
Western Parkland City Authority

Bradfield City Centre
Master Plan Application

Transport Management Accessibility Plan Report

Prepared by AECOM

October 2023

wpca.sydney

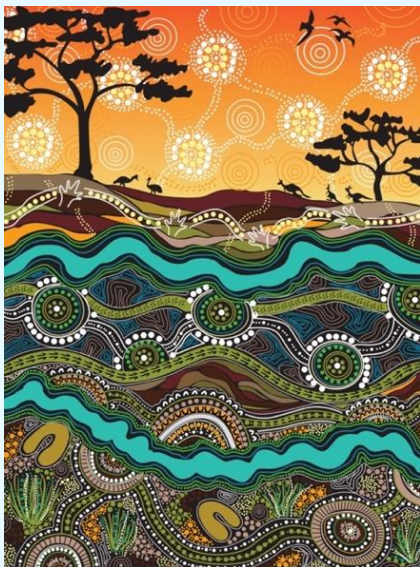
Acknowledgement of Country

Aboriginal people have had a continuous connection with the Country encompassed by the Western Parkland City (the Parkland City) from time immemorial. They have cared for Country and lived in deep alignment with this important landscape, sharing and practicing culture while using it as a space for movement and trade.

We Acknowledge that four groups have primary custodial care obligations for the area: Dharug/Darug, Dharawal/Tharawal, Gundungurra/Gundungara and Darkinjung. We also Acknowledge others who have passed through this Country for trade and care purposes: Coastal Sydney people, Wiradjuri and Yuin.

Western Sydney is home to the highest number of Aboriginal people in any region in Australia. Diverse, strong, and connected Aboriginal communities have established their families in this area over generations, even if their connection to Country exists elsewhere. This offers an important opportunity for the future of the Parkland City.

Ensuring that Aboriginal communities, their culture, and obligations for Country are considered and promoted will be vital for the future of the Parkland City. A unique opportunity exists to establish a platform for two-way knowledge sharing, to elevate Country and to learn from cultural practices that will create a truly unique and vibrant place for all.



Garungarung Murri Murri Nuru
(Beautiful Grass Country)

Artwork created by Dalmarrri artists Jason Douglas and Trevor Eastwood for the Western Parkland City Authority

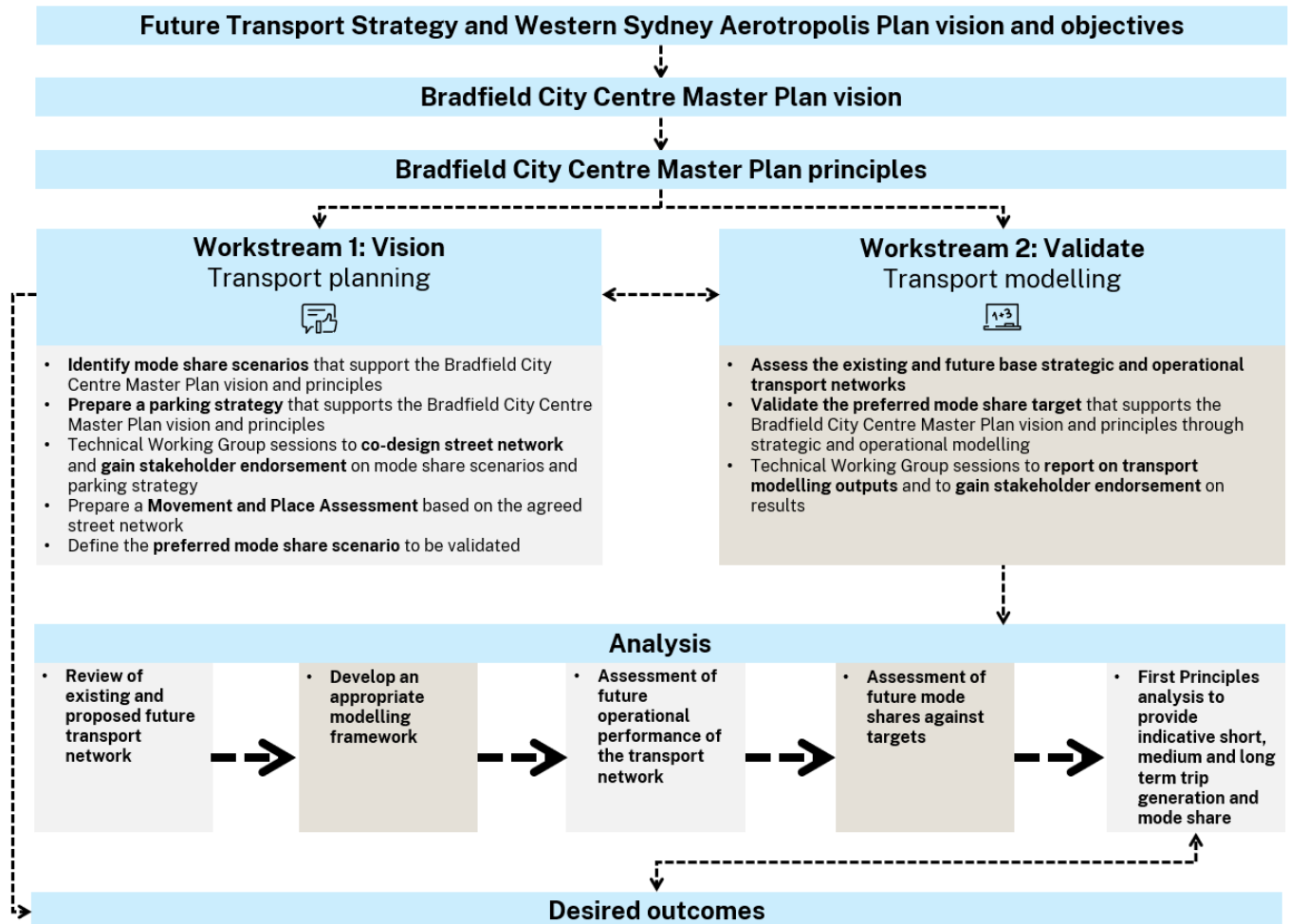
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Executive Summary

Scope of assessment

The Bradfield City Centre Transport Management Accessibility Plan (TMAP) has been prepared in accordance with the State Environmental Planning Policy (Precincts – Western Parkland City 2021 (Western Parkland City SEPP), Aerotropolis Precinct Plan and Master Plan Guidelines which establish the optional master planning process for land within the Western Sydney Aerotropolis. The Bradfield City Centre TMAP is a technical document covering transport, traffic, parking, and connectivity. It supports the Bradfield City Centre Master Plan Report.

A summary of the methodology used to develop this TMAP is shown below.



The Department of Planning and Environment has issued Master Plan Requirements (MPRs) to the Authority for the preparation of a Master Plan for Bradfield City Centre. This plan has been prepared to address the relevant transport, traffic, parking, and connectivity MPRs.

Prioritising measures and initiatives

The reference column in the following tables reflects the prioritisation of each measure or initiative for each modal grouping (walking and cycling, public transport and the road network). Prioritisation aligns with the modal access hierarchy.

The modal access hierarchy aligns with the intention of the Western Sydney Aerotropolis Precinct Plan to embrace a 'beyond business-as-usual approach' in the medium to long term,' which prioritises the use of sustainable transport modes such as walking, cycling and public transport over private vehicles.

Implementation plan

An implementation plan has been prepared for walking and cycling, public transport and the road network over each of the short, medium, and long term. A summary of the long term (2036-2056) implementation plan is shown overleaf.

Each implementation plan aims to define an impact, challenge or issue for walking and cycling, public transport and the road network in the Bradfield City Centre. A corresponding proposed measure or initiative is outlined to address the impact, challenge, or issue.

The proposed measure or initiative is then allocated to a lead stakeholder with partners identified to assist with delivery.

Note: The initiatives mentioned below are contingent on funding availability.

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Walking and cycling				
1	Network of footpaths	Optimise pedestrian connectivity to planned buildings, places and public transport infrastructure and services, and other communities outside the Bradfield City Centre (such as other parts of the Western Sydney Aerotropolis) for people walking and cycling	WPCA	Liverpool City Council, TfNSW, Sydney Metro
2	Network of dedicated cycling infrastructure	Embed sustainable travel options early by delivering dedicated cycling infrastructure to connect with other communities outside the Bradfield City Centre (sch as other parts of the Western Sydney Aerotropolis) to cater for all types of users	WPCA	Liverpool City Council, TfNSW, Sydney Metro
3	Enable access to blue-green grid for recreational walking and cycling	Optimise pedestrian and cyclist connectivity to blue-green grid to build on city-making place qualities	WPCA	TfNSW, Liverpool City Council
Public transport				
1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver rail extensions to Campbelltown-Macarthur and Schofields • Deliver metro railway to Bradfield City Centre via Western Sydney Airport • Deliver possible future rail extension from Bradfield to Glenfield • Deliver planned increase in service frequencies for rapid, frequent, and local bus routes • Bus priority measures along other parts of the Bradfield City Centre	Sydney Metro and TfNSW	WPCA, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
		including the Transit Boulevard to be considered in TfNSW's Access and Servicing Plan • Deliver a street network and associated bus infrastructure to support operation of high-quality bus services		
Road network				
1	Connectivity within Bradfield City Centre limits	• Develop an overarching Travel Demand Management Strategy for Bradfield City Centre • Deliver Bradfield City Centre street network in line with Bradfield City Centre Master Plan staging • Consider implementing travel demand management measures to reduce car usage	WPCA	TfNSW, Liverpool City Council
2	Develop an Access and Servicing Plan for Bradfield City Centre	• Develop an Access and Servicing Plan for the Bradfield City Centre within 12-18 months of an approved Master Plan. The scope of the plan will be developed by TfNSW with key stakeholders and will include, as minimum: • The refinement of road designs to inform subsequent planning applications • Consideration of intersection treatments • Bus servicing and operational needs (local and rapid services) to ensure identified roads are bus capable in line with TfNSW standards • Freight Access and Loading • Active transport connections • Network prioritisation and staging elements • Consideration of future speed zones • The conversion of the transit boulevard to bus only • Development of individual Green Travel Plans for future development sites post-TMAP and Master Plan to examine how mode share targets can be achieved • Integration of public transport and land use for accommodating bus stops on BLMR if high-density development is to be adequately served by public transport	TfNSW	WPCA, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
		- Examine potential to convert the Transit Boulevard Bus Zone to bus only as it may not be feasible to operate with mixed traffic from day one - Review street designs, tree canopy priorities and street carriageway space to ensure efficient bus and city centre traffic operations and pedestrian friendly environments - Review the need and options for service vehicles access to the Metro station		
Parking				
1	Demand for parking	Prioritise delivery of off-street parking over on-street parking to future proof for electric vehicles and their charging requirements	WPCA	TfNSW, Liverpool City Council
2	Demand for Park and Ride	Reallocate and repurpose commuter carparks out of Bradfield City Centre and encourage use of sustainable transport modes	Sydney Metro	WPCA, TfNSW, Liverpool City Council
Freight and servicing				
1	Demand for servicing and loading	Provide sufficient off-street and on-street space to optimise servicing and loading arrangements.	WPCA	TfNSW, Liverpool City Council
2	Travel Demand Management for freight and servicing	Increase efficiency by consolidating freight activity – for example, each truck can service multiple destinations.	WPCA	TfNSW, Liverpool City Council
3	Freight Hubs	Recommend implementing freight hubs to consolidate freight activity for Bradfield.	WPCA	TfNSW, Liverpool City Council

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Glossary of Terms

AS	Australian Standard
Aerotropolis	Western Sydney Aerotropolis
BC Act	Biodiversity Conservation Act 2016
CIV	Capital Investment Value
DA	Development Application
DP	Deposited Plan
DPE	Department of Planning and Environment
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
LEP	Local Environmental Plan
LGA	Local Government Area
NSW Government	State Government for NSW
SEPP	State Environmental Planning Policy

References

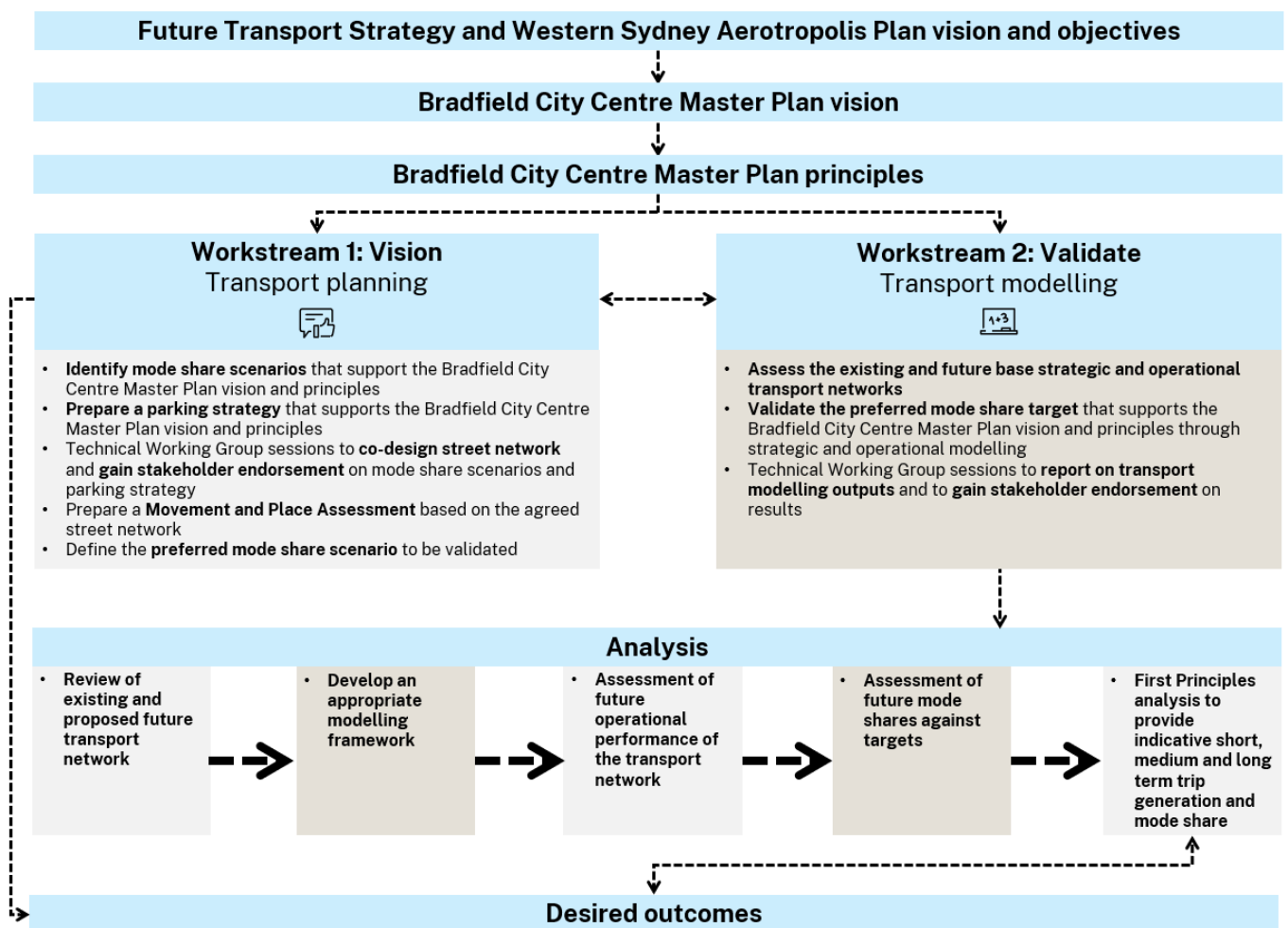
References have been provided throughout this document with sources credited under the relevant figure or table

1 Introduction

1.1 Background

The Bradfield City Centre Transport Management Accessibility Plan (TMAP) has been prepared in accordance with the State Environmental Planning Policy (Precincts – Western Parkland City 2021 (Western Parkland City SEPP), Precinct Plan and Master Plan Guidelines which establish the optional master planning process for land within the Western Sydney Aerotropolis. A summary of the methodology used to develop this TMAP is shown in **Figure 1**.

Figure 1 Methodology used to develop TMAP



1.2 Purpose of this report

This report accompanies the Master Plan Application for the Bradfield City Centre submitted to the Department of Planning Environment (DPE) pursuant to Part 7 of *State Environmental Planning Policy (Western Sydney Aerotropolis)* (WSA SEPP).

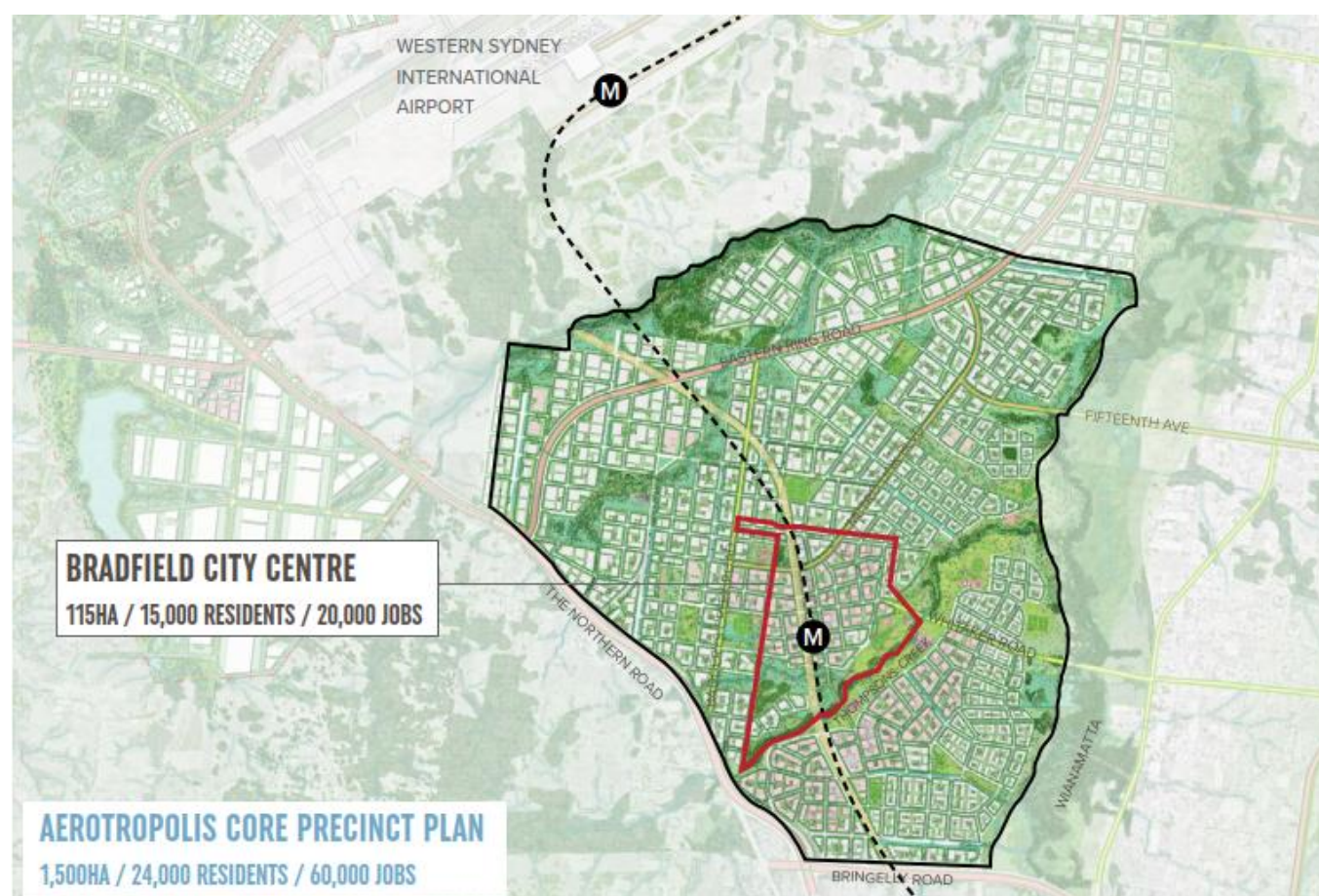
The Western Parkland City Authority (WPCA) is seeking to secure Master Plan approval for a mixed-use development, comprising industrial, commercial, open space and residential uses for a 114.6-hectare site centred around a new Sydney Metro station.

This report has been prepared to address transport planning and modelling and specifically to respond to the relevant Secretary's Master Plan Requirements issued in October 2022 as outlined in **Section 1.4**.

The technical report addresses transport planning and modelling and provides relevant information to ensure all considerations are appropriately identified and assessed. The following sections introduce the site, context, and nature of the Bradfield City Centre Master Plan.

The TMAP study area is illustrated in **Figure 2**.

Figure 2 Bradfield City Centre study area (outlined in red)



1.3 Western Sydney Aerotropolis

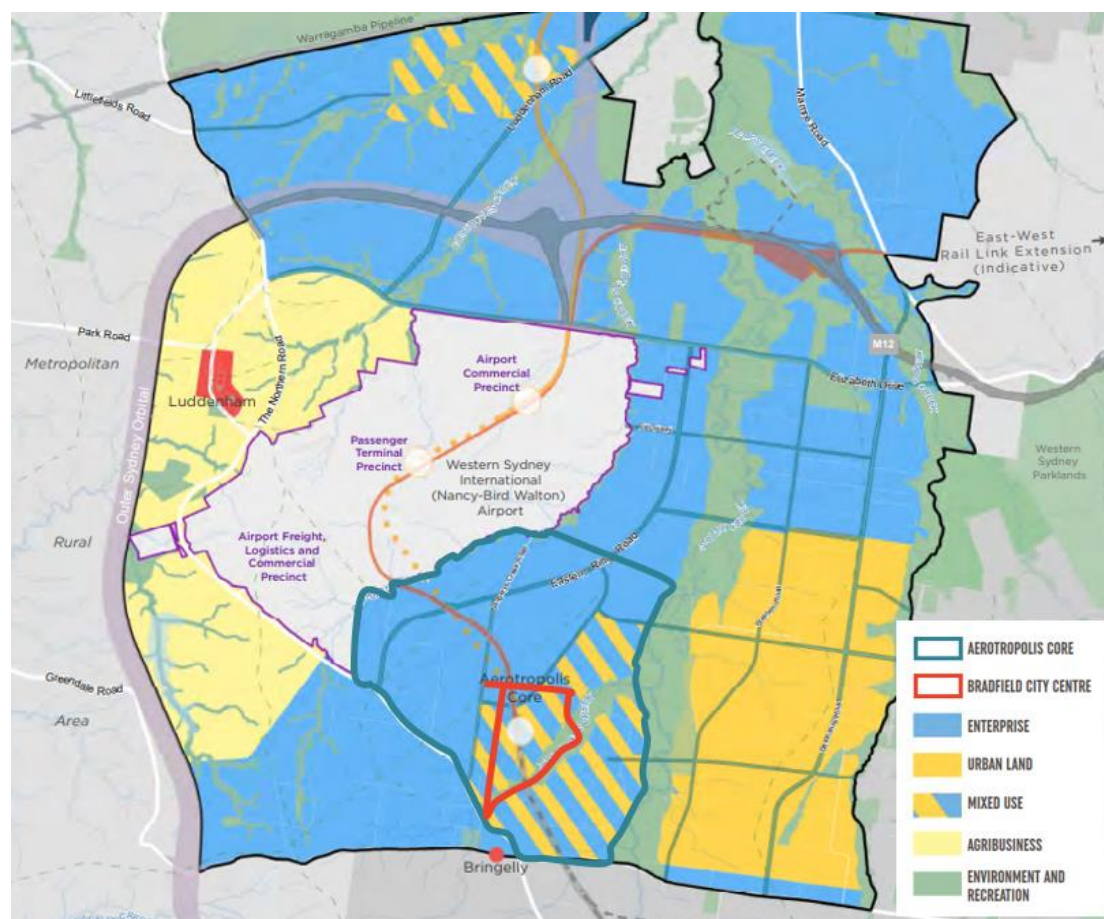
The Western Sydney Aerotropolis is an 11,000-hectare region set to become Sydney's third city (the Western Parkland City), and the gateway and economic powerhouse of Western Sydney.

The Aerotropolis is comprised of the new international airport surrounded by ten (10) precincts which focus on advanced manufacturing, technology, research, training, education, freight and logistics, agribusiness, and mixed-use development.

The first phase of the Western Sydney Aerotropolis Planning Package was finalised in September 2020, and includes the Western Sydney Aerotropolis Plan (WSAP), Western Sydney Aerotropolis (Aerotropolis) State Environmental Planning Policy (SEPP) and the Aerotropolis Development Control Plan (DCP) Phase 1. The Aerotropolis Precinct Plans and the Aerotropolis DCP Phase 2 have informed planning for the Bradfield City Centre.

On 1 March 2022, the Western Sydney Aerotropolis SEPP was consolidated into the Western Parkland City SEPP. The Precinct SEPPs are based on the strategic planning vision in Sydney outlined in the 'Greater Sydney Regional Plan – A Metropolis of Three Cities'. The 1,382-hectare Aerotropolis Core Precinct is one of six (6) precincts identified for early activation. Within this precinct, the first stage of city building, and the focus of this Master Plan, is the 114.6-hectare Bradfield City Centre. It is shown in **Figure 3**.

Figure 3 Western Sydney Aerotropolis



Source: Western Sydney Aerotropolis Plan, 2020

1.4 Master Plan Requirements

The Department of Planning and Environment have issued Master Plan Requirements (MPRs) to the Western Parkland City Authority for the preparation of a Master Plan for Bradfield City Centre. This plan has been prepared to address the following MPRs.

Table 1 Master Plan Requirements

Reference	Transport planning matters	Where addressed
Master Plan Requirements 11. Transport, traffic, parking, and connectivity	The draft master plan must include a transport and accessibility impact assessment, including an integrated package of transport plans, modelling, analysis, and reports which sets out the following:	This report addresses the requirement
Master Plan Requirements 11. Transport, traffic, parking, and connectivity	Predicted transport mode share split, and demonstrate design, strategic and statutory initiatives that will give rise to significant mode shift away from driving towards public and active transport, delivering on the urban, social, and economic benefits catalysed by the Sydney Metro infrastructure, from city opening date and beyond	The requirement is addressed in Section 5.4 , Section 6.5, Section 7.1 and Section 7.2.6
	Required road infrastructure, intersections, and traffic management measures, including details of funding and delivery; an analysis of existing and predicted peak traffic movements and intersection performance	The requirement is addressed in Section 6.9, Section 7.1.7, Section 7.2 and Section 8.
	Measures to promote walking, cycling and sustainable travel choices	The requirement is addressed in Section 6.7, Section 7.1.3, Section 7.1.4, Section 7.2 and Section 8
	Connections between the road network shown in the Precinct Plan and the planned road network for the Bradfield City Centre	The requirement is addressed in Section 6.9, Section 7.1.7, Section 7.2 and Section 8.
	Land use benefits as a result of the Metro Station, including walking catchments, and master plan outcomes for the station precinct	The requirement is addressed in Section 7.1.2
	Staging of transport infrastructure and services	The requirement is addressed in Section 6.4
	Protection of planned transport corridors, including: Planning control measures Consideration of the station precinct, walking catchments and transport integration needs	The Master Plan for Bradfield City Centre and the broader transport network is consistent and aligns with the SEPP corridors provided by TfNSW and DPE.

Reference	Transport planning matters	Where addressed
	South West Rail Link extension corridor Future arterial and regional roads Unused portions of corridors which are still to be retained in terms of staging, sequencing, and the consideration of appropriate surrounding land uses. Documentation supporting the draft master plan consistent with the Sydney Metro Corridor Protection Guidelines Changes proposed to the corridor alignments (and accepted by the responsible state and local authority) should be incorporated into the draft master plan Protected future corridors should be considered as at-grade future infrastructure consistent with the protected Future Infrastructure Corridors	The requirement is addressed in Section 6.4
	Movement framework throughout the site – both vehicular and pedestrian, which should demonstrate how the draft master plan will result in an improvement of the Precinct Plan	The requirement is addressed in Section 7
	The draft master plan is to provide an analysis of the adjoining sites to ensure a consistent provision of necessary infrastructure: Identification of new key access links to the east, linking Bradfield to the remainder of the Aerotropolis Core (and further east to Rossmore, Kemps Creek and Austral), with road corridor designs that provide continuity An examination as to how the eastern road and infrastructure links between Bradfield and the remainder of the Aerotropolis Core on the eastern side of Thompsons Creek are to be identified, and a discussion of funding Demonstrate how both vehicular and pedestrian access may be provided across Moore Gully and Thompsons Creek in such a way that will not impact negatively on pedestrian amenity and permeability.	The requirement is addressed in Section 6.9, Section 7.1.3, Section 7.1.4, Section 7.1.7, Section 7.2 and Section 8.
	The draft master plan must also address requirements outlined in the Western Sydney Aerotropolis TfNSW Master Plan Requirements (Attachment B) and be prepared in accordance with relevant TfNSW policies and guidelines. Additionally, the draft master plan must consider comments from Liverpool City Council, Sydney Metro and Sydney Water (Attachment A).	Refer to responses in Table 2 of this report.
	The draft master plan must also address site specific comments and requirements from TfNSW when they are received by the Department.	Refer to responses in Table 2 of this report.

This plan addresses requirements outlined in the *Western Sydney Aerotropolis TfNSW Master Plan Requirements* and was prepared in accordance with relevant TfNSW policies and guidelines. This plan also addresses comments from Sydney Metro and Liverpool City Council.

