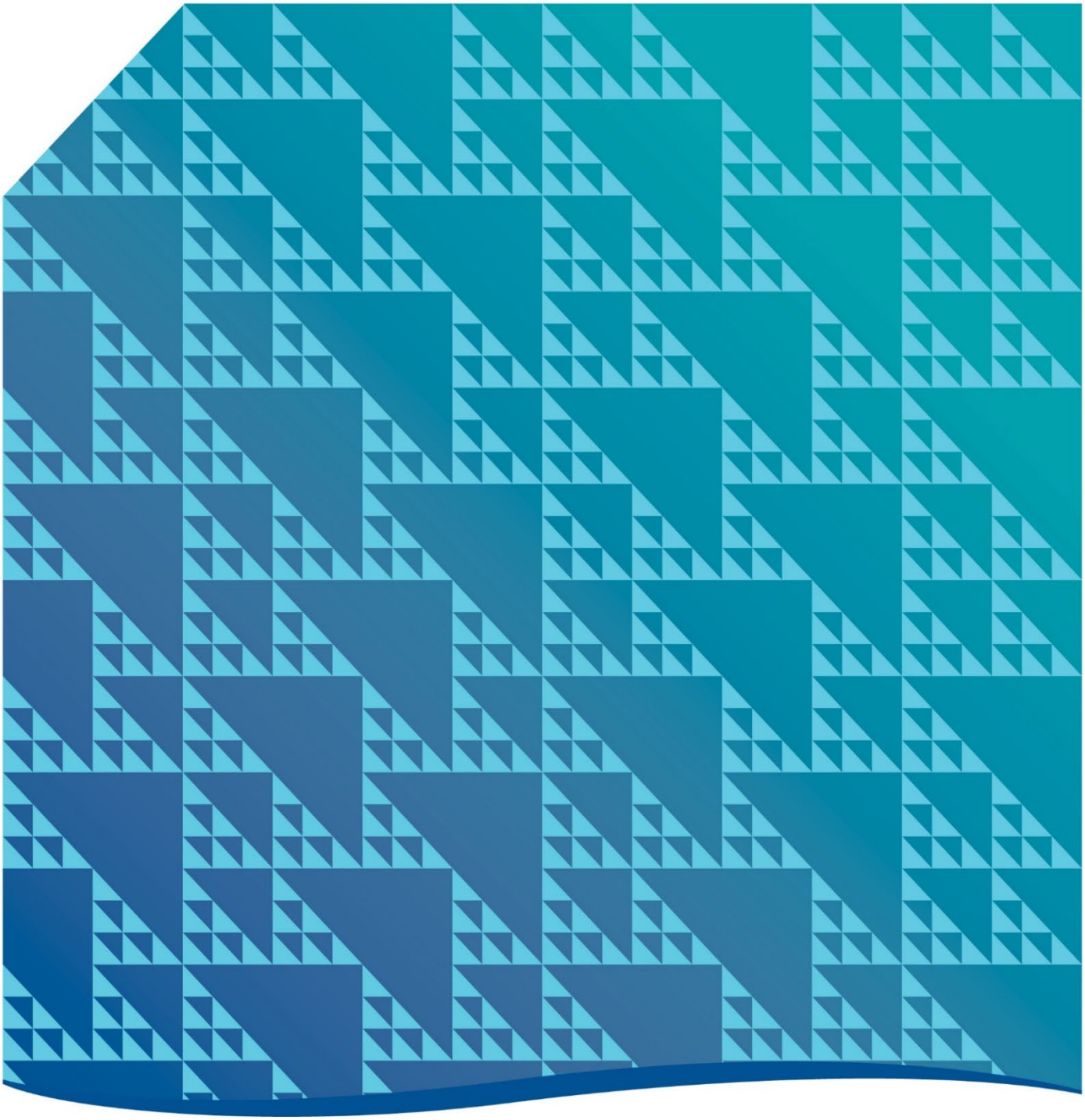
December / 2019

Domain Highway Long Term Planning Study



Department of State Growth

Tasmanian Government

Executive summary

The Domain Highway Long Term Planning Study has been funded by the Australian and Tasmanian Governments to investigate potential upgrades and improvements to the highways that surround Hobart's Queens Domain.

The overall vision of this study is: To facilitate the safe and efficient movement of people and freight into, out of, and through Hobart via the northern and inner eastern approaches by the most appropriate means.

The objectives of the study were to:

- Reduce crashes on the Brooker and Domain highways
- Improve peak travel time reliability on the Brooker Highway
- Ensure that peak queuing on the Brooker Highway does not undermine the functionality of the Risdon Road intersection on the northern boundary of the study area

The first part of the study used the evidence on current and forecast travel and performance to establish:

- The significance of increased peak travel times and, more importantly, the problems associated with travel time variability especially at or near major intersections
- The major conflict points in the study area and the importance of outcomes in terms of large numbers of (mostly minor) crashes and the impact of these on travel time reliability
- The strong policy drivers for improved public and active transport but the relatively minor roles these modes have for this study because the major movement routes do not pass through the study area. The study focused on the problems for active transport access to the Queens Domain and the accessibility of the two bus stops in the study area.

Stakeholder engagement during the first third of the study through peak body consultations and the use of State Growth's social pinpoint web analysis confirmed the problems and pointed to the better use of existing road infrastructure using technology and targeted improvements.

A plan to address the key problems was developed by:

- Considering a wide range of initiatives (types of intervention with the potential to address one or more of the identified problems) and short-listing the initiatives considered feasible. Initiatives were grouped based on the following themes:
    - *Road network improvements* –increasing road supply
    - *Better use of existing infrastructure* – improving the use of the existing infrastructure
    - *Promote alternative modes* – enhancing existing or providing new public and active transport services
    - *Travel demand management* – reducing the demand for travel (including capital and non-capital solutions).

  While alternative modes and travel demand management measures were found to have significant potential in addressing the identified problems, these were not advanced to the concept level due to the study area boundary and the scope limitations of the study area.
- Developing concepts or specific treatments for applying short-listed initiatives (road network improvements and better use of existing infrastructure) and assessing the effectiveness, viability and risks

of these concepts. These included concepts that were designed to be grouped to form a program as well as standalone concepts that would require further development and planning work to be undertaken.

- Recommending a package of selected measures as a program of works aiming to effectively address the problems identified in the short-medium term, as well as the longer-term actions likely required to meet longer term infrastructure needs (Domain Interchange intersection).

The rest of this summary describes the outcomes of this process and the next steps for implementing the recommendations.

Recommended short-medium term program option for the study area

The recommended program option was determined based on its potential to provide a positive impact to the key problems identified and project objectives in the short to medium term, as well as providing a foundation for further longer-term upgrades. It is designed to make better use of existing infrastructure by enhancing network safety and improving network management. Treatments proposed under the recommended program option are outlined in Table 1.1 with the location of treatments shown in Figure 1.1.

In general, the measures in the short-medium term include:

- **High impact:** the ability to manage speeds (via VSLs) on the network and provide advance warnings at key intersections, as this is likely to have the most impact on improving transport efficiency, reliability and safety by reducing the likelihood of incidents and smoothing traffic flow.
- **Medium impact:** better monitoring and control of traffic using variable messaging signs (VMS) and CCTV, as this will have a moderate impact on improving travel reliability and safety incidences by better managing traffic after incidents occur.
- **Low impact:** improving line markings, crossing points and bus facilities, as this will have a minor impact on improving safety and mode share by improving existing facilities.

Standalone concepts were not recommended in the short to medium term given:

- The potential inconsistency of these measures if implemented in the short-medium term with Government's policy goals and directions.
- Uncertainty about projected levels of traffic growth and the future development strategy for the wider Brooker Highway corridor undermining the strategic and economic case for investment in the short-medium term.
- Ongoing studies including the Northern Suburbs Transit Study that will impact the future development and level of demand on the Brooker Highway.

Table 1.1 Recommended Program Option – Treatments and Benefits

IMPACT	TREATMENTS	BENEFITS
High	• Targeted variable speed limits (VSLs) along Brooker Highway and Domain Highway to control speeds. • Advance intersection warning signs on approach to key intersections which have high crash rates (e.g. Brooker Highway/Risdon Road, Domain Interchange, Domain Highway/Queens Walk, Domain Highway/Lower Domain Road). • Advance warning line marking on approach to Risdon Road on Brooker Highway northbound.	• Improved speed management and more opportunity to react to upcoming conditions, **reducing the likelihood of incidents** (particularly rear-end crashes), and thereby also **improving travel time reliability** • **Reduced severity of incidents**

Medium	• Better monitoring and control of traffic, including:
	  ○ targeted variable message signs (VMS) at key decision points (e.g. on exiting Tasman Bridge, on approach to Domain Interchange, and at Railway Roundabout)
	  ○ improved monitoring through CCTV and increased vehicle detection
	  ○ network interfaces/control system improvements.
		• Improved traffic and incident management, resulting in **increased network efficiency**

Low	• Improved lane markings on Brooker Highway. • Advanced left turn must turn left warning on Brooker Highway, on approach to Brisbane Street. • Raised reflective pavement markers (RRPM) at key signalised intersections on Brooker Highway (i.e. at Risdon Road, Burnett Street, Warwick Street and Brisbane Street).	• Improved lane use leading to **more vehicle throughout** and less lane changing, which in turn may **reduce likelihood of incidents** (particularly side swipes crashes)

Low	• Improved crossings on the Domain Highway, including:
	  ○ advance crossing warning signs at crossing locations
	  ○ transverse lines on the road to alert drivers to the upcoming crossing location and the potential hazard of cyclists and pedestrians
	  ○ staggered or gated treatment to slow down cyclists and pedestrians on approach to the crossing location.
		• **Improved perception of safety**
		• **Reduced likelihood of incidents**
		• **Increased walking and cycling activity**

Low	• Improved bus stop safety and access on the Tasman Highway including:
	  ○ new bus stop signs
	  ○ new line markings for the bus bays
	  ○ wider footpaths
	  ○ DDA compliance pedestrian waiting area and pedestrian paths
	  ○ chevron line marking on the road shoulder approaching the bus bays.
		• **Improved perception of safety**
		• **Increased public transport patronage**

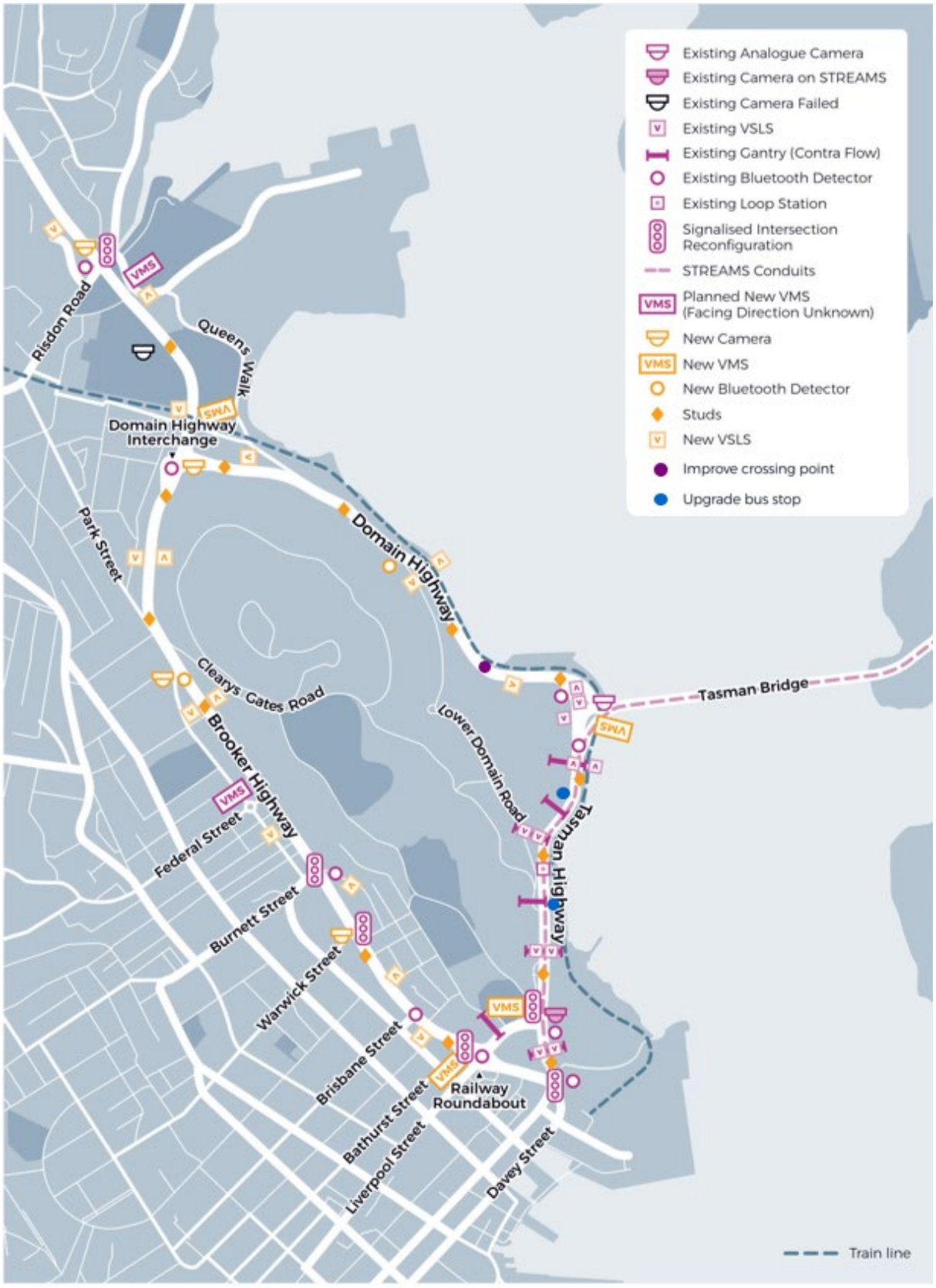


Figure 1.1 Recommended program option

Recommended long-term measures for the study area

The ability of this study to make significant long-term infrastructure recommendations was limited by external considerations and decisions in past strategies including:

- The decision not to expand capacity on the Tasman Bridge limiting the effectiveness of capacity improvements on the Domain and Tasman highways
- Risdon Road / Brooker Highway will likely remain at grade in the foreseeable future (the recent decision to upgrade the Elwick and Howard Roads as a signalised intersection has set the expectation that the Brooker Highway will remain as an at-grade corridor)
- The exclusion of Railway Roundabout (previously under Council control) from the study which forms a complex traffic sub-system with intersections in the study area and has a significant impact on routing and overall delay in the study area
- The lack of a clearly defined route hierarchy for the surrounding road network to provide strategic guidance on managing traffic flows into central Hobart

Further, analysis of existing conditions showed highly uneven levels of demand on the study area highways and therefore measures that change the attractiveness of alternate routes without consideration of the wider network impact may lead to significant unintended consequences.

Nevertheless, measures to address the deteriorating infrastructure performance at the Domain Interchange were found to likely be required in the longer term, with concept options developed for the full grade separation of the interchange.

A footprint analysis showed the full grade separation may be achievable within the existing road reserve and Concept Option 3 is recommended as a starting point if this is pursued as part of a long-term Brooker Highway corridor development strategy. However, further work is needed to determine feasibility given the potential impacts and uncertainties highlighted in this study.

If a Planning Scheme Amendment (PSA) is required to amend the current road overlay, a Public Acquisition Overlay (PAO) will also be required. The next steps to progress this further include:

- further engineering investigations, traffic modelling and assessments to inform the preferred design and justify any potential land acquisition
- consultation and input from the community and any land owners
- surveys to understand key ground impacts and property boundary impacts
- environmental and cultural heritage investigations and assessments to inform the design.

1 Study overview

The Domain Highway Long Term Planning Study has been funded by the Australian and Tasmanian Governments to investigate potential upgrades and improvements to the highways that surround Hobart's Queens Domain. Figure 1.1 shows Greater Hobart and the study area including the following highways:

- Domain Highway, including the interchange with the Brooker Highway
- Brooker Highway, from the Risdon Road intersection to Liverpool Street (Railway Roundabout)
- Tasman Highway, from the Tasman Bridge to Davey Street.

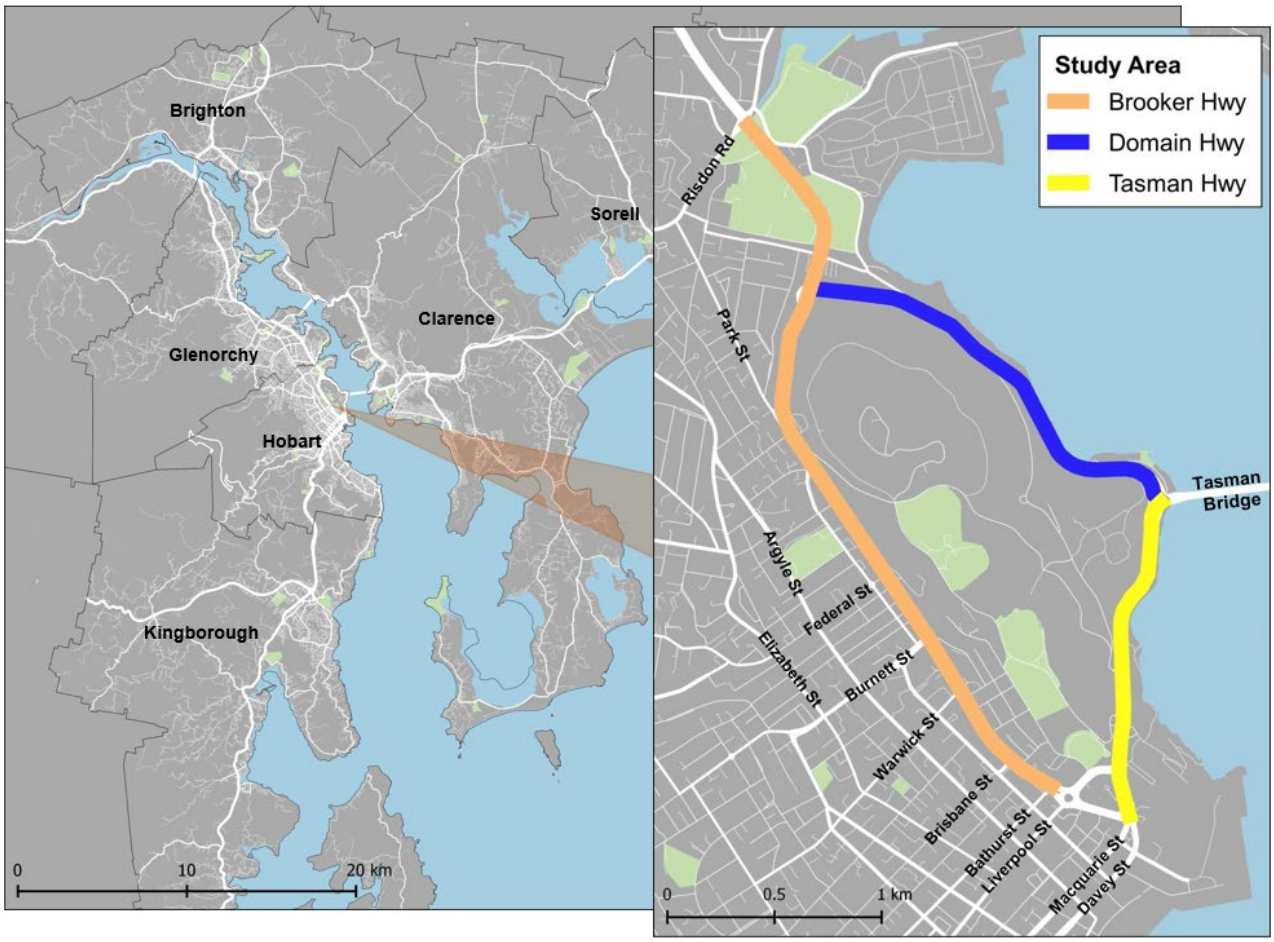


Figure 1.1 The study area

The vision of this study is: To facilitate the safe and efficient movement of people and freight into, out of, and through Hobart via the northern and inner eastern approaches by the most appropriate means.

