

## **Attachment 3**

### **Officer responses to key submission themes**

**Key submission themes covered are:**

- **current network issues**
- **study process**
- **alternative modal options**
- **alternative corridor alignments**
- **transfers**
- **capacity**
- **secondary route through the CBD**
- **the shortlisted options**
- **network design and wider network integration issues**
- **costs and funding**
- **other considerations – including provision for cyclists and pedestrians, Roads of National Significance, real time and integrated ticketing schemes, urban design strategy, environmental/sustainability issues.**

Key theme from written submissions	Officer comment
<b>Current network</b>	
<p>Strong desire for public transport to be improved from the current status quo.</p> <p>Suggested improvements included reducing bus queues, improving reliability of the services, reducing fares for short journeys, and ensuring public transport is flexible in the face of disruptions and delays.</p>	<p>The Ngauranga to Airport Corridor Plan (N2A Plan), adopted in 2008, identified the need for improvements to public transport through this corridor, which forms the key corridor for a significant number of trips in the region.</p> <p>The N2A Plan is based on an analysis of the transport needs of the whole corridor. It identified an integrated package of projects, including improvements to the strategic road network and a high quality, reliable, safe public transport service between the Wellington railway station and the regional hospital. The N2A Plan identified a ‘staged approach’ to passenger transport improvements, including early bus priority measures, in advance of any high quality, high frequency system that might be implemented.</p> <p>In the short term, improvements proposed were bus priority lanes/measures, bus fleet improvements, real time information and integrated ticketing. Some of these have been implemented already and others are planned.</p> <p>The subsequent Wellington City Bus Review looked at changes to network design and services to address some of the issues with the current network.</p> <p>In the longer term, implementation of the public transport spine, the subject of the PT Spine Study, will build upon measures to address current problems and forecast future issues.</p>
<p>Submitters were split between reducing the number of bus stops to improve travel speeds and concern that fewer bus stops will reduce accessibility to public transport.</p>	<p>The number of stops/stations along a public transport route needs to provide a balance between journey times and accessibility.</p> <p>Previous work commissioned by Greater Wellington Regional Council (Central Area Bus Operational Review) looked at the optimal number of stops, with consideration of these factors, and has suggested that some rationalisation of stops through the Golden Mile is warranted.</p> <p>The PT Spine Study assumed a lesser number of stops along the Golden Mile than currently exists, for the purposes of the feasibility level study only. No specific locations were identified. The number and location of stops implemented under a preferred option will be determined in future detailed design phases.</p>
<b>Study process</b>	
<p>Study biased against Light Rail Transit (LRT) because:</p> <ul style="list-style-type: none"> <li>• LRT is inappropriately expensive</li> <li>• Patronage figures underestimated for LRT</li> <li>• Less viable route for LRT deliberately chosen</li> <li>• LRT received harsher scrutiny in the Study than BRT</li> </ul>	<p>The PT Spine Study approach was to consider all possible options – route and mode – and refine the options down to a short list of the most feasible options. The short list evaluation methodology was based on the need to consider each of the short listed options equally and fairly, to understand the comparable costs and benefits between them. The same analytical framework was used for each option.</p> <p>Specific commentary in relation to the various issues perceived by</p>

<ul style="list-style-type: none"> <li>Study downplayed LRT's economic and development benefits.</li> </ul>	<p>submitters as resulting in bias against Light Rail Transit (LRT) are included below under the relevant headings in this table.</p>
<p>A separate second Mt. Victoria Tunnel is not required for Light Rail Transit (LRT)</p>	<p>During the study, consideration was given to the ability for LRT to utilise the duplicated SH1 Mt Victoria Tunnel in future. Advice was received from NZTA, together with a review of international experience. It is adopted international best practice for rail (including LRT) and road traffic to be kept separate from one another in tunnels for operational, safety, maintenance and design consideration reasons. The key factors are set out below:</p> <ul style="list-style-type: none"> <li>The interaction between infrastructure providing the power source for LRT with infrastructure for road traffic (lights, fans, signs) adds complexity and cost.</li> <li>Ventilation in a shared LRT/road tunnel is likely to be more complex compared to a road only or LRT only tunnel. Additional ventilation would increase construction and "whole of life" costs.</li> <li>From a maintenance perspective it is likely that a LRT/road tunnel would need to close more frequently (compared to separate LRT tunnel) in order to maintain the electrical system for the LRT system.</li> <li>From an operational perspective, LRT vehicles would need to transition from a dedicated lane outside the tunnel to a shared traffic lane within the tunnel. This transition would be more difficult for LRT vehicles than for Bus Rapid Transit (BRT) vehicles. LRT vehicles would require a dedicated signal phase, whereas BRT vehicles could merge directly into shared lanes without necessarily requiring a dedicated signal phase.</li> <li>From a resilience perspective, a shared road and LRT tunnel would be less desirable. If an incident occurred in the tunnel there would be no opportunity for LRT to "change lanes" to bypass the incident, and this would potentially affect both LRT and road networks.</li> <li>There would also be significant fire life safety concerns as to how an incident (including fire) could be feasibly managed in a LRT/road tunnel. In the event of an accident, drivers and LRT passengers would need to get out of their vehicles and safely move to the portal or a cross passage exit. Complications arise with a shared LRT/road tunnel in relation to the LRT power source and design to remove any risk of electrocution, the length of LRT vehicles and their potential to block emergency exit locations, and providing emergency exits to cater for the higher number of people associated with LRT vehicle capacity.</li> </ul> <p>For the purpose of the feasibility study it was considered that a shared LRT/road tunnel would be very problematic and therefore it was recommended that a separate tunnel be provided for LRT.</p>
<p>The Terms of Reference was wrong as it focused the Study on too narrow a geographic area. Wellington Railway Station</p>	<p>The PT Spine Study originates from a specific action identified in the Ngauranga to Airport Corridor Plan (N2A). The plan identified an integrated package of projects as a multi-modal</p>