Table 2 Western Sydney Aerotropolis TfNSW Master Plan Requirements and agency comments

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
Engagement with Transport for NSW	Outcome: Maintain effective and transparent engagement with master planners and other key stakeholders. Requirements: Upfront liaison with TfNSW and Sydney Metro is jointly recommended before commencing detailed investigations. This is particularly important where changes to a precinct plan and transport network are proposed. TfNSW and Sydney Metro will nominate key points of contact for ongoing engagement with Master Planners. The need for specific transport working groups will be considered by TfNSW and Sydney Metro through the Technical Assurance Panel (TAP) process TfNSW will involve probity advisors in relevant discussions consistent with its probity plan or as required by the TAP.	TfNSW Probity - Stakeholder Meeting Protocols 2022	WPCA has engaged and consulted with TfNSW and Sydney Metro during the development of the Master Plan for Bradfield City Centre as part of formal Transport Working Group meetings.
Strategic Alignment	Outcome: Demonstrate consistency with transport planning principles in the Western Sydney Aerotropolis planning package and key transport policies. Requirements: Demonstrate how identified transport planning principles and requirements are	Future Transport 2056 and supporting strategies Network Planning in Precincts Guide TfNSW Road User Space Allocation Policy	Transport planning principles from the Western Sydney Aerotropolis planning package. The requirements are addressed in Section 2.3, Section 3, Section

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	addressed in the master plan to inform future development applications Identify any proposed changes to a Precinct Plan that would impact the transport network and provide detailed justification for these changes against relevant planning principles TfNSW expects that a master plan will further refine the transport network as shown in the Precinct Plan. Any changes to the network will require detailed justification as part of the transport impact assessment. Requirements (continued): Provide a comprehensive review of how relevant transport principles will inform the master planning process and their interrelationship with other land use principles and requirements. to deliver effective transport networks within a movement and place context. Proposed variations to the Precinct Plan should demonstrate consistency with relevant transport planning principles		5, Section 6.10
Sydney Metro Place Making & Transport Integration	Outcome: Ensure development enhances Sydney Metro places and precincts, integrates with the station vision for place, character and function and contributes positively through land use mix and distribution. Requirements: Design approach and elements - Develop a Design Guideline outlining integration with Transport infrastructure including Sydney Metro stations, interchanges, precincts, and transport corridors. To include, but not limited to:	Western Sydney PIC (Place based Infrastructure Compact) Program Practitioner's Guide to Movement and Place Western Sydney Street Design Guidelines Sydney Metro Underground Corridor Protection Technical	WPCA has engaged and consulted with TfNSW and Sydney Metro regarding places and precincts within close proximity of Aerotropolis Station. The requirements are addressed in Section 3, Section 5, Section 3.5

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Alignment with placemaking objectives for the WS Aerotropolis	Guidelines	and Section 7.1
	Alignment with Sydney Metro's vision for place, character and function for the station location and surrounding precinct	Sydney Metro at Grade and Elevated Sections Guideline.	
	Alignment with Sydney Metro modal hierarchy by providing for access to Sydney Metro stations and interchanges from more equitable and sustainable modes		
	Alignment with Sydney Metro interchange distance to gateline requirements for transport interchange infrastructure		
	Guiding principles:		
	Contribution of land use mix and distribution in creating positive Sydney Metro places		
	Contribution to activation across day and night		
	Protecting sensitive interfaces and active frontages		
	Role of Sydney Metro places in a masterplan place hierarchy		
	Guiding principles (continued):		
	Solar access and wind impact to station plazas, precincts, and interchanges, addressing winter and summer customer comfort.		
	Coordination of cultural, heritage and public art elements		
	Customer and place management during construction phases		
	Coordination of construction activities with Sydney Metro construction,		

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	operations, and maintenance. Details of the Design Guideline are to be confirmed through consultation with TfNSW and Sydney Metro, will as a minimum include: Sub-division design Public space hierarchy Connecting with country Co-locate key land uses along priority walking, cycling and public transport corridors Places are to be delivered in alignment with the guidelines and policies. Places are to be accessible and well-connected to other important places in the area. Separate high-speed and high volumes of private vehicle movement from places.		
Network Planning and Staging	Outcomes: Ensure a safe, integrated transport network that can be delivered in stages and prioritises walking, cycling and public transport. The transport network contributes to achieving the modal split targets identified in the Western Sydney Aerotropolis planning package. Requirements: Network and Design Principles	Network Planning in Precincts Guide Transport Model Selection Guidance Practitioner's Guide to Road Network and Corridor Planning TfNSW Road User Space Allocation Policy and Procedure.	WPCA has incorporated the transport planning principles and mode share targets from the Western Sydney Aerotropolis planning package into the Master Plan for Bradfield City Centre. The requirements are

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Without limiting the guidance provided in the Western Sydney Aerotropolis planning package and other relevant transport policies, the master plan needs to demonstrate:	Freight and Servicing Last Mile Toolkit	addressed in Section 5 and Section 6.10
	Network and Design Principles (continued)	NSW Freight and Ports Plan	
	The appropriate allocation of road space based on identified modal priorities and transport investigations to develop the master plan.	NSW Movement and Place Framework	
	An urban structure that supports successful places and prioritises active and public transport access over private vehicles.	Better Placed Aligning Movement and Place	
	Outcomes that align with desired balance of movement and place objectives.		
	The sequencing of development and infrastructure to optimise outcomes around infrastructure investment and delivery.		
	Effective and upfront access to walking, cycling and public transport as part of a staged approach to development and infrastructure delivery		
	Highlight key linkages and demonstrate benefits - Link all centres to, and prioritisation of modes across the Masterplan site and integrated with the broader network		
	Servicing arrangements		
	Integrate with other precincts and the wider transport network using multiple access points		
	Identify priority and local walking, cycling and Public Transport corridors that provide safe, convenient, and connected access to, from and within precincts and centres		
	Supporting Transport Assessment and Modelling techniques		

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Demonstration of the above needs to be supported by outputs from the use of appropriate transport modelling and GIS tools agreed with TfNSW. Depending on the particular circumstances strategic and operational modelling may be required to investigate options that best deliver against the network vision as outlined above for all transport modes. Use of strategic modelling tools (PTPM) may also be of use to analyse desired mode share for public and active transport for each Masterplan area from the outset and in intervals relevant to the sequencing of development and infrastructure to test strategies to maximise active and public transport. Supporting Transport Assessment and Modelling techniques (continued) Early discussion with TfNSW on this matter should be arranged and documented. Any mesoscopic or operational modelling should be undertaken in accordance with the former Roads and Maritime Services' Traffic Modelling Guidelines, or the relevant guidance that might replace this during the course of the masterplan development, with any departures from those guidelines agreed with TfNSW. Base models should be validated and calibrated and reviewed by Transport for NSW prior to assessing future year Masterplan / network plan scenarios.		
Travel Demand Management and Mode Share Analysis	Outcomes: Travel Plans are provided to include measures that reduce car dependency for new developments by encouraging sustainable transport modes. The Masterplan should demonstrate how desired sustainable transport outcomes will be achieved as documented in the Western Sydney Aerotropolis planning package. The mode share targets should be used as the basis of the initial scenario.	Western Sydney Aerotropolis Transport Planning and Modelling AECOM report Western Sydney Aerotropolis DCP Phase 2 2021 (DCP parking rates) Western Sydney Engineering	A Travel Demand Management Strategy has been prepared in Section 7.2. This section provides eight measures and 14 interventions to effect the desired mode

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Mode share to active and public transport should be maximised, and the Masterplan must look for opportunities for achieving this outcome. For example, this may mean investigating providing fewer parking spaces than outlined in the relevant DCP. Requirements: Masterplan design should ensure that time taken to access and use active and public transport modes should be as little as feasibly possible. The Masterplan should outline commitment to a range of travel demand management measures which should be discussed and agreed with TfNSW and the relevant local council. As part of the operational modelling undertaken to support the network planning function, the mode share targets outlined in the WSA planning package should be used as a starting point to inform fundamental Requirements (continued): assumptions around trip rates for various modes of transport for the various land uses within the Masterplan area. Testing of the mode share assumptions can be undertaken using the available strategic modelling tools (PTPM - as outlined in the network planning section). Note that some initial testing of mode share in one of the masterplan areas indicates that with the planned and committed public transport infrastructure in place, higher use of sustainable modes of transport can be achieved with resultant less reliance on the use of private motor vehicles.	Design Manual Western Sydney Street Design Guidelines	share targets.
Bus Servicing	Outcome: The Masterplan must demonstrate the integration of public transport within the	Bus Priority Infrastructure Planning Toolbox Guidelines for Public Transport	The Master Plan for Bradfield City Centre has been prepared to align with future bus

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	master plan area, with neighbouring areas and the wider network. Requirements: Further consultation with TfNSW to be undertaken with regard to Bus Servicing. Suitable bus routes, indicative bus location, bus priority and suitable street design have been discussed with TNSW and further discussion will occur as needed. Ensure rational and serviceable land releases with sufficient road reserve. Local and Neighbourhood centres are to be located on or adjacent to bus routes. Primary school and high school sites are to be accessible by buses. On-road priority for public transport is provided on streets that connect centres where public transport services will run.	Capable Infrastructure in Greenfield Sites Guidelines for the Planning of Bus Layover Parking Transport Planning Resources	service planning options, bus stops and indicative bus stop locations The requirements are addressed in Section 6.4.3, Section 7.1.6.
Freight	Outcome: A plan freight servicing needs of development within the broader transport network. Requirements: Describe the legislative and policy context, as far as it is relevant to the issue Requirements (continued): Identify, describe, and quantify (if possible) the concurrence provision requirements for development in or adjacent (25m) to transport corridors, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts	Freight and Servicing Last Mile Toolkit NSW Freight and Ports Plan TfNSW Heavy Vehicle Access Policy Framework (2018) Western Sydney Aerotropolis DCP Phase 2 2021 - provides specify requirements for loading dock provision https://www.transport.nsw.gov.au/operations/freight-hub	The requirements are addressed in Section 1.1, Section 3.5

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Demonstrate how potential impacts will be avoided (through design, or construction or operation methodologies) Ensure adequate land has been preserved to accommodate the Transport Corridor(s) and the Transport Corridor(s) are correctly located Consideration of noise and vibration outputs from the Transport Corridor and design adjacent land use and buildings accordingly		
Major Transport Corridors	Outcomes: Masterplan is consistent with the Transport Corridor(s) as identified in any Environmental Planning Instrument (EPI). Adequate land has been preserved for the relevant Transport Corridor(s) Appropriate land uses are proposed adjacent to Transport Corridor(s) Staging responds and accommodates the delivery of Transport Corridor(s) Works are compatible with existing infrastructure and future Transport Corridor(s) as identified in any EPI. Requirements: Describe the legislative and policy context, as far as it is relevant to the issue Identify, describe, and quantify (if possible) the concurrence provision requirements for development in or adjacent (25m) to transport corridors, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts Demonstrate how potential impacts will be avoided (through design, or construction or operation methodologies) Ensure adequate land has been preserved to accommodate the Transport	https://roads-waterways.transport.nsw.gov.au/business-industry/partners-suppliers/private-development/rail/about/future-rail.html	The Master Plan for Bradfield City Centre and the broader transport network is consistent and aligns with the SEPP corridors provided by TfNSW and DPE.

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	Corridor(s) and the Transport Corridor(s) are correctly located		
	Requirements (continued):		
	Consideration of noise and vibration outputs from the Transport Corridor and design adjacent land use and buildings accordingly		
Walking and Cycling	Outcome: Pedestrians and cyclists' needs are prioritised and enabled from the outset and during all stages of development. Requirements: In consultation with TfNSW's Active Transport team, ensure: Adherence to the Western Sydney Aerotropolis planning package, Western Sydney Aerotropolis DCP Phase 2 2021 Alignment with the Western Sydney Street Design Guidelines Alignment with TfNSW's Walking Space Guide, Cycleway Design Toolbox and other applicable TfNSW policies, strategies, planning tools and guides for walking and cycling	TfNSW Cycleway Design Toolbox TfNSW Walking Space Guide Western Sydney Street Design Guidelines TfNSW Network Planning in Precincts Guide	The Master Plan for Bradfield City Centre has prioritised pedestrians and cyclists over other modes, as per the modal hierarchy shown in Section 1.1
Infrastructure Implementation and Delivery Strategy	Outcome: As required by DPE Master Plan Guidelines and in consultation with TfNSW.	Master Plan Guidelines	WPCA continues to engage with TfNSW on this Master Plan Request.
Sydney Metro request (P19)	Movement and Place Sydney Metro notes that the master plan should apply a Movement and Place	Practitioner's Guide to Movement and Place	The Master Plan has given due consideration to the

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	lens, define a place vision, and demonstrate how the proposed design responds to both the place vision and transport corridor functions. In support of this approach, the master plan should demonstrate co-design/engagement efforts made with Sydney Metro, TfNSW and Council during the master planning process, to define and design streets and transport corridors that provide access and movement functions into the city centre, responding to the place vision, policy objectives and requirements. Movement and Place (continued): As such, the Master Plan must give due consideration to the following documents and supporting toolkits, and provide justification where discernible departures from the following guidance are proposed: Practitioner's Guide to Movement and Place Walking Space Guide Cycleway Design Toolkit Bus Priority Infrastructure Planning Toolbox Last Mile Freight Toolkit Great Public Spaces Toolkit	Walking Space Guide Cycleway Design Toolkit Bus Priority Infrastructure Planning Toolbox Last Mile Freight Toolkit Great Public Spaces Toolkit	proposed guidance documents. The Practitioner's Guide to Movement and Place is applied in Section 3.5. The Master Plan was developed to align with the Walking Space Guide, the Bus Priority Infrastructure Planning Toolbox, and the Great Public Spaces Toolkit. The Cycleway Design Toolbox is utilised in Section 7.1.4. The Last Mile Freight Toolkit is utilised in Section 6.10.
Sydney Metro request (P20)	Transport, Traffic, Parking and Access Assessment As acknowledged in the letter from WPCA dated 1 July 2022, Sydney Metro request that the Master Plan Requirements be amended to include specific requirement to demonstrate design, strategic and statutory initiatives that will give rise to significant mode shift away from driving towards public and active transport, delivering on the urban, social, and economic benefits catalysed by		Low emissions vehicle zones and traffic free zones have not been precluded from future planning as shared zones and quiet streets have been identified in

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
	the Sydney Metro infrastructure, from city opening date and beyond. In particular, the assessment should consider measures such as: Removal of minimum parking requirements Imposition of maximum parking requirements/ parking capacity cap Priced parking framework Low Emissions Vehicle Zone/Cordon Transport, Traffic, Parking and Access Assessment (continued) Street design elements that prioritise active transport and public transport Traffic circulation plan that limits general through traffic to selected key routes Low traffic/ traffic-free zones Design initiatives that support transport interchange with Sydney Metro and future rail extensions First/ last mile freight servicing strategy, including potential for consolidated city freight hub Travel demand management strategies for future occupants / land uses that actively disincentivises driving to Bradfield and actively incentivises PT and AT use.		the Master Plan A parking strategy has been prepared in Section 7.2.6 The parking strategy has removed all reference to minimum parking requirements.
Schools Infrastructure NSW request	Additions to item 8 – Transport, Traffic Parking and Access SINSW request that transport planning consider the following matters:	Movement and Place Frameworks Built Form Indicators	Movement and Place is a constant theme throughout the TMAP and identifies street-

Transport planning matters	Outcomes and requirements	Transport guidelines	Where addressed
(P24)	Utilise the Movement and Place Frameworks (MAPF) Built Form Indicators for school sites. Identify indicative School Walking Catchment and User Paths Preferred active and public transport routes – including share paths and cycle lanes, bus servicing strategy		based classifications in Section 3.5.
Schools Infrastructure NSW request (P24)	SINSW request that transport planning consider the following matters: The MAPF's core 'Amenity and Use' and 'Primary Schools' indicators are of particular importance to SINSW, as these encourage urban designers to consider the impact on adjacent places/uses, as well as emphasising movement that supports place. The 'Primary Schools' indicator provides two specific metrics to judge the effect of infrastructure on the accessibility of public schools in an area; these being walkability and public transport access. These metrics require designers to assess whether proposed infrastructure facilitates access to primary school facilities (or public transport connections to schools) or whether it exacerbates gaps in the network. SINSW request that transport planning consider the following matters (continued): The primary school focused MAPF amenity indicator can be accessed via the link below: https://www.movementandplace.nsw.gov.au/place-and-network/builtenvironment-indicators/primary-schools	Movement and Place Frameworks Built Form Indicators	Movement and Place is a constant theme throughout the TMAP and identifies street-based classifications in Section 3.5.

1.5 Co-designing the TMAP

Weekly meetings to discuss traffic and transport considerations for the Bradfield City Centre Master Plan were held between Transport for NSW, Western Parkland City Authority and AECOM during January 2021 to March 2021.

Furthermore, AECOM has met fortnightly with a Transport Working Group comprising representatives from the Western Parkland City Authority, Transport for NSW (Land Use and Development, Corridor Identification and Protection, Integrated Planning, Advanced Analytics Insights, Sydney Metro, Western Parkland City – Transport Planning, Planning and Programs, Western Sydney Rapid Bus teams) and Liverpool City Council from April 2021 to October 2021 and from June 2022 to July 2022. This formal Transport Working Group co-chaired by Transport for NSW and WPCA provided subject matter advice on the Bradfield City Centre Master Plan including mode share targets, parking rates, trip generation rates, strategic modelling, and operational modelling issues to ensure a whole of government position is taken on transport outcomes as part of the TMAP process.

AECOM has also met on several occasions with the broader group of consultants and subject matter experts from Transport for NSW engaged to support the preparation of documents to support the Master Plan application for the Bradfield City Centre. This stakeholder group workshopped feedback on the Master Plan to ensure it is robust and responds to both Country and Place.

1.6 Report Structure

This report has been structured as follows:

- **Section 2** details the strategic context which supports the Bradfield City Centre with a range of policies and planning initiatives across all levels of Government, different institutions, and stakeholders.
- **Section 3** identifies the vision and guiding themes for the Western Parkland City and Bradfield City Centre Master Plan
- **Section 3** defines the site location and context that has been used to develop the Bradfield City Centre Master Plan.
- **Section 4** articulates the current transport context for the Bradfield City Centre including existing transport infrastructure and services and existing travel patterns.
- **Section 5** outlines the TMAP approach, the modelling methodology and approach and the transport forecasting and modelling process that was used to validate the agreed mode share targets for the Bradfield City Centre.
- **Section 6** details the technical assessment that was used to validate the agreed mode share targets for the Bradfield City Centre and assesses the impact on the transport network.
- **Section 7** articulates the transport strategy for the Bradfield City Centre, details future transport infrastructure and services and identifies measures and initiatives that will influence travel patterns and behaviour.
- **Section 8** summarises the transport-related recommendations to optimise outcomes for the Bradfield City Centre.

2 Strategic planning context

2.1 Strategic Alignment

Table 3 presents the key plans and policies prepared by the NSW Government. These plans and policies have shaped the strategic context in which the Bradfield City Centre Master Plan and this TMAP have been prepared. For example, the TMAP leverages the strategic themes identified in the Greater Sydney Services and Infrastructure Plan (such as committed and proposed transport infrastructure) as a baseline for the Vision and Validate approach. Similarly, the Practitioner's Guide to Movement and Place has informed the preparation of a comprehensive Movement and Place Assessment by carefully considering the road hierarchy, loading, servicing and how road space can be allocated to enhance the Place function on key streets within Bradfield City Centre.

Table 3 State Government plans and policies relevant to Bradfield City Centre

Plan/Policy	Prepared by	Overview / Key Information	Content relevant to Bradfield
Premier's Priorities	NSW Government	Five policy directives to address key issues for the people of NSW.	Increasing the proportion of homes in urban areas within 10 minutes-walk of green open and public space by 10% by 2023.
Future Transport Strategy	Transport for NSW	The Future Transport Strategy sets the direction for continuing to improve every part of the transport system for the benefit of customers, the community, and the economy.	Three desired outcomes: 1 – Connecting our customers' whole lives 2 – Successful places for communities 3 – Enabling economic activity
Greater Sydney Services and Infrastructure Plan	Transport for NSW	Transport blueprint designed to facilitate the growth of Greater Sydney over the next 40 years.	Development of committed and proposed transport infrastructure to support the 30-minute city concept over the next 0-10 years, 10-20 and 20+ years.
Greater Sydney Region Plan	Greater Cities Commission	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.	Development of infrastructure within Western Parkland City to support key objectives including the 30-minute city concept (objectives 1, 5 7, 12, 14, 15, 16, 20, 26, 31 and 32).
State Infrastructure Strategy 2018	Infrastructure NSW	Assesses infrastructure problems and solutions and provides recommendations to grow the state economy, enhance productivity and improve living standards.	Six cross-sectional strategic directions to be applied across NSW, as well as specific recommendations for Transport outlined in the strategy including (recommendations 48, 50, 53, 57, 69, 70 and 71).

Plan/Policy	Prepared by	Overview / Key Information	Content relevant to Bradfield
NSW Design Policy (Better Placed)	Government Architect NSW	Informs seven design objectives for the NSW built environment.	Objectives for good design 1 – Better fit 2 – Better performance 3 – Better for community 4 – Better for people 5 – Better working 6 – Better value 7 – Better look and feel
Practitioner's Guide to Movement and Place	Government Architect NSW	Objective to achieve roads and streets that contribute to the network of public space within a location and are enhanced by transport with appropriate space allocation to move people and goods safely and efficiently and connect places together.	Identification of different corridors within the framework which define their desired function and built form, including Civic Spaces, Local Streets, Main Streets and Main Roads (refer to Section 3.5 for Movement and Place assessment).
Beyond the Pavement	Transport for NSW	Outlines the urban design approach and procedures for road and maritime infrastructure planning, design, and construction.	Adoption and recognition of the four physical urban design objectives that should be achieved on all road and maritime infrastructure within Bradfield.
The Six Cities Region: Discussion Paper	NSW Government	Aims to stimulate discussion about how to plan a Six Cities region that benefits people and highlights global economic opportunities.	Adoption of the plan to deliver safe, healthy, sustainable, accessible, and integrated passenger transport.
Active Transport Strategy	Transport for NSW	Provide longer term ambitions accompanied by five-year priority moves to guide planning, investment, and priority actions for active transport across NSW.	Adoption of the plan to deliver safe and accessible active travel connections
Strategic Cycleway Corridor – Western Parkland City	Transport for NSW	Provide the foundation for establishing safe and convenient cross-city cycleway connections that better connect centres, precincts, and places, and enables councils to progressively expand local bike networks.	Identification of strategic cycleway corridors to connect to Bradfield City centre.

2.2 Western Parkland City

The Bradfield City Centre is located in the Western Parkland City and under the **Western Sydney City Deal** and **Western City District Plan**, development within this region will involve a highly collaborative approach between different levels of government and the private sector. **Table 4** presents the key themes of the Western Sydney City Deal and Western City District Plan.

Table 4 Overview of Western Sydney City Deal and Western City District Plan

Overview / Purpose	Vision	Relevant Commitments
Western Sydney City Deal		
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 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.	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
		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
		PH3: Transport and water infrastructure models.
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 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.	Planning Priorities:
		W1: Planning for a city supported by infrastructure
	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.	W2: Working through collaboration
		W7: Establishing the land use and transport structure to deliver a liveable, productive, and sustainable Western Parkland City
		W13: Creating a Parkland city urban structure and identity, with South Creek as a defining special element
		W15: Increasing urban tree canopy cover and delivering Green Grid connections
		W18: Delivering high quality open space

2.3 Western Sydney Aerotropolis

The Western Sydney Aerotropolis forms the broader precinct to be developed around Western Sydney International airport, with sub-precincts including the Aerotropolis Core (location of Bradfield City Centre), Agribusiness, Badgerys Creek, and Northern Gateway. **Table 5** presents the key land-use plans of relevance to Bradfield City Centre.

Table 5 Overview of key land-use plans for Western Sydney Aerotropolis

Plan Name	Prepared by	Overview / Key Information	Content relevant to Bradfield City Centre
Western Sydney Aerotropolis Plan	Department of Planning & Environment	Vision and planning framework for the Aerotropolis as a gateway to Australia and Greater Sydney, built around the Airport.	Transport network planning principles, including PR1, PR2, PR3, PR4, PR5, SU2, IC1, IC2, IC5, IC6, IC8, LV1, LV4, LV6, LV7, LV9, LV11 and LV15
State Environmental Planning Policy (Precincts – Western Parkland City) 2021	Department of Planning & Environment	NSW legislative document which will provide statutory weight to the planning and development of land around the Airport and will implement the <i>Western Sydney Aerotropolis Plan</i>	Transport corridors
			Sydney Metro - Western Sydney Airport (Major Infrastructure Corridor)
			Eastern Ring Road – Primary Arterial Road (60m)
			Metro Link Road which forms part of Fifteenth Avenue (45m)
			Badgerys Creek Road, north-south route connecting to the east-west route running parallel to Fifteenth Avenue – Arterial Road (40m)
Western Sydney Aerotropolis Development Control Plan	Department of Planning & Environment	Aims to achieve connectivity, liveability, productive and sustainability, and guides the preparation of masterplans and Development Applications for Bradfield City Centre.	Development controls including those relating to Aboriginal cultural heritage, landscaping, street network functions and layout, active transport network, travel demand management and parking.
Western Sydney Street Design Guidelines	Western Sydney Planning Partnership and Aspect Studios	Address the historical imbalance between designing streets for vehicles rather than all users, and aim to create streets with improved environmental, social and health outcomes for all street users.	Development of road network in accordance with the design guidelines for different street types (six local street types and four mixed-use street types), with a focus on creating greener, cooler, and safer streets for Western Sydney.

Plan Name	Prepared by	Overview / Key Information	Content relevant to Bradfield City Centre
Liverpool Local Strategic Planning Statement	Liverpool City Council	Outlines 16 planning priorities, and 74 corresponding actions, aligning with the four key themes of connectivity, productivity, liveability, and sustainability.	Planning Priority 2 – A rapid smart transit link between Liverpool and the Airport
			Planning Priority 3 – Accessible and connected suburbs
			Planning Priority 13 – A 24-hour Airport growing to reach its potential
Western Sydney Aerotropolis Precinct Plans	Department of Planning & Environment	Development and implementation of two key sets of enablers to support delivery against the <i>Western Sydney Aerotropolis Plan</i> vision and objectives.	Recognition of Transport Policies and Strategies, and Transport Infrastructure and Services as two key enablers for development within the Aerotropolis.

2.4 Planned transport infrastructure and services

The policies and plans identified in this section have established the strategic parameters for the delivery of new transport infrastructure and services in the Western Parkland City. New public transport infrastructure (such as Sydney Metro - Western Sydney Airport, the South West Rail Link Extension to Aerotropolis and the Western Sydney Rapid Bus Program) have enabled the Western Parkland City Authority to be bold in its aspirations for Bradfield.

2.4.1 Planned rail network

The planned rail network is the backbone of the Greater Sydney future transport network. A combination of Sydney Metro and Sydney Trains projects are planned across Greater Sydney to boost accessibility and connectivity. **Table 6** identifies the staging and headways for planned rail projects in the Western Parkland City. This is discussed in more detail in **Section 6.4.1**.

Table 6 Staging and headways for planned rail projects in the Western Parkland City

Project	2026	2036	2056
Metro North West Line	✓ (to Tallawong) 3-minute headways	✓ (to Tallawong) 3-minute headways	✓ (to Schofields) 3-minute headways
Sydney Metro - Western Sydney Airport	✓ (Aerotropolis to St Marys) 5-minute headways	✓ (Aerotropolis to St Marys) 5-minute headways	✓ (Schofields to Macarthur possible future extensions) 5-minute headways
South West Rail Link Extension to Aerotropolis		✓ 6-minute headways	✓ 6-minute headways

Source: Based on network assumptions taken from the TfNSW Western Sydney Rapid Bus project, and subsequently updated and agreed with TfNSW and Sydney Metro (2021). Assumptions are indicative for future planning and are subject to decision of Government.

2.4.2 Planned bus network

The planned bus network will enhance public transport accessibility and connectivity across the Greater Sydney future transport network. A two tiered-bus network will enable different bus products to service different user groups. For example, the rapid bus network will provide fast, frequent, and efficient connections between Metropolitan Centres, Metropolitan Clusters, and the Western Sydney Aerotropolis. **Table 7** identifies the staging and estimated headways for rapid bus routes in the Western Parkland City. This is discussed in more detail in **Section 6.4.3**.

Table 7 Staging and headways for rapid bus routes in the Western Parkland City

Rapid bus route	2026	2036	2056
Penrith to Aerotropolis	✓ 15-minute headways	✓ 10-minute headways	✓ 5-minute headways
Liverpool to Aerotropolis	✓ 15-minute headways	✓ 10-minute headways	✓ 5-minute headways
Campbelltown to Aerotropolis	✓ 15-minute headways	✓ 10 minute headways	✓ 5-minute headways
Blacktown to Science Park/ Luddenham Metro Station	✓ 15-minute headways	✓ 10-minute headways	✓ 5-minute headways
Parramatta to Bonnyrigg	✓ 15-minute headways	✓ 10-minute headways	✓ 5-minute headways

Source: Western Sydney Rapid Bus Project Modelling Report (2021)

Note: The planned bus services are subject to future customer demand and funding availability.

The secondary bus network will play a pivotal role in connecting Metropolitan Centres, Metropolitan Clusters, and intermediate neighbourhoods. The secondary bus network will have more stops than the rapid bus network. Table 8 identifies the staging and estimated headways for secondary bus routes in the Western Parkland City.

Table 8 Staging and headways for secondary bus routes in the Western Parkland City

Secondary bus route	2026	2036	2056
Warragamba to Aerotropolis	✓ 60-minute headways	✓ 30-minute headways	✓ 20-minute headways
Aerotropolis to Sydney Science Park		✓ 30-minute headways	✓ 20-minute headways
Aerotropolis to Mt Druitt	✓ 30-minute headways	✓ 20-minute headways	✓ 10-minute headways
Oran Park to Aerotropolis		✓ 30-minute headways	✓ 20-minute headways
Leppington to Aerotropolis		✓ 30-minute headways	✓ 20-minute headways

Source: Western Sydney Rapid Bus Project Modelling Report (2021)

Note: Initial public transport assumptions are indicative for future planning and are subject to decision of Government including the availability of funding.

2.4.3 Planned road network

The planned road network will enable the efficient movement of freight and goods. It will also give people who have no option but to drive the appropriate provisions to do so. **Table 9** provides an overview of the planned road projects and staging in the Western Parkland City. This is discussed in detail in **Section 6.4.2**.

