6. APPRAISAL OF MELROSE PARK STRUCTURE PLANS

6.1 Overview

Transport modelling has been used as the basis for assessing the surface transportation network presented in the Melrose Park structure plans. This section examines the overall road network performance based on the land use estimates of 11,000 residential dwellings proposed for overall Melrose Park precinct and assesses future infrastructure enhancements for 2026 and 2036. In assessing the adequacy of the Melrose Park road network to meet the proposed future land-based demands, a desired assessment criteria for strategic road network planning and intersection performance has been developed.

This section addresses the potential impacts of the public transport system in the study area in the context of the mode shift objectives. This section also recognises the role walking and cycling replaces car-based trips within Melrose Park, and how the provision of improved transport facilities and opportunities can help drive positive mode change in the future.

6.2 Approach to appraisal

The appraisal of the Melrose Park structure plans was tested using the PTPM, MPPM and the Melrose Park Traffic Model (using Aimsun) to examine the potential impacts on transport infrastructure and services on the local and regional road network, public transport and walking and cycling. The key stages of the Melrose Park TMAP approach were as follows:

- Land use development scenario of 11,000 dwellings for the combined northern and southern precincts
- Update the TfNSW PTPM model to forecast travel demand and mode share
- Traffic forecasts and assessments for the road network produced by the Melrose Park traffic model based on:
  - ‘Do Minimum’ (without Melrose Park development)
  - ‘With Project’ (with Melrose Park development)
- Identify future system problems and user needs for the public transport network
- Develop appropriate transport network infrastructure and services
- Define appropriate travel demand management measures.
- Iteratively test staging scenarios to develop a strategy that ensures adequate capacity for both road and public transport networks at all stages of development.

6.3 Road network performance

6.3.1 Introduction

The Melrose Park Aimsun traffic model has been used as the basis for assessing the surface transportation road network presented in the structure plan. This section examines the overall road network performance based on the land use estimate of 11,000 dwellings proposed for Melrose Park and assesses future road infrastructure enhancements 2036. The following key performance indicators were used to assess the strategic merits of the structure plans and proposed road infrastructure enhancements:

- Midblock flow and density (measures of congestion in mesoscopic models)
- Intersection Level of Service (based on average delay)
- Travel times on key movement corridors (i.e. Victoria Road).

The above performance indicators have been extracted from the Melrose Park traffic model for the highest impact peak hour, under a future ‘do minimum’ (no development) and a future ‘with project’ (with development) scenario for 2036.

6.3.2 Desired service criteria

Midblock traffic density

The Melrose Park traffic model has traffic flows constrained by capacity whether due to saturation flows in midblock sections or due to capacity limitations at intersections. When traffic demand exceeds capacity, traffic queues form and these are depicted within the mesoscopic model as increases in traffic density. Traffic density is the average number of vehicles per kilometre on each section of road.

In this context, the road network traffic density was used to examine key capacity constraints within the road network developed for the structure plan. Higher densities indicate vehicles are closer together and therefore traveling more slowly and spending more time queuing (i.e. higher densities indicate more congestion). The assessment of network performance on the basis of traffic density was used to resolve capacity constraints (if any). Road network infrastructure improvements identified on the basis of traffic density were assessed according to whether they increased the volume of traffic that could be assigned to the network.

Intersection level of service

The performance of an urban road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. It is therefore appropriate to consider intersection operation as a measure of the capacity of the road network.

The criteria for evaluating the operational performance of intersections is provided by the RTA Guide to Traffic Generating Development (2002); these criteria are shown in Table 6.1. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (the level of service) which is applied to each band on the basis of average delay. This average vehicle delay is equated to a corresponding level of service from A (best) to F (worst).

Based on the performance measures shown in Table 6.1 a target maximum level of service threshold for new intersections of level of service E (as agreed with PCG) has been adopted for peak period conditions for future signalised intersection performance where practicable.

Table 6.1 : Intersection level of service criteria

Level of Service	Average delay (sec/veh)	Signalised intersections and roundabouts	Give way and stop signs
A	<14	Good operation	Good operation
B	15 – 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29-42	Satisfactory	Satisfactory but accident study required
D	43-56	Operating near capacity	Near capacity and accident study required
E	56-70	At capacity; incidents will cause excessive delays	At capacity, requires other control mode
F	>70	Over capacity, unstable operation, excessive queuing	Over capacity. Unstable operation

Travel times

Victoria Road is a regionally significant movement corridor which carries more than 60,000 vehicles per day through the study area. It is also a key east-west bus corridor with up to 30 services per hour projected by 2026. 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 private vehicle travel time increases of more than 5% through the study area.

6.3.3 Future road link and segment performance

Future traffic volumes

The traffic volume plots in Figure 6.1 to Figure 6.4 show the 2036 forecast volume of traffic in the model area for Melrose Park. They provide a useful indication of the volume of traffic using a road and helps to understand the demand for access to the road network. This demonstrates the areas on the road network expected to experience an increase in traffic volumes as a result of the development. More detailed plots showing only traffic generated by the development are presented in Figure 5.9 and Figure 5.10.

The future traffic volume plots show:

- In the 'with development' scenario, Victoria Road is forecast to carry over 3,000 vehicles per hour in the peak direction (eastbound in AM and westbound in PM) an increase of approximately 300 vehicles per hour in the morning peak and 900 in the evening peak, compared to the do minimum scenario
- The largest increase in traffic volumes occurs in the westbound direction on Victoria Road in the morning peak. This is due to the fact that trips towards the Eastern City in the morning peak are more likely to use proposed public transport options (further discussed in Section 6.4)
- The Andrews Street-Constitution Road corridor carries between 800 and 1,000 vehicles per hour in the peak direction. This is an increase of approximately 300 vehicles per hour in the morning peak and 100 in the evening peak
- Increases in volumes on the local road network would not lead to adverse impacts to the performance or amenity of the network.

It is noted that some links would experience a reduction in volume in the 'with development' scenario. This is generally a result of the upgraded road network leading to a change in traffic assignment. Some morning peak southbound trips on Marsden Road and Kissing Point Road traveling from the north-west of the model to the east, for example, are observed to re-direct to Silverwater Road due to the improved performance and hence attractiveness of Victoria Road eastbound.

Figure 6.1 : Traffic volume - 2036 AM do minimum - no development

Figure 6.2 : Traffic volume - 2036 AM with development

Figure 6.3 : Traffic volume - 2036 PM do minimum - no development

Figure 6.4 : Traffic volume - 2036 PM with development

Future midblock traffic density

An assessment of midblock traffic density (vehicles per km) has been calculated for all road sections within the Melrose Park model area. When traffic demand exceeds capacity, traffic queues form and these are depicted within the mesoscopic model as increases in flow density. Traffic density is the average number of vehicles per kilometre on each section of road. Density plots are shown in Figure 6.5 to Figure 6.8, for 2036.

It is noted that the plots represent the results of the hour in which the highest vehicle flows occur throughout the entire modelled period. Performance before and after these time periods (i.e. in the 'shoulder' of the peak) is generally better to that presented below.

The plots show:

- Significant congestion is observed at north-western and south-eastern extents of the modelled area in all scenarios. This is not a direct result of the Melrose Park development but rather an indication that minor network improvements may be needed to accommodate regional traffic growth. Vehicles entering the model at these locations are not able to change their route to avoid congestion in the same way trips through the central part of the model are able to. In reality it is likely that some of these trips may use a different route and congestion would not be as severe as shown in these results.
- Modelled congestion on Devlin Street northbound on approach to Blaxland Road is likely to be relieved by proposed widening works along Devlin Street in this location. These works were announced after the finalisation of future network assumptions for the project and have not been included in this modelling.
- Upgrades on Victoria Road proposed as part of the Melrose Park structure plans would result in reduced congestion at Kissing Point Road and Wharf Road intersections in the 'with development' scenario during both of the peak periods.
- Minor increases in density are observed on Victoria Road eastbound near Shaftsbury Road in the AM peak. This is partly due to the increased throughput at Kissing Point Road and Wharf Road intersections allowing higher vehicle flows to reach the Shaftsbury Road intersection, rather than solely due to traffic generated by the Melrose Park development.
- Increases in density are observed on Victoria Road westbound near Hermitage Road in the PM peak but are considered within acceptable thresholds
- Increased flows on the Andrews Street-Constitution Road corridor lead to minor increases in density however no significant delays or adverse impacts are observed.

Figure 6.5 : Density - 2036 AM do minimum - no development

Figure 6.6 : Density - 2036 AM with development

Figure 6.7 : Density - 2036 PM do minimum - no development

Figure 6.8 : Density - 2036 PM with development

6.3.4 Intersection level of service

Future intersection performance metrics are provided in Figure 6.10 to Figure 6.13 for key intersections in the study area. It is noted that the results represent only the busiest one-hour period on the road network. Results from the Melrose Park traffic model show that:

- Upgrades on Victoria Road - outlined in detail in section 4.2 and section 7.2 - proposed as part of the Melrose Park structure plan would reduce congestion at Kissing Point Road and Wharf Road in the 'with development' scenario
- Delays Victoria Road intersections with Shaftsbury Road in the AM peak and Hermitage Road in the PM peak would increase with the additional development traffic would still be within acceptable limits.
- All intersections along Hope Street through the precinct operate satisfactorily with the introduction of PLR Stage 2 and associated intersection changes. It is noted that the intersection of Hope Street and Wharf Road is proposed to be maintained as a priority controlled intersection. Modelling demonstrates that the intersection is forecast to operate satisfactorily without signalisation. This location has been identified as a key route for pedestrians accessing Melrose Park Public School. As such, investigation of a midblock crossing on Hope Street between Wharf Road and Waratah Street is recommended. This crossing would align with the key desire line between the new town centre and the school.

Further intersection performance metrics are provided in Figure 6.9 below. This analysis shows:

- Several key intersections in the study area are forecast to operate above capacity in a 'do minimum' scenario by 2036
- The 'with development' scenario reduces the number of intersections operating above capacity in both the AM and PM peak periods, mainly due to proposed improvements on Victoria Road.

Figure 6.9 : Intersection level of service comparison

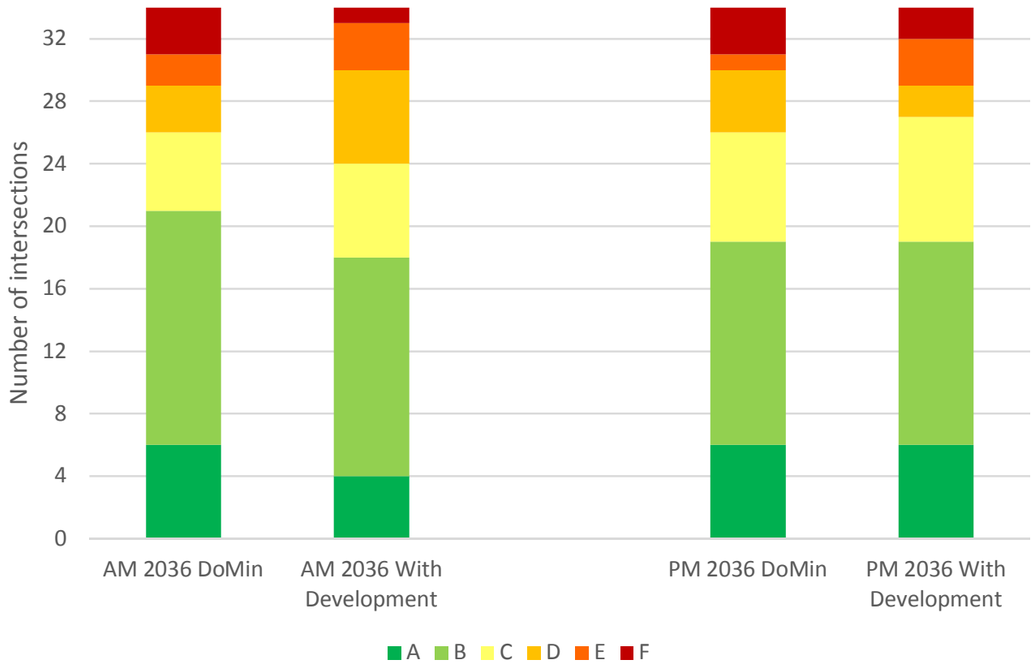


Figure 6.10 : Intersection level of service - 2036 AM do minimum - no development

Figure 6.11 : Intersection level of service - 2036 AM with development

Figure 6.12 : Intersection level of service - 2036 PM do minimum - no development

Figure 6.13 : Intersection level of service - 2036 PM with development

6.3.5 Travel times along key routes

This section presents forecast travel times along Victoria Road through the model area, between Silverwater Road and Church Street/Devlin Street. Victoria Road is the key movement corridor in the study area and the efficiency and productivity of trips through the area needs to be maintained.

Figure 6.14 to Figure 6.15 shows a comparison of car travel times along Victoria Road between Silverwater Road and Church Street-Devlin Street for the 2036 AM and PM peak hour for both the 'do minimum' and 'with development' scenarios.

The results of the 'with development' scenarios indicate:

- Travel time through the upgraded intersections at Kissing Point Road and Wharf Road would significantly improve compared to the 2036 do minimum scenario
- Travel time through the remaining sections of the corridor would be slightly higher compared to the 2036 do minimum scenario
- Overall travel time along the corridor would improve in the AM peak and remain comparable in the PM peak

Figure 6.14 : Victoria Road travel time - Eastbound AM

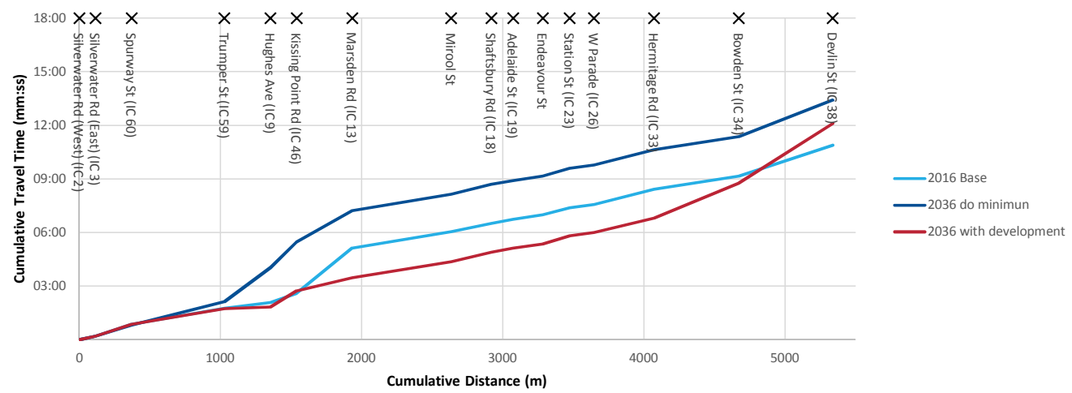
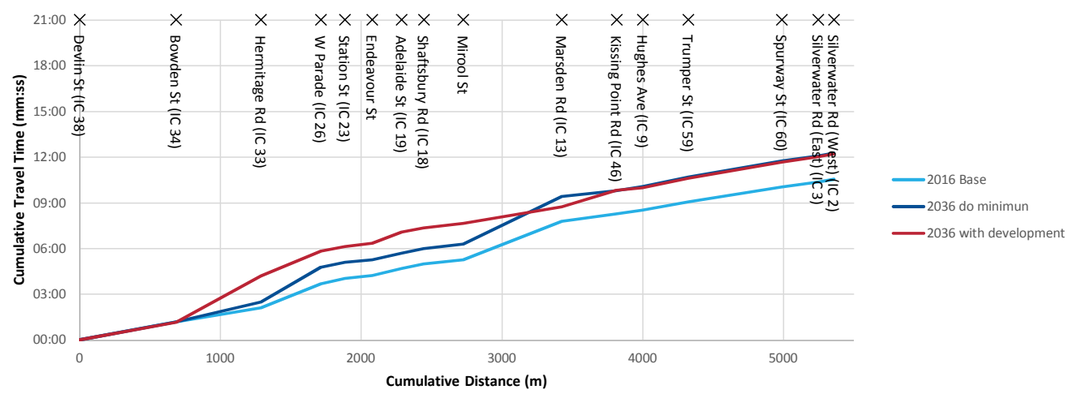


Figure 6.15 : Victoria Road travel time - Westbound PM

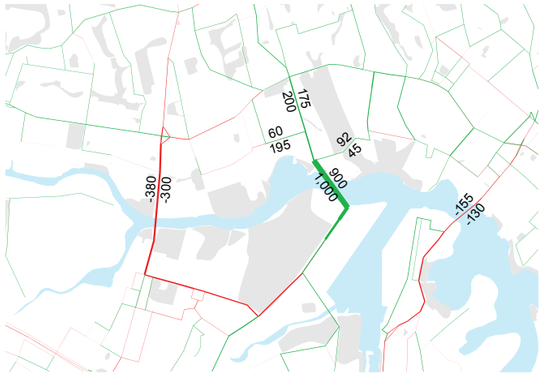


6.3.6 Implications of new bridge across Parramatta River open to vehicular traffic

The provision of a new active and public transport bridge across the Parramatta River has been identified as a key piece of infrastructure which will have a transformative impact for both Melrose Park and the wider GPOP area. Investigations using PTPM were undertaken to assess the impacts of also allowing general traffic on the bridge to understand the wider implications.