<p>is not a natural transport hub and should not have been considered as the northern terminus of the Study area.</p>	<p>solution to the issues faced in the transport corridor.</p> <p>The purpose of the study was to look for the best option to provide a high quality public transport spine through central Wellington from Wellington Railway Station to Wellington Regional Hospital. It also considered connections with the wider public transport network and possible extensions of the spine. It was not intended to be a review of the whole public transport network.</p> <p>The study terms of reference reflect the recent significant investment made in the region's heavy rail network (rolling stock and infrastructure) and therefore duplication or replacement of the function provided by the heavy rail network is excluded.</p> <p>The decision to extend the PT Spine to the east (Kilbirnie) was made when analysis showed good potential to increase public transport mode share from the eastern suburbs catchment.</p>
<p>Study inconsistent with other strategic documents.</p> <ul style="list-style-type: none"> <li>• Study should have been designed to meet the public transport patronage and climate change targets in the Wellington Regional Land Transport Strategy (RLTS) 2010.</li> <li>• Study did not take into account the whole of Wellington City's 'Growth Spine' and was therefore inconsistent with the Wellington City Council Transport and Urban Design Strategies.</li> </ul>	<p>As noted above, the PT Spine Study is an action from the Ngauranga to Airport (N2A) Corridor Plan 'To undertake a feasibility study for a high quality public transport system, including light rail'.</p> <p>The N2A Corridor Plan was developed under the policy framework provided by Wellington RLTS. The targets in the RLTS for public transport and climate change are deliberately aspirational targets. It is recognised that a range of projects and measures will be required to move towards these targets, not just one public transport project. In addition, it is recognised that a number of external factors will affect the region's ability to meet these targets such as economic climate, fuel prices, etc.</p> <p>The N2A Corridor Plan and the PT Spine Study took direct account of the Wellington City Council Transport and Urban Development Strategies, and supports the Wellington City Growth Spine.</p> <p>The route options proposed in the PT Spine Study take account of projected trip demand, and reflect the dominance of the CBD as the origin/destination of the majority of trips, and the lack of demand for through trips.</p>
<p>Transport modelling issues included:</p> <ul style="list-style-type: none"> <li>• The transport model used to calculate patronage and economic benefits was the wrong model to use because it is a car focused model</li> <li>• Including the Roads of National Significance (RoNS) in the economic calculations was wrong approach</li> <li>• Inconsistent public transport patronage growth forecasts in the 2010 Regional Land Transport Strategy (RLTS) and the Study – with the RLTS patronage forecasting significantly higher than the Study's patronage growth forecasts.</li> </ul>	<p>The transport models used are not car focussed. The Wellington Transport Strategy Model (WTSM) considers active modes, public transport and commercial vehicles also. The Wellington Public Transport (WPTM) considers public transport users in a more detailed way than WTSM. WPTM was the main analytical tool used in the study and was specifically develop for use in this study.</p> <p>Projects included in the study analysis were consistent with other planning and programming assumptions. Sensitivity tests were conducted which excluded the RoNS projects (except Basin Bridge) from the analysis.</p> <p>The transportation modelling analysis done for the RLTS development process cannot be directly compared to that done for PT Spine Study. This is because the packages developed as part of the RLTS development process at that time cannot now be</p>