Table 9 Planned road projects in the Western Parkland City

Description	2026	2036	2056
The Northern Road widening (north)	✓	✓	✓
Luddenham Drive Widening (Sydney Science Park)	✓	✓	✓
M12 Motorway (Aerotropolis to M7 Motorway)	✓	✓	✓
Elizabeth Drive widening (west)	✓	✓	✓
WSIA Access	✓	✓	✓
The Northern Road realignment	✓	✓	✓
Devonshire Road widening	✓	✓	✓

Description	2026	2036	2056
Bringelly Road widening	✓	✓	✓
Campbelltown Road widening (and extension)	✓	✓	✓
The Northern Road widening (south)	✓	✓	✓
Southwest Growth Centre	✓	✓	✓
Outer Sydney Orbital (OSO) Stage 1		✓	✓
Luddenham Drive Widening (to OSO)		✓	✓
Elizabeth Drive widening (east)		✓	✓
Western Sydney Airport access (2036)		✓	✓
Fifteenth Avenue widening		✓	✓
Eastern Ring Road		✓	✓

Source: Western Sydney Rapid Bus Project Modelling Report (2021)

Note: The above planned road projects would be subject to future government prioritisation and investment decisions.

3 Bradfield City Centre

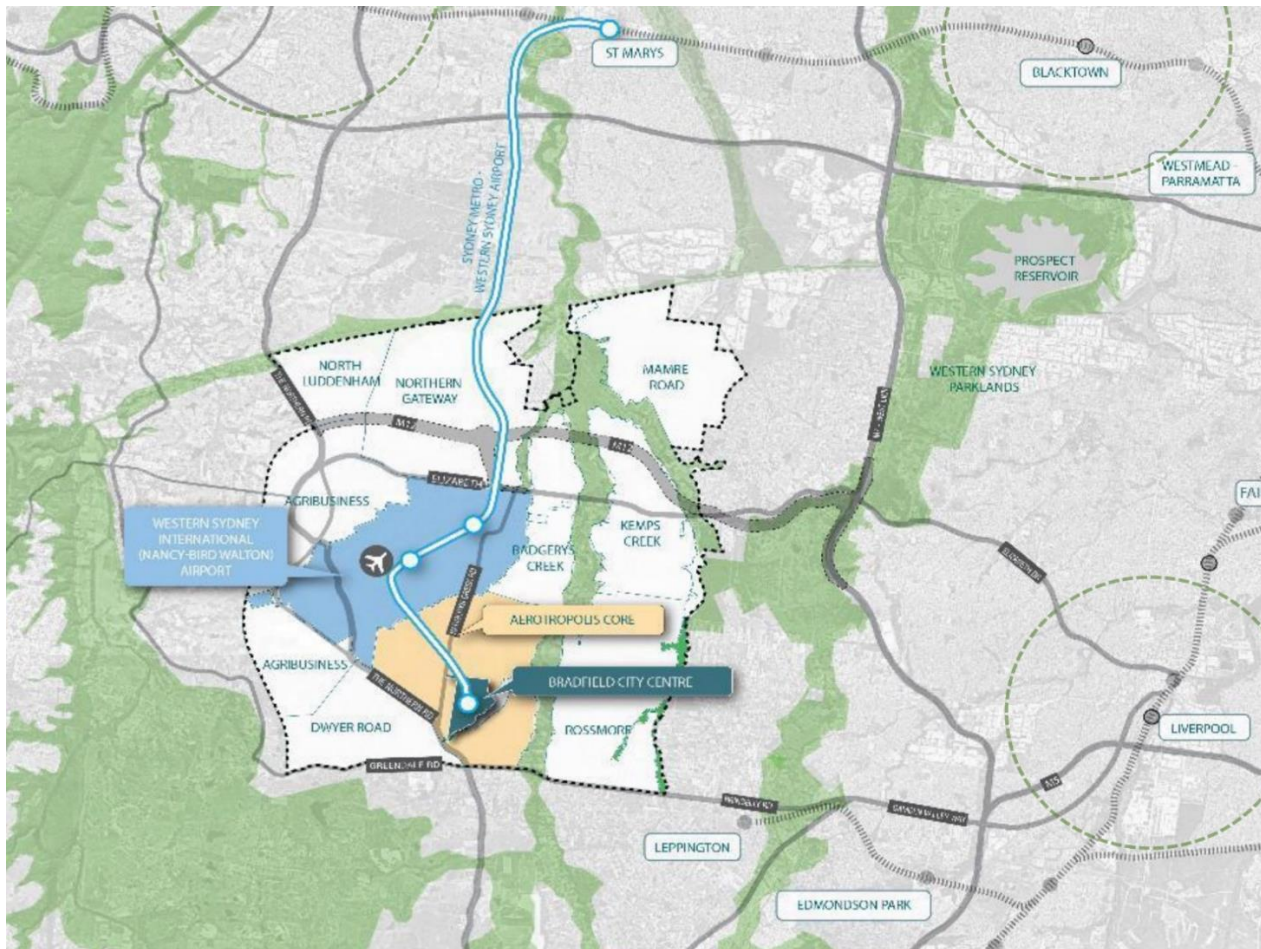
3.1 Strategic Context

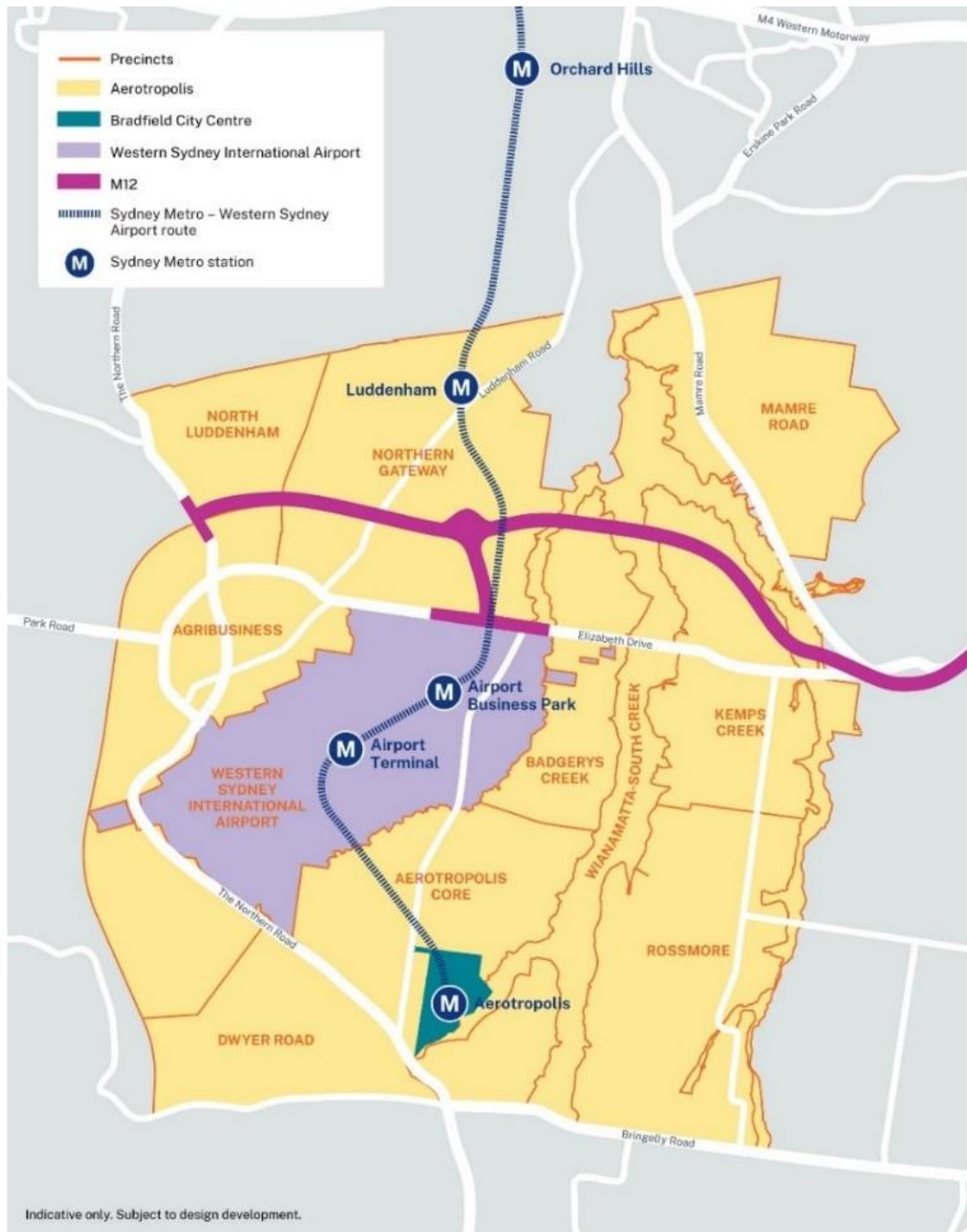
The Bradfield City Centre is located to the south-east of the new Western Sydney Airport at the intersection of Badgerys Creek Road and The Northern Road (see **Figure 4** below).

The Sydney Metro - Western Sydney Airport line runs through the site, providing connections from the key centres of St Marys through to stations at Orchard Hills, Luddenham, Airport Business Park, Airport Terminal and the Aerotropolis which is located within the site.

The site is surrounded by several key roads and infrastructure corridors including Bringelly Road, Badgerys Creek Road, Elizabeth Drive, M12 and The Northern Road. Set on natural waterways, Bradfield City Centre presents a rare opportunity to showcase the best urban design and to create a thriving, blue and green, connected City in which Australians will want to live, learn, and work. The Bradfield City Centre will be a beautiful and sustainable 22nd Century City. It will foster the innovation, industry and technology needed to sustain the broader Aerotropolis and fast track economic prosperity across the Western Parkland City.

Figure 4 Strategic Context





3.2 The Master Plan Site

The street address for Bradfield City Centre is 215 Badgerys Creek Road, Bringelly (the Site) within the Liverpool Council Local Government Area (LGA). The site is legally described as Lot 3101 DP 1282964 and has an area of 114.6 hectares, with road access to Badgerys Creek Road at the north-western corner of it. The site includes land that is located within the Aerotropolis Core and Wianamatta-South Creek Precincts of the Western Sydney Aerotropolis. The Site is outlined in **Figure 5** below.

The Site is predominantly zoned Mixed Use under the Western Parkland City SEPP, with a small portion of Enterprise zoned land located on the north-western corner of the site. The site includes Environment and Recreation zoned land mostly along Thompsons Creek.

Figure 5 Master Plan Site

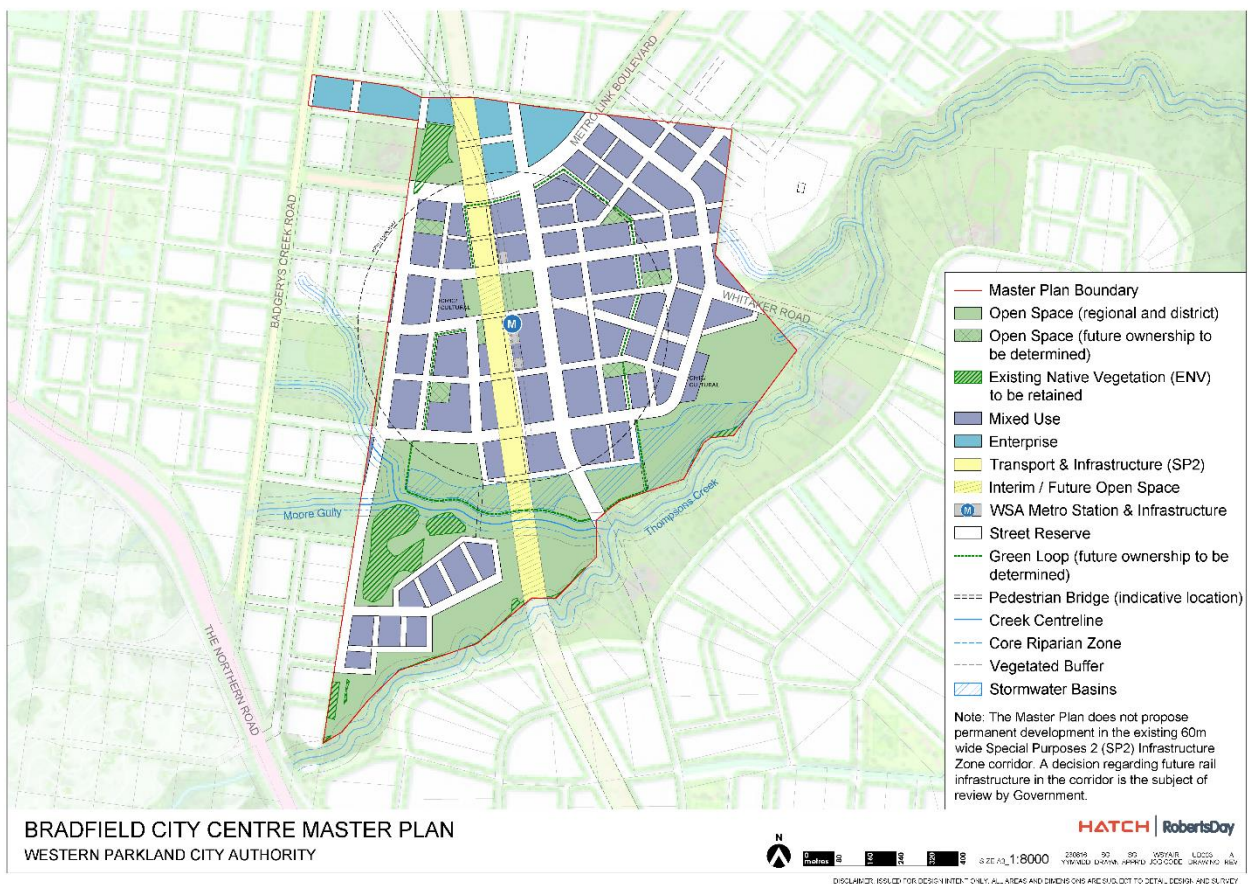


3.3 The Bradfield City Centre Master Plan

The WPCA has prepared a Master Plan (**Figure 6** below) in accordance with the DPE Master Plan Requirements. The Master Plan sets out a framework for future development within the Bradfield City Centre which includes:

- Road network, key connectors to adjoining land and the regional road network (existing and future)
- Block structure
- Indicative open space network
- Sustainability strategy
- Social and infrastructure strategy
- Arts and culture strategy
- Infrastructure servicing strategy

Figure 6 Master Plan



Source: Hatch Roberts Day, 16th August 2023

The Master Plan does not propose permanent development in the existing 60m wide Special Purposes 2 (SP2) Infrastructure Zone corridor. A decision regarding future rail infrastructure in the corridor is the subject of review by Government.

3.4 The proposal

The Bradfield City Centre Master Plan is intended to facilitate the growth of the centre over time. Three planning horizons have been established for the purpose of planning for and assessing the development of the Master Plan as a part of the TMAP process, as presented in **Table 10**.

Table 10 Planning and development horizons

Phase	Indicative Timeframe	Estimated employment	Estimated residential population	Total Gross Floor Area
Immediate	2026	1,000 – 1,200 jobs	0 residents	48,500 sqm
Stage 1	2036	8,000 – 8,300 jobs	3,000 – 3,100 residents	341,000 sqm
Long-term	2056	20,000 – 24,000 jobs	15,000 – 15,200 residents	1,258,000 sqm

Note: The table above is an estimate of the population and employment forecast used for the purposes of modelling only.

The master plan has the capacity to accommodate ~10,000 residential dwellings. In accordance with NSW Government policy a proportion of the residential dwellings will be affordable housing. The timing and delivery of residential dwellings will be subject to market demand and future master plan reviews that consider the impact of additional population on the scope and timing of social and physical infrastructure.

3.5 Spatial parameters

Five spatial parameters have been identified to help define the urban structure of the Bradfield City Centre; emerging walking, cycling and public transport networks, streets, and green space. These parameters are closely linked to the Bradfield City Centre Master Plan vision and have informed decision-making around the street hierarchy, road space allocation and balancing the competing needs to different user groups. The five spatial parameters are defined in **Figure 7**.

Figure 7 Spatial parameters for Bradfield City Centre

Spatial parameters				
Emerging walking network 	Emerging cycling network 	Emerging public transport network 	Streets 	Green space 
• Prioritise people over cars • Deliver great Places and public spaces that are safe, legible and walkable • Access to public transport infrastructure to facilitate seamless transport integration	• Provision of dedicated cycling infrastructure • Appropriate allocation of bicycle parking facilities • Access to Aerotropolis Station to facilitate seamless transport integration • Future-proof for emerging technologies such as e-bikes and micro-mobility	• Provision of dedicated bus lanes and / or bus priority at intersections • Kerbside bus bays and bus stop infrastructure • Wayfinding signage to facilitate seamless transfers • Access to Aerotropolis Station • Future-proof emerging public transport technologies	• Determine appropriate road space allocation for different user groups • Deliver great Places and public spaces that are safe, legible and walkable • Facilitate access for servicing and loading to enable great Places • Allow for cars	• City in the parklands • Leverage blue-green grid • Deliver great Places and public spaces that are safe, legible and walkable

3.6 Movement and Place Classification

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 the figure following.

- **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 Movement and Place assessment has been prepared to appraise the Bradfield City Centre Master Plan. This assessment considered the street network and street typologies by overlaying the proposed land uses and applying best practice planning principles. The outcomes of this assessment are shown in Figure 8.

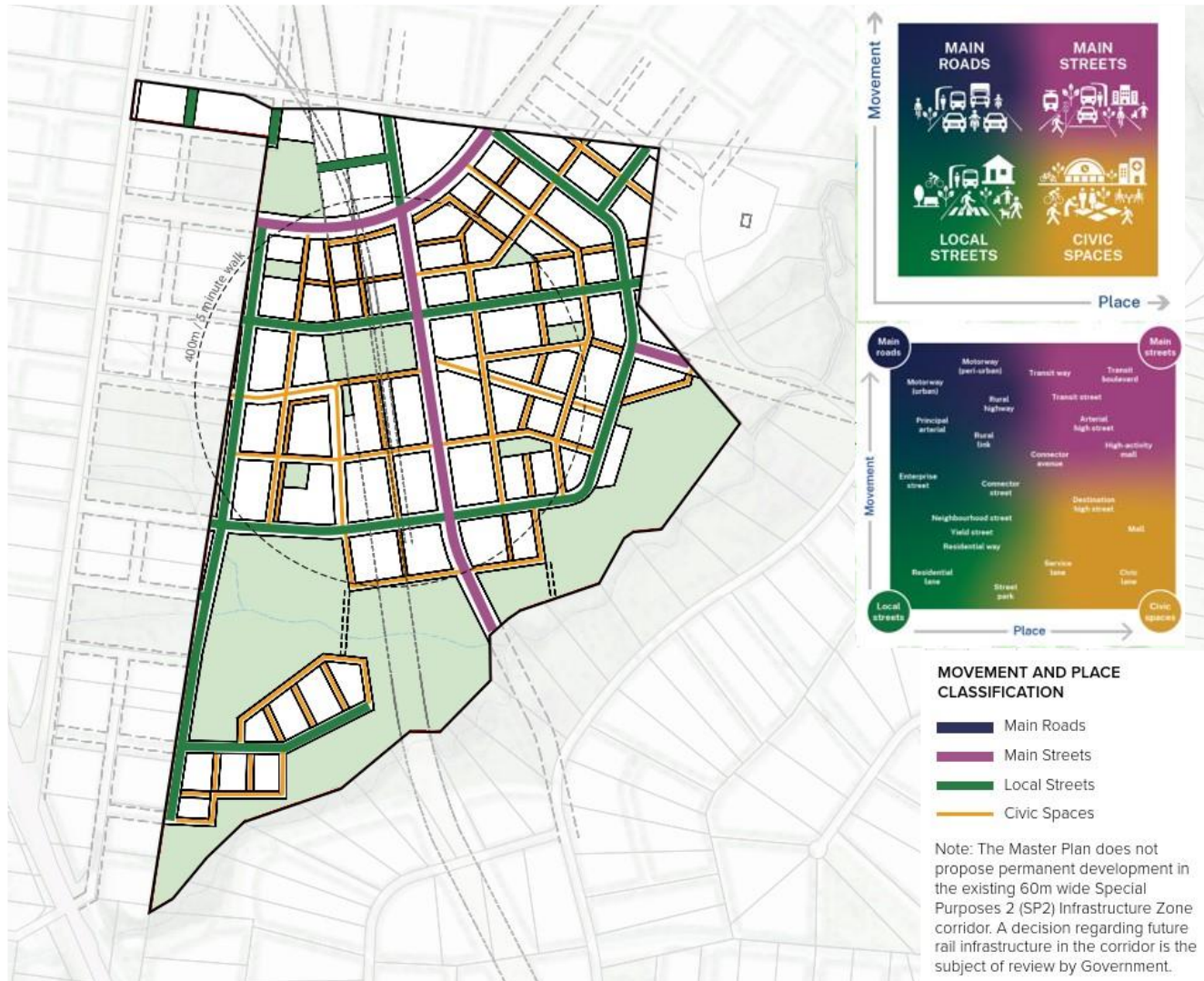
The Northern Road is identified as a Main Road. Based on the street types in the Design of Roads and Streets Guide, The Northern Road is a principal arterial, and its configuration and function supports its role as a major freight route

Badgerys Creek Road, Fifteenth Avenue and Whitaker Road are identified as Main Streets due to their location in and immediately adjacent to Bradfield City Centre. Based on the street types in the Design of Roads and Streets Guide, these roads are connector avenues.

The north-south transit spine is also identified as a Main Street. It is a strategic street for active and public transport mobility in a lively and high amenity place environment.

The remainder of the Bradfield City Centre street network is identified as local streets and civic spaces. This is consistent with the dense land use anticipated and the prioritisation of pedestrians over cars.

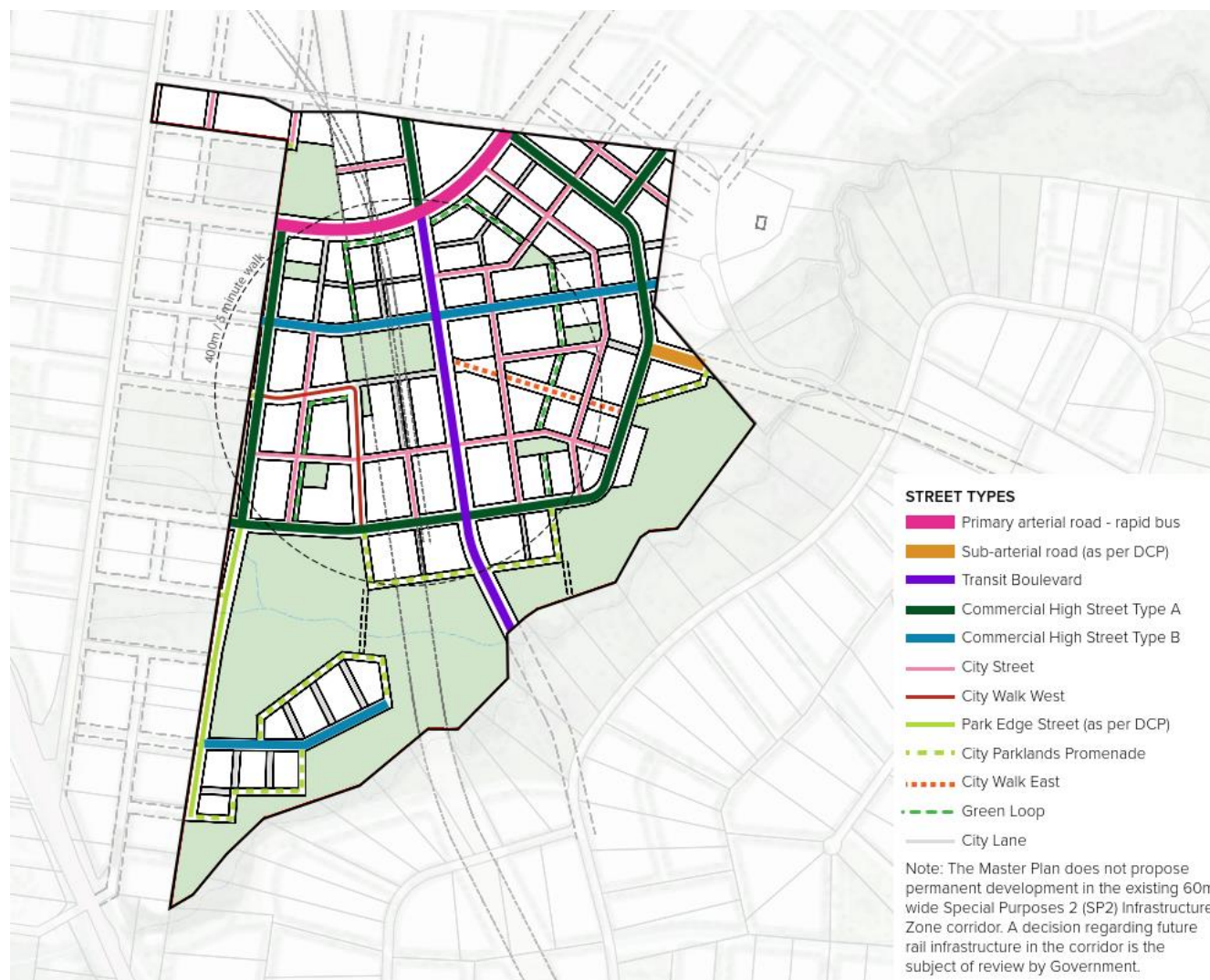
Figure 8 Movement and Place assessment for Bradfield City Centre

Source: Hatch Roberts Day, 26th July 2023

3.6.1 Street network and typologies

The Bradfield City Centre Master Plan is generally consistent with the street network and Movement and Place hierarchy proposed in the Western Sydney Aerotropolis Precinct Plan. Some street sections have been refined and additional street types have been added to offer greater diversity. These changes achieve the vision for a pedestrian-focused, safe, and sustainable movement network within Bradfield City Centre. The changes also enable the efficient delivery of goods and services that enhance great places. The street network is shown in **Figure 9**. Speed limits will be subject to future approvals.

Figure 9 Bradfield City Centre Master Plan street network

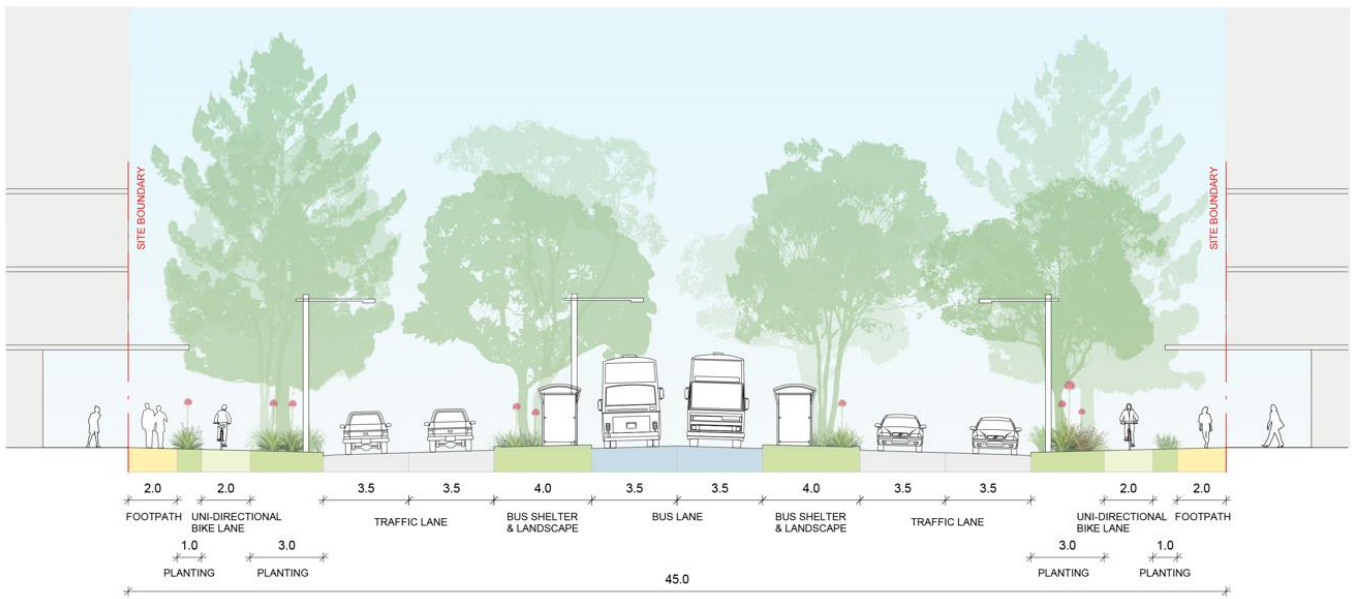


Source: Hatch Roberts Day, 26th July 2023

Within the Movement and Place hierarchy, key links have been designed to facilitate pedestrians, cyclists, buses, general traffic, servicing and loading vehicles as well as through freight movements which may not originate or have destinations within Bradfield.

Bradfield Metro Link Road typical cross-section – will be the key transit and movement corridor, delivering high quality public transport from Bradfield City Centre to Western Sydney International (Nancy-Bird Walton) Airport and Liverpool. The proposed cross-section is consistent with the Western Sydney Aerotropolis Precinct Plan and the Western Sydney Rapid Bus Program. It does this by adding an additional travel / turn lane in each direction, adjusting the footpath locations, and increasing the width of the landscape zones. A typical 45 metre cross-section is shown in Figure 10.