The Department of State Growth's key objectives include: reducing crashes on the Brooker and Domain highways, improving peak travel time reliability on the Brooker Highway and ensuring that peak queuing on the Brooker Highway does not undermine the functionality of the Risdon Road intersection on the northern boundary of the study area. To achieve these key objectives, this study:

- Looked at how the roads are used by motorists, freight transporters, public transport, cyclists and pedestrians and considered the different ways to meet peoples' transport needs, including making better use of existing infrastructure, building new infrastructure and improving public and active transport.

- Developed and assessed options for managing congestion, improving safety and addressing future transport needs through short-medium term treatments to better use existing infrastructure and potential, longer-term capacity and planning measures.
- Shaped recommendations considering:
    - The emerging and strengthened policies across State and local governments supporting a more balanced system of transport and rejecting extensive road capacity improvements that entrench the current dominant role of travel by private motor vehicle
    - The function of study area highways as high-volume, movement corridors (refer to Figure 4.1) and their strategic importance in facilitating both north-south and east-west intra-regional movements
    - The study area boundaries and how the capacity and functioning of the wider transport system is likely to impact on the effectiveness of potential improvements within the study area
    - The outcome and expected recommendations from parallel studies commissioned by the Government examining how best to improve and diversify the transport system for Hobart's eastern, southern and northern approaches.

This study has progressed through three key stages:

- **Identifying and prioritising problems (Stage 1)**: Setting the policy context and analysing current and forecast transport demands and performance to define key study area problems. Agreeing on and prioritising these problems through extensive consultation with State and local government stakeholders.
- **Forming options for addressing problems (Stage 2)**: Developing a long-list of initiatives, selecting those that best address the problems and recommending preferred short-medium term measures and parallel measures to address longer-term needs through capacity enhancements.
- **Final recommendations and next steps (Stage 3)**: Confirming the preferred program of short-medium term measures and the actions and next steps to meet longer-term needs.

2 Policy and planning context

State, Federal and local government policies and plans are important in framing the study area problems and potential solutions. The State's 2018 Hobart Transport Vision, the 2018 City of Hobart Draft Transport Strategy and the joint Federal, State and local governments' 2019 Hobart City deal establish the need for a transport system that is sustainable, efficient and that effectively supports economic growth and livability.

The above documents recognise that constructing more road infrastructure will entrench rather than manage congestion and that the transport system needs to be rebalanced to provide more choice so there is a shift in dependence from private motor vehicles to public and active transport.

The clear implication is that future actions should focus on addressing congestion, reliability and safety problems by making public and active transport more attractive relative to private motor travel, and by better managing traffic though the smarter use of existing infrastructure. Any new road infrastructure upgrades should have a targeted role in managing safety and the reliability of travel without detracting from the overall goal of rebalancing travel to be less reliant on cars.

The other policy and planning issues relevant to this study are:

- The role of the proposed upgrade of the Domain Highway Interchange and the Brooker Highway (between the interchange and Risdon Road):
    - This was identified as a medium-term priority in 2011, upgraded to a high priority in 2013 and the joint state/federal funding for this study included consideration of this upgrade.
    - The study considers the role and priority of this upgrade compared to other measures to better manage traffic and the wider-network constraints and impacts of redesigning the interchange to improve capacity.
- Recent upgrade of intersections on the Brooker Highway confirmed the highway's future as a major movement corridor with at-grade interfaces at major intersections:
    - The Federal Government provided $32 million funding to upgrade the Elwick-Howard Roads staggered 'T' intersections with the Brooker Highway and convert the Howard Road/Brooker Highway roundabout to a signalised intersection.
    - The project was completed in 2017 as an at-grade solution confirming that the Government did not see the Brooker Highway being upgraded to a freeway standard in the foreseeable future.
- Parts of the road network that will continue to constrain the movement of road traffic into and out of the study area include:
    - The Risdon Road / Brooker Highway intersection: This is in the study area and limits the volumes of traffic that can enter or leave the study area to the north. There are significant challenges in further improving capacity and no suggestion grade separation is being considered.
    - The Tasman Bridge: This is outside the study area and constrains the volume of traffic that can access or exit from the Domain Highway. Government is managing rather than planning to expand the road capacity of this corridor.
    - Railway Roundabout: This intersection plays an important function in distributing traffic through the study area and is the source of queuing for key movement in both peak and non-peak periods. The operation of the intersection and linked approaches affects route choice in the study area. The intersection was until recently under council control and is therefore not within the study scope.
- The scope of this study and the recommendations of ongoing or imminent studies have shaped the reach and content of this study's recommendations. For example:

- The City Deal funding focuses on public transport and smarter ways to use the existing network. The Deal commits $25 million to activating a Northern Suburbs Transit Corridor by identifying the most effective solution and developing an implementation plan in 2019 and 2020. The outcomes from this and the boundaries of the current study area (excluding the Main/New Town roads bus corridor) limit the scope of public transport improvement recommendations.
- The exclusion of the Railway Roundabout intersection from this study and the imminent review of its operation means the study has not recommended how to improve the performance of this and the connected intersections. Railway Roundabout is linked to Davey and Liverpool Streets on the Tasman Highway and Warwick and Burnett Streets on the Brooker Highway, and has a significant impact on performance and routing of traffic on the study area highways.

3 Community involvement

Community and stakeholder engagement has been undertaken to identify issues of concern within the study area. Engagement undertaken has included:

- Advertising the study on State Growth social pinpoint portal between 12 November and 21 December 2018 and allowing site visitors to locate and identify issues and comment or vote on issues raised by others.
- Providing briefings for peak bodies and interest groups between 28 and 30 November 2018.

In total 697 people visited the social pinpoint portal, with 139 users making 331 comments and 622 users voting on one or more of these comments, while 30 representatives from peak bodies and interest groups attended the briefings (with nine formal submissions received).

3.1 Feedback summary

A summary of the major community and stakeholder themes is provided in Figure 3.1.

Overall the community's responses aligned with current government policies around safeguarding the livability and prosperity of Greater Hobart by making better use of existing road infrastructure using technology and targeted improvements, and by investing to make public and active transport more attractive. Most respondents welcomed a change in direction that did not lock in additional, un-controlled road capacity, because this would entrench the dominant role of private motor vehicles into the future. Respondents viewed this as unsustainable and detrimental to Greater Hobart's prosperity and environment.

Long-term thinking:

- *People often raised the need for long-term thinking not short-term fixes, particularly in the online forum.*
- *There is support for a long-term, holistic approach to planning in Greater Hobart. Many people commented that they value Hobart's liveability and fear that temporary fixes in response to growth will threaten this.*

Making infrastructure more efficient:

- *A clear theme to emerge from the consultation process was that many people support retrofitting and improving existing infrastructure over developing new roads.*
- *Improvements to intersections and interchanges and the provision of slip lanes and in places additional lanes were noted as the main desired outcomes for this study.*

Technology:

- *Integrating new technologies into existing infrastructure was often raised by both key stakeholders and online respondents. Tidal lanes, interactive signage and live traffic monitoring were some of the suggestions made during the consultation process.*

Public transport:

- *Improvements to existing public transport and investigating new potential modes of transport was frequently raised during the consultation.*
- *There is support for a strong, multimodal approach to transport planning.*
- *Many respondents understood that an over-emphasis on private vehicle travel threatens Hobart's livability.*

Active transport:

- *There is strong support for improvements to the existing active transport network, particularly improving safe access to Queens Domain.*
- *Respondents often referenced the Queens Domain Master Plan as a good guide to desired pedestrian connectivity.*

Figure 3.1 Major community and stakeholder themes

3.2 Response to feedback

The feedback received through the community engagement has been collated and used to inform the development of transport solutions to address the issues raised.

Table 3.1 summarises the key stakeholder issues and concerns and how these have been considered in developing recommendations.

Table 3.1 Key stakeholder issues/concerns and how they were considered

STAKEHOLDER ISSUE/CONCERN	DEPARTMENT OF STATE GROWTH RESPONSE
Multimodal approaches Participants supported multimodal approaches to transport planning as well as improvements to the existing active transport network, enhancements to pedestrian connectivity and long-term planning to improve the existing road network, improve Hobart's liveability and address the current city growth demands.	• Recognise that low mode share for alternative modes including active and public transport is a primary problem in the study area. • Prioritised interventions that do not provide an advantage for private motor vehicles over other modes. • Prioritised enhancements to existing public transport and active transport facilities in the study area.
Traffic Congestion and Efficiency Participants prioritised improving existing infrastructure over developing new roads. Some of the suggestions to improve the traffic efficiency in the area included improvements to intersections design and the provision of slip lanes and additional lanes to address specific problems.	• Prioritised options that improve the efficiency of existing infrastructure. • Included potential intersection treatments at key locations. • Long-term planning for upgrade of Domain Interchange.
Smarter approach to transport planning Participants would like to see navigation, safety and smart technologies applied to the existing infrastructure to improve its efficiency and safety.	• Safe system review of the study area highways informed recommendations. • High priority for expanding the coverage and function of intelligent transport systems (ITS) to improve efficiency and manage conflicts.
Links to the Queens Domain Potential upgrades should prioritise the protection of the biodiversity of the area as well as providing improved active transport access to existing facilities, such as the Royal Tasmanian Botanical Gardens.	• Low impact interventions considered in the first instance. • Review and upgrade of key active transport crossing points.

4 Transport demand and roles

4.1 Network role and movement characteristics

Greater Hobart has an extensive road network connecting central Hobart and major activity centres to the urban fringe. Greater Hobart is divided by the River Derwent with the three river crossings from south to north: the Tasman Bridge, Bowen Bridge and Bridgewater Bridge (see Figure 1.1).

There are three main corridors that connect areas of Greater Hobart to the CBD; the Brooker Highway (north), Tasman Highway (east) and Southern Outlet (south). Domain Highway provides an east-west link connecting the Tasman Highway and Brooker Highway.

Inter-LGA and intra-state movements travelling east-west or north-south must travel through central Hobart, and are serviced through the Davey Street and Macquarie Street one-way couplet. The primary movement functions for the study area highways are:

- **North-South movement:** Brooker Highway is the primary corridor to move people between the and Central Hobart, while the Domain Highway/Tasman Highway provide an alternative route into the south CBD, Salamanca Place, Battery Point and caters also for through traffic going south.
- **East-West movement:** Tasman Highway provides the primary access to the south and central Hobart, while Domain Highway provides access to Central Hobart and the North.

There are few alternative routes serving these movements. From the north, Main Road/New Town Road runs parallel to the Brooker Highway. From the east, the Tasman Bridge is the only route into Central Hobart. From the south, Sandy Bay Road services the bay area in addition to the Southern Outlet. The lack of alternatives results in high dependency on the three study area highways.

While there is a high-level road hierarchy defined for the state of Tasmania *(Roads for our Future – State Road Hierarchy 2015*), a clearly defined and more detailed road hierarchy for Greater Hobart is lacking. To assist with determining the function of the highways and surrounding environment, a baseline Movement and Place analysis was used to identify the network's strategic purpose (Figure 4.1). The key findings are that:

- The Tasman Highway is a major movement corridor due to its high-volume movement function and the lack of 'place', or high volume destinations, within the corridor.
- The Brooker Highway and Domain Highway are high-level movement corridors and are the principal routes for traffic moving into Central Hobart from the north, and between the east and the north. However, the highways also provide local access to surrounding land uses, particularly as the Brooker Highway approaches Central Hobart.
- There is a mismatch between the movement function of Queens Walk and Park Street, which are both used to access high activity areas in New Town and Moonah, while also being used as local roads to serve residents and the community.

This classification is indicative and further, current work by State Growth will confirm the movement and place hierarchy. This is particularly important for managing the Brooker Highway to ensure it best meets its confirmed function within the transport network.

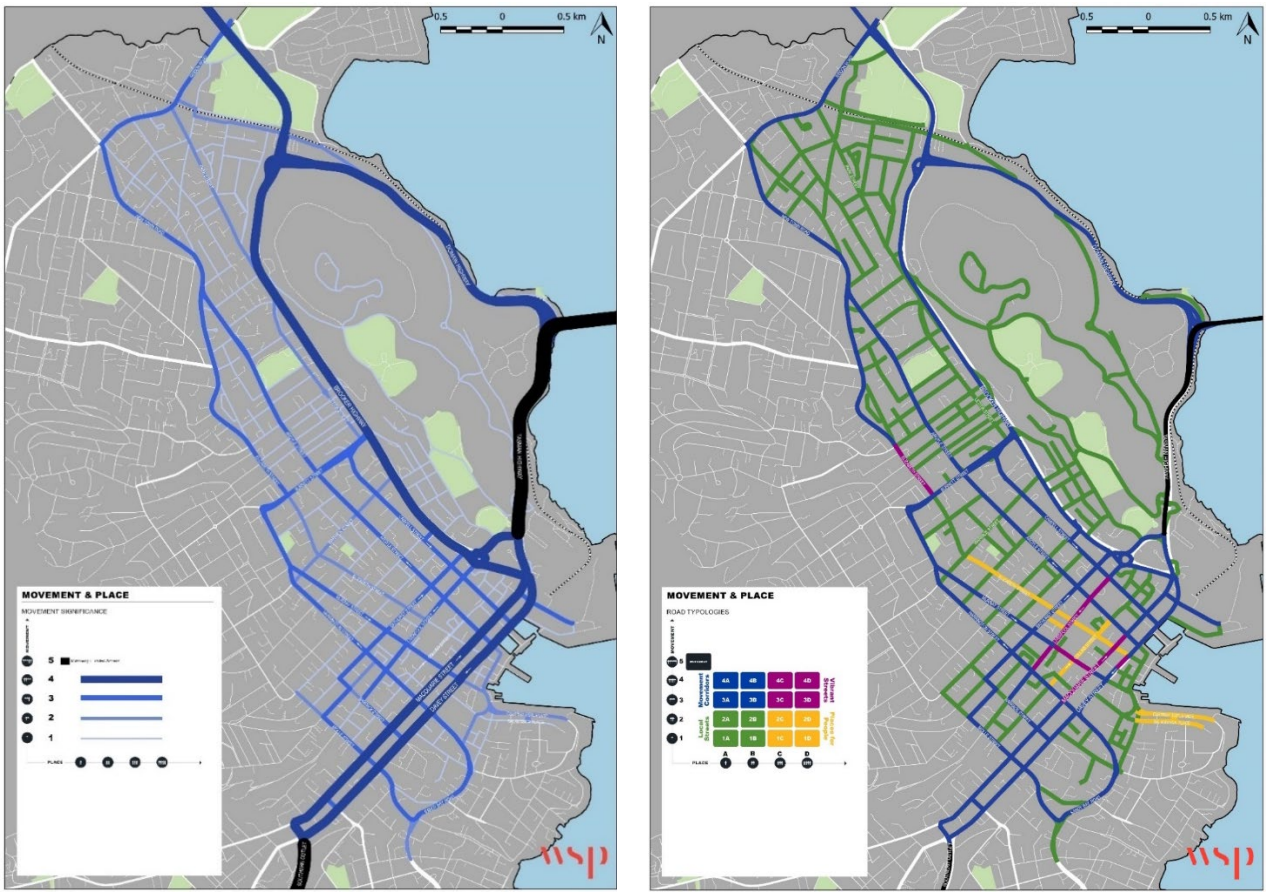


Figure 4.1 Hobart Baseline – Movement significance (left) and streets environment (right)

Movement into Central Hobart and Queens Domain from the north and the east is provided by both controlled and uncontrolled intersections. Some key points to note about the study area are:

- Controlled access is provided into and out of the study area on all corridors. There are traffic signals at the Risdon Road intersection to the north, metered access to the Tasman Bridge to the east, and traffic signals at the Davey Street and Railway Roundabout intersections in the south. These locations provide an element of control for traffic entering or leaving the study area.
- At key decision points within the study area, at the Domain Interchange and Tasman Highway Interchange, traffic is uncontrolled with free flow intersections. Given the high degree of route choice on the study area highways this can lead to a high degree of fluctuation in traffic volumes as users make reactive decisions based on their perception of congestion. This can result in the rapid build-up of traffic where controls are provided and subsequent issues with queuing and incidents.
- The highest number of uncontrolled access points are at the north of the study area including between Burnett Street and Risdon Road on the Brooker Highway. Further, no controlled access is provided along the length of the Domain Highway.

Managing a network with a high level of uncontrolled entry/exit points is challenging due to fluctuating demand levels and the impact this has once traffic encounters controlled intersections at the study area boundaries. This means that the benefits of any large-scale infrastructure interventions in the study area will be diminished given upstream and downstream constraints, and planning for these should therefore be considered as part of a wider corridor or network strategy.

4.2 Current population and land use

Figure 4.2 shows 2016 census populations for Greater Hobart's six Local Government Areas (LGA's).

There were 222,356 residents in Greater Hobart in 2016 and the LGA's closest to the study area had the highest populations (City of Hobart 50,439, Glenorchy 46,253 and Clarence 54,819). In addition, there was a significant population of 35,383 to the south of Hobart in the Kingborough LGA.

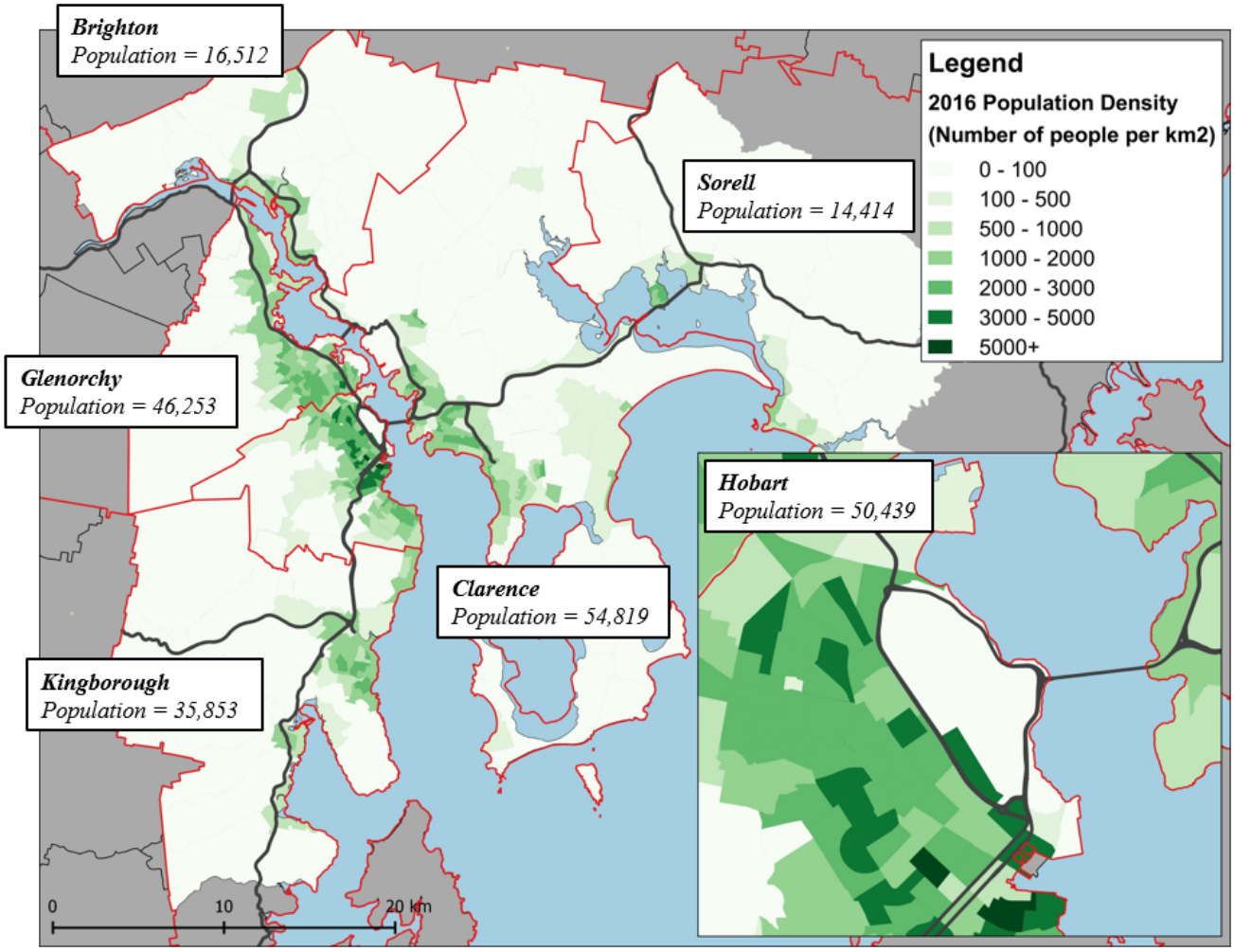


Figure 4.2 Greater Hobart LGAs, 2016 population *(Source: ABS Census 2016, visualisation based on GHUTDM 2016)*

The City of Hobart and its immediate surrounds are diverse, with a broad range of land uses, as shown in Figure 4.3 over the page.

