Regional Land Transport Plan

Working Paper 4 – Development of Future Scenarios

Data & Analysis Team
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1. Introduction

1.1 Policy context for RLTP working papers

The Regional Land Transport Programme represents the Wellington region’s bid for funding from the National Land Transport Fund (NLTF) which is administered by the New Zealand Transport Agency (NZTA). The current Regional Land Transport Programme, covering the period 2012 to 2015, reflects both the national direction provided in the Government Policy Statement on Land Transport Funding 2012/13-2021/22 (GPS) – which includes a focus on economic growth and productivity, value for money and road safety – and the Wellington region’s priorities and outcomes in the Regional Land Transport Strategy (RLTS).

From 1 July 2015, the Land Transport Management Act (2013) requires that the RLTS and Regional Land Transport Programme be consolidated into a new planning document called the Regional Land Transport Plan (RLTP). The Wellington Regional Transport Committee is developing the new RLTP to be adopted in April 2015. The RLTP will set out the region’s land transport objectives, policies, measures and targets for at least 10 years, i.e. for the period 2015 to 2025 (with a view to the strategic approach for development of the land transport network over the longer term, of up to 30 years). The RLTP will identify the transport activities for funding in the short term (up to six years) and the regional priority to be given to these projects.

As shown in Figure 1, the RLTP will address the challenges facing the region in terms of its transport network, relating to four key areas – economic growth, safety, resilience and liveability. The figure shows the benefits associated with addressing the challenges, then these feed into a list of eight key objectives and associated outcomes. How these outcomes are measured, and the targets relating to the objectives, are the focus of this set of RLTP working papers.

The new RLTP needs to reflect changes to the purpose and decision-making criteria in the Land Transport Management Act (LTMA) with a new focus on aiming for an ‘effective, efficient, and safe’ transport network and to reset targets out to 2025 (the targets are out to 2020 for the existing RLTS). It is therefore timely to review the region’s outcomes and targets to ensure that they are relevant and measurable.

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1 Note that funding is not guaranteed for all projects included in the RLTP. Final decisions regarding funding are taken by the NZTA.
2 The Regional Transport Committee comprises Greater Wellington Regional Council (GWRC), the city and district councils in the Wellington region, and NZTA.
3 Definitions of these terms may be found at GWRC (2015): Regional Land Transport Plan 2015 (for consultation), p.141.
1.2 Overview of RLTP working papers

In order to inform the RLTP policy framework, a series of five working papers have been developed. There is a set of measures and targets associated with the RLTS for 2010-2040. The RLTP for 2015 will also contain a comparable set of measures and targets, but with changing circumstances and patterns of behaviour, and developments in the region since the last set were established, some revision is appropriate.

The five working papers start with a review of the current situation for the Wellington regional transport network, look at trends and influences in recent years; pressures and issues relating to the region’s transport network; and arrive at a revised set of targets and measures for the RLTP, informed by modelling and by actual trends.
The five working papers, of which this is the fourth, are as follows:


This paper begins the process of transition from RLTS to RLTP by reviewing the region’s land transport outcomes and associated targets which are determined by the strategic objectives for the region. The paper focuses on whether the targets are relevant, measurable and achievable, and the extent to which the work carried out by the Greater Wellington Regional Council can influence progress towards achieving these targets. The purpose of this paper is to provide information to guide the development of SMART targets – specific, measurable, achievable, realistic and time-bound – for the 2015 RLTP, which will cover the period 2015 to 2025.

**Working Paper 2: Background Trends and Issues**

This paper summarises demographic and transport-related trends over the last 10 to 20 years, suggests how these trends might develop in the short to medium term and the implications that this might have for future travel demand and the transport system. It arrives at a summary of trends and issues affecting the region’s transport network and identifies areas where future travel demand growth may occur. The purpose of this paper is to provide an evidence base for the development of an ‘expected future’ scenario that will be used to inform the development of RLTP targets.

**Working Paper 3: Transport Modelling Approach**

Drawing upon information presented in Working paper 2, this paper outlines the infrastructure, land use and economic assumptions that form the basis for the development and modelling of a number of future scenarios in the Wellington Transport Strategy Model (WTSM). This paper provides a description of the scenarios that are modelled in the WTSM. The modelling produces an ‘expected future’ for the Wellington region’s transport network, and a range of alternative scenarios as key assumptions are varied. The scenario results are analysed in Working paper 4.

**Working Paper 4: Development of Future Scenarios**

This paper presents the results from the WTSM scenarios modelling in Working paper 3 and outlines how the different future scenarios that are modelled result in different travel patterns. The modelled impacts of the scenarios are compared according to key performance indicators. The results of ‘revised future’ modelling are presented with revisions to two central expected future assumptions based on 2014 policy decisions. Drawing upon the modelling and information presented in the background paper, the ‘expected future’ scenario is developed further, and this is the expected future that forms the basis for the development of the RLTP targets.

**Working Paper 5: Targets Development**

This final working paper brings together the analysis from the first four working papers to produce a revised set of targets and measures for the RLTP. The purpose of this paper is to outline and provide rationale behind a set of targets that are considered challenging, yet achievable, and will help the region make progress towards a range of strategic objectives and outcomes.
A glossary of terms for the five working papers is provided as a separate document.

1.3 Outline of this working paper

This working paper, WP4, is structured as follows:

Section 2 summarises the packages (i.e. scenarios with policy assumptions explicitly stated) that were outlined in WP3 and were modelled in the WTSM. The key performance indicators (KPIs) against which the impacts of the various scenarios are to be assessed are also detailed and explained.