Figure 10 Bradfield Metro Link Road typical cross-section

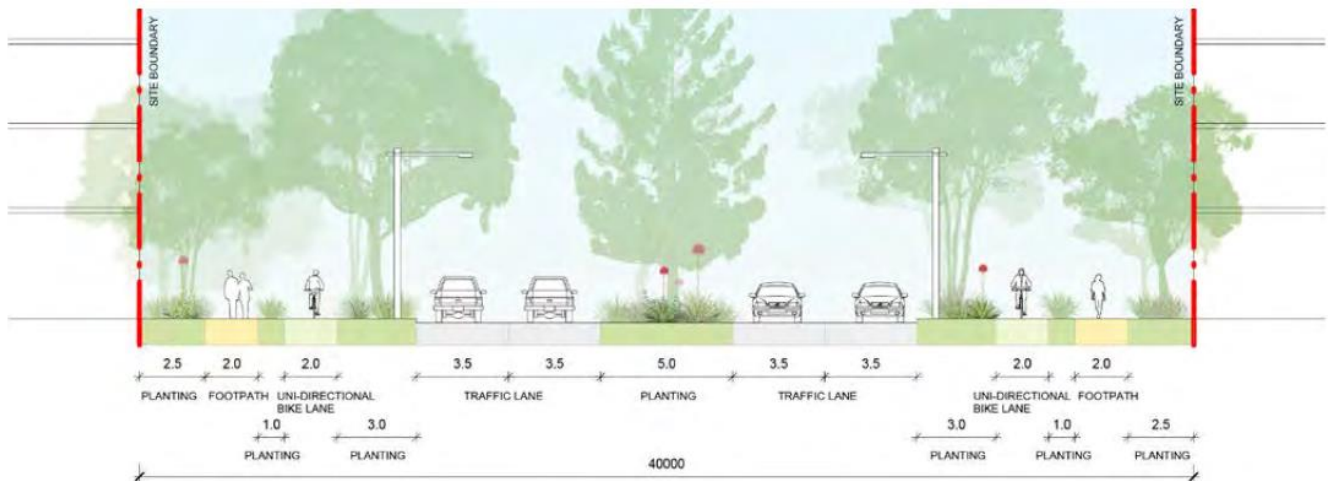


Source: Hatch Roberts Day, 2023

Note: The overall form and road space allocation for the Bradfield Metro Link Road will be subject to detailed design. Tree planting will not preclude operation of double deck buses on bus-capable roads.

Sub-arterial **typical cross-section** – corridor that provides an important connection for all modes between Bradfield, Bradfield South, and other communities in the Western Parkland City. Whitaker Road is an example of this street type and will be a key crossing over the City Parklands and Thompsons Creek. A typical 40 metre cross-section is shown in **Figure 11**.

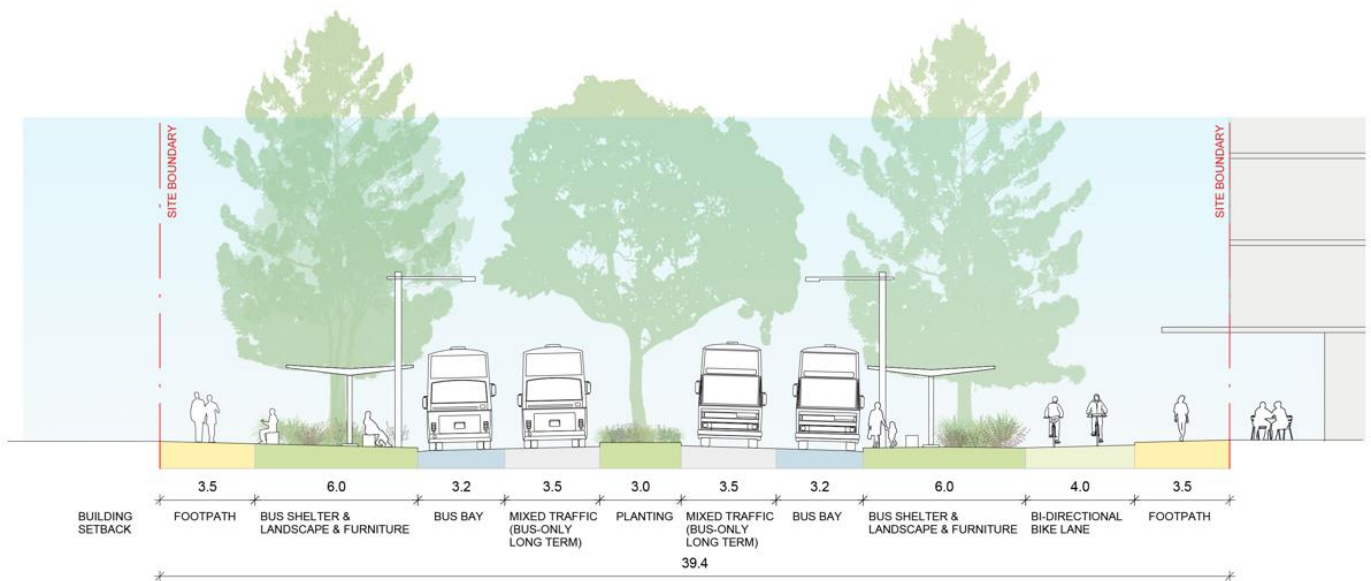
Figure 11 Sub-arterial typical cross-section



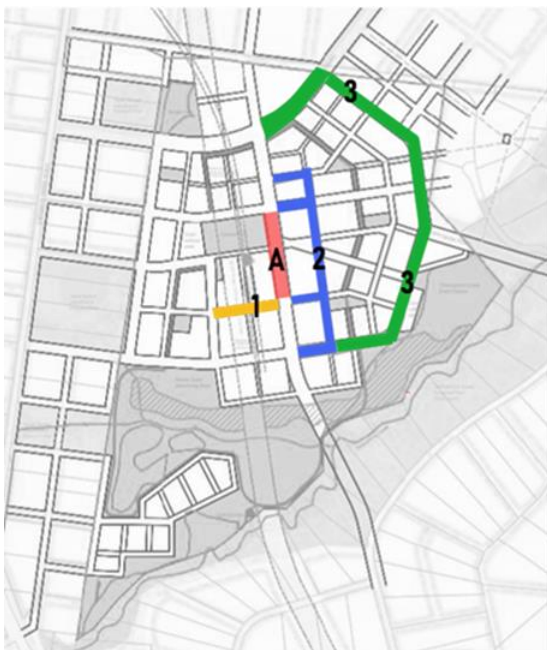
Source: Hatch Roberts Day, Turf, Turner, 2023

- Transit Boulevard (bus zone) cross-section** – the Transit Boulevard is a premier street running from the Bradfield Metro Link Road, past Aerotropolis Station, across the City Parklands to Bradfield South. The street type was not identified in the Western Sydney Aerotropolis Precinct Plan and has been designed specifically for Bradfield City Centre. The intention is for this street type to have slower speeds and a more urban characteristic than the rapid bus corridor. The Master Plan provides future flexibility for the section of the Transit Boulevard to become 'bus-only' at the Bradfield bus interchange. General traffic would be allowed to run through the bus interchange in the short to medium term while the local street connections are implemented throughout the Bradfield City Centre. WPCA will work with TfNSW to examine “triggers” for bus-only conversion when alternative traffic paths become available in the local street network for Bradfield City Centre by diverting through-running general traffic from the future bus interchange. The bus interchange can be potentially converted to bus-only as soon as any one of the alternative street links marked '1', '2' or '3' on the map shown underneath Figure 12) are opened in their final condition in accordance with the Master Plan. A typical cross-section at a bus zone is shown in **Figure 12**.

Figure 12 Transit boulevard (bus zone) typical cross-section



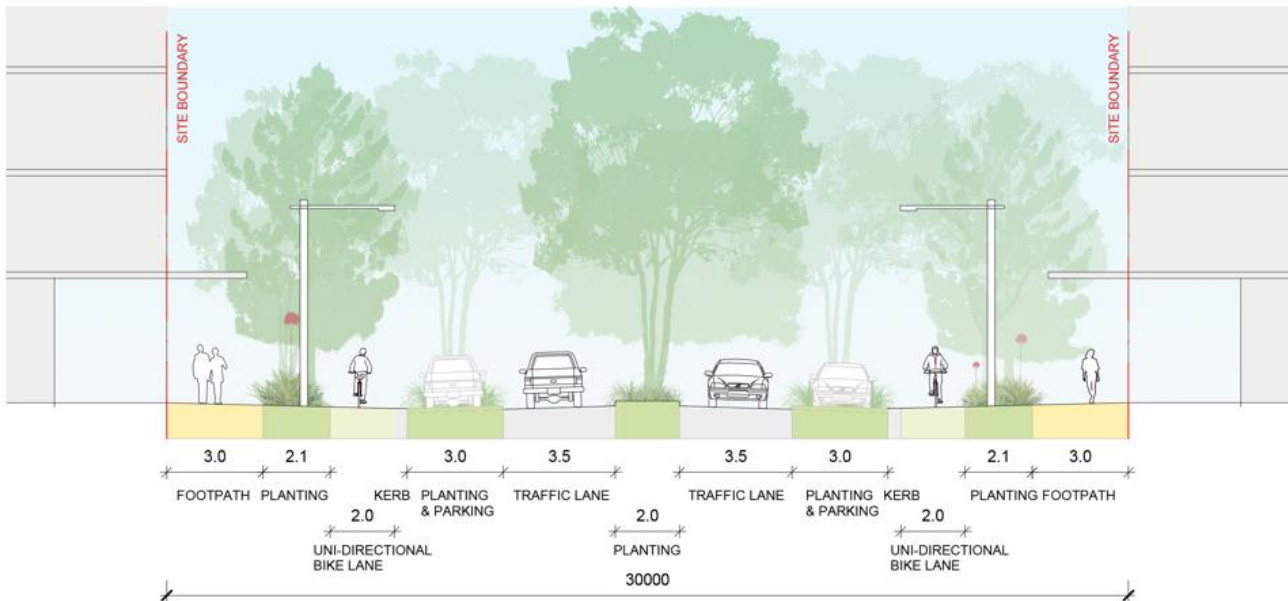
Source: Hatch Roberts Day, Turf, Turner, 2023



Source: WPCA, 2023

Collector Street Type A typical cross section – Collector Street Type A comprises trees, dedicated cycleways on each side and wide footpaths for a diversity of alfresco uses such as outdoor dining, street furniture and gardens, as **Figure 13** shows.

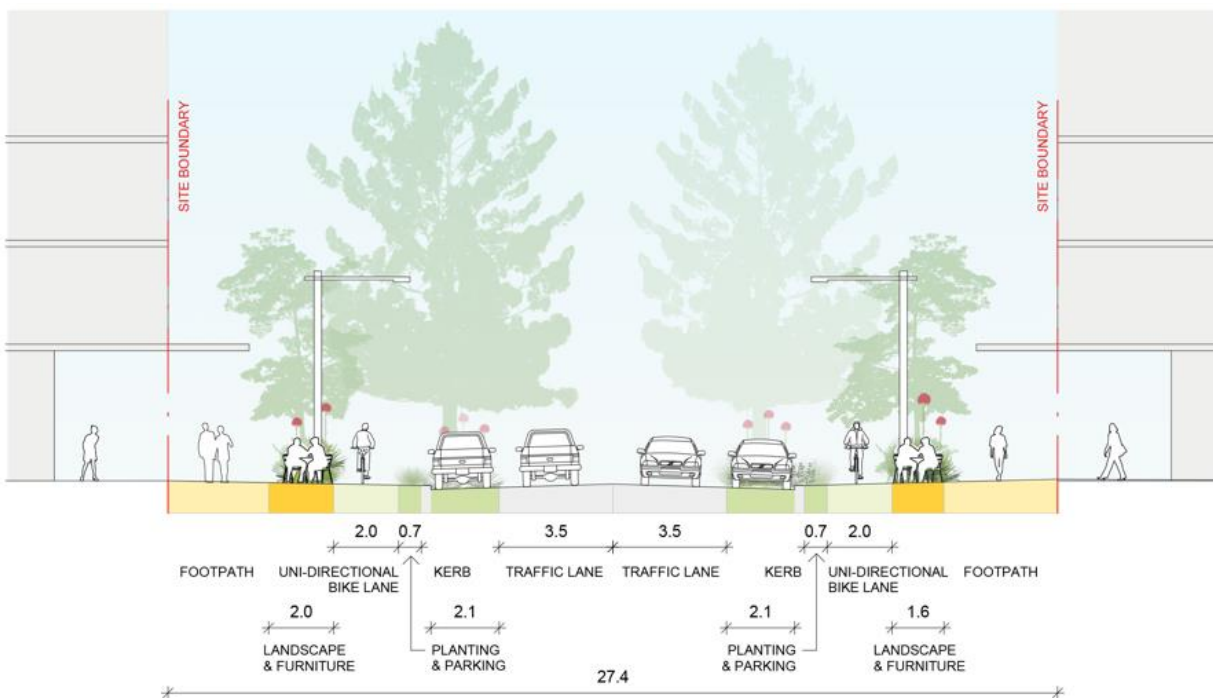
Figure 13 Collector Street Type A typical cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

Collector Street Type B typical cross section – Collector Street Type B comprises trees, dedicated cycleways, and wide footpaths for a diversity of alfresco uses such as outdoor dining and street furniture. There are also provisions for tree pits between on-street parking bays. As **Figure 14** shows, this 27.4-metre-wide street type does not allow for future conversion of the planting/parking zone to general traffic lanes like Collector Street Type A.

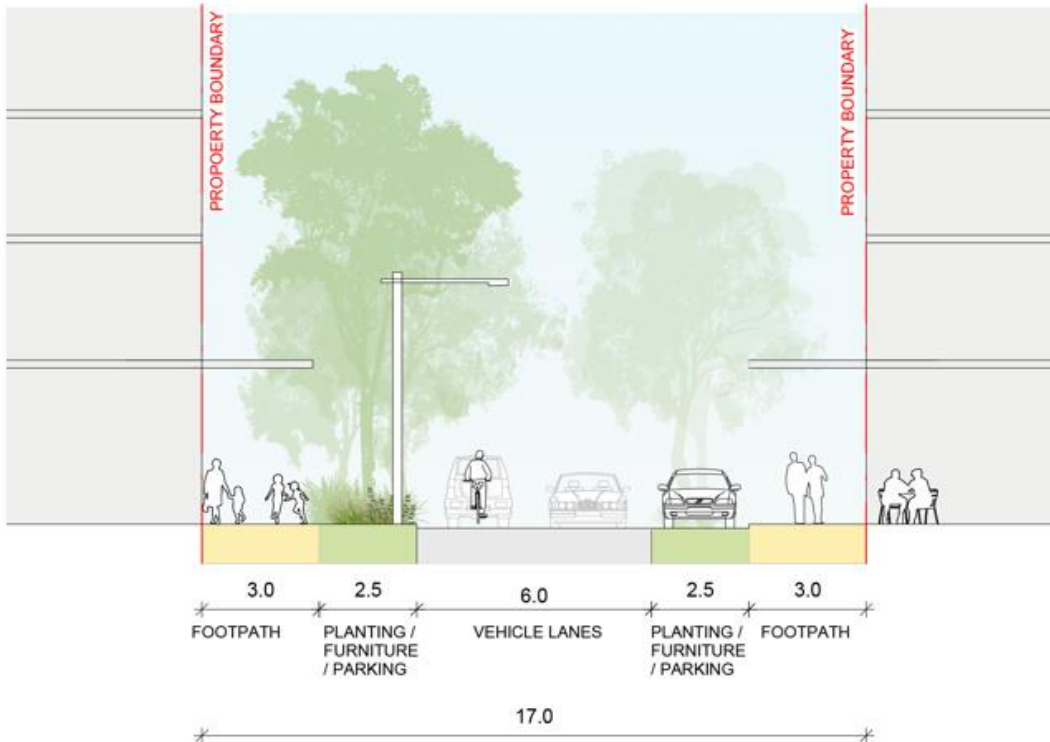
Figure 14 Collector Street Type B typical cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

City Street – Comprises of trees, wide footpaths, and street furniture. There are also provisions for tree pits between on-street parking bays as **Figure 15** shows, this 17-metre-wide street type serves a different purpose to Collector Streets.

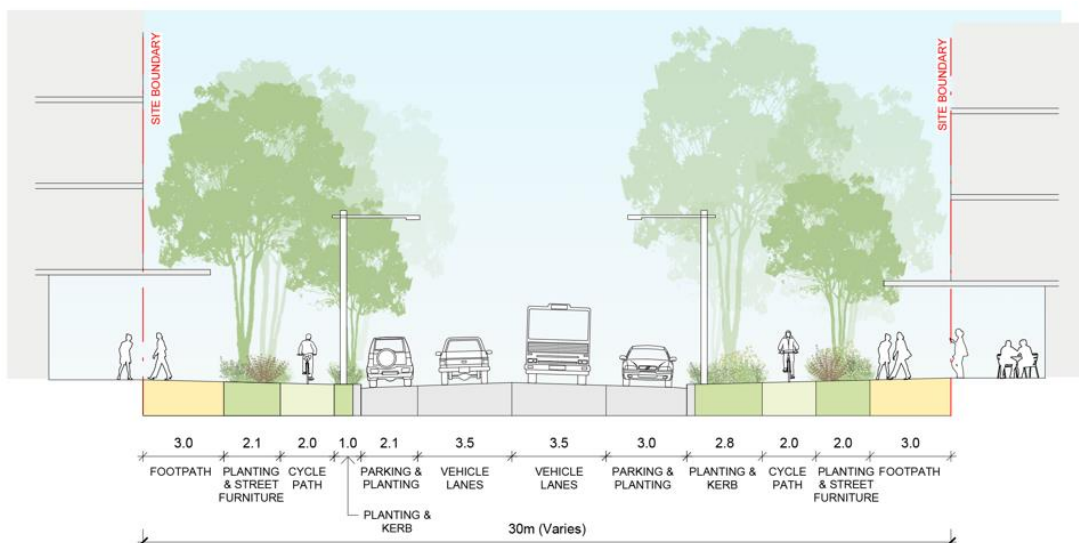
Figure 15 City Street typical cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

City Walk West – a primary pedestrian link between Aerotropolis Station and Central Park, south to the City Parklands and Moore Gully. This street provides for a wide range of interchange functions such as for taxi, kiss and ride and rail replacement buses. This diversity also means it is well-placed to leverage future transport innovations such as micromobility and kerbside drop off / pick up by autonomous vehicles. A typical 30 metre cross section is shown in **Figure 16**.

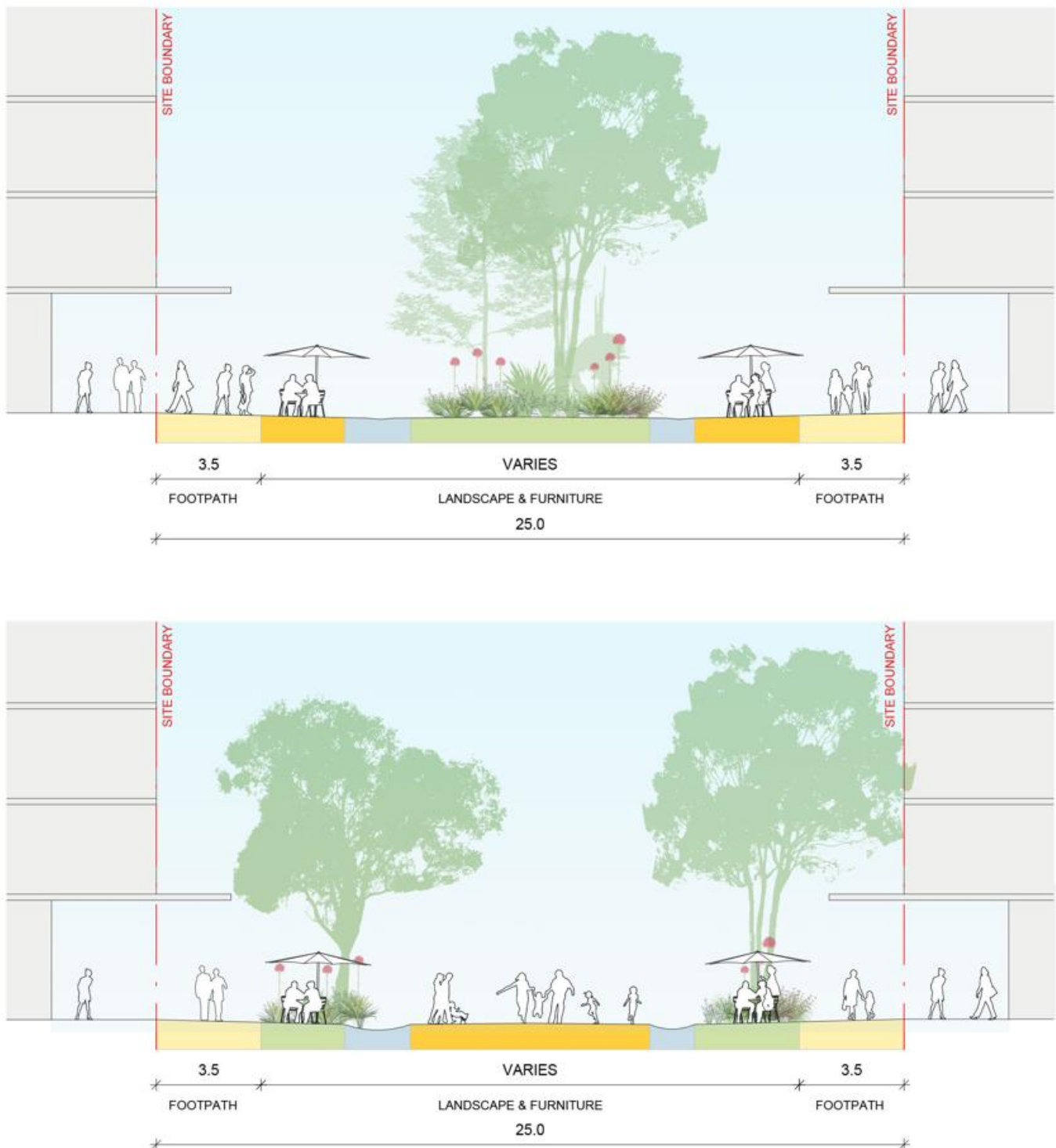
Figure 16 City Walk West cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

City Walk East – a primary pedestrian link between Aerotropolis Station and Central Park, south-east to the City Parklands and major event space. This street provides for a wide range of active transport functions such as walking, cycling, and emerging micro-mobility technologies. A typical 25 metre cross section is shown in Figure 17.

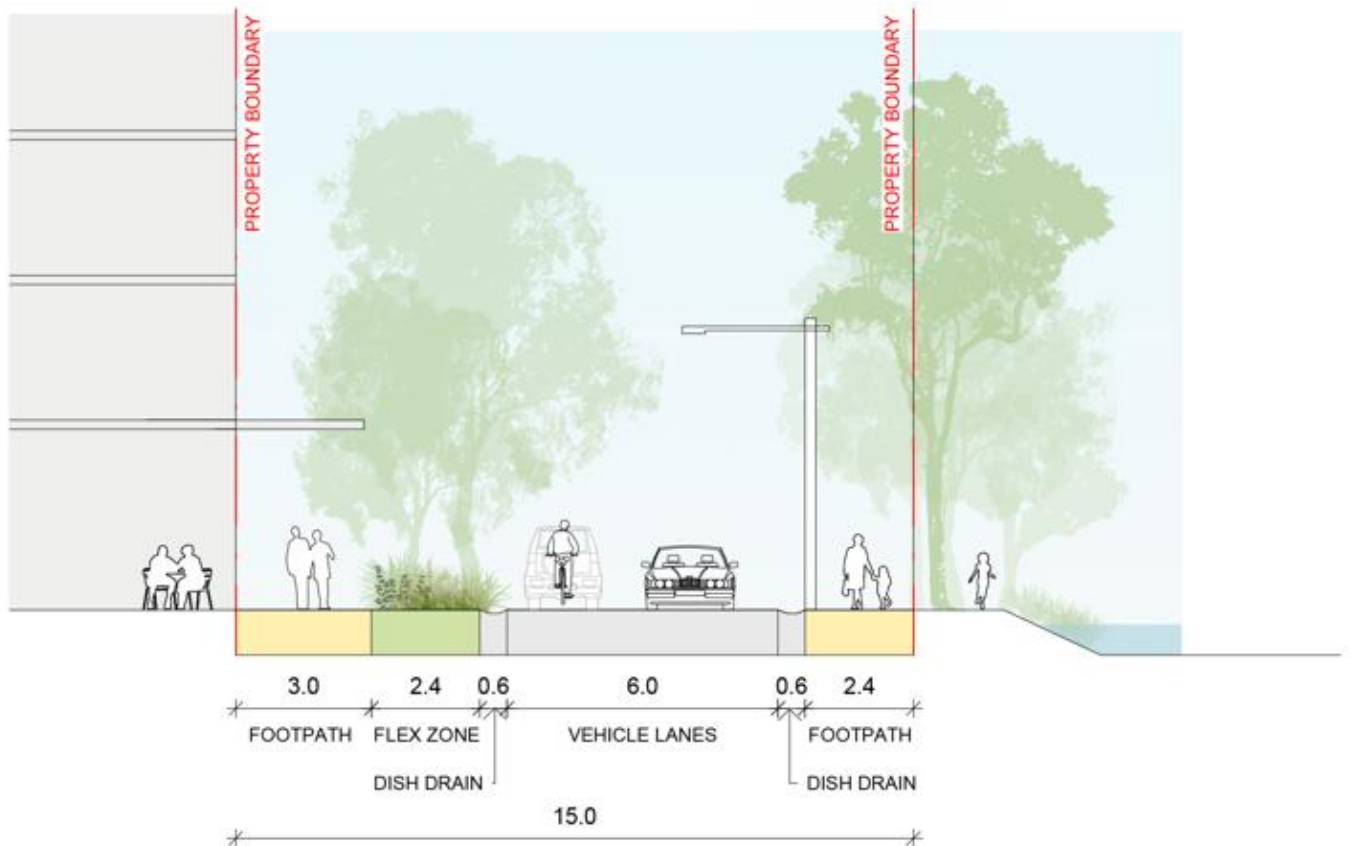
Figure 17 City Walk East typical cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

Parklands Promenade – Comprises of trees, wide footpaths, and street furniture. The flex zone could be used for street furniture, parking, and tree plantings. As **Figure 18** shows, this 15-metre-wide street type provides the community with direct access to the Parklands.

Figure 18 Parklands Promenade cross section



Source: Hatch Roberts Day, Turf, Turner, 2023

Note: The intersection designs and bus stops will be developed in consultation with TfNSW and are subject to future approvals.

4 Current transport context

4.1 Technical baseline site consideration

Delivery of Western Sydney International (Nancy-Bird Walton) Airport and Sydney Metro - Western Sydney Airport are two significant opportunities that have catalysed the opportunity to plan and build a new city centre at Bradfield. This opportunity has been enhanced by the Western Sydney City Deal and the collaborative approach between Commonwealth, NSW, and local governments.

Bradfield City Centre is being planned on a greenfield site, approximately 27 kilometres south-west of the Parramatta City Centre and 44 kilometres south-west of the Sydney City Centre. The following sections provide a summary of the baseline site context for both transport and land use considerations.

4.2 Transport and land use context

Under the *Six Cities Vision* prepared by the Greater Cities Commission, future development will be centralised around six cities: the Eastern Harbour City, Central Coast City, Central River City, Illawarra-Shoalhaven City, Lower Hunter and Greater Newcastle City, and the **Western Parkland City**, where Bradfield City Centre will be located. In addition to Bradfield, the precinct will also include the Strategic Centres of Fairfield, Leppington, Marsden Park, Mt Druitt, Narellan, and St Marys, as well as the Metropolitan Clusters of Penrith, Liverpool, and Campbelltown. The Six Cities Region is shown in **Figure 19**.

Bradfield City Centre has been identified as part of a future Metropolitan Cluster within the Western Parkland City, 45 kilometres south-west of Sydney CBD.

Bradfield City Centre site is located on primarily greenfield land, with some existing low-density residential land use. Previous zoning within Bradfield City Centre study area was dominated by the land use zoning types of RU1 Primary Production, RU2 Rural Landscape, RU4 Primary Production Small Lots, SP1 Special Activities and SP2 Infrastructure.

Zoning within Bradfield City Centre has now been updated to align with the future land uses, being ENT Enterprise Zone, MU Mixed Use Zone, SP2 Infrastructure Zone and ENZ Environment and Recreation Zone.

Figure 19 Six Cities Region



Source: Six Cities Region: Discussion Paper, 2022

4.3 Existing transport infrastructure and services

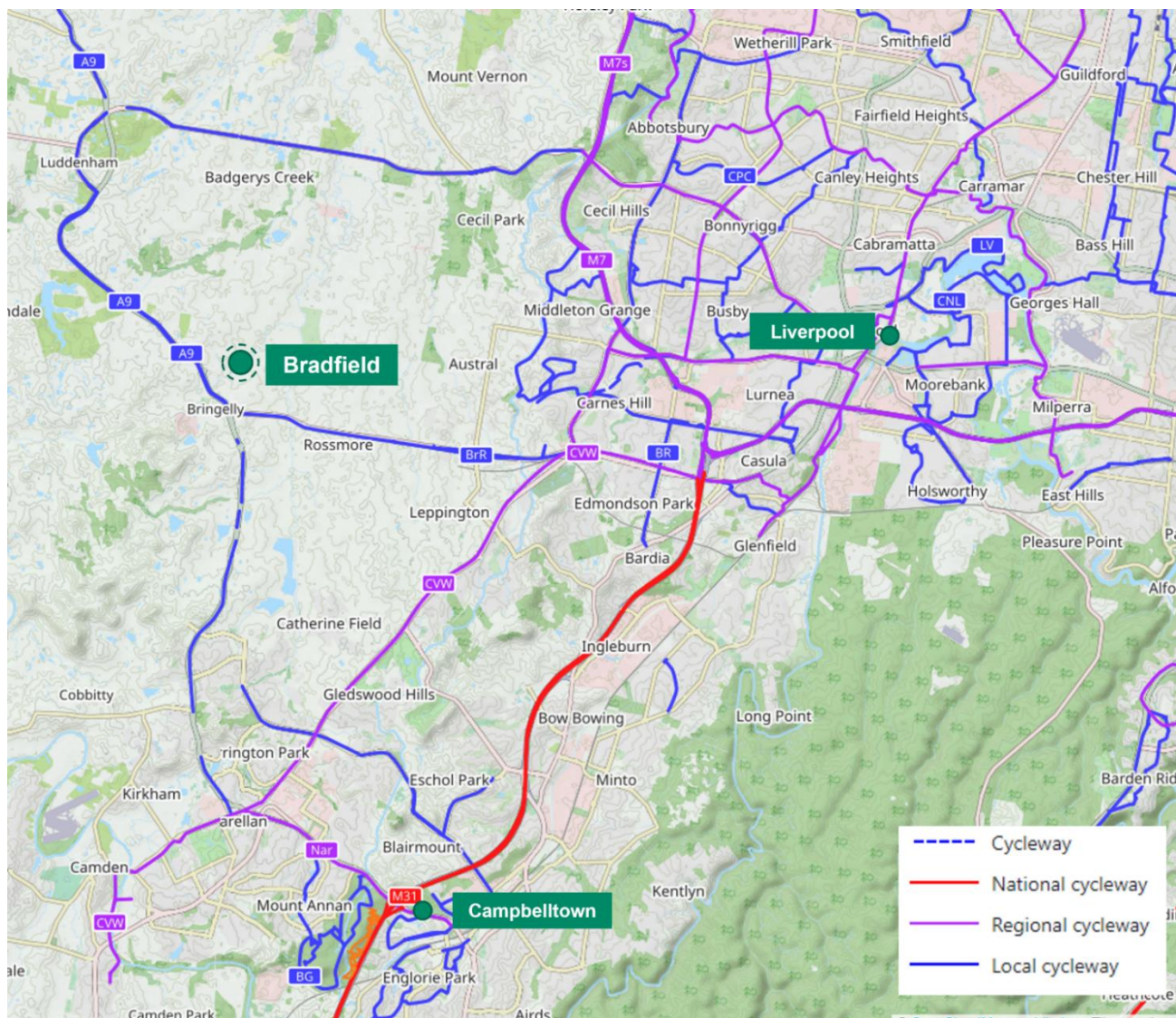
4.3.1 Walking

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

4.3.2 Cycling

No existing Principal Bicycle Network (PBN) segments are located within the existing site proposed for Bradfield City Centre. Currently, cyclists are presented with a 'high difficulty' road shoulder route along the Northern Road, with no cycling connections into the City Centre study area. **Figure 20** illustrates the existing cycling network surrounding the proposed location of Bradfield City Centre.

