Chapter 9
Transport

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9 Transport

This chapter assesses the potential impact on transport during the construction and operation of the project. It describes the existing transport environment and proposed transport upgrades and identifies the potential nature and extent of impacts to transport services as a result of the project. Measures to address the potential impacts are also identified. The full transport assessment is provided in Technical Paper 1 (Transport).

9.1 Overview

Potential transport and traffic impacts of the project have been avoided and minimised, primarily by tunnelling underneath or bridging over key roads such as the Great Western Highway, M4 Motorway and Luddenham Road, identifying the most efficient haul route to the arterial road network and minimising movements during existing network peak periods. In addition, the management of construction traffic would be in accordance with the Sydney Metro Construction Traffic Management Framework and site specific mitigation measures. This includes measures to manage pedestrian, cyclist and motorist safety around construction sites.

Key potential impacts on the transport network during construction would be primarily focused around the urban areas of St Marys. The project would require the temporary partial closure of Station Street and the temporary relocation of the existing bus stops, interchange and routes at St Marys Station. This could result in temporary minor delays and the need for commuters to walk further to reach their destinations. Access to the existing St Marys Station on the T1 Western Line would be maintained throughout construction.

The provision of a new Station Plaza on the northern side of the existing St Marys Station would require the removal of the existing at-grade commuter car park on Harris Street. The adjacent multi-level commuter car park on Harris Street would be extended to include two additional levels of parking (subject to separate approval) and is proposed to be in place prior to the removal of the at-grade commuter car park. The project would also affect other on-street and off street parking; however, there is spare capacity within other existing parking locations within 400 metres of the affected parking spaces.

There may be some potential temporary impacts to traffic performance on the road network due to the temporary addition of construction vehicles and temporary road closures as a result of the project. In general, most of the network would continue to perform at an acceptable level of service. At some locations, as a result of background traffic growth, the road network would have a reduced level of service, in particular at the intersection of Mamre Road and the M4 Western Motorway. Sydney Metro would consult with Transport for NSW to enable the coordination of infrastructure upgrades necessary to maintain effective road network operation during the construction of the project.

Cumulative temporary transport impacts may also be experienced where the same haul routes are concurrently used for the construction of the future M12 Motorway project and Western Sydney International. Sydney Metro would consult with these projects to ensure these cumulative impacts are effectively managed.

Once operational, the project would integrate seamlessly with the station precincts and existing and future transport interchange facilities, providing connectivity with pedestrian, cycling and public transport networks, and providing opportunities for integration with future land uses and infrastructure.

9.2 Legislative and policy context

9.2.1 Off-airport

A number of guidelines and standards, including those identified as part of the Planning Secretary's Environmental Assessment Requirements (SEARs), were considered as part of the preparation of the transport impact assessment (Technical Paper 1 (Transport)). These include:

- *Australian Standards 2009, AS1742.3 Traffic Control for works on roads*
- *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (Austroads, 2017)

- *Traffic Modelling Guidelines* (Transport for NSW, 2013)
- *Traffic control at work sites manual* (Transport for NSW, 2018)
- Appendix G (Construction Traffic Management Framework).

9.2.2 On-airport

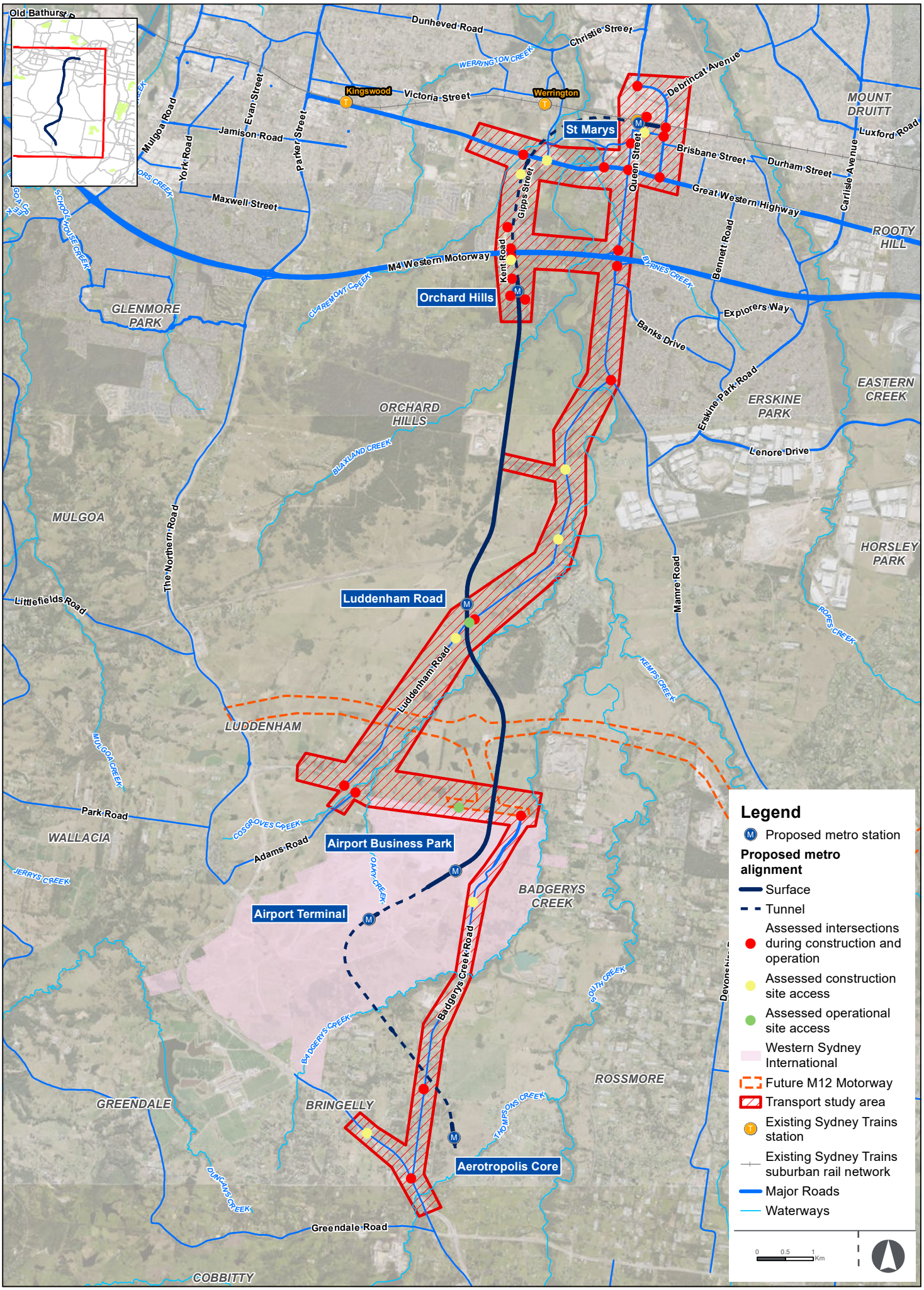
The key legislation which guides land use for the on-airport components of the project is the *Airports Act 1996* (Cth) (Airports Act). For Western Sydney International, a transitional planning instrument, the *Western Sydney Airport – Airport Plan* (the Airport Plan) has been determined under the Airports Act to guide development on the site until a master plan is developed and approved. With respect to traffic and transport arrangements, the project would aim to be consistent with the traffic and transport provisions identified in the Airport Plan. The conditions in the Airport Plan and the Construction Environmental Management Plans approved in accordance with those conditions are also part of the regulatory context for the on-airport environment.

The remaining legislative and policy considerations for on-airport traffic, transport and access is consistent with the off-airport context described in Section 9.2.1.

9.3 Assessment approach

9.3.1 Study area

For the purposes of the transport impact assessment, a transport study area (refer to Figure 9-1) was determined based on the potential impacts of the project on the existing and future road and public transport network during the construction and operational phases of the project. The transport study area includes intersections and roads likely to be affected by the project including the project alignment, construction site locations, ancillary infrastructure, proposed station precincts and transport interchange infrastructure. Figure 9-1 also indicates the locations of the intersections that were modelled as part of the transport assessment.



Australian Government | NSW Government | sydney METRO

Sydney Metro – Western Sydney Airport

Indicative only, subject to design development

Study area and local context

Figure 9-1

9.3.2 Off-airport

Key tasks

The assessment of potential transport impacts associated with the off-airport components of the project involved:

- reviewing the project design (including proposed indicative construction methodology)
- reviewing existing road features, traffic, transport services, pedestrian and cyclist facilities, and available traffic data
- identification of the existing traffic and transport conditions in the study area
- review of car parking surveys undertaken within the St Marys town centre and immediate surrounds. The parking demand surveys were undertaken within the St Marys precinct during a typical weekday in the first week of December 2019
- assessment of the potential road-based impacts on public transport and general traffic caused by the construction and operational scenarios of the project. The assessment included consideration of potential cumulative construction impacts from the project and other major infrastructure projects being delivered in the study area. The assessment also included a review of the forecast road-based public transport mode share at the proposed station precincts and its potential impacts on the capacity of the future network
- a qualitative assessment of potential impacts to the pedestrian and cycling transport network during the construction and operational scenarios. The assessment also included a review of transport integration at each station and assessment of the potential transport impacts during the operational scenarios
- identification of performance outcomes and mitigation measures to manage the potential impacts on transport.

Further details regarding each of the key tasks undertaken as part of the transport assessment is provided in Chapter 2 of Technical Paper 1 (Transport).

Assessment scenarios

Base year scenario

A 2019 network base year peak hour was adopted for the base year assessment scenario.

Construction scenarios

Assessment of the potential transport and traffic impacts during construction considered two scenarios:

- 2023/2024 without construction traffic
- 2023/2024 with construction traffic.

The assessment of the 2023/2024 without construction traffic scenario was informed by outputs from the WestConnex Road Toll Model (WRTM) prepared for the Environmental Impact Statement for the future M12 Motorway project.

Construction traffic from the future M12 Motorway project has also been considered as part of the cumulative impact assessment (see Chapter 24 (Cumulative impacts)).

Further details regarding the construction assessment scenario is provided in Section 2.4.2 of Technical Paper 1 (Transport).

Operational scenarios

Assessment of the potential transport impacts during operation of the project considered future scenarios for 2026 and 2036 with and without the project. Consistent with the methodology used to assess the construction impacts, the assessment of the future operational years without the project was informed by outputs from the WRTM modelling.

The distribution of light vehicles arriving and departing at each proposed station precinct was guided by the existing traffic distribution, precinct location, proposed future developments and the proposed location of transport facilities. These road-based traffic volumes included park and ride, kiss-and-ride, point-to-point services and bus movements.

The transport operational assessment includes a summary of the future operational performance of St Marys Station as a result of the forecast rail-to-rail transfers. The assessment also includes the integration of the project with the proposed station precincts at St Marys and other locations along the project including walking and cycling facilities proposed by others.

The assessment of the 2026 and 2036 future year with and without the project scenarios considers future road upgrades as well as the operation of Western Sydney International, future M12 Motorway project and other projects within the transport study area. As a result, this assessment also represents the cumulative operational assessment.

Further details regarding the operational assessment scenario and assumptions is provided in Section 2.4.3 of Technical Paper 1 (Transport).

An overview of the modelling methodology and scenarios considered is provided in Figure 9-2.

