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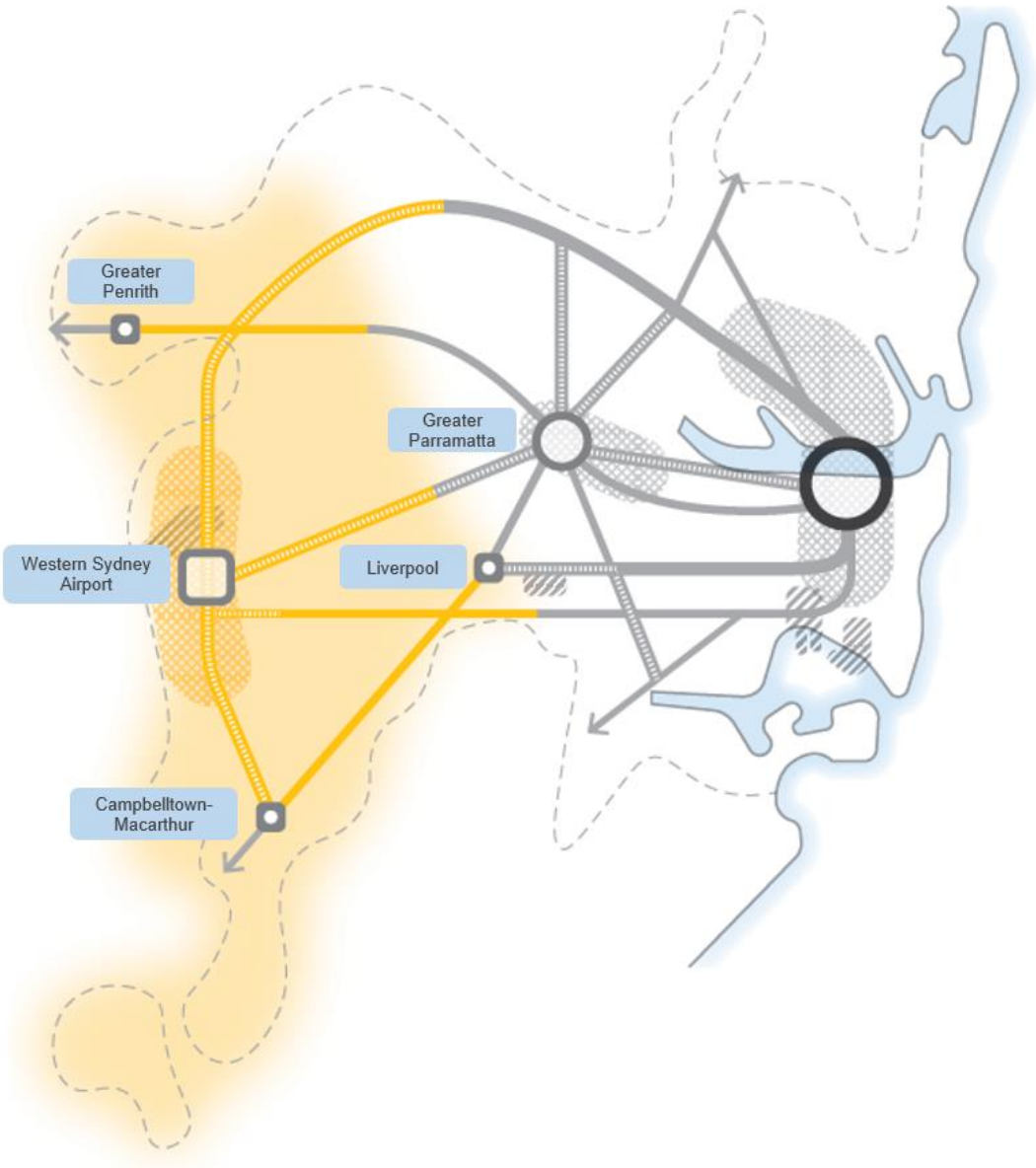
Western Sydney Aerotropolis Transport Planning and Modelling Stage 2 Report



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Western Sydney Aerotropolis Transport Planning and Modelling Stage 2 Report

Client: Western Sydney Planning Partnership

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Executive Summary

Context and Vision for the Western Sydney Aerotropolis

In April 2014, the Commonwealth Government committed to the construction of a second airport for Sydney, **Western Sydney International (Nancy-Bird Walton) Airport**, located at Badgerys Creek.

Following this commitment, in 2018 the ***Western Sydney City Deal*** was struck as a ground-breaking agreement across three tiers of government. This sets the foundation for all future investment in Western Sydney, to support the successful delivery of the airport and the surrounding precincts.

The 'City Deal' is enabled by the two key NSW strategic planning instruments: *Future Transport Strategy 2056;* and the *Greater Sydney Region Plan*. These strategies jointly define the future of Sydney, from both a land use and transport perspective, as a highly connected city of three cities; the Eastern Harbour City, the Central River City and the **Western Parkland City**, as shown in **Figure E-1**.

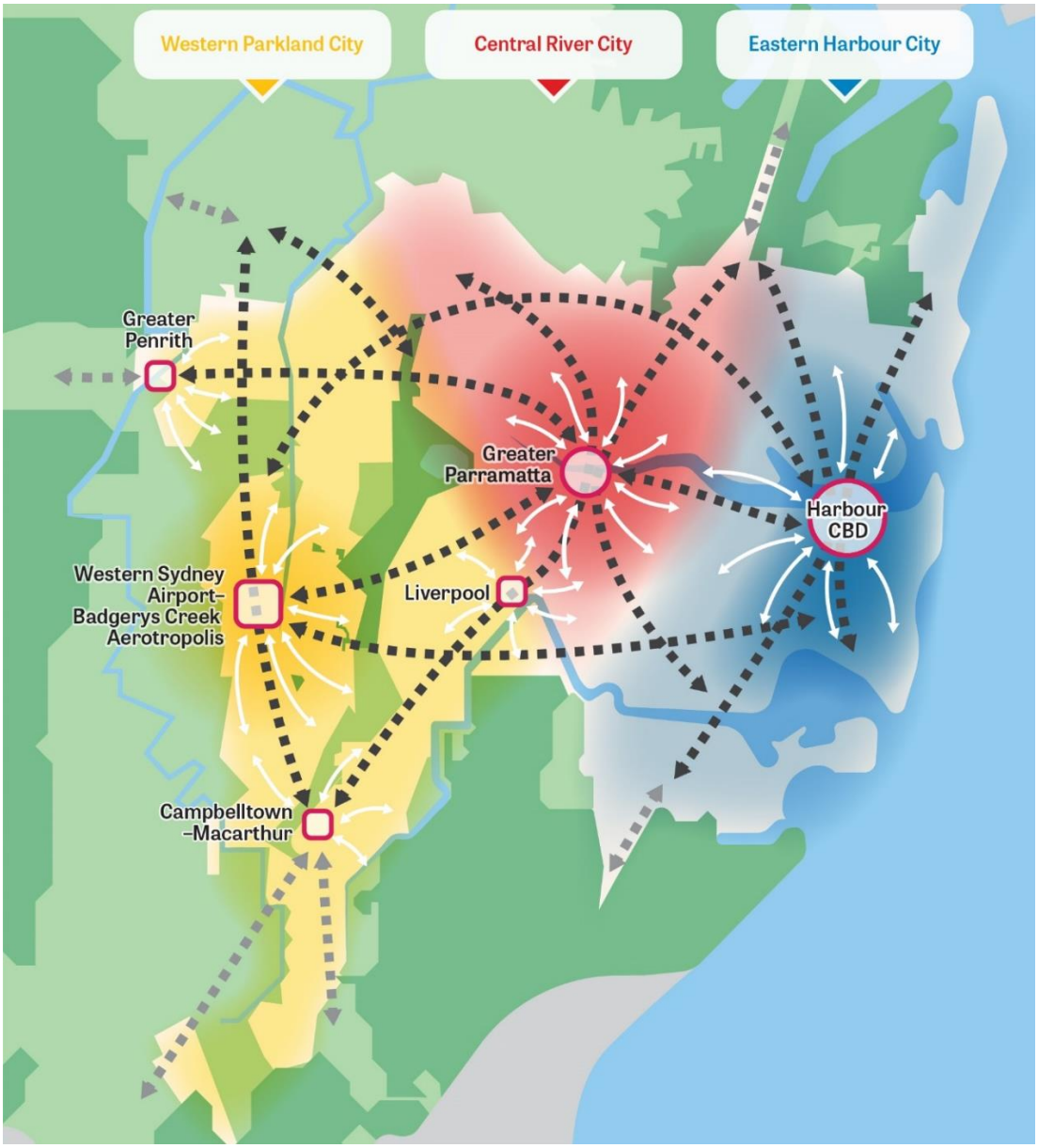

Figure E-1: Sydney: A City of Three Cities

The **Western Parkland City** encompasses both the **Western Sydney International Airport (Airport)** and the broader **Western Sydney Aerotropolis (Aerotropolis)**. The Aerotropolis will be the focal point for job creation and economic development aligned with the Airport and Western Parkland City.

The **Western Parkland City** will benefit from a high-quality, future focused transport network which will support mobility within the Aerotropolis, and between the Aerotropolis and the closest strategic centres of Penrith, Liverpool, Campbelltown-Macarthur and the wider Sydney region.

The primary regional transport connections between the **Western Parkland City**, local strategic centres, the Central River City and the Eastern Harbour City are shown in **Figure E-2**.

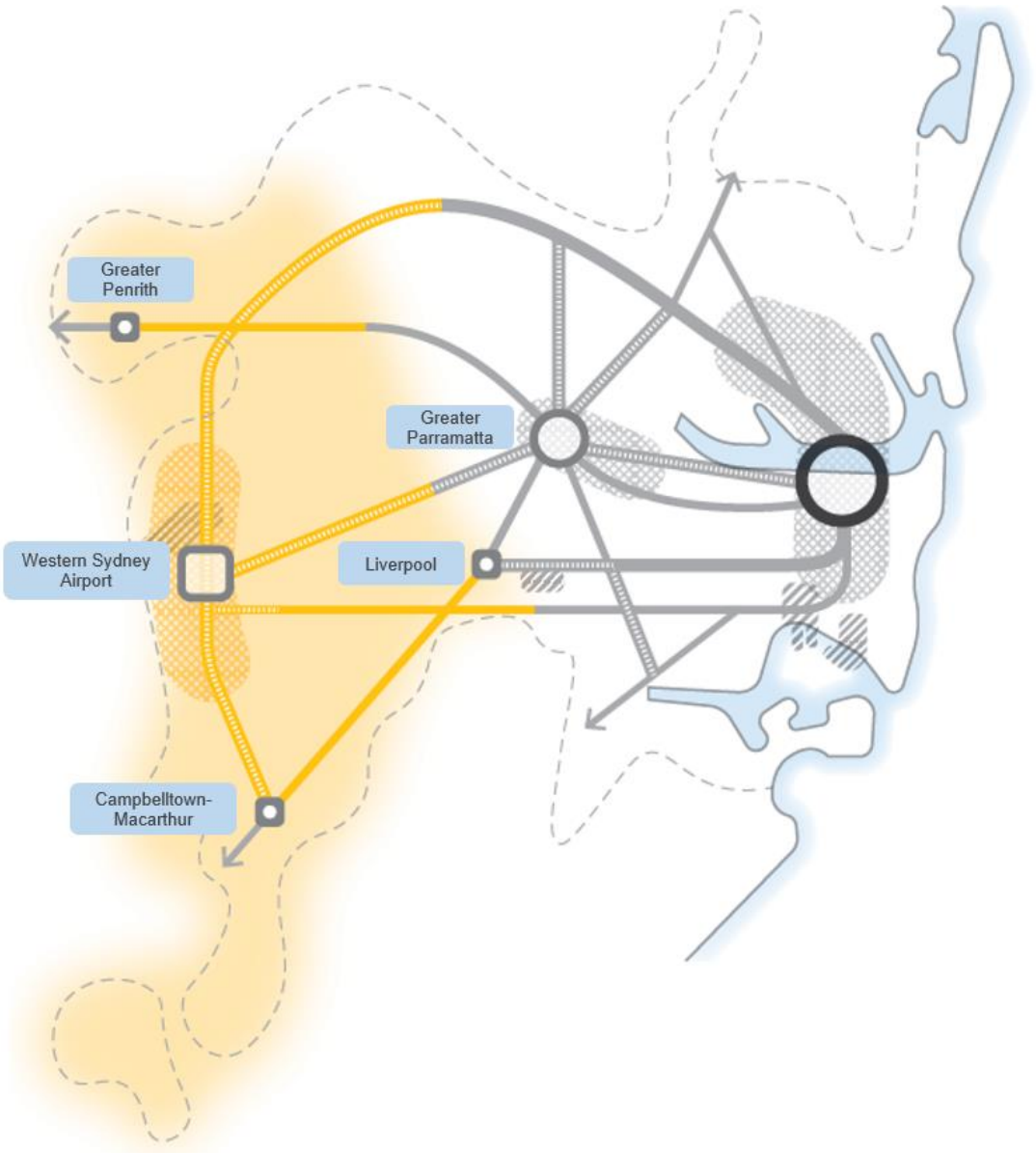

Figure E-2: Western Parkland City: primary regional transport connections

The ***Western Sydney City Deal*** defined six key initiatives for the **Western Sydney Parkland City**, as shown in **Figure E-3**.

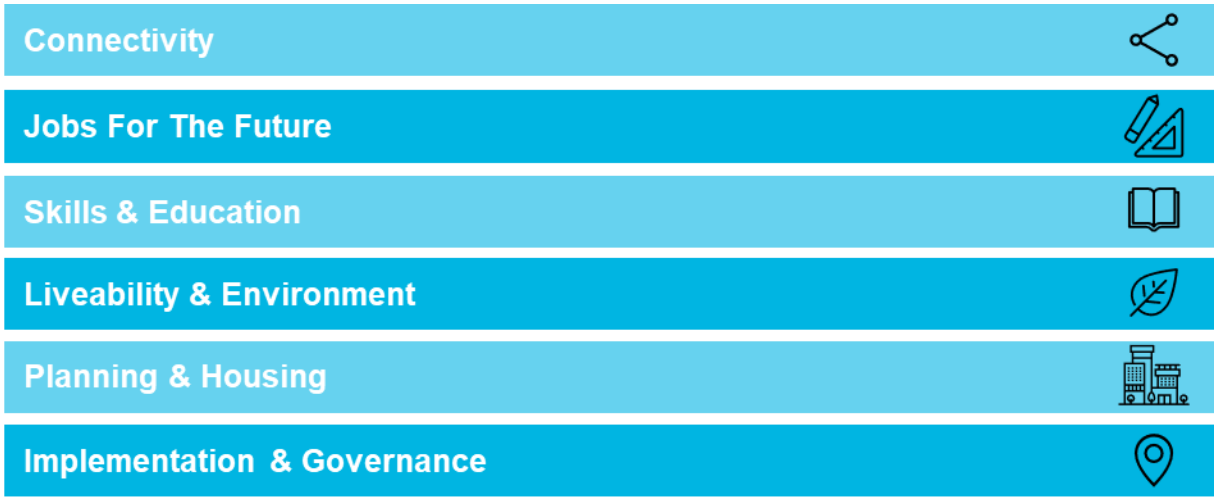

Figure E-3: Western Sydney City Deal: Key Initiatives

The ***Western Sydney City Deal*** further defined 38 commitments to deliver on these six overarching visionary initiatives. Eleven of the 38 commitments relate to the future land use, transport and mobility commitments and have shaped the **Western Sydney Aerotropolis** precinct planning.

The eleven ***Western Sydney City Deal*** commitments on land use, transport and mobility are:

- C1: Deliver rail for the Western City with construction of Sydney Metro Western Sydney Airport
- C2: Western City rapid bus services linking Liverpool, Penrith, Campbelltown and the Aerotropolis
- C3: Smart Western City Program
- C3: Openly available data sets
- J1: The Aerotropolis as world-class employment sector for 200,000 jobs
- J1: Western Sydney Development Authority
- L1: Western Parkland City Liveability Program
- PH1: Housing targets for the Western Parkland City facilitated by Growth Infrastructure Compacts
- PH1: New Growth Area for the Greater Penrith to Eastern Creek corridor
- PH2: Western Sydney Planning Partnership
- PH3: Transport and water infrastructure models.

The **Western Sydney Aerotropolis** covers an area of 11,200 hectares and spans across the Local Government Areas of Liverpool City Council and Penrith City Council.

The Aerotropolis has been defined by ten precincts, five of which are subject to accelerated planning and have been investigated through this precinct planning process.

These precincts are listed below and shown in Figure E-4:

- Aerotropolis Core,
- Agribusiness,
- Badgerys Creek,
- Northern Gateway and
- Wianamatta-South Creek.

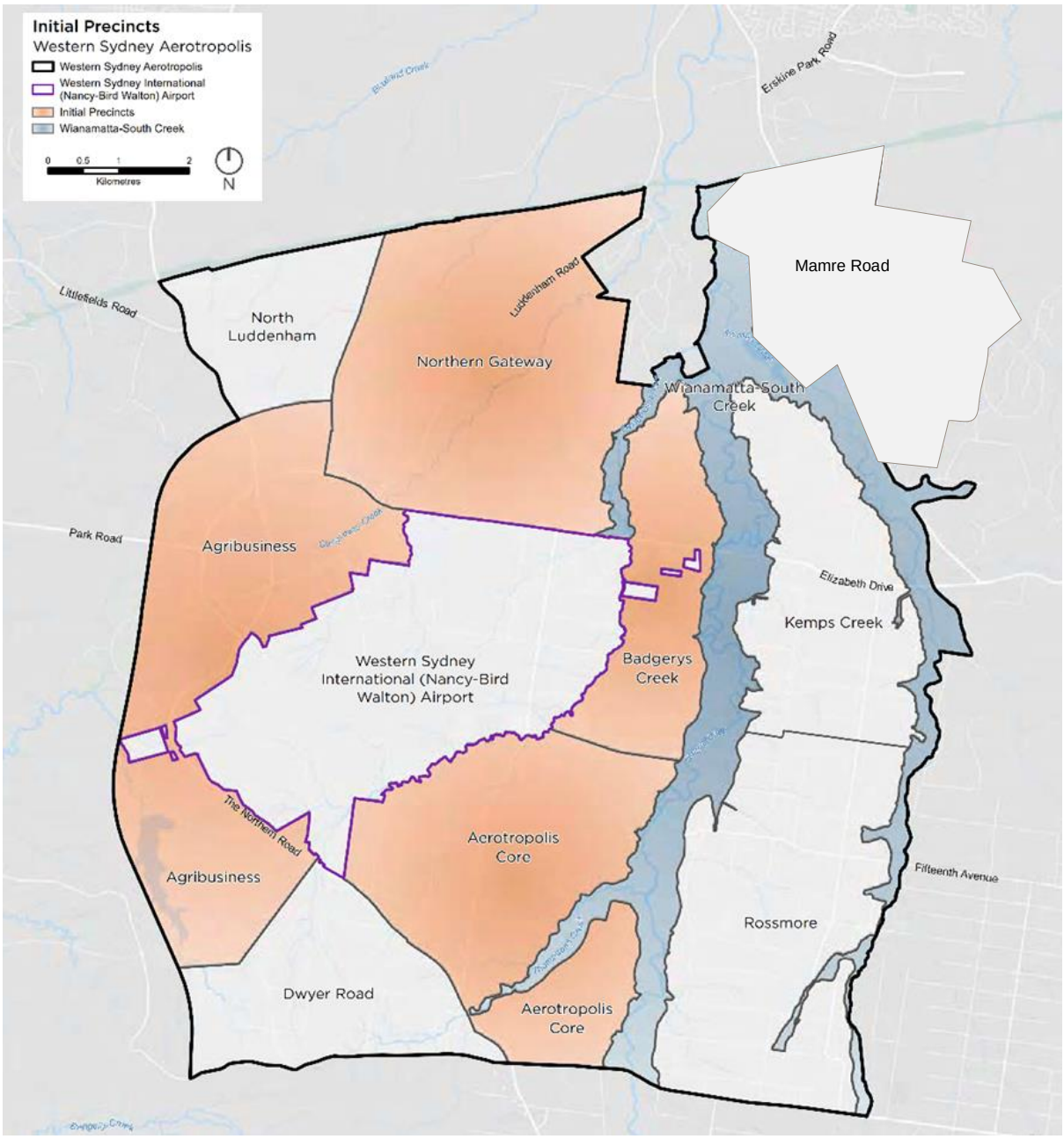

Figure E-4: Western Sydney Aerotropolis with the five initial precincts highlighted in orange

Delivering on the Vision for the Western Sydney Aerotropolis

AECOM's work has focused on the development and implementation of two key sets of enablers to support delivery against the *Western Sydney Aerotropolis Plan* vision and objectives.

These two enablers can be grouped into: **Transport Policies and Strategies** and **Transport Infrastructure and Services**. These two enablers aim to integrate transport and land use outcomes to support the successful delivery of the five initial Aerotropolis precincts in line with the strategic vision.

1. **Transport Policies and Strategies –** implementation of transport policies and strategies which foster a mode shift to sustainable transport to support the strategic vision and objectives. These policies and strategies, developed in collaboration with key stakeholders, are:

- A **Travel Demand Management strategy** which defines and promotes sustainable travel options and choices to influence mobility to deliver sustainable outcomes in terms of mode of travel and volume of travel
- The ***Western Sydney Aerotropolis Development Control Plan*** to realise the precinct planning principles, objectives and performance outcomes through the application of planning controls
- The **Western Parkland Sydney Street Design Guidelines** to ensure both the design requirements and guidelines are consistency incorporated into street environments within the Aerotropolis providing a high-quality public realm which is designed for all users.

2. **Transport Infrastructure and Services –** the planning and definition of a multi-modal transport network which will support the strategic vision and objectives. This considers the relationships between place and customers with the transport networks, has been developed through a detailed stakeholder collaboration process, which has been very much design-led, and is a multi-layered vision for how future transport networks will operate to support the overarching *Western Sydney Aerotropolis Plan* objectives. This sets out:

- **A dedicated walking network** with pedestrian footpaths on all roads and streets. With consideration of a high amenity environment for walking throughout the precincts, which provide for priority access to, and within, centres and to key public transport nodes, as well as facilitating well-connected, high amenity green corridors.
- **An extensive, dedicated bicycle network** with separated bicycle facilities built on all key roads and streets, to support the needs of all cyclists. The extensive coverage of the network, combined with the dedicated infrastructure is designed to make cycling an easy and comfortable travel choice for short, medium and long-distance journeys.
- **The key public transport infrastructure and services** – built around a backbone of transit infrastructure and services through government commitments to the Sydney Metro Western Sydney Airport Line and the *Western Sydney City Deal* Rapid Bus Routes. These together will be integral to providing safe, convenient and efficient public transport travel options for those who live, work or visit the Aerotropolis.
- **A highly efficient road network for private vehicles, freight, and all other modes**. There is a focus on accessibility at the local level, in centres and high value places, in areas where accessibility is critical to network function. Intermediate roads have a balanced focus of access, place and movement. Higher order roads which make up the strategic network (i.e. motorways, arterial roads) focus on movement, reliability of travel times and safe operations to support the efficient movement of people and goods for strategic travel.

Together these two key enablers will support the delivery of the desired outcomes specified in the *Western Sydney Aerotropolis Plan*.

The relationship between the strategic objectives documented in the ***Western Sydney Aerotropolis Plan*** and the two key enablers (as set out above) is described in **Figure E-5**.

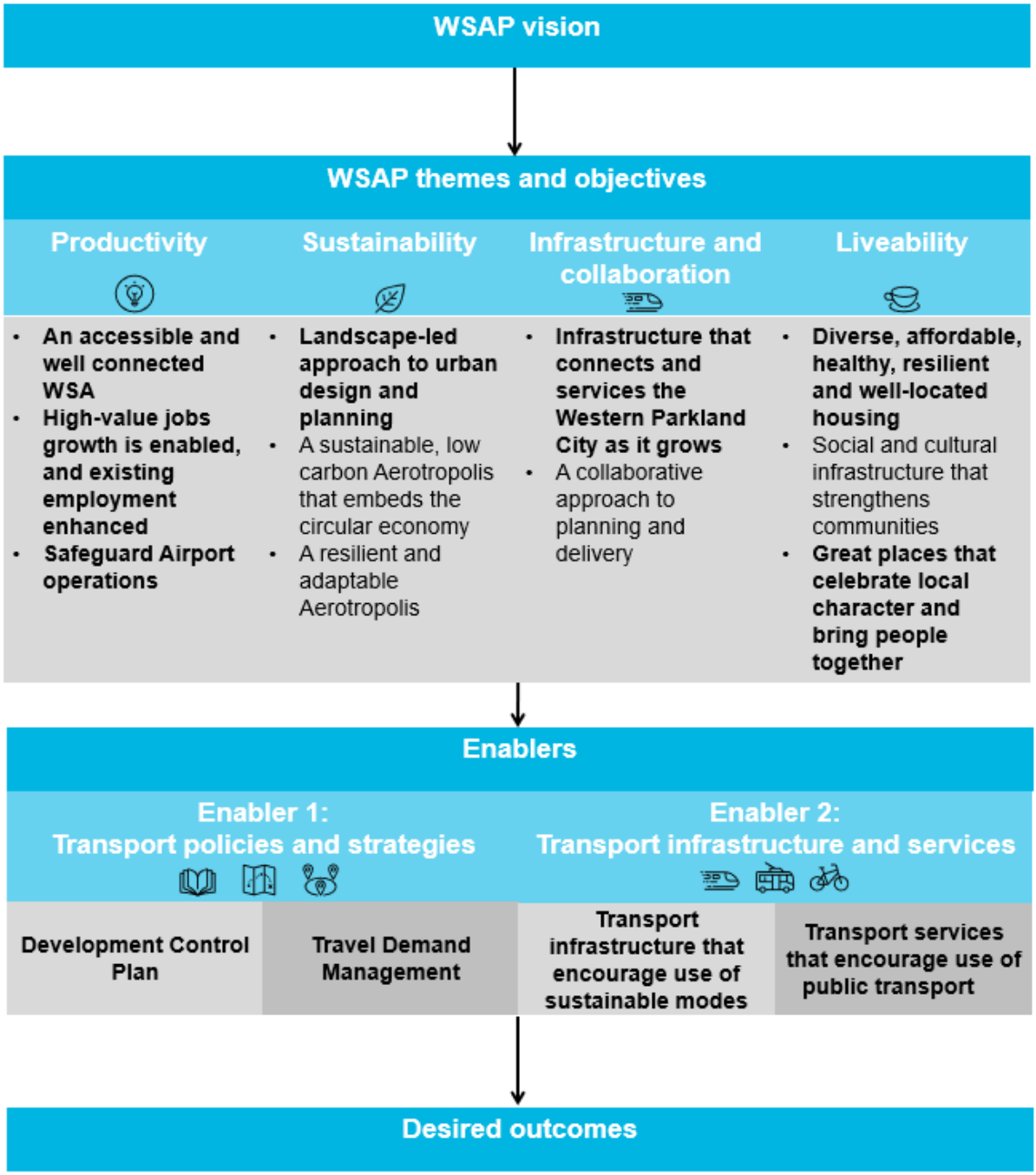

Figure E-5: Mapping the relationship between the two key Enablers and the *Western Sydney Aerotropolis Plan* vision

Indicators and mode share targets

Three mode share scenarios were assessed to support delivery of the *Western Sydney Aerotropolis Plan* vision and objectives: low sustainable mode share, medium sustainable mode share and high sustainable mode share. High level characteristics of the three scenarios are defined in **Figure E-6**.

Indicators and mode share targets

Scenario 1: Low sustainable mode share targets	Scenario 2: Medium sustainable mode share targets	Scenario 3: High sustainable mode share targets
• Low population and employment densities • Few effective policies and strategies to influence travel behaviour • High use of private vehicles • Limited access to public transport infrastructure and services • Disconnected cycling network • Walking not an attractive option • **Business As Usual**	• Higher population and employment densities • Effective policies and strategies to influence travel behaviour • Balanced use of cycling, public transport and private vehicles for medium- and long-distance trips • Good access to public transport infrastructure and services • Connected cycling network • Walking attractive for short trips • **Beyond Business As Usual**	• Highest population and employment densities • Very effective policies and strategies to influence travel behaviour • High rate of cycling and public transport use for medium- and long-distance trips • Excellent access to public transport infrastructure and services • Connected cycling network which is a very attractive option for short and medium trips • Walking is a very attractive option for short trips • **Beyond Business As Usual**

Figure E-6: Mode share scenarios for the five initial Aerotropolis precincts

Validating the Vision for the Western Sydney Aerotropolis

An assessment was undertaken to analyse the feasibility of the vision and scenarios presented. The outcome of the assessment demonstrated the medium sustainable mode share scenario to be a realistic target for the five initial Western Sydney Aerotropolis precincts as it develops through to 2056. This scenario is well **beyond business as usual** and supports the vision and objectives defined in strategic planning for the Western Parkland City and the Western Sydney Aerotropolis.

There are approximately three planned jobs for every planned resident in the five initial Western Sydney Aerotropolis precincts. This means the dominant transport task during the morning peak period will be to accommodate people travelling longer distances to the Aerotropolis from other parts of Sydney. The five initial Western Sydney Aerotropolis precincts will accommodate a range of land use zonings including agribusiness and industrial. Together, these factors present a challenge to achieving higher sustainable mode share.

All these factors therefore support the validation of the medium mode share scenario. This is an ambitious future scenario, but a scenario which can be delivered on, so long as all the strategies and measures presented in this report are delivered by the responsible parties, as set out in the Delivery Strategy, Staging and Implementation Plan, as detailed in Section 9.0.

The higher sustainable mode share target is considered an ambitious stretch target to be worked towards in the longer-term future, with all the policies, strategies and measures, as outlined in this report, geared towards supporting working towards this outcome in the longer term.

Figure E-7 defines the specific mode share targets developed for all modes within this scenario. The mode share target for walking and cycling is set at 6%, public transport at 38% and private vehicle at 56%. These are ambitious, but achievable targets, backed by the policy framework, actions, initiatives, infrastructure and services defined through the precinct planning process.

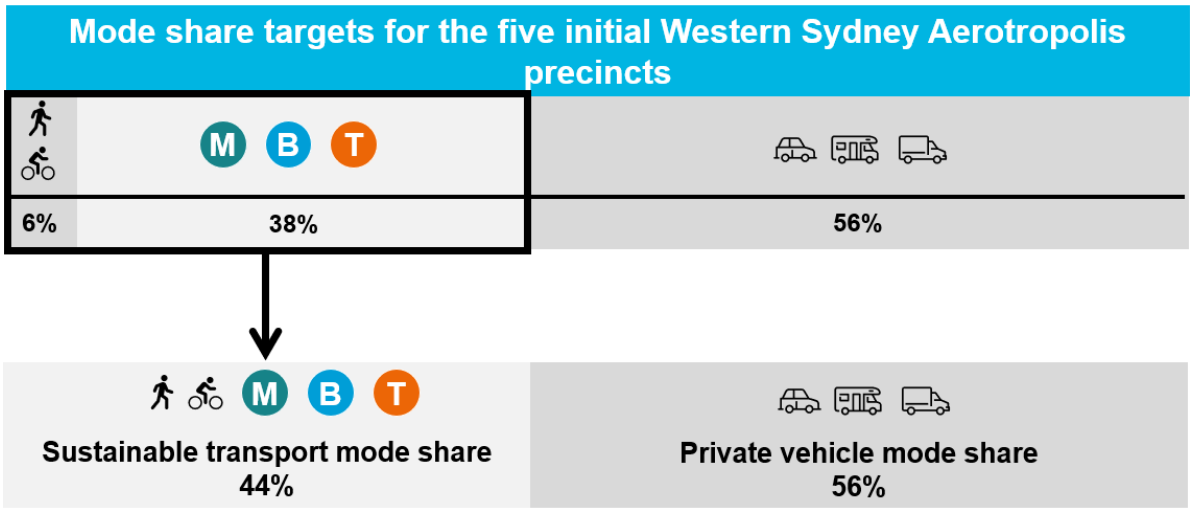

Figure E-7: Mode share targets for the five initial Western Sydney Aerotropolis precincts

Key learnings from case studies

The case study research undertaken provided learnings leveraged in the planning of the Aerotropolis precincts. The two enablers: **transport policies and strategies; transport infrastructure and services**; have been built up using these learnings, as summarised in **Table E-1** and **Table E-2**.

Table E-1: Summary of key learnings from international case studies

Case study	Key learnings
Schiphol & Zuidas	• Compact urban form influence on sustainable mode share • Future projects to return the city to people and improve connectivity • Investment by private companies in the centre • Mixed-use development appealing to people to live and work close by.
Dallas Fort Worth	• Appeal of edge city to people who travel often • Integration of non-aeronautical activities with private industry investment • Urban motorways are a significant barrier to connectivity • Mixed-use is contained to high streets with little activation within suburbs.
Heathrow	• Investment in accessibility improvements for employees and passengers • Fare incentives • Implementation of a Sustainable Travel Plan and a Surface Access Strategy.
Putrajaya	• Lack of integration of rail network with city • Quality of services and onward connections are limitations to public transport • Few behaviour change measures were implemented to shift mode share
Incheon & Songdo International	• Opening of airport and transport infrastructure and services at same time • Competitiveness of price and time of public transport • Connections to nearby cities

Business District	• Urban form not conducive to a car-free society.
Sky City	• Competitiveness of price and time of public transport • Compact urban form influence on sustainable mode share.
Clichy-Batignolles	• Freight hub reducing service vehicles on surface roads • Extension and integration of existing transport networks • Restriction on parking.
Tyson's Corner	• Importance of transport options to reduce vehicle reliance and congestion.
Food Valley	• Dedicated cycling infrastructure is provided throughout the town • Development of technology and intellectual property for additional revenue.
Noord-Holland Noord	• Cooperation between stakeholders with government investment • Companies collaborating with agribusinesses to grow region.

Table E-2: Summary of key learnings from domestic case studies

Case study	Key learnings
Randwick	• Impact on public transport use through lack of night-time services • Good connectivity and integrated networks support active transport use • Walkable and diverse neighbourhoods.
Green Square	• Critical infrastructure constructed alongside development • Development success from proximity to direct transport to centres • Influence of density and walkability on sustainable mode use
Sydney Airport	• Protecting of industrial lands zones adjacent to the Airport • Trade gateways adjacent to distribution centres for effective freight activities • The competitiveness of price and time for public transport modes against private vehicles for employee travel.
Greater Parramatta	• Public transport connections to suburbs and Metropolitan Centres • Investment in the cycling network and end-of-trip facilities is needed
Macquarie Park	• Transport Management Association • Travel behaviour change programs to facilitate mode shift • High frequency of the turn up and go services incentivises.
Liverpool Penrith	• Lack of public transport connections to employment areas • Poor active transport network in car-dominated environment.
Springfield	• Critical infrastructure constructed alongside development • Poor active transport network and substantial distance between centres.
Wagga Wagga	• Cooperation between multiple levels of stakeholders for agricultural success.

Bringing Case Study Learnings into Enabler 1: Transport Policies and Strategies

Whole-of-government collaboration is required to implement the policies and strategies which will influence travel patterns in favour of more sustainable modes, progressing beyond the business as usual approaches outlined in the domestic case studies.

International case studies highlight the success of restrictions on parking provision, use of freight hubs, fare incentives for public transport use, the collaboration between government and industry in the investment in successful centres as well as the growth of employment sectors.

Bringing Case Study Learnings into Enabler 2: Transport Infrastructure and Services

The provision of infrastructure and services, integrated with land uses, will drive a greater use of sustainable transport modes. This can be seen through the higher sustainable mode shares in case studies that are compact in urban form, mixed-use, higher in density with an integrated active transport network supported by high frequency and connected public transport.

Enablers

Enabler 1: Transport policies and strategies

Two policies and strategies are pivotal to achieve the desired outcomes: the *Draft Western Sydney Aerotropolis Development Control Plan*; and the Travel Demand Management Strategy, as shown in **Figure E-8**. These two strategies will influence use of public transport, walking and cycling as desirable modes of travel for those that live, work and visit the Western Sydney Aerotropolis.

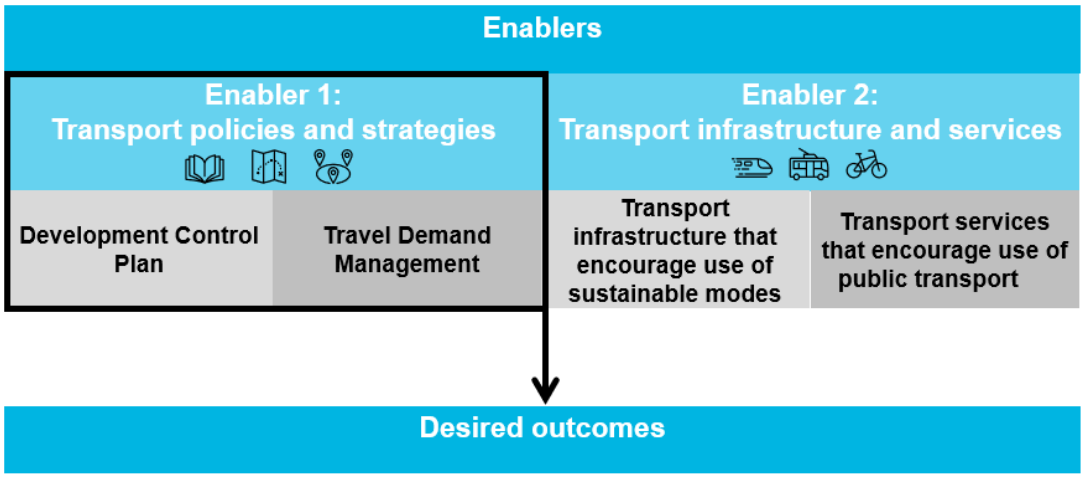

Figure E-8: Transport policies and strategies are pivotal to achieving the desired outcomes

The *Draft Western Sydney Aerotropolis Development Control Plan* defines a detailed set of planning and design guidelines that support the planning controls in the Local Environmental Plan. This has been prepared in accordance with the NSW Environmental Planning and Assessment Act 1979. Whilst this is a standalone document, it is summarised in Section 2.3.9.

The Travel Demand Management Strategy applies focused, evidence-based measures and interventions to change demand on transport networks by redistributing journeys to other modes, times, routes or by removing the journey altogether. Travel Demand Management is most effectively applied when there is an impetus or catalyst for behaviour change. The Aerotropolis Travel Demand Management Strategy is detailed in Section 6.0.

Enabler 2: Transport infrastructure and services

The right balance of transport infrastructure and services is pivotal to achieve the desired outcomes. An integrated, multi-modal network with metro, train and bus services will deliver connectivity to, from and within the Aerotropolis. Dedicated, safe and attractive walking and cycling networks are integral to encouraging walking and cycling for shorter trips and to support longer distance public transport trips.

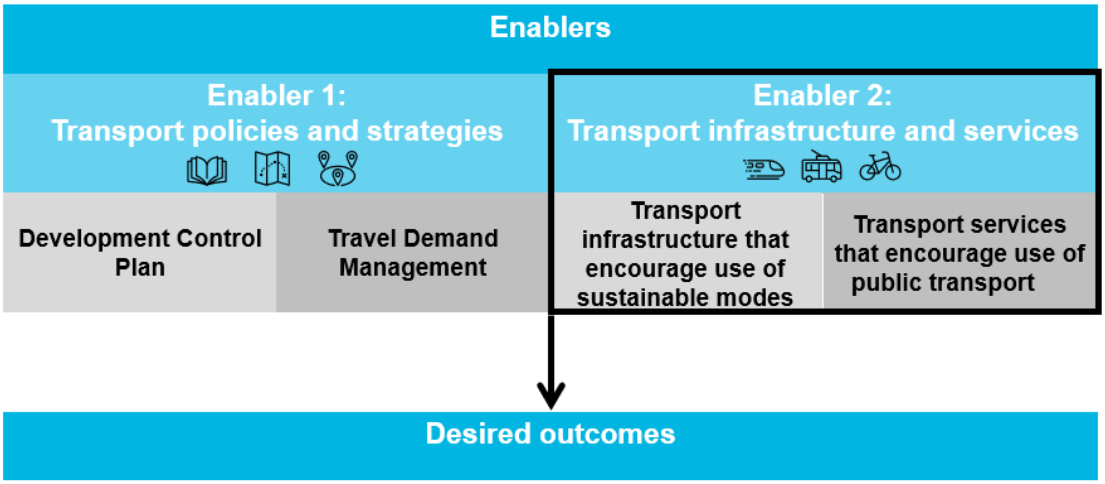

Figure E-9: Transport infrastructure and services are pivotal to achieving the desired outcomes

Validating the Vision

A travel demand assessment was undertaken against the mode share targets developed, to understand the benefits that can be realised from the investments and initiatives outlined.

This assessment validation process underpins the vision and helps us understand the effectiveness of the multi-modal transport networks and services proposed to support delivery of the *Western Sydney Aerotropolis Plan* objectives for a sustainable mode share (walking, cycling and public transport use) of 44% for the five initial Aerotropolis precincts in the morning peak period (6:00am to 9:30am).

The Public Transport Patronage Model and Sydney Freight Model were used together to inform the travel demand analysis undertaken, to validate the mode share targets as defined.

The travel demand assessment, described in Section 8.2, defines that a total of 81,840 passenger and freight trips are forecast to occur during the 2056 morning peak period (6:00am to 9:30am).

The transport network capacity assessment, in Section 8.3, demonstrated that **a business-as-usual approach would result in demand exceeding capacity on several links on the road network**. However, validating the vision of the top down mode share targets (with a higher sustainable mode share) in line with the polices and networks defined, demonstrated the effectiveness of this vision. This adjusted the strategic model outputs to reflect the targets set and the vision through trip reassignment.

The assessment demonstrated the public transport network and services proposed to have capacity to cater for all public transport travel demand, in line with the mode share targets.

In fact, it has been proven that there will be additional public transport service capacity, which could potentially see even more substantial share of public transport as a mode. Although, based on the evidence presented in case studies and analysis in this report, it is not reasonable to predict a higher public transport mode share, which can be reasonably validated based on a credible evidence base.

Further analysis, through the appraisal of relevant case studies provided an evidence-based approach to reassigning private vehicle trips to walking and cycling.

The travel demand assessment and transport capacity assessment are an evidence-based validation process for the 2056 mode share targets. These rely on the effective deployment of travel demand management strategies and policies, allied with an effective network of infrastructure and services.

Figure E-10 presents the level of mode shift which can be reasonably achieved, based on the validation of mode share targets undertaken. This shows the level of change from business as usual and reflects the beyond business as usual approach presented in this report.

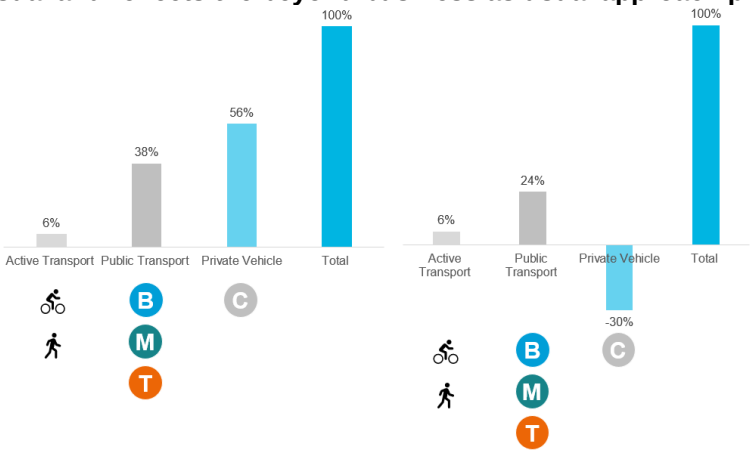

Figure E-10: Validated mode share targets for a beyond business as usual approach

Delivery Staging and Sequencing Strategy

Land use staging and sequencing across the Aerotropolis has been indicatively identified in order to communicate priorities for infrastructure development. This aligns Government investment with achieving the targets established in the *Western Sydney Aerotropolis Plan* to deliver the mode share targets defined in this report, establishing sustainable patterns of travel behaviour from day one.

The **first areas of priority** are:

- Land around the committed Metro Stations at North Luddenham and Aerotropolis Core
- Associated large landholdings where development can be relatively easily coordinated
- The land adjacent and outside of the M12 corridor and interchange area that can support access to the Western Sydney Airport
- Luddenham Village, where existing infrastructure can support development
- Enabling access to the Western Sydney Airport from The Northern Road
- Early delivery of public transport and active transport infrastructure to support sustainable mode share targets.

The **areas of second priority** are:

- Mixed use zoned land east of Thompsons Creek that can bolster employment and resident populations
- Connecting developed areas between the Aerotropolis Core, Badgerys Creek and Northern Gateway precincts.

The **third areas of priority** are:

- Land that is more difficult to develop owing to environmental and topographical constraints east of Badgerys Creek Road and east of The Northern Road.

Considerations informing these priorities are:

- High order transport nodes (Metro) and centres (ability to create a place)
- Unfragmented land
- Servicing (extending from existing infrastructure)
- Environmental constraints.

Considering these priorities, the proposed land use staging and sequencing for the Aerotropolis is outlined in **Figure E-11**.

The transport infrastructure and services response to cater for the proposed staging and sequencing is outlined for each precinct in the following sub-sections.

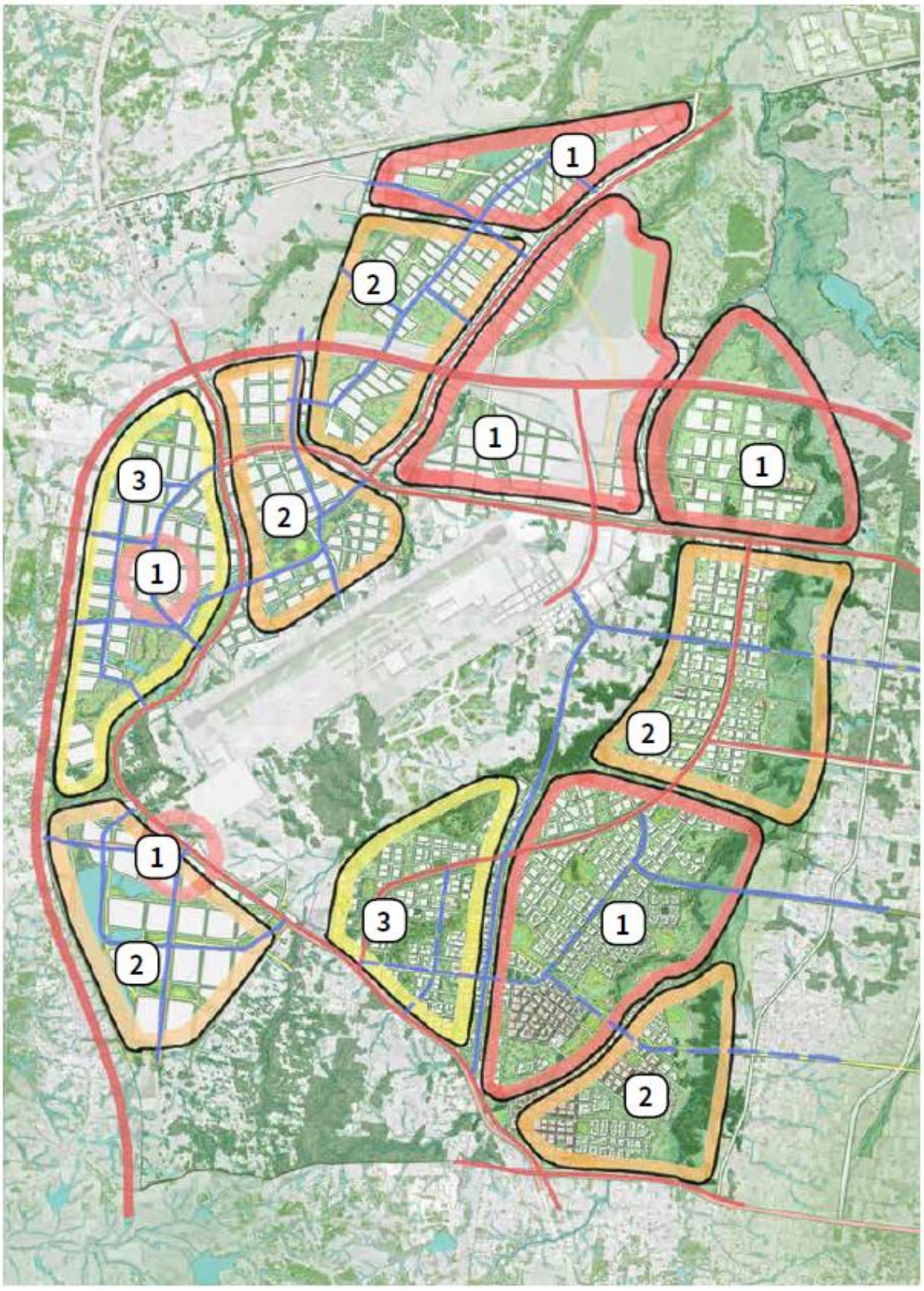

Figure E-11: Proposed land use led staging approach for the Western Sydney Aerotropolis

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1.0 Introduction

1.1 Context

In April 2014, the Commonwealth Government committed to the construction of Sydney's second airport, located in Badgerys Creek.

This commitment was supported by the *Western Sydney City Deal,* which was agreed to in 2018 by all three tiers of government.

The *Western Sydney City Deal* forms the foundation for investment in Western Sydney. It is supported by a range of NSW planning initiatives including the *Future Transport Strategy 2056* and the *Greater Sydney Region Plan*.

The *Future Transport Strategy 2056* and the *Greater Sydney Region Plan* identify Sydney as a city of three cities; the Eastern Harbour City, the Central River City and the Western Parkland City.

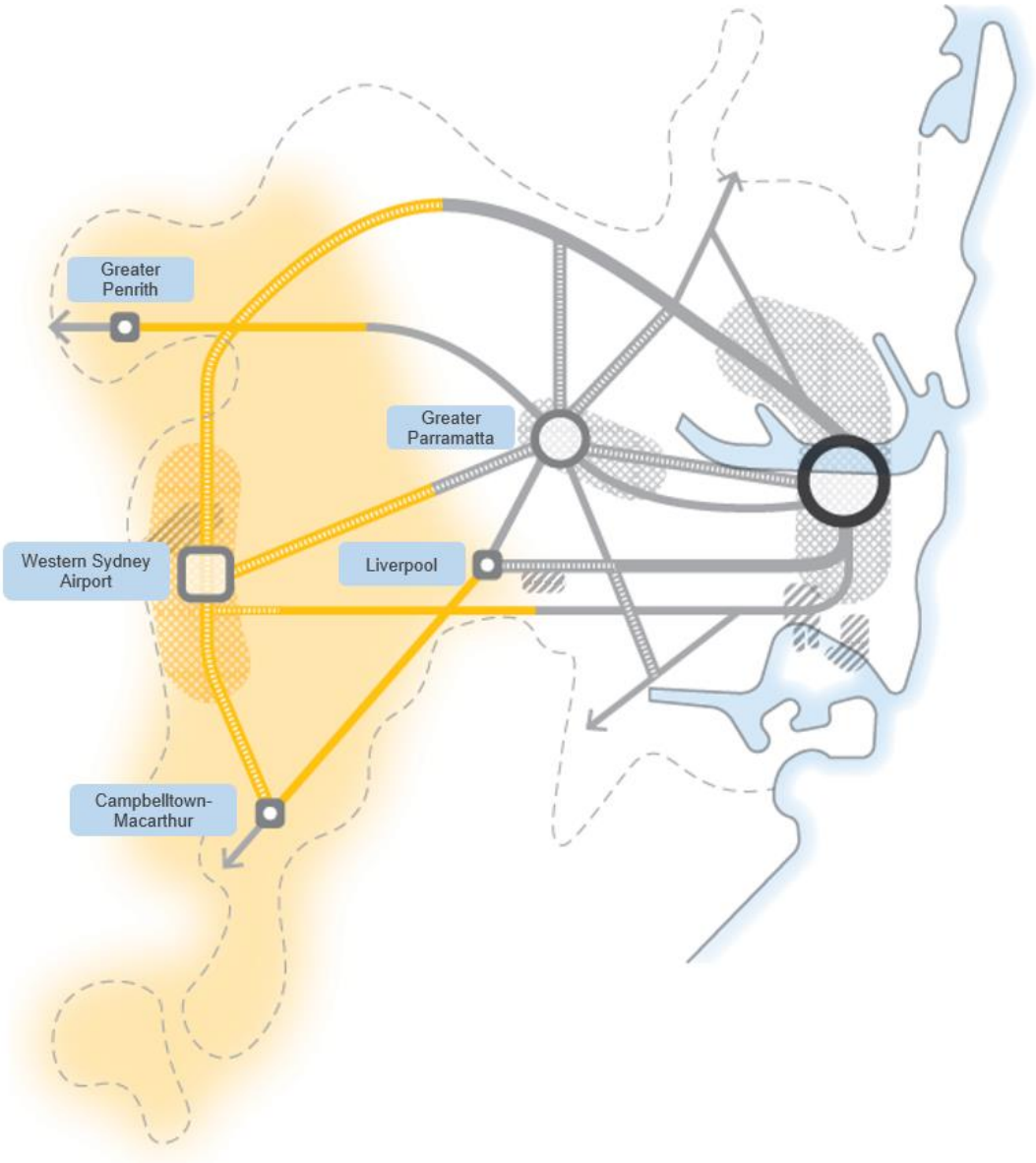


Figure 1-1 The Western Parkland City

Source: AECOM, *adapted from Original Image produced by the* Greater Sydney Commission, 2020

The Western Parkland City is projected to grow from a population of 740,000 in 2016 to over 1.5 million by 2056. It is also intended to provide a greater range of job opportunities in proximity of residents.

The Western Sydney Aerotropolis (Aerotropolis) covers 11,200-hectares located within the Western Parkland City. The Aerotropolis will be a focal point for job creation and economic development, built around the new Western Sydney International (Nancy-Bird Walton) Airport (Airport).

A primary objective for the Western Parkland City is to provide residents with more jobs and services within a 30-minute journey of where they live. 200,000 jobs are planned within the Aerotropolis, meaning it is integral to achieving this objective. Furthermore, the Aerotropolis aims to enable a resilient 24-hour economy, with a transport network that supports the safe and efficient movement of people and goods.

The Aerotropolis is located within the Liverpool City Council and Penrith City Council Local Government Areas and will eventually contain ten precincts; Aerotropolis Core, Agribusiness, Badgerys Creek, Dwyer Road, Kemps Creek, Mamre Road, North Luddenham, Northern Gateway, Rossmore and Wianamatta-South Creek.

1.1.1 Western Sydney International (Nancy-Bird Walton) Airport (Airport)

Western Sydney International (Nancy-Bird Walton) Airport (Airport) will be the cornerstone of the future Western Sydney Aerotropolis (Aerotropolis), within the Western Parkland City.

A representation of the future Airport is shown in Figure 1-2.

Figure 1-2: Concept design of the exterior of the new Airport passenger terminal

Source: Western Sydney Airport, 2019

The airport will be a new full-service airport with domestic, international and freight services planned to operate 24 hours a day upon opening in 2026.

The *Western Sydney Airport Environmental Impact Statement* identifies three planned activity levels (2031, 2050 and 2063) for passenger forecasts and employment estimates.

The Airport is projected to support 10 million passengers annually and 8,730 full-time jobs in the early 2030s. By 2063, the Airport is projected to accommodate 82 million passengers annually and 61,500 jobs.

1.2 The Western Sydney Aerotropolis precincts

The five initial Aerotropolis precincts are shown in orange on the plan below, in Figure 1-3.

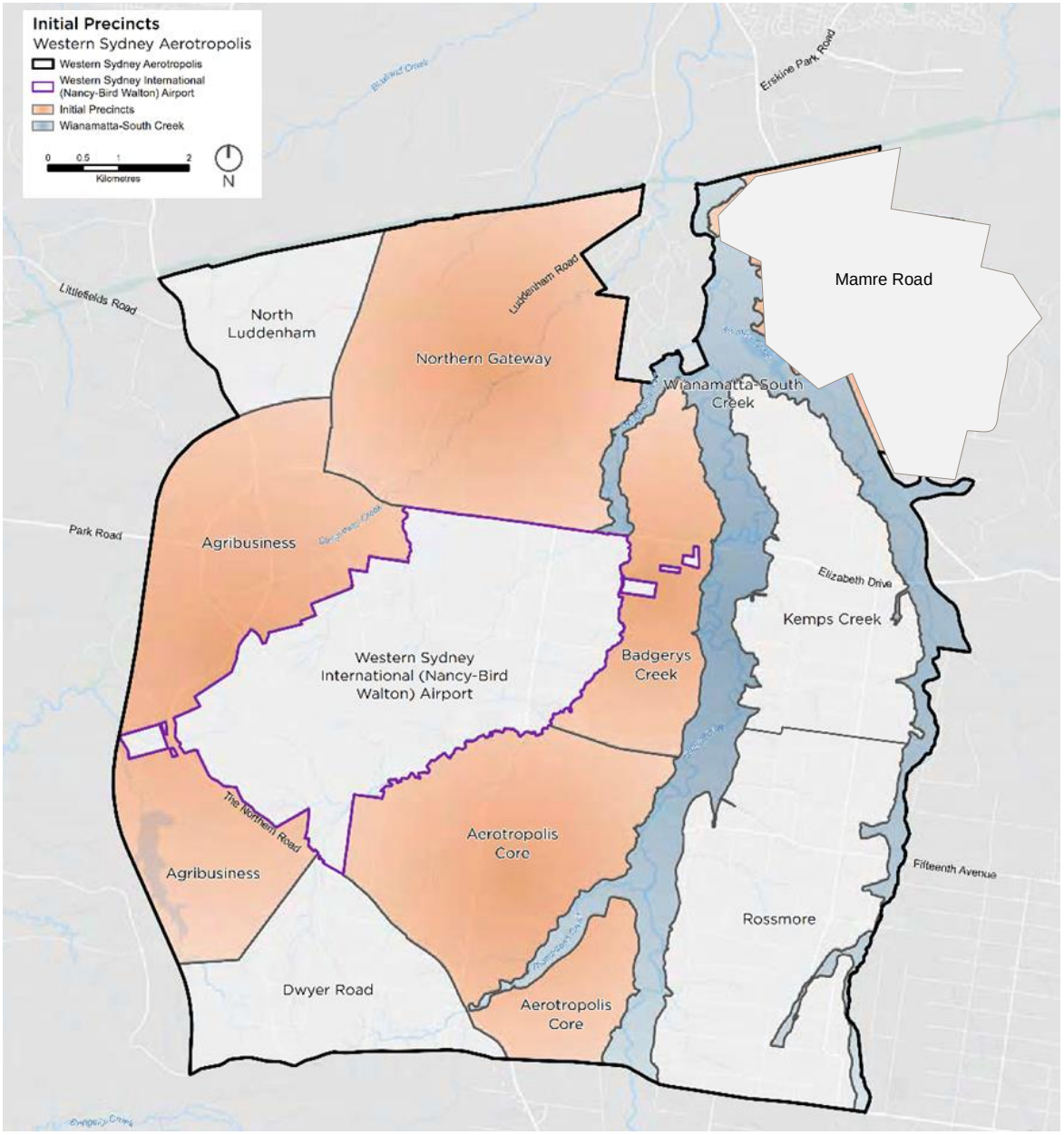


Figure 1-3 Western Sydney Aerotropolis with the five initial precincts highlighted in orange

Source: Department of Planning, Industry and Environment, adapted by AECOM, 2020

The five initial Western Sydney Aerotropolis precincts which are being investigated and developed through the precinct planning process are:

- Aerotropolis Core,
- Agribusiness,
- Badgerys Creek,
- Northern Gateway and
- Wianamatta-South Creek.

1.2.1 Definition of the five initial Western Sydney Aerotropolis precincts

The five initial Western Sydney Aerotropolis precincts comprise approximately 6,600 hectares (or 59%) of the overall Aerotropolis land area of 11,200 hectares.

Together, the five initial Western Sydney Aerotropolis precincts are projected to accommodate 102,000 new jobs and 34,000 new residents by 2056. This equates to a job density of 16 jobs per hectare and a population density of five residents per hectare.

These projections indicate the five initial Western Sydney Aerotropolis precincts will have a job to resident ratio of 3:1, meaning the dominant task is to transport people into the five initial Western Sydney Aerotropolis precincts from across Greater Sydney.

Table 1-1 outlines the future employment and population projections for the five initial Western Sydney Aerotropolis precincts.

Table 1-1 Future employment and population projections for the five initial Western Sydney Aerotropolis precincts

Precinct	Area (hectares)	Jobs	Job density (jobs per hectare)	Residents	Population density (residents per hectare)
Aerotropolis Core	1,382	60,000	43	24,000	17
Northern Gateway	1,616	21,000	13	10,000	6
Agribusiness	1,572	10,000	6	Minimal	0
Badgerys Creek	612	11,000	18	No additional	0
Wianamatta – South Creek	1,392	0	0	0	0
Total	**6,574**	**102,000**	**-**	**34,000**	**-**
Average		**-**	**16**		**5**

The Aerotropolis Core is projected to have the highest number of jobs (60,000) and the highest job density (43 jobs per hectare). It is also projected to have the highest number of residents (24,000) and the highest population density (17 residents per hectare).

In contrast, Wianamatta – South Creek is expected to become a recreational and environmental precinct with no development planned. As such, it is not expected to accommodate jobs or housing.

1.3 AECOM's scope

AECOM was engaged by the Western Sydney Planning Partnership to undertake transport planning and transport modelling services for these five initial precincts.

1.4 Report structure

This report has been structured as follows:

- Section 2.0 details the strategic context which back the Western Sydney Aerotropolis vision with a range of policies and planning initiatives across all levels of Government, different institutions and stakeholders.
- Section 3.0 identifies the existing transport and land use context for the Western Sydney Aerotropolis.
- Section 4.0 articulates the *Western Sydney Aerotropolis Plan* vision and objectives, and sets out a range of complementary enablers, indicators and targets.
- Section 5.0 outlines a selection of international and domestic case studies which have geographic, land use and infrastructure commonalities with the Western Sydney Aerotropolis.
- Section 6.0 detailers the first enabler (transport policies and strategies in the form of travel demand management) to achieve the *Western Sydney Aerotropolis Plan* vision and objectives.
- Section 7.0 details the second enabler (future transport infrastructure and services) to achieve the *Western Sydney Aerotropolis Plan* vision and objectives.
- Section 8.0 details the process that was undertaken to validate the vision. It covers travel demand assessment, the transport capacity assessment and how these were used to justify the future mode share targets.
- Section 9.0 summarises the Delivery Strategy with the proposed staging and implementation of transport infrastructure, services, policies and strategies within the Western Sydney Aerotropolis, including a Travel Demand Management action plan.

Appendix A: Parking requirements and Appendix B: Case studies present additional information to support the Stage 2 Report.

2.0 Strategic context

2.1 Introduction

2.1.1 Strategies defining the vision

The Western Sydney Aerotropolis vision is set out in a range of policies and planning initiatives across all levels of Government.

The *Western Sydney City Deal* is a multi-tiered collaboration between all three levels government with a shared commitment to the creation of world-class jobs and a great quality of life for the people of the Western Parkland City. It is supported by key land use, transport and infrastructure policies such as the *Greater Sydney Region Plan,* the *Future Transport Strategy 2056*, the *State Infrastructure Strategy 2018-2038* and the *NSW Design Policy*.

The Western Parkland City's potential for education, business and employment is in alignment with the NSW *Premier's Priorities* and at a local level, growth in specific areas within or adjacent to the five initial Aerotropolis precincts is supported by *Collaboration Area Place Strategies*.

The initiatives outlined in these strategic policy documents are supported by regional plans across a range of areas which include land use, transport and infrastructure.

The Greater Sydney Commission outlined the vision and strategy for Greater Sydney to become a global metropolis of three unique and connected cities through the *Greater Sydney Region Plan*. The metropolitan clusters of Penrith, Liverpool, Campbelltown-Macarthur and Aerotropolis form the major activity centres in the Western Parkland City. The vision and objectives for the Western Parkland City were further developed in the *Western City District Plan*.

2.1.2 Planning the future Western Sydney Aerotropolis

Planning of the Western Sydney Aerotropolis must align with transport and land use initiatives from all three tiers of government in order to deliver a thriving economic hub supported by new jobs, homes and infrastructure.

Figure 2-1 illustrates the NSW policy and planning framework for Greater Sydney.

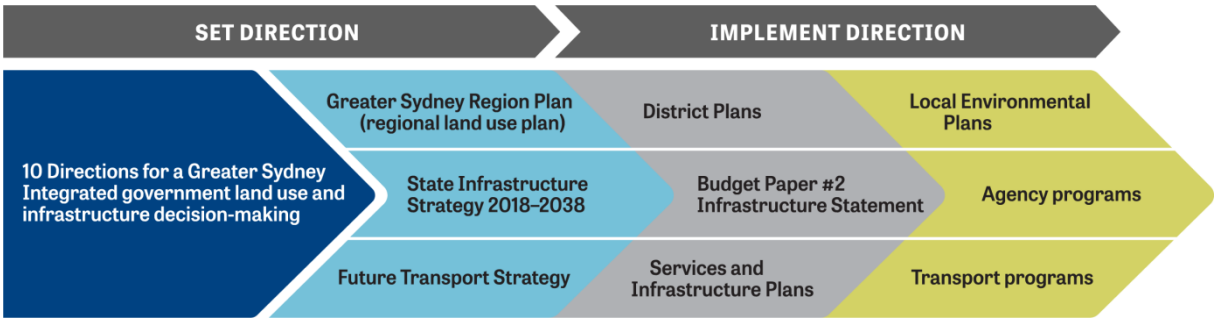


Figure 2-1 NSW policy and planning framework

Source: Greater Sydney Commission, 2018

Infrastructure initiatives have been driven through the *Greater Sydney Services and Infrastructure Plan* with support from Infrastructure Australia's *Outer Urban Public Transport Paper*. Proposed land use scenarios stem from the *Western Sydney Place Infrastructure Compacts Transport Modelling Report* and *Co-Design Alternative Land Use Scenario Report*. Specific transport initiatives that support the Aerotropolis vision include the *Western Sydney Rail Needs Scoping Study* and *Rapid Bus Services for Western Parkland City*.

The NSW Government and local councils have worked collaboratively through the Western Sydney Planning Partnership, and together have released detailed reports to support the Aerotropolis vision. These include the *Western Sydney Aerotropolis Plan*, *State Environmental Planning Policy* and *Aerotropolis Development Control Plan – Phase 1*.

Individually, local councils have also set out their aspirations within the Western Parkland City as they seek to harness the opportunities of the Airport to improve outcomes for their residents. Penrith City Council and Liverpool City Council have released their *Local Strategic Planning Statements*, *Delivery Program 2017-21* and *Operational Plan 2019-20* to facilitate these goals.

Figure 2-2 outlines the hierarchy of the strategic planning documents which relate to Aerotropolis.

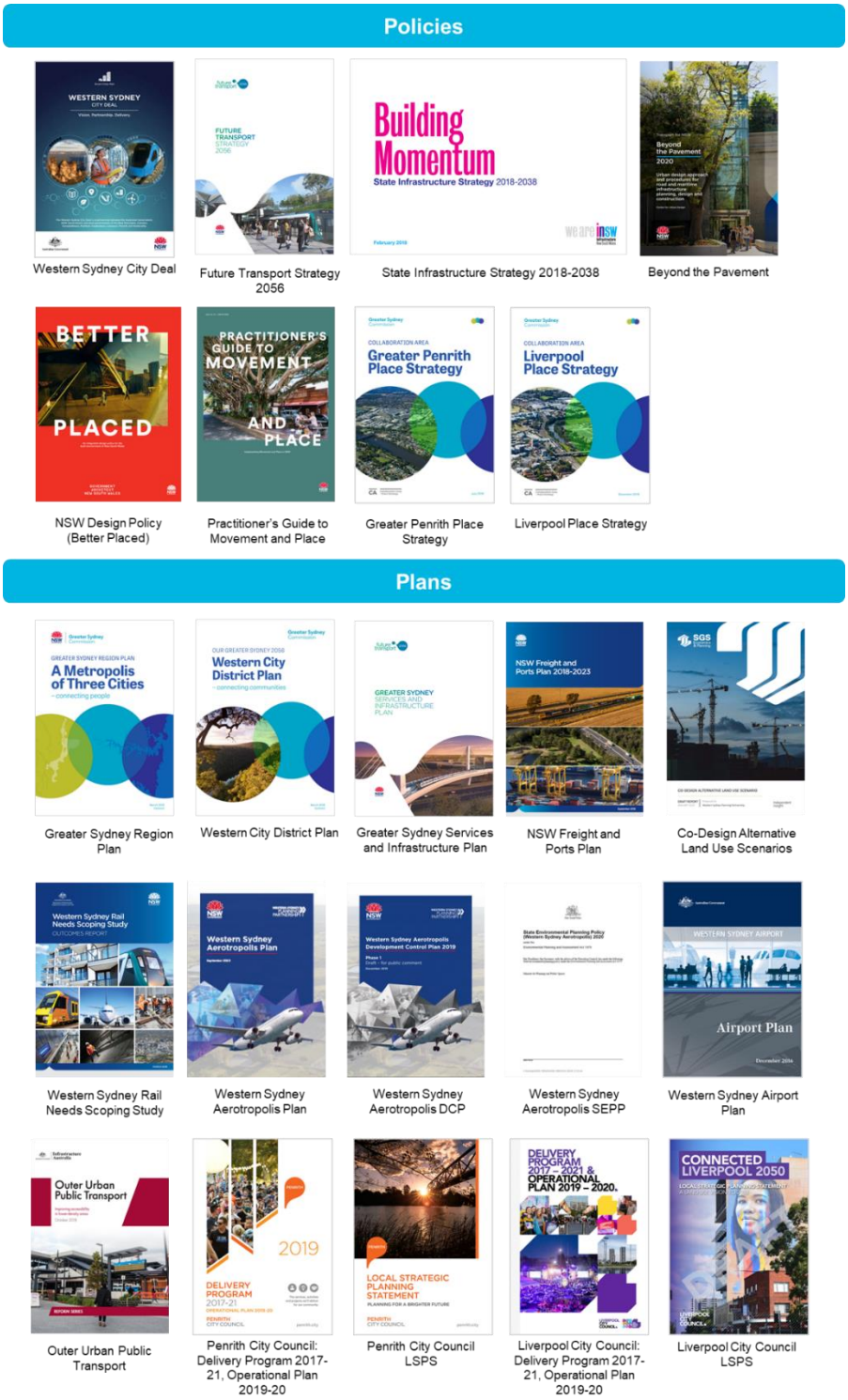


Figure 2-2 Hierarchy of strategic planning documents

2.2 Policy documents

2.2.1 Western Sydney City Deal

The *Western Sydney City Deal* is a multi-tiered collaboration between the Commonwealth Government, NSW Government and eight local councils in the Western Parkland City: Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly. The vision outlined in the *Western Sydney City Deal* is:

> *The Western Parkland City will be one of Australia's most connected cities. In an emerging 30-minute city, innovative public transport, aviation and digital infrastructure will bring residents closer to jobs, services, education and the world.*

As part of the *Western Sydney City Deal*, there are six key initiatives outlined, shown in Figure 2-3.

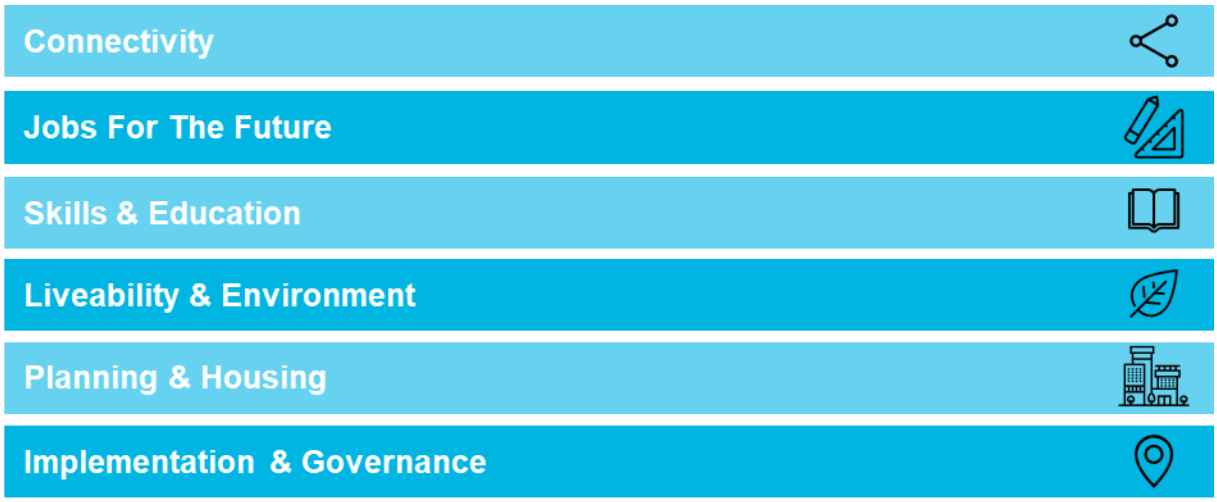


Figure 2-3 Western Sydney City Deal key initiatives

Aligned with these six key initiatives are 38 commitments. Of the commitments, the most relevant to transport within Aerotropolis include:

- C1: Deliver rail for the Western City with construction of Sydney Metro Western Sydney Airport
- C2: Western City rapid bus services linking Liverpool, Penrith, Campbelltown and the Aerotropolis
- C3: Smart Western City Program
- C3: Openly available data sets
- J1: The Aerotropolis as world-class employment sector for 200,000 jobs
- J1: Western Sydney Development Authority
- L1: Western Parkland City Liveability Program
- PH1: Housing targets for the Western Parkland City facilitated by Growth Infrastructure Compacts
- PH1: New Growth Area for the Greater Penrith to Eastern Creek corridor
- PH2: Western Sydney Planning Partnership
- PH3: Transport and water infrastructure models.

2.2.2 Premier's Priorities

The five *Premier's Priorities* reflect a whole-of-government approach to addressing key issues for the people of New South Wales. The creation of *well-connected communities with quality local environments* and *a strong economy* are most relevant to the Aerotropolis as they refer to key infrastructure projects delivered to immensely benefit the local economy through sustainable urban connections and land use planning. These are supported by 14 targeted initiatives that deliver on key policy priorities.

The Premier's five key policy priorities are presented in Figure 2-4.

Figure 2-4 Premier's Priorities

The initiatives most relevant to transport and planning within the Aerotropolis are presented in Figure 2-5.

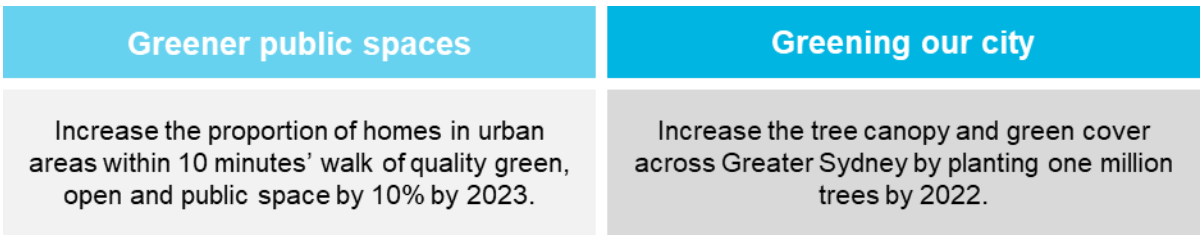


Figure 2-5 Premier's Priorities initiatives relevant to the Aerotropolis

2.2.3 Future Transport Strategy 2056

Future Transport Strategy 2056 is an overarching 40-year strategy which identifies transport as an enabler of economic and social activity and contributes to long term economic, social and environmental outcomes.

Six state-wide transport outcomes have been developed by Transport for NSW to provide a framework for planning and investment for the future of transport in NSW, shown in Figure 2-6.

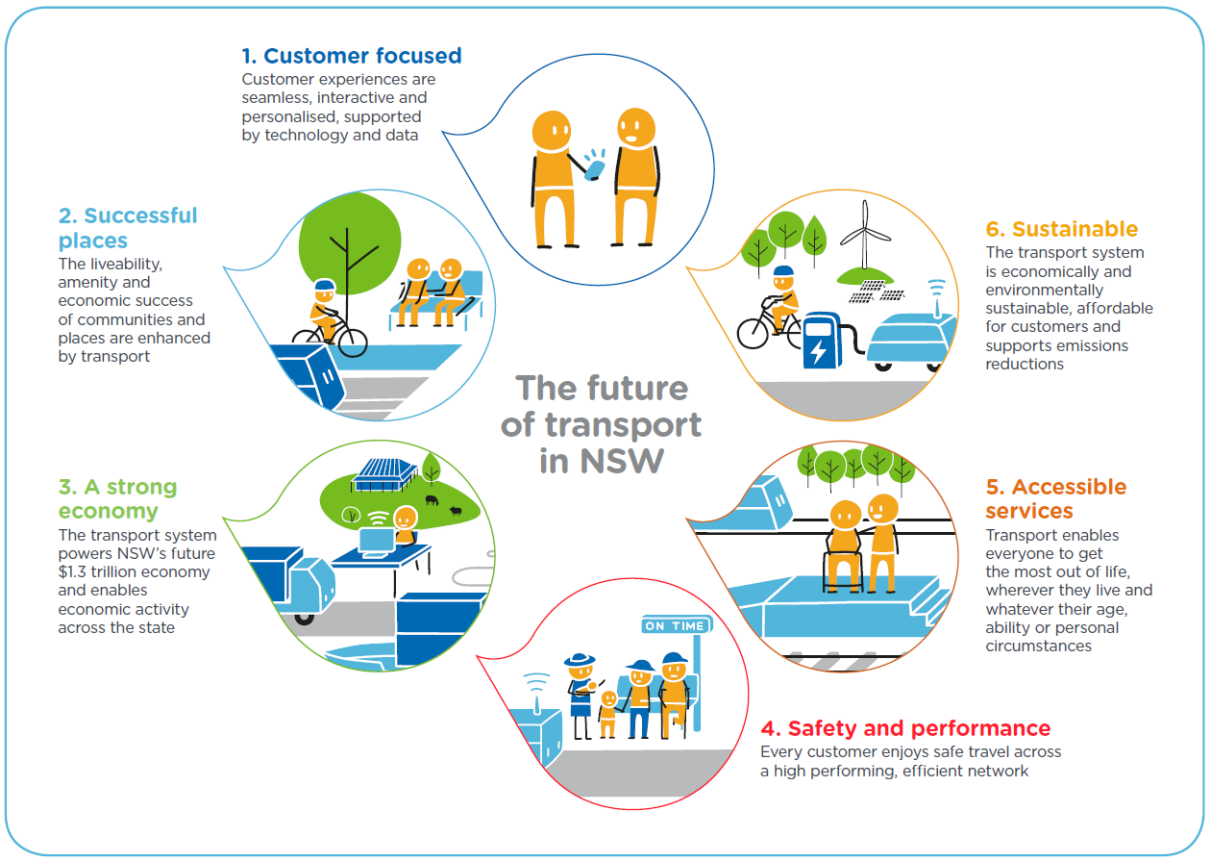


Figure 2-6 Six state-wide outcomes

Source: Transport for NSW, 2018

In addition, 12 Greater Sydney transport customer outcomes have been developed which directly align with the state-wide outcomes: Figure 2-7 presents the NSW and Greater Sydney outcomes and their alignment.

Figure 2-7 Alignment of NSW transport outcomes and Greater Sydney transport customer outcomes

Source: Transport for NSW, 2018

Two key concepts have been outlined in *Future Transport Strategy 2056* which will shape the future transport network within Greater Sydney; Movement and Place and the 30-minute city.

The Movement and Place framework provides a tool to manage the road network in a way that supports safe, efficient and reliable journeys for people and freight while enhancing the liveability and amenity of places. The Movement and Place framework presented in *Future Transport Strategy* 2056 has since been updated by the Government Architect of NSW. This update is detailed in Section 2.2.6.

The 30-minute concept has been defined by Transport for NSW as *a planning concept for a city in which people can easily access the places they need to visit, on a daily basis, within 30 minutes travel from where they live. In the Greater Sydney context, the focus is on access to the nearest centre within 30 minutes by public transport, walking or cycling.*

The concept will be used in conjunction with land use visions to guide planning, investment and deliver customer outcomes including faster, convenient and reliable travel times within Greater Sydney.

The plan has been developed concurrently with the *Greater Sydney Region Plan* and the *State Infrastructure Strategy 2018 – 2038.* It is also supported by a suite of supporting documents, of which the *Greater Sydney Services and Infrastructure Plan* is the most relevant to the Aerotropolis. Together, these plans will align land use, transport and infrastructure outcomes across Greater Sydney to facilitate the delivery of 725,000 new dwellings and 817,000 new jobs in Greater Sydney by 2036.

2.2.4 NSW Design Policy (Better Placed)

The *NSW Design Policy (Better Placed)* informs seven design objectives for the New South Wales built environment:

- Better fit: contextual, local and of its place
- Better performance: sustainable, adaptable and durable
- Better for community: inclusive, connected and diverse
- Better for people: safe, comfortable and liveable
- Better working: functional, efficient and fit for purpose
- Better value: creating and adding value
- Better look and feel: engaging, inviting and attractive

These are all relevant considerations for the Aerotropolis design process. The Aerotropolis design process involves the construction of a brand-new built environment. The built environment must recognise the importance of design quality on the function, integration and contribution of places and spaces to users, inhabitants and audiences they support or attract.

2.2.5 State Infrastructure Strategy 2018 – 2038: Building Momentum

The *State Infrastructure Strategy* is a 20-year investment plan prepared by Infrastructure NSW. The *State Infrastructure Strategy* assesses infrastructure problems and solutions and provides recommendations to grow the state economy, enhance productivity and improve living standards.

The *State Infrastructure Strategy* outlines six cross-sectional strategic directions, shown in Figure 2-8, which are designed to embed good design practice across the lifecycle of infrastructure.

Figure 2-8 State Infrastructure Strategy strategic directions

Source: Infrastructure NSW, 2020

The *State Infrastructure Strategy* recognises that different parts of NSW face different opportunities and needs; outlining geographic directions for infrastructure planning, investment and policy. These are presented in Figure 2-9.

Figure 2-9 State Infrastructure Strategy geographical infrastructure directions

Source: Infrastructure NSW, 2020

The strategic directions and geographic directions were built upon, with the *State Infrastructure Strategy* outlining policy and investment options across the key infrastructure sectors. These sectors are shown in Figure 2-10.

Figure 2-10 State Infrastructure Strategy sectors

Source: Infrastructure NSW, 2020

The following recommendations outlined in the *State Infrastructure Strategy* that are relevant to the Aerotropolis and the Western Parkland City include:

- **Recommendation 48:** Infrastructure NSW recommends that Transport for NSW develop business cases by the end of 2019 for the progressive delivery of a bus rapid transit network connecting the centres of Liverpool, Campbelltown, Greater Penrith, Blacktown and the Airport over the next 10 years.
- **Recommendation 56:** Infrastructure NSW recommends that subject to completion of the business case in 2018, the NSW Government invest in the Western Harbour Tunnel to complete a Western CBD Bypass and inner urban motorway network.
- **Recommendation 57:** Infrastructure NSW recommends that Transport for NSW complete the business case for the M12 Motorway for delivery in time for opening of the Airport. Corridor planning and protection for future strategic road links in the Western Parkland City and to the Illawarra-Shoalhaven should continue to be progressed.

- **Recommendation 69:** Infrastructure NSW recommends that the NSW Government plan and protect the corridors and precincts necessary for future transport, freight, logistics, energy and communications facilities and infrastructure in the Western Parkland City.
- **Recommendation 70:** Infrastructure NSW recommends the NSW Government partner with the Commonwealth Government to plan the staged investment in mass transit to support the Western Parkland City over the period from 2036 to 2056.
- **Recommendation 71:** Infrastructure NSW recommends that investment in rapid, express rail services to the Airport be considered only as a long-term proposition when an expected step-change in airport patronage occurs.

The infrastructure response for the Western Parkland City can be summarised as:

- Prioritise road connections to support access to the Western Parkland City from all directions.
- Prioritise a north-south mass transit connection.
- Prioritise sustainable transport connections, particularly walking and cycling infrastructure.
- Facilitate high quality digital connectivity infrastructure as part of all development.
- Provide social infrastructure, such as schools, social housing and hospitals, to support population growth, provide additional cultural and recreational infrastructure and encourage local council and private investment in recreation infrastructure.
- Facilitate South Creek catchment to become an enabler of world class water management, urban greening and climate control.
- Deliver a freight network to support a growing city and the next tranche of container imports into Sydney.

2.2.6 Practitioner's Guide to Movement and Place

The objective of Movement and Place is to achieve roads and streets that:

- Contribute to the network of public space within a location, where people can live healthy, productive lives, meet each other, interact, and go about their daily activities
- Are enhanced by transport and have the appropriate space allocation to move people and goods safely and efficiently and connect places together. Balancing Movement and Place recognises that trade-offs may be required to achieve a best fit for the objectives.

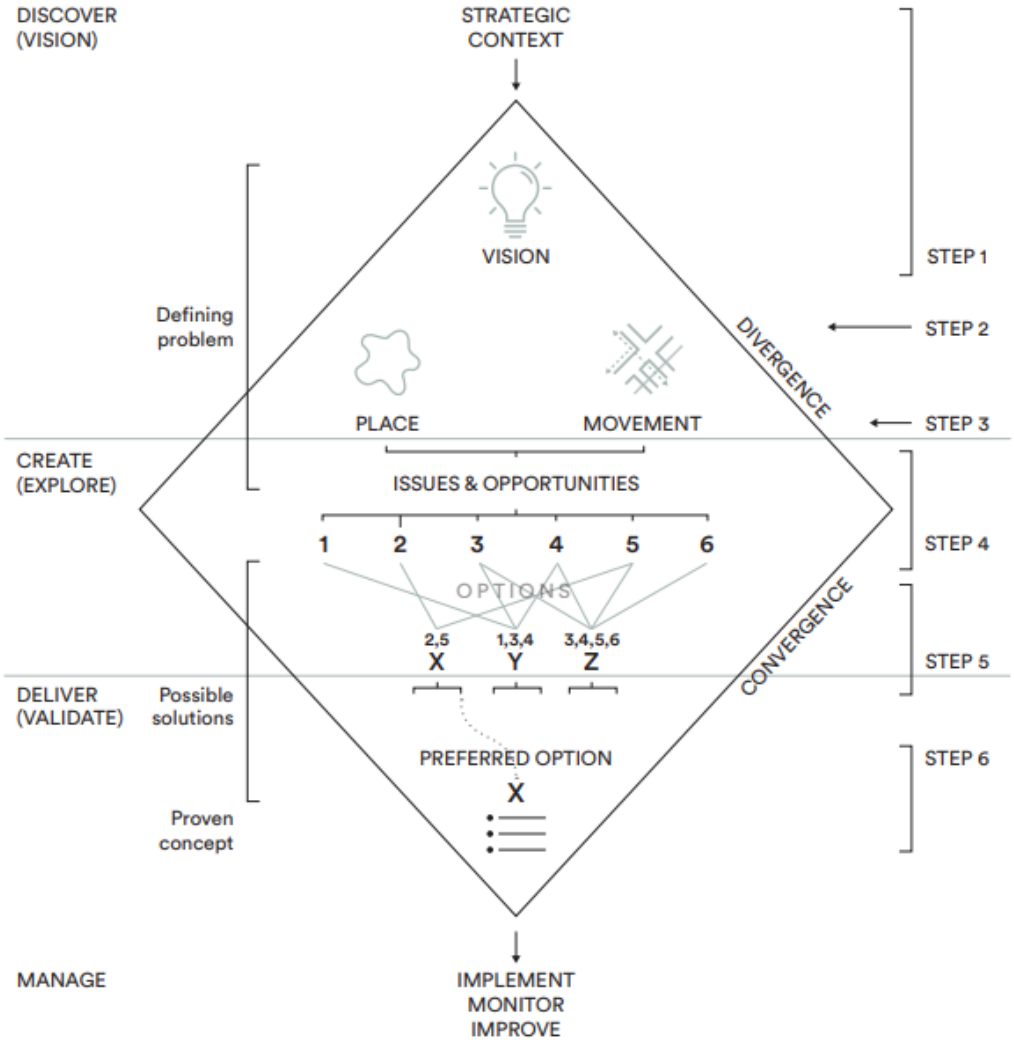


Figure 2-11 The six steps in the core Movement and Place process

Source: Government Architect of NSW, 2020

The Movement and Place process is designed to ensure this is done in the context of informed conversations, working collaboratively towards a shared vision, identifying a range of options to determine the best approach, considering multiple points of view, and consulting with multiple disciplines and stakeholders.

Movement and Place principles apply throughout New South Wales and can be adapted to any scale of project and level of decision-making. They apply to places where activity occurs and to the connections between these places. The document is therefore highly relevant to the development of the Aerotropolis precinct plans.

The core process presented in the following six steps, presented in Figure 2-12, outlines the spectrum of activities that constitute “taking a Movement and Place approach.” This involves collaboration and ‘design thinking’ and a focus on existing work where possible. The process should not be taken as preventing more integrated methods of working.

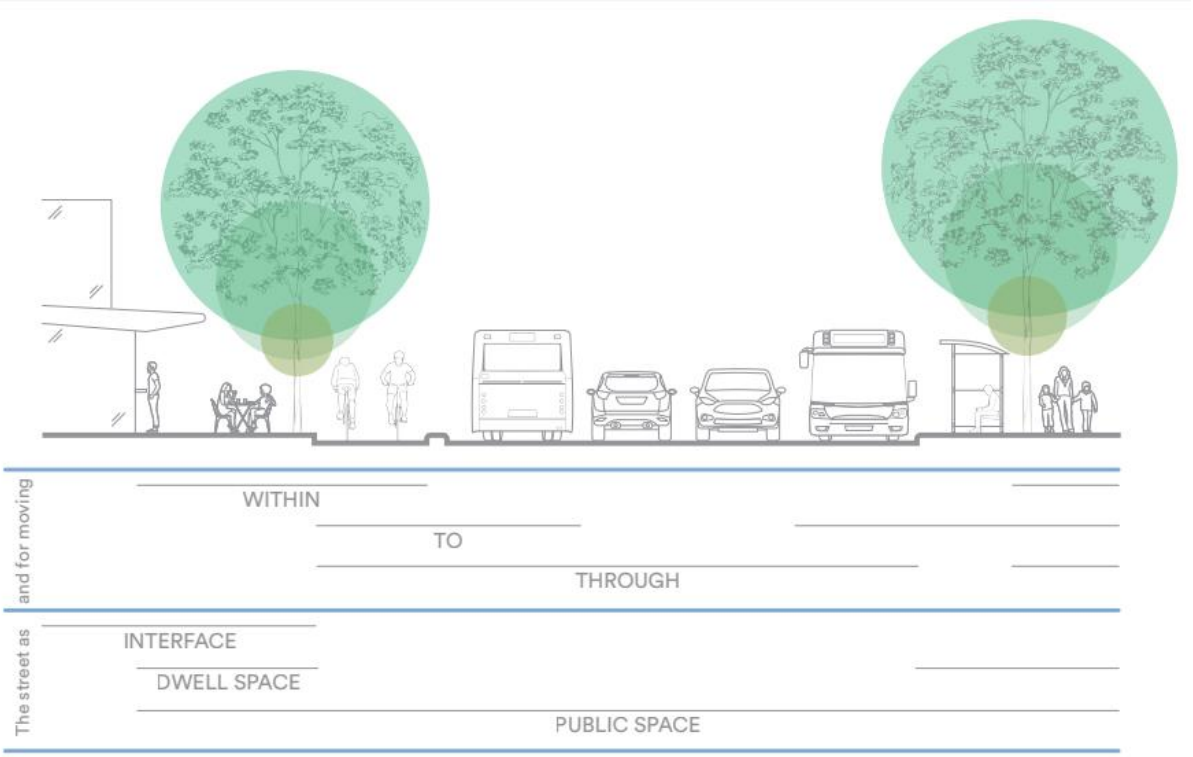


Figure 2-12 All considerations of the street environment

Source: Government Architect of NSW, 2020

The document acknowledges the importance of compromise in balancing Movement and Place, due to limitations on space available in urban areas or in new projects where there is tension between the vibrancy or value for money compared to accommodating all functions. To ensure the best outcome for both Movement and Place, the process needs to be as inclusive and exploratory as possible.

In pursuing balance between Movement and Place outcomes, practitioners must recognise that, Movement and Place are not always able to be complementary. Balancing outcomes requires consideration of the place as a whole, and is generally considered spatially, by deciding which streets should accommodate which networks or place functions to get the best overall outcome for the place as a whole (and the wider strategic context).This is evaluated against a set of questions.

The built environment can be assessed in a number of ways including quantitative and qualitative comparison; gap analysis by reference to benchmarks or standards; needs assessment; an analysis of strengths, weaknesses, opportunities and threats; analysing the capacity and performance of an area; and studying its character. The five built environment themes and the ten user outcomes that contribute to a well-designed built environment are illustrated in Figure 2-13.