Section 3 presents the results of the WTSM scenarios modelling, assessing the impacts of the packages using the KPIs set out in section 2. Section 3 focuses on:

- changes between the 2011 base case and the 2031 expected future
- changes between the expected future and alternative views of the future that involve increased public transport investment and travel demand management measures
- the extent to which varying some of the expected future assumptions might change the expected future outcomes

Section 4 presents results from the modelling of two revised future scenarios where the Wellington Roads of National Significance schemes are not completed and there is no Bus Rapid Transit system as is included in the expected future. The impact of a lesser level of bus priority is provided in the second scenario.

The difference between these revised futures and the expected future are outlined with reference to several key performance indicators.

Section 5 summarises information provided in the background paper (WP2) of transport-related issues and trends. It then summarises recent trends relating to car, public transport and active mode trips across the region, based on two key data sources that will also form the basis for future measures and targets, namely the New Zealand Census journey-to-work data and Wellington City CBD cordon data in the AM peak.

A summary of key points from discussions and a subsequent report between New Zealand officials and UK researchers and commentators is also outlined, focusing on key trends and the concept of ‘peak car’, i.e. a saturation point of private car use.

Section 6 draws upon both the results of the WTSM and recent trends to outline, in a qualitative sense, the likely characteristics of the expected future to be used in WP5 in the setting of RLTP targets.

Section 7 summarises key points in the working paper.
2. Packages and indicators

WP3 entitled ‘Transport modelling approach’ outlines a series of packages that were modelled in the WTSM. The purpose of this modelling exercise was to:

- provide an indication of how the expected future scenario might affect travel demand, travel patterns and the transport network
- provide an indication of the extent to which varying some of the assumptions underlying the expected future might affect the outcomes

The packages are summarised below. The base year for the WTSM (2011) and the expected future (2031) scenario provide a basis against which the packages can be assessed. All packages were modelled for the year 2031. Once run through the WTSM, the results are referred to as future scenarios that are based upon the specific input assumptions outlined below for each package. These definitions are reproduced from section 5 of WP3:

**Base year** – the validated 2011 base year model that replicates travel demand and travel patterns in 2011

**Expected future** – scenario including all expected infrastructure projects

**Alternative future** – the expected future plus all measures in the enhanced PT (public transport) future

**Alternative future + parking levy** – the alternative future plus a Wellington City CBD parking levy

**Alternative future + congestion charge** – the alternative future plus a Wellington City CBD congestion charge

**Alternative future + tolling** – the alternative future plus the tolling of Transmission Gully and the Petone to Grenada link road

**Sensitivity 1** – the expected future with a 0% p.a. public transport fare increase in real terms (as opposed to 0.45% p.a. increase in real terms assumed as part of the expected future)

**Sensitivity 2** – the expected future with a 25% inter-peak public transport fare discount for all modes

**Sensitivity 3** – the expected future minus three of the RoNS schemes – Petone to Grenada (P2G), Ngauranga to Aotea Quay (N2AQ) and the Terrace Tunnel Duplication (TT)

**Sensitivity 4a, 4b, 4c** – the expected future with an alternative land use scenario that assumes higher regional population growth and then focuses assumed increases in population in turn on a) Wellington City; b) Kapiti Coast and Porirua; and c) Lower Hutt and Upper Hutt

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4 Equivalent to long-run GDP growth (1.8% per annum) and an elasticity of 0.25
The results of the sensitivity tests are documented in section 3.

The effects that changing the underlying assumptions for each scenario have upon travel demand patterns and the transport network are assessed against a number of KPIs, as defined below:

- **boardings per capita** – annual public transport boardings across the whole region divided by the regional population
- **annual public transport trips** – annual public transport trips across the whole region
- **annual public transport trips to CBD** – annual public transport trips to Wellington City CBD
- **annual car trips** – annual car trips across whole region (excluding freight vehicles)
- **annual car trips to CBD** – annual car trips to Wellington City CBD (excluding freight vehicles)
- **AM peak public transport mode share** – the public transport mode share of all trips (excluding active mode trips) in the AM peak (car trips measured in terms of vehicles as opposed to persons)
- **AM peak public transport mode share to CBD** – the public transport mode share of all trips (excluding active mode trips) in the AM peak only for trips to Wellington City CBD
- **annual regional vehicle kilometres travelled (VKT)** – VKT across the region (including light commercial vehicles, excluding freight vehicles)
- **annual regional VKT per capita** – annual regional VKT divided by population
- **AM peak delay per pcu kilometre travelled** – average delay per kilometre travelled across the entire region in the AM peak
3. Results from WTSM scenarios modelling

This section presents the results of the modelling of the packages reporting against the KPIs outlined in section 2.

The charts in this section can be interpreted using the following key:

- the black bar represents the base year (2011)
- the red bar represents the expected future
- the light brown bars represent the three sensitivity tests around the expected future (4a, 4b and 4c as listed in section 2)
- the orange bar represents the alternative future
- the blue bars represent the three tests that take the alternative future and add the following travel demand management (TDM) measures; parking levy, congestion charge, tolling of the state highways Transmission Gully (TG) and Petone to Grenada (P2G) which will be completed as part of the Roads of National Significance (RoNS) scheme
- the red horizontal line (left hand axis) is a benchmark showing the expected future value for each indicator, against which the other scenarios can be gauged
- the green line (right hand axis) shows the percentage change for each scenario with reference to the 2011 base year

Note that for Figures 2 to 11, public transport is written as PT, and IP refers to inter-peak.

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5 RLTP Working paper 2, section 4.0 p.30.
3.1 Public transport boardings per capita

Figure 2 shows how public transport boardings per capita change across the various scenarios.

