Panmure: The Evolution of an Interchange

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Abstract:
The provision of a bus/rail interchange at Panmure has been a key part of the AMETI project since its inception. Until recently, this involved installing a pair of standard bus stops on each side of the Ellerslie-Panmure Highway where it crosses over the rail station. Recently the AMETI project team reviewed this proposal, and the interaction between the bus / rail station with the proposed Panmure Transit Oriented Development (TOD), and found it to be wanting. Since then the design of the interchange has evolved to include a segregated busway with greatly improved interchange, more capacity and integration with the TOD that will transform this part of Panmure into a vibrant hub. The proposed interchange now includes excellent walking and cycling infrastructure and public open spaces.
This project has brought together the disciplines of urban design, transport planning, structural engineering and architecture to develop what we believe will be a world class facility that will increase public transport attractiveness and patronage, help the local economy and enhance the local environment to the benefit of both local and wider communities. The paper will cover the evolution of the design and highlight the benefits of the revised scheme over the original.

INTRODUCTION

The Panmure Interchange is a key component of the Auckland Manukau Eastern Transport Initiative (AMETI) project, which is focused upon developing an integrated multi-modal transport system that supports population and economic growth in east Auckland and Manukau. This involves providing more and better transport choices and aims to significantly enhance the safety, quality and attractiveness of passenger transport, walking and cycling while recognising that not all transport demand can be accommodated by these modes alone.

Planning for the AMETI scheme began in 2005 after the cancellation of the Eastern Transport Corridor project. The AMETI project objectives are to:

- Provide for sustainable movement of people, goods and services in a modern, planned and integrated manner;
- Provide connectivity between communities and businesses;
- Promote economic development and the economic and social well being of communities;
- Provide for Auckland's growth needs;
- Promote good urban design – a sense of place, physical safety and environmental sensitivity; and
- Address travel demand requirements

The AMETI project includes the following major components as shown on Figure 1:

- A new 4-lane arterial road between Mt Wellington Highway and Merton Road
- Widening of Mt Wellington Highway between SH1 and Triangle Road to a "liveable arterial"
- Bus Priority between Botany and Panmure and along Mt Wellington Highway
- Capacity enhancements to South Eastern Arterial and Waipuna Road including grade-separated intersections at Reeves Road, Waipuna Road and Carbine Road.