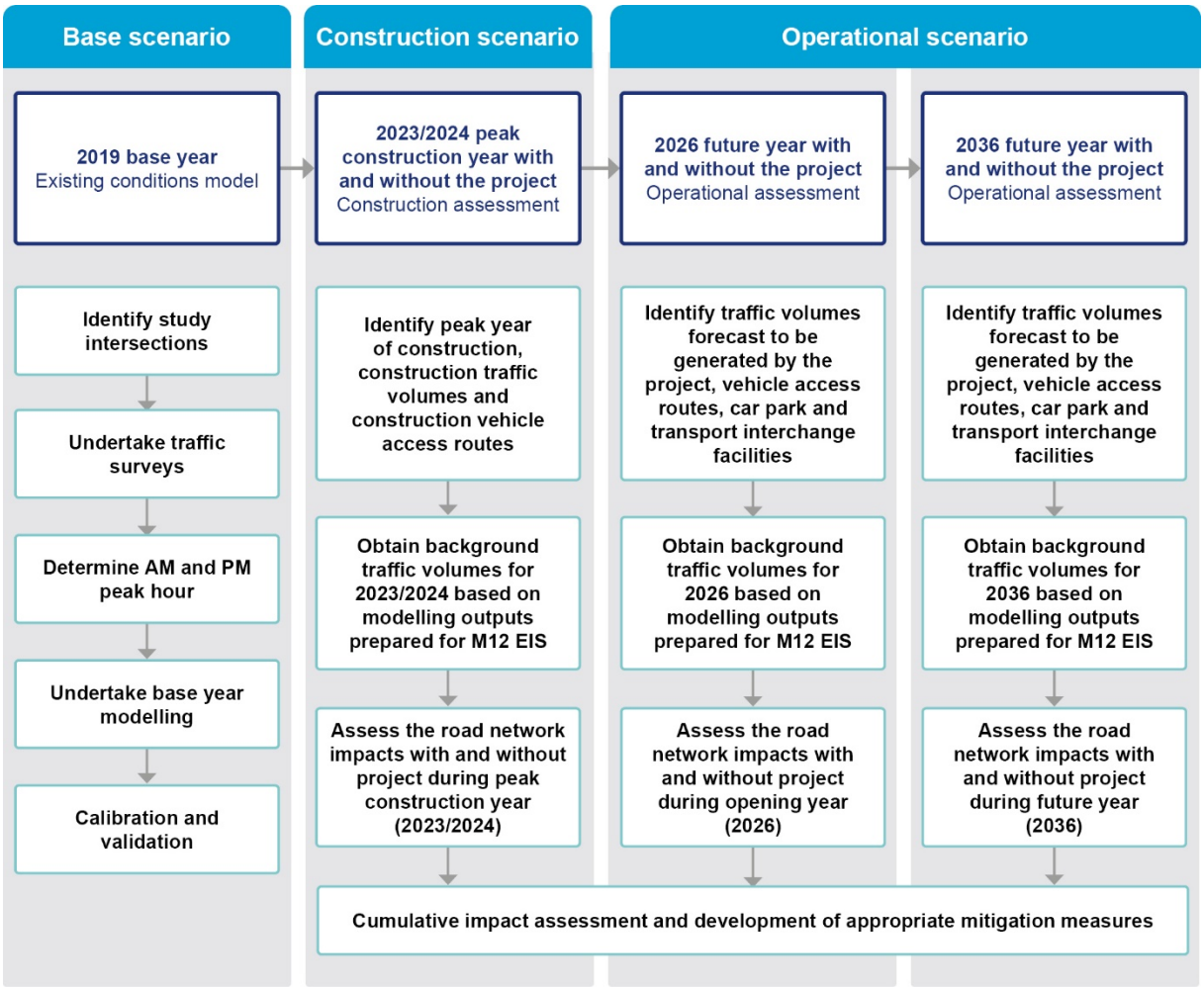


Figure 9-2 Summary of modelling methodology and assessment scenarios

Assessment criteria

Operational performance of the road network can be assessed in several ways, including at a mid-block level, showing the changes in traffic volumes or to travel routes, or at an intersection level, showing changes to the performance of an intersection. The assessment criteria adopted for the transport assessment is outlined in the following sections with further details in Section 2.6 of Technical Paper 1 (Transport).

Mid-block performance

Analysis of mid-block level of service Level of Service (LoS) was conducted based on criteria set out for arterial and collector roads by the *Austroads Guide to Traffic Management – Part 3*. Further information on LoS is presented in Technical paper 1 (Transport). LoS may range from LoS A to LoS F. LoS A refers to primarily free flow operations at average travel speeds. Vehicles are completely unimpeded in their ability to manoeuvre within the traffic stream. LoS C is generally considered satisfactory and LoS F is an interrupted flow with urban street flow at extremely low speeds, with high delays, high volumes and extensive queuing. For the assessment of mid-block performance, LoS E is close to capacity and LoS F is considered at or above capacity (see Section 2.6.1 of Technical Paper 1 (Transport)).

Intersection performance

The operation of the key intersections within the study area was assessed using SIDRA INTERSECTION 8, a computer-based modelling package that calculates intersection performance. The commonly used measure of intersection performance, as defined by Transport for NSW (TfNSW), is vehicle delay. SIDRA INTERSECTION 8 determines the average delay that vehicles encounter and provides a measure of the LoS.

Similar to mid-block performance, intersection performance may range from LoS A indicating good operation to LoS F indicating an intersection that is over capacity involving extreme delays. For the assessment of intersection performance, LoS E is generally considered close to or at capacity and LoS F as operating above capacity (see Section 2.6.2 of Technical Paper 1 (Transport)).

9.3.3 On-airport

The assessment approach for potential on-airport transport impacts was generally consistent with the off-airport approach described in Section 9.3.2. While there is currently a limited number of publicly accessible roads within the airport site (such as Badgerys Creek Road), the same construction scenarios were also considered for the on-airport assessment as for the off-airport assessment.

For the purpose of the transport assessment, the impacts due to the on-airport operational activities without the project were captured as part of the assessments of the road network surrounding the Western Sydney International site boundary and detailed in the off-airport assessment in Section 9.5.1.

9.4 Existing environment

This section outlines the existing transport environment, including the public and active transport environments, existing parking arrangements, the traffic conditions and the existing road network performance on the key roads within the transport study area forecast to be impacted by the project and that directly interface with the project (see Figure 9-1)

9.4.1 Off-airport

Overview of existing road network

The key roads within the off-airport of the project study area include:

- **Great Western Highway** – an arterial road and, in the vicinity of St Marys, is aligned in an east-west direction. It connects to The Northern Road in the west and the M7 Motorway in the east
- **Glossop Street** – a collector road generally aligned in a north-south direction. It connects to the Great Western Highway in the south and Forrester Road in the north

- **Forrester Road** – a collector road aligned in a north-south direction. It connects to Glossop Street in the east and provides access to St Marys Station in the south
- **Queen Street** – a collector road connecting St Marys Station in the north to the Great Western Highway in the south
- **Kent Road** – a sub-arterial road connecting to Gipps Street and the Great Western Highway in the north and providing access to the M4 Western Motorway in the south via ramps
- **M4 Western Motorway** – an arterial road which connects western Sydney to the wider arterial network and provides an uninterrupted journey to the M7 Motorway. It connects to Kent Road in the west and Mamre Road in the east
- **Mamre Road** – an arterial road which connects the Great Western Highway in St Marys in the north to Elizabeth Drive in the south
- **Luddenham Road** – a collector road in a rural environment connecting Elizabeth Drive at Luddenham in the south to Mamre Road in the north
- **Elizabeth Drive** – an arterial road that connects The Northern Road at its western end and Liverpool via crossings of the M7 and Cowpasture Road at its eastern end. The intersection of Elizabeth Drive and Badgerys Creek has been upgraded to a roundabout as part of the realignment of Badgerys Creek and the construction works at Western Sydney International. Transport for NSW has allocated funding to investigate improvements to Elizabeth Drive between the M7 Motorway and The Northern Road
- **Adams Road** – a collector road to the west of Western Sydney International connecting Luddenham in the south to Elizabeth Drive in the north, with a future signalised interchange with the upgraded The Northern Road at its midpoint (due to open in 2021-2022)
- **Badgerys Creek Road** – a collector road which connects The Northern Road at a roundabout to the south through the Western Sydney International site to Elizabeth Drive in the north. The existing Badgerys Creek Road has been realigned for the section between Elizabeth Drive and Longleys Road, as part of the early earthworks for the new Western Sydney International. The intersection of Badgerys Creek and Elizabeth Drive has been upgraded to a roundabout as part of these realignment works and the construction of Western Sydney International. This section of the road was opened to traffic in February 2020
- **The Northern Road** – an arterial road that connects Narellan in the south west to the Great Western Highway in Penrith. The Northern Road has recently been upgraded as part of the Western Sydney Infrastructure Plan. The realigned section of The Northern Road to the west of the Western Sydney International was opened in April 2020.

A number of other local roads also traverse the transport study area such as Phillip Street, Harris Street, Putland Street/Reserve Road, Patons Lane and Derwent Road which are to be used by the project to access the main arterial network. The roads in Orchard Hills, Luddenham, Badgerys Creek and Bringelly are predominantly characterised by unsealed road shoulders, with poor pedestrian and cycle facilities. It is however expected that these facilities would be improved in the long term, as urban development occurs with the Western Sydney Aerotropolis precincts.

Road network performance

The road network performance during the base year scenario (2019) was assessed to understand the performance of the road network. A summary of this assessment is provided below.

Mid-block performance

An assessment of existing weekday AM peak and PM peak hour traffic volumes was completed based on traffic survey data to determine the general performance of the current road network configuration in the transport study area.

The base year mid-block assessment indicated that most intersections within the transport study area operate within their theoretical capacity and at a satisfactory LoS (generally LoS C or better). The assessment however indicated that:

- the current configuration of Elizabeth Drive (east of Badgerys Creek Road) operates close to its theoretical capacity
- Mamre Road (north of Luddenham Road) operate above its theoretical capacity during both peak hours in the base year
- The Northern Road (east of Badgerys Creek) operate above its theoretical capacity during both peak hours in the base year.

Further details of each of the base year (2019) mid-block performance results, as well as predicted future year (2036) without project scenario results for each affected road, are provided in Table 3.4 and Table 5-5 of Technical Paper 1 (Transport).

At some locations background traffic growth would result in reduced LoS without the project, assuming there are no further upgrades to the road network over this period.

Intersection performance

The operational performance of the transport study area intersections during the base year (2019) were assessed using SIDRA INTERSECTION 8.

Assessment of the intersections within the transport study area indicated that all intersections analysed currently operate satisfactorily at LoS D or better with spare capacity. The addition of the forecast background traffic growth during the future scenarios in 2023/2024, 2026 and 2036 is expected to lead to significant increases in delays and queueing, negatively impacting on the operation of these intersections.

Further details of the base year (2019) intersection performance results at each affected intersection are provided in Table 9-1. The table also presents LoS for predicted future year (2036) without project scenario at each affected intersection. At some locations, as a result of background traffic growth, the road network would have a reduced LoS, in particular at the intersection of Mamre Road and the M4 Motorway. These instances are shaded in the table.

Table 9-1 Base year (2019) and predicted future year (2036) intersection performance without project

Intersection	AM Peak 2019	AM Peak 2036 without project	PM Peak 2019	PM Peak 2036 without project
	LoS	LoS	LoS	LoS
Glossop Street/Forrester Road (S)	C	**D**	B	**D**
Glossop Street/Harris Street (P)	A	A	A	**B**
Glossop Street/Phillip Street (S)	A	**B**	B	**F**
Queen Street/Charles Hackett Drive (S)	B	B	B	B
Glossop Street/Great Western Highway (S)	D	**E**	D	D
Queen Street/Great Western Highway/ Mamre Road (S)	D	**F**	D	**F**
Charles Hackett Drive/Great Western Highway/Pages Road (S)	C	**F**	D	**F**
Mamre Road/M4 Western Motorway Eastbound Ramp (S)	C*	**F**	B	**F**
Mamre Road/M4 Western Motorway Westbound Ramp (S)	B	**E**	B	**F**
Great Western Highway/Gipps Street (S)	C	-	C	-
Gipps Street/Sunflower Drive (S)	B	-	A	-
Kent Road/Caddens Road (S)	B	B	B	**C**
Kent Road/M4 Western Motorway On-ramp (S)	A	A	A	A
Kent Road/M4 Western Motorway Off-ramp (S)	B	B	B	B
Kent Road/Lansdowne Road (P)	A	A	A	**B**
Mamre Road/Luddenham Road (P)	A	**E**	B	**F**
Luddenham Road/Elizabeth Drive (P)	B	**C**	B	**D**
Elizabeth Drive/Adams Road (P)	B	**C**	B	**D**

Intersection	AM Peak 2019	AM Peak 2036 without project	PM Peak 2019	PM Peak 2036 without project
	LoS	LoS	LoS	LoS
Elizabeth Drive/Badgerys Creek Road (P)	C	B	B	B
Badgerys Creek Road/The Northern Road (R)	A	**F**	A	**C**

Notes
Assessments have been undertaken using SIDRA INTERSECTION 8.
For traffic signals, the average movement delay and level of service over all movements is taken. For roundabouts and priority control intersections (with stop and give way signs), the critical movement for level of service assessment with the worst movement delay is taken.
Intersection control type as indicated against each (P: Priority-controlled, R: Roundabout, S: Signalised).
Dashes indicate intersections have not been assessed during the future year scenario in 2036 as they were assessed for construction site access.
* Mamre Road/M4 Western Motorway Eastbound Ramp intersection has a high degree of saturation on the western approach.
Assessments based on traffic survey data collected in June 2019 and modelled using SIDRA INTERSECTION 8

Parking arrangements

St Marys to Great Western Highway

St Marys town centre and surrounding streets currently have considerable car parking capacity, reflecting the dominant mode of access to and from the town centre and station. Car parking capacity within the St Marys precinct comprises over 4,500 spaces which are provided in the form of on-street kerbside parking and off-street car parking facilities.

Car parking facilities are currently provided on both sides of St Marys Station. A commuter car park is also provided to the north of St Marys Station (accessed from Harris Street). To the south of the Station, a number of off-street car parking facilities are provided.

Car parking surveys undertaken in the St Marys town centre suggests high turnover occurs on streets with retail frontages, significant commuter parking occurs on streets close to St Marys Station, and significant unrestricted parking exists in nearby largely residential streets, though overall this remains underutilised

A summary of the available car parking provisions and restrictions within the St Marys precinct is provided in Table 9-2. Available on-street parking and off-street parking facilities within the St Marys precinct are shown in Figure 9-3.

Table 9-2 Available car parking in the St Marys precinct

Car parking	Parking restrictions	Car parking spaces
On-street	Restricted	300
	Unrestricted	1,300
	Sub-total	***1,600***
Off-street	Restricted	505
	Unrestricted	676
	Commuter	618
	Disabled	25
	Other	1,091
	Sub-total	***2,915***
Total		**4,515**

Source: M2A parking surveys, December 2019

Note: This information only covers the area within the town centre and immediately surrounding St Marys Station. The actual capacity of on-street parking within the St Marys precinct will vary by time of day and associated uses. An estimate is provided here for indication of on-street capacity.

