

10 Transport and traffic - Stage 1

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This chapter provides an assessment of the potential impact of Stage 1 on transport and traffic and identifies mitigation measures to address these impacts. This chapter draws on information in Technical Paper 1 (Transport and traffic).

10.1 Secretary’s Environmental Assessment Requirements

The Secretary’s Environmental Assessment Requirements relating to transport and traffic, and where these requirements are addressed in this Environmental Impact Statement, are outlined in Table 10-1.

Table 10-1: Secretary’s Environmental Assessment Requirements – Transport and traffic Stage 1

Reference	Requirement	Where addressed
5. Transport and Traffic		
5.1	Commitments made in Section 9.1.2 of the Scoping Report.	Sections 10.6 to Section 10.15 Refer to Table 2 of Appendix A for Scoping Report requirements
5.2	Transport and traffic (vehicle, pedestrian and cyclists) impacts of construction, including, but not necessarily limited to:	Section 10.4
	a. a considered approach to route identification and scheduling of construction vehicle movements;	Sections 10.6 to Section 10.15
	b. the indicative daily number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements) across the construction schedule;	
	c. the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements);	
	d. construction worker parking;	Section 10.5
	e. access constraints and impacts on public transport (infrastructure and services), pedestrians and cyclists and property; and	Sections 10.6 to Section 10.15
	f. the need to close, divert or otherwise reconfigure elements of the road, pedestrian and cycle network associated with construction of the project and the duration of these changes; and	
g. impacts to on-street parking, loading, servicing and pick up, including to residents and businesses.		

10.2 Legislative and policy context

The Transport for NSW Traffic Modelling Guidelines (2013) were developed to provide consistency in traffic modelling practice and promote high quality model outputs. The approach to traffic modelling for this assessment aligns with the Traffic Modelling Guidelines and includes the following broad steps:

- Development of calibrated and validated base models to align with existing operational conditions along each construction vehicle route
- Development of future year base models to align with anticipated operational conditions in the year of peak construction activity (2023), including road network changes as a result of the future Parramatta Light Rail (Stage 1) and the operation of WestConnex (M4 East)
- Application of anticipated construction traffic demands to the future year base models to allow the identification of potential impacts to road network performance.

10.3 Assessment approach

10.3.1 Method

Overview

The methodology includes assessing project wide construction transport and traffic impacts, across the Stage 1 corridor, followed by a detailed analysis of impacts surrounding each construction site. The project wide impacts considered include:

- Pedestrian, cyclist, motorist safety
- Emergency services access
- Major special events
- Construction worker parking
- Spoil transport options.

The assessment methodology for construction transport and traffic impacts at each Stage 1 construction site considered five core components:

- Active transport network (pedestrians and cyclists)
- Public transport services
- Road network performance
- Parking
- Property access.

The method of assessment and assessment outputs for each of these components are summarised in Table 10-2. The modelling methodology for road traffic is described in more detail in Technical Paper 1 (Transport and traffic).

Table 10-2: Overview of approach to the construction transport and traffic assessment

Assessment component	Method of assessment	Assessment output
Active transport network	Analysis of changes to shared user paths, cycle ways, footpaths and pedestrian crossings.	Qualitative assessment of impacts on pedestrian and cycling networks and accessibility.
Public transport services	Analysis of changes to public transport routes and public transport stops, and service timeliness and efficiency.	Qualitative assessment of impacts on public transport performance (increase or decrease in travel times).
Road traffic	Analysis of road network performance based on traffic modelling.	Quantitative assessment of road network performance with and without Stage 1 construction traffic.
Parking	Analysis of number of removed parking spaces and availability of comparable alternative parking in nearby locations.	Qualitative assessment of parking availability during Stage 1 construction.
Property access	Analysis of existing access provisions and a comparison with access provisions during construction.	Qualitative assessment of property access during construction of Stage 1.

Consultation has been undertaken with other relevant parts of Transport for NSW including Transport Coordination.

Road traffic assessment methodology

The construction traffic impact assessment is based on the analysis of existing traffic movements on the road network near each Stage 1 construction site to determine the current operational performance and model future operational performance without Stage 1. Construction traffic from Stage 1 was then added to the existing network and analysed to identify potential impacts. The approach to traffic modelling carried out for this assessment aligns with the Transport for NSW Traffic Modelling Guidelines (2013).

For the purposes of this assessment, it was assumed that all spoil would be transported from each Stage 1 construction site by truck. As such, this assessment provides a potential worst-case assessment of road-based traffic. The use of other methods of transport, such as train or barge, may be possible subject to further investigation which would reduce the potential road traffic impacts as described in this chapter. Refer to Chapter 9 (Stage 1 description).

Consistent with the standard approach for traffic assessments on major infrastructure projects, traffic modelling was carried out for the AM (7-9 am) and PM (4-6 pm) peak periods only. These peak traffic periods represent a worst-case scenario because during these periods the road network experiences the maximum background traffic demand and the available spare capacity on the road network is at its most limited.

To assess the impact of the construction activities on the road network performance, intersections along the proposed construction routes between Stage 1 construction sites and the arterial road network were assessed using Aimsun modelling software. Vissim modelling software was used for The Bays Station construction site to provide consistency with existing modelling carried out for other major transport infrastructure projects in the Rozelle area. The main performance indicators for the modelling software was Intersection level of service (LoS) which measures the overall performance of the intersection. For this purpose, average delay from *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002) was used. Criteria for these performance indicators are provided in Table 10-3. Additional intersection performance indicators are report in Technical Paper 1 (Transport and traffic).

Table 10-3: Level of service criteria

Level of service	Average delay (seconds per vehicle)	Traffic signals and roundabout operations
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals incidents will cause excessive delays
F	Greater than 70	Exceeds capacity; roundabouts require other control mode

Cumulative impact assessment methodology

Cumulative impacts have been assessed through a qualitative analysis and the use of traffic modelling (where available) to determine the performance of the road network with construction vehicle movements associated with other major projects expected to be occurring at the same time as Stage 1 based on current publicly available information.

10.3.2 Assumptions

Construction hours

As identified in Chapter 9 (Stage 1 description), tunnelling and station excavation activities would be carried out up to 24 hours per day and seven days per week. These activities would require construction vehicles for material supply and spoil removal, to also occur up to 24 hours per day and seven days per week.

The proposed timing of vehicle movements throughout the day for each construction site is identified for each construction site in Sections 10.6 to 10.15. The development of these truck movements has aimed to minimise movements during the AM (7-10 am) and PM (4-6 pm) peak traffic periods and during the night-time period.

Construction vehicles

Table 10-4 identifies the truck type for each Stage 1 construction site for spoil transport and the delivery of construction materials and equipment that has been assumed in the assessment. In some locations (such as at North Strathfield and Five Dock), further assessment is being undertaken to determine the suitability of using rigid truck and dog trailers.

Table 10-4: Construction vehicle types

Construction site	Truck type ¹
Westmead metro station	Rigid truck and/or truck and dog
Parramatta metro station	Rigid truck and/or truck and dog
Clyde stabling and maintenance facility	Rigid truck and/or truck and dog
Silverwater services facility	Rigid truck and/or truck and dog
Sydney Olympic Park metro station	Rigid truck and/or truck and dog
North Strathfield metro station	Rigid truck and/or truck and dog
Burwood North Station	Rigid truck and/or truck and dog Medium rigid truck
Five Dock Station	Rigid truck and/or truck and dog
The Bays Station	Rigid truck and/or truck and dog

Note 1: A truck and dog is the common term for a tipper truck and trailer.

10.4 Avoidance and minimisation of impacts

The design development of Stage 1 has included a focus on avoiding or minimising potential transport and traffic impacts. This has included:

- Minimising rail corridor works to reduce disruption to existing train stations and the T1 Western Line and T9 Northern Line operations
- Modifying the design to minimise impacts to existing commuter car parking around Westmead Station and town centre
- Locating the Parramatta metro station away from the existing Parramatta Station to avoid disrupting Sydney Trains operations at one of the busiest stations on the suburban rail network
- Adopting a cavern typology at Five Dock Station to minimise impacts to Great North Road
- Selecting tunnel boring machine launch, retrieval and support sites to allow tunnel spoil and transport of other materials to be managed away from busy CBD locations. Haulage routes have been developed to provide the most efficient route to the arterial road network
- Developing haulage routes in consultation with relevant sections of Transport for NSW including Transport Coordination that would minimise the use of local roads and use the most efficient route to the arterial road network.

10.5 Project wide impacts

10.5.1 Existing regional transport and traffic environment

The existing transport and traffic environment is considered from a regional perspective in Section 8.1.3 of Chapter 8 (Concept environmental assessment).

10.5.2 Pedestrian, cyclist and motorist safety

Access and egress arrangements at construction sites have been developed with consideration of pedestrian, cyclist and motorist safety. For example, the need for construction vehicles to perform a right turn to or from an arterial road to access a construction site has been avoided where possible.

Appropriate controls would be established where vehicles are required to cross footpaths to access construction sites. This may include manual supervision, physical barriers or temporary traffic signals as required. Road safety reviews or audits would be carried out at each of the construction site.

Options to further enhance pedestrian, cyclist and motorist safety near construction sites are currently being considered. This includes consideration of measures such as:

- Assessing the suitability of construction haulage routes through sensitive land use areas with respect to road safety
- Deployment of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers
- Providing community education and awareness about sharing the road safely with heavy vehicles
- Specific construction driver training to understand route constraints, safety and environmental considerations such as sharing the road safely with other road users and limiting the use of compression braking
- Requiring the use of technology and equipment to improve vehicle safety, eliminate heavy vehicle blind spots, and monitor vehicle location and driver behaviour.

The introduction of additional heavy vehicles on the road network may introduce safety risks to pedestrians, cyclists and other motorists, especially where there is an increased likelihood for interaction with pedestrians and cyclists.

Key locations where pedestrian and cyclist safety issues may arise include:

- Construction site access and egress points where construction vehicles would interface with pedestrians using surrounding footpaths. This would be especially important in Westmead, Parramatta, Sydney Olympic Park, North Strathfield and Five Dock, where there are high volumes of pedestrians
- Construction sites where access and egress points, or construction vehicle routes would interface with marked cycle routes. This would occur at the Parramatta metro station, Sydney Olympic Park metro station, Burwood North Station, and Five Dock Station construction sites
- Locations where footpath widths are reduced around construction sites.

10.5.3 Emergency services access

The introduction of construction traffic is anticipated to result in minor impacts to the surrounding intersection performance. As such, there is not anticipated to be any substantial change to emergency vehicle access, except at the Westmead metro station construction site. Construction sites would be arranged so that emergency vehicle access to nearby buildings and the surrounding areas is maintained. Construction sites may also be made available for emergency vehicle passage if required. Consultation would be carried out with emergency service providers in relation to changed traffic conditions. This is particularly important in Westmead due to the close proximity of the Westmead metro station construction site to the Westmead health precinct.

10.5.4 Major special events

A large number of special events occur within the Parramatta CBD and Sydney Olympic Park precinct. Special events are also held at the Rosehill Gardens racecourse and sporting events are held at Leichhardt Oval.

The Transport for NSW special events management guidelines 2018, identifies the following classes of special events:

- Class 1: an event that impacts major transport systems and traffic and there is significant disruption to the non-event community. For example, an event that affects a principal transport route in Sydney, or one that reduces the capacity of the main highway through a country town
- Class 2: is an event that impacts local transport systems and traffic and there is low scale disruption to the non-event community. For example, an event that blocks off the main street of a town or shopping centre but does not impact a principal transport route or highway
- Class 3: is an event with minimal impact on local roads and negligible impact on the non-event community. For example, an on-street neighbourhood Christmas party
- Class 4: is an event that is conducted entirely under Police control (but is not a protest or demonstration). For example, a small march conducted with a Police escort.

Liaison would occur with event organisers of Class 1 and 2 events, and (as relevant) Transport for NSW including Transport Coordination, to provide appropriate management of construction vehicle movements to address potential impacts to event patrons, the public and the construction works. This may involve measures such as temporary adjustment to construction vehicle routes, construction working hours or potentially stopping works for the duration of the event.

Construction activities on road corridors would require a Road Occupancy Licence to close the road or lane for any period. The granting of a Road Occupancy Licence would generally be subject to network operation restrictions, which would preclude road closures during high-activity holidays such as New Year's Eve, or during the set up and pack down times for major events such as sports grand finals or during major road closures. Special events and the impact to transport and traffic is particularly important around the Parramatta metro station construction site and the Sydney Olympic Park metro station construction site.

Major special events near the Parramatta metro station construction site are shown in Table 10-5.

Table 10-5: Major special events in the Parramatta CBD

Indicative month	Event	Location
December/January	New Year's Eve	Centenary Square
January	Australia Day	Parramatta Park
February	Lunar New Year	Centenary Square
February	Tropfest	Parramatta Park
March	Parramasala	Prince Alfred Square
July	Winterlight Festival	Prince Alfred Square
July	Burrumbidgee NAIDOC	Parramatta River Foreshore
October	Parramatta Lanes Festival	Throughout Parramatta CBD
November	Loy Krathong: Thai Water Festival	Parramatta River Foreshore
November	Christmas in Parramatta	Centenary Square
Year-round	Various sporting events	Western Sydney Stadium

There are more than 5,000 events of varying size held each year at Sydney Olympic Park, with the existing Sydney Olympic Park Station being a major transport focus for access to and from these events. Larger events held within the precinct are shown in Table 10-6.

Table 10-6: Major special events in Sydney Olympic Park

Indicative month	Event	Location
April	Sydney Royal Easter Show	Sydney Showground
June	Supanova Comic Con and Gaming	Sydney Showground
January	The Sydney International	Sydney Olympic Park Tennis Centre
January	Sydney Festival	Sydney Olympic Park
Year-round	Music concerts	Throughout Sydney Olympic Park
Year-round	Football matches (Rugby Union, Rugby League, Australian Football League)	ANZ Stadium
Year-round	Soccer matches	ANZ Stadium
Year-round	Other sporting events	Various stadiums, Arenas and centres

10.5.5 Construction worker parking

Due to the generally constrained nature of the construction sites, car parking for construction workers would not be provided at most of the Stage 1 construction sites. With the exception of the Clyde stabling and maintenance facility construction site, each Stage 1 construction site would typically provide a limited number of parking spaces intended to be used by trade vehicles or other light vehicles that are required for travel between construction sites.

Most construction sites are near public transport services and construction workers would be encouraged to use these services. At The Bays Station construction site, the feasibility of providing shuttle bus services to transfer construction workers to and from major transport interchange(s) would be considered.

10.5.6 Spoil transport options

Road would be the primary transport method for transporting spoil from most construction sites. Road transport is considered feasible for all construction sites due to their location directly adjacent to the existing road network, in particular the proximity to the motorway and arterial road network. Opportunities to reuse spoil at the Clyde stabling and maintenance facility construction site would be maximised to minimise the number of required road based trips.

Other options for the transport of spoil by barge and trains have also been considered and are discussed further in Chapter 3 (Sydney Metro West development and alternatives).

10.6 Westmead metro station construction site

10.6.1 Existing environment

The Westmead metro station construction site is bound by Hawkesbury Road, Bailey Street, Hassall Street and the existing rail corridor. The location of the construction site and the surrounding transport network are shown on Figure 10-1.

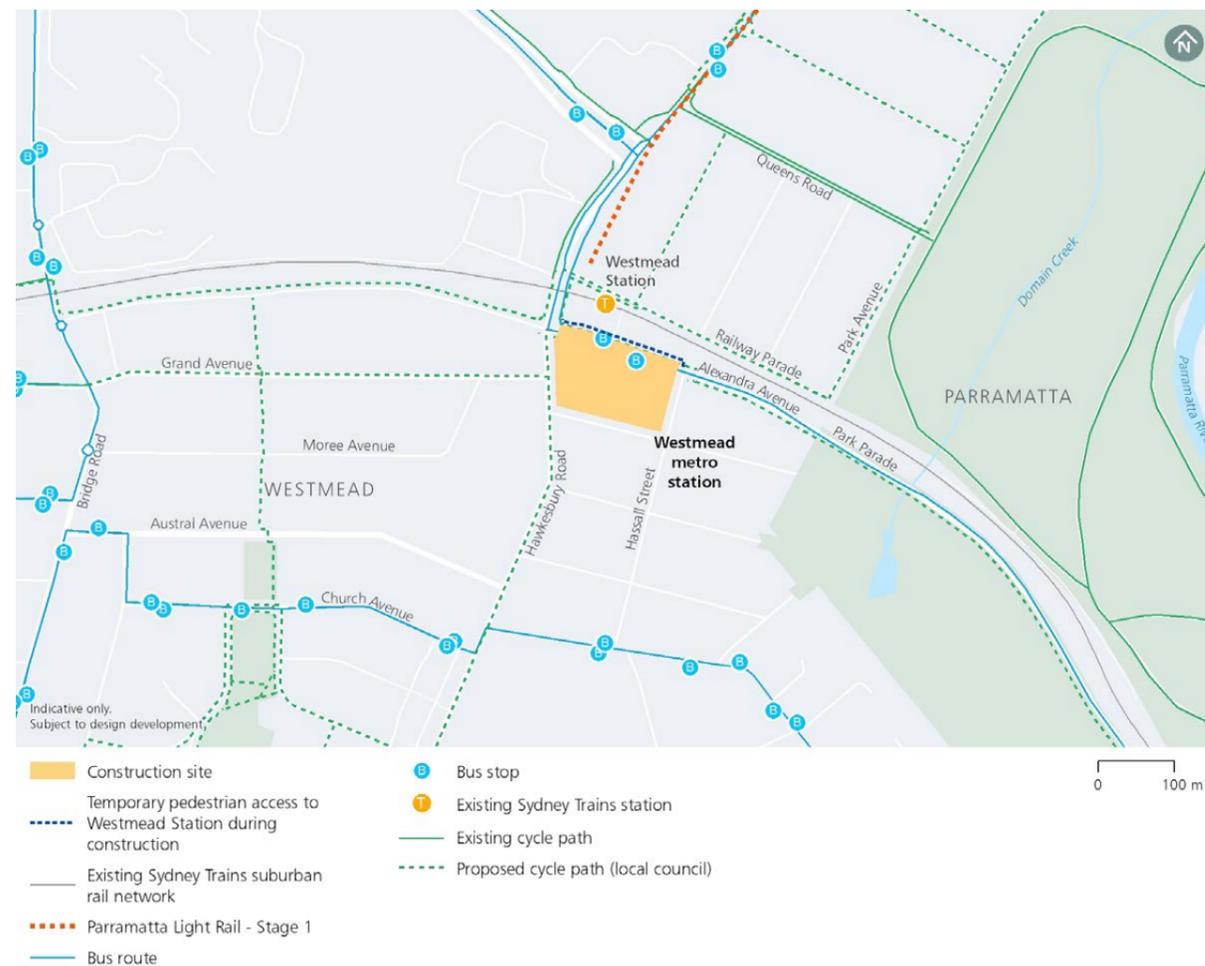


Figure 10-1: Westmead metro station construction site transport network

Active transport network

Footpaths are provided along all roads near the construction site. High levels of pedestrian activity occur around the existing Westmead Station and the Westmead health and education precinct located about 400 metres north of the construction site. Darcy Road is a signposted High pedestrian activity area between east of Bridge Road and Hawkesbury Road.

Pedestrian crossings are provided at the following locations:

- Signalised crossings at the Hawkesbury Road/Alexandra Avenue intersection, the Hawkesbury Road/Railway Parade intersection and Hawkesbury Road/Darcy Road intersections (including a staged pedestrian crossing on the western approach of the Hawkesbury Road/Darcy Road intersection to accommodate bus lanes)
- Zebra crossings across Queens Road, across Railway Parade and across Hawkesbury Road (adjacent to Westmead Hospital car park and emergency area).

The cycle network surrounding the construction site includes:

- On-road route along Queens Road and within Parramatta Park
- Off-road shared paths on Mons Road, Darcy Road and Hawkesbury Road
- A separated on-road bicycle lane on the north side of Queens Road
- A marked cycle path adjacent to the zebra crossing across Hawkesbury Road near Queens Road
- Bicycle racks and lockers located on Railway Parade and Alexandra Avenue near Westmead Station.

Public transport services

A summary of the public transport services around the Westmead metro station construction site is provided in Table 10-7.

Table 10-7: Westmead metro station construction site existing public transport services

Public transport mode	Description
Rail	<ul style="list-style-type: none"> • Sydney Trains suburban rail network – T1 Western Line and T5 Cumberland Line • NSW TrainLink network – Blue Mountains Line • The future Parramatta Light Rail (Stage 1) including a Westmead Station stop (currently under construction)
Bus	<ul style="list-style-type: none"> • 14 bus routes (including two NightRide bus routes) • 17 school bus routes • One bus transitway (North-West Transitway) • Major bus stops on Darcy Road, Hawkesbury Road, Alexandra Avenue and Park Parade

Road traffic volume and patterns

The Great Western Highway is a major arterial road that carries a high volume of traffic through the road network surrounding the construction site. Hawkesbury Road (collector road) and Alexandra Avenue (sub-arterial road) form part of the North-West Transitway bus rapid transit route near the construction site. Key local roads near the construction site include Hassall Street (local road) and Railway Parade (local road).

During the morning peak hour, higher traffic volumes are experienced on the following routes near the construction site:

- Eastbound traffic on the Great Western Highway and Alexandra Avenue
- Northbound traffic on Hawkesbury Road and Hassall Street.

During the evening peak hour, higher traffic volumes are experienced on the following routes near the construction site:

- Westbound traffic on the Great Western Highway and Alexandra Avenue
- Southbound traffic on Hawkesbury Road and Hassall Street.
- The existing traffic volumes on the surrounding road network are provided in Table 10-8.

Table 10-8: Westmead metro station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Alexandra Avenue east of Hawkesbury Road	Eastbound	520	430
	Westbound	410	520
Great Western Highway west of Hawkesbury Road	Eastbound	1,770	1,100
	Westbound	1,100	2,570
Grand Avenue west of Hawkesbury Road	Eastbound	130	10
	Westbound	60	90
Bailey Street east of Hawkesbury Road	Eastbound	40	40
	Westbound	60	210
Hawkesbury Road south of Alexandra Avenue	Northbound	760	440
	Southbound	390	620
Hassall Street south of Alexandra Avenue	Northbound	520	130
	Southbound	160	450
Bridge Road north of Grand Avenue	Northbound	670	480
	Southbound	490	600

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections near the Westmead metro station construction site is shown in Table 10-9.

The existing performance of Hawkesbury Road/Grand Avenue and Hawkesbury Road/Bailey Street is due to these intersections not being signalised where the worst movement is reported, which for both intersections corresponds to vehicles turning out of Grand Avenue or Bailey Street onto Hawkesbury Road. Grand Avenue and Bailey Street are minor roads and therefore vehicles must give way to vehicles travelling on Hawkesbury Road. In addition, northbound queues at these intersections are the result of downstream queues from the Hawkesbury Road / Alexandra Avenue intersection.

High traffic volumes on most approaches at the Hawkesbury Road/Great Western Highway/Coleman Street intersection contributes to its existing performance during both peak hours.

At the Bailey Street / Hassall Street intersection, existing queuing along Hassall Street is the result of downstream queues from the Alexandra Avenue / Hassall Street intersection (northbound) and the Hawkesbury Road / Bailey Street intersection (westbound), due to vehicles avoiding the Hawkesbury Road / Alexandra Avenue intersection.

Table 10-9: Modelled peak hour existing intersection performance – Westmead metro station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Hawkesbury Road/Alexandra Avenue	Morning	2,310	36	C
	Evening	2,259	45	D
Hawkesbury Road/Grand Avenue	Morning	1,264	79	F
	Evening	1,349	47	D
Hawkesbury Road/Bailey Street	Morning	1,246	25	B
	Evening	1,420	80	F
Hawkesbury Road/Priddle Street	Morning	1,245	10	A
	Evening	1,269	7	A
Hawkesbury Road/Amos Street	Morning	1,386	10	A
	Evening	1,388	45	D
Hawkesbury Road/Great Western Highway/Coleman Street	Morning	3,605	66	E
	Evening	3,825	>100	F
Bailey Street/Hassall Street	Morning	708	16	B
	Evening	646	5	A
Alexandra Avenue/Hassall Street	Morning	1,426	22	B
	Evening	1,405	13	A
Alexandra Avenue/Bridge Road	Morning	1,549	23	B
	Evening	1,422	10	A
Bridge Road/Grand Avenue	Morning	1,626	21	B
	Evening	1,408	46	D

On-street parking, loading, servicing and pick-up arrangements

On-street parking is provided on both sides of most local roads and is generally time-restricted to two hours on weekdays and Saturdays. Near the construction site, on-street parking is provided on the eastern side of Hawkesbury Road south of Alexandra Avenue. On-street parking is not provided on Alexandra Avenue between Hawkesbury Road and Hassall Street and on Hawkesbury Road between Alexandra Avenue and Queens Road. East of Hassall Street, on-street parking is provided along the southern side of Alexandra Avenue. North of the rail line, unrestricted 90-degree parking is provided along the southern side of Railway Parade, primarily serving commuters using Westmead Station.

Point to point transport service zone is located on the northern side of Railway Parade between Hawkesbury Road and Ashley Lane and a mail zone is located on the northern side of Alexandra Avenue near the existing Westmead Station entrance. There are no kiss and ride or loading zones on the roads immediately surrounding the construction site.

10.6.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-2 and Figure 10-3 respectively.

The proposed primary haulage route is shown in Figure 10-4. Access to and egress from the construction site would be left in from Bailey Street and left out to Hawkesbury Road. The primary haulage route uses Hawkesbury Road to access the M4 Western Motorway to the south.

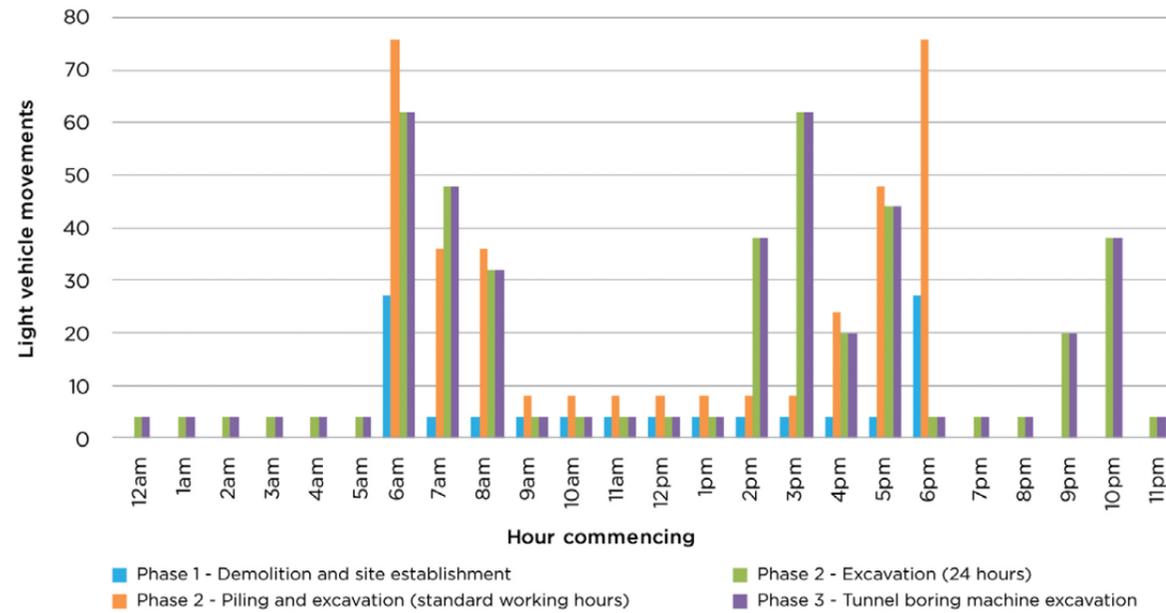


Figure 10-2: Hourly light vehicle movements at the Westmead metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

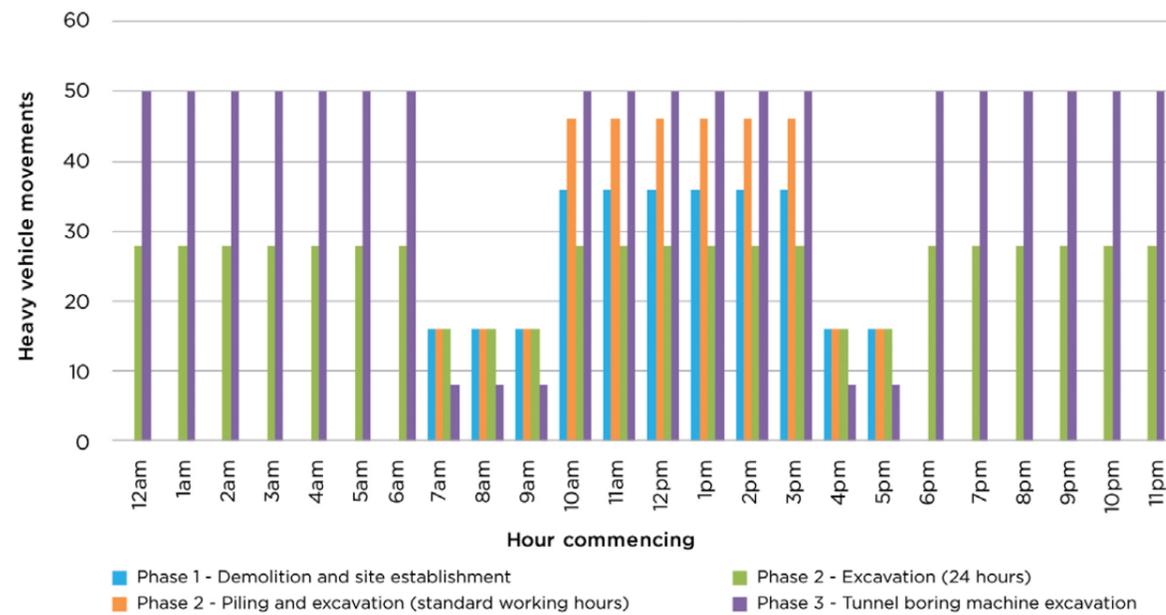


Figure 10-3: Hourly heavy vehicle movements at the Westmead metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

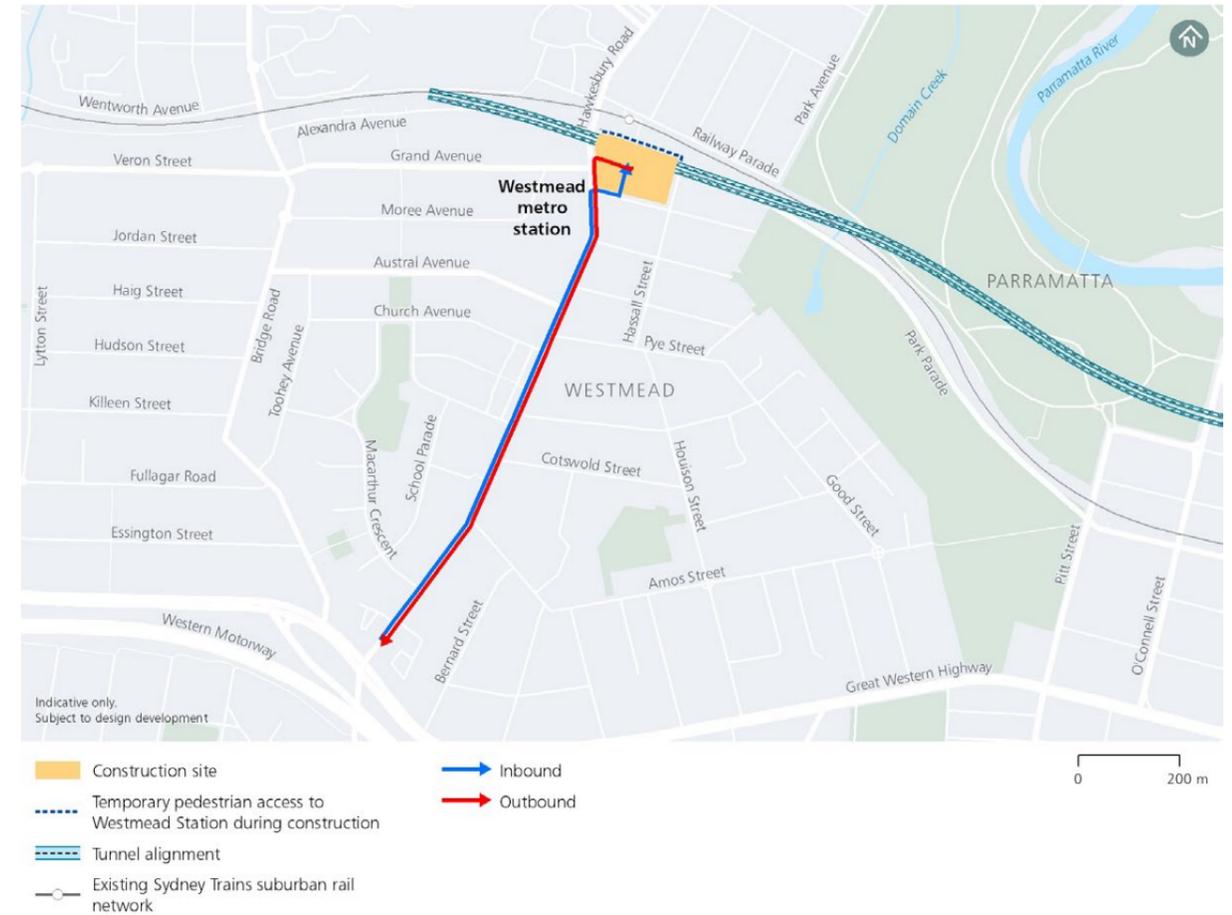


Figure 10-4: Westmead metro station construction site primary haul route

Active transport network

Overall, impacts to the pedestrian network would be minimal. East-west connectivity along the northern side of the construction site, and access to the existing Westmead Station would be maintained via a temporary pedestrian footpath, although there may be some periods when pedestrian access to the southern entrance to the existing Westmead Station would be restricted.

