

Auckland Northern Busway Retrospective: Updated Review of Impacts

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Abstract

This paper summarises the effects of Auckland Northern Busway, connecting bus routes and associated services (collectively referred to as 'the busway'). The busway is a highly significant project in a NZ context, being one of the most substantial public transport projects of the past 50 years.

The objective of the paper is to assess whether the investment in the busway achieved its intended outcomes. Factors considered include; changes in patronage, busway travel times and the interrelationship with traffic flow and travel times on the parallel State Highway 1.

The effect of the busway in terms of the growth of commuter access to Auckland CBD in a multi-modal context is described and the role of segregated travel modes in meeting demand is highlighted.

Current issues and future plans are reviewed, including the possible conversion of the busway corridor to light rail as the busway approaches capacity.

1. Introduction

Auckland Northern Busway (the 'busway') in the north of New Zealand, consists of a segregated non-guided busway, dedicated bus stations and park-and-ride facilities. The busway was implemented in stages, over the period 2005 to 2009.

The busway runs parallel to the national north-south highway, State Highway 1 (SH1), connecting the North of the Auckland City-Region, via the Auckland Harbour Bridge, to the Central Business District (CBD), as shown in Figure 1.

Transport investment in Auckland in recent decades has mainly focussed on road projects (Mees P, 2007). The busway is therefore a highly significant project in a NZ context, being broadly equivalent to the recent revitalisation of the rail network, and one of the most substantial PT projects of the past 50 years.

The opening of the busway substantially reduced bus travel times (initially by around a third from Albany to the CBD) and improved bus reliability. These improvements, together with increased bus frequencies and higher capacity buses have resulted in high bus patronage growth in the corridor, for example, the morning peak patronage in 2016 was almost double pre-busway demand.

The implementation of the busway resulted in a reduction in parallel SH1 road traffic volume and an increase in commuter car occupancy.

Figure 1 Northern Busway Corridor



Several outstanding busway issues are currently in the process of being addressed, including:

- The removal of discontinuities in bus priority measures along the corridor, to minimise the incidence of delay to buses interacting with road traffic.
- Local bus service integration with express busway services is proposed to be improved.
- Peak bus service capacity is being increased, to reduce passenger waiting times and crowding problems.
- Car parking (for park and ride access) capacity and the potential for charging is under review.
- Long term plans for further extension and improvement of the busway are being prepared.

2. Background

Auckland is a 4,894 km² city-region of 1.6 million people, containing a third of New Zealand’s population, with an estimated annual population growth of 2.2% (Statistics NZ, 2017).

NZ has high car ownership levels at 0.77 vehicles per capita. Auckland also has high ownership, but at 0.72 vehicles per capita is slightly below the NZ average (MoT, 2016).

The rate of growth in vehicle kilometres per capita in Auckland has slowed over the past 10 years (Greater Auckland, 2015).

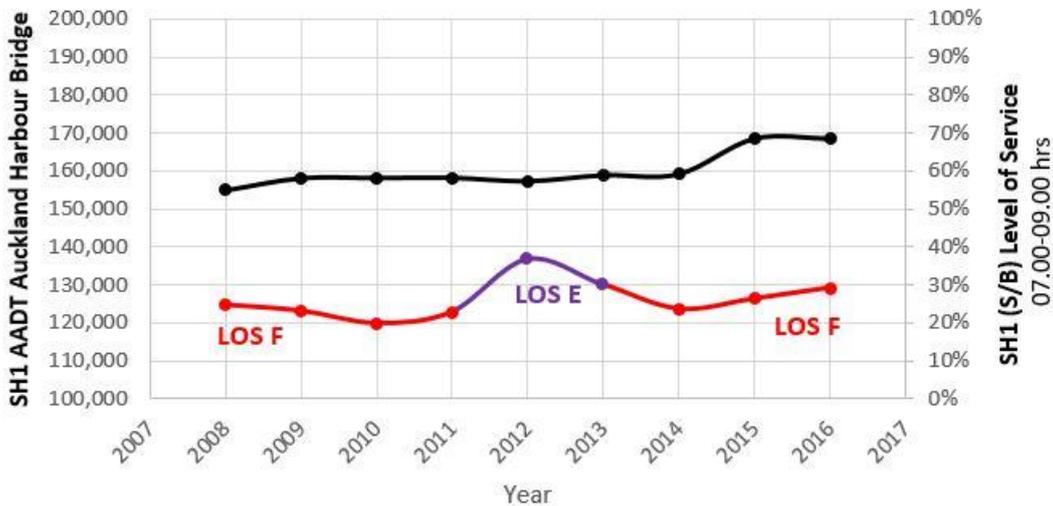
Public Transport (PT) use in Auckland has been increasing from a low point in the 1990’s and now stands at 83 million trips per annum with an annual PT trip rate of approximately 50 per capita (Auckland Transport, 2016).

