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Cycle Share for the Auckland city centre and fringe

Indicative Business Case

Auckland Transport

Auckland Transport

Cycle Share IBC

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12 March 2018

Cycle Share Indicative Business Case

Dear Kathryn

We are pleased to provide our final Indicative Business Case in relation to a cycle share scheme in Auckland's city centre and fringe.

This report is provided in accordance with our contract (Contract No. 475-17-748-PS) dated 17 August 2017 and is subject to the restrictions set out in Appendix A.

If you have any queries, please do not hesitate to contact us.

Yours sincerely

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Table of contents

1 Cycle share project overview

1.1 A cycle share scheme for Auckland

As part of its Auckland Cycling Programme, Auckland Transport plans to implement a cycle share scheme in the Auckland city centre and fringe. A successful cycle share scheme in this area would provide a convenient and accessible alternative means of transport for residents, workers, students, and visitors alike to get into, out of, and around the city centre and fringe. It would increase cycling participation rates and the utilisation of city cycling infrastructure. The ability to explore Auckland's sites and attractions by bike would also improve the experience locals and visitors have while in the city.

1.2 Project staging

Auckland Transport has been working on a project to identify and evaluate the cycle share scheme options available to it.

In 2016 Auckland Transport commissioned a feasibility study on the potential for a cycle share scheme in Auckland. The feasibility study examined a selection of international cycle share schemes and identified the key features of what makes them successful.

Auckland Transport then progressed to the Indicative Business Case (IBC) stage, culminating in the production of this IBC. The IBC focuses primarily on developing the strategic and economic aspects of the investment, however it does also include outline financial, commercial, and management cases.

To inform this IBC, an initial market Request for Information (RFI) was run with potential vendors for a cycle share scheme in Auckland. The results of the RFI are incorporated into this IBC.

Figure 1 is the overall process required to implement a cycle share scheme. Assuming this IBC is endorsed and a decision is secured to proceed, the next stage would be the production of a Detailed Business Case (DBC). The outcome of the DBC would be a decision whether or not to implement a scheme and proceed to procurement.

This would be followed by the initiation of a formal procurement process through a Request for Proposals (RFP) ultimately resulting in the selection and contracting of a preferred vendor. Scheme implementation would then follow.

Figure 1: Overview of the business case phase

2 Executive summary

2.1 Strategic case

2.1.1 Strategic context and problem / opportunity definition

Cities around the world are realising the benefits of investing in cycle share schemes and there are now over 600 schemes operating internationally.[1] Cycle share schemes can increase cycling participation rates and change attitudes and behaviours towards cycling, especially when delivered alongside other cycling initiatives including infrastructure improvements which Auckland is committed to.

There are numerous benefits to cycle share including:

- improved transport choice by providing a more convenient and efficient transport option for certain trips
- alleviating pressure on other parts of the transport network including public transport services
- improved use of transport modes that support user health and well-being
- creating a more productive and accessible city centre and fringe
- improved visitor experience in the city centre and fringe for Aucklanders and tourists (both international and domestic).

Auckland's city centre and fringe is a prime candidate for the development of a cycle share scheme. The variety of land uses in the area – residential, employment, education, leisure and tourism – means there is an abundance of people who make short trips into, out of, and within the city centre and fringe every day. Currently, many of these short trips, which are prime candidates to be made by cycle share, are made using other less efficient travel modes

2.1.2 Demand for cycle share in Auckland and potential scheme size and coverage

Demand for cycle share

Customer research undertaken by Auckland Transport as part of this IBC shows that there is significant demand for cycle share in the Auckland city centre and fringe and a cycle share scheme may achieve approximately 3,200 trips per day (or 1.17 million trips per year). We also estimate an uplift in demand for a scheme with 50% e-bikes to 4,000 trips per day (or 1.46 million trips per year).

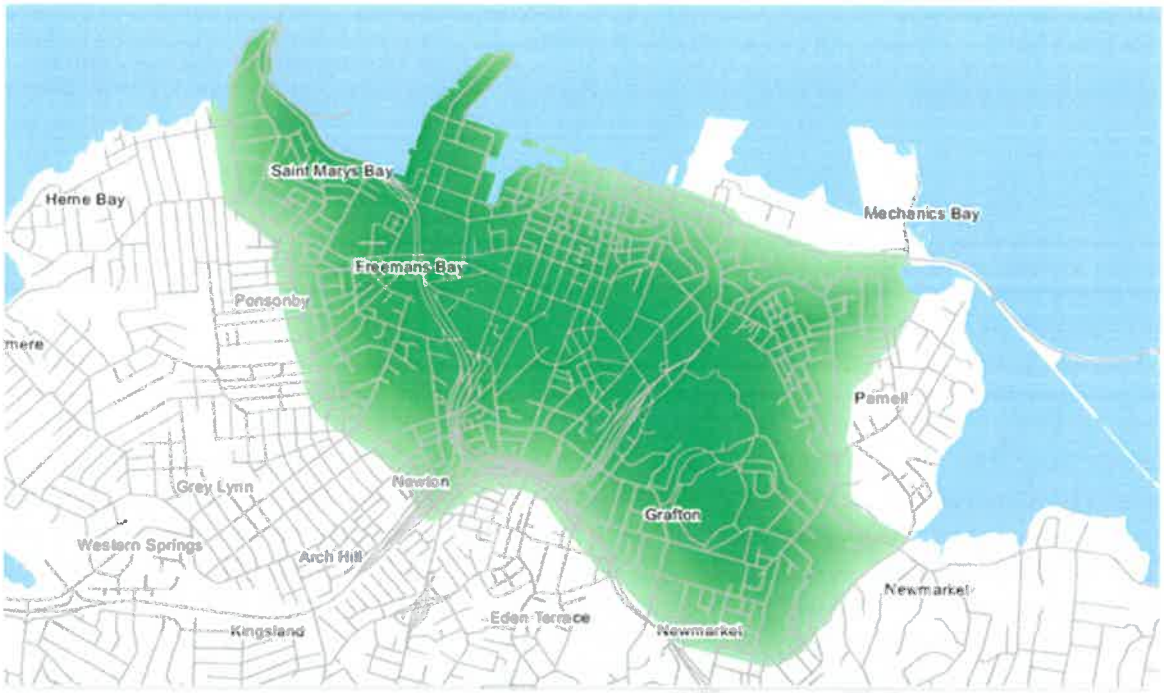
Regular users would likely form the backbone of cycle share ridership, with 13% of potential users indicating they would use the cycle share scheme every day. Bikes would be used throughout the day as people travel for a variety of reasons - to get to and from work, to get to meetings, to meet friends for lunch, to get to class or to cruise the waterfront and take in the harbour views. Use is expected to peak in the mornings and evenings as the majority of people commute to and from work at these times and making part of this journey by cycle share has been shown to be an attractive option.

Scheme size and coverage

The city centre and fringe covers an area of some 7km^2 and includes the suburbs of Ponsonby, Newton, Grafton and Newmarket as shown in Figure 2. To achieve the necessary density of bikes and enable a successful, well utilised scheme, analysis shows that approximately 710 bikes with 70 docking stations (or areas) across the area would be needed.

1 New York Institute for Transportation and Development Policy. The Bike-Share Planning Guide.

Figure 2: Proposed reach of cycle share scheme



Source: Jacobs New Zealand Ltd

An initial smaller scheme of approximately 370 bikes could be implemented as part of a staged approach to cover just the city centre area (the area bound by SH1 and SH16).

2.1.3 OnzO Bikes and other potential dockless scheme operators

The recent entry of the OnzO Bikes scheme into the Auckland market means the cycling landscape has changed dramatically in a short space of time. There is now already a large scale cycle share scheme in Auckland and it is possible that other dockless cycle share schemes are looking to enter the market too.

The prevalence of these types of schemes overseas has led to a number of common, significant issues that local authorities have struggled with, such as vandalism and insufficient management by the operators. [redacted]

On the positive side, the OnzO scheme (and potentially other dockless operators that enter the market) comes at no significant cost to Auckland Transport. All of the financial risk is taken by OnzO Bikes, though there is some operational and reputational risk that remains with Auckland Transport. If Auckland Transport progresses with the procurement of its own cycle share scheme, it needs to balance the cost of doing so with the benefits over and above those which can be delivered by private dockless operators such as OnzO, noting the limitations on control and influence able to be effected by Auckland Transport.

2.2 Economic case

2.2.1 Cycle share design options

There are two main factors which define the design of a cycle share scheme being:

- docking approach (docked versus geofenced versus dockless)
- type of bike (standard 'smart-bikes' versus e-bikes or a combination of the two)

In the case of e-bikes there are also choices with respect to how the batteries are charged.

A range of options were developed and assessed, with five scheme options remaining as potential options for Auckland Transport. While an IBC would typically reduce the number of preferred options to one or two, the five options below only differ by the two main factors above (docked vs geofenced and whether e-bikes are included). The options are:

- **Option 1:** Docked 'smart-bike' scheme[2]
- **Option 2:** Geofenced 'smart-bike' scheme
- **Option 3:** Docked e-bike (or mixed) scheme with interchangeable batteries
- **Option 4:** Geofenced e-bike (or mixed) scheme with interchangeable batteries
- **Option 5:** Docked e-bike (or mixed) scheme with charging infrastructure at dock

Docking approach

Physical docking stations that bikes are locked to, generally provide high levels of bike security and minimise the impact on public amenity arising from disorderly management of the bikes themselves. Early docking stations were 'permanent' due to the infrastructure and utility requirements, but modern docking stations are typically modular and often solar-powered so are flexible to changing requirements.

Geofencing uses GPS technology to ensure that bikes are returned to docking areas, but without the need for physical restraint at the docking site. This approach also helps to minimise disorder as bikes must still be returned to defined locations (or users are subjected to some form of penalty). Geofencing however can reduce the upfront capital costs of the scheme and make station relocation much easier.

In both cases, where the design of docking stations or areas is done with proper regard to the surroundings, cycle share can enhance public amenity.

While dockless systems have been discounted from further consideration through this IBC, there are some distinct user advantages to a dockless scheme. One such advantage is the ability to leave a bike anywhere eg directly outside while attending an appointment or meeting, without the need to return it to a docking station or area. For this reason, a hybrid docking approach which allows users to temporarily lock their bike outside of formal docking stations (as part of their overall hire) is still in consideration for any of the five options identified above. Figure 3 shows images of three cycle share schemes from around the world that utilise the three docking approaches.

2 'Smart bike' refers to a bike with fully integrated payment and booking technology on the bike. It is assumed that bikes under all options will have this capability, including e-bikes (for options 3, 4, and 5).

Figure 3: Docking approaches

Docked scheme | Geofenced scheme | Hybrid scheme

Source: Jacobs New Zealand Ltd

Bike type

E-bikes can make cycling uphill or longer distances easier, potentially reducing barriers and encouraging some people to cycle more. E-bikes may also have some safety benefits where cyclists travel on the road (as they do under New Zealand legislation) by allowing the cyclist to travel at a speed closer to that of the flow of motor vehicle traffic – particularly in the city centre where speeds are typically slower due to the number of signalised intersections. Customer research undertaken as part of this IBC indicates that if e-bikes are made available then there could be a substantial uplift in the usage of the scheme. This could potentially help to achieve a level of bike utilisation that is more commercially sustainable.

Charging for e-bikes

Most docked forms of cycle share schemes require some form of power supply, to operate the docking station locking mechanisms, and to power any on-bike or kiosk-based payment and booking systems. E-bike schemes have higher power requirements due to the need to recharge the e-bike batteries in between hires. Most modern cycle share schemes operate on solar technology, as this reduces the invasiveness of implementing the docking station infrastructure, ie there is no need to connect to mains power. The solar requirements to power e-bikes are larger, requiring solar panels with an area approximately the size of a bus-shelter roof. An alternative and less intrusive approach with lower capital cost is to charge the e-bike batteries off-site and swap batteries as required as part of the bike rebalancing operation.

2.2.2 *The costs of the options*

There is significant variance in the capital and operating costs of cycle share schemes currently operating world-wide. The main drivers of capital cost are: the choice of docking approach; the choice of power supply; the level of installation works required; and the choice of bike technology ie the inclusion of e-bikes or otherwise. The main drivers of operating costs ultimately depend on the nature and level of service provided.

The cost of the different options in this IBC have been developed in consultation with Alta Planning and Design, a transport planning and design consultancy based in the United States with specialist expertise in cycle share and prior experience operating cycle share schemes. The costs are as outlined in Table 1.

Table 1: Summary of the costs of the options per bike (2017 prices)

Option	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	Docked 'smart-bike' scheme	Geofenced scheme	Docked 'smart-bike' scheme with 50% e-bikes / batteries	Geofenced 'smart-bike' scheme with 50% e-bikes / batteries	Docked 'smart-bike' scheme with 50% e-bikes / charging at dock
Launch costs	1,111	556 - 1,111	1,111 - 1,667	556 - 1,111	1,667 - 2,222

Option	Option 1	Option 2	Option 3	Option 4	Option 5
(NZ$ / per bike)					
Procurement of bikes and equipment (NZ$ / bike)	2,222 - 5,278	1,528 - 2,778	2,569 - 5,764	2,014 - 4,167	3,472 - 5,833
Administrative costs / overheads (NZ$ / bike)	222 – 528	153 - 278	257 - 576	201 - 417	347 - 583
Costs of operating the scheme (NZ$ / bike / per annum)	1,944 - 3,472	1,944 - 3,472	2,083 - 3,993	2,083 - 3,993	2,639 - 3,993

Source: Costs from Alta Planning and Design LLC[3]; converted to NZ dollars

Auckland Transport recently ran an RFI in relation to a potential cycle share scheme in Auckland. [redacted]

2.2.3 Economic benefits of a cycle share scheme

The economic benefits from a transport perspective include travel time savings and health benefits from cycling. These have been quantified using a methodology consistent with NZTA's Economic Evaluation Manual (EEM) and are shown in Table 2.

Table 2 Annual transport economic benefits summary

Benefit	Standard bike scenario Estimate (2017 prices)	E-bike scenario Estimate (2017 prices)
Travel time savings	$1.28m	$1.59m
Health benefits[4]	$0.18m	$0.22m
Total	$1.45m	$1.81m

Source: PwC analysis

We have undertaken a benefit-cost analysis across the range of scenarios relating to the costs and benefits. The results are summarised in Table 3.

Table 3 Benefit cost ratio (BCR) summary

Benefit	BCR (excluding user revenue)	BCR (including user revenue)
Standard bikes (Options 1,2)	0.6 (high costs) – 1.2 (low costs)	0.9 (high costs) upwards

3 Alta Planning and Design LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

4 Note that we have not modelled the impact on health benefits of any reduced effort associated with e-bike use vs standard 'smart bike' use.

E-bikes (Options 3,4,5)	0.7 (high costs) – 1.4 (low costs)	1.0 (high costs) upwards

Source: PwC analysis

2.3 Commercial case

2.3.1 Cycle share operating and commercial models

Research into international cycle share schemes[5] undertaken as part of this IBC has revealed that scheme development is often undertaken as a partnership between local authorities and a cycle share vendor under a wide variety of different operating and commercial models. By leading the development of cycle share through a structured procurement process, local authorities are in a better position to influence the scheme design and deliver maximum benefits to ratepayers.

In many international cities, schemes have also been developed by operators in the absence of consultation with local authorities. Such schemes are typically dockless (no physical docking or payment infrastructure is required) and have very little involvement, if any, from local authorities. The recent introduction of OnzO Bikes in Auckland is an example of such a scheme. While local regulations often apply to how these schemes are supposed to operate, local authorities have less control over the cycle share design and the outcomes that can be achieved.

2.3.2 Market capability and interest

It will be important to proactively seek interest from established operators throughout the procurement process, to assist in developing interest and ensuring robust and competitive choice in the final tender process. There may also be a need to encourage parties to form consortiums to address weaknesses including cycle share experience, technology solutions, station provision or financial capacity.

Auckland Transport recently ran an RFI to investigate operator interest and capability in the Auckland market. Nine responses were received in total, indicating a healthy level of interest in delivering and operating a cycle share scheme. The variety and flexibility in technology offerings demonstrates that market capability exists to deliver a range of solutions for Auckland Transport.

2.4 Financial case

2.4.1 Sources of revenue for cycle share

Cycle share schemes around the world typically collect revenue from users of the cycle share through hireage fees and subscriptions for use. For some schemes this user revenue is the only source of revenue. This is more often the case with dockless schemes, which typically operate independently of local authorities, and which typically have lower costs as there are generally fewer or no performance requirements that need to be met.

For other schemes user revenue is supplemented by additional revenue streams including sponsorship, advertising and government grants / subsidies. These revenue streams help cover the costs associated with cycle share schemes. This additional revenue is often necessary for providers to break-even (in a similar fashion to how public transport services are provided), particularly where a scheme does not achieve a high level of utilisation. The way in which schemes utilise these revenue sources is often overseen by the relevant local authority.

5 A summary of the key design aspects of each of these schemes is included in Appendix B. Several of these schemes are of a scale comparable to that proposed for the Auckland city centre and fringe.

Local authorities can also be required to de-risk cycle share proposals for operators by agreeing to meet any shortfall in revenues and cover any outstanding operating costs on an annual basis. Lessons from international schemes have shown that in such arrangements it is important for the local authority to have visibility over financial performance including the collection of revenue.

2.4.2 Potential user uptake and utilisation

Research shows that cycle share schemes around the world generally achieve between 2 and 7 rides per bike per day. Schemes generally target the higher end of this range and those that achieve this level of utilisation are generally considered to be successful eg the London, Paris, and Portland schemes. The potential of a scheme in Auckland to achieve 4.5 - 5.7 trips per day is a fair level of utilisation, assuming that the scheme is designed to meet user expectations and requirements.

2.4.3 Comparison of operating costs and user revenues

Table 4 shows projected per bike user revenue and costs for each option. The user revenue figures are based on a range of assumptions about the user pricing structure and the use of different subscription types. The revenue figures are also based on an assumed usage of 3,200 trips per day for options including standard 'smart bikes' (Options 1 and 2) and 4,000 trips per day for options including e-bikes (Options 3, 4, and 5).

Table 4: Per bike user revenues and operating costs

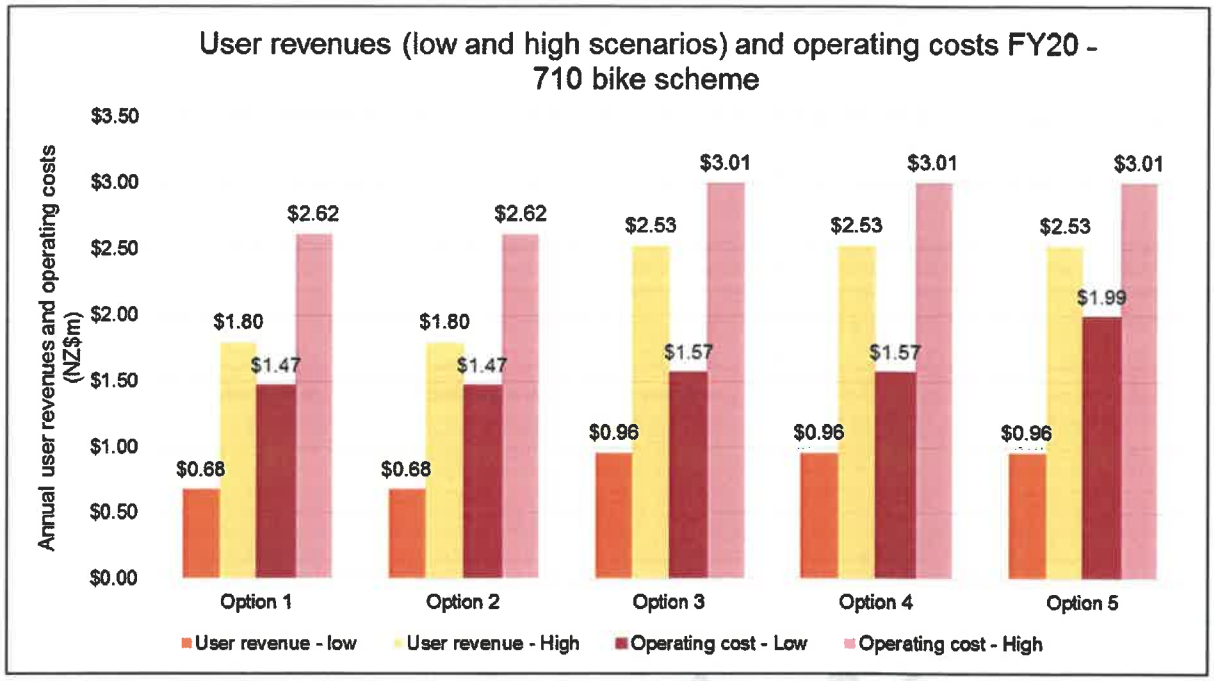
Option	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	**Docked 'smart-bike' scheme**	**Geofenced scheme**	**Docked 'smart-bike' scheme with 50% e-bikes / batteries**	**Geofenced 'smart-bike' scheme with 50% e-bikes / batteries**	**Docked 'smart-bike' scheme with 50% e-bikes / charging at dock**
Operating costs per bike ($NZ)	1,944 - 3,472	1,944 - 3,472	2,083 - 3,993	2,083 - 3,993	2,639 - 3,993
User revenue per bike ($NZ)	939 - 2,476	939 - 2,476	1,321 - 3,482	1,321 - 3,482	1,321 - 3,482

Source: Costs from Alta Planning and Design LLC[6]; converted to NZ dollars

The figures in Table 4 show that a wide range of outcomes are possible and highlight the sensitivity of the outcome to both the pricing structure for usage and the operating costs of the scheme. Figure 4 compares the user revenues at the low and high ends of the possible pricing range, with the low and high estimated annual operating costs for each option.

6 Alta Planning and Design LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

Figure 4: Annual user revenues and operating costs of the different options



Source: Costs from Alta Planning and Design LLC[7]; PwC analysis

The results show that for all options, where user revenues are at the low end of the estimated range they do not cover the operating costs of the scheme, regardless of the cost range. The estimated annual operating deficit will be between $0.8m and $2m depending on the option.

Revenue at the high end of the estimated range is sufficient to cover the low estimate of the operating costs of the scheme (with a potential surplus). However, if the operating costs are at the high end of the estimated range, the estimated annual operating deficit will be between $0.5m and $0.8m depending on the option.

Break-even analysis shows that, assuming a mid-range level of user revenues and a mid-range level of operating costs, for all options the break-even point lies somewhere in the range of 7 to 8 trips per bike, per day. It is unlikely that such a high level of utilisation will be achieved and therefore it is expected that an operating deficit will exist.

2.4.4 Other funding options

There are other forms of funding that may help to off-set any operating deficit. Sponsorship is one option and the overall level of sponsorship that can be achieved is dependent on having a clearly marketable scheme, ie some level of exclusivity and/or clear benefit differentiation for the sponsor. [redacted]. In these cases the scheme is named after the sponsors, and there is significant branding on bikes and docking stations. Such a high level of sponsorship would be unlikely in Auckland given the scale of the scheme.

Auckland Transport may also seek funding from other government funders. For example, Auckland Transport may wish to seek funding from NZTA eg through the National Land Transport Fund. Development of a cycle share scheme potentially aligns well with the NZTA's objectives of building a more effective, efficient, resilient and safe transport network within New Zealand. There is also a case for an NZTA subsidy for a cycle share scheme, in a similar way to which public transport is funded, as a cycle share scheme is a form of public transport.

7 Ibid.

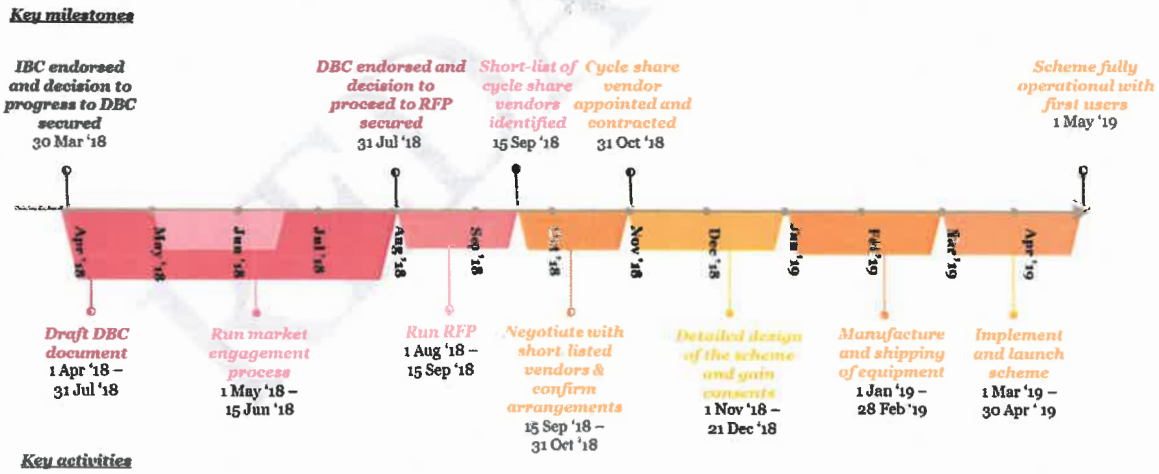
2.5 Management case

Assuming this IBC is endorsed and a decision is secured to proceed to a DBC, then next steps for the cycle share project would include:

- develop the preferred scheme design and commercial aspects further, to enable more focussed market engagement
- run a market engagement exercise providing greater specificity around scheme design and calling for more detailed cost and other commercial information from potential vendors[8]
- develop a DBC incorporating the results of the market engagement exercise. The outcome of the DBC will be a decision on whether or not to implement a cycle share scheme and proceed with procurement
- run a formal RFP for detailed submissions from cycle share vendors, followed by shortlisting of potential vendors
- work with shortlisted vendors to establish scheme design parameters and potential sponsorship and partnership arrangements. Negotiate with vendors to establish their final offers
- select, appoint, and contract a preferred vendor
- complete detailed design of the scheme in cooperation with the contracted vendor
- secure the required resource and / or building consents for docking locations
- contracted vendor to manufacture and ship the scheme equipment
- implement the scheme infrastructure and launch the scheme.

Potential indicative timeframes for the implementation of a cycle share scheme are shown in Figure 5.

Figure 5: Next steps and timeframes, showing high level activities and milestones



Actual timeframes will be subject to Auckland Transport's expectations of cycle share and its implementation, as well as the procurement approach taken.

8 The term cycle share vendors is used here to refer to one or more parties who individually or jointly deliver the range of goods and services necessary to construct and operate the cycle share scheme. It is possible that the required goods and services may be procured from one vendor or from multiple vendors.

3 Strategic case

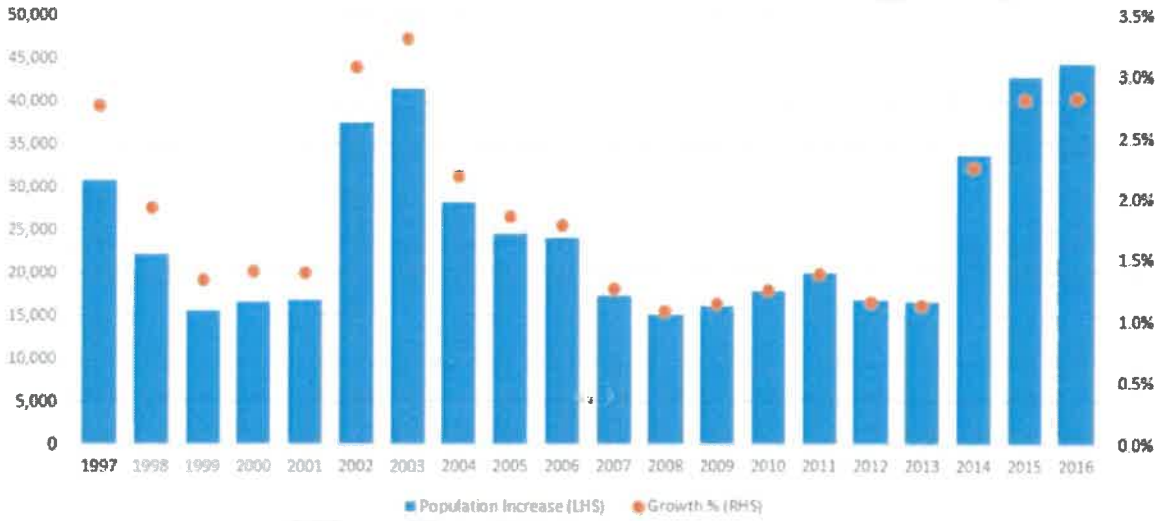
This section sets out the strategic context and the case for change to implement a cycle share scheme in the Auckland city centre and fringe. It also describes the key benefits, risks, constraints and dependencies for implementing a cycle share scheme.