Existing signalised pedestrian crossings at modified intersections including Hawkesbury Road/Alexandra Avenue and Alexandra Avenue/Hassall Street would be maintained. The introduction of traffic signals and signalised pedestrian crossings at the Hawkesbury Road/Bailey Street intersection and Bailey Street/Hassall Street intersection would improve conditions for pedestrians.

Footpaths on both sides of Alexandra Avenue between Hawkesbury Road and Hassall Street would be temporarily closed during construction.

The bicycle racks and lockers located on the northern side of Alexandra Avenue near the existing Westmead Station may be temporarily relocated. If required, these facilities would be relocated close to their current location and therefore the potential impact to cyclists is expected to be minor.

Public transport services

A summary of the potential impacts to public transport services around the Westmead metro station construction site is provided in Table 10-10.

Table 10-10: Westmead metro station construction site public transport impacts

Public transport mode	Impact description
Rail	<ul style="list-style-type: none"> No impact to services. If works are required within the rail corridor, these works would be carried out during rail track possessions.
Bus	<ul style="list-style-type: none"> Potential temporary minor increase in travel time due to additional construction vehicles on the road network Minor temporary impact as buses currently travelling along Alexandra Avenue east of Hawkesbury Road would be detoured along Hassall Street, Bailey Street and Hawkesbury Road Minor temporary impacts as bus stops on Alexandra Avenue between Hawkesbury Road and Hassall Street would be relocated. Some customers may be required to walk an additional distance to alternative bus stops. The location of the relocated bus stops would be determined in consultation with Transport for NSW, City of Parramatta, and relevant bus operators.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods and during school drop off and pick up periods.

Stage 1 would result in both temporary and permanent impacts on the surrounding road network.

Alexandra Avenue would be closed between Hassall Street and Hawkesbury Road during Stage 1 construction works and traffic would be temporarily diverted via Hassall Street and Bailey Street, with new and altered traffic signals provided where required.

At the end of Stage 1 construction works at the Westmead metro station construction site, Alexandra Avenue would be permanently realigned between Hassall Street and Hawkesbury Avenue, including a new signalised intersection at Alexandra Avenue, Hawkesbury Road and Grand Avenue.

Impacts associated with the temporary road network changes

Figure 10-5 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1, for the temporary road network arrangement. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Analysis of modelled intersection performance results shows that at some locations, changes to the road network to accommodate construction activities and the addition of construction traffic would result in an improvement in intersection performance.

Modification of the Hawkesbury Road/Alexandra Avenue intersection would improve its efficiency and overall intersection performance, and would lead to lower delays at the Hawkesbury Road/Grand Avenue and Hawkesbury Road/Bailey Street intersections. Similarly, modification of the Alexandra Avenue/Hassall Street intersection would result in lower delays to vehicles as the only conflicting movement is when a pedestrian phase is called during a signal cycle.

The improved performance of the Alexandra Avenue/Bridge Road intersection is due to Alexandra Avenue carrying a lower number of vehicles during construction, as (depending on destination) some detoured vehicles would preference Grand Avenue when travelling west of Hawkesbury Road.

The closure of Alexandra Avenue between Hawkesbury Road and Hassall Street would require vehicles to be temporarily rerouted via Hassall Street, Bailey Street and Hawkesbury Road, resulting in an additional travel distance of about 150 metres. This is a minor impact due to the small increase in travel distance and resultant small increase in travel time.

Modelled intersection performance with construction traffic indicates that the following intersections would experience a temporary reduced level of service:

- Hawkesbury Road/Priddle Street during the morning and evening peak hour. This is due to the closure of Alexandra Avenue, resulting in vehicles performing a detour. The majority of detoured vehicles would travel on Bailey Street, however some would instead travel on Priddle Street. This intersection would still operate with spare capacity with the addition of construction traffic

- Hawkesbury Road/Amos Street during the morning and evening peak hour. This intersection would still operate with spare capacity with the addition of construction traffic during the morning peak hour. During the evening peak hour, the deterioration in performance is due to downstream congestion emanating from the Hawkesbury Road/Great Western Highway/Coleman Street intersection
- Bailey Street/Hassall Street during the morning peak hour. As discussed above, this is due to most detoured vehicles traveling on Bailey Street while Alexandra Avenue is closed. This intersection would still operate with spare capacity with the addition of construction traffic.

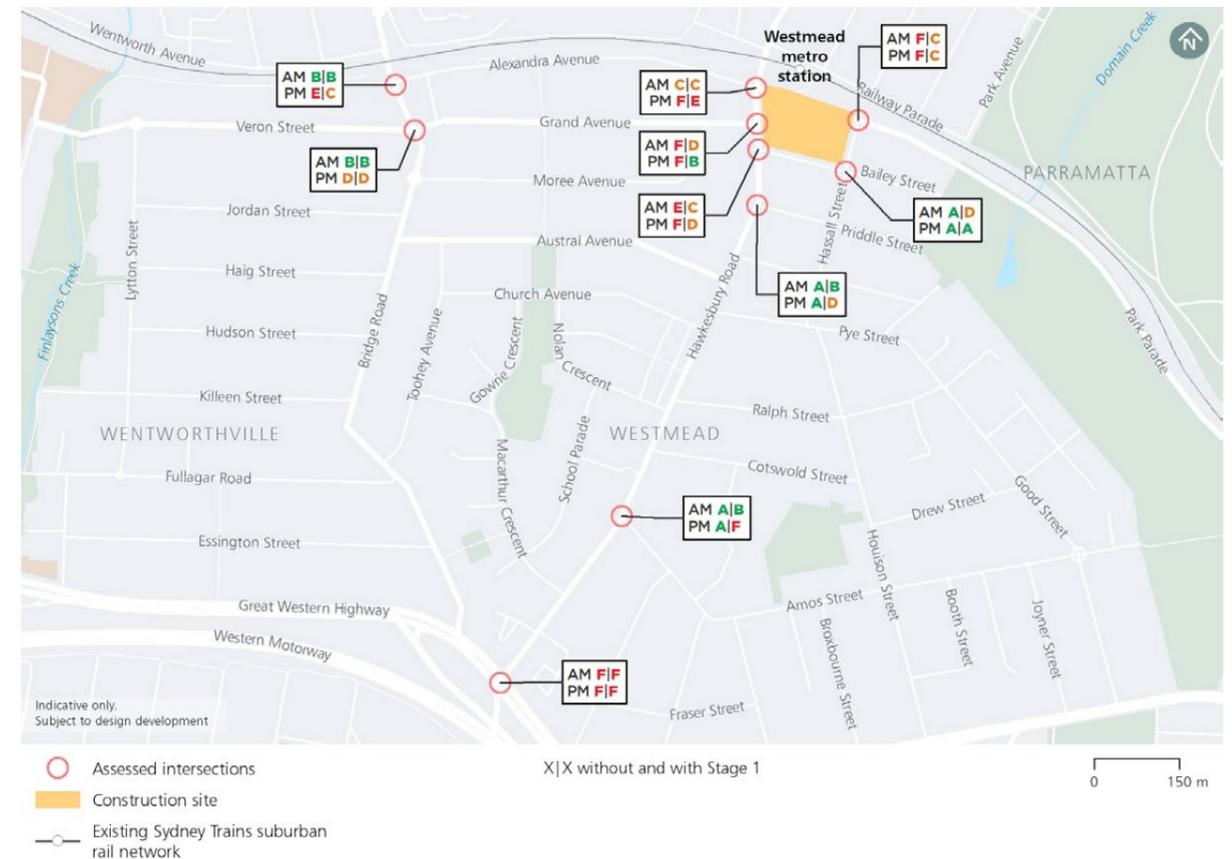


Figure 10-5: Westmead metro station construction site intersection performance (2023) (temporary)

Impacts associated with the permanent road network changes

Following station excavation and tunnelling works at Westmead metro station construction site, Alexandra Avenue would be permanently realigned to form a new intersection at Hawkesbury Road with Grand Avenue. Figure 10-6 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1, for the permanent road network arrangement. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Analysis of modelled intersection performance results shows that at some locations, the permanent realignment of Alexandra Avenue would result in an improvement in intersection performance. This is forecast to occur at the following intersections:

- Hawkesbury Road/Alexandra Avenue during the evening peak hour – from level of service F to A
- Hawkesbury Road/Grand Avenue during the morning and evening peak hour – from level of service F to C
- Hawkesbury Road/Bailey Street during the morning and evening peak hour – from level of service E to C and F to E, respectively
- Alexandra Avenue/Hassall Street during the morning and evening peak hour – from level of service F to B
- Bridge Road/Grand Avenue during the evening peak hour – from level of service D to C.

The permanent realignment of Alexandra Avenue would lead to a reduction in traffic on Hassall Street, Bailey Street and Alexandra Avenue west of Hawkesbury Road, reducing overall delays experienced at intersections along Hawkesbury Road at Alexandra Avenue, Grand Avenue and Bailey Street, and at the Alexandra Avenue/Hassall Street intersection.

Modelled intersection performance with construction traffic indicates that the following intersections would experience a reduced level of service:

- Hawkesbury Road/Priddle Street during the morning and evening peak hour – from level of service A to B and A to C, respectively. This intersection would still operate with spare capacity
- Alexandra Avenue/Bridge Road during the morning and evening peak hour – from level of service B to C and E to F, respectively. This intersection would still operate with spare capacity in the morning peak. The impact in the evening peak is due to additional vehicles travelling along Grand Avenue, and the Grand Avenue/Bridge Road intersection accommodating a higher number of vehicles with increased queue lengths on most approaches. This would result in congestion on the westbound approach of the adjacent Alexandra Avenue/Bridge Road intersection. Potential opportunities to mitigate the impacts at this intersection would be determined in consultation with relevant parts of Transport for NSW and Cumberland City Council and may include local area traffic management changes, intersection turning bans and similar
- Bridge Road/Grand Avenue during the morning peak hour – from level of service B to C. This intersection would still operate with spare capacity.



Figure 10-6: Westmead metro station construction site intersection performance (2023) (permanent)

Parking

The combined loss of on-street parking spaces would have minor impacts given the availability of parking on other local roads nearby.

On-street parking spaces would be temporarily removed along Hassall Street and Bailey Street adjacent to the construction site (about 10 parking spaces on each road). To accommodate signalisation, some additional parking spaces may be permanently removed at the Hawkesbury Road/Bailey Street (about four parking spaces) and Hassall Street/Bailey Street intersections (about 10 parking spaces).

Emergency vehicle access

Emergency response services, particularly those travelling to and from the Westmead health precinct may also be impacted by the closure of Alexandra Avenue. Emergency response vehicles that would have previously used Alexandra Avenue to travel between the Westmead health precinct and Parramatta CBD would be diverted onto Bailey Street and Hassall Street. Emergency services (Ambulance, Fire & Rescue and Police) would be consulted about the proposed road network changes during construction. The potential for ambulance services to travel through the site in specific circumstances would be further investigated during detailed construction planning.

10.7 Parramatta metro station construction site

10.7.1 Existing environment

The Parramatta metro station construction site would be located at Horwood Place and within the block bound by George Street, Church Street, Macquarie Street and Smith Street.

The location of the construction site and the surrounding transport network are shown on Figure 10-7.



Figure 10-7: Parramatta metro station construction site transport network

Active transport network

Footpaths are provided along both sides of all roads near the construction site. High levels of pedestrian activity occur around the existing Parramatta Station, bus interchange and Westfield Parramatta shopping centre. Church Street is the main north-south pedestrian route and includes a pedestrian only zone between Macquarie Street and Darcy Street. Phillip Street, George Street, Macquarie Street, Darcy Street, Hassall Street and Argyle Street provide the main east-west pedestrian routes between Parramatta Park, the Parramatta CBD and Harris Park.

Signposted high pedestrian activity areas near the construction site include:

- Church Street between Palmer Street and Macquarie Street
- Phillip Street between Marsden Street and Charles Street
- Charles Street between Phillip Street and George Street
- Horwood Place between George Street and Macquarie Street.

Pedestrian crossings are provided at the following locations:

- Signalised crossings at the Church Street/George Street intersection, the George Street/Smith Street intersection, the Macquarie Street/Smith Street intersection, the Church Street/Macquarie Street intersection, and across Macquarie Street between Church Street and United Lane
- Zebra crossings across Horwood Place and across the access road on the southern side of Macquarie Street between Horwood Place and Smith Street.

The cycle network surrounding the construction site includes:

- On-road east-west cycle route along Phillip Street, George Street and Macquarie Street, connecting to shared paths along O'Connell Street, Elizabeth Street and Macarthur Street to Parramatta River and Parramatta Park
- On-road north-south cycle routes along O'Connell Street, Horwood Place, Elizabeth Street, Smith Street and Church Street.

In the future, the active transport network will be modified in Parramatta CBD as part of the future Parramatta Light Rail (Stage 1). These changes include new pedestrian zones on Church Street and Macquarie Street, modification of scramble and midblock pedestrian crossings surrounding the construction site on Church Street, Macquarie Street, George Street and Smith Street, and adjustments to cycle routes on Macquarie Street.

Public transport services

A summary of the public transport services around the Parramatta metro station construction site is provided in Table 10-11.

Table 10-11: Parramatta metro station construction site existing public transport services

Public transport mode	Description
Rail	<ul style="list-style-type: none"> • Sydney Trains network – T1 Western Line, T2 Inner West and Leppington Line, T5 Cumberland Line • NSW TrainLink network – Blue Mountains Line, Western NSW Line • The future Parramatta Light Rail (Stage 1) including a new stop on Macquarie Street (currently under construction)
Bus	<ul style="list-style-type: none"> • 48 bus routes (including four NightRide bus routes) • 41 school bus routes • Three shuttle bus services – Parramatta CBD free public shuttle bus, Western Sydney University private shuttle, Parramatta Leagues Club private shuttle • Two bus transitways – North-West T-Way, Liverpool to Parramatta T-Way • Major bus stops on Argyle Street (Parramatta Interchange), Smith Street, Wilde Avenue, Victoria Road, Church Street • Bus lanes on Smith Street and Station Street East.
Ferry	<ul style="list-style-type: none"> • F3 Parramatta River Line.

Road traffic volume and patterns

The Great Western Highway is the major arterial road that carries a high volume of traffic through the road network surrounding the construction site. Key roads near the construction site include O'Connell Street (sub-arterial road), Macquarie Street (collector road), Pitt Street (sub-arterial road) and George Street (collector road). O'Connell Street operates in both directions north of Macquarie Street, and south of Macquarie Street it operates in the southbound direction only. Macquarie Street operates one-way in an eastbound direction. Prior to November 2019, George Street operated one-way in an eastbound direction however was recently converted to two-way operation between O'Connell Street and Harris Street as part of network modifications to accommodate Parramatta Light Rail (Stage 1). Pitt Street operates one-way in a northbound direction, with buses only permitted to travel in a southbound direction.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on the Great Western Highway (near Pitt Street), Macquarie Street and George Street
- Northbound traffic on O'Connell Street (north of Macquarie Street) and Pitt Street
- Southbound bus traffic on Pitt Street.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Westbound traffic on the Great Western Highway near Pitt Street
- Northbound traffic on Pitt Street
- Southbound bus traffic on Pitt Street
- Eastbound traffic on George Street.

The existing traffic volumes on the surrounding road network are provided in Table 10-12.

The future road network near the Parramatta metro station will be modified to accommodate Parramatta Light Rail (Stage 1). These changes are expected to be implemented by 2023 and have been incorporated into the construction traffic modelling assessment.

Table 10-12: Parramatta metro station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Great Western Highway west of Pitt Street	Eastbound	1,780	940
	Westbound	990	1,790
Macquarie Street west of O'Connell Street	Eastbound	2,440	1,480
	Westbound	N/A	N/A
George Street east of Church Street¹	Eastbound	780	510
	Westbound	N/A	N/A
Pitt Street north of Great Western Highway	Northbound	1,330	810
	Southbound	20	30
O'Connell Street south of George Street	Northbound	2,140	1,350
	Southbound	1,420	1,100
O'Connell Street north of Great Western Highway	Northbound	N/A	N/A
	Southbound	1,020	1,460

Note 1: George Street was converted to two way traffic flow as part of the future Parramatta Light Rail (Stage 1) works in November 2019

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections near the Parramatta metro station construction site is shown in Table 10-13.

Modelled intersection performance indicates that all intersections perform at level of service D or better during the morning and evening peak hour. Some intersections along Great Western Highway, O'Connell Street and Pitt Street are approaching capacity and experience queues that extend past adjacent intersections.

Table 10-13: Modelled peak hour existing intersection performance – Parramatta metro station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Great Western Highway/Pitt Street	Morning	3,954	44	D
	Evening	3,410	32	C
Great Western Highway/O’Connell Street	Morning	2,894	29	C
	Evening	2,990	48	D
Pitt Street/Argyle Street/Park Parade	Morning	2,618	53	D
	Evening	2,040	28	B
O’Connell Street/Aird Street	Morning	1,438	6	A
	Evening	1,429	53	D
O’Connell Street/Argyle Street	Morning	1,881	15	B
	Evening	2,360	32	C
O’Connell Street/Hunter Street	Morning	1,608	<5	A
	Evening	1,872	24	B
O’Connell Street/Macquarie Street	Morning	3,291	13	A
	Evening	2,620	44	D
O’Connell Street/George Street	Morning	3,640	36	C
	Evening	2,671	22	B
George Street/Marsden Street	Morning	1,761	21	B
	Evening	1,713	20	B
George Street/Church Street	Morning	772	23	B
	Evening	587	27	B
George Street/Horwood Place	Morning	939	14	A
	Evening	808	17	B

On-street parking, loading, servicing and pick-up arrangements

On-street parking in Parramatta consists of free and paid parking. Immediately surrounding and within the construction site, there are some paid on-street parking spaces along Horwood Place, Macquarie Street and Church Street. On-street paid parking is also provided on a number of sections of George Street, particularly near Horwood Place and east of Smith Street. In contrast, there are no on-street parking spaces provided on Smith Street.

Kiss and ride and loading zones are located throughout the Parramatta CBD. Point to point transport service zones are located close to Parramatta Station on Fitzwilliam Street and Valentine Avenue.

10.7.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-8 and Figure 10-9 respectively.

The proposed primary haul routes are shown in Figure 10-10. Access to and egress from the construction site would be right in and left out via George Street and Horwood Place. Light and heavy vehicles may also access the construction site right out and left in via this same intersection. Traffic control would be required to safely manage access and egress at this intersection and may include signals. Roads forming part of the construction vehicle route include Great Western Highway, Pitt Street, Macquarie Street, O’Connell Street, George Street and Victoria Road.

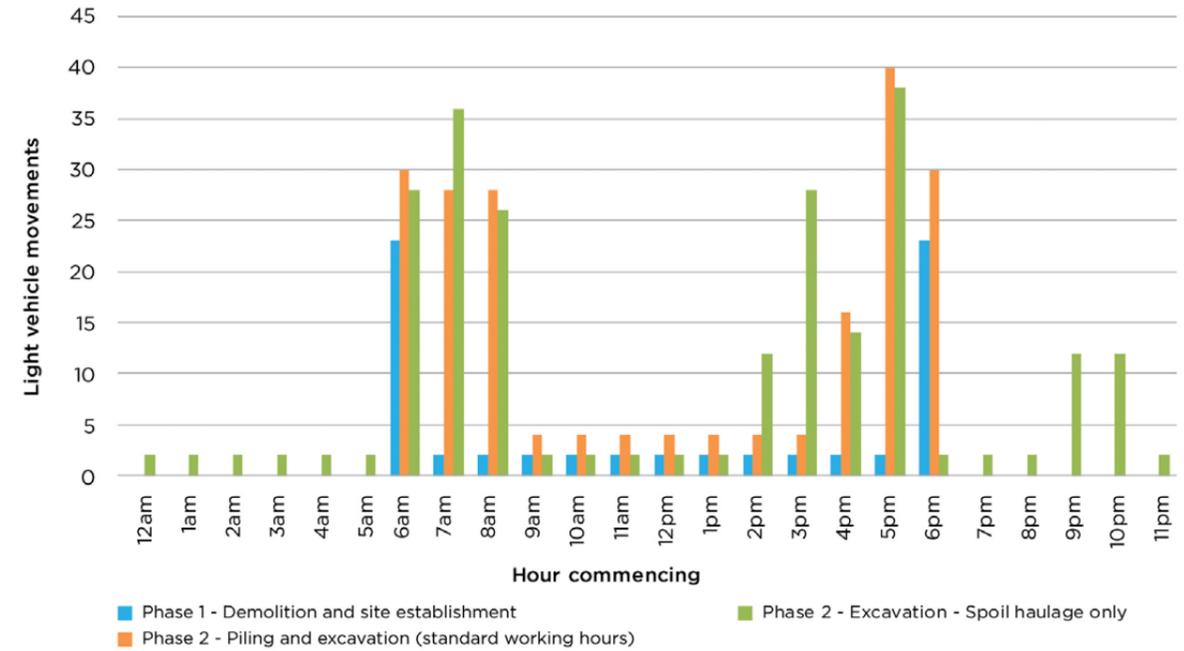


Figure 10-8: Hourly light vehicle movements at the Parramatta metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

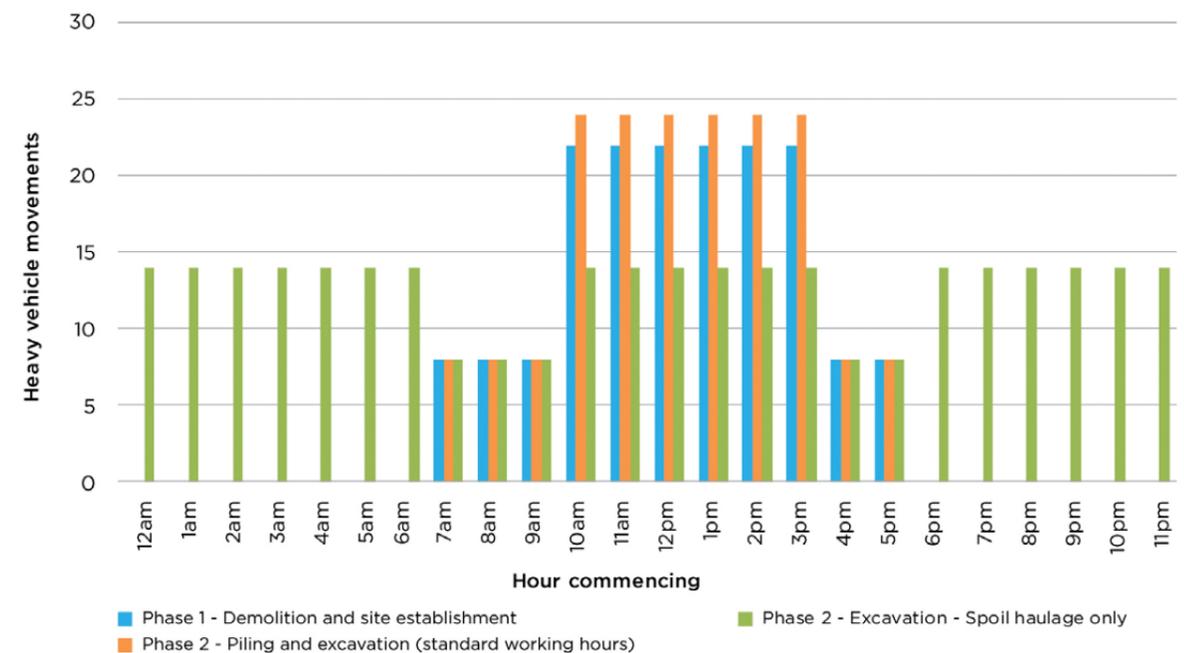


Figure 10-9: Hourly heavy vehicle movements at the Parramatta metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

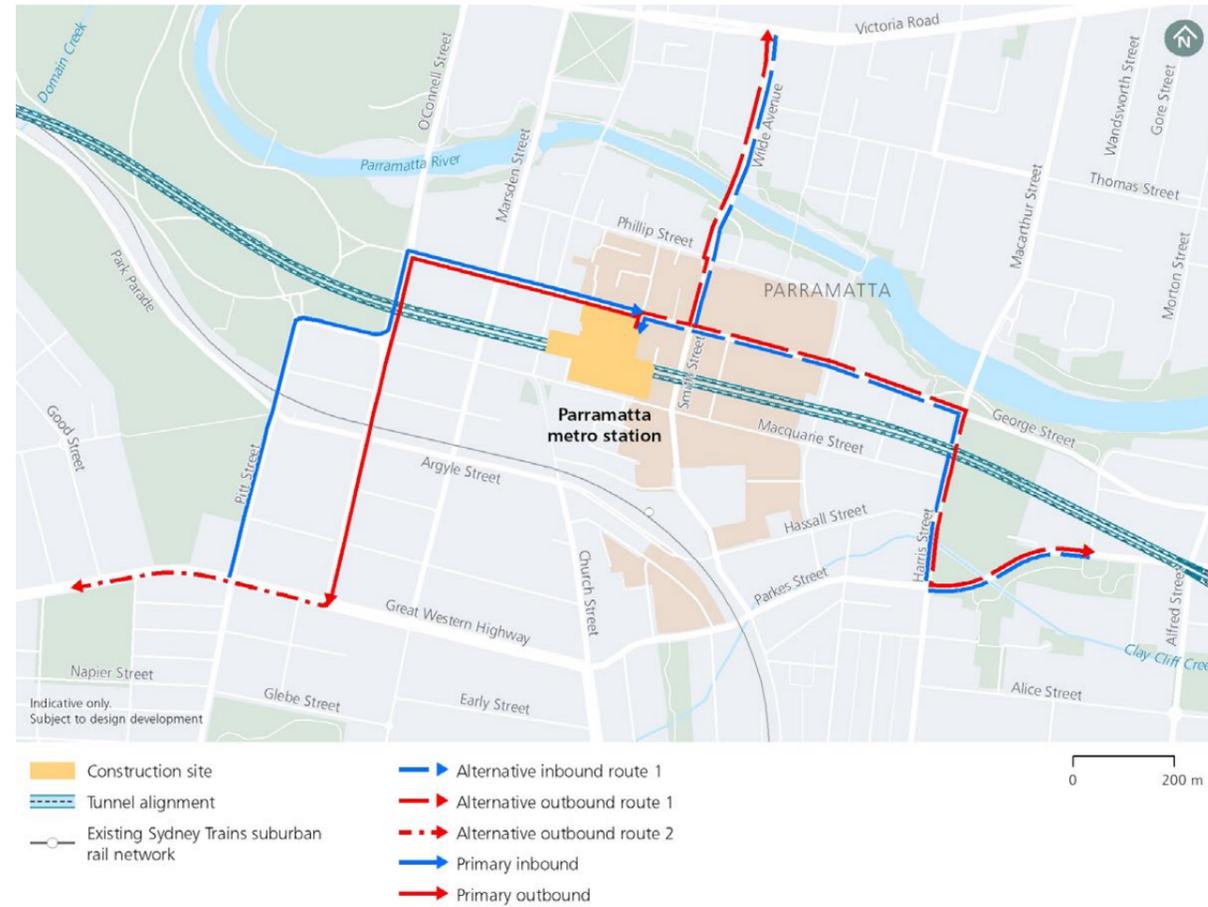


Figure 10-10: Parramatta metro station construction site primary haul routes

Active transport network

Existing pedestrian connectivity surrounding the Parramatta metro station construction site is expected to be maintained throughout construction. Horwood Place would be temporarily closed and north-south pedestrian connectivity would be maintained using Church Street and Smith Street.

