

A photograph of a blue sign with white text, mounted on a ceiling. The sign reads "Wellington Public Transport Spine Study". The background is a blurred view of a railway station with large glass windows and structural beams.

Wellington Public Transport Spine Study

RAILWAY STATION
TO HOSPITAL
Inception and
Scoping Report

Inception and Scoping Report

Prepared for
Greater Wellington Regional Council

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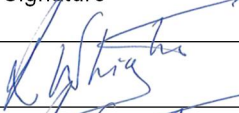
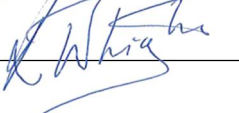
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Table of Contents

EXECUTIVE SUMMARY		i
1.0	INTRODUCTION	1
	1.1 Background	1
	1.2 Study Area	1
	1.3 Report Purpose	1
	1.4 Report Outline	1
2.0	STUDY VISION AND KEY OBJECTIVES	2
	2.1 Study Vision for the PT Spine	2
	2.2 Study Purpose	2
	2.3 Study Objectives	2
	2.4 Key Issues	2
	2.5 Problem Definition	3
	2.6 Study Outputs	3
3.0	STUDY APPROACH AND MILESTONES	5
	3.1 Study Approach	5
	3.2 Treasury Better Business Case	7
	3.2.1 Why use the Better Business Case Framework?	7
	3.2.2 What is the Better Business Case Framework?	7
	3.2.3 How Will the Better Business Case Framework be Applied to the PT Spine Study?	8
	3.2.4 Being Clear About What Problem Needs to be Fixed	8
	3.2.5 Compiling the Strategic Case for Change, Business Needs and Investment Objectives	8
	3.2.6 Programme Business Case	8
	3.3 The Option Tests	8
	3.3.1 Transport Network Scenarios	9
	3.4 Base Case	10
	3.4.1 Sensitivity Tests	10
	3.4.2 Land Use Scenarios	10
	3.5 Milestone 1: Inception and Scoping Report	10
	3.6 Milestone 2: International Review	10
	3.7 Milestone 3: Completion of Long List Evaluation	11
	3.7.1 Option Evaluation	11
	3.7.2 Long List to Medium List Evaluation	12
	3.8 Milestone 4: Medium List to Short List Evaluation	13
	3.9 Milestone 5: Short List Evaluation and Next Steps in Decision Making	14
4.0	STUDY WORKSTREAMS	15
	4.1 Concept Design of Options	15
	4.1.1 Concept Design: Medium List	15
	4.1.2 Concept Design: Short List	15
	4.2 Transport Modelling	15
	4.2.1 Long, Medium and Short List Evaluation	15
	4.2.2 Long List Testing	16
	4.2.3 Medium and Short List Testing	17
	4.3 Urban Design	17
	4.3.1 Medium and Short List Evaluation	17
	4.4 Costing	17
	4.4.1 Medium and Short List Evaluation	17
	4.5 Land Use Assessment	18
	4.5.1 Medium and Short List Evaluation	18
	4.6 Car Parking Assessment	19
	4.6.1 Medium and Short List Evaluation	19
	4.7 Social and Environmental Assessment	19
	4.7.1 Medium and Short List Evaluation	19
	4.8 Communication and Engagement	20
	4.8.1 Long, Medium and Short List Evaluation	20
	4.8.2 Community Engagement Plan	20

5.0	PROGRAMME	21
6.0	INITIAL SCOPING OF MODES AND CORRIDOR OPTIONS	22
6.1	Introduction	22
6.2	A Framework for the Identification of Options	22
6.3	Factors Affecting Routing	22
6.4	Factors Affecting Spatial Placement	24
6.5	Factors Affecting Mode Choice	24
6.6	Public Transport Functionality	25
6.7	Development of Options	25
6.8	Intended Assessment Process for Option Refinement	25
Appendix A	Study Context	A
Appendix B	Extracts from Background Documents Used to Develop the Study Vision	B
Appendix C	Programme	C
Appendix D	International Review List of Case Studies	D
Appendix E	Summary Table of Documents Reviewed	E

List of Figures

Figure 1	Study Area	4
Figure 2	Treasury Better Business Case (BBC) Framework	11
Figure 3	Option Testing Methodology	17
Figure 4	Types of Running Way	24
Figure 5	Typical Cost-Capacity Matrix for Comparing Modes	24
Figure 6	Map of the Wellington tramway network at its greatest extent	A-1
Figure 7	The Future Network Plan	A-4
Figure 8	Existing Conditions, Land Use	A-7
Figure 9	Existing Conditions, Demographic and socio-economic	A-8
Figure 10	Existing Conditions, Environmental	A-9
Figure 11	Existing Conditions, Transport	A-10
Figure 12	Existing Conditions, Public Transport	A-11
Figure 13	Existing Conditions: Active Transport	A-12

List of Tables

Table 1	Summary of how the Main Considerations will apply at Various Option Evaluation Stages	6
Table 2	The Option Tests	8
Table 3	Do Minimum Transport Network	9
Table 4	Modelling Detail Matrix	16
Table 5	Summary of Key Study Milestones and Deliverables	21
Table 6	List of Potential Route Options	23
Table 7	Potential List of Options	26

Glossary

Abbreviation	Definition
BBC	Treasury's Better Business Case Framework
BCR	Benefit Cost Ratio
BRT	Bus Rapid Transit
CBD	Central Business District
EEM	Economic Evaluation Manual
EMME/2	Multimodal Equilibrium (Modelling Package)
GIS	Geographical Information Systems
GPS	Government Policy Statement
Greater Wellington	Greater Wellington Regional Council
HOV	High-Occupancy Vehicle
KPI	Key Performance Indicator
LOS	Levels of Service
LRT	Light Rapid Transit (e.g. tram)
LTMA	Land Transport Management Act
LU	Land Use
MCA	Multi-Criteria Assessment
MoT	Ministry of Transport
MRT	Mass Rapid Transit (e.g. heavy rail)
N2A	Ngauranga to Airport Corridor Plan
NZTA	New Zealand Transport Agency
NZTS	New Zealand Transport Strategy
PPM	Parry People Mover
PT	Public Transport
PTSS, the Study	Public Transport Spine Study
RLTS	Regional Land Transport Strategy
RMA	Resource Management Act 1991
RoNS	Roads of National Significance
RPTP	Regional Public Transport Plan
RTN	Rapid Transit Network
SATURN	Simulation and Assignment of Traffic to Urban Road Networks

Abbreviation	Definition
SES	Social Environmental Screen
SWOT	Strengths, Weaknesses, Opportunities, Threats
TDM	Travel Demand Management
TOD	Transit Orientated Development
TSD	Transit-Supportive Development
TWG	Technical Working Group
UD	Urban Design
ULT	Urban Light Transit
WCBR	Wellington City Bus Review
WCC	Wellington City Council
WPTM	Wellington Public Transport Model
WTSM	Wellington Transport Strategy Model

EXECUTIVE SUMMARY

The Wellington Public Transport Spine Study (PTSS), “the Study” has been commissioned by Greater Wellington Regional Council (Greater Wellington) to assess the feasibility and the merits of a range of long term options for providing a high frequency and high quality public transport system between the Wellington Railway Station and the Wellington Regional Hospital.

The purpose of this Inception and Scoping Report is to outline the Study approach, methodology and study programme.

Context

Between 2011 and 2031 Wellington City’s population is forecast to grow by around 28,000 people¹. The City is planning for much of that growth to occur around key identified growth points such as through the CBD and along Adelaide Road (the Growth Spine). Increased development along this Growth Spine will provide housing opportunities to people living within the City as well as employment for both them and the wider regional population.

While Wellington currently has a high level of passenger transport usage compared to other New Zealand cities, it is expected that an even higher proportion of the new population will utilise passenger transport because it will provide an attractive transport option.

The transport challenge for both the City and the region will be to provide access to employment opportunities as well as health, education, recreation and social activities for both the existing and forecast population.

The Public Transport (PT) system already struggles to provide a quality service to existing users. This is in part due to congestion at peak times along the Golden Mile (see Figure 1 for location of Golden Mile), as lots of buses passing through the city often queue at bus stops and traffic lights. As a result travel times through the CBD are unreliable. There is also growing pressure as pedestrians, cars and buses compete for the same space - this has significantly affected the safety record of both buses and pedestrians from the Golden Mile through to Manners Street. Physical space restrictions in some areas along the Growth Spine limit the opportunity to make even minor improvements by allocating additional space for existing PT services. While these issues are currently more prominent during peak time, increased use of PT in the future will see them appear more and more during the off peak. In the long term it will be even

more difficult to provide quality PT services along the same route.

If congestion and un-reliability are left to increase there will be a direct impact on people’s ability and willingness to access the city for work or other reasons. With the city forecast to provide a large proportion of the region’s employment this would have a detrimental impact on the city being able to fully capitalise on existing economic opportunities, but also to realise increased growth and improvements in productivity.

A number of steps are already being taken. This includes a review of bus routes and bus services to see if the number of buses travelling through the CBD can be reduced (especially at peak time) to lower congestion and improve reliability of journey time while also trying to improve the level of service and how efficiently the services are run. There are also changes being made to signalling (including bus priority traffic lights) and real time information at inner city bus stops.

These steps are likely to make improvements for current users, however, only have a limited effect in the long term as the population grows and more people are encouraged to use PT.

What Role Will PT Play?

There are a number of existing strategy documents that set out the vision for the region, the city and the role that PT has in supporting this vision.

From these it is clear that PT is to play a key role in supporting both economic and social objectives. It is expected to increase its relative share of total trips along with walking and cycling which will increase their share of shorter trips.

The existing strategies also make it clear that taking a passive approach will not be sufficient to enable PT to support the economic and social objectives of the city or region. It requires a more active approach to increasing the usage of PT, including making it attractive in terms of price and service compared to car based alternatives and creating an urban environment within which PT is accessible to people and links them to the key areas they need to go to.

As recognised in the Ngauranga to Airport Study, PT must play a role in supporting access across the city from the north to the Regional Hospital and Wellington International Airport, as well as providing for access alongside other modes into and within the city. To do this effectively it must provide a network of services that

¹ Department of Statistics, medium growth forecast

enable people to move seamlessly across the network and between the different modes.

An action from the N2A study was to look in more detail into the PT options available for the Growth Spine.

The Public Transport Spine Study

This Study has been commissioned by Greater Wellington to assess the feasibility and the merits of a range of long term options for providing a high frequency and high quality public transport system between the Wellington Railway Station and the Wellington Regional Hospital.

The Study Vision has been developed as follows:

“To deliver a high quality, high frequency, reliable, accessible and safe public transport system along the PT Spine that supports the region’s long term public transport and urban development strategies and provides long term access to the CBD, railway station and regional hospital in a way that is economically, environmentally and socially sustainable.”

The purpose of this Inception and Scoping Report is to outline the Study approach, methodology and Study Programme, which has been further defined through analysis of data and information available (including transport modelling). This Report also outlines work undertaken around the Treasury’s Better Business Case, such as defining a clearer problem definition and understanding the basic activities that will likely occur across the period of the analysis (the do minimum).

This Study report then provides the starting point for enabling the Study Vision.

The Study approach and scope is that:

- The Better Business Case framework is being used to provide the organising framework to guide the analysis undertaken in the Study. This will assist Greater Wellington taking a step towards an indicative business case should it be felt that government funding may be required in the future.
- Since the Study commenced Treasury have introduced a Programme Business Case approach. Following two workshops with Treasury, Greater Wellington has decided the Study should adopt a Programme Business Case rather than a Project Business Case which was originally envisaged.
- To this end Greater Wellington will undertake a Programme Strategic Assessment including three investment logic mapping workshops resulting in a programme problem definition, benefit definition and solution definition. The outcomes of these workshops will be tested against the Study Medium List of options to ensure it is consistent with the Programme Business Case approach and, if needed, amendments to the list will be made.

- The definition of the Do Minimum² – which is consistent with the requirements of NZTA’s Economic Evaluation Manual – is important for the Study as it defines a reasonable Level of Service for the transport network against which the Study options are compared. It also defines the point of reference against which costs and benefits of the options are quantified.
- The Base Case³ takes into account relevant roading and public transport changes that are currently being considered up to 2026 within the City and Region, including the Wellington RoNS within the Study area, Rail Extensions, rolling stock and station improvements, bus lanes and priority measures, and Travel Demand Management measures such as fare policy reviews.
- An International Review will provide input into the option evaluation, design, operation and costings of public transport options so that the Study is informed by the successes and lessons of comparable approaches elsewhere.
- In accordance with the Treasury Better Business Case guidelines, a potential list of options will be reviewed and impractical options discounted. Then three specific lists of options (long-list, medium-list, short-list) will be developed and refined as the Study progresses. This will provide a transparent audit trail and logical approach for assembling the five complementary business cases.
- Options will initially be assessed as conceptual designs to build the level of information and detail needed to develop a business case and provide decision makers with the information they need – including infrastructure requirements, design criteria, social and environmental impacts, and capital and operational costs - to determine which of the options best respond to the Study vision and problem definition.
- Modelling of future potential patronage will provide an assessment of the Level of Service for any particular option, and will also provide an understanding of whether or not adequate demand is likely to exist and when that may occur to a sufficient level to justify that option.