3.1 Strategic context

3.1.1 Resident population growth the Auckland city centre

Auckland has the fastest population growth of any city in New Zealand, and accounted for 46% of the population growth in New Zealand in 2016. Figure 6 shows that since 1997 the rate of population growth in Auckland has frequently been in the range of 1% – 2% per annum, and that since 2013 this rate has been on the increase towards almost 3% in 2016.[9]

Figure 6: Change in Auckland population 1997 – 2016

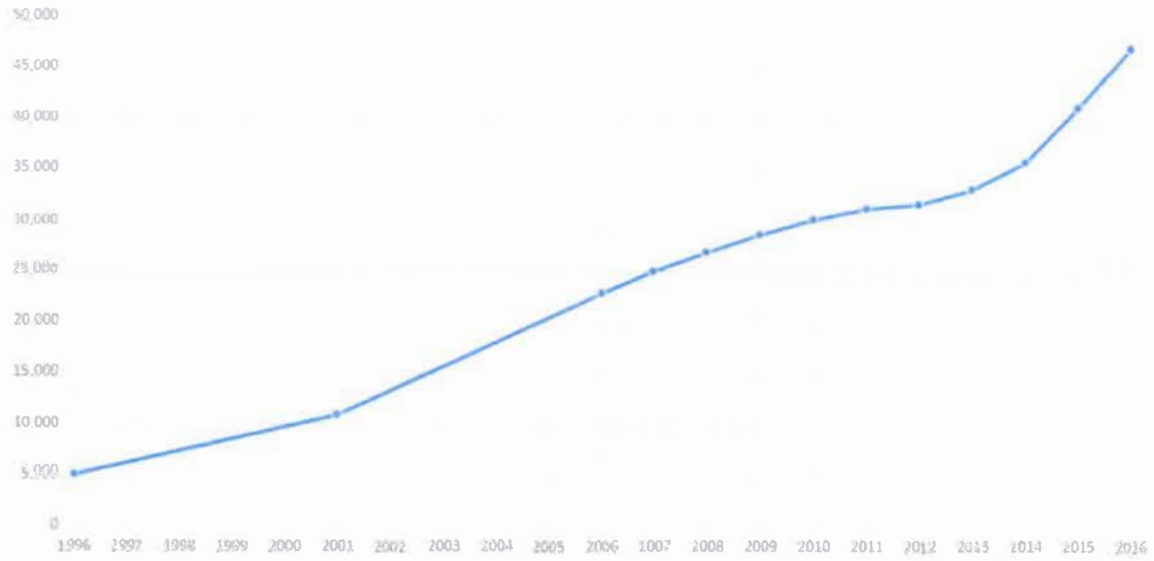


Source: Statistics New Zealand data; Greater Auckland analysis

An even greater increase has been seen in the Auckland city centre. Figure 7 shows the resident population of the city centre has increased to 47,000 people, up from just 5,000 people 20 years ago. Again the annual % rate of increase has been trending upwards since 2013.

9 Greater Auckland. Auckland Population Growth 2016. [Online]. URL: https://www.greaterauckland.org.nz/2016/10/31/population-growth-in-2016/ accessed: 6/10/2017.

Figure 7: Auckland city centre population 1996 - 2016[10]



Source: Statistics New Zealand data; Greater Auckland analysis

The level of population growth that has occurred in the city centre in recent years has outstripped many projections. In 2016 alone the population of the Auckland Harbourside, Auckland Central West, and Auckland Central East Area Units (as defined by Statistics New Zealand) increased by approximately 5,000 people from 2015.

3.1.2 Employment growth in the Auckland city centre

The number of people working in the Auckland city centre has also been increasing, driven by economic growth, and enabled by the construction of new commercial infrastructure in the city centre. This employment growth in the city centre has driven an increase in the number of commuters from all parts of Auckland.

In 2017, approximately 80,000 people commuted into the city centre by car or public transport on a daily basis. This was an increase of approximately 30% since 2001.[11] This number increases to well over 100,000 people when the analysis is expanded to include city fringe suburbs.[12]

With the current and planned levels of commercial infrastructure construction in the city centre, the city centre continues to be an increasingly attractive place for businesses to operate. By 2046, the Waitemata Local Board area (the majority of which is the city centre and fringe) is forecast to have over 200,000 employees.[13]

3.1.3 Implications for public transport in the Auckland city centre and the importance of walking and cycling

The resident population and city centre workforce growth is forecast to continue for the foreseeable future, and this will put increasing pressure on Auckland's transport system to keep pace. Significant investment is

10 City centre defined as the following Statistics New Zealand Area Units: Auckland Harbourside; Auckland Central West, Auckland Central East, Newton, and Grafton West. This is the definition of the city centre that was by the Ministry of Transport for monitoring targets for the City Rail Link project.

11 Source: Auckland Transport

12 Area Units included in this analysis of city fringe areas are St Mary's Bay, Freeman's Bay, Ponsonby East, Grafton East, Parnell West, and Newmarket. These are in addition to the city centre areas listed above.

13 Auckland Forecasting Centre modelling.

already being made in Auckland's public transport infrastructure and services to cater for this forecast growth, including in the Rapid Transit Network (RTN). Investment in Auckland's public transport will continue for the foreseeable future.

Making cycling and walking more accessible and enjoyable in the city centre and fringe is key to enabling more people to efficiently move about the city. If people can move about the city centre and fringe suburbs easily and efficiently using alternative transport modes, then they will choose to do so more often. This will help to get motor vehicles off the road, and help to manage the impacts of increasing demand on the transport system, including the bus network through the city centre.

3.1.4 Growth and investment in cycling infrastructure and cycle share

Cities around the world are realising the benefits of investing in cycling infrastructure and cycle share. A review of international cycle share schemes was undertaken as part of this IBC. A summary of the key design aspects of each of these schemes is provided in Appendix B.[14]

By constructing safe and connected cycle ways, cycling is becoming more accessible to people living in major cities. With better cycling infrastructure comes the opportunity for safe and effective cycle share, which in turn can further increase cycling participation rates and change attitudes and behaviours towards cycling.

Cycle share is valuable both for the support that it provides to the transport network, but also for the experience it can provide to residents and visitors to explore and enjoy their cities. More and more cities are investing in cycle share, with over 600 schemes now operating internationally.[15]

Since 2011, cycle journeys in Auckland have increased by 20%, with a 43% increase in the morning peak cycling count.

3.1.5 Strategic alignment with transport and tourism objectives

The New Zealand Transport Agency (NZTA), Auckland Council, and Auckland Transport agree that a comprehensive, safe, and efficient cycling network is a key component of plans to manage Auckland's growing transport demands, and to enable people to move efficiently about the city.

Table 5: Cycle share strategic alignment with transport and tourism agency objectives

Agency	Strategic objectives and cycling	Cycle share alignment
NZTA[16,17]	As per its Statement of Intent NZTA's purpose is to develop an effective, efficient, and safe land transport system. Two of the three big changes NZTA wants to make over the next five years are around delivering a single connected transport system and one that is more responsive to the needs of commuters. NZTA aims to make public cycling options more attractive and safe for commuters, including through the supporting the development of new	Cycle share can improve connections in the public transport network, providing alternative and in some cases more efficient first and last leg connections to commuters travelling into and out of the city centre and fringe. Cycle share improves cycling accessibility by providing bikes

14 Several of these schemes are of a scale comparable to that proposed for the Auckland city centre and fringe

15 New York Institute for Transportation and Development Policy. The Bike-Share Planning Guide.

16 NZTA. Statement of Intent 2017.

17 NZTA. National Land Transport Programme. (2015-2018).

Agency	Strategic objectives and cycling	Cycle share alignment
	cycling infrastructure. NZTA is also working to improve perceptions of safety among cyclists. As per the National Land Transport Programme (NLTP) cycling is an efficient mode of urban transportation and is a strategic priority for NZTA. The NLTP identifies funding for cycleway improvements through the Urban Cycleways Fund (UCF) and other indirect investment through other infrastructure projects.	conveniently available for use within the city centre and fringe. Cycle share can help to build awareness of cyclists on Auckland streets and increase cycle safety. This is especially true when delivered in conjunction with cycling infrastructure eg new dedicated cycleways.
Auckland Council / Auckland Transport [18,19,20,21]	As per its Statement of Intent, Auckland Transport's purpose is contributing to the development of an effective, efficient, and safe land transport system for Auckland. It's role includes developing a transport system that puts people first, shaping the city through providing high quality facilities and urban spaces, and providing choices for a vibrant, growing Auckland. Auckland Council (through Auckland Transport) and NZTA are investing in the Auckland Cycling Programme, which includes funding for new cycleways. Auckland Transport has also allocated funding for a range complementary cycle initiatives through the programme. More detail on the Auckland Cycling Programme is provided in Section 3.1.6. The Auckland Transport Alignment Plan prioritises cycling investment towards serving higher intensity areas, short-to-medium length trips and extending the reach of strategic public transport corridors.	Cycle share can improve connections in the public transport network, providing alternative and in some cases more efficient first and last leg connections to commuters travelling into and out of the city centre and fringe. Cycle share improves cycling accessibility by providing bikes conveniently available for use within the city centre and fringe. Cycle share can help to build awareness of cyclists on Auckland streets and increase cycle safety. This is especially true when delivered in conjunction with cycling infrastructure eg new dedicated cycleways.
Panuku Development Auckland [22,23]	As per its Statement of Intent, Panuku is the sole entity within the Auckland Council group responsible for leading urban redevelopment and/or regeneration leveraging off Council-owned property. Investment in new cycleways is part of Panuku Development's Waterfront Master Plan to further develop and enhance the Auckland waterfront area to become an increasingly relevant destination for local and international people and	Cycle share in the Auckland city centre has the potential to enhance public amenity. The cycle share described in this IBC is proposed to include the Auckland waterfront area. Cycle share area will provide locals and visitors with an alternative means of exploring the Auckland waterfront in a way that

18 Auckland Transport. Statement of Intent. 2017/18 – 2019/20

19 NZTA, Auckland Council, Auckland Transport. 2015. Urban Cycleways Programme: Auckland. (2015).

20 NZTA, Auckland Council, Auckland Transport. Auckland Transport Alignment Plan: Recommended Strategic Approach. (2016).

21 Auckland Council. Long-term Plan 2012-2022.

22 Panuku Development Auckland. Statement of Intent. 2017 – 2020.

23 Panuku Development Auckland. The Waterfront Master Plan. 2012.

Agency	Strategic objectives and cycling	Cycle share alignment
	events.	is both more enjoyable and more efficient for some than other means of transport.
ATEED [24]	As per its Statement of Intent, ATEED's purpose is supporting Auckland Council to make Auckland the world's most liveable city. It has a particular focus on growing a vibrant and competitive economy, and generating customers for Auckland. From a tourism and economic development perspective, investment in cycling infrastructure can improve visitors' and residents' experience of the city. Auckland Tourism, Events, and Economic Development (ATEED) has identified investment in new cycle trails as an element of its strategy to grow the visitor economy. This could result in more visitors, residents, students, migrants, and investment, in turn providing jobs and an improved standard of living for New Zealanders.	In addition to cycle trails, cycle share is one way that ATEED may help to provide a good visitor experience in Auckland. Cycle share can provide a cost effective and enjoyable way for visitors to explore the Auckland city centre and fringe. Research undertaken as part of this IBC indicates that cycle share may be more popular among younger visitors eg international backpackers. This group may be more price sensitive around transport choices, and may seek a more active experience in exploring the city.

3.1.6 The Auckland Cycling Programme and the city centre cycling network

The Auckland Cycling Programme, agreed by NZTA, Auckland Council, and Auckland Transport, originally identified $88 million to be invested in 52km of cycleways in Auckland between 2015 and 2018. This included:

- Investment in the city centre network to provide a safer and more connected cycling network throughout Auckland city, with a variety of routes that are largely separated from traffic and pedestrians.
- The public transport links work to encourage people to cycle to public transport hubs, where the distance to their destination is not attractive for cycling the entire length. The projects would provide more attractive options for people to cycle to various destinations, and would help to increase the numbers of people choosing to cycle.[25]

Figure 8 shows the current state of the city centre network (end of 2017).

24 ATEED. Statement of Intent. (2016-19).

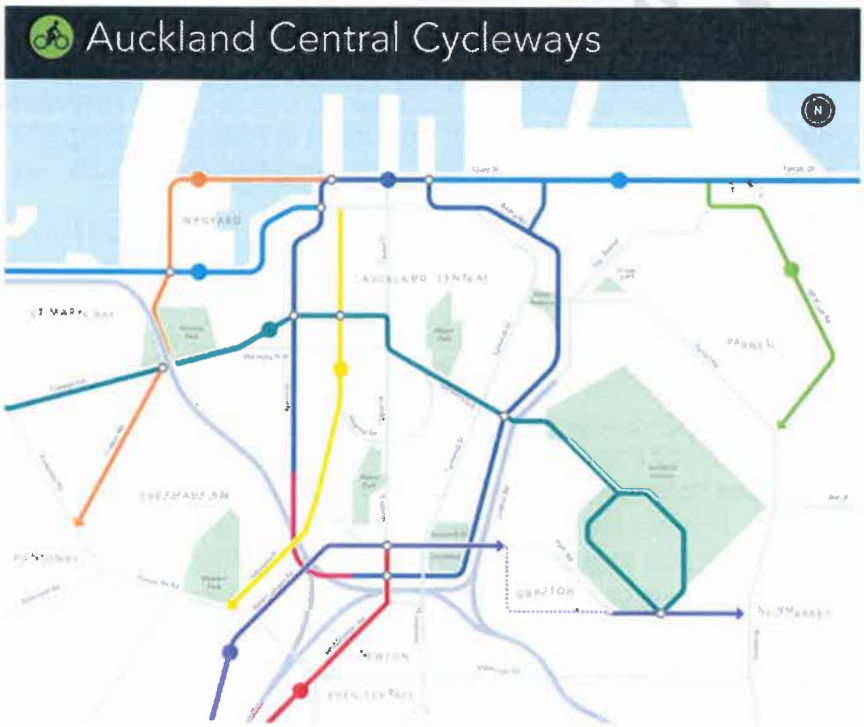
25 NZTA, Auckland Council, Auckland Transport. 2015. Urban Cycleways Programme: Auckland. (2015).

Figure 8: Current cycling infrastructure in the Auckland city centre[26]

Source: Auckland Transport

Figure 9 shows the completed cycling infrastructure that Auckland Transport aims to deliver by the end of 2018.

Figure 9: Planned cycling infrastructure in the Auckland city centre



Source: Auckland Transport

Auckland Transport has now worked with NZTA and Auckland Council to develop and expand this programme to include further investment in additional cycling infrastructure, along with a supporting programme of behaviour change activities, to be rolled out over the period 2018 - 2028.[27]

26 1 = Westhaven Promenade; 2 = Wynyard Quarter; 3 = Quay Street protected cycle way' 4 = Quay Street shared path; 5 = Lower Grafton Gully; 6 = Upper Grafton Gully; 7 = Te Ara I Whiti – The Lightpath; 8 = Nelson Street cycle way.

27 Auckland Cycling: An Investment Programme Proposed 2018 – 2028. NZTA, Auckland Council, Auckland Transport.

The purpose of the programme is to improve travel options and increase reliability across the transport network, with a focus on liveability and sustainability. The programme targets practical trips to benefit the wider transport system eg commuter first and last leg connections to main transportation hubs, trips to school, and everyday household trips.

Between 2018 and 2028 Auckland Transport and NZTA will invest an additional $635 million in the Auckland Cycling Programme, with approximately $600 million of new cycleways and $35 million of complementary initiatives. One of the key initiatives identified in the programme is a public cycle share scheme.[28]

3.1.7 Cycle share and the need for good cycling infrastructure

For cycle share to work there needs to be good supporting cycling infrastructure. Dedicated cycleways and other infrastructure is critical to ensuring that cyclists and potential cycle share users are able to move about the city centre efficiently, and feel safe while doing so. There are many examples of cities around the world, that have implemented cycle share schemes in combination with the construction of new or upgrades to existing cycling infrastructure.

Customer research undertaken as part of this IBC has shown that safety ranks highly for potential users of a cycle share in Auckland. For some users, completion of the city centre network will mean they feel safer on the streets and make them more likely to use cycle share.

3.1.8 Suitability of Auckland for cycle share

There are a number of things that make the Auckland city centre and fringe suited for cycle share:

- a large number of people live within a short distance of the Auckland city centre, meaning that there is opportunity for some to cycle directly into the city centre and fringe for work or leisure
- significant public transport infrastructure and services are already in place, and which are continuing to be developed and optimised. Cycle share can integrate with public transport to extend the range of easy and convenient access for people
- Auckland has a temperate climate which is conducive to cycling most of the year ie it is not too hot or too cold
- New Zealanders have a culture and tradition of participating in outdoor activities. Some Aucklanders are therefore likely to enjoy the active and outdoor part of using cycle share as a transport or leisure option
- cycling is already popular with Aucklanders. Customer research shows that almost one in four people living in Auckland owns a bike.

The hilly terrain of the Auckland city centre and fringe presents some challenges for cycle share. Many other cities around the world with hilly terrain have been able to successfully implement cycle share schemes. Examples of hilly cities that have implemented cycle share include: San Francisco, Vancouver, and Bristol. The use of e-bikes can help to overcome some of the hurdles of driving user adoption in hilly areas.

3.1.9 OnzO Bikes bike scheme and other dockless operators

The recent entrance of the OnzO Bikes bike scheme into the Auckland market means there is already a large scale cycle share scheme operational in Auckland. It is possible that other dockless cycle share scheme operators are also looking to enter the Auckland market.

28 Other initiatives include: public cycle parking, bikes on buses, speed management, NZ police enforcement at high speed, high cycle volumes, cycle lane enforcement, marketing and events, travel behaviour change, cycle training, cycle way-finding, signage and maps.

A number of issues have been encountered with these dockless schemes internationally, and this approach has been discounted for Auckland. Issues include:

- The schemes can appear cluttered or messy due to no physical docking station or areas. Some schemes have experienced major issues with bikes piled up in the streets, on the footpaths, and outside major trip destinations eg public transport hubs.
- The bikes are prone to vandalism and theft due to there being no need to return them safely to a docking station or area.
- There is also often no restriction on where bikes can be taken, resulting in many bikes ending up far outside the city centre. Many of these bikes are lost and never recovered. Where this occurs the benefit of dockless schemes being more accessible for users is undone, as the ability to reliably find a bike reduces.

[redacted]

On the other hand the OnzO scheme, and potentially other dockless operators that enter the market come at no cost to Auckland Transport. All of the financial risk is taken by OnzO Bikes.

Auckland Transport has decided that it will allow such dockless schemes to operate, provided they have a licence to operate and adhere to the recently drafted code of practice. Auckland Transport intends to continue working with OnzO in the near future to minimise risk and maximise the outcomes that the scheme delivers.

If Auckland Transport decides to progress with the procurement of an additional cycle share scheme for the Auckland city centre and fringe, then it will need to weigh the cost of doing so against the marginal benefits over and above those which can be delivered by private dockless operators such as OnzO.

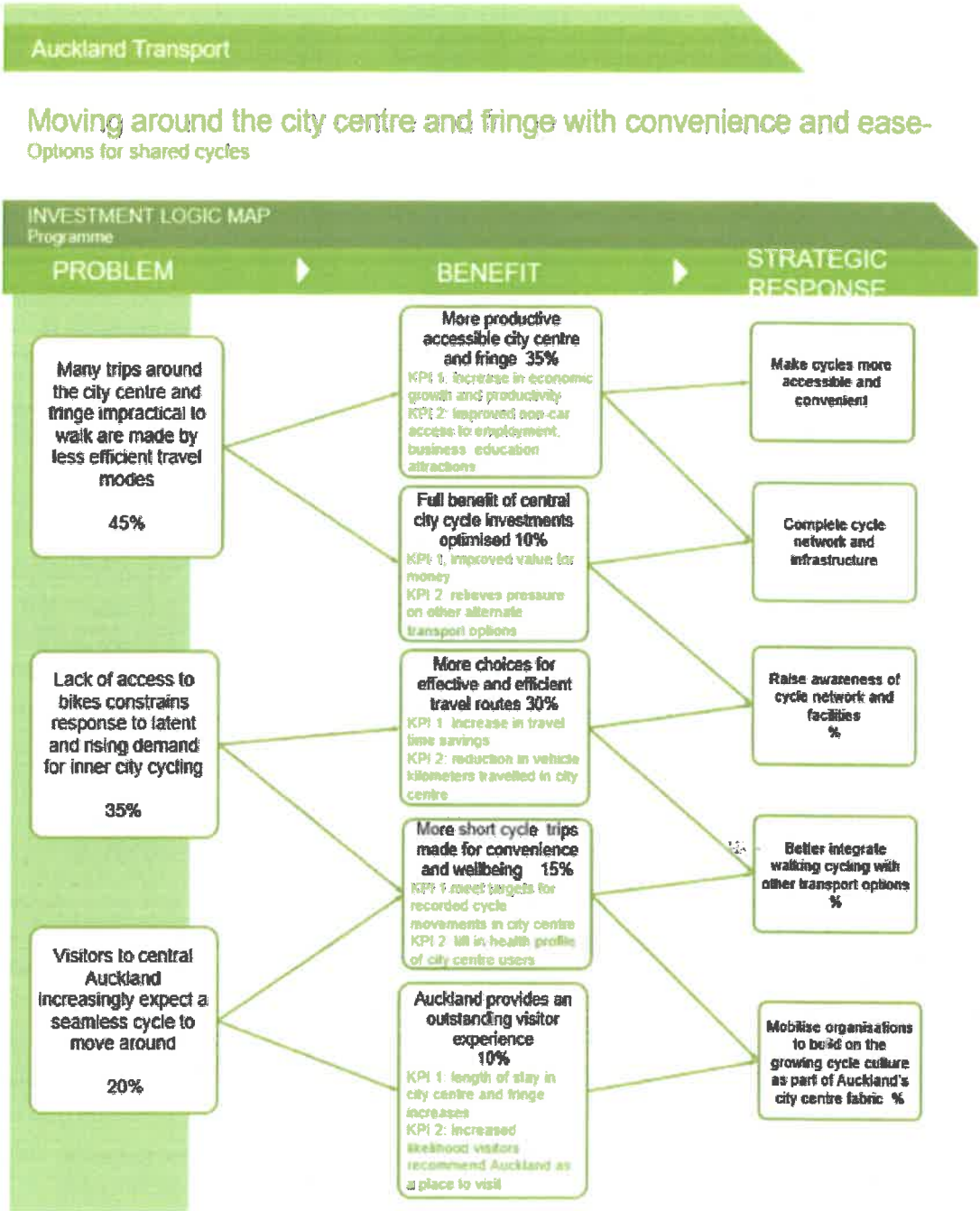
3.2 The problems and the opportunities

3.2.1 Investment Logic Map

An Investment Logic Map (ILM) workshop was undertaken to define the problem that a cycle share scheme in the Auckland city centre and fringe would address, and / or the opportunity that cycle share presents.

The workshop was completed in August 2017 and involved participants from Auckland Transport, NZTA, ATEED, Panuku Development Auckland and Auckland Council. The resulting ILM is presented in Figure 10.

Figure 10: Cycle share ILM



The ILM frames the drivers for change as problem statements, however some of these can also be framed as opportunities. The problem and benefit statements in the ILM are discussed in more detail below.

Problem statement 1: Many trips made by Aucklanders around the city centre and fringe could be made by bike, but are currently made by less desirable transport means.

There are many short trips currently made by Aucklanders within the Auckland city centre and fringe using public transport, motor vehicle, or on foot. Many of these trips would be candidates to be made by bike.

The trips are generally short trips within the range of 300m to 3km that could be completed comfortably by bike. Some good examples of trip types that could be made by bike instead of some other mode include:

- the last leg of inbound commuter journeys and first leg of outbound commuter journeys from the Auckland city centre and fringe. Many of these trips are currently made by public transport (involving a transfer) or by walking, and often both
- city workers, residents, and students completing short trips within the city centre and fringe via public transport or motor vehicle. For example workers attending business meetings or other appointments may need to make short return trips

Many of these trips are undesirable, when compared with a cycling alternative. Issues include:

- traffic can mean that it is difficult to move about the city centre and fringe via public transport or private motor vehicle. Peak traffic times in the mornings and afternoons are the worst, however even short trips during the day can take longer than expected due to traffic conditions, short block lengths and the high density of traffic signals
- use of cars in the inner city can be inefficient for short trips due to the need to retrieve a car, and to find a parking space at the destination, which may still involve a modest walk
- the time taken to walk some of these trips could be better spent by people on other business or personal activities.

Problem statement 2: *Lack of access to cycles is constraining the response to latent and rising demand for inner city cycling*

Cycling is growing in popularity in Auckland. Network infrastructure improvements and increasing appreciation of the benefits of cycling mean more and more Aucklanders are changing their transport behaviours and choosing to cycle in order to get about town. Some recent cycling statistics are telling in this regard:

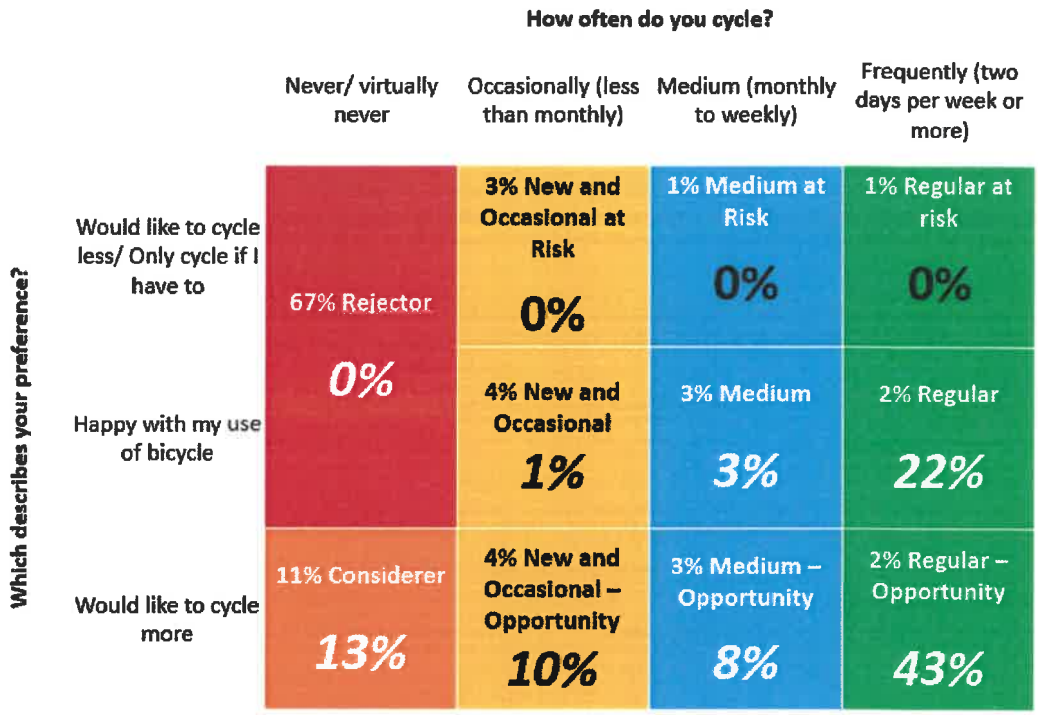
- 39% of Aucklanders are positive about the state of cycling, compared with 22% in 2015.
- a 248% increase in cycle trips into the city via Upper Queen Street since 2013
- an estimated 45,600 new cyclists hit the roads in 2016
- a 44% increase in the number of people on bikes using the North-Western Cycleway.[29]

However, there is also latent demand for cycling among a range of potential users within the Auckland city centre and fringe. Latent demand already exists for a range of would-be cyclists, who are convinced of the benefits of cycling, but who simply don't have convenient access to a bike in order to make the types of trips described above.

Customer research undertaken as part of this IBC has revealed that more people would be using Auckland's cycleways if bikes were more accessible to them. Figure 11 shows how respondents to two surveys – one with cycling enthusiasts and one with a wider group of Aucklanders – rated themselves in terms of current cycling use and preference for cycling more. The Auckland Transport Cycling Adoption Framework is then overlaid to show where the opportunities are to increase cyclist numbers.

29 NZTA, Auckland Council, Auckland Transport. Auckland Cycling: An Investment Programme Proposed 2018 – 2028.

Figure 11: How survey respondents rated themselves in terms of current cycling use and preference for cycling more[30]

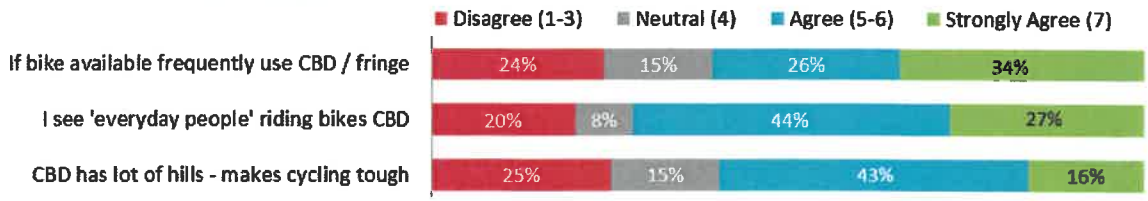


Source: Auckland Transport Customer Insights[31] The large numbers show the proportion of respondents to the survey directed at cycling enthusiasts (the market profiling survey) falling into each category. The small numbers show the number of respondents to the survey directed at a wider group of Aucklanders (the market perceptions survey) falling into each category.

The bottom row of Figure 11 shows that among both groups there is the opportunity to get people cycling more. In total 74% of respondents to the market profiling survey (most likely to be cycling enthusiasts) would like to cycle more. 20% of respondents to the market perception survey (a broader population) would like to cycle more.

In addition, all respondents were asked to indicate how much they agree with the statement: *"I would cycle more frequently if bikes were more available in the city centre and fringe"*. 60% of respondents agreed or strongly agreed with this statement.

Figure 12: Attitudes towards cycling in the city centre and fringe



Source: Auckland Transport Customer Insights[32]

30 The percentages in each square represent the proportion of survey respondents who responded as per the criteria for that square in the matrix. The bottom numbers in each box (in large text) are results from the market profiling survey with cycling enthusiasts. The top number in each square are results from the market perceptions survey with a broader population of Aucklanders.

31 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

32 Ibid.

Creating a cycle share scheme will give some of these potential users a real viable choice to cycle, and will thus increase cycling rates for those cross town and commuter trips that users currently make by some other means.

Importantly, increasing access will maximise the usage of existing cycleways infrastructure. While many existing cyclists already do and will continue to use these cycleways, making the most of the investment already made in these cycleways means making cycling as accessible and convenient as possible to those who are currently travelling by other means.

