Transport
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GOVERNMENT

Technical Paper 2

Transport and Traffic

Parramatta Light Rail Stage 2
Environmental Impact Statement

GHD Pty Ltd | ABN 39 008 488 373| ABN 39 008 488 373
133 Castlereagh Street, Level 15
Sydney, New South Wales 2000, Australia
T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.comsydmail@ghd.com | **ghd.com**

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Glossary and abbreviations

Term / abbreviation	Description
AIMSUN	AIMSUN is a mesoscopic traffic simulation software package used in the operational modelling of the 'off-corridor' intersections for the project.
Alignment	The alignment refers to the physical horizontal and vertical location, position and direction of the light rail tracks.
ATL	Active Transport Link
CBD	Central Business District
Concept design	The output from the assessment of infrastructure design concepts, tested through discussions and workshops to inform the final design – described more detail in Chapter 6 and 7 of the EIS for this project.
Crossover	Rail infrastructure that connects two parallel tracks, allowing a vehicle on one track to cross over to the other. When two crossovers are present between adjacent tracks in the same location, it is referred to as a double crossover.
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry and Environment (former)
EIS	Environmental Impact Statement
GPOP	Greater Parramatta and the Olympic Peninsula
GSO	Greater Sydney Operations (formerly Transport Management Centre)
HAT	The Highest Astronomical Tide (HAT) or highest high tide is defined as the highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions. Higher tides can occur under extreme meteorological and oceanographic conditions.
HML	Higher mass limit vehicle or route
HV	Heavy Vehicles
Interchange	A location where it is possible to change within a mode or between modes.
km/h	kilometres per hour
LoS	Level of Service, a qualitative measure which is applied based on the average vehicle delay and used to evaluate the operational performance of an intersection. Refer to section 2.3.2.
NSW	New South Wales
Off-corridor intersections	Those intersections which are located outside of the project site but may be indirectly impacted by the project.
On-corridor intersections	Those intersections which are located within the project site and are directly impacted by the project.
OSOM	Oversize and Overmass vehicle or route
Parramatta Light Rail Stage 1	Refers to Stage 1 of the Parramatta Light Rail network, between Westmead and Carlingford via Parramatta and Camellia. Stage 1 was approved on 29 May 2018 and is currently under construction and expected to be operational in 2024.
Parramatta Light Rail network	Refers to Stage 1 and Stage 2 of Parramatta Light Rail.
Project	The construction and operation of Stage 2 of the Parramatta Light Rail network.
Project route	The route refers to the locations/suburbs through which the Project travels i.e. Parramatta, Camellia, Melrose Park, Wentworth Point, Sydney Olympic Park, etc.
Project site	Refers to the area that would be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the location of construction activities, compounds and work sites, and the location of permanent infrastructure.

Term / abbreviation	Description
PTPM	Public Transport Project Model, developed by Transport for NSW and used to forecast travel demand for the project across various future year scenarios.
RAV	Restricted access vehicle
Roads and Maritime Services	The former Roads and Maritime Services is now part of Transport for NSW.
ROL	Road Occupancy Licence
SEARs	Secretary's Environmental Assessment Requirements
SIDRA	Micro-analytical software used as an aid for the design and evaluation of single intersections and networks of intersections.
SMPM	Strategic Motorway Planning Model
Sydney Metro West	An underground metro railway that would link the Parramatta and Sydney CBDs and communities in between. The Sydney Metro West project is currently in planning stage, with stations proposed at Sydney Olympic Park and Parramatta.
STM	Sydney Strategic Travel Model
Study area	The study area relevant to the impact 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, river and other transport networks along and surrounding the alignment with the potential to be directly or indirectly affected by the project during either the construction or operational phase.
Transport for NSW	Transport for NSW is the lead agency of the NSW Transport cluster.
Turnback	A track layout which facilitates a rail vehicle to 'turn around' at a particular location using a double crossover. A turnback may exist either at the end of a track or at any other point to facilitate 'short-running' of vehicles.
VISSIM	VISSIM is a microscopic multi-modal traffic flow simulation software package used in the operational modelling of the 'on-corridor' intersections for the project.

Executive summary

Background

Parramatta Light Rail will deliver an integrated light rail service that supports population and employment growth as well as the additional development expected throughout the Greater Parramatta and the Olympic Peninsula (GPOP) area. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

It will be delivered in stages to keep pace with development, and Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Assessment methodology

Study area

The study area relevant to the impact 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 network, Parramatta River and other transport networks along and surrounding the project site with the potential to be directly or indirectly affected by the project during construction or operation.

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 nested series of traffic models
– reviewing proposed construction activities and staging with respect to site access, road closures and impacts on the transport network
– assessing potential transport and traffic impacts during construction, including on the Parramatta River
– reviewing project conditions during operation, including integration with other transport modes, changes to road network conditions, walking and cycling connections
– modelling future traffic volumes with the project to assess potential impacts on road network performance
– identifying measures to manage and/or mitigate the identified potential impacts
– assessing cumulative effects with other existing and proposed developments.

Construction impact

Construction traffic generation

The project is expected to generate up to around 738 heavy vehicle trips, and up to around 1,478 light vehicle trips, per day during the peak construction period. Construction traffic would be distributed across all work areas along the project site, with increased intensification around access points and worker parking areas. A review of existing and anticipated peak construction traffic volumes shows:

– major roads would experience a low proportional increase in traffic due to the construction works
– minor roads would have a higher proportional increase in traffic, however existing volumes are generally low such that the proposed traffic volume remains well within the capacity of these roads.

Road closures and detours

The project is anticipated to require a number of full and partial road closures throughout the duration of construction. Where road closures are required, suitable detour routes are available with sufficient capacity to accommodate the additional traffic volumes.

Parking

The following impacts on parking availability would occur during construction:

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

A small amount of construction worker parking would be established at each site compound. In addition, it is anticipated that a centralised parking location would be provided at Sydney Olympic Park for up to 200 parking spaces. However, the anticipated excess construction worker parking demand is in the order of 154 parking spaces, likely to occur across Camellia, Rydalmere and Ermington.

Property access

There are a number of locations along the route where property access would be temporarily impacted by construction works. Access to properties would be maintained at all times, or alternative access arrangements provided to facilitate construction works.

Public transport and active transport

The impacts to public transport and active transport links during construction would include:

– impacts to existing bus services, particularly where there are full or partial road closures required, namely routes 524, 525, 526, 533 and N81
– access impacts to existing active transport links and recreational walking and cycling trails, including the Parramatta Valley Cycleway on both sides of the river due to the presence of construction. Access would be maintained through provision of new connections or detour routes.

River access and navigation

The project is anticipated to result in significant construction impacts at two locations along the Parramatta River:

– Rydalmere Wharf
    - The existing commuter car park and adjacent area would be used as a construction compound and would be unavailable for a period of approximately three years. Temporary access to the existing ferry wharf would be maintained via a new temporary footpath connecting Jean Street to the wharf. The wharf would remain in service except two occasions for periods of up to two months each to facilitate construction of the bridge deck for the bridge between Camellia and Rydalmere. Alternative transport arrangements for ferry customers would be provided by Transport for NSW in consultation with the operator of the F3 ferry service.
– Ermington Boat Ramp
    - The Ermington Boat Ramp and car park would be closed for approximately three years during the construction works associated with the bridge between Melrose Park and Wentworth Point. Boat ramp users would be required to access the Parramatta River from other nearby boat ramps, including Silverwater, Blaxland Road and Kissing Point boat ramps which are within about 10 to 14 minutes drive (approximately five kilometres) of Ermington Boat Ramp. These other boat ramps are all of smaller capacity than Ermington and would not be able to provide adequate offset for the boating demand when Ermington Boat Ramp is closed.

Upstream navigation would be maintained for the majority of the bridge construction period and would facilitate continued operation of ferries and for other commercial operations. Closure of the waterway upstream of the two bridges would be required: on two occasions for about two months each (at Camellia) and for a period of up to three months (at Wentworth Point) to facilitate bridge construction.

During these periods, alternative transport arrangements would be put in place by Transport for NSW in consultation with the operator of the F3 ferry service with ferry services needing to be terminated at Sydney Olympic Park Wharf.

Commercial operations by the owners of private jetties and for upstream salvage and maintenance of maritime structures would also be unavailable during these waterway closure periods, depending on their location, unless prior arrangements are made with the bridge contractor to provide ad hoc river access.

Depending on the location of the waterway closure, at Camellia or Wentworth Point, access to Sydney Harbour or other downstream locations on the river may be unavailable from the Silverwater Boat Ramp.

Proposed mitigation includes investigating opportunities to minimise impacts to recreational use of the Parramatta River 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.

No observable impacts on fishing, rowing or yachting activities are expected given there are other and preferable areas for these activities further downstream of the bridge work areas.

Operational impact

Traffic network connectivity

There are a range of localised network connectivity impacts that may result due to the light rail corridor crossing existing traffic routes. These include permanent road closures, restriction of right turns across the light rail corridor, and left-in/left-out only at minor roads. These changes would have a minor impact on traffic volumes on adjacent routes, however are primarily localised to the immediate area surrounding the change. The project provides new signalised intersections to facilitate safe traffic movements across the light rail corridor at key locations.

Traffic network performance

The key observations from traffic network modelling include the following:

– Most of the intersections along the alignment are expected to operate satisfactorily. The introduction of specific light rail signal phases is shown by the modelling to have no substantial impacts on the performance of the majority of the key intersections in the modelled corridor.

– The following signalised intersections along the project alignment are anticipated to perform at worse than Level of Service (LoS) D during either the morning or afternoon peak period under the 2031 with project scenario:

  - South Street / Primrose Avenue (LoS E in the afternoon peak)
  - Hope Street / Waratah Street (LoS F in the morning and LoS E in the afternoon peaks)
  - Waratah Street / Mary Street (LoS F in the morning and afternoon peaks)
  - Hill Road / Footbridge Boulevard (LoS E in the morning peak)
  - Hill Road / Holker Street (LoS E in the morning peak)
  - Park Street/ Dawn Fraser Avenue (LoS E in the morning and afternoon peaks).

  Of the above six intersections, only three have an increase in the combined morning and afternoon peak delay compared to the ‘without project’ scenario (Waratah Street / Mary Street, Hill Street / Holker Street and Park Street / Dawn Fraser Avenue).

– The following give-way or stop controlled intersections along the project alignment are anticipated to perform at worse than LoS C during either the morning or afternoon peak period under the 2031 with project scenario:

  - Silverwater Road / South Street (LoS E in the afternoon peak)
  - Hope Street / Atkins Road (LoS D in the morning peak)
  - Hill Road / Nuvolari Place (LoS D in the morning and LoS E in the afternoon peaks)
  - Hill Road / Baywater Drive (LoS D in the afternoon peak).

  Of the above four intersections, none have an increase in the combined morning and afternoon peak delay compared to the ‘without project’ scenario.

– The following key intersections outside of the project site are anticipated to perform at worse than LoS D during either the morning or afternoon peak period and experience increased delays under the 2031 with project scenario:
    - Victoria Road / Kissing Point Road / William Road (approximately 32 seconds in the afternoon peak)
    - Victoria Road / Wharf Road (approximately 20 seconds in the morning peak and 23 seconds in the afternoon peak)
    - Hill Road / Parramatta Road (approximately 10 seconds in the morning peak)
    - Australia Avenue / Homebush Bay Drive (approximately 13 seconds in the morning peak).

    Impacts to intersections outside of the project site are primarily due to land use changes and development causing an uplift in traffic volumes in the network generally under the 2031 with project scenario.

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 would be impacted at Rydalmere and the Ermington Boat Ramp. The total number of parking spaces permanently impacted by the project would be approximately 698.

Public transport

The project would result in substantial changes to way the public transport network operates generally within the study area, with the light rail enhancing and complementing existing public transport services by providing an additional, direct, high frequency public transport option between the Parramatta CBD and Sydney Olympic Park. While the project for which approval is being sought does not include any changes to public bus routes and stops, bus planning and optimisation measures are being considered separately by Transport for NSW.

Active transport

The walking and cycling links proposed as part of the project would connect to the existing and proposed active transport network in the City of Parramatta and City of Ryde local government areas.

Special events

The project would provide enhanced transport network integration for special events held at Parramatta CBD, Rosehill Gardens Racecourse and Sydney Olympic Park by improving transport options available for customers. Event specific traffic management arrangements would be in place when major events are occurring and may include terminating light rail services at Jacaranda Square and / or providing increased services between Sydney Olympic Park and Melrose Park to service the increased volume of customers.

River access and navigation

The proposed height of the bridge between Camellia and Rydalmere would impose a constraint on the height of vessels travelling upstream of this location. Vessels taller than 7.1 metres (including RiverCats and HarbourCats ferries which have an air draft of 7.8 metres) would only be able to pass under the bridge between Camellia and Rydalmere at Highest Astronomical Tide (HAT) level with equipment removed or dismantled, or alternatively at tide levels lower than Mean High Water (defined as 0.7 metres below HAT).

Vessels taller than 8.8 metres would no longer be able to access the river upstream of Camellia except at tide levels below Mean Low Water.

The proposed height of the bridge between Melrose Park and Wentworth Point is consistent with upstream and downstream structures and would be navigable by all ferry classes and commercial vessels up to 10.5 metres air draft at HAT level or below. There is not expected to be any impact on recreational or other vessels.

Recommended mitigation measures

A range of impact mitigation measures have been recommended and would be implemented to manage the potential impacts due to the project, including consideration of construction traffic, river access and navigation, temporary and permanent impacts to parking availability, access to public transport and active transport connectivity.

Mitigation measures have been developed in conjunction with learned experience from Stage 1 of the Parramatta Light Rail project (for example with respect to parking impacts). Key mitigation measures are listed below:

– A Parking Management Strategy would be prepared to provide an overarching framework for parking management during construction and operation. The strategy would include measures to manage the reduction in on-street and off-street parking availability as well as measures to manage construction worker parking.
– An overarching Traffic and Access Management Plan would be prepared prior to construction and implemented as part of the CEMP. The plan would detail processes and responsibilities to minimise traffic and access delays and disruptions, and identify and respond to changes to road safety during construction. Additional specific construction traffic and transport management plans detailing site specific activities, impacts and mitigations will be prepared as the project progresses.
– A Maritime Works and Navigation Management Plan would be prepared prior to construction and implemented. The plan would detail processes and responsibilities to manage maritime construction vessels and impacts on navigation during construction of the bridges over the Parramatta River. Responsibility for co-ordination of the maritime works and liaison with maritime stakeholders would be by a Maritime Works Co-ordinator.

Details of these and other mitigation measures are provided in section 8.

1. Introduction

1.1 Parramatta Light Rail

The NSW Government's Greater Sydney Region Plan *A Metropolis of Three Cities* (Greater Sydney Commission, 2018) outlines a vision for a three-city metropolis. The Central River City covers the four local government areas of the City of Parramatta, Blacktown City, Cumberland City and The Hills Shire. *A Metropolis of Three Cities* highlights Greater Parramatta as the focal point for the Central River City, with employment growth and public transport being of key importance.

The Greater Parramatta and the Olympic Peninsula area (GPOP), which extends from Westmead and Parramatta in the west to Sydney Olympic Park to the east, is fast emerging as the heart of Sydney's Central River City and is set to grow and change significantly over the next 20 years. Forecasts predict that GPOP will accommodate almost 170,000 new residents by 2041. Employment opportunities will also grow, with an additional 100,000 jobs predicted by 2041 (SGS, 2017).

Parramatta Light Rail will deliver an integrated light rail service that supports the population and employment growth as well as the additional development expected throughout the GPOP. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

Parramatta Light Rail will be delivered in stages to keep pace with development:

– Stage 1 will connect Westmead to Carlingford via the Parramatta central business district (CBD) and Camellia. The construction and operation of Parramatta Light Rail Stage 1 was approved by the NSW Minister for Planning in May 2018. Major construction is underway, with the track installation complete and light rail stop construction in progress. Stage 1 is expected to start operating in 2024. Further information on Stage 1 is available at **Parramatta Light Rail**.
– Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Figure 1.1 provides an overview of Parramatta Light Rail showing both stages.

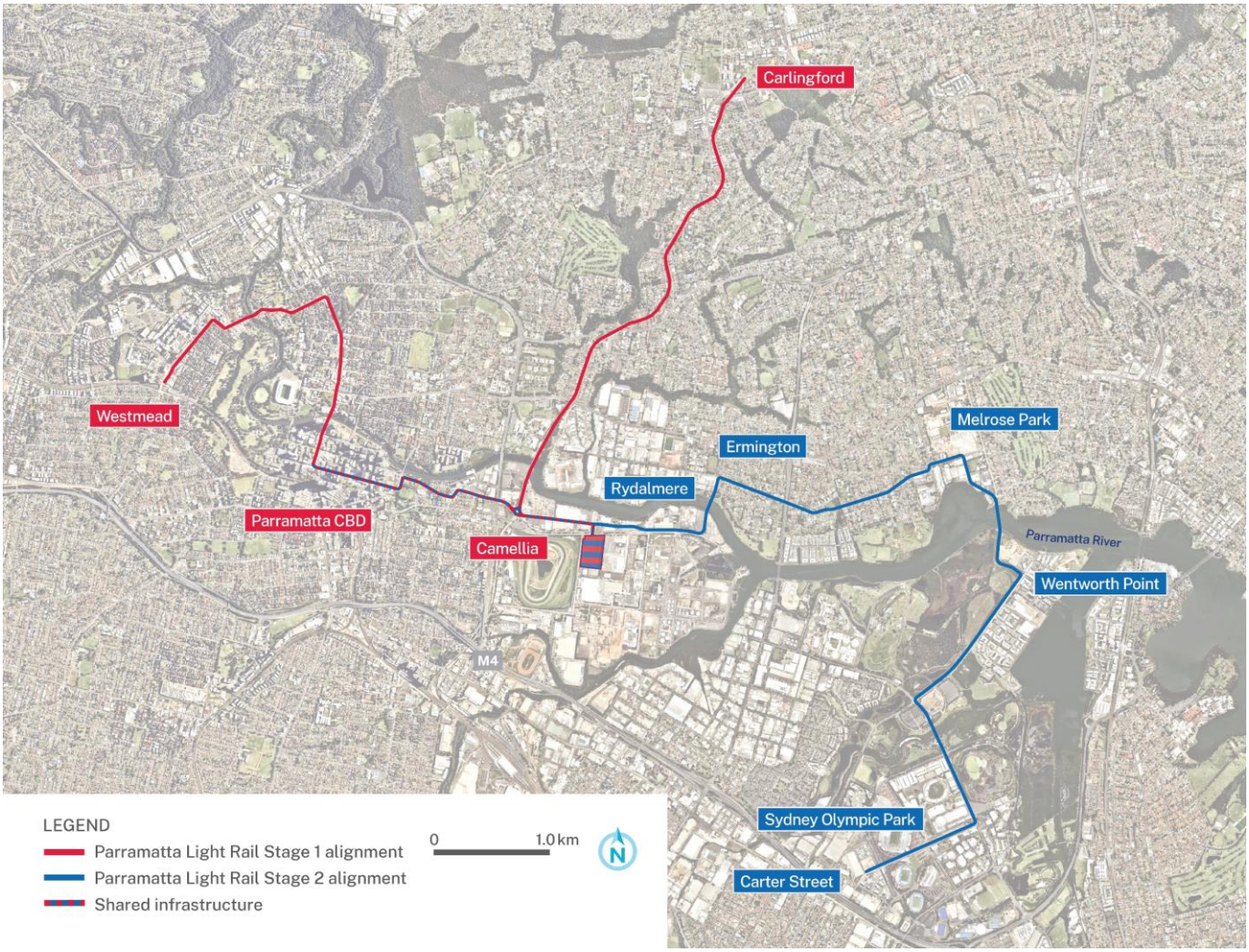

Figure 1.1 Parramatta Light Rail network

1.2 Project overview

The project comprises two main elements:

– construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
– operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.

Further information on the location of the project, and a description of the project site for the purposes of this document, is provided in the environmental impact statement (EIS).

1.2.1 Key features

The key features of the project, which are shown on Figure 1.2, include:

Light rail track and bridges

– a new 10 kilometre long dual light rail track, with 14 stops, between the Parramatta Light Rail Stage 1 line in Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
– two bridges over the Parramatta River between Camellia and Rydalmere, and between Melrose Park and Wentworth Point

– a bridge over Silverwater Road between Rydalmere and Ermington
– other bridge works in Ken Newman Park and Sydney Olympic Park.

Active and public transport integration

The project would also deliver:

– about 8.5 kilometres of new active transport links between Camellia and the Carter Street precinct, which would connect with the existing cycling and pedestrian network
– interchanges with other forms of public transport, including trains, ferries, buses and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Rydalmere and Sydney Olympic Park
– a light rail and pedestrian zone (no through vehicle access) within Sydney Olympic Park along Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard
– bus access over the proposed bridge between Melrose Park and Wentworth Point.

Other works

Works proposed to support the project's operation:

– turnback facilities, including along part of Macquarie Street in the Parramatta CBD
– adjustments to the Parramatta Light Rail stabling and maintenance facility at Camellia
– five new traction power substations to convert electricity to a form suitable for use by light rail vehicles
– new and improved open spaces and recreation facilities at Ken Newman Park, the Atkins Road stop and Archer Park.

Further information on the project's features is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)) and section 4 of this report.

1.2.2 Operation

The project would operate between the Parramatta CBD and the Carter Street precinct, using a section of the Parramatta Light Rail Stage 1 alignment and the alignment constructed as part of the project.

Between the Parramatta CBD and Camellia, the project would operate along about three kilometres of the Parramatta Light Rail Stage 1 alignment. Parramatta Light Rail Stage 2 services would terminate at the Stage 1 Parramatta Square stop to allow customers direct and convenient access to Parramatta's CBD, and interchange with Stage 1 light rail services, trains, buses and Sydney Metro West.

From Camellia, the project would operate along the light rail infrastructure proposed as part of Stage 2, terminating at the proposed Carter Street stop.

The project would operate as a turn-up-and-go light rail service from 5am to 1am, seven days a week, as for Parramatta Light Rail Stage 1. The project would have travel times of around 31 minutes from the Carter Street stop in Lidcombe to the proposed Sandown Boulevard stop in Camellia, and a further seven minutes from Camellia to the Parramatta Square stop in the Parramatta CBD.

Further information on the project's operation is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation) and section 4 of this document.

1.2.3 Timing

It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and the first passenger services are proposed to start from 2030/2031.

An indicative construction methodology is provided in the EIS (see Chapter 7 (Project description – construction)) and section 4 of this report.

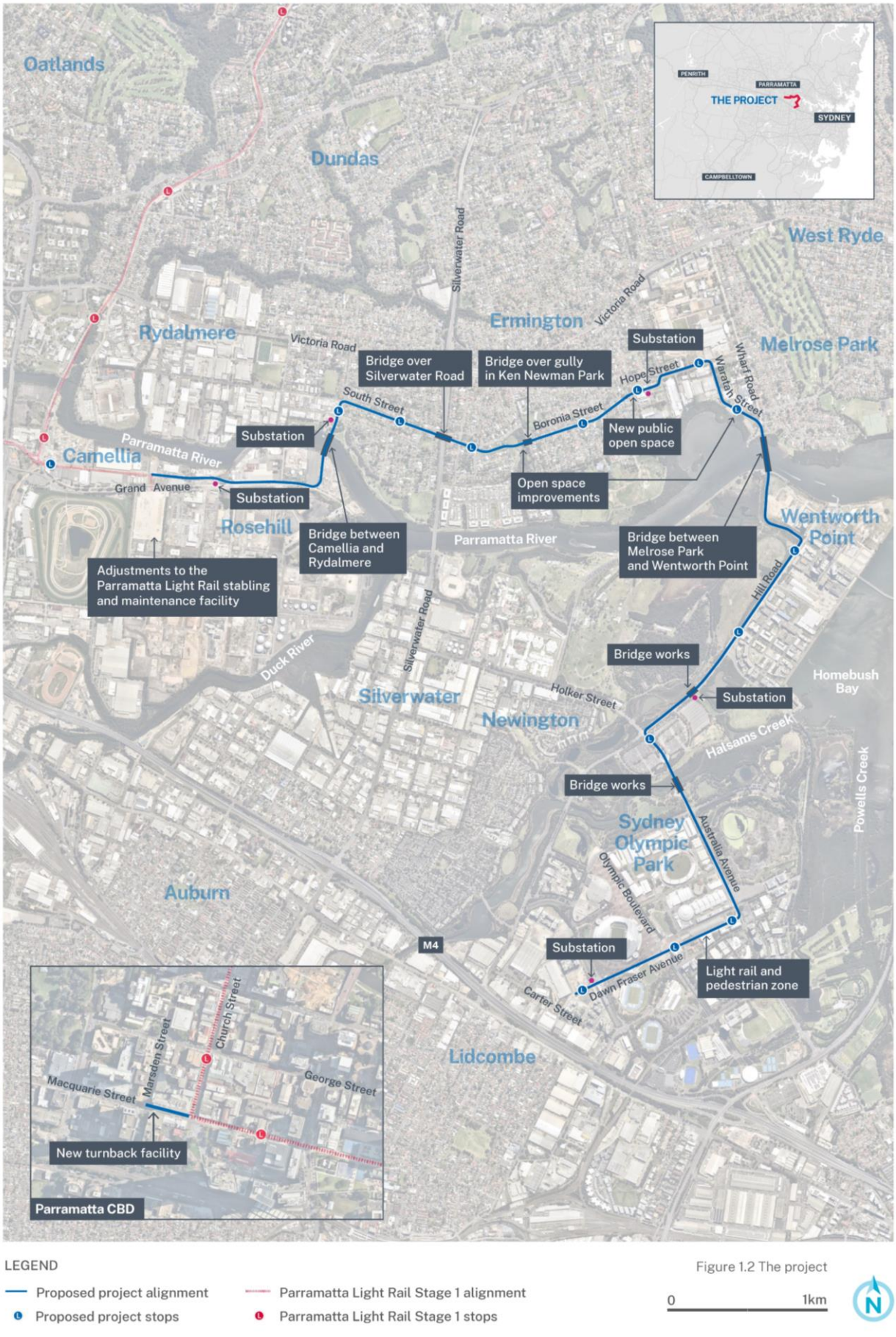

Figure 1.2 The project

Figure 1.2 Key features of the project

1.2.4 Approval requirements

The project is State significant infrastructure and is subject to approval by the NSW Minister for Planning under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The project is also determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and requires approval from the Australian Minister for the Environment and Water.

1.3 Purpose and scope of this document

The EIS has been prepared to support an application for approval of the project in accordance with Division 5.2 of the EP&A Act. It addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment (SEARs).

This report has been prepared as part of the EIS to assess the potential transport and traffic impacts from constructing and operating the project. The report:

– addresses the relevant SEARs listed in Table 1.1
– describes the existing environment with respect to transport and traffic
– assesses the impacts of constructing and operating the project on transport and traffic
– recommends measures to mitigate and manage the impacts identified.

The methodology for the assessment is described in section 2.

Table 1.1 SEARs – transport and traffic

SEARs requirement	Where addressed in this document
1) Construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:	
(a) a considered approach to route identification and scheduling of construction vehicle movements, with particular consideration of traffic impacts and transport movements outside standard construction hours including cumulative impacts	Route identification and scheduling is discussed in section 4.9.4, 4.9.5 and 4.9.6. Traffic impacts and transport movements for construction activities are described in section 4.9. Cumulative impacts of construction activities are described in section 7.1.
(b) the indicative number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements)	Section 4.9.6 contains the estimated trip generation for heavy and light vehicles.
(c) construction worker parking	Construction workforce estimates are provided in section 4.9.3. Impacts of construction worker parking are described in section 5.3.
(d) the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times, special event periods, pedestrian and cyclists, and parking arrangements)	Section 3.1 outlines the existing traffic environment and section 3.7 provides an overview of interfaces with the existing freight network. Sections 5.2 to 5.7 describes the impacts of construction activities across these aspects.
(e) access constraints and impacts on public transport (infrastructure and services), pedestrians and cyclists	Sections 3.2, 3.3 3.4 and 3.5 outline the existing public and active transport environment. Impacts on public transport are covered in sections 5.5 and 5.7.3 and active transport in section 5.6.
(f) the need to close, divert or otherwise reconfigure elements of the road, pedestrian and cycle network associated with construction of the proposal and the duration of these changes	Section 5.2 in relation to general road closures, section 5.6 in relation to active transport and section 5.7 in relation to maritime navigation and assets of the Parramatta River.

SEARs requirement	Where addressed in this document
(g) impacts to on-street parking, including to residents and businesses.	Section 3.10 outlines the existing parking conditions. Section 5.3 describes impacts of construction activities on parking. Section 5.4 outlines the impacts of construction activities on property access.
2) Operational transport impacts, including**:**	
(a) performance of key interchanges and intersections by undertaking a level of service analysis at key locations	Section 3.1.4 (existing), section 6.1.2 (summary) and section 6.2 (details for each precinct).
(b) the legibility and useability of the traffic and transport network	Section 6.2 provides a summary of proposed changes to circulation in each area along the project site which considers the legibility and usability of the transport network.
(c) wider transport interactions (local and regional roads, walking and cycling, public and freight transport) including during special event periods	Sections 3.1, 3.7 and 3.8 provide a description of existing conditions. Sections 6.1.2.2, 6.1.6, 6.1.7 and 6.1.8 summarise off-corridor road impacts (including public transport and freight), active transport, special events and interactions with Parramatta River usage respectively. Further details are provided for each precinct in section 6.2.
(d) property and business access and on-street parking	Impacts to parking are summarised in section 6.1.3. More details for property and business access and parking are provided for each precinct in section 6.2.
(e) the accessibility of each stop and the general catchments	Refer to Technical Paper 1 (Design, Place and Movement).
(f) the provision of infrastructure to support accessible paths of travel and interchange	Section 4.1.5 describes the provision of an active transport link as part of the project. Section 6.2.1 to 6.2.7 describe the active transport link along the alignment. Integration with other transport modes as part of the project is described in section 4.2.
(g) an explanation of the scope of the modelled area, including justification of the nominated boundaries.	Section 2.1 describes the general study area and section 2.3 shows the boundaries of the traffic modelling area.

1.4 Disclaimer

This document has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and the Transport for NSW.

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2. Assessment methodology

The assessment for both operation and construction impacts, included the following steps.

– research and document the existing environment, including site inspections, stakeholder consultation and traffic survey data obtained in 2018 and 2019
– review the proposed construction activities and staging with respect to indicative site access, road closures and temporary disruption of the transport network
– identify the potential impacts of the project during construction including impacts on traffic volumes in the road network, road closures and detour routes, disruption to property access, impacts of parking unavailability (including for school operations) and construction workforce parking, temporary public transport arrangements and access to shared paths and Parramatta River
– review the project conditions during operation including integration with other transport modes, changes to road network conditions, intersection performance, walking and cycling connections, and property access considerations
– consider potential impacts on special events, including major events held within Rosehill Gardens Racecourse and Sydney Olympic Park
– identify the potential impacts of the project on the modelled transport network based on:
    - for on-corridor intersections along the alignment: 2019 (base case), 2031 without the project and 2031 with the project model scenarios
    - for off-corridor intersections in the external road network: 2018 (base case), 2031 without the project and 2031 with the project model scenarios
– identify mitigation measures that could avoid, substantially reduce and/or mitigate the likelihood, extent and/or duration of potential impacts
– assess cumulative effects with other existing and proposed developments.

Further details are provided in sections 2.2 and 2.3.

2.1 Study area definition

The study area relevant to the 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 network, Parramatta River and transport networks within and surrounding the project site with the potential to be directly or indirectly affected by the project.

The project has been developed through reference to a number of geographical areas where planned urban development and upgrades would occur. These ‘precincts’ or smaller study areas are generally (but not always) aligned with suburbs and have been used in this assessment to facilitate a systematic assessment of the project and its impacts. These areas together form an overall study area which has been used for assessment purposes.

The study area (and sub areas) used in this assessment are shown in Figure 2.1, and includes the Parramatta CBD.

A description of the modelled traffic area is provided in section 2.3.

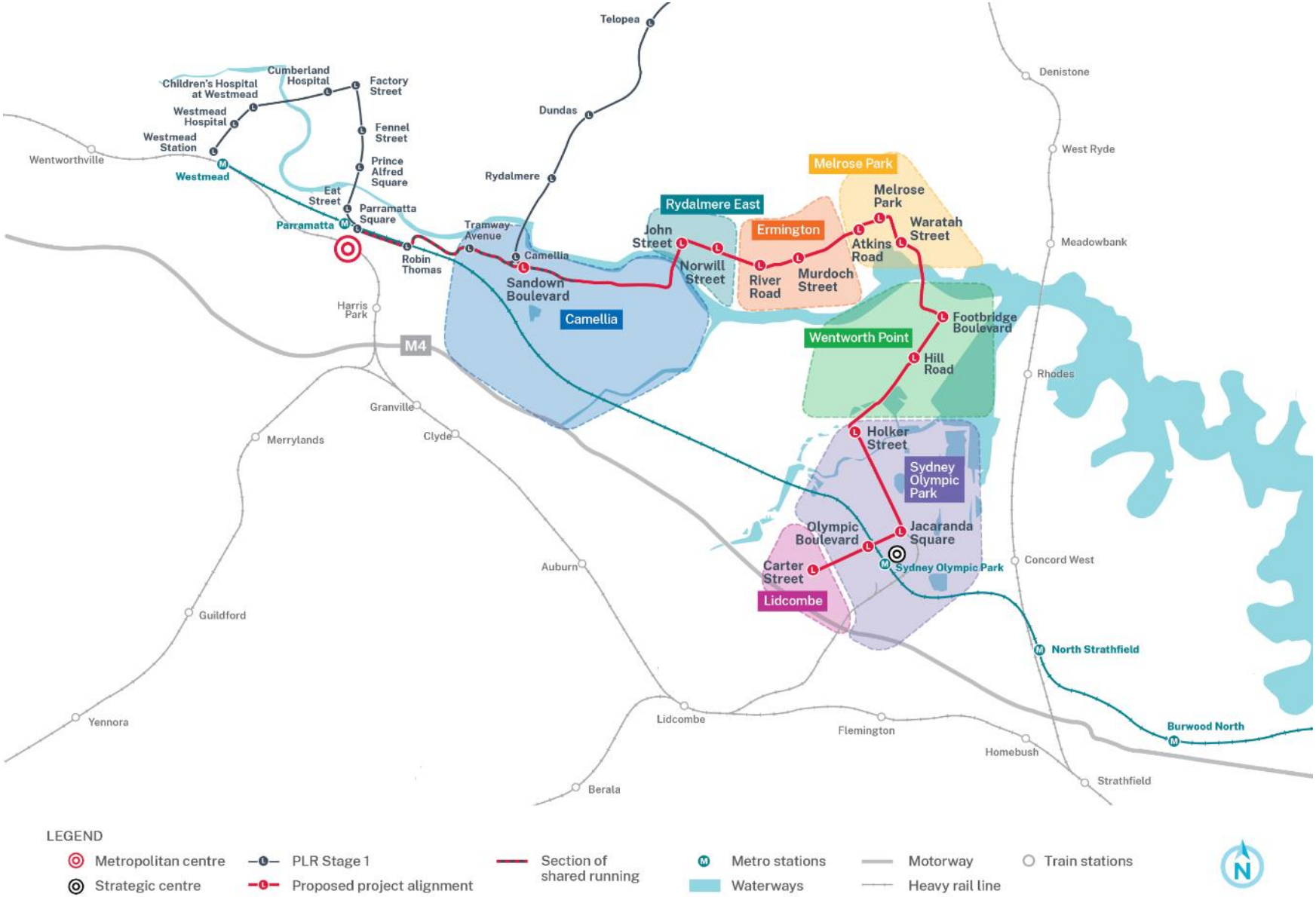


Figure 2.1 Study area and geographic areas referred to in the assessment

2.2 Construction traffic

The construction impact assessment has been carried out based on the following general approach:

– identify and document the key activities associated with construction works for the project including construction staging, site access arrangements and haulage routes
– estimate the trip generation to each area of the project during the peak period of construction, including construction trips (heavy and light vehicles) as well as forecast travel by the construction workforce
– superimpose the construction traffic volumes on key access roads to identify the level of traffic increases on the road network with respect to actual numbers and as a proportion of existing traffic volumes
– review proposed road closures and the suitability of available detour routes for general traffic during the road closure period
– identify the likely impacts on availability of parking in the study area, impacts on property access along the project site, potential temporary bus stop relocation and temporary bus route detours, shared path access, and use of the Parramatta River
– consider potential impacts on special events, including events held at Sydney Olympic Park during the construction period
– where the impacts on traffic and transport have the potential to be significant, mitigation measures have been proposed in order to manage the works
– review the potential cumulative impacts due to construction of the project alongside other projects in the area.

Construction is anticipated to start in 2025, subject to obtaining all necessary approvals, and take around five to six years to complete. For the purpose of this assessment, the peak construction period is expected to be during 2026 and 2027, and as a conservative approach, all areas along the alignment are assumed to be under construction simultaneously. The construction impact assessment has therefore adopted the total forecast construction traffic during this period and applied this to proposed access roads.

2.3 Operational traffic

2.3.1 Traffic and transport modelling

A three-stage traffic forecasting and modelling approach was followed, including a combination of strategic and operational models, to incorporate the wider regional infrastructure and growth influences using the following:

– Sydney Strategic Travel Model (STM) and Public Transport Project Model (PTPM)
– Strategic Motorway Planning Model (SMPM)
– AIMSUN and VISSIM (separate operational models).

The two strategic models (STM and PTPM) were used to estimate the current or future levels of travel demand and their impact on the transport network across the Greater Metropolitan Area. Strategic models typically cover an entire metropolitan area, region or state and are typically used to evaluate major infrastructure plans and population and employment changes over time.

The operational traffic models (AIMSUN and VISSIM/SIDRA) were developed specifically for this project and used to assess the operational traffic impacts on the local road network and surrounding intersections.

The three models used for this assessment and the key inputs and relationships are shown in Figure 2.2.

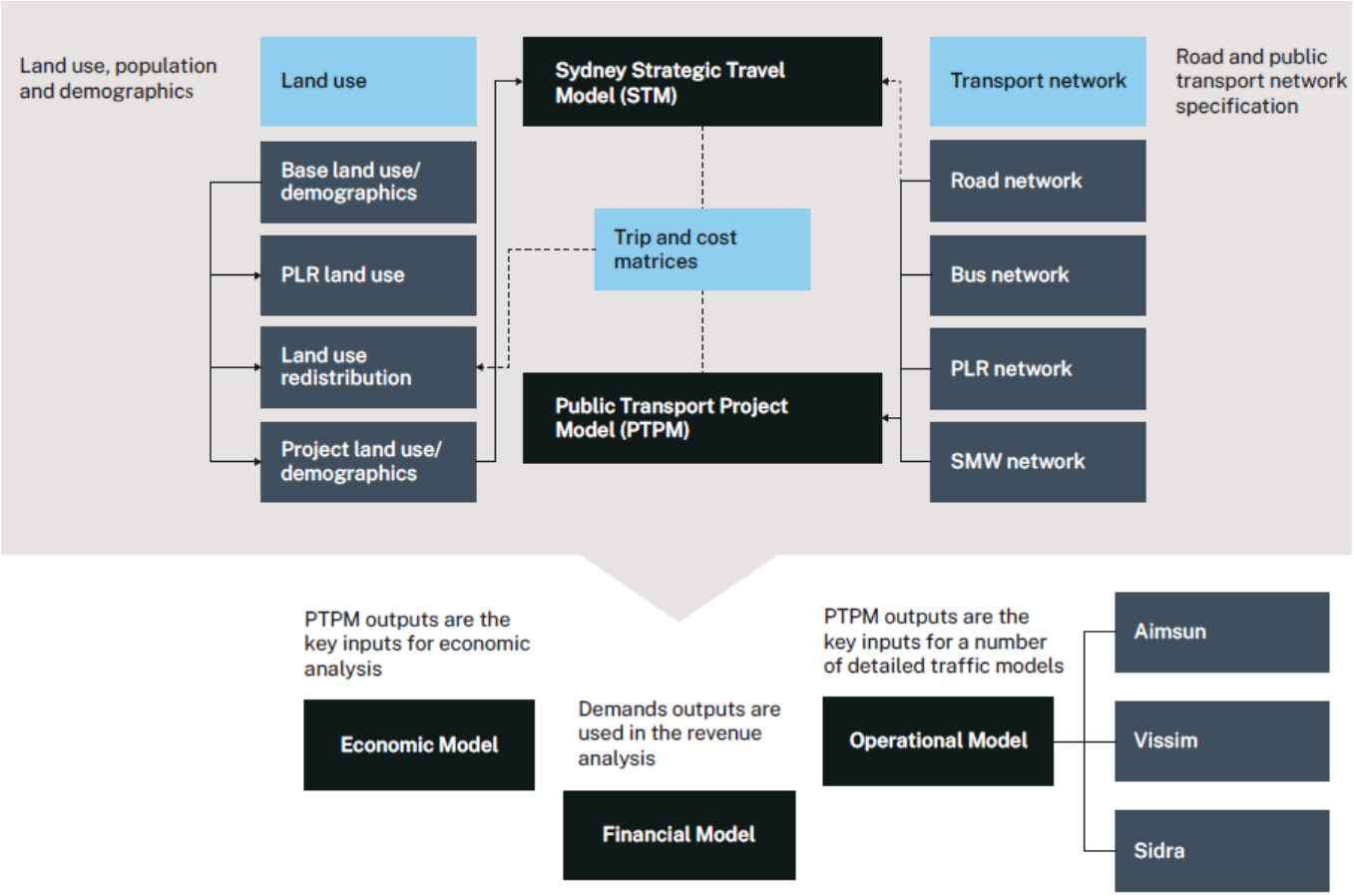


Figure 2.2 Transport modelling overview

The transport network in the operational models is more detailed than in the strategic models as they include the existing and proposed traffic control systems (including signals, sensors, etc). The operational models were used to evaluate the dynamic effects of the project on traffic flows, including individual vehicle lane allocation and merging and weaving manoeuvres, among others.

The AIMSUN operational model is a mesoscopic model with a footprint which covers the study area and surrounds. Given the wide area modelled, as shown in Figure 2.3, the AIMSUN model was primarily used to model off-corridor intersections (that is, intersections outside of the project site) including major intersections along Victoria Road and James Ruse Drive which are not within the project site, but may still be impacted by the project.

It is noted that the AIMSUN model extents do not cover the Parramatta CBD. This area was included in VISSIM modelling developed for the project.

Figure 2.3 AIMSUN modelling extents for the project

The VISSIM microscopic traffic simulation model was developed to analyse existing conditions and forecast future changes to the traffic network and on-corridor intersections within the project site and along the Parramatta Light Rail Stage 1 corridor through the Parramatta CBD. The model used the traffic demands generated from higher level transport models including the Sydney Strategic Travel Model (STM), the Public Transport Project Model (PTPM) and the AIMSUN mesoscopic model as inputs.

The base VISSIM model was calibrated and validated against 2019 traffic network data. This data was collected prior to the COVID-19 pandemic and is considered to represent actual existing conditions on the road network without the traffic impacts of pandemic restrictions. The calibrated and validated base case (2019) model was reviewed by the (former) Roads and Maritime Services and determined as being fit for assessing the potential impacts of the project.

The base model was then modified to incorporate the land use changes which would accompany the Parramatta Light Rail Stage 2 network and other complementary transport services changes as well as development uplift. This included planned revisions to bus routes, known changes to road conditions e.g. upgrades, etc as well as the inclusion of Sydney Metro West and associated development. All proposed intersection layouts within the project site were based on concept designs.

The VISSIM models were then interrogated to understand the expected performance of the traffic network in 2031 both pre- and post-development of the project infrastructure and services. The performance of key intersections within the project site were then analysed and reported. No specific modelling of travel times, either for cars, trucks or buses was carried out. Generally, the reported intersection level of service and delays, would apply to any vehicle using the intersection, including cars, buses or freight vehicles.

Changes to local and regional bus routes and stops are not part of the project for which approval is being sought. Changes to existing and new bus routes are implemented in response to a number of changes in roadway conditions, patronage and public transport services. Changes to public bus services and routes would be designed to complement the efficient operation of Parramatta Light Rail but would be developed and implemented separately by Transport for NSW planners. Where reference or commentary about bus changes is made, it is for information and context only.

A summary of the relevant findings for key intersections within the project site, and in the surrounding area, is included in section 6 of this document.

2.3.2 Intersection performance

The transport network performance is described using the measure Level of Service (LoS).

The transport network performance is largely dependent on the operating performance of key intersections, which are critical capacity control points within the transport network.

The criteria for evaluating the operating performance of intersections are provided by the *Guide to Traffic Generating Developments* (Roads and Maritime Services, 2002) and reproduced in Table 2.1.

Table 2.1 Level of service criteria for intersections

Level of Service	Delay (seconds per vehicle)	Intersection type	
		Traffic Signals, Roundabouts	**Give Way and Stop Signs**
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity At signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over capacity Unstable operation	Over capacity Unstable operation

Source: *Guide to Traffic Generating Developments (Roads and Maritime Services 2002)*

Traffic modelling results in this document are reported based on:

– the average delay for all vehicles at roundabouts and signalised intersections (in seconds)
– the worst delay experienced by a vehicle at stop and give-way controlled intersections (in seconds).

LoS is applied to each “band” of delays experienced. For example, a signalised intersection having LoS A means there is good operation with average delay being less than 14 seconds per vehicle travelling through the intersection. In contrast, a signalised intersection having LoS F means there is unstable operation and the intersection is over capacity with average delay being greater than 70 seconds per vehicle travelling through.

For signalised sites, intersection performance of LoS D or better is considered acceptable. Where forecast LoS is E or F, mitigation of traffic performance impacts may be required subject to site-specific conditions.

Similarly, for stop and give-way controlled sites, intersection performance of LoS C or better is considered acceptable. LoS D may be considered acceptable under some circumstances, for example at left-in / left-out sites with minimal conflict points. Where forecast LoS is E or F, further mitigation of traffic impacts may be required.

3. Existing traffic and transport environment

3.1 Local, regional and state roads

3.1.1 Key characteristics

The project site is located on either side of the Parramatta River, which separates areas to the north and south. There are three existing north-south options available for crossing the Parramatta River. These are located at James Ruse Drive, Thackeray Street (pedestrians and cyclists (walking) only) and Silverwater Road.

There is also generally limited connectivity for people travelling to and from areas such as Wentworth Point, as well as parts of Melrose Park, and Ermington, including by cycling and walking, with relatively long and circuitous routes required for people in these areas to access regional facilities around Parramatta.

3.1.2 Existing road typologies

A brief description of the existing local, state and regional roads along or close to the project site is provided in Table 3.1.

Table 3.1 Summary of key existing road and street characteristics

Road name and suburb	Categorisation	Typology
Macquarie Street, Parramatta	Local road (east of O'Connell Street)	– Single carriageway, single lane (eastbound) between O'Connell Street and Church Street – 40 km/h speed limit in area east of O'Connell Street (subject to Parramatta Light Rail Stage 1 construction works) – No dedicated cycling facilities
James Ruse Drive, Camellia	State road	– Dual carriageway separated by narrow median strip – Three lanes in each direction – 70 km/h speed limit – No dedicated cycling facilities
Grand Avenue, Camellia	Local road	– Single carriageway with a wide central reservation between Grand Avenue North and Durham Street, one lane in each direction – Single carriageway east of Durham Street, one lane in each direction – 50 km/h speed limit (not signposted) – No dedicated cycling facilities
John Street, Rydalmere	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
South Street, Rydalmere	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
Victoria Road, Rydalmere	State road (east of Church Street) and Regional road (west of Church Street)	– Dual carriageway separated by narrow median strip – Two lanes in each direction – Varying 60 km/h to 70 km/h speed limit – No dedicated cycling facilities

Road name and suburb	Categorisation	Typology
Silverwater Road, Rydalmere	State road	– Dual carriageway separated by median strip – Two lanes in each direction – 80 km/h speed limit – No dedicated cycling facilities
Boronia Street, Ermington	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
Hughes Avenue, Melrose Park	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
Hope Street, Ermington	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
Waratah Street, Melrose Park	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit (not signposted) – No dedicated cycling facilities
Wharf Road, Melrose Park	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit with a 40 km/h school zone for Melrose Park Public School – No dedicated cycling facilities
Hill Road, Wentworth Point	Local road (north of Holker Street bus way) and Regional road (south of Holker Street bus way)	– Dual carriageway separated by line marked central reservation – One lane in each direction – 50 km/h speed limit north of Bennelong Parkway – 60 km/h speed limit south of Bennelong Parkway – On-road cycle lanes north of Bennelong Parkway only
Holker Busway, Sydney Olympic Park	Bus only	– Dual carriageway separated by median strip north of P5 public amenities – Single carriageway south of P5 public amenities – One lane in each direction – 60 km/h speed limit (not signposted) – On-road cycle lane in each direction
Australia Avenue, Sydney Olympic Park	Local road	– Dual carriageway separated by median strip – Two lanes in each direction – 60 km/h speed limit – On-road cycle lane in each direction
Dawn Fraser Avenue, Sydney Olympic Park	Local road	– Single carriageway – One lane in each direction – 40 km/h speed limit – On-road cycle lane in each direction
Showground Road, Sydney Olympic Park	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities

Road name and suburb	Categorisation	Typology
Murray Rose Avenue, Sydney Olympic Park	Local road	– Single carriageway – One lane in each direction – 50 km/h speed limit – No dedicated cycling facilities
Uhrig Road, Lidcombe	Local road	– Single carriageway – One lane in each direction – 60 km/h speed limit – No dedicated cycling facilities

The key roads in the immediate vicinity of the project site and their existing speed limits are shown in Figure 3.1.

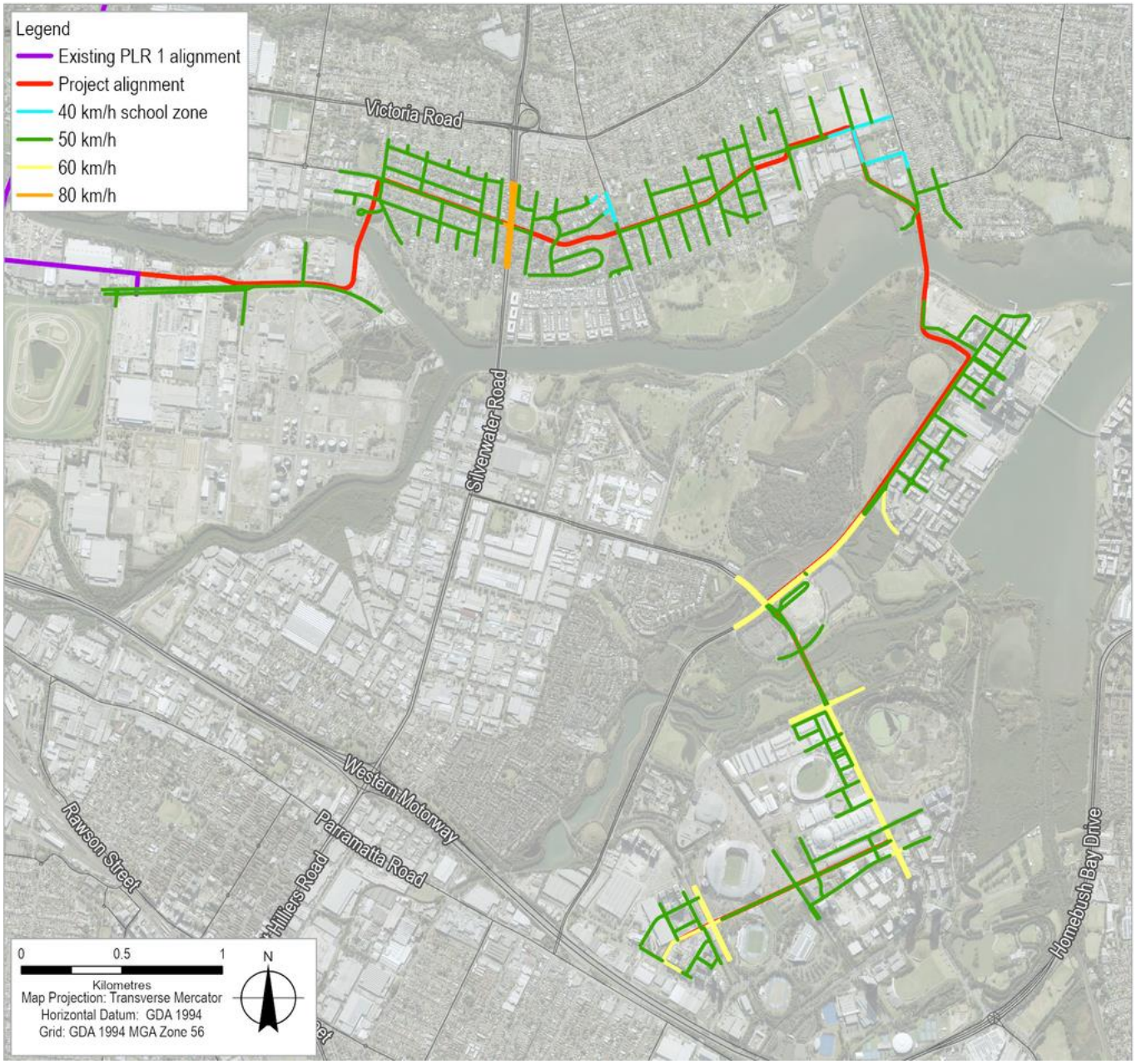


Figure 3.1 Existing speed limits along key roads close to the project alignment

3.1.3 Traffic volumes

An estimate of the peak hourly traffic volumes and heavy vehicle composition on key road/streets in 2019 is provided in Table 3.2 below. This is based on traffic surveys completed in 2018 and 2019. While the data is from over two years ago, this is considered acceptable given the changes in travel demand and behaviour which has occurred since the advent of the COVID-19 pandemic. The 2018 and 2019 traffic surveys are considered to be conservative estimates of current traffic volumes.

Table 3.2 Peak traffic volumes on key roads and streets

Road section and precinct	Weekday morning peak (8am to 9am)		Weekday afternoon peak (5pm to 6pm)	
	Total volume (vehicles)	% HV	Total volume (vehicles)	% HV
Macquarie Street (near Smith Street), Parramatta CBD	**476**	5%	**542**	2%
Grand Avenue and Hassall Street (James Ruse Drive to ALDI Access/Rosehill Gardens Racecourse Gate 1 Access), Camellia	**895**	17%	**774**	5%
South Street (Park Road to John Street), Rydalmere	**614**	6%	**613**	3%
Boronia Street (Honor Street to Trumble Avenue), Ermington	**509**	1%	**616**	1%
Atkins Road (Boronia Street to Hope Street), Melrose Park	**517**	3%	**597**	1%
Hope Street (Hughes Avenue to Waratah Street), Ermington	**907**	2%	**926**	1%
Wharf Road (Mary Street to Andrew Street), Melrose Park	**603**	1%	**1,007**	1%
Hill Road (Bennelong Parkway to Holker Street, Sydney Olympic Park), Wentworth Point	**1,484**	6%	**1,678**	4%
Holker Street, Sydney Olympic Park	**1,018**	4%	**1,274**	3%
Australia Avenue (Dawn Fraser Avenue to Parkview Drive/Herb Elliott Avenue), Sydney Olympic Park	**876**	6%	**949**	5%
Dawn Fraser Avenue (Showground Road to Olympic Boulevard), Sydney Olympic Park	**256**	9%	**239**	9%

Note: HV= heavy vehicles

3.1.4 Intersection performance

3.1.4.1 On-corridor intersections

Table 3.3 shows the modelled LoS and vehicle delay (in brackets) at each of the modelled intersections within the project site under 2019 traffic conditions. For traffic signals and roundabout control, the average delay for all vehicles using the intersection has been reported. For give-way and stop control, the worst delay experienced by any one vehicle using the intersection has been reported. Note that at intersections for which traffic modelling results were not available, traffic performance has not been reported.

Table 3.3 2019 on-corridor intersection performance – morning (8am to 9am) and afternoon (5pm to 6pm) peak periods

Intersection	Control type	Morning LoS (delay in seconds)	Afternoon LoS (delay in seconds)
Grand Avenue / Thackeray Street		A (2)	A (1)
South Street / John Street		A (8)	A (6)
South Street / Patricia Street		A (2)	A (4)
South Street / Nowill Street		A (10)	A (4)
South Street / Primrose Avenue		A (11)	A (12)
Silverwater Road / South Street		B (24)	E (59)
South Street / River Road		A (2)	A (3)
Boronia Street / Spurway Street / Broadoaks Street		A (4)	A (7)
Boronia Street / Honor Street		A (4)	A (1)
Boronia Street / Trumble Avenue		A (4)	A (5)
Boronia Street / Boyle Street		A (4)	A (5)
Boronia Street / Murdoch Street		A (13)	B (13)
Boronia Street / Spofforth Street		A (0)	A (6)
Boronia Street / Trumper Street		B (13)	B (25)
Boronia Street / Atkins Road		A (3)	A (4)
Hope Street / Hughes Avenue		A (14)	B (15)
Hope Street / Waratah Street		A (9)	A (6)
Waratah Street / Mary Street		-	-
Hill Road / Footbridge Boulevard		A (11)	B (16)
Hill Road / Verona Drive		-	-
Hill Road / Nuvolari Place		B (16)	A (12)
Hill Road / Baywater Drive		B (16)	C (35)
Hill Road / Stromboli Strait		B (27)	B (27)

Intersection	Control type	Morning LoS (delay in seconds)	Afternoon LoS (delay in seconds)
Hill Road / Bennelong Parkway		B (17)	F (>150)
Hill Road / Holker Street / Holker Busway		B (25)	B (25)
Australia Avenue / Kevin Coombs Avenue / Marjorie Jackson Parkway / Holker Busway		A (9)	A (5)
Australia Avenue / Grand Parade		A (7)	A (3)
Australia Avenue / Murray Rose Avenue		D (46)	B (27)
Australia Avenue / Dawn Fraser Avenue		A (2)	A (2)
Dawn Fraser Avenue / Park Street		A (5)	A (3)
Dawn Fraser Avenue / Showground Road		A (12)	A (10)
Dawn Fraser Avenue / Olympic Boulevard		B (20)	B (19)
Dawn Fraser Avenue / Uhrig Road / Edwin Flack Avenue		B (24)	B (22)

Note: For signalised intersections, the intersection average is reported and for other intersections, the movement with the longest delay is reported.

The level of service performance of all on-corridor intersections in 2019 was acceptable (that is, LoS D and better for signalised intersections and LoS C and better for stop and give-way control) with the following exceptions:

– The intersection of Silverwater Road and South Street is currently operating at LoS E during the afternoon peak period with delays of up to 59 seconds for vehicles turning left out of South Street onto Silverwater Road heading northbound. This is generally reflective of the high volumes of traffic using Silverwater Road.
– The intersection of Hill Road and Bennelong Parkway is currently operating at LoS F during the afternoon peak period with delays greater than 150 seconds. Hill Road provides the primary access from Parramatta Road and the M4 Western Motorway to Sydney Olympic Park and developments at Newington and Wentworth Point for freight and general traffic. Adjoining roads such as Bennelong Parkway therefore receive a lower priority at intersections resulting in delays during both the morning and afternoon peak periods.

3.1.4.2 Off-corridor intersections

Table 3.4 shows the modelled LoS and average vehicle delay (in brackets) at each of the modelled off-corridor intersections in the vicinity project site which may be impacted by the project under 2019 traffic conditions. For traffic signals and roundabout control, the average delay for all vehicles has been reported. For give-way and stop control, the worst delay experienced by any user of the intersection has been reported.

Table 3.4 2018 off-corridor intersection performance – morning (8am to 9am) and afternoon (5pm to 6pm) peak periods

Intersection	Control type	Morning LoS (delay in seconds)	Afternoon LoS (delay in seconds)
Grand Avenue North / James Ruse Drive		E (62)	F (>150)
Hassall Street / James Ruse Drive / Grand Avenue		E (59)	D (46)
South Street / Park Road		A (4)	A (4)
Victoria Road / Park Road		D (50)	D (46)
Victoria Road / John Street		B (21)	B (21)
Victoria Road / Silverwater Road		B (15)	B (26)
Victoria Road / River Road		A (13)	A (15)
Victoria Road / Spurway Street		C (36)	C (38)
Victoria Road / Trumper Street		B (16)	A (14)
Victoria Road / Kissing Point Road / William Street		A (13)	C (30)
Victoria Road / Wharf Road		C (43)	E (60)
Hope Street / Wharf Road / Lancaster Avenue		A (6)	A (6)
Hill Road / Pondage Link		A (12)	B (18)
Olympic Boulevard / Sarah Durack Avenue		B (16)	B (21)

Note: For signalised intersections, the intersection average is reported and for other intersections, the movement with the longest delay is reported.

The level of service performance for most of the off-corridor intersections is generally acceptable (that is, LoS D or better for signalised intersections and LoS C or better for stop or give-way control) with the following exceptions:

– The intersection of Grand Avenue North and James Ruse Drive is currently operating at LoS E in the morning peak and LoS F in the afternoon peak. It is likely that traffic exiting Grand Avenue North must wait for queues to develop on James Ruse Drive and utilise the Keep Clear markings in order to proceed through the intersection.

– Other intersections along James Ruse Drive and Victoria Road are currently approaching capacity and operating at LoS D or LoS E during peak periods including Hassall Street / James Ruse Drive / Grand Avenue, Victoria Road / Park Road and Victoria Road / Wharf Road.

3.1.4.3 Parramatta CBD intersections

Table 3.5 shows the modelled LoS and vehicle delay (in brackets) at each of the modelled intersections along the Parramatta Light Rail Stage 1 route within the Parramatta CBD. These intersections may be impacted by increased light rail frequency when the project is operational. For traffic signals and roundabout control, the average delay for all vehicles has been reported. For give-way and stop control, the worst delay experienced by any user of the intersection has been reported.

Table 3.5 2018 Parramatta CBD intersection performance – morning (8am to 9am) and afternoon (5pm to 6pm) peak periods

Intersection	Control type	Morning LoS (delay in seconds)	Afternoon LoS (delay in seconds)
Macquarie Street / Church Street		B (27)	B (26)
Macquarie Street / Smith Street		D (47)	D (52)
Macquarie Street / Charles Street		B (21)	B (16)
Macquarie Street / Harris Street		B (18)	A (9)
George Street / Harris Street / MacArthur Street		B (17)	C (31)
George Street / Purchase Street / Noller Parade		A (2)	A (3)
George Street / Alfred Street		A (2)	A (1)
Alfred Street / River Road West / Tramway Avenue		A (2)	A (3)

The level of service performance for all of the modelled Parramatta CBD intersections is generally acceptable (that is, LoS D or better for signalised intersections and LoS C or better for stop or give-way control).

3.2 Rail

3.2.1 Light rail

Stage 1 of Parramatta Light Rail would run from Westmead to Carlingford, via Camellia providing 16 light rail stops along a 12 kilometre light rail corridor. A stabling and maintenance facility would be located at Camellia to the south of Grand Avenue with capacity for both Stage 1 and future stages of the network.

Parramatta Light Rail Stage 1 was approved on 29 May 2018 and is currently under construction, expected to be operational in 2024.

3.2.2 Heavy rail

The nearest access points from the project to the Sydney Trains network are at:

– Parramatta Station – approximately 375 metres from the project (T1, T2, T5 and Blue Mountains line services)
– Rhodes Station – approximately 1.3 kilometres from the project (T9 Line)
– Olympic Park Station – approximately 375 metres from the project (T7 Line).

Heavy rail connections to Parramatta, Sydney Olympic Park and Rhodes are currently difficult to access from suburbs like Ermington and Melrose Park. This is due to geographical barriers, the distance between travel modes and lack of alternatives to private car use, creating less efficient interchanges.

Although Wentworth Point is adjacent to Rhodes, access from Wentworth Point to Rhodes Station is either by walking approximately two kilometres, three public bus services or taking the Baylink shuttle bus (the latter being operational on weekdays only), all via Bennelong Bridge.

3.2.3 Sydney Metro West

Sydney Metro West is a new 24-kilometre metro line with stations between Westmead and Hunter Street in the Sydney CBD which is currently under construction. Major stops have been announced at Sydney Olympic Park and Parramatta, where they would be accessible from Parramatta Light Rail Stage 2 stops. Construction of Sydney Metro West commenced in 2020 and is expected to be operational in 2030. The cumulative construction impacts of Sydney Metro West are outlined in section 7.1.2.

A summary of the existing and proposed rail transport services in the study area is provided in Table 3.6 and shown in Figure 3.2. Note that the T6 Carlingford Line has been closed to heavy rail services since January 2020 and is being converted to light rail as part of Parramatta Light Rail Stage 1.

Table 3.6 Summary of rail access along the alignment

Area	Rail access
Parramatta CBD	– Parramatta Station which provides access to the Sydney Trains' T1, T2, T5 and Blue Mountains Lines. – Proposed Sydney Metro West station at Parramatta.
Camellia	– Former Camellia Station, on the former T6 Carlingford Line, is located on Grand Avenue North. – Stage 1 of the Parramatta Light Rail network involves converting the former T6 heavy rail line and Camellia Station to light rail.
Rydalmere	– No train station. – The closest train station was Rydalmere on the former T6 Carlingford Line; however, Stage 1 of the Parramatta Light Rail network involves converting the heavy rail line and Rydalmere Station to light rail.
Ermington	– No train station. – The closest train station is to the east at Meadowbank on the T9 Northern Line and Rydalmere Station, on the former T6 Carlingford Line, which is being converted to light rail as part of Parramatta Light Rail Stage 1, is located to the west.
Melrose Park	– No train station. – The closest train station is Meadowbank on the T9 Northern Line to the east.
Wentworth Point	– No train station. – The closest is Rhodes Station on the T9 Northern Line across the Bennelong Bridge to the east. – From Wentworth Point, Rhodes Station can be accessed via walking, cycling, two public bus services (533, 526), or the Baylink shuttle bus. – The walking distance via Bennelong Bridge is around two kilometres (25 minutes) while the travel time by bike or bus is around 10 minutes.
Sydney Olympic Park	– The T7 Olympic Park Line provides a 'shuttle service' between Lidcombe, with the main access point to Olympic Park Station located adjacent to Dawn Fraser Avenue. – This shuttle service operates with a headway of 10 minutes and travel time between Sydney Olympic Park and Lidcombe is around 10 minutes. – At Lidcombe Station, customers can connect to the T1 North Shore & Western, T2 Inner West, and T3 Bankstown lines. – Proposed Sydney Metro West station at Sydney Olympic Park.
Lidcombe	– No train station. – The closest train stations are Sydney Olympic Park (T7 Olympic Park Line) and is within 15 minutes walking distance. Lidcombe and Flemington Stations are located further to the south and provide connectivity to the T1, T2 and T3 lines.

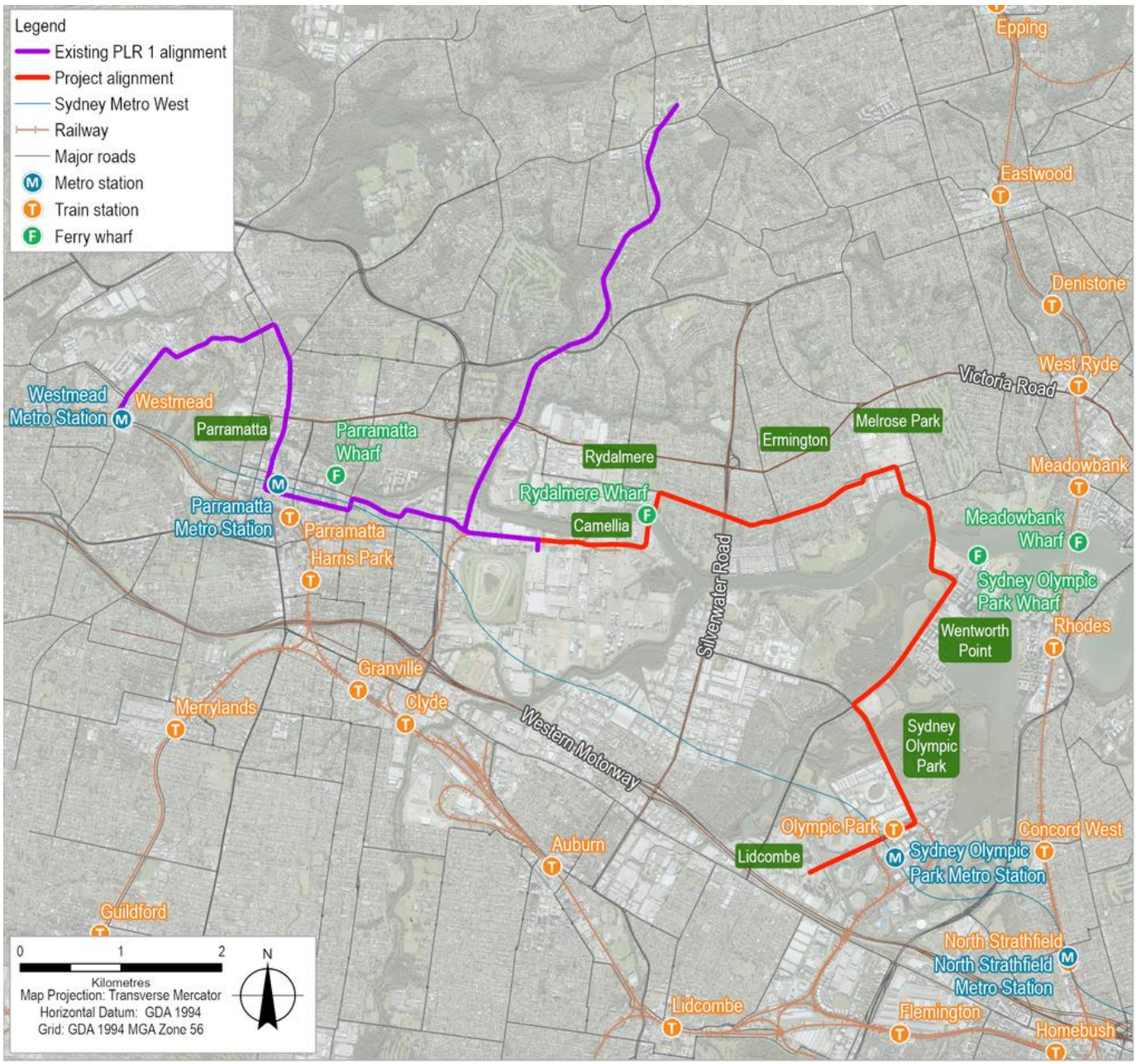


Figure 3.2 Existing and proposed rail and ferry wharves in the study area

3.3 Bus

There are seven bus routes which currently operate near the project site between Camellia and the Carter Street precinct, as summarised in Table 3.7. A map of these current routes is shown in Figure 3.3. Although the local bus network is diverse and provides coverage to Parramatta CBD and Sydney Olympic Park, the bus schedules are less frequent than connecting train services and can be subject to traffic congestion. This makes it an unreliable transport option for many customers in the study area.