² The Do Minimum is defined as the minimum level of expenditure to maintain a minimum level of service and is used to compare options against.

³ The Base Case is a development of the Do Minimum which assumes that projects in the study area that are likely to go ahead but do not yet have funding committed, do go ahead.

- WCC urban design assessment criteria will provide an understanding of the character and form of the corridor and of the wider context within which it sits, and will align with the implementation plans such as '*Towards 2040: Smart Green Capital*' and '*The Central City Framework*' and the Urban Design Protocol .
- The outputs of the car parking assessment and the land use assessment will provide guidance on where land use change could occur to better support public transport and policy reforms which could support the development of Transit Oriented development. These developments may provide further economic stimulus within Wellington.
- The social and environmental impacts and merits of the options will identify, compare, and be used as a decision-making input for consultation and engagement, option assessment and risk treatment plans.
- Communication and engagement with the public and stakeholders is vital for seeking input to the Study, informing people about the Study and responding to enquiries and issues. This further acknowledges the relationship with previous consultation and the opportunities for enhancing future engagement on and beyond the Study.

The Study programme has been developed in order to meet the overall desired end date of February 2013. In the build-up to each milestone there are opportunities to engage further with interested and affected parties, and key decisions will be further informed through this engagement.

The framework proposed for identification of options considers routes (i.e. how PT will access the Study area and the interfaces it will have on land uses) as well as mode choices (i.e. the type of PT scheme and its capability to perform the task identified).

The potential list of options identified in this report includes 88 options based on up to 8 routes within the Study area for connecting the Railway with the hospital in Newtown, and up to 11 discreet mode options with further permutations around elevation requirements, interchange requirements and carrying capacity of each.

This Inception and Scoping Report provides a comprehensive and robust framework for moving forward with the overall approach and in particular the next step of the Study, which is to summarise existing material on strategic fit, business and service needs, and from that develop a set of strategic evaluation criteria to be applied to the long list of options.

1.0 INTRODUCTION

1.1 Background

In August 2011, AECOM was appointed by Greater Wellington to undertake the Study. This is a joint study led by Greater Wellington in partnership with the New Zealand Transport Agency (NZTA) and Wellington City Council (WCC).

This Study is one of the recommendations of the multi-modal Ngauranga to Airport (N2A) Corridor Plan⁴ adopted by the Regional Transport Committee in 2008. This Study is undertaken in the context of the N2A Corridor Plan and takes account of the investigations carried out in developing that plan.

Furthermore, recent developments in the Wellington Region – for instance the Wellington City Bus Review (WCBR) and updated Strategic and Regional transport models – provide further context for this Study.

There are a number of issues that impact on the Study, including transport in general, public transport, land use, demographic and socio-economic issues and environmental considerations. More detail about these issues and how they characterise the Study area are included in Appendix A.

1.2 Study Area

The Study area is illustrated in Figure 1 on page 4 and is a subset of the N2A Corridor Plan, “the Plan”.

The N2A Corridor Plan starts at the SH1/SH2 merge at Ngauranga and continues through the Wellington City CBD to Newtown (including the regional hospital), the eastern suburbs and Wellington International Airport. The Plan identified that a step change in passenger transport is required between the Wellington Railway Station and the regional hospital in order to deliver on the strategic outcomes of the RLTS.

The core Study area is that identified in Figure 1 between the railway station and the regional hospital. The Study area is bounded by The Terrace and Wallace Street in the west and the Waterfront, Kent Terrace and Adelaide Road in the east.

The Study will also consider possible connections and the implications of public transport feeder services and population/employment growth outside the core Study area. This includes Wellington International Airport and suburban centres, such as: Hataitai, Kilbirnie, Brooklyn, Karori, Island Bay, Miramar, as well as connections to the north of the Railway Station

1.3 Report Purpose

The purpose of this Inception and Scoping Report is to outline the Study approach and methodology - through confirmation of the Study scope and methods – and the Study programme. It builds on work undertaken during the Inception phase of the Study (since August 2011), which includes confirmation of the modelling approach, development of the Study Vision and Problem Definition, feedback from focussed stakeholder engagement, market surveys, and refining how best to apply Treasury’s Better Business Case Framework. All of this work has been undertaken to further inform the Study Scope.

Prior to the commencement of the medium-list option evaluation and the short-list option evaluation, a more refined approach will be documented through briefing papers for approval by the Technical Working Group (TWG). This will then be tailored to identify medium-list and short-list options worthy of consideration at each stage.

At this point of the Study, the report summarises the findings from work undertaken to date in Phase 1 and addresses comments from the Technical Working Group on the Draft Inception and Scoping Report.

Where gaps have been identified in existing information, this report outlines the process required to fill the gaps.

This report has been developed in collaboration with the Client project team and constitutes the deliverable for Milestone 1 of the Study.

1.4 Report Outline

This report outlines:

- the Study vision and objectives and Study problem definition;
- the approach to address the vision, objectives and problem definition;
- the Study programme;
- the land use, socio-economic, environmental and transport characteristics of the Study area; and
- key factors and constraints that will affect option selection.

⁴ Ngauranga to Airport Corridor Plan 2008 (p10)

2.0 STUDY VISION AND KEY OBJECTIVES

The study vision and the Study objectives together will inform the Study approach and methodology, and in so doing will provide the guidance needed for positioning any work subsequent to this Feasibility Study. In other words, these move the Study forward, with the end in mind and therefore it is recommended that the vision and objectives should be reviewed periodically during the Study.

2.1 Study Vision for the PT Spine

The study vision of the PT Spine is:

“To deliver a high quality, high frequency, reliable, accessible and safe public transport system along the PT Spine that supports the region’s long term transport and urban development strategies and provides access to the CBD, railway station and regional hospital in a way that is economically, environmentally and socially sustainable.”

This vision has been developed for the purposes of this study and provides a basis against which to measure the Study purpose, objectives and outcomes. It places the Study within the context of the Ngauranga to Wellington Airport Corridor Plan, Regional Public Transport Plan and Regional Land Transport Strategy. It also places the Study in the context of other regional strategies/plans as set out in Appendix B.

2.2 Study Purpose

The purpose of the Study is:

“To assess the feasibility and the merits of a range of longer-term options for providing a high frequency and high quality public transport system between the Wellington Railway Station and the Wellington Regional Hospital, as part of the Ngauranga to Airport Corridor Plan. It will consider connections to the wider public transport network and will seek to support the urban intensification of this growth corridor.”

This purpose is derived from the overall purpose and overall study objective as set out in the Study terms of reference.

2.3 Study Objectives

The study objectives are:

- 1) To determine the desirable characteristics of a “high quality public transport system” in the context of the Ngauranga to Airport corridor.

- 2) To understand the interdependence between land use patterns/densities and transport infrastructure and what the trigger points are for one to support the other.
- 3) To estimate the costs, transport benefits, inherent resilience to emergencies, compatibility and other impacts of different public transport modes along this corridor and any potential connections to the existing public transport network.
- 4) To advise on the relative merits of alternative routes and modal options for providing a high quality public transport system in the corridor over the medium/ longer-term, including the need for, indicative timing and phasing of the most meritorious options.
- 5) To provide all relevant research and evidence to assist decision-making on the long-term planning for public transport along this key growth corridor.

These objectives are the terms of reference for the Study and should be considered in the context of the Study purpose and outcomes.

2.4 Key Issues

Key issues related to the PT Spine Study identified during the Inception and Scoping phase include the following:

- the need to support the economic function of the central city as the key centre within the region and the location of a significant proportion of the region’s jobs;
- the need to support and service the planned residential, retail and business growth within the Study area;
- the need for a high quality and high frequency public transport spine to provide an attractive choice and reduce congestion on the roading network;
- increasing travel demand as a result of increasing population in the Wellington Region and changes to travel trips and patterns, in particular with respect to the central city and associated major regional facilities (such as the airport and port);
- pressure on the existing public transport network and services, parts of which are close to capacity at peak times;
- restrictions on capacity of the current PT network from physical space restrictions and service delivery;
- The quality of interchanges between modes and services at various points along the spine, including the time and distance barriers around transfers at the Wellington Railway Station;

- The impact of the significant number of large vehicles along the Golden Mile at peak times on other users and overall amenity; and
- The need to give priority to public transport through the spine as part of the Ngauranga to Airport Corridor Plan, recognising its critical role in providing for travel demand as part of the wider transport network.

Awareness around many of these issues has been re-inforced through surveys and engagement conducted during Inception and Scoping Phase.

There is an ongoing programme of work addressing the short term impact of these issues, with projects such as the Restoration of the Golden Mile, the Wellington City Bus Review, and other signalling and public transport improvements. However, the efficiencies that can be made to the existing public transport operations will not be sufficient to address these issues in the medium to long term.

2.5 Problem Definition

A clearly defined 'problem definition' is a requirement of the Treasury Better Business Case approach. It is based on the underlying cause(s) of the problem and long-term (i.e. 10-30 years ahead).

The problem definition describes why there is a gap between the future state (once the base case is implemented) and the desired future state (what it is that the community wants).

It provides the basis from which the project is built. It identifies the most critical thing(s) to be fixed in order to achieve the desired future state, and thus helps to focus the design of options and their assessment. The problem definition does not in itself limit what can be fixed, either directly or indirectly. The range or diversity of options does not need to be explicitly identified or enabled in the problem definition because the problem is not defined by its possible solutions.

The following problem definition will be adopted as the working definition for this Study:

The problem definition of this study is:

"Within the next 10-30 years, the public transport system along the PT Spine is likely to be increasingly inefficient and ineffective in supporting the function of the central city."

This is based on the underlying causes applicable to the Study area:

- growing demand⁵ for passenger transport and an increase in total trips, particularly at peak periods;
- the number of public transport vehicle movements exceeding the capacity of the space available;

- conflicts between different road users, in particular pedestrians, private vehicles and public transport vehicles;
- the quality of interchanges between modes and services at various points; and
- the scale of vehicles and the impact of vehicle movements along the spine negatively impacting on amenity, vitality and economic productivity.

The problem is likely to result in:

- customer needs and expectations for public transport not being met;
- reduced attractiveness and competitiveness of public transport as an alternative to the private car;
- slow and unreliable journey times particularly during the peak;
- a lack of capacity to meet increased demand for patronage;
- reduced central city amenity, vitality and economic productivity;
- increased congestion on the roading network; and
- further pressure on parking within the central city.

The problem definition may need to be refined as appropriate due to the adoption of the Treasury Programme Business Case and to reference the evidence on which it is based.

2.6 Study Outputs

The anticipated study outputs based on the Study purpose, objectives and strategic need for change are:

- a more detailed understanding of the issues likely to arise in the long-term from the current public transport system and its integration with other modes of transport, taking into account the base case;
- an evaluation of up to four feasible options to provide a high quality public transport system along the spine, including costings;
- a robust process and clear evidence as to why other feasible options have been rejected;
- a sequencing plan for each of the four feasible options to provide a clear path towards a high quality public transport system for the medium to long-term (10-20 years), including clear trigger points for specified levels of investment in the system.
- identification of any immediate actions needed to secure a public transport corridor along the spine in the medium to long term (10-20years);
- evidence to assist subsequent decision-making on the long-term planning for public transport along the spine; and
- identification of any changes to urban development policy needed to facilitate or support investment in a high quality public transport system along the spine.

⁵ Based on current projections in the Wellington Region Public transport Plan 2011-2021

The Study Milestones and key deliverables have been formulated to tie back to these outputs.

These outputs are supported by additional deliverables during the Study process. For example, the Study

Engagement Report (which summarises all engagement activities undertaken throughout the study) provides further understanding of the key factors that the public believes make up high quality PT and issues/problems that feed into the Problem Definition.