The existing multi-level commuter car park located at Harris Street is proposed to be extended by two additional levels (subject to separate approval). This will provide additional parking capacity for commuters within the St Marys precinct. This is likely to be completed prior to the 2023/2024 peak year of construction of the project.

Great Western Highway to Aerotropolis Core

North of the M4 Western Motorway, on-street car parking is not permitted along Great Western Highway, Mamre Road and Kent Road within the transport study area, and off-street car parking is generally not provided.

South of the M4 Western Motorway, there is limited demand for on-street car parking along Mamre Road, Luddenham Road, Elizabeth Drive and Badgerys Creek Road. This is due to the surrounding land uses predominantly consisting of undeveloped lands and rural and agricultural lands. Existing car parking primarily consists of informal parking, with no off-street parking facilities provided.

Source: M2A parking surveys, December 2019

Figure 9-3 On-street and off-street parking within the St Marys precinct

Public transport

Overall, the transport study area south of the M4 Western Motorway has generally limited public transport services due to the current low population density and consequent low demand for public transport services. However, the area around St Marys has an extensive public transport network comprising rail and bus services connecting to the surrounding town centres and the Sydney CBD as described below.

Rail network

Train lines currently operating within and adjacent to the transport study area include:

- T1 Western Line – St Marys interchange
- T2 Inner West and Leppington Line – Leppington interchange
- T5 Cumberland Line – Leppington interchange.

Leppington interchange is included as it is adjacent to the study area and the proposed South West Rail Link would connect the project to Leppington Station. The South West Rail Link Extension would extend the existing passenger rail line from Leppington Station to the Aerotropolis and provide a direct link to the Western Sydney Aerotropolis and the surrounding business areas.

Rail services at the existing St Marys Station and Leppington Station provide access to the wider Sydney Trains suburban rail network with many services provided during the peak periods at good frequencies. In St Marys, rail services operate on average every 10 minutes during both peak periods.

The high number of unrestricted car parking spaces available within the station precinct encourages commuters to drive to the station and catch the train to their destination.

Bus services

The transport study area is serviced by 15 bus routes as summarised in Table 9-3.

Table 9-3 Bus routes and operators in the transport study area

Route	Description	Operator	Key roads along the route
745	St Marys to Norwest Hospital via Stanhope Gardens	Busways	Station Street, Lethbridge Street, Phillip Street, Glossop Street, Gidley Street
758	St Marys to Mount Druitt via Tregear and Shalvey	Busways	Station Street, Lethbridge Street, Phillip Street, Glossop Street, Gidley Street
759	St Marys to Mount Druitt via Ropes Crossing	Busways	Station Street, Lethbridge Street, Phillip Street, Glossop Street, Forrester Road, Gidley Street
770	Mount Druitt to Penrith via St Marys	Busways	Mamre Road, Queen Street, Station Street, Charles Hackett Drive, Great Western Highway
771	St Marys to Mount Druitt via Colyton	Busways	Station Street, Queen Street, Charles Hackett Drive
774	Mount Druitt to Penrith via Nepean Hospital	Busways	Great Western Highway, Glossop Street, Phillip Street, Gidley Street, Station Street, Queen Street, Charles Hackett Drive, Lethbridge Street
775	Mount Druitt to Penrith via Erskine Park	Busways	Great Western Highway, Charles Hackett Drive, Queen Street, Station Street, Mamre Road
776	Mount Druitt to Penrith via St Clair	Busways	Mamre Road, Queen Street, Station Street, Charles Hackett Drive, Great Western Highway
779	St Marys to Erskine Park	Busways	Station Street, Queen Street, Mamre Road

Route	Description	Operator	Key roads along the route
781	St Marys to Penrith via Glenmore Park	Busways	Station Street, Queen Street, Charles Hackett Drive, Great Western Highway, Gipps Street
782	St Marys to Penrith via Werrington	Busways	Station Street, Lethbridge Street, Phillip Street, Glossop Street, Gidley Street
801	Badgerys Creek to Liverpool	Transit Systems	Badgerys Creek Road, Elizabeth Drive
835	University of Western Sydney to Prairiewood	Transit Systems	Great Western Highway, Charles Hackett Drive, Queen Street, Station Street, Lethbridge Street, Phillip Street, Glossop Street, Gidley Street
856	Bringelly to Liverpool	Interline bus services	The Northern Road, Bringelly Road
S11	St Clair to St Marys	Busways	Station Street, Lethbridge Street, Phillip Street, Glossop Street, Gidley Street

These bus routes connect residential areas, community services, schools, retail precincts and transport interchanges. Dedicated school buses also directly service a number of local schools through the St Marys bus interchange.

Bus services operating in the transport study area primarily provide local coverage and generally operate at low frequency (typically between one and five services in the morning or afternoon peak).

Pedestrian and cycle network

Pedestrian network

To the north of the M4 Western Motorway, the roads in the transport study area are typical of an urban environment with most streets consisting of footpaths on either side, or as a minimum, footpaths on one side of the road.

Along Mamre Road, between the Great Western Highway and the M4 Western Motorway, footpaths are generally provided on both sides of the road with pedestrian crossings provided only at signalised intersections. Near the M4 Western Motorway ramps, footpaths are provided along both sides of the Mamre Road bridge.

To the south of the M4 Western Motorway are the suburbs of Orchard Hills, Luddenham, Badgerys Creek and Bringelly, where pedestrian connectivity is generally poor due to the more rural nature of this environment. However, it is expected that once the area becomes more developed, pedestrian connectivity in these precincts would be improved.

Cycling facilities

Cycling network provision within the transport study area is typically limited to on-road cycling facilities. Within the transport study area, these include:

- on-road cycling facilities in the northern area around St Marys. Facilities are provided along the road network immediately surrounding the existing St Marys Station, including Station Street, Phillip Street, Queen Street and Charles Hackett Drive
- on-road cycle paths along Mamre Road to the north of the M4 Western Motorway
- a two-way shared path along the southern end of the Great Western Highway, west of Queen Street
- a two-way shared path is along the western side of Kent Road
- within the southern precincts, on-road cycle paths are provided along Mamre Road in Orchard Hills, Elizabeth Drive in Luddenham, near Devonshire Road in Badgerys Creek and along The Northern Road in Bringelly.

Overall, site observations indicated that cycle demand within the transport study area is low, with very low volumes of cyclists observed using the available facilities. In addition, connectivity to the wider cycle network is limited.

Proposed transport upgrades

As part of the broader development of the Western Parkland City including Western Sydney International, the Australian and NSW Governments are currently undertaking a number of investigations for proposed public transport, road and active transport projects including identification of proposed upgrades to existing infrastructure and corridor preservation for additional public transport corridors. While not all of the proposed transport upgrades have currently committed funding, they include:

- **M12 Motorway** – a new motorway is being delivered between the M7 Motorway, Cecil Hills and The Northern Road in Luddenham over a distance of about 16 kilometres. Construction of the project is expected to start in 2022 and be open to traffic before the opening of the Western Sydney International Airport in 2026
- **Mamre Road** – Stage 1 of the upgrade includes the section of road between the M4 Motorway in St Clair and Erskine Park Road in Erskine Park, while Stage 2 includes the section of the road from Erskine Park Road to Kerrs Road in Kemps Creek. The NSW Government has committed $220 million to Stage 1. Investigations to inform the concept design are currently underway
- **The Northern Road** – consisting of upgrade of a 35-kilometre section of The Northern Road between Mersey Road, Bringelly and Glenmore Parkway in Glenmore Park. The Northern Road upgrades are being delivered in stages with some stages completed and the final stages having started construction in 2019
- **Badgerys Creek Road** – Badgerys Creek Road has been realigned as part of the early earthworks for Western Sydney International. The realigned section of the road was completed in February 2020 and constitutes the first major piece of infrastructure for the Western Sydney International, which is now ready for traffic. Early earthworks for this project have now been completed with the northern section having been realigned providing a new connection point to Elizabeth Drive. By opening of the project in 2026, the intersection of Badgerys Creek Road and Elizabeth Drive will be signalised as part of the M12 Motorway/Elizabeth Drive works
- **Elizabeth Drive** – consisting of an upgrade of Elizabeth Drive directly in front of the Airport. Elizabeth Drive will be upgraded and grade separated over the Metro and M12 Motorway entry to Western Sydney International
- **St Marys Intermodal Facility** – approved construction and operation of an intermodal (road and rail) terminal
- additional infrastructure upgrades to Cowpasture Road, Camden Valley Way, Narellan Road, and the M4 Western Motorway with development of a managed motorway system
- corridor preservation activities for the Outer Sydney Orbital
- potential public transport upgrades including the potential future extensions of the project to the north and south, and potential future East West Rail Link and South West Rail Link Extensions (see Section 2.4.3 of this Environmental Impact Statement)
- additional rapid and suburban bus routes within Western Sydney
- pedestrian and cyclist upgrades including walking and cycling infrastructure as part of Western Sydney International, future M12 Motorway project, The Northern Road and Bringelly Road upgrades. TfNSW also proposes walking and cycling links along Elizabeth Drive as part of future upgrades
- proposed freight transport upgrades including the Western Sydney Freight Line corridor.

Proposed transport upgrades within the transport study area are discussed in greater detail in Section 3.4 of Technical Paper 1 (Transport).

9.4.2 On-airport

The Western Sydney International is located in Badgerys Creek and Luddenham. The northern boundary of the airport site adjoins Elizabeth Drive.

For the commencement of operation of the project, the existing traffic and transport environment is assumed to consist of Western Sydney International Stage 1. There are existing off-airport transport interactions that occur beyond the boundary of the Western Sydney International, including interfaces with existing off-airport road network and intersections that would be impacted by on-airport works.

Pedestrian and cycle infrastructure is not currently provided within the on-airport environment. However, it is assumed that some pedestrian and cycle pathways would be provided as part of the airport development.

A summary of intersection performance during base year (2019) is presented in Table 9-1. The table also presents LoS for predicted future year (2036) without project scenario at each affected intersection. The following intersections are considered relevant to the on-airport environment:

- Luddenham Road/Elizabeth Drive
- Elizabeth Drive/Adams Road
- Elizabeth Drive/Badgerys Creek Road
- Badgerys Creek Road/Badgerys Creek Site Access
- Badgerys Creek Road/Aerotropolis Site Access
- Badgerys Creek Road/The Northern Road
- The Northern Road/Derwent Road.

9.5 Potential impacts – construction

9.5.1 Off-airport

Overview

This section summarises the potential temporary impacts of the construction activities on the road network, access, parking, as well as public transport and walking and cycling networks.

St Marys town centre would be potentially impacted by construction activities. Construction activities would result in temporary road network modifications, road closures and/or street reconfiguration, removal of parking and relocation of bus facilities as well as some potential impacts to pedestrian and cycling access.

The road network outside St Marys town centre and near other construction sites is expected to experience minimal temporary impacts as a result of the construction of the project. The network would generally perform to an acceptable LoS due to the low level of development in the study area south of the M4. Where cumulative temporary transport impacts may be experienced due to haul routes being used concurrently for the project and construction of the future M12 Motorway project and Western Sydney International, Sydney Metro would consult with these projects to manage impacts. This is discussed further in Chapter 24 (Cumulative impacts).

Potential temporary construction impacts of the project on the road network, access, parking, walking and cycling networks and the public transport network are described in detail in the following sections.

Road network performance

Mid-block performance

An assessment of the weekday AM peak and PM peak hour traffic volumes was completed to determine the general performance of the road network configuration during the peak construction year without and with project construction. The findings of this assessment are summarised in Table 9-4.

The results indicate that the mid-block sections of Mamre Road, Luddenham Road and Elizabeth Drive (east of Badgerys Creek Road) are forecast to operate at or above theoretical capacity during the peak construction year without the addition of construction traffic generated by the project.

As shown in Table 9-4, most of the road network is forecast to operate at satisfactory LoS (LoS D or better) with the addition of construction traffic generated by the project. The temporary addition of construction traffic forecast to be generated by the project is expected to result in the following sections of the road network operating at or above theoretical capacity:

- Luddenham Road west of Mamre Road (southbound) would change from LoS E to LoS F during the PM peak
- Luddenham Road north of Elizabeth Drive (southbound) would change from LoS E to LoS F during the PM peak
- Elizabeth Drive west of Badgerys Creek Road (westbound) would change from LoS D to LoS E during the PM peak
- Elizabeth Drive east of Badgerys Creek Road (eastbound) would change from LoS D during the AM peak and LoS C during the PM peak to LoS E during the AM and PM peaks
- Badgerys Creek Road north of The Northern Road (northbound) would change from LoS C to LoS F during the AM peak. Badgerys Creek Road (southbound) would change from LoS C to LoS F during the PM peak
- The Northern Road east of Badgerys Creek Road (northbound) would change from LoS D to LoS F during the AM peak. The Northern Road (southbound) would change from LoS C to LoS F during the PM peak.