Problem statement 3: *Visitors to Auckland increasingly expect a seamless cycle experience to move about the city*

The Auckland city centre and fringe are well-suited to a cycle share scheme that supports visitor mobility with various tourist attractions within a short bike ride from the city. Auckland is also a picturesque city with a long and diverse waterfront, and the overall visitor experience of Auckland could be enhanced by providing cycling as a means of exploring the city's sights.

Cycle share in other major cities around the world plays a part in visitor experiences of those cities. The increasing popularity of cycle share around the world means that visitors to Auckland increasingly expect to be able to move easily and conveniently about the city via bike. They increasingly expect that modern cities in developed countries like New Zealand, especially cities with a strong tourism industry like Auckland, provide cycle share as a means to get about and explore the surrounding area much more efficiently than on foot.

The use of cycle share would also make a good impression with international visitors who have heard of New Zealand's clean, green, image. This is a brand and image that the New Zealand tourism and other industries trade heavily on. The provision of a zero emissions alternative to current transport options that frees up public transport capacity and gets people out of their cars fits well with this image.

While domestic visitors to Auckland may not necessarily have the same expectation, the provision of a cycle share scheme would deliver them significant benefits as well.

Customer research undertaken as part of this IBC indicated that the visitor group most likely to use cycle share may be younger travellers and backpackers. This demographic is typically more adventurous and less constrained in their transport choices as many are not travelling with children or other family. They are also typically more conscious about expenditure on transport and may be more likely to use a cheaper option such as cycle share to explore the city.

While it was initially anticipated that cruise ship passengers would likely be big users of the scheme, customer research and engagement with ATEED, has revealed that this is less likely. Cruise ship passengers often have transport arrangements made for them, and / or are only in dock for a short period of time. Most would likely want to use faster transport options to explore the key attractions, further from the city centre, in a short period of time, or would not be willing to venture too far into the city using cycle share, for fear of missing their departure.

3.3 Expected benefits of cycle share in Auckland

The benefits of cycling and cycle share are numerous. Benefits that we might expect from the implementation of a successful cycle share scheme in the Auckland city centre and city fringe are identified in the ILM and discussed in further detail below.

These benefits are explored further in the economic case, where the ability of different scheme options to deliver these benefits are quantified and compared where possible.

3.3.1 More choices for effective and efficient public transport routes

Cycle share in the Auckland city centre and fringe will improve the reach and efficiency of the existing public transport network. Cycle share will provide an efficient means for many commuters into and out of the Auckland city centre and fringe to make last leg connections (for inbound commute) and first leg connections (for outbound commutes).

For people that currently walk these first and last leg connections, cycle share has the potential to deliver travel time savings. These travel time savings may be converted into improved workplace or personal productivity.

For people that currently use buses or private motor vehicles for those first and last leg connections, cycle share again has the potential to reduce travel times, and make commuting trips easier for people.

Good examples of the above scenarios are people who currently commute in to Britomart or other transport hubs, who then have to either make a further bus connection or walk a moderate distance to reach their final destination. For those who walk less than 300m from station to work, cycle share is unlikely to be of much benefit. However, for those who currently bus or walk between 300m and 3km to work, cycle share may be very useful.

1km to 3km may be a long way for some people to walk, and they may value the time saving that cycle share could deliver. Relying on buses to make final connections means people may need to plan their trips around the timing of bus schedules, however cycle share would be available on arrival, removing any waiting time.

By providing a more efficient public transport option in the form of cycling, cycle share also has the potential to reduce vehicle use in the city centre and fringe, resulting in environmental benefits arising from reduced fossil fuel consumption and greenhouse gas emissions.

3.3.2 More productive and accessible city centre and fringe

Aside from the commuter benefits cycle share will enable people to access and explore parts of the city that they wouldn't otherwise. This would include workers, shoppers, and visitors and would potentially benefit businesses and attractions operating in the city centre and fringe.

The implementation of cycle share may also bring reduced travel time between businesses and institutions, resulting in productivity benefits. It also provides a fast and convenient way for business people to move between meetings in the city centre.

3.3.3 Full benefit of central city investments optimised

Over the last three years, Auckland Transport and NZTA have made a significant investment in Auckland cycling infrastructure through the Urban Cycleways Fund and Auckland Cycling Programme. There has been a significant increase in cycling rates in the Auckland city centre and fringe. However, cycling infrastructure will support a much greater level of utilisation.

Cycle share is expected to increase overall cycling rates and thereby increase the utilisation and value for money from existing infrastructure investment. There is significant latent and growing demand for cycling in Auckland and cycle share has the potential to make cycling more accessible to these people.

A cycle share scheme has the opportunity to increase the acceptance of cycling as an urban transportation mode, leading to more people using bikes. Good visibility of cycle share and its benefits could help to convince people to take up cycling – both cycle share, but also private cycle use – it can have a 'snowball' effect.

Other cities around the world that have seen sustainable growth in cycling, have also found that the implementation of cycle share is typically correlated with increased cycling safety. Many cities have seen a decrease in accidents involving cyclists, even though there are more cyclists on the roads.[33]

This is particularly true where new cycling infrastructure such as dedicated cycle routes are built at the same time. However, increasing cyclist numbers also means people, including motorists, become familiar with the presence of cyclists and expect to see them more frequently. They therefore pay more attention to cyclists and are more likely to adapt their driving behaviour. In this way cycling becomes safer for cyclists.

What is more, the implementation of cycle share is a superb opportunity to launch a campaign around cycling safety and many schemes around the world have done just this.

Cycle share would also relieve pressure on alternative transport options within the city centre and increase the total capacity of the public transport network.

3.3.4 More short cycle trips made for convenience and wellbeing

As discussed above the implementation of a cycle share would increase the accessibility and convenience of cycling to a wide range of people. More people may choose to commute or go out and explore the city by bike, where they previously may not have wanted or thought to do so. This would get more people active and would have flow on benefits in terms of health and wellbeing outcomes.

3.3.5 Auckland provides an outstanding visitor experience

Investing in cycling infrastructure makes travelling around a city a more enjoyable activity. Both international and domestic visitors will benefit from being able to explore the city by bike. This would provide a convenient option to explore multiple attractions in one day ie take a multi-stage journey around the city centre and fringe. It would also be a more enjoyable way of exploring the city sights, providing a more immersive experience where people get to see more of the city than they would on foot, at a pace where they are still engaged and able to take it all in.

Improving visitor experience of Auckland has the potential to increase the frequency and length of visitor stays, and to increase the likelihood that visitors will recommend Auckland to others. Both of these things have obvious advantages from a tourism and economic development perspective.

3.4 Potential cycle share users and their requirements

It is important that a cycle share scheme is developed for Auckland that meets, and is capable of continuing to meet, the specific needs of Aucklanders. This is important – incorrect decisions with regard to scheme design could significantly impact uptake and the ultimate success of the scheme.

The cycle share value proposition for users will be different in different locations. City topography and layout, and the nature and efficiency of transport alternatives available can all influence this. User expectations and requirements may also be different and changing.

We have made a concerted effort through this IBC to understand potential users in Auckland, the value proposition of cycle share to them, and their requirements with respect to scheme design. Significant customer research has been undertaken both through a deep dive with a small number of potential users, and through surveys with a broader population of cyclists and other Aucklanders.

33 New York Institute for Transportation and Development Policy. The Bike-Share Planning Guide.

3.4.1 Potential user groups

Nearly everyone who spends any time in the city centre or fringe is a potential user of the proposed cycle share scheme. There are many different ways to categorise potential cycle share users, however one that reflects the different problem statements and groups within the city centre breaks users down into the following groups:

- **Workers**: People who work in the Auckland city centre and fringe
- **Students**: Students of tertiary education institutes located in the Auckland city centre and fringe, including the University of Auckland, Auckland University of Technology, and a range of other institutes and polytechnics, English language schools, wananga, and workplace training centres
- **Residents**: Residents of the Auckland city centre and fringe, including those living in inner city apartment complexes
- **Visitors**: International and domestic visitors arriving into the Auckland city centre and fringe via cruise, train, bus, or private transport. Also Auckland residents coming into the city and fringe on weekends and evenings for leisure activities.

The typical demographic or characteristics of each of these groups are different. Furthermore customer research has shown that a wide variety of demographics are interested in cycle share, with very little preference found for any particular gender or age group.[34] It is possible that some groups may be more price sensitive than others This would be addressed at later stages through the development of a pricing schedule.

There are differences in the trip types that we expect potential users belonging to each of these groups to make. Table 6 provides a brief summary of the main features of the different user groups, and the trip types they would potentially make by cycle share.

Table 6: User groups characteristics and potential trip types

User group	Characteristics	Trip types potentially made via cycle share
Workers	• Age range generally 18-65 • Range of fitness levels • For some, professional attire may not be suitable for cycling • Would likely need or want to get changed before / after commute, however professional attire may be suitable for short trips	• Short trips within the Auckland CBD city centre and fringe • First and last leg of commuter journeys into and out of the city - the leg between public transport stops and their destination • Getting to business meetings and other appointments during the day which may be made using less efficient modes, or not made at all • Return trips - may want to keep hold of the bike while attending a meeting / appointment
Students	• Generally young – aged 18-25 • Likely fitter on balance than the population as a whole • More likely to walk the first and last leg of their commuter journeys • Likely price sensitive in terms of their transport costs	• Short trips within the Auckland city centre and fringe • First and last leg of commuter journeys into and out of the city - the leg between public transport stops and their destination

34 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

User group	Characteristics	Trip types potentially made via cycle share
Residents	• Wide range of demographics • Less likely on average to own private motor vehicles • Likely that they currently mostly walk, taxi, Uber use public transport to make short trips about the city	• Short trips within the Auckland city centre and fringe • Trips to and from retail shops / restaurants & bars / supermarket etc. • Trips directly to and from work (not as part of a longer commuting journey)
Visitors	• Wide range of demographics • Some travelling with families, including elderly and young children • Perceived safety likely particularly important • May find it more difficult to navigate / return bikes	• Interest primarily in seeing the city • May want to use cycle share for longer trips to explore multiple destinations • Likely value integration with public transport networks

The interest of these user groups was explored further through customer research undertaken as part of this IBC.

3.4.2 Customer research

In the preparation of this IBC a two stage customer research process was undertaken.

Firstly, a deep dive was undertaken with a small number of users who fit the user types described above. The research was delivered as a one week sprint led by Auckland Transport Customer Central. The intention was to explore the value proposition of cycle share to each of these groups and to better understand user preferences and requirements. This exercise provided good qualitative evidence and provided guidance for subsequent research efforts with a wider group of potential users.

Subsequently, the Auckland Transport Customer Insights Team ran a number of surveys with different populations, in order to validate the findings of the deep dive with a larger group of potential users, and estimate the potential uptake of a cycle share scheme. More specifically, the research objectives were to;

- identify the most likely users of cycle share including early adopters, who they are and why / how they would use cycle share
- gather some evidence of the level of demand from these user groups
- understand the potential of cycle share to support first and last leg public transport connections within the city centre and fringe
- understand cyclists' perceptions of safety aspects of cycling in the city centre and fringe suburbs.

Two surveys were run in total, and the results amalgamated. The surveys were:

- market sizing survey of a broad Auckland audience which asked a small number of questions aimed at understanding the potential demand for a cycle share scheme. This survey was distributed through the quarterly Auckland Transport Market Perceptions Survey, run with an external research panel representative of the Auckland population
- market profiling survey which aimed to better understand challenges and opportunities in cycling and for cycle share from more knowledgeable cyclists / cycling enthusiasts. The survey was sent to
  - readers of the Auckland Transport Cycling Newsletter
  - Auckland Transport external cycling panel.

Taken together the results of this customer research provided a clear picture of the cycle share value proposition, potential usage, and design features that are important to users.

3.4.3 What the research told us about potential cycle share users

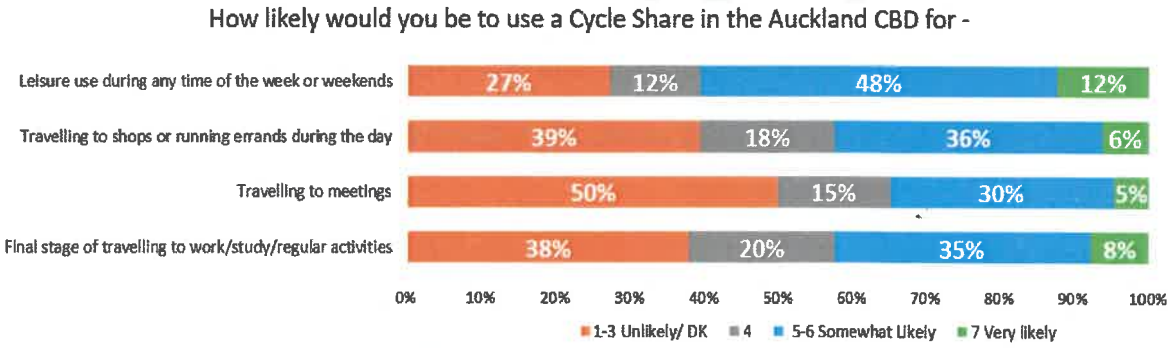
There are a number of potential use types

The research explored a range of potential uses of cycle share, including:

- leisure use during any time of the week or weekends
- travelling to shops or running errands during the day
- travelling to meetings
- final or first stage of travelling to work / study / regular activities.

Figure 13 shows that those surveyed would use a cycle share scheme for all of the above purposes. The greatest potential use of cycle share is for leisure use (60% of those surveyed), followed closely as part of commuting journeys in and about the city centre and fringe. Travelling about the city for meetings was the least likely use type, however with 35% of those surveyed saying they would likely or very likely use the cycle share scheme for this purpose this use type is still significant.

Figure 13: How potential users would use cycle share



Source: Auckland Transport Customer Insights.[35]

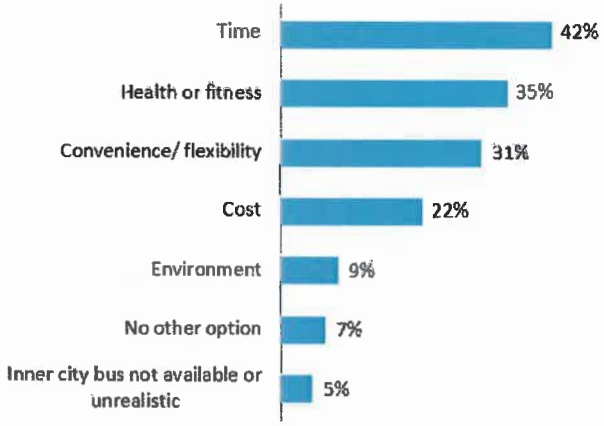
The main reasons why people cycle include time savings, health and fitness benefits, convenience, and cost savings

There are a range of reasons why potential users may choose to cycle over other transport modes. The survey found that of those who currently cycle the final stage of their commute to work or study, the reasons they do so are primarily time savings (42% of users), health and fitness benefits (35%), convenience (31%), and cost savings (22%).

35 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

Figure 14 shows the results of the survey, with reasons that scored 5% and above shown.

Figure 14: Why people surveyed choose to cycle as part of their journey to work or study



Source: Auckland Transport Customer Insights.[36]

While environmental benefits are important to some these are not often a primary driver for choosing to cycle as part of commuter journeys. Interestingly a lack of other transport modes in the city eg buses is not considered to be a strong driver for current cycle use, which is a positive message for Auckland Transport overall.

When asked more generally about the reasons why people might use cycle share, similar results are obtained, with time savings, cost savings, and health and wellbeing benefits featuring strongly in the results. However, in addition to this, a large number of respondents also said that enjoyment of cycling and environmental benefits are additional reasons why they might choose to use a cycle share scheme if implemented in the city centre and fringe.

Cycle share appeals to a wide demographic

The results of the customer research indicated that there were no significant differences in propensity to use cycle share between people of different genders, ages, or employment statuses. It is acknowledged that the research sample was light on the under 25 and over 55 age groups, however the results do show that cycle share appeals to people of all ages. Overall the results reflect the fact that cycling is a popular and accessible activity across a wide demographic.

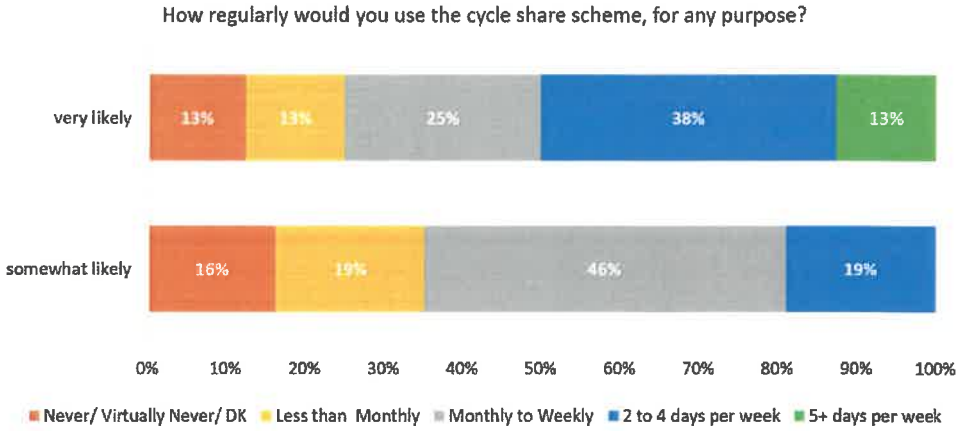
3.4.4 What the research told us about potential uptake

The survey results indicate there will be a substantial number of regular users of cycle share

The survey was designed to gauge potential interest in using a cycle share scheme. This was necessary to inform a view of potential uptake of the proposed scheme. Figure 15 shows that approximately 13% of those who indicated they would be very likely to use cycle share would use it five or more days per week. 38% would use it between two and four days per week. In addition, of those who said they were somewhat likely to use cycle share, 19% said they would use it between two and four days per week.

36 Ibid.

Figure 15: Frequency with which survey respondents would use cycle share (among those who had indicated that they would be somewhat likely or very likely to use cycle share)



Source: Auckland Transport Customer Insights.[37]

The above results are based on a small sample size, limited by the number of responses received to the Market Perceptions survey (n=61). The results should be interpreted with caution, however they do indicate that there are a substantial number of users who would use cycle share on a regular basis ie most days per week.

These regular users will likely form the backbone of cycle share ridership. Bike use will be throughout the day as people travel to and from work and study etc. within the city centre and fringe, with use likely peaking in the mornings and evenings as the majority of people commute to and from work at these times. In addition to those who will use cycle share on a regular basis, there will be others who will use the scheme on a more ad hoc basis, supplementing cycle share ridership further.

E-bikes will likely increase cycle share patronage

E-bikes can make cycling uphill or longer distances easier, reducing barriers and encouraging some to cycle more. E-bikes may also have some safety benefits where cyclists travel on the road (as they do under New Zealand legislation) by allowing the cyclist to travel more smoothly at a speed that matches that of the flow of motor vehicle traffic.

The survey results suggest that if electric bikes are available then the number of respondents who would be very likely to use the scheme increases by 50%. This indicates that there could be a substantial uplift in the patronage of the scheme if e-bikes are made available. Interestingly, the survey results again indicate no difference in the preference for e-bikes between demographic groups. There was a small skew towards younger and female users, however this was statistically insignificant.

3.4.5 What the research told us about what aspects of cycle share are important to potential users

Safety is important to all users, and a perceived lack of safety may stop some people from using cycle share

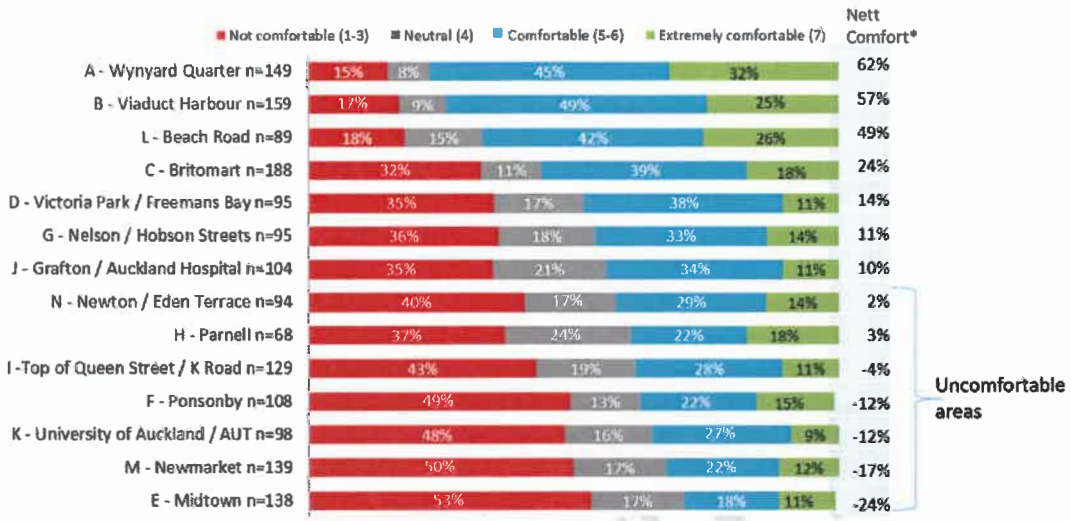
Among those who might otherwise use cycle share, safety is an important consideration. 27% of those unlikely to use cycle share very often, if ever, said that one of their top concerns was safety. Most either felt that driver behaviour, and the lack of dedicated cycle lanes to separate cyclists from drivers, were enough of a deterrent not to use cycle share. This sentiment is shared by those who would use cycle share, who were

37 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

found to be more critical than non-users of the lack of safe and well connected cycling infrastructure, perhaps due to greater familiarity with the infrastructure.

Those surveyed through the Market Perceptions Survey reported that they felt more comfortable cycling in certain parts of the city eg Wynyard Quarter, Viaduct Harbour, Britomart, and Beach Road, where investment has been made to improve cycling infrastructure, compared with other parts of the city.

Figure 16: Comfort with cycling about different parts of the city centre and fringe



Source: Auckland Transport Customer Insights.[38]

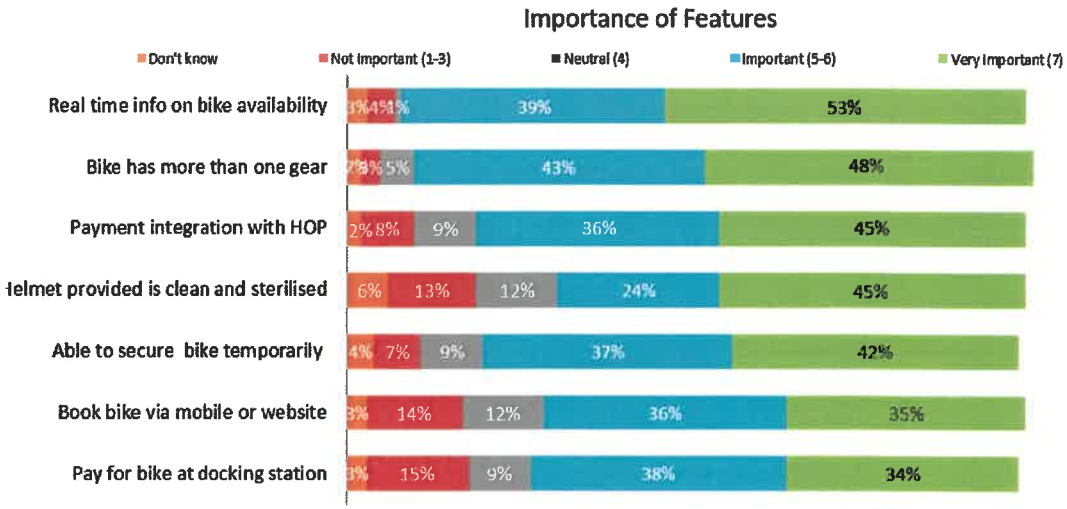
The survey found that many respondents would be much more likely to use cycle share as the Auckland Central Cycleways network is further developed and improved. 75% of all respondents indicated they would be more likely to use a cycle share scheme, including 33% who would be *much* more likely.

Users expect a functional and convenient cycle share scheme which with modern and appropriate cycling and payment technologies

Potential users were asked to rate the importance of a range of features common to modern cycle share schemes around the world. The results shown in Figure 16 confirm that potential users of a cycle share scheme for Auckland have high expectations of a functional and convenient scheme with most of these features. Top priorities were real time information, multiple gearing, AT HOP card integration, and clean helmets.

38 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

Figure 17: Importance of a range of features associated with modern cycle share schemes



Source: Auckland Transport Customer Insights.[39]

The results also indicated that just 6% of potential users would be prepared to walk more than 10 minutes in order to pick up or return a bike to a bike docking station. Just 31% of users would be prepared to walk more than five minutes to pick up or return a bike, with the large majority (69%) prepared to walk up to five minutes if using the scheme was of benefit to them. This reflects lessons learned from other cycle share schemes around the world that suggest the need for a docking station at least every 250m-300m to create effective bike density and ensure convenience and uptake among users.

39 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

3.5 Potential cycle share scheme uptake

3.5.1 There are a large number of people living, working, studying, and visiting within the proposed scheme coverage area

Figure 18 summarises some of the key statistics for the number of people living, working, studying, and visiting within the Auckland city centre.

Figure 18: Summary of the number of people living, working, studying, and visiting within the city centre[40,41,42,43,44]

Source: See footnotes

All of these people are within the proposed scheme coverage are, and are potential users of a cycle share scheme built in the city centre. If even a small proportion of these people were to opt to use a cycle share scheme as opposed to their existing transport methods, then there could potentially be a high level of demand for a cycle share scheme.

40 Residents: City centre facts. Auckland City Centre Residents' Group. [Online]. URL: https://www.ccrg.org.nz/city-centre-facts/ accessed 29/01/2018.

41 Workers & commuters: City centre facts. Auckland City Centre Residents' Group. [Online]. URL: https://www.ccrg.org.nz/city-centre-facts/ accessed 29/01/2018.

42 Workers & commuters: Statistics New Zealand. Commuter View: Beta version. [Online]. URL: http://archive.stats.govt.nz/datavisualisation/commuterview/index.html?url=/datavisualisation/commuterview/index.html# accessed 29/01/2018.

43 Students: Facts and figures about AUT 2017 shows total students at 29,000. [Online]. URL: http://www.aut.ac.nz/about-aut/fact-and-figures-about-aut accessed 29/01/2018. Auckland University key statistics 2016 shows total student numbers at 33,118. [Online]. URL: https://cdn.auckland.ac.nz/assets/auckland/about-us/our-ranking-and-reputation/key-statistics-2016-final.pdf accessed 29/01/2018. Assumed half of all AUT and Auckland University students study at Auckland city centre campuses (total 30,000). Added 10,000 for students attending all other polytechnics, language schools, and wananga etc.

44 Residents: City centre facts. Auckland City Centre Residents' Group. [Online]. URL: https://www.ccrg.org.nz/city-centre-facts/ accessed 29/01/2018.

3.5.2 The number of people using public transport to get in and out of the scheme coverage area is large and increasing

The number of people using public transport to get in and out of the city centre has been trending upward, due to a wide array of service level and capacity improvements across Auckland's public transport network. In particular, many more people are using the train network to enter the city centre.

Table 7 shows the annual patronage of the three train stations within the proposed scheme coverage area. The number of people boarding and alighting trains at these stations has seen a substantial increase in recent years, particularly at Britomart.

Table 7: Number of people arriving at train stations within the proposed scheme area (per annum)

Train station	FY15	FY16	FY17
Britomart	3,973,982	4,840,540	5,123,949
Newmarket	1,057,911	1,303,920	1,220,586
Grafton	228,722	298,567	413,773
Total	**5,260,615**	**6,443,027**	**6,758,307**

Source: Greater Auckland[45]

Customer research undertaken as part of this IBC has indicated that many people arrive in the city close to their final destination eg their workplace. It has also indicated that many are prepared to walk whatever distance remains to this final destination, which given the current lack of alternatives (such as cycle share) is not unexpected.

However, we can assume that there are some people who are arriving at these train stations, and other major transport hubs eg Britomart for buses and ferries, who would value a cycle share scheme to help them make their last and first leg connections more efficient.

3.5.3 Customer research indicates that there is strong demand for a cycle share scheme

As discussed earlier, the customer research that was undertaken for this IBC indicated there is strong demand for a cycle share scheme in the proposed area. The results indicated that of those who indicated they would be very likely to use cycle share, 13% would use it five or more days per week, 38% would use it between two and four days per week; 25% would use it monthly to weekly; 12% would use it less than monthly; and 12% would never use it.

When these percentages are applied to the adult population of Auckland (who are not cycling rejecters) whose most common daily travel destination is central Auckland, and who would be very likely to use cycle share, then we get the results shown in Table 8.

Table 8: Calculating the potential number of regular users of a cycle share scheme

Item	Population
Number of Aucklanders who's most common destination is central Auckland, who are not cycling rejecters, and who would be very likely to use cycle share	18,425

45 Greater Auckland. 2017 Rail Station Boardings. August 18, 2017. [ONLINE]. URL: https://www.greaterauckland.org.nz/2017/08/18/2017-rail-station-boardings/) accesses 29/01/2018.

Item	Population
Those who say they will use cycle share five plus days per week	2,395 (13% of 18,425)
Those who say they will use cycle share between two and four days per week	7,002 (38% of 18,425)
Those who say they will use cycle share on a weekly to monthly basis	4,606 (25% of 18,425)
Less than monthly	2,111 (12% of 18,425)
Those who say they would not use cycle share	2,111 (12% of 18,425)

Source: Auckland Transport Customer Insights.[46]

The survey results suggest that if electric bikes are available then the number of respondents who would be very likely to use the scheme increases by 50%. However, this is potentially an optimistic estimate and we are also unable to say with what frequency these additional users would use the scheme. Taking a conservative approach we might assume a 25% increase in the number of people would use the scheme.