Figure 2 Public transport boardings per capita

The graph shows:

- an increase in boardings per capita between the base year and expected future from 72 to 77
- little change between the expected future and each of the sensitivity tests, suggesting that they have minimal impact upon boardings per capita
- an increase from 77 in the expected future to 83 in the alternative future
- compared to the alternative future, adding a parking levy results in a further moderate increase in boardings per capita, introducing a congestion charge results in a large increase whilst introducing a toll results in little or no increase
3.2 Annual public transport trips

Figure 3 shows how annual public transport trips change across the various scenarios.

The graph shows the following:

- a 17.8% increase in annual public transport trips from the base year to the expected future
- little change between the expected future and each of the sensitivity tests
- an additional 3 million annual public transport trips (approximate) generated by moving from the expected future to the alternative future
- of the TDM measures, the congestion charge has the greatest impact in terms of increasing public transport trips compared with the alternative future, followed by a parking levy and tolling
3.3 Annual public transport trips to Wellington City CBD

Figure 4 shows how annual public transport trips to Wellington City CBD vary between the different scenarios.

Figure 4 Annual public transport trips to Wellington City CBD

The graph shows:

- around a 30% increase in annual public transport trips to Wellington City CBD between the base year and expected future
- small further increases in annual public transport trips to Wellington City CBD for each of the sensitivity tests
- an increase in annual public transport trips to Wellington City CBD under the alternative future
- a parking levy and, more so, a congestion charge, result in a significant increase in annual public transport trips to Wellington City CBD compared with both the expected future and alternative future
### 3.4 Annual car trips

**Figure 5** shows how numbers of car trips change across the various scenarios.

The graph shows:

- an increase in the number of annual car trips between the base year and the expected future of 13%.
- little change between the expected future and each of the sensitivity tests
- a small decrease in car trips between the expected future and alternative future
- a congestion charge has the greatest impact in terms of reducing car trips compared with the expected future and alternative future
3.5 Annual car trips to Wellington City CBD

Figure 6 shows how annual car trips to Wellington City CBD vary between the different scenarios.

The graph shows:

- an approximate 16% increase in annual car trips to Wellington City CBD between the base year and expected future
- little change between the expected future and each of the three sensitivity tests
- the alternative future results in a small decrease in annual car trips to Wellington City CBD compared with the expected future
- of the TDM measures, a congestion charge has by far the greatest impact in terms of reducing annual car trips to Wellington City CBD
3.6 AM peak regional public transport mode share

Figure 7 shows how regional public transport mode share in the AM peak changes across the various scenarios.

Figure 7 AM peak public transport mode share (region)

The graph shows:

- a 6% increase in regional public transport mode share (from 15.8% to 16.7%) from the base year to the expected future, equivalent to around a 18% increase in actual public transport trips (section 3.2)

- little change between the expected future and each of the sensitivity tests

- a further slight increase in public transport mode share between the expected future and alternative future

- a congestion charge and parking levy have a significant impact in terms of further increasing the public transport mode share compared with the alternative future whilst a tolled future has a limited impact
3.7 AM peak public transport mode share to Wellington City CBD

Figure 8 shows how the regional public transport mode share to Wellington City CBD in the AM peak changes across the various scenarios.

The graph shows:

- around a 11% increase in public transport mode share (from 38% to 42%) between the base year and expected future scenarios
- no discernable change in public transport mode share between the expected future and each of the three sensitivity tests
- the alternative future generates a further slight increase in public transport mode share compared with the expected future
- similar to regional mode share, a parking charge and congestion charge have a significant impact in terms of increasing AM peak public transport mode share to Wellington City CBD compared with both the expected future and alternative future
3.8 Annual regional VKT\(^6\)

Figure 9 shows how annual regional VKT changes between the various scenarios.

The graph shows:

- annual VKT is forecast to increase by around 17% between the base year and expected future
- of the sensitivity tests, only the delayed RoNS results in a significant drop in annual VKT compared with the expected future
- the alternative future results in a slight decrease in regional VKT compared with the expected future
- of the various TDM measures, a congestion charge has the greatest impact in terms of reducing regional VKT compared with the expected future and the alternative future

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\(^6\) Excluding heavy commercial vehicles (HCVs)
3.9 VKT per capita

Figure 10 shows how VKT per capita for vehicles in the Wellington region changes between the various scenarios.

The graph shows:

- VKT per capita increases by nearly 7% between the base year and expected future
- delaying some of the RoNS reduces VKT per capita by 1.4% compared with the expected future
- the alternative future results in a 1.1% drop in VKT per capita compared with the expected future
- a parking levy and tolling both result in a small reduction in VKT per capita compared with the alternative future; a congestion charge results in a significant decrease in VKT per capita, almost bringing it back down to base year levels
3.10 AM peak delay per passenger car unit km

Figure 11 shows delay per passenger car unit (pcu) km change between the various scenarios.

Figure 11 AM peak delay per pcu km

The graph shows:

- AM peak delay per pcu km reduces slightly between the base year and expected future

- delaying some of the RoNS results in a significant increase in AM peak delay per pcu km, highlighting how the RoNS projects will reduce delays and congestion across the regional road network

- the alternative future does not result in a noticeable change in AM peak delay per pcu km compared with the expected future

- of the TDM measures, a congestion charge results in the most significant reduction in AM peak delay per pcu km
3.11 Land use sensitivity tests

Three land use sensitivity tests were undertaken, as defined below. The ‘medium’ forecasts are defined in section 3.3 of WP3 as 9% population growth and 12% employment growth between 2013 and 2031. These land use sensitivity tests assume a higher regional population growth than 9%, with that growth focused in each of the three areas defined in each test (according to local authority areas) as detailed in Table 1 below.