Overall, the potential impacts forecast along Luddenham Road would be due to construction vehicle movements to the off-airport construction corridor, the Luddenham Road station site and stabling and maintenance facility. Potential impacts forecast along Elizabeth Drive, Badgerys Creek Road and The Northern Road are due to the combined construction vehicle movements to the sites located within, and in the general vicinity of, Western Sydney International.

A conservative assessment has been undertaken whereby all spoil generated by the project within the Western Sydney International site is expected to be transported by road to disposal sites located outside the airport site. However, it is anticipated that the use of the proposed permanent spoil placement site within Western Sydney International is likely to reduce impacts on the road network.

These potential impacts would be managed through the preparation of a Construction Traffic Management Plan (CTMP), which would manage movement of construction vehicles as far as practicable to minimise impact on the road network (see Chapter 25 (Environmental management and mitigation) and Appendix G (Construction Traffic Management Framework)).

Table 9-4 2023/2024 peak construction year mid-block performance

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Future year without construction scenario		Future year with construction scenario		Future year without construction scenario		Future year with construction scenario	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Glossop Street (north of the Great Western Highway)	NB	1900	1120	C	1330	C	1150	C	1190	C
	SB	1900	1180	C	1230	C	1240	C	1450	**D**
Great Western Highway (east of Queen Street)	EB	2800	1780	C	1870	C	1400	B	1470	**C**
	WB	2800	1570	C	1640	C	2190	D	2290	D
Great Western Highway (west of Queen Street)	NB	2800	1510	C	1590	C	1150	B	1210	B
	SB	2800	1080	B	1140	B	1820	C	1900	C
Queen Street (north of Great Western Highway)	NB	900	620	C	620	C	540	C	540	C
	SB	900	350	B	350	B	620	C	620	C
Mamre Road (south of the Great Western Highway)	NB	1800	1080	C	1120	C	1150	C	1200	C
	SB	1800	960	C	1010	C	1310	C	1350	**D**
Great Western Highway (east of Gipps Street)	EB	2800	2000	C	2010	C	1870	C	1920	C
	WB	2800	1650	C	1700	C	1870	C	1870	C
Great Western Highway (west of Gipps Street)	EB	2800	1670	C	1720	C	1900	C	1900	C
	WB	2800	1880	C	1890	C	1740	C	1790	C
Kent Road (north of the M4 Western Motorway)	NB	1900	1230	C	1260	C	1270	C	1350	C
	SB	1900	1090	C	1160	C	1130	C	1160	C
Kent Road (south of the M4 Western Motorway)	NB	900	550	C	630	C	340	B	550	**C**
	SB	900	230	A	440	**B**	300	A	380	**B**
Mamre Road (north of Luddenham Road)	NB	900	1630	F	1670	F	1570	F	1670	F
	SB	900	1800	F	1900	F	1460	F	1500	F
Luddenham Road (west of Mamre Road)	NB	900	1020	F	1070	F	660	C	790	**D**
	SB	900	300	A	430	**B**	850	E	900	**F**

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Future year without construction scenario		Future year with construction scenario		Future year without construction scenario		Future year with construction scenario	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Luddenham Road (north of Elizabeth Drive)	NB	900	1080	F	1280	F	590	C	660	C
	SB	900	300	A	370	**B**	860	E	1070	**F**
Elizabeth Drive (west of Badgerys Creek Road)	EB	900	560	C	720	**D**	580	C	680	**D**
	WB	900	690	D	790	D	730	D	880	**E**
Elizabeth Drive (east of Badgerys Creek Road)	EB	900	770	D	840	**E**	620	C	850	**E**
	WB	900	930	F	1160	F	1000	F	1070	F
Badgerys Creek Road (south of Elizabeth Drive)	NB	900	420	B	510	**C**	380	B	690	**D**
	SB	900	440	B	750	**D**	610	C	710	**D**
Badgerys Creek Road (north of The Northern Road)	NB	900	500	C	1320	**F**	340	B	440	B
	SB	900	280	A	400	**B**	550	C	1370	**F**
The Northern Road (west of Badgerys Creek Road)	NB	1900	880	B	960	**C**	770	B	840	B
	SB	1900	1100	C	1170	C	1100	C	1180	C
The Northern Road (east of Badgerys Creek Road)	NB	1900	1550	D	2330	**F**	1380	C	1440	**D**
	SB	1900	1110	C	1180	C	1260	C	2040	**F**

Notes:
Assessments have been undertaken using SIDRA INTERSECTION 8.
Traffic volumes have been rounded to the nearest 10.
Peak hour construction traffic forecast to be generated by the project from each construction site have been distributed as per assumptions stated above and added to the forecast future year network traffic without the project.

Intersection performance

A summary of the performance of intersections within the transport study area in the peak periods during the peak construction year and with construction traffic is summarised in Table 9-5.

The assessment identifies that even with the temporary addition of construction vehicles, most intersections are expected to operate at a LoS D or better. All intersections are expected to continue to operate similar to the peak construction year without construction scenario. There are a number of intersections that would operate at or above capacity, but would not experience a change in LoS as a result of the project as follows:

- Queen Street/Great Western Highway/Mamre Road is forecast to operate at a LoS E during the with and without project scenario during the PM peak
- Mamre Road/M4 Western Motorway Eastbound Ramp is forecast to operate at LoS F during the with and without project scenario during the PM peak
- Mamre Road/M4 Western Motorway Westbound Ramp is forecast to operate at a LoS E during the with and without project scenario during the PM peak
- Mamre Road/Luddenham Road is forecast to operate at a LoS F during the with and without project scenario during the AM and PM peak.

There are a small number of intersections where the temporary addition of construction vehicles associated with the project are forecast to potentially result in increased delays and additional queuing, and these are summarised in Table 9-5 and include:

- Mamre Road/M4 Motorway Eastbound Ramp and Westbound Ramp
- Mamre Road/Luddenham Road (addition of construction vehicles at this intersection is forecast to further exacerbate delays and queuing due to the oversaturated conditions)
- Luddenham Road/Patons Lane.

Impacts to road infrastructure and diversions during construction

St Marys town centre is likely to be the most impacted during construction as a result of temporary road closures and/or street reconfiguration and removal of parking. At St Marys, alternative parking may be provided as part of enabling works to mitigate parking impacts and minimise associated impacts on nearby commercial properties.

Temporary road modifications or closures would be required to facilitate the construction works along the project alignment (see Section 8.9.7 and Figure 8-38 for details) and particularly at St Marys. Localised intersection upgrades would also be required to allow construction vehicles to access construction sites.

The temporary modifications which are proposed are expected to generate limited impacts on the overall operation of the road network, given their localised and short-term nature and given the majority of these roads provide local access. Network performance as a result of the temporary diversions and road closures is not expected to deteriorate significantly due to these works not occurring simultaneously and mostly occurring outside of the peak periods.

These potential impacts would be managed through the preparation of a CTMP, which would ensure that safe passage for all road users to pass these work sites is provided, and diversion routes are provided, where required (see Chapter 25 (Environmental management and mitigation) and Appendix G (Construction Traffic Management Framework).

Table 9-5 2023/2024 peak construction year intersection performance

Intersection	AM Peak				PM Peak			
	Future year without construction scenario		Future year with construction scenario		Future year without construction scenario		Future year with construction scenario	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Glossop Street/Forrester Road (S)	29	C	30	C	35	C	46	**D**
Glossop Street/Harris Street (P)	9	A	8	A	10	A	11	A
Harris Street/Harris Street Site Access (P)	-	-	9	A	-	-	9	A
Glossop Street/Phillip Street (S)	13	A	15	**B**	17	B	17	B
Queen Street/Charles Hackett Drive (S)	15	B	15	B	25	B	25	B
Glossop Street/Great Western Highway (S)	33	C	37	**D**	39	D	42	D
Queen Street/Great Western Highway/Mamre Road (S)	45	D	49	D	55	E	67	E
Charles Hackett Drive/Great Western Highway/ Pages Road (S)	26	C	26	C	43	D	44	D
Mamre Road/M4 Western Motorway Eastbound Ramp (S)	>100	F	>100	F	75	F	>100	F
Mamre Road/M4 Western Motorway Westbound Ramp (S)	48	D	52	D	61	E	67	E
Great Western Highway/Gipps Street (S)	35	C	41	**D**	30	C	32	C
Gipps Street/Sunflower Drive (S)	11	B	12	B	13	B	16	B
Kent Road/Caddens Road (S)	25	B	24	B	26	B	24	B
Kent Road/M4 Western Motorway On-ramp (S)	5	A	7	A	5	A	6	A
Kent Road/M4 Western Motorway Off-ramp (S)	21	B	23	B	19	B	22	B
Kent Road/Orchard Hills TBM Site Access (P)	-	-	24	B	-	-	17	B
Kent Road/Orchard Hills Station Site Access (P)	-	-	20	B	-	-	13	A
Kent Road/Lansdowne Road (P)	7	A	12	A	18	B	21	B
Lansdowne Road/Orchard Hills Site Access (P)	-	-	10	A	-	-	7	A

Intersection	AM Peak				PM Peak			
	Future year without construction scenario		Future year with construction scenario		Future year without construction scenario		Future year with construction scenario	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Mamre Road/Luddenham Road (P)	>100	F	>100	F	>100	F	>100	F
Luddenham Road/Patons Lane (P)	22	B	53	**D**	27	B	44	**D**
Luddenham Road/Warragamba Site Access (P)	-	-	40	C	-	-	48	D
Luddenham Road/Station Site Access West (P)	-	-	42	C	-	-	34	C
Luddenham Road/Station Site Access East (P)	-	-	50	D	-	-	47	D
Luddenham Road/Elizabeth Drive (P)	10	A	15	**B**	12	A	16	**B**
Elizabeth Drive/Adams Road (P)	9	A	13	A	16	B	32	**C**
Elizabeth Drive/Badgerys Creek Road (R)	13	A	17	B	14	A	28	**B**
Badgerys Creek Road/Badgerys Creek Site Access (R)	-	-	33	C	-	-	36	C
Badgerys Creek Road/Aerotropolis Site Access (P)	-	-	43	D	-	-	42	C
Badgerys Creek Road/The Northern Road (S)	34	C	53	**D**	28	B	32	**C**
The Northern Road/Derwent Road (S)	6	A	7	A	6	A	6	A

Notes:
Assessments have been undertaken using SIDRA INTERSECTION 8.
Peak construction traffic likely to be generated in 2023 by the construction sites north of Elizabeth Drive have been used for the assessments. For all other construction sites, peak construction traffic forecast in 2024 have been used for the assessments.
For traffic signals, the average movement delay and level of service over all movements is used. For roundabouts and priority control intersections (with stop and give way signs), the critical movement for level of service assessment with the worst movement delay is used.
The intersection of Kent Road/Lansdowne Road experiences the worst movement delay for through traffic approaching from the west on Lansdowne Road during the 2023 base scenario due to low traffic volumes (less than 5 veh/hr). However, the delay is not representative of the overall intersection performance. Therefore, the movement that corresponds to the next highest delay is reported here to provide an indication of the intersection performance.
Dashes indicate new construction site accesses that would only be constructed and used by construction vehicles and hence would not exist during the future year scenario without construction.
Intersection control type as indicated against each (P: Priority-controlled, R: Roundabout, S: Signalised).

Access impacts

During construction of the project, it is anticipated that access would generally be maintained for local vehicles, pedestrians and cyclists, however, some temporary diversions may be required, and space may be constrained. Some temporary delays may also be experienced due to obstruction by construction vehicles. These potential impacts would be experienced by pedestrians, cyclists and vehicles accessing properties within the local network.

Access to the existing St Marys Station would be maintained during construction. Access to properties near the project would be maintained at all times except where properties are proposed to be acquired or used for the project.

In St Marys, access to East Lane would be maintained during construction. Access under normal conditions would be maintained along Chesham Street.

Outside of St Marys, potential impacts to property access are generally limited given the project would generally be located in rural areas. In the event that access to a property is temporarily impacted as a result of the project, affected properties would have their access reinstated via diversion in consultation with the property owner (unless property acquisition or amalgamation would make this unnecessary).

Access would also be maintained for emergency, delivery and waste collection vehicles during the construction period of the project albeit that in some locations waste bins may need to be temporarily relocated to areas accessible for collection by the waste collection service.

Access to the Claremont Meadows services facility construction site, located south of the Great Western Highway, would be provided via either Gipps Street or an alternative access from Reserve Road via Putland Street to the Great Western Highway.

Parking impacts

On-street and off-street parking

During construction, some on-street parking would be temporarily or permanently unavailable. In particular, the St Marys town centre is likely to experience potential impacts during construction.

In total, about 435 car parking spaces are temporarily impacted within the St Marys precinct and the road network immediately surrounding the station during the construction period. This includes about 310 off-street parking spaces and 125 on-street parking spaces, comprising both restricted and unrestricted spaces. These car parking spaces are generally used for on-street parking by the retail and commercial establishments in this area as well as by commuters using the St Marys Station.

At St Marys additional parking would be provided by extending the existing multi-level commuter car park on Harris Street by two additional levels (subject to separate approval) and is proposed to be in place prior to the removal of the Harris Street at-grade commuter car park. These spaces would replace the commuter car parking spaces lost as a result of the construction of the project.

