Hobart to Northern Suburbs Light Rail Business Case

Stage One Report

Prepared for the Department of Infrastructure, Energy and Resources Tasmania

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ACIL Tasman

Economics Policy Strategy

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Contents

List of figures

List of tables

Glossary

BITRE	Bureau of Infrastructure, Transport & Regional Economics
CBD	Central Business District
DCCEE	Department of Climate Change and Energy Efficiency
DIER	Department of Infrastructure Energy and Resources
GJ	Giga Joules
$kgCO_2$-e	Kilogams of Carbon Dioxide Net
LGA	Local Government Area
MONA	Museum of Old and New Art
NSLR	North Suburbs Light Railway
SEIFA	Socio Economic Indices for Areas

Executive summary

ACIL Tasman, Hyder Consulting and SEMF have been appointed by the Department of Infrastructure, Energy and Resources (DIER) to assess the business case for a light rail system which makes use of the existing rail corridor between Hobart and Brighton, traversing the Northern suburbs of Hobart. The study consists of three distinct phases:

- A background phase which describes the context and setting for the project as a whole and sets broad parameters for the remainder of the project.
- A phase which develops optimal operating service models for the light rail system.
- A phase which calculates the economic costs and benefits associated with the optimal operating service models.

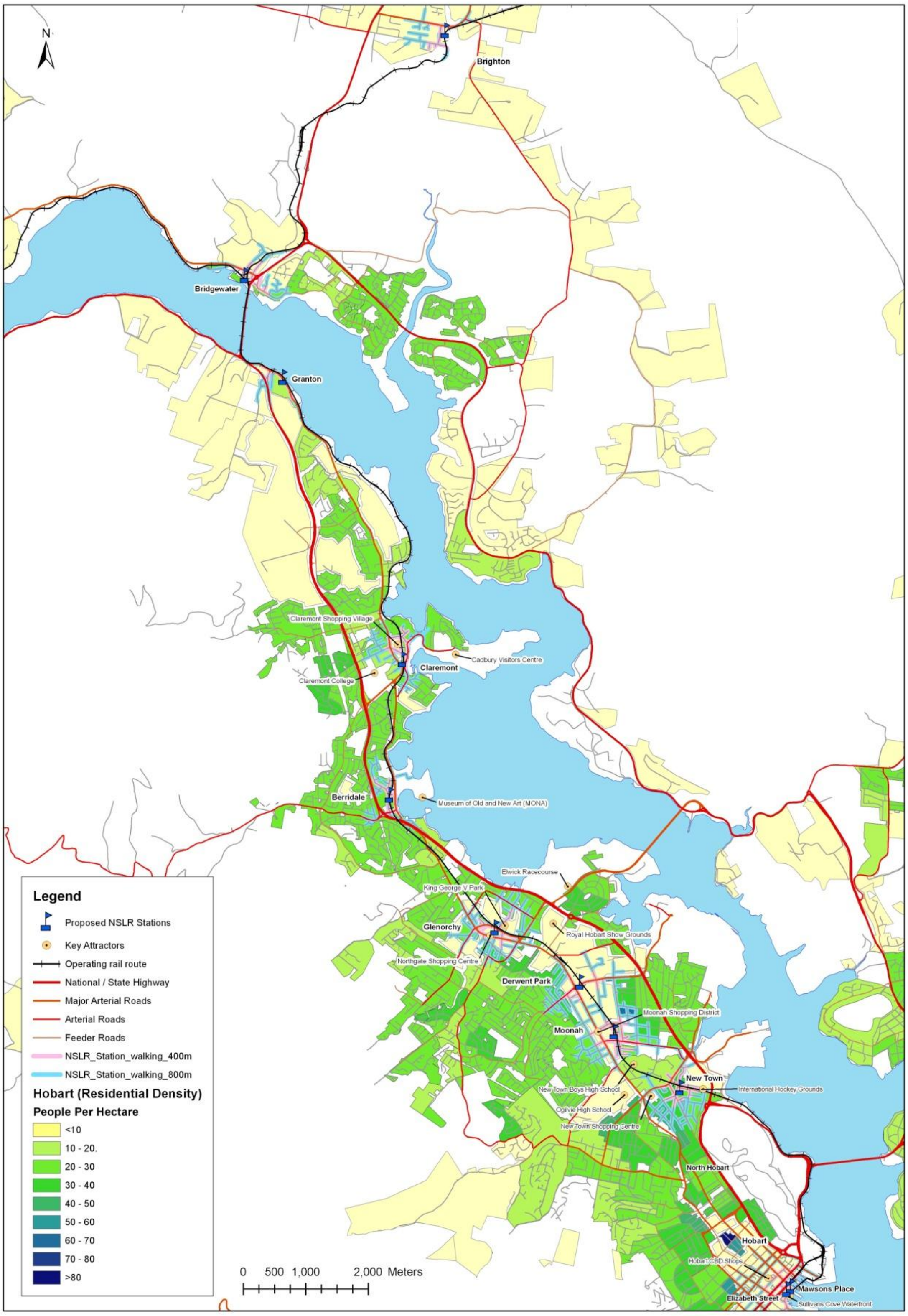
A final phase of the project brings the reports for each of these phases together into a single final report.

The purpose of this report is to provide background for the next two stages of the project which will involve a detailed model of the costs of the light rail system, and a detailed assessment of its likely benefits. This report, in assessing background information, has performed two key roles. Firstly, it has explored the policy settings and transport problems and solutions evident in Hobart that have lead to the consideration of the light rail option. This is part of the requirements of an Infrastructure Australia submission, which must show evidence that numerous solutions to the identified problems were assessed. However, assessing alternate solutions is also useful as it provides some indications of complementary policy changes which could be made to facilitate the light rail project attracting greater ridership.

The second key role of this report is to explore whether it is worthwhile to limit the scope of potential options to be examined in Stage 2. There are finite resources being put towards the creation of the detailed costing models, and it is appropriate that these resources be used in the most efficient way possible allowing all feasible options and variations to be considered. Thus, if part of an option is simply not possible for some reason, or if it is very costly relative to its benefits, it should not be considered further.

There do not appear to be any planning or heritage issues which might restrict what can be considered in Stage 2. We also find that the locations for stations proposed by Johnston (2010) with the addition of a station at Derwent Park, are probably likely to be the best locations for stations, given loci of demand and space to build the relevant infrastructure. These are shown in Figure ES1, together with information on trip attractors and population density along the route.

Figure ES 1 **Potential station locations**



Data source: DIER analysis and Johnston, 2010.

In a similar vein, we suggest that only one park 'n ride should be considered, at Bridgewater and that there are only a few suitable locations for maintenance facilities. We therefore recommend that Stage 2 proceed with these restrictions in scope.

In terms of likely costs and benefits, we conduct a high-level analysis of demand, and costs of service provision. The former is based upon bus patronage and assumptions on numbers of people likely to walk from home to their nearest station. The latter is based upon work by Johnston (2010) and some very conservative track cost estimates made by Hyder ahead of their site visit.

Our simple analysis involves converting the capital costs of the project into an annuity and then adding them to operating and maintenance costs to provide an annual expenditure figure. This is then compared with revenues based upon a simple model of demand incorporating transference of passenger from existing bus routes to light rail and new passengers within walking distance (400 and 800 metres) of each proposed station using the light rail service. Both cost and revenues are allocated to stations to assess the viability of each station along the route. Track costs are allocated based upon the kilometres of track between one station and the next, and rolling stock costs are allocated across stations based upon demand at each station. Demand is allocated to the station of origin of the bus transfer passengers and the new walk-on passengers. Thus, if a new walk-on passenger travels from Claremont to Hobart every day and back again, both trips are allocated to Claremont. Demand originating from the terminal at Hobart is not assessed, as any rail system would need to include it, and the smaller number of travellers projected to travel outwards from Hobart to stations along the route (mostly Glenorchy) are allocated to their destination stations. This has the effect of (slightly) improving the viability of each of the stations along the route.

The result of this analysis are presented in terms of the net annual revenue per station, and the costs per passenger boarding per station. These are shown in Tables ES1 and ES2 respectively. We analyse numerous demand and cost scenarios. Tables ES1 and ES2 summarise the results for the worst and best cases of demand, and for all of the cost scenarios.

Table ES 1 **Annual net revenues per station ($'000)**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	-$1,000	-$1,158	-$1,380	-$1,949	-$1,098	-$1,256	-$1,478	-$2,047
Moonah	-$427	-$475	-$542	-$734	-$590	-$638	-$705	-$897
Derwent Park	-$355	-$385	-$426	-$546	-$538	-$568	-$610	-$729
Glenorchy	$11	-$42	-$117	-$266	-$646	-$699	-$774	-$923
Berridale	-$262	-$350	-$472	-$824	-$372	-$460	-$583	-$934
Claremont	-$438	-$510	-$611	-$836	-$516	-$588	-$689	-$914
Granton	-$837	-$1,017	-$1,269	-$1,927	-$886	-$1,066	-$1,318	-$1,975
Bridgewater	-$909	-$970	-$1,055	-$1,300	-$1,762	-$1,823	-$1,909	-$2,153
Brighton	-$1,081	-$1,282	-$1,564	-$2,369	-$1,308	-$1,509	-$1,790	-$2,595
	Best Case Demand Scenario							
New Town	-$591	-$750	-$971	-$1,540	-$689	-$848	-$1,069	-$1,639
Moonah	-$68	-$116	-$183	-$375	-$231	-$279	-$346	-$538
Derwent Park	$29	-$1	-$43	-$162	-$154	-$184	-$226	-$345
Glenorchy	$354	$301	$226	$77	-$303	-$356	-$431	-$580
Berridale	-$37	-$125	-$248	-$599	-$147	-$235	-$358	-$709
Claremont	-$117	-$190	-$291	-$516	-$195	-$267	-$369	-$593
Granton	-$817	-$998	-$1,250	-$1,907	-$866	-$1,046	-$1,299	-$1,956
Bridgewater	-$755	-$816	-$901	-$1,146	-$1,608	-$1,669	-$1,754	-$1,999
Brighton	-$868	-$1,069	-$1,350	-$2,156	-$1,094	-$1,296	-$1,577	-$2,382

Table ES 2 **Cost per boarding per station**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	$46.31	$53.26	$62.96	$87.91	$50.62	$57.56	$67.26	$92.21
Moonah	$5.08	$5.37	$5.77	$6.93	$6.06	$6.35	$6.76	$7.92
Derwent Park	$4.33	$4.48	$4.70	$5.31	$5.27	$5.43	$5.64	$6.26
Glenorchy	$2.49	$2.54	$2.61	$2.74	$3.08	$3.13	$3.20	$3.33
Berridale	$5.46	$6.06	$6.88	$9.25	$6.21	$6.80	$7.63	$9.99
Claremont	$10.91	$12.10	$13.76	$17.47	$12.19	$13.38	$15.04	$18.74
Granton	$95.55	$115.35	$143.01	$215.12	$100.88	$120.68	$148.35	$220.45
Bridgewater	$8.01	$8.30	$8.70	$9.86	$12.05	$12.34	$12.74	$13.90
Brighton	$63.04	$73.96	$89.23	$132.92	$75.33	$86.26	$101.52	$145.22
	Best Case Demand Scenario							
New Town	$5.67	$6.53	$7.71	$10.77	$6.20	$7.05	$8.24	$11.30
Moonah	$2.72	$2.87	$3.09	$3.71	$3.25	$3.40	$3.62	$4.24
Derwent Park	$2.42	$2.50	$2.62	$2.97	$2.94	$3.03	$3.15	$3.49
Glenorchy	$2.22	$2.26	$2.32	$2.44	$2.74	$2.79	$2.85	$2.97
Berridale	$3.88	$4.30	$4.88	$6.56	$4.40	$4.82	$5.41	$7.09
Claremont	$4.50	$4.99	$5.67	$7.20	$5.02	$5.52	$6.20	$7.73
Granton	$60.48	$73.01	$90.52	$136.16	$63.85	$76.38	$93.90	$139.54
Bridgewater	$6.69	$6.93	$7.27	$8.23	$10.06	$10.30	$10.64	$11.61
Brighton	$17.31	$20.31	$24.50	$36.50	$20.69	$23.68	$27.88	$39.87

Our analysis suggests that the last three stations on the proposed line (Granton, Bridgewater and Brighton) seem unlikely to be viable, even when issues such as emissions and travel time savings are included. Bridgewater appears viable in Tables ES1 and ES2 due to its being close to Granton and the way in which our cost allocation mechanism operates (see Section 6). We also undertake some sensitivity analysis looking at Bridgewater, Granton and Claremont as potential termini for the system, to see if this improves viability. Placing the terminus at Bridgewater does not change its situation markedly from that shown in Tables ES1 and ES2. Placing it at Granton reduces the high cost per boarding of Granton shown in Table ES2 (chiefly because the park 'n ride would move to Granton under this scenario), but it is still roughly twice as costly as the average for the other stations on the system. Placing the terminus at Claremont (and thus moving the park 'n ride) makes Claremont one of the lowest cost stations on the system, and is likely to improve the overall system benefit-cost ratio. By contrast, a terminus at Granton, Bridgewater or Brighton is likely to significantly reduce the overall system benefit cost ratio, and the high costs associated with improving the line out to these stations and investing in extra rolling stock to maintain the 15-minute service recommended to ensure the service is attractive to users may in fact render the system as a whole unviable if they are included. We thus recommend that they not be considered further in Stage 2.

This does not mean, however, that the relevant rail corridor should be removed. Brighton is the fastest-growing municipality in the region, and it may be that at some time in the future (more than a decade hence, given growth rates and current costs of service) there is scope to extend the service further. Maintaining the corridor therefore provides an important option for the future flexibility of public transport provision in Hobart, and should remain an important policy priority.