3.6 Risks, constraints, and dependencies in cycle share implementation

There are a number of significant risks around the implementation of a cycle share scheme that need to be effectively mitigated or managed. Some of the major ones are described in Table 9.

Table 9: Key strategic risks associated with cycle share

Risk	Explanation
The scheme does not achieve estimated utilisation	This might happen for a number of reasons, including because: • the scheme design doesn't meet user needs • the sizing or staging of the scheme's implementation is not well considered • insufficient 'buzz' is generated around scheme launch • the cycle share is not safe or people do not see it as safe If forecast utilisation is not achieved this may be a bad look for Auckland Transport and its partners. It may also affect the commercial viability and thus sustainability of the scheme. Most of these factors can be reasonably controlled to some degree through robust customer engagement and analysis of design options, as well as careful planning and sufficient investment in the cycle share launch. The safety aspect will require the provision of dedicated cycleways or other cycling infrastructure that is considered safe by users and further safety campaigns.

46 Auckland Transport Customer Insights. December 2017. Cycle Share Market Sizing and Customer Market Research.

Risk	Explanation
The scheme will clutter the streets and take away from public amenity reflecting negatively on Auckland Transport	Implementation of cycle share is likely to bring between 400 and 1,200 bikes into the Auckland city centre and fringe. Unless carefully monitored, and depending on the docking approach, there is the potential for these bikes to clutter the streets. Depending on the docking approach, cycle share may also bring up to 2,500 docking spaces and supporting infrastructure across up to 70 docking stations into the city centre and fringe. Without thoughtful design this docking infrastructure could significantly impact on public amenity. Installation of some of these docks and supporting infrastructure may require connection to mains power, which could be disruptive to the public. It is possible that the public may have a negative reaction to the above, particularly if the negative impacts are perceived to outweigh the benefits of cycle share. Careful consideration of the impacts of different docking approaches should help Auckland Transport and its partners land on the most suitable solution. In terms of docking infrastructure the right design may even enhance public amenity, as opposed to taking away from it.
The space taken up by the scheme could be used for infrastructure	There is limited available space in the Auckland city centre and fringe to support a growing population. There is therefore the need to be efficient in the allocation of available space eg roads, footpaths, parks, etc – both for transport and other civic purposes. There is the risk that having implemented cycle share, there is a future need to use the land for a higher value purpose to support a critical initiative. The use of low impact and easily moveable infrastructure eg modular docking stations would mitigate this risk.

These risks are included in the evaluation framework used in the economic case to qualitatively assess the relative advantages and disadvantages of different scheme options. Several of these risks can be addressed through aspects of the scheme design. Ultimately the decision to implement a particular scheme design is going to require Auckland Transport and its partners to balance the relative costs, benefits, and risks of different scheme designs.

In addition to the risks described in Table 9 there are some constraints and dependencies that should be considered alongside a cycle share scheme. The most important of these is the timing of proposed expansion of existing cycling infrastructure in the city centre and fringe. As described earlier, further development of this infrastructure is likely to increase ridership for cycle share in the city centre as potential users will be more confident to ride bikes on city centre roads.

Other constraints and dependencies include:

- the further implementation of dockless schemes in the city centre, which could potentially have a material impact on the adoption of the cycle scheme proposed here
- the ability to find suitable sponsors and or scheme partners who could provide physical space for docking stations/areas and or investment to support the scheme.

4 Economic Case

The purpose of the economic case is to scope and evaluate the different options for a cycle share scheme in the Auckland city centre and fringe, including consideration of the associated costs, benefits, and risks. It refines the scheme options down to a short-list of possible options.

The economic case begins by analysing the appropriate size and reach for a cycle share scheme in the Auckland city centre and fringe, as well as potential staging opportunities. It then focusses on comparing the cycle share docking approach, equipment and technology options. It analyses the potential of various docking approaches including dockless and hybrid docking schemes, the inclusion of e-bikes in the scheme, options around providing critical power infrastructure, and approaches to booking and payment.

4.1 Investment objectives

The investment objectives are the primary reasons for implementing a cycle share scheme in the Auckland city centre and fringe. When considering the different cycle share options, consideration must be given to how these options address each of the investment objectives.

Based on the cycle share ILM developed and the discussion in the strategic case, the specific investment objectives of this investment are to:

1 make cycling a more accessible and convenient transport option for trips within the city centre and fringe taken by people living, studying, and working

2 act as an extension of public transport modes through convenient first and last leg options

3 provide domestic and international visitors to Auckland the ability to easily move around the Auckland city centre and fringe by bike

4 maximise existing and planned investment in the Urban Cycleways Programme and Auckland cycling infrastructure.

4.2 Estimated size and layout of a cycle share scheme for Auckland

The scheme size is defined by the number of bikes, docking spaces, and docking stations or areas the scheme has. The layout is defined by the spread of the network of docking stations or areas across the scheme area. These things are paramount when designing a cycle share network that meets user requirements.

From a user perspective there are two important criteria:

- the number of bikes and spaces available to dock bikes, as well as where the majority of these are located
- the density of docking stations or areas across the cycle share scheme coverage area.

A lack of bikes or docking spaces for bikes in the right areas results in frustrated users. Convenience is important for cycle share, and a lack of easily available bikes may dis-incentivise some users, particularly those who may otherwise plan to use the scheme on a regular basis. The provision of sufficient bike numbers and docking spaces in the right locations is critical to support effective cycle share adoption.

Desirable docking station or area density within the coverage area ensures that no matter where a user is, there will be a station within a short walking distance to both the origin and destination of their trip. The farther apart the stations, the less convenient the system is for the user.

A dense network of docking stations or areas, with sufficient bikes and docking spaces, creates a network that users can learn to count on for their trips within the city. GPS enabled bikes and flexible docking areas can

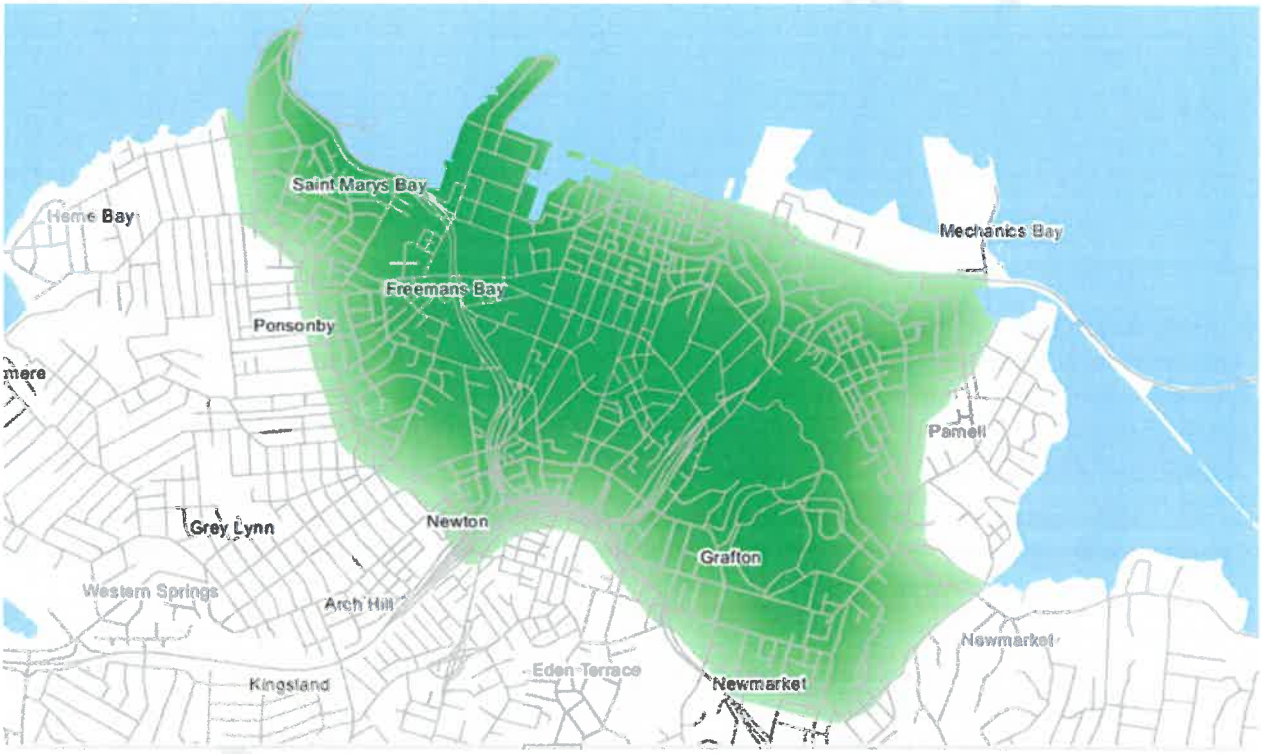
make a scheme even more convenient to use. Modular docking station designs can help scheme owners to scale up the scheme or change the network layout with ease as adoption increases or use patterns change.

The rest of Section 4.2 summarises our findings with respect to the potential size and layout of a cycle share scheme for Auckland. Please see Appendix C for further detail on how this proposed size and layout was estimated.

4.2.1 Scheme coverage area and number of docking stations or areas

Auckland Transport wants to develop a cycle share scheme for the Auckland city centre and fringe that supports a wide user base for a wide range of trip types. The proposed scheme coverage area is shown in Figure 19. This figure includes: Wynyard Quarter, the Viaduct area, the Britomart area, Queen Street, Auckland University and surrounding areas, Victoria Park / Freemans Bay, Grafton, Ponsonby, Newmarket, and Parnell.

Figure 19: Proposed reach of cycle share scheme



Source: Jacobs New Zealand Ltd

Alternatively a smaller scale scheme could be launched which focusses on the city centre (inside the inner motorway ring), Wynyard Quarter, Grafton, and Parnell, but excludes other parts of the city that are included above, including Newmarket, Ponsonby, Newton, Freeman's Bay, and Saint Mary's Bay.

For the purposes of this IBC a range of docking station or area densities has been tested from 10 docking stations or areas per square kilometre within the scheme coverage area, up to 20 per square kilometre. Assuming a docking station density of 10 stations per square kilometre, the proposed scheme will likely require between 56 and 70 docking stations depending on reach.[47]

47 Jacobs New Zealand Ltd. Bike number assessment, 21 November 2017. Bike number assessment – consideration of a smaller scheme, 22 November 2017.

Geofencing

Where a geofencing approach is used instead of a fully docked scheme, then bikes may be hired from and returned to docking areas as opposed to stations. There would be no physical docking infrastructure for each bike in the station, but rather users would need to take and leave bikes in a specified area. If such a design was preferred consideration should be given to how the number of bikes at each station is managed.

4.2.2 Number of bikes and docks

Large, dense cities or areas with high numbers of commuters and/or tourists typically require a bicycle-to-resident population ratio of approximately 10-30 bikes per 1,000 people. On the other hand a review of international cycle share schemes undertaken as part of this IBC has identified that many successful schemes operate with a ratio of bikes close to between 8 and 12 bikes per resident population. This reduced bike number may help to support higher levels of utilisation.

To estimate the number of bikes that would be required to support a cycle share scheme of the proposed reach, we have applied the above assumptions to the population estimates for the respective area. Assuming a bike to resident population of approximately 10 bikes per 1,000 people, the proposed scheme will likely require between 370 and 710 bikes depending on reach.[48]

As per cycle share planning guidance it is likely that cities will require between 2.0 and 2.5 docking stations per bike. Assuming that the scheme is docked and will include between 370 and 710 bikes with 2.5 spaces per bike, then the number of docking spaces required will be in the range of 900 – 1,800 spaces.[49]

4.2.3 Size and location of docking stations or areas

While the right density of docking stations or areas must be achieved across the entire scheme coverage area, there are choices with respect to the exact location and size of individual docking stations or areas.

Heat map analysis of key trip generators has been undertaken to determine potential docking station area location and sizing. Figure 20 provides a view on the areas within the scheme coverage area where demand for cycle share may be greatest. This heat map image has been built up from individual heat maps including those for worker and student density, residential density, retail destination density, visitor attractions, and public transport hubs. The individual heat maps that combine to make this overall heat map are included in Appendix C.

48 Jacobs New Zealand Ltd. Bike number assessment, 21 November 2017. Bike number assessment – consideration of a smaller scheme, 22 November 2017.

49 Ibid.

Figure 20: Combined heat-map showing locations of likely strongest demand for cycle share

Source: Jacobs New Zealand Ltd

Based on this heat map analysis and the docking station analysis above, a preliminary scheme docking station layout for 710 bikes has been prepared. This is set out in Appendix C.

4.2.4 Staging of implementation

Research into cycle share schemes operating internationally shows that most schemes start with a core area covering the city centre. Subsequent phased expansion occurs swiftly afterwards, building on the use already occurring in the initial scheme coverage area.

Staged implementation has a number of advantages:

- mitigation of risk, minimising any losses from getting the scheme design or scale wrong. Where contracts with providers generally include a minimum contract term of five years it is sensible to stage the implementation
- to learn more about user behaviour through scheme use, which can be useful in shaping subsequent stages of the scheme and ensuring the best possible outcomes are achieved
- it enables the opportunity for the scheme to gain public support and momentum while it is still new and then is able to expand based on this momentum.

It is important that each stage of the scheme's expansion is adequately sized to ensure that the scheme is able to meet demand. Unless there is an extremely high degree of latent demand (for example in larger cities such as Paris, New York, and London), schemes introduced on a large scale are likely to take longer to gain momentum.

A staged approach may be right for Auckland, with development of a cycle share scheme for the city centre and fringe taking place in two stages. These stages could parallel the two schemes scoped in this section of the IBC ie a 710 bike scheme, preceded by a smaller scale 370 bike scheme across a reduced coverage area.

The scheme could eventually be expanded even further if desired, to include other more distant areas including Mission Bay and the other Eastern Bays, as well as parts of the North Shore eg Devonport,

Birkenhead, particularly if the linkage with public transport users proves to be strong.

4.3 Options evaluation framework

An evaluation framework has been developed that incorporates the essence of the investment objectives and a number of other criteria considered critical to the success of a cycle share scheme in the Auckland city centre and fringe. There are three categories of evaluation criteria:

- the ability to deliver principal outcomes sought
- the appropriateness of the scheme design and implementation aspects
- the usability and operations of the scheme.

The options evaluation framework is detailed in Figure 21.

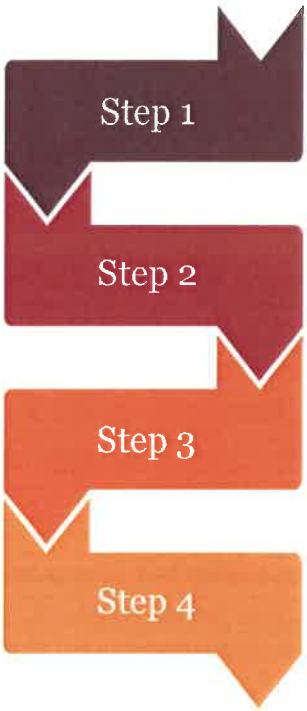
Figure 21: Options evaluation framework

Principal outcomes	Design and implementation	Usability and operations
• Improves the accessibility of cycling in the CBD and city fringes • Reduces the number of short inner city and city fringe trips made by less efficient transport modes, including first and last leg public transport connections • Promotes active lifestyles and improved user health outcomes • Improves the experience of Auckland city among all users (including visitors) • Is accessible to all potential users for a range of trip types • Meets customer expectations now and can easily adapt for future changes • Is capable of providing a quality and sustainable service into the future • Minimises potential reputational risk to Auckland Transport and its partners	• Is appropriate for Auckland's topography • Makes efficient use of public space (including transport space and other public spaces) • Provides potential for enhancing urban outcomes • Is scalable to meet potential future expansion needs • Maximises use of existing cycle infrastructure by increasing cycling rates • Provides opportunity for / incentivises partner involvement • Utilises existing cycle share technology and future proofs for emerging transport technology (including mobility platforms) • Can work well alongside other road users	• Users find the scheme easy and convenient to use e.g. booking, payment, general use • Maximises utilisation of the scheme • Reduces the risk of theft and / or vandalisation of bikes and scheme infrastructure • Reduces the chance of injury or harm to users of the scheme and others e.g. pedestrians • Required operations and maintenance can be delivered with minimal disruption and in a cost effective manner

4.4 Process for identifying and evaluating the cycle share options

A four stage process was used to identify and evaluate the cycle share options. The process is outlined in Figure 22.

Figure 22: Process for identifying and evaluating cycle share options



Evaluate the options around individual scheme elements (e.g. docking approach, bike type etc.) against the evaluation framework. Decide which scheme elements should be discounted and which are possible or even preferred.

Develop appropriate schemes based on the element options. Do this in a logical manner, identifying any constraints that exist and any elements of choice that remain.

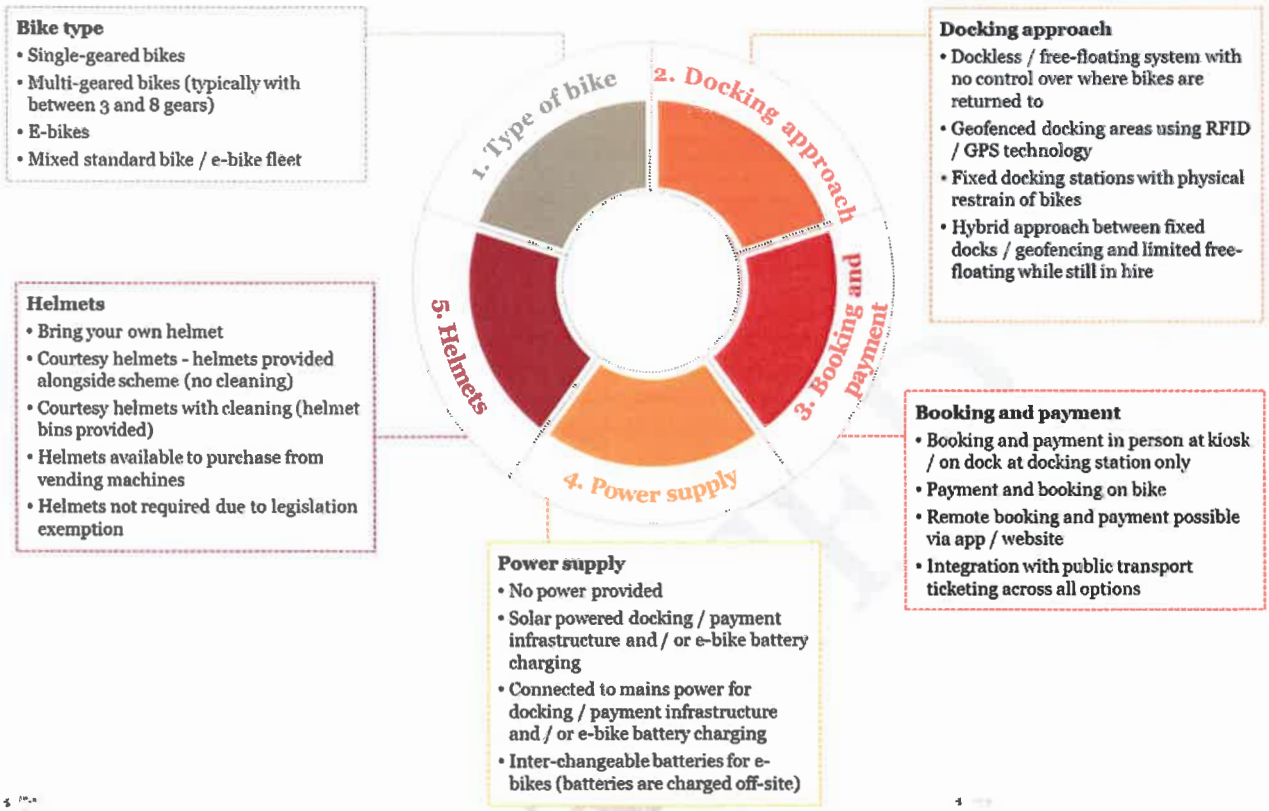
Consider the pros and cons of the overall scheme options as a whole. Quantify the potential costs and benefits of each of the overall scheme options, and attempt to narrow the list of potential options further.

Decide on the possible / preferred overall scheme options to look into further as part of the market RFI.

4.5 Individual element options

The five major elements of a cycle share scheme and the options within each one are shown in Figure 23.

Figure 23: Cycle share scheme element options



There are examples of cycle share schemes around the world that have employed each of these different options around bike type, docking approach etc. Each option has different pros and cons, and these vary across geographies based on a number of factors, including (among other things) city topography, and the appetite of local government stakeholders for free-floating schemes.

4.5.1 Summary of element options evaluation results

A workshop was held in September 2017 to evaluate the scheme element options. This workshop included representation from Auckland Transport, NZTA, and Panuku Development.

Table 10 provides a summary of the results from the element option evaluation. It also states which element options (if any) have been discounted for each element. For a more comprehensive discussion of the main advantages and disadvantages of each element options refer to Appendix D. For the complete evaluation of all element options against the full set of evaluation criteria refer to Appendix E.

Table 10: Summary of evaluation results

Individual element options	Summary of evaluation	Outcome
Bike type	• Single-speed bikes not as suitable for hilly terrain and not used by any of the international schemes that were benchmarked. Use of multi-gear bikes common • E-bikes better for overcoming hills and travelling longer distance, but schemes operating e-bikes generally have 20% greater capital costs for bikes and charging infrastructure, and 20%-30% higher operating costs	Single-gear bikes discounted.

Individual element options	Summary of evaluation	Outcome
	• Mixed fleet of e-bikes and standard bikes possible. Considerations for mixed fleet include where to place e-bike charging infrastructure (if relevant) – either at all or selected docks	
Docking approach	• Dockless schemes becoming more common, as this can significantly reduce the scheme launch and capital costs. • Experience in other cities shows that bikes end up in the streets, water, etc. unless operators are made responsible and monitored closely for performance. Council / Auckland Transport concerned about the reputational risk around perceived failure of the scheme in this regard • Vandalism and theft of bikes common with dockless and geofenced schemes where there is no physical restraint of the bike. The risk and impact of this is greater with e-bikes • Dockless and geofencing schemes more scalable and flexible, however modular and removable infrastructure is possible with docked schemes. This can help minimise the costs of expansion and relocation • Geofencing and docked schemes keep bikes closer to where they are needed eg at public transport hubs. Greater opportunity to provide on-site payment options with these approaches too • Docked approaches provide more security of bikes, and present less risk of bikes becoming 'out of control' in the streets	Dockless approach discounted.
Booking and payment	• Use of 'smart-bikes' where payment and booking technology is on the bike or available through mobile / web application is increasingly common. Booking and payment may be completed either in person at the bike or remotely through mobile / web application • While the main advantage of this is that it enables dockless approaches, it can also provide users convenience by enabling them to reserve a bike in advance and pay via a saved credit / debit card or other account • The ability to pay in person at the bike (or alternatively at a kiosk) will be more convenient for some users, including eg older customers / the less digitally savvy / travellers • A range of booking and payment options may therefore be preferable to ensure accessibility by a wide range of users • Integration with AT HOP card would be useful for some, particularly commuters	Non-'smart-bikes' discounted.
Power supply	• Connection to mains power has additional consenting and implementation requirements, and there is additional effort and cost in relocating docks • Solar power may be enough to operate docking station locks and payment kiosks. International schemes demonstrate that charging of e-bike batteries would require significant solar	All power supply options considered possible.

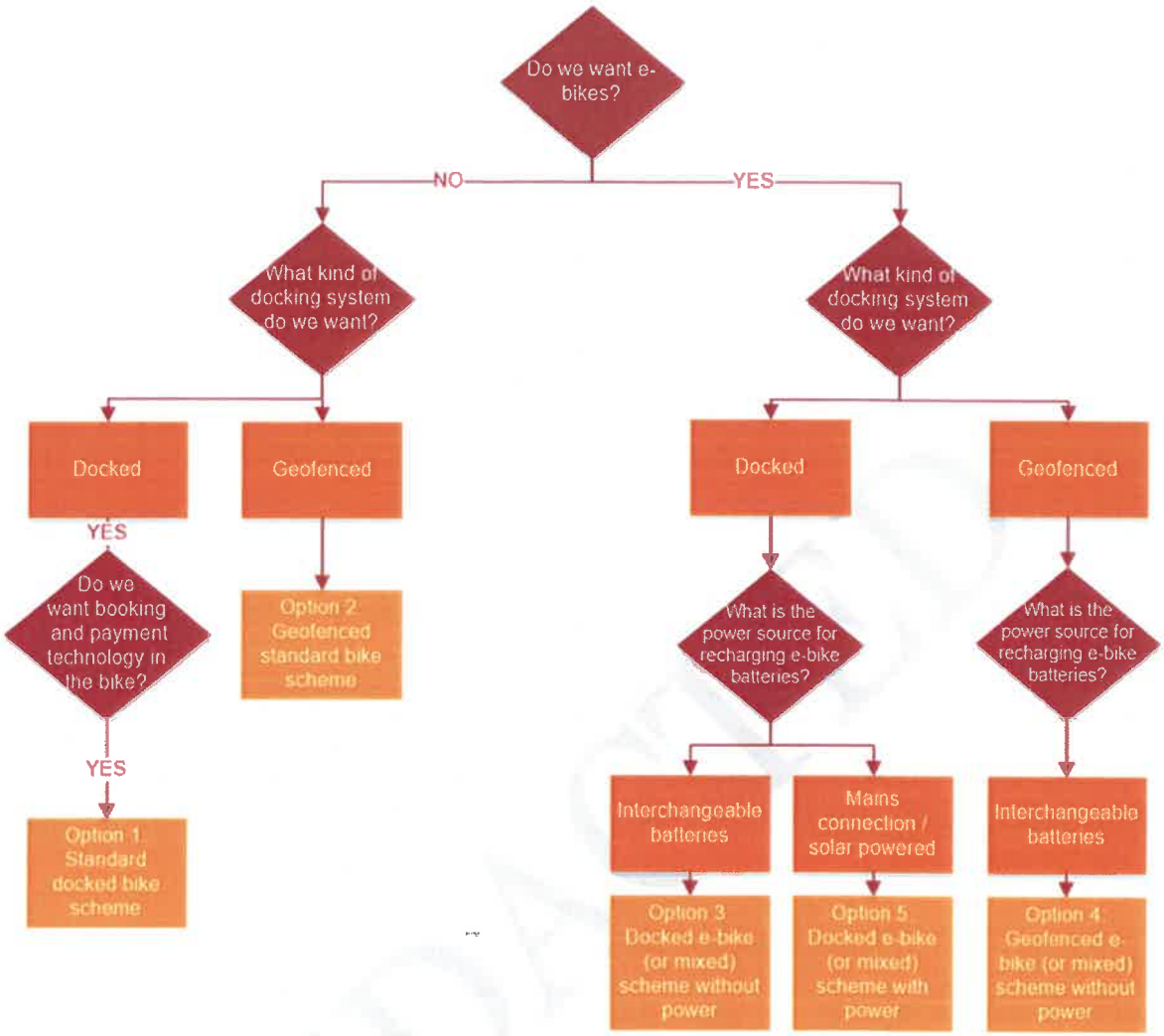
Individual element options	Summary of evaluation	Outcome
	infrastructure. If this was of interest it would require further investigation • E-bike batteries will be interchangeable and charged off-site, instead of providing power on-site at docking stations. Where this is the case it will be important to consider how an appropriate level of service can be maintained • Where e-bikes are not used, and where all payment and booking technology is on the bike, it may be possible to have low tech docking approaches that have minimal / no requirement for mains connection / solar power	
Helmets	• An exemption of the legislation requiring cyclists to wear helmets is not desirable or likely in the near term • The need to bring their own helmet is likely to put potential users off the scheme, impacting uptake • There are options for providing helmets alongside the scheme, either at cost to the user or otherwise • The provision of clean, dry, sterile helmets will be important for some users	Bring your own helmet option discounted.

4.6 Overall scheme options

In this section we combine the different element options into overall scheme options to be taken forward. Element options that have already been discounted are excluded from the scheme options. The scheme options are shown in Figure 24. Examples of each of these overall scheme options can be found in other cycle share schemes operating around the world.

We have not created scheme options that reflect every possible permutation of the element options. We have focused on the major anchor elements: the inclusion or otherwise of e-bikes, the docking approach, and the approach to charging e-bike batteries (where relevant). There are a number of elements such as helmet provision, and the approach to booking and payment that are independent and can apply to any of the scheme options presented.

Figure 24: Formation of overall scheme options based on main scheme element choices



Note about a hybrid docking approach: Across all options listed in Figure 24 there is the possibility of a hybrid approach where users have some flexibility to temporarily park bikes outside of docking stations / geofenced areas while still in hire. For example when using a bike to attend a meeting / appointment in the city.

Table 11 provides a summary of each of these overall scheme options, as well as examples of other schemes around the world that are similar to each option.