Batman Walk, which is a short pedestrian-only lane, would be closed during construction. This lane connects Macquarie Street and Macquarie Lane and primarily functions as an access route to the City Centre (Horwood Place) car park. As this car park would be closed permanently, an alternative for this pedestrian route is not required.

Horwood Place is also designated on-road cycle route of moderate difficulty. As this would be temporarily closed during construction, cyclists would be required to travel via alternative roads. These could include Smith Street or Church Street. Given the closure of Horwood Place, the impact to cyclists is anticipated to be minor given the closure would be temporary and short in duration.

Public transport services

A summary of the potential impacts to public transport services around the construction site is provided in Table 10-14.

Table 10-14: Parramatta metro station construction site existing public transport impacts

Public transport mode	Impact description
Rail	<ul style="list-style-type: none"> Potential temporary minor increase to light rail travel time (post Parramatta Light Rail Stage 1 opening) due to additional construction vehicles on the road network No impact on suburban and intercity rail
Bus	<ul style="list-style-type: none"> Potential temporary minor increase in travel time due to additional construction vehicles on the road network No impacts to the operation of bus stops
Ferry	<ul style="list-style-type: none"> No impact

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods and during school drop off and pick up periods.

Figure 10-11 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Analysis of modelled intersection performance results shows that the Pitt Street/Argyle Street/Park Parade intersection improves with Stage 1. This is due to downstream changes at the Hawkesbury Road/Alexandra Avenue and Alexandra Avenue/Hassall Street intersections in Westmead, which would be modified during construction. The modification of these intersections would result in a reduction in westbound queues along Alexandra Avenue and Park Parade, improving the overall operational performance of the Pitt Street/Argyle Street/Park Parade intersection.

Modelled intersection performance with construction traffic indicates that the O’Connell Street/Argyle Street intersection would experience a temporary reduction in performance during the evening peak. This is due to the additional construction vehicles travelling on O’Connell Street in the southbound direction. Furthermore, O’Connell Street between Macquarie Street and Argyle Street is a major weaving segment, and the additional construction vehicles increases the difficulty for vehicles to change lanes, potentially resulting in increased congestion.

Traffic control measures would be required for the construction site access of George Street, and may include traffic signals. The final measures would be determined in consultation with Transport for NSW.

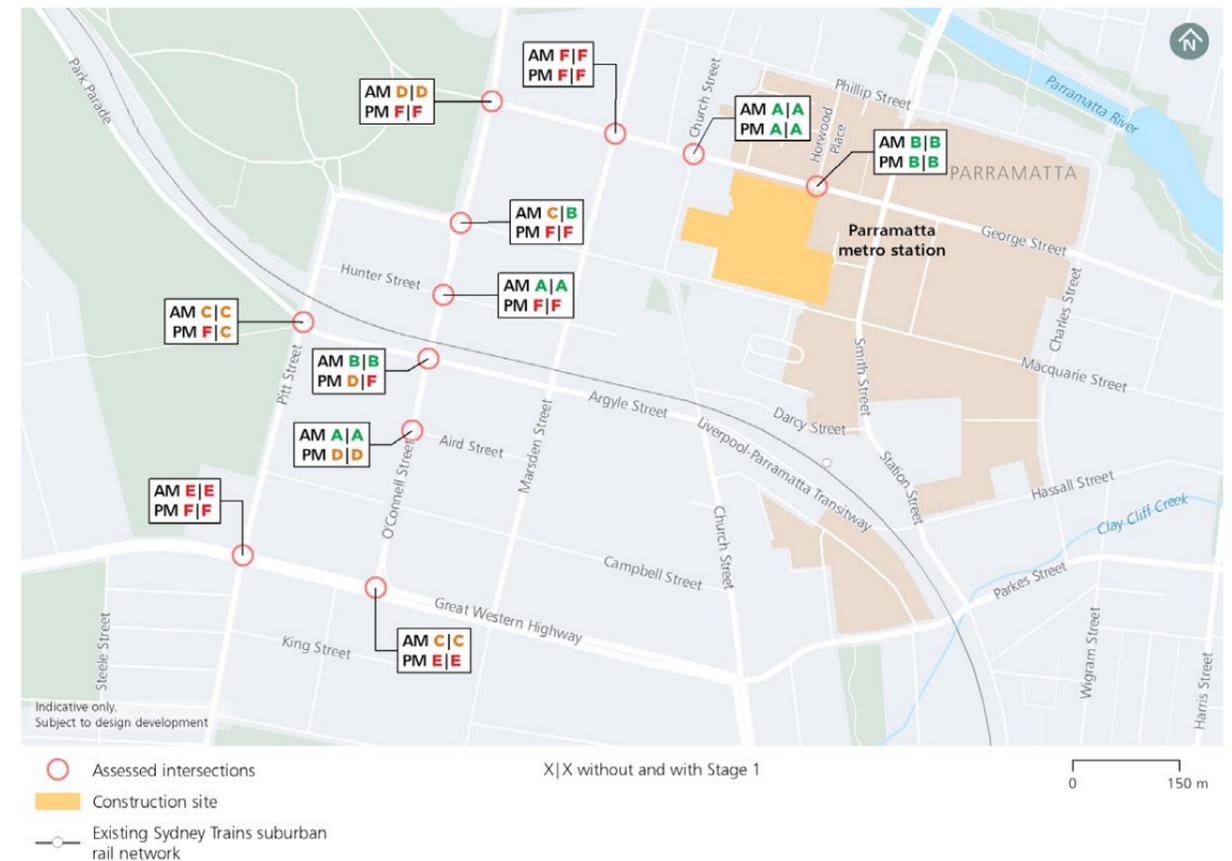


Figure 10-11: Parramatta metro station construction site intersection performance (2023)

Parking and property access

Several on-street and off-street parking spaces would be permanently removed. These include:

- About 30 metered on-street parking spaces in Horwood Place
- 20 off-street parking spaces accessible from Horwood Place and located to the rear of properties being acquired as part of Stage 1 at the Church Street/George Street intersection
- About 800 off-street parking spaces in the City Centre (Horwood Place) multi-level car park.

Closure of the City Centre (Horwood Place) car park is consistent with the City of Parramatta’s approach of closing some council-owned parking facilities to allow redevelopment within Parramatta CBD, as stated in the Draft Parramatta CBD Public Car Parking Strategy (City of Parramatta, 2017b). The City of Parramatta strategy also identifies potential measures to offset this loss of car parking.

Existing rear access provided from Horwood Place for properties fronting Church Street would be maintained via an alternative access lane to be constructed at the start of the construction phase. This access lane would be accessible to and from George Street. Impacts to vehicles accessing these properties are anticipated to be minor with the potential increase in travel distance of up to 360 metres and potential increase in travel time of up to two minutes. Access from Macquarie Lane to properties fronting Smith Street that would remain during construction would be maintained via the existing laneway. Vehicular access to the rear access to 69 George Street would be maintained during construction.

Sydney Metro would consult affected property owners to develop alternative access arrangements. There would be no other impacts to private property access.

10.8 Clyde stabling and maintenance facility construction site

10.8.1 Existing environment

The Clyde stabling and maintenance facility construction site is bound by Shirley Street, Unwin Street, James Ruse Drive and the M4 Western Motorway. The location of the construction site and the surrounding transport network are shown on Figure 10-12.

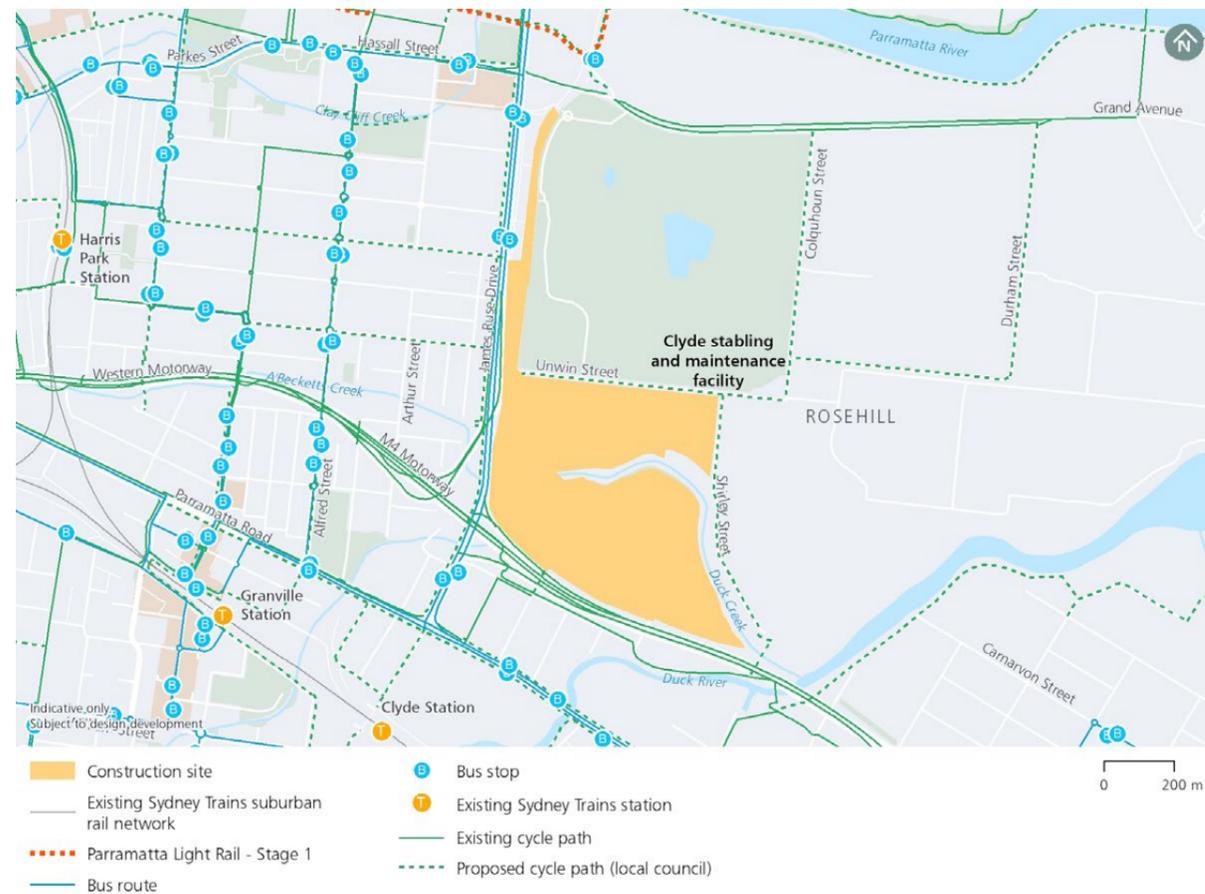


Figure 10-12: Clyde stabling and maintenance facility construction site road network and indicative vehicle routes

Active transport network

The pedestrian network around the Clyde stabling and maintenance facility construction site is limited given the industrial land uses to the east of Rosehill Gardens racecourse and north of Duck River. Formal pedestrian crossings are limited and are generally a considerable distance from the construction site. Pedestrian volumes near the Clyde stabling and maintenance facility construction site are expected to be low.

Crossings are provided at the following locations:

- Signalised crossings at the Parramatta Road/Wentworth Street intersection
- Signalised crossings at Parramatta Road/James Ruse Drive intersection
- Pedestrian footbridge over James Ruse Drive near the now closed Rosehill Station.

The cycle network surrounding the construction site includes:

- M4 cycleway located near the southern boundary of the construction site
- Off-road shared path along the norther side of Parramatta Road
- On-road route along Kendall Street, Martha Street, Alfred Street, Prospect Street and Virginia Street.

Public transport services

A summary of the public transport services around the Clyde stabling and maintenance facility construction site is provided in Table 10-15.

Table 10-15: Clyde stabling and maintenance facility construction site existing public transport services

Public transport mode	Description
Rail	<ul style="list-style-type: none"> • No train services in close proximity to the construction site
Bus	<ul style="list-style-type: none"> • Four bus routes (including two NightRide bus routes) • Six school bus routes • Major bus stops on Alfred Street, James Ruse Drive and Parramatta Road

Road traffic volume and patterns

Parramatta Road is a major arterial road that carries high traffic volumes of at least 1,600 vehicles during the peak hour in each direction. West of Wentworth Street (collector road), the Parramatta Road westbound volumes are higher than eastbound volumes, with comparatively higher volumes experienced in both directions during the morning peak hour compared to the evening peak hour. To a lesser extent, traffic volumes on James Ruse Drive (arterial road) north of Parramatta Road are also high, ranging between 1,110 and 1,500 vehicles in each direction during the peak hour. This section of James Ruse Drive has a southbound morning peak direction and a northbound evening peak direction.

Given the industrial land uses east of James Ruse Drive, low traffic volumes are experienced on the local road network at Unwin Street (local road), Kay Street (local road) and Wentworth Street, with fewer than 280 vehicles per hour observed in each direction during both peak periods.

The existing traffic volumes on the surrounding road network are provided in Table 10-16.

Table 10-16: Clyde stabling and maintenance facility construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Unwin Street west of Colquhoun Street	Eastbound	220	190
	Westbound	280	130
Parramatta Road west of Wentworth Street	Eastbound	1,730	1,600
	Westbound	2,110	1,950
Kay Street west of Wentworth Street	Eastbound	150	170
	Westbound	270	90
James Ruse Drive north of Parramatta Road	Eastbound	1,300	1,280
	Westbound	1,500	1,110
Wentworth Street north of Parramatta Road	Eastbound	260	120
	Westbound	150	180

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections near the Clyde stabling and maintenance facility construction site is shown in Table 10-17.

Modelled intersection performance indicates that all intersections currently perform at a level of service D or better during the morning and evening peak hour.

Table 10-17: Modelled peak hour existing intersection performance – Clyde stabling and maintenance facility construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Parramatta Road/James Ruse Drive	Morning	5,078	42	C
	Evening	4,764	53	D
Parramatta Road/Marsh Street	Morning	3,214	52	D
	Evening	3,430	40	C
Parramatta Road/Wentworth Street	Morning	4,044	15	A
	Evening	3,670	19	B
Wentworth Street/Kay Street	Morning	413	<5	A
	Evening	258	<5	A

On-street parking, loading, servicing and pick-up arrangements

Unrestricted on-street parking is provided on Kay Street, Unwin Street and Wentworth Street. Parking is prohibited on Parramatta Road and James Ruse Drive, with clearways in operation seven days a week during daylight hours (6 am to 7 pm Monday to Friday, 8 am to 8 pm Saturday and Sunday).

There are no kiss and ride, loading zone or point to point transport service zones on roads immediately surrounding the construction site.

10.8.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-13 and Figure 10-14 respectively.

The proposed primary haul routes are shown in Figure 10-15. Access to and egress from the site would be from Wentworth Street. Roads forming part of the construction vehicle route include Parramatta Road and Wentworth Street.

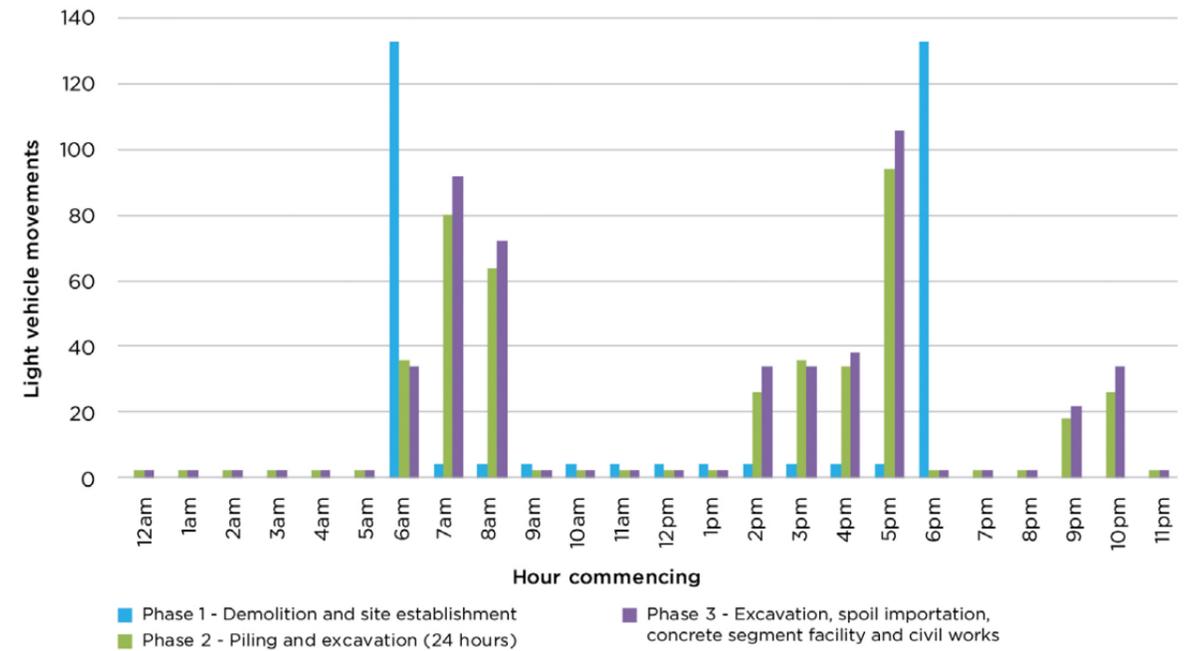


Figure 10-13: Hourly light vehicle movements at the Clyde stabling and maintenance facility construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

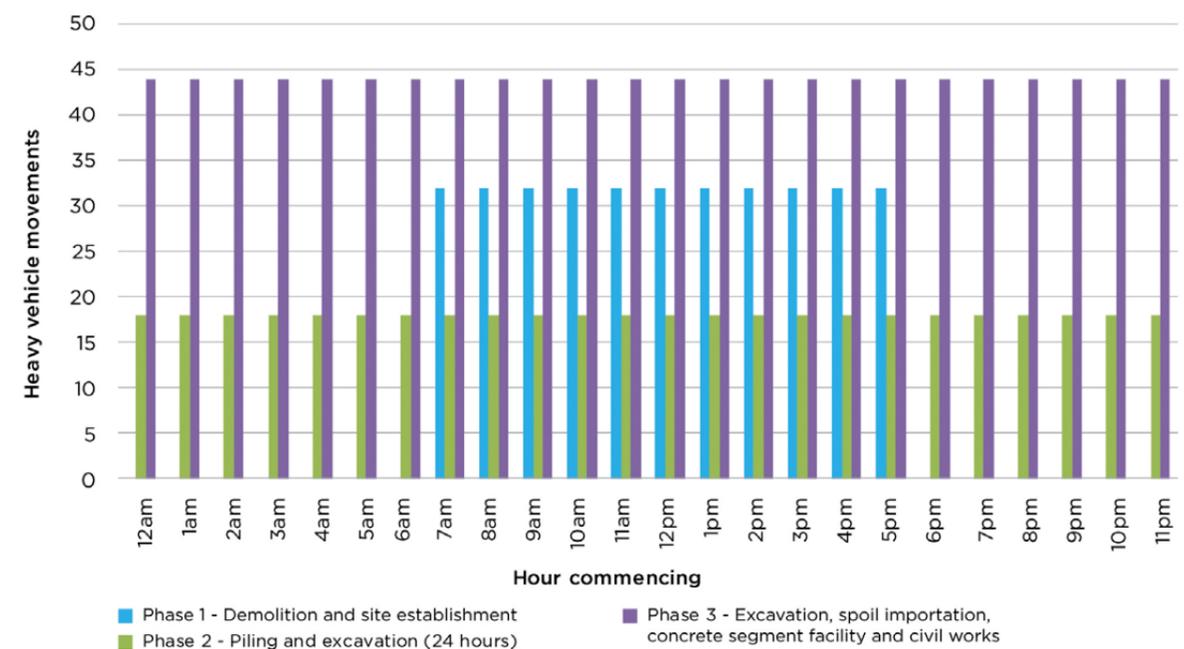


Figure 10-14: Hourly heavy vehicle movements at the Clyde stabling and maintenance facility construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

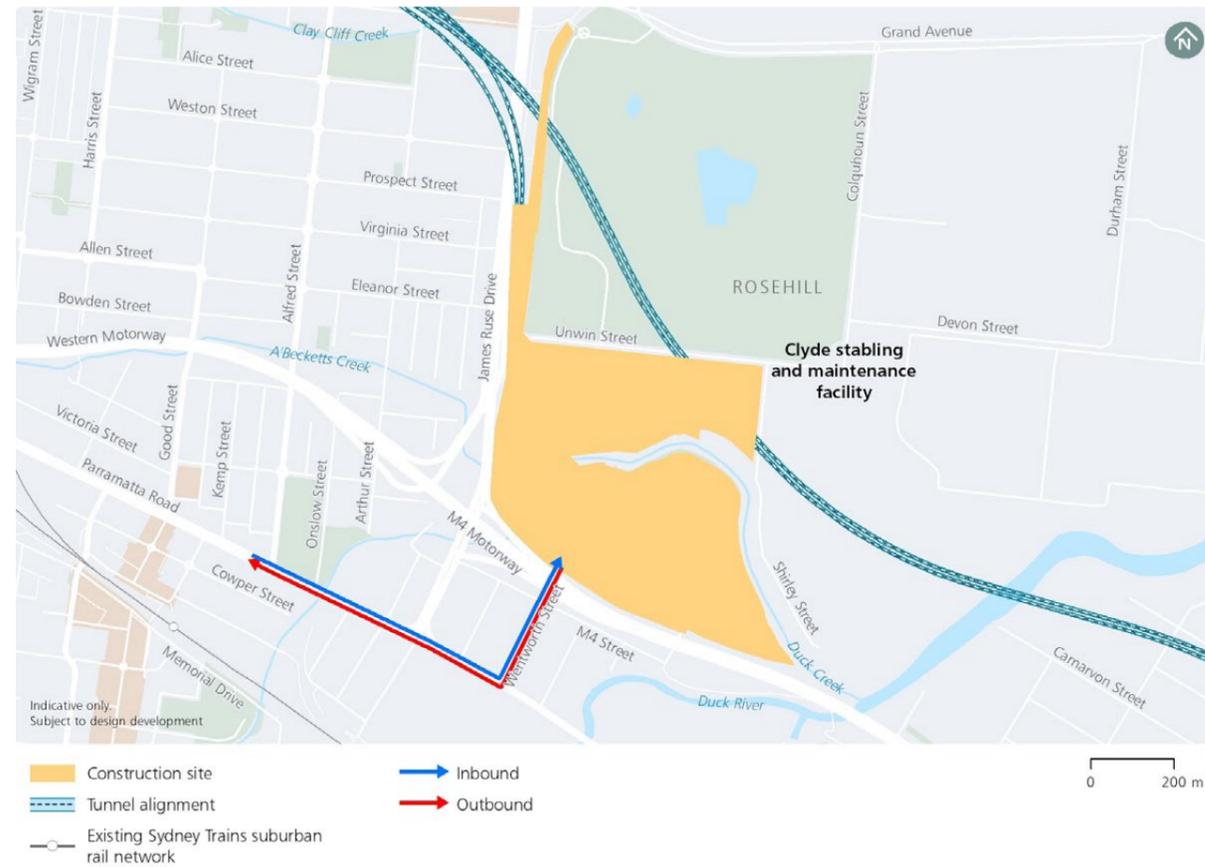


Figure 10-15: Clyde stabling and maintenance facility construction site primary haul routes

Active transport network

Footpaths located on Unwin Street and Kay Street would be removed to accommodate the construction site. These footpaths serve properties that would be within the construction site and therefore the impact to the pedestrian network is expected to be minimal. Pedestrian access through this area and on the realigned road would be managed to ensure safe pedestrian environments.

No impacts to the cycle network are anticipated during construction.

Public transport network

Bus services operate on Parramatta Road, which also forms part of the Clyde stabling and maintenance facility construction haul route. Minimal temporary impacts to buses are expected and would be limited to a potential minor increase in travel time due to the additional construction vehicles on the road network. No impacts are anticipated on the operation of bus stops.

The construction of the future Parramatta Light Rail (Stage 1) has resulted in the cessation of T6 Carlingford Line services and the closure of the existing Rosehill Station, as part of this line is being converted to allow for light rail operation. Replacement bus services will be in place until the light rail is operational. No impacts to the rail network, replacement bus services or light rail network are anticipated due to Stage 1.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods.

Figure 10-16 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Modelled intersection performance shows that Stage 1 would not result in a decline in intersection performance and that at some intersections, the addition of construction traffic would result in a temporary small reduction in demand flow and/or average delay due to the following factors:

- Additional ‘latent’ or ‘unreleased’ demand, which is traffic that is not able to be assigned in the model during the morning and/or evening peak period. These trips are assumed to still exist, however, these trips would be delayed and not completed until after the peak period, effectively increasing the duration of the peak period
- Fewer vehicles passing through an intersection due to the addition of construction-related heavy vehicles, which have a slower acceleration profile compared to light vehicles. This would likely result in an increase to average delay.

Increased traffic on Parramatta Road associated with Stage 1 would result in a temporary increase in southbound queue lengths at the Parramatta Road/Wentworth Street during the evening peak period.

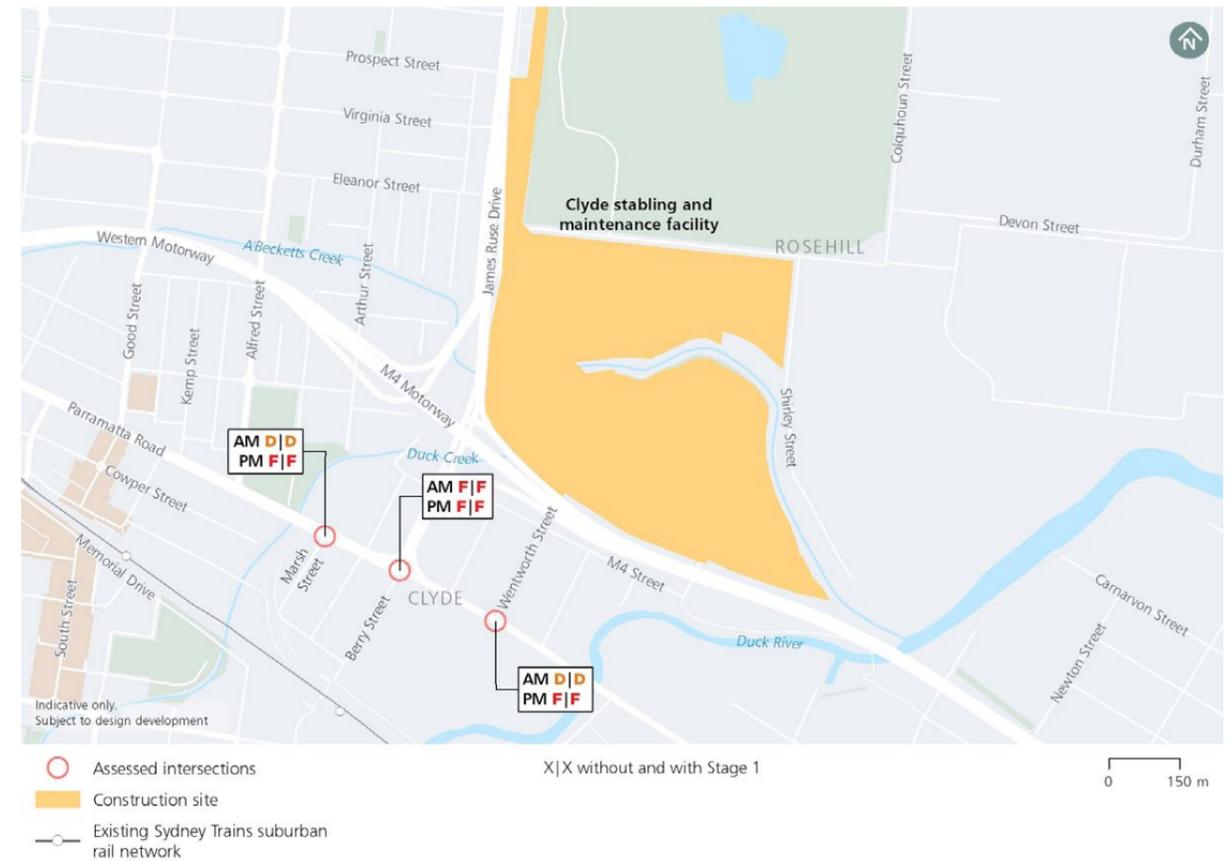


Figure 10-16: Clyde stabling and maintenance facility construction site intersection performance (2023)

Parking

On-street parking spaces along Kay Street would be permanently removed. These parking spaces serve the properties that would form the construction site. Therefore, the impact of the lost parking spaces would be minimal. Up to 10 parking spaces may be removed on Unwin Street and Wentworth Street where the realigned Unwin Street ties in with the existing road network. The impact of these lost parking spaces would be minimal due to the low net decrease in parking spaces, and the availability of alternative parking nearby.