1 Introduction

ACIL Tasman, Hyder Consulting and SEMF have been appointed by the Department of Infrastructure, Energy and Resources (DIER) to assess the business case for a light rail passenger system which makes use of the existing rail corridor between Hobart and Brighton. The study consists of three distinct phases:

- A background phase which describes the context and setting for the project as a whole and sets broad parameters for the remainder of the project.
- A phase which develops optimal operating service models for the light rail system.
- A phase which calculates the economic costs and benefits associated with the optimal operating service models.

A final phase of the project brings the reports for each of these phases together into a single final report.

This report details the outcomes of the first stage, providing background and a basis for the rest of the project. The reason for this report is two-fold. In the first instance, it provides information important for any future submissions to Infrastructure Australia to fund the light rail system. For this reason, it has a structure very similar to an Infrastructure Australia submission, and considers issues important to Infrastructure Australia. Secondly, however, it provides background to the remainder of the project. In particular, it outlines the results of a high-level feasibility analysis of the light rail system, section by section. The intent of this is to explore whether it is appropriate to reduce the scope of Stage 2, allowing for greater focus on models which have the best chance of being viable. A more detailed demand analysis will be conducted in Stage 3 of the project.

Section 2 of this report provides an overview of the policy framework within which the proposed passenger rail project sits. Section 3 outlines the transport problems the light rail system aims to solve. Section 4 examines different solutions, other than the proposed system, which might be used to solve these problems and assesses each of these solutions. Section 5 provides a background to the rail solution and Section 6 assesses this solution in broad terms. Section 7 offers some conclusions from the analytical process.

2 Policy Framework and Background

The document which relates most directly to the provision of public transport services in a planning sense is the *Tasmanian Urban Passenger Transport Framework* (DIER, 2010a). It seeks to improve outcomes in five priority areas:

- Greenhouse gas emissions
- Liveable and accessible community
- Travel reliability
- Healthy, active communities
- Integrated transport and land use.

The *Framework* focuses on how alternative modes, particularly walking, cycling and public transport, can be best utilised to achieve these outcomes.

The *Framework* specifically identifies aspects of Hobart that are considered to constrain the use of alternative transport modes to private cars, most particularly its low-density of population and the increasing complexity of trips undertaken by people in Hobart. Both of these factors make the provision of public transport more difficult and opportunities for walking and cycling less frequent.

The *Framework* addresses all aspects of public transport, including buses, trains and ferries. Its short to medium term recommendations are based on further development of the existing bus-based public transport system, recognising the need for 'incremental, linked improvements' in the urban passenger transport system to increase utilisation of alternative transport modes.

In support of its recommendations, the *Framework* details numerous travel demand measures, and the results of modelling intended to assess how demand for public transport might be increased.

The *Framework* identifies the development of mass transit services, such as light rail, bus rapid transit or ferries, as the outcomes of implementing a long term strategic planning framework providing for better integration of land use and transport. In particular, in response to greater densification of residential and commercial activities around major corridors.

The *Framework* details a process by which it aims to achieve the desired Outcomes in Hobart through six key "moves" shown in Figure 1.

Figure 1 **Framework action areas**

Action Area	*Vision*	*Identified opportunities*
Moving Minds	Increased public awareness, acceptance and usage of public transport, walking and cycling options. Building partnerships between key stakeholders.	• *Implement travel behaviour initiatives to target household travel choices, including TravelSmart and school and workplace travel plans* • *Support car pooling programmes* • *Establish an Urban Transport Advisory Council to guide implementation of the Framework* • *Improve the marketing of alternative transport modes*
Moving Places	Consolidation of population around designated transit corridors, providing the critical population density to support future mass transit systems. Strengthening the role of regional urban centres to support more localised access to commercial centres and other key facilities.	• *Designated transit corridors for high frequency bus services* • *Integration of transport and land use planning* • *Development of Metropolitan (Integrated Land Use and Transport) Plans*
Moving People	High frequency public transport delivered with high quality infrastructure that enhances the attractiveness, efficiency and utility of public transport	• *Improving frequency and span of services* • *Development of off bus infrastructure* • *Pricing mechanisms* • *Better provision of Information* • *Integration of modes* • *Delivering Transit priority on key corridors* • *Marketing services*
Moving Policies	Encouraging use of alternatives to private vehicles	• *Reduce State Government car parking spaces* • *Develop an effective metropolitan car parking strategy addressing:* ▪ *Minimum parking requirements* ▪ *Shared parking provisions* ▪ *Uniformity of parking requirements*
Moving Legs	Encouraging walking and cycling though through infrastructure, land use planning and behavioural change.	• *Implement the Walking and Cycling Strategy which will include:* ▪ *Mapping the existing network* ▪ *Gathering data on usage and potential future demand* ▪ *Identifying new routes and linkages* ▪ *Safety, signage and supporting infrastructure*
Moving Forward	Adopting a long term approach to integrated land use and transport planning.	• *Establishing a Strategic Integrated Land and Transport Committee in conjunction with the Tasmanian Planning Commission and 3 regional authorities.* • *Implementing the Key Initiatives of the Framework* • *Monitoring and evaluating the implementation of measures* • *Reviewing the Framework in five years time*

Data source: DIER, 2010, p24

2.1 Land use and zoning policies

Transport planning and the provision of public transport services sit within a wider planning context. Most importantly, both interact with land use planning and all three are ideally considered together; decisions on land use can drive transport demand, and decisions relating to transport infrastructure and public transport services can drive location decisions made by firms and households.

Land use planning is primarily the responsibility of Local Government in Tasmania. There is currently limited integration between land use and infrastructure planning, both at a local and strategic level. This is an issue for cohesive planning that has been recognised by the Tasmanian government (see below).

The current pattern of development in Hobart does not support the efficient and effective provision of public transport, as land use has primarily been designed around private cars and road-based transport. In Hobart, the key development trends which affect transport and land use planning, include:

- a dispersed settlement pattern
- segregation of land use types
- emphasis on car-based development approvals
- the location of affordable housing in urban fringe areas.

Moreover, there is also a tendency for Local Governments to compete with one another for economic activities to increase their own rate base, without considering broader effects. The result is that infrastructure providers are left confronting multiple residential and commercial growth corridors and ad-hoc industrial precincts, which mean that finite resources for the provision of infrastructure are thinly spread.

One mechanism to change this is through regional or metropolitan based planning. Regional land use strategies are being developed for the three regions in the State, including Southern Tasmania. The intent of this approach is to develop new planning schemes which are consistent with each regional land use strategy which will guide development and investment decisions and encourage a pattern of settlement and infrastructure provision important for the future needs, capabilities and potentials of each region. The *Strategy* for Southern Tasmania (Southern Tasmanian Councils Authority, 2010) underwent consultation in November to December 2010 and is in the process of being revised. The *Strategy* seeks to better integrate land use and infrastructure planning by using transport infrastructure more efficiently, rather than building new infrastructure. One mechanism by which it is hoped this will be achieved is through holistically managing residential growth through the creation of an urban growth boundary, land release program and increasing residential densities through infill development.

This approach aims to balance growth at the urban fringe by encouraging more infill development to meet land and housing supply needs. It is believed that encouraging more infill development will support the greater use of public transport and walking and cycling options. The intent is to support this by increasing densities around designated high frequency public transit corridors.

If the Strategy is successful in creating more infill development and higher density living along transit corridors then it is believed by government that this will result in greater use of public transport.[1] However these measures alone will not result in an increase in public transport without implementation of the measures identified in the *Framework* to provide greater incentives to use public transport.

Much more detail on transport and its integration with land use planning is contained in the *Southern Integrated Transport Plan* (DIER, 2010b). In terms of passenger transport, its main focus is on the provision of alternative transport options to the car in Hobart. On the transport side, it details plans for improving the public transport network, and how travel patterns will be analysed to understand better how to make such improvements. On the land-use side, it details how planning will change to ensure better local-level connectedness, and to provide more opportunities for walking, cycling and using public transport. This includes not only infrastructure solutions such as improving footpaths, but also changing planning decisions to manage the demand for travel.

In broad terms the *Plan* aims to make use of a range of policy tools to achieve its aims, including (DIER, 2010b p4)

- **Targeted infrastructure upgrades or better use of existing infrastructure:** using existing infrastructure more effectively to increase the capacity, efficiency and safety of the existing system and ensuring new infrastructure demonstrates and supports wider economic and social benefits.
- **Demand management:** encouraging more efficient use of the existing transport system by focusing on the movement of people over vehicles and reducing the number of single occupancy car trips using a mixture of infrastructure and non-infrastructure solutions.
- **Technology:** using technology such as intelligent transport systems to improve the efficiency, safety and environmental performance of the

1 Although with more people living in a given area, it will result in more trips by car as well. This may cause more congestion in these proposed high density areas than exists at present.

transport system and modes through a mixture of policy and regulation responses.

- **Education and information:** helping people to better understand the implications of their travel behaviour and available transport choices, and managing people's expectations regarding infrastructure performance and responses required.
- **Regulation:** providing an innovative infrastructure substitute or support mechanism, including pricing strategies that facilitate changes in transport use by encouraging or discouraging particular choices and behaviours and that reflect the true cost of infrastructure provision.
- **Engagement and partnerships:** engaging and developing partnerships across all spheres of government, industry and the community in order to develop innovative, bottom-up solutions.

3 The Transport Problem in Hobart

In this chapter we explore in detail the nature of the transport "problem" in Hobart. The Northern Suburbs Light Railway (NSLR) has been proposed as part of the solution to numerous transport issues in this part of Hobart, and in this chapter, we explore some of these issues. The importance of examining the problem (or problems) initially is that doing so can often suggest various potential solutions, not all of which would require the building of infrastructure. Infrastructure Australia requires consideration of all of these solutions in order that it can assess the appropriateness of a particular proposed option in a submission. It is also useful outside the Infrastructure Australia context because it can shed light on complementary policies which might improve light rail ridership.

3.1 Goal definition

The goal of transport provision in Hobart (of passengers) is summarised in the *Framework* (DIER 2010a p4) thus:

> "A safe and responsive passenger transport system that supports improved accessibility, liveability and health outcomes for our communities in the context of the challenges of climate change"

That is, the goal of the transport system incorporates not only the efficient operation of public transport in Hobart, seeking to make it a viable alternative to the use of the car, but also broader aspects associated with public transport use, such as health and environmental outcomes.

In addition it is recognised that there is need for a public transport system to provide seven day a week access for the transport disadvantaged and in particularly those who would otherwise be socially excluded.

3.2 Transport associated problems

In this section, we provide an overview of the various problems which have been identified in relation to transport in Hobart.

Congestion

Certain roads within Hobart experience congestion at certain times of the day. In particular, the Brooker Highway and Main Road traversing the Northern suburbs experience congestion in the morning peak period, roughly between 8am and 9am. Some congestion is also evident on Main Road and the Brooker Highway during the PM weekday peak, but this is not as significant as the morning peak. This is shown in Table 1, which records average speeds and delays on a 10km section of the Brooker Highway radiating out from central Hobart in 2006.[2]

Table 1 **Brooker Highway congestion**

	Morning Peak In	Morning Peak Out	Afternoon Peak In	Afternoon Peak Out	Off Peak In	Off Peak Out
Delay in seconds per km (compared to travel at speed limit)	87.10	33.45	27.34	41.64	16.39	22.04
Average travel speed	27.12	46.64	49.32	42.17	58.02	54.73

Data source: DIER, 2011, pp6-7

Speeds in the morning peak are roughly half those in the off-peak, and represent a delay of roughly 12 minutes over the course of the 10km section of highway. The afternoon peak is much more moderate. Compared with other cities, congestion in Hobart is rather moderate, as shown in Table 2.

Table 2 **Urban Congestion Indicator for roads in Hobart and other states**

Location	Morning Peak	Off peak	Afternoon peak
Southern Outlet	0.09	0.06	0.10
Tasman-South Arm Highway	0.37	0.11	0.35
Brooker Highway	0.33	0.28	0.27
Average for above 3 routes	*0.26*	*0.15*	*0.24*
NSW	0.77	0.33	0.60
Victoria	0.73	0.42	0.59
Queensland	0.78	0.25	0.55
Western Australia	0.44	0.14	0.34
South Australia	0.66	0.41	0.56

Data source: DIER, 2011, p8.

The most congested roads during the morning and afternoon peak periods are substantially less congested than in other states. However, the Booker Highway is more congested off-peak than roads in Queensland and WA, and almost as congested as those in NSW. It is thus a busy road by any Australian standard.

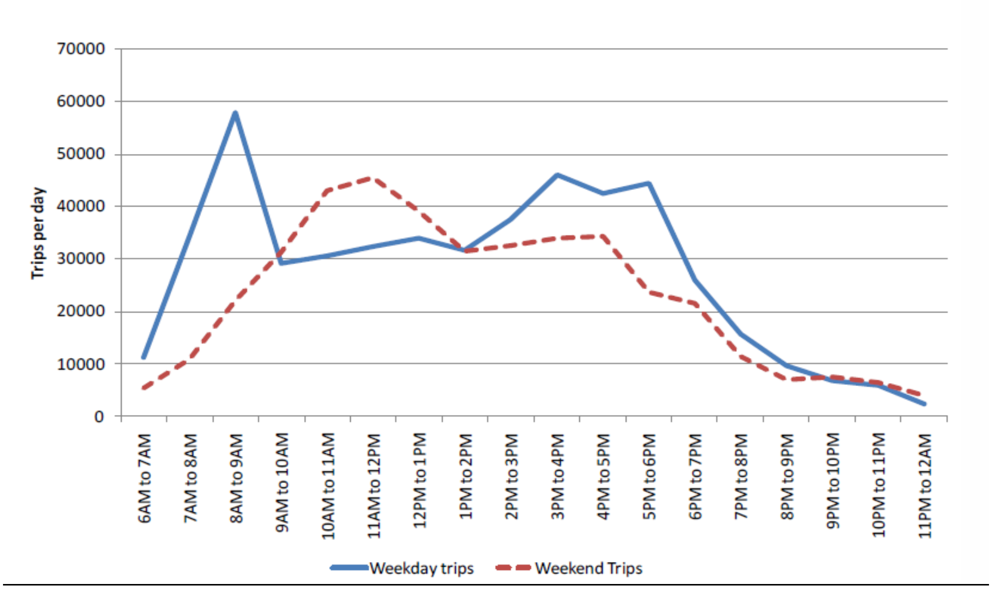
The fact that congestion is generally not as bad as other states suggests that expensive measures, such as road-widening, tunnels and the like, are probably not appropriate for Hobart, or would take a lower priority than similar measures in other states. However, congestion is always a local issue, and even though the levels in Hobart are relatively low compared to other states, this

[2] Anecdotal evidence suggests conditions are worse now than in 2006, but DIER is undertaking the process of re-assessing congestions across Greater Hobart, and the 2006 data are the most recent available.

does not mean it is not an issue for the community in Hobart, which benchmarks (generally) against its own past experience rather than that of other states. There is thus an expectation in the community that reasonable measures will be taken to alleviate congestion.

