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Making Rotorus's Bus Network More Efficient

Andy Lightowler (BSc (Hons), FCILT), Technical Director (Beca Ltd)

(andy.lightowler@beca.com)

ABSTRACT

The Rotorua urban bus network has seen increasing patronage in the last decade, especially with the introduction of free travel for students of the Waiariki Institute of Technology. Whist additional services have been introduced to cater for this demand, the increased patronage is resulting in overcrowding at peak times.

Many of the current bus routes in Rotorua provide a relatively slow service compared to a trip by car, as the bus routes were designed to optimise coverage. This priority has changed, with the Bay of Plenty Regional Public Transport Plan 2013 setting out policies for high quality (frequent, reliable, convenient and efficient) urban services.

Bay of Plenty Regional Council (BOPRC) places significant emphasis on cost effectiveness of services, and believes that the network has further potential to increase patronage with more direct, simple services.

In 2014 a review of the bus network was undertaken to inform future bus service contracts. The review included an analysis of socio-economic data to better understand gaps in the market currently being served.

This paper will explain the improvements identified affecting routes in the inner city and outer urban areas. It will also explain how these improvements were developed in consultation with a range of stakeholders.

DESIRED OUTCOMES OF THE REVIEW

In 2013 BOPRC staff conducted a network review for Rotorua services. The main focus of the 2013 review was to use route design to improve on-time performance without increasing the size of the Rotorua fleet. The review findings prompted discussion, but ultimately the BOPRC did not reach a consensus on the review outcome. The decision was made to retain the status quo in terms of routes and service provision, and conduct a review in 2014.

The 2014 review had a wider scope, building on the 2013 work. The review was informed by work Rotorua District Council (RDC) was doing investing in revitalising inner-city Rotorua. This provided an opportunity for BOPRC to work with them to improve inner city bus routes and bus stop locations.

The outcomes for the network review are:

- to align bus services in Rotorua with the Bay of Plenty Regional Public Transport Plan 2013 policies, specifically to move services to a more efficient operation designed to optimise patronage and increase on-time performance
- to contribute to the revitalisation within the inner city of Rotorua
- to improve the routing of services within the inner city to ensure that the routes are future proofed
- to identify preferred inner city bus stop locations (four to six pairs of bus stops) to support the proposed new interchange in Haupapa Street
- to work with Rotorua District Council

- to estimate of the operational costs of the proposed network.

Recommendations are required to have no significant resource cost implications (i.e. they are required to be broadly cost neutral).

Tourist buses are out of scope of this project.

BACKGROUND

Many of the current routes were designed with coverage goals in mind. This priority has changed, with the Bay of Plenty Regional Public Transport Plan 2013 setting out policies for high quality (frequent, reliable, convenient and efficient) urban services.

The Rotorua urban bus network has been getting busier, especially with the introduction of free travel for students of the Waiariki Institute of Technology. This increasing patronage is resulting in reduced on-time performance.

Customer feedback suggests the main concerns in Rotorua are the late running of services, safety concerns in the Central Business District (CBD) and challenges with boarding and alighting from vehicles.

BOPRC places a significant emphasis on cost effectiveness of services -proposed route changes need to be costed and efficiency gains quantified. It believes that the network has further potential to increase patronage with more direct, simple services.

A fully accessible fleet has recently been introduced, together with timetable changes designed to relieve pressure on bus stop capacity at Pukuatua Street in the city centre.

OVERVIEW OF REVIEW APPROACH

Review Current Bus Network Performance and Operations

A review of all routes and timetables and service operations was undertaken to understand the current bus network operation and its performance, the infrastructure it uses, and the scope for improvements to be made. The review included an analysis of socio-economic and demographic data to better understand the market currently being served by the bus network and to help identify opportunities to improve the network.

Discussions also took place with the following key stakeholders:

- RDC
- Waiariki Institute of Technology (WIT)
- The currently contracted bus service operator
- Rotorua Police
- Local Councillors
- Rotorua Airport.

Establish the Key Principles and Aims to Guide the Review

A number of principles and aims were defined to guide the review of routes, based on the key goals and objectives of the stakeholders. These were identified from a review of relevant transport and future development strategies/policies, as well as from the discussions with key stakeholders.

Identify and Evaluate Opportunities for Improvements to the Bus Network

A number of options to improve the inner city and wider urban area bus network were identified.

The options were evaluated against the key principles and aims for the bus network. GIS analysis was undertaken to examine the effect of route changes on the route length and on the residential catchment area served.

Determine Recommendations for Future Changes to the Bus Network

Based on the outcome of the evaluation process, a number of recommendations were made and suggestions made with regard to how the changes could be progressed towards implementation

CURRENT BUS NETWORK OPERATION AND PERFORMANCE

The Rotorua urban network consists of ten routes, centred on the inner city area, as shown in Figure 1. All bus routes converge on the main inner city bus facility on Pukuatua Street.

Figure 1: Rotorua Urban Bus Network

All but one of the ten routes operates every 30 minutes on Mondays to Saturdays. Route 2 (Polytech) operates every 15 minutes on Mondays to Fridays and every 30 minutes on Saturdays. Service frequencies on Sundays are every hour. Services operate between approximately 06.30 and 18.30 hours on all routes on Monday to Saturdays. Sunday services operate between approximately 07.00 and 16.30 hours.

Two additional bus services were introduced in 2012 to run in the morning and one in the afternoon (on Mondays to Fridays in term times only) direct between the Polytechnic and the inner centre to ease the pressure on Route 2.

