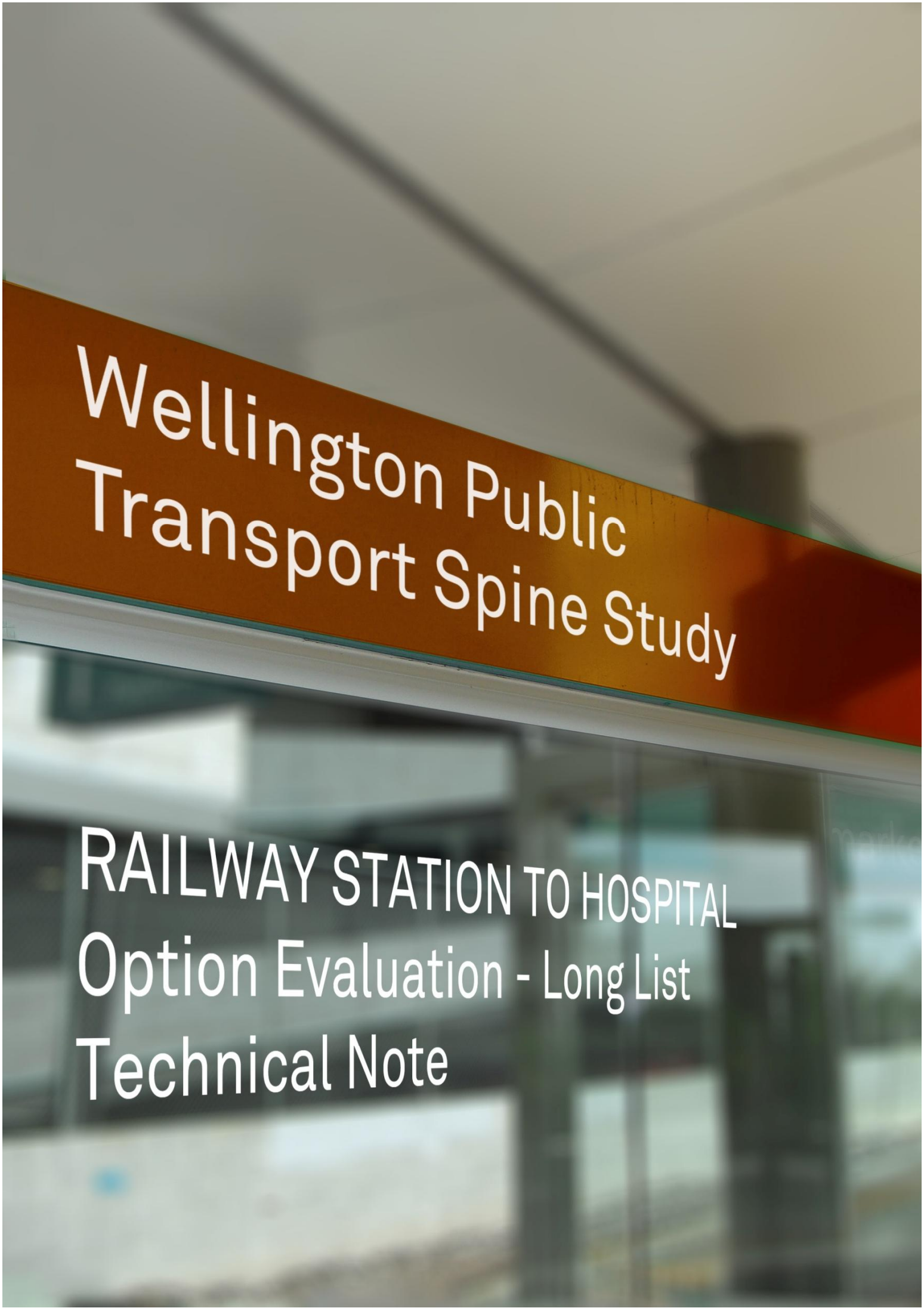


RAILWAY STATION TO HOSPITAL
Option Evaluation - Long List
Technical Note

Wellington Public Transport Spine Study

Option Evaluation - Long List

Prepared for

Greater Wellington Regional Council

Prepared by

AECOM New Zealand Limited
47 George Street, Newmarket, Auckland 1023, PO Box 4241, Shortland Street, Auckland 1140, New Zealand
T +64 9 379 1200 F +64 9 379 1201 www.aecom.com

20 April 2012

60222076

AECOM in Australia and New Zealand is certified to the latest version of ISO9001 and ISO14001.

Quality Information

Document	Wellington Public Transport Spine Study
Ref	60222076
Date	20 April 2012
Prepared by	Shaun Hubbard (AECOM), Chris Ballantyne (AECOM), Andrew Foy (AECOM), Ben Petch (MRC)
Reviewed by	Rob Napier, Rob Whight (AECOM)

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	29-Mar-2012	Draft Final	Rob Whight Project Director	
1	19-Apr-2012	Final	Rob Whight Project Director	

Table of Contents

Executive Summary

Background

The Wellington Public Transport Spine Study is investigating options for a high quality public transport spine between Wellington Station and Wellington Regional Hospital. Through the initial Scoping process of the Study, a total of 88 possible options have been identified which to varying degrees potentially address the future issues and problems associated with the PT Spine.

In order to assess these options and produce a Medium list of up to 8 options, followed later-on by a Short list of up to 4 of the most feasible options for further consideration, the Study methodology requires a structured and systematic process. This process is described in detail in the Inception and Scoping Report, however essentially involves three levels of assessment:

1) Long List of Options (Strategic evaluation);
2) Medium List of Options (Technical evaluation);
3) Short list of Options (Contextual evaluation).

The purpose of this Technical Note is to focus on the Long List of Options evaluation. This Note describes in detail the evaluation approach, the use of specific criteria to assess the possible options, detailed rationale for proceeding with or dismissing particular options, and concludes with the next steps required to further evaluate the eight recommended options on the Medium List.

Evaluation Approach and Criteria

The approach adopted for this Strategic evaluation is to separately assess the various transport modes (e.g. bus, light rail) and various sub-areas with the overall Study area, against an agreed set of criteria. The criteria have been developed with input from supporting technical assessments (as outlined in the Scoping Report) including an International Review of PT systems, Engagement activities to-date on the Study, traffic/transport modelling and a City-wide and Corridor Review of Land Use aspects.

The set of agreed criteria to be applied include:

- For Areas to be assessed – Ability to support Transit Supportive Developments (TSD's), Accessibility, and Environmental.
- For Modes to be assessed – Attractiveness to Users, Ability to support Transit Supportive Developments (TSD's), Accessibility, Capacity, Engineering Feasibility, Financial Viability, Environmental, and Safety.

Evaluation Outcomes

As an outcome, the Medium List options have been built up from a strategic assessment of:

- Areas that public transport need to serve - and can be underpinned by transit supportive development;
- Modes that have the ability to move the forecast demand;
- Modes that meet customer service needs identified in the Engagement Survey; and
- Modes that can assist in providing environmental, safety and amenity benefits.

In summary, and at the conclusion of the evaluation process, 3 of the 5 areas have been identified for further investigation, whilst 4 of the 6 modes have been recommended for further investigation. Once these areas and modes are combined through a "compatibility assessment", a sum total of 8 options (so-called Medium List) are recommended for further evaluation during the Study.

These 8 options are:

- Option 1: Bus, along a Central alignment;
- Option 2: Bus, along a Waterfront alignment;
- Option 3: Bus Rapid Transit (BRT), along a Central alignment;

- Option 4: Bus Rapid Transit (BRT), along a Waterfront alignment;
- Option 5: Light Rail Transit (LRT), along a Central alignment;
- Option 6: Light Rail Transit (LRT), along a Waterfront alignment;
- Option 7: Mass Rapid Transit (MRT) or heavy rail extension, underground along an alignment to be determined;
- Option 8: Mass Rapid Transit (MRT) or heavy rail extension, along a Waterfront alignment;

Insofar as the Next Steps for this Study are concerned, a series of Technical Assessments are required (including Land Use, Planning, Social and Environmental) in order to support the concept designs and associated Capital and Operational Cost Estimates for these 8 options. The conclusions from these assessments will once again be considered through a multi-criteria analysis, and will be documented in the next Technical Note, i.e. Medium List Evaluation. That Technical Note will identify the 4 most feasible options (i.e. the Short list).

Glossary

Abbreviation	Definition
TBBC	Treasury's Better Business Case Framework
BRT	Bus Rapid Transit
GWRC	Greater Wellington Regional Council
LRT	Light Rapid Transit (e.g. tram)
MCA	Multi-Criteria Assessment
MRT	Mass Rapid Transit (e.g. for the purpose of this Long List assessment this is an extension of heavy rail)
NZTA	New Zealand Transport Agency
PPHPD	Passenger per hour per peak direction
PT	Public Transport
PRT	Personal Rapid Transit
PTTS	Wellington Public Transport Spine Study
RTN	Rapid Transit Network
TOD	Transit Orientated Development
TSD	Transit Supportive Development
TWG	Technical Working Group
WCBR	Wellington City Bus Review
WCC	Wellington City Council

Definitions

Reference	Definition
Route	Routes have been identified from previous studies. They form part of a List of Potential Options - along with a potential list of modes. A full list of Routes is provided in the Inception and Scoping Report.
Area	The Study area has been broken down into logical Areas based on key corridor and catchment areas. An Area may contain more than one route.
Alignment	An alignment is the key road that dissects through an Area.

1.0 Purpose of Technical Note

The assessment of public transport options for the Wellington PT Spine Study (PTSS), as specified in the Project Brief, is to be aligned to the Treasury Better Business Case (TBBC) guidelines. This process is described in the Inception and Scoping Report through three levels of assessment:

1) Long List of Options (Strategic evaluation);

2) Medium List of Options (Technical evaluation);

3) Short list of Options (Contextual evaluation).

It is important to note that this Long List evaluation of options is a high level strategic qualitative evaluation. More detailed technical analysis will be undertaken at the Medium List and Short List stages. The purpose of this Long List evaluation is to reduce 88 options to eight options.