	<p>matched to programming decisions made since. RLTS patronage targets for public transport were not met unless combined with congestion charging. Population and employment numbers are also different.</p>
<p>Study did not adequately examine the environmental, social and health impacts of the three short listed options.</p>	<p>At the medium list evaluation stage, a multi-criteria analysis was used to further refine the long list options. This included factors under environmental and safety headings – relating to emissions, noise, heritage, severance and safety.</p> <p>As part of the short list evaluation, an Environmental and Social Assessment was undertaken.</p> <p>These elements were assessed at a level considered appropriate for a feasibility study. The purpose being to compare between the potential options. In many cases, these types of impacts will largely depend on the detailed design of any future options including the vehicle specifications, impact on property, station design. This detailed design is not available and will have to be considered at the next stage of scheme assessment.</p>
<p><b>Alternative modal options</b></p>	
<p>Preference for other modes that were looked at, and ruled out through the Study process. These included:</p> <ul style="list-style-type: none"> <li>• Heavy rail</li> <li>• Ultra pods</li> <li>• Monorail</li> </ul>	<p>The study went through a process of sieving the range of options from a long list, through to a medium, then short list. The study started off with over 88 possible options, the purpose being to give consideration to all possibilities before ruling anything out.</p> <p>Ultra pods were considered and ruled out at the long list evaluation stage. Key reasons were the inability of this option to provide adequate capacity, combined with the need for significant space for vehicle marshalling, waiting, and queuing. The operating characteristics of this mode mean it would probably require a completely exclusive corridor (likely to be provided via a raised structure with associated accessibility, space constraints and visual amenity issues).</p> <p>Options for extending heavy rail beyond the Wellington Railway Station and through the Wellington City CBD to Courtenay Place were considered through the study and were subsequently ruled out, scoring the worst out of the all of the options considered at the medium list stage. The key reasons were:</p> <ul style="list-style-type: none"> <li>• Underground heavy rail has a very high cost.</li> <li>• There could only be two additional rail stations (at the BNZ Centre and Courtenay Place) as heavy rail is not suitable for short stops. This would not provide the required high level of access through the CBD.</li> <li>• The terminus at Courtenay Place would provide no benefit to passengers from the southern and eastern suburbs of Wellington and to make the service viable it would probably require all buses to terminate at this point and passengers to transfer to the rail line to continue to destinations within the CBD which is inconvenient</li> <li>• The construction of an underground rail tunnel that was resilient to earthquakes and flooding would be technically</li> </ul>

	<p>very difficult</p> <ul style="list-style-type: none"> <li>• A rail line at ground level would remove considerable road space, affecting traffic flows as well as providing a significant physical barrier to pedestrian movements</li> </ul> <p>A monorail option was grouped within the ‘Light Rail’ sub-category. It is essentially a form of light rail on a raised track – however there are currently no monorail design solutions that can provide an equivalent carrying capacity to Light Rail Transit or Bus Rapid Transit. While not requiring dedicated lanes within the road corridor, this option would cost significantly more than at-grade light rail (due to the cost of a raised structure), and would have visual amenity and accessibility issues. ‘At grade’ light rail was investigated in detail at the short list stage as the most viable of the light rail options.</p>
<p><b>Alternative corridor alignments</b></p>	
<p>Alternative CBD routes commonly suggested were:</p> <ul style="list-style-type: none"> <li>• Waterfront</li> <li>• Wakefield Street</li> <li>• Featherston Street</li> <li>• Victoria Street.</li> </ul>	<p>A wide range of different route options or corridor alignments were tested throughout the study, including possible alignments through the CBD.</p> <p>All the PTSS options involve use of the Golden Mile route through the CBD. A range of alternatives were assessed at the medium list evaluation through a multi-criteria analysis, including use of the Quays route, Featherston Street, Wakefield and Victoria Streets. The Golden Mile emerged as the preferred route because it:</p> <ul style="list-style-type: none"> <li>• provides convenient access to major destinations</li> <li>• maximises the potential catchment within easy walking distance, including major office buildings along Lambton Quay and The Terrace</li> <li>• provides direct access to major retail and entertainment facilities</li> <li>• provides a legible, well-defined route</li> <li>• has existing public transport stop facilities and weather protection along footpaths</li> <li>• provides an important component of activating key streets and providing informal surveillance, particularly after business hours.</li> </ul>
<p>Alternative routes to the east commonly suggested were:</p> <ul style="list-style-type: none"> <li>• Using the existing bus tunnel and on through Moxham Avenue, Hataitai</li> <li>• A single spine from Newtown to Kilbirnie via Constable Street</li> <li>• LRT travelling via a tunnel between the Wellington Zoo and Coutts Street in Kilbirnie.</li> </ul>	<p>The study found that extending the PT spine through to the east (to Kilbirnie) was warranted due to the available public transport catchment and potential for mode shift. A number of sub-options were considered for linking the PT spine to the east.</p> <p><u>Using the existing Hataitai Bus Tunnel</u></p> <p>The existing Hataitai bus tunnel has limited capacity – it is one way only, and is currently restricted to one vehicle at a time. This does not align with use as a future high frequency, high capacity corridor.</p> <p>In addition, using this tunnel would require the spine to travel through the relatively narrow residential streets of Mt Victoria to</p>

the west and Hataitai Village/Moxham Avenue to the east. These environments are considered to be unsuitable for a high capacity public transport corridor due to the restricted width of the corridor and conflict with the numerous vehicle crossings to residential properties. Providing dedicated public transport lanes would involve loss of all on street parking and would adversely impact on residential property and the village centre.

A single spine through Newtown, via Constable Street to Kilbirnie

A single spine to Kilbirnie via Newtown was considered as part of the study. A single route via Newtown would involve a longer distance and travel times for passenger to/from Kilbirnie and the eastern suburbs than a route via Mt. Victoria.

The single route to Kilbirnie via Newtown is estimated to be around half a kilometre longer in travel distance. Due to the route characteristics, the average travel speed for the single Newtown route would be 26km/h rather than 30km/h via Mt. Victoria. Analysis showed a combination of distance and route characteristics mean that a trip to Kilbirnie via Newtown and Constable Street would be around 3 minutes longer. This would affect the ability of public transport to compete effectively with private vehicles, and as such projected patronage would reduce.

