3.4 Road network

3.4.1 Existing strategic road network

The key features of the road network in the vicinity of the Melrose Park site are summarised below:

Victoria Road

Victoria Road is a State Road providing access between Parramatta and the western end of Anzac Bridge. It is currently carrying approximately 60,000 veh/day and there are approximately 2,000 bus services provided along Victoria Road on a weekly basis in the vicinity of the site. Whilst serving as a primary arterial road and movement corridor, there is still a significant amount of direct access to properties on both sides of the road in the vicinity of the development site.

There is significant traffic congestion at nearby intersections on Victoria Road during peak hours. There are delays and queues eastbound in the AM peak at both signalised intersections with Wharf Road / Marsden Road and Kissing Point Road. Similar delays and queues exist in the PM peak at the Wharf Road / Marsden Road intersection.

Wharf Road

Wharf Road is a local road which provides direct access to properties on both sides of the road. Its main function is to facilitate the convenient and safe movement of local traffic to and from Victoria Road. This road generally provides two traffic lanes with parking on both sides. The road has a posted speed limit of 50km/h.

Hope Street

Hope Street is a local road which provides direct access to properties on both sides of the road. The Boronia Street-Hope Street-Andrews Road corridor distributes traffic within residential and industrial areas. These roads form a link between the local and higher order road network. This road generally provides two traffic lanes with parking on both sides. The road has a posted speed limit of 50km/h.

Hughes Avenue

Hughes Avenue is a local road which provides direct access to properties on both sides of the road. This road generally provides two traffic lanes with parking on both sides. The road has a posted speed limit of 50km/h.

Key issues and opportunities of the existing road network are summarised in Table 3.1 below.

A summary of the function of key roads in and around the Melrose Park precinct is summarised in Figure 3.10. This is based on observations pertaining to existing traffic volumes and the type of trips currently facilitated by particular corridors. The presented hierarchy is not intended to strictly correlate with the classification and governance structure of these assets i.e. some sub-arterial corridors are state roads whilst others are local roads.

Planned road improvement – Devlin Street

RMS are currently investigating improvements to intersections at Devlin Street, Blaxland Road and Parkes Street. These works were announced after the finalisation of future network assumptions for the project and have not been included in this modelling. Observed congestion in future traffic modelling at this location is likely to be significantly improved by these works.

Figure 3.10 : Indicative road hierarchy

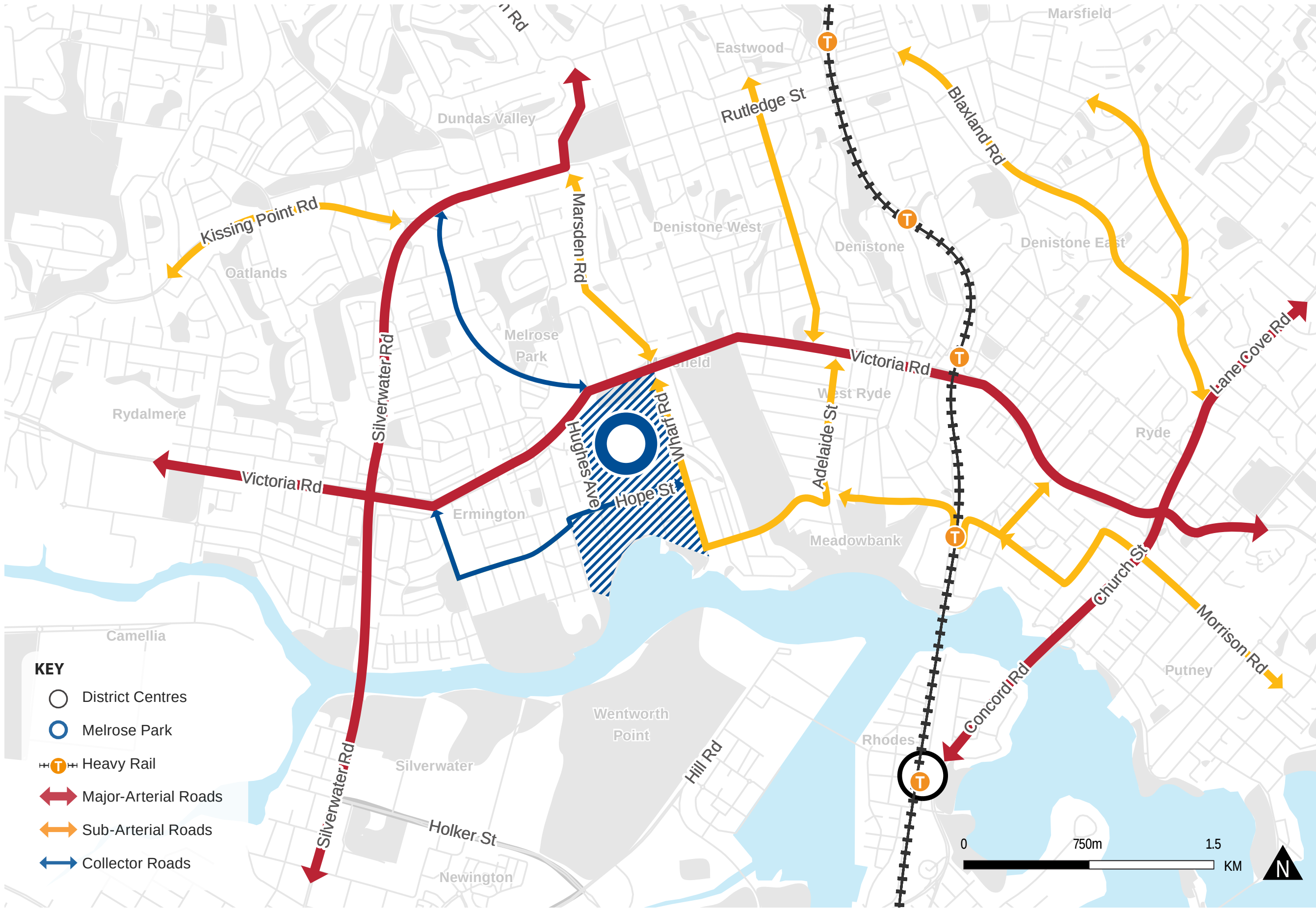


Table 3.1 : Key road access corridors serving Melrose Park

General Traffic Corridor	Role / Function	Opportunities
Victoria Road (A40)	Regional route and predominant movement corridor fronting Melrose Park and providing the most direct access for the development	Direct access from major arterial roads is generally discouraged as it may reduce efficiency of the corridor. Possible opportunities for left in left out access to relieve congestion on local roads
Wharf Road	Local access route along eastern edge of Melrose Park, providing alternative route into the development	Restricted by capacity to access by intersection on to Victoria Road. Opportunity to distribute traffic to reduce congestion.
Hughes Avenue	Local access route along western, edge of Melrose Park, providing alternative route into the development	Restricted to left in left out at priority intersection. Additional access to west and Parramatta.
Hope Street	Local access route along southern, edge of Melrose Park, serving as a local 'back route' and providing alternative route into the development.	Circuitous alternative route already in use to Meadowbank Station and Concord Road that avoids Victoria Road. Forms part of planned route for PLR Stage 2.

3.4.2 Existing traffic volumes

Peak hourly traffic volumes on selected roads in the study area, available from Aimsun Model, are summarised in the figure below depicting the traffic survey data collected in 2017. The key points from the traffic volumes include:

- Victoria Road, Silverwater Road and Church St/ Devlin Street carry significant traffic volumes of between 2,000 – 3,000 vehicles per hour in the peak direction.
- The section of Victoria Road east of Wharf Road carries the most traffic along this movement corridor.
- The Andrew Street/Constitution Road corridor performs a sub-arterial function and serves as an alternative east-west corridor to Victoria Road, with flows of up to 1,000 vehicles per hour.

These volumes are shown in Figure 3.11 and Figure 3.12.

Figure 3.11 : Existing traffic volumes AM peak hour

Figure 3.12 : Existing traffic volumes PM peak hour

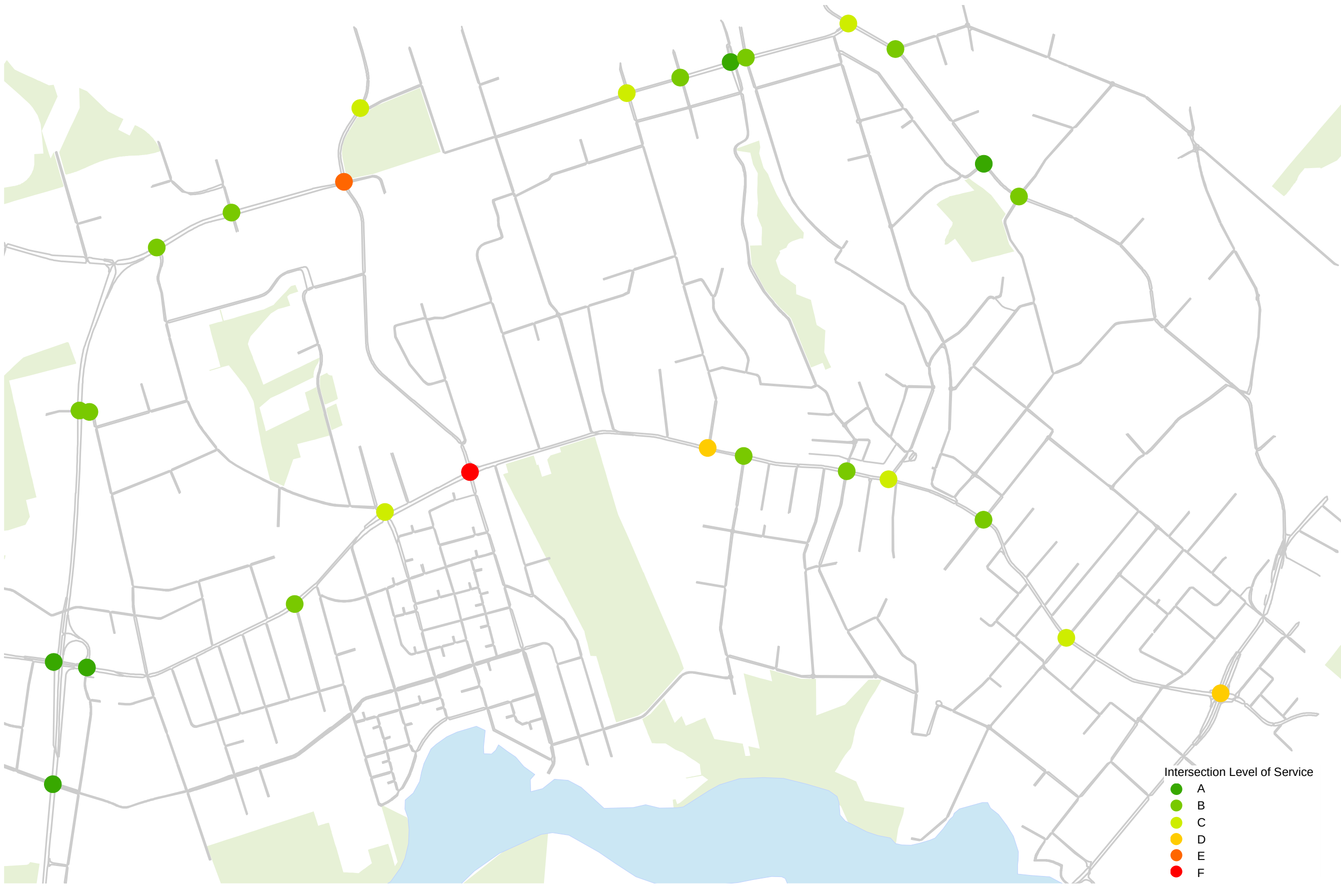
3.4.3 Intersection Performance

The existing intersection performance of the Melrose Park study area was analysed using the Aimsun model for peak conditions (AM and PM peak) for 2017. The results of the analysis are presented in Figure 3.13 and Figure 3.14. The key points from the intersection performance include:

- Significant delays are observed along Victoria Road near Melrose Park at Wharf Road. The remaining intersections on Victoria Road perform satisfactorily with the exception of Church Street intersection in both peak periods and the West Parade intersection in the PM peak.
- Significant eastbound delays are observed on the Kissing Point Road/Stewart Street corridor in the AM peak, particularly at the Stewart Street/Marsden Road intersection.

Figure 3.13 : Existing intersection level of service AM peak hour

Figure 3.14 : Existing intersection level of service PM peak hour



3.4.4 Network Performance

A summary of the key existing performance indicators for general traffic, namely travel time and average vehicle speed, have been summarised in Table 3.2 and Table 3.3. The key points from the network performance include:

- Average speeds of approximately 33km/h in both the AM and PM periods indicates that the overall network performs relatively well, considering the modelled network is in an urban environment and does not include any motorways
- There is more demand for travel in the PM period with approximately 25,000 more km traveled across the four hours compared to the AM period
- All of the modelled traffic is able to enter the network in both modelled periods i.e. there is no unreleased traffic .

Table 3.2 : Travel time (2017)

		6:00am – 10:00am	3:00pm – 7:00pm
Victoria Road (between Silverwater Road and Devlin Street)	EB	12:14	11:23
	WB	9:02	12:16
Silverwater Road/Stewart Street (between South Street and Marsden Road)	NB	10:10	7:10
	SB	5:37	4:43
Wharf Road/Marsden Road (between Andrew Street and Stewart Street)	NB	5:40	7:54
	SB	4:05	4:19

Table 3.3 : Network statistics (2017)

	6:00am – 10:00am	3:00pm – 7:00pm
Vehicle kilometres travelled (VKT)	332,582	356,925
Vehicle hours travelled (VHT)	9,982	10,985
Average network speed (km/h)	33.3	32.5
Unreleased traffic (veh)	0	0

3.5 Pedestrian and cycling network

Figure 3.15 shows the current walking and cycling catchment from Melrose Park. The catchment analysis is indicative only and does not take into account locations in the road network which may be difficult for pedestrians and cyclists to traverse, such as major grade separated intersections. It does however provide a useful strategic assessment of active transport accessibility.