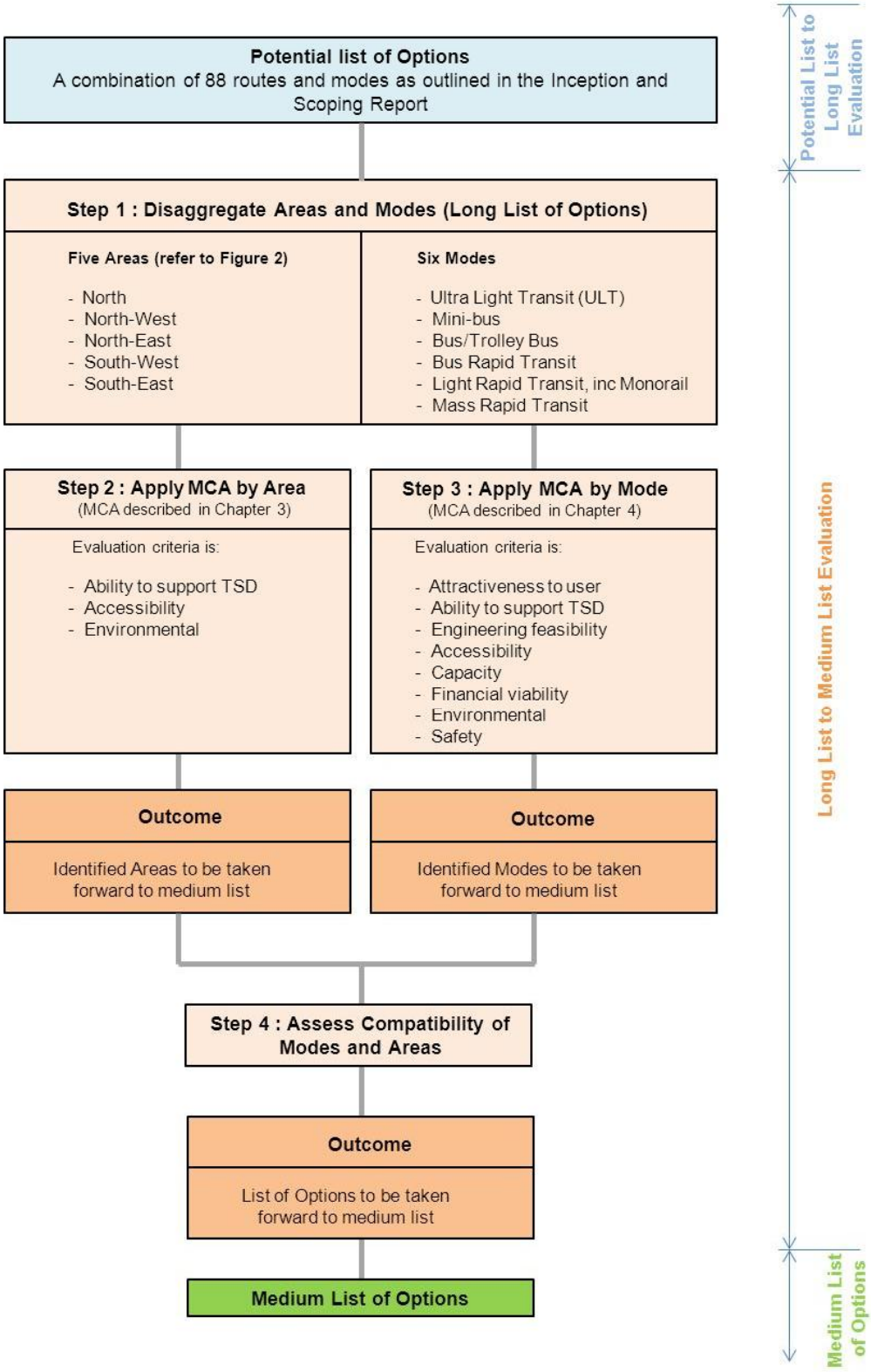
This Technical Note is structured in the following way:

- The approach to evaluate the options (Chapter 2);
- Analysis of the merits and de-merits of each option (by area – Chapter 3, by mode – Chapter 4);
- Detailed rationale for those options that are recommended to be dismissed (Chapter 5);
- Details of the options that are recommended to proceed to the Medium List - Technical Evaluation (Chapter 6);
- The Technical Evaluation to be undertaken in the Medium List assessment, i.e. next steps (Chapter 7).

2.0 Approach to Long List Evaluation

The approach is presented in Figure 1 and described thereafter.

Figure 1 Option Evaluation Approach



2.1 Potential List of Options

Prior to the Long List of Option evaluation an extensive list of all modes and routes was identified and agreed with the Technical Working Group (TWG). These modes and routes include those identified from other studies. Eleven modes and eight routes (a total of 88 options) were identified which are summarised in Table 1.

Table 1 Potential List of Options

Mode Name	Main Route Name
1) Bus on-street 2) Trolley bus on-street 3) Transit/HOV lanes 4) Bus Rapid Transit 5) Mini-bus on-street 6) Light Rapid Transit 7) Mass Rapid Transit 8) People Parry Mover 9) PRT 10) Monorail 11) Guided O'Bahn Busway	1) Waterfront 2) Featherston Street 3) Lambton Quay 4) The Terrace 5) Cuba Street 6) Combination e.g. Aotea Quay, Waterloo Quay, Customhouse Quay, Willis Street through to Adelaide Road, Riddiford Street 7) Loop route 8) Taranaki Street

Note: Refer to the Inception and Scoping Report for further details of the modes and routes.

2.2 Step 1: Disaggregate Areas and Modes (Long List of Options)

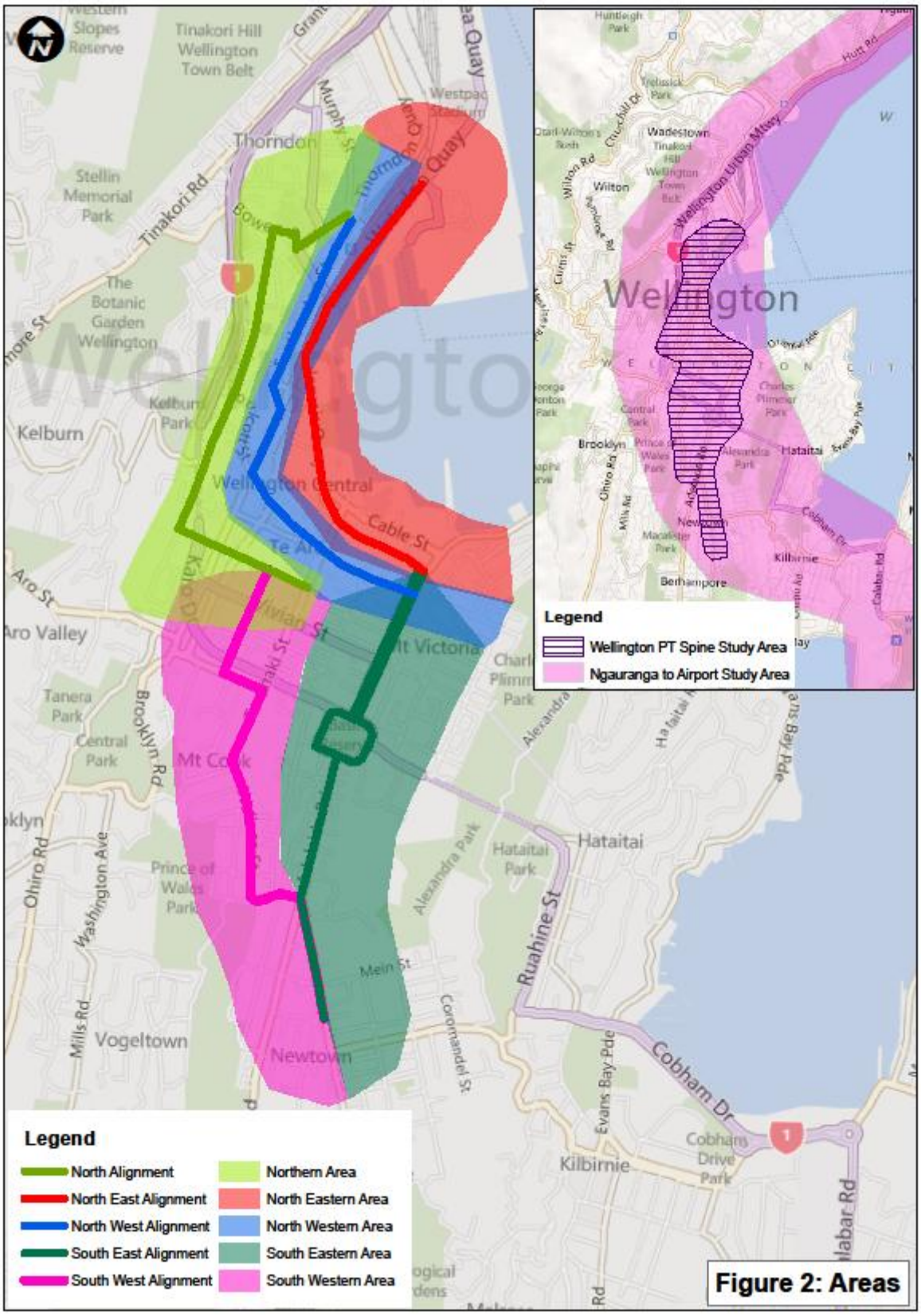
The Potential List of Options was simplified into six modal types according to carrying capacity and degree of segregation (refer to Table 2) and five Areas. The five Areas represent key corridors across the Study area (refer to Figure 2).

Table 2 Modal Carrying Capacity and Degree of Segregation

Modal Type	Typical Carrying capacity				Typical Degree of segregation			
	Very low	Low	Medium	High	Non-Segregated	Partially Segregated	Segregated	Exclusive right-of-way
ULTra (incl PRT and People Parry Mover)	●						●	
Mini-bus	●				●			
Bus-on-street / Trolley bus		●	●		●	●		
Bus Rapid Transit (incl Guided O'Bahn busway)			●				●	
Light Rapid Transit (incl Mono-rail)			●				●	
Mass Rapid Transit				●				●

Note: HOV lanes not specifically covered under modal type as not a form of public transport. Transit Lane is covered under Bus Rapid Transit.