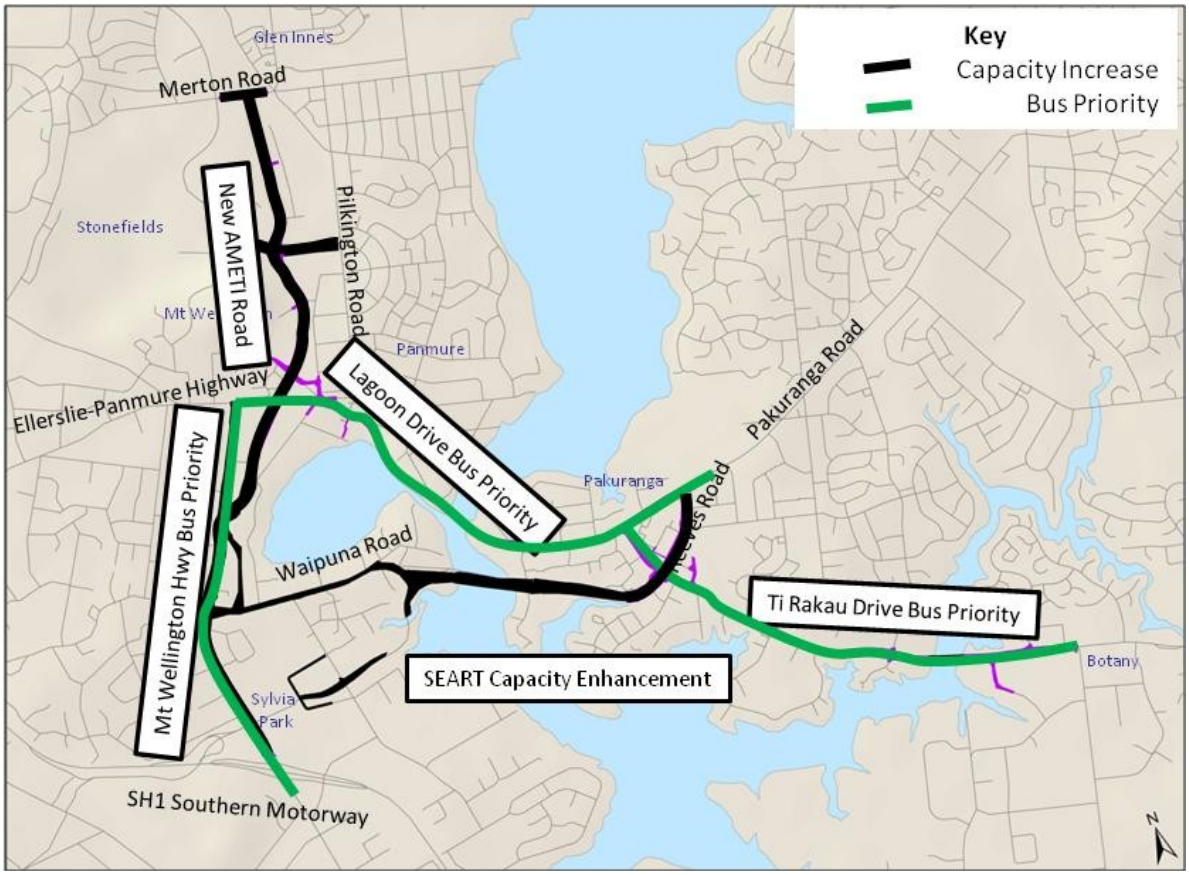

Figure 1: AMETI Project Major Components

CONTEXT

Panmure lies on the eastern branch of the Auckland rail network and also at the western end of the proposed Rapid Transit Network (RTN) corridor serving Manukau, East Tamaki, Botany and Pakuranga which, in the short to medium term, will be bus based. This means that Panmure will be a very important interchange between the bus and rail services. Figure 2 shows the location of Panmure station and the convergence there of passenger transport corridors.

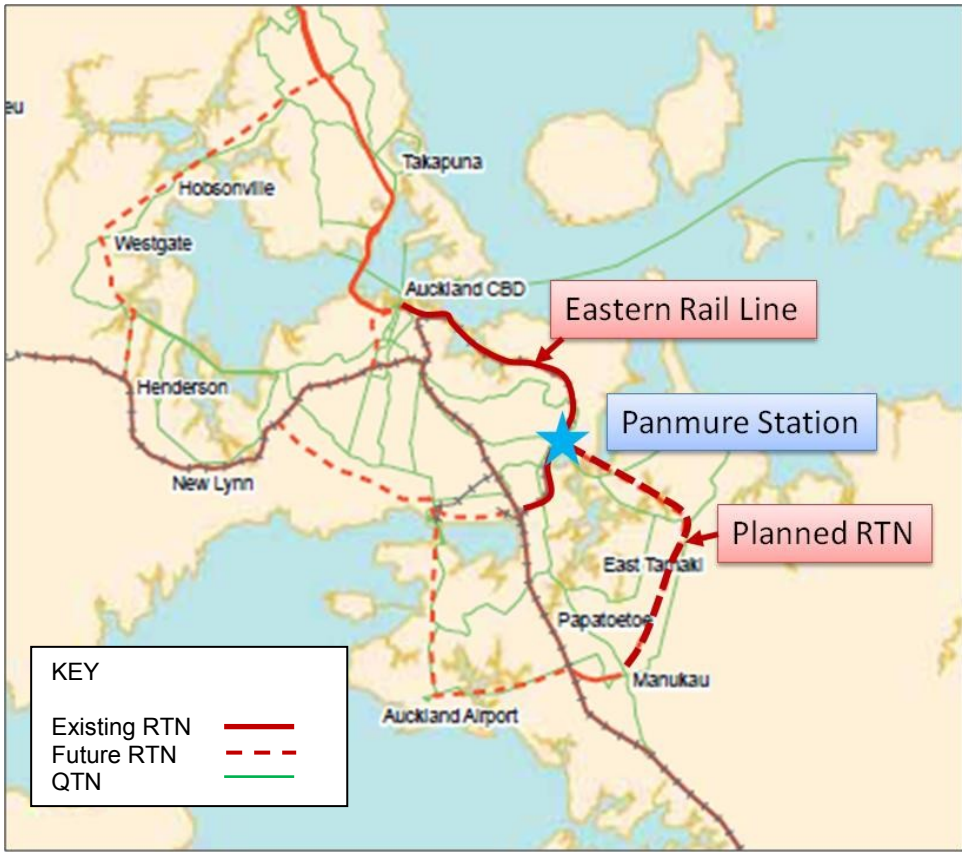

Figure 2: Panmure in Context of Passenger Transport Corridors

PANMURE SCHEME STAGE PROPOSAL

A Scheme Assessment for the Panmure package of the AMETI project was completed in July 2009. The scope of the Panmure section had been reduced from the 2007 concept as a result of peer review and optimisation during 2008 which resulted in an interim 2 lane link road (rather than a 4 lane one) and removal of the proposed bus priority lane across Panmure Bridge. The scheme was divided into three phases for implementation:

- Phase 1: New Road connecting Mt Wellington Highway with Morrin Road
- Phase 2: Bus priority Ellerslie-Panmure Highway and Lagoon Drive including replacement of Panmure Roundabout with signalised intersection
- Phase 3 extension of new road to Merton Road

The link road would be covered where it passes Panmure station with the ability for buildings to be constructed on top of the link that would form part of the proposed Panmure Transit Oriented Development (TOD) that is planned to be developed on both sides of the rail station. The three phases are shown on Figure 3.