None of the services are advertised as cross-city services though six of the ten routes are linked together at the Pukuatua Street inner city terminus for operational reasons (i.e. to make best use of the resources used to provide the services). Route 2 is operated independently of other routes. This allows the highest capacity buses to be used on this route.

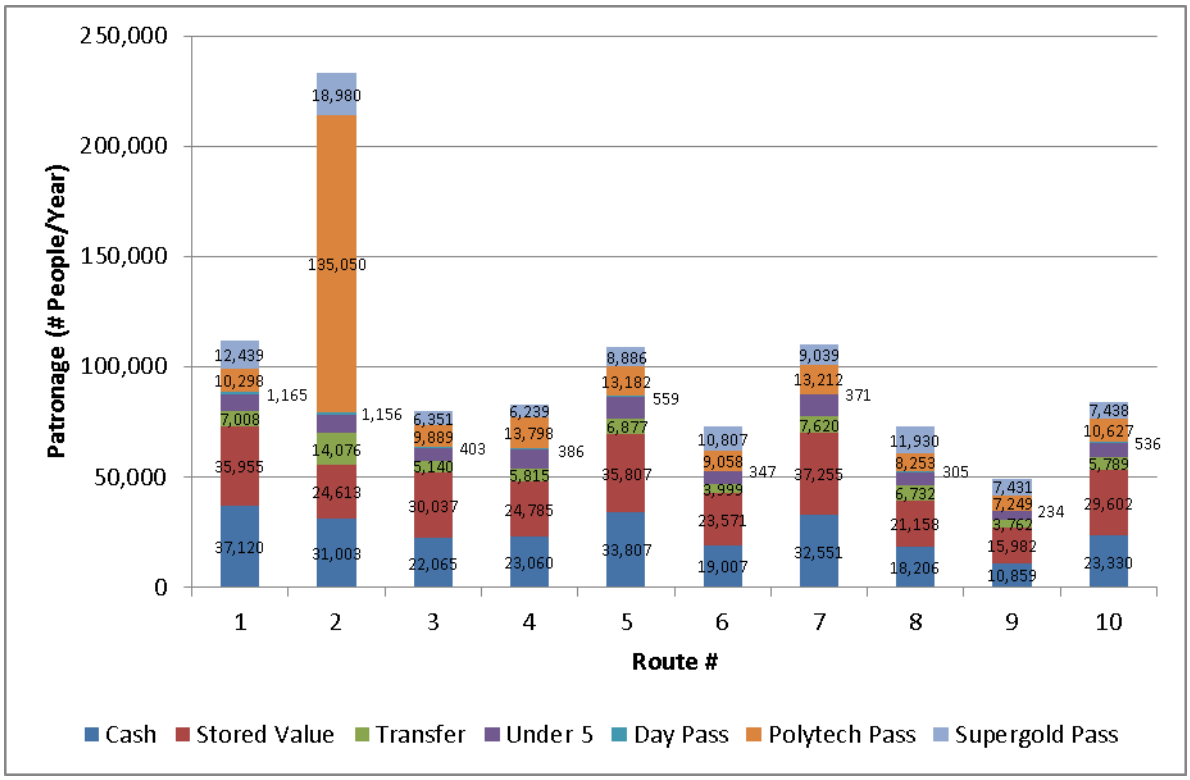
Buses are timed to maximise interchange opportunities in the city centre. However many of the routes have different round trip (i.e. 'out and back') travel times, which means that achieving a true pulse-time network (whereby all bus routes are scheduled to arrive and depart at the same time) could only be achieved with additional resources (i.e. buses and drivers). Also, the limited capacity of the bus stops at Pukuatua Street prevents a true 'pulse-time' network to operate.

A flat fare system is in existence for all trips made on the Rotorua urban bus network. Fares can be paid by cash or by a pre-purchased electronic card. A day ticket is also available. Children under five travel for free, and holders of NZ Supergold cards travel for free in the off-peak period (between the hours of 9am to 3pm on weekdays, and any time on weekends and public holidays). Free transfer tickets are issued on request at the start of a trip for journeys made within 60 minutes of issue between most routes.

Figure 2 shows the total demand for travel by route over the latest one year period for which data is available, and the number of tickets sold by ticket type. This shows that Route 2 (Polytech) is by far the busiest bus service. The next busiest services are Route 1 (Ngongotaha), Route 5 (Western Heights), and Route 7 (Mitchell Downs). Demand on these three routes is approximately 45% of demand on Route 2. The least busy service is Route 9 (Springfield), though this is one of the shorter routes on the network.

Demand often exceeds capacity at peak times on some routes, in particular on Route 2 (Polytech), Routes 5 (Western Heights), and Route 7 (Mitchell Downs).

Figure 2: Bus Demand by Route



The proportion of transfer tickets varies between 5% (on Route 6) and 9% (on Route 8), as shown in Figure 3.