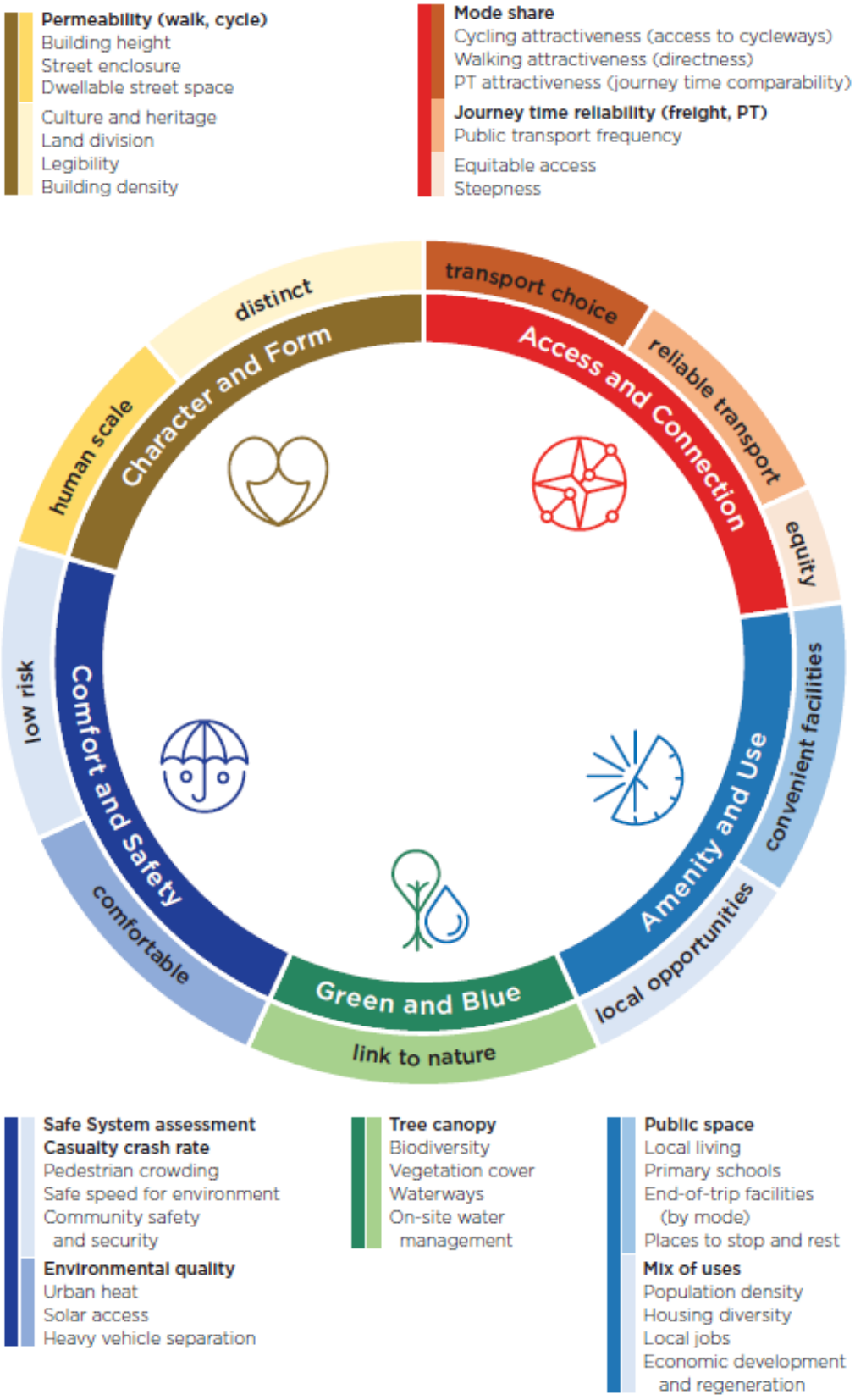


Figure 2-13 Alignment of the build environment indicators and the ten user outcomes

Source: Government Architect of NSW, 2020

The classification of streets is no longer the focus of Movement and Place analysis, with the role of this tool clarified to focus on outcomes or the identification of priority streets.

Classification requires breaking roads and streets into segments to understand the variety of roles, uses, and place qualities, and the potential need and priorities for modifications and improvements. Roads and streets may change character for lengths as short as 50 metres. For corridor planning, a segment length of 200 metres is recommended.

The updated framework comprises four different street environments, as outlined in Figure 2-14:

- **Civic spaces** are streets at the heart of our communities and have a significant meaning, activity function, or built environment. They are often in our major centres, our tourist and leisure destinations, and our community hubs. These streets are often shared spaces with pedestrian priority
- **Local streets** are the majority of streets within our transport networks and often have important local place qualities. Activity levels are less intense, however these streets can have significant meaning for local people
- **Main streets** have both significant movement functions and place qualities. Balancing the functions of these streets is a common challenge
- **Main roads** are routes central to the efficient movement of people and freight. They include motorways, primary freight corridors, major public transport routes, the principal bicycle network, and key urban pedestrian corridors. Place activity levels are less intense, however, these roads and routes can have significant meaning to local people.

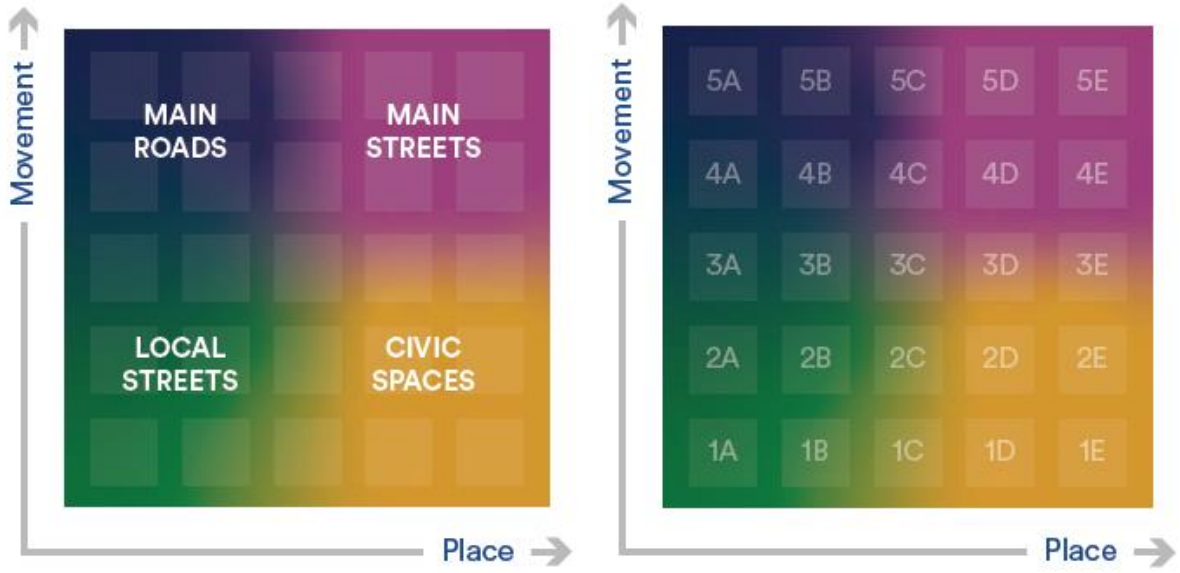


Figure 2-14 Movement and Place Framework

Place Intensity and Movement Significance are then assessed with the assistance of the advisory note *Classifying Street Environments* and a range of factors outlined in the document.

2.2.7 Beyond the Pavement

This document by the Centre for Urban Design with Transport for NSW outlines the urban design approach and procedures for road and maritime infrastructure planning, design and construction.

There are four physical urban design objectives that should be achieved on all road and maritime infrastructure:

- Projects should fit sensitively into the built, natural and cultural environment in both urban and rural locations.
- Projects should contribute to the accessibility and connectivity of communities and a general permeability of movement through areas by all modes of movement.
- The design and management of projects should contribute to the overall design quality of the public domain for the community, including transport users.
- Projects should help revitalise areas and contribute to the local and broader economy.

The objectives are then outlined in more detail through nine *Beyond the Pavement* design principles which are presented in Figure 2-15.

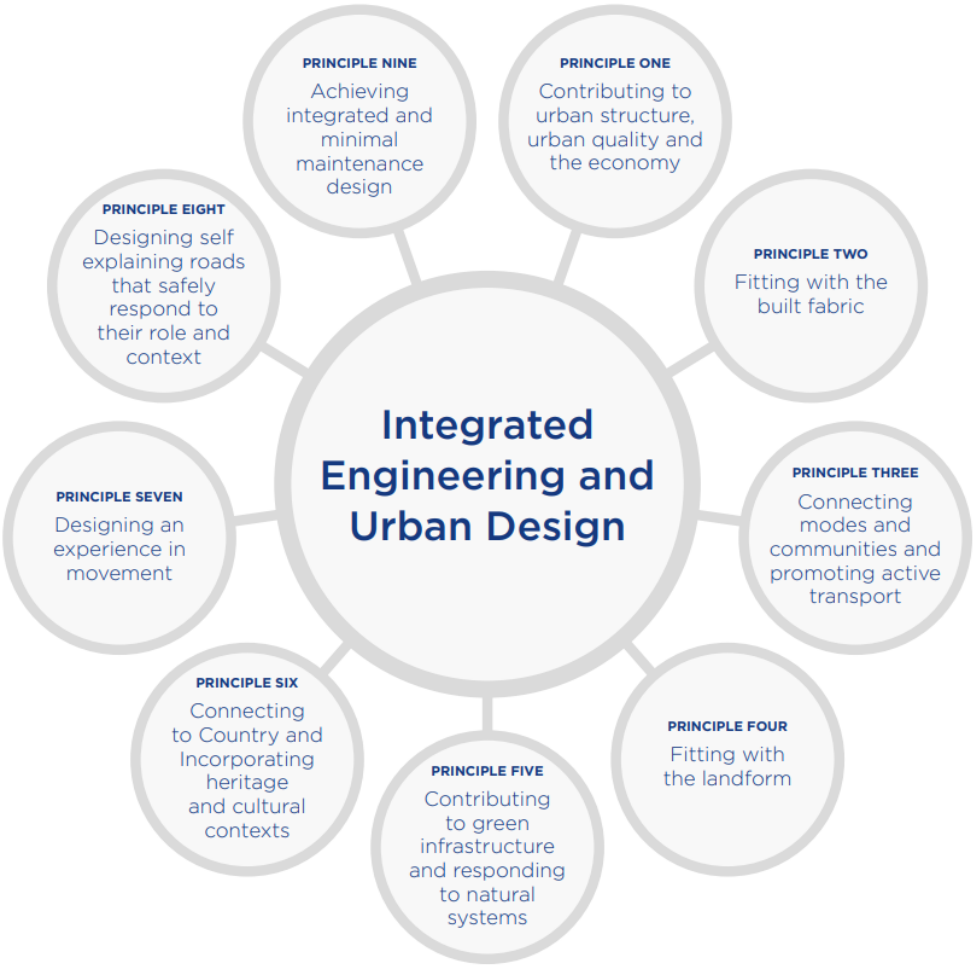


Figure 2-15 Beyond the Pavement urban design principles

Source: Centre for Urban Design, Transport for NSW, 2020

As an area with a projected variety of land uses, urban design for the Aerotropolis must be integrated and context sensitive with quality infrastructure instead of considering purely engineering or other criteria.

2.2.8 Collaboration Area Place Strategies

Greater Penrith and Liverpool have been identified as Collaboration Areas by the Greater Sydney Commission. Collaboration Areas require a place-based, multi-stakeholder approach to solving complex urban issues that the Greater Sydney Commission facilitates over a 12-month period. The Place Strategy represents the outcomes of the Collaboration Area process.

2.2.8.1 Greater Penrith Collaboration Area Place Strategy

The *Greater Penrith Collaboration Area Place Strategy* has been developed by the Greater Penrith Collaboration Area Stakeholder Group, including representatives from Penrith City Council, Western Sydney University, University of Sydney, TAFE NSW and NSW Government agencies covering health, education, planning, environment, transport and housing. Released to the public in September 2018, the Place Strategy outlines the following vision for the Collaboration Area:

> *In 2036, Greater Penrith is a key metropolitan centre in the Western Parkland City and the principal gateway to Greater Sydney for western NSW, offering sustainable, diverse and growing residential, employment and tourism opportunities.*

Six shared objectives were agreed to by the Collaboration Area Stakeholder Group to guide the growth and change of Greater Penrith in the future. The objectives act as markers so that future developments and projects build towards the realisation of the overall vision for Greater Penrith.

The Greater Penrith Place Strategy aligns directly with the five themes identified in the *Greater Sydney Region Plan* and the *Western City District Plan*: Infrastructure and Collaboration, Liveability, Productivity and Sustainability, and Implementation. A total of seven priorities have been identified in the Place Strategy resulting in direct outcomes with 36 corresponding actions developed to guide the delivery of the Greater Penrith Collaboration Area vision. The following actions relate to the Western Sydney Aerotropolis:

- Action 2: Investigate integration between Greater Penrith and Sydney Metro Western Sydney Airport in the context of the Greater Penrith to Eastern Creek Growth Area.
- Action 9: Develop a local green grid connecting popular destinations and Greater Sydney Green Grid corridors centred around active transport routes, and implement a management and maintenance framework.
- Action 14: Deliver great places by prioritising a people-friendly public realm and open spaces; providing fine grain and diverse urban form, high amenity and walkability; and recognise and celebrate the character of the place and its people.
- Action 17: Map innovation ecosystem connections and develop a business/industry attraction strategy to sustainably grow entrepreneurial and innovation-led businesses, leveraging opportunities created by the Airport.
- Action 20: Identify ways to grow the number of jobs in Greater Penrith, and leverage the tourism, health and education, and opportunities created by *Western Sydney City Deal*, the Airport, the Aerotropolis and associated investments.

The Place Strategy which has been developed for the Greater Penrith Collaboration Area is shown in Figure 2-16.

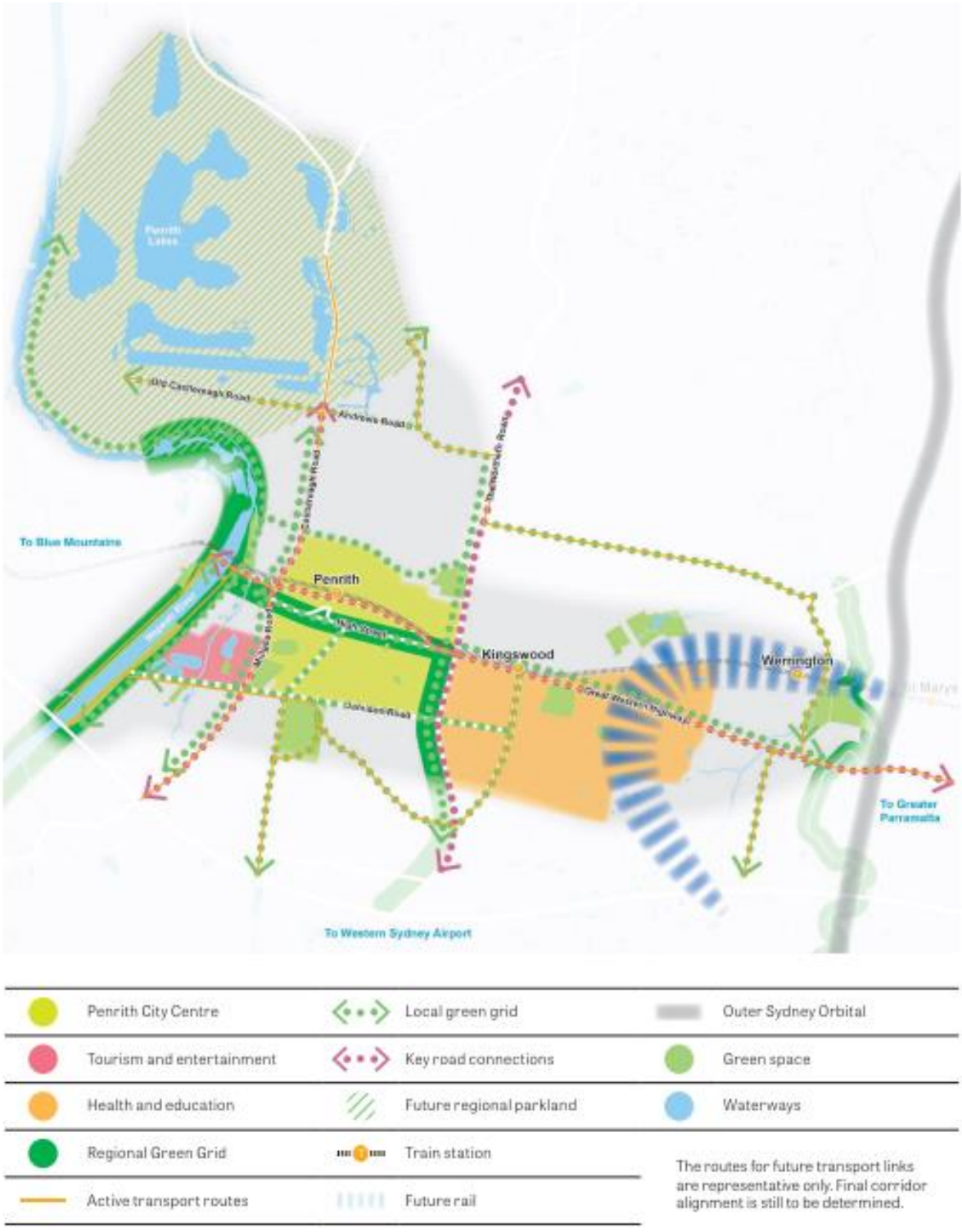


Figure 2-16 Greater Penrith Place Strategy

Source: Greater Sydney Commission, 2018

2.2.8.2 Liverpool Collaboration Area Place Strategy

The *Liverpool Collaboration Area Place Strategy* has been developed by the Liverpool Collaboration Area Stakeholder Group, including representatives from Liverpool City Council, Western Sydney University, TAFE NSW, University of Wollongong and NSW Government agencies covering health, education, planning, environment, transport and housing. Released to the public in September 2018, the Place Strategy outlines the following vision for the Liverpool Collaboration Area:

> *By 2036, Liverpool is a rejuvenated river city, offering diverse and growing residential and employment opportunities. Major health, education and retail precincts, and a network of open spaces and parklands alongside the Georges River, create a rich mix of jobs and workplaces, public spaces, shops and entertainment.*

The Liverpool Place Strategy aligns directly with the five themes identified in the *Greater Sydney Region Plan* and the *Western City District Plan*: Infrastructure and Collaboration, Liveability, Productivity and Sustainability, and Implementation. A total of ten priorities have been identified in the Place Strategy resulting in direct outcomes with 35 corresponding actions developed to guide the delivery of the Liverpool Collaboration Area vision. The following actions relate to the Aerotropolis:

- Action 4: Plan for city-shaping and city-serving public transport corridors, and increased speed and frequencies to improve connections and reduce travel times to surrounding areas, the Airport, the Aerotropolis, Greater Parramatta and the Harbour CBD
- Action 18: Increase the university and TAFE presence and align with relevant industry specialisations and new smart jobs in sectors such as engineering, med-tech robotics, agribusiness, health and aerospace.

The Place Strategy which has been developed for the Liverpool Collaboration Area is shown in Figure 2-17 overleaf.

Figure 2-17 Liverpool Place Strategy

Source: Greater Sydney Commission, 2018

2.3 Planning documents

2.3.1 Greater Sydney Region Plan

The *Greater Sydney Region Plan* was developed by the Greater Sydney Commission. The *Greater Sydney Region Plan* is built on a 40-year vision of three cities where most residents live within 30 minutes of their jobs, education and health facilities, services and great places. The *Greater Sydney Region Plan* identifies three cities which make up Greater Sydney, shown in Figure 2-19:

- **Eastern Harbour City**: Centred on the Harbour CBD
- **Central River City**: Based on Greater Parramatta
- **Western Parkland City**: Focused on the future Airport and Aerotropolis.

The *Greater Sydney Region Plan* has been developed concurrently with the *Future Transport Strategy 2056* and the *State Infrastructure Strategy 2018 – 2038.* Together, these plans align land use, transport and infrastructure outcomes across Greater Sydney to facilitate the delivery of 725,000 new dwellings and 817,000 new jobs by 2036.

The four themes of Infrastructure and Collaboration, Liveability, Productivity and Sustainability shape the ten directions that will initiate the delivery of the *Greater Sydney Region Plan,* shown in Figure 2-18.

Figure 2-18 Alignment of the Greater Sydney Region Plan four themes and ten directions

Source: Transport for NSW, 2018

A total of 40 objectives have been outlined which align with the themes and directions presented in Figure 2-18. Of these objectives, those that are most relevant to Aerotropolis include:

- Objective 12: Great places that bring people together
- Objective 14: A Metropolis of Three Cities – integrated land use and transport creates walkable and 30-minute cities
- Objective 15: The Eastern, GPOP and Western Economic Corridors are better connected and more competitive
- Objective 16: Freight and logistics network is competitive and efficient
- Objective 20: The Airport and Aerotropolis are economic catalysts for the Western Parkland City.

The *Greater Sydney Region Plan* aligns directly with *Future Transport Strategy 2056* through the Movement and Place framework and the 30-minute city by supporting the liveability, productivity and sustainability of Greater Sydney.

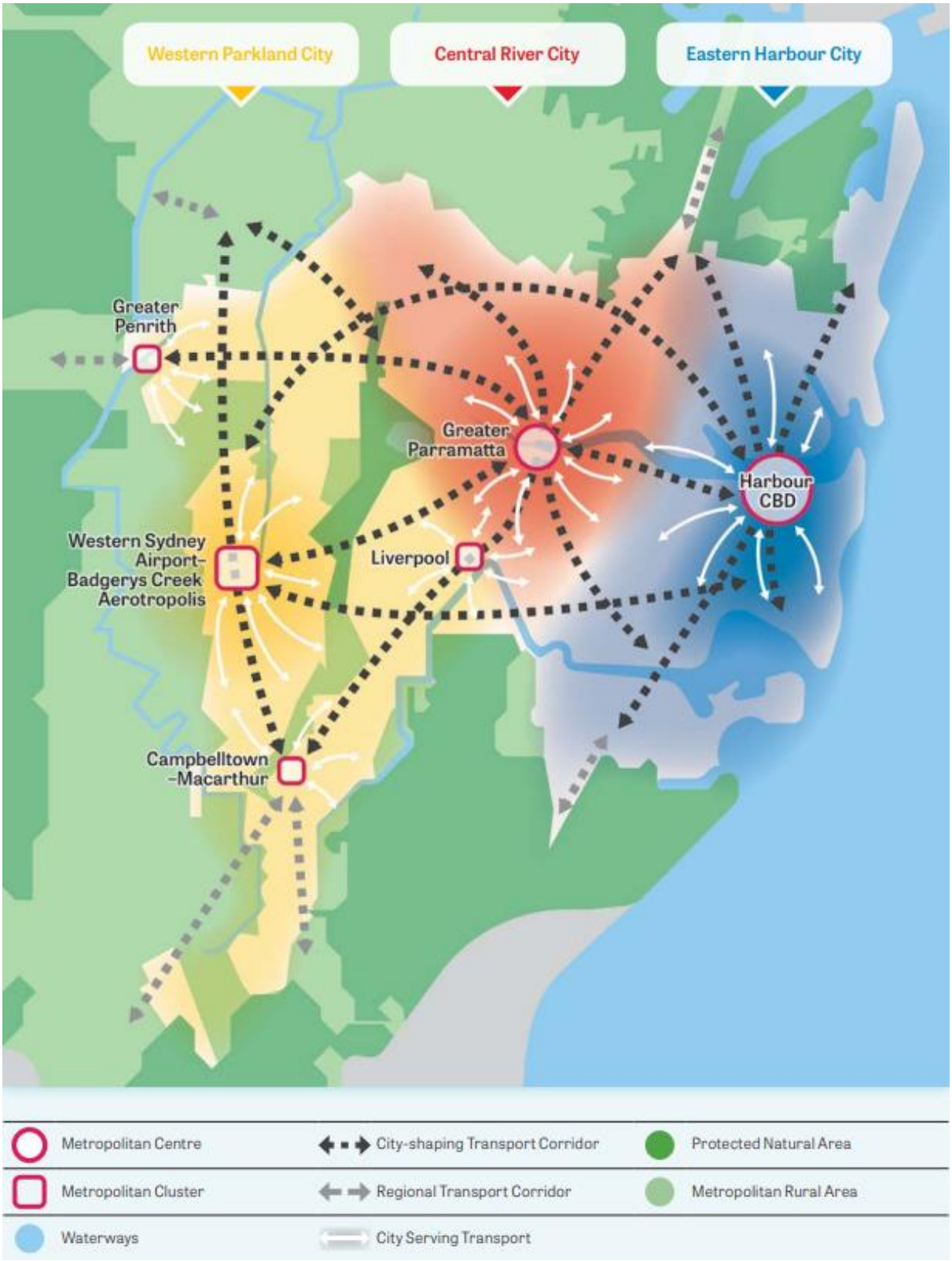


Figure 2-19 The three-city concept

Source: Greater Sydney Commission, 2018

2.3.2 Western City District Plan

The *Western City District Plan* is a district-level guide for the implementation of the *Greater Sydney Region Plan* over a 20-year period.

The *Western City District Plan* aims to facilitate the 40-year vision for Greater Sydney and covers the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly Local Government Areas.

The Aerotropolis is located in the Penrith City Council and Liverpool City Council Local Government Areas and within the Western Parkland City.

The population of the Western Parkland City is projected to grow from 740,000 in 2016 to 1.1 million by 2036, and to well over 1.5 million by 2056. The following vision has been set for the Western Parkland City to support this growth:

> *The city will be established on the strength of the new Airport and Aerotropolis. It will be a polycentric city capitalising on the established centres of Liverpool, Greater Penrith and Campbelltown-Macarthur.*
>
> *New city-shaping transport and the airport will make the city the most connected place in Australia. The Commonwealth and NSW Governments will deliver the first stage of Sydney Metro Western Sydney Airport from St Marys to Airport and Aerotropolis. A potential new east-west mass transit corridor will connect the Western Parkland City to the Central River City. In the long term a potential Outer Sydney Orbital will provide the city with direct connections to Greater Newcastle, Wollongong and Canberra.*
>
> *A Western Economic Corridor will attract globally significant defence and aerospace activities and contribute to a strong trade, freight, logistics, advanced manufacturing, health, education and science economy. This will produce knowledge-intensive jobs close to areas of high population growth and drive the development of the corridor and the metropolitan cluster.*
>
> *The city will include housing diversity around centres and transit nodes. A future investigation area from Greater Penrith to Eastern Creek will link existing areas and major infrastructure. The Greater*

The *Western City District Plan* outlines 22 planning priorities, each with a number of actions which correspond with the ten directions developed in the *Greater Sydney Region Plan*. These planning priorities and 92 actions are distributed between five key themes:

- Infrastructure and collaboration
- Liveability
- Productivity
- Sustainability
- Implementation.

The *Western City District Plan* identifies the Western Sydney Aerotropolis as a Metropolitan Cluster, and plans to strengthen it through:

- Delivering more and a greater diversity of jobs closer to where people live
- Growing existing industry sectors such as aerospace and defence, tourism, agriculture and freight and logistics
- High quality transport corridors and connections.

The planning priorities and their corresponding actions most relevant to the Western Sydney Aerotropolis include:

- Planning Priority W5: Providing housing supply, choice and affordability with access to jobs, services and public transport

- Planning Priority W7: Establishing the land use and transport structure to deliver a liveable, productive and sustainable Western Parkland City
- Planning Priority W8: Leveraging industry opportunities from the Airport and Aerotropolis
- Planning Priority W9: Growing and strengthening the Metropolitan Cluster
- Planning Priority W10: Maximising freight and logistics opportunities and planning and managing industrial and urban services land
- Planning Priority W11: Growing investment, business opportunities and jobs in strategic centres
- Planning Priority W13: Creating a Parkland city urban structure and identity, with South Creek as a defining special element
- Planning Priority W15: Increasing urban tree canopy cover and delivering GreenGrid connections
- Planning Priority W18: Delivering high quality open space.

The 30-minute city has also been outlined to guide decision-making on new locations for transport, housing, jobs, tertiary education, hospitals and other amenities within the Western Parkland City. Connecting people via public transport access to their closest Metropolitan Centre or Strategic Centre within 30 minutes will enable efficient access to workplaces, services and community facilities.

The extent of the Western Parkland City is shown in Figure 2-20.

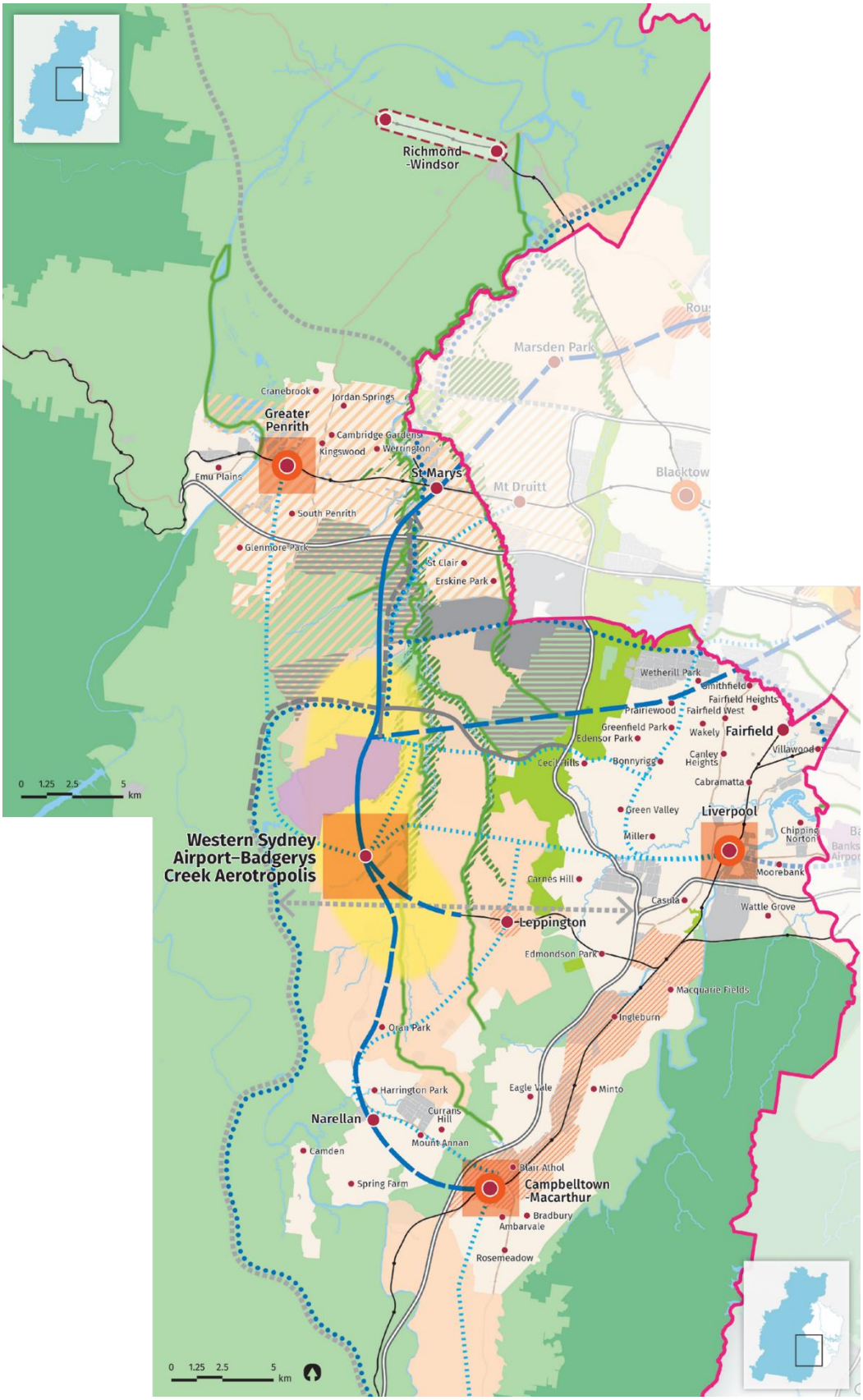


Figure 2-20 Western Parkland City urban area

Source: Greater Sydney Commission, 2018

2.3.3 Greater Sydney Services and Infrastructure Plan

The *Greater Sydney Services and Infrastructure Plan* is a transport blueprint designed to facilitate the growth of Greater Sydney over the next 40 years.

The *Greater Sydney Services and Infrastructure Plan* supports the whole-of-government approach to Greater Sydney becoming a metropolis of three cities, outlined in Section 2.3.1. The *Greater Sydney Services and Infrastructure Plan* aims for people to have access to jobs and services in their nearest Metropolitan Centre and Strategic Centre within 30 minutes by public transport, seven days a week. The 30-minute city concept has been based on research which indicates that travelling more than 60 minutes a day impacts on quality of life and liveability.

There are two components to the 30-minute city concept within Greater Sydney:

- Connecting people in each city to their nearest Metropolitan Centre or Cluster; Harbour CBD, Greater Parramatta, Airport -Aerotropolis, Greater Penrith, Liverpool and Campbelltown-Macarthur.
- Connecting residents in each of the five districts to one of their Strategic Centres by public and active transport, giving people 30-minute access to local jobs, goods and services.

The 30-minute city directly aligns with the customer outcomes of *Future Strategy Transport 2056.*

Figure 2-21 outlines 30-minute public transport catchment areas for the Metropolitan Centres and Metropolitan Clusters of Greater Sydney.

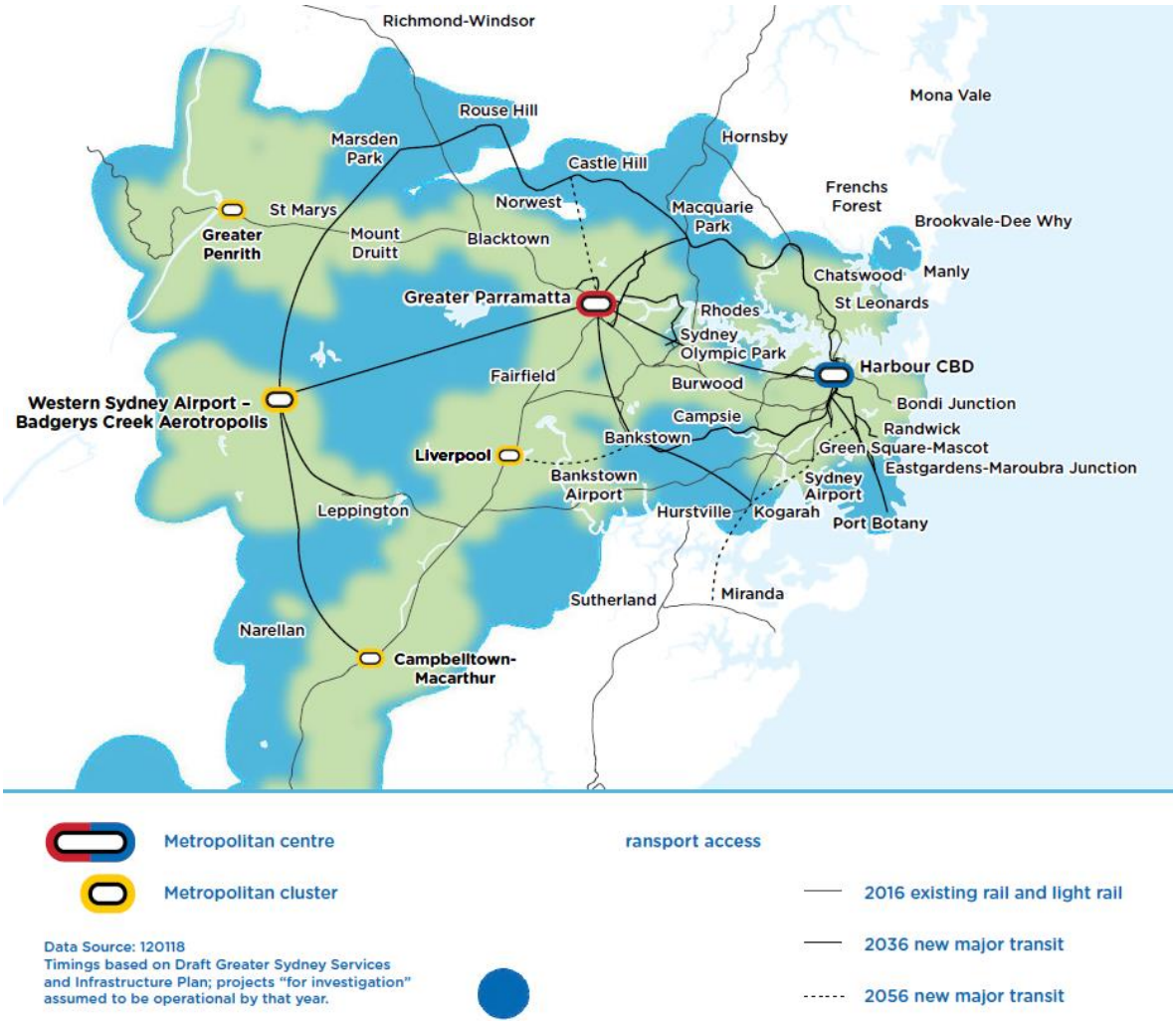


Figure 2-21 Areas accessible within 30-minutes by public transport in Greater Sydney in 2016, 2036 and 2056

Source: Transport for NSW, 2018

To support the vision for Greater Sydney, the NSW Government has developed a vision for the transport system to enable people and goods to move around the city efficiently and reliably adhering to the 30-minute city concept through the use of three types of transport corridors:

- City-shaping corridors – major trunk road and rail public transport corridors providing higher speed and capacity linkages
- City-serving corridors – higher density corridors concentrated within approximately ten kilometres of Metropolitan Centres providing high frequency access with more frequent stopping patterns
- Centre-serving corridors – corridors that support local trips to connect people with their nearest centre and transport node.

Figure 2-22 outlines the proposed strategic transport corridors within Greater Sydney.

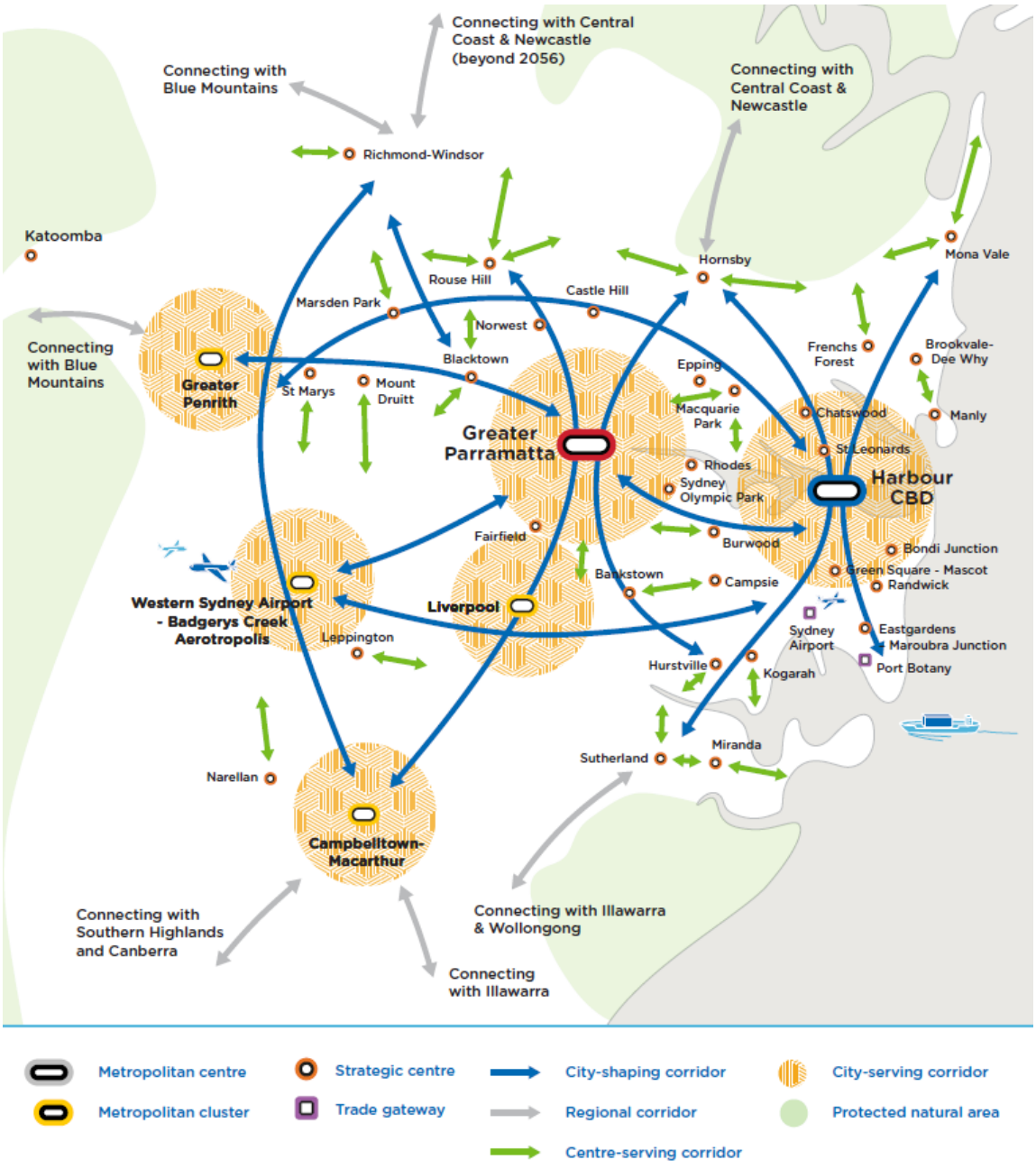


Figure 2-22 Proposed strategic transport corridors within Greater Sydney

Source: Transport for NSW, 2018

Figure 2-23 presents the vision for the city-shaping transport network in 2056.

The city-shaping network includes higher speed and volume linkages between Metropolitan Centres and Metropolitan Clusters / Strategic Centres. The network is expected to enable people living in any of the three cities to access their nearest Metropolitan Centre within 30 minutes and to be able to travel efficiently between the Metropolitan Centres.

As Greater Sydney transitions to a metropolis of three cities, the city-shaping network will expand to provide improved access to and between each Metropolitan Centres / Metropolitan Cluster, particularly Greater Parramatta and centres in the Western Parkland City.

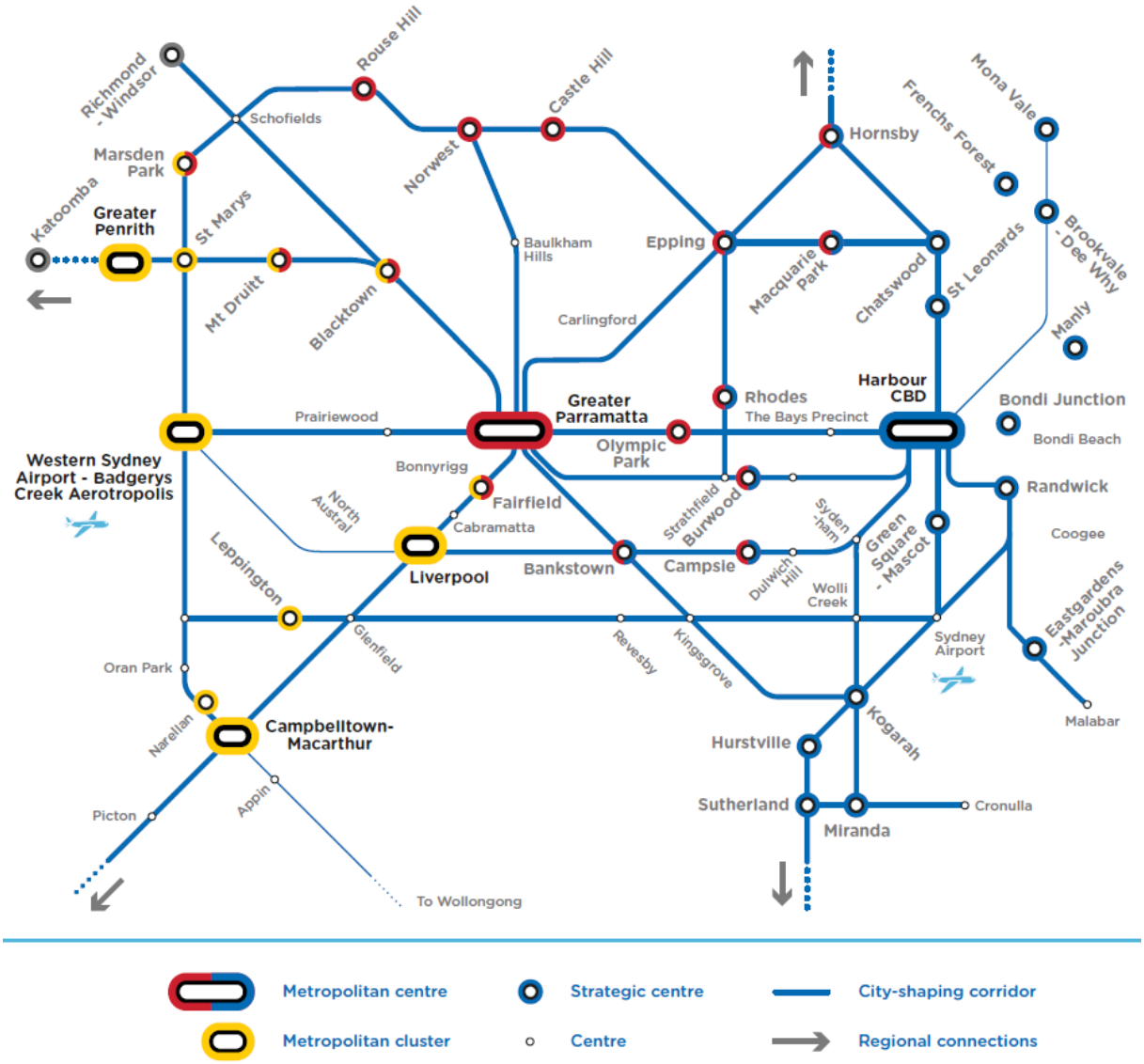


Figure 2-23 Greater Sydney city-shaping transport network vision

Source: Transport for NSW, 2018

Figure 2-24 presents the vision for the city-serving transport network in 2056.

The city-serving network will provide high-frequency services within a ten kilometre radii of Metropolitan Centres. This network is expected to support access within some of the densest land use in Greater Sydney where demand is most concentrated.

Figure 2-24 Greater Sydney city-serving transport network vision

Source: Transport for NSW, 2018

The *Greater Sydney Services and Infrastructure Plan* also outlines the strategic road network, which facilitates the movement of public transport, freight and private vehicles.

The future vision for the strategic road network by 2056 has been developed based on committed initiatives and initiatives for investigation, aligning with the city-shaping transport network outlined previously. In addition to supporting some city-shaping public transport services, the strategic road network also facilitates the movement of through traffic; separating this from centres.

The future vision for the 2026, 2036 and 2056 strategic road network includes:

- 2026 network with initiatives for investigation: over the next ten years Transport for NSW will investigate improvements to the strategic road network, focusing on connectivity to the south, with detailed planning of further stages of the M6 Extension, capacity upgrades on the movement corridors that surround Greater Parramatta and early investigations into road upgrades to support priority growth precincts around Wilton and Greater Macarthur.
- 2036 network with initiatives for investigation: the priority investment to be investigated in the next ten to 20 years is the Outer Sydney Orbital Motorway. This will boost capacity to the Airport and Aerotropolis from the north and form the first stage of an outer Greater Sydney bypass. Transport for NSW will also investigate the Parramatta Outer Ring Road, to reduce pressure on roads within the Metropolitan Centre, enabling them to support local journeys and a higher Place function.
- 2056 network with visionary initiatives: the longer-term strategic road network initiatives are expected to address remaining missing links in the motorway network, providing a network of high-capacity movement corridors across the three cities. The Outer Sydney Orbital is expected to provide an outer bypass of Greater Sydney, connecting the Central Coast, Western Parkland City and Illawarra. Investment in a north-south strategic road corridor east of Parramatta will improve access and support better places by enabling local roads to support local journeys.

Figure 2-25 presents the 2056 vision for the strategic road network within Greater Sydney

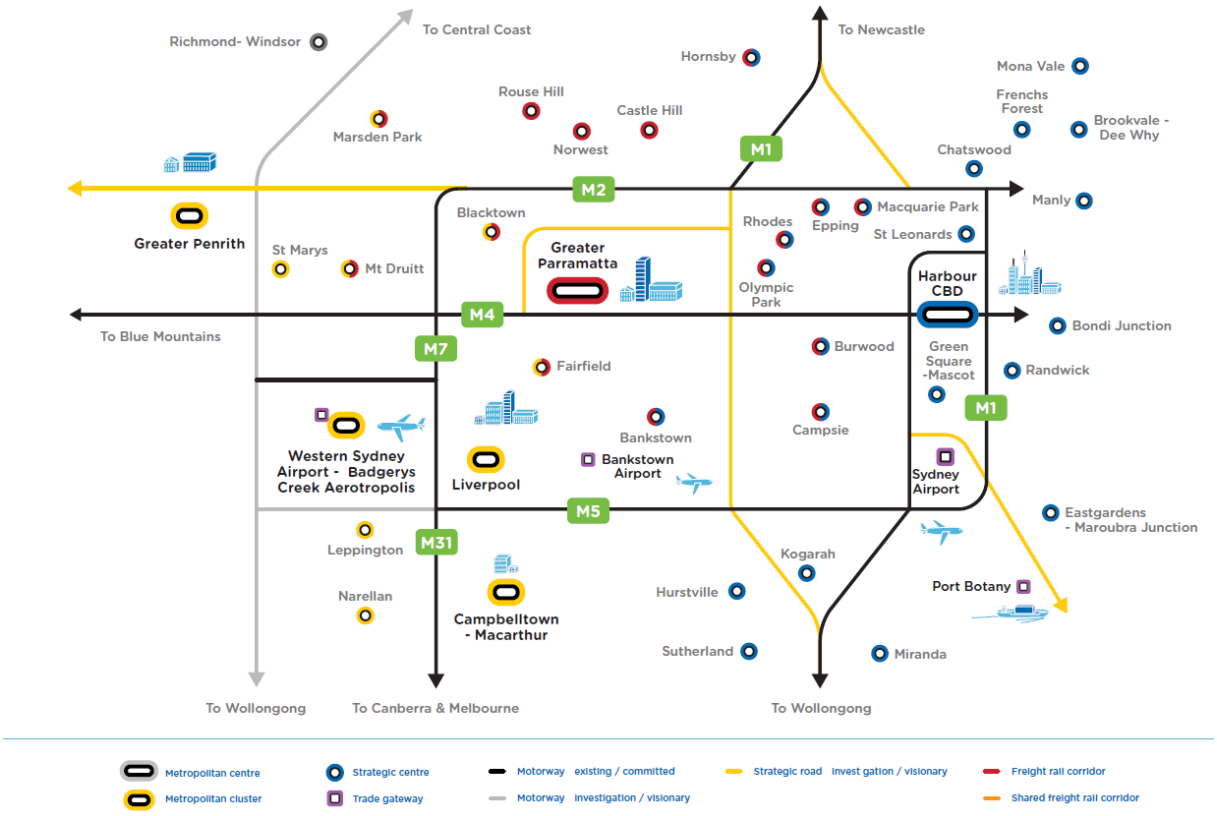


Figure 2-25 Greater Sydney strategic road network vision for 2056

Source: Transport for NSW, 2018

The *Greater Sydney Services and Infrastructure Plan* identifies the important roles walking and particularly cycling have to play in the future for short trips around centres and local areas. These short trips may be for access to shops, services, schools, entertainment and connect to metro, train, bus, ferry or light rail services. Cycling as a mode has significant health benefits, in addition to creating places, lowering carbon emissions, improving access to public transport services and reducing the cost of travel for customers and the community.

The Principal Bicycle Network is the network of major bike corridors across Greater Sydney. In addition to supporting longer distance cycling journeys, the individual components have an important role in supporting shorter distance city-serving and centre-serving journeys.

The future vision for the 2026, 2036 and 2056 Principle Bicycle Network includes:

- 2026 network with initiatives for investigation: a connected cycle network to the Harbour CBD and Greater Parramatta, offering improved safety and convenience of cycling around these centres and increasing liveability by supporting Place-based planning and delivery of great places. Walking and cycling network coverage will be improved by using state-held corridors for public transport, pipelines, waterways, crown land and service easements for bicycle infrastructure.
- 2036 network with initiatives for investigation: by 2036, Transport for NSW proposed that all Strategic Centres will have connected walking and cycling networks, including those across the Western Parkland City.
- 2056 network with visionary initiatives: further investment in connections to Strategic Centres and in the Principle Bicycle Network is expected to support walking or cycling being the most convenient mode for short trips, improving health outcomes, safety and convenience for customers as well as boosting the productivity, liveability and sustainability of Greater Sydney.

Figure 2-26 presents the 2056 vision for the Principle Bicycle Network within Greater Sydney.

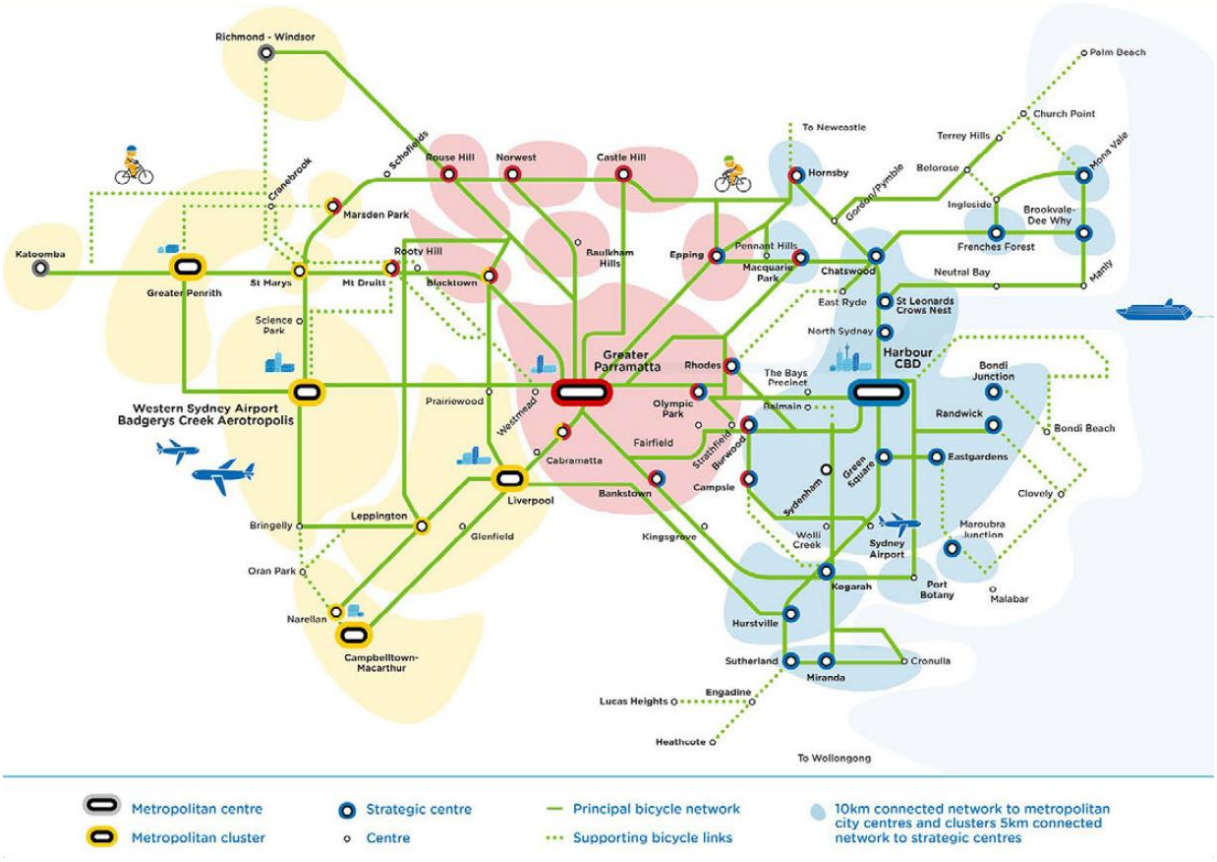


Figure 2-26 Greater Sydney Principal Bicycle Network vision for 2056

Source: Transport for NSW, 2018

The strategic freight network in Greater Sydney includes the most significant corridors that support the efficient movement of goods; connecting trade gateways, freight precincts, centres and regions.

The total freight task in Greater Sydney is expected to nearly double over the next 40 years. To support this, the future vision for the 2026, 2036 and 2056 strategic freight network includes:

- 2026 network with initiatives for investigation: improved access to trade gateways in the Western Parkland City, additional rail capacity for container movement and the protection of future corridors to ensure links can be delivered and that land use is aligned with the long-term network vision.
- 2036 network with initiatives for investigation: the network will enable 24/7 freight rail access between ports and intermodal terminals. East-west freight rail capacity will be boosted by the Western Sydney Freight Line, facilitating movement of containerised goods by rail between Port Botany and the Western Sydney Intermodal Terminal near the Western Sydney Aerotropolis.
- 2056 network with visionary initiatives: north-south and east-west links in the Western Parkland City to support the growth in freight volumes and help manage pressure on local roads by enabling more goods to be moved by rail or on strategic roads:
    - As freight demand grows, significant investment in the Western Parkland City will be required given the expected concentration of consolidation and distribution facilities in this area. The Outer Sydney Orbital will enable goods, particularly from outside Greater Sydney, to efficiently access these facilities. It will also help reduce pressure on north-south connections in the Eastern City and Central City.
    - Higher capacity north-south links would be supported by additional capacity on the east-west road corridor between Liverpool and the Outer Sydney Orbital. Additional capacity on this corridor would support access to freight facilities near Liverpool from the Outer Sydney Orbital, managing pressure on the M7 and reducing pressure on local roads.

The strategic freight network vision for 2056 is shown in Figure 2-27.

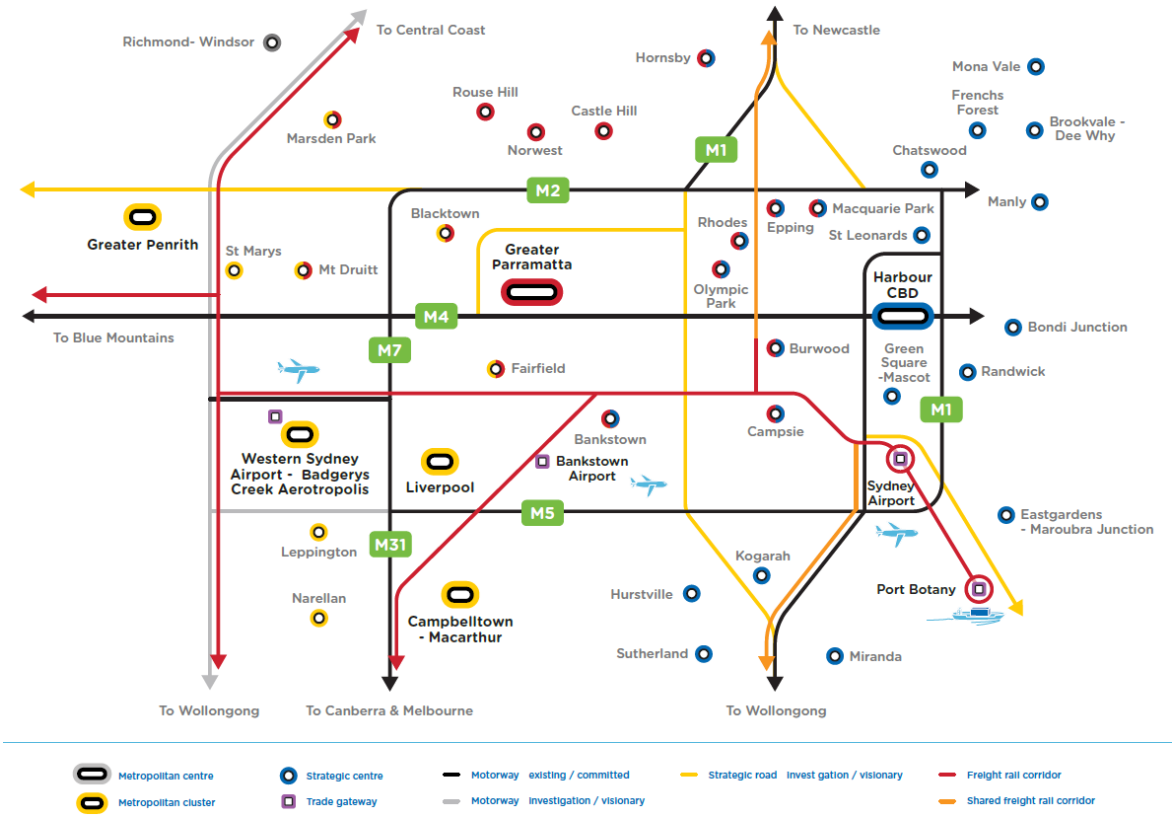


Figure 2-27 Greater Sydney strategic freight network vision for 2056

Source: Transport for NSW, 2018

The *Greater Sydney Services and Infrastructure Plan* identifies targeted investment opportunities in services and infrastructure in order to achieve the outcomes of *Future Transport Strategy 2056* and the future networks outlined above. Policy, service and infrastructure opportunities sit within four types of initiatives shown in Figure 2-28.

Figure 2-28 Services and Infrastructure Plan types of initiatives

The initiatives relevant to the Western Sydney Aerotropolis and the Western Parkland City include:

- Committed initiatives (0-10 years):
  - Construction of M12 Motorway
  - Priority Cycleway links in the Western Parkland City
  - Western Sydney Growth Roads Program
  - Sydney Metro Western Sydney Airport (St Marys to the Aerotropolis via the Airport)
  - Rapid Bus Routes between Aerotropolis, Penrith, Liverpool, Campbelltown-Macarthur[1]
- Initiatives for investigation (0-10 years):
  - Sydney Metro Western Sydney Airport extensions (Tallawong to St Marys and the Aerotropolis to Campbelltown-Macarthur)
  - Extension of the South West Rail Link from Leppington to the Airport via the Aerotropolis
  - Aerotropolis to Parramatta Rail Link
  - Infrastructure to support rapid bus connections and improved bus connections between Aerotropolis and Penrith, Liverpool, Blacktown and Campbelltown-Macarthur
  - City-shaping corridor for the Aerotropolis and Leppington (to Sydney Kingsford-Smith Airport)
  - City-serving bus connections for the Aerotropolis, Liverpool, Greater Penrith and Campbelltown-Macarthur
  - Western Parkland City bus interchange
- Initiatives for investigation (10-20 years):
  - Outer Sydney Orbital from Great Western Highway to the Aerotropolis

[1] While this is labelled as an 'Initiative for Investigation (0-10 years)' in the *Greater Sydney and Services Infrastructure Plan*, this has been superseded by the *Western Sydney City Deal* which has made this a committed initiative.

- Safe cycleway network within ten kilometres of Greater Penrith, Liverpool, Campbelltown-Macarthur and the Aerotropolis
- Western Sydney Freight Line

- Visionary initiatives (20+ years):
  - Sydney Metro City and Southwest extension to Liverpool
  - M5 Motorway extension from Liverpool to Outer Sydney Orbital
  - Aerotropolis inner and outer ring roads
  - Outer Sydney Orbital from Great Western Highway to Central Coast and from the Aerotropolis to Hume Highway and Illawarra
  - Further investment in active transport connections to Strategic Centres and in the Principal Bicycle Network.

2.3.4 NSW Freight and Ports Plan 2018-2023

The *NSW Freight and Ports Plan 2018-2023* (the Plan) outlines the strategy for government and industry to collaborate together in order to make freight more efficient and safer in order to enable future movement and growth in within NSW. The Plan is a supporting document to *Future Transport Strategy 2056* and aligns with the *Greater Sydney Region Plan,* District Plans and *the State Infrastructure Strategy.*

The Plan identifies key issues that NSW Government agencies, the Australian Government and Local Councils need to consider and incorporate into land use and infrastructure planning to meet the demand of freight in the future, as outlined in Figure 2-29.

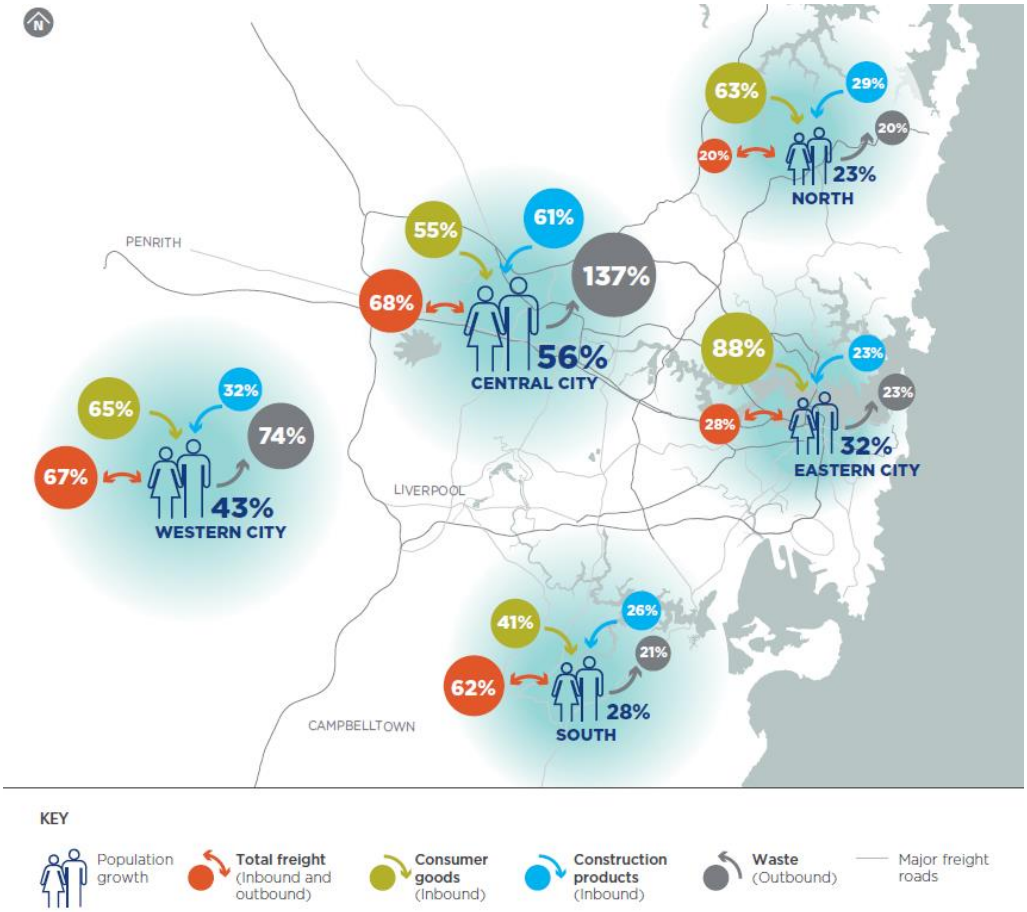


Figure 2-29 Greater Sydney population growth and changes in freight demand to 2036

Source: Transport for NSW, 2018

Responding to these issues, five key objectives have been identified, as presented in Figure 2-30.

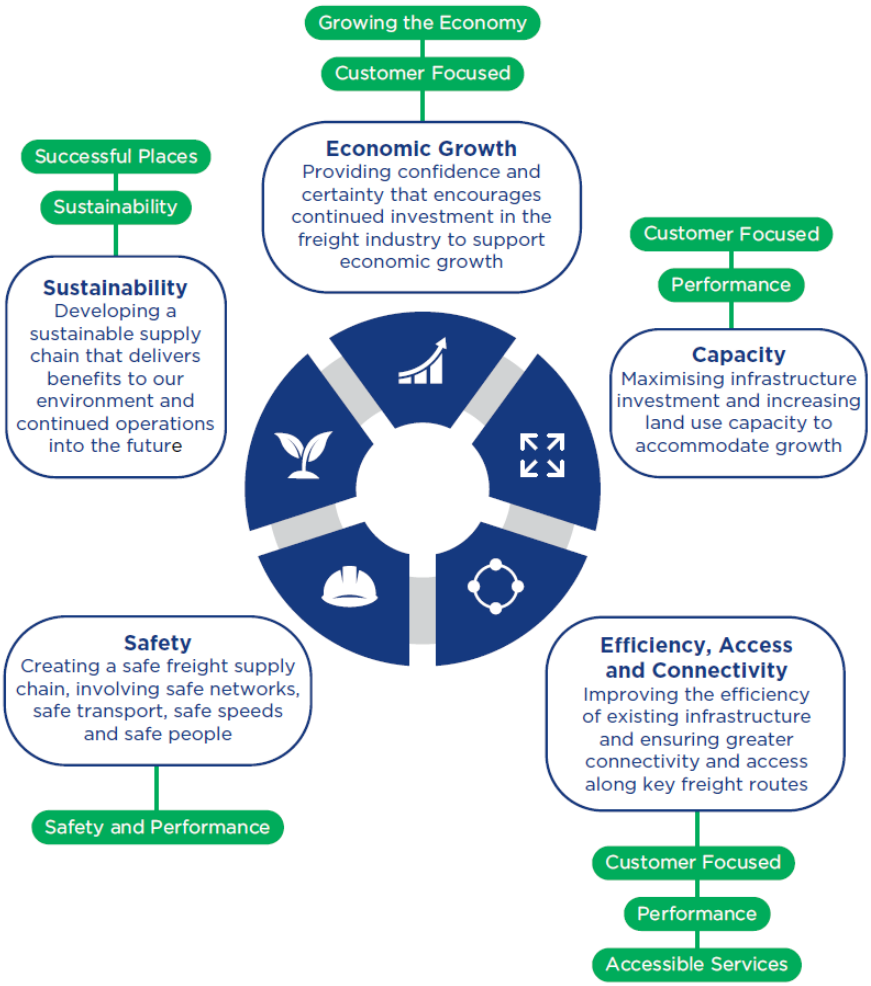


Figure 2-30 NSW Freight and Ports Plan key objectives

Source: Transport for NSW, 2018

Each key objective is broken down further into goals and actions for the NSW Government. The goals which will have an impact on the future of freight within the Aerotropolis are set out below:

- Improve freight data
- Support the use of technology to improve efficiency and productivity
- Manage freight in urban centres
- Deliver new infrastructure to increase rail freight capacity
- Deliver new infrastructure to increase road freight capacity and improve safety
- Deliver new pipelines to increase capacity
- Protect land needed for freight and logistics uses and infrastructure
- Safer networks, transport, speeds and people
- Support initiatives to reduce freight emissions
- Manage the noise impacts of freight.

Progress of these goals will be measured against strategic targets which are detailed in the Plan.

2.3.5 Infrastructure Australia Outer Urban Public Transport Paper

Infrastructure Australia published the *Outer Urban Public Transport Paper* in 2018 as part of is Reform Series with the aim to improve public transport accessibility in lower-density areas. The paper assesses the quality and accessibility of public transport services in Australia's five largest cities, including Greater Sydney.

The *Outer Urban Public Transport Paper* outlines and quantifies the existing public transport disadvantage and challenge around investment, operation and services:

- Public transport disadvantage in outer suburbs is significant. Access to public transport services and service frequencies are lower, while travel times and distances to major employment centres are longer in outer suburbs.
- Public transport usage is lower for people living and working in the outer suburbs. Fewer people use public transport in outer suburbs, and those who do are more likely to also need to drive to reach local services.
- Car operating costs are higher in the outer suburbs. People in the outer suburbs pay more for operating their vehicles. A significant part of the costs is from fuel, lubricants, and additives, which increases as people travel longer distances.

Infrastructure Australia establishes a reform agenda through seven key recommendations for future action around public transport in outer Australian suburbs:

- Prioritise the seamless integration of transport networks for users by coordinating service planning, timetabling, fare policy, digital tools and operations
- Embrace innovation and new modes
- Implement a coordinated policy approach to encourage interchanging within an integrated transport network
- Improve the physical integration of the public transport network with private, active and emerging transport modes
- Embrace technological innovation in transport, working with third-party operators to improve the user experience
- Undertake integrated land use and transport planning to examine opportunities for employment and residential densification at key sites adjacent to public transport
- Support the development and growth of suburban and outer urban employment centres to improve job accessibility.

2.3.6 Western Sydney Rail Needs Scoping Study

The Commonwealth and New South Wales Governments undertook the joint *Western Sydney Rail Needs Scoping Study* to determine the long-term need, timing and service options for passenger rail to service both Western Sydney and the Airport. This was conducted in collaboration between the Commonwealth Government's Department of Infrastructure, Regional Development and Cities and the New South Wales Government's Transport for NSW.

The findings and recommendations that are most relevant to the Aerotropolis include:

- Finding 1: There is an urgent need to strengthen capacity and manage growing transport demand between Western Sydney and the Harbour CBD
- Finding 2: A North-South Link could be a game-changer for Western Sydney
- Finding 3: There are strong economic grounds for an East-West Link that will connect the three cities and support a broader Airport catchment
- Finding 4: Protecting the South West Link corridor from Leppington to the Aerotropolis interchange, south of the Airport, would support growing communities in the southwest
- Finding 5: Rail could play an important role in shaping Western Sydney, but it is not essential to the success of the Airport at opening in 2026.

2.3.7 Western Sydney Aerotropolis Plan

The *Western Sydney Aerotropolis Plan*, developed by the Western Sydney Planning Partnership sets a vision and planning framework for the Aerotropolis as a gateway to Australia and Greater Sydney, built around the Airport.

A comprehensive vision has been developed for the Aerotropolis:

> *The Aerotropolis is Australia's newest global gateway, built around the world-class Airport. Its evolution has driven transformational change in the Western Parkland City. Development is framed around the Wianamatta–South Creek corridor and an expansive network of parklands and waterways to realise the cool and connected Western Parkland City. Above all, it respects and connects Country. It creates opportunity, amenity and sustainability for workers and residents in Western Sydney.*
>
> *It nurtures the industry of the future. It contributes to greater productivity and a significant increase in jobs for Western Sydney in areas such as defence and aerospace, advanced manufacturing, technology, agribusiness, health, education, research and tourism.*
>
> *A diversity of housing in parts of the Aerotropolis Core, Northern Gateway and Rossmore precincts provide a vibrant and living city, protected from the 24/7 operations of the Airport. Centres are easy to walk around, with quality public areas and a mix of social and cultural infrastructure.*
>
> *The Aerotropolis is low carbon, featuring next-generation energy, waste and water infrastructure. Circular economy principles minimise waste and pollution, retain water in the environment, reuse energy and regenerate natural systems to increase the tree canopy and urban cooling. Sustainable food production in the Agribusiness Precinct minimises food miles and reduces food wastage.*
>
> *Sustainable urban connections include efficient and accessible public transport links, walking and cycling facilities, smart technologies and an efficient road network. Efficient freight movements are mainly by rail. People and business can access key centres in the Western Parkland City and Greater Sydney.*
>
> *The Aerotropolis accommodates high value jobs closer to where people live. It is an accessible, innovative 24-hour metropolitan centre, connected globally, nationally, locally and digitally.*

The *Western Sydney Aerotropolis Plan* aims to drive strategic and integrated planning across different levels of government and collaboration between agencies and stakeholders.

The *Western Sydney Aerotropolis Plan* outlines a sequenced approach to precinct planning, aiming to optimise major infrastructure and to activate the Aerotropolis. The *Western Sydney Aerotropolis Plan* outlines ten precincts within Aerotropolis, with six of these to be the focus of the initial precinct planning work; Aerotropolis Core, Agribusiness, Badgerys Creek, Mamre Road, Northern Gateway and Wianamatta – South Creek.

Detailed precinct planning will propose the staging and sequencing of development within and between these precincts, optimising infrastructure provision.

The *Western Sydney Aerotropolis Plan* aligns with the *Greater Sydney Region Plan* and the *Western City District Plan*, and sits above the following suite of policy documents:

- *Western Sydney Aerotropolis State Environmental Planning Policy*
- *Western Sydney Aerotropolis Development Control Plan – Phase 1 and Phase 2*
- State and Local Infrastructure Contribution Plans
- Individual Precinct Plans.

The *Western Sydney Aerotropolis Plan* will be implemented through a statutory planning framework that includes the *Western Sydney Aerotropolis State Environmental Planning Policy* and Development Control Plan. This statutory planning framework will guide the detailed precinct planning and master planning, promoting exemplary design outcomes and implementing detailed development controls to achieve the Aerotropolis vision.

Four themes have been identified within the *Western Sydney Aerotropolis Plan* to guide planning within the Aerotropolis. A total of 11 principles then align with these themes, supported by an additional 50 principles. Figure 2-31 outlines the themes and objectives.

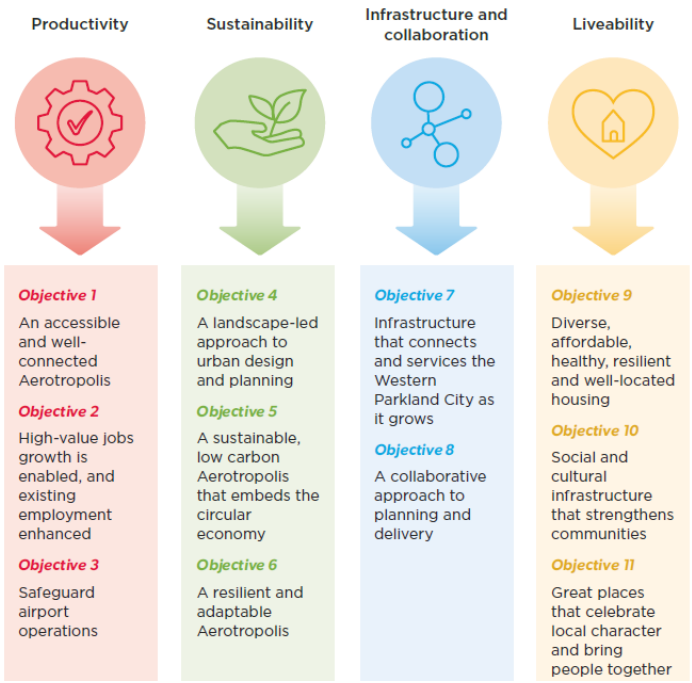


Figure 2-31 Western Sydney Aerotropolis Plan themes and objectives

Source: Western Sydney Planning Partnership, 2020

An overarching objective has been identified to underpin the *Western Sydney Aerotropolis Plan* and be integrated into all planning:

> *Acknowledge Traditional Custodians and provide opportunities for Connecting with Country, Designing for Country and Caring for Country in all stages of planning for the Aerotropolis.*

2.3.8 Western Sydney Aerotropolis State Environmental Planning Policy

The *Western Sydney Aerotropolis State Environmental Planning Policy* is a New South Wales legislative document which will provide statutory weight to the planning and development of land around the Airport and will implement the *Western Sydney Aerotropolis Plan*. The State Environmental Planning Policy aims to:

- To facilitate development in the Aerotropolis in accordance with the objectives and principles of the *Western Sydney Aerotropolis Plan*, outlined in Section 2.3.7
- To promote sustainable, orderly and transformational development in the Aerotropolis
- To ensure development is compatible with the long-term growth and development of the Airport (including in relation to 24-hour operations) and other critical transport infrastructure
- To promote employment and world-class innovation and provide for residential development in suitable locations
- To recognise the physical and cultural connection of the local Aboriginal community to the land and to incorporate local Aboriginal knowledge, culture and tradition into development
- To preserve land for future infrastructure development
- To protect, maintain and enhance, and to minimise the impact of development on, trees and vegetation, soil quality and the health of waterways and to contribute to the conservation of biodiversity
- To recognise and protect the ecological and cultural value of Wianamatta–South Creek.

The *Western Sydney Aerotropolis State Environmental Planning Policy* applies to the 11,200-hectare area surrounding the Airport, including all precincts except Mamre Road.

A combination of new and existing zones will be applied in the *Western Sydney Aerotropolis State Environmental Planning Policy* to enable unique development opportunities within the Aerotropolis. The following five land use zones have been adopted for the precincts, presented in Figure 2-32:

- Enterprise Zone: land where enterprise uses are supported while mitigating impacts of the Airport operations. Residential development and other noise sensitive uses are not permitted
- Agribusiness Zone: to support high-tech agribusiness uses, including freight, logistics and horticulture in the Agribusiness precinct
- Mixed Use Zone: mixed flexible employment, residential and noise sensitive uses on land not affected by the ANEC/ANEF 20 and above contours in high amenity areas and areas well connected to public transport
- SP2 Infrastructure Zone: new and existing road and rail corridors, transport facilities, land required for utilities, Airport and associated land in Commonwealth ownership to support the Airport operations. The *Western Sydney Aerotropolis State Environmental Planning Policy* will need to be amended to accommodate infrastructure as it is planned and as corridor and site boundaries are further refined
- Environment and Recreation Zone: most of the Wianamatta–South Creek precinct and other areas identified for conservation, biodiversity and recreational uses.

The *Western Sydney Aerotropolis State Environmental Planning Policy* further outlines the objectives of each zone, development which is permitted with and without consent and those that are prohibited. Additional sections of the *Western Sydney Aerotropolis State Environmental Planning Policy* outline Airport safeguards and general development controls, design excellence, exempt development and precinct plans and master plans.

The *Western Sydney Aerotropolis State Environmental Planning Policy* allows for out-of-sequence development provided that a number of criteria have been met. These include: not impacting the servicing of initial precincts; not impacting Airport operations; and ensuring that utility infrastructure is available.

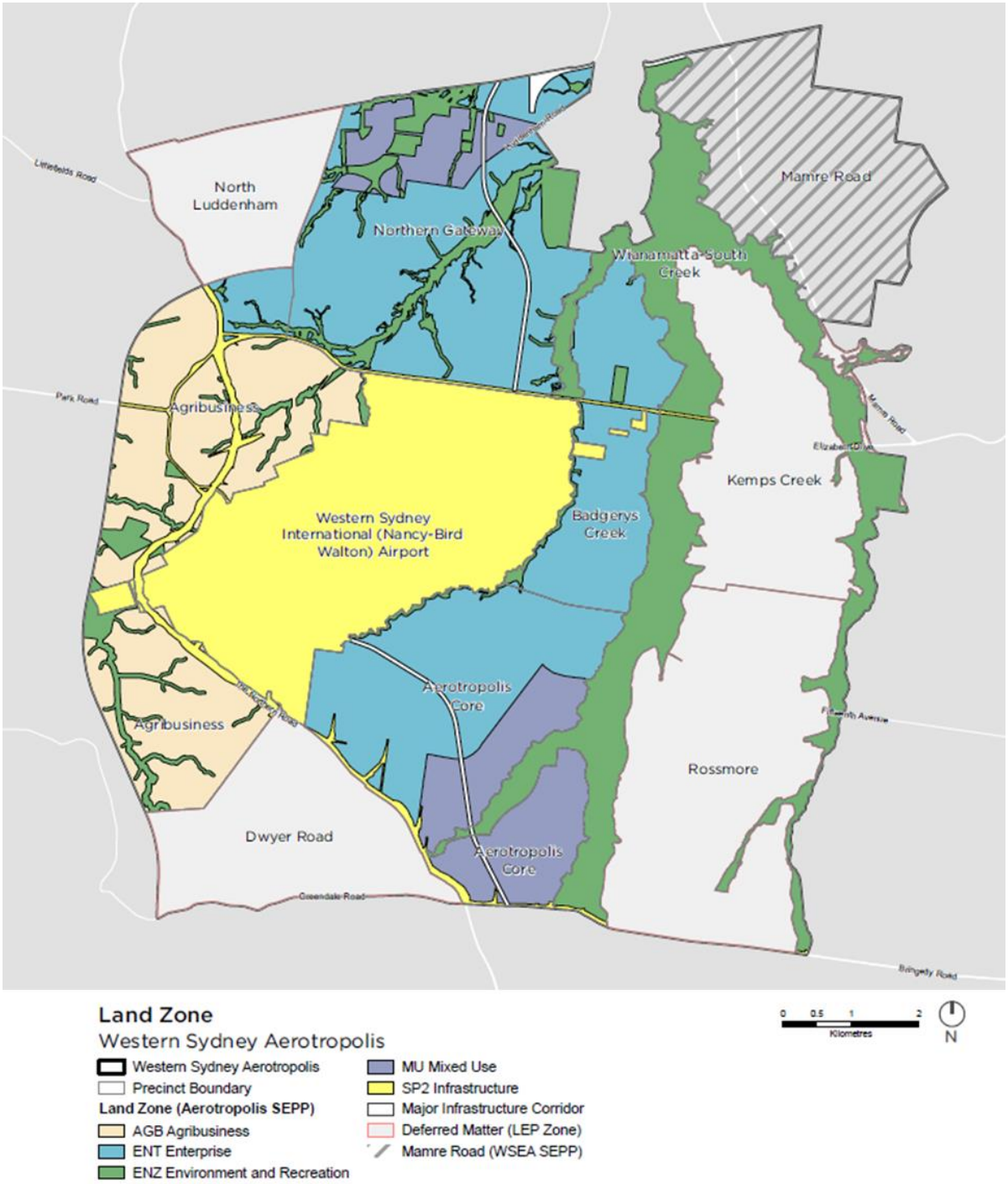


Figure 2-32 Aerotropolis land use zoning

Source: Western Sydney Planning Partnership, 2020

2.3.9 Western Sydney Aerotropolis Development Control Plan Phase 1

Phase 1 of the *Western Sydney Aerotropolis Development Control Plan* identifies the precinct planning principles, objectives and performance outcomes to allow precinct planning to progress within the Aerotropolis. The Draft Development Control Plan provides controls to achieve, connectivity, liveability, productivity and sustainability by:

- Giving effect to the *Greater Sydney Region Plan* and the *Western City District Plan*
- Encouraging development that responds to its context and is compatible with the Principles set out in the *Western Sydney Aerotropolis Plan*
- Recognising and reinforcing the distinctive characteristics of the Western Parkland City
- Adopting the principles set out in Government Architect of NSW's *Better Placed and Greener Places*
- Building upon the objectives and principles under the *Western Sydney Aerotropolis Plan* and *Western Sydney Aerotropolis Plan State Environmental Planning Policy*
- Protecting and enhancing the green and blue assets of the area
- Safeguarding the airport operations of the Airport
- Encouraging design that maintains and enhances the character and heritage significance of Aboriginal and European heritage items and heritage conservation areas
- Encouraging ecologically sustainable development and reducing the impacts of development on the environment.

2.3.10 Fifteenth Avenue Smart Transit Corridor Design Framework

The Fifteenth Avenue Smart Transit (FAST) Corridor Design Framework outlines Liverpool City Council's vision to deliver a place-led transit corridor between Liverpool city centre and the Western Sydney International (Nancy-Bird Walton) Airport (Airport). The corridor is expected to support significant growth, improve regional transport connectivity and be guided by the existing landscape and character of South West Sydney.

The vision which has been outlined for the corridor is:

> *A place-led transit corridor connecting Liverpool to Western Sydney International Airport through South West Sydney's distinctive landscape. The multimodal corridor will link urban places which are sensitive to their bushland and farming landscape. It will serve residents, workers and visitors and support a range of housing types and employment opportunities.*

The framework outlines four key elements along the FAST corridor, presented in Figure 2-33.

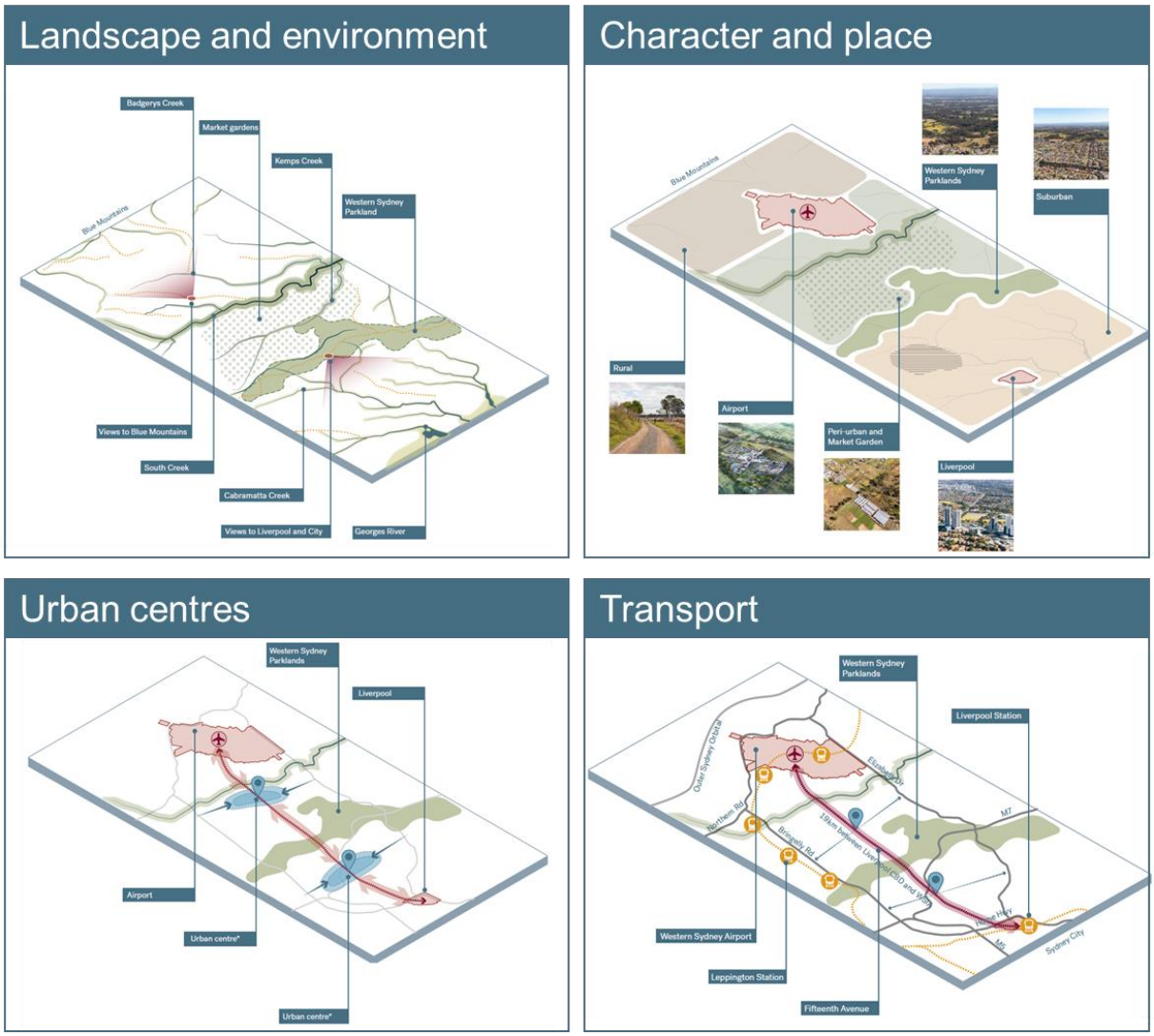


Figure 2-33 Elements of Fifteenth Avenue

Source: Liverpool City Council, 2020

These elements directly line with 16 principles to guide planning towards the FAST vision. These principles are presented in Figure 2-34.

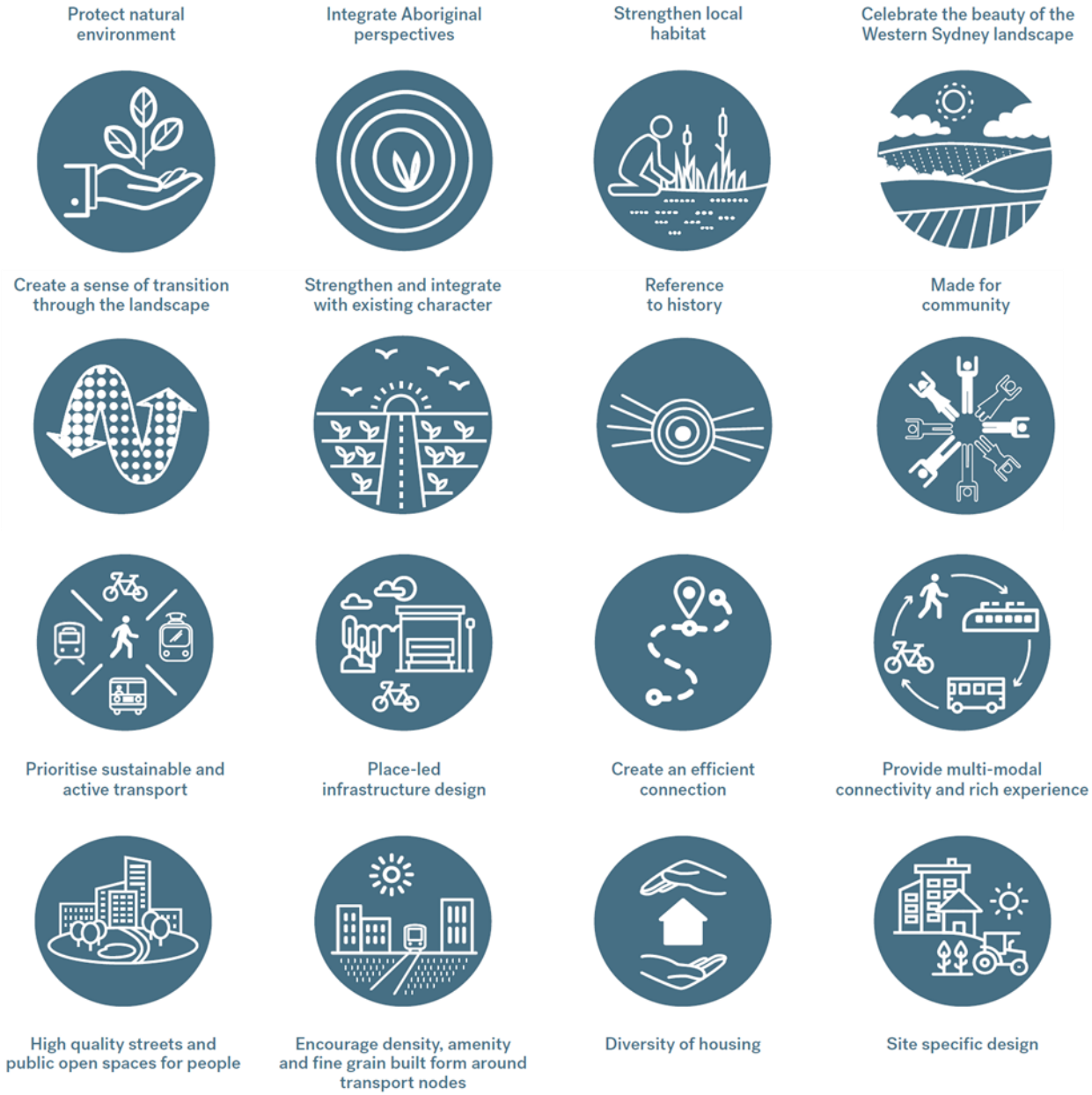


Figure 2-34 Principles of the FAST corridor

Source: Liverpool City Council, 2020

2.3.11 Local Strategic Planning Statements

Following amendments made to the *Environmental Planning and Assessment Act 1979* in March 2018, each council must now develop a Local Strategic Planning Statement for their Local Government Area. The Local Strategic Planning Statement sets the 20-year vision for land use in the Local Government Area, the special character and values that are to be preserved and how change will be managed into the future. The Local Strategic Planning Statement is the linking document between the Greater Sydney Commission's District Plans and the finer-grained planning undertaken by councils to ensure consistency in strategic planning approaches within New South Wales. The statements will implement actions in the *Greater Sydney Region Plan*, District Plans and the priorities of councils in Community Strategic Plans prepared under Local Government legislation.