10.9 Silverwater services facility construction site

10.9.1 Existing environment

The Silverwater services facility construction site is bound by Silverwater Road, Carnarvon Street, Wetherill Street North and Derby Street.

The location of the construction site and the surrounding transport network are shown on Figure 10-17.

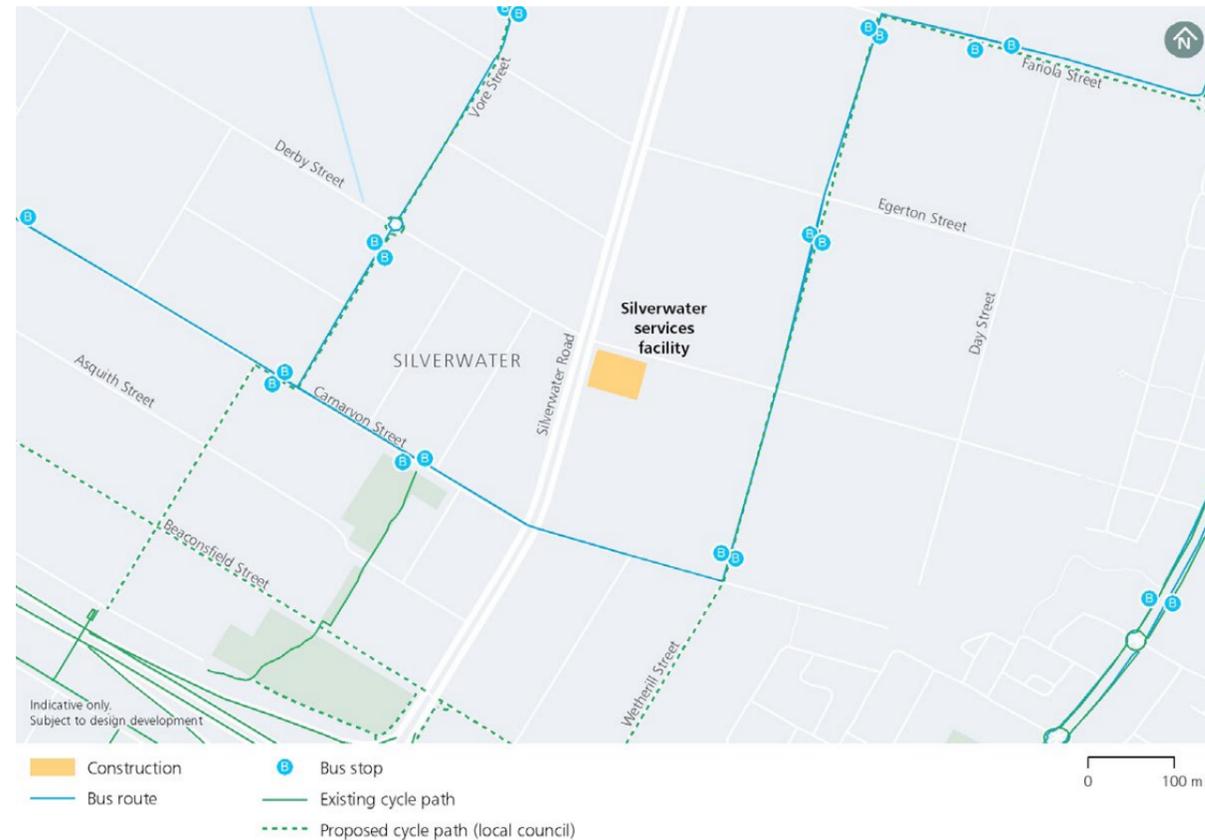


Figure 10-17: Silverwater services facility construction site transport network

Active transport network

The local road network surrounding the construction site generally has a footpath on at least one side of the road. Pedestrian activity near the construction site is low and is primarily generated by the employees of surrounding commercial and industrial businesses.

Pedestrian crossing facilities are limited and include signalised crossings at the Silverwater Road/Carnarvon Street and Silverwater Road/Fariola Street intersections.

The cycle network surrounding the construction site is limited and includes:

- A shared path on the M4 Western Motorway and through Deakin Park, shared paths through Deakin Park and between Beaconsfield Street and the Louise Sauvage Pathway
- On-road cycle routes south of the M4 Western Motorway which connect to Auburn Station and surrounding suburbs via the local road network and east of the site on Newington Boulevard and John Ian Wing Parade.

Public transport services

The public transport network around the Silverwater services facility is limited to bus services. A summary of these services is provided in Table 10-18.

Table 10-18: Silverwater services facility construction site existing public transport services

Public transport mode	Description
Bus	<ul style="list-style-type: none"> • Four bus routes • One public on-demand bus service • Major bus stops on Stubbs Street, Carnarvon Street, Vore Street, Parramatta Road and Wetherill Street North.

Road traffic volume and patterns

Silverwater Road is the primary arterial road near the construction site. Key local roads include Carnarvon Street, Wetherill Street North and Derby Street.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Southbound traffic on Silverwater Road
- Eastbound on Carnarvon
- Northbound on Wetherill Street North
- Westbound on Derby Street.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Southbound traffic on Silverwater Road
- Westbound on Carnarvon
- Southbound on Wetherill Street North
- Westbound on Derby Street.

The existing traffic volumes on the surrounding road network are provided in Table 10-19.

Table 10-19: Silverwater services facility construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Derby Street east of Silverwater	Eastbound	30	20
	Westbound	110	40
Carnarvon Street east of Silverwater Road	Eastbound	280	130
	Westbound	160	350
Silverwater Road south of Derby Street	Northbound	1,600	1,710
	Southbound	2,110	1,890
Wetherill Street North south of Derby Street	Northbound	270	110
	Southbound	90	260

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections in the vicinity of the Silverwater services facility construction site is shown in Table 10-20.

Modelled intersection performance indicates that the Silverwater Road / Derby Street intersection currently performs at level of service F during the evening peak hour. This is due to the intersection not being signalised where the worst movement is reported, which is vehicles turning left from Derby Street onto Silverwater Road during the evening peak hour. Given that the intersection is restricted to left-in and left-out movements, its existing performance during the evening peak hour does not impact vehicles travelling on Silverwater Road. Southbound queues on Silverwater Road from the Carnarvon Street intersection extend past Derby Street, resulting in an increase to average delays at the Silverwater Road / Derby Street intersection.

Table 10-20: Modelled peak hour existing intersection performance – Silverwater services facility construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Silverwater Road/Carnarvon Street	Morning	4,283	29	B
	Evening	4,229	54	D
Silverwater Road/Derby Street	Morning	3,796	18	B
	Evening	3,684	77	F
Carnarvon Street/Wetherill Street North	Morning	474	<5	A
	Evening	494	5	A
Derby Street/Wetherill Street North	Morning	408	9	A
	Evening	355	15	A

On-street parking, loading, servicing and pick-up arrangements

Unrestricted on-street parking is provided on both sides of most local roads including Derby Street, Wetherill Street North and Carnarvon Street. However, during special events on-street parking on these roads is time restricted to two hours. Parking is prohibited on Silverwater Road, with clearways in operation seven days a week during daylight hours (6 am to 7 pm Monday to Friday, 9 am to 6 pm Saturday and Sunday).

There are no kiss and ride, loading zone or point to point transport service zones on roads immediately surrounding the construction site.

10.9.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-18 and Figure 10-19 respectively.

The proposed primary haul routes are shown in Figure 10-20. Access to and egress from the construction site would be left-in, left-out, to and from Derby Street. Roads forming part of the construction vehicle route include the M4 Western Motorway, Silverwater Road, Carnarvon Street, Wetherill Street North and Derby Street.

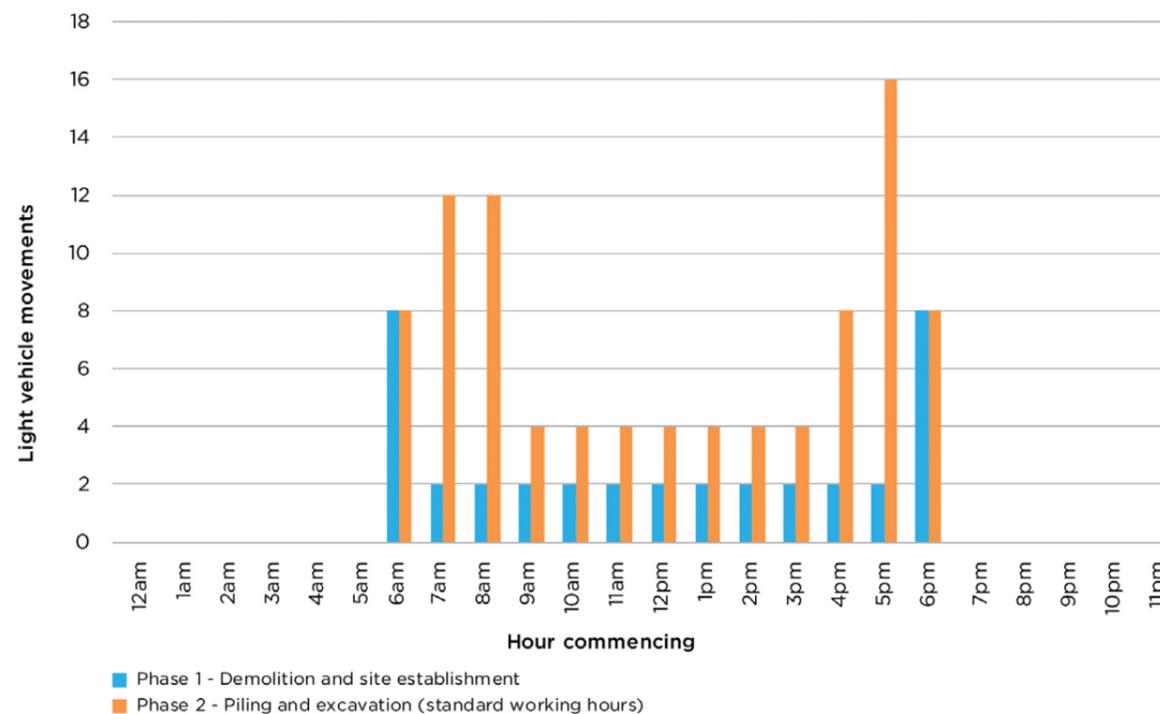


Figure 10-18: Hourly light vehicle movements at the Silverwater services facility construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

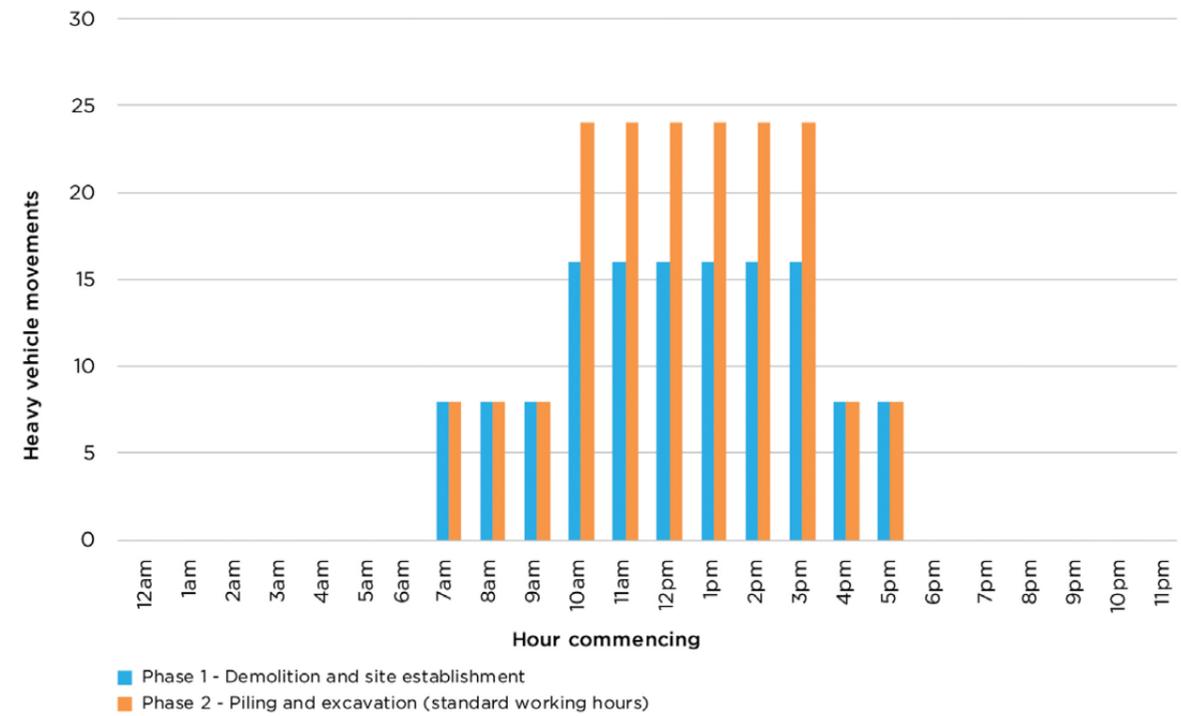


Figure 10-19: Hourly heavy vehicle movements at the Silverwater services facility construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

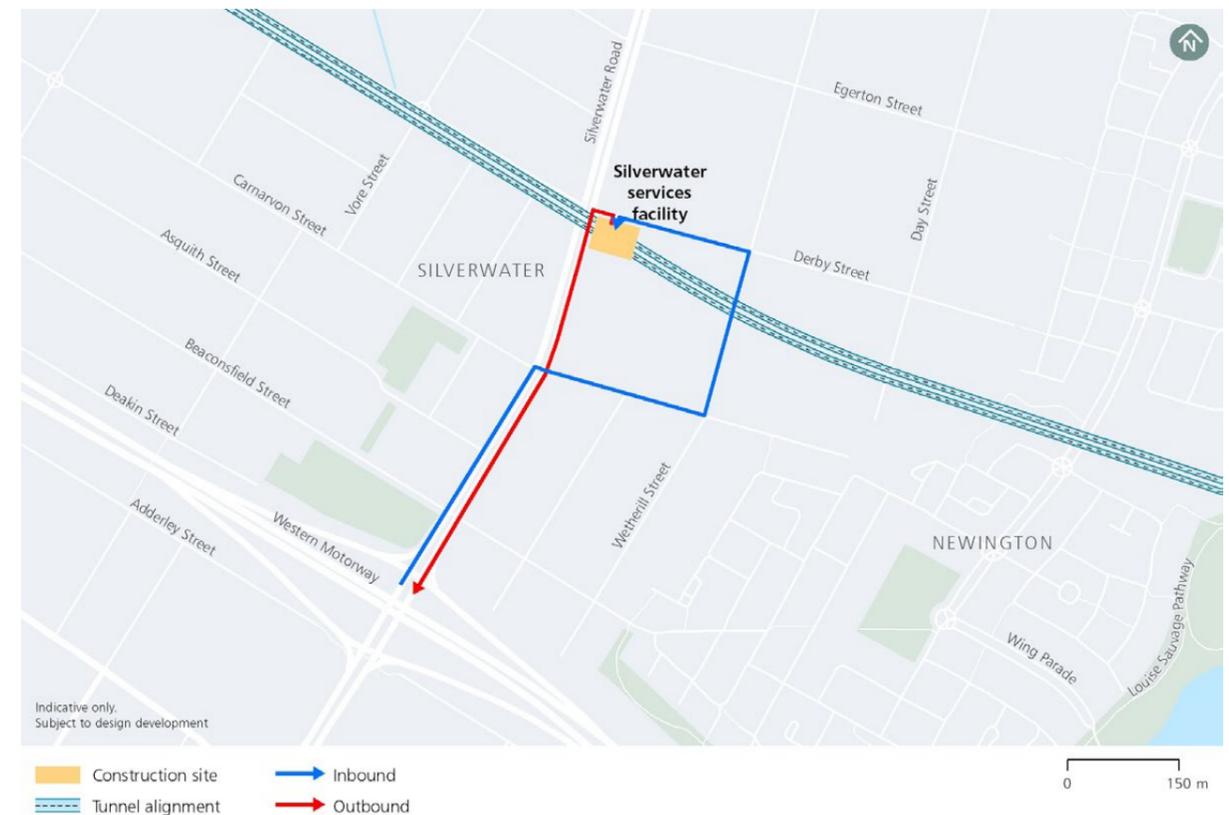


Figure 10-20: Silverwater services facility construction site haulage routes

Active transport network

No impacts to the pedestrian and cyclist networks are anticipated during construction.

Public transport network

Carnarvon Street and Wetherill Street North are used by route 544 buses and forms part of the construction vehicle route for the Silverwater services facility construction site. Route 544 operates every 30 minutes during the weekday morning and evening peak periods. The impact to this service due to additional construction vehicles on the road network would be negligible due to the limited frequency of the service. No impacts are anticipated on the operation of bus stops.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods.

Figure 10-21 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Modelled intersection performance with construction traffic indicates that the following intersections would experience a temporary reduction in level of service:

- Silverwater Road/Carnarvon Street during the morning peak hour. This intersection would still operate with spare capacity with the addition of construction traffic
- Silverwater Road/Derby Street during the evening peak hour. This is due to an increase in traffic volumes at the intersection, with outbound construction vehicles turning left from the westbound approach. Southbound queues on Silverwater Road from the Carnarvon Street intersection during the evening peak hour extend past Derby Street, resulting in an increase to average delays experienced by vehicles turning left from Derby Street into Silverwater Road.

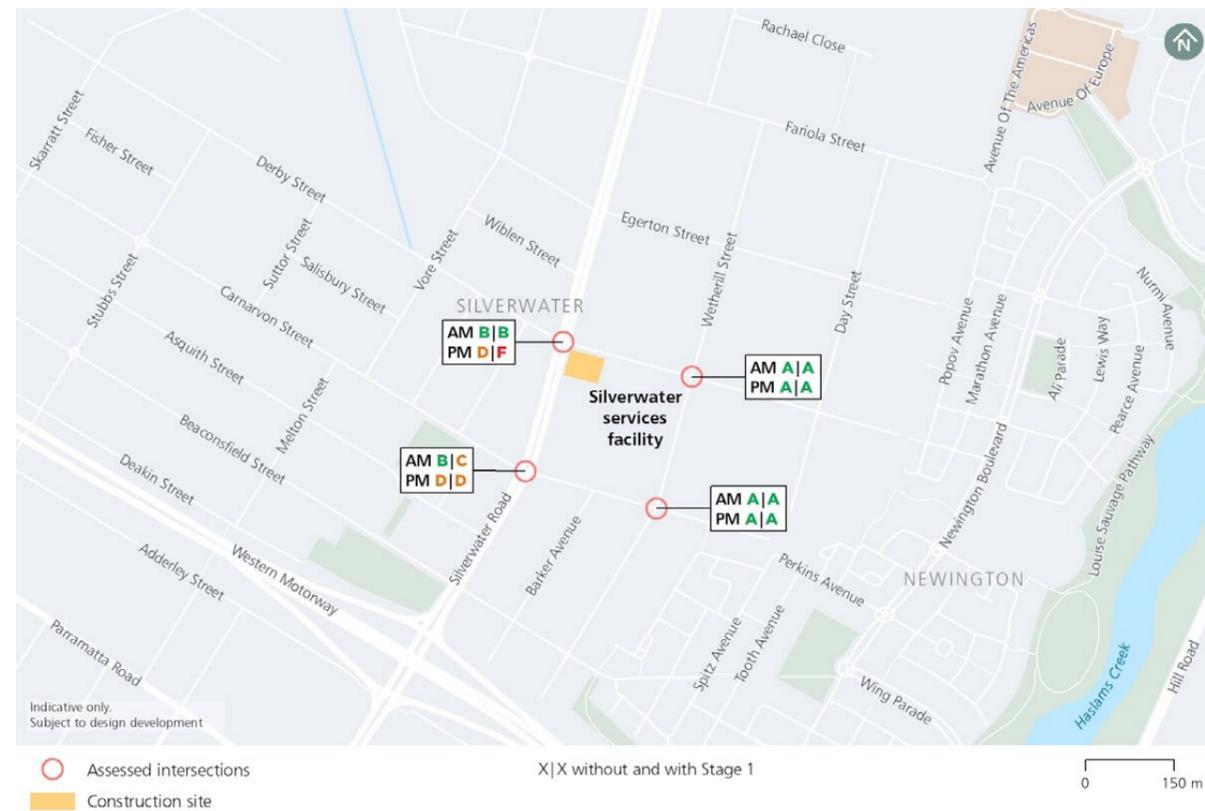


Figure 10-21: Silverwater services facility construction site intersection performance (2023)

Parking

Up to six on-street parking spaces may be temporarily removed near the site access on Derby Street to accommodate construction vehicle movements. Impacts are anticipated to be minor given the low number of potential lost parking spaces and the availability of alternative on-street parking on roads nearby.

10.10 Sydney Olympic Park metro station construction site

10.10.1 Existing environment

The Sydney Olympic Park metro station construction site would be located on Herb Elliott Avenue near Figtree Drive, Showground Road and Dawn Fraser Avenue.

The location of the construction site and the surrounding transport network are shown on Figure 10-22.



Figure 10-22: Sydney Olympic Park metro station construction site transport network

Active transport network

The pedestrian network near the Sydney Olympic Park metro station construction site is well established with wide footpaths and large, paved pedestrian areas to accommodate large crowds during major special events. There are no formal pedestrian crossing facilities immediately surrounding the construction site. However, local roads such as Herb Elliott Avenue, Showground Road and Figtree Drive carry low vehicle volumes and have a 40 kilometres per hour signposted speed limit, which provide pedestrians with generally safe road crossing conditions.

Pedestrian crossings are provided at the following locations near the construction site:

- Signalised crossings at the Sarah Durack Avenue/Olympic Boulevard intersection, the Sarah Durack Avenue/Australia Avenue intersection, the Australia Avenue/Herb Elliott Avenue intersection and the Homebush Bay Drive/Australian Avenue/Underwood Road roundabout
- A staged crossing via the central median on Olympic Boulevard.

The cycle network surrounding the construction site is well-developed and includes:

- Marked cycle lanes on both sides of Australia Avenue, Sarah Durack Avenue, Edwin Flack Avenue, Dawn Fraser Avenue and Bennelong Parkway
- On-road cycle routes along Shirley Strickland Avenue and Rod Laver Drive
- Off-road shared paths throughout the area, particularly to the west of Olympic Boulevard and east of Australia Avenue around Bicentennial Park
- Defined bicycle circuits within the Sydney Olympic Park precinct, including the Olympic Circuit, River Heritage Circuit and Parklands Circuit. These circuits comprise the above on-road and off-road cycle paths, and other cycle paths located north of Bicentennial Park and Dawn Fraser Avenue.

Public transport services

A summary of the public transport services around the Sydney Olympic Park metro station construction site is provided in Table 10-21.

Table 10-21: Sydney Olympic Park metro station construction site existing public transport services

Public transport mode	Description
Rail	<ul style="list-style-type: none"> • Sydney Trains network – T7 Olympic Park Line • Planned Parramatta Light Rail (Stage 2) including a planned stop on Dawn Fraser Avenue near Showground Road
Bus	<ul style="list-style-type: none"> • Four bus routes (including one Night Ride bus route) • Nine additional bus routes for major events • One public on-demand bus service • Two school bus routes • Major bus stops on Edwin Flack Avenue, Dawn Fraser Avenue, Park Street and Australia Avenue.

Road traffic volume and patterns

Parramatta Road and Homebush Bay Drive are the primary arterial roads near the construction site and carry the highest levels of traffic. Key local roads connecting the wider road network to Sydney Olympic Park include Australia Avenue, Sarah Durack Avenue, Edwin Flack Avenue and Birnie Avenue. Olympic Boulevard, Herb Elliott Avenue and Figtree Drive provide access to the construction site and are signposted with a 40 kilometres per hour speed limit.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound and westbound traffic on Parramatta Road
- Eastbound traffic on Homebush Bay Drive
- Northbound traffic on Australia Avenue
- Northbound traffic on Birnie Avenue.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound and westbound traffic on Parramatta Road
- Eastbound traffic on Homebush Bay Drive
- Northbound and southbound traffic on Australia Avenue
- Westbound traffic on Sarah Durack Avenue
- Northbound traffic on Edwin Flack Avenue
- Southbound traffic on Birnie Avenue.

The existing traffic volumes on the surrounding road network are provided in Table 10-22.

Table 10-22: Sydney Olympic Park metro station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Parramatta Road west of Birnie Avenue	Eastbound	1,840	1,510
	Westbound	2,070	1,760
Homebush Bay Drive ramps west of Australia Avenue	Eastbound	850	670
	Westbound	360	480
Herb Elliott Avenue west of Australia Avenue	Eastbound	160	330
	Westbound	370	90
Sarah Durack Avenue west of Olympic Boulevard	Eastbound	370	570
	Westbound	450	810
Figtree Drive west of Australia Avenue	Eastbound	40	150
	Westbound	230	20
Australia Avenue north of Homebush Bay Drive	Northbound	1,810	1,750
	Southbound	1,300	1,800
Australia Avenue north of Figtree Drive	Northbound	760	400
	Southbound	420	630
Olympic Boulevard north of Sarah Durack Avenue	Northbound	160	240
	Southbound	140	290
Edwin Flack Avenue north of Sarah Durack Avenue	Northbound	460	830
	Southbound	480	430
Birnie Avenue north of Parramatta Road	Northbound	650	600
	Southbound	500	980

Intersection performance

Modelled existing intersection performance during the morning and evening peak hours for key intersections near the Sydney Olympic Park metro station construction site is shown in Table 10-23.

Traffic congestion along Parramatta Road adjacent to Sydney Olympic Park is high during both peak hours, which is reflected in the existing performance of the Birnie Avenue/Parramatta Road intersection. Queuing on Parramatta Road impacts the ability of vehicles to turn out of Birnie Avenue. Southbound queues from the intersection reduces the capacity and impacts on the performance of the Edwin Flack Avenue/Shane Gould Avenue/Birnie Avenue intersection upstream, particularly during the evening peak hour.

The roundabout at Australia Avenue/Underwood Road/Homebush Bay Drive also currently performs at or near capacity during the morning and evening peak hour, with long queues on the Homebush Bay Drive westbound off ramp. This is due to vehicles approach from the off ramp having to yield to vehicles from Australia Avenue. The existing performance of the roundabout is further compounded as vehicles from the Underwood Road northbound approach yield to right turning vehicles from Australia Avenue and the Homebush Bay Drive westbound off ramp.

The existing performance of the Australia Avenue/Sarah Durack Avenue/Bennelong Parkway intersection in the evening peak hour can be attributed to the high number of vehicles travelling northbound into the Sydney Olympic Park precinct.

Table 10-23: Modelled peak hour existing intersection performance – Sydney Olympic Park metro station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Australian Avenue/Sarah Durack Avenue/Bennelong Parkway	Morning	3,418	24	B
	Evening	3,176	57	E
Australia Avenue/Underwood Road/Homebush Bay Drive	Morning	3,973	64	E
	Evening	3,931	>100	F
Birnie Avenue/Parramatta Road	Morning	4,617	>100	F
	Evening	4,535	79	F
Edwin Flack Avenue/Shane Gould Avenue/Birnie Avenue	Morning	1,406	30	C
	Evening	1,857	58	E
Herb Elliot Avenue/Parkview Drive/Australian Avenue	Morning	1,263	43	D
	Evening	887	56	D
Olympic Boulevard/Herb Elliot Avenue	Morning	618	<5	A
	Evening	528	<5	A
Olympic Boulevard/Sarah Durack Avenue	Morning	1,166	17	B
	Evening	1,671	22	B
Sarah Durack Avenue/Edwin Flack Avenue	Morning	968	17	B
	Evening	1,315	6	A
Olympic Boulevard/Figtree Drive	Morning	884	<5	A
	Evening	926	<5	A

On-street parking, loading, servicing and pick-up arrangements

Free, time-limited on-street parking spaces are available along Olympic Boulevard, Murray Rose Avenue, Dawn Fraser Avenue, Figtree Drive, Herb Elliot Avenue, Showground Road, Grand Parade and Parkview Drive. There are also paid on-street parking spaces available along Herb Elliot Avenue, Dawn Fraser Avenue and Showground Road. During major special events, on-street parking may not be available due to road closures in place around the Sydney Olympic Park precinct.

A number of other on-street parking arrangements exist on Herb Elliott Avenue and include parking for motorbikes, a loading zone on the northern side about 90 metres east of Showground Road, a kiss and ride zone near Olympic Boulevard and a point to point transport service zone on the southern side near Showground Road. There is a mail zone on the western side of Showground Road and a loading zone on the southern side of Dawn Fraser Avenue between Showground Road and Park Street.

10.10.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-23 and Figure 10-24 respectively.

The proposed primary haul routes are shown in Figure 10-25. Access to and egress from the construction site would be left in and both left and right out via Herb Elliot Avenue. Roads forming part of the construction vehicle route include the M4 Western Motorway, Homebush Bay Drive, Australia Avenue and Herb Elliott Avenue.