Figure 2 Area Assessment



2.3 Step 2 and 3: Apply MCA (Long List of Options)

The Areas and Modal Types were critiqued against Multi-Criteria as explained below and described in Table 3 and Table 4.

The development of the Multi-Criteria first focused on the customer service aspects which were gleaned, in part from the PTSS Engagement Survey i.e. attractiveness to user (frequency, reliability, efficiency), accessibility (does it take people where they want to go?), financial (is it a good use of people's money?), will it respect the level of safety, comfort and amenity required? These questions are considered as "Trigger questions" which lead to the development of Key Indicators as per Table 3 and Table 4.

The Multi-Criteria then considered other strategic and business needs such as the ability of the mode to support forecast demand, the ability to change land use activity to support public transport, engineering feasibility and environmental impacts (e.g. noise, visual intrusion, greenhouse gas effects).

The Multi-Criteria Assessment (MCA) is described in Chapter 3.0 and Chapter 4.0. The MCA for this Long List assessment describes a high level strategic assessment as a first sieve of options. For those options that pass through this first sieve greater scrutiny will be applied to these and additional criteria in the Medium List Technical Assessment.

2.3.1 Explanation of Criteria

The criteria are described briefly below, however, in each case the Assessments are supported by further, more detailed information. For example, the Land Use Planning Report: Citywide and Corridor Review, March 2012 contains significant technical detail to support the assessment of Areas in terms of their ability to support Transit Supportive Developments :

Area Assessment

- **Ability to support Transit Supportive Development (TSD) –** The distribution of activities such as employment and housing and the intensity of that development will determine the demand for travel. These aspects define the form of the City. The public transport spine will help unlock the potential for development, and as such should be considered as areas for such development potential. The Land Use Planning Report: Citywide and Corridor Review, March 2012 reviews drivers for land use change, determines the maximum development capacity in the Study area and identifies areas of opportunities for TSD. This criterion assesses whether an area provides a good opportunity for TSD.
- **Accessibility –** Accessibility, by Area, in this context is taken to mean ease of access to public transport in order to reach key destinations and services. As the location of public transport stops is vital to attracting people to use public transport this criterion is focussed on the key areas that people want to go to and accessibility to those areas. The extent of demand within a catchment from a station / stop is therefore important to the overall patronage of the public transport service. A catchment is measured as a radius around a station / stops rather than a distance either side of an area. For the purpose of this Study access by walking has been assigned a catchment distance of 400 m. This criterion assesses the extent of a catchment area, and areas that would be captured, or missed within a 400 m catchment of a potential public transport spine alignment.
- **Environment –** Environment, by Area, refers to the physical impact that a public transport spine would have through an Area. For example are there limitations for a public transport alignment, or stop / station in an Area.

Mode Assessment

- **Attractiveness to User –** A critical success factor of public transport is its ability to attract high ridership by providing a competitive service. Although this needs to include reliability, attractive fares and service quality, of particular importance is providing competitive door-to-door journey times. Journey times will be a function of: public transport mode (including degree of segregation from other vehicles), length of route, number of stops / stations, directness of route, speed of mode, and the need for interchange. This criterion focuses on how attractive the mode will be to the user.
- **Ability to support TSD –** There are common design features that a mode can assist with in facilitating TSD including the location of mode stops, and whether a mode has a fixed route, or not. This is because typically a fixed route / station location gives more certainty to investors that a high quality public transport service will operate at a certain location. Furthermore, different modes have different land use transformation and value

capture rates for TSD as outlined in the International Review of Public Transport Systems Report. This criterion assesses each modes' ability to support TSD.

- **Engineering Feasibility –** Wellington has relatively flat terrain along the waterfront and Golden Mile with more undulating terrain in the vicinity of the Terrace. This needs to be considered in terms of major civil engineering works and the gradients that different modes can operate on. Other intangible factors that will affect engineering feasibility include: property acquisition, heritage protected buildings and culturally sensitive areas. This criterion assesses engineering challenges for each mode.
- **Accessibility –** In the context of this study access by mode refers to how easy is the mode to access for all people including those with disability. This criterion considers how well a mode can be served by people, including those with disabilities.
- **Ability to Support Forecast Demand –** A hierarchy of public transport choice ranges from bus with relatively low capacity, to MRT (heavy rail) with high capacity as outlined in the International Review of Public Transport Systems Report. The ability to move the forecast demand in the future is paramount. This future demand is forecast from traffic modelling (refer to Appendix C). This criterion assesses how well a mode will service the 2031 forecast public transport demand.
- **Financial Viability -** The funding and investment of the Mode will need to enable a comprehensive design that can support future changes e.g. growth. This will need to include capital costs, operational costs and the commercial viability of operating a service. This criterion provides a broad, qualitative indication of the spectrum of public transport costs.
- **Environment –** Key factors for the environment include how environmentally friendly the modes is. The criterion focuses on the likely impact of the mode from an environmental perspective e.g. noise, visual intrusion, greenhouse gas.
- **Safety –** It is inherent that the PT Spine will be designed to be safe. However, there are factors that assist in providing a safer environment such as the degree of segregation between motor vehicles, public transport and pedestrians. This criterion evaluates how the mode could negate conflict between modes and pedestrians in terms of segregation.

Table 3 Multi-Criteria Assessment Criteria, by Area

Criteria	Key Indicator	Assessment Supported By
Ability to support TSD	- Potential to support Transit Supportive Development (TSD) - Extent to which development could occur based on District Plan rules	Land Use Planning Report : Citywide and Corridor Review, March 2012
Accessibility	- Extent of topographical constraints (e.g. gradient) - Extent of catchment area (400 m walk distance from alignment)	Horizontal and Vertical Alignment Mapping (refer to Appendix A) Catchment mapping (refer to Appendix B)
Environment	- Opportunity to incorporate footprint of stations/stops - Opportunity to reallocate road space	Horizontal and Vertical Alignment Mapping (refer to Appendix A)

Table 4 Multi-Criteria Assessment Criteria, by Mode

Criteria	Key Indicator	Assessment Supported By
Attractiveness to User	- Reliability of mode (frequency and speed) - Likely perception of mode to users	International Review of Public Transport System Report, February 2012
Ability to support TSD	- Capacity of mode to support higher density development - Ability to attract developer investment e.g. fixed route option gives investors more certainty	Land Use Planning Report : Citywide and Corridor Review, March 2012

Criteria	Key Indicator	Assessment Supported By
Engineering Feasibility	- Extent of gradient/topographical limitation - Impact on land take	Horizontal and Vertical Alignment Mapping, (refer to Appendix A)
Accessibility	- Flexibility of mode to respond to new land use activity and catchments - Degree of station spacing by mode i.e. support catchment areas	International Review of Public Transport Systems Report, February 2017
Ability to Support Forecast Demand	- Ease of use by disabled community - Capacity of mode to meet forecast demand in 2031 - Ability to serve key demand nodes e.g. Golden Mile, Courtenay Place	Traffic modelling WTSM outputs
Financial Viability	- Extent of construction cost - Extent of maintenance cost - Extent of commercial viability	International Review of Public Transport Systems Report, February 2012
Environment	- Extent of vehicle emissions, noise, power source - Extent of visual intrusion - Impact on land values	International Review of Public Transport Systems Report, February 2017
Safety	- Degree of segregation from general traffic/pedestrians - Degree of personal safety	International Review of Public Transport Systems Report, February 2012

2.3.2 Explanation of Scoring

The purpose of this Long List evaluation is to be a high level strategic assessment. Hence, the scoring has been aligned with this purpose and is deliberately qualitative, not quantitative.

A scoring system has been devised for this Long List evaluation which is:

- Green circle, or (G), positive
- Amber circle, or (A), indifferent
- Red circle, or (R), negative

No weightings have been applied to the criteria for this high level assessment. Weighting of criteria will be considered in more detail for the Medium List evaluation.

As agreed by the TWG, for the Area assessment two reds for an area is deemed as a fatal flaw and that area would then be dismissed from further assessment. For the Mode assessment if there is a red in the criteria of 'Engineering Feasibility' and/or 'Capacity' then that mode is deemed to have a fatal flow and this would be dismissed.

The commentary around each criterion in Chapter 3.0 and Chapter 4.0 focuses on the main relevant matters and key indications. Where there is no commentary for a key indicator it can be assumed that it is not a specific matter of relevance for that Area or Mode.

2.4 Step 4: Assess Compatibility of Modes and Corridors (Long List of Options)

The outcome from the Modes and Areas MCA were combined and compatibility assessed. Eight recommended options are identified to proceed to the Medium List of Options assessment.