Existing residential, commercial and industrial land uses imply significant demands for accessing jobs, retail and industrial premises, and much of this demand, especially for those working in Hobart but living elsewhere, are likely to use private motor vehicles.

Housing is mostly in the form of low-density dwellings predominately in the urban fringe areas, with some general (denser) residential development within Central Hobart. There is an absence of high-density development, and significant opposition to new schemes to introduce this.

In terms of commercial/business and industrial land uses:

- Commercial/business and mixed-use areas are most concentrated the Hobart CBD, but also along Main Road in Moonah and Derwent Park, as well as some smaller areas in east Hobart (Rosny Park and Bellerive).
- Major general industrial sites are located to the north of the City of Hobart at Derwent Park and Lutana as well as in the east at Mornington, with light industrial sites for the most part in proximity to these locations and concentrated at Glenorchy, Moonah and Mornington.
- Mixed use zones also boarder the study area outside the Hobart CBD around New Town, while industrial precincts are generally contained in the inner north and east of Hobart.

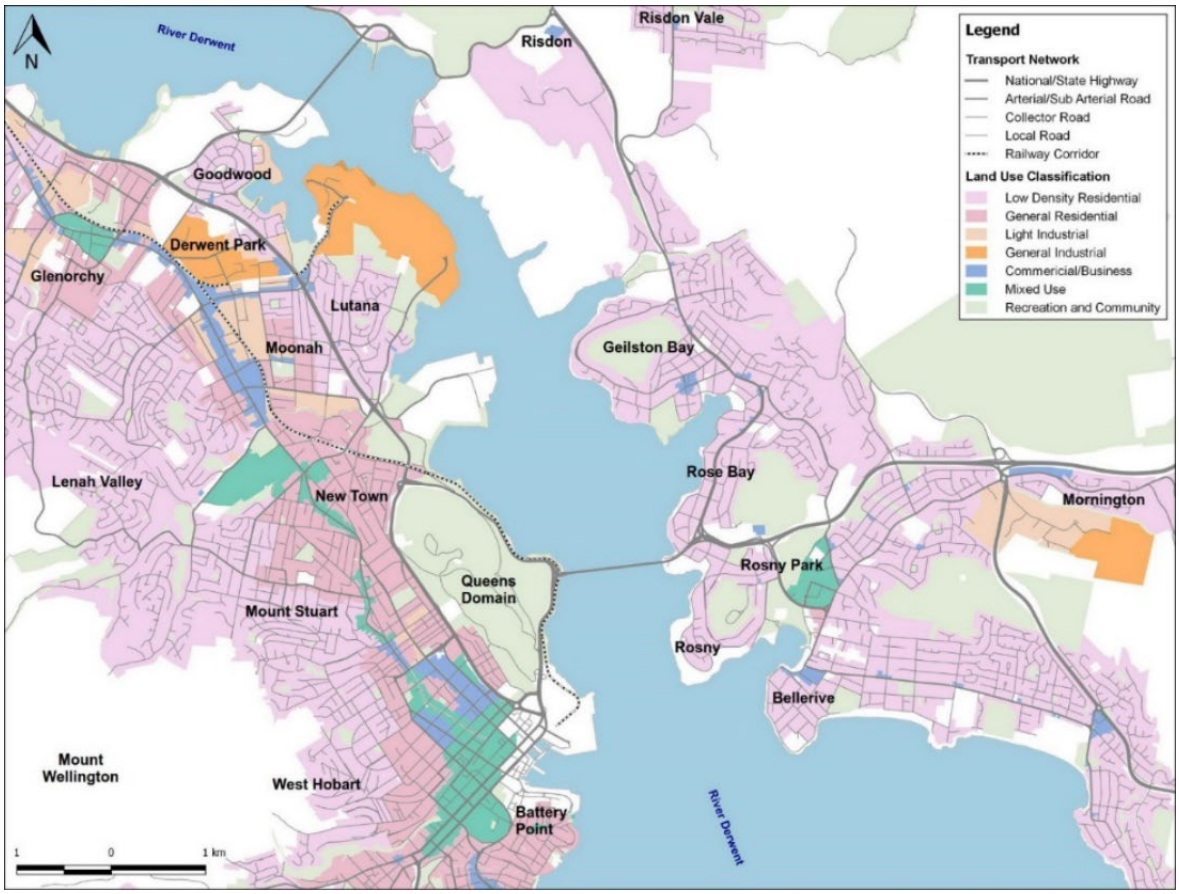


Figure 4.3 Land use around central Hobart

This type of land use distribution will predictably drive a strong radial movement of traffic from the north and east into Central Hobart to access jobs and services. However, the pattern will also drive other movements as people access mixed use, commercial and industrial developments outside of Central Hobart.

The figure shows how the study area highways around the Queens Domain form a key conduit for these diverse movements, especially for those who choose to use private motor vehicles for these trips. Catering for and appropriately controlling these conflicting movements are key issues for this study.

4.3 Current traffic volumes and heavy vehicle use

Daily volumes by direction for the study area highways are shown in Figure *4.4*, together with the differences by direction. These show that for the:

- **Brooker Highway**: Daily two-way volumes are highest north of the Domain Interchange where there are approximately 60,000 vehicles, of which just over half (53%) travel in the southbound direction. In contrast, daily two-way volumes south of the Domain Interchange fall to around 48,000 vehicles, of which just over half (54%) travel in the northbound direction.
- **Domain Highway:** Daily two-way volumes are over 30,000, with approximately 30% more eastbound trips per day than westbound trips.
- **Tasman Highway:** Daily two-way flows are over 58,000, with approximately 11% more southbound trips per day than northbound trips.

Overall, daily flows show that trip patterns are not balanced. Based on the traffic volumes a significant number of vehicles are travelling southbound via Domain Highway/Tasman Highway (in the AM Peak) and northbound via Brooker Highway (probably in the PM Peak). Route choice therefore likely has a significant impact on both peak and daily traffic volumes on the study area highways.

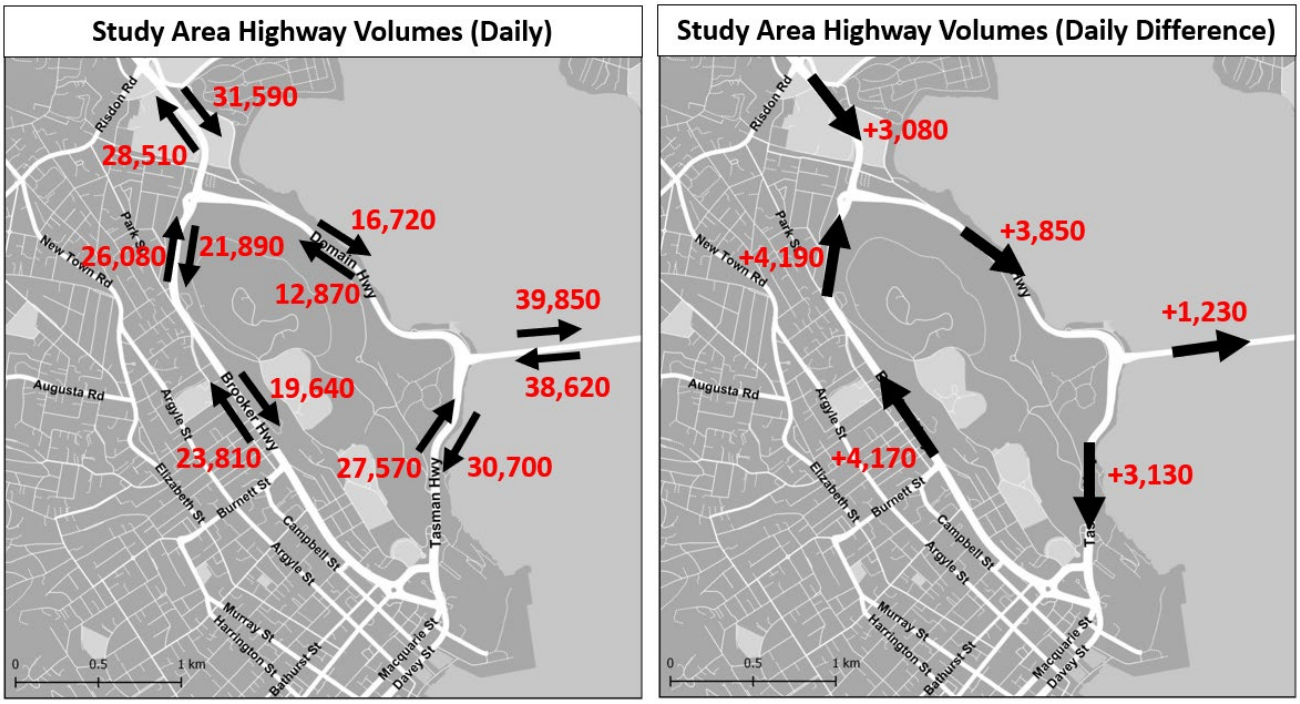


Figure 4.4 Daily study area volumes (Source: State Growth 2019)

In terms of daily two-way truck flows in the study area in 2018:

- Brooker Highway (north of Domain Highway) has an average heavy vehicle (HV) percentage of around 10% (equivalent to around 6,000 vehicles), with HVs representing less than 8% of vehicles south of Domain Highway near Clearys Gates.
- Domain Highway has an average of around 10% HVs, equivalent to around 3,000 vehicles.
- Tasman Highway has an average of less than 7% HVs, equivalent to around 3,500 vehicles.

4.4 Industry and economic development

Road is the dominant land freight mode in Tasmania, and the Brooker and Tasman Highways form part of the State key freight route (KFR) through Hobart, serving both regional and local distribution functions with:

- The Brooker Highway carrying 1.8 million tonnes annually[1], the highest tonnage across southern Tasmania, with major flows between Hobart, Glenorchy and locations further to the north.
- The Tasman Highway also carrying a significant amount of freight, at around 0.9 million tonnes annually, between Hobart Airport and destinations in central Hobart.

The road freight task is forecast to grow, with the Brooker Highway and Tasman Highway remaining the most important links. It is estimated that the Brooker Highway (between Domain Highway and Risdon Road) will carry approximately three million tonnes annually by 2035[2].

A map of the State Roads Hierarchy and B-Double routes is shown in Figure 4.5 . The three highways in the study area are all B-Double approved routes and have higher mass limits, while the Domain Highway is the only route for over-height vehicles travelling to the eastern shore. Intersections on the Brooker Highway at Risdon Road, Federal Street, Burnett Street, Warwick Street, Brisbane Street and Macquarie/Davey Street are all approved B-Double access routes.

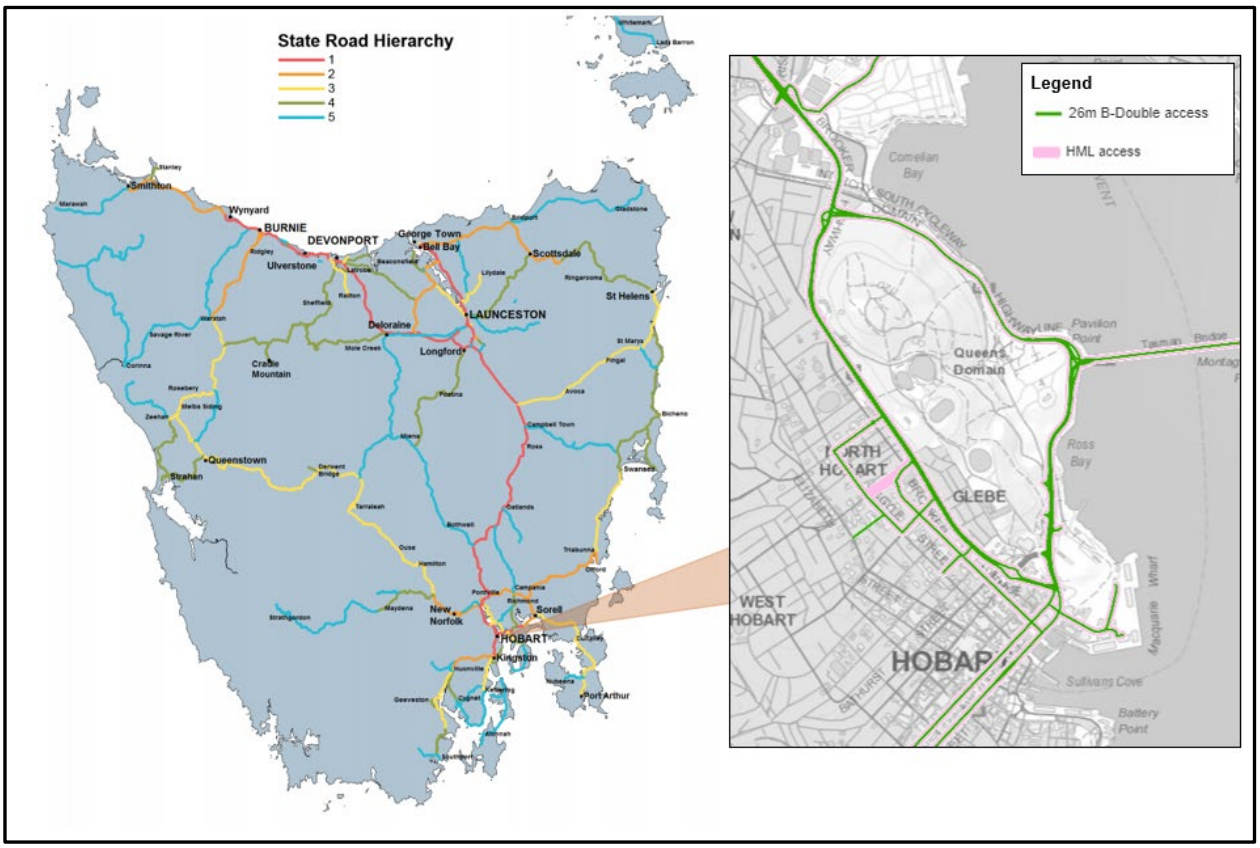


Figure 4.5 State Road Hierarchy and B-Double Routes/HML access routes (Source: State Growth)

[1] Brooker Highway Transport Plan 2010

[2] Tasmanian Integrated Freight Strategy, 2016

4.5 Public transport and active transport

4.5.1 Public transport

While the study area highways are primarily vehicle movement corridors, they also play a role for the through movement of people using public and active transport travelling to or from Hobart. Importantly, the dominant PT and active transport routes are outside the study area and PT currently does not have a significant role in moving people between the study area and Central Hobart.

Figure 4.6 shows bus routes in the study area and its surrounds, grouped into:

- **Express services**: limited stopping services
- **High frequency corridor services**: routes that when combined, create a service equivalent to a 10-minute frequency weekday service on a primary corridor (outside the study area) between 7 am and 7 pm
- **Other services:** all non-express or high frequency corridor services.

Bus routes have broad coverage for the north and east, although commuter-focused 'express' and high frequency services have more limited coverage. Communities more distant from Hobart rely on less frequent services with limited hours of operation.

In the study area, express bus routes from the north run inbound via the Domain Highway and outbound via the Brooker Highway. There are no bus stops for northern services in the study area, with two bus stops (one inbound and one outbound) on the Tasman Highway that serves eastern routes.

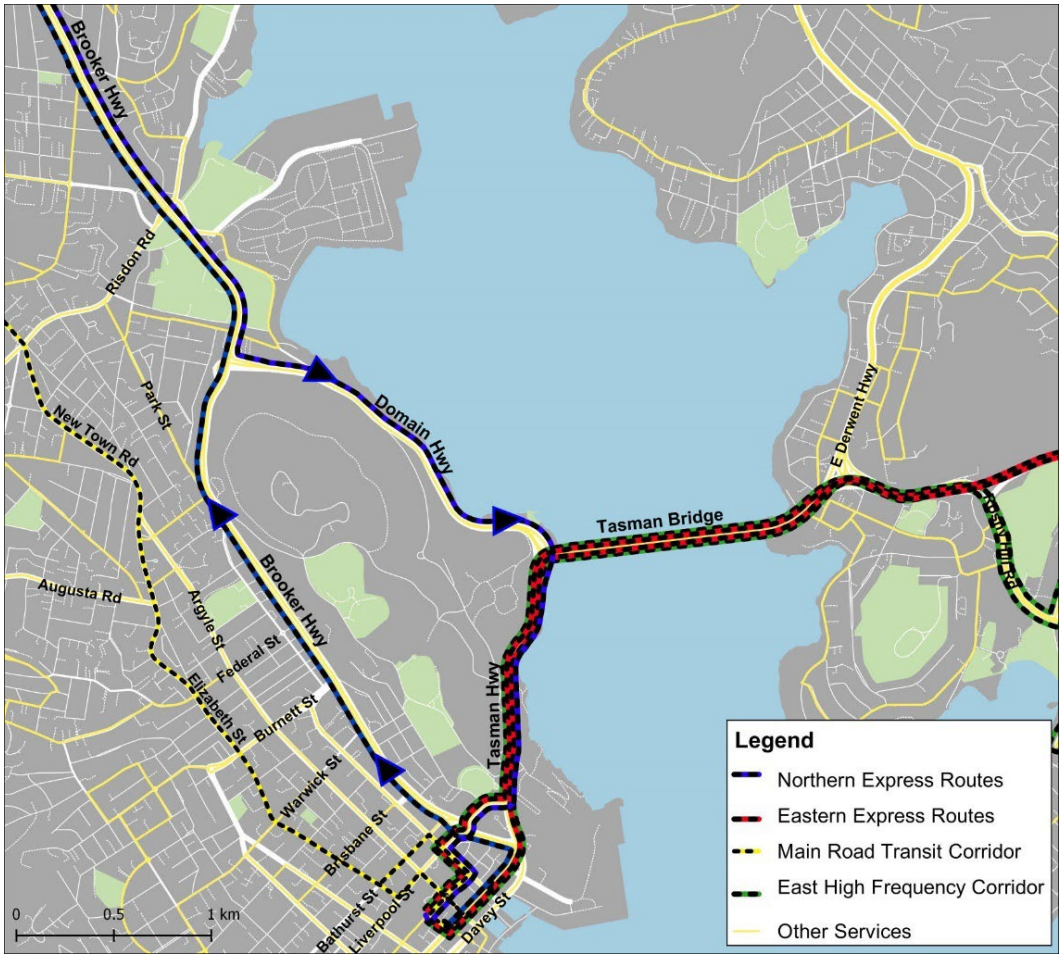


Figure 4.6 Hobart Bus Routes

4.5.2 Active transport

Pedestrian and cycling trips are an important transport mode in Hobart, especially in central areas where they account for a significant proportion of trips. Better active transport provision reduces demand for private vehicle travel and promotes a more equitable, accessible and safe transport system.

The role of the study area highways as vehicle movement corridors makes them unsuitable for cycling. However, these highways border the Queens Domain, one of Hobart's premier open spaces and an important recreational facility. The suburb of Glebe is also located adjacent to Queens Domain at the south of the study area, with pedestrian access via the Brooker Highway footpath.

It is therefore important that facilities are provided for the safe and efficient crossing of the study area highways. The existing shared use paths in the study area are shown in Figure 4.7. The access points to Queens Domain and designated crossings (underpasses, overpasses and at-grade crossings) are also marked. This provides an indication of the limited crossing points to the Queens Domain, with only one crossing of the Domain Highway currently provided.

The Queens Domain Master Plan provides a blueprint for improving pedestrian and cycling crossing facilities to the Queens Domain in the future, with recommendations for an additional six grade separated crossings. The recommendation for a grade separated crossing at Bathurst Street has been funded and is currently under construction.