The car parking survey undertaken by Sydney Metro in 2019 indicates there is existing on-street and off-street capacity within the town centre at St Marys to accommodate the temporary loss of car parking spaces.

Outside of the St Marys precinct, construction of the project is not anticipated to impact on-street parking arrangements, given the existing land uses in the remaining precincts largely comprise greenfield and rural lands. In these precincts, available on-street car parking is limited and largely consists of informal parking.

Construction worker parking

Some construction worker parking would be provided at construction sites however it will not meet the demand based on the construction workforce. Construction worker parking would be managed in accordance with the Construction Traffic Management Framework (Appendix G).

Pedestrian and active transport

The introduction of additional heavy vehicles to the network during construction has the potential to result in safety impacts to pedestrians, cyclists and other motorists, especially where there is an increased likelihood for interaction.

Existing pedestrian and cycle infrastructure within the traffic study area is primarily limited to areas adjacent to construction sites at St Marys, Claremont Meadows and Orchard Hills.

Pedestrian access to St Marys Station would be maintained at all times during construction. During rail possessions, access may be temporarily altered to facilitate construction activities. Construction works may potentially restrict access to pedestrian facilities and cycle routes surrounding the station but in these circumstances access to the station would be maintained through temporary diversions. These temporary diversions may result in increased travel distances for pedestrians and cyclists seeking to access the station.

Pedestrian access to residential properties along Station Street would be maintained via local traffic control measures. Construction vehicle access to the new Harris Street construction site may potentially impact the existing footpath on Harris Street and local traffic control measures would be provided to maintain pedestrian access.

At the Claremont Meadows services facility construction site, the intersection of Gipps Street and Sunflower Drive would be upgraded to construct a new eastern leg for access to the site. The existing pedestrian path along the east side of Gipps Street opposite Sunflower Drive would be maintained, and the upgraded intersection would include a pedestrian phase.

In Orchard Hills, short-term local pedestrian diversions may be required throughout the Orchard Hills construction site. It is expected that local pedestrian and cyclist diversions would be accommodated within the existing road environment.

Temporary local pedestrian diversions may be required within the residential area west of Gipps Street and for the shared pathway and the footpath located to the west and east of Gipps Street and Kent Road respectively as a result of the Claremont Meadows temporary construction power route. It is expected that local pedestrian and cyclist diversions would be accommodated within the existing road environment.

Temporary pedestrian and cycle routes provided as part of diversions would be required to meet minimum specifications outlined in Australian Standards, with appropriate signposting provided along the routes. Other pedestrian facilities or access to residential properties and cyclist routes within the transport study area are expected to be maintained during the construction period.

Public transport

Temporary changes to the existing public transport network during the construction of the project would be predominantly limited to the St Marys precinct. Changes to the public transport network would be reviewed during ongoing design development with the objective of minimising disruptions to public transport services.

Bus service impacts

In St Marys, the existing bus interchange and layover on Station Street is proposed to be decommissioned and temporarily relocated to Nariel Street for the duration of construction to facilitate construction activities. An off-street option on the Station Street at-grade car park for the temporary relocation of the bus interchange is also being investigated.

Pedestrian access to the existing St Marys Station for bus passengers would be maintained during construction. Relocation works would be completed prior to the decommissioning of the existing interchange to ensure disruption to bus services is minimised.

It is anticipated that some customers requiring access to the relocated bus facilities would need to temporarily walk longer distances to their desired bus stops. Any relocation of bus facilities would be undertaken such that potential disruptions to access and walking distances are minimised.

Other bus services outside of the St Marys precinct would only be minimally impacted during construction, with minor delays due to temporary traffic diversions. There would be no changes to infrastructure supporting the existing public transport network at other locations.

Train service impacts

Some construction activities within the T1 Western Line rail corridor would require track possessions, where train services are temporarily suspended. Track possessions would generally occur over the weekend and at night and a replacement bus service would be provided for rail customers. Other works within the rail corridor would generally be carried out during standard construction hours and would not disrupt existing rail services. No other impacts are anticipated to the existing rail network within the study area.

Point-to-point impacts

The point-to-point vehicle facility (including taxis) on the southern side of Station Street would be retained near its existing location during construction and accessed via East Lane and/or Queen Street. The arrangements would be confirmed during design development, in consultation with relevant stakeholders.

The existing kiss and ride facilities located at St Marys Station, north of Station Street would be maintained during the construction phase.

9.5.2 On-airport

Construction traffic movements within Western Sydney International would affect the performance of the road network and surrounding intersections located off-airport. This includes roads such as Elizabeth Drive, Badgerys Creek Road, The Northern Road, Luddenham Road and Adams Road. The impacts due to construction activities proposed within the airport for the peak construction year scenario during 2023/2024 were captured as part of the assessments of the road network surrounding Western Sydney International and presented in the off-airport assessment (see Section 9.5.1).

Construction vehicle movements to/from the on-airport construction sites within Western Sydney International would be managed in coordination with Western Sydney Airport, Transport for NSW and their respective contractors for the development of the Western Sydney International and the future M12 Motorway project. Some construction trucks would require the use of internal construction routes also used for the construction of Western Sydney International. As such traffic management measures would need to be developed in consultation with Western Sydney Airport to manage access to construction sites as well as the cumulative construction impacts.

During the peak construction scenario in 2024, construction works for the airport would still be progressing at the airport site. As such, public access to the airport would be restricted, and potential transport related impacts would be limited.

It is expected that construction vehicle movements would be planned in conjunction with the airport construction works as per the guidelines included in the Construction Traffic Management Framework (Appendix G).

The Traffic and Transport Liaison Group (TTLG) would be established to coordinate, manage and minimise transport impacts during construction and would include Western Sydney Airport, TfNSW, local councils, emergency services and other stakeholders. Development of the traffic management measures will be carried out in consultation with the TTLG.

Road network performance

Mid-block performance

An assessment of the weekday AM peak and PM peak hour traffic volumes was completed to determine the general performance of the road network configuration during the peak construction year without and with project construction activity. The findings of this assessment are summarised in Table 9-4.

The assessment indicates that sections of Luddenham Road and Elizabeth Drive within the on-airport study area are forecast to operate at or above theoretical capacity during the peak construction year without the addition of construction traffic generated by the project. However, the assessment has found that some sections of the road network are forecast to temporarily operate at or above their theoretical capacity due to the addition of construction traffic likely to be generated by the project. These locations include Luddenham Road in the PM peak and Elizabeth Drive, Badgerys Creek and The Northern Road during both AM and PM peaks.

The potential impacts forecast along these roads are temporary and due to construction vehicle movements accessing the on-airport construction sites using these roads. Potential impacts forecast along Elizabeth Drive, Badgerys Creek Road and The Northern Road are due to the combined construction vehicle movements to the sites located within and around Western Sydney International.

Intersection performance

Construction traffic movements within Western Sydney International would temporarily affect the intersection performance of surrounding intersections located off-airport. These potential impacts have been assessed in Section 9.5.1. A summary of the on-airport intersections likely to be temporarily impacted during construction activities is presented in Table 9-5.

The assessment identified that all intersections expected to be impacted by the on-airport construction activities are forecast to perform satisfactorily with acceptable delays and spare capacity during future year conditions in 2024 without construction. During the peak year with construction scenario, intersections likely to be temporarily impacted by the construction activities planned in the on-airport environment are forecast to operate at a LoS D or better.

Pedestrian and active transport impacts

During the peak year of construction of the project, the airport is forecast to be under construction and as such active transport links are not anticipated to exist within Western Sydney International. No impacts to public transport networks are therefore expected within and adjacent to the on-airport environment during construction.

Public transport impacts

During the peak year of construction of the project, the airport is forecast to be under construction and as such public transport services are not forecast to be operational within the on-airport environment. No impacts to public transport networks are therefore expected within and adjacent to the on-airport environment during construction.

9.6 Potential impacts – operation

9.6.1 Off-airport

Overview

This section outlines the transport interchange provisions proposed at each of the off-airport stations. It also discusses the potential impact of station traffic on the road network at each off-airport station precinct during operation. Assessment of operational impacts was based on the demands, characteristics, access modes and precinct design plans for each of the planned stations. The planning of stations has considered the convenient and safe transfer of customers between the stations and other transport modes. The proposed station precinct designs take into consideration the existing and proposed development parcels around each station precinct, future proposed master plans, infrastructure projects and network upgrades.

The transport interchange provisions in the proposed station plans were designed to maximise the seamless travel experience for all customer groups transferring between the project and other transport modes. Stations have been designed for ease of interchange from the different modes including pedestrian and cycle facilities and to minimise disruptions to public transport users and the surrounding road network.

The modal access hierarchy is shown in Figure 9-4. The modal access proposed for each of the off-airport stations is shown in Table 9-6 and discussed briefly below. The objective of the hierarchy is to allow the most prominent locations within an interchange precinct to be allocated to the most efficient and sustainable modes. Further details regarding the rationale for each mode is provided in Section 5.1 of Technical Paper 1 (Transport).

Table 9-6 Modal access proposed for off-airport stations

Station	Walking	Cycling	Train	Bus	Point-to-point	Kiss and ride	Park and ride
St Marys	●	●	●	●	●	●	●
Orchard Hills	●	●		●	●	●	●
Luddenham Road	●	●		●	●	●	●
Aerotropolis Core*	●	●		●	●	●	●

Note:
Temporary commuter car parking would initially be provided at Aerotropolis Core Station to cater for planned developments to the south of the station. However, these spaces would be removed once the new Aerotropolis and transport systems develop.

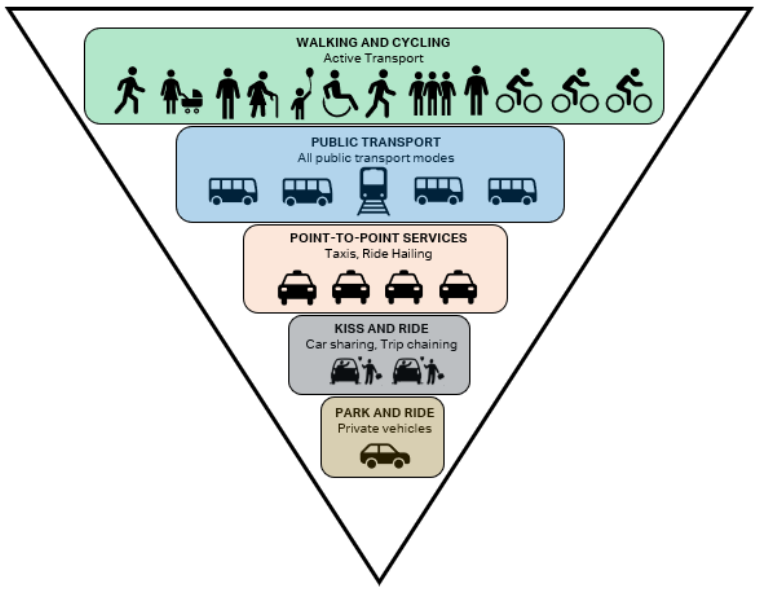


Figure 9-4 Modal access hierarchy

Integration with other transport modes

This section provides a summary of the transport interchange provisions proposed at each of the off-airport stations. The provisions identified below are indicative only and based on the current project design. The final transport integration provisions would be subject to ongoing design development and consultation with relevant stakeholders.

St Marys Station

The project is designed to facilitate transfers between the project and the existing T1 Western Line at St Marys Station. Customer access to the existing St Marys Station is expected to significantly increase as a result of the project, especially given plans to further intensify development, population and employment around the interchange precinct.

Transport interchange facilities proposed at St Marys Station would be generally consistent with the existing facilities. St Marys Station would:

- integrate with the existing Sydney Trains suburban rail network, connecting to the T1 Western Line
- retain bus pick-up and drop-off facilities along the southern road frontage of the station on both sides of Station Street
- provide a new dedicated bus layover directly east of the new metro station with access to this facility provided from Station Street
- provide point-to-point and kiss-and-ride facilities west of Queen Street, on Nariel Street to reduce private vehicle access along Station Street
- retain the existing point-to-point facilities at the southern end of Forrester Road
- retain the park and ride facilities to the north of the station, with access provided from Harris Street, to encourage private vehicles to approach the station from the north and removing traffic from the town centre
- retain (and expand) the existing car parking facilities at St Marys Station
- provide secure bicycle parking close to the station entrances along Station Street and south of the commuter car park on Harris Street.

Orchard Hills Station

The proposed Orchard Hills Station precinct would service a future residential, commercial and mixed use precinct and would help transform the area into a compact, high-amenity and walkable new community. All proposed interchange facilities would be located on the proposed north-south street that borders the eastern side of the station, east of Kent Road.

Orchard Hills Station would provide:

- secure bicycle parking close to the station entrance
- bus stop locations proposed on both sides of the road to provide convenient pedestrian movement to the station
- commuter parking for up to 500 spaces located to provide direct access from Lansdowne Road and close to Kent Road and the M4 Western Motorway
- upgrade to the existing road reserve for Kent Road and Lansdowne Road including intersections with new precinct roads are proposed as part of the station, emphasising the need to maintain reliable traffic access to and from the M4 Western Motorway.