2.3.11.1 Penrith City Council Local Strategic Planning Statement

The Penrith Local Strategic Planning Statement gives effect to the *Greater Sydney Region Plan* and the *Western City District Plan* and is informed by Penrith City Council's *Community Strategic Plan*. It sets Penrith City Council's strategic planning vision for the next 20 years:

> *In 2036, our City remains unique, we have capitalised on our opportunities, and our City is connected, healthy, innovative and balanced.*

Ten key themes have been identified to guide the delivery of the vision within the short-, medium- and long-term. These themes are outlined in Figure 2-35.

Figure 2-35 Penrith City Council Local Strategic Planning Statement key themes

Source: Penrith City Council, 2020

Aligning with these ten themes are 21 priorities with corresponding actions developed to guide future planning. The planning priorities outlined in Figure 2-36 relate to the future Aerotropolis conditions.

Planning Priority 9	Planning Priority 10	Planning Priority 11	Planning Priority 12
Support the North South Rail Link and emerging Structure Plan	Provide a safe, connected and efficient local network supported by frequent public transport options	Support the planning of the Western Sydney Aerotropolis	Enhance and grow Penrith's economic triangle

Figure 2-36 Penrith City Council Local Strategic Planning Statement planning priorities relevant to the Aerotropolis

Figure 2-37 provides an overview of the Structure Plan for Penrith City Council in 2036.

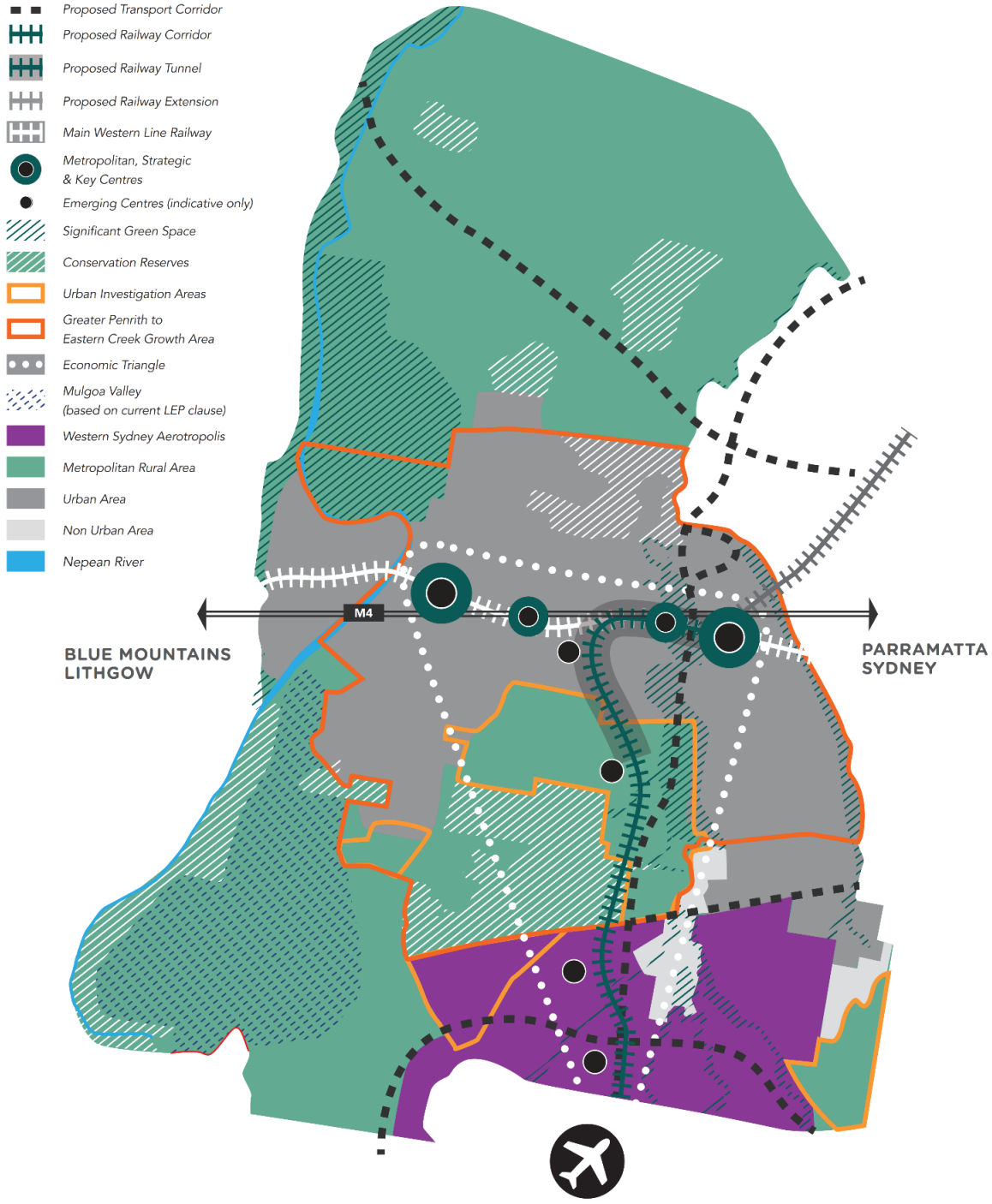


Figure 2-37 Penrith City Council Structure Plan

Source: Penrith City Council, 2020

2.3.11.2 Liverpool Local Strategic Planning Statement

The Liverpool Local Strategic Planning Statement gives effect to the *Greater Sydney Region Plan* and the *Western City District Plan* and is also informed by Liverpool City Council's *Community Strategic Plan*. It sets Liverpool City Council's strategic planning vision for the next 20 years:

> *A vibrant place for people that is community focused, walkable, public transport-oriented, sustainable, resilient and connected to its landscape. A place that celebrates local diversity and history and is connected to other Sydney centres. A jobs-rich city that harnesses health, research, education, innovation and growth opportunities to establish an inclusive and fair place for all.*

The Local Strategic Planning Statement outlines 16 planning priorities, and 74 corresponding actions, aligning with the four key themes of connectivity, productivity, liveability and sustainability. The relevant priorities for Aerotropolis are presented in Figure 2-38.

CONNECTIVITY Our Connections		PRODUCTIVITY Our Jobs	SUSTAINABILITY Our Environment
Planning Priority 2	**Planning Priority 3**	**Planning Priority 13**	**Planning Priority 16**
A rapid smart transit link between Liverpool and the Airport	Accessible and connected suburbs	A 24-hour Airport growing to reach its potential	Rural lands are protected and enhanced

Figure 2-38 Alignment of Liverpool Local Strategic Planning Statement key themes and planning priorities relevant to the Aerotropolis

Figure 2-39 provides an overview of the Liverpool City Council Structure Plan.

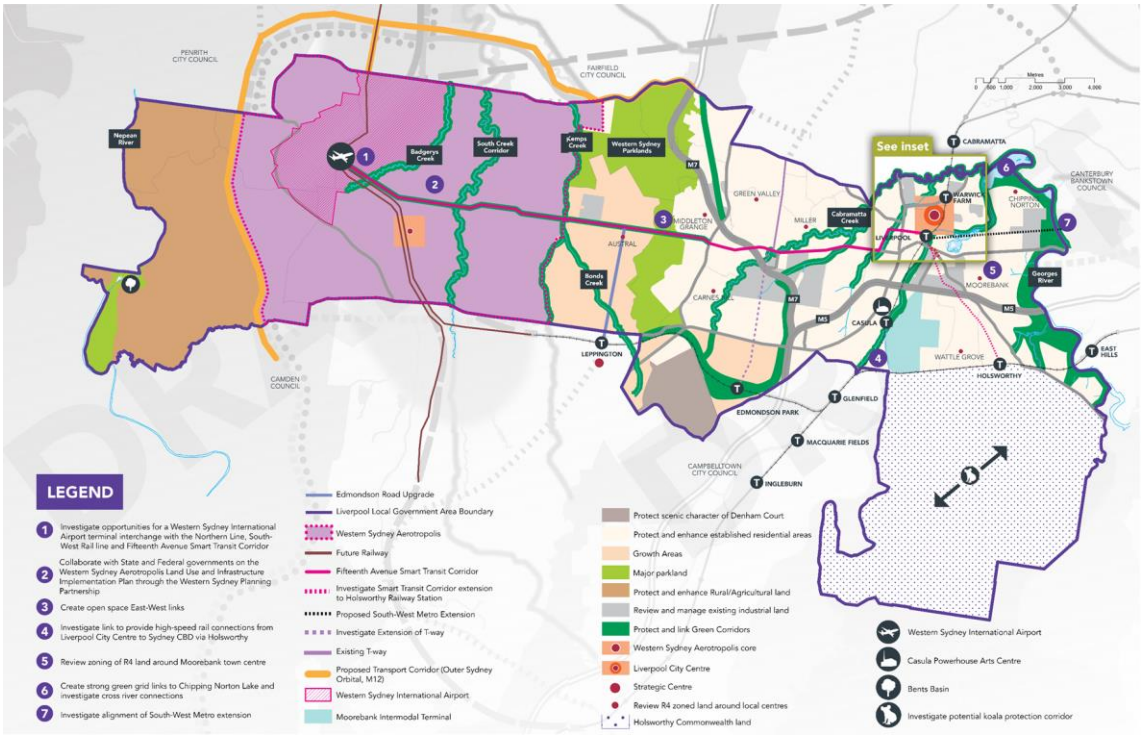


Figure 2-39 Liverpool City Council Structure Plan

Source: Liverpool City Council, 2020

2.3.12 Delivery Program 2017-21 & Operational Plan 2019-20

The Delivery Program translates the directions of Penrith City Council and Liverpool City Council in 10-year *Community Strategic Plans* into strategies that will guide the councils for the next four years. This is then implemented by the Operational Plan which details the actions councils will undertake within the financial year.

2.3.12.1 Penrith City Council: Delivery Program 2017-21 & Operational Plan 2019-20

The seven outcomes to guide the implementation of these plans for Penrith City Council are outlined in Figure 2-40.

Figure 2-40 Penrith City Council Delivery Program and Operational Plan outcomes

A total of 24 strategies are outlined to achieve these seven outcomes, with the following strategies relevant to the Aerotropolis:

- Strategy 2.3: Ensure services, facilities and infrastructure meet the changing needs of our City
- Strategy 3.1: Work with partners to improve public transport
- Strategy 3.2 Provide a safe and efficient road and pathway network
- Strategy 3.4 Improve passenger and freight transport connections in the region.

2.3.12.2 Liverpool City Council: Delivery Program 2017-21 & Operational Plan 2019-20

The four directions guiding implementation within Liverpool City Council are presented in Figure 2-41.

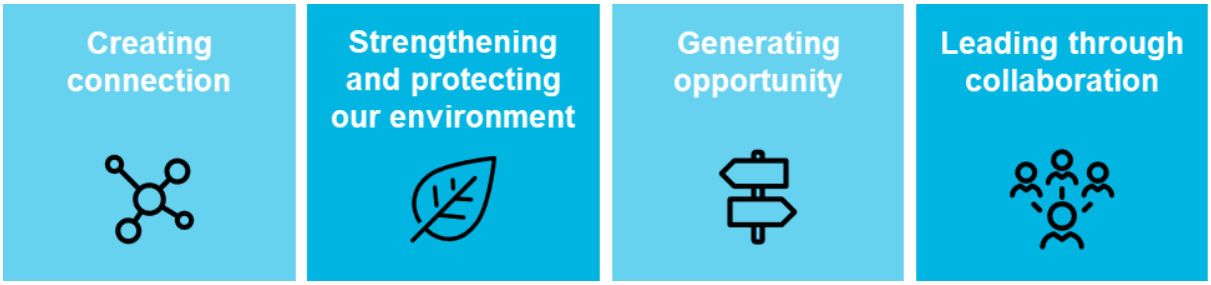


Figure 2-41 Liverpool City Council Delivery Program and Operational Plan directions

The Delivery Program and Operational Plan outline 18 delivery program actions, each supported with a number of operational actions. The delivery program actions and its corresponding operational actions which are most relevant to the Aerotropolis are:

- G.2.05: Monitor and advise Council on matters relating to the development of the Airport
- G.4.01: Deliver Council's adopted upgrade and renewals program for roads and transport related assets
- G.4.02: Manage traffic and transport for Liverpool.

2.3.13 Western Sydney Place-based Infrastructure Compacts

The Greater Sydney Commission has designed Place-based Infrastructure Compacts (PIC) as a strategic planning model that looks holistically at place to better align growth with the provision of infrastructure and services. It does this through four key areas:

- Model the growth potential of an area and explore scenarios for its long-term future
- Encourage opening about the range of infrastructure and services needed to grow an area, the costs involved and how this could feasibly be funded
- Stage growth by being selective about where, when and what to invest in to deliver successful areas
- Make the roll-out of new areas more certain, cost effective and easier to understand for investors, developers and the local community.

This approach has been adopted in the design of the Aerotropolis which has been designated as PIC 1 with the surrounding areas being designated under the Western Parkland City growth area.

2.3.14 Co-Design Alternative Land Use Scenario Report

A Codesign process was developed to provide a common land use forecast basis for future work using Travel Zone Projections. This involved direction from Transport for NSW, the Western Sydney Planning Partnership and the Greater Sydney Commission Growth Infrastructure Compact alongside other state agencies and councils.

This culminated in a Greater Sydney demographic forecast (TZP16V1.51) which included population and employment projections for 2016, 2036, and 2056. Population and employment were projected across different Local Government Areas. Furthermore, employment was separated by industry.

These population and employment projections were used to inform the development of this report.

2.4 Summary

The relevant strategic policy and planning initiatives that support the Aerotropolis vision are summarised in Table 2-1.

Table 2-1 Strategic initiatives relevant to the Aerotropolis

Strategic Initiative	Level	Application
Policy		
Western Sydney City Deal	Federal / State / Local	General
Premier's Priorities	State	General
Future Transport Strategy 2056	State	Transport
State Infrastructure Strategy 2018-2038: Building Momentum	State	Infrastructure
NSW Design Policy (Better Placed)	State	Land Use
Practitioner's Guide to Movement and Place	State	Land Use
Beyond the Pavement	State	Land Use
Collaboration Area Place Strategies	Region	Land Use
Planning		
Greater Sydney Region Plan	Region	General
Western City District Plan	Region	General
Greater Sydney Services and Infrastructure Plan	Region	General
NSW Freight and Ports Plan	Region	Transport and Infrastructure
Infrastructure Australia Outer Urban Public Transport Paper	Federal	Transport
Western Sydney Rail Needs Scoping Study	Region	Transport
Western Sydney Aerotropolis Plan	Region	General
Western Sydney Aerotropolis State Environmental Planning Policy	Local	Infrastructure and Land Use
Western Sydney Aerotropolis Development Control Plan Phase 1	Local	Infrastructure and Land Use
Local Strategic Planning Statements	Local	Land Use
Delivery Program 2017-21 & Operational Plan 2019-20	Local	Land Use
Western Sydney Place-based Infrastructure Compact	Region	Infrastructure
Co-Design Alternative Land Use Scenario Report	Region	Land Use

3.0 Existing transport and land use context

3.1 Site location and existing land use

The Aerotropolis is identified as a future Metropolitan Cluster in the Western Parkland City, located approximately 43 kilometres west of the Harbour CBD. The Aerotropolis site is located on primarily greenfield land, with little development having occurred in the study area.

Previous zoning within the Aerotropolis is dominated by five land use zoning types: RU1 Primary Production, RU2 Rural Landscape, RU4 Primary Production Small Lots, SP1 Special Activities and SP2 Infrastructure.

Zoning has now been updated to align with the future land uses: Enterprise Zone, Agribusiness Zone, Mixed Use Zone, SP2 Infrastructure Zone and Environment and Recreation Zone. The location of these zones is outlined in Figure 2-32 in Section 2.3.8

The Aerotropolis comprises the following Travel Zones, shown in Figure 3-1, as defined by NSW Transport Performance and Analytics:

- Badgerys Creek
- Bents Basin Greendale
- Bringelly Mersey Road and Severn Road
- Kemps Creek Emmaus Catholic College
- Kemps Creek Shopping Centre
- Luddenham
- Luddenham Hall
- Luddenham Model Park SSME
- Twin Creeks Golf Course
- Wallacia.

The Travel Zones within and adjacent to the Aerotropolis have an existing residential population of approximately 4,660 people.

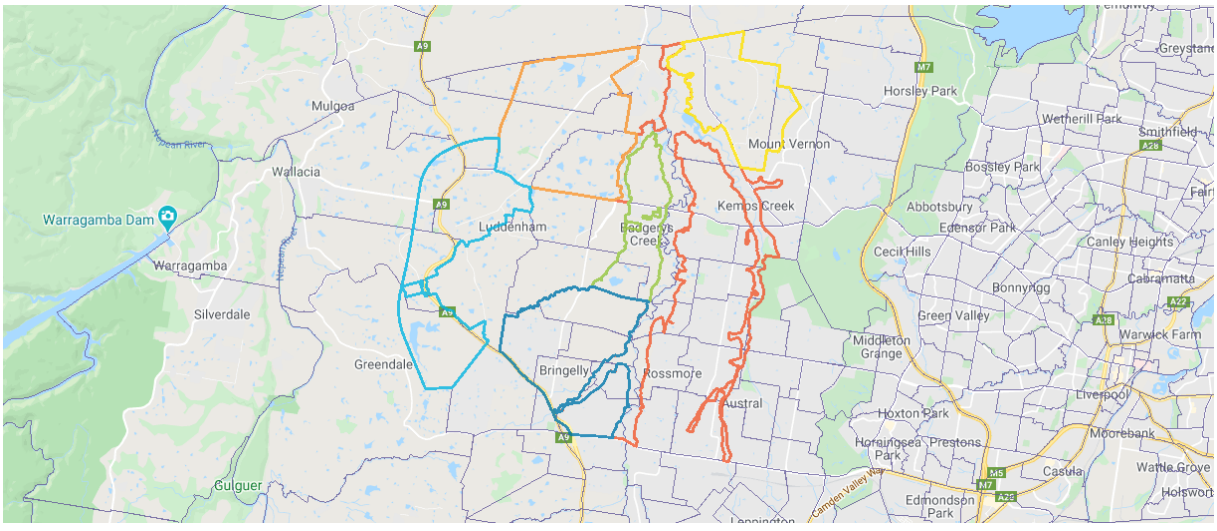


Figure 3-1 The Aerotropolis Travel Zones

Source: Greater Sydney Commission, 2020 (TZP16V1.51)

3.2 Existing transport

3.2.1 Walking

Due to the lack of activated land use and the scale of the Aerotropolis, walking opportunities are primarily found within close proximity of residential areas for first and last mile access. Roads within the Aerotropolis do not always cater for pedestrians with a lack of footpaths.

3.2.2 Cycling

No Principle Bicycle Network segments are located within the Aerotropolis. Cyclists are presented with 'high difficulty' rides along the Northern Road and parts of Mamre Road and Elizabeth Drive. The current bicycle network is shown below in Figure 3-2.

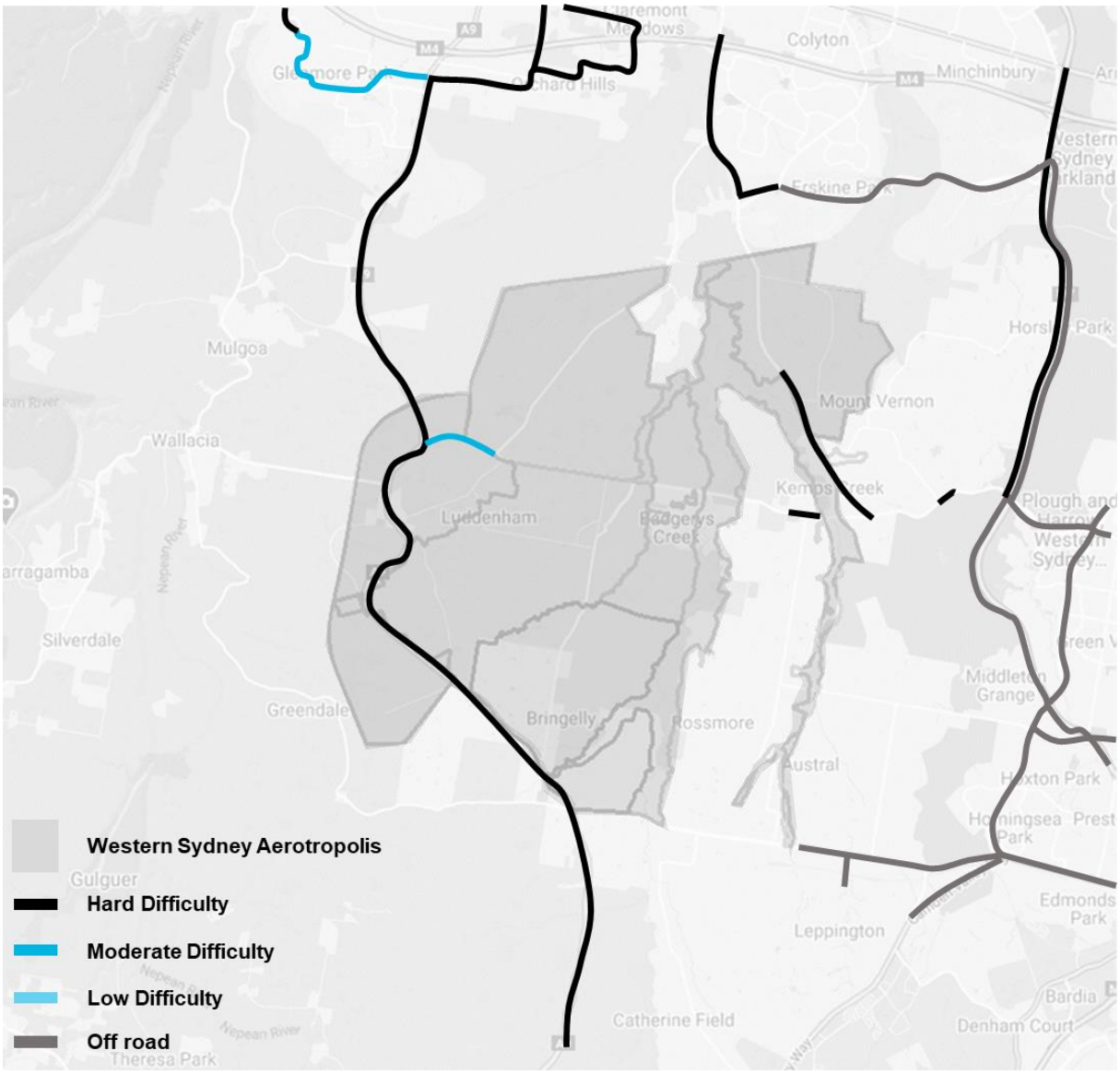


Figure 3-2 Bicycle network within the Aerotropolis

Source: RMS Cycleway Finder (overlayed with coloured Aerotropolis precinct boundaries - AECOM)

3.2.3 Train

No railway lines currently exist within the Aerotropolis. Three train lines operate within 15 kilometres of the Aerotropolis, including:

- T1 Western Line to St Marys Station and Penrith Station, located approximately 14 kilometres north of the Aerotropolis
- T2 Inner West and Leppington Line to Leppington Station, located approximately 11 kilometres south-east of the Aerotropolis
- T5 Cumberland Line to Leppington Station, located approximately 11 kilometres south-east of the Aerotropolis.

In addition, Intercity services operate beyond the Sydney Trains network to the Blue Mountains via Penrith.

3.2.4 Bus

Eight bus routes currently operate within the Aerotropolis, primarily connecting to the Metropolitan Clusters of Penrith and Liverpool:

- 789 Luddenham to Penrith
- 795 Warragamba to Penrith
- 801 Badgerys Creek to Liverpool
- 813 Bonnyrigg to Fairfield
- 852 Carnes Hill Marketplace to Liverpool via Greenway Drive & Cowpasture Road
- 855 Rutleigh Park to Liverpool via Austral & Leppington Station
- 856 Bringelly to Liverpool
- 857 Narellan to Liverpool.

The wider bus network within south-west Sydney is shown in Figure 3-3.

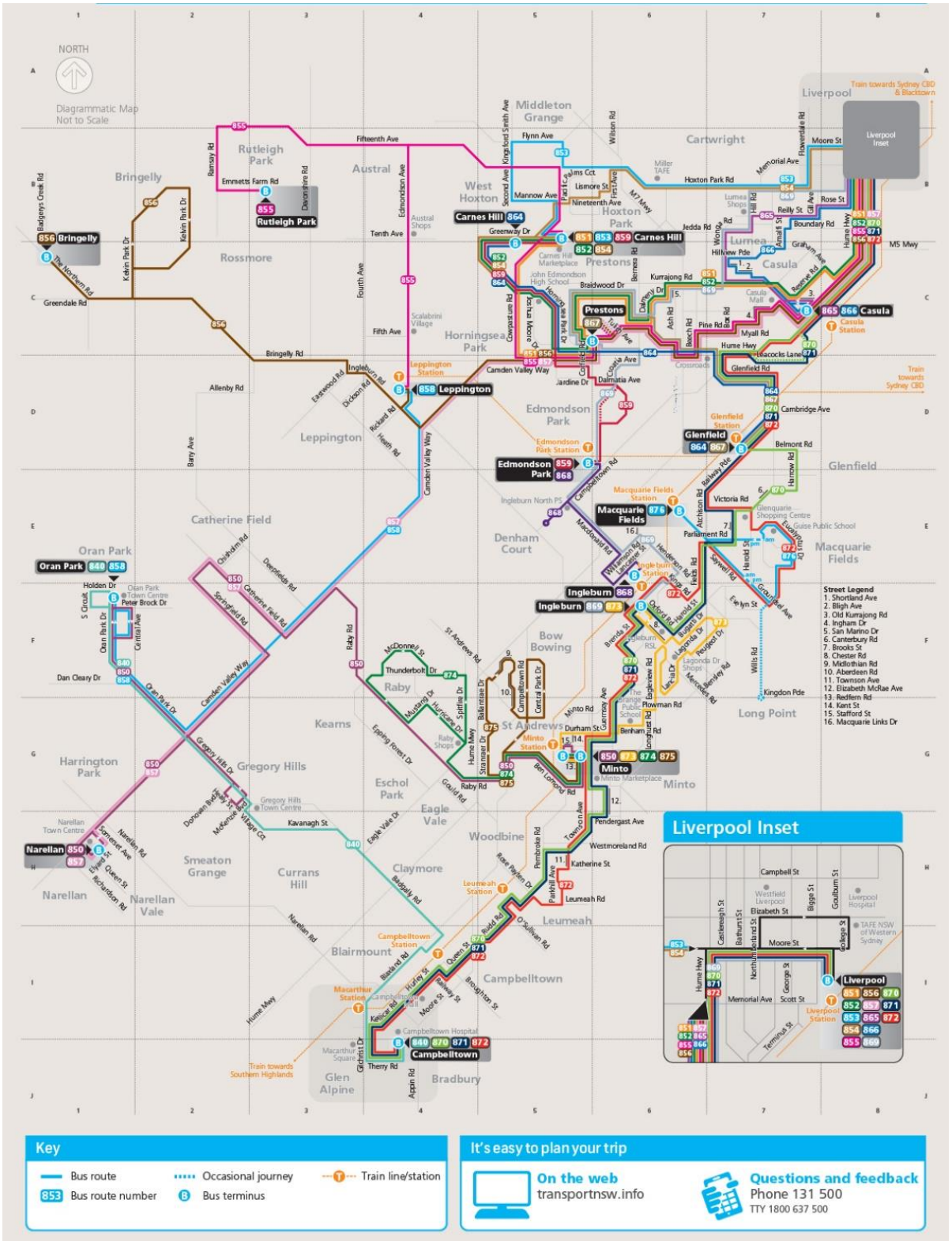


Figure 3-3 Campbelltown, Liverpool, Bringelly and Oran Park Bus Network Map

Source: Transport for NSW, 2020

3.2.5 Road network

The *Schedule of Classified Roads and Unclassified Regional Roads* by Transport for NSW (formerly Roads and Maritime Services) provides definitions for different types of roads under the administrative classification system. Administrative classifications help define jurisdictional responsibility and the basis for funding responsibility for different types of roads. Under the administrative classification system, the three-tier road hierarchy comprises:

- **State roads:** Managed and financed by Transport for NSW
- **Regional roads:** Perform an intermediate function between State roads and council-controlled Local roads. Financial assistance provided by Transport for NSW to councils for management
- **Local roads:** Council-controlled collector and local roads.

The following State roads are located within and adjacent to the Aerotropolis, and are outlined in Figure 3-4:

- Bringelly Road
- Camden Valley Way
- Cowpasture Road
- Elizabeth Drive
- Erskine Park Road
- Lenore Drive
- M7 Motorway
- Mamre Road
- Mulgoa Road
- Park Road
- The Northern Road.

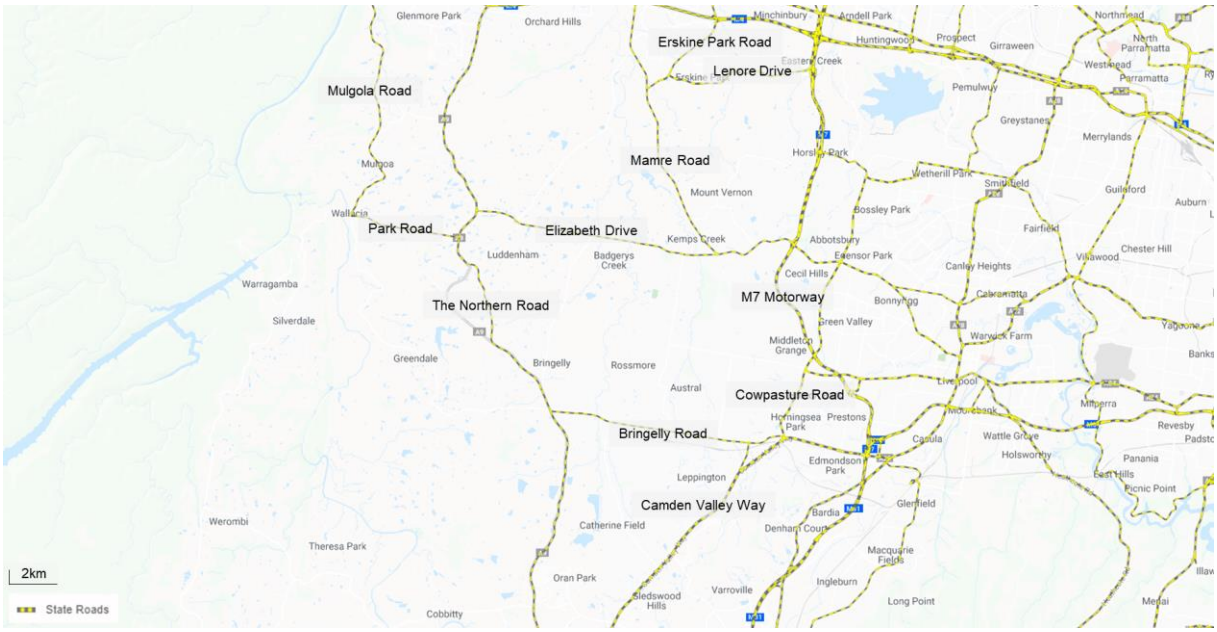


Figure 3-4 State roads within the Western Sydney Aerotropolis study area

Source: Transport for NSW, 2020

3.3 Existing travel patterns

3.3.1 COVID-19 Impact

2016 travel patterns have substantially changed due to COVID-19 in 2020. COVID-19 initially resulted in a significant reduction in overall travel demand across Australian cities as people complied with lockdown orders. Demand slowly began to increase as the number of active COVID-19 cases fell. General impacts on travel patterns include:

- An initial reduction in travel demand caused by the closure of non-essential services and a significant proportion of employees working remotely from home. This reduction was compounded by increased unemployment and underemployment
- An increase in road traffic congestion during peak hours as demand recovered when the number of active COVID0-19 cases fell. Demand for private vehicles recovered more quickly than demand for public transport. This is due to decreased capacity on public transport for reasons such as social distancing requirements limiting public transport capacity and the increased unwillingness to commute via public transport
- A flattening of peak hour demand with trips staggered over longer time periods as individuals have more flexibility around work and shopping
    - NSW Government initiatives such as incentivising off-peak travel through Opal Card discounts and employer flexibility have contributed to this.

However, COVID-19 will continue to pose a significant challenge to accurately predicting travel patterns in the future. This is because it is likely any return to previous ‘normal’ travel patterns will continually be influenced by localised COVID-19 outbreaks. In the absence of a vaccine, there is uncertainty about future travel demand which will be influenced by the severity and frequency of COVID-19 outbreaks

The Journey to Work data below is reflective of pre-COVID-19 conditions.

3.3.2 2016 Census

The results of the 2016 Census have been analysed for the Austral – Greendale, Badgerys Creek, Horsley Park – Kemps Creek and the Mulgoa – Luddenham – Orchard Hills Statistical Area Level 2 (SA2) zones to understand existing travel behaviour within the Aerotropolis.

3.3.2.1 Journey to Work – origins for workers

The top five most common Journey to Work origins for workers in the Aerotropolis are shown in Table 3-1. Metropolitan Centres, Metropolitan Clusters and Strategic Centres typically have highly dispersed worker origins, reflecting their ability to generate a wide range of trip types from across Greater Sydney to access employment. Within the Aerotropolis, worker origins are currently highly concentrated, reflecting the localised nature of employment at present.

Table 3-1 Most common origins for workers in the Aerotropolis

Origin	Trips	Percentage
Austral – Greendale SA2		
Austral – Greendale	1,107	35%
Cobbitty – Leppington	111	3%
West Hoxton – Middleton Grange	95	3%
Elderslie – Harrington Park	64	2%
Mount Annan – Currans Hill	62	2%
Other	1,740	55%
Total	**3,193**	**100%**
Badgerys Creek SA2		
Canley Vale – Canley Heights	10	100%
Other	0	0%
Total	**10**	**100%**
Horsley Park – Kemps Creek SA2		
Horsley Park – Kemps Creek	511	17%
Bossley Park – Abbotsbury	77	2%
St Clair	76	2%
Mulgoa – Luddenham – Orchard Hills	51	2%
Rooty Hill – Minchinbury	51	2%
Other	2,285	75%
Total	**3,041**	**100%**
Mulgoa – Luddenham – Orchard Hills SA2		
Mulgoa – Luddenham – Orchard Hills	796	31%
Glenmore Park – Regentville	196	8%
Warragamba – Silverdale	109	5%
Blaxland – Warrimoo – Lapstone	109	5%
Castlereagh – Cranebrook	95	4%
Other	1,162	47%
Total	**2,559**	**100%**

Source: Source: Australian Bureau of Statistics, 2016

3.3.2.2 Journey to Work – worker mode share

Private vehicles are the dominant mode for workers in the Aerotropolis SA2 zones. Private vehicles represent at least 75% of mode share for Journey to Work trips to all four SA2 zones. The second most common response was working from home or did not go to work (representing between 11% and 20% in three of the four SA2 zones) followed by active transport (representing between 1% and 4% in three of the four SA2 zones). These numbers highlight the lack of existing public transport infrastructure and services in the Aerotropolis. Table 3-2 outlines the mode share breakdown of each of the four SA2 zones.

Table 3-2 Journey To Work mode share for workers in the Aerotropolis

Travel Mode	Counts	Percentage
Austral – Greendale SA2		
Public transport	39	1%
Vehicle	2,410	75%
Active transport	128	4%
Other	26	1%
Worked at home*	590	18%
Total	**3,193**	**100%**
Badgerys Creek SA2		
Public transport	0	0%
Vehicle	10	100%
Active transport	0	0%
Other	0	0%
Worked at home*	0	0%
Total	**10**	**10**
Horsley Park – Kemps Creek SA2		
Public transport	28	1%
Vehicle	2,610	86%
Active transport	45	1%
Other	12	0%
Worked at home*	346	11%
Total	**3,041**	**100%**
Mulgoa – Luddenham – Orchard Hills SA2		
Public transport	42	2%
Vehicle	1,921	75%
Active transport	76	3%
Other	19	1%
Worked at home*	501	20%
Total	**2,559**	**100%**

Source: Source: Australian Bureau of Statistics, 2016

* Includes people who stated they '*did not go to work'*

3.3.2.3 Journey to Work – destinations for residents

The top five most common Journey to Work destinations for residents in the Aerotropolis are shown in Table 3-3. The most common destinations for residents are still concentrated in and around the Aerotropolis, however there is a broader distribution than origins for workers. This highlights the attraction of Metropolitan Centres (such as the Harbour CBD and Greater Parramatta) and Metropolitan Clusters (like Liverpool and Penrith) which are common destinations for residents.

Table 3-3 Most common destinations for residents in the Aerotropolis

Destination	Trips	Percentage
Austral – Greendale SA2		
Austral – Greendale	1,107	29%
Liverpool	162	4%
Prestons – Edmondson Park	132	4%
Sydney – Haymarket – The Rocks	97	3%
Chipping Norton – Moorebank	80	2%
Other	2,185	58%
Total	**3,763**	**100%**
Badgerys Creek SA2		
Austral – Greendale	14	100%
Other	0	0%
Total	**14**	**100%**
Horsley Park – Kemps Creek SA2		
Horsley Park – Kemps Creek	511	25%
Wetherill Park Industrial	195	10%
Sydney – Haymarket – The Rocks	57	3%
Parramatta – Rosehill	52	3%
Greenfield Park – Prairiewood	50	2%
Other	1,153	57%
Total	**2,018**	**100%**
Mulgoa – Luddenham – Orchard Hills SA2		
Mulgoa – Luddenham – Orchard Hills	796	16%
Penrith	528	11%
Jamisontown – South Penrith	205	4%
Parramatta – Rosehill	182	4%
St Marys – North St Marys	166	3%
Other	3,062	62%
Total	**4,939**	**100%**

Source: Source: Australian Bureau of Statistics, 2016

3.3.2.4 Journey to Work resident mode share

Private vehicles are the dominant mode for residents in the Aerotropolis SA2 zones. Private vehicles represent at least 72% of mode share for Journey to Work trips from all four SA2 zones. The second most common response was working from home or did not go to work (representing between 14% and 17% in three of the four SA2 zones) followed by active transport (representing between 2% and 4% in three of the four SA2 zones). These numbers highlight the lack of existing public transport infrastructure and services in the Aerotropolis. Table 3-4 outlines the mode share breakdown of each of the four SA2 zones.

Table 3-4 Journey To Work mode share for residents in the Aerotropolis

Travel Mode	Trips	Percentage
Austral – Greendale		
Public transport	204	5%
Vehicle	2,701	72%
Active transport	139	4%
Other	30	1%
Worked at home*	689	18%
Total	**3,763**	**100%**
Badgerys Creek		
Public transport	0	0%
Vehicle	14	100%
Active transport	0	0%
Other	0	0%
Worked at home*	0	0%
Total	**14**	**100%**
Horsley Park – Kemps Creek		
Public transport	95	5%
Vehicle	1,522	75%
Active transport	47	2%
Other	16	1%
Worked at home*	338	17%
Total	**2,018**	**100%**
Mulgoa – Luddenham – Orchard Hills		
Public transport	313	6%
Vehicle	3,804	77%
Active transport	79	2%
Other	28	1%
Worked at home*	715	14%
Total	**4,939**	**100%**

Source: Source: Australian Bureau of Statistics, 2016

* Includes people who stated they '*did not go to work*'

3.4 Existing road network issues and opportunities

A series of assessments have been undertaken for the State road network within Greater Sydney by Transport for NSW. A number of roads within and connecting to the Aerotropolis study area were reviewed, with the key issues and opportunities identified presented in Table 3-5 and Table 3-6.

Table 3-5 Key issues

Key Issues
• Development of the Western Parkland City will drive road function and investment requirements along corridors • Growing job opportunities and residential development will change existing traffic flows towards the east, to new patterns towards the new Western Parkland City • Demand for transport will increase as the Western Parkland City is developed • There are crash hotspots at key intersections • There are limited pedestrian facilities along some corridors • There are limited cycling facilities along some corridors.

Table 3-6 Key opportunities

Key Opportunities
• Ongoing multi-agency coordination is critical to ensure that cumulative impacts of multiple construction projects is considered during development of Western Parkland City • Develop a bus strategy for Western Sydney including a review of bus routes, service provision, facilities requirements and stop locations • Investigate bus stop locations and ensure proximity to safe crossing opportunities, including accessibility to the centre running T-way stops • Improve facilities at bus stops and services to support Sydney Metro Western Sydney Airport • Investigate options for bus priority and rail replacement buses during metro construction • Provide safe and continuous cycling connections to employment centres and the Green Grid • Investigate opportunities to develop a cycling network to connect to the Airport and Aerotropolis • Provision of continuous shared paths with appropriate wayfinding, particularly near centres • Provide wider footpaths, dwelling opportunities and shade, particularly near centres • Review pedestrian lighting and general pedestrian safety at night • Review signalised intersections and assess the need for an additional pedestrian crossing arms to improve safe crossing opportunities • Review speed limits through local centres and areas of high pedestrian activity • Investigate opportunities for active frontages, concentrated developments, street trees and general landscaping to create more of a Place function • Ensure that development allows alternate freight routes • Investigate extending permitted access for High Performance Freight Vehicles to, from and within Western Sydney Employment Area and investigate opportunities for decoupling • Review flooding issues and mitigation strategies around flood prone areas.

4.0 Vision

4.1 Western Sydney Aerotropolis Plan vision

The vision for the Western Sydney Aerotropolis is defined in the *Western Sydney Aerotropolis Plan*:

The Aerotropolis is Australia's newest global gateway, built around the world-class Airport. Its evolution has driven transformational change in the Western Parkland City. Development is framed around the Wianamatta–South Creek corridor and an expansive network of parklands and waterways to realise the cool and connected Western Parkland City. Above all, it respects and connects Country. It creates opportunity, amenity and sustainability for workers and residents in Western Sydney.

It nurtures the industry of the future. It contributes to greater productivity and a significant increase in jobs for Western Sydney in areas such as defence and aerospace, advanced manufacturing, technology, agribusiness, health, education, research and tourism.

A diversity of housing in parts of the Aerotropolis Core, Northern Gateway and Rossmore precincts provide a vibrant and living city, protected from the 24/7 operations of the Airport. Centres are easy to walk around, with quality public areas and a mix of social and cultural infrastructure.

The Aerotropolis is low carbon, featuring next-generation energy, waste and water infrastructure. Circular economy principles minimise waste and pollution, retain water in the environment, reuse energy and regenerate natural systems to increase the tree canopy and urban cooling. Sustainable food production in the Agribusiness Precinct minimises food miles and reduces food wastage.

Sustainable urban connections include efficient and accessible public transport links, walking and cycling facilities, smart technologies and an efficient road network. Efficient freight movements are mainly by rail. People and business can access key centres in the Western Parkland City and Greater Sydney.

The Aerotropolis accommodates high value jobs closer to where people live. It is an accessible, innovative 24-hour metropolitan centre, connected globally, nationally, locally and digitally.

4.2 Western Sydney Aerotropolis Plan objectives

The *Western Sydney Aerotropolis Plan* has one overarching objective which is integrated into all planning for the Aerotropolis:

Acknowledge Traditional Custodians and provide opportunities for Connecting with Country, Designing for Country and Caring for Country in all stages of planning for the Aerotropolis.

Below this are 11 specific objectives that align with four key themes; productivity, sustainability, infrastructure and collaboration, and liveability. These objectives are being applied to strategic and integrated planning.

The *Western Sydney Aerotropolis Plan* objectives most relevant to this report are shown in bold in Figure 4-1. Development of this transport plan has been guided by these objectives.

Productivity	Sustainability	Infrastructure and collaboration	Liveability
• **An accessible and well connected WSA** • **High-value jobs growth is enabled, and existing employment enhanced** • **Safeguard Airport operations**	• **Landscape-led approach to urban design and planning** • A sustainable, low carbon Aerotropolis that embeds the circular economy • A resilient and adaptable Aerotropolis	• **Infrastructure that connects and services the Western Parkland City as it grows** • A collaborative approach to planning and delivery	• **Diverse, affordable, healthy, resilient and well-located housing** • Social and cultural infrastructure that strengthens communities • **Great places that celebrate local character and bring people together.**

Figure 4-1 Western Sydney Aerotropolis Plan key themes and specific objectives

4.3 Enablers

Our work has focused on the development and implementation of two sets of enablers to support delivery against the *Western Sydney Aerotropolis Plan* vision and objectives. The two enablers are **Transport Policies and Strategies** and **Transport Infrastructure and Services**. These enablers aim to integrate transport and land use outcomes to support the delivery of the five initial Aerotropolis precincts.

1. **Enabler 1: Transport Policies and Strategies –** the implementation of transport policies and strategies which foster a mode shift to sustainable transport will support the strategic vision and objectives. These have been developed by and in collaboration with key stakeholders. These policies and strategies include:
    - The Travel Demand Management strategy which defines and promotes sustainable travel options and choices to influence mobility to deliver sustainable outcomes in terms of mode of travel and volume of travel
    - The Development Control Plan to realise the precinct planning principles, objectives and performance outcomes through the application of controls to the future vision of the Aerotropolis
    - The Street Design Guidelines to ensure both the design requirements and guidelines are consistency incorporated into street environments within the Aerotropolis providing a high-quality public realm which is designed for all users.
2. **Enabler 2: Transport Infrastructure and Services –** the planning and definition of a multi-modal transport network which will support the strategic vision and objectives. This considers the relationships between place and customers with the transport networks, has been developed through a detailed stakeholder collaboration process, which has been very much design-led, and is a multi-layered vision for how future transport networks will operate to support the overarching *Western Sydney Aerotropolis Plan* objectives. This sets out:
    - A dedicated walking network with pedestrian footpaths on all roads and streets. With consideration of a high amenity environment for walking throughout the precincts, which provide for priority access to, and within, centres and to key public transport nodes, as well as facilitating well-connected, high amenity green corridors.
    - An extensive, dedicated bicycle network with separated bicycle facilities built on all key roads and streets, to support the needs of all cyclists. The extensive coverage of the network, combined with the dedicated infrastructure is designed to make cycling an easy and comfortable travel choice for short, medium and long-distance journeys.
    - The key public transport infrastructure and services – built around a backbone of transit infrastructure and services through government commitments to the Sydney Metro Western Sydney Airport Line and the *Western Sydney City Deal* Rapid Bus Routes. These together will be integral to providing safe, convenient and efficient public transport travel options for those who live, work or visit the Aerotropolis.
    - A highly efficient road network, which provides for private vehicles and freights, as well as all the other modes identified above. There is a focus on accessibility at the local level, in centres and high value places, in areas where accessibility is critical to network function. Intermediate roads have a balanced focus of access, place and movement. Higher order roads which make up the strategic network (i.e. motorways, arterial roads) focus on movement, reliability of travel times and safe operations to support the efficient movement of people and goods for strategic travel.

Together these two key enablers will support the delivery of the desired outcomes, as outlined in the *Western Sydney Aerotropolis Plan*. The relationship between the strategic objectives and the key enablers is described in Figure 4-2 overleaf.

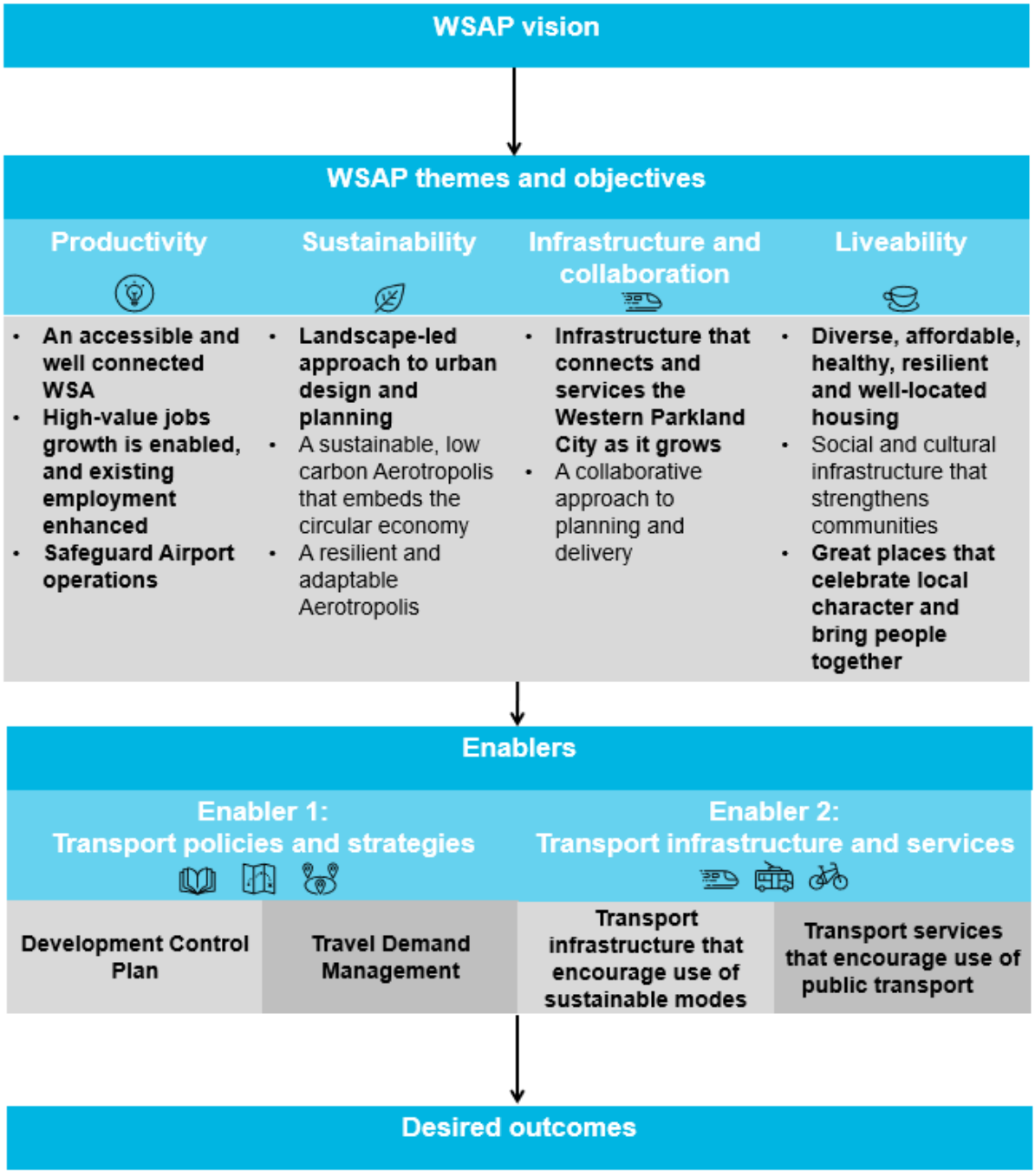


Figure 4-2 Enablers support the *Western Sydney Aerotropolis Plan* vision, themes and objectives to deliver the desired outcomes

4.3.1 Enabler 1: Transport Policies and Strategies

Two Policies and Strategies have been developed which are pivotal to achieving the desired outcomes in future: **the *Draft Western Sydney Aerotropolis Development Control Plan*** and **the Travel Demand Management Strategy**, as Figure 4-3 shows. Together, these two documents aim to influence the use of public transport, walking and cycling as desirable modes of travel for those that live, work and visit the Aerotropolis.

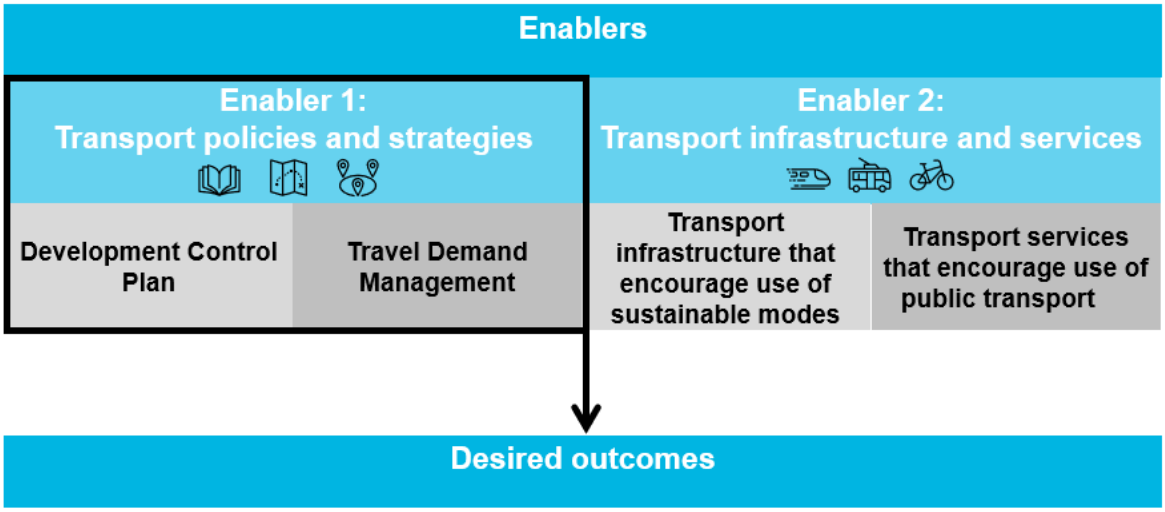


Figure 4-3 Transport policies and strategies are pivotal to achieving the desired outcomes

The *Draft Western Sydney Aerotropolis Development Control Plan* is a detailed set of planning and design guidelines that support the planning controls in the Local Environmental Plan. The *Draft Western Sydney Aerotropolis Development Control Plan* is a standalone document. It has been prepared in accordance with the *NSW Environmental Planning and Assessment Act 1979*. The *Draft Western Sydney Aerotropolis Development Control Plan* is summarised in Section 2.3.9.

The Travel Demand Management Strategy involves the application of focused, evidence-based measures and interventions that change demand on transport networks by redistributing journeys to other modes, times, routes or by removing the journey altogether. Travel Demand Management is most effectively applied when there is an impetus or catalyst for behaviour change. The Western Sydney Aerotropolis Travel Demand Management Strategy is detailed in Section 6.0.

4.3.2 Enabler 2: Transport infrastructure and services

A well-planned network of transport infrastructure and services is pivotal to achieve the desired outcomes. An integrated, multi-modal network comprising dedicated walking and bicycle facilities, metro, train and bus services will facilitate the right balance of travel options.

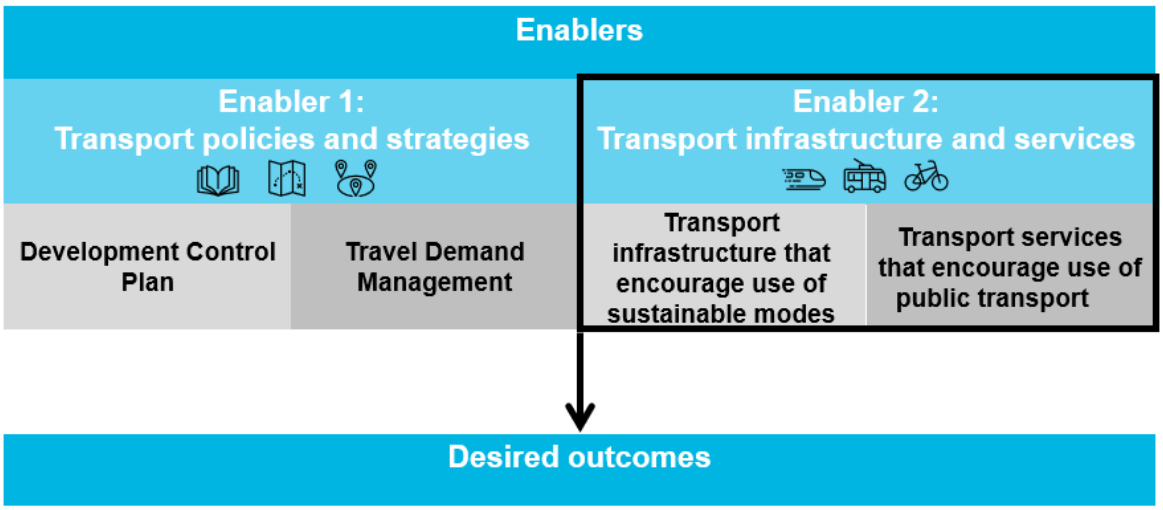


Figure 4-4 Transport infrastructure and services are pivotal to achieving the desired outcomes

4.4 Indicators and mode share targets

Three potential mode share scenarios have been identified to support the *Western Sydney Aerotropolis Plan* vision and objectives, as shown in Figure 4-5.

Indicators and mode share targets

Scenario 1: Low sustainable mode share targets	Scenario 2: Medium sustainable mode share targets	Scenario 3: High sustainable mode share targets
• Low population and employment densities • Few effective policies and strategies to influence travel behaviour • High use of private vehicles • Limited access to public transport infrastructure and services • Disconnected cycling network • Walking not an attractive option • **Business As Usual**	• Higher population and employment densities • Effective policies and strategies to influence travel behaviour • Balanced use of cycling, public transport and private vehicles for medium- and long-distance trips • Good access to public transport infrastructure and services • Connected cycling network • Walking attractive for short trips • **Beyond Business As Usual**	• Highest population and employment densities • Very effective policies and strategies to influence travel behaviour • High rate of cycling and public transport use for medium- and long-distance trips • Excellent access to public transport infrastructure and services • Connected cycling network which is a very attractive option for short and medium trips • Walking is a very attractive option for short trips • **Beyond Business As Usual**

Figure 4-5 Potential mode share scenarios for the five initial Aerotropolis precincts

These scenarios are assessed below, and a preferred scenario is identified.

The remainder of this document has been structured to support the mode share targets identified for the preferred scenario.

4.4.1 Scenario 1: Low sustainable mode share targets

4.4.1.1 Scenario 1: Definition

A low sustainable mode share target is defined as walking, cycling and public transport comprising 0% to 33% of all trips in the five initial Aerotropolis precincts. Under this scenario, private vehicles comprise the remaining 67% to 100% of all trips.

Scenario 1 represents a Business As Usual approach to land use and transport policy. Under this scenario, suburbs typically have low densities. Few effective policies and strategies have been implemented to influence travel behaviour, and public transport infrastructure and services are limited. These factors generate high use of private vehicles. Walking and cycling are typically unattractive options due to car-dominated streets and longer travel distances. Figure 4-6 summarises the characteristics of a scenario with low sustainable mode share targets.

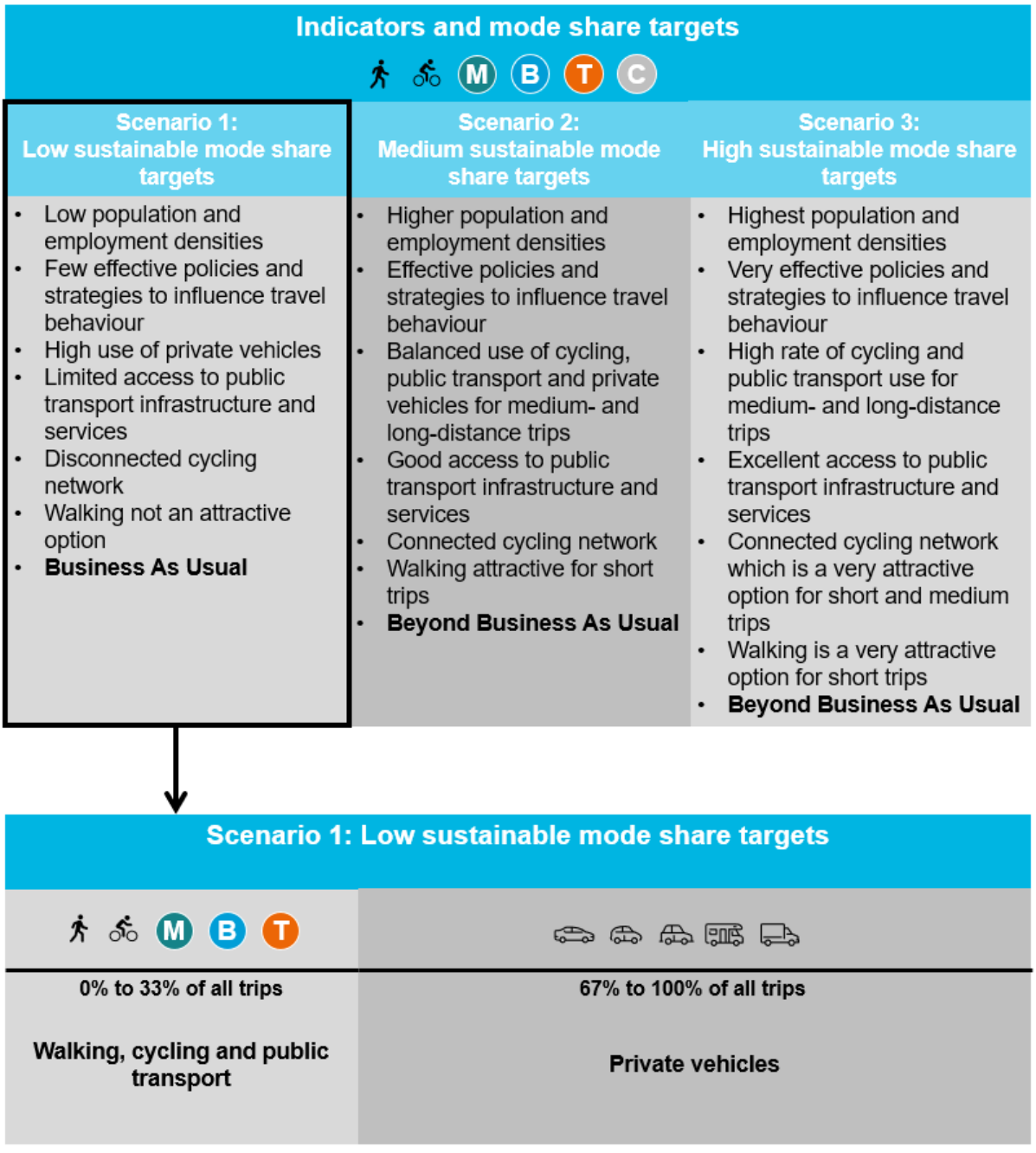


Figure 4-6: Scenario 1 summary

4.4.1.2 Scenario 1: Analysis

Table 4-1 provides a comparison of the total number of jobs and job density between the five initial Aerotropolis precincts, the City of Liverpool and City of Penrith. The five initial Aerotropolis precincts have the highest number of jobs (102,000 planned in 2056) and the highest job density (1,545 jobs per square kilometre). In contrast, the City of Liverpool and the City of Penrith share a similar number of jobs (67,790 and 68,530 in 2016) with job densities significantly lower (222 jobs per square kilometre and 142 jobs per square kilometre respectively) than the five initial Aerotropolis precincts.

Table 4-1 A comparison of jobs between the five initial Aerotropolis precincts, the City of Liverpool and the City of Penrith

Precinct	Size	Jobs	Job density
Five initial Aerotropolis precincts	66km^2	102,000 (planned in 2056)	1,545 jobs/km^2
City of Liverpool	306km^2	67,790 (2016)	222 jobs/km^2
City of Penrith	484km^2	68,530 (2016)	142 jobs/km^2

Table 4-2 provides a comparison of the total number of residents and population density between the five initial Aerotropolis precincts, the City of Liverpool and City of Penrith. The five initial Aerotropolis precincts have the lowest number of residents (34,000 planned in 2056) and the lowest residential density (515 residents per square kilometre). In contrast, the City of Liverpool has almost seven times more residents (223,300 in 2016), and a higher population density (730 residents per square kilometre) than the five initial Aerotropolis precincts. Whereas, the City of Penrith has six times more residents (209,210 in 2016), yet with a lower population density (423 residents per square kilometre) than the five initial Aerotropolis precincts.

Table 4-2 A comparison of population between the five initial Aerotropolis precincts, the City of Liverpool and the City of Penrith

Precinct	Size	Residents	Population density
Five initial Aerotropolis precincts	66km^2	34,000 (planned in 2056)	515 residents/km^2
City of Liverpool	306km^2	223,300 (2018)	730 residents/km^2
City of Penrith	484km^2	209,210 (2018)	432 residents/km^2

Figure 4-7 shows the Journey To Work mode share for workers in the City of Liverpool Local Government Area. Private vehicle was the most popular mode (90%), followed by public transport (7%). Walking accounted for 3% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 10% of all Journey To Work trips. Private vehicles accounted for 90%.

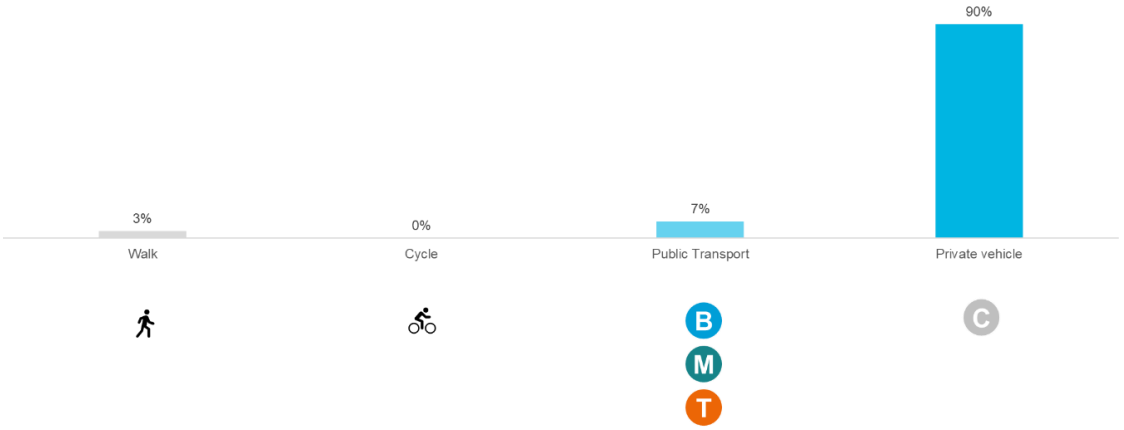


Figure 4-7 Journey to Work mode share for workers in the City of Liverpool Local Government Area

Figure 4-8 shows the Journey To Work mode share for workers in the City of Penrith Local Government Area. Private vehicle was the most popular mode (92%), followed by public transport (6%). Walking accounted for 2% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 8% of all Journey To Work trips. Private vehicles accounted for 92%.

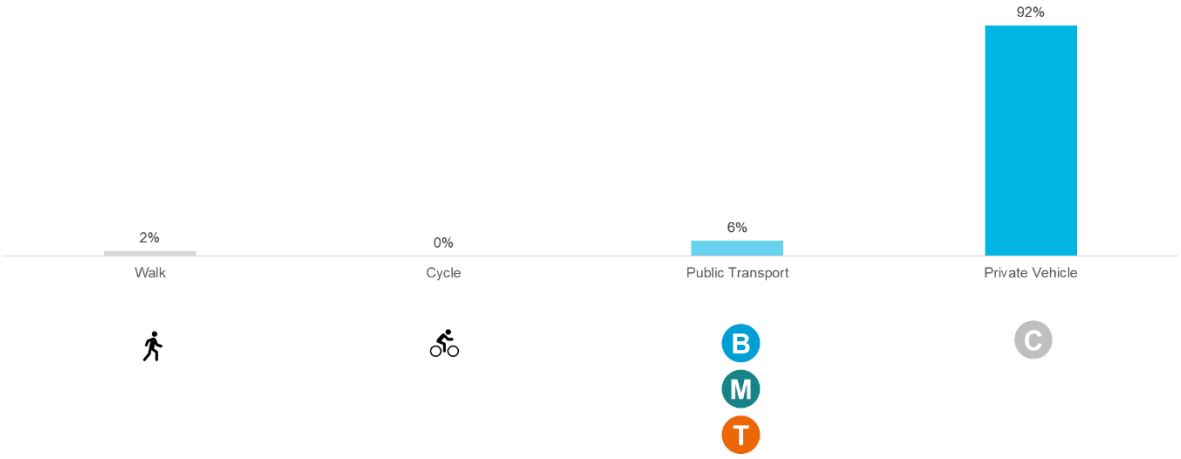


Figure 4-8 Journey to Work mode share for workers in the City of Penrith Local Government Area

Figure 4-9 shows the Journey To Work mode share for residents in the City of Liverpool Local Government Area. Private vehicle was the most popular mode (82%), followed by public transport (16%). Walking accounted for 2% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 18% of all Journey To Work trips. Private vehicles account for 82%.

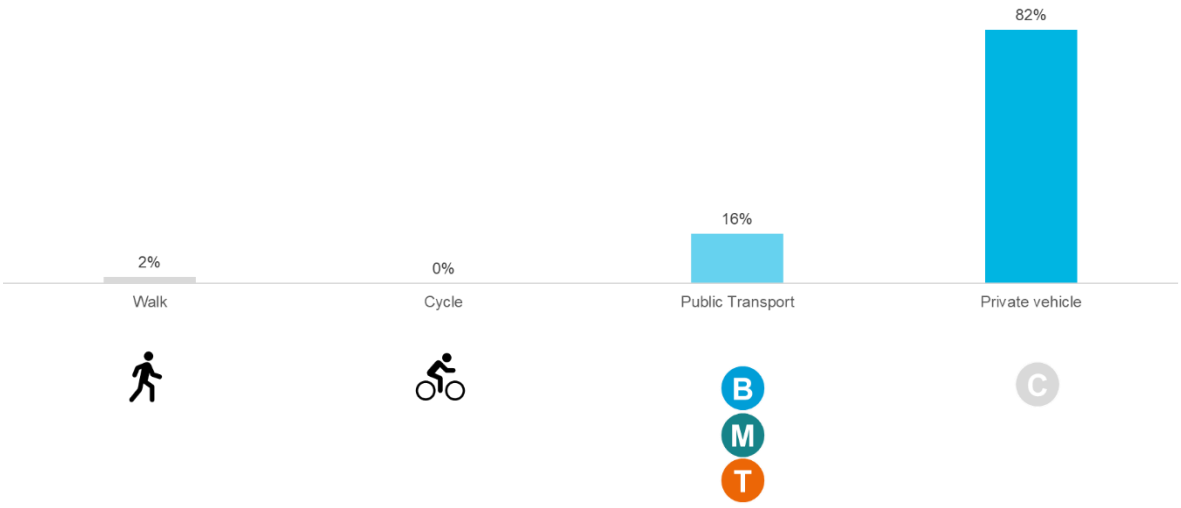


Figure 4-9 Journey to Work mode share for residents in the City of Liverpool Local Government Area

Figure 4-10 shows the Journey To Work mode share for residents in the City of Penrith Local Government Area. Private vehicle was the most popular mode (85%), followed by public transport (13%). Walking accounted for 2% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 15% of all Journey To Work trips. Private vehicles account for 85%.

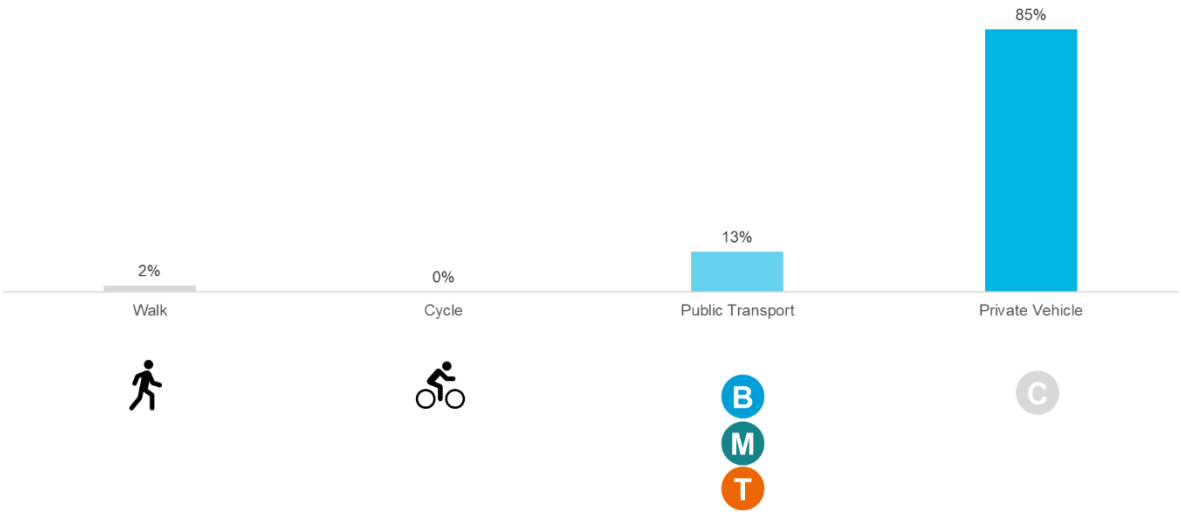


Figure 4-10 Journey to Work mode share for residents in the City of Penrith Local Government Area

4.4.1.3 Scenario 1: Conclusion

The City of Liverpool Local Government Area and the City of Penrith Local Government Area have very low sustainable mode share for Journey To Work trips. This can be partially attributed to their disperse and low-density nature. Density tends to lend itself to the provision of a comprehensive public transport network of infrastructure and services. Dispersed urban form also means walking and cycling are typically less attractive choices.

The population density planned in the five initial Aerotropolis precincts is similar to the City of Liverpool Local Government Area and the City of Penrith Local Government Area. The five initial Aerotropolis precincts are, however, considerably smaller. This means walking and cycling are likely to be more attractive mode choices for shorter trips in the five initial Aerotropolis precincts. The provision of a comprehensive network of transport infrastructure and services are also likely to enable higher use of sustainable modes in Aerotropolis. Figure 4-11 summarises the outcomes of this assessment.

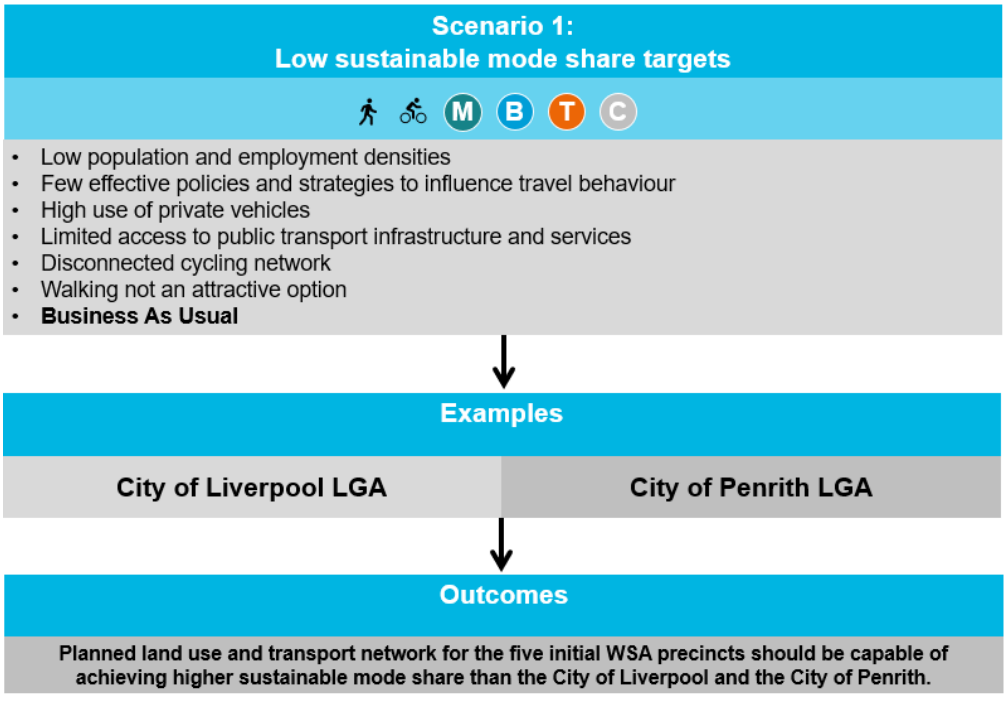


Figure 4-11: Scenario 1 conclusion

4.4.2 Scenario 2: Medium sustainable mode share targets

4.4.2.1 Scenario 2: Definition

A medium sustainable mode share target is defined as walking, cycling and public transport comprising 33% to 67% of all trips in the five initial Aerotropolis precincts. Under this scenario, private vehicles comprise the remaining 33% to 67% of all trips.

Scenario 2 represents a Beyond Business As Usual approach to land use and transport policy. Under this scenario, suburbs typically have higher densities than Scenario 1. Effective policies and strategies have been implemented to influence travel behaviour, and there is a balanced use of cycling, public transport and private vehicles for medium- and long-distance trips. Walking and cycling are typically more attractive options than Scenario 1 due to safe, efficient and connected infrastructure and balanced road space allocation. Figure 4-12 summarises the characteristics of a scenario with medium sustainable mode share targets.

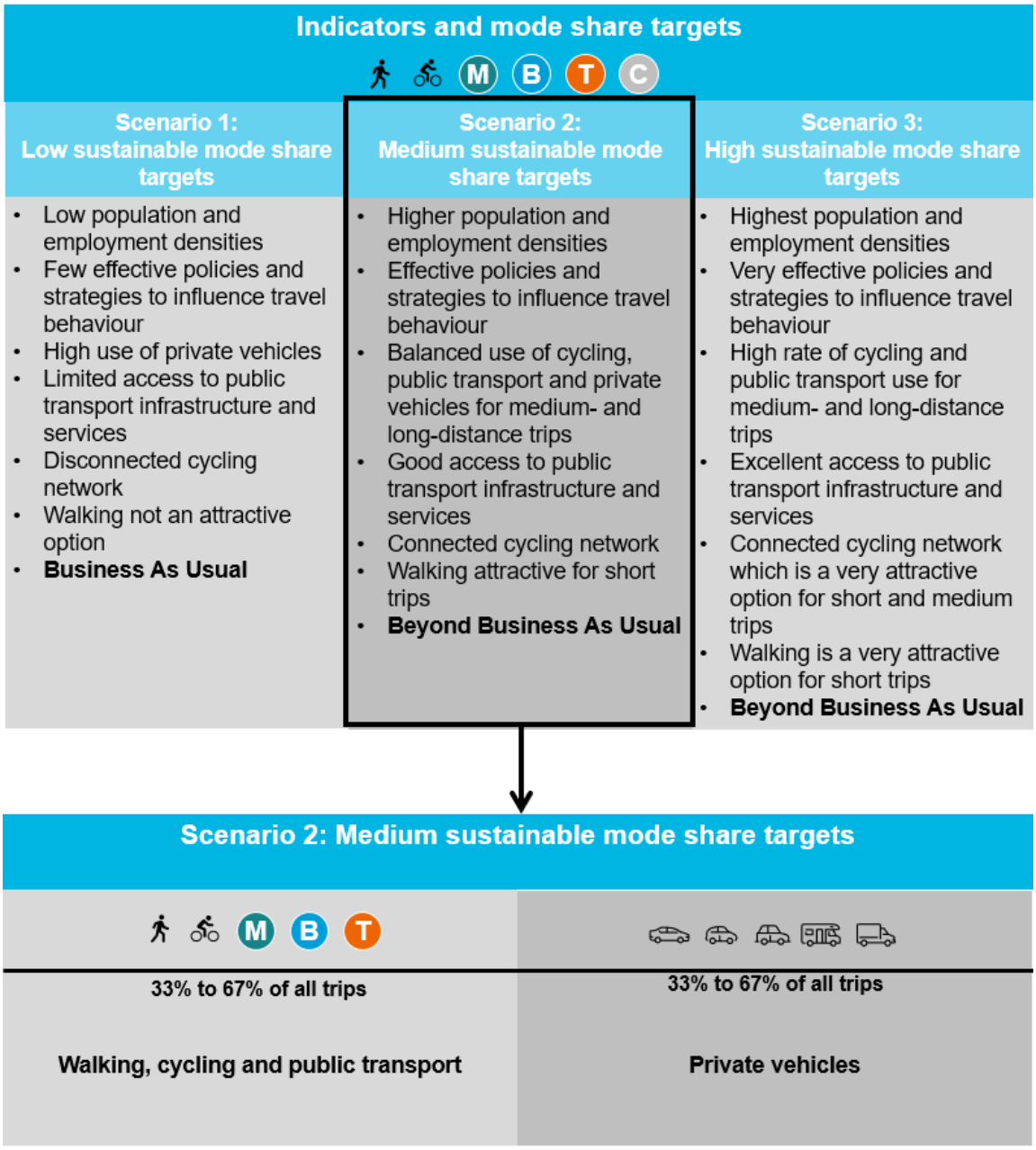


Figure 4-12: Scenario 2 summary

4.4.2.2 Scenario 2: Analysis

The Aerotropolis will anchor the Western Parkland City, with the Aerotropolis Core identified as its Metropolitan Centre. As such, the City of Parramatta Local Government Area represents an appropriate location to benchmark this significant city-building opportunity against. The City of Parramatta anchors the Central River City, with Greater Parramatta as its Metropolitan Centre.

Similarly, South-East Sydney represents an appropriate location to benchmark the five initial Aerotropolis precincts against. Like the five initial Aerotropolis precincts, South-East Sydney has a diversity of land uses including an international airport, a port, a university, hospitals, schools, shopping centres, town centres, industrial land and housing.

Table 4-3 provides a comparison of the total number of jobs and job density between the five initial Aerotropolis precincts, the City of Parramatta and South-East Sydney. The five initial Aerotropolis precincts have the lowest number of jobs (102,000 planned in 2056) and the lowest job density (1,545 jobs per square kilometre). In contrast, the South-East Sydney has more than double the number of jobs (240,000 in 2016) and a job density almost 80% higher (2,759 jobs per square kilometre) than the five initial Aerotropolis precincts. This analysis shows the City of Parramatta Local Government Area has a similar job density to the five initial Aerotropolis precincts.

Table 4-3 A comparison of jobs between the five initial Aerotropolis precincts, the City of Parramatta and South-East Sydney

Precinct	Size	Jobs	Job density
Five initial Aerotropolis precincts	66km^2	102,000 (planned in 2056)	1,545 jobs/km^2
City of Parramatta	84km^2	137,900 (2016)	1,642 jobs/km^2
South-East Sydney	87km^2	240,000 (2016)	2,759 jobs/km^2

Table 4-4 provides a comparison of the total number of residents and population density between the five initial Aerotropolis precincts, the City of Parramatta and South-East Sydney. The five initial Aerotropolis precincts have the lowest number of residents (34,000 planned in 2056) and the lowest residential density (515 residents per square kilometre). In contrast, South-East Sydney has almost ten times more residents (320,000 in 2016), and a population density almost six times higher (3,678 residents per square kilometre) than the five initial Aerotropolis precincts.

Table 4-4 A comparison of population between the five initial Aerotropolis precincts, the City of Parramatta and South-East Sydney

Precinct	Size	Residents	Population density
Five initial Aerotropolis precincts	66km^2	34,000 (planned in 2056)	515 residents/km^2
City of Parramatta	84km^2	257,200 (2019)	3,062 residents/km^2
South-East Sydney	87km^2	320,000 (2016)	3,678 residents/km^2

Figure 4-13 shows the Journey To Work mode share for workers in the City of Parramatta Local Government Area. Private vehicle was the most popular mode (73%), followed by public transport (24%). Walking accounted for 3% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 27% of all Journey To Work trips. Private vehicles accounted for 73%.

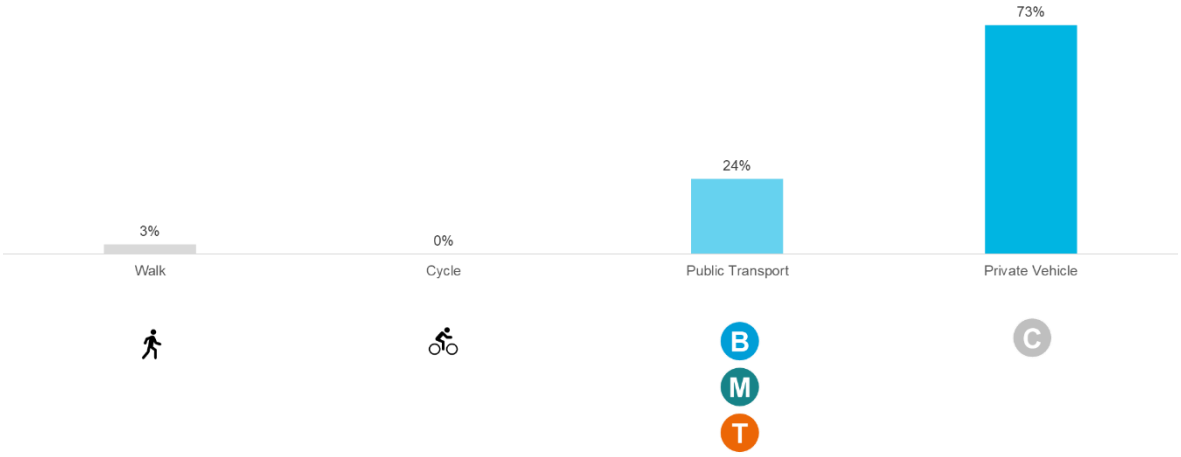


Figure 4-13 Journey to Work mode share for workers in the City of Parramatta Local Government Area

Figure 4-14 shows the Journey To Work mode share for workers in South-East Sydney. Private vehicles were the most popular mode (59%), followed by public transport (30%). Walking accounted for 6% of all Journey To Work trips, and cycling accounted for 1%. When combined, walking, cycling and public transport accounted for 37% of all Journey To Work trips. Other modes (not shown) accounted for 4%.

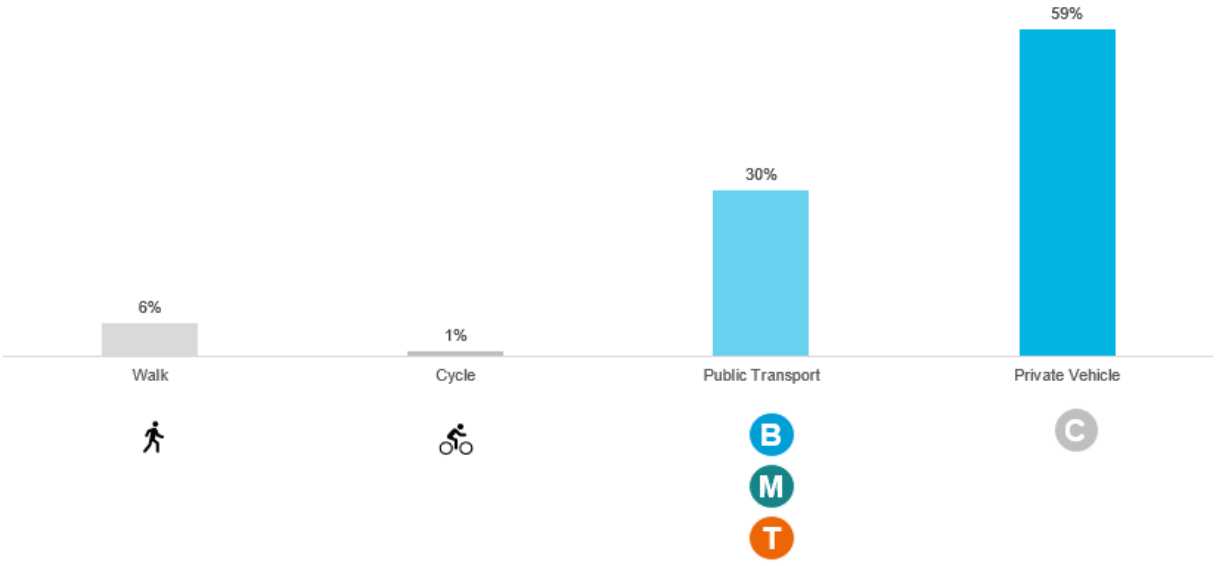


Figure 4-14 Journey to Work mode share for workers in South-East Sydney

Figure 4-15 shows the Journey To Work mode share for residents in the City of Parramatta Local Government Area. Private vehicle was the most popular mode (64%), followed by public transport (31%). Walking accounted for 4% of all Journey To Work trips, with no cycling mode share. When combined, walking, cycling and public transport accounted for 35% of all Journey To Work trips. Private vehicles account for 64%.

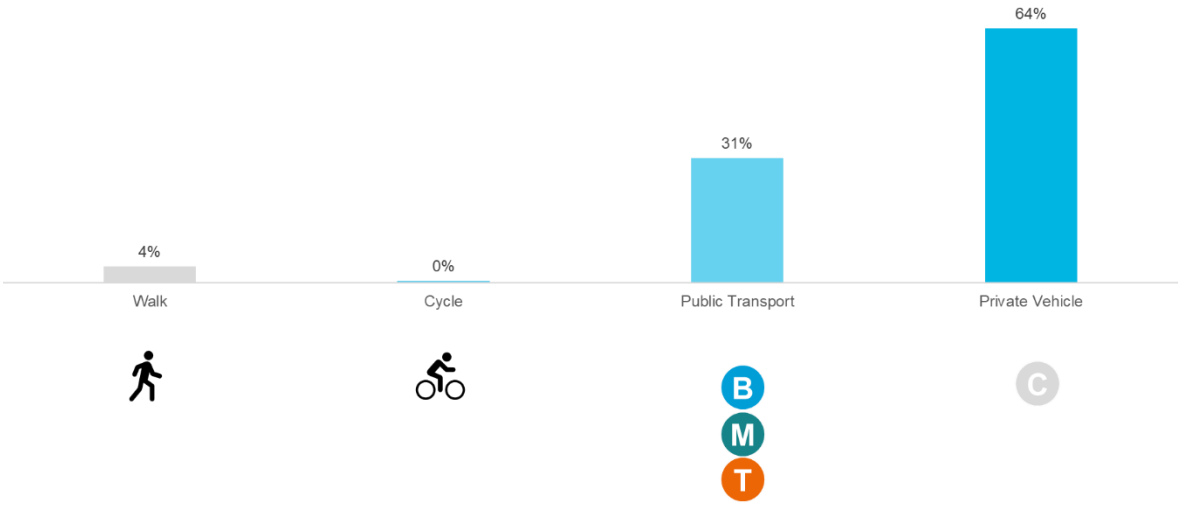


Figure 4-15 Journey to Work mode share for residents in the City of Parramatta Local Government Area

Figure 4-16 shows the Journey To Work mode share for residents in South-East Sydney. Private vehicles were the most popular mode (47%), followed by public transport (39%), walking (9%) and cycling (2%). Other modes (not shown) accounted for 3%. When combined, walking, cycling and public transport accounted for 50% of all Journey To Work trips.

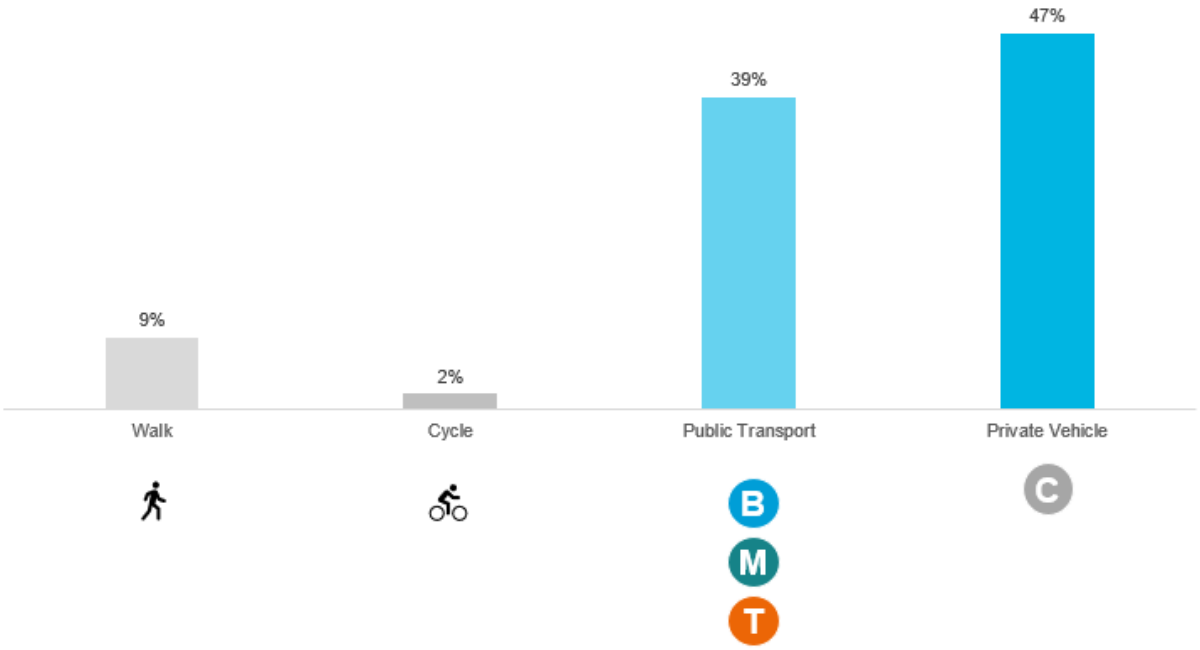


Figure 4-16 Journey to Work mode share for residents in South-East Sydney

4.4.2.3 Scenario 2: Conclusion

Outcome: The City of Parramatta Local Government Area is currently in transition from a typically car-dependent area with low to medium sustainable mode share for Journey To Work trips. South-East Sydney achieves a higher sustainable mode share for Journey To Work trips. It is a similar size to the City of Parramatta Local Government Area but has more jobs and residents, resulting in higher densities. Density lends itself to the provision of a comprehensive public transport network of infrastructure and services. Compact and dense urban form also makes walking and cycling attractive mode choices for shorter trips.