Figure 4.7 Existing pedestrian and cycle paths with access points and safety concerns

The cycling network and future proposed links are shown in Figure 4.8. Given the lack of observed trip data, a **Strava[3] heat map** is included, showing cycling activity in Hobart:

- Most cycling activity occurs outside of the study area highways on the Intercity Cycleway and Main/New Town roads. The shared pedestrian/cyclist footpath on the Brooker Highway is rarely used because of its poor quality, lack of connections to the wider network and unclear strategic purpose.
- Intercity cycleway counts show the daily two-way use of the cycleway ranges from 200 to a maximum of 1,200 depending on the season and weather conditions.
- The New Town Road / Elizabeth Street is also a popular route as it provides the most direct connection between the northern suburbs and Central Hobart. This route has limited cycling infrastructure but overall is an incomplete, disjointed facility that falls below current, accepted standards.

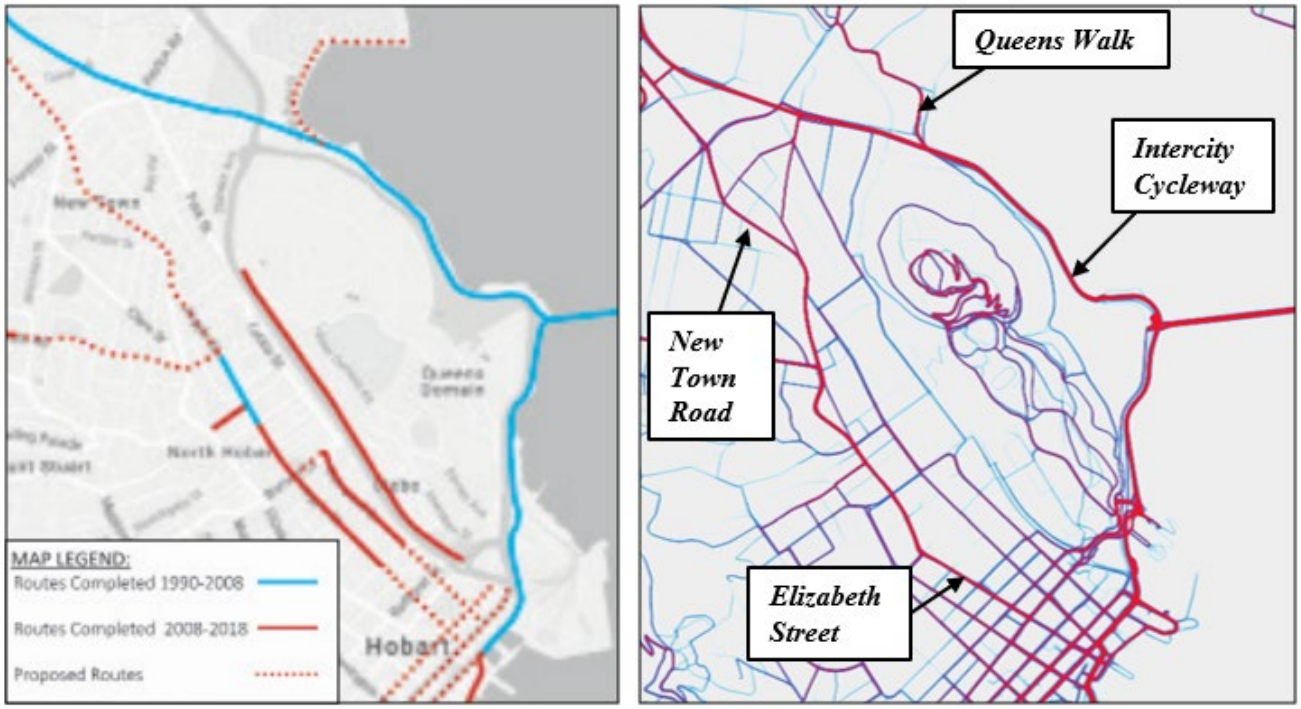


Figure 4.8 Principal cycling network[4] (left) and Strava heat map of cycling in the study area (right)

The key, longer-distance cycling routes are not within the study area. The focus of the study is therefore on improving access to the Queens Domain for active transport users and better connecting this to existing active transport infrastructure.

[3] 'Strava' is an application, where cyclists can track and publish their journeys (and is most popular with recreational riders)

[4] 2012 Glenorchy to Hobart CBD Transit Corridor: Walking and Cycling

5 Future corridor changes

5.1 Population and demographics

The Tasmanian Government has set a long-term target to increase the island's population to 650,000 by 2050 (from a base of 515,000 at time of publication in 2015). This target is based on the current growth rate and projections by the Australian Bureau of Statistics (ABS) which project the population to rise to between 581,000 (medium scenario) and 744,000 (high scenario) by June 2066.

As the State capital, Hobart is the principal driver of economic growth in Tasmania and will become more important in the future, with a projected increase in its proportion of Tasmania's population, from 44% of in 2017 to 46% in 2027, and to between 55% and 57% by 2066. From a current growth rate of around 1%, the ABS forecast an increase in population of between 1.2% to 1.7% over the next 10 years.

Current available forecasts up to 2037 based on population data from the Department of Finance and employment data from the Australian Government Department of Employment visualised in Figure 5.1 and Figure 5.2 show:

For population:

- Relatively modest growth for the City of Hobart (around additional 2,800 additional residents) with most growth centred around the inner north around New Town.
- Much higher growth for adjacent areas that are currently heavily dependent on car travel with around 9,900 additional residents in Kingborough, 7,600 residents in Clarence and over 5,500 in Glenorchy. Further afield growth of between 4,800 and 5,200 residents is expected for Brighton and Sorell.
- With population becoming increasingly decentralised, there will likely be greater reliance on private motor vehicle travel to access employment.

For employment:

- The largest growth of over 4,900 jobs is within the Clarence LGA to the east of the Tasman Bridge. Most of this growth is forecast to occur around Cambridge (+2,200 jobs) and Hobart Airport (+1,200 jobs). While some of the extra residents in Clarence may fill these jobs, this will also likely create additional demand on the Domain Highway and Tasman Highway, which provide the east-west links between these areas.
- Continuing but modest employment growth in Kingborough (1,600 jobs) and Glenorchy (1,900 jobs), with relatively small employment growth of under 1,000 jobs in each of Brighton and Sorrel.
- While the City of Hobart will remain the centre of employment, there is only limited jobs growth forecast with just 2,300 extra jobs, most of which is forecast in the inner north around New Town with relatively little job creation within Hobart CBD.
- Overall increasing decentralisation of employment will make it difficult for public transport to compete with private vehicle due to lower connectivity in outer areas.

Overall these patterns of development are unlikely to reduce the need for travel, with greater employment growth outside the City of Hobart and most population growth occurring in outer areas in the south, north and east. If this is realised it may lead to more cross city trips rather than city bound trips. This would particularly impact demand for travel on the Domain Highway and Tasman Bridge.

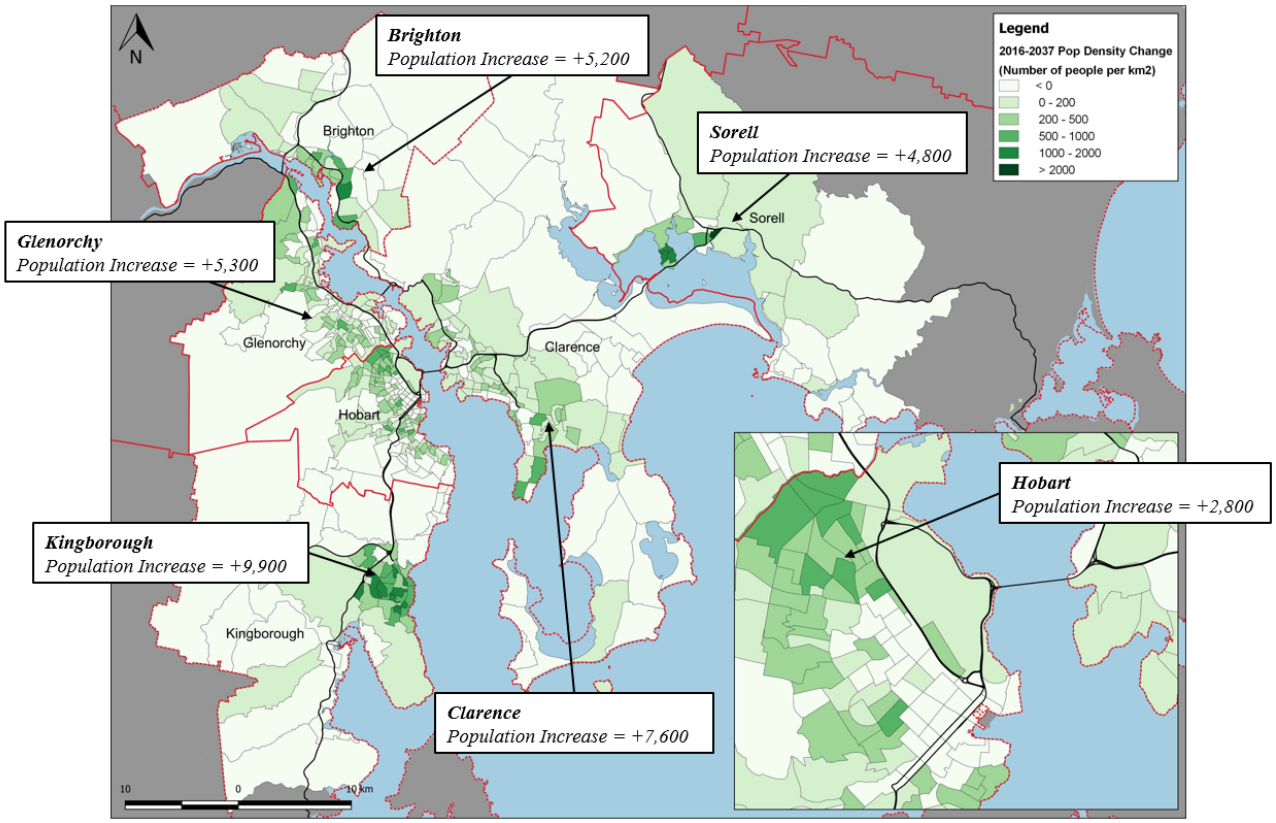


Figure 5.1 Population projections for Greater Hobart (Source: GHUTDM difference 2016-2037)

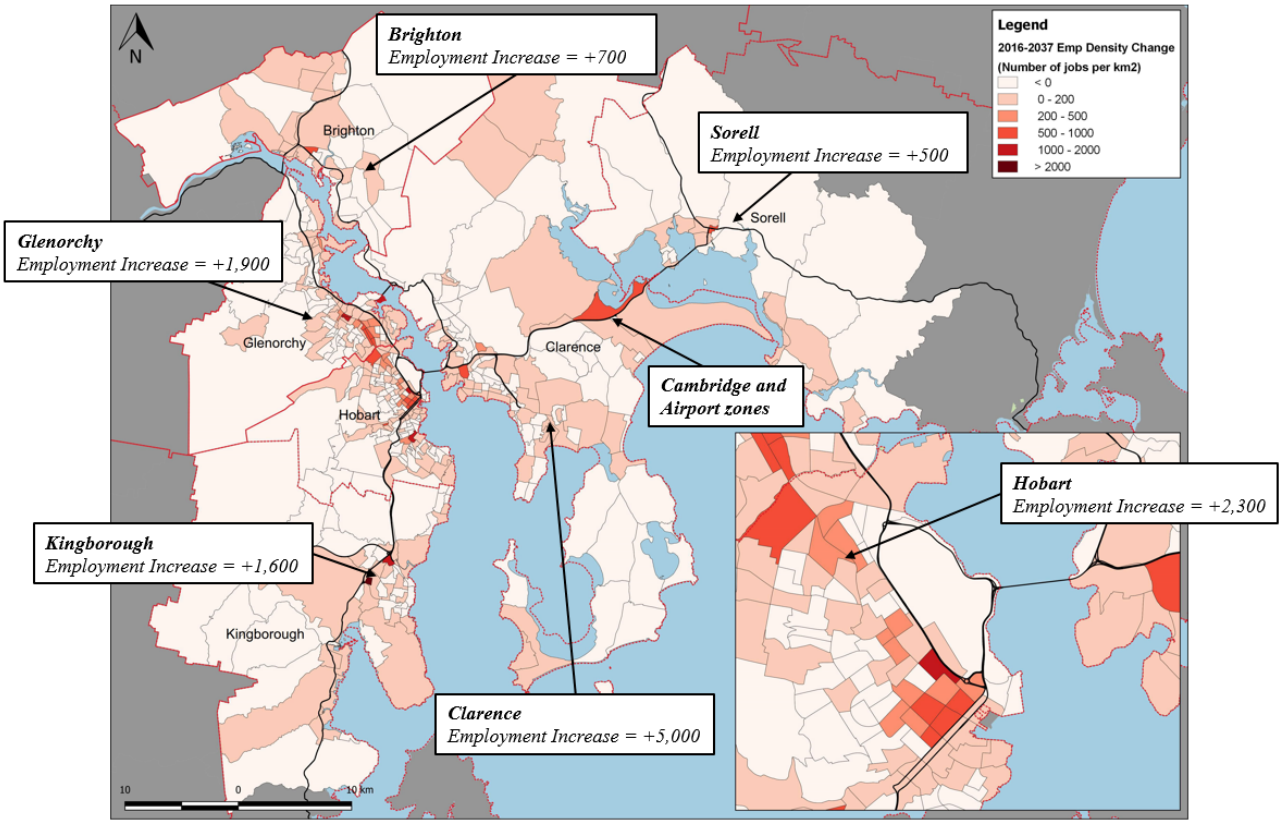


Figure 5.2 Employment projections for Greater Hobart (Source: GHUTDM difference 2016-2037)

5.2 Traffic growth

Historic average annual daily traffic volumes for the study area between 1982 and 2017 shows that:

- Brooker Highway traffic has grown on average at **1.5% annually**. Data on peak period growth has not been provided but existing capacity constraints and congestion are likely to have limited peak growth. Without capacity expansion, peak spreading is likely to occur with further growth.
- Tasman Bridge traffic has grown on average at **1.3% annually**. Similarly, due to existing congestion and capacity constraint at the bridge the peak growth is likely to be considerably less.

While historical data was not available for the Domain Highway, due to its location between the Tasman Bridge and Brooker Highway, it is likely to have experienced similar levels of daily growth. Furthermore, due to the capacity constraints at the bridge and intersections, there are constraints on peak period growth.

The forecast change in traffic volumes for the 2-hour AM and PM peaks between 2016 and 2037 based on the Greater Hobart Urban Travel Demand Model (GHUTDM) are shown in Figure 5.3. The results show volumes will increase across the network in both the morning and evening peak periods. However, forecast increases in the study area are very modest due to land use assumptions and existing capacity constraints affecting the study area highways. It is difficult to support major infrastructure upgrades based on these growth assumptions. The main findings from the model forecasts are that:

- In the AM peak the largest increase in volumes is outside the study area on the Brooker Highway southbound to Glenorchy (up to 640 vehicles), where employment growth is forecast. In the absence of further capacity increases, vehicle growth will likely lead to further congestion on the Brooker Highway outside the study area. However, due to limited forecast employment growth in the Hobart CBD, volumes on the Brooker Highway are forecast to increase by only 200 vehicles in the peak southbound direction, within the study area.
- AM Forecasts show much greater use of the Bowen Bridge and East Derwent Highway in the future to access employment growth areas in the east. The Tasman Highway is also forecast to support over 400 vehicles travelling to the east, with significant employment attractors around Cambridge and Hobart Airport. This will also increase vehicles on the Domain Highway and Tasman Highway, with an expected increase of around 200 vehicles in the Domain Highway and Tasman Highway eastbound in the AM peak. The Tasman Highway will have just over 100 extra vehicles travelling into the city in the same period.
- In the PM peak, there is a similar pattern of movements in the reverse direction, with the Bowen Bridge, East Derwent Highway and Tasman Bridge likely to be the largest areas of growth.

The growth on the main highways in the study area is driven in the model by land use assumptions including significant employment growth in eastern part of Greater Hobart, and modest employment growth in Central Hobart and the CBD. In addition, the model does not assume major capacity upgrades outside the study area and this will constrain the volume of vehicles that can access and leave the study area. These factors make the results appear reasonable.

The relatively small increase in volumes will have limited impact on exiting midblock capacity constraints across the peak periods (refer to Figure 6.2 for existing capacity constraints). The most likely performance impacts will be from peak spreading which will lead to the highways experiencing performance issues over a longer time across peak periods. However, where there is still some capacity at the busiest part of the peak periods, volumes are likely to grow and performance get worse, This applies to the Risdon Road, Domain Interchange and Queens Walk intersections.

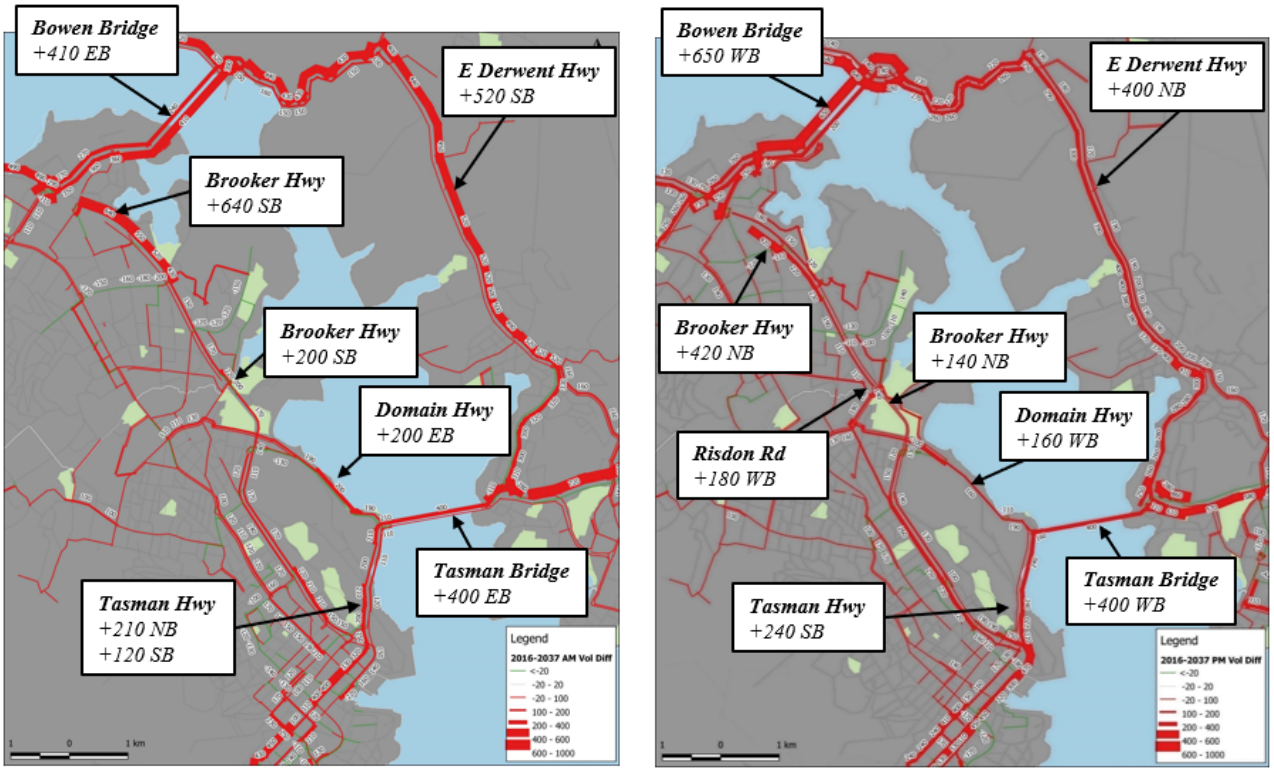


Figure 5.3 AM (left) and PM (right) peak traffic volumes difference, 2016-2037 (Source: GHUTDM 2016 - 2-hour peak)

6 Key problems in the study area

Figure 6.1 describes the key problems for the study area and the benefits that are likely to be realised in addressing these problems. These are the result of an analysis of the evidence and review and confirmation by the project working group (including representatives from across State Growth, the City of Hobart and City of Glenorchy).

