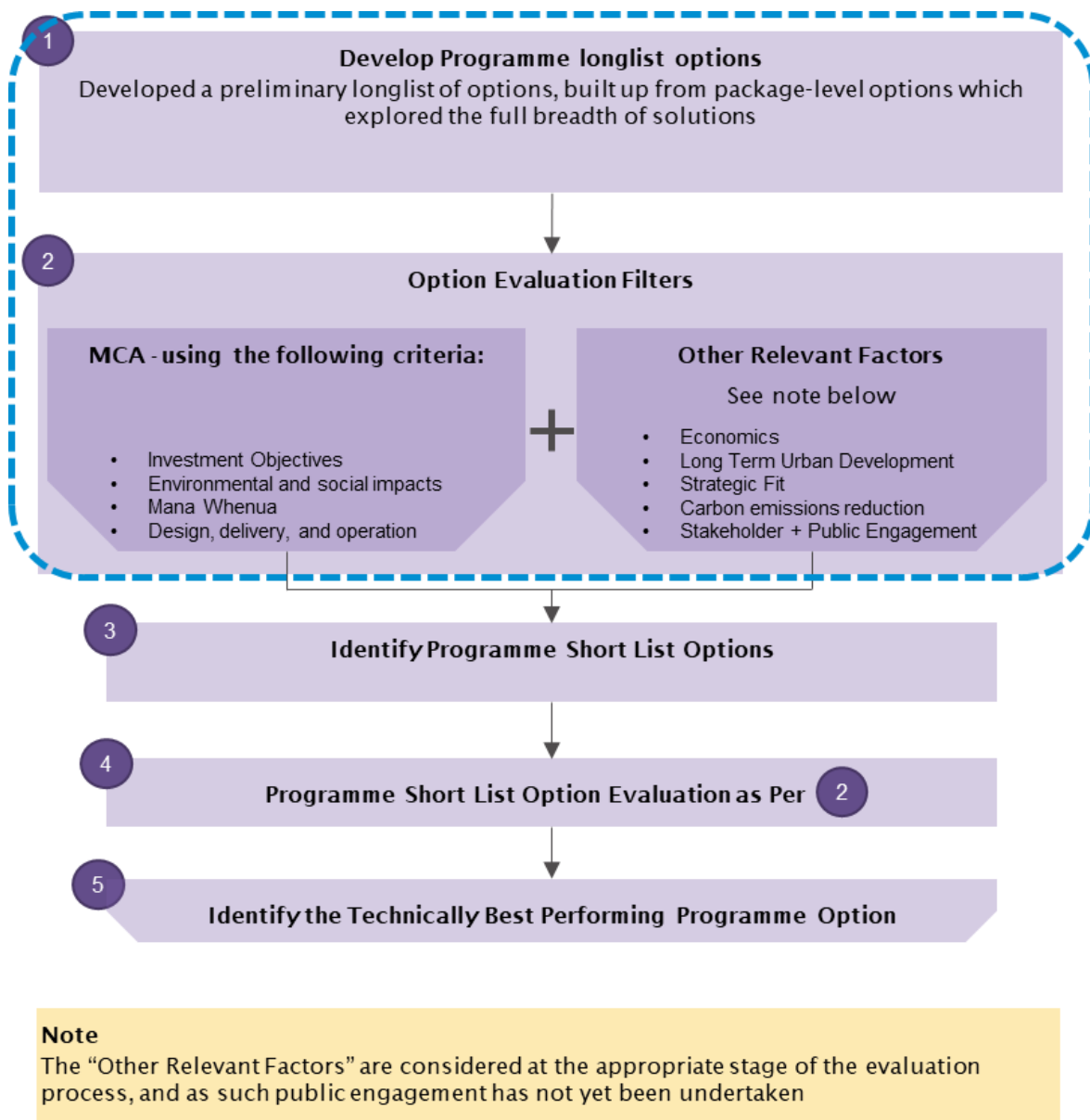
Key:	 - Mass Rapid Transit	 - Enhanced bus services	 - Grade separation	 - At grade improvements	 - General traffic tunnel	 - Shared MRT/ general traffic tunnel	 - Active modes tunnel	 - Covered general traffic trench with active modes above	 - General traffic tunnel
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Figure 1: Programme short list options

The programme long list to short list process applied is summarised in Figure 2.



----- This report

Figure 2: Programme long list to short list process

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1 Introduction

1.1 Overview

Let's Get Wellington Moving (LGWM) is working with the people of Wellington to develop a transport system that supports aspirations for how the city looks, feels, and functions. The LGWM vision for Wellington is a great harbour city, accessible to all, with attractive places, shared streets, and efficient local and regional journeys. To realise the vision the transport system needs to move more people with fewer vehicles.

A Programme Business Case¹ (PBC), released in June 2019 documented a package of network-wide transport programmes for Wellington. The PBC outlined a Recommended Programme of Investment (RPI) with a strong focus on people and the desire to enable improved quality of life.

After consideration of the RPI by Ministers, the Ministry of Transport and Treasury, an Indicative Package consisting of the majority of the projects in the RPI was developed. The final Indicative Package endorsed by the Government attempts to balance delivering a step change in transport in Wellington, while complementing transport investments for the wider Wellington region and remaining achievable within funding constraints.

A number of investigations as part of the LGWM programme were progressed in 2020 and 2021, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Central City Pedestrian Improvements
- Thorndon Quay / Hutt Road Improvements.

These investigations also identified that some of the elements of the Indicative Package may not be optimal in terms of delivering the desired benefits, and the expected cost, due to rising escalation in construction and property acquisition costs, is likely to be greater than previously estimated at the time of the LGWM Programme Business Case (PBC) in 2019.

Furthermore, since the completion of the PBC, other significant factors have arisen, each with potential to reshape the LGWM programme:

- Greater emphasis on climate change commitments
- Increased focus on addressing housing and development challenges for the city and the wider region. There was also an update to the population projections including increased levels of intensification of land use and residents as a result of improvements related to the LGWM investment.
- COVID-19.

In light of these factors, programme partners reviewed and updated the programme objectives. As a result of the updated objectives, the changes in the individual elements and the new external factors, the programme team was instructed by the LGWM Board to check that the Indicative Package still represented the best way forward for Wellington.

¹ <https://lgwm.nz/assets/Documents/Programme-Business-Case/LGWM-PBC-Report-21-June-2019-Draft.pdf>

1.2 Purpose

The purpose of this report is to document the assessment of the long list programme options for LGWM, to identify a short list of options that best aligns with the outcomes sought for the LGWM programme. The remainder of this report is structured as follows:

- **Section two** provides a summary of work completed to date
- **Section three** describes the programme long list development
- **Section four** details the evaluation methodology applied to assess the programme long list
- **Section five** presents the programme long list MCA assessment, sensitivity tests and emerging short list
- **Section six** outlines the next steps.

2 Work Completed to Date

A summary of the work completed to date, including investigations into each element of the Indicative Package are summarised in this section.

2.1 Programme Business Case

The LGWM PBC was approved in June 2019 and identifies a package of network wide transport programmes for Wellington. This includes the RPI, which documents several improvements including:

- Better public transport with high-capacity MRT so people have more travel choices, and buses and trains are more reliable and attractive. MRT from the railway station to the airport via a new waterfront spine, Taranaki Street, the hospital, Newtown, Kilbirnie, and Miramar
- Multimodal State Highway improvements to relocate cars out of the central city and enable better public transport, walking and cycling, and so people can get to key destinations, such as the hospital and airport, more reliably²:
 - Basin Reserve improvements
 - Extra Mt Victoria tunnel and widening Ruahine Street/Wellington Road
 - Reconfiguring State Highway 1 (SH1) into a tunnel under a new city park in Te Aro*
 - Extra Terrace Tunnel*
 - SH1 Southbound widening between Ngauranga and Aotea Quay*

Other integrated interventions that made up the RPI were:

- High-quality walking and cycling so that streets are safer and better places for people
- Urban development and land-use changes integrated with transport, so people have better travel options where they live and work
- Smarter transport network so people and goods make better use of the transport system without more cars.

The RPI identified in the PBC was then presented to a range of political stakeholders, along with a proposal for how to split the funding between central and local government. This included asking for central government funding from the National Land Transport Fund (NLTF) and consolidated revenue.

The fundability of the RPI was tested during the PBC phase. This included requesting advice from the Ministry of Transport and the Treasury on how to fund and finance the components of the RPI. The analysis included an assessment of the anticipated demands on the NLTF and the ability to commit funding and financing over 30-50 years.

This process resulted in the development of a refined 'indicative package' consisting of many of the projects in the RPI. The final indicative package endorsed by the government attempts to balance delivering a step change in transport in Wellington, while complementing transport investments for the wider Wellington Region and remaining achievable within funding constraints.

The Indicative Package which was endorsed and supported by central and local government partners is outlined in Table 1.

² * Not included in the indicative package agreed by Cabinet

Table 1: LGWM Indicative Package³

Component	Description	Objectives
A walkable city	Accessibility and amenity improvements, setting safer speeds for vehicles, and walking improvements	A city that is safe and attractive to walk around
Connected cycleways	Cycleways on Featherston Street, Thorndon Quay, Courtenay Place, Dixon Street, Taranaki Street, Willis Street, Victoria Street, Kent/Cambridge terraces and Bowen Street	A connected and safe city centre cycleway network integrated with the wider cycleway network
Public transport (city and north)	Dual public transport spine through the city centre on the Golden Mile and waterfront quays, rail network improvements and bus priority on Thorndon Quay and Hutt Road	A reliable public transport system that enables Wellington to grow and encourages public transport mode shift, better public transport choices to the north and enables a 30 percent increase in rail peak patronage
Smarter transport network	Full integrated ticketing, transition to integrated transport network operating systems, travel demand management measures including Mobility as a Service, parking policy improvements and education and engagement	A well-managed transport system that makes best use of infrastructure and helps smooth transition through implementation of the Indicative Package
Mass Rapid Transit	Provide MRT as part of the wider public transport network from the Wellington Railway Station to Newtown, and Newtown to the airport	Improves travel choice through the city with an attractive public transport option to the hospital and airport and creates an opportunity to share a more compact and sustainable Wellington City
Unblocking the Basin Reserve	Package of minor at-grade changes to improve reliable access for all modes, Basin Reserve grade separation between north-south movements, east-west movements, and any rapid-transit corridors.	Reduces conflict between different movements and modes creating more reliable access for all modes
Extra Mt Victoria tunnel and widening of Ruahine Street	Extra Mt Victoria tunnel and widening of Ruahine Street / Wellington Road to improve access for buses and dedicated walking and cycling facilities	Improves access, reliability and travel choice from the east for all modes, relocates through traffic from Evans Bay route and Constable Street, onto state highway, and enables network to function while rapid transit constructed (Newtown)

³ MoT, 2020. Let's Get Wellington Moving. Retrieved 25 May 2020, from <https://www.transport.govt.nz/land/lgwm/>

One of the key differences between the Indicative Package and the RPI is that the Indicative Package does not include substantive improvements on SH1 between Ngauranga Gorge and the Basin Reserve. The RPI also included additional capacity at the Terrace Tunnel and along Karo Drive with the objective of removing traffic from the central city and Waterfront to allow road space to be reallocated to public transport and active modes.

The Programme Business Case (PBC) identified further pricing mechanism such as congestion charging in the RPI recognising that it could help to reduce congestion to efficient levels on strategic road corridors to, from and through the central city. It would also be used to encourage use of more space-efficient modes and reduce the impact of traffic flows on sensitive areas in the city, such as the waterfront. Congestion charging was not included in the Indicative Package scope.

Each investigation area of the Indicative Package is discussed in the following sections. Figure 3 provides an overview of the indicative process undertaken to determine a short list for each of the six areas of investigation.

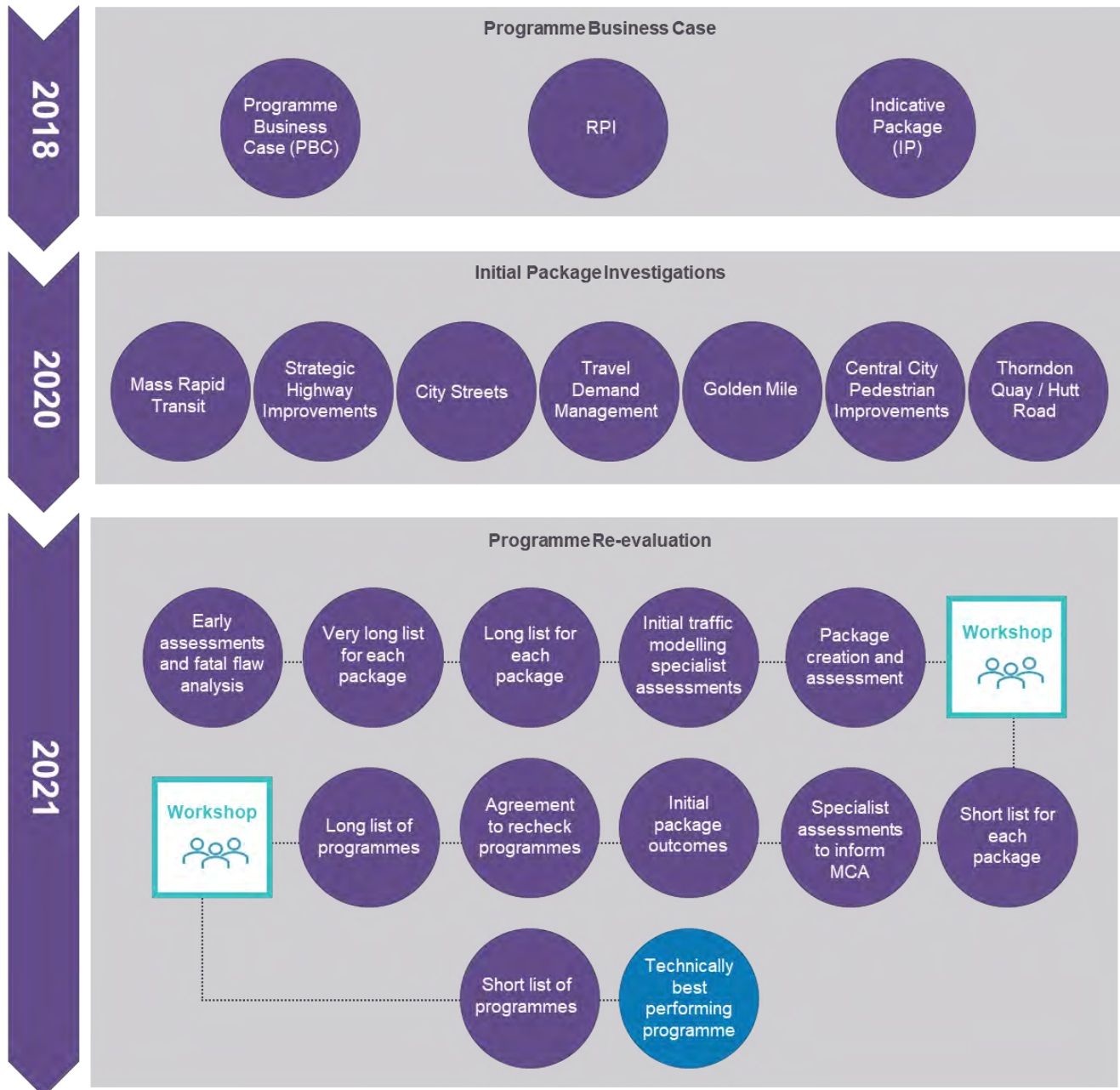


Figure 3: Indicative option development and assessment process

2.2 Mass Rapid Transit

MRT represents a transformative opportunity to offer a better range of transport options, providing increased choice and improved mobility for more people. The MRT package investigates the need for a high-capacity public transport service between the Wellington Railway Station and the eastern and southern suburbs that is frequent, fast, and comfortable.

Work undertaken in 2020 investigated the need for a second public transport spine, while also delivering a public transport step-change to enhance mode shift and encourage an urban development future⁴. MRT investigations sought to identify a short list of potential mode and route options as detailed below.

⁴ Note: As outlined in the Our City Tomorrow – Draft Spatial Plan for Wellington City.

2.2.1 MRT Mode Options

As documented in the standalone MRT Mode Options report, a key consideration for MRT is the identification of a suitable mode for the Wellington environment. Several potential MRT mode options were identified and assessed for their suitability to encourage and enable mode shift in Wellington. A long list of 18 vehicle options were identified and considered including a range of bus and light rail options, along with a cable car, suspended light rail, trackless tram, and heavy rail mode options.

Each potential long list mode option was assessed against the LGWM programme objectives, using a Multi-Criteria Analysis (MCA) framework to identify a short list of potential MRT mode options that best align with the outcomes sought by the LGWM partners. Following the long list mode option MCA, several mode options were discounted from further analysis as summarised in Table 2.

Table 2: Discounted MRT long list mode option

Mode Option	Rationale
Cable Car	This mode option was not progressed as it was considered to be highly susceptible to disruption, particularly in high wind events
Rigid Bus	Whilst such vehicles may provide opportunities to cater for projected growth in the short-to-medium horizon, the required high frequencies to handle long term growth will cause problems with operation reliability and bunching issues. The assessment concluded that a rigid bus option is unlikely to deliver the step change in quality (vehicle and infrastructure) required to shift more trips onto public transport as a long term feasible solution and to meet longer term growth projections.
Bus (biarticulated high floor)	This mode option was discounted as it was not considered to align with the carbon neutrality objective
Suspended Light Metro	This mode option was not progressed as it is unlikely to meet the minimum capacity requirement sought for MRT in Wellington (based on available international examples) and high negative visual amenity and noise impact risks due to its elevated nature in a highly urbanised context
Light Rail 7 and 10 modules	The assessment concluded that the level of capacity would be higher than the forecasted level of passenger demand and would result in unnecessary capital and operational cost
Automated Light Metro, Suburban Rail, Suburban Metro and Heavy Rail	These mode options typically require a grade separated corridor which is not considered suitable for the constrained Wellington environment

Following the long list MCA assessment, the three highest performing MRT mode options were taken forward to the short list for further analysis, these are described below.

Articulated / Biarticulated Bus

Bespoke vehicle design with a tram-like appearance and similar interior layout and level of quality – vehicles range in length from 18 metres to around 25 metres with capacity for 110 up to 180 passengers.

Subject to legal assessment including road controlling authority approval, there is potential for even the longest of these vehicles to operate MRT services beyond the end of the dedicated MRT infrastructure. The rationale for preserving both articulated and bi-articulated sub-options is that this range allows flexibility for size/vehicle capacity to match demand on potential spurs/branches as well as catering for future growth.

Trackless Tram

Distinct from an articulated/biarticulated bus due to its higher capacity (170+ passengers), wider vehicle (2.65 metres) and the potential higher level of automation/route guidance. It is assumed that these features would likely result in the need to contain the vehicle to a defined corridor with dedicated MRT infrastructure (similar to Light Rail Transit) and as such is different to the above articulated/biarticulated bus option.

Light Rail (3 or 5 module vehicle)

With a range from 180 to 240 passengers, a modern low floor Light Rail Transit option can be supplied by a wide range of vehicle manufacturers and are modular and able to be extended to suit future growth and patronage demands.

The MRT mode options all scored well against the LGWM objectives and were all considered to be able to attract new customers by offering high quality vehicles and infrastructure. The long list MRT mode option assessment also recommended that a high level of segregation and right of way is provided to maximise journey time reliability and travel-time competitiveness against private vehicle trips.

For the purpose of assessing the different programme options, technical specialists were instructed to score both a rubber tyre based mode (articulated/biarticulated bus) and a track based mode (light rail). Noting that trackless tram has also been identified as a viable short list mode option for the Wellington environment, it requires equivalent levels of infrastructure investment compared to light rail. To bookend the range of the assessment scoring, trackless tram has been considered comparable to light rail at this IBC phase.

The identification of a preferred mode is largely dependent on the identification of the preferred route/s and will be confirmed following public consultation at the Detailed Business Case stage.

2.2.2 MRT Route Review Process

As documented in the MRT Route Review report, following a comprehensive review of previous documentation conducted over the past decade, 27 different routes were identified as potential MRT core end-to-end route options within the study area, along with five potential Extension Route options.

Given the large number of possible route options that were identified, along with a lack of consistency in terms of their start and end points, the team devised a process whereby options are grouped in segments, with each segment covering an area where there are discrete decisions to be made on alternate route options.

This approach enabled the evaluation of specific route option characteristics such as geometric feasibility, land, and property acquisition requirements in addition to distance, potential road speeds and travel time performance based on benchmarked operating speeds of comparable systems internationally.

Figure 4 shows this process used for developing MRT route options. Through this process, 16 options (plus one sub-option) were assessed against the programme objectives, from which a short list of three options were identified for further investigation.

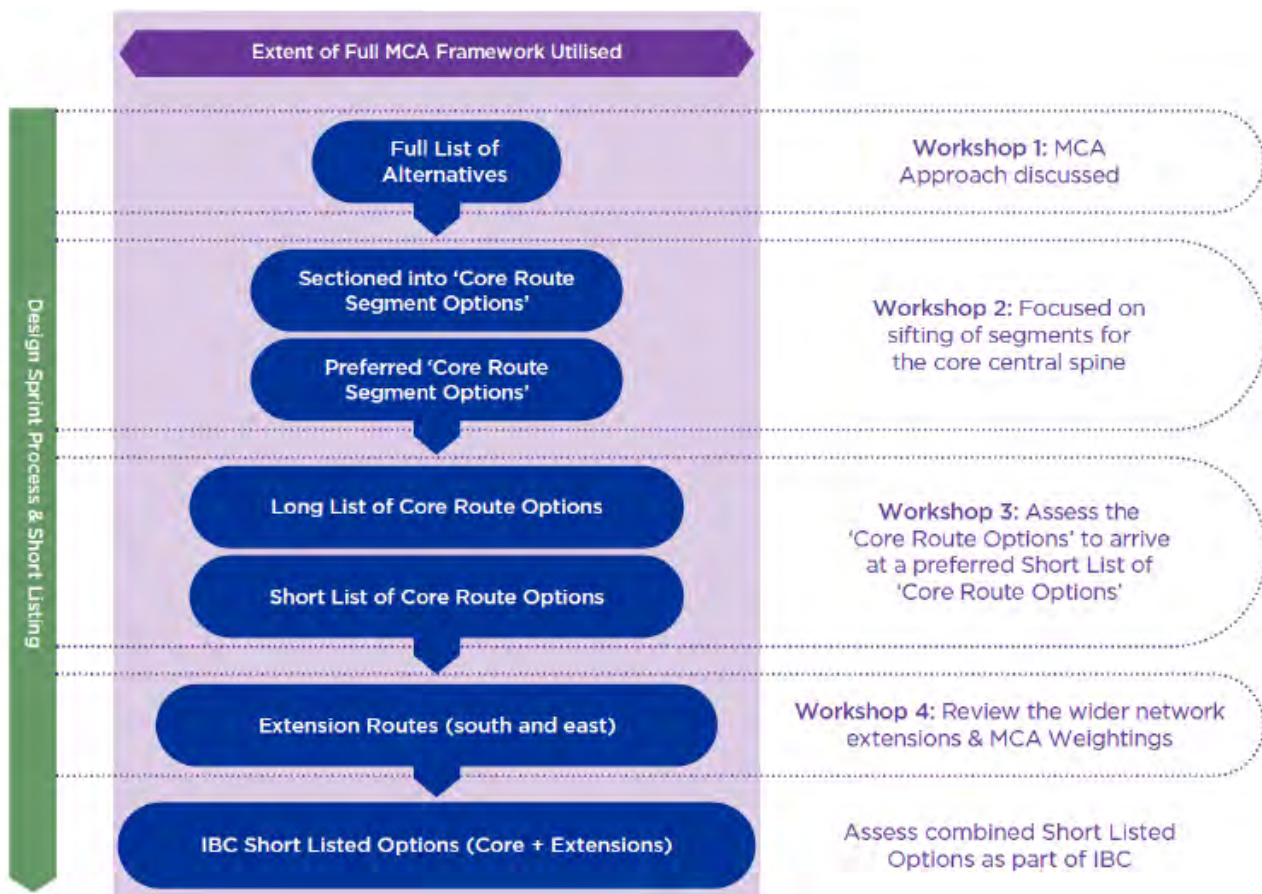


Figure 4: MRT route assessment process

The three short listed options identified for further investigations were:

- Option 3: This option provides a single MRT route that serves the suburbs of Mt Cook, Newtown, Kilbirnie, Miramar and the airport; linking Wellington Railway Station with Wellington Airport. Based on the PBC recommendation, this MRT alignment travels through the central city, uses Pukeahu, Taranaki Street, and the Waterfront Quays.
- Option 3 Grade Separated: This option serves the suburbs of Mt Cook, Newtown, Kilbirnie, Miramar and the airport, linking Wellington Railway Station with Wellington Airport. Through the central city, MRT uses Haining Street (or an alternative), Taranaki Street, and the waterfront quays. The alignment between Taranaki Street and Kent/Cambridge terraces is subject to integration with the SHI solution at the Basin Reserve.
- Option 12: This option provides the maximum coverage which combines a dual spine of a southern corridor to Island Bay and the eastern corridor to Seatoun, Wellington Airport and Miramar north. The southern and eastern corridors would merge at Fifeshire Avenue and use Taranaki Street and the waterfront quays through the central city. The alignment through the Basin Reserve, Mt Victoria tunnel and Fifeshire Avenue/Haining Street is subject to integration with the SHI package for that corridor.



Figure 5: Option 3 route



Figure 6: Option 3 Grade Separated route



Figure 7: Option 12 route

The MCA assessment concluded Option 12 as the best performing technical option and scored highest against the investment objectives and under all MCA weighting scenarios. This option was considered to be the most likely to stimulate urban development along the MRT corridor. It also achieves the desired liveability outcomes and the public transport aspirations for the city.

2.3 Strategic Highway Improvements (SHI)

The strategic highway network connects people and freight to key destinations such as the central city, port, hospital, airport, and eastern suburbs. However, at peak times the queues are long, and traffic moves very slowly. Work undertaken in 2020 aimed to provide a clear direction for improvements at the Basin Reserve and the Mt Victoria Tunnel whilst confirming these projects fit within the future needs of the Ngauranga to Airport SH1 transport corridor and the Let's Get Wellington Moving vision. Firstly, an Initial Corridor Plan was undertaken to understand the future needs of the SH1 corridor. Secondly further investigation was undertaken into the Basin Reserve and the Mt Victoria Tunnel.

2.3.1 Initial Corridor Plan

The first investigation undertaken as part of the Strategic Highway package was an Initial Corridor Plan (ICP), which provided a strategic view of the problems and challenges associated with the Strategic Highway Corridor from Ngauranga to the Airport. The ICP also considered proposed future investment on the Strategic Highway Corridor to identify potential conflicts and/or interdependencies with the wider LGWM programme. It also sought to confirm that investments in the targeted areas would not become redundant or require change by later investment.

As shown in Figure 8 the ICP divided the highway into six geographic areas based on the characteristics of the highway and surrounding area.

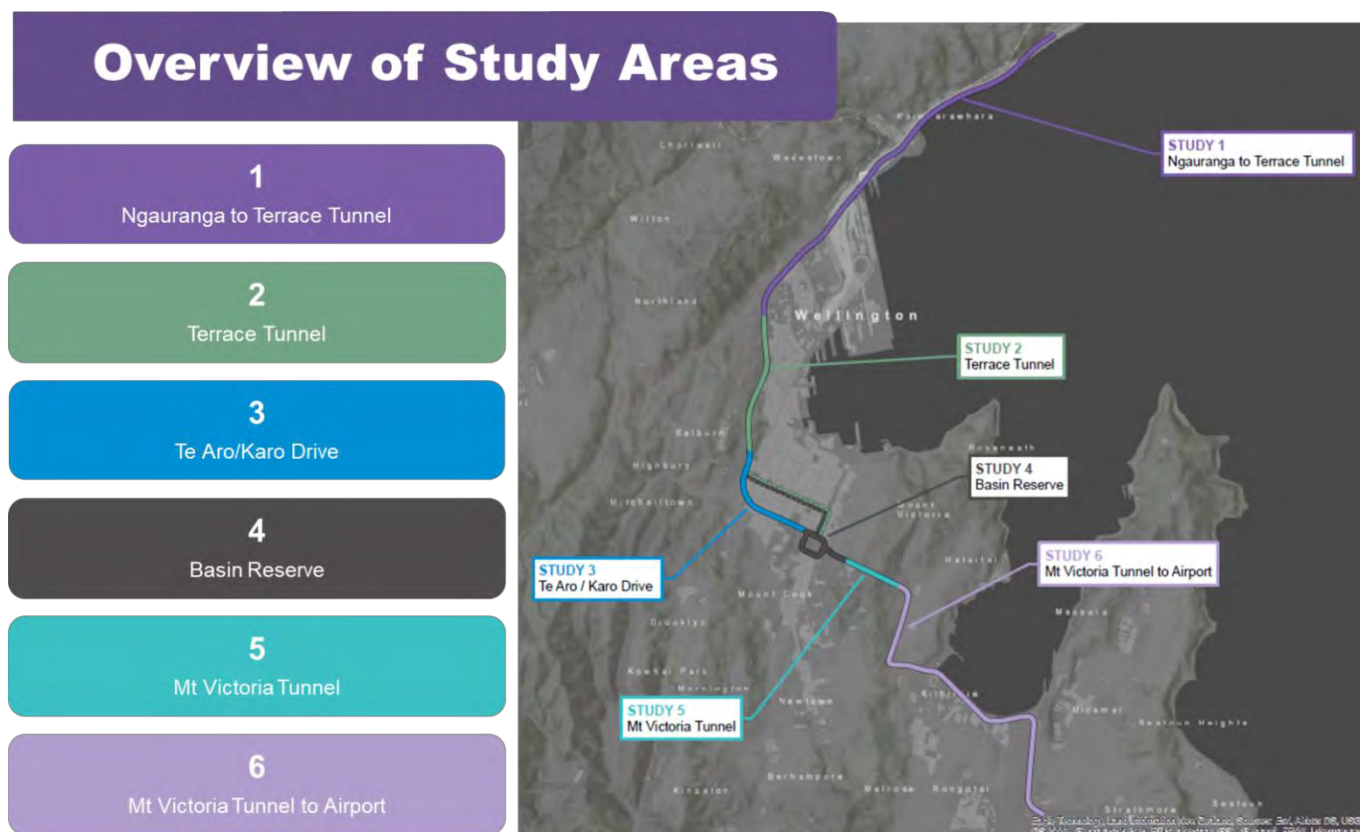


Figure 8: Overview of the SHI corridor

Initial options were identified and developed to address the problems identified within each area and these were filtered down to a short list for each section. Following the shortlisting process, six corridor packages were developed to understand the corridor implications, including low and partial interventions along the corridor. This gave a good understanding of the potential long-term view against which to assess the Basin Reserve and Mt Victoria Tunnel investments.

Basin Reserve

The ICP collated over 40 options for the Basin Reserve, drawing on reports authored in the past two decades, including at-grade improvements, elevated structures, and tunnels. The project team also included new ideas. Two groups of options were shortlisted in the ICP: at-grade improvements and grade-separated options, including an extension of the Arras Tunnel to enable Sussex Street to continue over the state highway and connect back into Cambridge Terrace north of the Basin Reserve. All other options either did not contribute to achieving all investment objectives and/or had significant effects on the surrounding environment.

After the ICP, the remaining Basin Reserve options were expanded to incorporate different potential MRT routes. This was undertaken alongside the MRT team and included transport modelling, effects assessments and 3D concept design. The long list was progressively reduced to a short list through a series of optioneering workshops and additional design development.

The MCA process for the Basin Reserve SHI investigation considered four options:

- At-grade improvements without MRT
- At-grade improvements with MRT
- Grade-separated improvements without MRT
- Grade-separated improvements with MRT.

Each option was assessed against a wide range of criteria, including the LGWM investment objectives (and Key Performance Indicators), effects, and design and implementation difficulty. The results of the MCA assessment suggest that the grade separated options have the strongest alignment to the investment objectives. Grade-separated options will also have greater effects and increased construction difficulties than at-grade options, but many of the effects are less than previous Basin Reserve proposals and can be mitigated. The at grade options will limit the routes MRT can take through the City (as they would prevent some routes through the Basin Reserve) and severely impact the performance of other public transport modes through the Basin Reserve. Should MRT not be provided, the analysis suggests that at grade changes may deliver modest efficiency improvements.

Mt Victoria Tunnel

The Mt Victoria Tunnel and improvements to the east as far as Kilbirnie Park were also considered through the SHI investigation. The ICP considered a parallel tunnel in this location, as well as a range of other options to provide additional capacity through Mt Victoria. New options considered included widening, tunnels for active modes only, or new vehicle tunnels starting and finishing at a range of different locations. The three shortlisted options included:

- A new parallel tunnel immediately north of the existing Mt Victoria tunnel
- A new diagonal tunnel from the Basin Reserve to the intersection of Wellington Road and Ruahine Street
- An active mode only tunnel north of the existing Mt Victoria tunnel.

After the ICP, these options were expanded to allow for the possibility of MRT, high occupancy vehicle lane, different land configurations and widening on different sides of Ruahine Street. As with the Basin Reserve, this was undertaken alongside the MRT team and included transport modelling, effects assessments and 3D concept design.

The long list was progressively reduced to a short list through a series of optioneering workshops and additional design development. All options included a new shared use active modes tunnel to connect Hataitai to Mt Victoria with a purpose-built access that encourages both cycling and walking under Mt Victoria. Analysis of potential catchments for this connection indicates that the latent demand for high quality walking and cycling infrastructure could be significant.

The 2020 investigations considered tunnel alignment, lane allocation and widening along Ruahine Street as detailed below.

Mt Victoria Tunnel Alignment

To determine a preferred tunnel alignment four options were considered:

- Current tunnel retained and shared with MRT plus addition of new active mode tunnel.
- Construct a new two-lane tunnel north of the current tunnel for eastbound traffic and MRT. The current tunnel would be used for westbound traffic and MRT
- Construct a new two-lane tunnel north of the current tunnel for two-way MRT. The current tunnel would continue to be used for two-way traffic noting that there would be no improvement to existing performance
- Construct a new two-lane diagonal tunnel from the Basin Reserve to the Wellington Road / Ruahine Street intersection for traffic only. The current tunnel would be used for two-way MRT.

The MCA assessment concluded that the diagonal tunnel scores highest of all the options, however, this is the most expensive option. The only investment objective against which this option does not rank best is urban amenity / urban development, as it has a significant impact on schools and a church. The parallel tunnel options are the next best options and outperform the active mode only tunnel for both the investment objectives and effects.

Mt Victoria Tunnel Lane Allocation

To determine the preferred lane allocation four options were considered. All options assume a parallel Mt Victoria tunnel north of the existing tunnel and include a separate new tunnel for active modes:

- Two general traffic lanes and two dedicated MRT lanes
- Two general traffic lanes and two shared MRT/HOV lanes
- Four general traffic lanes
- Two general traffic lanes and two HOV lanes.

The MCA assessment concluded that there is a slight preference across the different criteria for dedicated MRT lanes rather than sharing with HOV lanes, but this should be considered further through more detailed modelling. All options are similar in cost (excluding MRT infrastructure), but the benefits increase with additional traffic capacity.

Integration of MRT benefits is required to understand the full economic implications of different lane allocation options. No decision can be made on lane allocation until the MRT route is known and a decision has been made on the best tunnel alignment.

Mt Victoria Widening Along Ruahine Street

Three options were developed to investigate widening of Ruahine Street, which is the key access route to the Mt Victoria tunnel from the southeast, including:

- Widening into the Town Belt
- Widening into properties
- Hybrid option which widens into the properties at either end but utilises Town Belt land around Goa Street.

The MCA assessment concluded that there is very little difference between the scoring of the options under all MCA weighting scenarios. However, the hybrid option generally scored the best. Ruahine Street widening involves significant property impact with over \$100 million of property required for this option. No heritage assessment has been made on the properties through this area and this could further impact the outcome. While none of the properties are currently listed as significant, they could be of an age where, collectively, heritage values exist.

The Town Belt option requires extensive Town Belt land to be impacted, a process that would require public consultation and negotiation with the Guardians of the Town Belt.

The Hybrid option seeks to reduce the extent of Town Belt land required and reduce the property take, resulting in a lower overall cost and reduced impact to existing landowners. This option could also improve the access to the Town Belt. This is the technically preferred option as it appropriately balances the effects across the different areas.

2.4 City Streets

The LGWM programme includes substantial investment in public transport, walking, cycling and amenity/place making to provide enhanced travel choice with a strong focus on the central city and effective and efficient connections between the central city and key sub-urban centres. This investment is collectively known as City Streets.

The City Streets Indicative Business Case (IBC) sets out the case for investment in an optimal city wide, multi-modal package of interventions to maximise a shift away from single occupancy vehicles and provide an indicative implementation strategy for the next phases.

The high-level five stage methodology adopted for City Streets IBC is based on assessing current levels of service against aspirational levels of service for walking, cycling, public transport, placemaking and safety. Through the investment sifting assessment, prioritised interventions were identified towards the areas with the largest levels of service gap which have the potential to influence the largest number of people.

In developing a package of intervention options under the City Street programme, the study area was divided into 163 network sections and over 40,000 data points collected from over 15 data sources to build an assessment tool which considered levels of service for:

- Public transport
- Walking
- Cycling
- Safety
- Amenity/Place
- Growth.

Seven investment scenarios were then investigated:

- Balanced option – treating all levels of service gaps broadly equally with three scenarios considered to test the sensitivity of the tool to incremental changes in the balanced weightings
- Public transport corridor focus– sections prioritised based on PT Level of Service (LoS) gaps walking/cycling corridor focus - sections prioritised based on walking/cycling LoS gaps only
- LGWM indicative funding – a package built bottom up based on the indicative modal funding envelopes arising from the PBC. Two scenarios were tested:
 - Public transport corridors first – where the worst performing public transport sections were selected first up to an indicative \$250m level of investment and then from the remaining sections the combined worst performing walking and cycling sections to an indicative investment level of \$100m.
 - Walking/cycling corridors first – where the worst performing walking and cycling sections in the central city were selected up to \$100m with the remaining sections being prioritised on the basis of the worst public transport levels of service up to \$250m.

Overall a public transport corridor focussed package was found to perform best overall with enhancements made to:

- East-west walking and cycling connections within the Central City
- Walking improvements to key people-moving corridors
- Remove lower priority enhancements
- Include any relevant and high-priority integration considerations arising from delivery of the other LGWM components
- Amalgamate corridor sections to form coherent ‘projects’

The resulting recommended package is made up of 19 projects with a programme capital cost estimate of \$284m. The recommended programme is envisaged to lead to around 3,000 new daily cycle users and, through improvements to public transport reliability, over 4,000 new daily bus trips leading to mode share uplifts of 3.7 percent for trips from Wellington city to the central city and a reduction in transport related carbon dioxide emissions of over 1,000 tonnes per annum.

2.5 Other Relevant Reports

The other key elements of the LGWM programme are the Golden Mile and Thorndon Quay/Hutt Road packages, which are discussed below. The recommended option(s) from each of these packages has been included in the programmes already detailed.

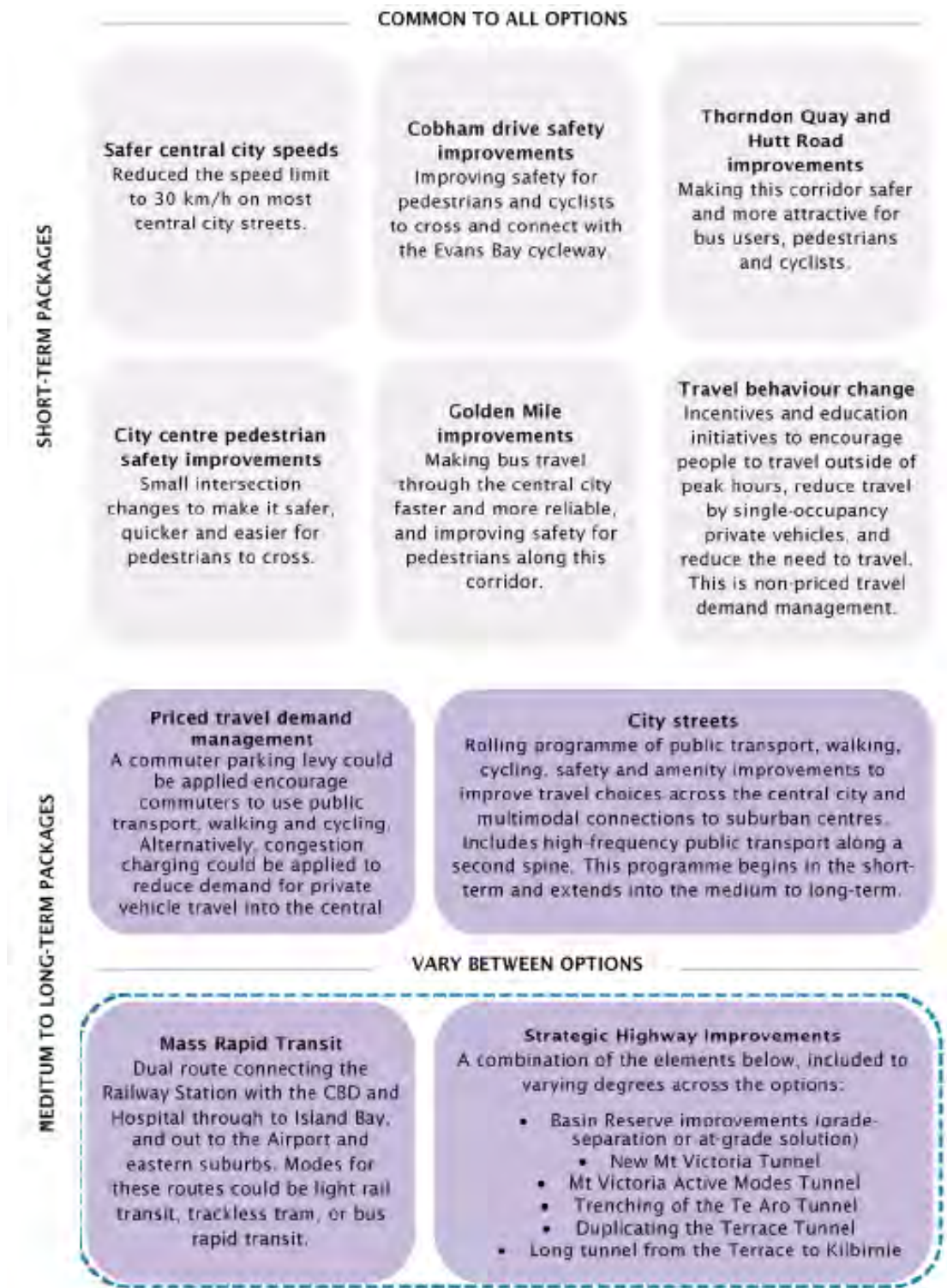


Figure 9: LGWM programme

2.5.1 Golden Mile

The Golden Mile plays a vital role in the success of Wellington's transport system and regional economy. Transecting central Wellington, it provides the core spine to the city's bus network and enables thousands of people to access employment, shop, and other central city destinations each day.

It has very high pedestrian volumes and is also the main bus corridor for moving people to destinations in the central city as well as through the city to other destinations such as the hospital and airport. Most of Wellington City's high frequency bus services travel along all or part of the Golden Mile.

A vision was used to communicate the aspirations for the future of the Golden Mile and guide the development of early interventions. The 2036 vision for the Golden Mile is:

"Connecting people across the central city with a reliable public transport system that is in balance with an attractive pedestrian environment."

To help achieve this vision, the Golden Mile Improvements Project was identified as one of the early delivery projects and defines a package of public transport and pedestrian improvements for implementation as part of the LGWM programme.

The Golden Mile Single Stage Business Case (SSBC) identified a long list of over 150 potential interventions from a variety of sources, including suggestions from the public engagement process. These interventions informed the development of a 'package of interventions' applicable to each of the four sections of the Golden Mile (Lambton Quay, Willis Street, Manners Street and Courtenay Place). By applying a filtering process based on feasibility and effectiveness, the number of scenarios identified for further development was reduced from 256 to 21.

Each of the 21 scenarios were further refined and evaluated using an MCA process, which resulted in a long list of 12 scenarios to be taken forward for further investigation. As shown in the decision tree in Figure 10, through technical assessments and considering corridor-wide trade-offs, the 12 long list scenarios resulted in the identification of three short list options:

- Option 1: Reduced traffic
- Option 2: Bus emphasis
- Option 3: Bus and pedestrian emphasis.

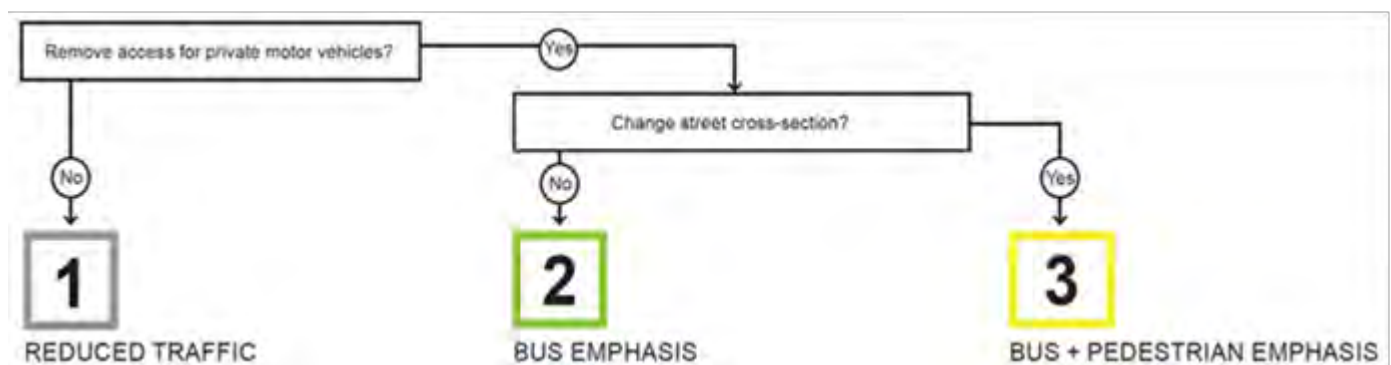


Figure 10: Golden Mile decision tree

Community engagement was undertaken on the three short list options to understand public appetite for each of the options. Following this, the three options went through a detailed MCA process to determine a preferred option. Through this process, the bus and pedestrian emphasis or “Transform” (Option 3) emerged as the preferred option.

The preferred option proposes to remove private motor vehicle access and introduce ten side road closures along the Golden Mile. The option provides one lane for buses in each direction along the entire Golden Mile (plus use of in-line bus stops). This intervention enables the conversion of existing carriageway, particularly on Lambton Quay and Courtenay Place, to new pedestrian / public space areas. As a consequence, there would be an overall increase of pedestrian / public space by approximately 75 percent.

The key outcomes expected through delivery of the preferred option include improved bus reliability and travel times and increased pedestrian / public realm space in the Golden Mile. The preferred option also provides opportunities for dedicated cycling/micro-mobility facilities to be located on Courtenay Place and / or Lambton Quay.

The SSBC is currently being finalised, with the preferred option to proceed to detailed design in the second half of 2021 and construction proposed to start in the second half of 2022.

2.5.2 **Thorndon Quay/Hutt Road**

The Thorndon Quay and Hutt Road (TQHR) SSBC is also one of the LGWM programme early delivery projects. The early delivery workstream is aiming to develop and implement components of the LGWM programme that are capable of progressing in the short-term (up to five years), ahead of the more complex components of the wider programme of investment.

As shown in Figure 11, Thorndon Quay begins just north of the Lambton Quay bus interchange and runs for about 1 kilometre north to the intersection with Tinakori Road where Hutt Road begins. Hutt Road runs parallel to State Highway 1 and the railway for about 4 kilometres to the bottom of the Ngauranga Gorge where State Highway 1 and 2 splits.

With growing numbers of people living and working in Wellington City and the northern suburbs, more people are expected to use Thorndon Quay and Hutt Road.

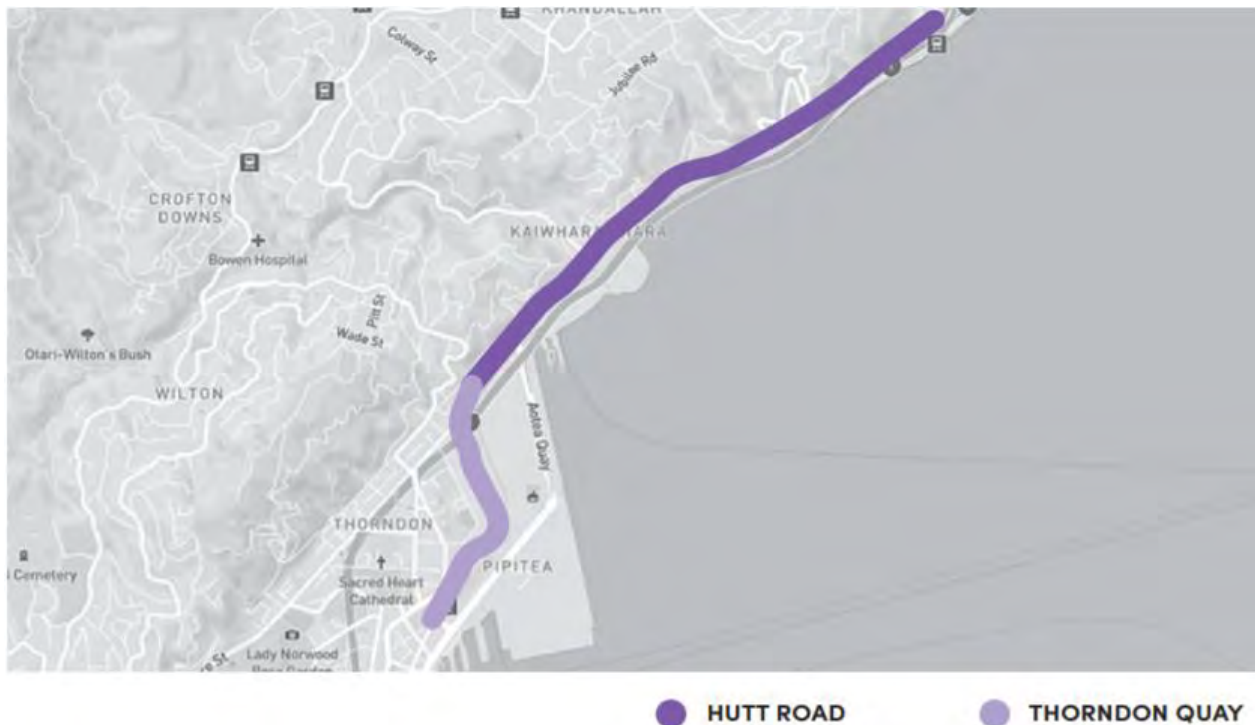


Figure 11: Thornton Quay and Hutt Road study area

The overall vision for TQHR is to recognise the character and humanistic values of the corridor along with the need to improve safety and travel conditions for people who move through and access the corridor. The focus is on bus travel, active modes, and vulnerable road users.

The option development stage identified options which could be standalone projects or combinations of interventions to support a bigger package of investment. The long list of options was assessed using the LGWM MCA framework to identify a short list of options that is currently being considered by the community through a consultation exercise.

The short list proposal for Thornton Quay currently being consulted on includes:

- Providing part-time bus lanes in both directions
- Extending the two-way cycle path from Hutt Road to the bus interchange at Mulgrave Street
- Improving footpaths and the streetscape
- Removing angle parking
- Improving pedestrian crossings.

These proposed changes will allow for future growth of bus users and cyclists and encourage more people to walk, shop and spend time on Thornton Quay. Safety will be improved for everyone through the removal of angle parking, improved pedestrian crossings, and dedicated cycle path.

The short list proposal for Hutt Road also includes:

- Part-time bus lanes in both directions
- Bus priority at the Ngauranga/Jarden Mile intersection.

By proposing bus lanes in both directions, this could improve bus travel times and reliability during peak hours, making buses more reliable and attractive.

The project is also proposing to:

- Upgrade and extend the existing shared cycle and footpath to the Ngauranga/Jarden Mile intersection
- Provide a connection to Te Ara Tupua and a proposed cycle path on Thorndon Quay into the city
- A central raised median to stop traffic making right turns to improve safety
- A roundabout at Aotea Quay (at the entrance to KiwiRail's container terminal currently managed by traffic lights) to provide alternative access to the ferry terminal.
- A roundabout on Aotea Quay to provide a safe turning location for large vehicles wanting to travel north from a property on Hutt Road. This provides additional benefits of reducing traffic, in particular trucks, on Hutt Road by providing an alternative access to the Interislander ferry terminal.

2.5.3 Cobham Drive Crossing and SH1 Safer Speeds

Cobham Drive Crossing and SH1 Safer Speeds aims to provide a safe crossing for walking and cycling on Cobham Drive, and review speed limits on SH1 between Mt Victoria tunnel and the airport, to improve safety. The crossing also seeks to improve access to the new Tahitai walking and bike paths which link the eastern suburbs with the central city. This project is scheduled for implementation in late 2021.

2.5.4 Central City Safer Speeds

Central City Safer Speeds was implemented in 2020, with the aim of encouraging greater mode shift to active modes through the central city. As a result, the speed limit on most central city streets has changed from 50 km/h to 30km/h.

2.5.5 Smarter Transport Network

Investigation will be undertaken into a smarter transport package that makes the best use of existing infrastructure and smooth the transition while components of LGWM are being built and implemented.

3 Programme Long List Option Development

The programme long list to short list process applied is summarised in Figure 12.

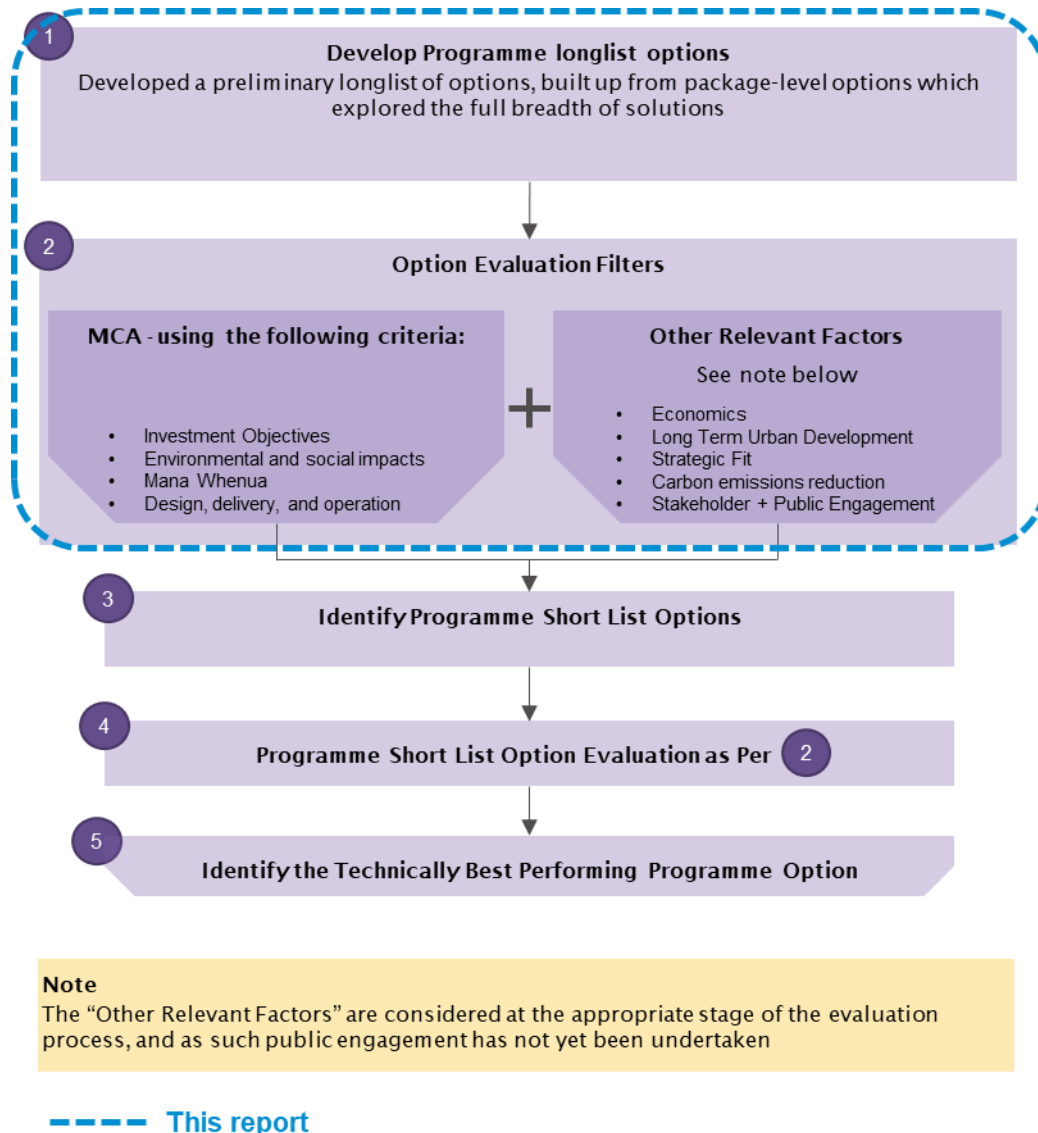


Figure 12: Programme long list to short list process

The MRT and SHI investigations formed the starting point for the development of the LGWM programme long list as they are the largest components and have the most variability in terms of the remaining options. Each programme long list option has also been supplemented by elements from the wider LGWM packages and this is generally the same across all programmes.

Technical assessments and a series of workshops were undertaken to identify the LGWM programme long list and reduce it to a short list as detailed in this section of the report. The long list of LGWM programme options has been developed to:

- Compare and assess any new options against the original PBC recommendations – therefore the RPI and IP were both included as options
- Include the outcomes of the investigations in 2020. Updated RPI and IP options (RPI V1 and RPI V1A) were developed based on dual MRT routes and greater focus on active modes
- Consider the possibility of a long tunnel from the Urban Motorway to Kilbirnie as an alternative to upgrading the existing SH1 through the central city (RPI V2)
- Assess the benefits of an option which invests to the north rather than the east (RPI V1B)
- Consider an option with no improvements to private vehicle capacity, in order to respond to climate change outcomes (RPI V3)
- Evaluate lower cost options, should funding become constrained (RPI V3 and RPI V3A).

The Local Government Act requires identification of a range of options to be considered and assessed.

The additional factors described above resulted in a significant number of options, compared with those identified in the RPI. To limit the number of variations of options and to consider the key factors noted above, the following assumptions were applied:

- Mt Victoria tunnel diagonal only (as parallel tunnel options are assumed to provide a similar level of service and the decision on diagonal or parallel tunnel alignment can be made after the recommended programme has been determined)
- No Mt Victoria tunnel diagonal tunnel without MRT to the east (as this would result in significant additional traffic capacity and limited additional public transport capacity which goes against the LGWM objectives)
- Not differentiating between either Light Rail Transit (LRT) or Bus Rapid Transit (BRT) as the MRT mode (this decision can be made after the recommended programme – although some consideration has been given through the programme process)
- MRT segregation from general traffic is only assumed at the Basin Reserve (but is provided at other locations where space permits)
- No additional Mt Victoria tunnel without Basin Reserve improvements either grade separation or at grade (as without the basin improvements, the additional capacity is not enabled)
- Options were considered with and without congestion charging.

This resulted in 16 programmes (8 with and 8 without congestion charging) as shown in Figure 13, and further detailed in the LGWM Programme Report.

LGWM Programme Long List

All options to be considered with and without congestion charging, shows key differences only. Items in blue have not been developed to same level of detail under IBC process to date.

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI	Airport via Newtown					
IP	Airport via Newtown					
RPI V1	Island Bay	Miramar				
RPI V1A	Island Bay	Miramar				
RPI V1B	Island Bay	Miramar				
RPI V2	Island Bay	Miramar				
RPI V3	Island Bay	Miramar				
RPI V3A	Island Bay	Miramar				

Key:

- Mass Rapid Transit
- Enhanced bus services
- Grade separation
- At grade improvements
- General traffic tunnel
- Shared MRT/general traffic tunnel
- Active modes tunnel
- Covered general traffic trench with active modes above
- General traffic tunnel

Figure 13: LGWM programme long list

The key differences between the programmes include:

- RPI: As per the PBC with **MRT to the airport via Newtown**, a **grade separation** solution at the Basin Reserve, new **general traffic tunnel at Mt Victoria** and **upgraded for active travel, new MRT tunnel** between Newtown and Kilbirnie, and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel
- IP: As per the PBC with **MRT to the airport via Newtown**, a **grade separation** solution at the Basin Reserve, new **general traffic tunnel at Mt Victoria** and **upgraded for active travel, new MRT tunnel** between Newtown and Kilbirnie
- RPI V1: **MRT to the south and east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel** and a new tunnel for general traffic and MRT at Mt Victoria and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel
- RPI V1A: **MRT to the south and east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel** and a new tunnel for general traffic and MRT at Mt Victoria
- RPI V1B: **MRT route to the south**, **enhanced bus services to the east**, a **grade separation** solution at the Basin Reserve, an **active mode tunnel at Mt Victoria**, and a **covered trench for general traffic and above ground active mode connections** at Te Aro and Terrace Tunnel

- RPI V2: **MRT route to the south, enhanced bus services to the east**, an **at grade** solution at the Basin Reserve, with an **active mode tunnel at Mt Victoria**, and a **Long Tunnel** bypassing the city
- RPI V3: **MRT route to the south, enhanced bus services to the east**, an **at grade** solution at the Basin Reserve, and an **active mode tunnel at Mt Victoria**
- RPI V3A: **MRT route to the south, enhanced bus services to the east**, a **grade separation** solution at the Basin Reserve and an **active mode tunnel at Mt Victoria**.

Further detail on the long list option development is detailed in the LGWM Mode and Route reports.

4 Evaluation Methodology

This section outlines the evaluation methodology that has been applied to assess the LGWM long list programme options. This summarised methodology is detailed in the LGWM MRT/SHI MCA Framework Report (August 2021).

The original LGWM programme objectives were reviewed in a joint Partner workshop held in April 2021. The workshop was attended by members of the LGWM Governance Reference Group, LGWM Partnership Board (the Board), and councillors from GWRC and WCC. During the workshop participants reviewed the existing objectives and weightings for the programme.

The workshop provided attendees with an opportunity to clarify the intent of certain objectives and to reconsider the objectives to reflect emerging issues (such as climate change, COVID-19, population growth and housing supply), together with new and updated policy direction, and following the initial investigations undertaken in 2020. Key feedback from workshop attendees included:

- The need for greater focus on carbon emission reduction and mode shift
- The importance of safety as an integral part of the programme
- The need for clarity on the meaning of liveability in the programme context
- The importance of housing intensification, urban development, and urban amenity
- The need to consider equity of access.

Following the workshop, the LGWM Board considered the feedback, alongside technical considerations, and agreed to amendments some of the original objectives and weightings, as summarised in Table 3.

Table 3: LGWM programme Investment Objectives

Ref	Previously Approved	Previously Applied	Updated	Weight
IO 1	Liveability Enhances the liveability of the central city	Liveability Enhances the urban environment and helps enable appropriate development	Liveability Enhances urban amenity and enables urban development outcomes	20%
IO 2	Access A transport system that provides more efficient and reliable access for users	N/A	Access A transport system that provides more efficient and reliable access for users	15%
IO 3	Reduced Private Motor Vehicle Reliance Reduces reliance on private vehicle travel			40%
IO 4	Safety Improves safety for all users			15%
IO 5	Resilience Is adaptable to disruption and future uncertainty			10%
IO 6	N/A	Carbon Moves Wellington towards its carbon neutral goals	*Combined with IO 3	N/A

Investment Objective 1 (Liveability) was revised to be a more outcome-focused objective that includes urban amenity/development. Investment Objective 3 (Reducing Private Motor Vehicle Reliance) was also expanded to include carbon emissions.

4.1 Assessment Criteria

As shown in Figure 14, the programme long list was assessed against all of the programme objectives as well as environmental and social impacts, and design, delivery, and operation criteria.