The number of jobs and residents planned in the five initial Aerotropolis precincts is lower than the City of Parramatta Local Government Area and South-East Sydney. This results in lower job and population densities, meaning walking and cycling are likely to be less attractive mode choices for shorter trips in the five initial Aerotropolis precincts. However, the development of an integrated multi-modal transport network is expected to embed travel patterns early and achieve mode share targets beyond business as usual.

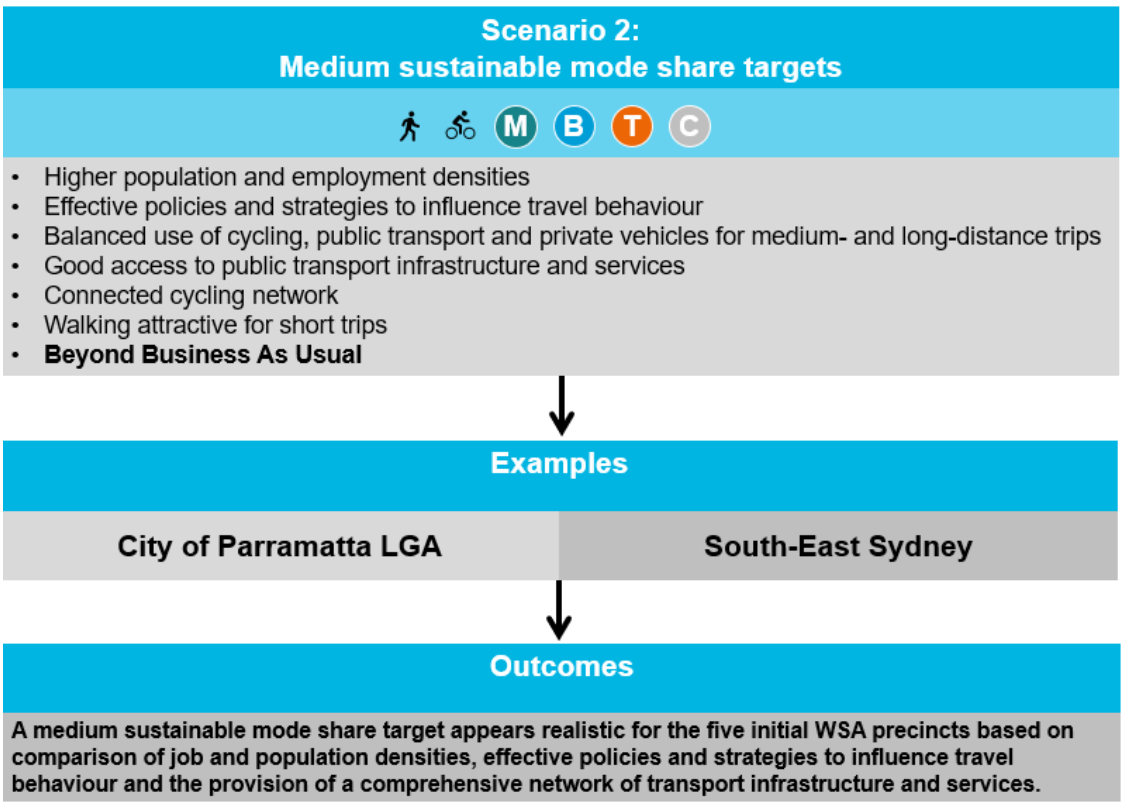


Figure 4-17: Scenario 2 conclusion

4.4.3 Scenario 3: High sustainable mode share targets

4.4.3.1 Scenario 3: Definition

A high sustainable mode share target is defined as walking, cycling and public transport comprising 67% to 100% of all trips in the five initial Aerotropolis precincts. Under this scenario, private vehicles comprise the remaining 0% to 33% of all trips.

Scenario 3 represents a Beyond Business As Usual approach to land use and transport policy. Under this scenario, suburbs typically have the highest densities. Very effective policies and strategies have been implemented to influence travel behaviour, and there is a high rate of cycling and public transport use for medium- and long-distance trips. Walking and cycling are typically more attractive options than in Scenarios 1 or 2 due to safe, efficient and connected infrastructure that is very attractive for short and medium-length trips. Figure 4-18 summarises the characteristics of a scenario with high sustainable mode share targets.

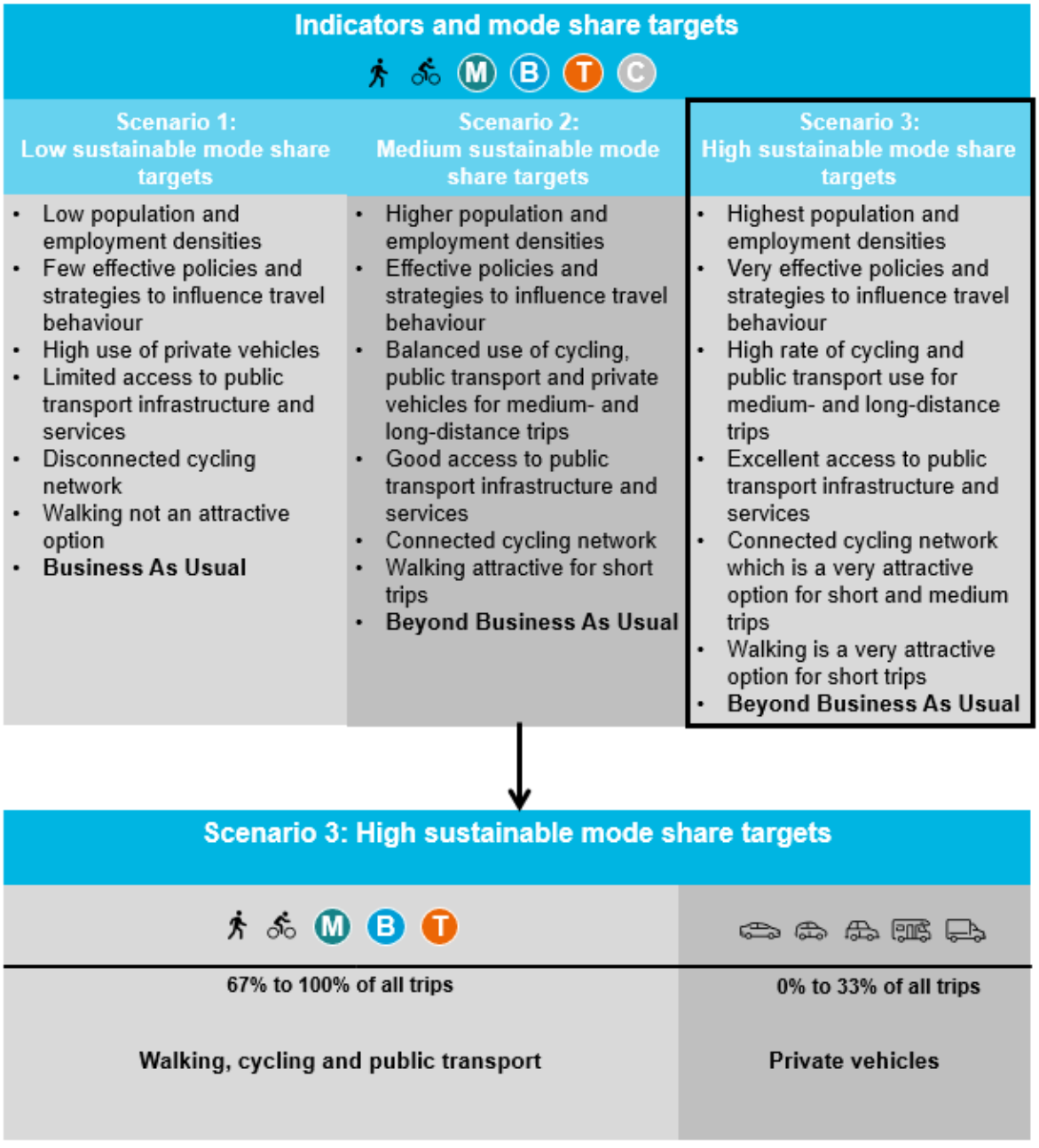


Figure 4-18: Scenario 3 summary

4.4.3.2 Scenario 3: Analysis

Aerotropolis will anchor the Western Parkland City, with the Aerotropolis Core identified as its Metropolitan Centre. As such, the City of Sydney Local Government Area represents an appropriate location to benchmark this significant city-building opportunity against. The City of Sydney anchors the Eastern Harbour City, with the Sydney CBD as its Metropolitan Centre.

Table 4-5 provides a comparison of the total number of jobs and job density between the five initial Aerotropolis precincts and the City of Sydney. The five initial Aerotropolis precincts have the lowest number of jobs (102,000 planned in 2056) and the lowest job density (1,545 jobs per square kilometre). In contrast, the City of Sydney has almost five times the number of jobs (502,000 in 2016) and a job density approximately 13 times higher (20,080 jobs per square kilometre) than the five initial Aerotropolis precincts.

Table 4-5 A comparison of jobs between the five initial Aerotropolis precincts and the City of Sydney

Precinct	Size	Jobs	Job density
Five initial Aerotropolis precincts	66km^2	102,000 (planned in 2056)	1,545 jobs/km^2
City of Sydney	25km^2	502,000 (2016)	20,080 jobs/km^2

Table 4-6 provides a comparison of the total number of residents and population density between the five initial Aerotropolis precincts and the City of Sydney. The five initial Aerotropolis precincts have the lowest number of residents (34,000 planned in 2056) and the lowest residential density (515 residents per square kilometre). In contrast, the City of Sydney has almost six times more residents (246,340 in 2019), and a population density almost 25 times higher (9,854 residents per square kilometre) than the five initial Aerotropolis precincts.

Table 4-6 A comparison of residents between the five initial Aerotropolis precincts and the City of Sydney

Precinct	Size	Residents	Population density
Five initial Aerotropolis precincts	66km^2	34,000 (planned in 2056)	515 residents/km^2
City of Sydney	25km^2	246,340 (2019)	9,854 residents/km^2

Figure 4-19 shows the Journey To Work mode share for workers in the City of Sydney Local Government Area. Public transport was the most popular mode (66%), followed by private vehicles (25%). Walking accounted for 7% of all Journey To Work trips, and cycling accounted for the remaining 2%. When combined, walking, cycling and public transport accounted for 75% of all Journey To Work trips. Private vehicles accounted for 25%.

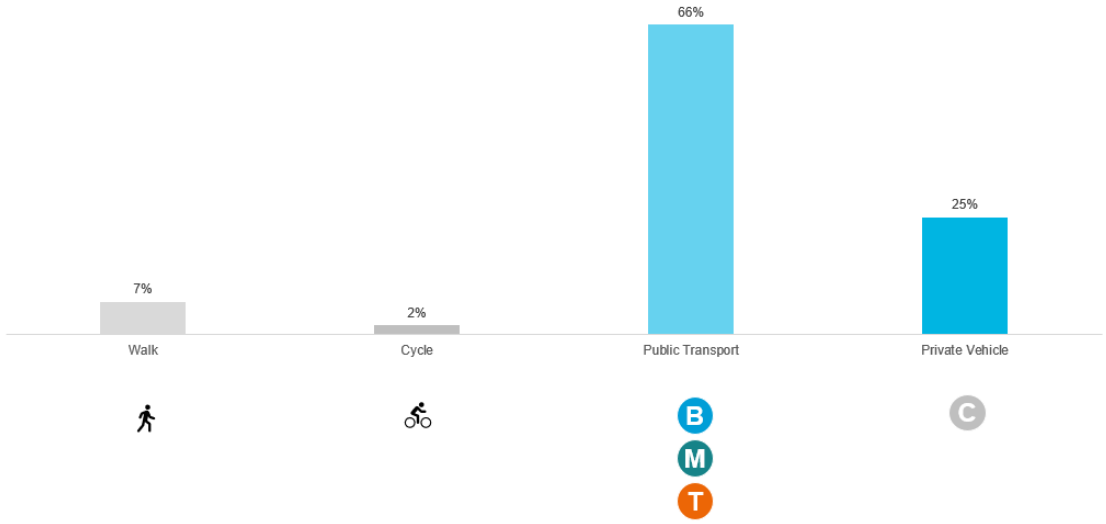


Figure 4-19 Journey to Work mode share for workers in the City of Sydney Local Government Area

Figure 4-20 shows the Journey To Work mode share for residents in the City of Sydney Local Government Area. Public transport was the most popular mode (41%), followed equally by walking and private vehicles (28% each). Cycling accounted for 3% of all Journey To Work trips. When combined, walking, cycling and public transport accounted for 72% of all Journey To Work trips. Private vehicles account for 28%.

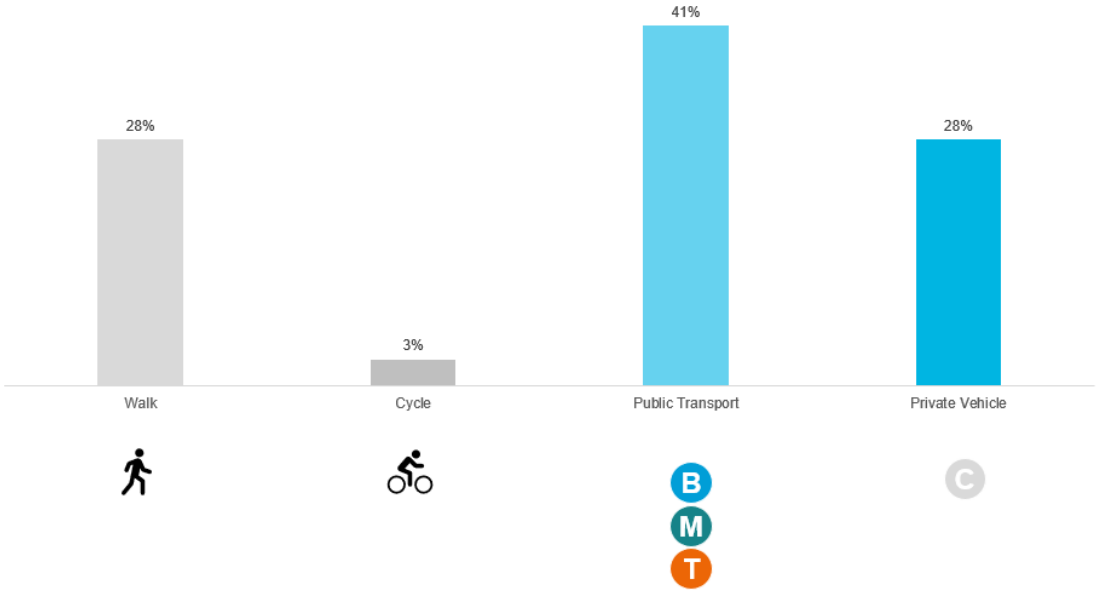


Figure 4-20 Journey to Work mode share for residents in the City of Sydney Local Government Area

4.4.3.3 Scenario 3: Conclusion

Outcome: The City of Sydney Local Government Area achieves high sustainable mode share for Journey To Work trips because it is compact and dense by Sydney standards. Density lends itself to the provision of a comprehensive public transport network of infrastructure and services. Compact and dense urban form also makes walking and cycling attractive mode choices for shorter trips.

Scenario 3 may be deemed more of a stretch target, but it is less reasonably validated based on the significant changes to culture and travel behaviours required to achieve this in the timeframe in consideration. It can still however be considered a longer-term aspiration, which will be supported and encouraged over time as travel patterns develop in a different way in the Aerotropolis precincts.

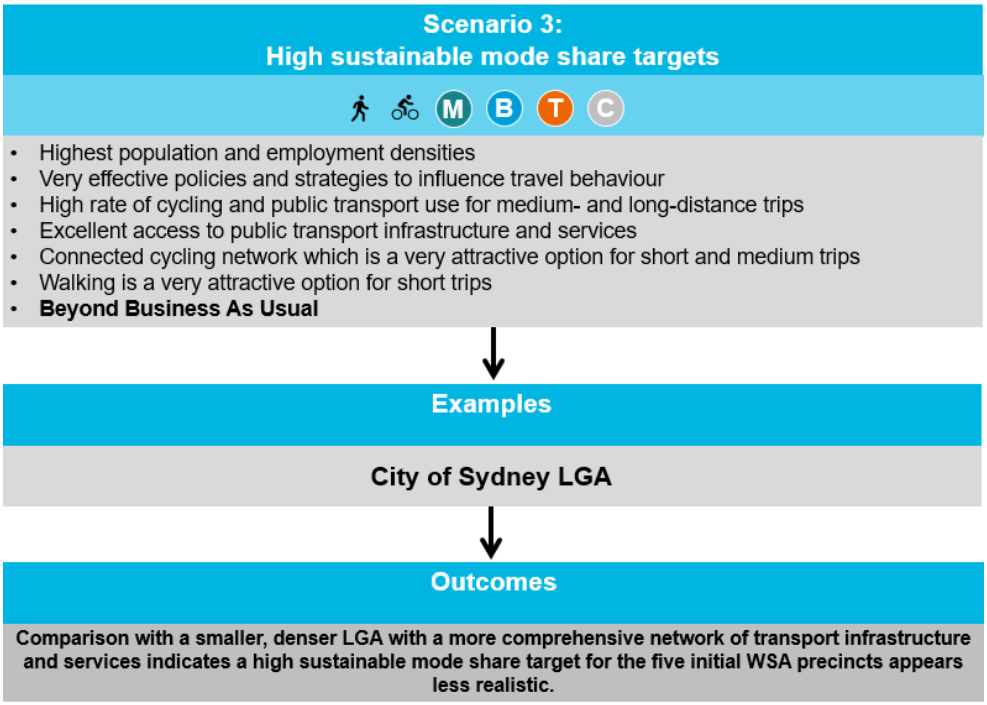


Figure 4-21: Scenario 3 conclusion

4.4.4 Outcome

The outcome of the assessment presented above is that the medium sustainable mode share scenario is the most realistic for the five initial Western Sydney Aerotropolis precincts, therefore a set of targets have been developed for the five initial Western Sydney Aerotropolis precincts for the medium term (in 2056), which fall within this scenario.

Figure 4-22 identifies specific mode share targets for walking and cycling, public transport and private vehicles. This defines a mode share target for walking and cycling of 6%, for public transport at 38%, a total sustainable transport mode share target of 44%, and a private vehicle mode share target of 56%.

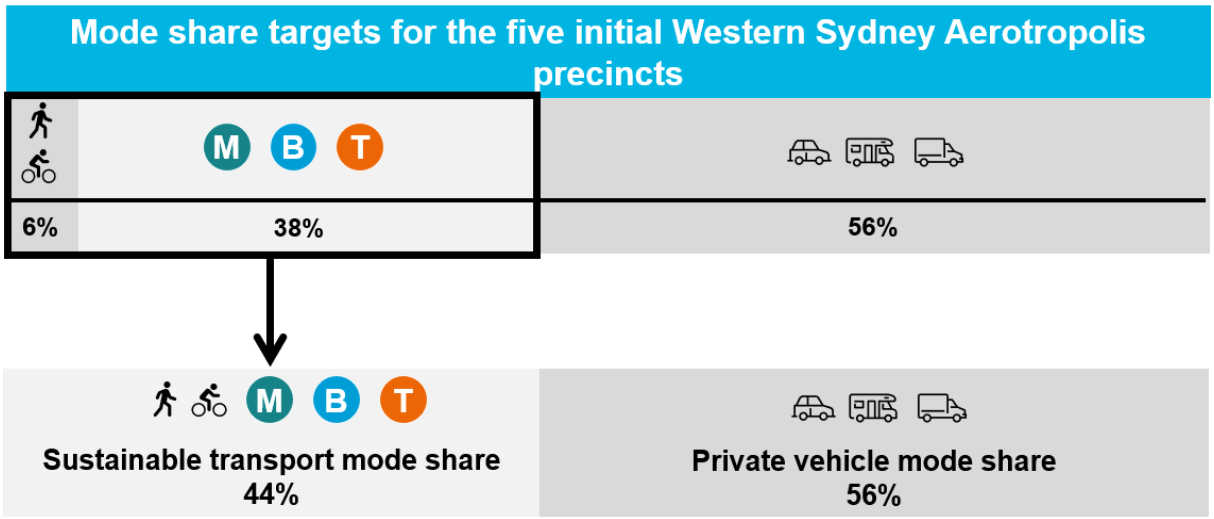


Figure 4-22: Mode share targets for the five initial Western Sydney Aerotropolis precincts

Note: The higher sustainable mode share target is considered an ambitious stretch target to be worked towards in the longer-term future.

4.5 Western Sydney International (Nancy-Bird Walton) Airport

4.5.1 Passenger demand and mode share estimates

The *Western Sydney Airport Environmental Impact Statement* identifies passenger projections for three future years; 2030, 2050 and 2063. In 2030 the Airport is projected to accommodate ten million annual passengers. This is projected to grow by 270% to 37 million annual passengers in 2050 and 720% to 82 million annual passengers in 2063, as Figure 4-23 shows.

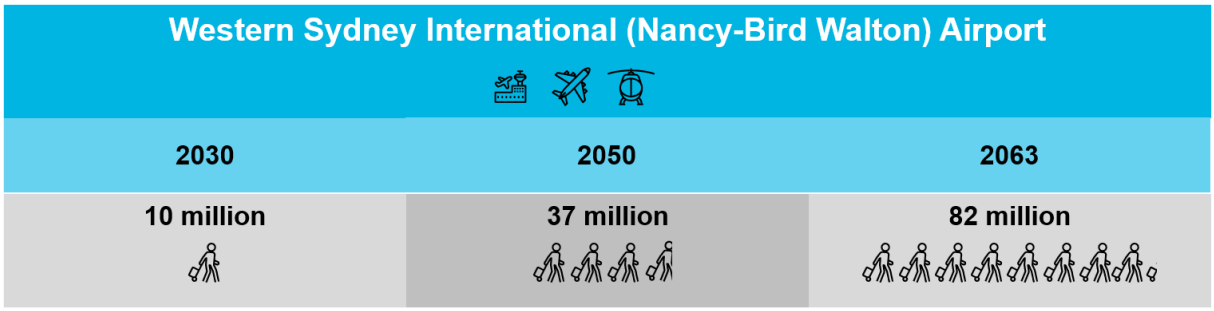


Figure 4-23: Passenger growth projections for the Airport between 2031 and 2064

The *Western Sydney Airport Environmental Impact Statement* also identifies private vehicles as the dominant mode for passenger arrivals and departures. In 2063, 67% of domestic passengers and 69% of international passengers are anticipated to use a private vehicle. The remaining 33% of domestic passengers and 31% of international passengers are projected to use public transport. This is shown in Figure 4-24

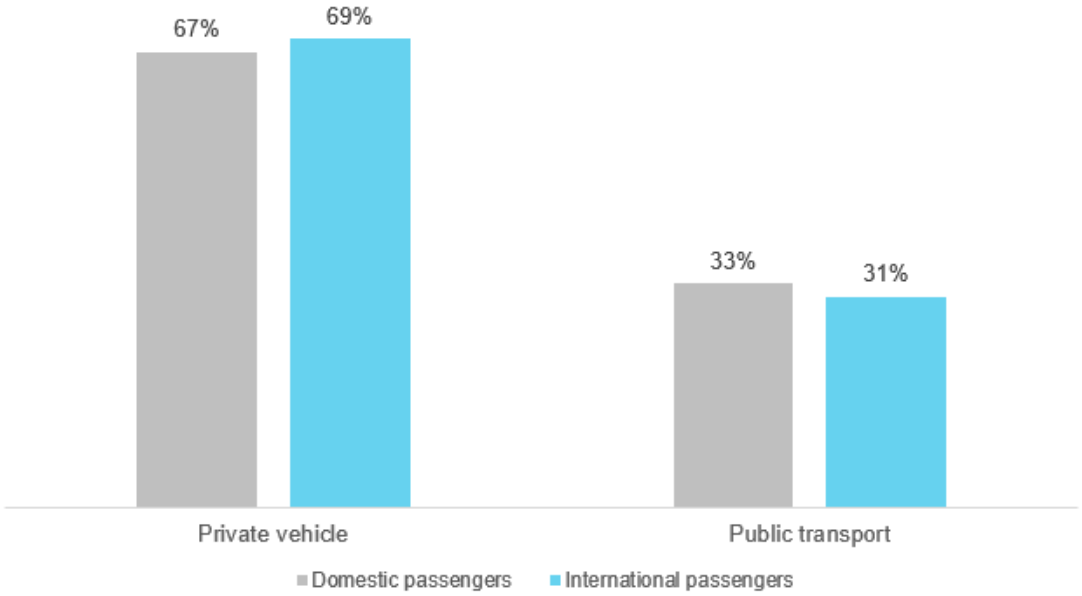


Figure 4-24 Airport passenger mode share by year

4.5.2 Collaboration between Airport and Aerotropolis precincts

It is important to recognise the role of Western Sydney International Airport in shaping this transport strategy. The mode share targets for the five initial Aerotropolis precincts can only be achieved through an integrated approach with the Airport. It is important that collaboration and further integration of planning continues between the Aerotropolis and the Airport.

5.0 Case studies

5.1 Context

International and domestic case studies which share geographic, land use and infrastructure commonalities with Aerotropolis have been investigated to provide additional context to inform the two enablers; transport policies and strategies, and transport infrastructure and services.

International case studies were selected based on comparable size to the five initial Aerotropolis precincts, future transport infrastructure and service provision, edge city characteristics and proximity to international airports.

Domestic case studies were selected to reflect individual Aerotropolis precincts based on size, future residential and employment populations as well as transport infrastructure and services.

The location of the selected case studies is presented in Figure 5-1.

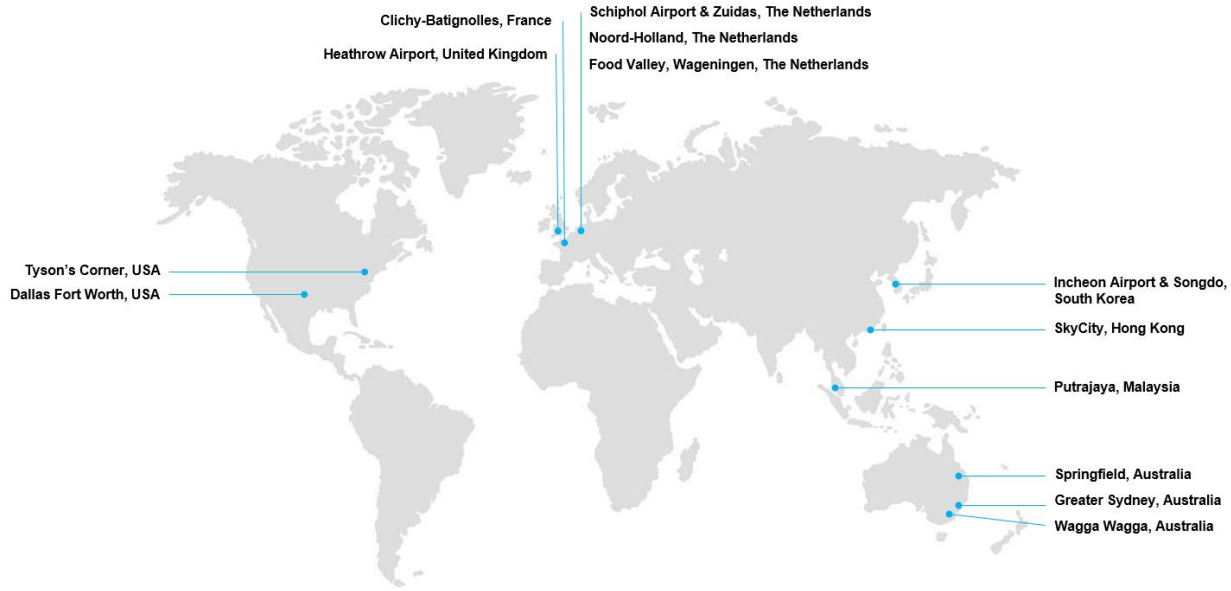


Figure 5-1 Location of case studies referenced

The alignment of these case studies with four of the initial Aerotropolis precincts[2] is presented in Figure 5-2, with description following.

Alignment of Aerotropolis case studies

	Aerotropolis Core	Northern Gateway	Agribusiness	Badgerys Creek
International	Schiphol Airport and Amsterdam Zuidas Dallas Fort Worth International Airport Putrajaya Incheon Airport and Songdo International Business District SkyCity Tyson's Corner Clichy-Batignolles	Schiphol Airport and Amsterdam Zuidas Dallas Fort Worth International Airport Putrajaya Incheon Airport and Songdo International Business District SkyCity Tyson's Corner Heathrow Airport	Food Valley, Wageningen Noord-Holland Noord	Putrajaya Incheon Airport and Songdo International Business District Tyson's Corner
Domestic	Parramatta Macquarie Park Randwick	Liverpool Penrith Sydney Airport	Wagga Wagga	Green Square Springfield

Figure 5-2 Alignment of case studies

Case studies which align with the Aerotropolis Core have been selected based on their employment and land use characteristics; focused on knowledge intensive industries within a dense mixed-use development, often situated adjacent to an international airport.

Similarities can be drawn between the case studies outlined for Northern Gateway in the areas of proximity to an international airport, employment and freight task.

Food Valley, Noord-Holland Noord and Wagga Wagga have been selected as case studies for the Agribusiness precinct as they serve as agricultural precincts with significant collaboration between stakeholder in the production of food and related technologies.

The Badgerys Creek precinct is primarily focused on enterprise zones with activity concentrated to centres. The aligned case studies share a mix of employment, supporting the functions of the strategic centres and key trade operations through airports and distribution centres.

[2] As Wianamatta-South Creek is being designed as a recreational and environmental precinct, it is projected to have no residents or jobs. This means Wianamatta-South Creek is neither an origin nor a destination for passenger trips. As such, it is assumed that passenger trips to/from Wianamatta-South Creek are subsumed into the four remaining precincts. Wianamatta-South Creek has then been omitted from the case study analysis.

The selected case studies have a range of sustainable mode shares, with all falling in the low and medium scenarios outlined in Section 0. The average of the Journey To Work sustainable mode shares for the domestic case studies is presented in Figure 5-3.

The sustainable mode share for centres such as Randwick, Green Square, Greater Parramatta and Macquarie Park sit within the medium scenario of 33% to 67%. These centres with a medium sustainable mode share represent beyond business as usual and have the following characteristics:

- Higher population and employment densities
- Effective policies and strategies to influence travel behaviour
- Balanced use of cycling, public transport and private vehicles for medium- and long-distance trips
- Good access to public transport infrastructure and higher service frequencies
- Connected cycling network
- Walking is attractive for short trips

Centres with characteristics such as these support the overall *Western Sydney Aerotropolis Plan* vision.

Centres which are located further from CBDs in lower density suburbs, including Liverpool, Penrith and Springfield, have a much lower sustainable mode share, falling within the low scenario of 0% to 33%. These centres represent business as usual and have the following characteristics:

- Low population and employment densities resulting in greater distances to travel
- Few effective policies and strategies to influence existing travel behaviours
- High use of private vehicles
- Limited access to public transport and services
- Disconnected cycling network
- Walking is not an attractive mode due to the hostile environment created through car dominance.

Centres with characteristics such as these do not support the overall *Western Sydney Aerotropolis Plan* vision.

Sustainable mode share is low for Sydney Airport and Port Botany with limited public transport accessibility from neighbouring suburbs whilst the location and environment, within a car and freight dominated environment between arterial roads and motorways, deters active transport use.

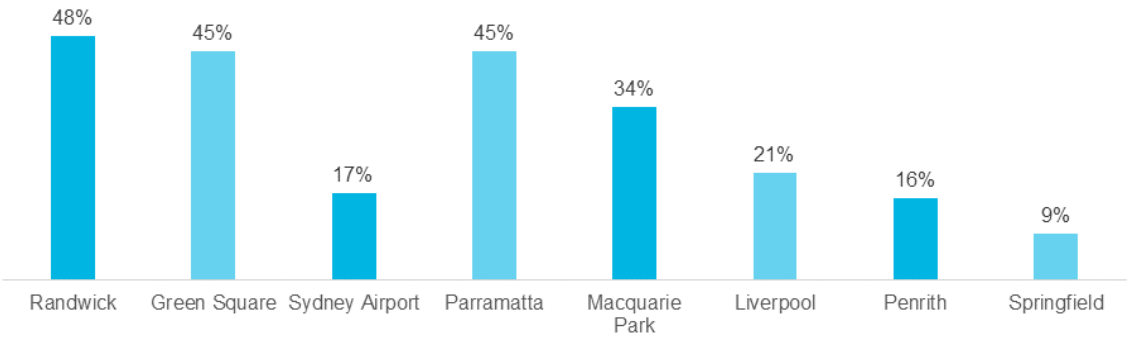


Figure 5-3 Comparison of average sustainable mode shares from Journey To Work data for domestic case studies

Source: Australian Bureau of Statistics, 2016

5.2 International case studies

5.2.1 Schiphol Airport and Amsterdam Zuidas, The Netherlands

Schiphol Airport is the international airport which serves Amsterdam, situated 12 kilometres south-west of Amsterdam Centraal Station. The European travel hub received 72 million visitors in 2018 and is supported by Schiphol CBD which consists of a precinct of office buildings, hotels and exhibition spaces.

Schiphol Airport's strategic location is key to its success: located on the doorstop of the cultural centre of Amsterdam, connected to major European cities via intercity rail with access to regional centres via national highways.

Table 5-1 presents the key information for Schiphol Airport and Zuidas.

Table 5-1 Schiphol Airport and Zuidas key information

	Schiphol Airport	Zuidas	Five initial Aerotropolis precincts
Size	2,787 hectares	271 hectares	6,574 hectares
Population	-	4,000 (2018), 9,000 (2030)	34,000 (2056 projection)
Employment	64,000	43,700	102,000 (2056 projection)

The mass transport infrastructure from Schiphol Airport includes train, metro, light rail and buses, with GVB[3] operating routes between Schiphol Airport and Amsterdam. Combined pass options which promote public transport modes include the 90-minute Bus Tram Metro (BTM) tickets at €6.50 or multi-day tickets from €8.00. Table 5-2 presents a comparison of transport modes between Schiphol Airport and its edge city, Zuidas, shown in Figure 5-4.

Table 5-2 Comparison of transport options between Schiphol Airport and Zuidas

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	6-7	15	13	32	10
Maximum frequency (services per hour)	14	10	5	3	-

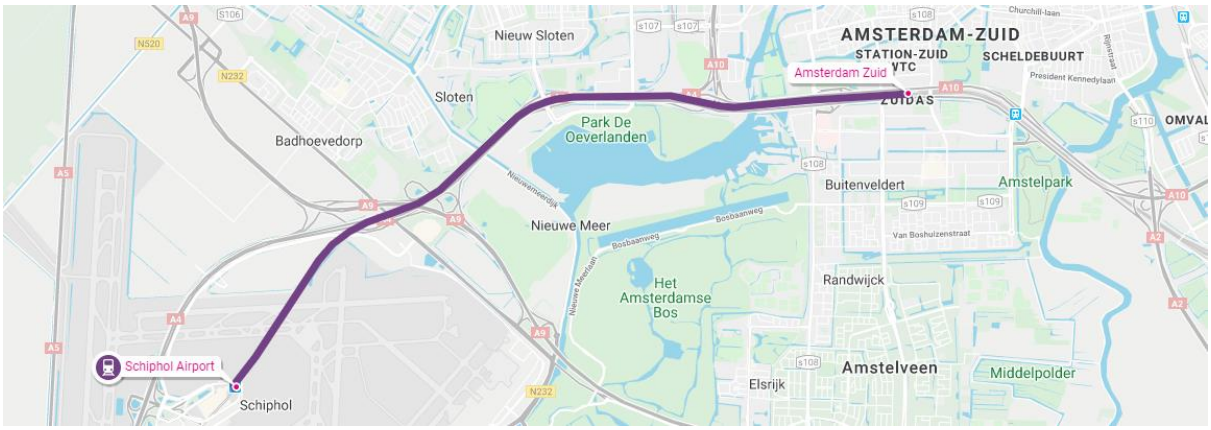


Figure 5-4 Connection between Schiphol Airport and Zuidas

Source: Rome2Rio, 2020

[3] GVB is the public transport operator of Amsterdam.

Zuidas, an edge city which brings together aviation, commerce, education and residential land uses, supports the activity of Schiphol Airport. The high-density centre's land use consists of 45% to residential dwellings, 45% to office space and 10% to amenities. Zuidas is located between Amsterdam and Schiphol Airport, shown in Figure 5-5; five kilometres from Amsterdam Centraal Station and eight kilometres from Schiphol Airport. Development will be complete in 2025.

Zuidas is serviced by a range of ground transport services at Amsterdam Zuid (South) Station:

- Nine train services including Intercity and Sprinter lines
- Three metro services
- Two light rail services
- Ten bus services including city and regional routes.

In the future, the WTC Station which services Zuidas will be expanded to be an interchange precinct between buses, trams, metros, trains and high-speed trains. Some key similarities are apparent between Schiphol Airport, Zuidas and the five initial Aerotropolis precincts include:

- The proximity to an international airport and the industries it supports: finance and medicine
- Train services connect Schiphol Airport and Zuidas, integrated with a wider transport network for regional and international connections
- Connections from Schiphol Airport and Zuidas to surrounding residential areas via bus and light rail services.

A number of key lessons are evident from Schiphol Airport and Zuidas, and can be applied to the five initial Aerotropolis precincts:

- Zuidas benefits from a compact urban form and green urbanism, which influences the mode share of the centre, encouraging the use of public and active transport over private vehicles
- Future projects in Zuidas are focused on the relocation of motorways, metro and railway infrastructure underground to create an additional 80 hectares of space to return the city to people, improving connections between the urban area and expanded transit stations
- Significant investment from private companies has aided in the success of Zuidas, with over 700 companies located in the centre, including Google, Uber, Deloitte, EY, Arcadis, JP Morgan, JC Decaux and the global headquarters for ING and ABN Amro
- The composition of Zuidas, as a mixed-use development, appeals to international workers to live and work close by.

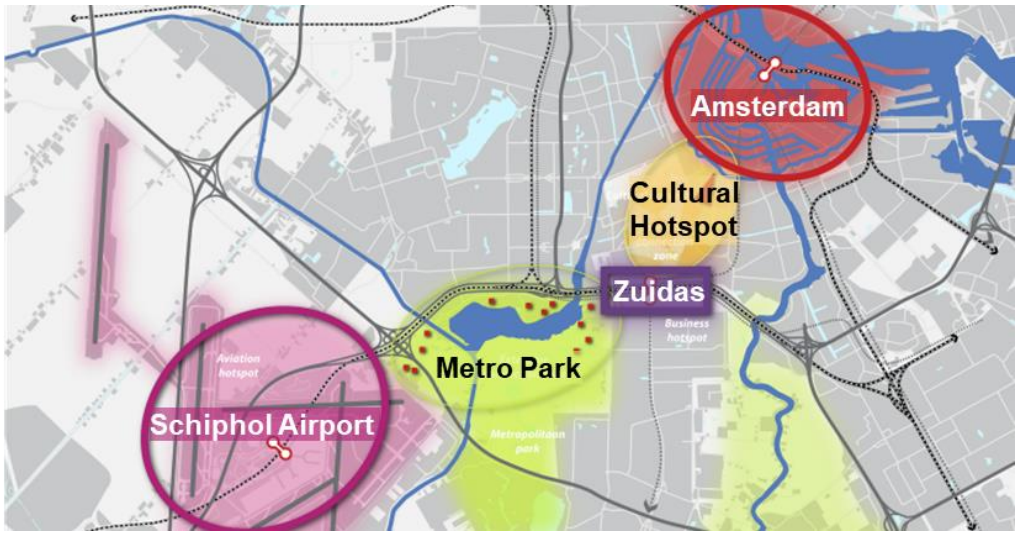


Figure 5-5 Location of Zuidas in relation to Schiphol Airport and Amsterdam

Source: Royal HaskoningDHV, 2020

5.2.2 Dallas Fort Worth International Airport, United States of America

Dallas Fort Worth Airport is an international airport which serves the cities of Dallas, Fort Worth and Denton, supporting a population of over seven million people. Situated 26 kilometres from Dallas, 31 kilometres from Fort Worth and 36 kilometres from Denton, the airport is the operational hub for American Airlines; strategically positioned between the east and west coasts of the United States of America. The airport was used by over 75 million visitors in 2019.

Dallas Fort Worth Airport is supported by edge cities, including Las Colinas which is located ten kilometres east and is connected via a dedicated light rail link. Las Colinas balances residential, community and recreational development with commercial, light industry, retail and educational activity, and is home to the University of Dallas.

Table 5-3 presents the key information for Dallas Fort Worth Airport.

Table 5-3 Dallas Fort Worth Airport key information

	Dallas Fort Worth Airport	Five initial Aerotropolis precincts
Size	6,963 hectares	6,574 hectares
Population	11,000 in Las Colinas	34,000 (2056 projection)
Employment	60,000	102,000 (2056 projection)

Major highways including the International Parkway run through the centre of Dallas Fort Worth Airport and connect to the Airport Freeway and John W. Carpenter Freeway.

Bus routes serving the airport are operated by Dallas Area Rapid Transit (DART) and Trinity Metro. An additional three rail systems serve the airport: DART Light Rail, TEX Rail, and the Trinity Railway Express.

Transport infrastructure and services within Dallas, Fort Worth and Las Colinas include light rail, intercity rail, regional and suburban rail and over 120 bus routes.

Table 5-4 and Table 5-5 present a comparison of transport modes between Dallas Fort Worth Airport, Dallas and Fort Worth, with the connections shown in Figure 5-6Table 5-6 and Figure 5-7.

Table 5-4 Comparison of transport options between Dallas Fort Worth Airport and Dallas

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	-	-	49	21	21
Maximum frequency (services per hour)	-	-	2	On demand	-

Table 5-5 Comparison of transport options between Dallas Fort Worth Airport and Fort Worth

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	55	-	-	114	27
Maximum frequency (services per hour)	1	-	-	1	-

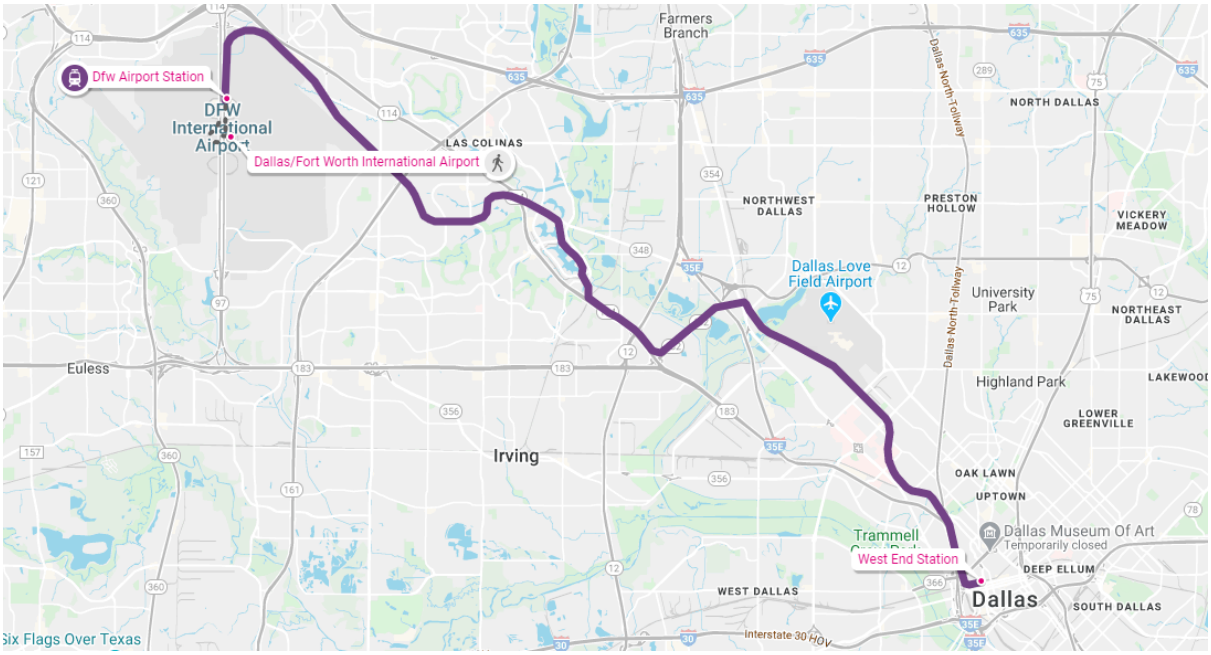


Figure 5-6 Connection between Dallas Fort Worth Airport and Dallas

Source: Rome2Rio, 2020

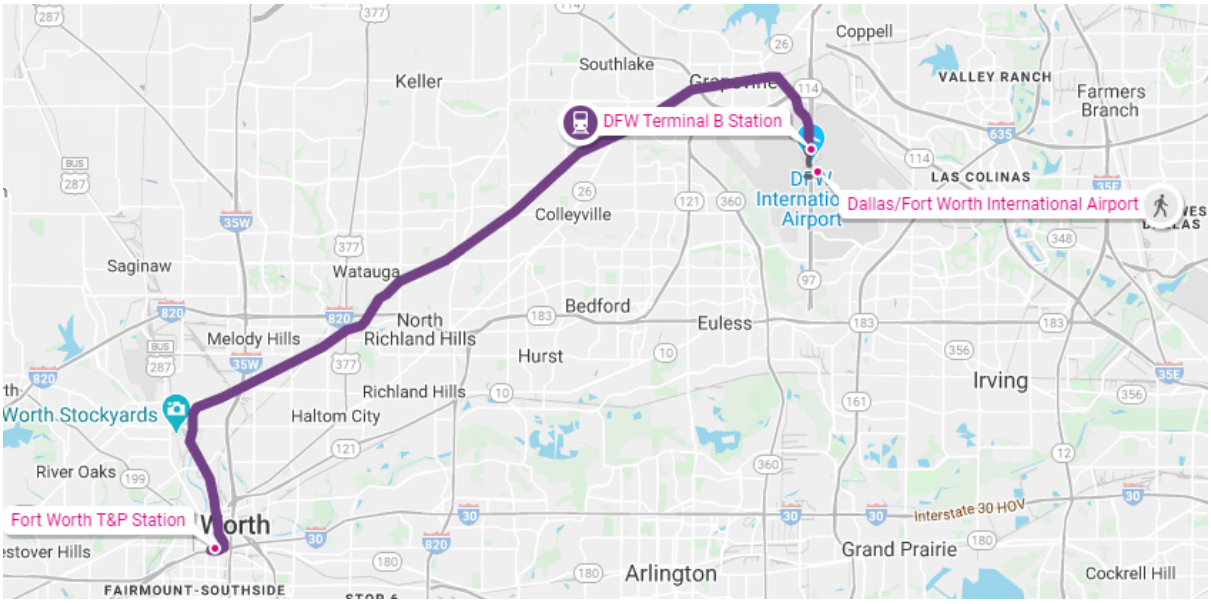


Figure 5-7 Connection between Dallas Fort Worth Airport and Fort Worth

Source: Rome2Rio, 2020

Some key similarities are apparent between Dallas Fort Worth Airport, Las Colinas and the five initial Aerotropolis precincts:

- Train lines connect Dallas Fort Worth Airport to nearby cities with one line to Dallas and one line to Fort Worth
- The study area is still car dependent with private car use at 89% in Dallas.

A number of key lessons are evident from Dallas Fort Worth Airport and Las Colinas, and can be applied to planning for the five initial Aerotropolis precincts:

- The edge cities appeal to people who are required to travel often for work, as they are places where professionals in the knowledge industry base themselves to maintain a balance between family and work.
- Dallas Fort Worth Airport integrates non-aeronautical industries with strong investment by private industries, and as a result attributes 66% of their revenue from non-aeronautical activities with 24 Fortune 500 companies based in the metroplex.
- The legacy of city planning during the car boom and its influence on the urban form of Dallas and Fort Worth does not encourage public and active transport use, with urban motorways dominating the cityscape; downtown Dallas is surrounded by motorways and Las Colinas is split in two.
- Mixed-use land within the estate developments around Dallas Fort Worth Airport is contained to high streets, resulting in large tracts of residential land use with little activation.

Figure 5-8 DART rail service at Dallas Fort Worth Airport

Source: Dallas Fort Worth Airport, 2020

5.2.3 Heathrow Airport, United Kingdom

Heathrow Airport is a major international airport located 23 kilometres west of London and is one of the busiest airports in the world, servicing both the United Kingdom and Europe.

Table 5-6 Heathrow Airport key information

	Heathrow Airport	Five initial Aerotropolis precincts
Size	1,214 hectares	6,574 hectares
Population	-	34,000 (2056 projection)
Employment	76,000	102,000 (2056 projection)

The industrial areas around Heathrow Airport support airport-related activities such as air freight, aircraft maintenance and in-flight catering, and distribution centres are located nearby. This airport-related activity employs an additional 38,000 people.

Heathrow Airport handles 78 million passengers a year, which is a 24% increase from 2002. In comparison, the Western Sydney International Airport is projected to serve approximately ten million passengers by 2031, increasing to 82 million in 2064.

Heathrow Airport is serviced by three rail lines; the Heathrow Express, Heathrow Connect/Transport for London Rail and the London Underground Piccadilly Line. Additional transport services and infrastructure also facilitate access to the airport including a Heathrow car-share scheme for staff, bus and coach services, cycling lanes, parking facilities and bike servicing at the Heathrow Cycle Hub as well as direct general traffic access via the strategic road network from the M25 and M4 motorways.

Rail and coach connections between Heathrow Airport and Central London is shown in Figure 5-9, with a comparison of transport modes presented in Table 5-7.

Figure 5-9 Rail and coach connections from Central London to Heathrow Airport

Source: Heathrow Airport Limited, 2019

Table 5-7 Comparison of transport options between Heathrow Airport and London (Covent Garden)

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	-	48	-	65	31
Maximum frequency (services per hour)	-	12	-	1	-

Policy interventions have been adopted to incentivise public transport access for employees to Heathrow Airport. These include:

- A 75% discount on Heathrow Express and Transport for London Rail train fares for Heathrow staff
- Heathrow Travelcards for Heathrow ID holders with discounts on bus and train routes.

Through these policy interventions, the mode share of public transport users accessing Heathrow Airport is has increased, particularly for workers:

- Air passengers: 33% to 39% (1990 – 2016)
- Workers: 14% to 39% (1991 – 2013).

The change in mode share to Heathrow Airport between 1990 and 2016 is shown in Figure 5-10.

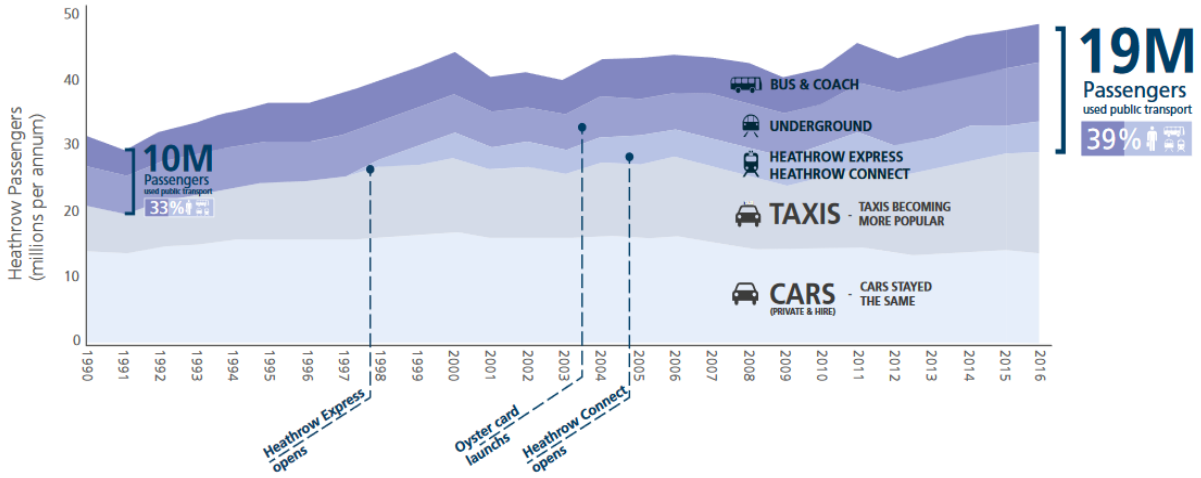


Figure 5-10 Heathrow Airport mode share from 1990 to 2016

Source: Heathrow Airport Limited, 2018

A number of key lessons are evident from Heathrow Airport, and applied to planning for the five initial Aerotropolis precincts:

- Supporting air passenger growth through transport investments, services and policy intervention to improve accessibility to and from the airport for all customers (passengers and staff)
- Fare incentives designed to encourage public transport use to and from the airport
- Implementation of a Sustainable Travel Plan and a Surface Access Strategy.

5.2.4 Putrajaya, Malaysia

The administrative capital of Malaysia was moved from Kuala Lumpur in 1999 due to severe congestion and land limitations, and relocated to Putrajaya, 25 kilometres to the south. Government employees were encouraged to also relocate to the city through a series of subsidy programs, ensuring people would both live and work in the capital. Table 5-8 presents the key information for Putrajaya.

Table 5-8 Putrajaya key information

	Putrajaya	Five initial Aerotropolis precincts
Size	4,900 hectares	6,574 hectares
Population	91,000	34,000 (2056 projection)
Employment	254,000	102,000 (2056 projection)

A metro system comprising three lines is under construction, with Line 2 travelling via Putrajaya. Existing rail links do not integrate with the city. Putrajaya is serviced by five rail services, including a limited stops Airport Express Line which directly connects the Kuala Lumpur International Airport to Kuala Lumpur Sentral Station, operated by KLIA Transit. Kuala Lumpur International Airport received over 60 million visitors in 2018.

The major highways in Putrajaya include the Kuala Lumpur-Putrajaya Expressway, Utara-Selatan Plus Expressway and Utara-Selatan Hubungan Tengah Expressway.

Six bus services operate within the city, however the frequency of these services is very low with unreliable timetables due to variable traffic congestion.

Table 5-9 presents a comparison of transport modes between Kuala Lumpur International Airport and Putrajaya, shown in Figure 5-11.

Table 5-9 Comparison of transport options between Kuala Lumpur International Airport and Putrajaya

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	20	-	-	70	27
Maximum frequency (services per hour)	2	-	-	1	-

Some key similarities can be drawn between Putrajaya and the five initial Aerotropolis precincts:

- The city of Kuala Lumpur decentralised through the relocation of administrative services to Putrajaya, similar to the city of three cities concept in Sydney
- The connection between Putrajaya and Kuala Lumpur is via a rail link.

A number of key lessons can be learned from Putrajaya, and applied to planning for the five initial Aerotropolis precincts:

- The lack of integration of the rail network with the city and its impact on mode share within the city
- An ambitious public transport mode share target of 70% was set for Putrajaya, however the current public transport mode share is 15%.
- Studies to assess this gap have found that the most significant limitation to public transport use is the quality of services and provision of onward connections. In Putrajaya, it was also found that the high public transport mode share target was not back up by high-frequency services.
- Few behaviour change measures were implemented to shift mode share in a very car dependent society, with factors such as the provision of a high-quality road network and the availability of cheap parking contributing to the dominance of private vehicles in the city.

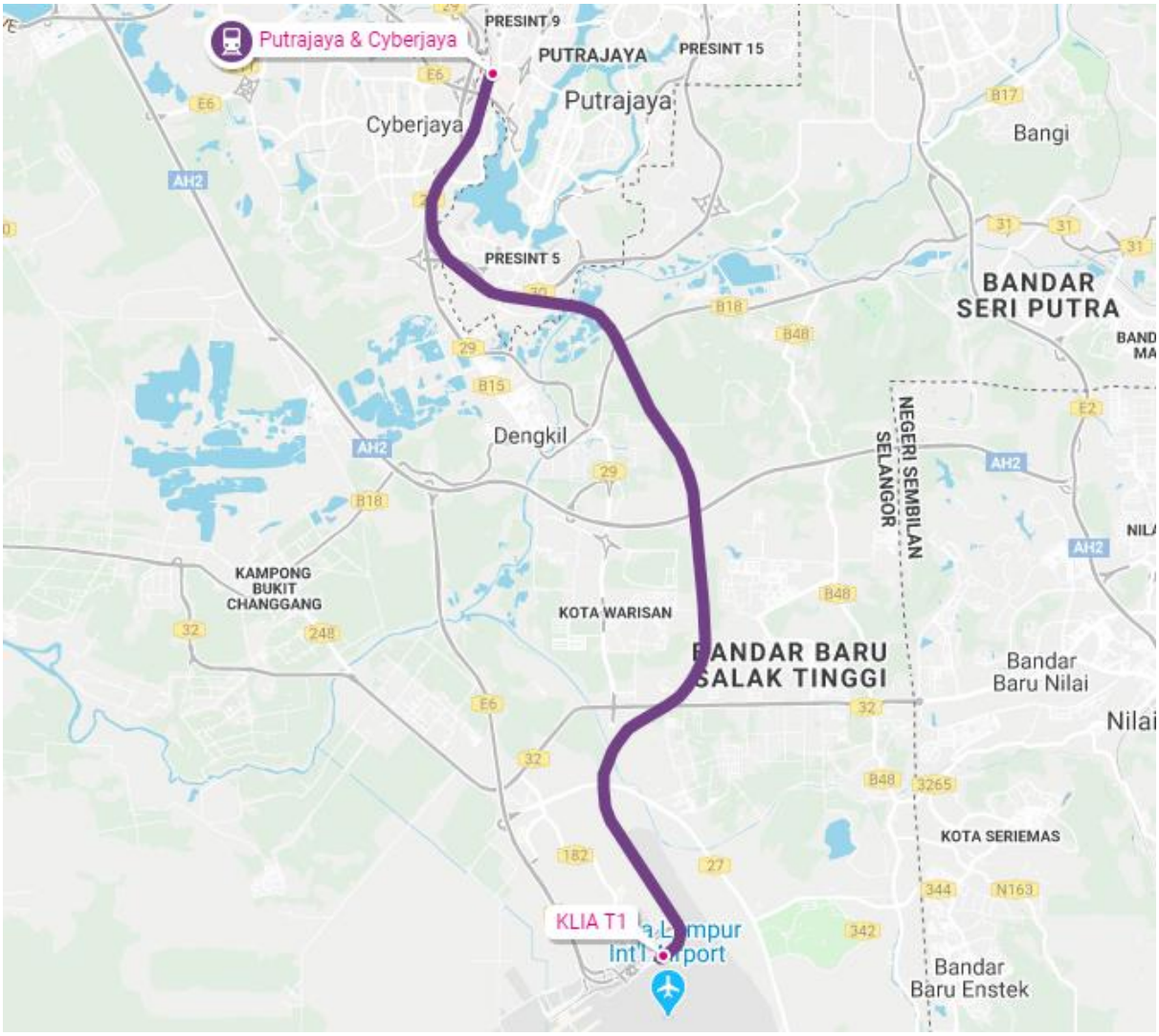


Figure 5-11 Connection between Kuala Lumpur International Airport and Putrajaya

Source: Rome2Rio, 2020

5.2.5 Incheon Airport & Songdo International Business District, South Korea

Incheon Airport is an international airport located 50 kilometres east of Seoul in South Korea. Incheon Airport and its surface transport centre opened in 2001 and has been awarded the Best Airport Worldwide Award for ten years in a row; highlighting the high-quality infrastructure and services provided. The airport is continuing to develop through its 'Airport City' masterplan; a 15-year development focusing on commercial and residential land uses.

A key part of the masterplan is the Incheon Free Enterprise Zone; with the area positioned to be a central business city of Northeast Asia, located within an hour of a third of the world's population. The zone will devote a large portion of land to medical research to attract healthcare firms.

Table 5-10 presents the key information for Incheon Airport and Songdo.

Table 5-10 Incheon Airport and Songdo key information

	Incheon Airport	Songdo	Five initial Aerotropolis precincts
Size	6,000 hectares	600 hectares	6,574 hectares
Population	N/A	100,000 (2018), 300,000 (future)	34,000 (2056 projection)
Employment	40,000	N/A	102,000 (2056 projection)

Access to the airport from nearby cities can be done via a number of modes: private vehicle, bus and rail. Table 5-11 outlines the cost and time comparisons for each mode. Car access minimises travel time, but this is offset by its high expense with bus and rail costing much less. In addition, the frequent congestion on road networks within Seoul make public transport even more attractive due to their reliability. Overall, the airport bus service is the most competitive mode for access; accounting for 53% of the mode share. In total, public transport represents 67% of trips to and from Incheon Airport.

Table 5-11 Time and cost comparison of airport access via bus, rail and private vehicle

City	Bus		Rail		Private vehicle	
	Time*	Fare	Time**	Fare	Time	Cost***
Seoul	1h 20-50m	$12	1h 30-45m	$5 - $10	1h	$56
Busan	5h 30m	$50	3h 55m	$86	5h	$136
Gwangju	3h 50m	$38.64	3h 5m	$71	4h	$117

Source: Sustainable and Inclusive Transport, 2016

Note: fare converted from South Korean Won to Australian Dollars

* Waiting time at 30 minutes ** Waiting time at 45 minutes *** Toll, petrol and three days of parking

Songdo is a supporting city, purposefully built on reclaimed land as a smart city. The city has capacity for 300,000 residents upon full completion. The residential population was estimated at 100,000 in 2018.

Songdo is served by two bus routes and one rail line. Table 5-12 presents a comparison of transport modes between Incheon Airport and Songdo, with the connection shown in Figure 5-12. Incheon Bridge does not support rail services, and as a result travel by private vehicle or bus is faster for passengers travelling between Songdo and Incheon Airport.

Table 5-12 Comparison of transport options between Incheon Airport and Songdo

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	87	-	-	34	24
Maximum frequency (services per hour)	4	-	-	3	-

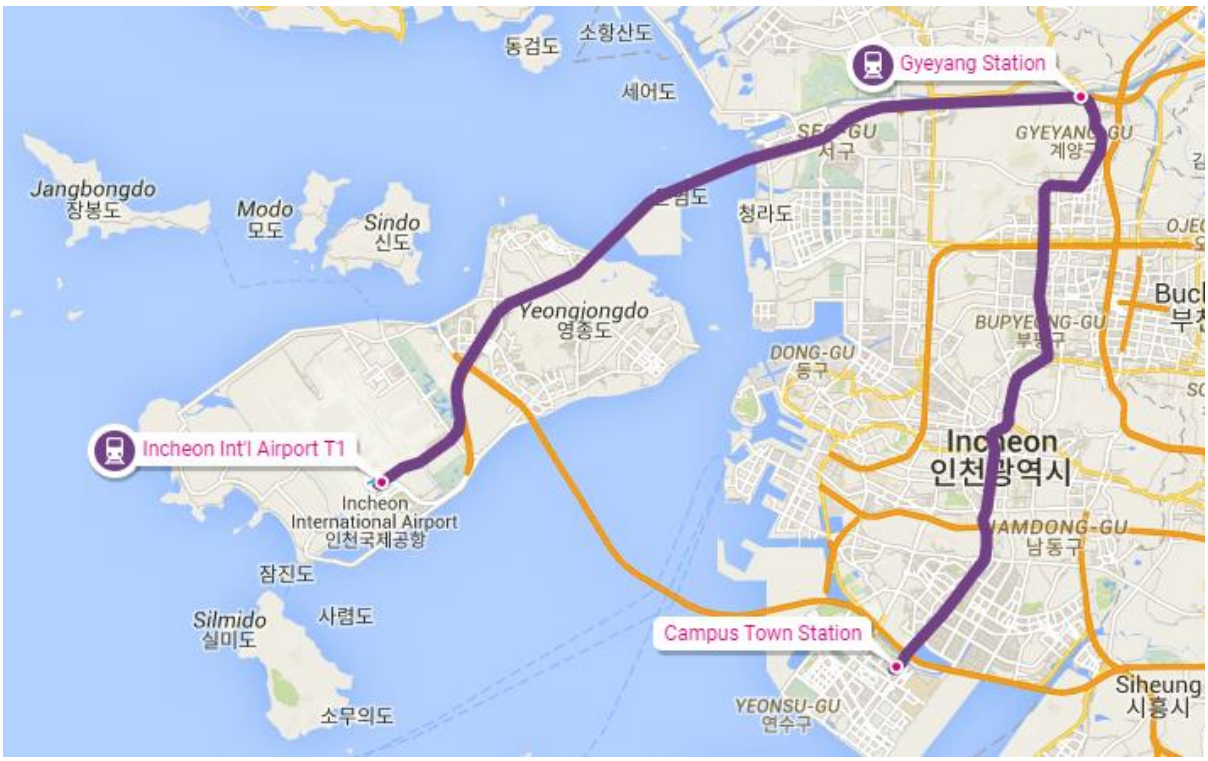


Figure 5-12 Connection between Incheon Airport and Songdo

Source: Rome2Rio, 2020

Key similarities are evident between Incheon Airport, Songdo and the five initial Aerotropolis precincts:

- Songdo was a planned city, being constructed on reclaimed land meant that all elements of the city had to be included in the development, such as utilities, roads, transport infrastructure, services and recreational space
- The transport network is integrated well within the smart city, with seamless connections to Seoul via commuter and express train lines.

A number of key lessons can be learned from Incheon Airport and Songdo, and applied to planning for the five initial Aerotropolis precincts:

- The opening of the airport and supporting transport infrastructure and services at the same time, resulting in a high public transport mode share
- The competitiveness of price and time for public transport modes, encouraging greater mode share through the airport bus services
- Connections to nearby cities, via high speed rail through Seoul from Incheon Airport within four hours
- Songdo is connected to Seoul via two rail lines, aiding in its integration and public transport use
- For a self-sufficient metropolitan city area such as Songdo, a public transport mode share goal of 50% in 2016 has been set, extending to 55% in 2030
- To promote walkability, developers have built shopping centres and convention centres within a 15-minute walk of Central Park and are constructing extensive cycling infrastructure, A bus or subway stop were also promised within 12 minutes of every neighbourhood
- Songdo is striving to be a car-free society., however its urban form is attractive for driving private vehicles, with wide roads spanning as many as ten lanes to adhere to national building codes that mandate street width and fire access. Wide roads are also partly a homage to the tree-lined boulevards of Paris. Songdo roads are, however, wide enough to retrofit light rail, which may assist in achieving its car-free promise.

5.2.6 SkyCity, Hong Kong

SkyCity is a major mixed-use development situated adjacent to Hong Kong International Airport. SkyCity consists of an expansion of Terminal 2, office and retail space, hotels, a cross-boundary ferry terminal, an exhibition centre and leisure/entertainment venues to form an 'airport city.' Early stages of SkyCity are open, however full completion is targeted for 2027. Figure 5-13 outlines the location of SkyCity in relation to Hong Kong International Airport.

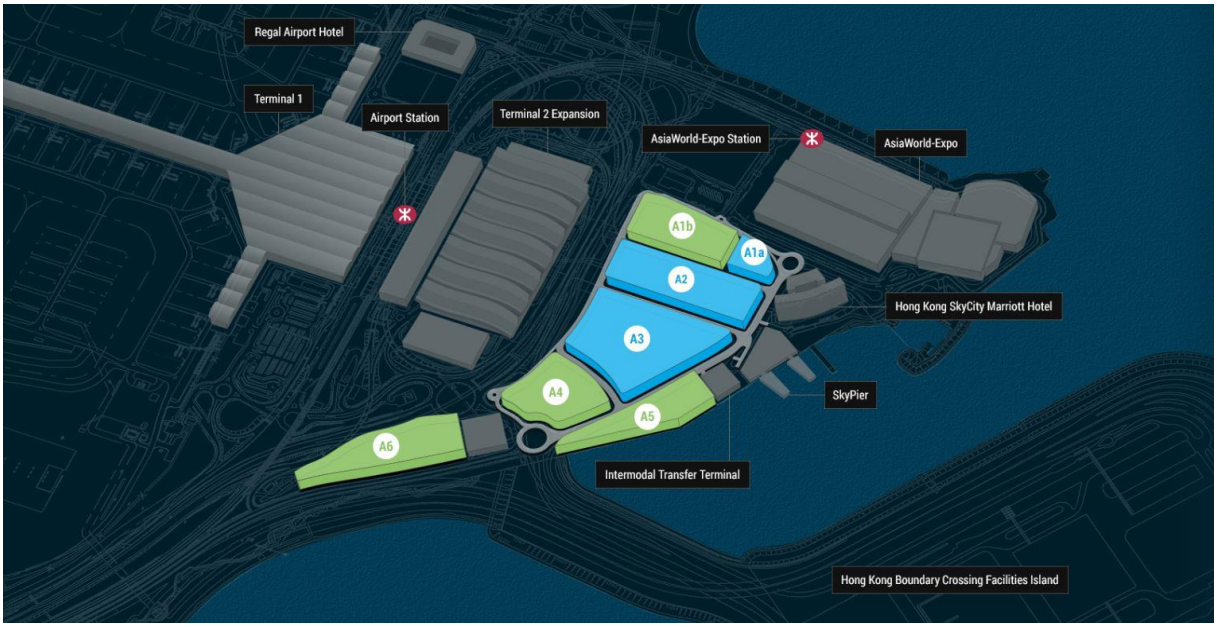


Figure 5-13 Proximity of SkyCity and Hong Kong International Airport

Source: SkyCity, 2019

Table 5-13 presents the key information for Hong Kong International Airport and SkyCity.

Table 5-13 Hong Kong International Airport and SkyCity key information

	Hong Kong International Airport	SkyCity	Five initial Aerotropolis precincts
Size	1,255 hectares	25 hectares	6,574 hectares
Population	N/A	N/A	34,000 (2056 projection)
Employment	65,000	N/A	102,000 (2056 projection)

The Mass Transit Railway (MTR) system is the major public transport network serving Hong Kong, MTR provides connections to Hong Kong International Airport and SkyCity, with the two destinations located one station apart. Given the short distance between the airport and SkyCity, walking is also an option. There are also shuttle buses and taxis. Bus services including the Airport Express connect SkyCity to areas of Hong Kong.

Table 5-14 presents a comparison of transport modes between Hong Kong International Airport and SkyCity, shown in Figure 5-14.

Table 5-14 Comparison of transport options between Hong Kong International Airport and SkyCity

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	-	1	-	-	2
Maximum frequency (services per hour)	-	12	-	-	-

Figure 5-14 Connection between Hong Kong International Airport and SkyCity

Source: Rome2Rio, 2020

Some key similarities are apparent between Hong Kong International Airport, SkyCity and the five initial Aerotropolis precincts:

- SkyCity is capitalising on a number of major transport infrastructure investments within the study area that improve connectivity to and from Hong Kong International Airport:
    - Hong Kong-Zhuhai-Macau Bridge
    - Tuen Mun-Chek Lap Kok Link
    - Guangzhou-Shenzhen-Hong Kong Express Rail Link
- The projects will also boost regional connectivity within the study area, improving connections to Macau and Guangzhou and Shenzhen in mainland China.

A number of key lessons are evident from SkyCity, and can be applied to planning for the five initial Aerotropolis precincts:

- Access to the centre of Hong Kong via the Airport Express Line and dedicated limited-stop bus services. The price of rail tickets and more direct services with fewer transfers encourages more people to catch franchised buses; accounting for 67% of mode share to the airport.
- Connections between SkyCity and Hong Kong International Airport is possible via the Airport Express Line (one stop) or a dedicated pedestrian bridge system with elevated people movers. Ease of access to SkyCity and its major attractions make it an appealing destination both during layovers and for travel.
- The urban form of Hong Kong is very dense, with the city located within a constrained area, leading to much higher densities and public transport use compared to Sydney.

5.2.7 Clichy-Batignolles, France

Clichy-Batignolles is a 54-hectare master planned urban renewal development in Paris, France. Clichy-Batignolles (shown in Figure 5-15) is located on the site of a former marshalling yard approximately four kilometres north-west of Central Paris. The urban renewal is due to be completed by 2020. Table 5-15 represents the key information for Clichy-Batignolles.

Table 5-15 Clichy-Batignolles key information

	Clichy-Batignolles	Five initial Aerotropolis precincts
Size	54 hectares	6,574 hectares
Population	7,500	34,000 (2056 projection)
Employment	12,700	102,000 (2056 projection)

Figure 5-15 Render of the masterplan of Clichy-Batignolles

Source: Paris Batignolles Aménagement, 2015

Table 5-16 presents a comparison of transport modes between Charles de Gaulle Airport and Clichy-Batignolles, shown in Figure 5-16.

Table 5-16 Comparison of transport options between Charles de Gaulle Airport and Clichy-Batignolles

	Train	Metro	Light Rail	Bus	Ride Share
Duration (minutes)	60	-	-	78	22
Maximum frequency (services per hour)	11	-	-	4	-

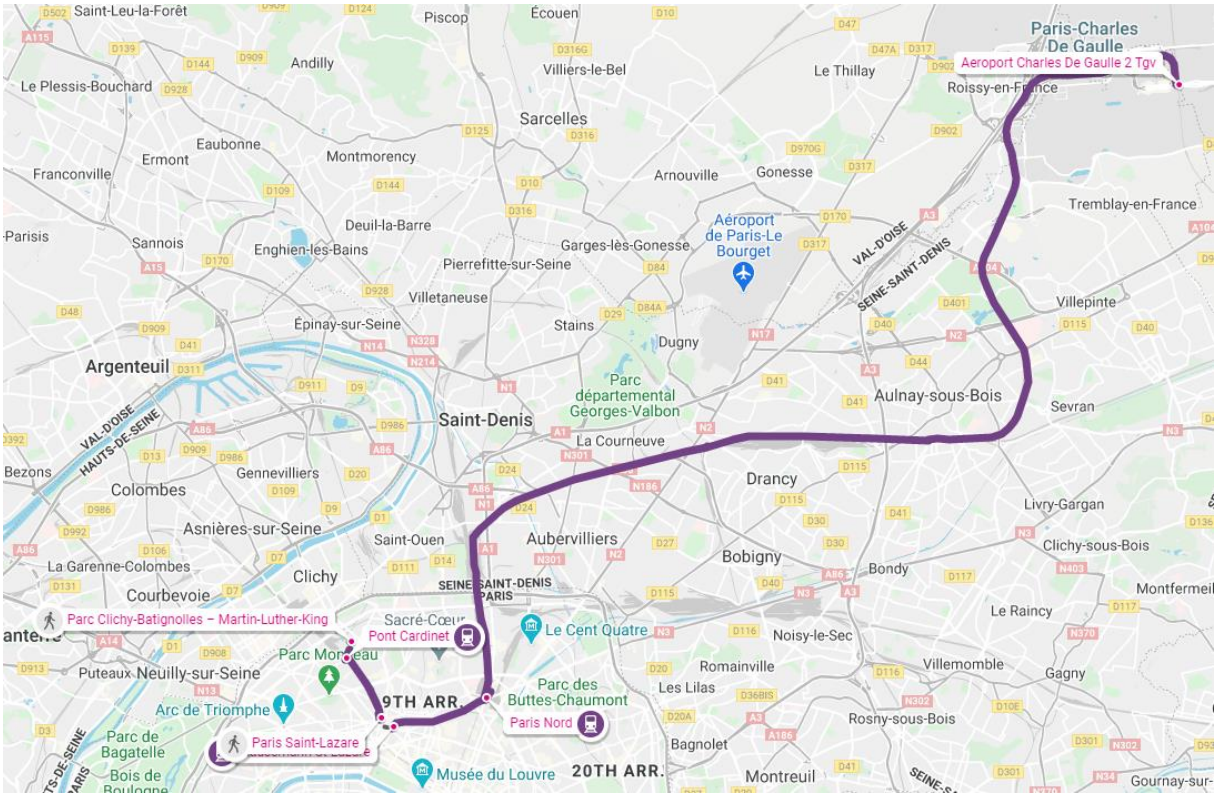


Figure 5-16: Connections between Charles de Gaulle Airport and Clichy-Batignolles

Source: Rome2Rio, 2020

New transport infrastructure and improved services will be introduced to support the redevelopment, shown in Figure 5-17, which includes:

- Two new metro stations on the extension of Line 14.
- The extension of the T3 Tramway.
- Increased train services at Pont Cardinet.
- Restructure of the local bus network to meet the needs of the future planned neighbourhood.

To further reduce carbon emissions, the development was designed to encourage walking and the use of mass transit whilst limiting car parking spaces. Parking was restricted with the Local Urban Development Plan used as a guideline. In addition, ground-level parking is reserved for deliveries and short stay parking and a car-share station is being implemented as part of the development.

Roads were restricted to 12% of the total surface area of the development with low-speed limits to prioritise pedestrians over general traffic.

A freight hub is established at the outskirts of the precinct directly adjacent to the railway line and ring road, to help curb heavy vehicle traffic in the area, where electrically powered light utility vehicles are used for the last mile delivery of parcels for residents and workers.

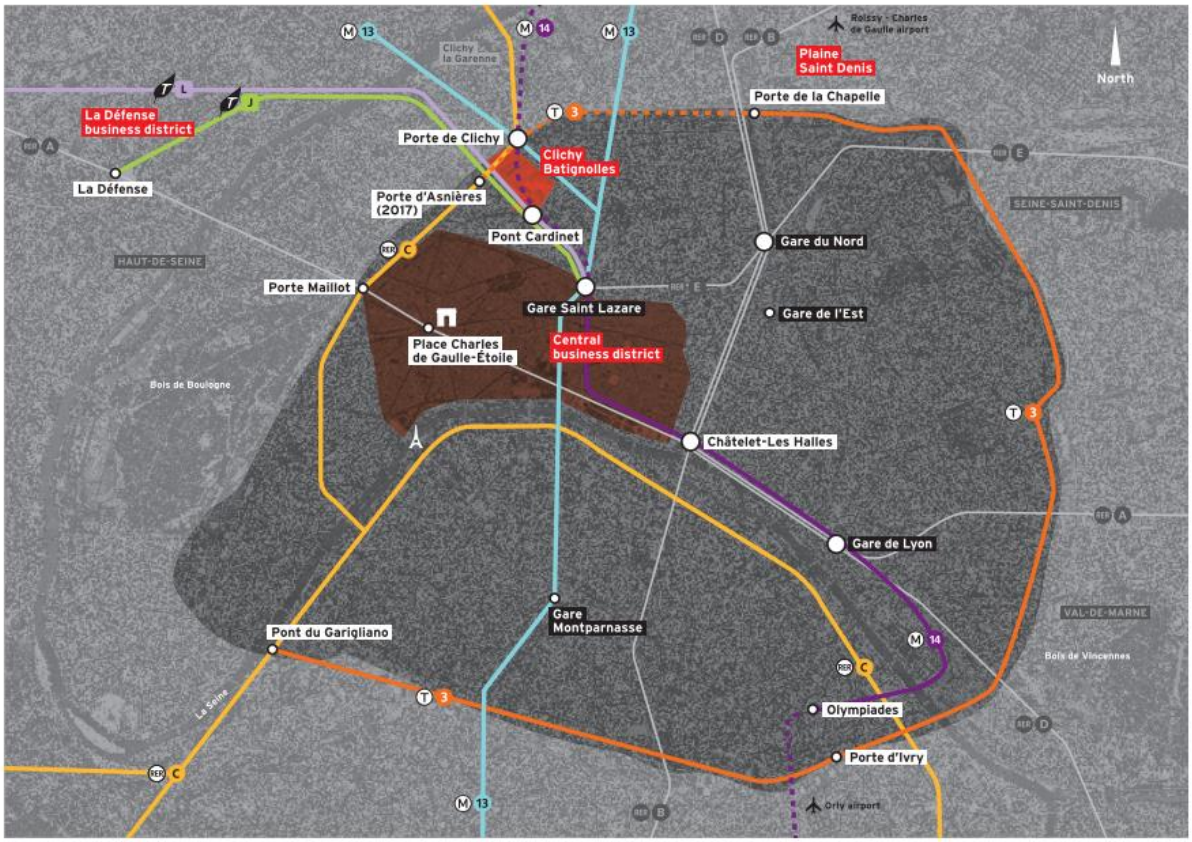


Figure 5-17 Clichy-Batignolles transport infrastructure upgrades

Source: Paris Batignolles Aménagement, 2015

A number of key lessons are evident from Clichy-Batignolles, and can be applied to planning for the five initial Aerotropolis precincts:

- The eco-district is showcasing sustainable development and includes a freight hub and automated waste networks to reduce freight and service vehicles using surface roads
- The existing public transport network will be extended and integrated into the development
- Restriction of parking in the precinct to support the uptake of sustainable transport modes
- Provision of roadways will be restricted to encourage the use of mass transit and active transport modes and prioritise pedestrians throughout the development.

5.2.8 Tyson's Corner, United States of America

Tyson's Corner is characterised as an 'edge city' with a concentration of business, shopping and entertainment outside a traditional central business district. It is equipped with two major shopping centres and the corporate headquarters of large companies. The city is located in the north-east part of Virginia, east of Dulles International Airport.

Table 5-17 represents the key information for Tyson's Corner.

Table 5-17 Tyson's Corner key information

	Tyson's Corner (VA)	Five initial Aerotropolis precincts
Size	1,110 hectares	6,574 hectares
Population	23,749 (2018)	34,000 (2056 projection)
Employment	200,000 jobs	102,000 (2056 projection)

Table 5-18 presents a comparison of transport modes between Tyson's Corner and Dulles International Airport, with passengers required to switch between buses and the subway at transport interchanges. One option for the route to Dulles International Airport is via Whele-Reston Station, shown in Figure 5-18.

Table 5-18 Comparison of transport options between Dulles International Airport and Tyson's Corner

	Train & Bus	Metro	Light Rail	Ride Share
Duration (minutes)	11 /31	-	-	16
Maximum frequency (services per hour)	4/4	-	-	-

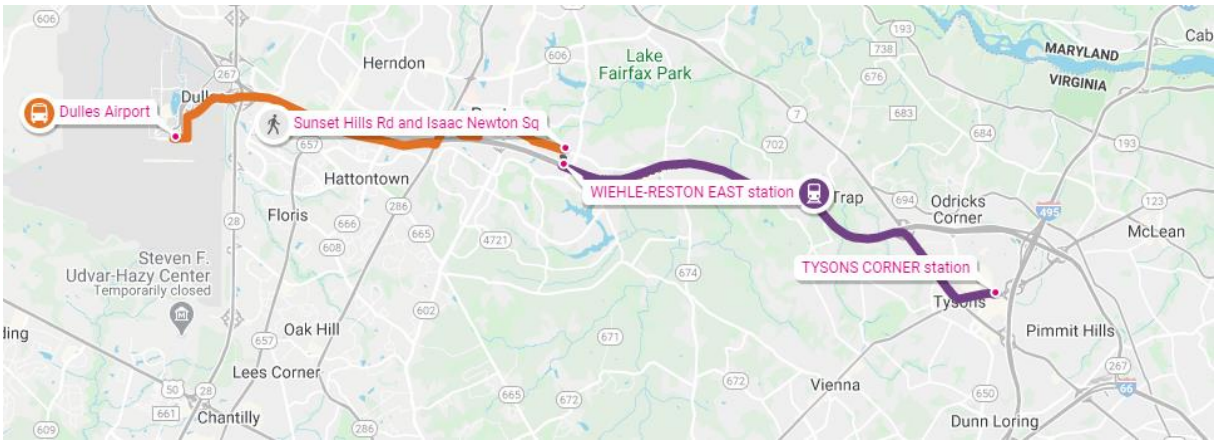


Figure 5-18 Connections between Dulles International Airport and Tyson's Corner

Source: Rome2Rio, 2020

Some key similarities are evident between Tyson's Corner and the five initial Aerotropolis precincts:

- Co-location and collaboration between private industry, businesses, and government
- The strategic location at the intersection of two national highways, via provincial roads, connecting to the airport
- The town intends to be serviced by improved rail infrastructure, with metro stations located in each of the eight districts of Tyson's corner

However, the area suffers from inadequate public transport infrastructure and the presence of large regional shopping malls has incentivised private vehicle usage resulting in high levels of congestion within Tyson's Creek. Fairfax County recognised the additional and exorbitant costs of upgrading road infrastructure which would only delay the congestion caused by their imbalanced transportation system. Recent infrastructure programs to improve connectivity to Dulles International Airport and Washington DC are a response to this.

The key lesson that is evident from Tyson's Corner, and can be applied to the planning for Aerotropolis is:

- Transportation infrastructure development is important for the growth of a small town into a large city but commuters must be provided with a range of transportation options to avoid over-reliance on private vehicles and excessive congestion.

5.2.9 Food Valley, Wageningen, The Netherlands

Food Valley is a knowledge-intensive agri-food ecosystem in The Netherlands. It is a town focused on collaboration between private industry, education and government, centred at Wageningen University. Table 5-19 presents the key information for Food Valley.

Table 5-19 Food Valley key information

	Food Valley	Five initial Aerotropolis precincts
Size	3,236 hectares (Wageningen Municipality)	6,574 hectares
Population	38,774	34,000 (2056 projection)
Employment	15,000 in food related sciences and technological development industry	102,000 (2056 projection)

Table 5-20 presents a comparison of transport modes between Schiphol Airport and Wageningen, with passengers required to travel to nearby towns to access rail services, such as Rhenen and Ede. One option for the route to Schiphol Airport via Utrecht is shown in Figure 5-19.

Table 5-20 Comparison of transport options between Schiphol Airport and Wageningen

	Train & Bus	Metro	Light Rail	Ride Share
Duration (minutes)	61 / 24	-	-	59
Maximum frequency (services per hour)	1 / 6	-	-	-

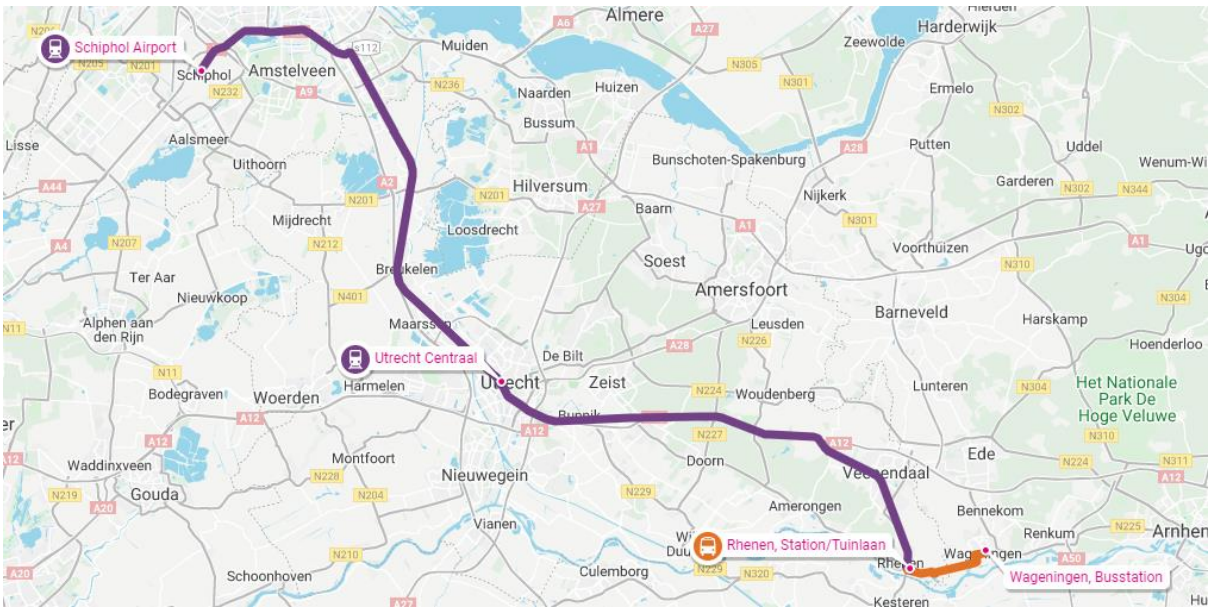


Figure 5-19 Connections between Schiphol Airport and Wageningen

Source: Rome2Rio, 2020

Some key similarities are evident between Food Valley and the five initial Aerotropolis precincts:

- The colocation and collaboration between private industry, research and education, and government

- The strategic location between two national highways, via provincial roads, connecting directly to Utrecht and the major port city of Rotterdam
- The town is serviced by two rail lines, with train stations located five kilometres north and south of the centre of the town, connecting to Utrecht, Rotterdam and Schiphol Airport (Amsterdam).

A number of key lessons are evident from Food Valley, and can be applied to planning for the five initial Aerotropolis precincts:

- The urban form of the town is focused on medium density within the town centre, supported by surrounding residential land use and then productive land
- Collaboration between government and transport operators ensures coordinated bus and train timetables and high-frequency services
- Local bus services facilitate connections within the residential areas of Wageningen and to other nearby towns
- Dedicated cycling infrastructure is provided throughout the town, with direct connections to the university, resulting a high cycling mode share; however, congestion issues are now arising due to the mode's popularity
- The agri-food centre is not just focused on the production of food from the arable land, but on the development of technology and intellectual property for generating significant revenue.

Figure 5-20 Food Valley, Wageningen

5.2.10 Noord-Holland Noord, The Netherlands

North Holland is a major innovative agricultural, technology and research region in the north of The Netherlands. The agricultural and research industries work in collaboration with the energy and water sectors to develop innovative solutions which are applied worldwide.

Table 5-21 presents the key information for North Holland.

Table 5-21 Noord-Holland Noord key information

	Noord Holland Noord	Five initial Aerotropolis precincts
Size	14,300 hectares	6,574 hectares
Population	2,853,000 people in North Holland province	34,000 (2056 projection)
Employment	20,940 jobs in the agriculture	102,000 (2056 projection)

A number of key facilities are located within the North Holland region, situated 40 kilometres north of Amsterdam, including:

- The Agricultural Research Centre (Proeftuin Zwaagdijk) has developed into a critical research centre for practical research in The Netherlands. The centre has a nationwide network with various locations of trial fields, aiding in the immediate use of the research by the commissioner.
- Agriport A7 is a 500-hectare project focused on the colocation and cross-sector innovation of large-scale greenhouses and energy solutions. Launched in 2005, the precinct has seen significant investment with both Microsoft and Google recently beginning construction on data centres. The heat from the data centre, which in conventional buildings disappears through the roof, is being channelled to the greenhouses to grow vegetables. The location of this investment is strategic for Microsoft; situated within an area with a strong internet connection, powered by renewable energy and in close proximity to the technology hub of Amsterdam; accessed via the A7 national highway in 30 minutes by car.
- Farmers, growers and chain partners in organic agriculture North Holland have joined forces in Bio Valley, creating innovative sustainable horticulture solutions and catering for the booming market of organic products in The Netherlands and Europe.
- Salt Farm Texel is demonstrating the potential of salt affected land worldwide through the cultivation of salt tolerant crops, innovating in the area of producing more food with less water; acknowledging the future concerns of limited water resources which needs to feed a growing population.
- Seed Valley is the global hub for plant breeding, seed cultivation and seed processing for the horticulture industry. The purposeful hybridisation and selection of seed varieties has been the focus of the region for generations. This area is home to dozens of companies specialising in the breeding, production and sale of high-quality seeds and basic plant material.
- Vezet is one of the largest vegetable and fruit processing business in The Netherlands and leads the market in freshly chopped, ready to cook vegetables.

The freight task of agricultural region is supported by the Port of Den Helder, with access to Amsterdam via intercity trains to Centraal Station or the A2 or A7 national highways.

A number of key lessons are evident from Noord-Holland Noord, and can be applied to planning for the five initial Aerotropolis precincts:

- Developing a reputation as an international centre for agricultural research requires cooperation between multiple levels of stakeholders which includes crucial government investment
- Encouraging large multinational companies to work together with the agricultural industry will spur further growth in the region.

5.3 Domestic case studies

5.3.1 Randwick Precinct, South East Sydney, New South Wales

Randwick is a Health and Education Precinct in the Eastern Economic Corridor and the Eastern Harbour City, located under six kilometres south-east of the Sydney CBD. Randwick has also been identified as a Collaboration Area by the Greater Sydney Commission with a Place Strategy developed between key stakeholders.

The Randwick Health and Education Precinct includes major health, education and research institutions including the University of NSW and Randwick Hospitals Campus (Prince of Wales Hospital, Sydney Children's Hospital and Royal Hospital for Women). It contains key centres that provide local services at Kensington, Kingsford and Randwick Junction. There are also regionally significant sports, entertainment and recreational facilities at Royal Randwick Racecourse, Centennial Park and Moore Park. Table 5-22 presents the key information for Randwick.

Table 5-22 Randwick key information

	Randwick	Five initial Aerotropolis precincts
Size	504 hectares	6,574 hectares
Population	31,544 residents at 62 residents per hectare	34,000 (2056 projection)
Employment	26,356 jobs at 52 jobs per hectare	102,000 (2056 projection)

The CBD and South East Light Rail services Randwick through a dedicated on-street mass transit connection from Circular Quay to Kingsford and Randwick via Central Station. The bus network has been reconfigured; however a high number of bus services still connect Randwick with the Sydney CBD and areas of the south-east.

