



Granville

Granville and Auburn Transport Study

Department of Planning, Industry and Environment
Final Report



Auburn

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GTA Report



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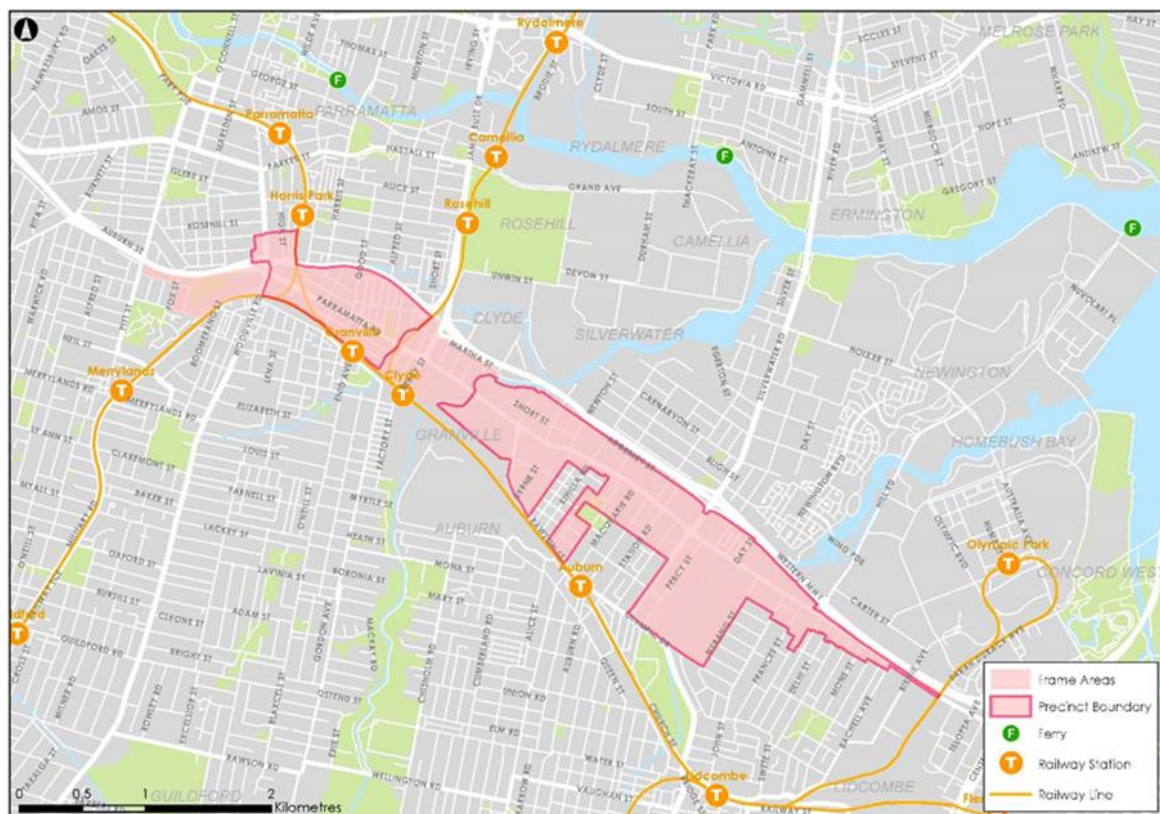
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EXECUTIVE SUMMARY

The NSW Department of Planning, Industry and Environment (DPIE) have been working with the City of Parramatta Council and Cumberland Council to undertake a traffic and transport study for the urban renewal precincts of Granville and Auburn. Close collaboration has been undertaken with Transport for NSW (TfNSW).

The Granville and Auburn urban renewal precincts were identified through the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) in 2011 and the study area is shown below.

Figure E.1: Granville and Auburn Study Area



Note: 2018 map includes the discontinued T6 Carlingford Line and railway stations.

An extensive review of the existing conditions of all transport modes, combined with an analysis of future transport and land use changes was undertaken. This review concluded in identifying several constraints, challenges and opportunities within the study area for the following topics:

- Active transport
- Public transport
- Road network
- Safety
- Freight
- Parking

Based on the opportunities and constraints, four strategic themes and eight objectives were identified.

Figure E.2 Strategic Themes and Objectives

Safety	Access and Connectivity	Support Place Functions	Travel Behaviour Change
Create safe conditions for people walking, cycling and driving	Enhance bus, walking and cycling access within the precincts	Manage movement impacts on place	Effect behaviours change to achieve mode shift, vehicle travel reduction and peak spreading
Reduce barriers to people walking and cycling	Establish multi-modal connections to outside the precincts	Allocate more road and street space to other modes and people activities in identified centres	Invest in active and public transport by leveraging off new development to shape sustainable land use

Source: GTA

Investigation into the future transport needs in and around the Granville and Auburn town centres as a result of forecast growth has been undertaken for a range of scenarios. The analysis has relied upon strategic multi-modal transport modelling undertaken by Transport for NSW that has sought to reflect the constraints of the road network to accommodate future traffic demand. This involved the use of the mesoscopic traffic model to inform initial estimates of available capacity in the road network which were accounted for in the Public Transport Project Model (PTPM) and subsequent Sydney Traffic Forecasting Model (STFM) to provide forecasts of future traffic growth through the study area that align more closely with the available road network capacity.

Based on the analysis, the following general observations across the study area are provided:

- Traffic conditions are expected to worsen through to 2036 due to increased trip generation.
- Road space reallocation for a rapid bus service does not have a significant impact on traffic performance in comparison to the base case.
- Likewise, the signalised crossings and through-site road at Alfred Street have a very minor impact on traffic at Parramatta Road, yet also improve pedestrian connectivity and permeability.

A key element of this study is the recognition that land use, mode share, parking strategy, the provision of public transport services and walking and cycling infrastructure are all inter-connected, and that changes to one can impact on the others. Therefore, a scenario-modelling process was carried out, that endeavoured to test these complexities, and to assist in the identification of transport shortfalls and remedial measures.

At a high-level, the three scenario options are as follows:

- Option 1: Active Transport Focused
- Option 2: Public Transport Focused
- Option 3: Travel Demand and Multi-Modal Transport Focused

Based on the above, Option 3 is the preferred scenario, as it achieves a significant transformation in active and public transport infrastructure and services, at no detriment to the future base traffic performance. By improving the attractiveness of non-car modes alongside the expected increase in residential and commercial density, the need to travel externally can be reduced, with a greater focus on local trips by a mode of sustainable transport.

The table below contains the full list of recommended actions, in response to the opportunities and constraints identified, the strategic themes and objectives, and the specific active and public transport routes identified in the Granville and Auburn *Option 3* maps.

Figure E.3 Recommended Actions

#	Recommended Action	Strategic Themes	Priority	Timing	Responsibility
1	Identify and implement appropriate upgrades to the pedestrian infrastructure at the identified 'prioritised walking links', including but not limited to formal crossings, crossing upgrades, kerb ramps, widened footpaths and landscaping.	Access and Connectivity, Safety, Travel Behaviour Change	High	Short to medium	Council/ TfNSW
2	Deliver high-quality cycling infrastructure at the identified 'proposed cycling links', predominantly involving shared user paths and separated cycleways. On-road mixed traffic facilities should only be delivered on low-speed, low-traffic local streets.	Access and Connectivity, Safety, Travel Behaviour Change	High	Short to medium	Council / TfNSW
3	Provide high-quality end-of-trip facilities at both Granville and Auburn station, supporting interchange between active and public transport modes.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
4	Incorporate and deliver the identified 'through-site' links into the site plans in development applications to improve pedestrian permeability and legibility.	Access and Connectivity, Support Place Function	Medium	Medium to long	
5	When appropriate, build the proposed Alfred Street extension to Cowper Street, including the signalised pedestrian crossings and roundabout.	Access and Connectivity, Support Place Function	Medium	Short to medium	Council / TfNSW
6	Consider implementing a high-frequency B-Line bus service between Parramatta and Burwood along Parramatta Road, with at least one super-stop at both Granville and Auburn.	Access and Connectivity, Travel Behaviour Change	High	Short to medium	TfNSW
7	Investigate a high-frequency B-Line bus service between Parramatta Hurstville via Bankstown, with the intention of a super-stop at Granville if feasible.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
8	Investigate the extension of the 911 bus route, or provision of a new bus route, to connect Auburn to the growing residential communities at Carter Street and Olympic Park.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
9	Investigate express rail services to/from Parramatta and Sydney CBD stopping at Granville, following the additional capacity provided by Sydney Metro projects.	Access and Connectivity, Travel Behaviour Change	Medium to High	Short to medium	TfNSW
10	Review and potentially rationalise freight access to selected freight routes to limit freight-related conflicts on roads and streets, e.g. Parramatta Road transition to freight-free during peak periods. In addition, investigate the impact of land use changes to residential development which likely results in increased smaller freight vehicle use.	Access and Connectivity, Support Place Function	High	Medium	Council/ TfNSW
11	Investigate expansion of 30km/hr or 40km/hr speed limits in high pedestrian	Safety, Support Place Function	High	Short to medium	Council

#	Recommended Action	Strategic Themes	Priority	Timing	Responsibility
	activity areas, generally aligned with streets classified as 'Civic Spaces' or 'Main Streets'.				
12	Review parking rates in centres and consider changes, especially those close to frequent public transport. Consider adopting maximum parking rates as proposed PRCUTS study (2016) for Granville and Auburn	Access and Connectivity, Support Place Function	Medium	Medium	Council/ other LGAs/ TfNSW
13	Develop a parking strategy for public on-street and off-street parking and loading in Granville and Auburn	Access and Connectivity, Support Place	High	Short	Council/ TfNSW
14	Develop a car share policy to encourage the establishment of car share vehicles in Granville and Auburn	Travel Behaviour Change	Low	Short	Council/ Car share operator
15	Consider advancing improved bicycle parking and electric vehicle charging stations in future DCPs	Travel Behaviour Change	Low	Short	Council

1. INTRODUCTION

1.1. Scope

The NSW Department of Planning, Industry and Environment (DPIE) is working with the City of Parramatta Council and Cumberland Council to undertake a traffic and transport study for the urban renewal precincts of Granville and Auburn. Close collaboration has been undertaken with Transport for NSW (TfNSW).

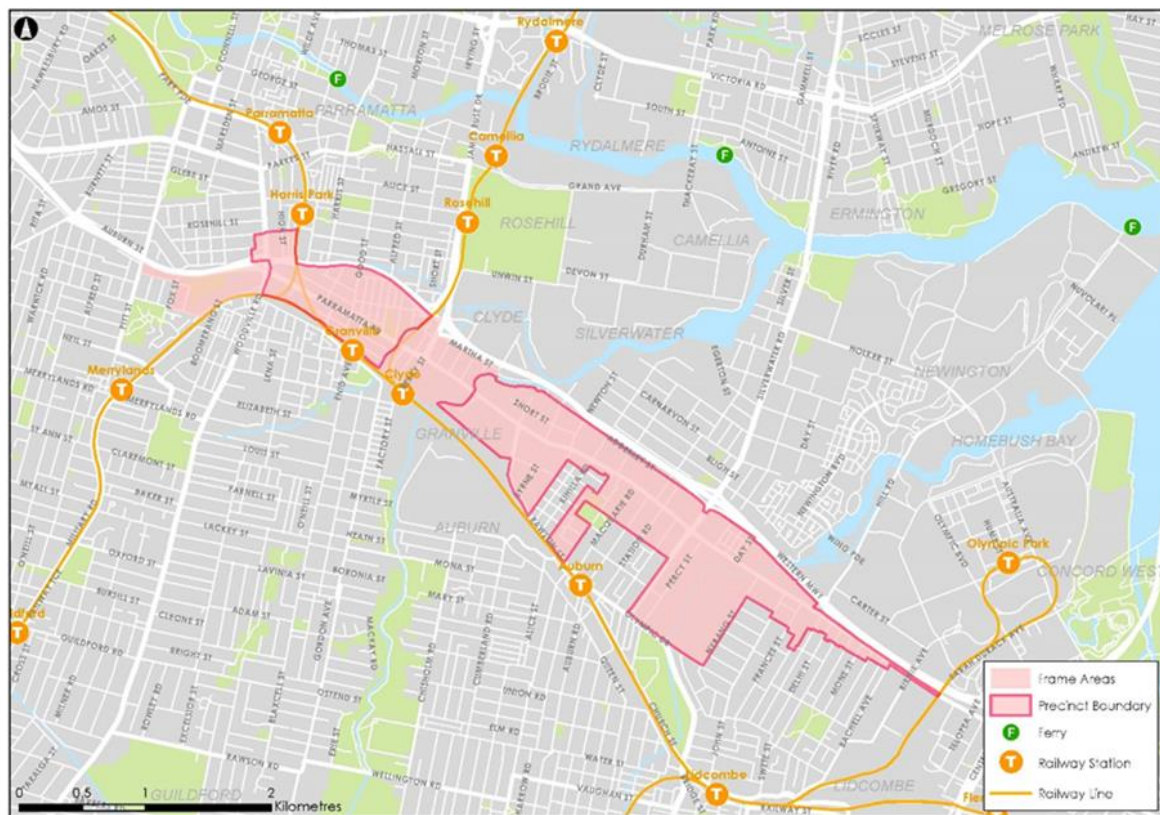
The Granville and Auburn urban renewal precincts were identified through the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) in 2016, which included a total of eight precincts along Parramatta Road between Parramatta and the Sydney CBD. The other precincts are subject to separate studies by other consultants.

GTA, now Stantec has been commissioned to undertake a Traffic and Transport Study for the Granville and Auburn urban renewal precincts.

1.2. Study Area

Figure 1.1 illustrates the Study Area for Granville and Auburn, which includes both the original core areas and the frame areas from the PRCUTS study. The traffic and transport analysis considers a wider area than just the defined Granville and Auburn precincts.

Figure 1.1: Granville and Auburn Study Area



Note: 2018 map includes the discontinued T6 Carlingford Line and railway stations.

1.3. Vision and Objectives

1.3.1. Vision

As part of the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS), there is detailed vision for Parramatta Road across all sub-disciplines of urban planning. The headline vision for the Parramatta Road Corridor is “a high quality multi-use corridor with improved transport choices, better amenity and balanced growth of housing and jobs.” This is divided into seven specific elements:

1. **Housing choice and affordability:** Plan for a diversity in housing types to accommodate a wide range of community needs, including affordable housing, family housing, student housing and seniors housing.
2. **Diverse and resilient economy:** Plan for and position the Corridor to attract new businesses and support existing businesses that create a diversity of jobs and promote jobs closer to home.
3. **Accessible and connected:** Reshape and better connect places and associated movement networks to better serve customers and encourage sustainable travel.
4. **Vibrant community places:** Promote quality places and built form outcomes to transform the Corridor over time.
5. **Green spaces and links:** Embellish existing open space and provide for new active and passive open spaces that support the recreational needs of the community and encourage active and healthy lifestyles.
6. **Sustainability and resilience:** Create liveable local precincts along the Corridor that are sustainable, resilient and make Sydney a better place.
7. **Delivery:** Deliver, drive, facilitate and monitor action.

1.3.2. Objectives

Specifically applied to this Transport Study, the PRCUTS' vision entails a series of movement-related objectives:

- Remove Parramatta Road as a barrier to communities by focusing on providing better connections to places and between movement networks. Maintain the reliable movement of people along the Parramatta Road Corridor.
- Prioritise public transport performance along Parramatta Road. Walking and cycling modes should be utilised for local trips, buses and/or light rail for intermediate trips, rail and/or car share for regional trips.
- Plan for quality-built form outcomes with the highest densities of urban living set away from Parramatta Road and appropriate supporting transport infrastructure.
- Create high amenity precincts along Parramatta Road by providing more connectivity through and across the Corridor.

2. LAND USE AND TRANSPORT CONTEXT

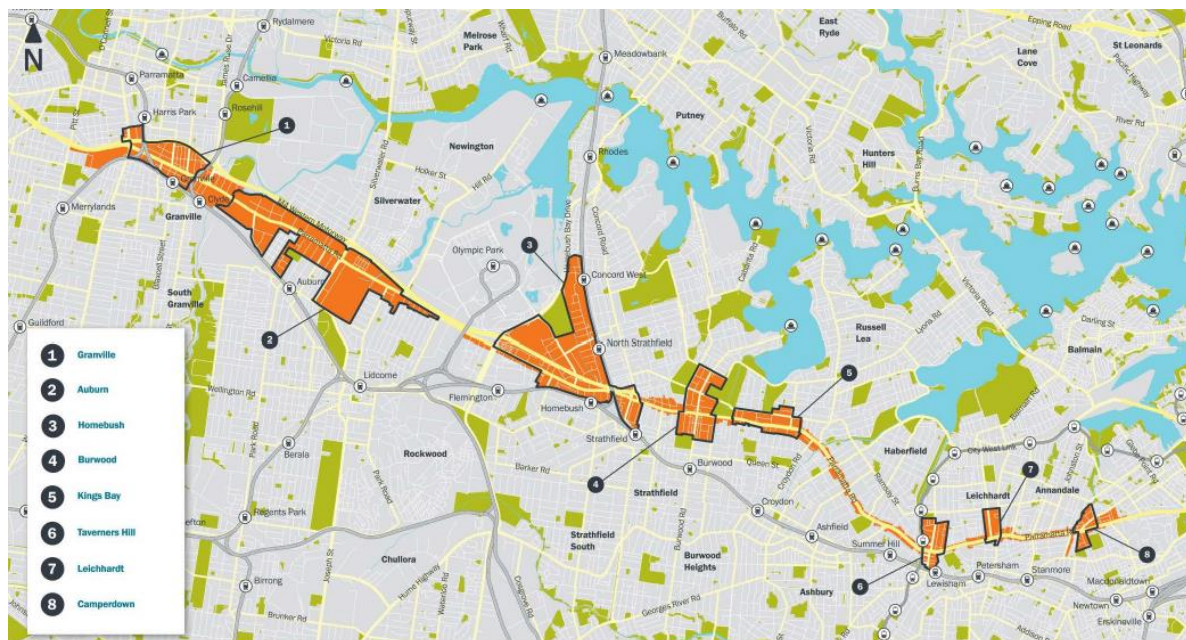
2.1. Policy and Strategic Context

2.1.1. Parramatta Road Corridor Urban Transformation Strategy

The *Parramatta Road Corridor Urban Transformation Strategy* (PRCUTS) is the NSW Government's program to revitalise and develop the 20 kilometres of Parramatta Road between Granville and Camperdown. PRCUTS sets forward a planning framework to achieve greater housing choice and affordability, increased jobs and economic outputs, better transport outcomes and overall liveability. By 2050, the corridor will have an estimated resident population of 62,000, approximately 33,000 new homes and 33,000 new jobs.

The Parramatta Road Corridor extends along the entire length of Parramatta Road, and includes land with direct frontage to Parramatta Road, across the eight Precincts. Within the context of this study, the Granville and Auburn precincts lie at the western end of the corridor which will have a different outcome, feel and objective compared to more inner-city precincts within this long-term adopted strategy, which can be seen in Figure 2.1.

Figure 2.1: PRCUTS Precincts



Source: Parramatta Road Urban Transformation Sustainability Implementation Plan (November 2016)

Within the Auburn and Granville Precincts, a number of targets have been proposed along the study area corridor. This includes:

- 13 per cent car share take up in Granville and 8.5 per cent in Auburn
- 29 per cent decrease in car use in Granville and 37 per cent in Auburn
- 9 kilometres of new safe bicycle connections in Granville and 8 kilometres in Auburn.

Whilst the PRCUTS study identified the need for safe bicycle connections, the proposed upgrades are often insufficient (e.g. just the provision of PS-2 logos rather than dedicated cycling facilities). Further investigations are required to achieve a safe and accessible cycling environment.

2.1.2. NSW State Infrastructure Strategy

The *NSW 2018 State Infrastructure Strategy* was prepared by Infrastructure NSW. It provides independent advice to the State Government on current infrastructure and project needs over the next 20 years. Two key strategic directions are of relevance to the Granville and Auburn study area:

- Integrating land use and infrastructure planning.
- Infrastructure planning, prioritisation and delivery.

In addition to these two strategic directions, several transport infrastructure initiatives are recommended within the 2018 State Infrastructure Strategy. Initiatives likely to impact the Granville and Auburn study area include the following:

- Recommendation 53 – TfNSW to complete the Sydney Metro West business case and continue corridor planning for future links to the Central River City.
- Recommendation 61 – TfNSW to develop a business case for on-road rapid transit and priority infrastructure for buses and other high efficiency vehicles between Parramatta and Sydney on the Parramatta Road corridor. This is to maintain mass transit accessibility into Sydney CBD while Sydney Metro West is being developed and delivered.
- Recommendation 64 – TfNSW to develop a business case to establish an outer Parramatta ring road bypass including improving James Ruse Drive to cater for population growth.
- Recommendation 66 – TfNSW to develop a business for investment in on-road rapid transit links for buses and high efficiency vehicles between Greater Parramatta and surrounding strategic centres.
- Recommendation 68 – TfNSW and GSC to develop a Greater Parramatta Access Plan to integrate various precincts across Greater Parramatta to Olympic Peninsula area with required infrastructure and connectivity.

2.1.3. Greater Sydney Region Plan and Central City District Plan

The *Greater Sydney Region Plan*, published in March 2018 by the Greater Sydney Commission, provides a 40-year vision and a 20-year plan to 2036. The Greater Sydney Region has been split into the three following cities:

- The Western Parklands City encompassing Campbelltown and Macarthur, Liverpool and Penrith as well as the future Western Sydney Airport Aerotropolis and Employment area.
- The Central River City encompassing Greater Parramatta and surrounding regions including the North-west Growth Area.
- The Eastern Harbour City encompassing the Sydney CBD, eastern, northern and southern suburbs.

Within the *Central City District Plan*, Auburn and Granville have been marked as Planned Precincts and Urban Transformation Precincts as part of the Greater Parramatta to Olympic Peninsula (GPOP) Urban Renewal Area.

Additionally, the study area, either in part or as a whole, has been marked for the following developments:

- Part of the “essential urban services, advanced technology and knowledge centres” where additional employment would be generated to support the Central City.
- The Clyde Intermodal Terminal will be located at the existing Clyde Stabling Yards.
- The Duck River Open Space Corridor, a continuous north-south active transport corridor linking Parramatta, Camelia, Granville, Auburn and Bankstown.

2.1.4. GPOP Place-Based Infrastructure Compact

Following from the identification of the Greater Parramatta and Olympic Park (GPOP) as an Urban Renewal Area in the Central City District Plan, the Greater Sydney Commission led a collaborative whole-of-government approach to identifying and evaluating the most cost-effective way to sequence growth in each of the 26 precincts across GPOP. Piloting a new model of holistic strategic planning, a Place-based Infrastructure Compact (PIC) was published in November 2019.

The Granville and Auburn precincts are classified as ‘Phase 2’ in the high-level growth sequencing plan. While a specific year is not provided, the PIC indicates that Phase 2 will occur at the opening of Sydney Metro West (SMW). As SMW will provide relief to the T1 Western Line, service frequency will be increased at Granville and Auburn railway stations, supporting the growth of these precincts. In the table of PIC proposals, a north-south regional cycleway is identified for the Granville precinct.

2.1.5. Future Transport 2056

The *Future Transport Strategy 2056* is a 40-year strategy for how transport will be planned and developed across NSW to facilitate accessibility for an expected 12 million residents within the state. From a metropolitan view, Future Transport 2056 and associated plans include the 30-minute city where jobs and services are within 30 minutes of residents with Greater Sydney. To achieve this, a series of city shaping and serving networks are proposed, some of which currently exist (such as the rail network and Parramatta Road) and others proposed. These strategic transport corridors to move people and goods are outlined between metropolitan and strategic centres, clusters and surrounds. The Movement and Place framework is emphasised to support liveability, productivity and sustainability. This study will build on the six outcomes proposed within Future Transport 2056 such as customer focus, successful places, strengthening the economy, safety and performance, accessibility and sustainability.

As the study area is located within the Greater Parramatta area and GPOP, no new corridors are outlined in *Future Transport 2056*. However, there are a number of initiatives and investigations relating to the study area and the broader region. The initiatives, projects and investigations as outlined within *Future Transport 2056* relevant to the site are listed in Table 2.1.

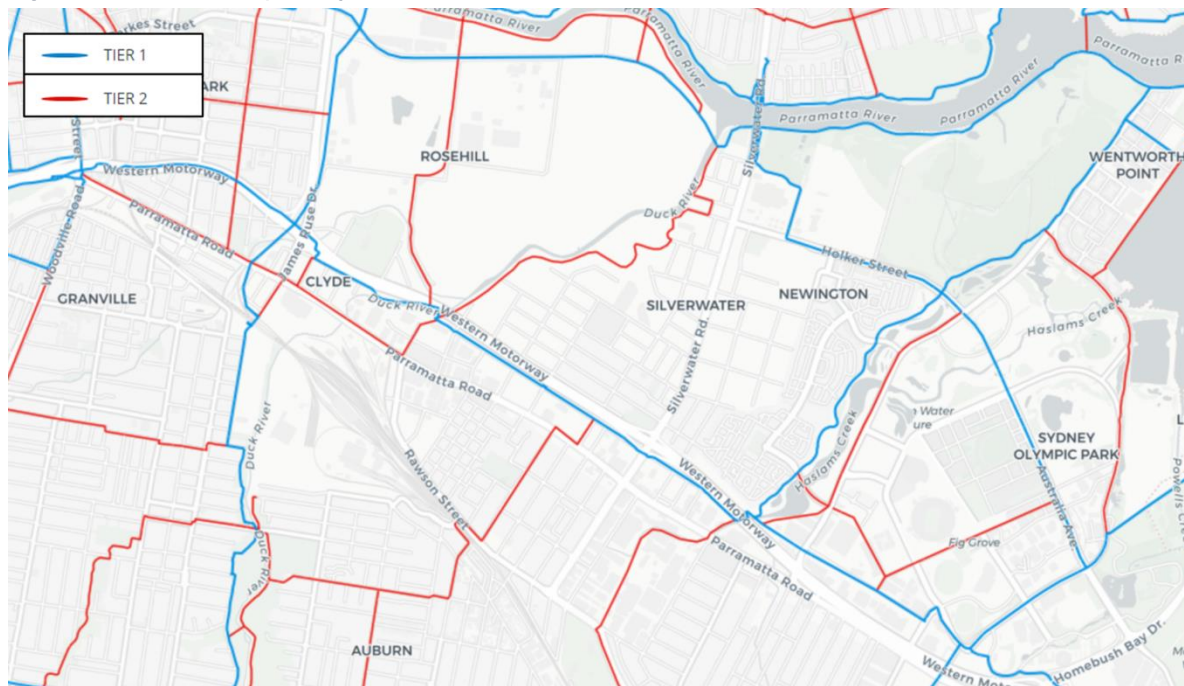
Table 2.1: Transport Initiatives and Investigations

Timeframe	Initiative/Investigation	Description
0-10 year investigation	Safe cycleway network within 10km of Parramatta	An investigation to encourage cycling for short trips around and between centres in Greater Parramatta.
0-10 year committed	Parramatta Road public transport improvements	Investment in improved on-road public transport between Strathfield and Sydney CBD along Parramatta Road. Whilst not directly applicable to the study area, this improvement would mean reductions in overall delay for public transport along Parramatta Road improving connectivity from the study area.
0-10 year committed	Sydney Metro West	Underground metro railway between Sydney and Parramatta to supplement the capacity of T1 Western Line. Initial alignment passes through the existing Parramatta Road corridor with a station at Olympic Park confirmed.
0-10 year investigation	Parramatta inner ring road	Improvements to existing Parramatta Inner Ring Roads including surface treatments, minor improvements, potential widening and prioritisation of vehicles to ensure major north-south and east-west vehicle movements remain outside Parramatta centre.
10-20 year investigation	Parramatta outer ring road	An outer ring road around Parramatta CBD linking James Ruse Drive, M4 Western Motorway to feed into the Parramatta Inner Ring Road and city centre.