3.0 Multi-Criteria Assessment, by Area

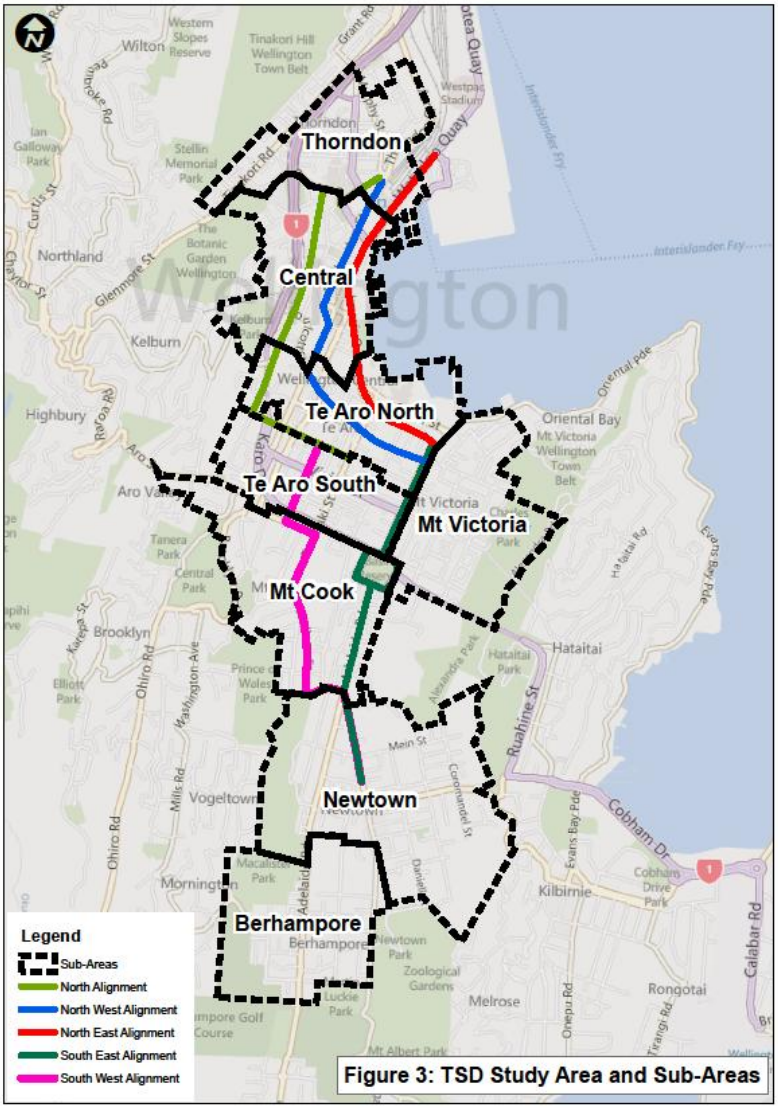
3.1 Overview

The MCA, by area has been informed by the PTSS Land Use Planning Report: Citywide and Corridor Review, traffic modelling, LiDar based orthorectified 3D model, and other supporting documents reviewed as part of this Study[1].

3.1.1 Transit Supportive Development

A Land Use Planning Report: Citywide and Corridor Review was prepared in March 2012, as part of this Study, to support the Area analysis and inform areas which would best support TSD (Transit Supportive Development). The report concluded that there are clear opportunities in the Study area for TSD in Te Aro South, Te Aro North, Mt Victoria and Thordon. These areas are recommended for further review of specific opportunities for TSD and would need to consider for example social and environmental factors such as the impact on heritage buildings in Mt Victoria. Areas identified as problematic to support TSD are: Mt Cook, Newtown and Berhampore. The boundaries of these areas are defined in Figure 3.

Figure 3 TSD Areas

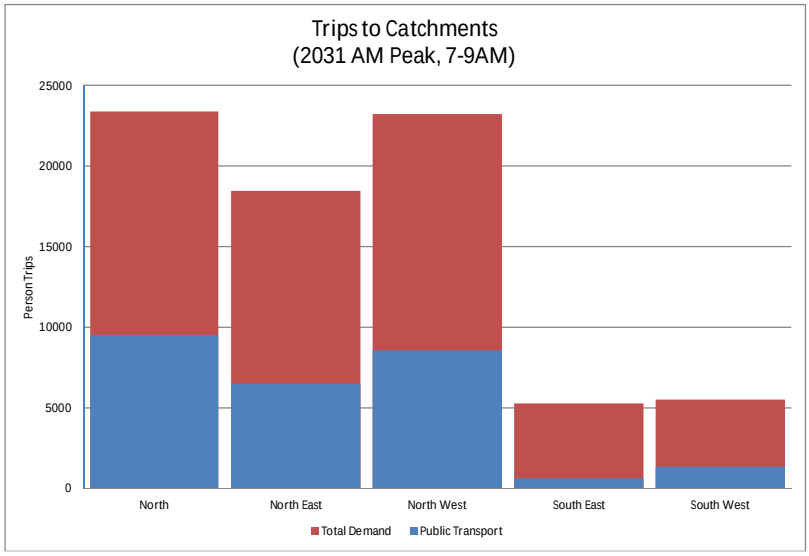


[1] Refer to Inception and Scoping Report, Appendix E

3.1.2 Traffic Modelling

The traffic modelling outputs have informed the main geographical markets that public transport needs to serve by the year 2031, and the size of these markets. To this end traffic modelling results to support the MCA are presented in Appendix C. These show that the northern catchments are the focus of trips in the morning with approximately 20,000 trips each over the morning peak period (refer to Figure 3). By comparison there are only approximately 5,000 trips to each of the southern catchments. The analysis also shows that there is a high use of public transport to access the northern catchments with approximately 35-40% of travel by public transport. In comparison the southern catchments are forecast to have a much lower use of public transport.

Figure 4 Trips to Catchment Area, 2031



3.1.3 Horizontal and Vertical Alignment Mapping

A project digital terrain LiDar based, orthorectified 3D model has been developed for this Study and provides a review of the north, north-west, north-east, south-east and south-west alignments as defined in **Figure 2**. Typical alignments for each area have been identified to gain an understanding of the physical characteristics (such as gradients, level changes) against which the assessment of its suitability as a route option can be informed. These alignments are not confirmed routes. The confirmed routes will be identified through a more detailed engineering technical assessment at the Medium List evaluation. Alignments are displayed for each Area in Sections 3.2 through 3.6 with full plans in Appendix A.

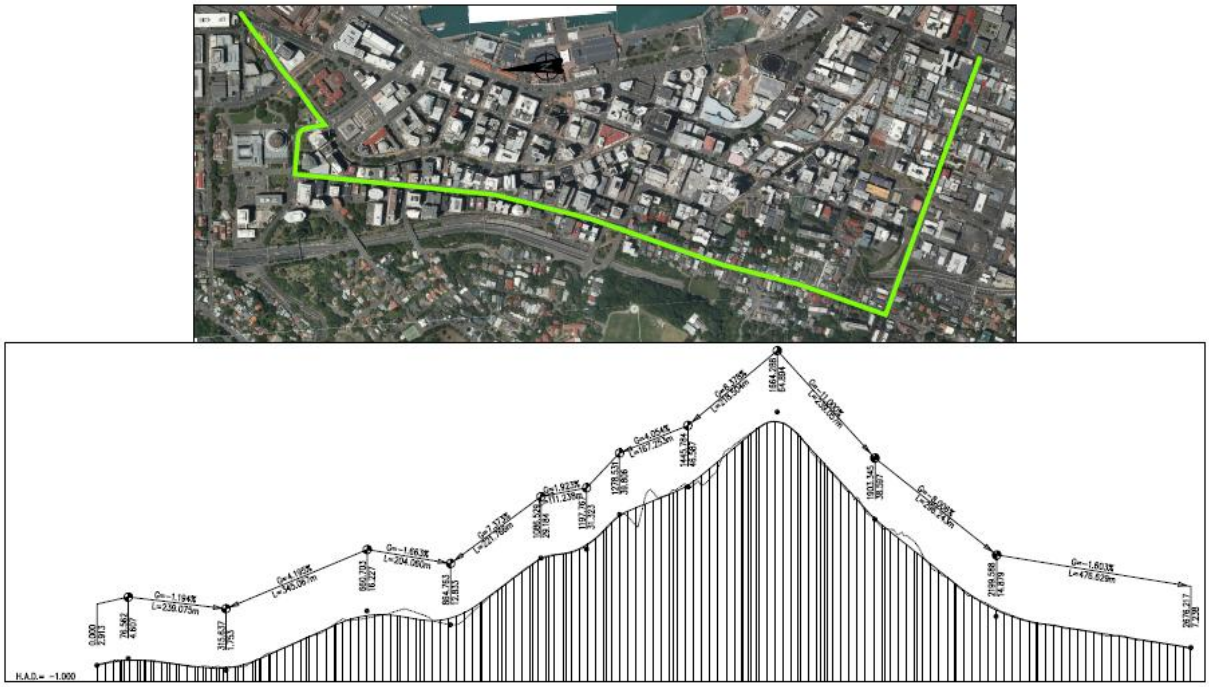
3.2 North

Refer to Figure 2 for location of the North Terrace (lime coloured area).

Ability to support TSD		- (A) Limited integration with the Thorndon area, which has a strong potential for TSDs.[2] - (G) Passes through the Central Area, which has a very high ratio of capital values to land values limiting opportunities to catalyse further TSD (although this area already operates as a TSD).[2] - (A) Does not fully support further intensification of the Central Area due to catchment limitations. [2] - (R) Passes on the western fringe of the Te Aro North Area, which limits the catchment and does not capitalise fully on the good TSD opportunities in this area. [2] - (G) Passes through part of the Te Aro South Area which may assist in supporting strong TSD opportunities here. Does not provide coverage to the eastern portion of the area. [2] - (R) Potential ridership catchment is restricted by severance caused by the motorway.
Accessibility		- (R) Challenging and varying gradients (up to 11%) along length likely to affect mode options[3] – refer to typical alignment below, or **Appendix A** drawing number 400) - (R) Height difference from Golden Mile likely to have negative pedestrian accessibility issues, affecting operational catchment - (R) Restricted catchment (motorway / grade difference)[4]. To the west catchment area is limited as area severed by motorway. - (R) Effective distance to waterfront unattractive (>400 m + gradient)[4]. Reasonable distance away from trip generators e.g. Te Papa, Oriental Bay in the south-east, key asset the waterfront. - (R) The above could limit uptake of system and potential fare revenues
Environment		- (R) Limited opportunities to incorporate footprint of stations / stops[3] - (R) Limited opportunities for the reallocation of road space [3]

[2] PTSS Land Use Planning Report: Citywide and Corridor Review, March 2012
[3] Refer to Appendix B, Catchment Area Analysis
[4] Refer to Appendix C, Modelling Analysis

Typical Alignment



Comment: Area has constraining characteristics to service CBD based on topography, severance and supporting the CBD vision i.e. shifting the City to the west and away from the Golden Mile and waterfront. Is at odds with assumptions from other strategies on how the City will develop e.g. RoNS. Gradients are likely to have negative impacts for rail based modes.