Table 3.7 Summary of existing bus routes

Route number	Route description	Suburbs serviced by the bus route	General service frequency*
M92	Parramatta to Sutherland Sutherland to Parramatta	– Camellia	Every 10 minutes during peak periods
525	Burwood to Parramatta via Sydney Olympic Park Parramatta to Burwood via Sydney Olympic Park	– Camellia – Rydalmere – Ermington – Sydney Olympic Park	Every 20 minutes during peak periods
544	Auburn to Macquarie Centre via Eastwood Macquarie Centre to Auburn via Eastwood	– Camellia – Rydalmere	Every 30 minutes during peak periods
524	Parramatta to Ryde via West Ryde Ryde to Parramatta via West Ryde	– Camellia – Rydalmere – Ermington – Melrose Park	Every 30 minutes during peak periods
533	Rhodes to Burwood Shopping Centre Burwood to Rhodes Shopping Centre	– Wentworth Point – Sydney Olympic Park	Every 15 minutes during peak periods
526	Chatswood to Sydney Olympic Park via Rhodes and North Ryde Sydney Olympic Park to Chatswood via North Ryde and Rhodes	– Wentworth Point – Sydney Olympic Park	Every 30 minutes during peak periods
401	Lidcombe Station to Lidcombe Birnie Avenue (Loop Service)	– Sydney Olympic Park	Every 30 minutes during peak periods

* Note: Bus service frequency indicated reflects information available at the time of this document. This may change in response to public restrictions associated with the pandemic response.

Currently there is also the Baylink Shuttle bus that connects customers in Wentworth Point to Rhodes Station.

The ‘regular service’ runs each weekday between 6.30am and 8pm with a 30-minute frequency. The ‘express service’ operates with a 15-minute frequency between 6.30am and 10am in the morning and between 2.30pm and 7.30pm in the afternoon.

There are 38 existing bus stops near the project site, as shown in Figure 3.4:

- South Street before John Street
- South Street at John Street
- South Street after Nowill Street
- South Street opposite Nowill Street
- Primrose Avenue opposite Dorothy Street
- South Street at Fallon Street
- Silverwater Road at South Street (northbound)
- Silverwater Road at South Street (southbound)
- Boronia Street at Spurway Street
- Boronia Street before Trumble Avenue
- Boronia Street after Boyle Street
- Boronia Street opposite Boyle Street
- Boronia Street before Murdoch Street
- Boronia Street at Spofforth Street
- Boronia Street after Trumper Street
- Boronia Street at Atkins Road (northbound)
- Boronia Street at Atkins Road (southbound)
- Hope Street at Hughes Avenue (eastbound)
- Hope Street at Hughes Avenue (westbound)
- Hope Street at Waratah Street
- Hope Street opposite Waratah Street
- Sydney Olympic Park Wharf, Hill Road
- Hill Road after Burroway Road
- Hill Road opposite Burroway Road
- Hill Road at Half Street
- Hill Road opposite Half Street
- Hill Road at Nuvolari Place
- Hill Road opposite Nuvolari Place
- Hill Road opposite Stromboli Strait
- Hill Road at Stromboli Strait
- Hill Road at Holker Street
- Olympic Park Station, Dawn Fraser Avenue
- Olympic Park Station, Park Street
- Park Street opposite Olympic Park Station
- Dawn Fraser Avenue opposite Olympic Park Station
- Dawn Fraser Avenue before Edwin Flack Avenue
- Dawn Fraser Avenue after Edwin Flack Avenue
- Carter Street at Uhrig Road.

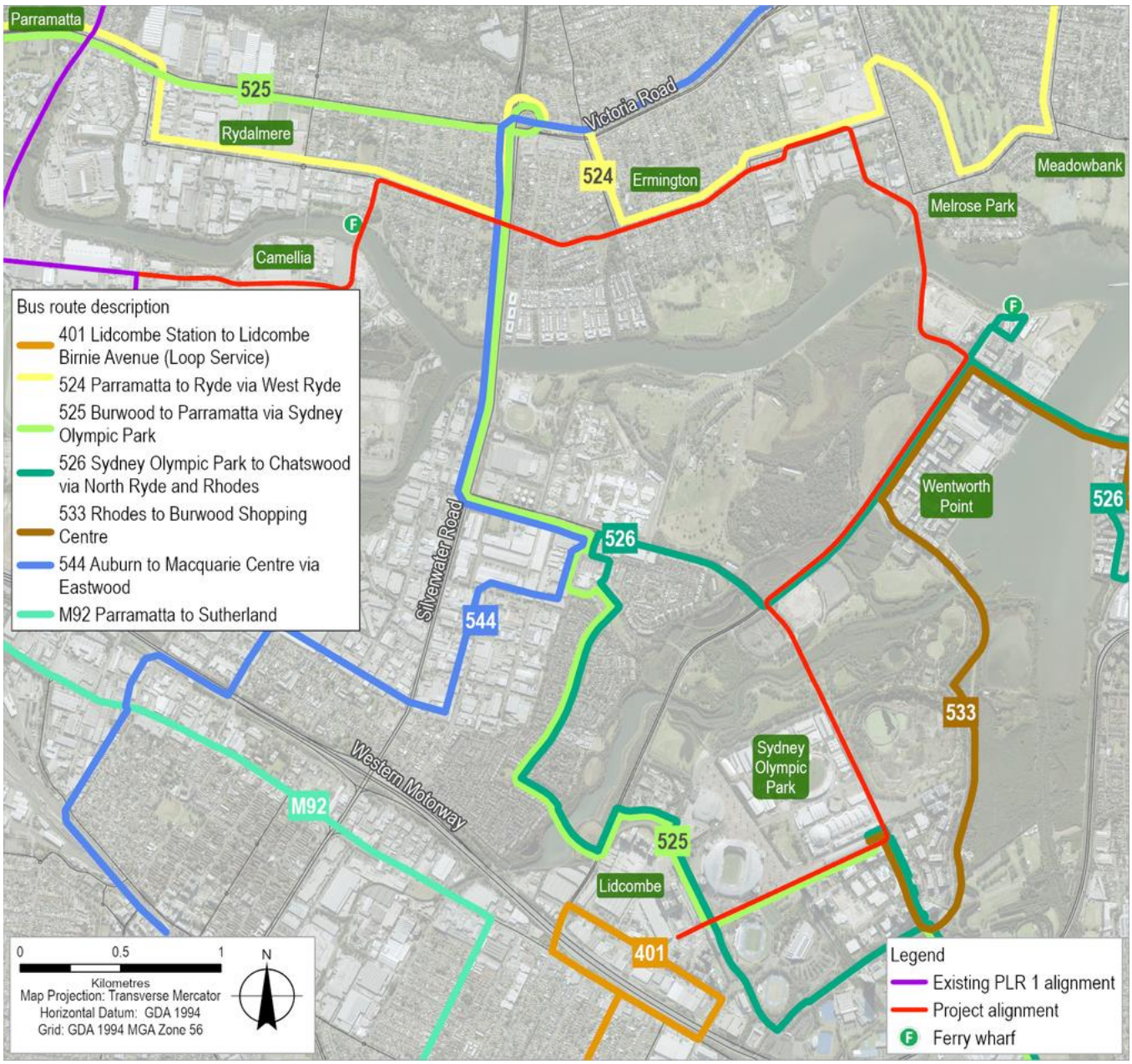


Figure 3.3 Existing bus routes near the project alignment

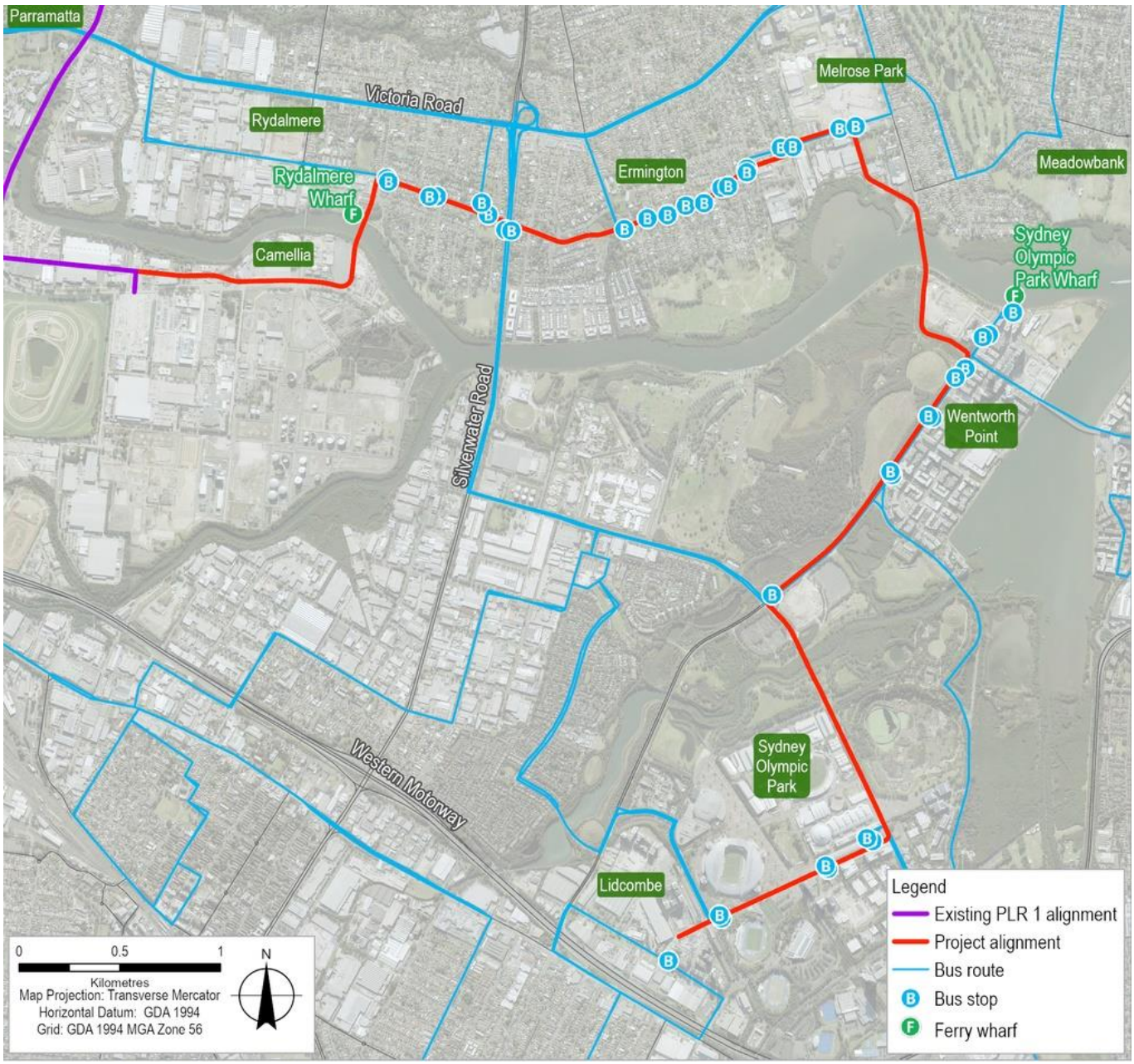


Figure 3.4 Location of existing bus stops near the project alignment

3.4 Ferry

The F3 ferry service between Parramatta and Circular Quay is operated by Transdev Sydney Ferries on behalf of Transport for NSW, with ferry wharves located at Rydalmere and Sydney Olympic Park (near Wentworth Point), both of which are located adjacent to the project site. Transdev Sydney Ferries operate a total of 34 services on weekdays and 33 on Saturdays, Sundays and public holidays along the route between the Parramatta CBD and Sydney Olympic Park ferry wharves.

Tidal conditions prevent up to 10 per cent of ferry services from operating at Parramatta each year. During these periods, ferries terminate at Rydalmere Wharf and bus replacement services operate between Rydalmere and Parramatta, via Victoria Road. The provision of a replacement bus service is needed because there is no frequent, direct, high-amenity public transport connection between the Rydalmere and Parramatta wharves.

The passenger demand profile for ferry services compared with other public transport modes was reviewed based on Opal card tap-off data for a period in February 2020. The results indicate that weekday ferry demand shows morning and afternoon peak periods similar to other modes, driven by commuting demand. However, demand between the two peak periods was higher than train and bus services, which may be due to recreational trips being more common for this mode.

Hourly use data for a period of seven consecutive days was also reviewed and showed weekdays exhibit a typical daily demand profile, with evident morning and afternoon commuter peak periods. Weekends did not have a pronounced peak, with demand building throughout the morning period and being fairly constant until the evening. Also, the Sunday peak demand period was observed to be greater than the weekday. Parramatta Wharf is located close to the 900 and 545 bus routes, providing services between key places within Parramatta CBD (e.g. Western Sydney Stadium, Parramatta Leagues Club, Saint Patrick's Cathedral) and Macquarie Park (via Eastwood). Further information regarding ferry usage is provided in Appendix A (Parramatta River Bridges Background Report).

At Rydalmere Wharf, there is currently limited connectivity to other transport modes with a single bus service (route 524) providing a duplicate transport connection between the Parramatta and Sydney Olympic Park wharves.

Sydney Olympic Park Wharf is located in close proximity to the 526 and 533 bus routes, providing services between the Burwood and Rhodes shopping centres. Recent upgrades at both Rydalmere and Sydney Olympic Park wharves have been completed for regular commuters and for recreational purposes.

3.5 Maritime users and facilities

A summary of maritime users and facilities within the study area is provided below and further information is provided in Appendix A (Parramatta River Bridges Background Report).

3.5.1 Public and private jetties

As well as the Rydalmere and Sydney Olympic Park ferry wharves, Armory Wharf is another public jetty located approximately midway between the proposed bridge between Melrose Park and Wentworth Point and the existing bridge over Silverwater Road. The wharf was previously serviced by the F3 ferry service but is currently in use by water taxis and private craft only.

Two private wharf facilities are also located in the study area. The first is on the southern foreshore immediately upstream of the intersection with Duck River and is owned by Viva Energy Australia. The second is approximately 600 metres upstream on Duck River owned by Lubrizol International Inc.

3.5.2 Public boat ramps

There are four public boat ramps located within the study area, with three located on the northern side of the river:

– Silverwater Boat Ramp, Silverwater Park (southern side of the river)
– Ermington Boat Ramp, Melrose Park
– Blaxland Road Boat Ramp, Rhodes
– Kissing Point Park Boat Ramp, Putney.

Ermington Boat Ramp is located immediately upstream of the proposed bridge between Melrose Park and Wentworth Point and is the largest of the four ramps with parking for 52 boat trailers as well as a large pontoon structure. Anecdotal information indicates that during peak periods, the entry to the boat ramp is congested and parking overflows into surrounding areas.

3.5.3 Recreational users

The waters of the Paramatta River upstream of the existing bridge over Silverwater Road are closed to all recreational and unauthorised commercial vessels.

There are no formal swimming sites, rowing or sailing clubs west of the Concord Road bridge or within the study area. The nearest would be the Concord & Ryde Sailing Club, located about 700 metres downstream of Concord Road bridge (east of the study area).

Further downstream, there are a number of rowing clubs which use Parramatta River for training and regattas which include a number of Sydney private schools as well as Sydney Rowing Club. Rowing NSW rowing courses extend as far as Homebush Bay in the east and do not extend into the area of interest for this report based on a map accessed from the Rowing NSW website. The Parramatta River also narrows substantially upstream of Wentworth Point and interactions with ferry movements become more hazardous for smaller, recreational vessels.

The locations of the identified facilities are shown on Figure 3.5.

3.5.4 Vessel types and specifications

A range of vessels are known to use the Parramatta River. These include:

– ferries (various classes)
– tug boats
– barges (various types and draughts)
– powered recreational vessels
– trailer yachts
– paddle craft
– rowing vessels.

Personal watercraft and kite surfing are banned from operating on the Parramatta River.

3.5.5 Clearance to existing structures

Table 3.8 provides details of the existing horizontal and vertical clearances under various structures upstream and downstream of the bridges between Camellia and Rydalmere and between Melrose Park and Wentworth Point.

Table 3.8 Clearance to existing structures

Existing structure	Location	Horizontal clearance (m)	Vertical clearance above HAT (m)
Thackeray Street pedestrian and utility bridge, Camellia	Upstream of proposed bridge between Camellia and Rydalmere	37.9	11.6
Silverwater Road bridge, Silverwater	Downstream of proposed bridge between Camellia and Rydalmere / upstream of proposed bridge between Melrose Park and Wentworth Point	58.9	11.7
T1 railway bridge, Rhodes (John Whitton Bridge)	Downstream of proposed bridge between Melrose Park and Wentworth Point	45.0	11.0
Concord Road (Ryde) bridge, Ryde	Downstream of T1 railway bridge	35.0 (upstream) 47.0 (downstream)	11.3 (upstream) 10.9 (downstream)

Source: Navionics ChartViewer, Transport for NSW Boating Maps

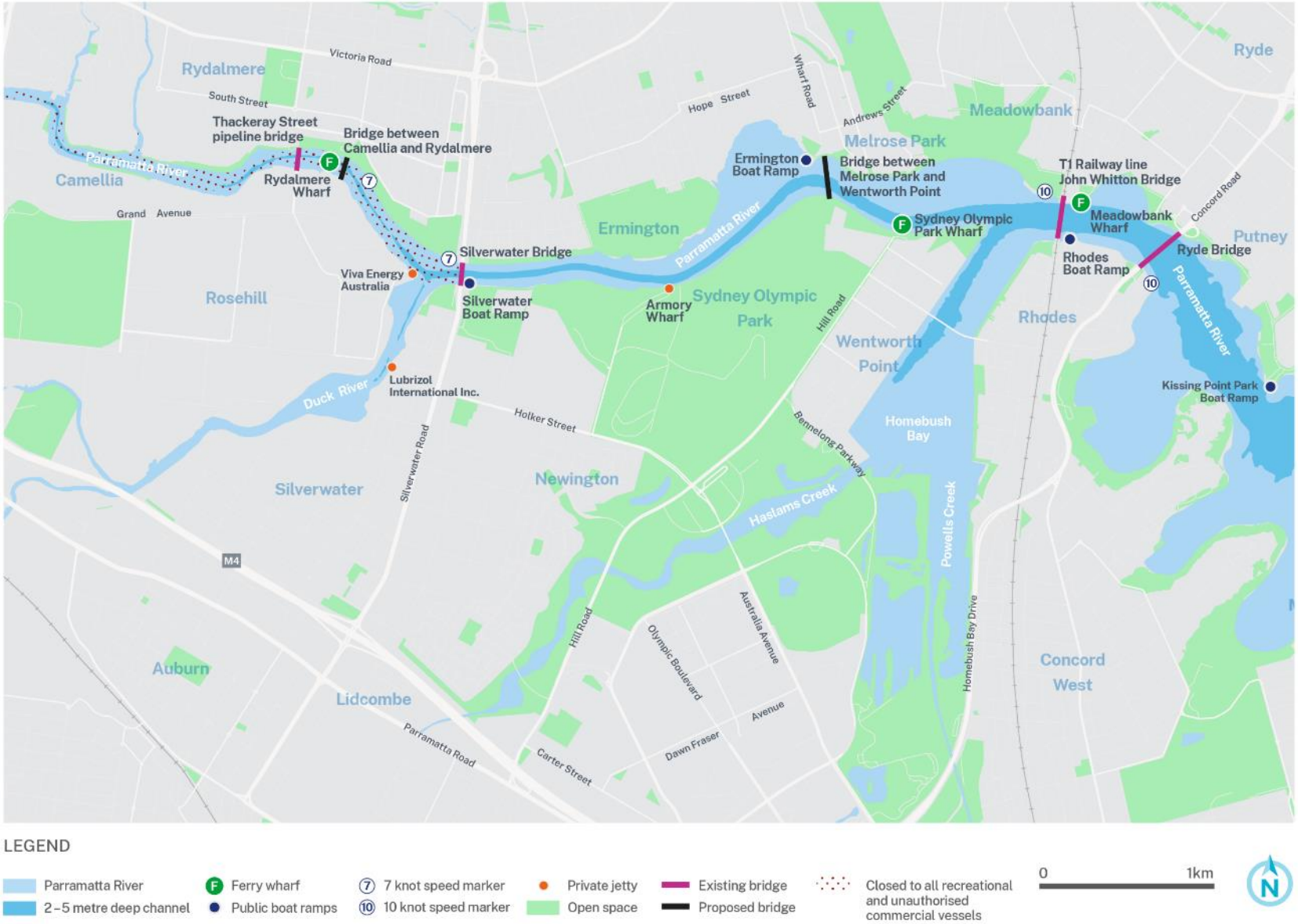


Figure 3.5 Existing ferry wharves, boat ramps and other maritime facilities within the study area

3.6 Walking and cycling

Dedicated off-road bicycle paths are currently located along the Parramatta River (Parramatta Valley Cycleway) and throughout Sydney Olympic Park, however they offer poor connectivity throughout the GPOP priority growth area due to the absence of a bridge between Melrose Park and Wentworth Point.

Sydney Green Grid Plan (Department of Planning, Industry and Environment, 2017) identifies existing cycleways near the project that provide open space access and connect the southeast areas of the West Central District. Existing cycleways include those along major corridors such as James Ruse Drive, Silverwater Road, M4 Motorway and Victoria Road. There are also existing cycleways identified along Durham Street, Australia Avenue and Dawn Fraser Avenue.

The Parramatta Valley Cycleway, linking Parramatta and Meadowbank, traverses the northern bank of the Parramatta River and is a 15-kilometre shared path for pedestrians and cyclists. People can travel along the Parramatta Valley Cycleway and access Parramatta Park for recreation via the central business district. Existing and proposed walking and cycling routes on and near the project site are shown in Figure 3.6.

A pedestrian bridge is provided across Silverwater Road providing pedestrian access between Ermington and Rydalmere.

Pedestrian bridges (also used by cyclists) across the Parramatta River are located at Thackeray Street, Camellia, Silverwater Road, Silverwater and adjacent to the T1 Line at Rhodes, and join the Parramatta Valley Cycleway on both sides of the river.

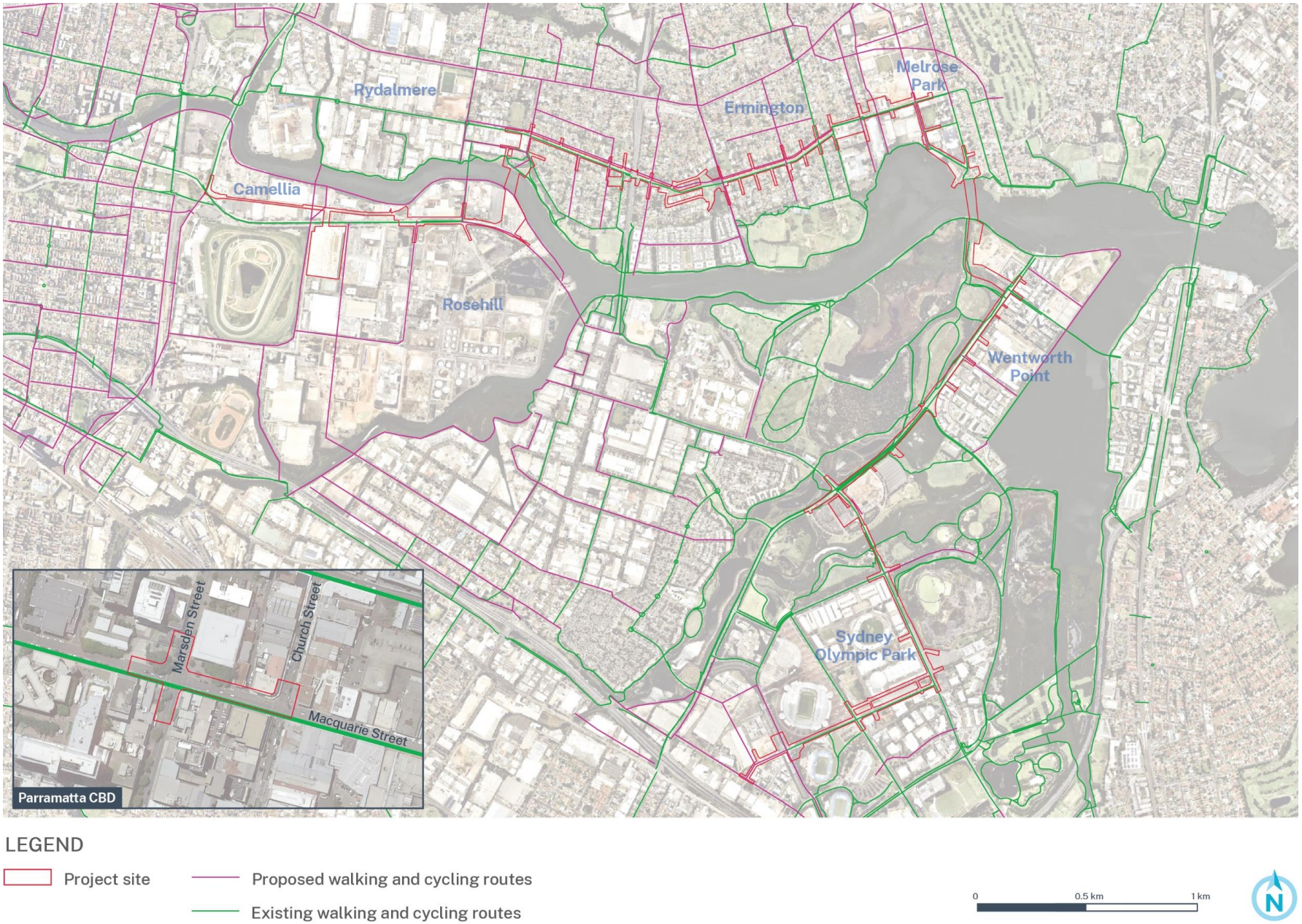


Figure 3.6 Walking and cycling routes on and near the project site

3.7 Freight

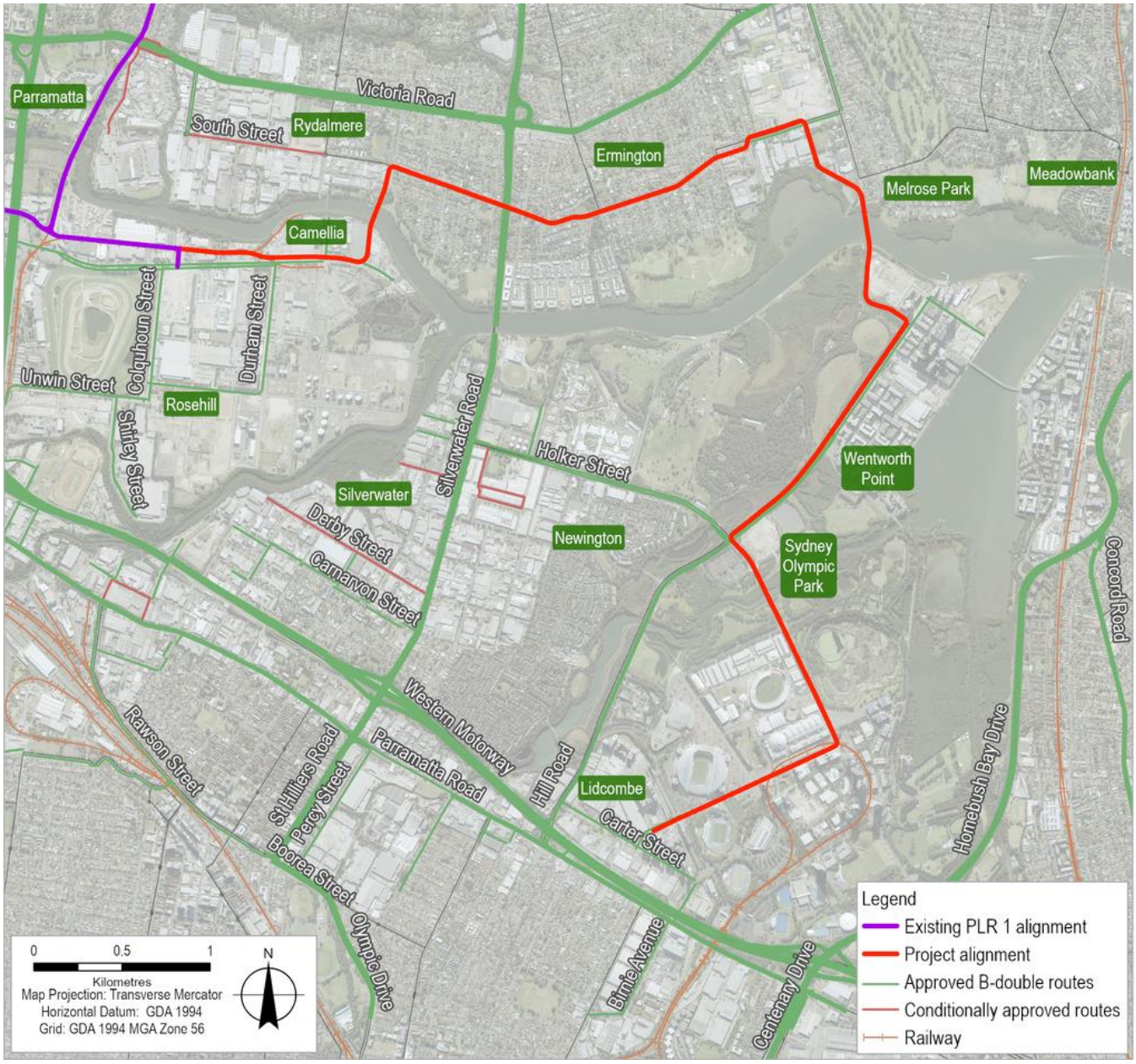
The project site interfaces with Restricted Access Vehicle (RAV) routes including B-doubles routes, Higher Mass Limit (HML) routes and Over-Sized-Over-Mass (OSOM) networks as outlined in Table 3.9 and shown in Figure 3.7. Most roads in the study area are approved 4.6 metre high vehicle routes, with the exceptions of Holker Busway, Dawn Fraser Avenue and parts of South Street between Park Road and Silverwater Road which are not included in the 4.6 metre high vehicle route network.

There are direct overlaps between the project site and freight routes at Hope Street (Melrose Park), Hill Road (Wentworth Point) and Uhrig Road (Carter Street). This is shown below in blue text.

Table 3.9 Project interfaces with the existing freight network

Area	Interaction with existing freight network	Road section of freight route
Parramatta CBD	No interaction	– No approved freight routes
Camellia	Close to and interfaces with	– B-Double routes • Grand Avenue, between Hassall Street and private property access (east of Thackeray Street) • Thackeray Street, between Grand Avenue and bridge over Parramatta River
	Close to but does not interface	– B-Double, HML and OSOM routes • James Ruse Drive – B-Double routes only • Colquhoun Street • Durham Street
Rydalmere East and Ermington	Close to and interfaces with	– B-Double, HML and OSOM routes • Silverwater Road
	Close to but does not interface	– B-Double, HML and OSOM routes • Victoria Road • Clyde Street • South Street (west of Park Road with conditions)
Melrose Park	Directly overlaps	– B-Double routes only • Hope Street, between Hughes Avenue and Wharf Road
	Close to and interfaces with	– B-Double routes only • Wharf Road, between Victoria Road and Hope Street
	Close to but does not interface	– B-Double, HML and OSOM routes • Victoria Road
Wentworth Point	Directly overlaps	– B-Double routes only • Hill Road, between Burroway Road and Holker Busway
	Close to and interfaces with	– B-Double routes only • Holker Street, between Hill Road and Silverwater Road
Sydney Olympic Park	Close to and interfaces with	– B-Double routes only • Uhrig Road, between Dawn Fraser Avenue / Edwin Flack Avenue and Carter Street

Area	Interaction with existing freight network	Road section of freight route
Lidcombe	Directly overlaps	– B-Double routes only • Uhrig Road, between Dawn Fraser Avenue / Edwin Flack Avenue and Carter Street
	Close to and interfaces with	– B-Double routes only • Carter Street
	Close to but does not interface	– B-Double, HML and OSOM routes • M4 Western Motorway • Parramatta Road



Source: Restricted Access for Vehicles Map (Transport for NSW 2020)

Figure 3.7 Existing freight network in the vicinity of the project alignment

3.8 Special events

The two major event venues close to, or within the study area include Rosehill Gardens Racecourse and Sydney Olympic Park. Special events are also held at Western Sydney Stadium and Parramatta Park, which although not within the study area, are within an area that would be serviced by the project. During special events, there are additional dedicated bus services that support movement of large numbers of people to these venues. To a lesser extent, movement of people from Parramatta Park/Western Sydney Stadium and Parramatta CBD also occur but these are more remote from the project study area, the number of events is fewer and crowd volumes are lower.

The following sections describe the ways patrons can currently travel to and from these major event venues.

3.8.1 Rosehill Gardens Racecourse

Rosehill Gardens Racecourse hosted 59 events in 2016, most of which occurred during the daytime. Only six events staged at Rosehill Gardens in 2016 had a crowd greater than 10,000 spectators.

Event patrons are currently able to travel to the racecourse via connecting modes: by ferry to Rydalmere or by train to Parramatta Station, then transfer to a bus service to Rosehill Gardens. This includes the M92 and 535 routes as well as supplementary bus shuttle services that may be provided by the Australian Turf Club.

Patrons of the racecourse would benefit from the operation of Parramatta Light Rail Stage 1 as soon as 2024 which would provide a connecting service between Parramatta Square and the Camellia light rail stop and extend the local and district catchment for spectators. The Camellia light rail stop would be located 300 metres north of Grand Avenue near the main entrance of Rosehill Gardens Racecourse.

Taxi set down and pick up is permitted at the Rosehill Gardens Racecourse. Rosehill Gardens also provides a number of on-site car parking areas for approximately 900 patrons. This includes around 14 accessible spaces for people with a disability or movement impairment.

3.8.2 Sydney Olympic Park

Sydney Olympic Park hosts frequent events with an estimated 5,600,000 visitors per year to its venues. In 2016, there were 1,648 events held. The largest events attract crowds greater than 60,000 people, mostly at night, but 98 per cent of all events staged at Sydney Olympic Park attract crowds under 25,000 which can be accommodated by regular public transport services.

Patrons travelling to Sydney Olympic Park for large events (up to 50,000 people) currently use a variety of public transport services (bus and train) and then walk to the venue. Sydney Trains provides a ‘shuttle service’ for patrons transferring at Lidcombe (T7 Line) and there are bus stops serviced by routes 525, 526, 533.

During major events (> 60,000 people), a special event transport management plan is implemented which includes some road closures, bus stop relocations and additional signage along with additional public transport services. Special event trains are provided direct to Sydney Olympic Park without requiring transfer at Lidcombe. Also, additional special event bus services operate which extend radially from Sydney Olympic Park to suburbs north and south of the Parramatta River, including the following routes:

- Route 1A Warriewood via Dee Why
- Route 1B Warriewood via Mona Vale
- Route 2 Glebe via Hunters Hill
- Route 4 Maroubra
- Route 5A Hills Showground
- Route 5B Tallawong
- Route 6 Woronora
- Route 7 Cronulla
- Route 8 Dural.

There is generally no available street parking due to road closures for events in Sydney Olympic Park. The P1 to P8 car parks provide around 7,100 parking spaces in total, which patrons have the option to pre-book. Sydney Olympic Park town centre also has 376 accessible and mobility car parking spaces for people with disabilities:

– 183 spaces at P1 car park
– nine spaces at P2 car park
– 31 spaces at P3 car park
– 32 spaces at P4 car park
– 77 spaces at P5 car park
– 11 spaces at P6 car parks
– six spaces at P8 car park.

There are also eight on-street accessible spaces on Showground Road, three on Herb Elliott Avenue, one on Murray Rose Avenue (east), five on Dawn Fraser Avenue (west) and 10 on Olympic Boulevard (south).

3.8.3 CommBank Stadium and Parramatta Park events

CommBank Stadium is a multi-purpose, 30,000 seat stadium in Parramatta accessed from O'Connell Street.

Patrons travelling to the CommBank Stadium and Parramatta Park for events would use public transport (bus and rail) and then walk to O'Connell Street. Pedestrian access is available from Westmead Station via Railway Parade (between 15 to 20 minutes) or from Parramatta CBD via Argyle Street and Church Street (around 10 minutes).

There are also regular bus services connecting patrons to and from the Parramatta Station interchange and CommBank Stadium every five minutes. Multiple routes stop on O'Connell Street outside the stadium, including 550, 546, 549, 600, 601, 603, 604, 606, 609, 625 and 706.

Parramatta Light Rail Stage 1 would also provide a connecting service between the Parramatta Square and the Prince Alfred Square light rail stops, for patrons attending events at CommBank Stadium and Parramatta Park. The Prince Alfred Square light rail stop would be located 350 metres east of the O'Connell Street entrance to the stadium.

Taxi set down and pick up are located at Marist Place and Villers Street near Victoria Road. Note that on-site parking is not available on stadium event days. However, there are a number of public parking stations close to the venue for patrons seeking to park in the area including:

– 1,150 spaces at Wentworth Street car park
– 497 spaces at Justice Precinct car park (Hunter Street)
– 560 spaces at Eat Street car park (George Street).

On event days, a transport management plan is implemented at the stadium which includes some road closures and bus stop relocations. Changes to traffic and transport conditions are typically communicated to motorists via Variable Message Signage (VMS) in the area. It is noted that the closures associated with events at Western Sydney Stadium and Parramatta Park are unlikely to impact the project during construction or operation due to being located outside of the immediate study area.

3.9 Property and business access

Driveway accesses to properties and businesses are numerous within the project site, which is reflective of the function of existing roads along the alignment. Through South Street, Boronia Street and Wharf Road, adjacent land use is primarily residential. Business access is more prevalent in Camellia, Melrose Park and Sydney Olympic Park, including connecting people with places of employment in Sydney Olympic Park via New England Avenue, Grand Parade and Figtree Drive.

Within Camellia, it is noted that industrial access is of particular importance due to the high heavy vehicle traffic and industrial land uses. This reflects nearby activities such as warehousing for the supply of goods, motor servicing and storage of fuel at Clyde Terminal.

3.10 Parking

3.10.1 Parking supply

The estimated number of existing on-street parking spaces across the study area is summarised in Table 3.10. This table also includes off-street parking provision at the Rydalmere ferry wharf, boat ramps and near Woo-la-ra, shown below in blue text.

Table 3.10 Summary of existing parking spaces

Area	Location	Road	Segment	Estimated number of existing parking spaces
Parramatta CBD (Macquarie Street turnback)	On alignment	Macquarie Street (northern side)	Marsden Street to Church Street	2 loading zone (daytime) 2P (other times) 4 1P (weekday daytime) 2P (other times) 1 accessible
		Macquarie Street (southern side)	Marsden Street to Church Street	1 mail zone 2 loading zone (daytime) 2P (other times) 4 1P (weekday daytime) 2P (other times) 1 P5min 2 accessible
Camellia	On alignment	Grand Avenue (northern side)	Colquhoun Street to end-point of Camellia	128 unrestricted
		Grand Avenue (southern side)	End-point of Camellia to Colquhoun Street	104 unrestricted
	Side-street	Thackeray Street (both sides)	North of Grand Avenue	52 unrestricted
		Durham Street (both sides)	Grand Avenue to Express Waste	91 unrestricted
Rydalmere	On alignment	South Street (northern side)	John Street to Silverwater Road	49 unrestricted
		South Street (southern side)	Silverwater Road to John Street	47 unrestricted
		John Street (both sides)	South Street to Antoine Street	10 unrestricted
	Side-street	South Street (northern side)	Park Road to John Street	45 unrestricted
		South Street (southern side)	John Street to Park Road	27 unrestricted
		John Street (both sides)	South Street to Dorothy Street	8 unrestricted
		Patricia Street (both sides)	South Street to Dorothy Street	11 unrestricted
		Nowill Street (both sides)	South Street to Antoine Street	19 unrestricted
		Primrose Avenue (both sides)	South Street to Antoine Street	15 unrestricted
		Primrose Avenue (both sides)	South Street to Dorothy Street	8 unrestricted

Area	Location	Road	Segment	Estimated number of existing parking spaces
		Fallon Street (both sides)	South Street to House No. 38	15 unrestricted
		Fallon Street (both sides)	South Street to House No. 28	13 unrestricted
		Antoine Street (both sides)	Park Road to John Street	85 unrestricted
		Antoine Street (both sides)	John Street to Nowill Street	49 unrestricted
	Off street		Rydalmere ferry wharf	68 unrestricted 2 accessible
Ermington	On alignment	South Street (both sides)	Silverwater Road to River Road	15 unrestricted
		Boronia Street (northern side)	Spurway Street / Broadoaks Street to Atkins Road	94 unrestricted
		Boronia Street (southern side)	Atkins Road to Spurway Street / Broadoaks Street	91 unrestricted
	Side-street	River Road (both sides)	Lister Avenue to Lindsay Avenue	80 unrestricted
		Hilder Road (both sides)	Tristram Street to Lindsay Avenue	38 unrestricted
		Spurway/ Broadoaks Street (both sides)	Allura Crescent to Tristram Street	17 unrestricted 1 accessible
		Honor Street (both sides)	Boronia Street to House No. 12	44 unrestricted
		Trumble Avenue (both sides)	Boronia Street to House No. 45	46 unrestricted
		Trumble Avenue (both sides)	Boronia Street to Marguerette Street	62 unrestricted
		Boyle Street (both sides)	Boronia Street to House No. 18	46 unrestricted
		Murdoch Street (both sides)	Boronia Street to House No. 41	63 unrestricted
		Murdoch Street (both sides)	Boronia Street to Marguerette Street	78 unrestricted
		Spofforth Street (both sides)	Boronia Street to House No. 21	66 unrestricted
		Spofforth Street (both sides)	Boronia Street to Marguerette Street	79 unrestricted
		Trumper Street (both sides)	Boronia Street to Saunders Road	65 unrestricted
		Trumper Street (both sides)	Boronia Street to Marguerette Street	58 unrestricted
		Atkins Road (both sides)	Massie Street to Marguerette Street	38 unrestricted 16 no parking (daytime)

Area	Location	Road	Segment	Estimated number of existing parking spaces
Melrose Park	On alignment	Hope Street (northern side)	Hughes Avenue to Waratah Street	20 unrestricted 3 15minP
		Hope Street (southern side)	Waratah Street to Hughes Avenue	31 unrestricted
		Waratah Street (eastern side)	Hope Street to Mary Street	8 unrestricted 9 15min (school times)
		Waratah Street (western side)	Mary Street to Hope Street	19 unrestricted
		Hughes Avenue (both sides)	Hope Street to new light rail alignment	12 unrestricted
	Side-street	Hope Street (northern side)	Atkins Road to Hughes Avenue	15 unrestricted
		Hope Street (southern side)	Hughes Avenue to Atkins Road	14 unrestricted
		Hope Street (northern side)	Waratah Street to Wharf Road	24 unrestricted
		Hope Street (southern side)	Wharf Road to Waratah Street	14 unrestricted
		Hughes Avenue (both sides)	New light rail alignment to No Through Road	50 unrestricted
		Hughes Avenue (both sides)	Hope Street to House No. 50	11 unrestricted 2 bus zone (school times)
		Mary Street (both sides)	Waratah Street to Wharf Road	32 unrestricted 3 bus and coach only 4 P15min (school times)
		Wharf Road (both sides)	No Through Road to Mary Street	71 unrestricted
		Andrew Street (both sides)	Wharf Road to Lancaster Avenue	24 unrestricted
	Off-street	-	Ermington Boat Ramp car park	52 boat trailer 8 unrestricted 2 accessible
Wentworth Point	On alignment	Hill Road (eastern side)	Footbridge Boulevard to Bennelong Parkway	70 unrestricted
		Hill Road (eastern side)	Bennelong Parkway to Holker Busway	Nil
		Hill Road (western side)	Holker Busway to Ferry Wharf	Nil
	Side-street	Hill Road (eastern side)	Ferry Wharf to Burroway Road	10 P30min (daytime) 1 accessible
		Hill Road (eastern side)	Burroway Road to Footbridge Boulevard	17 unrestricted
		Burroway Road (both sides)	Hill Road to Waterways Street	8 P15min (school times) 9 2P (daytime)
		Park Street N (both sides)	Hill Road to Waterways Street	5 unrestricted 1 car share only
		Footbridge Blvd (both sides)	Hill Road to Waterways Street	18 unrestricted

Area	Location	Road	Segment	Estimated number of existing parking spaces
		Half Street (eastern side)	Hill Road to Waterways Street	10 unrestricted
		Verona Drive (both sides)	Hill Road to Savona Drive	Nil
		Nuvolari Place (both sides)	Hill Road to Savona Drive	26 unrestricted
		Baywater Drive (both sides)	Hill Road to Savona Drive	17 unrestricted
		Stromboli Strait (both sides)	Hill Road to Amalfi Drive	11 unrestricted 2 no parking (daytime)
	Off-street	-	Woo-la-ra car park on Hill Road	23 unrestricted 2 accessible
Sydney Olympic Park	On alignment	Australia Avenue (both sides)	Holker Street to Herb Elliot Avenue	Nil
		Dawn Fraser Ave (southern side)	Australia Avenue to Showground Road	18 P30min (daytime) 2P (other times) 3 loading Zone (15min) 1 P15min
		Dawn Fraser Ave (southern side)	Showground Road to Olympic Boulevard	6 P15min
		Dawn Fraser Ave (southern side)	Olympic Boulevard to Edwin Flack Avenue	27 ticket parking 13 truck zone (daytime) ticket (other times) 1 accessible
		Dawn Fraser Ave (northern side)	Edwin Flack Avenue to Olympic Boulevard	40 ticket parking 4 accessible
		Dawn Fraser Ave (northern side)	Olympic Boulevard to Showground Road	12 1P
		Dawn Fraser Ave (northern side)	Showground Road to Australia Avenue	22 P30min (daytime) 2P (other times)
	Side-street	Murray Rose Ave (both sides)	Australia Avenue to Showground Road	46 P30min (daytime) 2P (other times) 1 charging (1P)
		Herb Elliot Ave (both sides)	Australia Avenue to Olympic Boulevard	31 ticket parking 11 P30min 12 P15min 6 P2min 3 accessible 9 taxi 2 loading zone (15min)
		Showground Rd (both sides)	Dawn Fraser Avenue to Herb Elliot Avenue	6 1P 5 P30min 4 P15min 2 accessible
		Olympic Blvd (northern side)	Dawn Fraser Avenue to Herb Elliot Avenue	9 P15min

Area	Location	Road	Segment	Estimated number of existing parking spaces
Lidcombe	On alignment	Uhrig Road (southern side)	Edwin Flack Avenue to Carter Street	29 unrestricted
		Uhrig Road (northern side)	Carter Street to Edwin Flack Avenue	31 unrestricted
	Side-street	Carter Street (both sides)	IBC Business Estate to Flock Street	106 2P (special events) unrestricted (other)
Totals			**On alignment**	**934 spaces** **Including 14 accessible**
			Side-streets	**1,887 spaces** **Including 7 accessible**
			Off-street	**157 spaces** **Including 6 accessible**

Additional public off-street parking facilities are mostly located in the Parramatta CBD and Sydney Olympic Park.

3.10.2 Parking occupancy

Parking occupancy surveys were completed in March 2018 (for Camellia, Rydalmere, Ermington and Melrose Park) and in May 2018 (for Wentworth Point and Sydney Olympic Park) between the hours of 7am and 7pm on two typical weekdays. Parking occupancy is presented in Figure 3.8 for parking within the project site, parking on side-streets immediately adjacent to the project site, and off-street parking facilities within the vicinity of the project site.

Parking occupancy is presented with respect to:

– average number of parking spaces occupied over the survey period
– maximum number of parking spaces occupied at any one time over the survey period
– total parking supply.

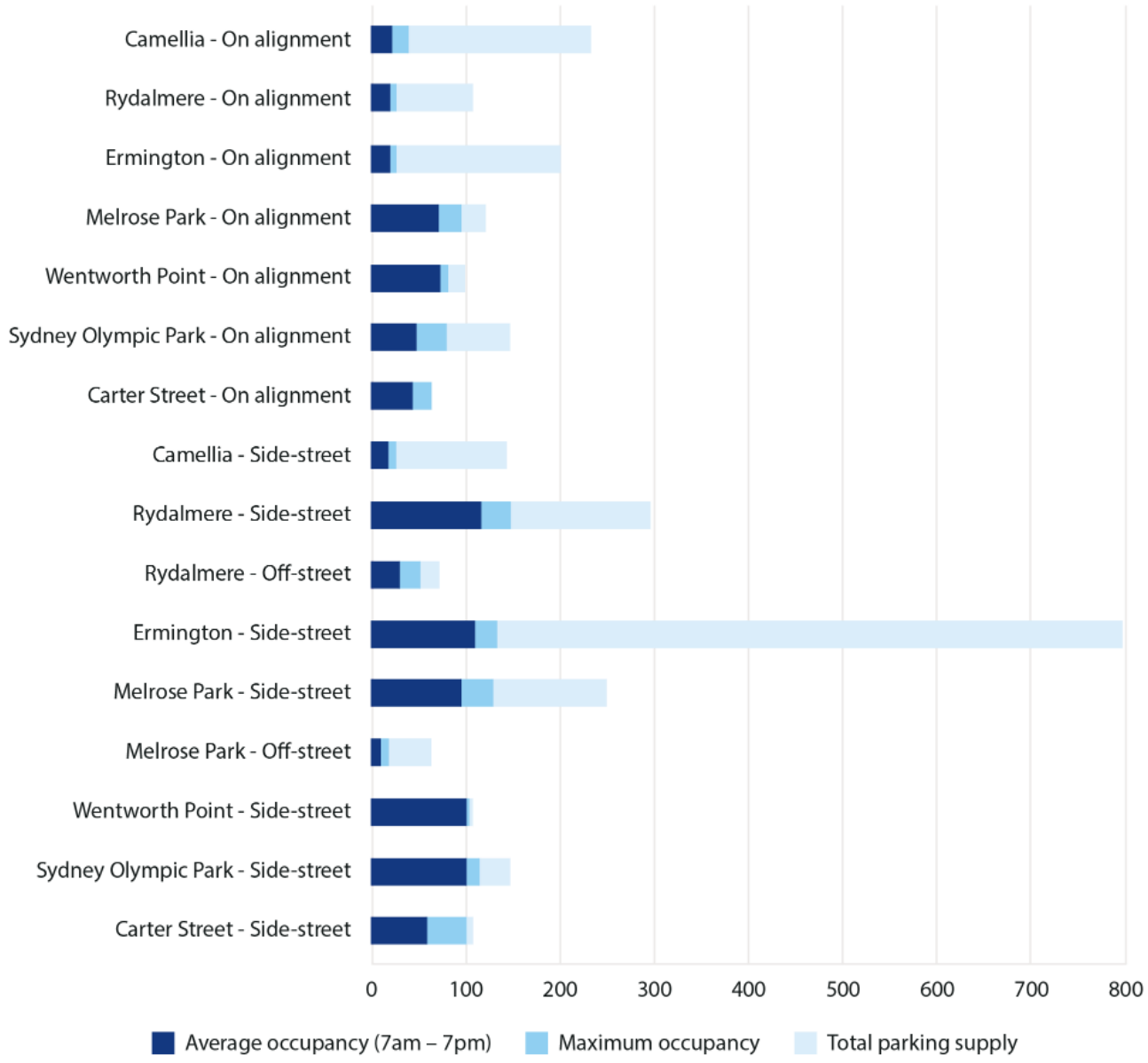


Figure 3.8 Existing parking occupancy (based on 2018 surveys)

4. The project

The project would have a direct interface with Parramatta Light Rail Stage 1 and operate over a length of approximately 13 kilometres between a new turnback facility at Macquarie Street in the Parramatta CBD and the Carter Street precinct in Lidcombe.

The project provides an opportunity to significantly improve the connectivity and liveability of communities in Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park with new active and public transport connections. The project would be a catalyst for more convenient, integrated, and frequent public transport services, through a combined network of light rail, metro, heavy rail, ferries, and buses.

The introduction of bridges as part of the project, including two new bridges over the Parramatta River, would join together previously disconnected neighbourhoods, unlocking opportunities to travel to work, study, and recreation destinations in the GPOP area. Over eight kilometres of new active transport infrastructure would also be provided, integrating with existing local and regional cycling links and connecting to similar infrastructure developed as part of Parramatta Light Rail Stage 1, to provide active and sustainable transport choices.

The project would enable planned urban renewal projects to be transformed through integrated land use and transport solutions, designed concurrently with precinct master plans.

4.1 Light rail infrastructure

4.1.1 Alignment

While construction for the project commences in Camellia, the project would including a new turnback facility at Macquarie Street (between Church Street and Marsden Street) and operate along part of the Parramatta Light Rail Stage 1 line between Camellia and the Parramatta CBD for a distance of about three kilometres. Parramatta Light Rail Stage 2 services would terminate at the Parramatta Square stop (Parramatta Light Rail Stage 1) to allow customers direct and convenient access to Parramatta's city centre, Parramatta Light Rail Stage 1 light rail services or other forms of public transport.

In Camellia, the alignment runs along the former Sandown freight rail corridor and Grand Avenue, before crossing to the north of the Parramatta River via a new bridge and running along South Street in Rydalmere, Boronia Street in Ermington, and Hope Street and Waratah Street in Melrose Park.

The alignment then returns to the south side of Parramatta River via a new bridge, connecting to Wentworth Point along Hill Road, and Sydney Olympic Park via Australia Avenue and Dawn Fraser Avenue, before terminating on Uhrig Road within the Carter Street precinct in Lidcombe.

A range of light rail track configurations would be established along the alignment to adapt to opportunities and to address constraints in different locations. A different speed limit would apply to each configuration. Generally, three types of configurations would be used:

– on-road (segregated) – where the light rail vehicles run adjacent to, but are segregated from, operational traffic lanes, and general traffic may need to cross the alignment where it traverses existing roads
– off-road (separated) – where the light rail vehicles run within their own separate corridor, and access by general traffic is not permitted or is controlled at key crossing locations
– shared – including mixed use environments such as shared light rail and pedestrian zones, or where the light rail vehicles share the corridor with specified vehicles, such as buses.

Table 4.1 summarises the route alignment in different locations along the route and the general arrangements to cater for other forms of traffic and transport along the alignment.

Table 4.1 Overview of light rail alignment and road configuration

Area	General alignment configuration
Parramatta CBD (Macquarie Street turnback)	A turnback facility would be provided to enable terminus operations in the section of Macquarie Street between Marsden Street and Church Street. The turnback facility would connect to the Parramatta Light Rail Stage 1 alignment at Church Street. The existing eastbound single traffic lane would be retained, with left turns permitted further east at United Lane and Horwood Place.
Camellia	The light rail alignment would be largely within the existing former freight rail (Sandown Line) corridor with existing vehicle access to industrial properties across the alignment maintained. Many of the existing and proposed property accesses across the alignment would require signals. The light rail would be integrated into the design of the future Camellia town centre with pedestrianisation as a key consideration.
Rydalmere and Ermington	For most of these areas, one general traffic lane would be provided in each direction either side of the light rail alignment. This configuration would restrict movements into and out of local streets along both sides of South Street and Boronia Street to left-in/ left-out. New signals are proposed at John Street, Primrose Avenue, River Road, Spurway Street, Murdoch Street, Trumper Street and Atkins Road. These intersections would allow vehicles to cross the tracks in order to maintain traffic circulation in these suburbs.
Melrose Park	The light rail alignment would cross Atkins Road at the end of Boronia Street and run in an off-road corridor parallel to Hope Street before crossing the Hope Street/ Hughes Avenue intersection diagonally and running along the northern side of Hope Street east of Hughes Avenue. New signals with turn restrictions are proposed at Hughes Avenue and Waratah Street as well as at Wharf Road and Mary Street to aid traffic circulation. The light rail alignment would be centre running along Waratah Street adjacent to Melrose Park Public School with a single traffic lane in each direction retained.
Wentworth Point	The light rail alignment would run off-road from the bridge between Melrose Park and Wentworth Point, around the Sanctuary Wentworth Point site, to connect to Hill Road opposite Footbridge Boulevard. The light rail would continue south adjacent to the western edge of Hill Road, with only minor impacts on the existing road configuration. Generally, the existing roadway configuration would be maintained on Hill Road, with new signals provided at Footbridge Boulevard, Verona Drive, Stromboli Strait and Bennelong Parkway, to facilitate access across Hill Road and to and from stop platforms.
Sydney Olympic Park	The light rail alignment would share the Holker Street busway with special event buses, and be aligned with the centre of Australia Avenue, retaining a single eastbound traffic lane and dual westbound traffic lanes while retaining vehicle access requirements to the Royal Agricultural Society showground. Kevin Coombs Avenue, Grand Parade, Murray Rose Avenue and Dawn Fraser Avenue would be signalised at Australia Avenue. Dawn Fraser Avenue would be closed to vehicles between Australia Avenue and Olympic Boulevard where the light rail would be centre-running. Showground Road is proposed to be closed to facilitate integration with Sydney Metro West, necessitating the extension of Murray Rose Avenue to Olympic Boulevard to maintain traffic circulation.
Lidcombe (Carter Street)	The alignment would be located in the centre of Uhrig Road and terminate at a proposed new intersection. Signals would be provided at the intersection of Uhrig Road and Stockyard Boulevard.

4.1.2 Light rail stops

The project would include 14 light rail stops. The project has safeguarded space for two possible future stops, which may be constructed later. No stop infrastructure is currently proposed to be constructed at these future stop locations.

The design and location of stops has been selected with consideration of a range of factors including Transport for NSW design requirements, and site-specific opportunities and constraints. These factors included:

- integration with the urban environment and surrounding land uses, both existing and future planned land use (such as the Melrose Park Town Centre and Sanctuary Wentworth Point development)
- access requirements to the project at various locations
- surrounding landform
- proximity to existing road intersections to allow use of existing (or upgraded) pedestrian crossings to provide access to the stops
- physical distance between stops, based on typical walking catchments

– providing key transport interchanges with minimal transfer distances and interface with other transport modes
– proximity to places of interest and destinations (such as foreshore recreation areas and open space)
– street widths, requirements for vehicular access and public safety
– potential property impacts
– environmental constraints such as biodiversity and heritage.

Further information on the design and location of stops can be found in Technical Paper 1 (Design, Place and Movement).

Table 4.2 lists the proposed light rail stops and the rationale for each proposed stop, with the potential future stops shown in blue text. Stop names are indicative only at this stage. The final stop names would be determined in consultation with the Geographical Names Board of NSW and locations as part of the design development and consultation process prior to construction.

Table 4.2 Proposed light rail stops

Suburb	Stop name	Location
Camellia	Sandown Boulevard	Located within the former Sandown freight rail corridor east of the former Carlingford line intersection.
	Camellia East (potential future stop only)	Located within the former Sandown freight rail corridor directly north of the intersection of Colquhoun Street and Grand Avenue, Camellia.
Rydalmere	John Street	Located on land west of John Street, Rydalmere between Antoine Street and South Street.
	Nowill Street	Located on South Street, Rydalmere, immediately east of Nowill Street.
Ermington	River Road	Located in existing green space reserve/ utility easement between River Road and Hilder Road, west of Ken Newman Park.
	Murdoch Street	Located on Boronia Street, Ermington between Boyle Street and Murdoch Street.
	Atkins Road	Located south of Hope Street, and immediately east of Atkins Road.
Melrose Park	Melrose Park	Located north of the existing Hope Street, immediately west of Waratah Street.
	Waratah Street	Located on Waratah Street, Melrose Park, near Archer Park between Mary Street and Wharf Road.
Wentworth Point	Footbridge Boulevard	Located on the western side of Hill Road, Wentworth Point immediately opposite the intersection with Footbridge Boulevard.
	Hill Road	Located on the western side of Hill Road, Wentworth Point immediately south of the intersection with Stromboli Strait.
Sydney Olympic Park	Holker Street	Located within the existing road median of the Holker Street busway, Sydney Olympic Park immediately south of its intersection with Hill Road.
	Australia Avenue (potential future stop only)	Located within the existing Australia Avenue, Sydney Olympic Park, between New England Avenue and Grand Parade.
	Jacaranda Square	Located within the existing Dawn Fraser Avenue, Sydney Olympic Park immediately west of the intersection with Australia Avenue.
	Olympic Boulevard	Located within the existing Dawn Fraser Avenue, Sydney Olympic Park between Olympic Boulevard and Showground Road.
Lidcombe	Carter Street	Located on Uhrig Road, Sydney Olympic Park approximately midway between Carter Street and Edwin Flack Avenue.

4.1.3 Turnback facilities

Track turnback facilities using double scissors crossovers would be provided at strategic locations along the alignment to facilitate efficient light rail operation. Crossovers between the tracks allow light rail vehicles to change tracks and travel in the opposite direction. Turnback facilities are proposed at the following locations:

Macquarie Street, Parramatta

A light rail turnback facility would be provided along part of Macquarie Street to the west of the Parramatta Square stop. The facility would consist of two tracks, about 100 metres long, between Church Street and Marsden Street, and enable the temporary layover of light rail vehicles. The turnback would be accessed via a new turnout from the Parramatta Light Rail Stage 1 line, located at the Macquarie Street and Church Street intersection.

Atkins Road stop, Melrose Park

A light rail turnback facility would be provided at Atkins Road stop to enable the temporary layover of light rail vehicles and provide additional services between Melrose Park and Sydney Olympic Park during special events. The facility would consist of a third track of about 140 metres long which would terminate at the Atkins Road stop. The stop would have two platforms, one side platform and one island platform.

Jacaranda Square stop, Sydney Olympic Park

The double crossover west of the Jacaranda Square stop, along with the turnback at the Atkins Road stop, would be used during major events at Sydney Olympic Park to provide increased frequency of services to match demand. This is described further in section 4.3.

Carter Street stop, Lidcombe

The turnback facility at Carter Street is the southern terminus for the project.

Locations of single crossovers are at:

– Camellia –east of the Sandown Boulevard stop
– Melrose Park –west of Atkins Road stop
– Wentworth Point –south of the Hill Road stop.

4.1.4 Light rail vehicles

Specification

The light rail vehicles for the project would match the specification for Stage 1, providing capacity for 300 customers, with seated capacity for 75. The vehicles would have a standard low-floor design with overhead traction power. Each vehicle would be equipped with modern passenger information, surveillance and communication systems. They would have full disability access provisions, in accordance with the *Disability Discrimination Act 1992* and Disability Standards for Accessible Public Transport (DSAPT), and would incorporate heating and air conditioning.

Customers would be able to pay for their fare using an Opal card or contactless card payment, with each light rail stop equipped with Opal card facilities. Opal integration would mean customers can seamlessly transfer between modes.

A fleet of 13 one-car vehicles would operate along the route, with twelve vehicles operating and one spare vehicle available to meet peak demand and provide additional capacity for special event services.

A similar vehicle type across Parramatta Light Rail Stage 1 and Stage 2 would allow for commonality of all interfaces between the operator, customer and maintainer.

Maintenance

Stabling and maintenance would be undertaken at the Camellia facility established for Parramatta Light Rail Stage 1. The site has sufficient area and has been planned to support the Parramatta Light Rail Stage 2 fleet.

Additional track infrastructure comprising new sidings and stabling tracks would be installed on the eastern side of the depot to accommodate the additional demand and the Stage 1 car park would be expanded.

Light rail vehicle maintenance activities undertaken at the facility would include:

– vehicle cleaning
– daily service inspections
– running repairs
– scheduled and unscheduled maintenance
– component change outs.

4.1.5 Active transport link

About 8.5 kilometres of new active transport infrastructure for pedestrians and cyclists would be provided along the alignment, integrating with existing local and regional cycling links and connecting to similar infrastructure developed as part of Parramatta Light Rail Stage 1.

The active transport link delivered as part of the project would facilitate pedestrian and cyclist access and connections to light rail stops, transport interchanges and main destinations, and provide missing links on existing routes.

The inclusion of the active transport link on the two bridges over the Parramatta River would create three new loop circuits for walkers and cyclists at Camellia, Ermington and Wentworth Point.

Further information is provided in section 4.8.

4.1.6 Bridges

The project includes several bridges, including five new structures:

– between Camellia and Rydalmere – crossing the Parramatta River and comprising light rail, integrated active transport link
– over Silverwater Road between Rydalmere and Ermington – crossing Silverwater Road and comprising light rail and integrated active transport link
– Ken Newman Park comprising light rail and integrated active transport link
– between Melrose Park and Wentworth Point – crossing the Parramatta River and comprising light rail, integrated active transport link and future busway
– Hill Road – crossing a tributary of Haslams Creek (comprising light rail only).

The project would also make use of an existing bridge in Sydney Olympic Park, which would require strengthening:

– Holker Busway – crossing Haslams Creek and comprising light rail, bus and active transport link.

Other considerations for the new bridges relate to the navigation of vessels within the Parramatta River, including maintaining adequate vertical and horizontal clearances for maritime vessels as follows:

– bridge between Camellia and Rydalmere: height of 7.6 metres (above the Highest Astronomical Tide) (minimum height of 5.2 metres) and a horizontal navigation clearance of 22.0 metres
– bridge between Melrose Park and Wentworth Point: minimum height of 11.0 metres (above the Highest Astronomical Tide) and a horizontal navigation clearance of 46.0 metres.

The location of these bridge structures is shown in Figure 4.1.

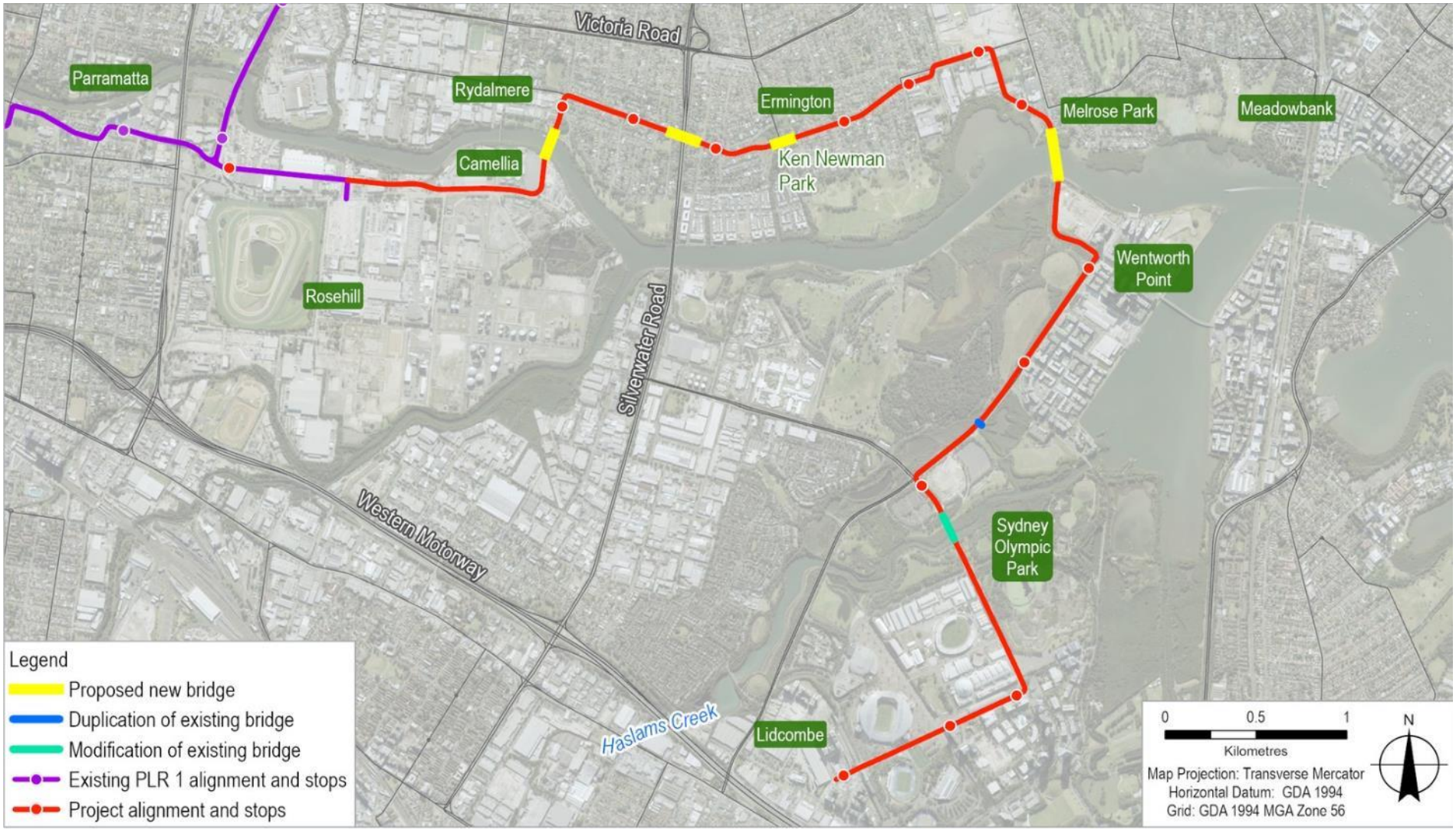


Figure 4.1 Bridge work locations

4.2 Integration with other transport modes

The project would operate along a common section of track between the Parramatta Square stop (part of Parramatta Light Rail Stage 1) in the Parramatta CBD and the proposed new Sandown Boulevard stop at Camellia.

A direct connection with Parramatta Light Rail Stage 1 services would occur at Parramatta Square stop (part of Parramatta Light Rail Stage 1) for customers wishing to travel within the Parramatta CBD. For customers wishing to travel towards Carlingford, another connection would be available by foot from the Sandown Boulevard stop (proposed to be constructed as part of the project) to the Rosehill Gardens stop (being constructed as part of Parramatta Light Rail Stage 1). The walking distance would be approximately 110 metres. Alternatively, customers could travel to the Tramway Avenue stop (part of Parramatta Light Rail Stage 1) and cross to the opposite platform to transfer to a Carlingford service.