Figure 6.16 presents the difference in traffic volumes between a scenario with the bridge open to general traffic and a scenario where the bridge is used by public and active transport only. Whilst the reduction in traffic on Silverwater Road and Church Street may provide some localised benefits, the increases on Wharf Road (almost 400 additional vehicles per hour) and Hope Street would have significant amenity and efficiency impacts on the local road network, affecting both Melrose Park and Wentworth Point. This TMAP has therefore proceeded on the basis that the new bridge across Parramatta River would be open only to public and active transport, as agreed with the PCG.

Figure 6.16 : General traffic use of new bridge - change in peak 1-hour traffic volumes



6.3.7 Overall network statistics

Table 6.2 and Table 6.3 provides a summary of the 'Do-Minimum' and 'With Project' scenario network statistics for the Melrose Park precinct. The results demonstrate the increased travel time and distance expected in all of the future scenarios. The 'With Project' scenario results show that increased travel is expected on the network due to the Melrose Park development. The AM average speed in the network is expected to increase, and the PM remain constant, compared to the Do Minimum scenario, demonstrating the benefits of the infrastructure improvements proposed as part of the Melrose Park structure plans.

6.3.8 Network staging

The full package of road upgrade works as presented in Figure 4.2 would be delivered in stages, in line with the delivery of dwellings. The staging has been developed through iterative traffic modelling of development yields in conjunction with proposed road network upgrades. The performance measures presented in this section have been applied to the various staging scenarios to ensure the road network performs satisfactorily for all stages.

Detailed road network staging is presented in Section 7.2. In general, a new access at Kissing Point Road will be provided followed by Victoria Road intersection upgrades at Wharf Road and Kissing Point Road. The ultimate layout will include a continuous bus lane in each direction on Victoria Road. The staging development process has also remained cognisant of the public transport network stages presented in Section 6.4. The entirety of the road works are proposed to be delivered prior to the implementation of the new bridge over the Parramatta River. This plan ensures that infrastructure is in place as early as possible to support the delivery of dwellings and minimise wider network impacts in the earlier stages of the project before delivery of critical public transport.

Table 6.2 : Network statistics - 6:00am - 10:00am

	2017 AM	2036 Do Min AM	2036 With Project AM
Vehicle km travelled (km)	332,582	378,030	422,657
Vehicle hours travelled (hours)	9,982	14,884	15,375
Average speed (km/hr)	33	25	27

Table 6.3 : Network statistics - 3:00pm - 7:00pm

	2017 PM	2036 Do Min PM	2036 With Project PM
Vehicle km travelled (km)	356,925	413,341	442,792
Vehicle hours travelled (hours)	10,985	16,402	18,095
Average speed (km/hr)	32	25	25

6.4 Public transport

6.4.1 Introduction

The public transport network for Melrose Park has been developed based on a series of key planning principles. These principles will ensure that the network provides the level of service and connectivity demanded of development of this scale and density. The network will provide connectivity to a range of key employment centres within the local and regional area thereby providing a range of choices for the future residents of Melrose Park.

6.4.2 Principles

The public transport principles have been developed to support the key TMAP objectives and physical planning process. These include:

- **Provide a staged network** that supports a high level of accessibility and connectivity from day one of the development, eventually realising its full potential upon full build-out
- **Take advantage** of areas of the existing bus and rail network with spare capacity and leverage additional capacity provided by future new infrastructure investment e.g. Sydney Metro City and South West
- **Connect to destinations and interchanges** within the local and regional area and aim to provide 30-minute public transport access to strategic centres within and outside GPOP
- **Provide accessibility** across the Melrose Park precinct recognising that the precinct itself covers a large area and that multiple access locations to the public transport network will be required
- **Support Melrose Park as a community** that provides for a variety of residents with a variety of economic and social needs

6.4.3 Staging approach

The public transport network for Melrose Park has been split into two key stages based on the development progression and the planned completion of relevant major infrastructure projects such as Parramatta Light Rail Stage 2 and Sydney Metro West. As established throughout the analysis in the TMAP, the bridge across Parramatta River is a key component of the development which will provide a transformative increase in accessibility for the future residents, workers and visitors of Melrose Park. The staging of the network has therefore been based on pre-bridge and post-bridge scenarios.

6.4.4 Stage 1 – Accessible and connected bus network

Stage 1 assumes the following parameters:

- PTPM forecast year is 2026
- Approximately 6,700 dwellings are developed
- Sydney Metro Northwest and City and Southwest are complete providing some relief to the T1 Northern rail line
- Parramatta Light Rail Stage 1 is complete.
- Stage 1 road network infrastructure is delivered as per section 7.2

The Stage 1 public transport network is shown in Figure 6.18 The network builds on the existing bus network to provide the following key improvements.

- **M52 bus route:** The AM peak service frequency along Victoria Road will be gradually improved to 20 per hour eastbound and 14 per hour westbound to provide direct connectivity from the northern portion of the precinct to Parramatta CBD and to West Ryde (rail connections to Sydney CBD and Macquarie Park) and Top Ryde. It is noted that service increases to 13 per hour eastbound and 9 per hour westbound would be required even without Melrose Park development based on PTPM demand forecasts.
- **Shuttle bus services to Meadowbank:** The proponent proposes to provide a shuttle bus service between Melrose Park and Meadowbank station to provide a direct connection to the T1 Northern Line. Provision of this service would begin with 1 bus providing 3 services per hour. More buses would be provided in line with the delivery of dwellings to provide an ultimate service headway of 5 minutes.
- **T1 Northern rail line:** Existing congestion on this line will be relieved by the completion of Sydney Metro City and Southwest. The removal of trains operating via the Epping to Chatswood rail link will provide some capacity for providing improved frequency. Connections to West Ryde via improved M52 services and Meadowbank via shuttle bus services will both be available for future Melrose Park residents workers and visitors. Figure 6.17 shows that there will be sufficient spare capacity on the T1 Northern Line in Stage 1. It is noted that 8 suburban services an hour are proposed to run in this stage.

As discussed, Stage 1 assumes that a new bridge across the river is not complete. As such, any development should be focused to the north of the precinct as the M52 bus route along Victoria Road will provide the highest level of accessibility until the bridge is complete.

It is also noted that MPPM public transport demand forecasts exceeds those provided by PTPM outputs. As such, MPPM demands have been used to assess the service requirements for Melrose Park, ensuring the assessment is conservative.

Figure 6.17 : Stage 1 2026 public transport demand (PTPM)

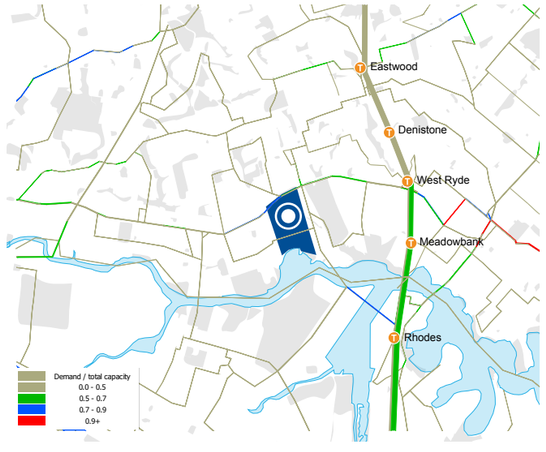
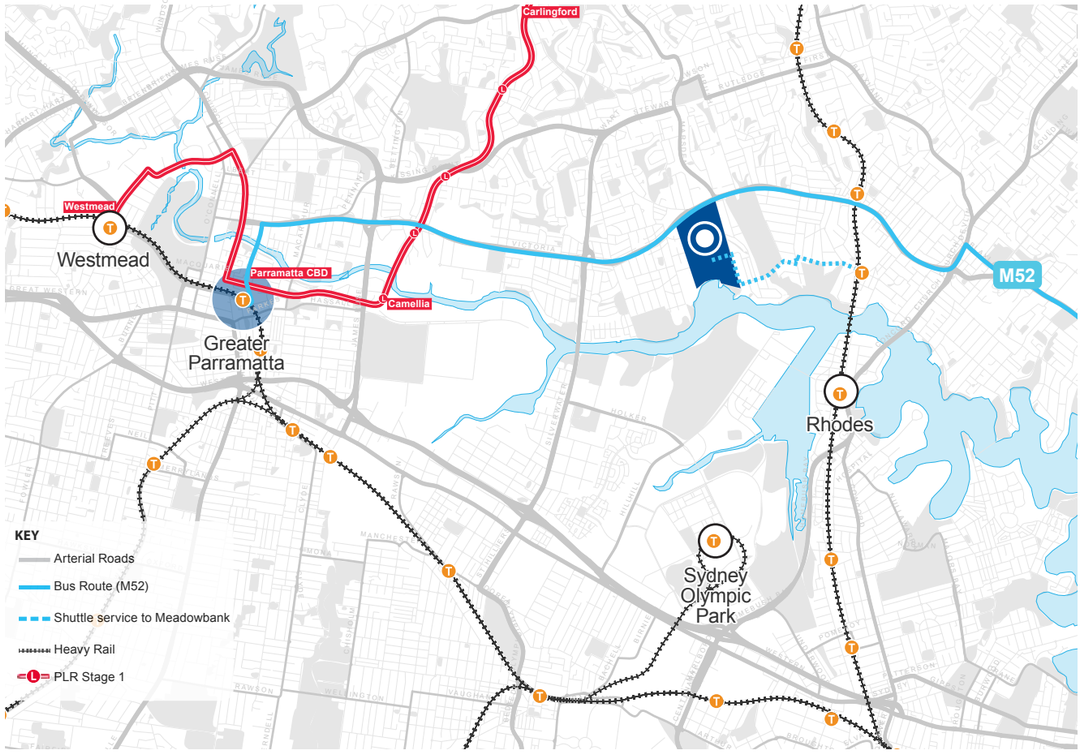


Figure 6.18 : Stage 1 public transport network



6.4.5 Stage 2 – Integrated network with new bridge over Parramatta River

Stage 2 assumes the following parameters:

- PTPM forecast year is 2036
- Development of the precinct is 100% complete (11,000 dwellings)
- Parramatta Light Rail Stage 2 is complete
- Sydney Metro West is complete

The Stage 2 network is shown in Figure 6.20. The network builds on committed infrastructure to provide the following key improvements:

- **Parramatta Light Rail Stage 2:** A new light rail line will be provided connecting Melrose Park with Parramatta CBD and Olympic Park. Additionally, there will be a major interchange point from the light rail to the new Sydney Metro West at Olympic Park. At least two stops will be provided within Melrose Park to cater for central / northern and southern precinct access to the line.
- **Sydney Metro West:** A new metro rail line is provided connecting Westmead, Parramatta CBD, Olympic Park, the T1 Northern rail line, Bays Precinct and Sydney CBD. There will be a major interchange point from the light rail at Olympic Park. This will be a key connection for Melrose Park residents, particularly connecting to Parramatta CBD and Westmead as this is likely to be the fastest route.
- **M52 bus route:** The AM peak service frequency along Victoria Road will be remain at 18 per hour eastbound and increase to 14 per hour westbound to provide direct connectivity from the northern portion of the precinct to Parramatta CBD and to West Ryde (rail connections to Sydney CBD and Macquarie Park) and Top Ryde.
- **New bus route (Top Ryde to Concord Hospital via Rhodes):** This new route will utilise the bridge and provide connectivity from Melrose Park, including the southern portion, to West Ryde in the north and to Wentworth Point, Rhodes and Concord Hospital in the south. The extension to Concord Hospital is proposed to provide a direct connection from new housing in Melrose Park to a major health precinct. This can support Melrose Park providing for a variety of different workers, rather than a sole focus on knowledge based workers based in centres. Notwithstanding this, an extension of the route to Macquarie Park may be viable and help to improve accessibility to this centre. Final route alignment will be at the discretion of TfNSW.
- **T1 Northern rail line:** Some customers traveling to the Sydney CBD and Macquarie Park would continue to interchange to rail at West Ryde rather than at Olympic Park. Sydney Metro West is likely to provide some relief to the Northern line as some customers on the Northern line may choose to interchange to Sydney Metro West at Concord West / North Strathfield. Capacity should be available on the T1 Northern line to cater for additional demand at West Ryde. Figure 6.19 shows that there will be sufficient spare capacity on the T1 Northern Line in Stage 2. It is noted that 8 suburban services an hour are proposed to run in this stage.

Figure 6.19 : Stage 2 2036 public transport demand (PTPM)

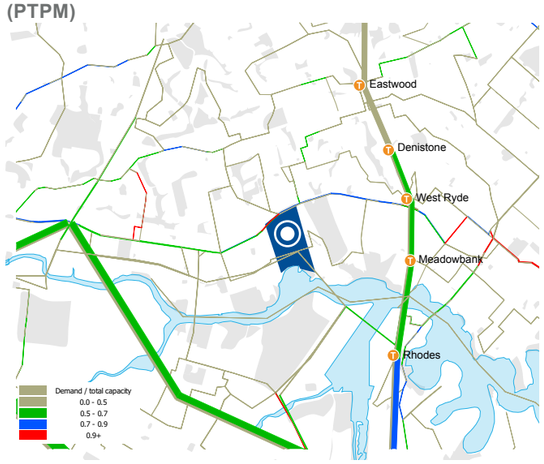
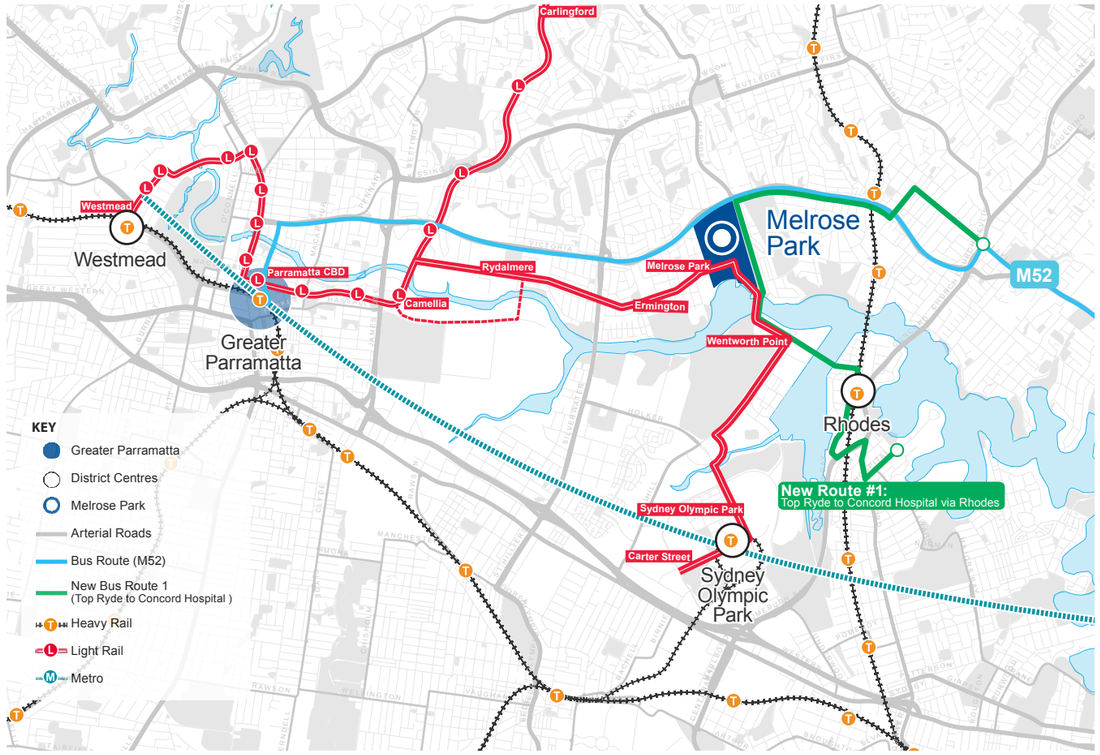


Figure 6.20 : Stage 2 public transport network



6.4.6 Future public transport performance

The success of the public transport network serving Melrose Park will be measured against the key metrics outlined in Section 4.4. In particular; mode share, 30-minute access, and capacity of key routes will be targeted. An analysis of peak direction demand with and without Melrose Park and required service provision is provided in Table 6.4 and Table 6.5 below. This analysis covers the two key stages.

Some key findings to note include:

- Consideration should be given to the fleet mix of the M52 service, including whether all services will be articulated or whether double deck services would be appropriate. Our capacity assumption of 80 people per bus is based on a mixed fleet with the majority of peak services operating articulated buses with a capacity of 100 people per service.
- Significant bus frequency improvements are required to serve background growth regardless of the Melrose Park development, as shown in Table 6.4 and 6.5.
- Consistency with previous analysis and agreed mode share targets has been achieved by replacing the PTPM Melrose Park boardings with MPPM public transport demands.
- PLR Stage 2 demands are within acceptable LRT capacity thresholds.