There are also significant physical constraints along this route south of Wellington Hospital. It is likely that only a single track or dedicated PT lane would be feasible through this part of the corridor with significant associated dis-benefits relating to capacity and timetabling issues. Riddiford Street south of Wellington Hospital is relatively constrained and has a number of heritage buildings that form part of the town centre. Providing for a two-way dedicated public transport spine through this section would have a significant impact on property and buildings. Along Constable Street the road is also relatively constrained along much of its length with very narrow existing lane widths for on-street parking and general traffic. Land use is a mix of retail and residential properties which have limited off-street parking provision. Constructing a two-way dedicated public transport spine through these sections would require loss of all on-street parking, and would impact on footpath widths, properties and up to 13 buildings in some locations. If on-street parking was retained on one side of the road only (or additional widths provided at stops/station locations) most properties and up to 30 buildings would be impacted by the required width<sup>1</sup>.

A route that continued along Crawford Road through to Kilbirnie would be relatively long and winding, and with steep topography either side the cost of any works required to widen the road corridor to fit in dedicated public transport lanes would be significant. An alternative would be a route that cuts directly through to the SH1 corridor from the top of Crawford Road and links to Kilbirnie via Kilbirnie Crescent. This more direct link is

<sup>1</sup> LRT widths were determined using LRT clearance requirements taken from best practice safety guidance in the UK. Refer "UK Tramways Safety Guidance November 2006". This was considered to be appropriate for the study context.

	<p>what the study assumed for the purpose of comparing overall route options (refer to travel time and distances above), but there would be a significant cost associated with providing this link due to the changes in ground level and other physical characteristics of the area.</p> <p><u>A new tunnel linking Newtown (near Wellington Zoo) with Kilbirnie (near Coutts Street)</u></p> <p>An alternative east-west tunnel for LRT/BRT between Roy Street, Newtown (Wellington Zoo) to Coutts Street, Kilbirnie was considered as part of the study. The tunnel length and associated cost is slightly higher for a Coutts Street tunnel compared with the Mt Victoria tunnel option and this route has slower travel times and lower projected patronage.</p> <p>The physical constraints through Newtown town centre (between the Hospital and the Zoo) remain a significant issue that will affect overall capacity and timetabling or require road widening that would impact on large numbers of heritage listed buildings and the amenity of this town centre.</p>
<p>Re-routing the Spine to avoid the Basin Reserve was suggested - either by using the existing bus tunnel or to the west of the Basin.</p>	<p>See above explanation regarding use of the existing Hataitai bus tunnel.</p> <p>Other corridor alignments were tested throughout the study, including a south-west alignment (via Cuba, Wallace St) at the long list evaluation stage. Alignment of the PT Spine to the west of the Basin Reserve was not compatible with the WCC Adelaide Road Framework Plan that promotes intensification along Adelaide Road. Topography and open spaces along the western side through Mt Cook also limit the existing public transport catchment as well as the potential for intensification along this alignment in future.</p>
<p>Various extensions of the spine route were suggested:</p> <ul style="list-style-type: none"> <li>• to the Airport and/or Johnsonville</li> <li>• Wider extensions such as the Hutt Valley.</li> <li>• to Miramar, Seatoun, Island Bay and Karori</li> </ul>	<p>Extension of the PT Spine to the north and to the south/east was considered as part of the study.</p> <p>Extending the options (including Light Rail) to the north of the Railway Station was considered. It was concluded that this would be of limited benefit, given the following considerations:</p> <ul style="list-style-type: none"> <li>• Significant investment has been made in heavy rail infrastructure and trains over recent years to provide a high quality urban commuter rail network to the north.</li> <li>• Public transport already has a high share of journey to work trips from destinations to the north (40% - 70%), and replacing heavy rail with an alternative mode is unlikely to increase this.</li> <li>• The proportion of trips from the north that continue through and beyond the CBD is relatively low.</li> <li>• Converting the Johnsonville Line to light rail has its own costs and challenges, including: significant costs for conversion (tunnel widening, platform lowering, additional passing loops). There would also be significant disruption to services</li> </ul>