The project would integrate with other transport modes as follows:

– Sydney Metro West (future transport integration):
  - at Parramatta (accessed from Parramatta Square stop, around three minutes walk for 250 metres)
  - at Sydney Olympic Park (accessed from Olympic Boulevard stop, around two minutes walk for 150 metres)
– Sydney Ferries:
  - at Rydalmere (F3 service) accessed from John Street stop, around three minutes walk for 250 metres
  - at Sydney Olympic Park (F3 service) accessed from Footbridge Boulevard stop, around four minutes walk for 350 metres
– Sydney Trains:
  - Parramatta Station (T1, T2 and T5 lines) accessed from Parramatta Square stop, around three minutes walk for 250 metres
  - Olympic Park Station (T7 line) accessed from Olympic Boulevard stop, around two minutes walk for 150 metres
– Sydney Buses: various routes and services depending on bus stop location. Further information on existing and future bus routes and stops is provided in section 4.6.3.

Integration between the Parramatta Light Rail network and these other transport modes is shown in Figure 4.2, Figure 4.3, Figure 4.4 and Figure 4.5 respectively.

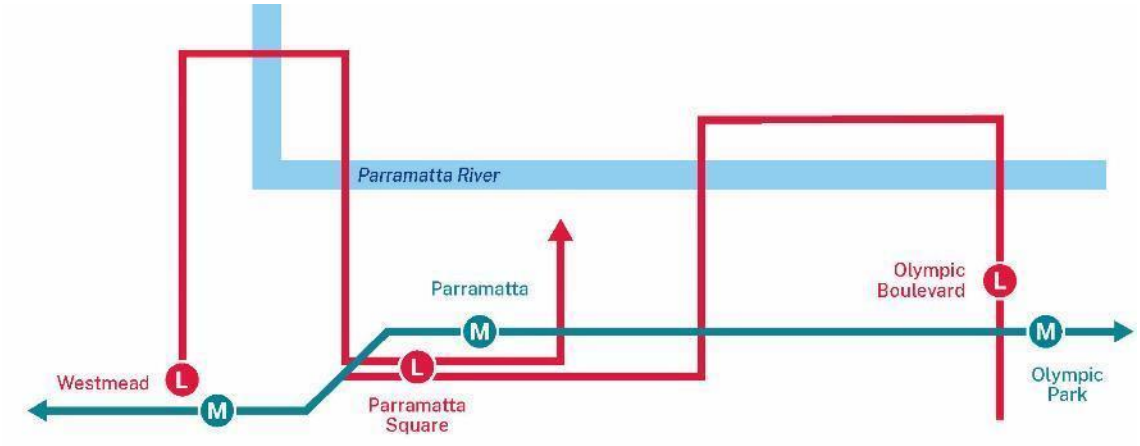


Figure 4.2 Parramatta Light Rail integration with future Sydney Metro West

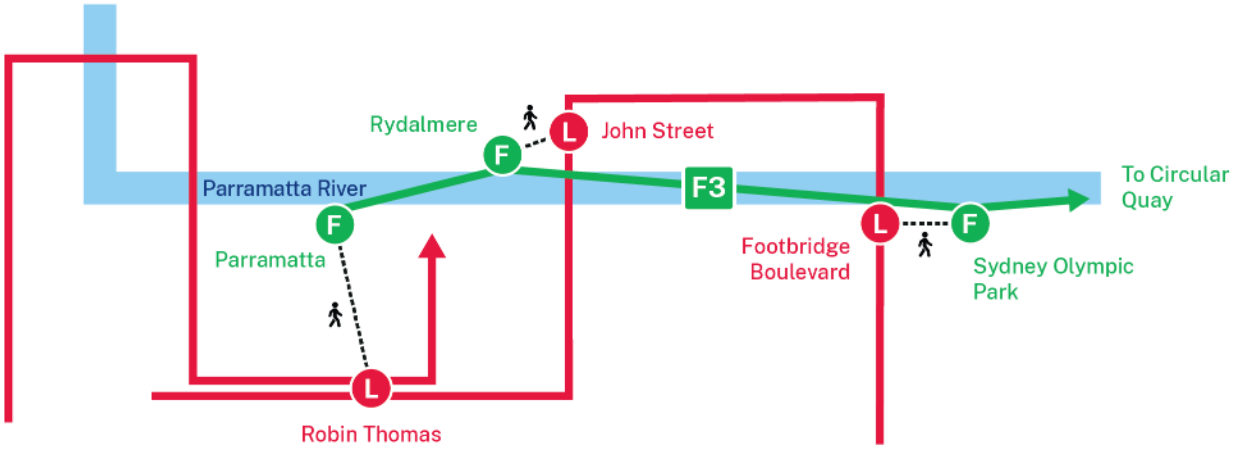


Figure 4.3 Parramatta Light Rail integration with Sydney Ferries F3 service

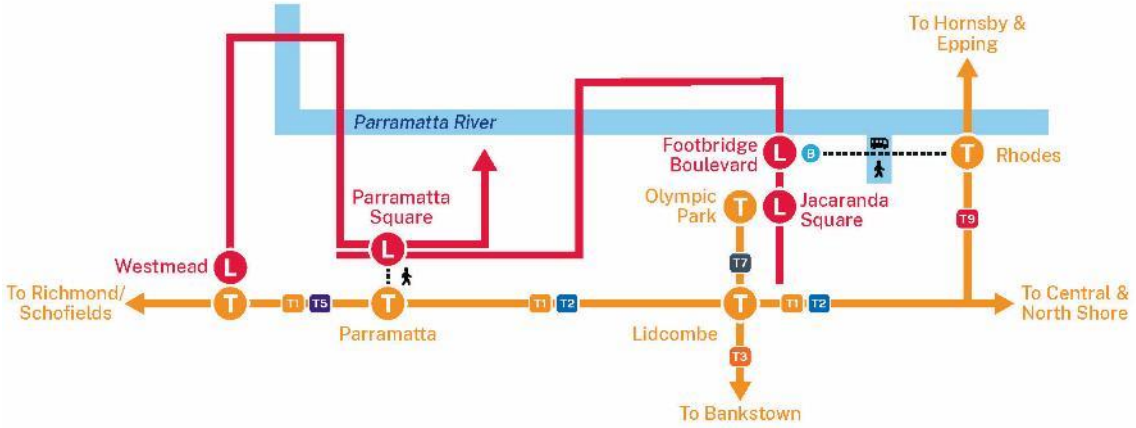


Figure 4.4 Parramatta Light Rail integration with Sydney Trains

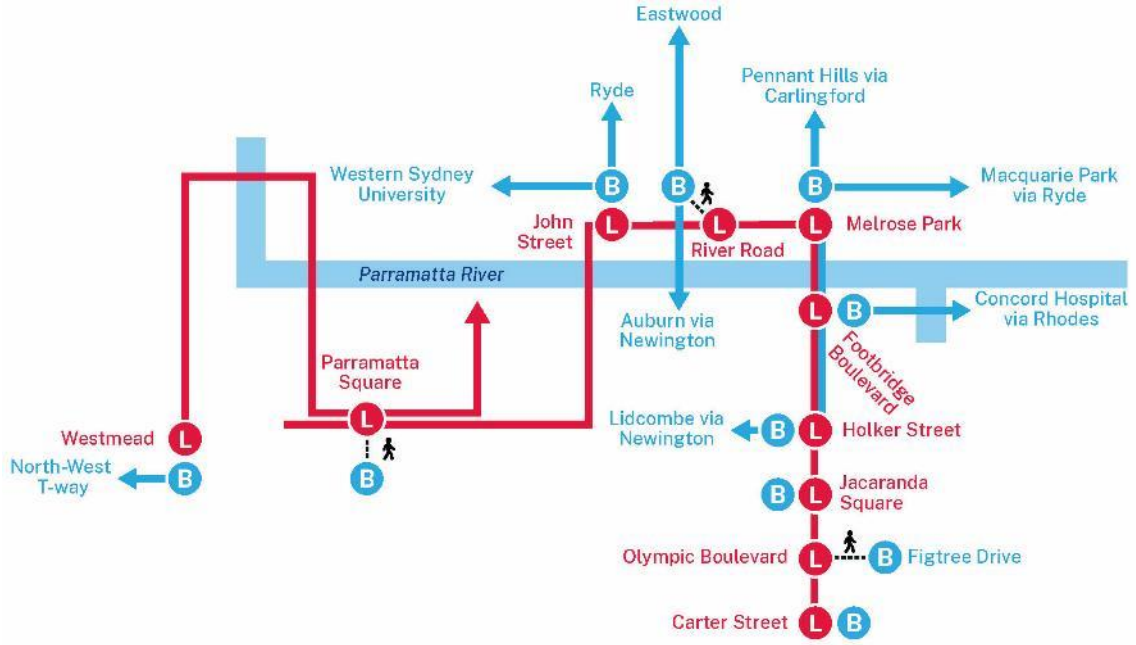


Figure 4.5 Parramatta Light Rail integration with Sydney Buses

4.3 Hours of operation and service frequency

Light rail services would operate between 5am and 1am the following morning, seven days per week, consistent with Parramatta Light Rail Stage 1 operations. The frequency of weekday services would be 7.5 minutes between 7am and 7pm and between 10 and 15 minutes at other times. On weekends and public holidays, the service frequency would be between 10 and 15 minutes at all times.

During peak hours or special events, it may be necessary to operate a higher frequency service to coordinate light rail services with heavy rail services and/or to match peak passenger demand. Event-specific arrangements would be in place during major events at Sydney Olympic Park, including provision of additional passenger queuing space, and managed running or termination of light rail services within Sydney Olympic Park.

Refer to section 6.2.7.7 for further details on changes to light rail service operations during special events within Sydney Olympic Park.

4.4 Forecast journey times

Indicative forecast journey times for the Project between key centres are outlined as follows:

– 20 minutes between the Parramatta Square stop and the Melrose Park stop
– 16 minutes between the Melrose Park stop and the Olympic Boulevard stop
– 11 minutes between the Footbridge Boulevard stop and the Carter Street stop
– 36 minutes between the Parramatta Square stop and the Olympic Boulevard Stop.

4.5 Expected passenger demand

Passenger demand forecasts for 2031 and 2041 are summarised in Table 4.3 based on a 7.5 minute service frequency. Ongoing residential and commercial development and urban renewal activities being carried out as part of various planning initiatives in the areas serviced by light rail would increase the resident and employee population and support the forecast increase in patronage to 2041.

Table 4.3 Light rail patronage forecasts – morning peak (6am to 9.30am)

Year	Average forecast customers
2031	7,500
2041	12,100

Note: The forecast assumes commencement of light rail services in 2030/2031 which is subject to necessary approvals being received and the actual duration of construction works.

4.6 Road network changes

4.6.1 Roadway configuration

The project would operate within the existing street environment for much of its alignment, necessitating a number of changes to roadway configuration, road network infrastructure and local traffic circulation and access.

The proposed road network changes associated with the operation (i.e. post-construction stage) of the project are described in Table 4.4 with off-corridor roads described in blue. Changes at individual intersections are presented in section 4.6.2. The subsequent impacts of the road reconfiguration and intersection works on parking are outlined in section 6.1.3.

Table 4.4 Proposed road configuration changes

Location	Existing arrangements	Proposed arrangements
Parramatta CBD		
Macquarie Street between Marsden and Church Streets	Single lane, one way movement eastbound	Existing single lane retained and relocated and converted to shared zone. Reconfiguration of Macquarie Street and Marsden Street intersection to accommodate terminus. Construction of two light rail tracks south of roadway.
Camellia		
Grand Avenue between Durham Street to just east of 35 Grand Avenue	Single carriageway, single lane two way movement	Dual carriageway, two lane, two way movement. ATL constructed as a shared path on the northern side of roadway. Reconfiguration of intersections and adjustment and signalisation of property accesses.
Access to 37 Grand Avenue	Access from Grand Avenue	New access road constructed north from Grand Avenue to rear of premises adjacent to river. Construction of two light rail tracks on western side of access road. ATL constructed as shared paths on either side of tracks with proposed crossing location on corner.
Rydalmere		
Antoine Street, intersection with John Street	Single carriageway, single lane two way movement	No access to Antione Street west of John Street. Antoine Street west of John Street would loop south through a reconfigured (ferry) commuter car park to Jean Street. ATL to connect from the bridge between Camellia and Rydalmere to a pedestrian plaza in the John Street stop precinct. Existing intersection of John Street and South Street to be signalised to facilitate light rail.
South Street	Single carriageway, single lane two way movement	No change to number of general traffic lanes. Reconfiguration of roadway for centre running light rail tracks with new stop infrastructure at Nowill Street stop. ATL constructed as separated cycleway to run on northern side of roadway west of Nowill Street and continuing as shared path east of Nowill Street. Signalisation of Primrose Avenue intersection and reconfiguration of other intersections to left-in and left-out only.
Ermington		
South Street	Single carriageway, single lane two way movement	No change to number of general traffic lanes. Reconfiguration of roadway for centre running light rail tracks. ATL constructed as shared path on north side of South Street from Nowill Street, crossing to south side of South Street east of Primrose Avenue and connecting to Silverwater Road overpass. Removal of existing pedestrian bridge and construction of new light rail and ATL bridge infrastructure.
South Street between River Road and Silverwater Road	Single carriageway, single lane two way movement	Closed to traffic entry from Silverwater Road. Becomes a shared zone with light rail and pedestrians. ATL constructed as shared path either side of centre-running tracks.
Hilder Road at Ken Newman Park	Single carriageway, single lane two way movement	Hilder Road would be severed by the light rail at Ken Newman Park adjacent to River Road stop, allowing pedestrian access only, and converted to a cul-de-sac north and south of the project site. No through road from Hilder Street to Tristram Street. ATL constructed as a shared use path along the southern side of light rail. Signalisation of River Road and light rail alignment.
Boronia Street	Single carriageway, single lane two way movement	No change to number of general traffic lanes. Reconfiguration of roadway for centre running light rail. ATL constructed as separated cycleway along northern side of Boronia Street with access via signalised crossing at Spurway Street. Signalisation of Murdoch Street and Trumper Street and reconfiguration of other intersections to left-in and left-out only.

Location	Existing arrangements	Proposed arrangements
Melrose Park		
Atkins Road, between Hope Street and Boronia Street	Single carriageway, single lane two way movement	No change to Atkins Road roadway. Signalisation of Boronia Street and Atkins Road intersection to provide for light rail crossing to off-road corridor parallel to Hope Street. Construction of Atkins Road stop east of Atkins Road at rear of private properties.
Hughes Avenue between light rail alignment and Hope Street	Single carriageway, single lane two way movement	No change to Hughes Avenue roadway. Two light rail tracks constructed on western side of Hughes Avenue and signalisation of Hope Street and Hughes Avenue to provide for light rail to cross diagonally to northern side of Hope Street.
Hope Street, between Hughes Avenue and Waratah Street	Single carriageway, single lane two way movement	No change to roadway. Two light rail tracks constructed on northern side of Hope Street. ATL constructed as separated cycleway constructed along southern side of Hope Street. Signalisation of Hope Street and Waratah Street east of Hope Street stop to provide light rail access to Waratah Street.
Waratah Street at Mary Street	Single carriageway, single lane two way movement	No changes to number of general traffic lanes. Reconfiguration of roadway for centre running light rail with merge lane for buses to and from bridge between Melrose Park and Wentworth Point. ATL constructed as shared path on eastern side of Waratah Street. Signalisation of Mary Street intersection.
Wharf Road at Waratah Street	Single carriageway, single lane two way movement	Wharf Road diverted under the bridge between Melrose Park and Wentworth Point for access to Ermington Boat Ramp car park at cul-de-sac. ATL constructed as shared path on eastern side of roadway between Hope Street and Mary Street and on both sides of track between Mary Street and Wentworth Point (including across the bridge).
Wentworth Point		
Hill Road	Single carriageway, single lane two way movement	No change to roadway configuration. Two light rail tracks constructed on western side of Hill Road. ATL constructed as on-road bicycle lanes in both directions along Hill Road. Signalisation of Footbridge Boulevard, Verona Drive and Stromboli Strait intersections.
Hill Road between Stromboli Strait and Bennelong Parkway	Dual carriageway, single lane two way movement	No change to roadway configuration. Two light rail tracks and Hill Road stop constructed on western side of Hill Road. ATL includes on-road bicycle lane (northbound) and new shared use path constructed along western side of tracks connecting to Louise Sauvage Pathway. Signalisation of Stromboli Straight and Bennelong Parkway intersections.
Hill Road southwest of Bennelong Parkway	Dual carriageway, single lane two way movement	Single carriageway, single lane, two way movement. Two light rail tracks constructed on northwest side of roadway. ATL constructed as shared path on southeast side of Hill Road accessed via signalised crossing at Bennelong Parkway intersection.
Sydney Olympic Park		
Holker Busway south of Hill Road	Dual carriageway, single lane two way movement	Single carriageway, single lane, two way movement. Reconfiguration of roadway for Holker Street stop and centre running light rail tracks. ATL constructed as separated cycle lanes on both sides of roadway.
Holker Busway between Hill Road and Kevin Coombs Avenue	Single carriageway, single lane two way movement	Reconfiguration of Holker Busway for shared running light rail tracks (buses and light rail vehicles only) and ATL constructed as shared path on both sides of roadway. Signalisation of intersection with Australia Avenue including merge lanes for buses in both directions.

Location	Existing arrangements	Proposed arrangements
Australia Avenue	Dual carriageway, two lane two way movement	Dual carriageway, two lanes northbound and one lane southbound, two way movement. Reconfiguration of roadway for centre running light rail tracks. ATL constructed as separated uni-directional cycleways both sides of roadway. New footpath on eastern side of road. Signalisation of Grand Parade, Murray Rose Avenue and Dawn Fraser Avenue intersections.
Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard	Single carriageway, single lane two way movement.	Pedestrianised zone shared with light rail. No vehicle access except for deliveries during specified periods. Construction of Jacaranda Square and Olympic Boulevard stops. ATL constructed as uni-directional cycleways either side of tracks. Signalisation of intersections at Park Street and Olympic Boulevard.
Dawn Fraser Avenue between Olympic Boulevard and Edwin Flack Avenue	Single carriageway, single lane two way movement.	Reconfiguration of roadway for centre running light rail tracks. All on-street parking removed. ATL constructed as shared path both sides of roadway.
Showground Road between Grand Parade and Murray Rose Avenue	Single carriageway, single lane, two way movement.	Closed to general traffic to facilitate integration and new Sydney Metro West station.
Murray Rose Avenue between Showground Road and Olympic Boulevard.	No current road	Construction of new road to cater for traffic circulation following the closure to traffic of Dawn Fraser Avenue.
Lidcombe		
Uhrig Road between Edwin Flack Avenue and Stockyard Boulevard	Single carriageway, single lane two way movement.	No change to number of general traffic lanes. Reconfiguration of roadway for centre running light rail tracks. All on-street parking removed. ATL constructed as uni-directional cycleways either side of roadway. Signalisation of Uhrig Road and Stockyard Boulevard adjacent to Carter Road stop.

4.6.2 Intersection changes

To ensure safety and minimise conflicts between light rail vehicles and general traffic and pedestrians, uncontrolled turns across the light rail track would generally not be permitted with a combination of new traffic signals and/or turning restrictions installed to facilitate vehicle and pedestrian access across the track at selected locations. It is proposed that new traffic signals would be introduced at 27 locations along the alignment with 21 of these being at road intersections and the remaining either being proposed pedestrian crossings (1) or new property accesses (5 in Camellia). Design development is ongoing and would include a review of proposed intersection treatments along the alignment with relevant stakeholders.

The existing and proposed intersection control arrangements are described in Table 4.5 and shown in Figure 4.6 and Figure 4.7. It is noted that these do not show the full extent of road network changes and are a summary only. For additional details regarding network circulation changes, intersection turning restrictions and design, refer to detailed assessments in section 6.2 of this document.

Table 4.5 Proposed intersection control changes

Intersection location	Existing control	Proposed control
Grand Avenue / Thackeray Street		
South Street / John Street		
South Street / Primrose Avenue		
South Street / River Road		
Boronia Street / Spurway Street / Broadoaks Street		
Boronia Street / Murdoch Street		
Boronia Street / Trumper Street		
Boronia Street / Atkins Road		
Hope Street / Hughes Avenue		
Hope Street / Waratah Street		
Waratah Street / Mary Street		
Hill Road / Footbridge Boulevard		
Hill Road / Verona Drive		
Hill Road / Stromboli Strait		
Hill Road / Bennelong Parkway		
Holker Busway / Marjorie Jackson Parkway / Australia Avenue / Kevin Coombs Avenue		
Australia Avenue / Grand Parade		
Australia Avenue / Murray Rose Avenue / Dawn Fraser Avenue		
Park Street / Dawn Fraser Avenue		
Olympic Boulevard / Dawn Fraser Avenue		
Uhrig Road /Stockyard Boulevard	-	

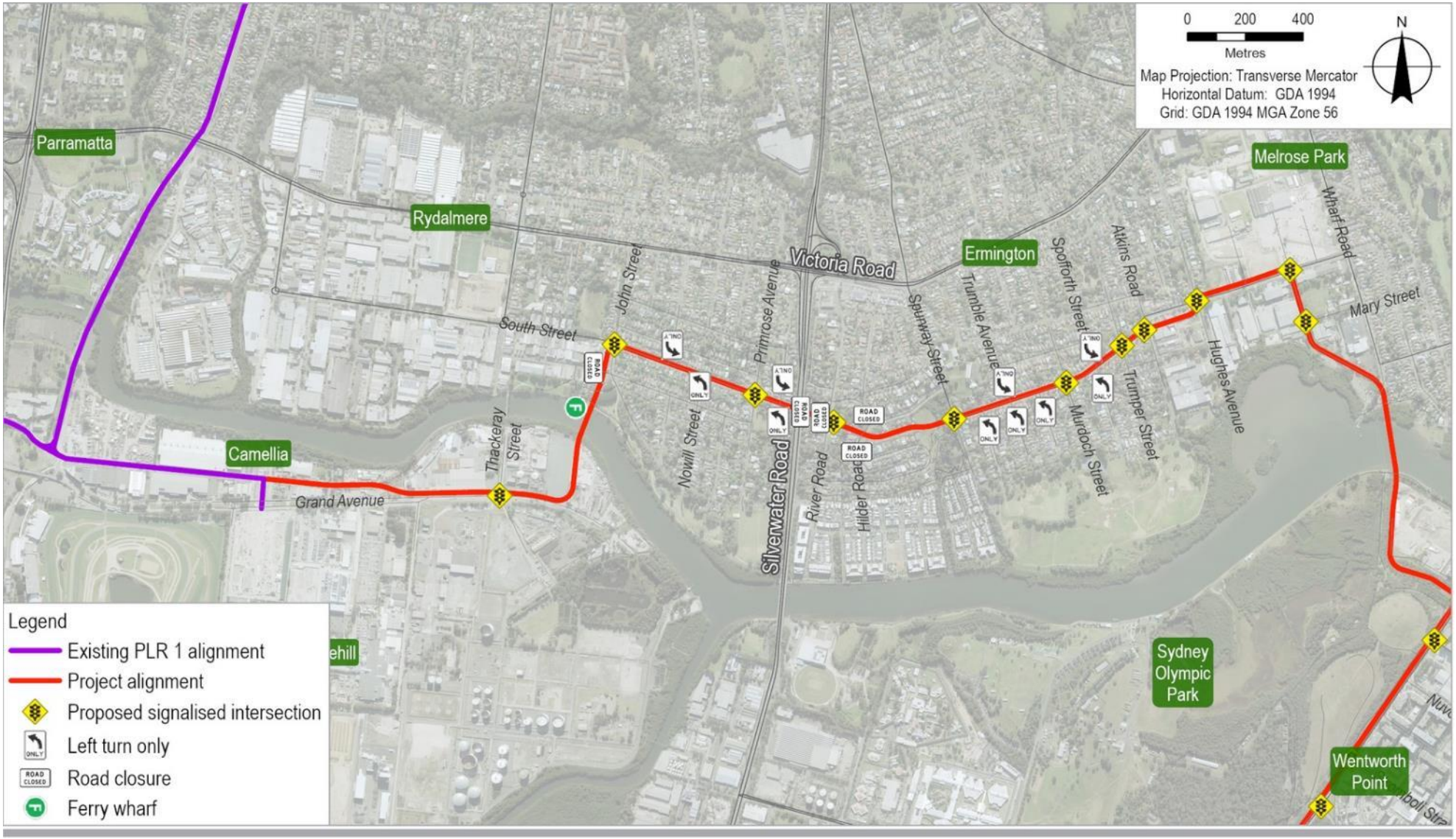


Figure 4.6 Proposed intersection changes along the alignment (Camellia, Rydalmere, Ermington and Melrose Park)

Figure 4.7 Proposed intersection changes along the alignment (Wentworth Point, Sydney Olympic Park and Lidcombe)

4.6.3 Property access

In addition to the above-listed road intersections to be upgraded to traffic signals as part of the project, there would also be five property accesses along the alignment in Camellia which would be signalised. The affected properties are as follows:

– 13 Grand Avenue, Camellia
– 15 Grand Avenue, Camellia
– 15A Grand Avenue, Camellia
– 19 Grand Avenue, Camellia
– 21 Grand Avenue, Camellia.

The provision of these intersections would be reviewed as the master planning for the Camellia peninsula progresses.

4.7 Bus services

4.7.1 Bus routes and stops

Changes to public bus routes and stops are not part of the project for which approval is being sought. Changes to bus routes and stops are implemented in response to a number of factors, including changes to roadway configuration, patronage, land uses, new public transport services and overall efficiency as well as for periods of infrastructure construction.

Changes to public bus services and routes would be designed to complement the efficient operation of Parramatta Light Rail but would be developed and implemented separately by Transport for NSW. The following commentary of possible bus service changes is for information only.

The following additional bus services are being considered to be implemented following commissioning of the project. Some of these services would make use of the proposed bridges over the Parramatta River which would be delivered as part of the project:

– Lidcombe to Sydney Olympic Park via Newington
– Macquarie Park to Auburn
– Bankstown to Macquarie Park via Sydney Olympic Park
– Strathfield to Wentworth Point via Sydney Olympic Park Wharf.

Further changes to the bus network are expected to be implemented following the opening of Sydney Metro West which might include the following services:

– Route 401 could be extended to Macquarie Park and connect residents in Newington, Wentworth Point and Melrose Park with destinations north of Parramatta River.
– Route 625 could be rerouted and connect Pennant Hills to Melrose Park. The route could also extend across the Parramatta River via the bridge between Melrose Park and Wentworth Point to provide access to Rhodes and Concord Hospital outside peak periods.
– Route 521 could be rerouted and connect Epping to Sydney Olympic Park via Silverwater.
– Route 524 could be replaced with a modified 523 service which would be rerouted from sections of South Street/Hope Street, Primrose Avenue and Spurway Street in Rydalmere to John Street, with new stops on John Street to integrate with the light rail. Existing bus stops on Hope Street would be relocated closer to the proposed Melrose Park light rail stop.
– New bus stops would be introduced in Wentworth Point in the vicinity of the proposed Footbridge Boulevard and Hill Road light rail stops to facilitate interchange.
– The number of bus services operating in Sydney Olympic Park would be rationalised. Bus services would be rerouted via a planned new transport interchange at Figtree Drive with additional bus stops to provide interchanges for the project as well as the proposed Sydney Metro West station at Sydney Olympic Park.

– Route 526 could be rerouted to better serve Carter Street. The 402 service could be extended to provide better opportunities for bus customers travelling north.
– two routes are proposed to service the future Sydney Metro West station in Sydney Olympic Park but would also provide additional bus provision for users of the project.

Further modelling of possible changes to bus services including travel times, operating costs, network efficiency and integration and discussions with key stakeholders including Sydney Olympic Park Authority, Sydney Metro West and relevant divisions of Transport for NSW will be carried out prior to confirming the final changes to be made and the timing of their implementation.

4.8 Walking and cycling connections

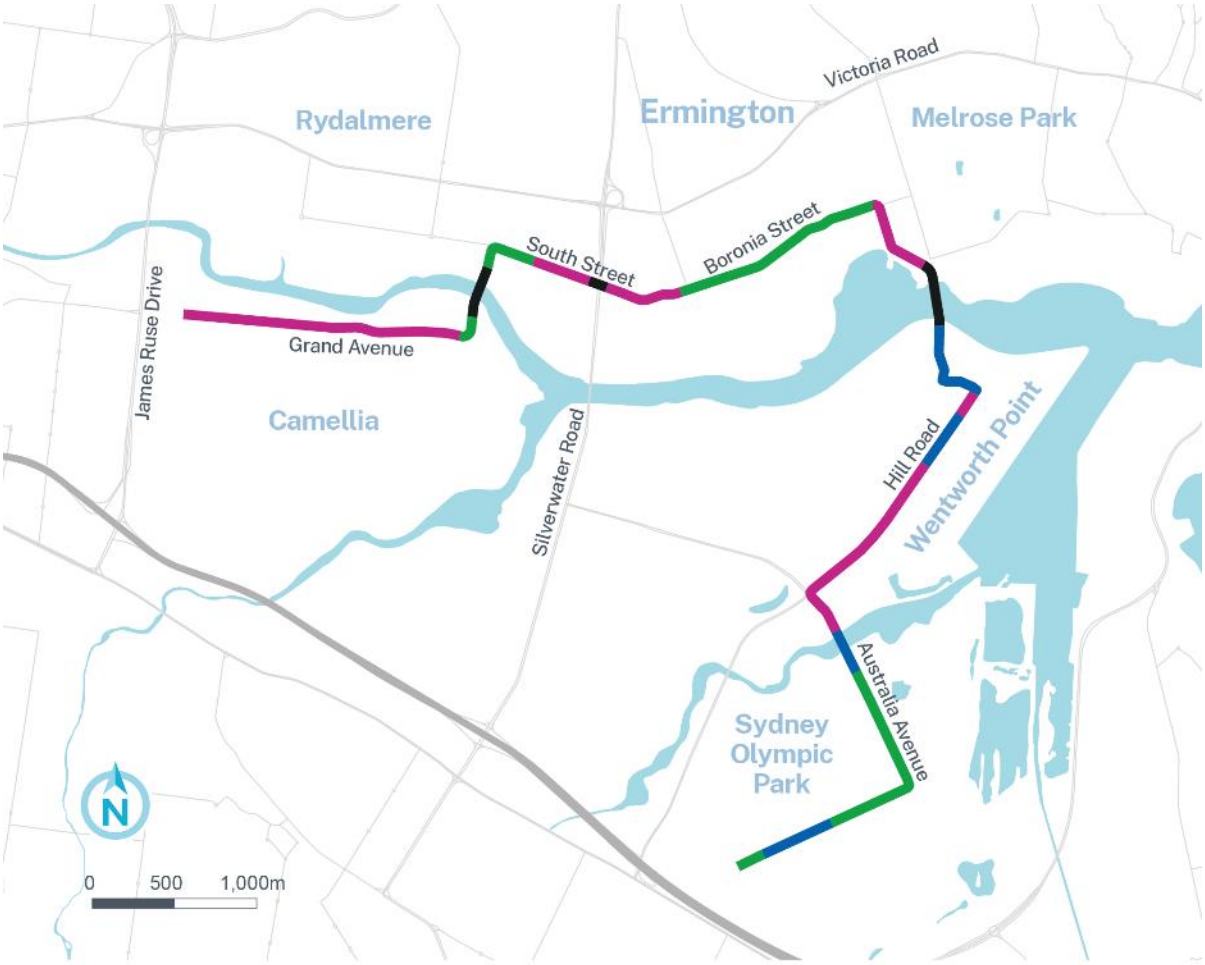
The active transport link to be implemented as part of the project would be designed to meet all relevant legislation and current guidance and standards from organisations such as Transport for NSW and Austroads. The active transport link would offer full and safe separation of users wherever possible, sufficient to encourage ordinary people to consider walking or cycling for everyday trips.

The proposed active transport link would connect to the existing and proposed network of routes and open spaces in the Parramatta and Ryde areas including:

– Parramatta Light Rail Stage 1 active transport link and Rosehill Gardens stop
– Parramatta Valley Cycleway
– River Walk
– Louise Sauvage Pathway
– existing cycle routes at Footbridge Boulevard connecting to Bennelong Bridge
– existing cycle routes at Sydney Olympic Park.

Uni-directional kerbside cycle lanes such as on Australia Avenue and Dawn Fraser Avenue in Sydney Olympic Park are generally preferred where space allows. Elsewhere constraints imposed by the need to avoid property, environmental and utility impacts require a two-way cycle path generally placed adjacent to the footpath. Bi-directional facilities are provided along South Street in Rydalmere, Boronia Street in Ermington and Hope Street in Melrose Park.

Existing shared paths would be retained wherever possible, including the majority of the Louise Sauvage Pathway and over the existing Holker Busway. Figure 4.8 shows the various categories of walking and cycling infrastructure proposed within the project site and connections with regional cycling infrastructure.



Separated cycleway

Separated facility over bridge

Shared path

Existing shared path to be retained

Figure 4.8 Proposed walking and cycling facilities within the project site

4.9 Construction activities and staging

4.9.1 Key activities

The key features of the project are described in detail in Chapter 6 (Project description – infrastructure and operation) of the EIS and Chapter 7 (Project description – construction). The following information is for context in relation to the potential traffic and transport impacts during construction of the project, which are discussed in section 5 of this document. The final construction method and staging be used would be confirmed by the construction contractor following appointment.

Generally, in each work area, some or all of the following would be undertaken:

– rail works
  - construction of new track, crossovers, turnouts
  - construction of new light rail stops
  - installation of drainage, combined services routes and overhead wiring for new tracks
  - installation of light rail systems and operational infrastructure, including vehicle monitoring system and CCTV etc.
– roadworks
  - construction of new car parking and access roads
  - modifications to existing roads including access arrangements, road widening, realignment and lane reallocation
  - modifications to existing intersections including new traffic signals and CCTV cameras at these new intersections
  - installation of CCTV cameras at other key locations for light rail and other mode operation and coordination
  - reinstatement of existing property accesses
  - adjustments to adjacent properties to facilitate access
– utilities
  - installation of drainage, combined services routes and overhead wiring for new track works
  - installation of drainage, lighting and security equipment for new car parking
  - relocation or protection of existing utilities.

The project also includes new bridges and modifications to existing bridges as described in section 4.1.6.

4.9.2 Staging

It is anticipated that construction of the project would occur in multiple locations simultaneously. Each area would be subject to a number of individual construction stages, with traffic management arrangements, including road closures, varying throughout the program of works.

Detailed construction planning, including timing, staging and work sequencing, would be confirmed once construction contractor(s) have been engaged. It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and would take around five to six years to complete. The two bridges over the Parramatta River are expected to take about 30 to 36 months to construct. For the purpose of this assessment, the peak construction period is expected to be during 2026 and 2027, and as a conservative approach, all areas along the alignment are assumed to be under construction simultaneously.

The impacts of construction during 2026 and 2027 are therefore representative for the project as a whole with the cumulative effect of all construction areas included.

4.9.3 Construction workforce

The estimated construction workforce for the project at its peak, when all areas of the alignment are assumed to be under construction simultaneously (i.e. during 2026 and 2027), is estimated to be between 750 and 1,000 workers. An estimated breakdown of construction workforce by location has been assumed for the purposes of this assessment (refer to Table 4.6) on the basis that all areas are under construction simultaneously.

Table 4.6 Construction workforce estimates

Area	Proportion of workforce	Peak workforce
Parramatta CBD (Macquarie Street)	5%[1]	38-50
Stabling and maintenance Facility – Camellia	6%	45-60
Camellia	14%	105-140
Rydalmere	14%	105-140
Ermington	14%	105-140
Melrose Park	14%	105-140
Wentworth Point	14%	105-140
Sydney Olympic Park (Australia Avenue & Dawn Fraser Avenue)	14%	105-140
Lidcombe (Carter Street)	5%	38-50
Total peak workforce		**750-1,000**

The construction workforce would be encouraged to travel to the worksite using public transport. For workers using private cars, parking would be made available at a number of locations including:

– Sydney Olympic Park P5 car park (200 spaces)
– site compounds (small component)
– on-street parking near work zones.

It is proposed that for parking at centralised locations (e.g. Sydney Olympic Park), transport arrangements provided by the contractor would transport workers to the various work areas. Existing parking availability is discussed further in section 3.10.

4.9.4 Site accesses

Access routes to each of the construction areas, and in particular heavy vehicle movements on the public road network, have been developed according to the following general principles:

– use of arterial roads and roads with a high traffic carrying function where possible
– use of local roads only where arterial roads are not possible to be used for transport to individual construction sites.

Due to the linear nature of the project, site accesses are spread across a very wide area, with multiple areas and accesses in use simultaneously. Where possible, multiple access routes have been identified such that construction transport avoids trafficking particular routes more than is necessary to facilitate the works.

For waste removal, including transport of contaminated soil where it is identified, separate outbound routes have been identified where possible to ensure the shortest path to the arterial road network and to avoid sensitive land uses.

[1] Night works only

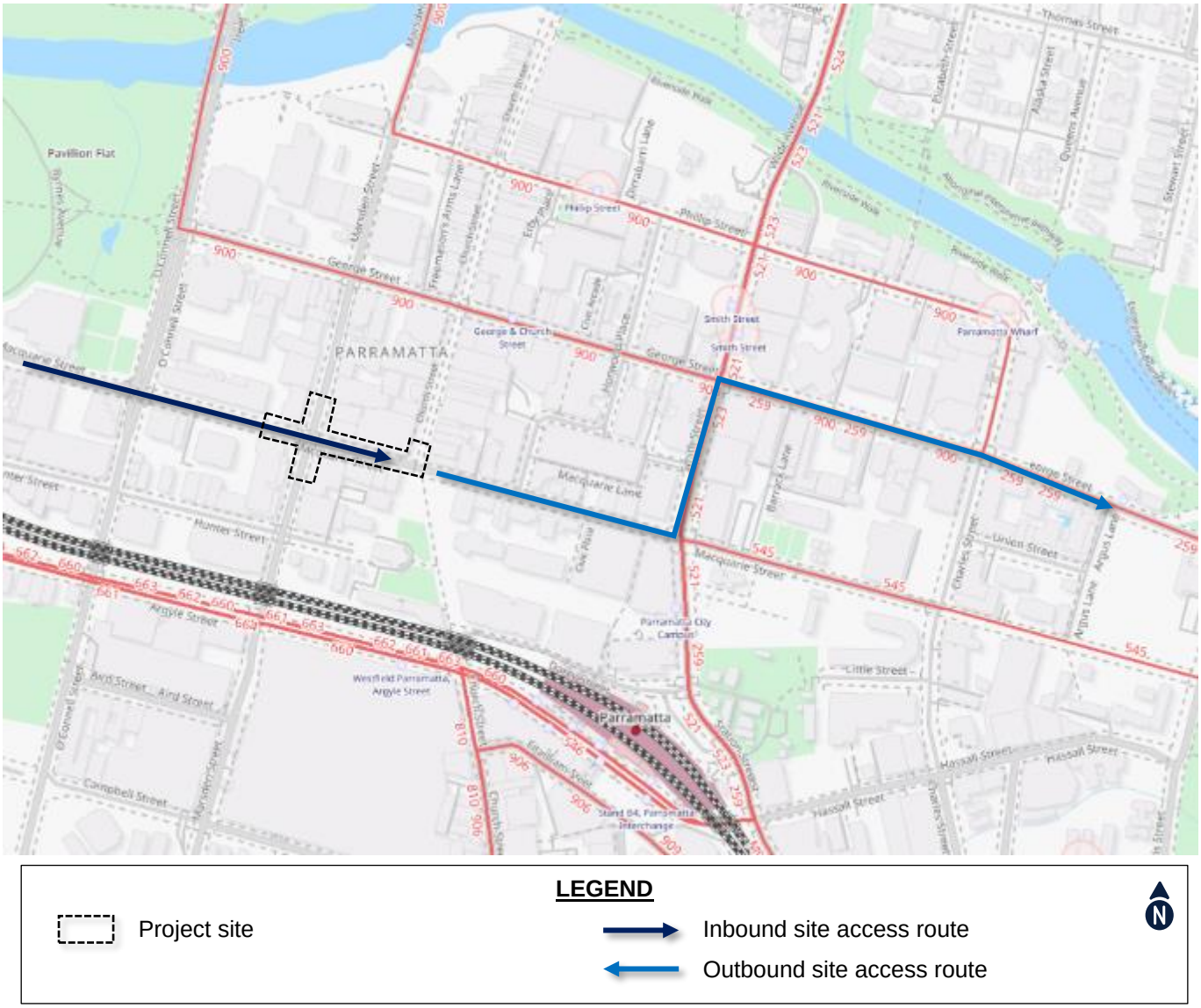
Site access and compounds

Vehicles accessing the project site would access one of the many site compounds that would be provided along the alignment. A summary of proposed compound locations and associated access is provided below.

Parramatta CBD (Macquarie Street)

Works in Macquarie Street include the construction of a new turnback facility between Church Street and Marsden Street. It is anticipated that the site compound would be located within the project site indicated in Figure 4.9.

The inbound site access route is limited to Macquarie Street in the eastbound direction due to existing access restrictions along this road. The primary route for outbound traffic would be via George Street.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 4.9 Parramatta CBD site access

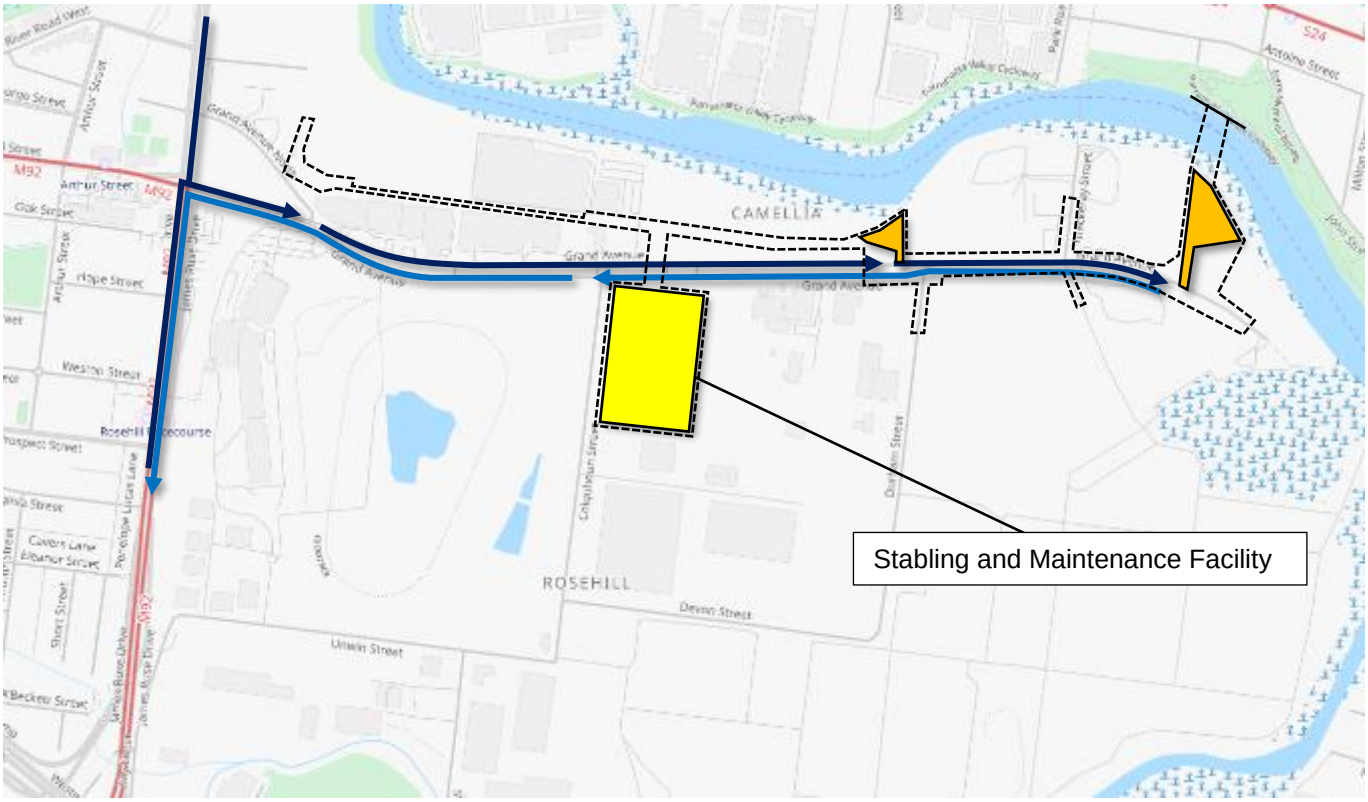
Camellia

Work areas in Camellia are described generally as follows:

– The western end of the project site within Camellia is located within the former Sandown Line corridor as indicated in Figure 4.10. Access to the project site in this area would be via the construction compound with all trucks and light vehicles anticipated to enter and exit the site at that location (west of Durham Street) and travel within the work zone to access areas further to the west along the corridor.
– The eastern end of the project site within Camellia is located within Grand Avenue from west of Durham Street to the construction compound at 37A Grand Avenue.

An additional site compound would be located at the eastern end of Grand Avenue within Lot 37A. This compound would serve primarily for construction of the bridge between Camellia and Rydalmere.

A diagram showing work areas, compound locations and truck access routes for Camellia is provided in Figure 4.10.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 4.10 Camellia site access

The traffic access routes for inbound and outbound trips are as follows:

– General access vehicles access the site via Grand Avenue with connection to the arterial road network via James Ruse Drive. Both Grand Avenue and James Ruse Drive are approved B-Double routes.
– Heavy trucks delivering bridge components for the bridge between Camellia and Rydalmere would travel via the same route. While James Ruse Drive is an approved route for Higher Mass Limit (HML) and Over-Sized-Over-Mass (OSOM) loads, use of Grand Avenue may require separate approvals.

– Waste and contaminated material would be exported from the site via Grand Avenue and James Ruse Drive, heading southbound to access the M4 Western Motorway.

Rydalmere

Work areas in Rydalmere are described generally as follows:

– The work area for the bridge between Camellia and Rydalmere is located south of Antoine Street and includes areas on either side of the Parramatta River. A large compound site is provided on the northern side of the river, accessed via Antoine Street or Jean Street. *Note that the southern side of the river is accessed via Camellia (refer above).*
– The remainder of the project site in Rydalmere is located within South Street, between John Street and Primrose Avenue.

The preferred traffic access routes for inbound and outbound trips for light and heavy vehicles are as follows:

– Vehicles approaching from the west would use South Street, accessed from Clyde Street and Victoria Road. Similarly, vehicles approaching from the east would use South Street accessed from Silverwater Road. Note that due to left-in/left-out restrictions at South Street and Silverwater Road, right turns would be facilitated via the interchange at Victoria Road. An alternative route is available via Antoine Street which may be used in the event South Street is subject to road closures.
– Heavy trucks delivering bridge components for the bridge between Camellia and Rydalmere would travel from the M4 Western Motorway, using the Silverwater Road interchange heading northbound and turning left onto South Street.
– While Silverwater Road and Victoria Road are approved routes for HML and OSOM loads, use of South Street and other local roads may require separate approvals.
– Waste and contaminated material (if present) would be exported from the site via John Street and Victoria Road.

A diagram showing work areas, compound locations and truck access routes for Rydalmere is provided in Figure 4.11.

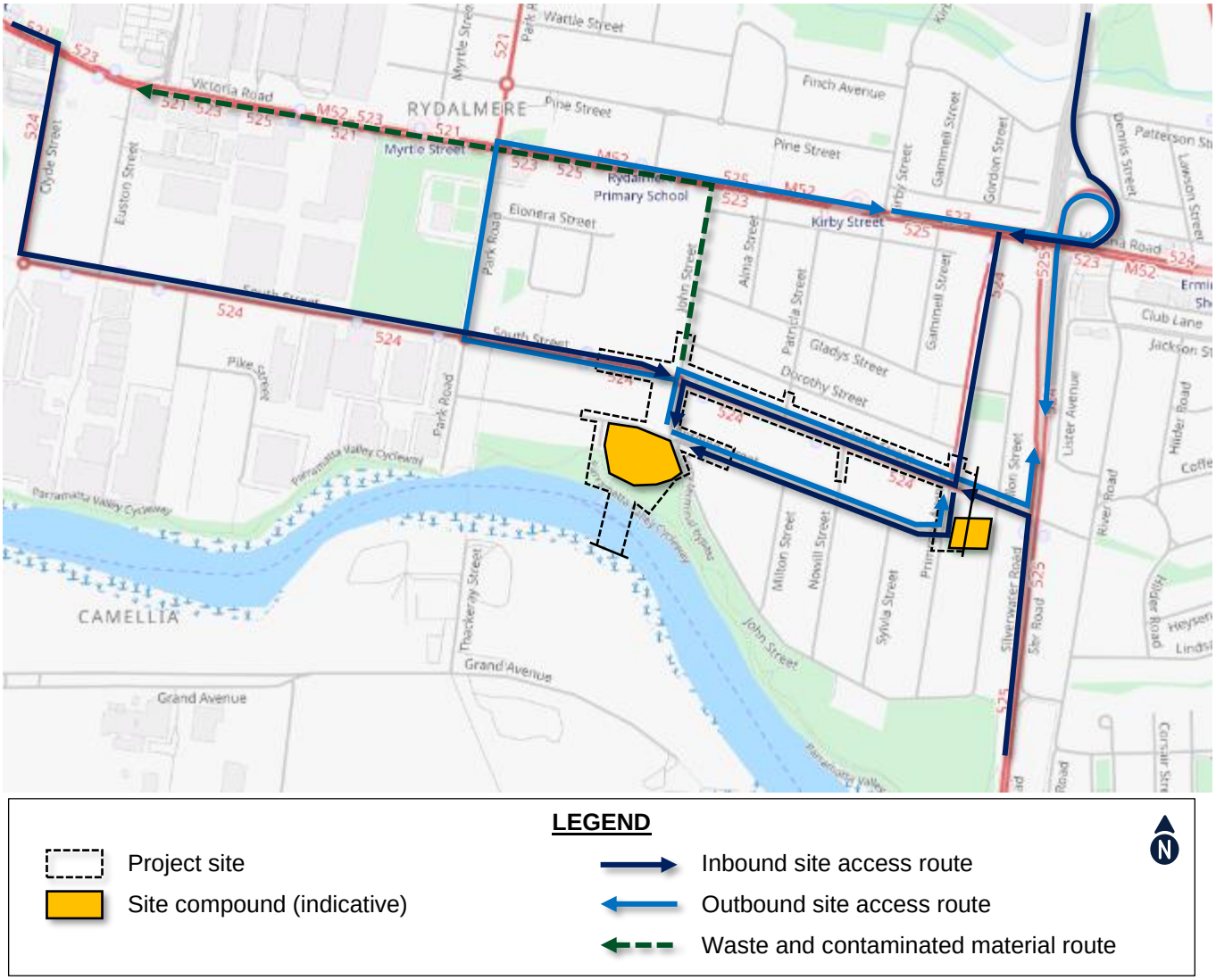


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Figure 4.11 Rydalmere site access

Ermington

Work areas in Ermington are described generally as follows:

– The work area for the bridge over Silverwater Road is located between Primrose Avenue and River Road and includes parts of South Street and Silverwater Road. The compound site would be located within Broadoaks Park accessed via Fallon Street.
– The project site then runs from River Road to Boronia Street through Ken Newman Park. The primary compound would be located at Tristram Street, with a secondary compound at Heysen Avenue if required.
– The project site includes Boronia Street, between Spurway Street and Atkins Road. The construction compound would be located at Hope Street, between Atkins Road and Hughes Avenue.

A diagram showing work areas, compound locations and truck access routes for Ermington is provided in Figure 4.12.

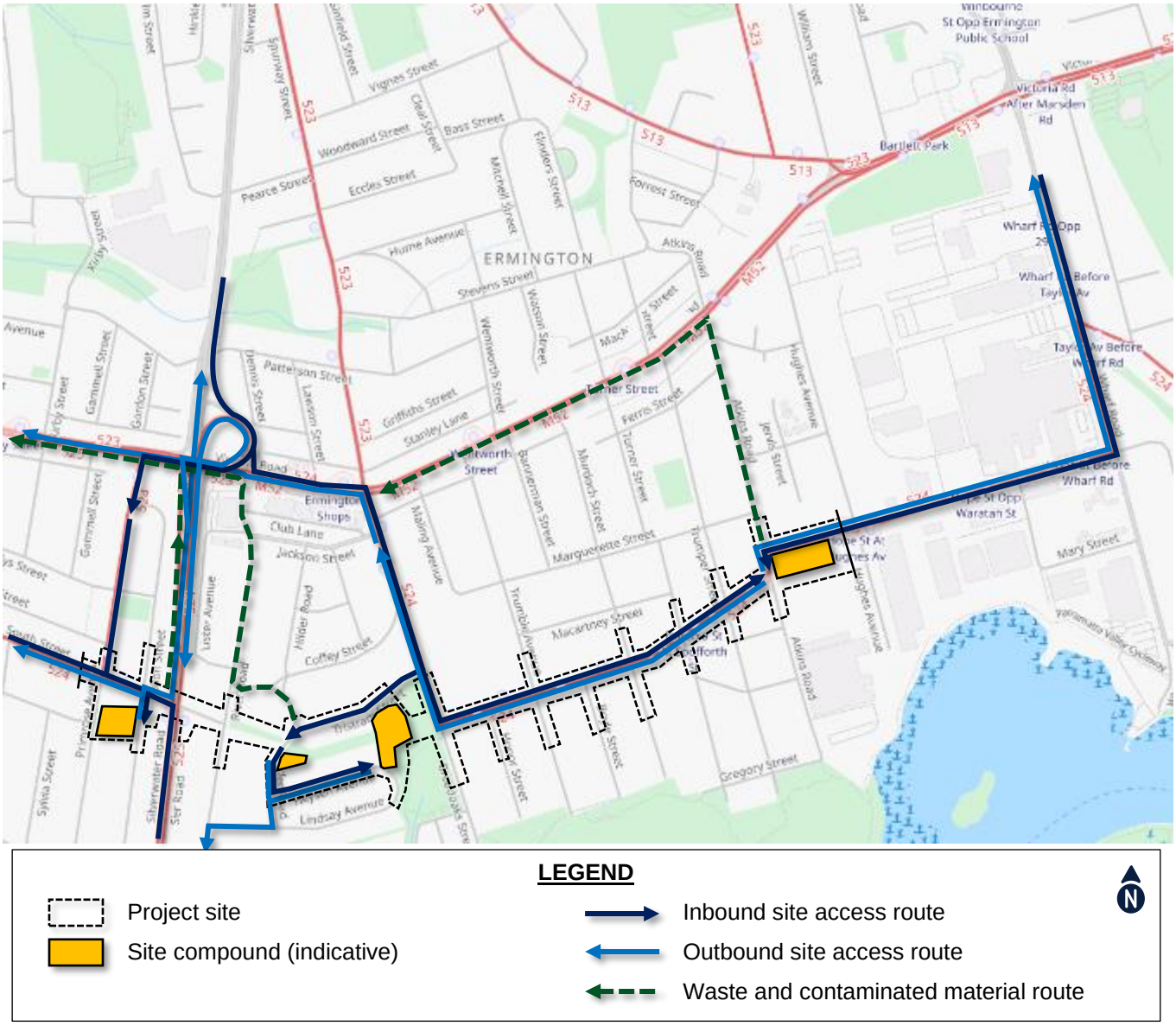

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Figure 4.12 Ermington site access

The preferred traffic access routes for inbound and outbound trips for light and heavy vehicles are as follows:

- Vehicles accessing Ermington can use Victoria Road with access via Spurway Street (west) or Wharf Road (east). Local access routes include Boronia Street and Hope Street. Ken Newman Park provides an alternative route for egress connecting to Silverwater Road via River Road and Silverse Street to the south:
  - For the compound for the bridge over Silverwater Road, vehicle routes would be similar to those for Rydalmere as outlined above. Note that access restrictions at the intersection of South Street and Fallon Street during construction may require access via Primrose Avenue to the site compound.
- Heavy trucks delivering bridge components for the bridge over Silverwater Road would travel from the M4 Western Motorway, using the Silverwater Road interchange heading northbound and turning left onto South Street.
- Heavy trucks delivering bridge components for the bridge over the gully in Ken Newman Park would utilise Victoria Road, Spurway Street, Tristram Street and Hilder Road.
- While Silverwater Road and Victoria Road are approved routes for HML and OSOM loads, use of South Street, Spurway Street and other local roads may require separate approvals.
- Waste and contaminated material would be exported from the site via the closest route to Victoria Road heading westbound.

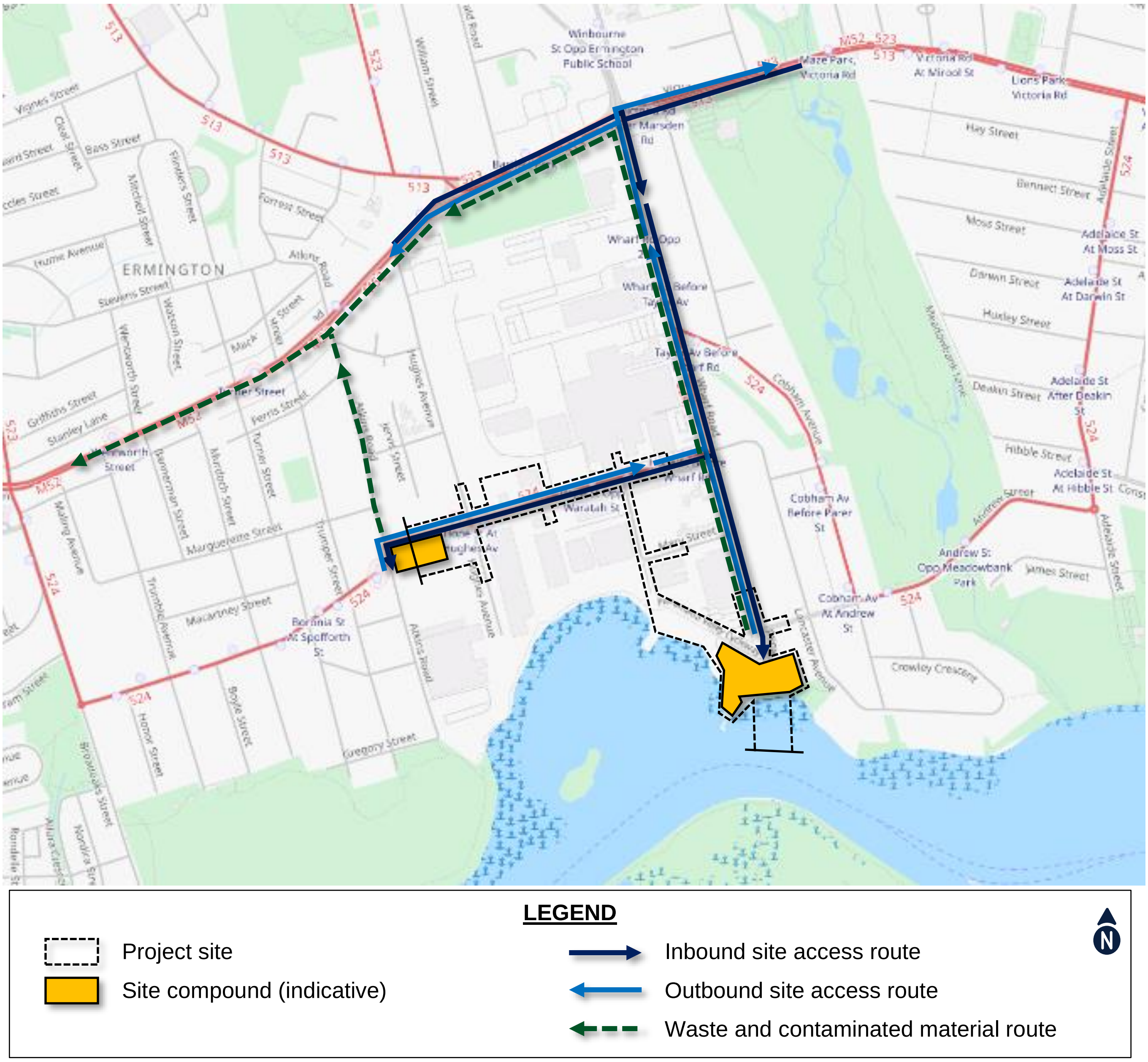
Melrose Park

Work areas in Melrose Park are described generally as follows:

– The project site through Melrose Park runs from Atkins Road to Hughes Avenue in an off-road corridor running parallel to, and south of, Hope Street, and then continues along the northern side of Hope Street, between Hughes Avenue and Waratah Street. The Hope Street site compound would be used for these areas (refer Ermington precinct above).

– From Hope Street, the project site runs along Waratah Street, as far as the location of the bridge between Melrose Park and Wentworth Point (refer below). The site compound for Waratah Street works would be the Ermington Boat Ramp, co-located with the site compound for the bridge between Melrose Park and Wentworth Point, and is accessed via Wharf Road.

A diagram showing work areas, compound locations and truck access routes for Melrose Park is provided in Figure 4.13.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 4.13 Melrose Park site access

The preferred traffic access routes for inbound and outbound trips for light and heavy vehicles are as follows:

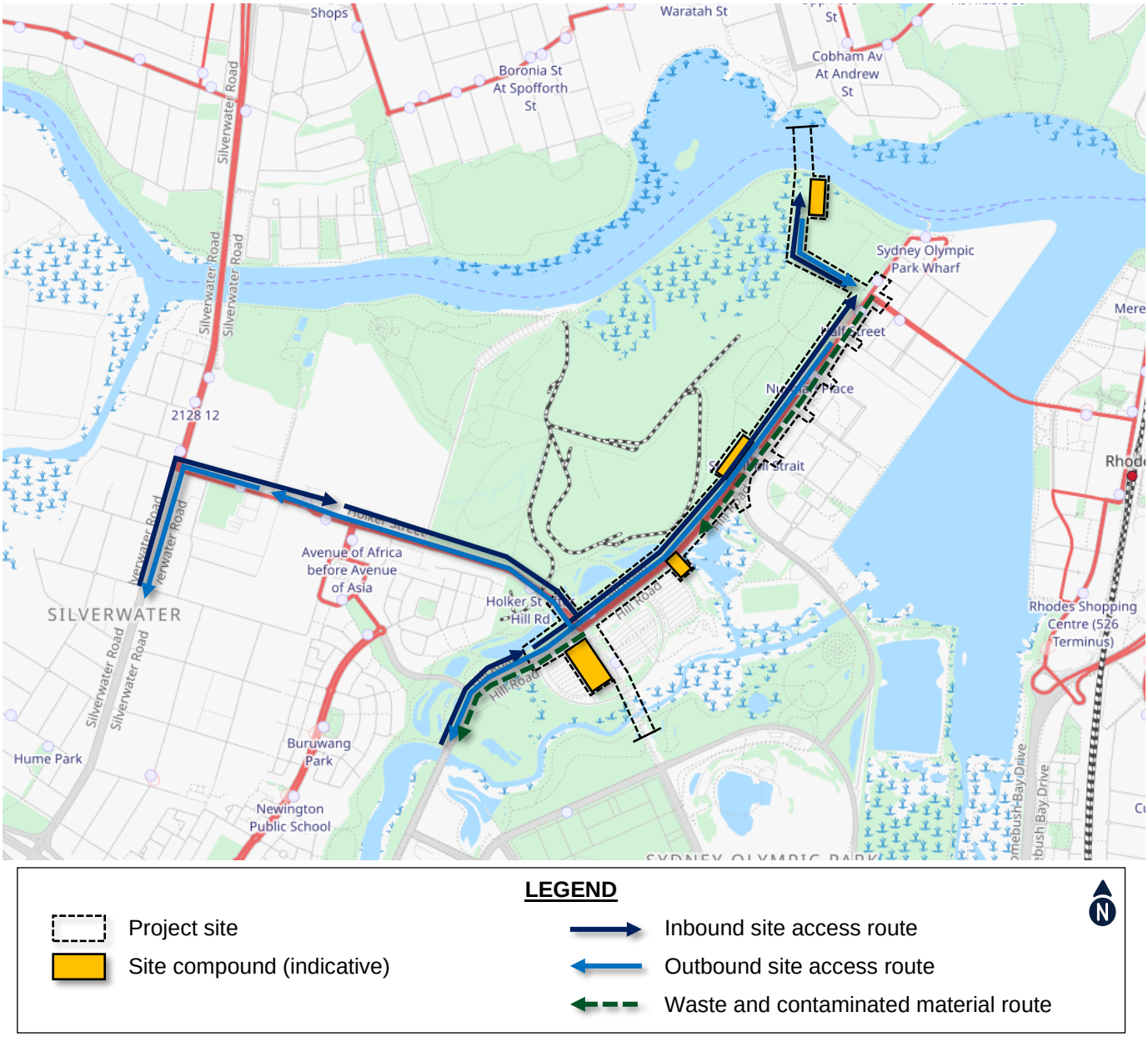
– Vehicles accessing Melrose Park primarily use Wharf Road, from Victoria Road. The Hope Street compound can be accessed via Hope Street, while the Waratah Street compound is accessed directly via Wharf Road.
– Heavy trucks delivering bridge components for the bridge between Melrose Park and Wentworth Point would travel from Victoria Road and turn right onto Wharf Road. While Silverwater Road and Victoria Road are both approved routes for HML and OSOM loads, use of Wharf Road may require separate approvals.
– Waste and contaminated material (if present) would be exported from the site via the closest route to Victoria Road heading westbound, either Wharf Road or Atkins Road.

Wentworth Point

Work areas in Wentworth Point are described generally as follows:

– The bridge between Melrose Park and Wentworth Point comprises the northern abutment, accessed via Wharf Road as per Melrose Park above, and the southern abutment, accessed from Hill Road. Compounds are located on both sides of the river as indicated in Figure 4.13 (above) and Figure 4.14.
– From the southern bridge abutment, the project site runs off-road around the Sanctuary Wentworth Point development connecting to Hill Road at Footbridge Boulevard.
– The project site then runs alongside Hill Road, between Footbridge Boulevard and Holker Busway. A site compound would be provided adjacent to the Sydney Olympic Park P5 car park, located at Hill Road and Holker Street. It is also proposed to occupy a portion of the Sydney Olympic Park P5 car park for construction worker parking.

A diagram showing work areas, compound locations and truck access routes for Wentworth Point is provided in Figure 4.14.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 4.14 Wentworth Point site access

The preferred traffic access routes for inbound and outbound trips for light and heavy vehicles are as follows:

– Vehicles accessing the Wentworth Point Precinct primarily utilise Hill Road, accessed via the interchange at the M4 Western Motorway. An alternative route is available via Silverwater Road and Holker Street.

– Heavy trucks delivering bridge components for the bridge between Melrose Park and Wentworth Point would travel from the M4 Western Motorway and travel northbound the full length of Hill Road to access the site southern site compound for the bridge. It is noted that Hill Road is not an approved OSOM or HML route and separate approvals may be required.

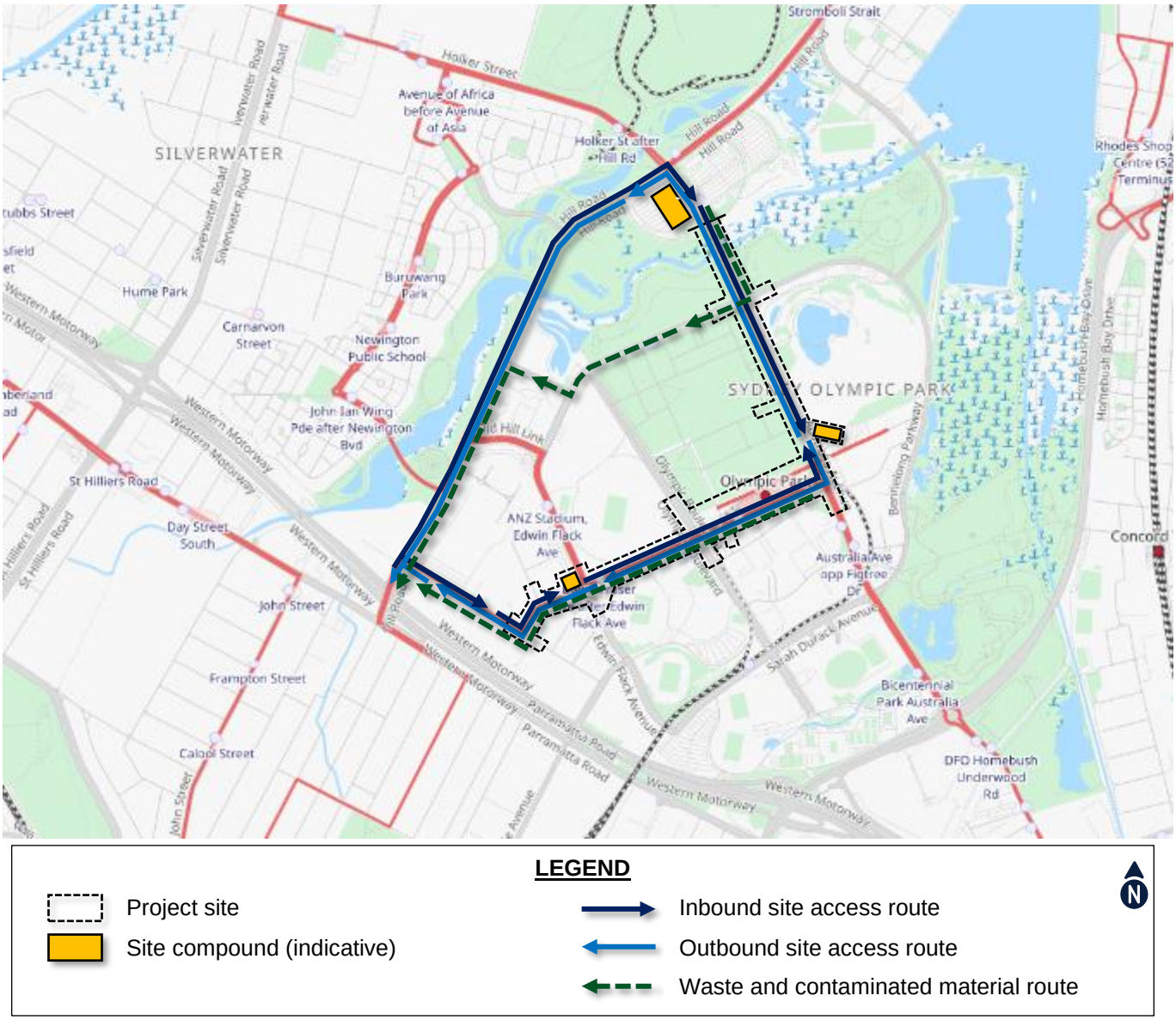
– Waste and contaminated material (if present) would be exported from the site via Hill Road connecting to the M4 Western Motorway.