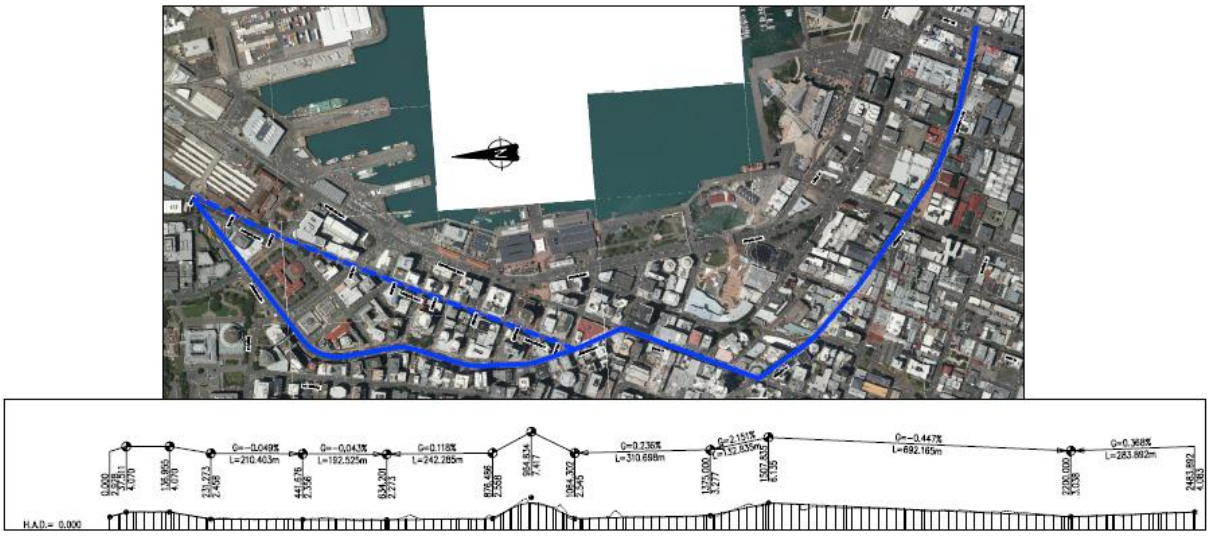
Recommendation: The Terrace on its own is unlikely to have merit in pursuing as a preferred public transport alignment but could be considered as part of a supplementary service e.g. bus. The Terrace alignment should be discarded from the Medium list based on the negative accessibility and environmental impacts.

3.3 North-West Area

Refer to Figure 2 for location of the North West Area (blue coloured area).

Ability to support TSD		- (A) Minor integration with Thorndon, which is an area of strong TSD opportunity. [2] - (A) Passes through the Central Area where high capital values indicate limited opportunity for TSD, although this area already operates as a TSD. [2] This alignment supports the further intensification of the Central Area due to an optimal catchment in this area. - (G) Passes through the centre of the Te Aro North area, which is a strong opportunity for TSD based on high consolidation, connectivity and high past growth. - (G) This route presents the least catchment restrictions of the northern alignments and therefore more potential to catalyse TSD. [2]
Accessibility		- (G) Relatively flat terrain (including for disabled access) [3] - (G) Large catchment area (no constraints such as motorway or sea) [4]
Environment		- (G) Less constrained by topography than The Terrace but still limited width[3] - (G) Not constrained by one alignment. Opportunity for alignment on Lambton Quay and Featherston Street.

Typical Alignment (for a larger scale representation of the alignments below refer to Appendix A)



Comment: The North-West area services a good catchment and is likely to have strong patronage. The typical alignment is relatively flat, with no significant gradients and would likely be able to accommodate all modes other than heavy rail.

Recommendation: The North-West area should be considered for further investigation at the next stage.

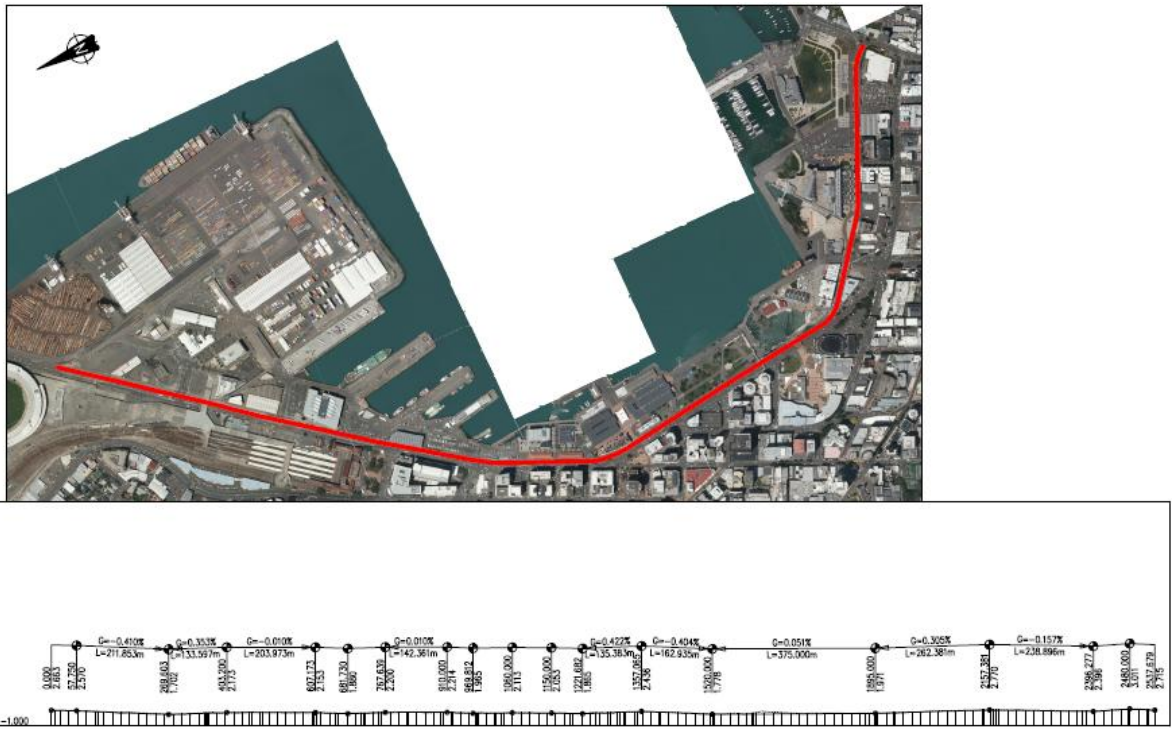
[2] PTSS Land Use Planning Report: Citywide and Corridor Review, March 2012
[3] Refer to Appendix B, Catchment Area Analysis
[4] Refer to Appendix C, Modelling Analysis

3.4 North- East Area

Refer to Figure 2 for location of the North East Area (red coloured area).

Ability to support TSD		- (R) For its northern portion, this route passes through industrial and transport areas (rail yards and port lands) which have limited potential for TSD. [2] - (R) This route passes on the eastern fringe of the Central Area, thereby missing some opportunities to support further intensification in the Central Area. [2] - (R) The waterfront properties along the eastern side of the route do not have significant potential to develop TSD under District Plan rules. [2] - (G) This route passes through the north eastern portion of Te Aro North which presents a strong opportunity for TSD. [2] - (R) The catchment for this alignment is significantly restricted by the waterfront/shoreline, rail and port infrastructure. [2] - (R) This alignment misses opportunities in Te Aro South. [2]
Accessibility		- (G) Relatively flat terrain (including for disabled access) [3] - (R) Catchment area effectively halved as sea to the east. [4]
Environment		- (G) Not constrained by one alignment e.g. Cable Street, Wakefield Street - (G) Good opportunities to accommodate footprint of stations / stops [3] - (G) Good opportunities for the reallocation of road space [3]

Typical Alignment (for a larger scale representation of the alignments below refer to Appendix A)



Comment: The North East area appears to have more available space for public transport options as well as servicing the Waterfront which could be viewed as an iconic feature. The typical alignment is flat with no sharp corners and is likely to be able to accommodate all modes.

Recommendation: The North East area should be considered for further investigation at the next stage.

[2] PTSS Land Use Planning Report: Citywide and Corridor Review, March 2012
[3] Refer to Appendix B, Catchment Area Analysis
[4] Refer to Appendix C, Modelling Analysis

3.5 South-West Area

Refer to Figure 2 for location of the South-West Area (blue coloured area).

Ability to support TSD		- (G) Passes through the west half of the Te Aro South area. This area presents strong opportunities for TSD. [2] - (R) Passes through the Mt Cook area, which is a poor opportunity for TSD. [2] This area saw little change in population or employment in the past decade thus indicates a barrier to TSD. This area has poor connectivity and a poor ratio of capital to land value. - (R) Passes through Newtown, which is a poor opportunity for TSD. [2] This area has had very low rates of growth in the past decade, presenting a barrier to TSD. - (R) This alignment misses significant opportunities to support TSD including Te Aro North and the south east of Te Aro South. [2] - (R) This alignment does not support the Adelaide Road Framework Plan. It passes through only a minor portion of the framework area along Wallace Street and does not support the existing commercial development along Adelaide Road. [2] - (R) The ridership catchment is limited by topography along Wallace Street as well as nearby open spaces which are part of the inner town belt. [2]
Accessibility		- (G) Relatively flat terrain [3] - (R) Distance greater than 400 m to Courtenay Place and Mount Victoria[4].
Environment		- (R) Negative impact on residential areas - (R) Constrained width / limited opportunities for the reallocation of road space. [3] - (G) Opportunity for more than one alignment, Cuba Street to Taranaki Street and Taranaki Street to Manners Street.

Typical Alignment (for a larger scale representation of the alignments below refer to Appendix A)

Comment: The South-West alignment does not focus on a particularly strong transport area that could focus TSD. Furthermore, the catchment appears to be limited. The significant gradients (close to 10%) are not conducive to rail based options. Typical alignment is on undulating terrain and has a significant number of sharp corners that may pose issues for public transport modes that require larger turning circles.

Recommendation: This area should be discounted as a primary public transport spine due to the alignment issues and limited TSD opportunities. However, it could be considered as a supplementary alignment for other services e.g. bus.