The catchments show that:

- Limited public transport services are within the existing walking catchment of Melrose Park
- Significant services and centres are within a 20 minute cycle of Melrose Park. These include:
  - T1 Northern Line
  - Rydalmere industrial area and future PLR stage 1
  - Sydney Olympic Park
  - Rhodes
  - Top Ryde.

Figure 3.15 : Walking and cycling catchments from Melrose Park

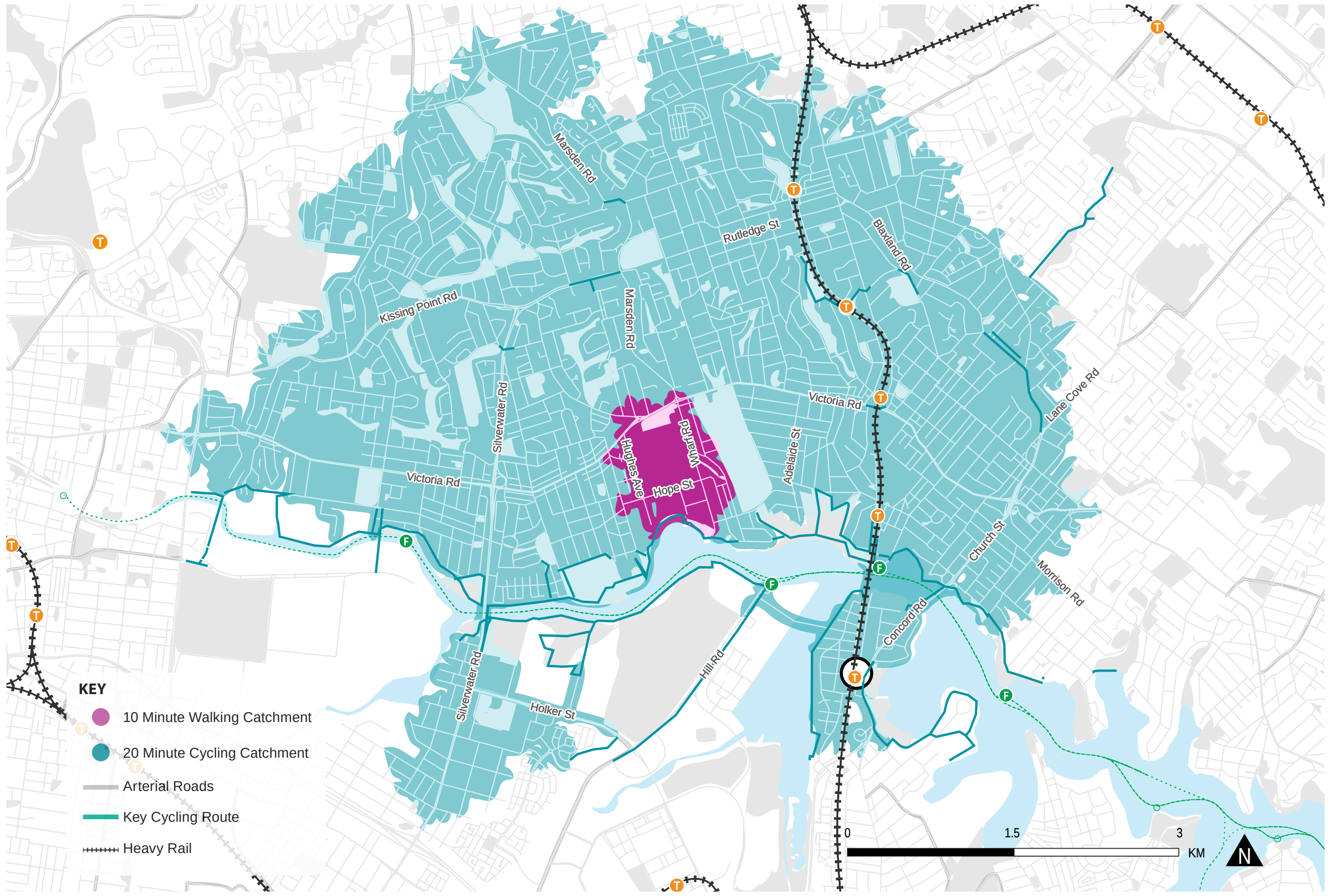
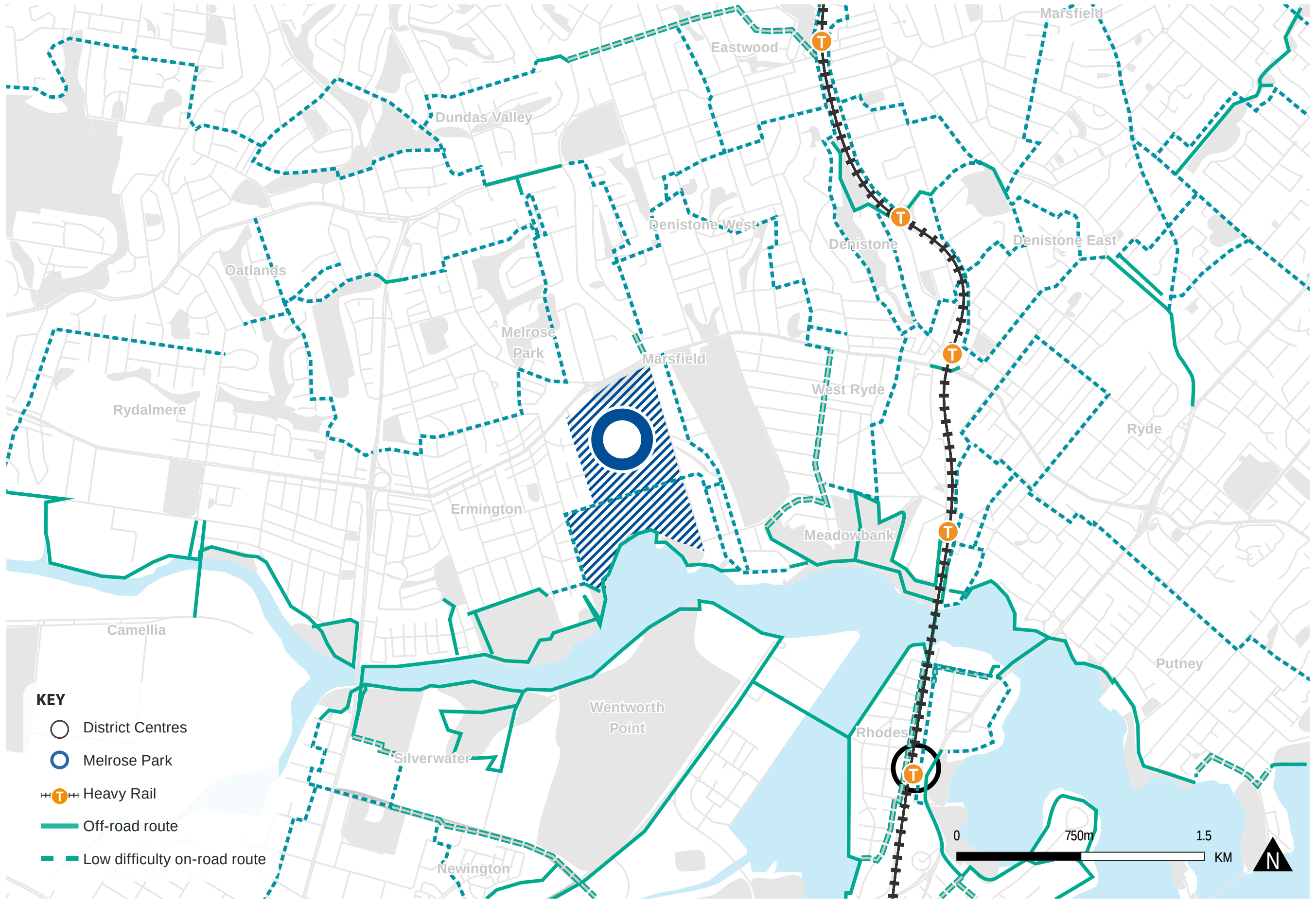


Figure 3.16 : Cycling routes



Existing off-road and low difficulty on-road cycling routes are shown in Figure 3.16 and are summarised in Table 3.4, below.

Table 3.4 : Key cycling connections serving Melrose Park

Connection	Role / Function	Route
Parramatta River Foreshore Pathway active transport shared path	Recreational and commuter cyclist connection to Meadowbank ferry wharf (and potentially station)	Parramatta River Foreshore Pathway east of the Melrose Park development (includes short section of Lancaster Avenue)
Southern precinct of Melrose Park to Victoria Road (West Ryde)	Local cycle connection	Andrew Street, Adelaide Street
Active transport shared path connections to southern side of Parramatta River and to Foreshore Pathway on southern side of river	Recreational and commuter cyclist connection to southern side of Parramatta River	Bridges across Parramatta River (Silverwater Road, Concord Road)

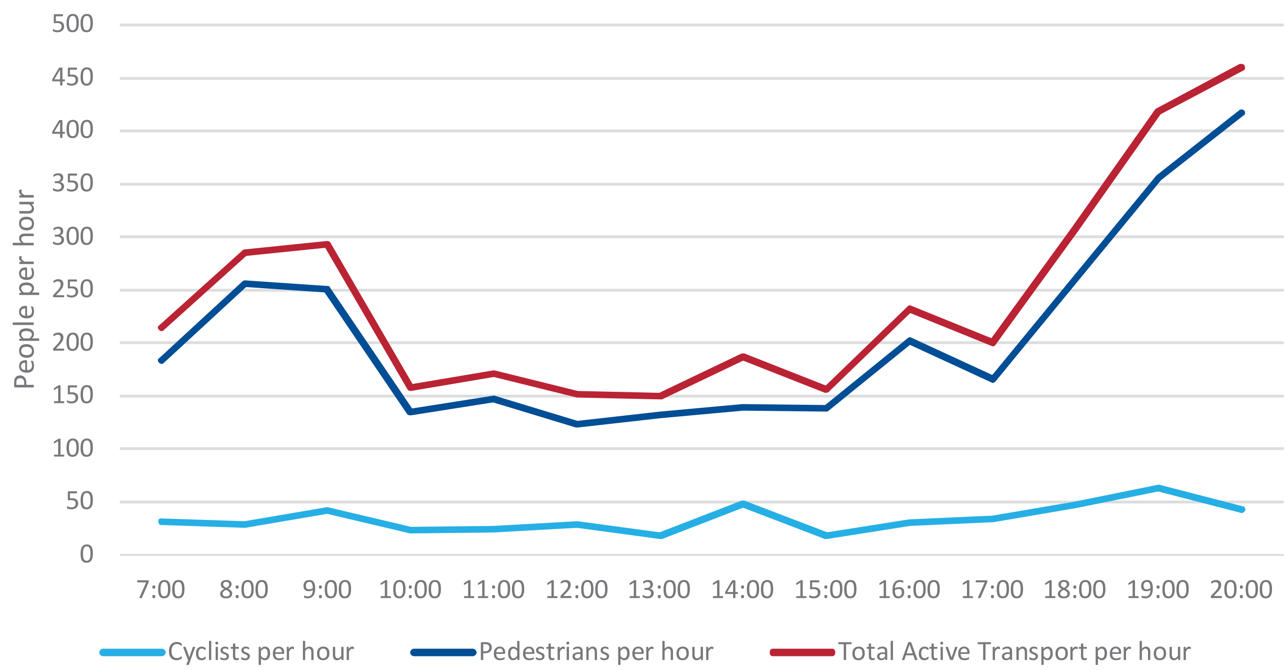
Bennelong Bridge active transport use

Surveys have been undertaken of active transport use on the Bennelong Bridge, connecting Wentworth Point and Rhodes. These surveys give an indication of the willingness of residents in the areas surrounding Melrose Park to use active transport if given safe and direct access to key centres.

Figure 3.17 outlines the results of the survey undertaken in November 2017. It is observed that:

- There is significant all-day use of the bridge by both pedestrians and cyclists.
- In the PM peak hour, over 50 cyclists and over 400 pedestrians utilise the bridge.
- Approximately 3,500 active transport trips are made across the bridge between 7:00am and 8:00pm.

Figure 3.17: Bennelong Bridge active transport use



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3.6 Existing travel behaviour

Travel patterns to, from, through and within Melrose Park and GPOP have been analysed using data extracted from a range of sources including the Australian Bureau of Statistics (ABS) 2016 Census journey-to-work (JTW), Household Travel Survey (HTS) and TfNSW Strategic Travel Model (STM).

3.6.1 Existing mode share

The current site's function and urban character without renewal is predominately industrial which influences the existing travel patterns and purpose of trips to and from the study area. A number of trips are generated by workers commuting to employment opportunities provided by established commercial and industrial businesses within the study area.

Considering the predominantly residential nature of the proposed development, travel zones with existing residential characteristics adjacent to Melrose Park have been chosen to provide a more robust assessment of existing and future travel behaviour.

The travel zones shown in Figure 3.18 have been used to examine current JTW travel patterns and behaviour within and in proximity to Melrose Park.

Figure 3.19 and 3.20 show that trips to and from Melrose Park are predominantly undertaken by private vehicle, particularly for trips to the study area. Of more relevance to the future residential development, non-car mode share for commuting trips from the study area is currently 23%.