Luddenham Road Station

The proposed Luddenham Road Station precinct would be located to the west of Luddenham Road within the proposed Northern Gateway precinct, which forms part of Western Sydney Aerotropolis. Future access arrangements between the station and the wider precinct, in addition to on-street car parking within the precinct, would be developed as part of the masterplan for the area.

Luddenham Road Station would provide:

- connection to future walking and cycling corridors (proposed as part of the master plan for the adjoining development)
- secure bicycle parking close to the station
- bus facilities on the eastern side of the Station Plaza with access from Luddenham Road
- point-to-point, kiss-and-ride and park and ride facilities on the eastern side of the station precinct
- commuter parking facility for up to 200 at-grade spaces with access provided directly from Luddenham Road. This facility would not preclude any future expansion of the facility into a multi-storey arrangement.

Aerotropolis Core Station

The proposed Aerotropolis Core Station precinct would be located within the core of the Western Parkland City. The precinct would be located in a greenfield space and provide opportunities to enhance user experience, focus on sustainable modes of travel and provide seamless interchanges between modes.

Aerotropolis Core Station would provide:

- interface with a new bus interchange facility. The plaza would be accessed by a new road provided as part of the Aerotropolis Core precinct. Bus bays and associated shelters as well as bus layover would be accessed from a bus-only corridor that would run in an east-west direction, creating a smooth interchange for transferring passengers
- dedicated walking and cycling route at the station, linking to a new road network to be provided as part of the Aerotropolis Core
- secure bicycle parking with up to 100 spaces
- point-to-point services and pick up and drop off facilities southwest of the station
- temporary car parking facilities for up to 300 at-grade spaces. It is anticipated that as the Aerotropolis Core precinct develops (and additional future public transport options are delivered), this parking would not be required in the Aerotropolis Core location.

Future year 2026 with the project

Road network changes

As part of the establishment of the future stations, a number of changes would be required in the surrounding road network to integrate the station design into existing and future land uses as part of Day 1 opening in 2026.

A summary of the potential impacts surrounding each of the stations is provided in the following sections.

St Marys Station

In the St Marys precinct, the following impacts would occur:

- Station Street would move from the current two-way access arrangement to restricted access for properties and service access for buses, establishing a bus priority along the road
- some private driveways would be removed or relocated where possible within the interchange vicinity and on-street parking would be converted to bus bays or no parking zones to permit bus operations
- traffic calming measures would be introduced, in addition to three pedestrian crossing points
- the intersection of Station Street and Gidley Street would be closed and potential traffic calming measures or a new pedestrian zone would be introduced
- in Nariel Street, town-centre parking would be removed to allow for new point-to-point and kiss and ride spaces
- a number of key roads within the town centre would be modified to facilitate bus movements. These would include potential changes to on-street parking at Lethbridge, Queen and Phillip streets and signal phasing at the Phillip Street and Glossop Street intersection
- minor improvements such as line marking the construction of kerb ramps would be required to permit active transport access at Camira Street and Chesham Street
- on-street parking along Harris Street would potentially be removed to permit more direct pedestrian access near the future plaza area at St Marys Station.

Orchard Hills Station

Road network improvements works would be required in Orchard Hills to facilitate station access. These upgrades would include:

- an upgrade and likely signalisation of the intersection of Lansdowne Road and Kent Road and the provision of a new signalised crossing at the intersection of Kent Road and the future precinct street
- a signalised crossing at Kent Road to permit vehicle movements into the station precinct.

These upgrades may include provisions for an additional approach, pedestrian and bicycle crossings and potential bus priority.

Luddenham Road Station

In the Luddenham Road precinct, the provision of traffic signals including signalised pedestrian crossings at the intersection of Luddenham Road and the future precinct street (north) and Luddenham Road and the future precinct street (south) may be required to permit vehicle movements into the station precinct. These upgrades may include provisions for an additional approach, pedestrian and bicycle crossings and potential bus priority.

Aerotropolis Core Station

As part of the Aerotropolis operational needs, the provision of a new signalised crossing at the intersection of Badgerys Creek Road and future precinct street may be required to permit vehicle movements into the Aerotropolis Core station precinct. Provisions for additional approach, new pedestrian and bicycle crossings may also be required.

Mid-block performance

An assessment of the weekday AM and PM peak hour traffic volumes was completed to determine the general performance of the road network configuration in the future year 2026 with the project operational. The findings of this assessment are summarised in Table 9-7.

The traffic volume across the transport study area is forecast to grow, primarily due to the growth associated with Western Sydney International, as well as developments in the Western Sydney Aerotropolis, Greater Penrith to Eastern Creek Growth Investigation Area and the South West Growth Area. The forecast traffic volumes along Mamre Road and Luddenham Road are expected to exceed their capacity, during both the AM and PM peak hours for the without and with project scenarios.

During the without project scenario in 2026, a number of roads are forecast to operate near or at the theoretical capacity including:

- Mamre Road north of Luddenham Road, Luddenham Road west of Mamre Road
- Luddenham Road north of Elizabeth Drive
- Elizabeth Drive east of Badgerys Creek Road and The Northern Road east of Badgerys Creek Road.

These roads are forecast to continue to operate at or above the theoretical capacity during the with project scenario in 2026 as follows:

- Great Western Highway east of Queen Street (westbound) would change from LoS D to LoS E during the PM peak
- Mamre Road north of Luddenham Road (northbound and southbound) would operate at a LoS F during the AM peak and at a LoS F (northbound) during the PM peak (no change in LoS with and without the project)
- Luddenham Road west of Mamre Road (northbound) would operate at a LoS F during the AM peak and at a LoS F (northbound and southbound) during the PM peak (no change in LoS with and without project)
- Luddenham Road north of Elizabeth Drive (northbound) would operate at a LoS F during the AM peak and (southbound) during the PM peak (no change in LoS with and without project)

- Elizabeth Drive east of Badgerys Creek Road (westbound) would operate at a LoS F during the AM and PM peak (no change in LoS with and without project)
- The Northern Road, east of Badgerys Creek Road (northbound) would operate at a LoS E during the AM peak (no change in LoS with and without project).

The assessment indicates that the project scenario is not forecast to cause significant impacts to the study area road network compared with the without project scenario.

The combined effects of the provision of the metro service, increases in the number of bus services and enhancements to the walking and cycling facilities are likely to reduce car dependency and minimise the impacts to the study area road network.

Table 9-7 Future year 2026 mid-block performance

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Without project		With project		Without project		With project	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Glossop Street (north of the Great Western Highway)	NB	1900	1090	C	1270	C	1220	C	1220	C
	SB	1900	1180	C	1180	C	1280	C	1280	C
Great Western Highway (east of Queen Street)	EB	2800	1850	C	2080	C	1470	C	1620	C
	WB	2800	1650	C	1810	C	2360	D	2510	**E**
Great Western Highway (west of Queen Street)	EB	2800	1590	C	1670	C	1230	B	1230	B
	WB	2800	1140	B	1140	B	2040	C	2040	C
Queen Street (north of Great Western Highway)	NB	900	640	C	800	D	560	C	700	**D**
	SB	900	350	B	510	**C**	640	C	780	**D**
Mamre Road (south of the Great Western Highway)	NB	1800	1050	C	1050	C	1190	C	1190	C
	SB	1800	960	C	960	C	1310	C	1310	C
Kent Road (north of the M4 Western Motorway)	NB	1900	1240	C	1280	C	1390	C	1440	**D**
	SB	1900	1160	C	1160	C	1200	C	1230	C
Kent Road (south of the M4 Western Motorway)	NB	900	630	C	680	**D**	480	C	570	C
	SB	900	310	A	410	**B**	330	B	380	B
Mamre Road (north of Luddenham Road)	NB	1900	1980	F	1990	F	1920	F	1930	F
	SB	1900	2070	F	2090	F	1650	D	1660	D
Luddenham Road (west of Mamre Road)	NB	900	1310	F	1330	F	950	F	990	F
	SB	900	370	B	410	B	1010	F	1030	F
Luddenham Road (north of Elizabeth Drive)	NB	900	1310	F	1340	F	730	D	760	D
	SB	900	340	B	380	B	980	F	1000	F

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Without project		With project		Without project		With project	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Elizabeth Drive (west of Badgerys Creek Road)	EB	2800	490	A	510	A	610	A	630	A
	WB	2800	730	A	760	A	730	A	750	A
Elizabeth Drive (east of Badgerys Creek Road)	EB	900	690	D	720	D	640	C	700	**D**
	WB	900	1030	F	1100	F	1030	F	1050	F
Badgerys Creek Road (south of Elizabeth Drive)	NB	1900	410	A	440	A	430	A	490	A
	SB	1900	510	A	580	A	700	B	730	B
Badgerys Creek Road (north of The Northern Road)	NB	900	550	C	610	C	390	B	430	B
	SB	900	300	A	350	**B**	610	C	680	**D**
The Northern Road (west of Badgerys Creek Road)	NB	1900	1340	C	1350	C	1290	C	1320	C
	SB	1900	750	B	780	B	720	B	720	B
The Northern Road (east of Badgerys Creek Road)	NB	1900	1840	E	1880	E	1600	D	1610	D
	SB	1900	1000	C	1010	C	1260	C	1260	C

Note:
Traffic volumes rounded to the nearest 10
Source: Traffic volumes used for the assessments was informed by the outputs of the WRTM modelling developed for the M12 Motorway Environmental Impact Statement

Intersection performance

A summary of the performance of the intersections within the transport study area during the AM and PM peak hours during the future year 2026 with the project scenario is outlined in Table 9-8.

During the future year 2026 with project, the majority of the intersections operate at a LoS D or better, except for the following:

- Queen Street/Great Western Highway/Mamre Road would change from LoS D to LoS F during AM peak and from LoS E to LoS F during the PM peak
- Mamre Road/M4 Western Motorway Eastbound Ramp is forecast to operate at LoS F during the PM peak (no change in LoS with and without the project)
- Mamre Road/M4 Western Motorway Westbound Ramp is forecast to operate at LoS F during the AM and PM peak (no change in LoS with and without the project)
- Mamre Road/Luddenham Road is forecast to operate at LoS F during the AM and PM peak (no change in LoS with and without the project)
- Badgerys Creek Road/The Northern Road is forecast to operate at LoS F during the AM peak (no change in LoS with and without the project).

Pedestrian and cyclist impacts

There are no major changes to the walking and cycling network proposed during the future year 2026 without project scenario and therefore no significant impacts are expected to the walking and cycling network.

The design of the station precincts is proposed to provide priority to active transport facilities as follows:

- footpaths and cycling facilities at the station precincts
- additional pedestrian crossing points for easy access to the station, provision of traffic calming measures on Gidley Street or conversion to pedestrian zone between Station Street and Phillip Street and facilitation of pedestrian access from Harris Street at St Marys
- new signalised pedestrian crossing on Kent Road at Orchard Hills
- new signalised pedestrian crossing to facilitate pedestrian movements into the station at Luddenham
- new pedestrian crossing to facilitate pedestrian movements at Badgerys Creek Road intersection at Western Sydney Aerotropolis.

The project has been designed so that it does not preclude the provision of new or planned walking and cycling services in areas outside the station precincts, along or across the project corridor or within future precincts surrounding the project.

Public transport impacts

The road-based public transport modes are likely to be impacted in the same way as general traffic.

Rail-to-rail transfer is expected to occur at St Marys between the project and the T1 Western Line. Assessment of the proposed interchange function of St Marys Station indicates that there is sufficient capacity on the T1 Western Line trains at St Marys Station to accommodate passengers transferring from/to the project.

As part of the Western Sydney City Deal, the Australian and NSW Governments have committed to delivering new rapid bus services to link the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Aerotropolis and to Western Sydney International. Regional and local bus services would also be provided to link the project to its local and wider surroundings. The frequencies of these bus services would be determined based on the travel demand at these stations.