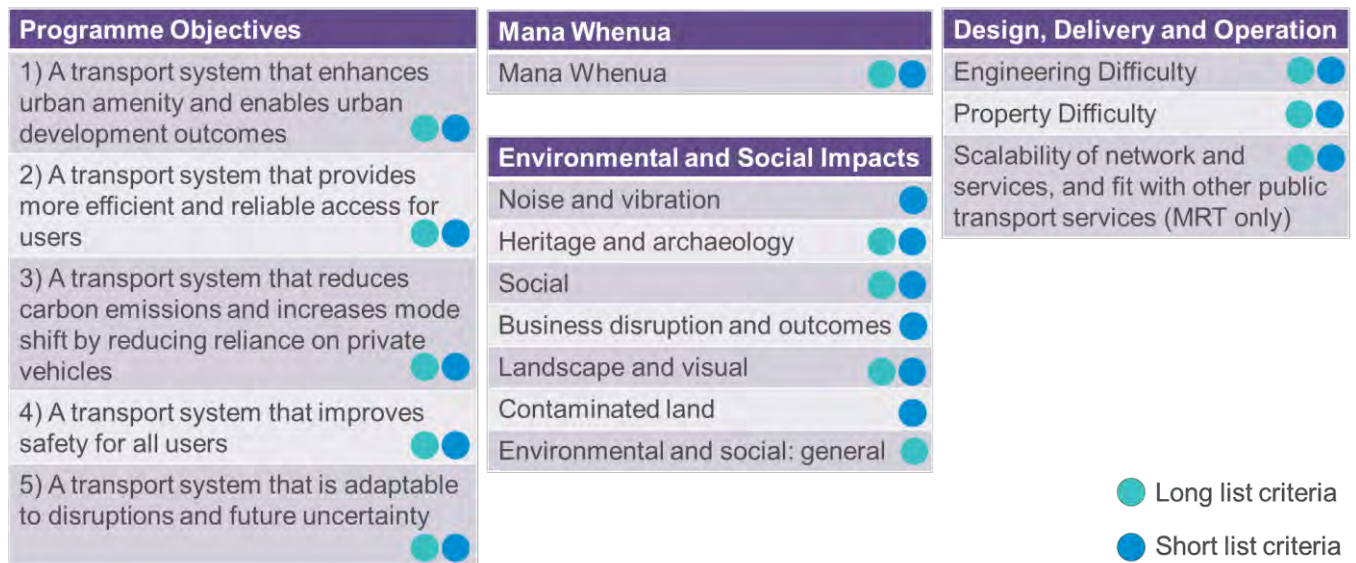


Figure 14: MCA framework applied to assess the programme long list

The criterion assessed at the long list stage are shown by the teal circles in Figure 14. The Long List assessment criterion were agreed by the Partners and Technical Advisory Group in a workshop in May 2021. The remaining criterion (shown by the blue circles) and the individual KPIs within each investment objective will be used to assess the programme options at the short list MCA stage.

5 Programme Long List Assessment

Technical specialists were tasked with working with Partner representatives to determine a score for each of the long list programme options. The scoring system used an 11-point scale as shown in Table 4. All options were assessed against the 2036 Do Minimum scenario⁵.

Options can, and have been, scored as fatally flawed in previous assessments (refer to the LGWM route review and ICP reports). A score of -5 is not fatally flawed but does need to be carefully considered in relation to potential mitigations and balanced with the benefits of the intervention.

Table 4: Scoring guide

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / performance benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, low cost or minor impacts on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impacts on resources/values and/or long term/permanent

Options were scored both with and without the application of congestion charging (CC) as summarised in Table 5. PwC were commissioned by the LGWM programme to undertake a study of congestion charging. The PwC recommended congestion charge assumptions were used to inform a sensitivity test. A congestion charge scenario was assessed by the technical specialists for each option using the following assumptions:

- Cordon inside of SH1
- \$3.50 inbound in AM peak, \$1.75 inbound / outbound in Inter-peak, \$3.5 outbound in PM peak

⁵ The Do Minimum is 2036 with the baseline (2019) land use scenario and assumes no additional intensification and assumes crowding and unreliability on the Golden Mile and key arterials. The short term programme elements of LGWM are consistent across all package options, i.e., Golden Mile, City Streets and Thornden Quay/Hutt Road improvements are delivered, along with a second public transport spine, but these interventions are not included in the 2036 Do Minimum scenario.

The approach for modelling assumed that the \$3.50 charge (in 2013 dollars) is applied to all vehicles crossing the cordon. In terms of implementation, the \$3.50 is factored down by 0.76 to 'deflate' to a 2001 price base. Therefore, in reality, a \$3.50 charge in 2013 would (considering inflation) be more like \$5 if implemented today.

Two workshops were held with the Technical Advisory Group to discuss and moderate the scores and to determine the programme short list. During the first workshop, each technical specialist presented their assessment methodology, outlined key considerations, including the level of detail, and provided proposed scores. Workshop attendees were asked to understand and challenge the scores.

Following the workshop and participant feedback, each technical specialist was asked to review the scores in light of the discussions, in consultation with partner representatives. During the second workshop the technical specialists presented the updated scores shown in Table 5 and attendees were asked to confirm the scores.

Table 5: Programme long list scores

Programme	Programme Objectives					Mana Whenua	Environmental and Social Impacts			Design, Delivery and Operation		
	Liveability	Access	Carbon Emissions and Mode Shift	Safety	Resilience	Mana Whenua	Heritage and Archaeology	Landscape and Visual	Environmental and Social General	Engineering Difficulty	Property Difficulty	Scalability of Network and Services
RPI	3	3	-3	4	3	0	-4	-2	4	-5	-5	-2
RPI (C)	4	3	0	4	3	0	-4	-2	4	-4	-5	-2
IP	2	1	-1	3	2	-2	-4	-2	3	-4	-4	-2
IP (C)	3	2	1	3	2	-2	-4	-2	3	-3	-4	-2
RPI V1	4	5	-1	4	3	2	-4	-3	4	-5	-5	3
RPI V1 (C)	4	5	2	4	3	2	-4	-3	4	-4	-5	3
RPI V1 A	3	3	0	3	2	1	-4	-3	3	-4	-4	3
RPI V1 A (C)	4	4	2	3	2	1	-4	-3	3	-3	-4	3
RPI V1 B	3	3	-2	3	1	2	-3	-1	3	-5	-4	4
RPI V1 B (C)	4	4	0	3	1	2	-3	-1	3	-4	-4	4
RPI V2	3	4	-3	4	1	2	2	-2	4	-3	-3	2
RPI V2 (C)	4	4	-1	4	1	2	2	-2	4	-2	-3	2
RPI V3	2	1	3	2	1	-1	0	0	2	-4	-3	2
RPI V3 (C)	3	3	5	2	1	-1	0	0	2	-3	-3	2
RPI V3A	2	2	2	2	1	2	-2	-1	3	-4	-3	4
RPI V3A (C)	3	3	4	2	1	2	-2	-1	3	-3	-3	4

Note: Options with (C) denotes 'with congestion charging'.

5.1 MCA Scoring Discussion

This section provides a summary of the scoring of the options related to the investment objectives, environmental and social impacts and design, delivery, and operational considerations.

Investment Objective 1 – Liveability

The liveability investment objective assessment considers how programme option enhances urban amenity and enable urban development outcomes. The results show that RPI V1 was the highest scoring programme option against this investment objective, without congestion charging. This Programme option was considered to provide the most positive amenity improvement and captures a high urban development enablement due to the dual MRT corridor to the south and east, active mode infrastructure coupled with improved access to/from the north.

When congestion charging was included, five of the eight congestion charge programme options (RPI (C), RPI V1 (C), RPI V1 A (C), RPI V1 B (C) and RPI V2 (C)) scored the same as RPI V1. This largely reflects increased amenity enhancement and urban development enablement from reduced vehicle volumes in city centre following the implementation of a charge. RPI V1, in contrast did not improve by the same respect as the specialist considered that receiving the upper end of the scoring scale would indicate that there is 'a high degree of confidence that substantial benefits will be realised' which was not deduced at this stage of the assessment and will requires further detailed quantitative assessment.

Scoring of liveability for each of the long list programme options is shown in Figure 15.

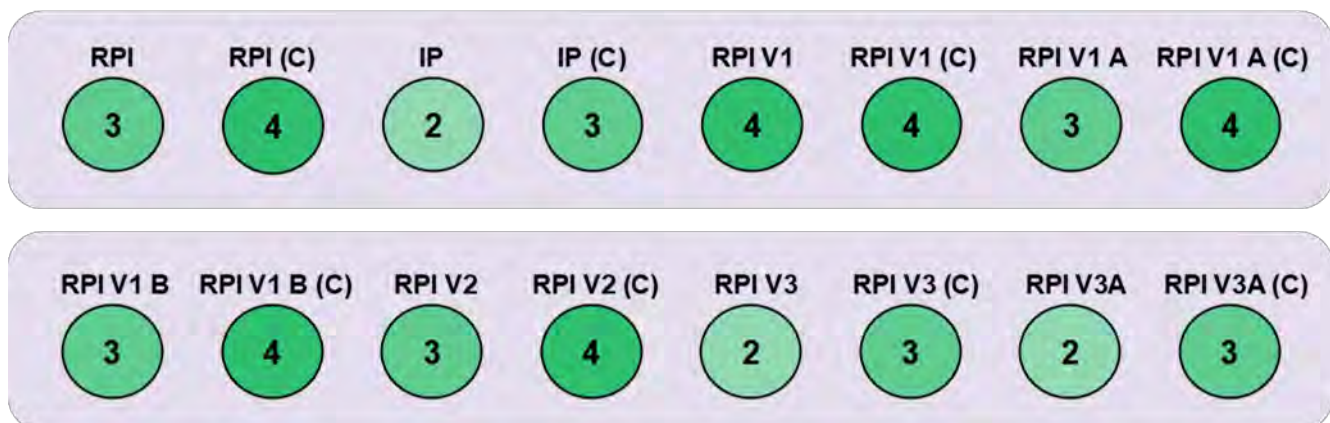


Figure 15: Liveability scoring

Investment Objective 2 – Access

Scores for this investment objective were based on an assessment of access and level of service for all modes within the study area. All programme options received a positive score reflecting the proposed investment in public transport and active mode infrastructure resulting in improved access.

RPI V1 scores slightly higher than all other options as it provides active mode upgrades, two MRT routes and a full suite of state highway upgrades. RPI V1A, RPI V1B and RPI V2 also score well but less than RPI V1 as it does not contain the full range of elements.

Scores for both IP and V3 were given more modest positive score as the combined components were considered to generate lower improvements towards multi-modal performance outcomes. For example, IP assumes a MRT alignment that is sub-optimal in that it creates issues with service duplication and introduces transfers which reduces PT customer experience. Moreover, the option does relatively less for active travel modes compared to other options. Similarly, for RPI V3 whilst this option does propose

improvements for PT and active mode users it does little for remaining general traffic users without further improvements on the Basin and Mt Victoria facilities.

Congestion charging has a more significant effect on the access investment objective score for programme options that propose limiting additional capacity.

Scoring for access for each of the long list programme options is shown in Figure 16.

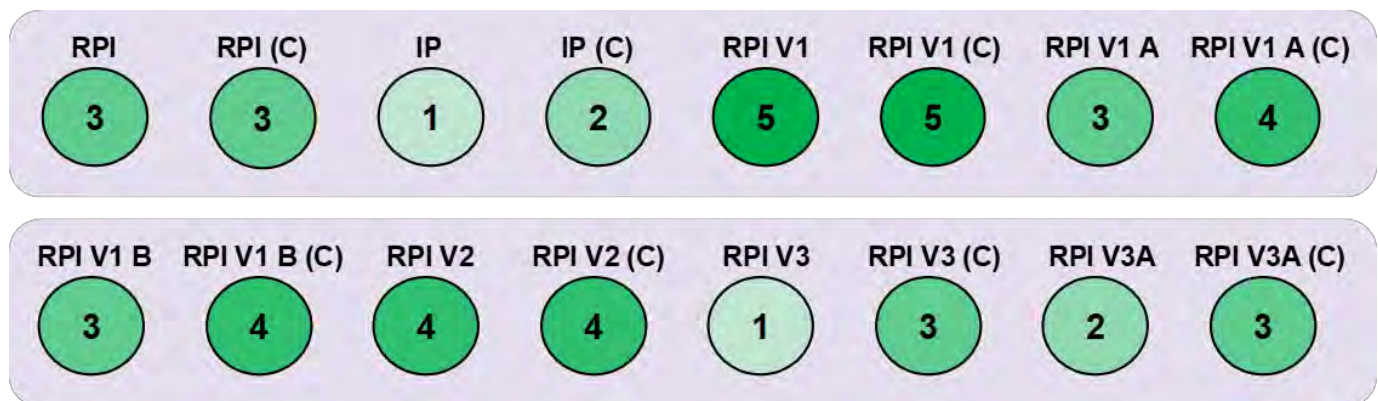


Figure 16: Access scoring

Investment Objective 3 – Carbon Emissions and Mode Shift⁶

The key aspects of the Carbon Emissions and Mode Shift investment objective are mode share and carbon (emissions and embodied only).

The approach to undertaking evaluation at the programme longlist level was through qualitative assessment, rather than relying on detailed modelling. A workshop was held with relevant TAG members and the scores were agreed at an overall investment objective level. This was different to the approach taken during the shortlisting exercise when modelling and other analysis was used to inform an assessment against a number of KPIs. The scores awarded at the long list level were heavily influenced by the carbon neutrality aspect of the investment objective – options that provided significant additional capacity for traffic were awarded a negative score whereas options that reduced traffic capacity and reallocated road space in favour of public transport and active modes were awarded a positive score. At the short list level, when the full KPI analysis was undertaken, there was less differentiation between options.

It is important to note that scores may differ if the design assumptions were to change. As an example, the score for RPI V1A would be positive if capacity in the second Mt Victoria Tunnel was dedicated to public transport.

RPI V3A performs best overall with and without congestion charging. This is due to lower levels of embodied carbon and reduced traffic capacity, which is likely to encourage mode shift.

RPI and RPI V1B performs worse than RPI V1A due to the more restricted MRT network and the additional traffic capacity provided for private vehicle travel from the north. RPI V2 performs worse than the other options due to it providing a more restricted MRT network, and encouraging additional longer distance, regional traffic movements. For example, vehicle movements from the eastern suburbs to the Hutt Valley.

⁶ It is noted that this investment objective is referred to as "Reduced Private Motor Vehicle Reliance" in the remaining sections of this report and supporting appendices.

Scoring for carbon emissions and mode shift for each of the long list programme options is shown in Figure 17.

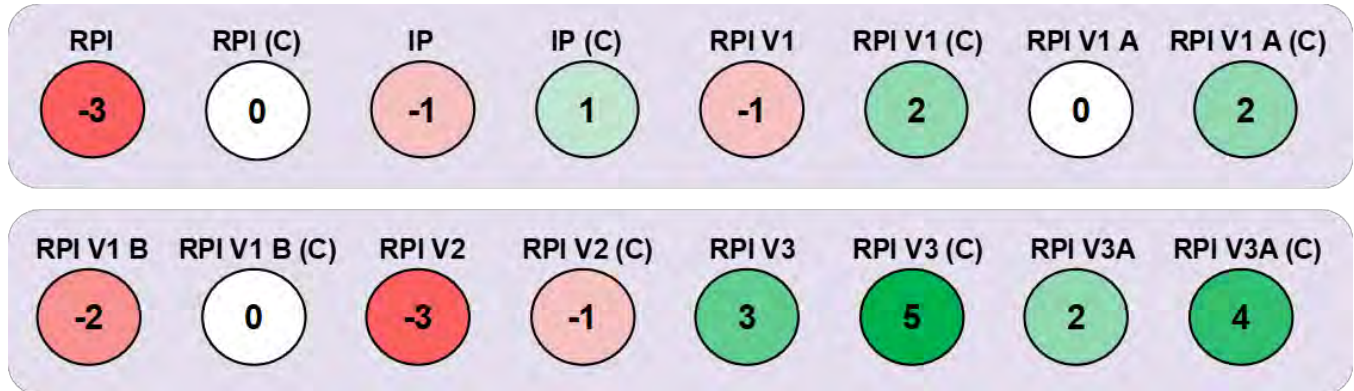


Figure 17: Carbon emissions and mode shift scoring

Investment Objective 4 – Safety

The key aspects considered for this investment objective was the likely safety impact on active modes and other users. City Streets, Golden Mile and Thorndon Quay / Hutt Road improvements were assumed to provide a baseline of safety benefits, which contributed to a score of at least 2 for each option.

The higher scores reflect the level of safety improvements proposed within each programme and the removal of traffic from local roads.

RPI, RPI V1 and RPI V2 are expected to provide the most safety benefits of all the options due to them providing the greatest level of new safe infrastructure and removing traffic from other streets.

Congestion charging is likely to reduce the level of vehicular traffic, however this may result in a higher operating speed of vehicles, which could result in more serious injuries. Whilst mitigation measures could address these negative impacts, mitigation measures were not assumed when the technical specialists assessed the programmes based on this investment objective.

Scoring of safety for each of the long list programme options is shown in Figure 18.

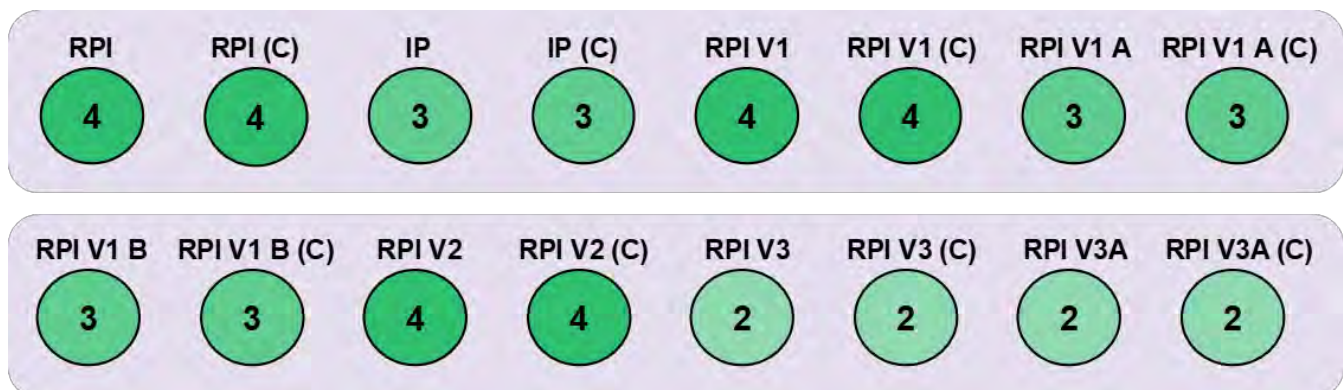


Figure 18: Safety scoring

Investment Objective 5 – Resilience

This investment objective was scored based on three sub-criteria:

- The ability of a programme option to enhance the resilience of land transport access to critical facilities and within the city (operational resilience)
- Resilience to high impact, low probability events and contribution to access for communities
- The ability of a programme option to enhance resilience of access, and to provide socio-economic functionality in low impact, high probability events as well as during unplanned events (redundancy).

A higher weighting was applied to operational resilience and redundancy. Programmes that included new tunnels and a higher quality MRT systems that were designed to have greater resilience than current bus vehicles scored best. Programmes that did not provide additional redundancy scored lowest.

Congestion charging had little to no impact on the results.

Resilience scoring for each of the long list programme options is shown in Figure 19.

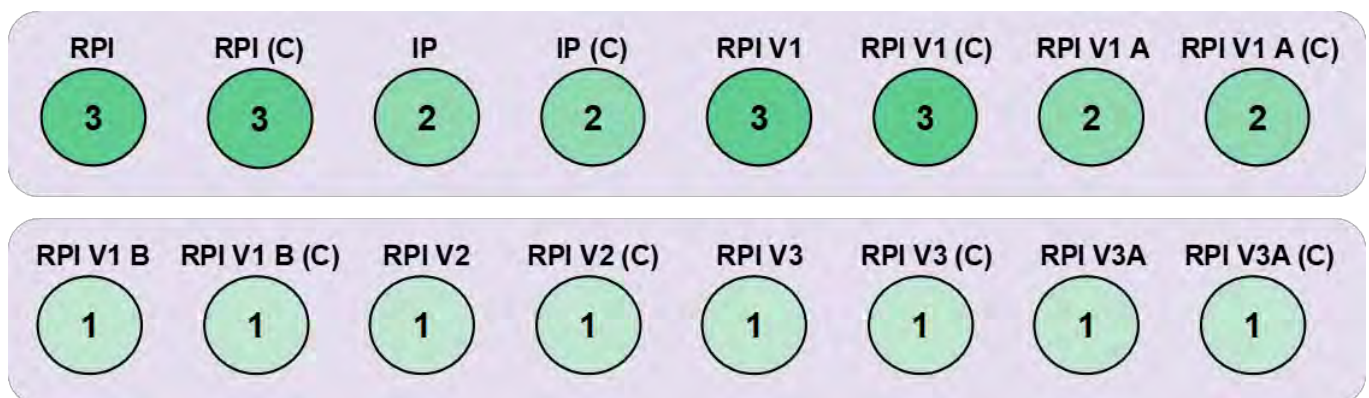


Figure 19: Resilience scoring

Mana Whenua

The long list programme options were all scored against a set of Mana Whenua values developed by iwi partners' representatives, with the authority of the iwi partner organisations Taranaki Whanui and Ngāti Toa. These values are:

1. Whakapapa - A sense of place
2. Wai-ora - Respect the role of water
3. Pūngao-ora – Energy
4. Hau-ora – Optimising health and wellbeing
5. Whakamahitanga - Use of materials
6. Manaakitanga – Support a just and equitable society
7. Whakāhuatanga - Celebrate beauty in design

These results show IP as the lowest scoring option in the assessment against this criterion. The major contributor to this low overall scoring is this option does not reclaim Karo Drive, resulting in negative sub-criteria scores against the values of Whakapapa, Hau-ora, Manaakitanga and Whakāhuatanga.

Options RPI V1, RPI V1B, RPI V2 and RPI V3A scored highest against this criterion due to the Whakapapa, Hau-ora, Manaakitanga and Whakāhuatanga opportunities presented by reclaiming Karo Drive and improving environments for people at Ruahine Street and around the Arras Tunnel.

Congestion charging had little to no impact on the results. Scoring of Mana Whenua for each long list programme option is shown in Figure 20.

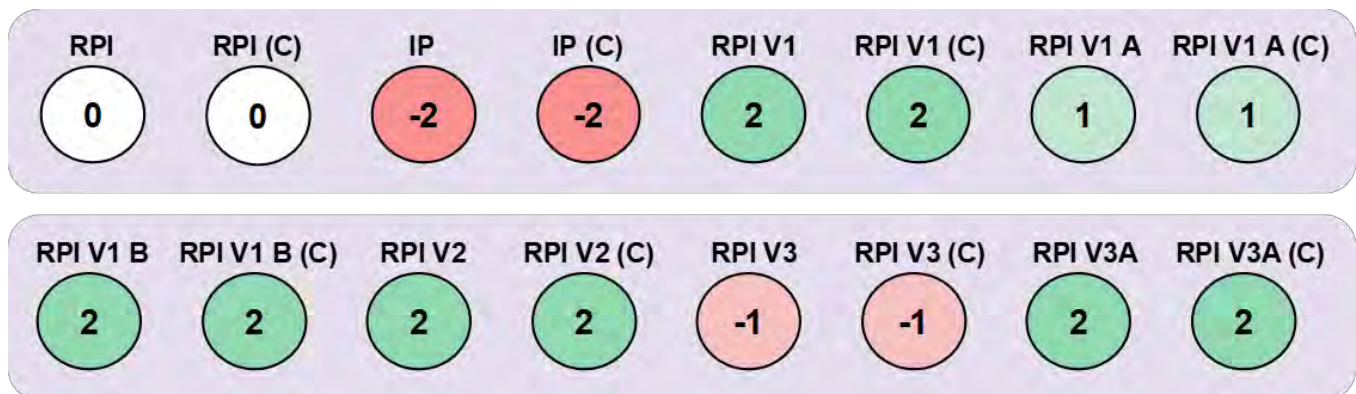


Figure 20: Mana Whenua scoring

Effects – Environmental and Social: Heritage and archaeology

The effects of the programme options on heritage and archaeology were scored by technical specialists based on the likely impacts on character areas, heritage building(s) and the Town Belt. In particular, the assessment considered:

- Impact of a new Mt Victoria tunnel on the adjacent character areas
- Impacts of widening around Basin on existing pre-1900 area of development and on connectivity between places with heritage value
- Impact of Te Aro trenching through the area of the city with a high number of heritage areas, buildings and archaeological sites
- Impact of duplicate Terrace Tunnel below the area of the city with a high number of heritage areas, buildings and archaeological sites.

Based on these key considerations RPI V2 scored highest. This programme option largely avoids heritage/historic areas including the Basin Reserve and enables traffic to be removed from the inner city, which improves accessibility to the heritage areas.

Congestion charging had little to no impact on the results. Heritage and archaeology scoring for each of the long list programme options is shown in Figure 21.

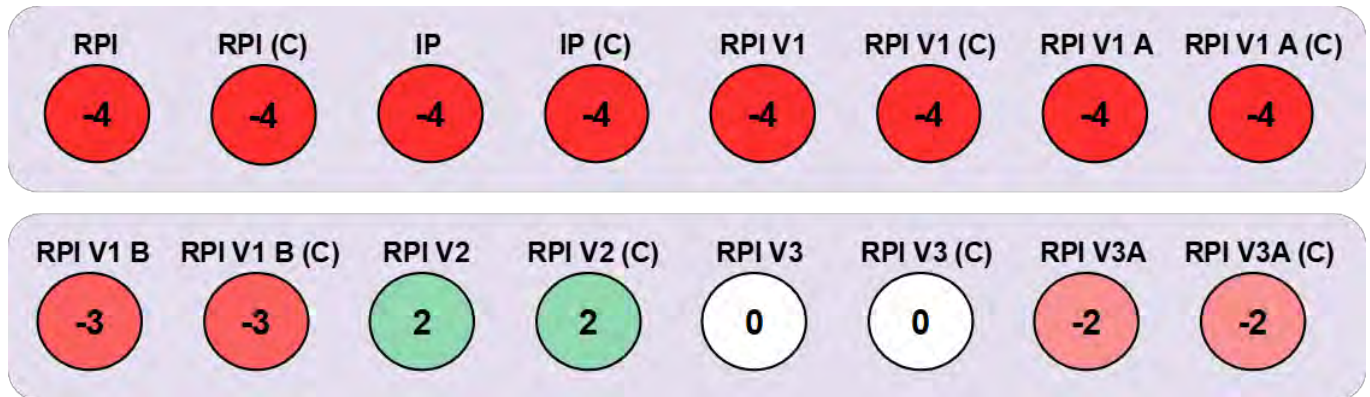


Figure 21: Heritage and archaeology scoring

Effects – Environmental and Social: Landscape and Visual

Scores for this effect were primarily based on visual impacts generated through the Programme options. The MCA assessment considered potential adverse effects of new and duplicate tunnel infrastructure, Basin Reserve grade separation and localised impacts anticipated for MRT grading and streetscape effects along the proposed routes.

RPI V3 is expected to have the least adverse effects as it proposes the least infrastructure.

Congestion charging had little to no impact on the results.

Landscape and visual scoring for each of the long list programme options is shown in Figure 22.

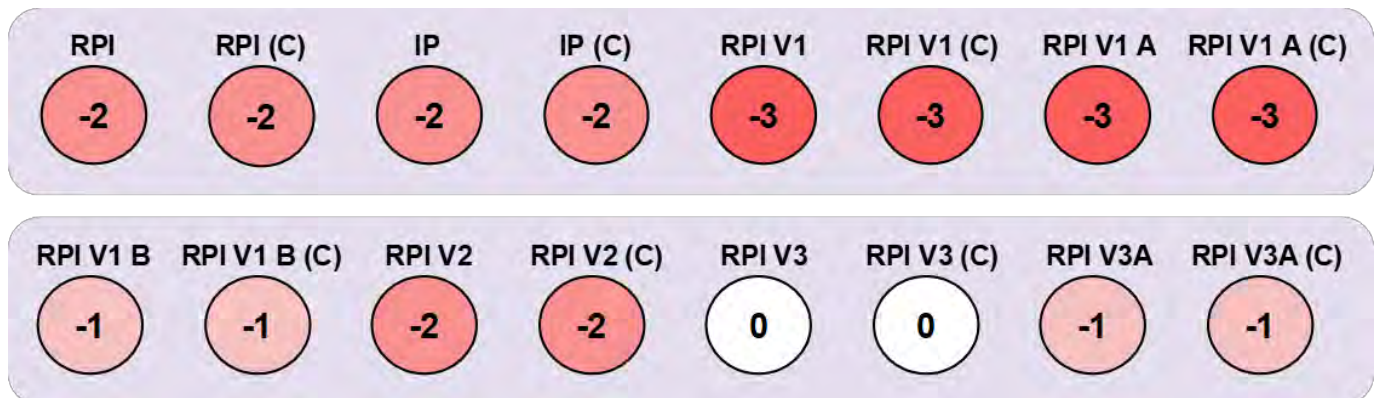


Figure 22: Landscape and visual scoring

Effects – Environmental and Social: General

These scores captured all other environmental and social outcomes, such as noise/vibration, social, business disruption, ecology (coastal and streams), ground water and contaminated land. In general, programme options which enable the removal of through-traffic from city streets and improve connectivity achieve higher scores.

Improved accessibility through a higher quality MRT solution was also assumed to provide long term environmental (reduced carbon emissions and improved local air quality) and social benefits after implementation through increased uptake of public transport. Therefore, RPI V1 and RPI V2 scored the highest for this criterion.

Congestion charging may provide some environmental benefits such as, less noise, air quality improvements, and connectivity benefits. However, it was assumed that congestion charging would not significantly alter the scores.

Scoring of environmental and social general for each of the long list programme options is shown in Figure 23.



Figure 23: Environmental and social general scoring

Design, Delivery and Operation – Engineering Difficulty

The assessment of engineering difficulty included consideration of:

- Construction disruption
- Overall construction duration
- Impact on utilities, groundwater, and contaminated land.

In general, programmes with more investment in new infrastructure scored lower. The assessment noted that congestion charging could result in a positive step change by reducing the need for complex traffic management arrangements during the construction phase, which would also reduce disruption.

The assessment of RPI V2 scored best as the majority of this construction would be offline and the long tunnel could be constructed first to reduce disruption during the MRT construction phase.

Scoring of engineering difficulty for each of the long list programme options is shown in Figure 24.

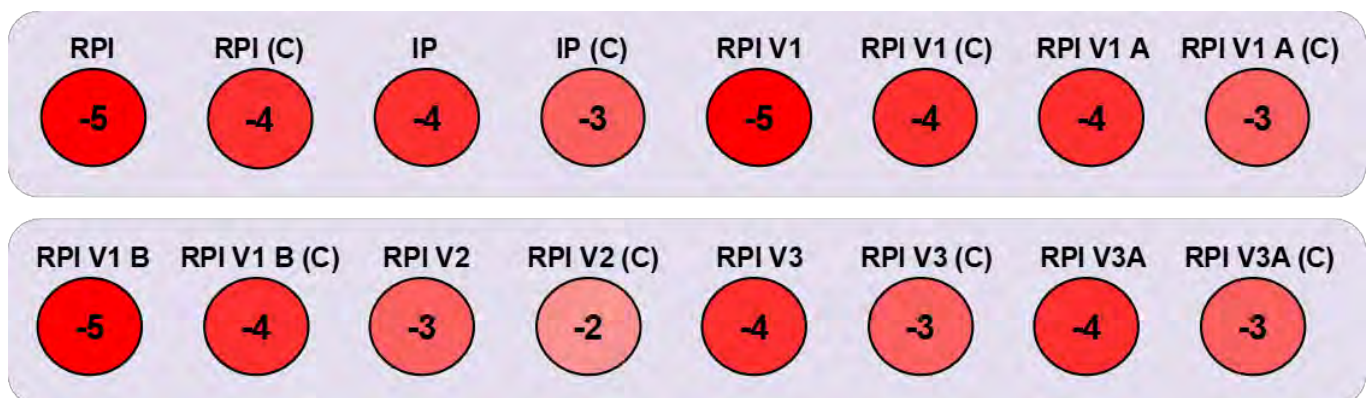


Figure 24: Engineering difficulty scoring

Design, Delivery and Operation – Property Difficulty

The assessment of property difficulty included consideration of the following criteria:

- Direct property impacts
- Subterranean property purchase
- Business disruption (impact of disruption and compensation to business owners).

Similar to the engineering difficulty criterion, programmes with more investment in new infrastructure were scored lower. Again, similar to the engineering difficulty criterion, the effects are less for RPI V2 as the development of the long tunnel is mostly offline or not considered to substantially impacting the network. Programme options with the largest direct property impacts include those which propose changes to the Basin Reserve, the Te Aro trench, tunnel portals and parts of the proposed MRT routes.

Congestion charging had little to no impact on the results.

It is noted that potential impacts on the Town Belt were not assessed during this round of scoring. These will be investigated during future assessment stages.

Scoring of property difficulty for each of the long list programme options is shown in Figure 25.

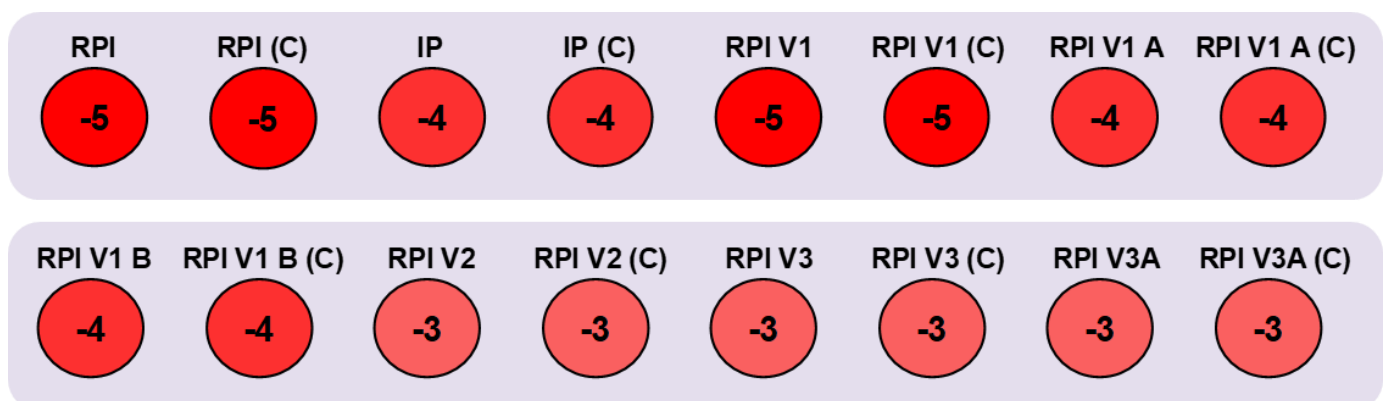


Figure 25: Property difficulty scoring

Design, Delivery and Operation – Scalability of Network and Services

Scores were based on the expected network fit/performance (once operational) and future scalability. Network fit is the degree to which the MRT route(s) would integrate with the wider public transport network on day one of implementation. Scalability is the degree to which the MRT route(s) could be extended to North and/or West Wellington on a date after MRT is operating.

The scalability of the RPI and IP programmes were the lowest scoring of all the programme options. This is because RPI and IP proposes the baseline route, which if implemented, causes transfer and duplicated services and is considered sub optimal for the public transport network performance. A large part of the core bus routes would be duplicated in both of these programme options, resulting in lower scores for network fit. This duplication is due to the configuration of the RPI and IP, i.e. therefore a duplicate service would run from the city to Island Bay via Newtown.

Overall, RPI V1B and RPI V3A score highest for this criterion, as both include an MRT route to the south and enhanced bus services to the east, which is considered to provide 'very good' network fit.

RPI V1B, V2, V3, V3A also assume MRT to replace Route 1 (south), while Route 2 was assumed to be replaced with a significantly enhanced bus service, and a Karori-Seatoun/Miramar North through route remains via Hataitai. However, these four options differ in terms of future scalability depending on the level of grade separation at key junctions like at the Basin Reserve.

Programme options IP, RPI V1, V1A, V1B and V3A include grade separation at the Basin Reserve which places the north-south MRT alignment on Sussex Street and Haining Street, enabling the MRT and inter-related street network to be extended to the east in the future if required.

The grade separation is also considered to provide additional capacity for other bus services, and reduce congestion, resulting in improved opportunities to grow other public transport routes through/near the Basin Reserve.

Congestion charging is expected to reduce traffic but is not expected to make a significant difference to network fit or future scalability of public transport.

Scoring of scalability of network and services for each of the long list programme options is shown in Figure 26.

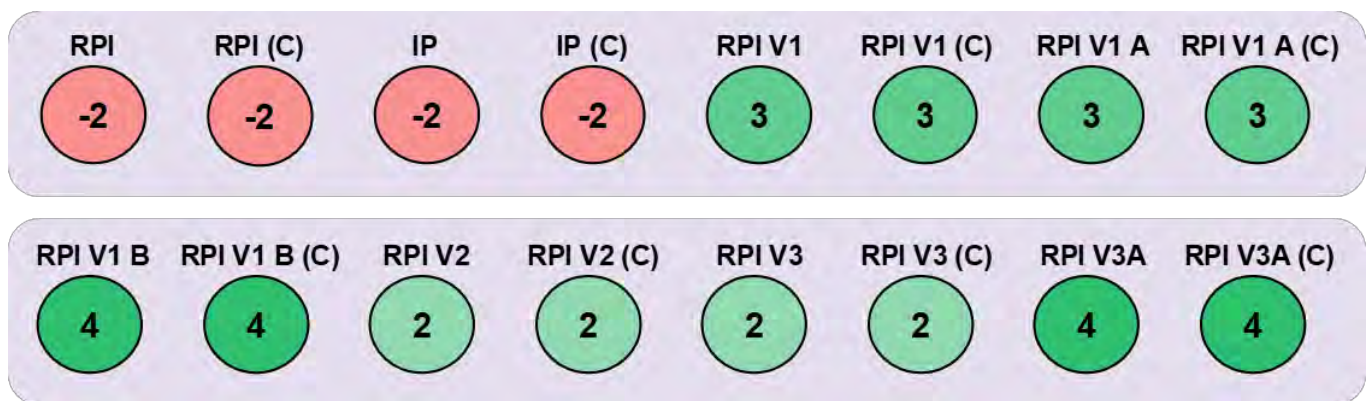


Figure 26: Scalability of network and services

5.2 Sensitivity Testing – Weighting Scenario

This section describes investment weighting scenario that was undertaken to evaluate the sensitivity of the long list programme option results and help inform which options should be progressed to the short list stage. Once the programme long list MCA scores were agreed, different investment objective, environmental and social impacts, and design, delivery and operational weighting scenarios were applied to the raw scores as outlined in Table 6.

Note, all of the weighting scenarios applied to the long list assessment scores were sourced from previous MRT or SHI investigations (2020).

Table 6: Weighting scenarios for sensitivity testing

LONG LIST	Group	Programme Objectives					Mana whenua	Environmental and Social Impacts			Design, Delivery and Operation		
Weighting Scenario	Criteria	Liveability	Reduced PMV reliance	Access	Safety	Resilience	Mana whenua	Heritage and archaeology	Landscape and visual	Environmental and Social General	Engineering Difficulty	Property Difficulty	Scalability of network and services
Programme objectives only	100%	20%	40%	15%	15%	10%	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted
Programme objectives 1 to 3 - equal	100%	33%	33%	33%	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted
Environmental and Social Impacts only	100%	unweighted	unweighted	unweighted	unweighted	unweighted	25%	25%	25%	25%	unweighted	unweighted	unweighted
Design, Delivery and Operation only	100%	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	unweighted	33%	33%	33%
50% PO, 25% ESI, 25% DDO	100%	10%	20%	8%	8%	5%	6%	6%	6%	6%	8%	8%	8%
70% PO, 15% ESI, 15% DDO	100%	14%	28%	11%	11%	7%	4%	4%	4%	4%	5%	5%	5%
All groups equal, equal within groupings	100%	7%	13%	5%	5%	3%	8%	8%	8%	8%	11%	11%	11%

The results of the weighting assessment for programme objectives (only), environmental and social impacts (only), and design, delivery, and operation (only) are presented in Figure 27. The results of the sensitivity test reflect MCA scores without congestion charging.

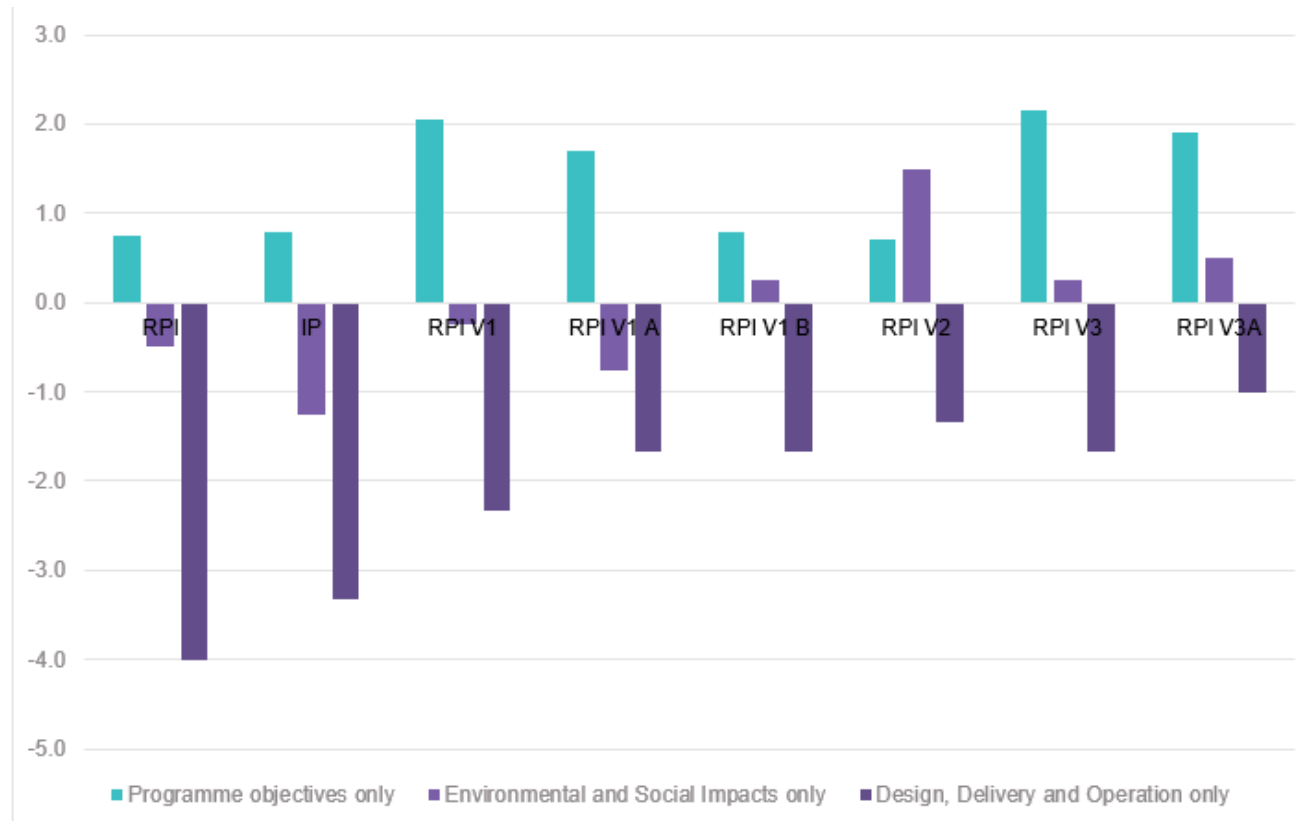


Figure 27: Weighting assessment scores by programme objectives, environmental and social impacts, and design, delivery and operation, without congestion charging

Figure 27 shows that the worst performing long list programme options based on weighting the investment objectives as per Table 6 are (refer to teal bar in figure):

- The RPI (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel)
- The IP (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria)
- RPI V1B (MRT route to the south, enhanced bus services to the east, a grade separation solution at the Basin Reserve, an active mode tunnel at Mt Victoria, and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel)
- RPI V2 (MRT route to the south, enhanced bus services to the east, an at grade solution at the Basin Reserve, with an active mode tunnel at Mt Victoria, and a Long Tunnel bypassing the city).

The worst performing options from an environmental and social impacts perspective, as per the weightings in Table 6 are (refer to light purple bar in figure):

- The IP (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria)

- RPI V1A (MRT to the south and east, a grade separation solution at the Basin Reserve, an active mode tunnel and a new tunnel for general traffic and MRT at Mt Victoria).

The worst performing options from a design, delivery and operation perspective, as per the weightings in are:

- The RPI (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel)
- The IP (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria)
- RPI V1A (MRT to the south and east, a grade separation solution at the Basin Reserve, an active mode tunnel and a new tunnel for general traffic and MRT at Mt Victoria).

Figure 28 presents the sensitivity test results for the long list programme options (without congestion charging) for the following weighting scenarios:

- 50 percent weighting for investment objective, 25 percent weighting for environmental and social impacts, and 25 percent weighting for design, delivery, and operational impacts
- 70 percent weighting for investment objective, 15 percent weighting for environmental and social impacts, and 15 percent weighting for design, delivery, and operational impacts
- 60 percent weighting for investment objective, 30 percent weighting for environmental and social impacts, and 10 percent weighting for design, delivery, and operational impacts.

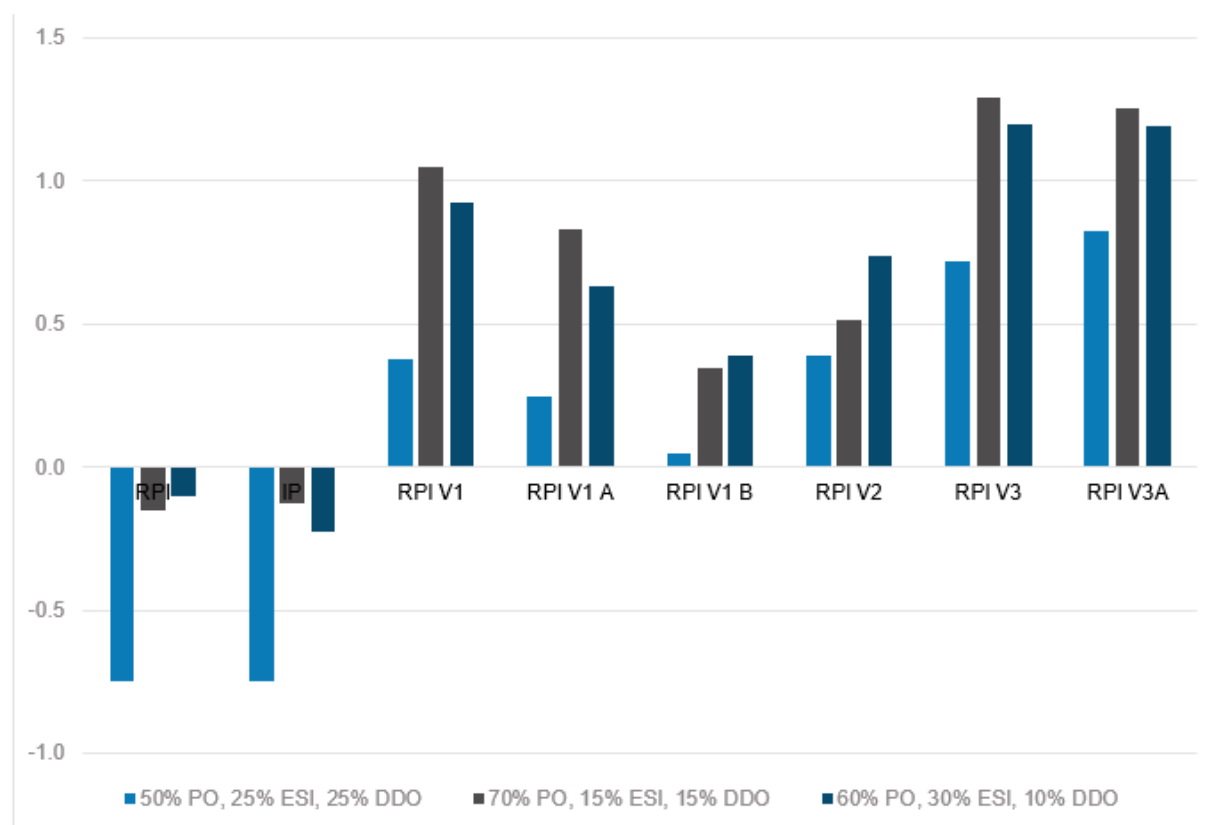


Figure 28: Sensitivity test results without congestion charging

Figure 29 presents the sensitivity test results for the long list programme options (with congestion charging) for the same weighting scenarios applied above in Figure 28.

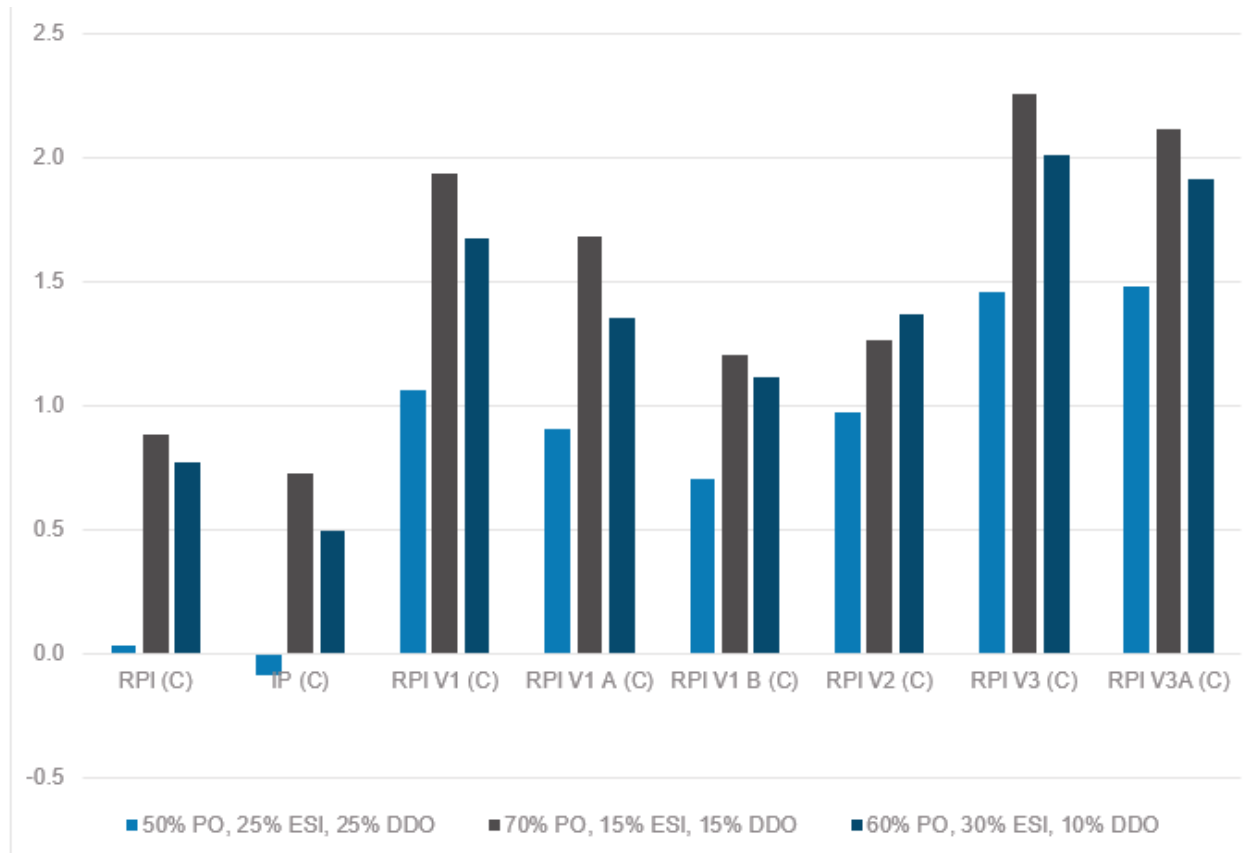


Figure 29: Sensitivity test results with congestion charging

Based on the MCA scoring and sensitivity test with weighting scenarios the workshop participants agreed to not progress with the following options:

- The RPI (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel) and the IP (As per the PBC with MRT to the airport via Newtown, a grade separation solution at the Basin Reserve, general traffic tunnel at Mt Victoria). The original PBC options do not perform as well as the other long list programme options. In particular they score lower against the programme investment objectives, and the single MRT route was shown to have less benefits, when compared to a dual route system through the 2020 MRT investigations.
- RPI V1B (MRT route to the south, enhanced bus services to the east, a grade separation solution at the Basin Reserve, an active mode tunnel at Mt Victoria, and a covered trench for general traffic and above ground active mode connections at Te Aro and Terrace Tunnel). This option performed worse than RPI V1 under all investment objectives, and therefore it is best to focus on access to the east rather than highway access to the north. Therefore, this programme option has been discounted from further consideration.




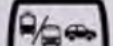






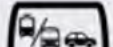














Workshop participants spent some time discussing the long tunnel option (RPI V2), to determine if the reduced costs and likely impacts (compared to RPI V1) warranted further investigation. It was noted that this option could have negative outcomes in relation to reducing carbon and achieving mode shift. Overall, it was decided that further information and analysis should be undertaken to enable an informed

decision on programme option RPI V2, and it has been retained for further analysis at the short list stage.

Workshop participants also discussed whether programme options RPI V3 and V3A should be retained. A decision was made to retain both these programme options as both have the capacity to improve access and other outcomes and could be considered as primary staging options for programme options V1 and V1A.

5.3 Emerging Short List

In total, five programme options were short listed for further technical analysis and consideration as shown in Figure 30. The short list programme options were selected as they best align to the programme investment objectives and the other assessment criteria.

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel
RPI V1	Island Bay 	Miramar 		 	 	
RPI V1A	Island Bay 	Miramar 		 		
RPI V2	Island Bay 	Miramar 				
RPI V3	Island Bay 	Miramar 				
RPI V3A	Island Bay 	Miramar 				






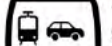



Key:	 - Mass Rapid Transit	 - Enhanced bus services	 - Grade separation	 - At grade improvements	 - General traffic tunnel	 - Shared MRT/general traffic tunnel	 - Active modes tunnel	 - Covered general traffic trench with active modes above	 - General traffic tunnel
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Figure 30: LGWM programme short list

6 Next Steps

The selected short list options will be further refined by the project team and will then be assessed using a detailed MCA framework to determine a recommended LGWM programme option(s). The findings of this further analysis will be presented in a separate standalone report.



Appendix

Appendix B – Programme Short List Specialists Report



June 2021

Programme Short List Options

MCA Approach and Methodology: IO1 – Liveability - enhance urban amenity and enable urban development

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14^h June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Liveability - MCA Scoring

The term Liveability was defined and agreed by the team and stakeholders for the purposes of the Liveability Investment Objective at the time of the separate MRT and SH programme cases in 2020. It has been agreed to be retained for the purposes of combined Highways and MRT assessment. The definition and the objective wording recognises that Liveability for the purposes of LGWM has an Urban Amenity component and an Urban Development component. Each is addressed in separate sections below and combined in the final section.

Scoring of the Programme Short List Options for Liveability (for both Urban Development and Urban Amenity) utilises an 11 point scale and relative to a 2036 time frame. At a later time there may need to be scoring relative to different time periods but for this assessment 2036 is the reference point.

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits

4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

The Liveability assessment approach for the Programme Short List has been discussed and agreed to be as used in the previous rounds of assessment with the relevant TAG representative members as shown below. Note that some members of the TAG have changed as indicated.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 1.1: Urban Amenity	SHI Team Member	SHI Team Member MRT Team Member	WCC TAG Members Waka Kotahi TAG Member LGWM Representatives	Working meetings separated from combined programme workshops.

2.1 Attracting traffic off city streets (KPI 1.3)

This KPI was transferred to Liveability during the latter part of the Programme Option evaluation process. The outcomes of the analysis undertaken to determine the impact of the options to attract traffic off city streets is provided within the Transport reporting for Investment Objective IO 3. Data for this analysis is shown in Appendix A of this report. The influence of reducing traffic on city streets for Liveability (Urban Amenity) is considered within the MCA scores as provided in Table 1 and combined within combined

Table 3 for Liveability below.

3 General Specialist Assessment Instruction

The Liveability assessment methodology approach is outlined in Section 2 above. The assessment steps followed were to:

1. Review the options (as described in the links within this document)
2. Using the Urban Amenity and Urban Development definitions, assess with the support team each of the Programme Options assuming a 2036 future city state (including the components of the programme such as Golden Mile being in place)
3. Score each option, using the 11 point scale and provide commentary to the matters considered as key differentiators for each and any assumptions made
4. Repeat the steps above with consideration to the effects of congestion charging
5. Undertake a comparison of Urban Amenity and Urban Development assessments and generate a combined Liveability score and provide the associated commentary.

Notes:

1. The images provided for each of the options within this document are indicative and the assessments have been made based on the (limited) level of detail these provide.
2. There are sub-options in some of the programmes to be considered (ie implications of parallel v diagonal tunnel)
3. The assessment addresses that there are two principal modal options for PT (BRT and LRT) with the assumption that the BRT is bus based and the LRT maybe either a tracked or trackless tram type vehicle. If the mode impacts the score then this will be noted.

4 Programme Short List Option Descriptions

4.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#).

4.2 Programme Short List Options

Please refer to the Programme Short List Options Pack in [LGWM Programme Short List Briefing Pack](#).

5 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop slide deck and minutes
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

6 Urban Amenity – MCA Methodology Approach (KPI 1.1)

The urban amenity assessment approach at this programme level consists of qualitative assessments that consider the four contributing attributes to urban amenity in Wellington city: comfort, composition, connectedness and activation. KPI's for each of these attributes will be used at such time as further detail is revealed through the design process. The assessment methodology was developed alongside the SHI work package to enable a consistent assessment to be performed.

It is noted that through stakeholder discussions that the KPI that pertains to removing vehicles off city streets (which sat within another Investment Objective) was transferred to Urban Amenity on the basis that the outcomes of this removal benefit the urban amenity of the city. For the purposes of scoring of the programme option this is shown as a differentiator in section 9 of this report.

Each of these amenity attributes are described below:

Comfort

How pleasant or comfortable a place is to be in – related to human senses (heat, light, aural, smell); and includes:

- Personal Safety (measured relative to CPTED principles)
- Environmental condition – noise, air quality, wind, sunlight access, shelter, cleanliness, night lighting

Composition

Relationship of buildings and open space and the character generated by these and includes:

- Street/open space – good quality streets and open spaces for a range of functions including 'dwelling' time and public life in general – includes green space to support public life/living, street trees/space trees
- Character – distinctiveness leads to strong 'place specific' identity – includes street/townscape character, built form – includes street/building scale relationship compatibility, logic/consistency with street pattern, built form layers and connections between places in the wider landscape of the city as heritage, vista/aspect to landmarks.

Connectedness

How easy it is to move around within a street context (the intention is to distinguish connectedness from the more movement-based walk/cycle connectivity as a destinational movement which might be more related to "Levels of Service" for peds or cyclists which will be addressed by other attributes in assessment). Includes:

- Allocation of space for pedestrian and active mode uses - includes universal access
- Pedestrian permeability and desire lines to destinations/anchors – ie the opposite of severance
Frequency of intersections/ route choices, informal crossings of streets (permeability), wait times for crossings/walking (ie anti-severance)
- Legibility and wayfinding - directness of routes, landmark visibility, hierarchy of street design/type

Activation

Conditions, facilities and activities supporting economic and social exchange. Includes:

- Street design and built edge contribution to public life
- Choice and diversity of activities for different needs and different times
- Community life and 'ownership' of places

Assumptions

Assumptions used within the Programme Short List urban amenity assessment approach are:

Surplus Land and Comprehensive Urban Development

There are opportunities to enable surplus land acquired for the purposes of implementing the transport related infrastructure to be redeveloped positively. Depending on the option there could be a lot of land implicated. It is very important for urban amenity that there is provision made to both enable positive outcomes by (a) aligning infrastructure to leave viably shaped and fronted streets (ie not 'left over bits'); (b) to require comprehensive development 'master plan's or the like so the areas are designed to reveal positive outcomes (from integrated design for open space, connections through blocks, street edge relationships, energy efficient built form etc); (c) that the market is incentivised to deliver the redevelopment expediently so there are not potentially large areas of dormant vacant land in the city. The understanding is from LGWM that progress is underway to develop a redevelopment approach to enable these positive outcomes, but this is not yet in place. The assumption is thus to assume a relatively conservative approach to the opportunities created to allow for redevelopment of surplus land as it relates to urban amenity. It is noted that this a different consideration than urban development where the benefits for Liveability relate more to the potential GFA enabled by the programme which pertains particularly to the market response to an MRT line and the associated stops.

Congestion Charging

The benefits of congestion charging as a travel demand management tool in respect of urban amenity is that it potentially can reduce the number of vehicles on the city's streets and this will make more comfortable, activated, connected street space. At the time of this assessment the impact of the congestion charging is a 10-15% reduction in vehicle numbers in the city. This would have a meaningful effect on urban amenity and is accordingly expressed in the assessment scores. It is noted that if there is reduced impact from using this travel demand management tool (such as by reducing the charge cost) then the urban amenity assessment would be consequently reduced.

6.1 Programme Short List Assessment Scores – Urban Amenity

The table below documents the Programme Short List Option – Specialist Scores for Urban Amenity criteria with commentary. Also refer to the differentiators section for further explanation as to approach which has influenced scoring.

Table 1: Specialist Scoring for Urban Amenity

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	
Do minimum (2036)	0	At 2036 there will be improved city urban amenity outcomes, , more people living in city in new buildings with good urban design outcomes from Spatial Plan/District Plan, but there will also be more congestion and city streets that are in conflict between people moving in vehicles and active modes which may adversely affect comfort and connectedness. The balance of positives with the negatives is a zero score.
Option RPI V1 (2036)	-3	Scale of impact of Te Aro Trench significantly negative (including Taranaki St on/off ramp), and the commitment to re-establishing a quality urban outcome (through the likes of a Comprehensive Development Area (CDA)) has been signalled but not yet committed. The extent of affected area and duration of the consenting, construction and regeneration will blight this area and have a wider zone of influence. The on and off ramp to Taranaki Street is also a significantly adverse intervention in the urban context obstructing connectedness, affecting composition, and activation on the street. The significant negativity of this trench intervention is balanced to an extent by the MRT south and east and the Basin grade separation benefits for connectedness from Pukeahu to Basin and new urban development interface and Vivian Street detuning opportunities. Also has active mode tunnel within existing tunnel so slightly more positive than the new tunnel for active mode options due to effect at Mt Vic. This balance prevents the score being more negative.
Option RPI V1 (2036) with congestion charging	-3	A reduced number of PMV in the city potentially can enable more detuning of city streets and bring additional benefits in terms of comfort and connectedness. However,

Options Assessment	Score	Commentary/ Rationale
		its relative benefit is offset by the scale of negativity and so the score remains as above.
Option RPI V1A (2036)	1	Includes positive differentiators of Basin and Haining CDA's (although this is a modest benefit given comments above about the commitment) and no Terrace Tunnel (which is seen as positive for urban amenity as it does no additional inducement of traffic into city streets) or Te Aro Grade trench which was the big negative influence in V1. MRT east and south is best combination which is positive. Also has active mode tunnel within existing tunnel so slightly more positive than the new tunnel for active mode options due to effect at Mt Vic. However, has negative condition of Vivian remaining as SH1 and has diagonal tunnel with its effects to street complexity north of the Basin, connectedness issues and a complex arrangement of tunnel portal and local streets at Hataitai/Kilbirnie – its not clear how this will work for connectedness and comfort.
Option RPI V1A (2036) with congestion charging	2	Has the benefits noted above as well as coming with a % reduction in vehicles movements within the city.
Option RPI V2 (2036)	2	The long tunnel enables amenity benefits for the city centre as traffic volumes will reduce on some of the key east-west streets within the city (noting that, overall, traffic volumes across the network increase). The city streets programme as currently proposed only goes some way towards amenity outcomes, in part because of reach, but also appears to have more of a movement focus than a place outcome focus. MRT (which improves streets along the way) to south and Enhanced Bus to east are positive. Enhanced Bus may have amenity issues winding through Mt Vic and not have same amenity as full MRT option. The tunnel portals and integration at Hataitai/Kilbirnie are complex and may generate urban amenity issues for connectedness and comfort.
Option RPI V2 (2036) with congestion charging	2	Has the benefits noted above as well as coming with an additional % reduction in vehicle movements through the city centre. However, the extent of the differential is not considered likely to shift the score given the long tunnel already affects traffic reduction and the congestion charging may not push this further. TDM needs to have

Options Assessment	Score	Commentary/ Rationale
		street space reallocated to secure amenity benefits, otherwise residual capacity will be re-consumed by vehicles over time.
Option RPI V3 (2036)	1	Includes Haining CDA which is positive, but no Basin grade separation which is a bit negative. Has MRT south route, Enhanced Bus East and separate Mt Vic active mode tunnel which are all positive (although not as good as the MRT east and south). Enhanced Bus may cause amenity issues through Mt Vic and the new active mode tunnel may have issues too as it relates to 9(2)(b)(ii), 9(2)(j) .
Option RPI V3 (2036) with congestion charging	2	Has the benefits noted above as well as coming with a % reduction in vehicles movements through the city centre - this makes better comfort, street connections and activation.
Option RPI V3A (2036)	1	Similar to V3 has Haining CDA is positive, but has benefit of Basin grade separation. Has MRT south route and Enhanced Bus East and separate Mt Vic active mode tunnel which are positive (although not as good as the MRT east and south). Enhanced Bus may cause amenity issues through Mt Vic and the new active mode tunnel may have issues too as it relates to 9(2)(b)(ii), 9(2)(j) .
Option RPI V3A (2036) with congestion charging	2	Has the benefits noted above as well as coming with a % reduction in vehicles movements through the city centre - this makes better comfort, street connections and activation.