The location of major water bodies, especially Manukau Harbour on the Tasman Sea and the Waitemata Harbour on the Pacific Ocean, mean that regional travel movements are concentrated on a limited number of crossing points through the small City Centre isthmus.

Approximately 250,000 residents north of the Harbour Bridge, do not currently have rail access and this is unlikely to change as the introduction of heavy rail to the North Shore is not envisaged in the foreseeable future (North Shore Times, 2016). PT commuting from the north is therefore by either bus or ferry.

The 1 km Auckland Harbour Bridge is a motorway section of State Highway 1, carrying road traffic to and from the north. On the section of SH1 parallel to the busway¹, average road traffic speeds in the peak period are very low, and below 30% of the posted speed limit (in other words, LOS F²) for 7 of the past 9 years as shown on Figure 2.

Figure 2 SH1 Traffic Volumes and Levels of Service



Congestion on Auckland’s road network (including motorways) is a longstanding problem and these problems are perceived to be worsening (NZ Herald, 2017).

¹ SH1 (N) Constellation-Onewa S/B Average Speeds - November weekdays

² Network Speed LOS definition, Transportation Research Board, 2016, Highway Capacity Manual, Sixth Edition, USA

3. Project Development

The 'concept' behind the busway was developed by the Auckland Regional Council in the early 1980's in response to the high level of SH1 congestion, the removal of tolls on the AHB³, and the difficulties experienced by peak period bus services travelling between the North Shore and Auckland CBD.

Bus use of the hard shoulder on the northern motorway (SH1) began in the early 1990's. The shoulder speed limit was 50 km/hr and its use was limited to peak periods. In practice, the sections of shoulder available for bus use changed over time and the lane was not continuous, requiring bus merging manoeuvres with motorway traffic. Even so, the use of the shoulder (reportedly) reduced bus travel times.

Concepts for a dedicated busway were investigated in detail between 1988 and 1992 and a 'Scheme Assessment Report' identified a preferred option for a dedicated busway, at an estimated cost at the time of approximately \$35m. The project was then modified, resulting in the 1997 proposal to allow high occupancy vehicles (HOVs) to use the busway.

In 1998, the project was further modified to increase the scale of construction required for the busway and to include the development of associated stations and facilities, resulting in a revised capital cost requirement of \$130m. By the time construction funding was approved, immediately prior to implementation in 2004, the estimated cost of the busway itself (excluding stations) had increased to \$215m and the estimated cost of the stations to \$84m.

The project improved access to PT for local bus users, pedestrians, cyclists and motorists and was designed to safeguard the potential for later conversion of the corridor to light rail.

4. Project Assessment

The busway project required extensive co-operation between the national transport funding body (Transfund NZ) the State Highway Authority (Transit NZ), the local district Council (NSCC), Auckland Regional Council, the Regional Transport Authority (ARTA), the local funding body (Infrastructure Auckland) and a major utility (Transpower)⁴.

The funding policy during the final period of project development (1999 to 2003) required minimum BCR thresholds to be reached for road proposals (Transit NZ, 1991). The equivalent technique for non-road proposals at the time was the calculation of Efficiency Ratios⁵ (Transfund NZ, 1997). Roading and non-roading projects were in competition based on the scale of their respective 'ratios'. A range of evaluation techniques were considered at the time for the busway project, including a full evaluation of all aspects of the proposal under the ATR procedures.

These complexities meant that it proved difficult to undertake a comprehensive evaluation, incorporating capital costs and associated PT services, and although the need for improved PT was widely acknowledged, the project was evaluated (in economic appraisal terms) as a road.

³ AHB construction start 1954, construction end April 1959, opened 30 May 1959, tolled until 31 March 1984.

⁴ Such is the rate of institutional change since the implementation of the busway that only the utility now remains in its original form.

⁵ A limited form of cost benefit appraisal measure based on incremental effects.

For a variety of reasons, it proved difficult for the project to achieve an “acceptable” Benefit Cost Ratio (BCR). However, in 2004, partly due to an allowance for wider project benefits, the busway obtained construction funding approval (NZTA, 2012).