- **Expected future** – medium growth in population across Wellington region
- **Sensitivity 4a** – Wellington expansion – high population growth in Wellington City, medium growth elsewhere
- **Sensitivity 4b** – western expansion – high population growth in Porirua and Kapiti Coast, medium growth elsewhere
- **Sensitivity 4c** – eastern expansion – high population growth in the Hutt Valley and Wairarapa, medium growth elsewhere

The three KPIs against which these scenarios and the expected future are compared are as follows:

- annual regional VKT per capita
- mode share to Wellington City CBD (AM peak)
- public transport boardings per capita

Table 1 shows how the regional population in 2031, one of the input assumptions to the model, varies between the expected future (medium population growth) and the three land use sensitivity tests (with high growth, varying according to each scenario as shown).

<table>
<thead>
<tr>
<th></th>
<th>Population in 2031</th>
<th>% change from expected future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected future</td>
<td>517,000</td>
<td></td>
</tr>
<tr>
<td>Wellington expansion</td>
<td>549,000</td>
<td>6.2%</td>
</tr>
<tr>
<td>Western expansion</td>
<td>526,000</td>
<td>1.7%</td>
</tr>
<tr>
<td>Eastern expansion</td>
<td>531,000</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

The population totals are not the same since population is not distributed evenly throughout the region. This is illustrated by the fact that about 40% of the regional population lives in Wellington City Council area.

Looking at regional VKT per capita (**Figure 12**) the western and eastern expansion scenarios result in a slight increase in VKT per capita, whilst the Wellington expansion scenario results in an approximate 4% decrease. This may be explained by population growth being focused in close proximity to the major area of employment (Wellington City), and also growth in Wellington City favours public transport and active modes compared with the other two expansion scenarios.
Looking at public transport mode share to Wellington City CBD in the AM peak (Figure 13), the Wellington expansion scenario results in an increase in public transport mode share as it focuses growth in an area of the network where the public transport level of service is relatively comprehensive and frequent. The other expansion scenarios result in a slight decrease in public transport mode share to Wellington City CBD.
As shown in Figure 14, the Wellington expansion scenario shows a small decrease in public transport boardings per capita. This is due to population growth in Wellington City under this scenario generating relatively short distance walking and cycling trips, thus leading to a reduction in the public transport mode share.

The other two expansion scenarios show smaller decreases in public transport boardings per capita compared with the expected future.

**Figure 14 Sensitivity tests – regional boardings per capita**

The sensitivity tests show that of the three land use scenarios (tests 4a, 4b and 4c) the Wellington expansion scenario results in the largest changes in public transport mode share and VKT. These changes are not unexpected given that this scenario focuses growth in areas likely to favour public transport and active modes over the private car. Neither the western nor eastern expansion scenarios result in significantly different outcomes compared to the expected future.

### 3.12 Summary of modelling results

This section summarises results from running the WTSM scenarios, as detailed above in sections 3.1 to 3.11. It summarises key points for the base case versus expected future; the expected future versus the alternative future with a range of assumptions about TDM measures (sensitivity tests 1 to 3); and the expected future versus the three land use scenarios (sensitivity tests 4a to 4c).

The following bullet points summarise the differences found between the base case and expected future, from the WTSM results:

- Public transport boardings per capita are forecast to increase from 72 to 77, equivalent to a 17.8% increase in annual public transport patronage.
• This increase is due to the public transport investment assumed as part of the expected future improving the attractiveness of public transport and driving up patronage.

• VKT per annum is forecast to increase by around 17%, which equates to a 7% increase in per capita VKT.

• This increase in both absolute and per capita VKT reflects the improvements to the strategic road network delivered by the RoNS.

• AM peak delay per pcu km is forecast to improve slightly, despite the forecast increase in VKT, due to increased roading capacity provided by the RoNS.

• A forecast increase in VKT per capita is contrary to recent trends where VKT per capita has fallen.

• Annual car trips to Wellington City CBD increase by 16%. This assumes that parking supply will increase to accommodate increased demand. However, future policies regarding parking spaces within the CBD may not lead to increased supply. There may instead be a focus on managing demand and promoting active modes and public transport.

• Annual public transport trips to Wellington City CBD are forecast to be 30% higher in the expected future.

• The public transport mode share to Wellington City CBD in the AM peak is forecast to increase from around from 38% (2011) to 42% under an expected future scenario, an increase of 11%.

• The regional AM peak public transport mode share is forecast to increase from around 15.8% in 2011 to 16.7% in the expected future, an increase of 6%. Many of the public transport infrastructure improvements, including the Bus Rapid Transit (BRT) project, are focused on improving the public transport level of service to and from Wellington City CBD, particularly at peak times. This helps to why the forecast increase in regional mode share is less than the corresponding forecast increase in AM peak public transport mode share to Wellington City CBD.

The following points summarise the differences between the expected future, the alternative future and the alternative future plus each of the TDM measures:

• The alternative future, which assumes enhanced public transport investment but no accompanying TDM measures, results in a slight increase in the various public transport metrics (boardings per capita, annual patronage, and public transport mode share), a slight reduction in VKT and a slight reduction in AM peak delays per pcu km.

• The combinations of TDM measures and enhanced public transport measures, as modelled in the alternative future scenarios with each TDM,
have a much greater impact upon car and public transport metrics than the alternative future with no TDM measures.

- A parking levy imposed in Wellington City CBD has a moderate impact, resulting in an increase in public transport patronage, a reduction in VKT and a reduction in delays per pcu km. As this measure is targeted, mainly affecting commuters who drive into Wellington City CBD, its impact is localised and most apparent when looking at metrics that focus on trips to Wellington City CBD.