	<p>for a long period during construction/conversion.</p> <ul style="list-style-type: none"> <li>• Double the number of light rail vehicles would be needed to replace the capacity of the 4 car Matangi.</li> </ul> <p>Trip demand analysis found that significant benefits could be obtained by extending the high quality, high frequency spine through to Kilbirnie. There was found to be strong trip demand and potential for mode shift to public transport from Kilbirnie and the eastern suburbs due to the available catchment and relatively low existing mode share.</p> <p>The PT Spine serves the core routes where trip demand converges. Services would serve catchments in the outer suburbs such as Miramar, Airport, Island Bay, Karori through transfers at the end of the core spine (primarily under LRT) or by providing ‘through running’ services (primarily under BRT) which can continue beyond the core spine facilities. While the predicted demand from these outer locations beyond the core spine would not be sufficient to justify the cost of providing dedicated corridors, this could be considered as a longer-term measure.</p>
<p>A loop was suggested, either between the rail station and Courtenay Place or between the rail station, Newtown and Kilbirnie.</p>	<p>Many different route alignment options were considered throughout the study. A loop configuration does not meet the study brief in terms of a high capacity and high frequency PT Spine. It would result in slower and longer journeys.</p> <p>A loop configuration may also have legibility issues if a single direction loop is proposed and also make undertaking return trips between locations more difficult.</p>
<p><b>Transfers</b></p>	
<p>Disagreement with the study findings in relation to transfers. Suggest well designed transfer points are not necessarily a disadvantage if they are well signposted, safe, comfortable, and accompanied by integrated ticketing.</p>	<p>In the PT Spine options for BRT and LRT, some transfers are required. These occur between bus and BRT/LRT and between rail and BRT/LRT. Transfers between services result in a physical time delay to a journey and a perceived inconvenience to users. Whilst transfers can be made more convenient through quality interchange facilities and frequent timed services, they are an important factor that needs to be included in the modelling results.</p> <p>Transfers for the PT Spine have been modelled to include a number of components, namely:</p> <ul style="list-style-type: none"> <li>• waiting and boarding time</li> <li>• walk time between stops</li> <li>• inconvenience of transferring.</li> </ul> <p>For BRT and LRT options a low transfer penalty was assumed, to reflect the high quality of the services proposed and the high quality of the interchange. In total a transfer penalty of 5.5 minutes has been applied. This compares favourably with international practice – the Australian Transport Council recommends a 7 minute penalty for same mode transfers (with 10 minutes for different mode transfers), whilst other studies suggest up to 9 minutes. There is no fare penalty applied as integrated ticketing has been assumed.</p>

	<p>[Note: the evaluation work was carried out based on the AM (morning) peak. For outbound trips in the PM (evening) peak, the transfer penalty would likely be higher as the transfer would be from high quality spine to standard bus services with a lesser frequency].</p> <p>When calculating the benefit-cost ratios for each of the options a flat transfer penalty of 5 minutes is applied, along with any additional waiting time that might be incurred. This method is taken from the New Zealand Economic Evaluation Manual (EEM).</p> <p>Transfers do have a material effect on the reported results of the options. They affect overall travel times and impact on people's choice of mode. For the relatively short length of network considered in the PT Spine options (the longest current bus journey from Wellington Station to Miramar is scheduled to take approximately 35 minutes) the transfer penalty takes on even greater significance</p> <p>It is notable that the LRT option has significantly more transfers than BRT. In the LRT option most passengers (around 90%) from Miramar and Island Bay will require transfers at Kilbirnie and Newtown respectively. This reduces to less than 30% for BRT.</p> <p>Transfers will often influence people's travel choices as they are generally perceived as a negative. As part of the Wellington Bus Review, where in the initial network proposals a number of suburban interchanges were proposed, a very significant number of submissions were received (over 6000) with one of the dominant themes being concern over the need to transfer between services and the quality of the interchange facilities. Research suggests that no matter how good an interchange might be and how services might be timed to provide seamless transfers, transferring is perceived as inconvenient and is a deterrent for many people.</p>
<p><b>Capacity</b></p>	
<p>Capacity was often raised as a key difference between the Light Rail Transit and Bus Rapid Transit options, suggesting that LRT would best provide the required capacity. It was also suggested that portions of the BRT system would be at capacity within the first year it is implemented.</p>	<p>All the shortlisted options provide sufficient capacity to cope with forecast growth in the AM peak.</p> <p>Analysis of loadings in the AM peak hour show that BRT and LRT services along the Newtown branch operate at 45% and 35% of their respective capacities, whereas along the Kilbirnie branch BRT and LRT operate at 100% and 70% of their respective capacities.</p> <p>If additional capacity is required beyond this level, then higher service frequencies can be scheduled. The theoretical capacity of the proposed BRT network is estimated to over 6,000 passengers per hour. As modelled in this option it is only running at a capacity of 3200 passengers per hour between the Basin Reserve and Wellington Railway Station and 1600 passengers per hour between the Basin Reserve to Kilbirnie and between the Basin Reserve to Newtown.</p> <p>If additional capacity is required beyond forecast levels, then higher service frequencies can be scheduled. Given that the</p>