Figure 3.19 : Mode share for residents commuting from Melrose Park

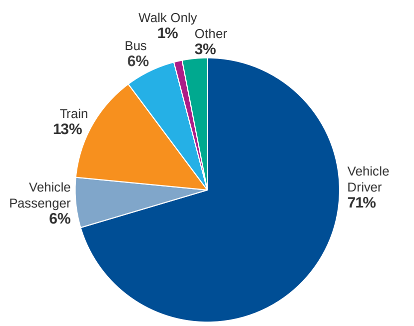


Figure 3.20 : Mode share for workers commuting to Melrose Park

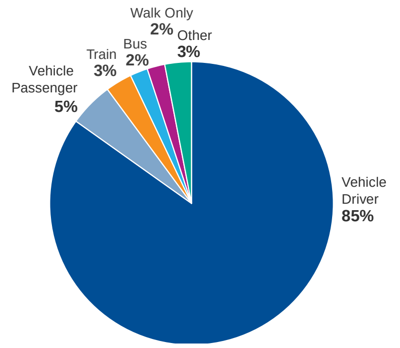
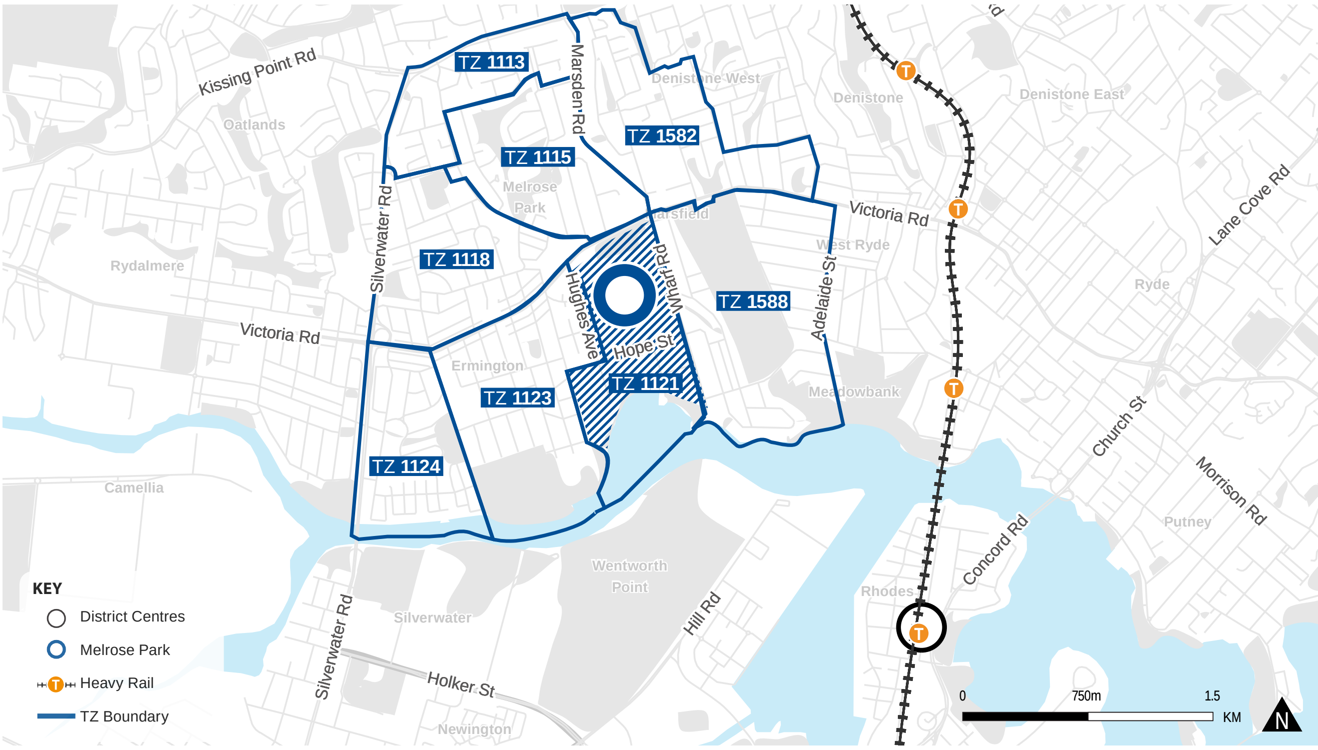


Figure 3.18 : Travel Zones - Melrose Park and surrounds



3.6.2 Existing trip purpose

A summary trip purpose is shown in Figure 3.21. This data is obtained from the Household Travel Survey (HTS). The Melrose Park data has been compared to the average trip purpose breakdown for the entire Sydney region. HTS data is available at the SA3 level so for the propose of this assessment the Melrose Park data has been derived from the Carlingford SA3 data. It is observed that:

- Commuter trips from Melrose Park make up a slightly higher proportion than the Sydney average.
- Trips for work related business, education, shopping and social/recreation from Melrose Park make up a slightly lower proportion than the Sydney average.

3.6.3 Existing trip lengths

Figure 3.22 shows the trip length distribution for all trips in the GPOP area. It is observed that:

- Average weekday trip distances have slightly shortened, with more trips in 0-5km category.
- On weekends, that trend is reversed, with more people taking longer trips (greater than 10km). This is indicative of a trend towards more car use for longer trips on weekends. This could particularly be the case if GPOP residents are traveling outside GPOP for discretionary weekend trips.
- Figure 3.23 shows that the breakdown of trips across the major weekday time periods has stayed relatively constant. There does not seem to have been any shift towards undertaking more off-peak travel in GPOP.

Figure 3.21 : Trip purpose

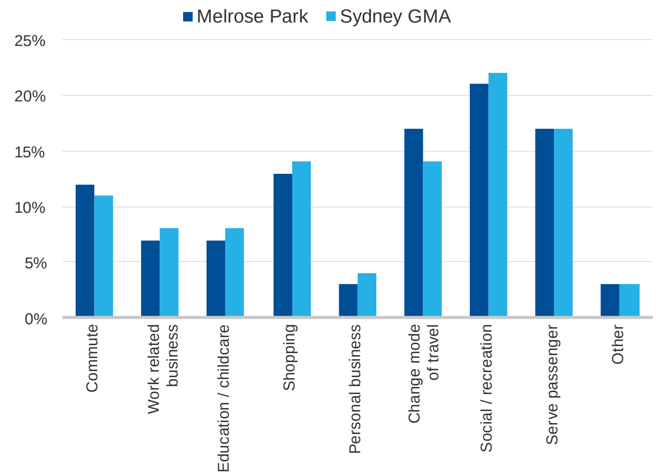


Figure 3.22 : Trip length distribution GPOP

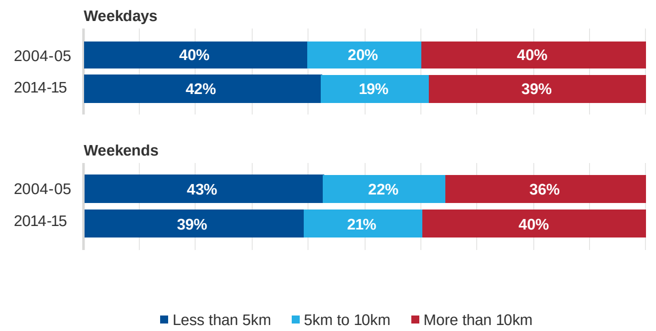
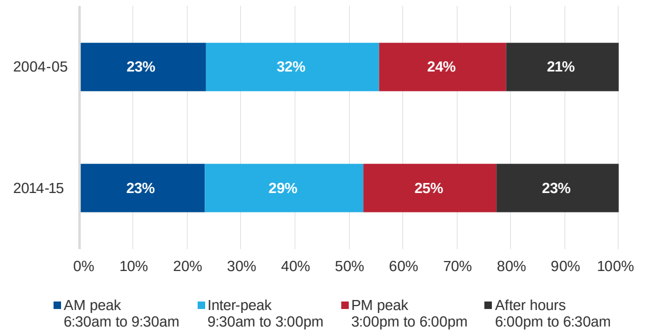


Figure 3.23 : Percentage of trips by time period



3.6.4 Existing trip distribution

The existing distribution of all trips leaving Melrose Park in the AM Peak has been analysed using TfNSW's Public Transport Project Model (PTPM), which is being used for planning of PLR Stage 1 and 2. Figure 3.24 shows the key 12 destinations – at the SA3 level – of these trips.

Figure 3.25 shows the destinations of all trips leaving Melrose Park at a '3 cities' level, with trips either remaining in the Central City or heading to the Eastern or Western Cities.

Both figures represent all modes of travel.

Several key observations can be made:

- A significant number of trips are relatively short and either remain in the Carlingford SA3 or travel to the adjacent Ryde-Hunters Hill SA3
- There is a strong desire line to the east of Melrose Park – due to the current imbalance of jobs and services in the Eastern City. 62% of trips originating around the Melrose Park precinct have destinations in the Eastern City.
- As the Parramatta CBD and wider Central City continues to grow it is expected that future residents of Melrose Park will be less reliant on the Eastern City. The existing 36% of trips which remain in the Central City is expected to increase.
- The balance of employment in Sydney has been shifting west, moving beyond the traditional employment hubs in the Eastern City

Figure 3.24 : Distribution of AM peak hour trips from Melrose Park - SA3 level (all modes)

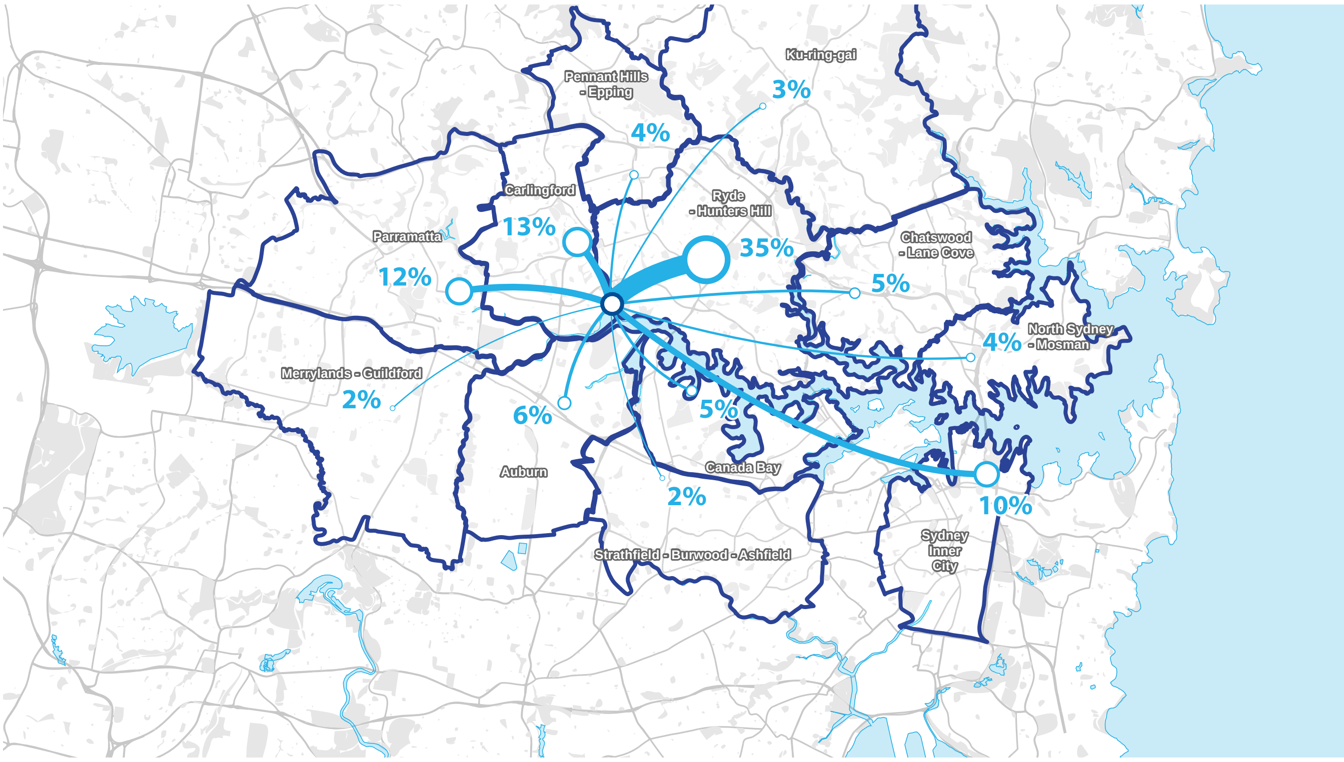
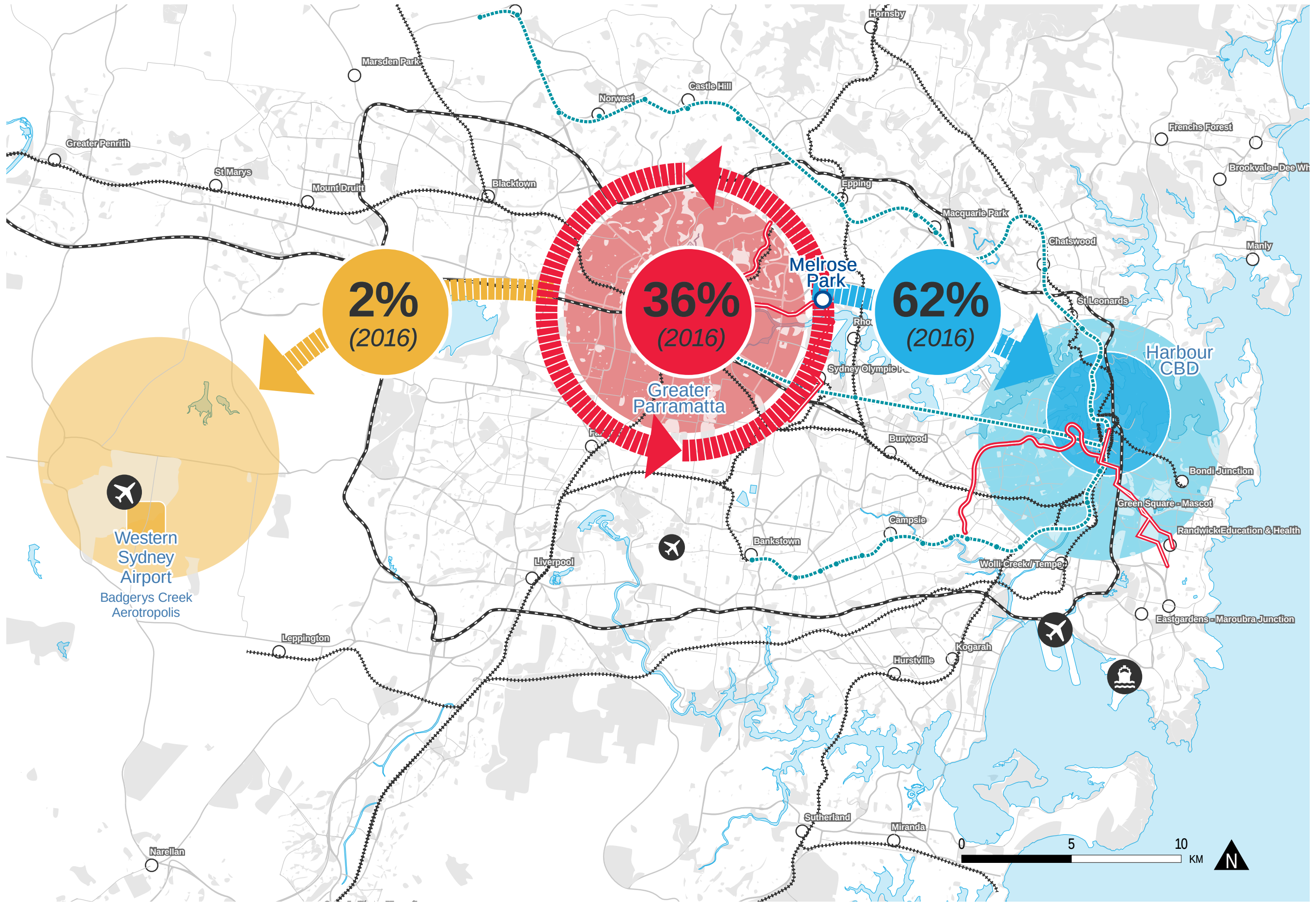