Future Transport 2056 also introduces the Principal Bicycle Network (PBN) for Greater Sydney, recognising that a comprehensive Sydney-wide cycling network will be critical in delivering 30-minute cities. The 2056 PBN envisages:

- Tier 1 routes on the M4 Cycleway, Church Street, Woodville Road and the former T6 Carlingford Line (from Clyde to Parramatta Light Rail).
- Tier 2 links along Haslams Creek, Macquarie Road, Duck Street, Parramatta Road, Kendall Street, Berry Street and Alfred Street.

Figure 2.2: 2056 Principal Bicycle Network



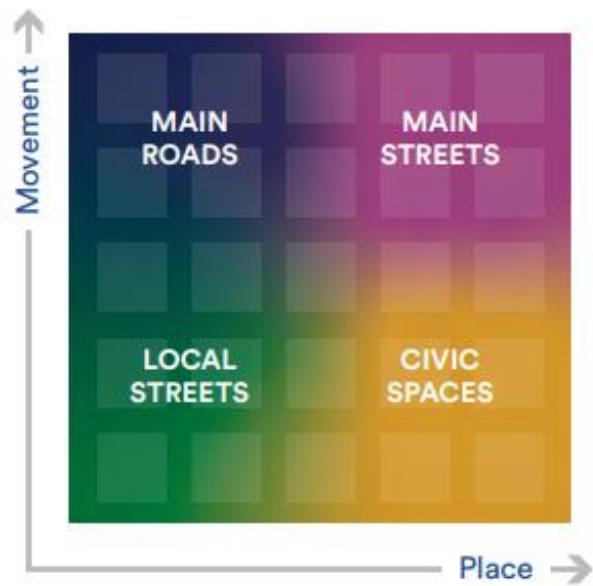
Source: Transport for NSW Principal Bicycle Network

2.1.6. Movement and Place Framework and Practitioners' Guide

The Movement and Place Framework underpins the Future Transport Strategy 2056 and aims to allocate road space in a way that improves the liveability of places. That is, it seeks to define streets and places that are geared for slow movement, pedestrian activity and the enjoyment of a place, and on the opposite end of the spectrum it defines roads and corridors that are designed for maximising the flow of vehicles and goods.

In March 2020, the Practitioner's Guide to Movement and Place was released by NSW Government as a complementing document to provide a common structure for place-based transport and city and town planning across NSW, and the ways to applying this approach. Figure 2.3 depicts the Guide's street classification matrix, categorising streets into 'main roads', 'main streets', 'local streets' and 'civic spaces'. All four street types within the framework are found in different parts of the Granville and Auburn precincts.

Figure 2.3: Movement and Place street type definitions



Source: Practitioner's Guide to Movement and Place, Government Architect NSW (2020)

The framework enables practitioners to identify which types of functions should be prioritised in each area. The potential for conflict between movement and place is most challenging where both movement and place are seen as important (i.e. in the 'main street' category), for which a lateral approach to planning and a holistic definition of success is critical. The Practitioner's Guide provides further detail on these concepts and also develops a six-step process for implementing a Movement and Place approach.

2.1.7. NSW Ports and Freight Strategy and Ports and Freight Plan 2018-2023

Built upon the NSW Freight and Ports Strategy, the NSW Ports and Freight Plan 2018-2023 is a five-year plan to increase and drive economic growth and deliver capacity enhancements within the NSW freight sector. The plan understands that the increase in congestion across high-density urban areas are driving up the cost of freight as competition grows for road spaces and kerbside uses. The plan provides support to Future Transport 2056 and is aligned with the general state-wide land use and infrastructure plans with initiatives that are focused on five key goals:

- Economic growth
- Efficiency, connectivity and access
- Capacity
- Safety
- Sustainability.

The plan emphasises the role of freight through the study area, including the use of Parramatta Road as a key freight route as well as WestConnex, which will be a catalyst for the revitalisation of the Parramatta Road corridor as a portion of freight vehicles transfer from Parramatta Road.

Finally, sections of the T1 train line form a nexus for rail-based freight for the Northern Sydney Freight Corridor, Main West Line and Southern Sydney Freight Line.

2.1.8. Sydney CBD to Parramatta Strategic Transport Plan

The Sydney CBD to Parramatta Strategic Transport Plan understands the importance of the growth corridor between the traditional Eastern CBD and Sydney's new Central CBD with the opportunities and constraints that it provides. The plan brings together a response to the Corridor's challenges, opportunities and visions throughout the growth corridor as a result of increased population and employment growth. This includes the understanding that whilst WestConnex will reduce the amount of regional freight traffic, smaller freight vehicle movements can be expected to increase following population and employment growth. This is especially pertinent for corridors such as Parramatta Road. The plan, in responding to the issues and opportunities, provides short, medium and long term initiatives on an area wide scale, a number of which will affect the Auburn and Granville precincts.

2.1.9. Parramatta Local Strategic Planning Statement

Every Council in New South Wales was required to prepare a Local Strategic Planning Statement (LSPS) that set out their 20-year vision for land use, to inform the development of an updated Local Environmental Plan (LEP) and Development Control Plan (DCP).

Regarding the City of Parramatta, the LSPS was finalised in March 2020 and is intended to harmonise the State Government's *Greater Sydney Region Plan* and *Central City District Plan* with the *Community Strategic Plan*. Parramatta's LSPS contains the following actions relevant to transport and movement:

- Collaborate with the State Government to prioritise the delivery of the Sydney Metro West project
- Collaborate with Government to fast track the future planning and delivery of these city-shaping transport links: Parramatta to Epping, Parramatta to Western Sydney Airport, Parramatta to Norwest, Parramatta to Kogarah via Bankstown and Parramatta Light Rail Stage 2.

2.1.10. Cumberland Local Strategic Planning Statement

Cumberland 2030: Our Local Strategic Planning Statement (Cumberland City Council, November 2020) lists the following priorities relevant to transport and movement:

- Train/mass transit investigation corridors such as Parramatta-Bankstown-Hurstville/Kogarah, which would travel through the Granville and Auburn precinct.
- Rapid bus link between Bankstown and Parramatta via Granville
- An extension of the Stage 2 light rail corridor from Carter Street south to Lidcombe Station.
- A public transport link from Sydney Olympic Park to Parramatta CBD via Parramatta Road, connecting the North Auburn and Granville precincts in the Parramatta Road Corridor.

2.2. Land Use

2.2.1. Carter Street Masterplan

The Carter Street Precinct is 52 hectares in area and is located approximately 14 kilometres west of the Sydney CBD and 6 kilometres east of the Parramatta CBD. The Precinct is bound by the M4 Motorway and Parramatta Road to the south, Haslams Creek to the west and Sydney Olympic Park to the east. The precinct has historically been a mix of light industrial, commercial and warehousing uses.

In December 2020, the NSW Government finalised the Carter Street Precinct Masterplan, rezoning the precinct to provide 6,200 new dwellings, a new village centre and a new primary school.

Key features of the Master plan connecting the precinct to Granville & Auburn include:

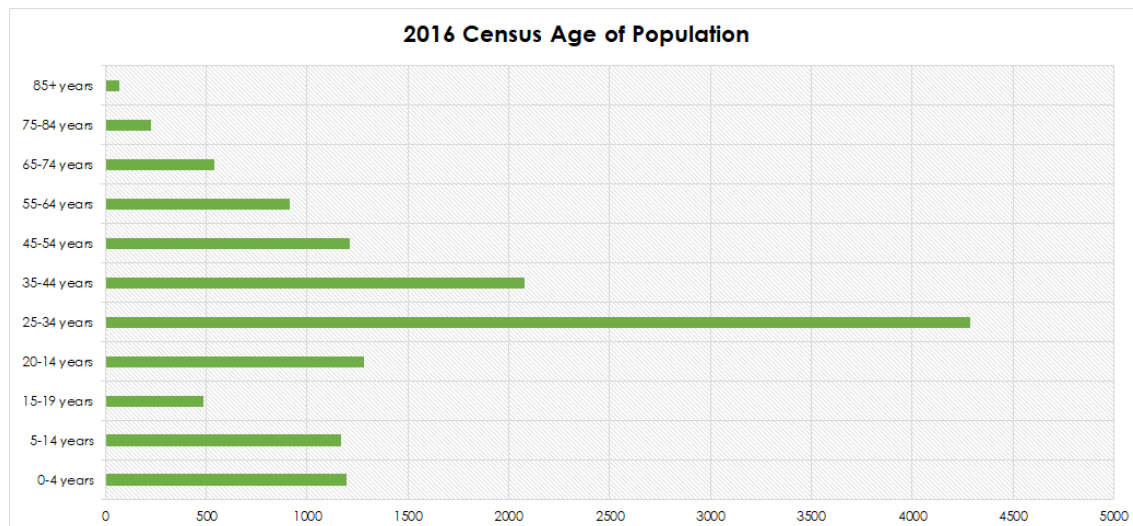
- A major east-west pedestrian spine, linking the Precinct to Haslams Creek and Sydney Olympic Park.
- A future green link along the southern side of Carter Street.
- A new pedestrian and cycle bridge over Haslams Creek.
- Upgrades to Hill Road including landscape verges, cycle and pedestrian pathways.

2.3. Population, Employment and Demographics

To understand population and demographics within the study area, ABS data has been derived from Census 2016. For the study site, statistical area 1 (SA1) has been chosen and is consistent with the study travel zones. ABS Census 2016 indicates that approximately 13,000 people lived within the study area SA1s. The population age distribution for the area is shown in Figure 2.4 and it can be seen that approximately 73 per cent of the surveyed population are between 20 and 64 years old (i.e. of typical working age).

This is significantly higher than the Greater Sydney equivalent of 61.4 per cent and indicates that more of the population is working within the study area. Similarly, as the current working age group grows older in the study area. The area will also contain a higher population of senior citizens and retirees, especially in the next 30 to 40 years when the 25-34 age range retires.

Figure 2.4: Age breakdown for study area

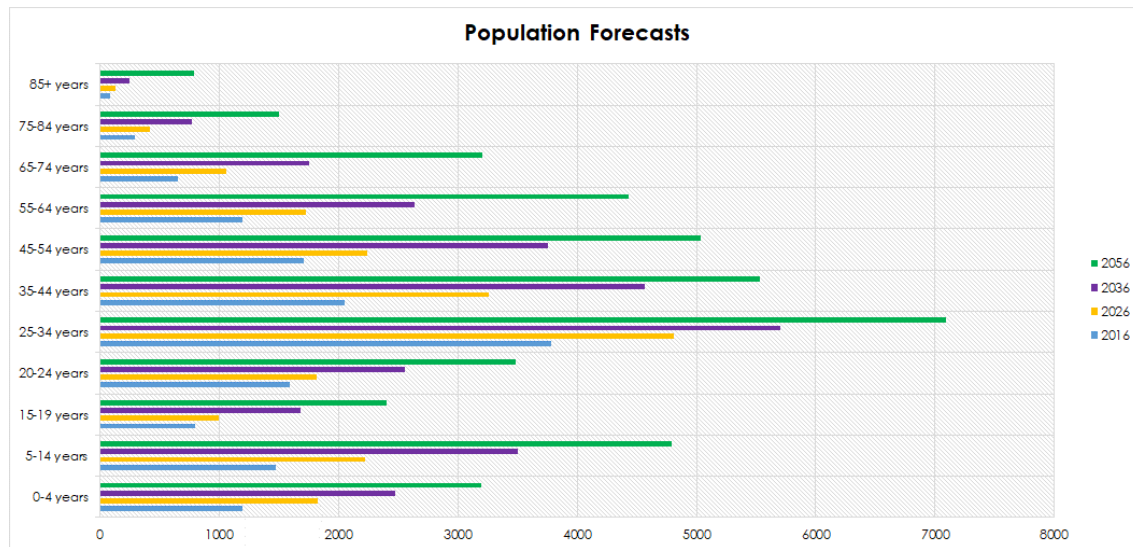


Source: ABS Census 2016 (URP)

Population projections from TfNSW Travel Zone Projection 2016 forecast that the population for the study area is expected to grow to approximately 20,500 by 2026, 29,500 by 2036 and 41,500 by 2056 (note that TPZ2016 is based on forecasts and projects from DPIE and includes natural births and deaths as well as expected migration into and out of the study area).

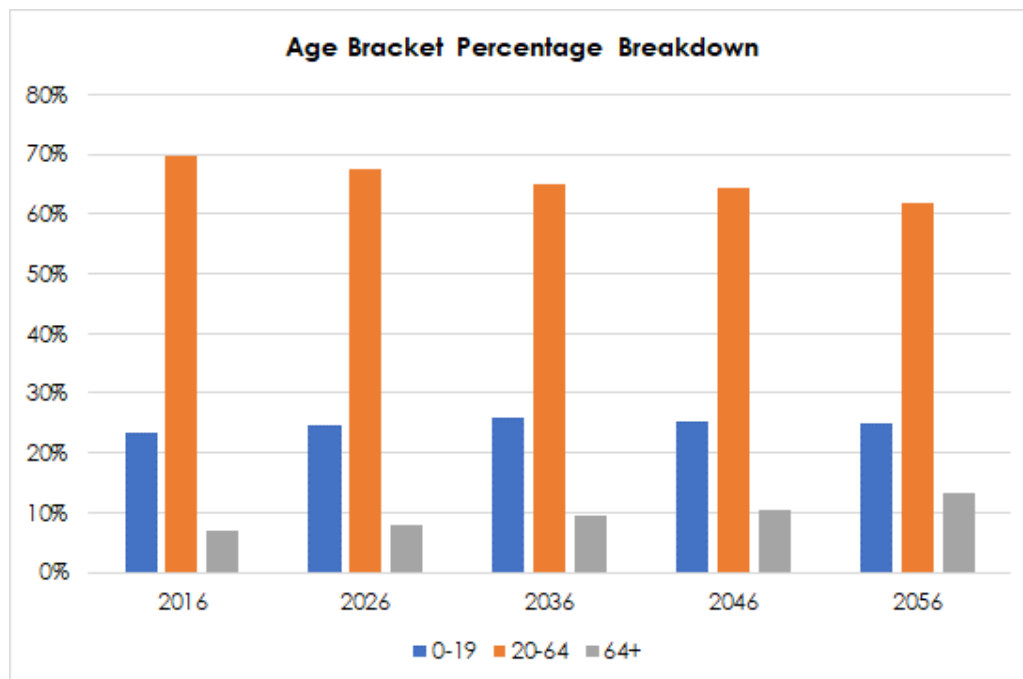
However, even as the population grows, the percentage of residents within the working age group has been forecasted to decline as the population ages. The forecasted population age groups are shown in Figure 2.5 with the percentage breakdowns shown in Figure 2.6.

Figure 2.5: Population forecast of the study area



Source: TfNSW TZP2016

Figure 2.6: Population age bracket percentage comparison for study area



Source: TfNSW TZP2016

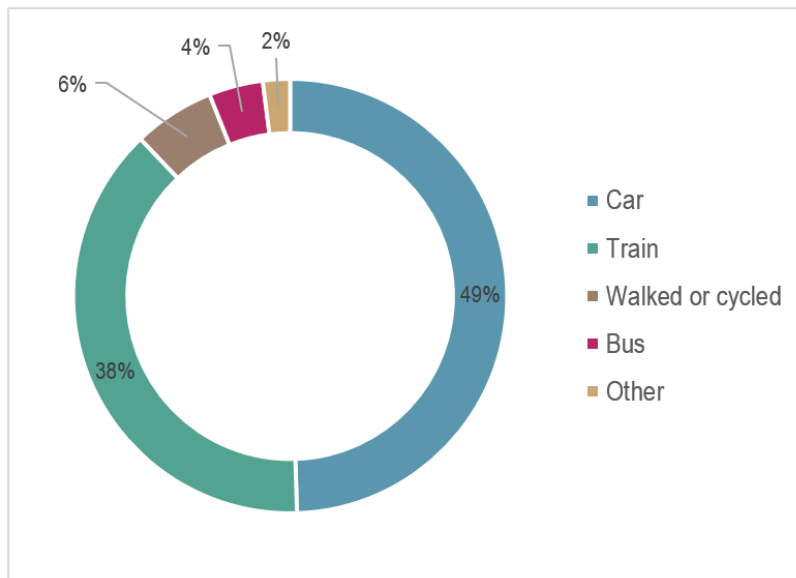
The above charts show a forecasted declining trend of residents in the area within the working age bracket with an increasing trend in those within retirement age. Of note is the age bracket of those studying or at school, generally between 0 to 19 years, remaining somewhat consistent. Overall, more demand can be expected on the transport network as the population grows in the study area to an expected 30,000 by 2036. This would likely include an escalating demand for public transport services as the proportion of elderly and retirees also increases.

2.4. Travel Patterns and Demand

2.4.1. Mode Choice

Mode of travel for residents from the 2016 Census is shown in Figure 2.7. As shown, private vehicle travel is the predominant mode of transport for people departing the study area, followed by train. As travel departing the study area tends to be for longer-distance trips, car and train trips are more prevalent.

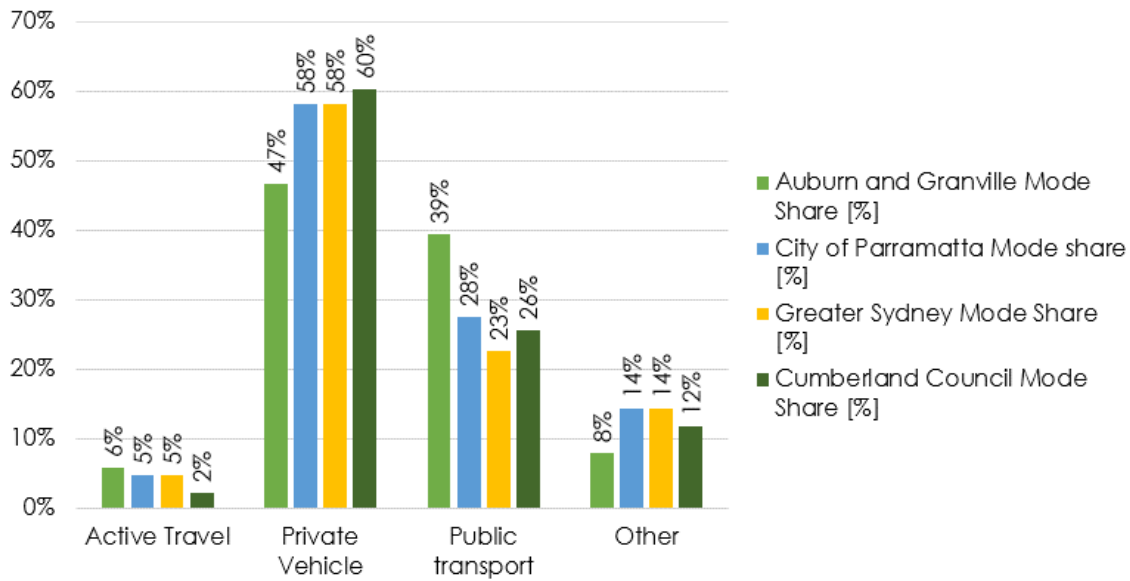
Figure 2.7: 2016 mode of travel for residents departing the study area



Source: 2016 Census, ABS

Additionally, residents within the study area have a higher mode share of active travel and public transport compared with residents within the broader Cumberland Council LGA, City of Parramatta LGA, and Greater Sydney, as shown in Figure 2.8. When viewed in conjunction with four train stations being located within or adjacent to the study area (Auburn, Granville, Clyde and Harris Park), the higher adoption of public transport use within the study area is logical.

Figure 2.8: Travel mode comparison



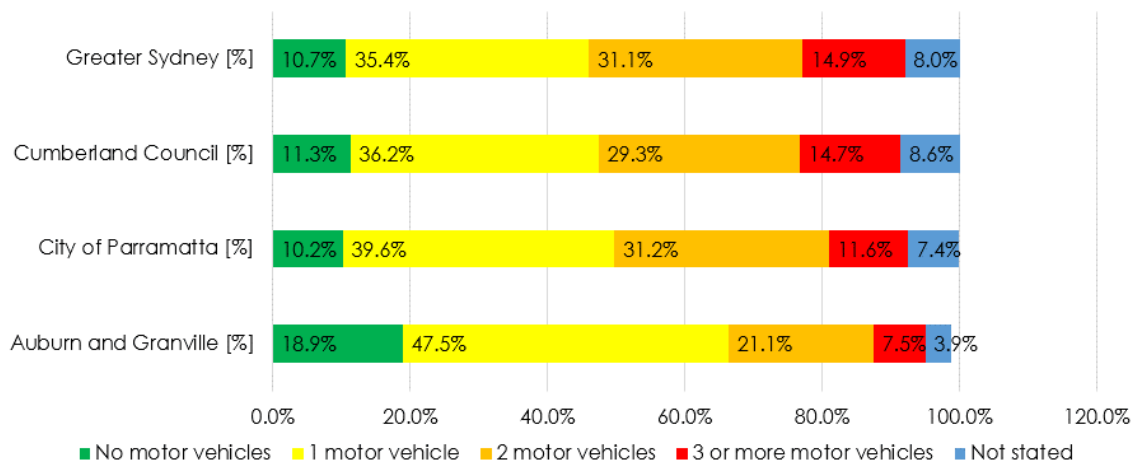
Source: 2016 Census, ABS

2.4.2. Car Ownership

The differences in mode choice discussed in Section 2.4.1 also correspond to car ownership with residents in the study area having fewer motor vehicles per dwelling compared to other residents in Cumberland and Parramatta LGA. Similarly, ownership of two or more motor vehicles per dwelling is lower in the study area compared to the surrounding LGAs.

Car ownership comparisons between the study area and surrounding LGAs are shown in Figure 2.9.

Figure 2.9: Car ownership comparison



Source: Census 2016, ABS

3. EXISTING TRANSPORT NETWORK

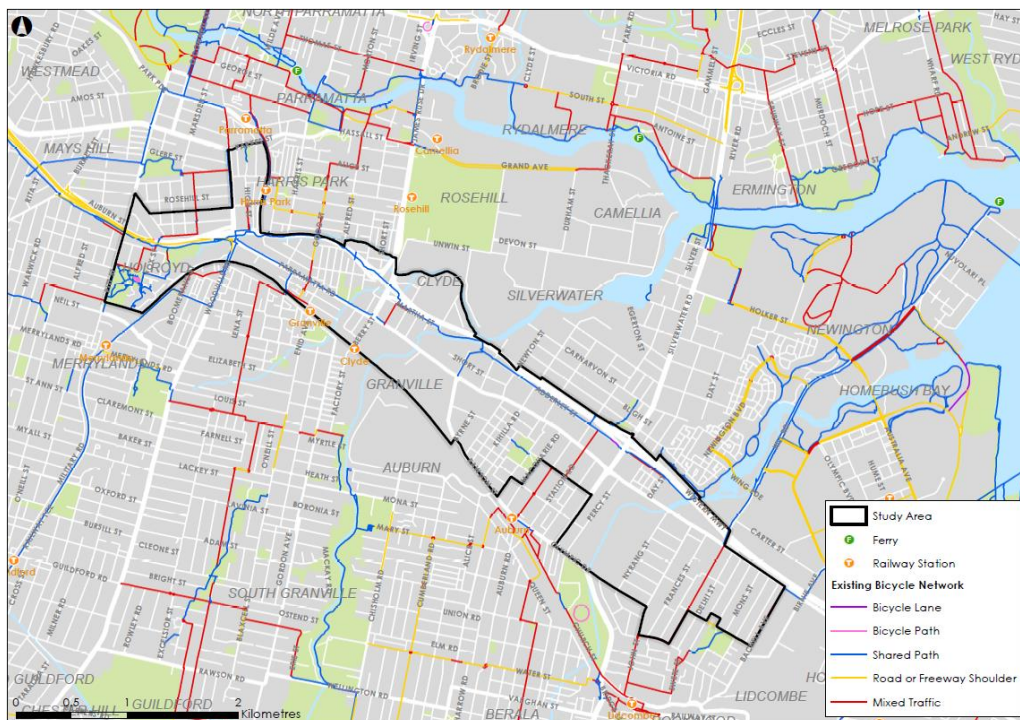
3.1. Active Transport Network

The Granville and Auburn precincts have an east-west shared path that starts at Burnett Street, Merrylands in the west (outside the study area) and runs along and later underneath the M4 Motorway. It crosses Duck River and James Ruse Drive in Granville and runs along Adderley Street through Auburn and further east to Haslams Creek. However, connections between this shared path and the town centres of Granville and Auburn are limited. Mixed traffic routes along Kendall Street (Granville) and Station Road (Auburn) provide some degree of town centre access whilst a shared path along Duck Street ends on Parramatta Road.

Paved footpaths are provided on most roads in the study area, however some local streets in Auburn only have a footpath on one side of the road and a limited number do not have a footpath present. Accessibility across Parramatta Road is limited in Granville as only two signalised crossings are provided (at Bold Street and Good Street intersections). In Auburn, more pedestrian crossing facilities are provided across Parramatta Road including a pedestrian bridge just south of Auburn North Public School. Typically, the quality of footpaths is poor and occasionally discontinuous, reflecting a largely car dominated environment.