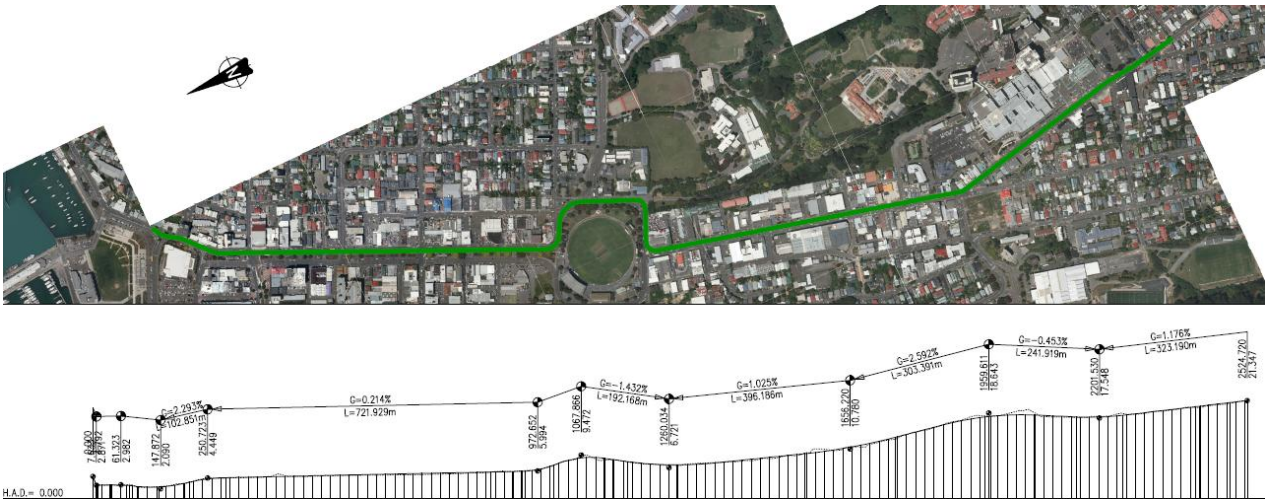
[2] PTSS Land Use Planning Report: Citywide and Corridor Review, March 2012
[3] Refer to Appendix A, Catchment Area Analysis
[4] Refer to Appendix C, Modelling Analysis

3.6 South-East Area

Refer to Figure 2 for location of the South-East Area.

Ability to support TSD		- (G) Supports strong opportunities for TSD in Te Aro North and Te Aro South. In combination with the North-West and North-East alignments this creates substantial coverage of the Te Aro North and Te Aro South areas with strong TSD opportunities. [2] - (R) Identified as a poor opportunity for TSD. Likely to need significant local government intervention to make it attractive to the market to support growth intensions around the Adelaide Road Framework. - (A) The catchment is limited by open spaces associated with schools and parks to the south of the Basin Reserve along the eastern frontage of Adelaide Road. [4] - (R) This alignment passes along Riddiford Street through Newtown. Newtown is identified as a poor opportunity for TSD, due to a low rate of change in the past decade. [2]
Accessibility		- (G) Reasonably flat terrain. A typical alignment for the South-East area, shows a maximum gradient of 2.6% on a largely straight alignment. [3] - (G) Service recreational area (Alexandra Park / Basin Reserve)
Environment		- (A) Difficulty of integration around Basin Reserve

Typical Alignment (for a larger scale representation of the alignments below refer to Appendix A)



Comment: This area has strong opportunities for TSD and supports direct connections to Wellington Regional Hospital. The alignment is generally straight (other than at the Basin Reserve) and the gradient does not exceed 2.6% so conducive for rail based modes.

Recommendation: The South East area should be considered for further investigation at the Medium List of Options stage.

[2] PTSS Land Use Planning Report: Citywide and Corridor Review, March 2012
[3] Refer to Appendix B, Catchment Area Analysis
[4] Refer to Appendix C, Modelling Analysis

3.7 Summary of MCA, by Area

A summary of the findings from the Area Assessment is tabulated in Table 5.

Table 5: Area Assessment Summary

Area Assessment					
	North	**North-West**	**North-East**	**South-West**	**South-East**
Ability to support TSD					
Accessibility					
Environment					
Recommendation	**Dismiss**	**Proceed**	**Proceed**	**Dismiss**	**Proceed**

Note: No weighing has been applied to the criteria for the Long List evaluation. For the purpose of this Long List evaluation it has been assumed that for the Area assessment then two reds is deemed as a fatal flow and thus that area should be dismissed from further assessment.

4.0 Multi-Criteria Assessment, by Mode

The multi-criteria assessment, by Mode has been informed by the International Review, Engagement Survey, traffic modelling and other supporting documents reviewed as part of this Study[5]. Modelling outputs which support the analysis are presented in Appendix C. The assessment is detailed in Sections 4.1 to 4.6 and summarised in Table 6.

4.1 ULTra Light Transit/PODs

Criteria		Rationale
Attractiveness to User		- (G) Generally fixed route so reliable in terms of frequency and speed - (A) The strength of PODs over alternatives is that PODs offer trips from origin to multiple destination options. PTSS is determining options for an area PT solution, not a network area-wide solution so this strength will not be beneficial relative to other modal options - (G) Novelty factor - (G) Ability to travel alone within a POD - (G) Convenient due to on demand nature of service.
Ability to support TSD		- (G) Fixed route which can be designed to support any land use activity. - (G) Convenience of on demand frequency of service would support TSD - (A) Raised infrastructure creates greater variety of built form integration options. - (A) May create severance issues depending on infrastructure design. - (R) High capacity stations will require large linear areas which may be geometrically difficult to provide in the context of TSD. - (R) System capacity may be insufficient for higher densities.
Engineering feasibility		- (G) Generally raised infrastructure so minimal impact on road space - (A) Fixed Route - can only travel on pre-determined routes - (A) Generally requires grade separation - (R) On-board batteries last around 60 km before they need charging - (R) Large interchanges required for docking areas. This is a big issue as a large space will be required to support the number of PODs required to meet demand at Wellington Railway Station. - (R) Raised infrastructure can require additional land take - (R) Potential gradient issues in hilly / uneven routes
Accessibility		- (A) Generally raised infrastructure so access via lift, or stairs
Ability to support demand		- (R) Capacity of each POD is low (typically four to six passengers) which is likely to be problematic when there is a high demand required at any one time, e.g. passengers transferring from a rail service. Note: Approximately 8,900 passengers in the peak hour are forecast to travel into the CBD by rail only (i.e. not outbound) in the 2031 morning peak[6]. 2,400 passengers are forecast to transfer from rail onto buses and the rest walk to their final destination. - (R) Not conducive to applications with strong unidirectional flow or where a concentrated interchange is required to the system from another form of transit. - (R) Indeed, it is noted in the ULTra PRT (Personal Rapid Transport), Project Investigation, March 2008 report, which is based on 2006 model runs (not 2031) that the peak number of passengers forecast to be moved between the railway station and Lambton Quay could provide a significant barrier to implementing the system. As such, mechanisms such as running more than one lane (at an additional infrastructure cost), by improving the technology to allow more frequent operation, or introducing

[5] Refer to Inception and Scoping Report, February 2012
[6] WTSM (2006) with updated land use forecasts

Criteria		Rationale
		pricing policies that encourage more sharing of the pods are likely to need to be considered to make a system viable. Given that the 2031 public transport demand is greater than that in 2006 the higher demand will further exaggerate this barrier.
Financial viability		- (A) Relatively cheap construction. However, is expensive per passenger journey compared to other modes.
Environment		- (G) Zero emission vehicles, energy efficient, low noise levels. - (R) Can be visually intrusive.
Safety		- (G) Like rail systems urban light transit is fully segregated from general traffic / pedestrian environment thus minimising conflicts

Recommendation: Urban Light Transit alone is unlikely to be a suitable mode of passenger transport to meet the future capacity demands to / from Wellington Railway Station. On this basis no further investigation of Urban Light Transit (PODs) should proceed.

4.2 Mini-bus

Criteria		Rationale
Attractiveness to User		- (G) Ability to organise personal services or premier business class services offering users door to door services and avoidance of incurring parking fees if using private vehicles - (G) High degree of flexibility subject to services offered by operators - (R) Speed and reliability - subject to general road conditions or classification of bus / taxi services enabling drivers to use HOV / Bus Lanes. However, could negatively impact on other modes performance in an HOV / bus lane.
Ability to support TSD		- (R) Likely to be seen as a less “permanent” public transport solution than more fixed modes due to a high degree of flexibility, thus not providing developers with assurance that they can safely invest in TSD. - (R) Possible higher frequencies can support TSD, although speed may not be sufficient if in a mixed traffic situation. - (G) Potential for the greater number of vehicles to service a greater number of end destinations making PT usage more attractive, thereby supporting reduced personal auto usage. - (R) Capacity may not prove sufficient for higher densities.
Engineering feasibility		- (G) Ability to use existing street networks and the potential to use any special vehicle lane e.g. BRT, HOV or bus lanes as a scheduled bus service.
Accessibility		- (G) Classification of bus / taxi services enabling drivers to use HOV / Bus Lanes - (G) Pick up / drop down locations pre-arranged between service provider and users.
Ability to support demand		- (R) Limited capacity per vehicle (eight to thirty passengers). - (R) Forecast (2031 AM) demand equates to approximately 193 mini buses per hour in each direction[6] – which is approximately double the number of forecast buses. - (R) If mini buses were used to provide for rail passengers (2031 AM) that walk to their destination this equates to approximately 300 minibuses[6].
Financial viability		- (G) No likely specific construction costs required for this mode which will make use of existing street networks - (A) Commercial viability of generating such a service may require significant subsidy. Low barriers to entry likely to stimulate greater competition for tendered services.

Criteria		Rationale
		- (A) Maintenance cost due to large number of min-buses required.
Environment		- (R) Adds to congestion due to number of mini-buses required to move demand. - (R) The number of mini buses required to support the forecast demand would be three to seven times the current number of buses[6].
Safety		- (G) Personal safety of a private service i.e. door to door - (A) Drivers to abide by road safety laws

Recommendation: Mini-buses alone do not have sufficient capacity to meet existing and future network demands. However, the introduction of premier bus services for targeted markets may offer beneficial (behavioural) step changes in reducing existing private vehicle use short term or until the development of other higher capacity modes are realised. This may include provisional bylaws for mini buses precincts / stopping zones etc. supplementing bus on-street services.