Figure 3.25 : Distribution of AM peak hour trips from Melrose Park - 3 cities (all modes)



4. MELROSE PARK STRUCTURE PLANS

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4. MELROSE PARK STRUCTURE PLANS

4.1 Overview

The land uses within the Melrose Park northern and southern precincts will generate activity that will result in demand for travel. This section provides a guide to the location of the proposed land uses and activities generated by the planned development. This section describes the transport planning vision and objectives for Melrose Park to ensure that planning and investment in the transport network will result in positive outcomes, address the areas of highest priority, and cater for increased future transport demands resulting from the planning proposal.

4.2 The structure plans

The overall structure plans will provide public space that will connect Victoria Road to Parramatta River Foreshore with Melrose Park. The structure plans will also have a rich land-use mix, including housing, offices, town centre, retail, and amenities, connected by public landscape elements. Throughout the day, different happenings in the public domain, including daily work and leisure activities, and urban intersections will enable encounters between different users on site.

The structure plan has been developed in two parts, a northern and southern precinct separated by Hope Street. The structure plans have been developed by the respective proponents of the sites however they have been done so in a collaborative and consistent manner.

The TMAP process has considered the development as an entire combined precinct as agreed by the Project Coordination Group (PCG) in order to develop a consistent and coherent plan for transport and accessibility throughout the whole site, and its connection with the wider GPOP.

4.2.1 Northern structure plan

The northern structure plan has been adopted by City of Parramatta and is shown in Figure 4.1. It has been developed based on the following guiding principles:

- Urban Renewal in the Right Location
- Creating New Employment Opportunities
- Creating New Communities
- Connected Urban Renewal
- Well-Mannered and Environmentally Conscious

The land use plan has higher densities at key locations, increasing the potential for public transport share at key transit nodes. The major activities of Melrose Park are concentrated along the Victoria Road rapid bus corridor and planned light rail corridor along Hope Street. This improves access and provides the opportunity to increase walking and cycling, with the aim of reducing car dependency and overall parking requirements.

The former Bartlett Park site located on Victoria Road forms part of the northern precinct and has been re-zoned with DA approval for 1,200 dwellings.

A new town centre located on Hope Street will provide the focal point for the mixed use development and will contain the major commercial and retail uses. All this will be supported by a series of high quality public spaces which are to be dedicated to he City of Parramatta. The proposed development will create at least 1,500 full-time jobs within the town centre.

As part of the northern structure plan, upgrades on Victoria Road have been proposed as outlined in Figure 4.2. These upgrades have been planned in order to:

- Increase the accessibility of Melrose Park for all road users. Increased capacity at the Wharf Road intersection and new access via a southern leg at Kissing Point Road will allow vehicle demand to be efficiently dispersed across the network
- Improve the efficiency of the Victoria Road corridor. Additional stopline capacity on Kissing Point Road, Wharf Road and Marsden Road as well as for turning movement into these roads will ensure that regionally significant trips on Victoria Road are not adversely impacted by the development.
- Reinforce bus priorty by filling in gaps in existing bus lanes along Victoria Road and facilitating increased public transport use along the corridor.

Further investigations will be required in order determine the final layout of these upgrades. It is noted that all traffic modelling presented in this TMAP assumes full one-stage pedestrian crossings on all legs of Victoria Road intersections with Kissing Point Road and Wharf Road.

The proposed land use programme for the northern precinct is shown in Table 4.1

Table 4.1 : Land use summary (northern precinct)

Land use	GFA/dwellings
Residential	
Dwellings	6,850 dwellings
Non-residential	
Commercial	15,000m²
Retail	12,500m²

Figure 4.1 : Northern structure plan (adopted by CoP)

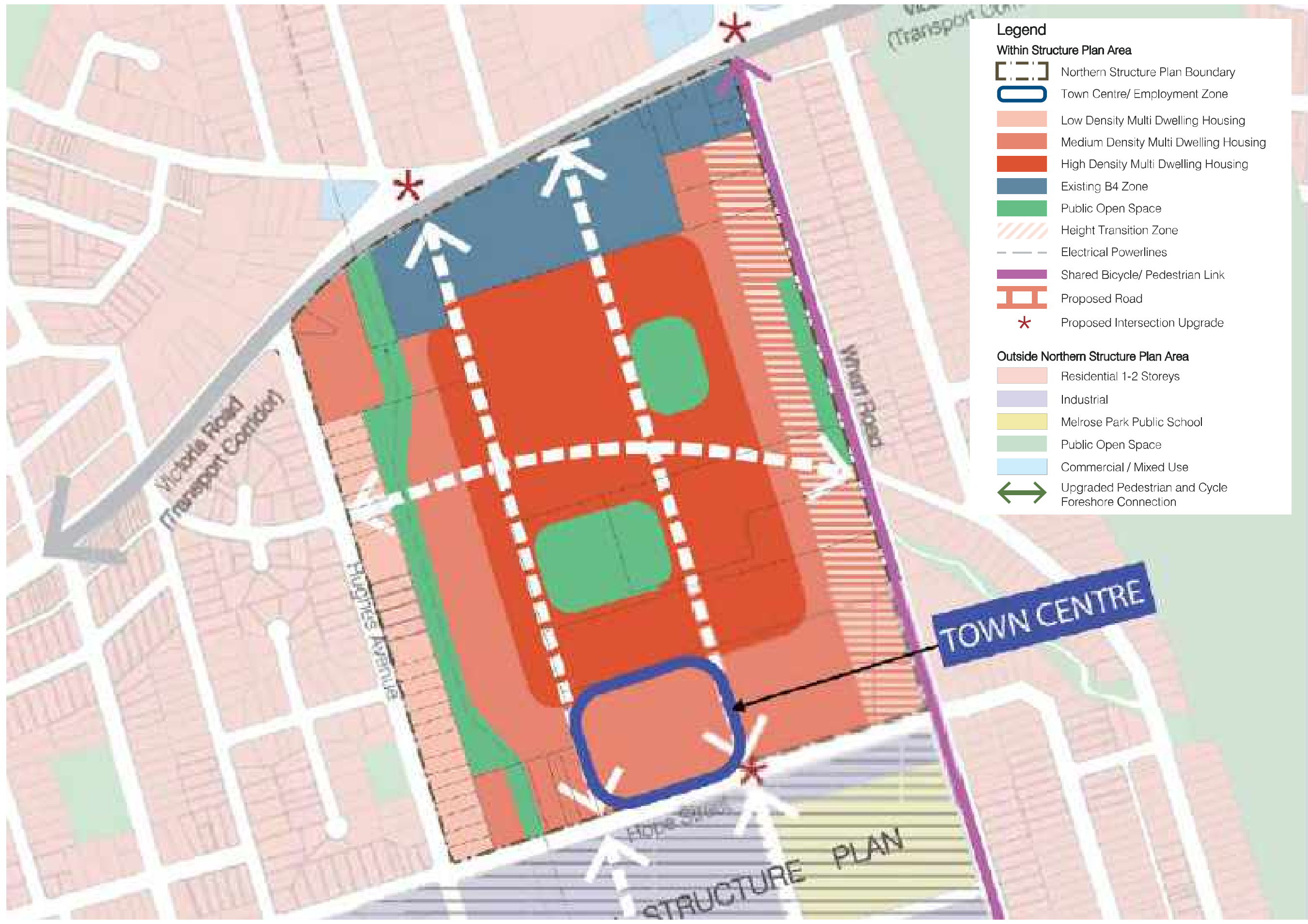


Figure 4.2 : Proposed Victoria Road Upgrades (Northrop)

4.2.2 Southern draft structure plan

The southern draft structure plan is shown in Figure 4.3 and has been developed based on the following guiding principles:

- A New Waterfront Community
- A Connected Precinct
- An Appropriately Scaled Precinct
- A Sustainable Precinct.

Built form in the Southern Precinct will be consistent with the scale of new development along Parramatta River and shall relate to the height of new development in the Northern Precinct.

- Built form will reduce in scale at the east and west edges of the precinct to affect a good transition in height to protect the amenity of adjoining low-rise neighborhoods.
- Along the riverfront park, scale will be limited to ensure a reasonable scale is achieved behind the mangrove line.
- There is to be no overshadowing of endangered Coastal Salt Marsh between 9am and 3pm at mid-winter, and no overshadowing of existing and new open space.

Higher density development is to be located at the heart of the precinct to facilitate a built form response that manages transitions adjoining low-rise residential. Densities will be reduced along the waterfront park edge.

At least 15% of the precinct and 15% of privately owned land has been identified as new open space.

The proposed land use programme for the northern precinct is shown in Table 4.2

Table 4.2 : Land use summary (southern precinct)

Land use	GFA/dwellings
Residential	
Dwellings	4,238 dwellings
Non-residential	
Commercial	4,400m²
Retail	3,100m²

Figure 4.3 : Southern draft structure plan

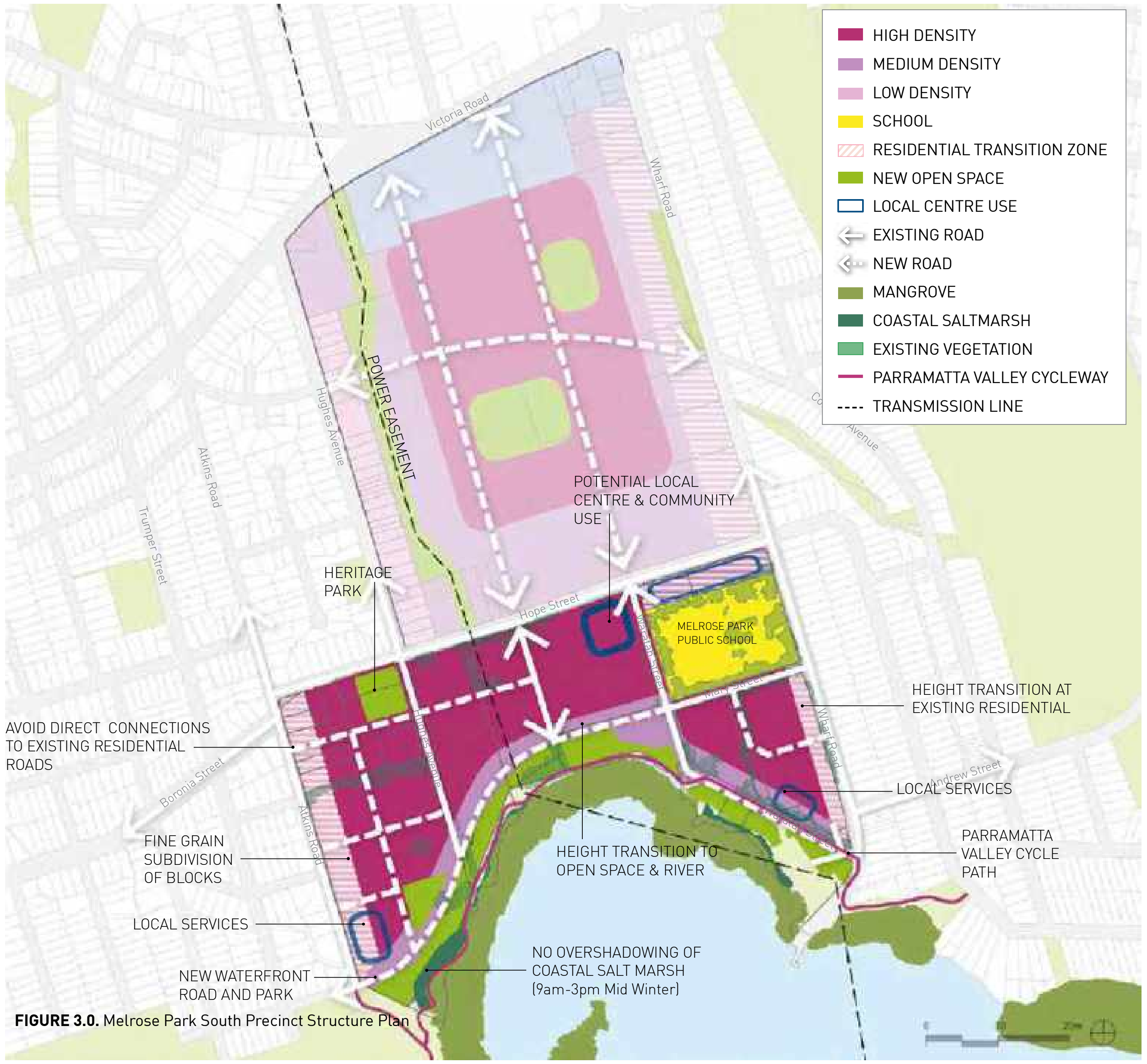


FIGURE 3.0. Melrose Park South Precinct Structure Plan

4.3 Transport planning objectives and indicators

The Melrose Park precinct has been planned with the goal of delivering balanced, integrated and sustainable outcomes that will potentially achieve the proposed transport targets of:

- Walking and cycling mode share - 5%.
- Public transport mode share - 45%.
- Car mode share - 50%.