6.2 Urban Amenity - Key Differentiators

The key differentiators and their relative influence are described in the table below – refer to 9.1 for further rationale.

SHORT LIST OPTIONS						
URBAN AMENITY DIFFERENTIATORS [not showing GM, TQ although these are positive but the same for all so not differentiators]	RPI V1	RPI V1A	RPI V2	RPI V3	RPI V3A	Cong. Charge
POSITIVE ELEMENTS						
Basin Area Grade Separation + CDA						
Haining Street CDA						
MT Vic active mode tunnel						
MRT – south and east						
MRT south and Enhanced Bus east						
Traffic off city streets						
Vivian Street SH/traffic detuned						
NEGATIVE ELEMENTS						
Additional Tunnels (Portal integration)						
Complexity of street layout						
Te Aro Grade Sep + Taranaki St ramps						

The colours depth indicates degrees of importance or significance to urban amenity outcomes. If the colour is best/worst then the influence of this to the urban outcomes and scores is higher order

Positive	Low Influence	Some Influence	High Influence
Negative	Low Influence	Some Influence	High Influence

6.3 Rationale for Influence of Urban Amenity Attributes

6.3.1 Comprehensive Development Areas (CDA): Assumed that:

- residual land will be repackaged and provided to market for comprehensive redevelopment as 'super blocks' (this will require resolution of ownerships of any redesignation and potential subdivision/amalgamation and retitling)
- the residual land areas will be a useful size and configuration given further consideration in design process to composition of (new) streets and allocation to modes
- LGWM (or some other agency that may be established to control ownership/redevelopment process (eg Wellington Waterfront model) puts in place urban design briefs/or requirements for these blocks to ensure development is suitable comprehensive/integrated as to outcomes which make positive urban environments
- There remains a risk to this being not well delivered as no responsibility to ensure these outcomes has been provided by LGWM therefore the scores are conservative (ie low level of influence)

6.3.2 Base 2036: Assumes that:

There is an additional population in the city and inner city suburbs – principally have assumed the growth will occur within the city centre/Te Aro central area. The new district plan provisions which enable density will take a while to take effect – probably another 5 years given statutory processes, but already there is incremental development occurring in Te Aro given the amenity this provides and access to employment without vehicle trips. The changes already occurring with Golden Mile, and civic projects like civic square, town hall, library should be in place by then and these will improve the city amenity.

However, on balance the positiveness of planned and underway city can be expected to be blunted if there is an increase in traffic on the city's streets with consequent effects on comfort and activation on the routes where the traffic occurs.

The balance of the above is that the score for liveability is considered to be relatively neutral (scored zero in Table 1 above).

6.3.3 Option Differentiators relative to Urban Amenity Attributes

BASIN AREA GRADE SEPERATION	
Connected green space Pukeahu and Basin Reserve by land bridge with good potential for positive new urban edge to park – additional green space is a need for the city (est 1.5 ha required for future pop.)	Composition Activity
Provides additional area ground space for the Basin Reserve and operational access – currently constrained by the connection to busy roads	Composition Connectedness
Provides for a legible and continuous active mode route through Basin Area – links to Mt Vic Tunnel – considers lots of schools on this alignment	Connectedness
Provides for better St Marks/Col area frontage – currently congested at drop off and pick up time and also address of Gov't House	Connectedness Activity
Work Ons	

Extent and complexity of the street network north of Basin if this includes MRT in street space of KCT – this affects relationship of Basin to KCT – best option is 3A (Enhanced Bus east)

HAINING STREET CDA (confirm notes with more information)

Opportunity for new comprehensive development area (see notes on CDA) – has some cross over with the Basin Area in its extent - ie CDA extends beyond Haining St to include Sussex and the area implicated in Basin grade separation

Connectedness
Activity

MT VIC ACTIVE MODE TUNNEL

Good legible network east, and allocation of space for active modes for getting people into city from east

Connectedness
Comfort

New tunnel maybe better than existing one – shown as sitting closer to urban context in Hataitai – existing one has route on town belt side – less connectedness for use by residents. However, may be balanced too by the way portals interface with the city side – depends on how this works as to whether difference between new and existing tunnel is neutralised. At this stage it appears that the new active mode tunnels will affect 9(2)(b)(ii), 9(2)(j) so this is seen as a less positive than the use of existing tunnel repurposed.

Comfort
Connectedness
Composition

Work Ons

CPTED through tunnel for users
Not clear though (see comments below on Tunnels) what happens with new tunnel at 9(2)(b)(ii), 9(2)(j) and interface with Basin Reserve grades and transitions and connections on/off network

MRT

MRT east is good for connectedness and the activation this provides within residential areas and with anchors – sports and airport for example.

Connectedness
Activity

Enhanced Bus is less likely to generate activation to the street so has less, but still some benefit to amenity

Connectedness
Activity

Enhanced Bus east in Mt Vic has potential effects to get system into existing character area – may assist with urban development to have service but getting it to fit may be an issue

Work Ons	
Enhanced Bus transition through Mt Victoria – sensitive area – not sure of design requirements for street space to fit?	
Enhanced city streets	
Positive, but descriptors suggest a movement function bias rather than amenity of place - score is subdued accordingly	Connectedness Activity Comfort Composition
For Vivian Street this is considered to have a higher order of influence on the city and urban amenity – if assumed that Vivian becomes 2 way, detuned (like Ghuznee) then a significant barrier to north south connectedness (ie removes a big severance) is removed – also enables a fully connected active modes connection across the city east to west.	Connectedness Activity Comfort Composition
Work Ons	
Extending City Street programme to a focus on amenity and place in the consideration of street design and allocation of space	
For Vivian Street look at alternatives to the options where Vivian Street remains SH1 – this is important to the urban amenity outcomes for the city centre	
Vivian Street /Sh not across central city	
Getting traffic crossing this city out of the central city area is considered to have a positive influence on the city and urban amenity – if assumed that Vivian becomes 2 way, detuned (Like Ghuznee) then a significant barrier to north south connectedness (ie removes a big severance) is removed – also enables a fully connected for active modes connection across the city east to west – also for slow vehicle movements	Connectedness Activity Comfort Composition
The issue is that the options that do the best to take cross city traffic off the central city streets makes a big adverse effect on the urban amenity too.	
Work Ons	
Look at the concept of an at grade city street arrangement which makes better use of the existing east/west network of Karo Dr and possibly Webb St. and it extension to top of Willis. Extending the concept of amenity and place into the consideration within the street design and allocation of space	
For Vivian Street look at alternatives to the options where Vivian Street remains SH1 – this is important to the urban amenity outcomes for the city centre	

Reduce Vehicles on City Streets	
Relative to the 2036 city environment the options all have a modest benefit to reducing vehicles on the city's streets. The CC is the best for changing behaviours to discourage people to use PMV to access the city. Reducing the number of vehicles in the city streets positively affects connectedness, and comfort and should flow into activation.	Comfort Connectedness Activation
Work Ons	
Limiting PMV access into city at north but also resolving in city street capacity – especially at Karo Drive and in conjunction with Webb Street maybe? Ultimately look to a more regional solution given regional growth is driving increased demand for travel trips into the city – more jobs out of Wellington or better PT transport capacity from north.	
ADDITIONAL TUNNELS	
<p>Issues with where portals sit in context and also the network that connects to the tunnels – creates new wider network affecting ability to get across, changes to existing logic of existing land uses (eg school), street layout and interpretation and to get access into those existing uses – introduces sweeping curves and speeds in design (Basin esp). Portals in landscape also an issue (addressed by Visual and Landscape).</p> <p>In order of significance of influence the most negative is:</p> <ul style="list-style-type: none"> • Diagonal tunnels and portals into Mt Vic north side) and the impact on Hataitai/Kilbirnie interface given complexity in street network here • TT tunnel north side • Active mode new tunnels in Mt Vic depending on how these are integrated- this could be as negative as above ones if it requires taking 9(2)(b)(ii), 9(2)(j) and retaining etc. 	Composition Comfort Connectedness
Work Ons	
If parallel tunnels (rather than diagonal) potential to make the alignment into existing city streets better. However, the impact to Ruahine Street likely to be greater.	
COMPLEXITY OF STREET LAYOUT	
There are locations where complexity of street layout is affected – at Basin Reserve north side with new diagonal lanes connecting across current patterns (esp with KCT) - this affects the ability to get across street (eg Basin to KCT) the quality of the edges spaces for activation and the composition of the street and	Composition Connectedness Activation

area. Other places too where there is additional complexity especially at Wellington Road area.	
Work Ons	
Considering the alignment of the complex streets – changing speed design, reducing options for separate lanes for turning movements etc	
TE ARO TRENCH	
<p>Although conceptually this scored higher in the last long list understanding of the impact required to accommodate this has significantly affected the consideration of urban amenity. The extent of area affected - some 10ha will generate a generation (at least 30 years) of poor urban amenity outcomes for the affected area and the many people moving through this area each day. The on and off ramps at Taranaki Street add to the poor outcomes. Although there is the prospect of a new green space on the trench top this will take a long time to occur (at the end of redevelopment) and the quality of outcomes of CDA appears to have no strong commitment from LGWM.</p> <p>The difference between Te Aro Trench and Basin area is that the Basin is more discrete, there are less people moving through this area currently that will experience the change, and the current environment is in a more degraded existing state. It is anticipated that the area can be restabilised more expediently.</p>	Composition Connectedness Activation
Work Ons	
Need for an at grade 'good street' that makes connectivity across top of Te Aro east/west to allow detuning of Vivian Street from a highway. The street can still carry significant volumes but deliver some 'place' qualities.	

7 Urban Development (KPI 1.2)

Urban development for the purposes of LGWM was defined at the outset as the market led intensification of land and building utilisation in response to the creation of new infrastructure. There is a spectrum for development which is expressed in Figure 1 below:



Figure 1: Development Spectrum

7.1 MCA Methodology Approach

The urban development assessment measured the potential land value uplift that would result from the programme options include consideration to:

- Land value uplift where the MRT infrastructure is located which encourages the market response by repurposing or removing existing buildings and intensified utilisation. The market also responds to the more enabling land use controls which will sit within the (currently draft) Wellington City District Plan which will give statutory weight to the direction of the Wellington City Spatial Plan and respond to the National Policy Statement on Urban Development for those areas around mass rapid transit stations.
- Land that has had buildings removed to accommodate transport infrastructure (could be MRT/PT, or new/realigned streets for SH1 or grade separations for either) where residual land (after construction) can be presented to the market to respond with new building development.

Further details as to assumptions pertain below.

Sub-criteria metrics that informed this assessment included:

Yield *The net benefit to providing for growth.* Attributes to be considered include:

- GFA by activity type (e.g. residential, office, retail, industrial, education, social infrastructure)
- Provision for open space.

Viability *The conditions that best enable land to be developed.* Attributes to be considered include:

- Block size(s)
- Land ownership complexity
- Constraints (e.g. heritage/land geotech/hazards/infrastructure)
- Relationship to city vision/spatial plan strategy (i.e. areas of change)

- Assumed profit from development (making assumptions around typology) through high level feasibility.

Value Uplift and Opportunity *The potential increase in land value and opportunity.* Attributes to be considered include:

- Land ownership (i.e. who owns, with public land scoring greater as can capture that uplift more readily)
- Increase in average property value.

7.2 MRT Development Response

To estimate the potential for development that may result from the introduction of MRT, The Property Group (TPG) were engaged to prepare Development Concept Plans for defined precincts along the potential PBC MRT route. This included the Wellington City, Te Aro, Newtown, Kilbirnie and Miramar precincts. The draft Development Concept Plans (dated October 2020) include capacity modelling to anticipate future development potential under a high growth / transit orientated development (TOD) scenario in each precinct. This was determined through detailed site analysis to identify potential development sites and translating feasible built forms and massing typical TOD across the development sites within each precinct.

Based on market analysis a projected number of jobs and dwellings the precinct has capacity to accommodate were generated. The development capacity around stop locations within the precincts has been extracted from the model, using a 200m radius around each stop.

To estimate the potential for development around indicative stop locations outside the precincts that have been assessed, an alternative methodology has been used to allow for comparison between the stops. This covers the areas of Island Bay, Hataitai, Miramar North and Seatoun. This has included a high-level review of property ownership details, site constraints (including issues of resilience) and current development within 200m of the stop to identify potential development sites. Assumptions have then been made around potential built form controls, development costs and risks, land use allocation and revenues for these areas based on learnings from the preparation of the Development Control Plans.

Development sites included in the capacity modelling across all of the stop locations include:

- Sites identified as supporting feasible comprehensive/infill development under Council's existing residential capacity model
- Additional opportunity sites identified as part of the context analysis undertaken for each precinct and around each additional stop (including those held in single ownership which currently do not maximise sites potential)
- Sites containing buildings that require rebuilding due to earthquake strengthening requirements within close proximity to the route and stations.

For each stop location, a Gross Floor Area (GFA) uplift under a 'high growth' scenario has been generated to reflect the anticipated development capacity resulting from introduction of MRT and TOD development controls. It should be noted that the GFA uplift represents the full feasible development capacity only. No analysis of take up or development over time has been undertaken. It is assumed that this development potential is taken to 2050, with a 40% reduction for 2036. An assessment of take up in the market versus the potential has not been completed at this stage but is not required as the comparison is between options and development potential, not actuals. This assessment would need to

be explored as part of the DBC. For the purposes of comparison, the GFA uplift as identified in the WCC residential capacity model (2018).

7.3 Residual Land Development Response

There are residual land areas generated by the options. Principally these are at Basin Reserve/ Haining Street and with the Te Aro Trench option. For each of these options there are different net yields of GFA. The quantification of those extents is provided for within the MCA scores. This is based on a similar enabled development capacity (ie height) to that allowed under the Spatial Plan with a consideration of the National Policy Statement on Urban Development.

7.4 Assumptions - Urban Development

Assumptions of the Programme Short List Urban Development assessment approach are noted below:

- The potential capacity is informed by the Spatial Plan
- The affected land areas are acquired to the fullest extent of the parcel
- That any existing buildings are removed
- That the acquired land not required for transport infrastructure or public space is 'packaged' – ie small parcels amalgamated to make 'super blocks' or marketable sized areas
- That the land is acquired using an agency/legislation that enables the areas not required for transport or public space to be passed to the market for redevelopment
- That redevelopment is managed so the market delivers the urban amenity/development outcomes sought (ie uses and relationship to street, height in relation to heritage etc) by an urban design framework or the like that is applied across the subject land areas by the acquiring agency prior to its release to market. Some 'incentivization' to the market may be needed (eg land value or timing of payment) to achieve both desired pace/timing of development, uses and urban amenity outcomes.
- There can be expected to be some factor of wider area benefit from the investment in the basin area transport and street development – however, at this time the score are attributed to the areas where the land is to be taken as part of the works and what the urban development benefit is from this
- It can be expected that some larger sites in the subject area could be 'naturally' expected to be able to be developed under current/normal market conditions – however, the market is not responding with the desired urban outcomes for a variety of reasons (conceivably planning 'blight' from LGWM, lack of amenity to support residential land uses, size of land parcels, complexity of ownership). It is estimated that 54% of the parcels that are affected by the project have an area of greater than 2000m² (as one factor towards developability) and would thus be of a size that might enable redevelopment currently. The factor of what the market could currently do versus the attribution accorded to what the LGWM project enables has been given some consideration, but the benefit is accorded to the project for urban development to the extent that it enables better urban outcomes from a comprehensive urban design framework wherein all the land is parcelled, ownership complexity or lease terms are extinguished, and spatial strategies for new block connectivity, public open space and street edge, heritage value consideration are able to be realised.

7.5 Programme Short List Assessment Scores – Urban Development

Table 2 below documents the Programme Short List Option – Specialist Scores for Urban Development criteria with rationale.

Table 2: Specialist Scoring for Urban Development

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	This is the base case of development as per the current market.
Do minimum (2036)	1	Assuming a slower than previously thought population growth of 29,600 in the CBD, 32,200 in the Inner Suburbs, 3,500 Eastern and 3,700 Southern the Do Minimum scores moderately well. Not all of this growth will occur in areas close to MRT so in fact the population growth in the areas impacted by MRT will be less than these levels. Have assumed a figure of 19,500 population growth in areas close to the MRT routes.
Option RPI V1 (2036)	2	<p>New Te Aro Trench development area and Haining Precinct comprehensive redevelopment area present urban development opportunities in the CBD/Te Aro. However for V1 the potential has been tempered as likely could be oversupply to hit the CBD market unless managed over a period and in the meantime negative reaction to area from market may occur if area does not look of good quality. This supply could also reduce attractiveness of development around MRT stations / hubs elsewhere in the CBD and Newtown.</p> <p>MRT south to Island Bay and East mean greater development potential for this option than those with Enhanced Bus to the East.</p> <p>TPG assessment of roading tunnels suggest higher level of urban development, but this has been tempered given the focus on development impact of the MRT investment is key for LGWM. There is also some possible duplication from the work completed by TPG on slightly different options for the Nov. 2020 and Feb 2021 programme sprints.</p> <p>It should be noted that the TPG estimates of development assume a future scenario where development constraints are relatively low. In reality this is unlikely to be the case and so a discount factor has been applied to the TPG estimates. It has also been necessary to look at the realistic change in market uptake from Wellington's historic</p>

Options Assessment	Score	Commentary/ Rationale
		growth pattern. Although LGWM investment could have transformational impact on the development attractiveness of sites opened up through MRT and improved private motor vehicle access, the changes are not as marked as the TPG assessments suggest they could be with low or no constraints.
Option RPI V1 (2036) with congestion charging	2	The congestion charge is not believed to make significant enough change to the attractiveness of the area with lower private vehicles, assumed to be a 10% reduction, to attract additional urban development to the V1 score.
Option RPI V1A (2036)	3	<p>Haining Precinct comprehensive redevelopment area presents urban development opportunities in the CBD/Te Aro. This option scores higher than V1 given that the possible negative impact or oversupply of the Te Aro Trench area is not discounted.</p> <p>MRT south to Island Bay and East mean greater development potential for this option than those with Enhanced Bus to the East.</p> <p>TPG assessment of roading tunnels suggest higher level of urban development, but this has been tempered given the focus on development impact of the MRT investment is key for LGWM. There is also some possible duplication from the work completed by TPG on slightly different options for the Nov. 2020 and Feb 2021 programme sprints.</p> <p>Additionally, the location of such development would not only be less aligned to the focus on public transport from LGWM but also where the Council's Spatial Plan is seeking to direct growth in the City.</p> <p>It should be noted that the TPG estimates of development assume a future scenario where development constraints are relatively low. In reality this is unlikely to be the case and so a discount factor has been applied to the TPG estimates. It has also been necessary to look at the realistic change in market uptake from Wellington's historic growth pattern. Although LGWM investment could have transformational impact on the development attractiveness of sites opened up through MRT and improved private</p>

Options Assessment	Score	Commentary/ Rationale
		motor vehicle access, the changes are not as marked as the TPG assessments suggest they could be with low or no constraints.
Option RPI V1A (2036) with congestion charging	3	The congestion charge is not believed to make significant enough change to the attractiveness of the area with lower private vehicles, assumed to be a 10% reduction, to attract additional urban development to the V1A score.
Option RPI V2 (2036)	2	<p>Haining Precinct comprehensive redevelopment area presents urban development opportunities in the CBD/Te Aro.</p> <p>MRT south to Island Bay mean significant development potential for this option than those with Enhanced Bus to the East.</p> <p>TPG assessment of roading tunnels suggest higher level of urban development, but this has been tempered given the focus on development impact of the MRT investment is key for LGWM. There is also some possible duplication from the work completed by TPG on slightly different options for the Nov. 2020 and Feb 2021 programme sprints. TPG advice suggests the long tunnel generates significant urban development opportunity to the East in a 5km circumference of the portal. This has also been tempered given the level of importance to LGWM on MRT, as opposed to roading.</p>
Option RPI V2 (2036) with congestion charging	2	The congestion charge is not believed to make significant enough change to the attractiveness of the area with lower private vehicles, assumed to be a 10% reduction, to attract additional urban development to the V2 score.
Option RPI V3 (2036)	2	<p>Haining Precinct comprehensive redevelopment area presents urban development opportunities in the CBD/Te Aro.</p> <p>MRT south to Island Bay mean significant development potential for this option. Enhanced Bus to the East is assumed to deliver lower levels of urban development than MRT.</p>

Options Assessment	Score	Commentary/ Rationale
Option RPI V3 (2036) with congestion charging	2	The congestion charge is not believed to make significant enough change to the attractiveness of the area with lower private vehicles, assumed to be a 10% reduction, to attract additional urban development to the V3 score.
Option RPI V3A (2036)	2	Haining Precinct comprehensive redevelopment area presents urban development opportunities in the CBD/Te Aro. MRT south to Island Bay mean significant development potential for this option. Enhanced Bus to the East is assumed to deliver lower levels of urban development than MRT.
Option RPI V3A (2036) with congestion charging	2	The congestion charge is not believed to make significant enough change to the attractiveness of the area with lower private vehicles, assumed to be a 10% reduction, to attract additional urban development to the V3A score.

7.6 Key Differentiators – Urban Development

Key differentiators impacting the overall relative scoring between options for Urban Development were:

- Urban development responds to the MRT routes specifically on the basis of The Property Groups assessments with walkable catchments from stops. The better reach of the MRT has a higher score.
- The Comprehensive Development Areas (CDA) contribute to urban development of residual land. These benefit scores where they are included.
- Enhanced Bus is considered to have a lesser contribution to urban development than MRT on the basis of an assumed lesser market response to non-rail based PT systems.
- Congestion charging is an influence, but relative to the benefits of MRT and/or CDA's (or the long tunnel influence to reducing traffic in the city) does not change the score for urban development.

8 Overall Scores

The Liveability Investment Objective (IO1) is contributed to by the Urban Amenity (KPI 1.1) and Urban Development (KPI1.2). As noted in section 2, the KPI associated with attracting vehicles off city streets was added recently as a transfer from IO3. It has been considered within the combined scores set out below. The approach to combining Urban Amenity and Urban Development scores has been:

- That where the scores for amenity and development are the same it is represented as the same in the combined score
- The urban development scores are typically more positive, but the effects for Urban Amenity are typically more conservative. The conflict between these two KPI's has resulted in the scores being more moderate with Urban Development positivity being reduced by Urban Amenity negativity. There is conflict to the extent that where large areas of new land are created by removing existing buildings that can be used for urban development the score might be positive, but the effect on urban amenity could be negative. Although extreme, the progression of the approach that all urban development is good is that demolishing larger areas of the city could score well for urban development, but would have very negative urban amenity effects.

Table 3: Overall Scores for Liveability

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Although the urban development score is positive (+1) the amenity score is less positive (0) given the increase in the numbers of people living in the city experiencing a poor street environment (and resultant connectedness, comfort and activity issues) resulting from a congested transport system.
Option RPI V1 (2036)	-1	The urban development score (+2) reflects the commentary above (large area (some 6ha) for redevelopment following construction), but the scale of impact on urban amenity is considered to be very negative but balanced by some good differentiating amenity elements (eg MRT south and east). (-3)
Option RPI V1 (2036) with congestion charging	-1	Same comment as above – the influence of urban amenity negativity is not outweighed by the reduced traffic on city streets
Option RPI V1A (2036)	+2	Has the positive influences of MRT and Haining Street CDA (which is more modest in scale than the Te Aro Trench effect) and has active mode tunnel and benefits of Basin Reserve grade separation for urban amenity. There are some negative aspects associated with diagonal tunnel and its interfaces both at Mt Vic and Kilbirnie (has +1 urban amenity score. The urban development scores well (+3) given the MRT reach and Haining CDA. The score has been averaged' to reflect that although some negative amenity aspects it is still positive so conflict is not as significant (as in V1)
Option RPI V1A (2036) with congestion charging	+3	The effects if congestion charging are considered to be positive for both urban amenity and urban development. It does assume a meaningful impact (10-15%) from traffic reduction and the securing of that reduced traffic (such as by street layout)
Option RPI V2 (2036)	+2	The long tunnel is positive for its ability to reduce the city centre streets traffic volumes. It is also seen as positive for urban development to the east. The retention of the benefits does implicate a need to configure city streets to prevent the additional capacity from being re-consumed over time. There is a sense that there may also be induced additional vehicle movements in areas of the city to the east as the tunnel travel opportunity is taken up by

Options Assessment	Score	Commentary/ Rationale
		people in PMV There are some issues with portal design and tunnel integration at the Kilbirnie interface.
Option RPI V2 (2036) with congestion charging	+2	The extent of the differential from the charge is not considered likely to shift the score given the long tunnel already affects traffic reduction.
Option RPI V3 (2036)	+1	Has Haining CDA which is positive for urban development, but no Basin grade separation. Has MRT south route and Enhanced Bus East and separate Mt Vic active mode tunnel which are positive (although not as good as the MRT east and south) for urban development. Enhanced Bus may cause amenity issues through Mt Vic and the new active mode tunnel may have issues too as it relates to 9(2)(b)(ii), 9(2)(j)
Option RPI V3 (2036) with congestion charging	+2	The effects if congestion charging are considered to be positive for both urban amenity more than urban development. It does assume a meaningful impact (10-15%) from traffic reduction and the securing of that reduced traffic (such as by street layout)
Option RPI V3A (2036)	+1	Similar to V3 has Haining CDA is positive, but has the additional benefit of Basin grade separation but the benefits of this are a lower level influence. Has MRT south route and Enhanced Bus East and separate Mt Vic active mode tunnel which are positive (although not as good as the MRT east and south). Enhanced Bus may cause amenity issues through Mt Vic and the new active mode tunnel may have issues too as it relates to 9(2)(b)(ii), 9(2)(j)
Option RPI V3A (2036) with congestion charging	+2	The effects if congestion charging are considered to be positive for both urban amenity more than urban development. It does assume a meaningful impact (10-15%) from traffic reduction and the securing of that reduced traffic (such as by street layout)

8.1 Scoring change between Long List and Short List assessment

Option	Long List Score	Short List Score	Reason for Change
RPI V1	4	-1	<p>The Te Aro Trench with linear park over was considered a significant positive influence at long list given the park and amenity this would provide together with reducing traffic on Vivian Street and the other positive elements of this option (such as MRT). The park was seen too as a positive context for urban development and would make a significant new urban space repairing an otherwise relatively compromised part of the city with existing Karo Drive condition.</p> <p>However, at short list, new plan information was presented to show the extent of existing city buildings removal (some 10ha) the construction process including street diversion, as well as footprint of a new Taranaki Street interchange. This new information saw the short list assessment to be significantly negative due to the disruption and loss of existing built form, but also the extent of area that would take generations to redevelop leaving poor amenity for a considerable time. Although after generations of disruption and rebuilding a good urban renewal result might occur, the negativity was seen as long term and adverse. The change to understanding of both scale and the time for new development to create the new city area significantly influenced the score. The incorporation of plan information as to the geometry for ramps from within the trench up to Taranaki Street also brought forward which added further to the more negative influence of this option. The score thus changed in assessment from very positive at Long List to negative at Short List with the new information. The urban development score remained relatively positive between Long and Short List on the basis that it focused to extent of the area that would yield new development GFA.</p>
RPI V1 (C)	4	-1	<p>The congestion charging influence was seen as minor influence relative to the other differentiating elements and thus did not alter the scores at either short or long list in this particular option.</p>
RPI V1A	3	2	<p>Between Long and Short List, all options that included the Basin Reserve grade separation and Haining Street areas (as comprehensively planned and designed quality new liveability precincts) were scored more conservatively (this applies to other the options that included these elements too).</p> <p>This shift to a more conservative score was in response to the team's enquiry as to the commitment of the LGWM Programme to an active role in urban development quality planning. This was to ensure that any larger land areas where, across multiple sites, there was removal of existing urban buildings/streets</p>

Option	Long List Score	Short List Score	Reason for Change
			<p>fabric, that there would be a purposeful integrated urban design approach taken to its quality redevelopment.</p> <p>The LGWM enquiry response was non-committal and although still scored positively, the level of influence within the differentiators was downgraded. Since this Programme phase of optioneering there has been a subsequent decision of LGWM to a higher level of commitment and the influence of this element (Basin grade separation and Haining Street) can be more positively considered.</p> <p>Another influence to the scores between Long and Short List was additional plan information provided as to the geometry of the new tunnels through Mt Victoria. For all options the new tunnels were shown as diagonal and the geometry of these to the existing street composition on the north side of the Basin Reserve was clearly revealed. Combined with the portal arrangements and change to amenity within the schools and Mt Victoria north face the score was seen to be more negative and this further drove the score to a more negative position.</p>
RPI V1A (C)	4	3	<p>As above the scores have shifted by the same relative extent (1 point) with the congestion charging option. In both the long and short list options the congestion charging was seen to generate a more positive score given the influence to reducing vehicle numbers circulating on the city's streets so allowing street space reallocation to urban amenity outcomes in the public realm. This registers a point difference for the score typically (it didn't for V1 A as it didn't register enough differentiation compared to the big influence of the park and other positive influences) when seen in combination with and relative to the other positive elements.</p>
RPI V2	3	2	<p>There is a general trend between Short and Long list towards more conservative scores which is influenced by the urban development certainty of outcome (as noted above with reference to Option 1A) as well as some other particular factors specific to each option. Particular to the V2 (long tunnel) option was the consideration given at the Short List stage to the type of urban development this long tunnel for private motor vehicles would enable. With the encouragement to private motor vehicle trips provided by the long tunnel the urban development GFA yield may be still be positive, but the form of this development and the resultant urban outcomes were considered to be less positive. Car based development would occur widely across the eastern suburbs and occasion more private motor vehicles circulating on the local streets, reduced opportunity to allocate street space for active modes, and development formats with car-based design responses.</p>

Option	Long List Score	Short List Score	Reason for Change
RPI V2 (C)	4	2	As above the scores have shifted by the same relative extent (1 point) with the congestion charging option. In both the long and short list options the congestion charging was seen to generate a more positive score that registers a point difference when seen in combination with and relative to the other positive elements.
RPI V3	2	1	As noted above the scores for V3 (has no Basin Reserve Grade Separation) were reduced from Long to Short List given both the urban development outcomes were considered less certain and the additional understanding gained of the diagonal tunnel geometry for composition of streets, adjacent spaces and the way this influences connectedness and activation.
RPI V3 (C)	3	2	In both the long and short list options the congestion charging was seen to generate a more positive score given the influence to reducing vehicle numbers circulating on the city's streets so allowing street space reallocation to urban amenity outcomes in the public realm.
RPI V3A	2	1	The score is reduced for the same reasons expressed above for V3.
RPI V3A (C)	3	2	In both the long and short list options the congestion charging was seen to generate a more positive score given the influence to reducing vehicle numbers circulating on the city's streets so allowing street space reallocation to urban amenity outcomes in the public realm.



Appendices

Appendix A

The following graphs represent traffic across city streets for KPI 1.3. Results from the AM Peak for the eastern, northern, southern, and Te Aro screen lines are presented below, as these peaks showed differentiation across the programmes.

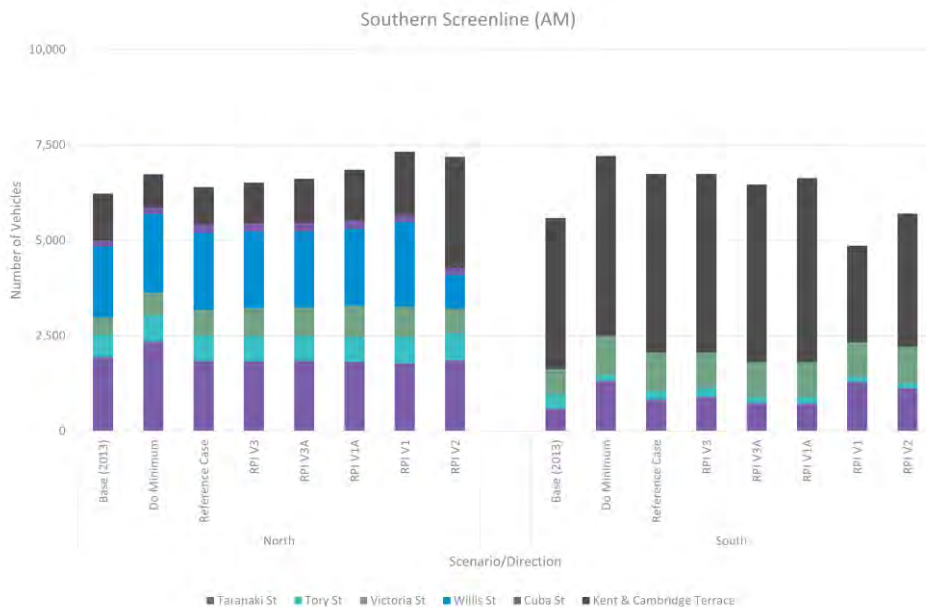


Figure 2: Southern Screenline for the AM Cycle

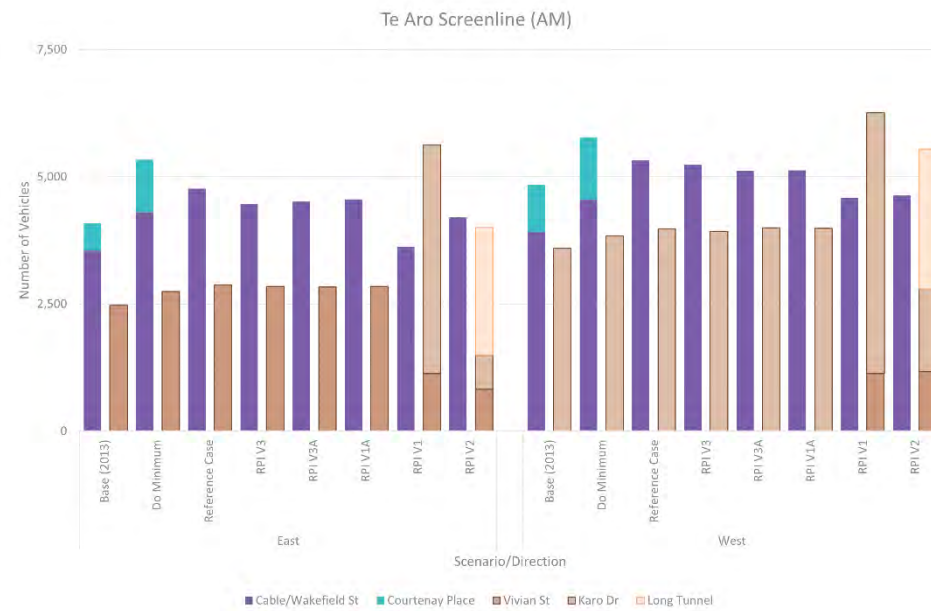


Figure 3: Te Aro Screenline for the AM Cycle

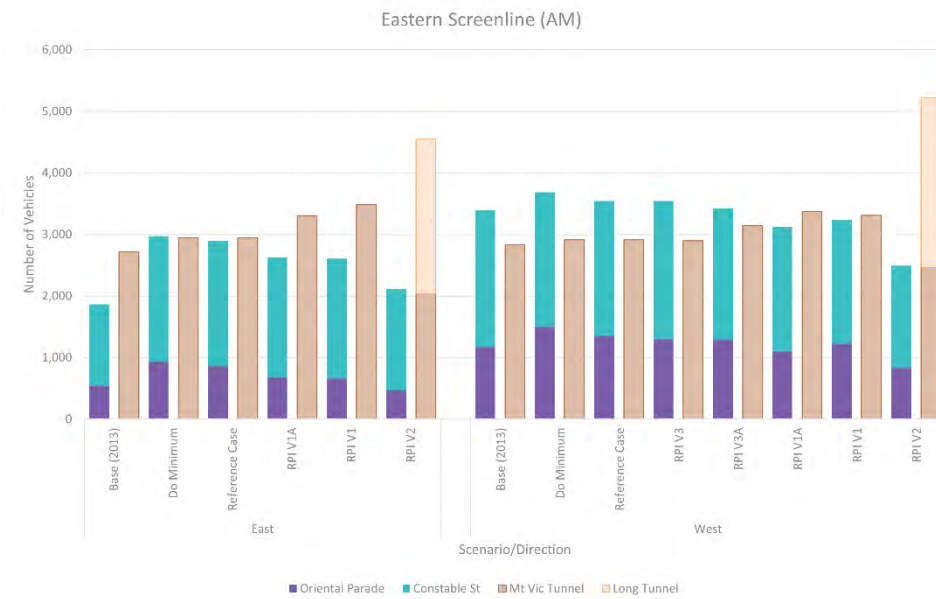
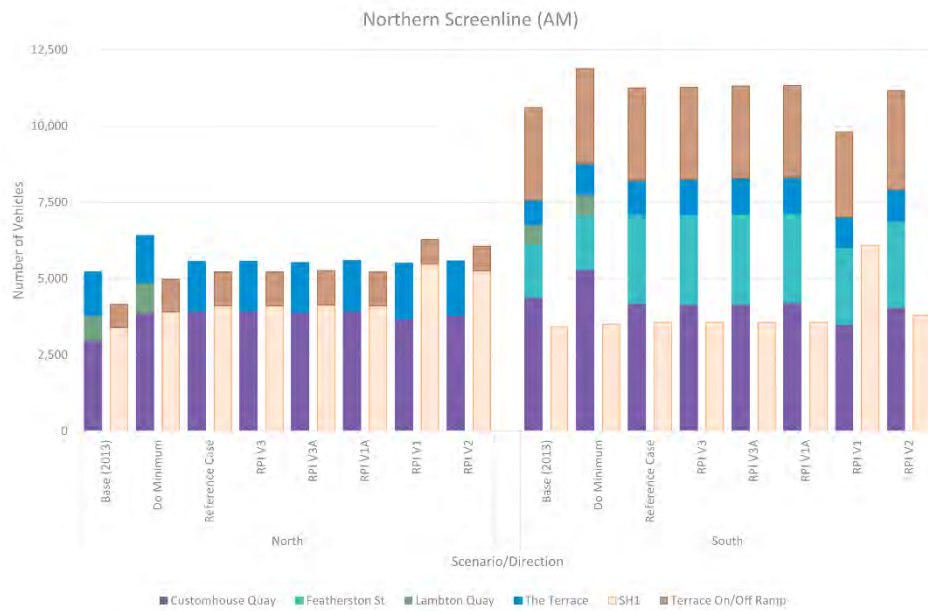


Figure 4: Eastern Screenline for the AM Cycle



Northern Screenline



Figure 5: Northern Screenline for the AM Cycle

To verify the results, an alternative method was used for traffic through and to the city centre. The outcomes of this alternative method are shown in Table 4.

Table 4: Trips Through and To the CBD

ROUTES	DM	V3	V3A	V1A	V1	V2
AM - Car trips from S&E suburbs to CBD	-2.0%	-7.0%	-6.8%	-6.5%	-4.8%	-2.0%
AM - Car trips from W & N suburbs and rest of region to CBD	-1.6%	-5.8%	-5.9%	-6.2%	-6.9%	-7.7%
AM - All car trips to CBD	-1.7%	-6.2%	-6.2%	-6.3%	-6.2%	-5.8%
AM - Car trips through CBD (e.g JVL to Airport, vv)	7.2%	4.5%	4.9%	6.1%	20.2%	14.6%
P - Car trips from S&E suburbs to CBD	11.2%	10.5%	10.8%	12.7%	13.6%	16.9%
P - Car trips from W & N suburbs and rest of region to CBD	13.1%	12.7%	12.8%	12.6%	11.7%	10.9%
P - All car trips to CBD	12.3%	11.8%	11.9%	12.6%	12.5%	13.5%
P - Car trips through CBD (e.g JVL to Airport, vv)	11.1%	9.8%	10.1%	11.6%	26.6%	20.6%
PM - Car trips to S&E suburbs from CBD	4.9%	1.6%	2.0%	2.7%	3.9%	6.6%
PM - Car trips from W & N suburbs and rest of region to CBD	4.1%	0.5%	0.5%	0.2%	-1.5%	0.0%
PM - All car trips from CBD	4.4%	0.9%	1.1%	1.1%	1.5%	1.5%
PM - Car trips through CBD (e.g JVL to Airport, vv)	7.9%	5.6%	6.2%	7.3%	22.7%	16.2%



Figure 6: South CBD 8-9



June 2021

Programme Short List Options

MCA Approach and Methodology: IO2 – Access

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 MCA Scoring

Scoring of the Programme Short List Options utilises an 11-point scale, using 2018 do nothing (or current conditions) as a base. In order to isolate the impact of background growth a 2036 do minimum has also been scored. The scoring scale is presented below:

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term

-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

3 Programme Short List Option Descriptions

3.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#), with a brief summary below:

- The Do Minimum represents a different land use scenario to base. A consistent land use scenario was used for Do Minimum and option tests
- The Do Minimum uses the November 2019 agreed population and employment forecasts which:
 - Shows significant population growth in CBD (34%) and inner suburbs (20%), albeit these represent lower rates of growth than previously assumed
 - Shows significant population growth to the north (14% in the Region as a whole, 35% in Porirua), these are much higher than previously assumed
- A key change in do minimum network assumptions from PBC is the removal of higher levels of rail capacity to the north (package of improvements known previously as RS2)
- Model refinements since PBC incorporates improved representation of public transport crowding and reliability

Figure 1: Forecast Population

	2013 Base	2018 Estimate	2036 Old (PBC)		2036 New (IBC)		2036 P4G ¹⁰		2036 RGF	
			Abs	% Diff	Abs	% Diff	Abs	% Diff	Abs	% Diff
CBD	19,400	22,100	32,500	47%	29,600	34%	26,500	20%	27,000	22%
Inner Suburbs	24,400	26,900	31,000	15%	32,200	20%	32,000	19%	31,100	16%
Eastern	36,800	38,000	40,100	6%	40,300	6%	39,800	5%	36,600	-4%
Southern	30,300	31,200	33,800	8%	34,000	9%	34,300	10%	31,900	2%
Western	25,300	25,700	26,600	4%	26,600	4%	29,500	15%	27,800	8%
Northern	64,100	67,600	77,600	15%	78,100	16%	78,600	16%	76,300	13%
Wellington City	200,300	211,500	241,600	14%	240,800	14%	240,700	14%	230,700	9%
Lower Hutt	101,100	107,600	107,300	0%	116,600	8%	116,600	8%	119,600	11%
Upper Hutt	41,400	45,300	47,400	5%	47,300	4%	47,300	4%	63,100	39%
Porirua	53,700	58,700	62,600	7%	79,400	35%	79,400	35%	64,400	10%
Kapiti	50,700	55,400	59,600	8%	62,600	13%	62,600	13%	70,000	26%
Wairarapa	42,400	46,700	44,200	-5%	50,900	9%	50,900	9%	49,800	7%
Region	489,600	525,200	562,700	7%	597,600	14%	597,500	14%	597,600	14%

Figure 2: Forecast Employment

	2013 Base	2018 Estimate	2036 Old (PBC)		2036 New (IBC)		2036 P4G		2036 RGF	
			Abs	% Diff	Abs	% Diff	Abs	% Diff	Abs	% Diff
CBD	90,400	96,400	107,500	12%	112,400	17%	112,400	17%	100,100	4%
Inner Suburbs	11,300	12,000	13,100	9%	14,300	19%	14,300	19%	13,600	13%
Eastern	10,600	11,300	12,400	10%	12,800	13%	12,800	13%	11,600	3%
Southern	4,600	4,700	4,800	2%	4,900	4%	4,900	4%	5,000	6%
Western	4,100	4,300	4,800	12%	4,900	14%	4,900	14%	5,000	16%
Northern	16,200	16,900	18,000	7%	19,200	14%	19,200	14%	17,900	6%
Wellington City	137,200	145,600	160,600	10%	168,500	16%	168,500	16%	153,200	5%
Lower Hutt	40,500	43,300	43,300	0%	46,100	6%	46,100	6%	48,400	12%
Upper Hutt	11,300	12,400	12,000	-3%	12,600	2%	12,600	2%	19,900	60%
Porirua	15,100	16,500	17,100	4%	20,000	21%	20,000	21%	23,900	45%
Kapiti	14,000	15,300	15,500	1%	16,500	8%	16,500	8%	19,800	29%
Wairarapa	17,500	19,100	19,400	2%	21,000	10%	21,000	10%	19,600	3%
Region	235,600	252,200	267,900	6%	284,700	13%	284,700	13%	284,800	13%

3.2 Programme Short List Options

Programme short list options are described elsewhere. Please refer to the Programme Short List Options Pack in [LGWM Programme Short List Briefing Pack](#).

4 KPI 2.1 - People living within close proximity of key destinations

4.1 KPI 2.1 – MCA Methodology Approach

This key performance indicator measures the total resident population within a 30-minute public transport or private vehicle journey of Wellington city centre and key social and economic activity nodes. It reflects how the resident population accesses employment, education and services by car and PT. Key destinations considered in the assessment include:

- CBD (considered to be the town hall and library precinct)
- Wellington Airport
- Hospital
- Johnsonville

The analysis is undertaken using output from the regional transport models, WTSM (Wellington Transport Strategy Model) and WPTM (Wellington Public Transport Model), for baseline and option tests for modelled years. Baseline and projected population and employment data were based at ward and at mesh block level extrapolated from Stats NZ population data.

4.2 KPI 2.1 - Assumptions

Assumptions for the "People within Close Proximity of Key Destinations" assessment approach are shown below:

- The accessibility for Car and PT will be evaluated separately. The final score will be derived by averaging the sub-category scores.
- Land use will not change between the different programme option tests. It should be noted that the 2018 base model uses a different land use scenario. The implications of this are discussed below.

4.3 KPI 2.1 – MCA Methodology Approach Approval

The people within close proximity of key destinations assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.1: People within Close Proximity of Key Destinations	SHI Team Member	MRT Team Member	GWRC TAG Member WCC TAG Member Waka Kotahi TAG Member	17 th June 2021 – evaluation workshop

4.4 KPI 2.1 - Programme Short List Assessment Analysis and Scores

The results are summarized in a series of graphs showing the resident population within 30 minutes of key destinations by car and PT respectively (Figure 3 and Figure 4). These graphs show the performance of options relative to the do minimum. The base accessibility is not shown due to the fact that it uses an alternative land use scenario (i.e. the population within 30 minutes is forecast to increase due to background growth, irrespective of the infrastructure changes). Analysis of the modelling shows that congestion on the network will increase over time. Without intervention this will result in the overall catchment areas becoming smaller for both car and PT.

The analysis shows that RPI V1 will have the highest impact on improving access to the Hospital for private vehicles and public transport. This is expected as this option has improved infrastructure to the north, south and east and will also have a larger catchment area when compared to the other programme options. RPI V2 results in similar levels of improvement to RPI V1 in terms of the airport reflecting the additional traffic capacity provided between the north and the east.

Although most options perform similarly for the CBD area, RPI V1A does appear to deliver the best overall performance for traffic. This is because it results in the highest amount of mode shift from the south and east, without increasing traffic from the north.

For PT, RPI V1 and RPI V1A deliver the best accessibility outcomes. This is likely due to the improved MRT to the south and east and the duplication of the Mount Victoria Tunnel. RPI V2, RPI V3 and RPI V3A only feature MRT to the south and therefore do not have the same level of PT accessibility benefit.

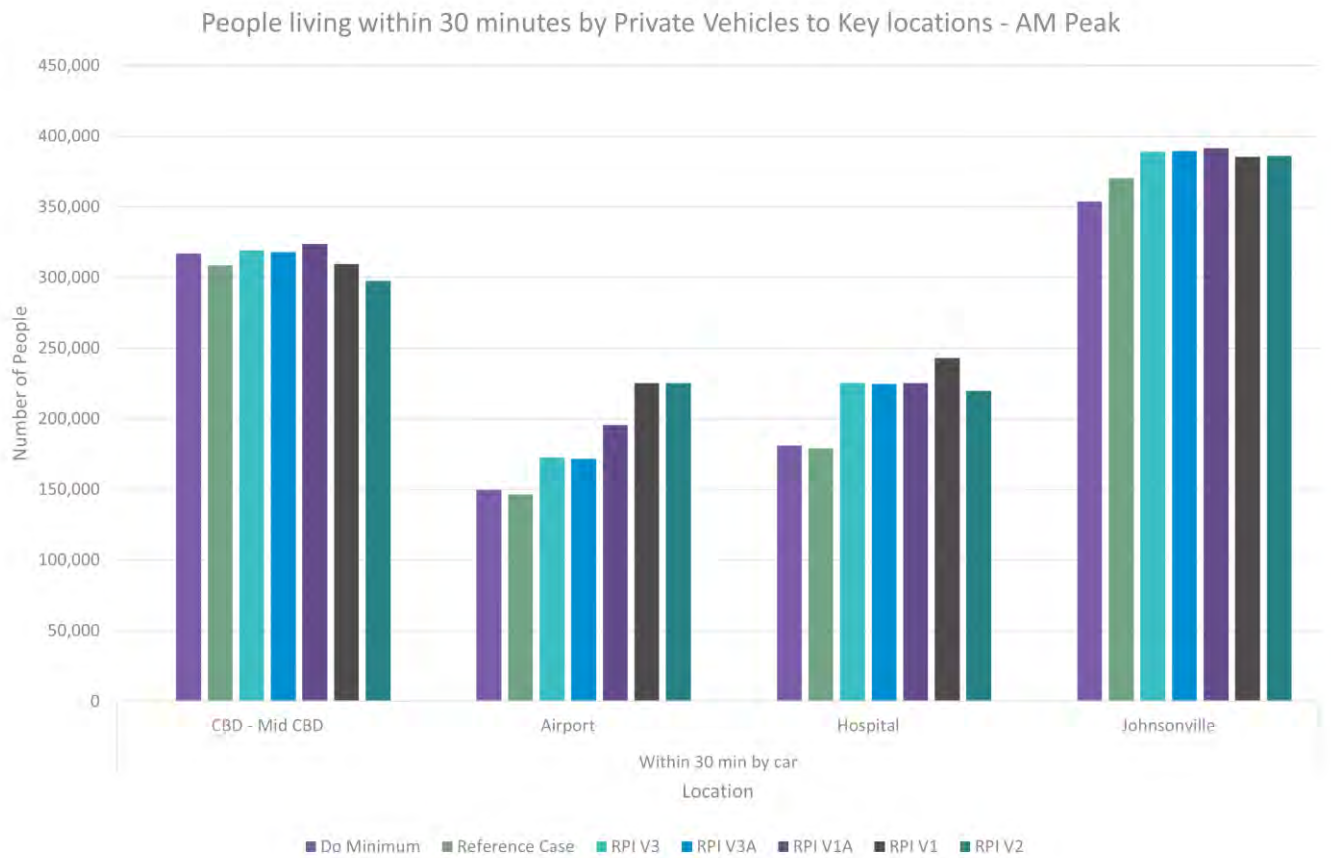


Figure 3: Private Vehicle Access to Key Locations

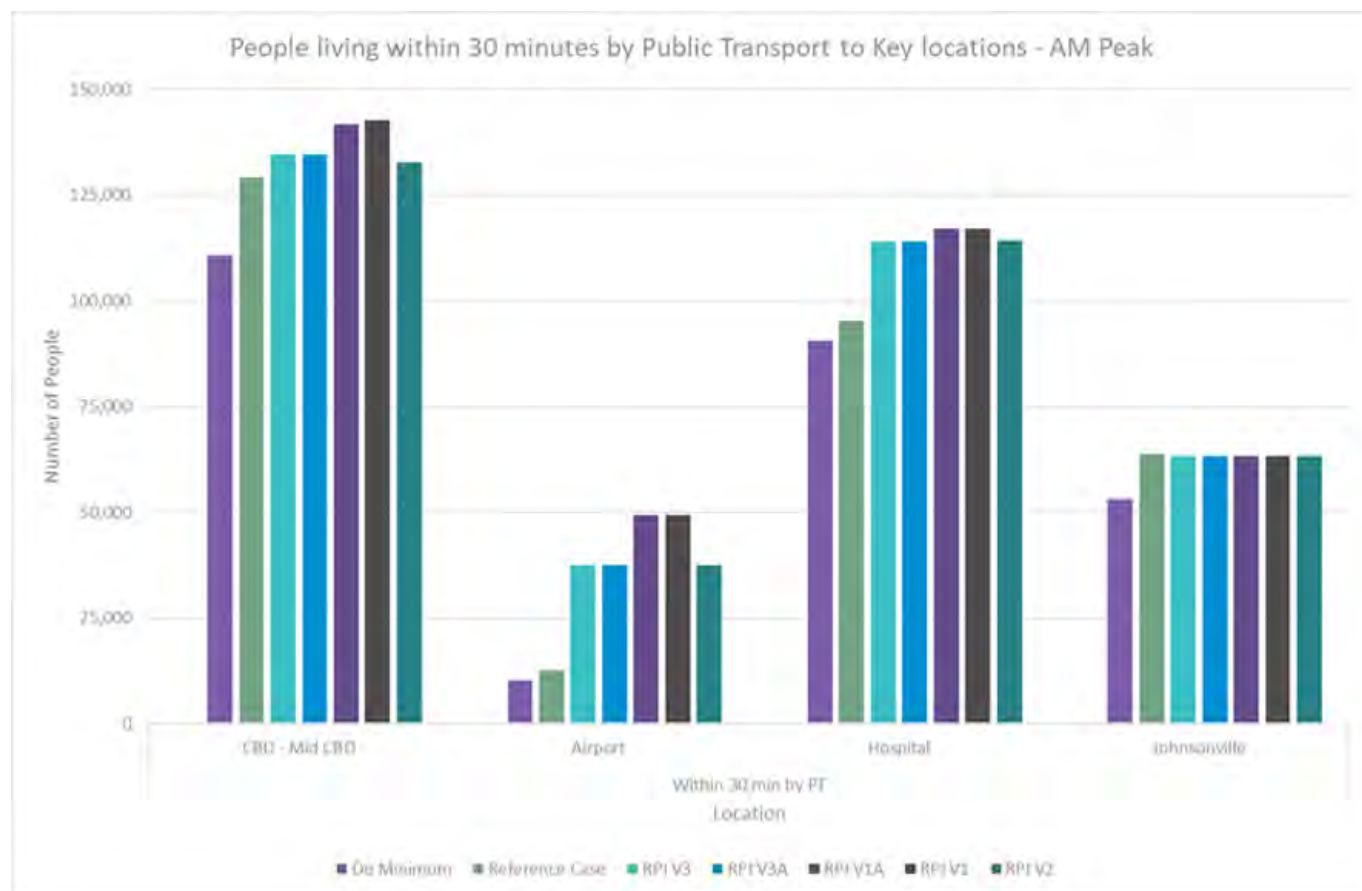


Figure 4: Public Transport Access to Key Locations

The tables below documents the specialist scores for the assessment along with a summary of the rationale. Two sets of scores are presented – one relative to the 2018 base, the second relative to the 2036 do minimum. This demonstrates that the programme options all perform well relative to the do minimum, however the scores relative to the baseline are more muted due to the effects of background population growth leading to higher levels of congestion.

Table 1: Specialist Scoring for People within Close Proximity of Key Destinations v 2018

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Baseline
Do minimum (2036)	-2	Slight decreases in levels of multi modal accessibility due to increased congestion Offset by increased population within CBD
Option RPI V1 (2036)	+2	Improved levels of PT accessibility accompanied with improvements to traffic accessibility
Option RPI V1A (2036)	+1	Similar PT accessibility to V1 but with slightly lower levels of improvement to traffic accessibility
Option RPI V2 (2036)	+1	Improvements to traffic accessibility to the north and east. Slightly lower levels of PT accessibility than V1/V1A due to lower levels of PT investment
Option RPI V3 (2036)	0	Similar levels of traffic accessibility to 2036 do minimum but still lower than existing situation. PT accessibility improvements resulting in a neutral score overall
Option RPI V3A (2036)	0	Very similar to V3

Table 2: Specialist Scoring for People within Close Proximity of Key Destinations v 2036 Do minimum

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Slight decreases in levels of multi modal accessibility due to increased congestion Offset by increased population within CBD
Option RPI V1 (2036)	+4	Improved levels of PT accessibility accompanied with improvements to traffic accessibility
Option RPI V1A (2036)	+3	Similar PT accessibility to V1 but with slightly lower levels of improvement to traffic accessibility
Option RPI V2 (2036)	+3	Improvements to traffic accessibility to the north and east. Slightly lower levels of PT accessibility than V1/V1A due to lower levels of PT investment
Option RPI V3 (2036)	+2	Similar levels of traffic accessibility to 2036 do minimum but still lower than existing situation. PT accessibility improvements resulting in a neutral score overall
Option RPI V3A (2036)	+2	Very similar to V3

4.5 KPI 2.1 Key Differentiators

Key differentiators impacting the overall relative scoring between options for People within Close Proximity of Key Destinations were:

- Improvements to PT – options with MRT to the east and south delivered higher levels of accessibility improvements than those options with MRT to the south only.
- Additional traffic capacity – those options with additional traffic capacity generally resulted in improvements to traffic accessibility.
- The long tunnel – the long tunnel provided in RPI V2 resulted in targeted accessibility improvements focussing on the north and the east.

5 KPI 2.2 – Travel Time Reliability

5.1 KPI 2.2 – MCA Methodology Approach

Private vehicle travel time reliability was assessed based on journey times extracted from WTSM for private vehicles and the UK WebTAG guidance which was used to estimate a coefficient of variation (CV – a proxy for travel time variability). The modelled travel times were compared against free flow travel times to derive congestion indices (CI - a comparative travel time metric) for key routes outlined in Table 3. This was then compared against the relationship between CI and CV, calibrated against Wellington data (TomTom). Public Transport reliability was assessed qualitatively based on assumed levels of PT priority under the various programme options

The 2018 baseline was determined using 2018 observed travel times (also TomTom data).

Table 3: Travel time reliability routes

Traffic travel time reliability routes
Taranaki Street - Johnsonville via Terrace Tunnel
Taranaki Street - Johnsonville via Quays
Island Bay - Bowen St via Terrace Tunnel
Island Bay - Bowen St via Quays
Airport - Bowen St via Terrace Tunnel
Airport - Bowen St via Newtown
Taranaki Street - Karori via Raroa
Taranaki Street - Karori via Glenmore
Hospital - Johnsonville via Customhouse Quay (single direction)
Hospital - Johnsonville via Terrace Tunnel (single direction)
Airport - Johnsonville via Terrace Tunnel (single direction)
Airport - Johnsonville via Customhouse Quay (single direction)

5.2 KPI 2.2 - Assumptions

The following assumptions have been used for this KPI:

- The car travel times are based solely on in vehicle time.

- The AM and PM peak periods were used to determine travel time reliability changes (acknowledging that lower levels of unreliability are likely to be prevalent in interpeak and off peak periods).
- When calculating the coefficient of variation, a buffer index was used (defined as 95th percentile travel time minus the mean travel time divided by the mean travel time).

5.3 KPI 2.2 - MCA Methodology Approach Approval

The travel time reliability assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.2: Travel time reliability	SHI Team Member	MRT Team Member	GWRC TAG Member WCC TAG Member Waka Kotahi TAG Member	17 th June 2021 – evaluation workshop

5.4 KPI 2.2 - Programme Short List Assessment Analysis and Scores

The 2019 Tom Tom Travel Time Variability is shown in Figure 5. This shows that, in general, as congestion increases, reliability decreases. However, once congestion increases beyond a certain level, the level of variability stabilizes (consistently unreliable travel times). The AM and PM peak relationships are shown separately and are used as the basis of this analysis.

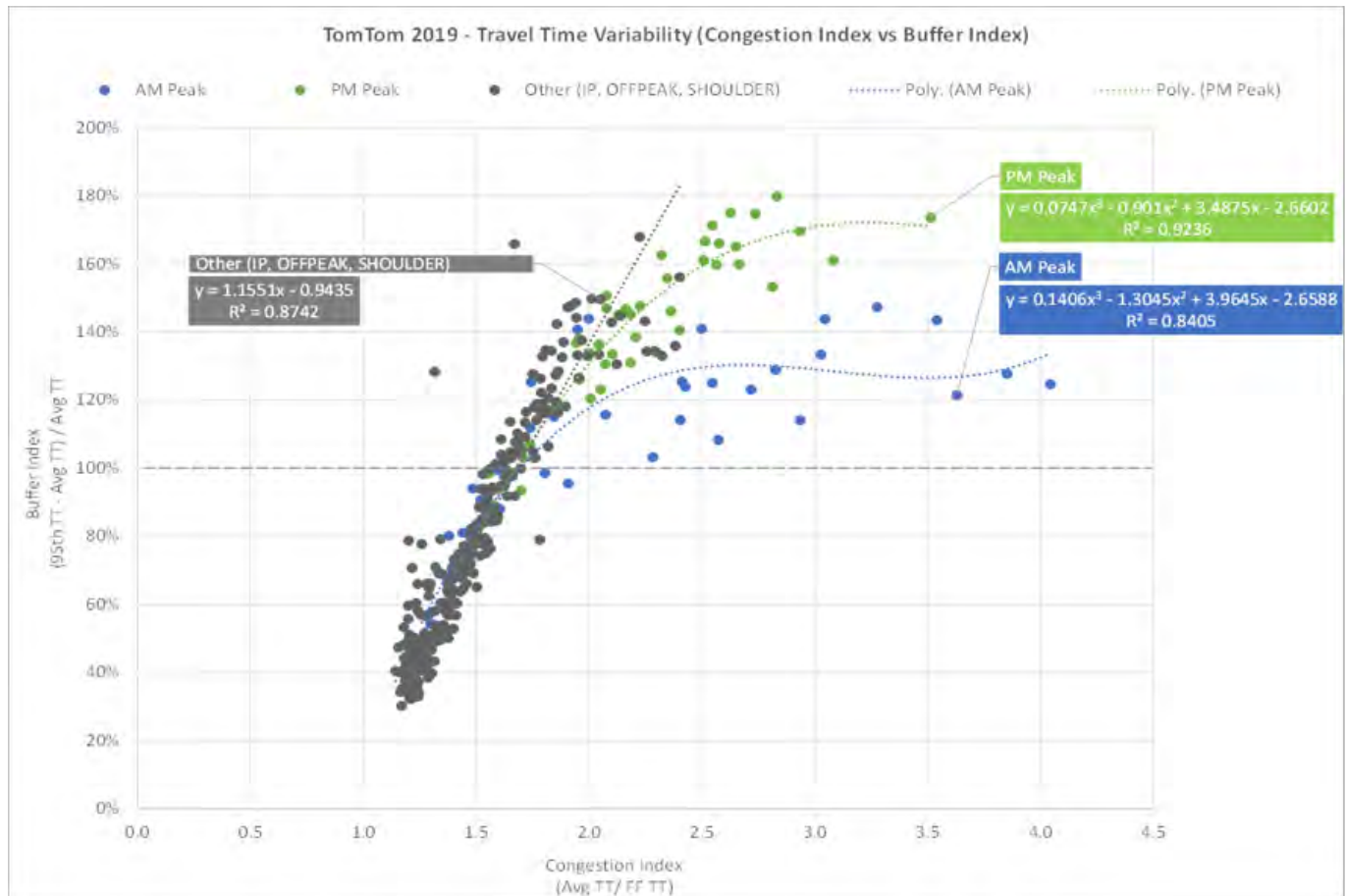


Figure 5: 2019 Tom Tom Travel Time Variability

The figure (Figure 6) below shows the changes in travel time reliability (relative to the do minimum) for the different programme options. Values above 100% indicate deteriorating levels of travel time reliability, values below 100% indicating improving levels of travel time reliability. Based on this information, the analysis showed that RPI V1 will have the best outcome for travel time variability, with an improved level of reliability on 10 of 16 routes.

RPI V3, RPI V3A and RPI V1A all show increased variability in travel time in the future. This is expected for RPI V3 and V3A as the infrastructure improvements for these options are not as great as other options, with no MRT to the east or MVT tunnel to improve travel times .

RPI V2 will have decreased performance to the CBD due to the limited access points from the tunnel to the CBD. It is worth noting that this is a partially intended consequence of RPI V2 where measures have been put in place within the model to restrict traffic capacity and reduce the risk of induced traffic.