Figure 3: Proportion of All Trips Issued by Type by Route

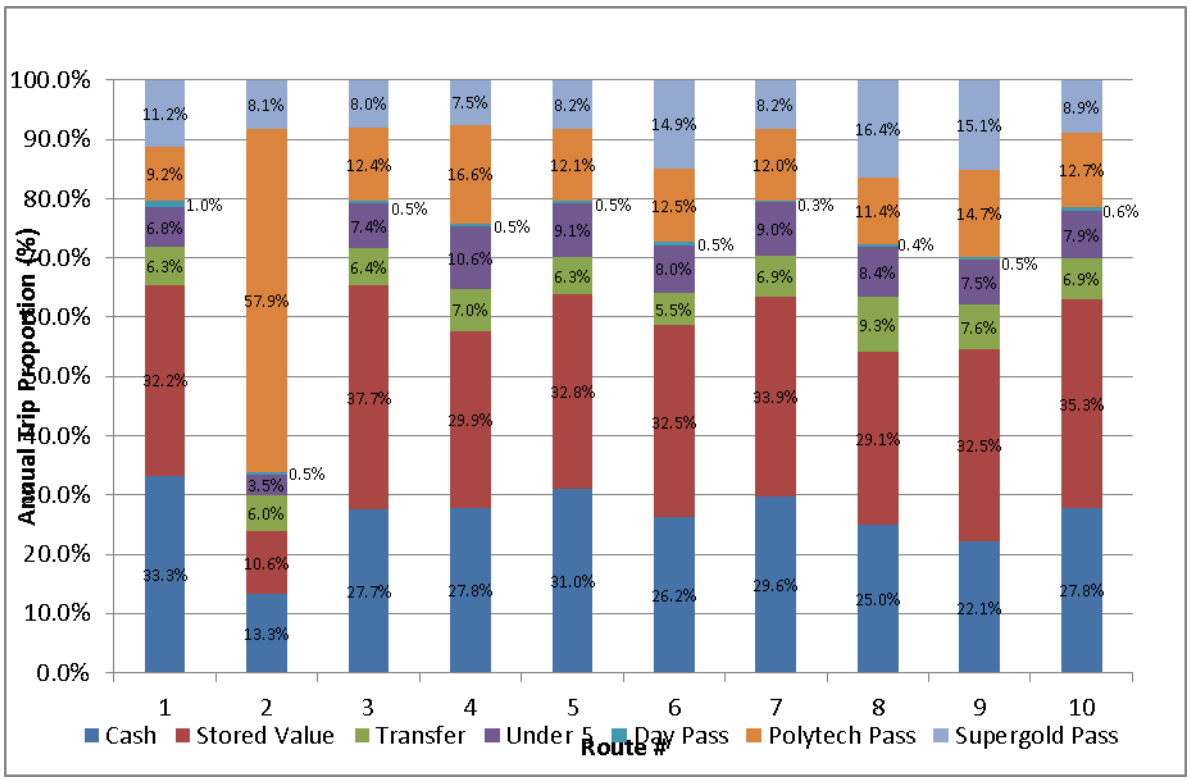


Figure 3 also shows that the greatest use of the student pass is on Route 2. The proportion of pass holders on the other routes varies between 9% (Route 1) and 17% (Route 4).

Bus patronage has risen from 119,000 trips in 2001/2 to approximately one million trips in 2012/13. Between 2005/6 and 2012/13 the average annual growth rate was approximately 15%. The annual trip rate per person in Rotorua has increased from around 2.2 in 2001/2 to around 17.4 in 2012/13. By comparison, the current trip rate per person in the Tauranga city area is approximately 15.3.

The bus fleet operating Rotorua's bus services is currently utilised intensively. The timetable operated is very resource driven. In a typical hour, the fleet of 13 buses is timetabled to be operating for 720 minutes, and have 60 minutes of 'layover' time. Only one route is scheduled to have more than five minutes layover between trips at Pukuatua Street (Route 3, which has a 15 minute layover period).

KEY PRINCIPLES TO GUIDE THE DEVELOPMENT OF THE RECOMMENDED FUTURE NETWORK

Based on our review of current public transport policies and strategies of the stakeholders, a number of principles were identified against which the future network has been reviewed. These were developed in collaboration with stakeholders around patronage, access and mobility, legibility and efficiency principles, and around the requirements of the inner city.

Patronage Principles

The following patronage principles were defined for the future bus network:

- Focus on serving demand from three broad user groups:
    - Education based trips targeted at those under 24-years accessing schools and tertiary institutes
    - People over 60-years of age who primarily use the service during the off-peak period to access shopping, essential services and for recreational purposes

    - Commuters in peak periods who wish to access the major employment centres
- Achieve a good match between demand and:
    - The route, number and timing of services
    - Bus capacity
- A stable route structure and stopping pattern
- Serve the areas and destinations most likely to generate the maximum demand.

Access and Mobility Principles

The following access and mobility principles were defined:

- Provide a service to people in the community without access to a motor vehicle (e.g. the mobility impaired)
- People will walk further to take a high frequency service at a high quality stop.

Legibility Principles

The following legibility principles were defined:

- Routes that are as direct as possible, without unnecessary impedance, deviation or variation
- Clock-face schedules
- Regular headways
- Schedules that provide for relatively easy transfers where routes cross or join
- Common corridors to be used by bus routes where possible.

Efficiency Principles

The following efficiency principles were defined:

- More direct and simpler routes
- Different peak and off-peak frequencies if needed to match capacity and demand
- Scheduling that makes efficient use of the bus fleet
- Scheduling that avoids, as far as possible, the clumping of buses in common corridors.
- To ensure an efficient and effective bus network into the future it must:
    - Be affordable and meet farebox recovery targets
    - Be integrated within land transport policy and investment decision making, recognising that bus currently plays a minor role in the total transport task.