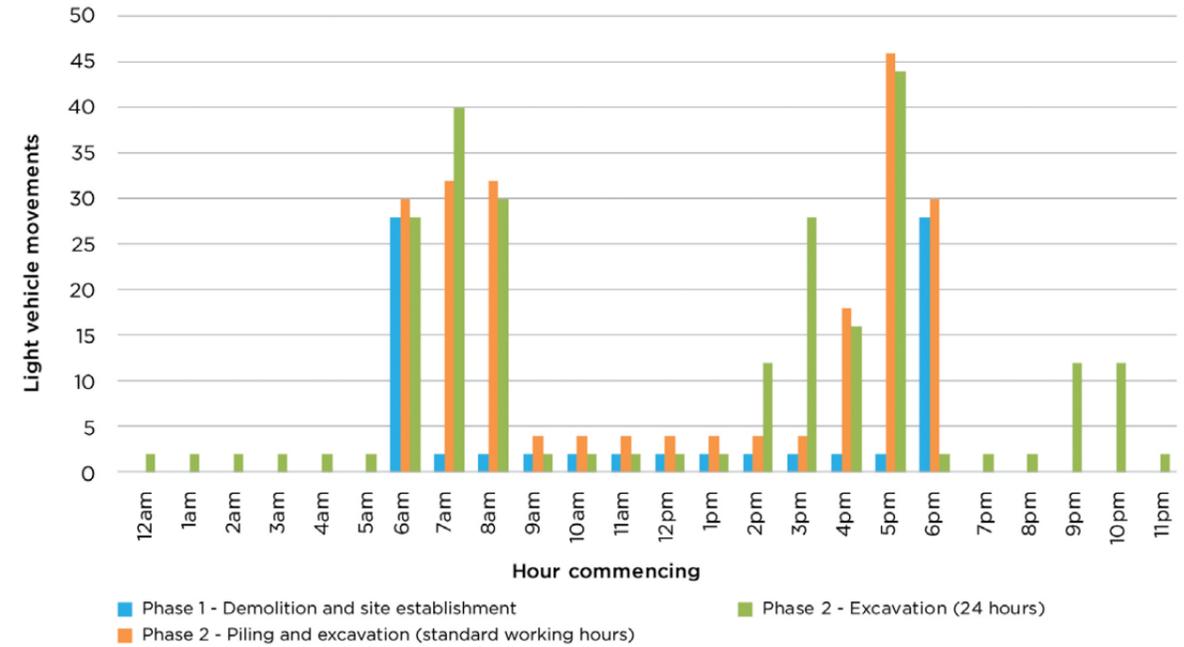


Figure 10-23: Hourly light vehicle movements at the Sydney Olympic Park metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

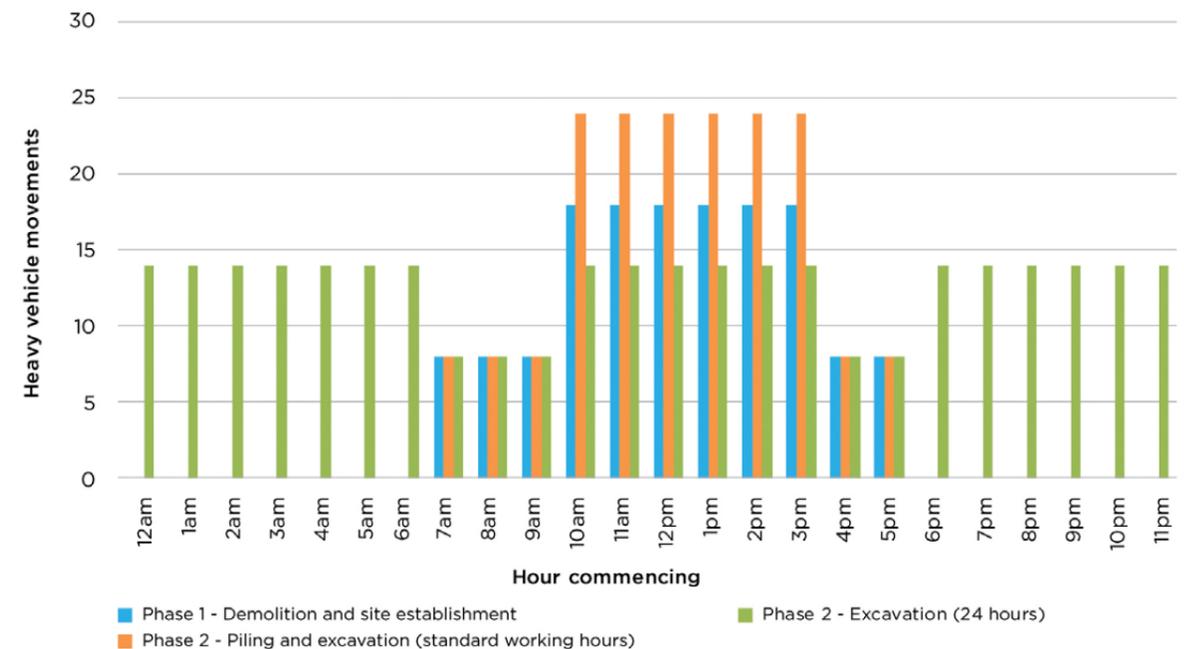


Figure 10-24: Hourly heavy vehicle movements Sydney Olympic Park metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

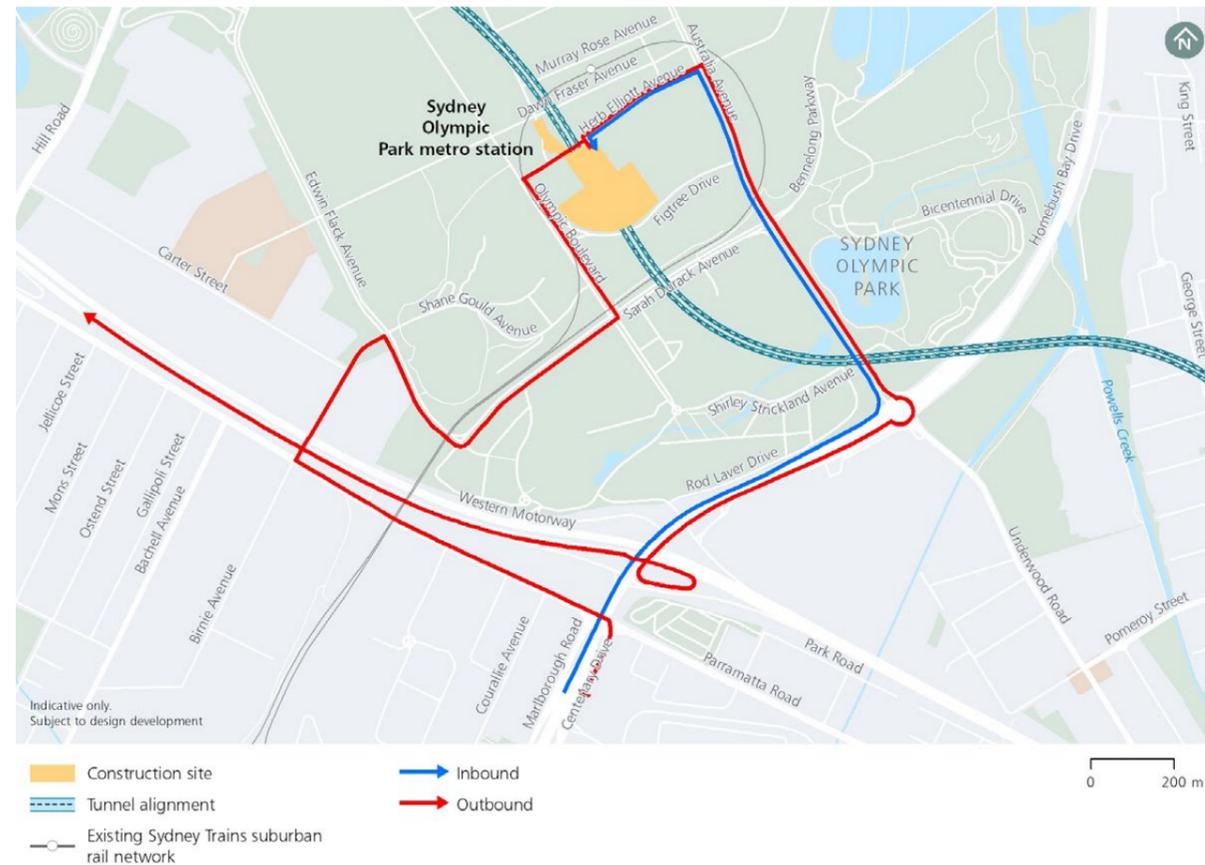


Figure 10-25: Sydney Olympic Park metro station construction site haulage routes

Active transport network

Part of Showground Road would be permanently pedestrianised as part of Stage 1 construction. This would improve the pedestrian network by removing potential existing conflicts between pedestrians and vehicles. Australia Avenue and Edwin Flack Avenue are designated on-road cycle environments of moderate difficulty. Temporary impacts to cyclists on these roads would be minor given that cyclists would be interacting with a low number of additional heavy vehicles generated at the Sydney Olympic Park metro station construction site.

Public transport network

A summary of the potential impacts to public transport services around the construction site is provided in Table 10-24.

Table 10-24: Sydney Olympic Park metro station construction site existing public transport impacts

Public transport mode	Impact description
Rail	<ul style="list-style-type: none"> No impact
Bus	<ul style="list-style-type: none"> Potential temporary minor increase in travel time due to additional construction vehicles on the road network During special events, construction vehicle movements would be limited where possible to minimise impacts on special event bus services No impacts to the operation of regular or special event bus stops.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods.

Figure 10-26 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Modelled intersection performance with construction traffic indicates that the following intersections would experience a temporary reduced level of service:

- Herb Elliott Avenue/Parkview Drive/Australia Avenue during the evening peak hour – from level of service D to F. This is due to an increase in traffic volumes at the intersection, with inbound construction vehicles turning left from the northbound approach and outbound construction vehicles turning right from the eastbound approach. This temporary impact is not considered a major impact as it does not interface with the arterial road network
- Sarah Durack Avenue/Edwin Flack Avenue during the evening peak hour – from level of service A to B. This intersection would still operate with spare capacity with the addition of construction traffic.

All other intersections forming part of the construction vehicle route would perform at the same level of service compared to the scenario without construction traffic.

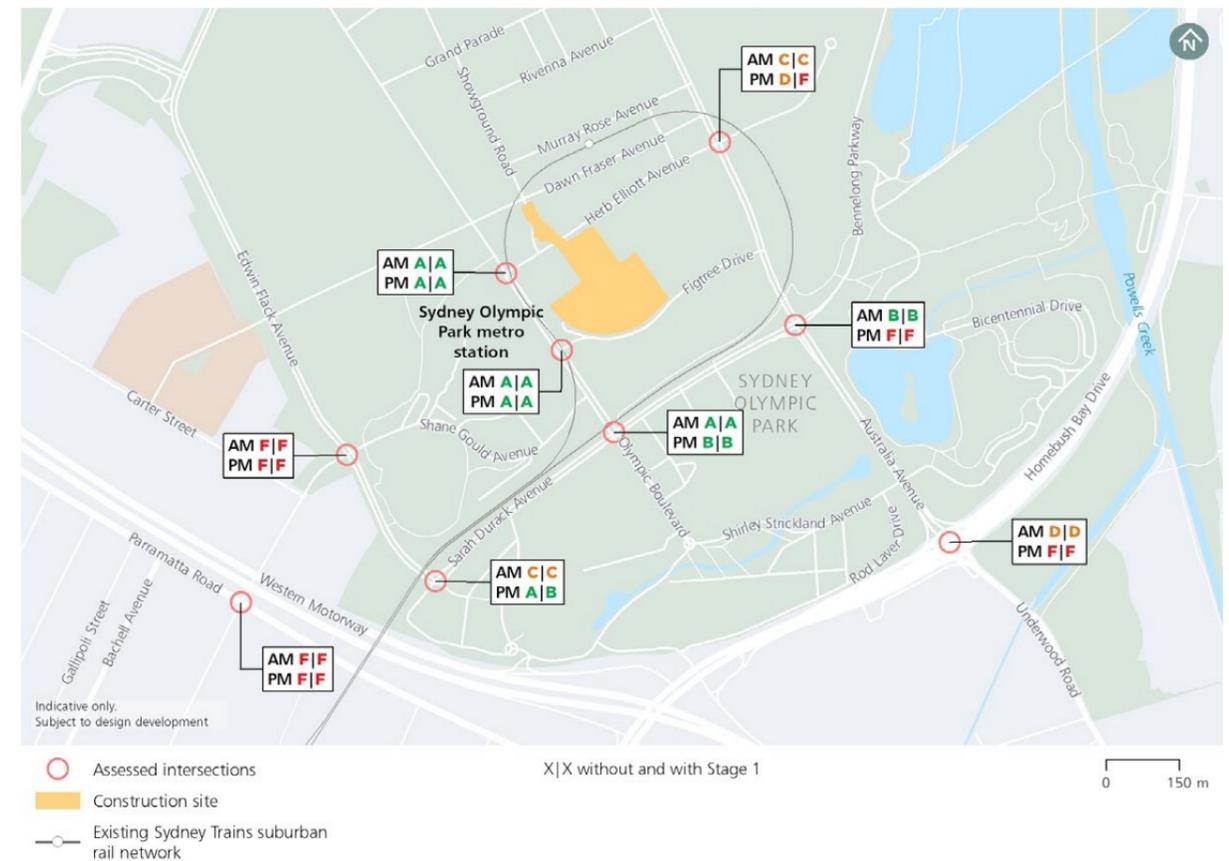


Figure 10-26: Sydney Olympic Park metro station construction site intersection performance (2023)

Parking and property access

Cut-and-cover works across Herb Elliott Avenue would require temporary closures of Herb Elliot Avenue. Options for this work are currently under investigation and may include:

- Full closure for an extended period: In this case, access to adjacent properties would be maintained from either end of Herb Elliott Avenue
- Stage partial closures: In this case, through traffic would be maintained under traffic control, although this would be likely to extend the total duration of works.

Sydney Metro is also investigating the feasibility of design and construction options to avoid cut-and-cover works across Herb Elliott Avenue.

Showground Road at its intersection with Dawn Fraser Avenue would be pedestrianised to accommodate the proposed northern station entry. Access to the Ibis, Pullman and Novotel Hotels’ underground car park and driveway access (for authorised vehicles only) to the Abattoir Heritage Precinct would be maintained via Olympic Boulevard and Herb Elliott Avenue, resulting in additional travel distance of up to 220 metres. This would be a minor impact due to the small increase in travel distance and resultant small increase in travel time. There would be no other impacts to parking or private property access.

The taxi rank on the southern side of Herb Elliott Avenue adjacent to the construction site would be temporarily relocated to an alternative site close to its current location. The potential impact to taxi customers would be minor.

10.11 North Strathfield metro station construction site

10.11.1 Existing environment

The North Strathfield metro station construction site would be bound by Pomeroy Street, Queen Street and the T9 Northern Line.

The location of the construction site and the surrounding transport network are shown on Figure 10-27.

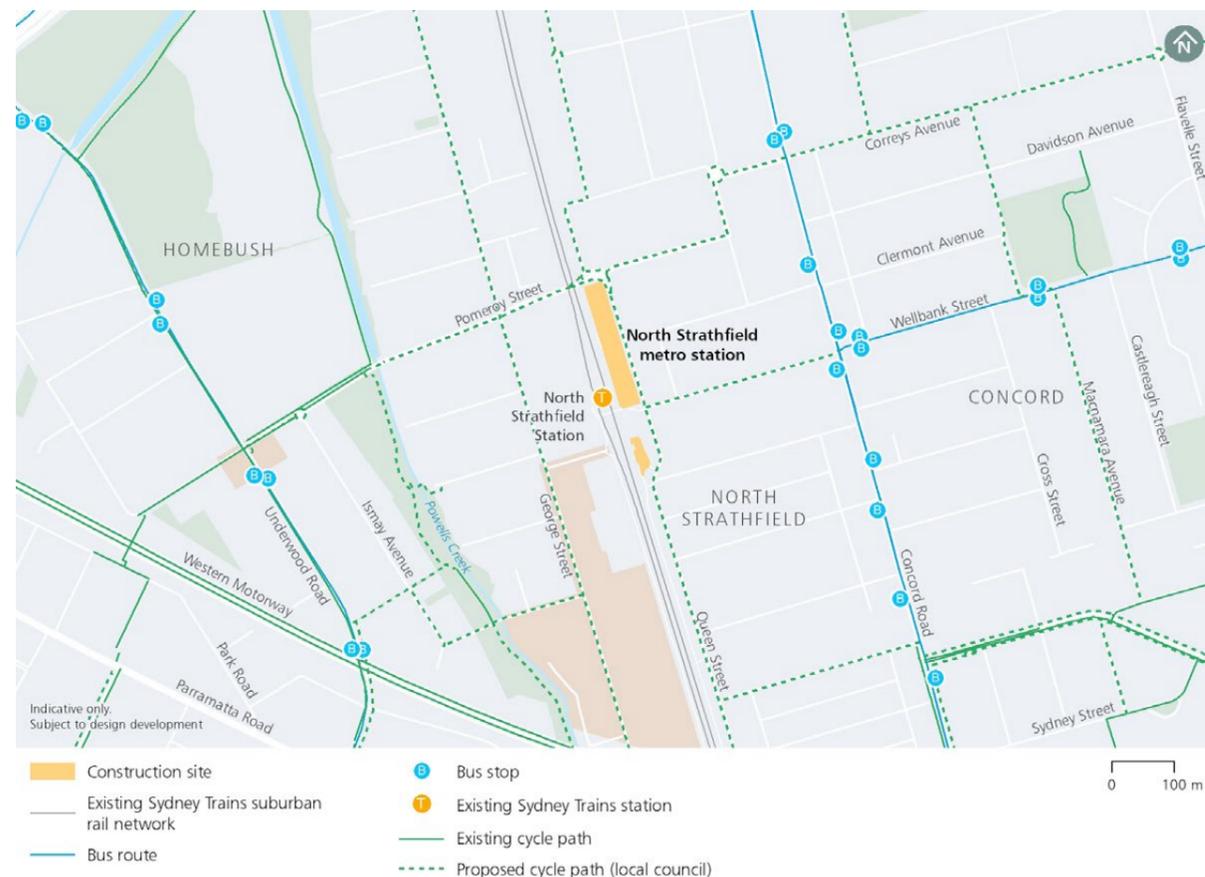


Figure 10-27: North Strathfield metro station construction site transport network

Active transport network

Footpaths exist on both sides of most streets near the North Strathfield metro station construction site. Pedestrian crossing facilities are limited and provided at the following locations:

- A pedestrian bridge across the T9 Northern Line at the existing North Strathfield Station between Queen Street and Hamilton Street East/Pomeroy Street. There are three short footpaths near the Queen Street/Wellbank Street intersection which converge at the pedestrian overbridge, providing access to the existing North Strathfield Station and the western side of the rail line
- Signalised crossing along Concord Road and at the Pomeroy Street/George Street intersection
- A raised zebra crossing at the Queen Street/Wellbank Street intersection.

The cycle network surrounding the construction site includes:

- On-road cycle routes to the west of the existing North Strathfield Station along Underwood Road, Bridge Road, Pomeroy Street and The Crescent
- Shared paths near Powells Creek to the west of the existing North Strathfield Station (including connections to the Cooks River cycleway and the Sydney Olympic Park precinct)
- On-road and off-road cycle routes to the east of the existing North Strathfield Station along Concord Road, Patterson Street and Gipps Street.

Public transport services

A summary of the public transport services around the North Strathfield metro station construction site is provided in Table 10-25.

Table 10-25: North Strathfield metro station construction site existing public transport services

Public transport mode	Description
Rail	<ul style="list-style-type: none"> • Sydney Trains network – T9 Northern Line.
Bus	<ul style="list-style-type: none"> • Six bus routes (including two NightRide bus routes) • One public on-demand bus service • 22 school bus routes • Major bus stops on Underwood Road, Concord Road and Wellbank Street.

Road traffic volume and patterns

The M4 Western Motorway, Parramatta Road and Concord Road are the major arterial roads that carry high volumes of traffic through the road network surrounding the construction site. Key collector roads near the construction site include Queen Street and Wellbank Street.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Westbound traffic on the M4 Western Motorway and Parramatta Road
- Northbound traffic on Concord Road
- Northbound and southbound traffic on Queen Street.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on the M4 Western Motorway and Parramatta Road
- Southbound traffic on Concord Road
- Eastbound and westbound traffic on Wellbank Street
- Northbound and southbound traffic on Queen Street.

The existing traffic volumes on the surrounding road network are provided in Table 10-26.

Table 10-26: North Strathfield metro station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Parramatta Road west of Concord Road	Eastbound	800	950
	Westbound	960	1,040
M4 Western Motorway north of Parramatta Road	Eastbound	2,060	2,140
	Westbound	2,500	1,990
Waratah Street west of Concord Road	Eastbound	60	50
	Westbound	60	40
Wellbank Street east of Queen Street	Eastbound	340	380
	Westbound	410	410
Concord Road north of Parramatta Road	Northbound	1,320	910
	Southbound	1,060	1,290
Concord Road south of Wellbank Street	Northbound	1,230	810
	Southbound	610	890
Queen Street north of Wellbank Street	Northbound	400	490
	Southbound	430	440

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections in the vicinity of the North Strathfield metro station construction site is shown in Table 10-27.

The high traffic volumes experienced on all approaches to the Concord Road/Parramatta Road/Leicester Avenue intersection result in its existing performance during the morning peak hour.

Queuing on Queen Street in the northbound direction during the evening peak hour comes from the Queen Street/Beronga Street intersection and extends past the Queen Street/Wellbank Street intersection, reducing its capacity and resulting in a deterioration in performance.

Table 10-27: Modelled peak hour existing intersection performance - North Strathfield metro station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Concord Road/Parramatta Road/Leicester Avenue	Morning	3,530	65	E
	Evening	3,756	45	D
Concord Road/Patterson Street	Morning	2,755	25	B
	Evening	2,834	23	B
Concord Road/Wellbank Street	Morning	2,626	24	B
	Evening	2,583	24	B
Queen Street/Parramatta Road	Morning	1,748	7	A
	Evening	2,010	5	A
Wellbank Street/Queen Street	Morning	740	41	C
	Evening	893	91	F
M4 Western Motorway/Concord Road	Morning	2,645	54	D
	Evening	2,804	33	C

On-street parking, loading, servicing and pick-up arrangements

A mix of time-restricted and unrestricted on-street parking is provided on roads near the construction site including Queen Street, Beronga Street, Waratah Street, Wellbank Street and Shipley Avenue. On-street parking spaces close to the existing North Strathfield Station are generally time-restricted. Weekday peak period clearways operate on Concord Road, with on-street parking available on the western side only, outside of these periods.

A kiss and ride zone is located on the western side of Queen Street near Wellbank Street and a mail zone is located on the eastern side of Queen Street near Wellbank Street. There are no loading zones on roads immediately surrounding the construction site.

10.11.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction sites over a typical day are provided in Figure 10-28 and Figure 10-29 respectively.

The proposed primary haul routes are shown in Figure 10-30. Access to and egress from the north and south construction sites would be left in and right-out for the northern site access and right-in, left-out for the southern site access, to and from Queen Street. Roads forming part of the construction vehicle route include the M4 Western Motorway, Concord Road, Wellbank Street and Queen Street.

Adjustments to construction site access arrangements and the local road network would be explored during detailed design to minimise conflicts with heavy vehicles movements. This may include use of Waratah Street for haulage, adjustments to local traffic circulation, and/or changes to traffic control at Queen Street and Wellbank Street.

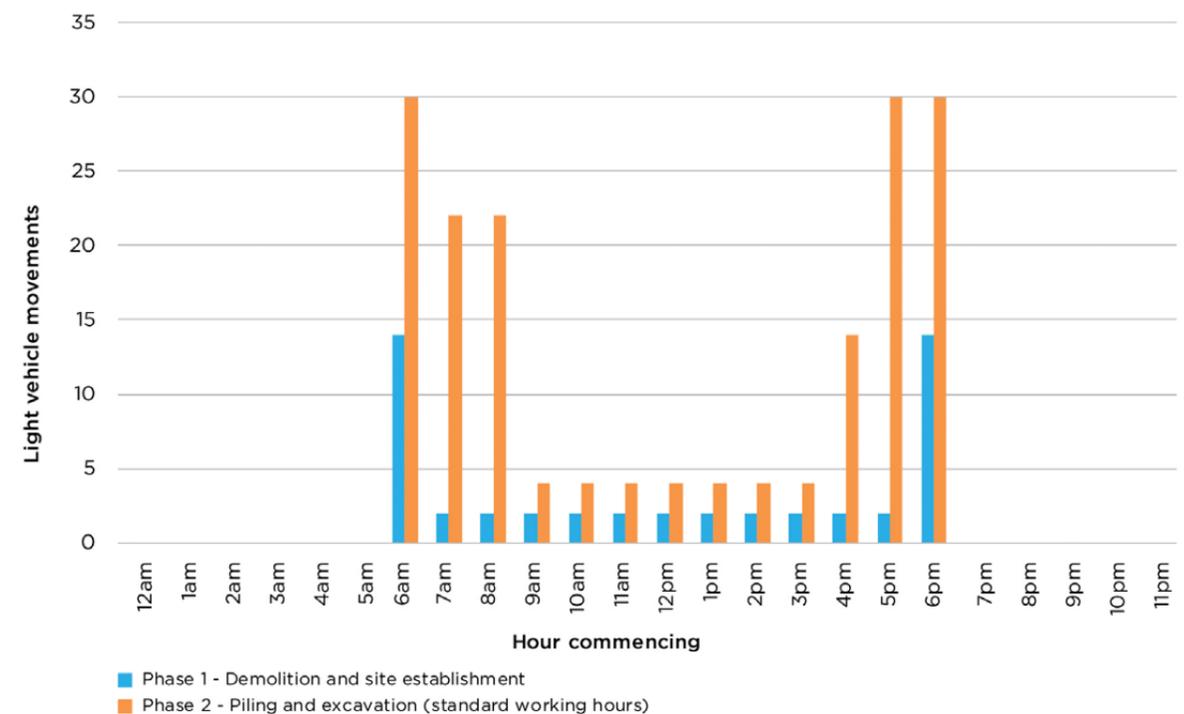


Figure 10-28: Hourly light vehicle movements at the North Strathfield metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

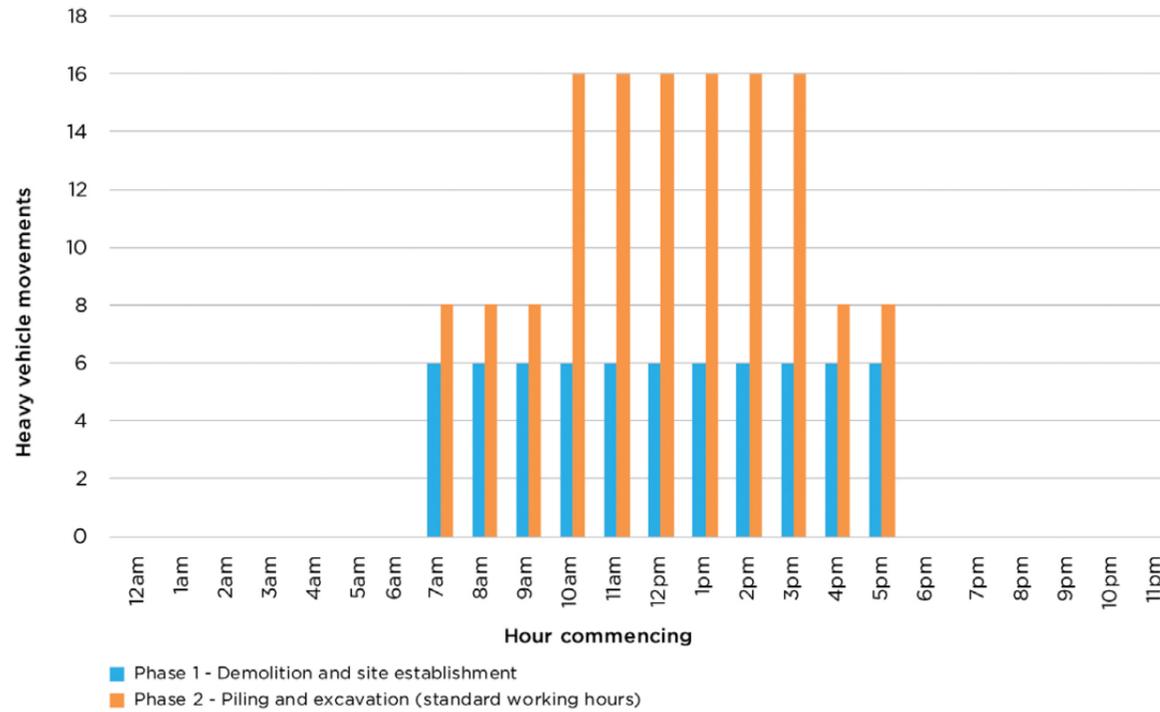


Figure 10-29: Hourly heavy vehicle movements at the North Strathfield metro station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

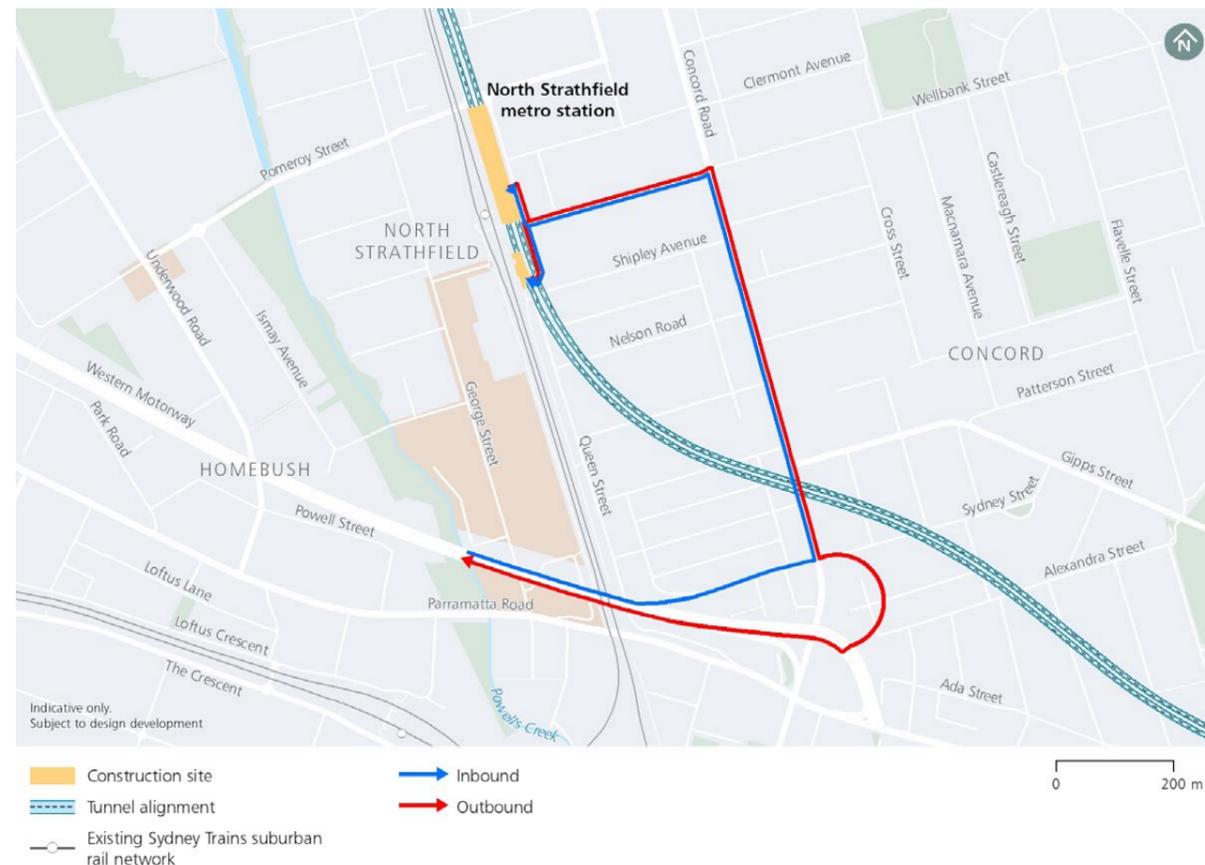


Figure 10-30: North Strathfield metro station construction site haulage routes

Active transport network

The western footpath on Queen Street adjacent to the construction site would be temporarily removed. Pedestrians would be diverted to the footpath on the eastern side of Queen Street. The Queen Street / Wellbank Street intersection would need to be modified to accommodate heavy vehicles movements and provide safe pedestrian access. Modification of the intersection may include signalisation and/or changes to zebra crossings.

