Transport for NSW

Chapter 9
Transport and traffic

NSW GOVERNMENT

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9. Transport and traffic

This chapter provides a summary of the transport and traffic impacts of the project. It describes the existing environment, identifies potential impacts during construction and operation, and provides measures to mitigate and manage the impacts identified. Further information is provided in Technical Paper 2 (Transport and Traffic).

9.1 Approach

Constructing and operating new light rail infrastructure, particularly within an existing road corridor, can affect traffic and transport conditions, and change access arrangements. This can affect the local and regional community, and impact on access to residences and businesses. It is important that potential impacts are identified and understood prior to construction. The transport and traffic assessment has been carried out in accordance with the *Guide to Traffic Generating Developments* (RTA, 2002), as the key guiding document to assessing potential traffic impacts for projects in NSW. The assessment has also been undertaken in accordance with:

- the SEARs (see Appendix A (SEARS compliance table))
- other relevant policies and guidelines, including traffic modelling guidelines, and Austroads traffic management and cycling guides.

An overview of the approach to the assessment is provided below. Further information on the assessment methodology is provided in section 2 of Technical Paper 2 (Transport and Traffic).

9.1.1 Methodology

Study area

The study area for the transport and traffic assessment generally extends from the Parramatta CBD in the west to Melrose Park in the east and Lidcombe in the south. It includes the road and transport networks within and surrounding the project site with the potential to be directly or indirectly affected by the project. It also includes the section of Parramatta River between Camellia in the west and Homebush Bay in the east.

Figures showing the study area and the modelling extents for the operational traffic assessment are provided in Technical Paper 2 (Transport and Traffic) (Figure 2.1 and Figure 2.3 respectively).

Key tasks

The assessment involved:

- reviewing the characteristics and conditions of the existing transport and traffic environment, including analysing existing and future traffic volumes without the project using a series of traffic models (described below)
- reviewing proposed construction activities and staging with respect to site access, road and navigation channel closures, and changes to the transport network and maritime facilities
- assessing potential transport, traffic and maritime impacts during construction

- reviewing project conditions during operation, including integration with other transport modes, changes to road network conditions, and walking and cycling connections
- modelling future traffic volumes with and without the project to assess potential impacts on road network performance
- identifying measures to manage and/or mitigate the identified impacts
- assessing cumulative effects with other existing and proposed developments.

Overview of traffic network modelling

Traffic modelling was carried out to provide predictions about future traffic conditions in the study area. These predictions were used to assess the construction and operational performance of the road network, with and without the project in place.

A base model was developed to analyse existing road network conditions. The model was then modified to incorporate the land use changes that are forecast to occur and other complementary transport services changes that would result. This includes planned changes to bus routes, changes to road conditions (such as road and intersection upgrades), and the implementation of Sydney Metro West.

The traffic modelling was used to understand the expected performance of key intersections, including those within the project site (on-corridor intersections) and those in the surrounding area (off-corridor intersections). Although no specific modelling of travel times was carried out, the reported intersection level of service and delays would generally apply to any vehicle using an intersection, including cars, buses or trucks.

9.1.2 How potential impacts have been avoided or minimised

The approach to design development has included a focus on avoiding and/or minimising the potential for impacts during all key phases of the design process. As described in Chapter 5 (Design development, alternatives and options) a project corridor and alignment options assessment process was carried out to identify the preferred alignment. This process considered a range of factors, including:

- existing and future traffic conditions and transport movements
- population growth and transport demand
- connectivity with the existing and planned future transport network.

The design has been refined to avoid impacts on transport and traffic as far as practicable, including:

- locating and designing the project (including the route and location of stops) to:
  - maximise interchanges with other transport modes
  - include accessible tie-ins to ensure light rail stop accessibility for all customers, including those with disabilities or reduced mobility
  - maximise access for the existing and future community, including recent medium and high-density residential and mixed-use development, and planned future development areas
- introducing signalisation of intersections and controlling traffic movements (as appropriate) to allow local traffic, cyclists and pedestrians to safely cross the light rail corridor, while maintaining satisfactory journey times for the light rail
- providing adequate clearances for navigation under the proposed new bridges over the Parramatta River.

9.2 Existing environment

Key transport infrastructure and features relevant to the assessment are summarised below and shown on Figure 9.1 and Figure 9.2.

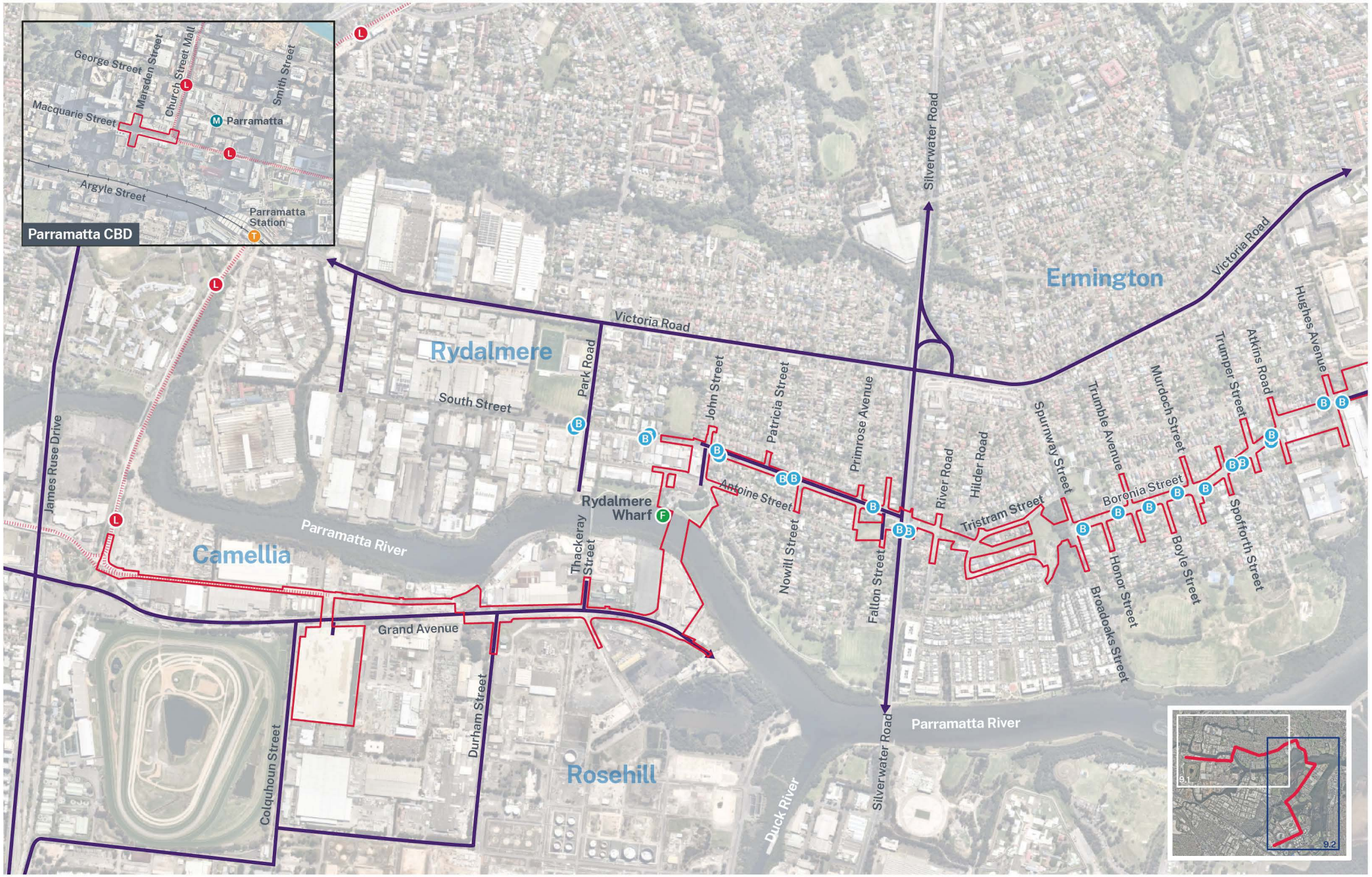
9.2.1 Road network and traffic

Key roads within and close to the project site are described in Table 9.1 and shown on Figure 9.1 and Figure 9.2. Further information on the road network, including speed limits, is provided in section 3.1 of Technical Paper 2 (Transport and Traffic).

Table 9.1 Key roads within and in the vicinity of the project site

Location	Road	Key characteristics	Road category
Parramatta	Macquarie Street, Parramatta (between Marsden Street and Horwood Place)	• Single carriageway with kerbside parking in the shoulder • One lane in the eastbound direction • No dedicated cycling facilities	Local road (east of O'Connell Street) Regional road (west of O'Connell Street)
Camellia	James Ruse Drive	• Dual carriageway separated by narrow median strip • Three lanes in each direction • No dedicated cycling facilities	State road
	Grand Avenue	• Single carriageway with a wide central median to around Durham Street, single carriageway with no median to end of road • One travel lane in each direction • No dedicated cycling facilities	Local road
Rydalmere	John Street	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road
	South Street	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road
	Victoria Road	• Dual carriageway separated by narrow median strip • Two lanes in each direction • No dedicated cycling facilities	State road (east of Church Street) Regional road (west of Church Street)
	Silverwater Road	• Dual carriageway separated by median strip • Two lanes in each direction • No dedicated cycling facilities	State road
Ermington	Boronia Street	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road
	Hope Street	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road

Location	Road	Key characteristics	Road category
Melrose Park	Wharf Road	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road
	Waratah Street	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road
Wentworth Point	Hill Road	• Dual carriageway separated by line marked central reservation, kerbside parking in the shoulder in the southbound direction • One lane in each direction • On-road cycle lanes north of Bennelong Parkway	Local road (north of Holker Street bus way) Regional road (south of Holker Street bus way)
Sydney Olympic Park	Holker Busway	• Single carriageway • One lane in each direction • On-road cycle lane in each direction	Busway
	Australia Avenue	• Dual carriageway separated by median strip • Two lanes in each direction • On-road cycle lane in each direction	Local road
	Dawn Fraser Avenue	• Single carriageway with kerbside parking • One lane in each direction • On-road cycle lane in each direction	Local road
Lidcombe	Uhrig Road	• Single carriageway with kerbside parking in the shoulder • One lane in each direction • No dedicated cycling facilities	Local road



LEGEND

- Project site
- PLR Stage 1 route (under construction)
- Approved B-double route
- Bus stop
- Ferry wharf
- Rail station
- Proposed Sydney Metro West stop
- PLR Stage 1 stop (under construction)