Inner City Bus Network Requirements

The following requirements have been identified (in order of priority) for an inner city bus facility:

- Be safe and secure for all users, incorporating good urban design and contributing to public amenity
- Be accessible and serve a wide range of inner city trip origins/destinations well
- Be served efficiently from an operation perspective
- Provide enough space for buses to layover between trips (ideally at a single location to maximise the scope for services to be planned to interchange)
- Maximise the opportunity for bus passengers to interchange between different routes
- Provide capacity for potential future growth in bus use
- Be prominent
- Provide a high quality passenger waiting space
- Make efficient use of space in inner city area.

NETWORK CHANGES FOR THE INNER CITY

Taking into account the inner city bus network requirements, a number of possible options were identified for improved inner city bus facilities for Rotorua, as follows:

- Option 1 – Continue to use the existing bus stops on Pukuatua Street (with improved amenity)
- Option 2 - Improve the amenity and capacity of the existing bus stops on Pukuatua Street
- Option 3 – Reroute all routes to serve Rotorua Central instead of Pukuatua Street (see Figure 4)
- Option 4 – Revise the routes to serve both Pukuatua Street and Rotorua Central
- Option 5 – Revise all routes to operate via a large loop around the inner city (see Figure 5)
- Option 6 – Revise all routes to operate via a smaller loop around the inner city (see Figure 6)
- Option 7 – Switch all routes to a new on-street facility on Haupapa Street
- Option 8 – Switch all routes to a new on-street facility on Arawa Street
- Option 9 – Extend some or all routes to a new layover area to make better use of the existing on-street at Pukuatua Street
- Option 10 – Operate all routes as cross city services using the existing stops on Pukuatua Street (Figure 7).

The options were subjected to a multi-criteria evaluation. Based on the evaluation findings, the option of continuing to serve the existing inner city terminus on Pukuatua Street, and making improvements are made to the passenger amenity facilities and to the infrastructure to provide additional capacity and operational flexibility scored well (i.e. Option 2).

The evaluation also identified that modifying routes in the inner city to serve the Rotorua Central retail area as well as the Pukuatua Street facility scored well (i.e. Option 4). This option is expected to increase the route distance operated and increase bus travel times, but the patronage benefits are likely to outweigh the additional operating costs. To overcome any additional adverse impact this change could have on service performance, it was recommended that this change is made in conjunction with the recommended changes to routes in the outer area (see later).

The option of operating all services via a one-way loop around the inner city (i.e. Options 5 and 6) scored well on a number of criteria, but it was concluded that the additional costs and time incurred by buses may result in this solution being unsuitable, particularly if a large loop is adopted (i.e. Option 5).

NETWORK CHANGES IN THE OUTER URBAN AREA

Options to revise the bus network in the outer urban area of Rotorua considered included:

- Revising service frequencies
- Splitting routes
- Minor changes to individual routes (including switching some parts of one route to another route)
- Combining or splitting routes to enable resources to be utilised more efficiently.

Revising Service Frequencies

Reducing the frequencies of some of the less busy routes on the network, such as Route 9 (Springfield), will allow the frequency of some of the busier parts of the network, such as Route 2 (Polytech), to be increased. This could be done at certain times of the day, or at all times of the day, and could theoretically allow supply to be better matched with demand across the network. Experience from elsewhere in New Zealand, and from overseas, suggests that's a half hourly frequency is the minimum service level required for urban public transport to attract and retain customers however. Furthermore, serving parts of routes less frequently than other parts is likely to be confusing for customers, and is therefore not consistent with the key objective of marking the network more legible. Changing the frequency of whole routes, or parts of some routes, was not recommended therefore.

Figure 4: Option 4 (All Routes Serve Rotorua Central)