The actual funding of the project was divided between several parties. The outturn cost of the segregated busway infrastructure was \$221m, funded at a rate of financial assistance rate of 100% by Transfund NZ as it was technically a State Highway. The bus stations were funded by local bodies at an outturn cost of \$85m, with no contribution from the National Land Transport Fund (NLTF). The total outturn capital cost of the project was therefore \$306m.

Bus operational subsidy costs were shared between the Regional Council and Transfund NZ⁶, although no economic evaluation of the associated busway related service changes was included. The following benefits were considered in the approved economic appraisal (NZTA, 2004):

- Existing bus user benefits
- New bus user benefits
- Congestion relief
- Vehicle operating cost savings
- Safety benefits

To be consistent with the funding rules applying at the time, the following conventions were adopted:

- Costs and revenues associated with setting up and operating new bus services were excluded from the economic appraisal.
- Bus station costs were required to be externally provided and so were also (mainly) excluded.
- For sensitivity test purposes, the busway was assumed to be available to high occupancy vehicle (T2 and T3⁷) car traffic.

The outcome of this work was to forecast a BCR of 1.2 with the addition of T2 and T3 vehicles raising the forecast BCR to 1.3 and 1.7 respectively. Current Economic Evaluation Manual (EEM) procedures (NZTA, 2016) now encourage a wider range of potential benefits to be considered and current funding rules permit a more comprehensive project scope to be tested as a ‘package’, for example to include the full station costs, associated facilities and bus services.

A post-implementation review (NZTA, 2012) undertook a re-evaluation of the economics of the project, including the testing of the original evaluation in terms the actual performance of the project and testing a package-approach to evaluation. The sensitivity testing of alternative approaches and of appraisal periods and discount rates, meant that a matrix of potential BCRs was produced as follows:

⁶ Now shared between ARTA and NZTA.

⁷ ‘Transit’ cars with at least 2 or 3 occupants, respectively.

Table 1 Economic Appraisal Assumptions: Sensitivity Testing

Alternative Approaches	BCR
Original 2004 evaluation (25-year appraisal period, 10% discount rate)	1.2
Re-evaluation (infrastructure only, based on actual performance, 25-year appraisal period, 10% discount rate)	1.3
Re-evaluation (infrastructure only, based on actual performance and updated procedures, 30-year appraisal period, 8% discount rate)	1.8
Package evaluation (based on actual performance and updated procedures, 30-year appraisal period, 8% discount rate)	1.4
Package (based on actual performance, updated procedures, extended appraisal period to 60 years, and reduced discount rate to 4%)	2.6
Re-evaluation (infrastructure only, based on actual performance, updated procedures, extended appraisal period to 60 years, and reduced discount rate to 4%)	5.2

The above table illustrates the importance of the assumptions and methodologies used in the economic evaluation of proposals. It is also important to note that the 2012 review was based on monitoring information from the early post-implementation period, and that a comprehensive revision of future year modelled forecasts was not undertaken.

5. Project Description

The segregated section of the busway consists of a dedicated busway of 6.2 km from Constellation Drive to Akoranga Station, on an undivided two-way single carriageway limited access road running parallel with the SH1 Northern Motorway.

The busway is effectively a continuous grade-separated special vehicle facility within the SH1 corridor and an integral part of the Northern Motorway, with the busway 'running lanes' only available to certain classes of authorised vehicles.

To overcome the issue of pedestrians being prohibited on a motorway, the sections of busway platform (and some buildings) within the motorway corridor were specially classified⁸. Areas of land at each bus station, have been defined as lying outside the motorway corridor proper, and are currently owned by Auckland Council and managed by Auckland Transport.

South of Akoranga Station, a one-way southbound bus lane extends a further 2.5 km to Onewa Road SH1 interchange, immediately prior to the Harbour Bridge. There are no dedicated bus lanes on the Harbour Bridge itself, but here, peak period tidal traffic flow is assisted by the operation of reversible lanes, protected by a moveable barrier

The busway operates at 80km/hr compared with 100 km/hr (for general traffic) on SH1.

Bus stations and interchanges on the segregated busway are located at Akoranga (Figure 3 Akoranga Bus Station), Smales Farm, Sunnynook and Constellation.