- The tolling of TG and P2G has a localised impact, mainly affecting trips between Kapiti and Porirua and Wellington City CBD, and Hutt Valley and Wellington City CBD.

- A congestion charge has the greatest impact, as it affects all persons either driving through Wellington City CBD or finishing their journey in the CBD, as opposed to a parking levy that would only affect commuters finishing their journey in the CBD. The effect of a congestion charge is to substantially increase the public transport mode share and public transport patronage whilst also substantially reducing car trips.

- Expressed in percentage terms, a congestion charge is expected to result in a 40% increase in annual public transport patronage, compared with the 2011 base scenario, whilst delivering a 11.5% reduction in delay per pcu km.

The following points summarise the results of the six sensitivity tests – 1, 2, 3, 4a, 4b and 4c.

- The two public transport fare sensitivity tests – zero public transport fare inflation and an inter-peak fare discount – result in a small increase in public transport boardings per capita, equivalent to a 2% to 3% increase in public transport patronage compared with the expected future.

- The delayed RoNS sensitivity test results in a small decrease in VKT but a 10% increase in average delay per pcu km travelled in the AM peak. This demonstrates the extent to which travel time savings are dependent upon the delivery of the RoNS.

- Of the three land use sensitivity tests, the Wellington expansion shows the largest changes compared to the outcomes in the expected future. Overall, results from these tests show that land use changes would have a minimal impact upon the expected future outcomes.
4. **Revised future**

The modelling work upon which the expected future and alternative future scenarios (all modelled for 2031) are based assumed that all the RoNS schemes, including the Basin Bridge, would be complete by 2025.

The final decision made by the Environmental Protection Agency board of inquiry and released by the on 30 August 2014, declined the resource consent application for the Basin Bridge project.

This decision and its implications for the RLTP are discussed in more detail in the RLTP document\(^7\). In simple terms, however, the plan still assumes that a solution that benefits both private vehicle and public transport users can be delivered at the Basin Reserve in order to reduce traffic congestion, improve travel times to the airport and provide the opportunity to implement a BRT system.

It was considered prudent to look at how two revised future scenarios might affect progress that is forecast to be made under the expected future. These revised future scenarios are as follows:

- **Revised future A** – expected future minus all Wellington RoNS schemes\(^8\) and minus the proposed BRT
- **Revised future B** – expected future minus all Wellington RoNS schemes and minus the proposed BRT but with bus priority measures along the proposed BRT corridors

The differences between these revised future scenarios and the expected future itself are outlined with reference to four KPIs:

- public transport boardings per capita
- public transport trips
- car VKT
- delay per pcu km

### 4.1 Annual public transport boardings per capita

Figure 15 presents annual public transport boardings per capita for the expected future and the two revised future scenarios.

The key for these charts (and the three subsequent charts) is as follows:

- the red bar represents the expected future

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\(^7\) GWRC (2015): Wellington Regional Land Transport Plan p.143

\(^8\) Basin Bridge, Mount Victoria to Cobham Drive, Terrace Tunnel Duplication, Ngauranga to Aotea Quay (southbound)
- the blue bar represents revised future A – no Wellington RoNS schemes, no BRT
- the green bar represents revised future B – no Wellington RoNS schemes, bus priority in place of BRT
- the black dotted line (right hand axis) is a reference point for the expected future
- the black solid line (right hand axis) shows the percentage change between the expected future and revised future scenarios

Figure 15 Boardings per capita

The data show the following:

- A small decrease in boardings per capita between the expected future (77.3) and revised future A (76.0). Adding in bus priority measures (revised future B) increases the number of boardings per capita back up to 76.5.
- In percentage terms, the revised futures result in a 1.7% (revised future A) and 1.1% (revised future B) decline in boardings per capita relative to the expected future.
4.2 Public transport trips

Figure 16 presents annual public transport boardings per capita for the expected future and two revised future scenarios.

Figure 16 Annual public transport trips

The data show the following:

- A small decrease in public transport trips per annum between the expected future (41.1) and revised future A (40.4). Adding in bus priority measures (revised future B) increase the number of annual public transport trips back up to 40.6.

- In percentage terms, the revised futures result in a 1.7% (revised future A) and 1.1% (revised future B) decline in public transport trips per annum relative to the expected future.
4.3 Annual car VKT

Figure 17 presents annual VKT across the region (car only) for the expected future and two revised future scenarios.

Figure 17 Regional car VKT

The data show the following:

- a small decrease in annual VKT across the whole region between the expected future and both revised future scenarios of 0.7%

- this is a result of reduced capacity on the roading network under due to the assumption of no Wellington RoNS projects going ahead
4.4 Delay per pcu km travelled (AM peak)

Figure 18 shows delay per pcu km in the AM peak resulting from each package and how the value changes with respect to expected future.

Figure 18 Delay per pcu km

The data show the following:

- Delays per pcu km increase by around 15% in 2031 between the expected future and both of the revised future scenarios.
- This is a result of reduced capacity on the roading network assuming no Wellington RoNS projects are completed.
- Whilst the decrease in car VKT (section 4.3) between the expected future and revised future scenarios is modest (around 1%), the increase in AM peak delay per pcu km between the expected future and revised future scenarios (~15%) is far more significant. This highlights the impact that the suite of RoNS schemes have in terms of delivering increased capacity, reduced delays and improved trip reliability on the region’s roading network.