	<p>current service frequency for BRT on the Kilbirnie branch is 16 vehicles per hour it would be practical to increase this to between 20 and 30 vehicles per hour without compromising travel times. There would however be limited capacity within the Bus Priority option to cope with greater than forecast growth, with the major constraint on growth being the number of additional buses that can be accommodated through Kilbirnie, Newtown and the bus tunnel given that the number of buses already causes congestion in these locations.</p> <p>Along the Golden Mile congestion is part of the problem that has already been identified. The BRT and LRT options propose to deal with this by providing more effective utilisation of services, increasing the capacity of vehicles, restricting other vehicles from using parts of the Golden Mile during business hours, and through utilising a secondary route through the CBD for some buses. This results in an overall increase in capacity through the CBD. However if patronage were over-time to exceed forecasts, additional BRT / LRT vehicles could also be accommodated along through the CBD.</p>
<p><b>Secondary route</b></p>	
<p>Most submitters supported use of a secondary route through the CBD. Those not in support, focused around legibility of the network, reduced level of service for services using secondary route, and the need for a single spine to be designed to handle expected patronage without need for secondary alignments.</p>	<p>The PT Spine Study noted the need for further work before a secondary route through the CBD is confirmed. Some of the detailed issues that will need to be considered in relation to the approach of a secondary route include:</p> <ul style="list-style-type: none"> <li>• What times of the day that it would operate and for which services.</li> <li>• The best and most effective routes.</li> <li>• How to ensure legibility for passengers using the affected services.</li> <li>• Opportunities to transfer to other spine services (ie BRT. LRT) if desired.</li> <li>• Provision of suitable station/stop infrastructure and signage.</li> <li>• Future traffic congestion levels along any secondary routes and any impacts on services.</li> </ul> <p>However with forecast patronage growth over the next 20-30 years, it is likely that there would be a need for an alternative route for some services.</p>
<p><b>Shortlisted options</b></p>	
<p>The most common comments in support or opposition of the three short listed options were:</p> <ul style="list-style-type: none"> <li>• Statements in support of Bus Priority noted that it is the least expensive option and that it can be implemented right away (even if only as an interim measure)</li> <li>• Statements in opposition to Bus Priority</li> </ul>	<ul style="list-style-type: none"> <li>• Bus Priority is the least expensive of the three short-listed options and could be implemented immediately. However it also has the lowest benefits and does not reflect the step change in public transport sought through the Ngauranga to Airport Corridor Plan. It could however form part of the implementation pathway towards BRT.</li> <li>• The BRT option is more expensive than Bus Priority, but costs significantly less than the LRT option. It also has the most public transport user benefits, attracting the most patronage of all the options. The BRT option would be able to meet the capacity predicted through future growth forecasts,</li> </ul>

<p>noted that it is not much of a change</p> <ul style="list-style-type: none"> <li>• Statements in support of Bus Rapid Transit focused on its overall value for money and effectiveness</li> <li>• Statements in opposition to BRT focused on capacity and vehicle issues</li> <li>• Statements in support of Light Rail Transit focused on a perceived anti-LRT bias in the study, urban amenity values, environmental benefits, greater economic benefits and consumer preference for light rail</li> <li>• Statements in opposition to LRT focused on this option's cost.</li> </ul>	<p>and further capacity can be added through higher vehicle frequencies if needed.</p> <ul style="list-style-type: none"> <li>• While LRT vehicles are often considered to provide a more attractive level of service for passengers (more comfortable, smoother, faster), modern BRT vehicles can provide a similar level of service to LRT – the only real difference being wheels vs track.</li> <li>• The environmental benefits of LRT and BRT are largely similar depending on the power source and vehicle specification.</li> <li>• The International Review indicated that BRT can have significant value uplift in the adjacent corridor (up to 20% increase), whilst LRT has up to a 25% increase in property values. The economic analysis has included within it an allowance for the Wider Economic Benefits arising from the options.</li> <li>• The cost of the LRT option is the most expensive of the three short listed options. Even if the cost of the additional LRT tunnel through Mt Victoria was removed (ie. it was assumed that LRT could share the road tunnel) it is still significantly more expensive than Bus Priority or BRT.</li> </ul>
<p><b>Network design and wider network issues</b></p>	
<ul style="list-style-type: none"> <li>• Integrated planning and implementation of Spine improvements with the rest of public transport and wider transport network</li> <li>• Suggested bus network design changes.</li> <li>• Suggested placing commuter hubs at either end of the CBD.</li> <li>• Better connections from outer suburbs, primarily Johnsonville to the CBD.</li> <li>• Future Spine routes should be designated and protected against incompatible development and service updates.</li> </ul>	<ul style="list-style-type: none"> <li>• The implementation and operation of the preferred option for the PT Spine will need to be integrated with the wider public transport network, both in terms of network design and timetabling. These aspects will be considered at the detailed design phase.</li> <li>• A key work-stream following selection of a preferred option will be network design to ensure integrated and optimised service design.</li> <li>• A network design with commuter hubs at either end of the CBD was considered through a previous piece of work, and was also an element of a heavy rail option through to the end of Courtenay Place. This was ruled out due to the dis-benefits of requiring people travelling into the CBD from the south and east to transfer at close proximity to their destination.</li> <li>• Extension of the spine to the north, including Johnsonville, is discussed earlier. It is noted that all short-listed options include new bus priority lanes along the Hutt Road which improves journey times for bus users from the north.</li> <li>• Once a preferred option is confirmed, further work will include corridor designations, if required, to provide for a future PT Spine.</li> </ul>
<p><b>Costs and funding</b></p>	
<p>Costs (rates and fares) should be kept low.</p>	<p>Cost and affordability was a key consideration when looking at the different options throughout the study. Some options were ruled out at the long and medium list stages (such as a heavy rail underground tunnel to the end of Courtenay Place and beyond)</p>