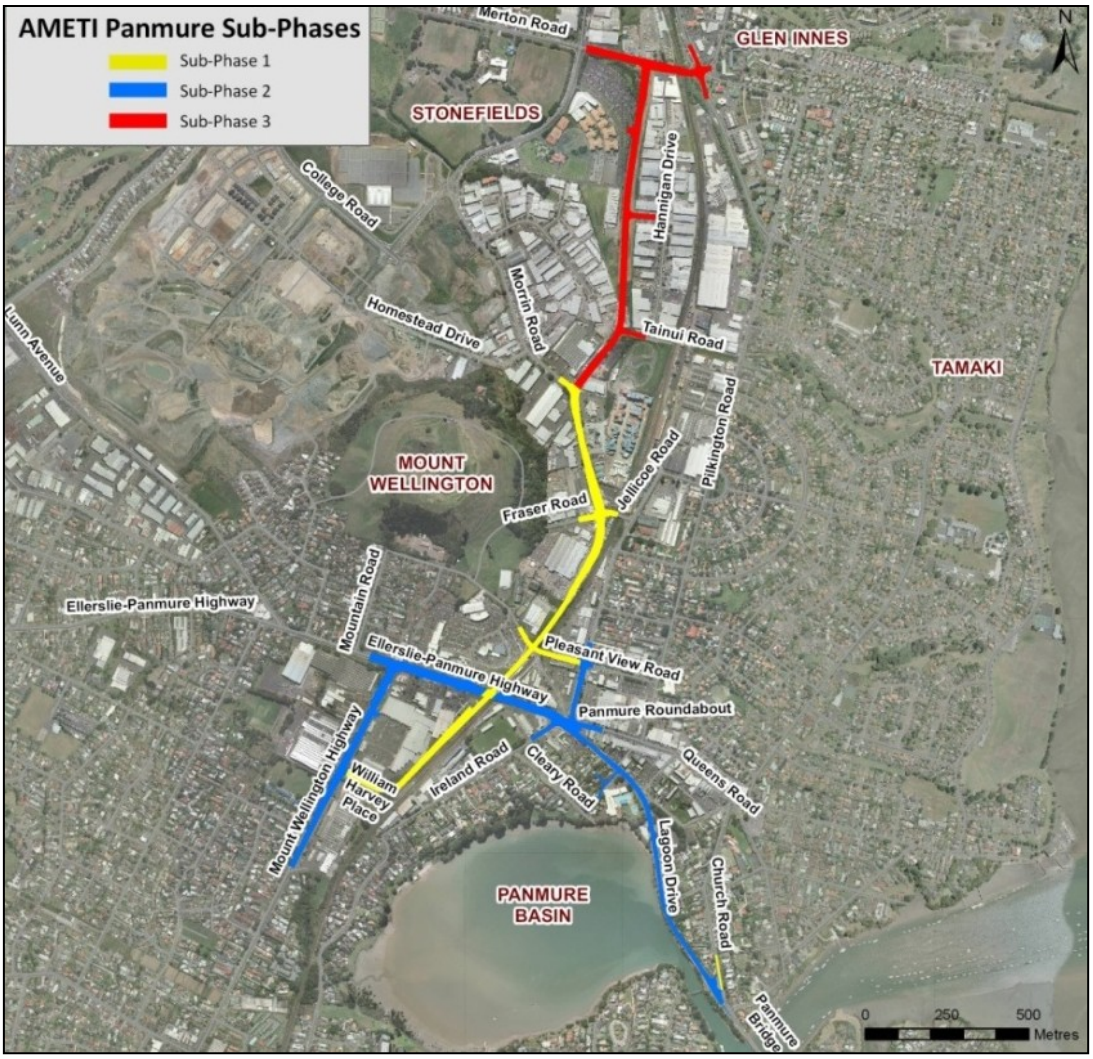

Figure 3: Scheme Stage Proposal Phases

The scheme included bus priority along Lagoon Drive and Ellerslie-Panmure (E-P) Highway in the form of 24 hour kerbside bus lanes, shared with cyclists and turning vehicles with setbacks at major intersections. The interchange at Panmure station consisted of a pair of indented bus stops each with the capacity for 2 buses, located on the E-P Highway rail overbridge. This required passengers interchanging between buses to cross E-P Highway via stairs leading down to the rail platform, then pass beneath the bridge and climb back up the stairs on the other side. These stops would be used by both RTN and local buses.

The scheme stage design is shown on Figure 4. The design of this bus infrastructure dates back to 2007, at which stage the bus corridor between Pakuranga and Panmure was identified in ARTA planning documents as a Quality Transit Network (QTN) facility, for which kerbside bus lanes would be entirely appropriate.

A key objective for the Package 1 of AMETI is that a high quality public transport interchange will be provided at Panmure rail station that will include improved facilities for both rail and bus passengers. It will further be supported by improvements to both rail and bus services, including rail electrification, a major increase in the number of buses serving Panmure and integrated ticketing. The interchange will be accessible for all and have secure cycle parking facilities.