A number of key lessons are evident from Randwick, and can be applied to planning for the five initial Aerotropolis precincts:

- Lack of late-night transport services with low frequency for shift workers at the hospitals is a barrier to further growth in public transport use
- Uptake of active transport and public transport to, from and within the Randwick Health and Education Precinct is promoted through good connectivity to surrounding areas and the provision of an integrated cycling network through proximity to Centennial Park
- Access to a diverse range of housing, employment opportunities, open space and recreation with walkable neighbourhoods for access to food retailers and services.

Table 5-23 presents the mode share breakdown for Randwick South, Kingsford and Kensington in 2016.

Table 5-23 Randwick South, Kingsford and Kensington SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	37%	26%
Private vehicle	44%	56%
Active transport	16%	17%
Other	3%	2%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to the nearest Metropolitan Centre (Sydney CBD) during the morning peak hour are presented below in Table 5-24.

Table 5-24 Summary of travel between Randwick and Sydney CBD

	Duration (mins)	Frequency (services per hr)
Bus	23	28
Light Rail	33	8
Private Vehicle	20	-
Cycling	30	-

Figure 5-21 Aerial view of Randwick Health and Education Precinct

Source: Airview, 2015

5.3.2 Green Square – Waterloo Precinct, South East Sydney, New South Wales

Green Square – Mascot is a Strategic Centre in the Eastern Harbour City, located four kilometres south of the Sydney CBD and four kilometres north of Sydney Kingsford-Smith Airport.

The precinct is undergoing rapid change and includes the Green Square Urban Renewal Area, one of the largest urban renewal precincts in Australia. The former industrial site will provide 30,500 new residential dwellings to support a population of 61,000 people by 2030. The development is focused on a new town centre with commercial, retail, community and recreational land uses to support the population.

Waterloo has also been identified as one of the major sites in the Communities Plus project to increase housing supply through social housing redevelopment and new private dwellings to leverage its proximity to a new metro station on the Sydney Metro City and Southwest Line.

Table 5-25 presents the key information for Green Square – Waterloo.

Table 5-25 Green Square key information

	Green Square	Five initial Aerotropolis precincts
Size	360 hectares	6,574 hectares
Population	33,060 residents at 92 residents per hectare	34,000 (2056 projection)
Employment	18,327 jobs at 51 jobs per hectare	102,000 (2056 projection)

The T8 Airport and South Line services Green Square Station. However the line suffers from crowding issues during weekday peaks, with half of the city-bound trains at Green Square exceeding seated capacity. Some trains reach 160% of seated capacity. Additional rail capacity will be provided via a new metro station at Waterloo with the completion of the Sydney Metro City and Southwest Line in 2024. Improvements to the T8 Airport and South Line will be delivered through the *More Trains More Services Program*, increasing capacity from ten to 20 trains per hour.

The precinct is also well connected by a number of high frequency bus routes, providing connections to major centres to the north, east, south and west of the precinct along major corridors including Botany Road, Bourke Street, Elizabeth Street and Epsom Road.

A number of key lessons are evident from Green Square, and can be applied to planning for the five initial Aerotropolis precincts:

- The construction of critical transport infrastructure must be timed alongside development to encourage adoption of public transport as the preferred mode
- The success of an urban renewal program is dependent on close proximity/direct transport connections to major areas of employment
    - Specifically, the existence of employment opportunities in both directions along the major rail line (Sydney Kingsford-Smith Airport and Sydney CBD) facilitated this
- Higher density and walkable neighbourhoods encourages greater active and public transport use.

Table 5-26 presents the mode share breakdown for Waterloo – Beaconsfield and Erskineville – Alexandria in 2016. The precinct has a high public and active transport mode share for residents travelling to work from the precinct, however a significant proportion of workers employed in the precinct choose to travel to work by private vehicle.

Table 5-26 Waterloo – Beaconsfield and Erskineville – Alexandria SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	45%	25%
Private vehicle	37%	65%
Active transport	13%	7%
Other	4%	3%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to the nearest Metropolitan Centre (Sydney CBD) during the morning peak hour are presented below in Table 5-27.

Table 5-27 Summary of travel between Green Square and Sydney CBD

	Duration (mins)	Frequency (services per hr)
Bus	29-39	34
Train	11-21	30
Private Vehicle	9-26	-
Cycling	19-21	-

Figure 5-22 Location of the Green Square urban renewal precinct in the City of Sydney

Source: City of Sydney, 2016

5.3.3 Sydney Airport and Port Botany Precinct, South East Sydney, New South Wales

Sydney Airport and Port Botany are the primary Trade Gateways for Greater Sydney and NSW, situated within the Eastern economic Corridor.

Table 5-28 presents the key information for Sydney Airport and Port Botany.

Table 5-28 Sydney Airport and Port Botany key information

	Sydney Airport	Port Botany	Five initial Aerotropolis precincts
Size	1,150 hectares	286 hectares	6,574 hectares
Population	N/A	N/A	34,000 (2056 projection)
Employment	57,400 jobs	25,000	102,000 (2056 projection)

The T8 Airport & South Line services the Domestic Station and International Station at Sydney Airport with bus routes providing access to Port Botany. A number of car parking facilities are available for use within and adjacent to Sydney Airport.

Committed transport projects aimed to improve the accessibility to and cater for future growth of Sydney Airport and Port Botany include WestConnex, Sydney Gateway and the Port Botany rail freight line duplication.

Sydney Airport is projected to grow from 43.3 million passengers in 2017 to 65.6 million passengers by 2039. In addition, container demand at Port Botany is projected to grow from 2.3 million TEU (twenty-foot equivalent unit) in 2015 to between 7.5 million and 8.4 million TEU per year by 2056.

A number of key lessons can be learned from Sydney Airport and Port Botany, and applied to the planning for Aerotropolis:

- Protecting of industrial lands zones adjacent to the Airport to prevent the subdivision of blocks and residential encroachment ensuring trade gateway function is served into the future
- Co-location of trade gateways and distribution centres for effective freight activities
- The competitiveness of price and time for public transport modes against private vehicles does not encourage a high public transport and active transport mode share for employees.

Table 5-29 presents the mode share breakdown for Banksmeadow, Port Botany Industrial and Sydney Airport SA2 in 2016. It should be noted that between 2012 and 2017, Sydney Airport has seen shift in the transport mode used by air passengers to access the airport terminals, with access by rail growing from 16% in 2012 to 24% in 2017.

Table 5-29 Banksmeadow, Port Botany Industrial and Sydney Airport SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	21%	8%
Private vehicle	74%	88%
Active transport	2%	2%
Other	3%	3%

Source: Australian Bureau of Statistics, 2016

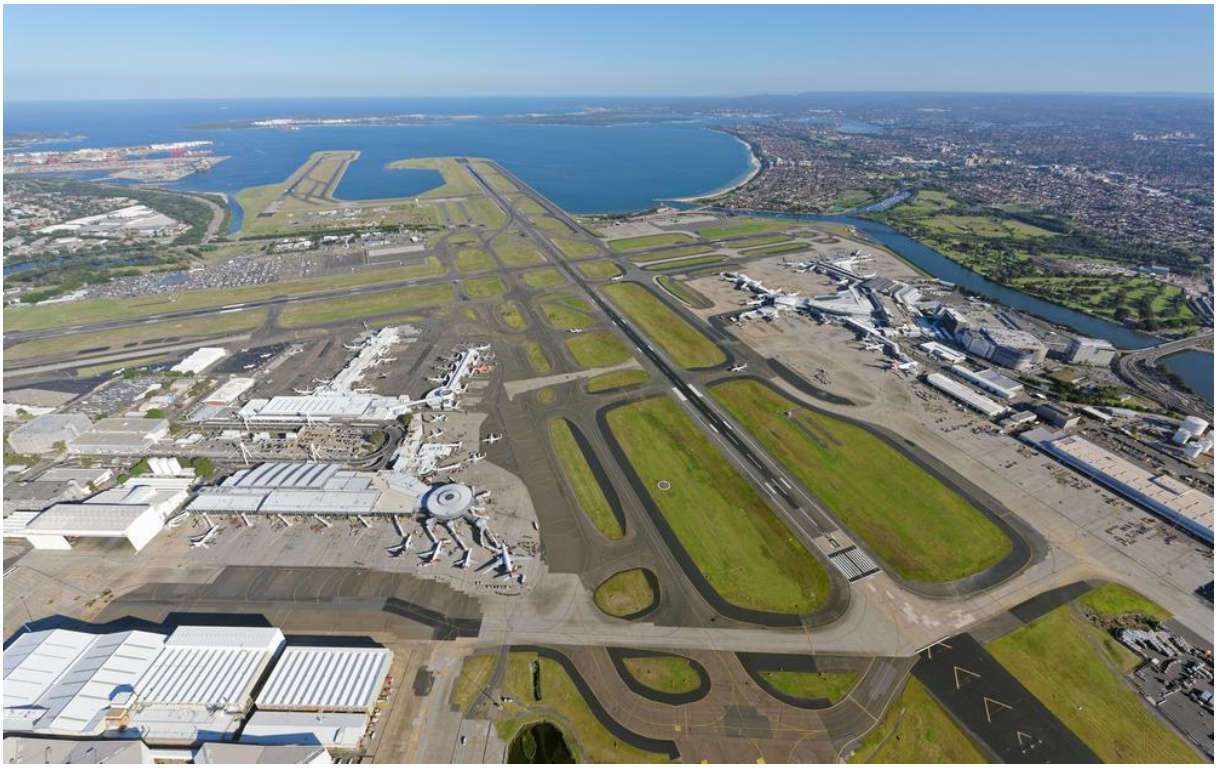


Figure 5-23 Aerial view of Sydney Airport

Source: Infrastructure Magazine, 2018

5.3.4 Greater Parramatta, New South Wales

Greater Parramatta is a Metropolitan Centre in the Central River City, located 19 kilometres west of the Sydney CBD. Table 5-30 presents the key information for Greater Parramatta.

Table 5-30 Greater Parramatta key information

	Parramatta	Five initial Aerotropolis precincts
Size	850 hectares	6,574 hectares
Population	29,249 residents at 34 residents per hectare	34,000 (2056 projection)
Employment	50,228 jobs at 59 jobs per hectare	102,000 (2056 projection)

Key destinations within Greater Parramatta include Westmead Hospital, The Children's Hospital, Western Sydney University, Westfield Parramatta and Bankwest Stadium, as well as the upcoming additional location for the Museum of Applied Arts and Sciences.

Several NSW Government agencies and private companies have relocated to Greater Parramatta, including Transport for NSW, Service NSW, the NSW Department of Planning, Industry and Environment, Sydney Water and the NSW Police Force, resulting in a large workforce travelling via public transport to the centre.

The T1 Western, T2 Inner West and Leppington, T5 Cumberland, T7 Olympic Park, Blue Mountains and Western NSW Lines service Parramatta Station. A number of bus services connect the station to the surrounding area. Express bus services also travel to and from Greater Parramatta, utilising the North-West T-way to access Sydney's north west. In addition, Stage 1 of the Parramatta Light Rail is currently under construction.

A number of key lessons are evident from Greater Parramatta, and can be applied to planning for the five initial Aerotropolis precincts:

- Having strong public transport connections with surrounding suburbs and a Metropolitan Centre has led to a high public transport mode share and further investment should continue
- Further investment in the cycling network and provision of end-of-trip facilities is required to increase active transport mode share.

Table 5-31 presents the mode share breakdown for Parramatta – Rosehill SA2 in 2016.

Table 5-31 Parramatta – Rosehill SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	45%	37%
Private vehicle	38%	49%
Active transport	4%	4%
Worked at home	9%	9%
Other	1%	1%

Source: Australian Bureau of Statistics, 2016

Figure 5-24 Aerial view of Parramatta CBD

Source: Mark Merton, 2016

5.3.5 Macquarie Park, New South Wales

Macquarie Park is a Health and Education Precinct in the Northern District, located 12 kilometres north-west of the Sydney CBD and adjacent to the M2 Motorway.

Table 5-32 presents the key information for Macquarie Park.

Table 5-32 Macquarie Park key information

	Macquarie Park	Five initial Aerotropolis precincts
Size	1,070 hectares	6,574 hectares
Population	21,274 residents at 20 residents per hectare	34,000 (2056 projection)
Employment	48,301 jobs at 45 jobs per hectare	102,000 (2056 projection)

Key destinations within Macquarie Park include Macquarie University, Macquarie University Hospital and Macquarie Centre, in addition to the business park which has a focus on healthcare and technology, being home to companies such as Optus, Foxtel, Johnson & Johnson and Beiersdorf.

Residential growth within Macquarie Park is primarily through medium density mixed-use private developments such as Lachlan's Line.

Macquarie Park Station was retrofitted with metro services in 2019, connecting to Tallawong and Chatswood on the Sydney Metro North West Line.

A number of travel behaviour change programs have been run within the area by Transport for NSW and Connect Macquarie Park and North Ryde (Connect), encouraging a shift from private vehicles to public transport and active transport to coincide with the opening of turn up and go services as part of Sydney Metro. Results from the Connect program are presented in Figure 5-25 and Figure 5-26, highlighting the decrease in single-occupancy private vehicle use.

A number of key lessons are evident from Macquarie Park, and can be applied to planning for the five initial Aerotropolis precincts:

- Travel behaviour change programs are effective and necessary ways of facilitating mode shift from private vehicle use to public transport and active transport when they coincide with the opening of new transport infrastructure
    - The high frequency of the turn up and go services incentivises its adoption as the preferred mode of transport for residents and employees accessing the business park.

Table 5-33 presents the mode share breakdown for Macquarie Park – Marsfield in 2016.

Table 5-33 Macquarie Park – Marsfield SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	31%	24%
Private vehicle	45%	63%
Active transport	10%	3%
Worked at home	12%	9%
Other	1%	1%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to the nearest Metropolitan Centre (Parramatta) during the morning peak hour is presented in Table 5-34.

Table 5-34 Summary of travel between Macquarie Park and Parramatta

	Duration (mins)	Frequency (services per hr)
Bus	49-58	15
Train	52-84	19
Private Vehicle	20-45	-
Cycling	59	-

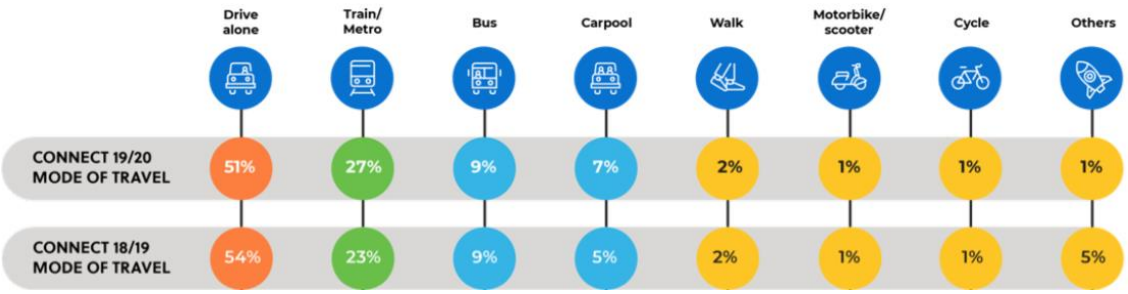


Figure 5-25 Mode share for employees within Macquarie Park (excluding Optus)

Source: Connect, 2020

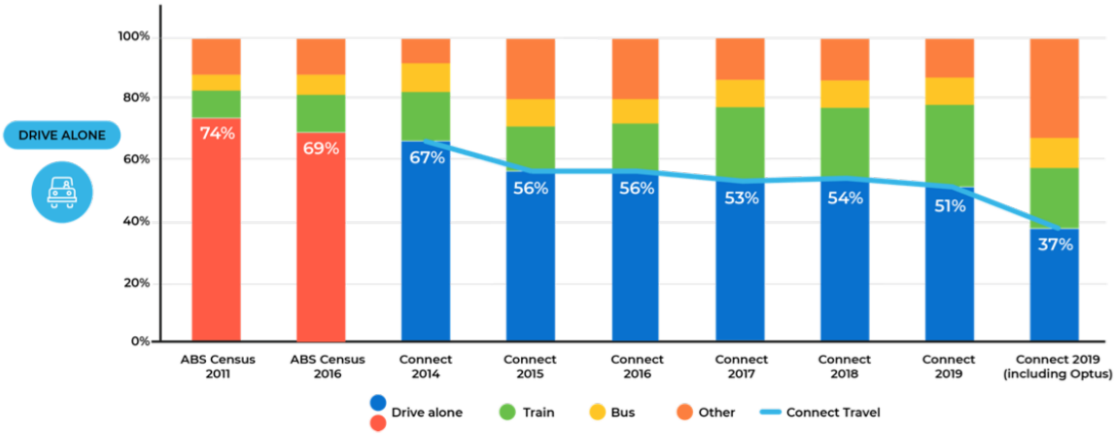


Figure 5-26 Single occupancy private vehicle mode share for travel to and from Macquarie Park between 2011 and 2019

Source: Connect, 2020

Figure 5-27 Aerial view of Macquarie Park

Source: The Australian, 2019

5.3.6 Liverpool, New South Wales

Liverpool is a Metropolitan Cluster in the Western Parkland City, located 26 kilometres south-west of the Sydney CBD and adjacent to the M5 Motorway. Table 5-35 presents the key information for Liverpool.

Table 5-35 Liverpool key information

	Liverpool	Five initial Aerotropolis precincts
Size	630 hectares	6,574 hectares
Population	27,172 residents at 43 residents per hectare	34,000 (2056 projection)
Employment	19,523 jobs at 31 jobs per hectare	102,000 (2056 projection)

Key destinations within Liverpool include Liverpool Hospital, TAFE NSW and Westfield Liverpool, with the centre located in close proximity to the Moorebank Intermodal Terminal.

The T2 Inner West and Leppington, T3 Bankstown and T5 Cumberland Lines service Liverpool Station. The Macquarie T-Way and local bus routes also servicing the centre.

A number of key lessons are evident from Liverpool, and can be applied to planning for the five initial Aerotropolis precincts:

- Lack of public transport connections to employment areas has resulted in high usage of private vehicles
- Poor walking and cycling infrastructure in an area dominated by roads and heavy traffic also discourages these modes.

Table 5-36 presents the mode share breakdown for Liverpool in 2016.

Table 5-36 Liverpool SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	19%	12%
Private vehicle	64%	73%
Active transport	7%	4%
Worked at home	8%	11%
Other	2%	1%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to nearest Metropolitan Centre (Greater Parramatta) during the morning peak hour are presented below in Table 5-37.

Table 5-37 Summary of travel between Liverpool and Greater Parramatta

	Duration (mins)	Frequency (services per hr)
Bus	69-71	6
Train	25-42	5
Private Vehicle	22-60	-
Cycling	56-65	-

Figure 5-28 Aerial view of Liverpool Metropolitan Cluster

Source: Ray White, 2019

5.3.7 Penrith, New South Wales

Penrith is a Metropolitan Cluster in the Western Parkland City, located 50 kilometres west of the Sydney CBD and north of the M4 Western Motorway for connections to the Blue Mountains and Western NSW.

Table 5-38 presents the key information for Penrith.

Table 5-38 Penrith key information

	Penrith	Five initial Aerotropolis precincts
Size	1,040 hectares	6,574 hectares
Population	13,295 residents at 13 residents per hectare	34,000 (2056 projection)
Employment	20,148 jobs at 19 jobs per hectare	102,000 (2056 projection)

The T1 Western Line, Blue Mountains Line and Western NSW Line service Penrith Station. Bus services connect to suburbs both north and south of Penrith.

A number of key lessons are evident from Penrith, and can be applied to planning for the five initial Aerotropolis precincts:

- Lack of public transport connections to employment areas resulted in high usage of private vehicles
- Poor walking and cycling infrastructure in an area dominated by roads and heavy traffic also discourages these modes.

Table 5-39 presents the mode share breakdown for Penrith in 2016, highlighting the car dependency of the centre.

Table 5-39 Penrith SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	18%	7%
Private vehicle	65%	78%
Active transport	5%	2%
Worked at home	11%	12%
Other	1%	1%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to nearest Metropolitan Centre (Greater Parramatta) during the morning peak hour are presented below in Table 5-40.

Table 5-40 Summary of travel between Penrith and Greater Parramatta

	Duration (mins)	Frequency (services per hr)
Bus	60-154	10
Train	38-49	6
Private Vehicle	28-45	-
Cycling	103-116	-

Figure 5-29 Aerial view of the Penrith Metropolitan Cluster

Source: Microsoft, 2020

5.3.8 Springfield, Queensland

Springfield is a planned development located 23 kilometres south-west of the Brisbane CBD. The future Springfield CBD will be 390 hectares in size with approval for over 260 hectares of mixed-use space and 22,850 apartments.

An educational hub will accommodate campuses for the University of Southern Queensland and TAFE Queensland, in addition to an integrated health campus with an 80-bed hospital.

Table 5-41 presents the key information for Springfield.

Table 5-41 Springfield key information

	Springfield	Five initial Aerotropolis precincts
Size	2,860 hectares	6,574 hectares
Population	35,952 residents, 115,000 residents (2036)	34,000 (2056 projection)
Employment	52,000 jobs (2030)	102,000 (2056 projection)

Two train stations have been constructed within the development; Springfield Station and Springfield Central Station, connecting to Brisbane Central Station in 45 minutes and Brisbane Airport in 75 minutes. However, the train was constructed in the growth area following large amounts of residential development, resulting in a car dependent society with low public transport and active transport use.

A number of key lessons are evident from Springfield, and can be applied to planning for the five initial Aerotropolis precincts:

- The construction of critical transport infrastructure must be timed alongside development to encourage adoption of public transport as the preferred mode of transport
- Poor active transport infrastructure in an area combined with substantial distance from centres of employment results in low usage of cycling and walking.

Table 5-42 presents the mode share breakdown for Springfield in 2016.

Table 5-42 Springfield Lakes SA2 mode share

	Journey To Work from Usual Place of Residence	Journey To Work to Place of Work
Public transport	11%	3%
Private vehicle	75%	76%
Active transport	1%	2%
Worked at home	12%	17%
Other	1%	1%

Source: Australian Bureau of Statistics, 2016

Mode of transport, its duration and frequency to nearest CBD (Brisbane City) during the morning peak hour are presented below in Table 5-43.

Table 5-43: Summary of travel between Springfield and Brisbane City

	Duration (mins)	Frequency (services per hr)
Bus	110-126	6
Train	41	3
Private Vehicle	30-60	-
Cycling	99-109	-

Figure 5-30 Proposed future layout of Springfield CBD and surrounding areas

Source: Greater Springfield, 2020

5.3.9 Wagga Wagga, New South Wales

Wagga Wagga is an inland regional centre in NSW situated 452 kilometres south-west of Sydney and 456 kilometres north-east of Melbourne. The regional centre is located at the junction of the Sturt Highway and the Olympic Highway, connecting west to Mildura, Adelaide and south-east to Albury-Wodonga. Table 5-44 presents the key information for Wagga Wagga.

Table 5-44 Wagga Wagga key information

	Wagga Wagga Local Government Area	Five initial Aerotropolis precincts
Size	482,450 hectares	6,574 hectares
Population	62,385	34,000 (2056 projection)
Employment	31,563	102,000 (2056 projection)

Wagga Wagga has a growing reputation for international agricultural research, education and technology commercialisation based on its cluster of Agricultural Technology research centres, industry groups and businesses.

The Graham Centre for Agricultural Innovation, a research alliance between the NSW Department of Primary Industries and Charles Sturt University, is part of the cluster. It offers partnering opportunities with growers, producers, industry and researchers, supported by facilities to improve the productivity, profitability and sustainability of grain and red meat value chains. It has strong international ties, particularly with Asian markets.

The regional city is supported by health and education facilities including Wagga Wagga Base Hospital, Calvary Riverina Hospital, Charles Sturt University and TAFE NSW.

Regional rail services connect Wagga Wagga to Sydney, Albury-Wodonga and Melbourne, with local bus services operating within the centre. However, due to the large and regional nature of the centre, Wagga Wagga is primarily car dependent region, with Journey To Work data indicating a mode share for vehicles above 70%.

Wagga Wagga has an extensive cycling network, comprising five strategic Principal Bicycle Network links connecting the Wagga Wagga city centre and suburbs. Cycling infrastructure is primarily off-road shared paths, however this is supported by on-road infrastructure for local access.

A number of key lessons can be learned from Wagga Wagga, and applied to the planning for Aerotropolis:

- Developing a reputation as an international centre for agricultural research requires cooperation between multiple levels of stakeholders which includes crucial government investment
- Given the amount of land required in agricultural districts, a high vehicle mode share is expected though investment in active transport infrastructure can encourage active transport usage.

Figure 5-31 CSIRO digital agriculture research centre in Wagga Wagga

Source: William Arnott, 2019

5.4 Case Study Learnings

The studies have highlighted several key lessons for consideration in the planning of Aerotropolis. These are presented in Table 5-45 and Table 5-46. Their influence on the development of the two enablers, transport policies and strategies, and transport infrastructure services, is documented in the following sections.

Table 5-45 Summary of key learnings from international case studies

Case study	Key learnings
Schiphol & Zuidas	• Compact urban form influence on sustainable mode share • Future projects to return the city to people and improve connectivity • Investment by private companies in the centre • Mixed-use development appealing to people to live and work close by.
Dallas Fort Worth	• Appeal of edge city to people who travel often • Integration of non-aeronautical activities with private industry investment • Urban motorways are a significant barrier to connectivity • Mixed-use is contained to high streets with little activation within suburbs.
Heathrow	• Investment in accessibility improvements for employees and passengers • Fare incentives • Implementation of a Sustainable Travel Plan and a Surface Access Strategy.
Putrajaya	• Lack of integration of rail network with city • Quality of services and onward connections are limitations to public transport • Few behaviour change measures were implemented to shift mode share
Incheon & Songdo International Business District	• Opening of airport and transport infrastructure and services at same time • Competitiveness of price and time of public transport • Connections to nearby cities • Urban form not conducive to a car-free society.
Sky City	• Competitiveness of price and time of public transport • Compact urban form influence on sustainable mode share.
Clichy-Batignolles	• Freight hub reducing service vehicles on surface roads • Extension and integration of existing transport networks • Restriction on parking.
Tyson's Corner	• Importance of transport options to reduce vehicle reliance and congestion.
Food Valley	• Dedicated cycling infrastructure is provided throughout the town • Development of technology and intellectual property for additional revenue.
Noord-Holland Noord	• Cooperation between stakeholders with government investment • Companies collaborating with agribusinesses to grow region.

Table 5-46 Summary of key learnings from domestic case studies

Case study	Key learnings
Randwick	• Impact on public transport use through lack of night-time services • Good connectivity and integrated networks support active transport use • Walkable and diverse neighbourhoods.
Green Square	• Critical infrastructure constructed alongside development • Development success from proximity to direct transport to centres • Influence of density and walkability on sustainable mode use
Sydney Airport	• Protecting of industrial lands zones adjacent to the Airport • Trade gateways adjacent to distribution centres for effective freight activities • The competitiveness of price and time for public transport modes against private vehicles for employee travel.
Greater Parramatta	• Public transport connections to suburbs and Metropolitan Centres • Investment in the cycling network and end-of-trip facilities is needed
Macquarie Park	• Transport Management Association • Travel behaviour change programs to facilitate mode shift • High frequency of the turn up and go services incentivises.
Liverpool Penrith	• Lack of public transport connections to employment areas • Poor active transport network in car-dominated environment.
Springfield	• Critical infrastructure constructed alongside development • Poor active transport network and substantial distance between centres.
Wagga Wagga	• Cooperation between multiple levels of stakeholders for agricultural success.

5.4.1 Enabler 1: Transport policies and strategies

Whole-of-government collaboration is required to implement the policies and strategies which will influence travel patterns in favour of more sustainable modes, progressing beyond the business as usual approaches outlined in the domestic case studies.

International case studies highlight the success of restrictions on parking provision, use of freight hubs, fare incentives for public transport use, the collaboration between government and industry in the investment in successful centres as well as the growth of employment sectors.

5.4.2 Enabler 2: Transport infrastructure and services

The provision of infrastructure and services, integrated with land uses, will drive a greater use of sustainable transport modes. This can be seen through the higher sustainable mode shares in case studies that are compact in urban form, mixed-use, higher in density with an integrated active transport network supported by high frequency and connected public transport.

6.0 Enabler 1: Transport policies and strategies

6.1 Travel Demand Management Strategy: Aims and Objectives

The Travel Demand Management Strategy defines a framework to achieve a future policy-driven, sustainable transport mode share target.

Travel Demand Management focuses, firstly, on making sustainable travel options and choices available to customers and, secondly, on the communication and promotion of sustainable travel options which can influence mobility. In so doing, Travel Demand Management can help to deliver sustainable urban outcomes, enhancing liveability and productivity, by supporting better choices in mode of travel and help in decision making that influences the volume of travel.

The definition of **objectives**, **principles**, **measures, Interventions** and **targets** are critical to a successful Travel Demand Management Strategy. The following sections describe each of these elements in relation to the Western Sydney Aerotropolis.

6.2 Travel Demand Management Strategy: Objectives

Objectives to ensure positive outcomes are defined for individuals, businesses and the broader community. The objectives developed to be applied to Aerotropolis are:

- Provide excellent travel choices and encourage walking, cycling and public transport trips
- Limit unnecessary car trips, particularly for shorter trips
- Promote alternatives to vehicle ownership
- Reduce the need to travel, especially in peak periods
- Facilitate the efficient use of land, through road space allocation and proximity of jobs and services to people
- Create a liveable community, with excellent local environmental quality and community cohesion.

6.3 Travel Demand Management Strategy: Principles

The following Travel Demand Management principles have been applied in the development of this strategy. They reflect the key principles of the *Draft Western Sydney Aerotropolis Development Control Plan* as well as stakeholder engagement.

6.3.1 Parking

The greater the restrictions placed on private vehicle parking; the less likely people are to use private vehicles. For example, requiring payment, restricting time limits and reducing the amount of parking available, have all been proven to deter people from driving to their destinations, which aids the shift towards public transport, walking and cycling.

6.3.2 Walking environment

Walking is an integral part of everyday life and an important part of Greater Sydney's transport system. Most journeys within Greater Sydney start and end with walking, and as a result, well-placed walking networks can extend the reach of public transport.

This Travel Demand Management Strategy recognises walking as an active and sustainable transport mode, and encourages people to walk for transport, especially for trips within two-kilometre catchments of origins and destinations. By encouraging more people to walk, and combining more walking with public transport trips, is an effective way to free up capacity on the transport system and reduce congestion in centres.

The quality of the walking environment within two kilometres of key destinations will influence walking as an option for residents, workers and visitors within the five initial Aerotropolis precincts. In addition, the quality of the walking environment within 400 metres of local bus stops and 800 metres of Rapid Bus stops will influence the uptake of public transport as a mode of travel within the Aerotropolis.

The road speed has a direct impact on a pedestrian's sense of safety within an environment.

The following eight principles have been identified as needing to be addressed in order to encourage walking in the five initial Aerotropolis precincts. These are based on the objectives and supporting priorities detailed in Collaboration Area Place Strategies in Greater Sydney:

1. Easy to cross – facilities which make it easy for pedestrians of all abilities and ages to cross roads
2. Shade and shelter – ample urban greening provides cover along pathways to ensure good amenity and comfortable use in all seasons
3. Places to stop and rest – shaded spaces for pedestrian to stop during journeys, in particular for people with restricted mobility
4. Not too noisy – pedestrians can hold conversations while walking on footpaths adjacent to roads
5. People feel safe – the environment is and feels safe for pedestrians to ensure all users, including those of different ages and mobility levels, feel able to walk comfortably
6. Quick and direct – pedestrian access to and from locations is uninterrupted to ensure timely travel over shorter distances
7. Lots of space and distance – pathways are wide enough to accommodate all users at a safe distance
8. Variety – the walking environment is interesting for pedestrians through the presence of urban greenery, active frontages and activated Places.

The provision of a high-quality walking environment within the Aerotropolis study area will result in a greater use of active modes of transport, assisting in the shift towards sustainable mode share goals outlined in Section 0.

6.3.3 Cycling environment

Cycling is an ideal mode of transport for short distances of approximately ten kilometres. Riding a bike or e-bike can often be quicker than a car for trips within the ten-kilometre catchment, and faster than public transport for trips up to eight kilometres.

Encouraging more people to cycle for transport will help to reduce the demand for other modes of transport. Well-placed cycling networks can also extend the catchment of the public transport system.

The quality of the cycling environment within ten kilometres of key destinations within the Aerotropolis could influence cycling volumes within the study area.

The following six key design principles have been identified as needing to be addressed in order to encourage cycling in the five initial Aerotropolis precincts:

1. Separated infrastructure – cyclists must be separated from high volume traffic and pedestrians, both at junctions and on the stretches of road between them
2. Connections – routes must connect with each other forming a wider network
3. Quick and direct – routes must be direct, logical and intuitive to all users
4. Priority – physical barriers along cycling routes, such as poles and fences, should be avoided to ensure ease of ride and cycle priority maintained throughout the network
5. Facilities – end of trip facilities should be provided to encourage cycling for commuting
6. Shade – ample urban greening along cycling routes provides shade to ensure comfortable use in all seasons.

The provision of a high-quality cycling environment within the Aerotropolis will result in a greater use of active modes of transport, assisting in the shift towards sustainable mode share goals outlined in Section 0.

6.4 Travel Demand Management Strategy: Measures and Impacts

The following sections describe Travel Demand Management measures that are suitable for businesses, educational facilities and communities to manage travel demand and promote sustainable travel in the Aerotropolis area. They focus on policy and travel interventions.

6.4.1 Transport Management Associations

Transportation Management Associations are non-profit, member-controlled organisations that provide initiatives to promote sustainable transport in a particular area. Transportation Management Associations are generally public-private partnerships, consisting primarily of area businesses with government support.

Transportation Management Associations provide a long-term framework for delivering Travel Demand Management programs and services. They are usually more cost effective than programs managed by individual businesses and allow small employers to provide services comparable to those offered by large companies.

Transportation Management Associations connect employers, employees, and government agencies to mitigate traffic congestion challenges through a variety of travel measures. A number of travel intervention measures identified in Section 6.5 are typically delivered as part of the Transportation Management Association framework.

In addition, Transportation Management Associations have the opportunity to utilise emerging technologies in the future, aligning with the *Western Sydney City Deal* commitments of a Western City Digital Action Plan, a Smart Western City Program, a 5G strategy and openly available data sets, to help shape their offering and monitoring of travel interventions.

Transportation Management Associations bring together a network of dedicated Travel Management Coordinators. Travel Management Coordinators are professionals who work on behalf of Transportation Management Associations or individual employers and focus on initiatives to facilitate a mode shift to sustainable transport modes.

Transportation Management Associations can also include education facilities that have an impact on the transport network including Universities.

Table 6-1 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway to assist in achieving the sustainable mode share target of 44% by 2056.

Table 6-1 Transport Management Associations summary table

Objectives	Comments
Travel choice	• Increase in basic transport options and choice
Limit vehicle trips	• Reduction in overall vehicle travel by more than 7%
Alternative modes	• Promote alternative modes of travel and the need to travel
Efficient land use	• Reduction in demand for parking
Community liveability	• Liveable places through a reduction in overall vehicle travel

Application					
• Cluster of multiple employers • Successful implementation of Connect in Macquarie Park and North Ryde • Aerotropolis Core and Northern Gateway precincts					
Business	•	Education	•	Community	

An example of a successful Transportation Management Association within Australia is Connect which serves Macquarie Park and North Ryde in Sydney. Launched in 2013, Connect provides a business-led suite of programs, to help influence transport decision-making and promote travel behaviour change; ensuring Macquarie Park can grow as a centre, without growing congestion. Connect coordinates with the leading landowners, employers and all levels of government in order to meet its vision:

To encourage the community in Macquarie Park and North Ryde to change their travel behaviour in order to increase the efficiency of transport, reduce traffic congestion and decrease drive-alone vehicle travel for the journey to work in Macquarie Park and North Ryde.

As the third largest employment area in Sydney, there is already a huge demand for travel to Macquarie Park and North Ryde, with the area forecast to double in size over the next 20 years. Connect recognise that such growth means many more people travelling to the area each day, and that reducing traffic congestion requires reducing private car travel and increasing sustainable travel choices.

The services which are available to members of Connect can be grouped into four key pillars; travel solutions, communications, professional development, and leadership and advocacy, presented in Figure 6.2.

Figure 6-1 Four key pillars of Connect's work with examples of offering

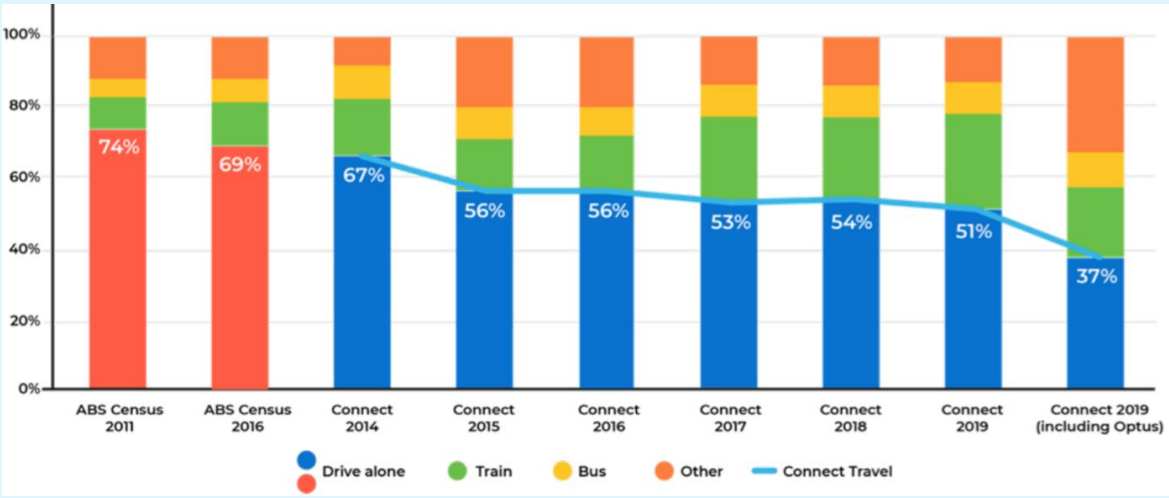
TRAVEL SOLUTIONS	COMMUNICATIONS	PROFESSIONAL DEVELOPMENT	LEADERSHIP & ADVOCACY
Annual travel survey Workplace travel plan Workplace travel website Area-wide benchmarking report Cohop carpooling app Cohop carpooling rewards Workplace travel expos Carpark tools Transport research Intro to new transport services (Keoride, GoGet etc)	Behaviour Change campaigns Employee newsletter Member-only news updates Annual progress report Connect website · Facebook · Instagram · LinkedIn Macquarie Park Travel Guide	"Connect Community" regular community of practice · Employer newsletter · LinkedIn group Toolkits: car park, flexi, remote work Member case studies	Your logo on Connect comms and web Special Event thought-leaders' forum Local and State Gov on the Connect Board Connect meets regularly with local politicians Local planning, traffic and bicycle committees Advocacy for local improvements

As of FY19, 21 members are collaborating with Connect, totalling to 62,480 employees within Macquarie Park and North Ryde. Connect has seen an 80% increase in the number of personal travel plans created through their program.

Data highlighting the mode shift from 2011 to 2019 with the implementation of Connect Travel Demand Management strategies is presented in Figure 6.2, highlighting a reduction of single occupancy vehicle trips from 74% to 51%, with a significant growth in 'Other' modes such as carpooling and shuttle buses.

However, it should be noted that this data predates the COVID-19 pandemic and as a result, travel patterns have significantly altered with a higher proportion of people working from home. Changes to travel patterns are expected when people begin to return to Macquarie Park and North Ryde for employment.

Figure 6-2 Comparison of Macquarie Park mode share from 2011 to 2019 with the intervention of Connect



6.4.2 Travel plan

A Travel Plan is an overarching set of measures designed to reduce private car dependency for a development by encouraging use of more sustainable transport modes. A plan should contain a series of complementary measures which will act in unison to discourage private car dependency. Travel plans can be developed for residential, business and education developments.

A Travel Plan is often submitted alongside development applications for residential and non-residential developments of a particular size and should align and integrate with a Transportation Management Association if established. This size differs based on Local Government Area.

A Travel Plan must include:

- Travel data – baseline travel demand and mode share estimates derived from experience with comparable developments
- Targets – including reductions in single occupancy car trips and increased mode share for sustainable transport
- Action plan – which outlines the measures to be implemented as part of the travel plan, associated promotional, information and education initiatives, and management mechanisms to be introduced as part of the Green Travel Plan
- Commitment – to the on-going maintenance and adaptation of the action plan to ensure its long-term success, by future occupants and/or owners
- Monitoring and review – shall be conducted in consultation with Council officers.

Table 6-2 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-2 Travel plan summary table

Objectives	Comments
Limit vehicle trips	• Reduction in overall vehicle travel through targets and data
Travel choice	• Encouraging use of active transport and public transport modes
Community liveability	• Improved local environmental quality through reduced car use • Reduction in noise pollution
Application	
• Inclusion in the Aerotropolis Development Control Plan for new development applications • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts	

Business	•	Education	•	Community	•

6.4.3 Provision of bicycle parking & end of trip facilities

The provision of ample and secure bicycle parking and end of trip facilities to serve the Aerotropolis study area would encourage more commuters, families and residents from a wider catchment to use active transport modes for travel. The facilities need to have space to store bicycles, scooters and helmets, in addition to end of trip facilities such as showers and changerooms.

The *Draft Western Sydney Aerotropolis Development Control Plan* needs to go 'beyond the business as usual' approach which is currently in place for Liverpool City Council and Penrith City Council, which is outlined in Appendix A: Parking requirements. To ensure a future shift towards sustainable modes of travel is achieved, the minimum bicycle parking requirements within commercial areas, educational facilities as well as community, medical, recreational and residential facilities need to be increased in quantity and be situated at easily accessible and safe locations.

The AustRoads *Bicycle Parking Facilities: Updating the AustRoads Guide to Traffic Management Report* provides information that assists policy makers in identifying what provision of bicycle parking and end-of-trip facilities is appropriate for developments, as well as how they should be designed and accessed. The report provides recommendations and principles that should be followed to encourage people to cycle regularly. The recommended rates for bicycle parking and end of trip facilities by AustRoads are outlined in Table 0-2 and Table 0-3 in Appendix A: Parking requirements, assuming a 10% mode share target and for long-term non-residential land use.

Where a higher bicycle mode splits are expected, the rates indicated in Table 0-2 should be factored up based on the specific mode split targets for Aerotropolis, and associated bicycle parking demand calculations rounded up, to help ensure a suitable level of bicycle parking provision is provided.

Additional information on the design of bicycle parking is outlined in the AustRoads report, which should be read in conjunction with the *Australian Standard AS 2890.3: 2015 Parking Facilities - Bicycle Parking*.

Table 6-3 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway precincts.

Table 6-3 Provision of bicycle parking and end of trip facilities summary table

Objectives	**Comments**
Travel choice	• Encouraging people from a wider catchment to use active transport
Alternative modes	• Encouraging people to utilise sustainable modes of transport
Community liveability	• Improved local environmental quality through reduced car use
Application	
• Inclusion in the *Draft Western Sydney Aerotropolis Development Control Plan* for new development applications • Aerotropolis Core and Northern Gateway precincts	

Business	●	Education	●	Community	●

6.4.4 Maximum parking provision

The introduction of maximum parking rates in the *Draft Western Sydney Aerotropolis Development Control Plan* would encourage early investors and developers in the five initial Aerotropolis precincts to adhere to a lower parking provision, restricting the number of people who are able to drive to and within the study area; making sustainable modes of transport more attractive and reducing vehicle trips.

The existing car parking requirements for Liverpool and Penrith Councils are outlined in Table 0-4 and Table 0-5 in Appendix A: Parking requirements. The *Draft Western Sydney Aerotropolis Development Control Plan* will be consistently applied throughout land within the study area with specifications for different types of land use. However, with no minimum car parking rates, the provision of parking can be reviewed on a case by case basis to be nuanced based on development accessibility to public transport services and active transport infrastructure.

A shift away from business as usual within the Local Government Areas by changing the development control to a significantly lower maximum parking rates would ensure developers and Councils adopt and enforce the appropriate parking supply given the land use and proximity to public transport services.

The adoption of maximum parking rates outlined in the *Draft Western Sydney Aerotropolis Development Control Plan* will encourage more compact transit-orientated design within the Aerotropolis, particularly within the Aerotropolis Core and Northern Gateway precincts to align with future Sydney Metro and Rapid Bus services, ensuring commercial areas, residential developments and community facilities are highly accessible by public transport and active transport modes in mixed-use areas. Maximum parking rates also contribute to the core theme of sustainability outlined in the *Western Sydney Aerotropolis Plan* in Section 2.3.7.

Table 6-4 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-4 Maximum parking provision summary table

Objectives	Comments
Limit vehicle trips	• Encouraging a mode shift away from private vehicle use • Reduction in overall trips through mixed-use developments • Encouraging the design of Transit-Oriented Developments
Travel choice	• Transit-orientated developments improve uptake of other modes
Efficient land use	• Less land required for roads and parking, preserving open space and reducing urban sprawl
Community liveability	• Healthier communities through greater active transport use • Greater economic mobility with success not linked to owning a car • Compact and affordable Transit-Oriented Developments ODs for equitable communities • Reduction in urban heat island effects through land allocation

Application					
• Inclusion in the *Draft Western Sydney Aerotropolis Development Control Plan* for new development applications • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts • Successful removal of minimum parking rates in urban residential and commercial areas of Sydney CBD, New Zealand and California					
Business	•	Education	•	Community	•

Additional measures such as the consolidation of car parking, such as just one dedicated area for a business park as opposed to private parking provision, and the construction of adaptable car parking structure to be repurposed as public transport services become more available are measures that can also be adopted by Councils through their Development Control Plan and Development Application process.

Further measures such as future road space reallocation can be considered by Transport for NSW and Councils for on-street parking. Future initiatives such as the *Western Sydney City Deal* Rapid Bus routes may require formal reallocation of lanes for dedicated bus priority, to be outlined in the business case work. However, in interim periods, the adoption of technology such as smart signage, investigated by Transport for NSW through the Smart Signage Strategic Business Case, would allow for greater flexibility to meet differing demand between peak periods, events and future state years. Such a measure would align with the *Western Sydney City Deal* commitments of a Western City Digital Action Plan, a Smart Western City Program and openly available data sets.

The development of additional plans relating to parking by both Transport for NSW and Council, such as a Sustainable Travel Plan and a Surface Access Strategy, for the Airport and its surrounding precincts would ensure the control the provision of long-term parking for airport passengers and workers. Through a restriction in parking, a shift towards public transport is more likely.

6.4.5 Traffic calming & speed reduction

Traffic calming refers to strategies implemented in the design and operation of roads which are intended to reduce vehicle traffic speeds and volumes on a particular section of road. It is used to change streetscape design to give greater emphasis to pedestrians, cyclists and residents. Traffic calming supports the diverse functions of roads and reallocation of road space and delivers complete streets and universal design principles to enable access for all including people with restricted mobility.

Traffic calming can range from minor modifications of an individual street to comprehensive redesign of a road network. Within the Aerotropolis it is recommended the focus is on roads with vulnerable users, such as educational facilities, with options explored in detailed design for kerb extensions, raised crossings, pavement treatments, road diets, street trees, shared zones and speed reductions.

Implementing measures to reduce traffic speed improves walking and cycling conditions with greater uptake of activity in addition to increasing safety, reducing air and noise pollution and accidents. This encourages more compact development and local business activity.

The adoption of complete streets policies, ensuring roads are designed to accommodate a balance of the diverse range of modes, users and activities, and the implementation of traffic calming measures within the Aerotropolis will assist in creating a safer environment for a shift to a greater uptake of active transport for travel to and from educational facilities, particularly primary and secondary schools.

The following factors influence the level to which a traffic calming project impacts travel:

- Magnitude of change – the more traffic calming reduces traffic speeds and improves walking and cycling conditions, the more it will affect overall travel and mode shift
- Walking and cycling demand – traffic calming projects have the most impact if implemented near major pedestrian and cycling trip generators, including schools
- Integration with other improvements – traffic calming complements other Travel Demand Management measures and when implemented together, can increase the effectiveness of the strategies
- Land use effects – traffic calming supports higher density, mixed-use and pedestrian orientated development that further reduce vehicle use and dependency over the long-term.

It should be noted that traffic calming and speed reduction needs to be balanced with the efficient movement of both freight and on-road public transport along key corridors.

Table 6-5 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-5 Traffic calming and speed reduction summary table

Objectives	Comments
Travel choice	• Reduction in overall vehicle travel within areas through the improvement of the environment for sustainable mode use
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood interaction and local economic activity through active travel • Increase in passive surveillance and property values • Lower traffic casualty rates through reduced vehicle travel speeds • Reduction in noise pollution
Application	
• Urban residential, commercial and community areas with compact land use • Successful implementation throughout areas of Greater Sydney • Balancing measures with movement on strategic freight and on-road public transport corridors • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts	

Business	•	Education	•	Community	•

6.4.6 Urban freight consolidation centres

Urban freight consolidation centres are larger distribution centres on the edges of CBD districts where freight is taken to via vehicle to be broken up and then delivered to its destination via cargo bikes. Cargo bikes are zero-emission alternatives to light goods vehicles with cargo e-bikes being able to be utilised to carry larger loads throughout central city areas.

Currently, delivery vehicles can make up almost 20% of cars and trucks venturing into the central area of Australian cities. As a result, significant congestion can occur within the urban areas. By shifting to last mile freight distribution for the majority of e-commerce deliveries by cargo bike, white vans within urban areas, such as the Aerotropolis Core and Northern Gateway, would be significantly reduced with the need for parking spaces within in activity centres and the associated congestion through vehicle circulation also reduced.

The use of cargo bikes is a time-efficient and climate friendly solution for the future of Australia cities; allowing freight to also shift to sustainable modes.

Local Governments have a key role to play in creating conditions that incentivise large logistic companies such as Australia Post and DHL to integrate cargo bikes into their supply chain and hence drive a long-term modal shift.

Table 6-6 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and the Northern Gateway. It should be noted that the Aerotropolis precincts will differ greatly from each other in terms of the generation and receiving of freight. The measure needs to be tailored to the conditions and implemented alongside the provision for maintenance and service vehicles.

Table 6-6 Urban freight consolidation centre summary table

Objectives	Comments
Limit vehicle trips	• Direct reduction in vehicle use and congestion in urban areas
Travel choice	• A driver's license is not required by staff; increasing accessibility
Efficient land use	• Reduced space required for parking within urban areas, giving greater space back to pedestrians
Community liveability	• Healthier communities through greater active transport use • Reduced stress for staff • Reduction in noise pollution

Application					
• Integrating the use of cargo bikes in urban residential and commercial areas with compact land use and high last mile activity with existing maintenance and service vehicles requirements • Aerotropolis Core and Northern Gateway precincts • Successful implementation of urban freight hubs and cargo bikes in European and American cities with cargo e-bikes utilised for larger and heavier deliveries					
Business	●	Education		Community	●

6.4.7 Provision of car share parking

The provision of ample and centrally located car share parking pods to serve the five initial Aerotropolis precincts would encourage more people and businesses to reconsider ownership of vehicles and to utilise car share programs for trips which cannot be completed via a sustainable mode.

The *Draft Western Sydney Aerotropolis Development Control Plan* needs to go 'beyond the business as usual' approach which currently impacts travel behaviour in the Liverpool City Council and Penrith City Council Local Government Areas. To ensure a future shift towards sustainable modes of travel is achieved, the minimum car share parking requirements within commercial areas, educational facilities as well as community, medical, recreational and residential facilities need to be established and be situated at easily accessible and safe locations.

Table 6-7 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-7 Provision of car share parking summary table

Objectives	Comments
Limit vehicle trips	• Reduction in overall vehicle ownership and vehicle trips
Travel choice	• Greater options available for people who don't own cars
Alternative modes	• Promotes alternative options to vehicle ownership
Efficient land use	• Less land required for roads and parking, preserving open space and reducing urban sprawl
Application	
• Successful adoption of car share programs throughout Greater Sydney • Aerotropolis Core and Northern Gateway precincts	

Business	•	Education		Community	•

6.4.8 Fringe benefit tax

The implementation of forthcoming fringe benefit tax regulations in April 2021 for major employers may result in more efficient use of car parking spaces. The tax is calculated on the utilisation of each car parking space, with the more car parking used at the office resulting in a larger tax bill. The tax will disincentivise employers from providing parking on their premises, instead encouraging employees to utilise sustainable modes of transport for travel.

Table 6-8 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-8 Fringe tax benefit summary table

Objectives	Comments
Limit vehicle trips	• Encouraging a mode shift away from private vehicle use • Reduction in overall trips through mixed-use developments • Encouraging the design of Transit-Oriented Developments
Travel choice	• Transit-orientated developments improve uptake of other modes
Alternative modes	• Promotes alternative options to vehicle ownership
Efficient land use	• Less land required for roads and parking, preserving open space and reducing urban sprawl
Application	
• To be implemented at business parks in April 2021 • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts	

Business	•	Education		Community	

6.5 Travel Demand Management Strategy: Interventions and Impacts

6.5.1 Alternative work schedules

Alternative work schedules can reduce peak period travel by shifting commute travel times to off-peak times, reducing congestion throughout the transport network:

- Flextime – employees are allowed flexibility within their daily work schedules. For example, companies may implement flexible start and finish times allowing employees to start and finish at times that suit them best; some employees work from 8.00am to 4.30pm, while some may work 7.00am to 3.30pm or 9.00am to 5.30pm.
- Compressed work week – employees work fewer but longer days such as four 10-hour workdays each week or 9-hour days with an additional day off each fortnight
- Staggered shifts – shifts are staggered to reduce the number of employees arriving and leaving a worksite at the same time. This measure is similar to flextime, however, doesn't give the employees as much control over their schedules.

Flextime and compressed work week are generally implemented when both employees and their managers agree to the selected workday hours. However, these hours may vary from day-to-day or week-to-week, depending on circumstances. Often formalised policies are put in place to support the existing practices following pilot programs; with management practices changing to reduce the need to have employees physically together at the one time through telework options. It should be noted that most major employers have some form of alternative work schedules available to employees, particularly following the impact of COVID-19 as people start to return to offices via public transport at off-peak periods.

Alternative work schedules are not suitable for all jobs and not all employees want to utilise these options due to personal preference of family commitments.

Table 6-9 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-9 Alternative work schedules summary table

Objectives	Comments
Limit vehicle trips	• Reduction in peak hour private vehicle trips and congestion • Spreading of peak demand across the transport network
Travel choice	• Increased transport options through use of alternative modes

Application					
• Most appropriate for jobs where rigid schedules are not required and in organisations which have effective employee performance assessment practices in place; assess performance and not time at the office • Most effective in urban areas where significant congestion and capacity restrictions exist • Aerotropolis Core and Northern Gateway precincts					
Business	•	Education		Community	

6.5.2 Active transport training and guides

Training and guides can be provided through the form of courses and online resources to help people develop the skills and confidence to use active transport modes within certain areas; primarily focused on cycling and tailored to specific study areas such as school catchments or Local Government Areas. Courses may include information on skills, traffic rules, route planning, bike care and maintenance. Guides can consist of information regarding bike network, self-guided routes and parking locations.

By providing training, active transport becomes a more accessible as people become more familiar with their surroundings and more confident in their skills. The higher level of confidence around active transport assists in the likelihood of school students and families using it as a mode of travel; helping to facilitate a mode shift. In addition, greater use of active transport as a mode of travel for various trip purposes will increase the amount of passive surveillance within a community as well as support businesses within centres as people walking and cycling are more likely to visit retail as parking is not required or significantly easier.

Table 6-10 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-10 Active transport training and guides

Objectives	Comments
Limit vehicle trips	• Reduction in overall vehicle travel through greater local uptake
Travel choice	• Increased awareness for active transport modes • Provision of information making sustainable transport accessible • Increase in commute choice and confidence in options available
Alternative modes	• Promotes alternative options to vehicle ownership • Encouraging people to utilise sustainable modes of transport
Community liveability	• Healthier communities through greater active transport use • Liveable places through a reduction in overall vehicle travel • Reduction in noise pollution
Application	
• Tailored application to specific study areas; precincts or the catchment areas of schools • Successful application by the City of Sydney with two group courses offered to residents • Aerotropolis Core and Northern Gateway precincts	

Business	•	Education	•	Community	•

6.5.3 Carpooling program

Carpooling, or ridesharing, describes the practice of private vehicles carrying additional passengers when making a trip with minimal additional mileage, to lower the number of vehicles travelling a similar journey, in turn reducing urban traffic problems like congestion.

Carpooling is a very common and cost-effective alternative mode of travel, especially in areas which are not well served by public transport, with many commuters utilising the service part-time and for people who don't drive. Carpooling offers financial savings to the driver by sharing their ride as well as time saving through the use of T2 and T3 lanes where provided.

Transportation Management Associations and community transportation organisations often provide ride matching services, however dynamic ridesharing apps and services are available to be used to match travellers together for individual trips based on the start and end points of journeys.

Ridesharing tends to experience economies of scale; as more people use the service the chances of finding a suitable carpool increases significantly. As a result, success of carpooling programs depends on their promotion to encourage a significant portion of potential users to register for participation.

An example of a carpooling program which has been implemented by a Transportation Management Association within Greater Sydney is Cohop by Connect serving Macquarie Park and North Ryde.

Table 6-11 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-11 Carpooling program summary table

Objectives	Comments
Limit vehicle trips	• Reduction in commute trips by up to 20% • Reduction in peak hour private vehicle trips and congestion • Reduction in overall vehicle kilometres travelled
Travel choice	• Increased transport options
Alternative modes	• Encouraging people to utilise more sustainable modes of transport

Application					
• Programs based on regions are most effective to create a larger pool to match commuters from • Greater uptake of carpooling is likely as additional information and encouragement is put in place, such as transit priority lanes and parking cash out measures • Should carpooling be successful in reducing a small percentage of private vehicle trips, the expenses of the program can be paid through reduced parking facility costs • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts					
Business	•	Education	•	Community	

6.5.4 Combined travel behaviour campaigns

Travel behaviour campaigns use education, information, incentives and other marketing-based approaches to persuade and assist people to reduce their need to travel, reduce dependence on private cars and increase physical activity by making voluntary changes in their travel habits and patterns. Such changes include reducing car use and increasing the share of trips by alternatives such as cycling, walking, public transport or carpooling.

Travel behaviour campaigns use a packaged approach to shift people's travel demand preferences by providing information, incentives and support to try alternative travel modes. The programs seek to permanently influence participants into more efficient travel patterns.

Table 6-12 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-12 Combined travel behaviour campaigns summary table

Objectives	Comments
Limit vehicle trips	• Reduction in vehicle traffic and parking demand adjacent to key land uses and destinations at peak periods
Travel choice	• Support the uptake of active transport modes • Increased accessibility for people without cars and those with restricted mobility
Alternative modes	• Encouraging people to utilise sustainable modes of transport • Promote alternative modes of travel and the need to travel
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood connectedness through active travel • Increase in passive surveillance • Reduction in noise pollution

Application					
• Partnership with Local Governments • Combination of Travel Demand Management measures which are tailored to the target audience • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts					
Business	•	Education	•	Community	•

6.5.5 Commuter financial incentives

Commuter financial incentives are financial incentives offered to commuters to use alternative modes of travel and reduce their use of parking facilities. Various financial incentives can be used to encourage employees use of more efficient commute modes:

- Employee parking pricing – companies charge for parking at existing parking lots or eliminate any subsidies in place for off-site employee parking
- Parking cash out – people with subsidised parking offered similar incentive to use alternate mode
- Travel allowances – financial payment provided to employees instead of parking subsidies so commuters can use this money to pay for parking or other modes of travel
- Transit and rideshare benefits – free or discounted fares to employees who use public transport or carpooling programs
- Company travel reimbursement policies – policies that reimburse active or public transport mode mileage for business trips when these modes are comparable in speed to driving.

The inclusion of employees in the program development and planning will assist in identifying any practical and equity concerns through implementation. In addition, employee participation in these programs can be offered as fulltime or part-time to ensure they are flexible for working arrangements.

California has passed a cash-out law requiring some businesses within the state to give employees a cash offer to give up their parking spots; with the offer being tax deductible, whilst the employee benefit of parking is not. In addition, the law provides incentives for carpooling and active transport modes and encourages businesses to further assess the value of their carparking.

The travel impacts of a commuter financial incentive program are dependent on the type of incentives on offer, the quality of travel choices and demographics. However, modal shift tends to be greater if current use of alternative modes is low. Travel tends to shift towards walking and public transport in urban areas, whereas it tends to shift to ride sharing, teleworking and cycling in more suburban areas.

Travel impacts vary, depending on conditions, including the quality of alternative modes and the degree to which inadequate information and encouragement limits their use. Table 6-13 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-13 Commuter financial incentives summary table

Objectives	Comments
Limit vehicle trips	• Reduction peak period travel and associated congestion
Travel choice	• Increased transport options and • Employee satisfaction, increased equity, recruitment and retention • Improved alternative modes of travel through economies of scale
Alternative modes	• Encouraging people to utilise sustainable modes of transport
Efficient land use	• Reduction in parking demand, productive land, increased density
Community liveability	• Liveable places through a reduction in overall vehicle travel • Lower traffic casualty rates through reduced vehicle travel • Reduction in noise pollution

Application					
• Most effective in areas with urban areas and suburban centres with greater mode choice • Unbundling of car parking from dwellings in residential land use • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts					
Business	•	Education		Community	•

6.5.6 Education

The inclusion of bicycle training and safety awareness in physical education curriculums to improve student's understanding, skills and confidence with using bikes as a mode of travel within their local area. The lessons may include practical instructions on how to ride a bike, the relevant road rules, as well as classroom learning about safety awareness through videos, discussions and presentations. Bike maintenance session could also be delivered.

In addition, toolkits may be developed to support the program with guidelines for teaching cycling safety outside of school through recreational use.

Table 6-14 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-14 Education summary table

Objectives	Comments
Travel choice	• Children develop a sense of independence and learn about safety
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood connectedness through active travel • Increase in passive surveillance • Lower traffic casualty rates through improved road awareness
Application	
• Tailored application to the target age group through curriculum development • Aerotropolis Core and Northern Gateway precincts	

Business		Education	•	Community	

6.5.7 Events and challenges

Events and challenges may be held by businesses and schools throughout the year to encourage use of alternative modes in a fun and interactive way. These events and challenges may include car free days, steps challenges and points challenges.

Table 6-15 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial Aerotropolis precincts.

Table 6-15 Events and challenges summary table

Objectives	Comments
Limit vehicle trips	• Reduction in overall vehicle travel
Travel choice	• Increase in commute choice and confidence in options available • Increased awareness for active transport modes • Provision of information making sustainable transport accessible
Alternative modes	• Encouraging people to utilise sustainable modes of transport
Community liveability	• Healthier communities through greater active transport use • Liveable places through a reduction in overall vehicle travel • Lower traffic casualty rates through reduced vehicle travel • Reduction in noise pollution
Application	
• Tailored application to the target audience • Examples: World Car Free Day, 10,000 Steps Challenge, Steptember, National Walk Safely to School Day and RideScore Active Schools • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts	

Business	•	Education	•	Community	•

6.5.8 Navigation and journey planning tools

Navigation and journey planning tools such as guidebooks, smartphone applications and websites provide information on journey planning and travel options to a destination, including routes, schedules, fares, connections, services, real time arrival information, and key contact information.

Navigation tools can be tailored for specific users or trips, i.e. commuters, tourists, visitors, people with disabilities. Stakeholder engagement in the development of tools assists in their effectiveness.

Navigation tools can come in a range of forms, including maps on printed information such as business cards or welcome packs for new employees, internet sites or smartphone apps. Some tools intentionally exclude information on vehicle access and parking options to discourage driving.

An example of a navigation tool is a multi-modal access guide, a document that provides concise and customised information on how to access a particular destination such as the Aerotropolis by various modes. The guide includes special consideration for sustainable modes of transport and can include:

- A map of the area, showing the destination, major roads, nearby landmarks, the closest train station or bus stops, and recommended cycling and walking routes
- Information about transit service frequency, fares, first and last services, and public transportation schedules if possible; plus, the website for transit service providers and taxi companies. Special transit schedule information can be provided for major events that start and end at specified times
- Information on how long it takes to walk from train stations or bus stops and other reference locations to your site
- Information on how to reach the destination from major transportation terminals including Western Sydney International Airport
- Universal access arrangements for people with restricted movement on public transport routes
- Availability of bicycle facilities, including secure bike parking, showers and change facilities
- Car parking availability and price.

Navigation tools are a good opportunity to improve mobility options to destinations within Transportation Management Associations, highlighting interventions to improve the environment to foster a culture of sustainable transport use.

Travel impacts vary, depending on conditions, including quality of alternative modes and information and encouragement. Table 6-16 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the five initial precincts.

Table 6-16 Navigation and journey planning tools summary table

Objectives	Comments
Limit vehicle trips	• Reduction in overall vehicle travel and increase in sustainable modes of travel
Travel choice	• Provision of information making sustainable transport accessible
Alternative modes	• Promote alternative modes of travel
Efficient land use	• Reduction in demand for parking
Community liveability	• Liveable places through a reduction in overall vehicle travel • Lower traffic casualty rates through reduced vehicle travel • Reduction in noise pollution

Application					
• Cluster of multiple employers or educational facilities which attract significant visitation • Most effective in areas with diverse travel options available • Aerotropolis Core, Northern Gateway, Agribusiness and Badgerys Creek precincts					
Business	•	Education	•	Community	•

6.5.9 Safe routes to school

Safe Routes to School is a road safety program which focuses on the travel to and from school. The program differs across states in Australia however generally involves four stages and is delivered by groups such as the school community, Transport for NSW, Councils and NSW Police:

- Planning and establishing the program at the school level
- Investigation of local issues and needs often through a combination of a travel survey which is used to establish the routes used by students to access schools and observation surveys to examine behaviour patterns
- Developing and implementing an action plan which may comprise of engineering, education, enforcement and encouragement dimensions
- Maintaining, monitoring and evaluating the program.

There is an opportunity to revisit the program previously implemented with a focus on behaviour as well as engineering interventions at locations of safety concern, particularly focused on the crossing of arterial roads. By identifying locations which present road safety dangers, students and parents are able to be mindful of these areas when planning their route to travel to and from school. However, with the addition of engineering solutions to the program; these locations can be reviewed and upgraded to improve the safety of those using active transport for a mode of travel to and from school.

By improving the safety of the areas surrounding schools, a primary barrier for children walking to school is removed; which may encourage a greater uptake of active modes of transport for local trips.

Table 6-17 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-17 Safe Routes to School summary table

Objectives	Comments
Travel choice	• Support the uptake of active transport modes • Children develop a sense of independence and learn about safety
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood connectedness through active travel • Increase in passive surveillance • Improved walking environment removing barriers to travel • Lower traffic casualty rates through reduced vehicle travel • Reduction in noise pollution
Application	
• Progressive application in the Aerotropolis as the study area and its precincts develop; both in terms of infrastructure available and population • Relates to the introduction of safety awareness education and active transport training / guides • Aerotropolis Core and Northern Gateway precincts	

Business		Education	•	Community	

6.5.10 School bus services

The provision of dedicated school bus services is common throughout Greater Sydney, providing students a number of routes within the surrounding area for direct access to the school campuses.

School bus services provide students with an alternative mode of transport to school; catching public transport instead of parents driving students via private vehicles, reducing vehicle traffic within catchments. This shift in mode also encourages greater independence of the students and builds their confidence in using public transport, making them more likely to use this as a more for future travel.

The School Student Transport Scheme (SSTS) gives eligible school students free or concession travel between home and school on public transport in NSW, including metro, train, bus, ferry and light rail services. Free or subsidised school travel is available for eligible students through school Opal cards and School Term Bus Passes.

Precinct planning will outline the most appropriate locations for schools within the Western Parkland City. The provision of school bus services should be considered if the schools are not well serviced by Transport for NSW routes or if the catchment includes remote areas with lower public transport frequency.

Table 6-18 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-18 School bus services summary table

Objectives	**Comments**
Limit vehicle trips	• Reduction in private vehicle trips and congestion at schools
Travel choice	• Increased transport options and confidence of alternative modes • Improved basic mobility
Alternative modes	• Promote alternative modes of travel
Efficient land use	• Reduction in demand for parking adjacent to schools • Lower traffic casualty rates through reduced vehicle travel

Application					
• Application is likely to differ throughout the Aerotropolis and its precincts, as the catchment areas of schools and proximity to other transport infrastructure and services may range significantly • Aerotropolis Core and Northern Gateway precincts					
Business		Education	•	Community	

6.5.11 Shuttle bus services

Circulating shuttle bus services carry passengers for short trips along busy corridors, including business districts, employment and education campuses, and parks or recreation areas. They may connect major activity centres, such as a train station and a commercial centre.

Shuttle bus services are usually implemented by a transit agency, business association or a Transportation Management Association, developer, campus administration or individual businesses. The services may be free or require a small fare and can be provided on a regular timetable basis to fill gaps in a transport network as well as during periods of high demand such as special events.

Dedicated space for these services is required to ensure they do not impede on the kerbside space allocated for other forms of on-road transport such as public transport buses.

An example of a shuttle bus service which operates within Greater Sydney is the connection provided by Goodman for trips between Central Station, St Peters Station and Sydney Corporate Park in Alexandria; facilitating the last mile connection for employees. The two services operate to a timetable with the Central Station service operating every 20 minutes between 6.30am and 6.40pm whilst the St Peters Station service operates every ten minutes during peak hours from 7.30am to 6.00pm.

Another example of a private shuttle bus provided for Optus employees or visitors is the Optus Express Bus, connecting Epping Station and Wynyard Station to Macquarie Park. The services are available to people arriving at Macquarie Park before 10.00am or departing from 3.00pm.

Table 6-19 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Agribusiness and Badgerys Creek precincts.

Table 6-19 Shuttle bus services summary table

Objectives	Comments
Limit vehicle trips	• Reduction in peak hour private vehicle trips and congestion
Travel choice	• Increased transport options • Improved basic mobility for people with restricted movement • Support the use of public transport and active transport modes
Alternative modes	• Promote alternative modes of travel
Efficient land use	• Reduction in demand for parking

Application					
• Effective in large commercial and employment centres, recreational spaces and education campuses during peak periods • Circulation bus services would assist in a mode shift for the Agribusiness precinct; operation hours outside of periods with frequent public transport services and productive land to be located further away from Metro stations resulting in significant gaps in last mile connectivity • Agribusiness and Badgerys Creek precincts					
Business	•	Education	•	Community	•

6.5.12 Staggered school start times

Staggered school start times involves spreading the start and finish times of schools to reduce road and public transport congestion during peak periods, normally within an area with a cluster of educational facilities. The staggering can be based on school or year levels and may range between 15 minutes to one hour to minimise bottlenecks for access to and from the schools.

However, staggered school hours do not directly promote mode shift or reduce the need to travel.

Table 6-20 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-20 Staggered school start times summary table

Objectives	Comments
Limit vehicle trips	• Eases congestion around the school grounds • Spreading of road network and public transport peak demand
Travel choice	• Support the use of public transport and active transport modes
Alternative modes	• Promote alternative modes of travel
Efficient land use	• Reduction in peak demand for parking adjacent to schools
Community liveability	• Reduction in large groups gathering at schools, ensuring social distancing can be met during periods of COVID-19 restrictions

Application					
• Most applicable to a location where there is a cluster of educational facilities, where a significant amount of people are trying to travel to and from the same area at the same time each day • Public schools can set their own start and finish times in consultation with the school community • Aerotropolis Core and Northern Gateway precincts					
Business		Education	•	Community	

6.5.13 Telework

Telework is the use of telecommunications such as telephone, email and video conferencing, to substitute for physical travel. The feasibility of telework has significantly increased following the COVID-19 pandemic, with many employees already working from home and likely to do this in combination with working from an office in the future; reducing the overall demand on the transport network.

Telework is generally implemented by businesses and government agencies to meet demand, improve services and reduce costs. However, following the COVID-19 pandemic, telework has been adopted across Australia, with business and educational institutions now equipped to work online. The continuation of telework in the longer-term is still uncertain.

Telework may require changes in management practices that reduce the need to have employees physically together at one time, including more outcome-oriented management practices, and increased reliance on electronic communication.

Table 6-21 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-21 Telework summary table

Objectives	Comments
Limit vehicle trips	• Significant reduction in peak hour trips and network congestion
Travel choice	• Increased transport options and convenience
Alternative modes	• Promote alternative modes of travel and the need to travel
Community liveability	• Greater uptake of walking and cycling for local trips • Reduction in vehicle use and associated noise pollution

Application					
• Application of telework is now widespread throughout Australian cities following COVID-19 • Likely to be used in combination with returning to the office for the foreseeable future • Can improve employment opportunities for some disadvantaged groups • Aerotropolis Core and Northern Gateway precincts					
Business	•	Education		Community	

However, the benefits of telework may be offset in a number of various ways:

- Employees may move further from their workplace, particularly in rural areas, as they only need to commute to the office, for example, two days a week; increasing urban sprawl
- People working from home may make additional vehicle trips to run errands that would otherwise be made during a commute
- Vehicles not used for commuting may be driven by other household members
- People working from home may use additional energy for heating, cooling and electricity in addition to that already being used at the office
- Shopping online increases light vehicle use for the delivery of freight throughout cities.

Should an increase in non-commute trips be seen through telework or urban sprawl, road safety and environmental benefits are reduced or eliminated.

It should be noted that some people may experience difficulty when utilising telework, particularly isolation. As a result, assistance must be in place for the mental health of those working from home.

6.5.14 Walking and cycling to school bus

A walking to school bus and a cycling to school bus are where groups of children walk to cycle to and from school with one or more adults.

Walking and cycling to school buses can range from informal agreements where two families take it in turns to walk to school to more structured programs with a route, meeting points, timetables and a schedule of trained volunteers. The groups generally operate within a 30-minute catchment of schools.

Parents often cite safety issues as one of the primary reasons they are reluctant to allow their children to walk to school. By providing adult supervision, walking and cycling to school becomes a safer option for families in addition to being social; creating opportunities to network within the community.

Table 6-22 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-22 Walking and cycling to school bus summary table

Objectives	Comments
Limit vehicle trips	• Eases congestion around the school grounds as every child on the bus is potentially one less car on the road
Travel choice	• Increased transport options • Children develop a sense of independence and learn about safety • Support the use of public transport and active transport modes
Alternative modes	• Encouraging people to utilise sustainable modes of transport
Efficient land use	• Reduction in demand for parking adjacent to schools
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood connectedness through active travel • Increase in passive surveillance • Lower traffic casualty rates through reduced vehicle travel • Reduction in noise pollution

Application					
• Schools or parent representative groups are best placed to coordinate the program following community engagement to ensure it will be utilised • Catchments differ for walking and cycling, with the programs needing to be tailored to the urban residential area of application • Aerotropolis Core and Northern Gateway precincts					
Business		Education	•	Community	

6.5.15 Wayfinding

Wayfinding refers to people's ability to navigate through an area, and to signs, maps, electronic devices, and other information resources that help orient visitors.

Wayfinding is particularly important when people walk or cycle through an unfamiliar area, and for traveling through transportation terminals such as bus and train stations, and airports; making these modes more accessible to people.

Table 6-23 presents a summary of the measures and how they align with the Travel Demand Management objectives, impacts and application within the Aerotropolis Core and Northern Gateway.

Table 6-23 Wayfinding summary table

Objectives	Comments				
Travel choice	• Increased transport options • Improved basic mobility for people new to the study area • Support the use of public transport and active transport modes				
Community liveability	• Healthier communities through greater active transport use • Greater neighbourhood interaction through active travel • Increase in passive surveillance and property values				
Application					
• Applied most often in urban areas and business parks • Low cost to implement within precincts • Aerotropolis Core and Northern Gateway precincts					
Business	•	Education		Community	•

6.6 Western Sydney Street Design Guidelines

Future infrastructure design can ensure that access routes to and within the five initial Aerotropolis precincts are wide enough to accommodate high volume of pedestrians and cyclists and offer sufficient shade and lighting to ensure the comfort and safety of all people traveling via active modes.

Collaboration with Councils, Transport for NSW, Department of Planning, Western Sydney Planning Partnership and the community is required to mandate a consistent footpath width, amount of shade and lighting to be provided within the five initial Aerotropolis precincts, aligned with adjacent land uses and continuously provided between key destinations.

The adoption of both the design requirements and the design guidelines documented in the *Western Sydney Street Design Guidelines* is essential to ensuring a street environment which is designed for all users; going beyond the business as usual approach currently adopted throughout cities.

7.0 Enabler 2: Transport infrastructure and services

7.1 Overview

7.1.1 Development of the Transport Infrastructure and Services Plan

This plan outlines the transport infrastructure and services required to support the land use proposed in the precinct plans for the initial five precincts, in three precinct groupings. It is the culmination of refinements between the Western Sydney Planning Partnership, Transport for NSW, the urban design consultants, AECOM as the transport planning consultants and stakeholders from across government.

This process has considered the needs of land use balanced against different customer requirements to develop a cohesive transport network, across all modes, that caters for all users. This balances strategic and local travel demands and facilitates sustainable patterns of movement and mobility.

The transport infrastructure and services plan builds upon the work undertaken by Transport for NSW during the structure planning process. The structure planning process defined key strategic transport corridors, with preferred corridor widths identified to accommodate the objectives outlined in the structure planning process. This precinct planning process has built upon the earlier structure planning work building in greater detail as the proposed land uses and urban form have been refined.

The following sub-sections outline the transport infrastructure and services plan by the three initial precinct groupings, with the proposed transport infrastructure and services for each precinct outlined by mode, with potential staging identified. A movement and place assessment is also presented.

The **initial three precinct groupings** as described in this section include:

- **Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek**
- **Agribusiness**
- **Northern Gateway.**

The proposed infrastructure and services for the Aerotropolis represent a **beyond business-as-usual** approach to transport planning in Western Sydney.

- The integrated transport network is planned around centres, which priorities walking and cycling for short trips, and public transport to provide access both to/from and within the Aerotropolis precincts.
- The provision of this active and public transport infrastructure and services will drive a sustainable transport mode share that, considering the size and density of the Aerotropolis, is not seen anywhere else in Western Sydney and will compete with some of the city's largest employment centres.
- Freight and vehicle needs are provided for on the primary freight network, which enables efficient movements of freight in what will be a 24/7 precinct centred around the Western Sydney International Airport.

Subsequent stages of planning, including masterplanning and development application, will build upon the *Western Sydney Aerotropolis Plan* and work undertaken during this precinct planning process. This further planning will take principles and strategic plans and turn this into deliverable, site appropriate proposals that bring the precinct vision to life at a local level.

Walking and Cycling

Walking and cycling will be prioritised for short, everyday trips within centres. In the Aerotropolis Core and Northern Gateway, the catchment around each Metro station in particular will be prioritised for active transport. Workers and residents will be able to walk or cycle to their nearest centre on separated infrastructure.

Even on sub-arterial and arterials roads which connect centres, and connect the Western Sydney Aerotropolis to greater Sydney, walking and cycling will be catered for with separated walking and cycling infrastructure on these corridors for longer trips.

Sydney Metro Western Sydney Airport

Beyond business as usual public transport service provision for Western Sydney is achieved through the backbone of public transport in the Aerotropolis, Sydney Metro Western Sydney Airport, which locates new metro stations within the Northern Gateway precinct, the Western Sydney International Airport business park and terminals, and the Aerotropolis Core. Sydney Metro Western Sydney Airport will provide fast, efficient, high capacity public transport services to form the backbone of the hub and spoke network within the Western Sydney Aerotropolis. It will connect the Aerotropolis with Greater Sydney and, along with the feeder network of bus services, provide a genuine alternative to car travel.

Western Parkland City Rapid Bus

Rapid bus services, in-line with the *Western Sydney City Deal*, are also proposed to connect three Western Sydney centres with the Western Sydney International Airport and Western Sydney Aerotropolis. The City Deal outlines the plan for Penrith, Liverpool and Campbelltown-Macarthur to be connected by fast and frequent rapid bus services that will provide additional connectivity to the airport and Aerotropolis from 2026. Transport for NSW is also planning two additional rapid bus routes to the Western Sydney International Airport, connecting Parramatta and Blacktown. Rapid bus services, which will be similar to the current B-Line product, will enable residents of Western Sydney to access the airport and Aerotropolis and drive a culture of public transport provision in the area from day one.

Other public transport services

A network of Frequent and Local bus services will be implemented to provide connectivity both between and within precincts. Frequent bus services are planned to operate every five minutes on average and will provide key links between centres that can connect businesses and residents to Metro services. Local bus services provide local connections within precincts to nearby centres, and ensure all businesses and residents are within walking distance of public transport.

7.1.2 Structure Plan (Previous Stage)

The Western Sydney Planning Partnership and Transport for NSW previously undertook strategic planning work on the Western Sydney Aerotropolis initial precincts. In terms of transport planning this work was defined within the Structure Plan. The Structure Plan was developed as part of the *Western Sydney Aerotropolis Plan*, the strategic framework for the Aerotropolis, which went on community exhibition in November 2019 and was finalised in September 2020.

Through the structure planning process, Transport for NSW defined key transport corridors that would be required to provide for all modes and journey types across freight, private vehicle, public transport, walking and cycling for access to, from and within the initial precinct groupings.

This work included the specification of requirements to cater for potential travel demand (e.g. number of lanes / typology of infrastructure), provision of high quality pedestrian and cycle infrastructure, provision of space for utilities outside the road carriageway, and sufficient area for tree planting and tree canopy coverage to satisfy targets developed by the Western Sydney Planning Partnership.

The previous work undertaken in the structure planning process has been carried through into the precinct planning process. It has been further refined and built upon as the proposed land use and precinct designs have been refined.

As part of this structure planning process, the defined transport network has been incorporated into the *Western Sydney Aerotropolis State Environmental Planning Policy*, which protects these corridors and the land required for future development. This proposed transport network is also integrated with the Western Sydney Corridors and the broader transport network.

The outcomes of the previous structure planning process, including key transport corridors and their potential function, is outlined in Figure 7-1.

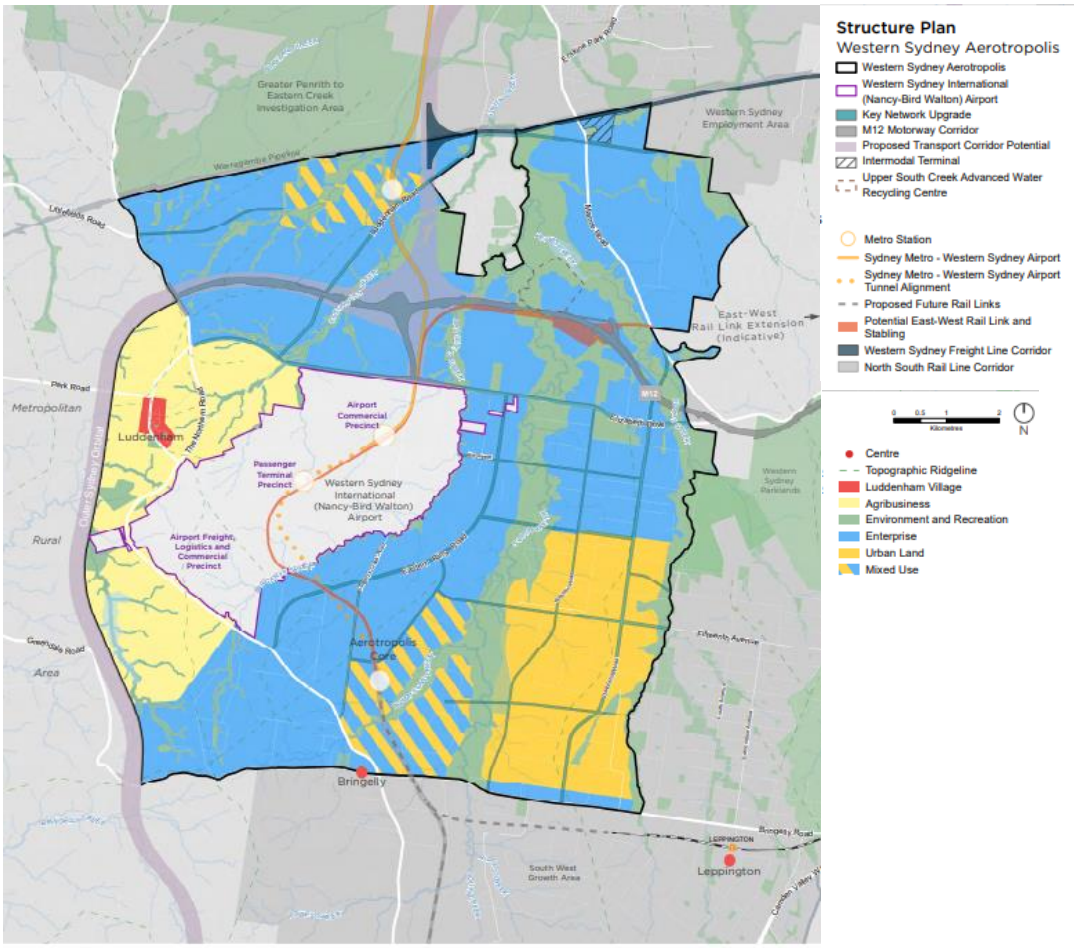


Figure 7-1 Western Sydney Aerotropolis Structure Plan

7.2 Transport principles

A series of principles have informed the development of this transport infrastructure and services plan. These have been developed based on a combination of transport planning best practice and NSW Government policy, as defined by *Future Transport 2056* (2018), the *Greater Sydney Services and Infrastructure Plan* (2018) and *Sydney's Cycling Future* (2013). Additional principles have also been outlined by Transport for NSW and stakeholders during the precinct planning process, and the development of this plan.

The 30-minute city is a key NSW Government policy which guides the improvement and maintenance of access to centres across Greater Sydney. It is about providing customers with convenient access to jobs and services in their nearest centres. The *Greater Sydney Region Plan* establishes the vision for Greater Sydney as a 30-minute city with convenient and reliable access for customers by public transport to their nearest centre to ensure the productivity, sustainability and liveability of the city.

An integrated approach to land use, transport and infrastructure is essential to this outcome. As part of this integrated approach, services and infrastructure that enable 30 minute access by public transport to the nearest metropolitan centre for customers in each city will enable customers to access the large share of jobs and services located in these centres, supporting productivity by connecting people and jobs. The public transport catchments to metropolitan centres and clusters across Greater Sydney, including the Western Sydney Aerotropolis, is shown in Figure 7-2.

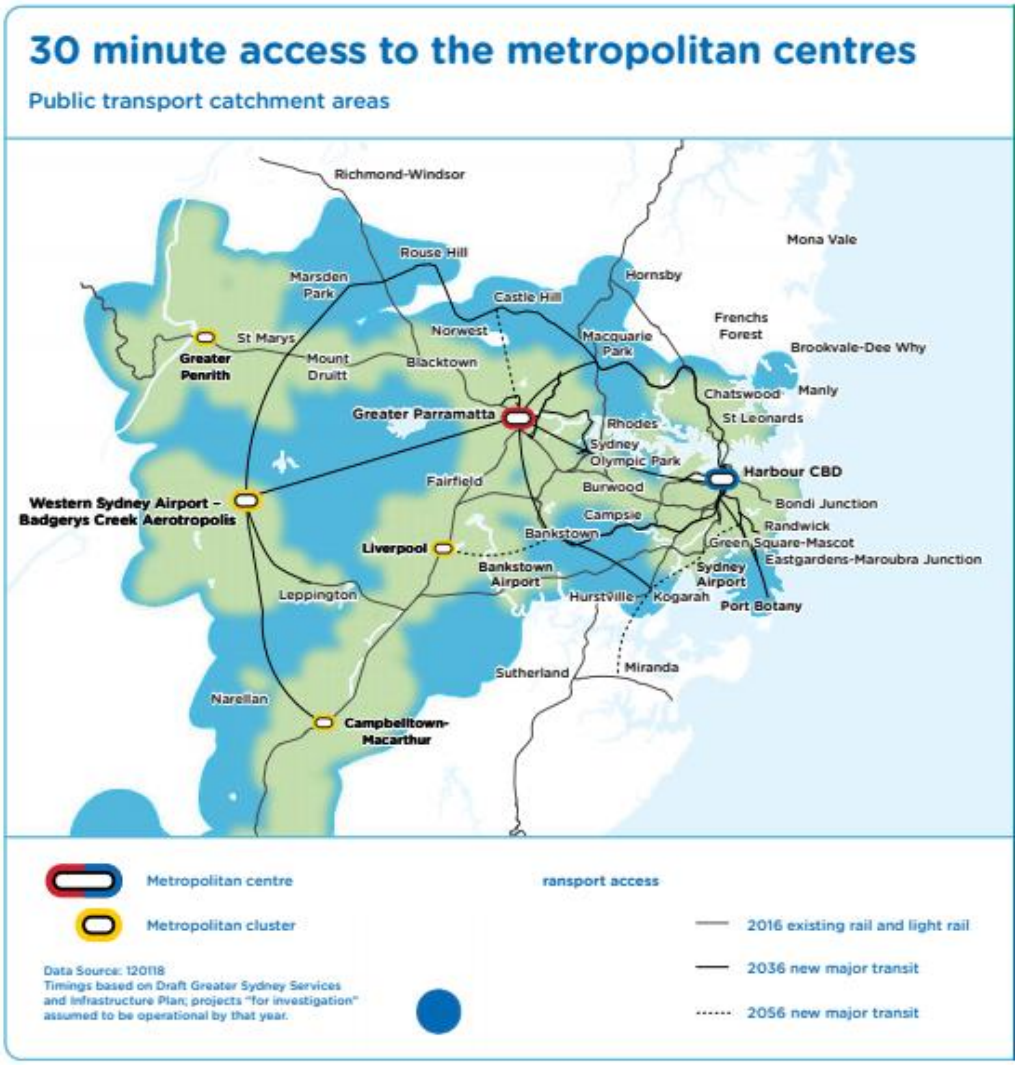


Figure 7-2 30-minute access to metropolitan centres by public transport

Source: *Greater Sydney Services and Infrastructure Plan*, 2018

7.2.1 A Place-Based, Integrated Network

The NSW Government vision for the future transport network is one where different links form part of an integrated network across the Greater Sydney region and each of the three cities. The future integrated transport network will see centre-serving corridors support and complement city-shaping corridors by providing access for people that live away from major city-shaping transport links (i.e. rail).

Public transport is the focus of the 30-minute city as it is the only way large numbers of people can access major centres efficiently and reliably, particularly as the number of trips on the network increases. To achieve the delivery of a 30-minute city, public transport will need to take a greater role in moving people around Sydney. This will be achieved through investment in mass transit, improving service frequencies, prioritising public transport around centres and improving walking and road base connections to public transport and centres.

To deliver on the outcome of customers being able to access their nearest centre within 30 minutes in the Aerotropolis, the city-serving and centre-serving public transport network is planned to provide connectivity to, from and within centres. Access to this network from surrounding areas will be improved by increased service frequencies and provision of on-demand services. The proposed centres hierarchy within the Aerotropolis, which the integrated transport network responds to, is shown in Figure 7-3.

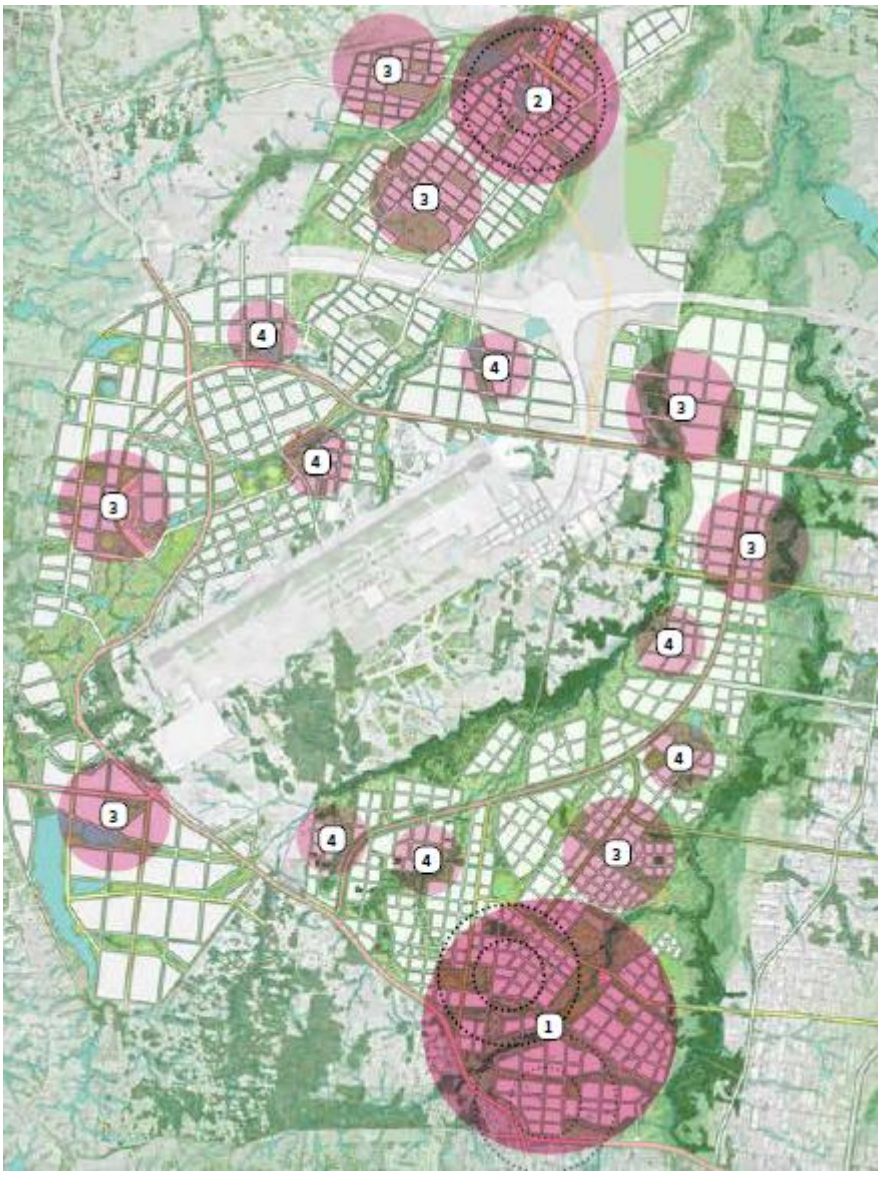


Figure 7-3 Proposed Aerotropolis centres hierarchy

A key innovation in planning for the Western Sydney Aerotropolis transport network is the focus on co-locating compatible uses and separating incompatible uses. This is implemented through an approach where freight and through traffic movement bypass centres, which results in both improved place outcomes for centres and improved efficiency on corridors where movement is a high priority. Public and active transport on the other hand are prioritised within centres to efficiently move people between and within centres.