Table 11: Description of overall scheme options

Option	Description of option	Other similar schemes
Option 1: Docked 'smart-bike' scheme	The scheme would include standard multi-geared 'smart-bikes', physically restrained at **docking stations** in specific locations. The requirement for power will depend on the design of the docking stations and the choice to include booking and payment options in docks or separate kiosks.	Vancouver Glasgow Portland

Option	Description of option	Other similar schemes
Option 2: Geofenced 'smart-bike' scheme	The scheme would include standard multi-geared 'smart-bikes', which will be located at specific **docking areas**. They will not be physically restrained as with a docked scheme. GPS technology will be used to ensure that bikes are returned to these docking areas after use.	Cologne Portland (although Portland has low tech docking stations)
Option 3: Docked e-bike (or mixed) scheme with interchangeable batteries	The scheme would include either all e-bikes or a mixture of e-bikes and standard multi-geared bikes. All bikes would be 'smart-bikes'. Bikes would be physically restrained at **docking stations** in specific locations. E-bike batteries would be interchangeable and would be charged off-site. A battery changing operation would be required.	Madrid Birmingham
Option 4: Geofenced e-bike (or mixed) scheme with interchangeable batteries	The scheme would include either all e-bikes or a mixture of e-bikes and standard multi-geared bikes. All bikes would be 'smart-bikes'. The bikes will be located at specific **docking areas**. They will not be physically restrained as with a docked scheme. GPS technology will be used to ensure that bikes are returned to these docking areas after use. E-bike batteries would be interchangeable and would be charged off-site. A battery changing operation would be required.	Jump mobility, San Francisco (small scale)
Option 5: Docked e-bike (or mixed) scheme with charging infrastructure at dock	The scheme would include either all e-bikes or a mixture of ebikes and standard multi-geared bikes. All bikes would be 'smart-bikes'. Bikes would be physically restrained at **docking stations** in specific locations. E-bikes would be charged at the docking station, either through connection to mains power or significant solar infrastructure.	Barcelona (mixed) Copenhagen (ebike) Summit County, Utah (e-bike) Lisbon (mixed

For all options, it is expected that bikes will be equipped with GPS to enable users to view bike numbers at each docking station/area and enable better monitoring by the operator. This is different to geofencing which ensures bikes are returned to specific docking areas after use.

4.6.1 Lessons learned from similar schemes around the world

Table 12 provides a summary of learnings from other schemes around the world that are similar to our five overall scheme options for an Auckland cycle share. Both the advantages and disadvantages are discussed.

Table 12: Lessons learned from similar schemes around the world

Option	Description, including any key requirements	Existing schemes with similarities
Option 1: Docked 'smart-bike' scheme	• High impact / visual presence – sense of permanence • Bikes are less susceptible to theft and vandalism • Bikes are kept under control and not left where they are not meant to be • Less reputational risk to local authority than a geofenced or dockless approach	• Not as suitable as e-bikes for hilly terrain • Issues experienced with users unable to return bikes to full docking stations • Bike rebalancing critical, especially where there is high commuter flow • Consenting required for docking stations and mains connection where required • Use of docking stations means greater upfront capital costs compared with geofencing / dockless approaches
Option 2: Geofenced 'smart-bike' scheme	• Easier to relocate docking areas • Lower upfront capital costs as no need to purchase docking stations • Potentially reduced permitting requirements • Cheaper and easier to scale than a docked approach • Bikes are kept mostly under control and not where they are not meant to be	• Not as suitable as e-bikes for hilly terrain • Bikes prone to theft and vandalism as they are not physically restrained • Must be enough space in docking areas to return bikes to • Still the risk that bikes are piled up in a docking area / left elsewhere if docking areas are crowded
Option 3: Docked e-bike or mixed) scheme with interchangeable batteries	• Same as Option 1, plus: • E-bikes useful in hilly terrain. Also allow for longer distance trips • Inclusion of e-bikes attracts a broader range of customers, stimulating demand • 'Cool factor' may help to stimulate demand on launch	• Same as Option 1, plus: • 20% higher capital costs associated with e-bike schemes • 20%-30% higher operational costs associated with e-bike schemes • In a mixed scheme, it would be impractical to restrict e-bikes to specific areas where they would have the greatest benefit (hire and return of bicycles would be too complicated for customers) • Less cost to relocate docking stations at a future date than an e-bike scheme with power infrastructure • Would require someone to collect, recharge, and redeploy batteries • Risk to service levels if battery recharging operation is not efficient
Option 4: Geofenced e-bike (or mixed) scheme with interchangeable batteries	• Same as Option 2, plus: • E-bikes useful in hilly terrain. Also allow for longer distance trips • Inclusion of e-bikes attracts a broader range of customers, stimulating demand	• Same as Option 2, plus: • 20% higher capital costs associated with e-bike schemes • 20%-30% higher operational costs associated with e-bike schemes • In a mixed scheme, it would be impractical to restrict e-bikes to

Option	Description, including any key requirements	Existing schemes with similarities
	• 'Cool factor' may help to stimulate demand on launch	specific areas where they would have the greatest
Option 5: Docked e-bike (or mixed) scheme with charging infrastructure at dock	• Same as Option 1, plus: • E-bikes useful in hilly terrain. Also allow for longer distance trips • Inclusion of e-bikes attracts a broader range of customers, stimulating demand • 'Cool factor' may help to stimulate demand on launch	• Same as Option 1, plus: • 20% higher capital costs associated with e-bike schemes • 20%-30% higher operational costs associated with e-bike schemes • In a mixed scheme, it would be impractical to restrict e-bikes to specific areas where they would have the greatest benefit (hire and return of bicycles would be too complicated for customers) • Less cost to relocate docking stations at a future date than an e-bike scheme with power infrastructure

4.6.2 Dockless (free-floating) cycle share schemes

There has been a rise in the popularity of dockless schemes due to reduced capital and launch costs, and easier access for users. In many cities around the world, dockless cycle share schemes have been implemented, often by private operators with no local authority involvement.

However, a number of serious issues have been encountered with these schemes, and this model is not preferred for Auckland. Issues include:

- The schemes can appear cluttered or messy due to no physical docking station or areas. Some schemes have experienced major issues with bikes piled up in the streets, on the footpaths, and outside major trip destinations eg public transport hubs.
- The bikes are prone to vandalism and theft due to there being no need to return them safely to a docking station or area.
- There is also often no restriction on where bikes can be taken, resulting in many bikes ending up far outside the city centre. Many of these bikes are lost and never recovered. Where this occurs the benefit of dockless schemes being more accessible for users is undone, as the ability to reliably find a bike reduces.

OnzO Bikes began operations in Auckland at the end of 2017. OnzO Bikes is a dockless cycle share scheme, which has deployed several hundred bikes on to the streets of Auckland. [redacted]

When OnzO Bikes first launched there was no notification to Auckland Transport and the scheme was not licensed. Auckland Transport has now completed an initial code of practice for dockless operators including OnzO Bikes, which operators must abide by in order to gain and keep a licence to operate. The code of practice includes rules aimed at maintaining an orderly scheme and avoiding the issues described above (among others).

Auckland Transport has indicated that it will continue to work with OnzO Bikes and any other dockless scheme operators, to ensure that these schemes meet the basic requirements. This may be a valuable way of collecting more information about user behaviours and other learnings regarding cycle share. However, with regards to a cycle share scheme developed by Auckland Transport itself, a dockless scheme is not preferred,

and is discounted from further consideration. Such dockless schemes do not align with the risk profile of Auckland Transport, and are not likely to meet the overall needs of users in the same way that a docked or geofenced scheme would.

4.7 Scheme options costing

For cycle share planning purposes, costs are often estimated using per bike figures. There is significant variance in the capital and operating costs of cycle share schemes currently operating worldwide. The docking approach, inclusion or otherwise of e-bikes, and the booking and payment technology systems used are some of the main drivers of cost. Schemes in other cities have cost in the range of NZ$5,000-$10,000 per bike to procure equipment and launch the scheme. Annual operating costs are in the range of NZ$1,000-$5,000 per bike, depending on scheme design.

4.7.1 Key cost components of cycle share

The level of costs vary significantly from system to system and evolve as the bike share industry and its market evolves. Implementation of and operating costs of cycle share can be categorised into the following four categories:

Launch costs

These are mostly one-off start-up costs, some of which recur during expansion phases. Launch costs include items such as hiring employees, procuring a storage warehouse, purchasing bike and station assembly tools, consenting and dock installation, website development, communications and IT set-up, and pre-launch marketing.

Launch costs vary significantly between cycle share schemes. Some small dockless schemes, which have become more popular in some jurisdictions in recent years, can be quick to set-up and have virtually no launch costs.

E-bike schemes typically incur higher launch costs due to the additional battery charging requirements of e-bikes, particularly where e-bikes will be charged through mains power infrastructure.

Capital costs

These include procurement of stations, transaction kiosks, map frame panels, bikes, and docks (or bike racks). Equipment costs will vary depending on system type and a variety of other factors related to equipment specifications.

Docked schemes involving physical restraint of the bike have higher capital costs than dockless systems, especially where mains power connection or any foundation works are required. Additional costs will be incurred where booking and payment infrastructure are incorporated into the bike docks or into a separate kiosk on-site.

The capital costs of e-bike schemes are typically 20% greater than standard bikes, due to the higher costs of e-bikes, and the need for power infrastructure to recharge e-bike batteries.

Administrative costs

Administrative costs to launch a scheme typically include recruitment and remuneration of development staff. Costs will vary depending on the scale and complexity of the scheme, and are calculated here as 10% of capital costs.

Ongoing operating costs

Operating costs will vary depending the nature and level of service provided by the operator (governed by the Service Level Agreement with the local authority). This will be a function of (among other things):

- **Bike rebalancing:** This is typically the largest operating costs for docked cycle share systems. Most cities levy a fine on the operator after stations have been empty or full for a certain amount of time,

which could range from 30 minutes to two hours. The shorter the time period, the more resources the operator needs to spend on bicycle rebalancing.

- **Bicycle and station maintenance protocols:** Some agreements will stipulate bikes to be checked once a week, others once a month. This is also true for stations, but typically with a longer time frame.
- **Percent of the system fleet in operation:** Most contracts will have a requirement that the operator keep a certain minimum number of bikes available for use at all times.
- **Customer service:** Most contracts indicate the maximum amount of time that customers are expected to wait on the phone, with the threat of fines for the operators if waits are long. Also, some operators may need to provide more-constant customer updates via text or on web site than others.
- **Station cleanliness:** The response times for rubbish and graffiti removal.

Other issues not related to service-level agreements that can significantly impact operating costs include:

- **Climate:** Whether the equipment is used on snowy/icy roads, esp. in areas that use rock salt and sand. This is not expected to be an issue in Auckland.
- **Commuter rebalancing requirements:** Systems in large cities with dense business districts experience greater peaks in demand during major commuting periods. System operators spend a lot more time and money rebalancing bikes to meet demand during these periods compared to smaller cities that may rely on a higher percent of trips that are recreational/discretionary and therefore more likely to occur on weekends and off peak.
- **System equity:** Systems which give high priority to placing stations in lower income and minority neighbourhoods typically spread their systems out.

E-bike operating costs

Operating costs for e-bike schemes are 20%-30% higher than total operating costs for standard bikes. An international pilot project using dockless e-bikes found that the operational costs of battery changing (and off-site charging) were less than charging e-bikes at docking stations. A few reasons were given for this:

- The job of changing the e-bike batteries is incorporated into the task of rebalancing, and the impact is marginal. The action has been reduced to under 1 minute for each change. Software is available that notifies operators of the battery level.
- The systems that use dock-charged e-bikes have had a number of difficulties, including:
  - the strength of the charge from solar-powered vs hard-wired stations
  - the need to move bikes around to get them to a high-charge station with the necessary regularity to stay charged
  - having batteries die on bikes, and the associated costs of retrieving the bikes and handling the associated maintenance / customer service.

Other one-off costs

Potential one-off costs can include relocation of docking stations. This can be an expensive exercise. [redacted]

Many modern cycle share schemes have modular and flexible docking station designs with minimal foundations works and are solar powered. These can be moved easily and at lower cost compared to others. We have not assumed any costs of station relocation in our analysis as relocation requirements are unknown.

4.7.2 Scheme design choices costed

We have costed each of the options as per the specifications outlined in Table 13. Options 3, 4, and 5 are assumed to include 50% 'smart-bikes" and 50% e-bikes.

Table 13: Overview of the components of each scheme option

Option name	Bike fleet	Docking approach	Booking and payment technology	Power supply for docking (and booking and payment systems if applicable)	Power supply for e-bike charging
Option 1: Docked 'smart-bike' scheme	All standard smart-bikes (no e-bikes)	Physical restraint of bike at dock	On bike	No power supply required for this purpose	Not applicable
Option 2: Geofenced 'smart-bike' scheme	All standard smart-bikes (no e-bikes)	Geofenced docking area created using GPS technology	On bike / in dock / at kiosk (likely modular)	Mains power on site / solar on site (if required – payment could be on bike)	Not applicable
Option 3: Docked 'smart-bike' scheme with 50% e-bikes with interchange-able batteries	50% smart-bikes / 50% e-bikes	Physical restraint of bike at dock	On bike / in dock / at kiosk	Mains power on site / solar on site (if required – payment could be on bike)	Off-site charging of interchangeable batteries
Option 4: Geofenced 'smart-bike' scheme with 50% e-bikes with interchange-able batteries	50% smart-bikes / 50% e-bikes	Geofenced docking area created using GPS technology	On bike / in dock / at kiosk (likely modular)	Mains power on site / solar on site (if required – payment could be on bike)	Off-site charging of interchangeable batteries
Option 5: Docked 'smart-bike' scheme with 50% e-bikes and charging infrastructure at dock	50% smart-bikes / 50% e-bikes	Physical restraint of bike at dock	On bike / in dock / at kiosk	Mains power on site / solar on site (if required – payment could be on bike)	Mains power on site / solar on site (in each case the same approach as used to power booking and payment technology

4.7.3 Summary of the costs of the options

Table 14 summarises the costs of the options. These have been developed in consultation with Alta Planning and Design, a transport planning and design consultancy in the United States, with specialist expertise in cycle share and prior experience operating cycle share schemes.

Table 14: Summary of the costs of the options per bike (2017 prices)

Option	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	Docked 'smart-bike' scheme	Geofenced scheme	Docked 'smart-bike' scheme with 50% e-bikes / batteries	Geofenced 'smart-bike' scheme with 50% e-bikes / batteries	Docked 'smart-bike' scheme with 50% e-bikes / charging at dock
Launch costs (NZ$ / per bike)	1,111	556 - 1,111	1,111 - 1,667	556 - 1,111	1,667 - 2,222
Procurement of bikes and equipment (NZ$ / bike)	2,222 - 5,278	1,528 - 2,778	2,569 - 5,764	2,014 - 4,167	3,472 - 5,833
Administrative costs / overheads (NZ$ / bike)	222 – 528	153 - 278	257 - 576	201 - 417	347 - 583
Costs of operating the scheme (NZ$ / bike / per annum)	1,944 - 3,472	1,944 - 3,472	2,083 - 3,993	2,083 - 3,993	2,639 - 3,993

Source: Costs from Alta Planning and Design LLC[50]

50 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

4.7.4 Total cycle share costs based on proposed scheme scale

The costs per bike for each option in Table 14 have been multiplied out by the proposed scheme size of approximately 710 bikes, to arrive at the figures in Table 15 and Table 16. Note that the costs have also been inflated to 2019 prices to reflect the proposed timing of implementation and operating the cycle share scheme by early 2019.

Table 15: Summary of the total upfront costs of the options - 710 bike scheme (2019 prices)

Upfront costs	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	**Docked 'smart-bike' scheme**	**Geofenced scheme**	**Docked 'smart-bike' scheme with 50% e-bikes / batteries**	**Geofenced 'smart-bike' scheme with 50% e-bikes / batteries**	**Docked 'smart-bike' scheme with 50% e-bikes / charging at dock**
Total launch costs (NZ$)	0.8m	0.4m - 0.8m	0.8m - 1.2m	0.4m - 0.8m	1.2m - 1.6m
Total capital costs (NZ$)	1.6m - 3.9m	1.1m - 2.0m	1.9m - 4.3m	1.5m - 3.0m	2.6m - 4.3m
Total administrative costs (NZ$)	0.2m - 0.4m	0.1m - 0.2m	0.2m - 0.4m	0.1m - 0.3m	0.3m- 0.4m
Total upfront costs (NZ$)	**2.6m - 5.1m**	**1.7m - 3.1m**	**2.9m - 5.9m**	**2.0m - 4.2m**	**3.9m- 6.4m**

Source: Costs from Alta Planning and Design LLC[51]; PwC analysis

Table 16: Summary of the annual ongoing costs of the options - 710 bike scheme (2020 prices)

Ongoing costs	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	**Docked 'smart-bike' scheme**	**Geofenced scheme**	**Docked 'smart-bike' scheme with 50% e-bikes / batteries**	**Geofenced 'smart-bike' scheme with 50% e-bikes / batteries**	**Docked 'smart-bike' scheme with 50% e-bikes / charging at dock**
Total operating costs (NZ$ / per annum) ongoing	1.4m - 2.6m	1.4m - 2.6m	1.5m - 3.0m	1.5m - 3.0m	2.0m - 3.0m

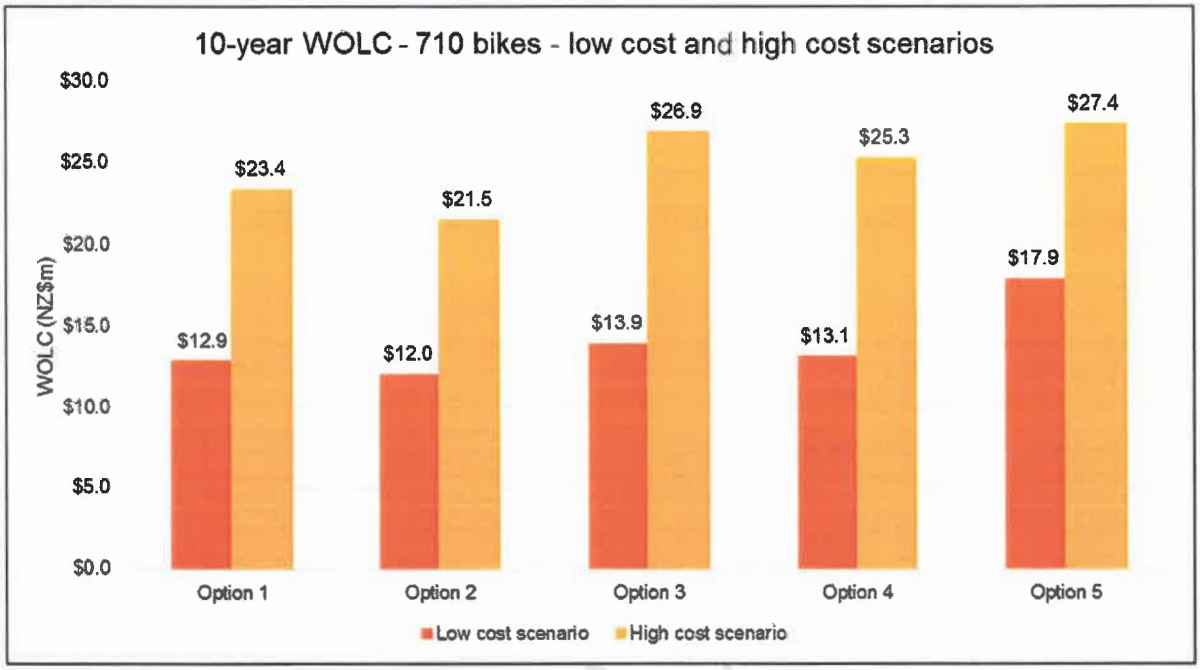
Source: Costs from Alta Planning and Design LLC[52]; PwC analysis

51 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

52 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

Based on the figures in the tables above the whole of life cost (WOLC) of each of the options has been calculated as shown in Figure 25, over a 10 year operation period. Note that the cost of any capital upgrades or renewals is not included in this WOLC analysis.

Figure 25: WOLC of options over 10 years (10 years of operations, with set-up in year 1; present value calculation with 8% discount rate)



Source: Costs from Alta Planning and Design LLC[53]; PwC analysis

4.8 Comparison with the results of recent RFI

Auckland Transport recently ran an RFI with potential cycle share vendors for a cycle share in Auckland. Not all respondents provided cost information. For those that did the capital and operating costs per bike were calculated. The range across all responses is shown in Table 17.

Table 17: Ranges for cost estimates per bike received through RFI

[redacted]

53 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

[redacted]

4.9 Economic benefits of cycle share

The expected economic benefits from a transport perspective have been quantified using a methodology consistent with NZTA's Economic Evaluation Manual (EEM). The transport benefits as defined in the EEM are:

- travel time savings
- health benefits from cycling.

There are also some potential benefits that relate to the following categories, however these are expected to be minor and have not been quantified:

- travel time reliability (when compared to travel by public transport or private vehicle/taxi)
- emission reductions associated with less car travel in the city centre.

The primary driver of economic benefits is the number of trips made by cycle share. The analysis is based on the following estimated annual trips:

- **1.17m trips** for a scheme consisting of standard 'smart' bikes (ie no e-bikes)
- **1.46m trips** for a scheme consisting of 50% e-bikes, reflecting the higher expected uptake.

4.9.1 Assumptions

In order to estimate the benefits, a number of assumptions have had to be made that relate to the following aspects as shown in Table 18.

Table 18 Input assumptions for economic assessment

Assumption	Values	Notes
How the trips would have otherwise been made	Walking – 50% Public transport – 20% Car/taxi etc – 20% New trips – 10%	We assume that most trips the cycle share is replacing would otherwise be made on foot. We make an allowance for a small portion of trips that are new and would otherwise have not been made.
Split of trip purposes	Work trips (eg meetings) – 5% Commuting – 40% Other – 55%	Used to determine the appropriate value of time in the EEM It is expected that work trips make up a low proportion of cycle share trips
Average trip length undertaken by cycle share bike	Average trip length of 1.25km	Minimum trip distance likely to be ~500m. Maximum trip distance likely to be ~3km. A maximum trip distance of 2km used to determine an average to reflect the likely bias towards shorter trips
The speed of walking, cycling and other	Walking – 5kph (12 mins/km)	No distinction has been made between standard bikes and e-bikes in terms of

Assumption	Values	Notes
modes in the city centre	Cycling – 15kph Public transport – 10kph Car/taxi etc – 15kph	average speed. For the motorised modes, this reflects the nature of the city centre, with closely spaced signalised intersections and a portion of walking at each end of the trip (ie it's not possible to go door to door in a vehicle). For the public transport speed this also allows for waiting/transfer time.
Annual growth in usage	2%	Assumption

Source: PwC analysis

4.9.2 Travel time savings

People consider the time it will take them as part of their travel choice, although this is not the only factor they consider. Cycle share would provide a more efficient method of travel for many people making short trips in and around the city centre and fringe, across a variety of trip purposes.

No benefits accrue to new trips, or those that we assume are currently being made by private vehicle. In relation to private vehicle trips, this is likely to be slightly conservative.

Table 19 summarises the value of time used in the analysis.

Table 19 Travel time value

Trip purpose	Value of time ($/hr)	Source
Work	$23.85	EEM Table A4.1(b)
Commuting	$7.80	EEM Table A4.1(b)
Other	$6.90	EEM Table A4.1(b)
Composite	$8.11	Applying the values above with the trip purpose split assumption from Table 18 and updating to 2017 prices using the EEM update factor of 1.47.

Source: EEM, PwC analysis

Based on the assumptions in Table 18 relating to average trip length and speed, the proportions of how trips would have otherwise been made, and the composite value of time of $11.92 per hour, the annual travel time benefit is estimated to be $1.45m for the standard bike scenario or $1.6m for the e-bike scenario, reflecting higher estimated usage. 90% of these benefits accrue to those people who otherwise would have walked.

4.9.3 Health benefits

Health benefits accrue to people who are making their trip by active mode (walking or cycling), who would otherwise travel by other means (eg car or public transport). Cycle share therefore presents a real opportunity to generate economic benefits associated with heath improvements.

The EEM defines a benefit of $1.73 / km for cycling (compared to $3.21 / km for walking).[54]

To determine the overall benefit, we have applied this benefit to all those trips made that we assume would otherwise have been made by motorised transport as well as the new trips. With an average trip of 1.25km, this generates approximately $1.3m or $1.6m of annual benefits for the standard bike and e-bike options respectively.

However, as we assume that a significant portion of the new cycle share trips would have otherwise been made by walking, we account for the difference in the value of those trips from a health perspective. As walking has a higher value per km, this means that there is an overall dis-benefit of $1.1m or $1.4m (for the standard bikes and e-bike scenario respectively) due to trips that would have been made on foot, now being made by bike. This is on the premise that walking requires more energy and is 'better for you' than cycling, over the same distance.

Taking the benefits from the new and motorised trips that are attracted to cycle share along with the dis-benefits from the walking trips creates a net health benefit of $173,000 or $217,000 per year for the standard bikes and e-bike scenario respectively.

4.9.4 Benefit summary

The estimated economic benefits for the two scenarios are summarised in Table 20.

Table 20 Annual transport economic benefits

Benefit	Standard bike scenario Estimate (2017 prices)	E-bike scenario Estimate (2017 prices)
Travel time savings	$1.28m	$1.59m
Health benefits	$0.18m	$0.22m
Total	$1.45m	$1.81m

Source: PwC analysis

The total benefits are summarised in Table 21 over the standard EEM evaluation period of 40 years. They are shown undiscounted, and discounted with a 6% discount rate (standard EEM discount rate) applied to show the net present value (NPV) of the benefits.

Table 21 Total transport economic benefits

Benefit	Standard bike scenario Estimate (2017 prices)	E-bike scenario Estimate (2017 prices)
Undiscounted	$84.4m	$105.5m
Discounted (NPV)	$28.2m	$35.2m

Source: PwC analysis

4.9.5 Benefit cost analysis

We have undertaken a benefit cost analysis across the range of scenarios relating to the costs (lower and upper range for capital and operating costs) and the benefits (standard bike or e-bikes) to understand the range of benefit cost ratios (BCRs) that the cycle share scheme is likely to deliver. The results are summarised in Table 22.

54 EEM, Section A20.3, updated to 2017 prices using the EEM update factor of 1.19

We have allowed for a capital renewal cycle (bikes, docking stations etc) every 10 years, adopting the same costs for those components (approximately 66% of the total capital cost), to reflect the need to renew the scheme over the 40 year evaluation period.

We have shown the BCR with and without the estimated user revenue, which itself is also estimated within a range (discussed further in Section 6.2). When included, this is applied to offset the operating costs. In the low cost scenario there is a net surplus when the user revenue is included (ie the scheme is more than paying for itself) and the BCR is not applicable.

Table 22 BCR summary

Benefit	BCR (excluding user revenue)	BCR (including user revenue)
Standard bikes (Options 1,2)	0.6 (high costs) – 1.2 (low costs)	0.9 (high costs) upwards
E-bikes (Options 3,4,5)	0.7 (high costs) – 1.4 (low costs)	1.0 (high costs) upwards

Source: PwC analysis

The BCR is sensitive to the costs, but even when user revenue is excluded, it is feasible that a BCR of 1 can be achieved. When only the net costs are used (ie user revenue is included) the BCR for both the standard bike or e-bike scenario is around 1 even with costs at the high end of the expected range.

The analysis suggests that the additional costs associated with the e-bike scenario are offset by the ability to generate sufficient additional usage, and therefore the associated benefits and user revenue that go with the usage. This gives confidence that if the expected usage uplift occurs, then the additional investment will be worthwhile.

5 Commercial case

This section provides a summary of common cycle share operating and commercial models. It also describes potential sponsorship and advertising opportunities, and summarises lessons learned from other international schemes with respect to vendor contracting and performance management. Finally, it also provides some insight on the level of market interest and capability to deliver the proposed cycle share scheme, and proposes procurement approaches and next steps.

5.1 Common operating and commercial models for cycle share

A review of international cycle share schemes undertaken as part of this IBC shows that development of schemes is often undertaken as a partnership between local authorities and a cycle share operator. By leading the development of cycle share through a structured procurement process, local authorities are in a better position to influence the scheme design and deliver maximum benefits to ratepayers.

In many international cities there are also schemes that have been developed by operators in the absence of consultation with local authorities. Such schemes are typically dockless (no physical docking or payment infrastructure is required) and have very little involvement if any from local authorities. The recent introduction of OnzO Bikes in Auckland is a good example of such a scheme. While local regulations often apply to how these schemes are supposed to operate, local authorities have less control over the cycle share design.

Further research undertaken with a short-list of international cycle share schemes has revealed a wide range of operating and commercial models. Table 23 provides a summary of the responsibilities of the operator and local authority under these different operating and commercial models.

Table 23: Summary of responsibilities under different operating and commercial models

Aspect of scheme	Summary of models observed
Who owns the cycle share docking infrastructure and is responsible for its maintenance and replacement as needed	• Typically for docked cycle share schemes, the docking infrastructure is implemented and owned by the local authority • It can be more efficient for local authorities to lead the process of gaining consents for docking infrastructure, and implementing this • Ownership of the docking infrastructure also means that it is easier for the local authority to retender for a new operator if the current vendor isn't performing • Dockless (or geofenced) schemes often do not require significant docking infrastructure
Who owns the bikes and is responsible for their maintenance and replacement as needed	• A number of models exist • In some cases the local authority owns the bikes and is responsible for their maintenance and replacement. The local authority may or may not charge the operator a fee for the use of the bikes • In other cases the bikes are provided entirely by the cycle share operator. Where bikes are owned by the cycle share operator, ownership often reverts to the local authority at the end of the contract period

Aspect of scheme	Summary of models observed
Who is responsible for day-to-day operation of the scheme eg bike retrieval, rebalancing, helmet cleaning, customer service and troubleshooting	• In all schemes reviewed the local authority does not manage the day-to-day operations of the cycle share scheme • A cycle share operator is contracted to operate the cycle share scheme • In some cases the local authority may prescribe that the cycle share operator partner with another party eg a charitable organisation to manage some aspects of the scheme operation
Who owns the booking and payment system and is responsible for its operation and upgrades	• Often the cycle share operator will bring a proprietary booking and payment system, that is integrated with the booking and payment hardware on the bikes • Where integration with existing systems owned by the local authority is required eg with public transport travel information and payment systems, then cooperation between the operator and local authority is required to implement this • Where cash payment options are required, the payment infrastructure to support this is often owned by the local authority
Who determines the user pricing	• The local authority will normally retain the ability to influence user pricing for the scheme • Typically the pricing is agreed between the operator and the local authority, and is reviewed at regular intervals
How profit and risk sharing between the parties is determined	• A wide range of models exist, with each commercial arrangement tailored to reflect the negotiations between local authorities and cycle share operators • In some cases 100% of user revenue is collected by the operator; in other cases revenue is collected and shared between local authority and operator according to a predetermined formula • In other cases the local authority collects all user revenue and pays a fee to the operator to operate the cycle share scheme • Securing sponsorship may be the responsibility of the operator or the local authority, however at a minimum the local authority often sets guidelines for sponsorship arrangements

5.2 Cycle share sponsorship and advertising

5.2.1 Sponsorship and advertising opportunities

Cycle share presents a number of unique opportunities for sponsorship and advertising. These include:

- sponsorship from Universities and workplaces for example, who are interested in their students / workers using the scheme. They might provide upfront funding and / or space for a docking station on their premises. They may also consider contributing to a portion of the scheme's operating costs
- sponsorship from corporate sponsors that want to be associated with the cycle share initiative eg because it promotes cycling, environmental friendliness, health and fitness, and urban lifestyle. Cycle organisations, power companies, and health and fitness organisations are potential candidates, but there are many others
- opportunities for organisations to advertise their goods and services. These need to align with Auckland Transport advertising rules and should not negatively impact on the cycle share scheme in any way.