The problems are consistent with the policies and plans of Federal, State and local governments and the percentages for each problem and benefit noted in Figure 6.1 have been designed to reflect what is achievable within the study scope. As such, although raised as a key problem for the study area, the weighting and scope of the public and active transport problems and benefits are limited because:

- The study area does not include the primary public or active transport corridors serving Hobart's northern suburbs, and this limits the potential to significantly change the shares of these modes.
- Public transport solutions depend on the outcomes of on-going planning work for the Northern Suburbs Transit Corridor, which will define the best solution for transit and the supporting urban renewal required to support this.
- The potential for active transport is limited by the study area highways' primary function as vehicle movement corridors, and because less exposed and more popular pedestrian and cycling routes are located outside the study area (along New Town Road, the Intercity Cycleway and on local streets).
- In addition, the absence of *Place(s)* that attract customers and visitors along the study area corridors limit the amount of pedestrian and bicycle traffic, except for those accessing the Queens Domain and at the southern section of the Brooker Highway around the residential suburb of Glebe.

Following sections examine the evidence underpinning these problems in greater detail.

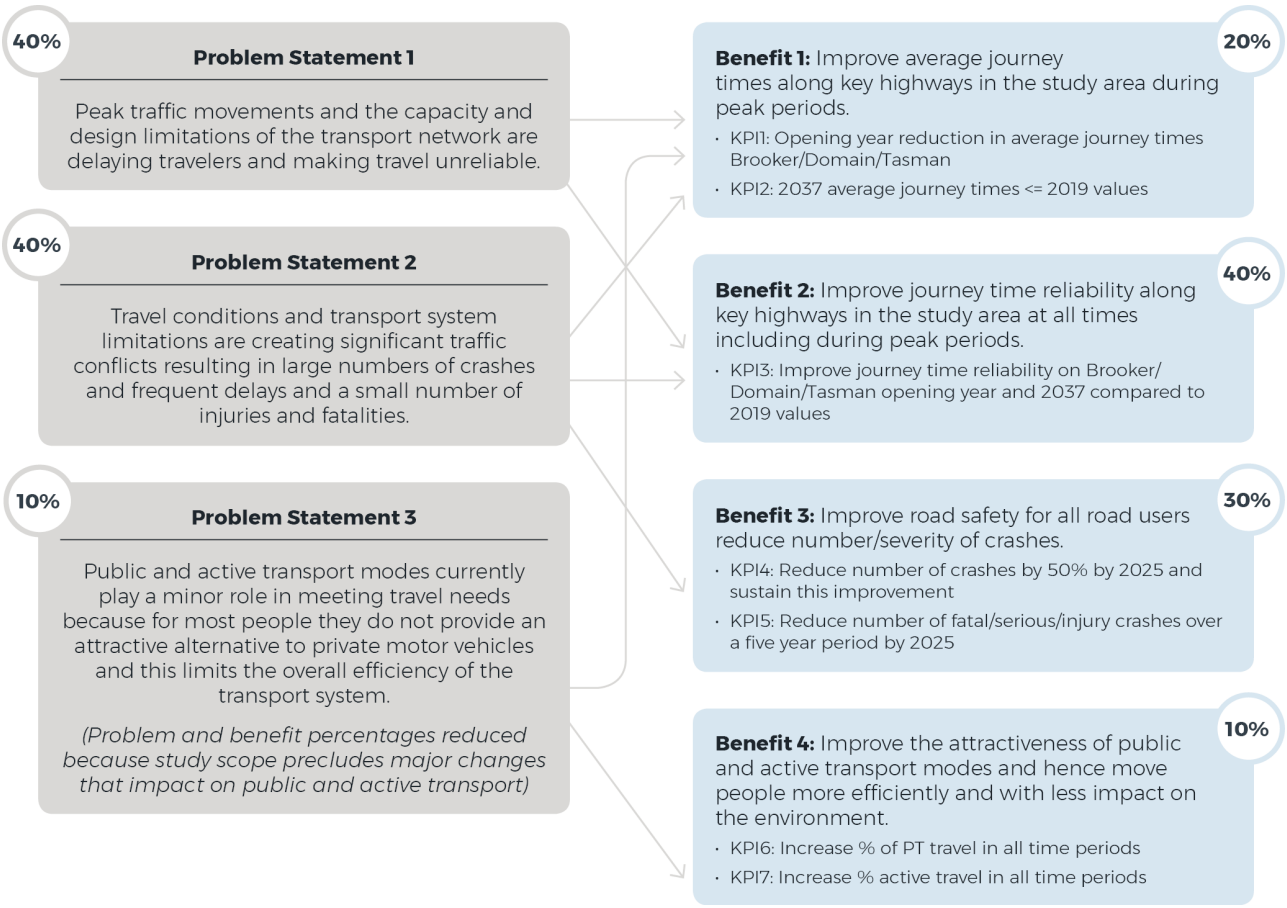


Figure 6.1 Problems and benefits

6.1 Travel reliability

Table 6.1 describes average delays and reliability for peak journeys on the study area highways and shows average travel time delays are relatively small in relation to overall travel times, with average peak period delays of less than two minutes. While all the highways are at, or approaching capacity at peak times, this is not causing significant traffic performance issues except at key intersections. The Domain Interchange is the most significant source of delay and variability in the study area, which in part is likely due to design deficiencies (which have been proved as part of this study).

- There are recurrent reliability issues on the main highways, which are likely a function of the peak demand for private vehicle travel. Site observations found that queues can build up quickly at key intersections, and then dissipate within 10-15 minutes. A key reason for this, is likely the high level of uncontrolled traffic flows around the study area, which results in road users adjusting their route choice in response to traffic conditions. This means that the level of congestion and impact at controlled entry and exit points will vary considerably across the peak periods and cannot be managed or controlled with the existing infrastructure provision.
- While it is challenging to predict the future changes in travel times for the study area, current land use forecasts suggest limited growth in employment within central Hobart, while population is expected to increase in the outer areas. This will likely increase the demand for private vehicle travel, including for cross city trips facilitated by the Domain Highway. However, it is noted that both westbound access points to the north at Domain Interchange and Queens Walk are at capacity.
- In addition, entries and exits to the study area from the north and east are approaching capacity at Risdon Road and the Tasman Bridge, respectively. If existing constraints are not mitigated, there is limited room for peak traffic volumes to increase further. It is therefore unlikely there will be a significant

deterioration in travel times in the study area, but peak spreading may result in an impact on performance on the shoulders of the peak periods.

- Given the scale of existing problems, the reactive nature of road users route choices and lack of control within the study area to influence these choices, it is likely measures that allow the better management of traffic across the study area will be the most effective response to current and emerging travel reliability problems. This would include measure to better manage peak demand and make more efficient use of existing infrastructure.

Table 6.1: Volume/travel times for AM (8:00-9:00 am) & PM (4:30-5:30 pm) peak hour (Source: TomTom[5] data)

CORRIDOR	DIRECTION	AM PEAK				PM PEAK			
		VOLUME	AVERAGE TIME	AVERAGE DELAY	RELIABILITY-SD & % AVG	VOLUME	AVERAGE TIME	AVERAGE DELAY	RELIABILITY-SD & % AVG
Brooker Highway	Southbound	2,630	05:08	01:38	1:28 (29%)	2,362	04:29	00:59	1:13 (27%)
	Northbound	1,843	04:35	01:04	0:56 (20%)	2,288	05:06	01:35	1:20 (26%)
Domain Highway	Westbound	1,177	03:25	01:10	1:15 (37%)	885	04:08	01:52	2:00 (48%)
	Eastbound	1,244	02:11	00:08	0:14 (11%)	1,614	02:40	00:37	0:54 (34%)
Tasman Highway	Southbound	4,107	03:05	01:09	1:04 (35%)	2,521	02:50	00:54	1:44 (61%)
	Northbound	1,564	02:59	01:25	1:00 (34%)	3,280	02:04	00:30	0:58 (47%)

6.1.1 Study area volumes and midblock capacity

The level of peak delay and variability in the study area is a function of the capacity of the network and the high demand for travel at peak times. Midblock volume-capacity ratios in Figure 6.2 give an indication of how close the highways are to capacity, while the study area traffic profiles in Figure 6.3 show how traffic changes across the day. The key issues for each study highway are described in Table 6.2.

Table 6.2: Key highway issues

HIGHWAY	KEY ISSUES
Brooker Highway	• The Brooker Highway is operating at a level that is approaching capacity for peak direction travel, both within and outside the study area. The highest volumes on the corridor are between Risdon Road and Domain Interchange, up to 2,900 vehicles per hour (vph) in the AM Peak and, up to 2,500 vph in the PM Peak. • Congestion on the Brooker Highway south of the Domain Interchange is relatively low in the AM peak in the peak direction, with a volume to capacity ratio approaching the limit of stable flow. Volumes in the peak direction in the PM peak however are higher and impact the ability of Domain Interchange users to merge. This inconsistency in AM and PM congestion is likely due to routing patterns as discussed below.

[5] TomTom data is based GPS measurements collected from road users across a route / study area

HIGHWAY	KEY ISSUES
Domain Highway	• Domain Highway traffic volumes are at capacity in the eastbound direction in the PM peak, and approaching capacity in both directions in the AM peak. This suggests there is a significant mismatch of flows in the peak directions between the AM and PM (i.e. >1,200 vph westbound in AM and >1,500 vph eastbound in PM). • Analysis of origin-destination patterns has shown the uneven demand is likely due to Domain Highway facilitating a high degree of north to south travel in both peaks, while the volume in the reverse direction (northbound/westbound) is effectively limited by the capacity of the Domain Intersection loop ramp and Queens Walk.
Tasman Highway	• The Tasman Highway has the highest volumes in the study area, reaching around 4,000 vph southbound across three lanes (including a contraflow lane that is operated in the AM peak only from 7:00am to 9:00am). • Northbound the highway is at capacity in both peaks, carrying around 1,500 vph across a single lane in the AM peak and around 3,200 across two lanes in the PM peak. • The Tasman Bridge is operating at or close to capacity in the peaks. Expanding the capacity of the Domain or Tasman Highways would therefore be unlikely to increase east-west travel, but instead may create further congestion at the Tasman Bridge.

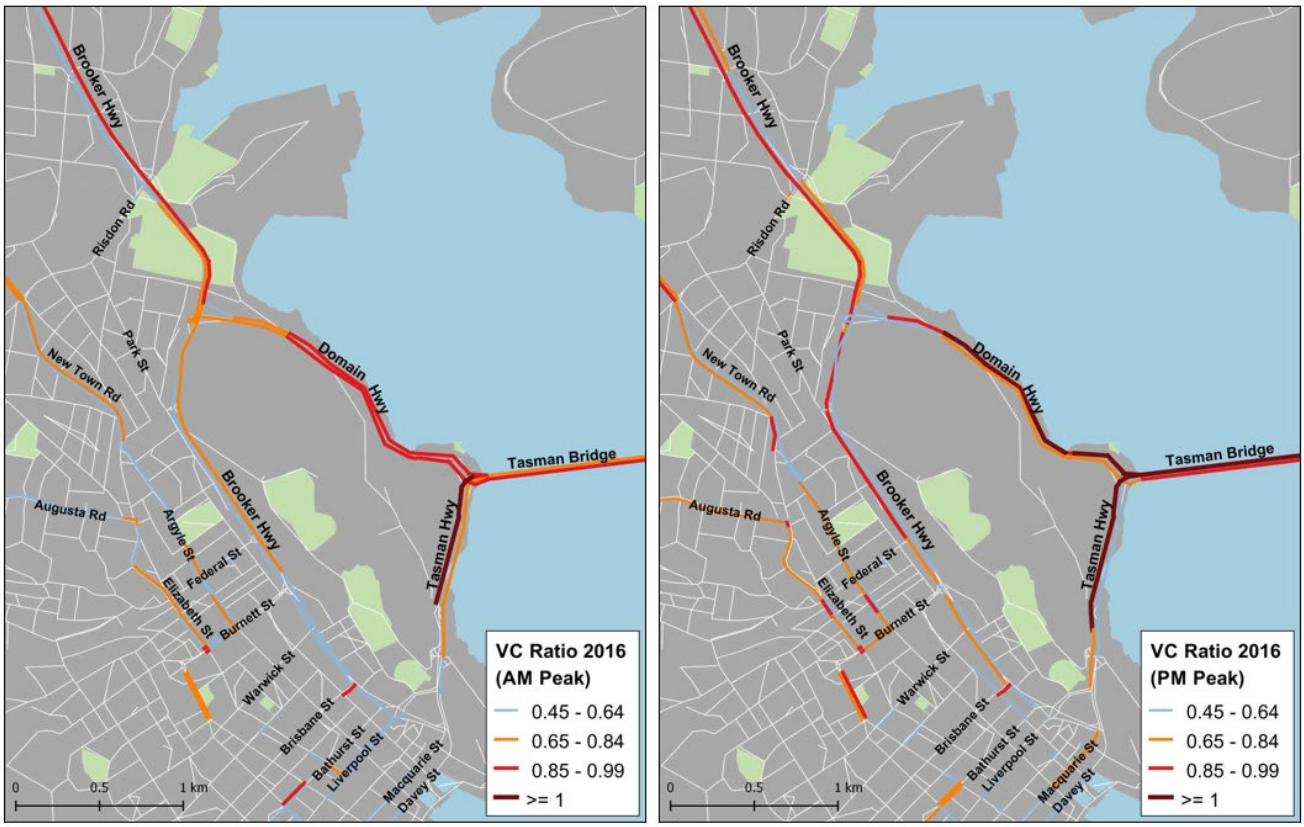


Figure 6.2 Volume capacity ratios for 2-hour AM peak (left) and PM peak (right) (Source: GHUTDM 2016)

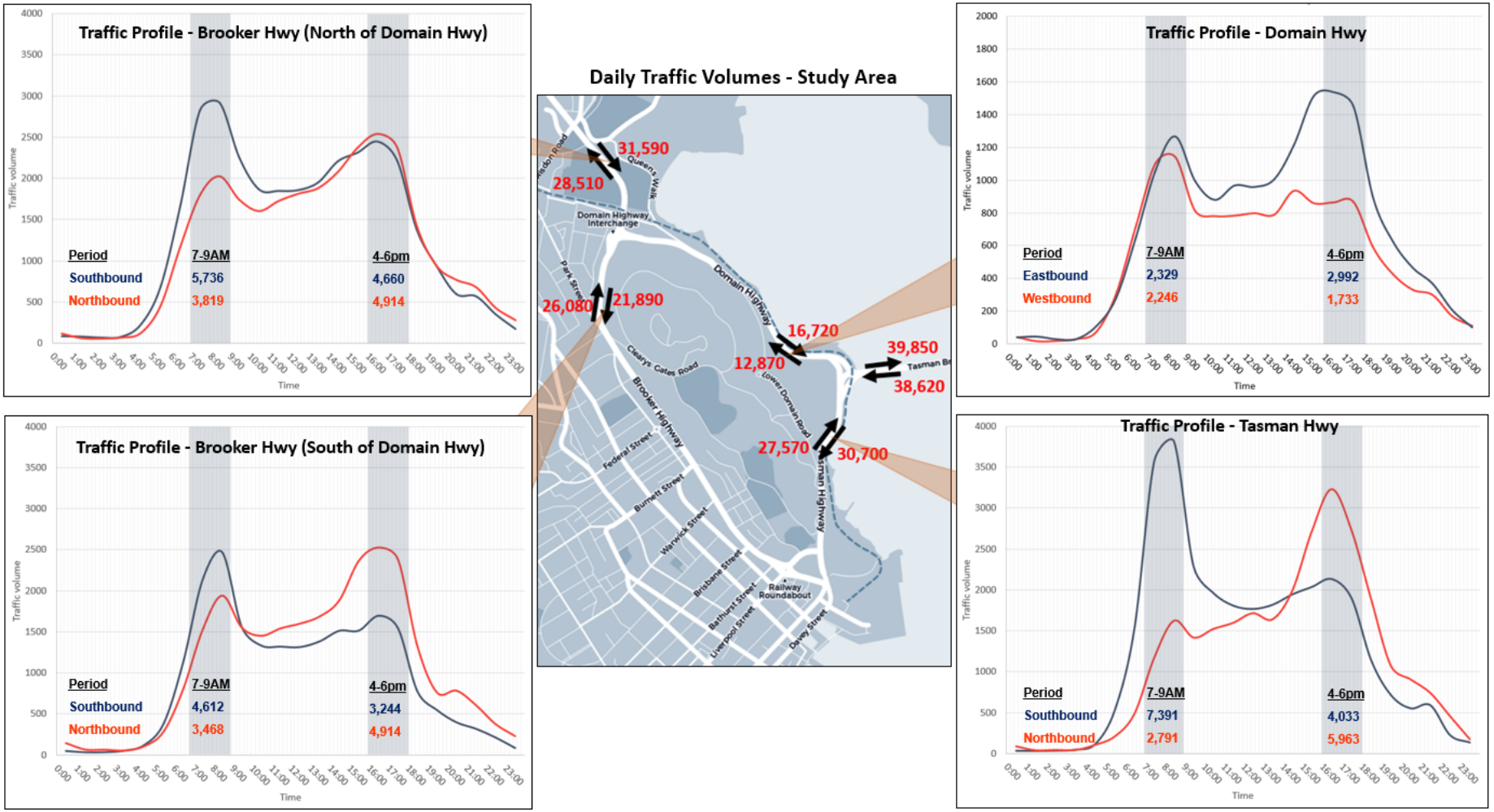


Figure 6.3 Daily and hourly flow profiles for the study area (Source: State Growth traffic volumes for Wednesday 22 May 2019)

6.1.2 Study area speeds and intersection capacity

Figure 6.4 shows the average speed (from TomTom data) on the network for the worst 15-minute periods in the AM and PM peaks, as well as the degree of saturation at key intersection across the AM and PM single, peak hours based on the SIDRA analysis of surveyed volumes.

The most significant delays are at intersections, with Railway Roundabout the biggest source of peak delays (this intersection is outside the study scope). Within the study area the Brooker Highway intersections with Risdon Road and the Domain Interchange have the biggest impact on performance, with the effects largest in the PM peak. However, much of the remaining study area network operates at reasonable speeds across the peak periods. The key intersection issues are described in Table 6.3.

Table 6.3: Key intersection issues in the study area

INTERSECTION	KEY ISSUES
Risdon Road / Brooker Highway	• This is a full movement signalised intersection providing through movement capacity for Brooker Highway as well as access to the high activity employment and education precincts in the inner north via Risdon Road. As such, the intersection affects traffic entering/leaving the study area, with queuing southbound in the AM peak and northbound in the PM peak. The intersection has been largely 'built out' and is run with extended cycle times during the peaks to maximise north-south movement, which impacts turning movements from Risdon Road. • The high level of uncontrolled access along the Brooker Highway leading up to this intersection, in the northbound direction (i.e. at Federal Street, Park Street and Domain Interchange), leads to significant variation in queue lengths throughout the peak period.
Domain Interchange	• Northbound loop ramp (east to north): has low speeds and queueing across the day, with delays more significant in the AM and PM peaks where the movement is approaching or at capacity. This is a function of the low radius for this ramp which ends in a give way entry to the high-volume Brooker Highway. • Southbound off ramp (north to east): has no deceleration lane and a low design speed, which can impact traffic leaving the Brooker Highway in peak periods. • Eastbound merge (south/north to east): has a short merge length occurring after a steep gradient requiring the higher volume movement from the Brooker Highway south to merge with the lower volume movement of traffic northbound on the Brooker Highway. Together with user behaviour issues at Queens Walk, this creates a queuing issue in the PM peak and this can lead to traffic queuing back onto the Brooker Highway.
Queens Walk / Domain Highway	• An uncontrolled T- intersection that attracts more vehicles than designed for due to its attractiveness as a through route to/from employment and education precincts, and as an alternative to avoid delays at Domain Interchange. This results in significant queuing for right turning traffic into Queens Walk, which can impact the Domain Highway through movement. • Vehicles on the Brooker Highway are also sometimes impacted by flow back effects from vehicles merging onto the Domain Highway eastbound because slow moving vehicles give way to right turning traffic at Queens Walk despite having priority. This issue is most significant in the PM peak when Doman Highway eastbound volumes are higher.
Railway Roundabout and linked intersections	• While outside the study area, the roundabout is linked to four intersections in the study area. These intersections form a complex traffic sub-system and have a significant impact on routing and overall delay in the study area.