Figure 9.1 Key transport infrastructure - map 1

0 500m

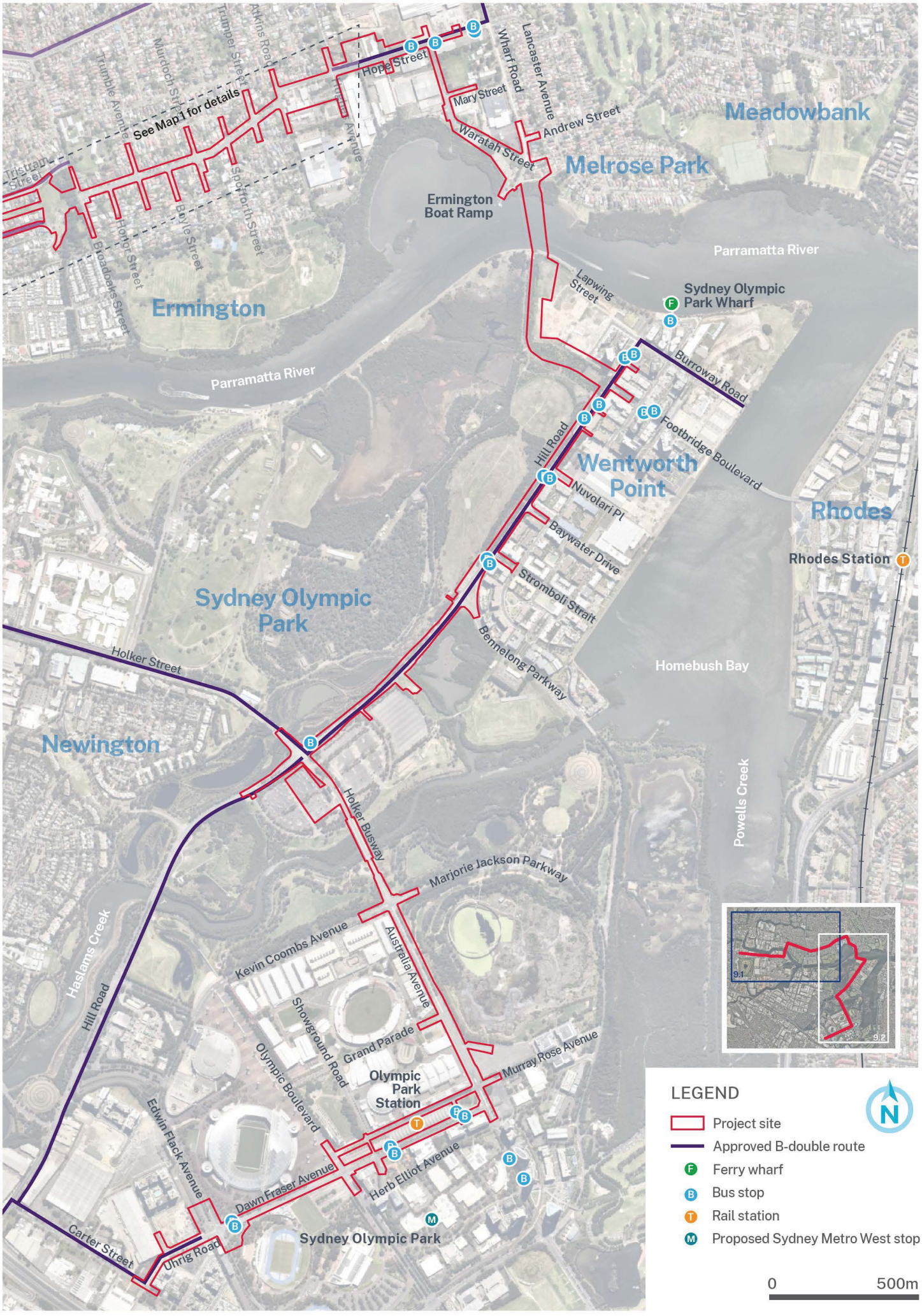


Figure 9.2 Key transport infrastructure - map 2

Heavy vehicle routes

Many of the roads within the study area are also designated heavy vehicle routes. These roads can accommodate large vehicles, including B-doubles that are used to move road and container freight.

Roads identified as B-double routes within the study area are listed in Table 9.2 and shown on Figure 9.1 and Figure 9.2.

Table 9.2 Heavy vehicle routes

Location	Road section of heavy vehicle route
Camellia	• Grand Avenue, between Hassall Street / James Ruse Drive and private property access (east of Thackeray Street) • Thackeray Street, between Grand Avenue and bridge over Parramatta River • James Ruse Drive • Colquhoun Street • Durham Street • Devon Street • Unwin Street
Rydalmere and Ermington	• Silverwater Road • Victoria Road • Clyde Street, between Victoria Road and South Street
Melrose Park	• Hope Street, between Hughes Avenue and Wharf Road • Wharf Road, between Victoria Road and Hope Street • Victoria Road
Wentworth Point	• Hill Road, between Burroway Road and Bennelong Parkway • Burroway Road, east of Hill Road
Sydney Olympic Park	• Hill Road, south of Bennelong Parkway • Holker Street, west of Hill Road
Lidcombe	• Uhrig Road, between Dawn Fraser Avenue / Edwin Flack Avenue and Carter Street • Carter Street • M4 Western Motorway • Parramatta Road

Traffic volumes

Morning and afternoon peak hour traffic volumes for key roads are summarised in Table 9.3. The percentage of heavy vehicle traffic is also provided.

Table 9.3 Peak traffic volumes on key roads

	Weekday morning peak (8am-9am)		Weekday afternoon peak (5pm-6pm)	
Road	**Total volume**	**Heavy vehicles (%)**	**Total volume**	**Heavy vehicles (%)**
Parramatta CBD				
Macquarie Street (near Smith Street)	476	5	542	2
Camellia				
Grand Avenue and Hassall Street (James Ruse Drive to ALDI Access/Rosehill Gardens Gate 1 Access)	1,032	17	774	5
Rydalmere				
South Street (Park Road to John Street)	402	6	613	3
Ermington				
Boronia Street (Honor Street to Trumble Avenue)	573	1	616	1
Hope Street (Hughes Avenue to Waratah Street)	1,149	2	926	1
Melrose Park				
Atkins Road (Boronia Street to Hope Street)	596	3	597	1
Wharf Road (Mary Street to Andrew Street)	572	1	1,007	1
Wentworth Point				
Hill Road (Bennelong Parkway to Holker Street, Sydney Olympic Park)	1,346	6	1,678	4
Sydney Olympic Park				
Holker Street and Holker Busway	1,018	4	1,274	3
Australia Avenue (Dawn Fraser Avenue to Parkview Drive/Herb Elliott Avenue)	879	6	949	5
Dawn Fraser Avenue (Showground Road to Olympic Boulevard)	273	9	239	9

The information in Table 9.3 shows that:

- peak traffic volumes are generally similar across both morning and afternoon peak periods, except for Grand Avenue and Hope Street (which have a higher morning peak volume) and Wharf Road (which has a higher afternoon peak volume)
- generally, heavy vehicles make up about six per cent or less of peak hour traffic volumes, except for Grand Avenue (17 per cent of traffic in the morning is heavy vehicles) and Dawn Fraser Avenue (nine per cent of traffic in both peaks is heavy vehicles).

9.2.2 Intersection performance

The performance of the road network is largely dependent on the operating performance of intersections that form critical capacity control points. Level of service is the standard measure used to assess operational performance of the network and intersections, as described in *Guide to Traffic Generating Developments* (RTA, 2002). There are six levels of service, ranging from level of service A, which represents the best performance, to level of service F, which represents the worst performance.

A review of existing intersection performance for intersections with the potential to be affected by the project was conducted based on traffic survey data from 2018 and 2019. This data was collected prior to the COVID-19 pandemic and is considered to represent conditions on the road network without the traffic impacts of pandemic restrictions. The key findings are as follows:

- intersections along the alignment generally operate at a level of service A or B during the morning and afternoon peak periods, except for the following intersections:
  - Silverwater Road / South Street, which operates at a level of service E during the afternoon peak
  - Hill Road / Baywater Road, which operates at a level of service C during the afternoon peak
  - Hill Road / Bennelong Parkway, which operates at a level of service F during the afternoon peak
- intersections in the surrounding area, including major intersections, generally operate at a satisfactory level of service (level of service D or better) during the morning and afternoon peak periods except for the following intersections:
  - Grand Avenue North / James Ruse Drive, which operates at a level of service E and a level of service F during the morning and afternoon peaks, respectively
  - Hassall Street / James Ruse Drive / Grand Avenue, which operates at a level of service E during the morning peak
  - Victoria Road / Wharf Road, which operates at a level of service E during the afternoon peak
- the performance of the Hill Road / Bennelong Parkway intersection significantly decreases to a level of service F during the afternoon peak, compared with a level of service B in the morning peak
- average delays and intersection performance are generally similar across both the morning and afternoon peaks, except in those cases noted above.

Most of the intersections along the alignment have 'give way' or 'stop' controls. Major intersections in the surrounding area are typically signalised.

Further information on the existing performance of each intersection is provided in section 3.1.4 of Technical Paper 2 (Transport and Traffic).

9.2.3 Public transport

Public transport in the study area includes bus, train and ferry services, as described below. According to 2016 census data (ABS, 2016), a relatively low proportion of people within the study area use public transport compared to private vehicles. Travel mode share by private vehicles is particularly high in the area between Rydalmere and Melrose Park, at around 77 per cent. Further information on transport choice issues is provided in Chapter 3 (Strategic context and need).

Bus

Seven bus routes operate near the project site, with 36 bus stops located within the project site (see Figure 9.1 and Figure 9.2).

Although the local bus network is diverse and provides coverage to the Parramatta CBD and Sydney Olympic Park, the bus schedules are less frequent than connecting train services and can be subject to traffic congestion.

In addition to these services, the Baylink Shuttle connects residents in Wentworth Point to Rhodes Station.

Further information on bus services is provided in section 3.3 of Technical Paper 2 (Transport and Traffic).

Trains

Three train stations are located close to the project site:

- Parramatta Station, which serves the T1 Western, T2 Inner West and T5 Richmond lines, is located about 300 metres south-east of the section of project site in Macquarie Street (see Figure 9.1)
- Olympic Park Station, which serves the T7 Olympic Park Line, is located adjacent to the section of the project site in Dawn Fraser Avenue (see Figure 9.2).
- Rhodes Station, which serves the T9 Northern Line, is located around 1.3 kilometres east of the section of the project site in Hill Road (see Figure 9.2).

Ferry

The F3 Parramatta River ferry operates between Parramatta and Circular Quay, with ferry wharves located adjacent to the project site at Rydalmere (Rydalmere Wharf) and Wentworth Point (Sydney Olympic Park Wharf) (see Figure 9.1 and Figure 9.2). Parramatta Wharf is located in the Parramatta CBD to the west of the project site. Ferry services generally operate hourly in each direction between the hours of 8am and 5pm weekdays and on weekends.

Tidal conditions prevent up to 10 per cent of ferry services from operating to Parramatta Wharf. During such conditions, ferries terminate at Rydalmere Wharf and a shuttle bus replacement service operates between Rydalmere and Parramatta.

At Rydalmere Wharf, a bus service (route 535) provides a duplicate transport connection between the Parramatta and Sydney Olympic Park wharves.

Sydney Olympic Park Wharf is located close to the 526 and 535 bus routes, providing services between Burwood and Rhodes shopping centres.