The recommendation is that mini-buses are dismissed from further analysis based on negative capacity and environmental impacts.

4.3 Bus on-street

Criteria		Rationale
Attractiveness to User		- (R) Operational speeds can be affected by congestion, signal delay - (G) Good network coverage subject to the type of service operation - (G) The potential of a bus stop within <400m walk from either home / office locations - (R) Poor perception of buses (although we note that this perception can be rapidly changed, for example Northern Express services in Auckland).
Ability to support TSD		- (A) Buses can offer flexibility to change the network and frequency of series to support land use activity, but do not provide developers with same assurance that investment will be safe from network changes as a fixed route option might (i.e. LRT, BRT, or Rail). - (G) Provision of an integrated bus stop and or interchange could anchor and support various types of mixed use activities. - (R) Frequency and speed may be an issue in congested areas. - (R) Bus volumes may be detrimental to walkability. Buses can be noisier than some alternatives, impacting negatively on the urban environment.
Engineering feasibility		- (G) Buses have the ability to use existing street networks without the need for any additional costs - (A) The provision of a special vehicle lane e.g. signal priority, queue jumps at intersections and / or HOV and bus lanes to improve bus operations on selected urban areas is subject to spatial constraints of the area road reserve and adjoining land use activities .
Accessibility		- (G) Route flexibility longer term to respond to new land use activity and catchments - (G) Ability to access and use HOV / Bus Lanes offering reliability in travel.
Ability to support demand		- (A) Capacity ranges of buses operating on-street are in the order of 60 to 75 persons. Capacity is constrained by the size of individual vehicles (e.g. standard bus vs. articulated buses) and operating frequency of services which in turn impose constraints on the attractiveness of services to users. Double-decker buses have a higher capacity 110 people which can use the same linear footprint as a normal bus. - (A) Forecast (2031 AM) demand equates to approximately 120 buses per hour in each direction at Screenline 4 (see Appendix C), assume a crush capacity of 80% [6]. Existing 2011 bus volumes are approximately 97 per

Criteria		Rationale
		hour. - (A) If buses were used to provide for rail passengers (2031 AM) that walk to their destination this equates to approximately 140 buses per hour.
Financial viability		- (G) Generally a cheaper option than other public transport modes e.g. BRT, LRT.
Environment		- (A) Operate within the existing traffic environment
Safety		- (A) Likely to still have bus / pedestrian conflicts which have contributed to a number of pedestrian accidents recently.

Recommendation: Buses on-street will continue to operate. However the attractiveness of the service is dependent on the fleet age, safety and provisions at bus stops and stations e.g. wireless connections on-board for users, bus shelters, time table information etc. Due to an increase in the number of buses operating on an area to meet the demand, existing priority schemes for buses may deteriorate reducing speed and reliability e.g. buses stopping in lanes for alighting passengers etc. The Wellington City Bus Review is currently consulting on an optimised bus scheduling and network in the short term. It is proposed that buses proceed to the Medium List of Options given that from the MCA, overall there are no overall negative impacts.

4.4 Bus Rapid Transit (BRT)

Criteria		Rationale
Attractiveness to User		- (G) Less delay than buses due to bus lanes, signal priority or segregated facility.
Ability to support TSD		- (A) TSD can be more difficult with BRT than with rail based systems, requiring greater public sector leadership and commitment. - (A) Interchanges / stations ideally can be integrated into TSD areas and/or developments. However, it can be difficult to address pedestrian access issues around stations to overcome severance effects from BRT areas. - (G) The permanence of a busway can support market decisions to intensify near interchanges/stations; - (G) BRT can operate at lower densities than higher order public transport systems, BRT related TSD can occur in areas where densities are not sufficient to support LRT or Rail based systems and in communities that do not want the required intensities to support LRT or Rail. - (G) Speed and frequency can support TSD.
Engineering feasibility		- (A) A fully segregated facility may dominate the area and /or segregate an existing urban environment - (A) Refer to the financial viability on funding on design parameters. - (A) BRT has similar operational gradient limitations as conventional bus, but the infrastructure requirements can limit elements such as turning radii and vehicle tracking which can restrict applicability in limited width areas or where tight corners exist.
Accessibility		- (A) Station spacing is typically between 500 m to 1 km but can be less. Accessibility is dependent on the type of design i.e. degree of segregation and right-of-way.
Ability to support demand		- (G) Capacity ranges of buses operating on BRT are between 60 to 150 persons. Capacity is constrained by the size of individual vehicles (e.g. standard bus vs. articulated bus) and operating frequency of services which in turn impose constraints on the attractiveness of services to users and the carrying capacity of vehicles operating on the BRT. - (G) 2031 AM peak hour demand forecasts show public transport patronage above 2,000 persons per hour on the rail area, and through the CBD from the rail station to Pirie Street where bus services diverge between Hataitai tunnel and Mount Victoria tunnel. Forecast demand of total travel shows a similar pattern of trips with a concentration of trips into the centre of the CBD[6].
Financial viability		- (G) The cost of BRT (capital and operating costs) can be less expensive than LRT or MRT depending on the design parameters and construction approach. - (A) Can have positive impact on land values but is typically less than LRT, MRT.
Environment		- (A) Depending on the design parameters and power source will significantly vary the environmental impact.
Safety		- (G) A fully segregated BRT can reduce the bus / general vehicle conflicts.

Recommendation: Buses and the ability to access and use BRT provide levels of operational flexibility that rail-based solutions will not be able to provide. Further consideration and investigation of BRT systems is recommended.

4.5 Light Rapid Transit (LRT)

Criteria		Rationale
Attractiveness to User		- (G) Viewed as a modern, convenient mode of travel supporting revitalisation of inner urban areas through redevelopment and reconstruction of buildings and infrastructure. - (G) Normally runs on a dedicated alignment but can share road space with other users. Generally less delay than buses as segregated facility.
Ability to support TSD		- (G) Many recent LRT systems developed internationally seek to: support compact land use development on areas and around stations e.g. Transit Planning Zones within District Plans, preserve historical towns and pedestrian "car free" environments - (G) The permanence of LRT systems offers a perception of more certainty for investments decisions. Developers are likely to react more favourably over less fixed options. - (G) LRT can be seen as a premium mode over other systems by its users and developers. - (G) An LRT system is likely to attract riders and investment easier than a street based bus system. - (G) Frequency and speed are likely to support TSD. - (G) There is a strong track record of LRT TSDs in existence.
Engineering feasibility		- (A) Engineering feasibility is a factor of numerous elements e.g. funding, existing block typologies and street layouts. This will determine the extent and nature of LRT provision including the ability to: • Undertake a comprehensive design of an LRT system that supports and is flexible to existing and future changes e.g. growth, technology • Effectively relocate services and accesses to existing buildings abutting proposed alignments subject to the degree of either a partial or fully segregated system • LRT is limited buy maximum gradients (depending upon the system) of around 6-7%[3] and required minimum width and turning radii, which can limit route selections and operational speeds.
Accessibility		- (G) Station spacing can range from 300 m (ideally starting at 400 m) to 600 m depending on density and / or key locations within the area. - (R) Block typologies and street layouts can impose constraints on the type of LRT vehicle (e.g. width and length). For example, for short blocks long LRT vehicles will inhibit intersections and pedestrian access to platforms / stations, factors that will impede on the systems performance and capacity.
Ability to support demand		- (G) Capacity ranges from 100 to 256 persons per carriage. Capacity is constrained by the size of individual LRT sets (typically two or four carriages sets) and the operating frequency of services which in turn impose constraints on the attractiveness of services to users and the carrying capacity of vehicles operating on the LRT. - (G) During peak hour periods a LRT area may support 2,000 to 40,000 persons. This range is comparable to BRT modes (refer to Appendix B of the International Literature Review). - (G) 2031 AM peak hour demand forecasts show public transport patronage above 2,000 persons per hour on the rail area, and through the CBD from the rail station to Pirie Street where bus services diverge between Hataitai tunnel and Mount Victoria tunnel. Forecast demand of total travel shows a similar pattern of trips with a concentration of trips into the centre of the CBD[6].

Criteria		Rationale
Financial viability		- (A) Subject to the type of LRT system capital costs are likely to be more than BRT and will depend on many factors e.g. the stringency of local engineering, labour costs, environmental conditions. Compensation to local businesses affected during construction may also push costs up.
Environment		- (G) LRT like BRT can define and shape an area and is dependent on the technology and design of the system adopted. Consideration needs to be given to position of the system e.g. relationship of interchanges, stations and the depots to adjoining land use activities. - (A) Many of the environmental considerations will depend on the design.
Safety		- (G) Safety and the level of interaction with other modes e.g. partial segregation of tramways vs. grade separation will influence safety factors. Many of the safety considerations and objectives should be addressed in the engineering feasibility phases

Recommendation: LRT systems and frequencies may provide a modern and attractive alternative to buses. LRT provides opportunity for the revitalisation of inner urban areas through redevelopment as evident through many of the international case studies reviewed. Further consideration and investigation of LRT systems should be advanced in the study of options.