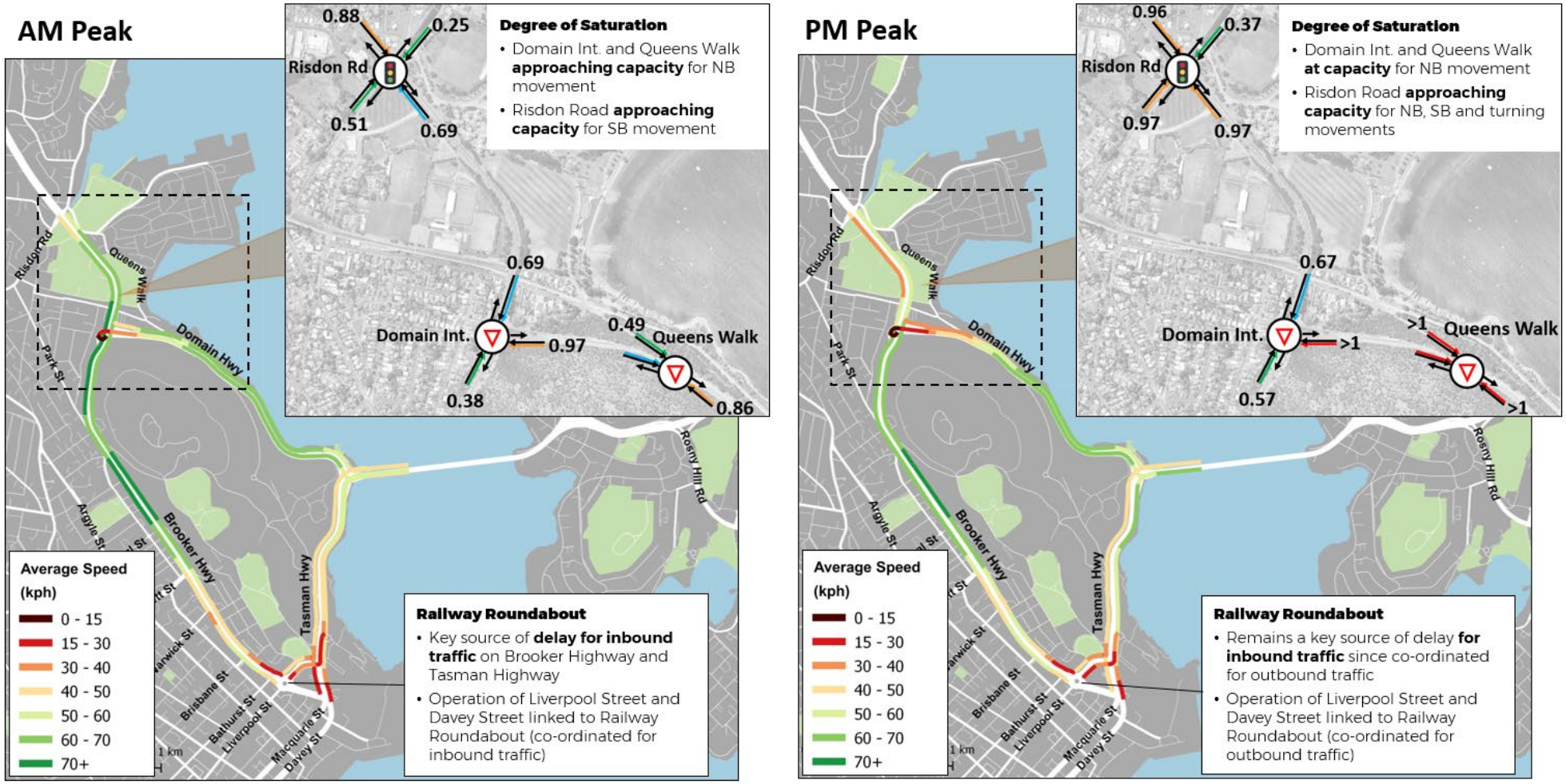


Figure 6.4 Study area average speeds for the worst 15min in the AM & PM peak periods (Source: TomTom data) and AM & PM peak hour degrees of saturation for key intersections for 1hr (Source: SIDRA intersection)

6.2 Conflict and safety

Table 6.4 and Figure 6.5 show the scale of road crashes and their locations within the study area. Although not within the scope of the study, crashes at Railway Roundabout are also shown given they impact the performance of the study area highways. Crash data shows that:

- The level of conflict for road traffic is significant, with a total of 691 recorded crashes in the study area over a five-year period to mid-2018. The total rises to 1,033 if Railway Roundabout is included.
- Most crashes do not involve serious injuries or fatalities. In the study area, 540 (or 78% of the total) resulted in damage only, 145 (21%) caused other, minor injuries, leaving less than 2% of all crashes resulting in fatal/serious injuries. All the 326 crashes at Railway Roundabout were non-fatal/serious and most resulted in property damage only.
- Most intersection crashes occurred at three intersections: Railway Roundabout (342 crashes), Domain Interchange (140 crashes) and Brooker Highway/Risdon Road (119 crashes).
- The high number of crashes at the north of the study area is likely due to design deficiencies at Domain interchange as well as a combination of other factors including the high variability in volumes through the corridor, inappropriate speeds, poor sight lines and steep gradients.
- There are also a significant number of midblock crashes on the Brooker Highway (144 crashes), which are predominantly rear ends occurring across the PM peak period.

The cost of crashes in the study area has been estimated to equal approximately $4.76 million over five years, using the Australian Transport Assessment Planning (ATAP) guidelines. However, this only assumes a delay cost of $200 for other injury crashes and $0 for property damage only crashes and may not be appropriate for the Hobart context.

To provide an indication of the cost of non-serious crashes, TomTom data was used to calculate the value of the additional delays observed for two 'other injury' crashes on the Brooker Highway between 4pm and 5pm (over 35% of crashes on the Brooker Highway occur across the 3-hour PM peak). The cost of delay on study area routes was estimated to be between $7,000 and $26,000, not including the cost of wider network impacts (compared to between $200 and $0 in the ATAP guidelines).

The reason delay costs for the study area are significantly higher than ATAP is likely due to the lack of alternative routes within Hobart which leads to a low resilience to even minor incidents. This suggests that the high frequency of minor injury and property damage crashes (which occur every 2.6 days in the study area or every 1.8 days including Railway Roundabout) has significant cost implications due to their impact on travel time reliability. Applying the ATAP values and traditional criteria focusing on serious/fatal crashes is unlikely to capture the true cost of crashes in the study area.

Overall, the frequency of crashes across the study area is a significant issue and a symptom of the high level of conflict present in the current transport system and its operation. These issues can be addressed through improved design and the improved management of driver behaviour by better managing vehicle speeds and raising drivers' awareness of traffic conditions and the likely risks they will face when travelling.

Table 6.4 Summary of crashes and ATAP costs (5yrs to mid-2018)

CORRIDOR	INTERSECTION	FATAL	SERIOUS	OTHER INJURY	PROPERTY DAMAGE ONLY	TOTAL	TOTAL ($)
Brooker Highway	Railway Roundabout	0	0	16	326	342	$811,000
	Risdon Road	0	1	25	93	119	$546,000
	Domain Interchange	0	0	20	120	140	$430,000
	Davey Street	0	0	3	48	51	$125,000
	Other (Signalised)	0	0	7	23	30	$112,000
	Other (Non-signalised)	0	0	11	25	36	$153,000
	Midblock	0	3	33	108	144	$897,000
	Total	**0**	**4**	**115**	**743**	***862***	***$3,074,000***
Domain Highway	Queens Walk	0	0	3	16	19	$60,000
	Lower Domain Road	0	0	2	3	5	$25,000
	Midblock	1	0	13	18	32	$1,851,000
	Total	**1**	**0**	**18**	**37**	***56***	***$1,936,000***
Tasman Highway	Lower Domain Road	0	0	2	14	16	$47,000
	Davies / McVilly Drive	0	0	2	7	9	$33,000
	Liverpool Street	0	1	5	24	30	$220,000
	Midblock	0	0	19	41	60	$260,000
	Total	**0**	**1**	**28**	**86**	***115***	***$560,000***
Total including Railway Roundabout		1	5	161	866	**1,033**	**$5,570,000**
Study Area (excl Railway Roundabout)		1	5	145	540	**691**	**$4,759,000**

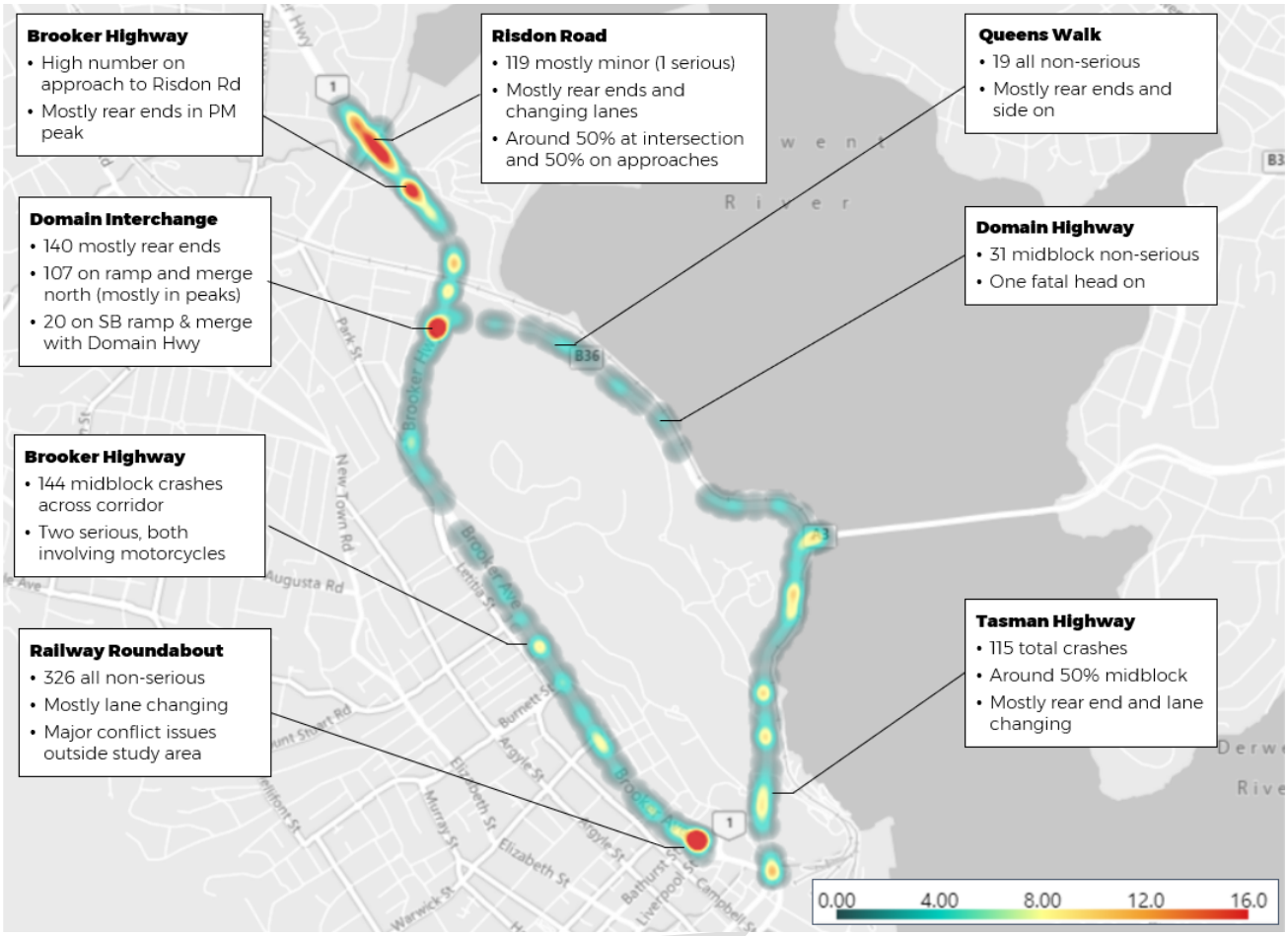


Figure 6.5 Heat map showing crashes in the study area and at Railway roundabout (5yrs to mid-2018)

6.3 Public and active transport

Public and active transport play a relatively minor transport role in Greater Hobart, which has the lowest mode share for public transport across all Australian capital cities[6].

While the City of Hobart is fairly walkable, which is reflected in its relatively high mode share for active transport trips, Table 6.5 shows that public and active transport accounted for just 13% of journey to work trips in Greater Hobart[7] compared to 84% for travel by motor vehicle. The share of public transport and active transport trips falls with distance from the CBD as shown in Figure 6.6. This is likely a function of many factors including lower service offering, low residential density and limited mixed-use developments making public and active transport less attractive or convenient than car outside Central Hobart.

Table 6.6 shows most north-south trips use cars via the Brooker Highway. Furthermore, most public transport trips are made using buses that run on the Main/New Town roads corridor, which carries more than double the bus passengers using the Brooker Highway corridor.

Most cycling activity occurs away from the study area highways on the Intercity Cycleway and Main/New Town roads, while the shared, lower quality pedestrian/cyclist footpath on the Brooker Highway is rarely used (due to its limited strategic purpose and lack of connections to the surrounding network).

Growing alternative transport modes is at the centre of State and local governments' transport policies and plans and received strong support from the community and stakeholders. The ability of this study to contribute to meaningful mode shift is limited by the geographical extents of the study area and the wider considerations required to deliver a successful public transport offering. However, the condition and accessibility of active transport infrastructure in the study area contributes to its low use and these issues may be addressed within this study. These issues include:

- Substandard condition and the lack of accessibility for the two bus stops on the Tasman Highway. These are the only bus stops in the study area because northern express services do not stop in the area.
- Lack of safe access points to Queens Domain, including design limitations at existing at-grade crossing points at Botanic Gardens and Warwick Street. This was one of the primary problems reported in the community consultation. The Queens Domain Master Plan provides a good reference for the provision of additional crossings.

The recommendations of the Northern Suburbs Transit Study (to be completed in 2020) will be significant in shaping public transport requirements for the north, and has the potential to reduce the demand for private vehicle travel on the Brooker Highway and shape the highway's role in public transport provision. Therefore, the outcomes of this study need to be properly understood prior to making further on-road public transport recommendations.

[6] Bureau of Infrastructure and Transport and Regional Economics (BITRE) 2013: Public Transport Use in Australia's capital cities: modelling and forecasting

[7] 2016 Journey to work data by destination

Table 6.5 Greater Hobart journey to work numbers by destination

MODE	BRIGHTON	CLARENCE	GLENORCHY	HOBART	KING'B	SORRELL	TOTAL	%
Motor vehicle	2,226	11,787	15,048	33,008	6,019	1,787	69,875	84%
Public Transport	35	344	491	4,063	188	25	5,146	6%
Cycling	5	49	131	900	40	3	1,128	1%
Walking	46	401	455	4,090	292	91	5,375	6%
Other/Not stated	40	214	280	605	127	41	1307	2%
% Motor vehicle	**95%**	**92%**	**92%**	**77%**	**90%**	**92%**	**84%**	**84%**
Total	**2,352**	**12,795**	**16,405**	**42,666**	**6,666**	**1,947**	**82,831**	**100%**

Source: ABS Census 2016

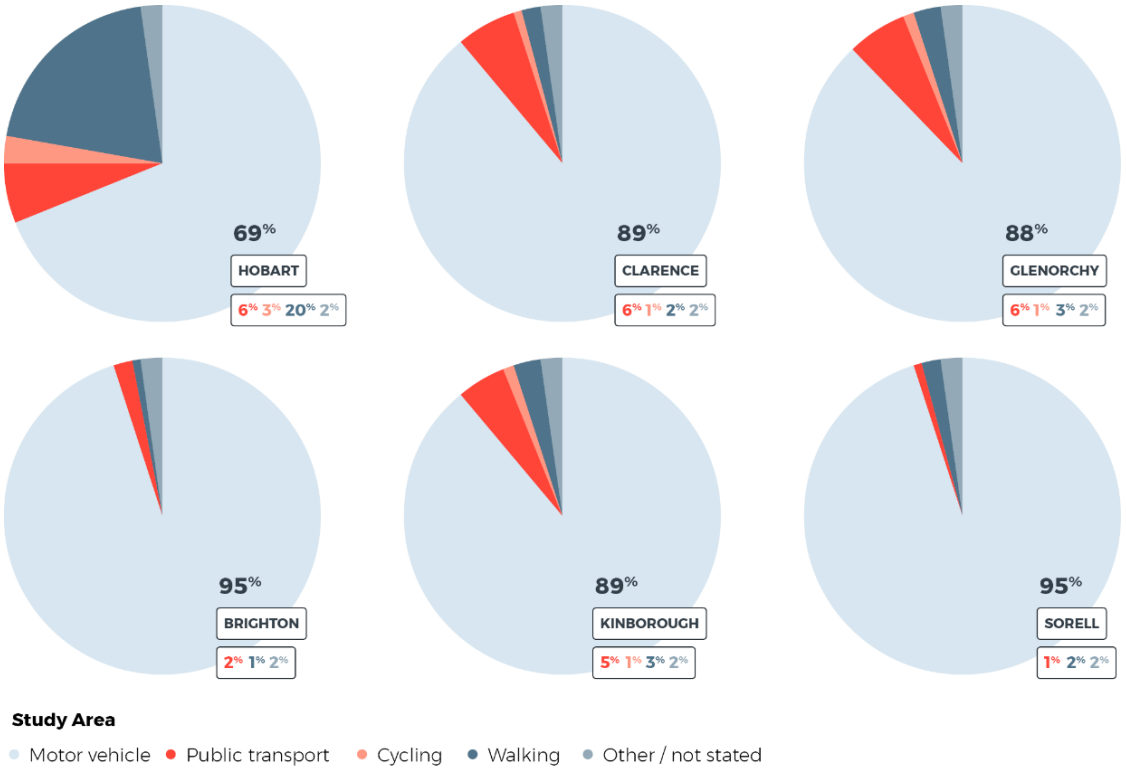


Figure 6.6: Journey to work proportions mode by origin

Table 6.6 Indicative people movement into/out of study area for key corridors over 2-hr peak periods

DIRECTION	CORRIDOR	CAR (VEH)	CAR (PEOPLE)	BUS	PEOPLE
Southbound (AM Peak)	Brooker Highway	5,700	6,270	560	6,830
	Main/New Town Roads	1,080	1,190	1,280	2,470
	Intercity Cycleway	N/A	N/A	N/A	110
Total		**6,780**	**7,460**	**1,840**	**9,400**
Northbound (PM Peak)	Brooker Highway	4,700	5,170	400	5,570
	Main/New Town Roads	1,160	1,276	870	2,150
	Intercity Cycleway	N/A	N/A	N/A	100
Total		**5,860**	**6,450**	**1,270**	**7,820**

Source: State Growth traffic and cycling counts, traffic modelling and Metro Tasmania bus patronage data

7 Developing a plan

A plan to address the key problems identified for the study area has been developed by progressing through the following four stages:

- **Initiatives:** A long-list of potential initiatives (types of intervention with the potential to address one or more of the identified problems) has been identified and reduced to a short-list through a multi-criteria analysis.
- **Concepts:** More specific concepts from the short-list of initiatives have been developed and assessed to identify which concepts to take forward for further assessment.
- **Options:** Options designed to impact study problems in the short-medium term and progress planning for longer-term infrastructure requirements have been developed and assessed.
- **Recommendations:** Specific actions have been recommended for the short-medium term as well as actions and next steps to meet longer-term needs.

7.1 Initiatives

A long-list of initiatives was initially considered under the following themes: road network improvements; better use of existing infrastructure; promoting modes that are an alternative to private motor travel; and, travel demand management.

The themes and initiatives were assessed for their viability within the context of this study, policy alignment and potential to address the identified problems. Table 7.1. describes the initiatives considered under each theme and which ones have been excluded and taken forward.