Peak Time	AM					PM				
% Difference to Do min	RPI V3	RPI V3A	RPI V1A	RPI V1	RPI V2	RPI V3	RPI V3A	RPI V1A	RPI V1	RPI V2
Johnsonville - Airport	104%	104%	103%	87%	77%	100%	101%	99%	66%	48%
Airport - Johnsonville	100%	97%	96%	81%	85%	102%	102%	98%	82%	88%
Johnsonville - Airport via Customhouse Quay	110%	111%	106%	101%	104%	92%	103%	87%	74%	69%
Airport - Johnsonville via Customhouse Quay	109%	107%	104%	99%	102%	123%	123%	123%	104%	126%
Johnsonville - Hospital	103%	103%	103%	88%	95%	102%	104%	102%	38%	60%
Hospital - Johnsonville	100%	94%	94%	54%	86%	105%	106%	99%	53%	112%
Johnsonville - Hospital via Customhouse Quay	111%	109%	110%	97%	98%	110%	107%	109%	64%	64%
Hospital - Johnsonville via Customhouse Quay	111%	103%	99%	92%	85%	139%	130%	128%	101%	120%
Airport - Bowen St	100%	98%	97%	87%	90%	103%	102%	100%	85%	92%
Bowen St - Airport	103%	103%	101%	76%	51%	100%	101%	100%	76%	60%
Island Bay - Bowen St	105%	105%	106%	105%	100%	105%	108%	106%	93%	137%
Bowen St - Island Bay	107%	106%	107%	63%	83%	101%	104%	101%	74%	88%
Island Bay - Bowen St via Quays	120%	114%	113%	106%	99%	155%	151%	149%	117%	134%
Bowen St - Island Bay via Quays	131%	129%	129%	109%	105%	130%	129%	129%	108%	96%
Karori - Taranaki Street via Glenmore	117%	118%	118%	115%	118%	152%	155%	152%	133%	141%
Taranaki Street - Karori via Glenmore	106%	105%	105%	121%	128%	152%	153%	154%	143%	183%

Figure 6: Changes in travel time reliability between the programme options

The tables below documents the Programme Short List Option – Specialist Scores with rationale.

Table 4: Specialist Scoring for traffic travel time reliability

Options Assessment	Score v 2018	Score v Do Minimum	Commentary/ Rationale
Do minimum (2036)	-2	-	Unreliability forecast to increase by 7-15% by 2036 without intervention
Option RPI V1 (2036)	-1	+1	Modest improvements in travel time reliability relative to the base or do minimum
Option RPI V1A (2036)	-2	-1	Slight reduction in travel time reliability relative to the do minimum. Not enough to warrant a drop in score relative to the base, but given a -1 for the do minimum comparison to reflect the change
Option RPI V2 (2036)	-2	0	Similar levels of reliability to the do minimum. Improvements on some corridors, but reductions on others
Option RPI V3 (2036)	-3	-1	Reduction in travel time reliability relative to the do minimum due to increased congestion on the network
Option RPI V3A (2036)	-3	-1	Reduction in travel time reliability relative to the do minimum due to increased congestion on the network. Basin grade separation improves the situation slightly, but not enough to warrant an improved score

Table 5: **Specialist Scoring for public transport travel time reliability**

Options Assessment	Score v 2018	Score v Do Minimum	Commentary/ Rationale
Do minimum (2036)	-2	0	Increased congestion results in decreased reliability for PT
Option RPI V1 (2036)	+3	+4	Improvements to PT reliability due to two dedicated MRT spines coupled with city streets priority improvements
Option RPI V1A (2036)	+3	+4	Similar to V1. May not be quite as good if additional traffic congestion delays services with lower levels of priority, but no modelling evidence to suggest this is happening
Option RPI V2 (2036)	+2	+3	Improvements to PT reliability to the south (MRT) coupled with city streets priority improvements
Option RPI V3 (2036)	+1	+2	Improved levels of reliability on MRT and city streets corridors. Tempered slightly by increased congestion
Option RPI V3A (2036)	+1	+3	Slight improvements relative to V3 due to grade separation at Basin Reserve

5.5 KPI 2.2 Key Differentiators

Key differentiators impacting the overall relative scoring between options for Travel time reliability were very similar to those influencing the accessibility scores:

- Improvements to PT – options with MRT to the east and south delivered higher levels of reliability improvements than those options with MRT to the south only. All options benefit from the city streets package of PT improvements meaning that all options score positively
- Additional traffic capacity – those options with additional traffic capacity generally resulted in improvements to traffic travel time reliability relative to the do minimum. Additional traffic capacity also has the potential to deliver PT reliability improvements by decongesting the network.

6 KPI 2.3 - Comparative travel time between modes

6.1 KPI 2.3 – MCA Methodology Approach

This KPI assessed public transport and private vehicle travel times for the various modelled programme options. Public transport and general traffic travel times for all peak periods were exported for the overlapping corridors listed in Table 6.

Table 6 : Private vehicle and PT routes

Car (both directions required)	PT
Taranaki Street - Johnsonville via Terrace Tunnel Taranaki Street - Johnsonville via Quays	Johnsonville – Wellington Station
Island Bay - Bowen St via Terrace Tunnel Island Bay - Bowen St via Quays	Island Bay to CBD (or Newtown to Station)
Airport - Bowen St via Terrace Tunnel Airport - Bowen St via Newtown Taranaki Street - Karori via Raroa Taranaki Street - Karori via Glenmore	Airport to Central Station (or Mirmar to CBD) Taranaki St to Karori
Hospital - Johnsonville via Customhouse Quay (single direction)	None
Hospital - Johnsonville via Terrace Tunnel (single direction) Airport - Johnsonville via Terrace Tunnel (single direction)	None
Airport - Johnsonville via Customhouse Quay (single direction)	None

6.2 KPI 2.3 - Assumptions

This analysis uses travel times determined for KPI 2.2.

6.3 KPI 2.3 – MCA Methodology Approach Approval

The Comparative Travel Time Between Modes assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.3: Comparative Travel Time Between Modes	SHI Team Member	MRT Team Member	GWRC TAG Member WCC TAG Member Waka Kotahi TAG Member	17 th June 2021 – evaluation workshop

6.4 KPI 2.3 - Programme Short List Assessment Analysis and Scores

The following graphs show travel times for public transport (Figure 7) and general traffic (Figure 8). The PT graph also includes data for the “reference case” (an assessment undertaken for the package level analysis to demonstrate the impact of the programme elements not covered by the Strategic Highways or MRT packages). This has been included here to demonstrate the benefits provided by the city street elements – these deliver improved travel times for PT users on most routes. The graph also shows the relative contributions of MRT to the south (as shown for the Island Bay route) and the east (the Miramar route). The traffic graph shows a generally positive correlation between scale of roading investment and travel time improvements. Options V1 and V2 deliver the greatest travel time benefits (with V2s benefits focused on journeys between the north and the east).

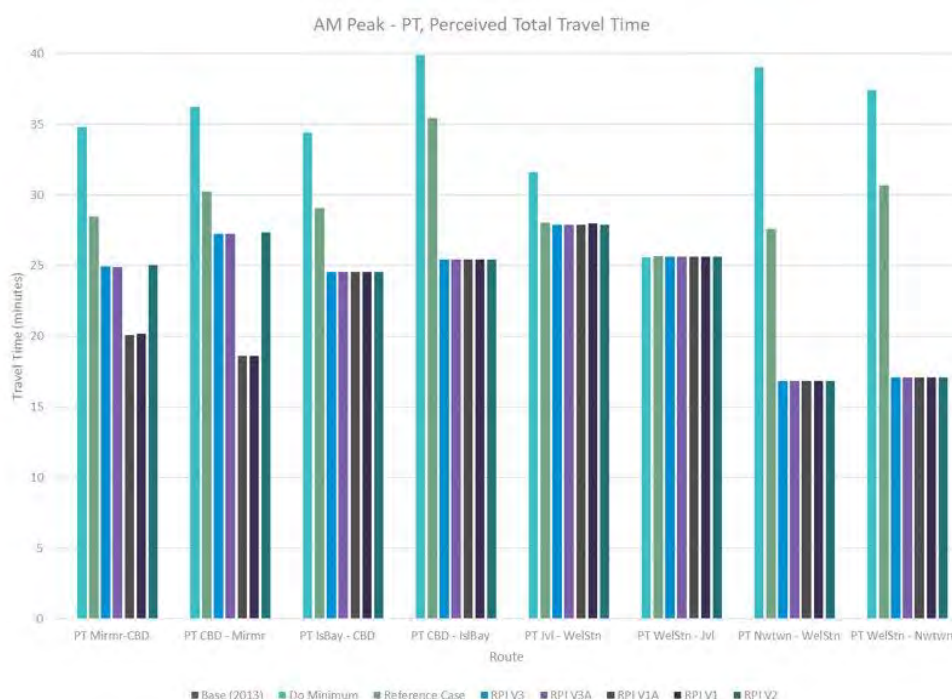


Figure 7: PT Travel Times

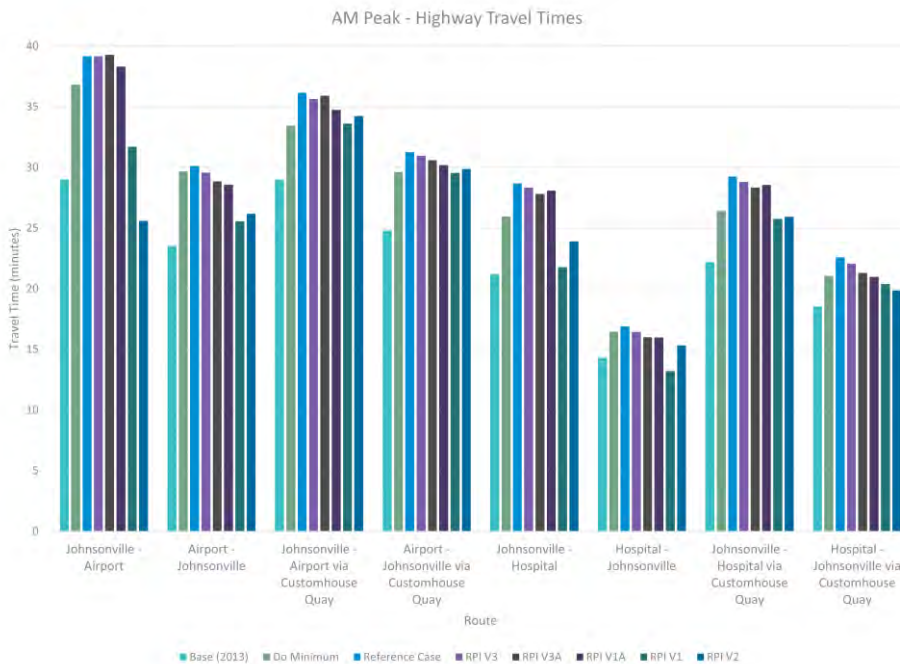


Figure 8: AM peak private motor vehicle travel times

In order to understand the relative contribution of changes at the Basin (to determine whether option V3A warrants a higher score than V3), the Aimsun model has been run with three different Basin configurations – the existing configuration (without MRT), an optimised at grade option (with MRT bypassing the Basin on Tasman Street) and a grade separated option (with MRT passing through the Basin). This shows that grade separation delivers some benefits, however they are relatively modest. Further interrogation of the Aimsun model indicates that this is due to the enduring effects of upstream and downstream bottlenecks limited the effectiveness of Basin changes.

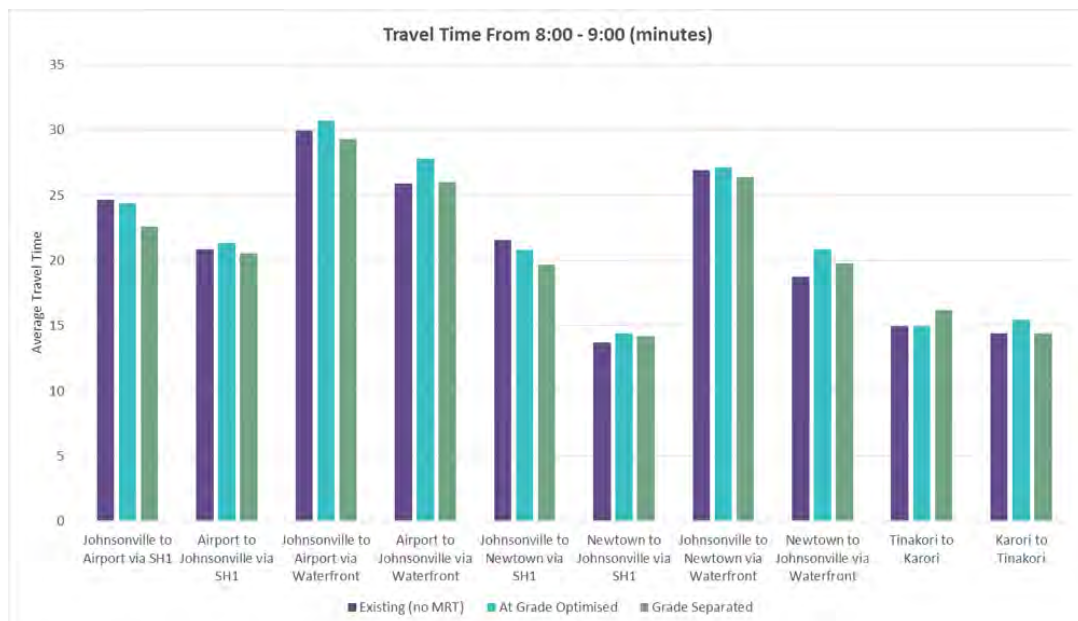


Figure 9: Basin Effects

The table below (Table 7) shows the ratio between private vehicle and PT travel times. Numbers greater than one show that private vehicles are faster, whereas number less than one indicate that PT is faster (for example, a figure of 1.38 would indicate that the PT journey is 38% longer than the equivalent traffic journey). This indicates that V3, V3A and V1A generally offer the most competitive PT travel times relative to general traffic.

Table 7: Ratio of Private Vehicle Traffic – PT travel times

Route	Do Minimum	Reference Case	RPI V3	RPI V3A	RPI V1A	RPI V1	RPI V2
Johnsonville - Taranaki Street	1.83	1.63	1.38	1.38	1.38	1.62	1.54
Taranaki Street - Johnsonville	2.96	2.56	2.23	2.22	2.22	2.75	2.41
Airport - Bowen St	1.48	1.40	1.17	1.22	1.08	1.23	1.36
Bowen St - Airport	1.43	1.26	0.98	0.98	0.90	1.20	1.90
Island Bay - Bowen St	2.48	2.16	1.87	1.87	1.86	1.87	1.90
Bowen St - Island Bay	2.22	1.93	1.40	1.40	1.39	1.79	1.61
Karori - Taranaki Street via Glenmore	2.01	1.79	1.80	1.79	1.79	1.80	1.76
Taranaki Street - Karori via Glenmore	2.35	2.02	1.99	1.99	2.00	1.85	1.80
Seatoun - Bowen St	1.45	1.47	1.31	1.33	1.23	1.40	1.46
Bowen St - Seatoun	1.09	0.95	1.31	1.31	1.07	1.41	2.47

The table below documents the specialist scores for this KPI with accompanying rationale.

Table 8: Specialist Scoring for Comparative Travel Time Between Modes v 2018

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Baseline
Do minimum (2036)	0	Increased congestion will result in deterioration in travel time for both traffic and PT
Option RPI V1 (2036)	+2	Improvements to PT offset by improvements to general traffic. Ratios still better than do minimum
Option RPI V1A (2036)	+4	Further improvements in comparative travel time relative to V1 due to similar PT/MRT travel times, but lower levels of travel time improvements to traffic travel time
Option RPI V2 (2036)	+2	Improvements to PT offset by improvements to general traffic. Ratios still better than do minimum
Option RPI V3 (2036)	+3	Travel time improves for PT and deteriorates for general traffic resulting in improved ratios
Option RPI V3A (2036)	+3	Very similar to V3. Basin grade separation performs slightly better than the at grade options, but not enough to warrant a change in score

6.5 KPI 2.3 Key Differentiators

Key differentiators impacting the overall relative scoring between options for Comparative Travel Time Between Modes were:

- Improvements to PT – options with MRT to the east and south delivered the largest improvements in overall PT travel time. All options benefit from the city streets package of PT improvements
- Additional traffic capacity – those options with additional traffic capacity generally resulted in reductions in travel time for motorists. This reduces the competitiveness of PT relative to general traffic and leads to a lower score.

7 KPI 2.4 - Equitable Access for/to transport

7.1 KPI 2.4 – MCA Methodology Approach

This key performance indicator assesses the impact of programme improvements on providing greater transport equity and accessibility across different societal groups. Transport equity analysis can be complex because there are several types of equity, many potential impacts to consider, various ways to measure impacts, and many possible ways to categorize people. Using research from the NZ Index of Multiple Deprivation

Measurement (draft) – changes in PT patronage at MRT station locations linked with socio demographic statistics so that we can assess how areas which are classed as 'deprived' (with ref. to IMD database) from a socio economic perspective is improved through public transport connectivity investments.

Focus of measurement:

- Earnings - Income bands (Source: IMD 2018 or StatNZ Census 2018)
- Employment status – Unemployed, employment sector (Source: WTSM)
- Education – levels (Source: WTSM or Census 2018)
- Demographic Profile – Children / Young Adult (Source: WTSM)

Changes to accessibility (measured using effective density, WTSM output) linked with socio-demographic statistics and NZ IMD database. Identifies the extent of programme PT and roading investments supports improved access in areas of high deprivation.

Transport Equity has previously been assessed using a number of different approaches. The SHI team previously assessed equity using a bespoke Connectivity & Deprivation Audit Tool (CDAT) and this approach could be reused. The tool provides a systematic way to identify areas which are classed as 'deprived' from a socio economic perspective and also suffer from poor public transport connectivity. The tool was previously configured to assess the correlation between the levels of deprivation and connectivity for each option against the existing PT network.

Should this approach be adopted again, the transport equity KPI will utilise WTSM employment zones, PT routes and socio demographic statistics to determine the level of connectivity to employment by PT to areas across the region.

However, further definition of the transport equity needs to be determined by the programme and the nominated subject matter experts.

7.2 KPI 2.4 - MCA Methodology Approach Approval

The Equitable Access for/to transport assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.4: Equitable Access for/to transport	MRT Team Member	MRT Team Member SHI Team Member	GWRC TAG Member	17 th June 2021 – evaluation workshop

7.3 KPI 2.4 - Programme Short List Assessment And Scores

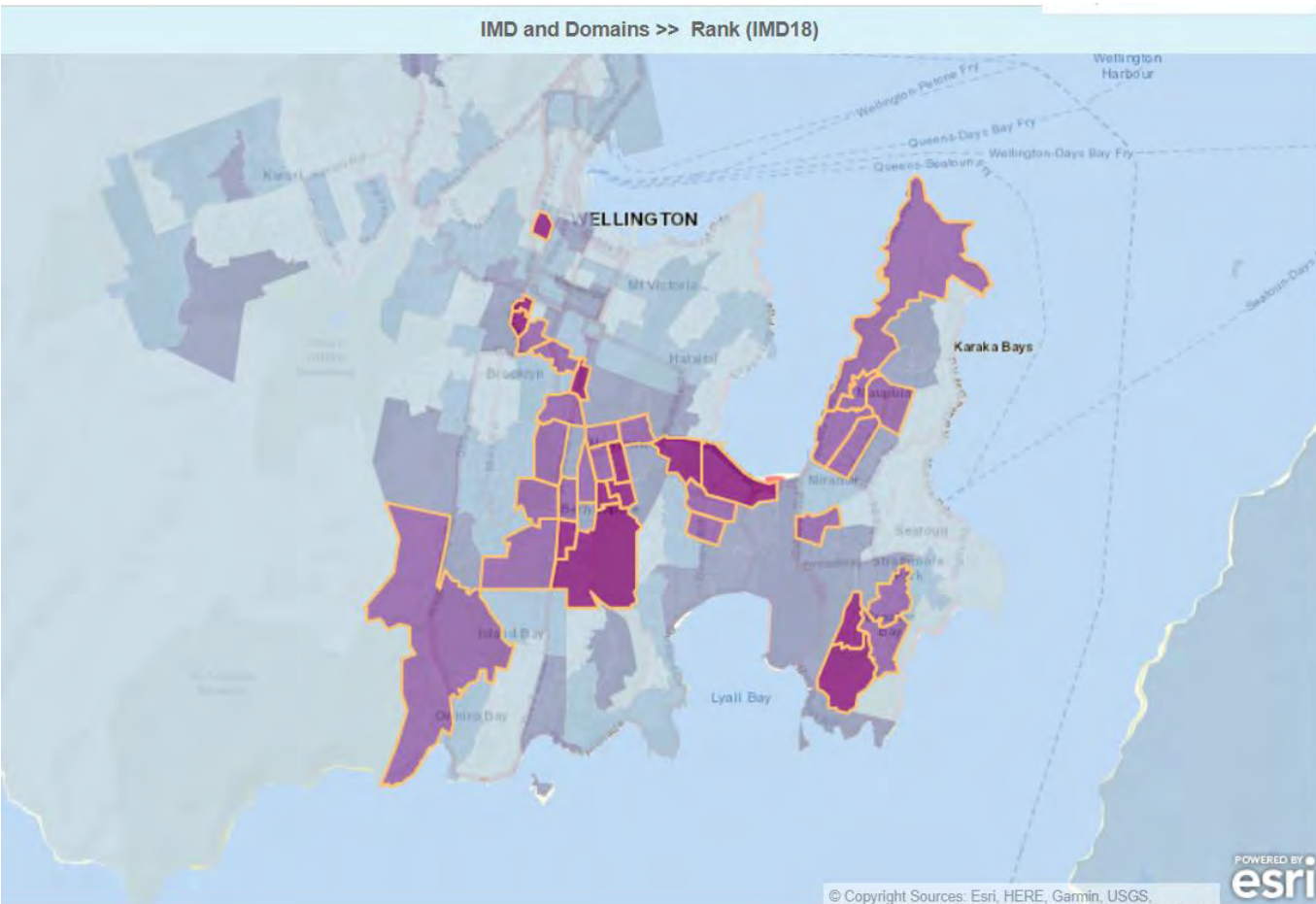


Figure 10: Transport Equity Map

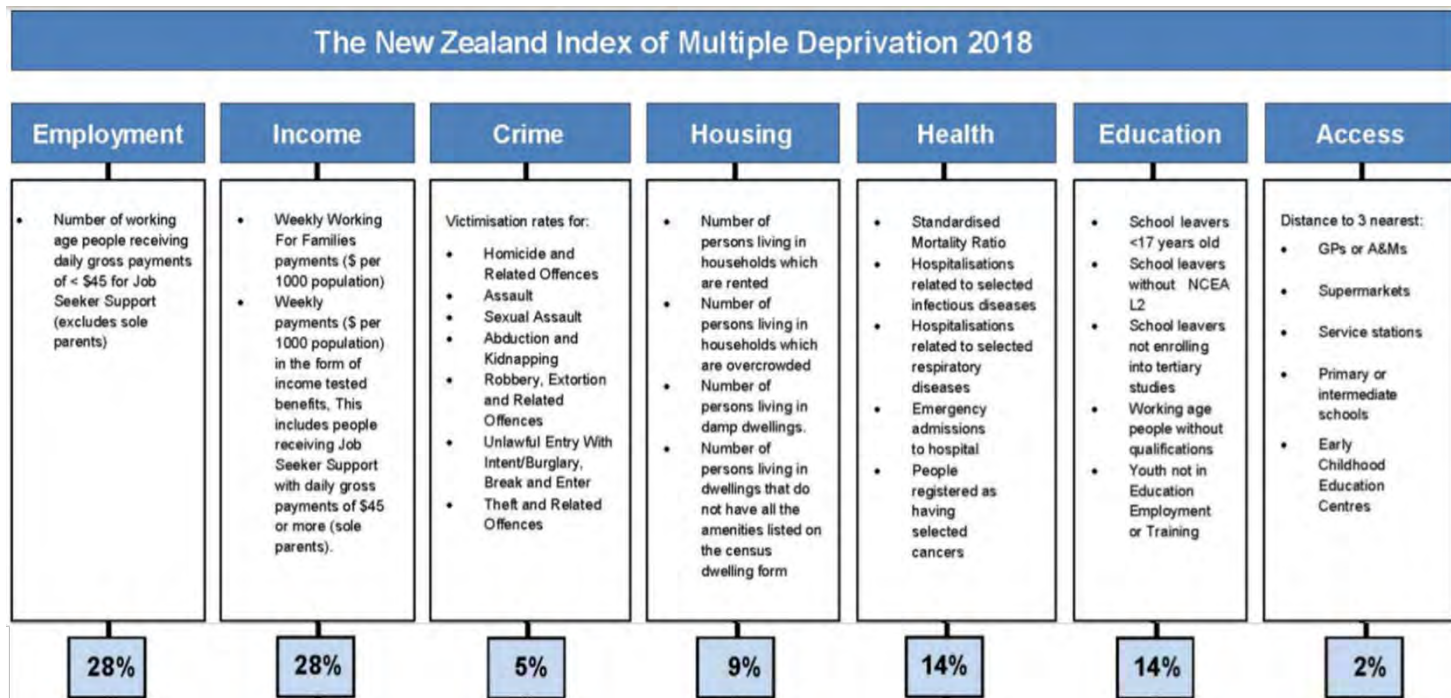


Figure 11: Indices of multiple deprivation

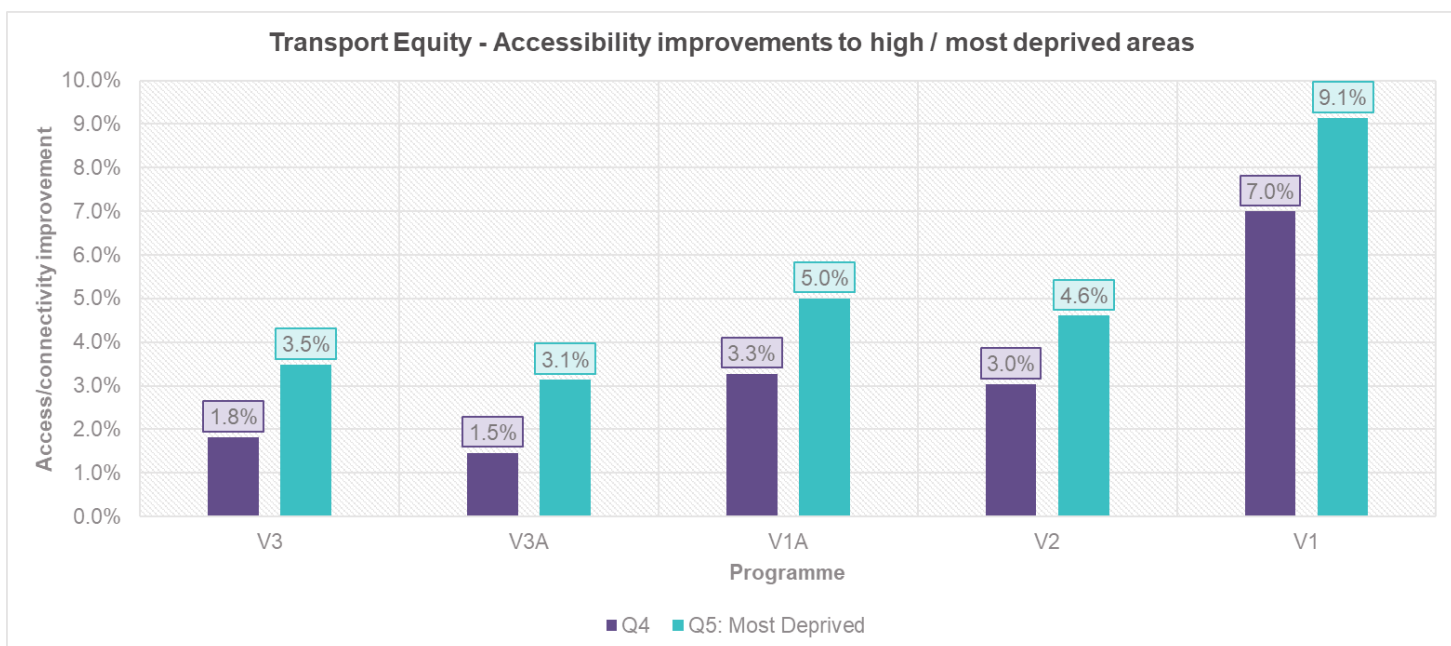


Figure 12: Accessibility improvements to high/most deprived areas

The tables below documents the Programme Short List Option – Specialist Scores with rationale.

Table 9: Specialist Scoring for Equitable Access for/to transport

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Baseline
Do minimum (2036)	-1	Increased network congestion results in deterioration in accessibility causing a slight worsening for equitable access.
Option RPI V1 (2036)	+4	High improvement in transport accessibility for users in deprived areas access to/from southern and eastern suburb and within CBD.
Option RPI V1A (2036)	+3	Good improvements from MRT coverage to eastern suburb and highlighted deprived areas. Slight lower score than V1A as removal of Te Aro trench and Terrace Tunnel investments which provide accessibility to CBD.
Option RPI V2 (2036)	+3	Good improvement for users in deprived areas to access south and also regional trips, but not a +4 as trade off with PT east assumption via Hataitai bus tunnel.
Option RPI V3 (2036)	+1	Scores marginally lower to V3 w.r.t improved accessibility to high deprived areas (4th and 5th quintiles), but does not warrant a full point deduction.
Option RPI V3A (2036)	+1	Slight improvements in accessibility to deprived areas in Newtown, Berhampore, Strathmore Park and Miramar Peninsula.

7.4 KPI 2.4 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for Equitable Access for/to Transport were:

- Improvements to PT – options with a fuller MRT extent to the east and south are more likely to deliver the largest improvements in overall PT catchments and accessibility to lower socio-economic areas. All options does benefit from the City Streets package of PT improvements that is beyond the current MRT geographic footprint.
- Additional traffic capacity – options with greater roading infrastructure is also likely to improve equitable accessibility scoring as it help alleviate growing congestive network performance and enable motorist to travel.

Improvements to active mode accessibility can also provide a means of differentiating between options. However, as this component was featured in all short list options this did not contribute towards any scoring differences.

8 KPI 2.5 - Pedestrian Level of Service

8.1 KPI 2.5 – MCA Methodology Approach

To assess Pedestrian Level of Service at a Programme level a qualitative assessment drawing on previous package assessments of changes to pedestrian delay at intersections was used as well as information from screenlines used for the “traffic off city streets” KPI (KPI 1.3)

8.2 KPI 2.5 - Assumptions

This KPI has been assessed qualitatively at this stage, drawing on an understanding of the contribution of various packages to pedestrian level of service across the city.

8.3 KPI 2.5 - MCA Methodology Approach Approval

The Pedestrian Level of Service assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.5: Pedestrian Level of Service	SHI Team Member	MRT Team Member	GWRC TAG Member MRT Team Member	17 th June 2021 – evaluation workshop

8.4 KPI 2.5 - Programme Short List Assessment Analysis and Scores

On balance it was considered that all options will perform better than the base or Do Minimum as a result of the infrastructure improvements to improve pedertrian comfort and reduce delays. Improvements such as:

- City Streets
- Golden Mile
- Mount Victoria Active Mode Tunnel
- Improved connections to the east via Ruahine Street

Although there are minor differences in the programme options, the majority were not considered significant enough to warrant changes in scores. RPI V1 was the only option awarded a higher score as this programme option further reduces pedestrian traffic conflicts by implementing the Te Aro trench (which provides improved north-south as well as east-west connectivity). The changes in traffic on city streets was not considered significant enough to justify changing scores. Further detail on this assessment is provided in the reporting for IO1 – liveability.

The tables below documents the Programme Short List Option – Specialist Scores with rationale.

Table 10: Specialist Scoring for Pedestrian Level of Service v 2036 Do minimum/Base

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Baseline
Option RPI V1 (2036)	+3	As Do Minimum plus <ul style="list-style-type: none"> • City Streets programme of improvements – reprioritised intersections • Golden Mile improvements • Dedicated Mt Victoria active mode tunnel • MRT stations created increased permeability across key streets • Traffic increases relative to 2018 • Some reductions in traffic on city streets • Te Aro trench reducing severance
Option RPI V1A (2036)	+2	As V1 but <ul style="list-style-type: none"> • Without the Te Aro trench • With some minor increases in traffic on city streets
Option RPI V2 (2036)	+2	As V1 but <ul style="list-style-type: none"> • Without the Te Aro trench • With a reduced MRT network (MRT south only)
Option RPI V3 (2036)	+2	As V1A but <ul style="list-style-type: none"> • With a reduced MRT network (MRT south only)
Option RPI V3A (2036)	+2	As V3 plus <ul style="list-style-type: none"> • Basin Reserve package of improvements

8.5 KPI 2.5 - Key Differentiators

There are limited key differentiators impacting the overall relative scoring between options for Pedestrian Level of Service. All programmes incorporate improvements to pedestrian level of service delivered through the City Streets package, the Golden Mile improvements and the Thorndon Quay/Hutt Road package.

9 KPI 2.6 - Public Transport Delay

9.1 KPI 2.6 – MCA Methodology Approach

Public Transport delays (in-vehicle) will be evaluated using WTSM outputs which determine mode shift and travel times along key PT corridors outlined below. This KPI was assessed by comparing public transport peak travel times vs free flow travel time in 2036 for all programme options

- Miramar - CBD
- Island Bay - Central Station
- Newtown - Wellington Station
- Taranaki Street - Johnsonville
- Taranaki Street - Karori

9.2 KPI 2.6 - Assumptions

The following assumptions were used for this KPI. The key differentiator for this assessment was the presence of MRT in an exclusive or shared lane.

- MRT counted as public transport;
- Buses could use MRT lanes at intersections;
- HOV usage would increase over time, resulting in reduced benefits where MRT shared space with HOVs; and
- The presence of MRT would not result in existing bus services being removed (unless directly replaced by the MRT service).
- New intersections that accommodate PT priority are functional and allow efficient passage of PT vehicles

9.3 KPI 2.6 - MCA Methodology Approach Approval

The public transport delay across key routes assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 2.6: Public Transport delay across key routes	MRT Team Member	SHI Team Member	GWRC TAG Member	17 th June 2021 – evaluation workshop

9.4 KPI 2.6 - Programme Short List Assessment Analysis and Scores

The graphs below show the baseline 5th, 25th, 75th and 95th percentile travel times, and the scheduled travel times for the following key corridors:

- Island Bay to Courtenay Place (Route 1)
- Miramar to Courtenay Place (Route 2)
- Johnsonville to Lambton Quay (Route 1)
- Karori to Lambton Quay (Route 2)

All of these graphs indicate a degree of variability in travel times, indicating variable levels of delay. All routes experience more delay during peak periods. This is allowed for in the timetable, however it is notable that all routes experience journey times in excess of the scheduled times. The Karori corridor has the most pronounced difference between actual and scheduled travel times for the AM peak.

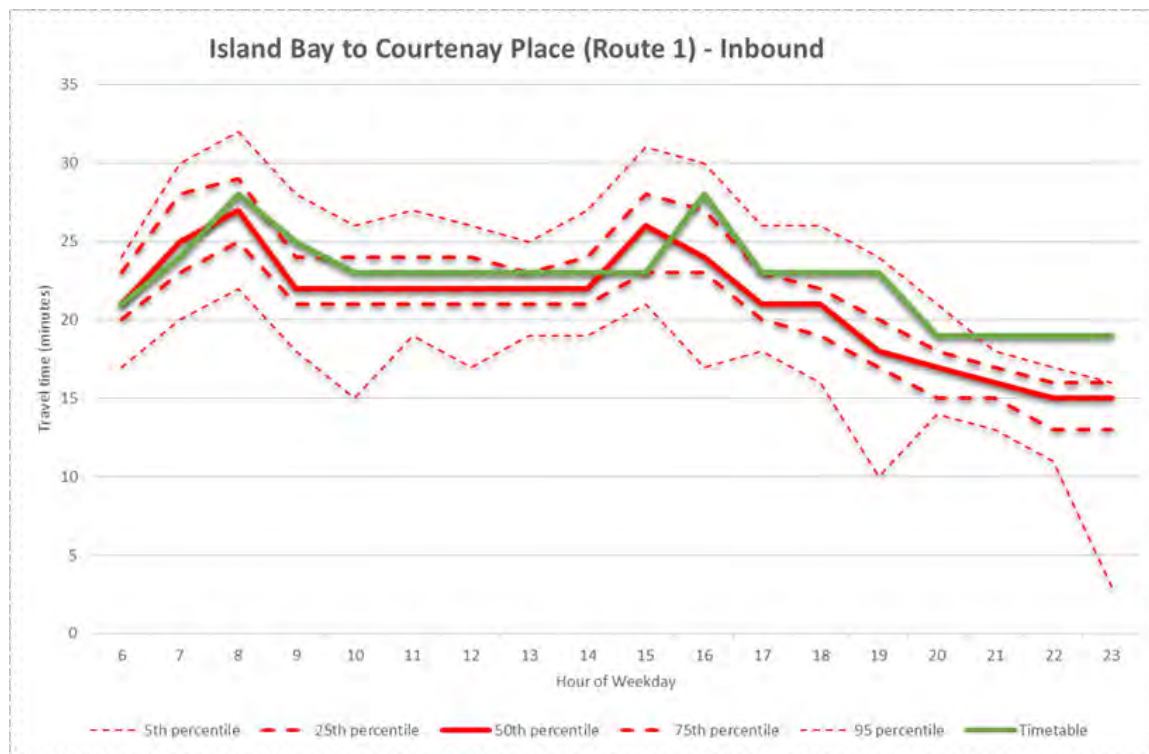


Figure 13: PT delay – Island Bay to Courtenay Place

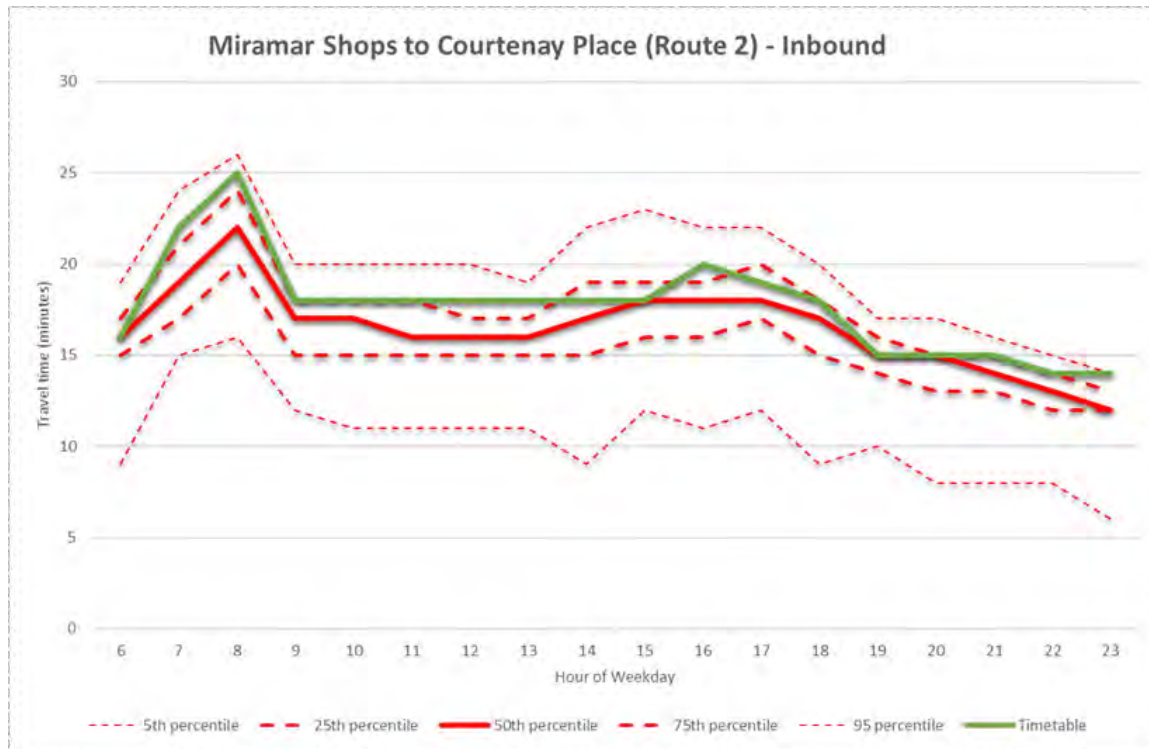


Figure 14: PT delay – Miramar to Courtenay Place

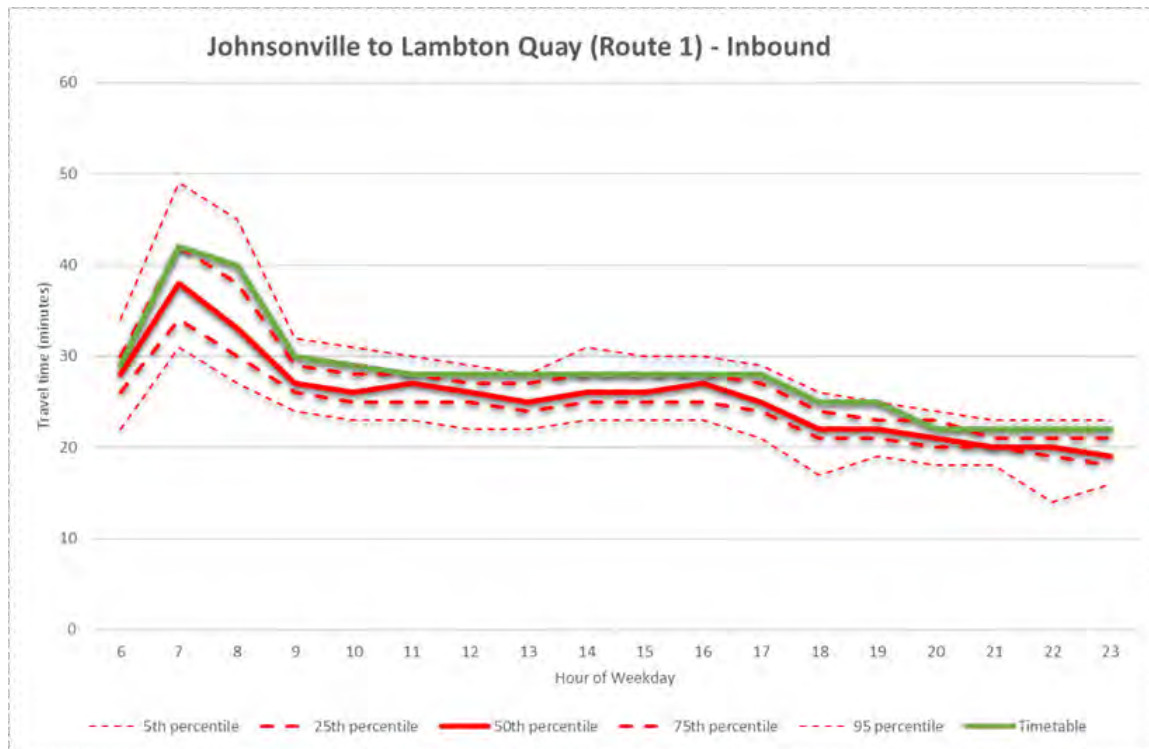


Figure 15: PT delay – Johnsonville to Lambton Quay

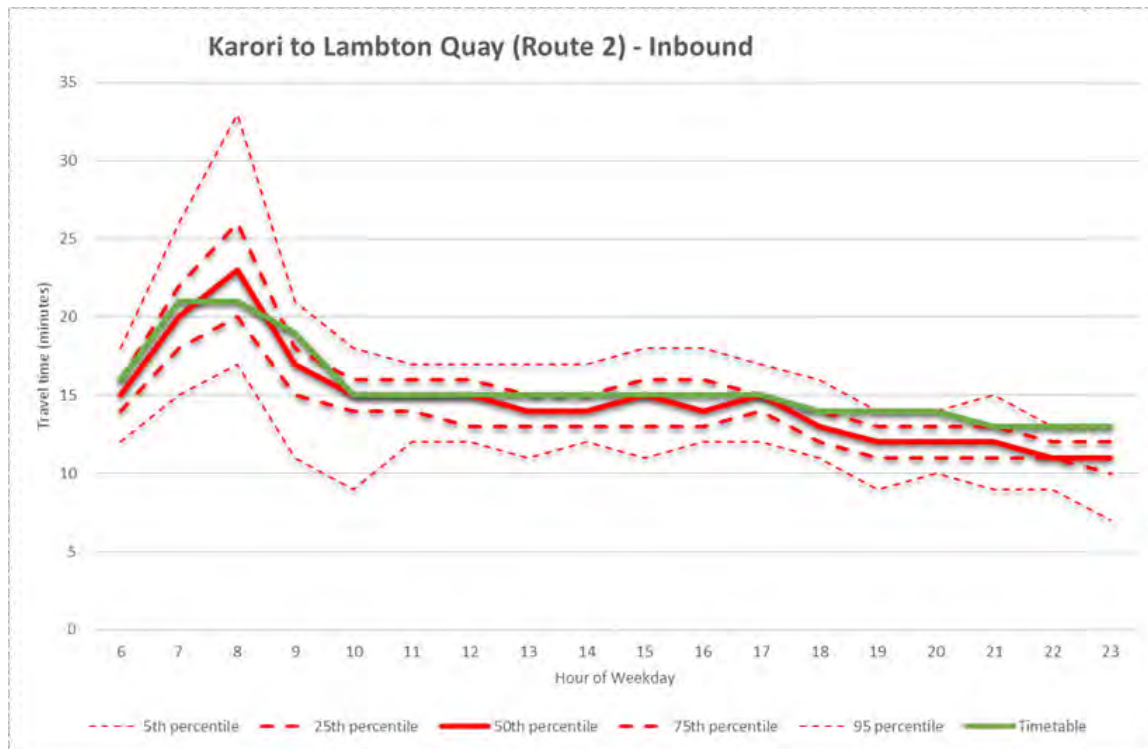


Figure 16: PT delay – Karori to Lambton Quay

Under the programme options it would be reasonable to assume that the level of priority afforded to MRT would reduce the delay to public transport services. Options with MRT to the south replace the route 1 corridor between the railway station and Island Bay, and options with MRT to the east replace the route 2 corridor between the CBD and Miramar.

The Johnsonville corridor will experience improvements in the peak direction due to the Thorndon Quay/Hutt Road package and the City Streets package is assumed to deliver priority measures along the Karori corridor. These two components are common to all programme options.

The tables below documents the Programme Short List Option – Specialist Scores with rationale.

Table 11: Specialist Scoring for Public Transport delay across key routes Score vs Base

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Baseline
Do minimum (2036)	-2	Future baseline, assumed to be worse than base, due to increases in traffic congestion
Option RPI V1 (2036)	+2	Virtually identical to V1A (according to WTSM)
Option RPI V1A (2036)	+2	Significant improvement from south and east
Option RPI V2 (2036)	+1	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+1	Significant improvement from south
Option RPI V3A (2036)	+1	Virtually identical to V3 (according to WTSM)

Table 12: Specialist Scoring for Public Transport delay across key routes Score vs Do Min

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Baseline
Option RPI V1 (2036)	+4	Virtually identical to V1A (according to WTSM)
Option RPI V1A (2036)	+4	Significant improvement from south and east
Option RPI V2 (2036)	+3	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+3	Significant improvement from south
Option RPI V3A (2036)	+3	Virtually identical to V3 (according to WTSM)

9.5 KPI 2.6 - Key Differentiators

The key differentiator impacting the overall relative scoring between options for Public Transport delay across key routes is the degree to which PT priority is provided.

10 KPI 2.7 - The quality of cycling facilities

10.1 KPI 2.7 – MCA Methodology Approach

To assess the quality of cycling facilities sub-criterion at a programme level a qualitative assessment drawing on previous package assessments of changes to quality of cycling infrastructure was used as well as information from screenlines used for the “traffic off city streets” KPI (KPI 1.3)

10.2 KPI 2.7 - Assumptions

The key assumption is that the city streets package delivers a suite of cycling network improvements across the city. The exact form of these improvements has not been defined but it is assumed that they will include dedicated facilities on key high demand corridors. Cycling improvements proposed through the Thorndon Quay/Hutt Road and Golden Mile projects are incorporated as are the proposed changes along the MRT corridor(s), through Mt Victoria, around the Basin Reserve and along/across the State Highway.

10.3 KPI 2.7 - Methodology Approach Approval

The Quality of Cycling Facilities assessment approach for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 3.5: Quality of Cycling Facilities	SHI Team Member	MRT Team Members	GWRC TAG Member	17 th June 2021 – evaluation workshop

10.4 KPI 2.7 - Programme Short List Assessment Scores

The tables below documents the Programme Short List Option – Specialist Scores with rationale.

Table 13: Specialist Scoring for Quality of Cycling Facilities v 2036 Do minimum/Base

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Baseline
Option RPI V1 (2036)	+4	As Do Minimum plus <ul style="list-style-type: none"> • City Streets programme of improvements – cycleway network improvements • Golden Mile cycling corridor • Hutt Road/Thorndon Quay cycling corridor • Dedicated Mt Victoria active mode tunnel • Some increases in traffic on city streets • Lower levels of increase in traffic on city streets • Te Aro trench providing E-W connectivity
Option RPI V1A (2036)	+3	As V1 but without the Te Aro trench
Option RPI V2 (2036)	+3	As V1 but without the Te Aro trench and with some increases in traffic on city streets
Option RPI V3 (2036)	+3	As V1 but without the Te Aro trench and with some increases in traffic on city streets
Option RPI V3A (2036)	+3	As V3 plus <ul style="list-style-type: none"> • Basin Reserve package of improvements

10.5 KPI 2.7 Key Differentiators

There are few differentiators impacting the overall relative scoring between options for Quality of Cycling Facilities. The city streets, Thorndon Quay/Hutt Road and Golden Mile packages

11 Overall Scores

11.1 Methodology and Weighting

The scores were presented and agreed at a workshop with relevant TAG representatives on 17th June 2021. In addition to this, weightings were discussed and agreed as follows:

- Access to key destinations – 10%
- Journey Time Variability (PT) – 10%
- Journey Time Variability (general traffic) – 5%
- Comparative Travel Time – 20%
- Transport Equity – 30%
- Pedestrian Level of Service – 5%
- Public Transport Delay – 15%
- Cycling Level of Service – 5%

It should be noted that pedestrian and cycling levels of service were awarded low weightings because the majority of the investment in the active travel network has been assumed to be delivered by the short term programme (city streets, Thorndon Quay/Hutt Road, Golden Mile) and these elements are common across all programme options.

11.2 Scores

The overall scores for access are presented in Table 14 below.

Table 14: Overall Scores for Access

Options Assessment	Score
Do minimum (2036)	-1
Option RPI V1 (2036)	+3
Option RPI V1 (2036) with congestion charging	+3
Option RPI V1A (2036)	+3
Option RPI V1A (2036) with congestion charging	+3
Option RPI V2 (2036)	+2
Option RPI V2 (2036) with congestion charging	+3
Option RPI V3 (2036)	+1
Option RPI V3 (2036) with congestion charging	+2
Option RPI V3A (2036)	+1

Options Assessment	Score
Option RPI V3A (2036) with congestion charging	+2

11.3 Scoring change between Long List and Short List assessments

Option	Long List Score	Short List Score	Reason for Change
RPI V1	5	3	In all cases, the short list score was slightly less positive than the long list score reflecting refinements in the approach. During the long list evaluation, assessment was undertaken based on professional judgment at an aggregated investment objective level. The short list assessment used the separate KPIs and the weightings agreed with the relevant TAG members. As a result of this, the evaluation captured a broader range of multi-modal factors and the scores became slightly diluted as a result.
RPI V1 (C)	5	3	
RPI V1A (C)	4	3	
RPI V2	4	2	
RPI V2 (C)	4	3	
RPI V3 (C)	3	2	
RPI V3A	2	1	
RPI V3A (C)	3	2	

12 Sensitivity Testing

Three sensitivity tests were carried out. The following section describes the implications of these sensitivity tests with regard to the Access KPI. The three scenarios cover intensified land use assumptions, increased uptake in active travel, and the implications of congestion charging.

12.1 Land Use Sensitivity Test

The land use sensitivity test adjusts the location of development within Wellington City to deliver increased intensification to the south and east (along the MRT corridors). Population growth of 10,000 was removed from the northern suburbs and redistributed to the south (60%) and east (40%).

Unsurprisingly, the intensified land use sensitivity test showed an increase in public transport use from both the south and east. A greater difference was observed from the south with a 1300-person increase when comparing the Do Minimum to the programme with land use investment. Overall, this sensitivity test indicates that patronage could increase by 30%, but reduce by 10% on Thorndon Quay as growth shifts from the north to the south/east. These areas have a higher propensity to take public transport, walk, and cycle. As such, this population shift drives a general reduction in VKT. Despite this reduction, there was a 2% increase in traffic generation from the south and east.



Figure 17: Change in PT patronage due to intensified land use

AM Peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	96.9%	95.3%
VKT - S&E Suburbs	100.0%	94.0%	96.2%
VKT - All of Wellington City	100.0%	96.6%	95.6%
VKT - Region	100.0%	98.2%	97.4%
Inter-peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	100.7%	100.1%
VKT - S&E Suburbs	100.0%	98.0%	101.4%
VKT - All of Wellington City	100.0%	99.2%	98.6%
VKT - Region	100.0%	99.4%	98.5%
PM Peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	97.9%	97.0%
VKT - S&E Suburbs	100.0%	96.6%	98.7%
VKT - All of Wellington City	100.0%	98.1%	97.0%
VKT - Region	100.0%	98.4%	97.3%

Figure 18: Change in VKT due to intensified land use

12.2 Active Travel Sensitivity Test

The active travel sensitivity test used a new WTSM module to look at increased uptake of walking and cycling due to enhanced levels of investment.

The results showed a potential increase of approximately 70% in cycling across the CBD cordon in the two-hour AM peak period, from 2800 to 4800. When comparing the do minimum to each of the programme scenarios, crossings from the east, south and west increased approximately by over 50%. In the north, crossings increased by approaching 100%.

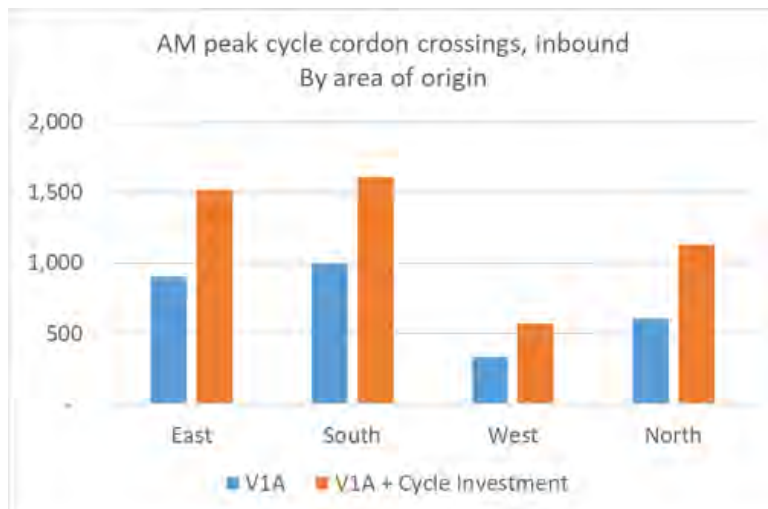


Figure 19: Active travel cordon crossing volumes

The test also found that additional people walking and cycling resulted in a reduction in both public transport patronage and car traffic, although the reduction in car traffic was to a lesser extent. These reductions are more prevalent in shorter trips. Overall, car and public transport demand experienced an approximate 3-4% reduction while cycle demand increased by 30%.

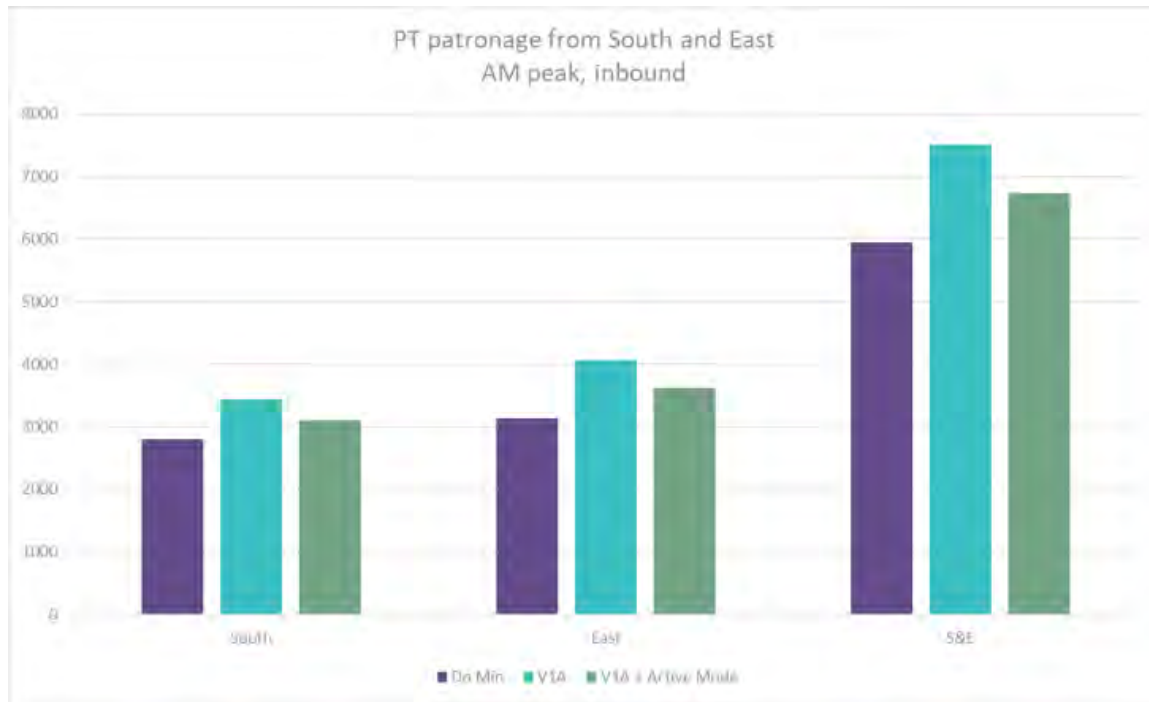


Figure 20: PT patronage under active mode sensitivity test

Summary	AM	IP	PM	Daily
Car Demand	-3.2%	-3.5%	-2.9%	-3.3%
Car Veh-hr	-2.5%	-2.8%	-3.1%	-2.8%
PT Demand	-4.4%	-4.1%	-4.3%	-4.2%
Cycle Demand	40.1%	28.1%	40.6%	32.1%
Walk Demand				10.2%

Figure 21: Change in vehicle and PT demand due to active travel sensitivity test

The test indicated that a new link to the Mount Victoria tunnel would draw in pedestrians/cyclists from alternative routes and induce a modal shift, hence new demand. From a vehicle perspective, the main impact would be decongestion around the bays. Vehicles would reassign to the Mount Victoria tunnel, resulting in no change in volumes through the tunnel but a 30% reduction round the bays. This would have a positive effect on the traffic volumes on city streets.

	Daily trips through tunnel	
	Cycle	Walk
Do Min	500	750
Option - Reassignment	960	1100
Option - reassignment + modal shift	1610	1250

Figure 22: Modelled outputs for cycle sensitivity test

Combining the land use and active travel tests result in an overall increase in public transport patronage. Although patronage from the south reduces for the tests with adjusted active mode demand, the increase in public transport use for the programme with land use investment is enough for an overall

increase when compared to the programme by itself. This trend is also true from the east, although the variation is to a lesser extent.

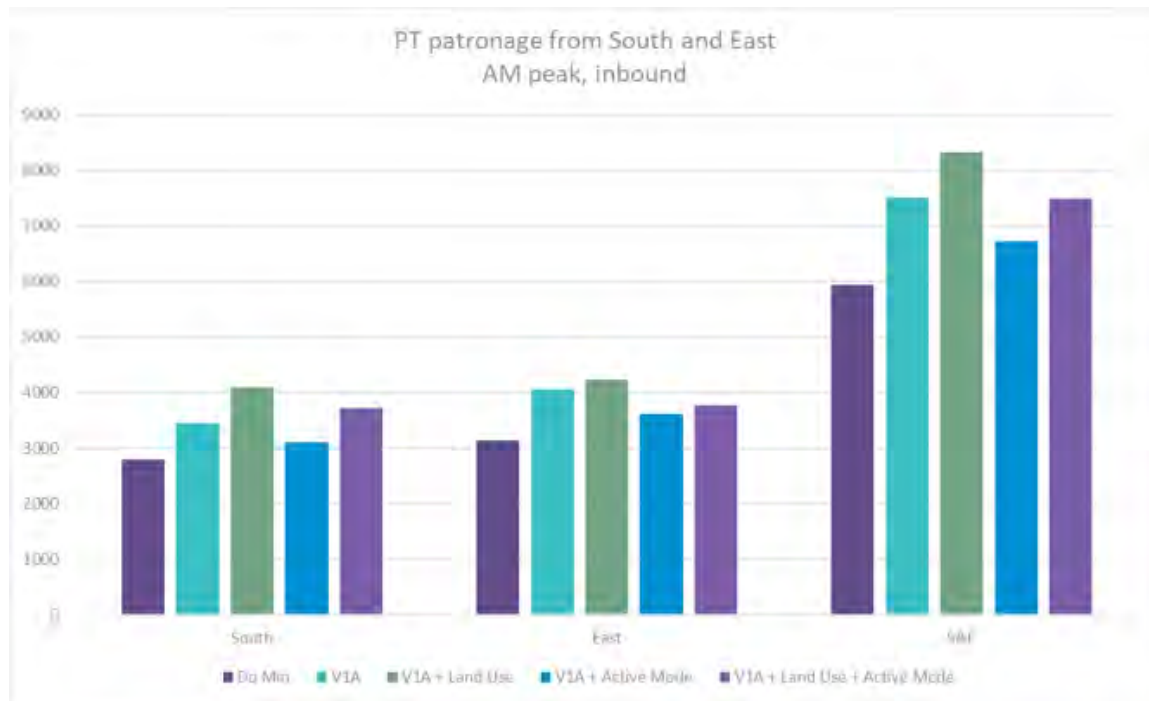


Figure 23: PT patronage – combined effect of land use and active travel sensitivity tests

12.3 Congestion Charging Sensitivity Test

The third sensitivity tests represents the effects of the implementation of a congestion charging zone. Following advice from PWC, it has been assumed that motorists will be charged \$3.50 to enter the zone.

Relative to the Do Minimum, there is a notable increase in public transport crossings with congestion charging in all areas. The south and east have the largest portion of public transport cordon crossings (reflecting the benefits of combining congestion charging with the investment in infrastructure and improved PT services).

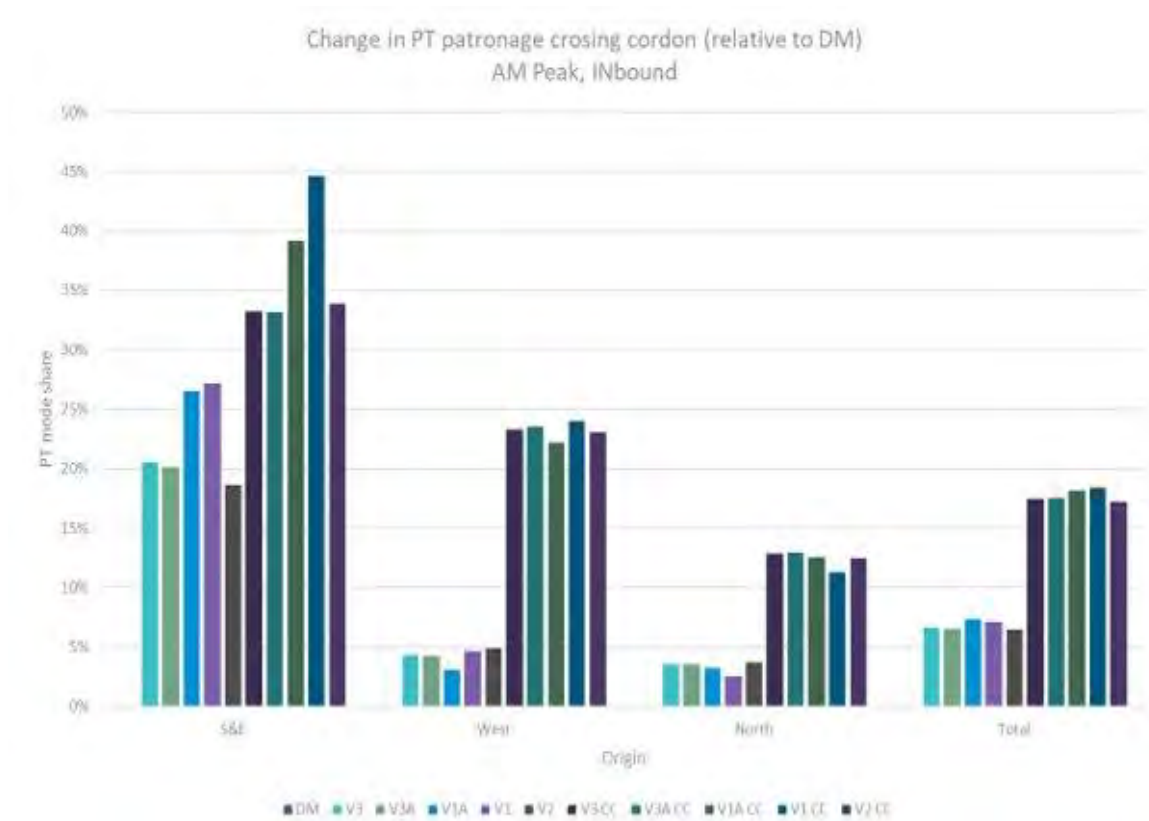


Figure 24: Change in PT patronage at cordon

All programmes with congestion charging, across all areas resulted in a reduction in car trip cordon crossings.