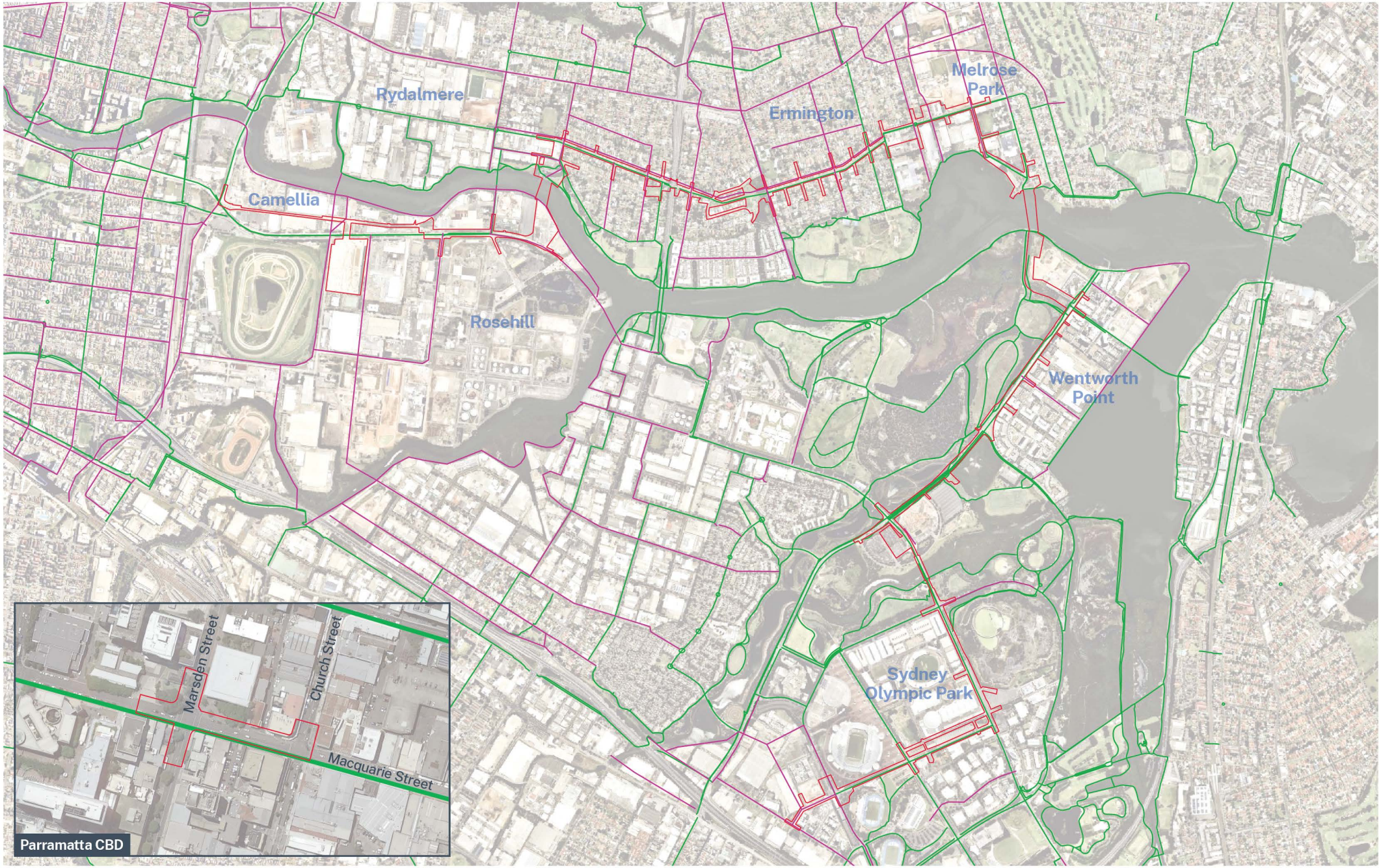
Under construction and proposed

The project forms the second stage of Parramatta Light Rail. As described in section 1.1, Parramatta Light Rail Stage 1 connects Westmead to Carlingford via the Parramatta CBD and Camellia (see Figure 1.1) and is expected to start operating in 2024. Parramatta Light Rail Stage 1 stops in the vicinity of the project site are shown on Figure 9.1.

As described in section 3.1.3, Sydney Metro West is a new 24 kilometre metro line between Westmead and the Sydney CBD. Metro stations are proposed in the vicinity of the project site at Parramatta and Sydney Olympic Park (see Figure 9.1 and Figure 9.2). Sydney Metro West is expected to be operational in 2030.

9.2.4 Active transport

Dedicated off-road bicycle paths are located along the Parramatta River and within Sydney Olympic Park. The Parramatta Valley Cycleway, linking Parramatta and Meadowbank, is located along the northern bank of the Parramatta River and is a shared path for pedestrians and cyclists. A similar shared path on the southern side of the Parramatta River (the River Walk) extends from the Silverwater Bridge to Wentworth Point. Existing and proposed walking and cycling routes in and near the project site are shown on Figure 9.3.



LEGEND

Project site

Proposed walking and cycling routes

Existing walking and cycling routes

Figure 9.3 Walking and cycling routes in the vicinity of the project

0 0.5 km 1 km

N

There are no direct active transport links between Wentworth Point and Melrose Park.

A pedestrian bridge across Silverwater Road provides pedestrian access between Ermington and Rydalmere.

Bennelong Bridge (part of Footbridge Boulevard), which crosses the Parramatta River between Wentworth Point and Rhodes, incorporates a dual lane, active transport link alongside a dedicated busway. The active transport link is well used by pedestrians and cyclists.

9.2.5 Special events

Additional bus services are activated during selected special events at Rosehill Gardens Racecourse and Sydney Olympic Park (including Sydney Showground) to move large numbers of people to and from these venues. Patrons for events at Rosehill Gardens Racecourse can travel to the racecourse via ferry to Rydalmere or by train to Parramatta Station, then transfer to bus services to the racecourse.

Patrons travelling to Sydney Olympic Park for events currently use a variety of public transport services. Trains operating along the T7 Olympic Park Line provide a 'shuttle' service to and from Olympic Park Station for customers transferring at Lidcombe Station. There are also special event trains that travel directly to Olympic Park Station without the need for transfer at Lidcombe.

Sydney Olympic Park is regularly serviced by three bus routes. Nine special event bus routes also operate from around Sydney during special events.

Visitors to Sydney Olympic Park can also drive and park, mainly within various car parks.

9.2.6 Parking

Most of the roads within and close to the project site provide on-street parking. The estimated number of spaces available near the project site, including those within the project site and on side-streets immediately adjacent to the project site, is summarised in Table 9.4.

Table 9.4 Estimated number of on and off-street parking spaces in the study area

Suburb	Location	Total	Number of restricted / disabled parking in total
Parramatta	Macquarie Street	17	3 disabled parking 4 loading zone (daytime) / 2P (other times) 8 1P (weekday) / 2P (other times) 1 P5min 1 mail zone
Camellia	Grand Avenue	232	n/a
	Other streets	143	n/a
Rydalmere	South Street and John Street	106	n/a
	Other streets	295	n/a
	Rydalmere Wharf	70	2 disabled parking
Ermington	South Street and Boronia Street	200	n/a
	Other streets	797	16 restricted (daytime) 1 disabled parking
Melrose Park	Hope Street and Hughes Avenue (within project site) and Waratah Street	102	12 time-restricted (15 mins)
	Other streets	264	4 time-restricted (15 mins) 5 are bus zones

Suburb	Location	Total	Number of restricted / disabled parking in total
	Ermington boat ramp	62	2 disabled parking 52 are boat trailer parking spaces
Wentworth Point	Hill Road (within project site)	70	n/a
	Other streets	135	10 time-restricted (30 mins) 17 time-restricted (P15mins or 2P) 1 disabled parking 1 car share service only 2 restricted (daytime)
	Woo-la-ra car park	25	2 disabled parking
Sydney Olympic Park	Australia Avenue (within project site) and Dawn Fraser Avenue	147	Spaces are a mix of time-restricted and ticket parking 5 disabled parking
	Other streets	147	Spaces are a mix of time-restricted and ticket parking 5 disabled parking
Lidcombe	Uhrig Road	60	n/a
	Carter Street	106	All spaces are time-restricted (two hours)
Totals	**Streets within the project site**	**934**	Including 14 disabled parking
	Other streets	**1,887**	Including 7 disabled parking
	Off-street car parks	**157**	Including 6 disabled parking

Public off-street parking facilities are predominately located in the Parramatta CBD and Sydney Olympic Park.

Parking occupancy surveys were carried out in March 2018 (for Camellia, Rydalmere, Ermington and Melrose Park) and in May 2018 (for Wentworth Point and Sydney Olympic Park). Parking occupancy within the study area is shown on Figure 9.4.

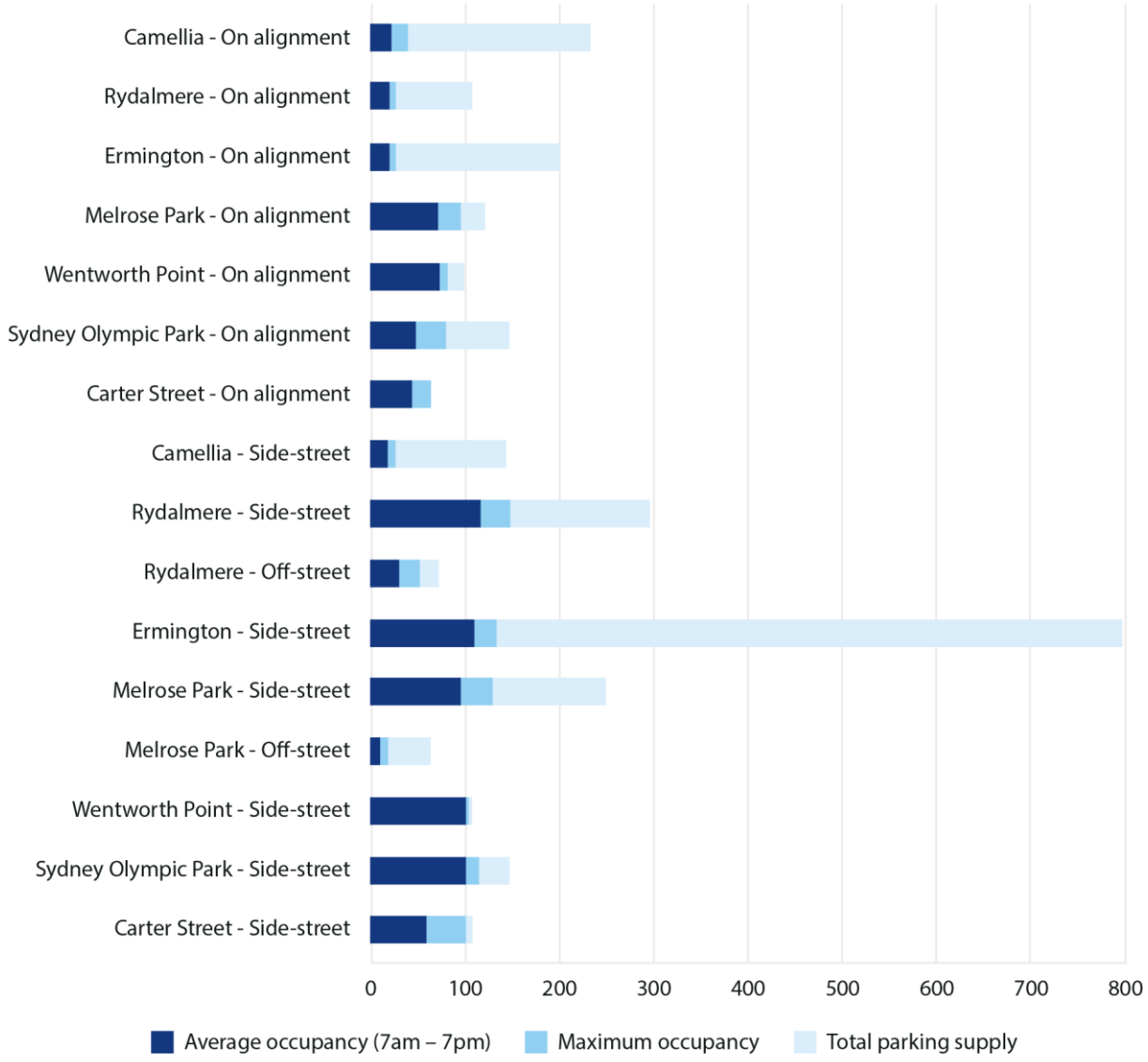


Figure 9.4 Parking occupancy (based on 2018 parking surveys)