⁸ As a 'road stopped and set apart for the functioning indirectly of a road (Passenger Transport Station)'

Figure 3 Akoranga Bus Station



All stations provide shelter and cycle parking and were designed with public safety in mind, with glass walls, low planting, night lighting and CCTV to enhance security. Technology provides real-time passenger information; audio help points and 24-hour security surveillance. Passenger facilities within the stations include, cycle lockers, covered walkways, new footpaths, bridges and lifts as well as drop off zones for motorists. Park and ride is available at Constellation Station.

Elsewhere along the busway corridor, other bus related facilities include:

- Bus lane operation on Onewa Road, approaching SH1 from the west.
- Stations with attached park and ride facilities at Albany and Hibiscus Coast.
- Bus-only ramps from SH1 to Albany station.
- Peak flow tidal lane configuration, providing 5 lanes southbound, 3 lanes northbound in the morning peak over the Auckland Harbour Bridge. The lane formation is reversed for the evening peak and is undertaken through the operation of a moveable barrier.
- Bus lanes on the Harbour Bridge exit to Fanshawe Street, and in both directions along Fanshawe Street.
- NEX services now terminate within the CBD at Lower Albert Street, a few minutes walk from the central Britomart Railway Station.

6. Services

Dedicated Northern Express (NEX) buses operate as the 'flagship service' on the busway and carry the majority of PT commuters from the north into the CBD. The majority of NEX services commence their routes at Albany bus station (18 km from the CBD) although a minority of NEX services (on a 10-minute peak headway) originate further north at the Hibiscus Coast bus station, a distance of 31 km from the CBD

The frequency of NEX services increased rapidly in response to demand, commencing with 15-minute peak headways in 2005, then changing to 10 minutes in 2006, 7.5 minutes in 2007, 5 minutes in 2005, 4 minutes in 2008, 3 minutes in 2011 and 5 minutes during the 'shoulder peak'. Additional buses are also run in response to demand pressures, especially in the morning peak.

Inter-peak services are less frequent, with 10-minute NEX headways, and one service in three continuing to and from the Hibiscus Coast.

Weekday NEX services operate from 5 AM until midnight. Pressure on peak capacity, in terms of crowding and wait time, lead to double-deckers (see Figure 4) being introduced progressively from 2015 onwards. Currently, double-deckers represent around 85% of the NEX fleet.

Figure 4 New NEX Double Deckers



Prior to the introduction of the busway in 2005, the average travel time for buses from Albany to the CBD in the morning peak was 35 minutes, slightly higher than the equivalent journey for cars at 34 minutes 30 seconds (NZTA, 2012 (2)). In 2009, immediately following the full opening of busway and associated facilities, bus travel times reduced by 36% to 23 minutes 20 seconds, while car travel times increased by 5% to 36 minutes 24 seconds (NZTA Tom-Tom database).

Since that time, bus travel time has stabilised to be typically between 27 and 30 minutes (Auckland Transport, 2017 (3)), with parallel car travel times fluctuating within the range 35 to 40 minutes. The contrast in peak period operational conditions between general traffic on the adjacent SH1 motorway and busway services can be seen in Figure 5.

Figure 5 SH1 and Busway Operations



Bus travel time is currently scheduled in the public timetable at 32 minutes, from Albany to CBD terminus. This does not vary with time-period and is set at the high end of potential timings, to allow service reliability to be maintained.

On some sections, bus services operate with general traffic, sometimes with intermittent and limited bus priority, north and south of the segregated busway section, as follows;

- South: To and from the CBD, approximately 8 km northbound and 5.5 km southbound.
- North: From Constellation station to and from Albany, approximately 4 km.

The 6.5 km segregated busway section is used by all NEX services. Some feeder service buses terminate at the busway stations, but other non-NEX service buses make use of the busway to access the CBD via the Harbour Bridge. Some buses make use of shorter busway sections. Vehicles currently allowed⁹ to use the segregated section are, in priority order, as follows:

- (a) First priority: Scheduled (25 seats and over) bus services.
- (b) Second priority:
 - (i) Special event bus services; for example, concerts, sporting events).
 - (ii) Airport shuttles; minibuses carrying between 9 and 12 people.
 - (iii) Charter buses; including school services.
 - (iv) Tour buses and coaches
 - (v) Longer distance buses and coaches

Emergency vehicles are also allowed to use the busway. All vehicles using the busway require a permit and all drivers require training. In the past, consideration was given to allowing high occupancy light vehicles to use the busway but this has been rejected on operational efficiency grounds.

Approximately 20 NEX services and 80 other scheduled buses, operate into the CBD from the northern corridor, in the peak direction, per hour.