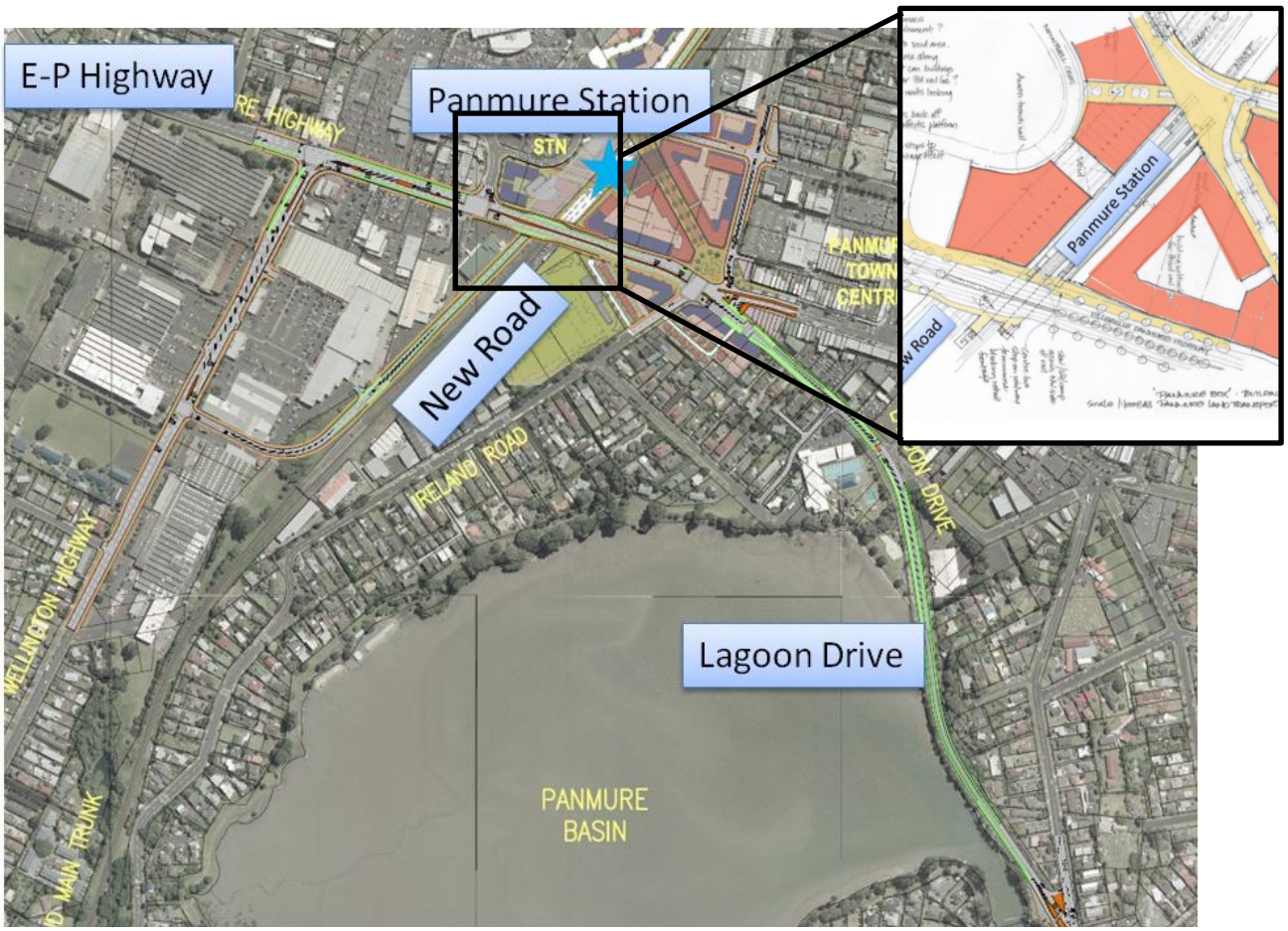

Figure 4: Scheme Stage Proposal for "RTN"

RTN PATRONAGE FORECAST

In 2008 the Auckland Regional Transport Authority (ARTA) commissioned McCormick Rankin Cagney to produce a Bus Staging and Implementation Study for the AMETI project, in particular for the RTN between Panmure and Manukau. This study utilised the Auckland Regional Council's Auckland Passenger Transport (APT) model to forecast patronage growth along the RTN corridor between 2016 and 2041.

In their report (McCormick Rankin Cagney, 2008)" the forecast am peak "inbound" bus patronage on the section between Pakuranga and Panmure was reported to be about 3,300 passengers per hour in 2016, rising to about 6,700 per hour by 2041. The demand build-up is illustrated on Figure 5.

Sensitivity testing was undertaken which produced high and low patronage scenarios,, however the range of patronage forecasts produced by these tests still showed the inbound am peak 2016 forecast demand between Pakuranga and Panmure as being between 3,000 and 3,600 passengers per hour, rising to between 5,700 and 7,500 passengers per hour in 2041.