Overall, five initiatives have been short-listed from the 34 initiatives developed. Short-listed initiatives were classified under the themes of road network improvement and better use of existing infrastructure themes.

Table 7.1 Summary of initiatives

STEP 1: THEMES & INITIATIVES	STEP 2: INITIATIVES EXCLUDED	STEP 3: INITIATIVES TAKEN FORWARD
A long-list of initiatives with the potential to improve the problems in the study area were derived from four key themes (listed below).	*An assessment against the study scope, government policy and criteria about the effectiveness of initiatives in delivering on the study objectives, excluded initiatives within each theme.*	*The initiatives taken forward (short-listed initiatives) come from two main themes.*
Road network improvements, including improved intersection design, providing additional capacity on study area corridors and providing new infrastructure outside the study area to improve study corridor performance.	Large-scale initiatives that improve corridor road capacity/utilisation for general traffic were excluded because they do not align with the government's policy of reducing dependency on private motor vehicles for travel in Greater Hobart.	Targeted intersection improvements were taken forward because they could potentially address specific problems without unduly strengthening the position of car-based travel as the dominant mode.
Better use of existing infrastructure, including safe system treatments, reviewing the function and operation of infrastructure assets, introducing high occupancy vehicle lanes, and using Intelligent Transport Systems (ITS) to better manage traffic and inform travellers' decision-making.	Some initiatives around modification to operation and function of roads (including closing access and tidal flows considerations) and lane use management (including high occupancy vehicle lanes), were excluded as they were either not aligned with policy or unlikely to have a significant impact on the problems in the study area.	Initiatives within this theme that were taken forward focused on the greater use of ITS systems to improve efficiency and make travel safer and more reliable.
Promoting alternative modes, including upgrading public transport and active transport infrastructure, redesigning the existing bus services and introducing new mass transit services	All initiatives which promoted alternative modes were excluded because: • The study scope prevented consideration of these initiatives. The geographical scope meant current, major public and active transport corridors are outside the study area, Also the review and redesign of bus services is not encompassed by the scope. • An effective approach to growing non-motorised mode share requires a whole of Greater Hobart approach that could not be considered within this study. This type of strategic planning and the formulation of major PT infrastructure investment for the northern suburbs of Hobart is underway but not complete. The outcomes of this work will be critical for defining the role of the study area highways for future public and active transport growth.	None
Travel demand management, including modifying travellers' modal, temporal and journey choices, land use planning, parking management and pricing to rebalance how people travel to be more sustainable and more reliant on public and active transport.	These initiatives require a broader scope and require specific, actionable policies from the state and local governments. All initiatives around travel demand management were therefore excluded.	None

7.2 Concepts

Concepts have been developed, assessed and grouped into the following two categories:

- **Program Concepts for short-medium term implementation**: Lower cost concepts that can be grouped to form a program, align strongly with policy and are expected to immediately impact the identified problems.
- **Standalone and Longer-Term Concepts:** High cost infrastructure upgrade concepts that are unlikely to provide net economic returns in the short-medium term, do not align as clearly with current policy and may lead to unintended, negative impacts (e.g. increased downstream congestion) that reduce their effectiveness if not undertaken as part of wider road network upgrades.

In total, **five program concepts and four standalone concepts have been developed,** as listed is Table 7.2. Of the concepts developed, **all program concepts and one standalone concept** has been **taken forward for further assessment**.

Table 7.2 Summary of concepts and assessment

CONCEPT TYPE	CONCEPTS	TAKEN FORWARD?	REASON(S)
Program concepts	• Targeted upgrades to improve safety and reduce the number of incidents	✔	Could reduce incidences in the study area and hence improve journey time reliability for minimal cost. Aligns with current policy and has minimal risk.
	• Intelligent transport systems including variable speed limits (VSL) and variable message signs (VMS)	✔	Could reduce incidences in the study area and improved transport network efficiency (travel times, reliability and throughput) for minimal cost. Aligns with current policy and has minimal risk.
	• Signalise the Domain Highway and Brooker Highway intersection (Domain Interchange)	✔	This concept could improve travel times and reliability on Domain Highway, but may slightly increase travel times on the Brooker Highway. It also has significant community risk. Nevertheless, this concept has not been ruled out, and will be considered if recommended as part of the Safe System assessment.
	• Signalise the Domain Highway and Queens Walk intersection	✔	Although this concept may reduce incidents and queuing issues, it may also increase travel times on the Domain Highway EB. This concept will therefore be considered if recommended as part of the Safe System assessment.
	• Signalise the Domain Highway and Brooker Highway intersection + Queens Walk + geometry change to Brooker Highway	✔	Although this concept could result in a reduction in incidences and improved travel time for some movements, but also an increase in travel time for other movements. As mentioned in Concept 1A, there is also some community risk associated with this concept. Nevertheless, this concept has not been ruled out, and will be considered if recommended as part of the Safe System assessment.

CONCEPT TYPE	CONCEPTS	TAKEN FORWARD?	REASON(S)
Standalone concepts	• Grade separate the Domain Highway and Queens Walk intersection	✘	This concept is likely to have minimal impact on journey time and journey time reliability, except for minor Queens Walk movements. This concept also does not align with current policy and may not align with the long-term strategy for Hobart.
	• Fully grade separated interchange at Domain Highway with three lanes in each direction on Brooker Highway (between Domain Interchange and Risdon Road)	✔	Although this concept could result in improved travel times and incidences, these benefits would likely not outweigh the high cost associated with this concept. The full benefits of this option would only be unlocked with the future grade separation of Risdon Road. It is uncertain whether this option will align with existing policy given that it is providing additional capacity for private vehicles, but this is to address an identified problem at a constrained location.
	• Single point interchange at Brooker Highway and Risdon Road (grade separation)	✘	This concept may result in worse travel times on the Domain Highway, and may have other wider network impacts not included in this assessment (e.g. north of Risdon Road). This concept also does not align with current policy and may not align with the long-term strategy for Hobart.
	• Single point interchange at Brooker Highway and Risdon Road (grade separation) AND full grade separation at Domain Highway with three lanes in each direction on the Brooker Highway	✘	Although this concept could result in improved travel times and incidences, these benefits would likely not outweigh the high cost associated with this concept. There are also significant risks with this concept, as it does not align with current policy and may not align with the long-term strategy for Hobart.

7.3 Options

Program options to address problems in the short-medium term and standalone concept options for potential targeted longer-term capacity enhancements have been developed through:

- identifying areas of key consideration, and desired objectives for each consideration
- listing and understanding existing and future assumptions, including the likely future base case (i.e. do minimum option)
- identifying possible treatment types and their suitability in the study area.

7.3.1 Program options for short-medium term actions

Based on the program concepts taken forward, three program options have been developed:

- **Program Option 1 - Enhancing network safety:** Some low cost/easy wins targeted at the issues identified. This includes reducing speeds on the Brooker Highway, improving pedestrian crossings in the study area, small geometry changes, improved line markings and additional signage.
- **Program Option 2 - Enhancing network safety and improving network management:** Program Option 1 plus ITS interventions to better monitor and control traffic through: dynamic speed control to better manage conflicts and, variable message signage to better inform and manage drivers' choice of routes. These measures will focus on the Brooker and Domain highways and be integrated with State Growth's existing plans and commitments for upgrading ITS on the study area highways.
- **Program Option 3 – Option 2 plus targeting critical safety issues and network constraints:** Option 2 plus signalisation of the Domain Highway Interchange and Domain Highway / Queens Walk intersection to better manage traffic flows between the highways, better manage capacity constraints and reduce the number of incidents at these locations.

These program options are designed to make best use of the existing infrastructure within the study area, allowing for the better management of existing traffic to improve reliability and reduce conflicts and crashes.

The options are designed to be cost-effective based on the scale of problems identified.

Table 7.3 Summary of program options

OPTION		TREATMENTS	BENEFITS
Program Option 1		• Consider reduced speed limits on Brooker Highway in each direction throughout the day, between Risdon Road and Burnett Street (from 80kph to 70kph) • Consider consistent speed limits on Brooker Highway in each direction throughout the day, between Burnett Street and Railway Roundabout (60kph) • Advance intersection warning signs on approach to key intersections which have high crash rates (Brooker Highway/Risdon Road, Domain Interchange, Domain Highway/Queens Walk, Domain Highway/Lower Domain Road) • Advance warning line marking on approach to Risdon Road on Brooker Highway northbound	• More opportunity provided to react to upcoming conditions, **reducing the likelihood of incidents** (particularly rear-end crashes), and thereby also **improving travel time reliability** • **Reduced severity of incidents**

OPTION		TREATMENTS	BENEFITS
		• Improved lane markings on Brooker Highway • Advanced left turn must turn left warning on Brooker Highway, on approach to Brisbane Street • RRPM at key signalised intersections on Brooker Highway (Risdon Road, Burnett Street, Warwick Street and Brisbane Street)	• Improved lane use leading to **more vehicle throughout** and less lane changing, which in turn may **reduce likelihood of incidents** (particularly side swipes crashes)
		• Improved crossings on the Domain Highway, including advance crossing warning signs at crossing locations, transverse lines on the road to alert drivers and staggered or gated treatment to slow down cyclists and pedestrians on approach to the crossing location.	• Improved perception of safety • Reduced likelihood of incidents • Increased walking and cycling activity
		• Improved bus stop safety and access on the Tasman Highway including new signs, line markings, wider footpaths and DDA compliant pedestrian waiting area and pedestrian path	• Improved perception of safety • Increased public transport patronage
Program Option 2		• targeted VMS at key decision points (on exiting Tasman Bridge, on approach to Domain Interchange, at Railway Roundabout) • targeted VSLs along Brooker Highway and Domain Highway • improved monitoring through CCTV and increased vehicle detection • network interfaces/control system improvements.	• Improved speed management, resulting in **reduced likelihood and severity of incidents** (study area wide) • Improved traffic and incident management, resulting in **increased network efficiency**
Program Option 3		• signalisation of Domain Interchange including two right turn lanes to Brooker Highway northbound • signalisation of Domain Highway/Queens Walk intersection and detector loops • extended merge on Domain Highway eastbound (two traffic lanes) between Domain Interchange and Queens Walk. • signal co-ordination with Brooker Highway / Risdon Road traffic signals • signal timing and detector loops at Domain Highway / Queens Walk •	• Improved control and network operation through signalising access to Brooker Highway and Domain Highway, and linked operation with Risdon Road, thereby **increasing network efficiency** • Increased capacity for traffic entering and leaving corridor at Domain Highway, resulting in **increased network efficiency** • **Reduced incidents** at Domain Interchange and Domain Highway/Queens Walk intersections • Detector loops and signal timing to regulate attractiveness of Queens Walk and prevent queuing impacting Domain and Brooker Highways

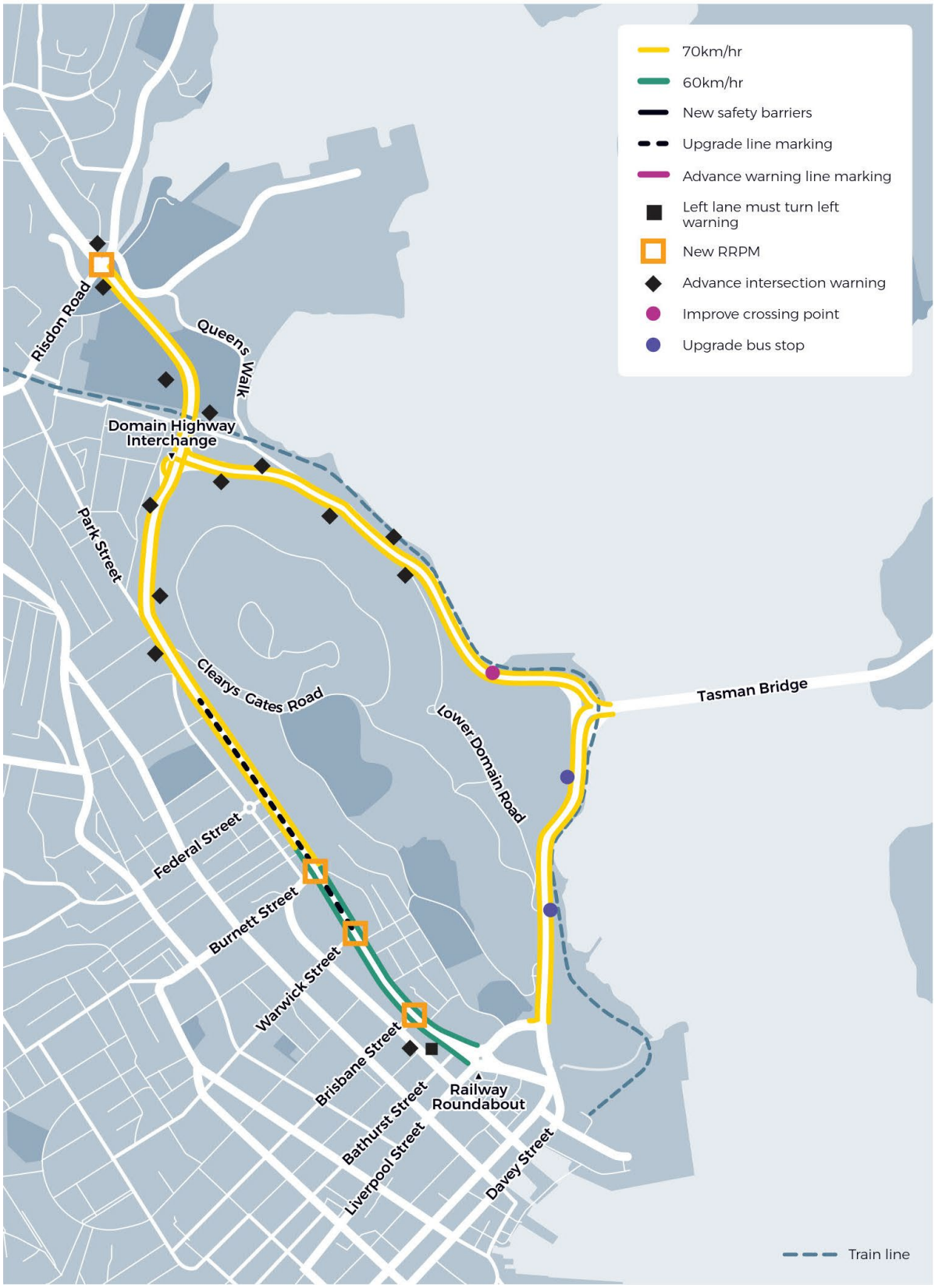


Figure 7.1 Program Option 1 – location of key infrastructure

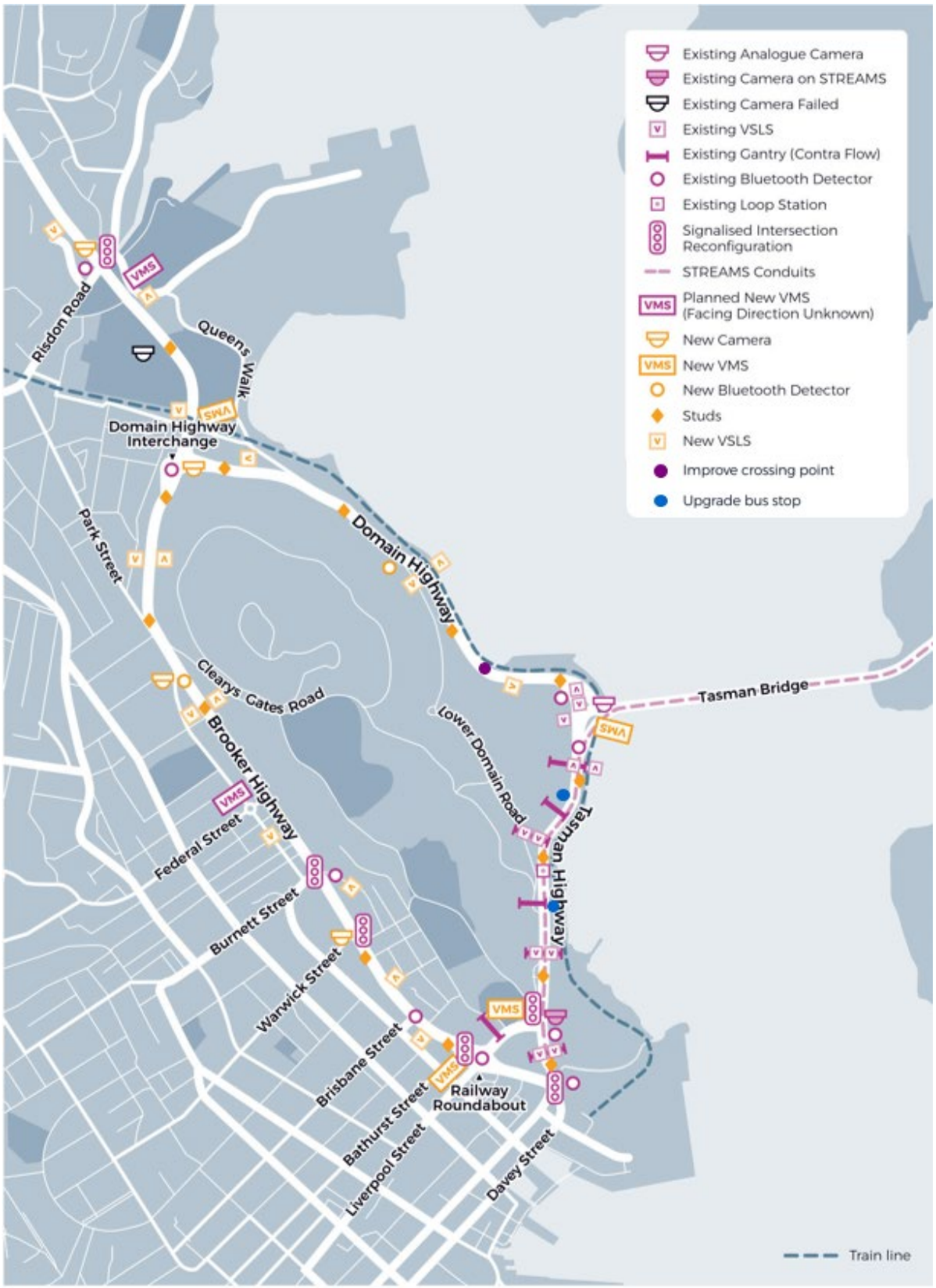


Figure 7.2 Program Option 2 – location of key infrastructure

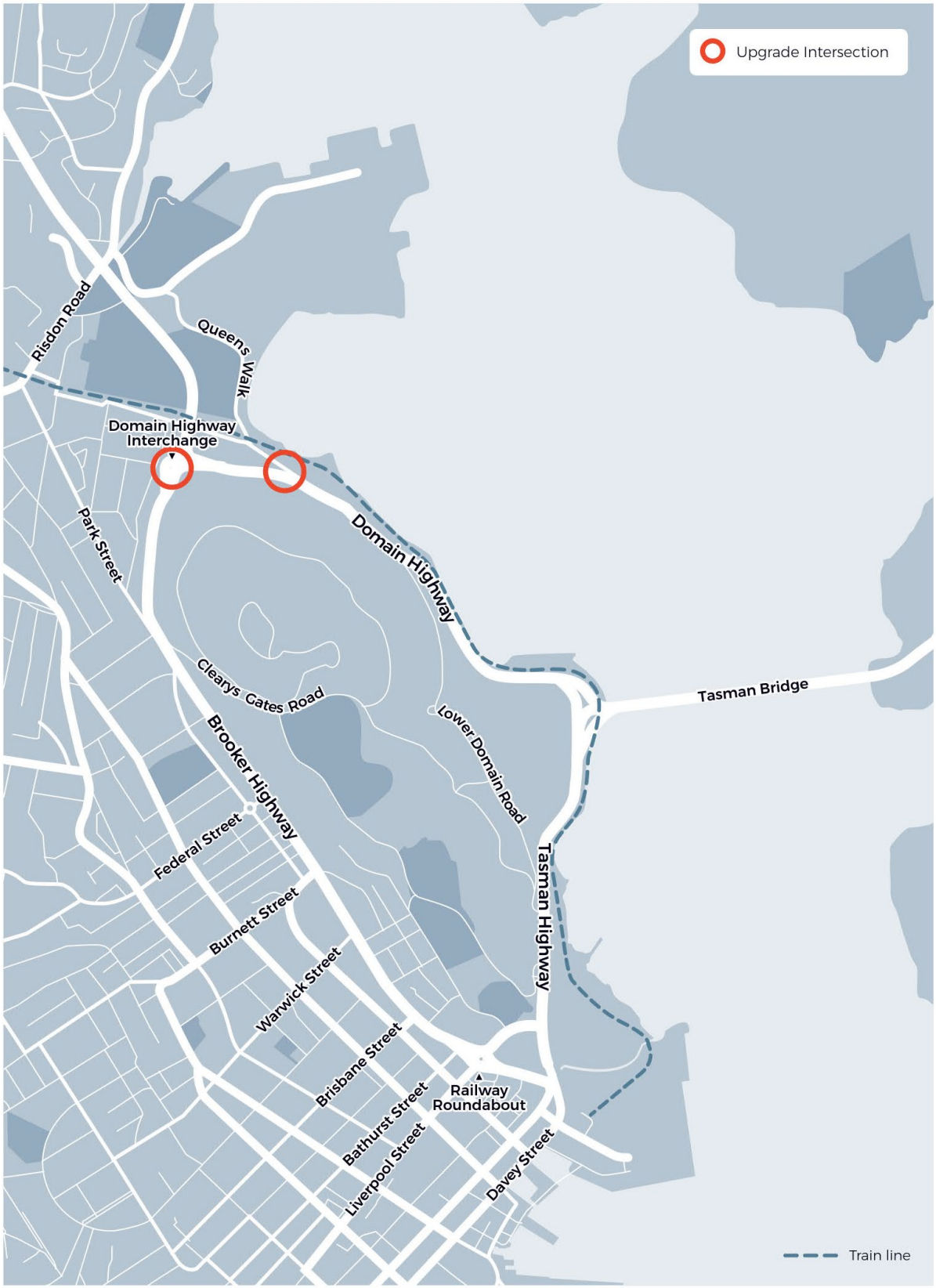


Figure 7.3 Program Option 3 – location of key infrastructure

7.3.2 Domain Interchange Concept Options for Longer-Term capacity enhancement

Four concept options have been developed to help determine a potential footprint and to address the substandard design issues and future capacity demands for the Domain Interchange.