The busway and associated works and service changes were implemented over the period July 2005 (commencement of new services) to February 2008 (formal busway opening). Park and ride extensions were added in 2009.

⁹ NZ Transport Agency Bylaw 2008/1

Service frequencies have been continuously reviewed since 2005, in response to changes in demand. Implementation of the busway was originally intended to be a catalyst for the bus service network to be comprehensively reshaped into a hub and spoke system. This was only partly implemented due to limited capacity on peak NEX services and a desire to allow well loaded local services to continue to the CBD to avoid imposing excessive interchange delays.

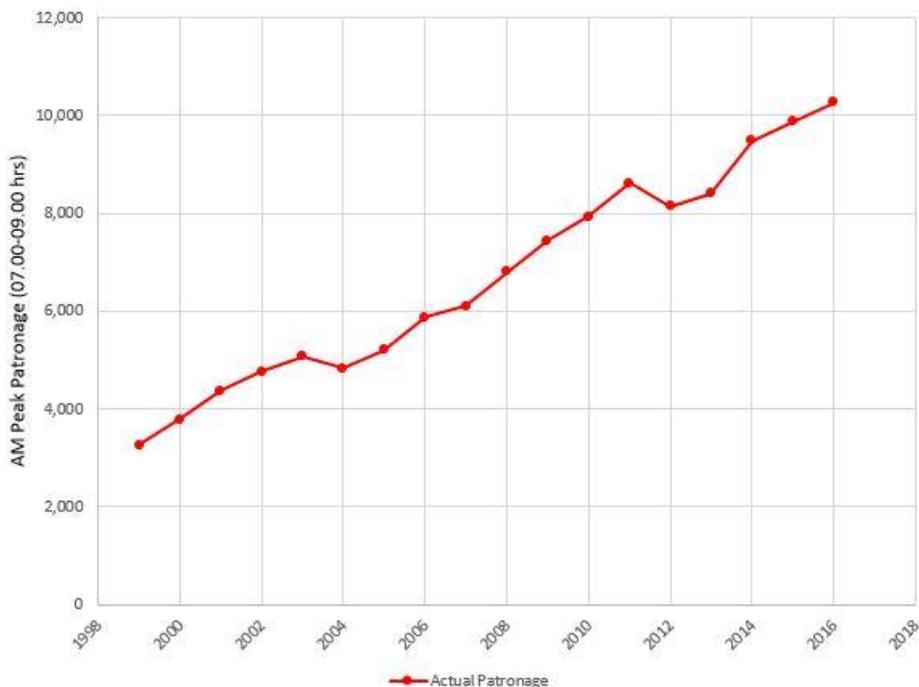
Since 2009, further facilities have been developed and approved, most notably the opening of Hibiscus Coast bus station and associated park and ride, the relocation of the CBD Terminus from Britomart to Lower Albert Street, and the construction of the segregated busway extension from Constellation to Albany.

7. Demand

7.1 Corridor Demand

Busway southbound patronage increased by 46%, between 2004 and 2009 during the two-hour AM weekday peak period 07.00-09.00. Patronage also increased rapidly following full busway opening, with current (2016) total (NEX and other services) in the same AM peak period patronage levels at 11,700, almost double the pre-busway (2007) level of 5,800, as illustrated in Figure 6.

Figure 6 Busway Patronage Growth



Following busway opening, general traffic volumes on SH1 remained high, but monitoring data indicates that southbound AM peak period traffic volumes fell in absolute terms by around 2% over the period 2005 to 2009 (Auckland Transport, 2017 (2)). Since that time, total traffic volumes over the Harbour Bridge have been relatively stable, at around 160,000 VPD.

The reduction in PT travel times, improved reliability and increased service frequency, and continued SH1 congestion resulted in immediate post-implementation (2009-2011) bus

patronage growth of 7.5% p.a., compared with pre-implementation bus patronage growth rates in the corridor of 3% p.a. (NZTA, 2012 (2)).

A change in car occupancy was also recorded over the same period from 1.21 to 1.28, although this was not due to any HOV initiatives, none of which had been implemented as at June 2011. The increase may have been related to increased bus use associated with additional (solo-direction) car ride sharing (NZTA, 2012 (2)).

A substantial proportion (26%) of busway users formerly travelled by car, prior to using the busway services (NZTA, 2012 (2)).