The future integrated transport network will also support the 24-hour operation of the Western Sydney International Airport and supporting freight and enterprise land uses associated with the airport and Aerotropolis. This will particularly be the case within centres, with on-street kerbside management prioritised for pedestrian and cycle access during the day, potential on-street parking in the evening and kerbside freight delivery late at night. Kerbside usage throughout a 24-hour period should be managed in-line with the modal hierarchy.

(Source: *Western Sydney Aerotropolis Plan*, 2020)

7.2.2 Walking network

As outlined in the *Greater Sydney Services and Infrastructure Plan*, walkable places are designed, built and managed to encourage people of all ages and abilities to walk or cycle for leisure, transport or exercise. Walkable neighbourhoods improve people's access to activity centres, provide opportunity for recreation and encourage active and healthy lifestyles.

Leading a healthy and active life means substituting walking and cycling for short car journeys.

The *Greater Sydney Region Plan: A Metropolis of Three Cities* identified principles for making our places easier for walking and cycling, including:

1. **Accessibility** – footpaths need to be suitable for use by people of all ages and abilities
2. **Connectivity** – direct routes to local destinations and services are required along streets that allocate sufficient road space to safe walking and cycling. A permeable and well-connected urban form is also essential
3. **Amenity** – safe, direct and comfortable pedestrian pathways for all people are essential. This includes commonly designed footpaths, pedestrian crossings and wayfinding, appropriate lighting, shading, pram ramps, rest points and surveillance.

Greener Places, a design framework produced by the *Government Architect of NSW* advocates for an integrated design approach for the built environment and explains why green infrastructure is needed as part of a network.

The aim of the framework is to guide the planning, design, and delivery of green infrastructure in urban areas across NSW. It aims to create a healthier, more liveable, and sustainable urban environment by improving community access to recreation and exercise, supporting walking ang cycling connections, supporting and maintaining Aboriginal culture and heritage, and improving the resilience of urban areas.

The *Greener Places Design Guide* (The Design Guide) supports this green infrastructure framework, focusing on open space for recreation, urban tree canopy and bushland and waterways.

The following principles of green infrastructure will help deliver green infrastructure in NSW.

1. **Integration –** combining green infrastructure with urban development and grey infrastructure promotes healthy and active living
2. **Connectivity –** create an interconnected network of open space which connect with town centres, public transport hubs, employment and residential areas and nature
3. **Multifunctionality –** deliver multiple ecosystem services simultaneously to provide social, environmental and economic benefits
4. **Participation –** involve stakeholders in development and implementation through an open planning process that incorporates knowledge of diverse parties.

7.2.3 Cycling network

The bicycle network for the Aerotropolis has been designed with direct and comfortable routes that are essential to encourage greater take-up of cycling. Cycling forms a key part of the integrated transport network and is an efficient means of travelling short distances within centres. Cycle infrastructure will be used to increase the catchment of Metro stations and bus stops, connect businesses and residents with nearby centres and provide a genuine alternative to private vehicle travel. Greater use of cycling as a mode of transport will result in healthier communities and aligns with the Aerotropolis vision of contributing to a sustainable, well connected Western Parkland City.

The 'Pulse of Greater Sydney' is the first comprehensive monitoring and reporting framework for Greater Sydney. The 10 Directions from the *Greater Sydney Region Plan* and collaboration with stakeholders formed the basis of four key indicators that will assess the progress of Greater Sydney's progress towards its evolution of a metropolis of three cities.

The four indicators are:

- The key spatial aspects of Greater Sydney – jobs and education opportunities and housing diversity
- The aspiration for a connected metropolis of three cities – 30-minute city
- Walkability as an important element of place-making – walkable places
- Responding to climate and resilience – addressing urban heat.

More convenient walking and cycling access to schools, shops, public transport and open space. A hierarchy of cycleways to and between centres will help identify and prioritise key projects that ensure a safe cycle network. Cycleways need to be design-responsive to the road and place environment in which they are located.

There are four major factors that influence choice to ride a bicycle:

1. **Connectivity and separation** – separated street space for bikes, more direct routes to destinations and improvements to the quality of roads for people on bikes
2. **Safe behaviour** – increased road user awareness of road rules and safety, higher priority for bicycles at road intersections, increased enforcement of road rules, reduced speed limits in busy areas and more responsible sharing of paths
3. **Supporting facilities** – better lighting, more facilities that support riding during a trip, bike routes that connect to public transport and more bicycle parking facilities at public transport interchanges
4. **Health, wellbeing and confidence** – more promotion and campaigns on the benefits of riding a bike, trip planning and knowledge of local roads, more education and confidence courses, greater encouragement of social riding and increased knowledge of road rules by bicycle users.

A hierarchy of safe cycleways to major centres will help to identify and prioritise key projects.

1. **Principal Bicycle network** – highly used routes that connect to major destinations, on cycleways that are separate from motor vehicles and pedestrians
2. **Local bicycle network** – lower use corridors that connect to priority corridors and neighbourhood destinations within catchments
3. **Quiet local streets** – connecting residential destinations and local services in low traffic environments, design treatments make provision for people on bikes.

Cycling will contribute to the vision of the Western Parkland City and Western Sydney Aerotropolis by supporting the 30-minute city concept. This will be achieved through connecting residents and workers to nearby centres and public transport on safe, comfortable cycling infrastructure that caters for all users.

7.2.4 Bus network

The *Greater Sydney Services and Infrastructure Plan* outlines buses as a key enabler of an integrated multimodal public transport system and currently make up approximately 44 per cent of all public transport trips in Sydney.

Buses provide public transport services accessible to communities across Sydney and primarily use the general road network and standard size buses. However, also serve an efficient mass transit function, where demand is greater, and reliability is important. To perform this function, larger buses and dedicated fleet and infrastructure; such as double-decker buses, bus-only lanes and bus-only bridges are used to allow for high capacity, frequent, and reliable bus journeys.

Achieving the 30-minute city vision of Future Transport requires a variety of public transport modes and services working in unison to provide a high level of service to meet the diverse needs of our customers.

Transport for NSW has developed a service hierarchy for bus network planning to meet the vision outlined in *Future Transport 2056*. The three tiers of bus service and their design principles are:

- **Rapid bus routes** – provide fast, efficient and frequent 'city shaping' or 'city serving' bus services, often with a differentiated product (e.g. B-Line services with yellow, double decker vehicles). Stops are often of high quality, with stop spacings farther apart to facilitate faster journey speeds

  A Final Business Case is currently in preparation for the three Western Sydney City Deal rapid bus routes (Penrith- Aerotropolis Core via Western Sydney Airport; Liverpool-Aerotropolis via Western Sydney Airport Core; Campbelltown-Aerotropolis Core via Western Sydney Airport), in addition to two others subsequently identified (Blacktown-Western Sydney Airport; Parramatta-Western Sydney Airport). This process will define the product, routes and stops, which will inform any future updates to the precinct plans and subsequent masterplanning.

- **Frequent bus routes** – provide frequent 'city serving' or 'centre serving' bus services that efficiently connect centres and other 'city shaping' public transport services to surrounding areas (e.g. increasing the catchment of Metro services). Services are on average every five minutes, depending on individual route needs and passenger demand

- **Bus capable streets for local routes** – facilitates future planning of local bus routes with the allocation of a series of roads and streets are designed to be bus capable. These future local bus routes will connect all residents and businesses with nearby centres or other public transport connections such as the frequent/ rapid bus routes and Sydney Metro.

The vision for the transport system includes city-shaping, city-serving, centre-serving networks. Each of these networks is designed to perform complementary functions, collectively forming an integrated transport system for Greater Sydney. Transport network planning for the Aerotropolis and broader Western Parkland City will maximise the use of the existing roads. New connections will respond to proposed urban development through precinct planning.

The proposed network includes local and transit-focused streets that will connect to key centres including the Aerotropolis Core and the Airport. The Fifteenth Avenue corridor will provide a direct connection to these centres from Liverpool. Similarly, the Pitt Street Extension Corridor will provide an east– west connection for public transport, walking, cycling local traffic between Devonshire Road and the Airport Commercial Precinct via Pitt Street.

The development of the bus network has considered previous work undertaken by Liverpool City Council on the *Fifteenth Avenue Smart Transit* (SMART) study, with this in particular being considered further in development of Western Parkland City Rapid Bus program. Future bus networks in the Aerotropolis will be benefit from the gradual move to zero emissions bus fleets as technology develops.

7.2.5 Road hierarchy and street design

The future transport network will not only link the Aerotropolis to the world, it will help realise the aspirations of community and industry. Transport networks and services will be coordinated with investment plans and land use planning. The streets and places of the Western Parkland City will be smarter, healthier and more focused on people.

People in the Aerotropolis will be able to walk to the Metro on safe and shaded streets, enjoy frequent and direct bus services, have convenient access to schools and shops, and benefit from a comprehensive network of cycleways. To realise this vision and support the functions of the Airport and high-tech sector, a network of smart motorways and arterial roads will efficiently accommodate time sensitive freight and private vehicle trips.

Planning for different movements considers local networks that pass-through centres and that link places where people want to go, as well as freight and bypass networks to bypass centres and directly link people and goods to the wider network.

Public transport services will be staged with development. Initial services on the Sydney Metro Western Sydney Airport and rapid bus services linking Liverpool, Penrith and Campbelltown with the Airport and Aerotropolis Core will be supported by local services delivered in line with demand.

As outlined in the *Greater Sydney Services and Infrastructure Plan,* roads have a critical role in the transport network, carrying most trips, and supporting efficient and reliable connectivity across the metropolitan area. Roads support multiple transport modes, including on-road public transport, on-demand services, private vehicles, walking, cycling and freight. The strategic road network facilitates the movement of public transport, freight and private vehicles.

The road network in the Aerotropolis precincts are informed by the *Western Sydney Street Design Guidelines*. The *Western Sydney Street Design Guidelines* have informed the definition of the road network corridors and the proposed form, function and design of these corridors.

Within the road network hierarchy, strategic transport corridors and arterial roads are key links to facilitate through traffic and freight, while the *Western Sydney Street Design Guidelines* outlines road and street types for sub-arterial roads and below, each with a distinct function in the road hierarchy:

- **Strategic transport corridors** – Motorways like the M12 and Outer Sydney Orbital which focus on the fast and efficient movement of people and freight across metropolitan Sydney
- **Arterial roads (60m)** – Corridors which focus on the efficient movement of people and freight between precincts. Arterial roads function as primary freight and through traffic routes, while also supporting rapid bus routes at key locations. Arterial roads are generally two to three lanes in each direction. The typical 60 metre corridor cross-section is shown in Figure 7-4.

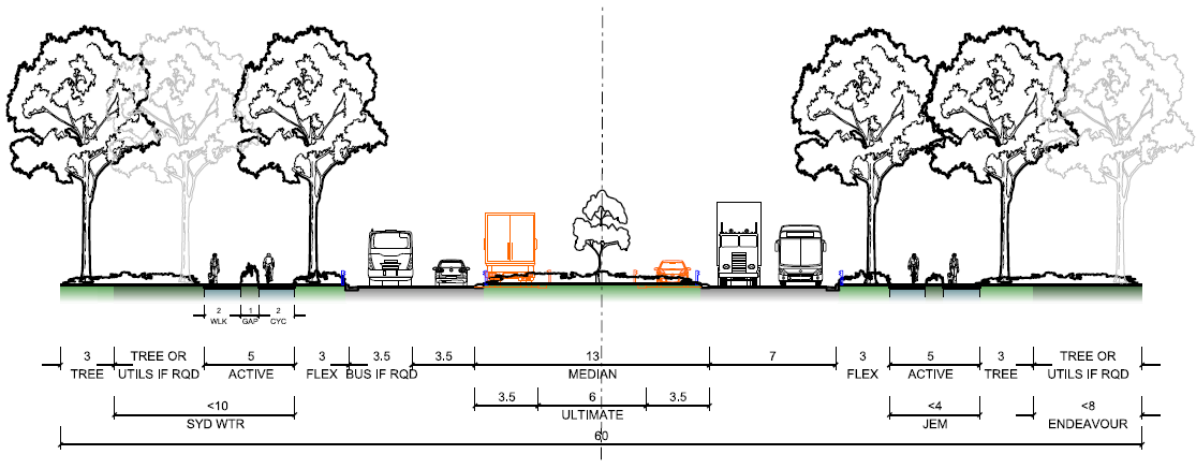


Figure 7-4 Typical 60m corridor cross-section

- **Sub-arterial roads (40-45m)** – Corridors which provide a higher order function to support freight/general traffic or efficient movement of public transport. Sub-arterial roads often form park of the frequent bus network. Sub-arterial roads are generally two lanes in each direction. The typical 40 metre corridor cross-section is shown in Figure 7-5 and the typical 45 metre corridor cross section is shown in Figure 7-6.

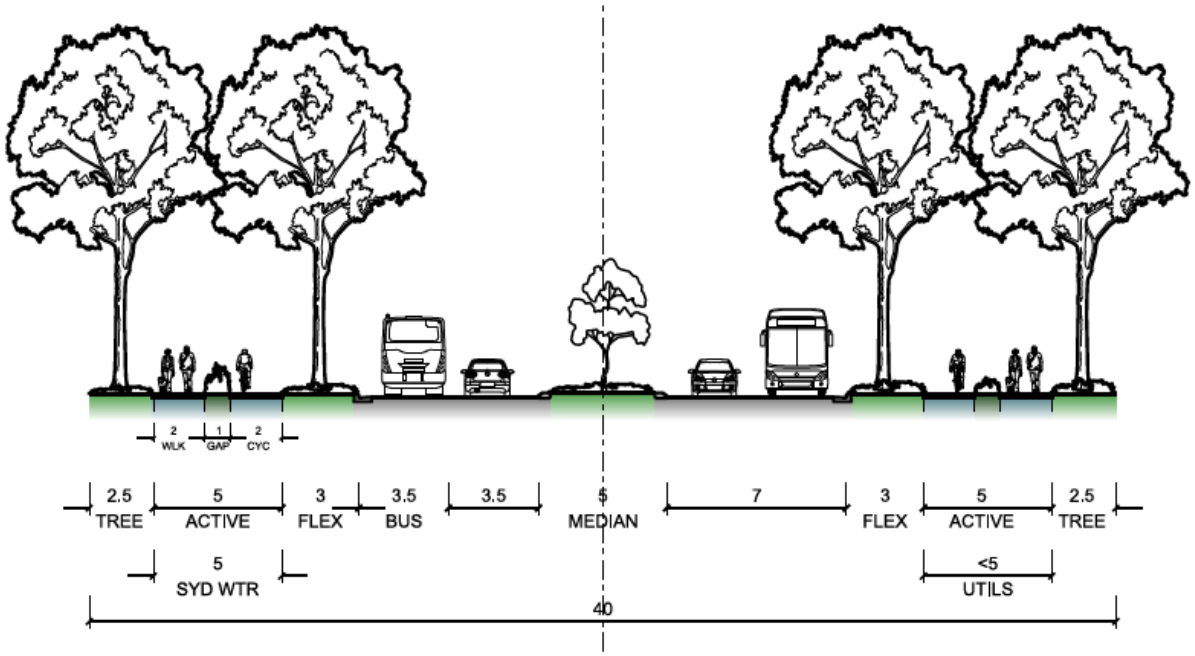


Figure 7-5 Typical 40m corridor cross-section

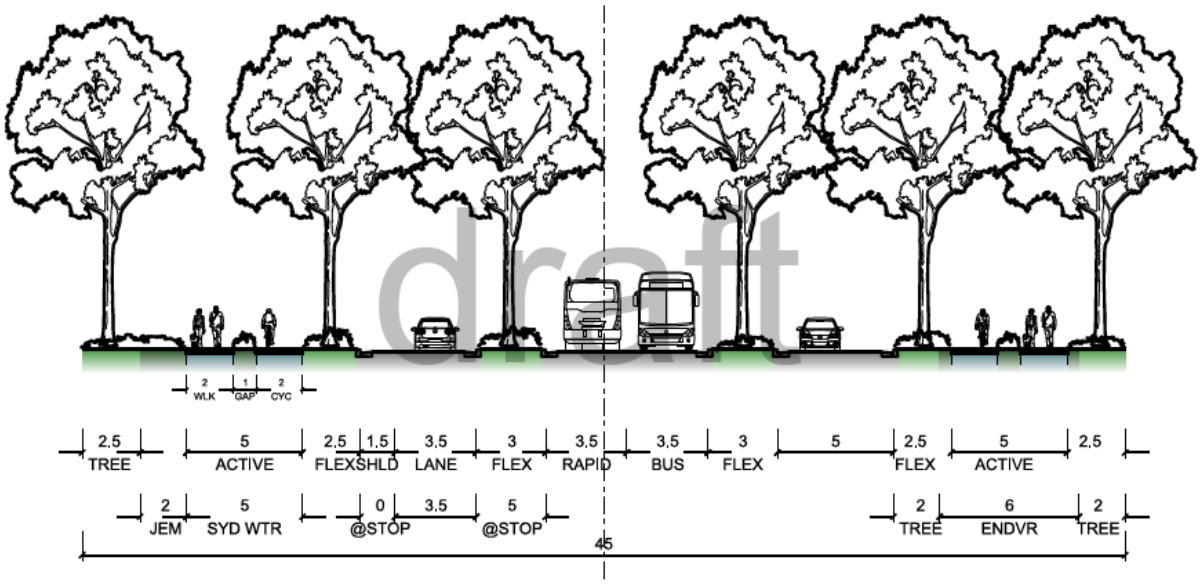


Figure 7-6 Typical 45m corridor cross-section

- **Collector roads (≥25m)** – Roads that function as feeders from local streets into the wider road network, support the local bus network through bus capable dimensions, while also providing a local cycle network function. A typical local collector cross-section is shown in Figure 7-7.

Figure 7-7 Typical 25m local collector corridor cross-section

- **Local streets (≤25m)** – Local roads and streets that provide local access for residents and businesses, while supporting safe and comfortable active transport trips. The typical local street cross-section is shown in Figure 7-8 to Figure 7-10.

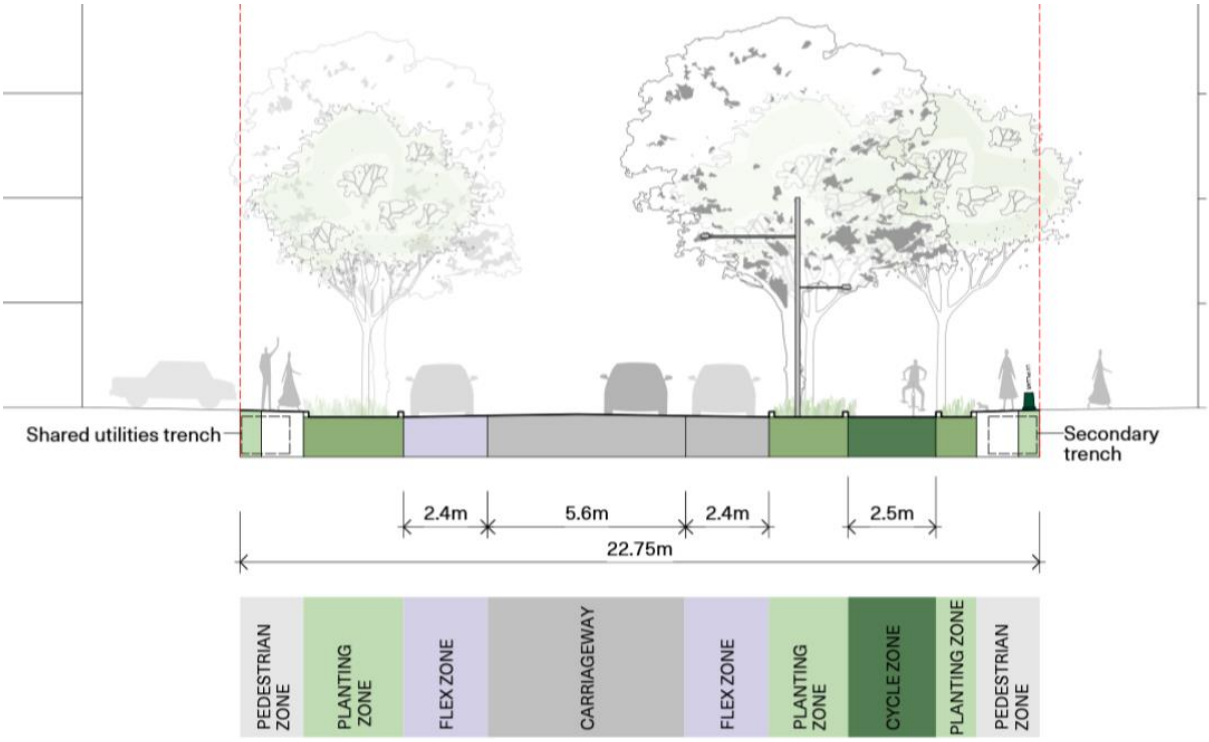


Figure 7-8 Typical <25m local street cross-section

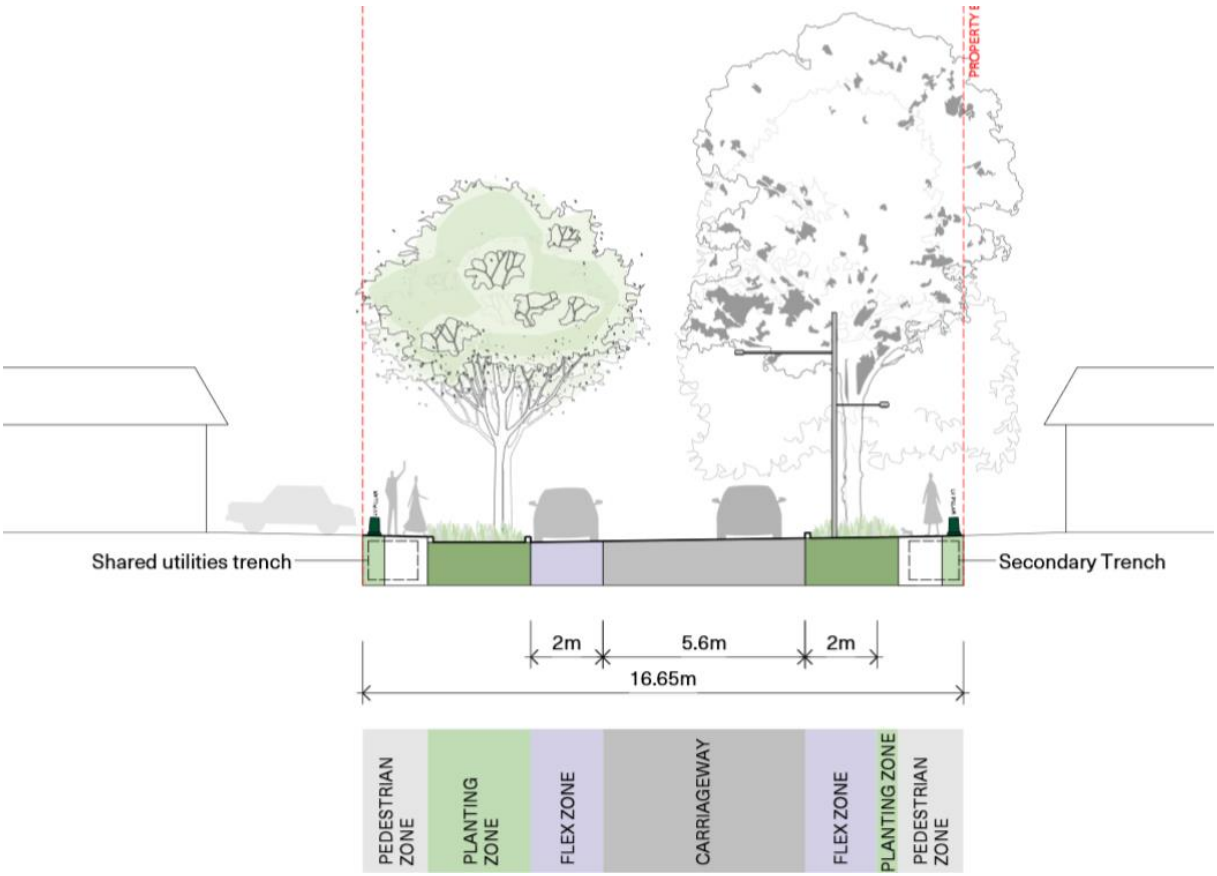


Figure 7-9 Typical <25m local street cross-section

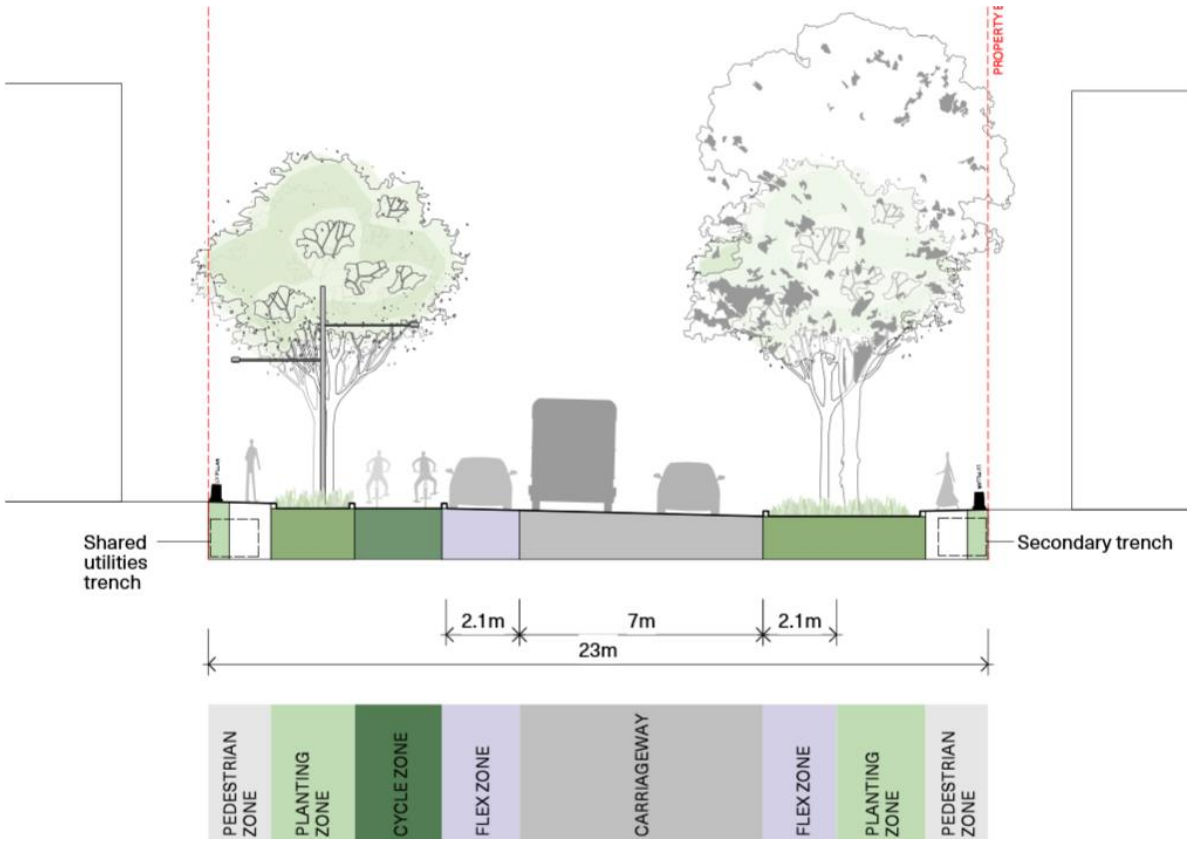


Figure 7-10 Typical <25m industrial street cross-section

7.2.6 Freight

Development of the Western Sydney International Airport and Western Sydney Aerotropolis will create a step change in the freight needs of Western Sydney, requiring a re-balance of infrastructure to support freight movement in what will become a 24/7 precinct. Other major freight receivers in the region include the Moorebank Intermodal Precinct, St Marys freight hub, Mamre Road Intermodal and the Western Sydney Intermodal Terminal. Strategic projects including the Outer Sydney Orbital and Western Sydney Freight Line are in planning and considered an important part of the long-term freight needs of the Western Parkland City.

To support these major projects, a strategic freight network is needed that includes the most significant corridors that support the movement of goods. This includes corridors connecting trade gateways, freight precincts and centres across Greater Sydney as well as corridors that connect the region with outer metropolitan areas and regional NSW. Efficient freight corridors will be required to move freight from the Aerotropolis to both the Western Sydney International Airport and Port Botany for international movement of goods.

The *NSW Freight and Ports Plan 2018-2023* outlines that the safe, efficient and reliable movement of goods around Greater Sydney will require a high capacity network for moving goods between trade gateways and freight precincts, such as from port to warehouse, and providing convenient access to centres. The future network will support this through the strategic road network and improved rail connections, particularly between ports and warehouses.

The characteristics of the strategic freight network are summarised below.

- **Capacity**: High capacity – strategic freight corridors support the highest volumes of goods that are generated by freight precincts and metropolitan and strategic centres
- **Typical mode**: Train and on-road – as demand grows, more goods will need to be moved by train where appropriate. This is particularly the case between Port Botany and intermodal terminals in the Western Parkland City, where demand is highest. The *NSW Freight and Ports Plan 2018-2023* outlines a road to rail mode share target of rail freight at Port Botany increasing to 28 per cent by 2021.

  The strategic road network will also be important for major freight movements, particularly motorways and roads that provide access to centres
- **Land use impact**: High impact – in conjunction with land use zoning, the strategic freight network has a significant influence on where consolidation and distribution facilities are located. Convenient access to the freight network is important for freight customers, meaning facilities are often clustered around these corridors.

As outlined in the *Greater Sydney Services and Infrastructure Plan*, the 40-year visionary freight network will provide new north-south and east-west links in the Western Parkland City as it continues to grow. These links will support growth in freight volumes and help manage pressure on local roads by enabling more goods to be moved by rail or on strategic roads. The Outer Sydney Orbital, a proposed north-south road and rail connection within the Western Economic Corridor, will enable goods, particularly from outside Greater Sydney, to efficiently access these facilities. It will also help reduce pressure on north-south connections in the Eastern and Central Cities and provide a bypass of good around Greater Sydney.

A higher capacity north-south link in the Western Parkland City would be supported by additional capacity on the east-west road corridor between Liverpool and the Outer Sydney Orbital, which has been developed into the M12 Motorway. A number of significant freight precincts are located near Liverpool, including the Moorebank Intermodal Terminal. Additional capacity on this corridor would support access to these facilities from the future Outer Sydney Orbital. This will help manage future pressure on the M7 corridor and reduce pressure on local roads.

The proposed transport network servicing the Aerotropolis will accommodate freight connections that maximise effective and reliable movements while protecting local amenity. Key freight links will serve the Airport, Airport Business Park and other key centres. The upgrade of The Northern Road is designed to serve the Agribusiness Precinct and the Airport Freight and Logistic Precinct.

The proposed M12 Motorway will be the major access route to the Airport and connect to Sydney's motorway network.

The proposed Outer Sydney Orbital Corridor will be the major north–south transport corridor between Richmond Road in the north and the Hume Motorway near Menangle in the south with a motorway interchange with the M4 Western Motorway. It will include dedicated freight rail infrastructure, providing a regional connection between Western Sydney and Port Botany, Port Kembla, Newcastle and regional NSW.

The potential Western Sydney Freight Line would link the Southern Sydney Freight Line with potential intermodal terminals in the Western Parkland City. It would serve freight, logistics and related industries, and consolidate WSEA as a key freight and logistics hub. This line would also divert freight from the Main West Rail Line, unlocking passenger capacity.

Freight hierarchy

Roads have a variety of roles and functions and have a wide range of users. Often, conflicts arise when trying to ensure that the needs of all road users are met. Hierarchies can assist in defining the function of the road and in balancing the needs of various road users and allocating priorities. In this vain, a freight hierarchy is used to plan for and manage freight vehicle traffic, including the provision of safe and efficient freight routes. This is particularly important in the Aerotropolis, with the Western Sydney International Airport, integrated logistics hub and surrounding logistics enterprise that will rely on the freight network. Freight routes also need to be carefully managed to ensure sensitive land uses are not adversely impacted by noise and that the movement of freight also works for local communities.

The freight network hierarchy is divided into three tiers:

- Primary freight routes: Connect regions, and service strategically important ports, airports, industrial areas, freight terminals, intermodal terminals and hubs
- Secondary: Connects within regions, and services significant clusters of major business and freight origins and destinations within a region
- Tertiary: Connects within major subregion, and services groupings of business and freight origins and destinations within a subregion

In addition to the three tiers of hierarchy to cater for freight movement, last-mile delivery is also a key consideration. Enabling last-mile freight will be of growing importance in our connected and global economy, and includes small trucks, vans and even cycle delivery of goods to residents and businesses. This last-mile freight will be catered for within the road network, but its needs will need to be considered in further planning processes in the future.

7.3 Movement and Place Assessment (Future State)

The objective of Movement and Place is to achieve roads and streets that:

- Contribute to the network of public space within a location, where people can live healthy, productive lives, meet each other, interact, and go about their daily activities.
- Are enhanced by transport and have the appropriate space allocation to move people and goods safely and efficiently and connect places together. Balancing movement and place recognises that trade-offs may be required to achieve a best fit for the objectives.

The Movement and Place framework is defined by the below future and associated description of each category. Classification into the four street environments provides an understanding of the function and form of a road corridor, where movement and place interact, which are illustrated in Figure 7-11.

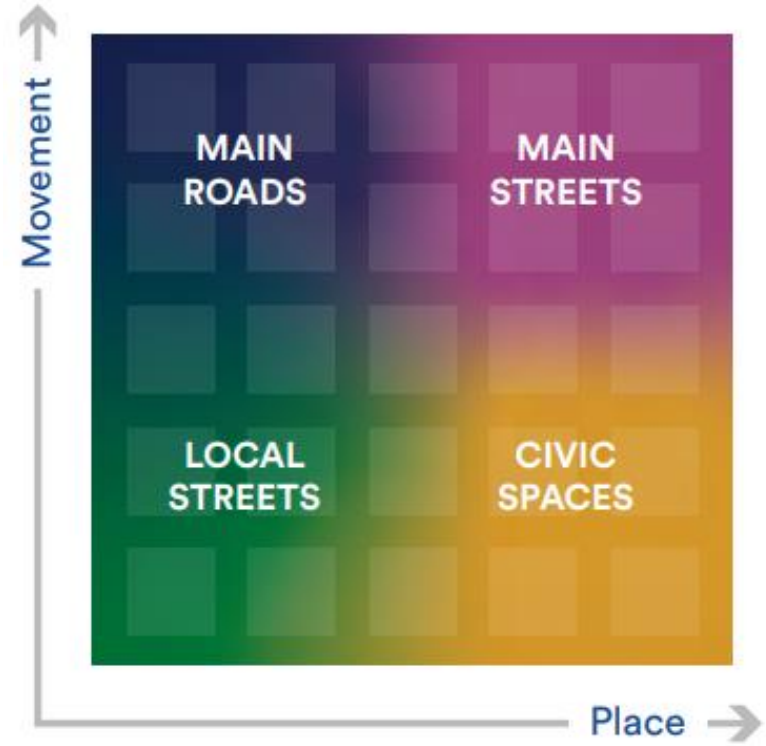


Figure 7-11 Movement and Place framework

Source: Government Architect NSW, 2020

- **Civic Spaces** (was “Places for People”) are streets at the heart of our communities and have a significant meaning, activity function, or built environment. They are often in our major centres, our tourist and leisure destinations, and our community hubs. These streets are often pedestrian priority, shared spaces.
- **Local Streets** are the majority of streets within our transport networks and often have important local place qualities. Activity levels are less intense; however, these streets can have significant meaning for local people.
- **Main Streets** (was “Vibrant Streets”) have both significant movement functions and place qualities. Balancing the functions of these streets is a common challenge.
- **Main Roads** (was “Movement Corridors” and “Motorways”) are routes central to the efficient movement of people and freight. They include motorways, primary freight corridors, major public transport routes, the principal bicycle network, and key urban pedestrian corridors. Place activity

levels are less intense; however, these roads and routes can have significant meaning to local people.

A future state assessment and definition of the roads and streets within the precincts have been undertaken using the Movement and Place framework, based on the proposed transport and land use plan for the Aerotropolis Core, Northern Gateway and Agribusiness precincts using the Government Architect's *Practitioner's Guide to Movement and Place*. The centres hierarchy shown in Figure 7-3 was also considered when potential future state place significance was assessed.

For this stage of the project, an initial classification of the roads and streets within the precincts has been undertaken to outline a future vision of what the road network will seek to achieve. This is likely to evolve as key issues and opportunities present for further investigation during the subsequent masterplanning stage. Figure 7-12, Figure 7-13 and Figure 7-14 present the analysis of the three precincts.

The relationship between infrastructure and land use is central to the precinct plans, which establish the strategic vision and general objectives, proposed land uses, performance criteria for development of land, and the approach to infrastructure management. They have been developed to align with the objectives of the *Western Sydney Aerotropolis Plan* and focus on five key layers; blue-green infrastructure framework, landscape, country, connectivity, and community and place. The precincts enable an interconnected network of corridors that provides for equitable access for jobs, businesses, residents and recreation purposes. The precinct plans denote various street typologies, which have been outlined to support the proposed adjacent land uses.

- Civic Spaces are largely located around major centres and support high place values for areas of greater land use intensity where through-movement is less of a priority.
- Local Streets provide for local access both outside of centres and within centres.
- Main Streets traverse through and within areas with greater land use intensity. They include major public transport routes that have an important movement function.
- Main Roads provide for the strategic sub-regional, regional or metropolitan movement of people and freight within, and between, the precincts, and major land uses. These are formed of 40-metre-wide sub-arterial roads, 60-metre-wide arterial roads and motorways. They can include major public transport routes that have an important movement function.

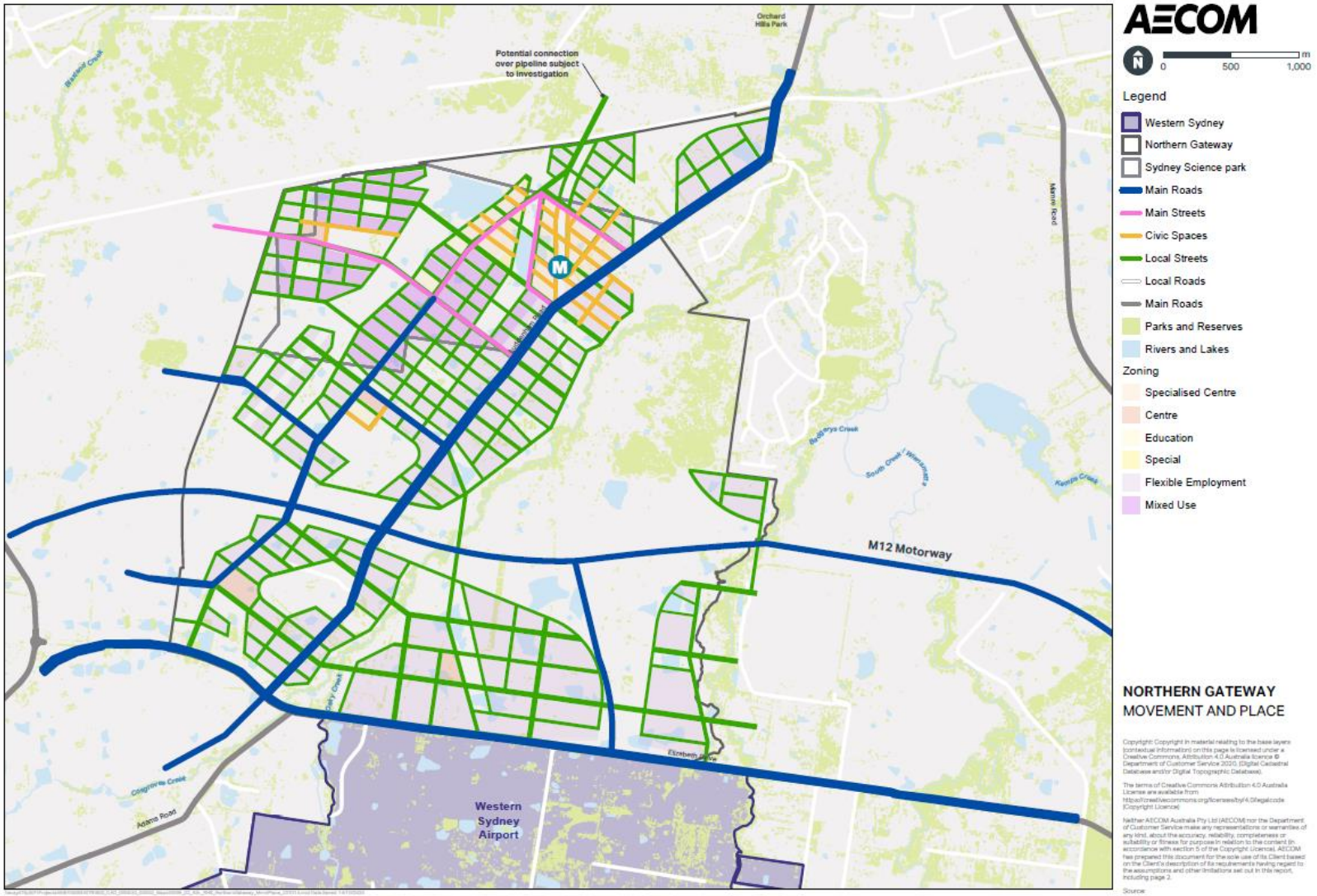


Figure 7-12 Movement and Place analysis of the proposed Northern Gateway transport plan

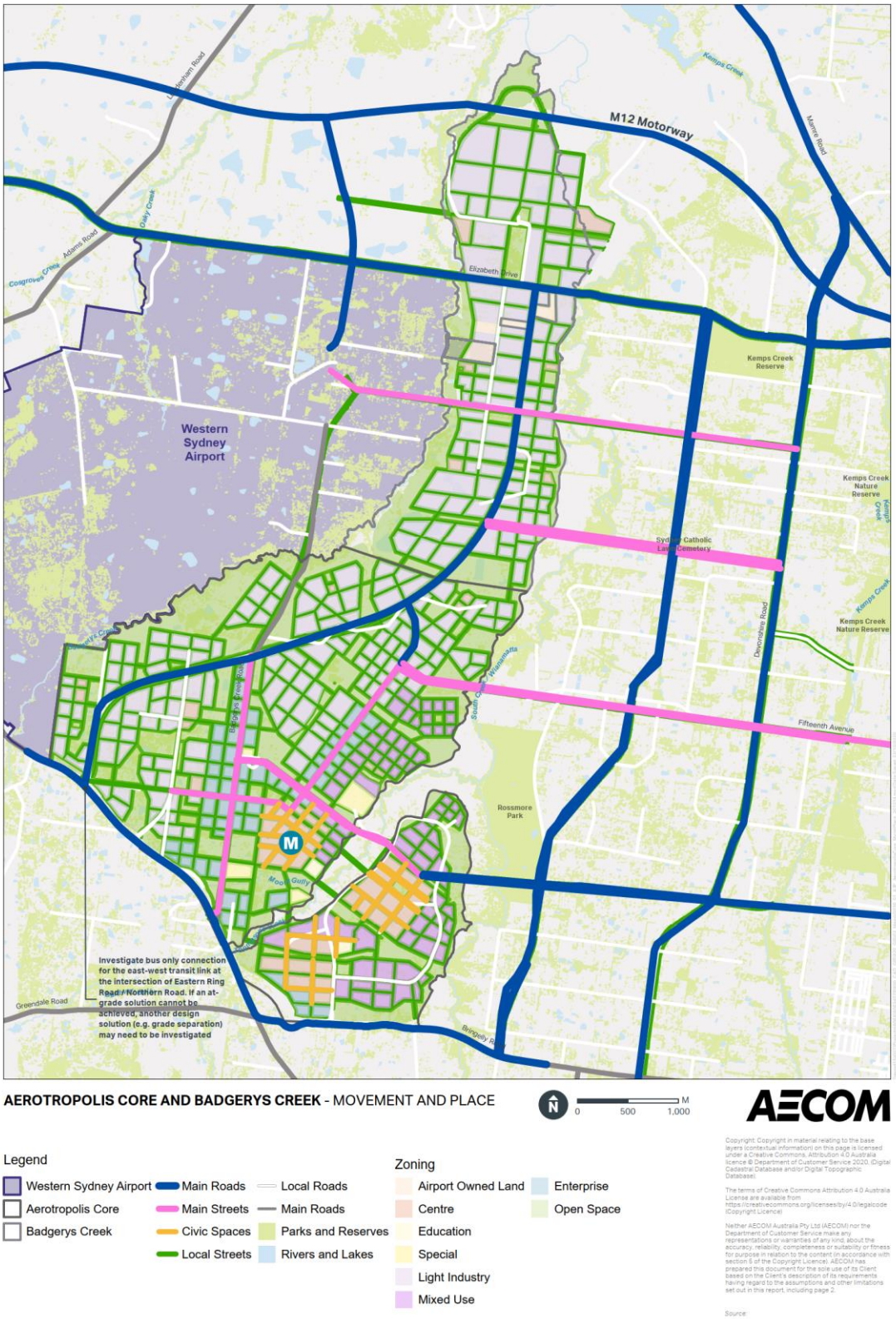


Figure 7-13 Movement and Place analysis of the proposed Aerotropolis Core transport plan

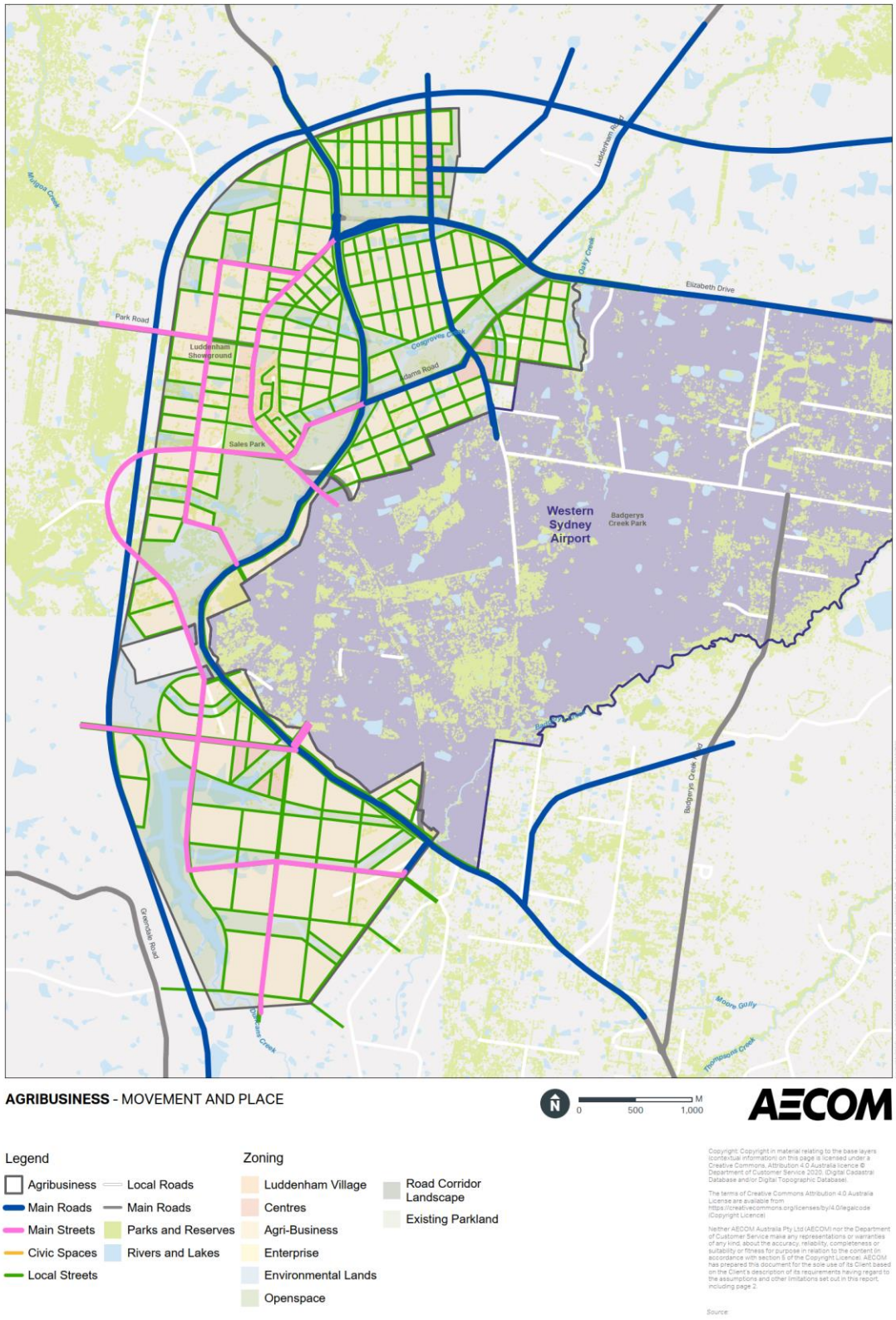


Figure 7-14 Movement and Place analysis of the proposed Agribusiness transport plan

7.4 Western Sydney Aerotropolis

The Western Sydney Aerotropolis initial precincts include Aerotropolis Core, Badgerys Creek, Wianamatta-South Creek, Agribusiness and the Northern Gateway. These initial precincts surround Western Sydney Airport and will provide supporting and complementary land use to airport operations, including industry, freight and logistics, agribusiness services, education and residential development in selected areas.

Transport networks to support the Western Sydney Aerotropolis have been developed in a co-design process by stakeholders to support the vision of the *Western Sydney Aerotropolis Plan*. This includes a beyond business as usual approach to providing facilities to encourage sustainable modes of transport, including walking, cycling and public transport. This has been balanced with providing a road network that can cater for land use which will require freight access, in addition to catering for the 24-hour freight access requirements of Western Sydney Airport.

Figure 7-15, Figure 7-16 and Figure 7-17 provide an overview of the road, bus and cycle networks within the Western Sydney Aerotropolis, illustrating how the precincts seamlessly connect to one another to form an integrated transport network. The transport network in individual precincts is explored further in Section 7.4 (Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek), Section 7.5 (Agribusiness) and Section 7.6 (Northern Gateway).

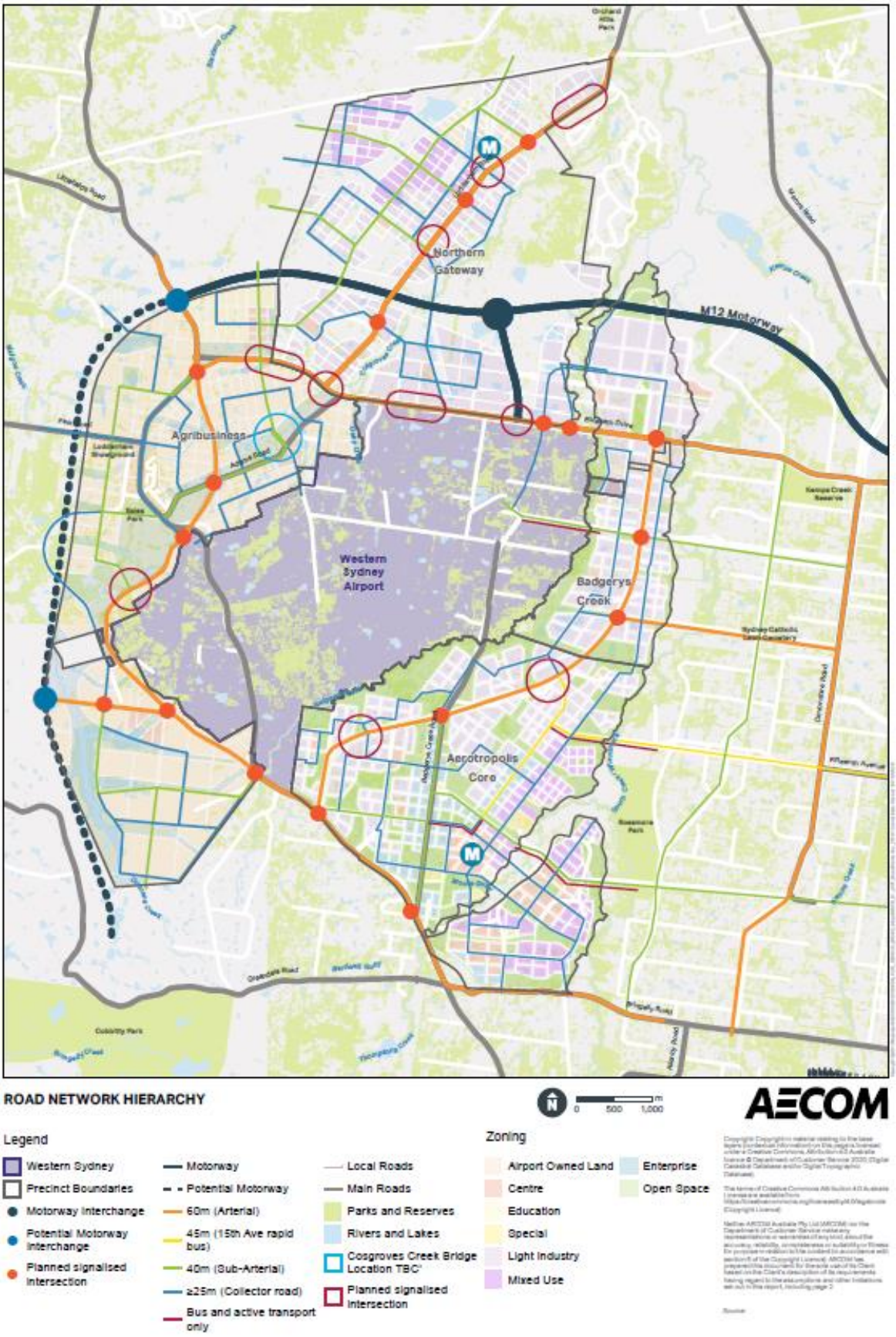


Figure 7-15 Western Sydney Aerotropolis road network

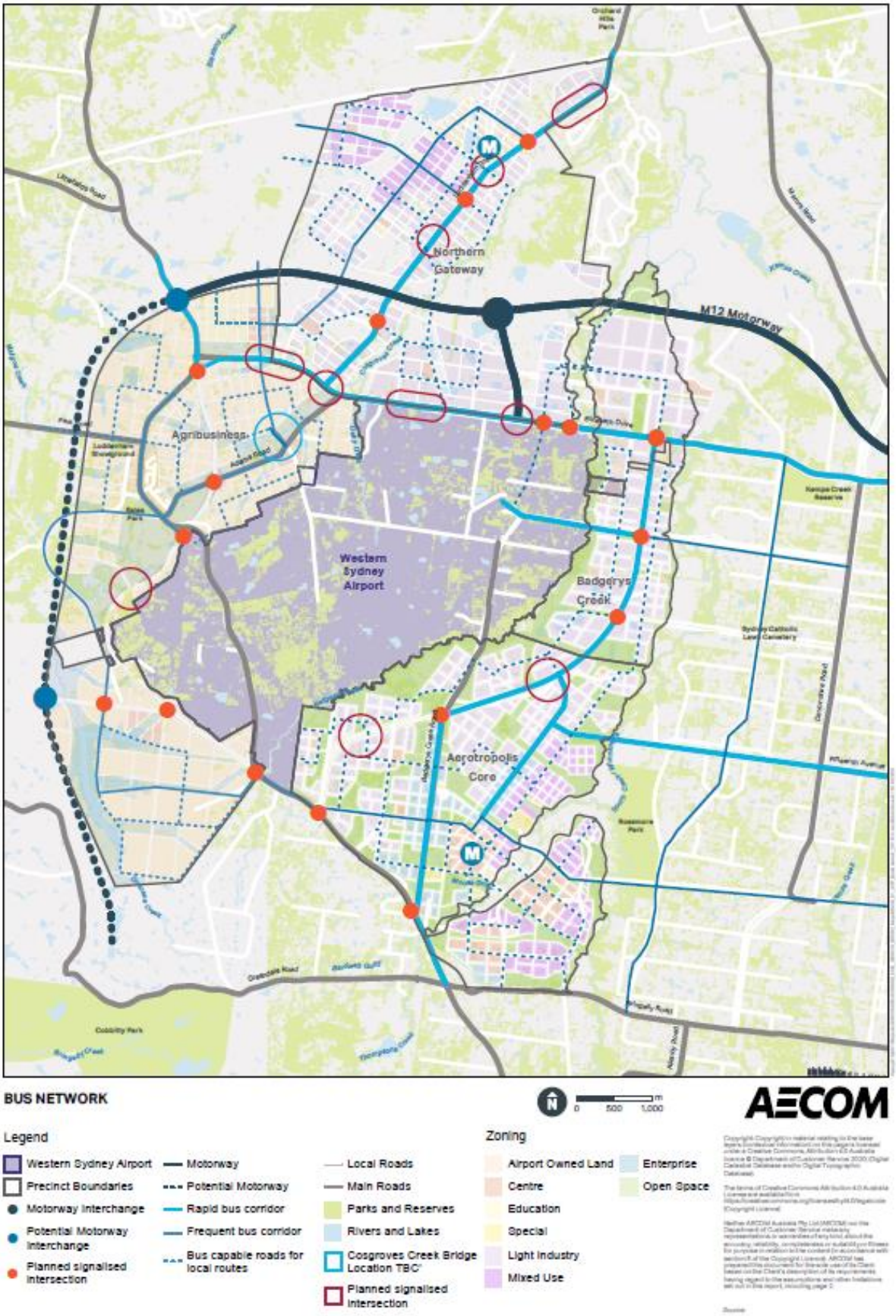


Figure 7-16 Western Sydney Aerotropolis bus network

Figure 7-17 Western Sydney Aerotropolis bicycle network

7.5 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek

7.5.1 Precinct Place Description

The *Western Sydney Aerotropolis Plan* identifies six initial precincts based on opportunities and constraints as well as likely future character and connectivity – with three of these initial precincts forming the Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek grouping.

The Aerotropolis Core will be a diverse, dynamic and sustainable global airport city with attractive places for workers, residents and visitors. It will be a place of choice to do business, a new employment-focused metropolitan centre with an industry focus on advanced manufacturing, research and development and industry led educational facilities. The Aerotropolis Core will also take advantage of its proximity to the airside and facilitate development of a cutting-edge aerospace and defence industries.

The Precinct will be centred around a new Sydney Metro station and be supported by retail, creative industries, civil and cultural facilities, and world-class public open spaces. Residential communities and other noise sensitive land uses will be located outside the ANEC/ANEF 20 and above contours. The Wianamatta–South Creek corridor will be a shaded, central lifestyle feature. Housing will be integrated with local services, retail and compatible commercial development that activates the ground plane.

Directly adjoining the Airport to the east, the Badgerys Creek Precinct will support airport operations, the new urban centre in the Aerotropolis Core to the south and the Northern Gateway to the west. The precinct will meet demand for a range of employment generating uses that benefit from its proximity to airport operations and the new urban centre, but do not require direct access to high capacity public transport. The precinct is not suitable for noise sensitive land uses such as residential, schools and hospitals. Defence and aerospace and technology-based industry which complements and supports the Aerotropolis Core may also locate here.

The Wianamatta–South Creek Precinct allows planning for the Aerotropolis to be structured around the landscape. The retention of water in the landscape, protection of significant remnant vegetation, and other Blue– Green Grid elements such regional parks will enable the greening of the Aerotropolis. The creation of a Blue– Green Grid will provide multiple opportunities for residents, workers and visitors to the area to benefit from improved amenity and liveability outcomes. Connectivity from Wianamatta–South Creek and its tributaries into the adjacent precincts will be integrated with green infrastructure to create extended green corridors

The proposed future employment and population projections for the Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek precinct grouping are outlined in Table 7-1.

Table 7-1 Future employment and population projections for the Western Sydney Aerotropolis initial precincts

Precinct	Size (ha)	Jobs	Jobs / ha	Residents	Residents / ha
Aerotropolis Core	1,382	60,000	43	24,000	17
Badgerys Creek	612	11,000	18	Limited	N/A
Wianamatta - South Creek	1,392	-	-	-	-

7.5.2 Network Functional Classification

The network function outlines the role each road and street will play in the integrated transport network. The *Western Sydney Aerotropolis Plan* separates conflicting uses where possible, with freight planned to bypass centres and public transport, walking and cycling used as the primary modes of transport to access centres.

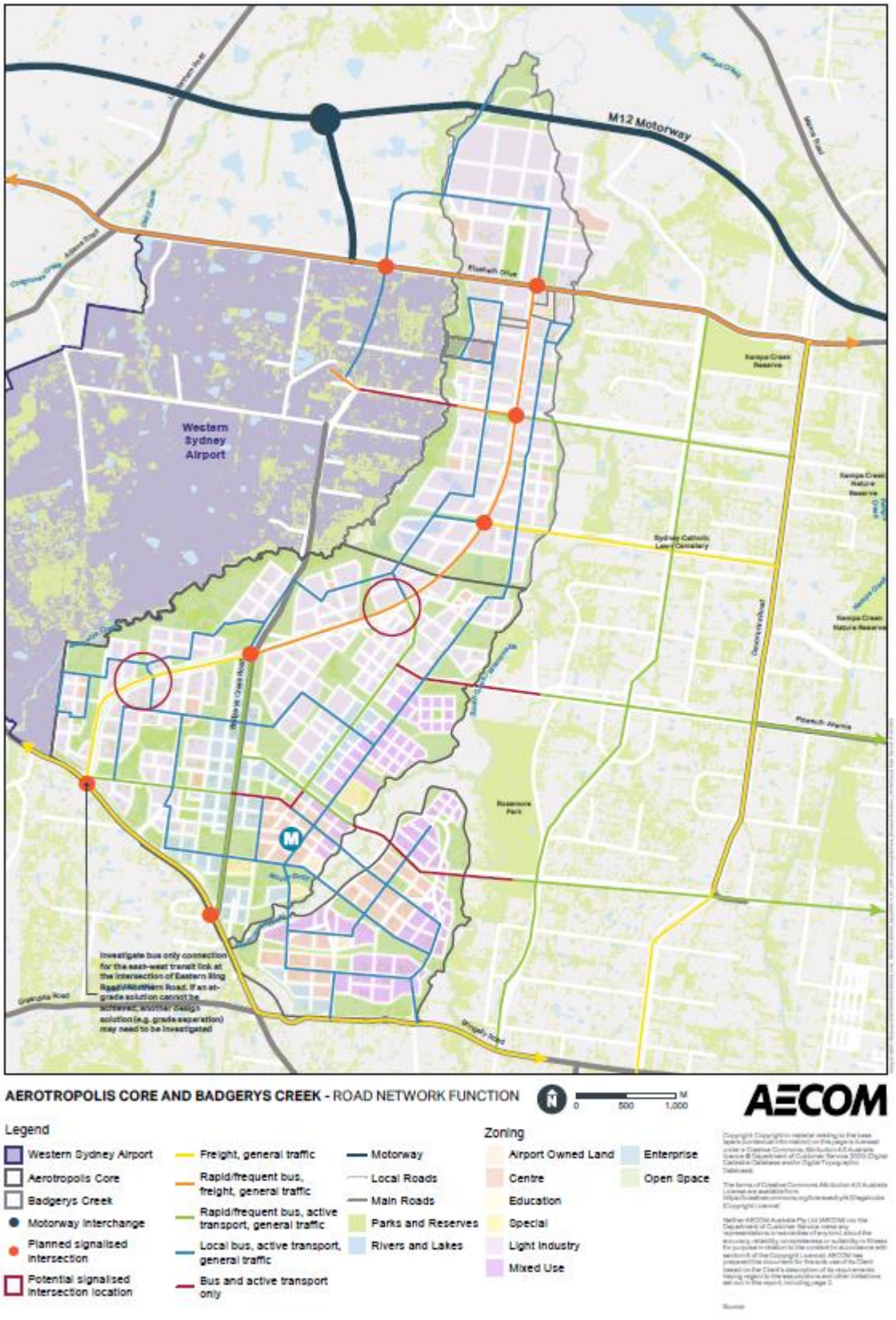


Figure 7-18 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed network function

7.5.3 Walking Network

The walking network is extensive, covers all roads and streets, enables ease of movement, is well connected, facilitates good pedestrian accessibility and permeability. Walking is an integral part of everyday life and an important part of Greater Sydney's transport system. Most journeys within Greater Sydney start and end with walking, and as a result, well-placed walking networks can extend the reach of public transport.

The transport plan recognises walking as an active and sustainable transport mode, and encourages people to walk for transport, especially for trips within two-kilometre catchments of origins and destinations. By encouraging more people to walk, and combining more walking with public transport trips, is an effective way to free up capacity on the transport system and reduce congestion in centres.

The quality of the walking environment within two kilometres of key destinations will influence walking as an option for residents, workers and visitors within the five initial Aerotropolis precincts. In addition, the quality of the walking environment within 400 metres of local bus stops and 800 metres of Metro stations or Rapid Bus stops will influence the uptake of public transport as a mode of travel within the Aerotropolis.

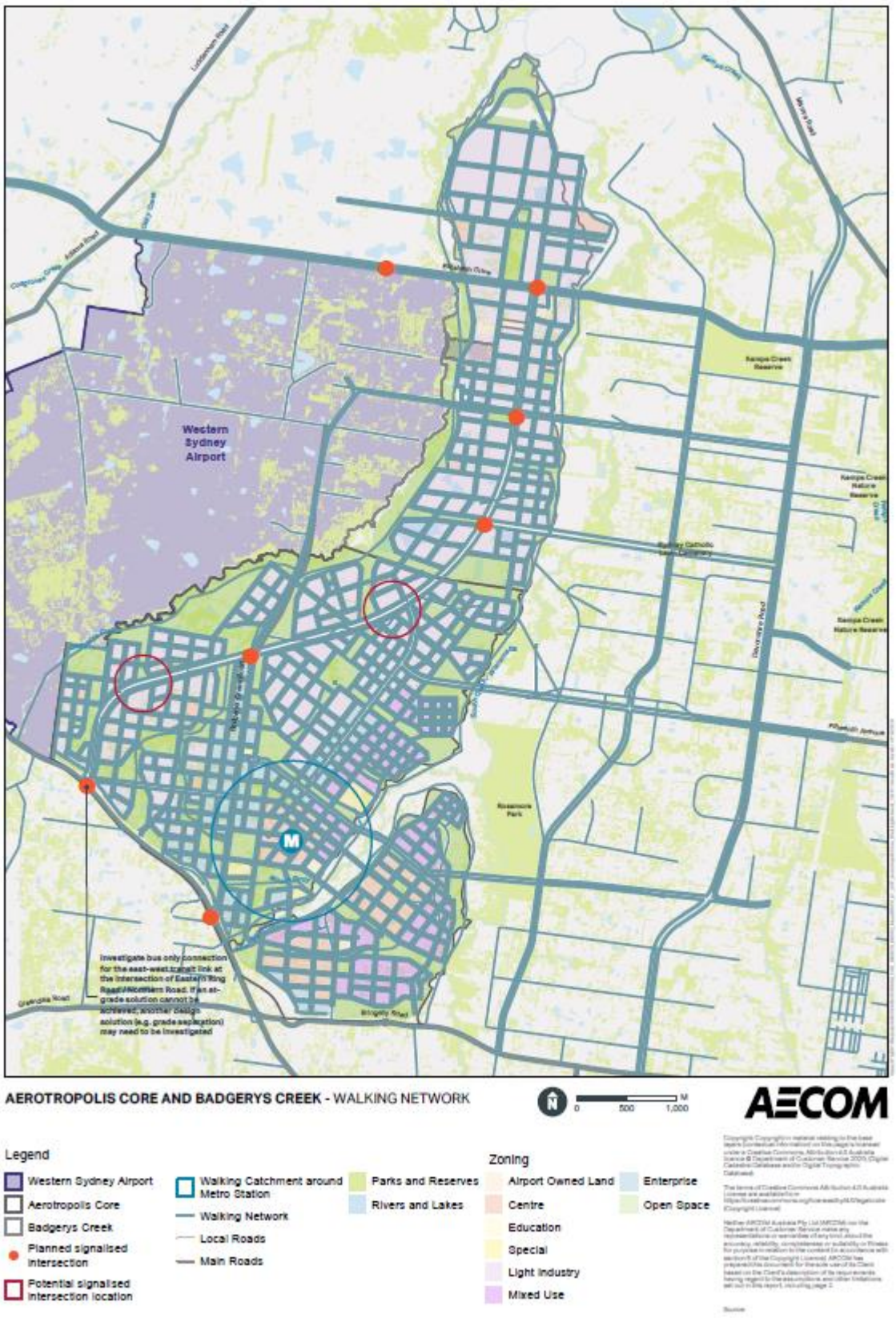


Figure 7-19 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed walking network

7.5.4 Cycling Network

The bicycle network for the Aerotropolis has been designed with direct and comfortable routes that are essential to encourage greater take-up of cycling and represents a beyond business as usual approach to cycle planning in Western Sydney. Cycling forms a key part of the integrated transport network and is an efficient means of travelling short distances within centres.

The walking and cycling networks in the Aerotropolis Core both utilise the blue-green grid to bring open space into the city. A well-developed principal bicycle network, both within open space and as part of the road network, provides a high degree of connectivity between and within centres. The principal bicycle network is supported by local bicycle routes which service businesses and residential areas by providing a greater catchment accessible to high quality separated bicycle infrastructure. All local streets within the Aerotropolis Core are designed to be cycle friendly and will support last-mile trips that connect workers and residents to separated bicycle infrastructure.

Wianamatta-South Creek will be an important cycling link that connects the Aerotropolis Core to Badgerys Creek within open space, acting as the north-south spine of the blue-green grid. This open space will provide the facilities to encourage cycling use in the Aerotropolis, driving sustainable transport usage.

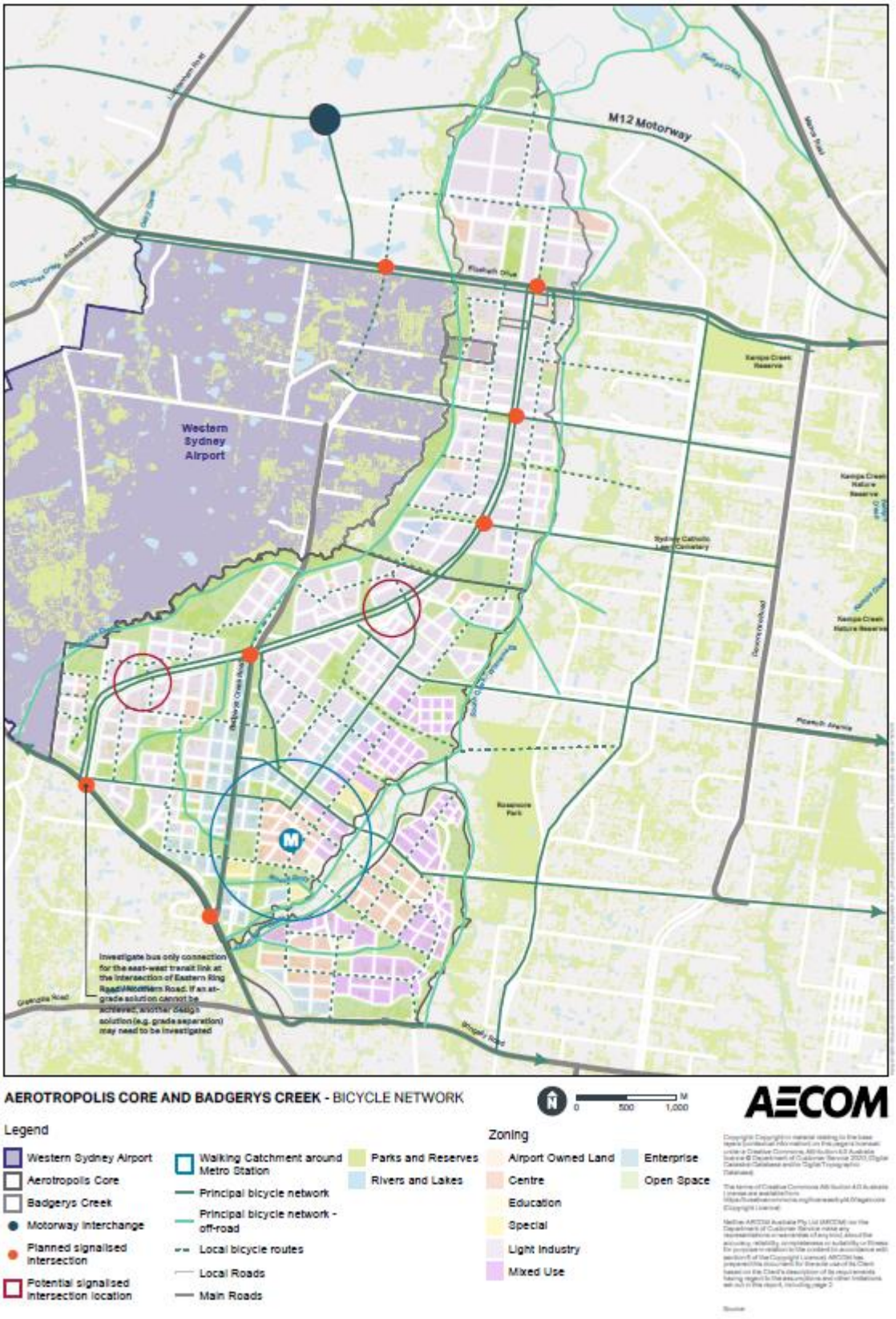


Figure 7-20 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed bicycle network

7.5.5 Bus Network

Note: A Final Business Case is currently in preparation for the three Western Sydney City Deal rapid bus routes (Penrith-Aerotropolis Core via the Western Sydney Airport; Liverpool-Aerotropolis Core via the Western Sydney Airport; Campbelltown-Aerotropolis Core via the Western Sydney Airport), in addition to two others subsequently identified (Blacktown-Western Sydney Airport; Parramatta-Western Sydney Airport). This process will define the product, routes and stops, which will inform any future updates to the precinct plans and subsequent masterplanning. The location of rapid bus routes on this figure are indicative only.

The bus network developed in the Aerotropolis Core represents a beyond business as usual approach to bus network planning in Western Sydney, providing three tiers of service hierarchy to cater for the future needs of workers and residents in this dynamic precinct. This high provision of bus services, which complement and support Sydney Metro Western Sydney Airport, will ensure that the public transport mode share is greater than a typical Western Sydney centre.

Rapid bus services provide fast, efficient and frequent 'city shaping' or 'city serving' bus services, with a high degree of bus priority, high quality stops which are spaced to facilitate faster journey speeds, and a differentiated product to enhance network legibility. At end state, the 15th Avenue Corridor will provide a Rapid Bus route from between Liverpool, the Aerotropolis Core and Western Sydney International Airport, providing fast, frequent bus services between these destinations. Services are proposed to operate on 15th Avenue, the Eastern Ring Road and Pitt Street.

Rapid bus services will also operate from Campbelltown-Macarthur and Penrith to the Aerotropolis Core and Western Sydney International Airport. These services are proposed to operate on Badgerys Creek Road, Eastern Ring Road, Elizabeth Drive and Pitt Street.

Frequent bus routes will also be provided, which offer frequent 'city serving' or 'centre serving' bus services that efficiently connect centres and other 'city shaping' public transport services to surrounding areas. Services are on average every five minutes, depending on individual route needs and passenger demand. In the Aerotropolis Core, frequent bus routes will efficiently connect centres to the Aerotropolis Core Metro station and provide connectivity between the Aerotropolis Core and the Agribusiness precinct. This connection between the two precincts will maximise connectivity to the Metro station and ensure a hub and spoke public transport network is prioritised.

Bus capable road for local routes lay the groundwork for further local bus network planning by ensuring that appropriate local roads are defined for this important modal role. This will ensure that the necessary road widths and other operational needs of buses are considered in further stages of planning. Local routes will provide a public transport catchment to connect residents and workers to nearby centres.

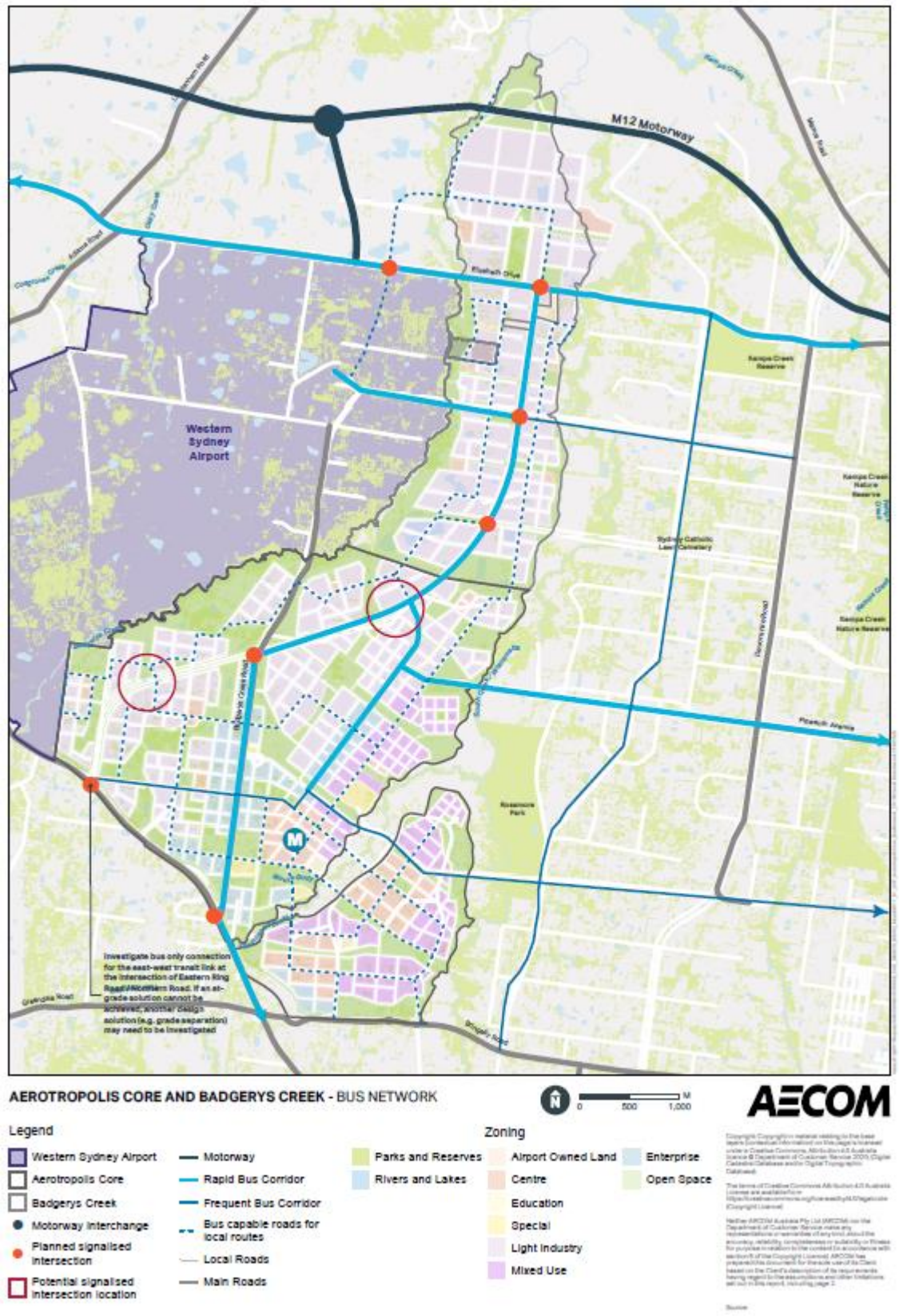


Figure 7-21 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed bus network

7.5.6 Road Network

Planning for different movements considers local networks that pass-through centres and that link places where people want to go, as well as freight and bypass networks to bypass centres and directly link people and goods to the wider network.

Within the Aerotropolis Core precinct, The Northern Road, Eastern Ring Road, Elizabeth Drive and a new connection linking the Eastern Ring Road to Devonshire Road provide an arterial function, which focus on the efficient movement of people and freight. All sub-arterial roads within the Aerotropolis Core are focussed on providing road space for frequent or rapid bus services.

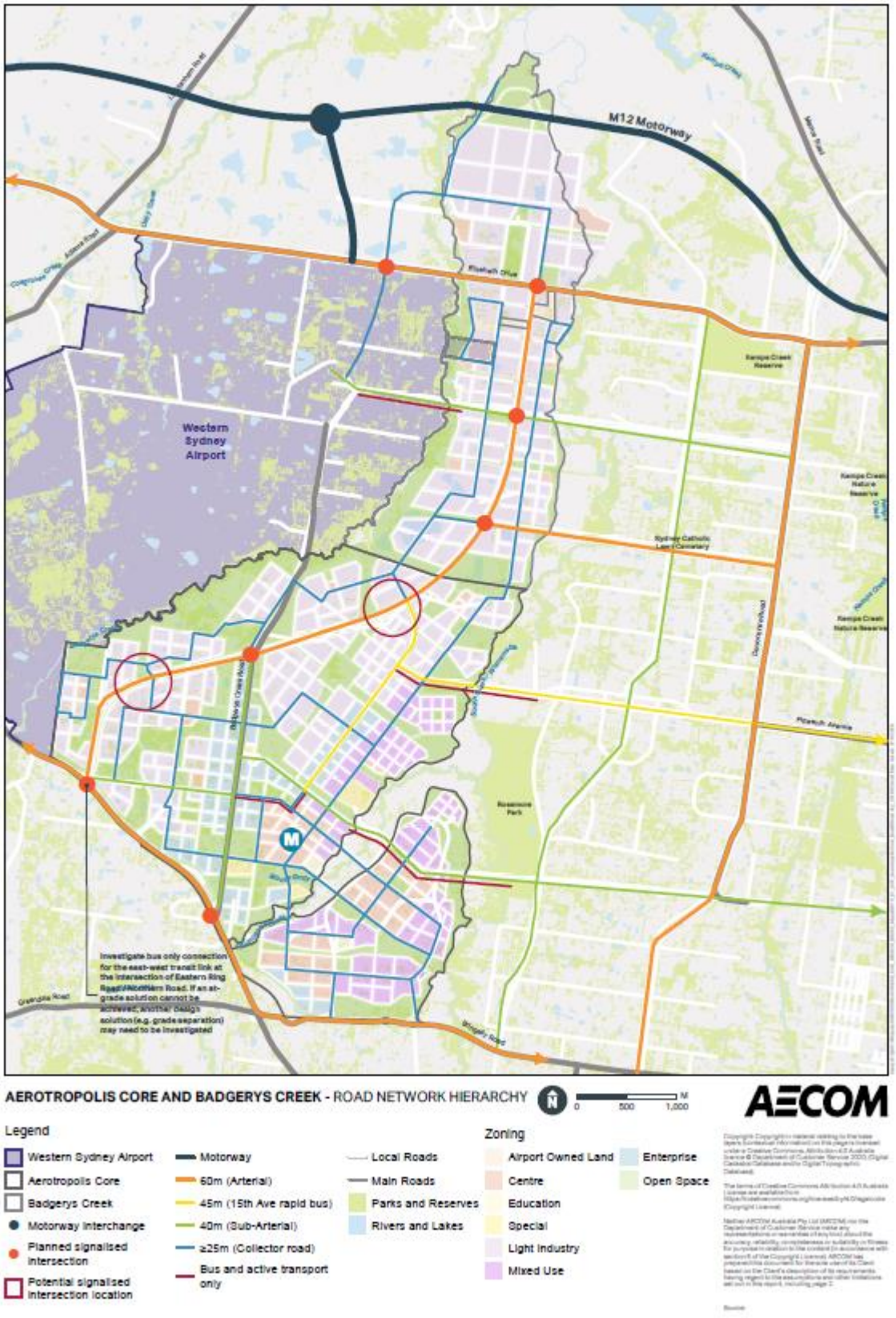


Figure 7-22 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed road network

7.5.7 Freight network

The freight network is designed to support the significant volume of freight expected to travel through and to the Aerotropolis. Development of the Western Sydney International Airport and Western Sydney Aerotropolis will create a step change in the freight needs of Western Sydney, requiring a re-balance of infrastructure to support freight movement in what will become a 24/7 precinct. Other major freight receivers in the region include the Moorebank Intermodal Precinct, St Marys freight hub, Mamre Road Intermodal and the Western Sydney Intermodal Terminal. Strategic projects including the Outer Sydney Orbital and Western Sydney Freight Line are in planning and considered an important part of the long-term freight needs of the Western Parkland City.

The M12 Motorway will play a significant role in moving freight between the Aerotropolis and Greater Sydney, and along with The Northern Road, Eastern Ring Road and parts of Elizabeth Drive will play key roles as primary freight routes. Devonshire Road, part of Elizabeth Drive and the new connection linking Eastern Ring Road and Devonshire Road will be secondary freight routes, providing access to freight origins and receivers, while connecting to and supporting the primary freight network. Elizabeth Drive and Eastern Ring Road will need to balance their roles as freight routes with their roles as rapid bus routes.

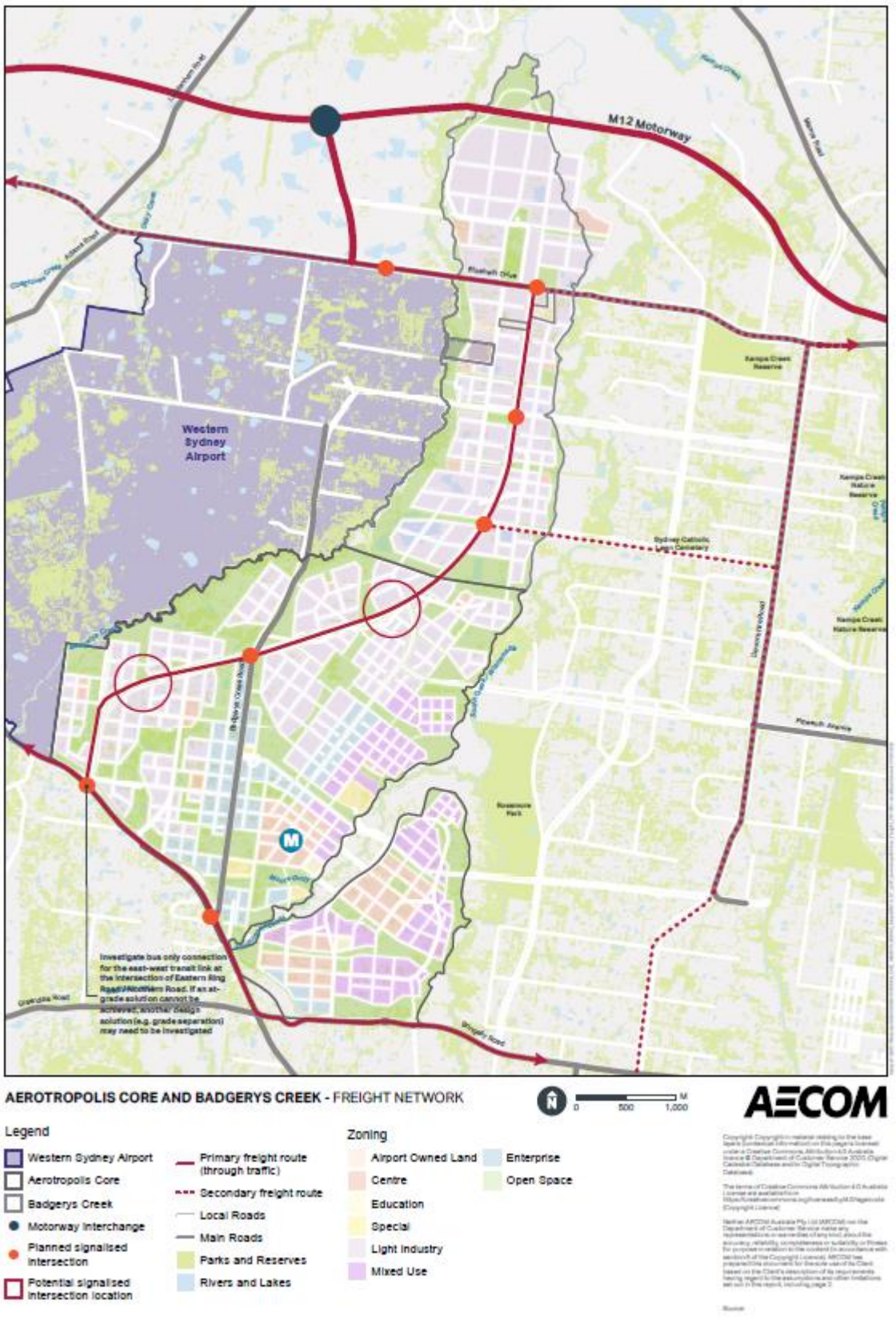


Figure 7-23 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed freight network

7.6 Agribusiness

7.6.1 Precinct Place Description

The Agribusiness Precinct will skirt the western edge of the Airport and support the long-term retention and growth of agriculture and agribusiness in the Aerotropolis. The Precinct will build on existing agricultural operations and natural landscape character, acting as a catalyst for agricultural export from the region.

The Precinct will retain significant peri-urban agricultural lands for production and enabling connections to a 24/7 international airport that will service an increasing demand nationally and internationally for high-quality fresh food, value-added pre-prepared meals and flowers. This high-technology precinct will drive opportunities for education and tourism.

Being located within the Sydney basin and close to an international airport will also enable visitors locally, domestically and globally to come and learn some of the cutting-edge processes occurring in the agriculture and agribusiness industry across Western Sydney. Design-led place-based planning at the precinct planning stage will help support existing rural landscapes and ensure biodiversity protection for remnant bushland vegetation. Part of the Agribusiness Precinct to the north of Elizabeth Drive and to the east of The Northern Road will provide opportunities for flexible employment uses given its proximity to the Northern Gateway Precinct.

Development within the Agribusiness Precinct will include uses that will benefit from opportunities for national and international trade. These uses may include:

- A world-leading integrated intensive production hub enabling the intensive production and value-adding of sustainable, high-quality fresh produce and pre-prepared meals
- A fresh food hub bringing a diversified and expanded fresh food marketplace to the Aerotropolis, becoming a major distribution centre for fresh produce to domestic and export markets
- A state-of-the-art integrated logistics hub creating land/air side linkages and a fully digital supply chain solution that will provide safe, secure and seamless connectivity for freight movements
- A value-added food and pharma hub to enable processing and manufacturing businesses to uplift value by shifting from a commodity focused to a value-added sector approach
- A proposed Australian Centre of Excellence in food innovation creating an industry-led national powerhouse in food science, technology, engineering and mathematics (FoodSTEM)
- Commercial and retail development ancillary to agriculture and agribusiness.

The proposed future employment and population projections for the Agribusiness precinct is outlined in Table 7-2.

Table 7-2 Future employment and population projections for the Western Sydney Aerotropolis initial precincts

Precinct	Size (ha)	Jobs	Jobs / ha	Residents	Residents / ha
Agribusiness	1,572	10,000	6	Limited	N/A

7.6.2 Network Functional Classification

The network function outlines the role each road and street will play in the integrated transport network. The *Western Sydney Aerotropolis Plan* separates conflicting uses where possible, with freight planned to bypass centres and public transport, walking and cycling used as the primary modes of transport to access centres.