There are currently three short footpaths near the Queen Street / Wellbank Street intersection which converge at the pedestrian overbridge, providing access to the existing North Strathfield Station and the western side of the rail line. During construction, some of these footpaths may be closed, however access to the existing North Strathfield Station would be maintained. There would be no impacts to the lift access provided to the existing station.

Collectively the adjustment of the pedestrian network would minimally temporarily increase the travel distance of pedestrians and therefore impacts are anticipated to be minor.

There would be no impacts to the cycle network near the construction site during Stage 1.

Public transport services

A summary of the potential impacts to public transport services around the construction site is provided in Table 10-28.

Table 10-28: North Strathfield metro station construction site existing public transport impacts

Public transport mode	Impact description
Rail	<ul style="list-style-type: none"> No impact to services. If works are required within the rail corridor, these works would be carried out during rail track possessions
Bus	<ul style="list-style-type: none"> Potential temporary minor increase in travel time due to additional construction vehicles on the road network Temporary relocation of the existing bus stop on the western side of Queen Street (north of Wellbank Street). This bus stop serves nine school bus routes. Bus operators, relevant parts of Transport for NSW, the City of Canada Bay and the affected schools would be consulted about the new bus stop location. This would not impact the operation of school bus services that use this stop, however may result in some customers having to temporarily walk slightly further distances to or from the bus stop.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods and during school drop off and pick up periods.

Figure 10-31 show the performance and the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Modelled intersection performance with construction traffic indicates that the following intersections would experience a temporary reduction in level of service from Stage 1:

- Concord Road/Patterson Street during the morning peak hour. Without construction traffic, average delay at the intersection is 53 seconds, which is close to the threshold between level of service D and E. With construction traffic, average delay increases by six seconds which would not substantially change the operational performance of the intersection
- M4 Western Motorway/Concord Road during the evening peak hour. Average delay at the intersection increases by 20 seconds with the addition of construction traffic. This is the result of additional construction vehicles travelling through the intersection to access and egress from the M4 Western Motorway, with increased queue lengths on the eastbound and southbound approaches.

There would be the need to modify the Queen Street/Wellbank Street intersection, which may involve changes to the zebra crossings or signalisation. This would improve pedestrian safety, accessibility and connectivity during construction, however may have impacts on traffic and pedestrian access and movements.

Sydney Metro is continuing to investigate construction site access arrangements to reduce potential impacts and minimise conflicts with heavy vehicle movements. This may include the use of Waratah Street for haulage, localised changes to traffic circulation, and / or changes to traffic control and pedestrian crossing facilities at the Queen Street / Wellbank Street intersection.

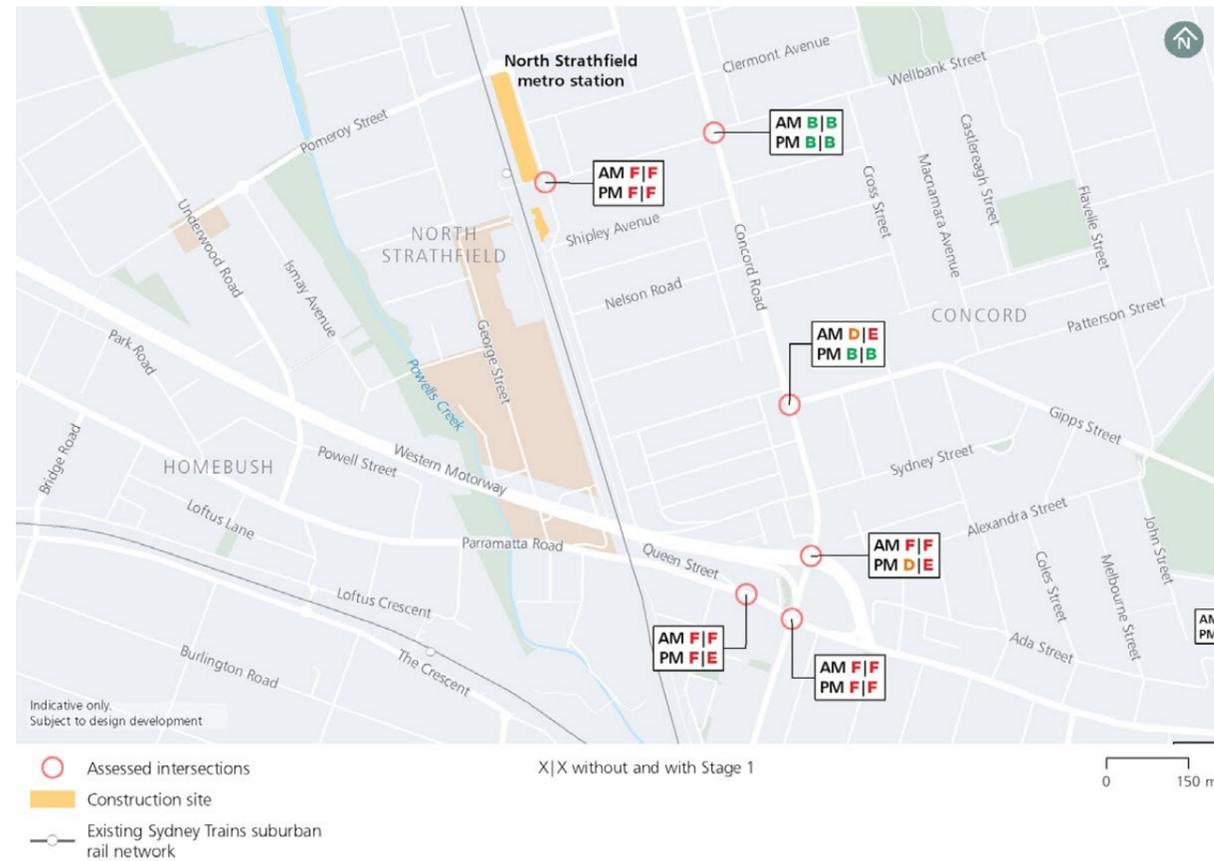


Figure 10-31: North Strathfield metro station construction site intersection performance

Parking

To enable construction works, the parking lane on the western side of Queen Street would be temporarily removed between Wellbank Street and Pomeroy Street, resulting in the temporary loss of about 20 on-street parking spaces. These parking spaces are time-restricted to one or two hours. Nearby streets have limited capacity to accommodate additional parking demand, and it is unlikely that all lost parking spaces could be accommodated. Therefore the impact to parking on the surrounding local road network would be moderate. Impacts to parking in the local road network surrounding the construction site would be minimised through the measures outlined in Section 10.17.

The kiss and ride zone on the western side of Queen Street north of Wellbank Street would also be temporarily relocated during construction. The kiss and ride zone would be relocated to the closest practical alternative to minimise disruption to users and therefore impacts are anticipated to be minor.

10.12 Burwood North Station construction site

10.12.1 Existing environment

The Burwood North Station construction site would comprise two separate sites, a northern site and a southern site on either side of Parramatta Road. The northern site is bound by Parramatta Road, Loftus Street, a part of the southern section of Burton Street, close to Burwood Road and Burwood Road. The southern site is on the corner of Parramatta Road and Burwood Road.

The location of the construction site and the surrounding transport network are shown on Figure 10-32.

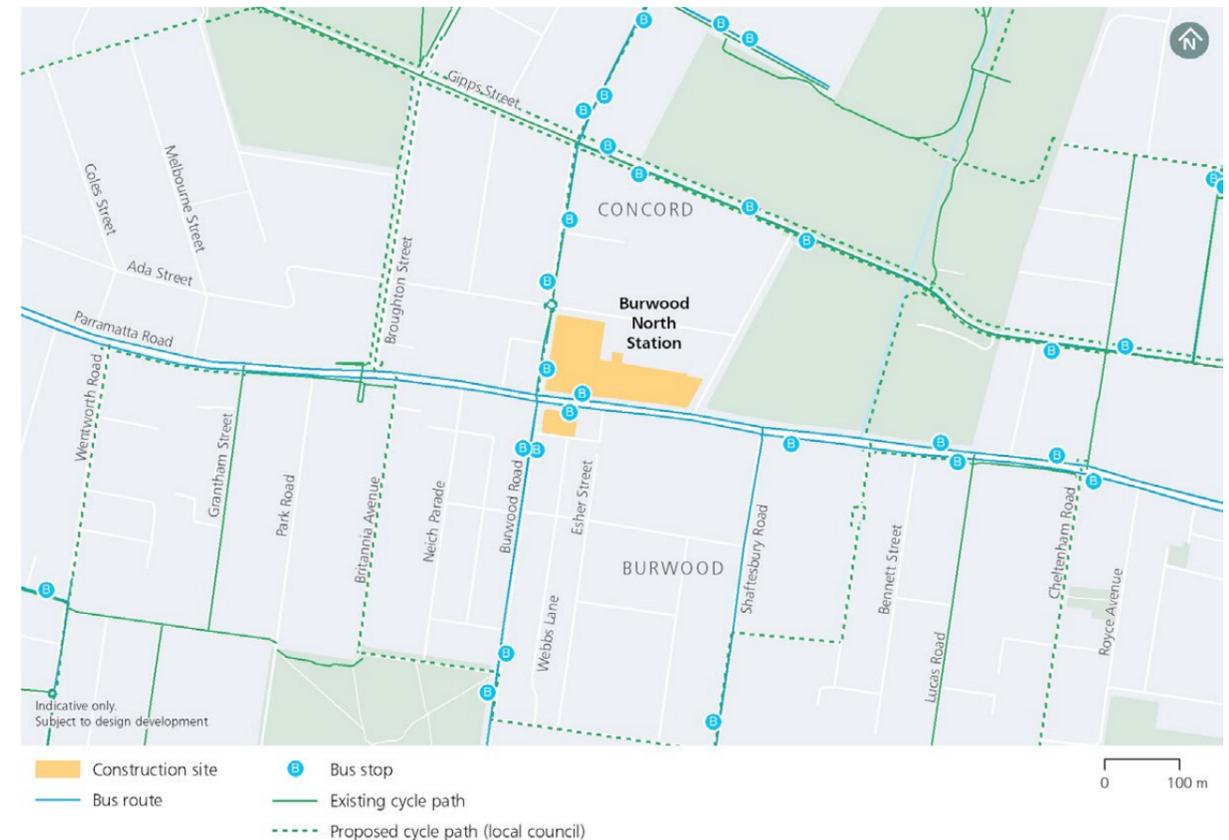


Figure 10-32: Burwood North Station construction site transport network

Active transport network

Footpaths are provided along both sides of most roads near the construction site. High levels of pedestrian activity occur along Parramatta Road and Burwood Road (south of Parramatta Road).

Pedestrian crossings are provided at the following locations:

- A pedestrian bridge over Parramatta Road near Broughton Street and Britannia Avenue
- Signalised crossings at the Parramatta Road/Burwood Road intersection, the Parramatta Road/Shafesbury Road intersection and the Parramatta Road/Broughton Street intersection
- Staged crossing of Loftus Street via the raised central median.

The cycle network surrounding the construction site includes:

- A shared path along the southern side of Parramatta Road between the Broughton Street bridge and Grantham Street
- On-road cycle routes along Gipps Street and Stanley Street, and over the Broughton Street bridge.

Public transport services

The public transport network around Burwood North Station construction site is limited to bus services. A summary of these services is provided in Table 10-29.

Table 10-29: Burwood North Station construction site existing public transport services

Public transport mode	Description
Bus	<ul style="list-style-type: none"> 27 bus routes One public on-demand bus service 46 school bus routes Major bus stops on Parramatta Road, Burwood Road, Gipps Street, Crane Street and Railway Parade.

Road traffic volume and patterns

Parramatta Road is the major arterial road that carries a high volume of traffic through the road network surrounding the construction site. Key local roads in the vicinity of the construction site include Burwood Road, Broughton Street, Gipps Street and Loftus Street.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on Parramatta Road and Gipps Street
- Southbound traffic on Broughton Street, Burwood Road and Loftus Street.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on Parramatta Road
- Eastbound and westbound traffic on Gipps Street
- Southbound traffic on Broughton Street and Loftus Street
- Northbound and southbound traffic on Burwood Road.

The existing traffic volumes on the surrounding road network are provided in Table 10-30.

Table 10-30: Burwood North Station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Parramatta Road west of Broughton Street	Eastbound	2,520	2,920
	Westbound	2,260	2,280
Parramatta Road west of Loftus Street	Eastbound	2,380	2,820
	Westbound	1,840	2,010
Gipps Street west of Loftus Street	Eastbound	1,120	1,030
	Westbound	820	1,030
Broughton Street north of Parramatta Road	Northbound	250	270
	Southbound	370	410
Burwood Road south of Parramatta Road	Northbound	440	450
	Southbound	520	430
Burwood Road south of Gipps Street	Northbound	350	380
	Southbound	360	350
Loftus Street north of Parramatta Road	Northbound	<10	30
	Southbound	180	140

Intersection performance

Modelled intersection performance during the morning and evening peak hours for key intersections near the Burwood North station construction site is shown in Table 10-31.

The existing performance of the Burton Street/Broughton Street intersection during the morning peak hour is due to downstream queuing from the Parramatta Road/Broughton Street intersection.

Traffic congestion along Parramatta Road delays vehicles from Loftus Street turning into Parramatta Road, and is reflected in the existing performance of the Parramatta Road/Loftus Street intersection. This is an unsignalised intersection, where the intersection performance reported is for the worst movement (in this case, the Loftus Street southbound left-turn).

Table 10-31: Modelled peak hour existing intersection performance – Burwood North Station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Broughton Street/Gipps Street	Morning	2,457	33	C
	Evening	2,698	21	B
Burton Street/Broughton Street	Morning	735	>100	F
	Evening	932	20	B
Gipps Street/Burwood Road	Morning	2,516	25	B
	Evening	2,820	22	B
Gipps Street/Loftus Street	Morning	1,868	29	B
	Evening	2,216	36	C
Loftus Street/Burton Street	Morning	263	6	A
	Evening	252	<5	A
Parramatta Road/Broughton Street	Morning	5,114	35	C
	Evening	5,155	27	B
Parramatta Road/Burwood Road	Morning	5,420	17	B
	Evening	5,506	22	B
Parramatta Road/Loftus Street	Morning	4,745	>100	F
	Evening	4,780	37	C

On-street parking, loading servicing and pick-up arrangements

On-street parking is provided on both sides of most local and collector roads including Loftus Street, Burton Street, Broughton Street and Gipps Street, east of Burwood Road. Most of these on-street parking spaces do not have any time restrictions. West of Burwood Road, on-street parking is prohibited on both sides of Gipps Street during weekday peak periods to allow for two trafficable lanes in each direction. On-street parking spaces provided on Burwood Road close to Gipps Street are not time-restricted. Near Parramatta Road, parking is prohibited on both sides of Burwood Road during weekday peak periods, with time-restricted parking available outside of these hours.

On-street parking along Parramatta Road is generally not provided with clearways in operation seven days a week during daylight hours (6 am to 7 pm Monday to Friday, 8 am to 8 pm Saturday and Sunday), and no parking or no stopping signs along most sections of the corridor.

There are no kiss and ride, loading zone or point to point transport service zones on roads immediately surrounding the construction site.

10.12.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements over a typical day are provided in Figure 10-33 and Figure 10-34 respectively for the Burwood North Station northern construction site and in Figure 10-35 and Figure 10-36 respectively for the Burwood North Station southern construction site.

The proposed primary haul routes are shown in Figure 10-37. Access to the northern construction site would be left in from Parramatta Road (for heavy vehicles) and left in from Burton Street (for light vehicles). Egress from the northern construction site would be left out via Loftus Street (most heavy vehicles) and left out via Burton Street (light vehicles). Roads forming part of the construction vehicle route for the northern site include the M4 Western Motorway, Parramatta Road, Loftus Street, Gipps Street and Broughton Street. Access to and egress from the southern construction site would be left in from Burwood Road and left out via Parramatta Road. Roads forming part of the construction vehicle route for the southern site include the Parramatta Road, Burwood Road and the M4 Western Motorway.

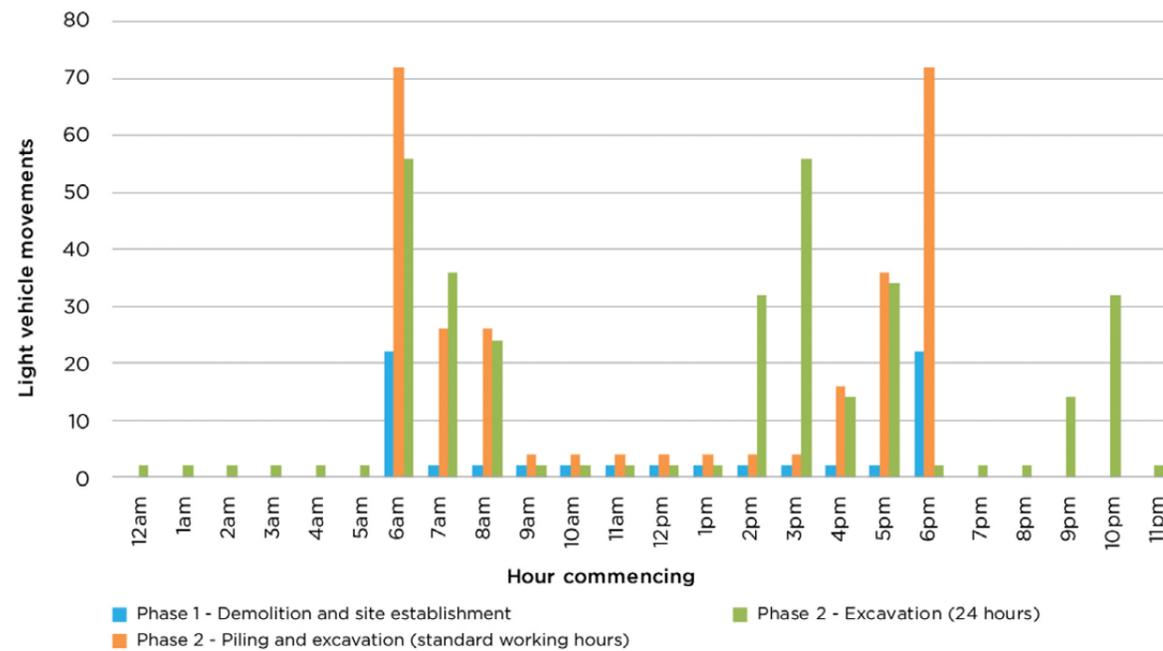


Figure 10-33: Hourly light vehicle movements at the Burwood North Station northern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

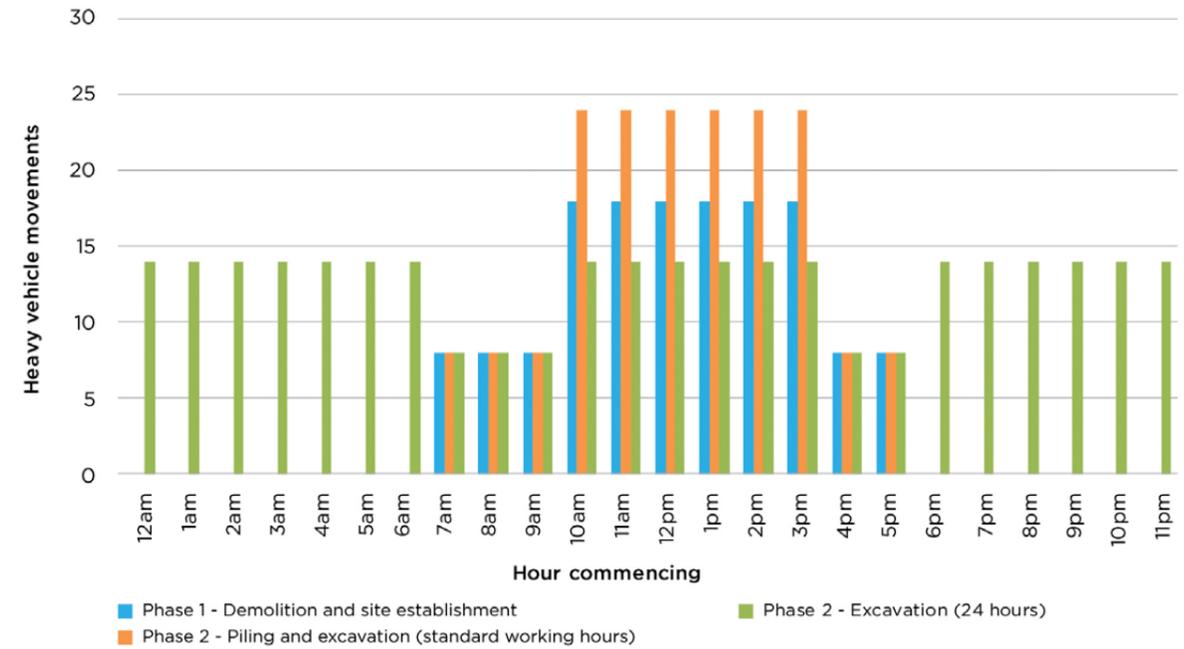


Figure 10-34: Hourly heavy vehicle movements at the Burwood North Station northern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

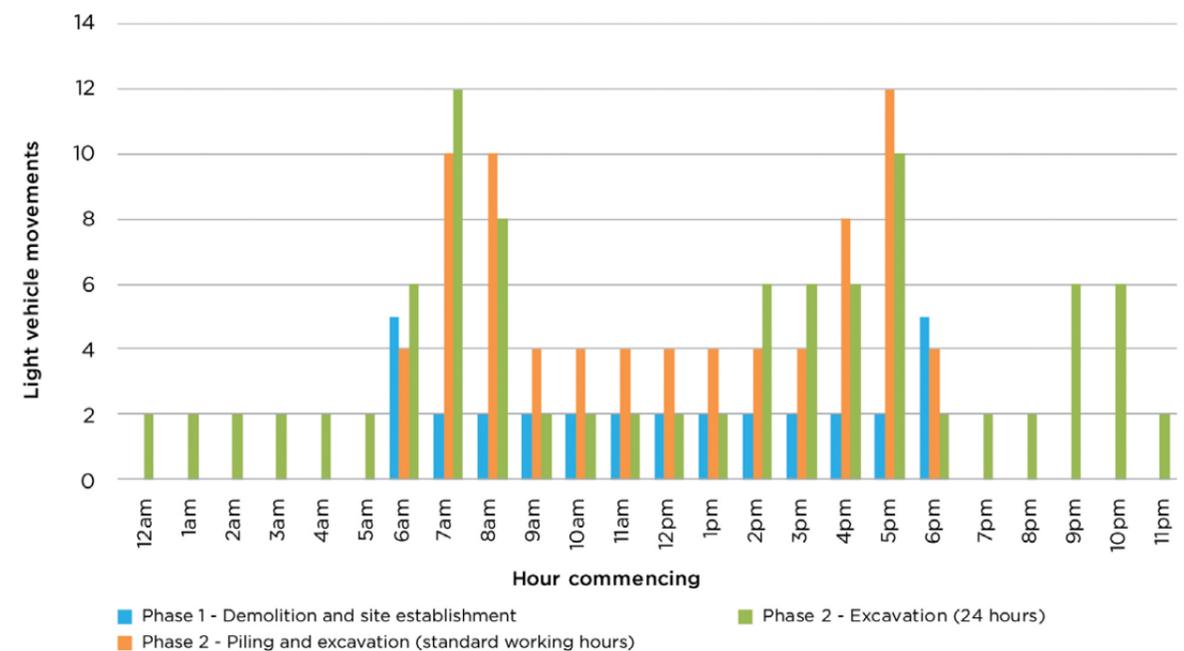


Figure 10-35: Hourly light vehicle movements at the Burwood North Station southern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

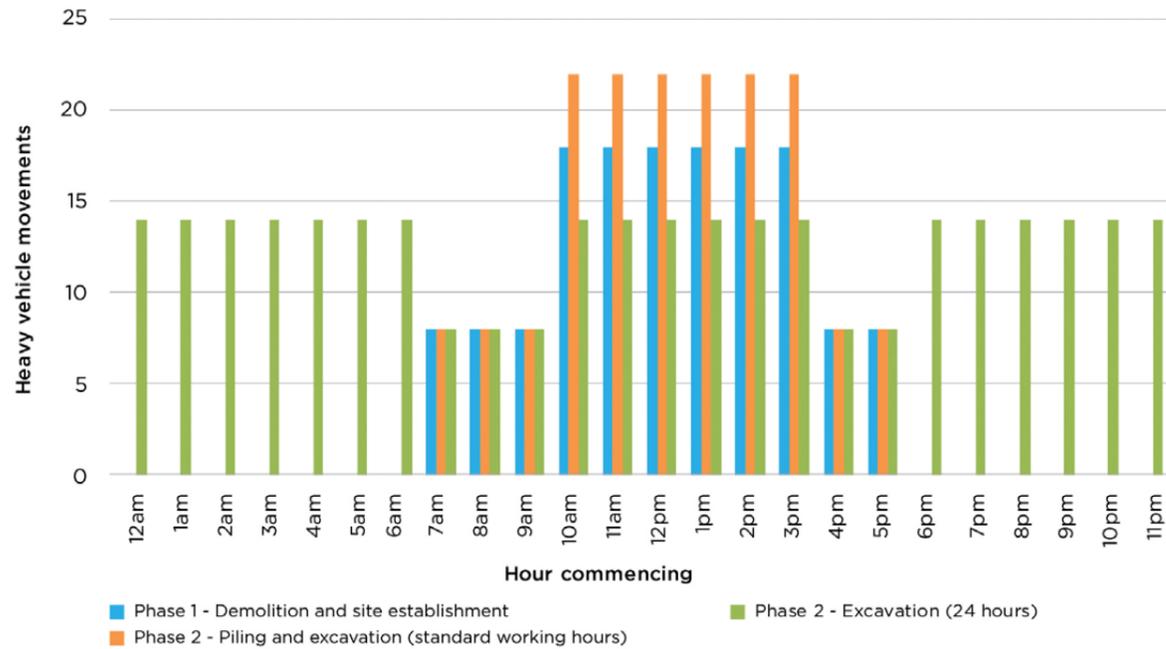


Figure 10-36: Hourly heavy vehicle movements at the Burwood North Station southern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

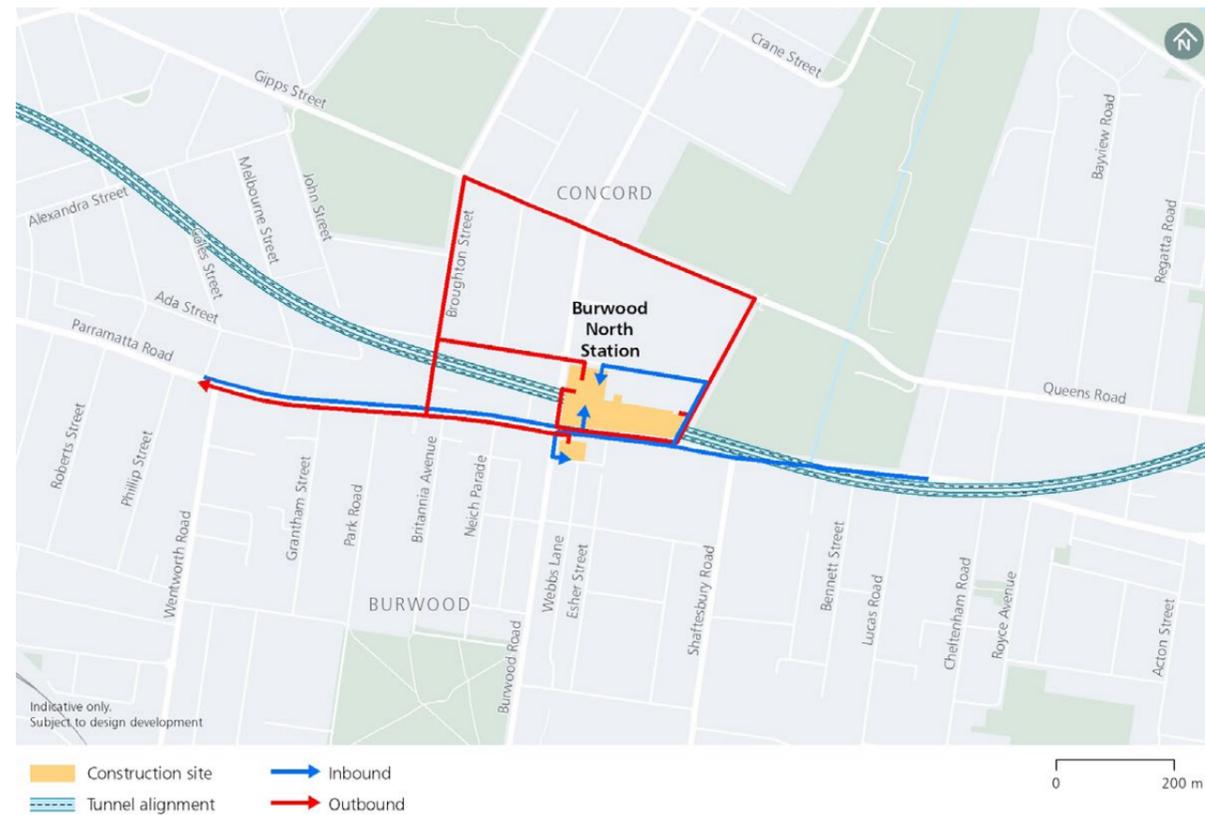


Figure 10-37: Burwood North Station construction site haulage routes

Active transport network

No impacts to pedestrians are anticipated during construction.