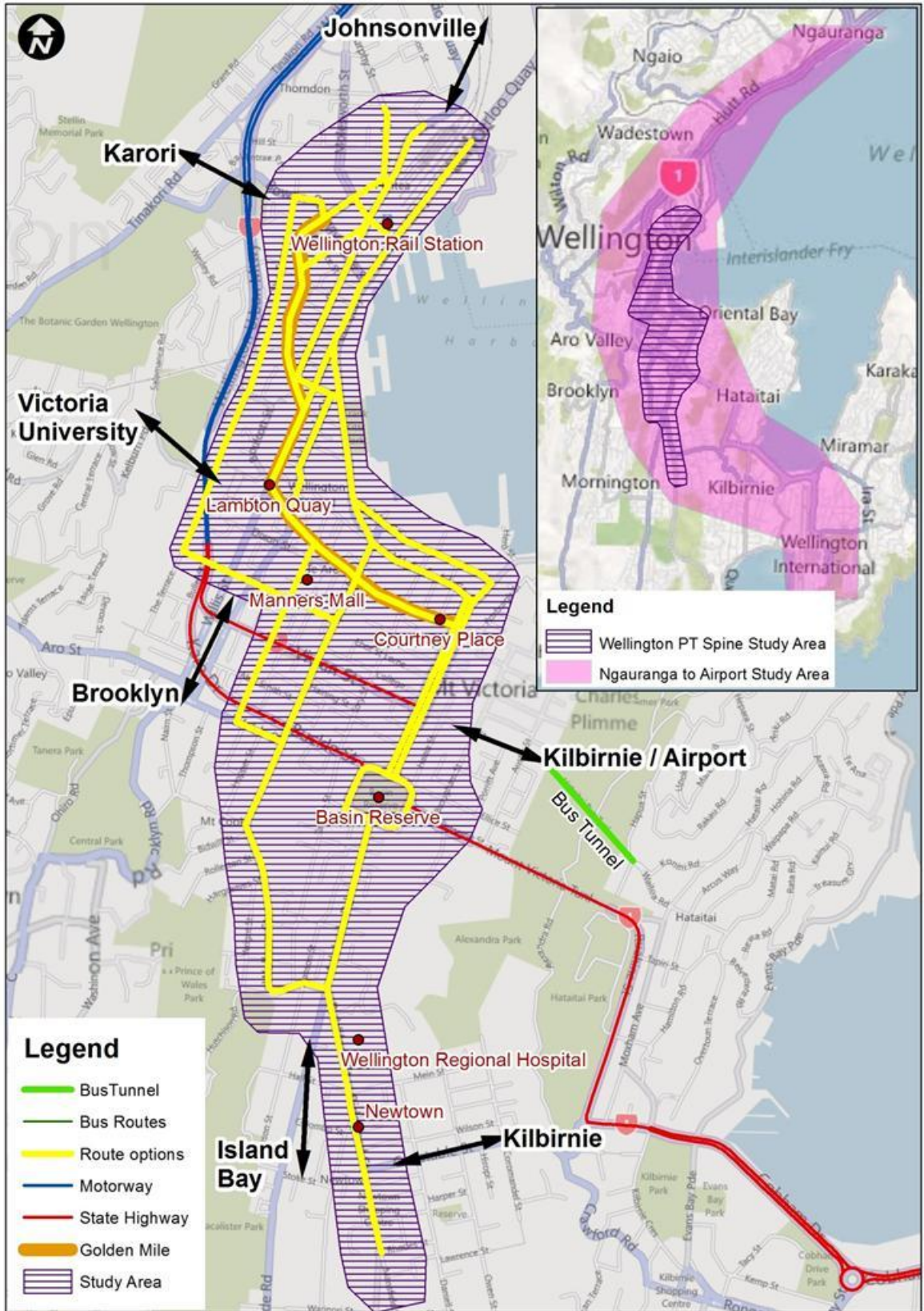


Figure 1 Study Area

3.0 STUDY APPROACH AND MILESTONES

This section of the report outlines the main aspects of the overall study approach, and how these will be reported on, through Key Deliverables and through reaching milestones.

3.1 Study Approach

The study approach has to address all of the significant requirements of the Study Vision and Purpose, which include:

- *Assess merits of a range of options;*
- *High quality, high frequency public transport system;*
- *Long-term (strategic) public transport system;*
- *Consider connections to the north and south-east;*
- *(Supportive of) Urban intensification and urban development strategies;*
- *(In ways that are) Economic, environmental and social sustainability.*

It is through the Study approach that these requirements will be directly addressed. The study approach achieves this in several ways:

- 1) Use of the Treasury Better Business Case framework. The BBC is being used as an organising structure to help guide the analysis undertaken in the Study.
- 2) Identification and evaluation of a range of options and routes within the Study area. The approach considers the range of options through a potential list, long-list, medium-list and short-list. In broad terms these lists of options pass through four evaluation stages, namely a Client workshop to apply a “fatal flaw” test (moving from potential list to long list), a strategic evaluation (moving

from long-list to medium-list), a technical evaluation (moving from medium-list to short-list) and a contextual evaluation of the short-list itself.

- 3) An International review of PT systems, which identifies the key success factors through a number of international case studies, some of which are directly comparable to the Wellington context.
- 4) A range of transport models (WTSM strategic model, WPTM public transport model, SATURN), which is part of the technical evaluation of the public transport system and the wider transport system.
- 5) Urban design, land use and patronage demand studies, which also inform the transport modelling.
- 6) An environmental assessment and a social assessment to help identify those options that contribute positively towards environmental and social sustainability objectives.
- 7) Ongoing community and stakeholder engagement, throughout the entire study.

In summary, the Study approach is made up of several key components which directly address the requirements of the Study purpose and objectives, and which consequently give effect to the Study vision.

Table 1 overleaf presents a summary of the main considerations of the Study approach (e.g. cost estimation) and how they will be applied at various stages of options being evaluated.

The remainder of Section 3 describes in more detail the various components that make up the overall study approach.

Table 1 Summary of how the Main Considerations will apply at Various Option Evaluation Stages

Option Evaluation Stage	Process	Business Case Requirements	International Review Inputs	Patronage Demand Modelling	Urban Design and Land use	Concept Design of Options	Social and Environmental Assessment	Cost Estimation	Stakeholder Communication & Community Engagement
Potential list of options	Develop broad list of options. Rule out impractical long list options (Fatal Flaw Test) to arrive at feasible long list options (approximately 12 options)	<ul style="list-style-type: none"> Treasury BBC guidelines recommend that potential options with fatal flaws should be discounted e.g. for financial, political, legal, or impractical reasons 	<ul style="list-style-type: none"> Use international review material to provide evidence around logic mapping decisions 	<ul style="list-style-type: none"> Not applied 	<ul style="list-style-type: none"> Not applied 	<ul style="list-style-type: none"> Not applied 	<ul style="list-style-type: none"> Not applied 	<ul style="list-style-type: none"> Not applied 	<ul style="list-style-type: none"> Targeted stakeholder engagement to better understand barriers to the use of public transport and key factors that make up a high quality public transport system
Long list to medium list (Completion of this coincides with Milestone 3)	Conduct multi-criteria strategic assessment to reduce the long list to a medium list (approximately eight options)	<ul style="list-style-type: none"> Summary of investment objectives, business and service needs, will inform Long List MCA strategic assessment criteria Test programme Business Case outcomes against medium list 	<ul style="list-style-type: none"> Review and refinement of long list from international experience 	<ul style="list-style-type: none"> High level assessment based on person trip demands from WTSM (2006) with updated future land use forecasts 	<ul style="list-style-type: none"> Not applied, except for assessment against future land use through patronage and demand modelling 	<ul style="list-style-type: none"> No concept designs are proposed. However, a high level assessment based on constraints and physical and operational requirements of the network 	<ul style="list-style-type: none"> No social or environmental assessment is proposed. However, high level assessment based on any significant adverse environmental impacts 	<ul style="list-style-type: none"> No cost estimation is proposed. However, a high level assessment on financial viability of options based on international review findings 	<ul style="list-style-type: none"> Engagement relates to informing stakeholders of the results of initial engagement, the international review and the strategic criteria used to test the long list of public transport options
Medium list to short list (Completion of this coincides with Milestone 4)	Further analysis of eight options to inform additional rationalisation. More detailed level assessment based on concept design, cost estimates, land use and urban design and traffic modelling analysis	<ul style="list-style-type: none"> Evaluation against technical and planning criteria 	<ul style="list-style-type: none"> As required to inform medium list options. High level CAPEX and OPEX estimates from international review to inform cost estimation for medium list evaluation 	<ul style="list-style-type: none"> Assessment of modes against KPI's with forecasted WTSM (2011), WTPM WTM 	<ul style="list-style-type: none"> Identification of maximum level of intensification and potential for Transit Supportive Development Car parking capacity assessment Identify ways in which designs should be influenced with WCC urban designers 	<ul style="list-style-type: none"> Scope out options based on design and operational criteria developed from the international review 	<ul style="list-style-type: none"> Effects based assessment to identify the merits and weaknesses of each option (as part of the MCA) 	<ul style="list-style-type: none"> Capital and operational costs will be estimated to compare options at an elemental level. The estimate will be based on a broad definition of scope and functionality 	<ul style="list-style-type: none"> Engagement is anticipated with a narrower group of stakeholders. Stakeholders would be informed of the option specification, and costing results
Evaluating short listed options (Completion of this coincides with Milestone 5)	Detailed evaluation of short listed options (maximum four). Higher level of concept design, cost estimation, land use and cost estimation	<ul style="list-style-type: none"> Second more detailed evaluation against technical and planning criteria, including EEM evaluation 	<ul style="list-style-type: none"> As required to inform assessment of short listed options 	<ul style="list-style-type: none"> Assessment of modes against KPI's with forecasted WTSM (2011), WTPM and SATURN model (for more detailed assessment of road network) 	<ul style="list-style-type: none"> Planning assessment of short listed options. Identify land use policies to deliver intensification which supports public transport mode. Develop land use progression plan 	<ul style="list-style-type: none"> Concept sketches of preferred routes and geometry to assist in more detailed costing and land acquisition requirements. 	<ul style="list-style-type: none"> More detailed effects based assessment to inform short listed options 	<ul style="list-style-type: none"> Capital and operational costs will be refined based on a detailed definition of scope and functionality including 1:1000 scale plans, typical cross sections and 1:500 scale drawings of critical details 	<ul style="list-style-type: none"> Engagement with stakeholders will seek to confirm that the evaluation of the short-listed options is appropriate considering relevant social, environmental and economic issues

3.2 Treasury Better Business Case

The Treasury Better Business Case framework is being used as an organising structure to guide the analysis undertaken in the Study.

3.2.1 Why use the Better Business Case Framework?

The Better Business Case (BBC) Framework was introduced in 2010 in response to the growing pressure on Government funding and the need to focus on making the right investment while getting the best value possible. Government projects and programmes over \$25 million must apply the BBC framework as part of the process of seeking Cabinet support and funding.

The Framework is also being applied to a growing number of projects outside the Government where the proponents are likely to seek Government funding.

3.2.2 What is the Better Business Case Framework?

The BBC Framework has introduced a significantly higher test for planning and delivering capital projects than has existed in the past. It requires more explicit and thorough analysis and clarity of logic as well as argument.

The BBC process seeks to provide explicit assurance that the proposed investment:

- is supported by a robust case for change – the strategic case;
- maximises value for money – the economic case;
- is commercially viable - the commercial case;
- is financially affordable – the financial case; and
- is achievable – the management case.

The strategic case – the purpose of the strategic case is to demonstrate that the investment proposal is well-aligned to government policy objectives, regional policy objectives and to organisational strategy. The strategic case should provide a robust and well-evidenced case for change and clear specification of the investment objectives and required service needs. The focus must be on service needs driving capital investment, not the other way round.

The economic case is intended to demonstrate that all available options for delivering the required services and meeting the investment objectives have been thoroughly analysed. The preferred options should represent the best value for money from a national economic perspective and under varying future scenarios.

As part of the economic case a Benefit Cost Ratio will be produced in accordance with NZTA's Economic Evaluation Manual (EEM). The economic evaluation will therefore attempt to meet both the needs of the Treasury BBC framework and NZTA's requirements for a feasibility study, to the extent that sufficient information is available.

In accordance with the EEM Volume 2, the economic evaluation will take account of capital, maintenance and operating costs, fare revenue, PT user benefits and road user benefits from decongestion.

The commercial case – The purpose of the commercial case is to show that the preferred option will result in a transparent, accountable and sustainable procurement arrangement that achieves desired outcomes and provides value for money.

The financial case shows that the preferred option can be funded and is affordable to both the Government and the organisation under various future scenarios.

The management case – the purpose of the management case is to demonstrate that the preferred option can be delivered successfully using best practice project and programme management. That includes setting processes in place for change, risk and contract management, as well as managing the on-going delivery of expected benefits.⁶

The five cases are not discrete business case deliverables. They are embedded into the business case development process and provide an organising structure for the underlying analysis and communications. There are however a number of distinct stages - the Study (feasibility study) is part of the start-up stage, and the other stages are illustrated below.

Project Methodology	Pre-project	Start-up	Initiate		Implement	Close
Better business case deliverables	Strategic Assessment	Indicative Business Case	Detailed Business Case	Implementation Plan	Implementation	Benefits realisation
Procurements process		Plan		Source	Manage	

⁶ Better Business Cases for Capital Proposals Toolkit: Overview. The Treasury. 8 July 2011 (p5-6)

3.2.3 How Will the Better Business Case Framework be Applied to the PT Spine Study?

Given the uncertainty about the possible cost implications and the point in time at which investment might be undertaken, the BBC approach will be used to provide an organising structure to guide the analysis undertaken in the Study. An indicative business case will not be completed as part of the Study, but a clear step will be taken towards understanding the options and possible solutions. This will position Greater Wellington to discuss an indicative business case with the Government at a later stage, should it be needed.

For the purpose of the Study it has been decided that at a corridor the strategic case for change has already been determined. The following are some of the key assumptions underpinning the scope of the Study:

- that an effective solution for the Ngauranga to Airport corridor requires there to be an effective PT Spine from the railway station to the Wellington Regional Hospital; and
- that the PT Spine operates as part of an overall bus network and provides a high quality rapid transit service within that network.