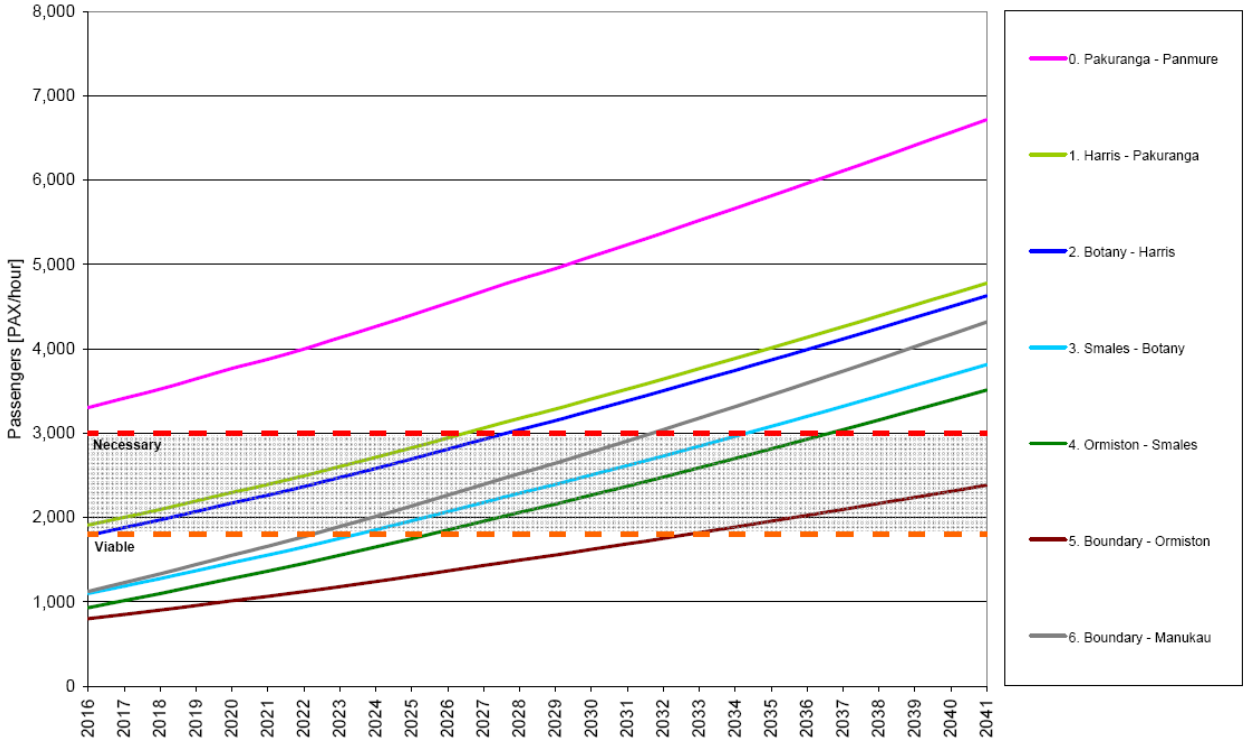

Figure 5: AMETI RTN AM Peak Bus Patronage Forecast 2016-2041 (McCormick Rankin Cagney, 2008)

The McCormick Rankin Cagney report concluded that an RTN grade facility is viable at a threshold demand of about 1,800 passengers per hour, at which point the bus service will carry about as many people as the capacity of a normal traffic lane, and is necessary for demand flows of over 3,000 passengers per hour, at which point bus flows would be at least 1 bus per minute.

RTN DESIGN CONSIDERATIONS

What is an RTN?

Having established that the bus priority infrastructure between Pakuranga and Panmure should be provided to RTN standards by 2016, the question remained as to what constitutes an RTN and what does not. ARTA's 2006-2016 Passenger Transport Network Plan (PTNP) (Auckland Regional Transport Authority, 2006) states that:

- *A Rapid Transit Network (RTN) involves a passenger transport system with a high frequency, high quality service operating on "transport spines" that does not get held up by road traffic congestion.*
- *Rapid Transit Network (RTN) – high quality, fast, high frequency service in its own right of way where it is unaffected by traffic congestion. The RTN will connect the major growth centres to the CBD. It will include the Northern Busway and the western, southern and isthmus rail corridors.*

Further, Table 3.1 of the PTNP states that the function of RTN is to be the passenger transport network back-bone, which connects regional centres to the Auckland CBD along high density corridors, influences future development patterns by encouraging more intensive urban development along the corridors and in the key growth centres it serves, and facilitates high speed, reliable access around the region.

The design team was then faced with the question of whether standard kerbside bus lanes, even 24 hour ones, would meet these criteria. The conclusion was that they would not, because:

- A kerbside bus lane is shared with left turning vehicles, and, usually, cyclists, Buses using them are affected by illegal parking and breakdowns, thus it cannot be described as having their own right of way,

- Kerbside bus lanes have inevitable conflicts at intersections with left turning vehicles. In many cases the design requires the bus lane to be set back for some distance before the intersection so that left turning vehicles can be safely accommodated, this in turn leads to inevitable delays to buses, so they cannot be described as being free from the effects of congestion.