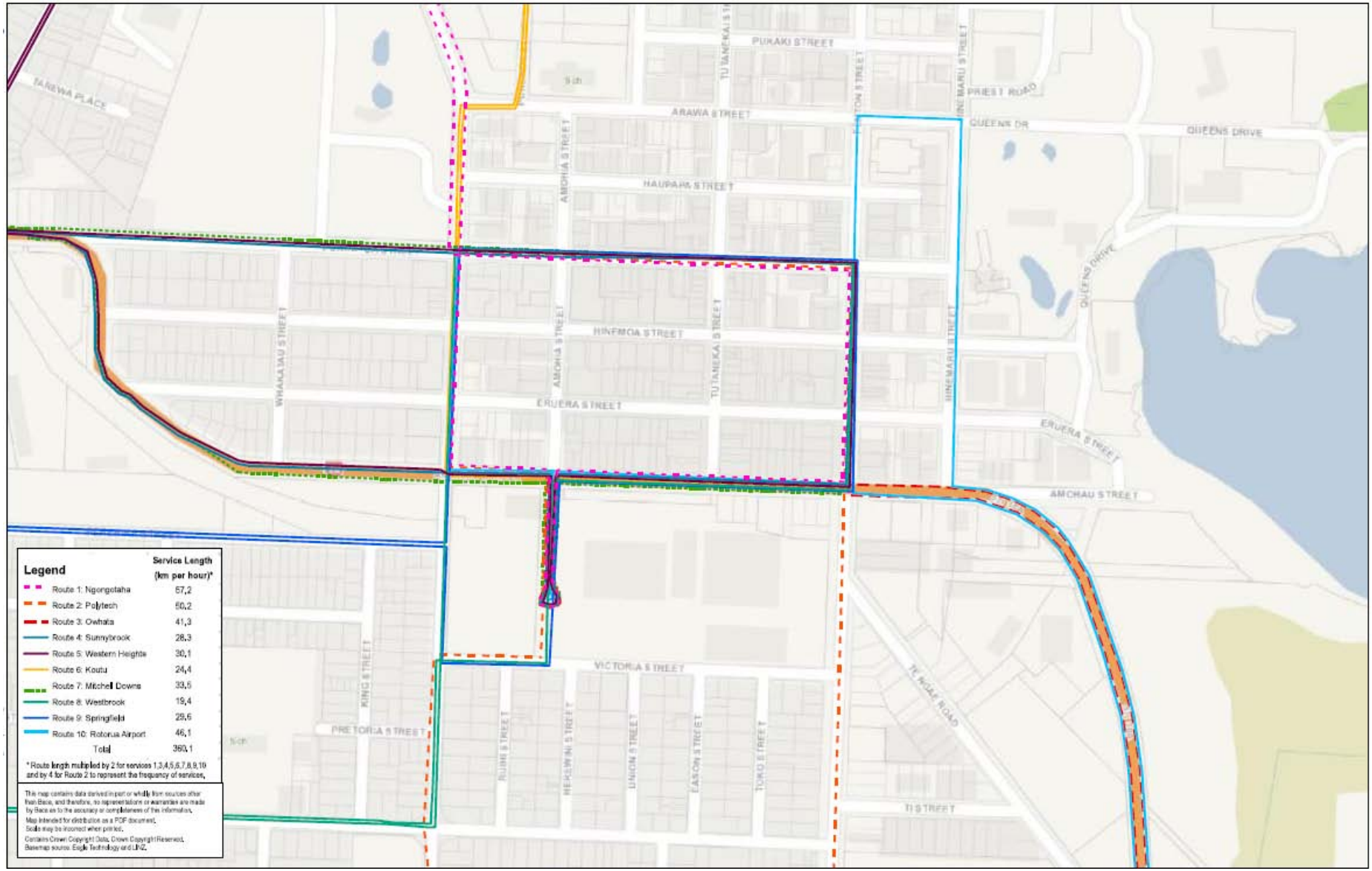


Figure 5: Option 5 (All Routes Operate in a Large Loop)

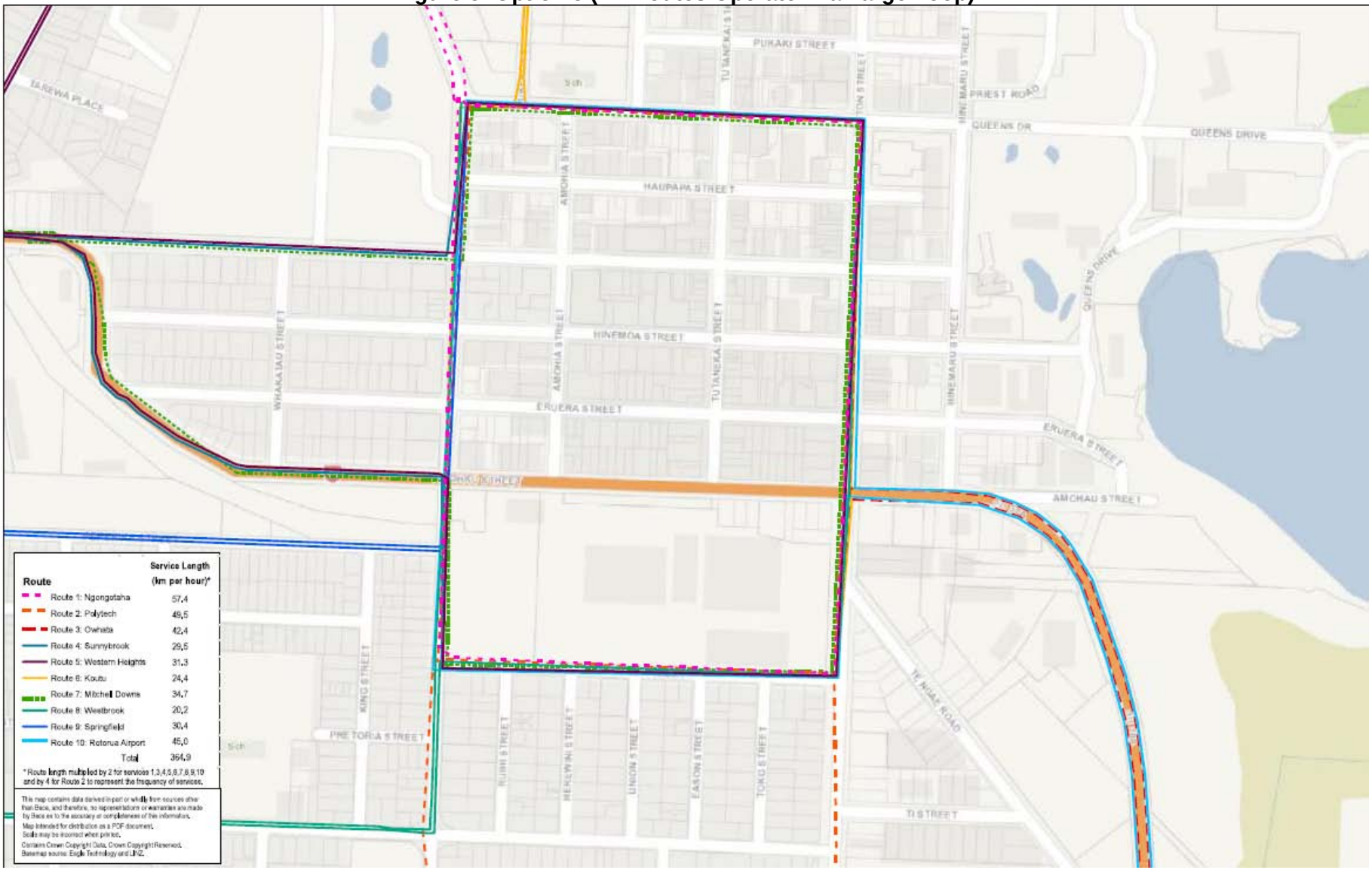


Figure 6: Option 6 (All Routes Operate in a Small Loop)