Gipps Street between Loftus Street and Broughton Street is designated as a moderate or high difficulty on-road cycle route. This section of Gipps Street would also be temporarily used by egressing construction vehicles generated at the northern construction site resulting in cyclists on Gipps Street temporarily interacting with a low number of additional heavy vehicles. Fencing located directly outside of the Pine Inn Hotel would be removed consistent with other sections of Parramatta Road nearby.

Public transport services

The public transport network around Burwood North Station construction site is limited to bus services. A summary of the potential impacts to bus services around the construction site is provided in Table 10-32.

Table 10-32: Burwood North station construction site existing public transport impacts

Public transport mode	Impact description
Bus	<ul style="list-style-type: none"> Temporary relocation of the following bus stops: <ul style="list-style-type: none"> The bus stop on the northern side of Parramatta Road between Burwood Road and Loftus Street, adjacent to the Burwood North Station northern construction site The bus stop on the eastern side of Burwood Road between Neichs Lane and Parramatta Road, adjacent to the Burwood North Station northern construction site The bus stop on the southern side of Parramatta Road between Burwood Road and Esher Street, adjacent to the Burwood North Station southern construction site. Bus operators, relevant parts of Transport for NSW, the City of Canada Bay and Burwood Council (as relevant) would be consulted about the new bus stop locations. Potential temporary minor increase in travel time due to additional construction vehicles on the road network.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods and during school drop off and pick up periods.

Figure 10-38 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Compared to existing conditions, there is a substantial decrease in demand flow at intersections along Parramatta Road. This is due to the progressive opening of WestConnex stages, where a considerable proportion of traffic that currently travels on Parramatta Road is forecast to shift onto WestConnex by 2023.

Modelled intersection performance with construction traffic indicates that the Parramatta Road/Broughton Street intersection would experience a temporary deterioration in performance from level of service B to C. However, this intersection would still operate with spare capacity.

Overall, all intersections would continue to perform satisfactorily at level of service D or better with construction traffic.

Sydney Metro is continuing to investigate opportunities to provide construction vehicle access and egress directly to Parramatta Road and minimise the use of Loftus Street by construction heavy vehicles.



Figure 10-38: Burwood North Station construction site intersection performance (2023)

Parking

About four on-street parking spaces would be temporarily removed on the western side of Loftus Street adjacent to the Burwood North Station northern construction site boundary. The temporary loss of parking spaces would not have any major impacts on parking considering the proximity and availability of other spaces.

Off-street private parking for properties fronting Burwood Road and Parramatta Road within the Burwood North Station northern construction site would be permanently removed. These parking spaces serve properties that would be demolished during construction and would result in negligible parking impacts.

10.13 Five Dock Station construction site

10.13.1 Existing environment

The Five Dock Station construction site would comprise two separate sites, a western site and an eastern site on either side of Great North Road. The Five Dock Station western construction site is between Great North Road and East Street to the north of Fred Kelly Place. The Five Dock Station eastern construction site is on the corner of Waterview Street and Second Avenue.

The location of the construction site and the surrounding transport network are shown on Figure 10-39.

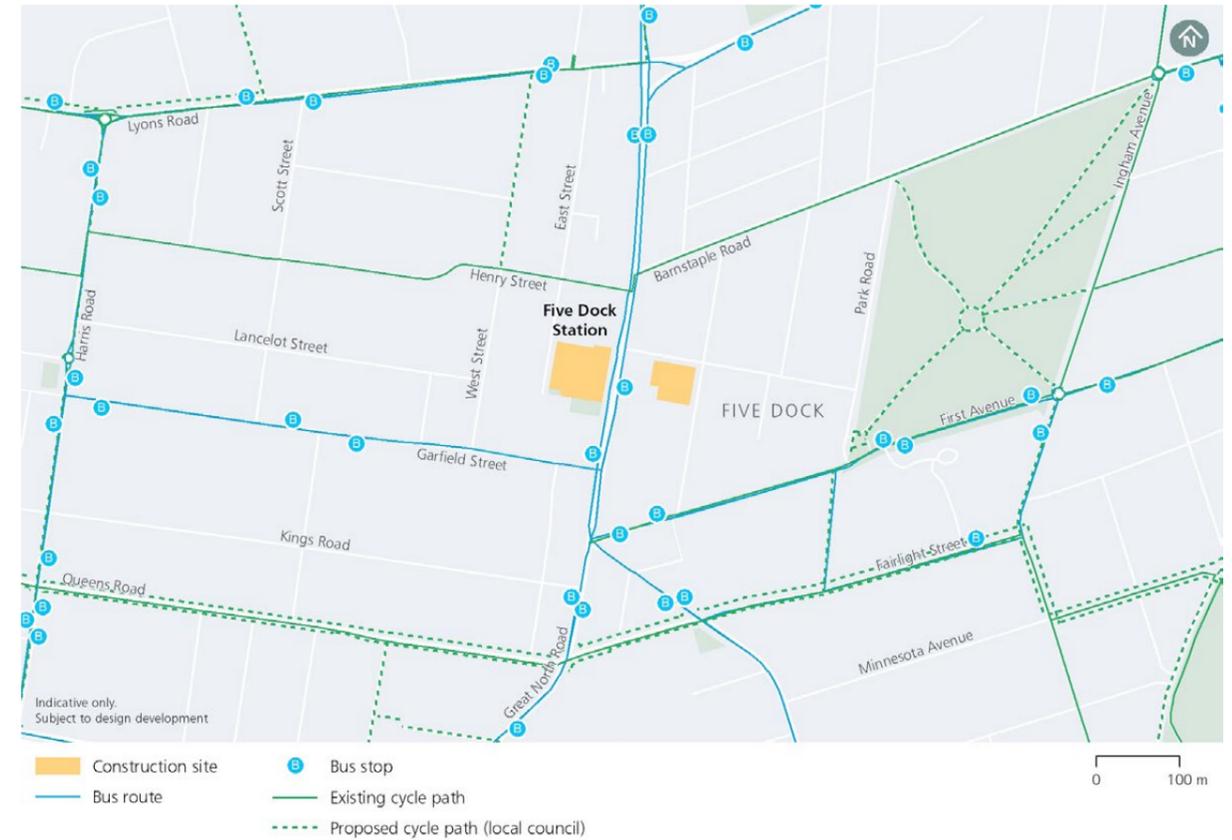


Figure 10-39: Five Dock Station construction site transport network

Active transport network

Footpaths are provided on both sides of all roads near the Five Dock Station construction site. Pedestrian activity near the construction site is concentrated around businesses and community facilities along Great North Road.

Pedestrian crossings are provided at the following locations:

- Signalised crossings at:
 - Great North Road/Ramsay Road/First Avenue intersection
 - Great North Road/Garfield Street intersection
 - Great North Road/Lyons Road intersection
 - Great North Road/Queens Road/Fairlight Street intersection
 - Great North Road at Fred Kelly Plaza
- A raised zebra crossing across Great North Road near Henry Street.

There are no controlled pedestrian crossings in the immediate vicinity of the Five Dock Station eastern construction site.

The cycle network surrounding the construction site includes:

- On-road cycle routes along Lyons Road West, Henry Street, Barnstaple Road, First Avenue and Queens Road
- An off-road cycle path on Lyons Road West
- A shared path along the southern side of Iron Cove Creek between Dobroyd Parade and Wolseley Street.

Public transport services

The public transport network around Five Dock station construction site is limited to bus services. A summary of these services is provided in Table 10-33.

Table 10-33: Five Dock station construction site existing public transport services

Public transport mode	Description
Bus	<ul style="list-style-type: none"> 16 bus routes (including four NightRide bus routes) One public on-demand bus service 56 school bus routes Major bus stops at Great North Road, Lyons Road, Lyons Road West, Garfield Street, Harris Road, First Avenue, Ingham Avenue, Ramsay Road and Parramatta Road.

Road traffic volume and patterns

Parramatta Road and Lyons Road are the main arterial roads that carry high volumes of traffic through the road network surrounding the construction site. Key collector roads near the construction site include Great North Road and First Avenue. Second Avenue and Waterview Street are local roads.

During the morning peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on Parramatta Road, Lyons Road and First Avenue
- Southbound traffic on Great North Road.

During the evening peak hour, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound traffic on Parramatta Road and First Avenue
- Westbound traffic on Lyons Road
- Northbound and southbound traffic on Great North Road
- Eastbound and westbound on Second Avenue
- Southbound on Waterview Street.

The existing traffic volumes on the surrounding road network are provided in Table 10-34.

Table 10-34: Five Dock Station construction site existing traffic volumes (2019)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
Lyons Road east of Great North Road	Eastbound	1,050	770
	Westbound	620	1,080
Parramatta Road west of Great North Road	Eastbound	2,430	2,560
	Westbound	2,150	2,270
Parramatta Road east of Great North Road	Eastbound	2,540	2,620
	Westbound	2,310	2,400
Second Avenue east of Great North Road	Eastbound	70	90
	Westbound	30	80
First Avenue east of Great North Road	Eastbound	290	270
	Westbound	100	160
Great North Road south of Lyons Road	Northbound	450	590
	Southbound	500	500
Great North Road north of Garfield Street	Northbound	490	570
	Southbound	540	600
Waterview Street north of First Avenue	Northbound	20	80
	Southbound	20	110

Intersection performance

Modelled existing intersection performance during the morning and evening peak hours for key intersections near the Five Dock Station construction site is shown in Table 10-35.

The existing performance of some intersections on Great North Road in the evening peak hour is due to the conflict between local traffic with their end destinations in Five Dock and regional traffic travelling between Lyons Road and Parramatta Road via Great North Road.

Table 10-35: Modelled peak hour existing intersection performance – Five Dock Station construction site (2019)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Great North Road/Garfield Street	Morning	1,308	21	B
	Evening	1,422	32	C
Great North Road/Lyons Road	Morning	2,748	47	D
	Evening	3,124	66	E
Great North Road/Queens Road/Fairlight Street	Morning	2,507	27	B
	Evening	2,520	30	C
Great North Road/Ramsay Road/First Avenue	Morning	1,418	16	B
	Evening	1,484	28	B
Parramatta Road/Great North Road	Morning	5,335	34	C
	Evening	5,193	62	E
Great North Road/Second Avenue	Morning	1,018	9	A
	Evening	1,121	15	A
First Avenue/Waterview Street	Morning	387	<5	A
	Evening	437	<5	A
Second Avenue/Waterview Street	Morning	98	7	A
	Evening	195	8	A

On-street parking, loading, servicing and pick-up arrangements

On-street parking is provided on both sides of Great North Road. Near the Five Dock town centre, parking spaces on the western side of Great North Road are time-restricted while parking spaces on the eastern side of Great North Road are not time-restricted. On-street parking is also available on both sides of local roads such as First Avenue, Waterview Street and Second Avenue, consisting of time-restricted and unrestricted spaces.

A loading zone is located on the northern side of Henry Street near Great North Road and a mail zone is on the northern side of Garfield Street near Great North Road. There are no kiss and ride zones on roads immediately surrounding the construction site.

10.13.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements over a typical day are provided in Figure 10-40 and Figure 10-41 respectively for the Five Dock Station northern construction site and in Figure 10-42 and Figure 10-43 respectively for the Five Dock Station southern construction site.

The proposed primary haul routes are shown in Figure 10-44. Access to and egress from the Five Dock Station western construction site would be left in and left out via Great North Road. Roads forming part of the construction vehicle route for the Five Dock Station west construction site include Parramatta Road, Great North Road and Lyons Road. Access to and egress from the Five Dock Station eastern construction site would be left in from Waterview Street and left out to Second Avenue. Roads forming part of the construction vehicle route for the Five Dock Station eastern construction site include Parramatta Road, Great North Road, First Avenue, Waterview Street and Second Avenue.

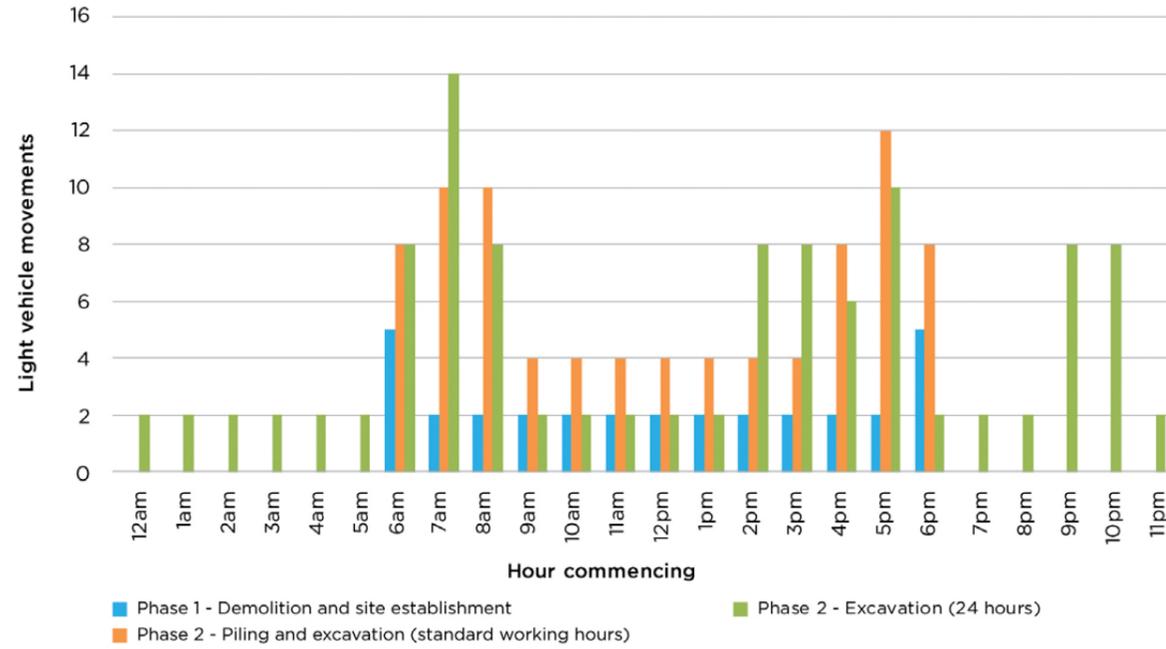


Figure 10-40: Hourly light vehicle movements at the Five Dock Station western construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

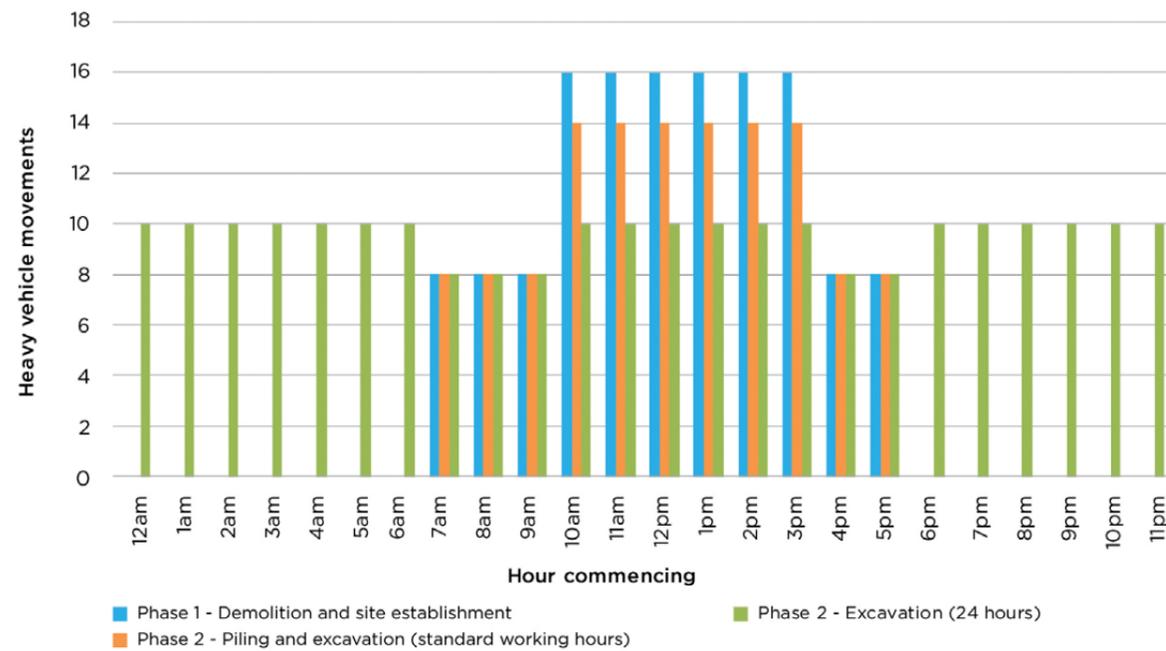


Figure 10-41: Hourly heavy vehicle movements at the Five Dock Station western construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

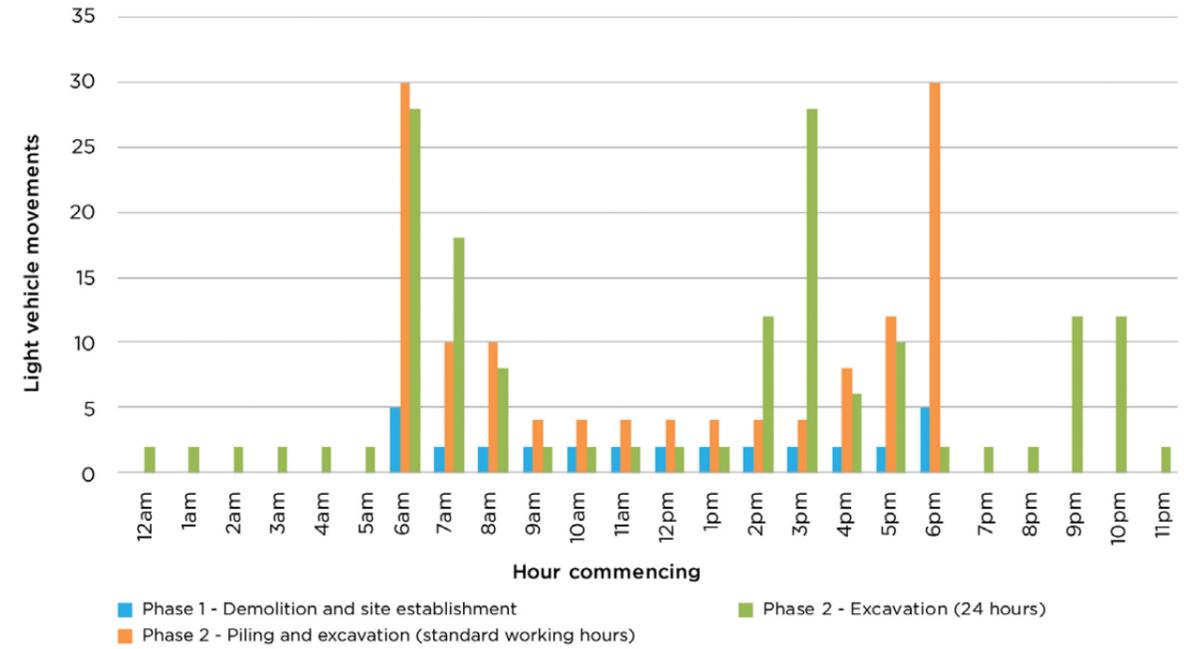


Figure 10-42: Hourly light vehicle movements at the Five Dock Station eastern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

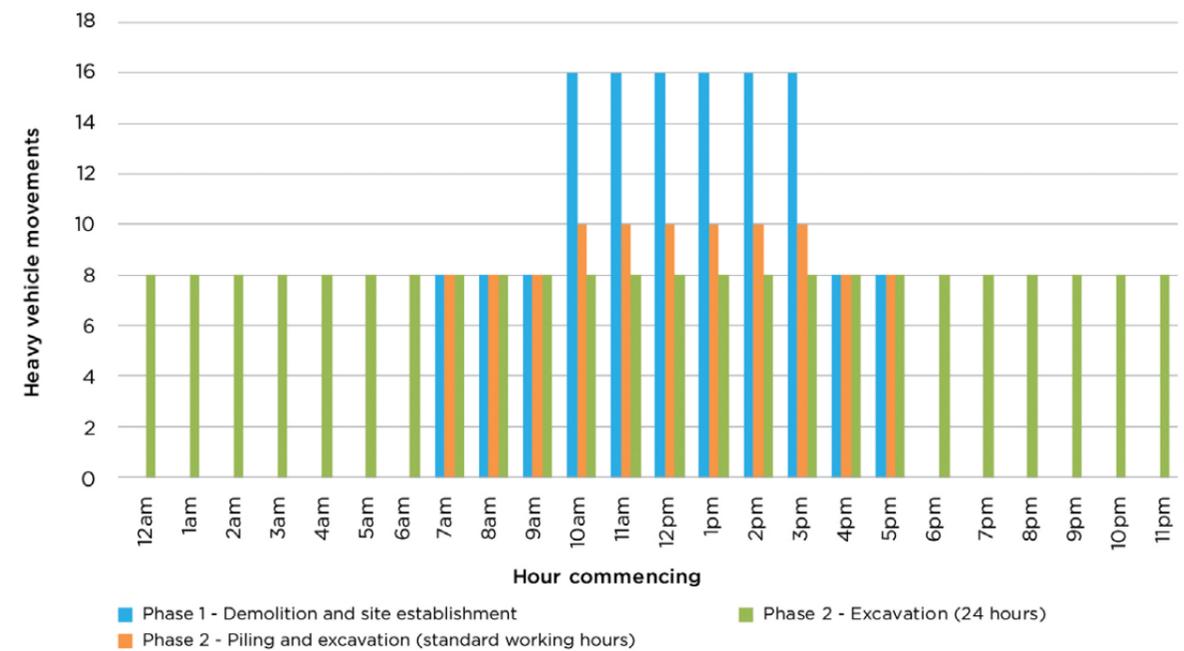


Figure 10-43: Hourly heavy vehicle movements at the Five Dock Station eastern construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

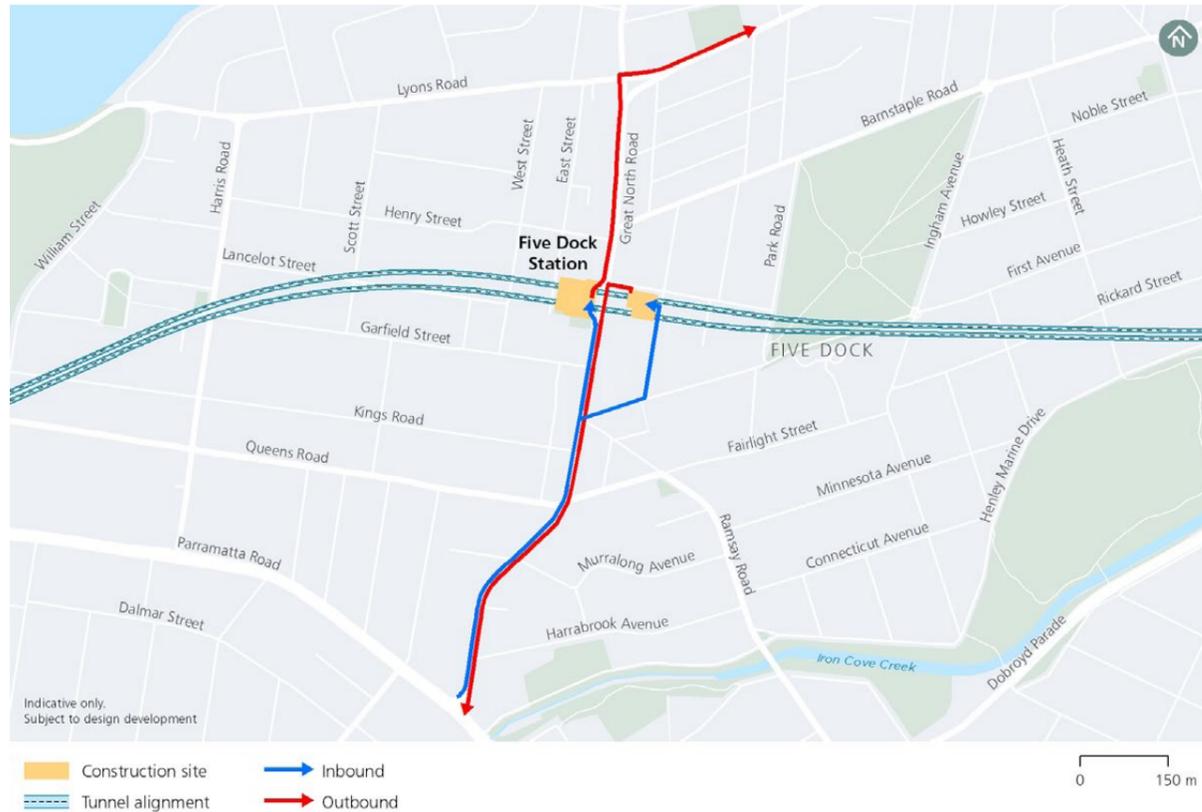


Figure 10-44: Five Dock Station construction site haulage routes

Active transport network

The Five Dock Station western construction site is located adjacent to Fred Kelly Place, which generates a substantial amount of pedestrian activity. Establishment of the construction site would require temporary changes to some pedestrian footpaths. No other impacts to pedestrians are anticipated.

Cyclists using First Avenue would be subject to temporary minor increases in additional heavy vehicles (four heavy vehicle movements per hour during peak periods).

Public transport services

The public transport network around Five Dock Station construction site is limited to bus services. Potential impacts to the bus services around the construction site would include a temporary minor increase in travel time due to additional construction vehicles on the road network.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods and during school drop off and pick up periods.

Figure 10-45 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

Compared to the existing conditions, there is a substantial decrease in demand flow at intersections along Parramatta Road. This is due to the progressive opening of WestConnex stages, where a considerable proportion of traffic that currently travels on Parramatta Road is forecast to shift onto WestConnex by 2023.

Modelled intersection performance with construction traffic indicates that several intersections near the Five Dock station construction site would experience a temporary deterioration in level of service. The temporary impacts of construction traffic on intersection performance in the evening peak hour in an already congested network are considered major due to the following:

- A number of intersections would experience a substantial temporary increase in average delay
- A number of intersections that operate with spare capacity prior to construction would be temporarily at or over-capacity during construction
- Construction vehicles would be travelling within a constrained environment, with Great North Road generally limited to a single lane in each direction.
- The temporary increase in vehicles on Great North Road during construction results in increased congestion at the Great North Road / Garfield Street intersection, which also impacts the operational performance of the Great North Road / Second Avenue intersection
- Great North Road / Second Avenue is an unsignalised intersection, with the worst movement reported as the overall performance of the intersection. This movement is the westbound approach along Second Avenue where construction vehicles turning left would experience difficulty finding a suitable gap in traffic due to queueing along Great North Road in the southbound direction.

Sydney Metro is continuing to investigate construction site access arrangement to reduce potential impacts and minimise conflicts with heavy vehicle movements. This includes the potential conversion of Waterview Street (north of the car park) to one-way northbound circulation.

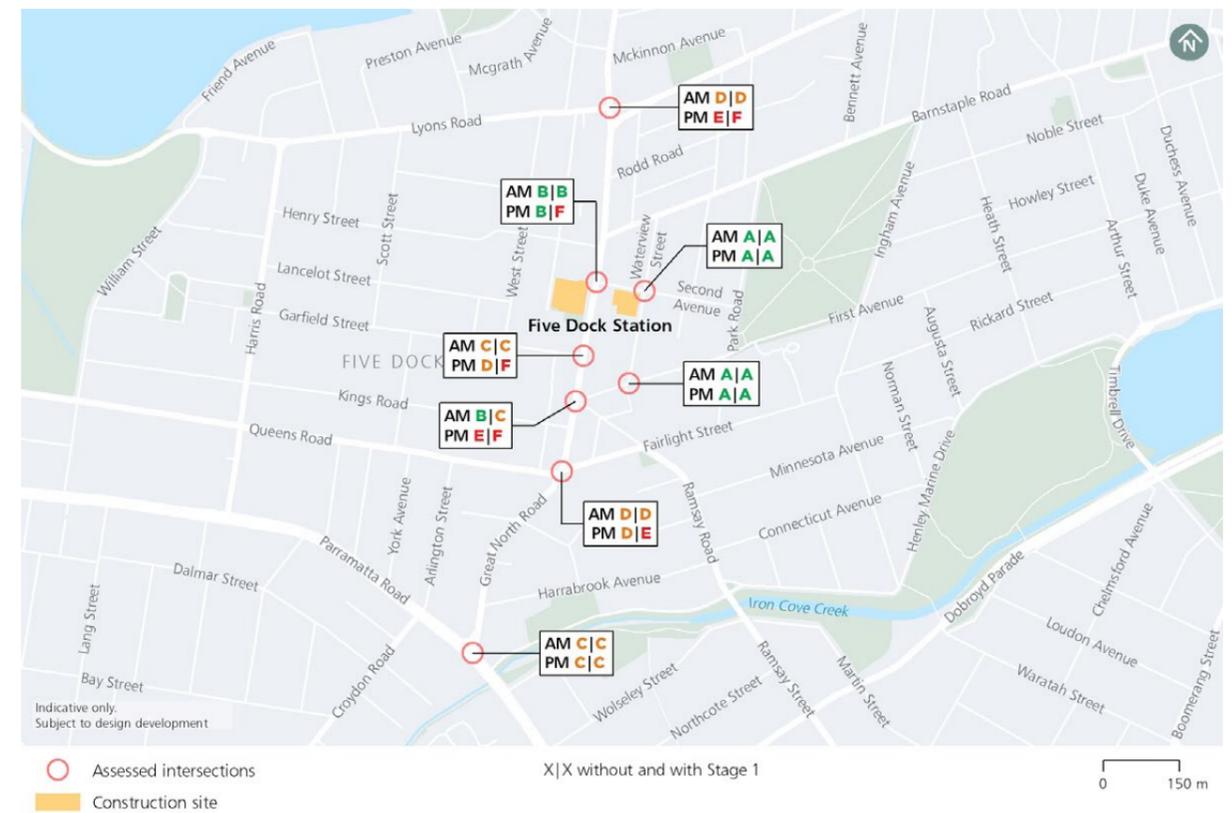


Figure 10-45: Five Dock Station construction site intersection performance (2023)

Parking and property access

Western construction site

About 12 on-street parking spaces may be temporarily removed along the western side of Great North Road between East Street and Second Avenue, adjacent to the Five Dock Station western construction site. These parking spaces are time-restricted to 30 minutes.