Key pedestrian movements within Granville and Auburn are between the residential areas and mixed land use and the public transport facilities near Parramatta Road and Granville/Clyde/Auburn Stations. The existing active transport network is shown in Figure 3.1.

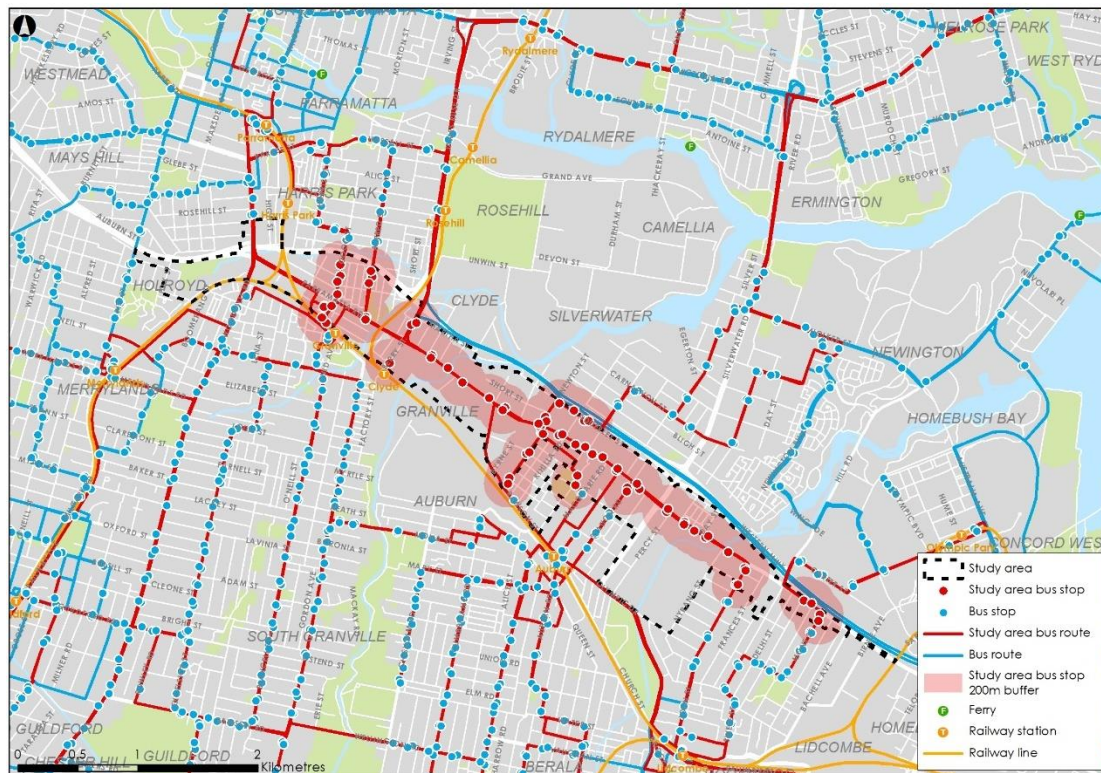
Figure 3.1: Existing Active Transport Network Granville and Auburn



3.2. Public Transport Network

The public transport network in the Granville and Auburn study area is shown in Figure 3.2. It comprises the T1 and T2 railway lines that connect Granville and Auburn to Parramatta, Strathfield and Sydney CBD. There is also a local bus network that provides two routes in Contract region 7, nine routes in Contract region 13 and two routes in Contract region 6. All data is from 2018 unless stated otherwise.

Figure 3.2: Public Transport Network in the Granville and Auburn Study Area



Note: 2018 map includes the discontinued T6 Carlingford Line and railway stations.

A summary of the existing train services on the T1 and T2 lines at the Granville and Auburn stations for weekdays and weekends is provided in Table 3.1.

Table 3.1: Train Services at Granville and Auburn Stations (2021)

Railway Line	Weekday Services	Weekend Services
T1 North Shore & Western	Every 15 minutes in peak periods Every 30 minutes during the off-peak daytime Every 15 minutes in the evenings	Every 15 minutes during the daytime Every 15 minutes in the evenings
T2 Inner West & Leppington	Every 5-10 minutes in peak periods Every 5-10 minutes during the off-peak daytime Every 10-15 minutes in the evenings	Every 5-10 minutes during the daytime Every 5-15 minutes in the evenings

The bus routes in the Granville – Auburn study area are described in Table 3.2. During the daytime only Routes 909 and M92 operate along Parramatta Road in the study area, whilst at night the NightRide Routes N60 and N61 use sections of Parramatta Road. Four bus routes in the study area stop at Granville Station whereas eight bus routes stop at Auburn Station.

Route 907 that operates north-south to Parramatta through the western part of the study area west of Granville is the only route that does not go to Granville or Auburn stations or along Parramatta Road.

Table 3.2: Bus Routes in the Granville and Auburn Study Area (2021)

Route	Description	Parramatta Road	Granville	Auburn
540	Auburn to Silverwater	No	No	Yes
544	Auburn to Macquarie Centre	No	No	Yes
906	Parramatta to Fairfield	No	Yes	No
907	Parramatta to Bankstown via Villawood And Bass Hill	No	No	No
908	Bankstown to Merrylands via Regents Park, Auburn and South Granville	No	No	Yes (south of study area)
909	Parramatta to Bankstown via Harris Park and Auburn	Yes	No	Yes
911	Bankstown to Auburn via Bass Hill Plaza and Chester Hill	No	No	Yes (south of study area)
M91	Parramatta to Hurstville via Chester Hill, Bankstown and Padstow	No	Yes	No
M92	Parramatta to Sutherland Metrobus	Yes	No	No
N60	City to Fairfield via Strathfield and Parramatta (NightRide)	Yes	Yes	Yes
N61	City to Carlingford (NightRide)	Yes	No	Yes
S2	Granville to Sefton via Chester Hill	No	Yes	No
S3	Auburn to Chisholm Road	No	No	Yes

The AM peak hour frequency of bus services at the bus stops in the study area is shown in Figure 3.3. None of the bus stops have services with greater frequency than 20 buses per hour. Most of the bus stops have less than 10 buses per hour.

Figure 3.3: AM Peak Hour Frequency of Bus Services in the Granville – Auburn Study Area



The weekday average boardings and alightings at the bus stops in the study area are shown in Figure 3.4 and Figure 3.5 respectively.

Figure 3.4: Weekly Average Bus Boardings by Stop in the Granville – Auburn Study Area

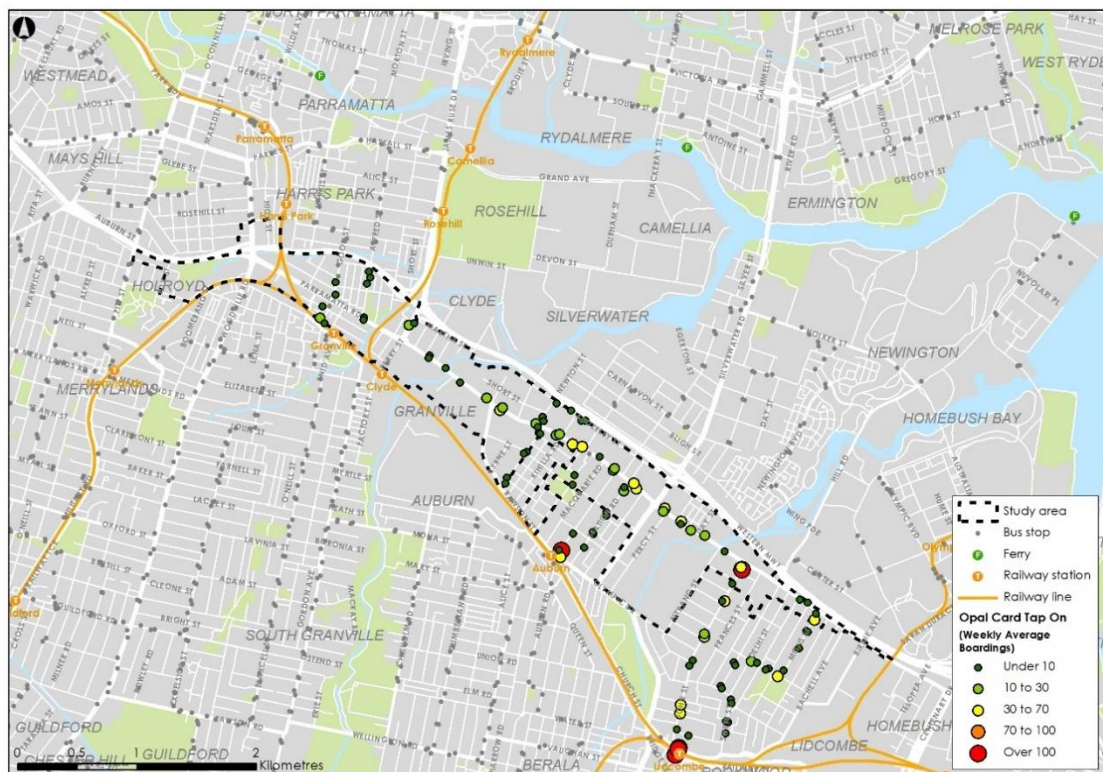


Figure 3.5: Weekly Average Bus Alightings by Stop in the Granville – Auburn Study Area

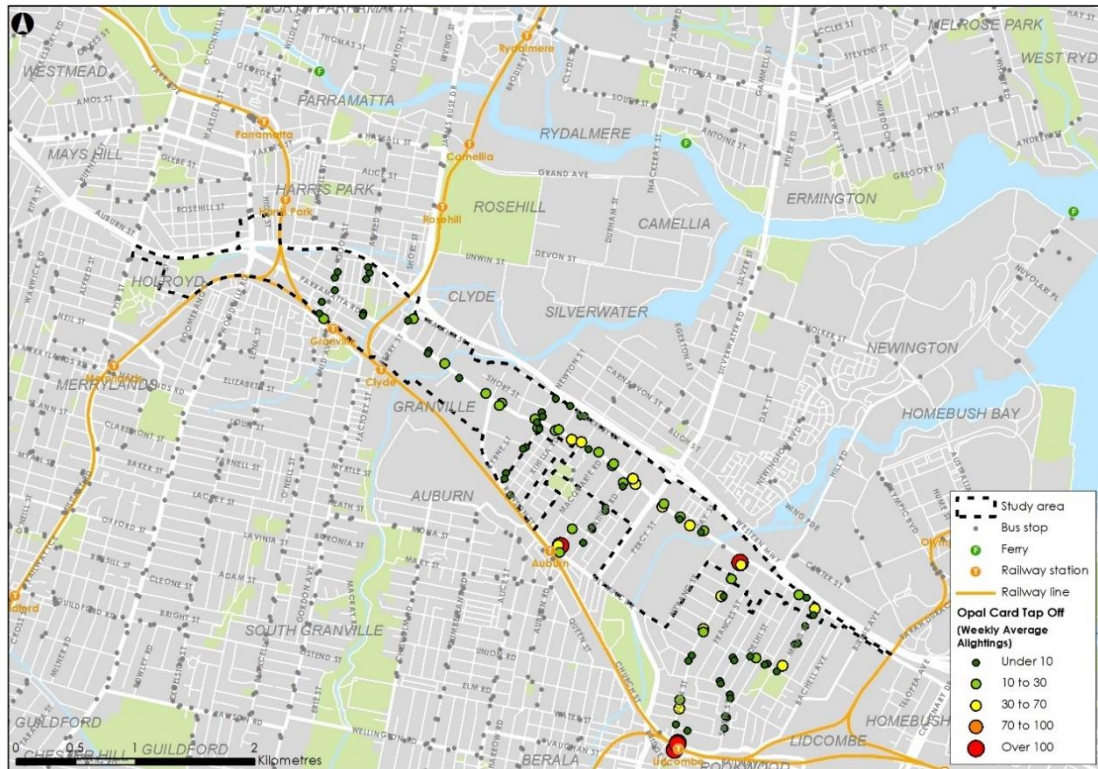


Figure 3.6 and Figure 3.7 depict the 30-minute public transport accessibility from Granville Station and Auburn Station, respectively. For both Granville and Auburn, public transport users can reach the major centres of Parramatta, Fairfield, Liverpool, Bankstown, Blacktown Burwood and the Sydney CBD within 30 minutes.

Figure 3.6: 30-Minute Public Transport Accessibility from Granville Station

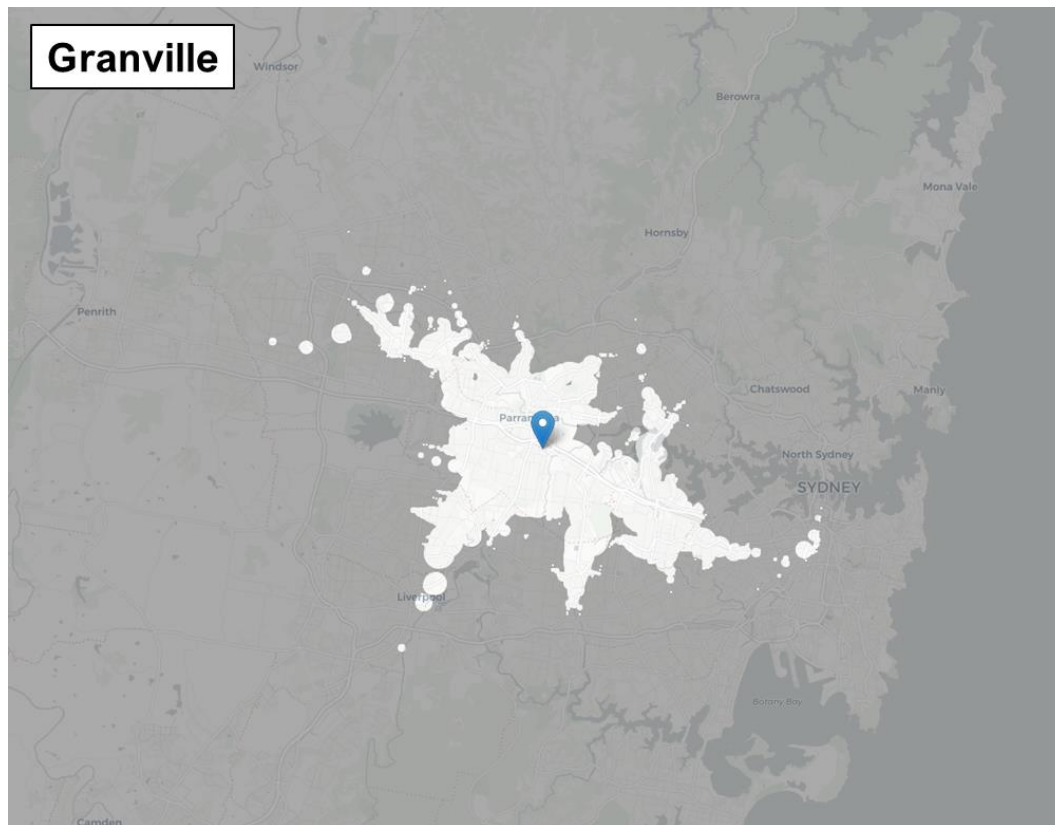
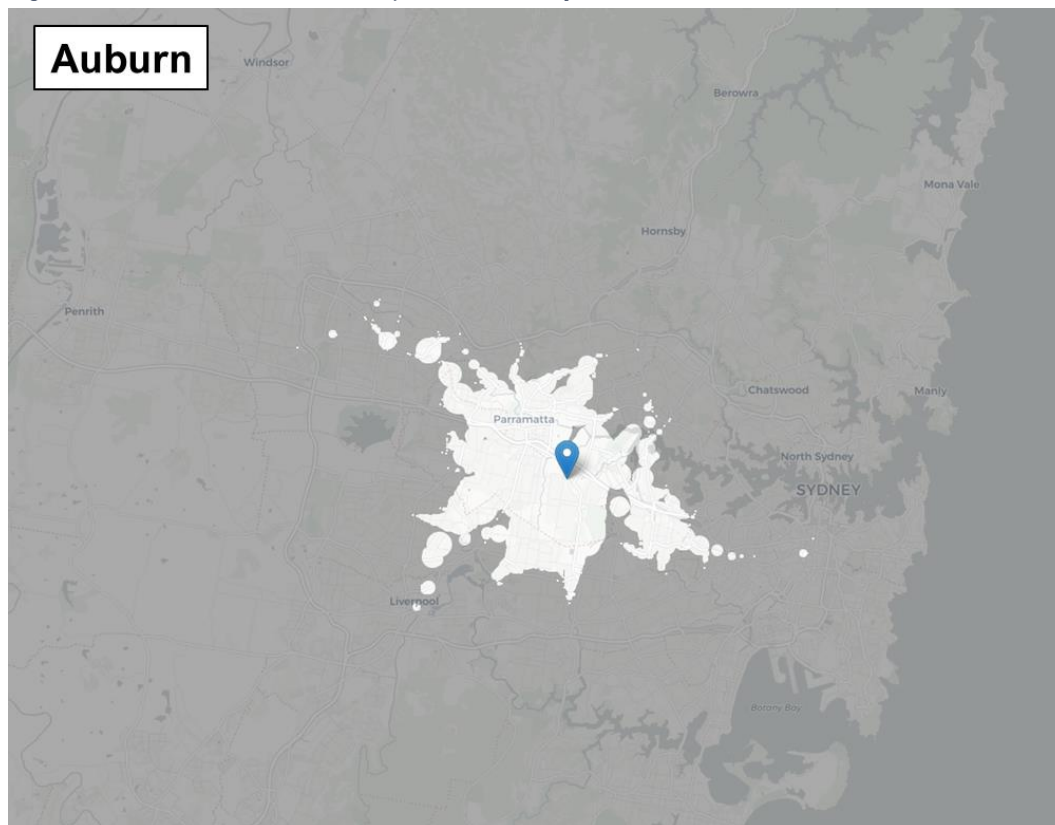


Figure 3.7: 30-Minute Public Transport Accessibility from Auburn Station



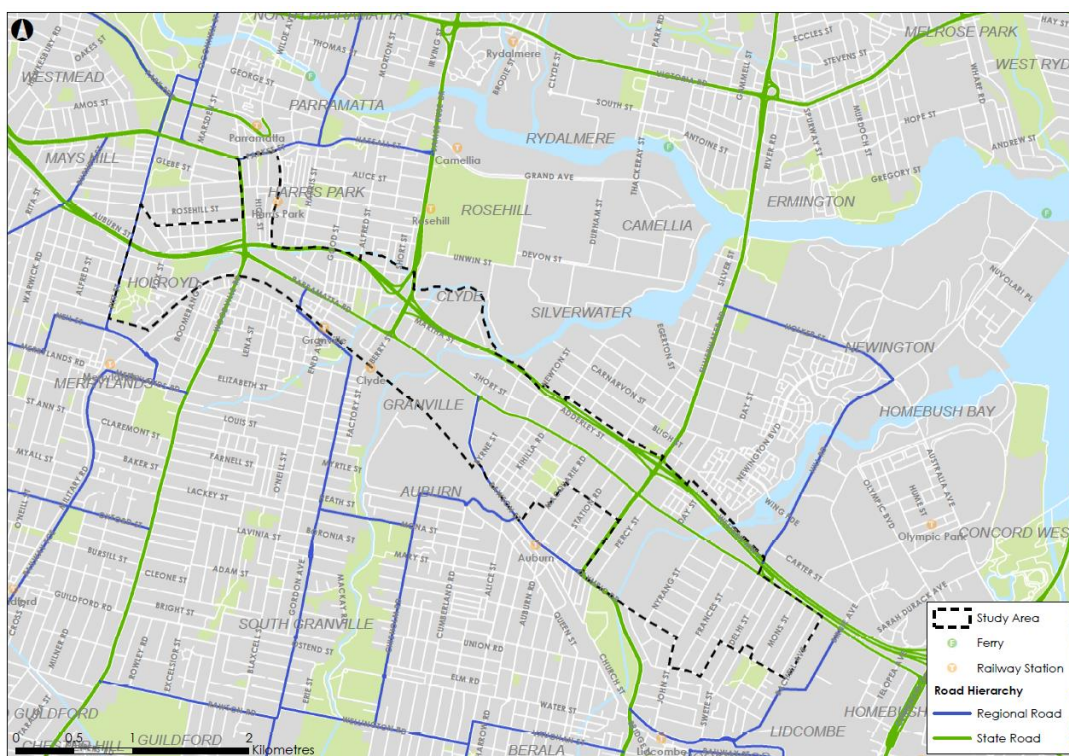
3.3. Road Network

3.3.1. Overview

The road network within the study area consists of State Roads, Regional Roads and Local Roads. State Roads are managed and funded by Transport for NSW (TfNSW) while Regional and Local Roads are managed and funded by councils. However, due to their network significance TfNSW provides financial assistance to councils for the management of their Regional Roads.

The State Network is the main arterial network which connects strategic centres and supports high volumes of traffic. Regional Roads are sub-arterial roads that perform an intermediate function between the main arterial network of State Roads and council controlled Local Roads. The existing State and regional road network surrounding and within the study area is shown in Figure 3.8.

Figure 3.8: State and Regional Road Network



In the east-west direction, the M4 Motorway and Parramatta Road are key regional corridors providing connections between Western and Inner Sydney. The M4 Motorway provides grade and intersection free travel through the corridor and is accessed by dedicated on and off ramps. It links Penrith, Parramatta and the Sydney CBD. The use of the M4 Motorway requires paying a toll. Parramatta Road is an urban arterial road without tolls. Its function has less regional character as less users are travelling the entire length of Parramatta Road. Traffic distribution between the two corridors is dependent on toll sensitivity and destinations.

In the north-south direction:

- St Hilliers Road/ Silverwater Road is the key corridor in the study area and provides a link between Pennant Hills, Carlingford and Bankstown.
- James Ruse Drive is part of the Parramatta ring road and has only a short section within the study area.
- Woodville Road links south-western Sydney suburbs with Parramatta.

EXISTING TRANSPORT NETWORK

At a local level, it is observed that the continuity of the local road network in both east-west and north-south directions is constrained by:

- The T1 Western Line (limited number of railway crossings)
- Duck River and the Clyde Railway Yard
- Large size industrial blocks and the Haslams Creek.

Key roads within the study area are described in Table 3.3.

Table 3.3: Key state and regional roads in the study area

Road Name	Administrative Road Classification	Movement and Place Street Environment	Key Function	Description
M4 Western Motorway	State	Main Road	Motorway toll road between Penrith, Parramatta and Sydney CBD.	▪ East-west alignment ▪ Toll road ▪ Three lanes in each direction with localised widening at various points to four lanes ▪ 80km/h posted speed limit (for roadworks). ▪ As part of the WestConnex project, M4 East was completed in 2019
Parramatta Road	State	Main Road	Arterial Road providing access to the M4 for longer distance trips and connecting key north-south corridors, including Cumberland Highway, James Ruse Drive, Silverwater Road and Homebush Bay Drive.	▪ East-west alignment ▪ Two lanes in each direction with widening to three lanes at various locations and intersections ▪ 60km/h posted speed limit ▪ Concrete median separating eastbound and westbound traffic ▪ No kerbside parking allowed with clearway conditions during the day.
St Hilliers Road/ Silverwater Road	State	Main Road	North-south arterial road connecting Auburn and Lidcombe to M4, Parramatta Road and industrial suburbs such as Newington and Ermington.	▪ North-south alignment ▪ 70km/h posted speed limit ▪ No parking permitted with clearway conditions for peak periods ▪ Three lanes in each direction with concrete median to separate southbound and northbound traffic ▪ On and off ramps to M4 for both east and west directions of travel.
Olympic Drive	State	Main Road	Arterial road linking Bankstown, Lidcombe with St Hilliers Road and Silverwater Road as well as on/off-ramps to M4 and Parramatta Road.	▪ North-south alignment ▪ 70km/h posted speed limit ▪ Three lanes in each direction with clearway conditions during peak periods and no parking at any other time ▪ Concrete median separating southbound and northbound traffic.

EXISTING TRANSPORT NETWORK

Road Name	Administrative Road Classification	Movement and Place Street Environment	Key Function	Description
James Ruse Drive	State	Main Road	North-south arterial road connecting M4, Parramatta Road with suburbs of Clyde, Rosehill, Harris Park and Parramatta with North Parramatta and beyond.	- North-south alignment with on and off-ramps to M4 - Three lanes in each direction with no stopping - Concrete median separating northbound and southbound traffic 70km/h posted speed limit.
Woodville Road	State	Main Road	Arterial road linking South-west Sydney with Parramatta.	- North-south alignment 70km/h posted speed limit - No parking permitted with clearway conditions during peak periods - Three lanes in each direction with concrete median to separate southbound and northbound traffic.
Rawson Street	Regional	Main Street	Continuation of Olympic Drive and serves the Auburn Town Centre and industrial area with Parramatta Road and St Hilliers Road.	- North-west to south-east alignment - One lane in each direction with localised widening at intersections - Kerbside parking allowed outside of morning peak period 60km/h posted speed limit - Anecdotal a rat run to avoid Parramatta Road
Pitt Street	Regional	Main Street	Regional road linking Holroyd, Merrylands and Parramatta.	- North-south alignment - Two lanes in each direction with clearway conditions during peak periods 60km/h posted speed limit.
Hill Road	Regional	Main Street	North-south road connecting Carter Street, Olympic Park and Wentworth Point precincts with M4 and Parramatta Road.	- North-south alignment 60km/h posted speed limit - Two lanes in each direction with no kerbside parking - On-ramps only to M4.
Adderley Street East and West	Local	Main Street	Collector road servicing Auburn North Public School and businesses area with active transport links across M4.	- East-west alignment - No marked lanes and kerbside parking permitted - Shared path along northern side connecting to wider active travel network - No speed limits posted.

3.4. Road Safety

Road safety forms part of the Premier's Priorities relating to Safer Communities. The intent is to reduce road fatalities from 2011 to 2021 by at least 30 per cent. Whilst most road fatalities occur in rural areas, the *2021 Road Safety Plan* outlines a number of priority areas including creating liveable and safe urban communities which includes the expansion of 40km/h high pedestrian activity areas, safety upgrades at intersections and safety integration in bicycle network programs.

A safe systems approach has been adopted which looks at safe roads (and intersections), safe speeds, safe vehicles and safe people. Whilst this moves away from the traditional crash cluster analysis to identify specific crash issues, an understanding of historical road crashes is still required to understand prevalent types of crashes within the study area. A crash map of the study area for a five-year history from 2012 to 2016 is shown in Figure 3.9 and Figure 3.10 showing light vehicle and heavy vehicle crashes, respectively.