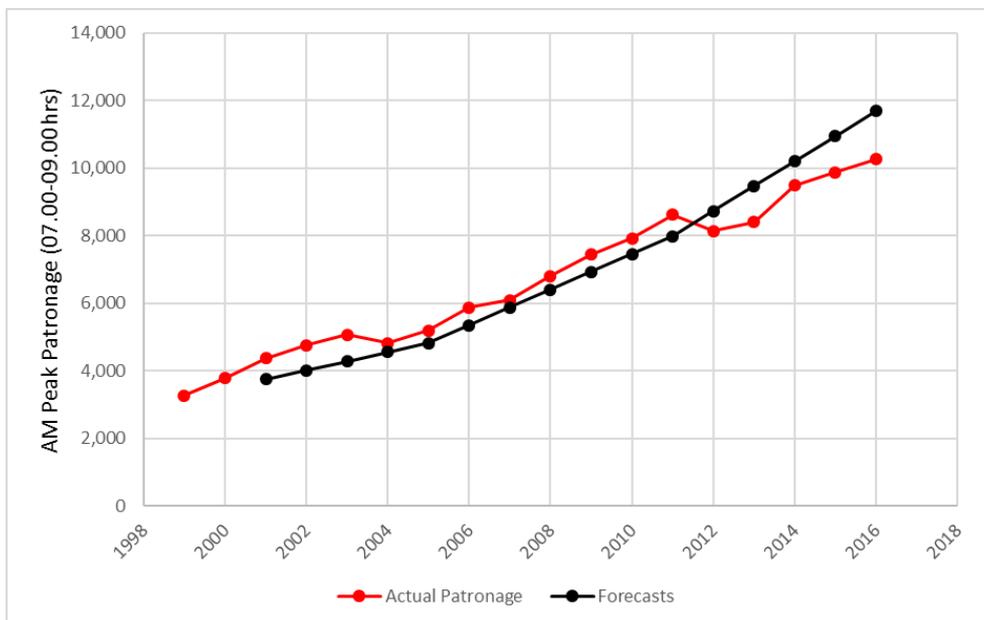
Park and ride facilities are currently at capacity and are used by non-PT users from adjacent commercial developments. Park and ride is not currently charged although some car parking spaces are reserved for dedicated HOV use.

It is doubtful that, in view of the high frequency of bus operations and the limited capacity at various locations, that any HOV car use of the existing busway would be feasible without substantial further investment.

7.2 Accuracy of Corridor Demand Forecasts

In the 2004 evaluation it was assumed that bus patronage (and associated benefits) would grow by 36% between 2001 and 2011. In fact, the growth over this 10-year period was much higher at 81% (CBD cordon-based ARTA analysis). Later forecasts (2006 onwards) have proven to be closer to reality, as shown in Figure 7.

Figure 7 Comparison of Busway Patronage with Forecasts



The forecasts for busway patronage were around 14% higher in 2016 than actually recorded. The fall-off in PT growth in 2012/13 may be due to the immediate increase in SH1 speeds associated with the opening of the Victoria Park Tunnel (see Figure 2). Overall however, there is a very good correlation between forecast and actual patronage trends.

Recent wider initiatives, real time information (NZTA, 2015) integrated ticketing (NZTA, 2017 (2)), integrated zone fares system and complementary fare discounting initiatives, have

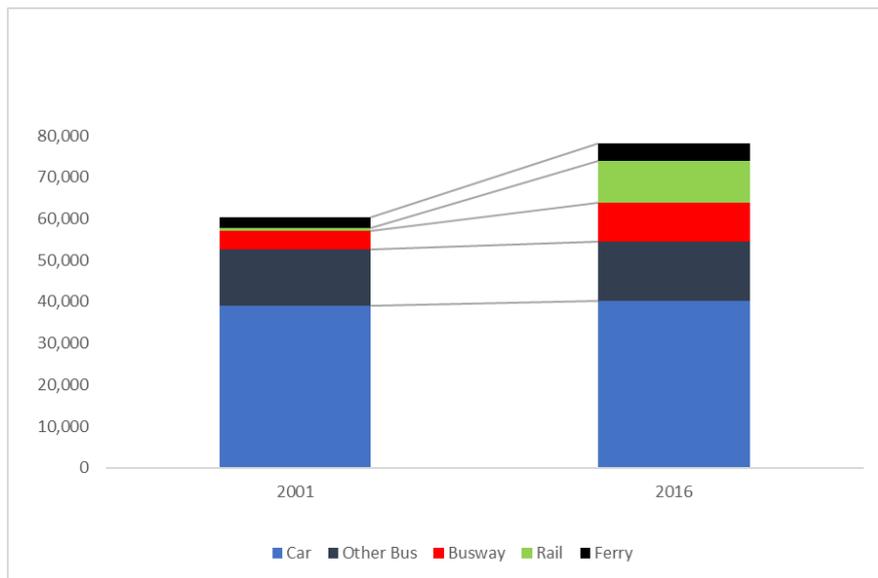
contributed to the success of the busway. The integrated fares system has also provided a very good database of passenger trip patterns, for planning and marketing purposes.