The ability to maximise potential sponsorship and associated revenue will be impacted by how marketable the scheme is to potential sponsors, ie a landscape where the cycle share scheme on offer is exclusive or clearly differentiated is a much greater proposition than one where competitors (such as dockless schemes) are also able to operate.

5.2.2 Sponsorship motivation

Further research undertaken with a short-list of international cycle share schemes shows that interest in cycle share sponsorship often arises:

- where access to public advertising space is limited
- from private sponsors seeking to build or rehabilitate their image
- from healthcare companies who want to be seen to be getting people active
- from companies that see alignment for a value elevation opportunity.

These cases for sponsorship positioning / motivation and advertising opportunities will be applicable to New Zealand.

5.2.3 Sponsorship offer

There is the potential for a lead naming sponsor and a healthcare and/or digital sponsor. It should be possible to offer full bike (a cycle wrap similar to the Nike example in Portland) to the lead sponsor. There would also ideally be some advertising opportunity at the station as well as sponsor acknowledgement through digital and print mediums used to promote the scheme including website, app, and social media channels.

The added advantage of a clear 'future of energy' message could also be helpful to achieve competitive sponsor interest and higher level of sponsor investment. Dockless schemes such as OnzO Bikes risk reducing the value of the sponsorship offering as cycle share becomes less unique.

5.2.4 Potential sponsorship approach

In the New Zealand market, the ability of one brand sponsor to achieve the total desired level of sponsorship investment may be a challenge. The creation of a compatible group of sponsors may be required, which does not detract from the marketing value for the title sponsor but achieves the required outcomes for other funding partners.

For example, to optimise funding levels, the final sponsor solution may see a philanthropic funder supporting a not-for-profit social enterprise as the bike re-distributer / bike mechanic employer and trainer.[55]

The brand sponsor will normally seek to achieve a clear positioning message, examples of which could range from health-related sponsor promoting key health messages in conjunction with and via the cycle share scheme, to a digital partner promoting their technology.

Any sponsors secured must be consistent with Auckland Council policy, for example, no tobacco, alcohol or high sugar companies. Similarly, city centre cycle share sponsors cannot be in conflict with any relevant Auckland Council Group sponsor obligations and must be desirably compatible with wider sponsorship strategies for associated cycle ways initiatives and the wider city centre area.

Some tender respondents may also be able to leverage other assets / opportunities, which add value to the offer for sponsors / funders, such as spare advertising stock, or access through co-marketing initiatives to an expanded customer database.

5.3 Key contractual considerations – learnings from international schemes

The research undertaken looked at key considerations in contracting. Table 24 provides a summary of the findings. It also includes some comments on each of these based on responses received through the recent RFI for an Auckland-based cycle share scheme where applicable.

Table 24: Key contractual considerations

Aspect of contract	Key considerations	Comments from vendors who responded to the RFI
Contract term	• The initial term for cycle share schemes considered ranged from five to nine years, with a range of renewal options typically in blocks of one to three additional years • Auckland could consider an initial term of five years, with a renewal option	• [redacted]
Flexibility in start-up period	• The second time the Vancouver scheme launched, the local authority provided greater flexibility in the start-up period, and worked closely with the vendor to make things work. This resulted in success, where prior attempts had failed. • Similarly, for Auckland, following feedback from the RFI process, there is need to consider what flexibility may be needed during the initial stages of the contract.	• Not applicable – not discussed with vendors through RFI

55 While this model has been shown to be successful elsewhere, a mixed response was received from respondents to the recent RFI run in Auckland. Where there was concern it was primarily around potential misalignment of organisational culture and performance expectations, which could lead to unwanted tension in a commercial arrangement.

Aspect of contract	Key considerations	Comments from vendors who responded to the RFI
Scope of services	• The contract needs to cover all cycle share operations eg contact centre, redistribution of bikes, maintenance, cleaning, marketing, reporting, etc. • Should also cover purchase and implementation of capital infrastructure, and renewals • International schemes have 24 hour / 7 day support for customers	• [redacted]
User pricing	• Contract needs to ensure that Auckland Transport has input into pricing policies / parameters in consultation with the operator	• [redacted]
Scheme expansion	• There should be provisions in the contract around scheme expansion, including responsibilities and prices for expansion	• Not applicable – not discussed with vendors through RFI
Performance	• There should be clear KPIs around how performance is measured • This may include incentives and penalties for over / under-delivery	• Not applicable – not discussed with vendors through RFI
Local presence	• Include the requirement for all aspects of the operation to be managed through a local presence in New Zealand • This is relevant to international operators only	• Not applicable – not discussed with vendors through RFI
Incident management / dispute resolution	• Need good incident management / make-safe provisions in contract	• Not applicable – not discussed with vendors through RFI
Performance reporting	• Be very clear about the type of reporting portal required – for both the overall scheme and revenue • In particular, ensure a business intelligence type of tool is adopted to support bespoke reporting on the scheme	• Not applicable – not discussed with vendors through RFI

Aspect of contract	Key considerations	Comments from vendors who responded to the RFI
Costs of infrastructure management	• For installing stations, the contract needs to be clear about liability for costs eg small traffic islands, kerb work, signage, services relocation, or road signage requirements • Also need to be clear on where liability rests for any station relocation	• Not applicable – not discussed with vendors through RFI
Signposting of scheme	• Requirements for wayfinding signage (to stations) and instructional signage (at stations) is helpful to minimise customer confusion and maximise usage	• Not applicable – not discussed with vendors through RFI

5.4 Key performance indicators

The contractual Key Performance Indicators (KPIs) will be important to drive performance. Interviews with local authorities and scheme operators identified that KPIs should be included in the following areas:

- patronage growth (with possible pain / gain share) – if not included, this could disincentivise a vendor from growing the scheme
- customer satisfaction, with clear repercussions / rectification requirements if KPI is not met. Include provision for the vendor to pay for annual customer surveys, but ensure that Auckland Transport has approval rights on all survey questions and scoring methodology
- need good hurdle rates on patronage and revenue, so that Auckland Transport has exit flexibility.

5.5 Market capability and interest

5.5.1 Internationally

The research undertaken with a short-list of international cycle share schemes found that for some cities that had implemented a cycle share scheme, there was often an initial lack of operator financial capacity when the city had first gone to market. The operator market locally was often in its infancy and although the operator may have had the local license for an international bike supply and operating system, it was often a separate company with potentially limited financial capacity and consequent ability to invest, generate cash flow and / or tolerate financial risk. From potential operator interviews, this may also be the case for Auckland.

It will be important to pro-actively seek interest from established players throughout the procurement process, to assist in developing interest and ensuring a robust and competitive choice in the final tender process. There may also be a need to encourage parties to form consortiums to address weaknesses including cycle share experience, technology solutions, station provision and / or financial capacity.

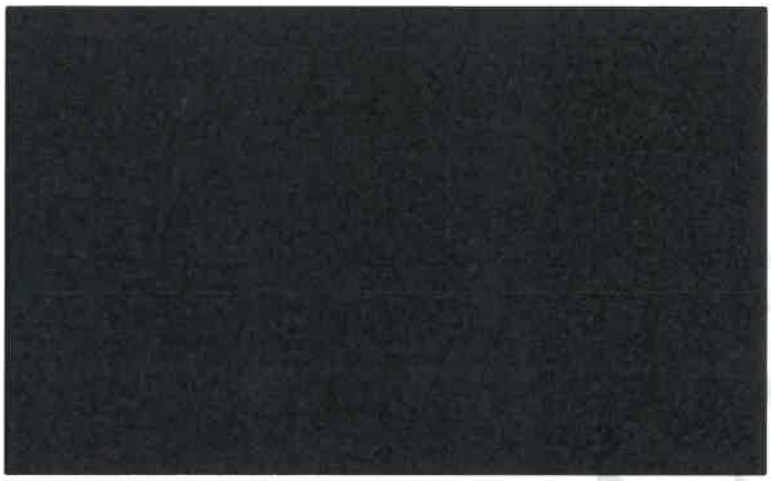
5.5.2 Request for Information in Auckland market

To investigate operator capability and interest in the Auckland market, Auckland Transport ran a Request for Information (RFI) process. The RFI was released on 12 December 2017 and submissions closed on 19 January 2018.

The RFI invited potential operators to provide an overview of their proposed solution, and requested information in the following areas:

- physical scheme
- operations
- contractual
- financial
- other information.

In total nine responses were received from a mix of local and international potential vendors as follows:



The key information from these responses is summarised in Appendix F.

5.6 Procurement approach

5.6.1 Station provision

A key concern expressed from potential operator interviews was the costs and risks associated with securing the necessary station sites for a successful cycle share scheme.

Securing and consenting of station sites is a key project risk. There is a need to assess whether Auckland Transport can with confidence take responsibility for securing all core sites and, associated consents to then assess the best procurement options, eg as a separate contract by Auckland Transport or if the core station build is offered as part of the operator tender. Auckland Transport should also consider whether any existing contracts and/or strategic relationships provide good opportunity to leverage the provision of station sites.

5.6.2 Helmet provision

The research undertaken with a short-list of international cycle share schemes found that helmet provision should be made the responsibility of the operator. This means that responsibility for provision and management should be placed with one party.

5.6.3 Not-for-profit social enterprise as bike redistributor / bike mechanic

There could be real financial and social merit in being able to pro-actively identify a not-for-profit (NFP) social enterprise to be the bike redistributor/bike mechanic and trainer for the cycle share, similar to the 'Glasgow Bike Station'. In the case of Glasgow, all tenderers named Glasgow Bike Station as their bike redistributor / mechanic sub-contractor.

To improve the viability of the overall scheme there may be the opportunity to gain the support of a philanthropic funder to help support this NFP (including the possibility of an equity user access programme) and, hence, the overall cost of the cycle share delivery. Other cycle share schemes have used other solutions to help mitigate bike redistribution costs such as the New York 'Bike Angel', which allows users to assist with daily operational rebalancing of bikes within the overall system.

5.6.4 Opportunity to broaden contract scope with aligned activity

Auckland Transport should consider the opportunity to broaden any contract scope by including delivery of aligned activity to assist with the attractiveness and viability of the city centre cycle share tender. For example, there may be the opportunity to operate guided cycling activity. There may also be other contract options that could have merit in being considered for clustering with this cycle share scheme.

5.7 Next steps in procurement

5.7.1 Request for Proposals next stage

Assuming this IBC is endorsed and a decision is secured to progress to a DBC, then there will be the need for further market engagement prior to completion of the DBC.

At that time it would be helpful if Auckland Transport was able to define its requirements in further detail, specifically around the preferred docking approach and use of e-bikes. While this IBC has identified a short-list of options, it would be beneficial for Auckland Transport to narrow this list further in advance of further market engagement. As a result, interested parties would be able to provide more specific and detailed responses, allowing for improved evaluation.

The outcome of the DBC will be a decision on whether or not to implement a cycle share scheme and proceed with formal procurement for example through a Request for Proposals (RFP).

6 Financial case

This section explores the financial implications of implementing a cycle share scheme. It draws on the cost information summarised in the economic case, and combines this with a view on the ability of the scheme to generate revenue to cover the cost of operations. The need for Auckland Transport to subsidise scheme operations is considered.

6.1 Sources of revenue for cycle share

Cycle share schemes around the world typically collect revenue from users of the cycle share through fees and subscriptions for use. For some schemes this user revenue is the only source of revenue. This is more often the case with dockless schemes, which typically operate independently of local authorities, and which typically also have lower costs due to less infrastructure and no contracted performance regime.

For other schemes user revenue is supplemented by sponsorship, advertising, and one-off government grants. This additional revenue is often necessary to break-even, particularly where a scheme does not achieve a high level of utilisation. The way in which schemes utilise these revenue sources is often overseen by the relevant local authority.

Local authorities can also be required to de-risk cycle share proposals for vendors by agreeing to meet any shortfall in revenues and cover any outstanding operating costs on an annual basis. This is particularly common where local authorities have had a key role in specifying the scheme design, or where there is little data available to support robust estimates of scheme user uptake. A review of international cycle share schemes undertaken as part of this IBC found that such arrangements are common.

There are a range of other cycle share commercial models that operate on quite different incentives. [redacted]

6.2 User revenue

6.2.1 Main factors affecting ability to generate user revenue

The two major factors that affect the ability to generate demand from a cycle share scheme are the utilisation and the price:

- **Utilisation**: The higher the utilisation of bikes the higher the user revenues generated. As utilisation increases, the ability of the scheme to pay for itself increases. Low utilisation typically creates funding challenges and / or the need for subsidies from the local authority.
- **Price**: Pricing reflects demand patterns, the costs of operating the scheme, and the extent to which the scheme is expected to be a public service.

Price will be a driver of utilisation for many users. The level of demand that can be achieved at different price points is an important consideration. A scheme that offers major advantages to users and attracts a high level of demand at higher price points is more likely to be commercially viable.

6.2.2 Maximising utilisation

A number of factors are important in maximising cycle share utilisation:

- **Scheme design:** Scheme design must meet the needs of users. First and foremost bikes must be conveniently located and accessible to a broad user base. People will not use the scheme if bikes cannot be conveniently hired and returned. Other scheme design aspects that may increase utilisation include e-bikes (particularly relevant in Auckland), mobile and web-based payment and booking systems.

- **Launch marketing:** Building hype around the launch of cycle share can help to maximise uptake of the scheme, particularly in the early stages. The greater the public awareness and understanding of the scheme, the greater the rate of adoption. If people actually see large numbers of cycles on the road, they may be more inclined to try cycle share themselves. Following launch, other elements such as scheme design will be more important in maintaining the user base.
- **Incentives:** Incentives can be used to get people using the scheme, who might otherwise not use it. They can also help the scheme to operate more efficiently and cost effectively. Incentives generally involve offering a discount or rebate to return bikes to specific docking stations, or rebalance bikes between docking stations. In cities like Auckland with lots of hills and high commuter flow, rebalancing is a significant consideration. Incentives are one way of getting people using the scheme more, as well as supporting the rebalancing operation.

6.2.3 Potential utilisation

Customer research undertaken as part of this IBC suggests that there is a high level of demand for cycle share among those that live and work in the Auckland city centre and fringe.

Table 25 shows how many trips can be expected. This is based on the survey results of the number of people expected to use the scheme with differing levels of frequency (as per Table 8). A reduction of 50% has been applied to the survey results to exclude optimism bias and to take account of a range of use mitigating factors, including:

- seasonal variation in use of the scheme. Generally schemes in sub-tropical climates like Auckland experience much reduced utilisation in the winter months
- the recent introduction of dockless cycle share schemes such as OnzO Bikes, who will provide direct competition for any new cycle share scheme. There are other dockless cycle share operators planning to enter the market and these schemes will provide further competition.

Table 25: Potential number of trips and possible scheme utilisation

User frequency level (number of trips per week)[56]	% of people who are "very likely " to use cycle share at each level	Number of people estimated at each frequency level[57]	Number of trips per week	Number of trips per week accounting for 50% reduction
5	13%	2,395	14,970	7,485
3	38%	7,002	26,256	13,128
0.5	25%	4,606	2,879	1,439
0.25	12%	2,211	691	345
0	12%	2,211	-	-
Total trips per week				**22,398 trips per week**
Total trips per day				**3,200 trips per day**

56 Based on the results of the customer research survey run by Auckland Transport Customer Insights. As summarised in Table 8 these are the frequencies people were asked to rate their potential cycle share use on a scale from "won't use cycle share" to "very likely to use it". Estimates were made to convert frequencies eg "monthly to weekly" use into figures that could be used for the analysis, in this example 0.25 uses per week.

57 Based on the results of the customer research survey run by Auckland Transport Customer Insights. As summarised in Table 8 these figures represent the number of adult Aucklanders whose primary destination each day is the city centre, and who are not cycling rejecters, that are very likely to use cycle share at different levels of frequency.

With a proposed scheme size of approximately 710 bikes, 3,200 trips per day equates to an average utilisation level of 4.5 trips per bike per day.

The survey data also showed that approximately 50% more people would be very likely to use the scheme if e-bikes were available. We have assumed an uplift of 25% in demand for a scheme with 50% e-bikes, resulting in an estimated demand of 27,997 trips per week, or 4,000 trips per day. With a proposed scheme size of approximately 710 bikes, 4,000 trips per day equates to an average utilisation level of 5.6 trips per bike per day.

Research shows that utilisation of other cycle share schemes around the world achieve between 2 and 7 trips per bike per day. Schemes generally set their sights at the higher end of this range. Those that achieve this higher level of utilisation are generally considered to be successful schemes eg the London, Paris, and Portland schemes.

By this scale the potential utilisation metrics calculated here indicate a fair level of utilisation. However, this does assume that the scheme is designed to meet user expectations and requirements and that pricing is not a barrier for users.

6.2.4 User pricing structure

User pricing structures vary widely. The pricing structure we have chosen to model for potential user revenues includes the following options: free trips of less than 15 minutes, ad hoc short trips, daily and weekly passes, and monthly and yearly subscriptions. Under this structure ad hoc short trips are priced on a per trip basis, whereas daily and weekly passes, and monthly and yearly subscriptions are priced on a per pass or subscription basis. These are collectively referred to as "subscription types" and "subscriptions" for the rest of the financial analysis.

Table 26 shows the user subscription types and corresponding fee ranges we have assumed for this analysis. We have assumed a 25% premium in user fees for use of e-bikes. The fee ranges included in Table 4 are based on the fee ranges for other international schemes. [58,59,60]

Table 26: User pricing structure (2018 prices; 25% premium for e-bikes)

Subscription type	Estimated fee range (NZ$) - standard 'smart-bikes'	Estimated fee range (NZ$) – e-bikes
Free trips eg < 15 mins	0	0
Ad hoc short trips	0.50 - 2	0.63 - 2.50
Daily subscription	2 - 5	2.50-6.25
Weekly subscriptions	5 - 10	6.25 - 12.50
Monthly subscription	15 - 30	18.75-37.50
Annual subscription	60-120	75-150

6.2.5 Subscription model

In order to estimate user revenues we have made some assumptions about the distribution of trips and subscription types. Table 27 outlines our assumptions with regard to the proportion of all cycle share trips under each subscription type, and the number of trips per subscription of each type.

58 New York Institute for Transportation and Development Policy. The Bike-Share Planning Guide.

59 Jacobs New Zealand Ltd. Auckland cycle share hire assessment, dated September 2016.

60 Jacobs New Zealand Ltd. Auckland cycle share scheme identification and benchmarking dated 6 September 2017.

Table 27: Assumptions regarding number and type of different cycle share subscriptions

Subscription type	Number of all cycle share trips made under each subscription type	Number of trips per subscription, by subscription type
Free trips eg < 15 mins	20%	1
Ad hoc short trips	15%	1
Daily subscription	40%	2
Weekly subscriptions	5%	10
Monthly subscription	10%	40
Annual subscription	10%	500

Applying these assumptions to the total demand of 3,200 trips per day (total annual demand of 1,167,890 trips)[61] for a standard bike scheme, the number of subscriptions generated by type are shown in Table 28.

Table 28: Calculating the number of subscriptions per subscription type[62]

Subscription type	(A) Number of all cycle share trips made under each subscription type	(B) Number of trips per subscription, by subscription type	(C) Number of subscriptions by subscription type
Free trips eg < 15 mins	233,578 (20%)	1	233,578
Ad hoc short trips	175,184 (15%)	1	175,184
Daily subscription	467,156 (40%)	2	233,578
Weekly subscriptions	58,395 (5%)	10	5,839
Monthly subscription	116,789 (10%)	40	2,919
Annual subscription	116,789 (10%)	500	234
Total	**1,167,890**		**651,332**

Doing the same for a scheme with 50% e-bikes (4,000 trips per day and total annual demand of 1,459,863 trips) results in 814,165 subscriptions per annum.

6.2.6 Total user revenue

Table 29 and Table 30 outline the total and per bike user revenue based on a standard 'smart-bike' scheme and a scheme incorporating 50% e-bikes. User revenues are inflated to 2019 prices (average inflation of 2% per annum) as this is the first year that the scheme is expected to be operational. Table 29 shows the results based on the low end of the user pricing structure included in Table 26, ie it assumes low fees. Table 30 shows the results based on the high end of the user pricing structure, ie it assumes high fees.

61 Calculated based on the average number of trips each day (3,200 trips for standard 'smart bike' scheme) over 365 days of the year. The daily rates are average numbers calculated based on weekly totals. It would be reasonable to expect some differences between weekday and weekend use due to the potential increased contribution of commuters to demand for cycle share on weekdays.

62 Column (C) = Column (A) / Column (B).

Table 29: Estimated revenue per bike (2019 prices; low user revenue scenario)

Option	Standard 'smart-bike scheme' – Options 1 and 2	Scheme with 50% e-bikes – Options 3, 4, and 5
Number of subscriptions	651,332	814,165
Average price of each subscription – LOW pricing	$1.03 per subscription	$1.15 per subscription
Total user revenue – LOW pricing	$0.67m	$0.94m
User revenue per bike – LOW pricing	$939	$1,321

Source: PwC analysis

Table 30: Estimated revenue per bike (2019 prices; high user revenue scenario)

Option	Standard 'smart-bike scheme' – Options 1 and 2	Scheme with 50% e-bikes – Options 3, 4, and 5
Number of subscriptions	651,332	814,165
Average price of each subscription – HIGH pricing	$2.70 per subscription	$3.04 per subscription
Total user revenue – HIGH pricing	$1.76m	$2.48m
User revenue per bike – HIGH pricing	$2,476	$3,482

Source: PwC analysis

6.3 Comparison of operating costs and user revenue

Table 31 shows the ability of the options to cover their annual operating costs under the different pricing scenarios. Costs are calculated based on a scheme size of approximately 710 bikes.

Table 31: Ability of different options to cover their annual operating costs (low and high estimates)

Option	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	**Docked 'smart-bike' scheme**	**Geofenced scheme**	**Docked 'smart-bike' scheme with 50% e-bikes / batteries**	**Geofenced 'smart-bike' scheme with 50% e-bikes / batteries**	**Docked 'smart-bike' scheme with 50% e-bikes / charging at dock**
Operating costs per bike ($NZ)	1,944 - 3,472	1,944 - 3,472	2,083 - 3,993	2,083 - 3,993	2,639 - 3,993
User revenue per bike ($NZ)	939 - 2,476	939 - 2,476	1,321 - 3,482	1,321 - 3,482	1,321 - 3,482
% annual operating costs recovered – LOW costs	48% - 127%	48% - 127%	63% - 167%	63% - 167%	50% - 132%
% annual operating costs recovered – HIGH costs	27% - 71%	27% - 71%	33% - 87%	33% - 87%	33% - 87%

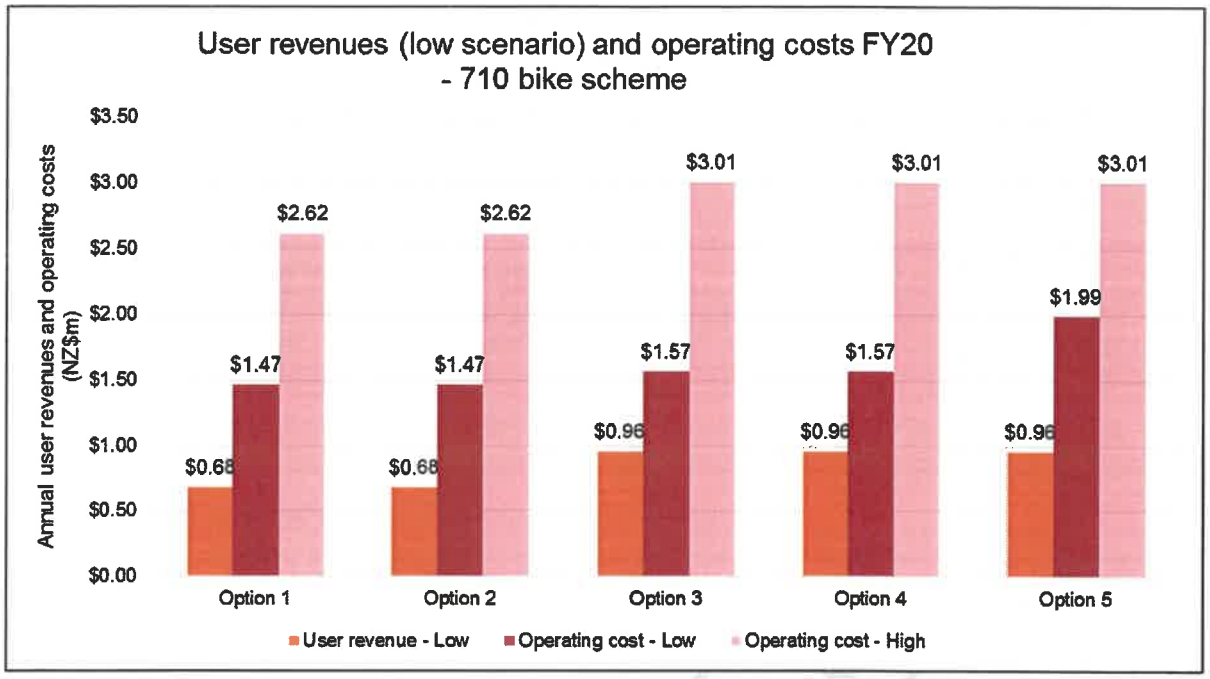
Source: Costs from Alta Planning and Design LLC[63]; PwC analysis

The figures in Table 31 show that a wide range of outcomes are possible and highlight the sensitivity of the outcome to the pricing structure and the operating costs of the scheme.

Figure 26 compares graphically for each option the user revenues at the low end of the possible pricing range, with the estimated annual operating costs.

63 Alta Planning and Design. LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

Figure 26: Annual user revenues (low estimate) and operating costs of the different options

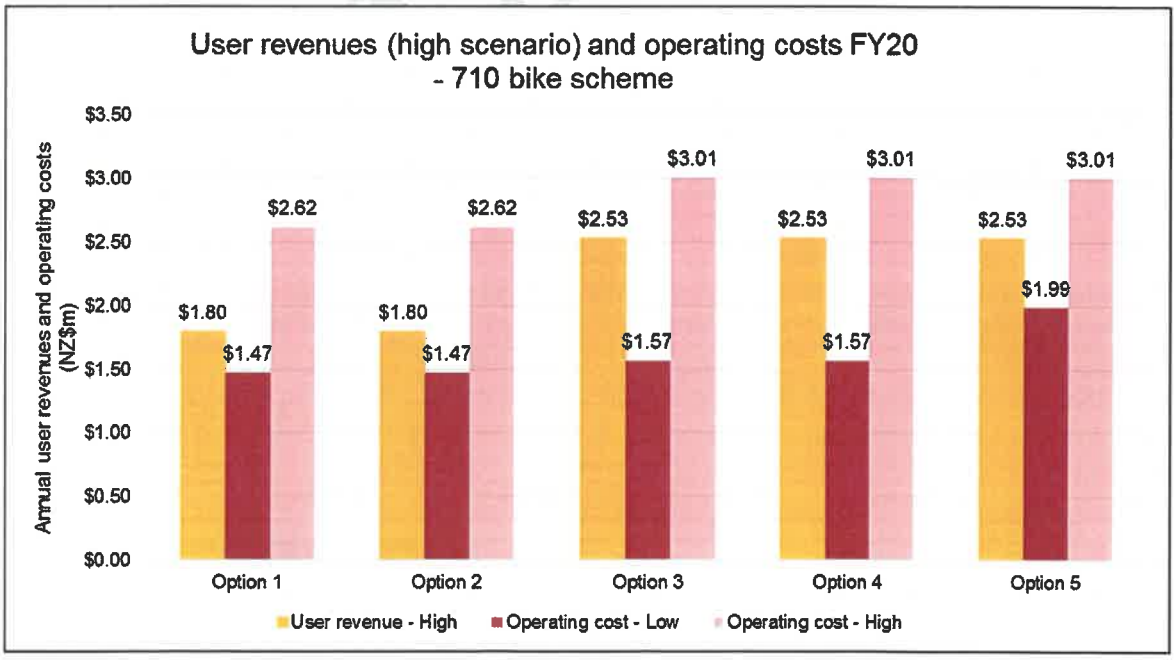


Source: Costs from Alta Planning and Design LLC[64] as per Table 31; PwC analysis

The results show that for all options, where user revenues are at the low end of the estimated range these are not sufficient to cover the operating costs of the scheme, regardless of whether these costs fall at the low or high end of the range. The scheme will have an operating deficit of between approximately $0.6m and $2m per annum depending on the option.

Figure 27 makes the same comparison as Figure 26, using the user revenues at the high end of the possible range.