Figure 20 Existing cycle network near Bradfield City Centre



Source: Open Street Map (2022)

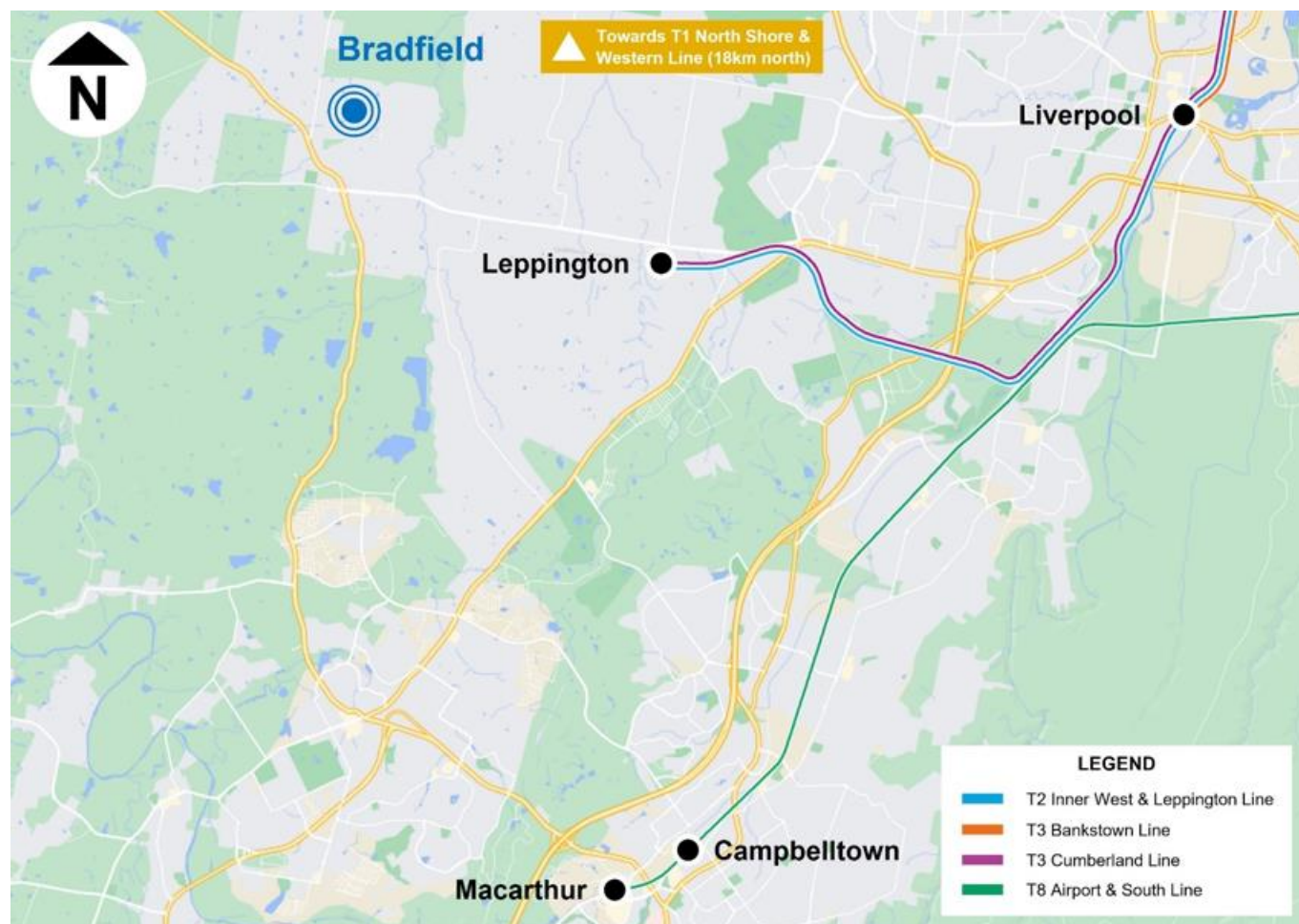
4.3.3 Passenger rail

No railway lines currently exist within the proposed site for Bradfield City Centre. However, five train lines operate within 20 kilometres of Bradfield City Centre, including:

- T1 Western Line at St Marys Station and Penrith Station, located approximately 18 kilometres north of Bradfield City Centre
- T2 Inner West and Leppington Line and T5 Cumberland Line at Leppington Station, located approximately 8 kilometres south-east of Bradfield City Centre
- T3 Bankstown Line at Liverpool Station, located approximately 18 kilometres east of Bradfield City Centre
- T8 South Line at Campbelltown Station located approximately 17 kilometres south-east of Bradfield City Centre.

Intercity services operate beyond the Sydney Trains network to the Blue Mountains via Penrith and the Southern Highlands via Campbelltown. Figure 21 illustrates the existing passenger rail network surrounding Bradfield City Centre.

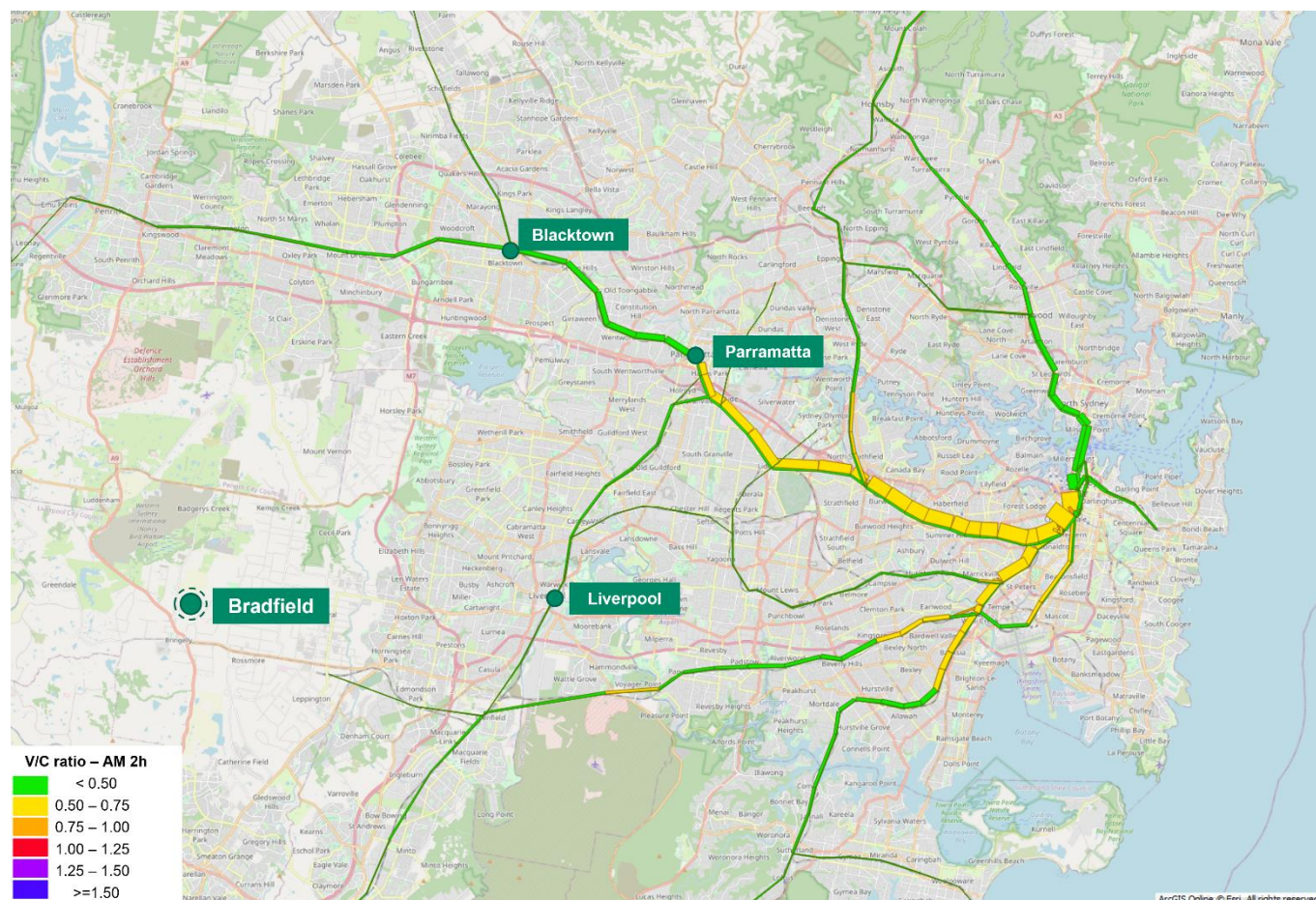
Figure 21 Existing passenger rail network near Bradfield City Centre



Source: Google Maps, Sydney Trains (2022)

Figure 22 shows the performance (expressed in passenger volume to total capacity ratios) of the Sydney's passenger rail network for the existing conditions in the morning peak period (7:00am-9:00am) for the base year 2019. During the morning peak period, most of the train lines operated with a satisfactory level of service (with a volume to capacity (v/c) ratio of less than 75% - shown in green or yellow colour bands). Several train lines operated with v/c ratios between 75% and 100% (indicated in yellow colour bands). These include the T8 Airport Line and the T9 North Line. No train lines exceeded a 100% v/c ratio during the morning peak period (note – the assessment is based on average train load across the morning peak period at a train service group level so some individual trains could still exceed a v/c of 100%).

Figure 22 Performance of the existing passenger rail network (2019)



Source: PTPMv5 (TfNSW)

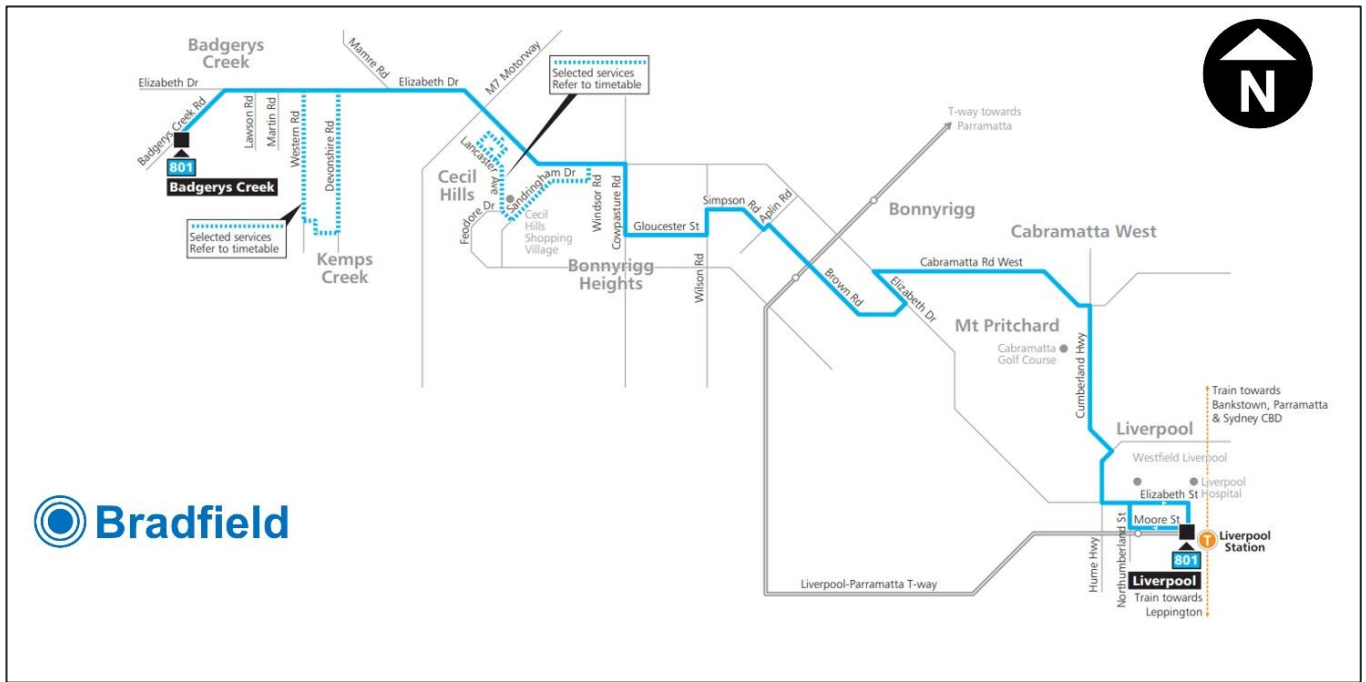
4.3.4 Bus

Three bus routes currently operate nearby to the proposed site for Bradfield City Centre, primarily connecting to the Metropolitan Centre of Liverpool:

- 801 Badgerys Creek to Liverpool
- 855 Rutleigh Park to Liverpool via Austral & Leppington Station
- 856 Bringelly to Liverpool

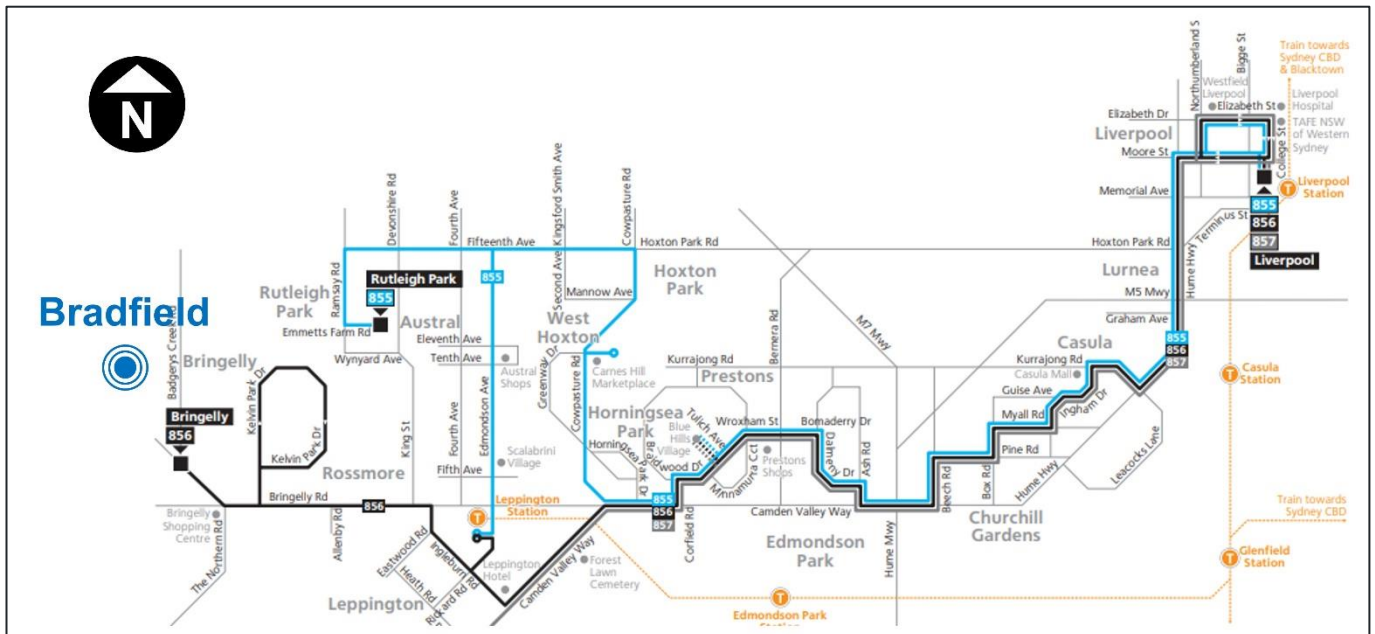
Figure 23 and **Figure 24** illustrate the existing bus routes operating near the proposed site for Bradfield City Centre.

Figure 23 Bus route 801 (operated by Transit Systems) and location of Bradfield (approx.)



Source: Transport for NSW

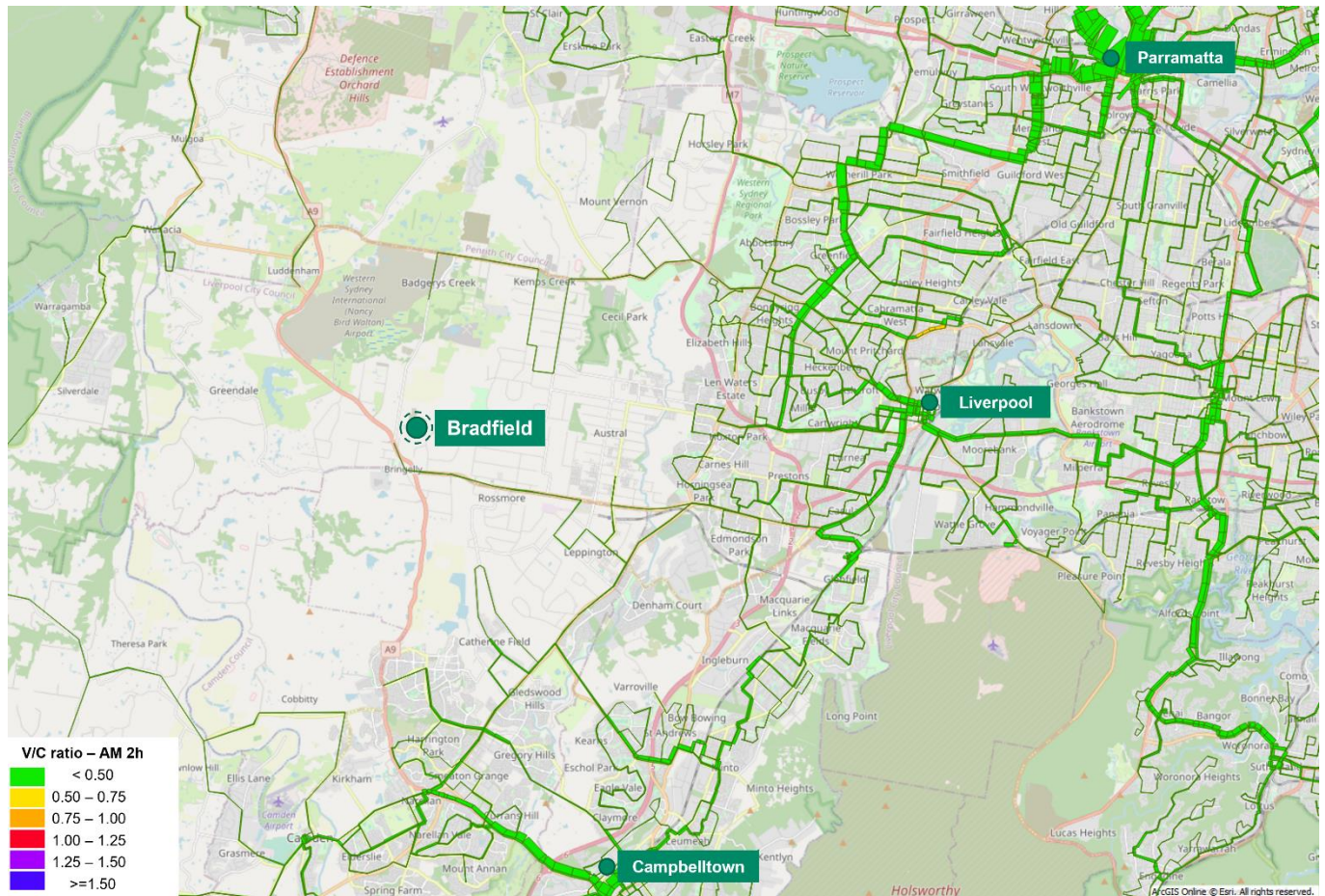
Figure 24 Bus routes 855 & 856 (operated by Interline Bus Services) & location of Bradfield (approx.)



Source: Transport for NSW

Figure 25 shows the performance (expressed in passenger volume to total capacity ratios) of the bus network near the future Bradfield City Centre for the existing conditions in base year 2019.

Figure 25 Performance of the existing bus network (2019)



Source: PTPMv5 (TfNSW)

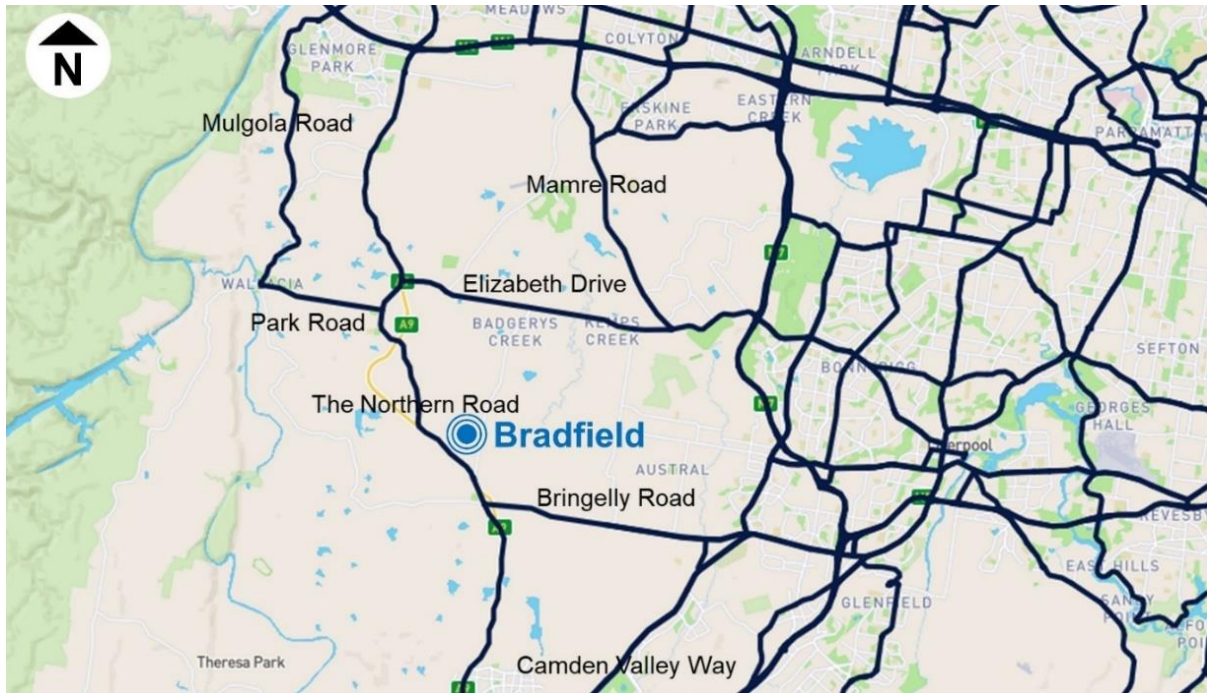
4.3.5 Road network

The *Schedule of Classified Roads and Unclassified Regional Roads* by TfNSW (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 TfNSW
- Regional roads: Perform an intermediate function between State roads and Council-controlled Local roads. Financial assistance provided by TfNSW to Councils for management
- Local roads: Council-controlled collector and local roads.

Bringelly Road and The Northern Road are the two State roads located adjacent to the proposed Bradfield City Centre, as shown in **Figure 26**.

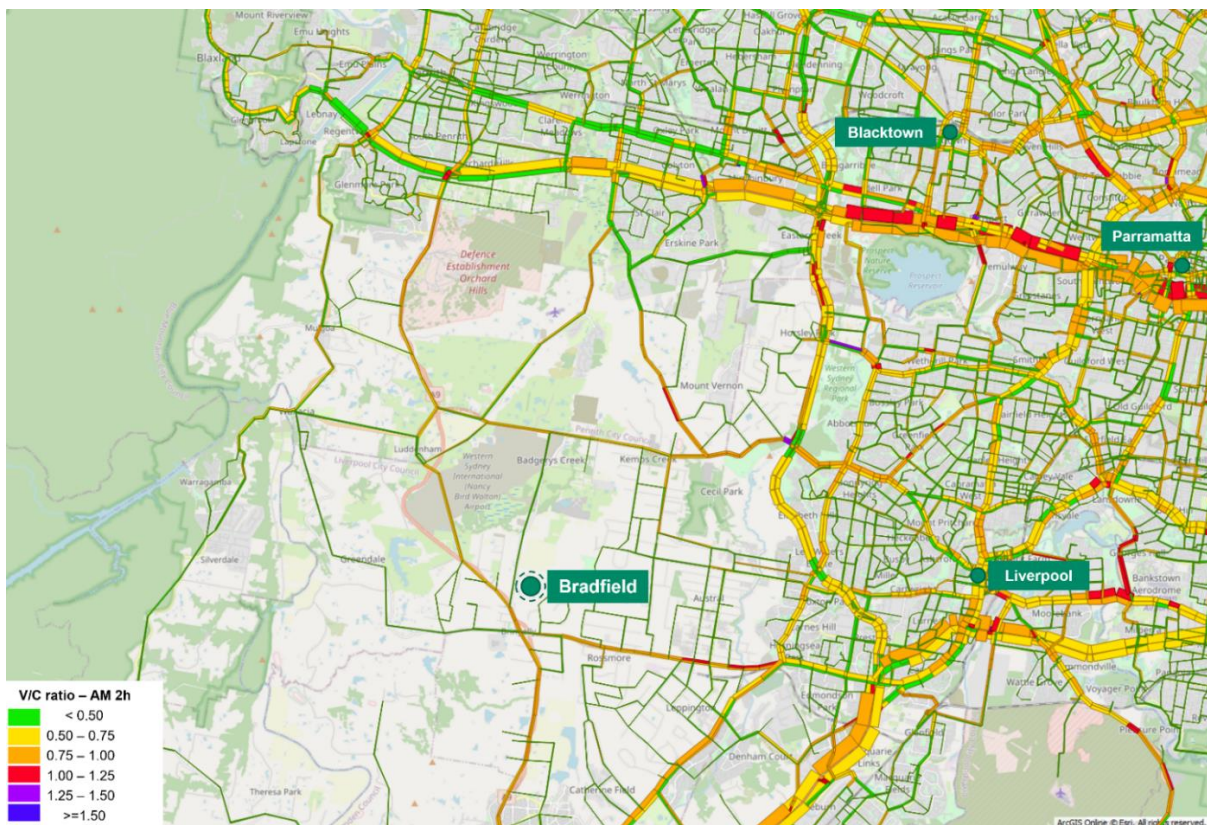
Figure 26 Key State roads within the Western Sydney Aerotropolis study area



Source: Transport for NSW, 2021

Figure 27 shows the performance (expressed in traffic volume to total capacity ratios) of the road network in Western Sydney near the Bradfield City Centre for the existing conditions in base year 2019.