While the problem definition that was adopted for the Ngauranga to Airport study has been reviewed as part of scoping this study, the remainder of the case for change for the PT Spine will be compiled from existing material including:

- Government Policy Statement on Land Transport Funding 2012/13-2021/22;
- Regional Land Transport Strategy 2010-2040;
- Regional Public Transport Plan 2011-2021; and
- Ngauranga to Airport Strategic Study: Problem Framing Report.

3.2.4 Being Clear About What Problem Needs to be Fixed

The problem definition lies at the heart of the BBC's Strategic Assessment.

Reliability of travel time through the city is not the problem but a symptom of the problem that indicates that things are not working as intended. This symptom has a root cause that any new investment proposed must resolve. The root cause or problem may be, for example, too many buses scheduled to travel at the same time through the central business district inside the constraints of the current PT routes.

For the Study, the problem definition focuses at the scale of the PT Spine - not network or systems wide. The impact of including additional investment beyond or linked to the Spine can be considered by using analysis such as sensitivity testing.

A working problem definition was developed and included in Section 2.5. It will be important that the Study is able to properly test this working definition and other aspects of the strategic case for change if a full indicative business case is required in the future.

3.2.5 Compiling the Strategic Case for Change, Business Needs and Investment Objectives

As noted above, this Study has taken the strategic case for change from work undertaken previously in the Ngauranga to Airport study. This is also the case for the investment objectives and business needs.

Along with the problem definition, these form the starting point for any future business case.

As part of the Study, this existing work will be compiled in a way that can be more readily compared to the BBC framework.

3.2.6 Programme Business Case

Since the Study commenced Treasury has introduced a Programme Business Case approach. Following two workshops with Treasury Greater Wellington has decided the Study should adopt a Programme Business Case rather than a Project Business Case which was originally envisaged.

To this end Greater Wellington will undertake a Programme Strategic Assessment including 3 investment logic mapping workshops resulting in a programme problem definition, benefit definition and solution definition. The outcomes of these workshops will be tested against the Study Medium List of options to ensure it is consistent with the Programme Business Case approach and, if needed, changes to the list will be made

3.3 The Option Tests

The option tests that will be assessed for the three stages (long, medium and short) of evaluation are identified in Table 2.

Table 2 The Option Tests

	Transport Network Scenarios		Land Use Scenarios			
	Do-Minimum	Base Case	Low Growth	Medium Growth	High Growth	Transit Supportive Development
Long	√				√	
Medium	√	√		√	√	√
Short	√	√			√	√

3.3.1 Transport Network Scenarios

Do-Minimum

The Do Minimum must consist of committed projects (as defined in Table 3), and provide a reasonable Level of Service.

The Do-Minimum will be confirmed at each stage (medium list and short list) through transport modelling.

Table 3 Do Minimum Transport Network

Network Changes 2006 to 2011			
Rooding Changes		PT Changes	
1) Inner City Bypass 2) Rugby Street/Adelaide Rd intersection 3) Dowse to Petone Interchange 4) MacKays Crossing overbridge 5) Otaki Roundabout 6) Lindale Grade Separation 7) Waiohine Bridge		1) Rail extension to Waikanae and station upgrade 2) Muri Station closed 3) Bus lanes and priority (Adelaide Road, to Karori Tunnel, to Ngaio lights, parts of Willis Street and Lambton Quay, Manners Mall and priority at Courtenay Place) 4) 20% public transport fare increase (to reflect the observed increase in fares at 2006)	
Network Changes 2011 to 2026			
Wellington Roads of National Significance changes	Other Rooding Changes	Public Transport Changes	Other Changes
1) Basin Reserve (grade separation). 2) Inner City Bypass Upgrade and Ruahine Street Improvements (details required from NZTA). 3) Aotea to Ngauranga Gorge (details required from NZTA).	1) Rimutaka (Muldoon's) Corner Easing (modelled as a speed increase). 2) SH2/58 Grade Separation.	1) The effects of rail station upgrades, park-and-ride carparks, integrated ticketing, real time information systems. 2) Bus lanes (those likely to be completed by 2026 to be confirmed by WCC). 3) Improved rail rolling stock with higher speeds. 4) Train services at 4 trains/hour in peaks and 2 trains/hour in inter-peak, except Wairarapa the same as existing.	Effects of TDM include a 5% reduction in commuting trips by car to Wellington CBD, and 90% transferred to PT.
Assumptions/Notes			
The RoNS included are based on including the RoNS within the Study area. This is consistent with the Ngauranga to Wellington Airport Corridor Plan and has schemes which are likely to provide a suitable minimum level of service, and meet EEM requirements (refer section 2).	The rooding and PT changes to be included in 2026 do not include changes that have no impact on the model (e.g. improvements to rail north/south junction) or are handled in another way (e.g. double tracking).	It is recommended that the new Wellington Bus Review network is not included in the Base Case. This will be tested and reviewed prior to confirming the Do Minimum for Step 2 and 3. However, for the Treasury Better Business Case it is considered that the Wellington Bus Review would realistically need to be part of the base case. This is because it is realistic to assume that steps will be taken within the long term horizon of this study to address some of the current inefficiencies of the bus system.	

*To be confirmed through transport modelling so a reasonable level of service is provided

3.4 Base Case

The Base Case will include options that are likely to go ahead but are not currently committed. For example, this may include the Basin Reserve grade separation, and/or Ruahine four-laning. It will also consider whether the Wellington City Bus Review will need to be part of the Do Minimum as opposed to the Base Case (to provide a reasonable level of service). The Base Case will be tested as a sensitivity test for the medium and short list tests.

3.4.1 Sensitivity Tests

In addition, to the Base Case it may also be appropriate to undertake additional sensitivity tests. This could include the following RoNS:

- 1) Cobham Drive to Mt Victoria Tunnel;
- 2) Terrace Tunnel Duplication;
- 3) Transmission Gully;
- 4) MacKays to Peka Peka;
- 5) Peka Peka to Otaki;
- 6) Otaki North to North of Levin; and
- 7) Petone to Grenada.

The extent of the sensitivity tests to be undertaken will be agreed with Greater Wellington prior to the medium list testing.

3.4.2 Land Use Scenarios

An opening year of 2030 has been assumed for Study option assessments to allow evaluation of benefits within the Study horizon, which extends out to 2040. Two interim years will be tested to allow estimation of benefits over time.

Presently there are three land use scenarios available; low, medium and high growth. The high growth scenario has been used in the Project Feasibility Report (PFR) for the Wellington RoNS and medium growth has been used for MacKays to Peka Peka (M2PP); this results from the view that regional growth in the last five years has been focussed on Wellington at the expense of places like Kapiti.

It is proposed that both the medium and high growth scenarios are used with the Do Minimum network for the medium list assessment. This will provide upper and lower indicators for consideration in the Study strategic evaluation.

The future land use assumptions are to be reviewed as part of the WTSM update project in consultation with study partners, and will be available for the later stages of the Study.

3.5 Milestone 1: Inception and Scoping Report

Milestone 1 comprises issue of this report, the Inception and Scoping Report.

The Inception and Scoping Report will describe the overall approach and the methodology for the individual work streams.

3.6 Milestone 2: International Review

The purpose of the international review of public transport systems is to learn from the implementation of comparable systems overseas. The findings of the review will provide input into the option evaluation, design, operation and costings of public transport options so that the Study is informed by the successes and failures of comparable approaches elsewhere.

The international review will define a range of characteristics for the Study including:

- 1) Modal characteristics i.e. capacity by public transport type, peak hour capacity, design characteristics (e.g. operating speed, turning radii), capital expenditure (per km), cost of vehicle, technology requirements.
- 2) Land use transformation/redevelopment (property value uplift) per public transport mode.
- 3) Constraints on the capacity of systems (e.g. corridor capacity, terminal capacity, depots).
- 4) How different modes might perform in environments such as Wellington.
- 5) What planning restrictions (such as car park limits) should accompany new developments to ensure successful utilisation of the public transport network.
- 6) Design issues that have previously been experienced (by mode).
- 7) Operational issues that have been experienced by mode, and by multi-modes of transport.
- 8) General characteristics in successful systems and unsuccessful systems of tram / bus operation in non-dedicated space (i.e. in general traffic).
- 9) How has successful integration been achieved between bus (and other?) corridors and cycleways or lanes.
- 10) How the demand for public transport responds to prevailing land use patterns, and in turn what infrastructure/services should be provided in response to the demand for public transport.
- 11) What are the range of procurement and governance models for high quality public transport schemes, their financial impacts and other strengths and weaknesses.
- 12) What are the impacts of variable pricing including the differential cost of operating an off peak lower capacity service and ramping up a high capacity service at peak times.

This range of information will be examined in approximately thirty case studies, which have been chosen due to their similarity to the Wellington environment from Australasia, North America, and Europe. These case studies are described in Appendix D.

The International Review Report will be prepared in two stages. A base report will be completed during February 2012 so the relevant information can be fed into the evaluation of the long list of options. Further, annexes to the report may be added if further research is required to inform detailed matters as they emerge throughout the Study, i.e. at the medium and short list stages.

3.7 Milestone 3: Completion of Long List Evaluation

3.7.1 Option Evaluation

A key element of the evaluation will be the initial identification of the options and the subsequent development of these and refinement throughout the Study.

A three sieve approach will be used for option evaluation. The first process will use the strategic and business needs work, the second uses the strategic test combined with theoretical and observed performance of each option, and finally these two tests will be combined with commercial, management and financial criteria. This approach is illustrated in Figure 2

The methodology for the evaluation of each level of option definition (long, medium, and short) is outlined in Section 3.7.2 to Section 3.9. The following areas of the methodology are explained in Section 4.1 to 4.6:

- Concept Design of Options;
- Cost estimation;
- Patronage demand modelling;
- Urban Design;
- Land use assessment; and
- Car parking assessment.

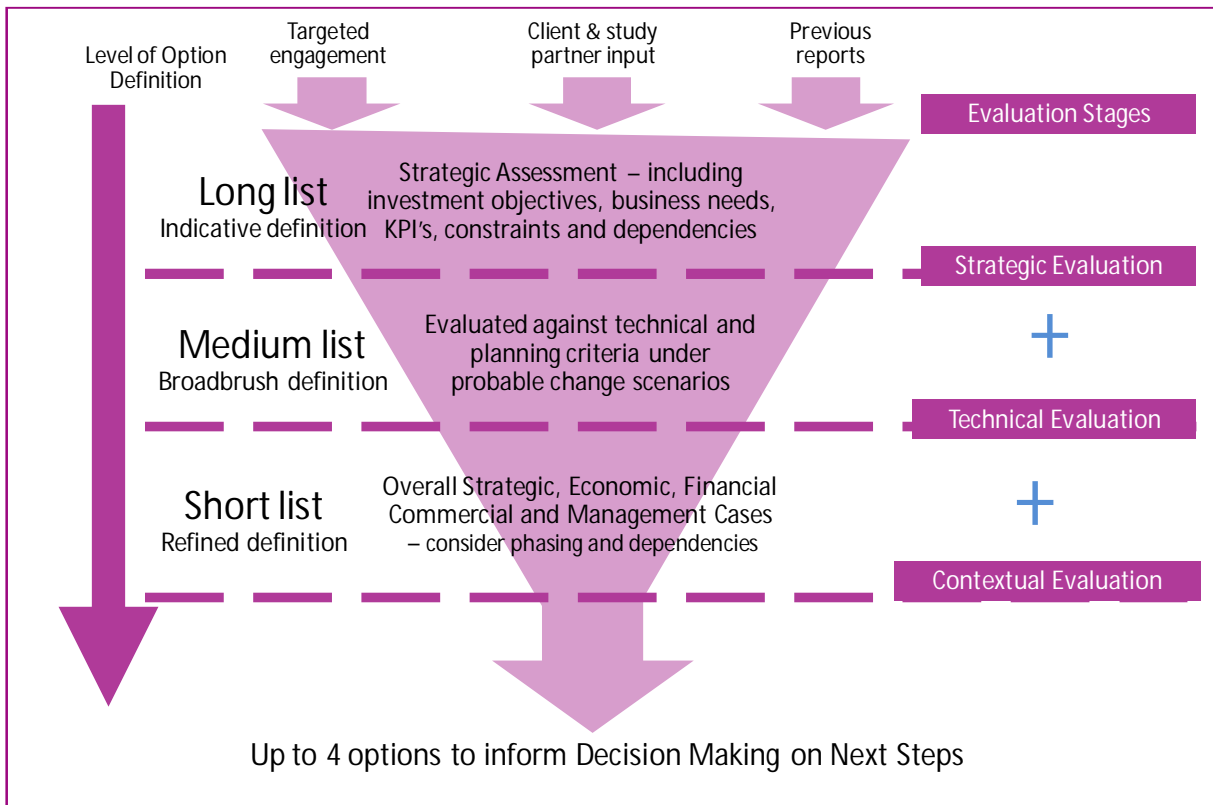


Figure 2 Treasury Better Business Case (BBC) Framework

3.7.2 Long List to Medium List Evaluation

Description
<ul style="list-style-type: none"> - Business case: including summary of existing investment objectives, business and service needs, KPIs, constraints and dependencies. Review of long list against summary of strategic context and business/service needs. - Technical: Long list development of Options. Set out underlying parameters for the Study e.g. problem definition, study vision, study area. First sieve of long list of initial options against fatal flaw criteria.
Inputs:
<ul style="list-style-type: none"> - Problem definition - Agreed summary of existing strategic context and business/service needs. - International review information on life cycle cost, service performance, etc. - Do-Minimum definition. - Transport model outputs – person trips. - Long list of options (based on modes and routes).
Objectives
<p>Fatal flaw assessment to filter out options that do not meet the key business or service requirements and identification of those options which perform poorly against other business or service requirements.</p>
Methodology
<ul style="list-style-type: none"> - Agree scope of analysis (which is as outlined in this Project Inception and Scoping Report). - Prepare potential list of options (as outlined in this Project Inception and Scoping Report). - Potential list of options reviewed and impractical options discounted to produce long list of options. - AECOM to develop fatal flaw and strategic evaluation criteria. These will be compiled primarily using summary of existing strategic context and business/service need. - Verification of fatal flaw and strategic evaluation criteria with the TWG in a workshop environment. - First sieve of long list of options to be undertaken by AECOM against agreed evaluation criteria. This will provide evidence on why options should or should not be pursued, drawing on information from the international review, traffic modelling, recognised performance standards, summary of strategic context, business/service needs, and background information. - Verify evaluation of long list options with TWG, and agree options worthy of consideration for medium list.
Evaluation process to proceed from long list to medium list
<ul style="list-style-type: none"> - The core of the criteria will be developed from the strategic case for change as well as already identified business and service needs. - A number of the criteria will be fatal flaw criteria (if they were not met then an option would be automatically off the list). - The criteria will need to be applied consistently to each option (the international review will assist to collect relevant information) and the assessment based on high level data, recognised standards of performance, and fact.
Outputs:
<ul style="list-style-type: none"> - List of Medium Options for evaluation and audit trail of decisions made. - Technical Note outlining medium list options worthy of consideration and detailed approach to evaluate these options.