Sydney Olympic Park

Work areas in Sydney Olympic Park are described generally as follows:

– The project site runs along Holker Busway between Sydney Olympic Park P5 car park and Australia Avenue. Site compounds would be provided at either end of Holker Busway as shown in Figure 4.15.
– The project site continues along Australia Avenue, between Holker Busway and Dawn Fraser Avenue, and a site compound would be provided within a car park on the corner of Australia Avenue and Murray Rose Avenue.
– The full length of Dawn Fraser Avenue, between Australia Avenue and Edwin Flack Avenue, would also be included in the project site. A site compound would be provided on the corner of Uhrig Road and Edwin Flack Avenue as shown in Figure 4.15.

A diagram showing work areas, compound locations and truck access routes for Sydney Olympic Park is provided in Figure 4.15.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 4.15 Sydney Olympic Park site access

The traffic access routes for inbound and outbound trips are as follows:

– Access is available from the Hill Road interchange at the M4 Western Motorway with circulation via either Hill Road and Holker Busway or Carter Street and Dawn Fraser Avenue. The most convenient route would typically be utilised for individual trips.
– Waste and contaminated material (if present) would be exported from the site via the shortest route connecting to Hill Road and the M4 Western Motorway (either via Kevin Coombs Avenue and Old Hill Link or via Dawn Fraser Avenue and Carter Street).

Carter Street

The site compound for the Carter Street construction area would be located on the corner of Edwin Flack Avenue and Uhrig Road (refer Figure 4.15) and site access would be the same as for Sydney Olympic Park as outlined above.

4.9.5 Haulage routes

The majority of materials and components for the construction of the project would be transported via the arterial road network where possible, predominantly using the M4 Western Motorway, with local access to construction areas via James Ruse Drive, Silverwater Road or Hill Road (as well as Victoria Road) as appropriate. Local roads would be used only where arterial roads are not possible for transport to individual construction sites and for 'last mile' transport from the arterial road network to the site compounds.

All nominated arterial roads are approved B-Double routes. The M4 Western Motorway, James Ruse Drive, Silverwater Road and Victoria Road are also approved Over-Sized-Over-Mass (OSOM) and Higher Mass Limit routes. Use of other roads (including Hill Road) for transport of heavy loads may require separate approvals. The arterial road network used for this project is shown in Figure 4.16.

Figure 4.16 Arterial road network including connections to the M4 Western Motorway

4.9.6 Trip generation

4.9.6.1 Heavy vehicles

This assessment considers the peak construction period during 2026 and 2027 when all areas are assumed to be under active construction simultaneously. A breakdown of average peak and daily traffic volumes, based on the key activities being carried out in each area, has been estimated for the project.

A summary of the anticipated heavy vehicle trip generation, including daily trips and trips during the peak period of the surrounding road network, is provided in Table 4.7. Note that in general, traffic management planning would aim to ensure that the peak construction traffic generation periods generally falls outside of the commuter peak periods of the road network to minimise congestion. For the purpose of this assessment, the construction peak periods have been assumed to coincide with the peak traffic periods of the surrounding road network.

Table 4.7 Anticipated heavy vehicle movements in 2026-2027 (two-way inbound and outbound combined)

Area	Key activities	Estimated heavy vehicle trips		
		Daily	Morning peak (8-9am)	Afternoon peak (5-6pm)
Macquarie Street turnback	Pre-construction and site mobilisation Drainage and utilities	30-50	2-4	2-4
Stabling and maintenance facility	Pre-construction and site mobilisation Drainage and utilities	30-50	2-4	2-4
Camellia	Pre-construction and site mobilisation Drainage and utilities Bulk earthworks, civil and road works	66-76	4-5	4-5
Rydalmere	Pre-construction and site mobilisation Drainage and utilities	110-120	7-8	7-8
Ermington	Pre-construction and site mobilisation Drainage and utilities Bulk earthworks, civil and road works	106-126	6-9	6-9
Melrose Park	Pre-construction and site mobilisation Drainage and utilities	30-50	2-4	2-4
Wentworth Point	Bulk earthworks, civil and road works Track work (rail and rail systems)	88-92	5-6	5-6
Sydney Olympic Park	Bulk earthworks, civil and road works Track work (rail and rail systems)	86-96	5-7	5-7
Lidcombe	Bulk earthworks, civil and road works Track work (rail and rail systems)	74-78	4-5	4-5
Total		**620-738**	**37-52**	**37-52**

Based on the information provided in Table 4.7, the project is expected to generate around 620 to 738 truck trips per day (two-way) spread across the project site. The volume during each of the peak hours (morning or afternoon) is estimated to be around six to seven per cent of daily truck movements at around 37 to 52 truck movements per hour (two-way).

Trucks would access each area as per the local site access routes identified in section 4.9.4.

4.9.6.2 Light vehicles

Light vehicles

A summary of the anticipated light vehicle trip generation is provided in Table 4.8. This includes an estimate of daily light vehicle trip generation as well as trips during the morning and afternoon peak periods of the surrounding road network. Note that this excludes workforce commuting trips (refer below) and considers only light vehicle trips associated with construction activities.

Table 4.8 Anticipated light vehicle movements in 2026-2027 (two-way inbound and outbound combined)

Area	Key activities	Estimated light vehicle trips		
		Daily	Morning peak (8-9am)	Afternoon peak (5-6pm)
Macquarie Street turnback	Pre-construction and site mobilisation Drainage and utilities	16-24	1	5-6
Stabling and maintenance facility	Pre-construction and site mobilisation Drainage and utilities	16-24	1	5-6
Camellia	Pre-construction and site mobilisation Drainage and utilities Bulk earthworks, civil and road works	16-24	1	5-6
Rydalmere	Pre-construction and site mobilisation Drainage and utilities	16-24	1	5-6
Ermington	Pre-construction and site mobilisation Drainage and utilities Bulk earthworks, civil and road works	24-36	1-2	7-9
Melrose Park	Pre-construction and site mobilisation Drainage and utilities	16-24	1	5-6
Wentworth Point	Bulk earthworks, civil and road works Track work (rail and rail systems)	16-24	1	5-6
Sydney Olympic Park	Bulk earthworks, civil and road works Track work (rail and rail systems)	16-24	1	5-6
Lidcombe	Bulk earthworks, civil and road works Track work (rail and rail systems)	16-24	1	5-6
Total		**152-228**	**9-10**	**47-57**

Workforce transport

As part of construction traffic management measures, construction workers would be encouraged to travel to and from the site via public transport. Notwithstanding, it is acknowledged that there would be a significant portion of workers that would travel via private car and park in areas near the construction sites. For the purpose of this assessment, the approach to estimate workforce movements is as follows:

– private car one car per two workers accounting for around 50 per cent mode share to private car (two movements (or trips) total)
– shuttle bus one bus per 22 workers (two movements (or trips) total).

The adopted trip generation for the workforce is therefore estimated as shown in Table 4.9.

Table 4.9 Anticipated workforce vehicle movements in 2026-27 (two-way inbound and outbound combined)

Area	Anticipated locations of worker car parking	Estimated light vehicle trips		
		Daily	Morning peak (8-9am)	Afternoon peak (5-6pm)
Macquarie Street turnback facility	On-street parking (nightworks only)	56-75	23-30	23-30
Stabling and maintenance facility (Camellia)	Stabling and maintenance facility (compound)	47-63	19-25	19-25
Camellia	Grand Avenue compound Reserved on-street parking Stabling and maintenance facility site	131-175	53-70	53-70
Rydalmere	Compound for the bridge between Camellia and Rydalmere Reserved on-street parking (north) Reserved on-street parking (south) Stabling and maintenance facility site	131-175	53-70	53-70
Ermington	Fallon Street compound Ken Newman Park compound Reserved on-street parking Stabling and maintenance facility site	131-175	53-70	53-70
Melrose Park	Hope Street compound Ermington Boat Ramp (Wharf Road) car park	131-175	53-70	53-70
Wentworth Point	Wharf Road car park Sydney Olympic Park car park	131-175	53-70	53-70
Sydney Olympic Park	Sydney Olympic Park car park	131-175	53-70	53-70
Lidcombe	Sydney Olympic Park car park	47-63	19-25	19-25
Total		**936-1,250**	**379-500**	**379-500**

5. Construction impact

5.1 Construction traffic generation

The forecast additional construction traffic on key roads used for access to and from the project site can be estimated by considering:

– the anticipated traffic generation for each area (section 4.9.6)
– the local site access routes (section 4.9.4)
– workforce parking locations (section 4.9.3).

Construction traffic volume estimates are provided in Table 5.1. Note that the adopted construction traffic volume is the top 15 per cent of the range indicated in trip generation estimates described in section 4.9.6. Note that while the commuter peak periods (morning and afternoon) are reported below, traffic management planning would aim to time traffic movements such that the peak construction traffic generation periods would fall outside of the commuter peak periods of the road network to minimise congestion.

Table 5.1 Proposed increase in two-way construction traffic in 2026-2027

Road	Daily volume		Morning peak volume (8-9am)		Afternoon peak volume (5-6pm)	
	Heavy	Light	Heavy	Light	Heavy	Light
Major roads						
Victoria Road (west of Silverwater Road)	106	320	7	115	7	122
Victoria Road (east of Silverwater Road)	212	320	15	108	15	119
James Ruse Drive (south of Grand Avenue)	61	171	4	61	4	65
James Ruse Drive (north of Grand Avenue)	61	171	4	61	4	65
Hill Road (north of Holker Street)	82	21	6	1	6	5
Hill Road (south of Holker Street)	109	390	7	147	7	152
Holker Street (west of Hill Road)	16	4	1	0	1	1
Minor roads						
Grand Avenue	122	342	8	121	8	130
Colquhoun Street	0	93	0	37	0	37
Durham Street	0	93	0	37	0	37
South Street (east of bridge between Camellia and Rydalmere)	87	17	6	4	6	5
South Street (west of bridge between Camellia and Rydalmere)	29	15	2	4	2	5
Antoine Street	12	140	1	54	1	55
Park Road	0	59	0	24	0	24
Primrose Avenue	45	84	3	31	3	32
Fallon Street	25	41	2	14	2	15

Road	Daily volume		Morning peak volume (8-9am)		Afternoon peak volume (5-6pm)	
	Heavy	Light	Heavy	Light	Heavy	Light
Spurway Street	94	122	6	42	6	46
Tristram Street	55	91	4	31	4	34
Hilder Road (north of Heysen Avenue)	55	91	4	31	4	34
Hilder Road (south of Heysen Avenue)	18	47	1	17	1	18
Heysen Avenue	0	84	0	34	0	34
Lindsay Avenue	18	64	1	24	1	25
River Road	18	64	1	24	1	25
Atkins Road	9	54	1	18	1	20
Boronia Street	39	48	3	17	3	18
Wharf Road	109	143	8	49	8	53
Holker Busway	32	8	2	0	2	2
Kevin Coombs Avenue	1	0	0	0	0	0
Old Hill Link	1	0	0	0	0	0
Australia Avenue	28	7	2	0	2	2
Dawn Fraser Avenue	28	7	2	0	2	2
Uhrig Road	125	34	9	2	9	8
Carter Street	125	34	9	2	9	8

Based on Table 5.1, the anticipated increases in daily and peak traffic volumes on key local site access roads is relatively low. The largest increases would be experienced on Victoria Road, which is a key collector road, and Grand Avenue, as the only access road available for Camellia. Hill Road would also experience increased volumes as the construction workforce accesses the proposed parking location at the Sydney Olympic Park P5 car park.

A summary of existing and forecast traffic volumes is provided in Table 5.2. Existing volumes were adopted from traffic count surveys completed between 2017 and 2019. As a conservative estimate, the construction peak period and commuter peak period have been assumed to coincide, however construction traffic management planning would aim to time peak construction traffic movements outside of normal commuter peak periods on the road network.

Table 5.2 Existing roads – peak two-way hourly traffic volumes (8am to 9am and 5pm to 6pm)

Road name	Nominal capacity[2]	Morning peak hourly volumes (8-9am)			Afternoon peak hourly volumes (5-6pm)		
		Existing	Add	Change	Existing	Add	Change
Major roads							
Victoria Road (west of Silverwater Road)	6,000	~3,800	123	3%	~4,420	130	3%
Victoria Road (east of Silverwater Road)	6,000	~4,000	123	3%	~4,000	134	3%
James Ruse Drive (south of Grand Avenue)	6,000	5,040	65	1%	5,010	69	1%
James Ruse Drive (north of Grand Avenue)	6,000	4,920	65	1%	4,750	69	1%
Hill Road (north of Holker Street)	2,000	1,520	7	0%	1,670	11	1%
Hill Road (south of Holker Street)	4,000	1,460	154	11%	1,470	159	11%
Holker Street (west of Hill Road)	4,000	1,730	1	0%	1,840	2	0%
Minor roads							
Grand Avenue	1,600	895	129	14%	774	138	18%
Colquhoun Street	2,000	~30	37	124%	~50	37	74%
Durham Street	2,000	31	37	124%	52	37	74%
South Street (east of bridge between Camellia and Rydalmere)	1,600	512	10	2%	538	11	2%
South Street (west of bridge between Camellia and Rydalmere)	800	614	6	1%	613	7	1%
Antoine Street	2,000	~100	55	55%	~100	56	56%
Park Road	1,600	460	24	5%	640	24	4%
Primrose Avenue	1,600	78	34	44%	100	36	36%
Fallon Street	1,600	32	16	49%	24	17	70%
Spurway Street	1,600	420	48	11%	500	52	10%
Tristram Street	2,000	82	28	35%	100	31	31%
Hilder Road (north of Heysen Avenue)	2,000	59	35	59%	49	38	77%

[2] Estimated using a nominal lane capacity as follows:

- Semi-interrupted arterial road corridor 1,000 vph/lane
- Highly constrained environment 400 vph/lane
- Local road with traffic-controlled intersections 800 vph/lane
- Local road with no traffic control 1,000 vph/lane

Road name	Nominal capacity[2]	Morning peak hourly volumes (8-9am)			Afternoon peak hourly volumes (5-6pm)		
		Existing	Add	Change	Existing	Add	Change
Hilder Road (south of Heysen Avenue)	2,000	~50	18	37%	~50	19	39%
Heysen Avenue	2,000	~30	34	112%	~30	34	112%
Lindsay Avenue	2,000	~50	25	50%	~50	26	52%
River Road	2,000	250	25	10%	310	26	52%
Atkins Road	1,600	360	18	5%	300	20	7%
Boronia Street	1,600	509	20	4%	616	21	3%
Wharf Road	2,000	603	56	9%	1,007	61	6%
Holker Busway	2,000	0	3	-	0	4	-
Australia Avenue	3,200	876	2	0%	949	4	0%
Dawn Fraser Avenue	1,600	256	2	1%	239	4	2%

Notes: Estimate for Colquhoun Street has adopted the same volumes as Durham Street. Survey count information was not available for Antoine Street or Lindsay Avenue and estimates were therefore made.

Based on the existing and proposed traffic volumes provided in Table 5.2, all roads are expected to perform satisfactorily considering the forecast estimate of construction traffic generated by the project. In particular:

– The proportional increase in traffic on roads which already carry high peak hour traffic volumes (i.e. major roads) is very low at generally three per cent or less.
– The proportional increase in traffic on Hill Road, south of Holker Street, is estimated to be around 11 per cent, however the ultimate construction volumes (1,614 to 1,629 vehicles per hour) are deemed to remain well within the nominal capacity of the road (~4,000 vehicles per hour).
– While the proportional increase in traffic on minor and local roads is higher (up to 112 per cent), this is compared to a very low base volume which means that the ultimate traffic volume (existing plus construction traffic) would remain well within the estimated two-way capacity of these roads during the construction peak.

Mitigation measures developed as part of the traffic management planning would include minimising the use of local roads where practicable, in particular with respect to heavy vehicle traffic, in order to mitigate the impacts to residential amenity.

It is noted that some of the roads assessed in this section may experience additional traffic due to road closures and detours that would be in effect for a period of the construction program. These additional impacts are discussed in section 5.2.

5.2 Road closures and detours

The project would establish a number of full and partial road closures throughout the duration of the construction period. A summary of indicative road closures and potential detour routes is provided in Table 5.3 and these closures and detours are discussed further in the following sections (see Table 5.3 for relevant cross-references). The ultimate extent and duration of road closures would be dependent on the construction methodology developed by the contractor during construction traffic management planning.

Table 5.3 Indicative summary of road closures and detours

Area	Closure type	Road closure	Detour / alternative route	Reference
Macquarie Street, Parramatta	Full	Along Macquarie Street between Marsden Street and Horwood Place	George Street	Section 5.2.1
Grand Avenue	Partial	Durham Street from Grand Avenue	Use Colquhoun Street as alternative	Section 5.2.2
	Partial	Thackeray Street from Grand Avenue	Reopens daily except on weekends	
South Street	Partial	South Street between 10-57 South Street (southbound)	Two-way traffic under management	Section 5.2.3
	Full	John Street between South Street and Dorothy Street	Dorothy Street ↔ Patricia Street Limited access for local residents	
	Partial	South Street between 88-106 South Street (southbound)	Two-way under traffic management	
	Full	John Street between South Street and Antoine Street	Antoine Street ↔ Nowill Street Limited access for local residents	
	Full	Antoine Street from John Street	South Street ↔ Nowill Street	
	Full	Patricia Street from South Street (north)	John Street ↔ Dorothy Street	
	Full	Nowill Street from South Street	Via John Street or Primrose Avenue ↔ Antoine Street	
Bridge over Silverwater Road	Full	Primrose Avenue from South Street (north)	Patricia Street ↔ Dorothy Street	Section 5.2.4.1
	Full	South Street between Silverwater Road and River Road	Silverse Street ↔ River Road Limited access for local residents	
	Full	Primrose Avenue from South Street (south)	Nowill Street ↔ Antoine Street	
	Full	Fallon Street from South Street (south)	Nowill Street ↔ John Street	
	Full	Silverwater Road at the South Street intersection (both north and southbound) Note: only short-term overnight closures would be in place at Silverwater Road.	River Road from Victoria Road (southbound) Temporary right hand turn into Silverse Street → River Road (northbound)	
	Partial	River Road between 30-36A River Road (northbound)	Bidirectional traffic under management	
Ken Newman Park	Full	Tristram Street and Hilder Road between 17 Tristram Street and 32 Hilder Road	Coffey Street ↔ River Road ↔ Lindsay Avenue	Section 5.2.4.2
	Partial	Spurway Street / Broadoaks Street east of Ken Newman Park	Two-way traffic under management	

Area	Closure type	Road closure	Detour / alternative route	Reference
Boronia Street	Partial	Boronia Street (north and south)	Two-way traffic under management	Section 5.2.4.3
	Full	Trumble Avenue from Boronia Street (south)	Staged works to allow access through Boyle Street	
	Partial	Trumble Avenue (north) one way off Boronia Street	Macartney Street → Murdoch Street	
	Full	Boyle Street from Boronia Street (south)	Staged works to allow access through Trumble Avenue	
	Partial	Murdoch Street (north) one way onto Boronia Street	Trumble Avenue ↔ Macartney Street	
	Full	Spofforth Street from Boronia Street (north and south)	Atkins Road ↔ Massie Street (south of Boronia Street) Atkins Road ↔ Marguerette Street (north of Boronia Street)	
Hope Street	Full	Atkins Road between Boronia Street and Hope Street	Hughes Avenue ↔ Swane Street (north of Hope Street) Trumper Street (north and south of Hope Street)	Section 5.2.5
	Full	Hope Street between Atkins Road and Hughes Avenue	Hughes Avenue ↔ Swane Street (north of Hope Street) Detour through new road (south of Hope Street) Limited access for local residents	
	Partial	Hughes Avenue (northbound) between 80 Hughes Avenue and Hope Street	Two-way traffic under management	
	Full	Waratah Street from Hope Street	Wharf Road ↔ Mary Street	
Waratah Street	Full	Waratah Street south of Mary Street to the boat ramp car park		
Hill Road	Partial	Baywater Drive from Hill Road	Use Stromboli Strait or Nuvolari Place as alternative	Section 5.2.6.2
Holker Busway	Partial	Holker Busway	Two-way traffic under management	Section 5.2.7.1
Australia Avenue	Full	Grand Parade from Australia Avenue	Use Showground Road or Orana Parade as alternative	Section 5.2.7.2
	Partial	Murray Rose Avenue (southbound) west of Australia Avenue	Dawn Fraser Avenue → Park Street	
Dawn Fraser Avenue	Full	Dawn Fraser Avenue between Olympic Boulevard and Australia Avenue	Use Herb Elliott Avenue or Grand Parade as alternative back onto Dawn Fraser Avenue through Olympic Boulevard	Section 5.2.7.3
	Full	Showground Road between Herb Elliot Drive and Murray Rose Avenue		
	Partial	Olympic Boulevard between Cathy Freeman Park and Herb Elliot Avenue (east)	Two-way traffic under management	
	Partial	Olympic Boulevard between Cathy Freeman Park and Herb Elliot Avenue (west)	Two-way traffic under management	
Carter Street	Partial	Stockyard Boulevard from Uhrig Road	Two-way traffic under management	Section 5.2.8

5.2.1 Macquarie Street, Parramatta

Construction of the Macquarie Street turnback facility would likely require the full closure of Macquarie Street, between Marsden Street and Horwood Place for night works. The most direct detour route for eastbound traffic is via George Street, which could be accessed via Marsden Street or Smith Street. While Macquarie Street is closed for night works, access to Horwood Place would be limited to two-way access via George Street under traffic control.

Indicative road closures and potential detour routes are provided in Figure 5.1.

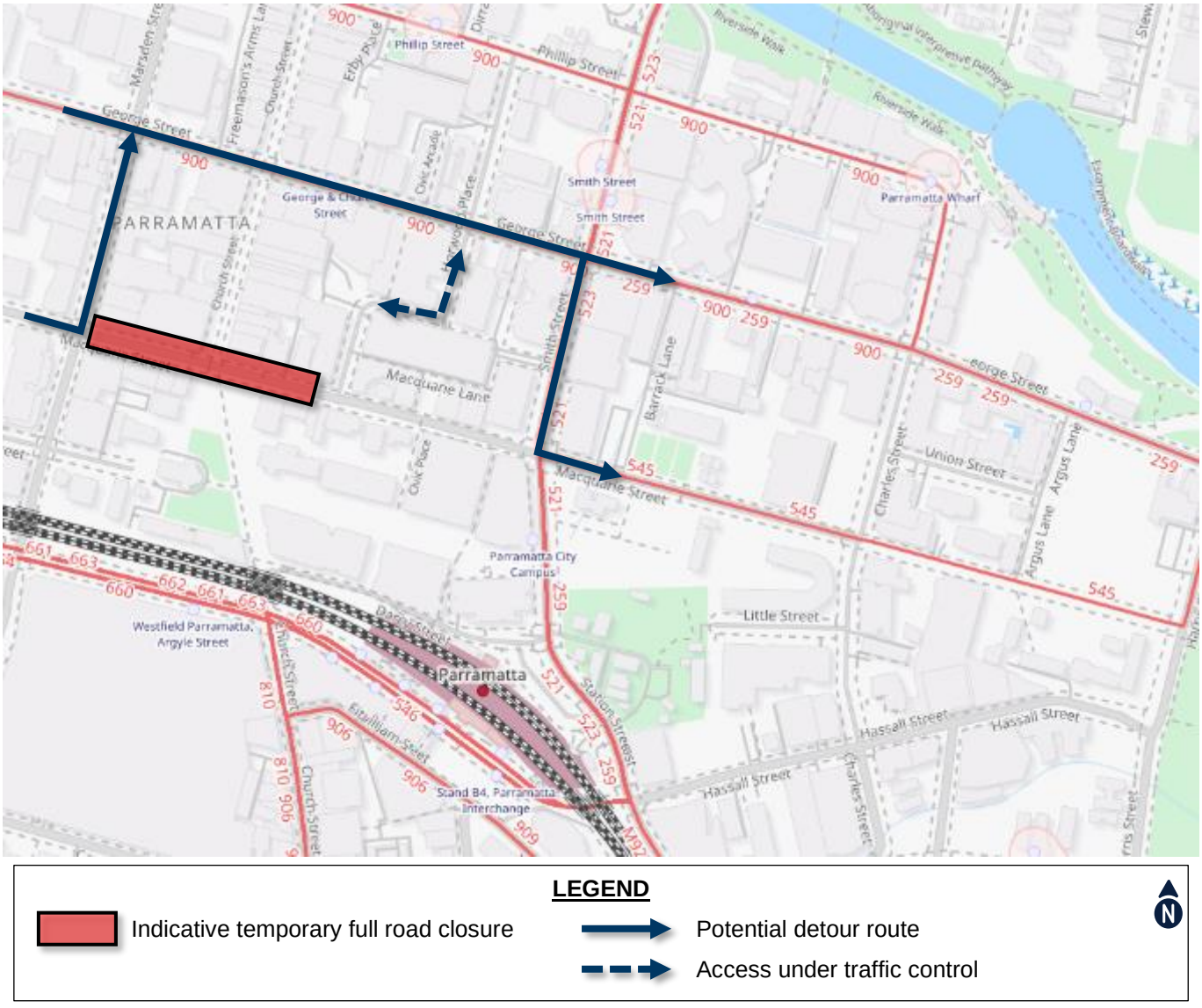


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Figure 5.1 Road closures and detour routes – Macquarie Street, Parramatta

Given that road closures would occur during night works only, the estimated traffic volume within the Parramatta CBD would be low and the detour route via George Street would perform adequately, with only minor impacts on journey times. It is noted that Macquarie Street is currently one-way in the eastbound direction (established during Parramatta Light Rail Stage 1 works) and therefore only eastbound traffic would be redirected to George Street during closures.

It is acknowledged that Sydney Metro West construction would likely be ongoing in this area while the Macquarie Street turnback facility is also under construction. Close coordination with the Sydney Metro West project would be required with respect to working hours, haulage routes, road closures and parking. Cumulative impacts are discussed in section 7.1.2.

5.2.2 Camellia

No road closures are required for the Sandown Line segment of the works. Construction of the Grand Avenue segment would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are summarised below:

– short-term closures of Durham Street for night works with alternative access available via Colquhoun Street as required
– partial, short-term closures of Thackeray Street with controlled access via 14A Grand Avenue
– Thackeray Street (north) to operate two-way with a single lane under traffic control.

Indicative road closures and potential detour routes are provided in Figure 5.2.

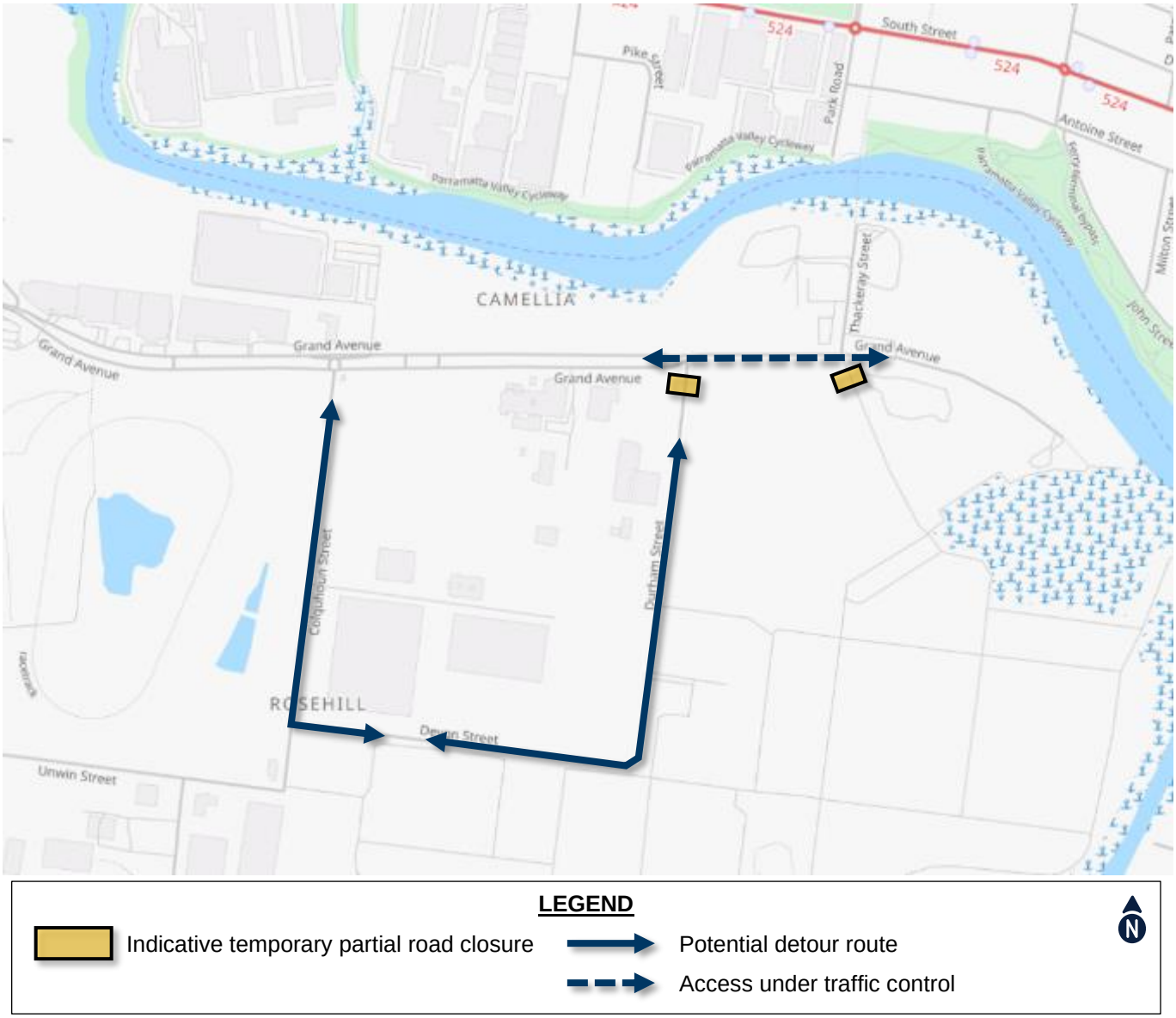

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Figure 5.2 Road closures and detour routes – Grand Avenue, Camellia

The proposed road closures would impact local roads only, which carry generally low traffic volumes. Grand Avenue would remain open to two-way traffic for the duration of the construction period.

The detour route for Durham Street would be via Colquhoun Street and Devon Street. Each of these roads have sufficient capacity to accommodate the relatively low detour traffic from Durham Street, with only a minor impact on journey total times. The intersection of Colquhoun Street and Grand Avenue is a roundabout, which provides a safe form of intersection control for detour traffic.

Local access to Thackeray Street, both north and south of Grand Avenue, would be maintained using traffic control.

5.2.3 Rydalmere

The construction areas for the bridge between Camellia and Rydalmere, comprising the northern bridge abutment and the section of project site along John Street, would not require any temporary road closures or detours. It is noted that access between John Street and Antoine Street (west) would be permanently closed as part of the project

Construction for South Street, between John Street and Primrose Avenue, would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

- partial closure of South Street at the John Street intersection (including north and south intersection approaches) and maintain two-way traffic flow along South Street
- closure of John Street, between South Street and Dorothy Street, with alternative access available via Dorothy Street and Patricia Street
- closure of John Street, between South Street and Antoine Street, with alternative access via Nowill Street
- partial closure of South Street between John Street and Primrose Avenue and maintain two-way traffic flow along South Street
- temporary closure of Antoine Street at John Street with alternative access via Nowill Street
- closure of Patricia Street at South Street with alternative access via Dorothy Street and John Street (note that John Street is reopened to traffic upon completion of John Street intersection works)
- partial closure of Primrose Avenue, north of South Street, allowing one-way southbound traffic only
- temporary closure of Nowill Street at South Street with alternative access via John Street or Primrose Avenue
- permanent closures of right turn access at Patricia Street / South Street
- partial closure of John Street between South Street and Antoine Street and maintain two-way traffic flow along John Street
- temporary nightworks closures at John Street / South Street intersection.

Indicative road closures and potential detour routes are provided in Figure 5.3.

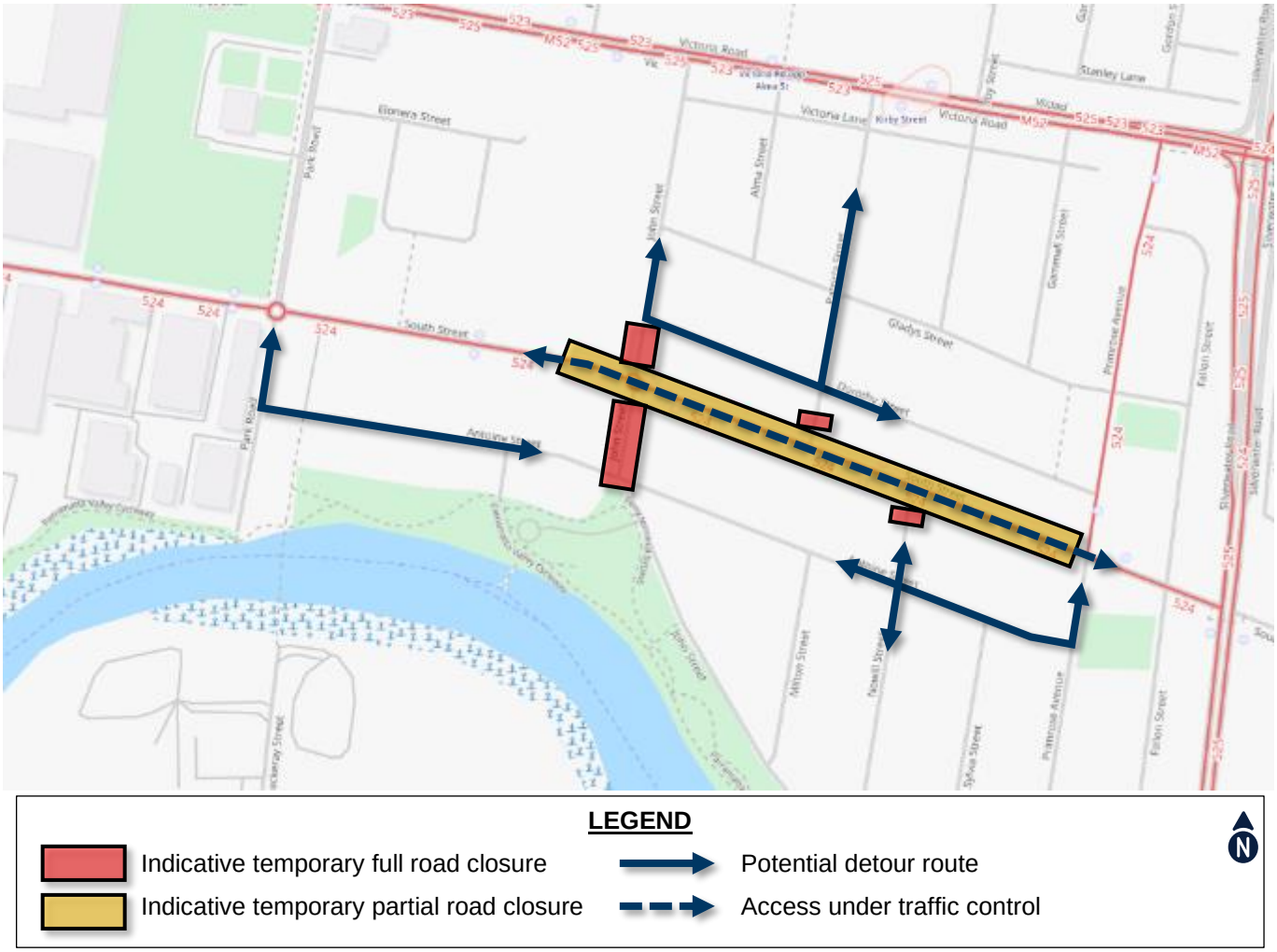

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Figure 5.3 Road closures and detour routes – South Street

The indicative road closures would impact local access roads only, which generally carry low traffic volumes. South Street would remain open to two-way traffic for the duration of the construction period.

The indicative detour routes involve use of other local streets for access including Primrose Avenue, Nowill Street, Antoine Street, John Street, Dorothy Street, and Patricia Street. Local conditions during the road closure period, and driver preference, would dictate which routes are more heavily utilised. Notwithstanding, given road closures are on local access roads only, it is considered that the network can accommodate the detoured traffic. Route diversions are not long enough such that journey times would be significantly affected. It will be important to adequately advertise and sign road closures and detour routes such that drivers are able to plan their trips accordingly.

It is noted that buses would be impacted by road closures in this area. The impacts to bus routes and stop locations are described in section 5.5.

5.2.4 Ermington

5.2.4.1 Bridge over Silverwater Road

Construction between Primrose Avenue and River Road, including removal of the existing pedestrian bridge and construction of the new bridge over Silverwater Road, would be staged to limit access impacts as far as practicable. Construction staging would be determined by the contractor during construction management planning. Indicative road closures that would likely be required during construction are outlined below:

– closure of Primrose Avenue, between South Street and Dorothy Street with alternative access available via Dorothy Street and Patricia Street (or John Street depending on stage of South Street works)
– closure of Primrose Avenue and Fallon Street, south of South Street, with alternative access available via Antoine Street and Nowill Street (or John Street depending on stage of South Street works)
– permanent closure of South Street, east of Silverwater Road
– closure of Silverwater Road at South Street for night works with alternative access via Silverse Street, River Road and Victoria Road. Temporary traffic control would be provided at Silverse Street to allow northbound right hand turns from Silverwater Road onto the detour route
– permanent closure of right turn access at Fallon Street / South Street intersection
– temporary closures on South Street west with alternative access via local detour routes
– partial closures of River Road. Maintain two-way access along River Road within one lane under traffic control.

Indicative road closures and detour routes are provided in Figure 5.4. Note that where full closure of Silverwater Road is required (for example during installation of the bridge girders), consultation with relevant stakeholders such as Transport for NSW, City of Parramatta Council, Emergency Services and property owners would be carried out. Additionally, route diversions associated with high productivity vehicles and Over-sized-Over-Mass vehicles would be considered by the relevant stakeholders.

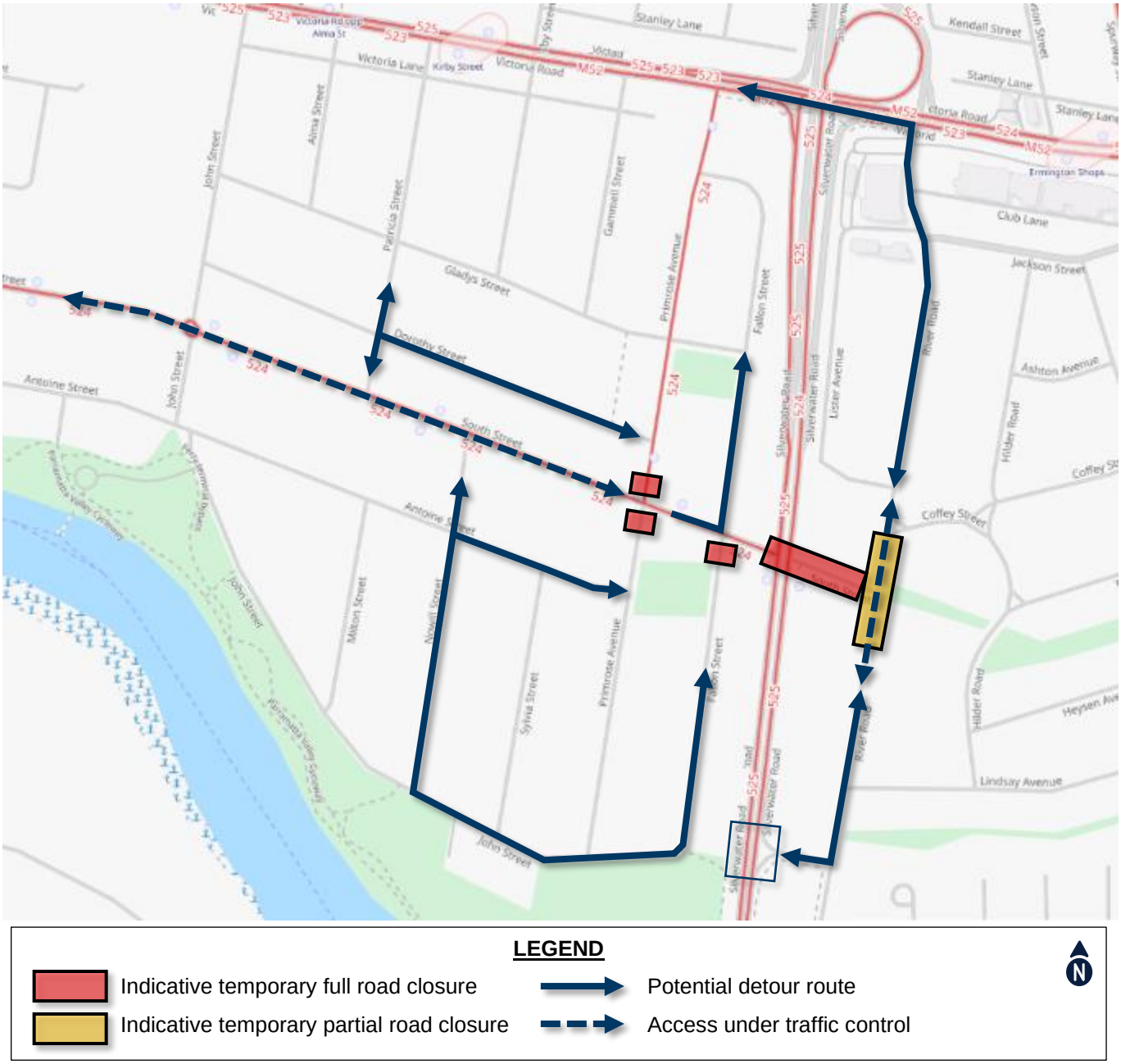

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Figure 5.4 Road closures and detour routes – Bridge over Silverwater Road

The proposed works at the bridge over Silverwater Road require closure of local roads (including Primrose Avenue and Fallon Street) as well as closure of the arterial corridor at Silverwater Road for night works. The permanent closure of South Street, east of Silverwater Road, would also require traffic to redirect via alternative routes.

This area also interacts with areas of South Street further to the west with the available detour routes dependent on staging in the adjacent works sites. Notwithstanding, it is anticipated that detoured traffic would be very low, given that Primrose Avenue and Fallon Street are local access roads, and the alternative routes including John Street, Patricia Street, Dorothy Street, Antoine Street and Nowill Street have sufficient capacity to accommodate the additional traffic volumes. Impacts on travel time for detoured vehicles would be low.

Temporary speed limit reductions may be required on Silverwater Road at various stages throughout the construction period. This may have a minor impact on the performance of the corridor. The extent and duration of speed limit reductions would be determined during construction traffic management planning for the project having regard to the nature of the road and its importance as an arterial corridor.

Closure of Silverwater Road would occur only during night works. Temporary traffic management would be established at the intersection of Silverwater Road and Silverse Street to allow northbound right turns towards River Road. Southbound traffic can utilise River Road onto Silverse Street and the existing left turn at Silverwater Road. Given that Silverwater Road would only be closed during night works, the alternative route at River Road is considered to have sufficient capacity to accommodate the loads. However, there may be some minor impacts to local amenity given that River Road is primarily a local access road, as well as impacts to journey times for vehicles travelling along the arterial road corridor.

Two-way access would be maintained along River Road using traffic control in the event of partial closures. Access to properties would be maintained, however street parking would likely be unavailable during the partial closures.

The design development process would include determining temporary road closures and diversions to be implemented during construction. Temporary traffic management arrangements are subject to further planning, and consultation with stakeholders, and would be documented as part of the Traffic and Access Management Plan prepared for the project.

5.2.4.2 Ken Newman Park

Construction between River Road and Boronia Street, including through Ken Newman Park, would be staged to limit traffic access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

– permanent closure of Hilder Road for a short distance south of Tristram Street, with alternative access via Coffey Street, River Road and Lindsay Avenue
– temporary closure of Tristram Street and Hilder Street, maintaining two-way traffic flow in a single lane under traffic control.

Indicative road closures and detour routes are provided in Figure 5.5.

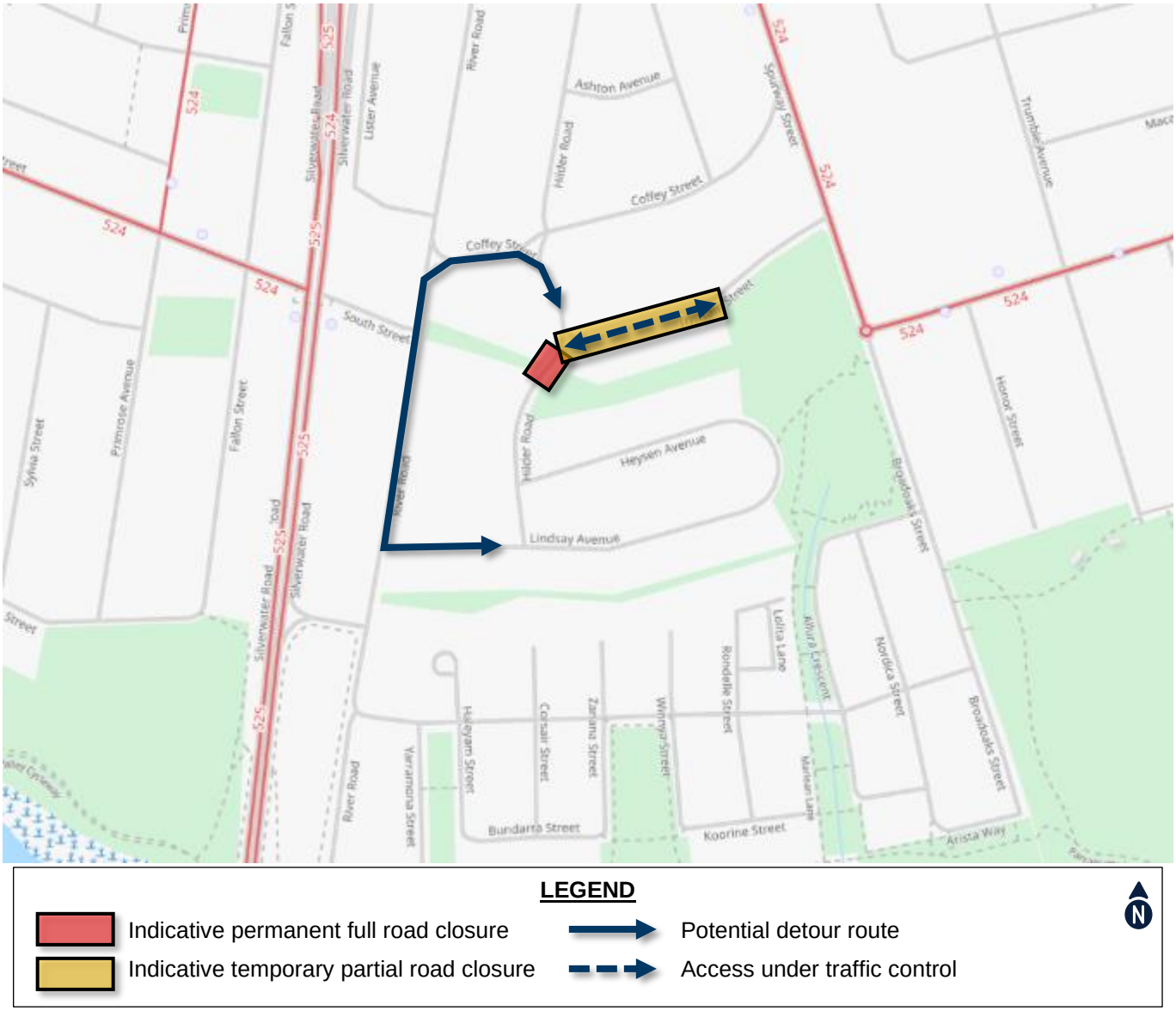

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Figure 5.5 Road closures and detour routes – Ken Newman Park

Indicative road closures around Ken Newman Park are generally considered to be low impact, with Hilder Road generally carrying low traffic volumes consistent with its function as a local access road, and a relatively direct alternative route available via Coffey Street and River Road. Two-way traffic flow would be maintained along Tristram Street during water main works under traffic control.

5.2.4.3 Boronia Street

Construction along Boronia Street would be staged to limit traffic access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

- partial closure of Spurway Street and Broadoaks Street north and south of the Boronia Street intersection and maintain two-way traffic flow
- partial closure of Boronia Street, between Boronia Street and Trumper Street, and maintain two-way traffic flow. Note that property access would be maintained where practicable
- closures of Trumble Avenue and Boyle Street, south of Boronia Street, to be staged to allow access through either Trumble Avenue or Boyle Street
- partial closure of Trumper Avenue north of Boronia Street to allow one-way traffic only
- partial closure of Murdoch Street north of Boronia Street to allow one-way traffic only

– closure of Spofforth Street north and south of Boronia Street with alternative access via Atkins Road and other local connecting streets
– permanent closure of right turns at Honor Street / Boronia Street, Trumble Avenue / Boronia Street, Boyle Street / Boronia Street and Spofforth Street / Boronia Street.

Indicative road closures and detour routes are provided in Figure 5.6.

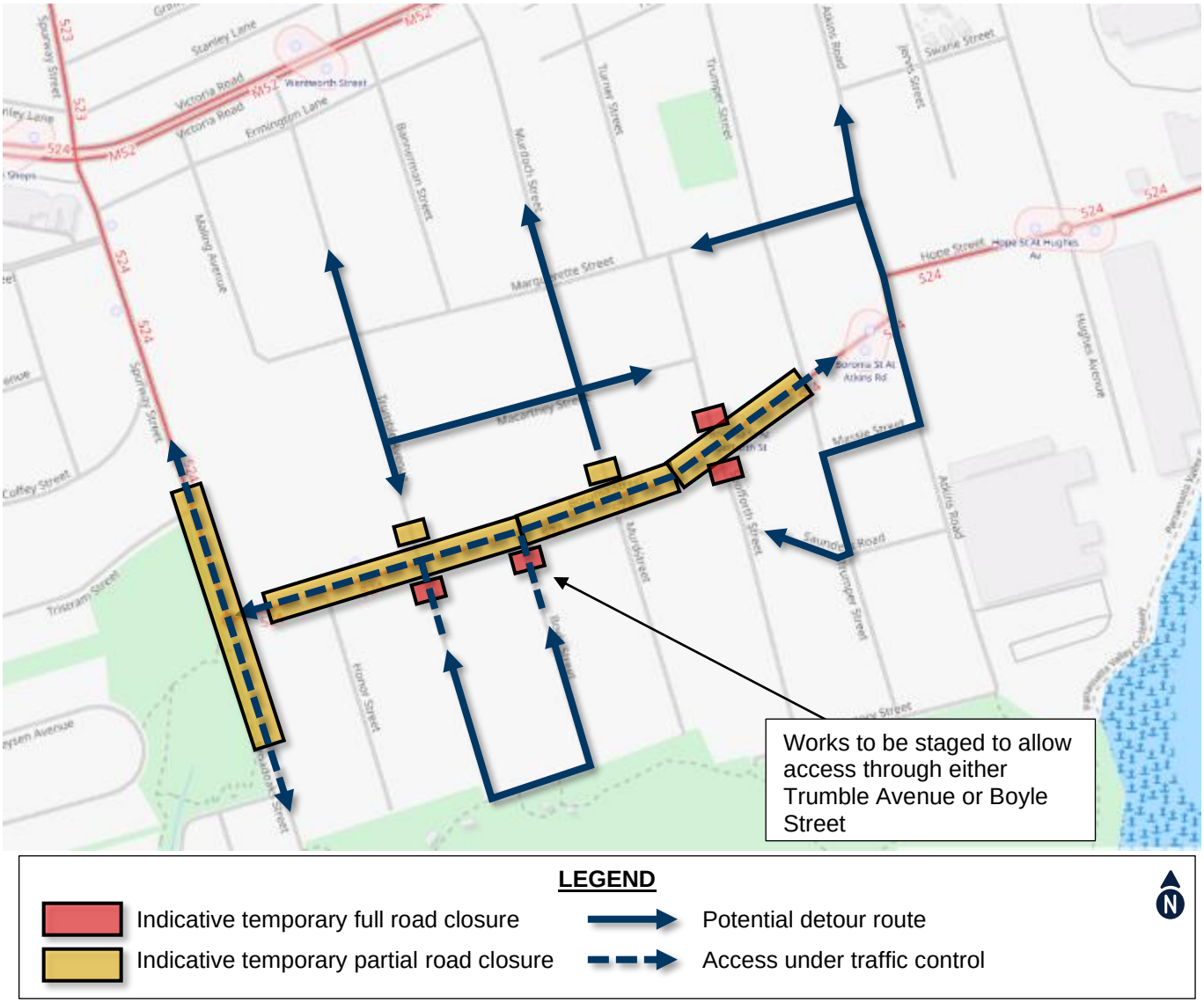

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Figure 5.6 Road closures and detour routes – Boronia Street

Two-way traffic would be maintained along Boronia Street at all times throughout the construction period. Works would be staged to maintain access to cul-de-sacs with no connecting roads (including Honor Street and Murdoch Street south).

Access to Boyle Street and Trumble Avenue (south) would be maintained by staging works such that either of these two streets are available for use at all times. The partial closures at Trumble Avenue (north) and Murdoch Street (north) allow for access between Boronia Street and residential areas to the north. Note that access is also available via Victoria Road.

Given that the areas serviced south of Boronia Street are very small, detoured traffic volumes are expected to be very low and the alternative routes have sufficient capacity to accommodate these flows. For areas north of Boronia Street, access is maintained via one of either Trumble Avenue or Murdoch Street, and access is also available via Victoria Road to the north. There is considered to be ample capacity in the network to accommodate the detour volumes during construction.

It is noted that buses would be impacted by road closures in this area. The impacts to bus routes and stop locations are described in section 5.5.

5.2.5 Melrose Park

Construction along Hope Street would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

– partial closure of Boronia Street, between Trumper Street and Atkins Road and maintain two-way traffic flow
– partial closure of Hughes Avenue, south of Hope Street, and maintain access to properties at the southern end of Hughes Avenue
– partial closure of Hope Street, between Hughes Avenue and Waratah Street, and maintain two-way traffic flow
– closure of Waratah Street south of Hope Street with alternative access via Wharf Road and Mary Street.

Construction along Waratah Street would involve partial closure of Waratah Street, between Hope Street and Mary Street, to allow one-way traffic only (northbound or southbound). Alternative access is provided via Wharf Road and Mary Street. The end of Waratah Street (south of Mary Street) would be subject to full closure for the duration of the works.

Indicative road closures and detour routes are provided in Figure 5.7.

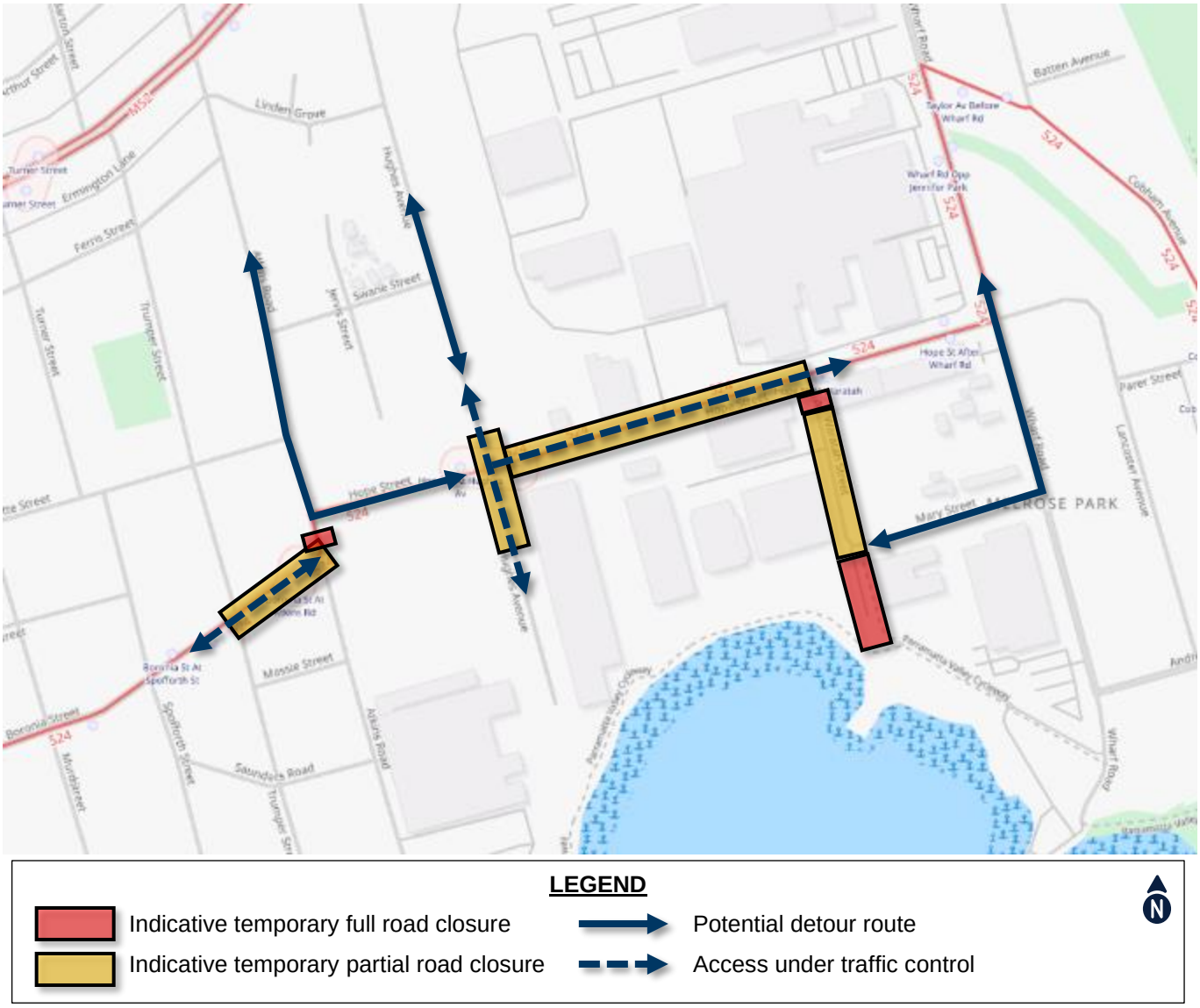

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Figure 5.7 Road closures and detour routes – Hope Street and Waratah Street

Two-way traffic would be maintained along Hope Street during construction. The requirement for vehicles to use Hughes Avenue to access areas of Atkins Road may cause an increase in trip times due to localised congestion. It will be important to ensure that road closures and preferred detour routes are advertised and signed so that drivers can plan their trips accordingly.

Road closures at Waratah Street would be low impact due to the local access function of this street, and low traffic volumes generally carried. The proposed alternative route via Wharf Road and Mary Street has sufficient capacity to accommodate the additional traffic flows, and the additional journey time due to the detour is likely to be low.

5.2.6 Wentworth Point

5.2.6.1 Sanctuary Wentworth Point

Construction in the vicinity of Sanctuary Wentworth Point would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

– partial closure of Hill Road and Footbridge Boulevard at the intersection of these roads, with two-way access maintained at lower capacity. Alternative routes are available via Half Street (one way only), Park Street North or Verona Drive

– partial closure of Hill Road and Verona Drive at the intersection of these roads, with two-way access maintained at lower capacity. Alternative routes are available via Half Street (one way only) or Park Street North or Verona Drive.

Indicative road closures and detour routes are provided in Figure 5.8.

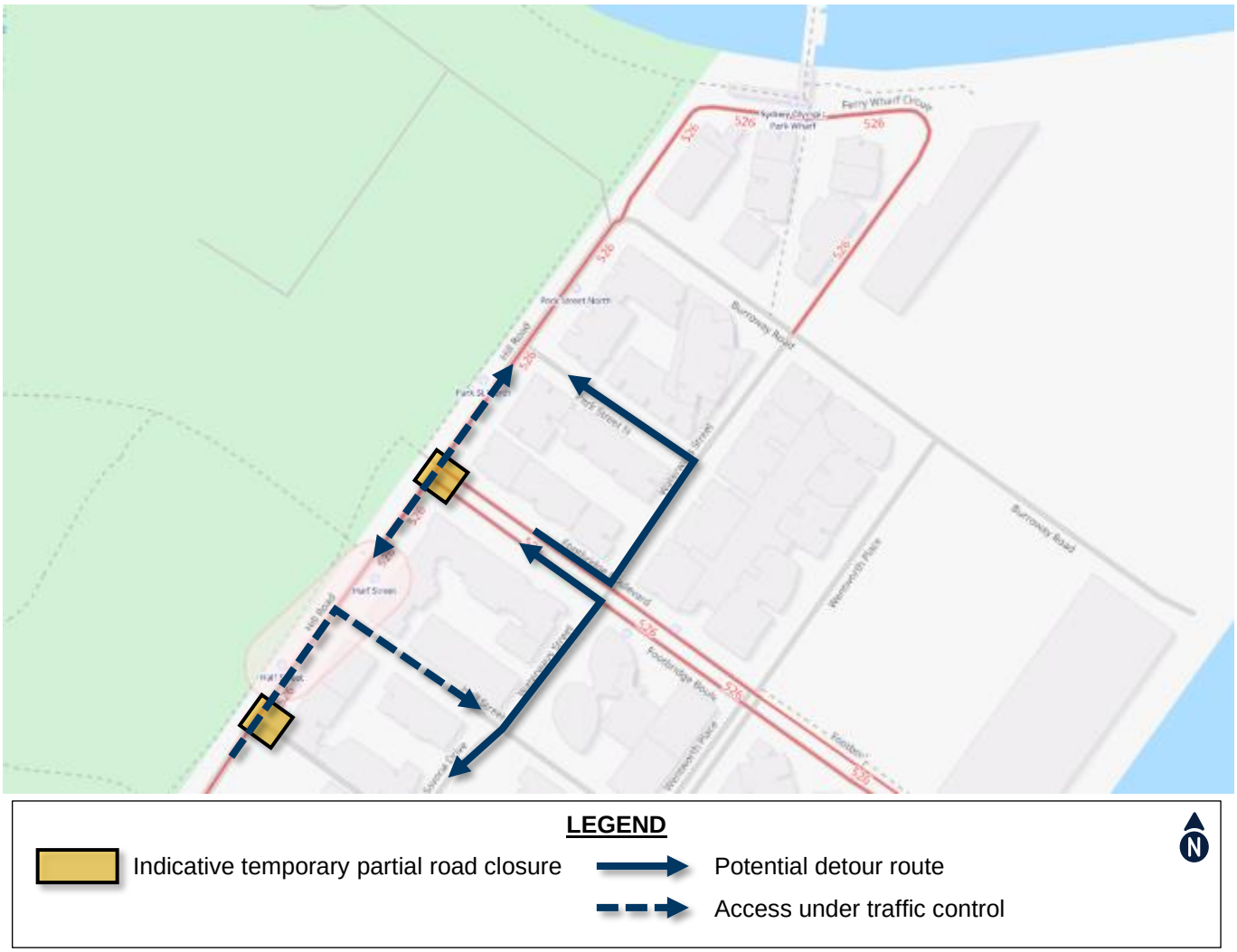

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Figure 5.8 Road closures and detour routes – south of Sanctuary Wentworth Point

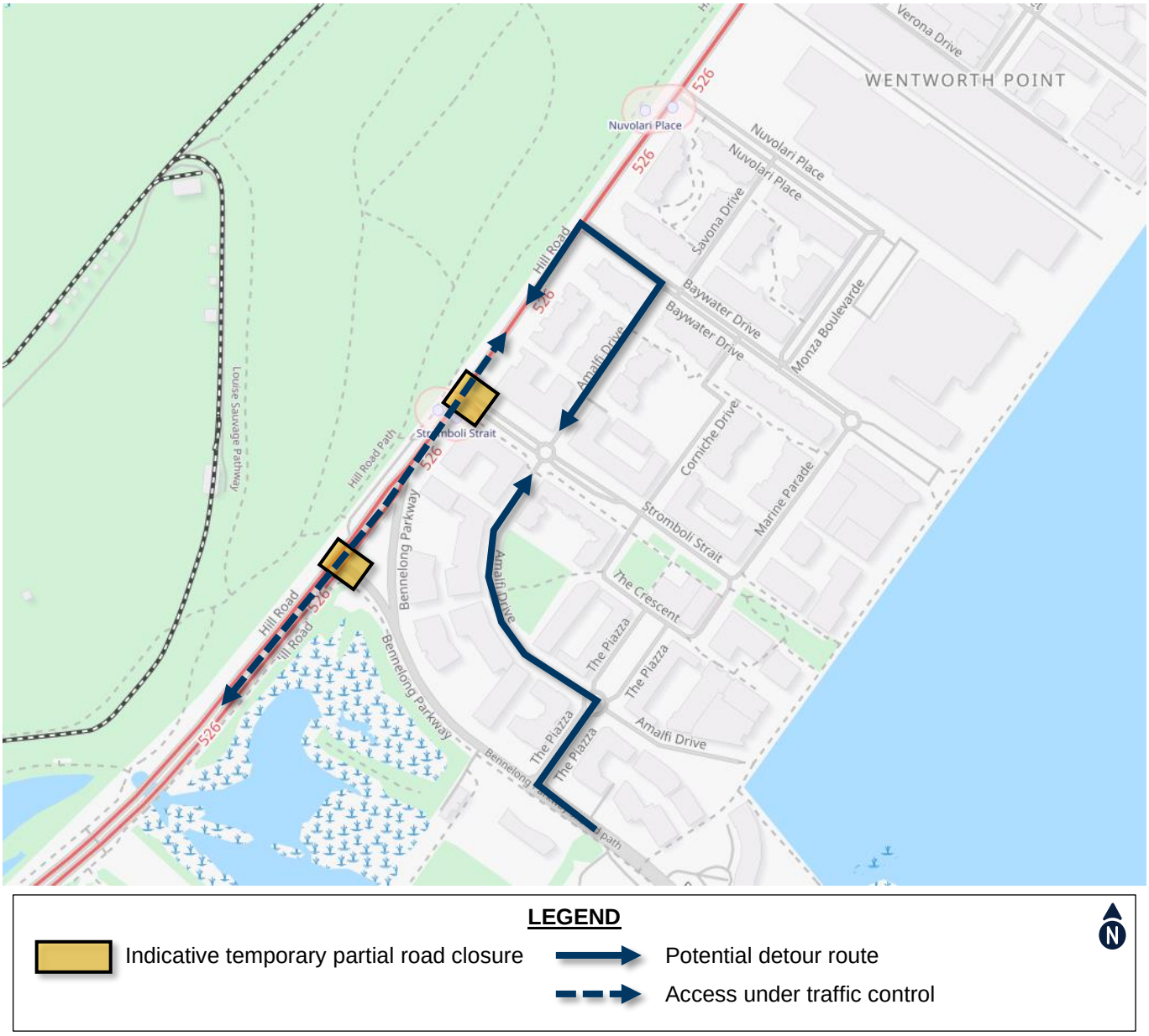
The indicative road closures south of Sanctuary Wentworth Point are generally low impact as traffic access would be maintained along Hill Road for the duration of the works, with relatively direct detour routes available for access to and from Footbridge Boulevard and Verona Drive.

5.2.6.2 Hill Road

Construction along Hill Road would be staged to limit access impacts as far as practicable. The proposed duplication of the Hill Road bridge over the tributary of Haslams Creek would be carried out off-line from the adjacent road, with minimal impacts anticipated. Indicative road closures that would likely be required during construction are outlined below:

– partial closure of Hill Road and Stromboli Strait at the intersection of these roads, with two-way access maintained at lower capacity. Alternative routes are available via Baywater Drive or Nuvolari Place
– partial closure of Hill Road and Bennelong Parkway at the intersection of these roads, with two-way access maintained at lower capacity. Alternative routes are available via The Plaza, Amalfi Drive and Baywater Drive.

Indicative road closures and detour routes are provided in Figure 5.9.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.9 Road closures and detour routes – Hill Road works

Two-way access would be maintained along Hill Road for the duration of the works. Partial closures at the intersection of Hill Road and Baywater Drive would cause reduced capacity at this intersection. Alternative access is available via parallel streets (Nuvolari Place and Stromboli Straight) to ensure sufficient capacity is available for the network. There would be a negligible impact on journey times for road users due to the detours.

5.2.7 Sydney Olympic Park

5.2.7.1 Holker Busway

Construction works would require the partial closure of the Hill Road / Holker Street / Holker Busway intersection for major track and intersection works. It is anticipated that two-way traffic flow would be maintained and any full closures (or disallowed movements) would be short-term and during night-works only. In addition, partial closures would be required along Holker Busway Bridge during the works. Two-way traffic flow would be maintained in one lane under traffic control. Indicative road closures and detour routes are provided in Figure 5.10.

Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.10 Road closures and detour routes – Holker Busway

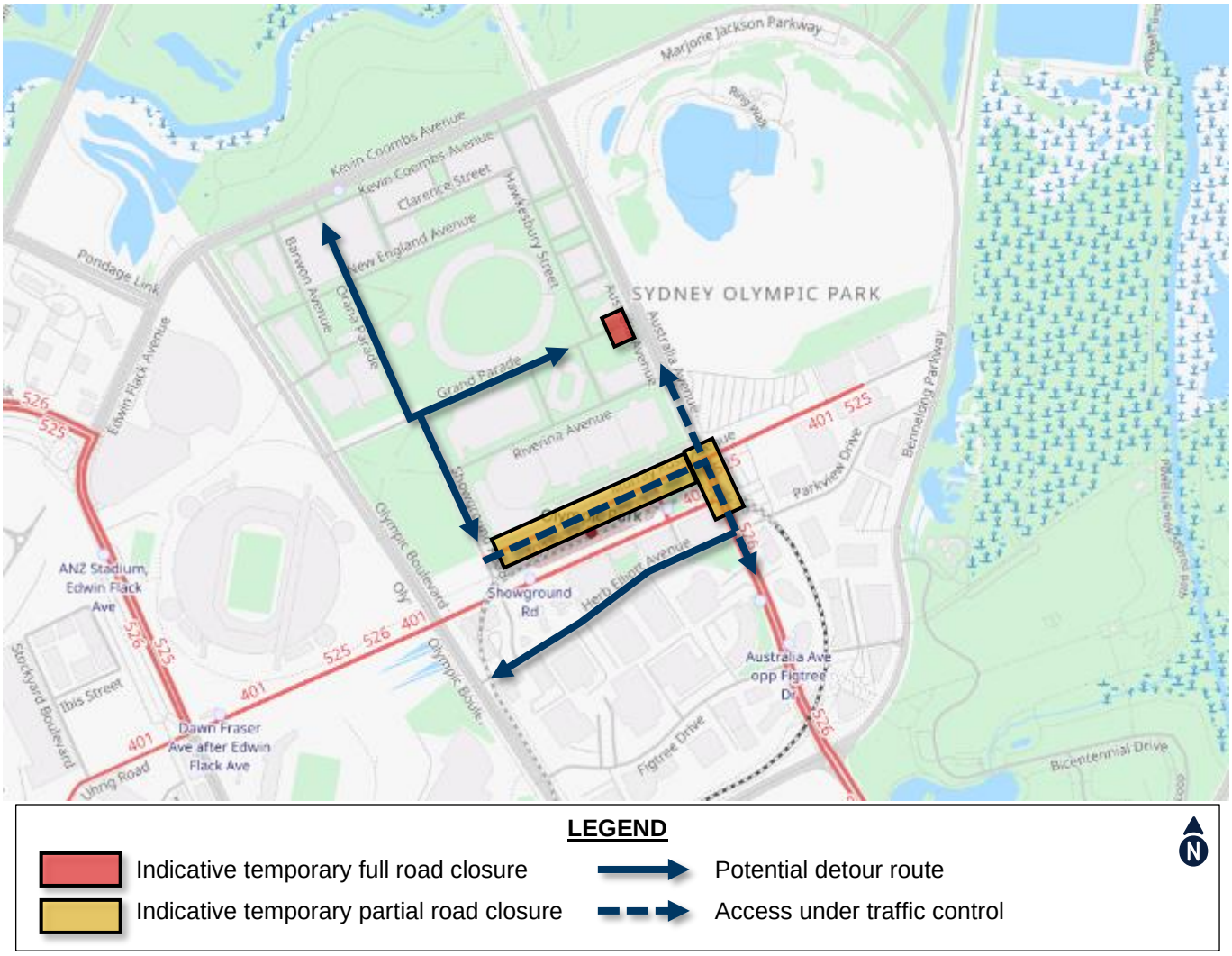
Holker Busway is a restricted access road, allowing buses and bicycles only. The volume of traffic using the Holker Busway Bridge is sufficiently low (except during special events) such that partial closure would not significantly impact on the capacity of the road.

5.2.7.2 Australia Avenue

Construction along Australia Avenue would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

– closure of Grand Parade at Australia Avenue with alternative access to and from Grand Parade available via Showground Road and Orana Parade
– partial closure of Australia Avenue around the intersections with Murray Rose Avenue and Dawn Fraser Avenue to facilitate construction works. Two-way access would be maintained under traffic control.
– partial closure of Murray Rose Avenue, allowing one-way traffic only connecting to Australia Avenue. Alternative access is available via Herb Elliot Avenue (or Dawn Fraser Avenue depending on staging of Dawn Fraser Avenue works).

Indicative road closures and detour routes are provided in Figure 5.11 and would be subject to ongoing consultation and access agreements with impacted land owners, businesses and authorities.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.11 Road closures and detour routes – Australia Avenue

The closure of Grand Parade would be generally low impact given the low traffic volumes within Sydney Olympic Park during normal conditions, when special events are not being held. Alternative access to and from Grand Parade is available via parallel roads including Orana Parade and Showground Road. Each of these roads have sufficient capacity to accommodate the likely detoured traffic

One way traffic along Murray Rose Avenue would be maintained, with a convenient alternative route available via Dawn Fraser Avenue. Park Street can be used for direct access between Murray Rose Avenue and Dawn Fraser Avenue. In the event that Dawn Fraser Avenue is also closed simultaneously with Murray Rose Avenue, Herb Elliot Avenue provides an additional alternative route.

It is noted that buses would be impacted by road closures in this area. The impacts to bus routes and stop locations are described in section 5.5.

5.2.7.3 Dawn Fraser Avenue

Construction along Dawn Fraser Avenue would be staged to limit access impacts as far as practicable. Indicative road closures that would likely be required during construction are outlined below:

– full closure of Dawn Fraser Avenue, between Australia Avenue and Olympic Boulevard, and Showground Road, between Murray Rose Avenue and Herb Elliot Avenue. Alternative routes are available via Olympic Boulevard along with Grand Parade (depending on timing of Australia Avenue works) and Herb Elliot Avenue
  - note that the closure of Dawn Fraser Avenue to general traffic, between Australia Avenue and Olympic Boulevard, is permanent

– new road connecting Murray Road Avenue to Olympic Boulevard to replace loss of connectivity via Dawn Fraser Avenue
– partial closure of Olympic Boulevard, between Murray Rose Avenue and Herb Elliot Avenue, and maintain two-way traffic under traffic control
– permanent removal of Showground Road between Murray Rose Avenue and new cul-de-sac south of Dawn Fraser Avenue.

Indicative road closures and detour routes are provided in Figure 5.12.

Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.12 Road closures and detour routes – Dawn Fraser Avenue

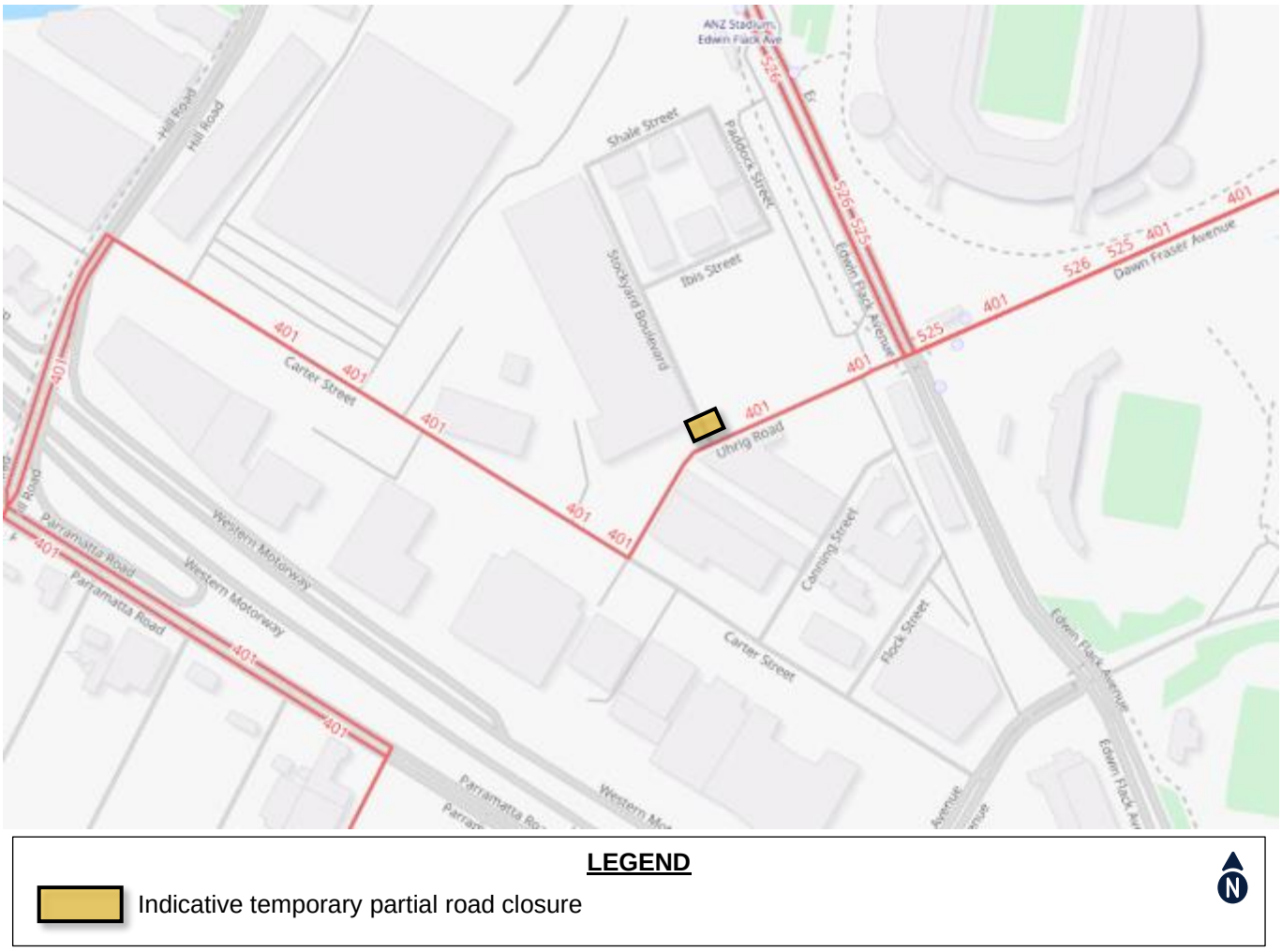
The indicative road closures at Dawn Fraser Avenue generally reflect permanent future conditions, with the closure of Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard and the severance of Showground Road. Detours during construction would not be significantly different to operational impacts of the project.

Two-way traffic flow would be maintained along Olympic Boulevard.

The timing and conditions associated with road closures needs to have regard to special events, and in particular, access to Olympic Park Station should be maintained. Additional traffic management may be required at Murray Rose Avenue or Herb Elliot Avenue in order to provide separation between vehicular traffic and large volumes of pedestrians travelling to and from the station under event conditions. The nature and duration of road closures within would be developed by the contractor in consultation with key stakeholders at Sydney Olympic Park as part of construction traffic management planning.

5.2.8 Lidcombe

Construction within Uhrig Road would likely require the partial closure of Stockyard Boulevard at Uhrig Road for a short duration. Access would be maintained under traffic control. The indicative road closure is provided in Figure 5.13.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.13 Road closures – Uhrig Road

Two-way traffic would be maintained along all roads within the Carter Street precinct.

5.3 Parking

Construction of the project is expected to have the following impacts on parking availability in the road network:

- permanent removal of on-street parking spaces to accommodate light rail infrastructure (refer operational impact assessment in section 6.1.3)
- temporary unavailability of on-street parking spaces due to full or partial road closures as outlined in section 5.2
- occupation of off-street car parks for establishment of site compounds (e.g. at John Street, Wharf Road, Hill Road and Australia Avenue)
- parking from the construction workforce.

The potential parking impacts during construction are summarised in Table 5.4. This table describes:

– The total parking supply within each specified area including on-street parking spaces within the project site, on-street parking spaces on side-roads adjacent to the project site, and off-street parking in the immediate vicinity of the project site.
– The number of parking spaces that would be permanently removed due to the project (and as outlined in section 6.1.3).
– The number of parking spaces that would be temporary removed due to the project construction, including as a result of partial or full road closures, and reinstated upon completion of the works. Note that this does not include those parking spaces permanently removed due to the project.
– The remaining parking capacity calculated by subtracting the parking spaces both temporarily and permanently removed from the total supply.
– The existing surveyed peak parking occupancy, or peak number of parking spaces occupied by vehicles, as described in section 3.10.

Table 5.4 Summary of parking impacts during construction

Area	Total supply	Permanent parking removed (refer section 6.1.3)	Temporary parking loss (in addition to permanent parking removed)	Remaining capacity	Existing peak parking occupancy
Macquarie Street turnback facility	17 spaces	17 spaces (100% of supply)	Nil	0 spaces	17 spaces (estimated)
Camellia	375 spaces	2 spaces (0% of supply)	North side of Grand Avenue – 48 spaces South side of Grand Avenue – 72 spaces **Total** **120 spaces (32% of remaining supply)**	253 spaces	69 spaces
Rydalmere	471 spaces	150 spaces (32% of supply)	Rydalmere Wharf commuter car park – 40 spaces South Street west of John Street – 16 spaces **Total** **56 spaces (17% of remaining supply)**	265 spaces	244 spaces
Ermington	997 spaces	156 spaces (16% of supply)	River Road – 20 spaces Tristram Street and Hilder Road – 35 spaces Boronia Street – 65 spaces Broadoaks Street – 10 spaces **Total** **130 spaces (15% of remaining supply)**	711 spaces	193 spaces

Area	Total supply	Permanent parking removed (refer section 6.1.3)	Temporary parking loss (in addition to permanent parking removed)	Remaining capacity	Existing peak parking occupancy
Melrose Park	428 spaces	120 spaces (28% of supply)	Ermington Boat Ramp (Wharf Road) boat ramp car park – 52 spaces **Total** **52 spaces (17% of remaining supply)**	256 spaces	249 spaces * accounts for reduced demand due to loss of access to open space at Boat Ramp
Wentworth Point	230 spaces	45 spaces (20% of supply)	Hill Road between Footbridge Boulevard and Bennelong Parkway east side – 50 spaces **Total** **50 spaces (27% of remaining supply)**	135 spaces	213 spaces
Sydney Olympic Park	294 spaces	154 spaces (52% of supply)	Australia Avenue east side – 60 spaces Secure Sydney Olympic Park P6 car park – 100 spaces **Total** **0 spaces (on-street)** **160 spaces (off-street)**	140 spaces	218 spaces
Lidcombe	166 spaces	54 spaces (33% of supply)	**Total** **0 spaces**	112 spaces	160 spaces
Totals	***2,978 spaces***	***688 parking spaces***	***On-street:*** – ***316 spaces*** ***Rydalmere wharf:*** – ***40 spaces*** ***Ermington Boat Ramp:*** – ***62 spaces*** ***Australia Avenue:*** – ***60 spaces*** ***P6 car park:*** – ***100 spaces***		

Based on Table 5.4, the total parking impact of the project during construction is expected to be in the order of 1,266 parking spaces. This includes approximately:

– 688 parking spaces permanently removed due to the project (refer section 6 for assessment of operational impacts)

– 262 off-street parking spaces temporarily occupied by site compounds including full occupation of John Street commuter car park (Rydalmere Wharf) and Ermington Boat Ramp car park (Wharf Road), full occupation of Australia Avenue car parking and partial occupation of Sydney Olympic Park P6 car park (Australia Avenue)

– 316 on-street parking spaces temporarily removed during construction, 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 experience strain on the existing parking network, where the parking demand (refer parking occupancy surveys in section 3.10.2) may exceed the available supply.

In order to mitigate the impacts of temporary parking loss, the following mitigation strategies would be put in place:

– Construction in each area would occur in stages such that the cumulative impacts of temporary parking loss from multiple construction stages is reduced.
– Temporarily unavailable parking spaces would be reinstated as soon as possible upon completion of the works in each area.
– Consideration of temporary changes to parking controls on adjacent streets to ensure that the provision of loading bays, accessible car parking spaces, bus stops and other high priority kerb-side uses are maintained. This is the responsibility of the relevant Council or road owner.
– Consideration of temporary changes to parking restrictions on residential streets to ensure parking supply is available to residents and businesses with temporary disruption to property access. This is the responsibility of the relevant Council or road owner.

The above parking mitigation strategies would be confirmed and documented in a detailed Parking Management Strategy which would be prepared as part of Traffic and Access Management Plan for the project, including identification of specific changes to parking across the project site (refer section 8.3.1). Coordination and consultation with Councils would be required in order to effect any changes to existing on-street parking controls.

Construction worker parking requirements are estimated in Table 5.5.

Table 5.5 Estimated construction worker parking requirements

Area	Estimated construction worker parking requirements
Parramatta CBD (Macquarie Street turnback facility)	Parking locations: – On-site (2 spaces) All other workers to travel via alternative means (e.g. public transport, shuttle buses etc.) to Paramatta CBD.
Stabling and maintenance facility	Estimated parking requirement: – 41-55 spaces (total) Parking locations: – On-site (~55 spaces)
Camellia	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Site compound (~7 spaces) – Surrounding streets (~63 spaces)
Rydalmere	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Site compound (~ 7 spaces) – *Contractor to arrange additional parking for up to 63 worker vehicles*
Ermington	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Fallon Street compound (~7 spaces) – Ken Newman Park compound (~7 spaces) – Surrounding streets (Rydalmere) (~14 spaces) – Surrounding streets (Ermington) (~42 spaces)

Area	Estimated construction worker parking requirements
Melrose Park	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Hope Street compound (~20 spaces) – Wharf Road compound (~20 spaces) – *Contractor to arrange additional parking for up to 30 worker vehicles*
Wentworth Point	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Sydney Olympic Park P5 car park (~70 spaces)
Sydney Olympic Park	Estimated parking requirement: – 53-70 spaces (total) Parking locations: – Sydney Olympic Park P5 car park (~70 spaces)
Lidcombe	Estimated parking requirement: – 19-25 spaces (total) Parking locations: – Edwin Flack Avenue parking area (up to 50 spaces)
Total	**378 to 500 construction worker vehicles**

Based on the above table, construction worker parking should be established at the following locations:

– Camellia site compound 7 spaces
– Rydalmere site compound 7 spaces
– Fallon Street compound 7 spaces
– Ken Newman Park compound 7 spaces
– Hope Street compound 20 spaces
– Wharf Road compound 20 spaces
– Sydney Olympic Park (P5 car park) 140 spaces (minimum)
– Edwin Flack Avenue up to 50 spaces.

In order to minimise the impacts of construction worker parking on adjacent areas, the contractor should provide additional parking arrangements for workers at:

– Rydalmere, with proximity to the proposed work area for the bridge between Camellia and Rydalmere (around 63 worker vehicles)
– Melrose Park, with proximity to the proposed work area for the bridge between Melrose Park and Wentworth Point (around 30 worker vehicles).

Subject to the above worker parking arrangements being provided, the potential impact of construction worker parking on the availability of on-street parking is:

– Camellia 63 spaces
– Rydalmere 14 spaces
– Ermington 42 spaces.

There may be opportunities to establish an additional centralised, off-site car parking facility for workers with relatively direct access to Camellia, Rydalmere and Ermington in order to accommodate the estimated overflow parking demand for up to 119 construction worker vehicles at these locations. These arrangements would be subject to further investigation during construction planning for the project by the construction contactor.

5.4 Property access

There are a number of locations along the project site where property access may be temporarily impacted by construction works. These include properties along parts of the following roads:

- Macquarie Street, Parramatta
- Grand Avenue, Camellia
- John Street, Rydalmere
- South Street, Rydalmere
- River Road, Ermington
- Tristram Street, Ermington
- Hilder Road, Ermington
- Spurway Street, Ermington
- Broadoaks Street, Ermington
- Boronia Street, Ermington
- Hope Street, Ermington
- Hope Street, Melrose Park
- Waratah Street, Melrose Park
- Hill Road, Wentworth Point
- Australia Avenue, Sydney Olympic Park
- Stockyard Boulevard, Lidcombe.

Access to properties would be maintained at all times wherever practicable, or alternative access arrangements provided to facilitate construction works. In the event of unavoidable loss of access due to road closures, the duration of closure would be limited to one night. Two or more nights of closure would only be used by exception, where site specific circumstances require an extended closure, and would be subject to detailed investigation, planning and consultation with affected property owners.

Prior to any change of any access to properties, engagement with residents and businesses would be undertaken at least seven days prior. All property accesses would be reinstated as soon as possible following completion of construction works or as agreed with the landholder.

5.5 Public transport

The bus services indicated in Table 5.6 would be impacted by construction works. The local impacts on each route are described in the following sections. Any proposed changes to bus stops and services are indicative only and are subject to the construction staging proposed by the construction contractor.

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. Details of any changes to bus stops / networks would be determined through consultation with Transport for NSW, bus operators and relevant authorities.

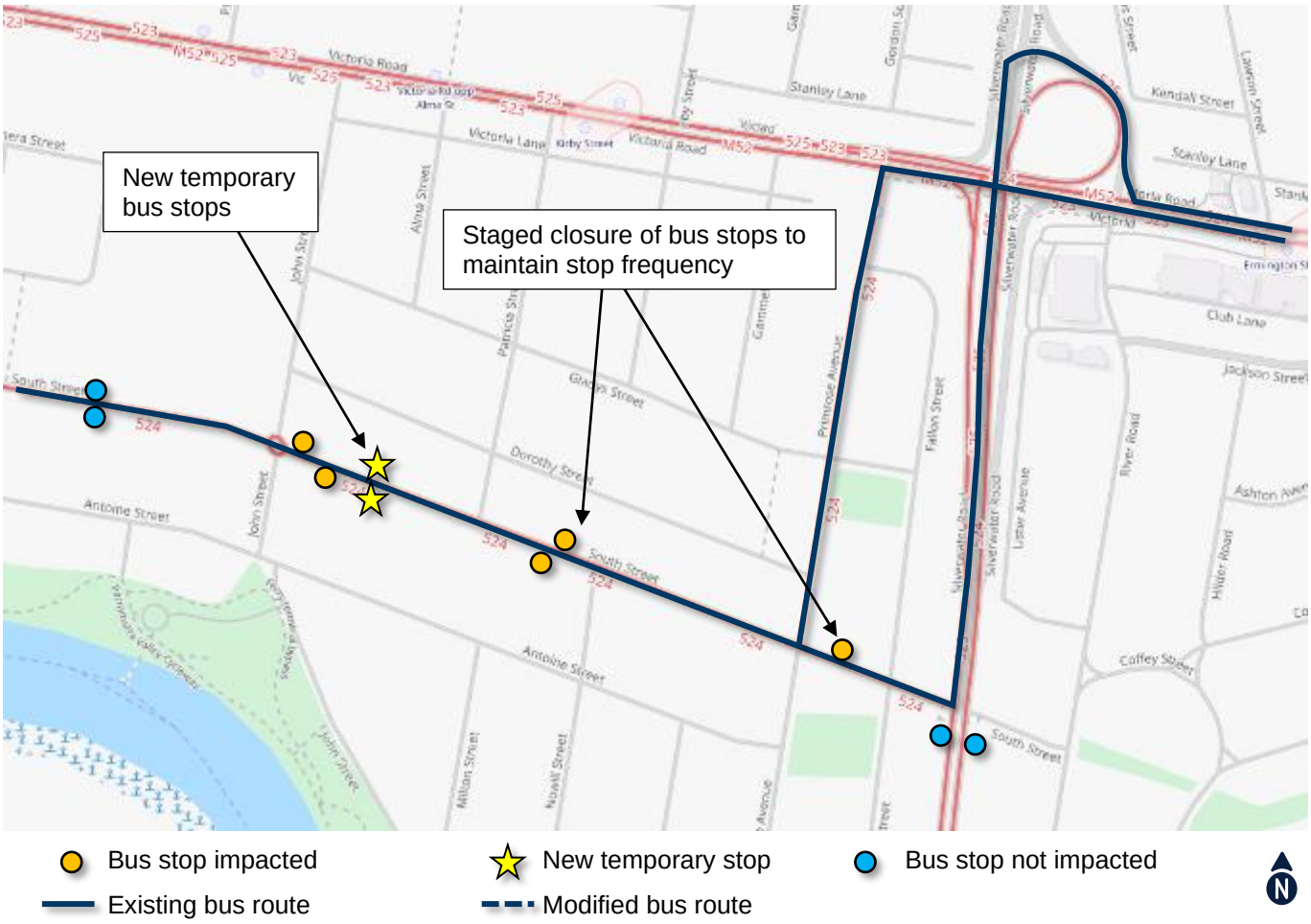
Table 5.6 Bus services impacted by construction works

Route No.	Service	Key roads
524	Parramatta to Ryde via West Ryde	South Street, Silverwater Road / Primrose Avenue, Victoria Road, Spurway Street, Boronia Street, Atkins Road, Hope Street
525	Parramatta to Strathfield via Sydney Olympic Park	Edwin Flack Avenue, Dawn Fraser Avenue, Murray Rose Avenue, Australia Avenue
526	Rhodes Shopping Centre to Burwood	Edwin Flack Avenue, Dawn Fraser Avenue, Murray Rose Avenue, Australia Avenue
533	Sydney Olympic Park to Chatswood via Rhodes and North Ryde	Murray Rose Avenue, Australia Avenue
N81	Parramatta to Town Hall via Sydney Olympic Park (Night Service)	Dawn Fraser Avenue, Murray Rose Avenue, Australia Avenue
5A, 5B, 6, 7, 8	Special event buses servicing Sydney Olympic Park (Hills Showground, Tallawong, Woronora, Cronulla, Dural)	Holker Busway

5.5.1 Route 524

The Parramatta to Ryde service would be impacted by full and partial road closures on South Street, Boronia Street, Atkins Road and Hope Street. Bus stops would be relocated as close as possible to the existing stops along the same route where feasible. Where relocation of bus stops along the same route is not feasible, rerouting of services would be required. Provision of temporary bus stops in Ermington may require the loss of two to three parking spaces on each of Trumble Avenue and Murdoch Street, depending on the specific location chosen.

A summary of changes to Route 524 in Rydalmere and Ermington is provided in Figure 5.14 and Figure 5.15.



Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.14 Temporary bus route changes – Rydalmere

Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.15 Temporary bus route changes – Ermington

5.5.2 Routes 525, 526, 533 and N81

Existing bus stops located on Park Street, adjacent to Olympic Park Station, would be relocated to Murray Rose Avenue (northbound) with buses likely to be rerouted as shown in Figure 5.16.

Base map obtained from OpenStreetMap © OpenStreetMap contributors

Figure 5.16 Temporary bus route changes – Sydney Olympic Park

5.5.3 Special event buses

Five special event bus services would 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 are 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. Based on a first principles assessment of bridge capacity under a 200-metre long single-lane scenario, the capacity of the bridge would be in the order of 160 buses per hour in each direction. Average delays for buses would be up to one minute due to temporary traffic signal operation and the maximum delays would be up to two minutes if a bus arrives at the start of the 'red phase'.

Traffic control arrangements for the Holker Busway, along with any other temporary disruption or changes to special event bus services, would be detailed in the Traffic and Access Management Plan prepared as part of construction planning for the project. This would occur in consultation with relevant stakeholders including bus operators, Sydney Olympic Park Authority and other divisions within TfNSW .

5.6 Active transport

Construction works would impact on the following walking and cycling trails:

– Construction of the bridge between Camellia and Rydalmere:
  - A short section of the Parramatta Valley Cycleway running alongside the northern side of the Parramatta River would be closed due to construction works associated with the bridge (north abutment) including access to Rydalmere Wharf.
  - A temporary shared path would be provided alongside John Street, Antoine Street and Jean Street to maintain connectivity around the work site. The detour represents around 150 metres additional travel distance for pedestrians and cyclists. Access to the site compound across the shared path may require temporary traffic control while a vehicle enters or exits the site.
  - A new temporary pedestrian access to the wharf would be provided from the shared path west of the John Street commuter car park and the construction compound.
– Construction of the bridge between Melrose Park and Wentworth Point (north):
  - The existing Parramatta Valley Cycleway on the northern side of the river runs alongside the Waratah Street alignment, using parts of Wharf Road to access through Koonadan Reserve and Melrose Park to terminate at Lancaster Avenue. It also has a connection to Mary Street.
  - The alignment of the shared path would be disrupted by road closures and the construction compound associated with the bridge.
  - A temporary shared path would be provided connecting the existing alignment to Andrew Street where it would connect to Lancaster Avenue. This detour represents around 70 metres additional travel distance for pedestrians and cyclists.
  - Access to and from the west for bicycles and pedestrians would be maintained through the work zone using traffic control
– Construction of the bridge between Melrose Park and Wentworth Point (south):
  - Access for the Parramatta Valley Cycleway (both north and south of the river) and Louise Sauvage Pathway would be maintained during construction as far as practicable with physical protection and/or local detours in place during construction as required.

5.7 River access and use

A desktop review of the commercial and recreational assets and users of the Parramatta River within the study area was carried out and is provided in Appendix A and summarised in section 3.5.

The anticipated impacts of the project to these users and structures are described in detail in Appendix A and summarised in the following sections.

5.7.1 Rydalmere Wharf

Rydalmere Wharf is located immediately upstream of the proposed bridge between Camellia and Rydalmere. During construction, the existing commuter car park and adjacent area would be used as a construction compound and worksite for about three years. Pedestrian access to the existing ferry wharf would be maintained through provision of a new temporary footpath connecting from Jean Street to the wharf.

Temporary closure of the wharf would be required on at least two occasions to facilitate bridge construction, typically for periods of up to three months. During these times, pedestrian access to the wharf would also be closed and alternative access would be provided via Jean Street.

Alternative transport operations for ferry customers would be provided by Transport for NSW in consultation with the operator of the F3 ferry service. See section 5.7.3 for further details of potential impacts on the F3 ferry service and customers.

5.7.2 Ermington and Silverwater boat ramps

The construction compound and worksite for the bridge between Melrose Park and Wentworth Point would occupy the Ermington Boat Ramp car park. As a result, the boat ramp and car park would be unavailable for a period of up to three years during bridge construction works. Boat users would need to access Parramatta River from other nearby boat ramps including the following:

– on the north side of Parramatta River, at Kissing Point Park (approximately 12 to 14 minutes drive or 5.1 kilometres from Ermington Boat Ramp)
– on the south side of Parramatta River, at:
    - Silverwater (approximately 8 to 10 minutes drive or 5 kilometres from Ermington Boat Ramp)
    - Rhodes (approximately 10 to 14 minutes drive or 5 kilometres from Ermington Boat Ramp).

However, for a period of about three months during major lifts for construction of the bridge between Melrose Park and Wentworth Point, the Silverwater Boat Ramp would not provide access to downstream areas of the Parramatta River. During this period, the remaining ramp options would only be Kissing Point Park and Rhodes.

Considering the number of trailer parking spaces provided, neither the Rhodes or Kissing Point Park boat ramps would have sufficient capacity to offset the demand during the closure of Ermington Boat Ramp and when the Silverwater Boat Ramp would not provide downstream access to Sydney Harbour. As these two boat ramps are also preferentially used by boaters from the western suburbs of Sydney and the capacity limitations of the other two boat ramps in the near vicinity, this is considered a moderate to major impact to recreational boaters seeking access to the river.

Opportunities to minimise impacts to recreational use of the Parramatta River would be investigated 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. With the implementation of these opportunities, the impact would likely reduce.

5.7.3 F3 ferry service

Periodic interruption of the F3 ferry services would occur at different times during construction. The temporary working platforms proposed as part of constructing the bridges over the Parramatta River would occupy portions of the Parramatta River waterway. During certain periods (such as major bridge lifts for areas not proposed to be serviced from the temporary working platforms), barges would occupy the remaining waterway area. This would result in a need to close the navigation channel. It is anticipated that closures of the navigation channel would occur at the following locations and durations:

– for the bridge between Camellia and Rydalmere – two closures of about two months each
– for the bridge between Melrose Park and Wentworth Point – one closure of up to three months.

Bridge construction work would also be ongoing outside these defined closure periods. It is likely that some of these works would also require short-term closures and result in additional impacts on ferry services and other commercial operations.

Ferries would be unable to operate between the Paramatta, Rydalmere and Sydney Olympic Park wharves during the navigational channel closure periods with all ferries terminating at Sydney Olympic Park. Alternate transport services would be needed for affected customers (about 645 each weekday and 903 each weekend). Alternative transport services are typically provided to ferry customers about 10 per cent of every year during periods of very low tides or when flooding debris is present in the river, therefore these closures are not considered to be a major impact on ferry customers.

The ferry services would also be affected by the temporary closures of Rydalmere Wharf which would be required on at least two occasions to facilitate bridge construction as a result of the proximity of the wharf to the bridge work area. Each closure would be typically for periods of up to three months.

The number and periods of closure of the Parramatta River upstream of Sydney Olympic Park and arrangements to convey passengers from Sydney Olympic Park to Rydalmere and Parramatta would be considered during pre-construction planning and documented in the Maritime Works and Navigation Management Plan.

Consultation and coordination with relevant divisions within Transport for NSW (e.g. NSW Maritime) and Sydney Ferries or the operator of the F3 ferry service would also be carried out prior to and during the construction period.

5.7.4 Private jetties and facilities

A number of other public and private maritime facilities are also present in the section of the river which would be affected by navigation channel closures. These are shown on Figure 3.5 and include:

– Armory Wharf
– private jetties owned by Lubrizol International Inc and Viva Energy Australia Pty Ltd.

Closure of the navigation channel due to construction of the bridge between Melrose Park and Wentworth Point would affect the use of these facilities for the period of three months.

A number of other commercial operators perform routine maintenance of ferry piers, upstream salvage works, removal of debris and other general works on drainage outlets, seawalls or other structures that are necessary to be carried out from the water would also not be able to be completed during these periods, unless specific arrangements were made with the bridge contractor to provide ad hoc access.

A Maritime Works and Navigation Management Plan would be prepared. The plan would include specific requirements regarding approvals for works within and over the Parramatta River, key stakeholders to be consulted and notification procedures, establishment of any exclusion zones, any necessary restrictions on speed limits, changes to any navigational channels or markers and impacts on maritime recreational assets. A Maritime Works Co-ordinator would co-ordinate all works with the potential to impact on the waterway and waterway users.

Identification and advance notification of navigation channel closures would be undertaken with the owners of these and any other facility owners upstream of Wentworth Point in accordance with the Maritime Works and Navigation Management Plan.

Assuming a need to access affected private facilities/access by commercial operators can be reasonably forecast in advance and that the barges moored in the navigation channel are able to be moved on occasion as needed, these potential impacts are considered to be low.

5.7.5 Recreational activities

No recreational vessels are permitted to operate upstream of the Silverwater Road bridge. Further, there are no formal swimming sites, rowing or sailing clubs west of the Concord Road (Ryde) bridge or within the study area. The nearest would be the Concord & Ryde Sailing Club located about 700 metres downstream of the Concord Road bridge.

Rowing courses in the Upper Parramatta River are designated in the area between Huntley's Point and Homebush Bay, outside of the area of the river impacted by the project. While it is possible that informal use may occur to the west of this location, the river narrows appreciably upstream of Wentworth Point and it is therefore unlikely to be preferable for use compared to downstream locations, including the existing designated training areas and regatta courses. The impacts to recreational activities would therefore be only for the section of river between Wentworth Point and the Silverwater Road bridge, which would potentially affect fishing activities and access for users of the Silverwater Road Boat Ramp and Armory Wharf. Therefore, for fishing and potential rowing and yachting activities, the impact would be low to negligible given there is other and preferable areas for these activities to take place downstream of the bridge work areas.

5.7.6 Channel markers

Port marker 731 and starboard marker 727, both in the vicinity of the proposed bridge between Camellia and Rydalmere are likely to be either directly impacted by bridge construction works or may restrict the movement/mooring of barges and may need to be removed to facilitate 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.

6. Operational impact

6.1 Summary of operational impacts

A summary of key operational impacts of the project is provided in the following sections with details of changes in each local area provided subsequently.

6.1.1 Traffic network connectivity

The project would create a new public transport connection between the Parramatta CBD and Sydney Olympic Park, via Camellia, Rydalmere, Ermington, Melrose Park and Wentworth Point. Interchange opportunities between light rail and other transport modes (heavy rail, metro, ferry and bus) are provided along the alignment and would create a more connected and integrated public transport network. The two bridges over the Parramatta River will be 'bus-enabled' to allow future shared use of the bridges with light rail and the opportunity for re-routing existing bus services to provide new and more direct routes from the north to recreation and employment destinations in Sydney Olympic Park and beyond.

It is expected that the overall level of traffic on the road network in the study area would decrease as travellers adjust their travel behaviour and choice of transport mode based on the new public transport infrastructure. There is also forecast to be significant development and population growth, most notably in areas such as Camellia, Melrose Park, Wentworth Point and Sydney Olympic Park for which the project would provide a viable, day one alternative to private vehicles.

Notwithstanding, there are a range of localised network connectivity impacts that may result due to light rail implementation. These include:

– property access control (traffic signals) along the northern side of Grand Avenue, Camellia
– severance of Antoine Street at John Street, Rydalmere
– left-in and left-out restrictions at local access roads along South Street, Rydalmere
– closure of South Street, between Silverwater Road and River Road, to general traffic
– closure of Hilder Road at Ken Newman Park in Ermington
– left-in and left-out restriction at properties and minor access roads (including Honor Street, Boyle Street and Spofforth Street) along Boronia Street, Ermington
– right turn restrictions at proposed signalised intersections along Boronia Street, Ermington (including Murdoch Street, Trumper Street and Atkins Road), as well as at the intersection of Hope Street and Waratah Street and the intersection of Waratah Street and Mary Street, Melrose Park
– right turn restrictions at the proposed signalised intersection of Australia Avenue and Murray Rose Boulevard, Sydney Olympic Park
– closure of Dawn Fraser Avenue, between Australia Avenue and Olympic Boulevard, to general traffic
– right turn restrictions at the proposed signalised intersection of Uhrig Road and Stockyard Boulevard, Lidcombe.

It is expected that the above changes would have a minor impact on connectivity as traffic would be able to travel on parallel roads in the immediate area surrounding the change. The proposed design has included signalised intersections at key locations to provide access across the light rail alignment, where required, to service adjacent land uses and maintain safe road conditions for all road users. Given the low volume of traffic redirected, impacts to local access would be adequately mitigated through the provision of alternate routes and new signalised intersections in the design of light rail.

6.1.2 Traffic network performance

6.1.2.1 On-corridor intersections

Impacts to traffic performance within the project site are primarily attributed to one or more of the following factors:

– changes to local access routes and local road network circulation resulting in an increase or decrease of traffic volumes on adjacent routes
– reconfiguration and road space reallocation due to the introduction of light rail infrastructure
– conversion of intersections from existing give-way or roundabout control to traffic signals to allow light rail operation.

Intersection performance at key intersections within the project site is discussed in sections 6.2.1 to 6.2.8. A summary of the main impacts to network performance due to the project is provided below:

– Most of the intersections along the alignment are expected to operate satisfactorily. The introduction of specific project signal phases is shown in the modelling to have no substantial impacts on the performance of the majority of the key intersections in the modelled corridor.
– The following signalised intersections along the project alignment are anticipated to perform at worse than LoS D during either the morning or afternoon peak period under the 2031 with the project scenario:
    - South Street / Primrose Avenue (LoS E in the afternoon peak)
    - Hope Street / Waratah Street (LoS F in the morning and LoS E in the afternoon peaks)
    - Waratah Street / Mary Street (LoS F in the morning and afternoon peaks)
    - Hill Road / Footbridge Boulevard (LoS E in the morning peak)
    - Hill Road / Holker Street (LoS E in the morning peak)
    - Park Street/ Dawn Fraser Avenue (LoS E in the morning and afternoon peaks).

    Of the above six intersections, only three have an increase in the combined morning and afternoon peak delay compared to the 'without project' scenario (Waratah Street / Mary Street, Hill Street / Holker Street and Park Street / Dawn Fraser Avenue).
– The following give-way or stop controlled intersections along the project alignment are anticipated to perform at worse than LoS C during either the morning or afternoon peak period under the 2031 with the project scenario:
    - Silverwater Road / South Street (LoS E in the afternoon peak)
    - Hope Street / Atkins Road (LoS D in the morning peak)
    - Hill Road / Nuvolari Place (LoS D in the morning and LoS E in the afternoon peaks)
    - Hill Road / Baywater Drive (LoS D in the afternoon peak).
– Of the above four intersections, none have an increase in the combined morning and afternoon peak delay compared to the 'without project' scenario.

In most of the above cases, deterioration in traffic performance at specific intersections can be attributed to the transport model assigning additional trips to these intersections, thereby resulting in increased traffic volume and congestion, due to routing in the model. Additional information regarding intersection performance can be found in the relevant precinct assessments in section 6.2.

A summary of intersection performance within the project site is shown in Figure 6.1 and Figure 6.2.

The following strategies would be implemented to mitigate the impacts of underperforming intersections:

– Intersection performance would be monitored following completion of the works, with a review of operational network performance to be undertaken 12 months and three years from the opening of the project.
– Where required, additional feasible and reasonable mitigation measures would be identified in consultation with the Department of Planning and Environment and other relevant stakeholders to manage any significant additional performance impacts identified during the review of operational network performance.

Potential future additional mitigation measures could include further intersection modifications, traffic signal optimisation to improve network performance while maintaining light rail priority, and travel demand management.

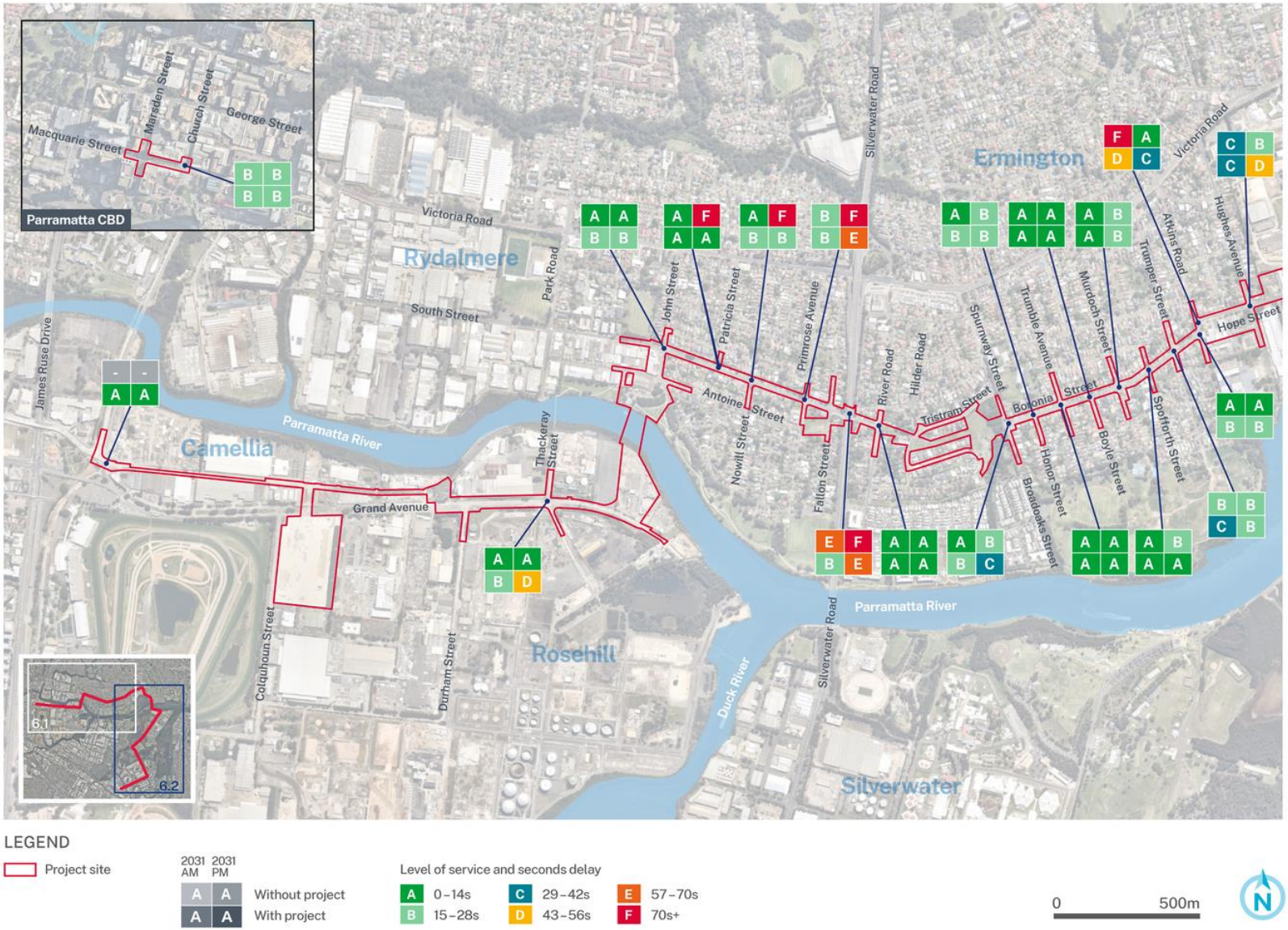


Figure 6.1 2031 Intersection Level of Service within the project site in Camellia, Rydalmere and Ermington

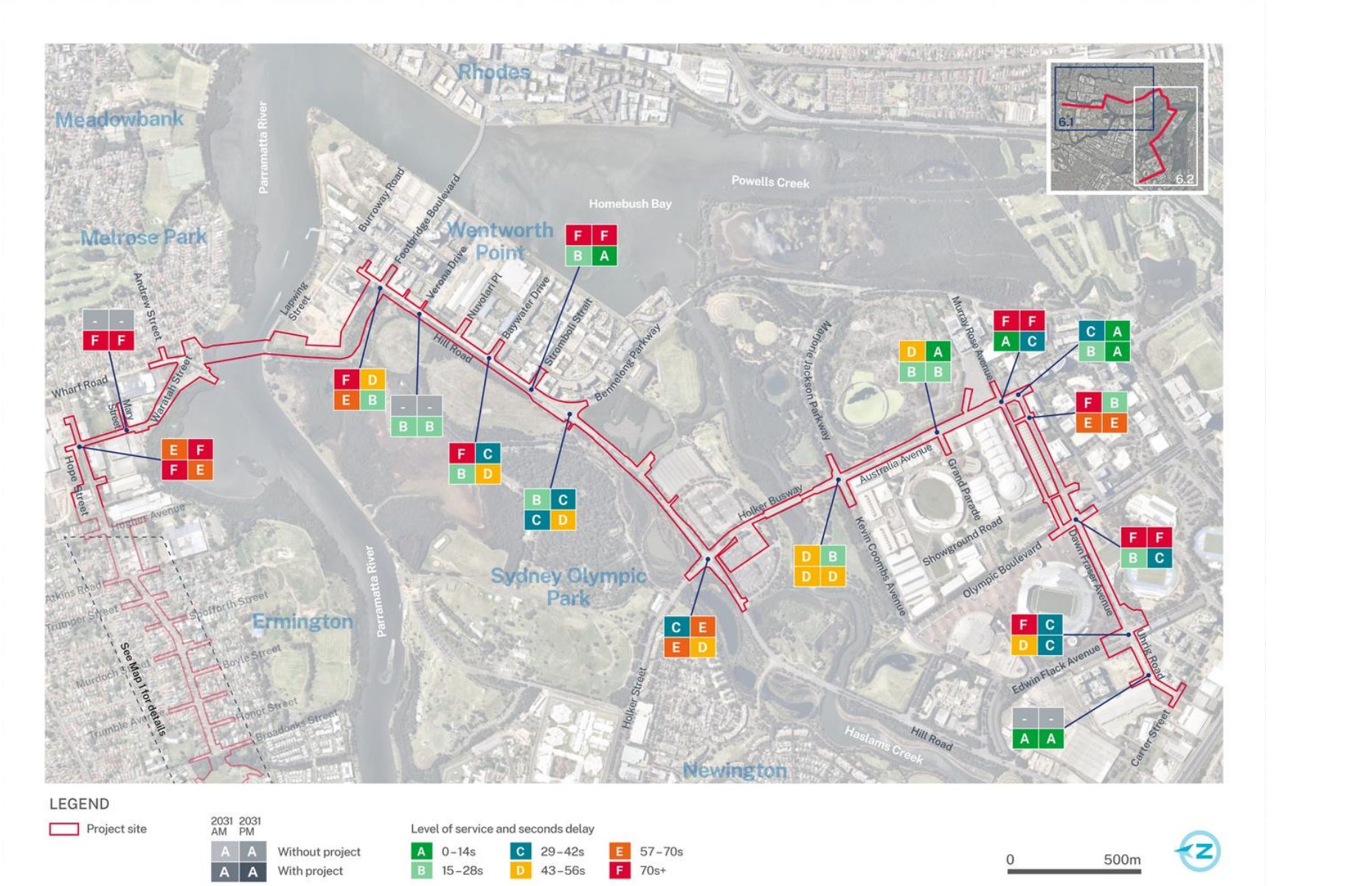


Figure 6.2 2031 Intersection Level of Service within the project site in Melrose Park, Wentworth Point and Sydney Olympic Park

6.1.2.2 Off-corridor intersections

Intersection performance for key off-corridor intersections surrounding the project site is discussed in sections 6.2.1 to 6.2.8. A summary of the main impacts to network performance due to the project is provided below:

– increased delays at the intersection of Victoria Road with Kissing Point Road / William Road by approximately 32 seconds in the afternoon peak only
– increased delays at the intersection of Victoria Road with Wharf Road by approximately 20 seconds in the morning peak and 23 seconds in the afternoon peak
– increased delays at the intersection of Hill Road and Parramatta Road by approximately 10 seconds in the morning peak only
– increased delays at the intersection of Australia Avenue and Homebush Bay Drive by approximately 13 seconds in the morning peak only.

For other key off-corridor intersections, performance would remain at an acceptable level (LoS D or better) or would not significantly worsen as a result of the project.

A summary of intersection performance for key off-corridor intersections is shown in Figure 6.3 and Figure 6.4.

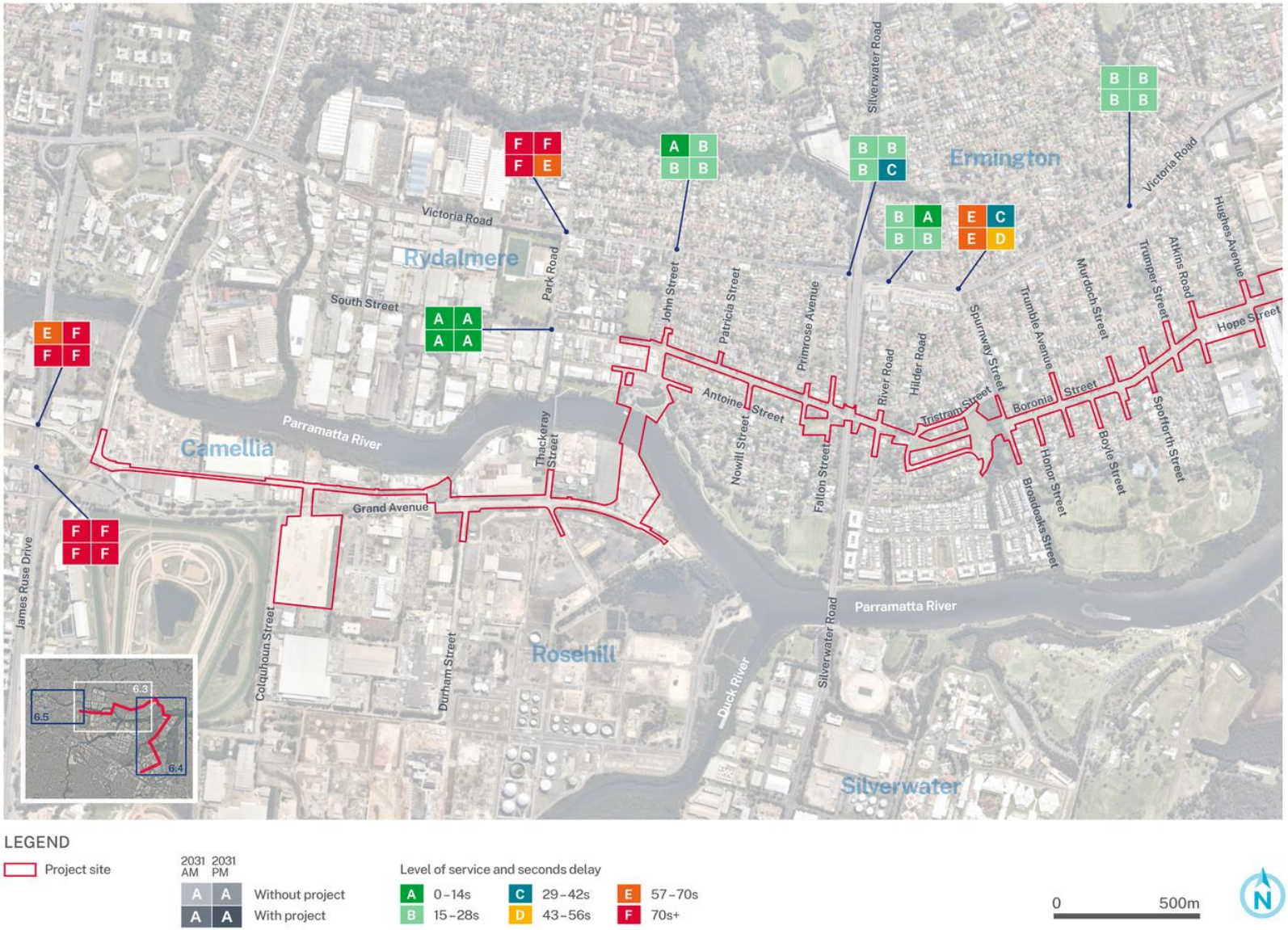


Figure 6.3 2031 Intersection Level of Service adjacent to the project site in Camellia, Rydalmere and Ermington

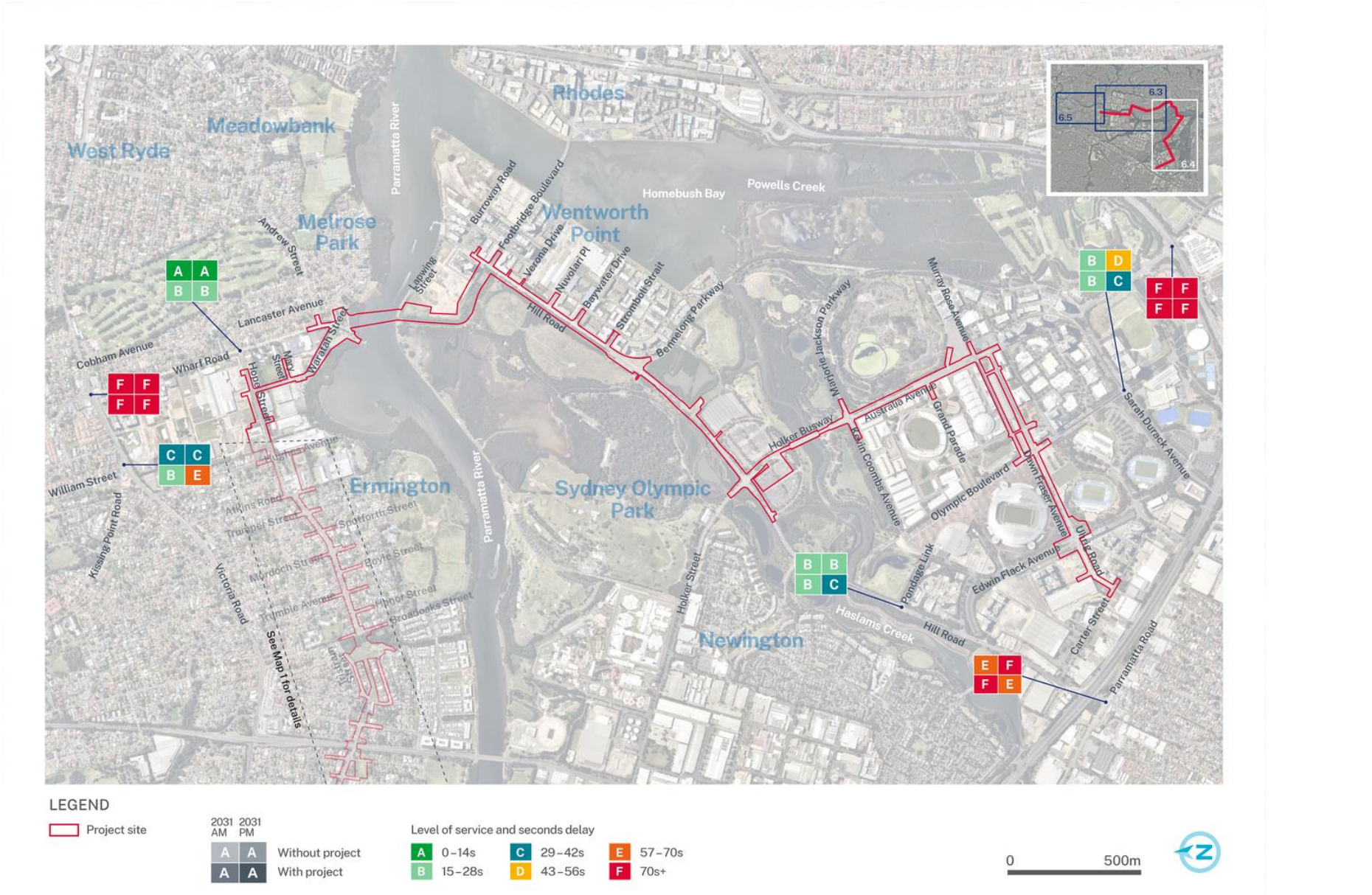


Figure 6.4 2031 Intersection Level of Service adjacent to the project site in Melrose Park, Wentworth Point and Sydney Olympic Park

6.1.3 Parking

The project would permanently reduce the number of on-street parking spaces along the roadways in which it is located. Similarly, off-street parking facilities would be impacted at John Street in Rydalmere, and the Ermington Boat Ramp at Wharf Road in Melrose Park. A summary of the estimated number of parking spaces that would be permanently removed is provided in Table 6.1. This table describes:

– the total parking supply within each specified area including on-street parking spaces within the project site, on-street parking spaces on side-roads adjacent to the project site, and off-street parking in the immediate vicinity of the project site
– the number of parking spaces that would be permanently removed due to the project
– the remaining parking capacity calculated by subtracting the parking spaces removed from the total supply
– the existing surveyed peak parking occupancy, or peak number of parking spaces occupied by vehicles, as described in section 3.10
– the estimated number of vehicles parked in those spaces which would be removed and would therefore have to park elsewhere in the area.

Table 6.1 Estimated number of parking spaces permanently removed

Location	Total supply	Spaces removed	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
Parramatta CBD	17	17	0	17 (estimated)	17
Camellia	375	2	373	69	0
Rydalmere	471	150	321	244	40
Ermington	997	156	841	193	2
Melrose Park	428	120	308	266	94
Wentworth Point	230	45	185	213	42
Sydney Olympic Park	294	154	140	218	94
Lidcombe	166	54	112	160	54
Total	***2,978***	***698***	***2,280***	***1,380***	***343***

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 removing parking in Camellia, Rydalmere, Ermington and Melrose Park are relatively low given that the supply of parking on streets immediately adjacent to the alignment is sufficient to accommodate displaced vehicles (that is, the remaining capacity is greater than the existing peak parking occupancy) as demonstrated in Table 6.1. The spaces in these areas are predominantly unrestricted parking associated with residential uses. It is acknowledged that particular consideration would need to be given to the short-term parking on Waratah Street for Melrose Park Public School (refer below).

Areas of Wentworth Point, Sydney Olympic Park and Lidcombe may experience increased competition for parking spaces given that the existing parking demand already exceeds the proposed supply (refer section 3.10.2).

The design of the project would continue to be refined with the aim of reducing the number of on-street parking spaces that would be permanently affected. 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. The approach to managing impacts to parking would be defined in the Parking Management Strategy, which would be developed and implemented in consultation with key stakeholders, the community and relevant property owners/occupants.

The Parking Management Strategy would aim to ensure that high priority kerb-side activity, such as accessible (DDA compliant) parking, loading zones and school pick-up areas, are reinstated as close as possible to their existing locations by converting long-term or unrestricted parking spaces to specific use. Reinstatement of other types of parking, including short and long-stay parking where applicable, would be prioritised based on the specific parking demands in the area under consideration.

6.1.4 Property access

The project would necessitate changes to existing property access as the following locations:

– Camellia
  - access to five properties north of Grand Avenue, Camellia, would be controlled with traffic signals including 14, 15, 15a, 19 and 21 Grand Avenue
  - a new access would be provided for the business at 37 Grand Avenue.
– Rydalmere, Ermington and Melrose Park
  - all existing property accesses to be retained in Antoine Street and John Street
  - left-in and left-out restrictions for properties along South Street and Boronia Street due to light rail alignment within roadway
  - adjustments required to around eight existing informal property accesses on the northern side of South Street
  - five existing properties on the northern side of Hope Street would be acquired. 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 and may require a formal, signalised intersection to provide access across the project alignment.

All property access at Wentworth Point, Sydney Olympic Park and Lidcombe would be retained.

6.1.5 Public transport

The project would result in substantial changes to way the public transport network operates generally within the study area, with the light rail enhancing and complementing existing public transport services by providing an additional, direct, high frequency public transport option between the Parramatta CBD and Carter Street precinct in Lidcombe. While the project for which approval is being sought does not include any changes to public bus routes and stops, bus planning and optimisation measures are being considered separately by Transport for NSW.

A commentary on potential changes to bus routes and stops is provided in section 4.7 of this document for information purposes only. Further modelling of possible changes to bus services including travel times, operating costs, network efficiency and integration and discussions with key stakeholders including Sydney Olympic Park Authority, Sydney Metro West and relevant divisions of Transport for NSW would be carried out prior to confirming the final changes to be made and the timing of their implementation.

6.1.6 Active transport

The walking and cycling links proposed as part of the project would connect to the existing and proposed active transport network in the City of Parramatta and City of Ryde local government areas. The proposed facilities would include high quality, continuous walking and cycling links along the project site comprising new shared paths, separated uni-directional cycling facilities, and dedicated crossing treatments. This would include completing gaps in existing networks and integrating with the Parramatta Valley Cycleway (both north and south of the river) as well as trails around Wentworth Point and Sydney Olympic Park.

The project (including the two bridges over the Parramatta River) would also create three walking and cycling 'loops' centred around the river in Camellia, Ermington and Wentworth Point. These loops would provide enhanced continuity, encourage increased movement and active lifestyles, and potentially draw in visitors from outside these areas across Parramatta River. In particular, the new bridges over the Parramatta River would:

– allow direct access from areas north of the river to Sydney Olympic Park, the Millennium Parklands, and Newington Armory
– allow direct access to playing fields and regional parklands on both sides of the river for existing and future communities
– connect new and expanding primary schools at Melrose Park, Wentworth Point and Rydalmere, as well as providing new connections to Western Sydney University via Rydalmere
– connect areas of urban renewal north of the river to facilities and transport modes at Wentworth Point, Rhodes and Sydney Olympic Park
– provide a new, accessible connection between Camellia and Rydalmere, linking areas of significant urban renewal potential
– form key components of future regional cycle connections, including north-south connections between Auburn and Ryde via Sydney Olympic Park, or between the planned Duck River Corridor and Rydalmere via Camellia.

The proposed active transport links would encourage increased use of active transport modes and provide a viable alternative to existing active transport routes that may experience congestion. The provision of cycling connections and bicycle parking at light rail stops also expands the catchment area around each stop to include adjacent suburbs, further promoting light rail as a viable mode of transport.

6.1.7 Special events

The project would result in net improvements to transport arrangements associated with special events, including events held in the Parramatta CBD, Rosehill Gardens Racecourse and Sydney Olympic Park by improving the transport options available for customers. The key benefits are:

– The Sandown Boulevard light rail stop would be located approximately 300 metres north of Grand Avenue, near the main entrance of Rosehill Gardens Racecourse. The project provides an alternative, direct transport mode to Parramatta Square and to other nearby residential catchments.
– The project provides convenient interchange opportunities for other modes of transport including heavy rail (at Parramatta Station and Olympic Park Station), bus (including special event bus routes servicing Sydney Olympic Park) and ferry. Light rail stops are generally co-located with stops for other transport modes.
– The new active transport connections provided by the project, in particular the new crossings of Parramatta River, provide new opportunities for walking and cycling to and from special event areas such as Sydney Olympic Park.

Special event traffic management arrangements would be in place at Sydney Olympic Park when major events are occurring. This may include terminating light rail services at the Jacaranda Square stop and/or providing increased services between Sydney Olympic Park and Melrose Park to service the increased volume of customers. Traffic management arrangements would be developed in consultation with key stakeholders.

6.1.8 River access and navigation

Operational impacts to access and vessel passage along the Parramatta River relate to the two proposed bridge structures:

– Bridge between Camellia and Rydalmere
    - The proposed bridge height of 7.6 metres above HAT exceeds the minimum required clearance advised by stakeholders (refer section 4.1.6). Analysis of specifications of identified commercial vessels relative to the proposed height of the bridge indicates that the proposed bridge would not allow upstream passage of the SuperCat ferries (air draft 9.07 metres). The RiverCat and HarbourCat ferries (air draft 7.8 metres) would only be able to operate at HAT level with equipment removed or dismantled.

- It is noted that tides at HAT levels or above are rare. The Mean High Water level (i.e. typical high tide) is approximately 0.7 metres below HAT. Both RiverCats and HarbourCats ferries could operate at Mean High Water level or below in the existing configuration without the need to remove or dismantle equipment.
- River Class ferries which are being progressively introduced into service could operate under all tidal conditions (air draft 4.76 metres).
- For commercial operators (other than ferries), only vessels less than 7.1 metres air draft could safely navigate under the bridge at HAT level (assuming a 0.5 metre safety margin). Other vessels would either have to remove, lower or dismantle equipment or navigate at lower tides. Additional crewing would be needed to dismantle masts, antennas, cranes, etc which would lead to increased costs and make some fleet items uncompetitive. This would be particularly relevant to the larger vessels (e.g. crane barges) but some vessels may not have the ability to reduce their air draft at all because of their configuration. Vessels above 8.8 metres air draft would no longer be able to access the river upstream of Camellia except at tides below Mean Low Water level.
- Given the semidiurnal nature of tides in the river and that most vessels (other than ferries) could still safely navigate by either lowering/dismantling certain equipment and/or using tides lower than HAT level to affect safe passage, this impact is considered low, noting that some vessels may no longer be able to pass safely or the operator may choose to withdraw them from servicing the part of the river upstream of Camellia.

– Bridge between Melrose Park and Wentworth Point
  - The proposed horizontal clearance of 46 metres between bridge piers would limit the passage of ferries and barges to one-way movements. While this is a change at this specific location, this same restriction is already present at other locations both upstream and downstream of the proposed bridge and is therefore not considered a major change to navigation requirements.
  - The proposed vertical clearance of 11.0 metres above the Highest Astronomical Tide (HAT) is consistent with other bridges in the vicinity (including the T1 railway (John Whitton) bridge) and therefore presents no additional constraints on vessel navigation. Passage would be possible by all ferry classes and commercial vessels less than 10.5 metres air draft at HAT level (assuming a 0.5 metre safety margin). Trailer yachts would generally be expected to have lower air drafts than commercial vessels and therefore would not be constrained.
  - Currently, the channel markers at Archer Point are not fully aligned with the deepest part of the channel. Following construction of the bridge between Melrose Park and Wentworth Point, the navigation channel would be shifted about 20 metres northward to better align with the deepest section of the river in this location (refer Figure 6.10).

6.2 Precinct impact assessments

6.2.1 Parramatta CBD

6.2.1.1 Traffic and transport

Implementation of the light rail in Macquarie Street between Marsden Street and Church Street would require the existing eastbound general traffic lane to be shifted to the northern side of the road. This general traffic lane would become a shared zone following the implementation of light rail, however no other changes to traffic volumes relative to existing conditions are expected.

An additional light rail signal phase would be introduced to the existing signals at the intersection of Macquarie Street and Macquarie Street and Church Street to accommodate light rail vehicle movements to/from the turnback facility, however this section of Macquarie Street only has eastbound traffic movements and Church Street is pedestrianised so there are no other traffic movements to consider. There are not expected to be any changes to the future operation of this intersection.

6.2.1.2 Parking and access

Existing on street parking provision (17 spaces total) in this section of Macquarie Street would be removed to allow sufficient space for the proposed turnback facility. Loading and unloading for local businesses in the immediate vicinity of the light rail would be allowed within all shared zones outside of peak activity periods.

The introduction of the turnback facility would result in a change in how the Macquarie Street and Church Street area would deal with demand for road space from general traffic, light rail and pedestrians. The light rail turnback facility would add an increased movement of light rail vehicles causing potential conflict with traffic and pedestrian movements.

Further design focus would be needed to ensure there is clear demarcation of light rail, traffic and walking areas, access for service, heavy and emergency vehicles and traffic management arrangements which are consistent with Parramatta Light Rail Stage 1. Design should also allow for flexibility to accommodate periods of high demand such as during special events in the Parramatta CBD and wider precinct.

6.2.2 Camellia

6.2.2.1 Traffic and transport

The light rail alignment would run largely within the former Sandown Line corridor to Durham Street and would require existing vehicle accesses across the corridor to industrial properties to be maintained and controlled by signals. Similarly, the Grand Avenue/Thackeray Street intersection would be signalised to allow for turning movements. East of Durham Street, where the light rail alignment would merge with the northern edge of Grand Avenue, the carriageway would be duplicated for about 150 metres.

Changes to precinct circulation are shown in Figure 6.5.

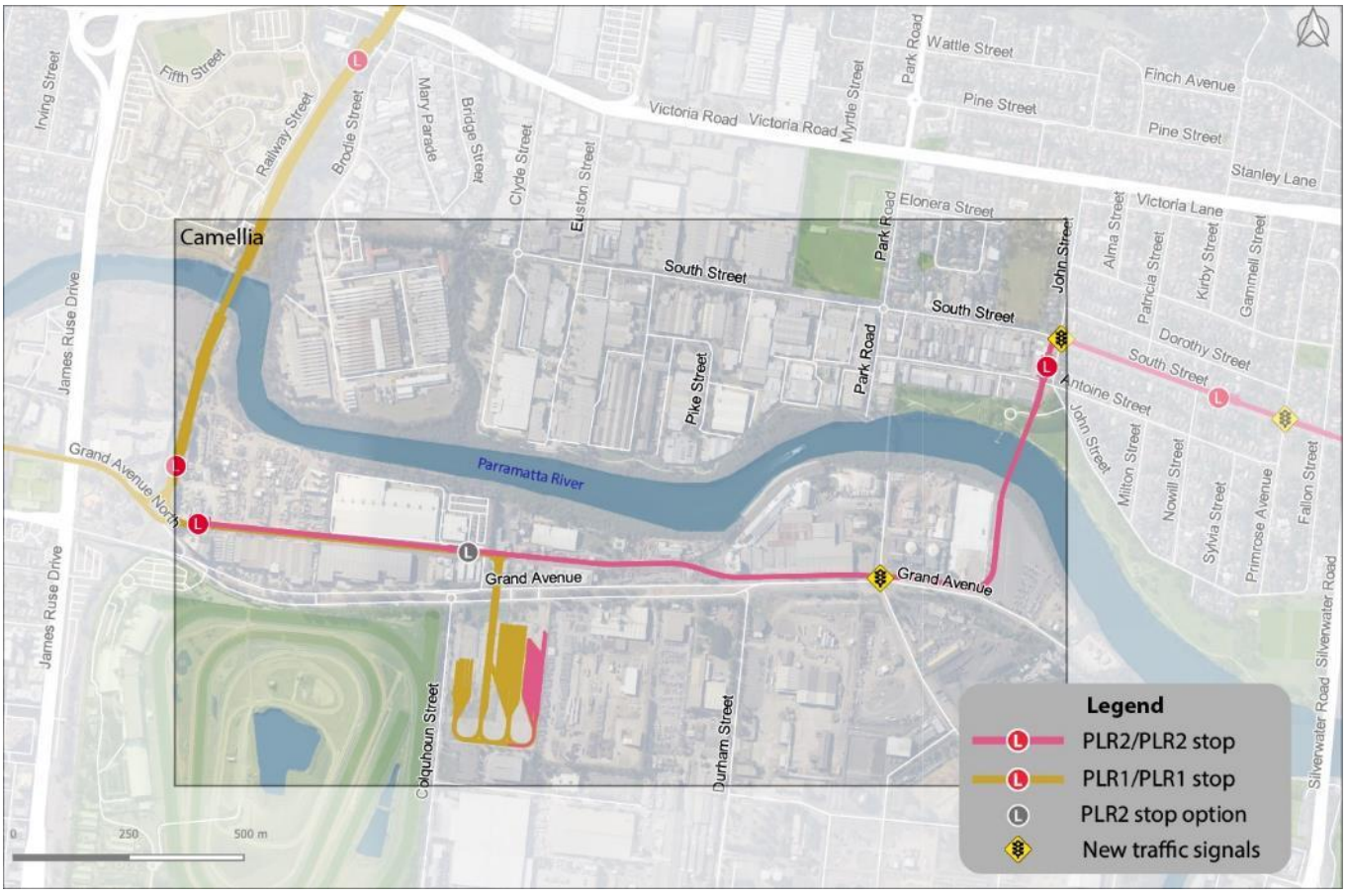


Figure 6.5 Changes to traffic circulation – Camellia

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.2. It is expected that all on-corridor intersections within Camellia would operate at acceptable levels of service during operation.