Figure 27: Annual user revenues (high estimate) and operating costs of the different options



64 Ibid.

Source: Costs from Alta Planning and Design LLC[65] as per Table 31; PwC analysis

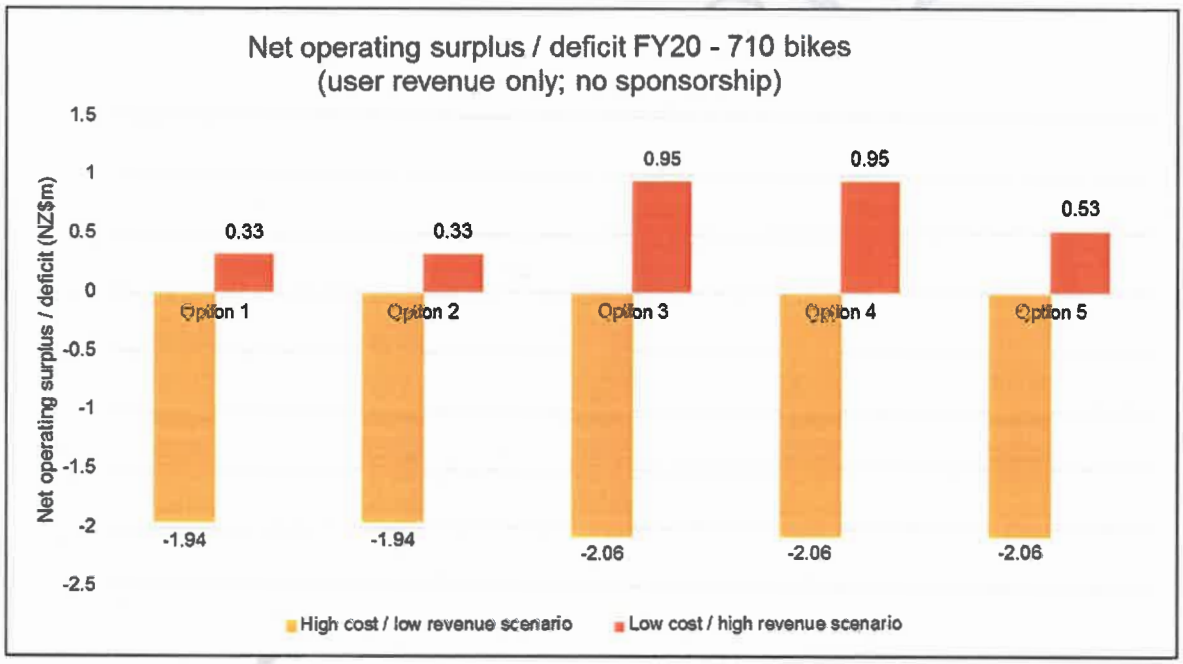
The results show that for all options, where user revenues are at the high end of the estimated range (as opposed to the low end) these will be sufficient to cover the low estimate of the operating costs. They are not able to cover the high estimate of the operating costs of the scheme. Where operating costs are at the high end of the estimated range there will be an operating deficit of up to $0.8m per annum depending on the option.

[redacted]

6.3.1 Operating surplus / deficit

Figure 28 shows the range of annual surplus / deficit outcomes possible based on the ranges of operating costs and user revenues in Table 31. This is a direct comparison of potential revenues and operating costs as previously outlined in this IBC and does not include depreciation. The low scenario combines the high end of the operating costs range and the low end of the user revenue range for each option. The high scenario combines the low end of the operating costs range with the high end of the user revenue range for each option.

Figure 28: Net operating surplus / deficit of the different options



Source: Costs from Alta Planning and Design LLC[66]; PwC analysis

This analysis shows that a range of outcomes are possible, ranging from a scheme that operates with an operating deficit of up to $2.1m, to a scheme that operates with an annual surplus of nearly $1m.

To incentivise potential cycle share operators to develop a cycle share scheme, Auckland Transport will likely need to agree to cover any shortfall in operating costs. However this will also depend on the other benefits that potential cycle share vendors may take from the scheme, including for example sponsorship and advertising opportunities, including in kind advertising.

65 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

66 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

6.3.2 Break-even analysis

Table 32 outlines the number of trips required to break even under each option, and the number of trips per day per bike (the level of utilisation) that this equates to. This break-even analysis considers only the potential revenues and operating costs as previously outlined in this IBC and does not include depreciation. As per the rest of this financial analysis, the break-even point is based on a scheme size of approximately 710 bikes.

Table 32: Break even analysis (710 bikes; mid-range revenue estimate; FY20 prices)

Option	Option 1	Option 2	Option 3	Option 4	Option 5
Option description	**Docked 'smart-bike' scheme**	**Geofenced scheme**	**Docked 'smart-bike' scheme with 50% e-bikes / batteries**	**Geofenced 'smart-bike' scheme with 50% e-bikes / batteries**	**Docked 'smart-bike' scheme with 50% e-bikes / charging at dock**
Number of trips to break even (annual)	1,927,070	1,927,070	1,921,580	1,921,580	2,097,267
Utilisation to break even (trips / bike / day)	7.4	7.4	7.4	7.4	8.1

Source: PwC analysis

The analysis shows that, assuming a mid-range level of user revenues and a mid-range level of operating costs, for all options the break-even point lies somewhere in the range of 7 to 8 trips per bike, per day. This aligns with the utilisation targeted by other international schemes.

This level of utilisation is probably at the limit of how many trips each bike can practically support each day. Challenges in achieving higher levels of utilisation and maintaining them year round include seasonal variations in demand, competition from other bike share operators, and also the anticipated commuter use of the scheme which is for the most part unidirectional in the mornings and the evenings.

It is unlikely that such a high level of utilisation will be achieved and therefore it is expected that an operating deficit will exist. This deficit will need to be met by other sources of funding, including potentially sponsorship and / or advertising, or otherwise met by Auckland Transport.

6.4 Sponsorship and advertising

As discussed in the commercial case, cycle share potentially presents a number of unique opportunities for sponsorship and advertising.

6.4.1 Level of sponsorship achieved by other schemes

Sponsorship data collected by Jacobs in July 2016 is shown in Table 33. These figures relate to the level of sponsorship achieved per bike from lead naming sponsors.

Table 33: Level of lead naming sponsorship secured by other international schemes

Scheme	Sponsor	[redacted]
London – Santander Cycles	Santander	
New York – Citibike	Citibike; Mastercard	

Source: Jacobs New Zealand Ltd[67]

This level of sponsorship is for a lead naming sponsor with significant branding rights. Branding on the bikes for the two examples above is shown in Figure 29.

Figure 29: Branding in London Santander and New York Citibike cycle share bikes

Schemes can also secure other smaller sponsors around specific elements of the scheme eg [redacted]

These schemes are operating in very large densely populated cities with lots of foot traffic, and that have less remaining advertising space than Auckland. For an Auckland scheme, it is unlikely that we can expect a level of sponsorship as high as these two examples.

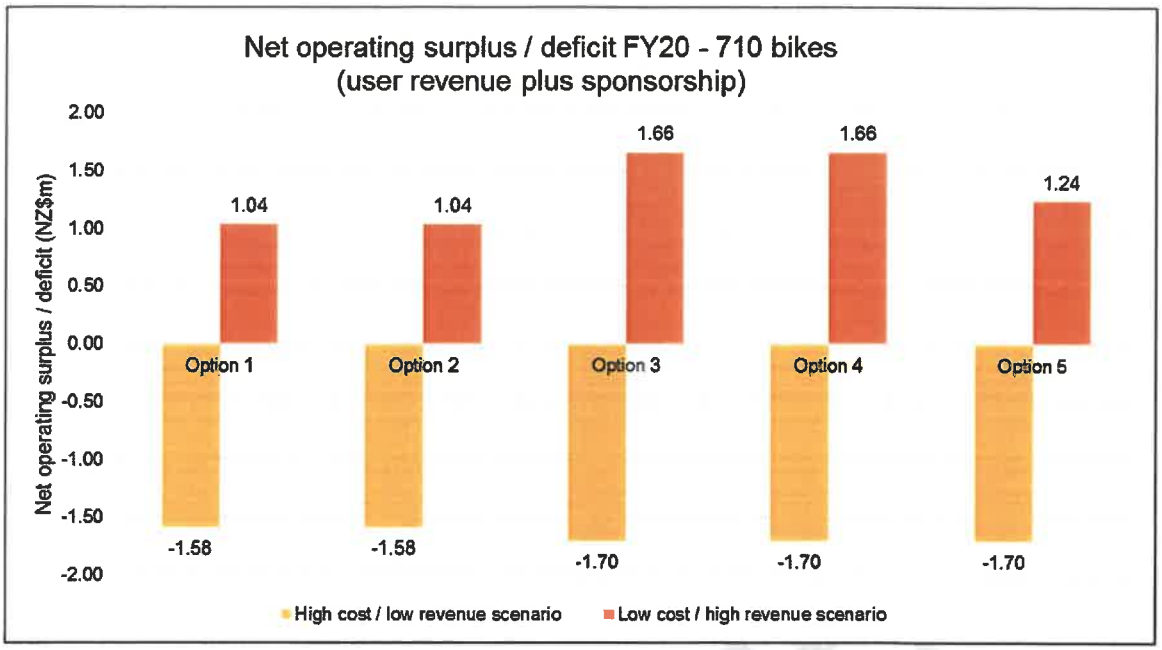
6.4.2 *Assumed level of sponsorship for this scheme*

Any sponsorship that is obtained will help to close any deficit between user revenues and scheme operating costs. A sponsor partner may make a cycle share scheme substantially more commercially viable than it otherwise would be, and would reduce the potential level of subsidy that Auckland Transport might have to contribute.

Sponsorship of between $500 and $1,000 per bike this would bring in additional revenue of between $0.4m and $0.7m in total (for a 710 bike scheme). We have modelled the impact of this level of sponsorship on the potential net surplus / deficit by option as shown in Figure 30.

67 Jacobs New Zealand Ltd. Auckland cycle share hire assessment, dated September 2016.

Figure 30: Net operating surplus / deficit of the different options



Source: Costs from Alta Planning and Design LLC[68]; PwC analysis

This shows that the maximum possible operating deficit under the high cost / low revenue scenario has been reduced from $2m to $1.7m. Likewise the maximum possible surplus under the low cost / high revenue scenario has increased from $1m to $1.7m.

6.5 Other funding options

Auckland Transport could seek funding from other government agencies. One-off grants or an ongoing funding commitment may be possible.

For example, Auckland Transport may wish to seek funding from NZTA eg through the National Land Transport Fund. Development of a cycle share scheme potentially aligns well with the NZTA's objectives of building a more effective, efficient, resilient and safe transport network within New Zealand.

There is also a case for an NZTA subsidy for a cycle share scheme, in a similar way to which public transport is funded, as a cycle share scheme is a form of public transport.

68 Alta Planning and Design .LLC. Auckland bike share cost estimates, dated 19 October 2017. Converted to New Zealand dollars.

7 Management case

This section sets out the next steps and potential timeframes for developing a cycle share scheme for the Auckland city centre and fringe. It also describes the project governance and management arrangements going forward, and considerations with regard to stakeholder management.

7.1 Next steps in implementation and timeframes

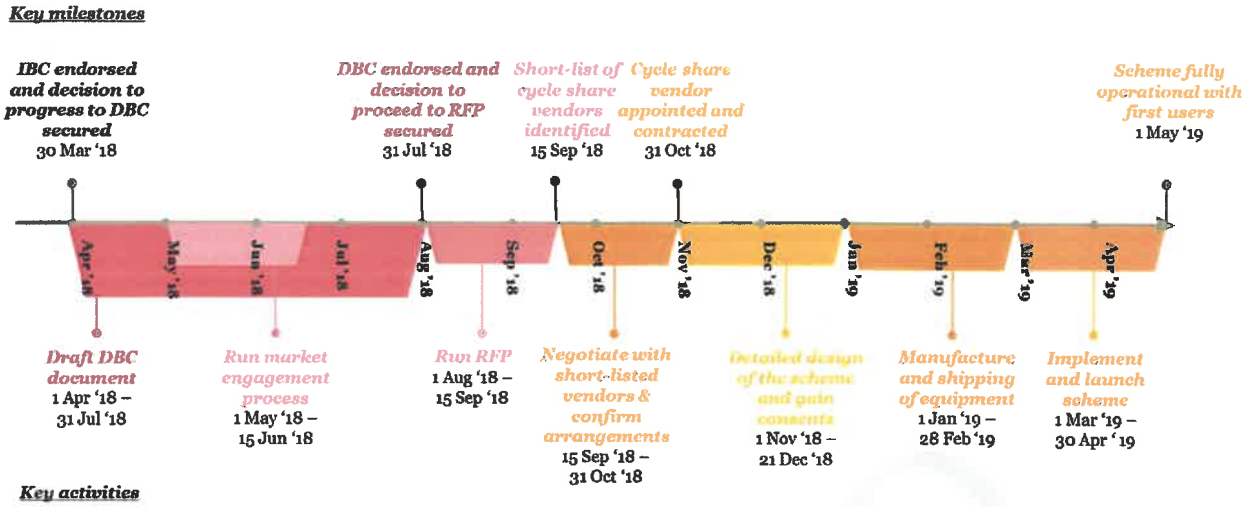
Assuming this IBC is endorsed and a decision is secured to proceed to a DBC, then next steps for the cycle share project would include:

- develop the preferred scheme design and commercial aspects further, to enable more focussed market engagement
- run a market engagement exercise providing greater specificity around scheme design and calling for more detailed cost and other commercial information from potential vendors[69]
- develop a DBC incorporating the results of the market engagement exercise. The outcome of the DBC will be a decision on whether or not to implement a cycle share scheme and proceed with procurement
- run a formal RFP for detailed submissions from cycle share vendors, followed by shortlisting of potential vendors
- work with shortlisted vendors to establish scheme design parameters and potential sponsorship and partnership arrangements. Negotiate with vendors to establish their final offers
- select, appoint, and contract a preferred vendor
- complete detailed design of the scheme in cooperation with the contracted vendor
- secure the required resource and / or building consents for docking locations
- contracted vendor to manufacture and ship the scheme equipment
- implement the scheme infrastructure and launch the scheme.

Possible timeframes for the implementation of a cycle share scheme are as shown in Figure 31.

69 The term cycle share vendors is used here to refer to one or more parties who individually or jointly deliver the range of goods and services necessary to construct and operate the cycle share scheme. It is possible that the required goods and services may be procured from one vendor or from multiple vendors.

Figure 31: Next steps and timeframes, showing high level activities and milestones



These timeframes are only indicative at this stage. Actual timeframes will be dependent on decision points to proceed and the final scheme that is to be implemented, as well as the procurement approach taken.

7.2 Project governance arrangements

Cycle share is one of the initiatives in the Auckland Cycling Programme. The governance arrangements for the continued development of a cycle share scheme for Auckland are show in Figure 32.

Figure 32: Auckland Transport governance structure

(Auckland Transport to provide)

7.3 Project management arrangements for next steps

As per the IBC, an Auckland Transport project manager will continue to manage the programme of work to develop a cycle share scheme for the Auckland city centre and fringe. Standard Auckland Transport project management practices will continue to be applied to subsequent stages of the project, to help ensure the effective and efficient delivery of the work, and the achievement of the desired outcomes.

Key project planning tasks that will be undertaken upon moving to the next stage(s) include:

- reconfirming the scope of the next stage(s) to be delivered
- updating the cycle share project plan to reflect this
- updating the project risk register to focus on the next stage(s)
- further developing the stakeholder engagement and communications plan to reflect the increased level of stakeholder engagement likely required for the next stage(s).

7.4 Stakeholder communication and management for next steps

Increased engagement with a range of stakeholders is expected as we progress further through the project. In particular:

- through the RFP and negotiation stages there will be much closer engagement with potential cycle share vendors. The expectations of these parties with respect to their participation in the procurement process will increase
- through the RFP and negotiation stages there will be the need to engage more fully with other potential scheme partners and sponsors about their potential interest and contribution to the scheme. It will be important to progress this work in parallel with the cycle share vendor RFP and negotiations
- as Auckland Transport moves closer towards agreeing the final design for the cycle share scheme, it will be important to keep Auckland Transport's local government and other stakeholders informed of decisions and progress made. Many of these stakeholder groups e.g. Local Boards have their own stakeholders who will have an interest in cycle share
- as Auckland Transport moves closer to the cycle share launch date it will be important to build excitement and expectation among the people of Auckland. A successful launch with a high level of public awareness will help to drive understanding and uptake of the scheme, particularly early on.

As mentioned above Auckland Transport will need to update its stakeholder engagement and communications plan. It will also need to make sure that sufficient and appropriate resource is given to managing all of the different stakeholder groups relevant to this project.

Appendices

Appendix A: Restrictions

This report has been prepared for Auckland Transport to assess the potential for a cycle share scheme in the city centre and fringe of Auckland. This report has been prepared solely for this purpose and should not be relied upon for any other purpose. We accept no liability to any party should it used for any purpose other than that for which it was prepared.

This report has been prepared solely for use by Auckland Transport and may not be copied or distributed to third parties without our prior written consent.

To the fullest extent permitted by law, PwC accepts no duty of care to any third party in connection with the provision of this report and/or any related information or explanation (together, the "Information"). Accordingly, regardless of the form of action, whether in contract, tort (including without limitation, negligence) or otherwise, and to the extent permitted by applicable law, PwC accepts no liability of any kind to any third party and disclaims all responsibility for the consequences of any third party acting or refraining to act in reliance on the Information.

We have not independently verified the accuracy of information provided to us, and have not conducted any form of audit in respect of Auckland Transport. Accordingly, we express no opinion on the reliability, accuracy, or completeness of the information provided to us and upon which we have relied.

The statements and opinions expressed herein have been made in good faith, and on the basis that all information relied upon is true and accurate in all material respects, and not misleading by reason of omission or otherwise.

The statements and opinions expressed in this report are based on information available as at the date of the report.

We reserve the right, but will be under no obligation, to review or amend our report, if any additional information, which was in existence on the date of this report, was not brought to our attention, or subsequently comes to light.

Where necessary we have relied on information provided by and assumptions agreed with Auckland Transport for developing aspects of this report and the majority, by their nature, are not able to be independently verified. Inevitably, some assumptions may not materialise and unanticipated events and circumstances are likely to occur. Therefore, actual results in the future will vary from the forecasts upon which we have relied. These variations may be material.

This report is issued pursuant to the terms and conditions set out in our contract with Auckland Transport, (Contract No: 475-17-748-PS) dated 17 August 2017.

Appendix B: Summary of findings from review of international schemes

As part of this IBC a review of cycle share schemes operating in other cities around the world was completed. The review was limited primarily to communications with the relevant local authorities, who had experience working with the selected schemes. This reflected the desire to obtain findings and lessons from the local authorities responsible for implementing the schemes. In most cases the scheme operators themselves were not directly contacted. Research activities included a brief questionnaire and follow up phone conversations / interviews, as well as a review of publically available information online.

Schemes were selected to canvas a variety of cycle share approaches and technologies, city types (population, climate, topography), and the presence or absence of helmet laws, among other factors. A wide range of schemes were identified. Those that could be contacted and therefore were included in the review were:

- City Cycle Brisbane
- Melbourne Bike Share
- Biketown Portland
- Nextbike Glasgow
- Mobi Vancouver Bike Share
- Youbike Taipei
- Spin, Seattle

Schemes operating in Paris, Madrid, San Francisco, and London were also selected for review, however ne response was received from these schemes. Table 34 provides a summary of the key findings of the review of international schemes. Additional detail is available in the memo titled *Auckland cycle share IBC – scheme identification and benchmarking* authored by Jacobs New Zealand dated 6 September 2017.

Table 34: Summary of key findings of the review of international schemes

Response	Bicycle	Docking stations	Bike / station numbers	Helmets	Payment and booking	Operations	Pricing	Funding	Planning and consenting	Implementation
City Cycle Brisbane	3 gears	Low tech (currently being upgraded)	2,000 / 150	Courtesy helmets	Via website and docking station	Operator contracted to manage; back office support provided offshore	24 hours - $2 Monthly - $5	Advertising; local authority subsidise operations	Operator responsible	Single stage
Melbourne Bike Share	3 gears	Low tech (currently being upgraded)	600 / 57	Courtesy helmets	Via website and docking station	Operator contracted to manage	24 hours - $3 Weekly - $8 Yearly - $60	Local authority funds capital and operating expenditure	Operator and local authority coordinate	Single stage
Biketown Portland	8 gears; shaft drive	High tech' GPS-enabled geofencing technology	1,000 / 100	Not required	Via app; on-bike	Operator contracted to manage	Single trip - $3 24 hours - $16 Monthly - $16	Sponsorship	Operator responsible	Single stage so far; expansion may occur
Nextbike Glasgow	Multiple gears	High tech; basic stations	900 / 100	Not required	Via app; on-bike	Operator contracted to manage	30 minutes - $2 (casual) 24 hours - $17 (casual) Monthly (subscription) - $8	Local authority funds capital expenditure; sponsorship	Operator responsible	Two stage
Mobi Vancouver Bike Share	7 speed	High tech; solar powered stations	1,500 / 125	Vending machines / dispensers at docking stations	Via app; on-bike	Operator contracted to manage	24 hours - $10 90 days - $81 Yearly - $140 Unlimited - $170	Local authority funds capital expenditure; sponsorship	Operator responsible	Two stage

Response	Bicycle	Docking stations	Bike / station numbers	Helmets	Payment and booking	Operations	Pricing	Funding	Planning and consenting	Implementation
Youbike Taipei	3 gears	Low tech	13,138 / 400	Not required	Via website and kiosk at docking station	Operator contracted to manage	30 minutes - $0.50 – first 4 hours $1 – 4-8 hours $2 – 8 hours+	Local authority funds capital expenditure; sponsorship	Unknown	Single stage
Spin, Seattle	Multiple gears	Dockless	1,000 / 0	Not required	Via app; on-bike	Operator contracted to manage	Per ride - $1 Monthly - $40	Privately owned and operated	None required, however do require licence to operate	Single stage

Source: Jacobs New Zealand Ltd

Appendix C: Estimating scheme size and layout

Method for designing the size and layout of a cycle share scheme

There are four steps to designing the size and layout cycle share scheme. These are shown in Figure 33. Following these steps can help to create a network that users can rely on and trust, and that can achieve target levels of utilisation.

Figure 33: Method for designing the size and layout of a cycle share scheme[70]

Step 1: Determine the scheme coverage area and number of docking stations or areas

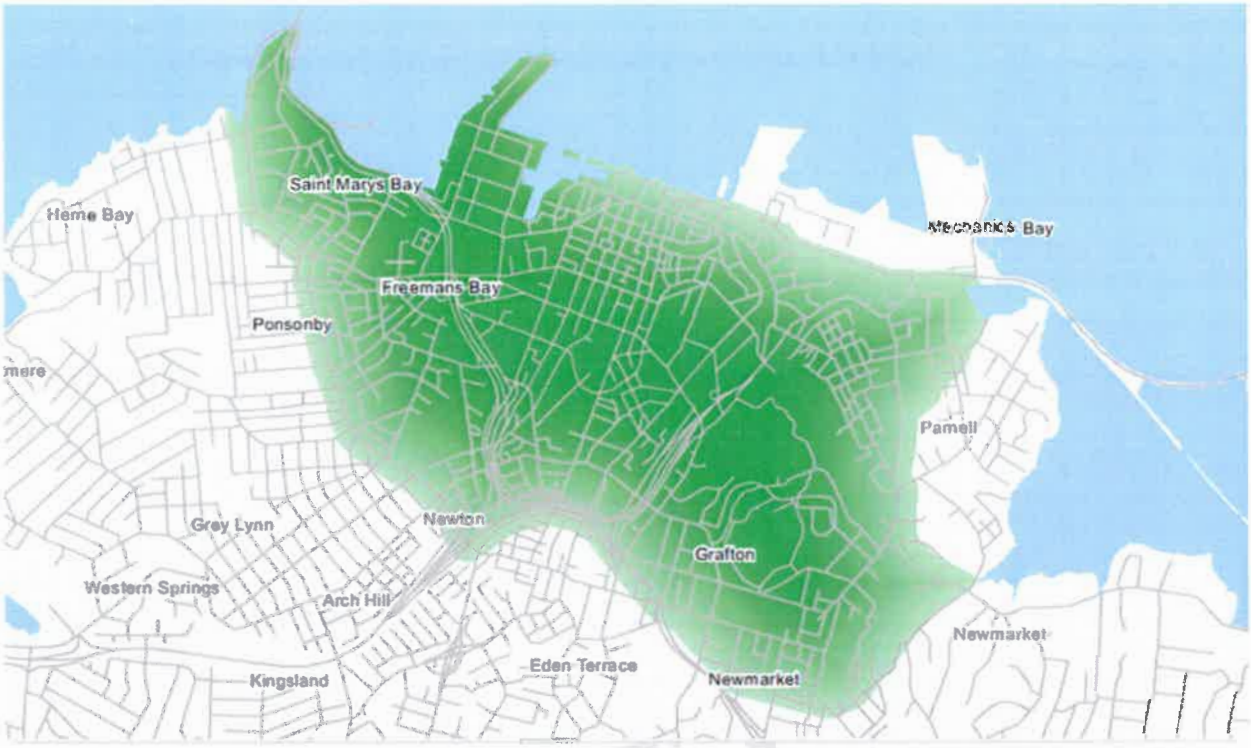
Scheme coverage area

Research into cycle share schemes operating internationally shows that most schemes start with a core area covering the city centre, and expand outward from there. Lessons learned from schemes internationally indicate that the coverage area of the scheme needs to be large enough to cater for trips between a variety of trip generators. Potential users need to see that the cycles can be used to access a variety of locations that they might wish to travel to and they need the security of knowing that as long as they are within the scheme coverage area they will be able to find a station to pick up or drop off a cycle.

Auckland Transport wants to develop a cycle share scheme for the Auckland city centre and fringe that supports a wide user base for a wide range of trip types. The proposed scheme coverage area is shown on the following page.

70 Adapted from: The Bike-Share Planning Guide. New York Institute for Transportation and Development Policy.

Figure 34: Proposed reach of cycle share scheme



Source: Jacobs New Zealand Ltd

This figure includes: Wynyard Quarter, the Viaduct area, the Britomart area, Queen Street, Auckland University and surrounding areas, Victoria Park / Freemans Bay, Grafton, Ponsonby, Newmarket, and Parnell. The total area of the proposed scheme coverage area is 7 km^2, excluding motorways.

Alternatively a smaller scale scheme could be launched which focusses on the city centre (inside the inner motorway ring), with the potential to expand at a later date. Figure 35 provides a view of the scheme coverage area, if a smaller scale scheme is preferred.

Figure 35: Proposed reach of cycle share scheme – scheme of reduced size

Source: Jacobs New Zealand Ltd

The total area of the reduced scheme coverage area is approximately 5.6km².

Number of docking stations or areas

Docking stations are where people hire bikes from and return bikes to at the end of their hire. Docking approaches vary considerably (as discussed in detail in the economic case of this IBC) and it is even possible to create geofenced docking areas using GPS technology that mean no actual physical docking station is required.[71] Dockless schemes also exist, however these are excluded from the options short-list in the economic case of this IBC.

Customer research undertaken as part of this IBC indicates that the majority of users (69%) will not walk more than 5 minutes to hire or return a bike to a docking station or area. Evidence from international schemes suggests that a docking station density of one station every 250m-300m is ideal, closely reflecting the tolerance of the majority of users surveyed for walking to hire and return bikes.

For the purposes of this IBC we have tested a range of docking station or area densities from 10 docking stations or areas per km² within the scheme coverage area, up to 20 per km². The results of this analysis are shown in Table 35.

71 Geofencing in this context refers to the establishment of a micro-geofenced area that delineates a priority docking area. The term geofencing is also used in the context of establishing a perimeter geofence that forms the overall scheme boundary.

Table 35: Sensitivity analysis on number of docking stations required

Docking station or area density (stations or areas per km²)	Total number of docking stations required
Proposed scheme area as shown in Figure 34 (total area of 7 km²)	
10	70 stations / areas
15	105 stations / areas
20	140 stations / areas
Reduced scheme areas as shown in Figure 35 (total area of 5.6km²)	
10	56 stations / areas
15	84 stations / areas
20	111 stations / areas

Source: Jacobs New Zealand Ltd.[72]

Assuming a docking station density of 10 stations per km², the proposed scheme will likely require between 56 and 70 docking stations depending on reach.

Step 2: Determine the number of bikes and docking spaces

Number of bikes

It is important to have an appropriate number of bikes for the scheme. A lack of bikes will result in frustrated users. Too many bikes will make the scheme expensive and underutilised. Large, dense cities or areas with high numbers of commuters and/or tourists typically require a bicycle-to-resident population ratio of approximately 10-30 bikes per 1,000 people.

On the other hand a review of international cycle share schemes undertaken as part of this IBC has identified that many successful schemes operate with a ratio between 8 and 12 bikes per resident population.

To get an idea of the number of bikes that would be required to support a cycle share scheme of the proposed reach, we have applied the above assumptions to the population estimates for the respective area. The results are shown in Table 36.

Table 36: Sensitivity analysis on the number of bikes required

Estimated number of bikes required per 1,000 resident population	Total number of bikes required
Proposed scheme area as shown in Figure 34 (resident population of 71,000 people)[73]	
8	570
10	710
12	850
20	1,420
Reduced scheme areas as shown in Figure 35 (resident population of 37,000 people)[74]	

72 Jacobs New Zealand Ltd. Bike number assessment, 21 November 2017. Bike number assessment – consideration of a smaller scheme, 22 November 2017.

73 The Auckland Regional Transport (ART) Model shows that for 2018 the resident population of the proposed scheme area (as per Figure 34) is forecast to be 71,057 people in 2018.

Estimated number of bikes required per 1,000 resident population	Total number of bikes required
8	300
10	370
12	440
20	740

Source: Jacobs New Zealand Ltd.[75]

Assuming a bike to resident population of approximately 10 bikes per 1,000 people, the proposed scheme will likely require between 370 and 710 bikes depending on reach.