Table 9-8 Future year 2026 intersection performance

Intersection	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Glossop Street/Forrester Road (S)	30	C	34	C	37	C	37	C
Glossop Street/Harris Street (P)	9	A	10	A	11	A	11	A
Harris Street/St Marys Station Car park Access (P)	-	-	5	A	-	-	5	A
Glossop Street/Phillip Street (S)	13	A	14	A	15	B	15	B
Queen Street/Charles Hackett Drive (S)	16	B	18	B	18	B	18	B
Glossop Street/Great Western Highway (S)	32	C	37	**D**	43	D	43	D
Queen Street/Great Western Highway/Mamre Road (S)	44	D	92	**F**	65	E	>100	**F**
Charles Hackett Drive/Great Western Highway/Pages Road (S)	23	C	33	C	46	D	47	D
Mamre Road/M4 Western Motorway Eastbound Ramp (S)	25	B	25	B	>100	F	>100	F
Mamre Road/M4 Western Motorway Westbound Ramp (S)	85	F	85	F	>100	F	>100	F
Kent Road/Caddens Road (S)	25	B	25	B	24	B	24	B
Kent Road/M4 Western Motorway On-ramp (S)	5	A	7	A	5	A	5	A
Kent Road/M4 Western Motorway Off-ramp (S)	21	B	22	B	20	B	22	B
Kent Road/Orchard Hills Station Access (S)	-	-	17	B	-	-	13	A
Kent Road/Lansdowne Road (S)	7	A	31	**C**	10	A	31	**C**
Lansdowne Road/Orchard Hills station Car park Access (P)	-	-	6	A	-	-	6	A
Mamre Road/Luddenham Road (S)	72	F	73	F	86	F	97	F
Luddenham Road/Station Access (North) (S)	-	-	11	A	-	-	11	A

Intersection	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Luddenham Road/Station Access (South) (S)	-	-	11	A	-	-	9	A
Luddenham Road Station Car park Access (P)	-	-	6	A	-	-	6	A
Luddenham Road/Elizabeth Drive/Adams Road (S)	29	C	29	C	52	D	54	D
Elizabeth Drive/Western Sydney International Access (S)	15	B	15	B	16	B	16	B
Elizabeth Drive/Badgerys Creek Road (S)	13	B	13	B	13	B	13	B
Badgerys Creek Road/Aerotropolis Core Station Access (S)	-	-	13	A	-	-	12	A
Aerotropolis Car park Access (P)	-	-	6	A	-	-	6	A
Badgerys Creek Road/The Northern Road (S)	>100	F	>100	F	28	B	28	B

Notes:
Assessments have been undertaken using SIDRA INTERSECTION 8.
For traffic signals, the average movement delay and level of service over all movements is used. For roundabouts and priority control intersections (with stop and give way signs), the critical movement for level of service assessment with the worst movement delay is used.
The intersection of Kent Road/Lansdowne Road experiences the worst movement delay for through traffic approaching from the west on Lansdowne Road during the without project scenario due to low traffic volumes (less than 5 veh/hr). However, the delay is not representative of the overall intersection performance. Therefore, the movement that corresponds to the next highest delay is reported here to provide an indication of the intersection performance.
Dashes indicate new operational site accesses that would only be used once the project is operational and hence would not exist during the future year 2026 without the project scenario.
Intersection control type as indicated against each (P: Priority-controlled, R: Roundabout, S: Signalised).

Future year 2036 with the project

Mid-block performance

An assessment of the weekday AM peak and PM peak hour traffic volumes was completed to determine the general performance of the road network configuration in 2036 with the project operational. The findings of this assessment are summarised in Table 9-9.

Table 9-9 indicates that the following sections of the road network are forecast to operate near or at the theoretical capacity during the without project scenario in 2036:

- Great Western Highway both east and west of Queen Street
- Mamre Road north of Luddenham Road
- Luddenham Road west of Mamre Road
- Luddenham Road north of Elizabeth Drive
- Elizabeth Drive east of Badgerys Creek Road
- The Northern Road both west and east of Badgerys Creek Road.

A number of road infrastructure projects are being delivered and proposed under the *Western Sydney Infrastructure Plan* (Department of Infrastructure and Regional Development, 2018c) that aim to address road congestion in the study area and are discussed in Chapter 24 (Cumulative impacts).

During the with project scenario, Table 9-9 indicates that the following mid-block road sections are forecast to operate at or above the theoretical capacity:

- Great Western Highway east of Queen Street (eastbound) would change from LoS D to LoS E during the AM peak. Great Western Highway (westbound) would change from LoS E to LoS F during the PM peak
- Great Western Highway west of Queen Street (westbound) would operate at a LoS E during the PM peak (no change in LoS with and without the project)
- Queen Street north of Great Western Highway (northbound) would change from LoS C to LoS F during the AM peak.
- Queen Street (northbound and southbound respectively) would change from LoS C to LoS E and from LoS D to LoS F during the PM peak
- Kent Road south of the M4 Western Motorway (northbound) would change from LoS D to LoS E in the AM peak and from LoS D to LoS F in the PM peak
- Mamre Road north of Luddenham Road would operate at a LoS E and LoS F (northbound and southbound respectively) during the AM peak (no change in LoS with and without the project). Mamre Road (northbound) would operate at LoS F during the PM peak (no change in LoS with and without the project)
- Luddenham Road west of Mamre Road would operate at LoS F during both AM and PM peak (no change in LoS with and without the project), except during the AM peak in southbound direction from LoS E to LoS F)
- Luddenham Road north of Elizabeth Drive would operate at LoS F and LoS E (northbound and southbound respectively) during the AM peak. Luddenham Road (northbound and southbound) would operate at LoS E and LoS F respectively during the PM peak (the intersection would be at or near capacity during without project scenario)
- Elizabeth Drive east of Badgerys Creek Road (eastbound and westbound) would operate at LoS F during both peak hours (no change in LoS with and without the project)
- The Northern Road west of Badgerys Creek Road (northbound) would operate at LoS F during the AM peak (no change in LoS with and without the project).
- The Northern Road east of Badgerys Creek Road (southbound) would operate at a LoS E during the PM peak (no change in LoS with and without the project).

Table 9-9 Future year 2036 mid-block performance

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Without project		With project		Without project		With project	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Glossop Street (north of the Great Western Highway)	NB	1900	1460	D	1630	D	1570	D	1570	D
	SB	1900	1520	D	1520	D	1220	C	1220	C
Great Western Highway (east of Queen Street)	EB	2800	2460	D	2780	**E**	2230	D	2480	D
	WB	2800	2250	D	2500	D	2760	E	3010	**F**
Great Western Highway (west of Queen Street)	EB	2800	2380	D	2450	D	2100	D	2100	D
	WB	2800	1940	C	1940	C	2520	E	2520	E
Queen Street (north of Great Western Highway)	NB	900	660	C	910	**F**	600	C	850	**E**
	SB	900	370	B	620	**C**	790	D	1040	**F**
Mamre Road (south of the Great Western Highway)	NB	1800	1360	D	1360	D	1290	C	1290	C
	SB	1800	1240	C	1240	C	1560	D	1560	D
Kent Road (north of the M4 Western Motorway)	NB	1900	1250	C	1320	C	1210	C	1300	C
	SB	1900	1260	C	1260	C	1140	C	1200	C
Kent Road (south of the M4) Western Motorway	NB	900	730	D	840	**E**	760	D	910	**F**
	SB	900	420	B	580	**C**	380	B	480	**C**
Mamre Road (north of Luddenham Road)	NB	1900	1730	E	1760	E	1950	F	1990	F
	SB	1900	2440	F	2490	F	1670	D	1690	D
Luddenham Road (west of Mamre Road)	NB	900	1140	F	1200	F	1020	F	1110	F
	SB	900	810	E	910	**F**	1060	F	1120	F
Luddenham Road (north of Elizabeth Drive)	NB	900	930	F	990	F	810	E	850	E
	SB	900	780	D	850	**E**	1020	F	1080	F

Location	Direction	Theoretical capacity (pcu/h)	AM Peak				PM Peak			
			Without project		With project		Without project		With project	
			Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS	Volumes (pcu/h)	LoS
Elizabeth Drive (west of Badgerys Creek Road)	EB	2800	1430	C	1470	C	1280	B	1320	B
	WB	2800	1020	B	1070	B	1690	C	1740	C
Elizabeth Drive (east of Badgerys Creek Road)	EB	900	1450	F	1520	F	1440	F	1560	F
	WB	900	1280	F	1410	F	1760	F	1830	F
Badgerys Creek Road (south of Elizabeth Drive)	NB	1900	140	A	220	A	330	A	450	A
	SB	1900	370	A	510	A	230	A	300	A
Badgerys Creek Road (north of The Northern Road)	NB	900	120	A	260	A	220	A	270	A
	SB	900	230	A	310	A	370	B	500	**C**
The Northern Road (west of Badgerys Creek Road)	NB	1900	2090	F	2130	F	1210	C	1280	C
	SB	1900	920	B	990	**C**	1590	D	1590	D
The Northern Road (east of Badgerys Creek Road)	NB	1900	1230	C	1300	C	940	B	980	**C**
	SB	1900	1180	C	1220	C	1840	E	1840	E

Note:
Traffic volumes rounded to the nearest 10

The assessment indicates that the project scenario is not generally forecast to cause significant impacts to the study area road network compared with the without project scenario. The above locations all operate in a similar manner to the future year 2036 without project scenario, except for Great Western Highway, Queen Street, Kent Road south of Great Western Highway and Luddenham Road west of Mamre Road which also operate above their theoretical capacity at LoS E or worse.

Intersection performance

A summary of the performance of the intersections within the transport study area in the peak hours during the future year 2036 is outlined in Table 9-10.

Table 9-10 indicates that during the future year 2036 without Project scenario, intersections generally operate at a LoS D or better, except the following intersections:

- Glossop Street/Phillip Street, Glossop Street/Great Western Highway
- Queen Street/Great Western Highway/Mamre Road
- Charles Hackett Drive/Great Western Highway/Pages Road
- Mamre Road/Western Motorway Eastbound and Westbound Ramps
- Mamre Road/Luddenham Road and Badgerys Creek Road/The Northern Road.

The assessment indicated that the above intersections are forecast to operate at or above capacity in 2036 with and without the project due to the forecast growth in background traffic within the transport study area. This is likely to result in significant delays and queuing at these intersections, exacerbated by the addition of traffic forecast to be generated by the project.

Table 9-10 indicates that during the with project scenario in 2036, in addition to the above intersections, the following intersections are also forecast to operate at or above capacity:

- Glossop Street/Forrester Road would change from LoS D to LoS E during the PM peak
- Glossop Street/Great Western Highway would change from LoS E to LoS F during the AM peak and from LoS D to LoS E during the PM peak
- Mamre Road/Luddenham Road would change from Los E to LoS F during the AM peak.

This indicates that the addition of traffic forecast to be generated by the project is not forecast to significantly impact the transport study area intersections.

Pedestrian and cycling impacts

Pedestrian and cycle facilities would be provided at off-airport stations during the 2036 future year with project scenario. The project includes provision of pedestrian and cycling facilities around the station precincts to enable safe and convenient access to the stations. These provisions would be focussed on the immediate vicinity of the station entries.

All new pedestrian and cycling facilities provided as part of the project would aim to have sufficient customer capacity to achieve a minimum Fruin LoS C.

Public transport impacts

The road-based public transport modes are likely to be impacted in the same way as general traffic. Therefore, the transport assessment included above includes potential impacts to road-based public transport.

As part of the Western Sydney City Deal, the NSW and Australian Governments have committed to delivering new rapid bus services to link the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Aerotropolis and to Western Sydney International. Regional and local bus services would also be provided to link the project to its local and wider surroundings. The frequencies of these bus services would be determined based on the travel demand at these stations.

Table 9-10 Future year 2036 intersection performance

Intersection	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Glossop Street/Forrester Road (S)	43	D	51	D	47	D	63	**E**
Glossop Street/Harris Street (P)	11	A	11	A	19	B	20	B
Harris Street/St Marys Station Car park Access (P)	-	-	5	A	-	-	5	A
Glossop Street/Phillip Street (S)	16	B	18	B	>100	F	>100	F
Queen Street/Charles Hackett Drive (S)	22	B	22	B	19	B	28	B
Glossop Street/Great Western Highway (S)	73	E	>100	**F**	47	D	69	**E**
Queen Street/Great Western Highway/Mamre Road (S)	>100	F	>100	F	>100	F	>100	F
Charles Hackett Drive/Great Western Highway/Pages Road (S)	>100	F	>100	F	>100	F	>100	F
Mamre Road/M4 Western Motorway Eastbound Ramp (S)	>100	F	>100	F	>100	F	>100	F
Mamre Road/M4 Western Motorway Westbound Ramp (S)	57	E	57	E	>100	F	>100	F
Kent Road/Caddens Road (S)	20	B	20	B	32	C	32	C
Kent Road/M4 Western Motorway On-ramp (S)	6	A	7	A	5	A	6	A
Kent Road/M4 Western Motorway Off-ramp (S)	21	B	22	B	23	B	23	B
Kent Road/Orchard Hills Station Access (S)	-	-	15	B	-	-	15	B
Kent Road/Lansdowne Road (S)	7	A	48	**D**	15	B	35	**C**
Lansdowne Road/Orchard Hills station Car park Access (P)	-	-	6	A	-	-	6	A
Mamre Road/Luddenham Road (S)	69	E	>100	**F**	96	F	>100	F
Luddenham Road/Station Access (North) (S)	-	-	12	A	-	-	13	A

Intersection	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS	Average Delay (sec)	LoS
Luddenham Road/Station Access (South) (S)	-	-	12	A	-	-	12	A
Luddenham Road Station Car park Access (P)	-	-	6	A	-	-	6	A
Luddenham Road/Elizabeth Drive/Adams Road (S)	30	C	31	C	54	D	54	D
Elizabeth Drive/Western Sydney International Access (S)	13	B	13	B	18	B	19	B
Elizabeth Drive/Badgerys Creek Road (S)	11	B	13	B	15	B	18	B
Badgerys Creek Road/Aerotropolis Core Station Access (S)	-	-	21	B	-	-	19	B
Aerotropolis Car park Access (P)	-	-	6	A	-	-	6	A
Badgerys Creek Road/The Northern Road (S)	>100	F	>100	F	34	C	35	C

Notes:
Assessments have been undertaken using SIDRA INTERSECTION 8.
For traffic signals, the average movement delay and level of service over all movements is used. For roundabouts and priority control intersections (with stop and give way signs), the critical movement for level of service assessment with the worst movement delay is used.
Intersection control type as indicated against each (P: Priority-controlled, R: Roundabout, S: Signalised).
The intersection of Kent Road/Lansdowne Road is a priority controlled intersection during without the project scenario. During with the project, this intersection is proposed to be upgraded to a signalised intersection.
Dashes indicate new operational site accesses that would only be used once the project is operational and hence would not exist during the 2036 future year without the project scenario.