One aspect of traffic peaking which is worthy of further comment is why the peak is higher in the morning than in the afternoon. This phenomenon is associated not only with the Brooker Highway and Main Road, but is prevalent across Hobart, as shown in Figure 2.

Figure 2 **Distribution of trips over the day**



Source: DIER, 2010c p24

The morning needle-peak occurs between 8am and 9am, but the afternoon peak is spread; peaking at 3-4pm and then again at 5-6pm. In the mornings, both schools and workplaces mostly commence between 8am and 9am, meaning that school children are being driven or are taking the bus to school at the same time as commuters are on the road travelling to work. In the afternoons, school finishes roughly two hours before the end of the working day, and thus there are two lower peaks in the afternoons.

The influence of school travel is important not just from the perspective of when trips occur, but also where they occur. Evidence from discussions with transport planners in Hobart suggest that travel patterns amongst students have changed in recent years, as students have become able to attend any school (not just the closest school). For schools in the Northern suburbs of Hobart, there are significant flows from east and west to attend the high schools including the public all girls Ogilvie High School, public all boys New Town High school, Dominic College, Scared Heart and Friends. Such east –

west flows are satisfied by the provision of student only bus services. This is important because the NSLR runs north-south, and it is thus not clear that it will be heavily used by school students. Moreover, bus services have been designed to take secondary school students from suburban areas directly to school and in some cases have a better market share than timetable Metro services in terms of the numbers of school students carried. They are popular with students. If students make use of the NSLR, they may require one or two transfers per trip and rail may be less popular for this reason amongst students.

Associated with the issue of congestion is the fact that buses currently have no priority on the road (with the exception of "give way to buses" signage on buses), which influences the degree to which they are able to keep to timetables. Where bus services are unable to adhere to timetables along routes, this can often result in their becoming a less attractive option for travellers.

Social inclusion and access to public transport

Social inclusion is a term that refers to whether a person has the resources, opportunity and capability to learn, work, engage (connect with people, use local services and participate in local, cultural, civic and recreational activities), and have a voice; influence decisions that affect them (Australian Social Inclusion Board, 2010, p15). Social exclusion occurs when constraints prevent adequate participation in these activities.

In Tasmania a Social Inclusion Unit has been established in the Department of Premier and Cabinet and has developed a Social Inclusion Strategy. The strategy considers transport is fundamental to connecting people to opportunity (see: www.dpac.tas.gov.au/divisions/siu/strategy/strategy).

Many factors can affect social inclusion. Low income, language barriers, isolation, education, long term unemployment and physical disability can limit people's ability to participate in some activities. Physical accessibility or the ability to reach (get transport to) desired goods, services, activities and destinations is often an important factor.

This is particularly the case for people who live in areas that are dependent on cars for transport but do not drive themselves. In a more car dependent community, driving is a necessity, due to the dispersion of destinations, poor travel options for non-drivers, and because alternative modes (walking, cycling and public transit) are often stigmatised.

Social inclusion in the Study Area

The Australian Bureau of Statistics publishes a range of Socio Economic Indices for Areas (SEIFA) calculated using selected data from the 2006 Census. The SEIFA indices are the main indicator of disadvantage in Australia

(Social Inclusion Unit, Department of Prime Minister and Cabinet, 2008, p14). These along with a range of socio economic variables for the Local Government Areas (LGAs) of Brighton, Glenorchy, and Hobart which are considered to be the main catchment areas for the Northern Hobart Suburbs Light Rail project are presented in Table 3.

Brighton has the lowest ranking of any LGA in Tasmania in terms of its SEIFA indexes for socio economic disadvantage and socio economic advantage and disadvantage. This means its residents are the most socially and economically disadvantaged in Tasmania. Hobart is the least disadvantaged LGA in Tasmania. Glenorchy ranks between the two, but towards the lower end of the scale.

Table 3 **Socio economic variables: Local Government areas of Brighton, Glenorchy and Hobart**

	Brighton	Glenorchy	Hobart
SEIFA index (socio economic advantage and disadvantage)	859	902	1058
SEIFA ranking in Tasmania	1 (most disadvantaged)	12	29 (least disadvantaged)
SEIFA index (socio economic disadvantage)	871	920	1041
SEIFA ranking in Tasmania	1 (most disadvantaged)	8	29 (least disadvantaged)
Population	14,122	43,413	47,700
Estimated annual population growth 2004 – 2009	3.0%	0.0%	0.4%
Aboriginal people as a share of the population	6.20%	3.80%	1.20%
Median age	31	39	37
% persons aged 15 and over	72%	81%	85%
Median weekly household income	$805	$727	1,036
Speaks language other than English at home	1.60%	5.60%	11%
Does not speak English well	2.40%	7.30%	6.30%
Share of total dwellings government housing	21%	8.70%	3.2%
Families with children aged under 15	50%	39%	36%
Share of families with children under 15 that are single parent families	35%	34%	22%
Unemployment rate 2006	8.9%	6.8%	5.5%
% population with no post school qualifications	61%	56%	38%
Number of employed persons in low skilled occupations	2,764	9,120	7,249
Share of employed persons in low skilled occupations	53%	51%	30%
Main industry of employment (% of workforce)	Manufacturing (14%) and Retail Trade (14%)	Retail Trade (14%)	Health Care and Social Assistance (13%)
Monthly loan repayment	$888	$867	$1,138

Data source: 2006 Australian Bureau of Statistics Census and catalogues 3218.0 and 2033.0.55.001, and (Department of Education, Employment and Workplace Relations, 2010)

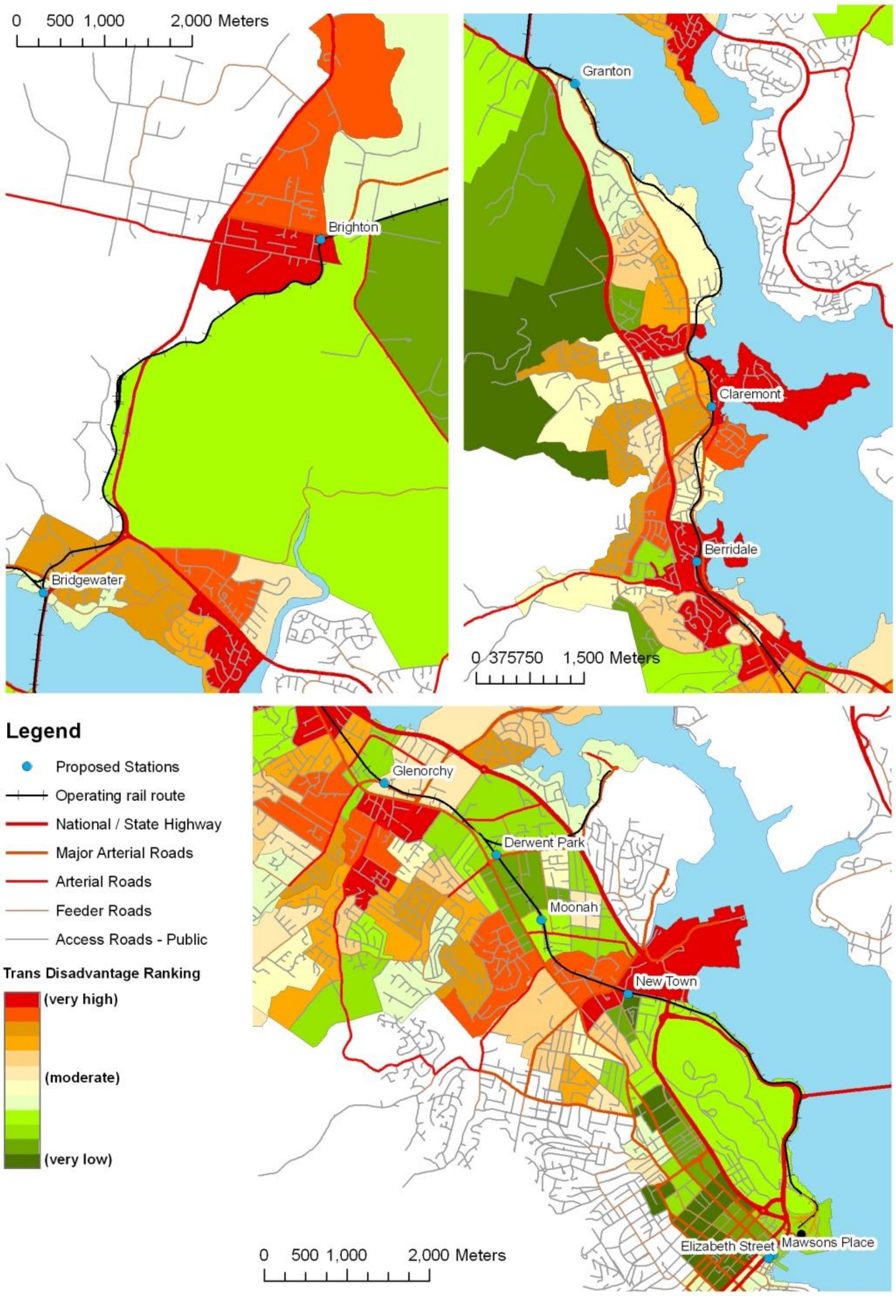
The Brighton and Glenorchy LGAs are characterised by some common disadvantages. These include low weekly incomes, a high reliance on government housing, a larger share of the population aged under 15 and a corresponding large share of families with young children, a very high rate of single parent families with young children (particularly in Brighton and Glenorchy), high rates of unemployment, low rates of educational attainment, a high rate of people employed in low skilled occupations and a corresponding reliance on low skilled jobs for employment. To the extent that transport systems can form part of the solution to these complex and multi-faceted issues of social exclusions, it is critical that they do so. This is something that will be explored in detail in Stage Three of the project.

A more transport-specific measure than SEIFA is transport disadvantage. A measure of transport disadvantage has been prepared for DIER by Booz and Company (2008) across Hobart. The measure developed by Booz & Company includes:

- Adults without cars
- Accessibility (how far along a public road from home to public transport)
- Persons aged over 60 years
- Persons on a disability pension
- Adults on a low income
- Adults not in the labour force
- Students

The results for this measure of transport disadvantage along the route of the proposed NSLR are shown in Figure 3.

Figure 3 **Transport disadvantage in Northern Hobart Suburbs**



Data source: DIER projection based on Booz and Company (2008) methodology

Much of the first part of the route (from the city) does not suffer transport disadvantage. New Town appears as an exception, but this is largely due to statistical anomalies.[3] The further north the track goes, in general, the higher

[3] Reflecting the particular mix of public and private housing in the study area.

are the levels of transport disadvantage. The problem is particularly acute in Brighton and in parts of Glenorchy, where transport disadvantage is coupled with socio economic disadvantage. This suggests that particular emphasis might usefully be placed on solving transport issues in these parts of Hobart.

Emissions

Tasmania has a target of a reduction in greenhouse gas emissions of 60 percent below 1990 by 2050 (DIER, 2010a). Some 21 percent of emissions in Tasmania come from the transport sector, and some 92 percent of that comes from road transport, with passenger cars being the largest contributor (DIER, 2010a). Most of the passenger vehicle kilometres are in Hobart, so initiatives that reduce passenger vehicle use in Hobart can have significant effects.

To appreciate the savings that can be generated through the use of light rail, according to the Department of Climate Change and Energy Efficiency (DCCEE, 2010, p17), a kilolitre of automotive petroleum contains 34.2 GJ of energy, and a GJ of energy contains 66.7 $kgCO_2$-e/GJ (kilograms of carbon dioxide net per gigajoule of energy). This means that there is roughly 2.28 $kgCO_2$-e emitted when a litre of petroleum is consumed by a passenger vehicle. Compared to figures from the Australian Bureau of Statistics (ABS, 2008) suggest that almost 14 billion litres of fuel were consumed by passenger vehicles in Australia in 2007, and from the Bureau of Infrastructure, Transport and Regional Economics (BITRE, 2009) suggest that these passenger vehicles travelled roughly 194 billion km in the same year. This gives an average fuel consumption of 0.072 litres per km, which is equivalent to roughly 164 gCO_2-e/km.

When a weighted average of passenger journey lengths (based upon boardings per station in Table 4) is taken, the average journey on the proposed NSLR is 10km. Thus, for every journey where a person shifts from their car to the light rail, roughly 1.64 kg of carbon dioxide emissions will be saved; less the emissions which are generated by either the light rail vehicle itself or the electricity generation units which supply its electricity. Over the course of a year, for the system as a whole, savings are roughly equivalent to 0.2 percent of Tasmania's carbon dioxide emissions from transport.[4] If the savings are valued at $30 per tonne of carbon, which is roughly the average price projected by the Commonwealth Treasury over the next decade if an emissions trading scheme is introduced, then the savings are worth between $90,000 and $135,000 in benefits per annum, depending upon demand levels.