The demand and required service capacity represents the ultimate scenario of both stages. It is anticipated that staged service capacity increases will be delivered in line with the development of dwellings.

Table 6.4 : Stage 1 public transport performance (6,700 dwellings - demand from PTPM 2026)

AM Peak 1-hour	M52 – To City	M52 – To Parra	Shuttle to Meadowbank	Other local services
Existing service	6/hr	6/hr	-	
Vehicle capacity (pax)	80	80	30	50
Peak line load without Melrose Park	980	650	-	
Required services without Melrose Park	13/hr	9/hr	-	
Melrose Park boardings[1] (outbound only)	**500[2]**	**370**	**330**	**150**
Peak line load with Melrose Park	1480	1020	330	
Required services with Melrose Park	20/hr	14/hr	12/hr	~3 additional/hr

[1] Melrose Park demand derived from MPPM

[2] Shuttle to Meadowbank not modelled in MPPM. Actual demand of 830 reduced by 330 to reflect redistribution to shuttle bus.

Table 6.5 : Stage 2 public transport performance (11,000 dwellings - demand from PTPM 2036)

AM Peak 1-hour	M52 – To City	M52 – To Parra	PLR S2 – to SOP	PLR S2 – to Parra
Existing services	6/hr	6/hr	-	-
Vehicle capacity (pax)	80	80	300	300
Peak line load without Melrose Park	1170	1150	1330	540
Required services without Melrose Park	16/hr	15/hr	4/hr	1/hr
Melrose Park boardings[1] (outbound only)	**220**	**80**	**1670**	**470**
Peak line load with Melrose Park	1390	1250	3000	1010
Required services with Melrose Park	20/hr	17/hr	10/hr	3/hr

[1] Melrose Park demand derived from MPPM

Bus interchange capacity

Consideration has also been given to the functional performance of bus routes at major interchanges along their respective routes. In particular at the interchange facilities at Parramatta and West Ryde.

At Parramatta, some spare capacity may be available due to service changes to support the introduction of PLR Stage 1. The PLR Stage 1 EIS states that supporting changes may include:

- Modifying services that access the Parramatta CBD
- Truncating some services to better integrate with the project and the broader transport network
- Discontinuing some routes with alternate travel options in place

All of the above may increase available capacity at Parramatta interchange. There is also potential to truncate some Victoria Road services if required to reduce pressure on the interchange whilst maintaining the required frequency through Melrose Park.

At West Ryde, M52 services stop on Victoria Road and do not use the bus interchange facility. The impact of a significant number of interchanging passengers on bus stop requirements has been considered. The westbound stop at Gaza Road in the PM period is considered the critical location due to the large number of boarding passengers interchanging from rail to bus at this location. On-site observations were used to derive a function to relate boardings to dwell time. The maximum forecast boardings of approximately 500 passengers per hour (2026 Stage 1 public transport network) would lead to average dwell times of approximately 60 seconds. The State Transit Bus Infrastructure Guide and TCRP Report 16 provide guidance on bus stop requirements based on bus frequency and average dwell times. Noting the expected service frequency of approximately 25 buses per hour, this leads to the requirement for 2 bus stop bays.

It is noted that the existing bus stop arrangement on Victoria Road at Gaza Road allows for 2 articulated buses and is therefore likely to be sufficient. If dwell times and/or the number of bus services are higher than forecast in the above analysis there is a risk of operational impacts to bus services, general traffic and pedestrians crossing Victoria Road at this location.

Roads and Maritime Services is currently undertaking a corridor study of Victoria Road, which includes examination of bus stop facilities and bus priority measures along the corridor. Should capacity issues arise at this location, the TMAP action plan allows for the provision of additional shuttle buses to intercept rail-to-bus travel demand at Meadowbank Station, reducing demand at West Ryde. Any capacity enhancements at the westbound West Ryde Bus stop should be considered as part of the overall Roads and Maritime Corridor Strategy, as this bus facility is outside of the sphere of influence of Melrose Park and passenger demand from Melrose Park at this stop will peak in 2026, after which time the proposed bridge across Parramatta River would be constructed.

Parramatta Light Rail Stage 2

The PTPM model was used to determine peak line loads along the planned PLR Stage 2 route between Parramatta and Sydney Olympic Park (via Melrose Park) as shown in Figure 6.22 and Figure 6.23.

Passenger volumes are highest at the Sydney Olympic Park end of the corridor where it connects to the proposed Sydney Metro West station. The forecast peak line loading into Sydney Olympic Park has spare capacity of approximately 400 passengers per hour. Loadings on services to Parramatta are much lower than in the southbound direction with spare capacity of approximately 1,700 passengers per hour.

Shuttle service to Meadowbank

The shuttle bus proposed under the Stage 1 network is planned to operate between Melrose Park and the western entry to Meadowbank station. This location is preferred as it avoids conflicts with the main bus interchange on the eastern side of the station.

Two stop location options have been identified (see Figure 6.21). Both stop locations have sufficient capacity to cater for the proposed 12 services per hour. It is noted that:

- Option 1 at the current 'kiss and ride' location provides the most direct access to the station.
- Option 2 would require the removal of 1-2 parking spaces and a potential installation of a marked pedestrian crossing across Bank Street.
- Option 1 is the preferred option as it utilities the existing kiss and ride facility and provides the most direct access to the station.
- Swept path analysis and indicative arrangement plans are shown in Appendix C and confirms the shuttle bus can safety negotiate the roundabout at Bank Street and Meadow Crescent.

Figure 6.22 : PLR Stage 2 line load - to Parramatta (2036 AM PTPM)

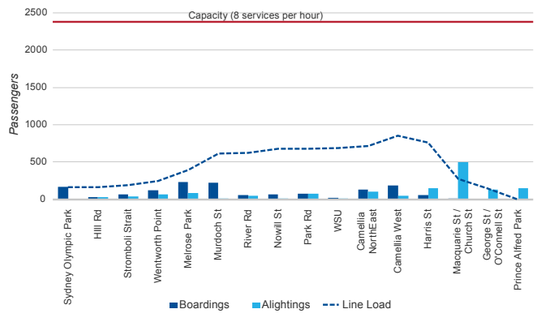


Figure 6.23 : PLR Stage 2 line load - to Sydney Olympic Park (2036 AM PTPM)

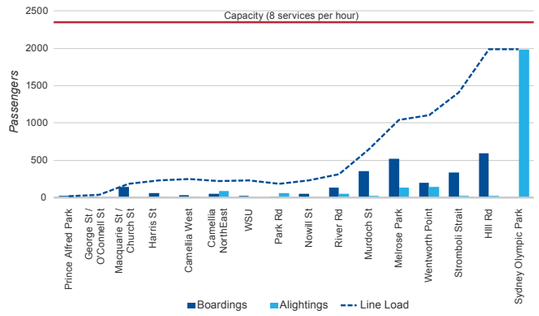
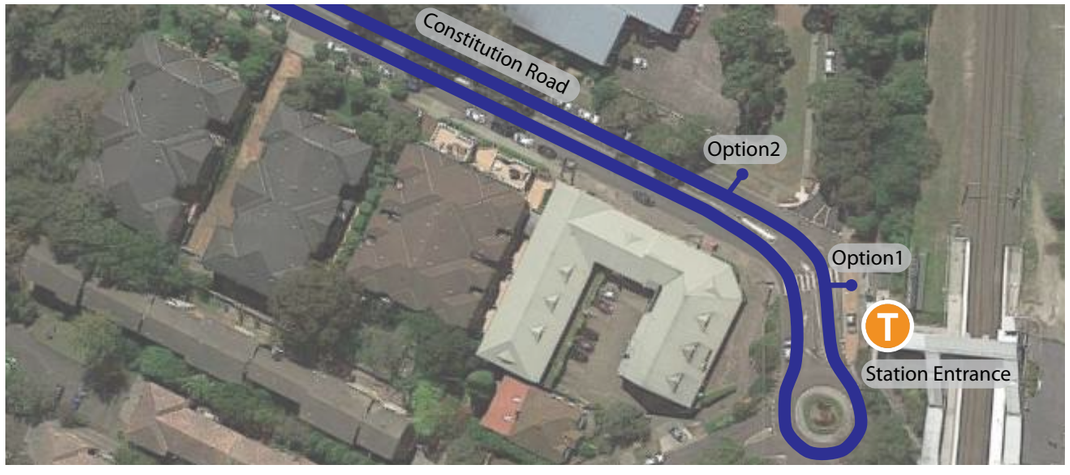


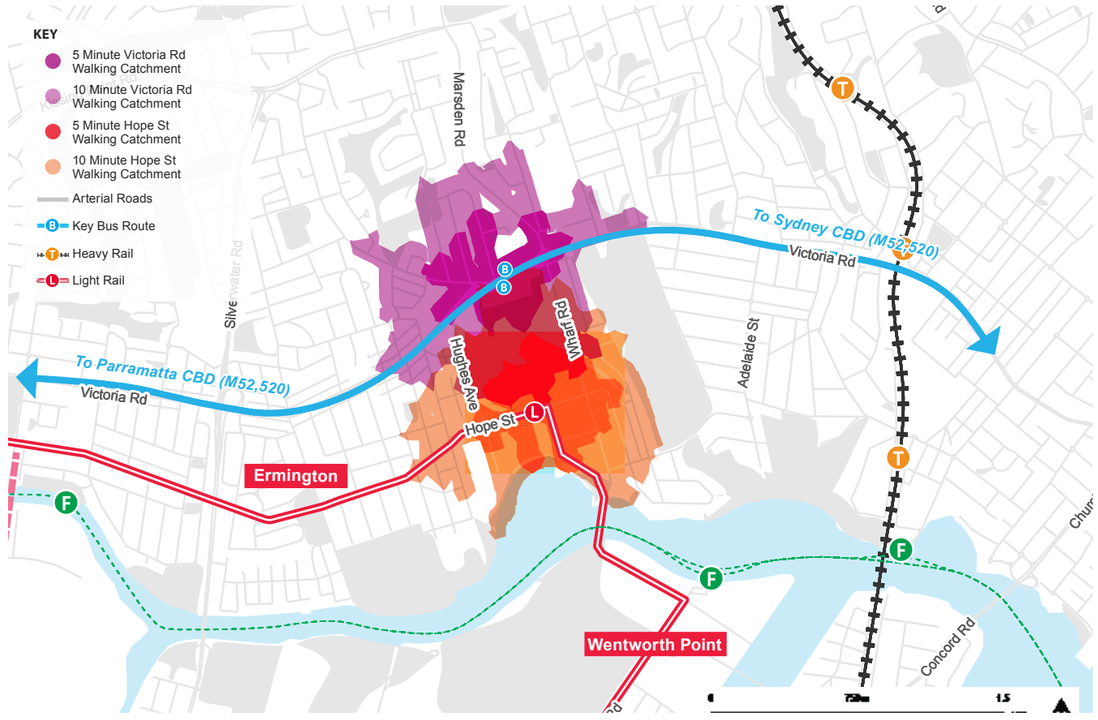
Figure 6.21: Shuttle bus stop location options at Meadowbank



Walking catchment to Public Transport

Another indicator of the function of the public transport network for Melrose Park is the walking catchment to bus and light rail stops of areas within 400 m of a bus stop and 800 m of a light rail station that meet minimum service frequencies. Figure 6.24 below shows that the majority of the Melrose Park precinct meets the minimum coverage area based on the proposed public transport network.

Figure 6.24 : Walking catchments for Victoria Road and Hope Street



6.4.7 Implications of new bridge across Parramatta River to public transport

The Melrose Park precinct proposes to create a new connection between Melrose Park and Wentworth Point via a new bridge suitable for active transport trips and public transport (bus and/or light rail) services. This is a key transport infrastructure component to create a direct, grade-separated link between the Parramatta River foreshore the southern end of the Melrose Park precinct.

A new bridge across Parramatta River offers a significant future opportunity for a local and regional transport connection between Melrose Park and Sydney Olympic Park / the Sydney CBD. Being separate from local and regional traffic would offer a major improvement in directness and amenity to people walking and cycling. The potential to establish a light rail service through PLR Stage 2 along this line is being considered, but there is also an opportunity to establish an active transport connection which also connects to the Parramatta River and Wentworth Point foreshore shared paths.

The key benefits of a new bridge across Parramatta River include:

- Significantly improved public transport access between Melrose Park and the following key centres:
  - Sydney Olympic Park – including the proposed Sydney Metro West station
  - Carter Street precinct
  - Rhodes business park
- The enabling of key new bus routes between:
  - Top Ryde and Concord Hospital via Wentworth Point and Rhodes
  - Top Ryde and Lidcombe via Sydney Olympic Park
- Improved active transport connections to the southern foreshore of the Parramatta River including the shared path.

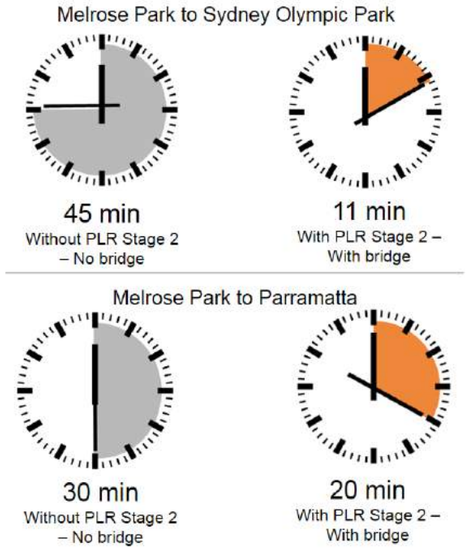
The provision of the new bridge will enable a light rail river crossing as part of Parramatta Light Rail Stage 2. This will lead to significant travel time savings for public transport trips between Melrose Park and both Sydney Olympic Park and Parramatta.

As shown in Figure 6.25, trips to Sydney Olympic Park would reduce from 45 minutes to 11 minutes. Trips to Parramatta would reduce from 30 minutes to 20 minutes. These are significant savings which will:

- Enhance the attractiveness of public transport trips between Melrose Park and these key centres.
- Reduce car reliance for future residents of Melrose Park and surrounding suburbs.
- Minimise the impact of the proposed development on the surrounding transport network.

It is noted that the delivery of PLR Stage 2 is yet to be confirmed and a business case is still to be finalised. If PLR Stage 2 was not to proceed, the Melrose Park development could be adequately supported by the provision of high frequency buses over the bridge connecting to Sydney Olympic Park.

Figure 6.25 : Public transport travel time savings resulting from new bridge

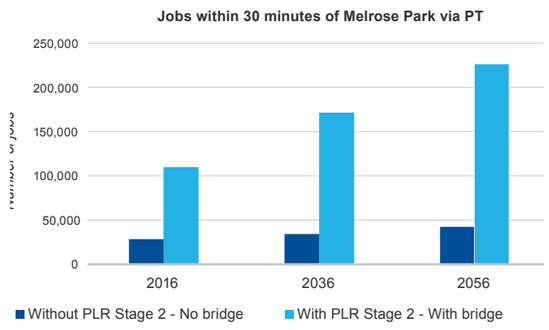


Public transport accessibility from Melrose Park

The future accessibility of Melrose Park is highlighted in Figure 6.26, which shows the catchment reachable from Melrose Park within 30 minutes by public transport. Accessibility is greatest in the north-south direction along the proposed PLR Stage 2 route with a new bridge across Parramatta River, reflecting the higher speeds of light rail which is also connected to Sydney Metro West (at Sydney Olympic Park) providing frequency services to Parramatta CBD and Sydney CBD. Accessibility is also enhanced considerably in the east-west direction with key connection opportunities provided with PLR Stage 2 to Parramatta via Rydalmere. The Melrose Park accessibility reflects coverage of the future network design, frequency, and speed of public transport services.

Figure 6.27 shows that approximately 175,000 jobs will be accessible within a 30-minute public transport journey from Melrose Park by 2036. Further, more than 200,000 people will live within a 30-minute public transport journey. This indicates that the proposed public transport network combined with a new bridge over the Parramatta River will ensure that Melrose Park is a highly accessible precinct for both residents and visitors. The delivery of regionally significant infrastructure in conjunction with the Melrose Park development will also have wide reaching benefits for surrounding communities.