	<p>due to an unacceptably high probable cost.</p> <p>The cost of each short-listed option is set out in the study and the likely impact on fares and rates to fund these will be a consideration for decision makers when confirming a preferred option. The PTSS ‘Alternative Funding Options Study’ provides an outline of how each of the options could be funded through a variety of funding tools.</p> <p>Public transport fares are reviewed and set by Greater Wellington Regional Council on an annual basis. These are considered at a regional scale, reflecting the fact that the public transport network is an integrated network. Local and regional rates are set by the relevant council as part of their Annual Plan/Long Term Plan processes. Community affordability is a key consideration in these processes.</p> <p>The question of willingness to pay more for the options through regional rates was raised in the submission form. Analysis of the responses (as below), shows that there was an overall reported willingness to pay more for the options, with between 57-79% of respondents willing to pay more for one of the options.</p> <table border="1" data-bbox="694 896 1412 1527"> <thead> <tr> <th data-bbox="699 902 949 1093"><b>Amount</b></th> <th data-bbox="954 902 1104 1093"><b>Bus Priority</b></th> <th data-bbox="1109 902 1246 1093"><b>Bus Rapid Transit</b></th> <th data-bbox="1251 902 1407 1093"><b>Light Rail Transit</b></th> </tr> <tr> <td></td> <td data-bbox="954 1032 1104 1093"><b>%</b></td> <td data-bbox="1109 1032 1246 1093"><b>%</b></td> <td data-bbox="1251 1032 1407 1093"><b>%</b></td> </tr> </thead> <tbody> <tr> <td data-bbox="699 1093 949 1176">Not willing to pay more</td> <td data-bbox="954 1093 1104 1176">29.1</td> <td data-bbox="1109 1093 1246 1176">15.8</td> <td data-bbox="1251 1093 1407 1176">14.6</td> </tr> <tr> <td data-bbox="699 1176 949 1227">\$1 - \$10</td> <td data-bbox="954 1176 1104 1227">18.1</td> <td data-bbox="1109 1176 1246 1227">11.0</td> <td data-bbox="1251 1176 1407 1227">4.0</td> </tr> <tr> <td data-bbox="699 1227 949 1279">\$11 - \$20</td> <td data-bbox="954 1227 1104 1279">14.1</td> <td data-bbox="1109 1227 1246 1279">16.7</td> <td data-bbox="1251 1227 1407 1279">5.8</td> </tr> <tr> <td data-bbox="699 1279 949 1330">\$21 - \$40</td> <td data-bbox="954 1279 1104 1330">12.8</td> <td data-bbox="1109 1279 1246 1330">12.3</td> <td data-bbox="1251 1279 1407 1330">6.6</td> </tr> <tr> <td data-bbox="699 1330 949 1382">\$41 - \$60</td> <td data-bbox="954 1330 1104 1382">2.2</td> <td data-bbox="1109 1330 1246 1382">11.8</td> <td data-bbox="1251 1330 1407 1382">11.9</td> </tr> <tr> <td data-bbox="699 1382 949 1433">\$61 - \$100</td> <td data-bbox="954 1382 1104 1433">4.8</td> <td data-bbox="1109 1382 1246 1433">10.1</td> <td data-bbox="1251 1382 1407 1433">15.5</td> </tr> <tr> <td data-bbox="699 1433 949 1485">More than \$100</td> <td data-bbox="954 1433 1104 1485">4.8</td> <td data-bbox="1109 1433 1246 1485">7.5</td> <td data-bbox="1251 1433 1407 1485">28.3</td> </tr> <tr> <td data-bbox="699 1485 949 1536">Don't know</td> <td data-bbox="954 1485 1104 1536">14.1</td> <td data-bbox="1109 1485 1246 1536">14.9</td> <td data-bbox="1251 1485 1407 1536">13.3</td> </tr> </tbody> </table>	<b>Amount</b>	<b>Bus Priority</b>	<b>Bus Rapid Transit</b>	<b>Light Rail Transit</b>		<b>%</b>	<b>%</b>	<b>%</b>	Not willing to pay more	29.1	15.8	14.6	\$1 - \$10	18.1	11.0	4.0	\$11 - \$20	14.1	16.7	5.8	\$21 - \$40	12.8	12.3	6.6	\$41 - \$60	2.2	11.8	11.9	\$61 - \$100	4.8	10.1	15.5	More than \$100	4.8	7.5	28.3	Don't know	14.1	14.9	13.3
<b>Amount</b>	<b>Bus Priority</b>	<b>Bus Rapid Transit</b>	<b>Light Rail Transit</b>																																						
	<b>%</b>	<b>%</b>	<b>%</b>																																						
Not willing to pay more	29.1	15.8	14.6																																						
\$1 - \$10	18.1	11.0	4.0																																						
\$11 - \$20	14.1	16.7	5.8																																						
\$21 - \$40	12.8	12.3	6.6																																						
\$41 - \$60	2.2	11.8	11.9																																						
\$61 - \$100	4.8	10.1	15.5																																						
More than \$100	4.8	7.5	28.3																																						
Don't know	14.1	14.9	13.3																																						
Use alternative means of financing public transport – a petrol tax, tolls, congestion and parking charges.	<p>A parallel report, the ‘Alternative Funding Options Study’, was carried out to look at different potential funding mechanisms that could be used to fund a preferred option. This included looking at a range of tools such as targeted rates, fuel tax, road pricing, parking levy, land value uplift, etc.</p> <p>It concluded that a range of alternative funding measures are likely to be needed to fund the most expensive option (LRT), in addition to rates and funding from the National Land Transport Fund. These would have to include broad based measures such as a regional fuel tax or road pricing to provide sufficient funding – although neither of these tools currently have a legislative mandate.</p>																																								
Fare policy changes – different peak / off-peak charges, free inner city trips subsidised	Fare policy is set on a region-wide basis by Greater Wellington Regional Council. A range of factors influence decisions around																																								