Interchange Capacity Requirements

Project workshops with ARTA officers resulted in the establishment of a forecast service pattern for the Panmure interchange for 2016 and the required increases in frequency and vehicle capacity up to 2041 to meet the demand forecast by McCormick Rankin Cagney and also to meet other service pattern desires. This work led to a 2016 forecast that would have 62 buses per hour per direction using the RTN across Panmure Bridge, plus 24 buses per hour on local north-south routes, Combined, this would result in 86 buses per hour per direction using the Panmure Interchange.

ARTA's modelling also suggested that about 50% of RTN passengers would change onto rail services at Panmure, In addition the modelling forecast a substantial bus/bus interchange demand particularly between the RTN and local services

The design team analysed the number of buses and the range of destinations served and recommended that to achieve a high level of passenger legibility the interchange would need to be able to accommodate six bus stops in each direction in 2016, four for RTN and two for local services.

The design for the interchange was thus amended to provide six bus stops in each direction of E-P Highway, as shown on Figure 6. This met the functional requirement for bus stop capacity but did not solve the issue of differentiating between normal bus priority and RTN.

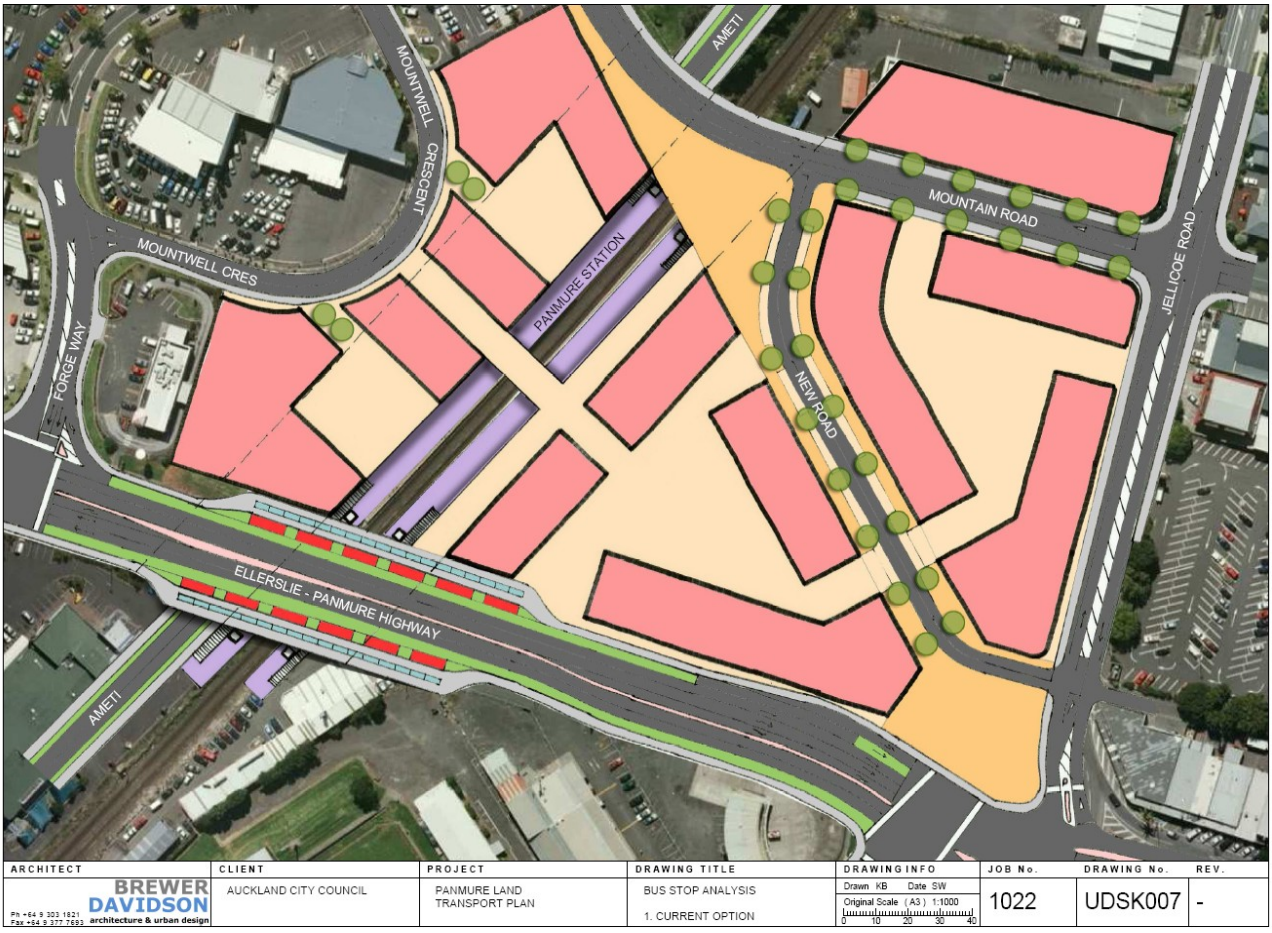

Figure 6: Panmure Interchange – Bus Lanes #1

In order to differentiate between the RTN and local bus services, one approach would be to separate the stops for these services. This could also reduce the number of bus stops on E-P Highway, which was considered an issue with the layout in Figure 6.