3.8 Milestone 4: Medium List to Short List Evaluation

Description
<ul style="list-style-type: none"> - Business case: Evaluate against technical and planning criteria under probable change scenarios. - Technical: Medium list definition of options. Second more detailed level of assessment based on concept design, high level CAPEX and OPEX elemental rate cost estimates, land use and urban design assessment, and traffic modelling.
Inputs:
<ul style="list-style-type: none"> - Medium list of options. - Transport model (medium list options). - Wellington land use change and growth scenarios. - Broad Definition of option scope and impact based on a minimum 1:2000 scale plans and typical cross sections. - High level CAPEX and OPEX estimates based on elemental rates from the international review
Objective
Eliminate options that do not meet criteria set for technical thresholds, investment objectives, and business needs.
Methodology (To be refined and detailed prior to medium list evaluation being undertaken)
<ul style="list-style-type: none"> - AECOM to develop initial criteria for the multi-criteria analysis. - Verification of the multi-criteria evaluation with the TWG in a workshop environment. - Undertake land use assessment to assess the dependencies between land use patterns/densities and other transport infrastructure and trigger points need to support one another. - Compare option performance through traffic modelling. - High level cost estimates based on elemental rates for CAPEX/OPEX from international review and adjusted for local conditions - Scoring of medium list to be carried out initially by AECOM. - Verification of medium list scoring with TWG through a workshop environment.
Outputs:
<ul style="list-style-type: none"> - Short List of Options and audit trail of decisions made - Technical Note outlining short list options worthy of consideration and detailed approach to evaluate these options.

3.9 Milestone 5: Short List Evaluation and Next Steps in Decision Making

Description
<p>Business Case: Overall strategic, economic, financial, commercial and management cases - phasing and dependencies considered.</p> <p>Technical: Short list definition of options (up to four options). Third more detailed level of assessment based engineering assessment, more detailed costs, and more detailed modelling. This will be at an adequate level to permit simplified economic benefit cost assessment.</p>
Inputs
<ul style="list-style-type: none"> - Short list of options. - Transport models (short list options). - Wellington land use change and growth scenarios. - Detailed Definition of option scope and impact including 1:1000 scale plans, typical cross sections and 1:500 scale plans of critical areas. - Estimates of revenue and other funding sources. - Estimates of Capex/Opex based on a schedule take off using local construction rates and rates from international review - Other projects and timing
Objective
<p>Provide Greater Wellington and stakeholders with more detail and context around short list options to enable informed debate and decision making about which options to take forward to the scheme assessment phase.</p>
Methodology (To be refined and detailed prior to short list evaluation being undertaken)
<ul style="list-style-type: none"> - Detailed engineering assessment of short listed options. - Refine transport models (WTSM future, WTPM future, SATURN) and test short listed options. - Refine capital and operational cost estimates. - Refine options details and assumptions, including consultation feedback and information on timing of other projects. - NZTA EEM assessment including indicative BCRs to identify relative economic merits of the options. This will also provide the input to the Treasury BBC economic case. - Develop Preliminary Business Case (incorporating key components of the Treasury Indicative Business Case – strategic, economic commercial, financial and management).
Outputs
<ul style="list-style-type: none"> - A comparative assessment of the short-listed options, based on technical and transport planning and business case requirements. - Sequencing plan of public transport development of the spine showing decision points and dependencies. - Final reporting

4.0 STUDY WORKSTREAMS

This section of the report identifies the main workstreams (often technical) of the study, and how they relate to the Option Evaluation Process.

4.1 Concept Design of Options

Medium and Short List Evaluation

The concept design of options will be considered in relation to the strategic and business requirements established earlier in the project

Concept designs will build the level of information needed to properly assess options. The result is that promising transport project options are advanced at the expense of less robust alternatives.

4.1.1 Concept Design: Medium List

Initially, options in the medium list will be scoped out at a high level based on design and operational criteria derived through the international review process. Assumptions will be established for each option around factors such as:

- vehicle operating speeds and capacity;
- service frequencies;
- typical stop spacing; and,
- how the wider PT network would operate for that option e.g. to what extent would a LRT option involve transfers from bus to LRT.

This information together with route length data will enable end to end journey times to be calculated so that the number of vehicles and operating staff needed can be determined. In addition, infrastructure requirements such as track/bus lanes, stops, maintenance facilities, etc, will be broadly scoped, to enable comparative capital and operating/maintenance cost estimates to be produced. These estimates will be prepared using typical ranges of costs for the main infrastructure and vehicle components of similar systems derived from the international review. At this stage, route specific implementation issues, such as utility diversions, will not be estimated in detail, but allowances based on typical international experience will be used.

4.1.2 Concept Design: Short List

More detailed concept designs will be produced for the shortlist options. The design criteria for each option, established at the medium list stage, will be reviewed and expanded if necessary to include factors such as:

- minimum horizontal and vertical curvature;
- maximum gradients;

- typical vehicle length, height and width; and
- typical construction requirements, such as depth of excavation for track/carriage ways.

This will enable the following concept design drawings to be prepared for each option:

- 1 to 1000 scale plans showing the proposed route, track/carriage way alignment and the locations and footprints of proposed stops, interchanges and termini. These plans will be overlaid on aerial photography so that impacts with existing roads, buildings and other infrastructure such as buried services can be identified.
- Typical cross sections (1 to 500 scale) at significant changes of direction or significant change in corridor width along the route. These cross sections will indicate proposed track/ corridor positions (e.g. in centre or side of the road) together with space allowances for pedestrians and other road users where there is sufficient room available in the corridor. No specific attempts will be made to mitigate adverse impacts of the proposed option on existing traffic and infrastructure during the preparation of the concept designs but such impacts will be considered in the short list evaluation.

The capital and operating cost estimates produced at the medium list stage will be refined and expanded to provide a greater level of detail for the short listed options. Building block level schedules of quantities will be prepared for each option, based on the major cost factors identified through the international review. Particular attention will be paid to estimating site specific impacts of each route such as diversions of buried services and land acquisition requirements. Major risks relating to each option will be identified and their impact assessed so that an appropriate level of risk contingency can be estimated.

In addition to estimating the direct costs of operating and maintaining each option, such as staff and energy costs, etc, assumptions will be made as to an appropriate level of organisational overhead costs to be included. This may vary between the options, for example bus options may assume that any additional buses and drivers would be supplied by existing bus operators, whereas a light rail system may require a complete new operating and maintenance organisation to be established.

4.2 Transport Modelling

4.2.1 Long, Medium and Short List Evaluation

The various transport models will be used to address the following questions:

- what are the main geographical markets in the CBD served by public transport?
- what is the size of these markets and how are they split between alternative transport modes (car, rail, bus, walk, cycle)?
- how will these markets grow in future?
- what is the potential for diversion from existing modes to a future public transport spine?
- how sensitive is the level of that diversion to the public transport spine?
- what are the benefits and costs for all modes from changes to the public transport spine?

modelling, however, the future WTSM (2011) and WPTM models will not be delivered until May 2012. An alternative methodology has therefore been developed by AECOM at Greater Wellington's request which uses the existing WTSM (2006) with updated future land use forecasts for the long and medium list tests. This will allow the Study to progress to meet the February 2013 final deliverable. The WPTM base year model will be available for use in March 2012 so there is the opportunity to use this model for medium list testing if there is a need to differentiate between similar options.

The modelling for short list options is reliant on the delivery of the future WTSM (2011) and WPTM and the availability of the Wellington Transport SATURN Model (WTM).

Table 4 displays the proposed matrix of transport modelling requirements. The original tender proposed the use of the updated WTSM (2011) for all stages of

Table 4 Modelling Detail Matrix

Modelling Detail	Long List	Medium List	Short List
Number of options	Large	Small	Up to four options
Analysis of base scenario model outputs	High reliance on future base scenario results	As a comparative for options	As a comparative for options
Use of the transport models to test options	Only if absolutely necessary	Required	Required
Level of detail of analysis	Region wide, catchment and corridor based	City, catchment, corridor and network based	City, catchment, corridor, network and operational
Reliance on model results	Indicative	Medium	High
Land use scenarios	Single	Multiple	Single or staged
Models to be used	Long List	Medium List	Short List
Person trip demand	Existing WTSM (2006) with updated forecast	Existing WTSM (2006) with updated forecast	WTSM (2011) future year forecasts
Public Transport assignment	N/A	WPTM (base year model potentially available)	WPTM future year forecasts
Traffic assignment	N/A	WTSM (2011)	WTM

Figure 3 illustrates the broad methodology of testing the options with the transport models, however, this is described in more detail below.

4.2.2 Long List Testing

The long list assessment will use the WTSM (2006) with updated future land use forecasts to analyse travel at a person trip level.

There are two fundamental questions to be answered by the long list assessment: Can the option provide adequate people moving capacity for future potential demand; and, is there adequate demand to justify the option? This is intended to provide an indication of the potential for demand to support options rather than to quantify all of the benefits of those options.

Current and future year person trip demand travelling to and through CBD catchment area will be analysed to gauge the demand for travel by mode (bus, rail, car). The capacity of these modes will be compared against potential options to improve public transport. As an example, we will assess whether MRT carrying capacity is required to move the passenger demand from the railway station to a screen line at Jervois Quay, Oriental Parade or through to Newtown. In particular an assessment will be made as to whether the future mode split supports specific options or provides insufficient or excess capacity given the demand.

If the capacity of an option significantly exceeds future demand then the required mode split to support that option will be calculated. A review of this required mode split will be required to ensure that it is sensible before any further testing.

To assess how different land use scenarios could affect potential demand, the matrices will be factored to take into account potential intensification of land use density along the corridor. This sensitivity testing will assess whether there is the potential for intensification to support the option.

4.2.3 Medium and Short List Testing

The methodology for medium and short list options will be confirmed once the long list testing has identified options and it is understood how the WTSM (2011), WPTM and WTM can be used. The options will be tested in these models and KPIs extracted.