Figure 6.27 : 30 minute job and population catchments



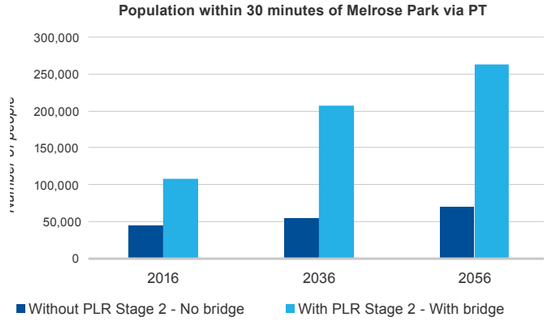
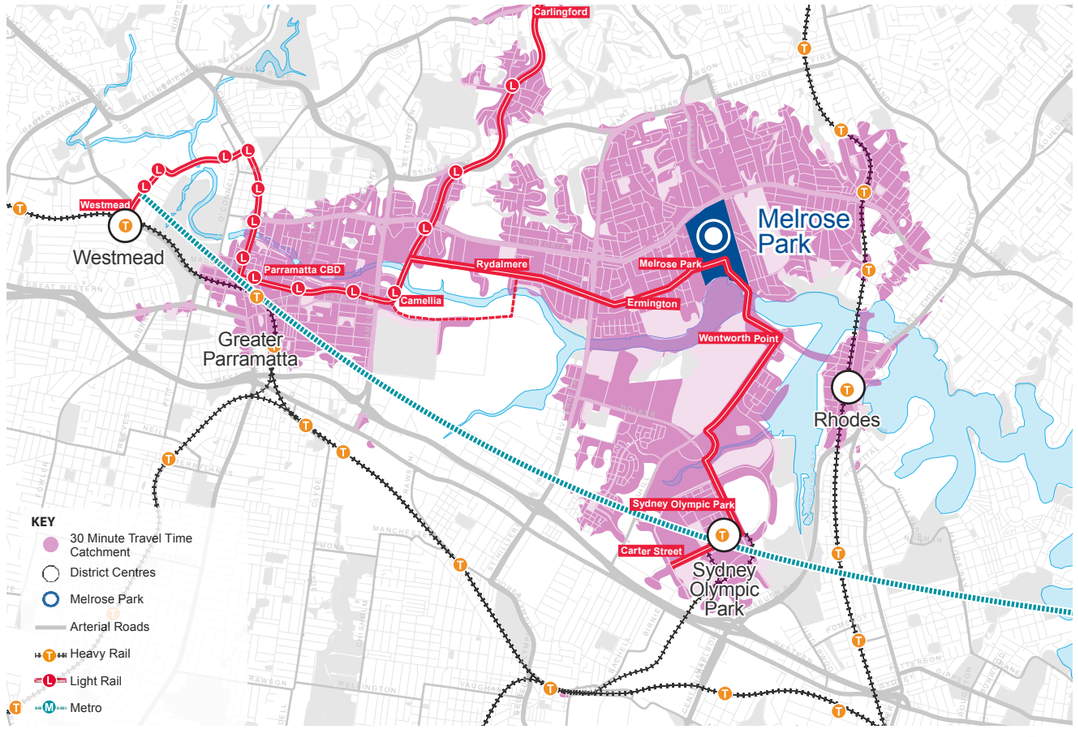


Figure 6.26 : Melrose Park 30 minute PT catchment (2036)



6.4.8 Ferry services

The current F3 Parramatta River Services provides all-stop services from Parramatta to Circular Quay and Darling Harbour/Barangaroo. The current peak hour frequency is three (3) services per hour. All-stop services to/from Parramatta suffer speed and reliability issues due to tidal and river conditions. The Melrose Park public transport network is set to include bus, light rail and connections to existing heavy railway and the future Sydney Metro system.

In this context, ferry services are not an essential component of Melrose Park transport network. Any new ferry services (private or public) at Melrose Park must stand on its own merits to determine whether new infrastructure and services are viable. The requirements for future ferry services and potential upgrade to the existing wharf at the end of Wharf Road are influenced by a number of considerations including:

- Forecast patronage
- Service frequency and vessel characteristics
- Navigation and safety considerations
- Operational considerations both maritime and land side
- Design parameters and site conditions.

Patronage forecasts

Patronage modelling was undertaken to produce a broad, strategic estimate of potential ferry demand at Melrose Park. Patronage modelling is based on the current service plan and the available information provided by TfNSW during the course of the TMAP. For the purpose of this modelling a new wharf was assumed at Melrose Park. This patronage modelling indicates that:

- Ferry mode share for trips from Melrose Park is projected to be approximately 1%
- Projected patronage in the AM peak hour at Melrose Park in 2036 would be less than 100 people.

The preliminary modelling results indicate fairly low patronage demand at Melrose Park. This suggests that travelling by ferry is generally less attractive when compared with competing land based public transport network on bus/light rail/metro.

Summary

The introduction of a ferry service will have minimal appreciable effect on both future public transport patronage and mode share targets for Melrose Park. For ferry services to provide a viable alternative to private vehicles and to complement the surface public transport network proposed, it must be based on infrastructure needed to enable efficient ferry service operation suitable to the conditions and requirements of its particular location. The location of new ferry wharf on the northern side of Parramatta River (near Wharf Road) to cater for relatively large vessels (i.e. Rivercat), will need to be further examined.

The Melrose Park public transport network has been developed to reflect the demand and growth potential of the precinct without the need for ferry services. Ferry users on the Parramatta River will have access to the newly-upgraded Sydney Olympic Park and Meadowbank wharves, as well as the new proposed ferry wharf proposed at Rhodes East. The proposed new bridge across Parramatta River (at the end of Wharf Road) will also provide the ability for Melrose Park residents to conveniently and comfortably access transport and ferry facilities on the southern side of Parramatta River and, when necessary, transfer between different transport modes.

Table 6.6: Ferry opportunity and constraints

Criterion	Advantages	Disadvantages
Land use	• Integrated with high density mixed use development • Land available for a potential park and ride function at existing wharf.	• New ferry wharf location will be located in sensitive mangroves and coastal salt march • Land acquisition may be required for a new ferry wharf.
Public transport integration	• Strategic opportunity to develop a sustainable transport option • Future light rail stop on Wharf Road (yet to be confirmed) may be within walking distance • Potential to expanding public transport services to address other customer markets (visitors and tourists) • Provides long-term growth and operational flexibility in response to demand.	• Low public transport market share and patronage for commuters • New ferry wharf must provide high level of access between future light rail stops on Wharf Road and ferry wharf • Ferry services are generally very slow and therefore not attractive to commuters who are time sensitive.
Pedestrian access	• Good access via Parramatta River foreshore shared path • Opportunity to integrated with existing Parramatta River foreshore shared path.	• Existing wharf location pedestrian access constrained and through an existing car park.
Road access	• Land available for potential park and ride site to be integrated with the ferry system • Land available to provide a coherent and legible road network.	• Existing car parking and boat ramps is likely to cause potential conflicts • New bridge proposed across Parramatta River (end of Wharf Road) will impact on circulation roadways to/from ferry terminal.
Maritime operations	• Protected from open water • Adjacent to F3 Parramatta River Services and the opportunity to join the broader ferry network for longer trips • Potential to operate on demand services via a private operator.	• Speed and tidal restrictions along Parramatta River may cause disruption to ferry operations particularly towards Parramatta • New bridge proposed across Parramatta River (end of Wharf Road) will impact on location of ferry wharf and vertical clearance requirements • Potential maritime operations issues relating to navigation safety considerations, turning and maneuvering space • Existing boat ramp activities closely spaced with existing wharf location • Water depth along foreshore near existing wharf and may need to be dredged • Significant subsidies required for both the initial investment and operational costs.

6.5 Walking and cycling

6.5.1 Introduction

There are numerous opportunities for walking and cycling in and around the Melrose Park precinct, particularly for short trips to nearby strategic centres. This is in line with one of the customer outcomes of *Future Transport 2056*, which aims to make walking and cycling the most convenient choice for short trips.

6.5.2 Active transport planning principles

Active transport planning for Melrose Park has been informed by a guiding set of planning principles. These aim to ensure that residents of and visitors to Melrose Park have the opportunity to walk and cycle as part of their everyday travel, especially for short trips and as part of multi-modal public transport trips. These include:

- **Encourage walking and cycling for short trips** by providing high quality, comfortable and safe facilities for walking and cycling, encouraging residents, visitors and in particular Melrose Park Primary School students to use active transport.
- **Integrate walking and cycling with public transport access** by providing adequate walking and cycling access and facilities at key public transport nodes, such as light rail stops, heavy rail stations and metro stations, promoting active transport as part of multi-modal public transport trips.
- **Provide connected and permeable walking and cycling networks** by ensuring that the walking and cycling networks are complete, closing existing gaps and improving connections where required. Provide connections to key local destinations such as Melrose Park Primary School and the new town centre. Pedestrian and cycle paths to be separated where feasible.

6.5.3 Walking and cycling network

The street network surrounding Melrose Park is relatively permeable for walking. The Melrose Park precinct will improve permeability by providing new links connecting through the precinct to Victoria Road, Hughes Avenue, Wharf Road and Hope Street. Travel to the north is somewhat constrained by uphill grades.

Major east-west cycling access is currently available along the Parramatta Valley Cycleway, which follows the Parramatta River. This is identified in *Sydney's Cycling Future and Future Transport 2056* as a key strategic cycling corridor, providing access to Parramatta CBD, Western Sydney University at Rydalmere, Meadowbank and Rhodes. Apart from this corridor there are presently limited cycling facilities provided in and around Melrose Park.

A number of new and upgraded active transport facilities are proposed in the precinct:

- *Parramatta Bike Plan 2017* proposes a fully separated cycleway is proposed for Hope Street, providing a new high quality east-west cycle connection through Melrose Park to Rydalmere
- A separated shared path on the western side of Wharf Road, connecting the Hope Street cycleway to the existing Parramatta Valley Cycleway
- Safe and adequate connections to Melrose Park Primary School as identified in the Southern Precinct Structure Plan

A new public and active transport bridge across Parramatta River is proposed which will provide significantly greater walking and cycling access to Sydney Olympic Park and beyond.

Figure 6.28 shows walking and cycling catchments 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 catchment analysis shows:

- **10 minute walking catchment,** with new through-site links through the Melrose Park precinct. This shows that major bus routes on Victoria Road would be accessible within a 10 minute walk from the centre of the Melrose Park site, as well as future light rail services as part of Parramatta Light Rail (PLR) Stage 2. Melrose Park Primary School is within a comfortable walking distance for the entire site and immediate surrounding areas.
- **20 minute cycling catchment,** with a new bridge crossing Parramatta River. The area shaded yellow shows the expanded cycling catchment resulting directly from the new bridge. Stations on the T1 Northern Line would be easily within a 15 – 20 minute ride, as would light rail stops on PLR Stage 1. The new bridge would provide access to Sydney Olympic Park and access to the future Sydney Metro West station in this location.

Active transport connections to key nearby public transport services are shown in Figure 6.29. Meadowbank is able to be accessed by a predominantly off-road route utilising the Parramatta Valley shared path. An on-road/footpath route is also available via Andrews Street. Connections to Rhodes will be possible via the new bridge over Parramatta River and the Bennelong Bridge. The majority of this route is via separated paths or local streets.

Figure 6.28 : Walking and cycling catchments

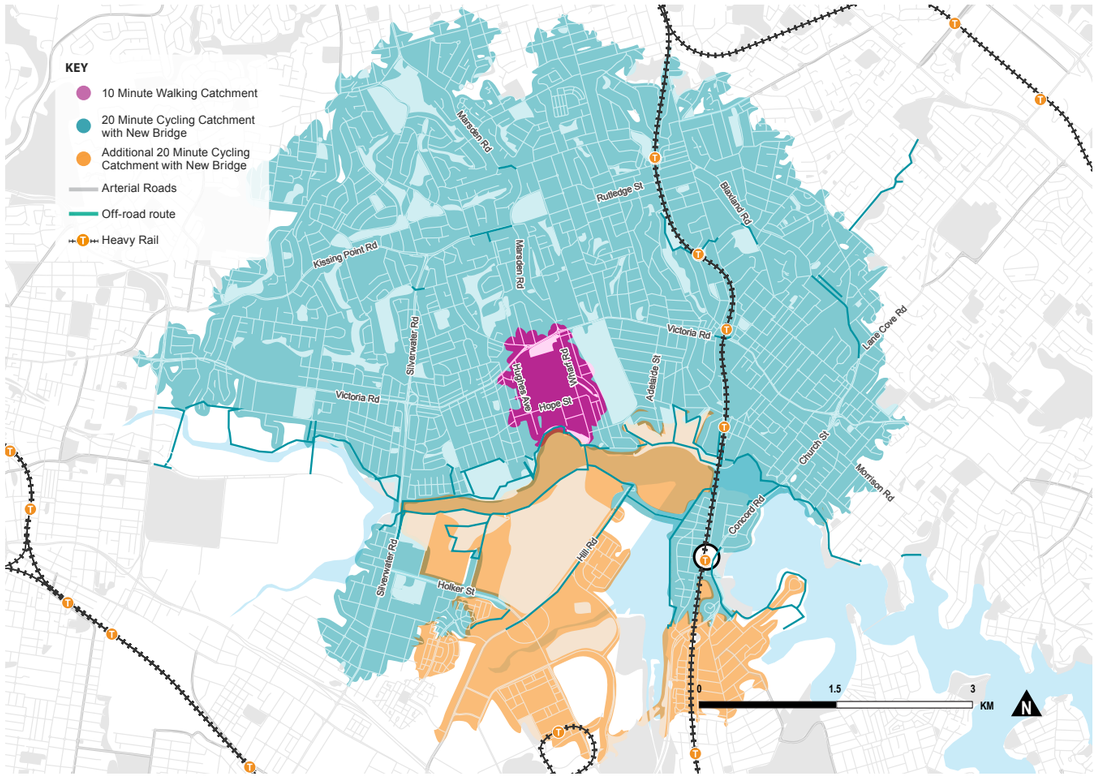
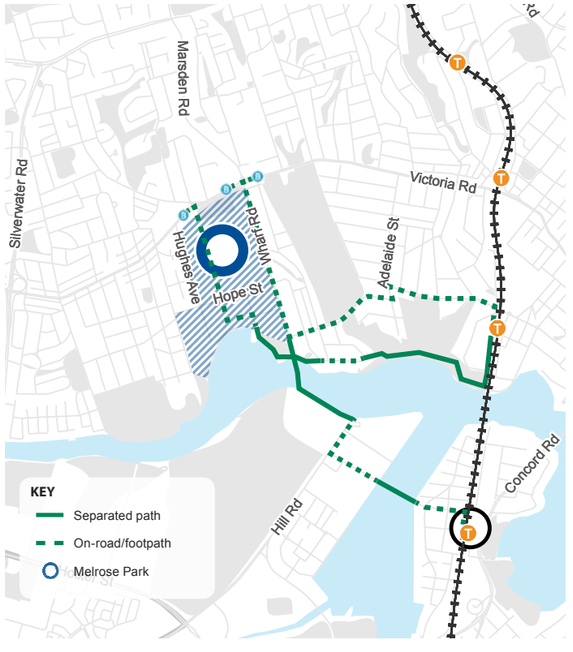


Figure 6.29 : Walking and cycling routes to public transport



6.5.4 Integration with other modes

There are several opportunities for multi-modal travel commencing with a walk or cycle trip from Melrose Park. Nearby public transport nodes should be provided with good active transport integration, including:

- Suitable pedestrian treatments at and around bus stops, light rail stops, heavy rail and metro stations. This includes traffic calming treatments to provide safe and easy pedestrian access.
- Provision of adequate bicycle parking facilities at or nearby bus and light rail stops, and bike cages or lockers at heavy rail and metro stations.
- Provision of adequate weather protection at stops and stations for waiting customers.
- Appropriate wayfinding signage in the Melrose Park precinct and at public transport stops and stations, advising customers on location and access points.

6.5.5 Promotion of walking and cycling within Melrose Park

A range of measures are proposed to promote walking and cycling within Melrose Park, including:

- Provide sufficient bicycle parking provision for residents, employees and visitors, including secure bicycle parking for residents
- Provide end of trip facilities for employees and primary school students
- Ensure residents and employees have access to sufficient travel information, including:
  - Maps of the walking and cycling network in and around Melrose Park precinct
  - Recommended walking and cycling routes
  - Average travel times to key destinations.
- Provide wayfinding and signage within the precinct to facilitate walking and cycling trips, and access to bicycle parking facilities
- Provide basic bicycle repair support, such as flat tyre repairs and tyre inflation.

All active transport infrastructure will be designed and implemented in accordance with the Disability Discrimination Act (1992)

Figure 6.30 : Example of supporting facilities for walking and cycling integration with public transport

6.5.6 Bicycle parking provision

An appropriate level of bicycle parking should be provided to support cycling to and from the Melrose Park precinct. The *Parramatta DCP 2011* has been used to develop a set of recommended minimum bicycle parking rates.

Table 6.7 outlines the bicycle parking provision for Melrose Park based on the *Parramatta DCP 2011* rates.