Figure 25: Change in vehicle cordon crossing volumes

Introducing congestion charging further encourages public transport patronage in all areas compared to just the programmes.

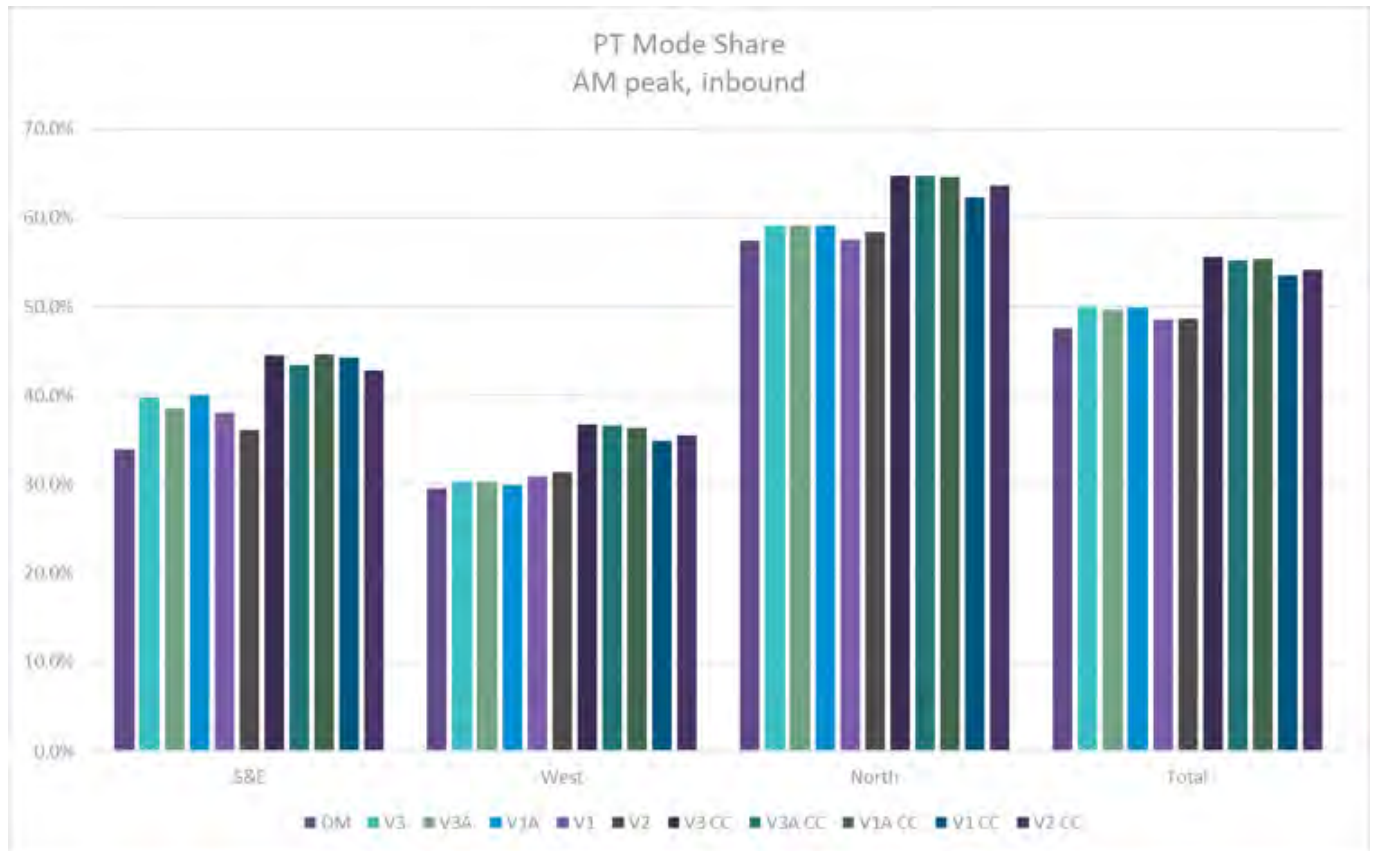


Figure 26: PT mode share

Following the general trend, this test also indicates that congestion charging lowers VKT and increases public transport km. The figures below show these changes.

Figure 27: Change in VKT by area

AM Peak - CBD	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	96.8%	97.0%	96.9%	102.1%	98.7%	88.0%	88.3%	88.5%	96.1%	92.9%
Land Use	95.2%	95.4%	95.3%	100.4%	97.1%	86.6%	86.8%	87.0%	94.5%	91.4%
Cycle	94.8%	95.1%	94.9%	100.1%	96.8%	86.2%	86.5%	86.7%	94.2%	91.0%
Cycle + LU	93.3%	93.5%	93.4%	98.4%	95.2%	84.8%	85.1%	85.3%	92.6%	89.5%
AM peak - S&E	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
VKT - S&E Suburbs	97.2%	97.0%	94.0%	95.9%	99.1%	94.7%	94.5%	91.1%	94.7%	97.8%
Land Use	99.4%	99.2%	96.2%	98.1%	101.4%	96.9%	96.7%	93.2%	96.9%	100.1%
Cycle	95.9%	95.7%	92.8%	94.7%	97.8%	93.5%	93.3%	90.0%	93.5%	96.6%
Cycle + LU	98.1%	97.9%	95.0%	96.8%	100.1%	95.6%	95.4%	92.0%	95.6%	98.8%
AM Peak - City	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
VKT - All of Wellington	97.4%	98.3%	97.9%	104.0%	99.0%	89.8%	90.6%	89.6%	96.7%	92.1%
Land Use	96.4%	97.3%	96.8%	102.9%	98.0%	88.9%	89.7%	88.7%	95.7%	91.1%
Cycle	96.7%	97.6%	97.1%	103.2%	98.3%	89.1%	90.0%	89.0%	96.0%	91.4%
Cycle + LU	95.7%	96.6%	96.1%	102.1%	97.3%	88.2%	89.0%	88.0%	95.0%	90.5%

Figure 28; Change in PT pax km

AM Peak - CBD	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	111.0%	110.8%	110.1%	109.6%	110.6%	121.0%	120.7%	120.2%	119.7%	120.8%
Land Use	109.9%	109.6%	109.0%	108.5%	109.4%	119.7%	119.5%	119.0%	118.4%	119.5%
Cycle	107.0%	106.8%	106.1%	105.6%	106.6%	116.6%	116.4%	115.8%	115.3%	116.4%
Cycle + LU	105.9%	105.7%	105.0%	104.5%	105.5%	115.4%	115.1%	114.6%	114.1%	115.1%
AM peak - S&E	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	112.8%	112.3%	120.3%	121.0%	111.2%	121.7%	121.1%	130.5%	131.9%	121.2%
Land Use	121.8%	121.2%	129.9%	130.5%	120.0%	131.3%	130.7%	140.9%	142.3%	130.8%
Cycle	104.5%	104.0%	111.4%	112.0%	103.0%	112.7%	112.2%	120.9%	122.1%	112.2%
Cycle + LU	112.7%	112.3%	120.2%	120.9%	111.1%	121.6%	121.0%	130.4%	131.8%	121.1%
AM Peak - Wellington City	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	109.4%	110.2%	108.4%	108.6%	108.0%	118.7%	119.7%	118.8%	118.5%	117.8%
Land Use	107.6%	108.5%	106.7%	106.9%	106.3%	116.9%	117.8%	116.9%	116.6%	116.0%
Cycle	105.4%	106.2%	104.5%	104.6%	104.1%	114.4%	115.3%	114.5%	114.2%	113.5%
Cycle + LU	103.7%	104.5%	102.8%	103.0%	102.4%	112.6%	113.5%	112.7%	112.3%	111.7%

Overall, the congestion charging results showed an 8% reduction in traffic entering the CBD, and a 10% increase in public transport uptake. Some travel times increased around the CBD cordon. Previous assumptions indicate a 15% reduction in traffic.

On balance, the congestion charge sensitivity warrants an increase in scores for the Access investment objective of one point.



June 2021

Programme Short List Options

MCA Approach and Methodology: IO3 – Reducing reliance on private vehicle

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14^h June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 MCA Scoring

Scoring of the Programme Short List Options utilises an 11 point scale, on the balance of 2036 time period, at a later time we may need to apply different scoring for different time periods but for this assessment one score is sufficient

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation

-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

3 Programme Short List Option Descriptions

3.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#).

3.2 Programme Short List Options

Please refer to the Programme Short List Options Pack in [LGWM Programme Short List Briefing Pack](#).

4 General Specialist Assessment Instruction

The assessment criteria have been developed and are currently being confirmed by the LGWM programme team. The assessment methodology has been developed and refined by the leads and is outlined in Section 2 above. The methodology and application of these criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036, using quantitative and qualitative assessments
5. Score the option, using the 11 point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

5 Previous work undertaken

There have been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop slide deck and minutes

[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)

2. Draft Programme Long List to Short List report

[Long List to Short List process](#)

6 KPI 3.1 – Mode share in the central city

6.1 KPI 3.1 – MCA Methodology Approach

The mode share in the central city assessment involves calculating the number of people travelling across the central city screen line by mode to determine mode share statistics for each option. It helps us understand the amount of mode shift that could occur to support reductions in private vehicle numbers in the central city and is measured through tests carried out using the Wellington Transport Strategic Model (WTSM).

This measure considers total people crossing the CBD cordon using motorized modes, to cover a range of trip purposes (not just journeys to work). Examining total people movement is important to understand the full extent of mode shift outcomes. Total public transport passenger numbers (not just MRT) are crucial because we should expect that the majority of MRT customers come from existing public transport modes, but we still want to see an increase in total public transport trips across all modes to be able to measure the success of an option, i.e. a successful MRT spine will improve the performance of bus services on other routes, thus attracting increased patronage.

6.2 KPI 3.1 – Assumptions

It is important to acknowledge that the assumptions outlined in Table 4 of the Modelling Report, regarding the Future Do Minimum scenario are an input into WTSM and will have a direct bearing on model results.

6.3 KPI 3.1 – MCA Methodology Approach Approval

The assessment approach for the Programme Short List was presented to and approved by the relevant TAG representatives as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 3.1: Mode Share in the Central City	MRT Team Member	SHI Team Member	GWRC TAG Member WCC TAG Members Waka Kotahi TAG Member ¹	16 June 2021

¹ Waka Kotahi TAG Member did not attend the workshop on 16 June, but was consulted on the proposed scores

6.4 KPI 3.1 – Programme Short List Assessment Analysis and Scores

The assessment was informed by the following results from WTSM.

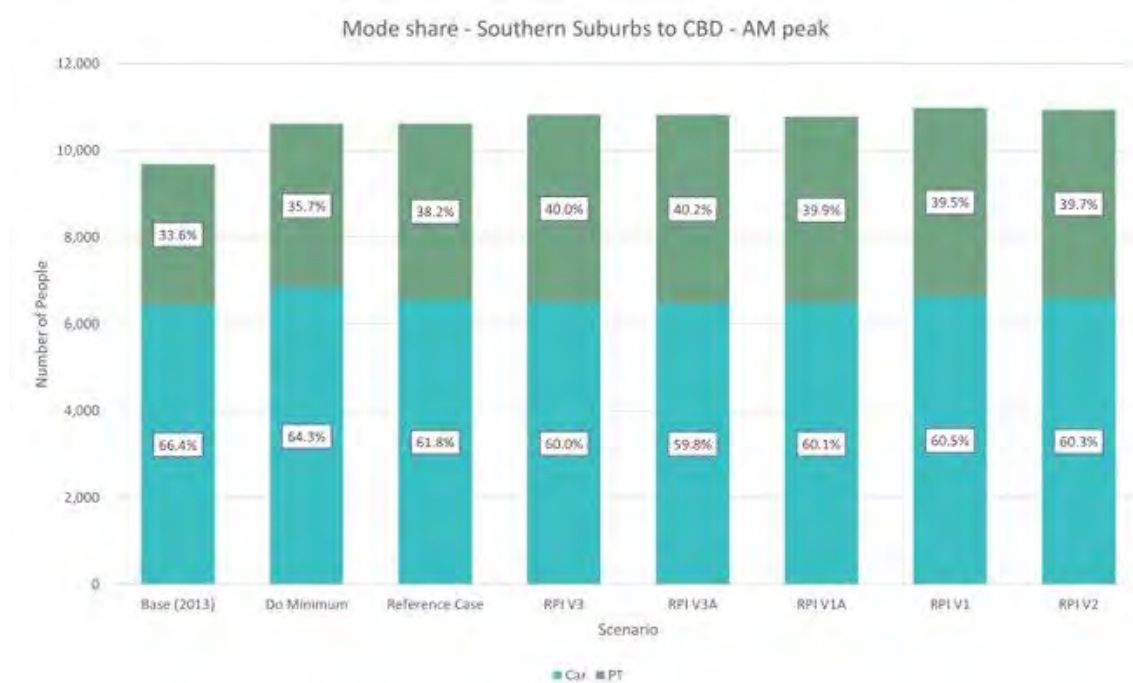


Figure 6-1: Mode Share in the Southern Suburbs - AM Peak

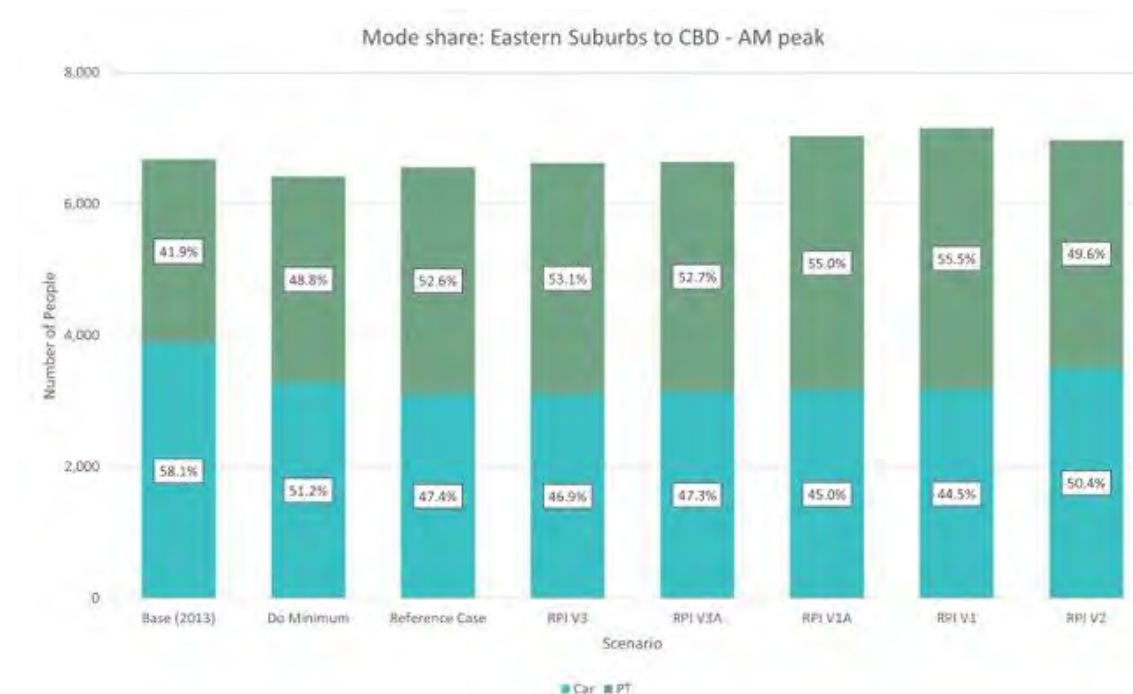


Figure 6-2: Mode Share in the Eastern Suburbs - AM Peak

Table 1: Percentage Change in Public Transport Patronage compared to the Do Minimum

	V3	V3A	V1A	V1	V2
South	18%	19%	18%	18%	17%
East	19%	17%	29%	32%	16%
West	5%	5%	3%	3%	5%
North	17%	17%	17%	16%	17%
Rail	1%	1%	1%	0%	1%
Total	7%	7%	7%	7%	6%



Figure 6-3: Public Transport Mode Share - Crossing the CBD Cordon in the AM Peak

The tables below document the Programme Short List Scores for the Mode Share in the Central City criterion. The programmes have been scored twice: firstly assuming that the programmes are compared against the 2018 base, and secondly against the 2036 Do Minimum scenario.

The following tables do not provide separate scores for the programmes with congestion charging. Information on the predicted effects of charging are provided in Section 12 below.

Table 2: Specialist Scoring for Mode Share in the Central City v Base

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	+2	Significant mode change expected from base
Option RPI V1 (2036)	+4	Virtually identical to V1A (according to WTSM)
Option RPI V1A (2036)	+4	Significant improvement from south and east
Option RPI V2 (2036)	+3	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+3	Significant improvement from south
Option RPI V3A (2036)	+3	Virtually identical to V3 (according to WTSM)

Table 3: Specialist Scoring for Mode Share in the Central City v Do Minimum

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Baseline
Option RPI V1 (2036)	+3	Virtually identical to V1A (according to WTSM)
Option RPI V1A (2036)	+3	Significant improvement from south and east
Option RPI V2 (2036)	+2	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+2	Significant improvement from south
Option RPI V3A (2036)	+2	Virtually identical to V3 (according to WTSM)

6.5 KPI 3.1 – Key Differentiators

Key differentiators impacting the overall relative scoring between options for Mode Share in the Central City were:

- The mode share by public transport from the south is predicted to increase by a modest amount between the base and the Future Do Minimum, from 33.6% to 35.7%, according to Figure 6-1, while the mode share from the east is predicted to increase by a greater amount, from 41.9% to 48.8%, according to Figure 6-2.
- The programmes are predicted to increase these figures, for example from 48.8% from the east with the Do Minimum to between 52.6% and 55.5% with the Programmes
- The different effects of the programmes can be seen from Table 1. The programmes with MRT to both south and east (V1A and V1) are predicted to lead to an increase in PT demands to the east by 29-32%, while those with MRT only to south (with a lower level of investment to the east) are predicted to increase PT demands by 16-19% (with these figures all being compared against the Do Minimum)
- All options include MRT to the south, and Table 1 indicates consistent levels of growth (relative to the Do Minimum) of 17-19%
- As a result, the scores in Tables 2 and 3 indicate significant positive scores for all programmes on this KPI, with the highest scores for V1A and V1.

7 KPI 3.2 - Mode share across the region

7.1 KPI 3.2 – MCA Methodology Approach

Mode share across the region assessment has originally been assessed by considering person kilometres travelled by mode around the region. However, this measure has been supplemented by a measure similar to KPI 3.1, identifying the mode share (by PT and by general traffic). The data source is the WTSM Model.

This key performance indicator is important to understand the impact that the interventions in Wellington City have on the mode share and travel distances around the region.

7.2 KPI 3.2 - Assumptions

It is important to acknowledge that the assumptions outlined in Table 4 of the Modelling Report, regarding the Future Do Minimum scenario are an input into WTSM and will have a direct bearing on model results.

7.3 KPI 3.2 - MCA Methodology Approach Approval

The assessment approach was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 3.2: Mode Share across the Region	MRT Team Member	SHI Team Member	GWRC TAG Member WCC TAG Members	<i>Workshop on 16 June 2021</i>

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
			Waka Kotahi TAG Member ²	

7.4 KPI 3.2 - Programme Short List Assessment Analysis and Scores

The assessment was informed by the following results from WTSM.



Figure 7-1: Regional Mode Share – Kilometres Travelled

² Waka Kotahi TAG Member did not attend the workshop on 16 June, but was consulted on the proposed scores

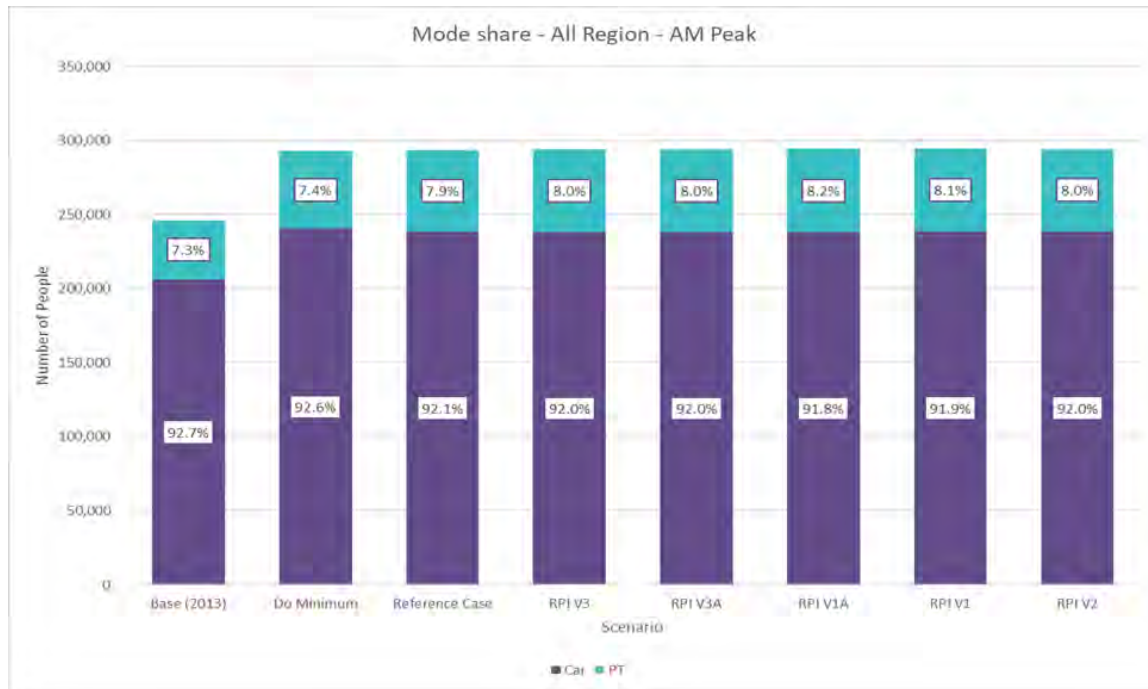


Figure 8-2: Regional Mode Share - Percentage

The tables below document the scores for this criterion, with rationale.

As with KPI 3.1, KPI 3.2 has been assessed firstly against the Base and then against the Do Minimum scenario. Tables 4 and 5 provide the results for the assessment using kilometres travelled, while Tables 6 and 7 set out the results using mode share.

The following tables do not provide separate scores for the programmes with congestion charging. Information on the predicted effects of charging are provided in Section 12 below.

Table 4: Specialist Scoring for Mode Share across the Region v Base, using total passenger kilometres travelled by public transport

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	+3	Significant increase relative to base (total pax km, not km per person)
Option RPI V1 (2036)	+3	Virtually identical to V3 (according to WTSM)
Option RPI V1A (2036)	+3	Virtually identical to V3 (according to WTSM)
Option RPI V2 (2036)	+3	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+3	Slight improvement
Option RPI V3A (2036)	+3	Virtually identical to V3 (according to WTSM)

Table 5: Specialist Scoring for Mode Share across the Region v Do Minimum using total passenger kilometres travelled by public transport

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	-	
Option RPI V1 (2036)	+1	Virtually identical to V3 (according to WTSM)
Option RPI V1A (2036)	+1	Virtually identical to V3 (according to WTSM)
Option RPI V2 (2036)	+1	Virtually identical to V3 (according to WTSM)
Option RPI V3 (2036)	+1	Slight improvement
Option RPI V3A (2036)	+1	Virtually identical to V3 (according to WTSM)

Table 6: Specialist Scoring for Mode Share across the Region v Base, using mode share (not passenger kilometres travelled)

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	0	Very slight increase, relative to Base (7.3 to 7.4%)
Option RPI V1 (2036)	+1	Improvement to 8.1%
Option RPI V1A (2036)	+1	Improvement to 8.2%
Option RPI V2 (2036)	+1	Improvement to 8%
Option RPI V3 (2036)	+1	Improvement to 8%
Option RPI V3A (2036)	+1	Improvement to 8%

Table 7: Specialist Scoring for Mode Share across the Region v Do Minimum using mode share (not passenger kilometres travelled)

Options Assessment	Score	Commentary/ Rationale
Do minimum (2036)	-	
Option RPI V1 (2036)	+1	Improvement to 8.1%
Option RPI V1A (2036)	+1	Improvement to 8.2%
Option RPI V2 (2036)	+1	Improvement to 8%
Option RPI V3 (2036)	+1	Improvement to 8%
Option RPI V3A (2036)	+1	Improvement to 8%

7.5 KPI 3.2 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for Mode Share across the Region were:

- Figure 7-1 could be interpreted to indicate significant improvements in the total kilometres travelled, by each of the programmes, compared against the Do Minimum. However, the scale is misleading, and the programmes are all predicted to increase total kilometres from 616,000 with the Do Minimum to between 636,000 and 640,000.
- In fact this criterion is swamped by the increase in population and therefore activity and travel, between the Base and Future Do Minimum scenario, from 466,000 with the Base to 616,000 with the Do Minimum
- As a result, Table 4 scores all programmes the same as the Do Minimum, when compared against the base, while the comparison against the Do Minimum allows the programmes all to show a positive score
- Table 6 indicates that the PT mode share across the region is predicted to be very similar for the Base and the Do Minimum. As a result, the scores for the programmes in Tables 6 and 7 are identical (when compared against the Base or the Do Minimum).

8 KPI 3.3 - Carbon Emissions

The carbon analysis has been split into Enabled carbon (user emissions) and Embodied carbon (construction and materials emissions) for the high level for the MCA of programme options.

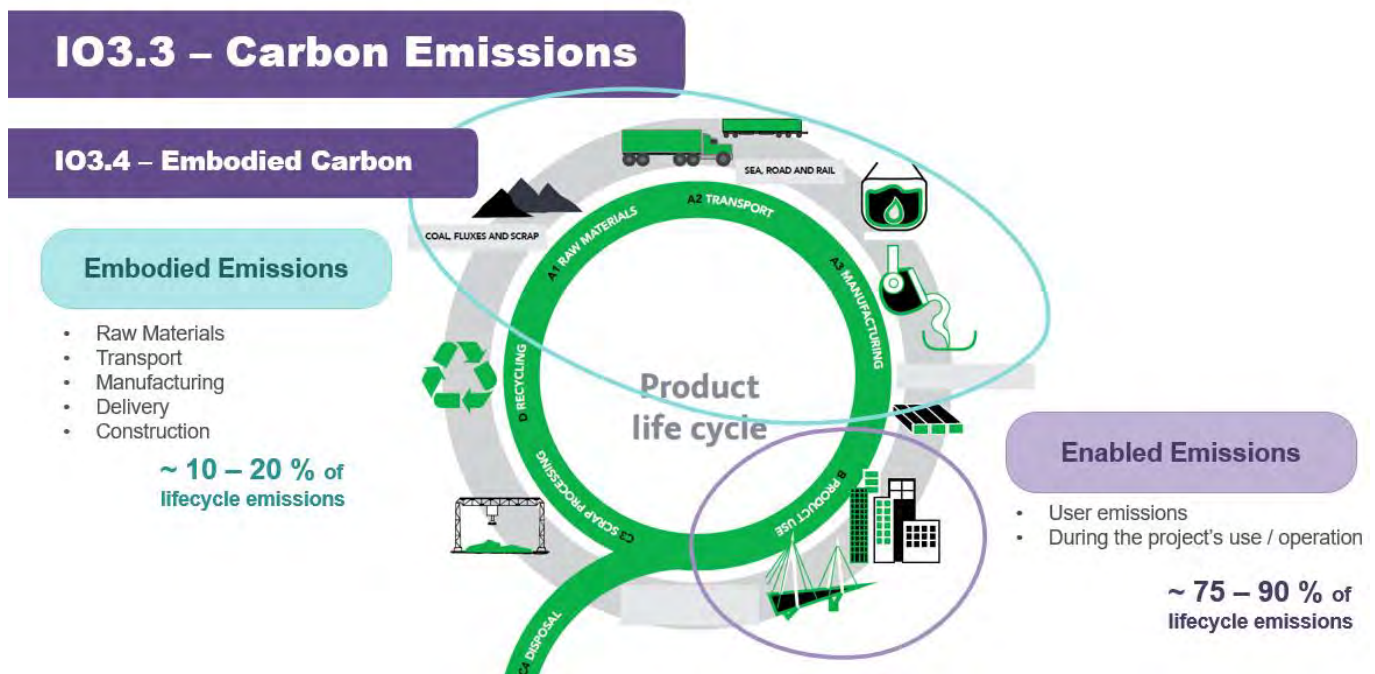


Figure 8-1 Carbon Emissions - Embodied and Enabled KPI explainer

8.1 KPI 3.3 – MCA Methodology Approach

Enabled Carbon emissions have been assessed using the Waka Kotahi Carbon Assessment Tool for investment (CATi). The extent to which the different components of each Programme Option contribute

to emissions increases or reductions has been identified. This is a sifting tool, based on the InterAmerican Development Bank transport infrastructure investment categories and services that align with Waka Kotahi project categories.

By comparing the relative investment options spend between Climate Negative, Climate Neutral and Climate Positive, it is possible to understand the GHG emissions implications of different option configurations and support better investment decision making.

CATi is being used as the primary evaluation of the Programme options. This primary evaluation is moderated by influencing factors for options in 2036:

1. Fleet Emissions – including modelled Vehicle Kilometres Travelled (VKT), proportion of electrification of fleet, and fuel consumption impact of congestion
2. Active Transport Enabled – including spend on active transport and cars off local city streets increasing active transport safety

These influencing factors have been used as a sensitivity test using existing modelling and assessment to inform expert judgement.

Limitations:

- Modelled outputs focus on transport system impacts, not urban form
- VKT and fuel consumption model outputs are based on previous behaviour, rather than any expectation of change and do not integrate active transport.
- Land use scenarios are applied in other KPIs for the MCA of Programme options, they were not included as this would be doubling up on this influence
- Active modes are not modelled, but are going to be integrated for the next stage through a new module on the transport model.

8.2 KPI 3.3 - Assumptions

- The costs of programme options received from the programme team are early estimates but provide indicative costs for comparison
- Increase of safety in local streets enables increase in active transport growth

8.3 KPI 3.3 - MCA Methodology Approach Approval

The above documented Transport related CO2 emissions assessment approach (refer Section 2) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 3.3: Transport related CO2 emissions	SHI Team Members	SHI Team Members MRT Team Member	WCC TAG Members	16/06/2021

8.4 KPI 3.3 - Programme Short List Assessment Scores

The Carbon Assessment Tool for investment (CATi) as the primary evaluation of the options in 2036 - 60% of score. This primary evaluation is moderated by influencing factors for options in 2036:

- Vehicle Kilometres Travelled (VKT) as modelled, proportion of electrification of fleet, and fuel consumption impact of congestion - 20% of score
- Influence of active transport, cars off local city streets and mode shift on Wellington City by option - 20% of score

The following information was used to assess the programmes.

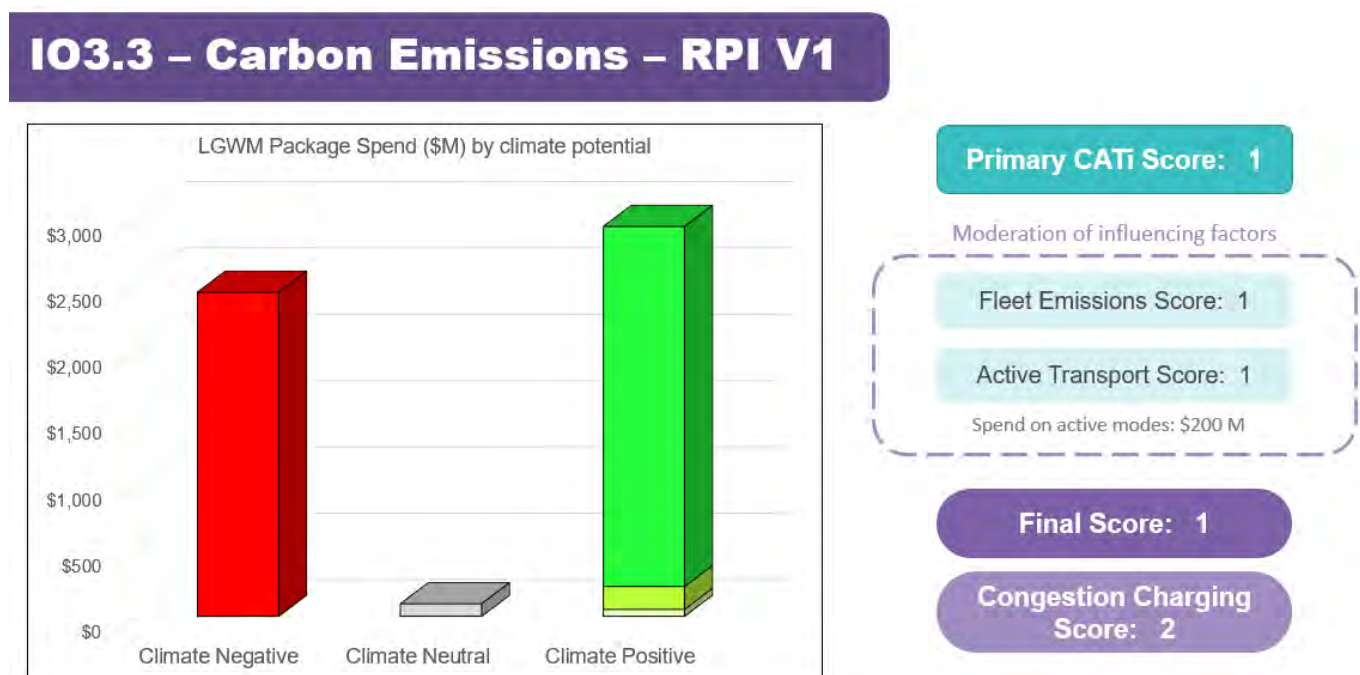
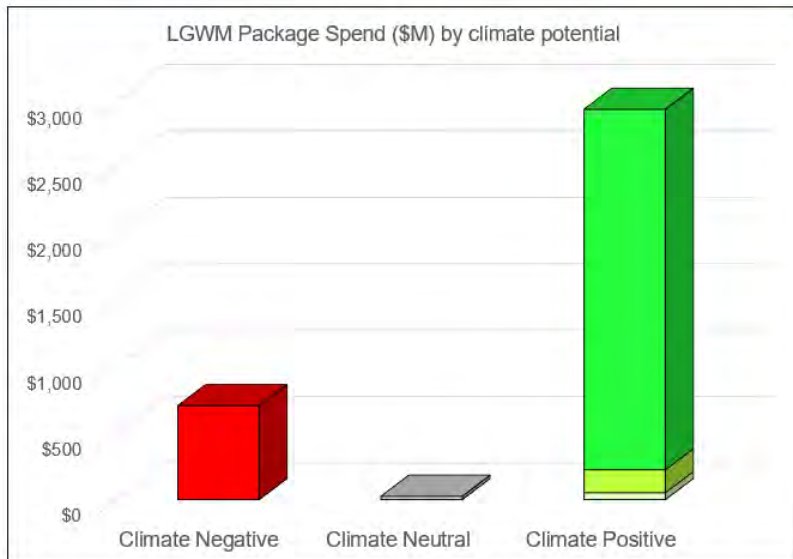


Figure 8-2 KPI 3.3 Carbon Emissions Score RPI V1

IO3.3 – Carbon Emissions – RPI V1A



Primary CATi Score: 3

Moderation of influencing factors

Fleet Emissions Score: 2

Active Transport Score: 2

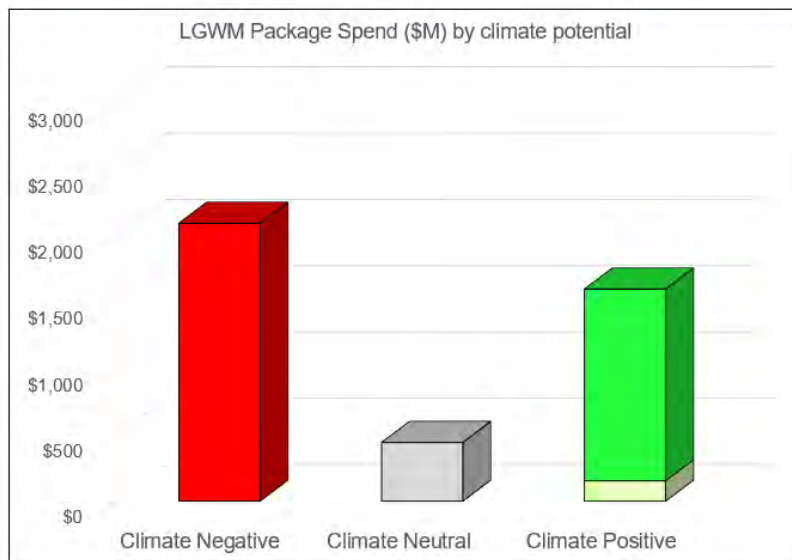
Spend on active modes: \$130 M

Final Score: 3

Congestion Charging Score: 4

Figure 8-3 KPI 3.3 Carbon Emissions Score RPI V1A

IO3.3 – Carbon Emissions – RPI V2



Primary CATi Score: -2

Moderation of influencing factors

Fleet Emissions Score: 1

Active Transport Score: 1

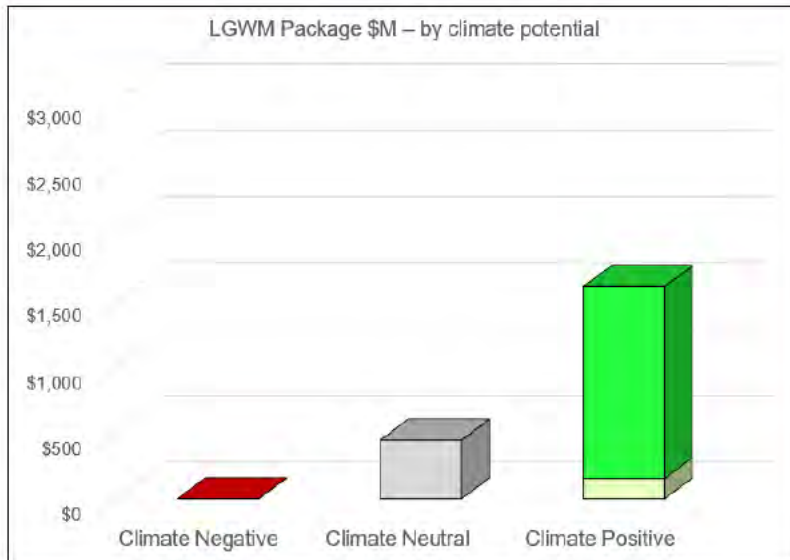
Spend on active modes: \$310 M

Final Score: -1

Congestion Charging Score: 0

Figure 8-4 KPI 3.3 Carbon Emissions Score RPI V2

IO3.3 – Carbon Emissions – RPI V3



Primary CATi Score: 3

Moderation of influencing factors

Fleet Emissions Score: 2

Active Transport Score: 2

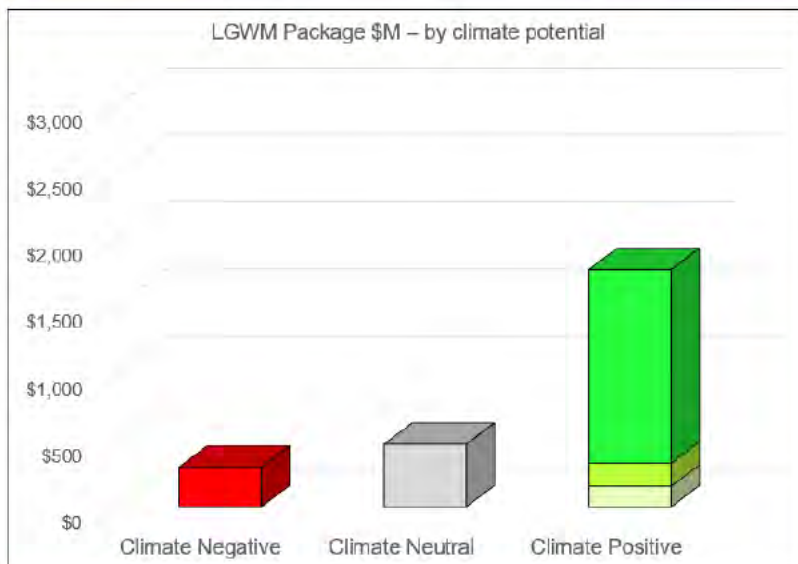
Spend on active modes: \$310 M

Final Score: 3

Congestion Charging Score: 4

Figure 8-5 KPI 3.3 Carbon Emissions Score RPI V3

IO3.3 – Carbon Emissions – RPI V3A



Primary CATi Score: 2

Moderation of influencing factors

Fleet Emissions Score: 2

Active Transport Score: 2

Spend on active modes: \$330 M

Final Score: 2

Congestion Charging Score: 3

Figure 8-6 KPI 3.3 Carbon Emissions Score RPI V3A

Table 8: Change in VKT by Sector compared to the Do Minimum

	V3	V3A	V1A	V1	V2
East to N / W / Rest	-4.9%	-5.1%	-7.4%	0.6%	7.5%
N/W/Rest to East	-4.7%	-4.4%	-5.6%	4.3%	6.3%

East to CBD	-7.1%	-6.7%	-11.7%	-6.2%	-0.5%
CBD to East	-1.5%	-0.8%	-3.6%	-1.1%	5.3%
South to N / W / Rest	-2.4%	-2.4%	-2.2%	5.4%	-2.1%
N/W/Rest to South	-2.8%	-2.4%	-2.2%	10.4%	-3.0%
South to CBD	-4.5%	-4.7%	-4.7%	-0.6%	-2.4%
CBD to South	0.0%	0.5%	0.9%	3.5%	0.7%
Total	-1.6%	-1.6%	-1.8%	-0.9%	-1.1%

Table 9: Change in Fuel Consumption by Sector compared to the Do Minimum

	DM	Ref	V3	V3A	V1A	V1	V2
Total	100.0%	99.9%	99.9%	100.1%	99.9%	100.4%	99.9%
Wellington City	100.0%	100.5%	100.6%	101.0%	100.4%	101.6%	100.2%
Rest	100.0%	99.6%	99.6%	99.7%	99.7%	99.8%	99.8%

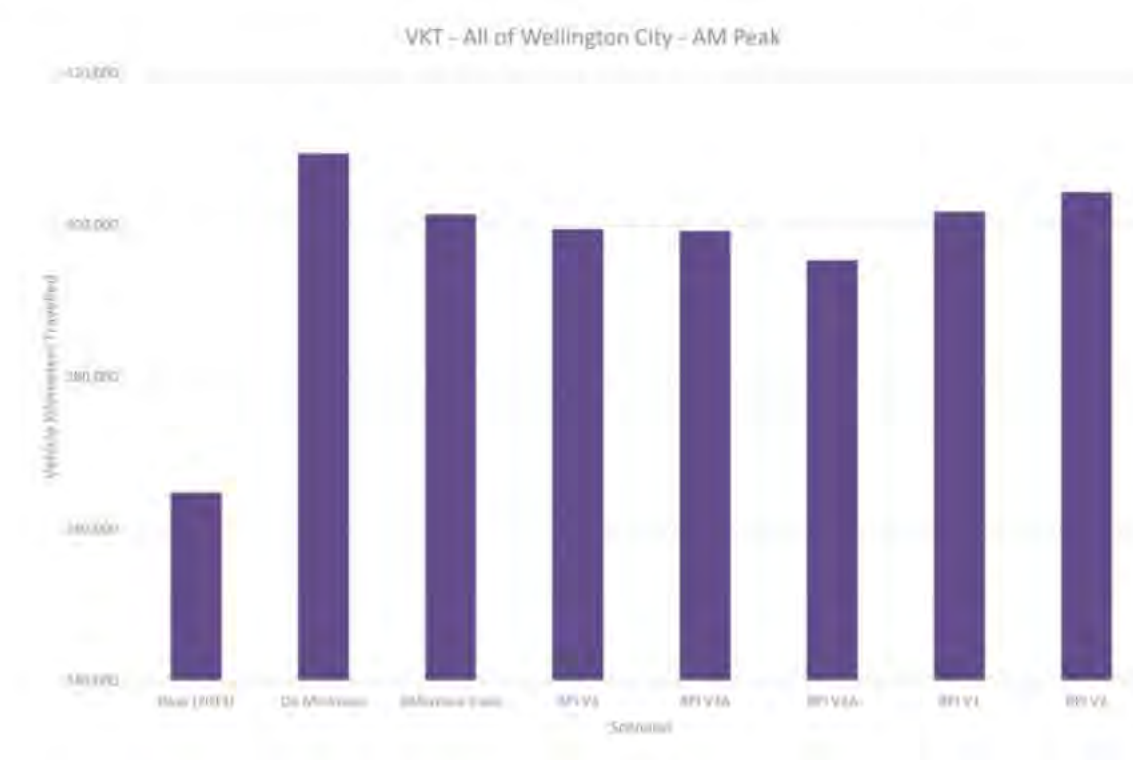


Figure 8-7: VKT Across all of Wellington City in the AM Peak

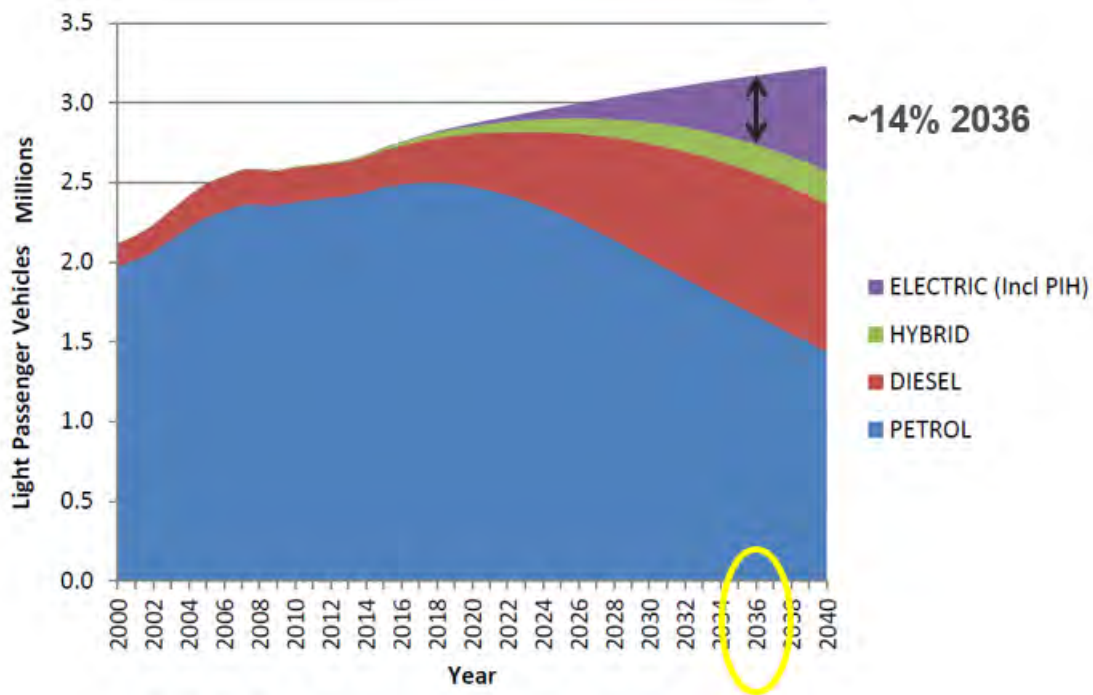


Figure 8-8 Projected electrification of NZ vehicle fleet (Waka Kotahi)

The tables below document the scores for this criterion.

Table 10: Specialist Scoring for Transport related CO2 emissions

Options Assessment	Score
Base 2018/2021	0
Do minimum (2036)	-3
Option RPI V1 (2036)	+1
Option RPI V1 (2036) with congestion charging	2
Option RPI V1A (2036)	+3
Option RPI V1A (2036) with congestion charging	4
Option RPI V2 (2036)	-1
Option RPI V2 (2036) with congestion charging	0
Option RPI V3 (2036)	+3
Option RPI V3 (2036) with congestion charging	4
Option RPI V3A (2036)	+2
Option RPI V3A (2036) with congestion charging	3

8.5 KPI 3.3 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for Transport related CO2 emissions were:

- The proportion of the spend between climate positive and climate negative
 - For example, V1 and V2 in far more road capacity increasing projects compared to the other programmes, therefore more climate negative spend
- The scale of spend on climate positive to effect carbon reduction in city transport system
- The influencing factors only changed the score for option V2 which increased from –2 to –1. Otherwise the influencing factors reaffirmed the primary score.
- Specifically:
 - V1 has both high climate negative and climate positive spend, slightly higher in the positive, with a modest reduction in total VKT, giving it a score of 1
 - V1A has high climate positive spend and low negative climate spend, with the greatest reduction in total VKT, resulting in a high positive score of 3
 - V2 has high climate negative spend and a moderate climate positive spend, with a modest reduction in total VKT, resulting in a negative score of -2
 - V3 has no climate negative spend, only a moderate climate positive spend (half the positive climate spend of V1A). However due to the no negative spend, and a similar reduction in total VKT to V1A, a high score of 3 has been given
 - V3A is similar to V3, with a similar reduction in total VKT. But with a minor negative climate spend, this option has been given a score of 2
- Congestion charging has a large positive effect across all programmes, and is considered climate positive investment, therefore adding +1 to each score.

9 KPI 3.4 - Embodied Carbon

9.1 KPI 3.4 – MCA Methodology Approach

The carbon analysis has been split into Enabled carbon (user emissions) and Embodied carbon (construction and materials emissions) for the high level for the MCA of programme options.

The embodied carbon analysis was high level estimation of Programme options using estimation of quantities of key high emissions materials such as concrete and steel. The proportion of the emissions for each programme option was reviewed against industry standards and similar projects to sense check the high-level estimation. The proportional difference in embodied emissions was used to complete the assessment.

The three elements of embodied carbon considered for this assessment include:

- Material creation / manufacturing process,
- Transport to the site, and
- Construction methodology (high level estimation of fuel/energy usage during construction).

9.2 KPI 3.4 - Assumptions

- Embodied emissions for this assessment include manufacturing/processing, delivery, and construction fuel use.
- Concrete strength was estimated as 40Mpa and 50 MPa
- Concrete is transported by road from local Wellington suppliers
- Steel is procured out of Asia (the average emissions factor for Asia Steel has been used)

- Steel is transported by ship, to Auckland, then by road to Wellington
- All steel used is reinforcement steel
- Density for steel is 8050 kg/m³
- The embodied emissions associated with the materials (manufacturing, processing, and delivery) account for approximately 55% of all embodied emissions of a project
 - Concrete and steel account for most of these emissions, approximately 50% of the project
- Fuel use during construction is approximately 30% of the project's embodied emissions

9.3 KPI 3.4 - MCA Methodology Approach Approval

The above documented Embodied Carbon assessment approach (refer Section 2) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 3.4: Embodied Carbon	SHI Team Members	SHI Team Members MRT Team Member	WCC TAG Members	02/06/2021

9.4 KPI 3.4 - Programme Short List Assessment Analysis and Scores

The following information was used to assess the programmes.

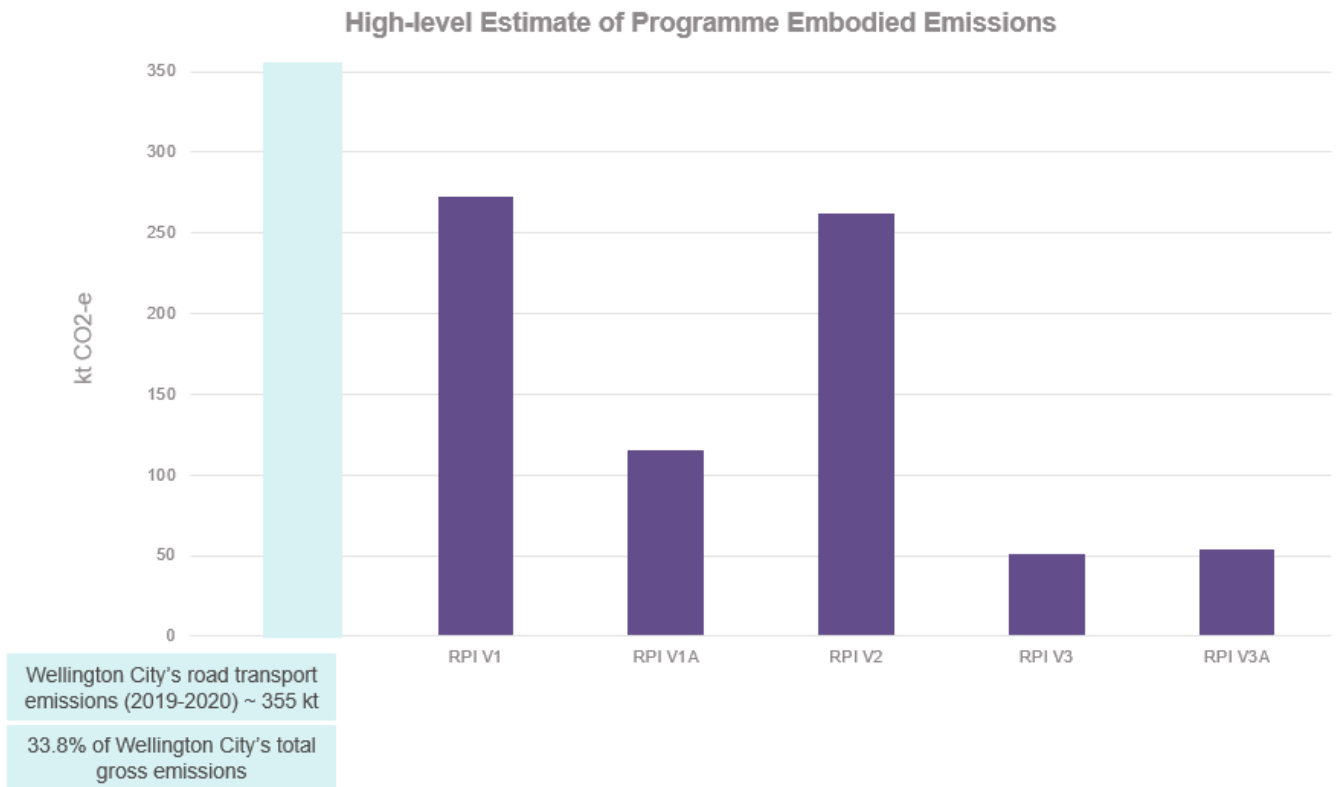


Figure 9-1 KPI 3.4 Embodied Emissions: high level estimate of emissions per programme

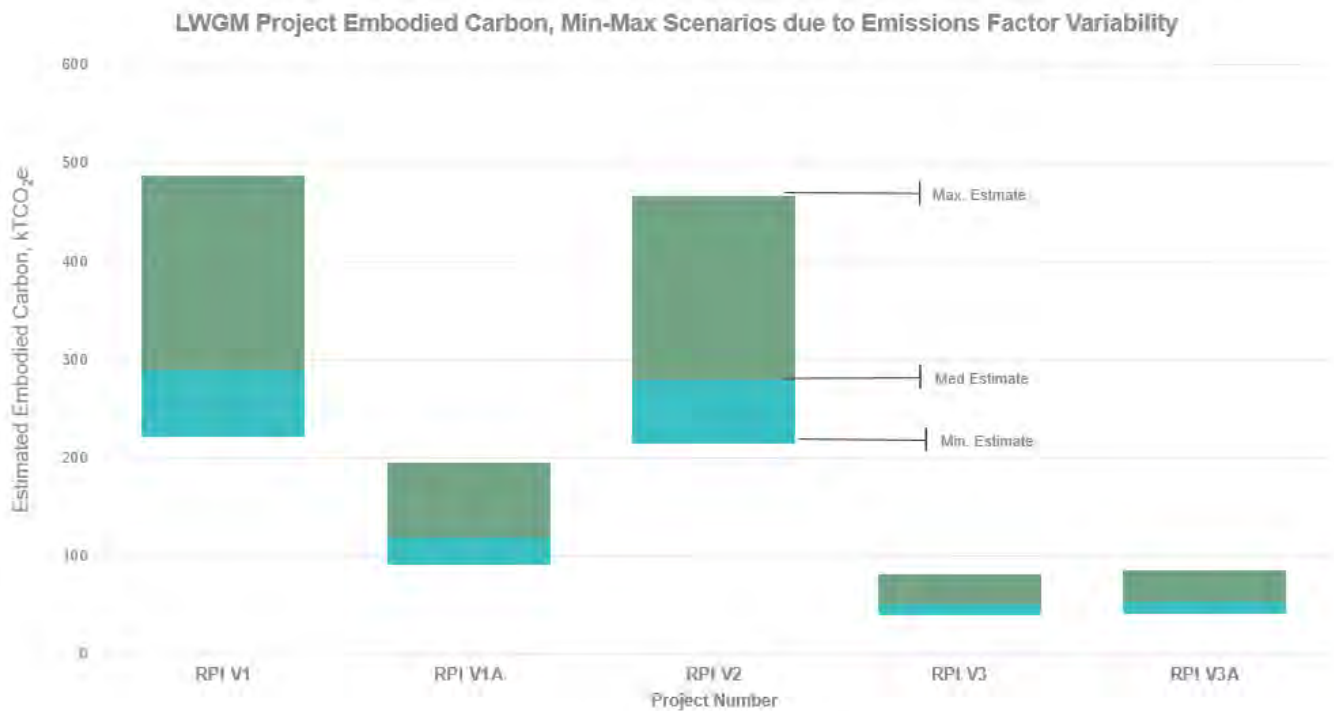


Figure 9-2 KPI 3.4 Embodied Carbon - variation in estimated emissions due to variation in emissions factors for concrete and steel production

The tables below document the scores for this criterion.

Table 11: Specialist Scoring for Embodied Carbon

Options Assessment	Score
Do minimum (2036)	0
Option RPI V1 (2036)	-4
Option RPI V1A (2036)	-2
Option RPI V2 (2036)	-4
Option RPI V3 (2036)	-1
Option RPI V3A (2036)	-1

9.5 KPI 3.4 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for Embodied Carbon were:

- The estimated amounts of embodied emissions associated with each programme of works
- Higher embodied emissions are associated with more projects, and therefore more construction being required
- Programme's V1 and V2 have the largest amount of projects included, and therefore the highest embodied emissions, and the lowest (worst) embodied carbon assessment score
- For the scoring:
 - All were negative as they are the generation of emissions, compared to the Do Minimum set at 0
 - V3 and V3A were the lowest, and set at -1
 - The other options were either double, or quadruple the V3 and V3A estimated amount

10 Overall Scores

At the workshop on 16 June, there was a discussion around the weighting of the four KPIs, and the following weightings were agreed:

- Mode share to the central city: 35%
- Regional mode share: 5%
- Carbon emissions: 45%
- Embodied carbon: 15%

As a result, the following scores were derived:

Table 12: Overall Scores for Reduced PMV Reliance

Programme Assessment	Score
Do minimum (2036)	-1
Option RPI V1 (2036)	+1
Option RPI V1 (2036) with congestion charging	+1
Option RPI V1A (2036)	+3
Option RPI V1A (2036) with congestion charging	+3
Option RPI V2 (2036)	0
Option RPI V2 (2036) with congestion charging	+1
Option RPI V3 (2036)	+2
Option RPI V3 (2036) with congestion charging	+3
Option RPI V3A (2036)	+2
Option RPI V3A (2036) with congestion charging	+3

10.1 Scoring change between Long List and Short List assessment

The scores for the programmes differed between the long list and short list assessments for the following reasons:

- The long list scores for IO3 were assessed for each programme as a whole (ie not by the four sub categories), based on professional judgement and on earlier transport model runs for comparable options
- At the short list stage, the programmes were assessed against the base, not the Do Minimum
- For the short list assessments, we had the benefit of new transport model results
- Also, we assessed each of the short listed programmes against the four sub categories (with two relating to mode share and two relating to carbon)
- These sub category scores were combined using weights for each that were developed with the TAG on 17th June.

Option	Long List Score	Short List Score	Reason for Change
RPI V1	-1	1	Scoring for option was updated to +1 during short list assessment mainly due to the re-scoring of the programmes against the base, which increased the mode share scores.
RPI V1 (C)	2	1	Same as V1 reasoning above. Also, a lower charge than previously assumed based on advice from PWC so assumed no difference to option without charging.
RPI V1A	0	3	Scoring for option was updated to +3 for similar reasons to V1, and V1A was also scored highly against carbon emissions.
RPI V1A (C)	2	3	Same as V1A reasoning above. Also, a lower charge than previously assumed based on advice from PWC and so assumed no difference to option without charging.
RPI V2	-3	0	Scoring for option was updated to 0 for similar reasons to V1, although it scored negatively against both carbon categories.
RPI V2 (C)	-1	1	Same as V2 reasoning above. Also, a lower charge than previously assumed based on advice from PWC so smaller difference to option without charging.
RPI V3	3	2	Programme V3 was originally scored +3 due to the limited investment in

Option	Long List Score	Short List Score	Reason for Change
			roading capacity. This was modified to +2 due to the reduced mode change predicted for options without full MRT to the east
RPI V3 (C)	5	3	Same as V3 reasoning above. Also, a lower charge than previously assumed based on advice from PWC and so assumed no difference to option without charging.
RPI V3A (C)	4	3	Same as V3 (C) reasoning above.

11 Sensitivity Testing

Three sensitivity tests were carried out, considering an intensified land use scenario, congestion charging, and a third test using a new active mode module (increasing cycle use). This paper considers the first two of these tests.

11.1 Land Use Sensitivity Test

The first sensitivity test considered the effects of greater intensification of the land use in 2036 in the southern and eastern suburbs. This test kept the same overall population within Wellington City as the Core 2036 scenario, but it assumed that more growth may occur in the south and east, with less in other sectors, as set out below.

	2013 Base	2018 Estimate	Abs	Core 2036 % Diff	2036 Intensified Abs	Abs
CBD	17,400	19,800	27,200	37%	23,100	17%
Inner Suburbs	24,400	26,800	32,200	20%	36,500	36%
Eastern	36,800	38,100	40,300	6%	43,500	14%
Southern	30,300	31,400	34,000	9%	36,600	17%
Western	27,300	28,000	29,000	4%	29,000	4%
Northern	64,100	67,800	78,100	16%	72,000	6%
Wellington City	200,300	211,900	240,800	14%	240,700	14%



AM Peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	96.9%	95.3%
VKT - S&E Suburbs	100.0%	94.0%	96.2%
VKT - All of Wellington City	100.0%	96.6%	95.6%
VKT - Region	100.0%	98.2%	97.4%
Inter-peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	100.7%	100.1%
VKT - S&E Suburbs	100.0%	98.0%	101.4%
VKT - All of Wellington City	100.0%	99.2%	98.6%
VKT - Region	100.0%	99.4%	98.5%
PM Peak			
	Do Min	V1A	V1A + Land Use
VKT - CBD	100.0%	97.9%	97.0%
VKT - S&E Suburbs	100.0%	96.6%	98.7%
VKT - All of Wellington City	100.0%	98.1%	97.0%
VKT - Region	100.0%	98.4%	97.3%

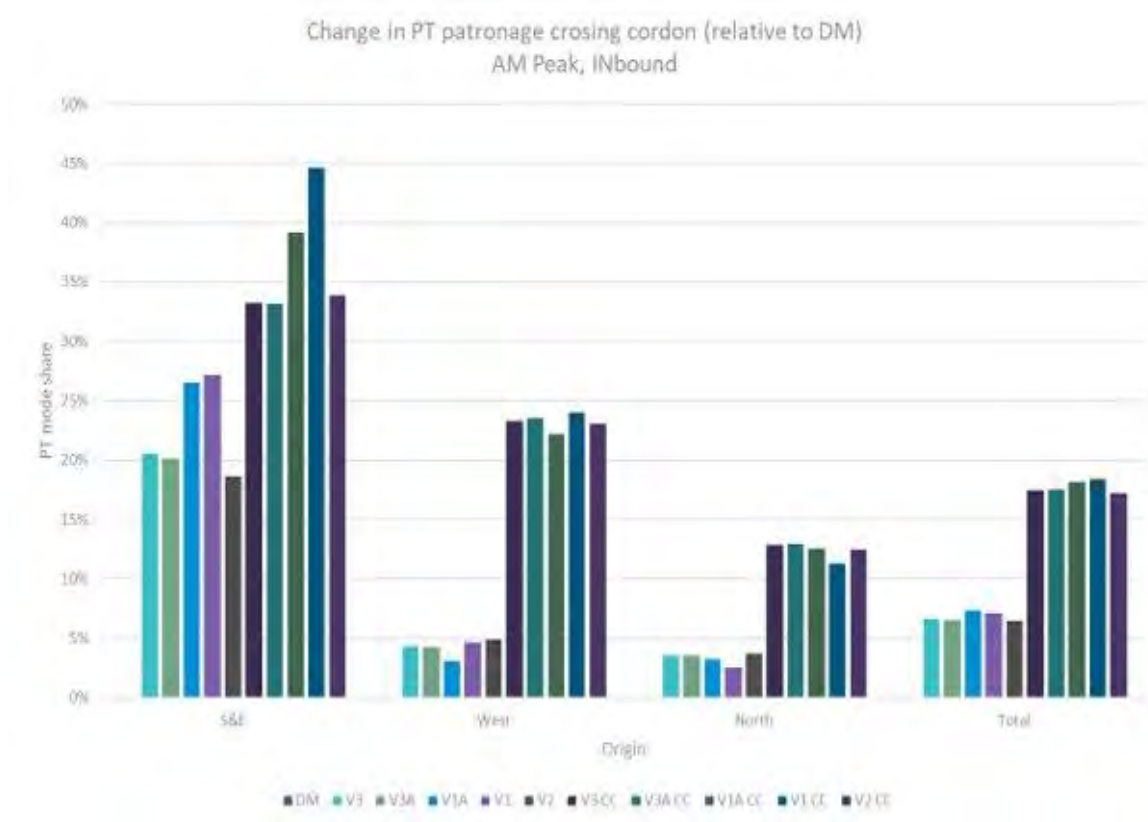
This sensitivity test indicates an increase in public transport use from both the south and east. A greater difference is predicted from the south with a 1300-person increase when comparing the Do Minimum to the programme with land use investment, with a smaller increase from the east. The assumed population

shift is predicted to lead to general reductions in VKT in the peak periods, but an increase of 2% is predicted in traffic generation from the south and east.