Overall, 2,111 crashes were recorded during the five year period for the area. The crash history also includes crashes 100 metres outside of the boundary on the approach to the study area boundary.

Figure 3.9: Light vehicle crashes

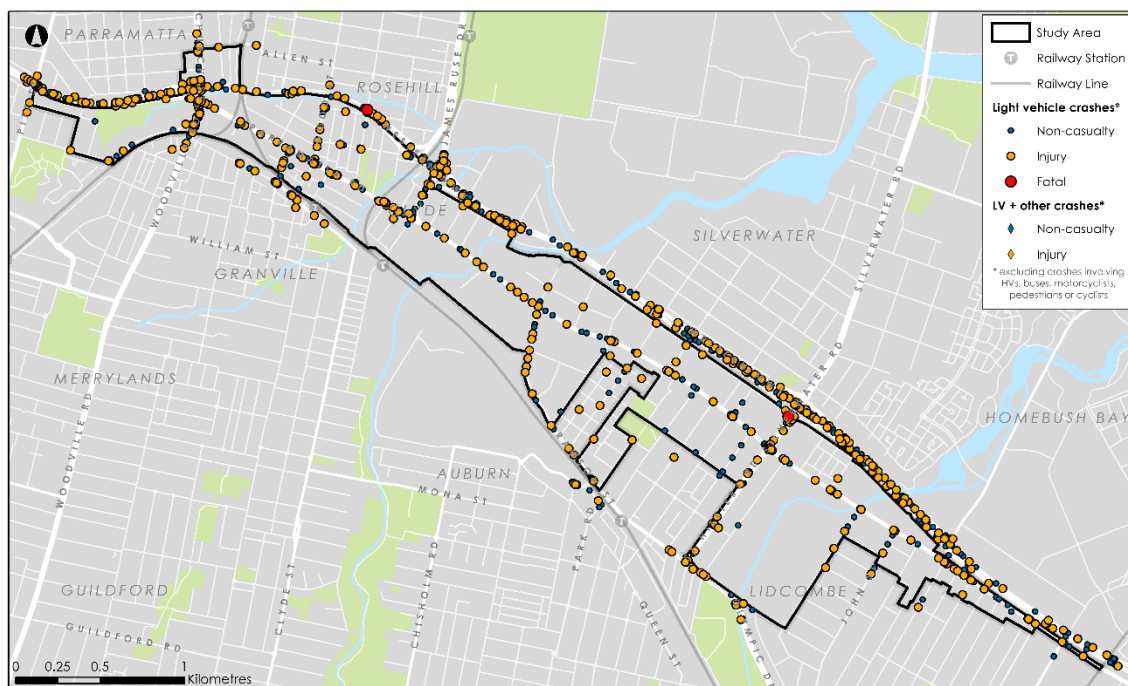
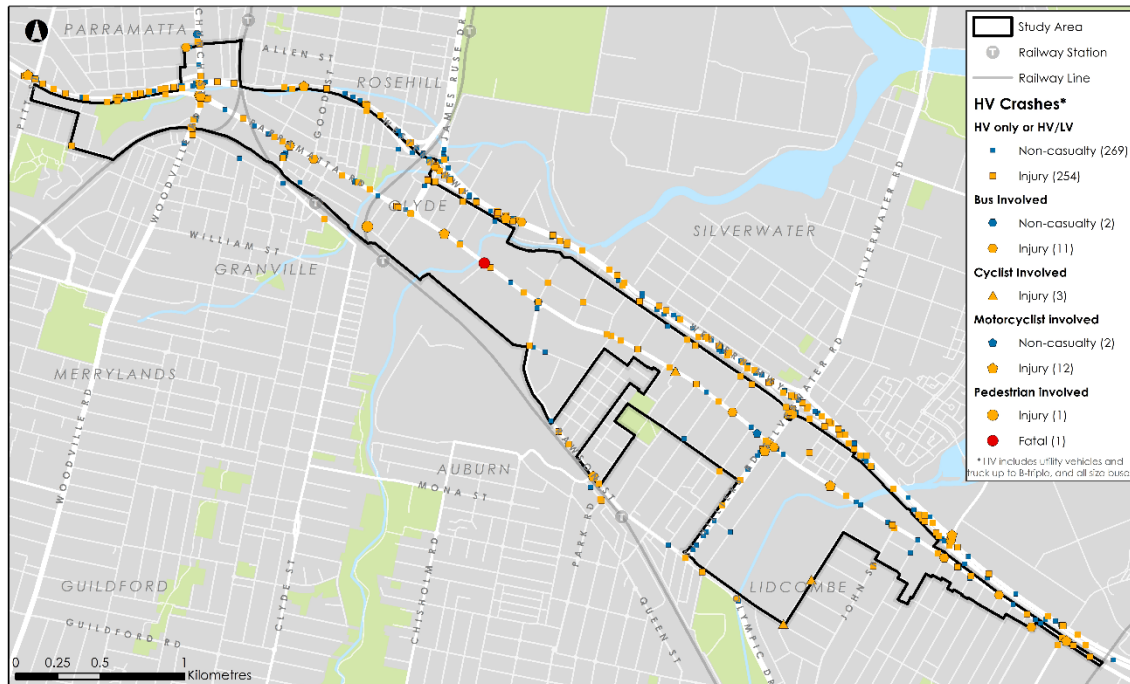


Figure 3.10: Heavy vehicle crashes

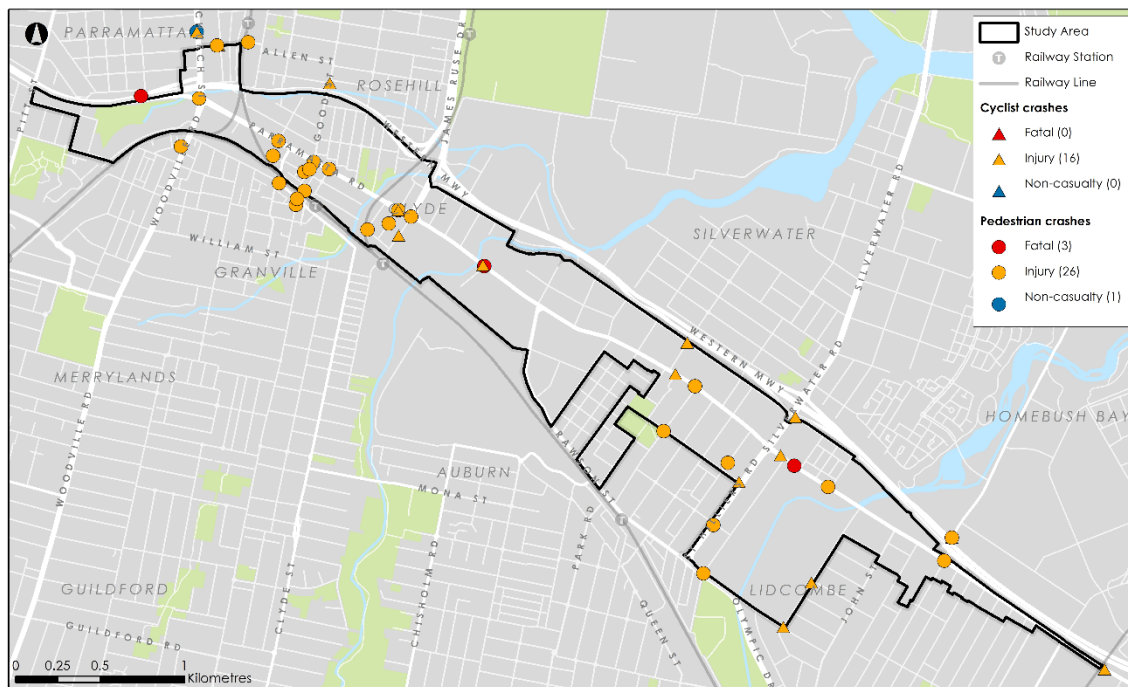


Further analysis of the crash history of the study area indicates that the most frequent location for crashes is along the M4 Motorway, attributable to the large volumes of traffic.

Following that, with approximately 40 per cent (852 crashes), intersection collisions accounted for the second largest portion of incidents. In terms of severity of crashes, only 969 crashes resulted in no injuries while of the remaining 1,142 crashes, 262 resulted in serious injury and 5 incurred fatalities.

Forty-five crashes involved cyclists and pedestrians within the study area, with 44 of these crashes resulting in an injury or death. 17 of these crashes occurred along or near Parramatta Road with the geographical distribution of these towards the western end within the Clyde and Granville Areas. These are shown in Figure 3.11 with the most prominent cluster centred around the Granville area, which is subject to high foot traffic.

Figure 3.11: Pedestrian and cyclist crashes



A summary of vehicle type against crash severity is shown in Table 3.4.

Table 3.4: Vehicle type versus severity of crash for five-year history in study area

Vehicle Type	No Injury/ Towaway	Injury	Fatality
Car	928	1050	4
Heavy vehicle	246	272	2
Bus	2	10	0
Bicycle/ Pedestrian	1	42	3
Other	74	87	0
Total	1251	1461	9

3.4.1. Intersection Risk Rating

As part of the safe systems approach adopted by the NSW Centre of Road Safety and Road Safety Plan 2021, intersection risk ratings have been developed based on the following criteria:

- Annual average daily traffic (AADT) passing through the intersection.
- A five-year crash history of the site.
- The rated speed of the approaches to the intersection.
- Intersection complexity including layout, phasing patterns and approach arrangements.

Intersections within the study area with a history of crashes have been rated as per this risk rating and are shown in Figure 3.12 with a table summary in Table 3.5. It should be noted that the intersection risk ratings presented are relative to each other within the study area and are not representative of risk ratings throughout NSW.

EXISTING TRANSPORT NETWORK

Figure 3.12: Risk rated intersections within study area



Source: NSW Centre for Road Safety

Table 3.5: Summary of risk rated intersections within study area

Risk rating band	Number	Proportion
Low	47	42%
Low-Medium	16	14%
Medium	21	19%
Medium-High	8	7%
High	21	19%

The above indicates that the majority of intersections are low risk (42 per cent) within the study area followed by medium risk (40 per cent) and then high risk (19 per cent). However, it should be noted that almost 20 per cent of intersections are rated as high risk which is a significant number of intersections.

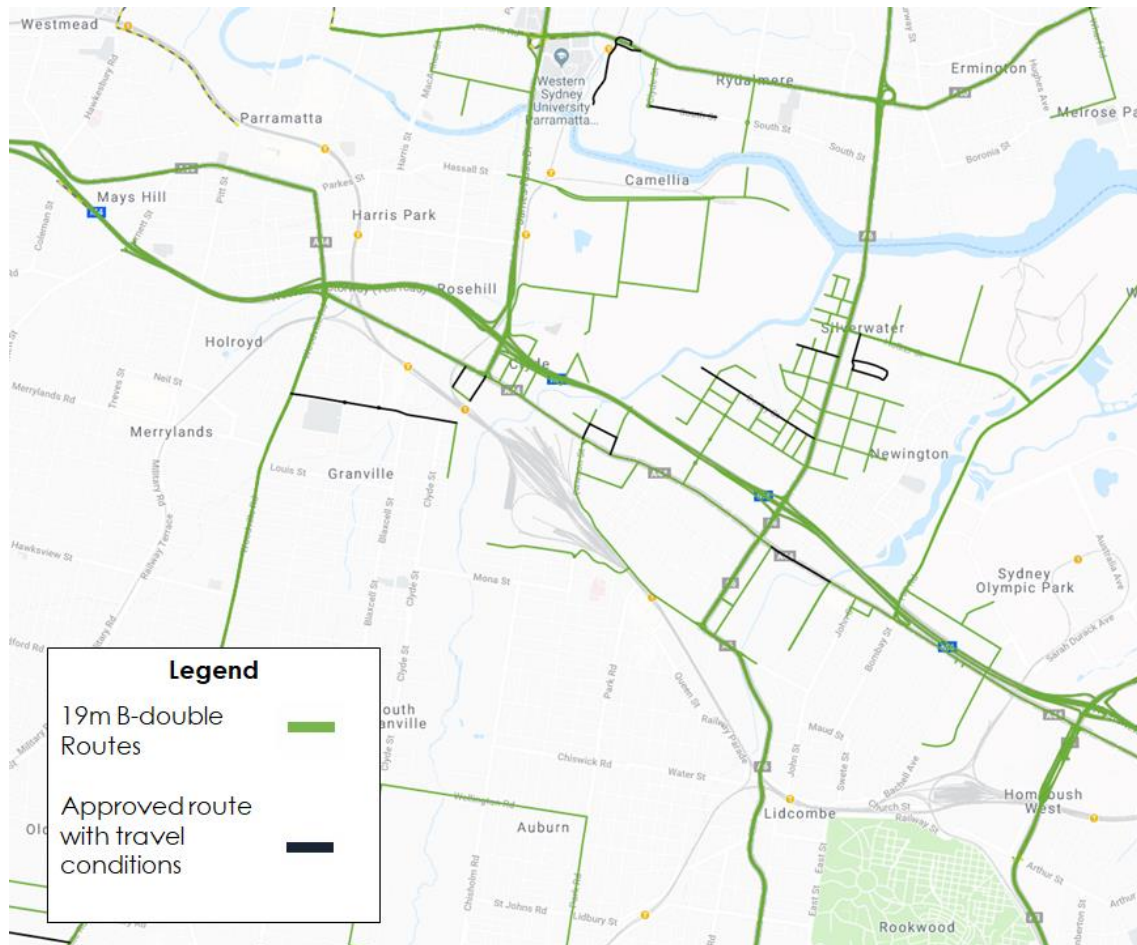
As seen in Figure 3.12, the majority of these high-risk intersections are located along major road corridors (e.g. Parramatta Road, James Ruse Drive and Woodville Road) which carry high traffic volumes and generally contain complex intersection arrangements (e.g. Woodville Road/ Parramatta Road). These roads also carry a higher proportion of heavy vehicle traffic which contributes to the safety concerns for pedestrians.

3.5. Freight

Within both the City of Parramatta LGA and Cumberland Council LGA portions of the study area, manufacturing, retail and transport and logistics account for a significant proportion of industry. Cumberland Council notes that 40 per cent of employment within the LGA is accounted for by these services, and on-site inspections have confirmed the presence of large warehouse and factory spaces throughout the study area. Similarly, City of Parramatta recognises the Rydalmere – Camelia – Rosehill – Silverwater districts as key manufacturing, wholesale trade, transport and logistics hubs that are likely to expand in the future. This is logical given the proximity of compatible facilities such as the Enfield Intermodal Terminal (approximately five kilometres south-east) and the historical Clyde Railway Sidings.

There are also cement-holding and concrete batching facilities located along Parramatta Road which contribute heavy vehicle and freight traffic to the road environment in the area. Overall, the study area presents a range of land uses associated with different forms of freight. Unlike more intense land uses that require last mile delivery such as residential and traditional retail, the study area generates large freight deliveries to service different industries currently present. This can be seen in the extensive network of approved heavy vehicle routes, as shown in Figure 3.13.

Figure 3.13: Existing approved B-Double routes



Source: <http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/index.html> (accessed 07/06/18)

Within the study area the approved roads for use by 19-metre-long B-Doubles include the entire length of Parramatta Road, St Hilliers Road, Silverwater Road, Percy Street, Rawson Street and M4 Western Motorway (which links to WestConnex).

Freight Road Hierarchy

The freight road hierarchy provides a structured definition of functionality on the State Road system.

The objectives of the metropolitan road freight hierarchy are:

- To support the pattern of industrial lands and activities that lead to varying freight flows on the road network by providing suitable road infrastructure
- To provide for the specific needs of freight vehicles in operating the road network as a safe, sustainable and efficient road transport system for all road users
- To supplement the administrative classification of roads by recognising the varying intensity of freight generating activities and heavy freight vehicle demand on roads within the State Road classification

EXISTING TRANSPORT NETWORK

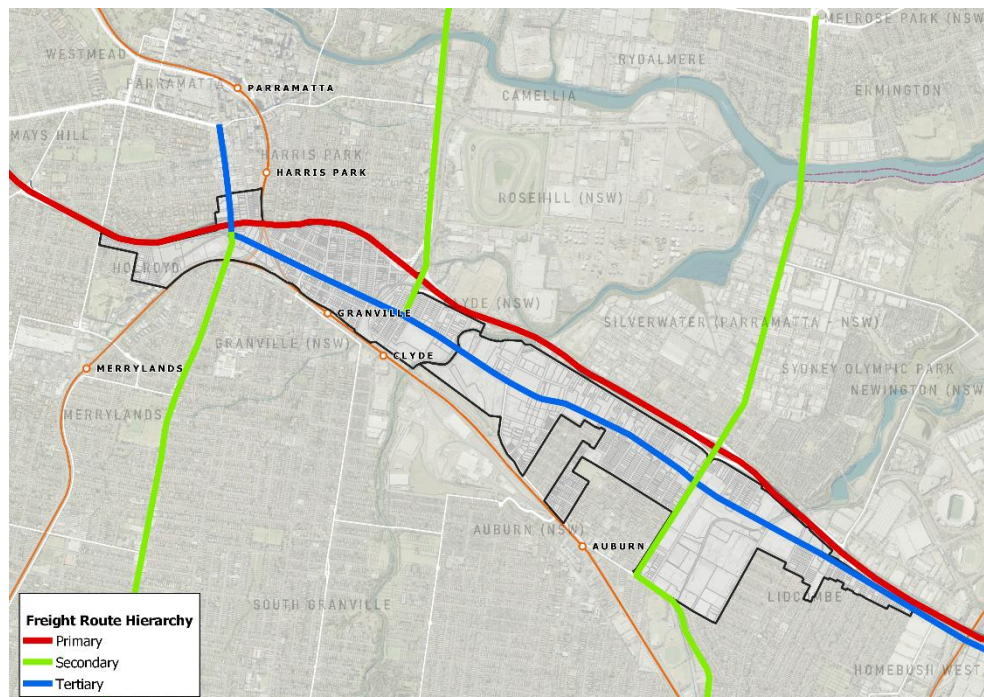
The Metropolitan Road Freight Hierarchy on the State Road Network - Practice Note defined the following hierarchy:

- Primary Freight Routes connect regions and services strategically important ports, airports, industrial areas, freight terminals, intermodal terminals and hubs. They typically carry high volumes of heavy freight vehicles (>4,000 heavy vehicle AADT)
- Secondary Freight Routes serve major business and freight origins and destinations within a regional area. They typically carry medium volumes of heavy vehicles (1,000-5,000 heavy vehicle AADT)
- Tertiary Freight Routes connect within major subregion and services groupings of business and freight origins and destination within a subregion. They typically carry lower volumes of heavy vehicles (<2,000 heavy vehicle AADT).
- Other State Roads serve general freight needs within a locality.

The freight hierarchy of state roads within the study area is the following:

- M4 - Primary Freight Route;
- James Ruse Drive - Secondary Freight Route;
- Woodville Road - Secondary Freight Route;
- Olympic Drive/Silverwater Road - Secondary Freight Route;
- Church Street - Tertiary Freight Route;
- Parramatta Road - Tertiary Freight Route.

Figure 3.14: Freight hierarchy



3.6. Parking

3.6.1. On-street parking

There are various parking management measures throughout the study area road network:

- No kerbside parking is permitted on major arterial roads. Stopping to drop off or pick up passengers is allowed in some sections outside of clearway conditions
- Kerbside parking is allowed outside of clearway conditions on regional roads
- Restricted parking is allowed on streets adjacent to Granville and Auburn Stations
- Unrestricted parking is allowed on remaining streets.

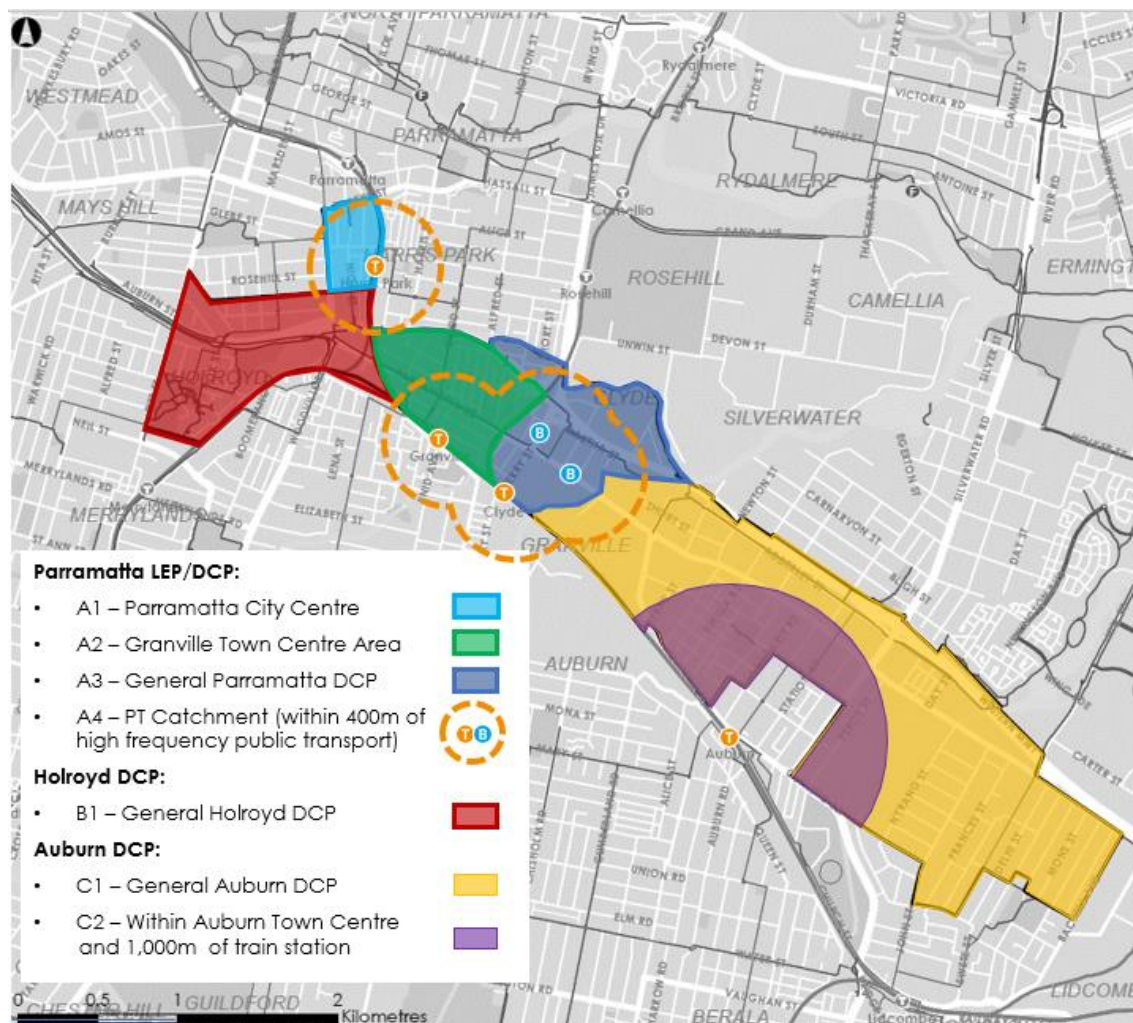
3.6.2. Off-street parking rates

Off-street parking requirements are set by Cumberland Council and City of Parramatta based on a series of local environment plans (LEPs) and development control plans (DCPs) that reflect land use and location:

- For Parramatta LGA, parking rates are set in Parramatta LEP 2011 for Parramatta City Centre and in Parramatta DCP 2011 for other areas.
- For Cumberland LGA, parking rates are set in Auburn DCP 2010 and Holroyd DCP 2013. A draft Cumberland DCP was on public exhibition in 2020 but is yet to be gazetted.

The different parking controls applying to the study area are shown graphically in Figure 3.15.

Figure 3.15: Applicable parking controls within the study area



A summary of parking requirements applicable to the study area is presented in Table 3.6 and Table 3.7.

Table 3.6: Car parking provision within the study area within Parramatta LGA

Land Use	Area A1 Parramatta City Centre	Area A2 Granville Town Centre	Area A3 General	Area A4 Parramatta – PT catchment	Area B1 Holroyd - General
High Density Residential					
Studio	0.6 space maximum	As per A4 if within high frequency PT catchment otherwise as per A3	0.6 space minimum	1 space minimum	0.8 space minimum and 1 space maximum
1-bedroom unit	1 space maximum		1 space minimum	1 space minimum	0.8 space minimum and 1 space maximum
2-bedroom unit	1 space maximum		1.25 spaces minimum	1 space minimum	1 space minimum and 1.5 spaces maximum
3-bedroom unit	1 space maximum		1.5 spaces minimum	1.2 spaces minimum	1.2 spaces minimum and 2 spaces maximum

EXISTING TRANSPORT NETWORK

Land Use	Area A1 Parramatta City Centre	Area A2 Granville Town Centre	Area A3 General	Area A4 Parramatta – PT catchment	Area B1 Holroyd - General
4 or more- bedroom unit	1 space maximum		2 spaces minimum	2 spaces minimum	1.5 spaces minimum and 2 spaces maximum
Visitor parking	0.2 space per dwelling maximum		0.25 spaces per dwelling minimum	0.25 spaces per dwelling	0.2 spaces minimum and 0.5 space maximum per dwelling
Commercial					
Office/ Commercial	1 space per 100m ² GFA maximum	1 space per 70m ² GFA minimum and 1 space per 50m ² GFA maximum.	1 space per 50m ² GFA minimum	As per A1, A2, A3 depending on location	1 space per 50m ² GFA minimum and 1 space per 15m ² maximum in B4 Mixed Use 1 space per 40m ² GFA minimum and 1 space per 20m ² maximum in B1, B2 and B6 zones
Retail	1 space per 30m ² GFA maximum	1 space per 60m ² GFA minimum and 1 space per 30m ² GFA maximum.	1 space per 30m ² GFA minimum		
Industrial					
Factories/ Warehouse	N/A	N/A	1 space per 70m ² GFA minimum	As per A1, A2, A3 depending on location	1 space per 70m ² GFA minimum
Bicycle Parking					
Residential	0.5 space per dwelling				Minimum 0.5 space per dwelling
Non-residential	1 space per 200m ² GFA minimum				Minimum 1 space per 200m ² employee + 1 1 space per 2,500m ² visitors for ground floor and 1 space per 750m ² for other floors

Table 3.7: Car parking provision within the study area within Auburn LGA

Land Use	Area C1 Auburn - General	Area C2 Auburn – Town Centre / Train station
High Density Residential		
Studio	1 space minimum	1 space minimum and maximum
1-bedroom unit	1 space minimum	1 space minimum and maximum
2-bedroom unit	1 space minimum	1.2 spaces minimum and 3 spaces maximum
3-bedroom unit	2 spaces minimum	1.5 spaces minimum and 4 spaces maximum

EXISTING TRANSPORT NETWORK

Land Use	Area C1 Auburn - General	Area C2 Auburn – Town Centre / Train station
4 or more-bedroom unit	2 spaces minimum	2 spaces minimum and 6 spaces maximum
Visitor parking	0.2 spaces per dwelling minimum	Dependent on block size
Commercial		
Business premises	1 space per 40m ² GFA	1 space per 60m ² GFA minimum and 1 space per 10m ² GFA maximum
Office Premises		
Retail Premises		
Industrial		
Factories	1.3 space per 100m ² GFA minimum	
Warehouse	1 space per 300m ² GFA minimum	
Ancillary Offices	1 space per 40m ² GFA minimum	
Bicycle Parking		
Residential	Mixed use development: 0.2 space per dwelling	
Non-residential	1 space per 10 employees	

As can be seen in Table 3.6 and Table 3.7, there is a mix of maximum and minimum parking provisions across the study area. Areas within the catchment of high frequency public transport or within mixed-use environments have lower parking requirements, which follows good practice. However, the variety of rates and parking philosophies applied across the former LGAs (e.g. the distance from station criterion) is inconsistent and would benefit from harmonisation/ consolidation.