4.5 Summary

Comparing the expected future against the two revised future scenarios in relation to public transport patronage, car VKT and delays per pcu km travelled, the following summary can be drawn:

- In terms of public transport indicators – boardings per capita and annual public transport trips – a revised future scenario without the Wellington RoNS schemes and without BRT results in only a small decrease in public transport trips throughout the region compared with the expected future.
• Replacing BRT with bus priority results in an even smaller decrease in public transport trips between the expected and revised future scenarios. This is because whilst on one hand a scenario without BRT might change the relative attractiveness of public transport versus car for certain journeys, this is at least partly countered by congestion resulting from none of the Wellington RoNS being built.

• Given that the suite of rail improvements envisaged by the Regional Rail Plan (RS1) are still implemented, not implementing the Wellington RoNS schemes will increase modal share and rail patronage from the Hutt Valley, Porirua and Kapiti into Wellington City CBD.

• Looking at the private travel indicators, annual car VKT only decreases slightly between the expected future and revised future scenarios. Whilst a scenario without the Wellington RoNS affects capacity and constrains demand at peak times, particularly heading to Wellington City CBD, at other times of the day and in other areas in the region there is still enough capacity on the road network to accommodate most trips without severe congestion.

• Delays per pcu km in the AM peak increase by around 15% between the expected and revised futures. Given that a large percentage of peak period trips heading to or from Wellington use the state highway network, this increase in delay per pcu km is a direct result of the exclusion of the Wellington RoNS schemes.

In summary, the exclusion of the Wellington RoNS schemes and replacement of BRT by bus priority only has a small impact upon public transport metrics at a regional level as additional congestion on the road network counterbalances the attractiveness of public transport and travelling by car for many journeys, particularly at peak times. With regard to rail, there may also be an increase in public transport mode share along corridors where there is competition between rail and car.

At a local level, public transport patronage from the northern suburbs along the rail corridors increases, due to congestion on the road network, whilst patronage from Wellington’s southern and eastern suburbs decrease as the enabling impact that the RoNS have upon the BRT network is not realised.

From a road network operational aspect, a scenario where the Wellington RoNS are excluded results in a large increase in congestion and delays on the road network at peak times.
5. Collated transport trends

Whilst the scenario modelling presented in section 3 provides some information upon which a regional expected future can be developed, modelling outputs have their limitations, such as the fact that the outputs are based upon a specific set of assumptions, inputs and relationships.

Therefore results from modelling work need to be viewed in light of other sources of data, particularly the analysis of observed transport-related trends and research looking at how transport trends might develop into the future.

This section draws upon data from the following sources to summarise recent observed trends:

- WP2 – background pressures and issues
- the 2013 Census and Wellington City CBD cordon survey
- recent research, commissioned by the New Zealand Ministry of Transport, looking at past trends and using them as a basis for understanding future trends

5.1 Background paper

WP2 presents data from a number of sources, at a regional, national and global level. The findings can be summarised as follows:

- All assumptions upon which forecasts of future travel demand are based – including population, employment, fuel price, public transport fares and GDP – are subject to a considerable level of uncertainty and variability. Therefore future travel demand is subject to a similar level of uncertainty and represents a view of the future using a particular set of variables.

- Between 2001 and 2013, the region’s population grew by 12% yet over the same period regional annual VKT remained broadly unchanged, signifying a reduction in the amount of road travel that people are undertaking. This trend is not unique to New Zealand – it has occurred to a similar extent throughout the western world over a similar time period.

- Public transport patronage grew rapidly between 2000 and 2005 but remained largely flat between 2005 and 2013,\(^9\) a period during which the population grew.

- Between 2005 and 2013, there was a per capita decrease in car trips and, to a lesser extent, public transport trips across the region.

- Historically, travel demand increased at the same rate as GDP. In recent years, however, increasing GDP has been accompanied by flat travel demand, suggesting that this historic relationship is starting to break down. This indicates that the economy is becoming more efficient in the sense that it does not require substantial traffic growth in order to increase GDP or

\(^9\) Rail patronage grew whilst bus patronage decreased, leading to little overall increase in patronage.
does not generate substantial increases in traffic as a result of GDP increasing.

• Two different views of the future were outlined, based upon recent trends and long-term trends:
  
  • a future where long-term trends return, namely high growth in trip rates and a per capita increase in trips across all modes; and
  
  • a future where recent trends continue over the short to medium term, namely lower car and public transport growth rates, equivalent to little or no further per capita increase in trips in the future.
  
• The balance of evidence points to a low growth future between 2015 and 2025 where travel demand increases at a rate equal to or less than population growth.

• This finding forms the basis for the analysis presented in section 6 of this paper.

5.2 Census and Wellington City CBD cordon survey

5.2.1 Overview
The New Zealand Census, undertaken every five years,\(^\text{10}\) provides a comprehensive summary of journey-to-work travel patterns, enabling journey-to-work trips by mode to be calculated across the whole region and compared with data from the previous censuses.

The Wellington City CBD cordon survey is undertaken annually in March by WCC and GWRC and captures all trips by mode – walking, cycling, public transport and motor vehicles – crossing a notional cordon around Wellington City CBD. This dataset provides a source of information that can be used to determine changes in travel patterns, mode share and patronage through time.

Whilst the census provides a comprehensive one-day snapshot of what is happening across the region as a whole, it is only undertaken every five years. Therefore the CBD cordon survey is a useful complimentary measure to identify commuter trends and changes in the balance of trips between modes.

WP2 summarises the census and CBD cordon data. What follows is therefore a summary of these data for the period 2001 to 2013. To place the data in context, the region’s population across this period grew by around 11%.

5.2.2 Recent trends

Table 2 shows the change in journey-to-work mode between 2001 and 2013. It also shows the growth in the number of trips, by mode, during this period for comparison.