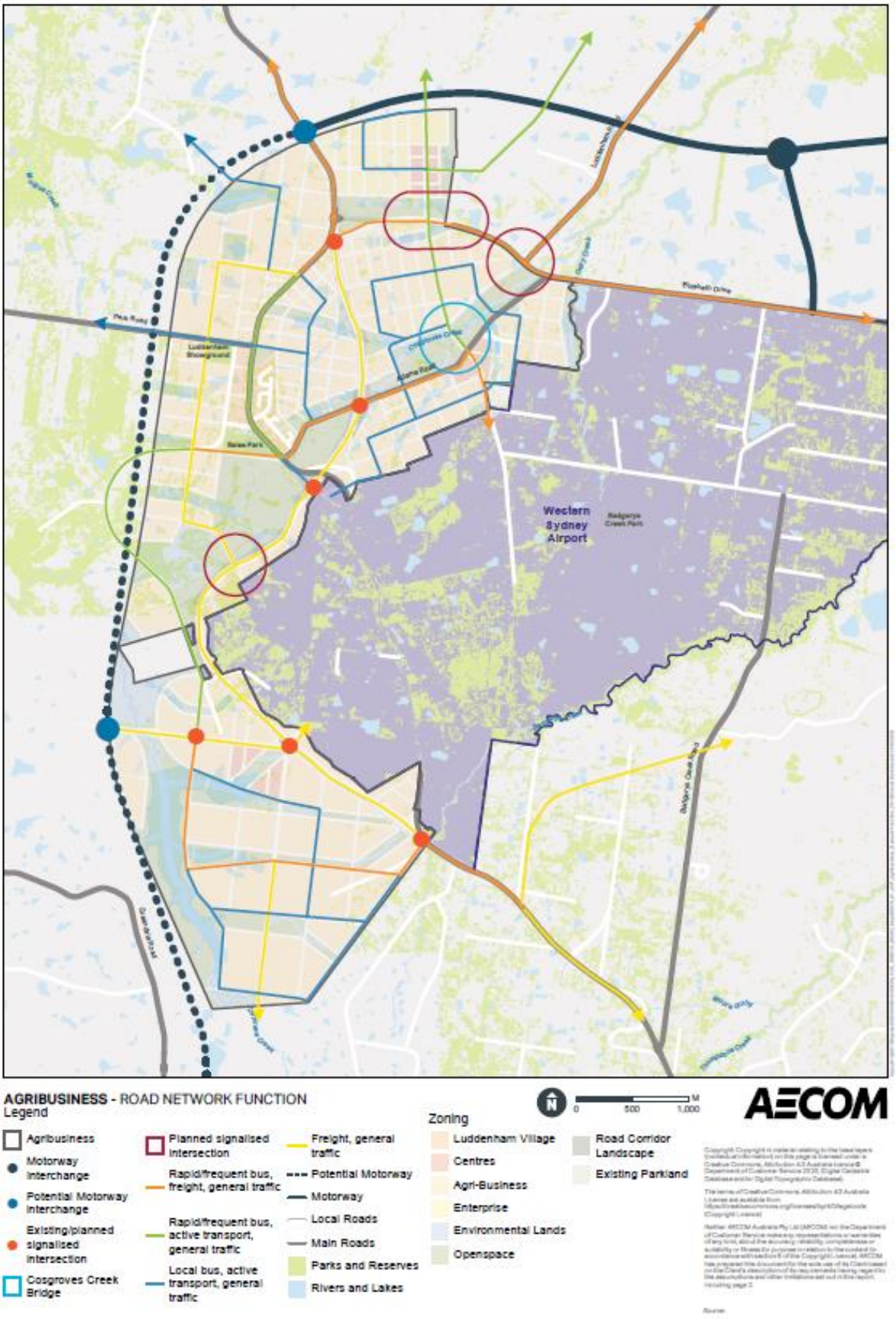


Figure 7-24 Agribusiness proposed network function

7.6.3 Walking Network

The walking network is extensive, covers all roads and streets, enables ease of movement, is well connected, facilitates good pedestrian accessibility and permeability. Walking is an integral part of everyday life and an important part of Greater Sydney's transport system. Most journeys within Greater Sydney start and end with walking, and as a result, well-placed walking networks can extend the reach of public transport.

The transport plan recognises walking as an active and sustainable transport mode, and encourages people to walk for transport, especially for trips within two-kilometre catchments of origins and destinations. By encouraging more people to walk, and combining more walking with public transport trips, is an effective way to free up capacity on the transport system and reduce congestion in centres.

The quality of the walking environment within two kilometres of key destinations will influence walking as an option for residents, workers and visitors within the five initial Aerotropolis precincts. In addition, the quality of the walking environment within 400 metres of local bus stops and 800 metres of Rapid Bus stops will influence the uptake of public transport as a mode of travel within the Aerotropolis.

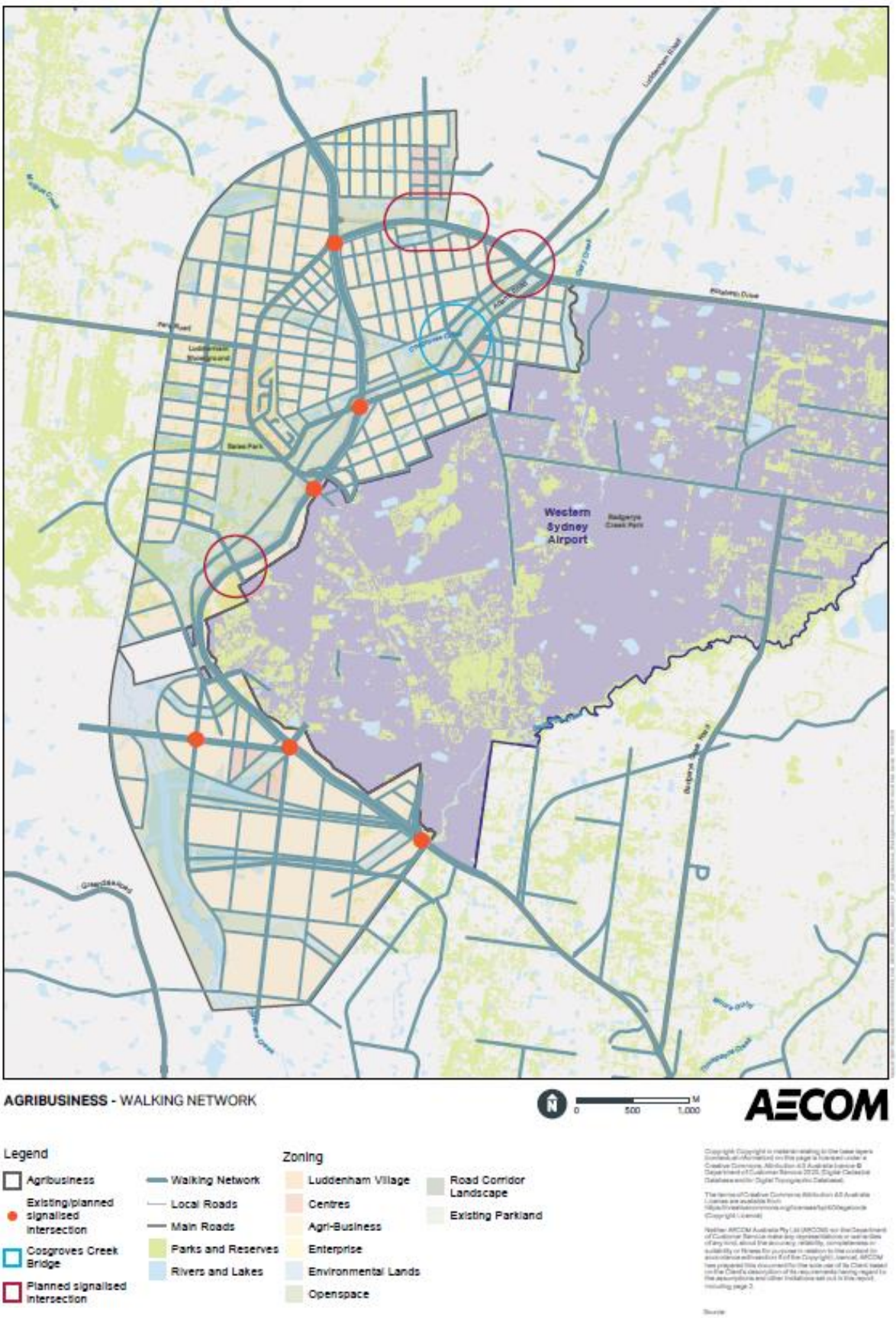


Figure 7-25 Agribusiness proposed walking network

7.6.4 Cycling Network

The bicycle network for the Agribusiness precinct has been designed with direct and comfortable routes that are essential to encourage greater take-up of cycling and represents a beyond business as usual approach to cycle planning in Western Sydney. Cycling forms a key part of the integrated transport network and is an efficient means of travelling short distances within centres.

The walking and cycling network in the Agribusiness precinct utilises the blue-green grid, including open space within Cosgroves Creek, to bring open space into the urban form of the precinct. A well-developed principal bicycle network, both within open space and as part of the road network, provides a high degree of connectivity between and within centres. The principal bicycle network is supported by local bicycle routes which service businesses by providing a greater catchment accessible to high quality separated bicycle infrastructure. All industrial streets within the Agribusiness precinct are designed with shared paths where pedestrian and cycle volumes are likely to be low, ensuring safety on streets which will likely carry a high proportion of freight. These local streets will support last-mile trips that connect workers to separated bicycle infrastructure.

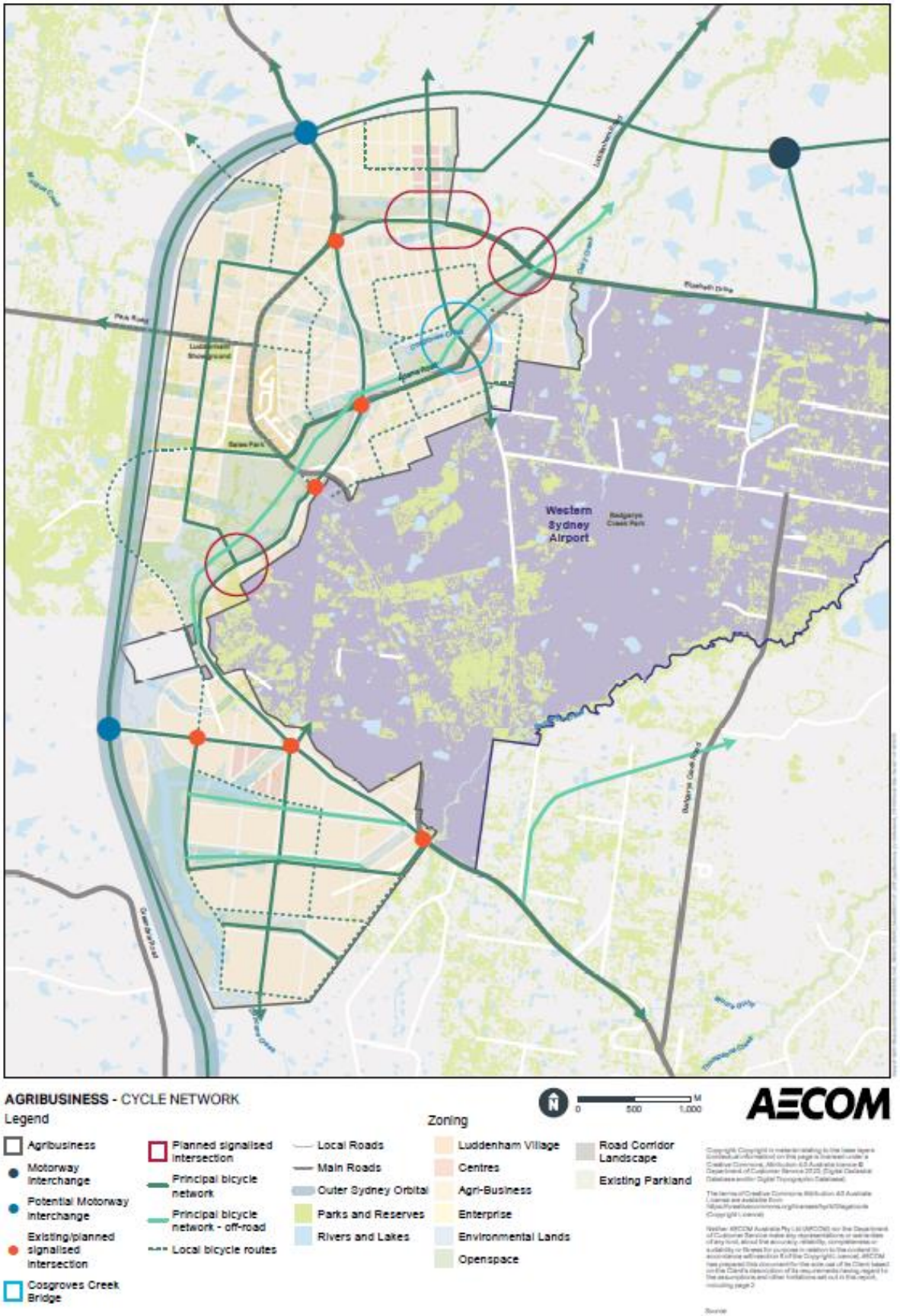


Figure 7-26 Agribusiness proposed bicycle network

7.6.5 Bus network

Note: A Final Business Case is currently in preparation for the three Western Sydney City Deal rapid bus routes (Penrith-Aerotropolis Core via the Western Sydney Airport; Liverpool-Aerotropolis Core via the Western Sydney Airport; Campbelltown-Aerotropolis Core via the Western Sydney Airport), in addition to two others subsequently identified (Blacktown-Western Sydney Airport; Parramatta-Western Sydney Airport). This process will define the product, routes and stops, which will inform any future updates to the precinct plans and subsequent masterplanning. The location of rapid bus routes on this figure are indicative only.

The bus network developed in the Agribusiness precinct represents a beyond business as usual approach to bus network planning in Western Sydney, providing two tiers of service hierarchy to cater for the future needs of workers in this employment precinct. This network also considers the future role of Luddenham Village by giving residents improved public transport services which put the village at the centre.

Frequent bus routes will be provided to the Aerotropolis Core and Northern Gateway, while also providing connectivity within the precinct. Frequent bus routes offer frequent ‘city serving’ or ‘centre serving’ bus services that efficiently connect centres and other ‘city shaping’ public transport services to surrounding areas. Services are on average every five minutes, depending on individual route needs and passenger demand.

In the Agribusiness precinct, frequent bus routes will efficiently connect centres in the Agribusiness precinct to the Aerotropolis Core and Northern Gateway Metro stations. This connection between the precincts will maximise connectivity to the Metro stations and ensure a hub and spoke public transport network is prioritised.

Bus capable road for local routes lay the groundwork for further local bus network planning by ensuring that appropriate local roads are defined for this important modal role. This will ensure that the necessary road widths and other operational needs of buses are considered in further stages of planning. Local routes will provide a public transport catchment to connect workers to nearby centres.

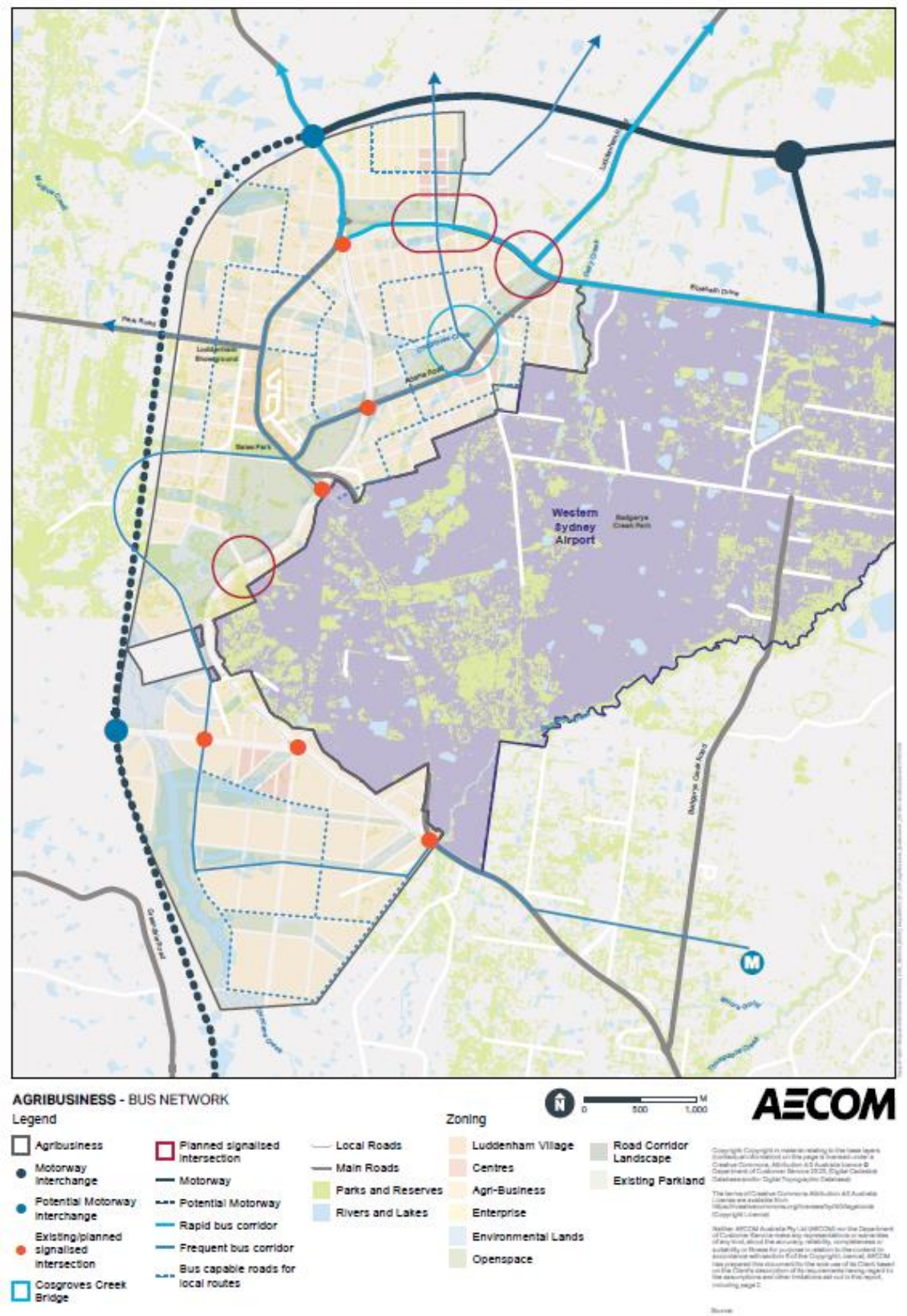


Figure 7-27 Agribusiness proposed bus network

7.6.6 Road network

Planning for different movements considers local networks that pass-through centres and that link places where people want to go, as well as freight and bypass networks to bypass centres and directly link people and goods to the wider network.

Within the Agribusiness precinct, The Northern Road, Elizabeth Drive and future connection between the Outer Sydney Orbital and The Northern Road provide an arterial function, which focus on the efficient movement of people and freight. Adams Road, the new connection west of Luddenham village and connection through the proposed Integrated Logistics Hub will be sub-arterial roads that are focussed on providing road space to allow the efficient movement of people and freight.

The configuration of Adam Road and location of the intersection of Adams Road and Luddenham Road is currently in design. The final configuration, including the location of where Adams Road will cross Cosgroves Creek, will be determined as part of the design process. The configuration of Adams Road will need to be appropriate for its role as a sub-arterial road, which is planned to carry frequent bus services, general traffic and freight, while providing separated active transport infrastructure.

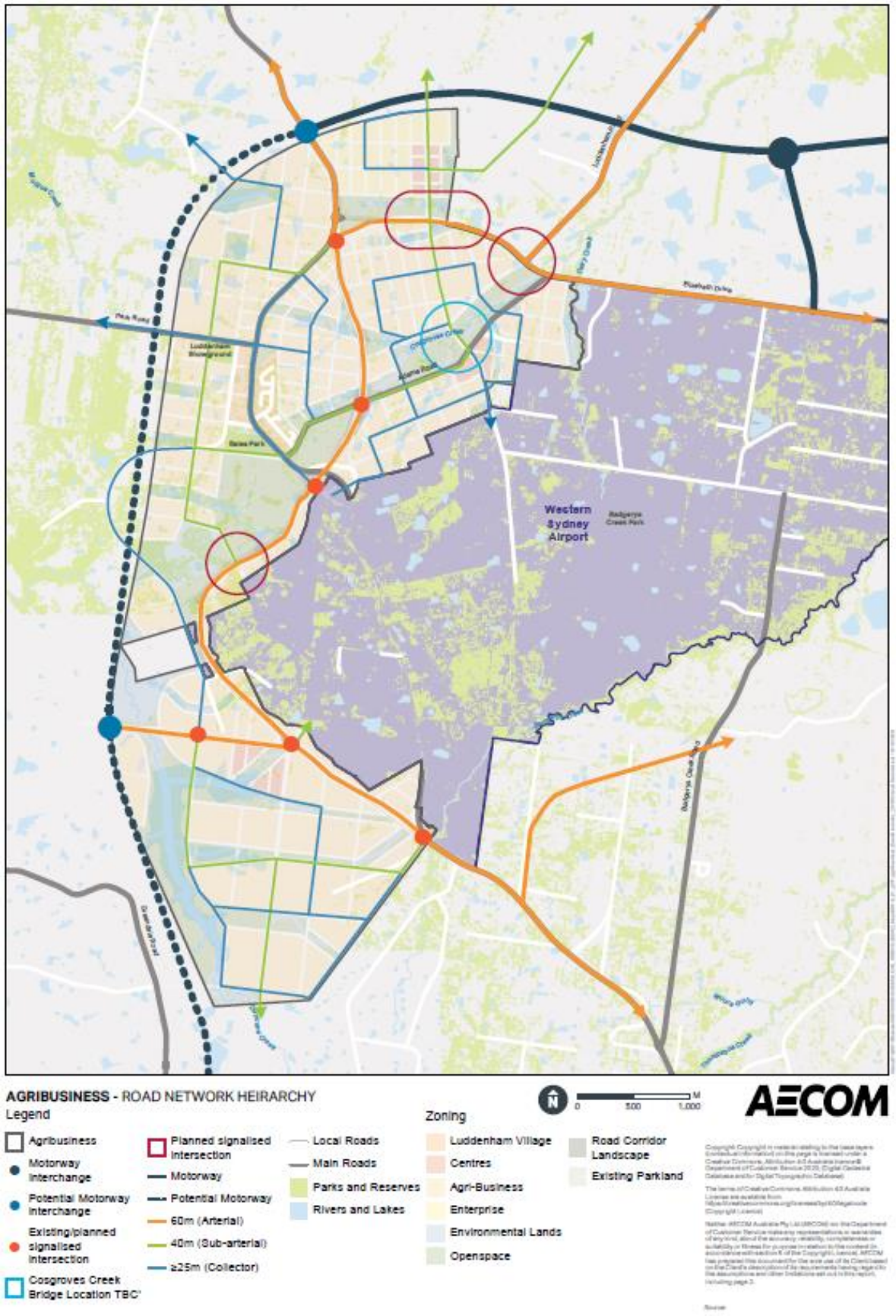


Figure 7-28 Agribusiness proposed road network

7.6.7 Freight network

The freight network is designed to support the significant volume of freight expected to travel through and to the Agribusiness precinct. Development of the Western Sydney International Airport and Western Sydney Aerotropolis will create a step change in the freight needs of Western Sydney, requiring a re-balance of infrastructure to support freight movement in what will become a 24/7 precinct. Other major freight receivers in the region include the Moorebank Intermodal Precinct, St Marys freight hub, Mamre Road Intermodal and the Western Sydney Intermodal Terminal. Strategic projects including the Outer Sydney Orbital and Western Sydney Freight Line are in planning and considered an important part of the long-term freight needs of the Western Parkland City.

The M12 Motorway and future Outer Sydney Orbital will play a significant role in moving freight between the Aerotropolis and Greater Sydney, and along with The Northern Road will play key roles as primary freight routes. Elizabeth Drive is proposed to be a secondary freight route, providing access to freight origins and receivers, while connecting to and supporting the primary freight network. Elizabeth Drive and Adams Road will need to balance their roles as freight routes with their roles as rapid and frequent bus routes.

In addition, Adams Road, the new connection west of Luddenham village and new connection through the Integrated Logistics Hub are proposed to be tertiary freight routes, providing connectivity to groupings of business and freight origins and destinations within the Agribusiness precinct.

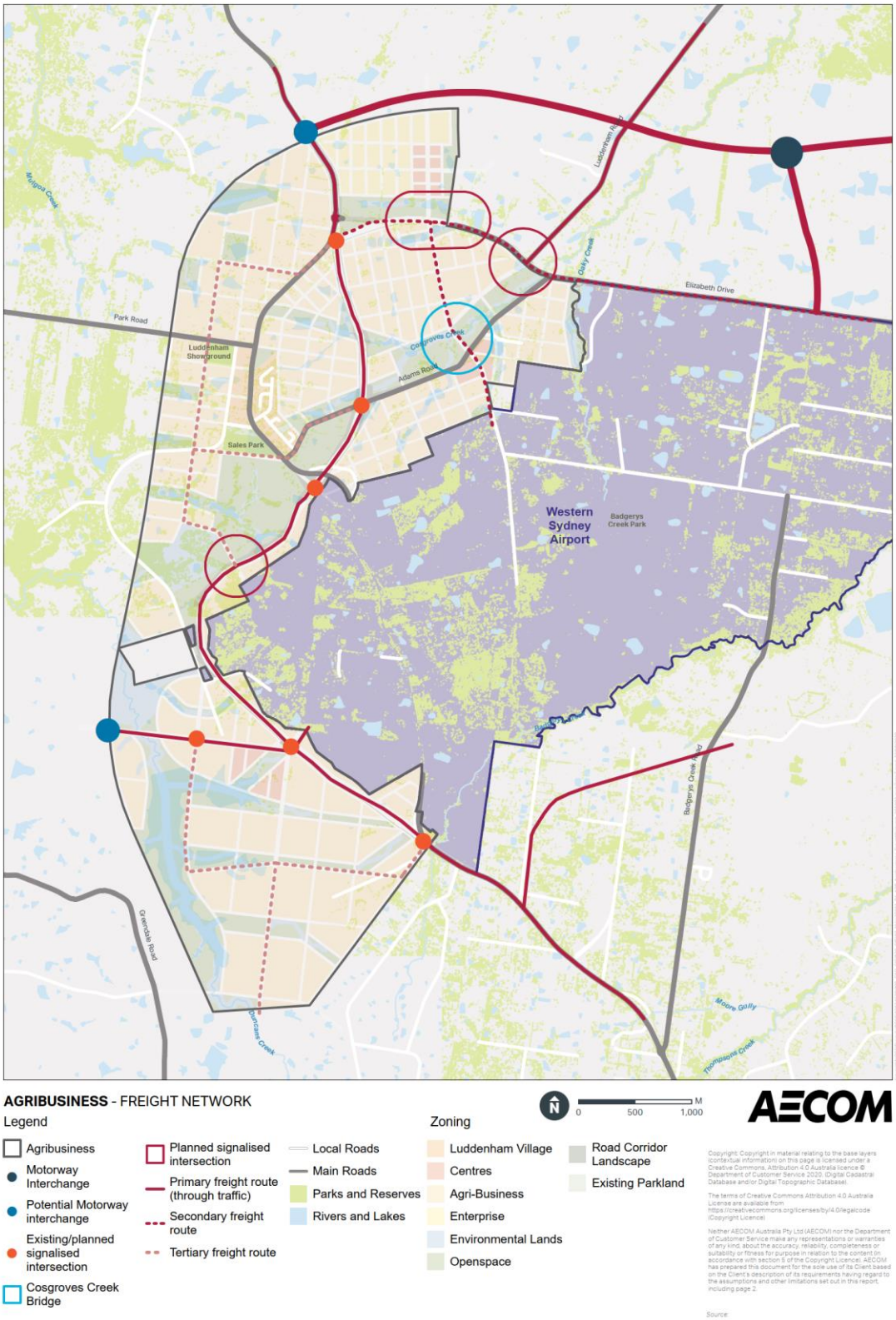


Figure 7-29 Agribusiness proposed freight network

7.7 Northern Gateway

7.7.1 Precinct Place Description

The Northern Gateway will be a major airport interface, serving as a key strategic centre within the Western Economic Corridor – linking the Airport with the Western Parkland City Metropolitan Cluster through high frequency public transport, freight, road and rail connections. The Northern Gateway will harness existing and emerging economic opportunities catalysed by the Airport and build on the approved Sydney Science Park development to provide a variety of employment generating uses.

With delivery of Luddenham (Northern Gateway) Metro station as part of Sydney Metro Western Sydney Airport, there is potential for land use uplift given the significant increase in public transport connectivity. Residential development will be located close to public transport and outside ANEC/ANEF 20 and above contours to ensure that airport operations are safeguarded, and residents have the opportunity to live in a 30-minute city. The Precinct will complement the Aerotropolis Core and will evolve as a centre focused on high technology incorporating health, education, knowledge and research.

The proposed future employment and population projections for the Northern Gateway precinct is outlined in Table 7-3.

Table 7-3 Future employment and population projections for the Western Sydney Aerotropolis initial precincts

Precinct	Size (ha)	Jobs	Jobs / ha	Residents	Residents / ha
Northern Gateway	1,616	21,000	13	10,000	6

7.7.2 Network Functional Classification

The network function outlines the role each road and street will play in the integrated transport network. The *Western Sydney Aerotropolis Plan* separates conflicting uses where possible, with freight planned to bypass centres and public transport, walking and cycling used as the primary modes of transport to access centres.

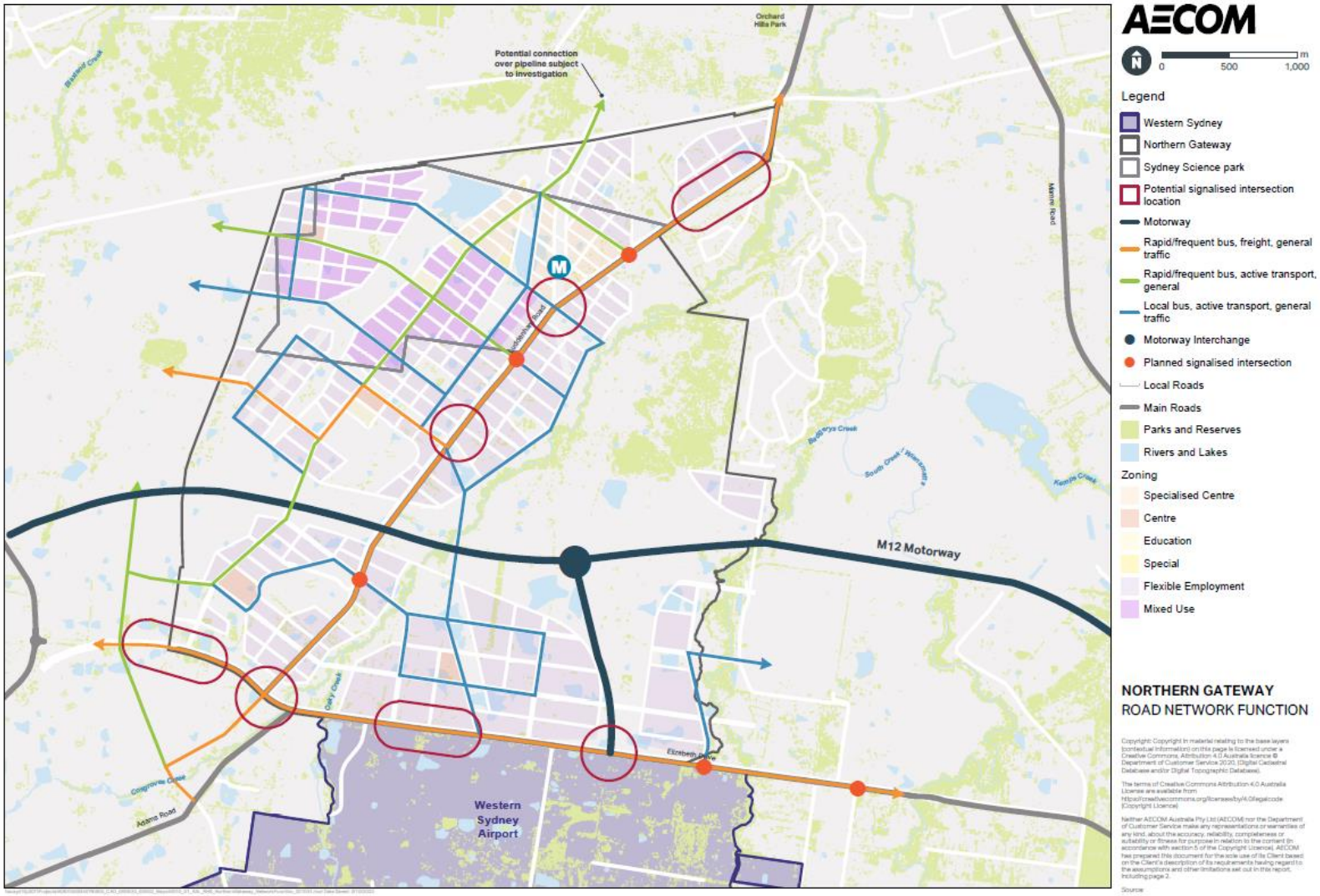


Figure 7-30 Northern Gateway proposed network function

7.7.3 Walking Network

The walking network is extensive, covers all roads and streets, enables ease of movement, is well connected, facilitates good pedestrian accessibility and permeability. Walking is an integral part of everyday life and an important part of Greater Sydney's transport system. Most journeys within Greater Sydney start and end with walking, and as a result, well-placed walking networks can extend the reach of public transport.

The transport plan recognises walking as an active and sustainable transport mode, and encourages people to walk for transport, especially for trips within two-kilometre catchments of origins and destinations. By encouraging more people to walk, and combining more walking with public transport trips, is an effective way to free up capacity on the transport system and reduce congestion in centres.

The quality of the walking environment within two kilometres of key destinations will influence walking as an option for residents, workers and visitors within the five initial Aerotropolis precincts. In addition, the quality of the walking environment within 400 metres of local bus stops and 800 metres of Metro stations or Rapid Bus stops will influence the uptake of public transport as a mode of travel within the Aerotropolis.

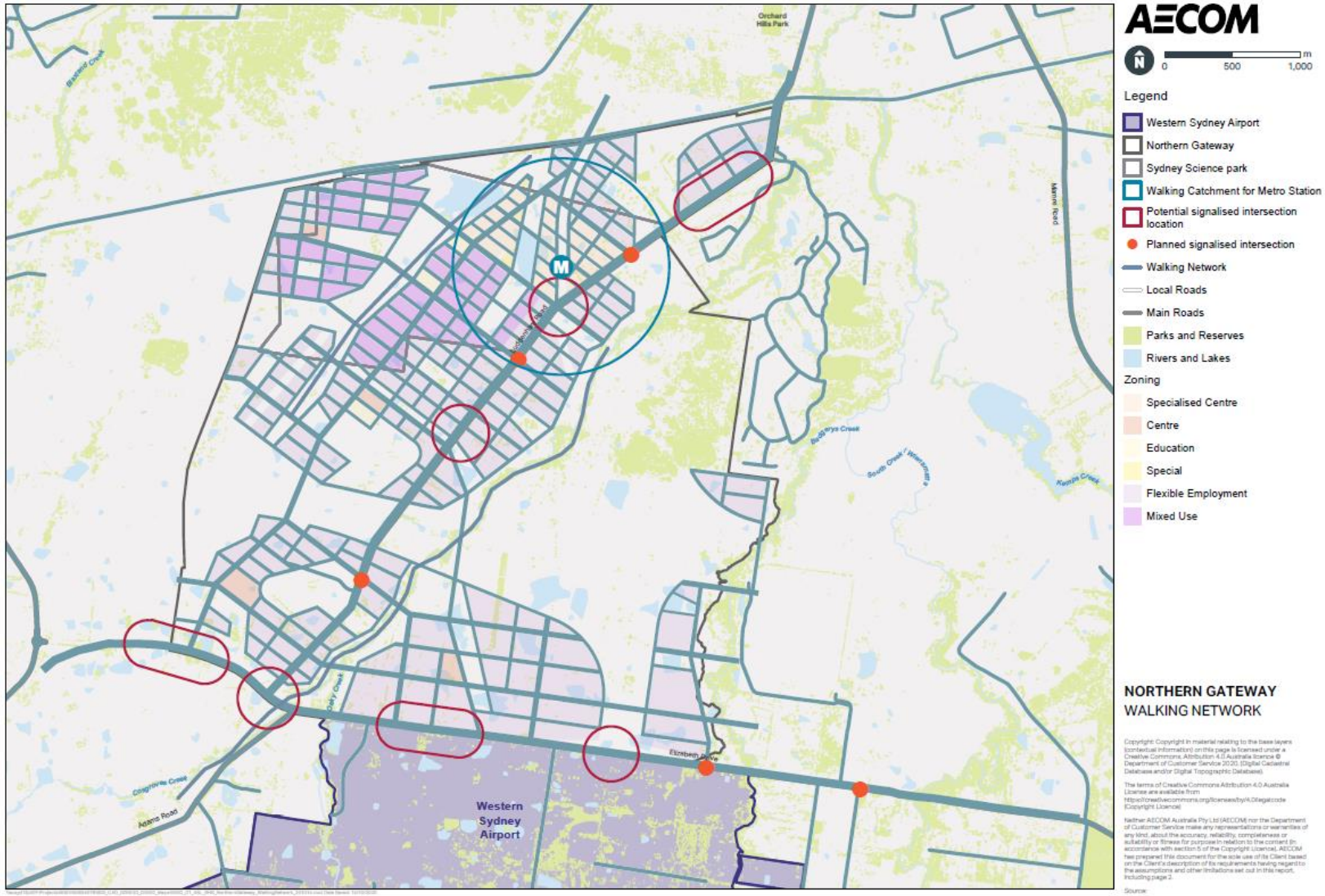


Figure 7-31 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed walking network

7.7.4 Cycling network

The bicycle network for the Northern Gateway has been designed with direct and comfortable routes that are essential to encourage greater take-up of cycling and represents a beyond business as usual approach to cycle planning in Western Sydney. Cycling forms a key part of the integrated transport network and is an efficient means of travelling short distances within centres.

The cycling network in the Northern Gateway utilises the blue-green grid to bring open space into the city. A well-developed principal bicycle network, both within open space and as part of the road network, provides a high degree of connectivity between and within centres. The principal bicycle network is supported by local bicycle routes which service businesses and residential areas by providing a greater catchment accessible to high quality separated bicycle infrastructure. All local streets within the Northern Gateway are designed to be cycle friendly and will support last-mile trips that connect workers and residents to separated bicycle infrastructure.

A connection to the north beyond the Northern Gateway precinct will be investigated alongside a new road corridor over the Warragamba pipeline, located adjacent to the Metro alignment. No other active transport connections to the north beyond the Northern Gateway precinct are proposed.

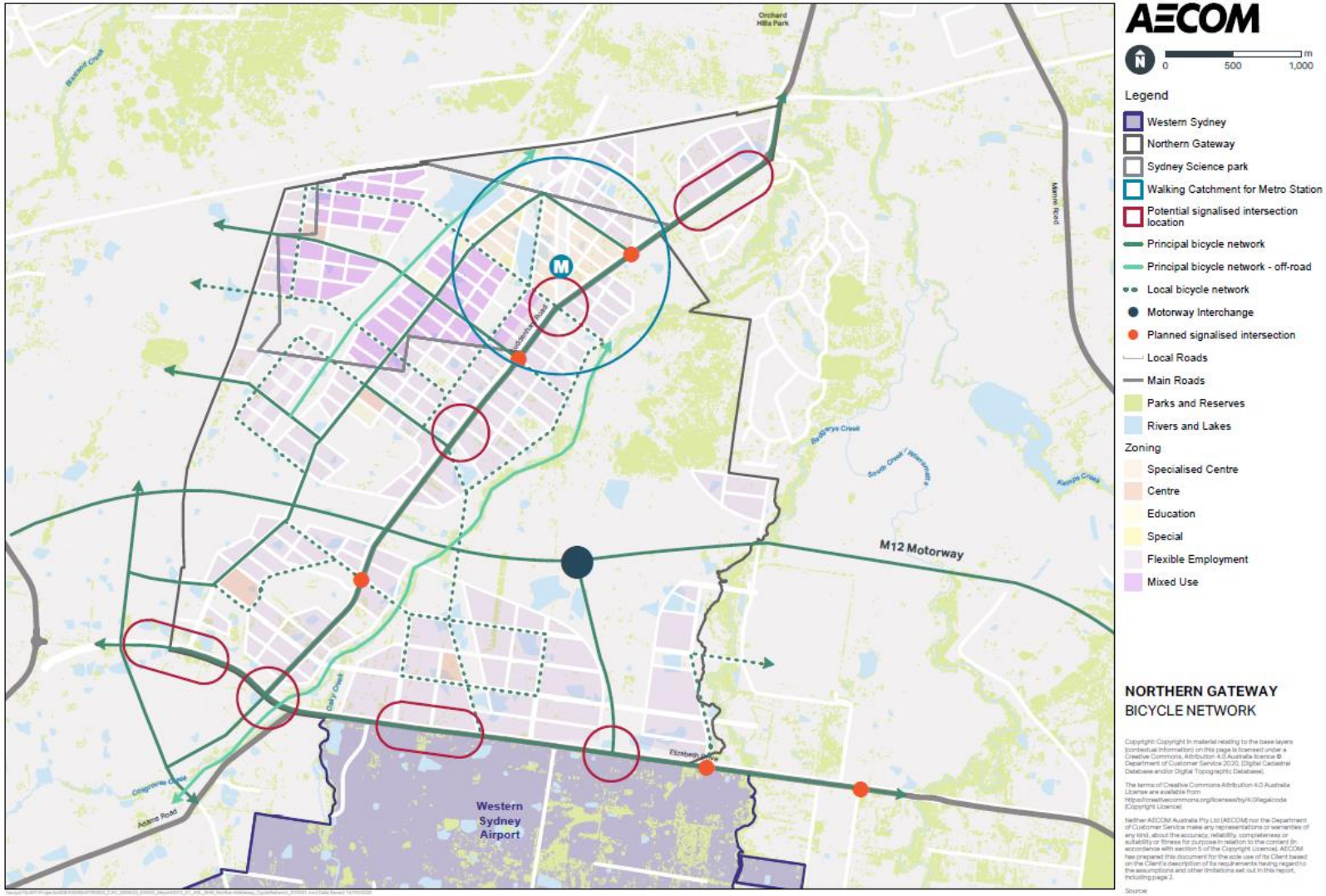


Figure 7-32 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed bicycle network

7.7.5 Bus network

Note: A Final Business Case is currently in preparation for the three Western Sydney City Deal rapid bus routes (Penrith-Aerotropolis Core via the Western Sydney Airport; Liverpool-Aerotropolis Core via the Western Sydney Airport; Campbelltown-Aerotropolis Core via the Western Sydney Airport), in addition to two others subsequently identified (Blacktown-Western Sydney Airport; Parramatta-Western Sydney Airport). This process will define the product, routes and stops, which will inform any future updates to the precinct plans and subsequent masterplanning. The location of rapid bus routes on this figure are indicative only.

The bus network developed in the Northern Gateway represents a beyond business as usual approach to bus network planning in Western Sydney, providing three tiers of service hierarchy to cater for the future needs of workers and residents. This high provision of bus services, which complement and support Sydney Metro Western Sydney Airport, will ensure that the public transport mode share is greater than a typical Western Sydney centre.

Rapid bus services provide fast, efficient and frequent 'city shaping' or 'city serving' bus services, with a high degree of bus priority, high quality stops which are spaced to facilitate faster journey speeds, and a differentiated product to enhance network legibility. At end state, Luddenham Road will provide a Rapid Bus route from between Blacktown, the Aerotropolis Core and Western Sydney International Airport, providing fast, frequent bus services between these destinations.

Rapid bus services may also operate from Penrith to the Aerotropolis Core and Western Sydney International Airport through Northern Gateway. These services are proposed to operate on The Northern Road and Elizabeth Drive.

Frequent bus routes will also be provided, which offer frequent 'city serving' or 'centre serving' bus services that efficiently connect centres and other 'city shaping' public transport services to surrounding areas. Services are on average every five minutes, depending on individual route needs and passenger demand. In the Aerotropolis Core, frequent bus routes will efficiently connect centres to the Luddenham (Northern Gateway) Metro station and provide connectivity between the Northern Gateway and the Agribusiness precinct. This connection between the two precincts will maximise connectivity to the Metro station and ensure a hub and spoke public transport network is prioritised. The 'sister' Luddenham Road corridor is proposed to be a frequent bus route, with a connection also provided west to connect to the future North Luddenham precinct.

Bus capable road for local routes lay the groundwork for further local bus network planning by ensuring that appropriate local roads are defined for this important modal role. This will ensure that the necessary road widths and other operational needs of buses are considered in further stages of planning. Local routes will provide a public transport catchment to connect residents and workers to nearby centres.

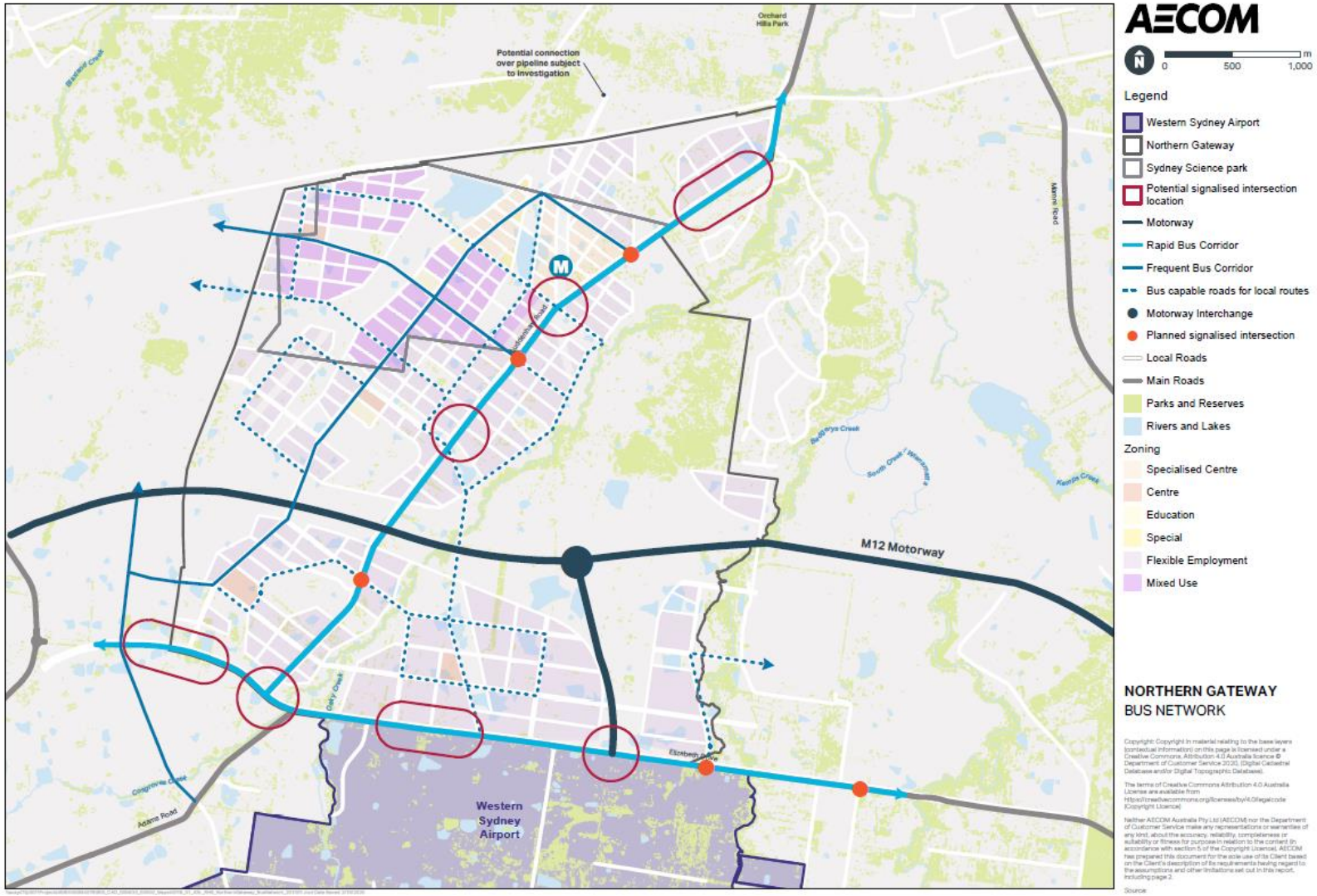


Figure 7-33 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek proposed bus network

7.7.6 Road network

Planning for different movements considers local networks that pass-through centres and that link places where people want to go, as well as freight and bypass networks to bypass centres and directly link people and goods to the wider network.

Within the Northern Gateway precinct, Luddenham Road and Elizabeth Drive provide an arterial function, which focus on the efficient movement of people and freight. All sub-arterial roads within the Aerotropolis Core are focussed on providing road space for frequent or rapid bus services.

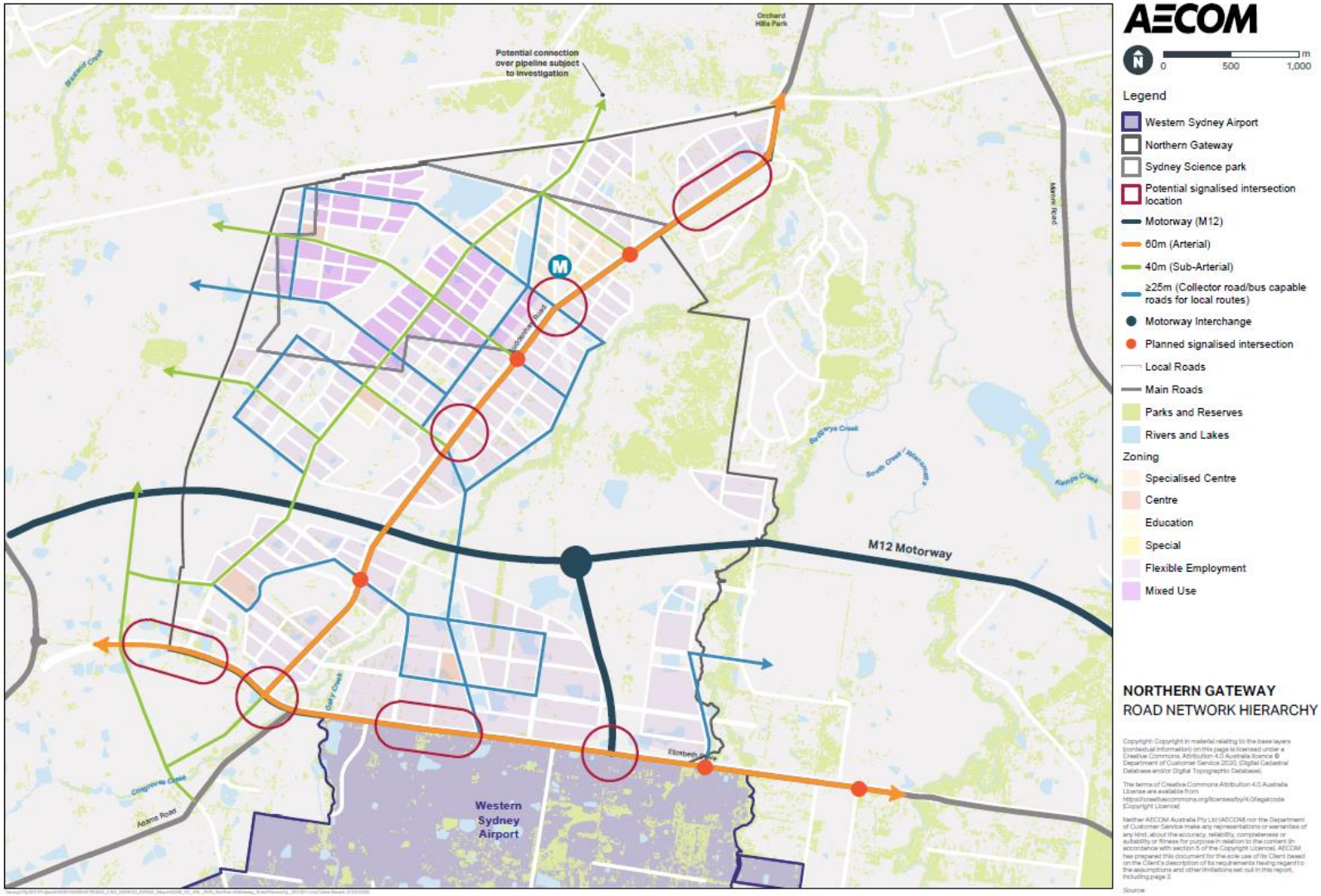


Figure 7-34 Northern Gateway proposed road network

7.7.7 Freight network

The freight network is designed to support the significant volume of freight expected to travel through and to the Aerotropolis. Development of the Western Sydney International Airport and Western Sydney Aerotropolis will create a step change in the freight needs of Western Sydney, requiring a re-balance of infrastructure to support freight movement in what will become a 24/7 precinct. Other major freight receivers in the region include the Moorebank Intermodal Precinct, St Marys freight hub, Mamre Road Intermodal and the Western Sydney Intermodal Terminal. Strategic projects including the Outer Sydney Orbital and Western Sydney Freight Line are in planning and considered an important part of the long-term freight needs of the Western Parkland City.

The M12 Motorway will play a significant role in moving freight between the Aerotropolis and Greater Sydney, and along with Luddenham Road will play key roles as primary freight routes. Elizabeth Drive will be a secondary freight route, providing access to freight origins and receivers, while connecting to and supporting the primary freight network. Both Luddenham Road and Elizabeth Drive will need to balance their roles as freight routes with their roles as rapid bus routes.

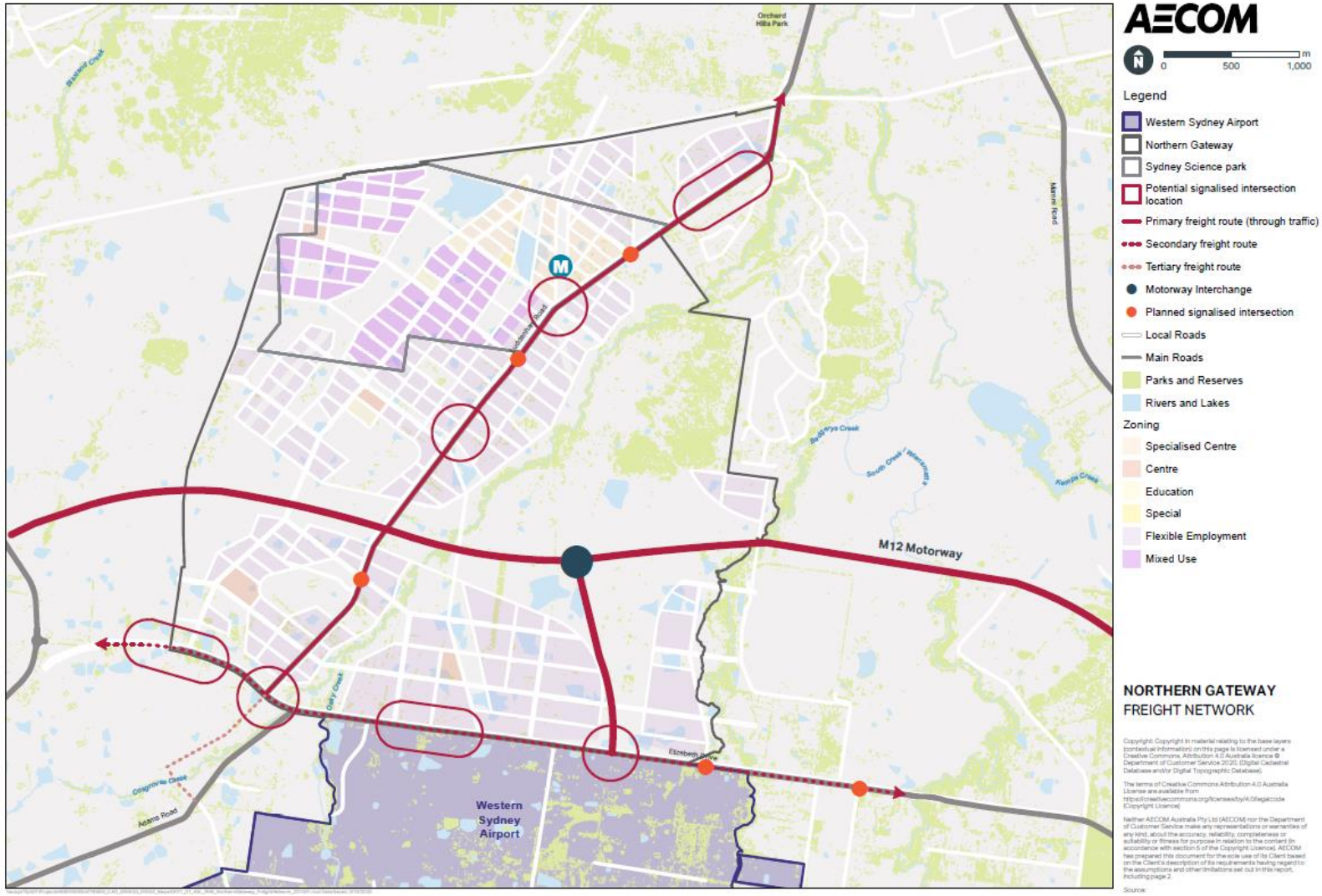


Figure 7-35 Northern Gateway proposed freight network

8.0 Validation

8.1 Validating the 2056 mode share targets

In line with the 'Vision and Validate' approach, visionary Mode Share Targets have been defined, which will support the delivery of the overarching *Western Sydney Aerotropolis Plan* objectives and vision.

Section 4.0 defined three potential mode share scenarios, these are reiterated Figure 8-1 below.

This visioning exercise presented *Scenario 2: medium sustainable mode share targets* as the most appropriate and viable option. Scenario 3 may be deemed more of a stretch target, but it is less reasonably validated based on the significant changes to culture and travel behaviours required to achieve this in the timeframe in consideration. It can still however be considered a longer-term aspiration, which will be supported and encouraged over time as travel patterns develop in a different way in the Western Sydney Aerotropolis precincts.

Scenario 2 is beyond business as usual. Particularly in the context of Western Sydney, and current patterns of travel behaviour with a high propensity for car use and ingrained behaviours and patterns of movement.

The **beyond business as usual** approach presented will support delivery of *Western Sydney Aerotropolis Plan* objectives with targets for walking, cycling and public transport far higher than those for private car, tipping the balance towards sustainable modes. This is a feasible and desirable scenario, validated in the section of this report.

Indicators and mode share targets		
Scenario 1: Low sustainable mode share targets	**Scenario 2: Medium sustainable mode share targets**	**Scenario 3: High sustainable mode share targets**
• Low population and employment densities • Few effective policies and strategies to influence travel behaviour • High use of private vehicles • Limited access to public transport infrastructure and services • Disconnected cycling network • Walking not an attractive option • **Business As Usual**	• Higher population and employment densities • Effective policies and strategies to influence travel behaviour • Balanced use of private vehicles and public transport • Good access to public transport infrastructure and services • Connected cycling network • Walking attractive for short trips • **Beyond Business As Usual**	• Highest population and employment densities • Very effective policies and strategies to influence travel behaviour • Low use of private vehicles • Excellent access to public transport infrastructure and services • Connected cycling network which is a very attractive option for short and medium trips • Walking is a very attractive option for short trips • **Beyond Business As Usual**

Figure 8-1: Potential mode share scenarios for the five initial Aerotropolis precincts

Table 8-1 outlines the 2056 mode share targets for the morning peak period (6:00am to 9:30am) for the five initial Aerotropolis precincts.

The 2056 mode share targets differ between precincts, with further description and definition of the targets by precinct in the following sections.

Table 8-1 2056 mode share targets for the morning peak period (6:00am to 9:30am) for the five initial Aerotropolis precincts

Precinct	Trips							
	Active Transport		Public Transport		Sub- Total Sustainable Modes	Car		Total
Aerotropolis Core	2,660	8%	16,090	45%	**53%**	16,640	47%	**35,390**
Agribusiness	110	2%	900	16%	**18%**	4,590	82%	**5,600**
Northern Gateway	650	6%	4,010	38%	**44%**	5,960	56%	**10,620**
Badgerys Creek	120	2%	1,050	18%	**20%**	4,720	80%	**5,890**
Average (Mode Share)		6%		38%	**44%**		56%	
Total (Trips)	3,540		22,050			31,910		**57,500**

Note: Wianamatta-South Creek is designated as a recreational and environmental precinct. Therefore, it is projected to have no residents or jobs. This means Wianamatta-South Creek is neither an origin nor a destination for passenger trips. As such, it is assumed that passenger trips to/ from Wianamatta-South Creek are subsumed into the four remaining precincts.

A robust, evidence-based validation process was established to ground truth these Mode Share Targets. The validation process comprised two parts:

- **Travel demand assessment** - as described in Section 8.2.
- **Transport network capacity assessment** - as described in Section 8.3.

8.1.1 2056 Aerotropolis Core mode share targets

The Aerotropolis Core has the highest sustainable mode share target (53%). This is attributable to the provision of public transport infrastructure and services (including a station on Sydney Metro Western Sydney Airport, and future connections on the East-West Rail Link and extension of the South-West Rail Link), connected walking and cycling networks and the planned number of jobs and residents. The Aerotropolis Core CBD is anticipated to be a dense, vibrant urban hub, where residents live within a short distance of jobs and services. This is anticipated to make walking and cycling attractive choices for short-distance trips. The 2056 Aerotropolis Core mode share targets are shown in Figure 8-2 .

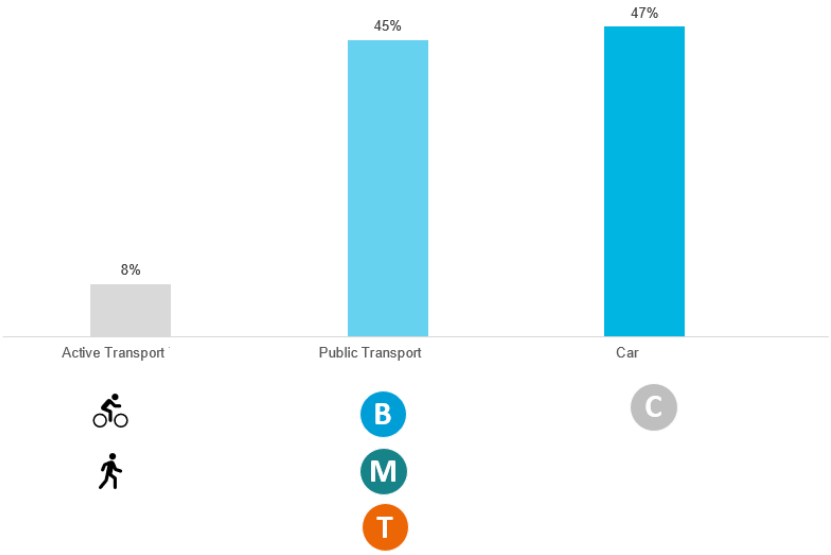


Figure 8-2: 2056 Aerotropolis Core mode share targets

8.1.2 2056 Agribusiness mode share targets

Agribusiness is projected to have the lowest sustainable mode share target (18%). This is attributable to the planned land uses, which are anticipated to support warehousing and logistics. Minimal housing development is planned, limiting opportunities for self-contained short-distance trips. No rail infrastructure or services are planned for Agribusiness. A range of bus services are, however, planned to service the precinct. The 2056 Agribusiness mode share targets are shown in Figure 8-3.

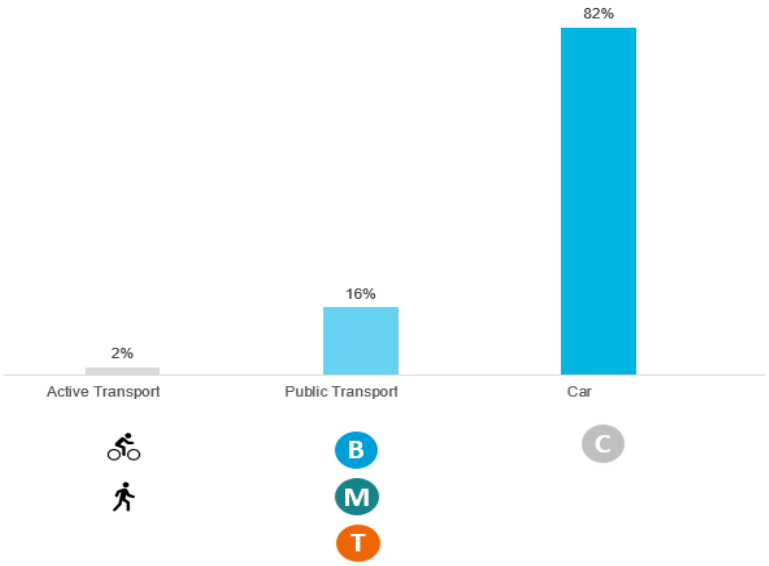


Figure 8-3: 2056 Agribusiness mode share targets

8.1.3 2056 Northern Gateway mode share targets

The Northern Gateway has the second highest sustainable mode share target (44%). This is also attributable to the provision of public transport infrastructure and services (including a station on Sydney Metro Western Sydney Airport), connected walking and cycling networks and the planned number of jobs and residents. The Northern Gateway is however, anticipated to be less dense than the Aerotropolis Core, with less potential for self-contained trips (due to lower population and employment estimates). As a result, the Northern Gateway has a lower 2056 sustainable mode share (shown in Figure 8-4) target than the Aerotropolis Core.

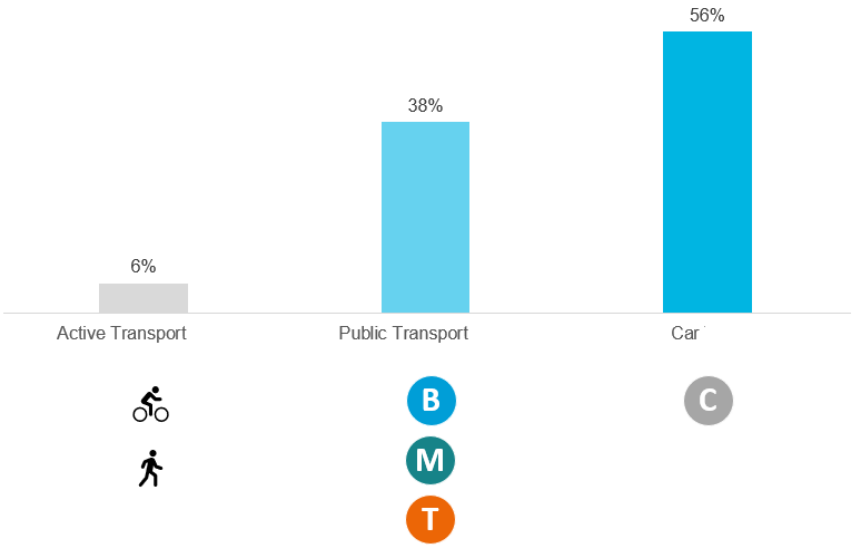


Figure 8-4: 2056 Northern Gateway mode share targets

8.1.4 2056 Badgerys Creek mode share targets

Badgerys Creek is projected to have the lowest sustainable mode share target (20%). This is attributable to the planned land uses, which are anticipated to support warehousing and logistics. Minimal housing development is planned, limiting opportunities for self-contained short-distance trips. No rail infrastructure or services are planned for Agribusiness. A range of bus services are, however, planned to service the precinct. 2056 Badgerys Creek mode share targets are shown in Figure 8-5.

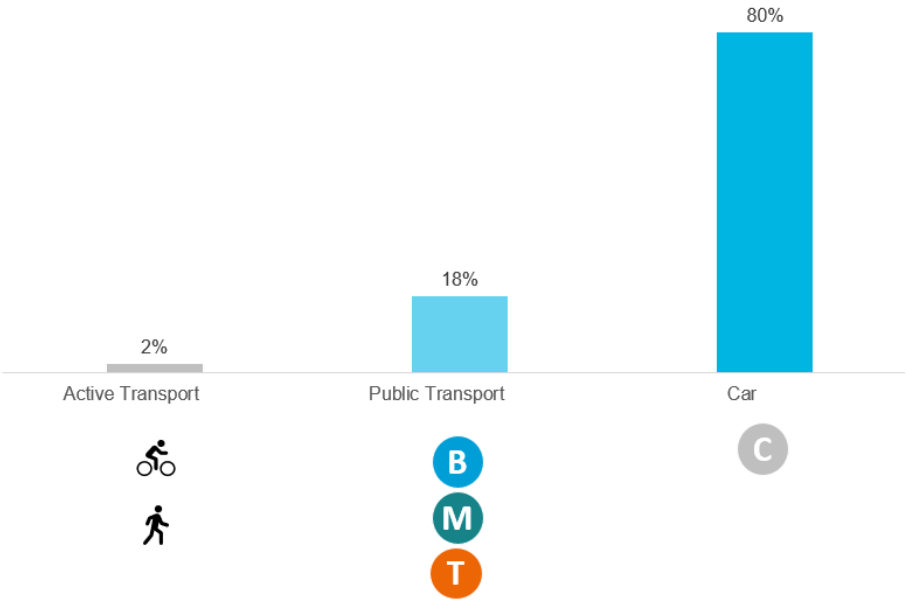


Figure 8-5: 2056 Badgerys Creek mode share targets

8.2 Travel demand assessment – process and methodology

The Public Transport Patronage Model assesses demand for mechanised passenger travel using vehicles and public transport. The Public Transport Patronage Model outputs were combined with Strategic Freight Model outputs to understand the transport task to, from and within the five initial Aerotropolis precincts. This assessment focuses on the morning peak period between 6.00am and 9.30am. The methodology for this assessment is described below, and summarised in Figure 8-6:

Step 1: develop hybrid zone system. A hybrid zone system was developed to quantify passenger and freight demand. The system identifies 20 zones for Greater Sydney. These are outlined below:

- The five initial Aerotropolis precincts
- SA2 for adjacent locations such as the Airport and Leppington.
- Statistical Area Level 3 for Liverpool, St Marys and Campbelltown. Partial Statistical Area Level 3 is also applied to Fairfield, Bringelly and Penrith.
- Statistical Area Level 4 for Blacktown and Parramatta.
- Aggregation of the remaining Statistical Area Level 4s across Greater Sydney.

Step 2: process Public Transport Patronage Model and Strategic Freight Model outputs for the new hybrid zone system. Public Transport Patronage Model and Strategic Freight Model outputs were processed using the hybrid zone system.

Step 3: create paths for each origin-destination pair. This step assigns passenger and freight trips from an origin to a destination via intermediate zones in the hybrid zone system. This process was based on transport connectivity, not necessarily the shortest geographical path.

Step 4: analyse travel demand. Outputs from the origin-destination pairings were analysed and used to assess transport network capacity, detailed in Section 8.3.

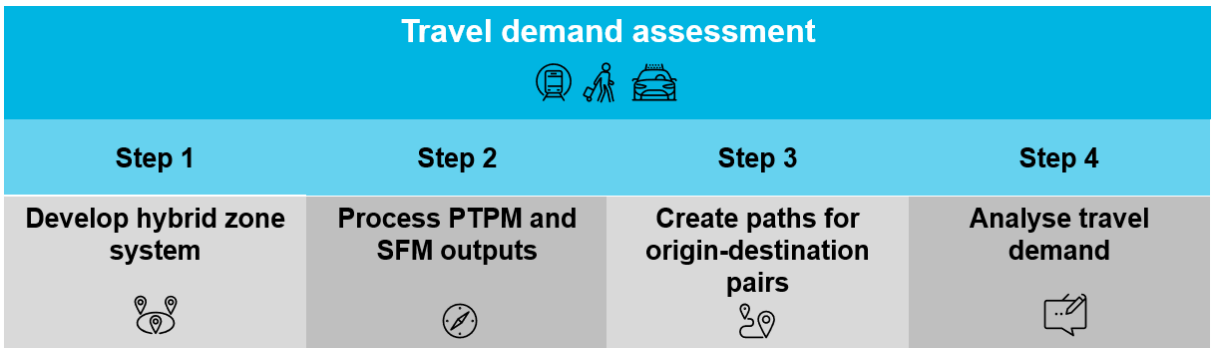


Figure 8-6: Travel demand assessment methodology

8.2.1 Assumptions

The *PIC Modelling Assumptions Book v2.1* was used to inform the passenger transport network modelling. The following assumptions were adopted from the Public Transport Patronage Model:

- Modelling for the morning peak period (6:00am-9:30am) based on tap-offs at the final destination
- The reference year for the Public Transport Patronage Model is 2056
- Land Use Option 1 2056 – the common planning assumptions option, with an emphasis on a stronger land use and transport project focus on the Airport and Aerotropolis
- The planned road and rail infrastructure modelled in the Public Transport Patronage Model has been prepared by NSW Transport Performance and Analytics with anticipated delivery dates (2026, 2036 or 2056) for each project. Only mechanised passenger demand was modelled. The infrastructure modelled does not reflect current NSW Government commitments and are assumptions only.

8.3 Analysis and Outcomes

8.3.1 Overview

Public Transport Patronage Model and Strategic Freight Model outputs were used to understand the transport task for the five initial Aerotropolis precincts.

This analysis shows a total of 81,840 passenger and freight trips are projected in the morning peak period (6:00am to 9:30am) in 2056. Consistent with the positioning of the Aerotropolis as a major employment hub, most trips (44,190 or 54%) will be to the five initial Aerotropolis precincts.

- 30,370 (or 37%) will be from the five initial Aerotropolis precincts.
- The remaining 7,280 (or 9%) will be within the five initial Aerotropolis precincts.
- The trip totals for rail, bus and private vehicles (including freight) are Figure 8-7.

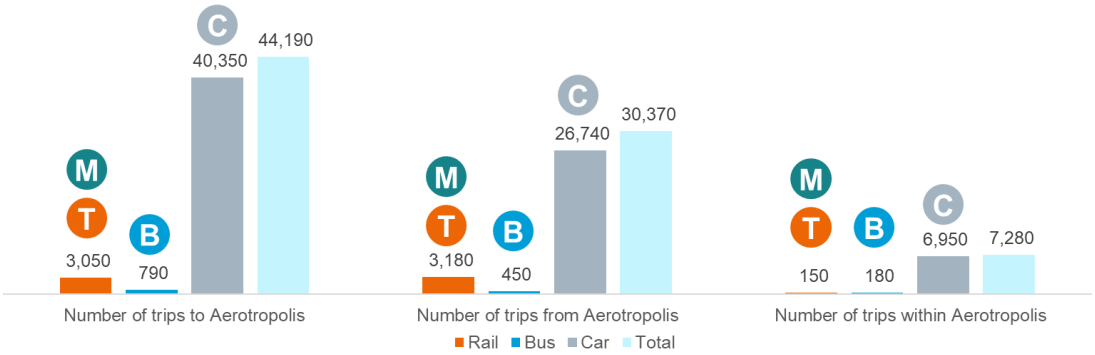


Figure 8-7 Public Transport Patronage Model passenger trip estimates to, from and within the Aerotropolis in 2056

8.3.2 Transport Network Capacity Assessment

The provision of planned 2056 transport infrastructure and services was reviewed to derive the capacity of each mode and the range of travel choices between an origin and a destination. This analysis was undertaken in line with the Public Transport Patronage Model and Strategic Freight Model assumptions around the provision of transport infrastructure and the frequency of services.

Figure 8-8 outlines the range of capacity by mode. Metro would have the highest capacity of any mode, ranging from 18,000 to 48,000 people per hour per direction. Sydney Trains has the second highest capacity of any mode, ranging from 9,600 to 24,000 people per hour per direction. Bus has the lowest capacity of any mode, ranging from 480 to 2,400 people per hour per direction.

The motorway and state road network provide a range of travel options for private vehicles. The cumulative analysis of the capacity of the road network concluded that there are significant variations in the capacity of the road network depending on the trip type. As such, the capacity of the road network ranges from approximately 1,400 people per hour per direction to over 20,000.

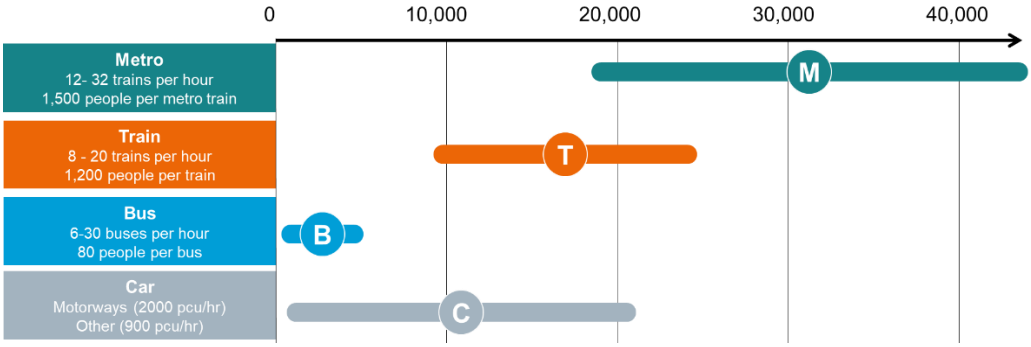


Figure 8-8 Aerotropolis transport network capacity assumptions by mode

Note: capacity of transport mode depends on the route and on what services are available within a zone

Table 8-2 outlines the mechanised passenger mode share from the Public Transport Patronage Model for the morning peak period (6:00am to 9:30am) for the five initial Aerotropolis precincts in 2056.

Table 8-2 2056 Public Transport Patronage Model mode share outputs for morning peak period (6:00am to 9:30am) for the five initial Aerotropolis precincts

Precinct	Trips						
	Rail		Bus		Car		Total
Aerotropolis Core	4,310	13%	890	3%	27,520	84%	**32,720**
Agribusiness	230	4%	110	2%	5,150	94%	**5,490**
Northern Gateway	1,450	15%	260	3%	8,260	82%	**9,970**
Badgerys Creek	300	5%	120	2%	5,350	93%	**5,770**
Total	**6,290**	**12%**	**1,380**	**3%**	**46,280**	**85%**	**53,950**

Note: The Agribusiness and Badgerys Creek precincts do not have a Metro station.

8.3.3 Transport Network Capacity Assessment Outcomes

8.3.3.1 Overview

The transport capacity assessment provides a reference case scenario for 2056. The outputs could be interpreted as a “business as usual” approach. The Public Transport Patronage Model has two limitations which impact this approach:

- The Public Transport Patronage Model is not capacity constrained. The Public Transport Patronage Model also focuses on mechanised passenger trips. Assessments undertaken previously note that the wider road network will experience significant capacity constraints by 2056. The Public Transport Patronage Model does not cap vehicle trips to reflect road capacity, resulting in roads operating at or above planned capacity.
- Recognising that Aerotropolis will have an integrated cycling network and quality pedestrian environments; it is likely to result in an increased walking and cycling uptake. It is noted that the case studies identified in Section 5.0 do not have integrated cycling networks and are identified as ‘business as usual’ application.

The transport capacity assessment approach was used to identify corridors where demand exceeds or is at the planned capacity in 2056. This approach was applied to public transport and roads to, from and within Aerotropolis from other parts of Greater Sydney.

The capacity assessment is presented in maps and summarised in the following sections. A guide to understanding the maps is detailed below:

- Blue lines represent precinct boundaries within the study area.
- Blue circles represent the centre of each precinct
- Red lines represent the boundaries of zones surrounding the study area. These are based on the hybrid zone system described in Section 8.2.
- Arrows represent trip volumes to and from the centre of each precinct:
    - Red arrows signify demand exceeds the capacity of the network. Significant congestion is anticipated during the morning peak. As a result, the network cannot accommodate demand
    - Orange arrows signify demand is close to the capacity of the network. Some congestion is possible during the morning peak, however the network can accommodate some additional demand
    - Green arrows signify demand is below the capacity of the network and congestion during the morning peak is negligible, with the network able to handle a substantial increase in demand.

For the purposes of the transport capacity assessment, trips on the road network include both private vehicles and freight. Trips on public transport include Sydney Metro, Sydney Trains and buses.

8.3.3.2 2056 public transport capacity assessment within the Aerotropolis

The Aerotropolis public transport capacity assessment is shown in Figure 8-9. There is sufficient capacity on the planned public transport network to accommodate the anticipated demand to, from and within the five initial Aerotropolis precincts.

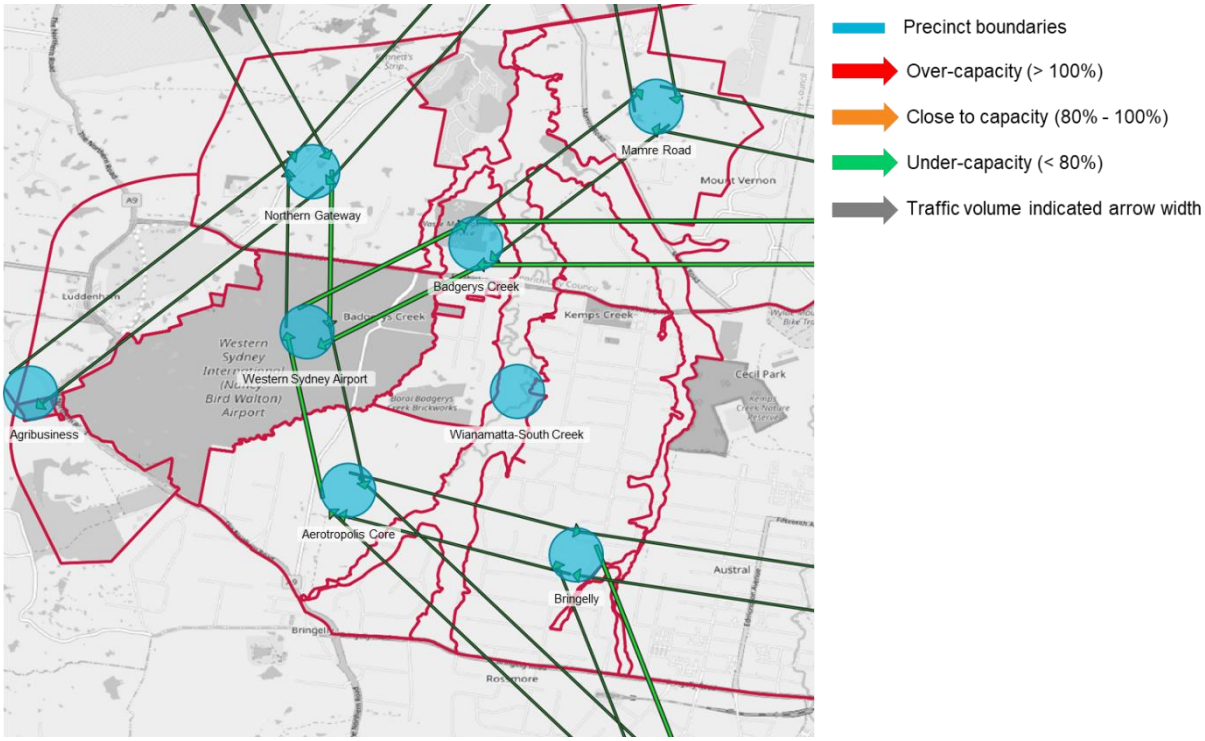


Figure 8-9 Aerotropolis 2056 public transport network capacity assessment

8.3.3.3 2056 public transport capacity assessment in broader context

The broader public transport capacity assessment is shown in Figure 8-10. There are few capacity issues on the planned public transport network. These are found on the busiest eastbound parts of the network, towards the Central River City and Eastern Harbour City. Key capacity constraints include:

- Demand exceeds capacity (117%) from Blacktown to Parramatta in the eastbound direction
- Demand exceeds capacity (105%) from Liverpool to the east of the Aerotropolis in the eastbound direction
- Demand at capacity (90%) from Parramatta to the south-east of the Aerotropolis in the eastbound direction.

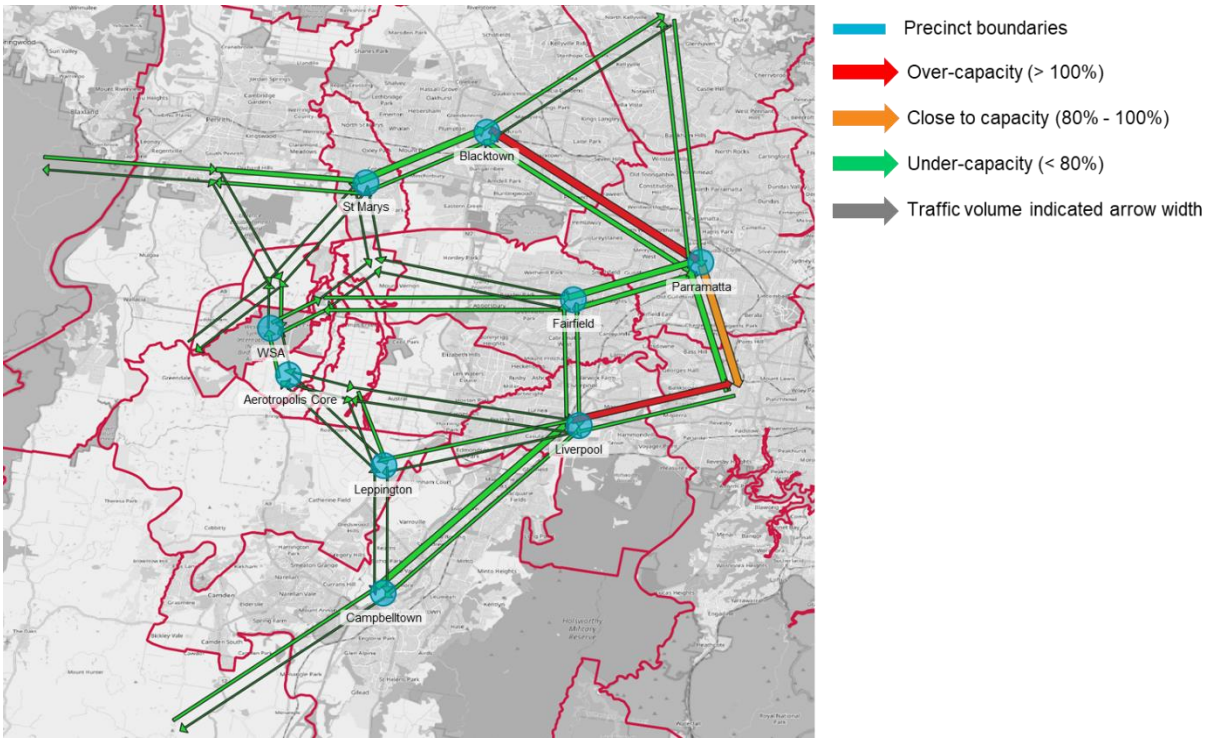


Figure 8-10 Wider 2056 public transport network capacity assessment

8.3.3.4 2056 road capacity assessment within the Aerotropolis

The Aerotropolis road capacity assessment is shown in Figure 8-11, and includes both freight and passenger trips. Key capacity constraints include:

- Demand exceeds capacity (129%) between Penrith and Agribusiness in the southbound direction
- Demand exceeds capacity (135%) between Agribusiness and Penrith in the northbound direction
- Demand at capacity (84%) from Northern Gateway to Badgerys Creek in the eastbound direction
- Demand exceeds capacity (99%) between Agribusiness and Leppington in the southbound direction
- Demand exceeds capacity (134%) between Leppington and Agribusiness in the northbound direction
- Demand exceeds capacity (145%) from Northern Gateway to St Marys in the northbound direction
- Demand exceeds capacity (168%) from Fairfield to Badgerys Creek in the westbound direction
- Demand exceeds capacity (125%) between Bringelly and Liverpool in the eastbound direction
- Demand exceeds capacity (107%) between Liverpool and Bringelly in the westbound direction.

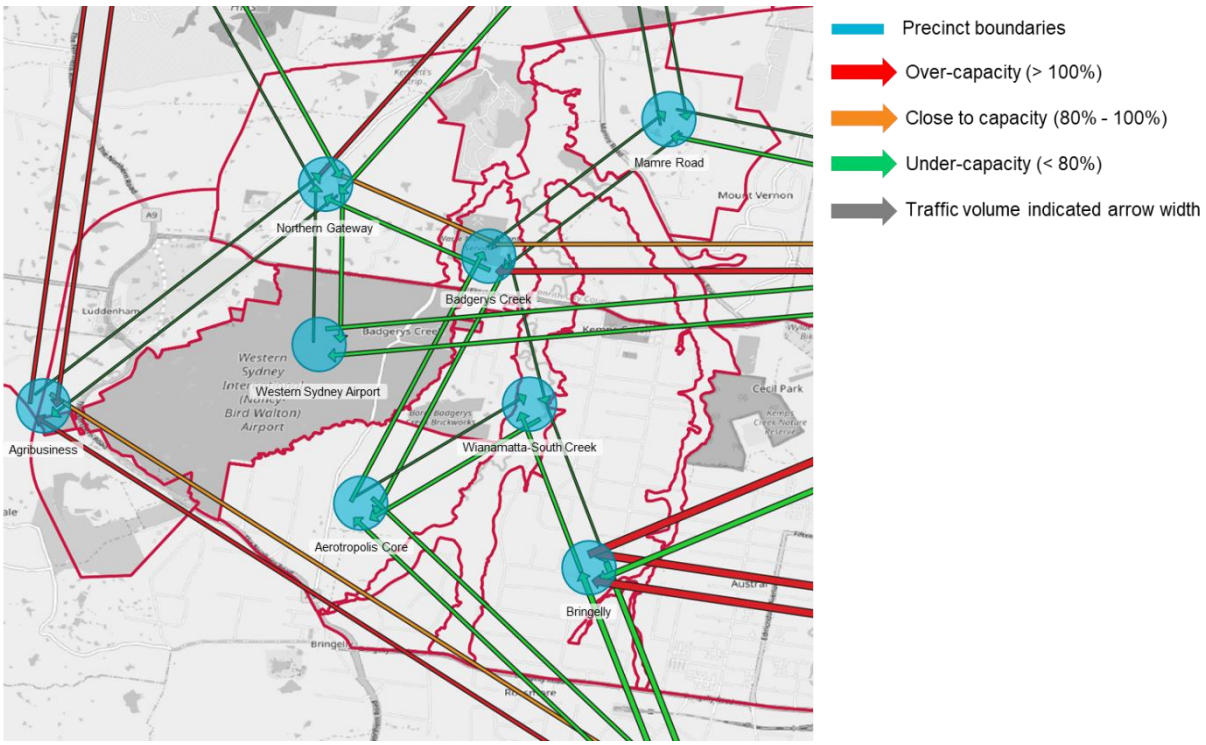


Figure 8-11 Aerotropolis 2056 road network capacity assessment

8.3.3.5 2056 road capacity assessment in broader context

The broader road capacity assessment is shown in Figure 8-12, and includes both freight and passenger trips. The broader road network is over capacity. Key capacity constraints include:

- **Demand exceeds capacity** between Metropolitan Centres, Clusters and Strategic Centres
  - Between Penrith and St Marys by 151% eastbound and 118% in the westbound direction
  - Between Blacktown and Penrith by 193% westbound and 138% in the eastbound direction
  - Between Blacktown and Parramatta by 164% to the south-east and 136% to the north-west
  - Between Blacktown and Fairfield by 262% southbound and 252% in the northbound direction
  - Between Fairfield and Liverpool by 310% southbound and 342% in the northbound direction
  - Between Leppington and Liverpool by 199% eastbound and 189% in the westbound direction
  - Between Campbelltown and Liverpool by 161% to the north-east and 121% to the south-west
- **Demand exceeds capacity** between the parts of the Aerotropolis and the wider road network
  - Between Blacktown and the north of the Aerotropolis by 155% to the south-west and 136% to the north-east
  - Between Parramatta and the east of the Aerotropolis by 132% to the south-west and 124% to the north-east
  - Between Liverpool and the east of the Aerotropolis by 221% in the westbound direction and 157% in the eastbound direction
  - Between the south of the Aerotropolis and Campbelltown by 104% in the north-west direction.

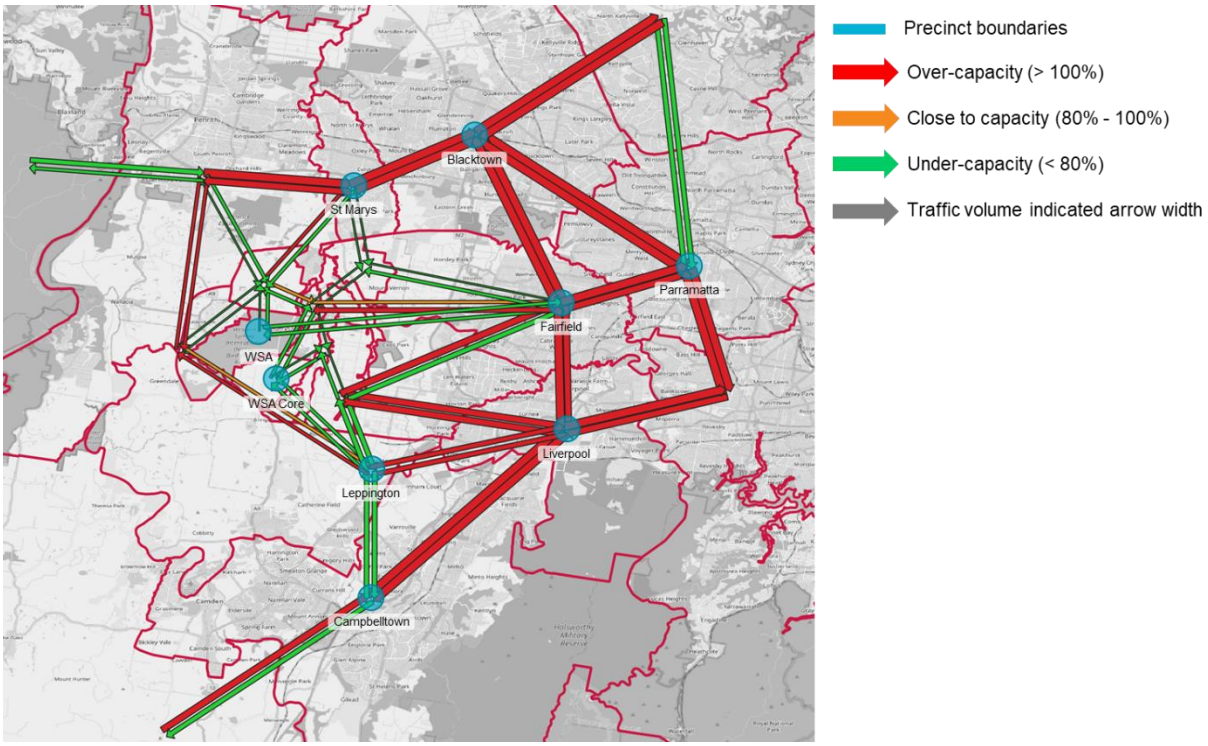


Figure 8-12 Wider 2056 road network capacity assessment

8.4 Summary

8.4.1 Validation of the Beyond Business as Usual Mode Share Approach

The 2056 mode share targets were set out in Section 4.0 and restated at the start of this section, in Section 8.0.