The Parramatta Road Corridor Urban Transformation (PRCUT) – Planning and Design Guidelines, Implementation Toolkit (November 2016) recommends that the following rates be applied for Auburn and Granville study area:

Table 3.8: Car parking provision within the study area within Auburn LGA

Land Use	Granville Precinct	Auburn Precinct Granville Frame Area
Residential		
Studio	0.3 space maximum	0.6 space maximum
1-bedroom unit	0.5 space maximum	0.9 space maximum
2-bedroom unit	0.9 space maximum	1.2 space maximum
3-bedroom unit	1.2 space maximum	1.5 space maximum
Visitor parking	0.1 spaces maximum	0.2 spaces maximum
Other		
Commercial	1.5 space per 100m ² GFA maximum	0.7 space per 100m ² GFA maximum
Retail	1.0 space per 100m ² GFA maximum	0.5 space per 100m ² GFA maximum
Industrial	1.5 spaces per 100m ² GFA maximum	1.0 spaces per 100m ² GFA maximum

As a way of comparison, Table 3.9 shows the parking requirements for selected parts of Sydney, and those recommended by TfNSW (former RMS) guidelines (Guide to Traffic Generating Development GTTGD 2002) for metropolitan regional and sub-regional centres. The benchmark areas have been selected based on the following considerations:

- In 2018 the City of Sydney had the lowest parking requirements in metropolitan Sydney. As Parramatta aspires to become Sydney's second CBD, reliance on the private car should reduce and parking requirements could progressively evolve towards those applied in Sydney CBD.
- The Macquarie Park Corridor presents some similarities with the study area, being an urban renewal area within an economic corridor and positioned on a main rail line.

Table 3.9: Benchmarking Parking Requirements in other areas in Sydney

Land Use		City of Sydney (vary depending on public transport accessibility)	Macquarie Park Corridor ^[1]	TfNSW rates metropolitan regional and sub-regional centres ^[2]
Residential (High Density)	Studio	0.1 to 0.4 maximum	0.6 space maximum	0.4-0.6 space
	One-bedroom	0.3 to 0.5 maximum	0.6 space maximum	0.4-0.6 space
	Two-bedroom	0.7 to 1 maximum	0.9 space maximum	0.7-0.9 space
	Three-bedroom	1 to 1.2 maximum	1.4 space maximum	1.2-1.4 spaces
	Visitors	0.1 to 0.4 maximum	0.1 space maximum	1/7-1/5 space
Commercial		1 space per 75 to 175 sqm GFA	1 space per 60 sqm GFA (or) 1 space per 100 sqm GFA*	1 space per 40sqm GFA
Retail		From 1 space per 60 sqm GFA to 1 space per 90 sqm GFA	-	1 space per 20-25 sqm GFA
Car Share		From 1 car share per 30 car spaces provided to 1 car share per 90 car spaces provided	1 car share per 50 proposed parking spaces	-
Bicycle Parking		Residential: 1 space per residential dwelling Commercial: from 1 space per 250 sqm GFA to 1 space per 150 sqm GFA	10% of required car spaces	-

[1] depends on location and if new use or change of use

[2] metropolitan regional centre: metropolitan centre or strategic centre as per the Sydney Region Plan
metropolitan sub-regional centre: remaining Sydney centres services by railway or light-rail stations

Based on this comparison and the review of the PRCUTS, residential apartment building car parking rates are relatively high in the study area. Car parking rates could potentially be reduced provided that public transport and active transport links to employment, shops and recreation are significantly improved as part of the project.

EXISTING TRANSPORT NETWORK

Furthermore, improved bicycle parking, car share parking and electric vehicle charging stations are requirements that could be advanced in future DCPs.

This was also part of the PRCUT Planning and Design Guidelines, which in addition recommended the provision of shared car parking spaces in all buildings. Shared parking is parking shared by more than one user, which allows parking facilities to be used more efficiently.

4. FUTURE TRANSPORT

4.1. Committed and Planned Projects

The list of key future projects within and surrounding the study area is shown in Table 4.1. These will all have varying levels of influence on the development and transport network for Granville and Auburn.

Table 4.1: Key Implications of Projects and Proposals

Project	Proponent	Scope	Implication	Project Status (December 2021)
WestConnex	WestConnex	Expansion of M4 and underground tunnel connection between Rozelle and St Peters Interchange.	Diverting proportion of vehicles travelling between Parramatta and Sydney CBD and Port Botany/ Airport, including a significant number of heavy vehicles, from Parramatta Road. This project has largely been completed for the study area which includes the widening of the M4 corridor to three and four lanes in each direction.	Completed in the study area
Parramatta Light Rail	Parramatta Light Rail	Multiple stage light rail with Stage 2 servicing current industrial suburbs.	Mass transit system to service Parramatta, Westmead and further north in Stage 1. Stage 2 will enable redevelopment of Carter Street into more intense land uses.	PLR Stage 1 under construction
Sydney Metro West	Sydney Metro	Metro rail between Sydney CBD, the Bays Precinct, Olympic Park and Parramatta.	Alleviation of train stations throughout GPOP and PRUTS corridors with confirmed new stations at Olympic Park.	Project Concept approved (March 2021), construction to start in 2022
Parramatta Road traffic and road improvements	TfNSW	Along Parramatta Road between Lidcombe and Parramatta	A series of traffic and road improvements to improve traffic flow and safety along Parramatta Road between Church Street and Birnie Avenue in Lidcombe.	Planned
Urban Roads Pinch Point Program	TfNSW	Intersection of Great Western Highway, Church Street and Parkes Street	Intersection and pinch point improvement work to reduce delays along Great Western Highway and Parramatta Road.	Project announced, construction to start
Upgrades to Parramatta Inner and Outer Ring Roads	TfNSW City of Parramatta	Inner Ring Road around Parramatta CBD and an Outer Ring Road through Westmead, Wentworthville and Harris Park.	Will allow through traffic to bypass Parramatta CBD linking James Ruse Drive, Cumberland Highway and M4. This will provide residents and businesses on the periphery, especially Granville and Harris Park to better access Cumberland Highway.	Early Stage Proposal (Stage 1)
Upgrade and Construction of Cycling infrastructure and Cycleways	City of Parramatta/ TfNSW	New pedestrian/cyclist crossing of Parramatta Road at Marsh Street; new shared path on the southern side of Parramatta Road between Rowell Street and George Street; New cycleway along Alfred Street.	Will provide safe cycling links and crossings in Parramatta	Construction started

4.1.1. M4 East

The WestConnex project is a predominately underground motorway allowing reduced travel times between Parramatta, Sydney Airport and Port Botany by bypassing intersections with a tunnel interchange to connect the M4 with the M5. The first stage of the project was the M4 widening from Parramatta to Concord, and the construction of the M4 East twin tunnels from Homebush to Haberfield.

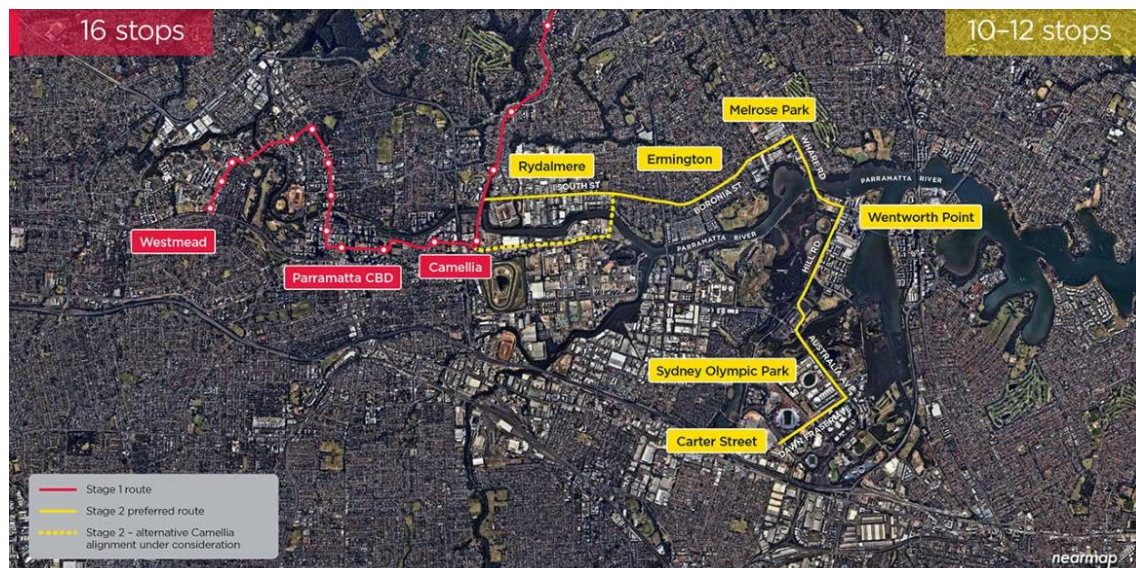
The desired outcome for the project is reduced travel time for vehicles as the M4 East will reduce demand for travel along Parramatta Road thereby bypassing several signalised intersections. Specifically, the widening provides between three to four lanes per direction of travel (depending on location) with a number of on and off-ramps to allow better access to the surrounding areas. Later stages of the WestConnex project involve construction of the King Georges Road Interchange, M8 Tunnel, St Peters Interchange, M4-M5 Link, Iron Cove Link and Rozelle Interchange.

4.1.2. Parramatta Light Rail

Parramatta Light Rail is a NSW Government commitment to support sustainable urban growth in the Greater Parramatta to Olympic Peninsula (GPOP) priority growth area and to make the City of Parramatta the focal point for Western Sydney.

Parramatta Light Rail will support urban growth by delivering a high-frequency, turn-up and-go light rail service that would attract people and jobs to the GPOP priority growth area. Stage 1 of Parramatta Light Rail will connect Westmead to Carlingford via Parramatta CBD and Camellia. Stage 2 of the project has not yet been finalised. It is expected to connect with Stage 1 with a preferred route to Sydney Olympic Park via Ermington and Wentworth Point with a terminus at Carter Street.

Figure 4.1: Parramatta Light Rail Stage 1 and 2



Source: NSW Government, 2018

4.1.3. Sydney Metro West

The Sydney Metro West project was announced by the NSW Government on 14 November 2016. Sydney Metro West will be a new underground metro railway line linking Parramatta and the Sydney CBD, with potential to be extended into other Western Sydney growth areas.

The Sydney Metro West will be able to move about 40,000 people per hour in each direction. While the number of stations and their locations will be finalised as investigations progress, Sydney Metro West will service four key precincts, as shown in Figure 4.2 and including:

- Parramatta, doubling in the number of jobs to 100,000 over the next 20 years
- Sydney Olympic Park, where 34,000 jobs and more than 23,000 residents will be located by 2030
- The Bays Precinct, planned to be a new innovation hub with regeneration of about 95 hectares of land
- Sydney CBD, where the Sydney Metro West will integrate with the other metro lines and with the CBD and South East Light Rail.

Sydney Metro West will integrate with long-term transport planning for Western Sydney including rail needs currently being investigated around the future Western Sydney Airport.

Figure 4.2: Sydney Metro West Station Focus Precincts



Source: Sydney Metro, 2021

In addition, the Sydney Metro City and Southwest project – due for completion in 2024 – will also have an impact on the Granville and Auburn precincts, despite it not crossing through the area. Largely due to conversion of the Bankstown Line to the Sydney Metro network, capacity on the other railway lines through the City Circle can be significantly increased. This includes the T2 Inner West & Leppington Line, with an extra 4,800 customer spaces created and a train expected every three minutes in the morning peak. Increased service frequency at the Granville and Auburn railway stations will improve accessibility and make rail a more attractive and convenient transport mode.

4.1.4. Upgrades to Parramatta Inner and Outer Ring Roads

The Parramatta Inner and Outer Ring Roads are a pair of ring roads to divert through traffic away from the Parramatta CBD to improve traffic flow in the region. The Inner Ring Road will include surface treatments, minor interventions, potential widening and prioritisation of vehicles to ensure major north-south and east-west vehicle movements remain outside the centre of Parramatta.

The Outer Ring Road will reduce car and freight congestion resulting from the eight strategic road corridors that converge on Parramatta and Westmead. A series of intersection upgrades are proposed along the M4

Motorway, James Ruse Drive and Cumberland Highway to create an arterial road network and allow traffic to circumnavigate Parramatta quickly and efficiently. The Outer Ring Road was recently listed as a high priority initiative by Infrastructure Australia (IA) and added to the Infrastructure Priority List. IA note that the next steps involve specific initiative identification and options development.

4.2. Land Use Changes

Main future land use changes within and nearby the study area within the next 20 years are summarised in Table 4.2.

Table 4.2: Future Land Use Changes

Plan	Relevance to this study
Parramatta Road Urban Transformation Strategy by Urban Growth (2016)	The Parramatta Road Corridor (the Corridor) is identified as an urban renewal corridor that will be the focus for increased housing, economic activity and social infrastructure. As currently proposed, the Corridor will be transformed over the next 30 years through implementation of the Parramatta Road Urban Transformation Strategy. In 2050, the Corridor will have an estimated resident population of 62,000, approximately 50,000 new jobs. The Corridor extends along the entire length of Parramatta Road, and includes land with direct frontage to Parramatta Road, as well as the eight Precincts. The Granville & Auburn precinct is within the corridor, located within the City of Parramatta and Cumberland City LGAs.
GPOP Place-Based Infrastructure Compact (2019)	Prepared by the Greater Sydney Commission, this is a strategic planning model that looks holistically at the Greater Parramatta and Olympic Peninsula (GPOP) area to better align growth with the provision of infrastructure and services. Split into several action stages, Action 1 features growing precincts already funded by major infrastructure such as Parramatta, Wentworthville and Carter Street. Proposed Action 2 is to grow precincts when more major infrastructure is delivered. These precincts include the study area of Granville and Auburn, as well as neighbouring areas such as Sydney Olympic Park and Homebush-North Strathfield. Proposed Actions 3 and 4 feature areas with higher costs for supporting growth. Proposed short term infrastructure priorities involving the study area include: • Primary and Secondary school proposals servicing the Granville Precinct • Granville Police Station upgrades • Improvements to the north-south regional cycleway at Granville
City of Parramatta Local Housing Strategy (2020)	The City of Parramatta Local Housing Strategy provides direction about when and where future housing growth will occur to 2036 and beyond. The City of Parramatta has exceeded the 0-5-year housing target in the Central City District Plan. Dwelling delivery in growth precincts is likely to exceed implied dwelling requirements outlined by the DPIE. Therefore, the principal objective of the land use planning approach in this Strategy is to ensure that housing delivery be staged to align with planned transport infrastructure upgrades. Granville's housing/population growth is designated as medium priority and is staged to align with the delivery of Sydney Metro West construction (expected 2030). As outlined in the Planning Forecast Scenario to 2036, the dwellings are expected to be delivered at different outlined time frames: • 0-5 years (2016-21): 1750 • 6-10 years (2022-26): 950 • 11-20 years (2027-36): 3130
Parramatta Employment Lands Strategy – Review and Update (2020)	This strategy provides direction for Parramatta's employment land zoning and reiterates the broader vision of employment land precincts in the council's LSPS. The Parramatta Road section of Granville is currently zoned as B6: small, multiple industries/businesses. Its strategic direction is classified as an Investigation Area and the Strategic Action being to rezone land for mixed use – commercial/residential.

Plan	Relevance to this study
Cumberland Local Housing Strategy (2020)	This strategy outlines housing targets to guide short, medium, and long-term housing growth. It also identifies a vision and key priorities with supporting objectives and actions, and defines our land use planning approach to deliver housing supply for Cumberland. Auburn is considered a principal local centre as it meets the criteria for 30 minute access to a Strategic Centre and provides services and facilities to meet the needs of the broader community. Auburn is therefore considered to have a higher population growth, projecting to grow from 41,495 (2018) to 57,698 (2036)
Cumberland Employment and Innovation Lands Strategy (2019)	This strategy presents a coordinated approach that has been developed to support future economic opportunities for Cumberland Council by outlining the land use approach for employment and innovation land precincts across the area. Within the strategic framework, the Parramatta Road (Auburn) precinct is identified as a Commercial Corridor. This focus will be on renewal with employment focus, including advanced knowledge creative industries and digital and advanced manufacturing.

4.3. COVID-19 Transport Implications

4.3.1. Introduction

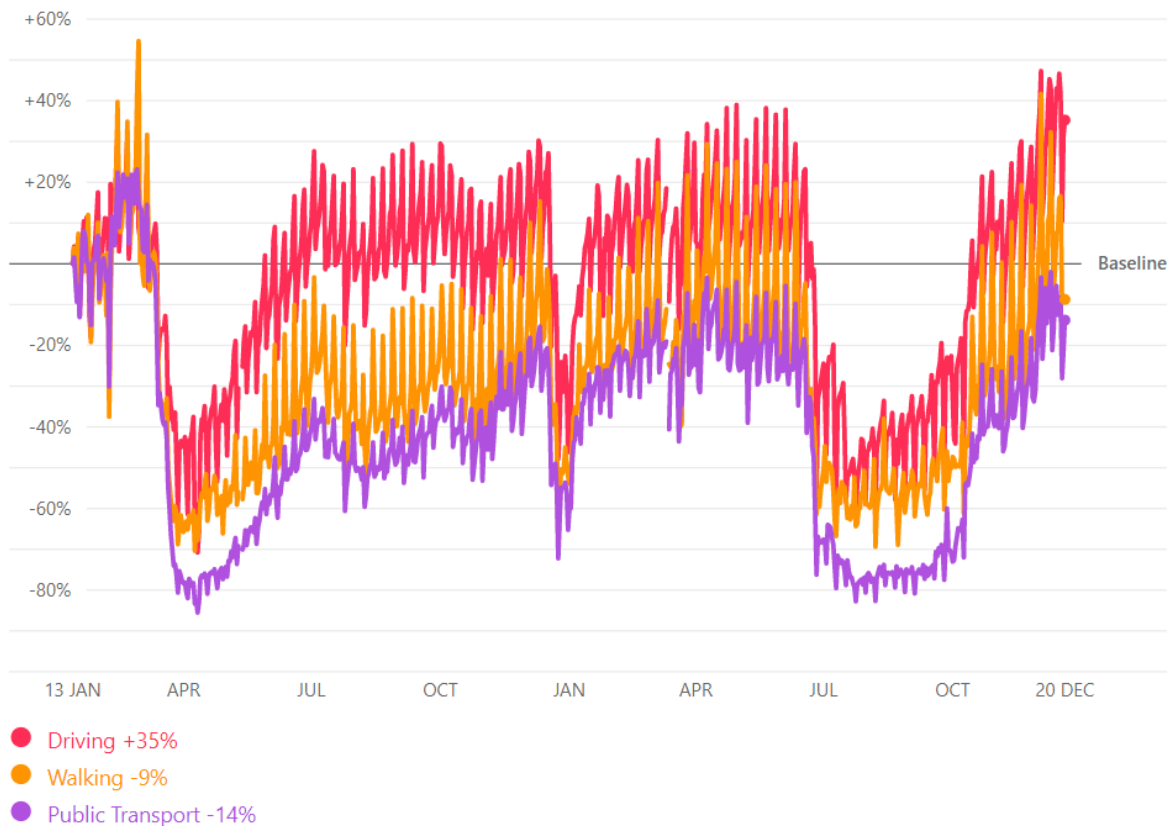
The effects of the global COVID-19 pandemic have had and continue to have far-reaching impacts on personal mobility and travel behaviour in all Australian cities. The impact of the initial lockdowns in March 2020, subsequent government-imposed travel and mobility restrictions and the general fear of contracting COVID-19 outside of people's homes have fundamentally changed the way people travel for work and other purposes in Australia. With continual uncertainty around the duration of this pandemic, changes to travel behaviour caused by COVID-19 are expected to remain in the interim. This section outlines the nature and scale of the travel-related impacts in Australia and sets out potential future implications for cities and council areas including Granville and Auburn in the short and longer terms.

4.3.2. Impacts on travel behaviour in Sydney and Australian cities

Initial shock, recovery and stabilisation

Across all transport modes in 2020 and 2021, personal mobility demand has undergone a steep decline during periods of hard lockdown, to phases of recovery and stabilisation as either community transmission cases of COVID-19 reduced and stabilised (first lockdown), or higher rates of vaccination (post-second lockdown).

Figure 4.3: Transport demand in Sydney, January 2020 to December 2021, percentage of baseline demand

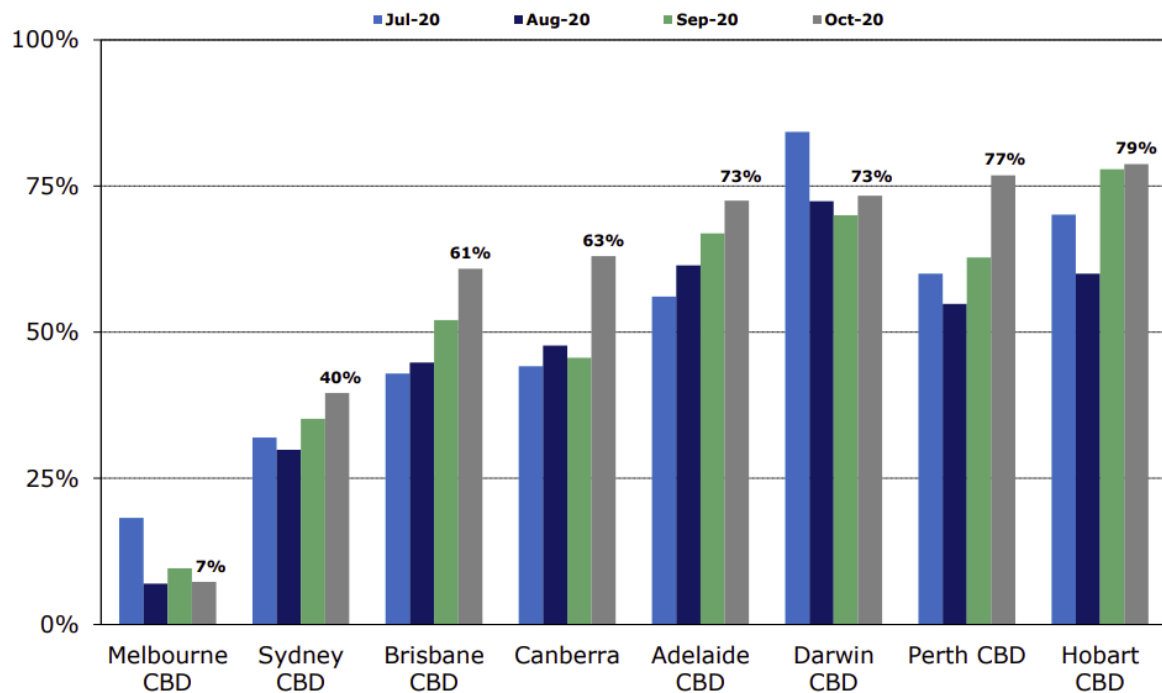


Source: Apple Mobility data - <https://covid19.apple.com/mobility>

Uneven recovery

Despite the stabilisation of COVID-19 case numbers and transport demand in Sydney, not all modes have yet returned to their pre-COVID-19 level of demand, with public transport lagging in its recovery compared to driving with driving demand back at or in some cases exceeding pre-COVID-19 levels (Figure 4.3). This trend suggests that the attractiveness of working from home and the fear of COVID-19 infection while using public transport are strong determinants of public transport use rather than actual COVID-19 case numbers. Working from home has caused sharp declines in Sydney city centre office occupancy rates, although this is gradually increasing in line with the slow public transport patronage recovery (Figure 4.4).

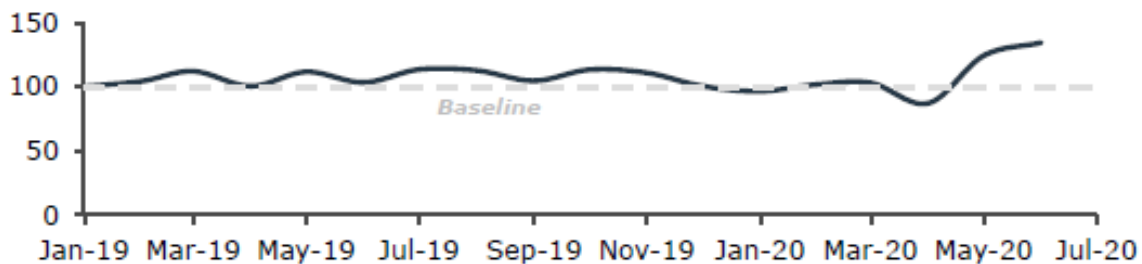
Figure 4.4: Office occupancy levels compared to the pre-COVID-19 period



Source: Property Council of Australia

The shift away from public transport use to more private vehicle use may also become an enduring trend, as demonstrated in the growth of second-hand vehicle registrations in NSW in 2020, which suggests more households were purchasing an additional car, shown in Figure 4.5.