Figure 27 Performance of the existing road network (2019)

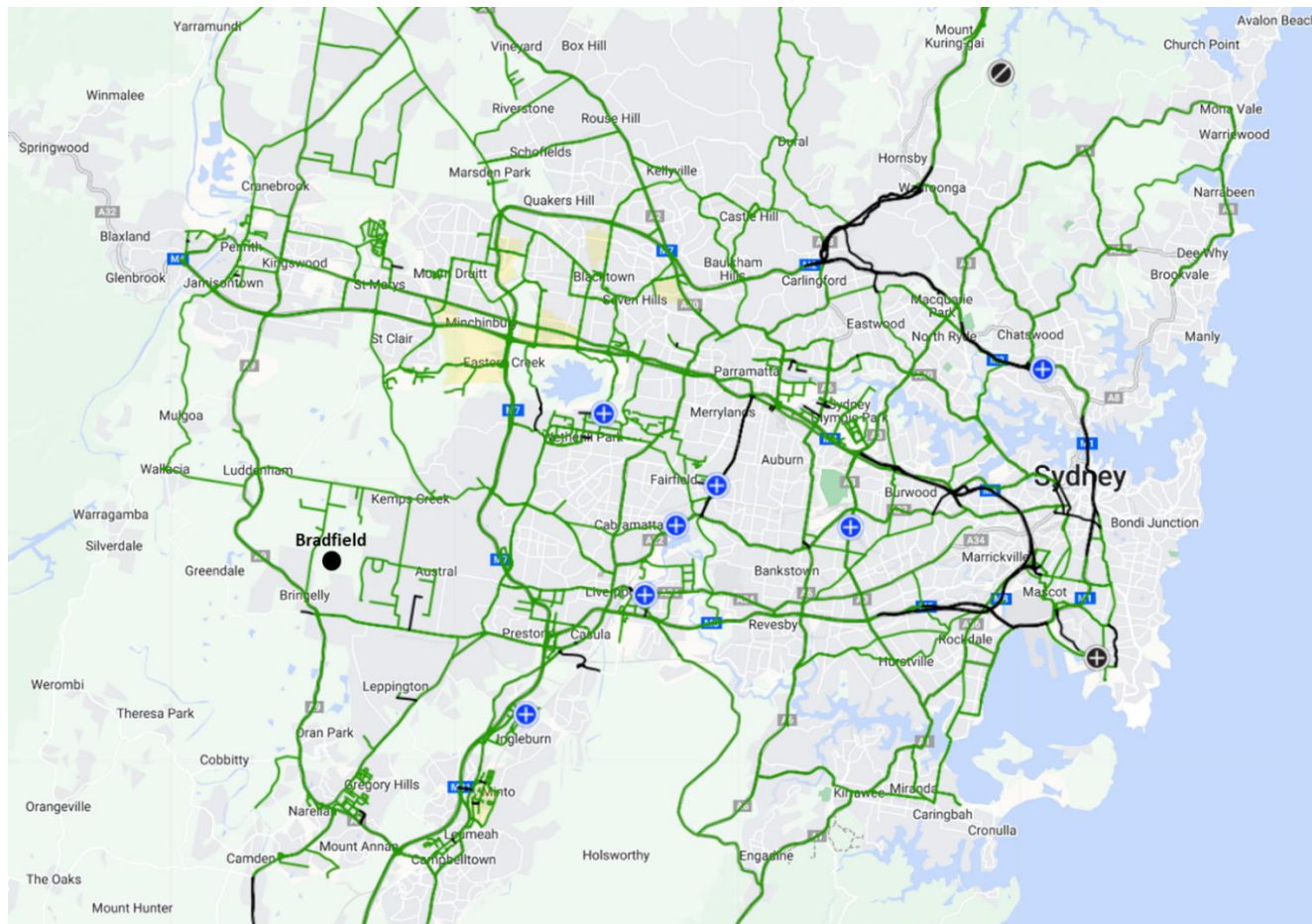


Source: PTPMv5 (TfNSW)

4.3.6 Freight network

Figure 28 shows the current freight network in Greater Sydney. The networks shown in green colour represents the network for PBS Level 2 GML and CML approved vehicles. Key freight routes near Bradfield includes Badgerys Creek Road, The Northern Road, and Elizabeth Drive.

Figure 28 Current freight network in Greater Sydney



Source: PBS Networks Map (TfNSW, 2023)

Note: The network shown in green is the network for PBS Level 2 GML and CML approved vehicles with a bridge assessment level of Tier 1 and with an overall length not exceeding 26 metres. The maximum mass on this network is 63.0 tonnes at GML and 65.0 tonnes CML respectively inclusive of the steer axle concession.

Future rail freight will play an important role in the Western Sydney Aerotropolis through the Western Sydney Freight Line and the Moorebank Intermodal Terminal. Together with future road projects such as the Outer Sydney Orbital, these projects will enhance the attractiveness of industrial precincts in the Western Sydney Aerotropolis such as Mamre Road. They will also future-proof the Western Sydney Aerotropolis to be technology-ready for the increasing freight task associated with same-day deliveries.

4.4 Existing travel patterns

4.4.1 2016 Census

The results of the 2016 Census for the 'Austral – Greendale SA2 zone' (where the Aerotropolis Precinct and Bradfield City Centre are located) provide an understanding of existing travel behaviour within the proposed Bradfield City Centre study area.

Journey to Work – origins for workers

The top five most common Journey to Work origins for workers within the Austral – Greendale SA2 zone are presented in **Table 11**. 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 study area, worker origins are currently highly concentrated, reflecting the localised nature of employment at present.

Table 11 Most common origins for workers in the Austral – Greendale SA2

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%

Source: Australian Bureau of Statistics, 2016

Journey to Work – worker mode share

Private vehicles are the dominant mode for workers within the Austral – Greendale SA2 zone. Private vehicles represent 75% of mode share for Journey to Work trips. The second most common response was working from home or did not go to work (representing 18%) followed by active transport (representing 4%). These numbers highlight the lack of existing public transport infrastructure and services in the proposed Bradfield City Centre study area. **Table 12** presents the mode share breakdown of the SA2 zone.

Table 12 Journey to Work mode share for workers in the Austral – Greendale SA2

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%

Source: Australian Bureau of Statistics, 2016 * Includes people who stated they 'did not go to work'

Journey to Work – destinations for residents

The top five most common Journey to Work destinations for residents within the Austral – Greendale SA2 zone are presented in **Table 13**. 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 Metropolitan Clusters (like Liverpool) which are common destinations for residents.

Table 13 Most common destinations for residents in the Austral – Greendale SA2

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%

Source: Australian Bureau of Statistics, 2016

Journey to Work – resident mode share

Private vehicles are the dominant mode for residents in the Austral – Greendale SA2. Private vehicles represent 72% of mode share for Journey to Work trips, with the second most common response being working from home or did not go to work (representing 18%). These numbers highlight the lack of existing active transport and public transport infrastructure and services in the proposed Bradfield City Centre study area. **Table 14** presents the mode share breakdown of the SA2 zone.

Table 14 Journey to Work mode share for residents in the Austral – Greendale SA2

Travel Mode	Trips	Percentage
Austral – Greendale SA2		
Public transport	204	5%
Vehicle	2,701	72%
Active transport	139	4%
Other	30	1%
Worked at home*	689	18%
Total	3,763	100%

Source: Australian Bureau of Statistics, 2016 * Includes people who stated they 'did not go to work'

4.4.2 2018/2019 Household Travel

The 2018/19 Household Travel Survey identifies the percentage of trips taken by trip purpose and the average travel distance. 'Serve passenger' was the more common trip purpose in the Liverpool LGA in 2018/19 (23.1% of all trips), followed by 'social recreation' (18.4%) and 'commute' (16.8%). Aside from 'other,' the least common trip purpose was 'personal business' (4.4%).

'Work related business' had the longest average travel distance in the Liverpool LGA in 2018/19 (21.6 kilometres), followed by 'commute,' (18.1 kilometres) and 'shopping' (11.2 kilometres). 'Personal business' had the shortest average travel distance (6.1 kilometres). Table 15 shows a full breakdown of the percentage of trips and average travel distance by trip purpose for the Liverpool LGA in 2018/19.

Table 15 Household travel survey 2018/19 for Liverpool LGA

Trip purpose	Percentage of trips	Average travel distance
Commute	16.8%	18.1km
Education/childcare	12.0%	7.1km
Personal business	4.4%	6.1km
Serve passenger	23.1%	7.8km
Shopping	15.1%	11.2km
Social recreation	18.4%	10.2km
Work related business	8.7%	21.6km
Other	1.4%	6.4km
Total	100%	

Source: Household Travel Survey 2018/19 (TfNSW)

4.4.3 COVID-19 impact

Recorded travel patterns from the 2016 Census may have changed due to the COVID-19 pandemic in 2020/2021. COVID-19 initially resulted in a 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. Current observations on 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. It is also noted that conditions may also change due to residents being able to work from home choosing to do so an average of two days a week.
- An increase in road traffic congestion during peak hours as demand recovered when the number of active COVID-19 cases fell. Demand for private vehicles recovered more quickly than demand for public transport. This is due to decreased capacity on public transport to maintain social distancing requirements by limiting public transport capacity and the increased unwillingness to commute via public transport through fear of contraction of the virus
- An increase in public transport demand for travel to and from employment on Tuesdays, Wednesdays, and Thursdays as individuals have more flexibility around working locations.

TfNSW's Future Transport Strategy states:

- Travel demand is expected to return to pre-Covid trend in the medium term, however the reduced activity in the short term provides Transport for NSW with the opportunity to deliver services in ways that support its customers through the pandemic and into the future.
- While the impact of COVID-19 has resulted in changes to mobility patterns, demand pressures on the transport network remain significant, and the State's population is forecast to continue to grow.

The Journey to Work data outlined in this section is reflective of pre-COVID-19 conditions. It should also be noted that although the COVID-19 pandemic is likely to have ended by the time Bradfield City Centre is constructed and operational, there may be some longer-term impacts on travel patterns.

The Sydney Strategic Travel Model (STM) and the Public Transport Project Model (PTPM) assume those that can work from home will continue to do so on average of two days per week.

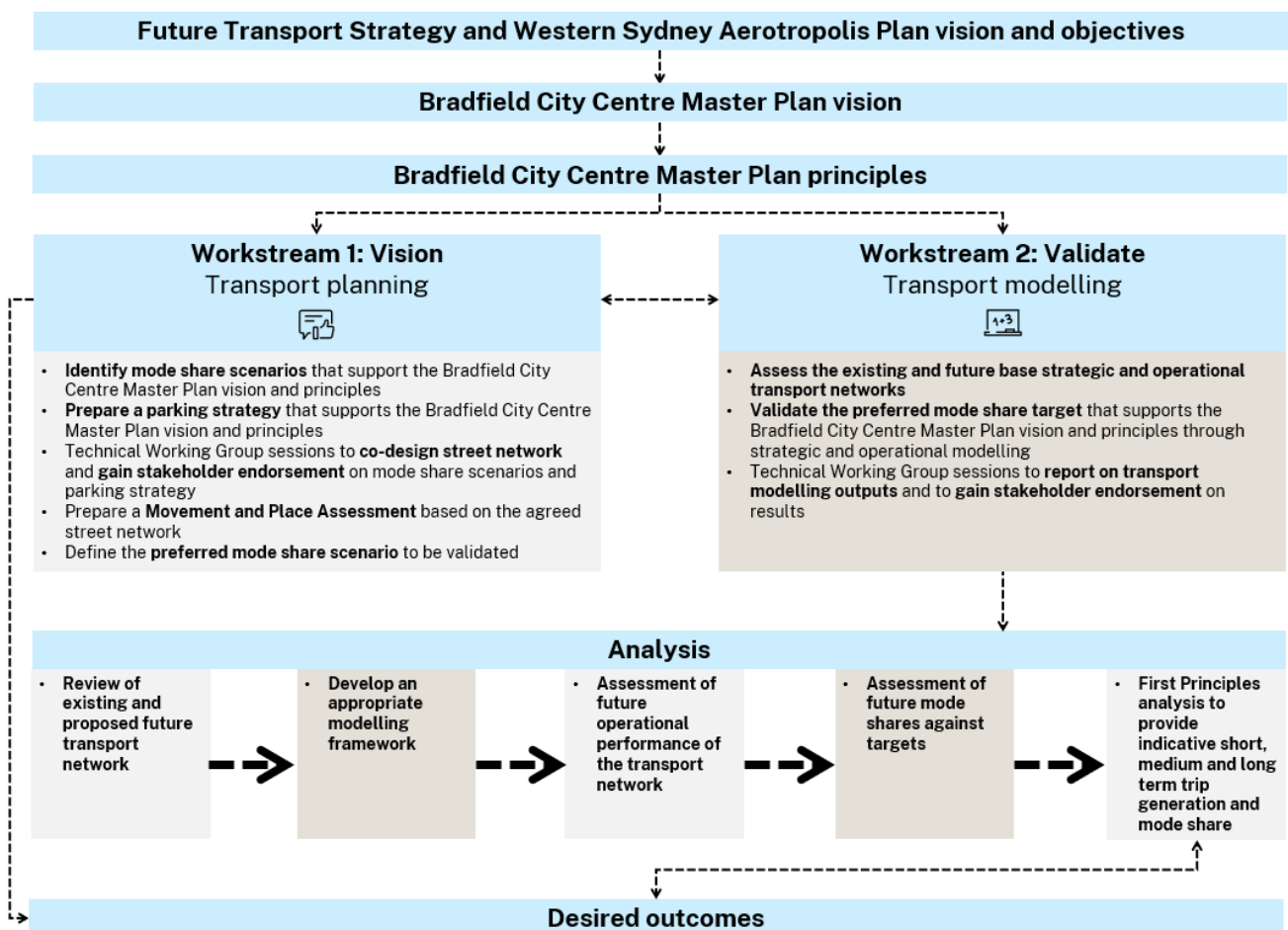
5 Technical Approach/ Framework

5.1 TMAP Approach

An evidence-based methodology as agreed with the Transport Working Group was established to guide the overall TMAP assessment framework for the Bradfield City Centre Master Plan. This approach ensured alignment with the vision, objectives and mode share targets established in the Western Sydney Aerotropolis Plan and Precinct Plans, as well as the vision and principles in the Bradfield City Centre Master Plan. The purpose of the transport modelling workstream was to provide a robust assessment (**validation**) of the mode share scenarios and parking strategy (**vision**) identified in the transport planning workstream.

The five-step analysis process as part of the TMAP is detailed in **Figure 29**.

Figure 29 Approach to overall assessment framework



5.2 Modelling Methodology and Approach

Transport and traffic modelling has been undertaken to support the development of the Master Plan for Bradfield City Centre. The modelling approach was developed in conjunction with the TfNSW cluster incorporating Advanced Analytics and Insights (AAI) and WPCA to provide an evidence-based assessment of the traffic and transport outcomes.

The modelling scope includes:

- A review of the existing and proposed future transport network servicing the Bradfield City Centre
- Development of an appropriate modelling framework to model future road network operation and future transport mode shares for Bradfield City Centre
- Assessment of the future operational performance of the transport network servicing Bradfield City Centre based on both strategic and operational modelling
- Assessment of future mode shares against Bradfield City Centre mode share targets
- First Principles analysis to provide indicative short, medium, and long term trip generation and mode shares for Bradfield City Centre, and assessment of these mode shares against Bradfield City Centre mode share targets.

During January to March 2021, weekly meetings were held between TfNSW, WPCA and AECOM to discuss traffic and transport considerations for the Bradfield City Centre Master Plan. Furthermore, fortnightly Transport Working Group (TWG) meetings on the transport and traffic assessment were held with representatives from TfNSW, Sydney Metro, Liverpool City Council, WPCA and AECOM from April 2021 to October 2021 and April 2022 to October 2022. Meetings were also held with TfNSW to discuss specific modelling during the course of the project. The outcomes from these meetings included:

- Agreement and endorsement of the transport and traffic modelling framework – including the use of the TfNSW suite of models i.e., STM, PTPM and Western Sydney Airport Growth Area Mesoscopic Traffic Model
- Agreement and endorsement of the modelling scenarios for horizon years 2026, 2036 and 2056
- Agreement and endorsement of the land use inputs and strategic network assumptions for both roads and public transport for input to modelling
- Agreement and endorsement of the mode share targets and trip generation rates for Bradfield City Centre

5.3 Transport Forecasting and Modelling Process

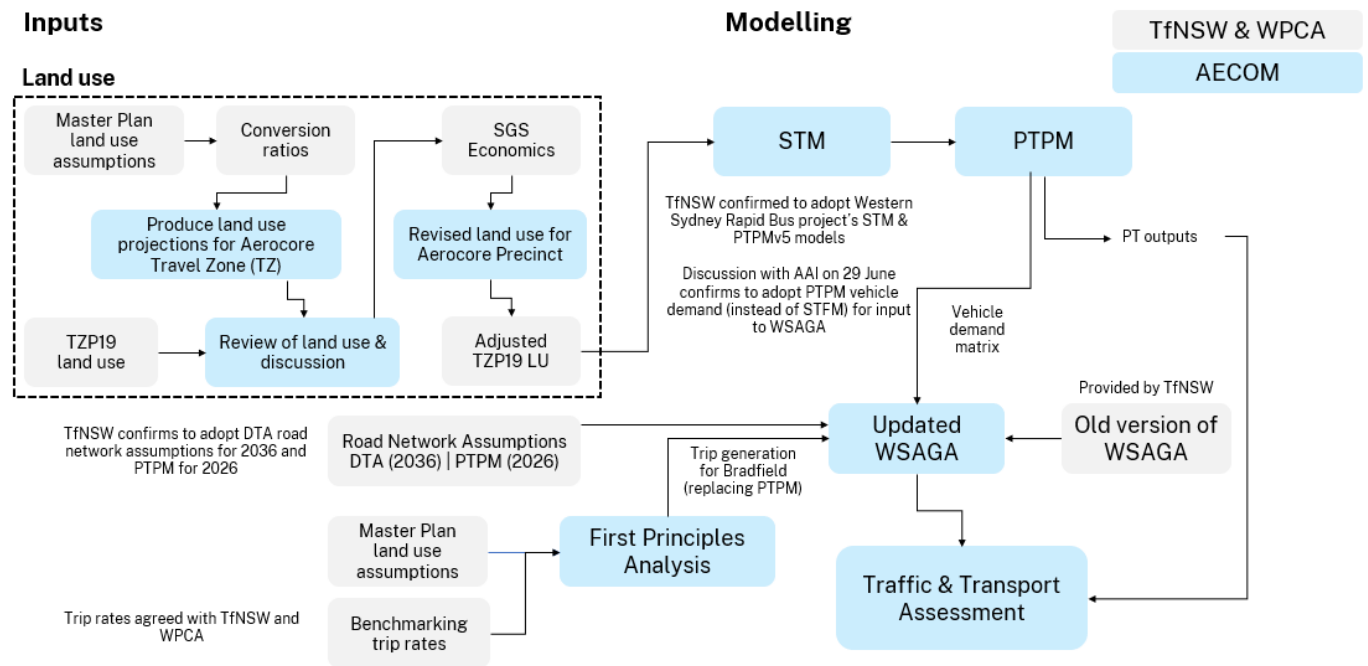
The traffic and transport modelling and assessment framework was developed in conjunction and endorsed by TfNSW and WPCA. It is summarised in Figure 30 and includes:

- Development of a set of project-specific land use projections in conjunction with WPCA and the TfNSW land use team for input to the strategic modelling
- Undertake strategic modelling using TfNSW's suite of strategic models including the STM and PTPM
- Undertake operational traffic modelling using the latest version of the TfNSW's Western Sydney Airport Growth Area (WSAGA) Mesoscopic Traffic Model with future road network inputs provided by TfNSW (for areas external to Bradfield City Centre) and WPCA (Bradfield City Centre)

Each of the three transport models has a different role in the transport modelling framework. The two strategic models, STM and PTPM, estimate future conditions on the road and public transport network surrounding the study area. The WSAGA mesoscopic model then takes outputs from strategic modelling, as well as incorporating trip generation outputs from a detailed first principles analysis, to assess the operational performance of the road network within and surround Bradfield City Centre.

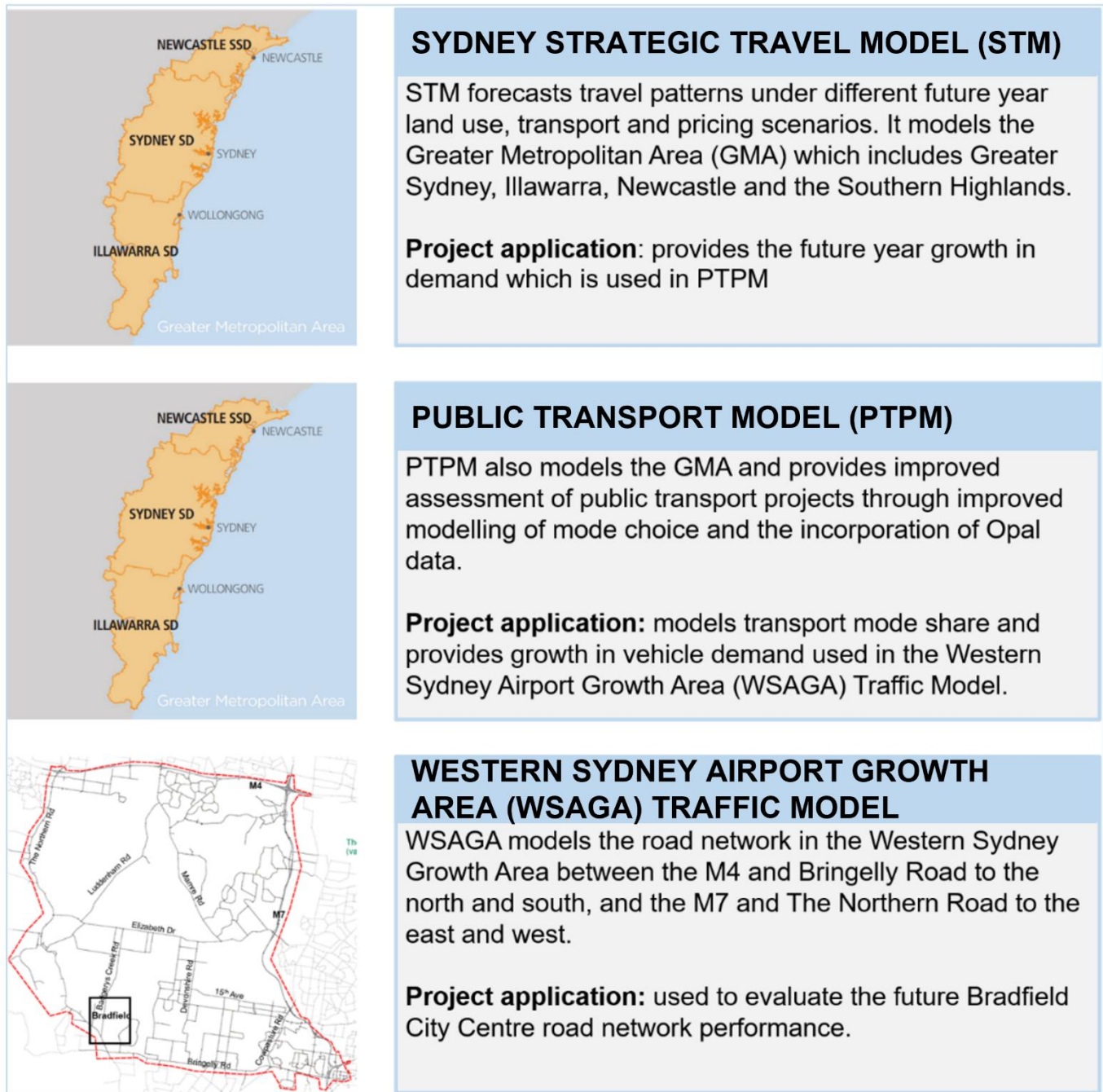
A general description and the roles of each of these models in the project modelling framework are summarised in **Figure 31** and discussed further as follows.

Figure 30 Transport and Traffic Modelling and Assessment Framework



Source: Developed in consultation with TfNSW and WPCA (AECOM, 2021)

Figure 31 STM – PTPM – WSAGA Modelling Framework



Source: AECOM, 2022

5.3.1 Stage 1: Sydney Strategic Travel Model (STM)

The Sydney Strategic Travel (STM) model forecasts travel patterns under different future year land use, transport, and pricing scenarios. It produces travel demand forecasts by origin and destination travel zones (TZs) for the Greater Metropolitan Area (GMA) which includes Greater Sydney, Illawarra, Newcastle, and the Southern Highlands. The output from STM provides the future year growth in demand used in PTPM.

The STM modelling approach is as follows.

- The AAI team provided STM version 3.61 for use to support the transport and traffic assessment for the Bradfield City Centre Master Plan. This is the same as the model version used for the TfNSW Western Sydney Rapid Bus (WSRB) project.
- A project-specific set of land use projections has been developed in conjunction with the TfNSW land use team using population and employment inputs for the Bradfield City Centre provided by WPCA.
- Future road and transport network assumptions for the purpose of strategic modelling have been agreed with TfNSW which largely reflect assumptions adopted in the STM model used for the TfNSW WSRB project.
- STM was run with the above inputs to produce total road and public transport trip matrices which were used to provide future year growth in demand for PTPM modelling.

5.3.2 Stage 2: Public Transport Project Model (PTPM)

Similar to STM, the Public Transport Project Model (PTPM) models the Greater Sydney Metropolitan Area. It provides a more detailed assessment of public transport projects through improved modelling of mode choice and incorporation of observed Opal data as part of the base year calibration and validation.

PTPM takes the growth in future demand from STM, to model transport demand and provide the vehicle demand growth used in the Western Sydney Airport Growth Area (WSAGA) Traffic Model, as well as transport mode shares for project mode share analysis.

The PTPM modelling approach is as follows.

- The TfNSW AAI team provided PTPM version 5 for use in this project. This is the same as the version of PTPM 5 used for the TfNSW WSRB project. The WSRB model is based on the Western Sydney Growth Infrastructure Compact (WS-GIC) demand modelling project PTPM with changes including a change in density factors based on land use updates, review, and update of bus services in Western Sydney, a network audit with some changes made to the WS-GIC assumptions for consistency with STM and project needs, and a review of bus service assumptions in Western Sydney.
- The land use forecasts adopted are the Bradfield City Centre project-specific land use forecasts which were developed in conjunction with the TfNSW Land Use team based on population and employment inputs for the Bradfield City Centre provided by WPCA.
- Future road and transport network assumptions for the purpose of strategic modelling have been agreed with TfNSW which largely reflect assumptions adopted in the PTPM model used for the TfNSW WSRB project.
- As agreed with TfNSW and WPCA, the PTPM precinct parking module (PPM) was applied for future years 2036 and 2056 to better represent the car parking controls for the Bradfield City Centre.
- PTPM was run with the above inputs and with demand growth from STM to produce vehicle demand growth for input to WSAGA modelling, and mode shares for subsequent analysis.

To keep consistency for Bradfield City Centre all modelling should be using the current WSAGA traffic model that supports the TMAP.

5.3.3 Stage 3: Western Sydney Airport Growth Area (WSAGA) Traffic Model

The Western Sydney Airport Growth Area (WSAGA) mesoscopic traffic model covers the road network in the Western Sydney Airport Growth Area between the M4 and Bringelly Road to the north and south, and the M7 and The Northern Road to the east and west. It was originally developed for DPE and has been subsequently refined and used for projects including the M12 Motorway EIS by TfNSW.

Mesoscopic modelling allows for dynamic equilibrium assignment and can model delays and capacity constraints better than strategic models. The WSAGA model takes vehicle demand growth from PTPM,

combined with trip generation estimated from a first principles analysis for the Bradfield City Centre to estimate future road network and intersection performance.

The WSAGA modelling approach for the TMAP is as follows.

- The TfNSW AAI team provided the WSAGA model for use in this project. This is a version of the WSAGA model used as part of the TfNSW M12 Motorway EIS study.
- The WSAGA model, as provided by TfNSW, already includes a representation of the road network in the Western Sydney area, but it does not represent the most up to date network as adopted by other TfNSW models such as the DTA and PTPM. As advised by TfNSW and for the purpose of this project, the WSAGA model network was subsequently updated to be consistent with the TfNSW Dynamic Traffic Assignment (DTA) model network for 2036, also provided by the TfNSW AAI team; and to be consistent with the PTPM model for 2026.
- The WSAGA model does not include a detailed road network representation of the Bradfield City Centre area. The Bradfield City Centre Master Plan road network has been coded in the WSAGA model for traffic modelling and performance assessment.
- The WSAGA model already has a calibrated and validated 2017 model base year. It was agreed with TfNSW (and it is a standard practice) that future year demand matrices are generated by applying the absolute growth in traffic from PTPM (future year matrix minus base year matrix) to the calibrated model base year matrix.
- To align with Bradfield City Centre agreed target trip generation for future years, the AM peak PTPM traffic demand matrix and mode share outputs are examined for discrepancies between the PTPM output mode shares and the target mode shares for Bradfield City Centre. The trip ends for Bradfield in the PTPM traffic demand matrix are then updated, if necessary, to reflect the target trip generation in the future years, before feeding into WSAGA modelling.
- For modelling the PM peak in the WSAGA model, an established TfNSW approach involved transposing the PTPM AM vehicle matrix.
- The WSAGA model has been developed and run as described above to provide the traffic performance measures presented in this TMAP assessment.

5.4 Mode Share Targets

Four potential mode share scenarios have been identified and assessed to support the short-, medium- and long-term vision and objectives for Bradfield City Centre, as illustrated in **Figure 32**. This assessment builds on the mode share scenarios identified in the Western Sydney Aerotropolis Precinct Plan. The assessment is also based on comparable City Centre case studies to demonstrate how density, policy and transport infrastructure and services can influence mode share.

Figure 32 Mode share scenarios for Bradfield City Centre

Indicators and mode share targets			
			
Scenario 1: Lower sustainable mode share targets	Scenario 2: Medium sustainable mode share targets	Scenario 3: Higher sustainable mode share targets	Scenario 4: Highest sustainable mode share targets
- Low employment and/or population densities - No/few effective policies and strategies to influence travel behaviour - Limited access to public transport infrastructure and services - High use of private vehicles - Disconnected cycling network - Walking not an attractive option	- Low to moderate employment and/or population densities - Some effective policies and strategies to influence travel behaviour - Reasonable access to public transport infrastructure and services - Balanced use of public transport and private vehicles for medium- and long-distance trips - Developing cycling network - Walking attractive for short trips	- Moderate to high population and/or employment densities - Effective policies and strategies to influence travel behaviour - Higher rate of public transport use and cycling for medium- and long-distance trips - Good access to public transport infrastructure and services - Connected cycling network which is an attractive option for short and medium trips - Walking attractive for short trips Beyond Business As Usual	- High population and/or employment densities - Very effective policies and strategies to influence travel behaviour - Highest rate of public transport use and cycling for medium- and long-distance trips - Excellent access to public transport infrastructure and services - Connected cycling network which is an attractive option for short and medium trips - Walking is an attractive option for short trips Beyond Business As Usual

Statistical Area 2 (SA2) data from the 2016 Census was used to inform this assessment. The following SA2 geographies form the basis of case studies for each mode share scenario, which were provided to TfNSW:

- Lower sustainable mode share targets:** Liverpool, NSW and Parramatta-Rosehill, NSW
- Medium sustainable mode share targets:** Chatswood (East)- Artarmon, NSW and Perth City, WA
- Higher sustainable mode share targets:** Melbourne, VIC and North Sydney-Lavender Bay, NSW
- Highest sustainable mode share targets:** Sydney-Haymarket-The Rocks, NSW

This analysis explored four potential mode share future scenarios for Bradfield City Centre. The analysis highlighted the importance of a well-connected public transport network with efficient infrastructure and services is critical to influencing mode share. Further to this, the analysis also outlined the value of employment and population density in influencing mode share.