Table 6.7: Recommended minimum bicycle parking provision for Melrose Park (Parramatta DCP 2011)

Melrose Park land use		Minimum bicycle parking provision
Development type	**Dwellings / GFA**	
Residential	11,086 dwellings	**5,543 spaces** (0.5 per dwelling)
Commercial	19,400m^2 GFA	**97 spaces** (1 per 200m^2 GFA)
Retail	15,600m^2 GFA	**78 spaces** (1 per 200m^2 GFA)

6.6 Parking

6.6.1 Introduction

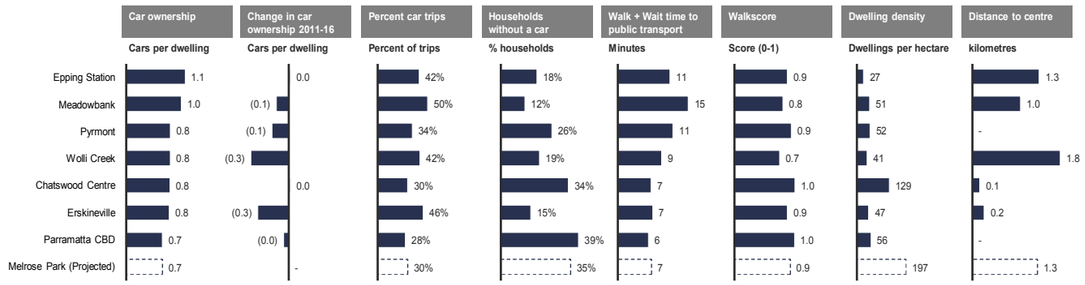
The Melrose Park structure plan recognises that there is a very strong link between parking provision and travel behaviour, and that it is a critical element of the integrated transport strategy. At the same time, it is necessary to develop a staged approach to parking that will balance the short term needs with the long term objectives for sustainable parking management within Melrose Park. Parking provision in the early stages at Melrose Park will need to balance the imperative of achieving development as early as possible, while parking provision in the later stages (beyond 2020) will need to constrain parking supply as a means of reducing travel by private car and to encourage public transport use. It is proposed to achieve the objectives relating to parking through physical planning, parking design, future trends in mobility as well as parking provision rates that reflect the site's accessibility.

6.6.2 Benchmarking and trends

Car ownership patterns

In developing a parking strategy for Melrose Park a benchmarking exercise was undertaken by Kinesis *"An Evidence Base Parking Strategy for Melrose Park"* (06 March 2018) of car ownership and car use patterns for similar high density developments within the Sydney context (refer Figure 6.31).

Figure 6.31 : Benchmarking and trends (Kinesis)



The results show:

- Car ownership in the selected locations is between 0.7 and 1.1 vehicles per household
- Most areas have seen a decrease in car ownership in the last 5 years.
- 50% of all trips are generally made by car
- Areas with high access to public transport contain a large number of households (30-40%) that don't own a car.

Comparison of Parking Provision

Some examples of existing parking rates in selected Sydney councils are shown in Figure 6.30 for residential car parking controls. These councils have been selected as part of the TMAP for the following reasons:

- To reflect different areas or parking policy approaches to parking
- To highlight different parking provision approaches to implementing parking strategies
- To identify and compare a wide spectrum of parking policy from other local government areas within the Sydney Metropolitan spectrum
- To identify parking policy approaches in areas with similar urban and transport environments.

Parking controls across Sydney vary widely by council areas, with some council's providing a more 'best practice' model than others. Generally, adoption of maximum parking rates is considered to be desirable to ensure that there is not an oversupply of parking. Minimum parking rates effectively force proponents and developers to provide a certain number of car spaces and provide no restriction on the overall number.

Parking provision

Parking provision rates specified by the City of Parramatta DCP, Epping Town Centre DCP and the RMS Guidelines have been compared to assess various scenarios the total number of parking spaces required for the Melrose park structure plan and these calculations are provided in Table 6.8 below. It is noted that the RMS rates are recommended only for high density centres with a significantly higher jobs to dwellings ratio than is proposed at Melrose Park. It has however been included in this analysis to demonstrate the variance in total parking requirements as a result of different available rates.

Parking Provision for High Density Developments

Figure 6.32 shows the parking rates for high density residential dwellings from recent survey data provided by TfNSW and RMS. It is observed that the majority of these sites provide between 1.0 and 1.5 spaces per dwelling. The average across all sites is 1.3 spaces per dwelling. The majority of these sites do not have immediate access to mass transit comparable to the access that will be available to future residents of Melrose Park i.e. Parramatta Light Rail Stage 2. Furthermore, unlike Melrose Park, several of these sites are not located within 30 minutes of both the Eastern and Central cities. There is a clear opportunity for Melrose Park to provide parking spaces at a rate towards the lower end of the range presented in these surveys.

Figure 6.32 : Parking provision benchmarking

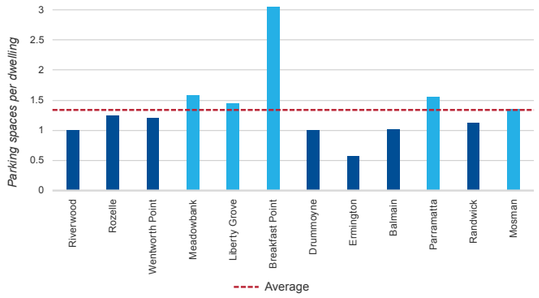


Table 6.8 : Comparison of parking requirements

		City of Parramatta DCP		Epping Town Centre		RMS (High density centre)	
Land use	GFA/ Dwellings	Parking Rate	Spaces	Parking Rate	Spaces	Parking Rate	Spaces
Commercial	19,400m^2	1 per 50m^2	388	1 per 70m^2	277	1 per 40m^2	485
Retail	15,600m^2	1 per 30m^2	520	1 per 60m^2	260	1 per 20m^2	780
Residential: 1 bed	2,910	1.0	2,910	0.75	2,182	0.6	1,746
2 bed	6,781	1.0	6,781	1	6,781	0.9	6,103
3 bed	1,190	1.2	1,428	1.5	1,785	1.4	1,666
4 bed	205	2	409	1.5	307	1.4	286
Total			12,436		11,592		11,066

It is clear that the application of existing parking controls would result in the provision of a significant amount of on-site parking. This would require significant construction and excavation costs, reducing the affordability of homes whilst also facilitating excessive car use and reducing the livability, vibrancy and sustainability of the precinct.

The current approach to parking provision does not represent industry best practice for an integrated transport network which entails innovative measures to achieve more sustainable access. There are several factors that would warrant a revised approach to parking policy for Melrose Park:

- Proposed future improvements to public transport as proposed by TfNSW, through the implementation of PLR Stage 1/2 and Sydney Metro West services improving connectivity and accessibility to public transport and major strategic centres
- The constraints of the higher order road network surrounding the site to accept a marked increase in traffic projected from other developments, even with improvements to capacity over time
- Planning trends show that residents living in areas of high dwelling density have lower car use and as such, lower car ownership relative to the Sydney Metro average
- Residents living in areas proximate to major centres areas exhibit lower car use relative to the Sydney Metro average. Melrose Park is located:
  - 5km from Rhodes Business Park
  - 8km from Sydney Olympic Park
  - 6km from Parramatta CBD
  - 7km from Macquarie Park
  - 15km from Sydney CBD.
- Melrose Park development includes a town centre with retail shopping, childcare centres and community facilities limiting the need for residents to make short car trips.

6.6.3 Parking provision considerations

Parking provision to public transport facilities

As development densities and public transport options increase at Melrose Park, the rate of parking demand is likely to decline. Public transport infrastructure such as Sydney Metro West, Parramatta Light Rail Stage 2 and new bridge across Parramatta River (suitable for active transport and public transport trips only) will constitute significant elements in the urban structure of the Melrose Park structure plan. Parking levels can be decreased as the public transport system improves and development momentum increases. In this context, the estimated reduction in the number of parking spaces required in major dense urban centres close to public transport facilities is provided in Table 6.9 (Professor Hans Westerman, *Cities for Tomorrow*).

By having development close to public transport infrastructure and services (such as Victoria Road and Hope Street) and by sharing and consolidating parking, overall parking requirements can be realistically reduced by 20%-30% for 'ultimate' build-out of Melrose Park. These parking reductions would need to be rolled out incrementally over time as higher mass, intermediate and active transport options are delivered to Melrose Park and GPOP.

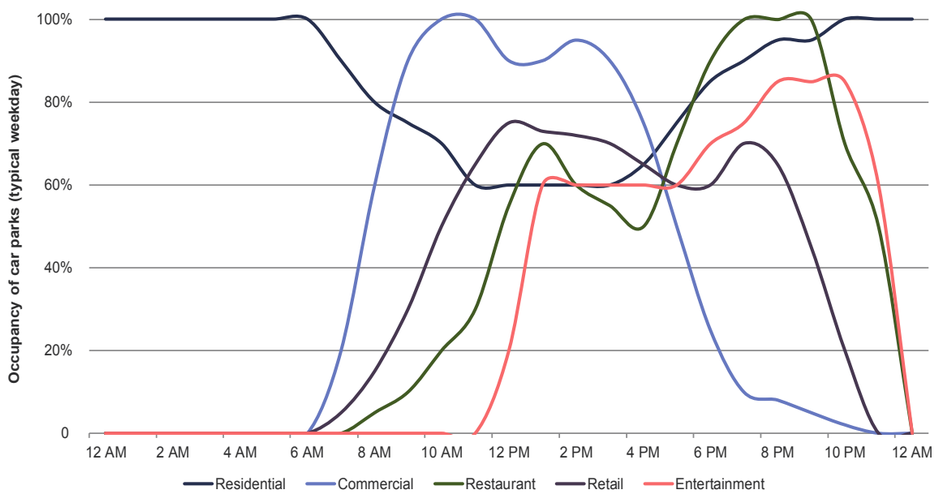
Table 6.9 : Parking reductions near public transport facilities

Location of development	Reduction (estimate)
Transit corridor	5%-10%
Station influence area	15%-20%
Transit interchange	25%-30%
Multi-modal transit hub	60%

Shared and complementary use of parking

By providing common parking facilities in locations where they can be used for a range of surrounding land uses, it will be possible to reduce the net parking provision as development progresses. Shared parking is parking shared by more than one user, which allows parking facilities to be used more efficiently. This arrangement reduces the potential for over-provision of parking spaces since complementary land uses can effectively use the same spaces. For example, the use of commercial parking for retail activities, since their times of peak demand do not coincide. These relationships are illustrated graphically in Figure 6.32 with parking assigned by type of activity based on time of day variations as reported in Urban Land Institute.

Figure 6.33 : Shared parking opportunities (Urban Land Institute)



Innovation to promote sustainable travel behaviour

Innovative parking solution for Melrose Park needs to respond to the site's level of accessibility but also to future trends in mobility. To complement the innovation incorporated into the structure plan elements of Melrose Park, we have developed a range of innovative approaches aimed at promoting more sustainable travel these include:

1. Unbundled Parking

Unbundled parking is parking that is separated from the cost or rent of a dwelling or building. In this case, residents have the choice to purchase/lease parking rather than it being bundled in the cost of housing. This can also reduce the total amount of parking required for the building. For buildings with unbundled parking, an overall parking rate reduction of 10-30% may be feasible.

2. Decoupled Parking

Decoupled parking is parking that is spatially separated from the building to which the parking services. It is also generally unbundled from the sale or rental of an apartment or building. The benefits of decoupled parking are significant, enabling transition to a low car dependent future and reduce parking rates by up to 10%. Decoupled parking has the potential to deliver the significant and mutually reinforcing benefits of parking. The shift towards lower car ownership rates and emergence of the autonomous vehicle will reduce the need for parking and investment in underground parking. In particular, parking stations/basement parking may lose value as vehicles may no longer need to be parked or housed at origin or destination locations.

3. Car Share and Planning for Reduced Car Ownership

Melrose Park is a multi-decade development and will be built out over the next 10 to 20 years. Encouraging residents to use car share schemes is one approach that can be used to reduce car dependence and ownership levels. A reduction in parking to reflect recent reductions and trends in car ownership could be expected to continue with the emergence and growth of car share, Mobility as a Service (MaaS) and connected autonomous vehicles. This will be initially supported through the delivery of car share spaces across the development and can potentially reduce parking rates by up to 10%.

4. Physical planning and design

Melrose Park will allow for common parking facilities in locations where they can be used for a range of surrounding land uses, it will be possible to reduce the nett parking provision as development progresses. The physical planning and design will incorporate:

- Dedicate parking space for car share programs and electric vehicles
- Parking location, design and access will enable better sharing of spaces and active management of supply. This will improve productivity of parking spaces and assist in achieving transport targets.
- Share mobility pods. Space will be provided within the Melrose Park for car and bike share, as well as emerging forms of share mobility such as e-mobility (electric mopeds etc).
- End of trip facilities for active transport (e.g. a bike hub providing showers, lockers and maintenance equipment).

Recommended parking provision

The overall transport objective of Melrose Park is to reduce the impact of the private car and promote alternative modes of transportation. Whilst there is a need to ensure that adequate access can be provided before public transport measures are introduced, in the medium and long term it is a core objective to reduce car parking and promote alternatives modes. This objective is supported by the demand management measures that are discussed above.

It is observed that all areas of the precinct will be within walking distance on high frequency buses and future light rail services on Victoria Road and Hope Street respectively. An 800 metre walking catchment was adopted on the basis that it is a readily accepted land use planning assumption that can be comfortably walked in 10-15 minutes. This also means the location is within close proximity to local services currently existing or planned within the Melrose Park precinct. The combination of the above strategies is expected to enable parking provision for Melrose Park as outlined below.

All parking rates are proposed to be maximum rates consistent with best practice to ensure there is not an oversupply of parking and that developers are not forced to provide additional costly parking that is not required, and which contributes to increased living costs.

It may be appropriate for earlier stages of the development to apply slightly higher rates if deemed appropriate and lower rates applied in the longer term. For this reason, proposed parking rates in Table 6.10 use the existing Parramatta Council DCP rates for short term development with medium to longer term rates representing the overall parking vision for the precinct.

Table 6.10 : Proposed maximum parking rates

	Residential (spaces per dwelling)						Non-residential (GFA per space)	
	Studio	1 bed	2 bed	3 bed +	Visitor	**Total**[1]	Commercial	Retail
Short term	1	1	1	1.2	0.25	**1.27**	50m^2	30m^2
Med-long term	0	0.3	0.7	1	0.1	**0.73**	50m^2	30m^2

1. Total residential rate per dwelling based on dwelling mix specified by Melrose Park proponents

Off-street

The parking provision rates set out in the Table 6.11 reflect suggested rates adopted for above which will have good public transport provision when the overall development is completed. The parking rates shown for the Barlett Park site have already been approved. The number of spaces proposed for 'full build-out' (2036) is below the levels required by the City of Parramatta standard parking standards. An overall objective of the Melrose Park development is to reduce the impact of the private car and promote alternative modes of transportation. Whilst there is a need to ensure that adequate access can be provided before public transport measures are introduced, in the medium and long term it is a core objective to reduce car parking and promote alternatives modes. In line with the objectives to reduce the level of car dependency it is recommended that the level of car parking provided on the site is reduced to a total of 9,441 spaces comprising 6,161 and 3,280 spaces for northern and southern precincts respectively.

Table 6.11 : Recommended off-street parking provision for Melrose Park (full build-out)

Land use	Parking Rate	GFA/Dwellings	Spaces
Northern Precinct			
Office/Commercial	1 space per 50m²	15,000m²	300
Retail	1 space per 30m²	12,500m²	417
Residential	0.73 spaces per dwelling	5,650 dwellings	4,125
Residenital (Bartlett Park)[1]	1 space per dwelling + 0.1 visitor spaces per dwelling	1,200 dwellings	1,320
Sub-total			**6,161**
Southern Precinct			
Office/Commercial	1 space per 50m²	4,400m²	88
Retail	1 space per 30m²	3,000m²	100
Residential	0.73 spaces per dwelling	4,236 dwellings	3,092
Sub-total			**3,280**
TOTAL			**9,441**

1. Parking rate as previously approved

On-street parking (within Melrose Park)

The amount of on-street parking within the Melrose Park has been raised as an issue by the City of Parramatta (CoP). The majority of residential parking for the Melrose Park precinct will be provided off-street including visitor parking. To cater for greater variability in parking demand for on-street parking in the future, CoP would like to see on-street parking on both sides for all internal streets where possible within the Melrose Park precinct.

The amount of on-street parking within Melrose Park should be time restricted as far as possible to ensure parking spaces are allocated efficiently around key transit nodes and the proposed town centre. This will prevent long term parking for residents and commuters within Melrose Park, in particular when light rail is implemented On-street parking within the internal street network will incorporate parallel kerbside parking either on-carriageway parallel bays and/or indented parallel parking bays. Car share parking spaces are also planned to be on-street that would highlight the presence of these share cars and encourage residents to take up car share instead of purchasing private vehicles. An estimate of the number of on-streets spaces proposed for Melrose Park is summarised below:

- Northern Precinct – approximately 700 spaces
- Southern Precinct – approximately 500 spaces
- Total – 1,200 spaces.

Car share on-street parking (within Melrose Park)

City of Sydney and Leichhardt DCPs have been used in the development of car share rates as these are considered best practice and applicable to the future vision of the precinct (1 space per 40 dwellings). Car sharing rates have been developed using the parking categories outlined above. Car share schemes are generally more successful in higher density areas with limited off-street parking availability and high quality public transport, and this aligns well with the parking categories.

The Melrose Park Parking Strategy (Kinesis 2018) suggests that car share spaces can be provided in lieu of standard car parking spaces. Each car share space can replace up to 5 standard spaces.

Car share spaces will be located in publically accessibility parking spaces and located in strategic sites across the development to enable short walking distances.

6.7 Travel demand management

6.7.1 Introduction

The success of the overall TMAP requires the identification of demand management options that could potentially address future congestion problems that could be experienced on the transportation system within and around Melrose Park. In order to enable the desired changes to travel behaviour, a number of headline demand management options are discussed in the sections below. All of these support the overall transport network approach outlined in the TMAP.