These targets are shown in Figure 4.4. It is noted that these mode shares are for peak hour trips external to the development. It is anticipated that trips within the development will be primarily undertaken by active transport.

The Melrose Park TMAP leverages off and facilitates existing, planned and potential future transport options and accommodates the staged implementation of these proposals. Table 4.3 shows the overall, integrated transport strategy for the Melrose Park TMAP. Specific transport objectives and indicators in the integrated network are discussed below to support the overall Melrose Park vision and respond to the constraints outlined in Section 3.0.

Figure 4.4 : Melrose Park peak hour mode share targets - excluding trips internal to development

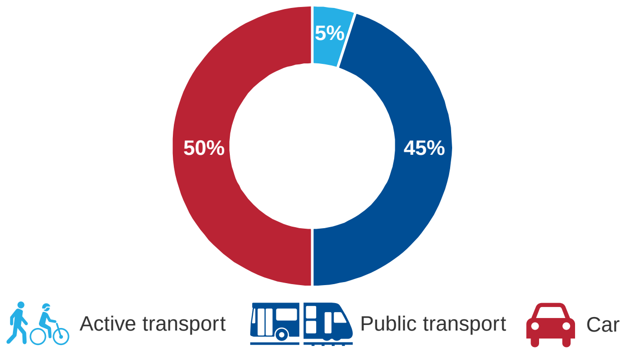


Table 4.3 : Melrose Park integrated transport objectives and indicators

Objective	Melrose Park indicators
1. Contribute to a general mode shift to public and active transport and reduce non-car mode share for peak trips to / from Melrose Park	Reducing the reliance on private car travel will provide significant benefits for future residents of Melrose Park whilst also minimising the impacts of the proposed developments on existing users of the road network. A non-car mode share of 50% represents a sizeable shift from the existing travel characteristics of the area. The delivery of significant new infrastructure – PLR Stage 2 and Sydney Metro West – will enable this step change in travel behaviour. These new public transport options will directly connect Melrose Park to the cores of the Eastern and Central CBD's, enhancing accessibility and reducing travel times to jobs and services.
2. Ensure that the transport network and services reflects the future growth and importance of key activity centres to / from Melrose Park	Melrose Park is perfectly located to provide 30-minute access to both the Eastern and Central CBD by public transport. Other nearby strategic centres include Sydney Olympic Park, Rhodes Business Park. This goal of 30-minute access to centres has been a key driver throughout the TMAP process and will be a key indicator for the overall success of the precinct.
3. Ensure all new residents in Melrose Park are within a safe walking distance of open space, social infrastructure and retail facilities.	The proposed development will deliver important non-residential facilities with retail, commercial and community uses as well as public open space. In order to maximise the benefits from these uses it will be imperative that a convenient, comfortable and safe walking environment is provided.
4. Minimise travel times along key public transport and movement corridors	Victoria Road is a regionally significant movement corridor. The efficiency and productivity of the corridor will need to be protected and the Melrose Park development will need to be implemented in a way that does not lead to travel time increases of more than 5% through the study area. This TMAP shall seek to meet this performance indicator through the provision of appropriate infrastructure upgrades and the minimisation of car use for trips to and from Melrose Park.
5. Ensure that the future transport network and services are attractive to the trip patterns of future residents	Melrose Park will be well served by existing and planned public transport services but there is a need to ensure patronage from the development does not exceed the planned future capacity of the network. The TMAP process will ensure that the staged development of the precinct occurs in lock-step with the provision of public transport infrastructure and services. The development will seek to focus highest intensity land uses around the primary public transport network such that 90% of the potential passenger catchment is within a 800 metre radius of a stop on the intermediate public transport system and/or within 400 metres of a local and suburban public transport route.
6. Ensure the key road network performs at acceptable levels of service during the highest impact peak hour.	The two key access points for the precinct will be on Victoria Road at Kissing Point Road and Wharf Road. Maintaining intersection level of service at LOS E or better will ensure that Victoria Road through traffic is not adversely impacted by the development whilst also allowing efficient access into and out of the precinct. It is noted that Victoria Road/Wharf Road currently performs at LOS F.
7. Prioritise active and public transport, and demand management measures to support sustainable travel behaviour and encourage reduced car use	Maximising the use of active and public transport will have significant benefits for the future residents and visitors of Melrose Park and will reduce the impacts of the development on the wider transport network. A key driver of active and public transport use will be the prioritisation of these modes throughout the precinct. This can primarily be done through best-practice urban and public realm design and by designing the precinct with pedestrians and cyclists as a primary consideration.

4.4 Movement and place framework

In recognition of these various functions, TfNSW has prepared new guidelines for street planning in NSW. The NSW Road Planning Framework (2017) proposes five different road types, as shown and described in Figure 4.5. Ultimately the classification of a road corridor to one of these types is based on a corridor's Movement needs and Place function.

The proposed road network within the Melrose Park precinct and hierarchy is shown in Figure 4.6. The hierarchy of the road has many functions on which the future precinct will rely on, including:

- Connecting communities through the movement of people and goods
- Supporting places and public spaces in urban areas and regional centres
- Facilitate economic growth and prosperity
- Facilitating social activities such as events and celebrations.

The Melrose Park structure plan is based on an interconnected, legible, urban-scale grid street pattern that will provide a pedestrian-friendly environment and provide optimal opportunities for bus servicing and access. The road network has been planned and dimensioned in conjunction with the spatial and land use planning of the precinct. This has ensured that the design of each street and its position in the movement and place hierarchy is appropriate to its role and the traffic demands placed upon it.

The internal road network has been conceived as a 'grid-like' system. Beginning from the higher order road network, each road type in the hierarchy branches into a smaller road with reduced speed environment. The hierarchy has been designed so that as individual blocks and access are approached, the level of speed of traffic decreases. The road network comprises three major elements:

1. The road hierarchy and street pattern

2. Road widths

3. Intersections

Figure 4.5 : Movement and Place

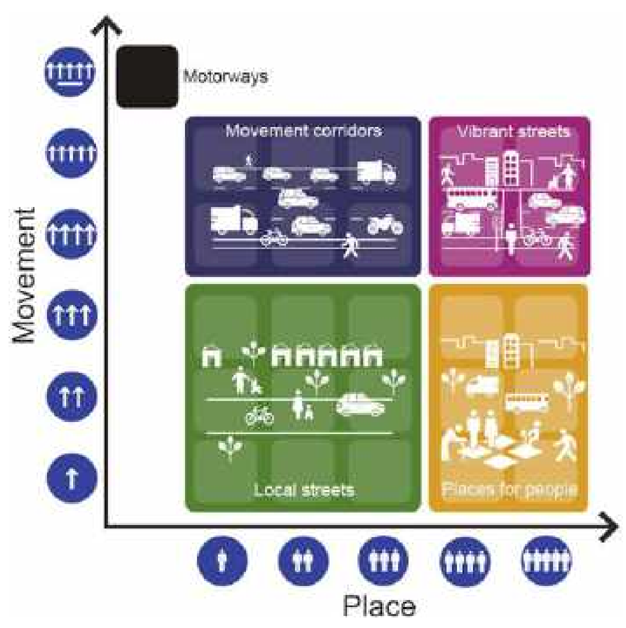


Figure 4.6 : Indicative internal street hierarchy

These elements have been integrated with a firm view of the broader aims of the structure plan to ensure the following outcomes:

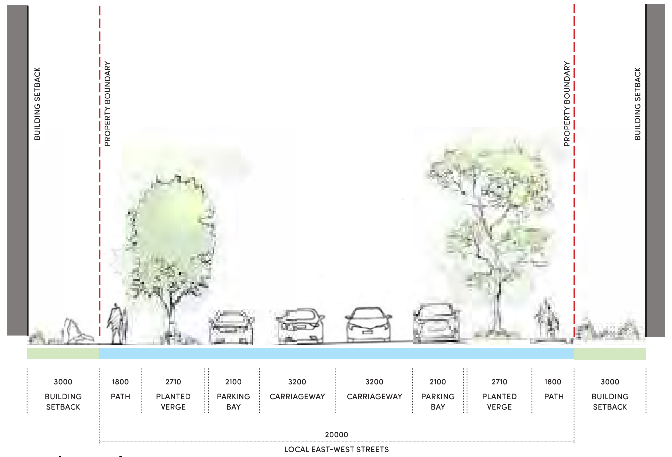
- An interconnected, legible, urban-scale grid street pattern that will provide a pedestrian-friendly environment and optimal opportunities for bus servicing and access
- The proposed Town Centre at the south east corner of Hope Street and Wharf Road is developed on the basis of promoting local access rather than regional traffic
- The road hierarchy is compatible with the land use and range of roles that each street serves. This incorporates a grid of local collector roads to distribute traffic within the Centre and to provide access into parking areas
- The alignment of roads and intersections support the urban structure and form. The structure plan includes proposed upgrades to Victoria Road in order to provide a new access into the precinct via the Victoria Road/Kissing Point Road intersection. Minor capacity upgrades to the Wharf Road/Victoria Road intersection are also proposed

Carriageways have been dimensioned to support the aims of the structure plan:

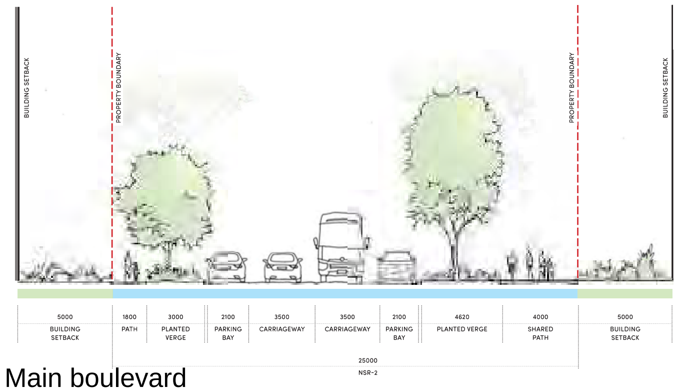
- Main roads in the core are proposed to each have a width capable of providing either four travel lanes or two travel lanes and two parking lanes
- Appropriate setbacks provided along the northern side of Hope Street (between Hughes Avenue and Waratah Street), future proofing the land to enable implementation of PLR Stage 2
- Some of the lesser roads are proposed to have 8.5m wide carriageways which would be capable of providing two travel lanes plus a parking lane on one side
- Roads in the residential areas are proposed to have carriageways typically 8m wide. These allow parking on each side plus a single travel lane between or parking on one side plus room for two vehicles to pass in opposing directions
- On-street parking (indented parallel parking bays) to be provided within the internal road network to provide for overspill of resident and visitor vehicles
- Comprehensive pedestrian and bicycle network providing sufficient footpath width that will provide permeability and a high degree of convenience for walkers and cyclists.

The right-of-way and typical cross sections associated with the northern and southern structure plans are shown in Figure 4.7 and Figure 4.8. It is noted these figures are indicative only and will be subject to refinement during detailed design and precinct delivery.

Figure 4.7 : Internal road sections - northern precinct

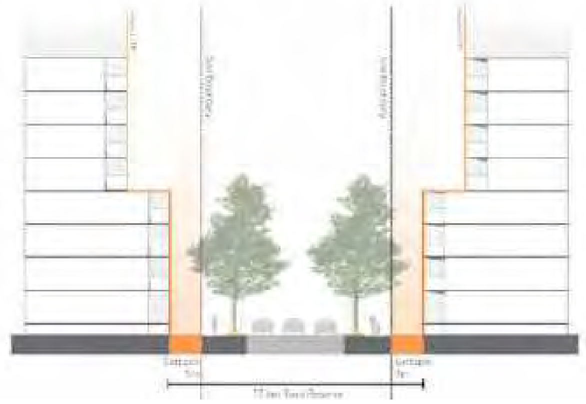


Local road



Main boulevard

Figure 4.8 : Internal road sections - southern precinct



5. TRANSPORT MODELLING

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5. TRANSPORT MODELLING

5.1 Overview

Transport modelling is a core part of the Melrose Park TMAP. The modelling process forecasts the traffic and transport impacts of the overall Melrose Park precinct. This section outlines the various platforms and processes used throughout the modelling components of the TMAP.