9.2.7 Maritime facilities, navigation and river users

Navigation and river users

The section of the Parramatta River in the study area is used by a range of commercial and recreational users, including:

- Parramatta River ferry (operated by Transdev) (see section 9.2.3)
- recreational power boating and fishing
- non-powered boating activities, including sailing, rowing, dragon boating and kayaking
- commercial vessels (e.g., fuel, spoil and crane barges) used for marine salvage and maintenance works to river structures.

Recreational users can access the river in the vicinity of the project site via the Ermington and Silverwater boat ramps (described below) as well as via other boat ramps further to the east.

Parramatta River waters upstream (to the west) of the Silverwater Bridge are closed to recreational and unauthorised commercial vessels.

Channel markers are generally present at regular intervals along the river to guide marine traffic to the deepest parts of the waterway.

Maritime facilities

The following wharves and boat ramps are located within the study area:

- Rydalmere Wharf (used by the Parramatta River ferry) – located on the northern bank of the Parramatta River about 50 metres upstream of the proposed bridge between Camellia and Rydalmere, accessed via John and Jean streets in Rydalmere
- Sydney Olympic Park Wharf (used by the Parramatta River ferry) – located on the southern bank of the Parramatta River about 475 metres downstream of the proposed bridge between Melrose Park and Wentworth Point, accessed via Hill Road in Wentworth Point
- Silverwater Boat Ramp (public boat ramp) – located on the southern bank of the Parramatta River adjacent to the Silverwater Road bridge, about 800 metres downstream of the proposed bridge between proposed bridge between Camellia and Rydalmere, accessed via Clyde Street
- Ermington Boat Ramp (public boat ramp) – located on the northern bank of the Parramatta River about 75 metres upstream of the proposed bridge between Melrose Park and Wentworth Point, accessed via Wharf Road in Melrose Park
- private wharves owned by Viva Energy Australia and Lubrizol International Incorporated – located on the southern bank of the Parramatta in Rosehill, to the west of Duck River
- Armory Wharf – located at Blaxland Riverside Park / Newington Armory in Sydney Olympic Park.

9.3 Assessment of construction impacts

9.3.1 Construction vehicle movements

Construction would generate additional vehicle movements, including light and heavy vehicles. Light vehicles would generally be used by construction workers moving to and from construction work areas and/or compounds. Further information regarding the location of compounds is provided in section 7.6. It is estimated that the following two-way traffic volumes would be generated daily during peak construction activities on arterial roads:

- Victoria Road (west of Silverwater Road) – up to 106 heavy and 320 light vehicle movements
- Victoria Road (east of Silverwater Road) – up to 212 heavy and 320 light vehicle movements
- James Ruse Drive (north and south of Grand Avenue) – up to 61 heavy and 171 light vehicle movements
- Hill Road (north of Holker Street) – up to 82 heavy and 21 light vehicle movements
- Hill Road (south of Holker Street) – up to 109 heavy and 390 light vehicle movements
- Holker Street (west of Hill Road) – up to 16 heavy and 4 light vehicle movements.

Construction traffic would also use local roads to access construction work areas and compounds. The following maximum daily traffic volumes are estimated for key local access roads:

- Grand Avenue – up to 122 heavy and 342 light vehicle movements
- South Street – up to 87 heavy and 17 light vehicle movements
- Spurway Street – up to 94 heavy and 122 light vehicle movements
- Wharf Road – up to 109 heavy and 143 light vehicle movements

- Holker Busway – up to 32 heavy and 8 light vehicle movements
- Carter Street – up to 125 heavy and 34 light vehicle movements.

While other local roads would also be used, traffic volumes would be lower than those noted above.

Increases in daily and peak traffic volumes as a result of construction traffic would be relatively low compared to existing traffic volumes on key site access roads. The largest increases in vehicle volumes would be experienced on Victoria Road, which is a key collector road, and Grand Avenue, as the main access road for Camellia. It is estimated that the increase in traffic on Victoria Road would be less than one per cent of existing traffic volumes.

Based on the number of existing traffic movements and forecast construction traffic volumes, all roads are expected to perform satisfactorily with the increased construction traffic generated by the project, well within the estimated two-way capacity of the road. Further information on existing traffic volumes, and the proportion of additional construction traffic movements as a result of the project, is provided in section 5.1 of Technical Paper 2 (Transport and Traffic).

Preliminary routes for the movement of construction vehicles (including heavy vehicles) to/from work areas and construction compounds have been proposed as described in section 7.7.1. The routes have been proposed to allow vehicles to access and egress the arterial road network in a safe and efficient manner and, wherever possible, avoid or minimise impacts on local roads and residential areas. The proposed routes would be subject to confirmation by the construction contractor(s) and would be defined in the traffic and access management plan (see section 9.6).

9.3.2 Road closures and detours

As described in section 7.7.4, some changes to the road network would be required to accommodate construction. Temporary road and/or lane closures would be required for works within/adjoining roadways to safely undertake construction activities and minimise potential traffic impacts on the road network. Some works, such as those required to remove the existing bridge structure and construct the new bridge over Silverwater Road, would require closures over a number of nights, whereas other closures may be required for longer periods. Wherever possible, closures would be undertaken during off-peak periods to minimise traffic network impacts.

Road and lane closures would be undertaken in consultation with relevant stakeholders, including Customer Journey Planning and Customer Journey Management. Detours and alternate routes would be provided as needed to maintain vehicle circulation and access. Road closures may result in additional travel distance for road users. However, at most locations where road closures are required, the impacts would be minor due to the short length of detours that would be needed.

Details of the proposed staging of works, including duration of road closures, affected infrastructure and services, and alternative routes and access arrangements, would be included in the traffic and access management plan (see section 9.6).

A description of the road closures and proposed detour routes is provided in section 5.2 of Technical Paper 2 (Transport and Traffic).

9.3.3 Public transport

Buses

Construction would temporarily affect the following bus routes:

- 524 – Parramatta to Ryde via West Ryde
- 525 – Parramatta to Strathfield via Sydney Olympic Park

- 526 – Rhodes Shopping Centre to Burwood
- 533 – Sydney Olympic Park to Chatswood via Rhode and North Ryde
- N81 – Parramatta to City Town Hall via Sydney Olympic Park (night service).

Potential impacts are described below.

Route 524

The Parramatta to Ryde service would be temporarily affected by full and partial road closures on South Street, Boronia Street, Atkins Road and Hope Street. Bus stops would need to be relocated along the route where practicable. Rerouting of services would be required where bus stops are not able to be relocated along the existing route.

Routes 525, 526, 533 and N81

Bus stops on Park Street, adjacent to Olympic Park Station, would be temporarily relocated to Murray Rose Avenue (northbound). As a result, bus services on routes 525, 526, 533 and N81 would be rerouted to use Grand Parade, Showground Road, Murray Rose Avenue and Olympic Boulevard.

Details of affected services, alternative routes and relocated stops, wayfinding signage, accessibility by end users, and measures to manage potential impacts on bus services and customer access, would be included in the traffic and access management plan (see section 9.6). Changes to bus stops / networks would be determined in consultation with Transport for NSW, bus operators and relevant authorities.

Ferries and associated infrastructure

As described in section 7.7.5, constructing the bridges over the Parramatta River would require the river's navigation channel to be temporarily closed for defined periods.

During the closure periods the Parramatta River ferry would not be able to operate to/from Rydalmere Wharf and Parramatta Wharf. Ferry customers (about 645 customers per day on weekdays and 903 customers per day on weekends, on average) would need to alight at Sydney Olympic Park Wharf and transfer to alternative transport services.

Bridge construction work would also be required outside these periods, and while ferries would still be able to operate, ongoing coordination and management would be required to ensure safe navigation along the river. It is likely that some crane lifts could require specific ferry services to be cancelled or other short-term closures – this would be on a pre-planned basis and co-ordinated with NSW Maritime and the ferry operator.

In addition, as described in section 7.7.5, constructing the bridge between Camellia and Rydalmere would require closure of Rydalmere Wharf on at least two occasions, typically for periods of up to three months, as a result of its proximity to the work area.

The commuter car park at Rydalmere Wharf would be closed for the duration of construction (up to three years). Pedestrian access to the wharf would be maintained during this period via a new connection from Jean Street (except when the wharf is closed). Opportunities for alternative parking provision would be considered during construction planning.

Ferry customers would be notified in advance of the proposed changes in accordance with the Community Communication Strategy (see section 9.6). Alternative transport services would be provided during navigation channel and wharf closure periods by the operator of the Parramatta River ferry service in conjunction with Transport for NSW.

Further information about potential impacts on maritime assets and navigation is provided in section 9.3.8.

9.3.4 Active transport

The section of the Parramatta Valley Cycleway through the project site at Eric Primrose Reserve would be closed during construction of the north abutment of the bridge between Camellia and Rydalmere.

A temporary detour of the cycleway would be provided along John Street, Antoine Street and Jean Street to maintain connectivity around the work area. The detour would add about 150 metres of additional travel distance for path users. Access to the site compound over the shared use path may require temporary traffic control to stop path users while a vehicle enters or exits the site.

The section of the Parramatta Valley Cycleway using Wharf Road at Melrose Park would be disrupted by road closures and the construction compound at Wharf Road car park associated with the proposed bridge between Melrose Park and Wentworth Point. The shared use path through Koonadan Reserve connecting to Wharf Road would also be closed. A temporary detour of the cycleway would be provided connecting the existing path along Waratah Street to Wharf Road, Andrew Street and Lancaster Avenue. This detour would add about 70 metres of additional travel distance for path users.