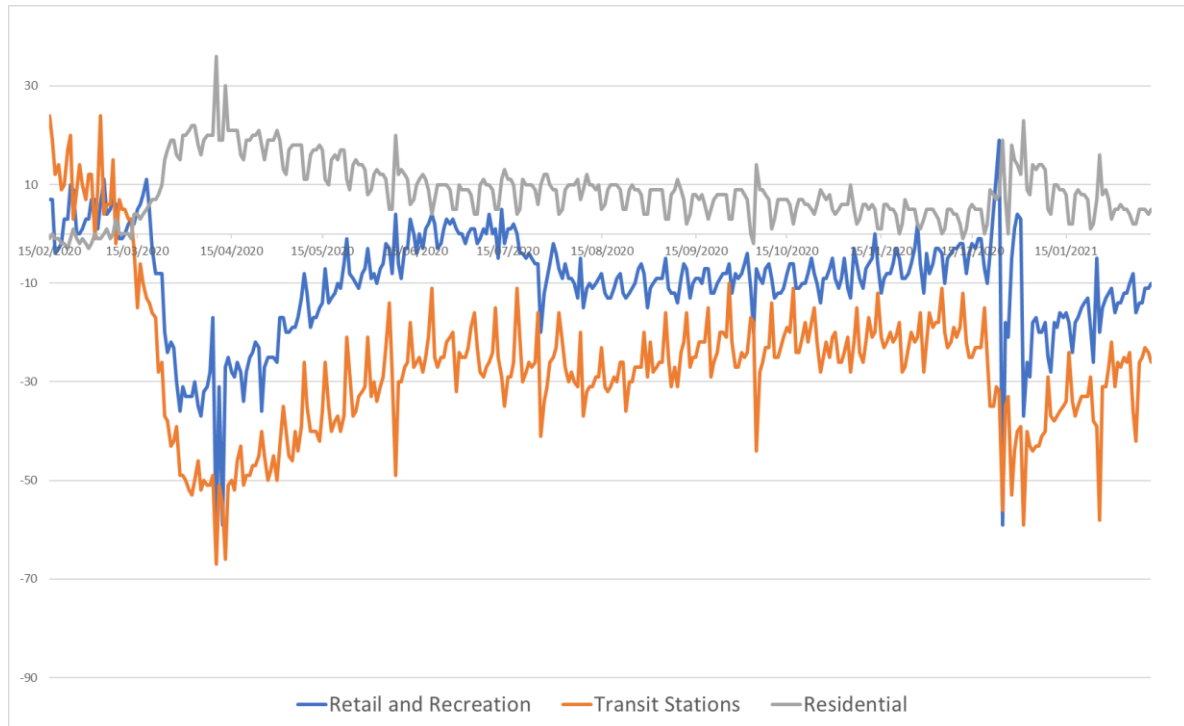
Figure 4.5: Growth in second-hand vehicle registrations in NSW, June 2017 – June 2020, percentage of baseline demand



Source: Transport for NSW registration data table 1.3.2 in *Infrastructure beyond COVID-19 – A national study on the impacts of the pandemic on Australia* (Infrastructure Australia, 2019)

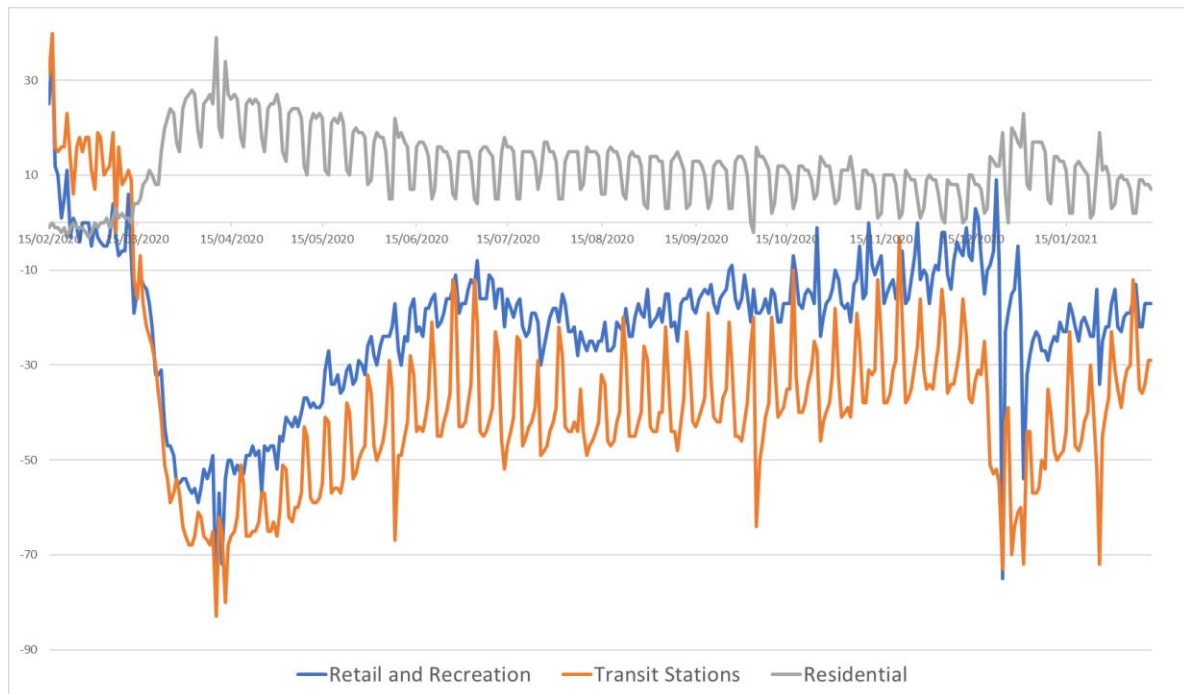
In terms of mobility trends for Granville and Auburn, Google Mobility data reveals a similar trend of a steep decline followed by recovery and stabilisation in line with Greater Sydney's transport demand trends in Figure 4.3

Figure 4.6: Percentage change in visitation to retail and recreational activities, transit stations and residential activity from the baseline in Cumberland Council LGA



Source: Google LLC "Google COVID-19 Community Mobility Reports". <https://www.google.com/covid19/mobility/> Accessed: 16/02/2021

Figure 4.7: Percentage change in visitation to retail and recreational activities, transit stations and residential activity from the baseline in City of Parramatta LGA



Source: Google LLC "Google COVID-19 Community Mobility Reports". <https://www.google.com/covid19/mobility/> Accessed: 16/02/2021

Figure 4.6 and 4.7 show that visitation to retail and recreational activities as well as public transit stations in the Cumberland Council and City of Parramatta LGAs experienced a steep decline during March before going through a recovery and stabilisation process throughout 2020 compared to the baseline of a five-week period across January and February 2020. At the same time, both Figures show residential activity rising during March 2020, as more people stayed at home due to lockdown measures. This stay-at-home activity declined slightly as the months progressed in 2020 but remained above the baseline throughout the year. There was an increase in late 2020/early 2021, most as a result of the cases relating to the Avalon cluster.

Growth in cycling

While people in Sydney have moved away from public transport, there has also been growth in cycling across many areas of Sydney. The City of Sydney reported an increase in cycle traffic of around 25 to 50 per cent as measured by its cycle counters¹. In response, Transport for NSW has worked with local councils to deliver over 10 km of pop-up cycleways in Sydney to cater for this increased demand and to incentivise socially distanced active transport.

The City of Parramatta reported a 50% increase in cyclists measured by the local cyclist counters.

Decentralised freight

The continued popularity of working from home, reduced travel to the Sydney city centre and the fear of contracting COVID-19 while shopping has led to a significant growth in online shopping and home deliveries. Online shopping in NSW grew by 102 per cent in April 2020 compared to April 2019, while usage of Australia Post parcel lockers outside of CBD locations increased by 25 per cent while CBD usage was down by 25 per cent between March and May 2020.² This increase in freight to decentralised locations has increased demand for loading in dispersed suburban locations.

4.3.3. Implications for the future

As Australia embarks on its ongoing recovery from the COVID-19 pandemic and the prospect of a vaccine may encourage more social interaction and mobility, the extent to which the impacts of COVID-19 on travel behaviour become enduring in the longer term is a question that policymakers across all levels of government must grapple with. In light of the trends observed in 2020, GTA has outlined a number of scenarios that may prevail in cities and LGAs throughout Australia, including Granville and Auburn. These scenarios include:

- **Hitting the Road** – desire for socially distanced transport and the fear of contracting COVID-19 leads to strong growth in car use and ownership that persists beyond the pandemic
- **Getting Active** – growth in cycling to avoid public transport leads to growing confidence in cycling and discovery of local cycle routes, which drives an ongoing uplift in active travel
- **Flex Working** – attractiveness of working from home leads to flexible working arrangements post-pandemic (e.g. half a week at home, half a week at the office)
- **Back to Business As Usual** – the success of Australia's recovery from COVID-19 and the roll-out of a vaccine provides confidence for greater social interaction and mobility on par with pre-COVID-19 trends. Office work returns largely to the office in city centres and public transport patronage returns to pre-COVID-19 levels.

The transport phenomena and future implications associated with each of these scenarios are summarised in Table 4.3 below.

¹ <https://www.afr.com/companies/infrastructure/bike-lanes-in-demand-as-cycling-is-rediscovered-20200612-p551xy>

² Australia Post 2020 eCommerce Industry Report

Table 4.3: Potential post-pandemic scenarios

Scenario	What could change?	Implications
Hitting the Road	- Continued high vehicle kilometres travelled and car ownership - Greater traffic volumes and longer peaks - Greater parking demand - Deterioration in road safety due to greater conflicts between vehicles and other users	- Demand for more road capacity to relieve growth in traffic - Demand management techniques such as road or congestion pricing to be explored - Rising parking costs and calls for more parking supply - Road space allocation away from cars becomes more difficult - Growth in tailpipe and greenhouse gas emissions
Getting Active	- Growth in cycling, walking and other forms of micro-mobility for short trips - Increased safety risks to people walking and cycling	- Demand for more safe and socially distanced walking and cycling infrastructure (e.g. wider paths) - Demand for more end-of-trip facilities at workplaces - Greater prevalence of e-mobility devices
Flex Working	- Reduced commuting demand as workers work from home for a part of the week - Variable start and finish times lead to spreading of peak commutes - Emergence of satellite offices leads to localised trips	- Reduced peak demand reduces the need to provide transport capacity based on peak requirements - Reduced interpeak demand due to more virtual meetings - Demand for major transport infrastructure softens. - Push for smaller scale local transport infrastructure
Business as Usual	- Same mode-share as pre-COVID 19 and associated pressures on transport networks. - Public transport will return to pre-COVID 19 levels.	- Continued impetus for delivery of the current pipeline of public transport and road network infrastructure. - A missed opportunity to build on lessons learnt during the pandemic – e.g. the need for safe and socially distanced active transport infrastructure, less travel for meetings, flexible working arrangements

Given the dynamic nature of the pandemic and the uncertainties that lie ahead, it is likely that the scenarios highlighted above will not play out in a mutually exclusive manner; cities will likely adapt and evolve and pick up on the travel behaviours that have proved advantageous moving forward. This could mean a mix of the possible changes will eventuate, rather than completely going back to business as usual or completely adopting travel behaviours observed at the height of COVID-19 lockdowns. Proactive planning and activity by governments, business and organisations can make the most of the silver lining of COVID-19.

4.4. Challenges and Opportunities

Several constraints, challenges and opportunities have been identified within the study area based on the above assessment, including document reviews, data review and analysis, site visit observations and preliminary discussions with the client group. These constraints and opportunities broadly fall under different categories based on their nature and which are as follows:

- Active transport
- Public transport
- Road network
- Safety
- Freight
- Parking.

4.4.1. Active Transport

Challenges:

- Both Granville and Auburn have major barriers for north-south movements with limited crossing facilities. These barriers include the M4 Motorway, Parramatta Road and the railway line. During a site visit the lack of permeability and safe crossing facilities, in particular across Parramatta Road was identified.
- The pedestrian and cycling links between the three train stations, Auburn, Clyde and Granville, and the employment centres around Parramatta Road are incomplete and of varying, often poor, quality.
- Links between existing cycleways and the town centres are incomplete and lack signage and wayfinding. This discourages cycling and presents hazardous route options. Due to the distance to Parramatta road, Auburn Station is particularly hard to access for cyclists as no directions or wayfinding support is provided.
- Low quality pedestrian facilities and amenities discourage walking. This includes narrow footpaths along Parramatta Road with localised further narrowing due to bus shelters.
- Large street blocks and lack of a fine grain network inhibit local access and increase travel times.

Opportunities:

- Provide high quality cycling links between the existing east-west cycle route along Adderley Street / M4 and Auburn, Clyde and Granville stations and town centres. This should also connect into adjacent neighbourhoods as well as other existing cycle routes such as the Parramatta – Liverpool rail trail.
- Upgrade footpaths and kerb ramps, in particular consider widening footpaths along Parramatta Road, to make walking a more attractive mode choice.
- Due to the proximity of the Parramatta CBD (a 20 minute walk or 10 minute bike ride) and other key employment areas close to Granville, the delivery of key walking and cycling infrastructure should be of high priority to make both the mode of choice for commute and other trips.
- Provide high quality wayfinding and improved end of trip facilities (including bike parking located close to station entrances and bus stops consistent with the TfNSW interchange access mode hierarchy) to support interchange to high frequency public transport services at train stations and at select bus stops on Parramatta Road.
- Provide safe crossing facilities at Parramatta Road to improve north-south permeability across the corridor.

4.4.2. Public Transport

Challenges:

- Poor walk access to bus stops along Parramatta Road
- Disconnection of north and south bus routes at Auburn station
- Poor walk access and amenity along walking routes to bus stops south of the M4 Motorway
- Barriers to walk access to bus stops from the developments north of the M4 Motorway.

Opportunities:

- Implement a high frequency route between Auburn and Parramatta via Parramatta Road, in accordance with Transport for NSW's plans for rapid bus services along this corridor, to supplement the Route M92. This requires a review of the local and cross-regional bus network to avoid route and service duplication.

- Consider additional local routes between Sydney Olympic Park and Auburn via the Carter Street precinct and Newington in order to improve the connectivity between these precincts and stations.
- Improve the access to and the amenity at the bus stops along Parramatta Road
- Implement on-demand transport service options for short trips to Auburn and Granville stations with vehicles. These buses are most applicable for late night and during low patronage demand periods to and from the railway stations.
- Trial autonomous vehicles for short trips within the Granville or Auburn precincts. These vehicles are most suited to transport residents with mobility issues from retirement villages and to medical and shopping facilities.

4.4.3. Road Transport

Challenges:

- The continuity of the local road network is constrained in both east-west and north-south directions by various barriers including the railway line, the M4 Motorway, Duck River and the Clyde Railway Yard. These barriers divide the precincts and force drivers to use longer routes and arterial roads for local movements.
- Large volumes of traffic were observed along Parramatta Road. Fewer trips have been completed on the M4 Motorway following the reintroduction of tolling. This has shifted traffic back onto Parramatta Road, lessening the desired effect of reducing congestion through the study area. The future road network functions and vision for Parramatta Road will need to incentivise drivers to prefer the M4 Motorway.
- The section of Parramatta Road between Woodville Road and James Ruse Drive would remain a major thoroughfare as it forms part of the access between M4 east and areas to the southwest (i.e. Woodville Road).
- Except around the stations, roads perform a movement function. However, future increase in residential development will need further reconciliation of the movement and place functions of roads and the consideration of residents' needs for amenity and place-making.
- Large street blocks and lack of a fine grain network inhibit local access and increase travel times.
- Parts of the study area (e.g. Holroyd) have low accessibility due to barriers created by road, rail and natural geography.

Opportunities:

- The M4 Motorway has been widened and the M4 East tunnel created as a part of the WestConnex Stage 1, aiming to ease congestion on Parramatta Road. While this has affected traffic along Parramatta Road, the long term effect will not be seen until Stages 2 and 3 are completed, creating a connection from the M4 to main arterial motorways such as the M5 and the future Western Harbour Tunnel
- Additional streets could be constructed with the redevelopment of the area to improve connectivity and permeability within the area.
- Good road accessibility to employment centres (Greater Parramatta to Olympic Park corridor) would enable high-quality on-road public transport to link residents to jobs.

4.4.4. Road Safety

Challenges:

- The significant number of heavy vehicle movements throughout the study area (and particularly along Parramatta Road) pose safety issues for other road users. This has resulted in serious injuries and

fatalities, especially pedestrian crashes, as a result of pedestrians crossing at undesignated locations and the speed at which vehicles travel along Parramatta Road.

- The large block sizes between intersections, and the relative lack of crossing locations present road safety issues as pedestrians have been seen to cross at undesignated locations across Parramatta Road.
- A number of pedestrian crossings do not have kerb ramps which can cause difficulties for wheelchair/walker/pram users.
- There is an overall high number of injuries, including serious injuries and fatalities, along Parramatta Road at intersections and in the mid-blocks. Mid-block collisions involving pedestrians have a high severity which is exacerbated by the larger block sizes and relatively few opportunities for pedestrians to cross safely. Intersection collisions with high severities have been noted to occur at slip lanes where high incidence angles are high and sightlines are strained.

Opportunities:

- Improvement at intersections by providing pedestrian crossing across all legs as well as providing better signage to warn drivers using slip lanes to beware of pedestrians.
- Identification of additional crossing points along Parramatta Road including building kerb ramps at all at-grade crossings for pram/ wheelchair/ walker access. Additional crossings at mid-block locations could be grade separated if warranted.
- Review of speed limits as an initiative to enable transformation of the corridor in line, especially adjoining streets to Parramatta Road to reduce crash risk and severities and provide more vulnerable user amenity in line with the NSW Speed Zoning Guidelines.
- Potential for expansion of 40km/h high pedestrian activity areas in line with Civic Space objectives in town centres and other local centres.

4.4.5. Freight

Challenges:

- Large numbers of heavy vehicles utilise Parramatta Road, especially between James Ruse Drive and Woodville Road causing noise, safety issues and increased delay at intersections.
- Growth of industrial and manufacturing within and near the study area resulting in additional heavy vehicle traffic, especially along Parramatta Road.
- High heavy vehicle dependency for large format and bulky goods retail currently present along Parramatta Road.
- Transition to smaller business types including food/hospitality/services in the future will lead to delivery by smaller vehicles. This presents a challenge as the road network will be subject to more vehicle trips, thereby increasing demand with the most noticeable impact at intersections.
- In high-density urban areas, roads are being used by increasing numbers of light vehicles delivering goods to homes and businesses. This includes consideration that 15 per cent of traffic in Greater Sydney consist of trade/freight light vehicles and 9 per cent consist of heavy freight vehicles.

Opportunities:

- Utilising green priority for heavy vehicle trials to provide a basis on which to develop heavy vehicle platooning through intersections along Parramatta Road, James Ruse Drive and Silverwater Road. This could potentially reduce overall delay throughout the road network by reducing intersection delay.
- Business mix transitioning to food/hospitality/services/admin/education with expanded hours of operation could present an opportunity for evening/ after-hours and off-peak delivery. The transition to

smaller commercial vehicles will lead to smaller loading footprints thereby gaining better space utilisation.

- Existing industrial land use will transition to residential and change the priorities for freight in the study area, this will provide more opportunity for the use of smaller freight vehicles to make last mile delivery to future residential development.

4.4.6. Parking

Challenges:

- High availability of unrestricted on-street parking across the study area will cause issues in the long-term with the increase in population and employment, which will induce an increase in parking demand. There are opportunities for more time-restricted parking to benefit local shops and maximise efficiency of the available parking.
- Off-street parking requirements are varied across the study area due to several DCPs applying. This creates a lack of legibility and consistency.

Opportunities:

There is an opportunity to consolidate off-street car parking requirements across the study area with requirements set based on public transport accessibility and land use

- Residential car parking rates could be reduced if public transport and active transport links to employment, shops and recreation are significantly improved as part of the project.
- Residential parking rates in Granville and Auburn could be set to maximum rates following the advice provided in the 2016 PRCUTS study
- Requirements for bicycle parking could be introduced considering that various employment centres are accessible within 5 kilometres where cycling must be encouraged.
- Requirements for car sharing spaces and electric charging provision could be introduced to plan for the future, as it is expected that the use of shared vehicles and electric vehicles will increase in the next 10 years.

5. STRATEGIC THEMES AND OBJECTIVES

5.1. Strategic Objectives

The following strategic themes were identified as an outcome of the issues, challenges and opportunities identified earlier in the study.

Table 5.1: Strategic Themes and Objectives

Safety	Access and Connectivity	Support Place Functions	Travel Behaviour Change
Create safe conditions for people walking, cycling and driving	Enhance bus, walking and cycling access within the precincts	Manage movement impacts on place	Effect behaviours change to achieve mode shift, vehicle travel reduction and peak spreading
Reduce barriers to people walking and cycling	Establish multi-modal connections to outside the precincts	Allocate more road and street space to other modes and people activities in identified centres	Invest in active and public transport by leveraging off new development to shape sustainable land use

Source: GTA

The themes and supporting objectives are explained further below.

5.1.1. Safety

Create safe conditions for people walking, cycling and driving

Creating safe conditions for people walking and cycling will enable and normalise walking and cycling as the preferred day-to-day transport mode for short trips. This can be achieved by providing new facilities that make active transport more accessible and safer. Where possible, walking and cycling should have their own spaces that are not shared with other transport modes. In areas of high pedestrian and bicycle volumes, street configurations should be amended to reflect this.

To provide an overall safer road environment for drivers, speed limits should be reviewed and reduced where possible to lower crash severities and the probability of fatalities and serious injury. The design of streets and roads in environments where there is a conflict between large volumes of vehicles and people walking and cycling should also be reviewed, as the design may be encouraging speeds higher than the posted speed limit. This is especially relevant for areas where there are high numbers of vulnerable road users, including the elderly and disabled, who may require extended time to cross wide busy roads.

Reduce barriers to people walking and cycling

The propensity to walk and cycle is inversely related to the presence of missing connections, safe crossing opportunities and safe route facilities to reach key destinations.

Providing a network of priority walking and cycling links will help to make walking and cycling safer, more accessible and a more attractive mode choice for journeys within the Granville and Auburn precincts. Identifying and targeting roads and streets with infrequent crossing facilities and missing safe connections will encourage more people to try walking and cycling as their preferred mode of choice for shorter trips.

5.1.2. Access and Connectivity

Enhance bus, walking and cycling access to the Granville and Auburn precincts

Access to town centres, employment locations, major destinations, and markets within the precincts is essential to improving the economic and social well-being of Granville and Auburn's residents and workers. Access provided to these locations via walking and cycling or bus is important as they represent safe, space-efficient and environmentally sustainable ways of moving large volumes of people to centres of agglomeration without the negative impacts associated with access by car (e.g. congestion and parking needs). Strategies to improve access by walking and cycling include the establishment of new safe active transport connections and facilities to centres and key destinations as indicated in Section 5.1.1, but also include creating safe walking and cycling conditions within centres to prioritise people walking and cycling through design measures that lower vehicle speeds and allocate more space for people.

Establish multi-modal connections to destinations outside the LGA

Granville and Auburn are connected to neighbouring centres and Greater Sydney via existing road, rail and bus networks. With the emergence of new Sydney Metro stations at Sydney Olympic Park, Parramatta and adjoining LGAs, as well as Transport for NSW's establishment of a principal bicycle network that connects different parts of Greater Sydney together, it is equally important to focus on developing high quality and safe cross-regional walking and cycling connections to nearby rail stations, cycling routes and key destinations external to the Granville and Auburn precincts. In doing so, these connections expand Granville and Auburn's residents' reach to other parts of Greater Sydney and equally make Granville and Auburn more accessible destinations for employment, shopping and recreation.

5.1.3. Support Place Functions

Manage movement impacts on place; and

Allocate more road and street space to other modes and people activities in identified centres

The NSW Movement and Place Framework identifies streets which support a high intensity of place activity (e.g. people, trade, shopping, social interactions, residential activity) and a high intensity of movement activity (e.g. high traffic volumes), which are known as Main Streets. Such streets are often found in existing centres such as the Granville and Auburn town centres. It is important that Council identify ways to manage the adverse impacts of movement on place activity in these centres to ensure these centres continue to be attractive destinations for people. Example measures include street space allocation for people activity and redistributing parking to peripheral parts of a centre. Furthermore, there are also roads with predominantly high movement activity that hold special importance for certain groups of people, which are known as Main Roads. In these locations, interventions that improve safe access to these places and foster a balanced level of place activity will be important.

In addition to reallocating space for people activities, other ways to support a place function in places throughout the LGA includes allocating space for public transport and cycling. For example, this may involve repurposing a vehicle lane to a bus priority lane or redesigning bus stops to allow greater space for kerb buildouts and floating bus stops for cycling.

Such measures assist with reducing the movement intensity associated with motorised modes, which in turn contributes to a greater appreciation of local places.

5.1.4. Travel Behaviour Change

Effect behaviour change to achieve mode shift, vehicle travel reduction and peak spreading

Behavioural change to achieve greater mode shift to public transport and active transport, a reduction in vehicle kilometres travelled and peak spreading can be realised through the previously discussed objectives as well as travel demand management.

Travel demand management balances the transport network by first understanding where there are current and forecast pressures, and then working out where there is spare capacity for these to move to. These movements are then redistributed to different modes, times, and routes with spare capacity. Behaviour change is the key, and effective travel demand management measures can:

- Manage expectations – so that reasonable expectations are set.
- Manage demand at hotspots – retime, re-mode, re-route, spread the peak.
- Help optimise the transport network – by providing users with guidance on the most appropriate routes.
- Provide foundations for long-term positive behavioural change.

Invest in active and public transport by leveraging off new development to shape sustainable land use

Both Councils have direct control over the maintenance and management of local roads, footpaths, bus shelters and shared paths for people walking and cycling and are charged with reviewing and approving development applications. When reviewing applications, Council's role is to ensure development is consistent with local and state planning policy. Council can also propose changes to influence car parking, the provision of footpaths, bicycle parking and land use planning controls to shape and influence the way our cities are created.

Both Councils should also pursue opportunities for large sites to provide new walking and cycling connections as part of new development applications, to ensure new developments create attractive environments for walking and cycling and demonstrate a genuine commitment to sustainable travel.

6. SCENARIO DEVELOPMENT

6.1. Outline

A key element of this study is the recognition that land use, mode share, parking strategy, the provision of public transport services and walking and cycling infrastructure are all inter-connected, and that changes to one can impact on the others. Therefore, a scenario-modelling process was carried out, that endeavoured to test these complexities, and to assist in the identification of transport shortfalls and remedial measures.