[4] Based upon figures from the DCCEE (2008), which suggest Tasmania's emissions from transport are roughly 1.75 $MtCO_2$-e.

The analysis above is preliminary. It does not take into account factors like the age of the fleet, or whether drivers in Tasmania drive more on average than the rest of Australia. However, it does provide a preliminary indication of the likely scale of emissions saved, and their potential value.

Ageing population

Tasmania is ageing more rapidly than elsewhere in Australia. The phenomenon associated with a large baby-boomer cohort being followed by smaller cohorts from later generations is common, but in Tasmania it is exacerbated due to emigration to other Australian states by younger Tasmanians, and inwards migration from other states by older people seeking "sea-change" or "tree-change" lifestyles (see Jackson & Wilde, 2010, for details on Tasmanian migration trends).

From the perspective of public transport, the major issue is that, as people become older, their needs in respect of public transport change. Rather than mostly using public transport to travel to and from work at the beginning and end of the day, they use it to travel around a city, throughout the day. They may also have special mobility needs, such as a need for wheelchair access, which is less prevalent amongst younger commuter travellers. A public transport system designed for commuters is not necessarily effective in meeting this demand, and trying to reconcile the two demand profiles and provide appropriate transport will be an important component of future public transport provision in Hobart.

Traffic and land-use planning interaction

This issue is covered extensively in Section 2.1. In essence, the interaction between transport and land use planning has been poor in the past. This is changing, but the legacy of past planning policies, in terms of the infrastructure and urban form that currently exist, may take some time to overcome.

Dispersed populations and separated land uses

From the perspective of passenger transport, perhaps the most important source of problems from the perspective of the interaction between transport and land use planning is the degree to which Hobart's population is dispersed at the urban fringe, and the prevalence of single, rather than mixed use zones.

This low-density of population has resulted in bus routes being planned, generally, on a low-frequency, high-penetration basis. That is, bus routes are often very long, and thus take a long time to reach their final destination, as they endeavour to service the widely spread-out suburbs. There are several express, or X-Series bus services, and these generally enjoy relatively high levels of patronage. However, providing coverage, speed and frequency is challenging in a low-density city such as Hobart.

The result is often poor service in outer suburbs, which is problematic because these are the suburbs which, due to their cheap land, are more likely to contain lower socio-economic groups, who are less likely to own a car and thus more likely to be dependent on public transport. Thus, those for whom modal choice is most important are those for whom it is least available.

High cost of public transport

The provision of public transport in a low-density city like Hobart is particularly costly. Metro's cost in Hobart equate to approximately $5.25 per trip, based upon an annual net costs of $31.4million[5] and patronage of 6 million trips per annum. By contrast, the full fare for a short distance trip of one to four sections (which would account for the majority of trips by rail) is $2.50. Most passengers do not pay this full fare, however; some 73% percent of trips are by concession-card holders including students, meaning fare-box revenue is approximately $1.50 per trip. With the exception of passengers from the outskirts of Hobart, for whom the government pays a direct subsidy on a per passenger basis, concession fares are funded via block grants from government. In 2010, this grant was $22.6 million for Hobart.

Many of the costs faced by Metro are fixed, at least at the level of an individual bus service, and hence subsidies could be reduced by putting more people on each bus. However, the price elasticity of demand for buses is relatively low (Metro uses estimates of -0.4), and hence even a large reduction in price would likely increase, rather than decrease subsidies.

The experience in Hobart has been that it is not price which drives public transport use, but frequency of service (EMRS, 2007). There have been examples in the past where increasing frequency particularly in non peak periods on a route has made the service sufficiently reliable that the increase in patronage offsets the higher costs of more services. However, there are limits whereby increases in frequency do not elicit sufficient additional demand to lower costs overall, and the strategy can involve high risks, as the services must be provided ahead of knowledge about how demand might react in a particular area.

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[5] Net of a special payment from the State Government to Metro of $3.25 million.

4 Potential Solutions to the Transport Problem in Hobart

In this chapter we look at possible solutions to the various problems outlined in the previous chapter. We do not examine the light rail option in this chapter, as it will be assessed in detail in Stages 2 and 3 of the project. We also note, prior to commencing the analysis, that there is no panacea; no solution can address all of the identified problems. In the assessment of each solution, we assess how well it addresses the various problems, and how many it addresses. In a policy context, one would obviously implement several of these solutions, as appropriate, to address different problems as part of a package of reforms.

4.1 Legislative solutions

There are many legislative solutions which can be applied to solve problems in transport, and in general, they have lower direct costs than infrastructure measures. However, they can often have large indirect costs. For example, Beijing (and other cities) rations road space by only allowing cars with particular numberplates to use roads on a given day. There are enforcement costs associated with this, but these are small compared to the direct costs of building more roads. However there are major costs imposed on road users in Beijing, who can only use their vehicles part of the time. Such solutions, whilst they may produce net benefits in very large, very crowded cities such as Beijing, would appear to be less appropriate for cities such as Hobart.

Here we explore some legislative options with smaller indirect costs, which may assist in addressing some of the problems outlined in the previous chapter.

Removing legislative barriers for taxis

One legislative option may be to change the legislative framework which governs taxis and buses. In outer areas, and at times of the day outside peaks across much of Hobart, demand is relatively low, and buses used to cater for peak capacities are often unsuitable to meet low demand cost-effectively. However, demand for point to point individual service such is traditionally offered by a taxi is also reduced at this time of day.

If someone wishes to enter the market in these areas with a taxi, to offer a regular passenger transport service,[6] or a modified form of booked service

[6] Especially with a maxi-taxi, similar to jitney services in Noumea and Manilla.

(such as para-transit), the legislation makes this difficult by placing additional restrictions on operators (such as removal of taxi top lights, covering taxi meters and signage). Taxis are also prohibited from offering multi-hiring, meaning that where multiple people travel in a taxi, only informal fare-sharing arrangements can be entered into between passengers.

However, simply removing legislative barriers may not be sufficient in this instance. Existing bus operators, making use of existing assets, may see few benefits from purchasing newer, smaller vehicles. At the policy level, consideration might be given to changing the way in which public transport contracts are let. In the Netherlands and in some smaller cities in Canada, for example, public transport contracts are output based. That is, instead of a contract for a bus service, the contract is for a service of a given level of reliability and capacity, and it is up to the transport company to choose the optimal form of transport. In some instances, this might be a bus, in some it might be a taxi or minibus, offering a quasi-scheduled service to meet the needs of people in the local community.

The main point is that public transport can be much more flexible than current practices currently allow. If some of the restrictions currently governing the system are removed, there may be scope to allow this flexibility to develop, and for new markets to be created, without necessarily buying more buses or building more infrastructure.

Assessment against problems

This legislative solution is likely to have only limited effects on congestion, as it is aimed at better filling niches on the outskirts of Hobart, and at time of the day when buses are not particularly efficient. However, it performs better against the other problems identified in Section 3.2. In particular it may be more suitable to addressing social exclusion, and issues around ageing, because it provides a more flexible way in which to address this niche sections of the market. The same is true of modal choice; many people will be able to go from one choice (the car, if they have one) to two.

To the extent that a legislative solution provides scope for more people to use public transport, then it may have a positive impact on emissions. However, it may also increase emissions if it means people who are currently not travelling begin to do so. It is thus difficult to ascertain the overall effect.

It may act counter to policies associated with increasing urban density and infill because, if successful, the delivery of a more flexible suite of public transport options at the urban fringe may increase the attractiveness of that part of the city compared to areas closer to the centre where policymakers desire people to live. However, to the extent that the desire by policymakers and planners for people to move inwards is a function of the difficulty of providing public transport at the fringe, the legislative option provides scope for a different way in to address this difficulty that does not require people to move.

Differential work start times

In Japan, different businesses and government departments begin work at different times of the day, so that all workers in large cities such as Tokyo are not trying to access transport (in the case of Tokyo, public transport) at the same time. This means that the peak goes from being a needle to being much lower and more spread out.

Assessment against problems

The solution lends itself primarily to congestion; it doesn't necessarily result in fewer trips or any mode-shift, but just spreads trips out over a longer time period. It also has considerable drawbacks, as businesses which open later may lose their competitive advantage, and hence be unwilling to partake in such a scheme.[7] Moreover, it could prove difficult to enforce, as some government agency would need to regularly check all businesses to check and ensure they open at the correct time. For the scale of the congestion problem that exists in Hobart, it does not seem a suitable solution.

Parking policies

One final option could be to consider parking policy in central Hobart; making it much more expensive than it is at present, and meaning that fewer people drive to work. Parking pricing has strong analogies to congestion pricing, except that the cars are not moving. By increasing the cost of parking, it seeks to effect a change in travel mode, to public transport. The *Framework* (DIER, 2010a, p17) suggests via traffic modelling, that doubling parking prices in Hobart City leads to a reduction in vehicle kilometres travelled of two percent, and an increase in the share of public transport in all trips from 6 percent to 9.7 percent (with a greater increase in peak times). This suggests relatively inelastic responses to parking prices on the part of public transport use.

A second issue is that there is not a neat relationship between parking and congestion, as some parked cars come in during off peak periods and some of the cars causing congestion are going through, not to, central Hobart. The extent to which increasing parking prices affects congestion also needs to be considered against the effects it has on other key transport "problems". By

[7] Government agencies, however, are not subject to these competitive forces, and there may be scope to use such policies with government employees, who make up a reasonable share of the overall workforce in the CBD.

increasing the cost of coming to work, for example, it may harm those from lower socio-economic backgrounds, or provide disincentives for the unemployed. Finally, in the context of Hobart, it also means that the City of Hobart will find it more difficult to attract shoppers into the city, disadvantaging its rate-paying shop-owners. This can be mitigated, to some extent, by providing low cost short term parking and very expensive long-term parking, which allows for shoppers to access cheap parking, without allowing office-workers to access these spaces.

Whilst parking policies may, therefore, play some role in assisting the problems outlined in Section 3.2, some thought may need to be given to their wider socio-economic effects.

4.2 Tidal busway

One option which has been considered in the past, and which is advocated by a number of stakeholders is the creation of a tidal busway. It is currently the subject of a feasibility study by Metro (which is concerned about whether its buses will physically be able to traverse the route safely). Its costs have also been the subject of a high-level, desk top study by DIER (Pitt and Sherry, 2009). The indicative pricing used in that study suggests that a one lane peak directional busway would cost around $115 million to develop.[8] Around half of this cost is associated with taking up the old track and putting in a concrete apron for the buses to drive along, and the remainder is for traffic facilities along the busway, and signals for the locations where it crosses existing roads. These costs are based upon the busway operating from Hobart to Claremont. If its costs of $7.7 million per kilometre are uniform (and correct – see footnote below), then it would cost a further $105 million to extend the busway to Brighton. It seems unlikely this would occur, however, as there are existing, uncongested roads which could be utilised for this portion of the transport task.

An alternative, shorter tidal busway designed to avoid congestion bottlenecks on both the Brooker Highway and main road, along the rail corridor between Chapel Street (Glenorchy) and Bay Road (New Town) has been proposed as a cheaper option. This option has not been costed, but if the costs per kilometre for the shorter busway match those in the Pitt & Sherry (2009) report, its cost would be roughly $33 million.

[8] A number of the members of the Community Advisory Group have suggested that these costs are relatively high. It is beyond the scope of this report to make engineering assessments and it may be necessary for DIER to explore these costs in more detail. However, our conclusions pertaining to marginal and average costs and the effects this has on the likelihood of rail being re-introduced are not altered if the costs of building the busway are lower.

The tidal busway Claremont to Hobart appears likely to be a more expensive solution than the rail option if the estimates from Pitt & Sherry (2009) are accurate; in Section 6, the most expensive option for track out to Claremont is only $60 million, with a further $30 to $50 million for the trains themselves. Although these are preliminary figures, with the detailed costing work still to come in Stage 2 of the project, it seems likely that rail might be delivered for a similar or lower cost than a busway, even though new rolling stock will be required.

The advantage of the busway when compared to rail, therefore, does not appear to be cost, but rather flexibility; trains can only operate along the corridor, but buses can enter and leave the corridor meaning that passengers do not have to switch modes. It is also easier to increase capacity, as more of the existing bus fleet can be allocated to the busway as necessary, whereas trains would need to be purchased. However, each bus has a much smaller capacity than each light rail vehicle, and thus more buses would be needed to carry the same number of people.

Assessment against problems

A tidal busway has a similar impact to a light rail system on the problems outlined in Section 3.2. However, many are likely to be attenuated somewhat. Emissions will be reduced compared to cars, but, since more buses are needed than light rail vehicles to carry the same number of people, since they are less energy efficient and since the trains will be powered largely by hydro electricity, the reductions will not be as great. In a similar vein, whilst putting train-like transport services in a corridor might provide incentives for people to move closer to the corridor in high density living as envisaged in the various planning document discussed in Section 2.1, buses are generally considered less attractive neighbours than light rail vehicles, because of the health effects associated with particulate emissions in their exhaust.

Impacts on congestion are unclear. It may improve, or indeed have a greater effect than a railway, because the flexibility associated with all buses being able to utilise the busway means that fewer people will need to change services to enjoy the time savings associated with having a dedicated corridor and hence demand for public transport may expand by more than the "spark factor" associated with light rail.[9] However, congestion may also get worse if the large

[9] Although we note the empirical evidence of the Southern Busway in Perth, which had this flexibility and carried 14,000 people per annum, whilst the railway which replaced it carries 50,000 people per annum (Newman, 2011). It is thus not clear that the busway would attract more passengers than rail down the same corridor.

numbers of buses using the corridor results in traffic delays on roads which cross the corridor (if buses are given priority and grades remain unseparated).

Impacts on social disadvantage are also unclear. There are, potentially, significant impacts on transport disadvantage if the service encourages more people to ride the buses. However, many of these benefits can arguably be achieved by increasing bus frequency, rather than spending new money on a bus corridor.