Access to and from the west for bicycles and pedestrians would be maintained through the work areas using traffic control.

Access to the River Walk and Louise Sauvage Pathway on the southern side of Parramatta River would be maintained during construction as far as practicable.

Impacts on other on-road cycling facilities and pedestrian facilities would be managed in a similar manner as road closures, with detours provided in advance of closures. All temporary detours or alternate routes would provide safe and efficient routes and, wherever possible, meet relevant accessibility requirements. The proposed replacement active transport routes would be defined in the traffic and access management plan.

9.3.5 Special events

Partial road or footpath closures near Rosehill Gardens Racecourse or in Sydney Olympic Park (including Sydney Showground) have the potential to cause delays in travel time for attendees of special events at these locations.

Five special event bus services would also be impacted by partial road closures along Holker Busway bridge during the works. These are:

- 5A Hills Showground
- 5B Tallawong
- 6 Woronora
- 7 Cronulla
- 8 Dural.

The partial closure of the bridge would allow two-way traffic in a single lane under traffic control so there would be no requirements for re-routing of special event bus services. However, the bridge would experience reduced capacity and there may be delays for some services.

Traffic control arrangements for footpaths and roads would be detailed in the traffic and access management plan as would arrangements for the Holker Busway, along with any other temporary disruption or changes to special event bus services.

9.3.6 Parking

Potential impacts on parking availability during construction include:

- progressive permanent removal of on-street parking spaces to accommodate light rail infrastructure along existing roads
- temporary occupation of on-street parking spaces due to full or partial road closures to facilitate construction
- occupation of off-street car parks to establish construction compounds (e.g., at John Street, Wharf Road, and Australia Avenue).

A summary of temporary parking impacts noted above is provided in Table 9.5. Permanent operational impacts (as a result of the presence of project infrastructure) are described in section 9.4.5).

Table 9.5 Estimate of parking impacts during construction

Suburb	Total supply near project site (see section 9.2.6) (no. spaces)	Number of permanent spaces removed (see section 9.4.5)	Temporary parking impacts (in addition to permanent parking removed)	
			Location	Spaces temporarily removed
Parramatta	17	17	n/a	0
Camellia	375	2	Grand Avenue (both sides)	120
Rydalmere	471	150	Rydalmere Wharf car park	40
			South Street west of John Street	16
Ermington	997	156	River Road, Tristram Street, Hilder Road	55
			Boronia Street, Broadoaks Street	75
Melrose Park	428	120	Ermington Boat Ramp car park	52
Wentworth Point	230	45	Hill Road (east side)	50
Sydney Olympic Park	294	154	Australia Avenue east side	60
			Secure Sydney Olympic Park P6 car park	100
Lidcombe	166	54	n/a	0
Total	**2,978**	**698**		**568**

It is estimated, based on the current design and indicative construction methodology, that about 1,266 parking spaces would be impacted during construction. This includes about:

- 698 parking spaces permanently removed due to the project (see section 9.4.5)
- 252 off-street parking spaces temporarily occupied by site compounds
- 316 on-street parking spaces temporarily removed due to road closures and reinstated upon completion of the works in each area.

The areas of Camellia, Rydalmere, Ermington and Melrose Park have sufficient parking on side-streets within the vicinity of the project site to accommodate displaced car parking due to road and car park closures. Other areas, including Wentworth Point, Sydney Olympic Park and Lidcombe, may have limited capacity to accommodate these changes, where the existing parking demand (see parking occupancy surveys in section 9.2.6) may already exceed the available supply.

While not all on-street parking spaces would become unavailable immediately at the commencement of construction, it is anticipated that following commencement of substantial construction activities in all work areas, most of the identified parking spaces would need to be removed to facilitate construction. This has the potential to impact on residents and visitors in residential areas and deliveries in commercial zones.

In addition, parking spaces required to accommodate construction workers, if not provided elsewhere, would have the potential to affect the availability of on-street parking in the vicinity of the project site. As described in section 7.7, some parking for the construction workforce would be provided at construction compounds. It is estimated that up to about 340 additional parking spaces would be required across the project site to service the parking demand from construction workers. This includes about 200 off-street spaces to be provided at the Sydney Olympic Park P5 car park and 50 off-street spaces to be provided at Edwin Flack Avenue. Opportunities for additional construction workforce parking would be investigated during construction planning, particularly for larger work areas. The use of public transport by construction workers where feasible, would also be encouraged.

The approach to managing impacts on on-street parking would be defined by the parking management strategy, which would be developed and implemented in consultation with key stakeholders, the community and relevant property owners/occupants (see section 9.6).

9.3.7 Property access

Works would be managed such that access to properties would be generally maintained at all times, However, some temporary impacts on access may be unavoidable during certain work periods or for some activities. Key locations where property accesses may be affected are provided in section 5.4 of Technical Paper 2 (Transport and Traffic). In these instances, consultation would be carried out with the property owner/occupant to ensure that satisfactory alternative arrangements are provided and/or the impact is minimised.

Proposed road/lane closures may result in temporary access restrictions to private properties. Where this occurs, alternative access arrangements would be provided and/or appropriate traffic controls implemented.

Measures to manage the potential for impacts on access are provided in section 9.6.

9.3.8 Maritime facilities, navigation and river access

Navigation and river users

As described in section 7.7.5, the Parramatta River's navigation channel (upstream of the proposed bridges) would need to be temporarily closed for defined periods to construct the bridges over the river. Use of the river upstream of the bridge work areas would be restricted during these periods. This would affect ferries, commercial operators, and recreational vessels/users. Potential impacts on ferries and their customers are described in section 9.3.3. Depending upon the frequency of access needed for other public/private wharves (listed in section 9.2.7), restrictions to river access may be accommodated by scheduling access in advance.

During these periods, recreational boaters/river users would not be able to access the section of river affected by closures. This would affect access to/from Silverwater Boat Ramp. The ramp would remain open; however, would not be able to be used to access areas of Parramatta River downstream of Wentworth Point for a period of up to three months while the navigation channel is closed to construct the bridge between Melrose Park and Wentworth Point. During this period, boat ramps at Rhodes or Kissing Point Park (or those further east toward Sydney Harbour) would need to be used.

Works with the potential to affect navigation and access along the river would be managed in accordance with the maritime works and navigation management plan (see section 9.6). Measures to manage the potential impacts on boat ramp access to Parramatta River are also provided in section 9.6.

Maritime facilities (direct impacts)

Rydalmere Wharf

In addition to the navigation channel closures noted above, and as described in section 7.7.5, Rydalmere Wharf would also need to be closed on at least two occasions (for up to three months each) as a result of its proximity to the work area for the bridge between Camellia and Rydalmere. Potential impacts on ferry services are considered in section 9.3.3.

Ermington Boat Ramp

In addition, as described in section 7.7.5, Ermington Boat Ramp would need to be closed for a period of up to three years to facilitate construction of the bridge between Melrose Park and Wentworth Point. Recreational boat users would need to access the Parramatta River via other nearby boat ramps, including:

- Kissing Point Park Boat Ramp on the northern side of Parramatta River in Putney
- Silverwater and Rhodes boat ramps on the southern side of the river.

These ramps are all located within about five kilometres of Ermington Boat Ramp.

Other assets

Port marker 731 and starboard marker 727, which are located close to the proposed bridge between Camellia and Rydalmere, may be either directly impacted by bridge construction works or their presence could restrict the movement/mooring of construction barges. The markers may need to be removed/relocated during construction.

Temporary markers may need to be installed at both proposed bridge locations to ensure safe navigation of ferries and other vessels during the construction period.

Any changes to channel markers would be conducted in consultation with NSW Maritime.

9.4 Assessment of operation impacts

9.4.1 Intersection performance

A number of changes to roadway configuration, road network infrastructure, and local traffic circulation and access would be required to provide space for the project's infrastructure and facilitate the safe operation of the light rail vehicles and traffic movements. A summary of roadway configuration changes is provided in Chapter 6 (Project description – infrastructure and operation) and section 4.6 of Technical Paper 2 (Transport and Traffic). Modifications to intersections would also be required to enable the safe operation of the project. This would include signalisation and other controls on movements at intersections to manage the safety of light rail and vehicle interactions.

Modelling of intersection performance in the study area (see Figure 9.5 to Figure 9.9) shows that, for intersections along the project alignment most intersections would operate at a satisfactory level of service under the 2031 'with project' scenario.

For signalised intersections, intersection performance of level of service D or better is generally considered acceptable. The following signalised intersections are predicted to perform at worse than level of service D during either the morning or afternoon peak period under the 2031 'with project' scenario:

- South Street / Primrose Avenue
- Hope Street / Waratah Street

- Waratah Street / Mary Street
- Hill Road / Footbridge Boulevard
- Hill Road / Holker Street
- Park Street / Dawn Fraser Avenue.

Of the six intersections noted above, only three (Waratah Street / Mary Street, Hill Street / Holker Street and Park Street / Dawn Fraser Avenue) would experience greater delays when compared to the 'without project' scenario taking into account both the morning and afternoon peak periods.

For give-way or stop controlled intersections, intersection performance of level of service C or better is generally considered acceptable. Four give-way or stop controlled intersections are predicted to perform at worse than level of service C during either the morning or afternoon peak period under the 2031 'with project' scenario:

- Silverwater Road / South Street
- Hope Street / Atkins Road
- Hill Road / Nuvolari Place
- Hill Road / Baywater Road.

Of the four intersections noted above, none would experience greater delays when compared to the 'without project' scenario taking into account both the morning and afternoon peak periods.

Further information on the above signalised, and give-way or stop controlled intersections, and the factors which contribute to intersection performance at these locations is provided in section 6.1.2 of Technical Paper 2.