4.6 Mass Rapid Transit (MRT) – Heavy Rail Extension

Criteria		Rationale
Attractiveness to User		- (G) MRT systems can offer fast, reliable travel to such a degree of confidence that timetable services are not necessary - (A) Interchange is likely to still be required from services at Wellington Railway Station.
Ability to support TSD		- (G) MRT systems can support compact land use development on areas and around stations to support high density populations and land use activities - (G) MRT has the largest potential ridership catchment area, and a commensurate influence on development. The “throw away the timetable” frequency offered by MRT is very supportive of TSD, as are the speed and reliability. - (G) Other abilities to support TSD are as with LRT.
Engineering feasibility		- (G) MRT systems can operate on a segregated right-of-way which may be either partially underground or elevated within cities - (A) MRT would likely only be implemented as an extension to the existing rail infrastructure requiring an extension of one or more of the existing lines. This would either have to come through or around the east or west side of the station. Alignments to the east or through the stations are limited in width and straight alignment, which would likely provide difficulties in construction and operation. The western alignment appears to have adequate width and continuity of alignment to be achievable.
Accessibility		- (A) Station spacing and location ideally would support high catchment area with station spacing ranging between 800 m to 1.5 km.
Ability to support demand		- (G) Peak hour capacity can range between <30,000 to 90,000 persons per hour. The capacity of an MRT is dependent on train length (i.e. carriage sets) and frequency at which the service operates within areas which can vary typically between 140 – 280 people per carriage - (G) Engineering feasibility must consider the future capacity of systems to ensure supporting infrastructure can cope with future demands. This includes the length of station platforms to support additional carriage configurations - (G) Approximately 7,500 passengers per hour are forecast to travel into the CBD by rail in the 2031 morning peak. Of these approximately 4,500 travel to the Manners Mall area and 1,600 have a destination in the vicinity of Courtenay Place. Forecast total demand from catchments served by rail to the CBD is approximately 15,000 rail with 2,700 travelling to destinations near Courtenay Place[6].
Financial viability		- (R) Subject to the type of MRT system capital costs may be around NZ$105 m per km. This is likely to be higher for an underground system. - Like LRT and BRT service planning is an on-going process, with timetabling and performance evaluated and modified to respond to changes in demand and changing community needs
Environment		- (R) Possible that severance created by MRT can undermine walkability unless accounted for in design phases. - (A) Environmental consideration and objectives should be addressed in the engineering feasibility phases
Safety		- (G) Safety consideration and objectives should be addressed in the engineering feasibility phases. The segregation from other modes is likely to provide safety benefits.

Recommendation: Like BRT and LRT systems further consideration and investigation of MRT systems should be advanced to the next phase of the study to confirm technical feasibility and compatibility with existing rail networks, existing and future land use activities.

4.7 Summary of MCA, by Mode

A summary of the findings from the Mode Assessment is tabulated in Table 6.

Table 6: Mode Assessment Summary

	ULTra/ PODS	Mini-bus	Bus-on Street	Bus Rapid Transit (BRT)	Light Rapid Transit (LRT)	Mass Rapid Transit (MRT)
Attractiveness to user						
Ability to support TSD						
Engineering Feasibility						
Accessibility						
Capacity						
Financial viability						
Environment						
Safety						
Recommendation	Dismiss	Dismiss	Proceed	Proceed	Proceed	Proceed

Note: No weightings have been applied to the criteria at the Long List evaluation. For the purpose of this Long List evaluation it was agreed by the TWG that two criteria - Engineering Feasibility and Capacity – would be considered as fatal flaw criteria. As a result, if there is a red for any of these, by Mode option, then that option should be dismissed and consequently not proceed to the Medium List evaluation.

4.8 Summary of Multi-Criteria Assessment

Table 7 Summary of Multi-Criteria Assessment (Area and Mode)

Area Assessment

	North	North-West	North-East	South-West	South-East
Ability to support TSD					
Accessibility					
Environment					
Recommendation	Dismiss	Proceed	Proceed	Dismiss	Proceed

Modal Assessment

	ULTra/ PODS	Mini-bus	Bus-on Street	Bus Rapid Transit (BRT)	Light Rapid Transit (LRT)	Mass Rapid Transit (MRT)
Attractiveness to user						
Ability to support TSD						
Engineering Feasibility						
Accessibility						
Ability to support demand						
Financial viability						
Environment						
Safety						
Recommendation	Dismiss	Dismiss	Proceed	Proceed	Proceed	Proceed

Compatibility of Modes and Areas (Options to be taken to Medium List)

	Bus-on-street	BRT	LRT	MRT
Central (North-West & South-East areas)				
Waterfront (North-East and South-East areas)				
Underground				

5.0 Detailed Rationale for Options Recommended to be Dismissed

This Chapter describes in further detail the options that are recommended to be dismissed. It elaborates on the findings from Chapter 3 and Chapter 4.

5.1 Area Assessment, North

Key TSD opportunities are missed. The North Area does not connect well with strong TSD opportunities identified in Te Aro North and only partially addresses the opportunity in Te Aro South. If developed with BRT, LRT or MRT this area is likely to support a shift in development to the west of the current "Golden Mile" area. However, this potential for development is limited by challenging topography along the western side of the area. Other alignments in the North better connect with the City Centre and TSD opportunities.

The potential ridership catchment is limited. Challenging topography along the western side of the route limits the spatial extent of the walking catchment. The severance created by the motorway further restricts the extent of the catchment. These constraints combine to limit the potential for redevelopment in this area likely to limit the potential catchment population and employment density. This in turn limits the suitability for high order modes (BRT, LRT, MRT) along this route.

5.2 Area Assessment, South-West

The alignment through this area misses key opportunities that are captured in other alignment area options. Specifically it misses opportunities to support strong TSD potential in Te Aro North, as well as a portion of Te Aro South. Instead of connecting with areas of opportunity for TSD, it passes through areas of difficulty, such as Mt Cook and Newtown. These are slow growth areas with lower densities.

The alignment through this area is at odds with the Adelaide Road Framework Plan that promotes intensification along Adelaide Road. This alignment nearly misses the framework area entirely, passing along its western boundary. This would serve to undermine efforts to intensify along Adelaide Road.

The catchment also has some limitations. Topography and open spaces along the western side through Mt Cook place limitations on the walking catchment as well as the potential for intensification within the alignment catchment.

5.3 Modal Assessment, ULTra/PODS

ULTra/PODS have been discounted due to the inability of the system to provide adequate capacity for forecast demand.

ULTra/PODS provide a capacity to move approximately 800 people per hour from a single access point. Approximately 8,900 passengers per hour are forecast to travel into the CBD by rail in the 2031 morning peak. More than two thousand passengers transfer onto buses, to service these passengers by ULTra/PODS would require three loading stations. The remaining rail passengers walk to their final destination with approximately 2,000 travelling along the waterfront and 2,000 to The Terrace. If half of these passengers transferred to ULTra/PODS then a further three loading points would be required.

A further limitation to the ULTra/PODS ability to provide for forecast demand is the need for a segregated area. This would either create a congested single area (given forecast demand), or would require the development of a number of areas to serve the area which would create congestion and accessibility issues for other users.

5.4 Modal Assessment, Mini-bus

Mini-buses have been discounted due to the increase in the number of additional vehicles required to service forecast demand.

Forecast (2031 AM) patronage in the centre is highest through the Manners Mall area with approximately 3,000 passengers per hour (northbound). Given occupancy of 25 people per bus the required capacity would be 120 min-buses per hour. Given the current congestion caused by buses queuing through this area mini-buses are unlikely to provide an adequate level of service and would not support any increase in demand. Even if alternative areas were also investigated it is unlikely that mini-buses would provide a saleable solution.

5.5 Compatibility, MRT Central Area

MRT extending though the Golden Mile has been discounted due to the implication of taking heavy rail, at grade through Featherston Street.

It is likely that heavy rail would need to be fully segregated and this would create significant severance for pedestrians and other road users. The land required and the impact on the CBD would likely have a significant negative impact on the viability of the CBD as an attractive place to work and locate business.

It is envisaged that there would be significant issues in extending the rail line through a central alignment, both technically and with respect to either going through the existing Station or to the east of it.

5.6 Compatibility, Bus-on-street, BRT, LRT Underground

Underground options for bus, BRT and LRT have been discounted due to the benefits of these systems integrating with other modes. It is viewed that underground options are unlikely to provide any benefits to a system other than the heavy rail which has a longer distance set service that could benefit from continuing this through to the Central CBD.

6.0 Recommended Options

The Medium List options have been built up from a strategic assessment of:

- Areas that public transport need to serve - and can be underpinned by transit supportive development;
- Modes that have the ability to move the forecast demand;
- Modes that meet customer service needs identified in the Engagement Survey; and
- Modes that can assist in providing environmental, safety and amenity benefits.

The options recommended to proceed to the Medium List (Technical Evaluation) assessment are illustrated in Appendix D and are:

- Option 1: Bus – Central
- Option 2: Bus – Waterfront
- Option 3: BRT – Central
- Option 4: BRT – Waterfront
- Option 5: LRT – Central
- Option 6: LRT – Waterfront
- Option 7: MRT – Underground
- Option 8: MRT – Waterfront

These options will be assessed at a more detailed quantitative level through the process identified for Medium List assessment in the Inception and Scoping Report, February 2012. This will include the linkage of these options to the wider network and an assessment from a concept design, engineering, social, environmental/planning, modelling and cost (CAPEX and OPEX) perspective.

Figure D1 to Figure D6 identifies areas (the envelope) that will be assessed for each Medium List option and also the potential linkage between the Central and Waterfront areas. For example, for BRT the envelope includes between Lambton Quay and Featherston Street in which the most suitable alignment will be assessed. Linkages between the Central and Waterfront areas will include an assessment of a link at Victoria Street.

For the two bus options this would consider any significant infrastructure improvements that could be implemented beyond that outlined in the Base Case.

7.0 Next Steps

On Greater Wellington endorsement that the above options M1 to M8 should proceed to the Medium List evaluation the following technical analyses will be undertaken (as specified and detailed in the Inception and Scoping Report).

Table 8 Medium List Evaluation Approach

Process	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. Additional process will also be followed in terms of identifying more detailed assessment criteria and the MCA framework, appropriate for the Medium List evaluation.
Business Case Requirements	Evaluation against technical and planning criteria.
Patronage demand and traffic modelling	Assessment of modes against KPI's with forecasted WTSM (2011) and WTPM.
Urban design and Land Use	Understanding of the interdependence between land use and PT and what the triggers are for one to support the other. Identify ways in which designs should be influenced with WCC urban designers to influence future form and design of the area.
Concept Designs	Scope out options at a high level based on design and operational criteria derived through the international review process.
Social and Environmental Assessment	Effects based assessment to identify the merits and weaknesses of each option (as part of the MCA).
Cost Estimation	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.
Stakeholder Communication and Community Engagement	Engagement with a narrower group of stakeholders. Stakeholders would be informed of the option specification, and costing results.