One final point is worthy of note. In stakeholder discussions, the busway was supported by some on the presumption that it preserves the corridor, for potential light rail use in future as demand expands. The busway can be designed in such a way that track can be added easily and trains operated on that track, or the busway can be removed and track relaid in the event that a decision is made to replace the busway with a light rail system in the future.[10] .

Whichever option is chosen, a similar issue exists. Once infrastructure is built, much of its costs become sunk (for example, the concrete used to build the busway, which has no other useful purpose after it is poured), and its ongoing viability is a function of its very low marginal costs. However, new infrastructure seeking to compete with or replace the existing infrastructure must cover its average costs before investors will be willing to invest. Average costs for infrastructure are generally much higher than marginal costs. This means that replacement is delayed beyond a timeframe that is socially optimal, and may indeed not occur at all.

We therefore consider that the argument that a busway might later be converted into rail as demand expands, given the slow growth of population in Hobart, to be unlikely to be true. Rather, we suggest that the issue of low marginal and high average costs outlined above may mean that rail is excluded from the corridor for the foreseeable future. Further, we note that conversion to a busway would mean that heritage and freight rail would be unable to utilise the corridor (unless track were laid for this purpose) whilst it is being used as a busway.

4.3 Increasing bus frequency

A major reason for low bus demand is that their frequency of service does not match the travel needs of passengers. Increasing frequency can have a significant effect on patronage. By way of an example Metro has experienced good increases in patronage when services have been increased in frequency

[10] The Pitt & Sherry (2009) report was not based on a busway engineered such that it could later accommodate rail, and it is not clear what this might cost.

particularly during non peak periods. For example when peak services increased by 33 percent to the West Hobart/Mt Stuart area in 2006 patronage increased by 17 percent. Stronger results were observed for non peak periods.

The decision on where to increase frequency on the network is a function of which aims are trying to be met. If capacity constraints are an issue, then more buses can be put on the busier parts of the network. If the aim is to bring more passengers into the service, frequency could be increased in areas where demand is low and services infrequent, in the hope that the demand will eventuate and that the bus services will not thus lose more money. Finally, increasing bus frequency could be based upon a social, rather than an economic justification. For example, it could be justified by the improvements it might cause to accessibility in low socio-economic areas where car ownership is low.

Assessment against problems

Increasing bus frequency can, potentially, address many of the transport problems identified in Section 3.2. It might decrease congestion and emissions if an increase in frequency is the deciding factor in modal choice. It might improve outcomes associated with social exclusion and the provision of transport needs for the elderly, and it might improve modal choice for those whose only real choice is a car. It seems unlikely, alone, to improve the interaction between land use and planning, but it might make such interaction easier if it results in a more reliable public transport system that can be factored into the strategic plans developed by government for land-use.

Its effects on the cost of public transport and congestion are unclear. If more buses results in proportionately more customers, then the cost of the average per-passenger subsidy would decline (though the total subsidy cost would increase). A similar issue relates to congestion; if each new bus attracts only a few passengers, then this may actually increase, rather than decrease congestion, because each bus takes up more room on the road than a car. There may also be a latent demand effect, whereby the less congested roads (subsequent to bus frequency being increased and consequent upon this generating more demand) induce more people to travel by car.

Finally, if the frequency of services on a given route is increased by purchasing new buses, rather than redirecting existing buses away from other existing services, then the financial cost of increasing frequency is high, but there are few impacts on the wider network. If, however, frequency on a given route is achieved by taking existing buses away from other routes, this may influence the wider network, depending upon the level of service those buses were providing in their former role. There is thus also a trade-off to consider when ascertaining how frequency might be increased.

4.4 Road widening and de-bottlenecking

One approach which is often used to improve road networks is to widen the road, or to remove bottlenecks which can exacerbate congestion. Road widening is often an expensive exercise. The Brooker Highway was not originally designed to be able to be expanded into three lanes each way, although it would be possible to do so. The addition of the extra lane has not been assessed or costed. In addition, it is not always feasible, particularly given the topography of Hobart, to easily widen roads.

De-bottlenecking is more targeted, focusing on particular points where bottlenecks exist in an endeavour to reduce congestion. Depending upon the scale and nature of bottlenecks in the system, it can be relatively cheap (for example, adding an extra turning lane or removing on-street parking) or very expensive (for example, providing grade separation).

Currently the Brooker Highway has two major points of congestion; the Elwick Road and Goodwood road intersections (located close to each other and constituting one choke-point) in Glenorchy and at the Risdon Road intersection in Moonah. Further, DIER is currently investigating improvement of junction capacity measures at the Berridale interchange associated with proposed Montrose Bay High School and Howard road.

Assessment against problems

Adding lanes and de-bottlenecking can only solve problems associated with congestion. Moreover, it is not clear how permanent such solutions might be. Each creates additional road-space and, depending upon levels of latent demand, this road-space may soon be filled by additional road users who had previously not used a road because it was too congested. Thus, benefits from removing congestion can, in many instances, only be short-lived.

In the particular case of Hobart, while improvement of junction capacities will ease congestion at these points DIER's analysis of traffic flows suggests that congestion will not disappear, but will rather move to other bottlenecks along the route (also mostly at traffic intersections) as most of the traffic is heading to the same destination in the city centre. It is thus not clear whether de-bottlenecking would have significant long-term effects.

4.5 Bus lanes and signal priority

Another option is to create bus lanes or create signal priority for buses. This could take the form of a dedicated bus lane (either all the way along a stretch of road or just near traffic lights) coupled with traffic signals which allow buses to leave the signals first (usually with several seconds headway) and thus move ahead of the traffic at each traffic signal. Alternatively, signals can be programmed to move to green at the approach of a bus, either in traffic or in its own dedicated lane.

Assessment against problems

The main impact of such measures is on congestion (and by extension, emissions) and is felt if people travelling in cars see the bus moving much more quickly through traffic and thus make the decision to shift modes. It would not affect social inclusion in Hobart, because the areas of greatest disadvantage are generally not near congested roads (with the exception of some parts of Glenorchy), and nor would it affect transport options for the aged considerably, as they tend to travel outside peak periods. It might affect the degree to which land use and transport planning can be integrated in practice, for similar reasons to those outlined above for the busway, and it might improve the cost recovery of the bus service if it increases patronage.

However, in order for these beneficial effects to operate, it would need to reduce congestion. In 2009 DIER commissioned a study to examine the impacts of installing bus-priority measures on sections of the Brooker Highway (GHD, 2009). It found that express buses benefited, as they do not have to stop as frequently and many stops are just after traffic lights, reducing the benefits of bus priority. However, these benefits were offset by increased congestion and travelling times for other road users, except in cases where investments were made to increase the numbers of lanes around certain intersections.

Thus, whilst in principle, bus priority lanes and signal priority can be useful, in the particular context of this section of road in Hobart, it does not appear that significant advantages would be provided.

4.6 Emissions and congestion pricing

The final option is an economic one; emissions and congestion are externalities, and hence they can be reduced through appropriate pricing. Emissions will be priced in any event if the Federal Government's proposed carbon price is implemented, and such prices in any case operate more effectively if imposed at a national level.

Congestion pricing involves setting a toll along congested roads, which may differ according to the time of day. In the case of Hobart's Northern Suburbs, it would appear that only the Brooker Highway should be tolled, and only during the morning rush hour; between roughly 7:30am and 9:30am. Both the Brooker Highway and Main Road experience congestion, but placing a toll on

Main Road would be difficult, because of its many entry and exit points, which would make it costly to toll.

Assessment against problems

Congestion pricing acts to control congestion, effectively shifting a time cost to a monetary cost. It might adversely affect social inclusion, however, if it makes car travel more expensive, and thus reduces travel by people from lower socio-economic backgrounds who have cars but for whom the bus is not a suitable transport option.

The problem with introducing charges on the Brooker Highway alone is that this may simply push traffic onto surrounding streets which are less equipped to handle it. This may in fact increase congestion. This can be obviated by charging a cordon tariff, as in Singapore or London, for all vehicles entering a particular zone. However, the costs of implementing this given the number of roads in and around Hobart, is likely to far exceed any benefits in terms of congestion reduction. It is thus not considered to be a suitable option for congestion.

5 Background to the Rail Solution

In this section, we provide some background to the basic analysis we undertake at this stage of the project of the benefits and costs of the rail solution to the problems outlined in Section 3.2. It should be noted that this is *not* the formal cost-benefit analysis of the rail solution. The formal analysis of costs will occur as a stand-alone task in Stage 2 of the project, and a formal analysis of the benefits associated with the best options derived in Stage 2 will occur as part of Stage 3.

Early in the project, it became apparent that not all parts of the NSLR are equal. For example, there is a denser population around Glenorchy and strong travel demand associated with the Glenorchy Shopping area, and a very sparse population around Granton without any travel attractors. Moreover, there are a number of restrictions around the system which were apparent early on. For example, there really only are a certain number of places where stations could feasibly be located, given topography and population density. These were identified by Ben Johnston (see Johnston, 2010). Moreover, planning and other restrictions limit what can feasibly be done in areas such as Mawson Place and the possible extension to Elizabeth Street.

It was considered, therefore, that if Stage 2 began with a blank slate in terms of what should enter the detailed costing models, considerable effort might be spent on aspects of the NSLR which are clearly infeasible, leaving less resources available to consider in greater detail the aspects of the NSLR which are in fact the most feasible. The purpose of this chapter and the next, therefore, is to attempt to draw some sensible, broad limits around what should be considered as part of Stage 2, to prevent the waste of resources, and ensure that the models developed have the greatest chance of success.

We do this in two ways. In the first instance, we examine planning and heritage barriers which might prevent some plans for the NSLR from going ahead. The main focus is on Mawson Place, where these restrictions are most pervasive. We do this to ensure that the optimal operating service models of Stage 2 do not include aspects which would fail to gain planning approval.

The second way we impose limits is to conduct a high-level assessment of likely demand on a station by station basis, and then to consider the costs of improving the track to the station to the point that passenger trains can operate upon it and the costs associated with operating trains out to that station. If the two are within the same "ballpark" in terms of likely revenues and likely costs, then they will form part of Stage 2. If they are not, then further consideration of these stations will cease at Stage 1.

The reason for doing this is simple. Even the busiest stations on the proposed line are likely to have patronage levels which would be considered low on many other systems. The least busy stations may have fewer than a dozen boardings per light rail vehicle, even in peak times. However, these quieter stations are, for the most part, at the edge of the system, attracting the greatest costs of service. It may be the case that the losses in serving these stations are sufficiently great that they take the system as a whole from being a net benefit to being a net cost.

We are happy to be challenged on the assumptions and assessment undertaken below, and for the results to be duly changed before Stage 2 commences. However, we have chosen this path on the basis that it is better to have a system serving most of the stations, rather than insist that it serves all of them and find that it can in practice serve none, because the costs significantly outweigh the benefits.

5.1 Planning issues

The proposed NSLR land use is controlled by the following planning schemes:

- *Glenorchy Planning Scheme* 1992
- *City of Hobart Planning Scheme* 1982
- *Brighton Planning Scheme* 2000
- *Sullivans Cove Planning Scheme* 1997

Most of the stations are covered by the *Glenorchy Planning Scheme* 1992, as they lie within the boundaries of the City of Glenorchy. The stations fall into two different zoning types (depending upon location); the Local Business 2 zone and the Public Utility zone. Using land for a station is discretionary in the Local Business 2 zone and permitted in the Public Utility zone. Development standards relating to lighting, height and design apply and would need to be considered when more detailed design of the stations is completed. Car parking is to be determined by Council.

The station at New Town falls into the jurisdiction of the City of Hobart. In this Scheme the proposed rail will traverse a residential zone. The use is discretionary and the use of on street car parking by commuters is discouraged. The proposed station site is not heritage listed.

The stations at Bridgewater and Brighton LGAs fall under the jurisdiction of the *Brighton Planning Scheme 2000*. In this scheme, the use of the land at the locations proposed for the stations is discretionary. Car parking is determined by the Council. It is noted the Bridgewater Bridge and the Bridgewater railway station are listed as places with cultural significance.

Potentially the most constrained site is at Mawson Place or the extension to Elizabeth Street. Both lie within Sullivans Cove, which is a multifunction iconic area in Hobart. It comprises a working port, historic buildings and entertainment areas. In this scheme the proposed use traverses 4 Activity Areas (Zone). Depending on the Activity Area the use is exempt (that is, there is no assessment, and no permit is required), permitted or discretionary. There may be heritage implications for some sites and a heritage report may be required. This would most particularly be the case if construction disturbed archaeological sites. There may also be issues associated with overhead catenary wires, if this form of power transmission is chosen. The scheme governing Sullivans Cove is performance based, which means that, rather than being subject to detailed rules, the design would need to be carefully considered in light of the Objectives and Performance Criteria requirements.

The proposed use and development has been assessed against the four relevant planning schemes and it was found the use ranges from being classified exempt, permitted and discretionary. Subject to the design meeting the various Schemes' standards, it appears there is no reason why the proposed development should not be approved.

5.2 Likely demand levels

In order to assess likely demand levels, we have looked to three potential sources.[11] The first of these is customers currently using a bus service which follows a similar route to the proposed light rail vehicle route, or travels between similar origin-destination points.

To calculate this demand, we used current Metro boarding data on bus services which include sections that operate between stations on the proposed rail route. Two types of trips on Metro buses were included:

- Firstly those trips which could be undertaken by passengers who would be able to travel from station to station. There is a significant number of current trips which fit this category. For example from Glenorchy Bus Station to Hobart.
- Secondly those trips which may be undertaken by a combination of a feeder bus and travel on the NSLR. An example of this would be travel from the Southern part of Bridgewater to Hobart. Such a trip would be undertaken by a combination of a bus then rail journey.