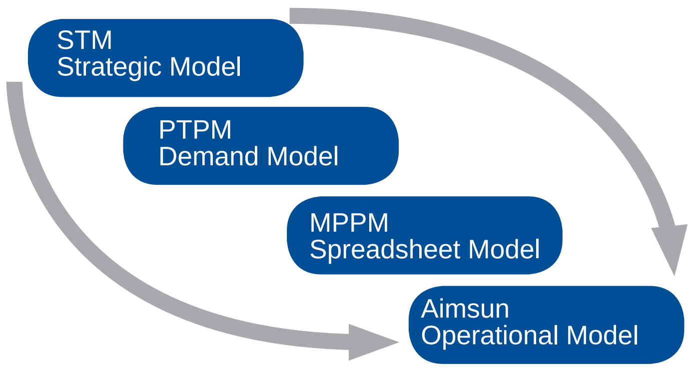
5.2 Modelling framework

The transport modelling approach was tailored to the needs of the Melrose Park TMAP included the use of three (3) separate models with linkages, as outlined in Figure 5.1. Transport modelling has been undertaken using a multi-tiered modelling approach using a combination of strategic, mesoscopic and microscopic modelling. Strategic modelling has been used for demand forecasting and mode split, while mesoscopic modelling has been undertaken to determine key performance indicators for general traffic, buses and light rail for the base and future scenarios.

The transport modelling approach and included the use of three (3) models with linkages as follows:

- **Public Transport Project Model (PTPM)** - used to determine future travel patterns based on population and employment forecasts from STM and estimate public transport patronage.
- **Melrose Park Precinct Model (MPPM)** - bespoke precinct wide spreadsheet modelling tool to derive high level patronage forecasts, and potential mode shares to assist in understanding the initial feasibility of various transport scenarios
- **Aimsun mesoscopic traffic model** - developed to assess transport impacts on the road network of the proposed land use changes and to ascertain the requirements for transport infrastructure and services to support this growth.

Figure 5.1 : Modelling process



5.2.1 Public Transport Project Model (PTPM)

PTPM (Public Transport Project Model), currently being used for PLR Stage 1 and 2, is an incremental multi-modal demand model developed for and operated by the Transport Performance Analytics (TPA) within TfNSW to assist in the evaluation of major public transport projects. It is closely related to the Strategic Travel Model (STM) which provides the overall growth factors before PTPM undertakes the mode choice and assignment functions using generalised costs. A key strength is the underlying observed demand, which provides a solid platform to forecast patronage and demand related impacts of public transport projects and policies.

In this context, the Melrose Park TMAP Project Coordination Group advised the use of PTPM to investigate the following for a 2026 and 2036 forecast year:

- Determine regional trip distribution across the Sydney Metropolitan Area
- Determine potential future travel patterns based on population and employment forecasts
- Estimate public transport patronage and future services through the study area.

5.2.2 Melrose Park Precinct Model (MPPM)

As part of the Melrose Park TMAP, Jacobs developed a bespoke precinct wide spreadsheet modelling tool (MPPM) in conjunction with Dr Neil Prosser to derive high level patronage forecasts, and potential mode shares to assist in understanding the initial feasibility of various transport scenarios. The MPPM is a combination of mode choice modelling with tailored assumptions trip generation, trip distribution, and travel attributes based on background data. The MPPM is a finer grain precinct wide model based on benchmarking future demand based on proposed developments near the vicinity of Melrose Park such as Meadowbank, Wentworth Point, Rhodes and Liberty Grove etc.

A summary of the development and operation of the model is provided below:

- A combination of mode choice modelling with assumptions about trip generation, distribution and travel attributes based on an analysis of JTW (2011) and HTS (2015/16) data
- Coarse representation of zones outside the study area – modelling of key origins and destinations
- No modelling of the road and traffic network – car travel times are obtained from STM
- Public transport – travel attributes, including travel time, walk time, wait time, transfers and fares, are estimated within the PT model based on specified public transport routes and services
- Walking and cycling – walk and cycle travel times are estimated based on specified average speeds and distance factors.

The MPPM has benefits associated with the modelling approach undertaken for the Melrose Park TMAP including:

- More accurate modelling of higher density land use at a block by block level near transit nodes
- Finer disaggregation of travel zones within the precinct when compared to PTPM
- Detailed modelling of bus, light rail and future rail services with 'walking up' components incorporated in mode choice
- Estimation of trip generation for work and non-work trips
- Modelling of public transport travel and mode share to and from Melrose Park during the AM and PM peak hours.

Detailed documentation of MPPM background and model development is provided in Appendix A.

5.2.3 Mesoscopic and microscopic modelling

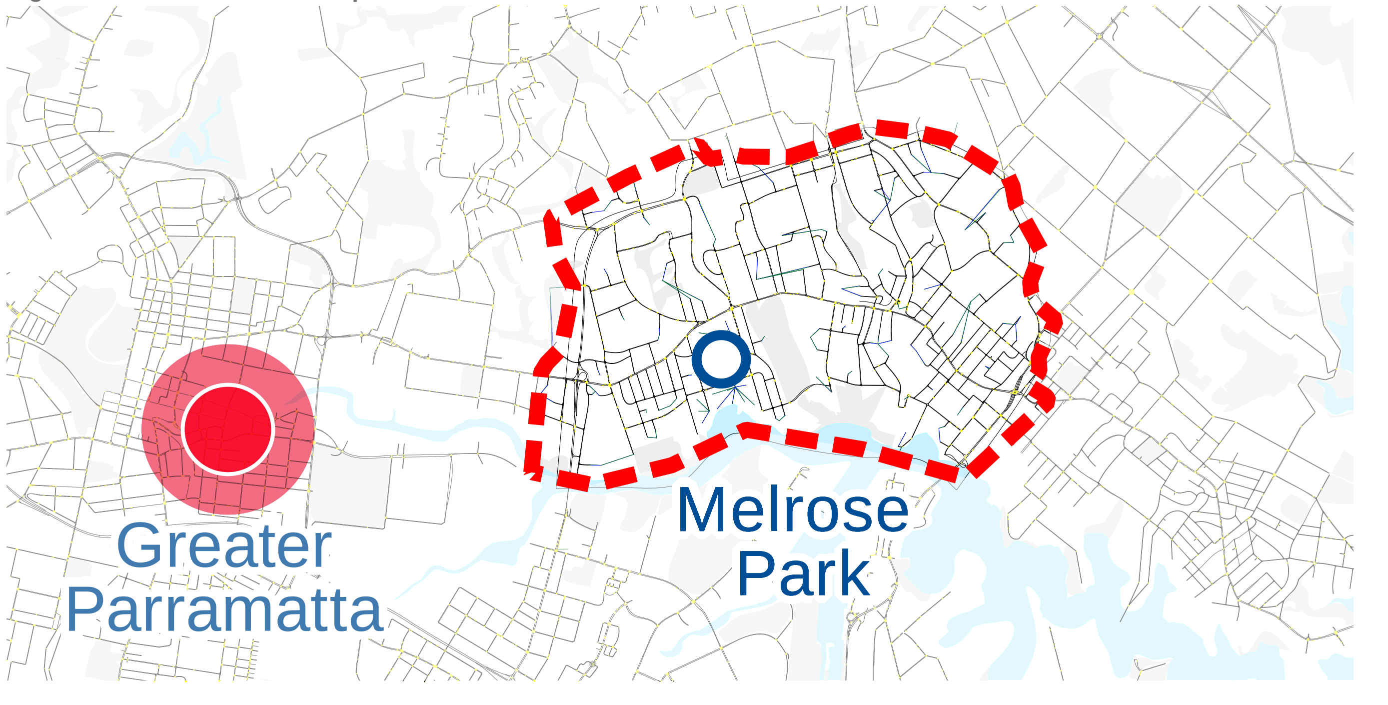
A mesoscopic model is a mid-level modelling tool which uses features from both strategic modelling and micro-simulation modelling to forecast the future transport demand on the road network by considering the predicted land use changes (population and employment). Operational modelling of the study area has been undertaken using the Aimsun modelling platform using a hybrid combination of mesoscopic and microscopic modelling. The extent of the model area is shown in Figure 5.2.

Mesoscopic modelling allows for simulation to be undertaken using dynamic assignment that takes into account the effects of congestion on the network and allows for the identification of network constraints at the arterial and sub-arterial level. Microscopic level modelling allows for more detailed examination of specific locations using microsimulation for selected areas. This hybrid configuration of mesoscopic/microscopic modelling has been undertaken for the TMAP, with microsimulation at the immediate development interface and mesoscopic modelling for the wider network.

The adopted hybrid modelling configuration provides sufficient detail to determine the performance of the network under proposed future land use demands and provides guidance on the need for further road infrastructure improvements. In addition, the hybrid simulation allows for true dynamic equilibrium assignment, where vehicles can select their optimum travel routes based on their previous travel experiences. This provides confidence that the modelled pattern of traffic represents a realistic response to all of the delays and capacity constraints that would be experienced on the network.

The Aimsun model calibration report is provided in Appendix B.

Figure 5.2 : Aimsun mesoscopic model area



5.3 Mesoscopic Modelling – Calibration and validation

The Melrose Park Traffic Model has been calibrated and validated according to the principles outlined in the RMS Traffic Modelling Guidelines, 2013. Calibration and validation of models is essential to ensure that they are an accurate reflection of observed traffic conditions.

Further detail on the calibration and validation process is provided in the *Melrose Park Mesoscopic Model Calibration and Validation Report* (Jacobs, 2018).

5.3.1 Data sources

The model has been calibrated using turning movement counts collected across the study area in August 2017. Travel time surveys were undertaken along key corridors in order to provide a basis for model validation. Travel times were collected for:

- Victoria Road
- Silverwater Road
- Wharf Road/Marsden Road.

5.3.2 Model coverage

The Melrose Park mesoscopic model is a sub-area model derived from the Sydney GMA model. The Melrose Park sub-area extends from Silverwater Road in the west to Church Street/Devlin Street in the east. The Parramatta river forms the southern boundary and the model extends to Stewart Street and Rutledge Street in the north.

The model is comprised of:

- Over 1,267 individual road sections
- Over 100 traffic generating centroids
- Over 40 signalised intersections.

5.3.3 Calibration

Through a process of demand adjustment and refinement of traffic signal settings and route attractiveness, the models were calibrated to the observed counts. The Melrose Park model has been calibrated according to the following criteria:

- R^2 of greater than 0.95
- Regression slope between 0.95 and 1.05

Whole model:

- At least 80% of flow comparisons with GEH less than 5
- At least 95% of flow comparisons with GEH less than 10

Core/microsimulation area:

- At least 85% of flow comparisons with GEH less than 5
- 100% of flow comparisons with GEH less than 10

The GEH statistic is used in the calibration of traffic models to compare the differences between modelled and observed traffic flows

The R^2 value generally represents the closeness of fit of the observed data points with the modelled data points and the slope of the trendline provides an indication of whether the model is generally over assigning (slope greater than 1) or under assigning (slope less than 1) traffic across the network.

Review of the GEH and regression statistics, see Table 5.1, Table 5.2 and Figure 5.3 shows that the model is sufficiently well-calibrated on the basis of turning movement flows, for both peak periods in aggregate and for each hour within those peak periods.

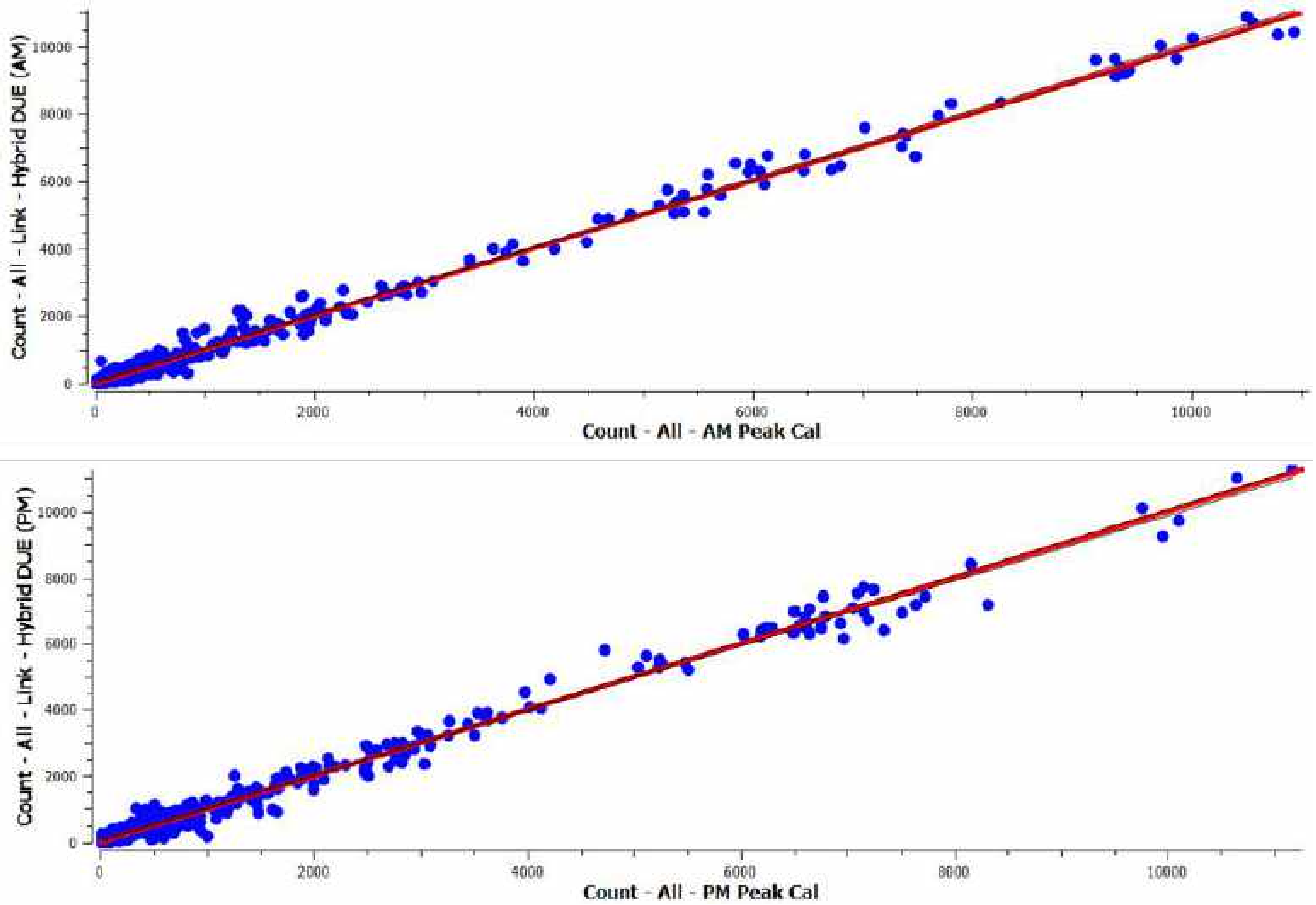
Table 5.1 : GEH statistics

Measure	Target	Hour starting				
		All hours	6:00am	7:00am	8:00am	9:00am
Whole model						
GEH<5	80%	85%	78%	80%	78%	80%
GEH<10	95%	98%	98%	99%	95%	98%
Core area						
GEH<5	85%	91%	82%	88%	86%	85%
GEH<10	100%	100%	100%	100%	100%	100%

Table 5.2 : Regression statistics

AM Peak	R^2	Slope
6:00 - 10:00 (Aggregate)	**0.992**	**0.989**
6:00 - 7:00	0.988	0.974
7:00 - 8:00	0.990	0.981
8:00 - 9:00	0.981	0.975
9:00 - 10:00	0.982	1.014
PM Peak	**R^2**	**Slope**
15:00 - 19:00 (Aggregate)	**0.987**	**0.979**
15:00 - 16:00	0.973	0.950
16:00 - 17:00	0.986	0.986
17:00 - 18:00	0.986	0.989
18:00 - 19:00	0.977	0.982

Figure 5.3 : Regression graphs



5.3.4 Validation

In order to determine the suitability of the Melrose Park model in forecasting future traffic conditions, it was necessary to validate the model against a set of data that is independent from that used in the demand estimation and calibration process. Validation of the Melrose Park model has been undertaken using travel time surveys outlined above and results for Victoria Road are shown in Figure 5.4 and Figure 5.5. Results indicated that the model was sufficiently validated in accordance with RMS Traffic Modelling Guidelines.