Table 2 Journey-to-work mode share and growth in trips – 2001 to 2013

<table>
<thead>
<tr>
<th>Mode</th>
<th>Census journey-to-work mode share</th>
<th>% growth in trips – 2001 to 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
<td>2013</td>
</tr>
<tr>
<td>Car (measured as number of occupants)</td>
<td>66.9%</td>
<td>62.2%</td>
</tr>
<tr>
<td>Public transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>15.6%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Train</td>
<td>6.9%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Active mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>12.1%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Cycle</td>
<td>9.8%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Overall</td>
<td>2.3%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

The journey-to-work data show the following:

- Total trips increased by 13% over the period.
- Public transport mode share increased from 15.6% to 16.6%, equivalent to a 20% increase in the absolute number of public transport trips.
- The active mode share of trips increased from 12.1% to 14.6% (equivalent to a 36% increase in absolute number of active mode trips).
- Looking at the active mode components in isolation, in 2013 walking accounted for 11.6% of journeys to work within the region whilst cycling accounted for 2.9%.
- Both walking (34%) and cycling (42%) saw similar growth rates over the 12 years to 2013.
- The car mode share (persons) of journey-to-work trips decreased from 66.9% to 62.2% between 2001 and 2013. In absolute terms, car journey-to-work trips increased by 5% between 2001 and 2013 against a 12% increase in population and employment.

Table 3 shows how the AM peak mode share to Wellington City CBD, as recorded by the CBD cordon survey, changed between 2001 and 2013. It also shows for comparison the growth in trips, by mode, during this period.

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11 Trips categorised as ‘motorcycle’ or ‘not known’ accounted for 4.7% of journey-to-work trips in the 2001 Census and 5.9% in the 2013 Census.
Table 3 Wellington City CBD cordon mode share and growth in trips – AM peak, 2001 to 2013

<table>
<thead>
<tr>
<th>Mode</th>
<th>CBD cordon mode share (AM)</th>
<th>% growth in trips – 2001 to 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
<td>2013</td>
</tr>
<tr>
<td>Motor vehicle (measured as number of occupants)</td>
<td>53.8%</td>
<td>45.9%</td>
</tr>
<tr>
<td>Public transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>13.1%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Train</td>
<td>15.5%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Active mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>16.0%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Cycle</td>
<td>1.7%</td>
<td>2.6%</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The AM peak Wellington City CBD cordon data show the following:

- The number of motor vehicle occupants crossing the cordon declined by 12% between 2001 and 2013.\(^\text{12}\)
- The number of trips crossing the cordon by public transport increased by 21%, increasing the mode share from 28.6% to 33.1%.
- The growth in active mode trips (24%) marginally exceeded the growth in public transport trips (21%).
- There was a 64% increase in the number of cycling trips, raising the cycling mode share from 1.7% to 2.6%. Much of this increase occurred post 2006.
- The walking mode share increased by 20% from 16.0% to 18.4%.

These observed trends between 2001 and 2013 can largely be explained with reference to the following (and discussed in more detail in WP2):

- Residential development around the Wellington City CBD fringe, favouring active modes/public transport ahead of the private car.
- A considerable amount of residential development within the Wellington City CBD cordon, meaning that a growing proportion of CBD workers live within the cordon, thus partly explaining the relative disconnect between population growth between 2001 and 2013 (12%) and the growth in trips crossing the cordon (4%). This is due to an increasing number of people

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\(^{12}\) Average car occupancy remained relatively unchanged, therefore this percentage decrease equates to a similar percentage decrease in vehicles crossing the cordon.
who commute to work living within the cordon, thus not getting picked up by the CBD cordon survey (although they will be picked up by the census).

- The increasing attractiveness of public transport, relative to car and cycling/walking. Reasons for this trend include increases in fuel prices exceeding increases in public transport fares between 2001 and 2013.

- A decrease in per capita car trips, due to economic factors (increasing fuel prices), structural factors (younger people driving less), increased parking costs in Wellington City CBD and continued parking capacity constraints.

- Limited employment growth between 2008 and 2013, with the concentration of employment growth within the CBD coming at the expense of other areas within the region.

- Continued congestion and capacity constraints on the strategic roading network, particularly at peak times, affecting travel times and limiting the extent to which the number of car trips on the network can increase at peak times.

5.3 Research report

At the request of the New Zealand Ministry of Transport (MoT), a meeting of UK researchers and commentators was convened in London on ‘peak car’, an hypothesis that per capita car use is close to its maximum level and may stabilise or decrease.

This discussion, which took place on 20 May 2014 and was facilitated by Glen Lyons (MoT) and Phil Goodwin (Emeritus Professor of Transport Policy, UCL and UWE Bristol), was written up into a report [link](http://eprints.uwe.ac.uk/23277/) and is summarised below.

The purpose of the meeting and associated report was to provide guidance to help improve understanding and support policy development within New Zealand.

5.3.1 Key points

The key points from the meeting, in no particular order, are as follows:

- Economic drivers have historically been identified as the key determinants of transport demand, whereas recent research suggests that other drivers are at play.

- There is little confidence in the notion that a single forecast or narrow band can accurately be used to represent a likely view of the future, rather multiple forecasts covering a wide range of eventualities is now considered ‘best practice’.

- Divergent trends can be seen in the recent past:
• a decline in the number of per capita trips in urban areas/regions,\textsuperscript{13} an increase in per capita trips in rural areas; and

• The decline is more noticeable in more economically buoyant and affluent areas,\textsuperscript{14} indicative of the digital age where people can work remotely and with less rigid working hours.

• Forecasts for traffic growth have continually been revised downwards since 1989, whilst public transport patronage forecasts (mainly rail and bus, in the UK particularly) have continually been revised upwards.