[11] We also assume a fourth source, assuming that 25 percent of MONA's estimated 300,000 visitors per annum will arrive at MONA by the light rail system. The estimate based on visitor numbers sourced from MONA and a view that any light rail service would be a secondary support service to MONA with the majority of patrons arriving by ferry.

Specific student trips on school services typically undertaken by travel from residences to schools were generally excluded with the exception of those travelling to places located near the proposed NSLR stations.

The data sample considered four weeks of indicative weekday data during October and November in 2010 and implicitly included demand associated with all attractors as well as capturing passengers transferring to Metro service who had first caught a non Metro bus service.

The second type of demand is the "walk-up" trade; people in surrounding areas who walk to the light rail system. In order to assess this, we assume that people within a radius of 400 metres, and 800 metres by foot are the target market and that five, ten and fifteen percent of the people within that radius catch the light rail vehicle every day (twice).[12] This is much more than the current public transport share of trips which is 3.5 percent.

Finally, we assume that a single 300 bay park 'n ride is built, and constructed at Bridgewater, which is well-located to capture people travelling in by car to access the system from rural and residential areas to the north and south of the station. We assume it will fill every day, including Saturday and Sundays. Realistically, Bridgewater and Claremont are the only two options for a large, dedicated park 'n ride. If the park n' ride is placed further in than Claremont, then travel time savings are relatively small, and it is less likely that people will actually get out of their car and use the light rail system once they have driven so far in. Granton has topographical issues, and a much lower surrounding population.

The result is shown in Table 4. Note that we do not include Hobart, where many of the return journeys for commuters will originate from in the afternoon. Instead, these journeys have been attributed to the stations nearest where the relevant people live.[13]

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[12] The figures were somewhat arbitrary, and more detailed assessment will be undertaken in Stage 3. To compare, in Perth, 5-8 percent of trips in Transit Oriented Development precincts are by public transport, as are around a fifth of commuter trips (see www.patrec.org/web_docs/publication_docs/53_Final%20TOD%20Indicators%20Report.pdf). None of the areas studied in Hobart are currently Transit Oriented Development sites, though these are planned along the corridor.

[13] There are some trips from Hobart City to employment in Glenorchy and in other areas. These trips have also been apportioned to other stations, but they are relatively small in number, and have the effect of making each of the stations appear slightly more viable than they may be. We do not assess the viability of a Hobart City station per se, because it will be the obvious end-point of the railway.

Table 4 **Daily weekday trips associated with each station in the network**

	Current bus passengers plus MONA plus…					
	5% of 400M	10% of 400M	15% of 400M	5% of 800M	10% of 800M	15% of 800M
New Town	72	119	166	214	403	591
Moonah	526	577	628	644	813	982
Derwent Park	616	636	656	765	934	1104
Glenorchy	3522	3547	3572	3651	3804	3957
Berridale	471	491	512	522	593	664
Claremont	193	225	258	263	365	468
Granton	29	32	36	32	39	46
Bridgewater	670	683	697	705	754	802
Brighton	59	74	89	100	156	213

Table 4 suggests, for example, that 213 trips might be expected to be associated with the station at Brighton every day, under the best case scenario where all of the current bus users in Brighton heading to Glenorchy or Hobart City switch to the light rail system, and 15 percent of all of those living within 800 metres of the station at Brighton decide to use the light rail system each day.

We believe that our assessments of demand are high, and subject to some double-counting.[14] Some of the people who currently ride on competing bus services, for example, also live within 400 or 800 metres walk of a station, but we have counted them as two people. However, at this stage, we are only looking at ballpark demand, and thus prefer to err on the side of estimating too much demand rather than too little.

5.3 Fixed factors

In the early stages of the analysis, it became clear that some factors in the analysis would need to remain fixed, for varying reasons. These factors are:

- The NSLR will have at most (see below) 11 stations, being Elizabeth St (optional), or Mawson Place, New Town, Moonah, Derwent Park, Glenorchy, Berridale, Claremont, Granton, Bridgewater and Brighton.[15]
- There would be one depot for the rolling-stock.

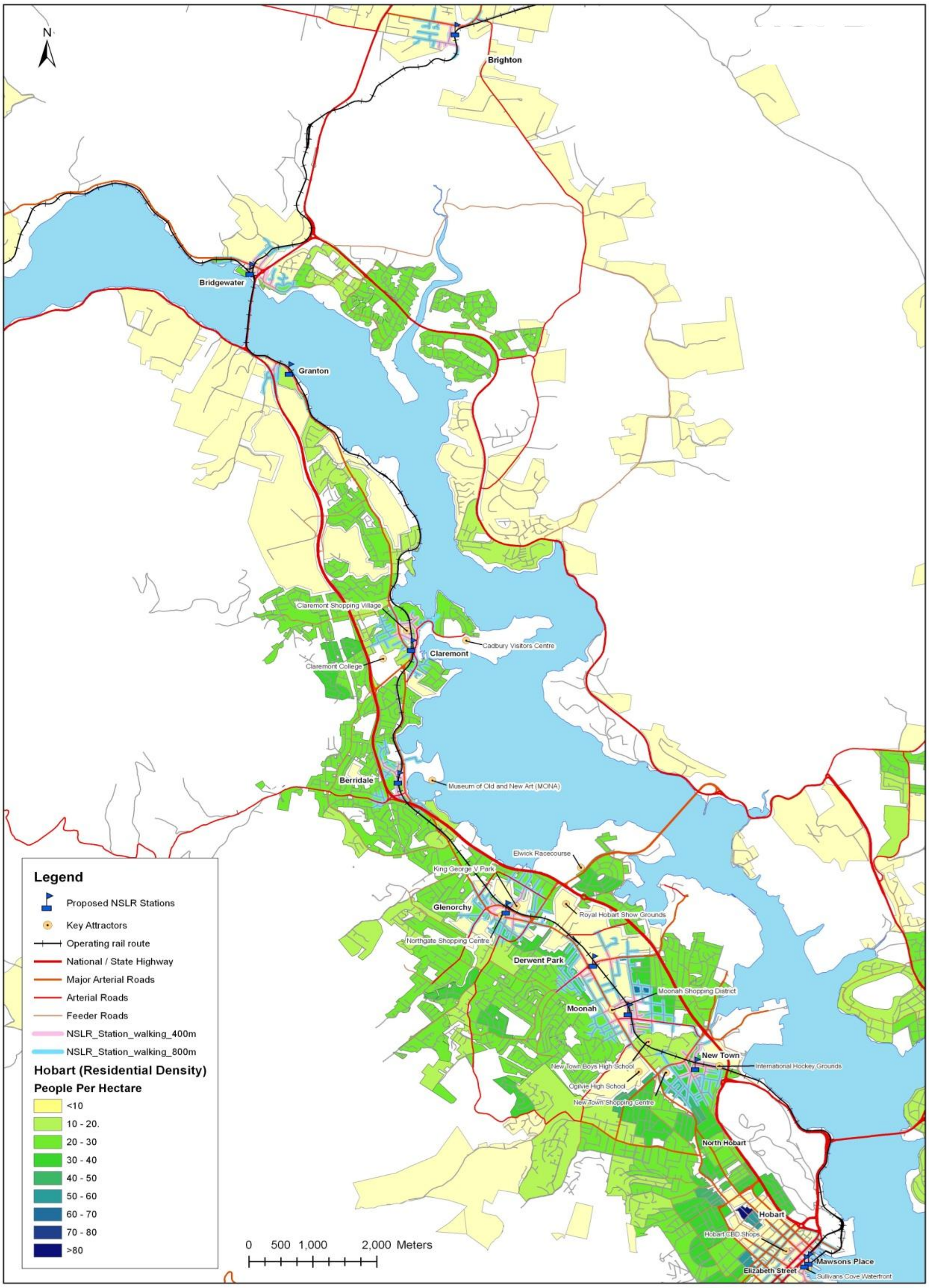
[14] Note also that the figures for Bridgewater are relatively high only because of the park 'n ride.

[15] We also considered the potential for a station at Austin's Ferry. If it is included instead of Granton, it faces the same cost issues as Granton. If it is included as well as Granton, its costs and Granton's costs are together roughly the same as those for Granton alone. The nature of our overall conclusions, however, are not altered by including Austin's Ferry and thus it is not examined in detail.

- There would be one park 'n ride facility at or near the terminus of the network, with smaller parking areas at stations en-route.
- There would be two bus interchanges; one at Glenorchy (requiring the existing facility to be moved) and the terminus of the line.
- Trains would run at a flat 15 minute interval from 6am to 7pm weekdays and 8am to 6pm Saturdays, with evening and Sunday services at half-hour intervals.
- There would be boom gates on all 17 roads that cross the line, unless DIER advises on road closures. Only one of these roads has a boom gate at present.

The reason for the number of stations is that there is limited scope for more stations, or for stations in different locations. The locations of likely demand and the locations of suitable, vacant land for the stations constrain, to some extent, choices for station location. Moreover, having more stations would limit the ability of the system to be able to operate with 15 minute headways (unless extra rolling stock is purchased) without necessarily adding greatly to patronage. The most likely location of stations is shown in Figure 4, which also provides a picture of population density and demand around each station, with the pink and blue areas highlighting 400 and 800m walking distances (respectively) into surrounding streets.

Figure 4 **Potential station locations**



Data source: DIER analysis and Johnston (2010)

The reason for a single depot is that any more than one would be unlikely to be used significantly, and would be costly. There are also limits in terms of land, which militate against multiple depots. A single park 'n ride is partly a factor of land availability (although it does not preclude parking facilities at other stations) and a desire to examine, initially, the simplest system possible. Its location in the system is based upon an acknowledgement that if it is placed too close to the centre, the relatively small travel-time savings will make it less likely that people would actually use it to transfer to the light rail vehicle.

We choose 15 minute headways rather than more frequent services because of signalling cost. Four light rail vehicles are sufficient to handle 15 minute headways out to Claremont, and these headways do not require complex signalling. Frequencies less than 15 minutes reduce the attractiveness of the system, but a 15 minute frequency service has enough capacity to handle demand as outlined in Table 4 above without attracting high signalling costs.

Although preliminary, we have constructed a model of the number of people likely to be on each light rail vehicle as it departs every station and travels into Hobart in the morning peak (when it is busiest). This is based upon the distribution of trips through the course of a day shown in Figure 2 (Section 3.2). The results are shown in Table 5, which highlights that a light rail vehicle with a capacity of 200 people would be more than enough, even during the morning peak period. New Town station is selected because it is at this point that the light rail vehicles would have the largest count of on board passengers.

Table 5 **Number of people on the inward train at New Town by hour**

	Proportion of total demand per train service	Current bus passengers plus …					
		5% of 400M	10% of 400M	15% of 400M	5% of 800M	10% of 800M	15% of 800M
6am to 7am	1.13%	40	42	44	43	48	54
7am to 8am	1.75%	62	65	68	67	75	83
8am to 9am	2.86%	101	106	111	109	122	135
9am to 10am	1.43%	51	53	55	55	61	68
10am to 11am	1.53%	54	57	59	58	65	72
11am to 12	1.63%	58	60	63	62	69	77

The figures do not include the Museum of Old and New Art (MONA) because it opens at 10am and visitors are unlikely to be travelling back from MONA to Hobart before noon. However, if the light rail vehicles are able to carry 200 people (as Johnston, 2010, suggests), then clearly they will be less than half-full almost all of the time. Unless more frequent trains elicit significant extra demand, there appears little reason, from a capacity perspective to go beyond 15 minute headways.

6 Rail Solution – Preliminary Analysis

In this chapter, we present our preliminary analysis of the costs and benefits associated with the rail solution. As noted previously, the intent is not to make definitive conclusions about the line per se, but only to make conclusions as to whether or not any limits should be placed on the number of stations on the line, or its extent.

Accordingly we do not, in this section, examine the benefits associated with travel time saved, pollution reduction or other "externalities" which would commonly form part of an analysis such as this, and will be examined in Stage Three of the project. The aim is to look, effectively, at the commercial viability of each station on the route. If a station is viable, then externalities only make it more so. If it is close to being viable, then externalities are likely to mean it has a positive benefit from the broader social perspective. If, however, it is highly unviable, externalities are unlikely to close the gap. These will be considered in detail in Stage Three of the Business Case.

Glenorchy is the busiest station on the route, so it does not make sense to consider a route shorter than this. With four light rail vehicles one can operate a system with a 15-minute headway out to Claremont, for almost the same cost as operating it out to Glenorchy; the only difference being the extra electricity and a little extra maintenance. Claremont is the furthest one can reach with four vehicles and a 15-minute headway between each, and thus we consider this as the first potential terminus for the system. Stations after Claremont would require additional rolling stock to maintain 15 minute headways.

In assessing costs, we have used Ben Johnston's (Johnston, 2010) work on this topic, which has been assessed by Hyder and is sufficiently accurate for the purposes of this paper. This includes his use of battery-powered vehicles, his four passing loops, his station locations (with the addition of Derwent Park) and his 400m extension into Mawson Place. The only difference is that we consider four, rather than five vehicles, and we have thus reduced relevant rolling stock costs by 20 percent. Johnston (2010) includes a high and a low cost scenario, based upon different costs for rolling stock, and we have kept these distinctions. We do not use Johnston's (2010) estimates for the costs of passing loops and stations, as Hyder has more accurate information available. However, our numbers are very similar to Johnston's. The numbers adapted from Johnston (2010) that we use are shown in Table 6.