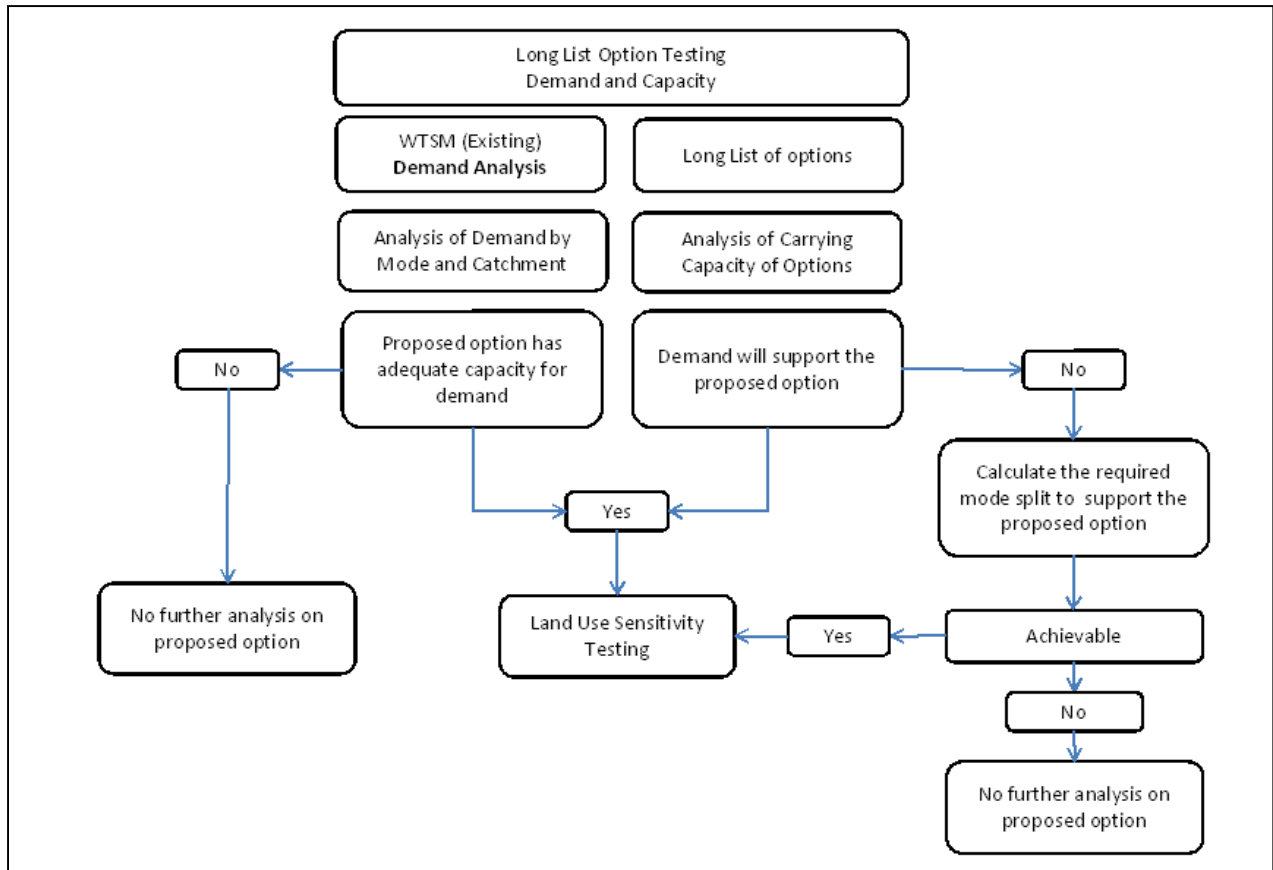


Figure 3 Option Testing Methodology

Inputs: Long list WTSM (2006). Medium list WTSM (2011) future forecasts and WPTM base year model. Short list WTSM (2011), WTPM and WTM. Tests to be run by the modelling consultant. AECOM to assess models in term of appropriateness of purpose and scope modelling requirements.

Outputs: Agree outputs to assess the operation of each option, inputs to multi-criteria analysis, inputs to economic evaluation.

4.3 Urban Design

4.3.1 Medium and Short List Evaluation

An understanding of the character and form of the corridor and of the wider context within which it sits will be developed, including a broad appreciation of the heritage of the area. This will include aligning the solutions with relevant strategy and associated implementation plans such as 'Towards 2040: Smart Green Capital' and 'The Central City Framework'.

These factors will influence the future form and design of the corridor and will be integrated within the development and evaluation of the medium and short listed solutions in liaison with WCC urban designers.

Inputs: WCC Urban Design Vision and Frameworks.

Outputs: Concept design and input to costings.

4.4 Costing

4.4.1 Medium and Short List Evaluation

As more detail becomes available during the option development, the estimates based on elemental information will be updated and superseded by more detailed estimates that reflect the improved definition of the option:

- At the strategic evaluation stage, i.e. the long to medium list of options no cost estimate is proposed as the evaluation will be determined by other criteria.

- the cost estimates for the medium list of options will be at an elemental level in order to compare options. The cost estimates will be based on a broad definition of scope and functionality including a scale plan with typical cross sections. Elemental rates will be derived from international reviews and adjusted for local conditions. Risk contingency will be based on a general contingency.
- The cost estimates for the short list of options will be refined by a detailed definition of scope and functionality including scale plans, typical cross sections and scale drawings of critical details. The cost estimates will be based on a schedule take off using rates derived from similar construction works and international reviews. The risk contingency will be assessed on a general contingency.

Inputs: Concept drawings, service frequency, routes and modal type.

Outputs: Capital and operational costs to feed into multi-criteria analysis and economic evaluation.

4.5 Land Use Assessment

4.5.1 Medium and Short List Evaluation

The purpose of the Land Use assessment will be to understand the interdependencies between land use patterns/densities and other transport infrastructure, and also to understand what the trigger points are to support one another.

This assessment will be undertaken for the medium listed options, and the results will be captured in a Land Use Report with an accompanying Land Use Action Plan.

The approach to the Land Use Assessment is as follows:

Step 1: Land use Policy Assessment
<p>Purpose: To understand current land use planning parameters / constraints and opportunity for growth along the Study corridors.</p> <p>Key Tasks:</p> <ul style="list-style-type: none"> - Assess land use policies on citywide basis, including planning policies (such as height limits and floor to area ratios), parking policies (such as parking minimums and maximums), and identify growth nodes and other policies that have a major influence on development. - Prepare thematic map which conveys the results of the citywide land use and policy assessment.
Step 2: PT Triggers Assessment
<p>Purpose: To understand the interdependence between land use patterns and public transport infrastructure and services to assist in identifying Transit Supportive Development (TSD) locations. For TSD definition refer to footnote below this table.</p> <p>Key Tasks: Literature review to define the inter-relationships between land use and public transport.</p>
Step 3: Corridor suitability for Transit Supportive Development
<p>Purpose: To identify which segments along the corridor are appropriate for enhanced growth as Transit Supportive Developments</p> <p>Key Tasks:</p> <ul style="list-style-type: none"> - Define maximum intensification permitted in the corridor under existing land use policies. - Assess existing city strategies and aspirations relating to the Study area (e.g. Adelaide Road Framework) to see if they contain elements that will support Transit Supportive Developments. - Prepare a SWOT analysis which will identify key areas for local level assessment based on the outcomes of the SWOT and GIS analysis. - Recommend suitability of Transit Supportive Developments.
Step 4: Local Level Assessment for Transit Supportive Developments
<p>Purpose: Undertake a more specific assessment of the suitability of Transit Supportive Developments e.g. through changes to land use policies in those areas, and other complementary actions.</p> <p>Key Tasks:</p> <ul style="list-style-type: none"> - Site visit assessment. - Review local connectivity, land ownership patterns, parcel areas, land values and capital values and other appropriate indicators at a detailed scale. - Select the most suitable sites for Transit Supportive Development and perform site assessments of a 400 metre radius area using a common multi-criteria assessment for Transit Supportive Development suitability. - Refine the SWOT assessment developed as part of the assessment of corridor suitability. - Propose ways to improve specific suitability for Transit Supportive Development.

Step 5: Route Evaluations and Mode Assessments

Purpose: Identify preferred modes in the medium list of options that will maximise potential for Transit Supportive Developments

Key Tasks:

- Review of how different modes might characteristically interact with land uses from our PT demands work and our observations from the city wide, corridor and local scale land analysis.
- Identify the best fit alignment that reflects maximum Transit Supportive Development opportunity and then assess where alignments depart from the best fit.
- Prepare table of three tier ranking system with preferred modes in the top tier. We will assess each mode option against the land use problem statement.

Step 6: Reporting

Purpose: Record the findings of the land use policy assessment, including when policy reforms could be undertaken to support the development of Transit Supportive Developments.

Tasks: Prepare standalone land use action plan.

TSD describes a spectrum of integrated land use and transport outcomes centred on a transit station. It is development that sustains transit ridership and overall reduction in automobile use by creating environments in which pedestrian and cycle modes provide attractive and efficient travel options (American Public Transport Association, 2009)⁷. There are three general classifications for types of TSD:

- Traditional Transit Orientated Developments (TODs) – a form of urban development that is centred on or around a transit node, such as a bus or rail station and designed to maximise access to the transit node by either walking or cycling through various design features. These are areas that support a mix of land uses in a dense development format. TODs are often developed in and around existing town centres, which offers further opportunities for retail, commercial, and education activities.
- Residential TSD – These are areas similar to TODs but the primary land use is residential, though it may include a small retail centre and possibly also community facilities.
- Employment TSD – These areas are similar to TODs but the primary land use is commercial and industrial. In some cases these areas may have residential as secondary functions, but these residential areas are not a key focus of the area's urban fabric.

All types of TSD implement initiatives to encourage transit use, which to be successful requires a high-quality walking and cycling environment. These initiatives typically arise from, and are supported by, reduced parking provision and elevated levels of density.

4.6 Car Parking Assessment

4.6.1 Medium and Short List Evaluation

The purpose of the car parking assessment is to examine current car parking practices and to identify possible changes to support successful Transit Supportive Developments and the PT system. In order to do so, the following will be undertaken:

- identify industry practice for parking management to support Transit Supportive Developments and review how they align with current parking management practices (e.g. policy and operational aspects).;
- assess available data on existing parking supply over time to determine growth rates in parking supply;
- forecast parking supply based on previous rates. If possible, show data supply spatial distribution. Compare forecasts to best practice parking management for Transit Supportive Developments and determine if supply poses a problem; and
- recommend best practice for parking management in the corridor to support the development of Transit Supportive Developments. Provide robust rationale based on international experiences in similar circumstances and studies.

Inputs: Parking supply data as available, parking pricing data as available, parking requirements and options (such as cash in lieu policies, etc).

Outputs: Recommended best practice for parking management to support Transit Supportive Developments. Land Use Report.

4.7 Social and Environmental Assessment

4.7.1 Medium and Short List Evaluation

Using an effects-based assessment, a Social Environmental Screen (SES) will be undertaken to compare all medium and short listed options. The SES will provide information to identify the merits and

⁷ American Public Transport Association. (2009, 12 31). *Defining Areas of Transit Influence*. Retrieved 02 09, 2012, from www.apta.com: http://www.apta.com/Portals/0/SUDS/SUDSPublished/APTA%20SUDS-UD-009-01_areas_of_infl.pdf

weaknesses of each option. This information can be used to support communication with stakeholders because it will detail how each short listed option may contribute towards the achievement of outcomes that support community aspirations and align with local and national legislation, policies and plans.

The SES will form a key component of the option assessment, project consultation process, risk register and treatment plan. Cultural impacts will be considered and an awareness of the views of local iwi will be sought.

Inputs: Environmental and cultural issues, Route alignments, Modes.

Outputs: Input to multi-criteria analysis

4.8 Communication and Engagement

4.8.1 Long, Medium and Short List Evaluation

Through a range of communication methods (i.e. letters, websites, meetings, focus groups, etc), the views and opinions of various stakeholders will be captured, and used as inputs for the lists of options, and subsequent evaluation of these lists.

Greater Wellington have developed an over-arching Communications Plan, and the Community Engagement Plan sits below this.

4.8.2 Community Engagement Plan

The community engagement plan has been created to understand key stakeholder and community engagement issues for the Study. It details “who” and “how” best to engage with different stakeholder groups.

The engagement approach will be undertaken throughout the study, using a variety of defined mechanisms (e.g. Appreciative Enquiry, Focus Groups, Online surveys) to obtain feedback and input from individuals, groups and the wider community. The engagement will coincide with the availability of key project deliverables and/or defined project milestones. Refer Section 5.0 below for further explanation of the project milestones and deliverables.

The stakeholders and the engagement methods are scoped and documented in the Plan, however, a brief outline is provided as follows:

- Milestone 1 (Completion of Inception and Scoping) engagement seeks to understand, discuss and clarify

any issues or concerns stakeholders may have relating to the study’s scope or underlying assumptions and to obtain broad feedback about how stakeholders and the public define the important characteristics of a high quality, high frequency public transport system. An Engagement Report on initial activities will be issued during the course of Milestone 1 activities.

- The next element of engagement will coincide with the completion of Milestone 2 (Completion of International Review) and Milestone 3 (Completion of Long-list evaluation and Identification of Medium-list) to inform stakeholders of the results of initial engagement, the international review and the strategic criteria used to test the long list. Engagement will be undertaken to get stakeholder feedback on the long list of options identified in the scoping report. Refer Section 5.2 within the Plan.
- Milestone 4 (Completion of Medium-list evaluation and Identification of Short-list). We will be informing stakeholders of the option specification, and costing results and provide an opportunity for people, who want to have a more in-depth understanding, to meet with the technical experts. Also, during the activities associated with Milestone 4, engagement would be undertaken to seek feedback on the medium list of options to inform the selection of a short-list of options (up to four, as indicated in AECOM’s tender). Refer Section 5.3 within the Plan.
- Milestone 5 (Completion of Short-list evaluation) concentrates on option evaluation. Engagement with stakeholders will seek to confirm that the evaluation of the options is appropriate considering relevant social, environmental and economic issues. Refer Section 5.4 within the Plan.
- Milestone 6 (Completion of PT Spine Study) will complete the short-list evaluation, identifying the final four feasible options and include targeted engagement with some key directly affected or representative of interest groups. Engagement would also inform all stakeholders about the next steps beyond the study. Refer section 5.6 within the Plan.

5.0 PROGRAMME

The study programme has been developed in order to meet the overall desired end date of February 2013. The key milestones and deliverables are summarised in Table 5 whilst a more detailed programme is included in Appendix C.