7.3 Travel to/from Auckland CBD

Auckland CBD contains almost 40,000 residents and over 100,000 employees (2016).

In 2001 there were approximately 60,000-person trips entering the Auckland CBD cordon in the morning two-hour peak period. Private vehicles accounted for around two thirds of all trips. By 2016 total person trips had increased to approximately 78,000, as shown in Figure 8.

Figure 8 Trips to CBD via Busway (Auckland CBD cordon survey)



The growth in PT demand was derived from:

- 89% (8% ferry, 28% busway, 52% rail) segregated PT growth
- 8% private car travel
- 3% conventional (non-busway) bus growth.

Consequently, the mode split of private vehicles reduced from approximately two thirds of all trips to around half, over the 15-year period.

It is fair to describe busway as predominantly segregated, as it has a range of bus priority protection and where it runs with general traffic over the Harbour Bridge it does so relatively freely, due to tidal traffic management arrangements. At some points, there are interactions with traffic and although these can be problematic, buses continue to maintain a good margin over general road traffic, in terms of travel time.

This is a success story, with bus patronage from the North Shore into the CBD in 2016, being three times higher than it was 25 years ago, and more than double the level in 2001.

Bus patronage has also continued to grow healthily in recent years, for example busway patronage has been growing by 5% p.a. between 2009 (when the busway was fully open) and 2016.

In contrast, patronage on other (non-busway) services into the CBD grew by only 5% in total over the period 2001-2016. There appears to have been some intermediate higher growth,

but by 2016 this has been eroded, partly due to competition with segregated PT services, and particularly rail.

Rail growth has been even steeper than busway growth, 2016 rail patronage was 14 times higher than in 2001. Rail and busway patronage entering the CBD in the AM peak are now at very similar levels at over 9,000 trips (non-busway bus travel at 14,000 trips is still larger than either).

Other major changes occurred over the period 2001-2016, overall (AM peak) trips into the CBD increased by 30%, CBD employment also increased by 30%, a good correlation, as might be expected. Both regional GDP and the residential population in the CBD have more than doubled over the same period.

7.4 Interpretation of CBD findings

Segregated PT has played the dominant role in facilitating recent growth in commuter travel to the CBD. Without segregated PT (busway, rail and ferry) trips into the CBD may not have been able to grow at all.

Over the period (2001-2016) there has been no substantial reduction in traffic congestion on approaches to and through central Auckland. In fact, congestion has probably worsened overall (NZ Herald, 2016) although (surprisingly) very little reliable quantification of this is currently available¹⁰.

There has been no substantial increase in private traffic accessing the CBD in the AM peak period, following the opening of several road projects including Victoria Park Tunnel. The presence of widespread and problematic roadworks may be a confounding factor when analysing true trends in congestion however, and we may see some change in congestion levels when the effects of recent large investments (including the NW Motorway widening and the Waterview Tunnel) have been monitored.

Wider PT initiatives over the period 2001-2016, such as bus priority (lanes and bus detection at signals), increased bus frequencies, fares discounting, the provision of real time information and integrated ticketing (HOP card) appear to have had little impact in increasing bus commuting into the CBD from non-busway sectors. It is possible however without these initiatives, non-busway patronage could have declined.

8. The Future

8.1 Plans

- A two-way extension (of approximately 4km) to the busway to connect with Albany Station is currently under-construction.
- An additional bus station is also planned at Rosedale, between Constellation and Albany, to co-incide with the opening of the extension.
- Bus services on the North Shore are currently subject to a re-organisation exercise, due to be implemented in mid-2018. This will include further rationalisation of bus services towards a hub and spoke model.

¹⁰ Data showing absolute changes in travel times on the central Auckland road network were not available from the Road Controlling Authorities, at the time of writing.