Increased delays are expected at the following key intersections adjacent to the project site:

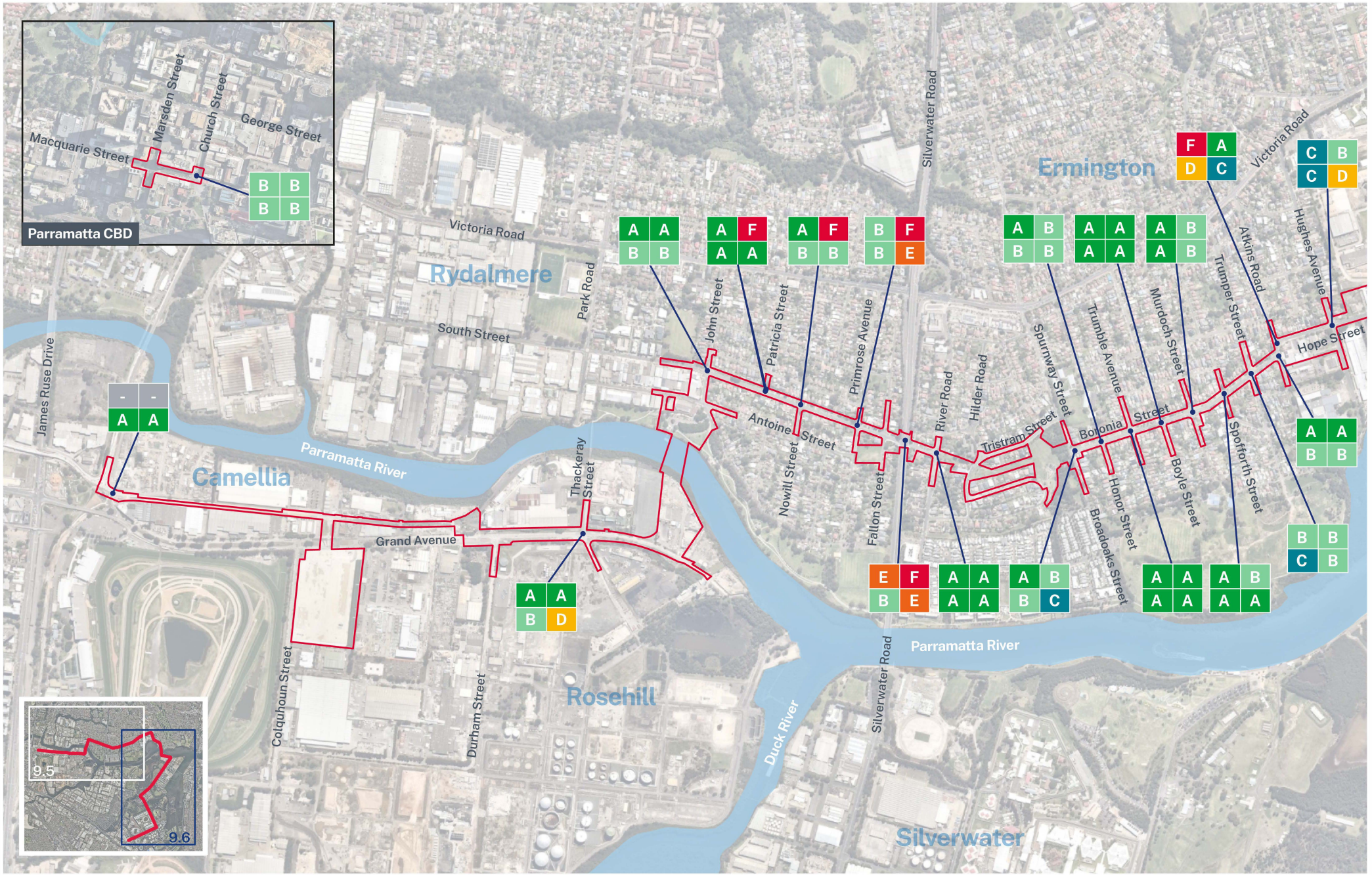
- Victoria Road / Kissing Point Road / William Road – a delay of about 32 seconds in the afternoon peak
- Victoria Road / Wharf Road – a delay of about 20 seconds in the morning peak and 23 seconds in the afternoon peak
- Hill Road / Parramatta Road – a delay of about 10 seconds in the morning peak
- Australia Avenue / Homebush Bay Drive – a delay of about 13 seconds in the morning peak.

These increased delays are mainly a result of future land use changes and development that would increase traffic volumes.

There would also be an increase in traffic volumes and associated delays due to the project along Boronia Street in Ermington and within Sydney Olympic Park due to the project. Modelling shows increased queues at the eastbound to northbound left turn movement at the Hill Road / Holker Street intersection. These queues could be reduced by optimising traffic signals at this intersection, increasing the length of the existing short through traffic lane on the northbound approach, and providing an additional left turn lane from Holker Street into Hill Road.

For all other key intersections modelled, performance would remain at an acceptable level of service or would not significantly worsen as a result of the project. Further information on intersection performance for each intersection is provided in section 6.1.2 of Technical Paper 2.

The proposed changes to the road network would also result in changes to traffic circulation patterns in local streets and additional travel distance for some residents and road users. Areas most impacted by changes to traffic circulation would be in the vicinity of South Street, Rydalmere and Boronia Street, Ermington. However, these impacts are expected to be minor due to the short length of road that would need to be used to access another intersection and the existing road arrangements in the vicinity of affected roads.



LEGEND

Project site

2031 AM / 2031 PM

Without project

With project

Level of service and seconds delay

A 0–14s
B 15–28s
C 29–42s
D 43–56s
E 57–70s
F 70s+

0 500m

N

Figure 9.5 Performance of intersections along the project alignment (2031) - map 1

LEGEND

Project site

2031 AM	2031 PM	
A	A	Without project
A	A	With project

Level of service and seconds delay

A	0–14s	C	29–42s	E	57–70s
B	15–28s	D	43–56s	F	70s+

0 500m

Figure 9.6 Performance of intersections along the project alignment (2031) - map 2

Figure 9.7 Performance of intersections adjacent to the project alignment (2031) - map 1

LEGEND

Project site

2031 AM / 2031 PM

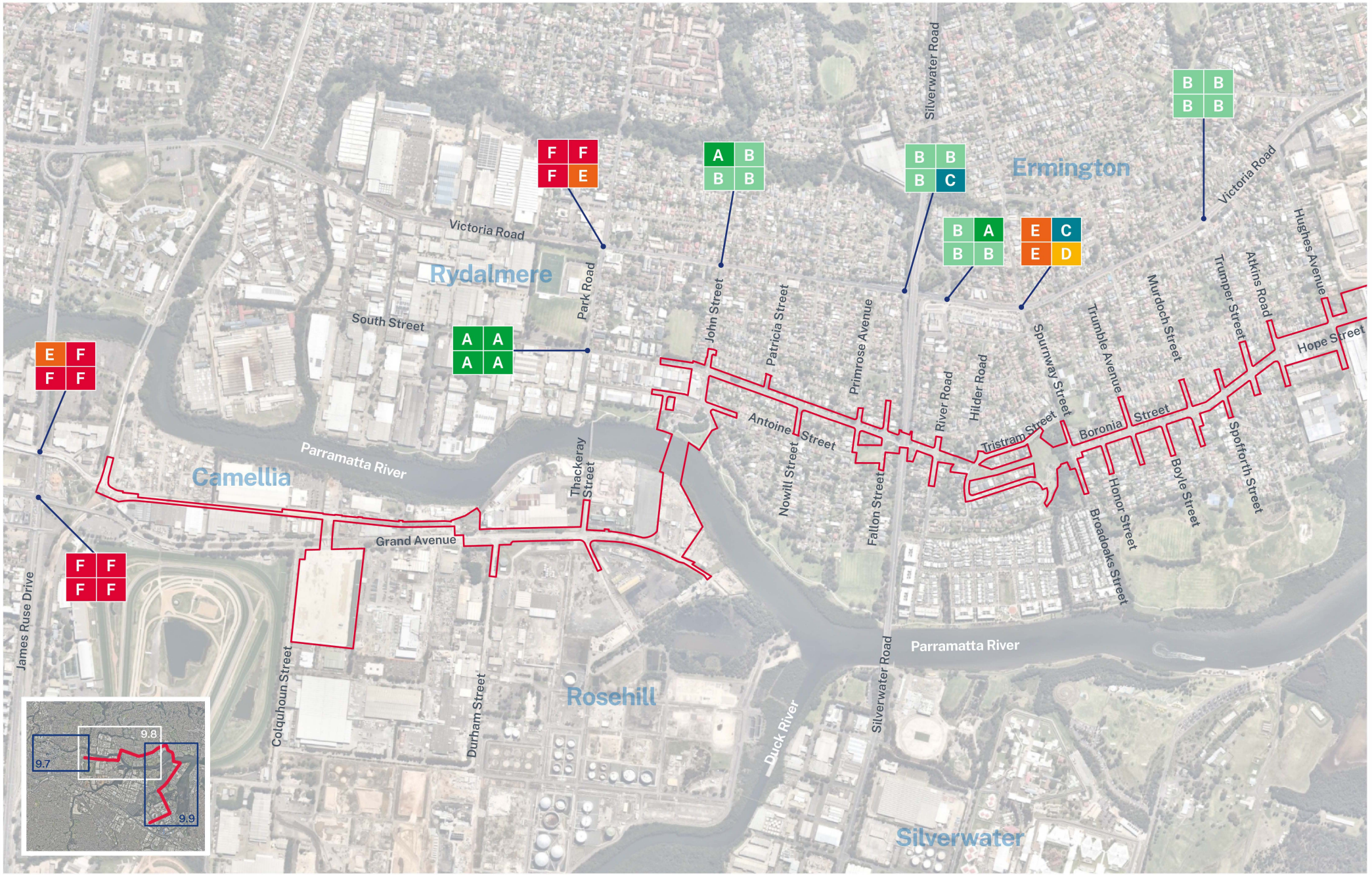
A A — Without project
A A — With project

Level of service and seconds delay

A 0–14s
B 15–28s
C 29–42s
D 43–56s
E 57–70s
F 70s+

0 500m

N



LEGEND

Project site

2031 AM / 2031 PM

Without project

With project

Level of service and seconds delay

A 0–14s

B 15–28s

C 29–42s

D 43–56s

E 57–70s

F 70s+

0 500m

Figure 9.8 Performance of intersections adjacent to the project alignment (2031) - map 2

LEGEND

Project site

2031 AM	2031 PM	
A	A	Without project
A	A	With project

Level of service and seconds delay

A	0–14s	C	29–42s	E	57–70s
B	15–28s	D	43–56s	F	70s+

0 500m

Figure 9.9 Performance of intersections adjacent to the project alignment (2031) - map 3

9.4.2 Public transport

The project would provide a number of interchanges with Parramatta Light Rail Stage 1, Sydney Metro West, train, ferry and bus services within/close to the project site. Cumulatively, these interchanges would encourage a modal shift away from private vehicle use to public transport, and increase access for public transport journeys to recreation and employment destinations in the Central River City and Greater Sydney.

The project would result in permanent changes to some bus routes, including the potential relocation of some bus stops and modification of some routes to ensure complementary bus services are provided for light rail customers. Additionally, changes to intersection performance, as described in section 9.4.1, have the potential to affect bus services where routes operate on the roads impacted by the project. Further development of future bus routes and services would be carried out by Transport for NSW to ensure effective integration with the project and the wider public transport network. Changes to the bus network are outside the scope of the project and would be assessed and delivered separately by Transport for NSW.

The project would provide a public transport facility for which there is a demonstrated need (see Chapter 3 (Strategic context and need)). It would also facilitate access to other forms of public transport. As a result, the project would result in overall benefits to public transport.

9.4.3 Active transport

The proposed active transport links would connect to the existing and proposed active transport network in the City of Parramatta and City of Ryde local government areas, filling gaps in the existing networks and providing enhanced opportunities for increased movement and activity, particularly across the Parramatta River. The proposed facilities would encourage higher use of active transport overall and provide a viable alternative to existing active transport routes that may experience congestion.

The project (including the two bridges over the Parramatta River) would create three walking and cycling 'loops' centred around the river in Camellia, Ermington and Wentworth Point, which would encourage movement and active lifestyles, and potentially draw in visitors from outside these areas.