The design team discussed with ARTA whether taking the local routes away from E-P Highway would be acceptable and, receiving a positive response, devised an alternative that would separate RTN and local buses yet retain good interchange between both RTN and local buses and trains. Utilising a proposed bridge across the midpoint of the rail station, the layout shown in Figure 7 improved passenger service legibility and reduced the number of bus stops required on E-P Highway to four,

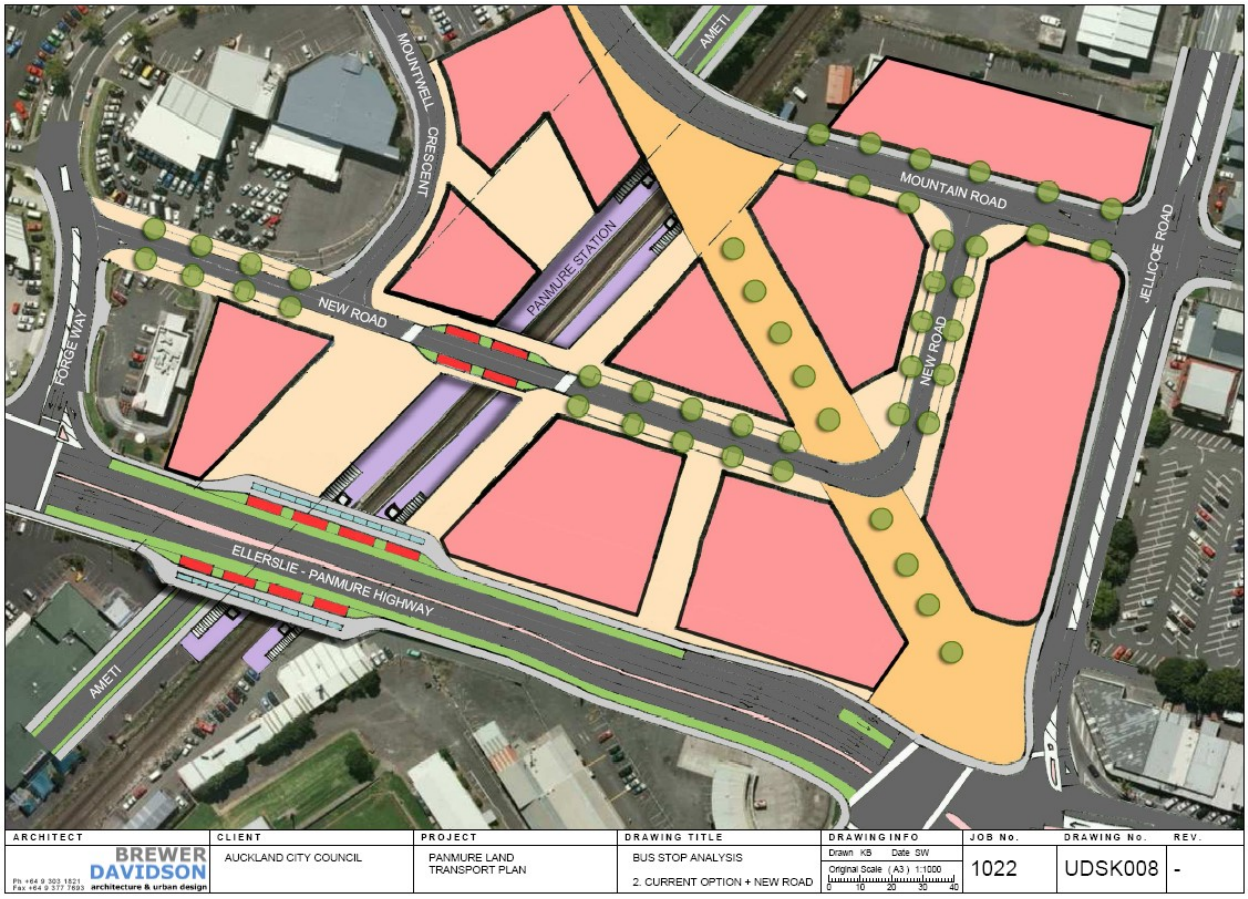

Figure 7: Panmure Interchange – Bus Lanes #2

This option had some advantages over the previous one (Figure 6) in terms of passenger legibility; however there were some outstanding concerns:

1. Are the kerbside bus lanes an RTN standard facility?
2. Is it acceptable that bus passengers would have to use the rail platforms to interchange between bus stops, with walk distances of up to 100 metres?
3. How to provide safe and convenient cycle facility along E-P Highway (as required by the ARTA and Auckland City cycle strategies) when cyclists would have to share a bus lane with over 60 buses per hour, most of which would be entering and leaving bus stops at Panmure station and thus causing many potential conflict situations.