Table 6.2 Intersection performance – Camellia (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
Grand Avenue / Thackeray Street			A (2)	A (1)	A (2)	A (1)	B (28)	D (47)

The expected traffic performance for key intersections in the area surrounding the project site through Camellia is shown in Table 6.3.

Table 6.3 Intersection performance – Camellia (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
Grand Avenue North / James Ruse Drive		E (62)	F (>180)	E (64)	F (>180)	F (101)	F (>180)
Hassall Street / James Ruse Drive / Grand Avenue		E (59)	D (46)	F (93)	F (92)	F (90)	F (89)

The performance of the Grand Avenue North / James Ruse Drive intersection is shown to deteriorate as a result of traffic growth along the James Ruse Drive corridor over the period to 2031. While the intersection is forecast to operate at LoS F based on modelling results, it is likely that drivers would use the Keep Clear markings to enter the traffic stream on James Ruse Drive and would not experience the modelled delays in practice.

The Hassall Street / James Ruse Drive / Grand Avenue intersection is expected to operate at LoS F in the future without the project, with performance improving by around three seconds in both peak periods under the 'with project' scenario. On this basis, the poor intersection performance is considered to be primarily a result of land use changes and forecast development in the area, which contribute to traffic volume growth to 2031, and are not a direct result of the project infrastructure.

6.2.2.2 Parking

Parking is primarily on-street along the road network and the off-street facilities associated with the adjoining Rosehill Gardens Racecourse, or private parking as part of individual premises. The area currently does not have restricted parking arrangements.

Table 6.4 outlines the upper limit number of parking spaces that would be impacted in Camellia as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.4 Parking impacts in Camellia

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment (impacted during construction only)					

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
Northern side of Grand Avenue	128	0 (0%)	128	36	0
Southern side of Grand Avenue	104	0 (0%)	104	4	0
Side-streets					
Thackeray Street	52	2 (4%)	50	12	0
Durham Street	91	0 (0%)	91	17	0
Total	**375**	**2 (1%)**	**373**	**69**	**0**

Based on the above figures, it is expected that only very few parking spaces along Grand Avenue or side-streets would be impacted permanently by the project.

The parking availability may be affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide dedicated off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.5.

Table 6.5 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Camellia

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	1-5
Park-and-Ride	10-15
Bicycle parking	10-20

6.2.2.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.5, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 12 to 60 movements per hour (based on each space used six times in the hour)
– Park-and-Rride: 10-15 movements per hour (based on all-day parking).

Local trips would be generated onto Grand Avenue primarily, with some potential use of Durham Street or Colquhoun Street depending on the desired parking location of users. Based on the existing traffic volume and nominal capacity on each of these roads, the impacts of local trip generation in Camellia are expected to be negligible.

6.2.2.4 Property access

Property access to existing industrial premises to the north and south of Grand Avenue in Camellia would be maintained, including for heavy vehicles. Access to properties north of Grand Avenue would be controlled with signals. These include:

– 13 Grand Avenue
– 15 Grand Avenue
– 15a Grand Avenue
– 19 Grand Avenue
– 21 Grand Avenue.

Similarly, the Grand Avenue/Thackeray Street intersection would be signalised to allow for turning movements with amendments to property access arrangements as required.

A new access would be provided for the business at 37 Grand Avenue. The access would be constructed north of Grand Avenue between 37 and 37A and would enter the rear of the block after passing under the proposed light rail bridge over the Parramatta River.

6.2.2.5 Bus

Apart from routes 535 and M92 along Hassall Street and James Ruse Drive, there are currently no bus routes servicing the Camellia area. These services are not anticipated to be impacted by the project due to being geographically separate from the project site.

6.2.2.6 Active transport

The project would include continuous walking and cycling facilities along the Sandown Corridor and Grand Avenue, complete with convenient, signalised crossing points where required, to maximise safe active transport connections through the precinct. Convenient interchange between Parramatta Light Rail Stage 1 and the project would be provided on Sandown Boulevard, within the future Camellia town centre.

The Parramatta River currently provides a barrier to north-south active transport. The bridge between Camellia and Rydalmere would include a high-quality, walking and cycling path, providing connectivity between the areas of Camellia and Rydalmere, including connections to the Parramatta Valley Cycleway and Rydalmere Wharf.

By providing an active transport link across this bridge, a new 5.9 kilometre walking and cycling loop would be created using the Parramatta Valley Cycleway westward from Rydalmere, active transport link across the Parramatta River at Camellia (constructed as part of Parramatta Light Rail Stage 1) and the active transport link along Grand Avenue constructed as part of the project.

6.2.3 Rydalmere

6.2.3.1 Traffic and transport

For most of the study area within Rydalmere, one general traffic lane would be provided in each direction either side of the centre-running light rail. This configuration would restrict movements into and out of local streets along both sides of South Street to left-in/ left-out. New signals are proposed at John Street and Primrose Avenue, where vehicle access across the tracks would be required to maintain traffic circulation.

Changes to precinct circulation are shown in Figure 6.6.

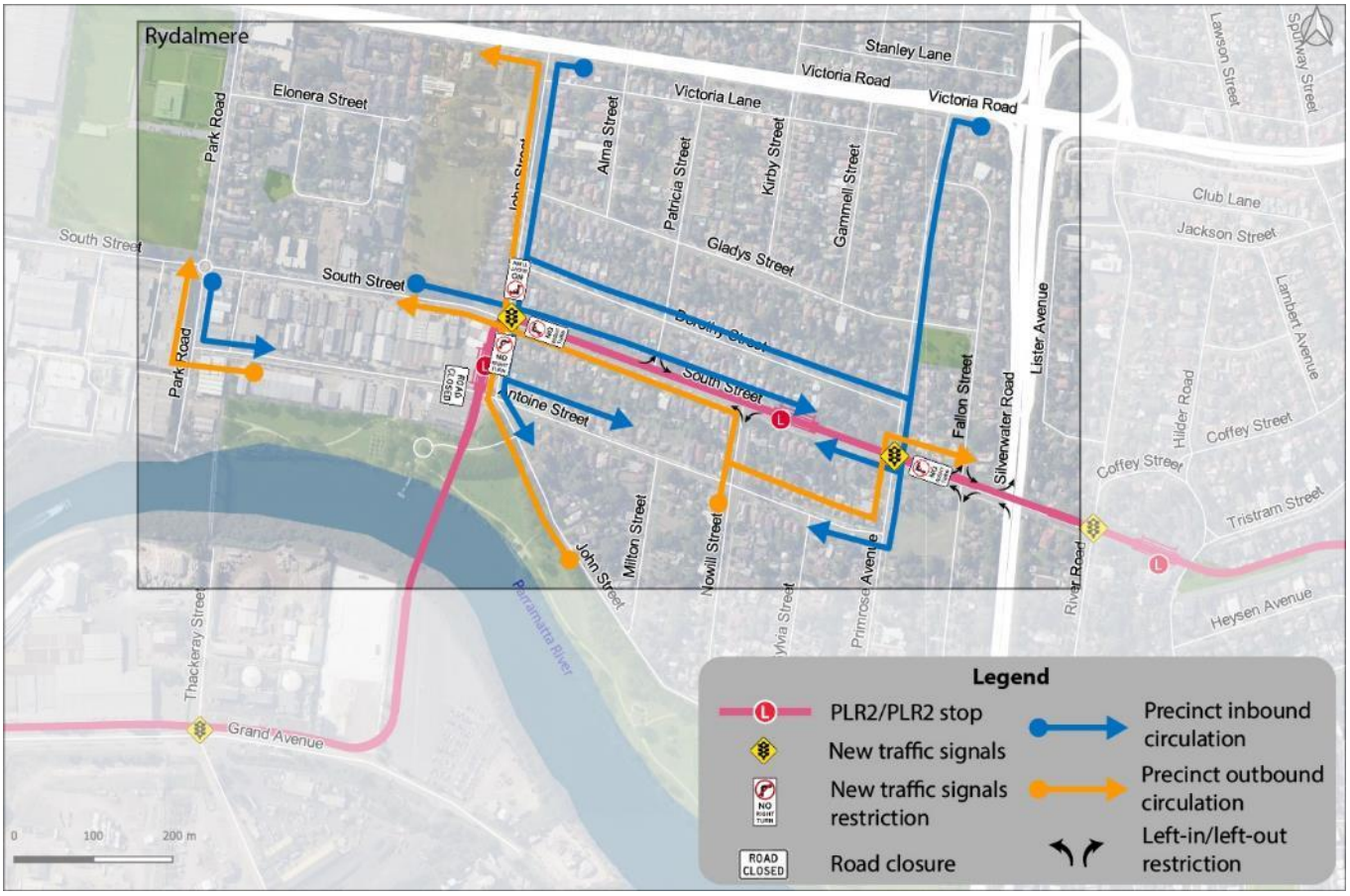


Figure 6.6 Changes to traffic circulation – Rydalmere

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.6.

Table 6.6 Intersection performance – Rydalmere (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
South Street / John Street			A (8)	A (6)	A (10)	A (10)	B (17)	B (24)
South Street / Patricia Street			A (2)	A (4)	A (4)	F (101)	A (2)	A (3)
South Street / Nowill Street			A (10)	A (4)	A (5)	F (>180)	B (15)	B (15)
South Street / Primrose Avenue			A (11)	A (12)	B (26)	F (>180)	B (17)	E (67)

The intersection of South Street and John Street would operate at a satisfactory LoS under future year conditions with the project in operation. The intersections of South Street with Patricia Street and South Street with Nowill Street are forecast to have significantly improved performance compared to the future year without the project due to conversion to left-in and left-out only.

It is noted that the intersection of South Street and Primrose Avenue is expected to operate at LoS E during the afternoon peak period with an average delay of 67 seconds. This represents a substantial improvement compared to the modelled 2031 conditions without the project (> 180 seconds delay) due to the signalisation of this site. The intersection accommodates redirected demand from other intersections, including Patricia Street and Nowill Street, which contributes to the relatively high delays under the 'with project' scenario. Measures such as design refinements, signal optimisation and other measures would be explored during ongoing project development to reduce delays at this location.

The expected traffic performance for key intersections in the area surrounding the project site through Rydalmere is described in Table 6.7.

Table 6.7 Intersection performance – Rydalmere (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
South Street / Park Road		A (4)	A (4)	A (3)	A (4)	A (4)	A (4)
Victoria Road / Park Road		D (50)	D (46)	F (101)	F (71)	F (99)	E (69)
Victoria Road / John Street		B (21)	B (21)	A (13)	B (17)	B (17)	B (15)

The intersection of Victoria Road and Park Road is expected to operate at LoS F in the future 'without the project' scenario with delays easing slightly under the 'with project' scenario by approximately two seconds in each peak period. The project is not expected to result in reduced performance at this intersection.

6.2.3.2 Parking

There would be potential loss of unrestricted street parking on South Street and commuter parking spaces (up to 30) at Rydalmere Wharf.

Table 6.8 outlines the upper limit number of parking spaces that would be permanently impacted in Rydalmere as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.8 Parking impacts in Rydalmere

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
Northern side of South Street (John Street to Silverwater Road)	49	48 (98%)	1	10	9
Southern side of South Street (Silverwater Road to John Street)	47	47 (100%)	0	13	13
John Street (South Street to Antoine Street)	10	10 (100%)	0	7	7
Side-streets					
South Street (Park Road to John Street)	72	0 (0%)	72	66	0
John Street (South Street to Dorothy Street)	8	0 (0%)	8	5	0

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
Patricia Street (South Street to Dorothy Street)	11	0 (0%)	11	3	0
Nowill Street (South Street to Antoine Street)	19	3 (16%)	16	2	0
Primrose Avenue (South Street to Antoine Street)	15	4 (27%)	11	5	0
Primrose Avenue (South Street to Dorothy Street)	8	4 (50%)	4	1	0
Fallon Street (South Street to House No. 38)	15	0 (0%)	15	1	0
Fallon Street (South Street to House No. 28)	13	0 (0%)	13	3	0
Antoine Street (Park Road to John Street)	85	0 (0%)	85	63	0
Antoine Street (John Street to Nowill Street)	49	4 (8%)	45	14	0
Off-street					
Rydalmere Wharf commuter car park	70	30 (43%)	40	51	11
Total	**471**	**150 (32%)**	**321**	**244**	**40**

Based on the above figures, it is likely that up to 150 parking spaces would be permanently impacted by the project, with approximately 40 vehicles displaced from South Street, John Street and the Rydalmere Wharf car park. All impacted parking spaces are existing 'unrestricted' parking, primarily associated with residential uses. The remaining capacity in the network, including side-streets immediately adjacent to the project, consists of 321 parking spaces, which is sufficient to accommodate the displaced vehicles.

The parking availability would be further affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.9.

Table 6.9 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Rydalmere

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	1-5
Park-and-Ride	50-60
Bicycle parking	20-30

6.2.3.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.9, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 12 to 60 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 50-60 movements per hour (based on all-day parking).

Local trips would be distributed throughout the road network, with some concentration around the John Street and Nowill Street stops. Traffic volume increases would be expected on South Street (up to 60 vehicles per hour) with lesser increases on each of Primrose Avenue, Nowill Street, Patricia Street, John Street and Antoine Street.

The additional traffic is considered relatively minor in the context of the existing and future traffic volumes on each of these roads, and would be somewhat equally distributed across the two proposed stop locations.

6.2.3.4 Property access

All existing property accesses would be maintained in Antoine Street and John Street. However, the project would restrict movements to left in and left out only of properties along South Street due to the light rail orientation within the roadway. For some movements, residents may need to use alternative, parallel local streets and cross the alignment at signalised intersections. Adjustments would also be required to existing access and parking arrangements for around eight properties on the northern side of South Street in the vicinity of the Nowill Street stop.

Transport for NSW would continue to explore options, such as modifying the stop design, changing the stop location or changing track levels, to minimise these changes to access.

6.2.3.5 Bus

The project would result in bus stop relocations and route diversions along South Street, which may impact some customers (such as through changed walking distances). The following services currently use South Street:

– Route 524 Parramatta to Ryde via West Ryde.

However, the introduction of light rail services along South Street may replace these trips and result in increased use of public transport in the area. There are opportunities to co-locate bus stops and light rail stops to allow for interchange between public transport modes, thereby improving public transport accessibility overall. This includes for the future bus route 523 that would service Rydalmere.

6.2.3.6 Active transport

East-west walking and cycling connections would be integrated into the design of the light rail corridor through Rydalmere. Light rail stop locations would ensure a large proportion of the catchment is within a 400-metre walking distance of a proposed stop. The proposed walking and cycling connection across Parramatta River via the bridge between Camellia and Rydalmere will enhance active transport network connectivity in the area generally, providing new options for travel.

Direct walking and cycling connections would be provided between the proposed John Street stop and the Parramatta Valley Cycleway. Antoine Street would be severed at John Street, providing an uninterrupted north-south walking and cycling route.

6.2.4 Ermington

6.2.4.1 Traffic and transport

South Street between River Road and Silverwater Road would be closed to general traffic from Silverwater Road and become a shared running zone. The light rail will run in a reserve between River Road and Spurway Street, where it connects to Boronia Street. Hilder Road would be terminated either side of the light rail alignment, with local traffic permanently redirected via River Road.

In Ermington, one general traffic lane would be provided in each direction on Boronia Street, either side of the centre running light rail. This configuration would restrict movements into and out of local streets and properties along both sides of Boronia Street to left-in/ left-out only. New signals are proposed at River Road, Spurway Street / Broadoaks Street, Murdoch Street and Trumper Street, where vehicle access across the tracks would be required to maintain precinct circulation.

Changes to precinct circulation are shown in Figure 6.7.

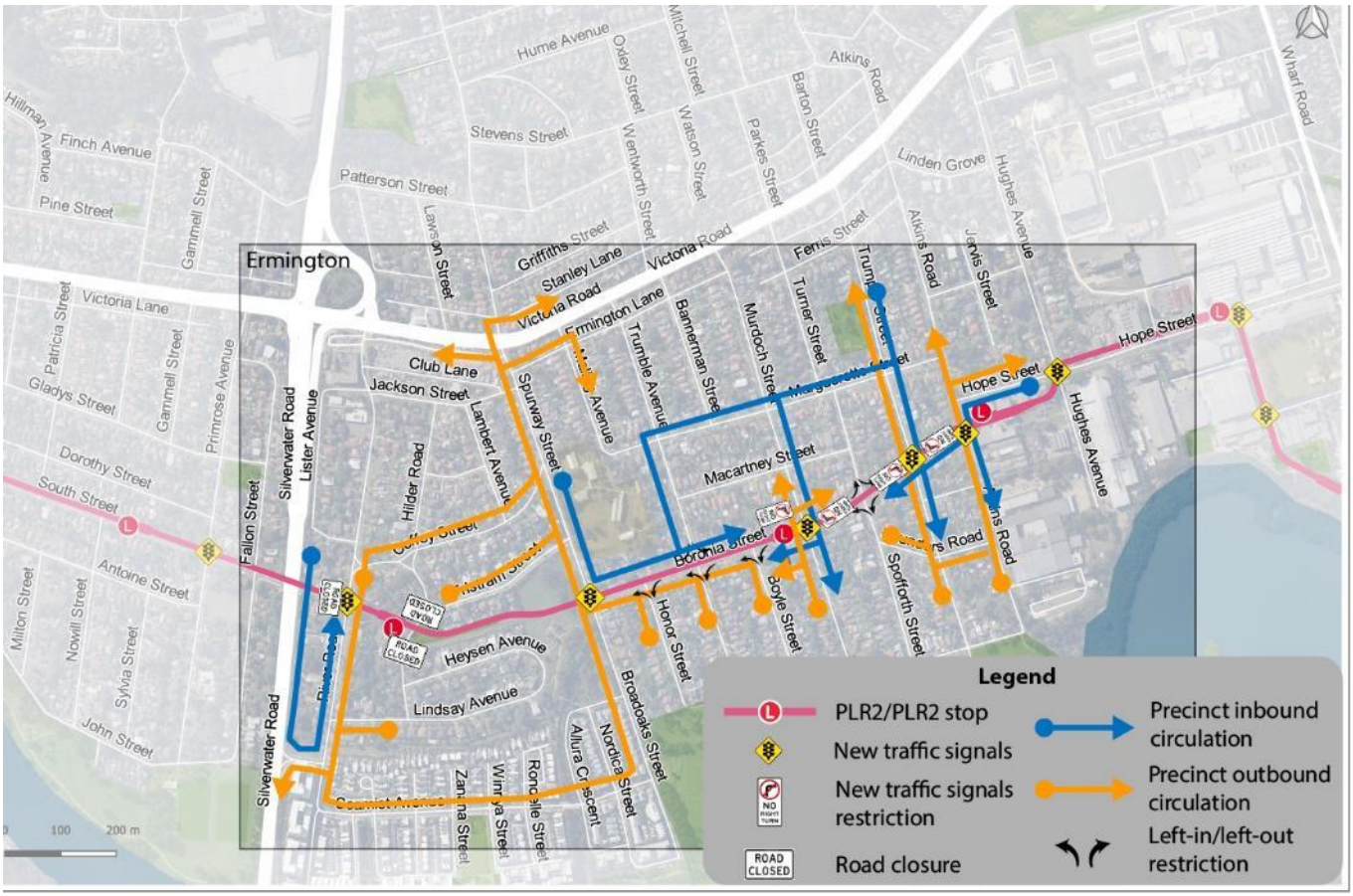


Figure 6.7 Changes to traffic circulation – Ermington

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.10.

Table 6.10 Intersection performance – Ermington (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
South Street / Silverwater Road			B (28)	E (59)	E (68)	F (81)	B (24)	E (66)
South Street / River Road			A (2)	A (3)	A (2)	A (3)	A (6)	A (6)
Boronia Street / Spurway Street /Broadoaks Street			A (4)	A (7)	A (14)	B (19)	B (29)	C (35)
Boronia Street / Honor Street			A (4)	A (1)	A (7)	B (17)	A (7)	B (15)
Boronia Street / Trumble Avenue			A (4)	A (5)	A (9)	A (14)	A (3)	A (6)
Boronia Street / Boyle Avenue			A (4)	A (5)	A (7)	A (11)	A (3)	A (5)
Boronia Street / Murdoch Street			A (13)	A (13)	B (17)	B (25)	A (21)	A (11)
Boronia Street / Spofforth Street			A (0)	A (6)	A (8)	B (18)	A (8)	A (2)
Boronia Street / Trumper Street			A (13)	B (25)	B (18)	B (23)	B (25)	B (16)

All modelled on-corridor intersections in the Ermington precinct are expected to perform at a satisfactory LoS under future year conditions with the project in operation, except for the intersection of South Street and Silverwater Road which would operate at LoS E during the afternoon peak period. It is noted that this represents an improvement from the 2031 scenario without the project where the intersection operates at LoS E during the morning peak period and at LoS F during the afternoon peak period.

Notably, satisfactory traffic performance is achieved at the intersection of Boronia Street / Spurway Street and Broadoaks Street which would have a new leg added for the project, as well as the intersections of Boronia Street with Murdoch Street and Trumper Street which have new traffic signals and would have increased demands due to right turn movements being relocated from other streets with access restrictions.

The expected traffic performance for key intersections in the area surrounding the project site through Ermington is described in Table 6.11.

Table 6.11 Intersection performance – Ermington (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
Victoria Road / Silverwater Road		B (15)	B (26)	B (24)	B (23)	B (23)	C (30)
Victoria Road / River Road		A (13)	A (15)	B (18)	A (13)	B (22)	B (19)
Victoria Road / Spurway Street		C (36)	C (38)	E (68)	C (36)	E (68)	D (57)
Victoria Road / Trumper Street		B (16)	A (14)	B (20)	B (17)	B (22)	B (17)

Intersections along Victoria Road within Ermington generally operate with a satisfactory LoS with the exception of 2031 performance at Victoria Road / Spurway Street (LoS E during AM). It is noted that the proposed delay in 2031 with the project represents no change from the 2031 delay without the project (68 seconds) at this location. The intersection of Victoria Road and Silverwater Road (northbound off-ramp) would operate at LoS C during the afternoon peak with an increase in delay of approximately 7 seconds compared to the 2031 without the project scenario. Similarly, the intersection of Victoria Road and Spurway Street would operate at LoS D during the afternoon peak with an increase in delay of approximately 21 seconds.

6.2.4.2 Parking

On-street unrestricted parking is generally permitted with unrestricted kerbside parking is available within the local road network of South Street and Boronia Street in front of residential properties.

There would be potential loss of unrestricted on street parking along on Boronia Street and other streets in this area as shown in Table 6.12. The table below outlines the upper limit number of parking spaces that would be permanently impacted in Ermington as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.12 Parking impacts in Ermington

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
South Street (Silverwater Road to River Road)	15	15 (100%)	0	2	2
Northern side of Boronia Street (Spurway Street to Atkins Road)	94	61 (65%)	33	6	0
Southern side of Boronia Street (Spurway Street to Atkins Road)	91	59 (65%)	32	9	0
Side-streets					
River Road (Lister Avenue to Lindsay Avenue)	80	1 (1%)	79	30	0
Hilder Road (Tristram Street to Lindsay Avenue)	38	5 (13%)	33	13	0
Spurway/Broadoaks Street (Allura Crescent to Tristram Street	18	6 (33%)	12	9	0
Honor Street (Boronia Street to House No. 12)	44	0 (0%)	44	14	0

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
Trumble Avenue (Boronia Street to House No. 45)	46	0 (0%)	46	12	0
Trumble Avenue (Boronia Street to Marguerette Street)	62	0 (0%)	62	23	0
Boyle Street (Boronia Street to House No. 18)	46	0 (0%)	46	11	0
Murdoch Street (Boronia Street to House No. 41)	63	0 (0%)	63	10	0
Murdoch Street (Boronia Street to Marguerette Street)	78	0 (0%)	78	7	0
Spofforth Street (Boronia Street to House No. 21)	66	0 (0%)	66	12	0
Spofforth Street (Boronia Street to Marguerette Street)	79	0 (0%)	79	12	0
Trumper Street (Boronia Street to Saunders Road)	65	9 (14%)	56	5	0
Trumper Street (Boronia Street to Marguerette Street)	58	0 (0%)	58	7	0
Atkins Road (Massie Street to Marguerette Street)	54	0 (0%)	54	11	0
Total	**997**	**156 (16%)**	**841**	**193**	**2**

Based on the above figures, it is likely that up to 156 parking spaces would be permanently impacted by the project, with approximately two vehicles displaced. All impacted parking spaces are existing 'unrestricted' parking, primarily associated with residential uses. The remaining capacity in the network, including side-streets immediately adjacent to the project, consists of 841 parking spaces which is sufficient to accommodate any displaced vehicles.

The parking availability would be further affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.13.

Table 6.13 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Ermington

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	5-10
Park-and-Ride	60-70
Bicycle parking	20-30

6.2.4.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.13, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 60 to 120 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 60 to 70 movements per hour (based on all-day parking).

Local trips would be distributed throughout the Ermington road network, with some concentration around the River Road stop, the Murdoch Street stop and the Atkins Road stop. Traffic volume increases would be expected on River Road (up to 95 vehicles per hour), as well as Boronia Street and Hope Street (up to 50 vehicles per hour on each of these roads).

Lesser increases would also be expected on other connecting roads including Spurway Street, Broadoaks Street, Trumble Avenue, Murdoch Street, Spofforth Street, Trumper Street and Atkins Road. The impacts of local trips would be spread across the road network, depending on the desired parking location of each user, such that there would not be a significant concentrated impact at any specific location.

6.2.4.4 Property access

The project would restrict movements in and out of properties along South Street and Boronia Street due to the light rail orientation within the roadway and utility easements.

All property access would be maintained in South Street east and Boronia Street albeit via left-in/ left-out only for Boronia Street properties:

– properties along Boronia Street would be restricted to left-in/ left-out only
– access to the local road network south of Boronia Street and Hope Street would be restricted due to the new intersection controls.

For some movements, residents may need to use alternative, parallel local streets and cross the corridor at signalised intersections.

6.2.4.5 Bus

The project would result in bus stop relocations and route diversions along South Street and Boronia Street, which may impact some customers (such as through changed walking distances). However, the introduction of light rail services may replace these trips and result in increased use of public transport in the area.

The following services currently use Boronia Street:

– Route 524 Parramatta to Ryde via West Ryde.

Proposed bus network changes, combined with the introduction of the project would necessitate some bus stop / route changes but there is the potential for additional bus stops and enhanced bus route augmentation to integrate with the project, including at the River Road stop where services to Eastwood and to Auburn via Newington would interchange. This includes for bus routes 525, 544 and 521 that would service Ermington.

6.2.4.6 Active transport

East-west walking and cycling connections would be integrated into the design of the light rail corridor through Ermington, including separate cycling facilities along Boronia Street. Light rail stop locations would ensure a large proportion of the catchment is within a 400 metre walking distance of a proposed stop. New traffic signals provide safe crossing opportunities at regular intervals along South Street, Boronia Street and Hope Street.

The existing pedestrian bridge connection over Silverwater Road would be replaced and significantly improved with new lifts and ramps providing a high quality cycling connection between the Rydalmere and Ermington areas. South Street would be closed to traffic between Silverwater Road and River Road, with road space reallocated to walking and cycling. Similarly, Hilder Road would be severed at the light rail alignment, providing an uninterrupted shared use path alongside the light rail through Ken Newman Park to Spurway Street.

By providing an active transport link across the bridge between Melrose Park and Wentworth Point (refer section 6.1.4), a new six kilometre walking and cycling loop would be created along the Parramatta Valley Cycleway to Silverwater Road, and then on the southern side of the Parramatta River using the shared path through Blaxland Riverside Park/Newington Armory.

6.2.5 Melrose Park

6.2.5.1 Traffic and transport

The alignment would run in an off-road corridor between Atkins Road and Hughes Avenue and then run along the northern side of Hope Street before centre running along Waratah Street adjacent to Melrose Park Public School.

Other road changes would include:

– new signalised intersections at:
- Boronia Street and Atkins Road
- Hope Street and Hughes Avenue
- Hope Street and development road (pedestrians only)
- Hope Street and Waratah Street
- Waratah Street and Mary Street.

Changes to precinct circulation are shown in Figure 6.8.

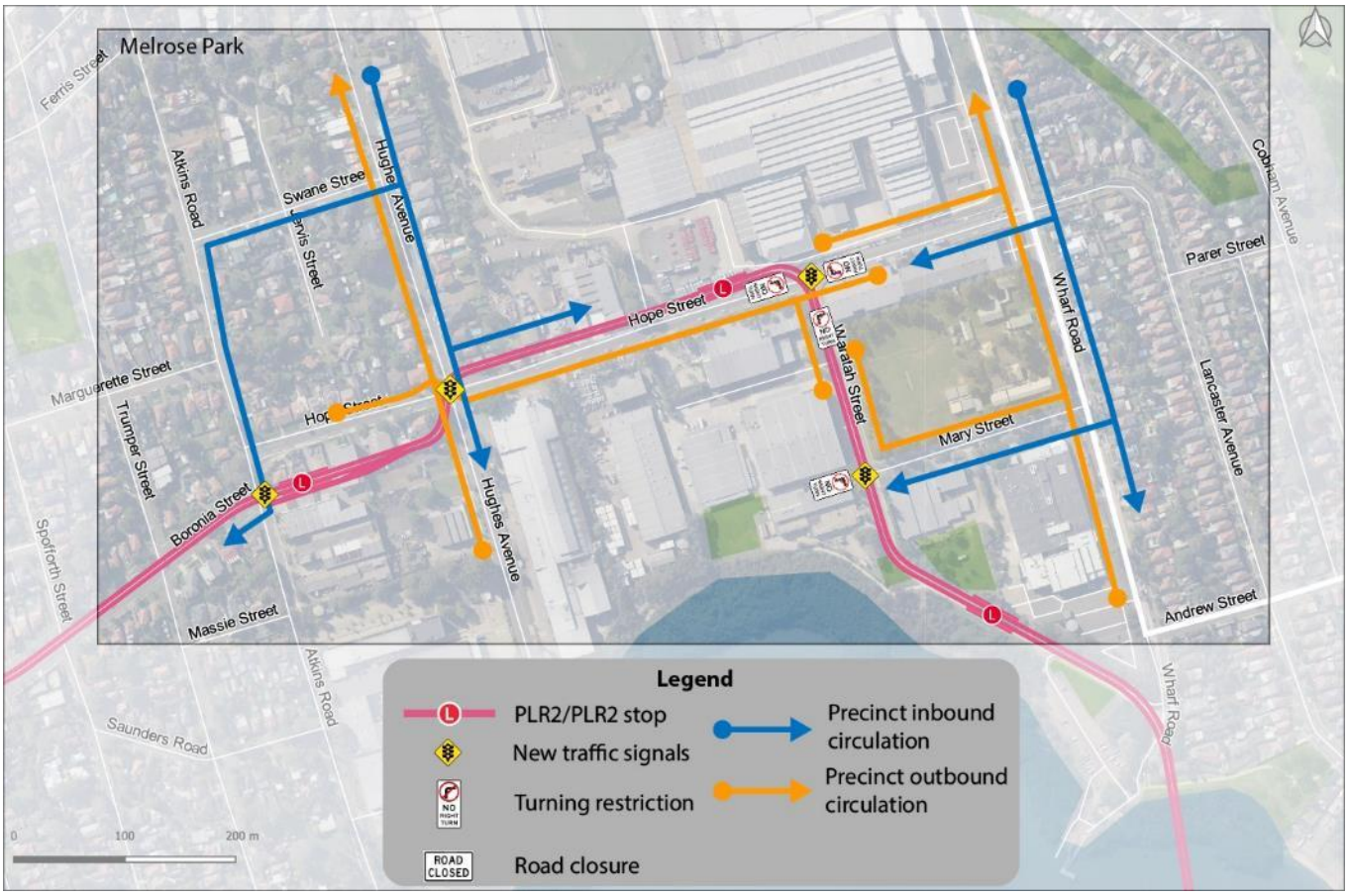


Figure 6.8 Changes to traffic circulation – Melrose Park

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.14.

Table 6.14 Intersection performance – Melrose Park (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
Boronia Street / Atkins Road			A (3)	A (1)	A (8)	A (1)	B (29)	B (15)
Hope Street / Atkins Road			B (27)	A (4)	F (72)	A (10)	D (52)	C (32)
Hope Street / Hughes Avenue			A (14)	B (15)	C (42)	B (24)	C (42)	C (38)
Hope Street / Waratah Street			A (9)	A (6)	E (57)	F (103)	F (74)	E (69)
Waratah Street / Mary Street			-	-	-	-	F (94)	F (94)

The intersection of Hope Street and Waratah Street is forecast to operate at LoS F (74 seconds delay) during the morning peak period under the 'with project' scenario and LoS E (69 seconds delay) during the afternoon peak. It is noted that this represents an overall improvement compared to the 2031 'without project' scenario where the intersection is forecast with delays of 57 seconds (AM) and 103 seconds (PM) under a give-way control. The signalisation of this site would provide more reliability with respect to travel times and delays.

The intersection of Waratah Street and Mary Street would also experience increased delays due to signalisation, with the project scenario showing LoS F in both morning and afternoon peak periods.

The performance at these intersections is considered to be due to large volumes of traffic which are using Andrew Street and Wharf Road in preference to Victoria Road in the 2031 models. The design of the project would continue to be refined to minimise delays at these two locations, including measures to reduce 'rat-running' behaviour that may contribute to increased use of Mary Street, Waratah Street and Hope Street in 2031.

The intersection of Atkins Road with Hope Street would remain give-way controlled, with Keep Clear markings allowing right turns into and out of this intersection. Intersection performance improves in the morning peak period under the 'with project' scenario with delays reducing from 72 seconds (LoS F) to 52 seconds (LoS D).

The expected traffic performance for key intersections in the area surrounding the project site through Melrose Park is described in Table 6.15.

Table 6.15 Intersection performance – Melrose Park (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
Victoria Road / Kissing Point Road / William Street		A (13)	C (30)	C (37)	C (35)	B (29)	E (67)
Victoria Road / Wharf Road		C (43)	E (60)	F (90)	F (134)	F (110)	F (157)
Hope Street / Wharf Road / Lancaster Avenue		A (6)	A (6)	A (6)	A (7)	B (23)	B (15)

Traffic performance at the intersection of Victoria Road and Wharf Road significantly worsens under future conditions with the intersection operating at LoS F under the 2031 'without project' scenario. Delays are expected to increase in both the AM and PM peak periods with the project, by approximately 21 seconds in the morning and 23 seconds in the afternoon.

The intersection of Victoria Road, Kissing Point Road and William Street shows reduced delays by around eight seconds in the morning peak and increased delays by around 32 seconds in the afternoon peak (LoS E).

It is considered that increased delays at intersections along Victoria Road are primarily a result of development in the area that is included in the 'with project' model scenario, rather than a direct result of the project infrastructure. This is evidenced as the project infrastructure does not cause delay increases on Boronia Street and Hope Street such that large volumes of traffic would be diverted to the alternative route along Victoria Road.

6.2.5.2 Parking

On-street unrestricted parking is generally permitted along Hope Street, with 15 minute spaces located near Melrose Park Public School on Waratah Street and 62 off-street spaces located at the Ermington Boat Ramp.

There would be potential loss of unrestricted on street parking on Hope Street and Waratah Road as shown in Table 6.16. The table below outlines the upper limit number of parking spaces that would be permanently impacted in Melrose Park as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.16 Parking impacts in Melrose Park

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
Hughes Avenue (Light rail alignment to Hope Street)	12	12 (100%)	0	11	11
Northern side of Hope Street (Hughes Avenue to Waratah Street)	23	23 (100%)	0	21	21
Southern side of Hope Street (Waratah Street to Hughes Avenue)	31	31 (100%)	0	31	31
Eastern side of Waratah Street (Hope Street to Mary Street)	17	17 (100%)	0	13	13
Western side of Waratah Street (Mary Street to Hope Street)	19	19 (100%)	0	18	18
Side-streets					
Hope Street (Atkins Road to Hughes Avenue)	29	2 (7%)	29	21	0
Hope Street (Waratah Street to Wharf Road)	38	0 (0%)	38	31	0
Hughes Avenue (Light rail alignment to No Through Road)	50	4 (8%)	50	44	0
Hughes Avenue (Hope Street to House No. 50)	13	0 (0%)	13	13	0
Mary Street (Waratah Street to Wharf Road)	39	2 (5%)	37	20	0
Wharf Road (No Through Road to Mary Street)	71	0 (0%)	71	18	0
Andrew Street (Wharf Road to Lancaster Avenue)	24	0 (0%)	24	8	0

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
Off-street					
Ermington Boat Ramp car park*	62	10 (16%)	52	17	0
Total	**428**	**120 (28%)**	**308**	**266**	**94**

*Note: Peak parking capacity provided in this table is representative of peak hours on weekdays while Ermington Boat Ramp is at peak usage on the weekend.

Based on the above figures, it is likely that up to 120 parking spaces would be permanently impacted by the project, with approximately 94 vehicles displaced. The majority of impacted parking spaces are existing 'unrestricted' parking primarily associated with residential uses. Exceptions include:

– three short-term (1/4P) spaces located on Hope Street
– 13 short-term (1/4P) spaces located on Waratah Street and used for school pick-up and drop-off.

The remaining capacity in the network, including side-streets immediately adjacent to the project, consists of 318 parking spaces which is sufficient to accommodate the displaced vehicles. The removal of parking from Waratah Road in the vicinity of expected high pick up/drop off activity associated with Melrose Park Public School would require further focus during design development and in the preparation of the Parking Management Strategy. Coordination and consultation with the school and City of Ryde Council would be required in order to organise alternative arrangements in place of the 15 minute on-street parking spaces and maintain safe access for students and other road users.

The above arrangements would be documented as part of the Parking Management Strategy developed for the project and described in section 8.3.1.7.

It is noted that the Ermington Boat Ramp is currently at capacity during the seasonal peak, with the demand for the facility frequently exceeding the available trailer parking supply, resulting in overflow parking on Wharf Road and local streets. The reduction in trailer parking supply at this location is likely to increase the likelihood and magnitude of overflow parking facility in the area. 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.

The overall parking availability would also be impacted from the demand generated by the project for Kiss-and-Ride and Park-and-Ride.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.17.

Table 6.17 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Melrose Park

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	10-15
Park-and-Ride	80-90
Bicycle parking	40-50

6.2.5.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.17, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 60 to 180 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 80 to90 movements per hour (based on all-day parking).

Local trips would be attracted from areas of Melrose Park to the east of Wharf Road, as light rail users would travel via Andrew Street and Wharf Road to either park, or pick-up and drop-off, within walking distance of the two light rail stops.

This activity has the potential to generate up to 200 to 250 vehicle movements per hour onto Andrew Street and/or Wharf Road which, along with 'rat-running' vehicles avoiding Victoria Road, is expected to contribute to increased traffic volumes at the intersections of Andrew Street, Mary Street and Hope Street with Wharf Road as evidenced in the 2031 traffic modelling outputs (refer section 6.2.5.1).

In order to mitigate the impact of additional trips on the local street network, it will be necessary to develop and implement a Parking Management Strategy to balance the supply of short-, medium- and long-term parking in the area surrounding each of the Melrose Park stops and to manage the traffic demand in the area. This strategy would also have regard to short-term parking associated with the Melrose Park Public School located in the block bounded by Hope Street, Wharf Road, Mary Street and Waratah Street.

The design of the project would be refined where possible to reduce delays at these locations, including measures to reduce 'rat-running' behaviour that may contribute to increased use of Mary Street, Waratah Street and Hope Street in 2031.

6.2.5.4 Property access

Five existing properties on the northern side of Hope Street, between Hughes Avenue and Waratah Street, would be acquired. 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.

6.2.5.5 Bus

Melrose Park would be serviced by the extension of two bus routes: 401 and 523.

6.2.5.6 Active transport

The project would integrate east-west bicycle connectivity along Hope Street and north-south bicycle connectivity along Waratah Street. This includes connection to the Parramatta Valley Cycleway at the southern end of Waratah Street.

New signalised intersections along Hope Street would provide safe crossing opportunities at regular intervals within the precinct.

6.2.6 Wentworth Point

6.2.6.1 Traffic and transport

The alignment extends across Parramatta River via a new bridge and then traverses around the Sanctuary Wentworth Point development to connect to Hill Road at Footbridge Boulevard, before travelling down Hill Road on its western side toward Sydney Olympic Park. The bridge between Melrose Park and Wentworth Point would provide opportunities for existing bus routes to be redirected to serve destinations in Rhodes, Concord and Sydney Olympic Park.

The project would generally operate with only minor impacts on the existing road configuration. Generally, existing traffic arrangements would be maintained on Hill Road, with new signals provided at Footbridge Boulevard, Verona Drive, Stromboli Strait and Bennelong Parkway, to facilitate access across Hill Road as well as to and from stops. Changes to precinct circulation are shown in Figure 6.9.

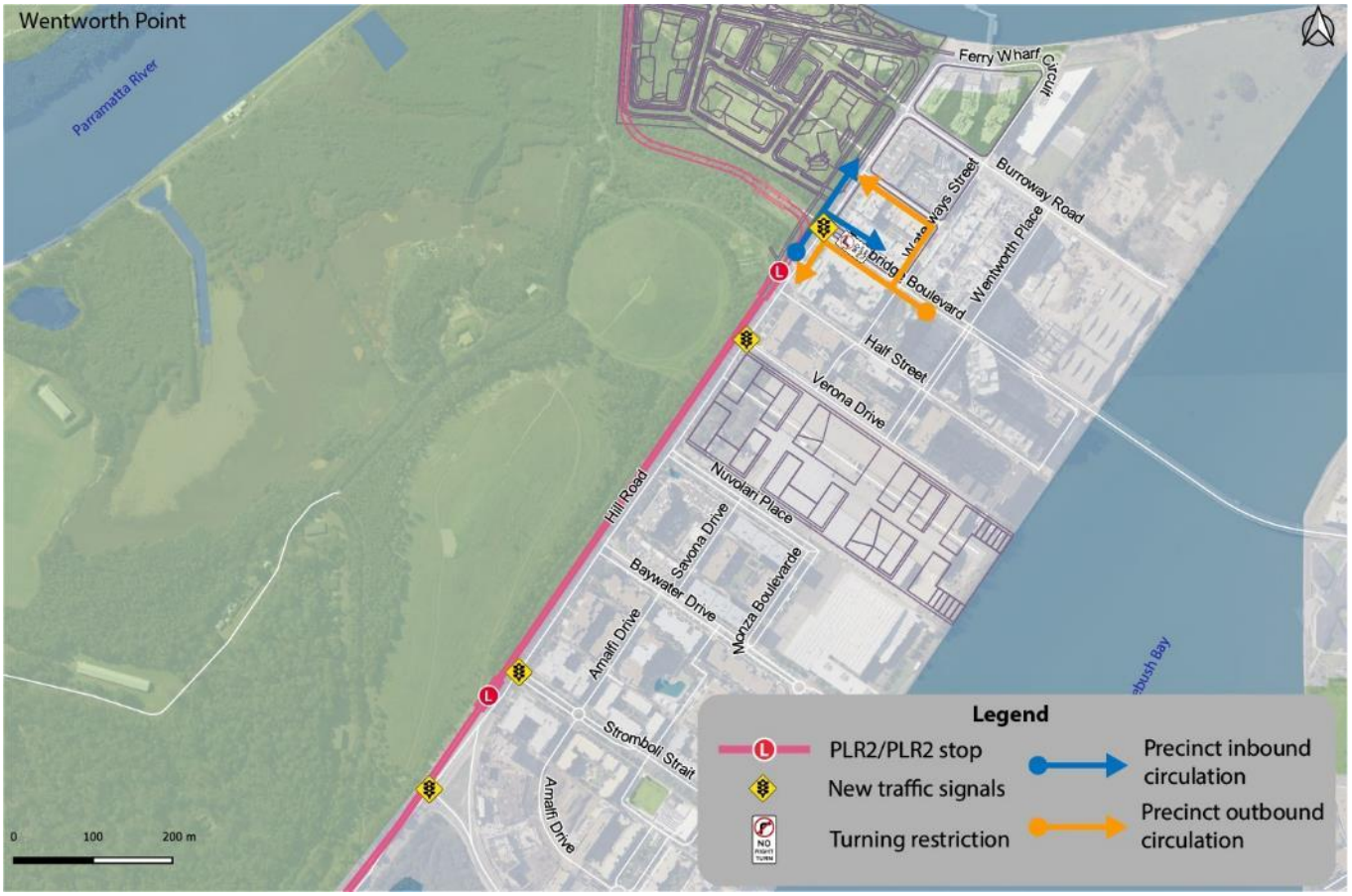


Figure 6.9 Changes to traffic circulation – Wentworth Point

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.18.

Table 6.18 Intersection performance – Wentworth Point (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
Hill Road / Footbridge Boulevard	GIVE WAY		A (11)	B (16)	F (159)	D (45)	E (60)	B (26)
Hill Road / Verona Drive	GIVE WAY		-	-	-	-	B (23)	B (23)
Hill Road / Baywater Drive	GIVE WAY	GIVE WAY	B (16)	C (35)	F (>180)	C (32)	B (25)	D (43)
Hill Road / Stromboli Strait	GIVE WAY		B (27)	B (27)	F (>180)	F (79)	B (28)	A (14)
Hill Road / Bennelong Parkway	GIVE WAY		B (17)	F (>180)	B (20)	C (38)	C (30)	D (49)

All intersections would operate at a satisfactory LoS under the project scenario with the following exceptions:

– The intersection of Hill Road and Footbridge Boulevard would operate at LoS E during the morning peak period. It is noted however, that this represents a substantial improvement compared to the 2031 without the project scenario with reported delays improving from 159 seconds (give-way) to 60 seconds (traffic signals).
– The intersection of Hill Road and Baywater Drive would operate at LoS D during the afternoon peak under give-way traffic control. It is noted that intersection performance improves substantially in the morning peak compared to the existing conditions, from LoS F to LoS B. The availability of alternative routes (including the adjacent signalised site at Stromboli Strait) would allow drivers to divert away from this intersection if required and, over time, it is expected that overall travel times would balance across the available routes.

The performance of the intersection of Stromboli Strait and Hill Road significantly improves as a result of new traffic signals at this location.

There were no off-corridor intersections requiring assessment at Wentworth Point.

6.2.6.2 Parking

There would be potential loss of on street parking along Hill Road and within the Woo-la-ra car park as shown in Table 6.19. The table below outlines the upper limit number of parking spaces that would be permanently impacted in Wentworth Point as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10).

Table 6.19 Parking impacts in Wentworth Point

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
Eastern side of Hill Road (Footbridge Boulevard to Bennelong Parkway)	70	2 (3%)	68	64	0
Side-streets					
Hill Road (Ferry Wharf to Footbridge Boulevard)	28	0 (0%)	28	18	0
Burroway Road (Hill Road to Waterways Street)	17	13 (76%)	4	17	13
Park Street N (Hill Road to Waterways Street)	6	2 (33%)	4	5	1
Footbridge Boulevard (Hill Road to Waterways Street)	18	1 (6%)	17	18	1
Half Street (Hill Road to Waterways Street)	10	0 (0%)	10	10	0
Nuvolari Place (Hill Road to Savona Drive)	26	0 (0%)	26	26	0
Baywater Drive (Hill Road to Savona Drive)	17	2 (12%)	15	17	2
Stromboli Strait (Hill Road to Amalfi Drive)	13	0 (0%)	13	13	0
Off-street					
Woo-la-ra car park on Hill Road	25	25 (100%)	0	25 (estimated)	25
Total	**230**	**45 (20%)**	**185**	**213**	**42**

Based on the above figures, it is likely that up to 45 parking spaces would be permanently impacted by the project, with approximately 42 vehicles displaced. Impacted parking spaces are predominantly 'unrestricted' parking. Existing parking in the area is highly utilised such that the existing peak parking occupancy would exceed the remaining capacity in the immediate area. This would result in overflow impact on surrounding areas in the order of 28 vehicles.

Mitigation of parking impacts would be documented as part of the Parking Management Strategy developed for the project (described further in section 8.3.1.7). This would include updated parking surveys and a detailed assessment of parking supply in the area, with an aim to ensure that high priority parking spaces (such as short term parking associated with Wentworth Public School) are reinstated, and alternative parking arrangements provided to accommodate the likely demand.

The parking availability would be further affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.20.

Table 6.20 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Wentworth Point

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	5-10
Park-and-Ride	15-25
Bicycle parking	40-50

6.2.6.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.20, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 60 to 120 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 15 to25 movements per hour (based on all-day parking).

The above trip generation may contribute to increased traffic volumes on Hill Road during operation (up to 145 vehicles per hour) with lesser increases on other connecting streets, including Bennelong Parkway. It is noted that Park-and-Ride activity would be limited to medium to long-term parking in the area, of which there is a very limited supply.

It is considered that Hill Road, and connecting streets, have sufficient capacity to accommodate this increase in traffic due to Kiss-and-Ride and Park-and-Ride activity.

6.2.6.4 Property access

All property access would be maintained along Hill Road. No impacts to property accesses are expected.

The proposed design requires an increase in the total width of the Hill Road corridor near the intersection with Holker Street to provide the necessary number of traffic lanes and maintain capacity through the intersection. This may have a minor impact on the property boundary at the URBNSURF commercial surf park currently under construction. The full extent of property impact is to be confirmed and subject to ongoing design development and consultation process to reduce impacts.

6.2.6.5 Bus

Proposed new bus stops combined with bus network changes in Wentworth Point would improve public transport access and facilitate shorter walking distances to interchanges.

Existing bus access to the Sydney Olympic Park Ferry Wharf would be maintained and provide an interchange opportunity at the Footbridge Boulevard stop. The Footbridge Boulevard stop would provide opportunity to interchange with buses using the new bridge to destinations in Melrose Park, Pennant Hills and Chatswood and buses that cross the Bennelong Bridge to Concord via Rhodes.

6.2.6.6 Active transport

The project includes new shared path connections across Parramatta River via the bridge between Melrose Park and Wentworth Point. This is a new active transport link which provides connectivity to Wentworth Point which is currently relatively isolated from other parts of the network. Connections to existing walking and cycling facilities such as the Louise Sauvage Pathway and Parramatta Valley Cycleway are also provided.

Wide footpaths and on-road, uni-directional cycle lanes would be provided along Hill Road. Additionally Wentworth Point trails would be connected to Melrose Park as a result of the project, to form an active transport loop circuit across the bridge between Melrose Park and Wentworth Point, to Meadowbank, to Rhodes and across Bennelong Bridge.

6.2.6.7 River access and navigation

The proposed bridge at Wentworth Point has adopted a horizontal navigation clearance width of 46 metres. This has been selected having regard to Australian and international standards as well as upstream constraints on the Parramatta River (such as the T1 railway bridge at Rhodes and the bridge over Silverwater Road). The navigation channel would also be shifted toward the centre and deepest part of the river in this location as shown in Figure 6.10. The channel markers would be relocated to define the revised navigation channel.

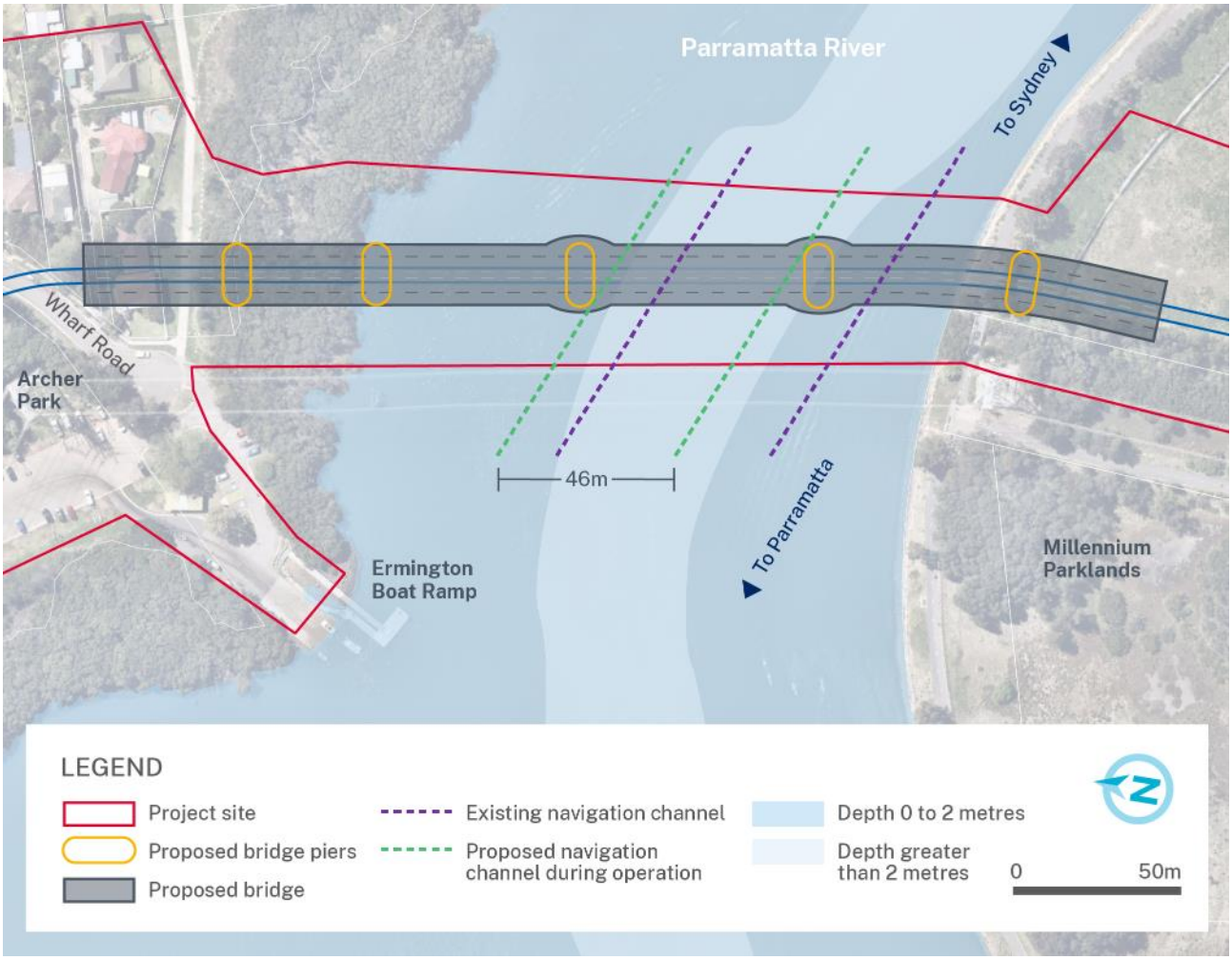


Figure 6.10 Changes to the Parramatta River navigation channel at the bridge between Melrose Park and Wentworth Point

While two barges or ferries are physically able to pass simultaneously at the location of the proposed bridge currently, the proposed clearance would restrict this to one direction at a time following construction of the bridge. This manoeuvre is already restricted both upstream and downstream of the proposed bridge location and is therefore not considered a major change to existing navigation.

The proposed height of the bridge between Melrose Park and Wentworth Point is 11 metres above HAT. This is consistent with other bridges in the area (including the T1 railway bridge) and does not present any additional constraints on navigation by ferries, commercial vessels up to 10.0 metres air draft or recreational craft at HAT level or below within the Upper Parramatta River.

6.2.7 Sydney Olympic Park

6.2.7.1 Traffic and transport

The alignment turns onto the Holker Busway where it would be shared with special event buses and continue along the centre of Australia Avenue. The alignment then extends south along Dawn Fraser Avenue which is the central access road within Sydney Olympic Park.

New traffic signals along the alignment are proposed at the following intersections:

– Holker Busway / Kevin Coombs Avenue / Marjorie Jackson Parkway / Australia Avenue
– Australia Avenue / Grand Parade
– Australia Avenue / Murray Rose Avenue / Dawn Fraser Avenue

– Dawn Fraser Avenue / Park Street
– Dawn Fraser Avenue / Olympic Boulevard.

Vehicle access to and from Sydney Olympic Park would be maintained via the outer ring roads, including Kevin Coombs Avenue, Australia Avenue, Sarah Durack Avenue, Edwin Flack Avenue, Marjorie Jackson Parkway and Bennelong Parkway. Precinct circulation changes are shown in Figure 6.11 as inbound and outbound routes for the areas that are affected including:

– access to/from Murray Rose Avenue would require some recirculation throughout various roads within the precinct due to the potential turn restrictions at Australia Avenue
– eastbound vehicles on Dawn Fraser Avenue would need to use Olympic Boulevard and adjacent roads instead of Dawn Fraser Avenue east of Olympic Boulevard
– signals at Hill Street and Holker Street would be adjusted to accommodate light rail services.

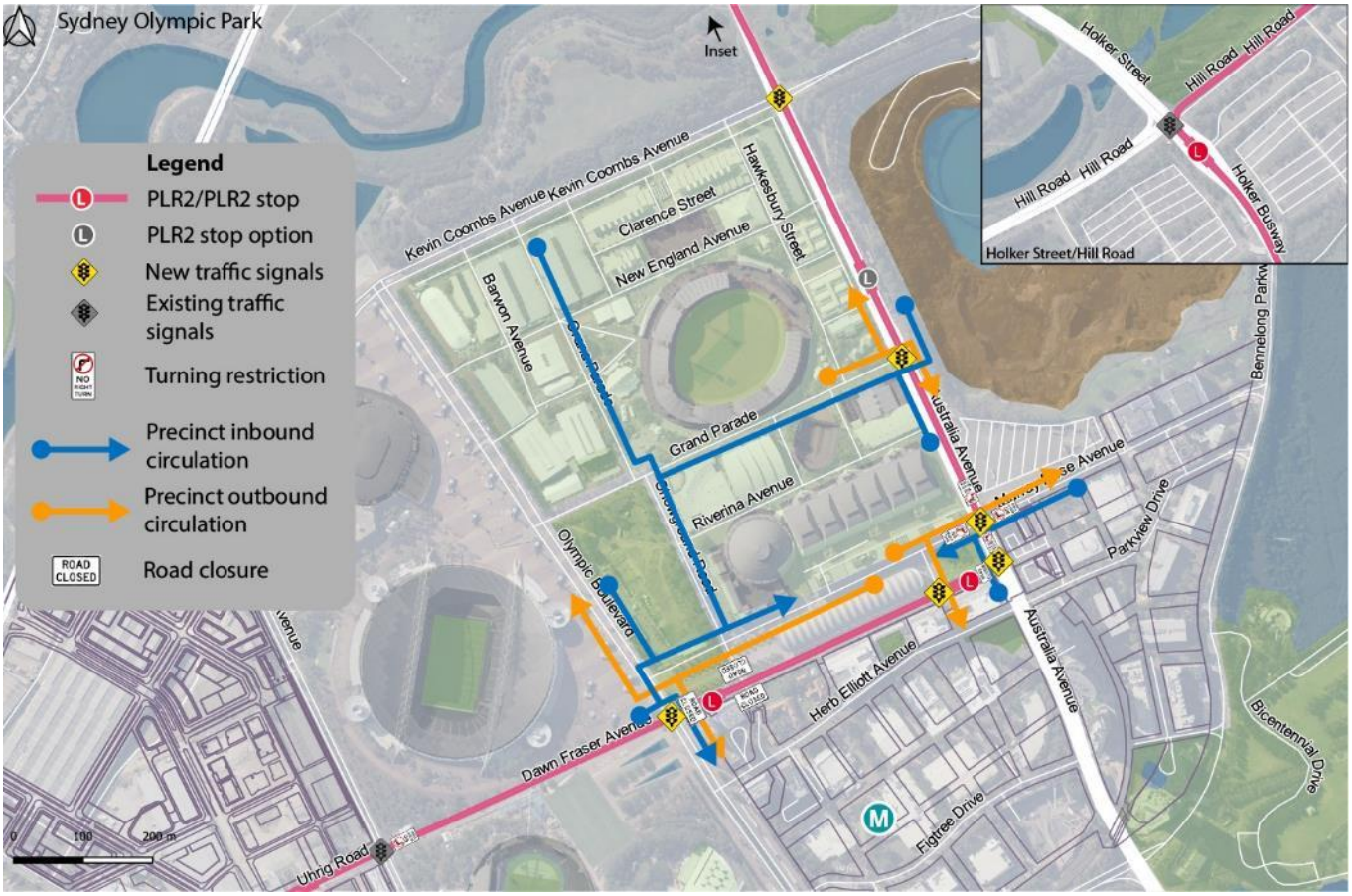


Figure 6.11 Changes to traffic circulation – Sydney Olympic Park

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.21.

Table 6.21 Intersection performance – Sydney Olympic Park (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
Hill Road / Holker Street			B (25)	B (25)	C (31)	E (58)	E (62)	D (54)
Holker Busway / Marjorie Jackson Parkway / Australia Avenue / Kevin Coombs Avenue			A (9)	A (5)	D (47)	B (29)	D (45)	D (45)
Australia Avenue / Grand Parade			A (7)	A (3)	D (54)	A (9)	B (17)	B (22)
Australia Avenue / Murray Rose Avenue			D (46)	B (27)	F (>180)	F (89)	A (9)	C (39)
Australia Avenue / Dawn Fraser Avenue			A (2)	A (2)	C (36)	A (4)	B (16)	A (14)
Park Street / Dawn Fraser Avenue			A (5)	A (3)	F (90)	B (19)	E (58)	E (69)
Showground Road / Dawn Fraser Avenue		-	A (12)	A (10)	NA	NA	NA	NA
Olympic Boulevard / Dawn Fraser Avenue			B (20)	B (19)	F (161)	F (176)	B (27)	C (31)

NA – Not applicable. Dawn Fraser Avenue will become pedestrianised following implementation of light rail. No general traffic will be allowed.

All modelled intersections are expected to perform at a satisfactory LoS under future year conditions with the project in operation, with the following exceptions:

– The intersection of Hill Road and Holker Street would operate at LoS E in the morning peak period with reported delays increasing from 31 seconds (LoS B) to 62 seconds (LoS E). The microsimulation model showed some substantial queuing at this site for the northbound left turn movement due to high demand. This contributes to the LoS E performance shown above. The modelling indicated that the performance at this approach could be improved through signal optimisation at this intersection post-completion of the project and by extending the length of the existing short land on the northbound approach. Measures including design refinement, signal optimisation and other measures would be explored during ongoing project development to reduce delays at this location.
– The intersection of Park Street and Dawn Fraser Avenue. would have a significantly changed configuration due to the introduction of a signalised pedestrian crossing at this location, and the removal of general traffic from Dawn Fraser Avenue (and presence of the dedicated light rail corridor). The reduced intersection performance is consistent with the function of Park Street and should be seen as a desirable outcome to prioritise pedestrian and light rail movements at this location over general traffic.

The intersections of Australia Avenue/Murray Rose Avenue and Olympic Boulevard/Dawn Fraser Avenue would have substantially improved performance due to the introduction of traffic signals at these locations.

The expected traffic performance for key intersections in the area surrounding the project site through Sydney Olympic Park is described in Table 6.22. Both of the assessed intersections are expected to operate at a satisfactory level of service under project conditions.

Table 6.22 Intersection performance – Sydney Olympic Park (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
Hill Road / Pondage Link		A (12)	B (18)	B (15)	B (24)	B (16)	C (38)
Olympic Boulevard / Sarah Durack Avenue		B (16)	B (21)	B (15)	D (43)	B (16)	C (36)

6.2.7.2 Parking

Table 6.23 outlines the upper limit number of parking spaces that would be permanently impacted in Sydney Olympic Park as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.23 Parking impacts in Sydney Olympic Park

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
Southern side of Dawn Fraser Avenue (Australia Avenue to Olympic Boulevard)	28	28 (100%)	0	20	20
Southern side of Dawn Fraser Avenue (Olympic Boulevard to Edwin Flack Avenue)	41	41 (100%)	0	26	26
Northern side of Dawn Fraser Avenue (Edwin Flack Avenue to Olympic Boulevard)	44	44 (100%)	0	25	25
Northern side of Dawn Fraser Avenue (Olympic Boulevard to Australia Avenue)	34	34 (100%)	0	21	21
Side-streets					
Murray Rose Avenue (Australia Avenue to Showground Road)	47	4 (9%)	43	38	0
Herb Elliot Avenue (Australia Avenue to Olympic Boulevard)	74	0 (0%)	74	67	0
Showground Road (Dawn Fraser Avenue to Herb Elliot Avenue)	17	0 (0%)	17	13	0
Olympic Boulevard (Dawn Fraser Avenue to Herb Elliot Avenue)	9	3 (33%)	6	8	2
Total	**294**	**154 (52%)**	**140**	**218**	**94**

Based on the above figures, it is likely that up to 154 parking spaces would be permanently impacted by the project, including the removal of all parking along Dawn Fraser Avenue, resulting in the displacement of approximately 94 parked vehicles. Impacted parking spaces are a mix of ticketed parking, short-term and special use parking spaces as outlined below:

– accessible spaces (5)
– P15mins spaces (10)
– P30mins spaces (44)

– loading zones (3)
– truck zones (13)
– 1P (12).

Existing parking in the area is highly utilised (refer Figure 3.8) such that the existing peak parking occupancy exceeds the remaining capacity in the immediate area. This would result in overflow on surrounding areas in the order of 78 vehicles.

Mitigation of parking impacts would be documented as part of the Parking Management Strategy developed for the project (described further in section 8.3.1.7). This would include updated parking surveys and a detailed assessment of parking supply and demand, with an aim to ensure that high priority parking spaces (such as accessible parking and short-term pick-up and drop-off spaces) are reinstated, and alternative parking arrangements provided to accommodate the likely demand.

The parking availability would be further affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Loading and unloading activity associated with local businesses would be allowed in shared zones where applicable outside of peak periods.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.24.

Table 6.24 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Sydney Olympic Park

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	10-15
Park-and-Ride	150-160
Bicycle parking	15-20

6.2.7.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.24, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 120 to 180 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 150 to160 movements per hour (based on all-day parking).

The additional traffic volumes would be spread across a wide area, including the three proposed Sydney Olympic Park stops at Holker Street (near Hill Road), Jacaranda Square and Olympic Boulevard. The parking and traffic demands would therefore be confined to existing (or future proposed) parking facilities which have been purpose-built to accommodate commuter parking. The impacts of additional traffic accessing light rail stops would therefore be diluted such that no particular road or street experiences a large volume increase due to this activity.

6.2.7.4 Property access

All property accesses would be maintained in Australia Avenue. Loading provisions on Dawn Fraser Avenue would also 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 the Showground Road site.

Given changes to property access for the URBNSURF commercial surf park at Hill Road, separate service access arrangements from Holker Busway are being reviewed in consultation with key stakeholders.

6.2.7.5 Bus

Sydney Olympic Park is serviced by existing bus routes 525, 526, 533 and N81 with interchange available at the Park Street bus stop, adjacent to the proposed Jacaranda Square light rail stop. The project proposes a river crossing at Wentworth Point that allows for new bus routes to be established connecting the Sydney Olympic Park and Wentworth Point precincts to Melrose Park and beyond. The project would also provide interchange between light rail and special event bus services.

6.2.7.6 Active transport

Existing walking and cycling links along Holker Busway would be enhanced as part of the bridge upgrade works for the project. The project includes uni-directional, separated cycleways along Australia Avenue and parts of Dawn Fraser Avenue. Shared paths would also be provided along the project site to provide high-quality walking and cycling connections in the area, linking with other facilities such as the Sydney Olympic Park train station.

6.2.7.7 Special events

During large and major events, it would be necessary to ensure that conflict between pedestrian traffic and light rail is effectively managed given the very high pedestrian traffic loads in the area. It is anticipated that the following management measures would be in place during special events at Sydney Olympic Park:

– During major events (>60,000 people), light rail services would terminate at the Jacaranda Square stop to accommodate high volumes of crowd movement across Dawn Fraser Avenue accessing Sydney Olympic Park Station:
  - Under these conditions, the light rail would not service the Carter Street stop and these passengers would be required to make alternative arrangements for transport. It is anticipated that this may occur up to eight times per year for a period of up to two hours.
  - A short-term turnback area would be used 100 metres west of the Jacaranda Square stop to facilitate driver changeover.
– During large events (25,000-60,000 people), the Olympic Boulevard stop would be closed and light rail movements along Dawn Fraser Avenue would be carried out under traffic control to the Carter Street stop.

It is also anticipated that services would run at a higher frequency during special events to assist in transporting higher passenger loads.

The introduction of light rail has the potential to reduce the demand for special event buses to service the Sydney Olympic Park precinct by providing additional options for travellers to and from the area.

6.2.8 Lidcombe

6.2.8.1 Traffic and transport

At Carter Street, the centrally aligned light rail alignment would continue from Dawn Fraser Avenue, across Edwin Flack Avenue, and along Uhrig Road to terminate at the Stockyard Boulevard intersection.

Precinct circulation changes are shown in Figure 6.12 as inbound and outbound routes for the areas that are affected including:

– Access to the western part of the development site on the south side of Uhrig Road would require some recirculation due to the banned right turn from Uhrig Road south of the Carter Street stop.