Table 5 Summary of Key Study Milestones and Deliverables

Deliverable	Programme Date	Note regarding Deliverable
Final Project Inception and Scoping report.	29 th February 2012	This Report broadly outlines the Study approach and methodology - through confirmation of the Study scope and methods – and the Study Programme.
Milestone 1 - Completion of Inception and Scoping Phase		
Final International Review Report.	27 th February 2012	The International Review report will provide input into the option evaluation, design, operation and costings of public transport options.
Milestone 2 - Completion of International Review		
Technical Note for TWG on Strategic Criteria for Testing Long List.	7 th February 2012	This Technical Note will describe the list of criteria that will be used to test the long list and produce the medium list.
Technical Note for TWG documenting the Medium List of Options.	2 nd April 2012	This Technical Note will describe the evaluation of the long list of options and document the resulting Medium list of options. The TWG workshop during March will confirm approval of the Medium List of Options.
Milestone 3 - Completion of Long-list Evaluation and identification of Medium List		
Working Paper on Option Specification and Costings.	20 th April 2012	This Working Paper will report on progress up to the point of evaluating the Medium List of options. The Working Paper will document preliminary modelling results, preliminary concept designs, and Capital and Operational costs associated with the Medium List of Options. The Working Paper will therefore be a precursor to the Option Modelling Results and Costs Report.
Technical Note for TWG documenting the Short List of Options.	31 st May 2012	This Technical Note will describe the evaluation of the Medium list of options and document the results.
Option Modelling Methodology and Results Report	5 th June 2012	Final reporting of medium list methodology, option tests and Short List identification.
Milestone 4 - Completion of Medium-list Evaluation and Identification of Short-list		
Option Modelling Results and Costs Report.	31 st July 2012	This Report will contain the final modelling results and updated capital and operational costs associated with the Short List of Options.
Option Evaluation Report and Sequencing Plan.	28 th September 2012 (draft) 26 th October 2012 (final)	This Report will provide details relating to the economic evaluation, financial/business case evaluation, social and environmental evaluation, and engineering feasibility of the Short-list of options.
Milestone 5 - Completion of Short-list Evaluation		
Final Study Report and Summary report.	Dec 20 th 2012 (draft) February 28 th 2013 (final)	The milestone marks the end of the Study. The deliverable will become a key input for subsequent decision-making, and will document the entire study process, all evaluations and identify up to 4 feasible options.
Milestone 6 - Completion of PT Spine Study		

6.0 INITIAL SCOPING OF MODES AND CORRIDOR OPTIONS

6.1 Introduction

In order to focus the research and analysis that will be undertaken as the Study progresses, it is important to document a range of transport options and the rationale as to why they have been included in the potential solution set. This list of options represents the full range of modes and routes that will be assessed as the Study progresses. It is proposed that this list will be analysed as part of Working Paper 1 in order to generate the 'Long List' of options. This list is expected to have a maximum of 12 options, in accordance with treasury guidelines. Therefore, there are some options presented in this document that will be dismissed in order to generate the 'Long List' of options, but they are included here in order to ensure thoroughness of the analysis.

In generating the list of potential mode and route options reference has been made to:

- Input from previous studies;
- An internal workshop with key AECOM team members;
- Feedback from our international review panel;
- Feedback from the Technical Working Group;
- A review of background documents and strategies including the Light Rail Feasibility Study;
- Consultation with Greater Wellington Regional Council, Wellington City Council and the NZ Transport Agency to understand planning undertaken for public transport and major infrastructure projects; and
- Our existing understanding of geographical constraints.

Once the Long List of options has been compiled and agreed, items will be taken through to the evaluation process as described in detail in Section 3.7. Each of the options on this Long List will be assessed through a Multi-Criteria Analysis (MCA) based on meeting the strategic assessment KPI's. This will be undertaken only after the criteria have been confirmed by the TWG. Those options that are still considered appropriate (or worthy) for further consideration will then pass through to the Medium List for more detailed assessment.

6.2 A Framework for the Identification of Options

Options will need to be generated across two different dimensions:

- Routes – The corridors through which PT will access the Study area and the interfaces it will have on land uses;
- Special Placement – Whether the route will be at street level, be elevated, or placed underground within the corridor; and
- Mode Choices – The type of PT scheme and its capability to perform the task identified.

6.3 Factors Affecting Routing

Table 6 provides details of the potential routes options for consideration, along with the source from which these routes have been identified. These are also represented on Figure 1 Study Area; page 4.

This list is not exhaustive and will be further informed at later stages of the Study when the particular characteristics of modes, and the engineering constraints associated with their right of way, are considered in further detail.

Within this collection of routes it will be necessary to consider impacts of elevated, street level and underground alignment solutions. Clearly not all possible outcomes will produce an acceptable result for the city and it will be necessary at the early stages of the evaluation process to make some informed judgement calls on issues such as – is an elevated structure along Lambton Quay likely to provide a solution that is consistent with the vision for the city. Also, there will be a trade-off between the degree of accessibility provided by a particular mode and the impact it is likely to have on the streetscape and land uses of the city. Clearly, heavy rail and its ability to move large numbers to only one or two points in the city provides a completely different outcome as compared to a finer grain transport network, such as bus, which will make multiple stops in the same area thus reducing walking distances to final destinations.

Table 6 List of Potential Route Options

Long List Route Options

Option No	Sub Option	Source	Main Routes Name									
1	A	Works MVA 1995	Waterfront	Aotea Quay	Waterloo Quay	Customhouse Quay	Jervois Quay	Cable Street	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street	
	B	Works MVA 1996		Aotea Quay	Waterloo Quay	Customhouse Quay	Jervois Quay	Wakefield Street	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street	
	C	Discussion with TWG Includes WCBR peak routes		Sub Option of LRT Station to West of Rail station								
2	A	Works MVA 1995	Featherston Street	Featherston Street	Willis Street/Hunter/Victoria*	Victoria Street	Manners Street	Courtenay Place	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street	
	B	Discussion with TWG		Sub Option of LRT to East of Station								
3	A	Works MVA 1995	Lambton Quay	Lambton Quay	Willis Street/Hunter/Victoria*	Manners Street	Courtenay Place	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street		
	B	Works MVA 1996/Stout St Sub option		Thorndon Quay	Stout Street	Lambton Quay	Willis Street/Hunter/Victoria*	Manners Street	Courtenay Place	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street
	C	Discussion with TWG		Sub Option of LRT to East of Rail Station								
4	A	TWG request	The Terrace	Lambton Quay	Bowen Street	The Terrace	Gluznee Street	Taranaki Street	Wallace Street	Riddiford Street		
5	A	Old Tram Route TWG Request	Cuba Street	Lambton Quay	Willis Street	Manners Street	Cuba Street	Webb Street	Taranaki St	Wallace St	Riddiford Street	
	B	Discussion with TWG		Sub Option of LRT to East of Rail Station								
6	A	TWG Request for combinations	Combination	Aotea Quay	Waterloo Quay	Customhouse Quay	Willis Street	Manners Street	Courtenay Place	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street
7	A	Recent Bus Circular Route One Way loop	Loop	Bunny Street >>	Waterloo Quay >>	Customhouse Quay >>	Jervois Quay >>	Cable Street >>	Kent Terrace >>	Kent Terrace / Cambridge Terrace	Adelaide Road	Riddiford Street
	B	Sub Option 2 Way loop		<< Lambton Quay	<< Willis street	<< Manners Street	Jervois Quay >>	Cable Street >>	<< Courtenay Place	Kent Terrace >>	Kent Terrace / Cambridge Terrace	Adelaide Road
8	A	Comment at TWG meeting	Taranaki Street	Aotea Quay	Waterloo Quay	Customhouse Quay	Jervois Quay	Taranaki street	Wallace Street	Riddiford Street		
	B			Sub Option of LRT Station to West of Rail station								

* = LRT Separate Running due to space constraints

Sub Options for all Adelaide Road Options
East/West/either side of Basin

Note: Further refinement of routes may be required once the constraints/opportunities are considered in further detail

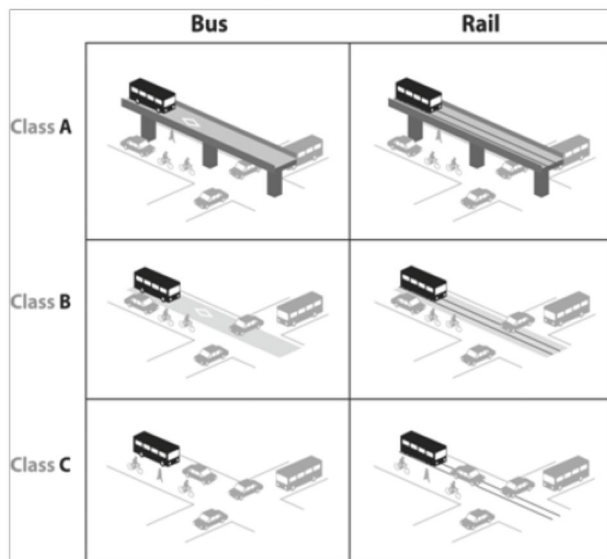
6.4 Factors Affecting Spatial Placement

In laying out the options, we will not confine ourselves to a conventional “mode-first” approach, in which the universe is divided first into bus and rail. In many ways, bus and light rail options will be similar, and other design features may turn out to have more impact than the bus-rail distinction. For example, consider Vukan Vuchic’s taxonomy of the three types of running way:

- Class A is exclusive (not mixed with traffic) and separated (not intersecting traffic). (Class A is unlikely on the Spine);
- Class B is exclusive but not separated. It meets other traffic at intersections; and
- Class C is mixed with traffic.

As Figure 4 below indicates, rail and bus can both be run in any of these three ways, but heavy rail cannot. The strict mobility outcomes, in each case, will depend much more on the class of running way than on whether the vehicle as a train or a bus.

Figure 4 Types of Running Way



6.5 Factors Affecting Mode Choice

There is a wide range of public transport modes available for consideration. Each mode has particular characteristics that will need to be assessed in the context of being best suited to the requirements of Wellington.

There are localised issues that result in mode choice decisions such as:

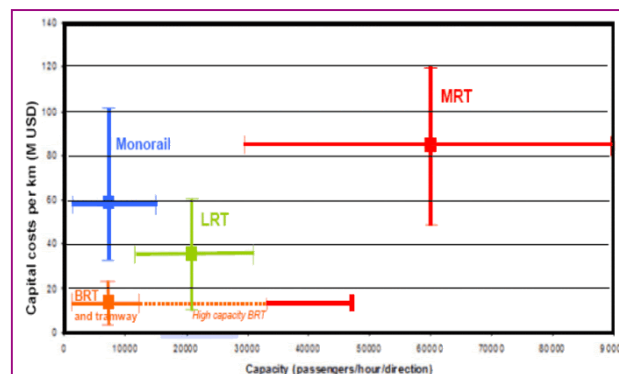
- Capacity – Matching the mode to the current and future levels of travel demand. There is a hierarchy of mode choice based on carrying capacity of a mode. There is a thought that it may be possible to

progress to higher order modes at a later time when this can be justified however the impact from the installation of the new mode may have significant impacts on the delivery of PT services on the corridor during construction.

- Right of Way – How demands on road space affect the ability to provide a segregated right-of-way will be the limiting factor for those modes that require such a dedicated right-of-way. This is important because with a grade separated system, the vehicles can operate at closer headways without disrupting street traffic and station platform lengths aren’t constrained by the distance between cross streets. Virtually any grade-separated system can be designed to have a higher capacity than any non-grade-separated system regardless of the transit mode. How these segregated right-of-ways can be accommodated within the city centre will determine mode choice outcomes.
- Modal interchange – at present the bus network brings people from the outer areas and delivers them to the central area. Some modes will result in people needing to change modes at some point in their journey. This introduces travel time delays and discomfort factors which make PT less attractive compared to using a private vehicle.
- Cost – Construction of underground solutions will be more expensive but less intrusive, elevated systems are generally expensive but more intrusive and at ground solutions will be capacity constrained and have capacity concerns. Different modes will be suited to each of these environments and therefore the application of cost will become a critical factor.

For illustrative purposes, Figure 5 below demonstrates the typical hierarchical relationship between 2 of these factors (Capital Costs and Carrying Capacity). (Source: Montassar DRAIEF-SYSTR; World Bank). For the options that will be considered in this Study, these relationships will need to be established for the Wellington context.

Figure 5 Typical Cost-Capacity Matrix for Comparing Modes



6.6 Public Transport Functionality

As part of the process of building a Long List of potential solutions it is beneficial to think about the functionality that different modes provide. Examples include:

- high levels of accessibility to city centre destinations;
- door-to-door convenience via a single mode;
- fast Journey time;
- comfort; and
- ease of accessing the mode – grade separated solutions have an impact on convenience.

6.7 Development of Options

A list of almost 90 combinations of options has been generated by cross referencing identified routes, spatial placements and modes.

Whilst it may be possible to consider a range of engineering solutions in order to install a mode into a particular route (i.e. elevated, at grade, underground), the focus should remain on the customer service aspects in the first instance and therefore the features of, and benefits delivered by, the mode will be of critical importance. Once it has been identified that a particular mode operating along a particular route is appropriate to address demand then the engineering issues can be addressed.