9.6.2 On-airport

On-airport integration with other transport modes

Similar to the off-airport station precincts, the operational assessment for the on-airport station precincts was based on the demands, characteristics, access modes and station and precinct design plans for each of the planned stations.

The modal access hierarchy for the Airport Business Park Station would include all modes, with coaches also proposed to operate. A pedestrian bridge would link the station to the future road network of the business park (to be provided as part of the airport construction).

The Airport Terminal Station would be the main connection between the project and the future airport terminal. Customer access would primarily be provided via an airport terminal connection with Western Sydney International (to be provided as part of the airport construction). Other interchange opportunities including bus stops would be provided by others as part of the wider development of the precinct and are outside the scope of this Project.

The forecast mode shares for point-to-point services, park and ride and kiss and ride are low for the Airport Business Park Station, as these modes would be provided as part of the development of Western Sydney International and the business park. The Airport Terminal station is not expected to have mode shares associated with private car-based trips accessing the station. As such, these stations are expected to introduce limited traffic demand once operational.

On-airport future year 2026 with the project

The potential impacts of the project on the on-airport road network for the future year 2026 are forecast to be minimal as the majority of the passengers using the proposed stations within the on-airport environment are expected to be generated by Western Sydney International or the Airport Business Park (and are therefore not arriving at the stations by car).

The potential impacts of the project on roads located off-airport and adjacent to Western Sydney International were captured in the assessment of the off-airport impacts (Section 9.6.1).

During the future year 2026 with the project scenario, the transport movements generated by the project within the on-airport environment are considered to be negligible compared to the future background traffic without the project. The forecast mode shares for point-to-point services, park and ride and kiss-and-ride provided at the on-airport sites in 2026 are limited. As such, these stations are expected to generate limited traffic once operational.

Mid-block performance

An assessment of the weekday AM and PM peak hour traffic volumes was completed to determine the general performance of the road network in the vicinity of Western Sydney International in the 2026 future year. This includes roads such as Luddenham Road, Elizabeth Drive, Badgerys Creek Road and The Northern Road. The findings of this assessment are summarised in Table 9-7.

The forecast traffic volumes on Luddenham Road are expected to exceed their capacity, during both the AM and PM peak hours for the without and with project scenarios. Elizabeth Drive also performs above its theoretical capacity in the afternoon peak during both with and without the project scenario. Similarly, The Northern Road is observed to operate at its theoretical capacity in the morning peak during both scenarios.

Intersection performance

The impacts due to the on-airport operational activities with the project were captured at the intersections around the airport site as part of the off-airport assessment. An assessment of the performance of these intersections is presented in Table 9-8 .

The intersections are forecast to operate satisfactorily at LoS D or better during the 2026 future year without project scenario, except the Badgerys Creek/The Northern Road intersection.

During the 2026 with project scenario, all intersections are forecast to maintain their operational performance with the addition of project generated traffic. The Badgerys Creek/The Northern Road intersection continues to operate at LoS F, with a minor increase in delay (about three seconds).

This indicates that the project would not cause any additional impacts to this intersection during the future year 2026.

Pedestrian and cyclist impacts

The active transport network during the future year 2026 without the project scenario is expected to include pedestrian and cycling infrastructure proposed as part of the future M12 Motorway project and The Northern Road and Bringelly Road upgrade projects. TfNSW also proposes to provide walking and cycling links along Elizabeth Drive as part of proposed upgrades. These active transport links would significantly improve the walking and cycling environment in the vicinity of Western Sydney International, therefore increasing the active transport mode share to the airport.

The on-airport active transport network for the future year 2026 with project scenario is proposed to be developed by Western Sydney International. It is envisaged that safe, convenient and direct active transport connections would be provided within Western Sydney International including to the Airport Terminal and Airport Business Park stations (to be developed by others).

Public transport impacts

The road-based public transport modes are likely to be impacted in the same way as general traffic.

As part of the Western Sydney City Deal, the Australian and NSW Governments have committed to delivering new rapid bus routes to link the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Aerotropolis and Western Sydney International.

On-airport future year 2036 with the project

The potential impacts of the project on the on-airport road network for the future year 2036 are forecast to be minimal as the majority of the passengers using the proposed stations within the on-airport environment are expected to be generated by Western Sydney International or the Airport Business Park (and are therefore not arriving at the stations by car).

The potential impacts of the project on roads located off-airport and adjacent to Western Sydney International were captured in the assessment of the off-airport impacts (Section 9.6.1).

During the future year 2036, the transport movements generated by the project within the on-airport environment are negligible compared to the future background traffic without the project. The forecast mode shares for point-to-point services, park and ride and kiss-and-ride provided at the on-airport sites in 2036 are limited. As such, these stations are expected to generate limited car traffic demand once operational. As a result, the project is not forecast to have an impact on the proposed transport network within the on-airport environment.

Mid-block performance

An assessment of the weekday AM and PM peak hour traffic volumes was completed to determine the general performance of the road network in the vicinity of Western Sydney International in the 2036 future year. This includes roads such as Luddenham Road, Elizabeth Drive, Badgerys Creek Road and The Northern Road. The findings of this assessment are summarised in Table 9-9.

Luddenham Road, Elizabeth Drive and The Northern Road are all forecast to operate near or at the theoretical capacity in peak periods during the without the project scenario. During the 2036 future year with project scenario, these roads continue to operate in a similar manner to the without the project scenario, at or above their theoretical capacity.

Intersection performance

The impacts due to the on-airport project operational activities are captured at the intersections surrounding Western Sydney International. A summary of the operation of these intersections likely to be impacted due to on-airport operations is presented in Table 9-10.

The intersections are forecast to operate satisfactorily at LoS D or better during the 2036 future year without project scenario, except the Badgerys Creek/The Northern Road intersection (which is forecast to operate at LoS F). The assessment indicates that the project would not impact this intersection as it is forecast to operate at a LoS F without the project during 2036. This intersection may need to be upgraded to support the forecast growth in background traffic demand within the transport study area.

Active transport impacts

The on-airport active transport network for the future year 2036 with project scenario is proposed to be developed by Western Sydney Airport. It is envisaged that safe, convenient and direct active transport connections would be provided within Western Sydney International including to the Airport Terminal and Airport Business Park stations (both to be developed by others).

Public transport impacts

The road-based public transport modes are likely to be impacted in the same way as general traffic.

As part of the Western Sydney City Deal, the Australian and NSW Governments have committed to delivering new rapid bus routes to link the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Aerotropolis and Western Sydney International.

9.7 Proposed management and mitigation measures

Environmental management for the project would be undertaken through an environmental management approach as detailed in Chapter 25 (Environmental management and mitigation). The construction and operational environmental management frameworks are discussed in Section 25.2 and 25.3 respectively.

Under these broad frameworks, a series of performance outcomes have been developed to define the minimum environmental standards that would be achieved during construction and operation (see Section 9.7.1), and mitigation measures that would be applied during construction and operation to support achievement of the performance outcomes and other commitments in the Environmental Impact Statement (see Section 9.7.2).

9.7.1 Performance outcomes

Performance outcomes have been developed consistent with the requirements of the SEARs for the project. Performance outcomes for transport for the project are listed in Table 9-11 and identify measurable, performance-based standards for environmental management.

Table 9-11 Performance outcomes – transport

SEARs desired performance outcome	Project performance outcome	Timing
Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts The safety of transport system customers is maintained Impacts on network capacity and the level of service are effectively managed	Safe and efficient routes are provided for pedestrians, cyclists and road users at/near construction sites	Construction
	Access to the existing St Marys Station is maintained while train services are operating	Construction
	Safe access to properties and businesses is maintained during construction, unless alternatives are agreed with property owners and businesses	Construction
	Heavy vehicles access the arterial network as soon as practicable on route to, and immediately after leaving, a construction site	Construction
	The local community and relevant authorities are informed of transport, access and parking changes/impacts to minimise inconvenience to the public	Construction
	Safe and efficient interchanges are provided between transport modes	Operation
	Transport interchange facilities provided at station precincts are designed in accordance with the modal access hierarchy	Operation
	Each station and station plaza is provided with sufficient customer capacity to achieve a minimum Fruin's Level of Service C (for 2056 demand)	Operation

SEARs desired performance outcome	Project performance outcome	Timing
	Stations and interchanges are fully accessible and compliant with the *Disability Discrimination Act 1992* (Cth) and the *Disability Standards for Accessible Public Transport* (Australian Government, 2002)	Operation
Works are compatible with existing infrastructure and future transport corridors	The project is designed to be compatible with existing infrastructure and future transport corridors	Operation

9.7.2 Mitigation measures

A Construction Environmental Management Framework (CEMF) (Appendix F) describes the approach to environmental management, monitoring and reporting during construction. Specifically, it lists the requirements to be addressed by the construction contractor in developing the Construction Environmental Management Plans (CEMPs), sub-plans, and other supporting documentation for each specific environmental aspect.

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

The CTMF provides the overall strategy and approach for construction traffic management for the project 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 and acceptable criteria to be considered and followed in managing roads and footpaths adjacent to construction sites. Site-specific CTMPs, along with Traffic Control Plans as required, would also be prepared by the contractor to align with the contents, principles and objectives of the CTMF, as well as the mitigation measures outlined below.

The Traffic and Access CEMP for the on-airport works would be developed in consultation with Western Sydney Airport and would be consistent with the existing *Western Sydney Airport Traffic and Access Construction Environmental Management Plan* (Western Sydney Airport, 2019h).

Mitigation measures that would be implemented under the provisions of the CEMF to address potential transport impacts are listed in Table 9-12.

Table 9-12 Transport mitigation measures

Ref	Proposed mitigation measure	Applicable location(s)
Construction		
T1	Construction Traffic Management Plans would be prepared in accordance with the Construction Traffic Management Framework	All
T2	The Construction Traffic Management Plan for St Marys would be developed to ensure existing transport interchange infrastructure continues to operate effectively within the St Marys station precinct would be developed in consultation with the Traffic and Transport Liaison Group.	St Marys construction site
T3	Coordination with Western Sydney Airport and Transport for NSW would be undertaken through the Traffic and Transport Liaison Group to manage potential cumulative construction traffic impacts with M12 Motorway and Elizabeth Drive	All

Ref	Proposed mitigation measure	Applicable location(s)
T4	Road Safety Audits would be carried out to address vehicular access and egress, and pedestrian, cyclist and public transport safety. Road Safety Audits would be carried out as per the guidelines outlined in Section 10 of the Construction Traffic Management Framework	All
T5	Maintain access for pedestrians and cyclists around construction sites as per the guidelines outlined in the Construction Traffic Management Framework. Appropriate signage and line marking would be provided to guide pedestrians and cyclists past construction sites and on the surrounding network to allow access to be maintained	All
T6	Access for construction vehicles to be planned as per the guidelines outlined in the Construction Traffic Management Framework. Construction site traffic would be managed to minimise movements during peak periods. Vehicle access to and from construction sites would be managed to maintain pedestrian, cyclist and motorist safety	All
T7	Temporary relocation of bus stops and bus layovers at St Marys relocations would be subject to further design development, including consideration of the use of the Station St carpark. Bus stop relocations would be implemented prior to impacts on existing bus facilities. Temporary relocation of bus stops and bus layover at St Marys would be carried out in consultation with the Traffic and Transport Liaison Group, Transport for NSW, Penrith City Council and bus operators. Wayfinding and customer information would guide customers to temporary bus stop locations.	St Marys construction site
T8	Transport for NSW would be consulted to discuss opportunities for their delivery of intersection upgrades at Mamre Road/M4 Western Motorway on and off ramps prior to the peak year of construction	Luddenham Road construction site
Operation		
T9	Interchange access plans would be prepared, in consultation with the Traffic and Transport Liaison Group, to ensure adequate pedestrian and cycle facilities and other transport interchange infrastructure is provided at each station precinct, in consultation with relevant authorities including Western Parkland City Authority	All
T10	The project would be designed such that access to properties and existing infrastructure neighbouring the proposed stations would be maintained	All
T11	Consultation and coordination would be undertaken with Transport for NSW through the Traffic and Transport Liaison Group to align proposed road and intersection upgrades with the year of opening, to enable safe and efficient interchanges between transport modes	All

9.7.3 Consideration of the interaction between measures

Mitigation measures in other chapters that are relevant to the management of potential transport impacts include

- Chapter 10 (Noise and vibration), specifically measures which address potential road traffic noise impacts during construction and operation
- Chapter 22 (Air quality), specifically measures which address the management of construction vehicle traffic emissions
- Chapter 23 (Hazard and risk), specifically measures which deal with construction traffic movement.