Figure 33 illustrates a summary of the characteristics of each scenario. The following conclusions were agreed in the Technical Working Group (TWG) and formed the basis for the validation section of this report in **Section 6**):

Lower sustainable mode share targets: most feasible in the short term (2026) as the provision of public transport infrastructure and services and development in the Bradfield city centre is in its infancy.

Scenario 1: Lower sustainable mode share targets	
	
0% to 50% of all trips Walking, cycling and public transport	50% to 100% of all trips Private vehicles

Medium sustainable mode share targets: most feasible in the medium term (2036) as the provision of public transport infrastructure and services and development in the Bradfield city centre starts to mature. Beyond business as Usual in context of Western Parkland City.

Scenario 2: Medium sustainable mode share targets	
	
50% to 66% of all trips	34% to 50% of all trips
Walking, cycling and public transport	Private vehicles

Higher sustainable mode share targets: most feasible in the long term (2056 and beyond) as provision of public transport infrastructure and development in the Bradfield city centre is well established. Beyond business as Usual in context of Western Parkland City.

Scenario 3: Higher sustainable mode share targets	
	
67% to 83% of all trips	17% to 33% of all trips
Walking, cycling and public transport	Private vehicles

- **Highest sustainable mode share targets:** determined to be infeasible within the timeframe of this report. Beyond business as Usual in context of Western Parkland City.

Figure 33 Scenario 3 summary

Indicators and mode share targets			
			
Scenario 1: Lower sustainable mode share targets	Scenario 2: Medium sustainable mode share targets	Scenario 3: Higher sustainable mode share targets	Scenario 4: Highest sustainable mode share targets
- Low employment and/or population densities - No/few effective policies and strategies to influence travel behaviour - Limited access to public transport infrastructure and services - High use of private vehicles - Disconnected cycling network - Walking not an attractive option - Case studies: Liverpool, NSW and Parramatta, NSW Feasible in 2026	- Low to moderate employment and/or population densities - Some effective policies and strategies to influence travel behaviour - Reasonable access to public transport infrastructure and services - Balanced use of public transport and private vehicles for medium- and long-distance trips - Developing cycling network - Walking attractive for short trips - Case studies: Chatswood, NSW and Perth, WA Feasible in 2036	- Moderate to high population and/or employment densities - Effective policies and strategies to influence travel behaviour - Higher rate of public transport use and cycling for medium- and long-distance trips - Good access to public transport infrastructure and services - Connected cycling network which is an attractive option for short and medium trips - Walking attractive for short trips - Case studies: Melbourne CBD, VIC and North Sydney, NSW Beyond Business As Usual Feasible in 2056	- High population and/or employment densities - Very effective policies and strategies to influence travel behaviour - Highest rate of public transport use and cycling for medium- and long-distance trips - Excellent access to public transport infrastructure and services - Connected cycling network which is an attractive option for short and medium trips - Walking is an attractive option for short trips - Case studies: Sydney CBD, NSW Beyond Business As Usual

Scenario 3: Higher sustainable mode share targets	
	
67% to 83% of all trips	17% to 33% of all trips
Walking, cycling and public transport	Private vehicles

6 Technical Assessment

6.1 Assessment Overview

An integrated transport assessment framework was developed in conjunction with and endorsed by the Transport Working Group, TfNSW and WPCA. The assessment framework adopts three transport models provided by TfNSW as part of the TMAP process. Each of the three transport models has a different role in the transport modelling framework. The two strategic models, STM and PTPM, estimate future conditions on the road and public transport network surrounding the study area. The WSAGA mesoscopic traffic model then takes outputs from strategic modelling, as well as incorporating trip generation outputs from a detailed first principles analysis, to assess the operational performance of the road network within and surrounding Bradfield City Centre.

6.2 Modelling and Assessment Scenarios

In discussion and as agreed with TfNSW and WPCA, STM and PTPM modelling has been undertaken for future years 2026, 2036 and 2056, to provide an assessment of transport demand growth and transport mode shares at different stages of the Bradfield City Centre Master Plan development. The agreed modelled STM and PTPM scenarios and inputs summary are shown in **Table 16** and **Table 17**.

Table 16 STM Modelling Scenarios

Scenario	WSRB model run	Land Use	Road and Bus networks
Future year 2026	#WSCD201	Project specific land use for 2026	Based on WSRB 2026, adopt project case freq. for the 5 rapid bus routes
Future year 2036	#WSCD301	Project specific land use for 2036	Based on WSRB 2036, adopt project case freq. for the 5 rapid bus routes
Future year 2056	#WSCD401	Project specific land use for 2056	Based on WSRB 2046, adopt project case freq. for the 5 rapid bus routes Additional rail schemes

Source: Developed in consultation with TfNSW and WPCA (AECOM, 2021)

Table 17 PTPM Modelling Scenarios

Scenario	WSRB model run	Demand Input	Road and Bus networks
Future year 2026	#WSCD204	From STM modelling (2026) described above	Based on WSRB 2026, adopt 'project case' bus network and frequencies
Future year 2036	#WSCD304	From STM modelling (2036) described above	Based on WSRB 2036, adopt 'project case' bus network and frequencies It was agreed with TfNSW and WPCA for 2036 to adopt the Precinct Parking Module with an Alternate Specific Constant (ASC) of 30 mins (after a review of the PTPM results for an ASC of 30 mins)
Future year 2056	#WSCD404	From STM modelling (2056) described above	Based on WSRB 2046, adopt 'project case' bus network and frequencies Additional rail schemes

Scenario	WSRB model run	Demand Input	Road and Bus networks
			It was agreed with TfNSW and WPCA for 2056 as part of a vision led planning process to adopt the Precinct Parking Module with an ASC of 90 mins within PTPM

Source: Developed in consultation with TfNSW and WPCA (AECOM, 2021)

Three mesoscopic traffic modelling scenarios have been developed and agreed with TfNSW and WPCA to provide the traffic modelling and assessment for the Bradfield City Centre Master Plan using the WSAGA traffic model. These are shown in **Table 18** below.

Table 18 Mesoscopic WSAGA Traffic Modelling Scenarios

Scenario	Time Period	Demand Input	Network
Future year 2026	AM & PM	PTPM cordon traffic demand matrix for 2026, with adjustments to trip ends at Bradfield City Centre based on First Principles trip generation analysis using 2026 Master Plan development yields (GFA 48,500 sqm)	Wider road network in the WSAGA area aligns with PTPM model for 2026.
Future year 2036	AM & PM	PTPM cordon traffic demand matrix for 2036, with adjustments to trip ends at Bradfield City Centre based on First Principles trip generation analysis using 2036 Master Plan development yields (GFA 341,000 sqm)	Wider road network in the WSAGA area aligns with TfNSW's Dynameq model for 2036.
Future year 2036 for the wider network <u>plus</u> 2056 development yields and internal network for the Bradfield City Centre	AM & PM	PTPM cordon traffic demand matrix for 2036, with adjustments to trip ends at Bradfield City Centre based on First Principles trip generation analysis using 2056 Master Plan development yields (GFA 1,258,000 sqm)	Wider road network in the WSAGA area aligns with TfNSW's Dynameq model for 2036.

Source: Developed in consultation with TfNSW and WPCA (AECOM, 2021)

The geographical extents of the modelling area for each of the models are shown in Figure 31 in the earlier section of this report.

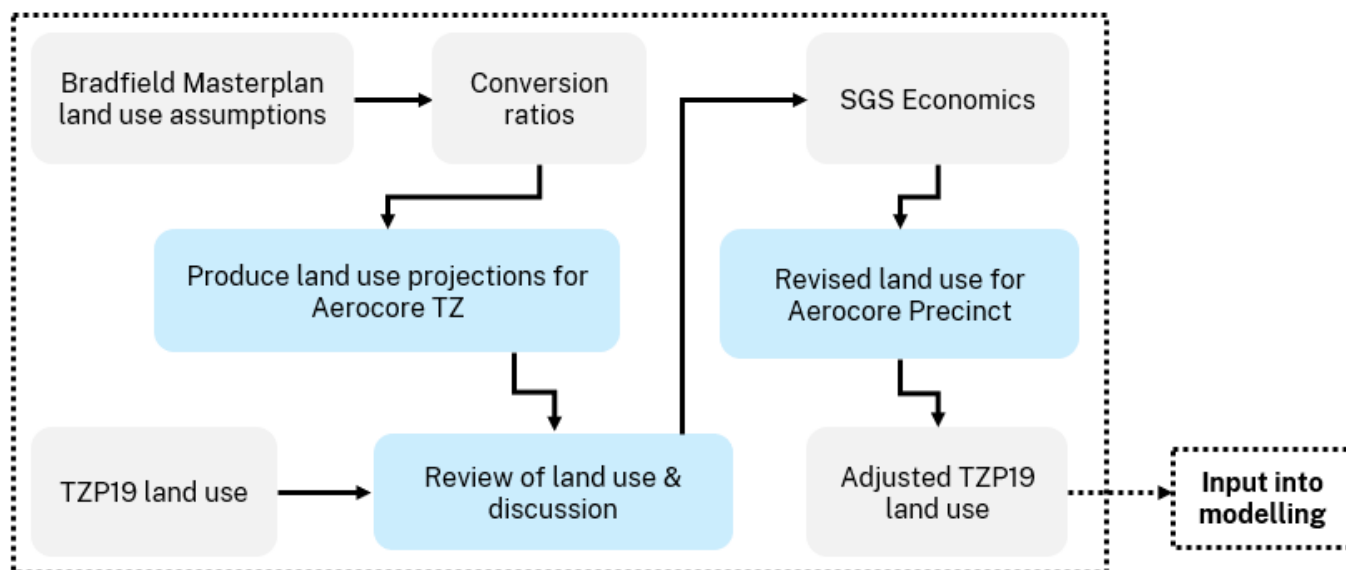
6.3 Land Use – Population and Employment

This section provides an overview of the key transport and traffic modelling assumptions underpinning the strategic (STM & PTPM) and mesoscopic (WSAGA) modelling for this project. The TMAP process and supporting analysis was based on the agreed TZP19 land use forecasts as advised by TfNSW in February 2021. This represented a consistent baseline and starting point during the TMAP process to review land use projections specifically for Bradfield City Centre.

AECOM undertook a review of the TZP19 land use projections (which is the TfNSW 'official' release of population and employment projections) and identified differences between the TZP19 projections and the target development yields provided by WPCA for the Bradfield City Centre (located at TZ3622). It was therefore agreed with TfNSW and WPCA in March 2021 to develop a project-specific land use for input to the transport and traffic modelling and assessment for the Bradfield City Centre Master Plan.

The process in developing a project-specific set of land use (population and employment) projections is shown in **Figure 34**.

Figure 34 Development of project-specific land use



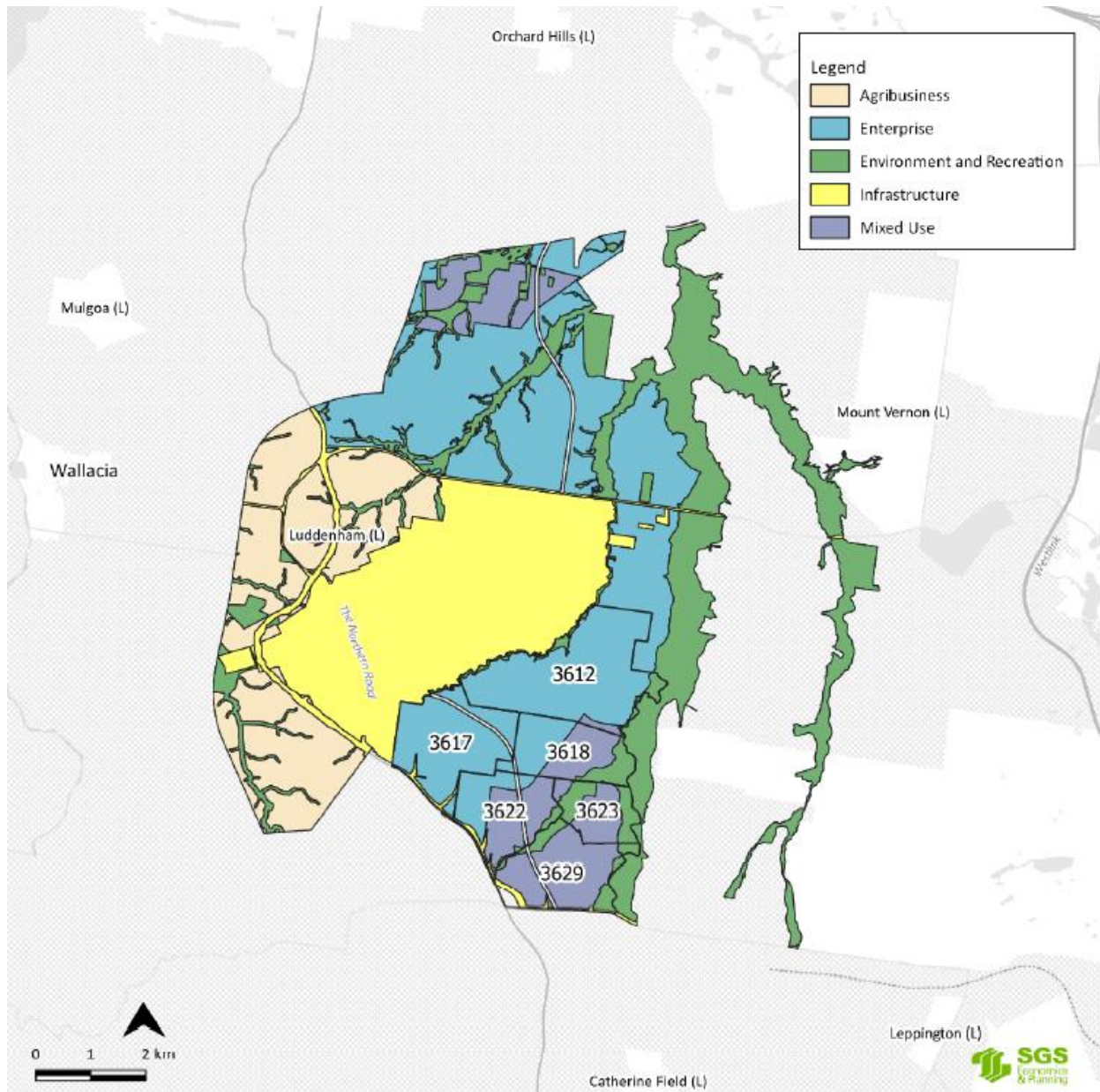
Source: AECOM 2023

The following steps are involved to develop the project-specific land use.

1. Step 1 - Undertake an initial review and estimate of future year land use for the Bradfield City Centre based on the development yields provided by WPCA
Employment projections implied from the Bradfield City Centre Master Plan development assumptions were derived by using Landcom common planning assumptions to convert Bradfield City Centre Masterplan GFA to employment numbers.
2. Step 2 - Compare initial population and employment estimates against TZP19 land use forecasts and discussed findings with TfNSW and WPCA
These draft employment land use projections were reviewed against TfNSW TZP19 projections for travel zone 3622 (see **Figure 35**), which is the travel zone which contains the planned development for the Bradfield City Centre Masterplan. It was found that there were some differences between the two sets of employment projections.

It was agreed with WPCA and TfNSW that additional analysis and a land use redistribution exercise be undertaken on TZP19 to address the differences between the two sets of projections.
3. Step 3 - WPCA engaged SGS Economics to review the differences in land use projections for the Aerotropolis Precinct (which includes Bradfield City Centre) and to provide advice on redistribution of land use forecasts for the whole Aerotropolis Precinct (including 6 travel zones)
SGS Economics undertook land use analysis for the Aerotropolis Core precinct which encompasses travel zones 3612, 3617, 3618, 3622, 3623 and 3629. These travel zones and the State Environmental Planning Policies (SEPP) zoning are shown in **Figure 35**.

Figure 35 Aerotropolis Precinct - travel zones and SEPP zoning



Source: SGS Economics & Planning informed by TfNSW and WPCA, 2021

6.4 Future Projects

6.4.1 Future Rail Network in Strategic Modelling

The future rail network in the Western Sydney Rapid Bus (WSRB) project's STM and PTPM models were adopted as a starting point for this project. For the WSRB project, a future rail network was developed to reflect the latest rail network common assumptions, including only currently funded projects. The rail network for the Bradfield City Centre project is the same as that used for the WSRB project except for the South West Rail Link extension to Aerotropolis station which was not included in the in WSRB project but has been included for this project. Rail projects which have been included in modelling are shown in **Table 19**.

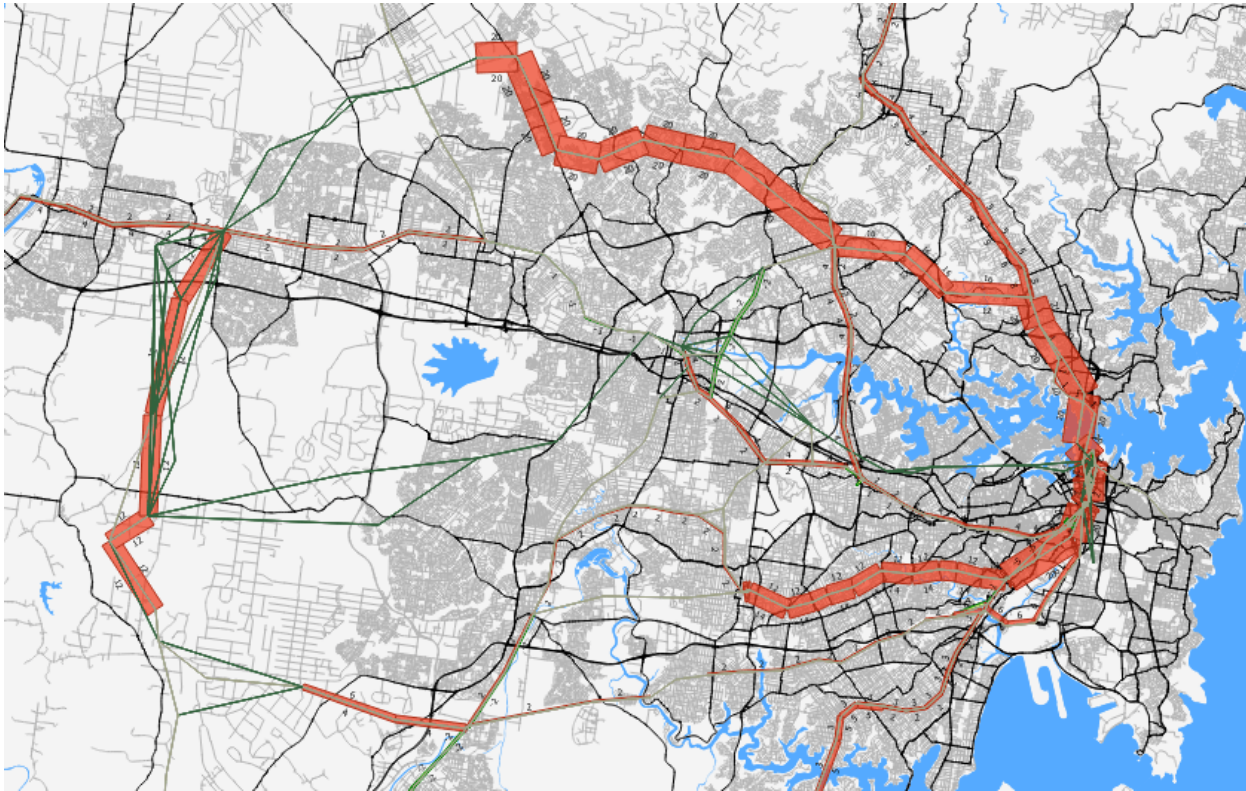
Table 19 Rail projects included in strategic modelling

Description	2026	2036	2056
More Trains More Services	✓	✓	✓
Sydney Metro North West Line and City and Southwest	20 trains per hour Tallawong to Bankstown	20 trains per hour Tallawong to Bankstown	20 trains per hour Schofields to Bankstown
Sydney Metro - Western Sydney Airport	12 trains per hour Aerotropolis to St Marys	12 trains per hour Aerotropolis to St Marys	12 trains per hour Schofields to Macarthur
Sydney Metro West		20 trains per hour Westmead to Zetland	20 trains per hour Aerotropolis to Zetland
South West Rail Link Extension to Aerotropolis		10 trains per hour	10 trains per hour
T1 North Shore and Western Line Upgrade		✓	✓

Source: Based on WSRB project and advice from TfNSW

The change in rail frequency as a result of these rail projects are shown in the rail frequency difference plots in **Figure 36**, **Figure 37** and **Figure 38**.

Figure 36 Change in rail frequency 2019 to 2026



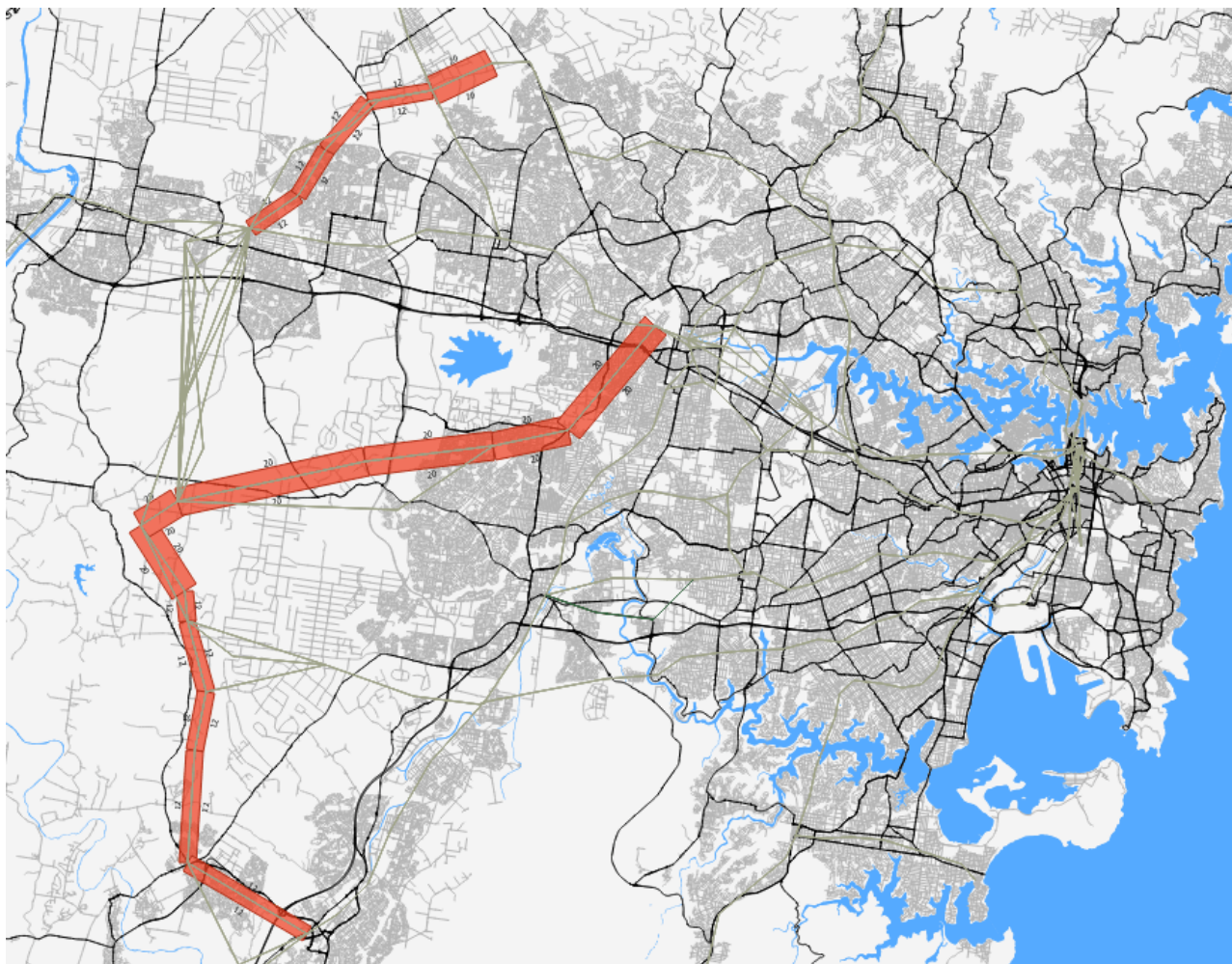
Source: PTPMv5 modelling

Figure 37 Change in rail frequency 2026 to 2036



Source: PTPMv5 modelling

Figure 38 Change in rail frequency 2036 to 2056



Source: PTPMv5 modelling

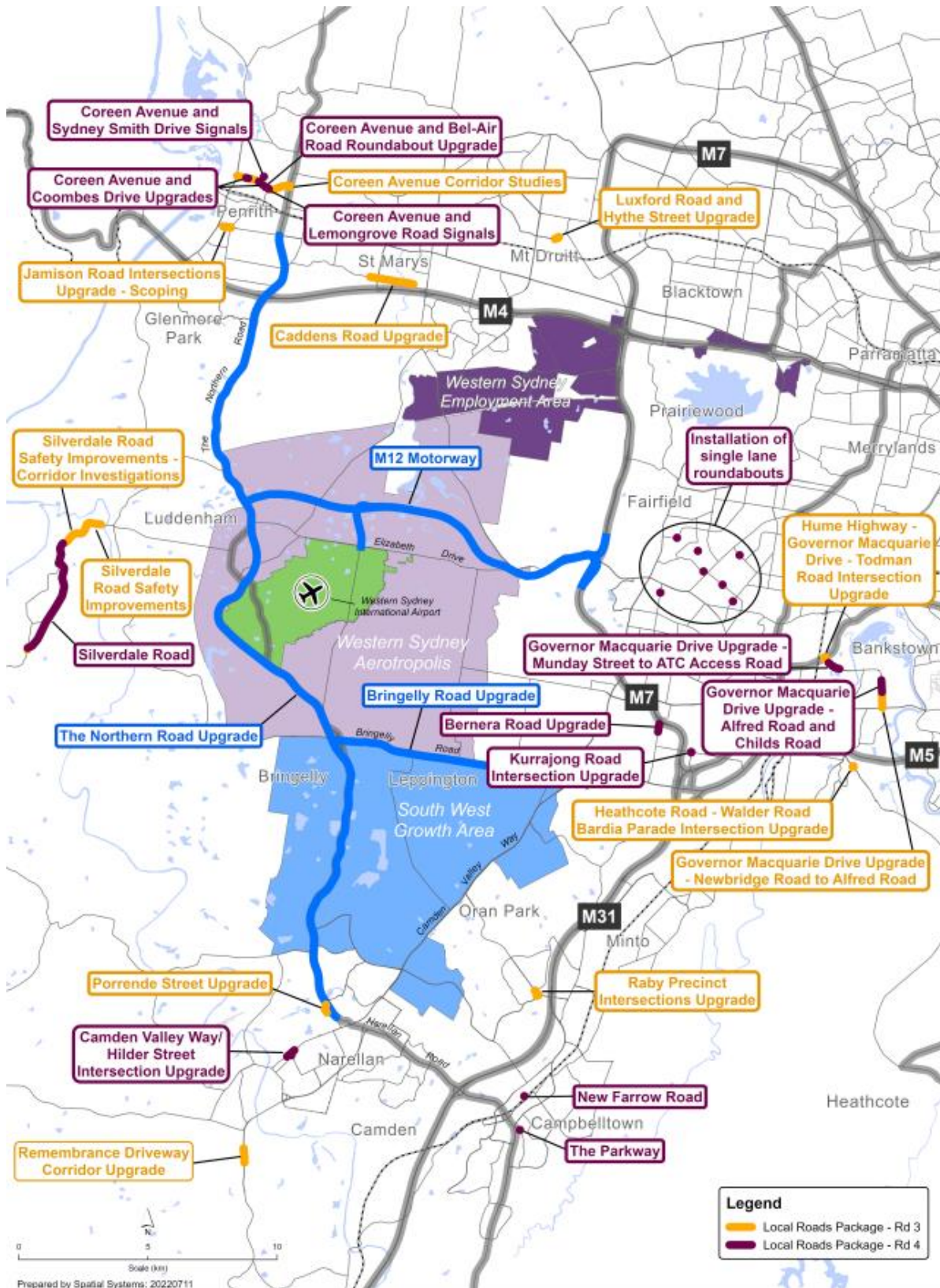
6.4.2 Target Future Road Network in Strategic Modelling

As part of the TMAP strategic modelling, both the STM and PTPM road networks remained the same as per the most recent Western Sydney Rapid Bus (WSRB) STM and PTPM models prepared on behalf of TfNSW. These WSRB STM and PTPM models were based on the road network used for the Western Sydney-Growth Infrastructure Compact (GIC) project, with modifications made for the WSRB project to better reflect updated road network assumptions. This allowed for the bus routes to be accurately represented, and to standardise the network assumptions between STM and PTPM, particularly in the Western Parkland City.

The major road improvements in the area included as part of forecast year 2026 include the M12 Motorway, Elizabeth Drive widening (west), access to the Western Sydney International Airport, The Northern Road realignment, Devonshire Road widening, and Bringelly Road widening. Further road improvements in 2036 include the widening of the M7 Motorway, Werrington Arterial, Outer Sydney Orbital Stage 1, Elizabeth Drive widening, Fifteenth Avenue widening and Eastern Ring Road.

Details of the major key projects included in the road network in STM and PTPM modelling are highlighted in Figure 39.