Consideration of these issues led to the development of an alternative approach, one which enabled improved passenger interchange, better bus priority and capacity, and enabled cyclists to be accommodated in dedicated lanes without conflict with bus stops. The alternative was a segregated and dedicated busway for the RTN service on the northern side of E-P Highway as shown on Figure 8. The location of the bus station (as it was now able to be described) also improved the connection between the buses and the town centre.

In addition, the new bridge over the rail line to accommodate the RTN could be constructed adjacent to the existing bridge and used as a temporary alignment for all traffic while the existing bridge is raised, removing the requirement for temporary bridge to be constructed.

Figure 8: Panmure Interchange – Segregated Busway #1

Subsequent to this design, the option of constructing buildings on the cover over the AMETI road was deemed undesirable and the urban designer considered alternative uses for the space that would be created. It was felt that the first alternative of a pedestrian plaza would be too large and would have an ill-defined purpose.

Alternative uses considered for the space included a local road on top of northern half of the cover connecting Mountwell Crescent with Mountain Road that would have several functions, as an access to potential commercial developments to the west of the station, for short term parking, and as an alternative route for local bus services. This would remove the need for a new vehicle bridge across the rail line and the new bus road through the TOD, although a pedestrian bridge in this location was considered desirable. The revised proposal is shown on Figure 9.

The southern half of the cover was proposed to be a pedestrian plaza, with allowance for a small building that could be a passenger transport information / ticketing / amenity building including toilets and cycle lockers. This is shown blue on Figure 9.

Figure 9 shows six bus stops in each direction on the RTN station, as would be required to service 2041 forecasts of passenger demand, which would require over 100 buses per hour on the RTN service.

Figure 9: Panmure Interchange – Segregated Busway #2

This design was circulated around the project team for feedback. ARTA commented that the distance between the RTN and local bus stops was longer than desirable and suggested that the road on top of the box could extend for the entire length of the box, connecting E-P Highway with Mountain Road, then the local bus stops could be positioned at the southern end of this road, considerably closer to the RTN station.

This idea was developed in the latest proposal shown on Figure 10. This design has the local road along the entire length of the box, with the southern half being bus only, while the northern half catering for all vehicles and also providing parking opportunities. In addition the RTN station layout has been refined to incorporate four stops in each direction, but with the ability to increase the number of stops in the future should demand and service patterns require this. Pedestrian crossings within the RTN bus station have been improved with kerb extensions.

This plan also shows the preferred design for the Roundabout replacement intersection, with Jellicoe Road access maintained but reduced to left in / left out only.

The next stage of work will concentrate on the feasibility of extending the segregated busway along Lagoon Drive and potentially widening Panmure Bridge to add an additional lane to allow the segregated busway to cross the river to join up with the busway proposals on Pakuranga Road that are being developed under a separate commission. The connections back to kerbside bus lanes further west on Ellerslie-Panmure Highway will also be developed to ensure that buses do not experience significant delays in changing from segregated to kerbside facility.

Figure 10: Panmure Interchange – Segregated Busway #3

COSTS AND BENEFITS

The cost of the proposed interchange and RTN has, not surprisingly, increased significantly from the scheme stage to the current proposal. The scheme assessment stage construction cost for Package 1 of AMETI was $140 Million; the latest cost estimate is closer to $200 Million.

The full benefits of the revised scheme will not be known until the area-wide transport model is available to quantify the cost savings to the transport system as a whole, expected in February 2011; however the quantifiable benefits will include:

- Travel time and vehicle operating cost savings for passenger transport users and operators;
- Travel time and vehicle operating cost savings for cars, freight operators;
- Decongestion benefits for traffic on the wider network as a result of mode switch to passenger transport;
- Crash reduction savings;
- Emissions reductions; and
- Wider Economic Benefits related to improved accessibility by all modes and releasing of capacity for new development.

In addition there will be intangible benefits to the urban realm of Panmure, more attractive walking and cycling facilities and public open space, and reduced severance particularly across E-P Highway and between the station and town centre.

CONCLUSIONS

The evolution of the Panmure rail / bus interchange from a pair of bus stops on each side of E-P Highway to the bus station and segregated busway shown on Figure 10 has resulted in a step-change in passenger transport provision for the Panmure area that will provide benefits to the whole of the AMETI project area and beyond. In particular the revised scheme is an improvement over the scheme design in the following ways:

- Segregated alignment provides better reliability and greater capacity for growth
- Interchange better serves both rail station and town centre
- Big improvement to bus-bus interchange
- Allows cycle lanes on E-P Highway without interaction with bus lanes.

However, it is recognised that the revised scheme:

- Needs more land; and
- Increased on design and, construction cost, and greater consenting requirements

On balance, the design team and the client agree that the revised scheme now meets the functional requirements of an RTN and will be of sufficient quality to attract the patronage increases forecast by the strategic modelling, to successfully deliver the overall AMETI project objectives.

BIBLIOGRAPHY

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McCormick Rankin Cagney. (2008). *Bus Staging and Implementation Study, AMETI Corridor 2016-2041.*