Table 6 **Rolling stock and Mawson Place extension costs**

	Low	High
4 vehicles	$14,000,000	$28,000,000
vehicle storage & maintenance	$8,000,000	$10,000,000
Mawson Place Extension	$2,000,000	$2,000,000
Ticketing/security	$1,000,000	$1,000,000
Other	$1,000,000	$1,000,000
Project Management	$1,000,000	$1,000,000
Total	$27,000,000	$43,000,000
Annualised (over 30 years)	$2,175,833	$3,465,215
Battery Cost per annum	$120,000	$120,000

Although very useful, Johnston (2010) does not consider some costs, including light rail vehicle operating costs (with the exception of battery costs), costs associated with track upgrades and the cost of the park 'n ride facility. For operating costs, we utilise the Parsons Brinkerhoff (2009) report, and Stages 1 and 3 of their model (Hobart to Granton). We acknowledge that some aspects of this report involved high-cost scenarios, but most of this is associated with track, not the operation of rolling stock. Also, battery-powered rolling stock is, according to Johnston (2010) less expensive than rolling stock using overhead catenary wires. Thus we reduce the operating costs of Parsons Brinkerhoff (2009) to $2,500,000 per annum.

In terms of track assessment, Hyder had yet to undertake its site visits when the analysis in this report was undertaken.[16] to assay the condition of the track to reach definitive conclusions. This will occur in Stage 2 of the project. However, Hyder notes that, even if the track were in perfect condition, it would require signalling suitable for passenger railways rather than freight, and this would costs a minimum of $180,000 per kilometre to install. Hyder suggests that this is likely to under-estimate costs on the track because, even if the track itself is sufficient to handle trains travelling at 60km/h (much faster than the current freight trains), it would need to be reground because the profile of a light rail wheel is different to that of a heavy rail wheel, and would require a minimum amount of tamping and re-ballasting. This, Hyder suggests, would cost $400,000 per km. It should be noted that, although Hyder has yet to inspect the track, these figures are considered by Hyder to be conservative minimal figures, likely to under-estimate the true costs of preparing the track to a suitable standard.

[16] These visits have occurred, as part of Stage Two of the project, and Hyder is currently developing a more detailed picture of track costs which will inform subsequent stages of the analysis.

As part of the early phase of the project, we spoke with TasRail, who indicated that the track was unsuitable for passenger rail at all (it is too light, and in poor condition), and suggested that the only suitable option would be to replace the track itself. TasRail also notes that replacing the single track with double track may in fact be more suitable, as then signalling can be simpler. According to Hyder, the minimum cost of replacing the single track would be $2,380,000 per km, and replacing it with double-track would be $3,980,000 per km. In this simple analysis, the signalling costs are the same, as $180,000 per km is considered to be a minimum value by Hyder.

Hyder suggest that a minimum cost for platforms would be $200,000. If the platform requires a passing loop, the cost rises to $1 million, because of requirements for turnouts ($250,000 each, with two required), the cost for extra track, and some minor earthworks. This provides for a very basic station which includes only a platform and basic shelter. We assume four passing loops at New Town, Glenorchy, Claremont and Granton, as per Johnston (2010). Hyder's costs are very similar to those suggested by Johnston (2010).

In terms of signalling at level crossings, of which there is almost none at present, we assume the most basic traffic-light arrangement which is capable of giving light rail vehicles priority. This would cost $150,000 per level crossing. If boom gates are also used (which we do not assume is the case) the cost rises to $300,000 per level crossing.

In terms of maintaining the track, Hyder suggests that the existing track would cost $100,000 per km initially, rising by $10,000 per km every year as it is further worn down. If new track is laid, it is likely to incur no maintenance costs for five years, and then attract a similar maintenance schedule. We assume costs of $100,000 per km if no new track is laid, and zero if new track is laid. This is thus likely to under-estimate track maintenance costs.

For the park 'n ride, we use DIER figures of $150 per square metre for construction costs, which gives a total cost for 300 bays of $1,350,000.[17] We do not assume any costs for surrounding roads and bridges along the track, nor any costs associated with earthworks on the track.[18] Finally, we do not assume any depot or head-office costs. We have thus adopted a very conservative cost profile.

[17] Note that this does not include the cost of the land. City of Glenorchy uses figures of $13,500 per bay (including land) when costing parking facilities. This is roughly four times our figure.

[18] In the event that double track is installed, if the cycle track is maintained, these earthworks and other costs would almost certainly be substantial.

All of the capital costs (above and below-rail) are amortised over 30 years assuming a borrowing rate of 7.00 percent. This is based upon advice from the Tasmanian Department of Treasury and Finance, who suggest that a 10 year government bond yield is around 6 percent but that another 100 basis points are needed to reflect Tascorp on costs. Treasury thus suggests that a rate of 7 percent per annum appropriately reflects the risk free cost of essential economic infrastructure. The cost of track and signalling (along with their maintenance) is based on the distance between the preceding station and the station being analysed. Level crossings are allocated in a similar way.

Rolling stock capital and operating costs (along with the other costs in Table 6) are allocated based on ridership (see Table 4 in Section 5.2) at each station. Thus, the cost for four light rail vehicles is allocated across all stations (except Hobart) out to Claremont. Since services with a 15-minute headway require an extra vehicle beyond Claremont, the cost of this extra vehicle is allocated, again based on ridership, to Granton, Bridgewater and Brighton.[19] This process does not reflect marginal costs exactly, but it does mean that smaller stations are advantaged, and hence more likely to appear viable.

In reality an additional spare vehicle would be required to guarantee maintenance of operations when vehicles are off track for maintenance. The additional spare vehicle has been excluded from this analysis to reduce costs, but in reality a spare vehicle is likely to be necessary to manage risks associated with vehicles breaking down.

Revenues are based upon ridership (see Table 4), multiplied by the full adult fare.[20] We assume 240 days in a year where demand is at the level of Table 4, and 125 when it is at a level of 60 percent of the figures shown in Table 4 to reflect weekends and public holidays. We do not include concession fares because the decision to provide a concession is a separate decision by government. Also, the light rail system operator still receives the relevant fare, but some of it comes from government and some from the passenger.

We explore two measures of viability. The first is the net profit at each station per annum, based upon the costs and revenues attributed to it. The second is the cost per boarding associated with the station (note the comments about Hobart above). Full adult fares are $2.50 in most cases, so for a station to be

[19] We believe one extra car could provide a 15-minute headway service out to Bridgewater, but that a sixth car would be needed to reach Brighton on this timetable. We have not included this sixth car in our analysis. Were we to do so, Brighton would appear much less viable.

[20] In reality, Green Card holders obtain a discount of 20 percent. Metro and private bus operators offer this discount, and similar discounts are also offered on the ferries. The rail operator may also offer a similar discount, though for the purposes of this exercise, we have assumed they will not.

commercially viable, costs per boarding of less than this figure would be required. However, public transport in Hobart is not commercially viable; the actual cost to Metro of providing services in Hobart is estimated at $5.25 per passenger journey. Were government to offer a similar concession rate to the rail operator, the equivalent benchmark for viability would be $5.25 per boarding. This, however, is on the assumption that the current gross payments for public transport subsidies could be effectively split between the bus and light rail systems, which may not be possible given the high costs of establishing the light rail system.

Table 7 shows the net revenues, and Table 8 the cost per boarding. We have a large number of options in our model, as there are two levels for costs from Johnston (2010), four track-cost options from Hyder and six different options associated with demand (see Table 4). Thus, we show only the worst and best case scenarios for demand.

Table 7 **Annual net revenues per station ($'000)**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	-$1,000	-$1,158	-$1,380	-$1,949	-$1,098	-$1,256	-$1,478	-$2,047
Moonah	-$427	-$475	-$542	-$734	-$590	-$638	-$705	-$897
Derwent Park	-$355	-$385	-$426	-$546	-$538	-$568	-$610	-$729
Glenorchy	$11	-$42	-$117	-$266	-$646	-$699	-$774	-$923
Berridale	-$262	-$350	-$472	-$824	-$372	-$460	-$583	-$934
Claremont	-$438	-$510	-$611	-$836	-$516	-$588	-$689	-$914
Granton	-$837	-$1,017	-$1,269	-$1,927	-$886	-$1,066	-$1,318	-$1,975
Bridgewater	-$909	-$970	-$1,055	-$1,300	-$1,762	-$1,823	-$1,909	-$2,153
Brighton	-$1,081	-$1,282	-$1,564	-$2,369	-$1,308	-$1,509	-$1,790	-$2,595
	Best Case Demand Scenario							
New Town	-$591	-$750	-$971	-$1,540	-$689	-$848	-$1,069	-$1,639
Moonah	-$68	-$116	-$183	-$375	-$231	-$279	-$346	-$538
Derwent Park	$29	-$1	-$43	-$162	-$154	-$184	-$226	-$345
Glenorchy	$354	$301	$226	$77	-$303	-$356	-$431	-$580
Berridale	-$37	-$125	-$248	-$599	-$147	-$235	-$358	-$709
Claremont	-$117	-$190	-$291	-$516	-$195	-$267	-$369	-$593
Granton	-$817	-$998	-$1,250	-$1,907	-$866	-$1,046	-$1,299	-$1,956
Bridgewater	-$755	-$816	-$901	-$1,146	-$1,608	-$1,669	-$1,754	-$1,999
Brighton	-$868	-$1,069	-$1,350	-$2,156	-$1,094	-$1,296	-$1,577	-$2,382

The upper half of Table 7 shows the worst-case scenario and the lower part the best case scenario. Each shows all the different cost profiles. If demand levels are low, no station is viable, and the system would lose between $5.2 million and $13.2 million per annum, inclusive of the costs of capital. It seems unlikely that such losses would be sustained. However, if demand is high, then the losses range from $3 million to $10 million for the system as a whole. Indeed, if the last three stations, which contribute significantly to system costs, are excluded, the system may come close to breaking even when assuming high demand and the lowest costs. The high costs of the last three stations is made more clear when we consider the costs per boarding, shown in Table 8.

Table 8 **Costs per boarding per station**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	$46.31	$53.26	$62.96	$87.91	$50.62	$57.56	$67.26	$92.21
Moonah	$5.08	$5.37	$5.77	$6.93	$6.06	$6.35	$6.76	$7.92
Derwent Park	$4.33	$4.48	$4.70	$5.31	$5.27	$5.43	$5.64	$6.26
Glenorchy	$2.49	$2.54	$2.61	$2.74	$3.08	$3.13	$3.20	$3.33
Berridale	$5.46	$6.06	$6.88	$9.25	$6.21	$6.80	$7.63	$9.99
Claremont	$10.91	$12.10	$13.76	$17.47	$12.19	$13.38	$15.04	$18.74
Granton	$95.55	$115.35	$143.01	$215.12	$100.88	$120.68	$148.35	$220.45
Bridgewater	$8.01	$8.30	$8.70	$9.86	$12.05	$12.34	$12.74	$13.90
Brighton	$63.04	$73.96	$89.23	$132.92	$75.33	$86.26	$101.52	$145.22
	Best Case Demand Scenario							
New Town	$5.67	$6.53	$7.71	$10.77	$6.20	$7.05	$8.24	$11.30
Moonah	$2.72	$2.87	$3.09	$3.71	$3.25	$3.40	$3.62	$4.24
Derwent Park	$2.42	$2.50	$2.62	$2.97	$2.94	$3.03	$3.15	$3.49
Glenorchy	$2.22	$2.26	$2.32	$2.44	$2.74	$2.79	$2.85	$2.97
Berridale	$3.88	$4.30	$4.88	$6.56	$4.40	$4.82	$5.41	$7.09
Claremont	$4.50	$4.99	$5.67	$7.20	$5.02	$5.52	$6.20	$7.73
Granton	$60.48	$73.01	$90.52	$136.16	$63.85	$76.38	$93.90	$139.54
Bridgewater	$6.69	$6.93	$7.27	$8.23	$10.06	$10.30	$10.64	$11.61
Brighton	$17.31	$20.31	$24.50	$36.50	$20.69	$23.68	$27.88	$39.87

The situation of the last three stations is made clearer in Table 8. Even if demand is low, most of the inner stations easily come within the $5.25 per boarding level (which, as discussed above, is a very rough indication of viability given current public transport funding arrangements) most of the time, with the exception of New Town and Claremont. New Town has relatively small ridership but, purely by the nature of the track, picks up all of the kilometres around the Domain in the methodology we have used. Claremont's viability would be increased considerably if it were the terminus of the line, and thus contained the park 'n ride allocated to Bridgewater.

However, the last three stations (Granton, Bridgewater and Brighton) are rather different; even under the best demand scenarios, Granton has costs ten times higher than the $5.25 threshold mentioned previously, and Brighton is roughly three times this level. Bridgewater appears satisfactory, but that is because it is only two kilometres further along the track than Granton. Thus Granton, with its low ridership, appears costly and Bridgewater does not.

6.1 Alternate terminus analysis

The last three stations in the system in Table 7 and Table 8 involve considerable costs and very poor returns, and it is thus worthwhile considering the implications of terminating the system before Brighton, to see what this does on a station-by station basis. We examine three different scenarios:

- Termination at Bridgewater.
- Termination at Granton.
- Termination at Claremont.

In each instance, we allocate all of the demand in the model past the new terminus station. Thus, when Granton is the terminus, all of the demand (from the park 'n ride, the walk-on passengers and the bus transfers) from Bridgewater and Brighton is assumed to make its way (without cost) to Granton to board the train there. We also allocate the costs of the park 'n ride to the relevant terminal station, and the allocation of operating costs changes when Granton and Bridgewater are chosen as termini because there are only two and one (respectively) stations over which to allocate the additional light rail vehicle that is needed to service demand beyond Claremont at 15 minute intervals. The results of this analysis are shown in Table 9 to Table 14.