At a high-level, the three scenario options are as follows:

- Option 1: Active Transport Focused
- Option 2: Public Transport Focused
- Option 3: Travel Demand and Multi-Modal Transport Focused

6.2. Option 1: Active Transport Focused

6.2.1. Objective: More local trips using active transport (mode share up to 15% active transport)

The main principles and initiatives included in Option 1 are as follows:

- Remove Parramatta Road as barrier
 - Improve key crossing locations
- Create more pedestrian spaces and increase connectivity
 - Identify places for people
 - Identify links for walking and cycling
- Improve pedestrian and cyclist safety
 - Separated or off-road cycleways and shared user paths: proposed routes sourced and validated from both *Parramatta Road Corridor Urban Transformation Strategy – Precinct Transport Report* (2016) and *Parramatta Bike Plan* (2017)
 - Widen footpaths

Figure 6.1: Option 1 - Granville

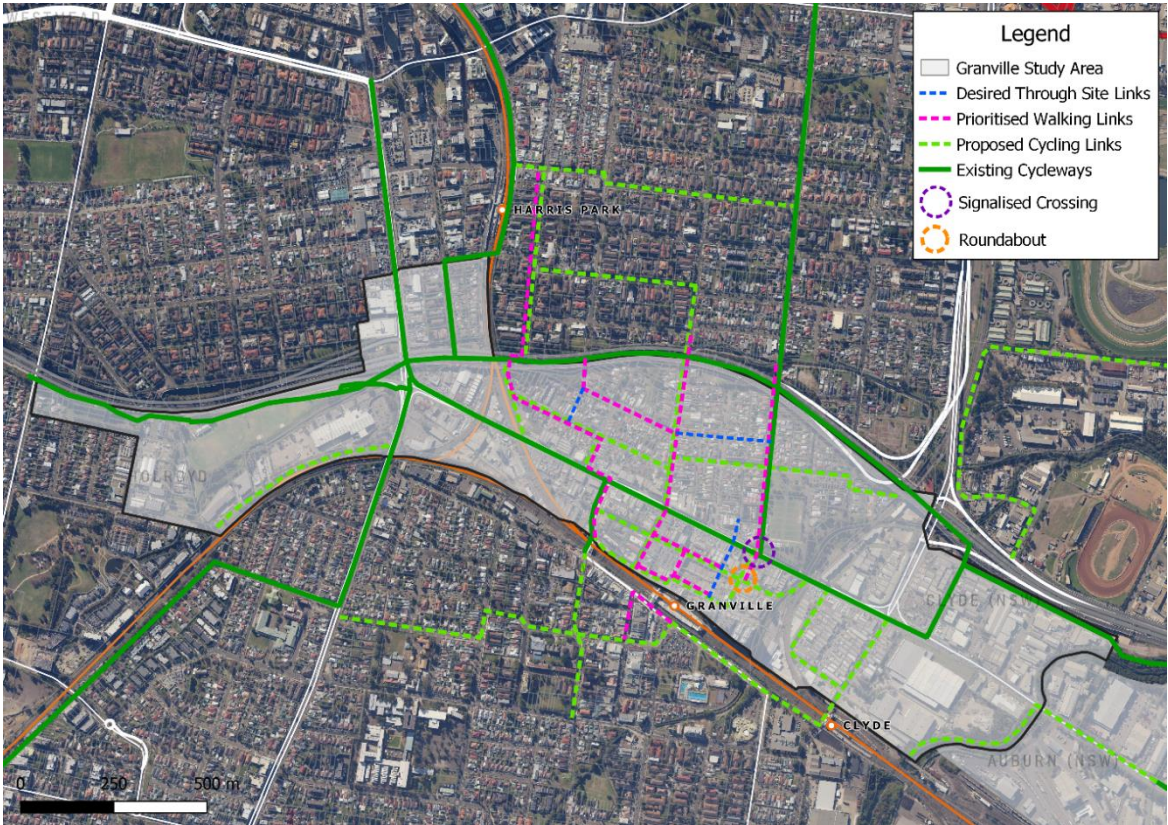


Figure 6.2: Option 1 - Auburn



6.3. Option 2: Public Transport Focused

6.3.1. Objective: Increase public transport mode share (mode share up to 50% public transport)

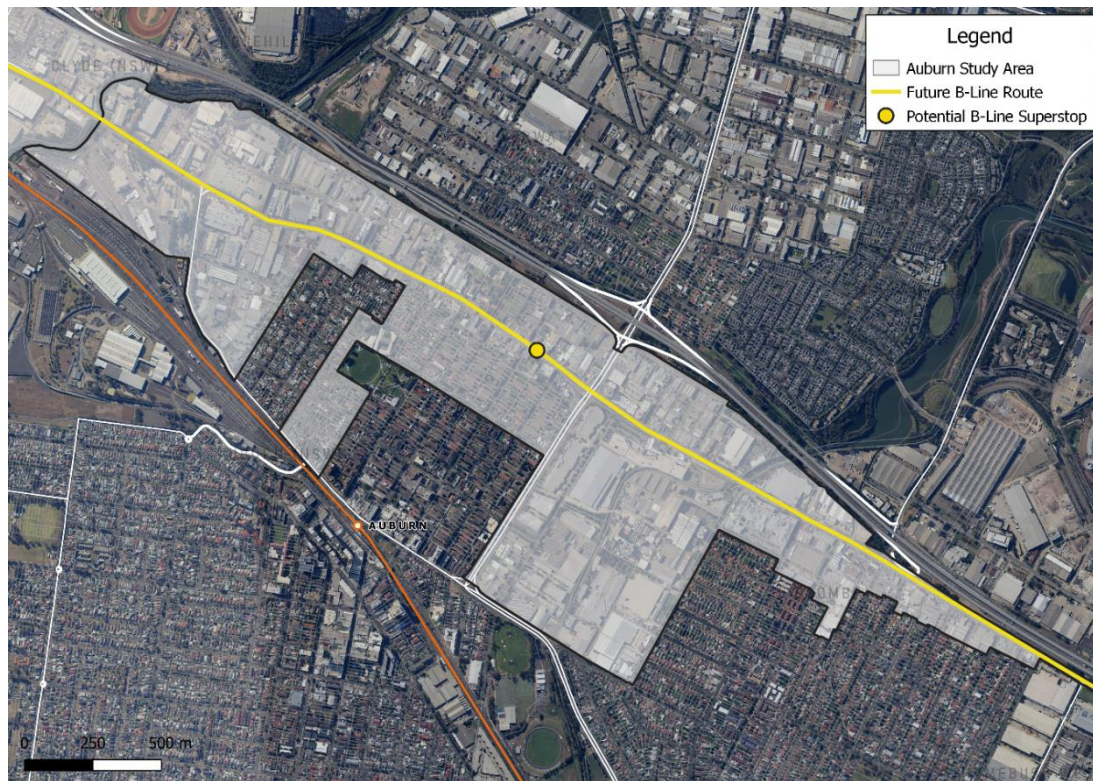
The main principles and initiatives included in Option 2 are as follows:

- Make bus services more attractive and competitive
 - Introduce B-Line style bus services in accordance with Transport for NSW's plan for the Parramatta Road corridor, upgrade bus stops, bus priority/bus lanes, wayfinding to stops, interchange, connect to more destinations
 - New routes to growing centres
- Make rail services more attractive
 - Re-introduce more services from Granville to Parramatta, more limited stops to Sydney CBD to provide more regular connections between Granville and key locations. This will help to reduce journey times, improve reliability and help with achieving a higher rail mode share.
 - Link active/buses to Auburn Station
 - Upgrade train stations (includes safety)

Figure 6.3: Option 2 - Granville



Figure 6.4: Option 2 - Auburn



6.4. Option 3: Travel Demand Management Focus

6.4.1. Objective: Mitigate and manage car travel demand/mode share (minimum 10% active transport and 45% public transport)

The main principles and initiatives included in Option 3 are as follows:

- Improve attractiveness of non-car modes
 - Include components from Options 1 and 2: proposed cycling routes sourced and validated from the *Parramatta Road Corridor Urban Transformation Strategy – Precinct Transport Report* (2016)
 - Road closures, reduction in road space
- Reduce/suppress the need to travel (work from home & work, shop, education locally etc)
 - Reduction of external trips, increase in internal trips

Figure 6.5: Option 3 - Granville

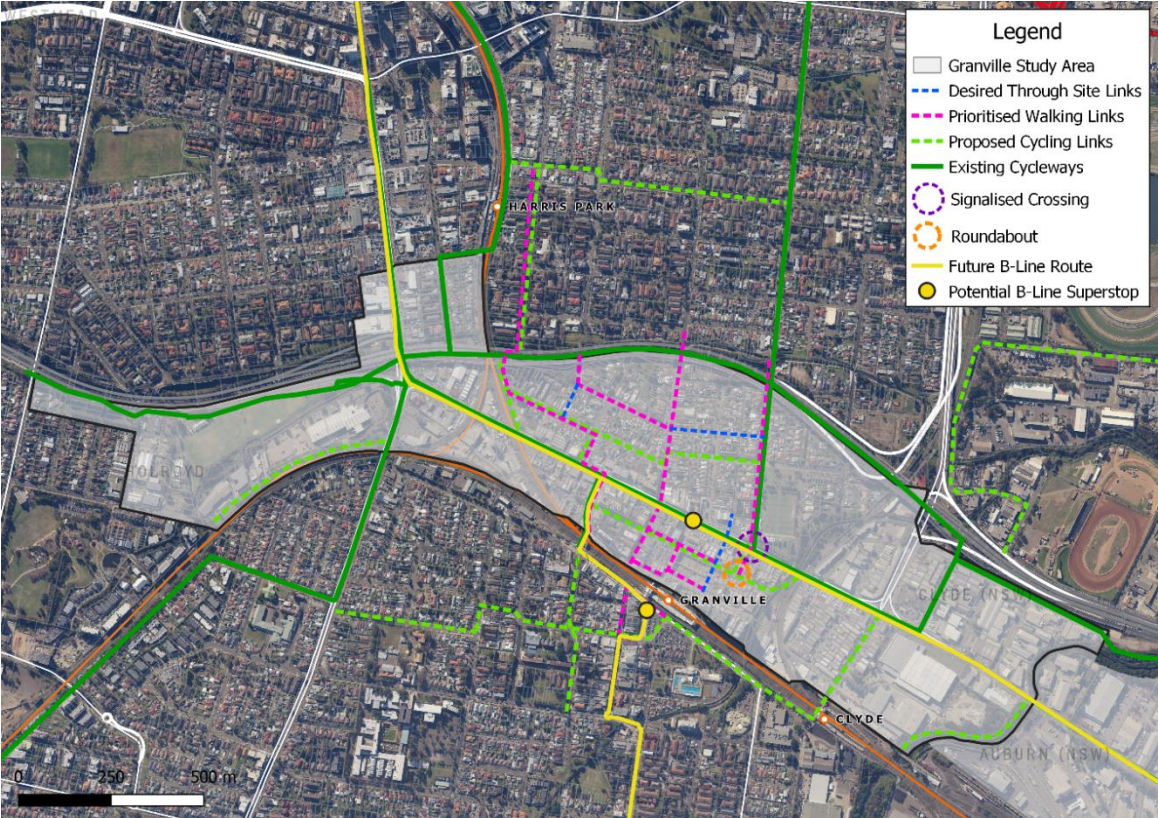


Figure 6.6: Option 3 - Auburn



7. OPTIONS ASSESSMENT

7.1. Introduction

The analysis has relied upon strategic multi-modal transport modelling undertaken by Transport for NSW that has sought to reflect the constraints of the road network to accommodate future traffic demand. This involved the use of the mesoscopic traffic model to inform initial estimates of available capacity in the road network which were accounted for in the Public Transport Project Model (PTPM) and subsequent Sydney Traffic Forecasting Model (STFM) to provide forecasts of future traffic growth through the study area that align more closely with the available road network capacity.

The iterative approach between outputs from different strategic models and modelling within the mesoscopic model is potentially limiting this process and would benefit from additional work.

Mesoscopic modelling was undertaken in AIMSUN to test the traffic impacts of various potential future scenarios in the Granville and Auburn precinct. The calibrated and validated base model used the basis for testing was developed by GTA Consultants, now Stantec in 2019. It is noted that the base model was developed from a mesoscopic model initially built by Jacobs as part of the Stage 1 Parramatta Light Rail Study.

The following scenarios were tested for both 2026 and 2036 design years:

- Do Minimum (no changes to existing infrastructure)
- Option 1 (active travel improvements)
- Option 2 (public transport improvements)
- Option 3 (active travel and public transport improvements)

Each of the future scenarios was coded to reflect proposed future changes (e.g. bus lanes, new traffic signals, pedestrian crossings).

The following section outlines the demand development process followed from the 2019 Aimsun base year model to the future year base models of 2026 and 2036.

1. Obtain demands for the corridor from STM base year model scenarios of 2019, 2026 and 2036.
2. Establish the equivalent two-hour demand periods for the 2019 base year Aimsun model as compared to STM time periods.
3. Compare the 2019 and future STM demands and use linear interpolation to growth the calibrated and validated Aimsun model demand from 2019 to 2026 and 2036, however a reduction in demand was limited to 10% of the base demand. This was used to ensure each OD pair maintained some demand and that no OD pairs would have negative demands
4. Undertaking addition and subtraction at the OD level can create some differences in the overall increase in demand from the STM, particularly when reductions in OD demands have been constrained. As such, origin and destination totals were compared for growth to create overall target values for each origin and destination zone. A finessing process was then undertaken to better match origin and destination totals, using the values obtained from Step 3 as a prior matrix.
5. Future demands were then profiled in accordance with the calibrated and validated base matrices, producing the final future demand matrices.

Scenario testing involved firstly running a macroscopic static assignment scenario with future demands to produce a set of paths. The sets of paths from the static assignment scenario were then fed into a mesoscopic Dynamic User Equilibrium (DUE) scenario to the future scenario. This process was repeated for each future scenario to obtain an understanding of its potential impact to road network performance.

2026 and 2036 scenarios for the three options were modelled, in addition to a base case 'control' – the 'Do Minimum' option – which does not make involve any changes to the road network. Table 7.1 summarises the specific road network changes included in each scenario. While Option 1 focuses on the new pedestrian and cyclist connectivity at Alfred Street, Option 2 incorporates dedicated bus lanes where possible, and Option 3 contains all the changes made to Options 1 and 2.

Table 7.1: Changes to the modelled road network per scenario

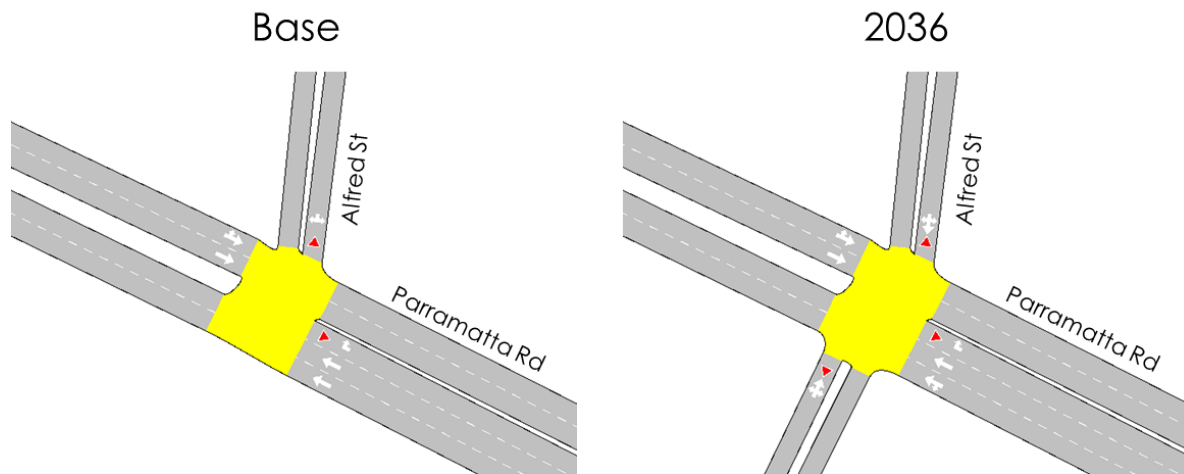
Detail	Option 1	Option 2	Option 3	Changes to model?
Alfred Street through-site extension and Alfred Street – Cowper Street roundabout. Alfred Street through-site extension introduced in 2036.	☑	-	☑	2036 only
1 x north-south signalised pedestrian crossing across Parramatta Road at Alfred Street intersection, 1 x east-west signalised crossing across Alfred Street at Parramatta Road. Introduced in 2026.	☑	-	☑	2026, 2036
New designated bus lane on Parramatta Road between Church Street and Burwood Road where capacity permits to maintain two general traffic lanes.	-	☑	☑	2026, 2036

Figure 7.1 shows the changes made to the Alfred Street/ Parramatta Road intersection in Options 1 and 3, involving:

- Introduction of Alfred Street through-site extension
- Signalisation of Parramatta Road / Alfred Street intersection
- Introduction of pedestrian crossings on northern and western legs
- Signal assumptions:
 - 130 second cycle time
 - 3-phases
 - 20 second phase for north approach & western leg pedestrian crossing
 - 20 second phase for south approach & western leg pedestrian crossing

As this is a state road corridor, further consultation with Transport for NSW is required to validated against other assessments of the same intersection.

Figure 7.1: Options 1 & 3 – Alfred Street model changes



For Options 2 and 3, bus lanes and other associated lane adjustments were made at four key intersections and their approaches. Figure 7.2 depicts these locations on a reference map, while Figure 7.3 through to Figure 7.6 juxtapose the 'do minimum' base to the Options 2 and 3 changes at each location.

Figure 7.2: Options 2 & 3 – Bus Lane model changes – reference map



Figure 7.3: Bus Lane model changes 'A' – Harbord Street

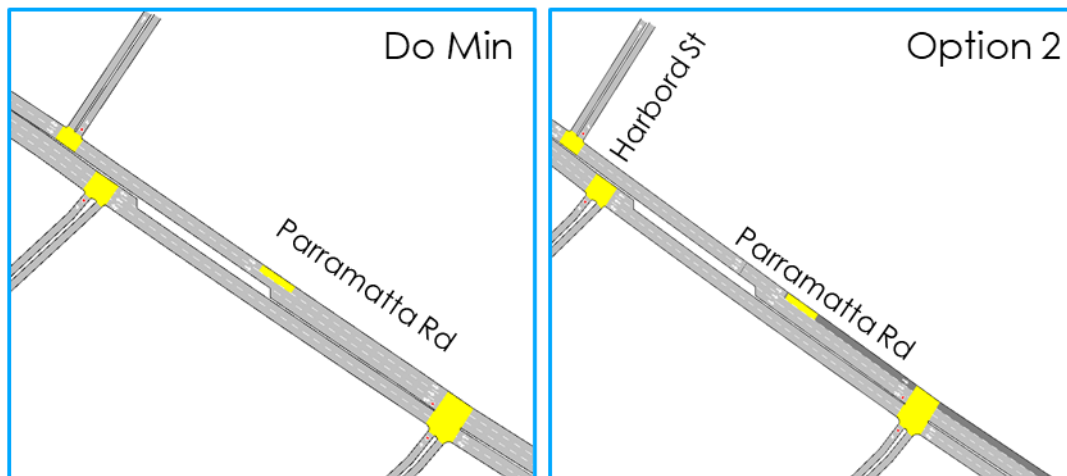


Figure 7.4: Bus Lane model changes 'B' – Duck Street

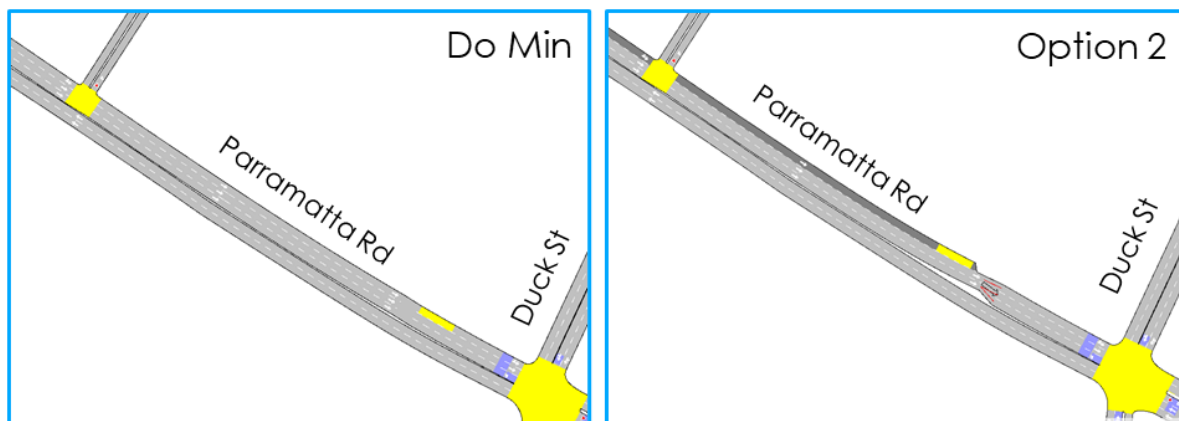


Figure 7.5: Bus Lane model changes 'C' – Silverwater Road

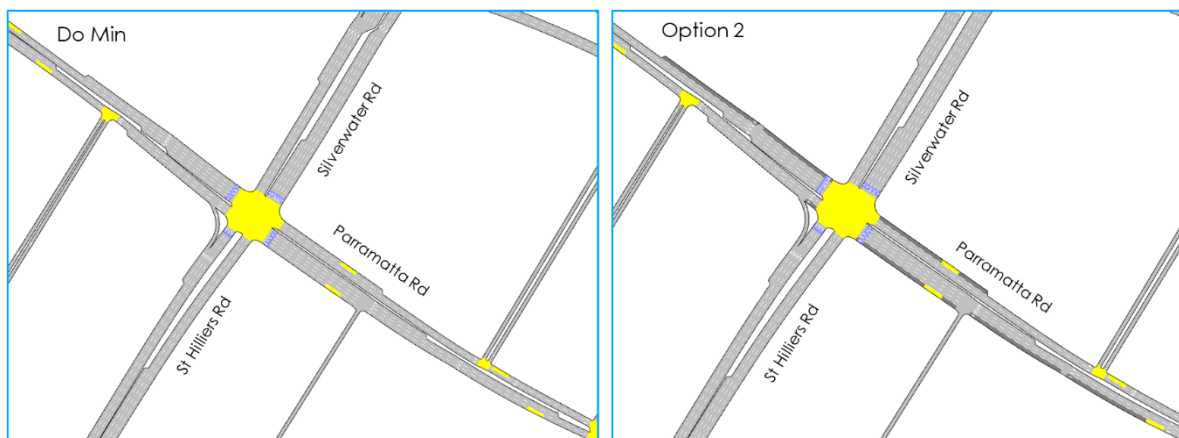
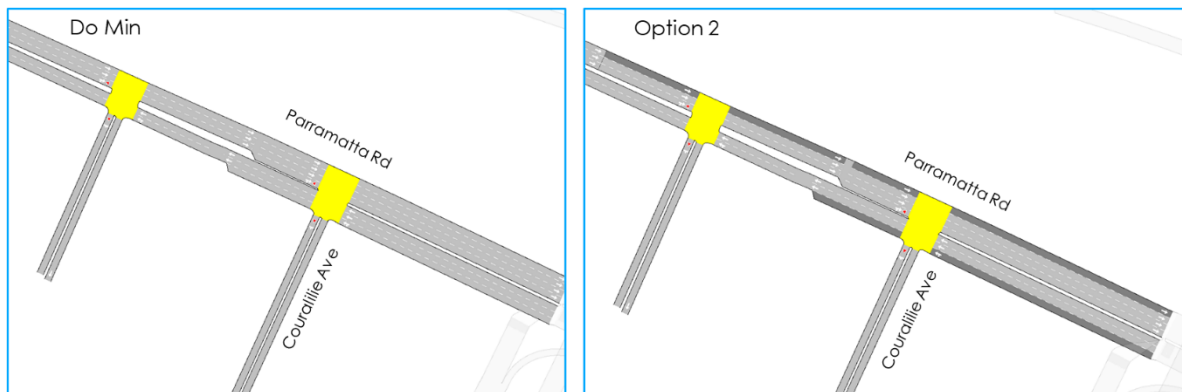


Figure 7.6: Bus Lane model changes 'D' – Courallie Avenue



7.2. Model Sensitivity to Pedestrians

The core function of the Aimsun model is to demonstrate road network performance under different scenarios; such scenarios can include changes to demand, the network or the operation of network elements, in particular intersections. It is recognised that this Aimsun model might underestimate the requirements for additional inter-green time (i.e. longer than the default of 6 seconds) at certain intersections to provide more time for pedestrians to cross these intersections. The additional green time could impact on the overall operation of the intersection and consequently on the performance of the network. To identify any potential impact, a series of sensitivity tests were carried out with an additional inter-green time of 7 or 8 seconds across the network. In addition, intersections were identified where left turn movements are greater than 300 vehicles per hour and conflicting with pedestrian crossing movements. At these intersections the left turn movement was held for 8 seconds.

These tests include all options during AM and PM peak periods for 2026 and 2036.

The sensitivity testing showed that a network-wide increase of the inter-green time would result in the following:

- Minor decreases of the overall average speed by less than 1km/h in some instances
- An increase in latent demand in some instance of less than 1%
- An increase in delay (sec/km) of up to 21% in one instance and 10-15% in most instances

The overall results suggest that the increases to inter-green times would result in similar overall network performance outcomes albeit with slightly greater average delay and travel time.

It is recommended that individual inter-green timings are included in the Aimsun model for future stages of planning.

7.3. Model Findings

This section summarises the key findings of the scenario option modelling process, focusing on the 2036 outcomes as they involve a higher level of trip generation, allowing for an evaluation of each option's worst-case traffic state. The model findings/ outputs are only showing the impacts on traffic outcomes and not show any direct impacts on public or active transport. In general, it is assumed that the provision of bus lanes improves the travel times and reliability of bus services and demonstrating no negative impact on traffic performance is seen as an in-principle support for the bus priority measures.