– Access from the eastern part of the development site on the south side of Uhrig Road to Dawn Fraser Avenue would require some recirculation due to the left-in/left-out arrangements at Uhrig Road.
– Southbound vehicles on Dawn Fraser Avenue would need to use an alternative route to access Edwin Flack Avenue and the broader precinct to the east due to the banned right turn at Edwin Flack Avenue.

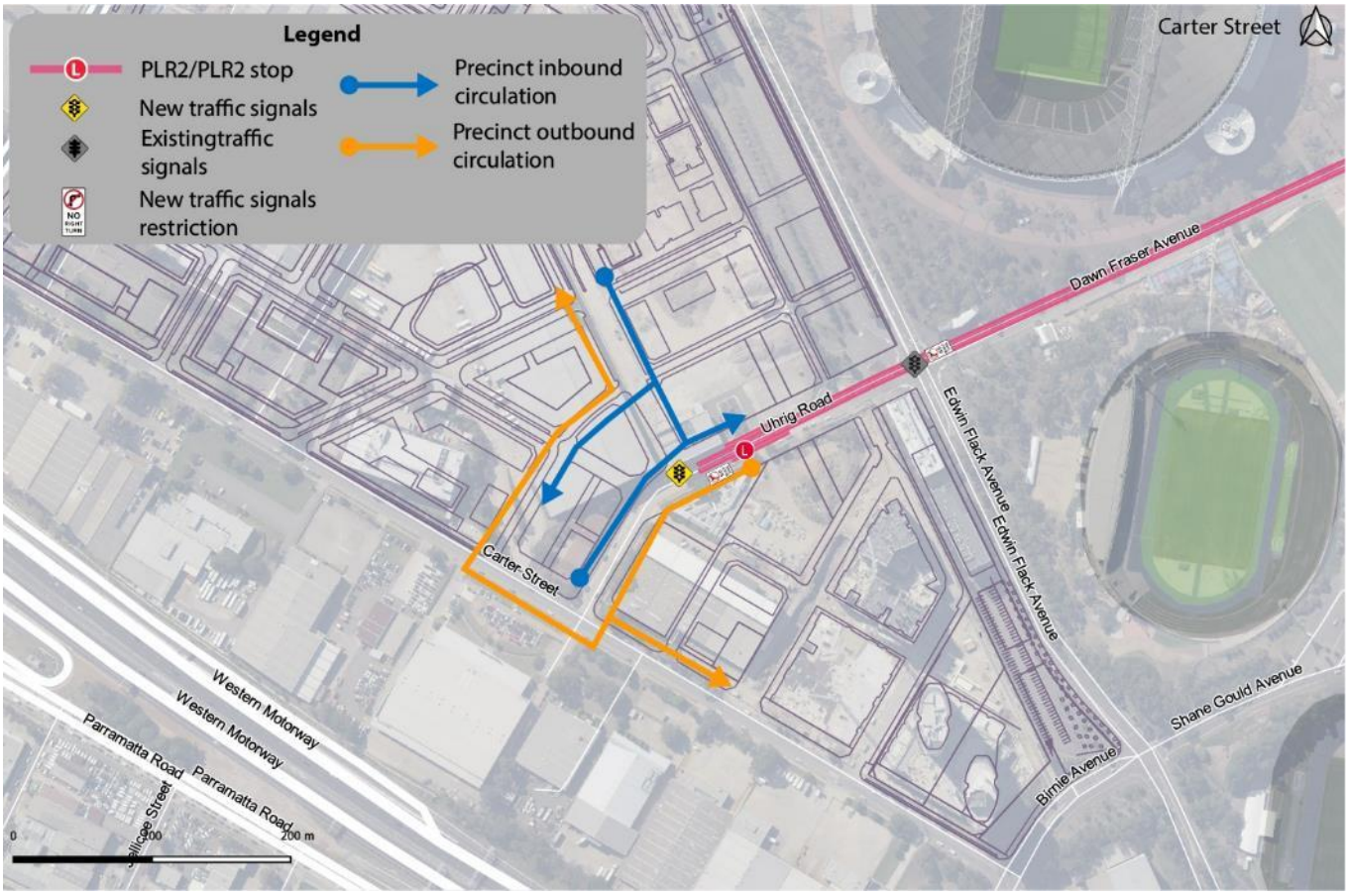


Figure 6.12 Changes to traffic circulation – Lidcombe

Expected changes in intersection control and operational performance for intersections within the project site are shown in Table 6.25.

Table 6.25 Intersection performance – Lidcombe (on-corridor)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project		2031 with project	
			AM	PM	AM	PM	AM	PM
Edwin Flack Avenue / Dawn Fraser Avenue / Uhrig Road			B (24)	B (22)	F (>180)	C (35)	D (44)	C (38)
Uhrig Road / Stockyard Boulevard			-	-	-	-	A (8)	A (8)

All modelled intersections are expected to perform adequately under future year conditions with the project in operation.

The expected traffic performance for key intersections in the area surrounding the project site through Lidcombe is described in Table 6.26.

Table 6.26 Intersection performance – Lidcombe (off-corridor)

Intersection	Intersection control	Level of service (average delay in seconds)					
		2018		2031 without project		2031 with project	
		AM	PM	AM	PM	AM	PM
Hill Road / Parramatta Road		-	-	E (63)	F (129)	F (84)	F (99)
Australia Avenue / Homebush Bay Drive		-	-	F (100)	F (118)	F (113)	F (88)

The intersection of Hill Road and Parramatta Road is expected to experience increased delays in the morning peak period (+21 seconds) and reduced delays in the afternoon peak period (-30 seconds). Similarly, the intersection of Australia Avenue and Homebush Bay Drive would have increased delays in the morning (+13 seconds) and reduced delays in the afternoon (-30 seconds). The overall change in performance at both of these intersections is considered not to be significant in the context of the existing delays and level of service.

6.2.8.2 Parking

There would be a potential loss of on street parking spaces on Uhrig Road. Table 6.27 outlines the upper limit number of parking spaces that would be permanently impacted as a result of the project, and the estimated number of parked vehicles displaced based on parking occupancy surveys (refer section 3.10.2).

Table 6.27 Parking impacts in Lidcombe

Location	Total supply	Spaces impacted	Remaining capacity	Existing peak parking occupancy	Estimated peak vehicles displaced
On alignment					
Southern side of Uhrig Road (Edwin Flack Avenue to Carter Street)	29	29 (100%)	0	29	29
Northern side of Uhrig Road (Carter Street to Edwin Flack Avenue)	31	25 (81%)	6	33	27
Side-streets					
Carter Street (IBC Business Estate to Flock Street)	106	0 (0%)	106	98	0
Total	**166**	**54 (33%)**	**112**	**160**	**56**

Based on the above figures, it is likely that up to 54 parking spaces would be permanently removed by the project, with approximately 56 vehicles displaced from parking on Uhrig Road. Impacted parking spaces are predominantly 'unrestricted' parking. Existing parking in the area is highly utilised (refer Figure 3.8) such that the existing peak parking occupancy would exceed the remaining capacity in the immediate area. This would result in overflow onto surrounding areas in the order of 48 vehicles.

Mitigation of parking impacts would be documented as part of the Parking Management Strategy developed for the project (described further in section 8.3.1.7). This would include updated parking surveys and a detailed assessment of parking supply in the area, with an aim to ensure that high priority parking spaces are reinstated, and alternative parking arrangements provided to accommodate the likely demand.

The parking availability would be further affected by demand for Kiss-and-Ride and Park-and-Ride generated by the project.

While the project is not planning to provide off-street parking facilities for the forecast Park-and-Ride customers (in line with the *Road User Space Allocation Policy* (Transport for NSW, 2021)), these customers may still choose to use existing kerbside or off-street parking provisions (including temporarily for Kiss-and-Ride). This would impact on local users as demand for available parking spaces would be increased.

Bicycle parking spaces would be integrated with the light rail stop design and surrounds to assist in facilitating access to light rail services and cater for the demand generated by the project. Bicycle parking demand and site-specific constraints would determine the nature of bicycle parking to be provided.

The approximate number of spaces that would be used for light rail stop access (based on forecast demand) is outlined in Table 6.28.

Table 6.28 Kiss-and-Ride, Park-and-Ride and bicycle parking demand in Carter Street

Number of spaces used for stop access	
Customer type	**2031**
Kiss-and-Ride	1-5
Park-and-Ride	10-20
Bicycle parking	10-15

6.2.8.3 Local trip generation

The project may attract additional vehicle trips to the local road network associated with kiss-and-ride activity and park-and-ride activity. This would occur generally in the area surrounding light rail stops as no dedicated parking spaces would be provided as part of the project for this purpose.

Based on the parking demands outlined in Table 6.28, the local trip generation during the morning and afternoon peak periods are estimated as follows:

– Kiss-and-Ride: 12 to 60 movements per hour (based on each space used six times in the hour)
– Park-and-Ride: 10 to 20 movements per hour (based on all-day parking).

The project may generate up to an additional 80 vehicle movements per hour during peak periods in the vicinity of the Carter Street stop, including additional traffic on Carter Street, Uhrig Road and Edwin Flack Avenue. There is sufficient capacity in each of these roads to accommodate the increased traffic due to light rail stop access.

6.2.8.4 Property access

The project would restrict movements into and out of properties along Uhrig Road due to the light rail orientation within the roadway, which includes during special event periods.

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.

7. Cumulative impacts

7.1 Construction

The project would involve construction activity at a number of work sites along the alignment as described in this document. The analysis carried out in section 4.9.6 identifies the likely level of light and heavy vehicle activity in each area The construction impacts assessment presented in section 5 considers the cumulative impacts of all areas along the alignment simultaneously under construction.

There would, however, be a range of other projects (unrelated to the project) being developed in the study area over the course of the five- to six year construction period (2025 to 2030/2031 inclusive). These include, but are not necessarily limited to, the following:

– Parramatta Light Rail Stage 1
– Sydney Metro West
– ongoing land use and future development sites
– road and other transport improvements.

The potential cumulative impacts of the project with each of the above are briefly discussed in the following sections.

7.1.1 Parramatta Light Rail Stage 1

The majority of the works associated with Parramatta Light Rail Stage 1 would be complete prior to commencement of the project construction works. Notwithstanding, there are some areas where cumulative impacts may result including:

– Stabling and maintenance facility (Camellia):
  - The proposed stabling and maintenance facility would be located at Grand Avenue, Camellia. The facility would be constructed as part of Parramatta Light Rail Stage 1, however additional works would be required to increase the capacity of the depot for the project.
– Macquarie Street turnback (Parramatta CBD):
  - Construction of turnouts at Macquarie Street would require occupation of the Parramatta Light Rail Stage 1 light rail corridor for night works.

Site-specific Traffic and Access Management Plans for the above would include consideration of potential interaction with operation of the Parramatta Light Rail Stage 1 project including the timing and duration of any occupation of the light rail corridor along Macquarie Street and Church Street.

7.1.2 Sydney Metro West

The connection between the project and Sydney Metro West facilitates interchange opportunities between travel modes for customers.

7.1.2.1 Parramatta CBD

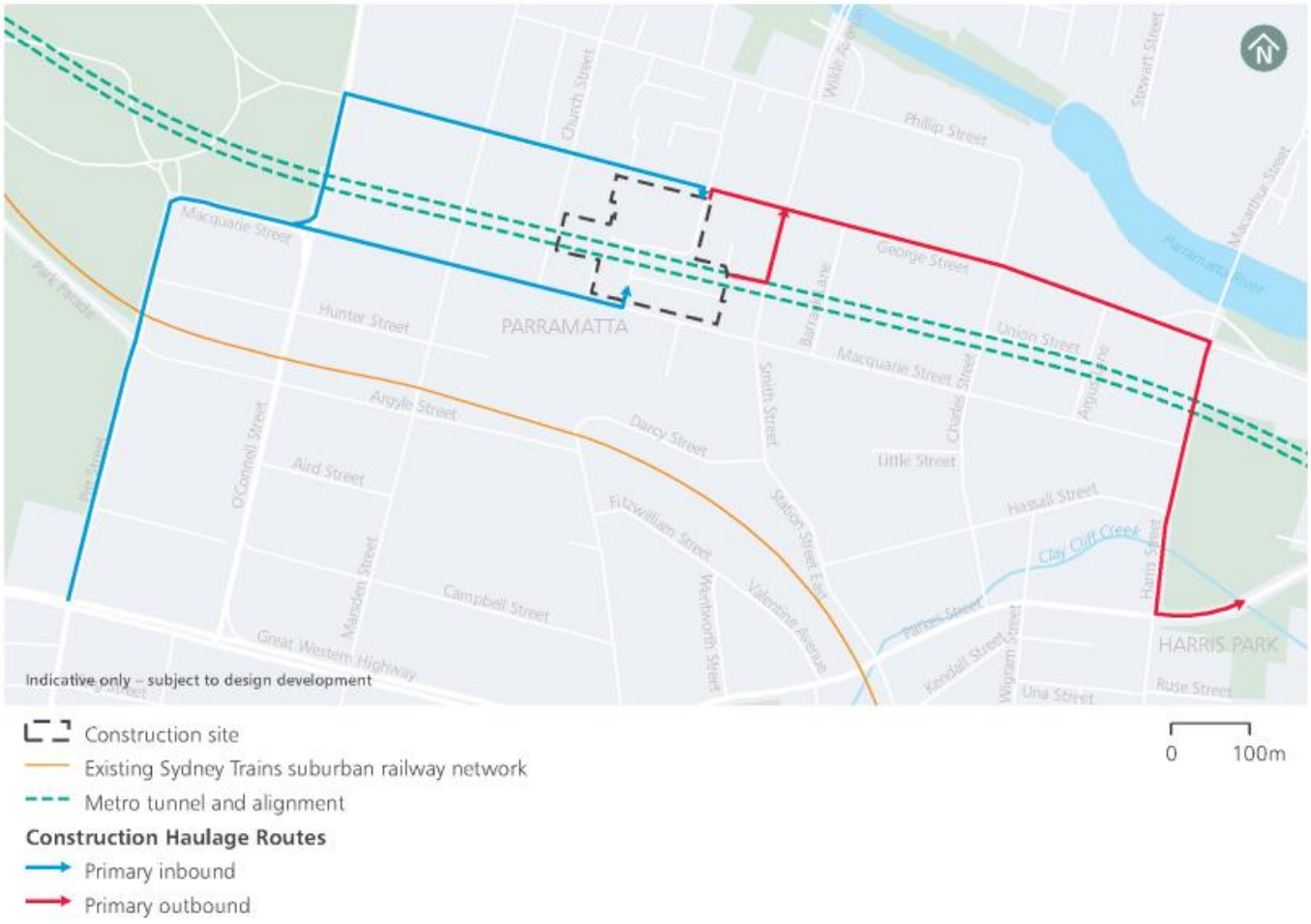
Preliminary engagement with Sydney Metro West has identified that when the contractor undertakes its work in Macquarie Street, considerable Sydney Metro West construction activity will be in progress within the city block bounded by Macquarie Street, Church Street, George Street and Smith Street. This introduces potential cumulative impacts with the works being carried out as part of the Macquarie Street turnback facility.

A diagram is provided in Figure 7.1 which indicates the likely extent of works by Sydney Metro West, and the current intention to use the relevant section of Macquarie Street as a transport corridor for incoming trucks. Coordination between the two projects would be required to ensure access is maintained to construction zones.

It is noted that project works in this area would be predominantly night works as outlined in the construction impact assessment. Nightworks may require the short-term, full closure of Macquarie Street, between Church Street and Marsden Street, which would result in reduced access for Sydney Metro West. The potential impacts are summarised as follows:

– The temporary disruption to access at Macquarie Street may increase intensification of night traffic volumes at the George Street access during the periods when Macquarie Street is closed for Parramatta Light Rail Stage 2 works.
– There may be increased activity during the daytime around the period where Macquarie Street is closed at night to account for reduced access and truck volumes.

Close coordination between the two projects is required to ensure that sufficient access arrangements, and traffic mitigation measures, are in place for Sydney Metro West prior to the closure of Macquarie Street.



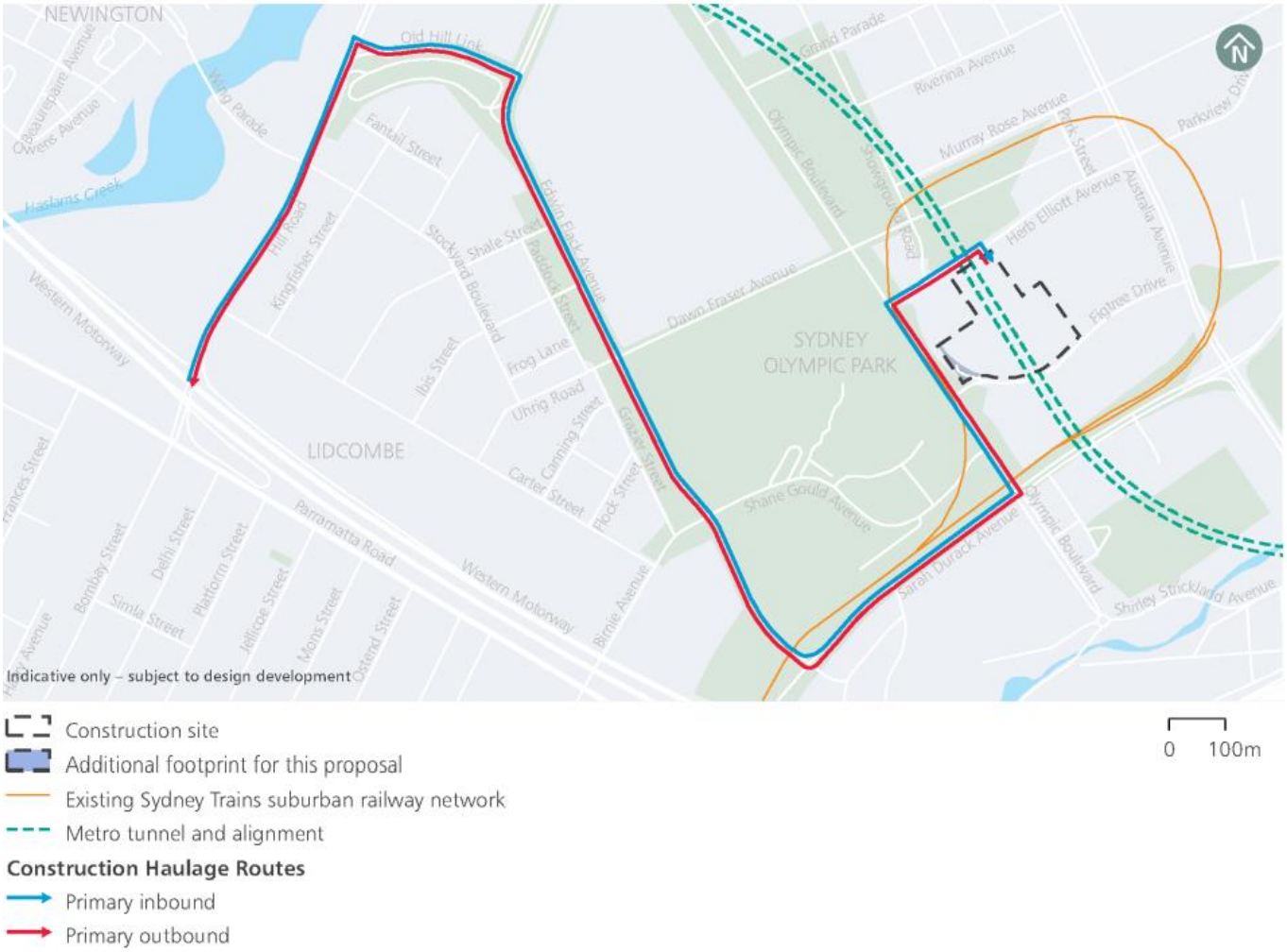
Source: Sydney Metro West Environmental Impact Statement, Chapter 8 Parramatta Metro Station

Figure 7.1 Sydney Metro West Parramatta CBD proposed extent of works and truck haulage routes

7.1.2.2 Sydney Olympic Park

Works associated with Sydney Metro West at Sydney Olympic Park are primarily constrained to areas south of Herb Elliot Drive. There is little overlap between the construction footprints of Sydney Metro West and the project in this area. The primary haulage routes for Sydney Metro West are anticipated to be via Sarah Durack Avenue and Olympic Boulevard to the south as indicated in Figure 7.2. 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 Parramatta Light Rail Stage 2. However, the proposed extension of Murray Rose Avenue to connect to Olympic Boulevard would increase the capacity of the network for east-west movements, thereby offsetting the loss of capacity at Dawn Fraser Avenue.



Source: Sydney Metro West Environmental Impact Statement, Chapter 9 Sydney Olympic Park

Figure 7.2 Sydney Metro West Sydney Olympic Park proposed extent of works and truck haulage routes

7.1.3 Other developments and road projects

There are a range of other land use developments and road projects that may have some level of interaction with the project during the construction period. Known developments and the potential interaction with the project are summarised in Table 7.1.

Table 7.1 Other development projects and potential interaction with Parramatta Light Rail Stage 2

Known development project	Location in relation to Stage 2	Potential interactions
Parramatta Private hospital and hotel	Approximately 200 metres south of Macquarie Street, Parramatta CBD	Construction traffic may require use of Macquarie Street during works.
Parramatta Sydney Metro West – Over Station Development	Adjacent to Macquarie Street work zone, Parramatta CBD	Development is related to proposed Parramatta Sydney Metro West Station works. Refer section 7.1.2.
Draft Camellia-Rosehill Precinct (Place Strategy)	Along Grand Avenue and proposed Sandown Boulevard stop	Medium-term works (5-10 years) associated with the strategy would involve initial road network enhancements in the precinct.
Viva Energy Clyde Western Area Remediation Project	Northern boundary of site directly interacts with project corridor along Grand Avenue.	Construction traffic associated with site remediation would likely utilise Grand Avenue for access.
Camellia Waste Facility	37 Grand Avenue, Camellia	Construction traffic associated with the project would likely utilise Grand Avenue for access.
Melrose Park North Planning Proposal	Southern boundary of the site is located along the project site on Hope Street	The project would interact with Parramatta Light Rail Stage 2 along Hope Street, Hughes Avenue and Wharf Road with primary access via these roads.
Holdmark Planning Proposal (Melrose Park Southern Precinct)	Includes sites on Wharf Road, Waratah Street and Hughes Avenue	The project would interact with Parramatta Light Rail Stage 2 along Hope Street, Hughes Avenue and Wharf Road with primary access via these roads.
‘Sanctuary’ Wentworth Point	Light rail corridor runs around ‘Sanctuary’ Wentworth Point site but does not directly interact	Construction traffic associated with the project would likely utilise Hill Road for access.
Sydney Olympic Park new high school	Located east of the project site with frontage along Burroway Road	Construction traffic associated with the project would likely utilise Hill Road for access.
Wentworth Point removal of existing buildings and new residential flat building	Block D, 37-39 Hill Road, east of the project site along Hill Road	Construction traffic associated with the project would likely utilise Hill Road for access.
URBN SURF Sydney	Sydney Olympic Park Pod B5 Car park, Hill Road	Refer to section 7.1.3.1 below.
Mixed Use Development – Sites 2A and 2B Sydney Olympic Park	Along the eastern boundary of the project site along Australia Avenue	Construction traffic associated with the project would utilise Australia Avenue for access.
Carter Street Precinct (Phase 3 and 4)	Along Uhrig Road where it connects to Dawn Fraser Avenue	Construction traffic associated with the project would utilise Uhrig Road and/or Carter Street for access.
‘Vivacity’ (5 Uhrig Rd, Lidcombe)	Adjacent to the northern boundary of the project site along Uhrig Road	Construction traffic associated with the project would utilise Uhrig Road and/or Carter Street for access.

The full extent of additional construction traffic to be generated by other projects (including those listed in Table 7.1) is unknown at this stage. The proposed construction methodology for the Parramatta Light Rail Stage 2 project maintains road network accessibility by ensuring that key transport corridors are maintained with two-way traffic for the duration of the works, and significant closures (such as full intersections or closure of major road corridors) are generally limited to night works.

While the access routes proposed for each area of the project have been designed to access the construction sites in the most direct way from the arterial road and motorway network, trucks to multiple precincts would be likely to be travelling on the same routes, resulting in a compounding effect on the network operations.

Most truck activity during the project's construction would take place outside the peak periods. While the identified construction routes are only indicative at this stage, analysis of those locations where construction routes are combined between multiple areas indicates that even the peak construction activity truck volumes associated with the project would represent only a small proportional increase in the total traffic volumes at those locations and on the wider road network, which can be readily be accommodated.

It is therefore considered that, having regard to the construction traffic management and road closure strategy, and the generally low proportional traffic generated by construction of the project, the works would not be incompatible with other projects under construction in the area.

Notwithstanding, where concurrent projects are known, site-specific Construction Traffic Management Plans should have consideration for maintaining access and managing impacts associated with the project in combination with other projects.

7.1.3.1 URBNSURF Sydney

Construction of the URBNSURF commercial surf park commenced in December 2021. It is located on the eastern corner of the intersection of Holker Street, Hill Road and Holker Busway and occupies land that was formerly dedicated to parking for Sydney Olympic Park. Construction site access for the surf park is via the loop road that runs around Sydney Olympic Park car park and Holker Busway.

Site-specific traffic management associated with the Parramatta Light Rail Stage 2 project would need to ensure construction site access remains available to the loop road for light and heavy vehicles, noting the expected completion date for the development in early 2023.

Once operational, primary access for URBNSURF Sydney guests would also be via the Sydney Olympic Park loop road. Access to the loop road is available both east and west of the Holker Street / Hill Road intersection. It is noted that the Hill Street scope of work for the project does not extend west of Holker Street and therefore access would be maintained via the western end of the loop road.

The URBNSURF development would include a service vehicle access adjacent to the Holker Street stop. Access may be disrupted at times during construction. Any closure of this access point would be undertaken in consultation with URBN SURF.

7.2 Operation

7.2.1 Parramatta Light Rail Stage 1

The project involves operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct adjacent to Sydney Olympic Park. The new route would share infrastructure constructed as part of the Parramatta Light Rail Stage 1 project between Parramatta Square and Camellia. The frequency and volume of light rail movements along the shared segment of the corridor would approximately double as a result of Parramatta Light Rail Stage 2 as both Parramatta Light Rail Stage 1 and Stage 2 operate as a 'turn up and go' services, resulting in an approximately three-minute service frequency over this section of alignment.

In order to understand the impacts of increased light rail frequency along the section of alignment between Parramatta CBD and Camellia shared by Stage 1 and Stage 2 services, the following intersections have been modelled:

– Macquarie Street and Church Street
– Macquarie Street and Smith Street
– Macquarie Street and Charles Street
– Macquarie Street and Harris Street
– George Street, Harris Street and MacArthur Street
– George Street, Purchase Street and Noller Parade
– George Street and Alfred Street
– Alfred Street, River Road West and Tramway Avenue.

The traffic model outputs are presented in Table 7.2 for the morning and afternoon commuter peak periods (8am to 9am and 5pm to 6pm respectively) under existing conditions (2019), and in 2031 with Parramatta Light Rail Stage 1 only and with both Parramatta Light Rail Stage 1 and 2 in operation. The results are also shown in Figure 7.3.

Table 7.2 Intersection performance – Parramatta CBD (cumulative)

Intersection	Intersection control		Level of service (average delay in seconds)					
	Without project	With project	2019		2031 without project (PLR1 only)		2031 with project (PLR1 + PLR2)	
			AM	PM	AM	PM	AM	PM
Macquarie Street / Church Street			B (27)	B (26)	B (27)	B (24)	B (22)	B (22)
Macquarie Street / Smith Street			D (47)	D (52)	C (33)	C (35)	B (27)	C (38)
Macquarie Street / Charles Street			B (21)	B (16)	C (31)	B (28)	B (28)	B (26)
Macquarie Street / Harris Street			B (18)	A (9)	B (21)	B (23)	C (40)	C (30)
George Street / Harris Street / MacArthur Street			B (17)	C (31)	B (23)	C (34)	C (21)	C (35)
George Street / Purchase Street / Noller Parade			A (2)	A (3)	A (11)	B (20)	A (10)	B (18)
George Street / Alfred Street			A (2)	A (1)	D (46)	C (42)	E (62)	C (42)
Alfred Street / River Road West / Tramway Avenue			A (2)	A (3)	A (1)	A (2)	A (1)	A (2)

Based on the traffic modelling results, the intersection performance along the Paramatta Light Rail Stage 1 route through the Parramatta CBD, which would experience increased frequency of light rail movements due to the project, is expected to be satisfactory (LoS D and better) with the exception of the following intersections:

– George Street and Alfred Street would operate at LoS E during the morning peak period. This represents an incremental increase in delay from 46 to 62 seconds due to the increased frequency of light rail. It is noted that Alfred Street is a relatively minor road and alternative routes including Arthur Street and Purchase Street are also available. The minor increase in delays at this intersection are not considered to be a significant impact to the traffic network.

Figure 7.3 2031 Intersection Level of Service – cumulative Parramatta Light Rail Stage 1 and Stage 2 alignment operations

7.2.2 Public transport integration

Integration with other public transport services (including trains, ferries and buses – refer section 4.2) provides cumulative benefits by increasing the range of travel options available for journeys within Parramatta and the surrounding area, thereby reducing reliance on private car trips, and the need for parking, on the road network. The operation of the light rail route would duplicate some existing bus services such that some minor route adjustments to existing bus routes would be provided.

7.2.3 Walking and cycling

The project also provides a range of upgrades to walking and cycling routes, and new infrastructure, to encourage mobility and patronage and provide enhanced connections between transport modes, including bus routes which complement the light rail corridor.

7.2.4 Other developments

There are a number of new and proposed residential and multi-use developments along the corridor, most notably within Wentworth Point. The project would provide a relatively direct, alternative route for transport from these developments to the Parramatta CBD and Sydney Olympic Park and connections to other regional public transport services.

7.2.5 Special events

The cumulative impacts of Parramatta Light Rail Stage 2 operating in conjunction with large and major events at Sydney Olympic Park would be managed strategically to ensure that separation between light rail operations and large volumes of pedestrians is provided, and that additional service frequency can be provided to accommodate traffic associated with special events. The following measures would complement the efficient and safe movement of large volumes of people across the light rail corridor:

– temporary termination of light rail services at the Jacaranda Square stop (outside Olympic Park Station) rather than the Carter Street stop
– special event traffic management to control pedestrian access across the light rail corridor
– additional queuing space provided at light rail stops under special event conditions.

It is noted that the introduction of light rail has the potential to reduce the demand for Special Event bus routes to service the Sydney Olympic Park during these events by improving transport options for customers.

8. Recommended mitigation measures

8.1 Approach

The project would introduce a new mode of transport within the existing road corridor, resulting in unavoidable changes to the configuration of the existing road network along the project site. The project would also introduce changes to the local road network through the introduction of 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 within the project site.

Careful and detailed planning would be required during further design stages and prior to construction to ensure the capacity and access to the arterial road network is maintained. This would require close co-ordination with a range of stakeholders, including various divisions of Transport for NSW, Customer Journey Planning/ Customer Journey Management, City of Parramatta and City of Ryde councils, emergency services, and any infrastructure contractors working in the vicinity of the project e.g. Parramatta Light Rail Stage 1 and Sydney Metro West and developers at Wentworth Point and Sydney Olympic Park particularly. Road safety audits would be undertaken at key stages in the design to identify potential road safety issues and identify opportunities for improvements in safety for all road users.

A Traffic and Access Management Plan would be prepared and implemented as a key part of the Construction Environmental Management Plan (CEMP) and approach to avoiding identified impacts. The plan would detail processes, relevant requirements and responsibilities to minimise potential traffic, transport and access impacts during construction, including specific measures during special event and for access by emergency vehicles. Other important documents included within the CEMP which will set the performance objectives and mitigation measures implemented by the project include the Parking Management Strategy and Maritime Works and Navigation Management Plan (see section 8.3).

Access to properties would be maintained during the construction period. 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.

All consultation will be undertaken in accordance with the project consultation plan.

8.2 Design and pre-construction

The mitigation measures that would be implemented during design development of the project include, but are not necessarily limited to, the following:

– Impacts on existing infrastructure, assets and access
  - Design development and construction planning would aim to avoid or minimise impacts on the surrounding road and transport network, recreational assets and property accesses as far as reasonably practicable.
  - Input would be sought from relevant stakeholders (including City of Parramatta and City of Ryde 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 would include confirming ongoing operation and maintenance arrangements.
– Maintaining permanent access to properties
  - Where the project affects access to and from a public road, input would 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 would 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 would 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).

– Road user safety at changes to the road network
  - Road safety audits would be undertaken where changes to the road network are required, in accordance with relevant Austroads guidelines, to ensure the safety of all road users is considered during design development and construction planning.

– Impacts on on-street parking
  - Opportunities to reduce the loss of on-street parking, including the amount of spaces reduced and the time associated with this reduction, would be reviewed during design development and construction planning.
  - A Parking Management Strategy would be prepared to provide an overarching framework for parking management during construction and operation. The strategy would include 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, including provision of designated parking areas within the project site, encouraging use of public transport, and implementing shuttle bus arrangements.

– Impacts on river access and navigation
  - Refinement of the pier design and alignment as well as signage would be considered to minimise the implications of impacts to vessel line of sight around Archer Point. Should there be implications to line of sight that cannot be adequately managed through design and signage, operational constraints may be required such as a reduced speed in vicinity of the bridge. Consideration of line-of-sight to vessels passing Archer Point and vessels accessing the waterway from the Ermington Boat Ramp would also be further considered as part of design progression.
  - Consider opportunities to optimise the required navigable channel width following confirmation of the likely size of future ferries e.g. the River Class ferries are smaller than the RiverCat ferries.
  - A suitable warning system, such as flashing lights activated by abnormal tides above the Highest Astronomical Tide, would be considered to warn vessels approaching the proposed bridges that the vertical clearance has been reduced.
  - Red and green lights would be installed to indicate which side river users are to use when passing under the bridges. Alternatively, install a red diamond similar to that used on the Harbour Bridge, to indicate the centre of the channel.
  - Further consultation with key stakeholders such as the operator of the F3 ferry service, Transport for NSW marine operations and boaters would be undertaken to confirm the key design requirements of the proposed bridge designs. All consultation will be undertaken in accordance with the project consultation plan.
  - Investigate opportunities to minimise impacts to recreational use of the Parramatta River 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.

8.3 Construction

The mitigation measures that would be implemented during construction for the project include, but are not necessarily limited to, the following:

– Traffic and Access Management Plan
  - 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. Refer to section 8.3.1 and section 8.3.2 for key considerations in the Traffic and Access Management Plan and a summary of the approvals required.
– Impacts on existing infrastructure, assets and access
  - A road condition report will be prepared, in consultation with relevant councils and road owners, identifying existing conditions of local roads that will be used by heavy vehicles associated with the project and mechanisms to repair damage to the road network (beyond normal wear and tear) caused by these movements.
– Maritime construction activities
  - A detailed navigational risk assessment (or similar) will be prepared by the bridge contractor and implemented prior to bridge construction commencing. The risk assessment will be circulated to key stakeholders for comment.
  - A construction zone around the temporary working platforms and bridge pier construction sites will be established. The zone will establish a buffer around the working areas to avoid collision by vessels. Delineation of the zone will be by markers or buoys, in accordance with the requirements of NSW Maritime.
  - A Maritime Works and Navigation Management Plan will be prepared prior to construction and implemented. The plan will detail processes and responsibilities to manage maritime 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. Examples of measures include, but are not limited to:
    – Construction maritime traffic will be scheduled to avoid times and locations of high maritime traffic where feasible and reasonable.
    – Construction vessel crews will be appropriately trained.
    – Establish a Maritime Works Co-ordinator to manage and co-ordinate the works associated with both bridges and ensure a centralised point of contact for stakeholders and all related marine issues. The Maritime Works Co-ordinator will also be responsible for ensuring compliance with all required legislation and permits.
    – Request extra patrols by Transport for NSW maritime operations during periods of expected high recreational boating activity.
    – Rig indicator lines with lights and flags will mark the area of reduced clearance for construction vessels.
    – Undertake a review of all approvals including secondary approvals required to enable construction of the proposed bridges.
– Impacts on ferry services and other recreational activities:
  - All proposed navigation channel closures will occur on a pre-planned basis and co-ordinated with NSW Maritime, the Maritime Works Co-ordinator and other key stakeholders. Ongoing and regular coordination will be required with affected stakeholders throughout the construction period to ensure safe navigation and minimise disruption to transport customers and commercial and recreational operators.
  - Investigate opportunities to minimise impacts to recreational use of the Parramatta River 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.
  - Conduct an education campaign with recreational boating clubs in downstream areas of the harbour and boat ramp users of the waterway restrictions and general safety around the proposed works areas. All

consultation will be undertaken in accordance with the project's communication and engagement strategy.

– Potential for transport, traffic and access impacts during construction:
  - Site-specific and detailed construction traffic management plan(s) will be prepared prior to construction and implemented as part of the overarching Traffic and Access Management Plan and the CEMP. The plans will detail all legislative requirements, processes and responsibilities to minimise traffic and access delays and disruptions and identify and respond to changes to road safety during construction.
  - This will identify worksite boundaries, site access arrangements, and traffic, pedestrian and cyclist controls around the worksite. This will also include specific measures addressing special events at Rosehill Gardens Racecourse and at Sydney Olympic Park during the course of construction. Such plans for special events should include adequate contingency to cater for potential unexpected events.
  - The project communications and engagement strategy will include a mechanism to inform the community in advance of the dates and durations of specific phases within the project, including information about specific lane, road and river closures and the times of day and night when works will be undertaken.
  - A mechanism will be provided for the community to report incidents and delays, such as a project phone number. The contact mechanism will be communicated in accordance with the projects' communications strategy.
  - Where reasonable and feasible, work areas, activities and construction access arrangements will be modified to address any traffic flow issues identified by key stakeholders, including the Sydney Coordination Office, City of Ryde and City of Parramatta Councils, and the Transport for NSW Customer Journey Planning.
– Construction traffic
  - Transport for NSW will undertake consultation with City of Parramatta and City of Ryde Councils, Sydney Olympic Park Authority, Greater Sydney Operations, emergency services, bus operators and other divisions within Transport for NSW to minimise transport and traffic impacts.
  - Construction road traffic will be managed to minimise impacts of movements during peak periods where feasible and reasonable.
– Worker parking management
  - Management of construction worker parking will be a key outcome of the Parking Management Strategy (refer section 8.3.1.7) developed for the project and implemented by the construction contractor(s). The aim is to minimise worker parking in public streets. Measures to be implemented during construction will include provision of designated parking areas within the project site, encourage use of public transport and implement shuttle bus arrangements.
– Pedestrians and cyclists
  - Direct impacts to existing pedestrian and cycling facilities will be minimised where reasonable and feasible. Any detours and adjustments will be designed with consideration of user safety and convenience.
  - Any temporary paths or detours will be implemented prior to existing permanent infrastructure being decommissioned and comply with relevant accessibility requirements and industry standards/codes.
  - Activities requiring temporary partial road closures will be undertaken outside of peak periods and/or during night time to minimise the impact of these activities on the road network where feasible and reasonable.
– Emergency vehicle access
  - Emergency vehicle access routes that may be impacted by the project will be identified, and appropriate control measures will be implemented, in consultation with the relevant emergency services providers.
– Changes to bus stops
  - Any adjustments to existing bus stops will be determined in consultation with relevant stakeholders including bus operators and other divisions of Transport for NSW and advanced notification will be provided to affected customers. Relocations will be as close to their existing position where feasible and reasonable.

– Feedback and improvement
    - Ongoing consultation and feedback from key stakeholders including divisions of Transport for NSW and Councils will be co-ordinated by Transport for NSW to facilitate the efficient completion of the works and ensure awareness of proposed road network or intersection changes and the efficacy of mitigation proposals.
– Cumulative
    - The cumulative impacts of major projects will be co-ordinated including the identification of efficient access and re-routing options during periods of road and lane closures. Particular attention will be paid to periods where special events are planned in Parramatta, Camellia and Sydney Olympic Park.

8.3.1 Construction traffic and access management planning

The following construction traffic management considerations will be included in construction traffic and access management planning for the project.

8.3.1.1 Worksites

Site specific Traffic Management and Access Plans (TMAPs) will be developed identifying the worksite boundaries, site access arrangements, traffic, pedestrian and cyclist controls surrounding the worksite.

8.3.1.2 Intersection work

Temporary and permanent works include the reconstruction and modification of existing signalised intersections and introduction of new signalised intersections. All changes to signalised intersections require approval from Transport for NSW through the development of traffic control signal (TCS) plans in accordance with *Traffic Signal Design* (Roads and Maritime Services, 2008) and *Specification TS101 Traffic Signals – New installation and Reconstruction* (Transport for NSW, 2021). Approval from the Transport for NSW Customer Journey Planning will be required to determine appropriate times for works.

The construction program should consider the lead times required for approvals for works on signalised intersections. Furthermore, the contractor needs to work in close collaboration with Transport for NSW in the TCS design process to streamline and facilitate timely approvals of proposed changes. The contractor will be responsible for the preparation of TCS plans and obtaining approvals. Traffic signal contractors who are accredited by Transport for NSW are required to undertake the works.

Changes to existing signalised intersections are likely to include:

– phase modifications
– temporary phasing to facilitate construction staging
– kerb adjustments
– geometry changes
– turn bans
– detector relocations.

Intersection works will be planned and staged to minimise disruption to the network. The following principles are recommended for any intersection works that are required:

– Partial or full closures will generally not be carried out during peak periods, limiting work to weekends or nights, with exceptions subject to detailed investigations and site specific construction management planning.
– Closures will be staged in consultation with Transport for NSW and will aim to minimise the impact on the road network.
– Coordination of major closures will be programmed during periods of reduced traffic such as during school holidays and having regard to increased traffic demands at the start and end of school holidays, long weekends and other special event periods.
– All intersection works will require approval from relevant divisions within Transport for NSW.

– The community and stakeholders will be informed of intersection works in advance of closures and appropriate alternative routes will be identified and advertised prior to closures.
– Pedestrian crossings will be managed appropriately maintaining safe and sufficient crossing opportunities at all stages of the works.

8.3.1.3 Midblock work

Midblock work will be staged to maintain access for local land uses, such as residential, employment, educational and retail.

Traffic lanes next to construction worksites will be managed in accordance with the Transport for NSW *Traffic Control at Worksites Manual* (version 6.1, February 2021) and Roads and Maritime Services G10 Traffic Management. Traffic guidance schemes (TGSs) will be prepared detailing appropriate set out locations for safety barriers and delineation in accordance with *AS1742.3 Manual of Uniform Traffic Control Devices Part 3: Traffic control for works on roads* and *Traffic Control at Worksites Manual* (version 6.1, Transport for NSW February 2021) and supplements. The TGS will be included as support documentation for the site specific TMPs.

8.3.1.4 Special events

The construction contractor(s) will be responsible for considering known special events in the construction program and making appropriate arrangements to manage the impacts of construction (including traffic management and contingency arrangements) during these events. The traffic management requirements of special events may require adjustments to times of construction and routes used by heavy vehicles, as well as varying approved road occupancy license conditions for construction. Pedestrian management.

Construction traffic and access management planning will include comprehensive pedestrian management plans to manage availability of footpaths, pedestrian detour routes, safe crossing opportunities and access to public transport across the corridor. Pedestrian management planning will be required particularly to accommodate special event planning within Sydney Olympic Park.

8.3.1.5 Interagency and community engagement

It is critical that stakeholders affected by construction activities are well informed at all stages of construction. Interagency and community engagement in the construction planning process assists in the development of appropriate and well considered TMPs, TGSs and Road Occupancy Licenses (ROLs). Inclusion of approval authorities in development of key documents and getting in principle approval prior to formal approval may assist in streamlining the approval process.

Effective interagency and community engagement contributes to:

– improving and maintaining communication between the wider project program and the project team and all other stakeholders
– planning and reviewing traffic management arrangements for construction activities and approvals
– mitigating overall impact of the project on the surrounding transport network
– coordinating work and schemes in the area
– developing measures that provide the best solutions for construction activities and maintain amenity for all road users and community
– facilitating achieving the project program.

The appropriate stakeholder liaison groups should be established to ensure effective communication and ongoing interaction for the project duration. This will facilitate the management of stakeholder and community expectation during the construction phase and address the requirements of key stakeholders in the preparation of site specific TMPs and approvals processes.

The groups to consider in the interagency engagement process include:

– Transport for NSW, including NSW Maritime
– Transport for NSW Greater Sydney Customer Journey management
– Transport for NSW Customer Journey Planning

– City of Parramatta and City of Ryde Councils
– Sydney Olympic Park Authority
– NSW Police
– NSW Ambulance
– Fire and Rescue NSW
– State Emergency Services
– Sydney Ferries
– State Transit (Sydney Buses) and Transdev who are the relevant bus operators in the study area
– Contractor.

The approval authorities for the project include:

– Transport for NSW, including NSW Maritime
– Customer Journey Management
– Transport for NSW Customer Journey Planning
– Sydney Olympic Park Authority
– relevant road authority.

Other stakeholders for may include, but are not limited to:

– NSW Police
– State Emergency Service
– City of Parramatta and City of Ryde Councils
– Sydney Trains
– Sydney Ferries
– Infrastructure NSW.

8.3.1.6 Road safety audits

Road safety auditing is a formalised procedure, which can be applied to all phases of a road project or to an existing road. The auditor and audit team must be independent of the designer, so that the design is viewed without prejudice. The purpose of the audit is to identify any road safety concerns from the perspective of road users, including pedestrians and cyclists.

The objectives of a road safety audit are to:

– review the operational site, design and background information and form conclusions about the safety performance and crash potential for the road
– evaluate the operational site in terms of interaction with its surrounds and nearby roads and to visualise potential impediments and conflicts for road users
– identify and report on aspects of the design that may result in unnecessary or unreasonable hazards for all road users.

Road safety audits are structured around standard checklists provided in the Austroads Part 6: *Road Safety Audit* and Roads and Maritime Service's *Guide to Road Safety Audit Practices* 2011.

Road safety audits will be undertaken at the following stages:

– Design development: This audit stage involves the review of the design drawings, reports and supporting information and an inspection of the site, its approaches and connections. Standard issues such as sight distance, speed zones, safety barriers, alignment, delineation pedestrian facilities and signage (amongst others) are assessed with respect to safety.
– Temporary work arrangements: The contractor is required to undertake regular inspections of the temporary traffic arrangements. Part of this maintenance and monitoring process involves Road Safety Audits to ensure temporary controls and arrangements are safely installed and are appropriate for maintaining safety for all

road users and construction personnel. This Road Safety Audit involves carrying out a site inspection during both day and night time periods.

– Pre-opening: Prior to the opening of the completed work a Road Safety Audit is carried out during both day and night time periods to ensure that the work has been constructed to consider all previous Road Safety Audit findings, addresses site constraints appropriately and provides safe facilities for all road users.

8.3.1.7 Parking Management Strategy

A detailed Parking Management Strategy will be prepared prior to commencement of construction. The Parking Management Strategy will document:

– existing parking supply and parking occupancy in the areas affected by the works including parking surveys
– proposed arrangements during various stages of construction including temporary and permanent removal of on- and off-street parking
– anticipated impacts of temporary and permanent removal of parking including outcomes of consultation with affected stakeholders
– measures to manage reduction in parking including provision of alternative parking arrangements for accessible car parking, loading zones, bus zones, taxi parking, motorcycle parking, bicycle parking and short and long stay car parking where applicable
– consideration of worker parking and measures to ensure worker parking does not significantly compound impacts due to removal of existing parking
– processes for monitoring the residual parking impacts and contingencies in the event that measures implemented are not adequate
– reinstatement of parking following completion of construction.

The Parking Management Strategy will also document permanent changes to parking arrangements including measures to minimise the total loss of parking across the project site, reinstatement or relocation of high-priority kerbside uses such as accessible car parking and loading zones, and any permanent changes to parking restrictions. The Parking Management Strategy will be prepared in consultation with local Council and other key stakeholders as required.

8.3.1.8 Maritime Works and Navigation Management Plan

A Maritime Works and Navigation Management Plan will be prepared. The plan will include:

– maritime works and maritime navigation management objectives
– specific requirements regarding approvals for works within and over the Parramatta River
– selection of a construction method to minimise impacts to navigation
– key stakeholders to be consulted and notification procedures
– establishment of any exclusion zones
– any necessary restrictions on speed limits
– changes to any navigational channels or markers
– impacts on maritime recreational assets
– incorporation of a Maritime Works Controller to supervise and be responsible for all works within and over the Parramatta River and consultation with stakeholders.

8.3.2 Approvals

8.3.2.1 Traffic management plan approvals process

Site specific TMPs are required in accordance with the Transport for NSW *Traffic Control at Worksites Technical Manual* (version 6.1, February 2022) detailing TGSs, ROLs and, temporary TCS plans. The TMPs will be submitted to the relevant road authority for approval.

Individual TMPs will be prepared for each individual construction site in consultation with Transport for NSW, Transport for NSW Customer Journey Planning (CJP), Customer Journey Management (CJM), City of Parramatta and City of Ryde Councils, Sydney Olympic Park Authority and other affected agencies, prior to the commencement of substantial construction on each site. The TMPs will be forwarded to Transport for NSW/ CJP for review and approval. Where City of Parramatta or City of Ryde Councils are the Roads Authority, approval of the TMP shall be sought from Councils, in consultation with Transport for NSW/CJP.

8.3.2.2 Road occupancy license approvals process

A Road Occupancy Licence (ROL) must be obtained from Greater Sydney Operations (GSO) for any activity likely to impact on the operational efficiency of the road network The ROL allows the applicant to use a specified road space at approved times, provided certain conditions are met. Proponents must allow a minimum of 10 working days for processing from date of receipt. TGSs are to accompany each ROL application.

The contractor is responsible for ROL applications, including supporting TGSs and speed zone authorisations. It is recommended that Transport for NSW oversees and coordinates all submissions for ROLs with consideration of cumulative construction impact within the construction corridor. The cumulative impact of multiple ROLs operating concurrently needs to be considered and maintaining appropriate travel times on the network during all stages of construction is required.

The relevant road authority will assess each application on this basis prior to granting approval.

In situations where the travel time or network are substantially impacted by ROLs communication protocols and strategies will be established in accordance with the project community consultation procedures, to inform road users of extended delays.

The contractor is responsible for ensuring all work is undertaken in accordance with the approved ROL safely, in compliance with legislation, regulation, Australian Standards and Transport for NSW' specifications and procedures. All changes to traffic arrangements will be communicated to construction personnel prior to implementation in the form of a site toolbox talk.

8.3.2.3 Speed zone authorisation

Changes to existing posted speed limits may be required to facilitate the construction of the project, such as to control traffic through work sites or mitigate the risk associated with the proximity of construction personnel to traffic in accordance with the requirements from Transport for NSW. Application for proposed modified speed zones (short term, temporary, long term or permanent) will be submitted to the relevant road authority via Transport for NSW. This application is submitted online on the Transport for NSW website and is sent to the GSO's Planned Incident Unit. No changes to speed limits will be implemented until authorisation is granted. Applications will be supported by site specific TMPs and TGSs.

8.3.2.4 Special events

Traffic management requirements of special events may result in changes to haulage routes and delivery for construction activities. This may result in ROLs requiring modification. The contractor will be required to incorporate all known special events into the construction program and detail measures required in the site specific TMPs in consultation with key stakeholders. ROLs are likely to be prohibited or restricted during special events.

All special events approvals will be assessed by Transport for NSW, Customer Journey Planning and the Major Events section of the Greater Sydney Operations in consultation with the Department of Premier and Cabinet. Event organisers are required to consider the event's interaction with the project corridor and construction activities and coordinate traffic management measures accordingly to address cumulative impact of the road network and, in particular, travel times.

All potential extended delays will need to be communicated to the community and stakeholders prior to the proposed event.

8.4 Operation

The mitigation measures that will be implemented for the operation of the project include, but are not necessarily limited to, the following:

– Intersection performance
  - A review of operational network performance will be undertaken 12 months and three years from the opening of the project to confirm the operational impacts of the project on surrounding arterial roads and major intersections. The assessment will be based on updated traffic data at the time and the methodology used will be comparable with that used in this document.
  - Where required, additional feasible and reasonable mitigation measures will be identified in consultation with the Department of Planning and Environment and the relevant council to manage significant traffic performance impacts identified during the review of operational network performance.
  - Local area parking restrictions will also be investigated as a possible measure to improve the performance of intersections subject to agreement with City of Ryde and City of Parramatta councils.

– New road infrastructure
  - A new road connection from Murray Rose Avenue to Olympic Boulevard will be provided to serve as a route replacement for Dawn Fraser Avenue following closure to general traffic.

– Pedestrians and cyclists
  - Existing shared paths to be retained wherever possible, including the majority of the Louise Sauvage Pathway over the existing Holker Busway.
  - Provision of uni-directional, kerbside cycle lanes to be preferred where space allows.
  - New signalised intersections will be provided at multiple locations along the light rail alignment including along South Street, Boronia Street, Hope Street and Hill Road to allow safe pedestrian crossing opportunities including for access to and from light rail stops.
  - Changes to light rail operation during special events to provide separation and safety for pedestrians (refer below).

– Parking
  - Where high-priority kerbside activity such as accessible (disabled) car parking and loading zones are permanently lost, these will be reinstated at a location as close as possible to the existing location, subject to an assessment of demand.
  - Implement parking restrictions, subject to consultation with councils and other local bodies, on adjacent residential streets, to mitigate impact of redirected parking demand on residential amenity, and to ensure adequate supply of short-stay parking for commercial and other uses.
  - Provide bicycle parking spaces integrated at light rail stops to facilitate access and reduce Park-and-Ride demand on adjacent streets.
  - 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.

– Property access
  - Where property access is impacted by the proposed alignment, provide alternative access arrangement (e.g. 37 Grand Avenue, Nowill Street stop).

– Special events
  - As necessary, develop and implement special event transport management plans for special events in Sydney Olympic Park, Rosehill Gardens Racecourse and the Parramatta CBD in conjunction with relevant stakeholders, including the operators of Parramatta Light Rail Stage 1 and 2.

9. Conclusion

This Transport and Traffic Assessment report has been prepared as part of the EIS for the Parramatta Light Rail Stage 2 project. The objectives of this report were to:

– address the relevant SEARs
– describe the existing environment with respect to transport and traffic and the infrastructure and changes to be implemented by the project
– assess the impacts of constructing and operating the project on transport and traffic
– recommend measures to mitigate and manage the impacts identified.

The impacts of the project during construction as detailed in section 5 of this document can be summarised broadly as follows:

– The anticipated increases in daily and peak traffic volumes on key local site access roads is relatively low. The largest increases would be experienced on Victoria Road, which is a key collector road, and Grand Avenue, as the only access road available.
– Access along key transport corridors would be maintained in both directions throughout the duration of the project. Full road closures are typically limited to minor road junctions and/or night works on major roads.
– The total impact on parking during construction is expected to be:
    - permanent removal of around 688 parking spaces and temporary removal of around 578 on- and off-street parking spaces during construction across the project
    - parking for around 378-500 construction worker vehicles is required.
– The impacts on parking would be mitigated through introduction of temporary parking controls, parking restrictions on residential streets and provision of centralised construction worker parking locations including approximately 200 parking spaces provided at Sydney Olympic Park P5 car park.
– Existing bus services and stop frequency would be maintained during construction with provision of temporary bus stops (where bus stops are impacted by partial road closures) and minor route diversions.
– Access along shared paths and access to the Rydalmere ferry terminal would be maintained as far as practicable throughout the duration of the works.
– Owing to closures of the Parramatta River waterway upstream of the proposed bridge crossings, ferry services would need to terminate at Sydney Olympic Park Wharf and board alternate transport services provided by Transport for NSW in conjunction with the operator of the F3 ferry service. Navigation upstream of the bridge crossing sites for commercial operators and the owners of private jetty facilities would need to be arranged in advance with the bridge contractor.
– Investigate opportunities to minimise impacts to recreational use of the Parramatta River 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.

The impacts of the project during operation as detailed in section 6 of this document can be summarised under the following categories:

– **Network integration**
    - The project provides direct integration with Parramatta Light Rail Stage 1, with several interchange stops located within the Parramatta CBD.
    - The project would integrate with other transport modes including Sydney Metro West, Sydney Ferries and Sydney Trains.
– **Traffic and transport**
    - The project would involve significant changes to road conditions along the alignment, including major amendments to existing intersections, changes to access due to light rail corridor and modification to road space allocation.

- Existing and proposed intersections within the project site, and within the surrounding network generally, operate at a satisfactory level of service under future (2031) conditions with the proposed road network changes with exceptions as summarised below.
- Based on microsimulation modelling, the locations where traffic performance is most impacted are:
  - intersection of George Street and Alfred Street (signals developed as part of Parramatta Light Rail Stage 1)
  - intersection of Victoria Road, Kissing Point Road and William Road (existing signals)
  - intersection of Victoria Road and Wharf Road (existing signals)
  - intersection of Hill Road and Parramatta Road (existing signals)
  - intersection of Australia Avenue and Homebush Bay Drive (existing roundabout)
  - intersection of Hope Street and Waratah Street (new signals)
  - intersection of Waratah Street and Mary Street (new signals)
  - intersection of Hill Road and Holker Street (existing signals)
  - intersection of Park Street and Dawn Fraser Avenue (new signals).

– **Parking**

- The introduction of the project would remove the majority of on-street parking along the alignment. However, the impact of this on residents is expected to be limited, as parking surveys found low utilisation of on-street parking except for at Wentworth Point and Sydney Olympic Park (including Carter Street).
- At Wentworth Point, the project is expected to catalyse greater uptake of public transport, encouraging residents to decrease their reliance on private vehicles.

– **Property access**

- Access to land uses either side of the alignment would be maintained during construction and following completion of the works. This may involve construction of new access points where access is lost, if not able to be resolved through subsequent design stages. Those properties which would have complete loss of access due to the project would be acquired if a mutually agreed solution with the property owner cannot be reached.
- Some properties may experience reduced accessibility due to left in and left out restrictions created by light rail running in the median (including South Street, Rydalmere and Boronia Street, Melrose Park). In these cases, alternate circulation routes are available through the local road network.
- In some cases, properties experiencing reduced access (or loss of access) could be provided with alternative access off adjacent streets.

– **Bus**

- The project would result in bus stop relocations and route diversions within the Rydalmere and Ermington precincts. It is expected that the project would replace some bus trips, and proposed bus network changes would allow for greater integration with the project and other transport modes. These would be undertaken in consultation with bus operators.

– **River access and navigation**

- The proposed height of the bridge between Camellia and Rydalmere would provide for continued operation of all ferry classes except the SuperCats at Mean High Water level (defined as 0.7 metres below HAT) or below.
- Some ferries (e.g. RiverCats and HarbourCats with air draft 7.8 metres) would only be able to pass under the bridge between Camellia and Rydalmere at HAT level with equipment removed or dismantled.
- The proposed bridge between Camellia and Rydalmere would allow navigation of commercial vessels less than 7.0 metres air draft at HAT level (or taller vessels with some equipment removed or lowered). Vessels taller than 8.5 metres would no longer be able to access the river upstream of Camellia except at tide levels below Mean Low Water.

- The proposed height of the bridge between Melrose Park and Wentworth Point is consistent with upstream and downstream structures and would be navigable by all ferry classes and commercial vessels up to 10.0 metres air draft at HAT level or below. There is not expected to be any significant impact on recreational or other vessels.
- The total number of boat trailer parking spaces at Ermington boat ramp would be reduced from 52 spaces to 42 spaces, which is likely to increase the likelihood and magnitude of overflow parking activity in the area. Opportunities for the formalisation of overflow parking facilities would be explored as part of ongoing project development to minimise the potential impacts.

The mitigation measures summarised in section 8 are considered to be proportionate and sufficient to mitigate the likely impacts of the project during operation and construction. Key mitigation measures include:

– **Construction**
  - preparation of detailed, site-specific construction Traffic Management Plans (TMPs) to ensure the impacts of site access, road closures, loss of parking and heavy vehicle transport are managed appropriately based on the specific activities being undertaken at each construction precinct
  - use of appropriate heavy vehicle transport routes, having regard to sensitive uses particularly in residential areas
  - provision of parking for construction workers, and implementation of parking controls and restrictions to manage the loss of parking due to road closures
  - maintain bus services and stop frequency during construction
  - provide detour routes for shared paths impacted by the works
  - maintain access to properties along the alignment.
– **Operation**
  - design refinements, optimisation of signal timing and other measures to reduce the likelihood of delay to light rail movements, and adequate service for all other vehicle movements at key intersections
  - ongoing design refinement to minimise the loss of on-street and off-street parking spaces within the project site and in the surrounding area.

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Appendix A

Parramatta River Bridges Background Report

Parramatta Light Rail Stage 2

Parramatta River Bridges Background Report

Transport for NSW

November 2022

Project name		Parramatta Light Rail Stage 2					
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GHD Pty Ltd | ABN 39 008 488 373

133 Castlereagh Street, Level 15

Sydney, New South Wales 2000, Australia

T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.com

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Glossary and abbreviations

Term / abbreviation	Description
Air draft	The distance from the surface of the water to the highest point on a vessel.
Bathymetry	The measurement of depth of water in oceans, seas, or lakes.
Beam	The widest part of a vessel.
COLREGS	Convention on the International Regulations for Preventing Collisions at Sea 1972.
Draft	Distance from the waterline to the lowest part of the vessel.
EIS	Environmental Impact Statement
Embayment	A recess in a coastline forming a bay.
Estuary	An enclosed or semi-enclosed body of water having an open or intermittently open connection to coastal waters and in which water levels vary in a periodic fashion in response to ocean tides.
Foreshore	The area of shore between low and high tide marks and adjacent land.
Highest Astronomical Tide (HAT)	The Highest Astronomical Tide (HAT) or highest high tide is defined as the highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions. Higher tides can occur under extreme meteorological and oceanographic conditions.
Knot	A unit of speed equal to 1 nautical mile per hour (or 1.8 kilometres per hour).
Mean High Water	The mean of all high waters observed over a sufficiently long period, preferably over the national tidal datum epoch. Refer Figure 2.1.
Mean Low Water	The average of all low waters observed over a sufficiently long period, preferably over the national tidal datum epoch. Refer Figure 2.1.
Navigable waters	A waterway that a vessel can navigate safely.
NSW	New South Wales
Paddle craft	A vessel that you paddle for example, kayaks, canoes and surf skis.
Personal watercraft (PWC)	A vessel with a fully enclosed hull that you drive standing up, lying down, sitting astride or kneeling and uses waterjet propulsion. For example, jet ski or jet-powered surfboard.
Port	The left side of the vessel when you are looking towards the bow and the side on which a red sidelight is displayed.
Powered vessel	A vessel with an engine for example, powerboats, sailing boats using an engine and personal watercraft (PWC).
Project	The construction and operation of Stage 2 of the Parramatta Light Rail network.
Project site	Refers to the area that would be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the location of construction activities, compounds and work sites, and the location of permanent infrastructure.
PTPM	Public Transport Project Model, developed by Transport for NSW and used to forecast travel demand for the project across various future year scenarios.
Rowing vessel	Vessel that you row for example, rowing shells and skiffs, dragon boats, rowing boats, rowing dinghies and small inflatable boats.
Sailing vessel	Any vessel using a sail for power. For example sailing boats without an engine or with an engine (but not using it), off-the-beach sailing boats, sailboards and kiteboards.
Skipper	The person in charge of a recreational vessel, whether driving or not. Often referred to as the master.
Starboard	The right side of the vessel when you are looking towards the bow and the side on which a green sidelight is displayed.

Term / abbreviation	Description
Tidal range	The difference between successive high water and low water levels. Tidal range is maximum during Spring Tides and minimum during Neap Tides.
Tide	The regular rise and fall of the sea level in response to the gravitational attraction of the sun, moon and planets.
Transport for NSW	Transport for NSW is the lead agency of the NSW Transport cluster.
Vertical clearance	The distance between the lowest point of the bridge to the surface of the water underneath using the Highest Astronomical Tide (HAT).
Vessel	Any vessel used as transport on the water. Includes powered vessels, sailing vessels, paddle craft and rowing vessels.
Wind waves	The waves initially formed by the action of wind blowing over the water surface. Wind waves are characterised by a range of heights, periods and wavelengths.

1. Introduction

1.1 Parramatta Light Rail

The NSW Government's Greater Sydney Region Plan *A Metropolis of Three Cities* (Greater Sydney Commission, 2018) outlines a vision for a three-city metropolis. The Central River City covers the four local government areas of the City of Parramatta, Blacktown City, Cumberland City and The Hills Shire. *A Metropolis of Three Cities* highlights Greater Parramatta as the focal point for the Central River City, with employment growth and public transport being of key importance.

The Greater Parramatta and the Olympic Peninsula area (GPOP), which extends from Westmead and Parramatta in the west to Sydney Olympic Park to the east, is fast emerging as the heart of Sydney's Central River City and is set to grow and change significantly over the next 20 years. Forecasts predict that GPOP will accommodate almost 170,000 new residents by 2041. Employment opportunities will also grow, with an additional 100,000 jobs predicted by 2041 (SGS, 2017).

Parramatta Light Rail will deliver an integrated light rail service that supports the population and employment growth as well as the additional development expected throughout the GPOP. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

Parramatta Light Rail will be delivered in stages to keep pace with development:

– Stage 1 will connect Westmead to Carlingford via the Parramatta central business district (CBD) and Camellia. The construction and operation of Parramatta Light Rail Stage 1 was approved by the NSW Minister for Planning in May 2018. Major construction is underway, with the track installation complete and light rail stop construction in progress. Stage 1 is expected to start operating in 2024. Further information on Stage 1 is available at **Parramatta Light Rail**
– Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Figure 1.1 provides an overview of Parramatta Light Rail showing both stages.

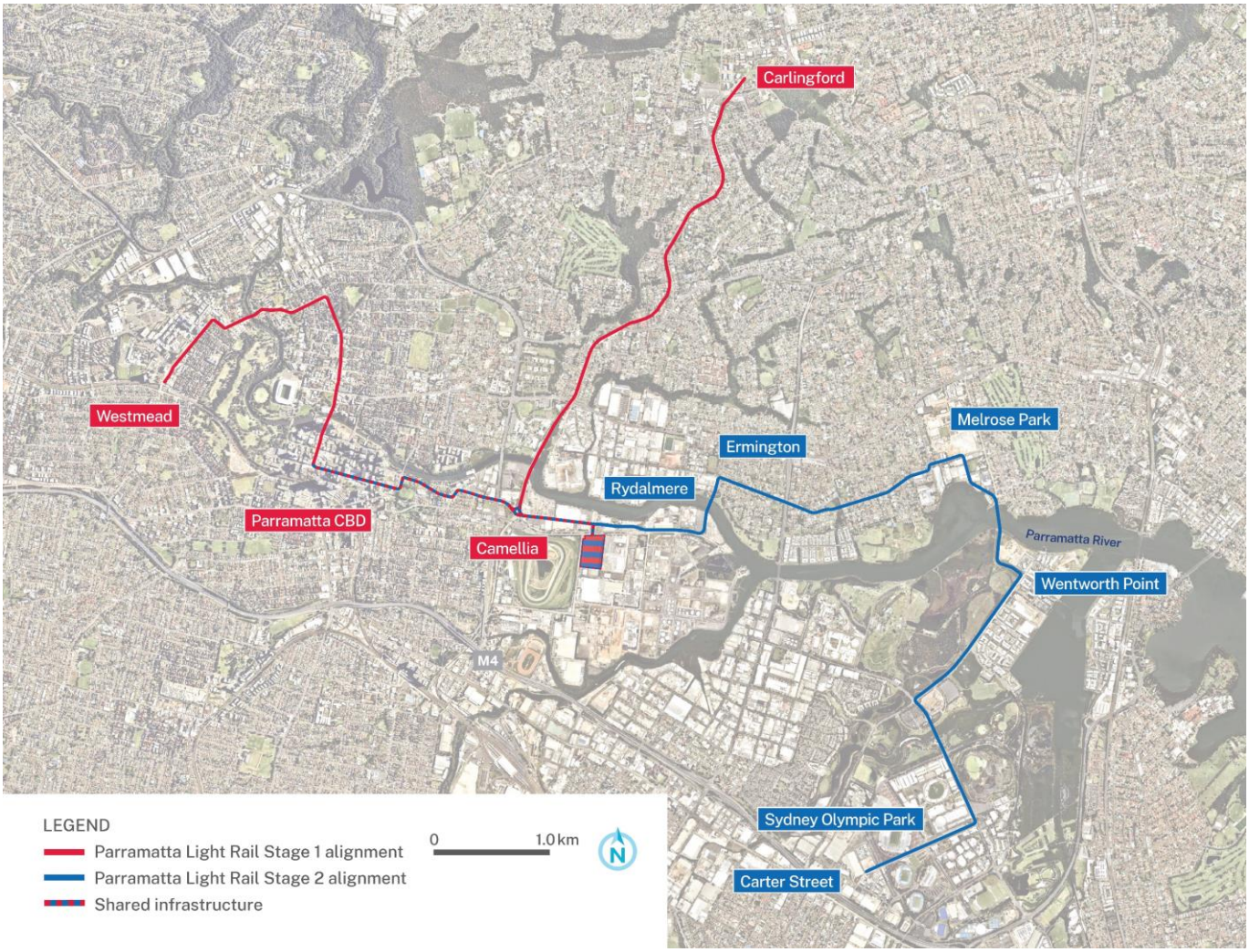

Figure 1.1 Parramatta Light Rail network

1.2 Project overview

The project comprises two main elements:

– construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park

– operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.

Further information on the location of the project, and a description of the project site for the purposes of this document, is provided in the environmental impact statement (EIS).

1.2.1 Key features

The key features of the project, which are shown on Figure 1.2, include:

Light rail track and bridges

– a new 10 kilometre long dual light rail track, with 14 stops, between the Parramatta Light Rail Stage 1 line in Camellia and the Carter Street precinct adjacent to Sydney Olympic Park

– two bridges over the Parramatta River between Camellia and Rydalmere, and between Melrose Park and Wentworth Point

– a bridge over Silverwater Road between Rydalmere and Ermington
– other bridge works in Ken Newman Park and Sydney Olympic Park.