All concept options replace the existing east to north loop ramp from Domain Highway to Brooker Highway, which is the primary design deficiency and most significant cause of existing problems. Given the existing three lane intersection configuration at Brooker Highway / Risdon Road and the short distance between the Domain Highway merge with Brooker Highway and Risdon Road, all concept designs also include three lanes between Risdon Road and Domain Highway.

The concept options are described below:

- **Concept Option 1: Grade separation into median**

  Replaces the existing east to north loop ramp configuration with a semi-directional ramp into Brooker Highway median north of Domain Highway. Existing overpass remains in situ and is modified to serve south to east movements only, with all other movements as existing.

- **Concept Option 2: Grade separation with into left lane**

  Replaces existing east to north loop ramp configuration with semi-directional ramp into Brooker Highway left lane north of Domain Highway. Existing overpass remains in situ and is modified to serve south to east movements only, with all other movements as existing.

- **Concept Option 3: Grade separation into left lane (reduced footprint)**

  Interchange is rebuilt with all movements replaced by semi-directional ramps with improved turning radii to fit within existing road reserve.

- **Concept Option 4: Grade separation with semi-directional ramp into left lane (south alignment)**

  Replaces existing east to north loop ramp configuration with semi-directional ramp into Brooker Highway left lane south of Domain Highway. Existing overpass remains in situ and is modified to serve south to east movements only, with all other movements unaltered.

Two further options that were developed in 2012 by GHD[8] for the Department of Infrastructure, Energy and Resources and have also been included for comparison. These are:

- **Concept Option 5: Maintain Brooker Highway alignment and increase loop ramp radius**

  Interchange is rebuilt with east to north loop ramp radius increased using a compound curve into Brooker Highway left lane, south to east and north to east ramp radii are increased with east to south radius maintained.

- **Concept Option 6: Realign Brooker Highway and increase loop ramp radius**

  Brooker Highway is realigned to east of existing alignment. Interchange is rebuilt with east to north loop ramp radius increased using a compound curve into Brooker Highway left lane, south to east and north to east ramp radius are increased with east to south ramp radius maintained.

It should be noted that the GHD concept designs were taken from a design report with no further design assessment undertaken as part of this study.

An overview of the key considerations for all options is provided in Table 7.4 with the following potential high-level impacts:

[8] *Initial Concept Design Assessment: Risdon Road to Domain Interchange 2012*

- Concept Option 1 has the smallest footprint, however the required changes in elevation and gradient and the associated operational risks mean this option is unlikely to be workable.
- Concept Option 2 has a larger footprint than Option 1, with associated land acquisition requirements. The major operational risks are due the closeness of the ramp merge to the Risdon Road intersection.
- Concept Option 3 involves a complete rebuild of the intersection with resulting traffic impacts during construction but addresses current design constraints with minimal or possibly no land acquisition e.g. within Queens Domain Road Reserve
- Concept Option 4, like Option 3 involves minimal land acquisition and should also resolve existing design and capacity issues. However, it's larger footprint encroaches on to the Queens Domain and this is likely to raise objections because of the environmental impacts and loss of amenity. The geotechnical conditions and approvals process are likely to significantly impact on the cost of this option compared to Option 3 for limited additional benefit.
- Concept Options 5 and 6 are variants of the same design, with Option 5 including a substantially increased footprint for minimal functional benefits (increased ramp speeds). Any benefits due to the additional footprint in terms of constructability and traffic management would have to be greater than the costs of land acquisition and environmental and social impacts.

A further consideration is the condition of the Bellevue Parade bridge on the Brooker Highway which GHD found to require strengthening or potentially replacement for an improved interchange. As such, the rebuilding of the structure as a three-lane configuration should be considered as a requirement for all options (although due to gradient requirements Concept Option 1 to 3 would require a separate structure for the east to north ramp). All options would require extensive traffic management plans.

Conclusion

The high-level analysis of impacts has shown that all options have potential disbenefits in terms of impact to the environment and community, while not fully realising the potential benefits of an increase in capacity given that Risdon Road and the wider Brooker Highway corridor will likely remain at grade in the foreseeable future.

However, if traffic volumes continue to increase in the future it is likely that a solution will be required to address the deteriorating performance of the interchange. While further design and traffic modelling work is required to develop the design, Concept Option 3 likely has the greatest potential given it has the smallest environmental and community impact, with manageable traffic operation and construction impacts.

Table 7.4 Overview of key considerations

OPTION		TRAFFIC OPERATION	ENVIRONMENTAL	COMMUNITY/AQUISITION	CONSTRUCTION IMPACTS
Concept Option 1		• Unconventional treatment, which may be unfamiliar for motorists, while retaining wall may impact sight distances • Limited effective weaving length between east to north merge and Risdon Road • Maintains substandard components of design including low radius for north to east ramp and give way condition east to south ramp	• Minimal impact to existing trees	• Minimal or no property acquisition required • Retaining wall required for ramp from east to north • Likely noise and visual impact from elevated structure would require attenuation	• Large impact to existing traffic operation during construction due to regrading of Brooker Highway and associated works
Concept Option 2		• Limited effective weaving length between east to north merge and Risdon Road • Maintains substandard components of design including low radius for north to east ramp and give way condition east to south ramp	• Minimal impact to existing trees	• Property acquisition required • Would be the tallest option, with associated visual/noise impacts	• Some sections could be constructed offline • New structure required from east to north with associated traffic impacts
Concept Option 3		• Improved capacity for all interchange movements • Consideration could be given to metering of traffic onto Brooker Highway north given the proximity of Risdon Road	• Some impact to existing trees • Encroachment into Queens Domain road reserve	• Minimal or no property acquisition required	• Some sections could be constructed offline • Rock excavation likely required on south-east corner of Domain interchange (with geotechnical testing determining impacts) • Demolition of existing structure required
Concept Option 4		• Low design speed for east to north ramp to minimise footprint	• Significant environmental impact to Queens Domain	• Minimal or no property acquisition required	• Ground conditions and length of structures will determine cost and constructability • Some sections could be constructed offline

OPTION		TRAFFIC OPERATION	ENVIRONMENTAL	COMMUNITY/AQUISITION	CONSTRUCTION IMPACTS
		• Maintains substandard components of design including low radius for north to east ramp and give way condition east to south ramp		• Community opposition likely due to impact on Queens Domain	• New structures would be required for east to north and south to east ramps with associated traffic impacts • Demolition of existing structure required
Concept Option 5		• Significant distance between east to north merge and Risdon Road to allow for weaving • Low design speed for east to north ramp to minimise footprint. However, compound curve is undesirable from a traffic operation perspective • Maintains give way condition at Brooker Highway southbound on ramp	• Some impact to existing trees	• Significant property acquisition required	• Some sections could be constructed offline to reduce impacts to existing traffic • New structure required from east to north with associated traffic impacts
Concept Option 6		• Significant distance between east to north merge and Risdon Road to allow for weaving • Low design speed for east to north ramp to minimise footprint. However, compound curve is undesirable from a traffic operation perspective • Maintains give way condition at Brooker Highway southbound on ramp	• Some impact to existing trees • Encroachment into Queens Domain road reserve	• Significant property acquisition required • Possible community opposition to impact on Cornelian Bay recreational grounds	• Some sections could be constructed offline to reduce impacts to existing traffic • Significant realignment required for Brooker Highway • New structure required from east to north with associated traffic impacts • Demolition of existing structure required

7.4 Recommendations

7.4.1 Recommended short-medium program option for the study area

Program Option 2 as the preferred program option is nominated as the preferred option. The measures provide improved and more flexible monitoring, control and information for better managing traffic conditions especially in peak periods. The option avoids expensive infrastructure upgrades, that are unlikely to be fully effective in the short to medium term because of other network constraints and, control mechanisms, such as additional intersection signalisations, that are likely to increase travel times for some travellers and attract significant community and peak body opposition. The program provides for:

- Improved speed control and the ability to vary speed limits to better match traffic conditions through the introduction of variable speed limits on the Brooker Highway
- Improved advanced information on traffic conditions for travellers warning of delays and queuing so they can take appropriate action to avoid potential delays and conflicts
- A range of small scale, sensible measures to improve public and active transport facilities and introduced localised road safety measures.

Program Option 1 and 3 were not preferred for the following reasons:

Program Option 1 – Reduced speeds and small-scale interventions to improve network safety and public and active transport facilities: These measures would be low-cost and beneficial but would not provide for the scale of improved traffic management likely to be achieved by the Program 2 measures. A permanent change in speed limits is likely to be more contentious than a system that allows for variable and flexible speeds. While this option isn't recommended in its entirety, targeted and low-cost safety and active/public transport improvements are recommended for inclusion in the preferred program option.

Program Option 3 - Targeting critical safety issues and network constraints by signalising and modifying key intersections: Domain Interchange and Queens Walk are key problem locations in the study area and signalising these intersections would introduce mechanisms to better control traffic movements. However, these additional measures are rejected because of significant disbenefits and risks described below:

- Domain Interchange: There is likely to be a strong, negative reaction from the community including freight users and public transport operators due to the small, additional delay introduced to Brooker Highway users. This is likely to be perceived as a reduced level of service converting a grade separated intersection to traffic signals. Further operational drawbacks include:
  - The gradient on Brooker Highway southbound would make it operationally challenging for heavy vehicles do a standing start if stopped at a red signal. The Brooker Highway is a key freight route for Tasmania.
  - This change not being an appropriate safe system treatment as it would replace existing risks (ramp entry) with additional safety risks for right turning traffic heading northbound on the Brooker Highway, with no clear way of addressing this (no red-light cameras are used in Tasmania).
  - Queuing is likely to impact peak, Brooker Highway southbound traffic exiting to the Domain Highway.

  Overall, while there would be benefits to Domain Highway traffic, including a redistribution of through traffic from using Queens Walk, but these would not be sufficient to overcome the limitations. As such, the signalisation of Domain Interchange is excluded from further consideration.

- Queens Walk/Domain Highway: Signalisation of this intersection would likely be unacceptable to Council as there is a requirement to not make council roads more attractive as pathways for through traffic. Signalising this intersection is likely to make Queens Walk more attractive as a through route. It will also likely be unacceptable to the community as it downgrades the movement function of Domain Highway.

  While controls could be put in place to mitigate some of these concerns through signal timings and the use of loop detectors to prevent queuing back to Brooker Highway, these are unlikely to overcome the perception that this route is being formalised and promoted. In addition, Queens Walk only solution would not address the key problems of queuing and incidents on Domain Highway, given the limited crashes at Queens Walk. Therefore, the signalisation of Queens Walk is excluded from further consideration.

7.4.2 Recommended concept option for longer-term Domain Interchange upgrade

The concept designs for the Doman Interchange have shown that it may be possible to achieve a full grade separation with no or limited acquisition and impact to the environment (Options 1 and 3). However, given that there are currently no plans to upgrade the Brooker Highway to a freeway standard corridor the benefits to undertaking these are limited and there are significant potential traffic operational issues including:

- **Queuing at Risdon Road** – Queuing and decelerating traffic on the Brooker Highway in the northbound direction, between Domain Interchange and Risdon Road, will impact the ability of vehicles on the Domain Highway to enter the traffic stream and change lanes.
- **Lane changing (weaving)** – westbound vehicles on the Domain Highway who wish to travel northbound on the Brooker Highway and turn at Risdon Road would need to cross through traffic. Similarly, northbound vehicles on the Brooker Highway wanting to turn left at Risdon Road would need to cross through traffic.
- **Traffic redistribution and induced trips** – east to north movements on Domain Highway are currently at capacity. The removal of the capacity constraint at the Domain Interchange will lead to a redistribution of trips from Queens Walk and could potentially lead to extra private vehicle trips. Given that Risdon Road is already approaching capacity, any additional traffic will impact delays at this intersection impacting a larger number of users.

While further design and traffic modelling are required to develop the concept options, if the full grade separation of Domain Interchange is pursued, Option 3 has the highest potential as a starting point for any further design work given the potential traffic operation issues associated with Option 1 and 2 if Brooker Highway / Risdon Road remains at grade, and the likely significant environmental and community impacts of Options 4 to 6.

However, given uncertainty about projected levels of traffic growth in the study area it is recommended that the travel demand forecasting tools are first updated to improve long term forecasting and allow for the effective testing of wider transport policy decisions. Consideration should also be given to the future development strategy of the wider Brooker Highway corridor including whether transit priority or capacity upgrades will be pursued, as well as the potential traffic demand impacts of any transit solution for the northern suburbs rail corridor.

8 Priorities and next steps

The Tasmanian Government priorities to address the study area challenges detailed in Chapter 6 are outlined in this section. The investment priorities are divided into short-medium and long term projects to be implemented as funds are made available over the next 20 years. Implementing these actions will improve travel reliability, road safety, encourage more public and active transport and futureproof key infrastructure needs for the long term.

8.1 Short-medium term measures

Treatments proposed under the recommended program option (Program Option 2) are outlined in Table 8.1, together with their priority and the key benefits which are likely to result from each treatment. The location of the treatments is also shown in Figure 7.2.

In general, the measures in the short-medium term include:

- **High impact:** the ability to manage speeds (via VSLs) on the network and provide advance warnings at key intersections, as this is likely to have the most impact on improving transport efficiency, reliability and safety by reducing the likelihood of incidents and smoothing traffic flow.
- **Medium impact:** better monitoring and control of traffic using variable messaging signs (VMS) and CCTV, as this will have a moderate impact on improving travel reliability and safety incidences by better managing traffic after incidents occur.
- **Low impact:** improving line markings, crossing points and bus facilities, as this will have a minor impact on improving safety and mode share by improving existing facilities.

The implementation of the high and medium impact measures in the short-medium term can also deliver extra benefits and cost savings if combined with the current committed ITS upgrades for implementation by 2021.

Overall, priority measures proposed for the short-medium term are considered a cost-effective solution to address the problems currently occurring in the study area, and can assist with monitoring and responding to any new infrastructure changes which may take place in the longer term.

Table 8.1 Program Option 2 – Treatments and benefits

IMPACT	TREATMENTS	BENEFITS
High	• Targeted variable speed limits (VSLs) along Brooker Highway and Domain Highway to control speeds. • Advance intersection warning signs on approach to key intersections which have high crash rates (e.g. Brooker Highway/Risdon Road, Domain Interchange, Domain Highway/Queens Walk, Domain Highway/Lower Domain Road). • Advance warning line marking on approach to Risdon Road on Brooker Highway northbound.	• Improved speed management and more opportunity to react to upcoming conditions, **reducing the likelihood of incidents** (particularly rear-end crashes), and thereby also **improving travel time reliability** • **Reduced severity of incidents**
Medium	• Better monitoring and control of traffic, including: o targeted variable message signs (VMS) at key decision points (e.g. on exiting Tasman Bridge, on approach to Domain Interchange, and at Railway Roundabout) o improved monitoring through CCTV and increased vehicle detection o network interfaces/control system improvements.	• Improved traffic and incident management, resulting in **increased network efficiency**
Low	• Improved lane markings on Brooker Highway. • Advanced left turn must turn left warning on Brooker Highway, on approach to Brisbane Street. • RRPM at key signalised intersections on Brooker Highway (i.e. at Risdon Road, Burnett Street, Warwick Street and Brisbane Street).	• Improved lane use leading to **more vehicle throughout** and less lane changing, which in turn may **reduce likelihood of incidents** (particularly side swipes crashes)
Low	• Improved crossings on the Domain Highway, including: o advance crossing warning signs at crossing locations o transverse lines on the road to alert drivers to the upcoming crossing location and the potential hazard of cyclists and pedestrians o staggered or gated treatment to slow down cyclists and pedestrians on approach to the crossing location.	• **Improved perception of safety** • **Reduced likelihood of incidents** • **Increased walking and cycling activity**
Low	• Improved bus stop safety and access on the Tasman Highway including: o new bus stop signs o new line markings for the bus bays o wider footpaths o DDA compliance pedestrian waiting area and pedestrian paths o chevron line marking on the road shoulder approaching the bus bays.	• **Improved perception of safety** • **Increased public transport patronage**

8.2 Long term measures

Upgrades to the Domain Highway Interchange are not recommended at this stage for the following reasons:

- The potential inconsistency of these measures if implemented in the short-medium term with Government's policy goals and directions.
- Uncertainty about projected levels of traffic growth and the future development strategy for the wider Brooker Highway corridor undermining the strategic and economic case for investment in the short-medium term. A significant update of the GHUTDM is planned for 2020 including future forecasting up to 2050.
- Ongoing studies including the Northern Suburbs Transit Corridor that will impact the future development and level of demand of the Brooker Highway.

Nevertheless, measures to address the deteriorating infrastructure performance at the Domain Highway Interchange are likely to be required in the long term. While the concept designs have shown that the full grade separation of the interchange may be possible with no or limited impact in terms of acquisition and environmental impact, further detailed studies are necessary to determine a final design and identify required approvals and permits.

8.3 Next steps

The program option developed for this study includes a suite of measures to alleviate the high number of incidents and travel time reliability issues identified in the study area, with the measures ranked based on their likely impact in addressing the problems.

There is no commitment to or funding of the program option identified, and it is intended that this will form the basis for more detailed planning and cost estimation, with future commitments dependent on government priorities and funding availability.

As part of the long-term planning component of this study, Concept Option 3 for the full grade separation of the Domain Intersection may be achievable within the existing road reserve. However, if a redesign of Domain Interchange is pursued as part of a long-term Brooker Highway corridor development strategy further work is needed to determine feasibility given the potential impacts and uncertainties highlighted in this study.

If a Planning Scheme Amendment (PSA) is required to amend the current road overlay, a Public Acquisition Overlay (PAO) will also be required. The next steps to progress this further include:

- further engineering investigations, traffic modelling and assessments to inform the preferred design and justify any potential land acquisition
- consultation and input from the community and any land owners
- surveys to understand key ground impacts and property boundary impacts
- environmental and cultural heritage investigations and assessments to inform the design.

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