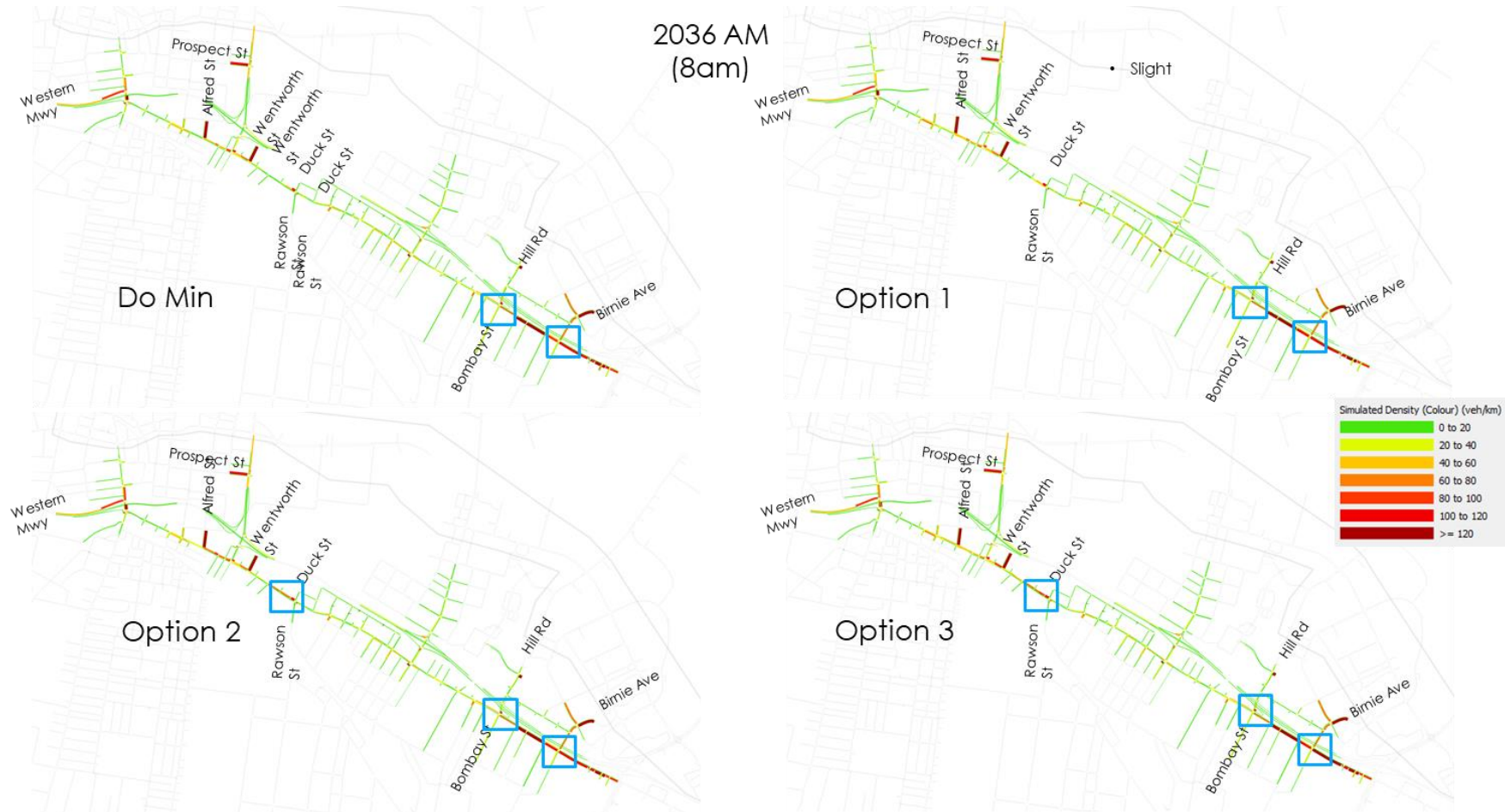
7.3.1. 2036 AM Peak

Figure 7.7 shows the 2036 8am state for the 'Do Minimum' base and three options, in which intersections of interest are highlighted by a blue square. In all scenarios, congestion builds up at the south-east approach of Parramatta Road at the Parramatta Road / Hill Road / Bombay Street intersection, and the north-east approach of Parramatta Road at the Birnie Avenue intersection.

There was generally a similar performance along the Parramatta Road corridor in all three scenarios, with delays turning onto major roads from the M4 Western Motorway, Prospect Street, Alfred Street and Wentworth Street. Looking at Options 2 and 3, the inclusion of the bus lanes led to a slightly increased vehicle density on approach to Duck Street (travelling eastbound).

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Figure 7.7: 2036 AM Peak – 8am Summary



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Figure 7.8 shows the 2036 9am summary for the 'Do Minimum' base and three options. Like the 8am condition, there was a similar performance along the corridor across all scenarios, as well the increased delays in the eastbound direction prior to the Duck Street / Rawson Street intersection in Options 2 and 3 due to the bus lane inclusion.

Figure 7.8: 2036 AM Peak – 9am Summary



Figure 7.9 and Figure 7.10 depict the 2036 8am 'Do Minimum' simulated density, or traffic congestion at the Parramatta Road / Hill Road / Bombay Street and the Parramatta Road / Birnie Avenue intersections, respectively. While the 'Do Minimum' results are shown below, the general results are applicable to all options.

At the Parramatta Road / Hill Road / Bombay Street intersection, congestion builds in the right-turn lane of Parramatta Road (south-east approach). At the Parramatta Road / Birnie Avenue intersection, congestion builds in the middle lane of Birnie Avenue (north-east approach).

Figure 7.9: 2036 AM Peak – Parramatta Road / Hill Road / Bombay Street

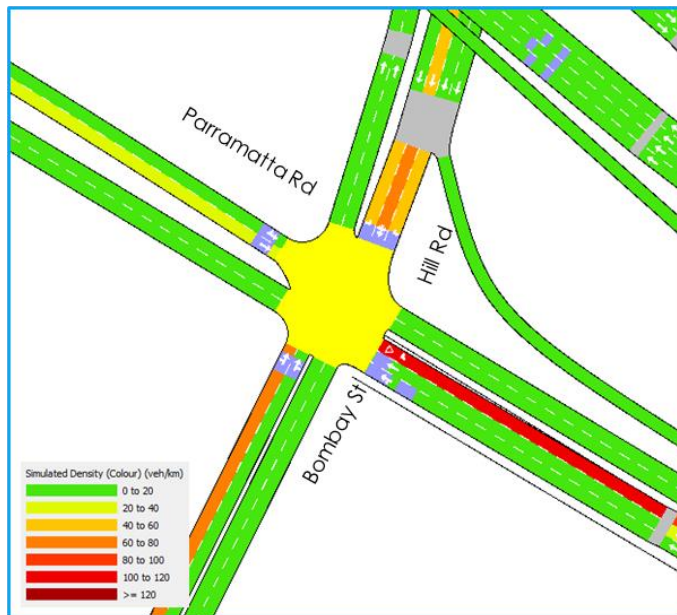
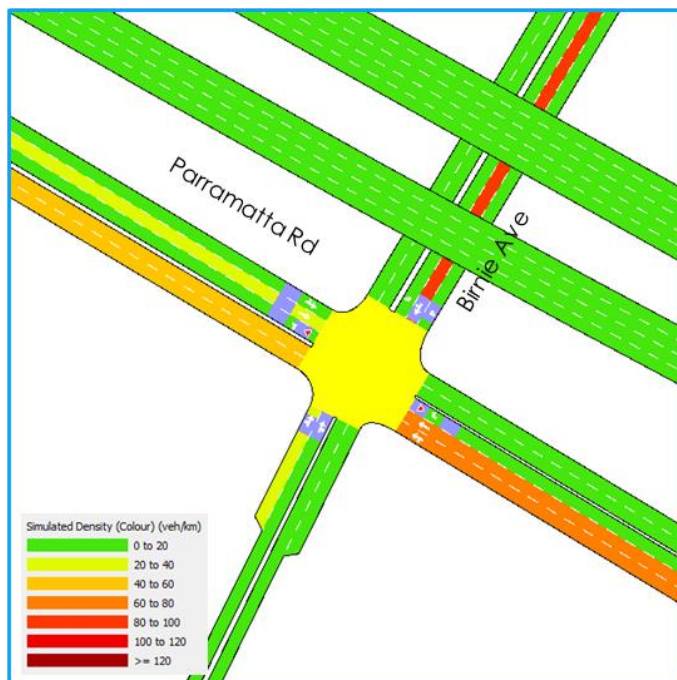


Figure 7.10: 2036 PM Peak – Parramatta Road / Birnie Avenue



7.3.2. 2036 PM Peak

Figure 7.11 and Figure 7.12 shows the 5pm and 6pm summaries for the 2036 PM peak, respectively. Similar to the AM model results, congestion builds up at the Parramatta Road / Hill Road / Bombay Street and Parramatta Road / Birnie Avenue intersections. Again, there is little difference in the traffic performance across scenarios.

Figure 7.11: 2036 PM Peak – 5pm Summary



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Figure 7.12: 2036 PM Peak – 6pm Summary



For the identified congested intersections, Figure 7.13 shows the congestion build-up on the north-west approach of Parramatta Road, while Figure 7.14 depicts the congestion in the middle lane of Birnie Avenue north-east approach.

Figure 7.13: 2036 PM Peak – Parramatta Road / Hill Road / Bombay Street

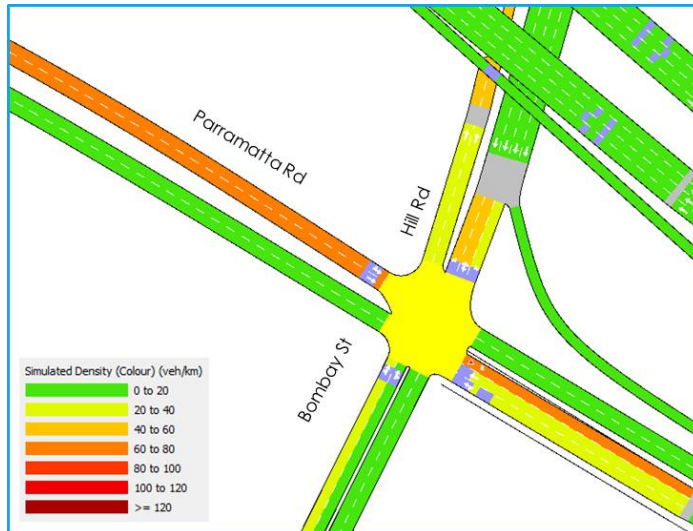
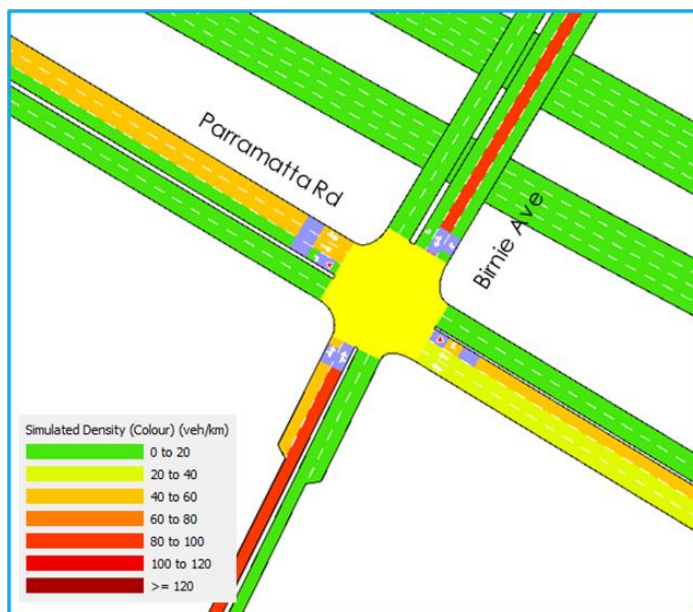


Figure 7.14: 2036 PM Peak – Parramatta Road / Birnie Avenue



While there is a slight increase in delay at the Parramatta Road / Alfred Street intersection in Option 1, as well as a reduction in capacity at the bus lane locations in Options 2 and 3, the density plots indicate that these changes have little impact on congestion through the overall corridor. The major bottleneck in the eastbound direction is still the Parramatta Road / Hill Road / Bombay Street intersection across all scenarios.

7.3.3. Network Statistics

Table 7.2 and Table 7.3 summarise the model's network statistics output, comparing key performance metrics across each scenario. The critical peak appears to be the PM peak, for which there is a large increase in latent demand (vehicles waiting to enter) between the 2026 and 2036 scenarios. However, the road network changes included in each option bore little impact on the overall traffic condition, compared to the 'do minimum' base. The overall network performance for each particular peak and year is very similar between scenarios. This suggests that under Option 1, 2 and 3, there will be no negative traffic impact due to their road network changes.

Table 7.2: 2036 AM Peak – Network Statistics

Peak	Year	Scenario	Total Demand (veh)	Total Distance Travelled (km)	Total Travel Time (h)	Speed (km/h)	Delay (sec/km)	Mean Travel Time (sec/km)	Throughput	Vehicles Waiting to Enter (veh)	Vehicles Waiting to Enter (%)
AM (7-9am)	2026	Do Min	113,473	91,512	2,703	53.5	52	105	56,699	205	0.2%
		Option 1	113,473	91,410	2,708	53.5	52	105	56,691	239	0.2%
		Option 2	113,473	91,589	2,718	53.6	52	104	56,743	206	0.2%
		Option 3	113,473	91,412	2,715	53.6	52	105	56,674	269	0.2%
	2036	Do Min	124,881	97,163	3,263	50.8	70	123	60,617	3,651	2.9%
		Option 1	124,881	97,275	3,281	50.8	70	123	60,789	3,504	2.8%
		Option 2	124,881	96,898	3,338	50.9	72	125	60,628	3,581	2.9%
		Option 3	124,881	96,347	3,341	50.7	72	125	60,449	3,802	3.0%

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Table 7.3: 2036 PM Peak – Network Statistics

Peak	Year	Scenario	Total Demand (veh)	Total Distance Travelled (km)	Total Travel Time (h)	Speed (km/h)	Delay (sec/km)	Mean Travel Time (sec/km)	Throughput	Vehicles Waiting to Enter (veh)	Vehicles Waiting to Enter (%)
PM (4-6pm)	2026	Do Min	127,369	99,535	2,940	52.7	58	110	63,270	1,480	1.2%
		Option 1	127,369	99,676	2,921	52.6	58	110	63,376	1,381	1.1%
		Option 2	127,369	99,320	2,918	52.7	57	110	63,216	1,389	1.1%
		Option 3	127,369	99,044	2,927	52.6	57	110	63,130	1,344	1.1%
	2036	Do Min	141,896	94,642	3,647	52.3	92	143	62,575	18,092	12.8%
		Option 1	141,896	96,118	3,708	52.0	90	142	63,306	16,347	11.5%
		Option 2	141,896	93,471	3,656	52.6	93	145	61,816	18,807	13.3%
		Option 3	141,896	93,735	3,831	52.1	97	149	62,019	17,769	12.5%

8. SUMMARY OF FINDINGS AND RECOMMENDATIONS

8.1. Discussion of Scenario Findings and Preferred Scenario

8.1.1. Key Findings

Investigation into the future transport needs in and around the Granville and Auburn town centres as a result of forecast growth has been undertaken for a range of scenarios. The analysis has relied upon strategic multi-modal transport modelling undertaken by Transport for NSW that has sought to reflect the constraints of the road network to accommodate future traffic demand. This involved the use of the mesoscopic traffic model to inform initial estimates of available capacity in the road network which were accounted for in the Public Transport Project Model (PTPM) and subsequent Sydney Traffic Forecasting Model (STFM) to provide forecasts of future traffic growth through the study area that align more closely with the available road network capacity.

Based on our analysis, the following general observations across the study area are provided:

- Traffic conditions are expected to worsen through to 2036 due to increased trip generation.
- Road space reallocation for a rapid bus service does not have a significant impact on traffic performance in comparison to the base case.
- Likewise, the signalised crossings and through-site road at Alfred Street have a very minor impact on traffic at Parramatta Road, yet also improve pedestrian connectivity and permeability.

Preferred Scenario

A key element of this study is the recognition that land use, mode share, parking strategy, the provision of public transport services and walking and cycling infrastructure are all inter-connected, and that changes to one can impact on the others. Therefore, a scenario-modelling process was carried out, that endeavoured to test these complexities, and to assist in the identification of transport shortfalls and remedial measures.

At a high-level, the three scenario options are as follows:

- Option 1: Active Transport Focused
- Option 2: Public Transport Focused
- Option 3: Travel Demand and Multi-Modal Transport Focused

Based on the above, Option 3 is the preferred scenario, as it achieves a significant transformation in active and public transport infrastructure and services, at no detriment to the future base traffic performance. By improving the attractiveness of non-car modes alongside the expected increase in residential and commercial density, the need to travel externally can be reduced, with a greater focus on local trips by a mode of sustainable transport.

8.1.2. Future Movement and Place

The realisation of Option 3 will also lead to demonstrable changes to the function and design of roads and streets in the precinct under the Movement and Place Framework. Here, the 'movement' and 'place'

SUMMARY OF FINDINGS AND RECOMMENDATIONS

classifications contained in the *PRCUTS Precinct Transport Report* (2016) align with the visions for Granville and Auburn in Option 3.

As shown in Figure 8.1, the implementation of the strategy would result in a greater emphasis on fostering high place intensity at streets with several new high-density dwellings, such as Cowper Street. Also shown is Parramatta Road as a 'main road' / 'movement corridor', while the proposed Alfred Street extension is a local street connecting to the Cowper Street 'civic space' / 'Place for People'.

Figure 8.1: Movement and Place Classification - Granville

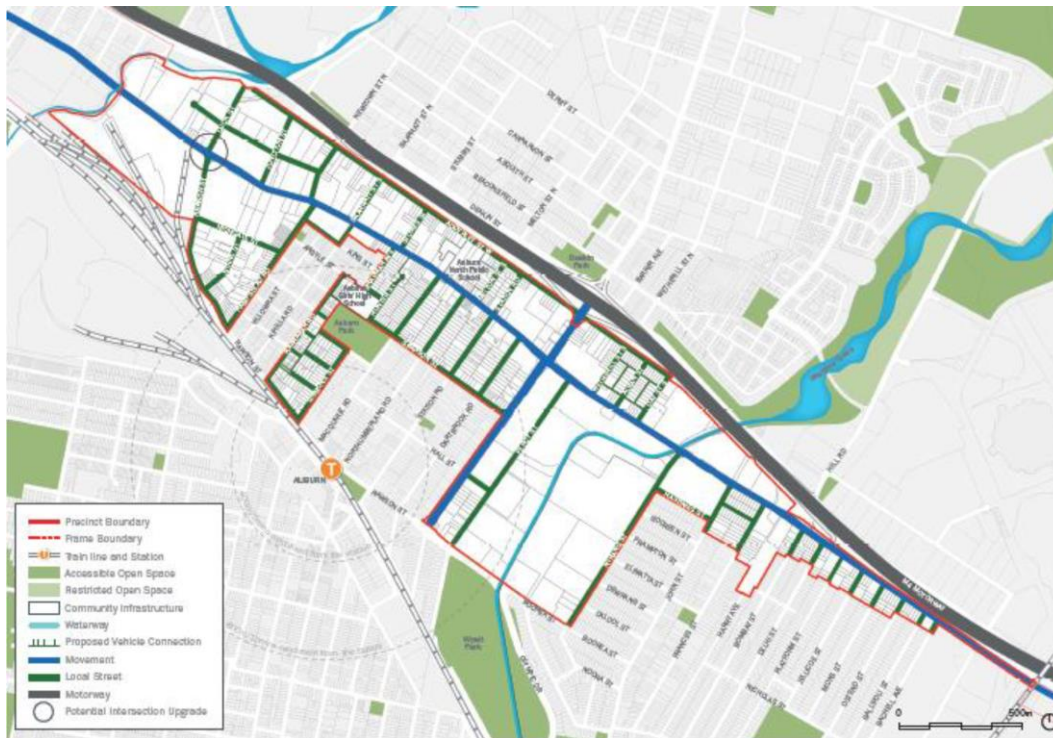


Source: Parramatta Road Corridor Urban Transformation Strategy – Precinct Transport Report (2016)

As seen in Figure 8.2, movement in Auburn is focussed along the Paramatta Road and St Hilliers Road. These two roads form major arteries in the East-West and North-South directions respectively, with less traffic movement outside these two roads.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Figure 8.2: Movement and Place Classification – Auburn



Source: Parramatta Road Corridor Urban Transformation Strategy – Precinct Transport Report (2016)

8.2. Mode Share Targets

A key way to monitor the effectiveness and the progress towards realising the proposed future network in Option 3 is through the setting and regular evaluation of mode share targets. As discussed in Section 2.4.1, public and active transport comprised a combined total of 48% of trips departing the Granville-Auburn study area. For all trips (leaving the study area and solely within the study area), the proportion of public and active transport is lower – approximately 38% for Granville and 43% for Auburn. This indicates that even local trips are predominantly carried out via private vehicle.

In light of the committed and planned transport and land use projects in the Granville and Auburn precincts, future transport trends and the future vision for the precincts in the PRCUTS and this report, it is important to set aspirational mode share targets for the precincts that are more sustainable than current conditions. The aspirational mode share targets draw from precincts in Greater Sydney whose character and vision align with the future visions for Granville and Auburn. For Granville, the locations include Rockdale, Green Square, Mascot and Ashfield. For Auburn, the benchmark areas include St Leonards, Green Square and Mascot. The proposed aspirational mode share targets are presented in Table 8.1 and Table 8.2.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Table 8.1: Proposed Granville aspirational journey-to-work mode share targets

Mode	2016	2036
Train	32%	39%
Bus	5%	8%
Car – as driver	52%	35%
Car – as passenger	6%	3%
Bicycle	<1%	5%
Walked only	5%	10%
Active Transport sub-total	5%	15%
Public Transport sub-total	37%	47%
Private Vehicle sub-total	58%	38%

Table 8.2: Proposed Auburn aspirational journey-to-work mode share targets

Mode	2016	2036
Train	42%	48%
Bus	1%	4%
Car – as driver	46%	31%
Car – as passenger	6%	3%
Bicycle	<1%	5%
Walked only	4%	9%
Active Transport sub-total	5%	14%
Public Transport sub-total	43%	52%
Private Vehicle sub-total	53%	34%

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Link to Modelling Work

It must be stressed that while these mode share targets apply to the Option 3 scenario, the impact of these targets and associated mode shift was not incorporated into the scenario modelling process. This iterative process between outputs from different strategic models and modelling within the mesoscopic model is a limitation of the modelling work undertaken. Additional modelling work might benefit the outputs of this study.

For example, the target of 15% active transport mode share in Granville would involve a redistribution of vehicle traffic to active transport, yet this redistribution is too difficult to accurately and usefully apply to the model. Particularly as the mode share goals are 'targets' and not forecasts, it would have been inappropriate to scale down the model's trip generation numbers on the basis of supplying more active transport infrastructure. As demonstrated in other regions in Sydney and elsewhere, growth in active transport mode share can be uneven – both spatially and temporally.

With all this in mind, the model findings in Section 7.2 are based upon the same number of private vehicle trips across all scenarios, functioning as a 'worst-case' assessment of how the road network performs with each option's road changes, but not any guaranteed mode shift.

8.3. Recommendations

Table 8.3 contains the full list of recommended actions, in response to the opportunities and constraints identified in Section 4.4, the strategic themes and objectives in Section 5, and the specific active and public transport routes identified in the Granville and Auburn *Option 3* maps in Section 6.4. The recommended timing and responsibility assignment is also shown below, for which 'Council' refers to either City of Parramatta and/or Cumberland Council where relevant.

Table 8.3: Recommended Actions

#	Recommended Action	Strategic Themes	Priority	Timing	Responsibility
1	Identify and implement appropriate upgrades to the pedestrian infrastructure at the identified 'prioritised walking links', including but not limited to formal crossings, crossing upgrades, kerb ramps, widened footpaths and landscaping.	Access and Connectivity, Safety, Travel Behaviour Change	High	Short to medium	Council/ TfNSW
2	Deliver high-quality cycling infrastructure at the identified 'proposed cycling links', predominantly involving shared user paths and separated cycleways. On-road mixed traffic facilities should only be delivered on low-speed, low-traffic local streets.	Access and Connectivity, Safety, Travel Behaviour Change	High	Short to medium	Council / TfNSW
3	Provide high-quality end-of-trip facilities at both Granville and Auburn station, supporting interchange between active and public transport modes.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
4	Incorporate and deliver the identified 'through-site' links into the site plans in development applications to improve pedestrian permeability and legibility.	Access and Connectivity, Support Place Function	Medium	Medium to long	
5	When appropriate, build the proposed Alfred Street extension to Cowper Street,	Access and Connectivity,	Medium	Short to medium	Council / TfNSW

SUMMARY OF FINDINGS AND RECOMMENDATIONS

#	Recommended Action	Strategic Themes	Priority	Timing	Responsibility
	including the signalised pedestrian crossings and roundabout.	Support Place Function			
6	Consider implementing a high-frequency B-Line bus service between Parramatta and Burwood along Parramatta Road, with at least one super-stop at both Granville and Auburn.	Access and Connectivity, Travel Behaviour Change	High	Short to medium	TfNSW
7	Investigate a high-frequency B-Line bus service between Parramatta Hurstville via Bankstown, with the intention of a super-stop at Granville if feasible.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
8	Investigate the extension of the 911 bus route, or provision of a new bus route, to connect Auburn to the growing residential communities at Carter Street and Olympic Park.	Access and Connectivity, Travel Behaviour Change	Medium	Medium	TfNSW
9	Investigate express rail services to/from Parramatta and Sydney CBD stopping at Granville, following the additional capacity provided by Sydney Metro projects.	Access and Connectivity, Travel Behaviour Change	Medium to High	Short to medium	TfNSW
10	Review and potentially rationalise freight access to selected freight routes to limit freight-related conflicts on roads and streets, e.g. Parramatta Road transition to freight-free during peak periods. In addition, investigate the impact of land use changes to residential development which likely results in increased smaller freight vehicle use.	Access and Connectivity, Support Place Function	High	Medium	Council/ TfNSW
11	Investigate expansion of 30km/hr or 40km/hr speed limits in high pedestrian activity areas, generally aligned with streets classified as 'Civic Spaces' or 'Main Streets'.	Safety, Support Place Function	High	Short to medium	Council
12	Review parking rates in centres and consider changes, especially those close to frequent public transport. Consider adopting maximum parking rates as proposed PRCUTS study (2016) for Granville and Auburn	Access and Connectivity, Support Place Function	Medium	Medium	Council/ other LGAs/ TfNSW
13	Develop a parking strategy for public on-street and off-street parking and loading in Granville and Auburn	Access and Connectivity, Support Place	High	Short	Council/ TfNSW
14	Develop a car share policy to encourage the establishment of car share vehicles in Granville and Auburn	Travel Behaviour Change	Low	Short	Council/ Car share operator
15	Consider advancing improved bicycle parking and electric vehicle charging stations in future DCPs	Travel Behaviour Change	Low	Short	Council