6.7.2 Approach

The provision of demand management measures has been undertaken based on the following principles:

- Reduce car dependency, improve and maximise the share of travel by public transport, pedestrians and cyclists.
- Support a modal shift from private vehicles to public transport.
- Recognise the competing demands for car parking and set out parking management measures.
- Provide environmental protection through the reductions in total travel and the congestion levels in the transportation system.
- Apply an approach consistent with ‘Travel Choices’ method adopted by Transport for NSW focusing on re-mode, re-time, re-route or reducing journeys.

6.7.3 Demand Management Measures

There are a broad range of travel demand management options outlined in Table 6.12 that could be applied to Melrose Park. These range from “hard measures”, such as parking charges and workplace parking levies through to “soft measures” such as car sharing, car clubs, public transport information, tele-working, etc.

Parking Management and Control

There are a number of ways in which parking management and control can be used to influence demand. These primarily include:

- Parking charges – for all or certain road user categories (i.e. time based pricing, vehicle occupancy pricing).
- Reducing or limiting available parking space for all or certain road user categories (i.e. vehicle size parking to encourage the use of smaller and more environmentally friendly vehicles).
- Variable parking pricing programs during congested hours of the day.
- Improving enforcement and control of available parking.
- De-coupling and/or unbundling of off-street car parking from being ‘locked into’ specific building structures or rent / ownership arrangements

Table 6.12: Suite of demand management measures

SOFT →				HARD
Providing Information	Encouraging behaviour change	Enabling behaviour change	Discouraging unsustainable behaviour	Preventing unsustainable behaviour
Awareness campaigns	Workplace and school travel plans	Prioritising public transport	Parking charges	Access control
Cycling and walking information	Flexible working hours	Car share schemes	Parking management	Pedestrianisation
Advanced traveller information	Personalised travel planning	Car pooling scheme		
	Opal card with pre-loaded value provided upon occupation	Smart work hubs		

Car-sharing

Car-sharing is an effective approach for encouraging reduced levels of car ownership. Car-sharing is best suited to high density, mixed use environments that provide a range of alternative transport options. Many car share providers provide a membership car share service that enables efficient online car booking and rental for registered users.

The service allows users to book, and have on-demand access to, a shared car or vehicle as their needs require. Cars are accessed through smart card technology with cars located in designated reserved spaces in established strategic locations. For example, GoGet has partnered with Parramatta City and City of Ryde councils to facilitate car share schemes within its boundaries with policy dedicated to promoting car share use including actions orientated towards management of kerbs and off-street car share parking.

Travel Choices

Travel Choices is a simple framework designed to help reduce peak hour travel, allow people to move around more efficiently and improve business productivity.

- *Remode*: use public transport as driving may no longer be your best option.
- *Retime*: avoid travel during the peak, especially between 8-9am and 5-6pm.
- *Reduce*: minimise the number of times you have to travel, especially by car.
- *Reroute*: use the city's preferred driving routes where possible.

Retiming and reducing are effective ways for people to avoid driving in the AM and PM peak. A number of approaches within the Travel Choices framework could be applicable to managing demand for private vehicles in Melrose Park.

Flexible working arrangements

Flexible working arrangements can include:

- *Flexible hours*: changing start or finish times.
- *Flexible patterns*: working longer days to provide for a shorter working week.
- *Flexible rostering*: split shifts.

All of these arrangements would require significant support from employers in employment locations of Melrose Park workers e.g. Sydney CBD, Parramatta CBD, Rhodes and Olympic Park.

A 'smart work hub' could be considered in Melrose Park due to the significant commuter population it is likely to contain. A Smart Work Hub offers all the conveniences of a modern office – high speed internet, meeting rooms, videoconferencing facilities, informal lounges and quiet booths – but in close proximity to home. It is a shared workspace with others from small businesses, government and corporate organisations utilising the facilities. Telecommuting allows worker to either eliminate a commute trip altogether by working from home or to reduce trip length by working from a satellite office, such as a smart work hub.

End-User Facilities

The decision to travel to work via walk or cycle tends to be driven in large part by the availability of enduser facilities. These may include showers for cyclists, bike cages or other bicycle parking facilities that ensure safe and secure storage of bicycles, changing rooms and drinking water facilities. These facilities should be incorporated within all employment locations within Melrose Park.

Figure 6.34 : Car-share opportunities (GoGet)

Transport Management Association

The implementation of the Melrose Park TMAP could be supported by the establishment of a Transport Management Association (TMA) charged with managing the delivery and monitoring of the plan's outcomes. The TMA's responsibilities in terms of travel demand management may include, but not be limited to:

- *Personalised Travel Planning*: Personalised travel planning involves the provision of tailored information and incentives directly to households with the aim of influencing travel behaviour and reducing car usage.
- *Travel Information:* Working with transport service providers to provide road users with information about congestion in the surrounding network so the trip characteristics can be altered to avoid congestion.
- *Public Transport Information*: Establishing a marketing campaign and developing a strong, overarching, brand image for public transport has the potential to perform a key role in supporting other demand management options and encouraging modal shift from the private car to public transport alternatives. It is imperative that a good level of public transport service be in place before the promotion and marketing of a route or service can be considered as an effective tool. This could also be supported by a commitment to the early provision of Opal cards by proponents.

Workplace and Green Travel Plans

Workplace travel plans and green travel plans are generally a set of practical initiatives that are put in place by employers or building managers before occupying a new of existing development that encourages staff and residents to choose alternatives to driving that are healthier and more sustainable. For travel plans to be successful in reducing vehicular travel demand, they should be developed in a tailored manner that respects the specific needs to each particular location / organisation.

Elements of such travel plans can include many of the initiatives mentioned above, as well as information programs for sustainable transport, active transport initiatives, flexible work hours, proactive cooperation with transport agencies to tailor public transport facilities to the site and employer initiated parking policy that support public transport use.

A TMA would be charged with supporting the development, delivery and monitoring of all travel plans within the precinct. Expected outcomes of the plans (e.g. mode share targets) will be monitored by the TMA

Recommendations

A summary of the demand management measures recommended as a part of this study area are outlined below

- Implement comprehensive parking management and control approach for Melrose Park including consideration of de-coupling and unbundling off-street parking
- Develop car sharing approach for Melrose Park including parking rates to be delivered for specific developments
- Investigate the provision of a 'smart work hub' within Melrose Park to reduce commuter peak demand
- Provide high quality end-user facilities for all new developments in Melrose Park
- Measures be considered for inclusion in relevent site specific control plans for Melrose Park.

7. IMPLEMENTATION PLAN

7. IMPLEMENTATION PLAN

7.1 Overview

The development of an integrated package of measures and strategies for the Melrose Park TMAP has evolved over an ongoing process based upon close consultation with City of Parramatta, Department of Planning & Environment, Transport for NSW, Roads and Maritime Services and key stakeholders.

The implementation plan provides a framework to ensure an integrated and coordinated approach to achieve the objectives set out in the TMAP.

Whilst a number of the specific measures and strategies of this TMAP will be pursued jointly by both local and NSW Government, there will also be a number of measures and that will be taken forward by Melrose Park proponents separately. In implementing the processes outlined in this TMAP, the outcomes across the precinct and wider region will be consistent and coordinated.

7.2 Staging and trigger points for major infrastructure and services

Melrose Park precinct is a multi-decade development and will be developed in stages. The initial staging will be based on land ownership, market demand, cash flow, constructibility, community needs and design considerations.

Melrose Park precinct needs to build in flexibility to accommodate future changes and to ensure land use strategies are closely coordinated with infrastructure delivery. It is important to understand the short, medium and long term changes in demand and service level requirements as the development progress. Although a particular capacity or service level is required for ultimate development, infrastructure will usually be provided in stages to match demand and lower levels of service can be tolerated in the short term.

A key aspect in the timely and cost-effective provision of infrastructure and services is the integration of land release strategies with the delivery of infrastructure. This is to ensure that the use of existing assets and any spare capacity is maximised early in the process to ensure efficient delivery of future infrastructure.

The key aspects of the Melrose Park staging approach include:

- Assessing infrastructure demand over the proposed development period and identifying critical short term, medium and long term demands
- Ensuring public transport services are provided in line with development to encourage sustainable behaviour and reduce car reliance
- Investigation of existing and future infrastructure capacity to identify “trigger” thresholds and timeframes for contribution and implementation
- Preparing an infrastructure staging plan which moderates the development staging plan as required taking advantage of infrastructure capacity.

The detailed staging and sequencing for Melrose Park will be further refined after the planning proposal with development contingent on the delivery of transport infrastructure. The following staging scenarios have been considered:

- An extension of the existing development front from Victoria Road following development occurring at the former Bartlett Park site (Figure 7.1)
- Development occurring on two fronts (i) an extension of the existing Bartlett Park site, and (ii) the proposed new town centre at the south-east corner of the northern precinct (Figure 7.2)

The indicative staging described below has been formulated in conjunction with the establishment of the road network and public transport facilities to ensure that Melrose Park evolves in a coherent and efficient manner.

Dwelling yields for each stage reflect the trigger point for the associated infrastructure. e.g. Stage 1A works are required in order to support a yield of more than 1,100 dwellings. Years shown are indicative only.

Stage 1A: Delivered at approx 1,100 total dwellings (2021)

- Widening of Wharf Road south of Victoria Road
- Left in/left out access from Victoria Road to NSR-2 (i.e. at Kissing Point Road)

Stage 1B: Delivered at approx 1,800 total dwellings (2022)

- Upgrade of Victoria Road/Wharf Road intersection to provide:
  - Additional dedicated left turn lane on eastern Victoria Road approach
  - 4 lanes at the stopline on Wharf Road approach - 1 left, 1 through, 2 right
  - Removal of slip lane on western Victoria Road approach and realignment of stopline to allow for more efficient ‘diamond’ signal phasing
  - Additional through lane on Marsden Road approach

Stage 1C: Delivered at approx 3,200 total dwellings (2024)

- Upgrade of the Victoria Road/Kissing Point Road intersection to provide:
  - Fully signalised intersection allowing all turning movements.
  - Dual right turn lanes on the eastern and western Victoria Road approach
  - Dual right turn lanes and a shared left/through lane on the southern Kissing Point Road approach
  - 4 lanes at the stopline on the northern Kissing Point Road approach - 1 right, 2 through, 1 left.
  - New signalised pedestrian crossings on the northern, southern and western intersection legs
- Widening of Victoria Road between Kissing Point Road and Wharf Road to allow for a continuous bus lane in each direction

There is potential to provide an indented bus bay for eastbound Victoria Road services directly east of the upgraded Kissing Point Road intersection. It is recommended that the provision of this facility be further investigated at the detailed design stage to ensure that relevant design standards can be met at this location.

Throughout Stage 1

- Provide shuttle buses to service the public transport demand from Melrose Park to Meadowbank Station. Provision of this service will commence with one shuttle bus, with further shuttles to be brought into service in line with delivery of dwellings with a total of 4 buses providing an ultimate Stage 1 frequency of 12 shuttles per hour in the peak periods.
- Staged improvements to frequency of M52 bus services on Victoria Road as described in section 6.4.6 to provide ultimate frequency of 18 per hour in peak direction. (Noting that Melrose Park demand accounts for 5 of the additional 12 hourly services)
- Staged delivery of internal road network and associated pedestrian and cycling infrastructure to provide access to development.

Stage 2: Delivered at approx 6,700 total dwellings (2028)

- New public transport and active transport bridge over the Parramatta River between Melrose Park and Wentworth Point. The bridge will be designed to cater for both bus and light rail vehicles.
- Public transport services as described in section 6.4.6 including maintaining Stage 1 M52 service improvements and also providing services over the new bridge either via Parramatta Light Rail Stage 2 or high frequency bus connections.
- Staged delivery of internal road network and associated pedestrian and cycling infrastructure to provide access to development.

Figure 7.1: Single front staging scenario

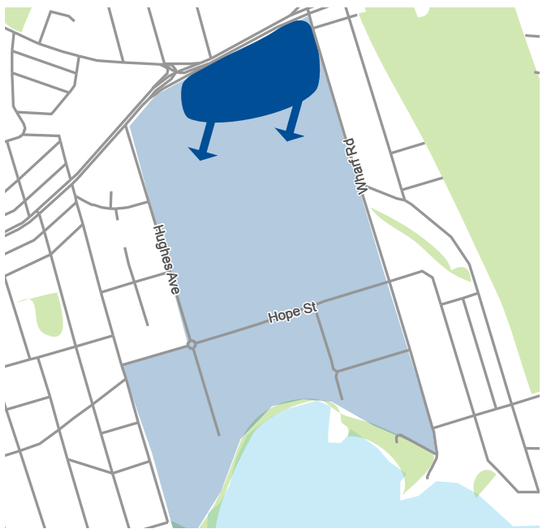
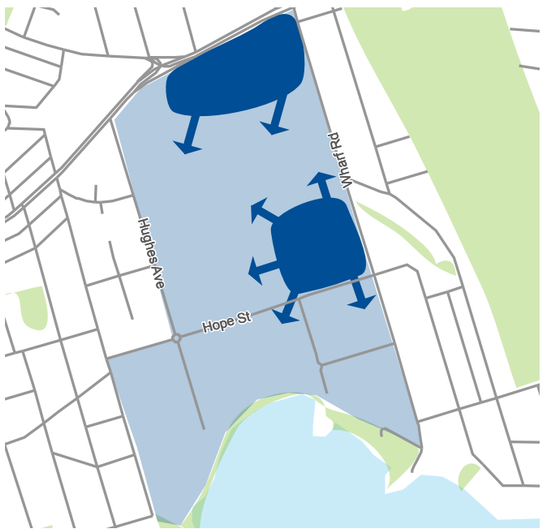


Figure 7.2: Two front staging scenario



7. IMPLEMENTATION PLAN

A summary of the proposed staging and the total dwelling yield able to be supported by each stage is shown in Table 7.1

Table 7.1: Staging summary

Stage	Delivered at (dwellings)	Yield supported (dwellings)
Existing network	N/A	1,100
Stage 1A	1,100	1,800
Stage 1B	1,800	3,200
Stage 1C	3,200	6,700
Stage 2	6,700	11,000

Figure 7.3 to 7.5 set out the staging of identified road infrastructure recommendations for the Melrose Park precinct. Intersection designs and pedestrian crossing facilities will be subject to further refinement at the detailed desgn stage. 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.

Figure 7.3 : Victoria Road Stage 1A upgrades (Northrop) - Required at approx 1,100 dwellings

Figure 7.4 : Victoria Road Stage 1B upgrades (Northrop) - Required at approx 1,800 dwellings

Figure 7.5 :Victoria Road Stage 1C upgrades (Northrop) - Required at approx 3,200 dwellings

7.3 Implementation plan

The table below sets out a summary of the proposed transport infrastructure and services required to support the Melrose Park development. Detailed staging of these items is outlined in section 7.2