9.4.4 Special events

The project would be designed and operated to facilitate access for special events at Rosehill Gardens Racecourse and Sydney Olympic Park (including Sydney Showground).

The introduction of light rail has the potential to reduce the need for special event buses to service Sydney Olympic Park. A specific 'special event' transport service plan would operate during special events (similar to the existing situation) including increased light rail service frequency and changes to the stopping patterns, depending on the scale of events.

9.4.5 Parking

The project would permanently affect the availability of on-street parking along the roadways in which it is located. There would be a reduction in on-street parking spaces to accommodate the light rail infrastructure, including track and stops, active transport links, and modified traffic lanes. Similarly, off-street parking facilities would be impacted at Rydalmere, Melrose Park and Wentworth Point to accommodate the light rail infrastructure.

A summary of the estimated number of parking spaces that would be permanently impacted is provided in Table 9.6.

Table 9.6 Estimated number of on and off-street parking spaces that would be permanently impacted

Location	Number of spaces removed	
	On-street	Off-street
Parramatta CBD	17	0
Camellia	2	0
Rydalmere	120	30 (within the John Street commuter car park)
Ermington	156	0
Melrose Park	110	10 (boat trailer parking spaces at Ermington boat ramp)
Wentworth Point	20	25 (within the Woo-la-ra car park)
Sydney Olympic Park	154	0
Lidcombe	54	0
Total	**633**	**65**

It is estimated that the project would permanently impact up to about 633 on-street parking spaces, which constitutes about 68 per cent (on average) of the identified parking supply along the light rail alignment.

A further 65 parking spaces would be impacted at off-street parking facilities, including the John Street commuter car park (30 spaces), the Ermington Boat Ramp car park (10 spaces), and the Woo-la-ra car park (25 spaces).

The impacts of permanently removed parking in Camellia, Rydalmere, Ermington and Melrose Park are, for the most part, considered relatively minor given that the supply of parking on roads immediately adjacent to the project alignment is sufficient to accommodate displaced vehicles. The impacted spaces in these areas are predominantly unrestricted parking spaces in residential streets. However, special consideration would need to be given to the short-term parking supply on Waratah Street for Melrose Park Public School.

The reduction in the supply of boat trailer parking at the boat ramp has the potential to increase the likelihood and magnitude of overflow parking activity on Wharf Road and surrounding local streets.

Areas of Wentworth Point, Sydney Olympic Park and Lidcombe would experience increased competition for parking spaces given that parking demand (see section 9.2.6) already exceeds supply.

In addition to these direct impacts, customers that drive and park near stops may also affect the availability of on-street parking in local streets surrounding the project site.

The design of the project would continue to be refined to reduce the number of parking spaces that would be permanently affected. Opportunities to provide further alternative parking facilities at Ermington Boat Ramp would be reviewed during design development to offset the impacts to existing boat trailer parking.

The approach to managing impacts on parking would be defined by the parking management strategy, which would be developed and implemented in consultation with key stakeholders, the community and relevant property owner/occupants (see section 9.6).

9.4.6 Local trip generation

Users accessing light rail stops may generate local trips onto the traffic network associated with either kiss-and-ride or park-and-ride activity. These trips would be distributed across the entire project site and surrounds; however, there would be some concentration around stop locations depending on the availability of short- and long-stay parking.

It is anticipated that the potential volumes of new local trips would be relatively low, and the impacts would spread across the network such that the potential impact of the additional traffic is expected to be minimal. The exception is in Melrose Park, where the additional traffic volumes from kiss-and-ride or park-and-ride activity would combine with vehicles avoiding Victoria Park, leading to increased traffic volumes around Andrew Street and Wharf Road. The proposed parking management strategy (see section 9.6) would include measures to balance the supply of parking in this area to ensure that this activity can be appropriately managed.

9.4.7 Property access

The project would change the way some properties located along roads in the project site are accessed. These changes are summarised in Table 9.7.

Measures to mitigate and manage potential access impacts are provided in section 9.6.

Table 9.7 Summary of property access changes

Area	Summary of changes
Camellia	• Access to properties north of Grand Avenue would be controlled with signals at the light rail alignment. • Signalisation of the Grand Avenue / Thackeray Street intersection to allow for turning movements and amendments to property access arrangements as required. • A new access would be provided for the commercial property at 37 Grand Avenue. The access would be constructed north from Grand Avenue between 37 and 37A and would enter the rear of the block after passing under the proposed bridge between Camellia and Rydalmere.
Rydalmere	• All property accesses would be maintained along Antoine Street and John Street. • Restricted movements (to left in and left out) for properties along South Street due to the light rail orientation within the roadway. • Adjustments to access and parking arrangements at eight properties along the northern side of South Street, Rydalmere in the vicinity of the Nowill Street stop. • For some movements, residents may need to use alternative, parallel local roads and cross the light rail alignment at signalised intersections.
Ermington	• Restricted movements (to left in and left out) for properties along South Street and Boronia Street due to the light rail orientation within the roadway and utility easements. • Access to the local road network south of Boronia Street would be restricted due to the new intersection controls. • For some movements, residents may need to use alternative, parallel local roads and cross the alignment at signalised intersections. • A small number of properties located on Heysen Avenue and Tristram Street have informal access to the Ken Newman Park from their properties. This would need to be removed to reduce potential safety risks associated with proximity to the project.
Melrose Park	• Five properties on the northern side of Hope Street between Hughes Avenue and Waratah Street would be affected by the project's permanent land requirements. Future access to these properties would be subject to consideration as part of the residual land management plan. • Access to the development site on the northern side of Hope Street would be provided by the developer. • Property access along both sides of Waratah Street would be restricted to left in/left out.
Wentworth Point	• All property access would be maintained along Hill Road.
Sydney Olympic Park	• All property accesses would be maintained in Australia Avenue. Loading provisions to businesses along Dawn Fraser Avenue would be maintained. • A signalised intersection allowing right turns would be provided for access at Grand Parade, and traffic signals would also be provided at Gate 13 (Murray Rose Avenue) from Australia Avenue to Showground Road.

Area	Summary of changes
Lidcombe	• Property access would be maintained via left in/left out along Uhrig Road, including for heavy vehicles. • Heavy vehicle access would be maintained to industrial properties along Carter Street.

9.4.8 Maritime facilities, navigation and river access

Navigation and river users

The proposed height of the bridge between Camellia and Rydalmere would provide for continued operation of all ferry classes, except SuperCats, at Mean High Water level or below. Mean High Water is defined as the average of all high waters observed over a sufficiently long period and is about 0.7 metres below the Highest Astronomical Tide. At tide levels above Mean High Water, RiverCats and HarbourCats may be required to remove or dismantle equipment to pass under the bridge. It is noted that River Class ferries, which are progressively being introduced into service, would be able to operate under all tidal conditions.

The bridge would allow navigation of commercial vessels less than 7.1 metres air draft at Highest Astronomical Tide (or taller vessels with some equipment removed or lowered). Vessels taller than 8.8 metres would not be able to access the river upstream of Camellia except at tide levels below Mean Low Water. Given the semidiurnal nature of tides in the river, and that most vessels would still be able to safely navigate by either lowering/dismantling certain equipment and/or using tides lower than Highest Astronomical Tide to affect safe passage, this impact is considered low.

Additional information regarding navigation clearance is provided in the Parramatta River Bridges Background Report, which forms Appendix A to Technical Paper 2 (Transport and Traffic).

There would be no bridge piers located within the currently defined navigation channel.

For the bridge between Melrose Park and Wentworth Point the proposed clearance between piers would potentially restrict the passage of ferries and barges to one-way movements under the bridge. While this is a change at this location, the same restriction is already present at other locations both upstream and downstream of the new bridge. As a result, this is not considered to be a major change to navigation in this area.

The channel markers in the vicinity of the bridge between Melrose Park and Wentworth Point would be moved about 20 metres to the north to better align with the deepest section of the river at this location.

The proposed height of the bridge is consistent with upstream and downstream structures and the navigation channel would be navigable by all ferry classes and commercial vessels up to 10.5 metres air draft at Highest Astronomical Tide levels or below.

There is not expected to be any impact on recreational or other vessels during operation.

Maritime facilities

The presence of the project's operational infrastructure adjacent to the Ermington Boat Ramp car park has the potential to reduce the number of boat trailer parking spaces. It is estimated that about 10 of the existing 52 trailer parking spaces would be affected. This would reduce the supply of boat trailer parking at the boat ramp, which (as noted in section 9.4.5) could increase overflow parking activity on Wharf Road and surrounding local streets.

The design would continue to be refined at this location to minimise the number of trailer parking spaces lost. Opportunities to provide further alternative parking facilities at Ermington Boat Ramp would be reviewed during design development to offset the impacts to existing boat trailer parking.

9.5 Cumulative impacts

9.5.1 Construction

There are a number of projects and developments currently occurring or planned within the study area that have the potential to result in cumulative impacts with the project. These include Parramatta Light Rail Stage 1, Sydney Metro West, ongoing future residential and commercial developments, and road and other transport improvements.

The potential for cumulative impacts during construction would depend on the scale and relative proximity of the other projects as well as their construction program and staging requirements. The proposed construction methodology for the project would aim to maintain road network capacity by ensuring that key transport corridors are maintained with two-way traffic, and that road closures are undertaken during off peak periods, wherever possible.

The proposed heavy vehicle access routes (see section 7.7) have been designed to allow access to work areas in the most direct way from the arterial road and motorway network. The access routes have also considered traffic generation from construction vehicles and road capacity to minimise impacts on the surrounding road network. The access routes would be finalised during construction planning.

For developments that directly adjoin the project site, ongoing consultation and co-ordination would be undertaken to ensure activities such as changes to road configuration and access arrangements are advertised well in advance and that arrangements are in place to manage potential cumulative impacts on the operation of transport infrastructure.

Key potential cumulative impacts are considered below. Measures to manage the potential for cumulative impacts are provided in section 9.6.

Parramatta CBD

Construction works for Sydney Metro West would occur within the city block bounded by Macquarie Street, Church Street, George Street and Smith Street. Access to this construction site would be from both Macquarie and George streets.

In this area, most of the project works would be at night and would require temporary, full closures of Macquarie Street between Church Street and Marsden Street. The potential cumulative impacts resulting from potential closures of this section of road include:

- temporary disruption to access from Macquarie Street may increase the volume of heavy vehicles using the George Street access
- increased heavy vehicle movements during the daytime to offset for periods of reduced access.

The project may result in cumulative impacts as works would be carried out within the same vicinity and would require similar access for construction vehicles when the construction programs for the two projects overlap (estimated between 2025 and 2026). Coordination between the two projects would be required to ensure access is maintained to construction areas and unintended disruption or congestion to traffic does not occur.

Sydney Olympic Park

Works associated with Sydney Metro West at Sydney Olympic Park would be within areas south of Herb Elliot Avenue such that there is no overlap between the construction footprints of Sydney Metro West and Parramatta Light Rail Stage 2 works. The primary haulage routes for Sydney Metro West are anticipated to be via Sarah Durack Avenue and Olympic Boulevard to the south. These routes do not overlap with the anticipated transport routes associated with the project.