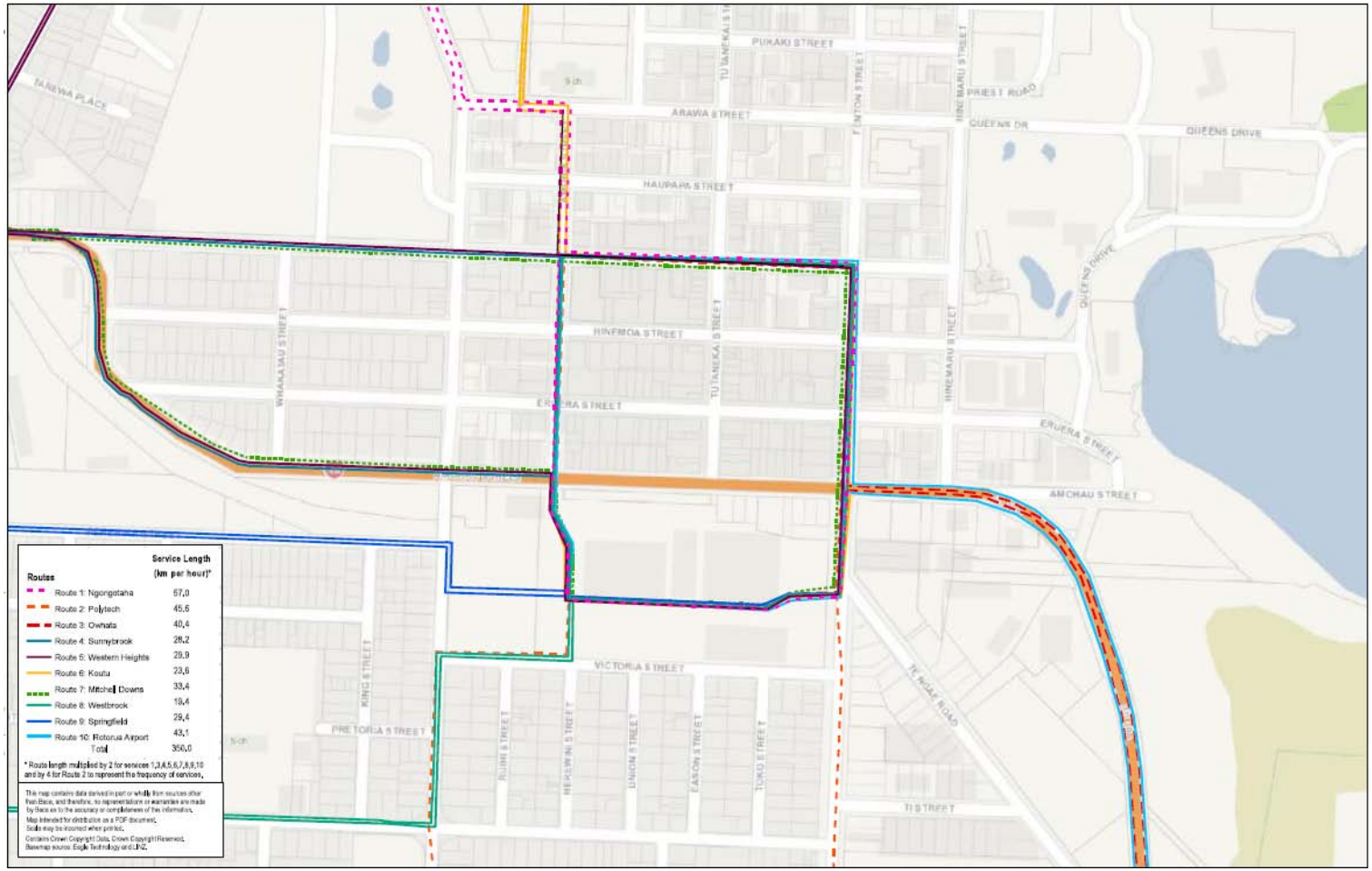
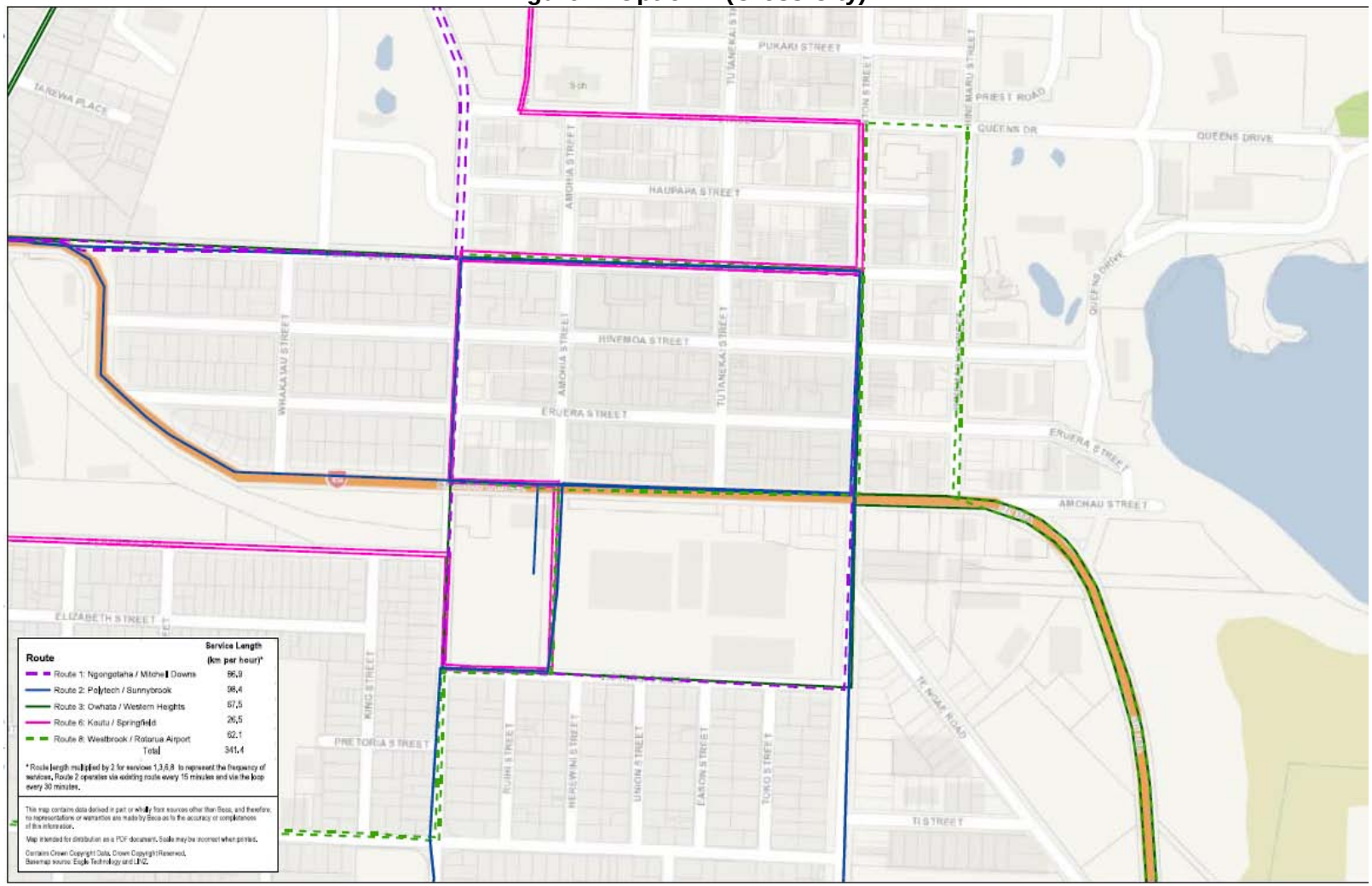