Table 9 Annual revenues per station ('000): Bridgewater terminus

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	-$1,000	-$1,158	-$1,380	-$1,949	-$1,098	-$1,256	-$1,478	-$2,047
Moonah	-$427	-$475	-$542	-$734	-$590	-$638	-$705	-$897
Derwent Park	-$355	-$385	-$426	-$546	-$538	-$568	-$610	-$729
Glenorchy	$11	-$42	-$117	-$266	-$646	-$699	-$774	-$923
Berridale	-$262	-$350	-$472	-$824	-$372	-$460	-$583	-$934
Claremont	-$438	-$510	-$611	-$836	-$516	-$588	-$689	-$914
Granton	-$837	-$1,017	-$1,269	-$1,927	-$886	-$1,066	-$1,318	-$1,975
Bridgewater	-$1,186	-$1,247	-$1,333	-$1,577	-$2,266	-$2,327	-$2,412	-$2,657
	Best Case Demand Scenario							
New Town	-$591	-$750	-$971	-$1,540	-$689	-$848	-$1,069	-$1,639
Moonah	-$68	-$116	-$183	-$375	-$231	-$279	-$346	-$538
Derwent Park	$29	-$1	-$43	-$162	-$154	-$184	-$226	-$345
Glenorchy	$354	$301	$226	$77	-$303	-$356	-$431	-$580
Berridale	-$37	-$125	-$248	-$599	-$147	-$235	-$358	-$709
Claremont	-$117	-$190	-$291	-$516	-$195	-$267	-$369	-$593
Granton	-$817	-$998	-$1,250	-$1,907	-$866	-$1,046	-$1,299	-$1,956
Bridgewater	-$819	-$880	-$965	-$1,210	-$1,899	-$1,960	-$2,045	-$2,289

Table 10 **Cost per boarding per station: Bridgewater terminus**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	$46.31	$53.26	$62.96	$87.91	$50.62	$57.56	$67.26	$92.21
Moonah	$5.08	$5.37	$5.77	$6.93	$6.06	$6.35	$6.76	$7.92
Derwent Park	$4.33	$4.48	$4.70	$5.31	$5.27	$5.43	$5.64	$6.26
Glenorchy	$2.49	$2.54	$2.61	$2.74	$3.08	$3.13	$3.20	$3.33
Berridale	$5.46	$6.06	$6.88	$9.25	$6.21	$6.80	$7.63	$9.99
Claremont	$10.91	$12.10	$13.76	$17.47	$12.19	$13.38	$15.04	$18.74
Granton	$95.55	$115.35	$143.01	$215.12	$100.88	$120.68	$148.35	$220.45
Bridgewater	$8.79	$9.06	$9.42	$10.47	$13.43	$13.69	$14.06	$15.11
	Best Case Demand Scenario							
New Town	$5.67	$6.53	$7.71	$10.77	$6.20	$7.05	$8.24	$11.30
Moonah	$2.72	$2.87	$3.09	$3.71	$3.25	$3.40	$3.62	$4.24
Derwent Park	$2.42	$2.50	$2.62	$2.97	$2.94	$3.03	$3.15	$3.49
Glenorchy	$2.22	$2.26	$2.32	$2.44	$2.74	$2.79	$2.85	$2.97
Berridale	$3.88	$4.30	$4.88	$6.56	$4.40	$4.82	$5.41	$7.09
Claremont	$4.50	$4.99	$5.67	$7.20	$5.02	$5.52	$6.20	$7.73
Granton	$60.48	$73.01	$90.52	$136.16	$63.85	$76.38	$93.90	$139.54
Bridgewater	$6.17	$6.35	$6.61	$7.34	$9.42	$9.60	$9.86	$10.59

Table 11 **Annual revenues per station ('000): Granton terminus**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	-$1,000	-$1,158	-$1,380	-$1,949	-$1,098	-$1,256	-$1,478	-$2,047
Moonah	-$427	-$475	-$542	-$734	-$590	-$638	-$705	-$897
Derwent Park	-$355	-$385	-$426	-$546	-$538	-$568	-$610	-$729
Glenorchy	$11	-$42	-$117	-$266	-$646	-$699	-$774	-$923
Berridale	-$262	-$350	-$472	-$824	-$372	-$460	-$583	-$934
Claremont	-$438	-$510	-$611	-$836	-$516	-$588	-$689	-$914
Granton	-$1,790	-$1,971	-$2,223	-$2,880	-$2,919	-$3,099	-$3,351	-$4,008
	Best Case Demand Scenario							
New Town	-$591	-$750	-$971	-$1,540	-$689	-$848	-$1,069	-$1,639
Moonah	-$68	-$116	-$183	-$375	-$231	-$279	-$346	-$538
Derwent Park	$29	-$1	-$43	-$162	-$154	-$184	-$226	-$345
Glenorchy	$354	$301	$226	$77	-$303	-$356	-$431	-$580
Berridale	-$37	-$125	-$248	-$599	-$147	-$235	-$358	-$709
Claremont	-$117	-$190	-$291	-$516	-$195	-$267	-$369	-$593
Granton	-$1,404	-$1,584	-$1,836	-$2,493	-$2,532	-$2,712	-$2,964	-$3,621

Table 12 **Cost per boarding per station: Granton terminus**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	$46.31	$53.26	$62.96	$87.91	$50.62	$57.56	$67.26	$92.21
Moonah	$5.08	$5.37	$5.77	$6.93	$6.06	$6.35	$6.76	$7.92
Derwent Park	$4.33	$4.48	$4.70	$5.31	$5.27	$5.43	$5.64	$6.26
Glenorchy	$2.49	$2.54	$2.61	$2.74	$3.08	$3.13	$3.20	$3.33
Berridale	$5.46	$6.06	$6.88	$9.25	$6.21	$6.80	$7.63	$9.99
Claremont	$10.91	$12.10	$13.76	$17.47	$12.19	$13.38	$15.04	$18.74
Granton	$11.10	$11.84	$12.89	$15.60	$15.76	$16.50	$17.55	$20.26
	Best Case Demand Scenario							
New Town	$5.67	$6.53	$7.71	$10.77	$6.20	$7.05	$8.24	$11.30
Moonah	$2.72	$2.87	$3.09	$3.71	$3.25	$3.40	$3.62	$4.24
Derwent Park	$2.42	$2.50	$2.62	$2.97	$2.94	$3.03	$3.15	$3.49
Glenorchy	$2.22	$2.26	$2.32	$2.44	$2.74	$2.79	$2.85	$2.97
Berridale	$3.88	$4.30	$4.88	$6.56	$4.40	$4.82	$5.41	$7.09
Claremont	$4.50	$4.99	$5.67	$7.20	$5.02	$5.52	$6.20	$7.73
Granton	$7.75	$8.27	$9.00	$10.89	$11.00	$11.53	$12.25	$14.15

Table 13 **Annual revenues per station ('000): Claremont terminus**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	-$1,000	-$1,158	-$1,380	-$1,949	-$1,098	-$1,256	-$1,478	-$2,047
Moonah	-$427	-$475	-$542	-$734	-$590	-$638	-$705	-$897
Derwent Park	-$355	-$385	-$426	-$546	-$538	-$568	-$610	-$729
Glenorchy	$11	-$42	-$117	-$266	-$646	-$699	-$774	-$923
Berridale	-$262	-$350	-$472	-$824	-$372	-$460	-$583	-$934
Claremont	$349	$276	$175	-$50	$271	$199	$98	-$127
	Best Case Demand Scenario							
New Town	-$591	-$750	-$971	-$1,540	-$689	-$848	-$1,069	-$1,639
Moonah	-$68	-$116	-$183	-$375	-$231	-$279	-$346	-$538
Derwent Park	$29	-$1	-$43	-$162	-$154	-$184	-$226	-$345
Glenorchy	$354	$301	$226	$77	-$303	-$356	-$431	-$580
Berridale	-$37	-$125	-$248	-$599	-$147	-$235	-$358	-$709
Claremont	$1,056	$984	$883	$658	$978	$906	$805	$580

Table 14 **Cost per boarding per station: Claremont terminus**

	Low Rolling Stock Costs				High Rolling Stock Costs			
	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling	signalling only cost per km (track perfect)	Realistic most basic option (signal plus minor track upgrade)	New single track plus signalling	new double track plus signalling
	Worst-Case Demand Scenario							
New Town	$46.31	$53.26	$62.96	$87.91	$50.62	$57.56	$67.26	$92.21
Moonah	$5.08	$5.37	$5.77	$6.93	$6.06	$6.35	$6.76	$7.92
Derwent Park	$4.33	$4.48	$4.70	$5.31	$5.27	$5.43	$5.64	$6.26
Glenorchy	$2.49	$2.54	$2.61	$2.74	$3.08	$3.13	$3.20	$3.33
Berridale	$5.46	$6.06	$6.88	$9.25	$6.21	$6.80	$7.63	$9.99
Claremont	$2.55	$2.79	$3.12	$3.86	$2.80	$3.04	$3.38	$4.12
	Best Case Demand Scenario							
New Town	$5.67	$6.53	$7.71	$10.77	$6.20	$7.05	$8.24	$11.30
Moonah	$2.72	$2.87	$3.09	$3.71	$3.25	$3.40	$3.62	$4.24
Derwent Park	$2.42	$2.50	$2.62	$2.97	$2.94	$3.03	$3.15	$3.49
Glenorchy	$2.22	$2.26	$2.32	$2.44	$2.74	$2.79	$2.85	$2.97
Berridale	$3.88	$4.30	$4.88	$6.56	$4.40	$4.82	$5.41	$7.09
Claremont	$1.56	$1.71	$1.91	$2.37	$1.72	$1.87	$2.07	$2.53

Terminating the system at Bridgewater leads to roughly the same level of costs for each of the stations involved as occur in the base case where the railway is extended to Brighton. However, this also means that the very large costs of Granton are maintained. If Granton were to be removed from the system, the costs per boarding at Bridgewater would roughly double, meaning that, rather than being comparable to the other stations in the system, it is considerably more expensive. Thus, terminating the system at Bridgewater would add considerably to overall system costs.

Some stakeholders have suggested Granton, located adjacent to a number of major regional roads, could make a useful terminus to encourage commuters from rural regions around Hobart to park their car (or transfer from a bus) and catch the train into town. However, even when all of the demand from Brighton and Bridgewater is allocated to Granton, it experiences costs more than double the average of the other stations, and higher than all of them.[21] Even with significant travel time savings and other externalities, it seems likely that including Granton would add considerable net costs to the system.

[21] Under some demand scenarios, the costs of Granton approach those of Claremont. However, this is only because a park 'n ride is placed at Granton, and not at Claremont.

Terminating the system at either Granton or Bridgewater adds considerable net costs to the system. However, this is not true of Claremont; largely because of the demand being transferred from the outer stations (including the park 'n ride), it experiences costs on a per passenger boarding basis which make it the second-lowest cost station on the route, and profitable over a wide range of demand scenarios. It thus appears likely to contribute significant net benefits to the system if it is the terminus. Note in particular that, when Claremont is the terminus, most stations in the system (with the exception of New Town, which picks up the high cost of track around the Domain) are below the $5.25 per fare level which makes for a favourable comparison with Metro, particularly when travel time savings and other externalities are included.[22]

Although it is slightly further for people coming into the system from rural areas around Hobart to drive (or travel by bus), and although some stakeholders have suggested that the sites suitable for parking are not as conveniently located adjacent to major regional roads, the significant cost savings which are implied in Table 13 and Table 14 from terminating at Claremont make it a more suitable termination point than stations further down the line.

6.2 Conclusions

The result from this very basic assessment is relatively clear; extending the service out to Claremont may produce net benefits. Extending it further, however, seems highly unlikely to do so. In fact, it appears likely that this would generate significant net costs to the system, and may result in the benefit cost ratio for the system as a whole dropping significantly below one. Accordingly, we believe that Stage 2 should proceed only with stops out to Claremont.

[22] This will form part of Stage Three of the project. However, our initial, "back of the envelope" calculations suggest externalities of between $4 and $5 per passenger journey (mostly due to travel time savings). On the basis of this initial analysis, most stations deliver net social benefits when demand is sufficiently high.

7 Conclusions and Ways Forward

The purpose of this report is to provide background for the next two stages of the project which will involve a detailed model of the costs of the NSLR, and a detailed assessment of its likely benefits. This report, in assessing background information, has performed two key roles. Firstly, it has explored the policy settings and transport problems and solutions evident in Hobart that have lead to the consideration of the light rail option. It is necessary in an Infrastructure Australia submission to include evidence that numerous solutions to defined problems have been explored. It is also useful from a Tasmanian perspective, as it provides some indications of complementary policy changes which could be made to facilitate the light rail project attracting greater ridership.

The second key role of this report is to explore whether it is useful to limit the scope of potential options to be examined in Stage 2. There are finite resources being put towards the creation of the optimal operating service models, and it is necessary that these resources be used in the most efficient way possible. Thus, if part of an option is simply not possible for some reason (say because topography was impossible, or because heritage issues intrude), or if it is very costly relative to its benefits, it should not be considered further.

In terms of restrictions, there do not appear to be any planning or heritage issues which might restrict what can be considered in Stage 2. We also find that the locations for stations proposed by (Johnston, 2010), with the addition of a station at Derwent Park, are probably likely to be the best locations for stations, given loci of demand and space to build the relevant infrastructure. In a similar vein, we suggest that only one park 'n ride should be considered, at Bridgewater (others further in are unlikely to attract people out of their cars, as the travel time savings are too small) and that there are only a few suitable locations for maintenance facilities.

In terms of likely costs and benefits, we conducted a high-level analysis of demand, and costs of service provision. The former is based upon bus patronage and assumptions on numbers of people likely to walk from home to their nearest station. The latter is based upon work by (Johnston, 2010) and some very conservative track cost estimates made by Hyder ahead of their site visit. The result of this analysis suggests that the last three stations on the proposed line (Granton, Bridgewater and Brighton) would not be viable, even when issues such as emissions and travel time savings are included. Moreover, their distance from other stations and high costs may in fact render the system as a whole unviable if they are included. We thus recommend that they not be considered further in Stage 2.

This does not mean, however, that the relevant rail corridor should be removed. Brighton is the fastest-growing municipality in the region, and it may be that at some time in the future (more than a decade hence, given growth rates and current costs of service) there may be scope to extend the service further. Maintaining the corridor therefore provides an important option in the future flexibility of public transport provision in Greater Hobart, and should remain an important policy priority.

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