Minor cumulative impacts may arise due to increased activity at Herb Elliot Avenue following closure of Dawn Fraser Avenue for the project. However, the proposed extension of Murray Rose Avenue to Olympic Boulevard would increase the capacity of the network for east–west movements, offsetting the loss of capacity from closure of Dawn Fraser Avenue.

Close coordination between the proponents and main contractors for project and Sydney Metro West is required to ensure site access routes are maintained, temporary road, footpath and cycleway closures and detours are co-ordinated, and unintended interruption to accesses and traffic congestion does not occur.

Special event buses associated with major events may be affected due to temporary road closures associated with construction works at Sydney Olympic Park. The traffic and access management plan (see section 9.6) would include measures to ensure access for special event buses is maintained.

9.5.2 Operation

Integration of the project with other public transport services would result in cumulative benefits by:

- increasing the range of travel modes available within the study area
- reducing reliance on private cars and the demand for on-street parking
- providing improved public transport connections from Wentworth Point to the Parramatta CBD and Sydney Olympic Park.

The project would provide new infrastructure (including active transport infrastructure) to encourage mobility and public transport patronage, and provide enhanced connections between transport modes, including bus routes that complement the light rail corridor.

The project would result in additional light rail frequency between the Parramatta CBD and Camellia along the section of alignment shared with Parramatta Light Rail Stage 1 services.

All but one of the signalised intersections along the route comprising Macquarie Street, Harris Street, George Street, Alfred Street and Tramway Avenue would operate at a satisfactory level of service (level of service D or better) with only minor increases in delays experienced. The intersection of George Street and Alfred Street would operate at level of service E during the morning peak period due to increased frequency of light rail. Intersection performance details for intersections between the Parramatta CBD and Camellia are shown on Figure 9.7.

The project would also provide an additional mode of travel for patrons accessing special events at the Rosehill Gardens Racecourse and Sydney Olympic Park. The project would be managed to ensure additional light rail services are provided to accommodate larger volumes of people and traffic at events.

9.6 Mitigation and management measures

9.6.1 Approach to mitigation and management

The project would introduce a new mode of transport, mainly within existing road corridors. This would result in unavoidable changes to the configuration of the road network along the project site. The project would also introduce changes to the local road network, including new signalised intersections, changed access onto some local roads, removal of on-street parking, changes to bus stop locations, and changes to some property access along the project alignment.

Careful planning would be required during further design stages and prior to construction to ensure that the capacity of, and access to, the road and transport network is maintained. This would require close co-ordination with a wide range of stakeholders. Road safety audits would be carried out at key stages in the design to identify potential road safety issues and opportunities for safety improvements for all road users.

A traffic and access management plan would be prepared and implemented as a key part of the CEMP. The plan would detail processes, relevant requirements and responsibilities to minimise potential traffic, transport and access impacts during construction, including impacts on the safe and efficient operation of the road network, public transport services, active transport and special events. The detailed requirements for the plan are provided in section 8.3 of Technical Paper 2 (Transport and Traffic).

Access to properties would be maintained during construction. While access arrangements would be outlined in the traffic and access management plan, the effectiveness of those arrangements, and the need for any alternative and/or temporary access arrangements, would be agreed with affected property managers/owners.

Impacts on navigation and access along the Parramatta River would be managed in accordance with the maritime works and navigation management plan. The plan would include:

- requirements for works within and over the river
- key stakeholders to be consulted, and notification and approval processes
- establishment of exclusion zones (where required)
- restrictions on speed limits or specific activities
- changes to any navigation channels or markers
- measures to manage impacts on marine recreational assets, including the potential to schedule navigation channel closures around public holidays and peak periods/seasons.

The project would reduce on-street parking capacity in roads along the project site by more than half during construction and operation. In addition, off-street parking would be impacted at some locations. This would be a key issue for stakeholders and the community. To effectively manage the potential impacts on on-street parking, a parking management strategy would be prepared to provide an overarching framework for parking management during all work and stages. The strategy would include:

- a summary of affected parking, including where it is located, when it would be impacted, and for what duration
- detailed surveys to understand existing demand and usage of both on and off-street parking
- measures to manage the reduction in on-street parking availability, including provision of alternative parking arrangements for accessible and service spaces, staged removal, resident parking schemes, and managed staff parking arrangements
- measures to manage construction worker parking to minimise worker parking in public streets, including provision of designated parking areas within the project site, encouraging use of public transport, and implementing shuttle bus arrangements
- details of the engagement strategy for stakeholders and the community
- a monitoring strategy to assess implemented measures.

9.6.2 List of mitigation measures

Measures that will be implemented to address potential impacts on transport and traffic are listed in Table 9.8

Table 9.8 Transport and traffic mitigation measures

Impact/issue	Ref	Mitigation measure	Timing
Impacts on transport and access	TT1	The design will continue to be refined to avoid or minimise impacts on the surrounding road and transport network and property accesses as far as reasonably practicable.	Design
	TT2	Input will be sought from relevant stakeholders (including local councils, Sydney Olympic Park Authority, bus and ferry operators) prior to finalising the design of those aspects of the project that affect the operation of road and other transport infrastructure under the management of these stakeholders. This will include confirming ongoing operation and maintenance arrangements.	Design
Maintaining permanent access to properties	TT3	Where the project permanently affects access to and from a public road, input will be sought from relevant property owners and occupants regarding alternative access arrangements prior to finalising the design. Where any legal access to a property is permanently affected and a property has no other legal means of access, alternative access to and from a public road will be provided to an equivalent standard, where feasible and reasonable. Where an alternative access is not feasible or reasonable, and a property or part of a property is left with no access to a public road, consideration will be given to acquisition of the property or part of the property in accordance with the provisions of the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW).	Design
Road user safety	TT4	Road safety audits will be undertaken where changes to the road network are proposed, in accordance with relevant Austroads guidelines, to ensure the safety of all road users is considered during design development.	Design
Impacts on parking	TT5	Opportunities to reduce the loss of on and off street parking will be reviewed during design development.	Design
	TT6	Opportunities to provide further alternative parking at Ermington boat ramp will be reviewed during design development to offset the impacts to existing boat trailer parking.	Design
	TT7	A parking management strategy will be prepared to provide an overarching framework for parking management during construction and operation. The strategy will include measures to manage: • the reduction in on-street parking availability, such as provision of alternative parking arrangements for accessible and service spaces, staged removal, resident parking schemes, and managed staff parking arrangements • measures to manage construction worker parking, such as provision of designated parking areas within the project site, encouraging use of public transport, and shuttle bus arrangements.	Design
Potential for traffic, transport and access impacts during construction	TT8	A traffic and access management plan will be prepared prior to construction and implemented as part of the CEMP. The plan will detail processes and responsibilities to minimise traffic and access delays and disruptions, and identify and respond to changes to road access and on-street parking arrangements. The plan will include, as appropriate, additional reasonable and feasible measures identified as an outcome of consultation (in accordance with mitigation measure TT12)	Pre-construction, construction
	TT9	The traffic and access management plan will include measures to manage staging of construction works to ensure that satisfactory capacity and minimum levels of service are maintained for all users.	Pre-construction, construction

Impact/issue	Ref	Mitigation measure	Timing
Impacts on navigation and recreational use of Parramatta River	TT10	A maritime works and navigation management plan will be prepared prior to construction and implemented as part of the CEMP. The plan will detail processes and responsibilities to manage marine construction vessels and impacts on navigation during construction of the bridges over the Parramatta River. The plan will include, as appropriate, additional reasonable and feasible measures identified as an outcome of consultation (in accordance with mitigation measure TT12).	Pre-construction, construction
	TT11	Opportunities to minimise impacts to recreational use of the Parramatta River will be considered during construction planning, based on a review of the usage of the facilities at Ermington Boat Ramp and at other existing boat ramps in the vicinity of the project site.	Pre-construction
Consultation and communication	TT12	Consultation with relevant stakeholders will be undertaken regularly to facilitate the efficient delivery of the project and to minimise impacts on road, river and transport infrastructure customers and users. Stakeholders will include the City of Parramatta and City of Ryde councils, Sydney Olympic Park Authority, bus and ferry operators, emergency services, and recreation groups. Additional measures identified as an outcome of consultation will be implemented during construction, where reasonable and feasible. This will include modifying work areas, activities and construction access arrangements to address traffic flow and access issues identified by key stakeholders, where practicable.	Pre-construction, construction
	TT13	The Community Communication Strategy (measure SE1) will include mechanisms to inform the community of the dates and durations of changes to transport services and access arrangements (including access restrictions for the Parramatta River) and proposed alternative services and access provisions.	Construction
Property, cyclist and pedestrian access	TT14	Access to properties, including residences, businesses and community infrastructure, will be maintained. Where temporary disruption to access cannot be avoided, consultation will be undertaken with the owners, occupants and managers of affected properties and infrastructure, to confirm their access requirements and determine alternative arrangements.	Construction
	TT15	Safe pedestrian and cyclist access will be maintained around and/or through work areas. Where disruption to access cannot be avoided, alternative routes that comply with relevant accessibility standards and guidelines will be provided, signposted and communicated. Alternative access arrangements will be established prior to implementing restrictions on existing routes.	Construction
Changes to public transport services	TT16	Modifications to existing bus stops and Rydalmere Wharf, implementation of new stops and services, and alterations to service patterns, will be undertaken in consultation with relevant key stakeholders, including Customer Journey Management, bus and ferry operators, the City of Parramatta and City of Ryde councils, and Sydney Olympic Park Authority. Advance notification of changes to services will be provided to affected customers.	Construction
Special events management	TT17	Traffic management for special events in the Parramatta CBD, at Rosehill Gardens Racecourse and Sydney Olympic Park (including Sydney Showground) will be considered during construction. Where special events require specific traffic and pedestrian management, measures will be developed and implemented in consultation with relevant stakeholders, including event organisers, venue managers, City of Parramatta Council and Sydney Olympic Park Authority.	Construction

Impact/issue	Ref	Mitigation measure	Timing
Managing the potential for cumulative transport and traffic impacts	TT18	The potential for cumulative construction transport and traffic impacts will be reviewed and coordinated with other projects, in consultation with relevant stakeholders, including Customer Journey Management, Customer Journey Planning, Traffic and Transport Liaison Group, City of Parramatta Council and Sydney Olympic Park Authority. The review will include: • other projects with the potential to affect access and capacity • reviews of programs for traffic staging, lane, footpath, cycleway and road closures for all projects • coordinating works and identifying efficient re-routing options as appropriate.	Construction
	TT19	A review of operational network performance will be carried out 12 months and three years from the opening of the project to confirm the operational impacts of the project. Appropriate changes which balance the performance outcomes for the project and general traffic will be considered to address identified issues along the alignment. For surrounding arterial roads, feasible and reasonable mitigation measures will be identified in consultation with the Department of Planning and Environment and other relevant stakeholders (including City of Parramatta Council and Sydney Olympic Park Authority) to manage identified traffic performance impacts.	Operation