ID	Description	Responsibility	Background	Objective	Timing
Road network					
1	Internal road network	Proponents	The internal road network will be delivered in lockstep with the staged development of Melrose Park. It is proposed to develop internal roads progressively to provide access to core development areas as they come online.	2,5,6	Ongoing
2	Wharf Road intersection upgrade at Victoria Road	Proponents/ RMS	Proposed upgrade to the Victoria Road/Wharf Road intersection will improve access to and from Melrose Park whilst also improving efficiency for buses, freight and general traffic on Victoria Road.	2,4,5,6	Short term
3	Kissing Point Road - new access at Victoria Road	Proponents/ RMS	New left-in/left-out access into the precinct via the Victoria Road/Kissing Point Road intersection. This will be required in the initial stages of the development to allow for local access.	2,4,5,6	Short term
4	Intersection upgrades - As part of PLR Stage 2	TfNSW	Intersections along Hope Street will require adjustments as PLR stage 2 is delivered. This will result in newly signalised intersections at Hughes Avenue, NSR-2 and NSR-3/Waratah Street.	2,4,5,6	Medium term
5	Kissing Point Road - intersection upgrade at Victoria Road	Proponents/ RMS	Full upgrade of the Victoria Road/Kissing Point Road intersection. This will provide full access into and out of the Melrose Park precinct whilst also improving efficiency for buses, freight and general traffic on Victoria Road.	2,4,5,6	Medium term
6	Victoria Road upgrade between Wharf Road and Kissing Point Road	Proponents/ RMS	Widening of Victoria Road between Kissing Point Road and Wharf Road to allow for extended turning lanes and a continuous bus lane in each direction.	2,4,5,6	Medium term
Public transport network					
7	On-demand services	TfNSW	On-demand services to Macquarie Park are currently being trialled in the Melrose Park area. The possible expansion of these services to other hubs will reduce car reliance for Melrose Park residents and workers.	1,2,5,7	Short term
8	Local bus shuttle services	Proponents	The provision of bus shuttle services to promote integration with local bus and rail services at Meadowbank. Staged provision of buses to allow an ultimate Stage 1 (pre-bridge) headway of 5 minutes in the weekday peak period. 4 buses required to support up to 6,700 dwellings. Potential minor works and pedestrian crossing on Bank Street or at kiss and ride facility to support shuttle operations at Meadowbank station.	1,2,5,7	Short term
9	Bus service enhancements	TfNSW	The following improvements will provide efficient and sustainable travel options for residents and visitors of Melrose Park in the short to medium term: • Increased frequency on M52 to cater for both background growth and Melrose Park demand along Victoria Road to Parramatta and the Eastern City • Potential new service Top Ryde to Concord Hospital via a new bridge over Parramatta River • New and upgraded bus stops on Wharf Road to ensure a maximum 400m spacing and to provide increased waiting areas and passenger amenity	1,2,5,7	Short to medium term
10	Ferry services	TfNSW	Investigations into the following ferry service improvements are recommended: • Service improvements for F3 Parramatta River services to cater for future commuter ferry and tourist patronage demand • Investigate and consult with TfNSW and RMS on ferry shuttles between Olympic Park and Parramatta and a potential new wharf at Melrose Park	1,2,5,7	Short to medium term
11	New bridge across Parramatta River	Proponents/ TfNSW	A new bridge connecting Melrose Park and Wentworth Point will have a transformative impact on Melrose Park and the wider region. Rapid transport connections via bus or light rail will directly connect Melrose Park with jobs, services and key transport corridors at Rhodes and Sydney Olympic Park.	1,2,3,4,5,7	Medium term
12	PLR Stage 2	TfNSW	A new light rail line will be provided connecting Melrose Park with Parramatta CBD and Olympic Park. At least two stops will be provided within Melrose Park to cater for central / northern and southern precinct access to the light rail corridor. The structure plans makes provision for a LRT corridor along Hope Street.	1,2,4,5,7	Medium term
13	Sydney Metro West	TfNSW	New metro line connecting Westmead, Parramatta CBD, Olympic Park, the T1 Northern rail line, Bays Precinct and Sydney CBD. This will be a key connection for Melrose Park residents who can access the line at Sydney Olympic Park via PLR Stage 2.	1,2,4,5,7	Medium term
14	Victoria Road bus improvements	TfNSW	As outlined in Future Transport 2056 - Improvements will include upgrading bus services and infrastructure on the Victoria Road corridor. Improvements will transform the Victoria Road Corridor into a more attractive place to live and work. Improvements would enhance access for Melrose Park residents traveling to Parramatta or the Eastern City. A potential indented bus bay to be investigated eastbound on Victoria Road east of Kissing Point Road.	1,2,4,5,7	Medium term
15	T1 Northern Line improvements	TfNSW	Investigations into capacity improvements for the T1 Northern Line are currently underway. TfNSW has indicated improvements will be necessary within the next 10 years. Improved services would enhance access for Melrose Park residents who could reach West Ryde/Meadowbank via bus or on-demand services before transferring to the T1 Northern Line	1,2,4,5,7	Medium term
16	T1 Western Line improvements	TfNSW	The T1 Western Line Rail Upgrade Program is recommended to be implemented in order to provide more capacity for Northern Line services	1,2,4,5,7	Medium term

ID	Description	Responsibility	Background	Objective	Timing
Active transport network					
17	Walking and cycling infrastructure on internal network	Proponents	The internal road network within the Melrose Park precinct will include provision for safe, efficient and attractive walking and cycling trips, particularly to/from Melrose Park Primary School. A midblock crossing on Hope Street between Wharf Road and Waratah Street is recommended to be investigated to facilitate safe connections between the northern precinct and the school. This will encourage local trips to be undertaken via active modes whilst also enhancing access to nearby public transport services. A shared path will be provided on the western side of Wharf Road.	1,2,3,7	Ongoing
18	Enhanced local connections	Proponents/ CoP	Enhancements to active transport infrastructure linking Melrose Park Precinct to the surrounding activity areas through new connections via the internal road network to the Parramatta River foreshore shared path and to George Kendall Reserve	1,2,3,7	Short term
19	Cycle parking and end of trip facilities	Proponents	End of trips facilities and secure and visible cycle parking should be provided at all commercial centres and other major trip generators Adopt bicycle parking provision of: • 1 per dwelling + 1 visitor space per 10 dwellings • 1 per 150m^2 commercial GFA + 1 visitor space per 450m^2 commercial GFA • 1 per 250m^{2}retail GFA + 1 visitor space per 100m^2 retail GFA	1,2,5,7	Short term
20	Implement and refine Parramatta Bike Plan 2017	Proponents/ CoP	• Fully separated cycleway for Hope Street providing a new high quality east-west connection between Melrose Park and Rydalmere • Painted lanes on Wharf Road connecting Hope Street cycleway to existing Parramatta Valley cycleway • New shared path connecting north-south through the Melrose Park precinct and connecting with the Parramatta Valley cycleway	1,2,3,7	Short to medium term
21	Shared mobility facilities	Proponents	Shared mobility pods to be provided within Melrose Park for bike share, as well as emerging forms of shared mobility such as electric mopeds.	1,5,7	Medium term
22	New bridge across Parramatta River	Proponents/ TfNSW	A new bridge connecting Melrose Park and Wentworth Point will include dedicated walking and cycling infrastructure. This will provide direct active transport connections between Melrose Park and key centres such as Rhodes and Sydney Olympic Park.	1,2,3,4,5, 7	Medium term
23	Walking and cycling facilities to be delivered as part of PLR Stage 2	TfNSW	Improved cycling and pedestrian facilities should be investigated during planning and delivery of PLR Stage 2 along the Hope Street and Waratah Street corridors.	1,2,3,7	Medium term
Policy					

24	Parking policy	CoP/ Proponents	• Consider maximum parking rates for Melrose Park in the long term with parking provision of:
			  • 0.73 spaces per dwelling (average based on currently assumed dwelling mix)
			  • 1 space per 30m^2 commercial GFA
			  • 1 space per 50m^2 retail GFA
			• Prioritise on-street car share within Melrose Park at a residential car share rate of 1 space per 40 dwellings
			• On-street parking to be provided within the internal road network and be designed to support the function for the street.
			• Provide real-time parking information along key access streets and the proposed town centre
			• Unbundling /decoupling parking from the sale of apartments, to deliver housing choice and efficient allocation of parking across the development.
			• Monitor on-street parking activity on the surrounding street network at Wharf Road, Hope Street and Hughes Avenue to minimise over flow parking from Melrose Park
				1,6,7	Ongoing

25	Demand management	Proponents	• Ensure that transport information is up to date and liaise with the local residential and business communities on transport issues • Aligning information at stops and streets with digital transport information provided through websites, apps and electronic information displays • Liaise with transport providers to resolve any impediments to their efficient service and promote regular improvements • Enabling significant investment in car share, providing accessible mobility choice to households without parking or who choose not to own a car • Introduce parking management and control measures e.g. parking charges, constraining parking supply, unbundled/decoupled off-street parking • Facilitate car-sharing to reduce the need for private car ownership • Provide shared work spaces and ‘smart hubs’ to facilitate flexible working arrangements and minimise the need for peak hour commute trips • Provide opal cards to initial residents of the precinct	1,2,6,7	Ongoing

8. KEY FINDINGS AND CONCLUSIONS

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Overview

The Melrose Park TMAP has examined a wide range of issues in a complex land use and transport planning environment given the strategic location of the precinct within Greater Parramatta Olympic Peninsula (GPOP). The TMAP has sought to address the following key issues:

- The need to achieve a high level of public transport use, cycling and walking in order to achieve the *Future Transport Strategy 2056* broad strategic planning objectives of improved integration of land use and transport planning
- A strong commitment to bring light rail into the precinct as part of PLR Stage 2 and anchored by future connections to PLR Stage 1 and Sydney Metro West at Sydney Olympic Park
- The need to balance transport and access expectations in an environment where the road network, particularly at key intersections surrounding the site, is already close to capacity
- A staged approach to parking provision that will balance the short term needs with the long term objectives for sustainable parking management within the precinct
- To cluster residential, commercial and retail development in such a way that a 'critical mass' of trip generation is established within public transport catchments from the earliest stages of development.

8.2 Key findings

The key findings of the Melrose Park Precinct incorporating 11,000 dwellings in terms of transport infrastructure and services requirements are:

- Based on the nominated service levels for the road network, upgrades to Victoria Road intersections (Wharf Road and Kissing Point Road) will be required in order to efficiently service the Melrose Park precinct
- The road network analysis has identified that the remainder of the existing road network is able to cater for traffic generated by the proposed development, with no significant impacts compared to a future 'do minimum' scenario
- The public transport network for Melrose Park has been planned to cater for the full development without the need for light rail.
- Increased bus service frequencies on Victoria Road are required to support development and achieve mode share targets. Investigations have confirmed the required bus service levels are feasible
- A new bridge crossing (public and active transport only) across the Parramatta River linking Melrose Park to Wentworth Point is required by 2028 (approximately 6,700 dwellings) to enable connections from residential and employment areas to key public transport nodes
- New bus services between Top Ryde and Concord Hospital via Melrose Park are proposed to operate via the new bridge
- Shuttle services between Melrose Park and Meadowbank station are proposed to operate prior to the implementation of the new bridge. Proposed operations can be implemented without signifcant works or impacts
- Ferry user patronage demand from Melrose Park is likely to be small but may play an important role for discretionary trips. A new bridge across the Parramatta River will provide access to Sydney Olympic Park and proposed new ferry wharf at Rhodes East
- A light rail corridor is being proposed by TfNSW established through the core of the development. This would bring light rail services through the heart of Melrose Park with direct access to the proposed Sydney Metro West station at Olympic Park
- The introduction of PLR Stage 2 leads to a number of access implications along Boronia Street, Hope Street and Waratah Street which will need to be carefully managed
- The northern precinct structure plan maintains a corridor on Hope Street between Hughes Avenue and Waratah Street to enable the implementation of light rail. The southern precinct allows for light rail along Waratah Street.
- The entirety of the road works shall be delivered early with all upgrades delivered prior to the implementation of the new bridge over the Parramatta River. This plan ensures that infrastructure is in place to support the development and minimise wider network impacts.
- Key elements of Stage 1 - Prior to bridge (up to 6,700 dwellings:
  - Stage 1A, Stage 1B and Stage 1C road upgrades
  - Enhanced Victoria Road bus services to cater for background growth and Melrose Park demand
  - Shuttle services to Meadowbank Station
- Key elements of Stage 2 - After new bridge (more than 6,700 dwellings)
  - New high frequency services (bus or light rail) over the bridge
  - Continued enhanced Victoria Road bus services to cater for background growth and Melrose Park demand

8.3 Key conclusions

The key conclusions of the Melrose Park TMAP are:

- The scale of development envisaged for Melrose Park (11,000 dwellings) presents very significant, but manageable challenges for road and public transport infrastructure and services
- The package of transport infrastructure and services proposed and assessed in the TMAP is capable of accommodating the Melrose Park development yields (11,000 dwellings) and regional transport requirements as defined in *Future Transport Strategy 2056*
- Sydney Metro West will deliver significant benefits across the entire rail network for residents from Melrose Park with high capacity and more frequent services between Parramatta CBD, Sydney Olympic Park and Sydney CBD
- A new bridge crossing (public and active transport only) across the Parramatta River linking Melrose Park to Wentworth Point is required by 2028 (approximately 6,700 dwellings) to enable connections between multiple trip origins and destinations linking residential and employment areas to key public transport nodes
- Parramatta Light Rail Stage 2 will provide a direct link to and through the Parramatta CBD, and to the broader rail network, for the growing areas of Melrose Park, Wentworth Point, Sydney Olympic Park, North Parramatta and Westmead
- The public transport network needs for Melrose Park Precinct has been planned to match the type and scale of development without the need for light rail. The new bridge across Parramatta River linking Melrose Park and Wentworth Point will provide a key connection and will provide, a fast, direct, high frequency feeder bus services linking Melrose Park to Rhodes Station and future metro station at Sydney Olympic Park
- The signalised intersections within the study area are adequate and will operate at acceptable level of service with the improvements recommended. The TMAP analysis has shown LOS E or better for all the signalised intersections within the study area during the peak hours
- The additional traffic demands as a result of Melrose Park development on the surrounding local road network fall within acceptable capacity thresholds
- Parking provision in the early stages will need to balance the imperative of achieving as much development as early as possible (to contain travel within the area), while parking provision in the later stages will need to constrain parking supply as a means of reducing travel by private car
- The proposed 9,441 off-street parking spaces provided within Melrose Park is considered adequate to cater for the likely parking demand generated from the site at full build-out by 2036, which will be complemented by the public transport initiatives identified in the TMAP
- An integrated package of measures is required to be implemented over the next five to ten years as the development progresses, with the package containing a mix of policy and infrastructure and transport services measures
- The staging of the development will not cause any noticeable degradation of performance on the surrounding road network with the proposed integrated package of mitigation measures
- The staging of infrastructure and services is focused on ensuring high levels of accessibility in the short term. Road network upgrades and significant public transport service improvements are proposed in the early stages of the development.
- The measures presented within the TMAP need to be integrated comprehensively and consistently over the short, medium and long term if the mode split targets are to be achieved, and if the surrounding road network is to continue to function at an acceptable level of service.

APPENDIX A - MELROSE PARK PRECINCT MODEL (MPPM)

JACOBS®

JACOBS

Memorandum

Level 7, 177 Pacific Highway
North Sydney NSW 2060 Australia
PO Box 632 North Sydney
NSW 2059 Australia
T +61 2 9928 2100
F +61 2 9928 2444
www.jacobs.com

Subject	**MPPM Spreadsheet model**	**Project Name**	Melrose Park TMAP
Date	12 October 2018	**Project No.**	IA130100

1. Introduction

The purpose of the Melrose Park Precinct Model (MPPM) is to assist in understanding the impacts of proposed developments and the potential travel behaviour for trips to and from the precinct. The model provides forecasts for trip generation, trip distribution, mode choice and trip assignment to and from a development. This memorandum details the process of generating forecasts using the MPPM.

2. Step 1 – Zoning System

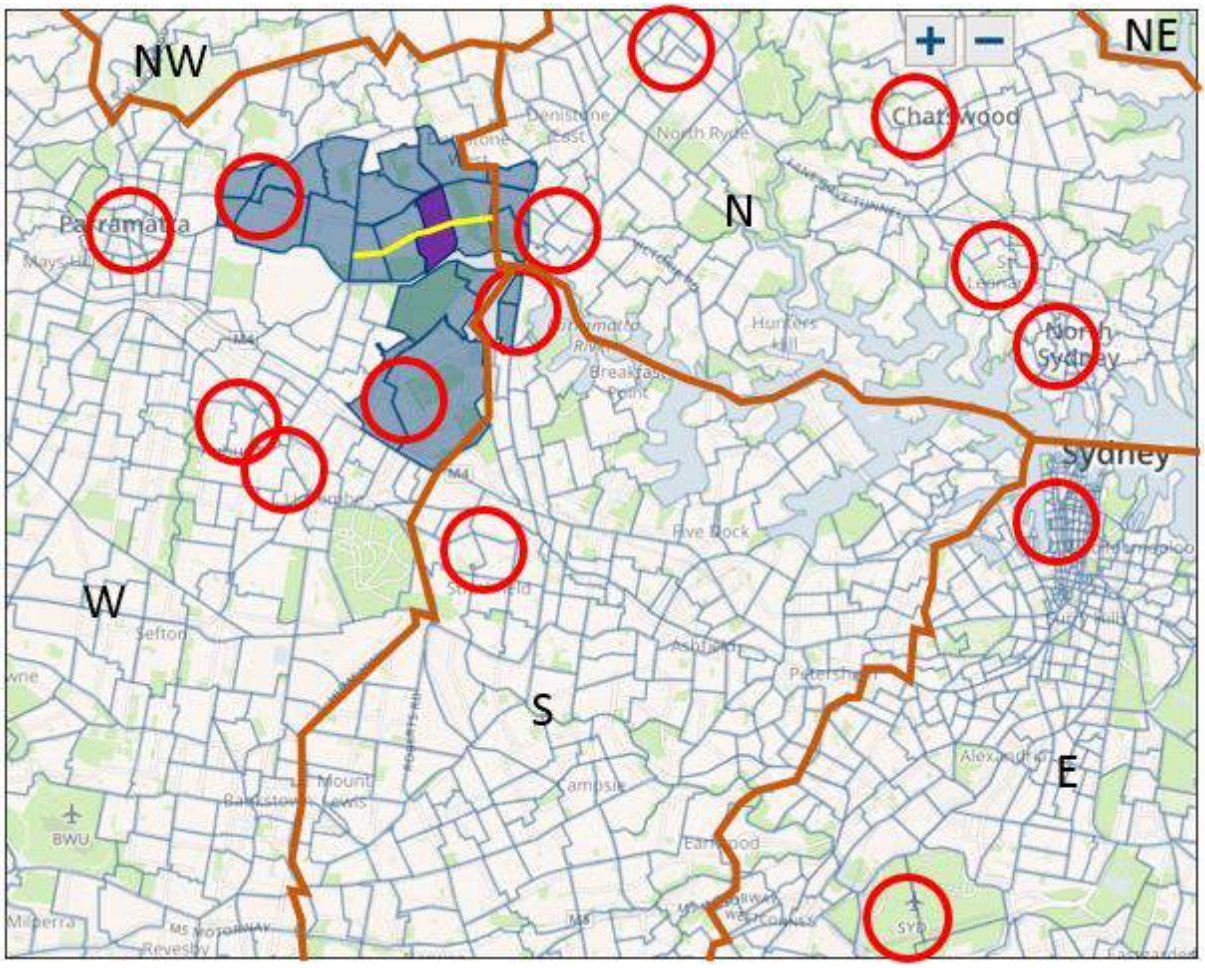
The first step is to define the zoning system. The zoning system forms the basis of the four-step analysis that is undertaken in the MPPM. MPPM uses Journey To Work (JTW) data from the 2011 census (the latest available at time of model development) for forecasting demand. As a result, JTW zones are used to define the geography of the model.