It is expected that further filtering of this list will occur once the characteristics of each mode are examined in more depth and some of the options will also be discounted on the basis that there is no engineering solution available.

The list is presented in Table 7 below, and will form the basis of the strategic assessment.

This table also identifies at this early stage the possible applicability of the mode options, in terms of the factors outlined above (carrying capacity, Interchange requirements, and elevation considerations).

6.8 Intended Assessment Process for Option Refinement

The methodology for assessing the options is proposed to be as follows:

- Step 1 – Develop of a broad list of potential options (contained in this scoping document)
- Step 2 – Use fatal flaw tests (financial, legal, political, practical) to rationalise of the potential list down to a ‘Long List’ of 12 options
- Step 3 – Use strategic assessment criteria to refine the Long List of 12 down to a ‘Medium List’ of 8 Options
- Step 4 – Production of a Technical Working Paper



- Step 5 – Conduct a multi-criteria assessment workshop to evaluate the Medium List 8 options and reduce down to a Short List of 4 Options
- Step 6 – Further analysis of Short List of 4 options to inform the Study Final Report

As a general consideration in the process, there will be a hierarchy of importance of assessment criteria related to achieving the right outcome from the study. There is all too often a temptation to jump straight into the engineering of a solution before the travel needs and passenger requirements are properly considered.

The list of criteria below is in descending order of importance, and increasing relevance as the end of the sieving process is progressed:



- 1) Travel needs that must be satisfied in order to have an attractive and supported PT network.
- 2) Identification of potential routes in response to demand desire lines.
- 3) Identify suitable modes that can satisfy demand on the identified routes.
- 4) Engineering considerations (vertical and horizontal design, power sources, etc).



Table 7 Potential List of Options



Mode	Definition	Applicability	Elevation ⁸			Inter-change Required ⁹	Carrying Capacity			Route Options (refer Table 6)	Option Number	
			E= elevated	G= Ground level	UG = Underground		H= High	M = Medium	L=Low			
			E	G	UG	Y/N	H	M	L			
Bus on-street  Wellington, New Zealand	Buses using traffic lanes within no priority lane treatments.	Highly flexible mode that can operate at a local street level within the city centre as well as provide route services into suburbia	N	Y	N	N	N	N	Y	Waterfront (Blue)	1	
			N	Y	N	N	N	N	N	Y	Featherstone Street (Yellow)	2
			N	Y	N	N	N	N	N	Y	Lambton Quay (Pink)	3
			N	Y	N	N	N	N	N	Y	The Terrace (Grey)	4
			N	Y	N	N	N	N	N	Y	Cuba Street (Brown)	5
			N	Y	N	N	N	N	N	Y	Combination (Green)	6
			N	Y	N	N	N	N	N	Y	Loop (Orange)	7
			N	Y	N	N	N	N	N	Y	Taranaki Street (Red)	8
Trolley Bus on-street  Wellington, New Zealand	Trolley buses using traffic lanes within no priority lane treatments.	Can operate at a local street level within the city centre as well as provide route services into suburbia. The need for overhead power lines restricts use to specific, pre-planned routes	N	Y	N	N	N	N	Y	Waterfront (Blue)	9	
			N	Y	N	N	N	N	N	Y	Featherstone Street (Yellow)	10
			N	Y	N	N	N	N	N	Y	Lambton Quay (Pink)	11
			N	Y	N	N	N	N	N	Y	The Terrace (Grey)	12
			N	Y	N	N	N	N	N	Y	Cuba Street (Brown)	13
			N	Y	N	N	N	N	N	Y	Combination (Green)	14
			N	Y	N	N	N	N	N	Y	Loop (Orange)	15
			N	Y	N	N	N	N	N	Y	Taranaki Street (Red)	16



⁸ Green Cells indicate the preferred uses relevant to each mode


⁹ Interchange will be required when the primary choice of transport mode within the CBD is unsuited to providing access to the greater suburban area thus requiring the use of more than one mode for a trip between the suburbs and the city centre.

Mode	Definition	Applicability	Elevation ⁸ E= elevated G= Ground level UG = Underground			Inter- change Required ⁹ Y/N	Carrying Capacity H= High M = Medium L=Low			Route Options (refer Table 6)	Option Number
			E	G	UG		H	M	L		
Transit / HOV Lanes  <i>Auckland, New Zealand</i>	A traffic lane which gives priority to selected permitted vehicles including on street buses	An adaptation of 'bus on street' networks which allows priority at conflict points in order to speed up journey times and increase capacity throughput	N	Y	N	N	N	Y	Y	Waterfront (Blue)	17
			N	Y	N	N	N	Y	Y	Featherstone Street (Yellow)	18
			N	Y	N	N	N	Y	Y	Lambton Quay (Pink)	19
			N	Y	N	N	N	Y	Y	The Terrace (Grey)	20
			N	Y	N	N	N	Y	Y	Cuba Street (Brown)	21
			N	Y	N	N	N	Y	Y	Combination (Green)	22
			N	Y	N	N	N	Y	Y	Loop (Orange)	23
			N	Y	N	N	N	Y	Y	Taranaki Street (Red)	24
Bus Rapid Transit (BRT)  <i>Auckland, New Zealand</i>	A segregated facility which gives absolute right-of way priority to buses	Requires a specialised dedicated right of way which will not fit into the profile of most city streets (it is assumed that BRT that reverts to street running in the city is treated as 'bus on street'	Y	Y	N	N	Y	Y	N	Waterfront (Blue)	25
			Y	Y	N	N	Y	Y	N	Featherstone Street (Yellow)	26
			Y	Y	N	N	Y	Y	N	Lambton Quay (Pink)	27
			Y	Y	N	N	Y	Y	N	The Terrace (Grey)	28
			Y	Y	N	N	Y	Y	N	Cuba Street (Brown)	29
			Y	Y	N	N	Y	Y	N	Combination (Green)	30
			Y	Y	N	N	Y	Y	N	Loop (Orange)	31
			Y	Y	N	N	Y	Y	N	Taranaki Street (Red)	32

Mode	Definition	Applicability	Elevation ⁸ E= elevated G= Ground level UG = Underground			Inter- change Required ⁹ Y/N	Carrying Capacity H= High M = Medium L=Low			Route Options (refer Table 6)	Option Number
			E	G	UG		H	M	L		
Mini-bus On Street 	A mini-bus is a motor vehicle which carries more than 8 but not more than 16 seated passengers in addition to the driver.	These vehicles are flexible enough to access most streets. They are usually used for special transport needs, or as a grid in hop-on-hop-off network, usually in third world countries	N	Y	N	Y	N	N	Y	Waterfront (Blue)	33
			N	Y	N	Y	N	N	Y	Featherstone Street (Yellow)	34
			N	Y	N	Y	N	N	Y	Lambton Quay (Pink)	35
			N	Y	N	Y	N	N	Y	The Terrace (Grey)	36
			N	Y	N	Y	N	N	Y	Cuba Street (Brown)	37
			N	Y	N	Y	N	N	Y	Combination (Green)	38
			N	Y	N	Y	N	N	Y	Loop (Orange)	39
			N	Y	N	Y	N	N	Y	Taranaki Street (Red)	40
Light Rail Transit  Seattle, USA	LRT is another term for a tram which normally runs on a dedicated alignment but can share road space with other users. Variety of traction power options available	More effective in dedicated reservations. Not normally elevated due to the additional cost involved and the impact the structure has on the streetscape. Expensive to extend beyond the city centre	Y	Y	N	Y	Y	Y	N	Waterfront (Blue)	41
			N	Y	N	Y	Y	Y	N	Featherstone Street (Yellow)	42
			N	Y	N	Y	Y	Y	N	Lambton Quay (Pink)	43
			N	Y	N	Y	Y	Y	N	The Terrace (Grey)	44
			N	Y	N	Y	Y	Y	N	Cuba Street (Brown)	45
			N	Y	N	Y	Y	Y	N	Combination (Green)	46
			N	Y	N	Y	Y	Y	N	Loop (Orange)	47
			N	Y	N	Y	Y	Y	N	Taranaki Street (Red)	48

Mode	Definition	Applicability	Elevation ⁸ E= elevated G= Ground level UG = Underground			Inter- change Required ⁹ Y/N	Carrying Capacity H= High M = Medium L=Low			Route Options (refer Table 6)	Option Number
			E	G	UG		H	M	L		
Heavy Rail / Metro  Wellington, New Zealand	Heavy rail operates on a fixed segregated corridor which is generally placed in tunnel within city centres, although it is elevated in some cities with associated visual impacts	It would not be practical to design this in any form as an underground solution. Opportunity exists to extend the existing rail network to provide commuters direct access to the city centre	N	N	Y	N	Y	N	N	Waterfront (Blue)	49
			N	N	Y	N	Y	N	N	Featherstone Street (Yellow)	50
			N	N	Y	N	Y	N	N	Lambton Quay (Pink)	51
			N	N	Y	N	Y	N	N	The Terrace (Grey)	52
			N	N	Y	N	Y	N	N	Cuba Street (Brown)	53
			N	N	Y	N	Y	N	N	Combination (Green)	54
			N	N	Y	N	Y	N	N	Loop (Orange)	55
			N	N	Y	N	Y	N	N	Taranaki Street (Red)	56
People Parry Mover  Stourbridge, UK	Lightweight trams and railcars that use flywheel energy storage (FES) to store energy for traction, allowing electric systems to operate without overhead wires or third rails.	Similar to comments made against LRT but these units are generally smaller and therefore carry fewer people. Few examples of use in city applications	Y	Y	N	Y	N	N	Y	Waterfront (Blue)	57
			N	Y	N	Y	N	N	Y	Featherstone Street (Yellow)	58
			N	Y	N	Y	N	N	Y	Lambton Quay (Pink)	59
			N	Y	N	Y	N	N	Y	The Terrace (Grey)	60
			N	Y	N	Y	N	N	Y	Cuba Street (Brown)	61
			N	Y	N	Y	N	N	Y	Combination (Green)	62
			N	Y	N	Y	N	N	Y	Loop (Orange)	63
			N	Y	N	Y	N	N	Y	Taranaki Street (Red)	64

Mode	Definition	Applicability	Elevation ⁸ E= elevated G= Ground level UG = Underground			Inter-change Required ⁹ Y/N	Carrying Capacity H= High M = Medium L=Low			Route Options (refer Table 6)	Option Number
			E	G	UG		H	M	L		
Personalised Rapid Transit  Heathrow Terminal 5, UK	Pods cars are design as personal vehicles typically carrying no more than 3 to 6 passengers per vehicle. Provides automated movement between multiple points.	An emerging technology best suited to multiple origin/destination networks. Does not handle interface with mass transit well due to wait times for pods.	Y	N	N	Y	N	Y	Y	Waterfront (Blue)	65
			Y	N	N	Y	N	Y	Y	Featherstone Street (Yellow)	66
			Y	N	N	Y	N	Y	Y	Lambton Quay (Pink)	67
			Y	N	N	Y	N	Y	Y	The Terrace (Grey)	68
			Y	N	N	Y	N	Y	Y	Cuba Street (Brown)	69
			Y	N	N	Y	N	Y	Y	Combination (Green)	70
			Y	N	N	Y	N	Y	Y	Loop (Orange)	71
			Y	N	N	Y	N	Y	Y	Taranaki Street (Red)	72
Monorail  Sydney, Australia	Monorail operates on exclusive elevated segregated right of way	Very few examples of application to commuter operations. Able to operate above street but expensive to run over extended distances in to the suburbs	Y	N	N	Y	N	N	Y	Waterfront (Blue)	73
			Y	N	N	Y	N	N	Y	Featherstone Street (Yellow)	74
			Y	N	N	Y	N	N	Y	Lambton Quay (Pink)	75
			Y	N	N	Y	N	N	Y	The Terrace (Grey)	76
			Y	N	N	Y	N	N	Y	Cuba Street (Brown)	77
			Y	N	N	Y	N	N	Y	Combination (Green)	78
			Y	N	N	Y	N	N	Y	Loop (Orange)	79
			Y	N	N	Y	N	N	Y	Taranaki Street (Red)	80

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			E	G	UG		H	M	L		
Guided O-Bahn Busway Elevated or partially elevated  <i>Adelaide, Australia</i>	A segregated busway design in which modified street buses enter and run on specially built track.	Existing application are related to route services in suburbia. Guided transitways are not easily compatible with pedestrians. Can leave the busway and operate similar to an 'on street bus'.	Y	N	N	N	N	Y	Y	Waterfront (Blue)	81
			Y	N	N	N	N	Y	Y	Featherstone Street (Yellow)	82
			Y	N	N	N	N	Y	Y	Lambton Quay (Pink)	83
			Y	N	N	N	N	Y	Y	The Terrace (Grey)	84
			Y	N	N	N	N	Y	Y	Cuba Street (Brown)	85
			Y	N	N	N	N	Y	Y	Combination (Green)	86
			Y	N	N	N	N	Y	Y	Loop (Orange)	87
			Y	N	N	N	N	Y	Y	Taranaki Street (Red)	88