There is the potential for conflict between vehicles exiting the Five Dock Station western construction site and vehicles exiting the St Albans Anglican Church driveway. Construction vehicle movements would be managed during church service times so that the potential for conflict with church patrons is minimised.

Eastern construction site

About 12 off-street restricted parking spaces that are accessible from Second Avenue between Great North Road and Waterview Street would be permanently removed. In addition, up to 10 on-street parking spaces may be temporarily removed near the site access and egress points along Waterview Street (unrestricted parking) and Second Avenue (time-restricted parking), respectively, to accommodate construction vehicle movements.

There is limited spare parking capacity available on the local road network in Five Dock.

10.14 The Bays Station construction site

10.14.1 Existing environment

The Bays Station construction site would be located on Port Access Road near Victoria Road, Robert Street and Solomons Way.

The location of the construction site and the surrounding transport network are shown on Figure 10-46.

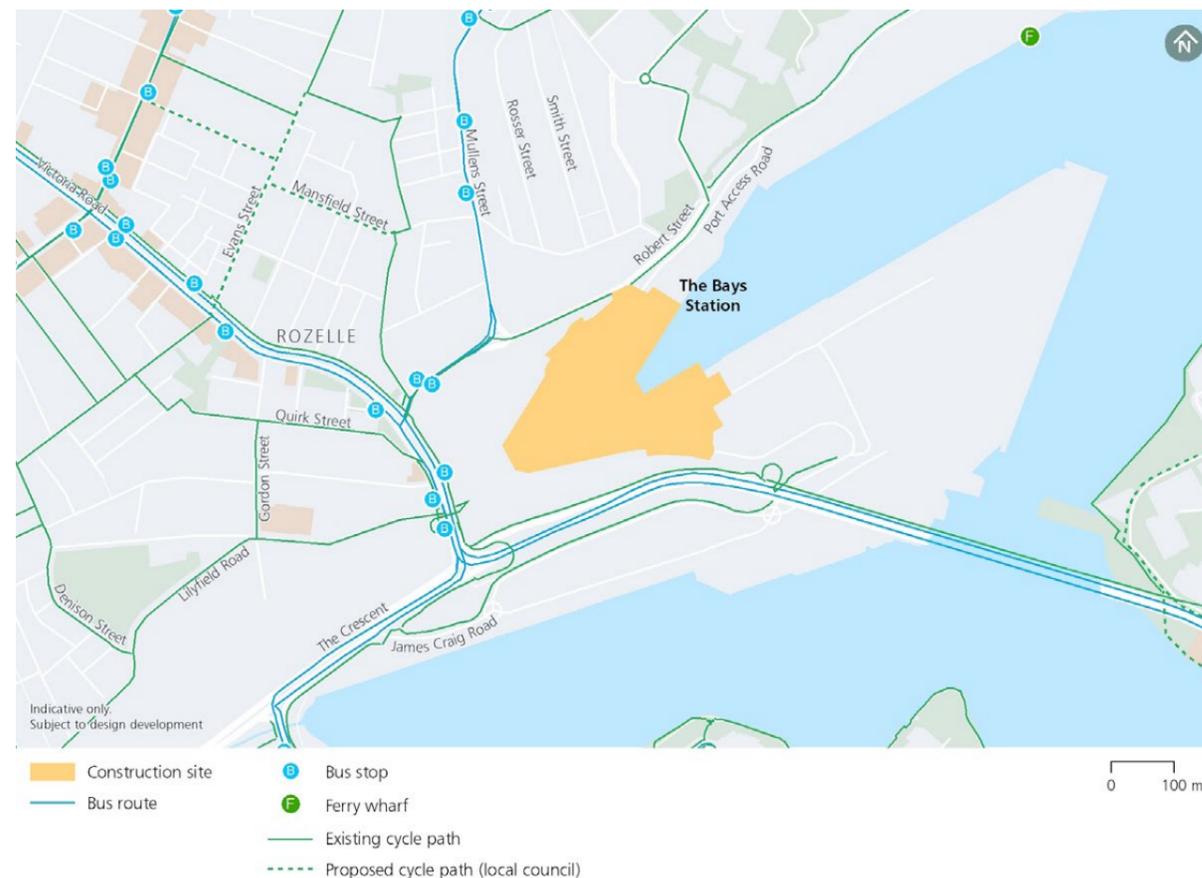


Figure 10-46: The Bays Station construction site transport network

Active transport network

Pedestrian activity within the immediate vicinity of the construction site is low given the industrial land uses present. Footpaths are provided on both sides of Victoria Road, James Craig Road and Robert Street. Footpaths are provided on one side of Solomons Way and Sommerville Road, however sections of these roads are not open to the general public. The surrounding suburbs of Rozelle, Balmain, Glebe and Annandale have well-developed pedestrian networks.

Pedestrian crossings are provided at the following locations:

- Pedestrian overpasses across Victoria Road and The Crescent near the Victoria Road/The Crescent intersection and near Lilyfield Road
- Signalised crossings at the Victoria Road/Robert Street intersection, the Victoria Road/The Crescent intersection and the James Craig Road/The Crescent intersection
- Staged crossing via the median at the roundabout on James Craig Road (east of The Crescent).

The cycle network surrounding the construction site includes:

- Off-road shared paths on Victoria Road, James Craig Road, ANZAC Bridge, The Crescent, Robert Street (east of Buchanan Street), Railway Parade, and throughout Jubilee Park and on the western side of White Creek
- On-road cycle routes along Balmain Road, Darling Street, Lilyfield Road, Robert Street, Crescent Street, Gordon Street, Denison Street and Cecily Street.

The future active transport network within the vicinity of The Bay Station construction site will be modified to accommodate WestConnex M4-M5 Link, which is part of the WestConnex program of works. These changes will be implemented by the time construction of Stage 1 commences.

Public transport services

A summary of the public transport services around The Bays Station construction site is provided in Table 10-36.

Table 10-36: The Bays Station construction site existing public transport services

Public transport mode	Description
Rail	No suburban, intercity train or light rail services near the construction site
Bus	<ul style="list-style-type: none"> • 23 bus routes • 20 school bus routes • Major bus stops on Victoria Road, The Crescent and Lilyfield Road. • Bus lanes on Victoria Road and The Crescent.
Ferry	<ul style="list-style-type: none"> • Ferry service between the White Bay Cruise Terminal and Barangaroo when cruise ships are docked at the White Bay Cruise Terminal (Captain Cook Cruises).

Road traffic volume and patterns

City West Link, The Crescent and Victoria Road are the major arterial roads that carry high volumes of traffic through the road network surrounding the construction site. Key collector roads near the construction site include James Craig Road, Robert Street and Solomons Way.

During the morning peak, higher traffic volumes are experienced on the following routes near the construction site:

- Eastbound on City West Link and The Crescent
- Southbound on Victoria Road.

During the evening peak, higher traffic volumes are experienced on the following routes in the vicinity of the construction site:

- Eastbound and westbound on City West Link and The Crescent
- Northbound on Victoria Road.

The future road network within the vicinity of The Bay Station construction site will be modified to accommodate WestConnex M4-M5 Link. These changes will be implemented by 2023. Additional road network changes are proposed as part of Western Harbour Tunnel and Beaches Link. This project is currently in its planning stages and if approved, would connect to WestConnex M4-M5 Link and the surface road network in Rozelle. Port Access Road is proposed to be relocated prior to commencement of site establishment for Stage 1. This project is subject to a separate planning pathway.

The existing traffic volumes on the surrounding road network are provided in Table 10-37.

Table 10-37: The Bays Station construction site existing traffic volumes (2016)

Road	Direction	Morning peak hour (vehicles per hour)	Evening peak hour (vehicles per hour)
The Crescent west of James Craig Road	Eastbound	2,630	2,990
	Westbound	2,240	2,990
City West Link west of The Crescent	Eastbound	1,830	2,260
	Westbound	1,500	2,250
James Craig Road east of The Crescent	Eastbound	330	130
	Westbound	160	210
Victoria Road north of The Crescent	Northbound	1,920	3,690
	Southbound	3,940	2,930

Intersection performance

Modelled existing intersection performance during the morning and evening peak hours for key intersections near The Bays Station construction site is shown in Table 10-38.

Existing performance of these intersections is a result of high volumes of through traffic conflicting with right turning and cross-street traffic, in conjunction with substantial queuing along City West Link in the eastbound direction.

Table 10-38: Modelled peak hour existing intersection performance – The Bays Station construction site (2016)

Intersection	Peak hour	Demand flow (vehicles per hour)	Average delay (second per vehicle)	Level of service
Victoria Road/Robert Street	Morning	5,876	48	D
	Evening	6,721	39	C
Victoria Road/The Crescent	Morning	9,741	32	C
	Evening	11,551	36	C
The Crescent/James Craig Road	Morning	5,190	29	C
	Evening	6,521	9	A
City West Link/The Crescent	Morning	5,076	>100	F
	Evening	6,699	32	C
City West Link/Catherine Street	Morning	3,926	73	F
	Evening	5,174	32	C

On-street parking, loading, servicing and pick-up arrangements

Parking is prohibited in both directions along City West Link and The Crescent east of City West Link with clearways in operation at all times. Also, on-street parking is not available along James Craig Road and The Crescent south of City West Link.

There are no kiss and ride, loading zone or point to point transport service zones on roads immediately surrounding the construction site.

10.14.2 Potential impacts

Vehicle movement forecast and routes

The anticipated vehicle (light and heavy) one way movements at the construction site over a typical day are provided in Figure 10-47 and Figure 10-48 respectively.

The proposed primary haul routes are shown in Figure 10-49. Access to and egress from the construction site would be right in and left out via Solomons Way. Roads forming part of the construction vehicle route include City West Link, The Crescent, James Craig Road, Sommerville Road and Solomons Way.

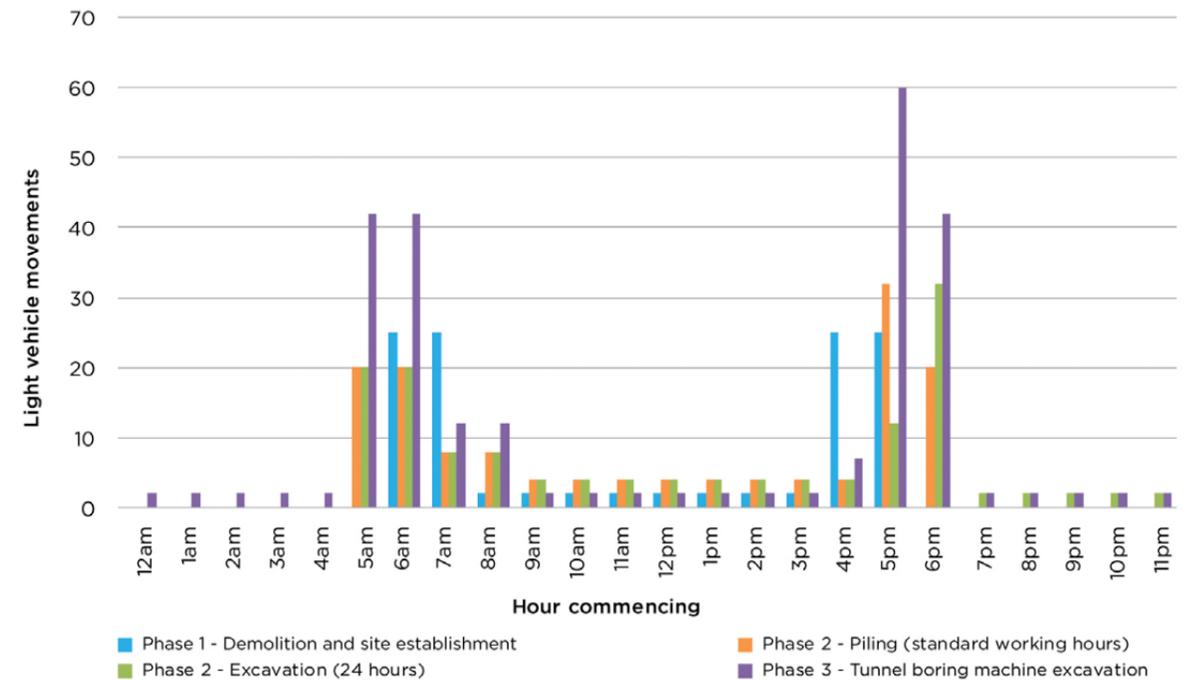


Figure 10-47: Hourly light vehicle movements at The Bays Station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

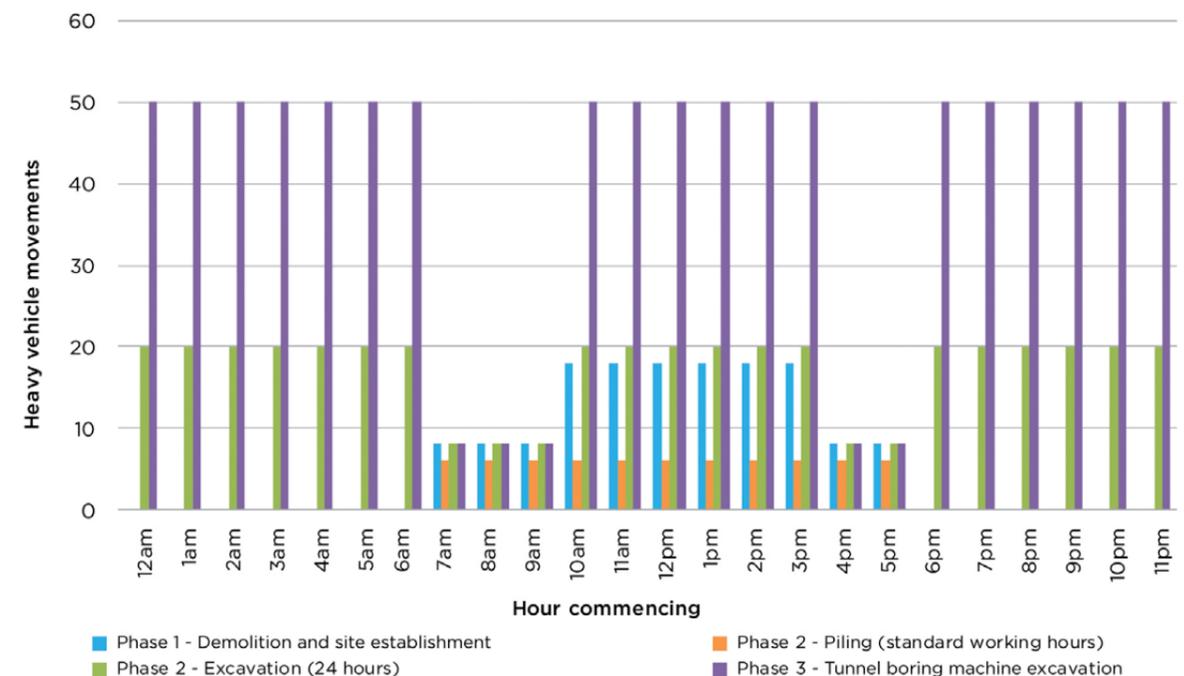


Figure 10-48: Hourly heavy vehicle movements at The Bays Station construction site

Note: Movement means a one way movement. A truck entering and then leaving a work site represents 2 movements.

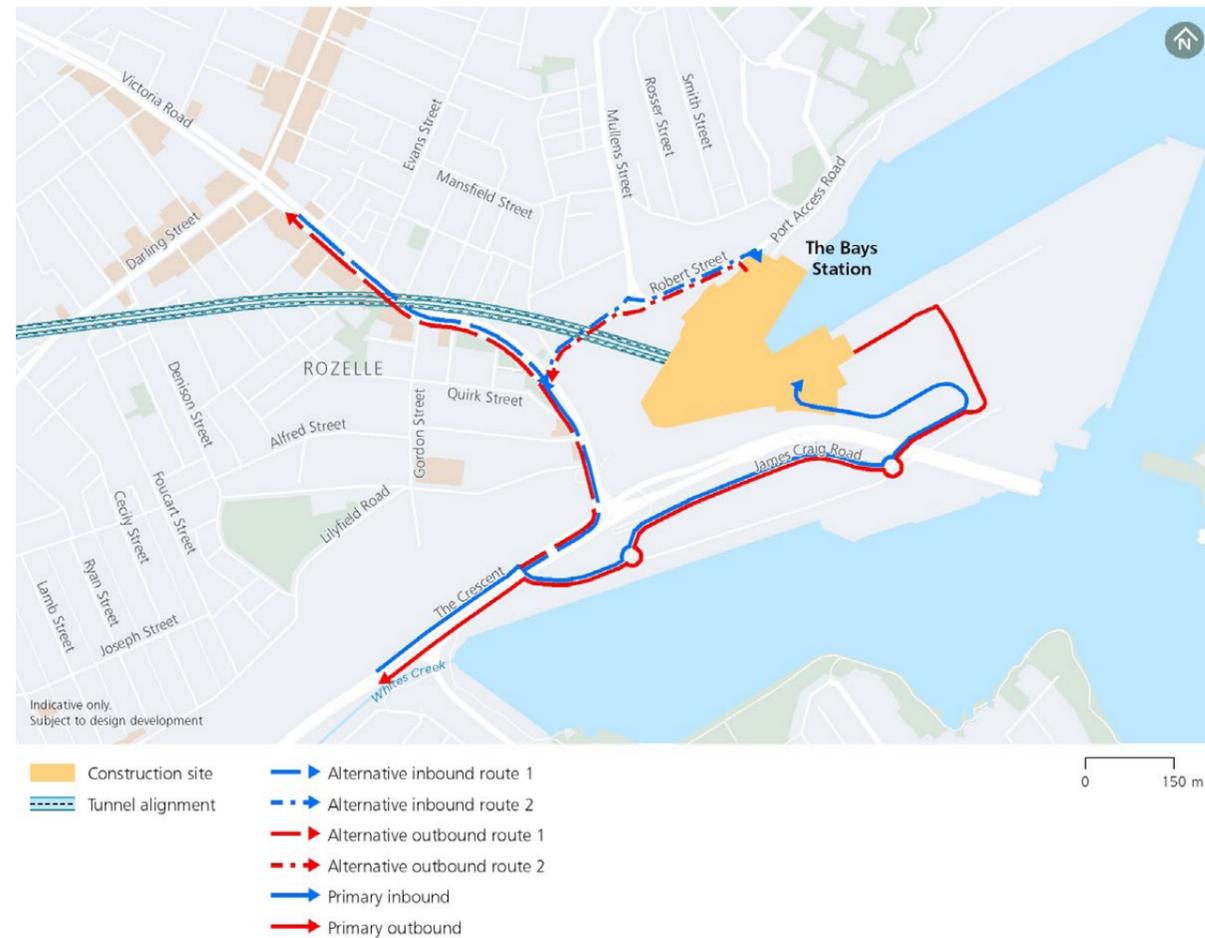


Figure 10-49: The Bays Station construction site haulage routes

Active transport network

The construction site is not anticipated to result in any impacts to the active transport network given that shared paths adjacent to James Craig Road and The Crescent would remain open.

Public transport services

There is potential for a minor temporary increase in bus travel time due to additional construction vehicles on the road network. There would be no other impacts to public transport services.

Road network performance

Potential impacts to road network performance would be minimised through the implementation of the Construction Traffic Management Framework and mitigation measures identified in Section 10.16. This includes reducing vehicle movements in network peak periods.

Figure 10-50 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

From an operational perspective, the performance of an intersection where the modelling results show a small reduction in demand flow and/or average delay would remain very similar with and without construction traffic.



Figure 10-50: The Bays Station construction site intersection performance (2023)

Parking and property access

No impacts to parking or property access are anticipated during construction.

10.15 Cumulative impacts

Potential cumulative impacts were considered for assessment based on the likely interactions of Stage 1 with other projects and plans that met the adopted screening criteria. The approach to assessment and the other projects considered are described further in Appendix G (Cumulative impacts assessment methodology – Stage 1).

Projects which have been considered for the cumulative construction traffic assessment are those which fall within the construction footprint of Stage 1, as well as construction vehicle routes that use roads near the Stage 1 construction sites.

The future Parramatta Light Rail (Stage 1) is being constructed near to the Westmead and Parramatta metro station construction sites. The construction vehicle routes in Westmead for the two projects are not anticipated to interact. However, in Parramatta construction vehicles for both projects are anticipated to use many of the same roads including Great Western Highway, O’Connell Street and Pitt Street.

Construction of the future Parramatta Light Rail (Stage 1) commenced in late-2018 and is scheduled for completion in 2023. The program for the future Parramatta Light Rail (Stage 1) indicates that the main construction works would be completed in 2022, with testing and commissioning completed in 2023.

Given that a low number of construction vehicles would be generated during the testing and commissioning phase in 2023, and that the future Parramatta Light Rail (Stage 1) construction vehicle routes do not directly interface with Stage 1 construction vehicle routes in Westmead, cumulative construction impacts at the Westmead metro station construction site are anticipated to be minimal. Cumulative construction impacts at the Parramatta metro station construction site are anticipated to be minor.

Stage 1 construction works at The Bays Station construction site would occur simultaneously with WestConnex M4-M5 Link and Western Harbour Tunnel. Cumulative impacts could occur associated with a temporary increase in construction vehicles on the road networks resulting in a reduction in intersection performance. The number of temporary construction vehicle movements generated by Stage 1, WestConnex M4-M5 Link and Western Harbour Tunnel during the morning and evening peak hour is provided in Table 10-39.

Table 10-39: Number of cumulative construction vehicle movements

Project	Construction site	Morning peak hour (vehicles per hour)		Evening peak hour (vehicles per hour)	
		Light vehicle	Heavy vehicle	Light vehicle	Heavy vehicle
Stage 1	The Bays Station construction site	2	8	60	8
WestConnex M4-M5 Link	Rozelle civil and tunnel site	100	46	350	46
	Iron Cove Link civil site	15	4	140	4
Western Harbour Tunnel	Rozelle Rail Yards construction support site	45	14	30	14
	Victoria Road construction support site	41	37	71	37
	White Bay construction support site	40	63	140	63

Figure 10-51 shows the anticipated performance of key intersections in the year 2023 with and without Stage 1. Additional intersection performance indicators are provided in Technical Paper 1 (Transport and traffic).

From an operational perspective, this means that the road network is already operating at capacity and the cumulative impact of construction vehicles would result in temporary increased intersection delays and queue lengths.

Co-ordination of traffic management arrangements between major construction projects would occur in consultation with Transport for NSW including Transport Coordination.

The temporary impacts of cumulative construction traffic on intersection performance in the evening peak hour in an already congested network are considered major due to the following:

- A number of intersections would experience a substantial increase in average delay as indicated by a level of service E or F during construction
- A number of intersections that already operate close to or at capacity would deteriorate even further with cumulative construction
- Cumulative construction vehicles would be travelling within an already congested environment.

WestConnex M4-M5 Link is expected to be operational in 2023 and should provide some improvement to the operational performance of the road network near The Bays Station construction site. Additional mitigation measures would also be adopted to reduce the anticipated impacts.



Figure 10-51: The Bays Station construction site cumulative intersection performance

10.16 Management and mitigation measures

10.16.1 Approach to management and mitigation

The approach to transport and traffic management during the construction phase, including the process for the development of all Traffic Management Plans, is outlined in Appendix F (Construction Traffic Management Framework).

The Construction Traffic Management Framework provides the overall strategy and approach for construction traffic management for Sydney Metro West, and an outline of the traffic management requirements and processes that will be common to each of the proposed construction sites. It establishes the traffic management processes (including the use of directional signage and variable message signs), emergency services consultation requirements for access impacts and acceptable criteria to be considered and followed in managing roads and footpaths adjacent to construction sites.

10.16.2 Mitigation measures

The mitigation measures that would be implemented to address potential temporary transport and traffic impacts are listed in Table 10-40.

Table 10-40: Mitigation measures – Transport and traffic Stage 1

Reference	Impact/issue	Mitigation measure	Application location(s) ¹
TT1	Changes to the network	The community would be notified in advance of proposed road and pedestrian network changes through appropriate forms of community liaison.	All
TT2	Traffic incidents	In the event of a traffic related incident, coordination would be carried out with Transport Coordination and/or the Transport Management Centre's Operations Manager.	All
TT3	Emergency vehicles access	Access to properties for emergency vehicles would be provided at all times.	All
TT4	Road safety	Vehicle access to and from construction sites would be managed to maintain pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasions, police presence.	All
TT5	Road safety	Additional enhancements for pedestrian, cyclist and motorist safety near the construction sites would be implemented during construction. This would include measures such as: <ul style="list-style-type: none"> Assessing the suitability of construction haulage routes through sensitive land use areas with respect to road safety Deployment of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers Providing community education and awareness about sharing the road safely with heavy vehicles Specific construction driver training to understand route constraints, safety and environmental considerations such as sharing the road safely with other road users and limiting the use of compression braking Requiring technology and equipment to improve vehicle safety, eliminate heavy vehicle blind spots, and monitor vehicle location and driver behaviour. 	All
TT6	Road safety	All trucks would enter and exit construction sites in a forward direction, where feasible and reasonable.	All
TT7	Congestion	Construction site traffic would be managed to minimise movements during peak periods.	All
TT8	Congestion	Construction site traffic immediately around construction sites would be managed to minimise vehicle movements through school zones during pick up and drop off times.	WMS, PMS, BNS, FDS
TT9	Congestion	Opportunities to minimise impacts at the Alexandra Avenue/Bridge Road intersection would be determined in consultation with Transport for NSW.	WMS
TT10	Loss of parking	Where existing parking is removed to facilitate construction activities, consultation would occur with the relevant local council to investigate opportunities to provide alternative parking facilities.	All
TT11	Loss of parking	Construction sites would be managed to minimise the number of construction workers parking on surrounding streets by: <ul style="list-style-type: none"> Encouraging workers to use public or active transport Encouraging ride sharing Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable. 	All
TT12	Change of bus stop locations	Any relocation of bus stops and kiss-and-ride facilities would be carried out in consultation with Transport for NSW including Transport Coordination (for relevant locations), the relevant local council and bus operators. Wayfinding and customer information would be provided to notify customers of relocated bus stops.	WMS, NSMS, BNS
TT13	Bus priority	Opportunities to improve bus priority along the temporary detour at Westmead metro station construction site would be investigated during detailed design.	WMS
TT14	Active transport	Pedestrian and cyclist access would be maintained during the temporary closure of Alexandra Avenue. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes.	WMS
TT15	Impacts on active transport	Where existing cyclist facilities (e.g. bicycle parking) would be temporarily unavailable to facilitate construction activities, suitable replacement facilities would be provided for this duration.	WMS, PMS
TT16	Taxi relocation	Any relocation of taxi ranks would be carried out in consultation with Transport for NSW, the relevant local council and taxi operators. Wayfinding and customer information would be provided to notify customers of relocated taxi ranks.	SOPMS
TT17	Impacts on special events	During major special events, impacts to the transport and traffic network would be reduced by (as necessary): <ul style="list-style-type: none"> Minimising the level of construction activity, and if necessary, ceasing all construction activity Maintaining appropriate access to all areas within the event precinct Erection of hoardings, site fencing and gates at key locations within the construction site boundary to permit pedestrian movements adjacent to the construction site and separate pedestrians from construction vehicles Scheduling deliveries to the construction site outside of event periods. For special events that require specific traffic measures, those measures would be developed in consultation with Transport for NSW including Transport Coordination (for relevant locations), and the organisers of the event.	PMS, CSME, SOPMS

Reference	Impact/issue	Mitigation measure	Application location(s) ¹
TT18	Property access	Access to existing properties and buildings would be maintained in consultation with property owners.	All
TT19	Construction vehicle impacts	Traffic control measures required at the Parramatta metro station construction site access on George Street would be determined in consultation with Transport for NSW.	PMS
TT20	Construction vehicle impacts	Adjustments to site access arrangements and the local road network would be explored during detailed design to minimise conflicts with heavy vehicle movements.	NSMS, FDS
TT21	Construction vehicle impacts	Construction site traffic generated at the Five Dock Station construction site would be managed to avoid or minimise travel during the evening peak period.	FDS
TT22	Construction vehicle impacts	Construction site traffic generated at the Five Dock Station construction site would be managed to minimise movements during church service times at St Albans Anglican Church.	FDS
TT23	Construction vehicle impacts	Opportunities to provide vehicle access and egress directly to Parramatta Road and minimise the use of Loftus Street at the Burwood North Station construction site would be explored during detailed design.	BNS
TT24	Cumulative construction traffic impacts	Co-ordination of traffic management arrangements between major construction projects would occur in consultation with Transport for NSW including Transport Coordination.	TBS

Note 1: WMS: Westmead metro station; PMS: Parramatta metro station; CSMF: Clyde stabling and maintenance facility; SSF: Silverwater services facility; SOPMS: Sydney Olympic Park metro station; NSMS: North Strathfield metro station; BNS: Burwood North Station; FDS: Five Dock Station; TBS: The Bays Station; Metro rail tunnels: Metro rail tunnels not related to other sites (eg tunnel boring machine works); PSR: Power supply routes.

10.16.3 Interactions between mitigation measures

There are no mitigation measures in other chapters that are directly relevant to the management of potential transport and traffic impacts.

There are no mitigation measures identified in the assessment of other environmental aspects that are likely to affect the assessment of transport and traffic.

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