All JTW zones are defined into two types: internal and external. Internal zones comprise of the zone containing the development and its surrounding zones (the study area). If necessary, these zones can be further disaggregated to better reflect their public transit network connectivity. In the case of Melrose Park, travel zones between Victoria Road and the Paramatta River are all split into a North and a South zone because the North-South distance between Victoria Road and the Paramatta River is 2km. Therefore, residents in the Southern parts of these zones fall outside of the catchment of bus services running along Victoria Road.

External zones are divided into two types: employment centres, and wider external zones. These zones are created through the amalgamation of appropriate JTW travel zones. Employment centres represent the main places of employment for the residents of the internal zones (e.g. the CBD, Paramatta, Macquarie Park etc.). Employment centres are chosen to capture the majority of work trips which are made by the residents of the internal zones.

The figure above shows the zoning system used in the model. Internal zones are shaded blue, employment centre zones are indicatively shown by the red circles. Wider external zone boundaries are marked by the brown lines, which extend to cover the rest of Sydney (not shown above). Melrose Park is shaded purple. The yellow line marks the location of the split for the zones between Victoria Road and the Paramatta River, including the Melrose Park zone.

Figure 2.1: MPPM zoning system



All remaining travel zones are amalgamated into wider external zones. These zones represent large geographic areas (e.g. North West) and are comprised of many zones to which there are a low number of trips from the internal zones.

3. Step 2 – Demand development

Once the zoning system is developed, an origin-destination demand matrix (OD matrix) is created. JTW data provides the number of work trips which take place between every travel zone disaggregated by mode. MPPM uses the sum of all car and public transit trips; modes 1-5 in the JTW. Trips which report modes such as 'other' and 'mode not stated' (modes 6-9 in the JTW) are excluded from the analysis.

The sum of all car and public transit trips is amalgamated to provide OD demand for each OD pair using the zoning system defined in Step 1; with the exclusion of external to external zone pairs, as these do not influence the study area. This provides the base OD matrix for the year 2011.

Census projections are used to factor the base 2011 OD matrix in order to create the base study year matrix (2016) as well as future study year matrices (2026, 2036). The census provides population and employment projections for every JTW travel zone. These projections are split or amalgamated in the same manner as the JTW data to convert them into the MPPM zoning system. Using the reported

2011 employment and population, and the projected future population and employment in each zone, growth factors are derived. These are applied to the 2011 OD matrix to create the base and future year OD matrices.

Each OD pair is factored by two growth factors to arrive at the future OD value.

The population growth factor is simply the percentage by which the population in the origin zone has grown over time. Every origin zone has a growth factor which is applied to all trips originating from that zone.

The employment shift growth factor takes into consideration the fact that not all destination zones will grow at the same pace. First a distribution of trips from each origin zone is created using the 2011 OD matrix. This distribution is then factored by the relative growth in projected employment in each destination zone. This way, the fact that certain destinations, such as Paramatta, grow at a faster rate than others, such as the CBD, and will attract more trips in the future is accounted for. This new distribution of trips is then applied to the trips factored by the population growth factor to arrive at the future year number of trips for each OD pair.

4. Step 3 – Benchmarking

The growth factors used in Step 2 cannot be applied to the development zone as the land use will be completely different than it currently is. Benchmarking is needed to develop an accurate representation for trip generation and trip distribution for this zone. Additionally, any other internal zones where significant change in land use has occurred or is planned to be happen must also be benchmarked.

In the MPPM benchmarking was applied to the development zones in Melrose Park, and the fast-growing zones at Olympic Park and Wentworth Point South.

Firstly, benchmark zones are specified. Benchmark zones of similar location, development level and public transit connectivity are chosen as they will provide the most accurate estimates for the trip generation and distribution for the zones which require benchmarking.

Benchmarking is used to provide an estimate for trip generation and trip distribution. Population and employment projections for other internal benchmark zones can be obtained from the census projections used in Step 2. For the development zones, projections for population and employment are extracted from the development documents.

A weighted average number of JTW trips out per population for the appropriate benchmark zones is calculated and applied to the projected population to obtain the projected total number of trips from the zone. These are then distributed by the weighted average distribution for the appropriate benchmark zones.

Once benchmarking is completed, final OD matrices for the base and future year are created. This completes the process of trip generation and distribution.

5. Step 4 – Public Transit Generalised Cost

The next step in the MPPM is to assign the trips from the final OD matrix. The MPPM uses a generalised cost binomial logit model to assign all trips for each OD pair to one of two modes: public transit (PT) or car.

To carry out the assignment, generalised cost for each OD pair for PT and car trips are computed. The generalised cost represents a representative average trip for each OD pair.

PT trips are divided into three types: Local to External (LE), External to Local (EL), and Local to Local (LL). LE trips take place between internal and external zones; EL trips the opposite, and LL trips occur between two internal zones. A representative average PT trip is then computed for each PT trip type.

LE trips are broken down into 3 legs. Leg 1 represents the walk to a local bus stop (or local light rail stop in light future light rail scenarios). Each internal zone is served by a local bus stop. All bus services which go through an internal zone stop at the local bus stop. Using GIS, a centroid is estimated for each travel zone based on its land use; i.e. accounting for dwelling density and green spaces. The centroid is taken as the origin of all trips from each zone to represent the average trip.

The distance from the centroid to the local bus stop via the road network is calculated using a GIS network of the area. The generalised cost is expressed in minutes. The formula for calculating Leg 1 costs is shown below:

$$Cost = Walk\ Distance\ x\ Walk\ Speed\ x\ Walk\ Factor$$

The cost of Leg 1 is computed by converting the distance to a walking time using an assumed average walking speed, and applying a factor reflecting the relative desirability of walking as a means of commute. The factor used in the MPPM is 1.5 reflecting the fact that walking is seen as a relatively undesirable means of commute.

Leg 2 represents the trip on a local bus to a gateway. A gateway is a train/ferry/metro/light rail stations inside or near the study area. A representation of bus services running through the study area is created. Each bus service is modelled to stop in each zone and at each gateway through which it passes. The travel times and frequencies are taken from the Transport for New South Wales (TfNSW) timetable for each local bus service. The cost for Leg 2 of the trip is calculated using the formula below:

$$Cost = Wait\ Factor\ x\ 0.5\ x\ \frac{60}{Frequency} + IVT\ Factor\ x\ IVT + Fare\ Factor\ x\ Fare + Mode\ Transfer\ Penalty$$

Where;

- Wait factor represents the disutility of waiting for a local bus service to arrive
- Frequency is the number of busses per hour
- In vehicle time (IVT) is the time taken for the trip
- IVT Factor represents the relative attractiveness of each mode of travel. It is different for busses, trains, light rai, ferry etc.

- Fare is calculated using Opal distance bands
- Fare factor converts the monetary value of the fare to a perceived minute cost
- Mode transfer penalty represents the perceived inconvenience in minutes of changing modes of travel at the end of Leg 2

Where zones are served by multiple overlapping services the frequency is the sum of all overlapping services per hour, since travellers would board the first available service.

The centroid of certain zones falls within 1km of a gateway. For these zones, Legs 1 and 2 are replaced by a single walking trip from the zone centroid to a gateway. The cost of the trip is calculated using the same methodology used in Leg 1.

Leg 3 refers to the trip from the gateway to the destination. It is divided in two parts. First, travellers use the rail/light rail/ferry/metro network to travel to a destination station. A destination station is the station which acts as the proxy for an external zone. Each external zone, both employment centre and wider external zone, is represented by a destination station. A representation of the rail/ferry network is created for Leg 3 using the TfNSW General Transit Feed Specification (GTFS). The formula for computing costs in Leg 3 is the same one used in Leg 2; with the exception of the mode transfer penalty, as it was already applied in Leg 2.

The second part of the Leg 3 trip is the trip from the destination station to the destination. Again, an average trip is created to represent the trips from the destination station to the final destination. For employment centres, this trip is a walking trip of various durations to account for the differing sizes of the employment centres. The cost of this part of the trip is computed using the same formula as in Leg 1. For wider external zones, another local bus trip is assumed to take place from the destination station to the destination. The costs of this trip are computed using the same formula as in Leg 2.

The final cost of a local to external public transit trip is calculated by the summation of the costs from all components of the three legs.

External to local trips are equivalent to LE trips but take place in the opposite direction. Since the only change is the order in which the trip is made, their costs are identical for equivalent EL-LE pairs.

Local to local trips also consist of three legs. Leg 1 is the walk to the local bus stop and is the same as in EL trips. Leg 2 consists of taking the local bus to a destination zone. The formula used is the same one as in Leg 2 of EL trips, with the only difference being that the trip is taken to another internal zone instead of a gateway. Finally, Leg 3 is another walking trip from the local bus in the destination zone to the centroid of the destination zone. The cost of this leg is calculated the same as Leg 1. If two zone centroids are within 1km of each other, or if two zones share the same local bus stop, a walking trip from one zone centroid to the other replaces Legs 1-3 of a LL trip.

The final cost of a local to local public transit trip is calculated by the summation of the costs from all components of the three legs.

An important note is that most zones are connected to multiple gateways via multiple local bus services. Each of these alternatives has a different generalised cost. For the purposes of public transit vs car mode choice, the generalised cost of a public transit trip is considered to be the lowest generalised cost of any of the possible public transit trips. Later, when the trips are assigned, they are assigned through a logit model so that trips are distributed via different gateways and via different local bus services.

6. Step 5 - Car Generalised Cost

Car generalised cost for each OD pair is computed via the following formula:

- $Cost = IVT + Fare\ Factor\ x\ \frac{(Distance\ x\ Car\ Operating\ Cost\ Per\ Km + Toll + Parking\ Cost)}{Car\ Occupancy}$

Where;

- IVT is in-vehicle time (travel time)
- Fare factor is used to convert monetary costs to perceived minute cost. It is the same factor used to convert fares into a perceived minute cost for public transit fares in Step 4

Car travel time, distances and tolls are all obtained from the Sydney Strategic Traffic Model (STM).

Car occupancy cost per km and car occupancy are globally assumed parameters. Parking costs are different for each external zone. Parking costs are chosen to reflect the scarcity of parking at each destination.

7. Step 6 – Mode Choice

A simple binomial choice model is used in the MPPM to calculate mode choice. Specifically, the following formula is sued to calculate the proportion of public transit trips:

$$PT\ Proportion = \frac{e^{-\beta\ x\ GC_{PT}}}{e^{-\beta\ x\ GC_{PT}} + e^{-\beta\ x\ (GC_{car} + ASC_{car})}}$$

Where;

- PT Proportion is public transit mode share
- GCpt is the public transit generalised cost calculated in step 4
- GCcar is the car generalised cost calculated in step 5
- ASCcar is the alternative specific constant for car
- β is the sensitivity parameter

The two parameters used in calibrating the model; the β and the ASCcar, are varied for different trip types. All trips are divided to fall into one of eight trip types. All origin zones are divided into two types – rail walk and rail non-walk, depending on whether the zone falls within the walking distance of a gateway station. Destination zones are divided into 4 types: CBD, other centre, rail walk and rail non-walk, where;

- CBD is the CBD
- Other centre refers to employment centres outside of the CBD
- Rail walk refers to destination zones which are within a walking catchment of a gateway station but are not employment centres

- Rail non-walk refers to destination zones which are not within a walking catchment of a gateway station

Trip types are the combinations of the origin and the destination types and are;

- Rail walk to CBD
- Rail walk to Other Centre
- Rail walk to Rail walk
- Rail walk to Rail non-walk
- Rail non-walk to CBD
- Rail non-walk to Other Centre
- Rail non-walk to Rail walk
- Rail non-walk to Rail non-walk

To ensure the most accurate representation of traveller's behaviour, a unique sensitivity and alternative specific constant for each of the eight trip types because the difference in costs is perceived differently depending on the trip type.

For example, the ASCcar for rail non-walk to rail non-walk trips is negative, indicating a preference for making these trips by car. This occurs because making such trips via public transit requires a minimum of two mode changes. While a mode transfer penalty is applied to each when computing generalised cost, the additional perceived inconvenience of having to change modes twice is not accounted for until the ASCcar parameter is applied. Conversely, the ASCcar for trips to the CBD is positive indicating a preference for public transit on such trips due to the additional perceived cost of spending additional time in congestion and difficulty finding parking at the destination.

The sensitivity parameter is also varied to reflect how strong some of these preferences are. It is lower for trip types where there is a clear preference for one mode over the other, such as the preference for public transit to the CBD or the car for non-walk to non-walk trips, and higher for trip types where there isn't a clear preference and the difference in general costs is the most important factor in mode choice.

Variation of the two parameters based on trip type allows for a better calibration of the model. The model is calibrated based on the 2011 JTW data. The shape of the logit curve represents a limitation for zone pairs where mode share is significantly skewed to either mode. While it would be very easy to replicate the 2011 mode choice using very high parameters, these parameters would not be realistic. Thus, the 2011 JTW mode shares are used a guide rather calibration targets.

The logit model is applied to each zone pair in the model to determine mode share to and from each individual zone. Demand values refer to JTW trips across the 24-hour period. These are converted into all trip purposes over a 3.5 Hr AM peak and then a 1 Hr AM peak using appropriate factors. The factors are derived by comparing the number of JTW trips assigning to the rail network to the total observed 3.5 Hr rail station entries. The 3.5 Hr rail station entries are sourced from the Rail Station Barrier Counts 2013 report authored for the Bureau of Transport Statistics and TfNSW.

8. Step 7 – Trip Assignment

The mode choice model provides forecasts for public transit trips between each zone pair. Multiple alternative paths exist for public transit trips, as they can be made via multiple gateways. Also, most gateways can be accessed via multiple local bus services. In the trip assignment stage, these trips are assigned to alternative paths through the modelled transit network.

First, the demand for each OD zone pair is distributed to all the possible gateways which can be used to complete each trip. This is done using a simplified version of the binomial choice used in determining mode choice. There is only one parameter in this model – the sensitivity parameter. The alternative specific cost parameter is not used as all of the trips are made using the same mode. The sensitivity parameter used here differs from the one used in the mode choice model. It is calibrated to create a reasonable distribution of trips to each gateway depending on their relative costs for each zone pair. The costs used in this assignment are the cost of making the entire trip via each gateway, not just the cost of leg 3, as the decision of which gateway to use is made at the beginning of the trip and not at the beginning of leg 3.

Next, the demand from each zone to a gateway (or to another internal zone for LL trips) is assigned to the appropriate bus services. Again, a simple binomial choice model is used, with the sensitivity parameter being the only factor. This is another internally calibrated factor based on a reasonable distribution in regards to relative costs of alternative routes which differs from sensitivity parameters used previously. Again, the costs used are for the whole trip made via each service, not just leg 2.

An allowance for park and ride is included at this stage. It is recognised that a certain proportion of public transit trips will be made via park and ride or kiss and ride instead of the local bus network, especially at gateways where significant parking provisions or on-street parking facilities exist such as Meadowbank or West Ryde. The park and ride factor reduces the demand on the local bus services leading to these gateways, while leaving the demand at the gateway unaffected.

Once the trips are assigned to each local bus service, statistics such as demand at gateways or bus on/off diagrams can be reported.

APPENDIX B - AIMSUN CALIBRATION REPORT

JACOBS®

Melrose Park Transport Management and Accessibility Plan (TMAP)

Payce Property

Calibration and Validation Report

Rev B - Final

10 May 2018

Melrose Park Transport Management and Accessibility Plan (TMAP)

Project No:	IA130100
Document Title:	Calibration and Validation Report
Revision:	Rev B - Final
Date:	10 May 2018
Client Name:	Payce Property
Project Manager:	Iwan Smith
Author:	Christian Arkell
File Name:	\\jacobs.com\anz\IE\Projects\04_Eastern\IA130100\21 Deliverables\Calibration and Validation Report\Melrose Park Calibration and Validation Report_R1.0.docx

Jacobs Australia Pty Limited

Level 7, 177 Pacific Highway
North Sydney NSW 2060 Australia
PO Box 632 North Sydney
NSW 2059 Australia
T +61 2 9928 2100
F +61 2 9928 2500
www.jacobs.com

Document history and status

Revision	Date	Description	By	Review	Approved
Rev A	8/1/2018	Draft	C Arkell/A Minic	I Smith	I Smith
Rev B	10/5/2018	Final	C Arkell/A Minic	I Smith	I Smith

Contents