11.2 Congestion Charging Sensitivity Test

This test considered the introduction of a cordon charge around the CBD. The test assumed a lower charge than previously assumed (\$3.50 vs \$5) based on advice from PWC.

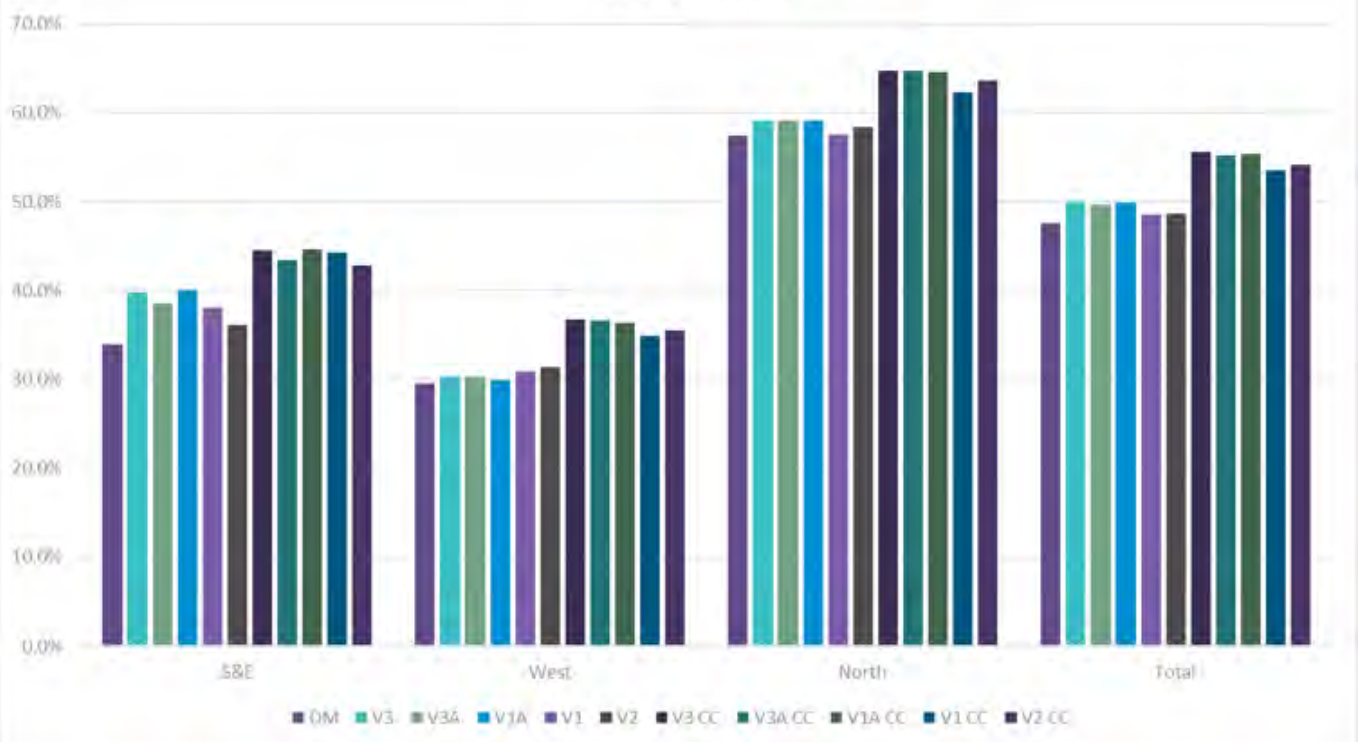
The results of this sensitivity test are summarised in the following Figures.



Change in car trips crossing cordon (relative to DM)
AM Peak, INbound



PT Mode Share
AM peak, inbound



Change in VKT by area:

AM Peak - CBD	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	96.8%	97.0%	96.9%	102.1%	98.7%	88.0%	88.3%	88.5%	96.1%	92.9%
Land Use	95.2%	95.4%	95.3%	100.4%	97.1%	86.6%	86.8%	87.0%	94.5%	91.4%
Cycle	94.8%	95.1%	94.9%	100.1%	96.8%	86.2%	86.5%	86.7%	94.2%	91.0%
Cycle + LU	93.3%	93.5%	93.4%	98.4%	95.2%	84.8%	85.1%	85.3%	92.6%	89.5%
AM peak - S&E	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
VKT - S&E Suburbs	97.2%	97.0%	94.0%	95.9%	99.1%	94.7%	94.5%	91.1%	94.7%	97.8%
Land Use	99.4%	99.2%	96.2%	98.1%	101.4%	96.9%	96.7%	93.2%	96.9%	100.1%
Cycle	95.9%	95.7%	92.8%	94.7%	97.8%	93.5%	93.3%	90.0%	93.5%	96.6%
Cycle + LU	98.1%	97.9%	95.0%	96.8%	100.1%	95.6%	95.4%	92.0%	95.6%	98.8%
AM Peak - City	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
VKT - All of Wellington	97.4%	98.3%	97.9%	104.0%	99.0%	89.8%	90.6%	89.6%	96.7%	92.1%
Land Use	96.4%	97.3%	96.8%	102.9%	98.0%	88.9%	89.7%	88.7%	95.7%	91.1%
Cycle	96.7%	97.6%	97.1%	103.2%	98.3%	89.1%	90.0%	89.0%	96.0%	91.4%
Cycle + LU	95.7%	96.6%	96.1%	102.1%	97.3%	88.2%	89.0%	88.0%	95.0%	90.5%

Change in PT pax km:

AM Peak - CBD	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	111.0%	110.8%	110.1%	109.6%	110.6%	121.0%	120.7%	120.2%	119.7%	120.8%
Land Use	109.9%	109.6%	109.0%	108.5%	109.4%	119.7%	119.5%	119.0%	118.4%	119.5%
Cycle	107.0%	106.8%	106.1%	105.6%	106.6%	116.6%	116.4%	115.8%	115.3%	116.4%
Cycle + LU	105.9%	105.7%	105.0%	104.5%	105.5%	115.4%	115.1%	114.6%	114.1%	115.1%
AM peak - S&E	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	112.8%	112.3%	120.3%	121.0%	111.2%	121.7%	121.1%	130.5%	131.9%	121.2%
Land Use	121.8%	121.2%	129.9%	130.5%	120.0%	131.3%	130.7%	140.9%	142.3%	130.8%
Cycle	104.5%	104.0%	111.4%	112.0%	103.0%	112.7%	112.2%	120.9%	122.1%	112.2%
Cycle + LU	112.7%	112.3%	120.2%	120.9%	111.1%	121.6%	121.0%	130.4%	131.8%	121.1%
AM Peak - Wellington City	V3	V3A	V1A	V1	V2	V3 CC	V3A CC	V1A CC	V1 CC	V2 CC
Core	109.4%	110.2%	108.4%	108.6%	108.0%	118.7%	119.7%	118.8%	118.5%	117.8%
Land Use	107.6%	108.5%	106.7%	106.9%	106.3%	116.9%	117.8%	116.9%	116.6%	116.0%
Cycle	105.4%	106.2%	104.5%	104.6%	104.1%	114.4%	115.3%	114.5%	114.2%	113.5%
Cycle + LU	103.7%	104.5%	102.8%	103.0%	102.4%	112.6%	113.5%	112.7%	112.3%	111.7%

Overall, the congestion charging results indicate 8% reductions in traffic entering the CBD, and increases of 10% in public transport uptake. Previous assumptions (with \$5 instead of \$3.50 as a charge) indicated 15% reductions in traffic.



June 2021

Programme Short List Options

MCA Approach and Methodology: IO4 – A transport system that improves safety for all users

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14^h June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 MCA Scoring

Scoring of the Programme Short List Options utilises an 11 point scale, on the balance of 2036 time period, at a later time we may need to apply different scoring for different time periods but for this assessment one score is sufficient

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term

1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

3 Programme Short List Option Descriptions

3.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#).

3.2 Programme Short List Options

Please refer to the Programme Short List Options Pack in [LGWM Programme Short List Briefing Pack](#).

4 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The assessment methodology has been developed and refined by the leads and is outlined in Section 2 above. The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11 point scale
6. Score all options with and without congestion charging and provide advise as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.

3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

5 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop slide deck and minutes
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

6 KPI 4.1 - Deaths and Serious Injuries (DSIs) for people walking or cycling

6.1 KPI 4.1 – MCA Methodology Approach

This key performance indicator assessed the impact of programme options on the possible change in the number of DSIs for people walking and cycling within the extents of the programme option.

The approach taken to determine this KPI has been to use a qualitative assessment. This assessment has utilised a number of inputs to consider the scoring, drawing on the authors experience in:

- Population forecasts / allowance for traffic growth
- Crash analysis
- Understanding of crash exposure
- Understanding of the infrastructure being constructed and to what degree it may provide a safer environment for users

The general premise for the assessment has been that a reduction in conflict locations and that higher quality infrastructure will result in a reduction in DSIs.

Significant active travel benefits are realised from the 'Short Term Programme'. As the Short Term Programme is consistent across all programme options, it was assessed as having equal considerations.

Qualitative assessment

The five programme options were broken down into separate elements to allow a safety comparison to be undertaken. The element comparison when considering safety outcomes is summarised below:

- PT South – same for all options therefore neutral; Enhanced Active travel provisions along the corridor; Safety benefits for 'non track option'
- PT East – Enhanced Active travel provisions along the corridor; Safety benefits for 'non track option'
- Basin - Grade Separated provides greater safety benefits

- Mt Vic – Separate active travel tunnel may have CPTED issues, resulting in alternative choices (routes or mode) for Active Travel users
- Te Aro and Terrace Tunnel – reduces conflicts through separation = safer outcome; possible rat running exposure increase.
- Long Tunnel – reduces conflicts through separation = safer outcome; possible rat running exposure increase.

6.2 KPI 4.1 - Assumptions

A number of assumptions have been made, and include:

- In the Basin area the provision of an active travel facility introduces a level of separation between cyclists and motorised traffic. Clearly this provides safety benefits for cyclists and this has been scored accordingly.
- Pedestrians are at risk when interacting with traffic at crossing points. Traffic signals provide a greater level of safety for pedestrians than an uncontrolled crossing.
- The introduction of new crossing points where previously there was no crossing demand does introduce additional risk for pedestrians. This is notable where MRT stations are centrally placed and pedestrians must cross from one side of the road to the station and vice versa.
- For V1 / V1A, we considered that there is no material score difference for differing light rail vehicle types.
- For V2 / V3 (South as light rail; East as Articulated bus; 30km/h)
 - On the Southern Branch, we consider that a trackless tram / articulated bus would provide safety benefits (over that of a tracked system) for Active travel users due to reduced track risk.
 - On the Eastern Branch, we consider that a trackless tram / articulated bus would provide safety benefits (over that of a tracked system) for Active travel users due to reduced track risk
- When considering the safety effect during construction compared to when operating (i.e. post construction). it was concluded that there is no material difference for scoring any of the programme options due to Traffic Management and suitable routes for Active users will be provided and also that lower speeds due to Temporary Speed Limits, are likely to be in place.
- When considering Congestion charging, we consider that this is likely to have positive safety outcomes, but these are limited and not sufficient to increase the scoring for any option.

6.3 KPI 4.1 - MCA Methodology Approach Approval

The above documented DSI for People Walking or Cycling assessment approach (refer Section 2) for the Programme Short List was discussed with Paul Barker as a representative of the TAG .

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 4.1: DSI for People Walking or Cycling	MRT Team Member	SHI Team Member	LGWM Representative WCC TAG Member	<i>Team meeting on 23 June 2021</i>

6.4 KPI 4.1 - Programme Short List Assessment Scores

The tables below document the Programme Short List Option – Specialist Scores for DSI for People Walking or Cycling criteria with rationale.

Table 1: Specialist Scoring for DSI for People Walking or Cycling

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Base
Do minimum (2036)	-1	Reduction in safety due to additional exposure associated with growth in active travel users / traffic
Option RPI V1 (2036)	+3	<ul style="list-style-type: none"> i. The improvements along the SH1 corridor are expected to reduce vehicle traffic along the quays and around the bays / through Newtown improving safety for active travel users ii. The Te Aro trench / Terrace Tunnel will significantly reduce risk for active travel users in the area by removing SH1 through traffic iii. The improvements to the Basin, through Mt Victoria and along the SH1 corridor will improve safety for active travel users through the construction of new dedicated facilities iv. The MRT routes will result in increased exposure risk but will also provide safer facilities for active travel users due to separated facilities / protected intersections etc.
Option RPI V1 (2036) with congestion charging	+3	No material change from scoring above.
Option RPI V1A (2036)	+2	<p>Safety benefits less than V1 due to exposure within the area north of Mt Vic with no 'Te Aro Trench / Terrace Tunnel'.</p> <p>i, iii, iv as above</p>

Options Assessment	Score	Commentary/ Rationale
Option RPI V1A (2036) with congestion charging	+2	No material change from scoring above.
Option RPI V2 (2036)	+2	<ul style="list-style-type: none"> i. The long tunnel will reduce active travel conflicts for an extended length, with vehicle exposure being less within the city area ii. The Basin at grade risk at all locations will remain, although improvement will be undertaken therefore better than existing. iii. Concerns about alternative route options for Active Travel users at night due to CPTED risk of separate tunnel use.
Option RPI V2 (2036) with congestion charging	+2	No material change from scoring above.
Option RPI V3 (2036)	+2	Additional exposure within the area north of Mt Vic with to no 'Long Tunnel'.
Option RPI V3 (2036) with congestion charging	+2	No material change from scoring above.
Option RPI V3A (2036)	+2	The improvements to the Basin will improve safety for active travel users.
Option RPI V3A (2036) with congestion charging	+2	No material change from scoring above.

6.5 KPI 4.1 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for DSI for People Walking or Cycling were:

- The removal of conflicts associated with the Tunnel and Te Aro Trench will increase the safety for active travel users by reducing the exposure of active travel users.
- Similarly, the inclusion of a long tunnel will increase the safety for active transport users by reducing the exposure. This provided a greater benefit for the V2 option.
- It is noted that safety benefits could be reduced due to increased rat running through the city, which will increase the exposure risk for People walking and cycling. At this time, the rat running effects are not fully known, therefore was concluded that it did not reduce the scoring for the tunnel options (v1 and V2) significantly to warrant a score change.

7 KPI 4.2 - Deaths and serious injuries of all transport users

7.1 KPI 4.2 – MCA Methodology Approach

This key performance indicator assessed the impact of programme options on the possible change in the number of DSIs for all transport users within the extents of the programme option.

The approach taken to determine this KPI has been to use a qualitative assessment. This assessment has utilised a number of inputs to consider the scoring, drawing on the authors experience in:

- Population forecasts / allowance for traffic growth
- Crash analysis
- Understanding of crash exposure
- Understanding of the infrastructure being constructed and to what degree it may provide a safer environment for users

The general premise for the assessment has been that a reduction in conflict locations and that higher quality infrastructure will result in a reduction in DSIs.

Significant active travel benefits are realised from the 'Short Term Programme'. As the Short Term Programme is consistent across all programme options, it was assessed as having equal considerations.

Qualitative assessment

The five programme options were broken down into separate elements to allow a safety comparison to be undertaken. The element comparison when considering safety outcomes is summarised below:

- PT South – same for all options therefore neutral; Enhanced Active travel provisions along the corridor; Safety benefits for 'non track option'
- PT East – Enhanced Active travel provisions along the corridor; Safety benefits for 'non track option'
- Basin - Grade Separated provides greater safety benefits
- Mt Vic – Separate active travel tunnel may have CPTED issues, resulting in alternative choices (routes or mode) for Active Travel users
- Te Aro and Terrace Tunnel – reduces conflicts through separation = safer outcome; possible rat running exposure increase.
- Long Tunnel – reduces conflicts through separation = safer outcome; possible rat running exposure increase.

7.2 KPI 4.2 - Assumptions

A number of the assumptions detailed in 6.1 remain valid for this KPI. Additional assumptions associated with general traffic are detailed below, and include:

- Intersections controlled with traffic signals provide a greater level of safety than uncontrolled intersections for all road users as it separates conflicting movements.
- The removal of turning movements by moving these to controlled intersections provides a greater level of safety than uncontrolled intersections due to decreased exposure levels and the provision of controlled movements.
- When considering the safety effect during construction compared to when operating (i.e. post construction). it was concluded that there is no material difference for scoring any of the programme options due to Traffic Management and suitable routes for all users will be provided and also that lower speeds due to Temporary Speed Limits, are likely to be in place.
- When considering Congestion charging, we consider that this is likely to have positive safety outcomes, but these are limited and not sufficient to increase the scoring for any option.

7.3 KPI 4.2 – MCA Methodology Approach Approval

The above documented DSI for All transport user assessment approach (refer Section 2) for the Programme Short List was discussed with Paul Barker as a representative of the TAG .

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
KPI 4.2: DSI for All Road Users	MRT Team Member	SHI Team Member	LGWM Representative WCC TAG Member	<i>Team meeting on 23 June 2021</i>

7.4 KPI 4.2 - Programme Short List Assessment Scores

The tables below document the Programme Short List Option – Specialist Scores for DSI for All Transport Users criteria with rationale.

Table 2: Specialist Scoring for DSI for All Road Users

Options Assessment	Score	Commentary/ Rationale
Do minimum (2018/2021)	0	Base
Do minimum (2036)	-1	Reduction in safety due to additional exposure associated with growth in active travel users / traffic
Option RPI V1 (2036)	+4	<ul style="list-style-type: none"> i. The improvements along the SH1 corridor are expected to reduce vehicle traffic along the quays and around the bays / through Newtown improving safety for all users ii. The improvements along the SH1 corridor will improve safety for all users through separation of vehicles in each direction and removal of uncontrolled intersections iii. The MRT routes will result in slower vehicle speeds, separation of vehicles in each direction and reduction in right turn movements improving overall safety for all users along each route <p>No / minimal difference between alternative modes</p>
Option RPI V1 (2036) with congestion charging	+4	No material change from scoring above.
Option RPI V1A (2036)	+2	<p>Safety benefits less due to exposure within the area north of Mt Vic with to no 'Te Aro Trench / Terrace Tunnel'.</p> <p>i, iii as above</p>
Option RPI V1A (2036) with congestion charging	+2	No material change from scoring above.

Options Assessment	Score	Commentary/ Rationale
Option RPI V2 (2036)	+3	<ul style="list-style-type: none"> i. The long tunnel will remove conflicts for SH1 through traffic for an extended length. However, rat running likely to increase. ii. The Basin at grade risk at all locations will remain, although improvements will be undertaken therefore better than existing. iii. The MRT routes will result in increased exposure risk but will also provide safer facilities for all users
Option RPI V2 (2036) with congestion charging	+3	No material change from scoring above.
Option RPI V3 (2036)	+2	<p>No long tunnel</p> <p>ii, iii, iv as per V2</p>
Option RPI V3 (2036) with congestion charging	+2	No material change from scoring above.
Option RPI V3A (2036)	+2	The Basin grade separated option reduces the risk at this location (in comparison to V3).
Option RPI V3A (2036) with congestion charging	+2	No material change from scoring above.

7.5 KPI 4.2 - Key Differentiators

Key differentiators impacting the overall relative scoring between options for DSI for All Transport Users were:

- The removal of conflicts associated with the Tunnel and Te Aro Trench will increase the safety for all transport users by reducing the exposure. This provided a greater benefit for the V1 option.
- Similarly, the inclusion of a long tunnel will increase the safety for all transport users by reducing the exposure. This provided a greater benefit for the V2 option.
- It is noted that safety benefits could be reduced due to increased rat running through the city, which will increase the exposure risk for all transport users. At this time, the rat running effects are not fully known, therefore was concluded that it did not reduce the scoring for the tunnel options (V1 and V2) significantly to warrant a score change.

8 Overall Scores

Combining of the two KPIs was required to give an overall score for this Investment Objective. This was done by considering both KPIs and how safety outcomes would change as a result of the Programme Options.

In summary, we concluded that the slightly higher scores for the All Transport Users, which include people walking and cycling, would provide the scores for both KPIs, therefore the scores for this investment objective are:

Table 3: Specialist Scoring for DSI for All Road Users

Options Assessment	Score
Do minimum (2018/2021)	0
Do minimum (2036)	-1
Option RPI V1 (2036)	+4
Option RPI V1 (2036) with congestion charging	+4
Option RPI V1A (2036)	+2
Option RPI V1A (2036) with congestion charging	+2
Option RPI V2 (2036)	+3
Option RPI V2 (2036) with congestion charging	+3
Option RPI V3 (2036)	+2
Option RPI V3 (2036) with congestion charging	+2
Option RPI V3A (2036)	+2
Option RPI V3A (2036) with congestion charging	+2

8.1 Scoring change between Programme Long List and Short List assessments

We note that in previous programme long list assessments, scores of one point higher were given to V1A and V2. The lower scores in this more recent assessment was due to the a deeper consideration of the scheme and its effects on safety outcomes, with a main differentiators being: V1A – was considered close in scoring to V3 &V3A and the differing features didn't warrant an increase in safety scoring; V2 – the long tunnel not detuning (ie removing) local roads, and therefore these conflict risks remained.



June 2021

Programme Short List Options

MCA Approach and Methodology: IO5 – Resilience

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Programme Short List Option Descriptions

2.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#).

2.2 Programme Short List Options

Please refer to the Programme Short List Options Pack in [LGWM Programme Short List Briefing Pack](#).

3 MCA Scoring

Scoring of the Programme Short List Options for Resilience of land transport access to critical facilities utilises an 11-point scale, on the balance of 2036 time period, at a later time we may need to apply different scoring for different time periods but for this assessment one score is sufficient.

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources / values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources / values and/or short term
-3	Some difficulties, moderate cost or some impact on resources / values and/or medium term
-4	Clear difficulties, high cost or high impact on resources / values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources / values and/or long term / permanent

For resilience scoring:

- Negative scores – imply the resilience is, in some or more aspects, less than the current status.
- Positive scores – imply that resilience is improved from the current status in most aspects.

4 General Specialist Assessment Instruction

The assessment criteria have been developed and is currently being confirmed by the LGWM programme team. The assessment methodology has been developed and refined by the leads and is outlined in Section 2 above. The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advise as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

5 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop slide deck and minutes
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

6 MCA Methodology Approach

6.1 Resilience

“Resilience is the ability to recover and return to functionality after shock events or ability to adapt to progressive events”

Resilience can be diagrammatically represented by Figure 6-1 for sudden events that compromise functionality and the time for return to functionality, based on Brabhaharan (2006).

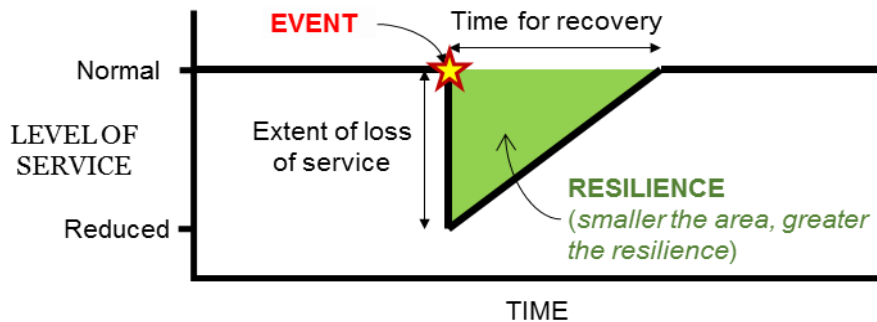


Figure 6- 1: Diagrammatic representation of Resilience of infrastructure (after Brabhaharan, 2006)

Several aspects of resilience that need to be considered for transport systems or networks are:

- 1) **Route resilience** – robustness of the route to remain functional or rapidly return to functionality after shock events
- 2) **Network resilience**
 - a) Redundancy – availability of alternate routes, if one or more routes are closed by shock events.
 - b) Interconnectivity – ability of the network to readily allow users to move from one route to the other to avoid areas of impact or closures.
- 3) **Maintenance and operations** – ability to remain functional and allow maintenance and operational incidents.

It is also important to consider the resilience to a range of events such as:

- 1) Different levels of natural hazards from frequent to infrequent events (including Low Impact High Probability and High Impact Low Probability events).
- 2) Anthropogenic hazards, such as:
 - a) Operational events, such as accidents and maintenance
 - b) Transport of hazardous substances such as petroleum
- 3) Temporal variation over time, such as due to:
 - a) Climate change
 - b) Population or changes in the built environment e.g. buildings along corridor.
 - c) Progressive degradation and weakening of assets (and slopes) over time.

The different hazards and the resilience of the options are considered in the assessment of the resilience of the option that have been developed by the project team.

6.2 Transport Resilience Context

The transport resilience context of the Wellington Region, in which the Let's Get Wellington Moving project is being considered was described in the Let's Get Wellington Moving – State Highways resilience report by WSP (2020) and is summarised below.

6.2.1 Wellington Transport Resilience Programme Business Case

The Wellington Transport Resilience programme business case (Transport Resilience PBC) led by the New Zealand Transport Agency (WSP Opus, 2018) and approved by its board sets the resilience context of land transport in the region, including Wellington city. This study identified important routes and prioritised resilience risks for the system. This therefore provides the agreed framework for considering resilience in the development of any transport initiatives in the Wellington region.

6.2.2 Importance of Routes

The Transport Resilience PBC identifies the relative importance of land transport routes in the region as shown in Figure 6-2.

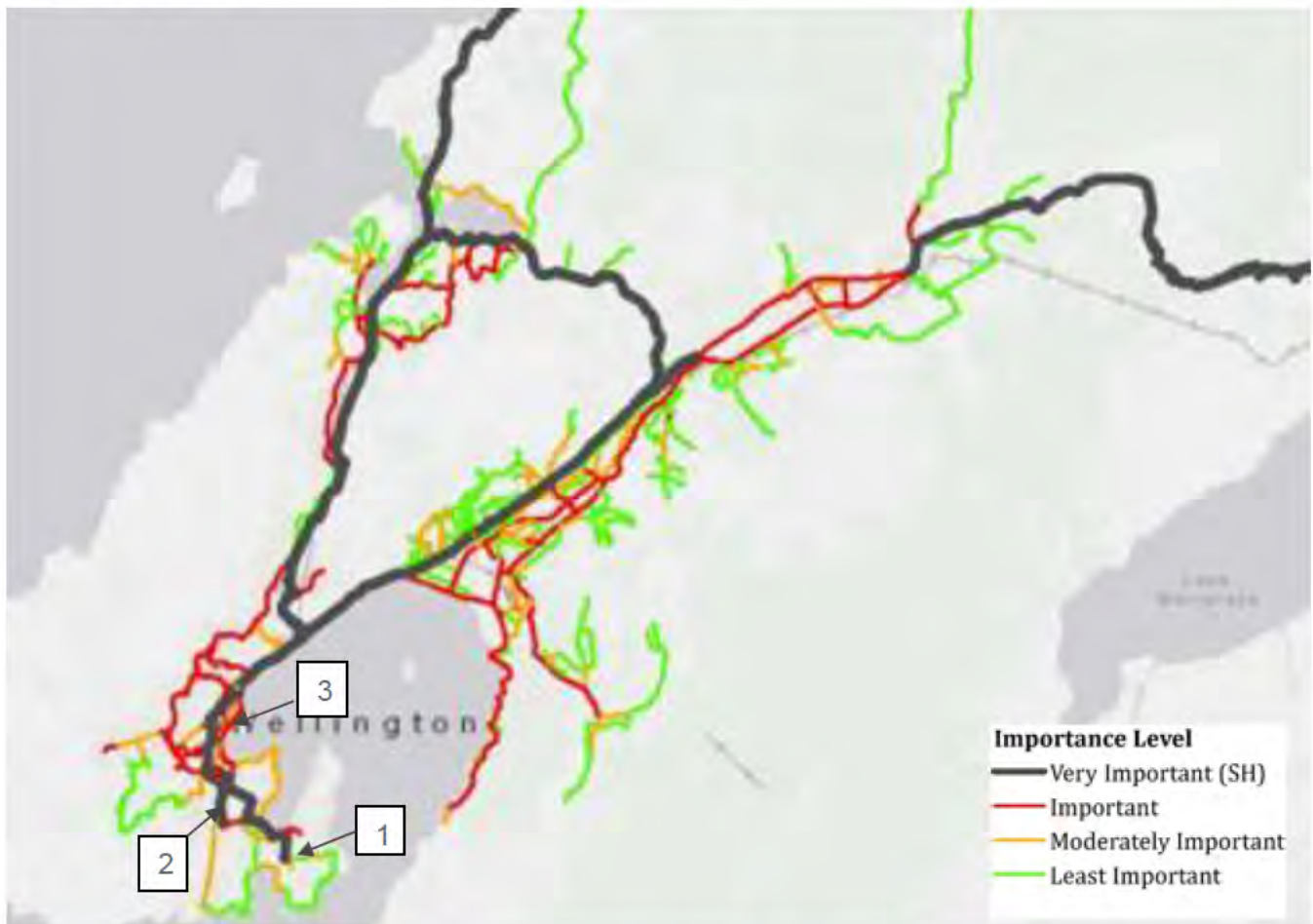


Figure 6-2: Importance of routes from Wellington Transport Resilience PBC (WSP Opus, 2018)

1. Wellington Airport
2. Wellington Regional Hospital
3. Wellington Railway Station

Critical facilities that are important to consider for this part of the network are:

- 1) Wellington Regional Hospital
- 2) Wellington Regional Airport

The Transport resilience PBC therefore identifies the following routes relevant to this current project as being very important for the region:

- 1) Wellington CBD to Wellington Regional Airport (via the Basin Reserve and Mt Victoria Tunnel)
- 2) Basin Reserve to Wellington Regional Hospital (in Newtown).

These routes (see 1 and 2 on Figure 6-2) provide access to critical facilities such as the Wellington Regional Airport [1] and the Wellington Regional Hospital [2] from the Wellington Railway Station (CBD North) and further north.

Other Important routes within this area are:

- The Wellington waterfront route (from Kaiwharawhara to Te Aro)
- Crawford Road (from Regional Hospital to Kilbirnie and Wellington Regional Airport)

The Transport Resilience Business case identifies critical journeys in the region that are important to the functionality of the Wellington region. In the context of this project, the following critical journeys is identified in the resilience business case:

- Wellington Regional Airport to Wellington CBD

Considering the importance of the routes and critical journeys identified in the Transport resilience PBC, Critical Journeys that are important to consider for this project include:

- Porirua and Hutt Valley to Regional Hospital, Newtown
- Porirua and Hutt Valley to Wellington Regional Airport, Rongotai
- Wellington CBD to Wellington Regional Airport, Rongotai
- Wellington CBD to Regional Hospital, Newtown

Considering the geographical extent of the programmes being considered as part of the Let's Get Wellington Moving project, the critical journeys within this project area are:

- Wellington CBD to Wellington Regional Hospital
- Wellington CBD to Wellington Regional Airport
- Thorndon to Wellington Regional Hospital
- Thorndon to Wellington Regional Airport

6.2.3 Levels of Events

The Wellington Transport Resilience programme business case led by the New Zealand Transport Agency (WSP Opus, 2018) considered three levels of events:

Low impact – high probability events (LIHP)

High impact – low probability events (HILP)

Frequent business as usual events.

6.2.4 Critical Resilience Risks

The natural hazards affecting the Wellington area are presented in the Let's Get Wellington Moving – State Highways resilience report by Brabhaharan (2020) and is not reproduced here. The MRT resilience assessment is included in the report presented by Eldridge (2020).

The Transport resilience PBC identifies critical resilience risks in the region, which need to be addressed as part of resilience initiatives and future transport projects, as shown on Figure 6-3.



Figure 6-3: Critical Transport Corridor Resilience Risks Identified for this Project area

For this project area and corridor in the vicinity, the critical resilience risks identified are:

- 1) Very high resilience risks from HILP events:
 - Mt Victoria tunnel portals (vulnerable to failure of the slopes in the portal areas)
 - Cobham Drive (vulnerable to liquefaction, lateral spreading and tsunami)

These resilience risks affect the Very Important transport corridor and could lead to closure of the route for long periods of time.

2) Other resilience risks within this area are:

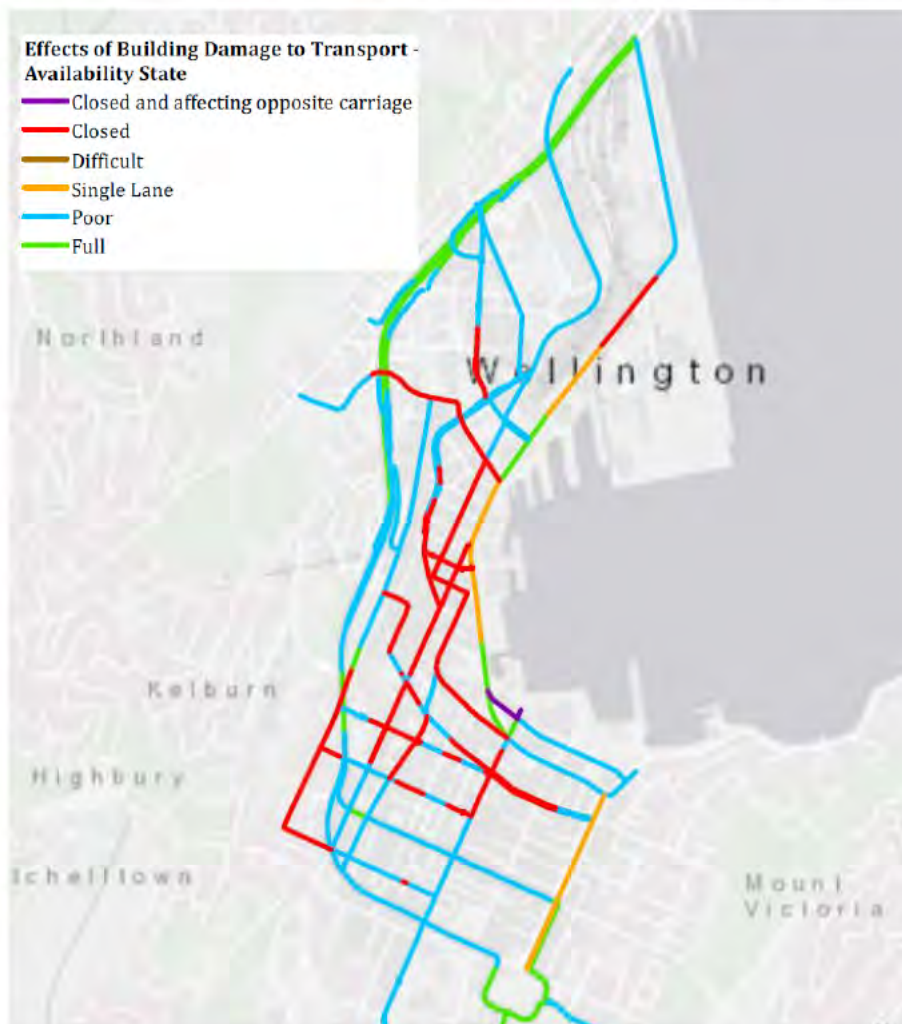
- Seawalls along the waterfront route
- Retaining wall / hillside just north of the Terrace Tunnel
- Crawford Road between Newtown and Kilbirnie
- Basin Reserve

Access through the Basin Reserve and Mt Victoria tunnel is also constrained by conflict between local (access to hospital) and state highway traffic (access to airport) under operational conditions and poses a resilience issue for access to these critical facilities.

These resilience risks must be addressed as part of this project.

6.2.5 Indirect Risk to Transport Access from Building Damage in Earthquakes

In addition to the direct risks to the transport corridor from natural hazards, there are also indirect risks to transport access from building damage and safety issues in the event of moderate to large earthquakes.



A key observation from the 2010-2011 Canterbury earthquake sequence which reinforced overseas observations was that access along inner-city transport routes was closed due to damage or collapse of buildings and safety hazards from buildings damaged by the earthquakes and aftershocks. Considering this observation, the post-earthquake availability state of inner-city roads was assessed as part of the Wellington Transport Resilience PBC, considering the type and height of buildings along the routes, and the likely impact on accessibility considering potential building collapse, damage and safety hazards for road users. Higher and more vulnerable building topologies could cause more disruption due to damage or safety concerns.

The expected availability state of the inner-city transport routes in the Wellington central business district is shown on Figure 6-4.

Figure 6-4: Earthquake risk to transport access from building damage (after WSP Opus, 2018)

This assessment shows that although the roads in the flat inner-city areas themselves are unlikely to be damaged by the earthquake sufficiently to cause closure, they could still be closed due to earthquake damage to adjacent buildings. The closure could be more due to cordons set up for operational reasons.

These are also independent risks that cannot be easily addressed by the transport authorities as part of the project as they arise from outside the transport corridor from often privately-owned buildings.

6.3 Inputs to the MCA Assessment

The Resilience assessment for the MCA process has been based on a variety of inputs, the main references are set out in this section.

These include previous technical specialist reports:

- [SHI Report and Scores](#)
- [Programme Short List Assessment Report](#)
- [MRT Report](#)
- [MRT Scores](#)

Other inputs include:

- a) LGWM - Options developed by the project team and presented as PowerPoint slides
- b) LGWM - Map showing the line diagrams for the various options
- c) LGWM - Preliminary geotechnical appraisal report
- d) Let's Get Wellington Moving – State Highways. Resilience of Options. Report No GER 2020-56 Issue 1 dated 30 October 2020. (Brabhaharan, 2020).
- e) Let's Get Wellington Moving. Mass Rapid Transit IBC. Short List Option Report. 19 October 2020 (Eldridge, 2020).
- f) Let's Get Wellington Moving – Resilience of Recommended Programme of Investment. Report No GER 2018 - 65 Issue 2 dated 9 November 2018. (WSP Opus, 2018).
- g) Wellington transport resilience programme business case. Draft. (WSP Opus, 2018)
- h) Basin Bridge reports (Opus, 2012)
- i) 1:250,000 Geology Map (Geological and Nuclear Sciences, 2000).
- j) 1:50,000 Geology Map of Wellington (Geological and Nuclear Sciences, 1996).
- k) GNS Science. Active Faults Database.
- l) Updated 3D basin model and NZS 1170.5 subsoil class and site period maps for the Wellington CBD (Kaiser et al, 2019).
- m) Structure and Seismic Potential of the Aotea & Evans Bay faults Wellington (Barnes et al, 2019).
- n) Engineering Geological Characterisation of the Wellington CBD (Semmens et al, 2010).
- o) Wellington Water (2018). WCC CBD Flood Management Workshop. 18 June 2018.
- p) T&T (2014). Sea Level rise options analysis. Prepared for Wellington City Council. June 2013.
- q) Wellington Regional Council. Tsunami Evacuation Maps published on the web.
- r) Wellington Region natural hazard reports

6.4 Assumptions

The following key assumptions have been made:

- 1) Existing hazard maps indicate the known potential hazards along the corridors
- 2) Aotea Fault is active and crosses the eastern side of the Basin Reserve, based on recent studies.
- 3) The fault on the eastern side of Mt Victoria crosses the parallel Mt Victoria tunnel options and may be active.
- 4) The MRT has been assumed to be LRT for both the south and east lines for the base options.
- 5) The project will be designed taking into consideration the new National Seismic Hazard Model under development by GNS and expected to be completed in 2022.
- 6) The proposed structures (bridges) will be designed and constructed to be resilient to liquefaction, slope instability and other hazards.
- 7) Some hazards are impractical or difficult to mitigate (e.g. active fault rupture, earthquake induced failure of high steep slopes) and these have therefore been assumed to remain unmitigated if the affected options are chosen.
- 8) The Aotea Fault, the Fault on the eastern side of Mt Victoria and the Terrace Tunnel and Happy Valley Faults will be investigated at an early stage during development of the scheme, to enable the risk to the scheme to be mitigated.
- 9) It is assumed that sea level rise will be minimal at the assessment timeframe of 2036, and therefore did not have a significant effect on the scoring. However, in 50 to 100 years, this is expected to have a significant effect on Wellington city.
- 10) BRT systems can vary from an articulated bus to a trackless tram, and the resilience of these systems will relate to the type of BRT system assumed, as no decision regarding the actual system has been made. In this assessment, it has been assumed that the BRT will be an articulated bus with its own motive power (e.g. Batteries, and no power feeders along the route).

It is assumed that the following standard mitigation will have been implemented during design and construction of the schemes:

- a) The vulnerable sea walls along Waterloo Quay and Jervois Quay will be strengthened to be resilient to large earthquakes and other hazards.
- b) The MRT line foundations will be designed to be able to be resilient i.e. minimise damage and be able to be quickly relevelled after liquefaction induced subsidence that will occur in a large earthquake.
- c) Drainage will be enhanced to address say a 10- year design event but flooding issues will remain at a 100 year plus climate change hazard levels.
- d) It has been assumed that the northern portal of the Long Tunnel would be adjusted to minimise the risks associated with the Terrace Fault zone.

Previous package assumptions are outlined in the report link above.

6.5 Key Performance Indicators

The investment objective in relation to resilience is:

- A transport system that is adaptable to disruptions and future uncertainty.

Three KPIs were developed for resilience and used as the basis for the assessment of the options and are presented by Brabhakaran (2020).

The KPIs that were developed for the assessment of resilience are listed in Table 6-1. The table lists the KPIs together with the measure and rationale and notes to facilitate the assessment.

Table 6-1: Key Performance Indicators for Resilience

No	Key Performance Indicator	Measure	Notes for Assessment	Rationale
1	Enhances the resilience of land transport access to critical facilities and within the city.	Improvement in resilience of access.	Degree to which the identified transport access vulnerabilities are addressed.	Increase transport system and network resilience for Wellington Region and New Zealand.
2	Resilient to HILP events and contributes to access for communities.	Improvement in access for emergency response and recovery after HILP event.	New option is resilient and contributes to access for emergency response and recovery.	Emergency response and recovery access is critical for wellbeing and economic recovery after major events.
3	Enhances the resilience of access to provide socio-economic functionality in LIHP and unplanned events.	Improvement in access for socio-economic functionality.	Enhances system resilience of the transport network in routine and frequent events.	Resilience of access is critical for socio-economic functionality and business confidence.

The individual KPIs were first scored individually independent of other KPIs. The overall scores were then assigned based on the individual KPIs, the degree to which the three KPIs affect the overall resilience of the critical journeys identified in the Transport resilience business case.

6.6 Methodology Approach

The methodology approach for KPI 5.1 is summarised in Table 6-2, and the approach for KPI 5.2 is provided in Table 6-3.

The approach used for assessment of KPI 5.3 is shown in Table 6-4.

Table 6-2 Approach for Assessment of KPI 5.1

	Description	Notes
Key Performance Indicator	Enhances the resilience of land transport access to critical facilities <u>and</u> within the city.	To increase transport system and network resilience for Wellington Region.
Measure	Improvement in resilience of access – degree to which the resilience of access to critical facilities are enhanced by addressing identified transport system vulnerabilities.	Existing identified system vulnerabilities are major impediments to access. The identified system vulnerabilities are shown on Figure 6-3.
Assumptions	Transport system vulnerabilities identified in the Wellington Transport Resilience PBC (WSP).	Identified agreed system vulnerabilities shown in Figure 6-4 are used.
Critical Facilities	Wellington Regional Airport Wellington Regional Hospital, Newtown Wellington Railway Station, CBD	Critical facilities identified in the project area, see Figure 6-2.
Assessment Approach	Identify critical journeys impacted by the option(s). Consider identified resilience gaps. Assess the degree to which these resilience gaps are addressed by the option(s).	The assessment is reviewed by the specialist to ensure it is consistent with the overall degree of resilience enhancement.

Table 6-3 Approach for Assessment of KPI 5.2

	Description	Notes
Key Performance Indicator	Enhanced resilience to High Impact Low Probability (HILP) events and contributes to access for communities.	To increase transport system and network resilience for Wellington Region.
Measure	Improvement in access for emergency response and recovery after HILP event.	Emergency response and recovery access is critical for societal and economic wellbeing.
Assumptions	Functionality of city businesses would have ground to a halt and therefore capacity of access is not important.	Past events such as the Canterbury Earthquake Sequence 2010-2011 show that emergency response access is critical.
Main events	Large local earthquake e.g. magnitude 7.5 Major storm, return period > 100 years. Major tsunami that inundates large areas.	Inner city roads likely to be closed due to damage and safety hazards from damaged / collapsed buildings.
Assessment Approach	Consider the resilience of different programmes when subject to high impact natural hazards. Assess availability of access for emergency response - recovery.	Capacity of access is unimportant, and therefore the resilience of MRT is of less importance, compared to roads to provide access for emergency equipment, plant, medical and food supplies.

Table 6-4 Approach for Assessment of KPI 5.3

	Description	Notes
Key Performance Indicator	Enhances the resilience of access to provide socio-economic functionality in LIHP <u>and</u> unplanned events .	Resilience of access (including capacity) is critical for socio-economic functionality and business confidence.
Measure	Improvement in reliable access for socio-economic functionality.	City remains functional and therefore reliability and capacity of access is critical for effective functionality.
Assumptions	Current vulnerability of the transport system to gridlock and loss of reliable access in high frequency and operational events get worse due to increased population and traffic volumes.	Identified and agreed system vulnerabilities are used.
Typical events	Frequent low impact storms and moderate earthquakes. Accidents, spills and other operation events. City centre events, protests, unexpected incidents affecting city streets.	Events and incidents do occur, and the transport system should be resilient to such disruptions.
Assessment Approach	Consider resilience implications by 2036 without investment to enhance the transport system. Consider the resilience implications for reliable access and capacity to ensure socio economic functionality with different packages. Assess availability of road access for emergency services to function effectively.	City remains functional and therefore capacity of access is critical for functionality. Improvement in the reliability and redundancy of access is critical for socio-economic functionality.

6.7 Programme Short List Options Considered

The Package Short List Options considered are summarised in Table 6-5, together with a brief description relevant to the resilience assessment.

The individual options can be referred to in the [LGWM Programme Short List Briefing Pack](#).

Table 6-5: Short List Programmes

Package Option	Notes
Do minimum (2018/2021)	Base case
Do minimum (2036)	Assumed that none of the critical vulnerabilities will be mitigated by 2036 in the absence of the LGWM programme.
Option RPI V1 (2036)	East and South MRT routes + twin diagonal Mt Victoria tunnels to carry 2x SH lanes and 2x MRT lanes + Grade separation at Basin Reserve + Active mode tunnel at Mt Victoria + Te Aro tunnel + Duplication of Terrace Tunnel.
Option RPI V1A (2036)	East and South MRT routes + twin diagonal Mt Victoria tunnels to carry 2x SH lanes and 2x MRT lanes + Grade separation at Basin Reserve + Active mode tunnel at Mt Victoria.
Option RPI V2 (2036)	South MRT route + East Buses + Mt Victoria Active mode tunnel + Long tunnel from north of Terrace tunnel to Wellington Rd, Hataitai.
Option RPI V3 (2036)	South MRT route + East Buses + Mt Victoria Active mode tunnel (at grade at Basin Reserve)
Option RPI V3A (2036)	South MRT route + East Buses + Mt Victoria Active mode tunnel + grade separation at Basin Reserve.

7 MCA Methodology Approach Approval

The above documented Resilience of land transport access to critical facilities assessment approach (refer Section 6) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Support	TAG Members	Date of TAG / OIM / Programme Representative Methodology Approval
KPI 5.1: Resilience of land transport access to critical facilities	SHI Team Member	SHI Team Member MRT Team Member	LGWM Representative	24 June 2021
KPI 5.2: High Impact Low Probability Events	SHI Team Member	SHI Team Member MRT Team Member	LGWM Representative	24 June 2021
KPI 5.3: Low Impact High Probability Events	SHI Team Member	SHI Team Member MRT Team Member	LGWM Representative	24 June 2021

8 Programme Short List Assessment Scores

8.1 KPI 5.1: Resilience of land transport access to critical facilities

KPI 5.1 considers land transport access to critical facilities and within the city. The specialist scores and rationale are presented in Table 8-1.

Table 8-1 Scores for KPI 5.1 Resilience of Land Transport Access to Critical Facilities

Programme Option	LRT Score	Notes
2018	0	Base Case
Do Min 2036	0	Assumed that none of the critical vulnerabilities will be mitigated by 2036 in the absence of the LGWM programme and could worsen over time due to deterioration of assets and slopes.
RPI V1 (2036)	+4	Critical vulnerabilities along waterfront and Mt Victoria Tunnel (see Figure 6-3) are addressed, and Basin Reserve partially addressed. Diagonal tunnel portals located in secure gently sloping terrain. Terrace Tunnel duplication and Te Aro tunnel bypass other vulnerabilities.
RPI V1 (2036) with Congestion Charging	+4	Same as V1.
RPI V1A (2036)	+2	Critical vulnerabilities along waterfront and Mt Victoria Tunnel (see Figure 6-3) are addressed, and Basin Reserve partially addressed. Diagonal tunnel portals located in secure gently sloping terrain. Other vulnerabilities remain.
RPI V1A (2036) with Congestion Charging	+2	Same as V1A.
RPI V2 (2036)	+2	Improvement in resilience to airport from the north through Long Tunnel from Terrace to Kilbirnie and MRT improves waterfront route (but marginal improvement from city).
RPI V2 (2036) with Congestion Charging	+2	Same as V2 above.
RPI V3 (2036)	0 to 1	Marginal improvement in resilience from MRT along waterfront route and active mode tunnel. Remaining critical resilience vulnerabilities identified, including Mt Victoria Tunnel and Terrace approach vulnerabilities remain.
RPI V3 (2036) with Congestion Charging	0 to 1	Same as V3 above.
RPI V3A (2036)	1	Very low improvement in resilience from MRT along waterfront route and active mode tunnel, and grade separation at the Basin Reserve. Remaining critical resilience vulnerabilities identified, including Mt Victoria Tunnel and Terrace approach vulnerabilities remain.
RPI V3A (2036) with Congestion Charging	1	Same as V3A above.

8.2 KPI 5.2: High Impact Low Probability Events

KPI 5.2 addresses the resilience to HILP events and contribution to access for communities.

Table 8-2 Scores for KPI 5.2 Resilience in High Impact Low Probability Events

Programme Option	LRT Score	Notes
2018	0	Base Case
Do Min 2036	0	Assumed that none of the critical vulnerabilities will be mitigated by 2036 in the absence of the LGWM programme and therefore there is no change to the significant vulnerability of the transport system in HILP events.
RPI V1 (2036)	+4 to +3	Highly improved resilience in HILP events from Mt Vic diagonal tunnel, Te Aro tunnel and Terrace Tunnels, grade separation at Basin Reserve and MRT at waterfront.
RPI V1 (2036) with Congestion Charging	+4 to +3	Same as V1.
RPI V1A (2036)	+ 3 to +2	Some improvement in resilience in HILP events from Mt Vic diagonal tunnel and Basin grade separation.
RPI V1A (2036) with Congestion Charging	+3 to +2	Same as V1A.
RPI V2 (2036)	+2 to +1	Improved resilience from the north through Long Tunnel from Terrace to Kilbirnie and MRT improves waterfront route (but marginal improvement in city).
RPI V2 (2036) with Congestion Charging	+2 to +1	Same as V2 above.
RPI V3 (2036)	0	Little improvement in resilience from MRT along waterfront route and active mode tunnel. Critical resilience vulnerabilities in HILP events remain.
RPI V3 (2036) with Congestion Charging	0	Same as V3 above.
RPI V3A (2036)	0	Little improvement in resilience from MRT along waterfront route and active mode tunnel. MRT in Kilbirnie vulnerable to liquefaction subsidence and ground damage. Critical resilience vulnerabilities in HILP events remain.
RPI V3A (2036) with Congestion Charging	0	Same as V3A above.

8.3 KPI 5.3 Package Short List Assessment Scores

KPI 5.1 considers resilience in low impact high probability hazards, operational and unplanned events. The specialist scores and rationale are presented in Table 8-3.

Table 8-3 Scores for KPI 5.3 Resilience in Low Impact High Probability and Operational Events

Programme Option	LRT Score	Notes
2018	0	Base Case
Do Min 2036	-2	The projected increase in population and an associated increase in transport demand is predicted for 2036, and this will lead to increase in traffic volumes, and reduced resilience due to operational incidents and frequent hazards, reducing socio economic functionality.
RPI V1 (2036)	+4	Diagonal Mt Vic tunnel, Basin grade separation, Te Aro tunnel and Terrace tunnel together with MRT greatly enhance resilience to operational events, with separation of arterial traffic from city streets and enhanced resilience of new tunnels.
RPI V1 (2036) with Congestion Charging	+4	Same as V1.
RPI V1A (2036)	+2	Enhanced resilience from Mt Vic diagonal tunnel / Basin grade separation, and MRT, but significantly less than V1 due to absence of Te Aro and Terrace tunnels, making city vulnerable to incidents in the city.
RPI V1A (2036) with Congestion Charging	+2	Same as V1A.
RPI V2 (2036)	+2	Enhanced resilience from Long tunnel and MRT, but significantly less than V1 due to absence of Te Aro and Terrace tunnels and Basin grade separation.
RPI V2 (2036) with Congestion Charging	+2	Same as V2 above.
RPI V3 (2036)	-1	Only marginal improvement over 2036 Do min due to MRT South and active mode tunnel, leaving city vulnerable to incidents in the city.
RPI V3 (2036) with Congestion Charging	-1	Same as V3 above.
RPI V3A (2036)	0	Only marginal improvement over 2036 Do min due to MRT South, Basin grade separation and active mode tunnel.
RPI V3A (2036) with Congestion Charging	0	Same as V3A above.

8.4 Overall Scores

The overall specialist assessment of the scores are presented in Table 8-4, with appropriate rationale.

Table 8-3 Overall Resilience Scores

Programme Option	LRT Score	Notes
2018	0	Base Case
Do Min 2036	-2	The projected increase in population and an associated increase in transport demand predicted for 2036 will lead to increased traffic volumes, and reduced resilience due to operational incidents and frequent hazards.
RPI V1 (2036)	+4	Resilience substantially enhanced due to more resilient access from the north (Terrace Tunnel duplication), from the CBD to the airport (Mt Victoria Diagonal Tunnel) and hospital (Te Aro Tunnel and MRTs), and grade separation of the Basin Reserve. Te Aro tunnel makes SH traffic much less vulnerable to incidents on city streets. MRT and SH in separate tunnels will enhance resilience in operational and HILP events.
RPI V1 (2036) with Congestion Charging	+4	Same as V1, as the reduction of 10% traffic from congestion charging will have little influence on resilience.
RPI V1A (2036)	+2	Same as V1, but absence of Te Aro and Terrace Tunnels means less enhancement of resilience of access from CBD to hospital and from the north to airport and hospital. Also makes system more vulnerable to operational events in the city compared to V1.
RPI V1A (2036) with Congestion Charging	+2	Same as V1A, as the reduction of 10% traffic from congestion charging will have little influence on resilience.
RPI V2 (2036)	+2	Enhanced resilience from the north with the long tunnel from Terrace to Kilbirnie. But access from CBD to hospital and airport not significantly improved, with minor improvements due to active mode tunnel and MRT to south and buses to east. Transport access still vulnerable to operational incidents. Long tunnel vulnerable if movement on Terrace Fault in sympathy to Wellington Fault rupture earthquake.
RPI V2 (2036) with Congestion Charging	+2	Same as V2 above, as the reduction of 10% traffic from congestion charging will have little influence on resilience.
RPI V3 (2036)	-1	Reduction in resilience due to traffic growth by 2036 partially offset by small improvements from active mode tunnel, MRT south and Buses East.
RPI V3 (2036) with Congestion Charging	-1	Same as V3 above, as the reduction of 10% traffic from congestion charging will have little influence on resilience.
RPI V3A (2036)	0	Only marginal improvement over 2036 Do min due to MRT South, Basin grade separation and active mode tunnel. Further minor improvements in resilience compared to V3 due to grade separation at Basin Reserve.
RPI V3A (2036) with Congestion Charging	0	Same as V3A above, as the reduction of 10% traffic from congestion charging will have little influence on resilience.

8.4.1 Scoring changes between Long List and Short List assessment

Option	Long List Score	Short List Score	Reason for Change
RPI V1	3	4	Option V1 offers substantial resilience benefits as MRT enhances resilience of access along its routes and the duplication of the Terrace Tunnel, the Te Aro tunnel and the diagonal Mt Victoria Tunnel provides resilient access to critical facilities and also substantially avoids operational incidents on city streets affecting this access. This wasn't adequately recognised by the previous assessor.
RPI V1 (C)	3	4	- Ditto – same as V1 above.
RPI V2	1	2	The resilience benefits of the long tunnel bypassing the identified critical resilience issues was overlooked by the previous assessor.
RPI V2 (C)	1	2	- ditto – same as V2 above.
RPI V3	1	-1	The 2036 baseline became -2, when taking into consideration the projected population growth leading to increased traffic and related operations resilience issues, and excluding the city street improvements as part of the LGWM programme. The improvements of Option V3 were from a -2 base score, and therefore V3 became -1.
RPI V3(C)	1	-1	- ditto – same as V3 above.
RPI V3A	1	0	The 2036 baseline became -2, when taking into consideration the projected population growth leading to increased traffic and related operations resilience issues, and excluding the city street improvements as part of the LGWM programme. The improvements provided by Option V3A were from a -2 base score, and therefore V3 became -1.
RPI V3A (C)	1	0	- ditto – same as V3A above



June 2021

Programme Short List Options

MCA Approach and Methodology:

Environmental effects – Mana Whenua

1 Introduction

Let's Get Wellington Moving is a joint **initiative** between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages (the packages) which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020, and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- [LGWM Programme Short List Briefing Pack](#) / Technical Assessment Team Assessment Launch Briefing held on 14^h June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Mana Whenua – MCA Methodology Approach

Methodology

The Short List Options are scored against a set of Mana Whenua Values developed by the iwi partners' representatives on the TAG with the authority of the iwi partner organisations Taranaki Whanui and Ngati Toa. These Values are:

1. Whakapapa - A sense of Place
2. Wai-ora - Respect the Role of Water
3. Pūngao-ora – Energy
4. Hau-ora – Optimising Health & Wellbeing
5. Whakamahitanga - Use of Materials
6. Manaakitanga – Support a Just and Equitable Society
7. Whakāhuatanga - Celebrate Beauty in Design

Assumptions

The Options that involve a duplicate Terrace Tunnel (RPI V1) or the Long Tunnel (RPI V2) are assumed to involve no material effect to the Bolton Street Cemetery beyond the original Ministry of Works alignment.

3 Mana Whenua – MCA Methodology Approach Approval

The above documented Mana Whenua assessment methodology and assumptions (refer Section 2) for the Programme Short List were presented to and approved by the relevant TAG representatives as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG / Programme Representative Methodology Approval
Mana Whenua	LGWM Mana Whenua Representative	SHI Team Member	LGWM TAG Member and Iwi partners Representatives	Methodology: iwi organisations and iwi partners' representatives February 2021 Scoring: iwi partners' representatives 21, 22 and 23 June 2021

4 Mana Whenua – MCA Scoring

Scoring of the Programme Short List Options for Mana Whenua Values utilises an 11-point scale to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria have been developed and confirmed by the LGWM programme team. The Mana Whenua assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1: Introduction above) are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separately to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options
10. Identify any dependencies or potential overlaps with other specialists to ensure we have consistent use of data and don't double count

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There have been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Previous Programme Long List Options assessments and scores –
[Programme Long List Mana Whenua Assessment](#)
3. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores – Mana Whenua

The tables below document the Programme Short List Option – Specialist Scores for Mana Whenua criteria with rationale.

Table 1; Specialist scoring for Mana Whenua assessment

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline
Do minimum (2036)	-2	Congestion will increase with population growth
Option RPI V1 (2036)	2	Reclaims Karo Drive and saves Ruahine Street
Option RPI V1 with congestion charging (2036)	3	Congestion Charging improves this Option
Option RPI V1A (2036)	1	Diagonal Tunnel saves Ruahine Street
Option RPI V1A with congestion charging (2036)	2	Congestion Charging improves this Option
Option RPI V2 (2036)	2	Long Tunnel offers a different future for Te Aro flat
Option RPI V2 with congestion charging (2036)	3	Congestion Charging improves this Option
Option RPI V3 (2036)	1	MRT south and enhanced bus service east, Basin at grade and Mt Victoria improved but not much else
Option RPI V3 with congestion charging (2036)	2	Congestion Charging improves this Option

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Option RPI V3A (2036)	2	Extends Arras Tunnel
Option RPI V3A with congestion charging (2036)	3	Congestion Charging improves this Option

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options for mana whenua impacts were:

The 2036 Do Minimum attracted a negative score. This is because absent any interventions matters such as congestion will get worse as population increases. The negative score could probably be even more negative.

At this point it might be noted that for allied reasons all of the Programme Options score better with Congestion Charging than without.

Now onto the Short List options:

Two of the Options contain the same MRT proposals so this is not much of a differentiator except that on this account RPI V1 and RPI V1A with MRT east score better than the other three options which have only enhanced bus service to the east.

RPI V1

Although it is the most intrusive of the options it scores well for this reason. The large swatch across Te Aro that the Te Aro trench construction will require will unlock land for development. We have less difficulty with the time frame for this than scorers of other criteria may have. Our time frame is driven by a desire to participate in development of what were once our lands. That ownership was quite a while ago. So, we are accepting of waiting a little longer if a major project is able to unlock the potential of the area. Our scoring is higher if the trench is covered (even if only with a park) than without.

RPI V1A

Deletes the Te Aro trench but provides an improvement at Ruahine Street because (as with RPI V1) the diagonal tunnel means none of the Town Belt in that area need be taken.

RPI V2

This option with the Long Tunnel is an innovative solution to the blight that affects the Karo Drive area. By taking SH1 away from this Te Aro area it can develop in a different and better way than it is now (and would be in 2036 under the Do Minimum). We do proceed on the basis that the construction material removed will be clean and that there will be no affect beyond the original MOW motorway alignment.

RPI V3

Largely RPI V2 without the Long Tunnel so does not score as highly.

RPI V3A

The Basin gains a grade separation, and this allows for an attractive extension of the Arras Tunnel to the west. This is a sensitive area given the history of the levelling of Mt Cook and construction of the Prison by men from Parihaka.

10 Scoring changes between Long List and Short List assessment

The only change in score from Long List to Short List was for Option V3. At Long List stage this option scored -1 and at Short List this was improved to +1. This is mostly down to a greater understanding of the options at this Short List stage, and a change in score relative to the Long Tunnel option as explained in the previous section on Key Differentiators.

Option	Long List Score	Short List Score	Reason for Change
RPI V1 (C)	2	3	This score increased by a point between Long List and Short List stage as a result of the positive benefits of traffic reduction in the city were understood as a consequence of congestion charging.
RPI V1A (C)	1	2	This score increased by a point between Long List and Short List stage as a result of the positive benefits of traffic reduction in the city were understood as a consequence of congestion charging.
RPI V2 (C)	2	3	This score increased by a point between Long List and Short List stage as a result of the positive benefits of traffic reduction in the city were understood as a consequence of congestion charging.
RPI V3	-1	1	The main change in score from Long List to Short List was for Options V3 and V3A. At Long List stage these options scored -1 and at Short List this they were improved to +1 and +2 respectively. This is mostly down to a greater understanding of the options at this Short List stage, and a change in score relative to the Long Tunnel option as explained in the previous section on Key Differentiators. The inclusion of the Basin Grade Separation also resulted in Option V3A increasing an extra point, in comparison with V3, and in combination with congestion charging, when the positive benefits of traffic reduction in the city were understood.
RPI V3 (C)	-1	2	
RPI V3A (C)	2	3	This score increased by a point between Long List and Short List stage as a result of the positive benefits of traffic reduction in the city were understood as a consequence of congestion charging.