Figure 7: Option 7 (Cross City)



Splitting Routes

It would be possible to split the existing Route 2 (Polytech) into two separate routes operating with a 30 minute frequency. This would enable Fenton Street and Ranolf Street to be served in both directions, rather than one-way only at present. It would also enable one of the two new routes to terminate at the Polytechnic, instead of continuing to the present Tihi-O-Tonga terminus (at Kerswell Terrace / Sloane Avenue), which would reduce operating costs.

It is noted however that some additional bus stops would need to be provided on some parts of the revised routes where they do not exist at present.

The disadvantage of this option is that additional services would need to operate on a weekend if the present frequencies along both Fenton Street and Ranolf Street are to be maintained. Alternatively the existing Route 2 could be operated at weekends, or both routes could operate less frequently than on Mondays to Fridays, if operating costs are not to increase.

On balance the change in route is considered to be of overall benefit, as it will make better use of existing resources and provide an improved service for both the Fenton Street and Ranolf Street areas.

No other service has been considered to be split, as all other services only operate with a half-hourly frequency on Mondays to Fridays, and therefore any splitting of these routes would result in services operating with a frequency that is less than the desirable minimum.

Minor Changes to Individual Routes

A number of options to refine individual routes were considered, with the aim of omitting sections of route which serve areas of low catchment, or areas where the catchment is located in close proximity to other roads which are, or could be served by buses.