through fare increases on longer trips.	the different rates or use of subsidies for different groups, times, and parts of the network.
<b>Other considerations</b>	
<p>Need for provision for cyclists - dedicated lanes through Wellington City CBD and linking with suburbs.</p> <p>Integration between public transport and cycling.</p>	<p>The PTSS was a feasibility level study looking at the best option for a high quality public transport system through central Wellington. It was not a detailed corridor design exercise and the purpose was not to look specifically at how all the modes would be provided for within the corridor.</p> <p>To check the physical feasibility/constraints relating to the short-listed options, cross sections were developed which showed how the PT Spine could fit within the road corridor alongside other road users. The approach used in terms of cyclist facilities was to include them along sections of the spine where they are currently provided for or where Wellington City Council has identified plans to provide them. - for example, along Kent/Cambridge Terrace and along Adelaide Road, cyclists are assumed to use wider bus lanes under a Bus Priority option and to have separate dedicated cycle lanes under BRT and LRT options. Along the Golden Mile, no specific cycle facilities are provided in cross sections. Wellington City Council's approach in the CBD is based on cycle trips being more dispersed, and the Golden Mile being a priority route for public transport and pedestrians. Future detailed corridor design work following confirmation of a preferred option would need to look at whether cyclists could or should share BRT/LRT lanes along the Golden Mile and/or whether dedicated facilities are needed on parallel routes through the CBD.</p> <p>Light rail tracks could create a potential hazard for pedestrians, cyclists and wheel chair users, however mitigation measures would be part of any future detailed design of the system.</p>
<p>Need for better pedestrian safety and improved pedestrian facilities.</p>	<p>Under a Bus Priority option, the pedestrian impacts will be similar to the current situation along the Golden Mile. In the Light Rail and Bus Rapid Transit options, there would not need to be any physical infrastructure segregating BRT/LRT lanes from pedestrian activity.</p> <p>Future detailed design of stops/stations will need to include sufficient space for waiting passengers to co-exist comfortably with high pedestrian through flows along the adjacent footpath. Pedestrian crossings will need to be provided between central median stops/stations and the adjacent footpaths.</p> <p>Both the Light Rail and Bus Rapid Transit options would involve a decrease in the number of public transport vehicles along the Golden Mile (30-40% BRT, 40-50% LRT compared with the current situation) and a reduced number of stops/stations. Also, during the day general traffic would be removed totally under these options. These characteristics would have some benefits in relation to pedestrians crossing mid-block.</p>
<p>Suggestion of a car-free CBD or a fully pedestrianized Golden Mile with cycle lanes.</p>	<p>This is outside the scope of the PT Spine Study.</p> <p>The Study does however identify the need to limit vehicle access to parts of the Golden Mile (parts of Willis Street and Lambton</p>

	<p>Quay) for general traffic during business hours - to enable a dedicated PT Spine to be implemented through those sections.</p>
<p>Opposition and support for Roads of National Significance (RoNS) projects noted. Need for bus priority and cycle facilities as part of the RoNS.</p>	<p>The RoNS projects are not within the scope of the PT Spine Study.</p> <p>However, the need for improvements to the State Highway 1 route was identified through the multi modal Ngauranga to Airport Corridor Plan, alongside the PT Spine and other improvements.</p> <p>Aspects of the PT Spine options are dependent upon the RoNS projects proceeding (particularly the Basin Bridge and the Mt Victoria/Ruahine Street projects). Integration between these projects at detailed design stages will be crucial for successful implementation.</p>
<p>Support for integrated ticketing and expansion of real time information displays</p>	<p>Integrated ticketing and real time information are important elements to support any option for a future high quality PT spine and they are improvements that are being progressed as part of the current public transport programmes. Both have been assumed in the PT Spine Study.</p>
<p>Need for a corresponding urban design strategy</p>	<p>Wellington City Council has an existing Urban Development Strategy which includes the concept of a Wellington City Growth Spine. This is directly aligned with the PT Spine concept which is aimed at serving identified future growth/intensification areas to the south and east such as Adelaide Road, Newtown and Kilbirnie.</p> <p>Wellington City Council is currently undertaking a review of its transport and urban development strategies. It is anticipated that the public transport spine will continue to be a key element of the strategies.</p> <p>Following the selection of a preferred option, detailed design of the corridors will be required. This will include consideration of urban design issues.</p>
<p>Need for Wellington to reduce its carbon emissions, improve air quality, and become a more sustainable and liveable city</p>	<p>Improving public transport in Wellington City through development of a high quality public transport spine has a number of objectives, including achieving reduced emissions, better air quality, and being a liveable city.</p> <p>Both BRT and LRT options will contribute to these outcomes and the vehicle specification process to be worked through following confirmation of a preferred option will give consideration to these factors.</p>