11 Conclusion

All the Options are positive which suggest that any of them provides an improvement over what would otherwise be the case. RPI V2 is narrowly our preference followed closely by RPI V1, then RPI V3A then RPI V1A and RPI V3.



June 2021

Programme Short List Options

MCA Approach and Methodology: Environmental Effects – Heritage and Archaeology

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020, and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Heritage and Archaeology – MCA Methodology Approach

2.1 Matters Considered

The matters previously considered in the heritage and archaeology assessment were the same for both the MRT and SHI assessments and were defined as follows:

Matters Considered
<ul style="list-style-type: none"> • Effect on WCC identified heritage buildings and sites including their context • Effect on WCC identified heritage and character areas • Effect on HNZPT identified heritage buildings, sites and areas, including their context • Effect on recorded archaeological sites • Effect on items included in Waka Kotahi's Heritage Inventory

- Potential effect on historic buildings and areas of historic character that have not been identified by WCC or HNZPT
- Potential effect on unrecorded archaeological sites
- Cohesion/interrelationships – including relationship between significant sites within the project area, and relation to key significant sites outside of the project area

No particular weighting of these matters was applied; the scores reflect the impact across all matters.

2.2 Methodology

The methodology used in this MCA is a combination of methodologies used in both of the previous assessments.

The impact on heritage and archaeology has been evaluated based on a street by street analysis of the proposed design options against the current environment, cross referencing this with existing information including the New Zealand Heritage List, the Wellington City Council Heritage Inventory, the New Zealand Archaeological Association's database ArchSite. It has considered unlisted heritage buildings or areas, or unrecorded archaeological sites, only where specifically referenced; but where further assessment is required, this is noted.

In parallel to the MCA process, a Heritage Landscape Assessment is being prepared, and the findings of this Assessment have also informed the evaluation where appropriate.

The impact of the proposed design options has been assessed against the current environment, not against a possible permitted baseline. Therefore, while it is the case that current permitted activity rules allow multi-storey development around the Basin Reserve, this is not taken into account in the heritage and archaeology assessment as this would lead to any number of hypothetical alternatives and make it impossible to assess the options.

The options for the Basin Reserve have not been compared to the Basin Bridge proposal of 2014 as this is not the purpose of the assessment. However, the Final Decision and Report of the Board of Inquiry (BoI) into the Basin Bridge Proposal has informed the evaluation insofar as the evaluation recognises and reflects the BoI's findings regarding the importance of the sensitivity of the Basin Reserve as a heritage setting, including the historically significant views and connections between places with strong historical associations.

2.3 Assumptions

The assessment assumes that all of the sites that are cleared as a result of the proposed project works will remain vacant. This is on the understanding that, although redevelopment of these sites may be prompted by the Project, it is not within the scope of the Project.

It should be noted that the impacts (benefits) of this development may have been included in MCAs for other disciplines, such as the urban amenity and social MCAs, and that this creates an inconsistency between the MCAs.

No mitigations have been allowed for in the assessment unless they are stated in the assumptions.

Other assumptions applied to the Heritage and Archaeology assessment are:

- Road widening, excavation, and other associated works will be the same for all three MRT modal options (BRT, TT and LRT), and therefore mode does not impact on the scoring. This is based on all options being battery electric with no overhead wires; and on the assumption that BRT will require roads to be resurfaced.
- Unless specifically detailed in the documents, there will be no widening of existing roads or transport routes beyond the existing corridors.
- Where a diagonal traffic tunnel/MRT tunnel is being proposed, that there will be no taking of properties on Paterson Street between Brougham and Austin Streets.
- Where the extent of a heritage building or structure has not been defined, the boundaries of the relevant land parcel have been assumed to be the extent.
- Where the extent of an archaeological site has not been defined, a likely extent based on the type of site identified has been assumed.
- Where the proposed route intersects with a property, that any buildings or structures on that property will be removed (demolished) in their entirety, and these sites will be left vacant (where they are not being built on for road or MRT purposes).
- Temporary protection of all listed and scheduled heritage places (buildings, structures, sites, etc) adjacent to the works will be put in place to prevent damage being caused during construction works.
- Where the proposed route intersects with an archaeological site, that the site will be largely or completely destroyed; and that an archaeological authority(ies) will be applied for as required by HNZPT for these works.
- Any taking of land from the Town Belt and the Canal Reserve follows the requirements of the Wellington Town Belt Act, including potential offset by adding land to the Town Belt.
- 9(2)(b)(ii), 9(2)(j) [Redacted]
- 9(2)(b)(ii), 9(2)(j) [Redacted]
- Relocation of any other buildings that have heritage significance and/or are within heritage or character areas (not necessarily statutorily identified individually) is not being managed within the requirements of the project (as this has not been confirmed).
- That any tunnels will be of a depth that avoids likely archaeological sites. Note that this excludes trenching.
- That while congestion charging may have a minor impact by reducing traffic volume on city streets, and therefore might create opportunities for positive heritage outcomes, it is not the role of this assessment to assess opportunities. As such, congestion charging does not result in a change in scoring.

- That there is no notable difference between construction and operation scores for heritage and archaeology. Once a building, archaeological site, or other heritage place has been damaged or destroyed, this impact is permanent.
- There are a range of mitigation measures that could be incorporated into the project that would improve the outcomes for heritage, but these are not included in the scores unless they are identified in the other assumptions above.

3 Heritage and Archaeology – MCA Methodology Approach Approval

The above documented noise and vibration assessment scope, methods and assumptions (refer Section 2) for the Programme Short List were presented to and approved by the relevant TAG/ OIM/ Programme Representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of Methodology Approval
Heritage and archaeology	SHI Team Member	SHI Team Member	Waka Kotahi TAG Member	Email, 21 st June 2021
		MRT Team Member	WCC TAG Member	Email, 21 st June 2021

4 Heritage and Archaeology – MCA Scoring

Scoring of the Programme Short List Options for Heritage and Archaeology utilises an 11-point scale to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme Options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria have been developed and are currently being confirmed by the LGWM programme team. The Heritage and Archaeology assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1: Introduction above) are in place by 2036 - using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options
10. Identify any dependencies or potential overlaps with other specialists to ensure we have consistent use of data and don't double count

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. Where using a different assumption to what is in the Programme Option description results in a different score, this is noted.

7 Previous Work Undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –

[13/05/2021 Workshop](#)

[13/05/2021 Meeting Record](#)

[18/05/2021 Workshop](#)

[18/05/2021 Meeting Record](#)

2. Draft Programme Long List to Short List Report

[Long List to Short List process](#)

8 Programme Short List Assessment Scores – Heritage and Archaeology

The table below documents the Programme Short List Option – Specialist Scores for heritage and archaeology criteria with rationale.

Table 1: Specialist scoring for heritage and archaeology

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
Do minimum (2021)	0	Baseline
Do minimum (2036)	0	<p>There are likely to be some minor positive outcomes for heritage relating to the Golden Mile and City Streets intersection improvements as these may improve the cohesion of significant heritage sites within the project area, and public enjoyment of those sites. However, assuming that no opportunities to improve other positive heritage outcomes are taken – such as the inclusion of interpretation, the enhancement of the public's access to or experience of heritage places, or the general upgrade and improvement of heritage areas – then the minor positive outcomes are not worth a point.</p> <p>The 2036 do minimum avoids demolition and/or impacts on the context of identified (and non-identified) heritage buildings, sites and areas; and avoids the destruction of archaeological sites. As this avoidance of impacts is also assumed to apply to the 2021 do minimum baseline, this does not affect the score.</p> <p>It is not clear whether or not a second public transport spine along the waterfront would require street widening and/or excavation along the route. If it did so, it may impact on heritage buildings, sites and areas, and their settings, and on archaeological sites, along the route.</p> <p>Assuming that no widening or excavation of the existing transport corridor is required, and that stations (or similar) will be positioned within the corridor, then a transport spine along the waterfront would have no impact in relation to the existing do minimum baseline.</p>
Option RPI V1 (2036)	-5	Duplicate Terrace Tunnel for SH1 encroaches onto gazetted land at the boundary of the Bolton Street Cemetery. This area is highly sensitive to change, having already been subject to the enormous intervention of the Wellington Urban Motorway. Any encroachment in this area has a negative impact on heritage values.

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
		<p>Properties on The Terrace, and on other streets impacted by the tunnel, will be purchased outright as part of the project and then sold back to the public at completion of the project. Therefore, there is a risk that these properties will remain vacant and/or unmaintained for the project period.</p> <p>The Te Aro Trench for SHI requires very high property take in a sensitive heritage area already modified by the Inner City Bypass. Buildings will need to be demolished or relocated. Relocation of the buildings within the project, and their relative positions, has not been confirmed so is assumed to be outside the scope. The trench will create “dead” zones where Willis, Victoria and Cuba Street “land bridges” cross the trench - a particular issue for Cuba Street due to heritage buildings in this area. Trenching may improve connectivity across the state highway route, but does not create positive outcomes for heritage; nor does it create places where people will engage with heritage/historic context.</p> <p>MRT severs the connection between the Civic Centre Heritage Area and the waterfront, assuming 9(2)(b)(ii), 9(2)(j) It then crosses the area where Te Aro Pā is located at the north end of Taranaki Street which is sensitive to ground works.</p> <p>MRT cuts through Haining Street, an area with high archaeological sensitivity.</p> <p>All sides of Basin are impacted in order to connect SHI to the east and MRT to south and east. 9(2)(b)(ii), 9(2)(j)</p> <p>Rising gradient of the land required for grade separation will impact on the sense of connectivity and coherence between the Basin and Pukeahu. An easier pedestrian route between Pukeahu and Basin will be created but still separated by a busy intersection at Sussex St.</p> <p>9(2)(b)(ii), 9(2)(j)</p>

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
		<p>9(2)(b)(ii), 9(2)(j) disconnect between Canal Reserve and Basin is worsened by widening the intersection in this location.</p> <p>Possible impact on Town Belt for new diagonal MRT/SHI Mt Victoria tunnel portal at Wellington Road. 9(2)(b)(ii), 9(2)(j) that may have heritage and archaeological significance that has not yet been defined.</p>
Option RPI V1A (2036)	-4	As for RPI V1, but without the negative impact of the Te Aro Trench and duplicate Terrace Tunnel.
Option RPI V2 (2036)	-2	<p>MRT severs the connection between the Civic Centre Heritage Area and the waterfront, assuming 9(2)(b)(ii), 9(2)(j). It then crosses the area where Te Aro Pā is located at the north end of Taranaki Street which is sensitive to ground works.</p> <p>MRT cuts through Haining Street, an area with high archaeological sensitivity. Although the route largely avoids the Basin by moving onto Tory and then turning onto Rugby Street, the route cuts through properties at the intersection between Rugby Street and Adelaide Road where there is a building potentially constructed pre-1900.</p> <p>9(2)(b)(ii), 9(2)(j) Taking of these properties will therefore have a negative impact on established heritage values.</p> <p>9(2)(b)(ii), 9(2)(j) A more careful design could avoid property take in this area, and thereby avoid these impacts.</p> <p>The active modes tunnel exits into Town Belt land to the east of the existing Mt Victoria Tunnel, then continues along Ruahine Street with no property take or Town Belt take</p>

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
		<p>required. Widening of Wellington Road is required at the south end of the long tunnel; however, there is opportunity to minimise property take with careful design.</p> <p>The north end of the long tunnel begins adjacent to, and west of, the existing Terrace Tunnel. The visualisations show additional motorway changes between The Terrace Offramp and the existing Terrace Tunnel portal. This requires the addition of new motorway flyovers that do not appear to converge with, or require taking of land from, private properties. There may be some residual negative impacts on houses along the western side of The Terrace due to the height of the flyovers.</p> <p>The long tunnel removes state highway traffic from the CBD, and largely avoids the impacts that the state highway improvements proposed in other options will have on heritage. However, traffic modelling indicates that this does not result in a significant net reduction in traffic in the CBD; and there are few other benefits for heritage provided by V2 as it is proposed. .</p>
Option RPI V3 (2036)	-3	<p>MRT severs the connection between the Civic Centre Heritage Area and the waterfront, assuming 9(2)(b)(ii), 9(2)(j). It then crosses the area where Te Aro Pā is located at the north end of Taranaki Street which is sensitive to ground works.</p> <p>MRT cuts through Haining Street, an area with high archaeological sensitivity. Although the route largely avoids the Basin by moving onto Tory and then turning onto Rugby Street, the route cuts through properties at the intersection between Rugby Street and Adelaide Road where there is a building potentially constructed pre-1900.</p> <p>9(2)(b)(ii), 9(2)(j)</p> <p>Taking of these properties will therefore have a negative impact on established heritage values.</p> <p>9(2)(b)(ii), 9(2)(j)</p>

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
		<p>9(2)(b)(ii), 9(2)(j)</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>This option does not include removing the State Highway from city streets, and therefore does not offer the same opportunities as RPI V2 in terms of city street improvements that could have positive outcomes for heritage.</p>
Option RPI V3A (2036)	-4	<p>MRT severs the connection between the Civic Centre Heritage Area and the waterfront, assuming 9(2)(b)(ii), 9(2)(j) [Redacted]. It then crosses the area where Te Aro Pā is located at the north end of Taranaki Street which is sensitive to ground works.</p> <p>MRT cuts through Haining Street, an area with high archaeological sensitivity.</p> <p>All sides of Basin impacted in order to connect with MRT to south and east. 9(2)(b)(ii), 9(2)(j) [Redacted]</p> <p>[Redacted] Rising gradient of the land required for grade separation will impact on the sense of connectivity and coherence between the Basin and Pukeahu. An easier pedestrian route between Pukeahu and Basin will be created but still separated by a busy intersection at Sussex St.</p> <p>9(2)(b)(ii), 9(2)(j) [Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p> <p>[Redacted]</p>

Options Assessment	Score	Commentary/ Rationale (note the assumptions identified above)
		<p>9(2)(b)(ii), 9(2)(j) [redacted], and disconnect between Canal Reserve and Basin is worsened by widening the intersection in this location.</p> <p>9(2)(b)(ii), 9(2)(j) [redacted] Taking of these properties will therefore have a negative impact on established heritage values.</p> <p>9(2)(b)(ii), 9(2)(j) [redacted]</p> <p>9(2)(b)(ii), 9(2)(j) [redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>[redacted]</p> <p>This option scores the same as RPI V1A as the differences between the two options roughly equalise in terms of impact. Both require comprehensive changes at the Basin Reserve including grade separation; both have new tunnels through Mt Vic – although V1A has a new SHI/MRT tunnel where V3A has a new active modes tunnel – and it is assumed that both avoid taking properties on Paterson Street but require taking of properties on Wellington Road. V3A also requires widening on Ruahine Street which is not required by V1A; however, this difference does not equate to a whole point difference in scores.</p>

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options for heritage and archaeology impacts were:

- Impact of the Te Aro Trench and, to a lesser degree, the duplicate Terrace Tunnel
- Impact of works around the Basin Reserve
- 9(2)(b)(ii), 9(2)(j)
- 9(2)(b)(ii), 9(2)(j)

Note: the destruction of heritage places and archaeological sites cannot be mitigated – once these are lost they are lost forever. Relocation is always better than demolition; however, relocation is not always possible and, where it is possible, it will always have negative impact on the heritage values of a place.

10 Scoring Change Between Long List and Short List Assessments

The scores have changed between the Programme Long List Analysis and the Programme Short List Analysis due to the increased amount of detail available about each option, particularly traffic modelling information and confirmation about the extent of city street improvements that are included within each option.

When it became evident that V2 would not reduce traffic volumes in the CBD to the extent initially assumed, and that there was little in the way of city street improvements included in the option that would have direct heritage benefits (as opposed to creating opportunities for heritage benefits), then the score for V2 dropped significantly

All scores have been adjusted to maintain the same relativity between them, and in relation to the baseline, on the basis of the increased detail that became available during Programme Short List Assessment, and Package Long and Short List Assessment.



June 2021

Programme Short List Options

MCA Approach and Methodology:

Environmental effects – social impacts

1 Introduction

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The programme includes a number of different packages (the packages) which are progressing through different stages of project development, including:

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- Travel Demand Management
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The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness, and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting, and methodology was developed and circulated in May 2020, and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

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- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Social impacts – MCA Methodology Approach

The International Association for Impact Assessment defines social impact assessment as: *'...the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.'*

The intent of this MCA assessment, therefore, is to consider potential social effects that may occur as a result of an Option during its construction and operational phases when compared to the existing situation (the baseline).

Social impacts are often the 'human' experiences of other impacts, and it is not the potential effect of those impacts that is assessed below as this assessment has taken place by others relevant to the individual technical area (e.g. noise and vibration, visual and traffic). A social impact is a (positive or negative) change that can affect aspects of people's lives, such as

- Way of life, cohesion
- Stability, character, services, and facilities in a community
- Quality of the living environment and amenity
- Health and well-being.

The assessment, therefore, focuses on the anticipated experiences of individuals, families / households, or communities in response to changes introduced by the Options, being the benefits of and impacts on community facilities, important places and features resulting from the construction and operation of the Options.

The criteria used to assess the potential Social impacts or effects from the construction and operation of the Options were as follows:

Social criteria	Associated explanation / matters considered
Equitable access to Community Facilities	<ul style="list-style-type: none"> Physical access to community facilities and places and features likely to be important to communities as well as the continued function of those facilities, places, space, and features Creation/reduction/loss of any facilities / business (local / regional role) or improvement of an existing facilities, places, space, and features Partial severance / restriction for access to facilities
Equitable access to day-to-day (routine) activities	<ul style="list-style-type: none"> Annoyance, disruption, and restrictions to people's accessibility to go about their normal living patterns and participation in social / cultural activities when compared to the current situation
Sense of place/neighbourhood/community	<ul style="list-style-type: none"> Impact on neighbourhoods and community cohesion / stability / identity including loss of private property
Minimal impacts during construction	<ul style="list-style-type: none"> Impacts of construction for communities, community facilities, important places, and features Annoyance, disruption, and restrictions to people's accessibility to go about their normal living patterns and participation in social/cultural activities when compared to the current situation, including impact on private property (access, means of enclosure) and associated on-street parking Challenging local residents' expectations of neighbourhood amenity, character, and safety

No particular weighting of these matters was applied; the scores reflect the impact across all matters.

It should be noted that impacts of Options with respect to Liveability, Equitable Transport and Business Disruption have been assessed by others and are individually scored as part of the Programme MCA process.

The social sub-criteria used in this assessment are those contained in the LGWM Programme's Multi Criteria Analysis Framework. It was considered that '*Equitable access to Recreation*' was not required as a separate sub-criterion as the effects on these facilities and spaces could easily be assessed and considered under sub-criterion '*Equitable access to Community Facilities*' recognising that recreation spaces and facilities are Community Facilities.

This social impact assessment is based on a street by street analysis of the proposed Options as depicted in the Drawing Sets provided against the Baseline (the current environment). While it is acknowledged that the intent is for the redevelopment of land required for construction purposes, once construction is completed, the potential for new (additional) community facilities and places and features has not been taken into account in this social assessment as this would lead to any number of hypothetical alternatives and make it impossible to assess the options.

The assessment considered both negative impacts such as noise, dust, community amenity effects¹ and property acquisition during construction, and the positive impacts Options created by improving access. These positive and negative impacts were assessed for the following:

- Community facilities and infrastructure such as museums, recreation grounds, parks, libraries, schools, and churches.
- Major facilities such as Wellington Airport, Wellington Regional Aquatic Centre, and Wellington Regional Hospital.
- Commercial and residential areas (including identification of where there was a good catchment of population served, but assuming that transport criteria would address increased trips/catchment in a more quantitative method).
- Private property and parking.
- Businesses providing a social service and parking.

Assumptions

Key assumptions made by the social assessor when undertaking the Programme short list Options assessment are as follows:

For all Options (excluding the 2036 Do Minimum) the following would occur:

- Golden Mile Improvements: current preferred option implemented
- Thorndon Quay / Hutt Road improvements: current preferred option implemented
- Central City pedestrian improvements – minor safety improvements at ~20 intersections around the city
- Cobham crossing and safer speeds – signalised crossing of Cobham Drive adjacent to ASB Sports centre and reduced speed limits on SH1 (Ruahine Street and Cobham Drive).

Other Assumptions made which underpin this assessment are listed below:

- Where an Option element intersects with a property, any buildings, or structures within its legal boundaries would be removed in their entirety unless specifically stated otherwise on the drawings. This applies for properties necessary for trenching purposes, even where the trench would be covered.
- The areas required for implementation of trenching works indicate the need for wide spread building and lot clearance resulting in large tracts of vacant/unoccupied land both during and post-construction. While it is acknowledged that this land would be available for redevelopment, the pace of reactivation would be over a long horizon (+20 years taking account of the 6-year construction period) resulting in significant neighbourhood / cityscape effects over a long duration. The scale of effects may be reduced if a lesser extent of land was required and / or the pace of redevelopment was expedited.
- While redevelopment of land may be stimulated by the transit-orientated development proposed by an Option, that development is not within the scope of the Programme.
- The Programme has confirmed that for the purposes of assessment where schools or libraries are directly impacted, as a minimum, a compensatory like for like replacement level of service would be provided.
- Properties above the Terrace Tunnel route would be purchased outright and placed on the market post construction.
- Widened routes and intersections would be required to accommodate MRT, alongside grade separation and / or the introduction of land bridges as required.
- Road widening, excavation, and other associated works would be the same for all three MRT modes (BRT, TT and LRT).

¹ There is some potential for cross-over between the assessment of community amenity effects and the assessment of the visual impact. The assessor clarified that the assessment focused on identifying where there were amenity effects on matters which are likely to have high community value, rather than identifying where there is a visual impact (which is covered in the landscape and visual assessment)

- Where there is no second Mt Victoria traffic / MRT tunnel being proposed, and/or where a diagonal tunnel traffic / MRT tunnel is being proposed, the acquisition of properties on 9(2)(b)(ii), 9(2)(j) is not required.
- There were no assumptions made about the construction sequencing between MRT and SH1 so if a piece of infrastructure was required to accommodate MRT (for instance the duplicated Mt Victoria tunnel proposed in a number of options) the impacts of the construction were considered, even if the infrastructure also accommodated a SH1 alignment. This approach to sequencing will ensure that the assessments by specialists is conservative, with the expectation that environmental effects that are identified when compared to the existing environment may not be as significant in the context of an environment with SH1 in it.
- That any taking of land from the Wellington Town Belt, would adhere to the requirements of the Wellington Town Belt Act with compensatory land added to the Town Belt.
- That the design of the Duplicate Terrace Tunnel would avoid impact on the Bolton Street Cemetery, being able to be developed within the designation / motorway reserve.
- That access to schools within the Option areas would be maintained.
- That the 9(2)(b)(ii), 9(2)(j) would be relocated within the site ensuring continuity of the recreational asset and that this would be within the requirements of the Project.
- In all Options, an overbridge connection to Hataitai Park, similar to the existing situation would be provided.
- That all on-street parking on Ruahine Street and Wellington Road would be removed.
- That properties on Ruahine Street and Wellington Road would only be accessible from a service lane running parallel to SH1. The service lane would be one-way south / east bound and accessible from Tuarima Street; Goa Street; Moxham Avenue; Walmer Street, and Hamilton Road.
- That standard environmental management measures would be implemented during construction (noise, dust, traffic management, engagement) and that provision of alternative temporary parking (at the Basin/ neighbourhood centres) to avoid or mitigate adverse social effects.
- That permanent replacement on-street residential parking identified for removal on an Option Drawing would not be provided. The ability to provide compensatory parks should be investigated.

The above documented social impacts assessment methodology and assumptions (refer Section 2) for the Programme Short List were agreed with the KPI deputies as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Social	SHI Team Member	MRT Team Members SHI Team Member	N/A	Meeting on 17 th June 2021 and subsequent email

A meeting with TAG members interested in the approach and scoring of Social Effects was convened on 28th June 2021, at which the consideration of future improved social infrastructure stimulated by transit-oriented development or within residual land post- construction was discussed. Additional assumptions were agreed, and clarity added to others to confirm the assessor's approach.

3 Social impact – MCA Scoring

Scoring of the Programme Short List Options for social impacts utilises an 11-point scale as shown below. The environmental assessment of the effects of the options shall be assessed against the existing environment in 2021. Note that as we are meeting the Resource Management Act requirements, this differs from the approach of comparing against the 2036 'do minimum' undertaken for all other (non-environmental) assessments.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

4 Programme Short List Option Descriptions

4.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

4.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

5 General Specialist Assessment Instruction

The assessment criteria have been developed and are currently being confirmed by the LGWM programme team. The social impacts assessment methodology has been developed and refined by the leads and is outlined in Section 2 above. The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1: Introduction above) are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores

8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options
10. Identify any dependencies or potential overlaps with other specialists to ensure we have consistent use of data and don't double count

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

6 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Programme Long List to Short List report
[Long List to Short List process](#)

7 Programme Short List Assessment Scores – social impacts

The table below documents the Programme Short List Option – Specialist Scores for social impacts criteria with rationale.

Table 1: Specialist scoring for social impacts

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline
Do minimum (2036)	1	There are likely to be some minor positive outcomes for the community over the Baseline, with the Do Minimum providing some degree of improved connection and accessibility through the modest investment in Active Travel and PT. It is understood that no local road changes are envisaged. This work is assumed to be confined to the existing road corridor so no property loss or direct impact on social infrastructure would result.
Option RPI V1 (2036)	-4	<p>MRT: 9(2)(b)(ii), 9(2)(j) [REDACTED]</p> <p>some in the community may feel a sense of severance from the waterfront as a result of 9(2)(b)(ii), 9(2)(j) [REDACTED].</p> <p>[REDACTED]. The route through Haining Street would result in a block of retail / office / services / residential buildings being demolished. While the residual land would have the capacity to accommodate future development bringing new services and facilities to the area, this is anticipated to occur over a medium horizon. Although proximity to the MRT route may stimulate quicker uptake, until that occurred, the area would be vacant and dormant. There is the potential for a negative knock-on effect on adjacent services and facilities during the undeveloped phase, with people avoiding the area due to personal safety perceptions or the area's lack of vitality.</p> <p>Removal of on-street car parking along the alignment would occur. There is a high value placed on on-street parking in neighbourhoods, particularly those with medium to high levels of either multi-generation occupied properties or rental properties.</p> <p>9(2)(b)(ii), 9(2)(j) [REDACTED]</p> <p>[REDACTED]</p>

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		<p>9(2)(b)(ii), 9(2)(j) The potential impacts on Seatoun Park and Shortland Park and the ability to mitigate any loss of recreational provision is unclear.</p> <p>Basin: This area would be altered to the east and south in order to connect SH1 and accommodate MRT. With the capacity improvements and active transport routes provided, the community should be able to move to and from their place of work / education establishments and go about their daily routine with greater ease and via their preferred mode.</p> <p>There would be a change in the sense of space / neighbourhood during and immediately following the work but recognising that this is already an area of transition. An easier pedestrian route between Pukeahu National War Memorial Park (Pukeahu) and the Basin would be created but they would still be separated by a busy intersection at Sussex Street which may create an impression of severance. There would be a degree of impact on existing community facilities with the final footprint of the Option dictating the range of those premises and services affected. 9(2)(b)(ii), 9(2)(j)</p> <p>9(2)(b)(ii), 9(2)(j)</p> <p>9(2)(b)(ii), 9(2)(j)</p> <p>9(2)(b)(ii), 9(2)(j)</p> <p>The resultant cul-de-sac arrangement in front of St Marks School, where currently drop off / pick up occurs around live traffic, would be an improvement with associated health and wellbeing benefits.</p> <p>Te Aro Trench: A significant number of buildings in the area would require demolition which currently accommodate a range of services, facilities as well as residential activities. While these uses may be able to relocate, the anxiety / pressure associated with the acquisition process on landowners / operators / clients / congregations / communities needs to be recognised. While the residual land would have the capacity to accommodate future development bringing new services and facilities to the area, this is anticipated to occur over a long horizon. In the short to medium term, the area would be vacant and dormant, similar to the Karo Drive situation following the Inner-City Bypass which is only now beginning to reactivate. Displacement of services and facilities to elsewhere in the city may negatively impact people's</p>

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		<p>day to day activities resulting in increased travel time or change of provider. There is the potential for a negative knock-on effect on adjacent services and facilities during the undeveloped phase, with people avoiding the area due to personal safety perceptions or the area's lack of vitality.</p> <p>It is unclear to what extent the works would permanently impact Pukeahu. There is an opportunity with cut / cover of the trench to extend the park, but the scope is likely to be restricted in terms of built form / green space.</p> <p>The south bound arm of the trench would have an impact on Mt Cook School resulting in the loss of buildings and outdoor space. This would affect the school's current educational operations and may have an impact on the school's offering long term and future rolls. Relocation of the school to an alternative location within the neighbourhood may be achievable, but the impact has the potential to unsettle the school community and established routines. Endeavours should be made to ensure a new facility is provided early and the need for staged relocation (i.e. temporary facility(ies) before permanent) is avoided.</p> <p>Duplicate Terrace Tunnel: The green space adjacent the motorway is seen by the community (residents, commuters, office workers) as part of the Bolton Street Cemetery / green spine, although it is acknowledged that the land nearest the motorway is gazetted for motorway purposes. Any encroachment in this area would have a potential negative impact on sense of place. The potential to avoid or mitigate the City to Sea Walkway, part of the City's recreational network, is required. With elevated lanes in closer proximity to residential blocks and office towers than the current situation, some of the community may perceive a reduction in amenity and an inability to use their curtilage as they do now.</p> <p>New diagonal MRT/SHI tunnel: <i>Northern Portal:</i> 9(2)(b)(ii), 9(2)(j)</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		<p>9(2)(b)(ii), 9(2)(j)</p> <p><i>Southern Portal:</i> A loss of Town Belt at Wellington Road which contributes to a sense of place and neighbourhood being a landscape of importance within this community would result under this Option element. The Option design appears to propose an area of green space at the western end of Wellington Road which could be developed as an extension to the Town Belt and might provide some mitigation.</p> <p>9(2)(b)(ii), 9(2)(j)</p> <p>Active Travel tunnel: Under this Option element, there would be associated restrictions on local roads. Ruahine Street would become one way for local traffic and there would be a loss of on-street parking which provides the only means of parking for some of the residential properties located between Tapiri Street and Goa Street.</p>
Option RPI V1 with congestion charging (2036)	-4	As Option RPI V1 above. Potential for positive social impacts for the community within the cordon or negative impacts for those outside the cordon but a change in score is not justified.
Option RPI V1A (2036)	-3	As for RPI V1, but without the negative impact of Te Aro Trench and Duplicate Terrace Tunnel.

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Option RPI V1A with congestion charging (2036)	-3	As Option RPI V1A above. Potential for positive social impacts for the community within the cordon or negative impacts for those outside the cordon but a change in score is not justified.
Option RPI V2 (2036)	-2	<p>MRT South: Under this Option element, the route largely avoids the Basin using Tory Street and Rugby Street and then onto Adelaide Road before continuing the route to Island Bay as per Options RPI V1 and V1A. 9(2)(b)(ii), 9(2)(j)</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>PT East: The Option design indicates that the service would terminate at Miramar Shops. Therefore, it avoids disturbance and land requirements associated with the MRT East extended network under Options RPI V1 and V1A. This Option element would impact Hataitai Village along Waitoa Road and Moxham Avenue including directional restrictions in what is a very tight urban form and where on-street parking is at a premium. These directional restrictions would be in conjunction with those required on Ruahine Street associated with the Active Travel Tunnel.</p> <p>Long Tunnel: This Option element avoids and removes State Highway traffic from city streets with associated positive social outcomes related to a sense of place and reduced severance.</p> <p>Northern Portal: The green space adjacent the motorway is seen by the community (residents, commuters, office workers) as part of the Bolton Street Cemetery / green spine, although it is acknowledged that the land nearest the motorway is gazetted for motorway purposes. Any encroachment in this area would have a negative impact on sense of place. The potential to avoid or mitigate the City to Sea Walkway, part of the City's recreational network, is required. With elevated lanes in closer proximity to residential blocks and office towers, some of the community may perceive a reduction amenity and an inability to use their curtilage as they do now.</p> <p>Southern Portal: This Option element would impact the area of Town Belt at Wellington Road which contributes to sense of place and neighbourhood. The Option design appears to propose the maintenance</p>

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		<p>of the link to Newton from Wellington Road within a landscaped setting. Accessibility north-south for vehicles remains which would have a beneficial impact on equitable access to community facilities (e.g. Airport, hospital) and allow the ability for the community to go about day-to-day routines. The residential block to the south of Wellington Road as far as the signalised intersection with Kilbirnie Crescent would be impacted with the removal of all street facing dwellings and other premises, plus the removal of accessways to some rear lots also triggering their acquisition. This would result in a displacement of a proportion of this suburb's population, and may cause a degree of community severance, impacting sense of place at this southern end of Hataitai.</p> <p>The northern extent of Kilbirnie Park would be directly impacted. This area includes the building occupied by Wellington Marist AFC, the bleachers, and the outer edge of the wider multi-sport area within the park. While reconfiguration of the park to re-accommodate these uses may be feasible, the loss of the AFC facility has the potential to adversely impact the club and its wider membership.</p> <p>New Active Travel tunnel: 9(2)(b)(ii), 9(2)(j)</p> <p>Town Belt land to the east of the existing Mt Victoria Tunnel would be required to accommodate the Southern Portal with potential effects on sense of place on this part of Hataitai. 9(2)(b)(ii), 9(2)(j)</p> <p>At grade network changes: These would very likely result in improved pedestrianisation and opportunities improving sense of place and reducing severance.</p>
Option RPI V2 with congestion charging (2036)	-2	As Option RPI V2 above. Potential for positive social impacts for the community within the cordon or negative impacts for those outside the cordon but a change in score is not justified.
Option RPI V3 (2036)	-2	MRT South and PT East: As for Option RPI V2.

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		<p>New Active Travel tunnel: As for Option RPI V2.</p> <p>At grade network changes: These would very likely result in improved pedestrianisation and opportunities improving sense of place and reducing severance. This Option element does not, however, have the benefit derived from Option RPI V2 of removing State Highway traffic from the city streets.</p>
Option RPI V3 with congestion charging (2036)	-2	As Option RPI V3 above. Potential for positive social impacts for the community within the cordon or negative impacts for those outside the cordon but a change in score is not justified.
Option RPI V3A (2036)	-2	<p>MRT South and PT East: As for Option RPI V2.</p> <p>New Active Travel tunnel: As for Option RPI V2.</p> <p>Basin: As per Options V1 and V1A.</p>
Option RPI V3A with congestion charging (2036)	-2	As Option RPI V3A above. Potential for positive social impacts for the community within the cordon or negative impacts for those outside the cordon but a change in score is not justified.

8 Scoring change between Long List and Short List assessments

No Social Impacts assessment was carried out at the Long List stage, rather a combined environment and social scoring was undertaken. As such there is no correlation between the Long List combined environment and social scoring and the discipline scoring presented in this report.

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options for social impacts were:

- Impact of Te Aro Trench, in particular the potential for vacant lots over a long-term horizon before any redevelopment would likely occur
- Lesser impact of the northern portal of the Duplicate Terrace Tunnel / Long Tunnel
- 9(2)(b)(ii), 9(2)(i)



June 2021

Programme Short List Options

MCA Approach, Methodology and Scoring: Effects - Economic (Business Disruption)

Ken Lam

DRAFT

t: Author Phone Number
e: Author email

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- [LGWM Programme Short List Briefing Pack](#), dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Economic (Business Disruption) – MCA Methodology Approach

This criterion assesses the extent of accessibility severance to businesses in addition to property access changes over the construction period and beyond.

A measurement methodology has been defined to reflect differentiation for short-term and long-term impacts, as follows:

- Short term (construction): density of affected commercial and industrial properties along frontage, 100m and 200m catchments. A buffer zone (100m and 200m used) of businesses near the Programme investments was used to reflect where potential changes in accessway / loss of visibility may be introduced during construction. Assessment conducted using Jacobs LGWM GIS Webapp of commercial and industrial layer as shown in Figure 1.
- Long term (post-construction): improved accessibility (change in effective density) and the long run impacts it has on businesses. This largely reflects the potential long term economic impacts that commercial and industrial properties may experience once the full build-out of Programme

investments have been undertaken. Assessment conducted using WTSM/WPTM transport modelling outputs provided by WAU.

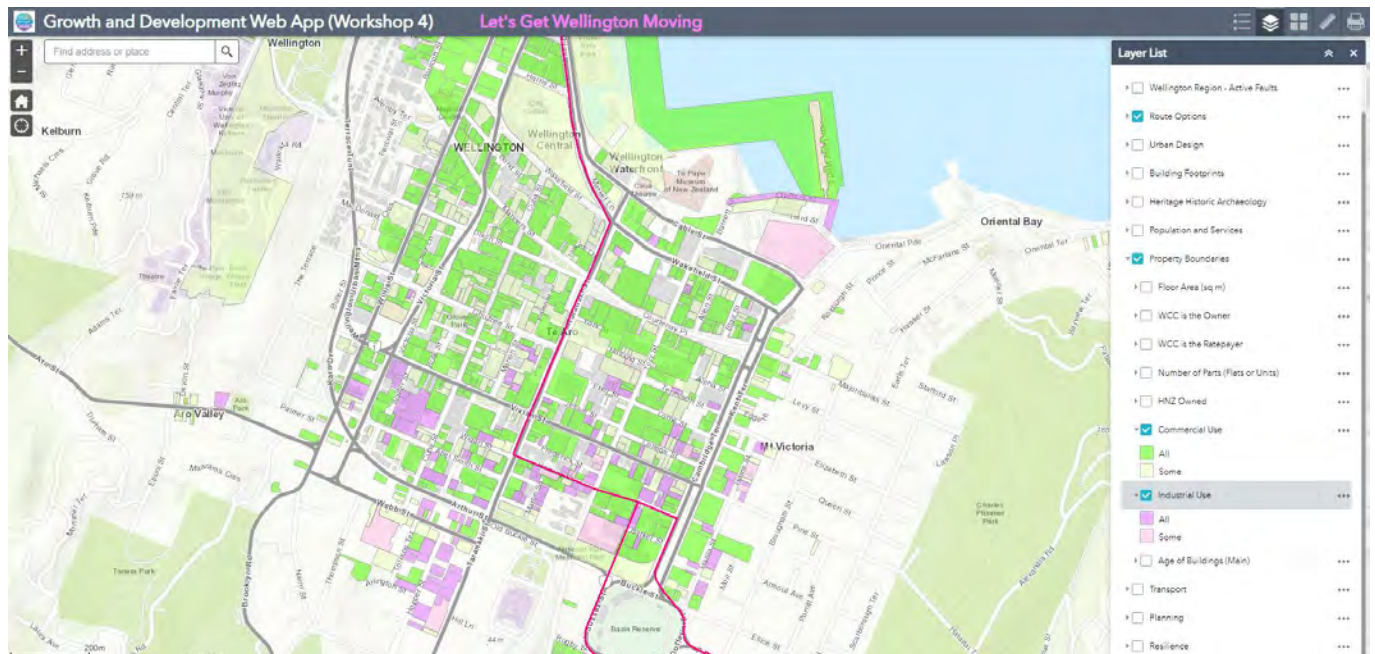


Figure 1 – Example of commercial and industrial plots layer identified in GIS Growth and Development WebApp Layers

Key assumptions:

The following key assumptions have been considered during the MCA scoring assessments:

- For all Options (excluding the 2036 Do Minimum) the following will occur:
 - Golden Mile Improvements: current preferred option implemented
 - Thorndon Quay / Hutt Road improvements: current preferred option implemented
 - Central City pedestrian improvements – minor safety improvements at ~20 intersections around the city
 - Cobham crossing and safer speeds – signalised crossing of Cobham Drive adjacent to ASB Sports centre and reduced speed limits on SH1 (Ruahine Street and Cobham Drive).
- Short term (during construction) impacts could vary depending on construction methodology and programme sequencing. As a result, the resulting scores have not examined the time profile of the business impacts. Timing and longevity of the construction disruption impact on businesses will be driven by engineering / delivery & timescale assumptions in DDO assessment. This has **not been** factored as part of this assessment. Further information on Engineering Difficulty can be found in the respective specialist report [Programme Short List Engineering Difficulty Specialist MCA Methodology and Scoring.docx](#).
- Social effects is covered separately as part of the Social effects assessment. For further detail, readers should reference the following specialist report: [Programme Short list environmental social impacts specialist MCA methodology and scoring.docx](#).
- It has generally been assumed that larger adverse impacts may occur around station locations and key corridor intersection. This could be mitigated and/or reduced depending on the construction methodology, however no assumptions on mitigation strategy has been assumed for the purposes of this scoring assessment.

- Weightings for frontage affected properties are given a higher relative weighting reflecting the distance to the corridor and likely station builds. Frontage plot counts are therefore given 50% weighting, 100m and 200m are given 25% each to derive the overall score.
- This criteria does not quantify the costs of disruption, either as a compensation event or other mechanism, as this will be considered separately at a LGWM Programme level.
- For short term impacts, options are scored within the range of 0 to –3. This reflects the scoring description that the impacts during construction are likely to be temporal in nature rather than to have a permanent effect.
- For long term impacts, options are scored within the range of –4 to +4. This reflects the scoring description that the impacts are likely to be realised over the “medium to long term” and moderate confidence of the underlying assessment used to inform the scores.
- Count of businesses affected within 100m / 200m radii is based on a crowd fly buffer zone along the shortlisted routes rather than actual walk distances.
- Assumption of 1 building per plot - cases where multiple business in building is consider as 1 so prudent assumption. Property category is an actual use of the land rather than the designated/planned use of the land.
- Mixed use plots are counted towards building plot count.
- Based on Council validated data as of 6 March 2020
- Assessment of long term business / economic impacts are based on traffic modelling by the Wellington Analytics Unit (WAU). Outputs take the form of Effective Density one spreadsheet per modelling scenario, each of which estimates impacts relative to the Do Minimum. We make use of one specific traffic modelling output: Effective Job Density. Despite the name, this is a measure of employment weighted journey costs, and indicates the impact of LGWM investment on employees travelling to jobs across Wellington. Unlike other measures of access and travel time considered within the MCA, it is entirely focussed on industry and commerce, such that spatial zones that are purely residential are excluded from the analysis.

The specific formula, consistent with Waka Kotahi Guidance, is provided below for reference. A full explanation can be found in the LGWM Economic Evaluation Outputs Report (v1, dated 03/08/20).

$$\text{Change in } EJD_i = DS \ EJD_i - DM \ EJD_i$$

$$EJD_i = \sum_j \frac{E_j}{AGC_{ij}}$$

$$AGC_{ij} = \frac{\sum_{ijps} 0.5 * ({}^0_{ijps}T + {}^1_{ijps}T) * ({}_{ijps}C)}{\sum_{ijps} 0.5 * ({}^0_{ijps}T + {}^1_{ijps}T)}$$

- Road widening, excavation, and other associated works would be the same for all MRT modes (BRT and LRT).

- The future redevelopment of land acquired for a Programme is beyond the Programme assessment scope.
- The potential property plots required for implementation of trenching works and tunnel duplication under Programme V1 are noted to be indicative based on emerging design at IBC stage and referenced in the option briefing pack [LGWM RPI V1 Karo Drive and Terrace Tunnel Duplication Design and Cost Estimation Pack](#). Whilst it is acknowledged that this land would be available for redevelopment, the pace of reactivation is currently uncertain but considered would be over a longer horizon term (after taking account of the assumed construction period between 5-6 years). This may result in some long term positive or adverse impacts but has not been currently evaluated as part of this metric assessment.

Data Source:

Short term impacts have been assessed based on proximity to commercial and industrial plots. The dataset is formed from Linz spatial data dated 1 February and Council Valuation data as at 6 March 2020. It is distributed on the basis it will be used for Council purposes only and not distributed for any further use.

Information identified in GiS Growth and Development WebApp Layers and covers NZ Parcel data with details on land use - specifically Commercial and Industrial Use.

Figure 2 examples how buffer polygons of 100m and 200m are generated to capture likely commercial plots along the centerline alignment of the MRT corridor to inform the short term effects assessment.

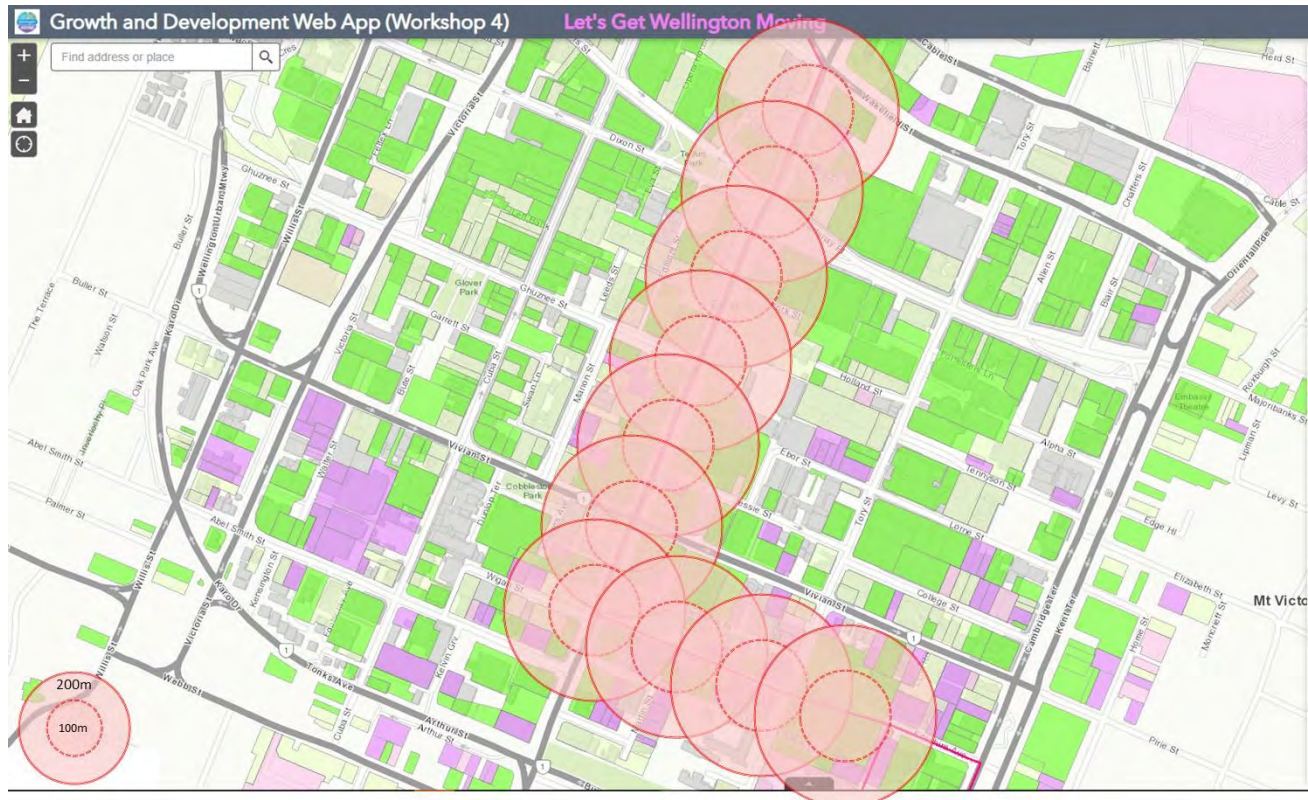


Figure 2 – Areas of influence captured in buffer polygons to assess affected commercial and industrial plots

Long term effects have been assessed based on transport modelling outputs from WTSM/WPTM provided by WAU in June 2021.

3 Economic (Business Disruption) – MCA Methodology Approach Approval

The above documented Economic (Business Disruption) assessment approach (refer Section 2) for the Programme Short List was agreed and confirmed on June 2021 as shown below. There are no relevant TAG representatives assigned to provide input into or approve the methodology approach.

MCA Criteria	Criteria Lead	Criteria Deputy	TAG Members	Date of TAG/OIM/Programme Representative Methodology Approval
Economic (Business Disruption)	MRT Team Member	MRT Team Members SHI Team Member	GWRC TAG Member	N/A

4 Economic (Business Disruption) – MCA Scoring

Scoring of the Programme Short List Options for Economic (Business Disruption) utilises an 11-point scale as shown below. The economic (business disruption) impacts of the options shall be assessed against the existing environment in 2021.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#).

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The Economic (Business Disruption) assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1 above) are in place by 2036 using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores

The table below documents the Programme Short List Option – Specialist Scores for economic effects criteria, with rationale.

Table 1: Specialist Scoring for Economic Effects (business disruption)

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline, and therefore set as 0.
Do minimum (2036)	-1	Short-term: assume no commercial plots affected. Score 0 for short term impact. Long-term: observed accessibility decreases due to increase network congestions. Score -1 for long term impact. Overall weighted score of -1
Option RPI V1 (2036)	+2	Short-term: Relative to V1A, +100 more commercial plots impacted from Te Aro trench and Terrace tunnel footprint. Score -3 for short term impact. Long-term: Higher improvement to accessibility to/from southern and easter suburbs and within CBD. In addition to PT accessibility improvements, access betterment for motor vehicles and freight through Te Aro trench and duplicated Terrace tunnel relative to V1A. Score +4 for long term impact. Overall weighted score of +2
Option RPI V1 with congestion charging (2036)	+3	Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility impacts. Assume +1 change in scoring compared to base option. May require further review once final assumptions on congestion charging and degree to which to which it impacts on transport network performance is confirmed.
Option RPI V1A (2036)	+1	Short-term: Circa. 1,100 commercial plots within the assessed catchment range. Score -3 for short term impact. Long-term: Good improvement to accessibility to/from southern and easter suburbs and within CBD. Score +3 for long term impact. Overall weighted score of +1
Option RPI V1A with congestion charging (2036)	+2	Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility impacts. Assume +1 change in scoring compared to base option. May require further review once final assumptions on congestion charging and degree to which to which it impacts on transport network performance is confirmed.
Option RPI V2 (2036)	+1	Short-term: Relative to V1A, lower number of plots identified largely reflecting the relocation of construction works from surface level to subterranean level. However, largely area of

		influences around tunnel portal impacts for the long tunnel indicates that in total circa.1,000 plots will still be influenced during construction. Score -3 for short term impact. Long-term: Good improvement to accessibility, similar to V1A. Whilst proposed PT improvements to the east is lesser than for V1A, this is largely offset by access improvements brought by the long tunnel and the improved level of service on the remaining network. Score +3 for long term impact. Overall weighted score of +1.
Option RPI V2 with congestion charging (2036)	+2	Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility impacts. Assume +1 change in scoring compared to base option. May require further review once final assumptions on congestion charging and degree to which it impacts on transport network performance is confirmed.
Option RPI V3 (2036)	0	Short-term: Material impact along MRT corridor to south and east, at-grade and active tunnel. Up to 900 commercial plots identified. Score -2 for short term impact. Long-term: Minor improvements to accessibility over 2030 DM. Score +1 for long term impact. Overall weighted score of 0.
Option RPI V3 with congestion charging (2036)	+1	Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility impacts. Assume +1 change in scoring compared to base option. May require further review once final assumptions on congestion charging and degree to which it impacts on transport network performance is confirmed.
Option RPI V3A (2036)	0	Short-term: Relative to V3, +30 more commercial plots impacted from larger footprint required for Basin grade-separation. Score -2 for short term impact. Long-term: Minor improvements to accessibility, similar to V3. Score +1 for long term impact. Overall weighted score of 0.
Option RPI V3A with congestion charging (2036)	+1	Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility impacts. Assume +1 change in scoring compared to base option. May require further review once final assumptions on congestion charging and degree to which it impacts on transport network performance is confirmed.

Overall scoring based on weights 25% short-term and 75% long-term.

Congestion charging will not materially affect the short-term impacts for business disruption but could affect long term accessibility. Assume +1 change in scoring but will require further review once final assumptions on congestion charging and degree to which it impacts on transport network performance is confirmed at Programme level.

The assessment of different modal options (eg. BRT, TT and LRT) has not been assumed to impact on the overall scoring as it is assumed that the corridor infrastructure and disruption will generally be the same regardless of the chosen vehicle mode. This is assuming that the MRT vehicles between the different options will remain within the same corridor infrastructure (i.e. a closed system) as oppose to vehicles being able to run beyond (i.e. an open system). The latter could bring some positive opportunities but has not be reviewed as part of this current assessment.



June 2021

Programme Short List Options

MCA Approach and Methodology:

Environmental effects – landscape and visual impacts

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages (the packages) which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020, and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Landscape and visual impacts – MCA Methodology Approach

The matters previously considered in the visual and landscape assessment were as follows:

Mode	Matters considered
MRT	<ul style="list-style-type: none"> • Fit with broader urban (landscape) patterns (fit into roading patterns and hierarchy; connectivity to city-wide destinations); • High level review of the WCDP provisions relating to viewshafts and anything else identified as a key issue • Effect on natural character (coastal environment) and natural landscape (natural features elsewhere); • Effects on views and visual amenity, with comment on any likely sensitive viewing audiences • Potential to mitigate adverse effects
SHI	<ul style="list-style-type: none"> • Loss of public views to Wellington Harbour, Mt Victoria etc • Dominance of infrastructure on surrounding environment • Effect on visual quality of neighbourhoods

MRT methodology

The assessment of potential effects has been carried out as a 'desktop review' at a broad scale. Methodology for the assessment of landscape and visual effects has followed best practice guidance as set out by the New Zealand Institute of Landscape Architects, Tuia Pito Ora (NZILA) in its Best Practice Note 10.1.

The assessment considered the fit of the options with broader urban patterns, the effect on natural character and landscape, and effects on views and visual amenity, and concluded that without any mitigation, the visual and landscape effects create moderate to minor adverse effects.

The assessor did propose mitigation including changes to alignment to avoid breaks in landscape pattern, and designing to respond to the underlying topography, replacement of removed street trees, and site-specific design responses, particularly at coastal edges, tunnel sites and stations. The mitigation significantly improved the options scores, but the un-mitigated scores were used for the MCA because:

1. The route re-alignment assumed by the assessor when assessing the options with feasible mitigation applied is not possible and is therefore not considered 'feasible'. Other mitigation measures proposed (such as site-specific design responses) were considered by the Project Team to be feasible, but the proportion of the mitigated score due to design measures rather than route re-alignment could not be easily ascertained, and therefore the un-mitigated score was used to err on the side of caution.
2. The assessment was cross-referenced against the SHI landscape and visual assessment. The SHI also used an 'un-mitigated score' to inform their MCA, although the assessor provided recommendations and suggestions to inform further design. This is similar to MRT, as the proposed mitigation measures are also expected to inform further design. Taking the un-mitigated scores for both MRT and SHI visual and landscape assessments promotes consistency between the two workstreams.

SHI methodology and assumptions

The notes within the MCA scoring sheets pertain. As with the other MCA attributes considered by other experts, a score of +5 to -5 has been used to rate each of the options for the two sectors assessed. A link to the assessment and MCA scoring sheets is found in Section 7 of this document.

More information about the approach can also be found in the Urban Integration Report supporting the 2020 SHI Indicative Business Case.

Assumptions

- For the purpose of the assessment, it is assumed that: "Landscape is the cumulative expression of natural and cultural features, patterns and processes in a geographical area, including human perceptions and associations".
- To avoid 'double counting', visual and landscape matters are assumed distinct from the following:
 - Urban design, recreation and urban amenity (connectivity, community cohesion, fit with regional strategies/plans); and
 - Natural environment (terrestrial and freshwater ecology and habitat).
- There is no overhead wire infrastructure included along the entire route for all mode options assessed.
- The Bus Rapid Transit (BRT) and Trackless Tram do not have a track.
- Trees are deemed necessary for removal as part of the proposed MRT route option alignments.

- Although having a draft status, Outstanding Natural Landscapes and Features (ONL/F), Special Amenity Landscapes (SAL) and Significant Natural Areas (SNA) are deemed necessary for inclusion in the assessment. These identified areas are currently undergoing community consultation.
- In the main, the MRT vehicles are seen to be not dissimilar to buses which are already existing in the environment, and therefore there is no significant effect resulting from the actual vehicles themselves
- Widened routes and intersections will be required to accommodate MRT, alongside grade separation and/or the introduction of land bridges as required

3 Landscape and visual – MCA Methodology Approach Approval

The above documented landscape and visual assessment scope, methods and assumptions (refer Section 2) for the Programme Short List were presented to and approved by the relevant TAG representatives as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Landscape and visual	SHI Team Member	SHI Team Members MRT Team Members	WCC TAG Members Waka Kotahi TAG Member LGWM Representatives	N/A

4 Landscape and visual – MCA Scoring

Scoring of the Programme Short List Options for social impacts utilises an 11 point scale as shown below.

The environmental assessment of the effects of the options shall be assessed against the existing environment in 2021. Note that as we are meeting the Resource Management Act requirements, this differs from the approach of comparing against the 2036 'do minimum' undertaken for all other (non-environmental) assessments.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative

-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#).

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The landscape and visual impacts assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the existing environment (Do Minimum 2021) which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1: Introduction above) are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options
10. Identify any dependencies or potential overlaps with other specialists to ensure we have consistent use of data and don't double count

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, Trackless Tram-and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

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[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores – landscape and visual

The tables below document the Programme Short List Option – Specialist Scores for landscape and visual impacts criteria with rationale.

Table 1: Specialist Scoring for Landscape and Visual Assessment

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline
Do minimum (2036)	0	No change. Incremental urban development and transport and public realm investment will occur across the central city, south and east areas of Wellington City, but in ways anticipated and expected within the overall planned urban form and function that does not result in overall changes in landscape character, nor result in large scale adverse effects to landscape values or adversely affect highly valued open space resources such as town belt and associated open space lands.
Option RPI V1 (2036)	-5	Total loss of key landscape elements/characteristics in areas required for implementation of trenching, resulting in complete change of landscape character and long term construction effects. These effects outweigh future long term benefits for the evaluation period. Adverse LVE from Terrace Tunnel duplication (to lesser extent) and new Mt Vic Tunnel portals and plant (greater extent associated with town belt) New Mt Vic Tunnel on new diagonal alignment this has higher impact from portals and tie-ins in two new locations each end vs staying to existing SH1 alignment, may be partially offset in terms of LVE by lesser effects on town belt beside Ruahine St and reduced impacts in vicinity of existing tunnel portals. Localised impacts for MRT grading and streetscape effects along 2 routes rather than 1.
Option RPI V1 with congestion charging (2036)	-5	Same as base option
Option RPI V1A (2036)	-4	No Terrace Tunnel duplication nor Te Aro Trench but adverse LVE from new Mt Vic Tunnel portals and plant with a greater extent associated with town belt. Loss of open space and change in landscape character as a result of portal alignment, some pre

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
		development character remains but materially changed. Adverse also at Pukeahu/Basin Reserve. Localised impacts for MRT grading and streetscape effects along 2 route
Option RPI V1A with congestion charging (2036)	-4	Same as base option
Option RPI V2 (2036)	-3	Adverse LVE from long tunnel at portals (although lesser for L&V of Mt Vic shorter tunnel, with impacts from establishing a new portal environment limited to eastern portal with northern tying in closely with ex TT motorway environment). Maintains open space/town belt values. More modest impacts for active mode tunnel portals and approaches, plus streetscape corridor effects for MRT and BRT routes. Appears neutral along ex SH route along Karo Drive and Basin with no or little change (and no positive effects of land bridge elements of other options).
Option RPI V2 with congestion charging (2036)	-3	Same as base option
Option RPI V3 (2036)	-1	Minimises LVE of all other options. Streetscape corridor effects along single MRT route, and lesser extent to BRT and new active mode tunnel and approaches on existing SH corridor alignment. Maintains open space/town belt values
Option RPI V3 with congestion charging (2036)	-1	Same as base option
Option RPI V3A (2036)	-2	Greater adverse LVE than 3 with basin solution impacts for some viewing audiences as well as effects from new Mt Vic active modes tunnel. Maintains open space/town belt values
Option RPI V3A with congestion charging (2036)	-2	Same as base option

Key Differentiators:

SHORT LIST OPTIONS					
LANDSCAPE AND VISUAL DIFFERENTIATORS	RPI V1	RPI V1A	RPI V2	RPI V3	RPI V3A
POSITIVE ELEMENTS					
Basin Area Grade Separation and Comprehensive Development Area					
Te Aro Trench Capped Park					
Ruahine Street De-Tuning					
Existing Mt Vic Tunnel active mode repurposing (detuning)					
NEGATIVE ELEMENTS					
Terrace Tunnel Duplication (Portal impacts)					
Te Aro Trench					
Diagonal Mt Vic Tunnel (Portal Impacts)					
Long Tunnel (Portal Impacts)					
New Active Modes Mt Vic Tunnel					
Basin Reserve Grade Separation					
Basin Reserve At Grade					
Rapid Transit Corridor Impacts South and East (MRT/BRT mode neutral)					

The colours depth indicates degrees of importance or significance to landscape and visual outcomes.

If the colour is best/worst then the influence of this to the landscape and visual outcomes and scores is higher order

Positive	Low Influence	Some Influence	High Influence
Negative	Low Influence	Some Influence	High Influence

8.1 Scoring change between Long List and Short List assessment

Option	Long List Score	Short List Score	Reason for Change
RPI V1	-3	-5	Greater understanding at short list stage of the wide-ranging scale and nature of effects associated with the demolition and wholesale clearance of a wide swathe of land for construction of Te Aro Trench. Associated with this, the potential 20+ year duration for urban development to rebuild and repair this large-scale change to this part of the city.
RPI V1 (C)	-3	-5	Same reasons for change as noted for RPI V1 above; the congestion charge not being an influencer on scores for landscape and visual.
RPI V1A	-3	-4	Change in scores relates to greater understanding of the nature, scale and duration of effects associated with northern and eastern tunnel portals for new diagonal alignment of Mt Vic Tunnel, including impacts on open space land part of or physically and visually contiguous with town belt.
RPI V1A (C)	-3	-4	Same reasons for change as noted for RPI V1A above; the congestion charge not being an influencer on scores for landscape and visual.

RPI V2	-2	-3	Change in score reflects greater understanding of the nature, scale and duration of effects associated with eastern tunnel portal and (more minor influence) northern end where works potentially skim the edge of cemetery.
RPI V2 (C)	-2	-3	Same reasons for change as noted for RPI V2 above; the congestion charge not being an influencer on scores for landscape and visual.
RPI V3	0	-1	Change in score reflects greater understanding of the nature, scale and duration of effects associated with basin reserve at grade works and new active mode tunnel integration.
RPI V3 (C)	0	-1	Same reasons for change as noted for RPI V3 above; the congestion charge not being an influencer on scores for landscape and visual.
RPI V3A	-1	-2	Change in score to reflect greater understanding of the nature, scale and duration of effects associated with basin reserve grade-separation works and new active mode tunnel integration. Remains more negative relative to Option 3 due to Basin Reserve grade separation.

RPI V3A (C)	-1	-2	Same reasons for change as noted for RPI V3A above; the congestion charge not being an influencer on scores for landscape and visual.
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June 2021

Programme Short List Options

MCA Approach and Methodology:

Environmental effects– noise and vibration

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

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The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

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- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021.
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021.
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Noise and Vibration – MCA Methodology Approach

The high-level, desktop assessment of noise and vibration involved considering the benefits of each option, as well as the negative effects. Whereas benefits can be directly realised, negative effects must be able to be appropriately managed. This may involve specific mitigation measures. Therefore, the assessment methodology required two passes over each short list option. The first determined which geographic areas would benefit from the option relative to the baseline and which would not. The second pass looked only at the areas that may have negative effects and determined the extent and severity of effect and considered whether mitigation is likely to be practicable.

The final MCA scoring for each option was driven mainly by the overall noise and vibration benefit/impact of the project, on a city-wide scale. Where the second pass on effects found that mitigation may be required in specific locations, the MCA scoring could be adjusted slightly to accommodate the localised effects and/or necessity for mitigation. If the second pass revealed highly problematic noise or vibration effects in a specific location that could not be practicably mitigated, this was noted to alert possible consenting and mitigation cost issues downstream if the option was progressed. In such cases, the MCA scoring may have had to be adjusted significantly.

In deciding where mitigation may be required, guidance was provided by the Resource Management Act as this requires the best practical option be adopted to ensure that noise and vibration do not exceed a

reasonable level. Reasonable noise and vibration are not defined in the Act, but are established by District plan rules, NZ Standards, guidance, or best practice. This is expanded on below.

2.1 Reasonable noise

In full noise assessments, the New Zealand Standards for road-traffic noise (NZS 6806) and construction noise (NZS 6803) and the District Plan provide noise limits (in decibels, dB) that apply to noise received by dwellings, education facilities, some medical facilities, and marae. There is no NZ Standard for rail noise, but the U.S. Department of Transport's "Transit Noise and Vibration Impact Assessment Manual (2018)"¹ is generally applied. For road traffic noise, the overall noise level and the change in noise level from the existing situation are relevant to assessment of effects. For construction noise, the overall noise level and the duration of exposure are relevant.