Figure 5.4 : Victoria Road travel time validation (AM peak hour)

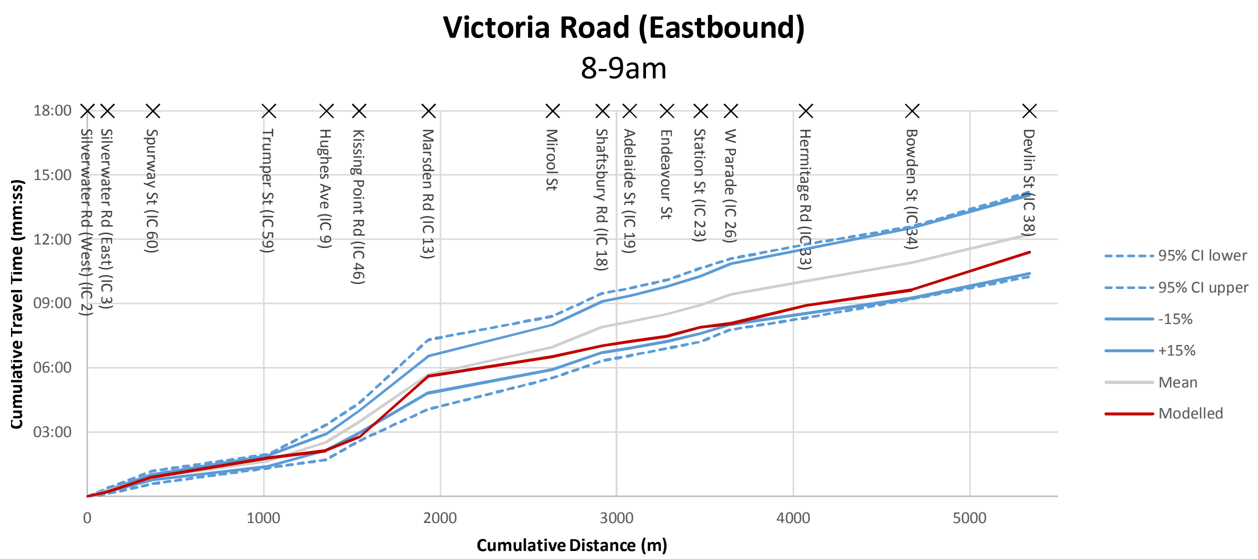
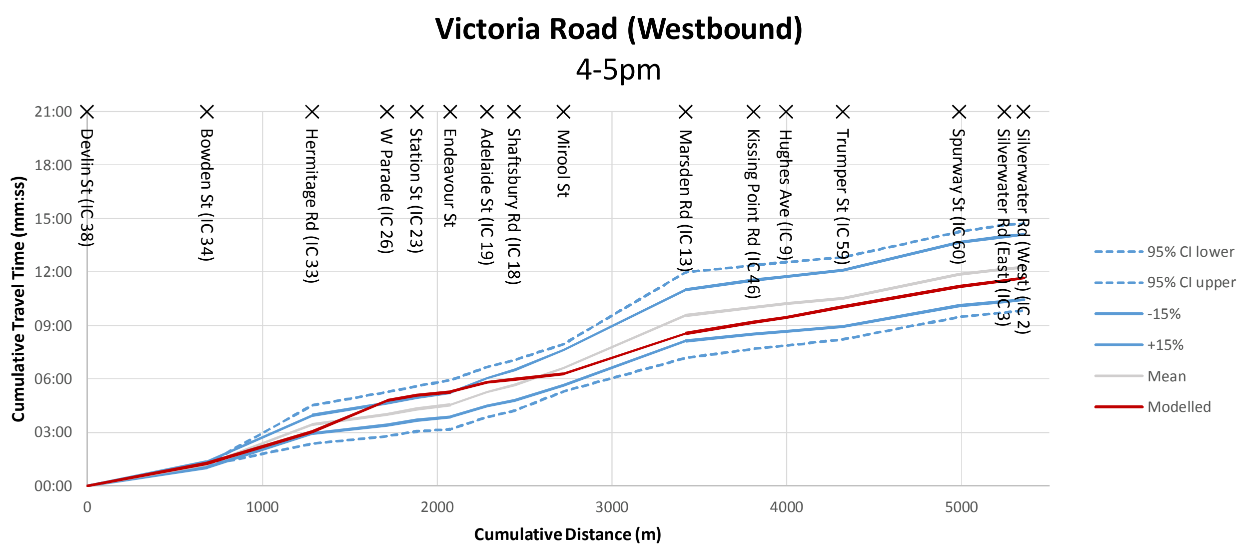


Figure 5.5 : Victoria Road travel time validation (PM peak hour)



5.4 Model inputs and assumptions

The transport models developed for the Melrose Park TMAP required a number inputs and assumptions, including population/employment forecasts, wider network changes, road network configurations and public transport service provision. Key assumptions in the immediate area impacting the Melrose Park TMAP included:

- Population and employment across Sydney GMA consistent with LU16 forecasts
- Major public transport projects – Parramatta Light Rail Stages 1 and 2 connecting Rydalmere and Sydney Olympic Park via Melrose Park (via new bridge across Parramatta River (in 2026), and Sydney Metro West connecting Parramatta CBD, Sydney Olympic Park and Sydney CBD in 2036
- Major motorway road projects – WestConnex Stages 1&2 by 2026 and WestConnex Stage 3 and Western Harbour Tunnel by 2036.
- Major arterial road projects – proposed structure plan incorporates widening of Victoria Road (from Wharf Road to Hughes Avenue), upgrades to Victoria Road signalised intersections at Wharf Road and Kissing Point Road in 2026
- Local road network changes – all intersections along Boronia Street-Hope Street between Spurway Street and Wharf Road along the PLR Stage 2 corridor have been assumed to be signalised with other intersections 'left-in' and 'left-out' in 2026

5.5 Trip generation

5.5.1 Approach

As agreed with the Melrose Park PCG, two methods were used to estimate the overall trip generation of the overall Aimsun model study area. The first method involved the application of the STM/PTPM, and the second method was based on the RMS Guide to Traffic Generating Developments (2002) and High Density Residential Car Based – Trip Generation Surveys Analysis Report (2017) undertaken on behalf of RMS.

5.5.2 Traffic generation calculations

The estimation of future traffic volumes to be used in the Aimsun model has been developed using a combination of both the STM/PTPM and RMS guidelines as follows:

- PTPM has been used to generate 'external trips' only with neither originating or ending in the study area
- RMS guidelines have been used to generate 'internal trips' into and out of Melrose Park precinct based on a combination of RMS updated surveys (TDT 2013/04a) and more recent surveys undertaken in 2017 on behalf of RMS.
- Commercial vehicle trip rates are based on rates from RMS updated surveys (TDT 2013/04a)
- Retail rates are based on surveys undertaken at East Village Shopping centre as outlined in the *Melrose Park Planning Proposal Traffic and Transport Study (2016)*.

An analysis of the above data along with an extensive benchmarking process led to the following rates being proposed and agreed with the PCG:

- The traffic generation rate for the former Bartlett Park site incorporating 1,200 dwellings has based on an AM and PM rate of 0.19 and 0.15 trips per dwelling per hour respectively as part of previously approved rezoning proposal
- The traffic generation rate for the remaining 9,855 dwellings for Melrose Park has been based on a rate of 0.25 trips per dwelling per hour for both the AM and PM periods.
- Retail rates includes a 20% reduction to account for linked trips already captured by the residential generation rates, as is appropriate for a high density mixed use development.

The expected generated trips for the AM and PM peak hours for the 'ultimate build-out' (2036) is shown in Table 5.3.

Table 5.3 : Melrose Park traffic generation (ultimate build-out)

		AM PEAK HOUR		PM PEAK HOUR	
		Trip generation rate	Vehicle trips	Trip generation rate	Vehicle trips
Dwellings (Bartlett site)	1,200	0.19 per dwelling	228	0.15 per dwelling	180
Dwellings	9,886	0.25 per dwelling	2,471	0.25 per dwelling	2,471
Commercial GFA	19,400m^2	1.6 per 100m^2	310	1.2 per 100m^2	233
Retail GFA	15,600m^2	2.5 per 100m^2	390	5.0 per 100m^2	780
Total			**3,399**		**3,664**

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5.6 Trip distribution

The distribution of all trips in the network has been based on the outputs of PTPM. Overall trip distribution for the Melrose Park Traffic Model has been undertaken on the basis of revealed travel patterns from the PTPM, and by extension the STM. Trip distribution in STM is an iterative process that distributes trips based on the proximity of jobs and population for the whole Sydney metropolitan area.

The PTPM trip matrices provide the most appropriate source of future trip distribution for all trips within and through the study area. The future land use projections for the entire Sydney metropolitan area are included in the PTPM hence the distribution of trips within PTPM takes into account the location of future jobs, dwellings and services likely to generate and attract trips which interact with the Melrose Park study area.

Figure 5.6 and Figure 5.7 show the distribution of trips leaving Melrose Park in the 2036 AM peak periods. There remains a relatively strong desire line to Sydney CBD, however there is a noticeable shift away from the Eastern City as a whole. More trips from Melrose Park remain in the Central City where a significant number of new jobs and services are expected to be provided within the next 20 years. Less than half of all trips originating from Melrose Park are expected to have destinations in the Eastern City, compared with almost 60% in 2016.

This change in trip distribution patterns will lead to shorter trips and will help to relieve the existing pressure on existing transport infrastructure which is currently constrained by the significant number of eastbound trips towards the Eastern City in the AM peak period.

Figure 5.6 : Distribution of trips departing Melrose Park - SA3 level (2036 AM)