8.2 Issues Under Review

- Delays to current services may require further priority extensions, especially the northbound approach to Akoranga Station and SH1 priority lanes from Albany to Hibiscus Coast.
- The potential introduction of car parking charges at stations remains under active consideration to manage demand and compliance, particularly at Constellation and Albany Stations.
- Responses to the effect of peak bus services approaching capacity in terms of reducing wait times and crowding.
- Terminal location, capacity and facilities in the CBD for current and future busway operations is likely to require rationalisation and further investment.
- Variations in permissions for busway use, in terms of high occupancy vehicles and other specific vehicle classes.

8.3 Future Development Options

It has been suggested that conditions may require upgrading to a light rail based system by around 2030, although there are complexities, including establishing the timing of conversion to light rail, and managing the service disruption effects through the construction period.

Initial feasibility work (Auckland Transport, 2016 (2)) estimated that the maximum theoretical busway capacity at 22,000 peak direction passengers per hour (PDPH), it has also been estimated (Auckland Transport, 2017 (3)) that the current practical capacity of a typical busway in Auckland conditions is likely closer to 5,500 PDPH. Conversion to light rail is also estimated (from the same sources) to extend the theoretical and practical operating capacities by around 3,000 PDPH in both cases. These estimated capacities are general approximations, and the actual capacity of segregated busways or segregated light rail needs to consider: the type of vehicles, frequencies, scheme design, passing opportunities and many other detailed factors.

No detailed work has yet been undertaken in respect of the optimum timing of any conversion to light rail in economic appraisal terms, and there appears to be a need for objective studies on the relative merits of enhanced bus-based provision and light rail provision, over the longer term.

A long-term extension of the busway is envisaged north of Albany, however recent revisions to land use projections following the Unitary Plan mean that Auckland Transport is reviewing the changes in the timing and scale of the passenger demands. The North Shore Rapid Transit Network business case work underway (in 2017/18) will include assessment of far northern changes, as will the ongoing greenfield growth land use planning, the 'Transport for Future Urban Growth Project', Auckland Transport is undertaking with NZTA (Auckland Transport (3), 2017).

There are proposals for further substantial PT improvements and the development of the strategic PT network (Figure 9) consisting of the new City Rail Link, existing rail corridors, the Northern Busway, a new Northwestern Busway), a new eastern busway (to Panmure and Botany), further bus priority corridors and potentially, a light rail corridor from the CBD to the Airport (Auckland Transport, 2017 (1)).

Figure 9 Future Strategic PT Network



8.4 Wider Applications

The success of the busway project and the enhancements to Auckland’s rail and ferry services indicate that segregated ‘rapid transit’ PT services, has been effective in growing patronage into the CBD, in heavily congested conditions for general road traffic. The largely non-segregated road based bus network was much less successful in achieving peak period patronage growth. Despite the success of the busway, and the widespread traffic congestion in Auckland, no further busways have yet been implemented.

The concept of upgrading a busway to another sub-mode, such as light rail, is complex, requiring changes in operational conditions to be adequately forecast and assessed. The timing of conversion of a corridor to another mode also needs to be optimal in economic appraisal terms, rather than being solely based on a capacity-related level of service ‘tipping-point’. It is also challenging to convert a busway to light rail without substantial disruption to PT services.

Cities considering new PT systems would be wise to consider these factors prior to implementation to ensure the most appropriate mode is developed initially and that the investment has a reasonable economic life.

9. Conclusions

The project was originally difficult to justify in economic (cost-benefit) terms and did not fit with earlier road-based appraisal procedures. The lessons learned on the busway project (in part) led to changes in PT appraisal procedures in NZ.

There was a view (at the time of funding approval) that unless high occupancy vehicles were allowed on the busway, the project would not be viable. However, this proved to be untrue and the busway has been successful in growing PT patronage, reducing PT travel times, improving service reliability and in doing so, has supported the economic viability of Auckland CBD.

The busway, together with other segregated PT modes (rail and ferry) have been overwhelmingly responsible for the growth of commuter travel into Auckland CBD, over the period 2001 to 2016. Car trips and non-segregated bus patronage has remained relatively static over the same period, despite the many initiatives to improve conditions for these modes.

Converting the busway to light rail at some point in the future is a complex issue and involves much more than identifying 'throughput capacity' requirements.

Despite the positive changes in economic appraisal and funding assessment procedures since the busway was originally evaluated and approved, and the widely-acknowledged success of the project, no further implementation of busways has yet occurred in Auckland. This situation is changing however, and a high quality and largely segregated PT network is now proposed for implementation in Auckland, to be completed by 2046.

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