At the MCA level of detail, prediction of noise levels is not possible, but the noise source may be broadly categorised (e.g. high, medium, low) and the consequent effects may be estimated based on the number and proximity of sensitive receivers. The magnitude of change between two scenarios can be estimated. Possible mitigation methods can be assumed (for example, by observing whether there is space for noise barriers or whether low noise surfaces could be practicable).

2.2 Reasonable vibration

In full vibration assessments, German Standard DIN 4150-3 is used to define reasonable vibration magnitudes that will not damage structures. Waka Kotahi's State Highway Construction and Maintenance Noise and Vibration Guide (2019)² suggests criteria for construction vibration that also consider the human experience of vibration. Some extent of vibration may be perceived by building occupants and still be reasonable. The Norwegian Standard NS 8176.E evaluates the effects on human beings of vibration from land-based transport.

At the MCA level of detail, prediction of vibration magnitudes is not possible, but effects may be estimated based on the approximate mass of vibration sources (e.g. trucks, trains, piling rigs), the speed vehicles travel and the number and proximity of sensitive receivers.

2.3 Noise and vibration sources considered

Road-traffic, MRT/LRT and construction activities are the only noise and vibration sources considered. These are the general dominant sources associated with Let's Get Wellington Moving Strategic Highway Improvements and will take place within the context of an existing active cityscape. Other noise and vibration sources could be relevant at other project stages. For example, noise and vibration associated with mechanical systems for tunnel ventilation also need to be reasonable.

2.4 Main factors affecting MCA scores

The key factors affecting the MCA scores for noise and vibration were as follows:

Operation: Traffic volume and speed profile, especially HCV's and public transport (PT) and their proximity to receivers are the critical determinants of problematic operational noise and ground vibrations. Regarding PT, light rail was considered higher risk for noise than either buses or trackless trams because of the higher source noise levels and wheel squeal generated whenever the horizontal

¹ https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/118131/transit-noise-and-vibration-impact-assessment-manual-fta-report-no-0123_0.pdf

² [State highway construction and maintenance noise and vibration guide - August 2019, version 1.1 \(nzta.govt.nz\)](https://www.nzta.govt.nz/state-highway-construction-and-maintenance-noise-and-vibration-guide-august-2019-version-1.1)

curvature of the track is tight. Wheel squeal was considered particularly problematic because of its tonal characteristics and high annoyance, being an individual event that stands out from background city noise.

Construction: Proximity of receivers to construction activity that generates either high noise levels or strong ground impacts or heavy commercial vehicle (HCV) trips to and from the construction site. Key activities include earthworks, piling, soil compaction and tunnelling. Duration of these higher risk construction activities was also a critical consideration.

Operation and construction were scored separately for each option so that any significant differences between options could be highlighted. The operation and construction scores were combined to give a single score based on “engineering judgement”, which traded off overall benefit against mitigation measures likely to be required. This way of combining scores was preferred over an arbitrary numerical weighting because it allowed the options to be ranked and grouped based on overall merit, whereas weighted scores would end up grouped, to a large extent, based on how they rounded to the nearest whole number.

2.5 Assumptions

The following assumptions were made in carrying out the noise and vibration assessments of the programme short list options:

- The noise and vibration effects of the ‘do-minimum’ option are assumed to be reasonable³.
- Reasonable mitigation of effects is assumed including:
 - Implementation of a “Construction Noise and Vibration Management Plan” during construction.
 - For construction of any tunnels, appropriate tunnelling techniques will be utilised to ensure resulting vibrations will not be problematic at surrounding receivers (e.g. roadheader and tunnel boring machines).
 - Newly constructed roads will employ low roughness (less than 2.5 m/km IRI_{qc}) and low noise road surfaces (e.g. asphalts).
 - Noise barriers and building modification will be used where appropriate to address noise sensitive receivers.
- Careful design of route alignments and station locations for PT/BRT/LRT to avoid close proximity to noise and vibration sensitive receivers wherever practicable.
- PT/BRT/LRT will be limited to a maximum travel speed of 30 km/h.
- PT/BRT will utilize quiet/low vibration engines i.e. electric not internal combustion.
- LRT will incorporate specific mitigation measures such as:
 - Speed restrictions on tight curves to reduce squeal and flanging noise.
 - Appropriate track treatment adopted to reduce noise and vibration levels (e.g. floating slab track-bed, high-resilience fasteners, rail dampers, etc.).
 - Appropriate alignment design to reduce turning curvature.
- Rubber tyred MRT options (articulated bus and trackless tram) are preferred over metal tyred MRT options (light rail) because induced noise and vibration levels are lower. Therefore, wherever an option included LR, rubber tyred MRT was additionally considered to determine if its inclusion changed the MCA score.

³ For the purposes of the assessment, reasonable noise and vibration levels are identified / guided by NZ standards for road traffic, noise and construction

- Trenched roadways preferred over elevated roadways because noise screening provided by trench walls and more screening options are possible.
- For construction noise and vibration, at-grade options preferred over grade-separated options as earthworks activity is generally less. Operationally, grade-separated is slightly preferred when it will minimize stop-start traffic.
- Congestion charging is assumed to reduce traffic volumes by between 8% and 15%. This will have negligible direct impact on traffic noise as it corresponds to a reduction of less than 1 dB (the threshold of noticeability for most people is typically reported as 3 dB).

3 Noise and vibration – MCA Methodology Approach Approval

The above documented noise and vibration assessment methodology and assumptions (refer Section 2) for the Programme Short List were presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Noise and vibration	SHI Team Member	MRT Team Members SHI Team Member	LGWM Representative WCC TAG Member Waka Kotahi TAG Member	Methodology description sent out for comment/review on 22/6/21 after being endorsed by all KPI deputies. Constructive feedback received from two TAG members (WCC 22/6/21 and LGWM 23/6/21) who both thought it was appropriate for a high- level assessment but wanted potentially significant effects highlighted if they impacted on the consenting process or project costs. This was able to be addressed through separate scoring of construction and operation effects. No comment received from Waka Kotahi due to changes in personnel.

4 Noise and vibration – MCA Scoring

Scoring of the Programme Short List Options for Engineering Difficulty utilises an 11-point scale, detailed below, to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria have been developed and are currently being confirmed by the LGWM programme team. The noise and vibration assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of these criteria were as follows:

1. Review the options contained in this document.
2. Review the assessment methodology.
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero.

4. Assess the options assuming all packages (summarised in Section 1 above) are in place by 2036 using quantitative and qualitative assessments.
5. Score the option, using the 11-point scale.
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging.
7. Provide commentary to support the score and, in particular, differentiators between option scores.
8. Provide a score for construction effects of each option. Where appropriate, evaluate construction effects separate to the operational effects and document accordingly.
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options.
10. Identify any dependencies or potential overlaps with other specialists to ensure consistent use of data and no double counting.

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts.
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, e.g. is there a difference in the resilience of a route with different mode options.
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score.

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Previous MCA assessments of MRT and SHI.
3. The previous MCA information was used to inform/sense check the current assessments.
4. Draft Programme Long List to Short List report
[Long List to Short List process](#)
5. Design Sprint 2021
 Mana Whenua matters not assessed as part of the 2021 design sprint work.

8 Programme Short List Assessment Scores – Noise and Vibration

The tables below document the Programme Short List Option – Specialist Scores for noise and vibration criteria with rationale.

Table 1 Specialist scoring for noise and vibration

Options Assessment	Score			Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
	Construction	Operation	Overall	
Do minimum (2021)	0	0	0	Baseline
Do minimum (2036)	0	1	0	Involves only minor construction. More electric vehicles and slower traffic due to speed limit reductions in CBD and increased congestion likely to lead to positive operation effects for noise and vibration.
Option RPI V1 (2036)	-4	3	2	Significant construction effects from new tunnels, Te Aro trenching and grade separation around Basin Reserve. However, takes traffic away from Ruahine Street and northbound traffic from city centre so good operational positives. Mitigation required at northern portals of both new tunnels. Northern portal of new Terrace Tunnel will be particularly challenging due to proximity of buildings.
Option RPI V1 with congestion charging (2036)	-4	3	2	Effect of congestion charging on traffic volumes insufficient to impact on RPI V1 scores.
Option RPI V1A (2036)	-2	2	2	Similar to RPI V3A but better due to reduced surface traffic and significant improvement in the noise/vibration environment in Ruahine Street, resulting in higher overall score. Mitigation required at northern portal of new Mt Victoria tunnel due to proximity to sensitive receivers. Construction effects from new tunnel and tracks associated with LRT to south and east.
Option RPI V1A with congestion charging (2036)	-2	2	2	Effect of congestion charging on traffic volumes insufficient to impact on RPI V1A scores.

Table 1 continued

Options Assessment	Score			Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
	Construction	Operation	Overall	
Option RPI V2 (2036)	-4	4	3	Best option operationally as removes a large volume of surface traffic resulting in improved noise and vibration environments in Karo Drive, Vivian Street and Ruahine Street. However, negatives are construction effects associated with new long and active mode tunnels, especially transport of tunnel spoil; LRT route around Basin Reserve; and increased noise levels in proximity of the northern portal of long tunnel during construction and operation. These increased noise levels will be difficult to mitigate due to proximity of the elevated roadways to nearby buildings.
Option RPI V2 with congestion charging (2036)	-4	4	3	Effect of congestion charging on traffic volumes insufficient to impact on RPI V2 scores.
Option RPI V3 (2036)	-1	1	0 (LRT) 1 (rubber tyred MRT)	Negative construction effects primarily related to new active mode tunnel, LRT track around Basin Reserve and new road corridor in Ruahine Street. Also, some possible LRT operational issues (wheel squeal, vibrations) because route along Tasman and Rugby Streets is close to buildings and contains many tight curves (also applies to RPI V2). In this case, rubber tyred MRT would be preferable. Overall, not much benefit over baseline.
Option RPI V3 with congestion charging (2036)	-1	1	0	Effect of congestion charging on traffic volumes insufficient to impact on RPI V3 scores.
Option RPI V3A (2036)	-2	2	1	Similar to RPI V3 but LRT alignment around Basin Reserve is better from operational noise and vibration perspectives. However, construction effects worse because of works required for grade separated Basin Reserve.
Option RPI V3A with congestion charging (2036)	-2	2	1	Effect of congestion charging on traffic volumes insufficient to impact on RPI V3A scores.

9 Scoring change between Long List and Short List assessments

No changes made.

10 Key Differentiators

Key differentiators impacting the overall relative scoring between options for noise and vibration impacts were:

- New tunnels negatively impacting construction scores due to cartage of tunnel spoil and duration of the tunnelling operations and positively impacting operation scores by removing surface traffic.
- Options with new elevated roadways were scored lower for operation because:
 - costlier screening options for noise mitigation,
 - support columns transmitting traffic induced vibrations to surrounding ground and
 - presence of expansion joints having the potential to generate troublesome noise and vibrations.
- Grade separated options for Basin Reserve preferred for operational noise because less stop-start traffic but have higher construction impacts because of the earthworks required.
- Alignment of LRT routes, with routes containing many tight curves in proximity to noise sensitive receivers scoring lower. However, this detrimental effect can be largely mitigated by electric powered rubber tyred MRT.

None of the assessed options generate noise or vibration effects that cannot be mitigated. However, mitigation of noise and vibration at the northern portal of the proposed new Terrace Tunnel (option RPI V1) and long tunnel (option RPI V2) could prove challenging because of the elevated roadways and their proximity to neighbouring commercial and residential tower blocks.



June 2021

Programme Short List Options

MCA Approach and Methodology:

Environmental effects – contaminated land

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages (the packages) which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 and refined in early 2021 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing the environmental effects of 'do minimum' and each of the proposed investment packages to the existing 2021 environment.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- [LGWM Programme Short List Briefing Pack](#) Technical Assessment Team Assessment Launch Briefing held on 14th June
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Contaminated land – MCA Methodology Approach

The matters previously considered in the contaminated land assessment were as follows:

Mode	Matters considered
MRT	<ul style="list-style-type: none"> • Identification of HAIL sites along the route. • Assess potential sites that may impact the cost of options –such as earthworks management, disposal and stormwater. • Provide an overview of potentially contaminated land that intercepts with the route.
SHI	<ul style="list-style-type: none"> • Scale of earthworks • Impact of recorded HAIL sites and historic industrial areas • Impact of closed landfill sites

MRT Methodology:

For this Program Shortlist Assessment the knowledge base gained from the previous MRT and SHI assessments was combined. This includes a cursory review of information extracted from the Selected Land Use Register (SLUR) for HAIL sites within the footprint of the proposed project areas (restricted to an approximately 50 m buffer), that is, sites which are on the 'Hazardous Activities and Industries List'. These sites, and any further contamination found during the proposed improvements, are likely to require management to avoid effects on human health and the environment, particularly during construction.

Due to the extent of the alignments the assessment has also been carried out with the acknowledgement that it is highly likely the project will encounter further unrecorded HAIL sites. A Preliminary Site Investigation (PSI) should be conducted when the preferred option has been chosen, in order to identify other unrecorded HAIL sites able to be located without intrusive works. There always remains the possibility of detection of HAIL impacted sites on commencement of excavation works.

Contaminated land has been considered in terms of earthworks volumes and therefore disposal/handling/costs. Options likely to result in a larger portion of 'contaminated' soil for disposal would score lower than options with less 'contaminated' soil. Options likely to encounter a larger number of known HAIL sites would be scored lower.

It is not possible at this stage of the project to put a monetary value on the earthworks portion of the project, however, there will likely be a significant cost incurred for any option chosen. The likely large amount of spoil that will be produced from these earthworks will require early input regarding the disposal destination or potential reuse.

It should be noted that as the SLUR is incomplete, and earthworks volumes are unconfirmed, scoring is indicative only.

Groundwater has not been considered as part of this assessment. The groundwater conditions within Wellington CBD and surrounds are very complex with both confined and unconfined aquifers which are influenced by regional groundwater, tectonic and fault related activity, and modern below-ground structures including drainage infrastructure, basements and foundations. Management of contaminated groundwater is likely to be required at some point during the construction phase of this project.

Assumptions

All prior assumptions made in the MRT and SHI assessments will apply to this Programme Short List assessment. Key assumptions made in those assessments, and new assumptions for this assessment are as follows:

- Waste spoil from contaminated sites will require off-site disposal;
- The majority of spoil from new tunnels is likely to be classified as natural ground/cleanfill, apart from the risk areas where identified/at tunnel entrances;
- The Project's construction methodology would be designed to limit the depth and volume of disturbance of HAIL sites as much as possible;
- Congestion charging will have no bearing on the contaminated land score;
- BRT will require less and shallower earthworks than for MRT;
- Some contaminated land issues will be common to all options, including:
 - o the potential presence of coal tar in asphalt road surfacing;
 - o potential to encounter demolition fill and reclaimed land;

- general issues of demolition related contamination associated with alignments that are located on private property;
- the potential risk of landfill gas from nearby closed landfills; and
- the potential risk of encountering gasworks waste, particularly nearby historic gasworks sites (Courtenay and Miramar).
- The Do Minimum (2036) is comprised of network changes which are already under construction or have already been committed to. It is assumed that these have already been considered on a case by case basis and so they are not scored as part of this assessment.

These assumptions are made for the benefit of this exercise only and will be revisited during the next stage of optioneering.

3 Contaminated land – MCA Methodology Approach Approval

The above documented contaminated land assessment methodology and assumptions (refer Section 2) for the Programme Short List were presented to and approved by the relevant TAG representatives as shown below.

MCA Criteria	KPI Lead	KPI Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Contaminated land	SHI Team Member	MRT Team Member	N/A	N/A

4 Contaminated land – MCA Scoring

Scoring of the Programme Short List Options for Engineering Difficulty utilises an 11-point scale to determine each programme short list option's performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Significantly positive
4	Moderate to significant positive
3	Moderately positive
2	Minor to moderately positive
1	Minor positive
0	Neutral or benign
-1	Minor negative
-2	Minor to moderately negative
-3	Moderately negative
-4	Moderately to significant adverse
-5	Significantly adverse

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria have been developed and are currently being confirmed by the LGWM programme team. The contaminated land assessment methodology has been developed and refined by the Leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages (summarised in Section 1: Introduction above) are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11-point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in the scoring, i.e. extrapolation of data from available information for different options
10. Identify any dependencies or potential overlaps with other specialists to ensure consistent use of data and no double counting.

Notes:

1. The images provided for each of the options within this document are indicative; assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than property. If using a different assumption to what is in the programme option description results in a different score, record this and the reasons in the report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score.

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores – contaminated land

The tables below document the Programme Short List Options – Specialist Scores for contaminated land criteria with rationale.

Table 1 Specialist scoring for contaminated land assessment

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline
Do minimum (2036)	0	As above – works included are currently being constructed or have already been committed and so are not considered here. See ‘assumptions’ for further information.
Option RPI V1 (2036)	-4	Component 7 and 8 are shallow tunnel/trenches likely to encounter larger amounts of contaminated fill than the longer/deeper tunnels of other RPI Variants (which are more likely to encounter natural ground). Link to Miramar is MRT, which we assume will require a larger quantity of earthworks than BRT.
Option RPI V1 with congestion charging (2036)	-4	As above
Option RPI V1A (2036)	-3	No shallow tunnels, however, all other components remain as in V1 and are shallow works that are likely to encounter contaminated fill. Link to Miramar is MRT, which we assume will require a larger quantity of earthworks than BRT.
Option RPI V1A with congestion charging (2036)	-3	As above

Option RPI V2 (2036)	-3	Long tunnel likely to be mostly in natural ground – contaminated land likely only to be encountered at tunnel entrances. More potential work within the CBD, however, it is assumed that earthworks in this area will be minimal and majority of suggested changes are 'At Grade'. Link to Miramar is an enhanced bus service, which we assume will require a lesser quantity of earthworks than MRT.
Option RPI V2 with congestion charging (2036)	-3	As above
Option RPI V3 (2036)	-2	Likely least quantity of earthworks overall and least number of HAIL sites encountered. Link to Miramar is an enhanced bus service, which we assume will require a lesser quantity of earthworks than MRT.
Option RPI V3 with congestion charging (2036)	-2	As above
Option RPI V3A (2036)	-3	Will result in more earthworks around the Basin area than V3. Similar to V1a, although may encounter a few more known HAIL sites in the Mt Vic area. Link to Miramar is an enhanced bus service, which we assume will require a lesser quantity of earthworks than MRT.
Option RPI V3A with congestion charging (2036)	-3	As above

9 Key Differentiators

Wellington City Centre, as a geographically constrained and relatively old urban centre has a spread of known and unknown HAIL sites some of which date to early European immigration to Wellington in the 19th century. Some parts of the City are located on reclaimed land, and others have been significantly modified (e.g. Basin Reserve). The known HAIL sites and expected wider issues have been broadly considered as part of this exercise, however, it is difficult to attribute any further detail to the review prior to a full Preliminary Site Investigation (PSI) or Detailed Site Investigation (DSI) of the chosen area.

Key differentiators impacting the overall relative scoring between options for contaminated land impacts have been refined to:

- Shallow Tunnel and Trench in Te Aro;
- Use of MRT or BRT for the connection to Miramar;
- Likely number of known HAIL sites directly encountered or directly adjacent to the suggested works areas;
- Works being noted as 'at grade'
- Less earthworks within known HAIL areas is likely to create a more favourable option from a contaminated land perspective.



June 2021

Programme Short List Options

MCA Approach, Methodology and Scoring:

Engineering Difficulty

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Engineering Difficulty – MCA Methodology Approach

The Engineering Difficulty assessment criterion addressed expected difficulties with construction of a route option, including matters such as likely geotechnical considerations, extent of structures, temporary works, access management, risks around “unknowns”, additional provisions to address natural hazards such as hydrological impact, flooding, geology and general degree of difficulty in construction. The assessment should also consider:

- Special Construction Techniques that require less common construction techniques (e.g. jacked box tunnel construction) or special equipment not readily available in NZ
- Providing a high degree of resilience for the corridors and critical support infrastructure (e.g. liquefaction resistant depot solution if on the foreshore, local flooding mitigation due to existing limited downstream capacity)
- Finding suitable special solutions for construction which minimises the duration of impact on local businesses
- Impact of temporary work on transport movements

This criteria does not include costs as it is considered separately, though there is of course some crossover because engineering difficulty is generally resolvable through means that increase costs through identified mitigations.

The following table outlines the sub-criteria used for the Engineering Difficulty criteria and the key aspects considered and contributing specialists.

Sub-criteria	Key Aspects/ considerations	Contributors
Impact of temporary works	<ul style="list-style-type: none"> On-line vs off-line construction Extent, number and ease of temporary diversions expected Significant construction traffic generators (e.g. tunnel excavation) 	Sam Thornton
New technology	<ul style="list-style-type: none"> Potential for new technology to enhance MRT efficiency through intersections and other areas of priority 	Sam Thornton
Groundwater	<ul style="list-style-type: none"> Excavation depth Dewatering potential Impact on aquifers 	Ben Dixon
Geotechnical conditions	<ul style="list-style-type: none"> Scale of earthworks (exaction and fill) Potential for retaining / stabilisation solutions 	Ben Dixon
Contaminated land	<ul style="list-style-type: none"> Scale of earthworks Impact on recorded HAIL sites and historic industrial areas Impact on closed landfill sites 	Shauna McAuley
Utilities	<ul style="list-style-type: none"> Impact on three waters Impact on other utilities (where known) 	Nick Simpson

Assumptions:

Indicative construction timeframes:

Construction Durations - Indicative

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel	TOTAL
RPI V1	5	5	4	5	6 + 4*		25 + 4*
RPI V1A	5	5	4	5			19
RPI V2	5	4		3 + 2*		7	19 + 2*
RPI V3	5	4		3 + 2*			12 + 2*
RPI V3A	5	4	4	3 + 2*			16 + 2*

*could be concurrent works with main works

Example Consideration: Indicative Construction Period

Programme	PT south	PT east	Basin	Mt Vic	Te Aro & Terrace Tunnel	Long Tunnel	TOTAL
RPI V1A	5	5	4	5			19
RPI V2	5	4		3 + 2*		7 (5+2)	19 + 2*

*could be concurrent works with main works

Programme	Potential^ Phase 1	Potential^ Phase 2	Total
RPI V1A	~5 (Basin and PT to south in parallel)	~5 (Mt Vic and to PT to east in parallel)	~10
RPI V2	~5 (Long tunnel and PT to east in parallel)	~5 (Active travel tunnel, PT to south and Te Aro changes in parallel)	~10

^subject to market capability / funding availability etc

Note that the V2 score is based on the assumption that the Long Tunnel would be constructed before the MRT infrastructure, thereby the MRT (PT) South construction would benefit from the reduced traffic volumes associated with the introduction of the long tunnel.

Link to Te Aro Trench and Basin Reserve constructability assessment:

Internal link

Programme Mode Assumptions

Mode	Element details							Potential Outcomes (cf. Do Min)	
	Vehicle	Pavement	Utility Relocation	Core* Corridor	Outer Corridor	System	Services	Uplift	Increased Ridership [#]
LRT	Steel Wheel Tram	Concrete	Significant	Full Separation	Investment in mixed running	Buses can use	Route only	~12%	~25%
BRT	Rubber Tyre Tram	Concrete	Significant	Full Separation	Investment in mixed running	Buses can use	Route only	~12%	~25%
Enh. Bus	Bus	Widen/Re seal	Minor	Some Bus Lanes	Minor	Buses can use	Extend off corridor [^]	~0%	~13%

3 Engineering Difficulty – MCA Methodology Approach Approval

The above documented Engineering Difficulty assessment approach (refer Section 2) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	Criteria Lead	Criteria Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Engineering Difficulty	SHI Team Member	SHI Team Member (Impact of temp works, new technology) SHI & MRT Team Members (Utilities) SHI Team Member (Contaminated Land) SHI Team Member (Groundwater & Geotechnical Conditions) Design Team	WCC TAG Member GWRC TAG Member	<i>Meeting on Friday 18th June from 10am until 12 noon with general agreement reached on methodology and scoring.</i>

4 Engineering Difficulty – MCA Scoring

Scoring of the Programme Short List Options for Engineering Difficulty utilises an 11-point scale to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realized and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realized and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term

-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

Engineering Difficulty scores are inherently negative and therefore only use the negative section of the rating scale (from 0 to -5). It should be noted that there are some small aspects of the options which are considered positive but these are outweighed by the negative aspects.

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The Engineering Difficulty assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11 point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the Programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
4. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores – Engineering Difficulty

The tables below document the Programme Short List Option – Specialist Scores for Engineering Difficulty criteria with rationale.

Table 1: Specialist Scoring for Engineering Difficulty

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline
Do minimum (2036)	0	No infrastructure changes
Option RPI V1 (2036)	-5	Significant construction disruption associated with MRT, trench through Te Aro, Basin grade separation (multiple diversions and stages with Te Aro and Basin in particular). Significant overall construction duration to implement programme, impacts include disruption to the transport system and the increase in HCV (particularly associated with the tunnels and trenching).
Option RPI V1 with congestion charging (2036)	-5	As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc (especially through Te Aro).
Option RPI V1A (2036)	-4	Significant construction disruption associated with MRT, Basin grade separation (multiple diversions and stages with Basin in particular) Moderate duration of construction disruption to the transport system to implement programme.
Option RPI V1A with congestion charging (2036)	-4	As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc.
Option RPI V2 (2036)	-3	Moderate construction disruption associated with MRT partially mitigated by construction of long tunnel prior to works beginning. Moderate overall construction duration to implement programme, impacts include disruption to the transport system and the increase in HCV (associated with the tunnels).
Option RPI V2 with congestion charging (2036)	-2	As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc.
Option RPI V3 (2036)	-3	Significant construction disruption associated with MRT. Low duration of construction disruption to the transport system to implement programme.
Option RPI V3 with congestion charging (2036)	-2	As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions, however much of MRT route has parallel routes which could accommodate diversions for these modes so +1 to score.

Option RPI V3A (2036)	-4	Significant construction disruption associated with MRT, Basin grade separation (multiple diversions and stages with Basin in particular) Moderate duration of construction disruption to the transport system to implement programme.
Option RPI V3A with congestion charging (2036)	-3	As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions, however much of MRT route (and Basin) has parallel routes which could accommodate diversions for these modes so +1 to score.

8.1 Scoring change between Long List and Short List assessment

Option	Long List Score	Short List Score	Reason for Change
RPI V1 (C)	-4	-5	For both Options RPI V1 and RPI V1A on review of the potential affect of the introduction of congestion charging, it was concluded that reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc. thereby somewhat 'cancelling out' the benefit of the traffic reduction of congestion charging.
RPI V1A (C)	-3	-4	
RPI V3	-4	-3	Option RPI V3 score changed as a result of the relativity of this option score changing in comparison with RPI V3A. At Short List stage, RPI V3A scored -4 as a result of the temporary traffic complexity associated with the Basin Grade Separation, whereas Option RPI V3 does not require this as there is no proposed change to the Basin Reserve.
RPI V3 (C)	-3	-2	Option RPI V3 (C) score changed as a result of Option RPI V3 (without congestion charging) dropping from -4 to -3 for the reasons outlined above, and, the introduction of congestion charging enabling a drop in score again to -2 for this option as congestion charging was concluded to have a positive benefit in reducing the traffic volumes and therefore temporary traffic management complexity of this option in facilitating the construction of the MRT infrastructure.

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options for Engineering Difficulty are noted in the Commentary/Rationale in Table 1 above.

10 Sub-criteria scoring

The following table shows the scores provided for each component that were used to help derive the overall score.

Programme	Impact of temporary works	New technology	Groundwater	Geotechnical conditions	Contaminated land	Utilities	Overall
RPI V1	-5	-2	-5	-5	-4	-5	-5
RPI V1 (C)	-5						-5
RPI V1A	-4	-2	-3	-4	-3	-4	-4
RPI V1A (C)	-4						-4
RPI V2	-3	-2	-4	-5	-3	-2	-3
RPI V2 (C)	-2						-2
RPI V3	-3	-2	-1	-2	-2	-1	-3
RPI V3 (C)	-2						-2
RPI V3A	-4	-2	-2	-3	-3	-3	-4
RPI V3A (C)	-3						-3

The following tables expand on the justification for the sub-criteria scores.

Programme	Impact of temporary works	New technology
RPI V1	<p>-5</p> <p>Significant construction disruption associated with MRT, trench through Te Aro, Basin grade separation (multiple diversions and stages with Te Aro and Basin in particular)</p> <p>Significant overall construction duration to implement programme, impacts include disruption to the transport system and the increase in HCV (particularly associated with the tunnels and trenching).</p>	<p>-2</p> <p>Potential for new technology to provide priority for MRT through intersections. Potential for innovative construction techniques to minimise disruption on narrow MRT corridors.</p>
RPI V1 (C)	<p>-5</p> <p>As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc (especially through Te Aro).</p>	
RPI V1A	<p>-4</p> <p>Significant construction disruption associated with MRT, Basin grade separation (multiple diversions and stages with Basin in particular)</p> <p>Moderate duration of construction disruption to the transport system to implement programme</p>	<p>-2</p> <p>Potential for new technology to provide priority for MRT through intersections. Potential for innovative construction techniques to minimise disruption on narrow MRT corridors.</p>
RPI V1A (C)	<p>-4</p> <p>As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc.</p>	
RPI V2	<p>-3</p> <p>Moderate construction disruption associated with MRT partially mitigated by construction of long tunnel prior to works beginning.</p> <p>Moderate overall construction duration to implement programme, impacts include disruption to the transport system and the increase in HCV (associated with the tunnels).</p>	<p>-2</p> <p>Potential for new technology to provide priority for MRT through intersections. Potential for innovative construction techniques to minimise disruption on narrow MRT corridors.</p>
RPI V2 (C)	<p>-2</p> <p>As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions etc.</p>	
RPI V3	<p>-3</p>	<p>-2</p>

Programme	Impact of temporary works	New technology
	Significant construction disruption associated with MRT Low duration of construction disruption to the transport system to implement programme	Potential for new technology to provide priority for MRT through intersections. Potential for innovative construction techniques to minimise disruption on narrow MRT corridors.
RPI V3 (C)	-2 As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions, however much of MRT route has parallel routes which could accommodate diversions for these modes so +1 to score.	
RPI V3A	-4 Significant construction disruption associated with MRT, Basin grade separation (multiple diversions and stages with Basin in particular) Moderate duration of construction disruption to the transport system to implement programme.	-2 Potential for new technology to provide priority for MRT through intersections. Potential for innovative construction techniques to minimise disruption on narrow MRT corridors.
RPI V3A (C)	-3 As above, reduced car use will result in increased PT and active travel demands which will need to be accommodated through diversions, however much of MRT route (and Basin) has parallel routes which could accommodate diversions for these modes so +1 to score.	

Programme	Groundwater	Geotechnical conditions	Contaminated land	Utilities
RPI V1	<p>-5 Significant dewatering and groundwater management required for multiple tunnel construction. The Aro Trench crosses multiple northward flowing historic stream channel. This is evidenced by the groundwater challenges during the construction of the Arras Tunnel. Deeper foundations or ground improvement associated with grade separation at the basin will need to consider the complex artesian groundwater conditions.</p>	<p>-5 Duplicate Terrace Tunnel, Aro Trench and Diagonal Tunnel provide significant ground engineering difficulty. Historic settlement during the construction of the existing Terrace Tunnel and location of proposed duplicate tunnel relative to known fault lines increases complexity. Aro Trench crosses variable ground and groundwater conditions, similar to that encountered in the existing Arras Tunnel. Similar ground engineering challenges expected, but increased by the length of the proposed trench. Grade separation at Basin requires additional liquefaction and settlement consideration. Diagonal tunnel, which has more favourable geometry than the Duplicate Terrace Tunnel, provides additional complexity.</p>	<p>-4 Significant amount of shallow earthworks within the CBD and areas of industry, in proximity to the largest number of HAIL sites of all RPI variants. Component 7 and 8 are shallow tunnel/trenches likely to encounter larger quantities of contaminated fill than the longer/deeper tunnels of other RPI Variants which are more likely to encounter natural ground</p>	<p>-5 Significant engineering challenges to accommodate diversion and provision of temporary connection through the Aro trench. Specific impact on a number of historic waterway connections through the area (e.g. Aro valley). A number of trunk service networks connect through the area. Aggregated impact on services with grade change at the Basin and adjacent to localised portals.</p>
RPI V1 (C)				
RPI V1A	<p>-3 Deeper foundations or ground improvement associated with grade separation at the basin will</p>	<p>-4 Grade separation at Basin requires additional liquefaction and settlement consideration.</p>	<p>-3 Significant amount of shallow earthworks within the CBD and areas of industry, in proximity to a large number of HAIL sites</p>	<p>-4 Impact of grade separation at basin with significant grade changes required with</p>

Programme	Groundwater	Geotechnical conditions	Contaminated land	Utilities
	need to consider the complex artesian groundwater conditions. Dewatering and groundwater management required for Diagonal Tunnel construction.	Diagonal tunnel which has more favourable geometry than the Duplicate Terrace Tunnel, provides additional complexity.	No shallow tunnels, however all other components remain as in V1 and are shallow works that are likely to encounter contaminated fill	aggregated impact with portals locally.
RPI V1A (C)				
RPI V2	<p>-4 Significant dewatering and groundwater management required for multiple tunnel construction. The Long Tunnel crosses below multiple northward flowing historic stream channel. While the tunnel is below the younger alluvial deposits, there are still likely to be north-south trending groundwater flows and fault related hydrogeological complexities.</p>	<p>-5 Long Tunnel carries similar ground engineering difficulty with potential for settlement and interaction with known fault zones. Construction of long tunnel through variable rock strength and quality, with changes in overburden thickness posing a risk of clashing with existing building foundations or inducing settlement. New Parallel Mt Victoria Tunnel provides some complexity, but expected to be similar in ground conditions as the existing Mt Victoria Tunnel.</p>	<p>-4 Significant earthworks within the CBD and areas of industry, in proximity to a large number of HAIL sites Long tunnel likely to be mostly in natural ground – contaminated land likely only to be encountered at tunnel entrances/exits. More suggested work within the CBD than the other RPI Variants although amount of actual ground disturbance is unclear.</p>	<p>-2 Impact of portals locally, given elevated nature of connection at terrace tunnel limited impact at northern end, proximity to main interceptor to be confirmed through design.</p>
RPI V2 (C)				
RPI V3	<p>-1 Relatively simple groundwater conditions expected for a predominantly at-grade solution. Some complexity provided by the</p>	<p>-2 Predominantly at-grade solutions. New Parallel Mt Victoria Tunnel provides some complexity, but</p>	<p>-2 Likely least quantity of earthworks overall and least number of HAIL sites encountered compared to all other RPI Variants</p>	<p>-1 Lightest touch of the options provided, still considered to have a negative impact with minor modifications likely</p>

Programme	Groundwater	Geotechnical conditions	Contaminated land	Utilities
	unconfined aquifer near existing ground level at the basin. Dewatering and groundwater management required for Parallel Mt Victoria Tunnel construction.	expected to be similar in ground conditions as the existing Mt Victoria Tunnel.		required to existing services to accommodate primarily at grade solutions.
RPI V3 (C)				
RPI V3A	-2 Deeper foundations or ground improvement associated with grade separation at the basin will need to consider the complex artesian groundwater conditions. Dewatering and groundwater management required for Parallel Mt Victoria Tunnel construction.	-3 Grade separation at Basin requires additional liquefaction and settlement consideration. New Parallel Mt Victoria Tunnel provides some complexity, but expected to be similar in ground conditions as the existing Mt Victoria Tunnel.	-3 Significant amount of shallow earthworks within the CBD and areas of industry, in proximity to a large number of HAIL sites. Similar to V1a, although may encounter a few more known HAIL sites in the Mt Vic area	-3 Significant impact of grade separation at basin with significant grade changes required, otherwise localised impact on service diversions for at grade upgrades.
RPI V3A (C)				



June 2021

Programme Short List Options

MCA Approach, Methodology and Scoring: Property Difficulty

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- LGWM Programme Short List Briefing Pack, dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Property Difficulty – MCA Methodology Approach

This assessment criterion assesses the expected challenges associated with the following:

- Property difficulty/ Implementability
- Number of sites that would need to be acquired for the route / stations.
- Look at the extent to which land might be more difficult to use/acquire
- Legislative constraints: Town Belt Act
- Land with multiple owners / multiple leases that might be difficult to negotiate with
- Maori-owned land (similar to multiple owners issues)
- Avoid qualitative / subjective assessment of owners' willingness to sell - don't jump to conclusions without negotiation.
- Dealing with political and commercial implications, social dislocation, etc.
- Finding a suitable site for the depot with respect to existing planning zoning.
- Impact on 'Town Belt' and similar special zones.

Assumptions

- Land purchase is subject to the PWA acquisition process which is well established and BAU.
- Note: Under the PWA, an Acquiring Authority can only take what it requires for the project. This does not preclude an Acquiring Authority from acquiring further property by agreement with an owner.
- No distinction made between whether any property will be a full or a partial purchase
- As there has been no landowner engagement, we cannot gauge landowner risk but assume as a minimum moderate adverse risk i.e. protracted negotiations are likely with solicitors/advocates acting for owners/lessees.
- Business loss claims and relocations are likely adding complexity to property negotiations.
- There is potential for objections – either RMA or PWA
- From a property perspective, the MCA assessment has focussed on the impact the “footprint” of the various options has on property and not for example whether there is MRT or not.
- The MCA assessment included the impact of loss of parking, loss of pedestrian access and/or loss of property access.

3 Property Difficulty – MCA Methodology Approach Approval

The above documented Property Difficulty assessment approach (refer Section 2) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	Criteria Lead	Criteria Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Property Difficulty	SHI Team Member	SHI and MRT Team Members	LGWM and Waka Kotahi TAG Members	NA

4 Property Difficulty – MCA Scoring

Scoring of the Programme Short List Options for Property Difficulty utilises an 11-point scale, to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realized and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realized and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term

-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The Property Difficulty assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11 point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Provide a score for construction effects of each option. Where appropriate please evaluate the construction effects separate to the operational effects and document accordingly
9. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)
2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 Programme Short List Assessment Scores – Property Difficulty

The tables below document the Programme Short List Option – Specialist Scores for Property Difficulty criteria with rationale.

Table 1: Specialist scoring for property difficulty

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)		
Do minimum (2021)	0	Baseline		
Do minimum (2036)	0	Baseline		
Option RPI V1 (2036)	-5	Option	Overall Score	-5
		1, 2, 3	MRT	-5
		4	SHI - Basin node	-5
		5	SHI - Diagonal tunnel for MRT and SH	-5
		6	SHI - Existing Mt Victoria tunnel and Ruahine Street	-1
		7	SHI - Te Aro trench and above ground changes	-5
		8	SHI - Duplicate Terrace tunnel	-4
		Largest property requirement of all options		
		MRT <ul style="list-style-type: none"> Property impacts at station locations Constrained alignment and significant property impacts on Island Bay route 		

		<p>Basin Node</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) Constrained builtup environment <p>Diagonal tunnel for MRT and SH</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) 9(2)(b)(ii), 9(2)(j) Subterranean Rights will be needed under Town Belt <p>Existing Mt Victoria tunnel and Ruahine Street</p> <ul style="list-style-type: none"> Assume No Property Take along Ruahine Street <p>Te Aro trench and above ground changes</p> <ul style="list-style-type: none"> Trench cuts a swathe through Te Aro to the Basin Reserve 5 bridges required at ground level to retain connectivity ignores economic impact <p>Duplicate Terrace tunnel</p> <ul style="list-style-type: none"> Northern Portal already owned ex MOW site Requirement for large construction staging area at each tunnel portal entrance Subterranean rights required for tunnel - residential development above Construction of original Terrace Tunnel caused settlement to above ground structures, needs further investigation to help drive full property acquisition v subterranean rights decision 			
Option RPI V1 with congestion charging (2036)	-5	Congestion Charging doesn't impact on property scoring so score remains as per above			
Option RPI V1A (2036)	-5	<table> <tr> <th>Option</th><th>Overall Score</th><th>-5</th></tr> </table>	Option	Overall Score	-5
Option	Overall Score	-5			

		<table> <tr> <td>1,2 3</td><td>MRT</td><td>-5</td></tr> <tr> <td>4</td><td>SHI - Basin node</td><td>-5</td></tr> <tr> <td>5</td><td>SHI - Diagonal tunnel for MRT and SH</td><td>-5</td></tr> <tr> <td>6</td><td>SHI - Existing Mt Victoria tunnel and Ruahine Street</td><td>-1</td></tr> </table> <p>MRT</p> <ul style="list-style-type: none"> Property impacts at station locations Constrained alignment and significant property impacts on Island Bay route <p>Basin Node</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) Constrained builtup environment <p>Diagonal tunnel for MRT and SH</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) Subterranean Rights will be needed under Town Belt <p>Existing Mt Victoria tunnel and Ruahine Street</p> <ul style="list-style-type: none"> Assume No Property Take along Ruahine Street 	1,2 3	MRT	-5	4	SHI - Basin node	-5	5	SHI - Diagonal tunnel for MRT and SH	-5	6	SHI - Existing Mt Victoria tunnel and Ruahine Street	-1
1,2 3	MRT	-5												
4	SHI - Basin node	-5												
5	SHI - Diagonal tunnel for MRT and SH	-5												
6	SHI - Existing Mt Victoria tunnel and Ruahine Street	-1												
Option RPI V1A with congestion charging (2036)	-5	Congestion Charging doesn't impact on property scoring so score remains as per above												
Option RPI V2 (2036)	-5													

Option	Overall Score	-5
1	MRT - Station to Island Bay	-4
2	PT - Courtenay Place to Miramar (via Bus Tunnel)	-4
3	SHI - Active travel tunnel, Ruahine Street	-4
4	SHI - Long tunnel	-5
5	SHI - At-grade network changes	-1

MRT - Station to Island Bay

- Property impacts at station locations
- Constrained alignment and significant property impacts on Island Bay route

PT - Courtenay Place to Miramar (via Bus Tunnel)

- More flexible Bus Rapid Transit mode to Miramar likely to reduce property impacts

Active travel tunnel (with Long Tunnel), Ruahine Street

- 9(2)(b)(ii), 9(2)(j)

Long tunnel

- Acquisition of multiple subterranean property interests (strata title) over a 3.5km distance for a long tunnel as well as a new Mt Victoria active travel tunnel
- Town Belt land required for both tunnels
- Requirement for large construction staging area at each tunnel portal entrance
- Need to consider avoiding Hospital, University and other large/heavy structures on route alignment
- Potential for large Injurious Affection claims if tunnel restricts potential development above ground from impact on depth of foundations

		<ul style="list-style-type: none"> Potential for large Injurious Affection claims from vibration/settlement damage 												
		At-grade network changes <ul style="list-style-type: none"> No SH property required 												
Option RPI V2 with congestion charging (2036)	-5	Congestion Charging doesn't impact on property scoring so score remains as per above												
Option RPI V3 (2036)	-4	<table border="1"> <thead> <tr> <th>Option</th><th>Overall Score</th><th></th></tr> </thead> <tbody> <tr> <td>1</td><td>MRT - Station to Island Bay</td><td>-4</td></tr> <tr> <td>2</td><td>PT - Courtenay Place to Miramar (via Bus Tunnel)</td><td>-4</td></tr> <tr> <td>3</td><td>SHI - Active travel tunnel, Ruahine Street & Wellington Road</td><td>-4</td></tr> </tbody> </table> <p>MRT - Station to Island Bay</p> <ul style="list-style-type: none"> Property impacts at station locations Constrained alignment and significant property impacts on Island Bay route <p>PT - Courtenay Place to Miramar (via Bus Tunnel)</p> <ul style="list-style-type: none"> More flexible Bus Rapid Transit mode to Miramar likely to reduce property impacts <p>New Active travel tunnel, Ruahine Street & Wellington Road</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) 	Option	Overall Score		1	MRT - Station to Island Bay	-4	2	PT - Courtenay Place to Miramar (via Bus Tunnel)	-4	3	SHI - Active travel tunnel, Ruahine Street & Wellington Road	-4
Option	Overall Score													
1	MRT - Station to Island Bay	-4												
2	PT - Courtenay Place to Miramar (via Bus Tunnel)	-4												
3	SHI - Active travel tunnel, Ruahine Street & Wellington Road	-4												
Option RPI V3 with congestion charging (2036)	-4	Congestion Charging doesn't impact on property scoring so score remains as per above												
Option RPI V3A (2036)	-5	<table border="1"> <thead> <tr> <th>Option</th><th>Overall Score</th><th></th></tr> </thead> <tbody> <tr> <td>1,2</td><td>MRT - Station to Island Bay</td><td>-4</td></tr> </tbody> </table>	Option	Overall Score		1,2	MRT - Station to Island Bay	-4						
Option	Overall Score													
1,2	MRT - Station to Island Bay	-4												

		<table> <tr> <td>3</td><td>PT - Courtenay Place to Miramar (via Bus Tunnel)</td><td>-4</td></tr> <tr> <td>4</td><td>SHI - Basin node</td><td>-5</td></tr> <tr> <td>5</td><td>SHI - Active travel tunnel, Ruahine Street & Wellington Road</td><td>-4</td></tr> </table> <p>MRT - Station to Island Bay</p> <ul style="list-style-type: none"> Property impacts at station locations Constrained alignment and significant property impacts on Island Bay route <p>PT - Courtenay Place to Miramar (via Bus Tunnel)</p> <ul style="list-style-type: none"> More flexible Bus Rapid Transit mode to Miramar likely to reduce property impacts <p>Basin Node</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) Constrained builtup environment <p>New Active travel tunnel, Ruahine Street & Wellington Road</p> <ul style="list-style-type: none"> 9(2)(b)(ii), 9(2)(j) 	3	PT - Courtenay Place to Miramar (via Bus Tunnel)	-4	4	SHI - Basin node	-5	5	SHI - Active travel tunnel, Ruahine Street & Wellington Road	-4
3	PT - Courtenay Place to Miramar (via Bus Tunnel)	-4									
4	SHI - Basin node	-5									
5	SHI - Active travel tunnel, Ruahine Street & Wellington Road	-4									
Option RPI V3A with congestion charging (2036)	-5	Congestion Charging doesn't impact on property scoring so score remains as per above									

8.1 Scoring change between Long List and Short List assessment

Option	Long List Score	Short List Score	Reason for Change
RPI V1A	-4	-5	Scores changed between the Long List and Short List assessments due to a change in the assessors and general methodology to introduce a more detailed and combined analysis between the SHI and MRT specialists.
RPI V1A (C)	-4	-5	
RPI V2	-3	-5	
RPI V2 (C)	-3	-5	
RPI V3	-3	-4	
RPI V3 (C)	-3	-4	
RPI V3A	-3	-5	
RPI V3A (C)	-3	-5	

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options for Property Difficulty were:

Mass Rapid Transport / Bus Rapid Transit

A key differentiator for property impacts for the options assessed is that options V2 and V3 assume Buss Rapid Transit to the airport and Mirimar. This mode in general has more flexibility in its alignment and therefore is likely to have less impact on property. This has contributed to a reduced score of -4 for the V2 and V3 options compared to the other options.

RPI V1

Option V1 has a new diagonal tunnel under Mt Victoria from the corner of Wellington Rd and Ruahine St, existing Mt Vic tunnel converted to Active Travel, impacts Basin Node and flows through to the Te Aro trench and a duplicate Terrace Tunnel

This option incorporates all of the variant options and therefore has the greatest overall impact on property.

The scoring criteria does not consider the wider economic and/or social impacts on the built environment e.g displacement/disruption of people/businesses over a considerable time period. Whilst not reflected in the scoring, this is considered a key differentiator when assessing scores between RPI V1 and RPI V1A.

RPI V1A

Option V1A has a new diagonal tunnel under Mt Victoria from Cnr Wellington Rd and Ruahine St exiting at Basin Node and impacting this area, existing Mt Victoria tunnel converted to Active Travel

This option excludes Te Aro trench and duplicate Terrace Tunnel when compared to RPI V1

RPI V2

New 3.5km long tunnel from Cnr Wellington Rd and Ruahine St linking to the Terrace Tunnel as well as a new active travel tunnel under Mt Victoria

Whilst this option impacts a large number of properties, the work is all subterranean.

RPI V3

New Mt Victoria parallel tunnel for active travel with impacts of widening on Wellington Road (no diagonal tunnel)

This has the least impact of all the property options considered. Parallel tunnel will require subterranean property from Town Belt Reserve.

9(2)(b)(ii), 9(2)(j)

RPI V3A

Basin Node, New parallel Mt Vic tunnel for Active Travel, Active travel improvements to Ruahine St

Basin Node has significant property impacts in what is a constrained builtup environment

Options ranking

In addition to the relative scoring above, it is considered that a ranking of options based on overall complexity and scale of acquisition would be helpful.

The options are ranked from highest in complexity and scale to lowest below:

1. **RPI V1**
2. **RPI V1A**
3. **RPI V3A**
4. **RPI V2**
5. **RPI V3**



June 2021

Programme Short List Options

MCA Approach, Methodology and Scoring: Network Fit and Scalability

1 Introduction

Let's Get Wellington Moving is a joint initiative between Wellington City Council, Greater Wellington Regional Council, and Waka Kotahi NZ Transport Agency to develop a transport system that supports the city's aspirations for how the city looks, feels and functions.

The programme includes a number of different packages which are progressing through different stages of project development, including:

- Mass Rapid Transit
- Strategic Highway Improvements
- City Streets
- Travel Demand Management
- Golden Mile Improvements
- Thorndon Quay / Hutt Road Improvements

The wider team has identified that a consistent approach to undertaking options assessment would be valuable across the programme to help with understanding, robustness and transparency. To this end, a framework for Multi Criteria Analysis (MCA) including the criteria, scoring, weighting and methodology was developed and circulated in May 2020 for all projects to use.

The MCA process for the combined Strategic Highways and Mass Rapid Transit Improvements package will be undertaken in line with that framework. This involves comparing each of the proposed investment packages to the Let's Get Wellington Moving do minimum option described separately.

The MCA assessment is based on a desktop review of available information, rather than detailed site investigations and is based on the option information provided to the technical assessment team for the Short List MCA process as follows:

- [LGWM Programme Short List Briefing Pack](#), dated 8th June 2021
- Technical Assessment Team Assessment Launch Briefing held on 14th June 2021
- Technical Assessment Team Drop-in Sessions held on 21st June 2021 and 23rd June 2021
- Programme Short List Options reference documentation can be found in Sections 5.1 and 5.2 below.

2 Network Fit and Scalability – MCA Methodology Approach

Network fit:

- Network fit is the degree to which the MRT route(s) would integrate with the wider public transport network on day one of implementation
- A good network fit is when MRT replaces whole bus routes or when the remaining bus routes could be joined to form a coherent service
- A poor network fit is when MRT replaces part of bus routes and results in service duplication or coverage gaps. Service duplication is when multiple public transport services overlap in an area and coverage gaps are when areas which previously had a public transport service would become difficult to serve
- Another consideration is whether MRT route(s) would result in an increase in services terminating in the central city by undoing the through running of existing bus services

Scalability:

- Scalability is the degree to which MRT route(s) could be extended to North and/or West Wellington on a date after MRT is operating
- Some of the identified factors for scalability are the gradient of the road, corridor width, the horizontal geometry of corners along the corridor and the ease/ difficulty of road widening

- Scalability of rubber tyre and rail based modes have been assessed individually to understand the differences between modes

Assumptions:

- That the current bus network is the baseline 2036 do minimum with additional bus trips being added to provide sufficient capacity

3 Network Fit and Scalability – MCA Methodology Approach Approval

The above documented network fit and scalability assessment approach (refer Section 2) for the Programme Short List was presented to and approved by the relevant TAG representative as shown below.

MCA Criteria	Criteria Lead	Criteria Deputy	TAG Members	Date of TAG/ OIM/ Programme Representative Methodology Approval
Network fit and scalability	MRT Team Member	MRT Team Member	GWRC TAG Members	Meeting and email in June 2021

4 Network Fit and Scalability – MCA Scoring

Scoring of the Programme Short List Options for Network Fit and Scalability utilises an 11-point scale, to determine each programme short list options performance relative to the existing environment - do minimum 2021.

Score	Scoring Description
5	Substantial benefits and a high degree of confidence of benefits being realised and/or long term / permanent benefits
4	High extent of benefits and confidence of benefit being realised and/or medium - long term benefits
3	Good benefits and/or medium term
2	Low or localised benefits and/or short term
1	Very low benefits and/or very short term
0	No change in benefits, impacts or difficulties from current situation
-1	Few difficulties, very low cost or low impact on some resources/values and/or very short term
-2	Minor difficulties, low cost or minor impacts on resources/values and/or short term
-3	Some difficulties, moderate cost or some impact on resources/values and/or medium term
-4	Clear difficulties, high cost or high impact on resources/values and/or medium - long term
-5	Substantial difficulties, very high cost or substantial impact on resources/values and/or long term / permanent

5 Programme Short List Option Descriptions

5.1 Do Minimum

A detailed description of the Do Minimum can be found in [here](#). The Programme options (including the future Do Minimum (2036)) will be scored against the existing environment (Do Minimum 2021) which will have a zero score.

5.2 Programme Short List Options

Please refer to the Programme Short List Options (including links to drawings and visualisations) shown within the [LGWM Programme Short List Briefing Pack](#).

6 General Specialist Assessment Instruction

The assessment criteria has been developed and is currently being confirmed by the LGWM programme team. The Network Fit and Scalability assessment methodology has been developed and refined by the leads and is outlined in Section 2 above.

The methodology and application of this criteria is:

1. Review the options contained in this document
2. Review the assessment methodology
3. Score the Programme Options against the 2018/2021 Do Minimum which must be considered the baseline and be given a score of zero
4. Assess the options assuming all packages are in place by 2036-using quantitative and qualitative assessments
5. Score the option, using the 11 point scale
6. Score all options with and without congestion charging and provide advice as to impact of congestion charging
7. Provide commentary to support the score and in particular differentiators between option scores
8. Detail any assumptions in your scoring, i.e. extrapolation of data from available information for different options

Notes:

1. The images provided for each of the options within this document are indicative only, assessments are to be undertaken using the detailed layouts
2. There are sub-options within the Programmes i.e. Diagonal Tunnel vs Parallel Tunnel or Ruahine widening into Town Belt rather than into Property. If using a different assumption to what is in the programme option description results in a different score, please record this and the reasons in your report.
3. The assessment needs to consider the three modal options (BRT, TT and LRT). Please note if a mode would impact the score, i.e. is there a difference in the resilience of a route with different mode options
4. Provide a score that reflects the lowest score for different modes, i.e. if BRT would score -2 and LRT -3, use -3 for the scoring and note in the commentary the different score

7 Previous work undertaken

There has been various assessments and workshops that have been undertaken since the commencement of LGWM project. Links to key documents for consideration are provided below:

1. Long list to short list programme workshop and minutes –
[13/05/2021 Workshop](#)
[13/05/2021 Meeting Record](#)
[18/05/2021 Workshop](#)
[18/05/2021 Meeting Record](#)

2. Draft Programme Long List to Short List report
[Long List to Short List process](#)

8 **Programme Short List Assessment Scores – Scalability of Network and Services**

The tables below document the Programme Short List Option – Specialist Scores for Network Fit and Scalability criteria with rationale. The details of the network fit and scalability scores have been shown separately in Table 1 and Table 2 with the combined score being shown in Table 3. The combined score is the average of the network fit and scalability scores.

Table 1: Specialist Scoring for Network Fit

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline with current bus network
Do minimum (2036)	0	Baseline with current bus network
Option RPI V1 (2036)	+2	Network fit is positive. MRT replaces route 1 south and route 2 east in part. But misses inner east catchments at Hataitai and Mount Victoria. Assume Karori through routed to Lyall Bay via Newtown. Need to retain a core route via Hataitai and bus tunnel for inner east. Needs reconfiguration to pick up missing catchment. Alternatively, if MRT services were to use Ruahine St/ current Mt Victoria tunnel with station at Hataitai Village, then score would be +3
Option RPI V1 with congestion charging (2036)	+2	As per RPI V1
Option RPI V1A (2036)	+2	As per RPI V1
Option RPI V1A with congestion charging (2036)	+2	As per RPI V1
Option RPI V2 (2036)	+4	Network fit is good – MRT replaces route 1 south. Route 1 (northern suburbs) through routed to route 3 (Lyall Bay) with no increase in CBD terminations or stranded routes. Route 2 assumed to still be significantly enhanced Karori to Seatoun/ Miramar North via Hataitai so good network fit. However MRT via Taranaki Street creates duplication of services on Taranaki Street which is used by route 3 and a gap in coverage along Kent/ Cambridge Terrace. Alternatively if MRT went via Kent/ Cambridge Terrace then score would be +5
Option RPI V2 with congestion charging (2036)	+4	As per RPI V2
Option RPI V3 (2036)	+4	As per RPI V2
Option RPI V3 with congestion charging (2036)	+4	As per RPI V2
Option RPI V3A (2036)	+4	As per RPI V2

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Option RPI V3A with congestion charging (2036)	+4	As per RPI V2

Table 2: Specialist Scoring for Scalability

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline with current bus network
Do minimum (2036)	0	Baseline with current bus network
Option RPI V1 (2036)	0	<p>With rail based mode (score carried toward): Scalability is extremely limited/ unlikely. To north Wellington grades approaching 8% are unlikely to suit the majority of light rail systems. An alternative route via Ngaio is significantly longer/ windier and largely single track limiting frequencies to every 15 minutes and with an uncompetitive journey time compared to bus via SH1 corridor. Scalability to West Wellington is constrained by winding curves, limited cross section width and Karori tunnel limiting the ability for dedicated high quality right of way needed to achieve an MRT level of quality. Score 0</p> <p>With rubber type mode: Scalability to north Wellington is likely to be feasible with good horizontal geometry and road corridors likely to be sufficient in width to be able to accommodate a dedicated right of way for rubber tyred MRT. Gradients are steep (approaching 8%) but compatible with even the largest rubber tyred vehicles (e.g. trackless tram/ biarticulated bus). Extendibility past Johnsonville into Churton Park and Grenada Village is challenging due to road geometry constraints. The northern corridor is considered the most significant in terms of growth potential and likely most important to serve with an extended MRT. However, scalability to the west is likely to be more constrained due to tighter curves/ horizontal geometry, narrower road corridors and Karori tunnel which are likely to preclude the implementation of dedicated right of way and/or result in significant property impacts. Overall score +3</p>
Option RPI V1 with congestion charging (2036)	0	As per RPI V1
Option RPI V1A (2036)	0	As per RPI V1

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Option RPI V1A with congestion charging (2036)	0	As per RPI V1
Option RPI V2 (2036)	0	<p>With rail based mode (score carried toward): Scalability is extremely limited/ unlikely. To north Wellington grades approaching 8% are unlikely to suit the majority of light rail systems. An alternative route via Ngaio is significantly longer/ windier and largely single track limiting frequencies to every 15 minutes and with an uncompetitive journey time compared to bus via SH1 corridor. Scalability to West Wellington is constrained by winding curves, limited cross section width and Karori tunnel limiting the ability for dedicated high quality right of way needed to achieve an MRT level of quality. Score 0</p> <p>With rubber type mode: Scalability to north Wellington is likely to be feasible with good horizontal geometry and road corridors likely to be sufficient in width to be able to accommodate a dedicated right of way for rubber tyred MRT. Gradients are steep (approaching 8%) but compatible with even the largest rubber tyred vehicles (e.g. trackless tram/ biarticulated bus). Extendibility past Johnsonville into Churton Park and Grenada Village is challenging due to road geometry constraints. The northern corridor is considered the most significant in terms of growth potential and likely most important to serve with an extended MRT. However, scalability to the west is likely to be more constrained due to tighter curves/ horizontal geometry, narrower road corridors and Karori tunnel which are likely to preclude the implementation of dedicated right of way and/or result in significant property impacts. Overall score +3</p>
Option RPI V2 with congestion charging (2036)	0	As per RPI V2
Option RPI V3 (2036)	0	As per RPI V2
Option RPI V3 with congestion charging (2036)	0	As per RPI V2
Option RPI V3A (2036)	0	As per RPI V2
Option RPI V3A with congestion charging (2036)	0	As per RPI V2

Table 3: Specialist Scoring for Combined Network Fit and Scalability

Options Assessment	Score	Commentary/ Rationale (also identifying if mode has an impact on your score, and / or providing different construction and operation scores if required)
Do minimum (2021)	0	Baseline with current bus network
Do minimum (2036)	0	Baseline with current bus network
Option RPI V1 (2036)	1	Network fit positive with some duplication and overlap. Scalability is very limited with rail-based mode both to the north and west. Alternatively adopting a rubber tyred MRT extendability is much improved, with a northern extension potentially feasible and as such the overall score would increase to +3
Option RPI V1 with congestion charging (2036)	1	As per RPI V1
Option RPI V1A (2036)	1	As per RPI V1
Option RPI V1A with congestion charging (2036)	1	As per RPI V1
Option RPI V2 (2036)	2	Network fit is very good. Scalability is very limited with rail-based mode both to north and west. Alternatively adopting a rubber tyred MRT extendability is much improved, with a northern extension potentially feasible and as such the overall score could increase to +4
Option RPI V2 with congestion charging (2036)	2	As per RPI V2
Option RPI V3 (2036)	2	As per RPI V2
Option RPI V3 with congestion charging (2036)	2	As per RPI V2
Option RPI V3A (2036)	2	As per RPI V2
Option RPI V3A with congestion charging (2036)	2	As per RPI V2

9 Key Differentiators

Key differentiators impacting the overall relative scoring between options are:

MRT via diagonal tunnel

MRT to the east via the diagonal tunnel would not serve Hataitai or Mount Victoria and this would result in a reduction in the level of service for this area compared to the do minimum. Under the do minimum, frequent bus route 2 and peak only routes 12e, 35 and 36 go via Hataitai and Mount Victoria. With RPI V1 MRT replaces route 2 that would run via a diagonal tunnel with the nearest station being located on Wellington Road. This would leave routes 12e, 35 and 36 to serve Hataitai village and Mount Victoria that would provide a peak only service. Alternatively, if an additional off-peak bus service was added to serve Hataitai and Mount Victoria then this would increase the overall service kilometres and hours which increases operating costs.

BRT to east Wellington

Bus Rapid Transit provides the potential for articulated buses to be able to be through run from Miramar North/ Seatoun to Karori. This assumes bus stop lengthening in Karori. The through running service would match the current route 2 bus route and therefore has a good network fit. Through running also reduces the number of terminating bus services in the central city because buses are able to run through to an outer suburb. Reducing the number of terminating buses in the central city is beneficial because it reduces the amount of layover spaces required and improves cross town journeys.

MRT mode

For the scalability score a rubber tyre-based mode is assessed to be more extendable to north Wellington due to the gradient through Ngauranga Gorge. This is because the majority of rail-based modes have a maximum allowable gradient of 7% for a short section. However, Ngauranga Gorge has a maximum gradient of 8% for a sustained length of approximately 1.5km long. This creates a significant technical risk for a rail-based mode where Wellington would need bespoke fleet and/or lower capacity vehicles. Rubber tyre based modes are able to accommodate gradients above 8% even assuming the largest vehicle type of bi-articulated bus or trackless tram.

10 Scoring changes between Long List and Short List assessment

There have been no changes to the network fit scores since the long list assessment.

Network scalability scores have been updated in the short list assessment to identify specific opportunities or constraint around implementing a rail based versus a rubber tyred MRT vehicle under each option. This reflects technical contributions from TAG for a more specific approach to assessing scalability at the short list stage. In contrast, the assumption made during the long list assessment was mode agnostic and instead focused largely on the proportion of a potential ultimate MRT network delivered under each option. The assessment scores should therefore be considered as complements to each other but cover different aspects of network scalability.

Option	Long List Score	Short List Score	Reason for Change
RPI V1	3	1	Network fit score of +2 is consistent between long list and short list assessment. However, future network scalability at short list assessment reflects opportunities on implementing a rail based versus a rubber tyred MRT vehicle rather than the proportion of a potential ultimate MRT network delivered under the option at long list stage. This captures the scalability score of 0 (for rail based vehicles) and +3 (for rubber tyred vehicles) in the short list assessment compared to a +5 at long list which reflected this option provided most of the ultimate network is in place. Due to the above elements, overall score has changed from +3 to +1.
RPI V1 (C)	3	1	As per RPI V1.
RPI V1A	3	1	As per RPI V1.
RPI V1A (C)	3	1	As per RPI V1.
RPI V3A	4	2	Network fit score of +4 is consistent between long list and short list assessment. However, future network scalability at short list assessment reflects opportunities on implementing a rail based versus a rubber tyred MRT vehicle rather than the proportion of a potential ultimate MRT network delivered under the option at long list stage. This captures the scalability score of 0 (for rail based vehicles) and +3 (for rubber tyred vehicles) in the short list assessment compared to a +4 at long list which reflected this option provided good elements such as a grade separated Basin and inter-related street network to be readily extended north and west. Due to the above elements, overall score has changed from +4 to +2.
RPI V3A (C)	4	2	As per RPI V3A.