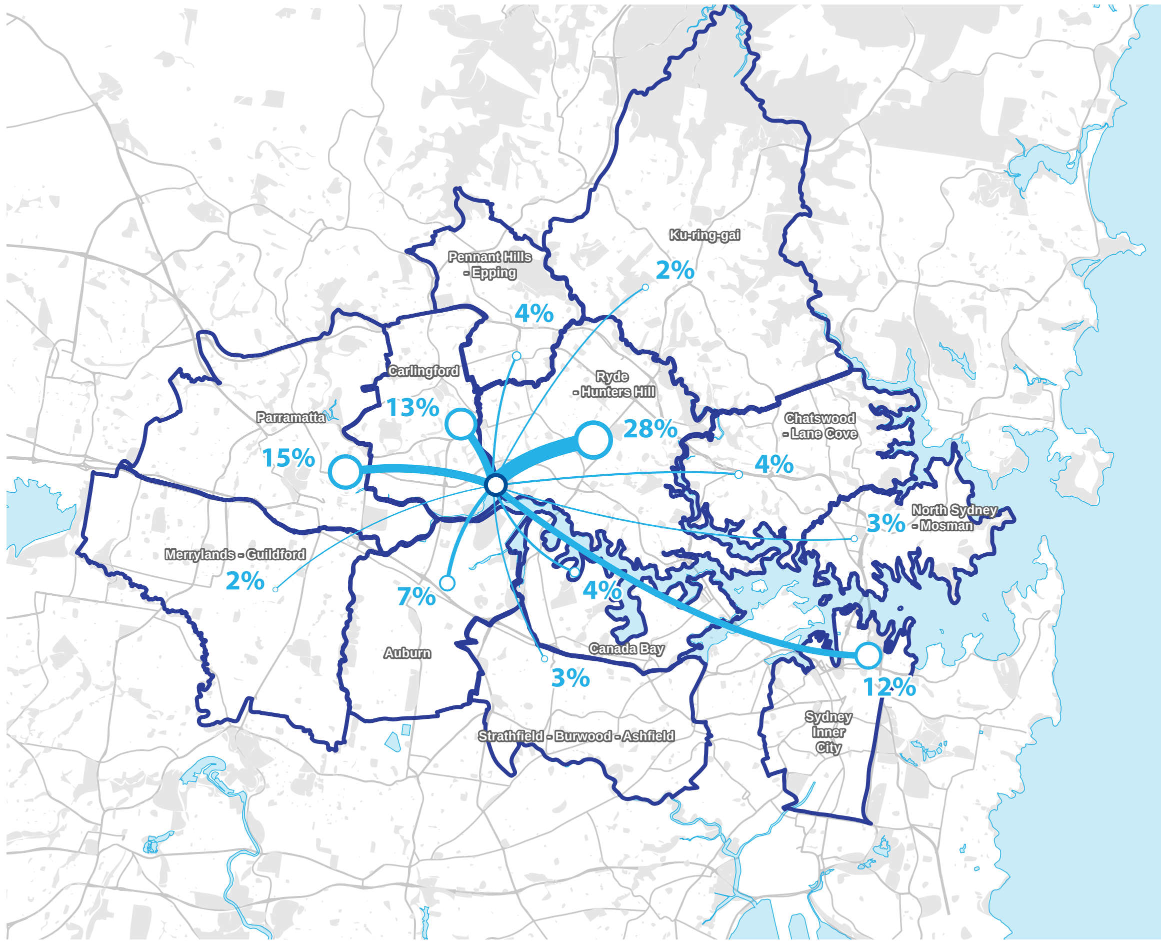
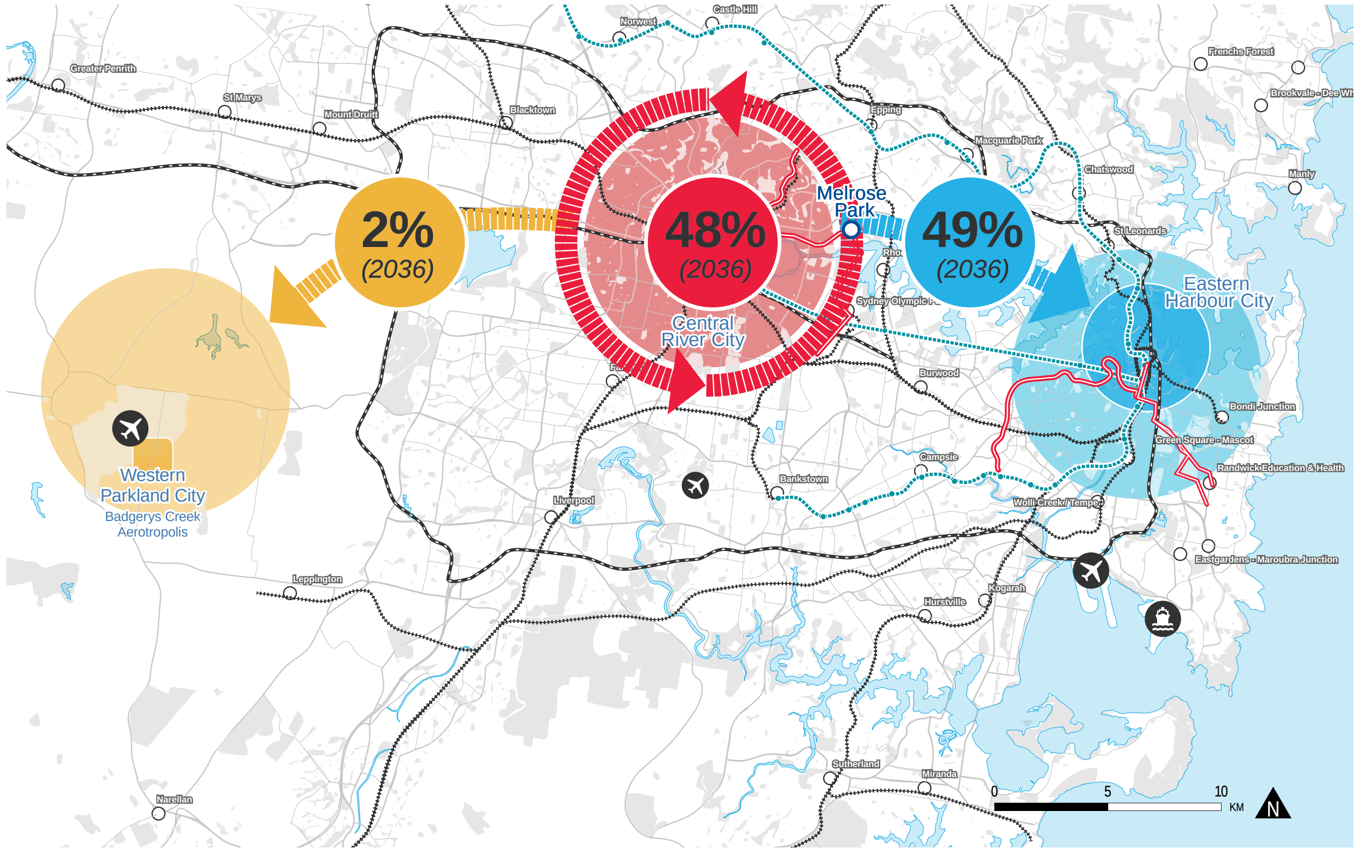


Figure 5.7 : Distribution of trips departing Melrose Park - 3 cities level (2036 AM)



5.7 Mode choice

Potential future mode shares for Melrose Park have been assessed using a combination of the PTPM and MPPM models. Both models use an assessment of the generalised cost of travel time to forecast mode choices for a particular journey.

The potential for reduction in car dependency by implementing the public transport initiatives (see Section 6.0) for Melrose Park is considerable, and preferable to the alternative of the traditional car-based solution. As discussed earlier, the Melrose Park site represents a major opportunity to influence travel through initiatives that encourage transport alternatives that will reduce car dependency.

The proposed PLR Stage 2 and its connection to Sydney Metro West via a new bridge across the Parramatta River represents a major commitment to promoting public transport, as a competitive and preferable mode to private vehicle use, which will be demonstrated later in this report.

The mode share for trips from Melrose Park derived from both the PTPM and MPPM is provided in Figure 5.8. It is noted that PTPM is forecasting higher car mode shares for all future horizon years compared to the MPPM results. Several points are noted regarding this difference:

- PTPM 'pivots' off the existing base conditions using a combination of incremental and absolute forecasting methods. The existing land use in Melrose Park is industrial and non-residential and existing car mode shares for trips from Melrose Park are therefore very high. The incremental forecasting component of PTPM is potentially unable to fully quantify the change in mode share that will result from the delivery of a highly accessible mixed use precinct and major public transport infrastructure.
- The MPPM results are based on an assessment of generalised costs for all mode options in the network. They are also founded on benchmarking of travel patterns from existing centres and developments similar in composition to the proposed Melrose Park precinct.

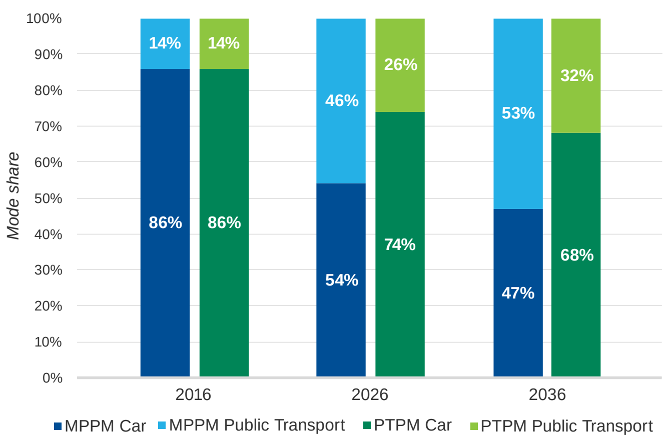
5.8 Trip assignment

The assignment of vehicle trips has been undertaken in two stages:

- Stage 1: Static traffic assignment in PTPM to determine sub-area traffic demand based on a traversal matrix from STM
- Stage 2: Dynamic user equilibrium assignment in Aimsun mesoscopic model

This assignment methodology is detailed below.

Figure 5.8 : Melrose Park mode share



5.8.1 Static assignment

The static assignment step has been undertaken to generate a sub-area traversal of the whole Sydney Greater Metropolitan Area model, suitable to be used as an input for future traffic demand within the smaller Melrose Park traffic model.

5.8.2 Dynamic user equilibrium assignment

Traffic generation as previously described was assigned to the Melrose Park traffic model Aimsun model using a Dynamic User Equilibrium (DUE) assignment method. DUE is an extension of the concept of static equilibrium however vehicle simulation is used to generate route costs, rather than a theoretical speed/flow curve. This has the advantage of taking into account the capacity constraints of the network in greater detail including traffic signals and intersections, merging and weaving on freeways and the accumulation of traffic in queues.

5.8.3 Assignment of Melrose Park trips

Figure 5.9 and 5.10 shows the assignment of trips in the 1-hour AM and PM peak periods generated by the Melrose Park development only. The origin and destination of trips has been defined by the PTPM strategic model whilst the route taken through the model is a result of DUE assignment. It is noted that:

- The majority of Melrose Park trips travel in an east-west direction, either via Victoria Road or the Andrews Street/Constitution Road corridor
- The Hope Street and Marsden Road corridors also serve as a key access for the Melrose Park precinct
- These volumes are not purely in addition to volumes in the do minimum scenario. It is noted that the development will replace existing traffic generating land uses and so the net increase in traffic would be lower than the total trip generation volumes in these figures.

Figure 5.9 : Traffic volume - 2036 AM peak hour (only trips generated by development)

Figure 5.10 Traffic volume - 2036 PM peak hour (only trips generated by development)

5.9 Development of future traffic forecasts

5.9.1 Future background traffic growth

Initial testing and analysis of the future year 2036 forecast travel demands – without Melrose Park development - showed that there was insufficient capacity on the network to accommodate forecast traffic growth. Demand capping was undertaken using simulation of the forecast traffic demand on the mesoscopic network and comparing forecast demand with model throughput across the network to:

- Identify network constraints where proposed demand exceeded capacity and resulted in either excessively low average speeds or vehicles being unable to enter the network
- Cap the growth in trips for any origin-destination pairs that must pass through identified capacity constraints
- Allow trips to change their departure time to avoid capacity constraints and maximise available traffic network capacity.

The process accounts for the fact that strategic model outputs from PTPM, are likely to overestimate the growth in peak hour trips. Historic traffic counts demonstrate that peak period vehicle trips have experienced limited growth despite significant population growth. PTPM forecasts significant growth (1-2% per annum) on Victoria Road and Silverwater Road which have experienced flat or negative growth since 2009 (-2% and -4% per annum respectively.) To account for this, traffic growth was capped to the modelled network capacity under the Do-Minimum scenario (without Melrose Park development).

The quantum of capped trips assumed to not depart during the modelled 4-hour period is shown in Figure 5.11 and equates to less than 2% of the total uncapped future demand from PTPM.

The primary result of the demand capping process has been to shift trips from the peak hour to the shoulder periods. This is consistent with the observed pattern of growth along Victoria Road and Silverwater Road, where peak hour volumes have remained relatively constant, but the peak period has expanded to cover a longer time period.

A difference plot comparing capped and uncapped static assignment hourly volumes is shown in Figure 5.12. It is noted that the majority of capped trips are those that use the Church Street/Devlin Street corridor in the far south east of the model area. The number of capped trips is also observed to be very low through the study area.

5.10 Trip generation summary

A summary of the AM peak 1-hour trip generation of Melrose Park for all modes is presented in Table 5.4. Trips are shown for the two major proposed staging scenarios i.e. 'No-bridge' representing the period prior to the implementation of the new bridge over Parramatta River and 'Post-bridge' representing the ultimate 11,000 dwelling scenario with the bridge in place. (See section 6.4.3 for a more detailed description of staging)

Table 5.4: All modes trip generation (AM peak hour person trips)

	No-bridge (approx 6,700 dwellings)	Post-bridge (approx 11,000 dwellings)
Private Vehicle[1]	2,525	4,080
Bus only	150	30
Bus/Train	1,590	450
Light Rail only	-	280
Light Rail/ Train	-	2,390

[1] Assuming vehicle occupancy of 1.2 people per vehicle

Figure 5.11 : Demand capping results (AM 4-hour period)

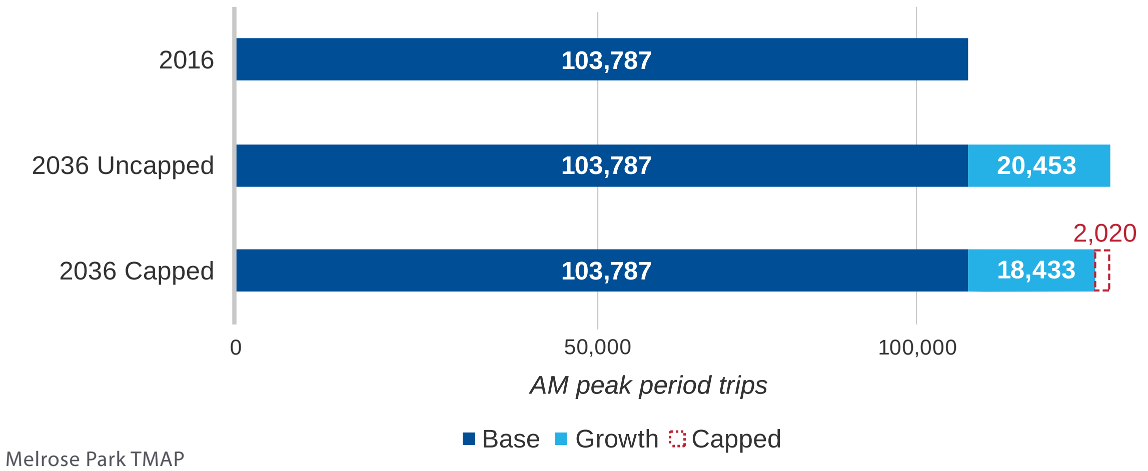


Figure 5.12 Difference plot comparing capped and uncapped 2036 AM demand (average hourly flows over 4-hour modelled period)

6. APPRAISAL OF MELROSE PARK STRUCTURE PLANS