Active and public transport integration

The project would also deliver:

– about 8.5 kilometres of new active transport links between Camellia and the Carter Street precinct, which would connect with the existing cycling and pedestrian network
– interchanges with other forms of public transport, including trains, ferries, buses and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Rydalmere and Sydney Olympic Park
– a light rail and pedestrian zone (no through vehicle access) within Sydney Olympic Park along Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard
– bus access over the proposed bridge between Melrose Park and Wentworth Point.

Other works

Works proposed to support the project's operation:

– turnback facilities, including along part of Macquarie Street in the Parramatta CBD
– adjustments to the Parramatta Light Rail stabling and maintenance facility at Camellia
– five new traction power substations to convert electricity to a form suitable for use by light rail vehicles
– new and improved open spaces and recreation facilities at Ken Newman Park, the Atkins Road stop and Archer Park.

Further information on the project's features is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)) and section 4 of this report.

1.2.2 Operation

The project would operate between the Parramatta CBD and the Carter Street precinct, using a section of the Parramatta Light Rail Stage 1 alignment and the alignment constructed as part of the project.

Between the Parramatta CBD and Camellia, the project would operate along about three kilometres of the Parramatta Light Rail Stage 1 alignment. Parramatta Light Rail Stage 2 services would terminate at the Stage 1 Parramatta Square stop to allow customers direct and convenient access to Parramatta's CBD, and interchange with Stage 1 light rail services, trains, buses and Sydney Metro West.

From Camellia, the project would operate along the light rail infrastructure proposed as part of Stage 2, terminating at the proposed Carter Street stop.

The project would operate as a turn-up-and-go light rail service from 5am to 1am, seven days a week, as for Parramatta Light Rail Stage 1. The project would have travel times of around 31 minutes from the Carter Street stop in Lidcombe to the proposed Sandown Boulevard stop in Camellia, and a further seven minutes from Camellia to the Parramatta Square stop in the Parramatta CBD.

Further information on the project's operation is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation) and section 4 of this document.

1.2.3 Timing

It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and the first passenger services are proposed to start from 2030/2031.

An indicative construction methodology is provided in the EIS (see Chapter 7 (Project description – construction)) and section 4 of this report.

1.2.4 Approval requirements

The project is State significant infrastructure and is subject to approval by the NSW Minister for Planning under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The project is also determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and requires approval from the Australian Minister for the Environment and Water.

1.3 Purpose and scope of this document

This document has been prepared as an appendix to Technical Paper 2 (Transport and Traffic). The purpose of this document is to document the existing environment within the Parramatta River, including users and structures, and identify the impacts to existing and future users and structures as a result of construction and operation of the project.

This report focusses on the section of Parramatta River between Camellia in the west and Homebush Bay in the east known as the Upper Parramatta River.

1.4 Disclaimer

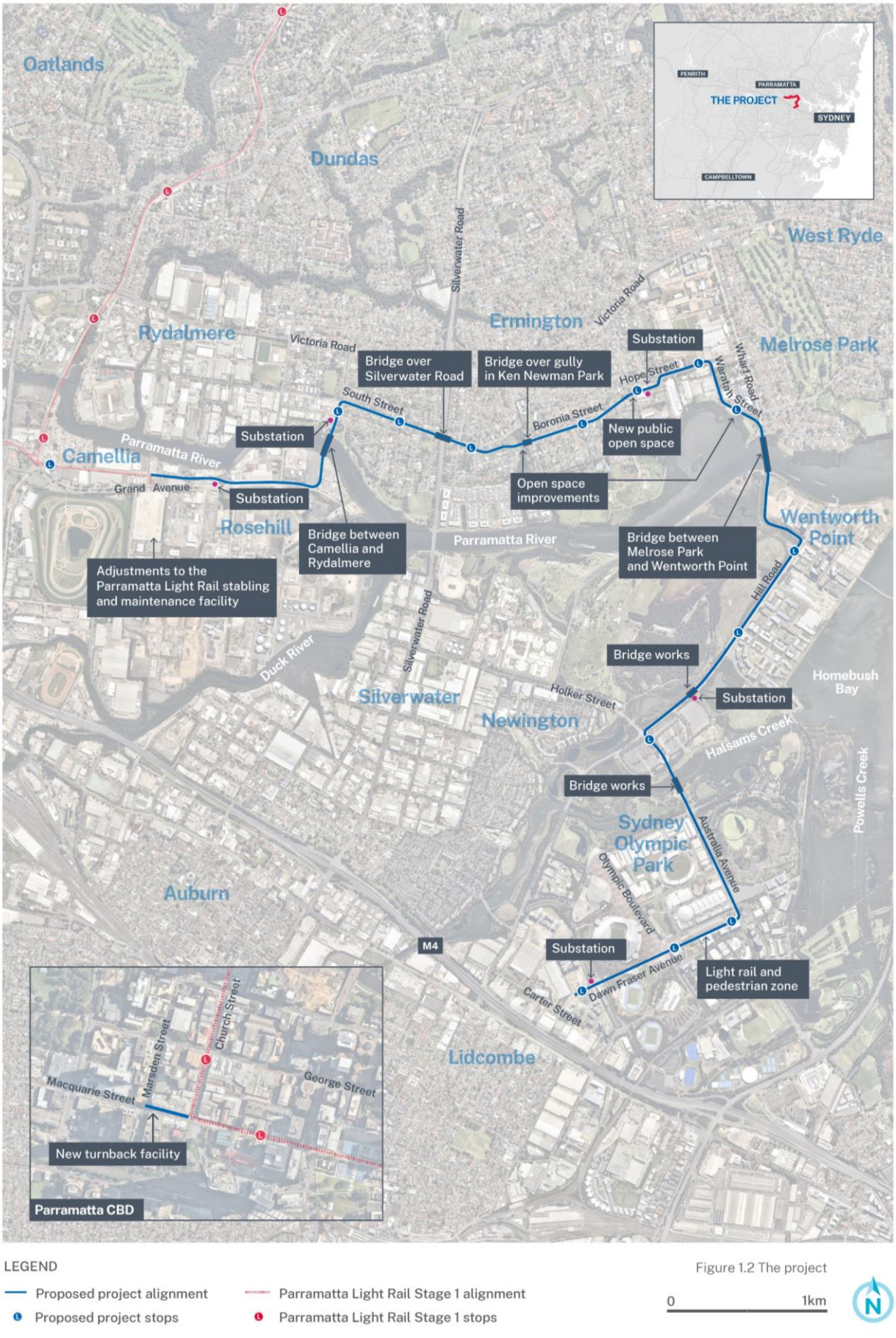

Figure 1.2 Key features of the project

2. Description of Parramatta River

The Parramatta River catchment encompasses an area of approximately 252.4 square kilometres. It is made up of 29 sub-catchments and is largely referred to as the Upper and Lower Parramatta River. The project is located within the Upper Parramatta River section which is controlled by a series of weirs including Kiosk Weir and Upstream Weir in Parramatta Park and Marsden Weir and Charles Street Weir in the Parramatta CBD. Charles Street Weir defines the tidal boundary of the river.

The Parramatta River is the main tributary of Sydney Harbour and flows in an easterly direction from North Parramatta to a line between Yurulbin Point in Birchgrove and Manns Point in Greenwich, where it flows into Port Jackson, about 21 kilometres from the Tasman Sea.

This report focusses on the section of Parramatta River broadly between Camellia in the west and Homebush Bay in the east (the area of interest – see Figure 1.1) which is in the Upper Parramatta River.

2.1 Waves and tides

The most common waves experienced within the Parramatta River are wind waves. The size depends on the fetch, the velocity and duration of a particular wind. The wave energy generated on the Parramatta River is reported to be relatively small.

Consultation with river users has indicated that there is an issue with wave pressure generated by ferries which are the largest and fastest moving craft in this section of the waterway.

The Parramatta River is tidal and the tidal range is approximately 1.9 metres. The tide cycle in the Parramatta River Tides is semidiurnal which means there are two high and two low tides each day. Tides are measured and published as heights above a hydrographic datum.

The Highest Astronomical Tide (HAT) or highest high tide is defined as the highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions. Higher tides can occur under extreme meteorological and oceanographic conditions.

For the purposes of this study, the tide levels for Sydney shown in Figure 2.1 have been adopted for the purpose of analysis. The HAT for Silverwater is 2.20 metres above Zero Fort Denison datum and has also been adopted for this report.

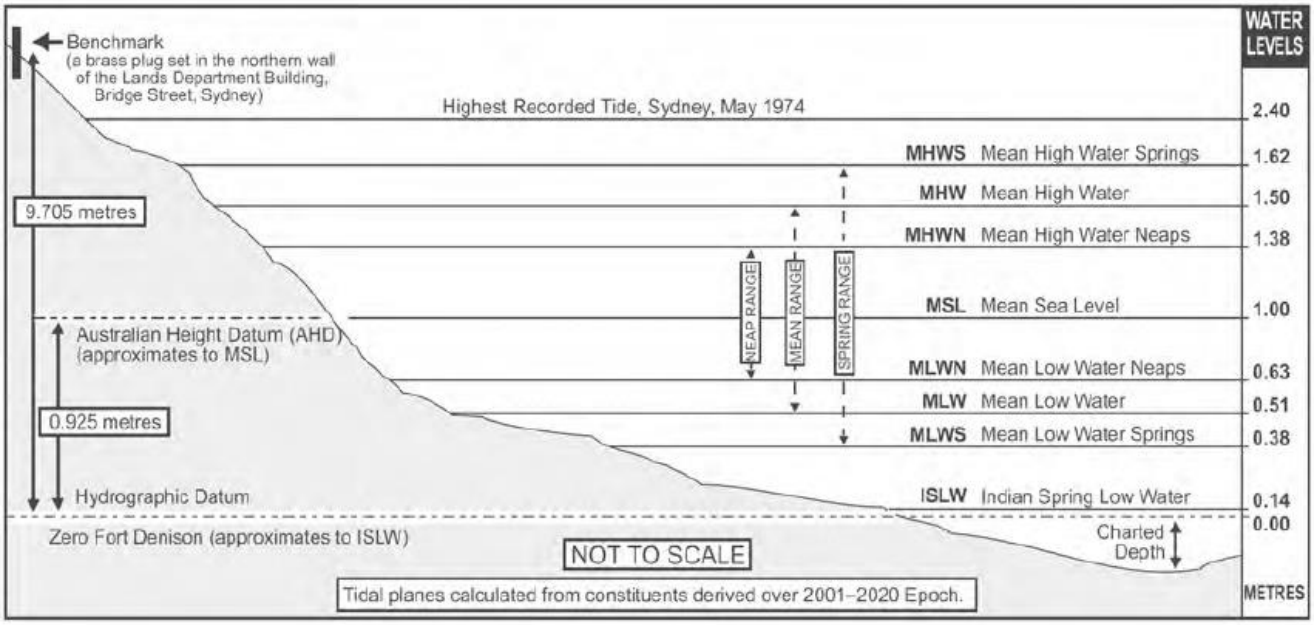

Figure 2.1 Sydney tide levels and datum

2.2 Bathymetry and waterway area

The Parramatta River generally reduces in width and depth as it travels upstream. Generally, the deepest areas are in the main channel and the embayments are much shallower. There are two specific points on the Parramatta River where there are notable changes in the width of the navigable channel:

– Wentworth Point at the confluence with Homebush Bay/Haslams Creek
– Rydalmere at the confluence of Duck River.

The water depths vary over this section of the river, ranging between 1.0 to 3.9 metres in the centre of the river (see Figure 2.3). The depth of the river reduces to less than 2.0 metres approximately 300 metres upstream of the Silverwater Road bridge, except for small, localised areas such as at Rydalmere Wharf (see Figure 2.3).

At Camellia, the distance between the banks of the river is approximately 90 metres and the deepest part of the river is approximately two metres adjacent to the Rydalmere Wharf. The width of the navigational channel (between channel markers) at Rydalmere is approximately 25 metres; approximately 20 metres of which is between the two metre water depth contours (see Figure 2.2).

At Wentworth Point, the deepest part of the river is approximately 3.7 metres just upstream of the proposed bridge. The existing shore-to-shore distance is approximately 180 metres. The channel width between navigational beacons and buoys is approximately 75 metres wide, and the width between the two metre water depth contours is approximately 50 metres (see Figure 2.3).

2.3 Clearance to existing structures

Table 2.1 provides details of the existing horizontal and vertical clearances under various structures upstream and downstream of the bridges between Camellia and Rydalmere and between Melrose Park and Wentworth Point.

Table 2.1 Clearances to existing structures

Existing structure	Location	Horizontal clearance (m)	Vertical clearance (m)
Thackeray Street pedestrian and utility bridge	Upstream of proposed bridge between Camellia and Rydalmere	37.9	11.6 HAT
Silverwater Road bridge, Silverwater	Downstream of proposed bridge between Camellia and Rydalmere / upstream of proposed bridge between Melrose Park and Wentworth Point	58.9	11.7 HAT
T1 railway bridge, Rhodes (John Whitton Bridge)	Downstream of proposed bridge between Melrose Park and Wentworth Point	45.0	11.0 HAT
Concord Road (Ryde) bridge, Ryde	Downstream of T1 railway bridge	35.0 (upstream) 47.0 (downstream)	11.3 HAT (upstream) 10.9 HAT (downstream)

Source: Navionics ChartViewer, Transport for NSW Boating Maps
HAT: Level above Highest Astrological Tide

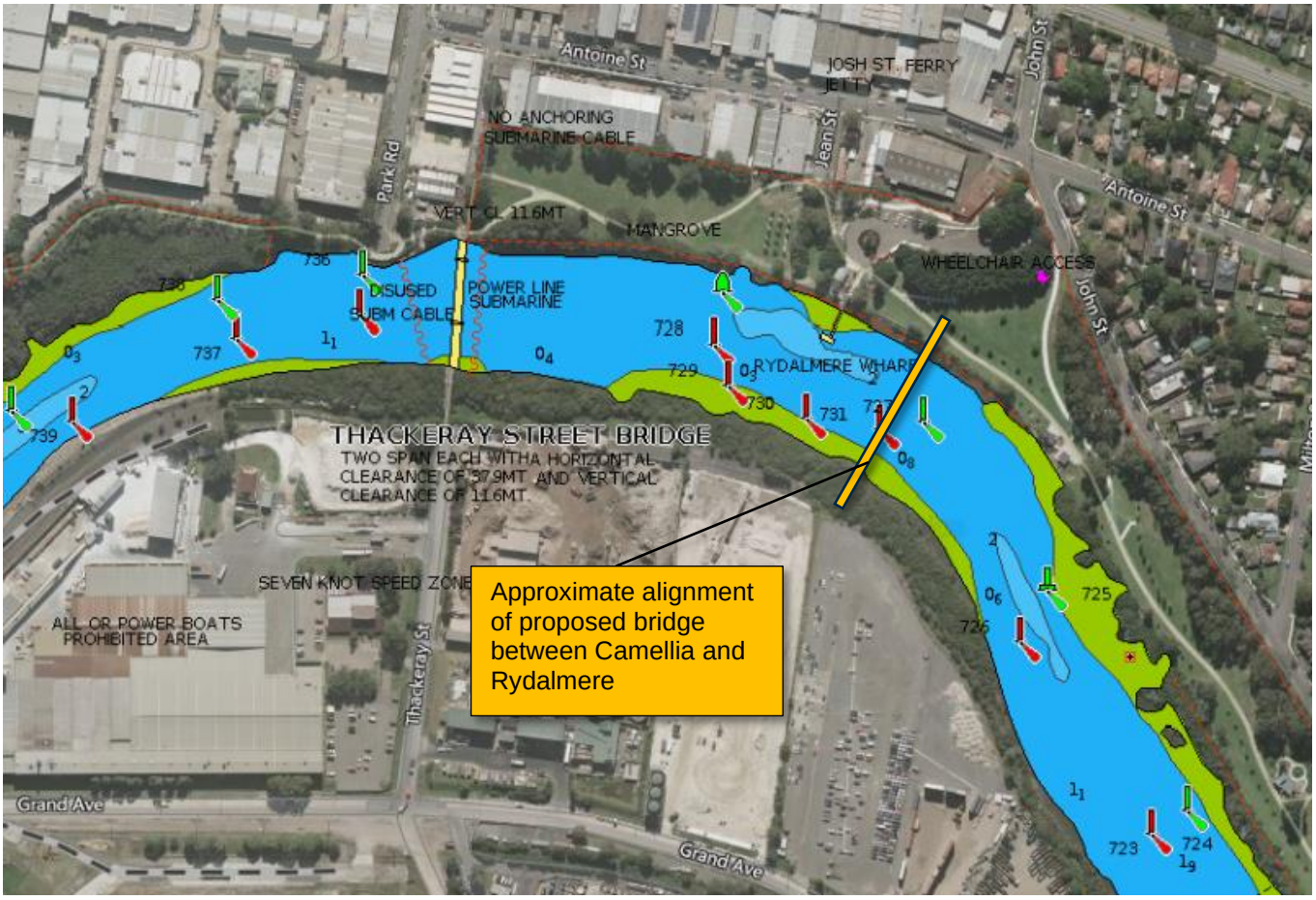

Figure 2.2 ***Bathymetry in the vicinity of proposed bridge between Camellia and Rydalmere***

Source: Navionics ChartViewer

Figure 2.3 ***Bathymetry in the vicinity of proposed bridge between Melrose Park and Wentworth Point at Archer Point***

2.4 Boat storage facilities

A number of boat storage and boat launching facilities which provide storage for recreational vessels are located along the Parramatta River. These include:

– pontoon jetties (public and private)
– boat ramps and trailer parking.

The identified facilities are shown on Figure 2.4 and discussed below.

2.4.1 Public jetties

Rydalmere Wharf

Rydalmere Wharf is located about 50 metres upstream of the proposed bridge between Camellia and Rydalmere and provides access to ferry services along the F3 Sydney Olympic Park to Circular Quay route.

The NSW Government recently undertook an upgrade of Rydalmere Wharf as part of the Transport Access Program. The new wharf was re-opened in March 2019 and contains the following facilities:

– commuter car park
– kiss and ride stopping area
– bike lockers
– departure indicator screen
– wheelchair accessible car space
– bike racks
– emergency help point.

Sydney Olympic Park Wharf

Sydney Olympic Park Wharf is located about 450 metres downstream of the proposed bridge between Melrose Park and Wentworth Point and provides ferry services along the Sydney Olympic Park to Circular Quay route.

The NSW Government undertook an upgrade of Sydney Olympic Park Wharf as part of the Transport Access Program. The new wharf was re-opened in May 2015 and contains the following facilities:

– kiss and ride stopping area
– wheelchair accessibility toilet
– emergency help point
– opal card top up or single trip ticket machine
– bike racks
– baby change table
– departure indicator screen.

Armory Wharf

Armory Wharf is a public jetty located approximately midway between the proposed bridge between Melrose Park and Wentworth Point and the existing Silverwater Road bridge and is located in Blaxland Riverside Park, part of Sydney Olympic Park. It was previously serviced by the F3 ferry service but ferries no longer stop at the wharf. The wharf is currently in use by water taxis and private craft.

2.4.2 Public boat ramps

There are four public boat ramps located within the area of interest at:

– Silverwater Boat Ramp, Silverwater
– Ermington Boat Ramp, Melrose Park

– Blaxland Road Boat Ramp, Rhodes
– Kissing Point Park Boat Ramp, Putney.

Table 2.2 provides an overview of the facilities at each boat ramp. The location of these boat ramps is shown on Figure 2.4.

Table 2.2 Public boat ramps and facilities

Boat ramp	Location	Trailer parking spaces	Number of ramp lanes	Facilities
Silverwater	South side of Parramatta River just downstream of Duck River	22	2	– Toilets – Jetty – Pontoon nearby
Ermington	North side of Parramatta River approximately 100 m upstream of the proposed bridge between Melrose Park and Wentworth Point	52	2	– Toilets – Lighting – Pontoon nearby – Boat washdown facilities
Blaxland Road	North side of Parramatta River immediately downstream of T1 railway bridge	14	2	– Lighting – Pontoon on ramp
Kissing Point Park (upgraded in 2021)	North side of Parramatta River approximately 1 km downstream of existing Concord Road bridge	39	2	– Toilets – Lighting – Kayak launching area – Fish cleaning table – Boat washdown facilities

2.4.3 Private jetties

Two private wharf facilities are located in the area of interest. The first is on the southern foreshore immediately upstream of the intersection with Duck River and is owned by Viva Energy Australia. The second is about 600 metres upstream on Duck River and is owned by Lubrizol International Inc. The location of these facilities is shown on Figure 2.4.

In addition, information reviewed for this report indicates that pontoons for boat shows are stored on land at Camellia upstream of Duck River and moved downstream by tug, when required.

2.4.4 Other

There are a number of other facilities which provide access onto the river. Some of the public boat ramps such as Kissing Point Park include a kayak launching facility. There is also a set of steps at the end of Park Road, Rydalmere upstream of the Thackeray Street pedestrian and utility bridge which provide access to the river and could be used for entering or launching very small boats such as paddle craft and rowing vessels.

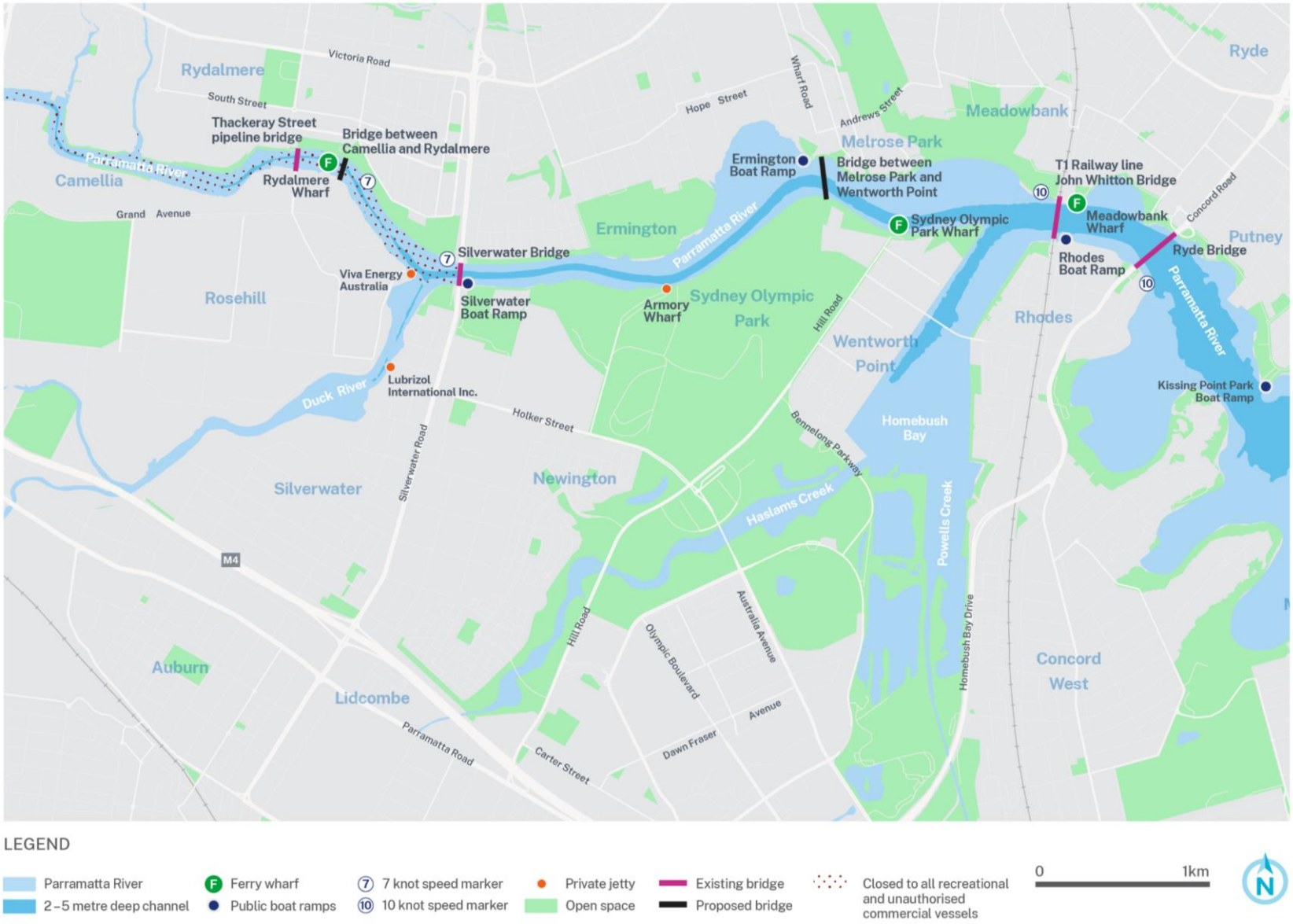

Figure 2.4 Location of public and private maritime facilities in the Upper Parramatta River

2.5 Vessel types and specifications

A range of vessels are known to use the Parramatta River. These include:

– ferries (various classes)
– tug boats
– barges (various types and draughts)
– powered recreational vessels
– trailer yachts
– paddle craft
– rowing vessels.

Commercial vessels (other than ferries) are used to perform construction and maintenance on upstream facilities e.g. ferry wharves, weirs, debris removal, spoil and product haulage and other salvage and maintenance activities.

Personal watercraft and kite surfing are banned from operating on the Parramatta River.

Typical specifications of ferries and selected commercial vessels known to use the Parramatta River are shown in Table 2.3.

Table 2.3 Typical specifications of commercial vessels using the Upper Parramatta River

Vessel	Length (m)	Beam (m)	Draft (m)	Air draft (m)
Ferries				
River Class	24.95	7.20	1.4*	4.76
RiverCat	36.80	10.50	1.4	7.80, 4.50 (all temporary equipment lowered or dismantled/ removed)
HarbourCat	29.60	7.24	-	7.80, 4.90 (all temporary equipment lowered or dismantled/ removed)
SuperCat	37.76	9.00	1.5	9.07
Barges				
Crane barge 1**	18.0	12.50	-	5.30 (all temporary equipment lowered or dismantled/ removed)
Crane barge 2**	35.0	17.00	-	10.00-11.00
Spoil barge	55.0	18.00	-	6.00
Fuel barge	-	-	-	8.0
Tugs				
Tug 1**	15.2	5.30	2.3	6.00
Tug 2**	14.8	6.50	-	8.20, 7.50 (all temporary equipment lowered or dismantled/ removed)

Note: * Assumed
** Vessel specifications based on consultation with government and marine industry stakeholders

The following types of trailer yachts are also able to be launched from boat ramps in the study area. Typical specifications of these selected trailer yachts are shown in Table 2.4.

Table 2.4 Typical specifications of selected trailer yachts

Type	Length (m)	Breadth (m)	Air Draft (m)
Catalina 22s	7.26	2.34	9.07
Sonata 7	6.90	2.45	9.28
Austral 24	7.47	2.36	10.00
Farr 7500	7.57	2.49	10.18

3. Navigation rules and restrictions

3.1 Acts and regulations

The legislation to be observed when navigating on NSW waterways includes:

3.1.1 Commonwealth legislation

– *Navigation Act 2012*
– *Shipping Registration Act 1981*
– *Maritime Safety (Domestic Commercial Vessel) National Law Act 2012*
– Marine Safety (Domestic Commercial Vessel) National Law Regulation 2013
– *Maritime Transport & Offshore Facilities Security Act 2003*
– Maritime Transport & Offshore Facilities Security Regulations.

3.1.2 NSW legislation

– *Marine Safety Act 1998*
– Marine Safety Regulation 2016
– *Ports and Maritime Administration Act 1995*
– Port and Maritime Regulation 2012
– *Work Health and Safety Act 2011*
– Work Health and Safety Regulation 2011.

The *Navigation Act 2012* is legislation that covers international ship and seafarer safety. The *Navigation Act 2012* applies to 'regulated Australian vessels', which includes vessels registered under the *Shipping Registration Act 1981* and vessels proceeding on an overseas voyage or for use on an overseas voyage. The *Navigation Act 2012* provides the legislative power for Australia to implement the following treaties developed by the International Maritime Organisation, the International Labour Organisation and United Nations Conferences:

– International Convention for Standards of Training, Certification and Watchkeeping for Seafarers
– Maritime Labour Convention
– International Convention on Load Lines (Load Lines)
– International Convention for the Safety of Life at Sea
– Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS)
– International Convention for Safe Containers
– International Convention on Tonnage Measurement of Ships
– International Convention for the Prevention of Pollution from Ships
– Convention of Limitation of Liability for Maritime Claims
– International Convention on Salvage
– United Nations Convention on the Law of the Sea – in certain parts.

The *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* is the regulatory framework for certification, construction, equipment, design and operation of domestic commercial vessels in Australia. The Marine Safety (Domestic Commercial Vessel) National Law Regulation 2013 is made under authority of the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012* and dictates how its provisions are to be applied. A domestic commercial vessel is defined as any vessel that is for use in connection with commercial, governmental or research activities, including construction activities. However, a vessel is not a domestic commercial vessel if the vessel is a 'regulated Australian vessel' whereby safety requirements are outlined in the *Navigation Act 2012*.

The *Marine Safety Act 1998* sets out the broad legal policy relating to marine safety and other matters in NSW. The Marine Safety Regulation 2016 is made under authority of the *Marine Safety Act 1998* and dictates how its provisions are to be applied.

The Marine Safety Regulation 2016 makes provisions with respect to:

– safety of navigation
– marine safety licences, including the following:
  - vessel registration
  - aquatic licences (including for commercial aquatic activities)
  - boat driving licences
– safety equipment that must be carried on vessels including requirements for the wearing of lifejackets.

With regards to safety of navigation in NSW, the Marine Safety Regulation 2016 adopts the Convention on the International Regulations for Preventing Collisions at Sea 1972 (COLREGS) with modifications. The COLREGS applies in all waters navigable by seagoing vessels. It is an international document that defines the navigation rules to be followed to prevent collisions between two or more vessels.

3.2 Regulatory authority

The Australian Maritime Safety Authority is the Australian Government authority with responsibility for operational activities of the *Navigation Act 2012* and administers the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*, Marine Safety (Domestic Commercial Vessel) National Law Regulation 2013 and marine orders.

Transport for NSW is the NSW Government authority with responsibility for marine safety and regulation of commercial and recreational boating, including enforcement of the *Marine Safety Act 1998* and Marine Safety Regulation 2016. Transport for NSW produced the *NSW Boating Handbook* (Transport for NSW, 2021), which is an interpretation of the law and legislation to assist the general public in understanding the navigation rules and requirements.

The NSW Police Marine Area Command also has the authority to enforce the Marine Safety Regulation 2016 in addition to additional duties they perform, particularly drug and alcohol testing of skippers.

3.3 Key navigation safety rules

The key navigation rules applying to the assessment of navigation in the Parramatta River are outlined in the following sections.

3.3.1 Lookout and safe speed

Rules 5 and 6 of the COLREGS relate to keeping a proper lookout and also to ensure you are travelling at a safe speed.

As the skipper of a vessel, you must keep a proper *lookout*, by sight and hearing, at all times. This helps you judge your situation and avoid the risk of collision. Extra care should be taken at times of restricted visibility, for example, at night (between sunset and sunrise) or in poor weather conditions. Keep a lookout for:

– people in the water
– other vessels, especially at bends in the river
– shallow waters
– structures including bridges, jetties and overhead powerlines
– floating and submerged hazards.

All vessels must at all times proceed at a *safe speed* so that proper and effective action can be taken to avoid collision and stop within a distance appropriate to the prevailing circumstances and conditions.

The Marine Safety Regulation 2016 provides additional requirements for a minimum distance to be maintained between vessels and other objects. The minimum distance is 30 metres from a vessel towing equipment to any other vessel, land, structure and other things when travelling at a speed of six knots or more.

If this distance is not practical, a safe distance and speed must be maintained which is defined as a distance and speed that will ensure the vessel will not cause danger or injury to the person or damage to the thing, having regard to all relevant safety factors; including: weather conditions, visibility, speed of the vessel and obstructions to navigation that are present.

3.3.2 Collision avoidance

The conduct of vessels in sight of one another is established in the COLREGS, which sets out international rules to avoid a collision. These rules are summarised in the *NSW Boating Handbook* (Transport for NSW, 2021). The general rules of navigation are that a powered vessel must give way to:

– sailing vessels
– vessels restricted in their ability to manoeuvre
– vessels approaching head on, by altering course to starboard
– vessels approaching from the right (starboard) hand side (i.e. crossing)
– any vessel being overtaken.

Additional rules apply to a sailing vessel underway, including a requirement for sailing vessels to keep out of the way of a vessel restricted in their ability to manoeuvre. Vessels restricted in their ability to manoeuvre include:

– a vessel engaged in dredging, surveying or underwater operations
– a vessel engaged in a towing operation (i.e. tug assisted) where the towing vessel and her tow are severely restricted in their ability to deviate from their course.

Vessels restricted in their ability to manoeuvre must display special lights and signals. In addition, in narrow waterways, powered vessels less than 20 metres in length and sailing vessels must give way to a vessel which can safely navigate only within a narrow channel or fairway (i.e. large ships). These vessels are not required to display special lights and signals.

One Special Rule under Schedule 4 of the Marine Safety Regulation 2016 allows high speed catamaran ferries to show an all-round flashing yellow light. High speed ferries are not afforded privileges under the Special Rules and must comply with the collision regulations, in particular giving way to sailing vessels. The light aids in identifying the ferry as a vessel that is likely to be approaching at speed.

The Marine Safety Regulation 2016 modifies Rule 18 of the COLREGS to include a clause that vessels displaying an orange diamond shape have priority over all other vessels (sail and power).

3.3.3 Wash

The Marine Safety Regulation 2016 includes a provision to minimise wash and notes that the operator of a vessel must not cause wash that damages or impacts unreasonably on:

– any dredge or floating plant
– any construction or other works in progress
– any bank, shore or waterside structure, or
– any other vessel, including a vessel that is moored.

This provision impacts the way in which a vessel is operated.

3.3.4 Marine incidents

Masters or persons in charge or skippers are required to report incidents to authorities under various legislation.

Masters of commercial vessels are obliged to report incidents or accidents under both Commonwealth and NSW legislation.

Masters of recreational vessels are obliged to report incidents or accidents under NSW legislation.

3.4 Site-specific navigation requirements

Upstream of Concord Road bridge, the maximum speed of vessels is limited to 10 knots.

The waters of the Paramatta River upstream of Silverwater Road bridge are closed to all recreational and unauthorised commercial vessels. Authorised vessels are subject to a seven knot speed limit.

4. The project

The key structures being constructed as part of the project which would have the potential to result in impacts to marine users are the bridges between Camellia and Rydalmere and between Melrose Park and Wentworth Point. Further information regarding the design and construction of these bridges is provided in this chapter.

4.1 Key bridge design parameters

4.1.1 Bridge between Camellia and Rydalmere

The bridge between Camellia and Rydalmere would be constructed to span about 120 metres of the Parramatta River located immediately east of the existing Rydalmere Wharf (section 2.4.1).

The bridge would include:

– light rail (two-track)
– shared user path (both sides)
– bridge barriers.

Key design parameters for the bridge are outlined below in Table 4.1.

Table 4.1 Key design parameters – bridge between Camellia and Rydalmere

Parameter	Details
Overall length	204 m
Bridge depth	Varies between 2.0 m – 4.5 m structural depth
Span arrangement	3 span, concrete box girder
Main span	90 m
Other spans	56 m
Vertical navigation clearance	7.6 m clearance above HAT (5.2 m minimum required).
Horizontal navigation clearance	22 m

4.1.2 Bridge between Melrose Park and Wentworth Point

The bridge between Melrose Park and Wentworth Point would be constructed to span about 250 metres of the Parramatta River located immediately east of the existing Ermington Boat Ramp (refer Figure 2.4) and about 450 metres west of the Sydney Olympic Park Wharf (section 2.4.1).

The bridge would include:

– light rail (two-track) with shared bus running
– shared user path (both sides)
– bridge barriers.

Key design parameters for the bridge are outlined below in Table 4.2.

Table 4.2 Key design parameters – bridge between Melrose Park and Wentworth Point

Parameter	Details
Overall length	318 m between abutment walls
Bridge depth	Structural depth varies from 2.4 m – 4.5 m
Span arrangement	6 spans, post-tensioned box girder constructed using the balanced cantilever method
Main span	72 m
Other spans	38 m to 62 m (five spans total)
Vertical navigation clearance	Minimum 11.0 m clearance provided above HAT for central 20.0 m of the main span and minimum 9.0 m either side within main span
Horizontal navigation clearance	46 m

As shown in Figure 2.3, the channel navigation markers at Wentworth Point are not fully aligned with the deepest part of the channel. As part of the construction of the bridge between Melrose Park and Wentworth Point, the navigation channel would be shifted about 20 metres northward to better align with the deepest section of the river in this location.

4.2 Overview of construction method

4.2.1 Temporary facilities and waterway occupation

Temporary working platforms would be constructed on both banks and extend into the waterway from the shores at Camellia and Rydalmere, and Melrose Park and Wentworth Point, to support bridge and bridge pier construction activities. Figure 4.1 and Figure 4.2 show the conceptual arrangement of temporary working platforms for the bridges, respectively. Temporary facilities are described below:

– at Camellia and Rydalmere, where the shore-to-shore distance is about 90 metres, the temporary working platforms would occupy about 75 per cent of the available waterway opening
– at Melrose Park and Wentworth Point, where the existing shore to shore distance is about 180 metres, the temporary working platforms would occupy about 55 per cent of the available waterway opening.

The majority of crane lifts needed to construct the bridges would be performed from the temporary platforms as well as from cranes mounted on the piers.

For both the Camellia and Wentworth Point bridges, between 45-50 precast bridge segments would need to be lifted into position from a large barge temporarily moored within the navigational channel between the temporary working platforms, requiring temporary closure of the navigation channel.

Closure of the Parramatta River navigation channel would be required for both bridges during major bridge lifts when barges would need to be present within the river between the working platforms. It is anticipated that closures of the navigation channel would occur at the following locations and durations:

– for the bridge between Camellia and Rydalmere – two closures of about two months each
– for the bridge between Melrose Park and Wentworth Point – one closure of up to three months.

Indicatively, these closures could occur in late 2026/early 2027, subject to scheduling by the construction contractor.

Other incidental lifts required to support general bridge construction activities would be needed sporadically across the bridge construction period and would be of much shorter duration; likely in the order of one to two days each. Where possible, these activities would be scheduled to occur outside of operating hours of the F3 ferry service.

The temporary working platforms would be decommissioned and removed upon completion of the project with piles cut off at ground/river bed level.

4.2.2 Marine vessels and movements

Bridge construction works would be primarily serviced via the temporary working platforms, with land transport primarily used for construction materials. However, during periods where a barge would be temporarily occupying the waterway, it would also be serviced by other marine vessels to transport workers and supplies each day as needed.

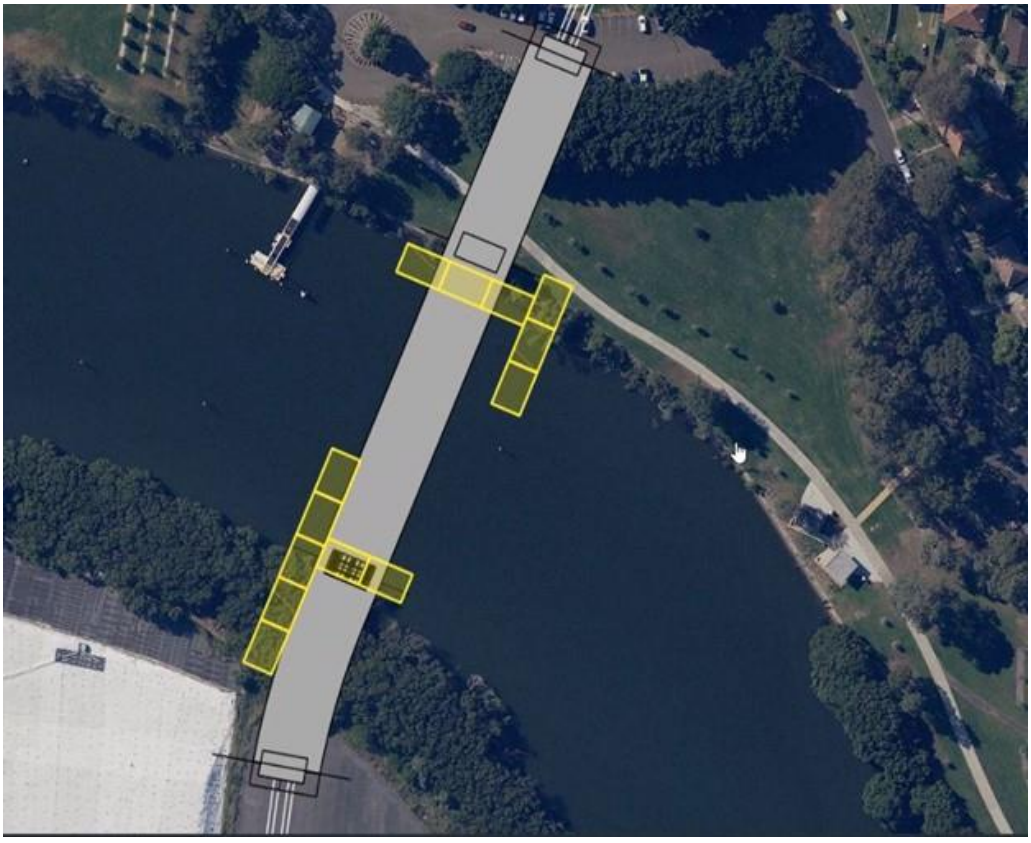

Figure 4.1 Conceptual arrangement of temporary working platforms between Camellia and Rydalmere

Figure 4.2 Conceptual arrangement of temporary working platforms between Melrose Park and Wentworth Point

5. Waterway users

This chapter describes the users of Parramatta River in the area of interest.

5.1 Commercial

Based on consultation conducted by Transport for NSW, the following commercial operators were confirmed as users of the Parramatta River within the area of interest:

– Transdev Sydney Ferries
– AusBarge Marine Services
– Polaris Marine
– AWB Contractors
– Viva Energy Australia
– Lubrizol International Inc.

5.2 Government

Government agencies which may use this section of Parramatta River of include:

– Transport for NSW maritime operations
– Water Police
– Harbour Master / Port Authority of New South Wales.

5.3 Community groups and clubs

There are no formal swimming sites or rowing or sailing clubs west of the Concord Road bridge or within the area of interest. The nearest would be the Concord & Ryde Sailing Club located about 700 metres downstream of Concord Road bridge.

Further downstream, there are a number of rowing clubs which use Parramatta River for training and regattas which include a number of Sydney private schools as well as the Sydney Rowing Club.

Fishing is permitted in the Upper Parramatta River except for within Duck River, Homebush Bay and Haslams Creek.

6. Existing use and activity

6.1 Public jetties

Transdev Sydney Ferries operate a total of 34 services on weekdays and 33 on Saturdays, Sundays and public holidays along the route between the Parramatta CBD and Sydney Olympic Park ferry wharves.

RiverCats, HarbourCats and River Class ferries are all used on services to Parramatta. SuperCats run services to Rydalmere only and are used if there are breakdowns with the other vessels.

River Class ferries are being progressively commissioned and once fully introduced, will replace HarbourCats.

6.1.1 Ferry use profile

The typical demand profile of Sydney ferry customers, compared to other public transport modes (including light rail (LRT)), has been obtained using Opal card tap-off data across the Sydney ferry network over a period in February 2020 (pre COVID-19). This period is considered to broadly represent existing travel demand unaffected by the COVID-19 pandemic conditions. Ferry patronage obtained from Opal data has been benchmarked against observed demand for other public transport modes (LRT, train and bus) obtained from the Public Transport Project Model (PTPM) developed by Transport for NSW.

The results presented in Figure 6.1, show that weekday ferry demand profiles are broadly similar to other transport modes, with morning and afternoon peak period driven by commuting demand. However demand between the two peak periods is typically higher than train and bus services which may be due to recreational trips being more common for this mode.

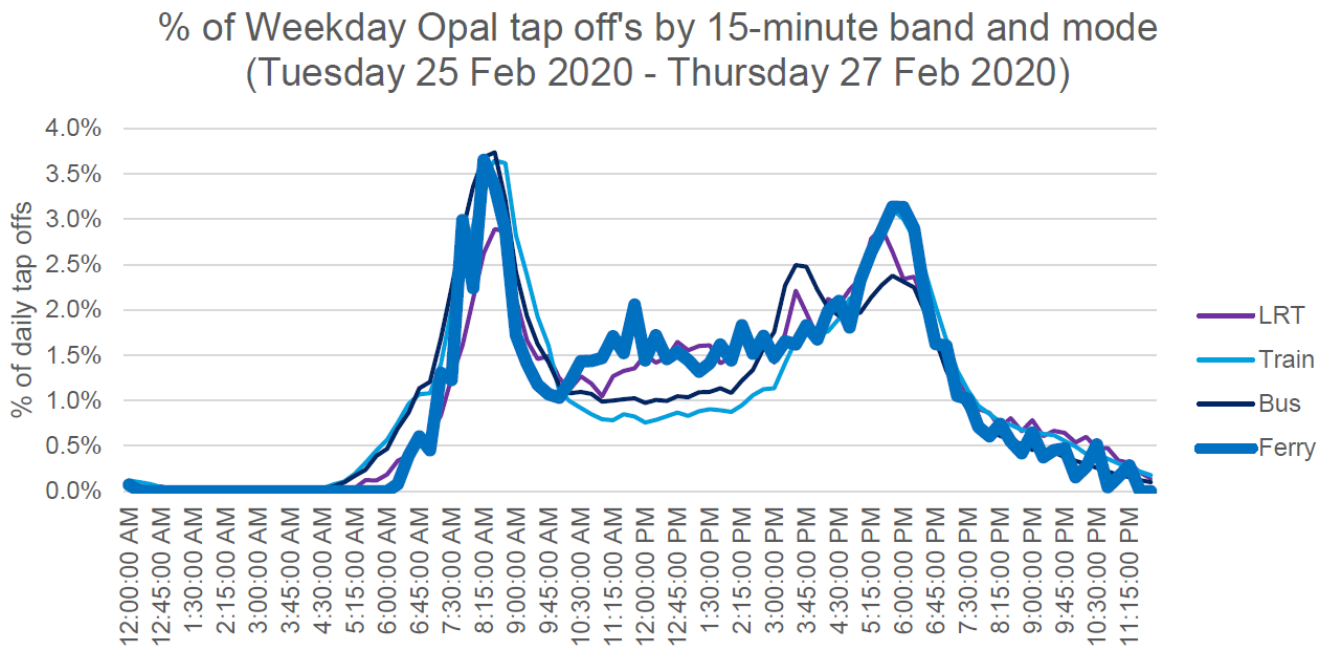

Figure 6.1 Comparison of weekday demand profiles by public transport mode

Sydney ferry patronage by day and time is presented in Figure 6.2 based on Opal card data for the Sydney ferry network between Monday 24 February 2020 and Sunday 01 March 2020. The data shows weekdays exhibit a typical daily demand profile with evident morning and afternoon commuter peak periods. Weekends did not have a pronounced peak, with demand building throughout the morning period and being fairly constant until the evening. Also, the Sunday peak demand period was observed to be greater than the weekday. It is noted that during the time when this data was collected, Sunday fares were lower, which may have contributed to much higher demand on Sunday compared to other days. This pattern may have changed recently due to fare structure changes.

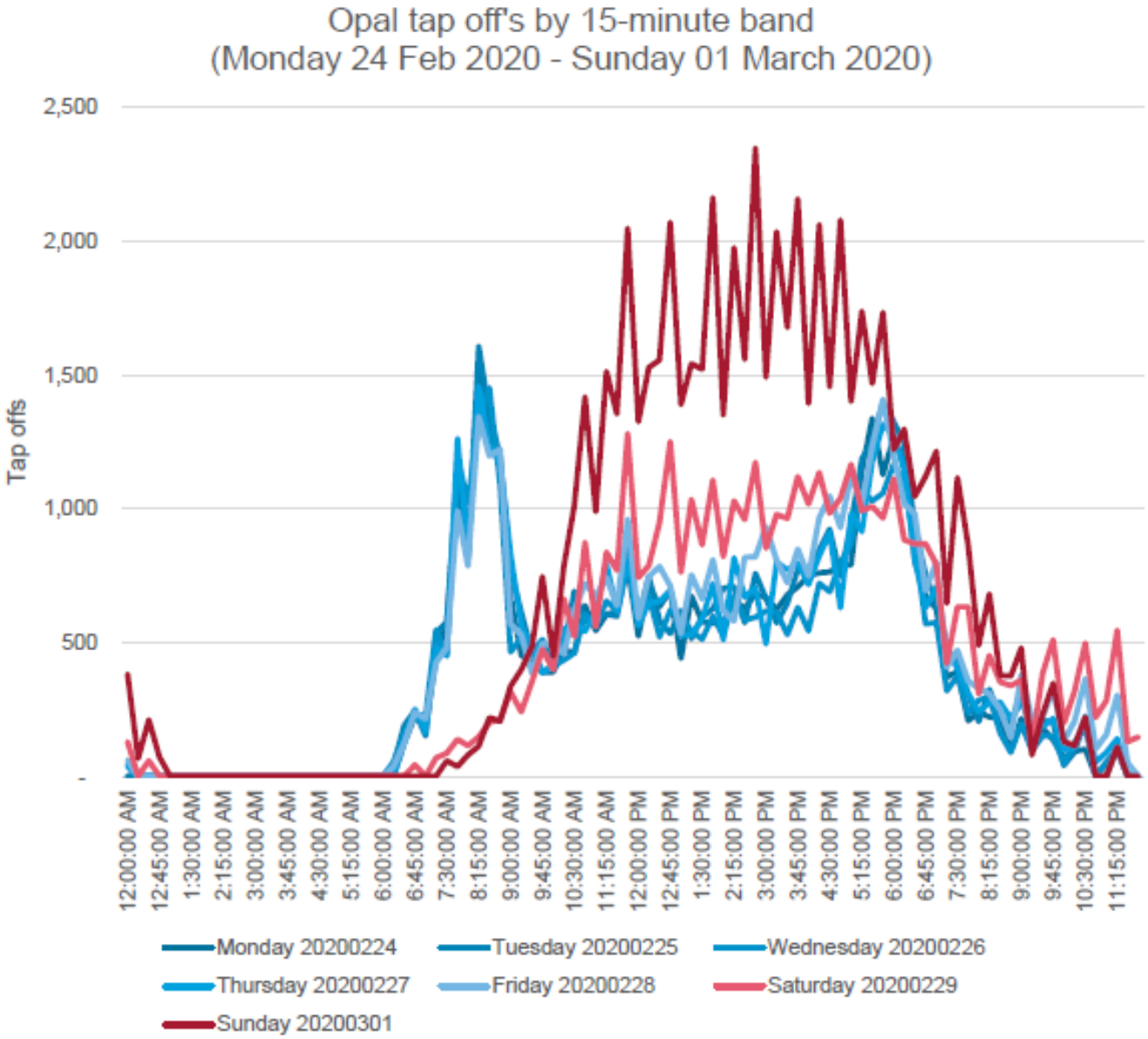

Figure 6.2 Day of week ferry demand profile analysis

6.1.2 Ferry use forecast

Demand for ferry use in the section of Parramatta River immediately upstream of the bridge between Melrose Park and Wentworth Point has been extracted from the PTPM for the year 2026. This year is considered to represent transport conditions across the network for the years during which the two bridges would be constructed. Forecast usage is provided in Table 6.1 and represents an estimate of the number of ferry customers that may be impacted by any river closure at either Camellia or at Wentworth Point.

Table 6.1 Forecast ferry customers in 2026 – upstream of bridge between Melrose Park and Wentworth Point

Scenario	Forecast volume (persons)
Weekday morning peak period (6am to 9.30am)	
Eastbound	93
Westbound	51
Total (both directions combined	**144**
Average weekday (24-hours)	**645**

Scenario	Forecast volume (persons)
Average weekend (24-hours)	**903**
Average week (7-days i.e. Monday to Sunday inclusive)	**5,032**

Source: Public Transport Project Model version 5 (PTPM5) 2026 Base Case forecast year model run "P4961".

Note that:

– Some ferry services cannot run during periods of low tide or flooding in the Parramatta River. On these occasions, ferry services are usually replaced by buses between Parramatta and Rydalmere.
– Ferry demand may be subject to seasonal or other fluctuations e.g. special events. Variability in demand has not been considered in these estimates which are approximate only.

6.2 Public boat ramps

Surveys were undertaken at random intervals on weekdays and weekends by Transport for NSW between 2017 and 2021 to identify the usage of boat ramps on the Parramatta River in the area of interest. The sites were visited 14 to 15 times in the survey period.

During the survey period, there were a number of lockdowns as a result of the COVID-19 pandemic which restricted people from leaving their place of residence /local government area. It is acknowledged that these lockdown events may have affected the usage of the boat ramps. A summary of the survey results is provided in Table 6.2.

Table 6.2 Boat ramp survey results 2017-2021

Boat ramp	Total number of trailer parking spaces	Occupancy			Comment
		Min.	Max.	Average	
Silverwater	22	0%	91%	26%	Silverwater Boat Ramp is less popular due to it being a shallow ramp, especially at low tide, and having less pontoons for vessel access. The most popular period of use during the survey was observed in the spring/summer of 2021.
Ermington	52	6%	100%	51%	Ermington Boat Ramp is particularly popular with boaters wishing to access Sydney Harbour from the western suburbs. It includes generous pontoon facilities and a large car park. Emergency services use this ramp for launching and retrieving vessels. Anecdotal information indicates demand for this ramp frequently exceeds the parking capacity in the summer months forcing cars and trailers to queue onto Wharf Road and park in local streets. Greater than 50% of the available trailer parking spaces were occupied during most dates the survey took place. The most popular period of use during the survey was observed in the summer of 2021.
Blaxland Road	14	21%	100%	47%	Blaxland Road Boat Ramp is a small facility. Of the 14 available parking spaces, 50% or less were typically occupied during most survey dates. The ramp is heavily affected by currents. The most popular period of use during the survey was observed in the spring/summer of 2021.

Boat ramp	Total number of trailer parking spaces	Occupancy			Comment
		Min.	Max.	Average	
Kissing Point Park	39	44%	100%	64%	Greater than 40% of the available trailer parking spaces were occupied during all dates the survey took place. The most popular period of use during the survey was observed in the summer of 2021.

6.3 Private jetties

The owners of private jetty facilities identified in the area of interest were unable to be contacted or did not respond to enquiries made by Transport for NSW so existing usage patterns were unable to be confirmed.

It is understood that the Viva Energy Australia jetty at Clyde (refer section 2.4.3) was recently used to remove tunnel spoil from the Sydney Metro Barangaroo station excavation and from the Blues Point Shaft. Tugs were used to guide two barges of 55 metre length per day, six days per week over a two-year period between 2018-2020. The current and proposed uses of this jetty are unknown.

6.4 Recreational use

As indicated in section 5.3, a number of rowing clubs are located along the shore downstream of the study area and towards Sydney Harbour.

According to a map accessed from the Rowing NSW website, rowing courses extend only as far as Homebush Bay in the east and do not extend into the area of interest for this report. The Parramatta River narrows substantially beyond Wentworth Point and interactions with ferry movements become more hazardous. While use by rowers and other recreational users cannot be ruled out, the section of river beyond Wentworth Point is more likely to be used by pleasure craft accessing the boat ramps at Silverwater and Ermington.

7. Potential impacts

This chapter describes the impacts to users and facilities within the area of interest, due to construction and operation. Mitigation measures to manage these impacts have been provided in Technical Paper 2 (Transport and Traffic).

7.1 Construction

7.1.1 Impacts on ferries and commercial operators

Ferries

The proposed use of barges to undertake major lifts and deck construction for sections of the bridges between the temporary working platforms would result in the navigation channel upstream of each bridge needing to be temporarily closed. For construction of the bridge between Camellia and Rydalmere, this would include two periods of about two months each and for the bridge between Melrose Park and Wentworth Point, the closure would be up to three months. It is unlikely that these closure periods would be able to be synchronised due to potentially different designs and scale of each bridge and these closures would affect different parts of the river (see Figure 2.4).

Bridge construction work would also be ongoing outside these defined closure periods requiring additional, incidental closures. It is likely that some of these works would also require short-term closures and result in additional impacts on ferry services and other commercial operations.

Ferries would be unable to operate between the Paramatta CBD, Rydalmere and Sydney Olympic Park wharves during the navigational channel closure periods, with all ferries terminating at Sydney Olympic Park Wharf. Alternate transport services would be needed for affected customers (about 645 each weekday and 903 each weekend). Alternative transport services are typically provided to ferry customers about 10 per cent of every year during periods of very low tides or when flooding debris is present in the river, therefore these closures are not considered to be a major impact on ferry customers.

Commercial operators

Only authorised commercial vessels are allowed to operate upstream of the existing Silverwater Road bridge. NSW Maritime do not keep formal record of authorisations provided and vessel traffic service facilities are not available on this section of the river. Therefore, records of usage and vessel ownership information are not available.

Commercial operators and owners of private jetties such as Viva Energy Australia and Lubrizol International Inc would be directly affected during the closure of the navigation channel due to construction of the bridge between Melrose Park and Wentworth Point, and would not be able to access their facilities. This may affect the ability for current Transport for NSW construction projects to barge excess spoil to Clyde for removal by road, as was recently conducted for the Sydney Metro: Chatswood to Sydenham project, and may also be being considered for the Western Harbour Tunnel project.

Access to pontoons stored on land upstream of Duck River for boat shows may also be affected if access is needed during a closure of the navigational channel at Wentworth Point.

Maintenance of ferry piers, upstream salvage works, removal of debris, works/maintenance of drainage outlets, private wharves, seawalls, utility bridges or other structures that are necessary to be undertaken from the water would also not be able to be undertaken during these periods, unless prior arrangements were made with the bridge contractor to provide ad hoc river access.

Assuming a need to access affected private facilities can be reasonably forecast in advance and that the barges moored in the navigation channel are able to be moved on occasion as needed, these potential impacts are considered to be low.

Ongoing and regular coordination would be required with affected stakeholders throughout the construction period to ensure safe navigation and minimise disruption to transport customers and commercial operators for upstream maintenance during periods when closures of the navigation channel are required.

7.1.2 Impacts to recreational activities

No recreational vessels are permitted to operate upstream of the Silverwater Road bridge. Further, there are no formal swimming sites, rowing or sailing clubs west of the Concord Road bridge or within the area of interest. The nearest would be the Concord & Ryde Sailing Club located about 700 metres downstream of the Concord Road bridge.

Rowing courses in the Upper Parramatta River are designated in the area between Huntley's Point and Homebush Bay, outside of the area of the river impacted by the project. While it is possible that informal use may occur to the west of this location, the river narrows appreciably upstream of Wentworth Point and it is therefore unlikely to be preferable for use compared to downstream locations, including the existing designated training areas and regatta courses. The impacts to recreational activities would therefore be only for the section of river between Wentworth Point and the Silverwater Road bridge, which would potentially affect fishing activities and access for users of the Silverwater Road Boat Ramp and Armory Wharf. Therefore, for fishing and potential rowing and yachting activities, the impact would be low to negligible given there is other and preferable areas for these activities to take place downstream of the bridge work areas.

Impacts from closure and inaccessibility to Sydney Harbour from boat ramps is considered in the section below.

7.1.3 Impacts on waterway facilities and assets

Closure of the navigation channel at Wentworth Point would restrict access for recreational boating activities to Sydney Harbour from both the Silverwater and Ermington boat ramps – the two westernmost boat ramps on the northern side of the Parramatta River. The Ermington Boat Ramp is proposed to be closed for a period of up to three years as a result of the construction of the bridge between Melrose Park and Wentworth Point and recreational boaters seeking to access Sydney Harbour would have to divert to the Silverwater (if the navigation channel at Wentworth Point is open) or Rhodes or Kissing Point boat ramps (if the navigation channel at Wentworth Point is closed). These two alternatives are around a 10 to 14 minute drive (approximately five kilometres) from the Ermington Boat Ramp.

As indicated in Table 2.2, considering the number of trailer parking spaces provided, neither of these other boat ramps would have sufficient capacity to offset the demand during the closure of Ermington Boat Ramp and when the Silverwater Boat Ramp would not provide downstream access to Sydney Harbour. As these two boat ramps are also preferentially used by boaters from the western suburbs of Sydney and the capacity limitations of the other two boat ramps in the near vicinity, this is considered a moderate to major impact to recreational boaters seeking to access the river.

Expansion of the existing trailer parking facilities at these ramps and/or other ramps in proximity to the works area may help to ameliorate some of the additional ramp demand that would be expected. Assuming this is able to be undertaken and that navigation channel closure does not occur during the peak spring/summer seasons, the impact might be considered moderate. Alternatively, investigation of opportunities for a temporary boat ramp during construction should also be undertaken.

Port marker 731 and starboard marker 727, both in the vicinity of the proposed bridge between Camellia and Rydalmere (refer Figure 2.2), are likely to be either directly impacted by bridge construction works or may restrict the movement/mooring of barges and may need to be removed to facilitate 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. If the temporary markers need to be removed at the end of construction, permanent markers may be replaced in consultation with NSW Maritime.

7.2 Operation

7.2.1 Impacts on future waterway use

Bridge between Camellia and Rydalmere

The design of the bridge between Camellia and Rydalmere would provide a horizontal clearance of 22.0 metres and vertical clearance of 7.6 metres above HAT (or 9.80 metres above chart datum). The nearest structures in an upstream and downstream direction are the Thackeray Street pedestrian and utility bridge and Silverwater Road respectively. Table 7.1 shows the relative design clearances for each bridge/structure in the area of interest.

Reference to the analysis presented in Table 7.2 indicates that the proposed bridge between Camellia and Rydalmere would not allow upstream passage of the SuperCats (air draft 9.07 metres). The RiverCats and HarbourCats (air draft 7.8 metres) would only be able to operate at HAT level with equipment removed or dismantled.

It is noted that tides at HAT levels or above are rare. The Mean High Water level (i.e. typical high tide) is approximately 0.7 metres below HAT. Both RiverCats and HarbourCats could operate at Mean High Water level or below in the existing configuration, without the need to remove or dismantle equipment.

River Class ferries which are being progressively introduced into service could operate under all tidal conditions (air draft 4.76 metres).

Of the commercial vessels identified, only vessels less than 7.1 metres air draft could navigate under the bridge at HAT. Other vessels would either have to remove, lower or dismantle equipment or navigate at lower tides. Additional crewing would be needed to dismantle masts, antennas, cranes, etc. which would lead to increased costs and make some fleet items uncompetitive. This would be particularly relevant to the larger vessels e.g. crane barges but some vessels may not have the ability to reduce their air draft at all because of their configuration. Vessels above 8.8 metres air draft would no longer be able to access the river upstream of Camellia except at tide levels below Mean Low Water level.

Given the semidiurnal nature of tides in the river and that most vessels could still safely navigate by either lowering/dismantling certain equipment and/or using tides lower than HAT to affect safe passage, this impact is considered low, noting that some vessels may no longer be able to pass safely or the operator may choose to withdraw them from servicing the part of the river upstream of Camellia.

Bridge between Melrose Park and Wentworth Point

The design of the bridge between Melrose Park and Wentworth Point has adopted a horizontal navigational clearance of 46.0 metres based on Australian and international standards for water-based transport as well the existing upstream and downstream constraints; being the T1 railway bridge at Rhodes and the Silverwater Road bridge. The existing navigational channel at Melrose Park/Wentworth Point (the section of the navigation channel deeper than two metres depth) is also not wide enough to accommodate larger horizontal widths without significant dredging and changes to the existing channel. The adopted horizontal navigational clearance width is sufficient to allow for one way movement of the largest current ferry (RiverCat) or commercial barges, or two way movement of the smaller River Class ferries and has been agreed with NSW Maritime.

While two ferries or barges are physically able to pass through the waterway currently, and the imposition of the new bridge would restrict this to one way movement, this manoeuvre is already restricted both upstream and downstream of the proposed bridge location and therefore is not considered a major change to existing navigation. It is also noted that generally there is no overlap of vessels passing under the T1 railway bridge at Rhodes and it is assumed that this would also be representative at the proposed bridge location.

The T1 railway bridge at Rhodes, downstream of the proposed bridge, sets a vertical (height) constraint on the passage of vessels upstream. The maximum clearance under the T1 railway bridge is 11.0 metres above HAT which is the same as proposed for the new bridge at Wentworth Point. Therefore, there is not considered to be any additional constraint on navigation by vessels beyond this bridge. Passage would be possible by all ferries at HAT levels or below, including the tallest ferry the SuperCat (air draft 9.07m).

Trailer yachts which are able to use the boat ramp at Ermington are likely to have air drafts less than 10.0 metres so there is not expected to be any impact on their passage beneath the proposed bridge.

There would be no impacts for commercial vessels with air drafts up to 10.5 metres at HAT levels or below. Details of the analysis conducted are shown in Table 7.2.

Table 7.1 Clearances to existing and proposed marine structures

Existing structure	Location	Horizontal clearance (m)	Vertical clearance (m)
Thackeray Street pedestrian and utility bridge	Upstream of proposed bridge between Camellia and Rydalmere	37.9	11.6 above HAT
Proposed bridge between Camellia and Rydalmere		*22.0*	*7.6* above *HAT*
Silverwater Road bridge	Downstream of proposed bridge between Camellia and Rydalmere/ upstream of proposed bridge between Melrose Park and Wentworth Point	58.9	11.7 above HAT
Proposed bridge between Melrose Park and Wentworth Point		*46.0*	*11.0* above *HAT*
T1 railway bridge, Rhodes (John Whitton Bridge)	Downstream of proposed bridge between Melrose Park and Wentworth Point	45.0	11.0 above HAT
Concord Road (Ryde) bridge	Downstream of T1 railway bridge	35.0 (upstream) 47.0 (downstream)	11.3 above HAT (upstream) 10.9 above HAT (downstream)

Source: Navionics Chart Viewer and RMS Boating Map

Table 7.2 Passage beneath proposed bridges based on vessel air draft

Vessel air draft (m)	Bridge between Camellia and Rydalmere 7.6m above HAT (9.8m relative to datum)		Bridge between Melrose Park and Wentworth Point 11.0m above HAT (13.2m relative to datum)	
	Vessel height at Mean Low Water (m)	Vessel height at HAT (m)	Vessel height at Mean Low Water (m)	Vessel height at HAT (m)
5.00	6.00	7.70	6.00	7.70
5.50	6.50	8.20	6.50	8.20
6.00	7.00	8.70	7.00	8.70
6.50	7.50	9.20	7.50	9.20
7.00	8.00	9.70	8.00	9.70
7.50	8.50	10.20	8.50	10.20
8.00	9.00	10.70	9.00	10.70
8.50	9.50	11.20	9.50	11.20
9.00	10.00	11.70	10.00	11.70
10.00	11.00	12.70	11.00	12.70
10.50	11.50	13.20	11.50	13.20
11.00	12.00	13.70	12.00	13.70

Notes: Assumes HAT=2.20 m, Mean Low Water level=0.5 m, Mean High Water level=1.5 m and safety margin of 0.5 m. Chart datum assumed. Refer Figure 2.1
Grey shaded cells indicates safe vessel passage beneath bridge structure may not be available
Table is for illustration purposes only. Not to be used to determine safe passage of vessels.

7.2.2 Impacts on waterway facilities and assets

Ermington boat ramp trailer parking

The design of the light rail alignment at Waratah Street, and the bridge between Melrose Park and Wentworth Point, would require the truncation of the existing Ermington Boat Ramp trailer parking area. The total number of boat trailer parking spaces would be reduced from 52 spaces (existing) to 42 spaces (proposed) representing a 19% reduction in the available supply.

Given that the Ermington boat ramp is currently at capacity during the seasonal peak, with the demand for the ramp frequently exceeding the available parking capacity in the summer months forcing cars and trailers to queue onto Wharf Road and park in local streets. Given a reduction in the available trailer parking supply, the likelihood and magnitude of overflow parking activity would likely increase as a result of the project.

The project design would continue to be refined at this location to minimise the number of trailer parking spaces lost due to the project. 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.

It is noted that the number of car parking spaces would remain as per the existing conditions with eight general access car spaces and two accessible car spaces.

8. Summary and conclusion

This report has been prepared as part of the EIS for the Parramatta Light Rail Stage 2 project. The objectives of this document were to:

– provide a general description of the Parramatta River hydrodynamic environment, existing facilities and usage
– assess the potential impacts of constructing and operating the two proposed bridges at Camellia and Wentworth Point on river users and facilities within the waterway.

The impacts of constructing the project are detailed in section 7.1 and can be summarised as follows:

– Ferry services would need to terminate at Sydney Olympic Park for three periods of between two to three months each during the construction period of the proposed bridges.
– Commercial operators and owners of private jetty facilities upstream of the bridge between Melrose Park and Wentworth Point would not be able to access their facilities in sections of the river during these periods, depending on location or by arrangement with Transport for NSW.
– The Ermington Boat Ramp would be closed for a period of three years for bridge construction works with demand redirected to other facilities such as at Silverwater, Blaxland Road and Kissing Point Park. Silverwater Boat Ramp may not be operational at the time, depending on the navigation channel closure at Camellia.

The impacts of the project during operation are detailed in section 7.2 and can be summarised as follows:

– The horizontal navigational clearance of 46.0 metres for the proposed bridge between Melrose Park and Wentworth Point would be sufficient for one-way movement of the largest current ferry class (RiverCat) or commercial barges, or two-way movement of the smaller River Class ferry and has been agreed with NSW Maritime.
– RiverCats and HarbourCats (air draft 7.8 metres) would only be able to operate at water levels at HAT level with equipment removed or dismantled beneath the proposed bridge between Camellia and Rydalmere. It is noted that both of these vessels could operate at Mean High Water (0.7 metres below HAT) or below in the existing configuration, without the need to remove or dismantle equipment.
– River Class ferries which are being progressively introduced into service could operate under all tidal conditions (air draft 4.76 metres).
– The area of operation for commercial barges or other vessels with air drafts greater than 7.1 metres at HAT level or 8.8 metres at Mean Low Water level would be restricted to downstream of the proposed bridge between Camellia and Rydalmere only. This may result in additional costs for some operators due to the need to manually remove/dismantle/lower fixed items to reduce the air draft of the vessel which could make them uncompetitive and unable to continue to perform operations upstream of Camellia.
– The trailer parking supply at the Ermington boat ramp would be reduced from 52 spaces (existing) to 42 spaces (proposed) resulting in a 19% reduction in the available supply. 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..

Mitigation measures to manage the impacts identified have been incorporated in Technical Paper 2 (Transport and Traffic), to which this report forms an appendix.

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