Number of docking spaces

Once the number of bikes needed for the system has been determined, the number of docks required should be considered as a function of the number of docks available per bike in service.

If the ratio of bikes to docking spaces across a docked scheme is too low, then it is likely that issues will arise with users not being able to return bikes to a docking station close to their destination. This could lead to bikes not being returned and hence loss of bikes and erosion of customer satisfaction. It could also mean increased rebalancing efforts are required to keep the scheme operating and avoid station saturation, especially at popular destinations.

Most successful medium and large systems have 2-2.5 docking stations for each bike in service. Montreal, London, and Washington, D.C., each have 2 docking stations for each bike in service, while New York has 2.5, Mexico City has 2.2, and Paris has 2.4.

As per cycle share planning guidance it is likely that cities with less mixed uses and highly directional peak flows of bicycles (generally toward the centre in the morning and toward the periphery in the evening) will need a ratio that is closer to 2.5. Whereas those with less of a commuter focus may require a ratio closer to 2.

Assuming that the scheme is docked and will include between 370 and 710 bikes with 2.5 spaces per bike, then the number of docking spaces required will be in the range of approximately 900 – 1,800 spaces.

Step 3: Determine the size and location of docking stations or areas

While the right density of docking stations or areas must be achieved across the entire scheme coverage area, there are choices to be made with respect to the exact location and size of individual docking stations or areas. Analysis of where demand is likely to be greatest, should inform decisions about where docking stations or areas are located and the number of docking spaces at each one.

The proposed cycle share will need to meet the needs of a range of users, and support a number of trip types. Placement of docking stations or areas should give consideration to the locations where potential users are mostly likely to want to hire and return bikes to.

Integration with the public transport network will be important in the Auckland city centre, particularly in support of commuter trips eg first and last leg connections. However, the cycle share scheme will also need to support a wide range of other cross-town trips for those working, studying, and living in the Auckland city centre and fringe.

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74 The Auckland Regional Transport (ART) Model shows that for 2018 the resident population of the proposed scheme area (as per Figure 35) is forecast to be 37,032 people in 2018.

75 Jacobs New Zealand Ltd. Bike number assessment, 21 November 2017. Bike number assessment – consideration of a smaller scheme, 22 November 2017.

Heat map analysis of key trip generators has been undertaken to inform decisions about docking station or area location and sizing. The following maps were created to build up a picture of where in the Auckland city centre and fringe user demand can be expected. Five maps in total have been constructed:

1 **Heat map 1** – employment density 2016 (ART model)

2 **Heat map 2** – residential population density 2018 (ART3 model), plus Universities

3 **Map 3** – tourist points of interest

4 **Map 4** – retail centres – shopping / dining / entertainment

5 **Map 5** – major train and bus lines and stations, including overlay of 300m radius around each major train and bus station

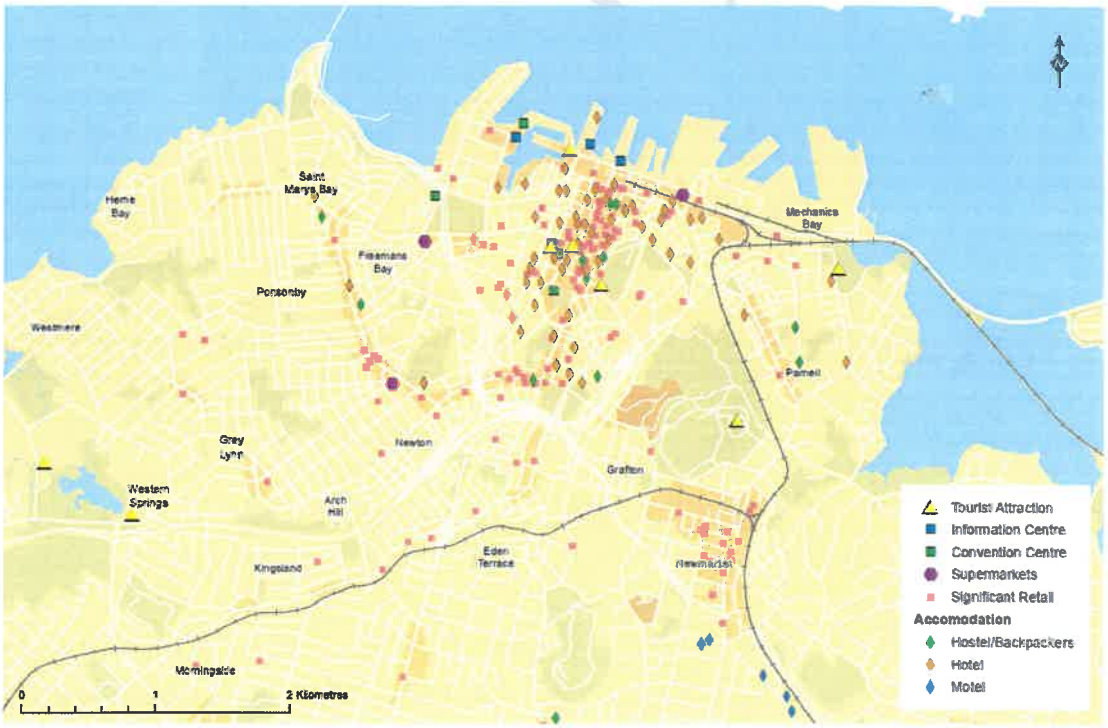
Figure 36: Heat map 1 – employment density 2016 ART model

Source: Jacobs New Zealand Ltd

Figure 37: Heat-map 2 – residential population density, plus Universities

Source: Jacobs New Zealand Ltd

Figure 38: Map 3 – tourist points of interest



Source: Jacobs New Zealand Ltd

Figure 39: Map 4 – retail centres - shopping / dining / entertainment

Source: Jacobs New Zealand Ltd

Figure 40: Map 5 – major train and bus lines and stations

Source: Jacobs New Zealand Ltd

These maps have been combined to produce the overall user demand heat map (Figure 41). This aims to provide a view on the areas within the scheme coverage area where demand for cycle share may be greatest.

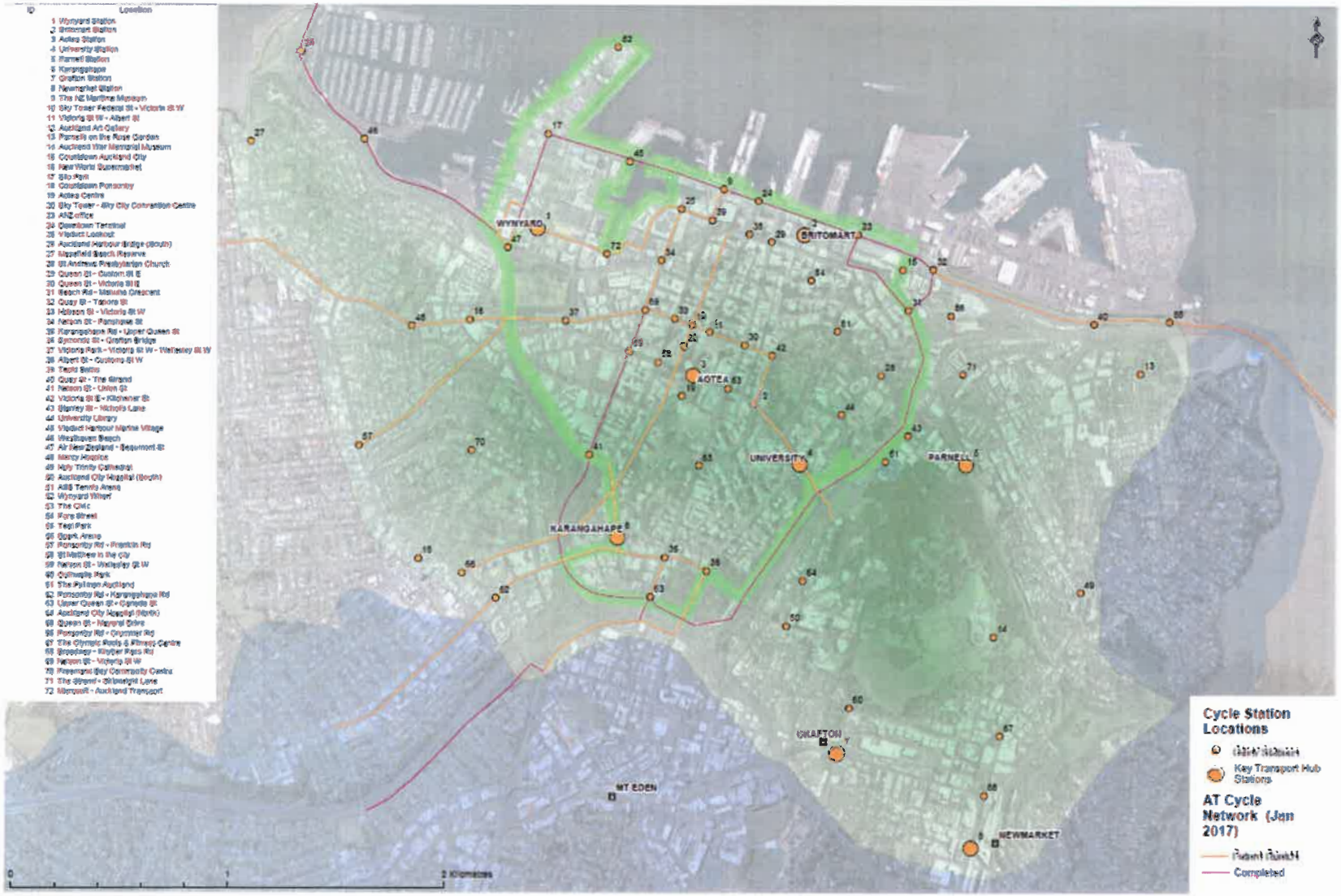
Figure 41: Combined heat-map showing locations of likely strongest demand for cycle share

Source: Jacobs New Zealand Ltd

Based on this heat map analysis and the docking station analysis above, a preliminary scheme docking station layout has been prepared, shown in Figure 42 on the following page.

For a scheme of approximately 710 bikes over the proposed coverage area, we have mapped the potential locations of 72 docking stations. Large docking stations are situated at key transport hubs / stations eg Britomart, Wynyard Quarter, and the University. The mapping also takes account of future transport hubs within the city centre due to the development of the City Rail Link project eg Aotea and Karangahape stations.

Figure 42: Proposed scheme layout – larger scale 710 bike scheme



Source: Jacobs New Zealand Ltd.

For a scheme of reduced size, the network layout would be similar to that shown in Figure 42, but restricted to the relevant coverage area; ie the city centre layout (within the motorway ring) would likely be similar to that shown above.

This design is only preliminary and will need to be further explored through the Detailed Business Case and with potential providers through the procurement and design process.

Appendix D: Element options pros and cons

Table 37 to Table 41 provide a summary of the major advantages and disadvantages of each element option. They also summarise whether each option element has been discounted through this initial evaluation, or whether it is considered possible / preferred.

Table 37: Scheme element 1 - Type of bike

Option name	Main advantages / disadvantages	Include / exclude
Single speed Single gear bikes 	• Lower capital and maintenance costs compared to other bike types • Offer a less comfortable ride and not a practical option for all • Not useful in hilly terrain • Not used by any of the benchmarked schemes internationally	Exclude
Multi gear Multi gear bikes 	• Multiple gears useful in hilly terrain. • Most common type of bike on schemes benchmarked. • Bikes work well in most situations. • Tried and tested option for cycle share schemes.	Include
E-bikes Pedal assist powered by batteries 	• Useful in hilly terrain. Also helps users keep up with traffic • Enhances social equity and equality for all users. Enables more / longer range trips for some • Potential to create a 'buzz' around scheme • Becoming a more popular option with schemes • Some schemes are waiting for wider availability of technology • Greater capital costs for bikes / charging infrastructure	Include
Mixed scheme Contains both standard bikes and e-bikes 	• Lower cost than full e-bike scheme • Provides the benefits of e-bikes to users in locations where they are favoured • How many e-bikes, and where to put charging stations (if applicable) are important considerations	Include

Table 38: Scheme element 2 - Docking approach

Option name	Main advantages / disadvantages	Include / exclude
Dockless / free floating No physical docking stations, bike taken from / left anywhere 	• Bikes can be hired and dropped off anywhere within the scheme area (this can be defined using GPS technology) • Vandalism is an issue with bikes being thrown into the ocean, onto train tracks etc • Not recommended for e-bikes • Scalable as minimum investment in docking	Exclude
Geofenced No physical restraint of bikes. Bike taken from / returned to a defined area – 'virtual' docking station. GPS or RF-enabled to track bike departure from / return to ring-fenced area. 	• Virtual docking stations can be created to define areas where bikes have to be left • Defined using GPS technology, and with minimal infrastructure. • Potentially low cost to define virtual docking areas • Scalable as minimum investment in docking required • Becoming more popular as reduced disruption during implementation • Scheme perimeter required to prevent bikes going too far	Include
Fixed docking stations Physical restraint of bikes with docking station 	• Easy to use, physical restraint of bike with automatic locking technology, hire ends when bike is locked in place • Offers a highly vandal and tamper proof solution • Common technology although the option requires connection to a power supply (either solar or mains) • May be integrated with payment technology	Include
Hybrid Mixture of physical and no physical docking stations 	• Combines the benefits of fixed docking stations and the flexibility of ring-fenced or free-floating schemes • Provides the ability to stop hire mid trip while running errands - increasing flexibility & attractiveness of scheme • Worth considering incentives to return bikes to docking stations • Implications for e-bikes around recharging of batteries. • Challenges of free-floating schemes still present	Include

Table 39: Scheme element 3 – Booking and payment

Option name	Main advantages/disadvantages	Include/ exclude
At docking station Payment at kiosk or on dock. Cash / card / PT ticketing integration possible. 	• Ease of use, technology available on the majority of established schemes worldwide • Potentially increases accessibility for people without smart phones / mobile data • Can accept credit card, PT card, and subscription • Solar power becoming popular option to reduce the need to connect payment kiosks to city utilities • Modularity of kiosks mean that they can be added to hybrid schemes at little cost • Cash payment option not suitable for cycle share	Include
On bikes Payment on bike 	• Most common type of technology on schemes benchmarked • Improved flexibility with regard to docking approach • Potentially lower cost • Can accept credit card, PT card and subscription payment. • Most new schemes use this technology as it reduces the need to have hard wired docking stations • Increases the flexibility and adaptability of the scheme (eg smart cards and RFID)	Include
App / website Payment through app or website 	• Commonly used for free floating schemes • Payment via app which may be able to accept credit card, PT card, and subscription payment • If sole source of hiring then this can reduce the accessibility of the scheme as it requires the use of a computer/ smart device to access the scheme	Include

Table 40: Scheme element 4 – Power supply

Option name	Main advantages / disadvantages	Include / exclude
None No power supply 	• Some options will not require a power supply as the bikes are tech enabled and hiring is undertaken via an app only. • May limit the accessibility of the scheme for some users as hiring must be undertaken via an app (requiring a cell phone connection and mobile data)	Include
Solar power Solar panels as power generation at docking station 	• Low installation cost and unobtrusive option • Low operational cost as power is free • Although solar is becoming a popular option to provide power to kiosks and docking stations it remains unclear if solar would be able to provide enough power to charge e-bikes	Include
Mains power Docking stations connected to power 	• Common and well understood technology • Continuous and uninterrupted supply of electricity. • As mains power requires docking stations to be connected to utilities there is added costs and consenting requirements involved • However as docking stations cannot be moved easily, the planning of station location is critical	Include
Interchangeable batteries Physical changing of batteries 	• Allows for the running of an e-bike scheme without physical docking stations • Battery technology is improving – some batteries provide 60km-70km range • Although charging e-bikes through interchangeable batteries allows for a ring-fenced scheme • To date this technology has only been used on a small scale trial • Potential for a poor battery changing operation to impact on customer experience • Design of batteries (and other parts) that are not interchangeable with other bikes can help protect against theft	Include

Table 41: Scheme element 5 – Helmets

Option name	Main advantages / disadvantages	Include / exclude
Bring your own Users are required to bring their own helmet 	• Option would require users to bring their own helmet • Unlikely to make the scheme attractive to use as would require people to carry a helmet around with them	Exclude
Courtesy helmets – no cleaning Helmets come with the bike 	• Low cost option to provide helmets • Having to reuse a helmet can put people off using the scheme for hygiene reasons • Helmets are prone to the elements (eg rain, dust etc.) making them unattractive in some situations • If not locked then helmets go missing	Include
Courtesy helmets with cleaning (helmet bins provided) Helmets are situated in bins to ensure a clean helmet each use 	• Attractive option for scheme users as each hirer is guaranteed a clean helmet • Option provides more security and protection from the elements than courtesy helmets (bins locked with code, users receive this at the time of hire) • Associated operational costs of having to restock bins daily • If not locked then helmets go missing	Include
Helmet vending machines Helmets situated in vending machines 	• Attractive option for scheme users as each hirer is guaranteed a clean helmet • Discontinued from the Melbourne scheme due to cost and lack of use	Exclude
Legislation exemption Users are not required to wear helmets 	• Option would remove the requirement for scheme users to use helmets • Unlikely to gain council and central government support	Exclude

Appendix E: Element options full evaluation

Scheme design elements evaluation		Bicycle				Docking stations				Payment and booking platform			Power supply to docking stations				Helmets				
		Minimum: Single gear	Multi-gear	Electric bikes	Mixed scheme: combination of e-bikes and geared bikes	**Minimum: Dockless /** free floating system with no control over where bikes are returned to	Geofenced docking areas using GPS or RF technology	Fixed docking stations with physical restraint of bikes	Hybrid approach between fixed docking / geofencing and limited free-floating while bike still in hire	**Minimum:** At docking station - at kiosk or on dock	On-bike payment	Remote via app / website / phone as well	**Minimum:** No power provided	Solar powered for docking / payment infrastructure and / or e-bike charging	Connected to mains power for docking / payment infrastructure and / or e-bike charging	Inter-changeable batteries for e-bikes charged off-site	**Minimum:** Bring your own helmet	Courtsy helmet provided alongside scheme - no cleaning	Coutesy helmets provided - bins provided to collect helmets for cleaning and drying at no cost	Helmet vending machines for users to purchase	Helmets not requried due to legislation exemption
Principal outcomes																					
1	Improves the accessibility of cycling in the CBD and city fringes												N/A	N/A	N/A	N/A					
2	Reduces the number of short inner city and city fringe trips made by less efficient transport modes, including first and last leg public transport connections												N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Promotes active lifestyles and improved user health outcomes					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	Improves the experience of Auckland city among all users (including visitors)												N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	Is accessible to all potential users for a range of trip types												N/A	N/A	N/A	N/A					
6	Meets customer's expectations now and can easily adapt for future changes	N/A	N/A	N/A	N/A																
7	Is capable of providing a quality and sustainable service into the future																N/A	N/A	N/A	N/A	N/A
8	Minimises potential reputational risk to Auckland Transport and its partners									N/A	N/A	N/A									
Design and implementation																					
9	Is appropriate to Auckland's topography					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	Makes efficient use of public space (including transport space and other public spaces)	N/A	N/A	N/A	N/A																
11	Provides potential for enhancing urban outcomes									N/A	N/A	N/A									
12	Is scalable to meet potential future expansion needs	N/A	N/A	N/A	N/A																
13	Maximises use of existing cycle infrastructure by increasing cycling rates												N/A	N/A	N/A	N/A					
14	Provides opportunity for / incentivises partner involvement					N/A	N/A	N/A	N/A												
15	Utilises existing cycle share technology and future proofs for emerging transport technology (including mobility platforms)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	N/A
16	Can work well alongside other road users					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Usability and operations																					
17	Users find the scheme easy and convenient to use e.g. booking, payment, general use																				
18	Maximises utilisation of the scheme												N/A	N/A	N/A	N/A					
19	Reduces the risk of theft and / or vandalisation of bikes and scheme infrastructure									N/A	N/A	N/A									
20	Reduces the chance of injury or harm to users of the scheme and others e.g. pedestrians	N/A	N/A	N/A	N/A					N/A	N/A	N/A	N/A	N/A	N/A	N/A					
21	Required operations and maintenance can be delivered with minimal disruption and in a cost effective manner	N/A	N/A	N/A	N/A					N/A	N/A	N/A					N/A	N/A	N/A	N/A	N/A
POSSIBLE / DISCOUNTED		EXCLUDE	INCLUDE	INCLUDE	INCLUDE	EXCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	INCLUDE	EXCLUDE	INCLUDE	INCLUDE	EXCLUDE	EXCLUDE

KEY:

NOT AN ACCEPTABLE OPTION BASED ON THE CRITERIA

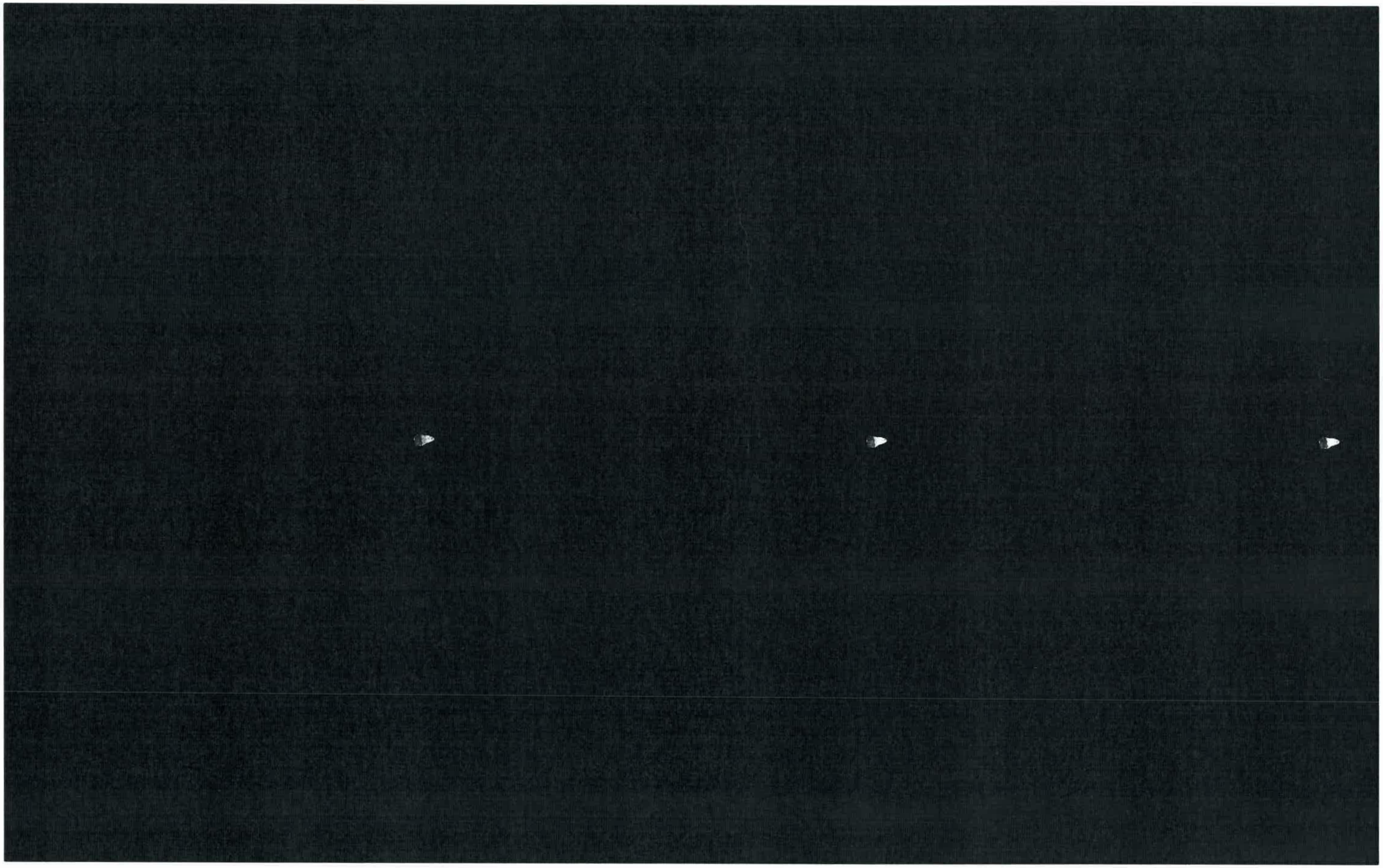
THE OPTION IS ACCEPTABLE BASED ON THE CRITERIA BUT IT IS NOT THE BEST OPTION

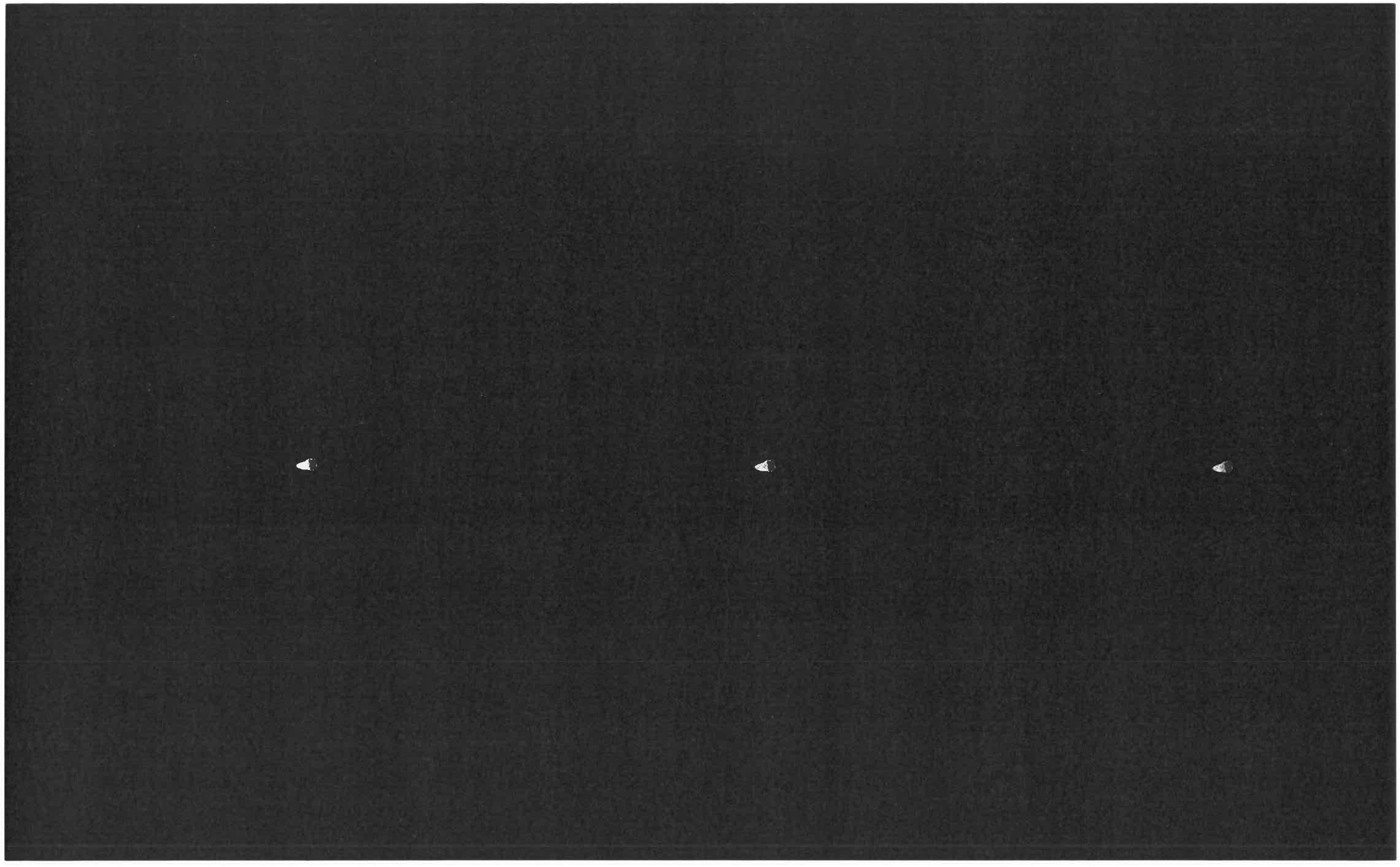
THE OPTION RATES HIGHLY / HAS THE POTENTIAL TO RATE HIGHLY AGAINST THE CRITERIA

THE CRITERIA IS NOT RELEVANT TO THE OPTION OR DEPENDS ON OTHER DESIGN FACTORS

N/A

Appendix F: Summary of RFI responses received





[redacted]

Appendix G: List of supporting documents

A number of documents provide further information relating to the conclusions and assumptions included in this IBC. A list of all supporting documents is provided in Table 44. These documents are available on request.

Table 44: List of supporting documents

Document	Author
Auckland cycle share hire assessment, dated September 2016	Jacobs New Zealand Ltd
Auckland cycle share IBC – scheme identification and benchmarking, dated 6 September 2017.	Jacobs New Zealand Ltd
Bike number assessment, 21 November 2017	Jacobs New Zealand Ltd
Bike number assessment – consideration of a smaller scheme, 22 November 2017	Jacobs New Zealand Ltd
Bike share planning assessment, dated 12 October 2017	Jacobs New Zealand Ltd
Key insights from Customer Central 1-week sprint	Auckland Transport Customer Central
Cycle Share Market and Customer Measure Report, dated December 2017	Auckland Transport Customer Insights
Funding and Commercial Framework, dated November 2017	SGL Funding
Funding and Commercial Framework – Summary, dated November 2017	SGL Funding
Auckland bike share cost estimates, dated 19 October 2017	Alta Planning and Design
Auckland NZ bike share study: e-bike overview, dated, dated 8 September 2017	Alta Planning and Design

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