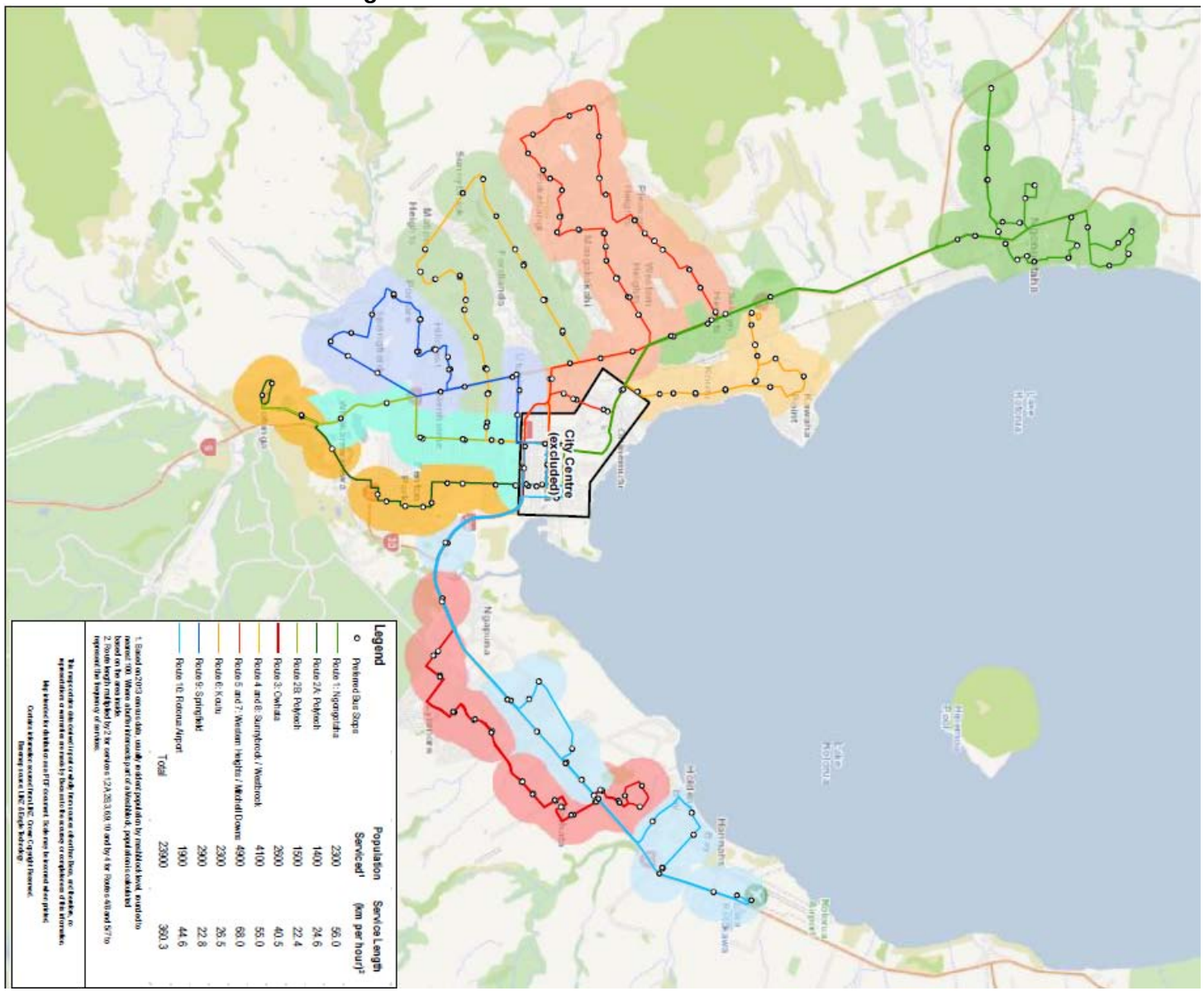
For all of the options identified, the effect of the potential route change on the route length and on the overall catchment served was calculated, and the main advantages and disadvantages were identified.

The main changes recommended are shown in Figure 8 and summarised below:

- Route 1 (Ngongotaha) to operate via Rotorua Hospital instead of via Ranolf Street
- Split Route 2 (Polytech) into two separate half hourly services, one operating to the Polytechnic via Fenton Street and one operating via Ranolf Street
- Link Route 4 (Sunnybrook) and Route 8 (Westbrook) into a new combined service, running in both a clockwise and anticlockwise direction
- Link Route 5 (Western Heights) and Route 7(Mitchell Downs) into a new combined service, running in both a clockwise and anticlockwise direction
- Route 6 (Koutu) to be revised to include an additional one-way loop serving Kawaha Point
- Revise Route 9 (Springfield) to operate as a large one-way loop by omitting the current end of route loop via Jackson Street and Nikau Street, and continuing along Otonga Road and Old Taupo Road to rejoin the existing route north of Hillcrest Avenue.

No changes were proposed to Route 3 (Owhata) and Route 10 (Airport).

Figure 8: Recommended Future Bus Network



NEXT STEPS

Prior to implementing the suggested changes to the network it was recommended that stakeholders and the public be adequately informed of the proposed changes, and given the opportunity to comment on them. This is in order to obtain "buy in" for the general concepts and overall shape of the proposed future network. Key stakeholders to be consulted should include RDC and the NZ Transport Agency, as well as BOPRC management. It was also suggested that a formal round of consultation on the proposals is undertaken, encompassing user groups and the public.

At all times it is important to adopt a robust approach to consultation, to avoid compromising the key principles that have been established for the future bus network. Following a period of stakeholder and public consultation, further work may be required to refine the strategy before embarking on implementation.

It was also highlighted that further discussion is required with RDC in particular to provide additional bus stops on roads that the proposed routes will serve that are not currently served. It was acknowledged that implementation of the infrastructure required to make the bus network changes is a risk to implementation of the proposals, as is reaching agreement with RDC on the route and stops served by buses in the inner city.

Targeted communication activities will be required to educate customers and the general public about changes resulting from the network review. The consultation process can provide an opportunity for BOPRC to grow its customer base through proactively targeting and promoting the benefits of the network to new customers.

It will also be important to monitor, evaluate and modify when required, the network after these changes have been implemented. The scale of the final changes, and the impact observed, will influence the timeframe with which the network will be monitored before corrective action is taken. The significance of monitoring, evaluating and making corrective action will enable BOPRC to manage the impacts to passengers, operations and operational performance.

REFERENCES

Bay of Plenty Regional Public Transport Plan, BAY OF PLENTY REGIONAL COUNCIL (2013)