• It will become apparent over time whether recent trends are due to economic factors (such as the GFC), structural factors, or elements of both.

• The decoupling of economic growth and traffic growth first becomes apparent with data from the mid-1990s onwards.

• The geographical distribution of the growing population (in the UK) has largely favoured active modes and public transport.

• Urbanisation, agglomeration and densification result in low levels of car usage, whilst still developing vibrant, social and economically progressive areas/regions.

• The idea of a ‘green metropolis’, typified by London, has emerged, whereby urbanisation and densification has led to high rise, inner city development that is acceptable to younger, richer, low car ownership individuals. This vision delivers a city that is vibrant and sociable.

• As the world is becoming more and more reliant on digital technology, communication and many aspects of business are becoming less reliant upon travel.

5.3.2 Report summary
The report can be summarised as follows:

• The focus of the report is on ‘peak car’, the idea being that per capita car use is (or has reached) a saturation level.

• Whilst some people think that the observed flat-lining of car demand (reduction in per capita terms) is solely due to economic factors, evidence suggests that there is a structural element to the changes that predates the GFC.

• Indications that this shift in demand predates recent economic difficulties include:

\textsuperscript{13} In a UK context, London and the south-east would be an urban area, while areas of rural Wales and rural Yorkshire, for example, would be considered rural areas. In New Zealand, the Wellington region can largely be considered an urban region, whereas areas such as the West Coast or Southland might be considered rural areas.

\textsuperscript{14} Placed in a New Zealand context, Wellington could be defined as such an area.
- decoupling of traffic growth and GDP growth starting in the mid-1990s;
- reductions in the propensity of young people to drive started prior to 2000; and
- changing land use and migration, with residential growth focused in urban areas and those people less dependent on the private car, started to occur from the mid-1990s onwards with the rejuvenation of city centres for living.

- Recent policy changes have encouraged public transport and active mode use. The cumulative effect of such policies may become significant over time.
- Per capita car use is influenced by both economic and structural factors.
- There have been recent divergent trends – a decline in per capita car trips in urban areas/city regions and an increase in per capita car trips in more rural areas.
- Best practice should focus on looking at a range of futures rather than just one view of the future.
- There is a general consensus amongst experts that any ‘central’ forecast for an urban areas/city regions should assume that per capita car travel distance remains largely unchanged.
6. Characteristics of the expected future

Looking at the balance of evidence obtained from the scenarios modelling in this working paper, and recent forecast demographic, economic, policy and behavioural trends as summarised below, this section presents an expected transport future for the Wellington region. It builds on the expected future scenario modelled in this working paper (and WP3), and adds information about the characteristics of that expected future, that then informs the setting of the RLTP targets in WP5.

It has been shown that the key characteristics of the Wellington region are as follows – largely urbanised; with a comprehensive, reliable and widely used public transport system; residential growth likely to be focused in urban areas of the region; and has a relatively young and well-educated population.

Informed by the observations and analysis in preceding sections and WP3, the region is expected to experience the following trends:

- The regional population is forecast to increase by 7% between 2013 and 2025 (Statistics NZ medium projections), with growth focused on Kapiti, the northern suburbs and Wellington City (as stated in section 3.3 of WP3). This compares to a 12% increase in population between 2001 and 2013 across the region.
- Little or no overall per capita growth is forecast in the number of trips between 2013 and 2025, resulting in a ~7% increase in overall trips (car, public transport and active modes combined).
- Residential growth in and around Wellington City CBD and Wellington’s inner suburbs is likely to favour active modes and public transport over the private car.
- Reductions in car ownership levels seen over recent years are thought likely to flatten out but not return to historic (pre-2000) levels as the focus of future residential development and future policies are expected to favour lower levels of car ownership.
- Economic growth and increasing travel demand will continue to decouple. The key characteristics of the Wellington region and its population (as stated above) mean that economic growth in the future will not be reliant upon a corresponding increase in travel demand as has been the case historically.
- Ongoing policies favouring public transport and active modes over the private car will continue to contribute to the increasing attractiveness of non-car modes.
- Car trips to the CBD will remain constrained by both the cost and availability of parking.
• Public transport investment is expected to improve the attractiveness of using public transport, generating modal shift from car to public transport across the region as a whole.

• The popularity of active modes will continue to increase, driven by residential development and infrastructure initiatives, potentially resulting in modal shift from the private car and public transport to active modes. Policy to encourage reduced private car use across the region will impact both upon the use of public transport and active modes.

• The exact future split of non-car trips amongst their constituent components – bus, train, walking, cycling – is dependent on many factors such as the exact location of proposed residential development and the phasing of transport-related infrastructure projects.

• The car mode share will continue to decline, but at slower rates than was seen between 2001 and 2013 (according to the census and CBD cordon data) as the RoNS schemes will improve the roading infrastructure and reduce congestion on the roading network between 2013 and 2025.
7. Conclusions

This working paper has:

- Summarised the packages that were modelled in the WTSM and the indicators used to analyse the results.

- Presented and compared results for the expected future and alternative future scenarios, along with an assessment of the extent to which varying some of the expected future assumptions might affect the outcomes.

- Presented results from two revised futures where the Wellington RoNS schemes are excluded, commenting upon how the outcomes from such a scenario might differ from the outcomes associated with the expected future.

- Summarised recent trends, drawing from census and Wellington City CBD cordon data, information presented in WP2 and the key points from discussion held in London in 2014 and a subsequent report looking at the topic of ‘peak car’.

- Outlined an expected view of the future taking into account results from the modelling, recent trends and forecast trends.

- Projected this view of the future to 2025. This information is the basis upon which the measures and targets reported in WP5 have been developed and set.