The Mode Share Targets support the overall *Western Sydney Aerotropolis Plan* objectives and aim to deliver a much more sustainable mode share (comprising walking, cycling and public transport use) of 44% for the five initial Aerotropolis precincts in the morning peak period (6:00am to 9:30am). This is shown in Figure 8-14.

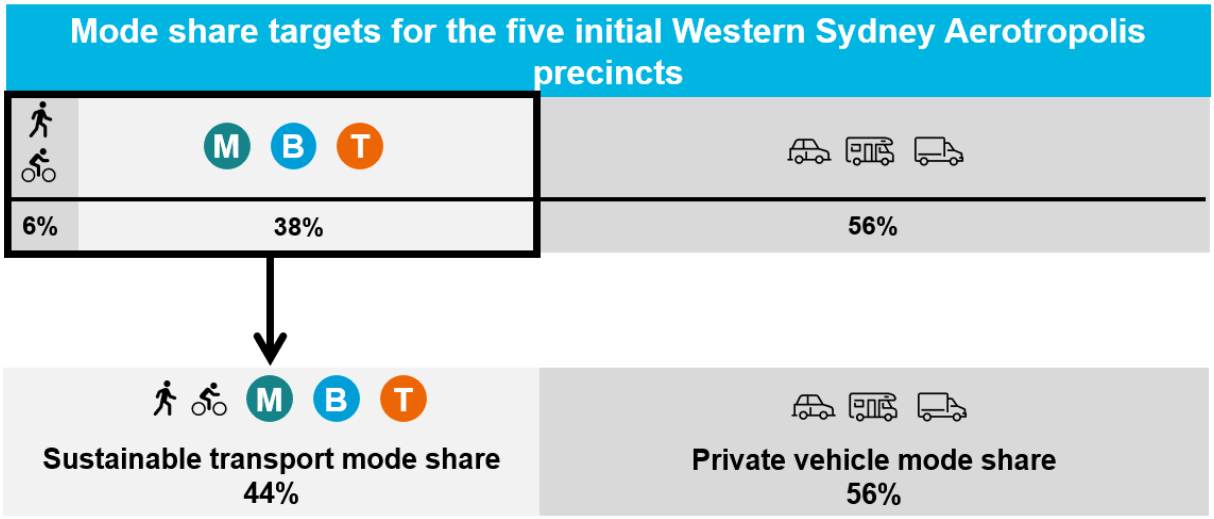


Figure 8-13: Mode share targets for the five initial Western Sydney Aerotropolis precincts

The Public Transport Patronage Model and Sydney Freight Model were used together to inform the travel demand analysis undertaken, to validate the mode share targets as defined.

The travel demand assessment, described in Section 8.2, defines that a total of 81,840 passenger and freight trips are forecast to occur during the 2056 morning peak period (6:00am to 9:30am).

The transport network capacity assessment, in Section 8.3, demonstrated that **a business-as-usual approach would result in demand exceeding capacity on several links on the road network**. However, validating the vision of the top down mode share targets (with a higher sustainable mode share) in line with the polices and networks defined, demonstrated the effectiveness of this vision. This adjusted the strategic model outputs to reflect the targets set and the vision through trip reassignment.

The assessment demonstrated the public transport network and services proposed (as defined in Section 7) **will have capacity to cater for all public transport travel demand, in line with the mode share targets**.

In fact, it has been proven that there will be additional public transport service capacity, which could potentially see even more substantial share of public transport as a mode. Although, based on the evidence presented in case studies and analysis in this report, it is not reasonable to predict a higher public transport mode share, which can be reasonably validated based on a credible evidence base.

Further analysis, through the appraisal of relevant case studies provided an evidence-based approach to reassigning private vehicle trips to walking and cycling.

The travel demand assessment and transport capacity assessment are an evidence-based validation process for the 2056 mode share targets. These rely on the effective deployment of travel demand management strategies and policies, allied with an effective network of infrastructure and services.

Figure 8-14 presents the level of mode shift which can be reasonably achieved, based on the validation of mode share targets undertaken. This shows the level of change from business as usual and reflects the beyond business as usual approach presented in this report.

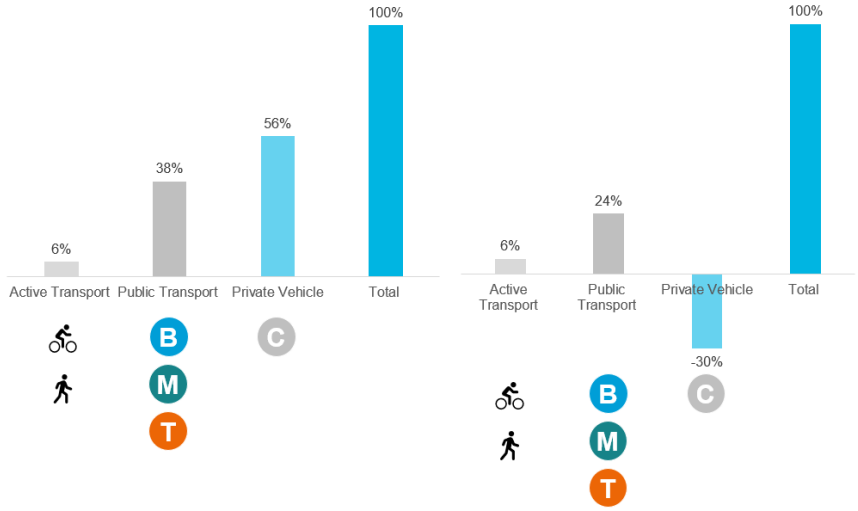


Figure 8-14: Validated mode share targets for the beyond business as usual approach

8.4.2 Validation of Travel Demand Management Measures to support Mode Share Targets

Section 4.0 identifies two transport enablers to support the *Western Sydney Aerotropolis Plan* vision; policies and strategies and infrastructure and services.

Travel Demand Management is one of two key strategies to support the *Western Sydney Aerotropolis Plan* vision (the other being the *Draft Western Sydney Aerotropolis Development Control Plan*). Travel Demand Management supports the 2056 mode share targets by influencing travel behaviour and encouraging the use of sustainable modes.

In the following sections, the 2056 mode share targets are compared against Greater Sydney case studies for business parks and Metropolitan Centres and Clusters.

8.4.2.1 Analysis of Case Studies – Business Parks

Macquarie Park is the largest business park in Greater Sydney. It has been developed in a retrospective manner; with land use, transport and planning principles retrofitted to the business park throughout its development in order to support a sustainable transport environment.

Table 8-3 outlines the mode share for the business park. It should be noted that a Transportation Management Association, Connect Macquarie Park and North Ryde (Connect), has been implemented for major employers in Macquarie Park, delivering a number of Travel Demand Management measures to support a mode shift to sustainable travel.

The sustainable mode share for people traveling to the Macquarie Park – Marsfield SA2 is 27%, with a further 9% of people working from home.

Table 8-3 Mode share for Macquarie Park

Business Park	Total Size (ha)	Mode Share	
		Commuting to SA2	Commuting from SA2
Macquarie Park[1]	161	**Macquarie Park – Marsfield**	
		• Public transport: 24% • Vehicle: 63% • Active transport: 3% • Worked at home: 9%	• Public transport: 31% • Vehicle: 45% • Active transport: 10% • Worked at home: 12%

Source: Department of Planning, Industry and Environment, 2015; Australian Bureau of Statistics, 2016

Note: Based on 2016 Census data – Macquarie Park does not yet reflect Journey To Work mode share with 2019 opening of Sydney Metro Northwest. Note: worked at home also includes persons who stated that 'did not go to work'.

[1] The Transport Management Association of Connect is operational at Macquarie Park

Table 8-4 outlines the business as usual mode share for four of the five largest business parks in Greater Sydney as outlined by the Department of Planning, Industry and Environment; Norwest, Marsden Park, Leppington North and Sydney Olympic Park / Rhodes.

The existing mode shares for the business park SA2 areas from the 2016 Census present a business as usual approach to travel to and from the centres, with limited coordinated activity to manage travel demand.

As a result, existing mode shares for people commuting to the SA2 areas primarily rely on private vehicles with moderate public transport use (between 2% and 23%) and low active transport use (between 1% and 4%). Residents travelling from the SA2 utilise public transport to a greater extent between 14% and 39% with active transport used for 1% to 5% of all trips.

Table 8-4 Mode share for four of the five largest business parks in Greater Sydney

Business Park	Total Size (ha)	Mode Share	
		Commuting to SA2	Commuting from SA2
Norwest	157	**Baulkham Hills (West) – Bella Vista**	
		• Public transport: 5% • Vehicle: 83% • Active transport: 1% • Worked at home: 9%	• Public transport: 17% • Vehicle: 66% • Active transport: 2% • Worked at home: 14%
Marsden Park	123	**Riverstone – Marsden Park**	
		• Public transport: 3% • Vehicle: 83% • Active transport: 2% • Worked at home: 11%	• Public transport: 16% • Vehicle: 70% • Active transport: 2% • Worked at home: 11%
Leppington North	92	**Cobbitty – Leppington**	
		• Public transport: 2% • Vehicle: 78% • Active transport: 2% • Worked at home: 16%	• Public transport: 9% • Vehicle: 73% • Active transport: 1% • Worked at home: 14%
Sydney Olympic Park / Rhodes	79	**Homebush Bay – Silverwater**	
		• Public transport: 15% • Vehicle: 75% • Active transport: 2% • Worked at home: 7%	• Public transport: 24% • Vehicle: 62% • Active transport: 4% • Worked at home: 10%
		Concord West – North Strathfield	
		• Public transport: 23% • Vehicle: 62% • Active transport: 4% • Worked at home: 10%	• Public transport: 39% • Vehicle: 44% • Active transport: 5% • Worked at home: 10%

Source: Department of Planning, Industry and Environment, 2015; Australian Bureau of Statistics, 2016

Note: Based on 2016 Census data – Norwest does not yet reflect Journey To Work mode share with 2019 opening of Sydney Metro Northwest.

Note: worked at home also includes persons who stated that 'did not go to work'.

[1] The Transport Management Association of Connect is operational at Macquarie Park

8.4.2.2 Analysis of Case Studies – Metropolitan Centres and Metropolitan Clusters

Table 8-5 outlines the mode share for the five existing Metropolitan Centres or Metropolitan Clusters for Greater Sydney as identified by the Greater Sydney Commission.

Data for the Metropolitan Centres and Metropolitan Cluster SA2 areas presents a range in mode shares for to travel to and from the centres. These vary significantly dependent on the availability of public transport to connect residents and employees to Metropolitan Centres or Metropolitan Clusters.

As a result, public transport and active transport use is highest in areas of greatest density and access to public transport such as the Harbour CBD; at over 70%. However, more prevalent are mode shares, in outer metropolitan areas of between 10% and 25%, such as in Penrith and Liverpool.

Table 8-5 Mode share for the Metropolitan Centres and Clusters of Greater Sydney

Business District	Mode Share	
	Commuting to SA2	Commuting from SA2
Harbour CBD	**Sydney – Haymarket – The Rocks**	
	• Public transport: 70% • Vehicle: 13% • Active transport: 7% • Worked at home: 8%	• Public transport: 35% • Vehicle: 11% • Active transport: 42% • Worked at home: 10%
	North Sydney – Lavender Bay	
	• Public transport: 58% • Vehicle: 26% • Active transport: 6% • Worked at home: 8%	• Public transport: 43% • Vehicle: 25% • Active transport: 18% • Worked at home: 12%
Greater Parramatta	**Parramatta – Rosehill**	
	• Public transport: 45% • Vehicle: 38% • Active transport: 4% • Worked at home: 9%	• Public transport: 37% • Vehicle: 49% • Active transport: 4% • Worked at home: 9%
Liverpool	**Liverpool**	
	• Public transport: 19% • Vehicle: 64% • Active transport: 7% • Worked at home: 8%	• Public transport: 12% • Vehicle: 73% • Active transport: 4% • Worked at home: 11%
Greater Penrith	**Penrith**	
	• Public transport: 7% • Vehicle: 78% • Active transport: 2% • Worked at home: 12%	• Public transport: 18% • Vehicle: 65% • Active transport: 5% • Worked at home: 11%
Campbelltown – Macarthur	**Campbelltown - Woodbine**	
	• Public transport: 6% • Vehicle: 78% • Active transport: 1% • Worked at home: 13%	• Public transport: 19% • Vehicle: 67% • Active transport: 2% • Worked at home: 10%
	Douglas Park – Appin	
	• Public transport: 1% • Vehicle: 75% • Active transport: 2% • Worked at home: 21%	• Public transport: 6% • Vehicle: 76% • Active transport: 2% • Worked at home: 15%

Source: Australian Bureau of Statistics, 2016

9.0 Delivery Strategy: staging and Implementation

9.1 Staging Plans

Land use staging and sequencing across the Aerotropolis has been indicatively identified in order to communicate priorities for infrastructure development. This aligns Government investment with achieving the targets established in the *Western Sydney Aerotropolis Plan* to deliver the mode share targets defined in this report, establishing sustainable patterns of travel behaviour from day one.

The **first areas of priority** are:

- Land around the committed Metro Stations at North Luddenham and Aerotropolis Core
- Associated large landholdings where development can be relatively easily coordinated
- The land adjacent and outside of the M12 corridor and interchange area that can support access to the Western Sydney Airport
- Luddenham Village, where existing infrastructure can support development
- Enabling access to the Western Sydney Airport from The Northern Road
- Early delivery of public transport and active transport infrastructure to support sustainable mode share targets.

The **areas of second priority** are:

- Mixed use zoned land east of Thompsons Creek that can bolster employment and resident populations
- Connecting developed areas between the Aerotropolis Core, Badgerys Creek and Northern Gateway precincts.

The **third areas of priority** are:

- Land that is more difficult to develop owing to environmental and topographical constraints east of Badgerys Creek Road and east of The Northern Road.

Considerations informing these priorities are:

- High order transport nodes (Metro) and centres (ability to create a place)
- Unfragmented land
- Servicing (extending from existing infrastructure)
- Environmental constraints.

Considering these priorities, the proposed land use staging and sequencing for the Aerotropolis is outlined in Figure 9-1.

The transport infrastructure and services response to cater for the proposed staging and sequencing is outlined for each precinct in the following sub-sections.

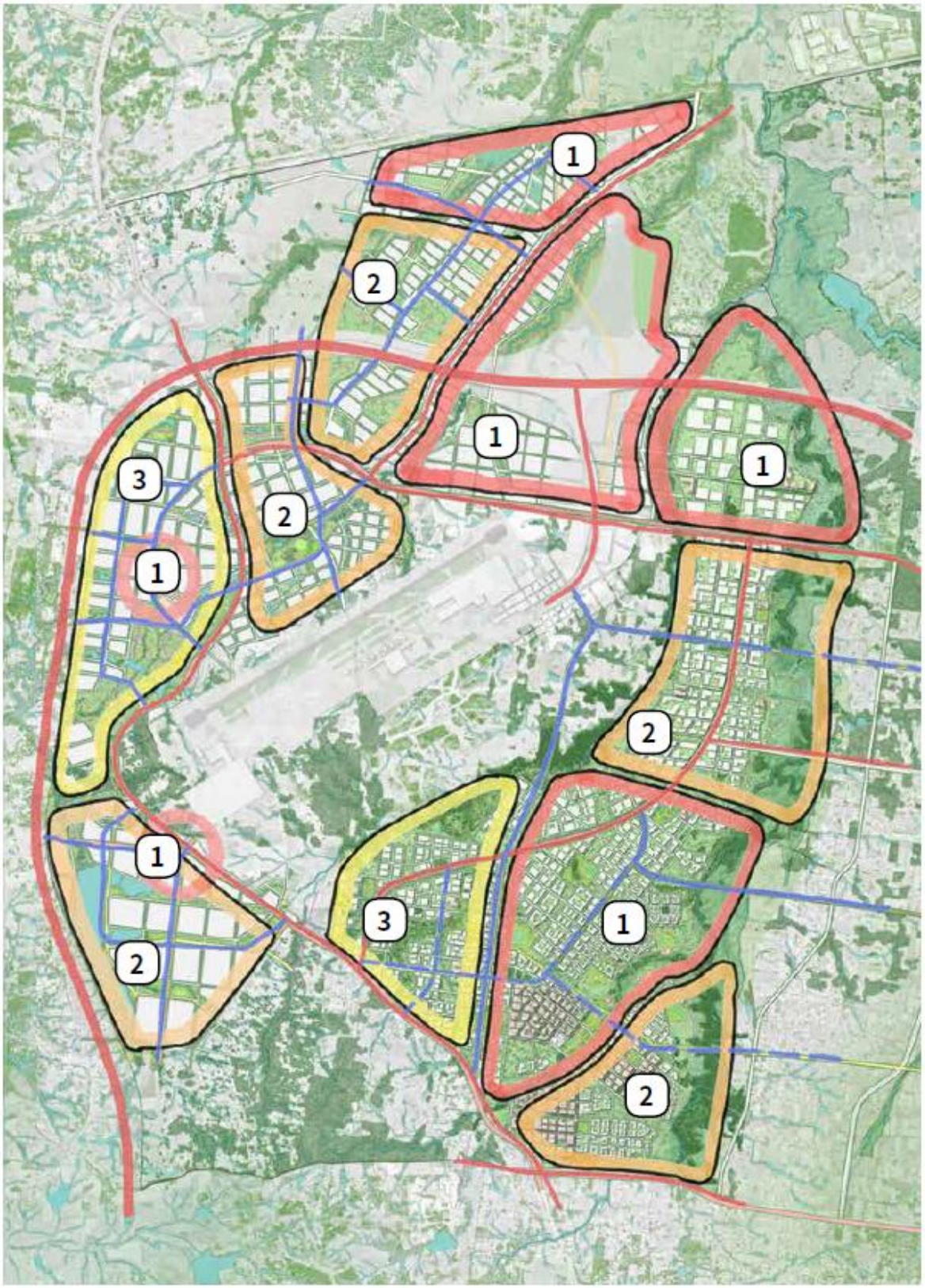


Figure 9-1 Proposed land use led staging approach for the Western Sydney Aerotropolis

9.1.1 Aerotropolis Core

Staging within the Aerotropolis is land use led, with transport infrastructure carefully staged to support land use as it develops while enabling efficient transport connectivity to and from Western Sydney International Airport from 2026. No timeframe is put on the evolution of each stage, with the market to determine when each stage will be required.

The first stage within the Aerotropolis Core is centred around the Metro station and Fifteenth Avenue corridor, in addition to the northern section of the Badgerys Creek precinct. Transport infrastructure to support Stage 1 includes Elizabeth Drive, Fifteenth Avenue and Badgerys Creek Road. During Stage 1, it is likely that rapid bus services from Liverpool, Campbelltown-Macarthur and Penrith will use Badgerys Creek Road, as Eastern Ring Road will not be fully developed. The roads used by the Rapid Bus routes will be determined by a separate business case process which will inform any future updates to the precinct plans and subsequent masterplanning.

The second stage includes the infill of development between the Aerotropolis Core and Badgerys Creek. To support this, the Eastern Ring Road is constructed between Elizabeth Drive and Badgerys Creek Road. The Twelfth Avenue and Pitt Street connections are added, which provide frequent bus services from the east though the Aerotropolis Core and to Western Sydney International Airport and business park respectively. The freight and general traffic connection between Eastern Ring Road and Devonshire Road is also added at this time to support freight connectivity as the precinct grows.

The third and final stage is the development of land west of Badgerys Creek Road. This stage includes the extension of the Eastern Ring Road south to The Northern Road and the extension of the Twelfth Avenue public and active transport corridor through the Aerotropolis Core to Eastern Ring Road, where it will connect onto the Agribusiness precinct.

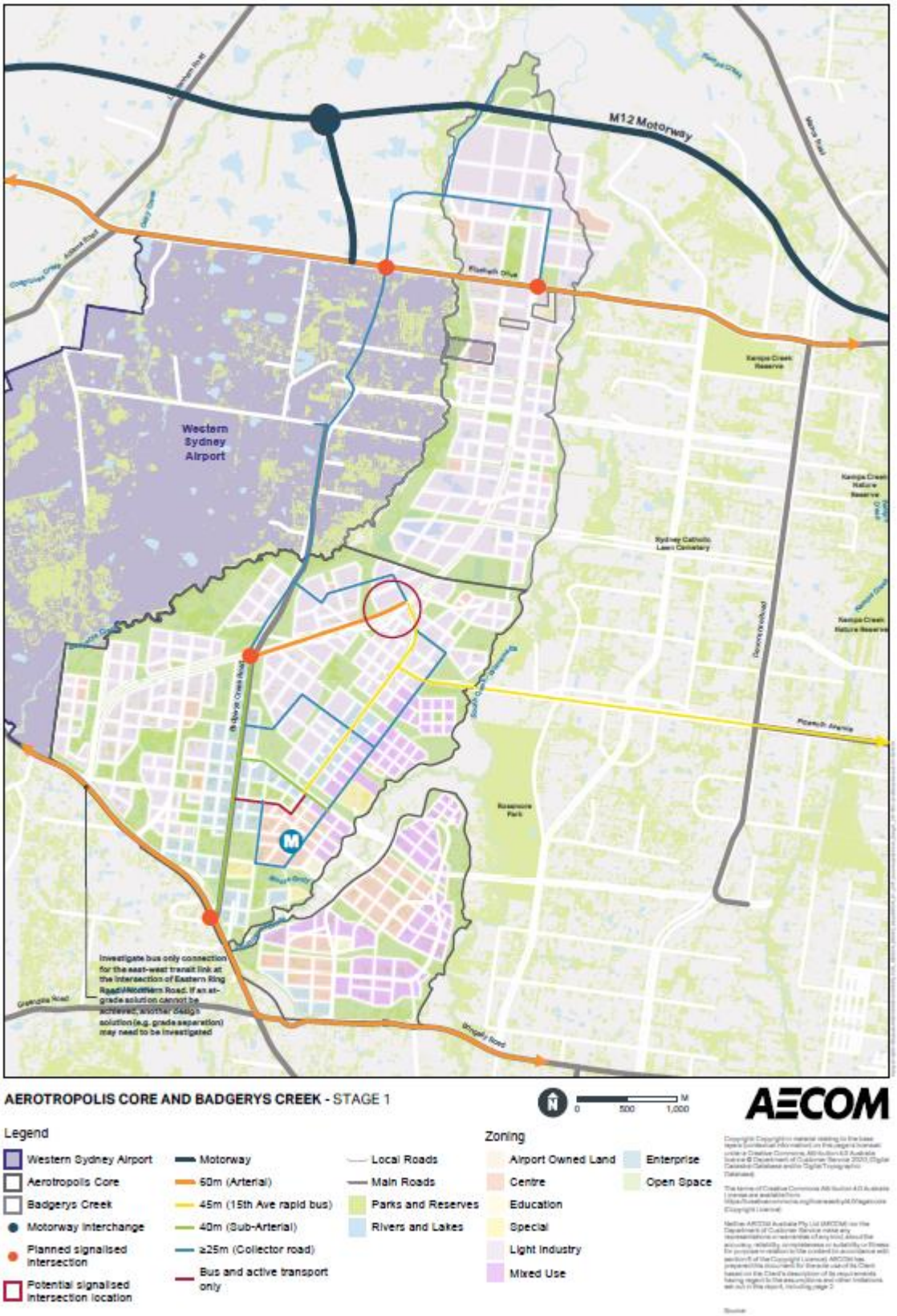


Figure 9-2 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek – Stage 1

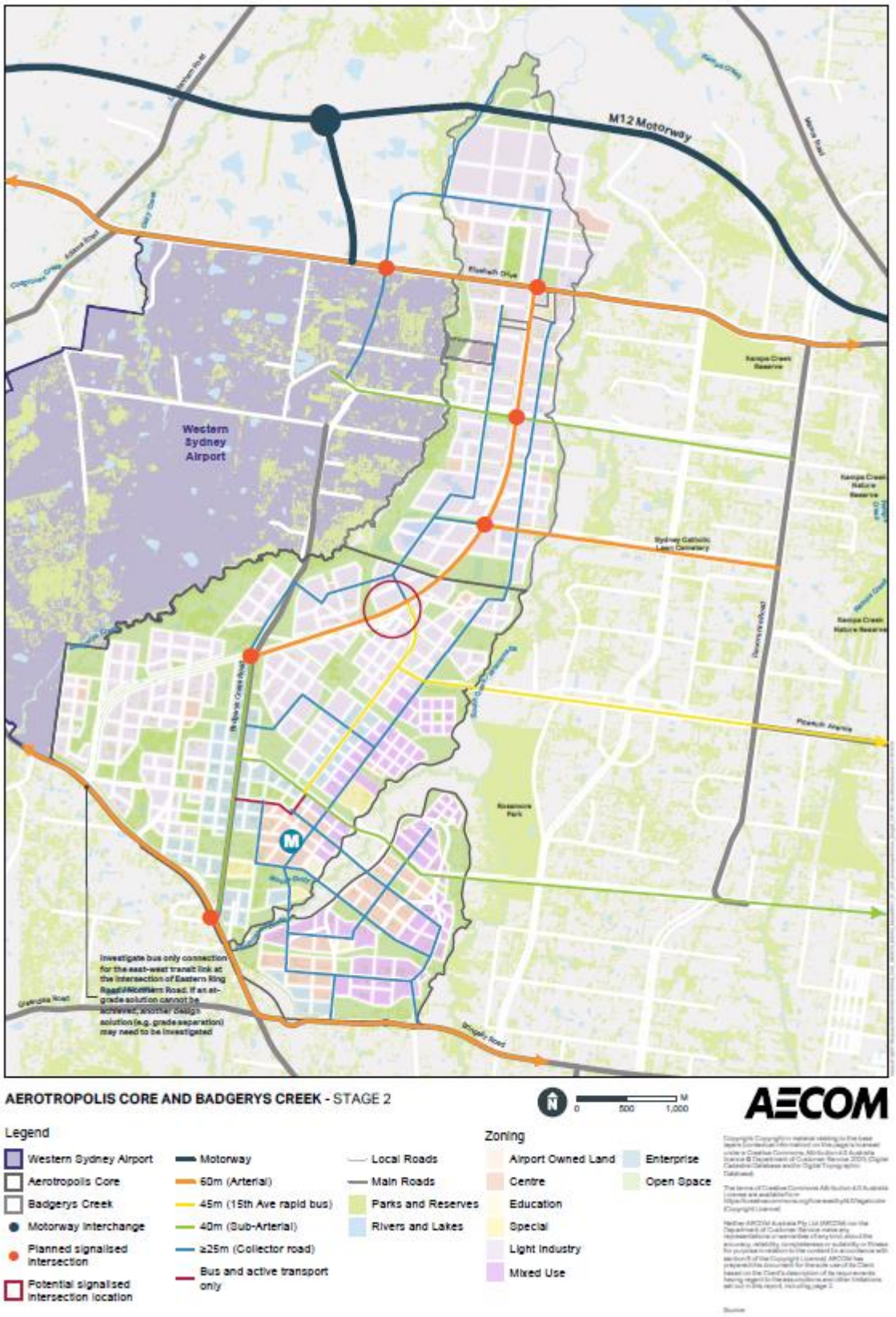


Figure 9-3 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek – Stage 2

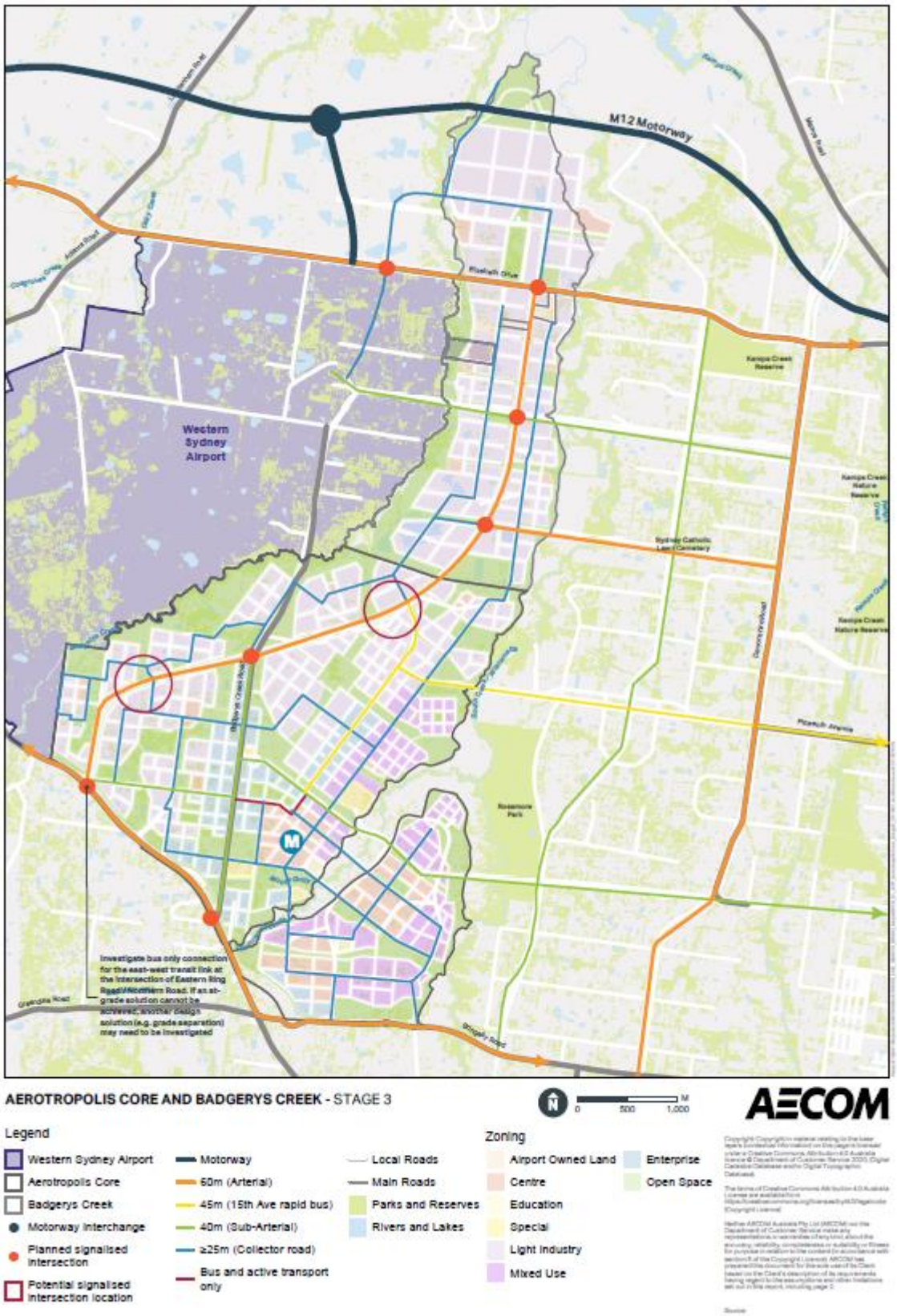


Figure 9-4 Aerotropolis Core, Badgerys Creek and Wianamatta-South Creek – Stage 3

9.1.2 Agribusiness

Staging within the Agribusiness precinct is land use led, with transport infrastructure carefully staged to support land use as it develops while enabling efficient transport connectivity to and from Western Sydney International Airport from 2026. No timeframe is put on the evolution of each stage, with the market to determine when each stage will be required.

The first stage within the Agribusiness precinct is centred around the Integrated Logistics Hub. Transport infrastructure to support Stage 1 includes The Northern Road, Adams Road and the new connection through the Integrated Logistics Hub.

The second stage includes the infill of development within the Integrated Logistics Hub and around Adams Road. To support this, a proposed sub-arterial connection is constructed north from Adams Road to Elizabeth Drive. The third and final stage is the development of land around Luddenham village, to the west of a re-aligned The Northern Road. This stage includes development of the new sub-arterial connection west of Luddenham village and an extension of Adams Road to connect with this new road.

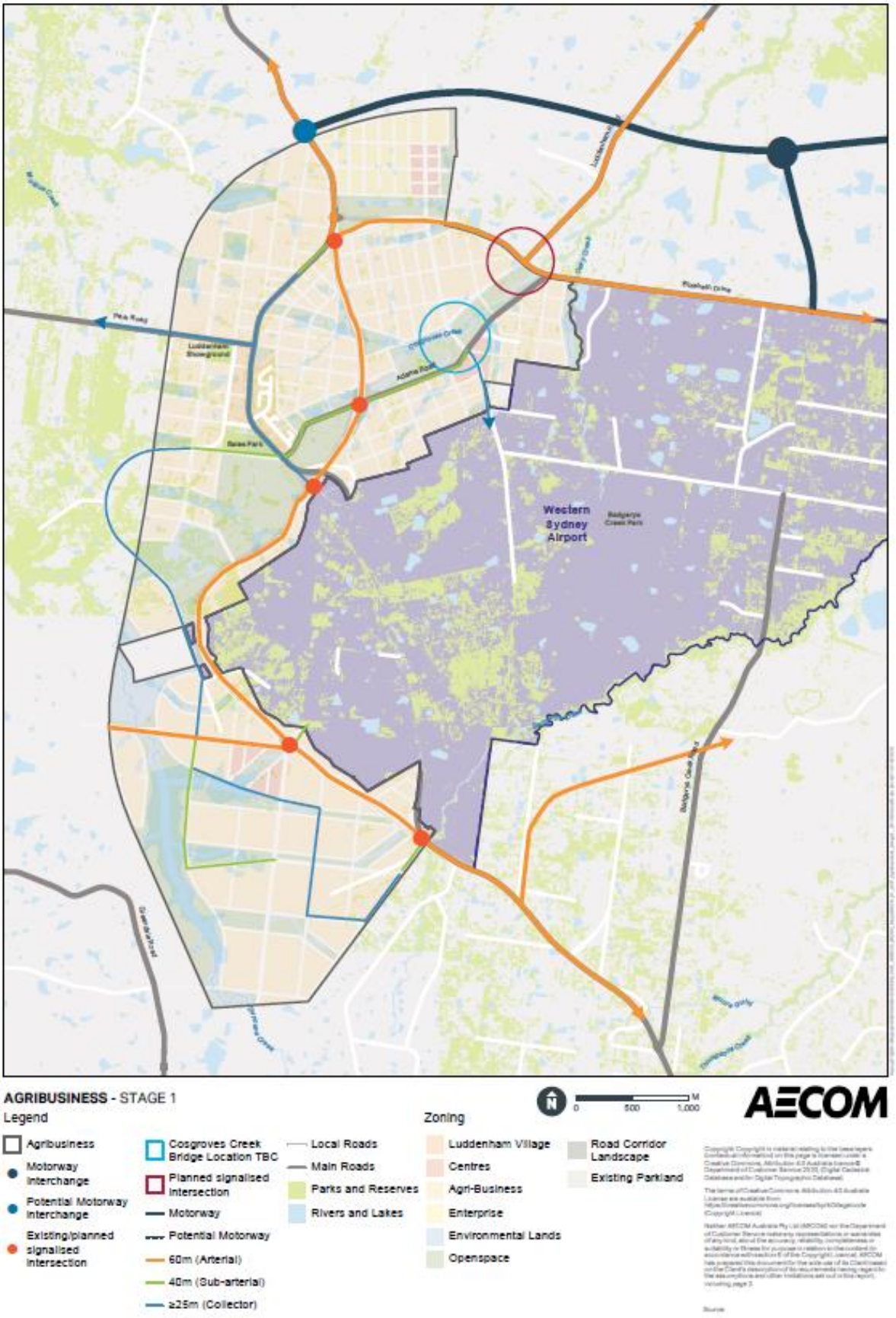


Figure 9-5 Agribusiness – Stage 1

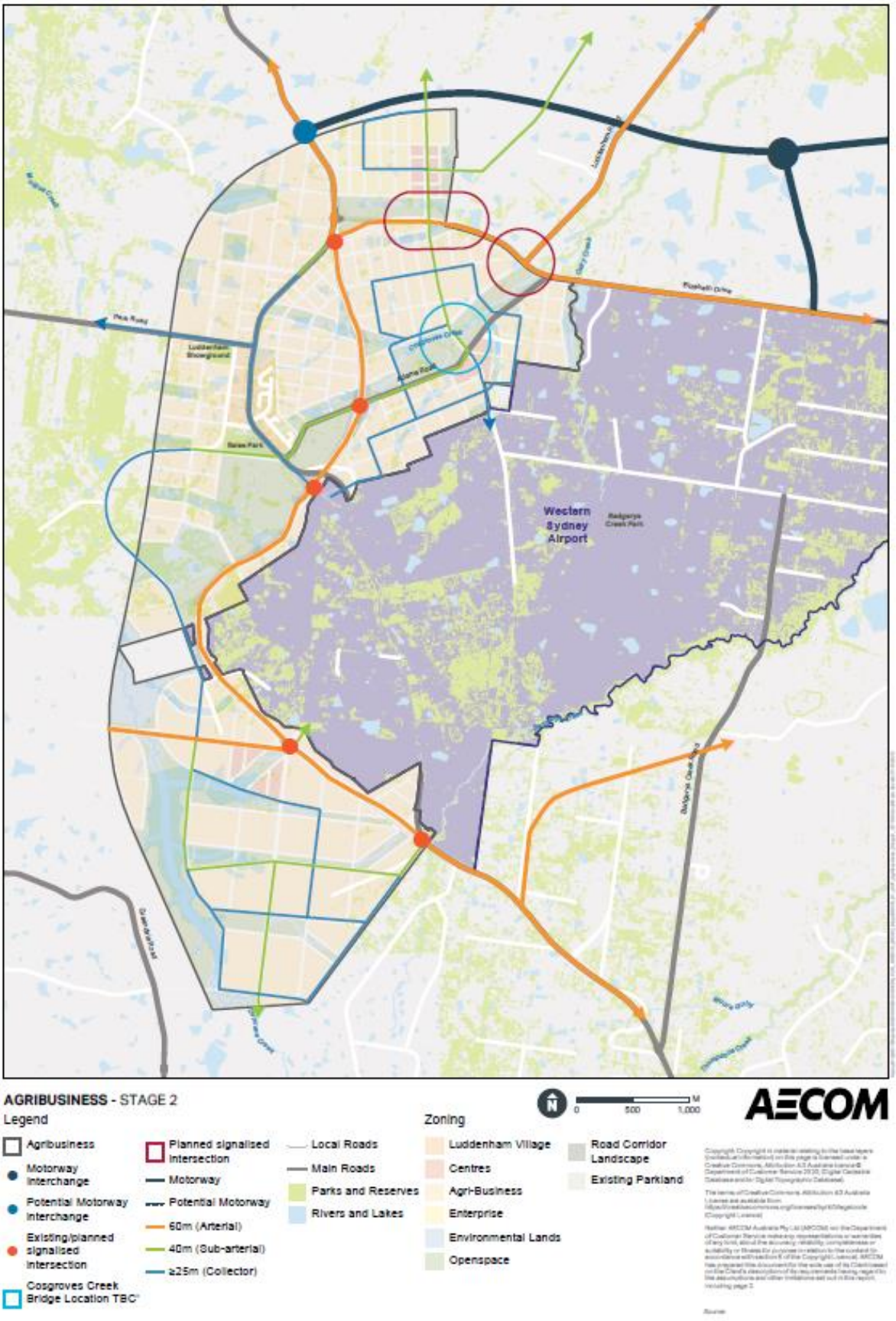


Figure 9-6 Agribusiness – Stage 2

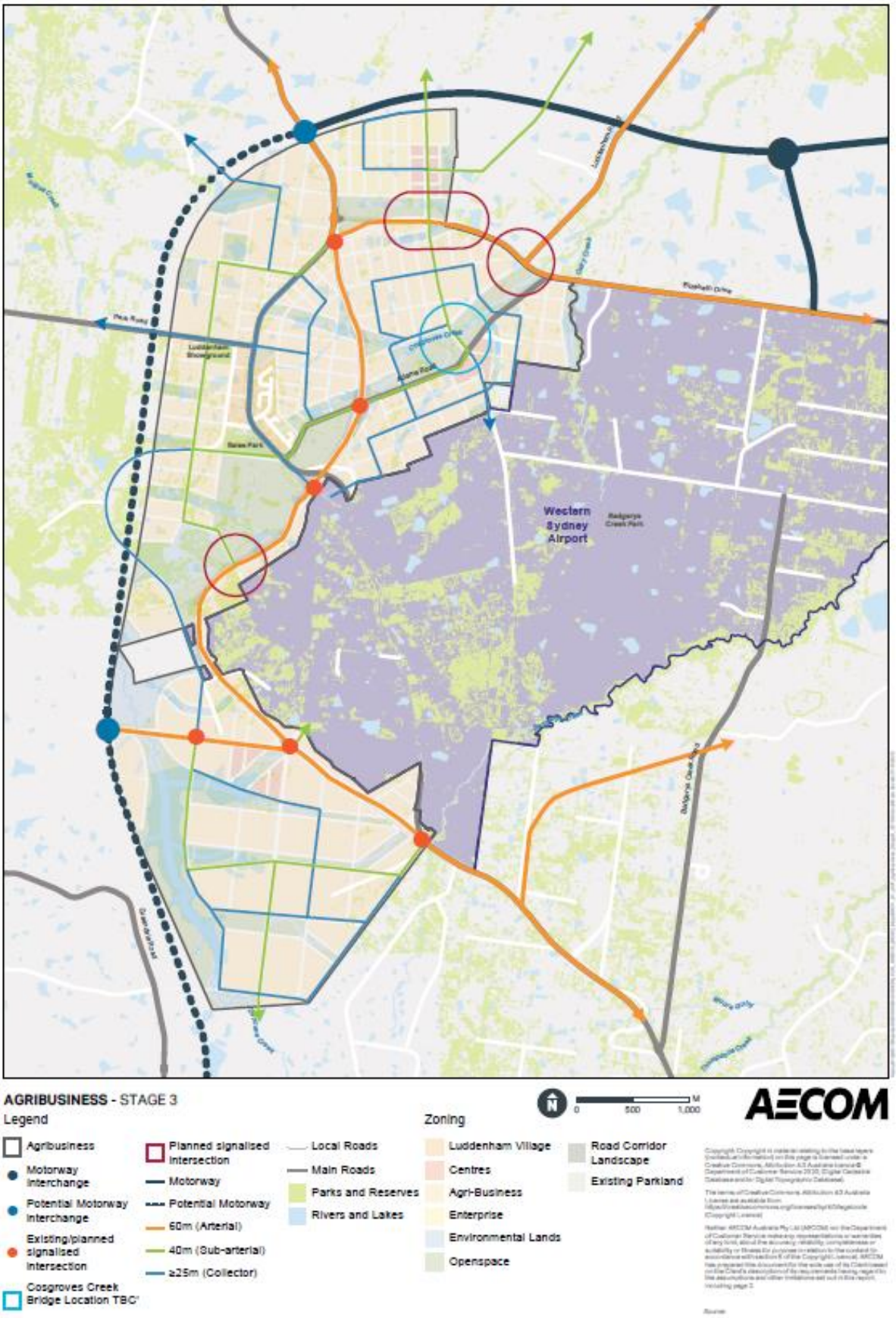


Figure 9-7 Agribusiness – Stage 3

9.1.3 Northern Gateway

Staging within the Aerotropolis is land use led, with transport infrastructure carefully staged to support land use as it develops while enabling efficient transport connectivity to and from Western Sydney International Airport from 2026. No timeframe is put on the evolution of each stage, with the market to determine when each stage will be required.

The first stage within the Northern Gateway is centred on the mixed-use precinct located around the Luddenham (Northern Gateway) Metro station and centres located to the west of the Metro station, in addition to the enterprise precinct located between Elizabeth Drive and the M12 Motorway. Transport infrastructure to support Stage 1 includes Luddenham Road, development of the sub-arterial 'sister' Luddenham Road and additional east-west sub-arterial connections to connect new centres to the west with frequent bus services and active transport infrastructure. The roads used by the Rapid Bus routes will be determined by a separate business case process which will inform any future updates to the precinct plans and subsequent masterplanning.

The second and final stage includes the infill of enterprise development between the mixed-use precinct and Elizabeth Drive. To support this, the 'sister' Luddenham Road is extended south to meet the Agribusiness precinct. An additional east-west sub-arterial is also constructed to provide connectivity between Northern Gateway and the future North Luddenham precinct to the west, which will provide a secondary freight and frequent bus role.

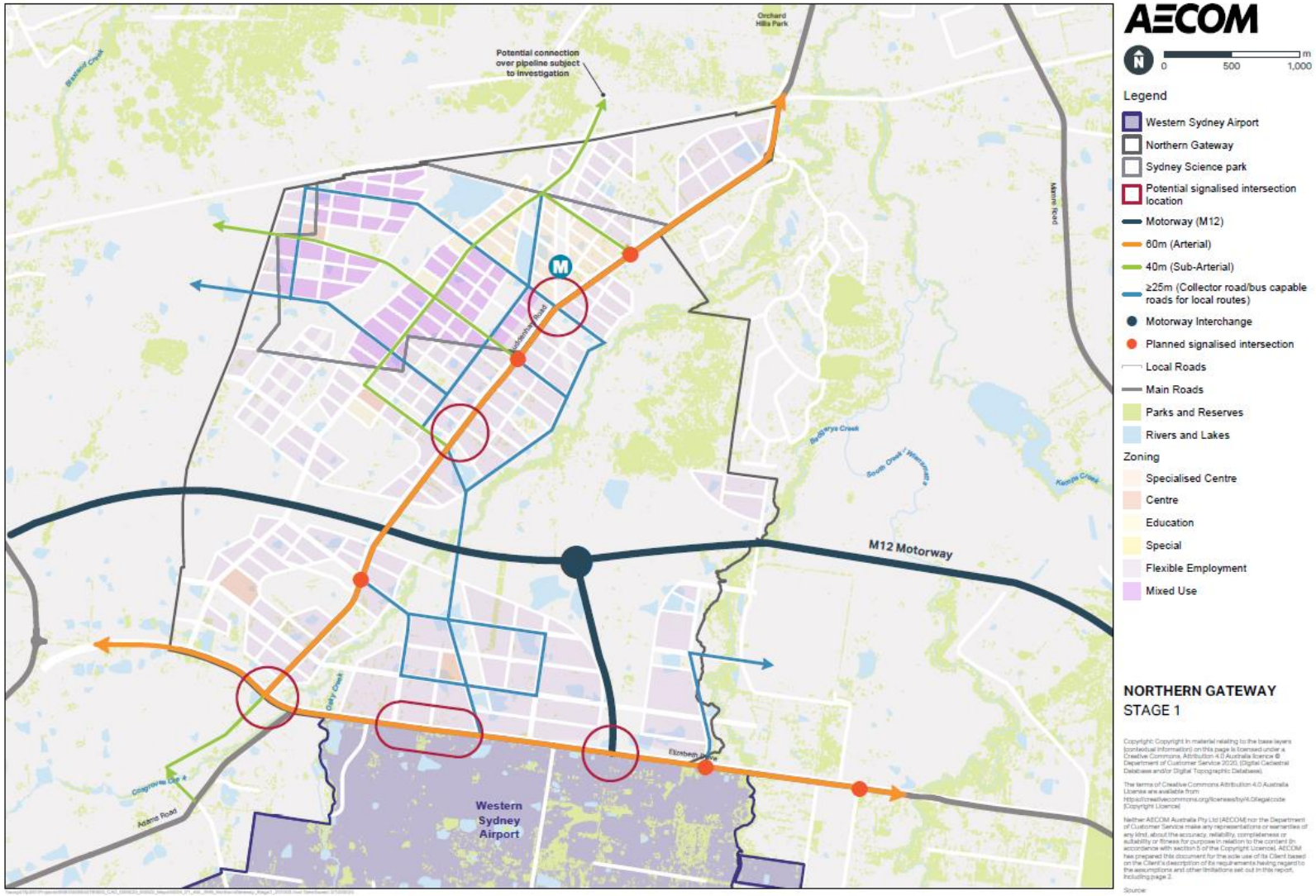


Figure 9-8 Northern Gateway – Stage 1

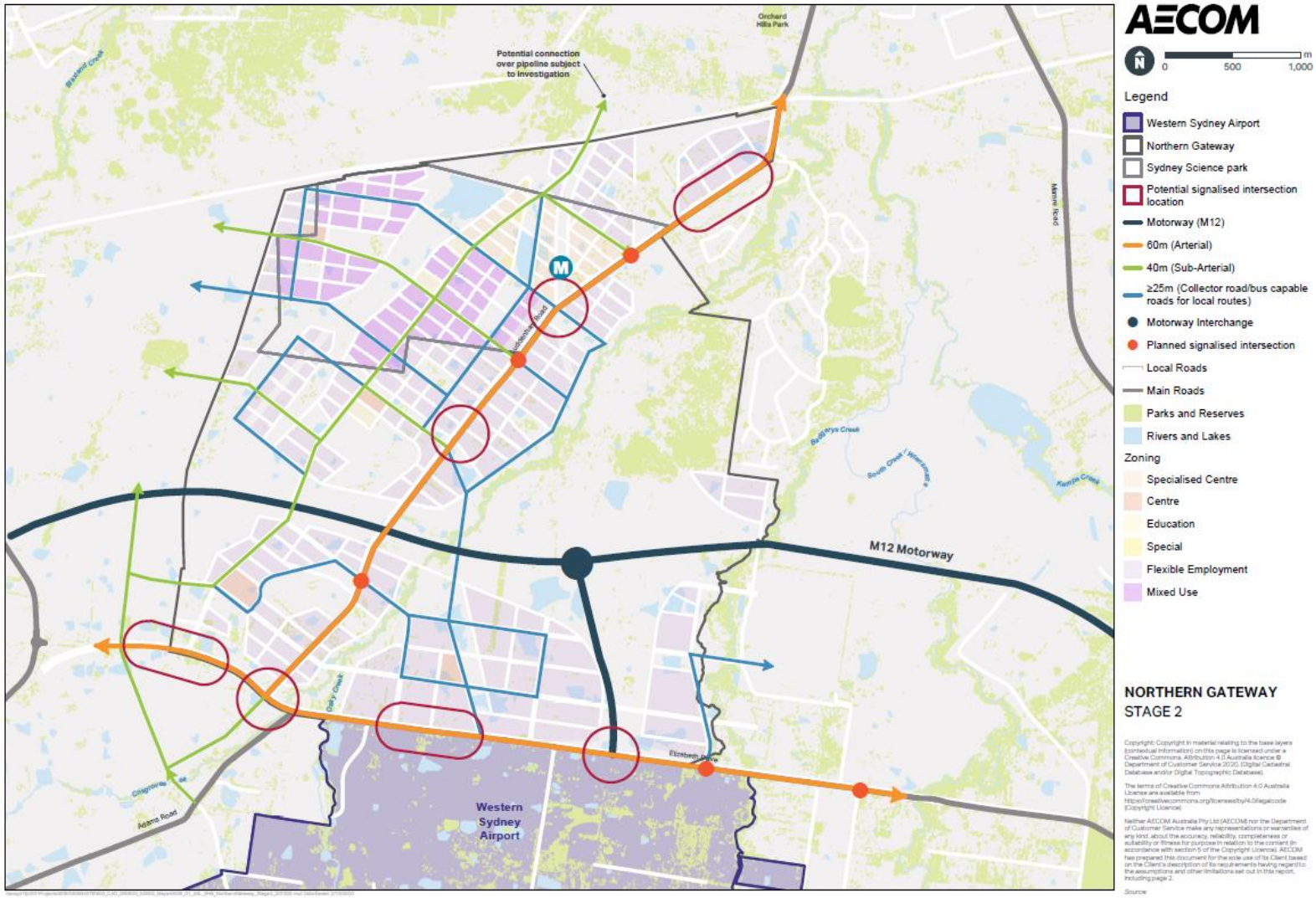


Figure 9-9 Northern Gateway – Stage 2

9.2 Implementation of Action Plan

Table 9-1 outlines the action plan for the implementation of the Travel Demand Management measures described in Section 6.0; presenting the alignment with the Travel Demand Management objectives, the relevant application groups, delivery time frames, precincts and agencies to lead the measures.

The short-term time frame refers to time between now and 2026, with medium-term between 2026 and 2036 and long-term between 2036 and 2056.

9.2.1 Monitoring and evaluation

The responsibility of monitoring and evaluating Travel Demand Management measures within Aerotropolis sits with the Western Parkland City Authority.

Travel Demand Management measures need to be reviewed on an annual basis, ensuring that they are positively contributing towards a shift in travel to more sustainable modes, reflected in mode share data.

When a Transportation Management Association is established, the organisation will then take responsibility for the monitoring and evaluation of the associated Travel Demand Management measures in place and their impact on private vehicle use and sustainable mode share.

An evaluation framework needs to be established prior to the precincts of Aerotropolis becoming operational.

Table 9-1 Travel Demand Management action plan

Travel Demand Management Measures	Objectives					Application			Time Frame			Precincts				Agency Involvement (L = Lead, C = Contributor)				
	Limit Vehicle Trips	Travel Choice	Alternatives Modes	Efficient Land Use	Liveable Communities	Business	Education	Community	Short Term	Medium Term	Long Term	Aerotropolis Core	Northern Gateway	Agribusiness	Badgerys Creek	Western Parkland City Authority	Transportation Management Associations	Developers / Businesses	Government / TfNSW	Councils
Policy and Framework																				
Transport Management Associations	●	●	●	●	●	●	●		●			●	●			L	L	C	C	C
Travel Plan	●	●	●		●	●	●	●	●			●	●	●	●			C		L
Bicycle Parking & End of Trip Facilities		●	●		●	●	●	●	●			●	●					C		L
Maximum Car Parking Provision	●	●		●	●	●	●	●	●			●	●	●	●	L		C		L
Traffic Calming & Speed Reduction		●			●	●	●	●	●	●	●	●	●	●	●	C			L	L
Urban Freight Consolidation Centres	●	●		●	●	●		●	●	●	●	●	●			L		C		C
Provision of Car Share Parking	●	●	●	●		●		●	●	●	●	●	●				C	L		L
Travel Interventions																				
Alternative Work Schedules	●	●	●			●			●	●	●	●	●				C	L		
Active Transport Training & Guides	●	●	●		●	●	●	●		●	●	●	●				L	C		L
Carpooling Program	●	●	●			●	●			●	●	●	●	●	●		L			

Travel Demand Management Measures	Objectives					Application			Time Frame			Precincts				Agency Involvement (L = Lead, C = Contributor)				
	Limit Vehicle Trips	Travel Choice	Alternatives Modes	Efficient Land Use	Liveable Communities	Business	Education	Community	Short Term	Medium Term	Long Term	Aerotropolis Core	Northern Gateway	Agribusiness	Badgerys Creek	Western Parkland City Authority	Transportation Management Associations	Developers / Businesses	Government / TfNSW	Councils
Travel Behaviour Campaigns	●	●	●		●	●	●	●		●	●	●	●	●	●		L		L	L
Commuter Financial Incentives	●	●	●	●	●	●		●		●	●	●	●	●	●		C	L		
Education		●			●		●			●	●	●	●						L	
Events and Challenges	●	●	●		●	●	●	●		●	●	●	●	●	●		L	C	C	
Navigation and Journey Planning Tools	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		L		C	
Safe Routes to School		●			●		●			●	●	●	●						L	
School Bus Services	●	●	●		●		●			●	●	●	●						L	
Shuttle Bus Services	●	●	●		●	●	●	●	●	●	●			●	●		L	C		
Staggered School Start Times	●	●	●	●	●		●			●	●	●	●						L	
Telework	●	●	●		●	●				●	●	●	●				C	L	C	
Walking and Cycling to School Bus	●	●	●	●	●		●			●	●	●	●						C	L
Wayfinding		●			●	●		●	●	●	●	●	●				C	C	L	L

Appendix A: Parking requirements

Development Control Plan Requirements of Provision of Bicycle Parking

Liverpool City Council

Table 0-1 Liverpool Council bicycle provision rates

Land Use	Employee / Residents	Visitor / Customer
Residential		
Residential flat buildings, multi-dwelling housing	Whichever is greater of 1 per 2 units or 1 for every 4 bedrooms	1 per 10 units
Commercial		
Bulky goods premises	Whichever is greater of 1 per 1,000m^2 GFA or 1 per 10 staff	1 per 1,000m^2 GFA
Office premises	1 per 1 per 200m^2 GFA	1 per 750m^2 GFA
Other	Whichever is greater of 1 per 10 staff or 1 per 1 per 200m^2 GFA	2 plus 1 per 1 per 100m^2 GFA
Shopping centres	1 per 300m^2 LFA	1 per 500m^2 LFA
Industry	1 per 10 staff or 1 per 10 car spaces if staff numbers are undetermined	-
Rural Industry	N/A	N/A
Community / Other		
Medical centres	1 per 10 staff	2 per centre plus 1 for every 5th consulting room
Educational facilities	1 per 10 staff	1 per 10 students
Childcare facilities		2 per centre
Community centre		2 plus 1 per 1,500m^2 GFA
Places of public worship		1 per 20 seats
Function centre		1 per 140m^2 GFA
Recreational Facilities		
Major facilities	1 per 1,500 spectator places	1 per 250 spectator places
Swimming pool	1 per 10 staff	1 per 15m^2 of pool
Other indoor facilities		2 plus 1 per 100m^2 GFA

Source: Liverpool City Council, 2008

Note: parking calculations that are not whole numbers are to be rounded up.

The *Liverpool Development Control Plan* outlines that end of trip facilities are to be provided at the rate of 1 per 10 employee bicycle space. Where less than four facilities are proposed, they should be unisex. Further guidelines are provided with regards to the design and location of these facilities.

Penrith Council

The *Penrith Development Control Plan 2014* does not state the required bicycle parking rates, instead outlines the following three controls in relation to the provision of bicycle parking spaces for developments within the Local Government Area:

- For commercial developments providing employment for 20 people or more, bicycle parking is to be in secure and accessible locations, and provided with weather protection, in accordance with AS2890.3:1993 Bicycle Parking Facilities
- The following associated facilities are to be provided:
  - Change and shower facilities for cyclists are to be conveniently located close to the bicycle storage areas
  - Where the building is to be strata-titled, the bicycle storage facilities and shower/change facilities are to be made available to all occupants of the building
- Applicants should comply with the suggested bicycle parking provision rates for different land use types in the document 'Planning Guidelines for Walking and Cycling' (NSW Government 2004).

AustRoads

Table 0-2 AustRoads bicycle parking provision rates

Land Use	Description	10% Mode Share Rate	
		Short Stay	Long Stay
Dwelling	Dwelling	0.02 spaces per dwelling	Based on average bicycle ownership levels per dwelling
Education	Primary School	-	0.3 spaces per student and staff
	Secondary School		
	Tertiary		
Food and drink premises	Restaurant	0.1 spaces per seat	0.1 spaces per staff
	Takeaway food		
Health services	Hospital	0.1 spaces per patient	0.1 spaces per staff
	Health facility		
Industry	Industry	0.02 spaces per 100m^2 NFA	0.18 spaces per 100m^2 NFA
Office	Office	0.05 spaces per 100m^2 GFA	0.45 spaces per 100m^2 GFA
Places of Assembly	Library	0.1 space per visitor	0.1 space per staff
	Sports facility		
	Community centre		
Retail	Bulky Goods Retail	0.3 spaces per 100m^2 NFA	0.07 spaces per 100m^2 NFA
Shop	Shop	0.4 spaces per 100m^2 NFA	0.1 spaces per 100m^2 NFA
	Department Store	0.3 spaces per 100m^2 NFA	0.07 spaces per 100m^2 NFA
	Supermarket	0.57 spaces per 100m^2 NFA	0.14 spaces per 100m^2 NFA

Source: AustRoads, 2016

Table 0-3 AustRoads end of trip facility provision rates

Number of Showers	Change Rooms
One shower for the first five bicycle spaces or part thereof, plus an additional shower for each 10 bicycle parking spaces thereafter.	One change room or direct access to a communal change room per shower.

Source: AustRoads, 2016

Development Control Plan Minimum Requirements of Car Parking Provision

Liverpool City Council

Table 0-4 Liverpool Council car parking provision rates

Land Use	Description	Requirements
Bulky goods premises		Developments of LFA < 600m^2: 1 space per 30m^2 LFA, Developments of LFA 600 to 3,000m^2: 1 space per 90m^2 LFA, Developments of LFA > 3,000m^2: 1 space per 150m^2 LFA
Child care	Residential and industrial zones	1 space per staff member and 1 space per 10 children
	Business zones	1 space per 35m^2 of LFA
Dwelling houses		2 spaces
Education	Rural, Residential & Industrial Zones	1 space per 1 staff member, plus 1 space per 30 students
	Business zones	1 space per 35m^2 of LFA
Entertainment facility		1 space per 10m^2 LFA of audience area or per 6 seats whichever is the greater
Health services	Health consulting rooms	3 spaces per consulting room or health care professional, whichever is greater, plus 1 space per person employed on the premises, plus any residential requirement
	Medical centre	1 space per 25m^2 of LFA for typical situation
Hotel		1 space per room/unit plus 1 space per 2 employees engaged in accommodation
Industry		1 space per 35m^2 of office LFA, 1 space per 75m^2 factory/warehouse LFA or 1 space per 2 employees, whichever is the greater Warehouse developments of GFA >1000m^2: 1 space per 250sqm in GFA
Multi dwelling housing and residential flat buildings		1 space per small dwelling (<65m^2) or 1 bedroom 1.5 spaces per medium dwelling (65-110m^2) or 2 bedrooms 2 spaces per large dwelling (>110m^2) or 3 + bedrooms 1 visitor car space for every 4 dwellings
Office	Business zones	1 space per 35m^2 of LFA
Places of Public Worship	Rural, Residential & Recreational Zones	1 space per 5m^2 LFA or 1 space per 6 seats, whichever is the greater
	Business Zones	1 space per 35m2 of LFA
	Industrial Zones	1 space per 70m2 of LFA
Recreation Facilities	Recreational & Industrial Zones	Gymnasia, Fitness Centres and Indoor Cricket 1 space per 22m^2 of LFA
	Business Zones	1 space per 20m^2 of LFA
Restaurant	Residential Zones	1 space per 7m^2 of LFA of uses under license OR 1 space per 3 seats, whichever is the greater
	Business Zones	1 space per 20m^2 of LFA
	Industrial Zones	1 space per 7m^2 of LFA of uses under license OR 1 space per 3 seats, whichever is the greater

Land Use	Description	Requirements
Retail		Developments of LFA < 12,000m^2: 1 space per 20m^2 LFA, Developments of LFA 12,000 to 30,000m^2: 1 space per 25m^2 of LFA, Developments of LFA > 30,000m^2: 1 space per 30m^2 LFA
Warehouses		1 space per 35m^2 of office LFA 1 space per 75m^2 factory/warehouse LFA or 1 space per 2 employees, whichever is the greater Warehouse developments of GFA >1000m^2: 1 space per 250m^2 in GFA

Source: Liverpool City Council, 2008

Penrith Council

Table 0-5 Penrith Council car parking provision rates

Land Use	Employee / Residents
Residential	
Dwelling house	2 spaces per dwelling
Dual occupancy	2 spaces per dwelling (2 or more bedrooms)
Multi-dwelling housing	On-site resident parking for each dwelling: 1 car space per 1 bedroom, 1.5 car spaces per 2 bedrooms or part thereof, 2 car spaces per 3 or more bedrooms In addition, visitor parking is to be provided for developments that have 5 or more dwellings: 1 space for every 5 dwellings
Residential flat buildings	On-site resident parking for each dwelling: 1 space per 1 or 2 bedrooms, 2 spaces per 3 or more bedrooms, 1 space per 40 units for service vehicles In addition, visitor parking is to be provided for developments that have 5 or more dwellings: 1 space per every 5 dwellings, or part thereof 1 space for car washing for every 50 units, up to a maximum of 4 spaces per building
Commercial	
Bulky goods premises	1 per 1 per 50m^2 GFA
Business and office premises	St Mary's Town Centre – 1 space per 60m^2 GFA Penrith City Centre – 1 space per 100m^2 GFA All other areas – 1 space per 40m^2 GFA
Childcare centres	1 space per 10 children plus 1 per employee plus provision for any dwelling
Entertainment facilities / function centre	1 space per 3.5 seats or 1 space per 3.5m^2 of GFA, whichever is the greater
Fitness centre including gym	7 spaces per 100m^2 GFA
Health consulting rooms / medical centre	3 spaces per health care professional practising at any one time plus 1 space per receptionist/support staff, plus 1 space per associated dwelling
Hospitals	1 space per 3 beds plus 1 space per 2 employees
Hotel / motel	1 space per unit plus 1 space per manager plus 1 space per 6 employees
Place of public worship	1 space per 4 seats or 1 space per 6m^2 of GFA, whichever is the greater

Land Use	Employee / Residents
Pubs / registered clubs	1 space per 4m^2 of bar floor area plus 1 per 6m^2 lounge and dining room
Restaurants, reception and function rooms	1 space per 6m^2 of seating area, plus 1 space per employee
Retail premises	Penrith City Centre and St Marys Town Centre – 1 space per 30m^2 GFA
Retail premises shop	Supermarkets – 1 space per 10m^2 of floor area that is to be used for retailing activities Other neighbourhood and specialty shops – 1 space per 30m^2 GFA
Industrial	
Freight transport services	1 per transport vehicle present at peak vehicle accumulation plus 1 per 2 employees
Industries	1 space per 75m^2 of gross floor area or 1 space per 2 employees, whichever is the greater
Warehouses or distribution centres	1 space per 100m^2 of GFA

Appendix B: Case studies

Case study: Macquarie Park, City of Ryde

The *City of Ryde Development Control Plan 2014* provides guidelines, objectives and controls for people who wish to carry out development in the Local Government Area. The Development Control Plan is to be read in conjunction with the *Ryde Local Environmental Plan 2014* and any relevant State and Regional Environmental Planning policies.

The Macquarie Park Corridor, situated within the City of Ryde, is comparable in scale to the Sydney CBD but has fewer roads and route choice. The current block size and building footprint lengthens the walk time for foot trips within the precinct and increases reliance on driving, even for short trips.

The future character of Macquarie Park will include intensifying the Commercial Core and other functions of the Corridor, including its residential areas. An effective transport network is required to service anticipated growth within Macquarie Park.

The following sections detail the controls required for developments within the Macquarie Park Corridor.

Parking controls

Vehicle parking

Part 9.3 of the Development Control Plan details the parking controls which apply to non-residential land use developments within the City of Ryde, outlined to meet the following objectives:

- To minimise traffic congestion and ensure adequate traffic safety and management
- To ensure an adequate environmental quality of parking areas (including both safety and amenity)
- To minimise car dependency for commuting and recreational transport use, and to promote alternative means of transport - public transport, bicycling, and walking
- To provide adequate car parking for building users and visitors, depending on building use and proximity to public transport
- To minimise the visual impact of parking when viewed from the public domain and adjoining sites
- To maximise opportunities for consolidated areas of deep soil planting and landscaping
- To reduce congestion in the Macquarie Park Corridor by restricting parking for commercial and industrial development to work towards achieving a 70% private vehicle mode share by 2031.

Special provisions have been made for land within the Macquarie Park Corridor. The parking rates for new floor space or alterations to existing industrial and commercial premises is presented in Table 0-1.

The purpose of the two rates is to take a staged approach to the implementation of reduced car parking rates in the Macquarie Park Corridor. Parking rates for alterations to existing premises are intended to be revised at a later date to be consistent with the parking rates for new floor space.

Table 0-1 Macquarie Park Corridor car parking controls

Industrial and Commercial Land Use	Car Parking Spaces
New Floor Space	A maximum of • 1 space / 60 m^2 or • 1 space / 100 m^2 GFA as shown in Table 0-2
Alterations to Existing Premises	A maximum of • 1 space / 46 m^2 or • 1 space / 70 m^2 or • 1 space / 80 m^2 GFA as shown in Table 0-3

Source: City of Ryde, 2014

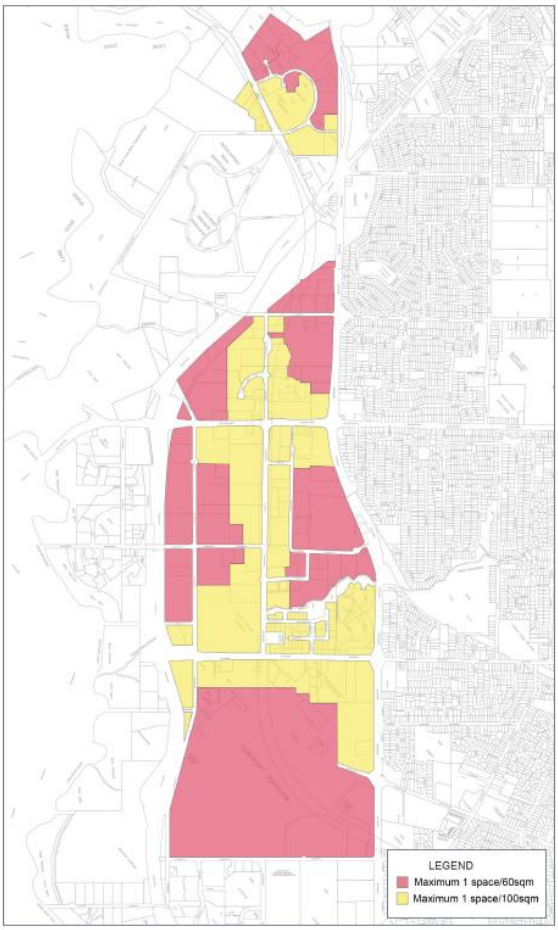


Table 0-2 Parking rates for new premises in the Macquarie Park Corridor

Source: City of Ryde, 2014

Table 0-3 Parking rates for Macquarie Park Corridor alterations / additions

Source: City of Ryde, 2014

Bicycle parking

Part 9.3 of the Development Control Plan details the bicycle parking controls which apply to developments within the Local Government Area:

- In every new building, where the floor space exceeds 600 m^2 GFA (except for dwelling houses and multi-unit housing) provide bicycle parking equivalent to 10% of the required car spaces or part thereof
- Bicycle parking should be designed in accordance with AS 2890.3 Parking facilities - Bicycle Parking Facilities
- Bicycle parking and access should ensure that potential conflicts with vehicles are minimised
- Bicycle parking is to be secure and located undercover with easy access from the street and building entries
- Bicycle parking is to be located in accordance with Safer by Design principles
- End of trip facilities accessible to staff (including at least one shower and change room) are to be provided in all commercial, industrial and retail developments
- Provide secure bicycle storage in all residential developments where the floor space exceeds 600 m^2 GFA except for dwelling houses and multi-unit housing
- Provide signage to Council's satisfaction indicating the location of bicycle parking and bicycle facilities, where provided, in all new buildings.

Access network

Applications within the Macquarie Park Corridor should also refer to Part 4.5 Macquarie Park Corridor of the Development Control Plan. The supporting Access Network Structure Plan within Part 4.5 provides a clear hierarchy of street types, including the extension of existing streets and a network of new streets and pedestrian connections. The supporting sections of the Development Control Plan referring to Macquarie Park access networks are summarised in the following sections.

Streets

The location of new streets within the Macquarie Park Corridor builds upon the existing configuration and layout of Waterloo Road and Talavera Road. These streets establish the main alignment with respect to the main axial configuration of the grid. This grid is supported by the alignment of Lane Cove Road in the north-south axis and establishes the dominant configuration of property boundaries.

Two street types have been identified within the Macquarie Park Corridor. These are based on the predominant use and frontages of existing buildings, the varying intensity of existing patterns of access, circulation and movement and the particular topographic conditions across the corridor:

- 20m wide streets
- 14.5m wide streets.

Prior to redevelopment of sites, landowners are to consult with Council at an early stage in the site planning process for details on location and set-out of new streets.

The following objectives have been outlined for streets within Macquarie Park Corridor developments:

- To provide for new streets to improve pedestrian, cycle and vehicular connectivity within the Macquarie Park Corridor
- To enhance connectivity with surrounding areas and provide new access points into the Macquarie Park Corridor from the surrounding street network
- To establish a clear hierarchy of streets, building on the existing street hierarchy within the Macquarie Park Corridor
- To accommodate increased traffic movement within the Corridor
- To provide additional opportunities for on-street car parking
- To promote active transport including walking, cycling and bus public transport usage
- To provide a street network that responds to the constraints of topography, existing development and subdivision patterns.
- The following street controls apply to developments within the Macquarie Park Corridor:
- Provide new public streets and pedestrian connections in accordance with Table 0-4
- New streets are to be maintained by the landowner until dedicated to Council
- Buildings are not permitted to be located on any proposed street and are required to be setback from proposed streets identified in Table 0-4
- Each site is to provide for co-ordination of proposed streets with neighbouring sites, including level adjustments and detailed plans
- Lighting, paving and street furniture, landscaped setbacks and tree planting are to be provided as required in the *Macquarie Park Corridor Public Domain Technical Manual*
- Provide new streets as follows:
    - 20m wide (typical) streets in accordance with Table 0-5
    - 14.5m wide (typical) streets in accordance with Table 0-6
- Where required by Council, an additional 0.5m footpath is to be provided to augment the 14.5m streets to achieve a minimum 2.5m footpath.

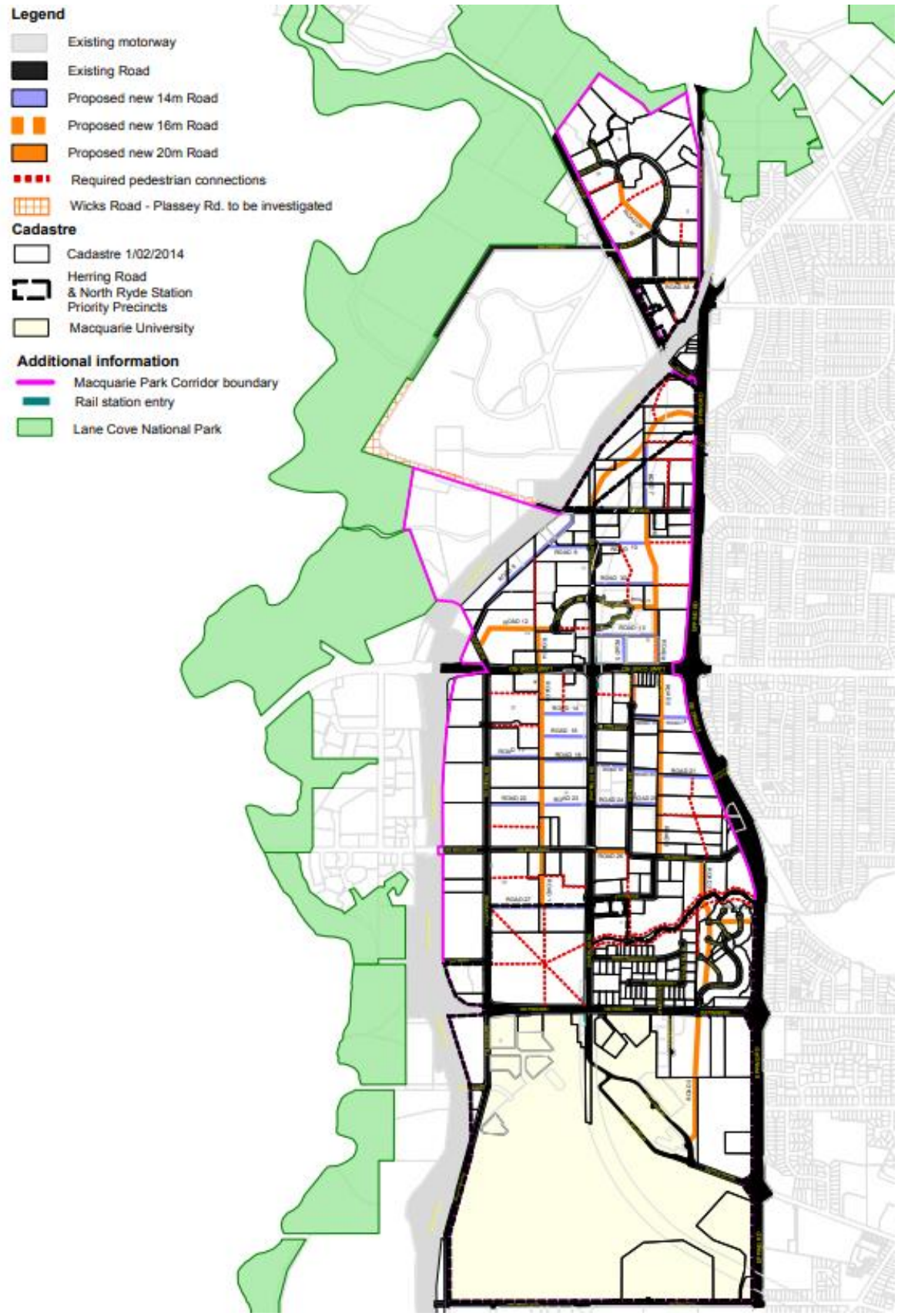


Table 0-4 MCP access network

Source: City of Ryde, 2014

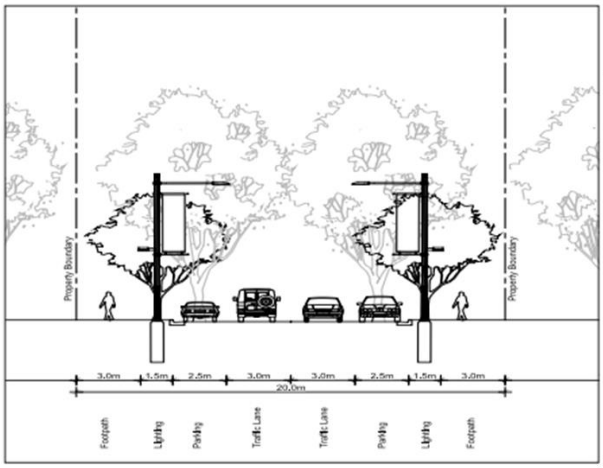


Table 0-5 Typical cross section of 20m wide streets

Source: City of Ryde, 2014

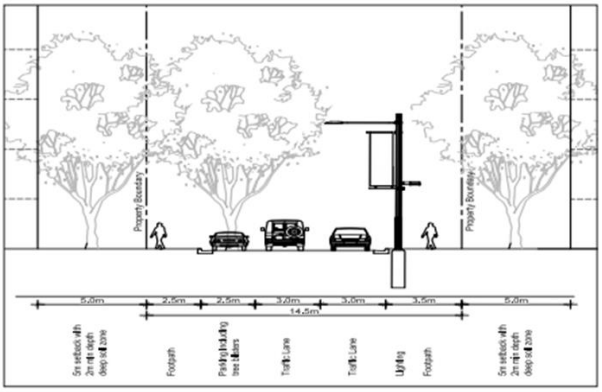


Table 0-6 Typical cross section of 14.5m wide streets

Source: City of Ryde, 2014

Pedestrian connections

Through block connections provide a fine grain overlay to the street and block structure of the Macquarie Park Corridor. Pedestrian through-site links are to be provided as they contribute to the walkability of the Macquarie Park Corridor by providing a useful addition to the street network and walkable destinations such as building entries, shopfronts, courtyards and outdoor dining. The design of through-site links is to maximise pedestrian accessibility, walkability, amenity and safety. The most successful connections are accessible, continuous, well-lit and safe.

The following objectives have been outlined for pedestrian connections within Macquarie Park Corridor developments:

- To expand and enhance the pedestrian network, and increase permeability throughout the Macquarie Park Corridor
- To provide pedestrian connections, across barriers such as the M2 Motorway, and link to pedestrian amenities, such as the Shrimptons Creek active transport path, Macquarie University Station and the bus interchange located at the Macquarie Centre in order to promote walking access to public space and public transport
- To ensure that through block connections are accessible at all times, continuous, well lit, safe
- To provide equitable access for all
- To promote pedestrian activity and contribute to the vitality of the Macquarie Park Corridor
- To encourage active uses adjoining pedestrian ways.

The following pedestrian connections controls apply to developments within the Macquarie Park Corridor:

- Provide pedestrian bridges in accordance with the Access Structure Plan
    - Over the M2 connecting Christie Park to Macquarie Park Corridor
    - Connecting across Shrimptons Creek
- Provide pedestrian connections in accordance with Table 0-4
- Provide pedestrian connections in accordance with Table 0-4
- Pedestrian connections are to:
    - Be a minimum of 6m wide comprising 4m wide paving and 2m wide soft landscaping

  - Be designed with a 2m setback to any building
  - Be publicly accessible at all times
  - Provide a clear sightline from one end to the other for surveillance and accessibility
  - Maximise active frontages pedestrian connections
  - Be designed to consider pedestrian safety and the security of adjacent businesses, particularly at night
  - Extend and enhance the public domain and have a public domain character
  - Be in accordance with Part 9.2 of this Development Control Plan Access for People with Disabilities and designed to provide barrier-free access in accordance with AS1428 and the Disability Discrimination Act 1992
  - Paving shall be in accordance with the Macquarie Park Public Domain Technical Manual
  - Remain in private ownership and be created as Rights-of-Way in favour of Council
- Each site is to provide for co-ordination of pedestrian connections with neighbouring sites, including level adjustments and detailed plans. Detailed plans, sections other material as necessary are to be provided together with the development application.

Bicycle network

Dedicated cycle lanes are to be provided along all existing and new streets within the Macquarie Park Corridor. This integrated cycle strategy maximises the opportunities for cycle circulation within the Corridor. In addition to the street network, active transport paths provide additional connectivity to surrounding areas.

The cycle network maximises interchange opportunities with bus and rail public transport. The strategy is supported by the provision of end of trip facilities.

The following objectives have been outlined for the bicycle network within Macquarie Park Corridor developments:

- To maximise cycle connections to regional cycle routes through and around the Macquarie Park Corridor
- To maximise cycle permeability within the Macquarie Park Corridor
- To create a safe, high quality cycle network
- To maximise interchange opportunities with public transport.

The following bicycle network controls apply to developments within the Macquarie Park Corridor:

- Provide dedicated cycle access in accordance with Ryde Bicycle Strategy 2014
- The Regional Bicycle network is to be implemented as off-street shared cycleways in accordance with the Macquarie Park Public Domain Technical Manual. The Regional Bicycle network comprises of Waterloo Road, Delhi Road, Epping Road, Lane Cove Road, Khartoum Road, the M2 Motorway and Shrimptons Creek pathways
- The Local Bicycle Network is to be implemented as on-street shared ways in accordance with the Macquarie Park Public Domain Technical Manual. The Local Bicycle network comprises of Lyon Park Road, Talavera Road, Wicks Road and proposed new roads in accordance with the Ryde Bicycle Strategy 2014.

Sustainable transport

Travel Demand Management has become a major strategic concern for policy makers, businesses and the public within the Macquarie Park Corridor. The modal split for public transport usage in 2011 was 20%. This plan and other activities by the NSW Government and City of Ryde aim to assist to increase public transport use to 40% by 2031 including:

- Three rail stations have been converted to metro standards as part of Sydney Metro Northwest

- A transport interchange upgrade supported to increase bus usage
- The establishment of the Macquarie Park Transport Management Association
- A review of the parking rates.

The following objectives have been outlined for sustainable transport within Macquarie Park Corridor developments:

- To adopt policies and procedures which encourage transport choice to and within the Macquarie Park Corridor
- To minimise rates of private vehicle use for commuters and business (particularly lone driver) trips and achieve a transport modal shift target of 40% public transport/60% private transport use for the journey to work in particular
- To support public transport, car-sharing, carpooling, walking, taxi, and bicycle users by enhancing amenities and infrastructure
- To more effectively manage the use of private vehicle trips and parking within the area
- Reduce congestion and the cumulative impacts of vehicle emissions upon air quality.

The following sustainable transport controls apply to developments within the Macquarie Park Corridor:

- Public transport
    - Any DA that includes residential development on the Macquarie Centre site is to provide a master plan that demonstrates how the bus interchange upgrade may be achieved
- Travel Plans
    - A Framework Travel Plan is required to be submitted to Council for approval together with a DA for all development that exceed 10,000 m^2 new floor space. The Framework Travel Plan must:
        - Adopt strategies and procedures to meet a 40% public transport/ 60% private transport target for the development for journey-to-work trips, to minimise drive-alone vehicle trips and to encourage transport choice to and within the Macquarie Park Corridor
        - Demonstrate how on-site parking provision and built form design will contribute to the Framework Travel Plan and assist meet the 40% / 60% mode share target for the development for the journey-to-work
        - Demonstrate infrastructure connections to the nearby footpath, bicycle and public transport networks including through site links where required
        - Provide, to council satisfaction, supportive infrastructure for:
            - Public transport passengers to be provided where a new public bus stop or service is required to service the additional demand from the development or meet relevant mode share targets for the development
            - Taxi drop-off areas or parking and carpooling and carshare dedicated parking in publicly accessible locations, within the development site. The number of dedicated parking spaces provided must support relevant mode share targets for the development
            - Walking and cycling (lockers and end of trip facilities)
    - For all development (excluding residential development) the Framework Travel Plan must also:
        - Identify measures in an Action Plan that will implement the 40% public transport/ 60% private transport target for the journey to work, including appointing a Travel Plan coordinator, minimising drive alone trips to work, encouraging walking, cycling, car sharing, carpooling and public transport use

  - Provide a final Travel Plan to Council for certification prior to the issue of any occupation certificate
- Parking rates
  - Bicycle parking and end of trip facilities are to be provided in accordance with the controls outlined in Section 0
  - Parking is to be provided in accordance with the controls outlined in Section 0
- Car share parking
  - All parking spaces for car share schemes are to be:
    - Publicly accessible 24 hours a day seven days per week
    - Located together in the most convenient locations
    - Located near and with access from a public road and integrated with the streetscape through appropriate landscaping where the space is external
    - Designated for use only by car share vehicles by signage
    - Parking spaces for car share schemes located on private land are to be retained as common property by the Owners Corporation of the site.

Case study: City of Sydney

The purpose of this *Sydney Development Control Plan 2012* is to supplement the *Sydney Local Environmental Plan 2012* and provide more detailed provisions to guide development. The Development Control Plan provides controls which guide development in order to:

- Encourage development to respond to its context and is compatible with the existing built environment and public domain
- Recognise and reinforce the distinctive characteristics of the City of Sydney's neighbourhoods and centres
- Build upon the detailed objectives and controls under *Sydney Local Environmental Plan 2012*
- Protect and enhance the public domain
- Achieve the objectives of the City's *Sustainable Sydney 2030 Strategy*
- Encourage design that maintains and enhances the character and heritage significance of heritage items and heritage conservation areas
- Encourage ecologically sustainable development and reduce the impacts of development on the environment.

Transport and parking

The transport and parking section of the Development Control Plan contains provisions for managing the transport and parking needs of the city so that the environmental and economic impacts of private car use can be managed. The provisions also encourage walking, cycling, public transport and car sharing.

The following objectives have been identified for developments within the City of Sydney:

- Ensure that the demand for transport generated by development is managed in a sustainable manner
- Ensure that bike parking is considered in all development and provided in appropriately scaled developments with facilities such as change rooms, showers and secure areas for bike parking
- Establish requirements for car share schemes for the benefit of people living and or working within a development

- Design vehicle access and basement layouts and levels to maximise pedestrian safety and create high quality ground level relationships between the building and the public domain
- Provide accessible car parking.

Provisions with relevant Travel Demand Management measures for development within the City of Sydney are outlined in the following sections.

Managing transport demand

This provision includes measures taken which minimise the need to travel and the length of trips, particularly by car, and encourages travel by the most sustainable mode of transport:

- A Transport Impact Study is required to address the potential impact of the development on surrounding movement systems where the proposed development is
    - A non-residential development equal to or greater than 1,000sqm GFA
    - Car park with more than 200 spaces
    - For 25 or more dwellings
    - In the opinion of the consent authority, likely to generate significant traffic impacts
- Commercial development is to include initiatives to promote walking, cycling and the use of public transport, through the submission of a Green Travel Plan, where the estimated peak trip generation is greater than or equal to
    - 100 vehicles per hour for non-residential development
    - 50 vehicles per hour for residential development within Green Square and shown as Category A on the Land Use and Transport Integration Map
    - 60 vehicles per hour for residential development within Green Square and shown as Category B or C on the Land Use and Transport Integration Map
    - Is likely to generate significant traffic impacts according to Council
- A Transport Access Guide and a strategy for the future availability of the Guide to residents, employees and visitors of a development is to be prepared for all developments except
    - Individual dwelling houses and dual occupancies
    - Residential flat buildings of less than 25 units
    - Individual businesses and services in existing shopping strips and retail centres
    - Developments having a floor area of less than 1,000sqm GFA
    - Businesses employing less than 10 staff.

Bike parking and associated facilities

The following provisions have been outlined in the Development Control Plan relating to bicycle parking and facilities within developments in the City of Sydney:

- All development is to provide on-site bike parking designed in accordance with the relevant Australian Standards for the design criteria of bike parking facilities
- Bike parking spaces for new developments are to be provided in accordance with the rates set out in Table 0-7, except where:
    - An apartment in a residential building has a basement storage area on title that is large enough to accommodate a bike and is no smaller than a Class 1 bike locker, then additional bike parking for that apartment is not required
    - A proposed use is not included in Table 0-7, an applicant is to provide bike facilities to accommodate Council's mode share target for trips by bike as described in the Cycle Strategy and Action Plan 2007-2017
- Secure bike parking facilities are to be provided in accordance with the following:

  - Class 1 bike lockers for occupants of residential buildings
  - Class 2 bike facilities for staff/employees of any land use
  - Class 3 bike rails for visitors of any land use
- Where bike parking for tenants is provided in a basement, it is to be located:
  - On the uppermost level of the basement
  - Close to entry/exit points
  - Subject to security camera surveillance where such security systems exist
- A safe path of travel from bike parking areas to entry/exit points is to be marked
- Access to bike parking areas are to be:
  - A minimum of 1.8m wide to allow a pedestrian and a person on a bike to pass each other and may be shared with vehicles within buildings and at entries to buildings)
  - Accessible via a ramp
  - Clearly identified by signage
  - Accessible via appropriate security or intercom systems
- Bike parking for visitors is to be provided in an accessible on-grade location near a major public entrance to the development and is to be signposted
- For non-residential uses, the following facilities for bike parking are to be provided at the following rates:
  - 1 personal locker for each bike parking space
  - 1 shower and change cubicle for up to 10 bike parking spaces
  - 2 shower and change cubicles for 11 to 20 or more bike parking spaces are provided
  - 2 additional showers and cubicles for each additional 20 bike parking spaces or part thereof
  - Showers and change facilities may be provided in the form of shower and change cubicles in a unisex area in both female and male change rooms
  - Locker, change room and shower facilities are to be located close to the bike parking area, entry and exit points and within an area of security camera surveillance where there are such building security systems.

Table 0-7 City of Sydney on-site bicycle parking rates

Proposed Use	Residents / Employees	Customers / Visitors
Residential		
Residential accommodation	1 per dwelling	1 per 10 dwellings
Commercial		
Office or business premises	1 per 150 m^2 GFA	1 per 400 m^2 GFA
Bulky goods premises	1 per 600 m^2 GFA	1 per 1,00 m^2 GFA
Shop, restaurant or café	1 per 250 m^2 GFA	2 plus 1 per 100 m^2 over 100 m^2 GFA
Shopping centre	1 per 200 m^2 GFA	1 per 300 m^2 sales GFA
Pub	1 per 100 m^2 GFA	1 per 100 m^2 GFA
Entertainment facility	-	Greater of 1 per 15 seats or 1 per 40 m^2 GFA
Place of public worship		

Proposed Use	Residents / Employees	Customers / Visitors
Industry		
Industry, warehouse or distribution centre	1 per 10 staff	-
Community		
Child care centre	1 per 10 staff	2 per centre
Medical centres, health consulting rooms	1 per 5 practitioners / professionals	1 per 200 m^2 GFA
Tertiary educational institution	1 per 10 staff and 1 per 10 students	-
Swimming pool	1 per 10 staff	2 per 20 m^2 of pool area
Library	1 per 10 staff	2 plus 1 per 200 m^2 GFA
Art gallery or museum	1 per 1,000 m^2 GFA	1 per 200 m^2

Source: City of Sydney, 2012

Vehicle parking

The following provisions have been outlined in the Development Control Plan relating to vehicle parking within developments in the City of Sydney:

- Where the development comprises a land use not specified in the *Sydney Local Environmental Plan 2012*, the proposed rate of car parking provision is to be justified via a Parking and Access Report
- For residential buildings, car parking spaces are to be allocated to dwelling units in accordance with parking rates in the *Sydney Local Environmental Plan 2012* and are to be a part lot to a dwelling unit in a strata plan so that they remain connected to the dwelling
- All visitor spaces are to be grouped together in the most convenient locations relative to car parking area entrances, pedestrian lifts and access points and are to be separately marked and clearly sign-posted
- Development applications are to indicate how visitor parking is to be accessed, including arrangements for access into a secure area if proposed
- New developments are to achieve high quality ground level relationships between the buildings and all public domain interfaces even where this will result in inefficient basement car parking layouts including spilt basement levels or additional excavation
- Where a residential development proposes less than the maximum number of car parking spaces permissible under *Sydney Local Environmental Plan 2012*, the reduction in the number of spaces should be shared proportionally between resident parking spaces and visitor parking spaces
- Development proposing less than the maximum number of parking spaces permissible under *Sydney Local Environmental Plan 2012* must adjust the number of visitor parking spaces in accordance with the reduction of total car parking spaces.

Division 2 of the *Sydney Local Environmental Plan 2012* outlines the maximum parking rates for a number of land uses, including land categories A to F.