Figure 39 Western Sydney Infrastructure Plan



Source: Western Sydney Infrastructure Plan (Spatial Systems, 2022)

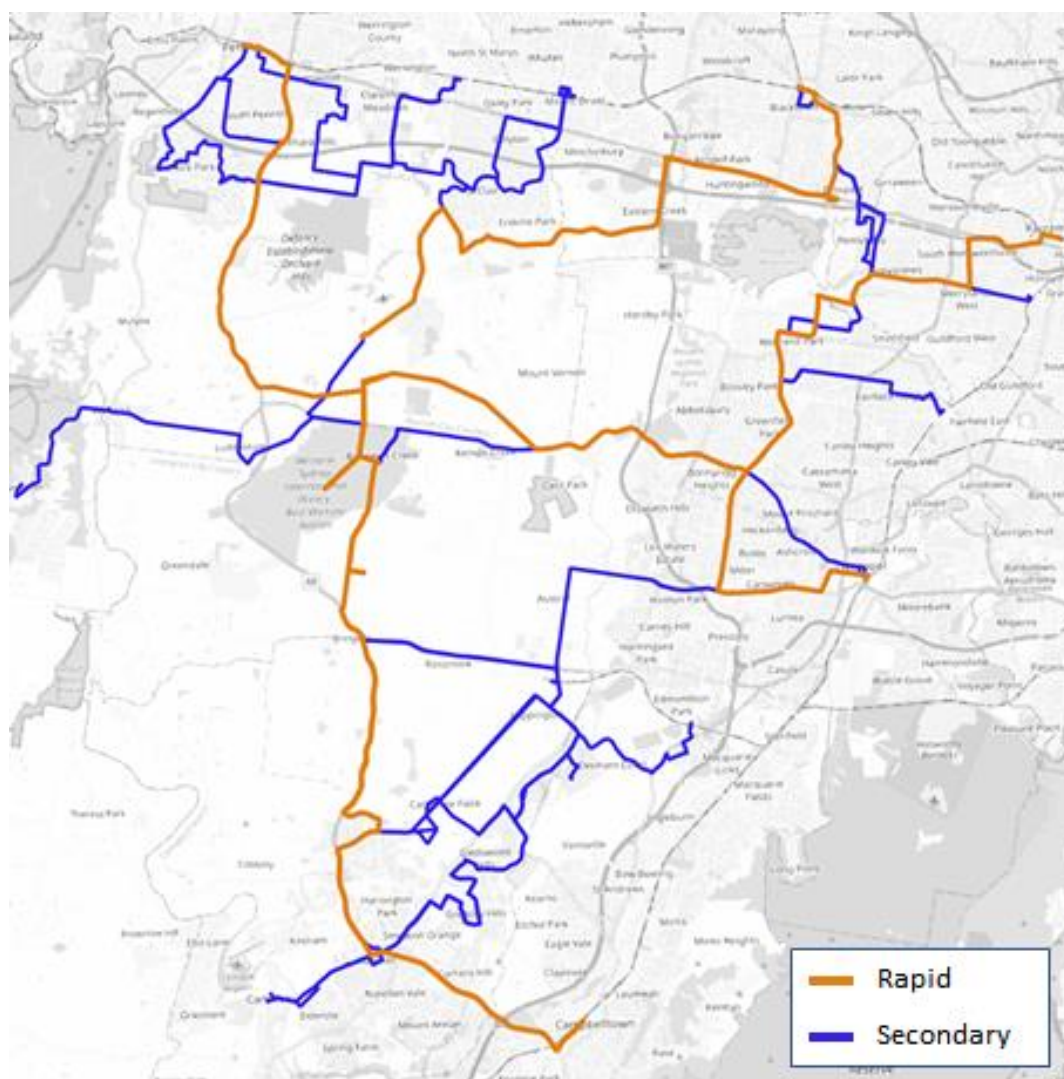
6.4.3 Future Bus Network in Strategic Modelling

The future bus network in the Western Sydney Rapid Bus project's STM and PTPM models were adopted as a starting point for the TMAP. For the purpose of Bradfield City Centre Master Plan, it was agreed with TfNSW to include the five Rapid Bus routes with project case frequency (a higher frequency scenario) in STM and PTPM modelling. The five Rapid Bus routes are:

- Penrith to Aerotropolis
- Liverpool to Aerotropolis
- Campbelltown to Aerotropolis
- Blacktown to Science Parl / Luddenham Metro
- Parramatta to Bonnyrigg

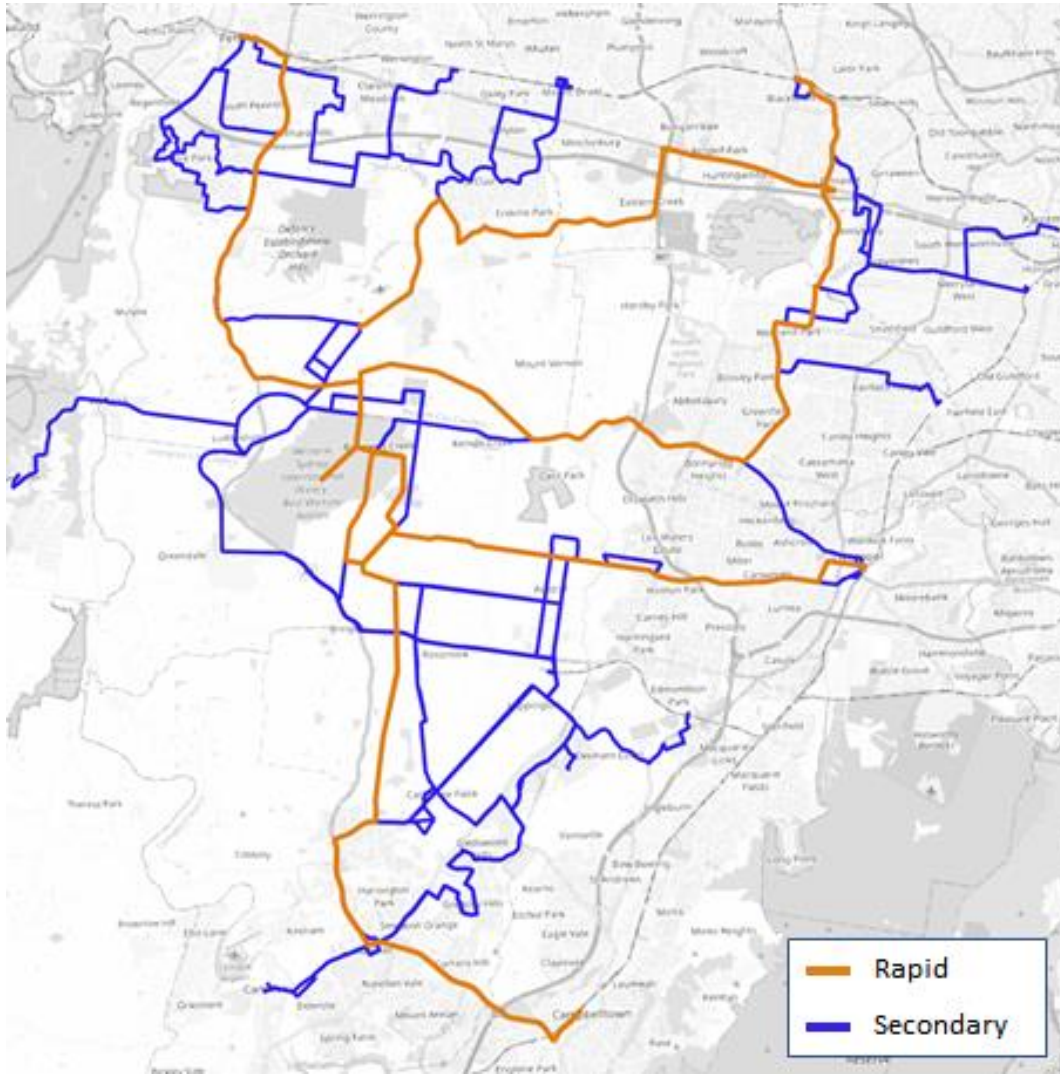
A map of the rapid and secondary services coded in the full project scenarios for each model year as part of the TMAP is shown in **Figure 40**, **Figure 41** and **Figure 42**.

Figure 40 2026 Rapid Bus and Secondary services



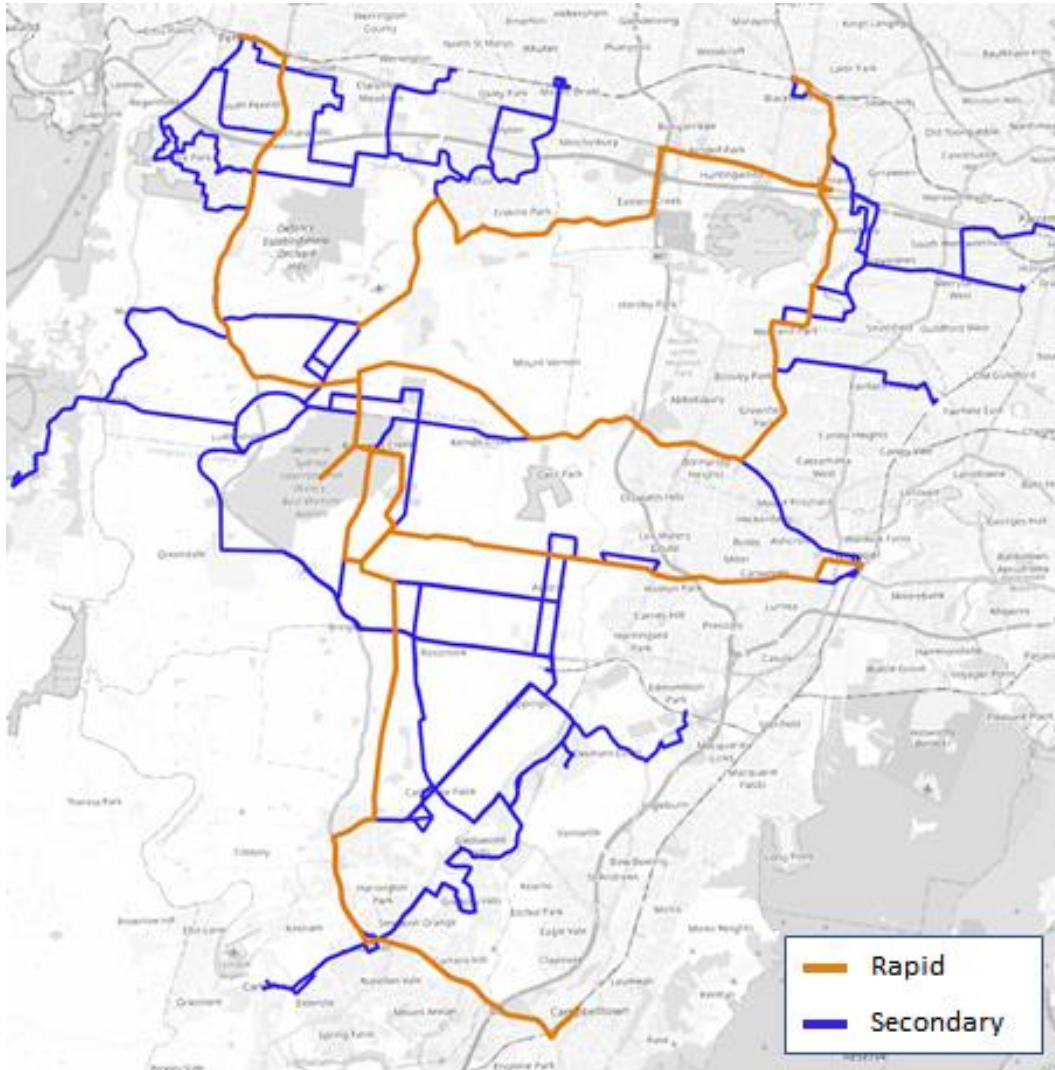
Source: Western Sydney Rapid Bus Project Modelling Report (2021)

Figure 41 2036 Rapid Bus and Secondary services



Source: Western Sydney Rapid Bus Project Modelling Report (2021)

Figure 42 2056 Rapid Bus and Secondary services



Source: Western Sydney Rapid Bus Project Modelling Report (2021)

6.5 Mode Share and Validation

Mode share targets for the Bradfield City Centre were derived based on mode shares in areas which have similar transport provisions and population and employment as planned for Bradfield City Centre in 2026, 2036 and 2056. The mode shares for car, public transport and active transport that were estimated based on the First Principles benchmarking of trip generation rates. The benchmarking of the trip generation rates were found to fall within these mode share targets and were subsequently agreed and endorsed by TfNSW in the Transport Working Group meetings. It is worth noting that the Bradfield Master Plan has been a vision led planning process and incorporates high target sustainable mode shares for 2056 (as agreed by TfNSW) with a key aim to reduce car mode share for the medium to long term.

The implied mode shares estimated from the trip generation analysis are summarised in **Table 20** below.

Table 20 Peak hour mode share estimates for 2026, 2036 & 2056 from benchmarking

Period	Future Year	Bradfield Mode Share Estimates (%)			Mode share targets (%) [Section 6.4]
		Private Vehicles	Public Transport	Active Transport	
AM peak	Short term (2026)	62%	34%	4%	50%-100% Private vehicles 0%-50% public transport & active transport
	Medium term (2036)	37%	51%	12%	34%-50% Private vehicles 50%-66% public transport & active transport
	Long term (2056)	27%	58%	15%	17%-33% Private vehicles 67%-83% public transport & active transport
PM peak	Short term (2026)	59%	36%	5%	50%-100% Private vehicles 0%-50% public transport & active transport
	Medium term (2036)	32%	55%	12%	34%-50% Private vehicles 50%-66% public transport & active transport
	Long term (2056)	23%	62%	15%	17%-33% Private vehicles 67%-83% public transport & active transport

Source: First Principles Analysis undertaken by AECOM (2022).

6.5.1 Mechanised mode shares

Mechanised mode shares (i.e. rail, bus and car) derived from PTPM modelling for the Bradfield City Centre (TZ3622) and the Aerotropolis Precinct (comprising six travel zones) for future years 2026, 2036 and 2056 are shown in **Table 21** and **Figure 43** below.

As population and employment activities increase over time, combined with the improvements to public transport provision and capacities, mode shares for public transport (rail and bus) are expected to continue to increase from 2026 to 2056. These mode shares only consider the mechanised modes and should be considered as indicative only.

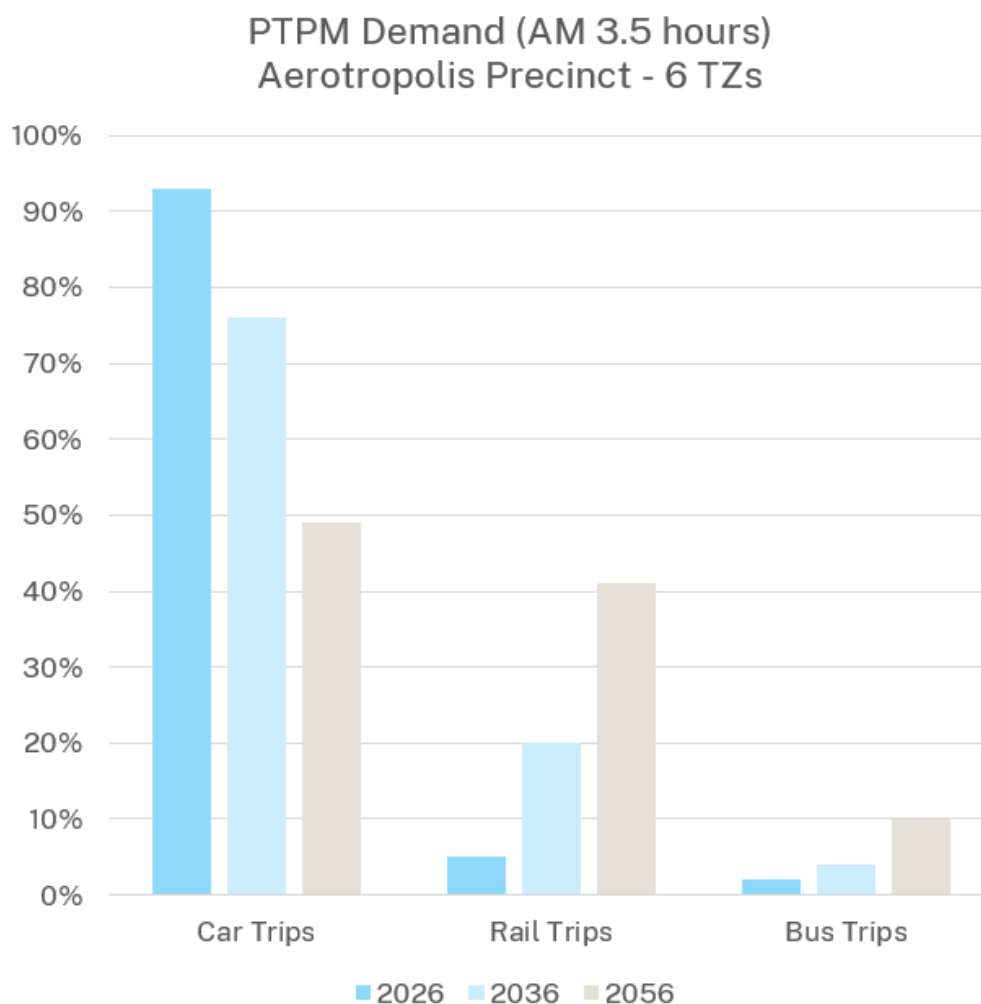
Table 21 Mode share for 2026, 2036 and 2056 from PTPM

Location	Year	PTPM Mode Shares (%)		
		Car	Rail	Bus
Bradfield	2026	92%	5%	3%
	2036	75%	20%	5%
	2056	34%	54%	12%
Aerotropolis Precinct	2026	93%	5%	2%
	2036	76%	20%	4%
	2056	49%	41%	10%

Source: PTPM modelling undertaken by AECOM (2022)

Note: Bradfield City Centre (Travel Zone 3622), and for the Aerotropolis Precinct (Travel Zones 3612, 3617, 3618, 3622, 3623, 3629)

Figure 43 Bradfield and Aerotropolis Precinct mode share - car, rail & bus trips only (AM 3.5hr)



Source: PTPM modelling undertaken by AECOM (2022)

Note - Bus to/from rail trips are grouped as Rail

6.6 Trip Generation

As agreed with TfNSW, a First Principles benchmarking exercise was undertaken to provide indicative short, medium, and long-term trip generation and mode shares to support the operational modelling for the Bradfield City Centre Master Plan. Based on a review of TfNSW (RMS) reference trip generation and guidance documents, as well as other relevant case studies, trip generation rates for both person and vehicle trips for different land use types were identified and agreed with TfNSW (see **Table 22**).

Table 22 Trip generation rates for each land use type

Land Use	Measure (Unit)	Total person trips (per measure)		Total vehicle trips (per measure)	
		AM	PM	AM (2026 2036 2056)	PM (2026 2036 2056)
Commercial	100m ² GFA	1.35	1.19	0.65 0.42 0.18	0.56 0.36 0.15
R&D Commercial	100m ² GFA	0.67	0.59	0.36 0.28 0.19	0.32 0.24 0.16
Advanced Industrial	100m ² GFA	0.41	0.36	0.25 0.21 0.17	0.22 0.19 0.15
Industrial	100m ² GFA	0.27	0.24	0.18 0.16 0.15	0.16 0.15 0.13
Retail	100m ² GFA	3.68	6.65	1.03 0.92 0.82	2.09 1.88 1.67
Hotel	Occupied room	0.5	0.5	0.15 0.13 0.10	0.15 0.13 0.10
Cultural	100m ² GFA	1.03	2.9	0.17 0.14 0.11	0.40 0.33 0.27
Education	Student	1.30	1.28	0.62 0.51 0.39	0.43 0.35 0.27
Residential	Dwelling	0.8	0.6	0.23 0.20 0.17	0.11 0.09 0.08

Source: Various TfNSW guidelines and references including benchmarked case studies

These agreed trip rates were then applied to the proposed Bradfield City Centre Master Plan to determine the overall trip generation potential for 2026, 2036 and 2056. These estimates are shown in **Table 23**, **Table 24** and **Table 25**, and form part of the traffic generation inputs for WSAGA traffic modelling.

Table 23 Short-term (2026) trip estimates for Bradfield City Centre

GFA (m ²)	Total person trips		Total vehicle trips	
	AM	PM	AM	PM
48,500	356	348	183	172

Note: In addition, to the trip estimates for 2026 shown in Table 23, a commuter car park was also assumed to be operational in 2026 (Sydney Metro WSA EIS). For the purpose of estimating traffic generation for input to WSAGA modelling, it is assumed the commuter car park would attract approx. 150 inbound vehicle trips during the AM peak hour and approx. 150 outbound vehicle trips during the PM peak hour (i.e., 50% of the car park capacity) based on a review of TfNSW commuter car park studies at Leppington, Edmondson Park, Revesby and St Marys stations.

Table 24 Medium-term (2036) trip estimates for Bradfield City Centre

GFA (m ²)	Total person trips		Total vehicle trips	
	AM	PM	AM	PM
341,000	5,679	5,990	1,761	1,607

Table 25 Long-term (2056) trip estimates for Bradfield City Centre

GFA (m ²)	Total person trips		Total vehicle trips	
	AM	PM	AM	PM
1,258,000	22,549	23,675	5,136	4,550

6.7 Pedestrians and Cyclists

The numbers of active transport trips (pedestrians and cyclists) for Bradfield City Centre during the AM and PM peak hours, estimated from the First Principles Analysis benchmarking exercise are shown in **Table 26**.

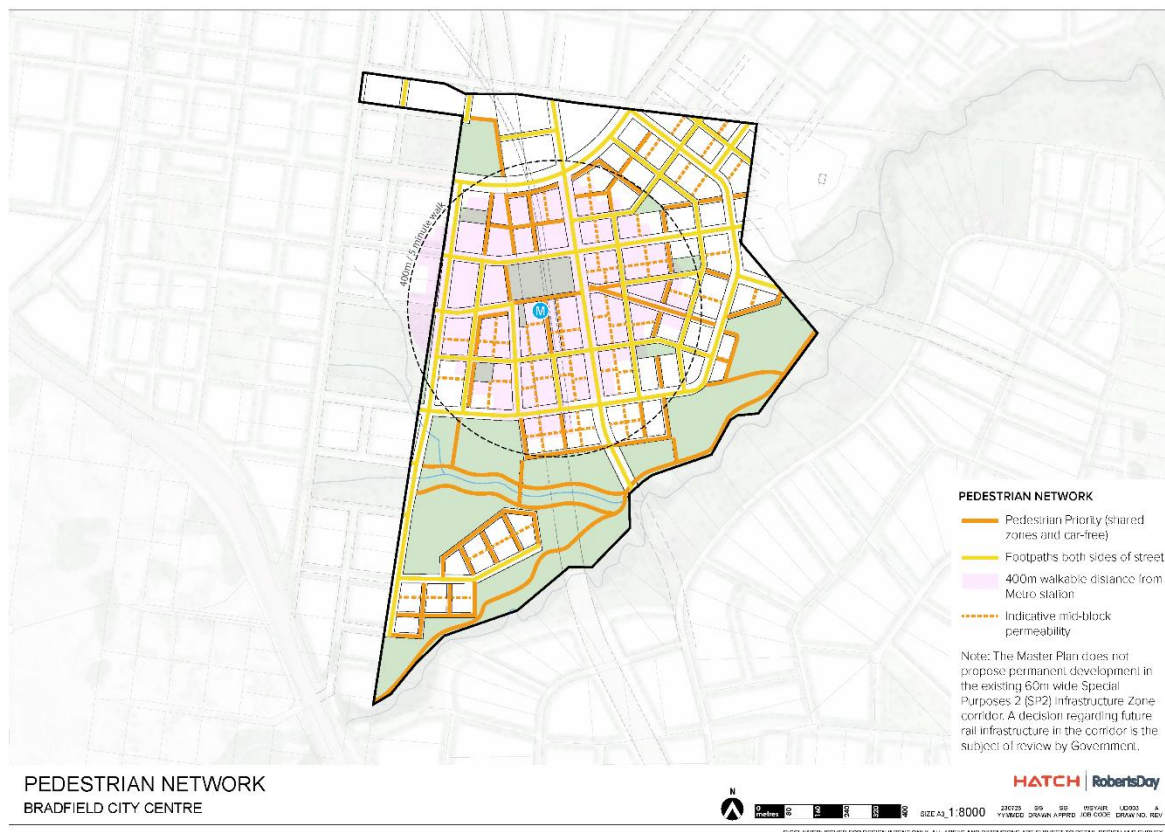
Table 26 Active transport trips for 2026, 2036 and 2056 – Bradfield City Centre

Period	Future Year	Total Person Trips	Active transport mode share (%)	Active transport trips
AM peak	2026	356	4%	14
	2036	5,679	12%	681
	2056	22,549	15%	3,382
PM peak	2026	348	5%	17
	2036	5,990	12%	719
	2056	23,675	15%	3,551

Source: First Principles Analysis undertaken by AECOM (2022).

Figure 44 shows the planned pedestrian network in Bradfield City Centre. The overarching principle is for the Bradfield City Centre to prioritise pedestrians over cars. As such, a dense, connected, and walkable street network that gives a fine grain quality to Bradfield City Centre was developed as part of the Master Plan. The Bradfield City Centre walking network is detailed further in **Section 7.1.3**.

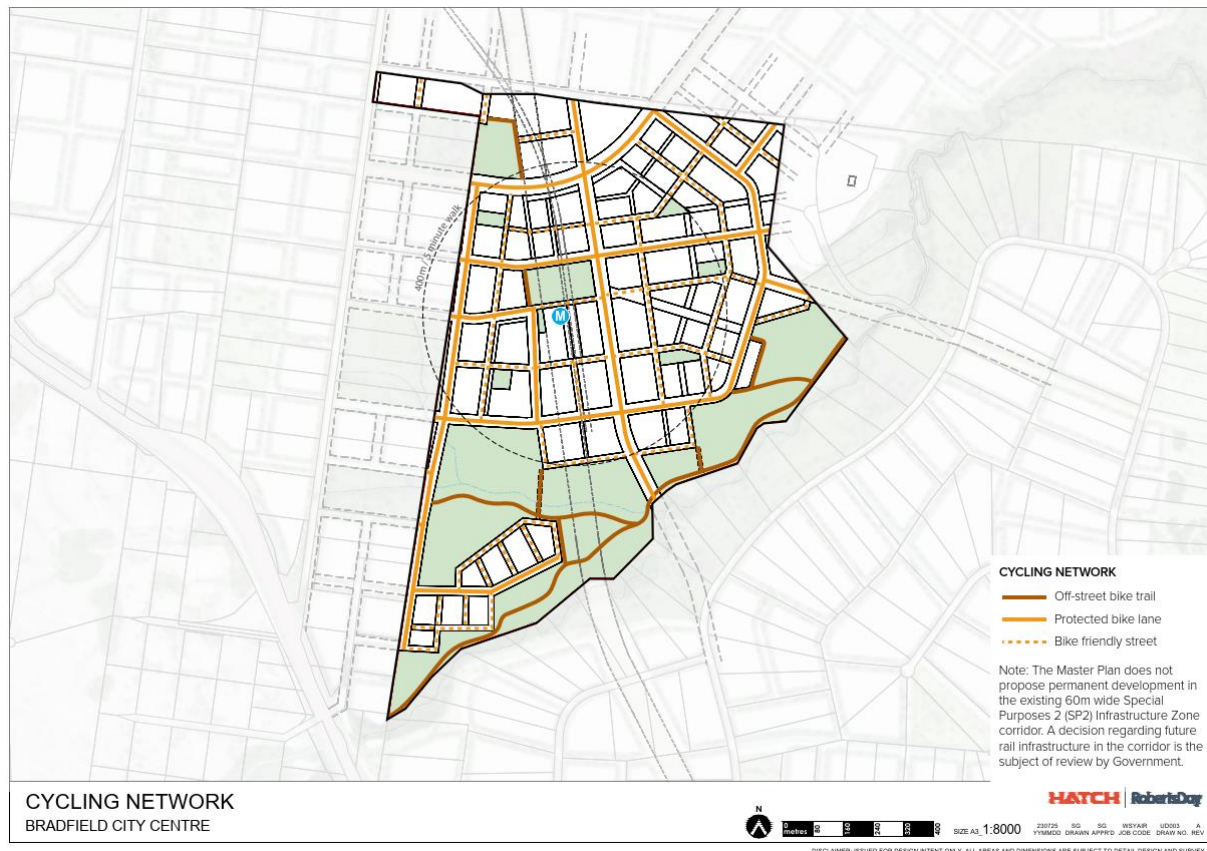
Figure 44 Bradfield walking network



Source: Hatch Roberts Day, 16th August 2023

Figure 45 shows the planned cycling network in Bradfield City Centre. The overarching principle is for the Bradfield City Centre to provide a dense, connected and cyclable street network that gives a fine grain quality to Bradfield City Centre. The Bradfield City Centre cycling network is further detailed in **Section 7.1.4**. This includes analysis of connections to the broader cycling network to facilitate movements to/from the Bradfield City Centre, and to leverage accessibility to the blue-green grid.

Figure 45 Bradfield cycling network



Source: Hatch Roberts Day, 26th July 2023

6.8 Strategic Modelling Results

STM and PTPM modelling has been undertaken to model transport mode share and future growth in transport demand (i.e., rail, bus, and car) used in the TMAP. STM provides future year growth for PTPM modelling. The results of PTPM modelling for rail and bus are presented below.

6.8.1 Trains and Metro trips

The future year PTPM 3.5hr AM peak rail (train and metro) trips, for the Bradfield City Centre (Travel Zone 3622), and for the Aerotropolis Precinct (Travel Zones 3612, 3617, 3618, 3622, 3623, 3629), are presented in **Table 27**.

Results show that there is a large increase in rail trips in 2036 as Bradfield and Aerotropolis Precinct land use intensifies, improved public transport provisions, and with the application of the Precinct Parking Module (PPM) in PTPM. In 2056, there is a significant increase in rail trips due to further land use intensification, rail improvements, and higher sustainable mode shares to public transport in the long-term horizon.

Table 27 PTPM rail trips - Bradfield and Aerotropolis Precinct (AM 3.5hr)

Year	PTPM AM 3.5hr trips		
	2026	2036	2056
Bradfield - TZ 3622	30	1,320	10,690
Aerotropolis Precinct TZs 3612, 3617, 3618, 3622, 3623, 3629	180	2,800	13,540

Source: PTPM v5 modelling (AECOM, 2022)

Figure 46, Figure 47 and **Figure 48** below show the passenger volume to capacity ratios on the train and metro lines for forecast years 2026, 2036 and 2056.

Figure 46 Plot of volume to capacity ratios for train and metro trips – 2026 AM 3.5hr

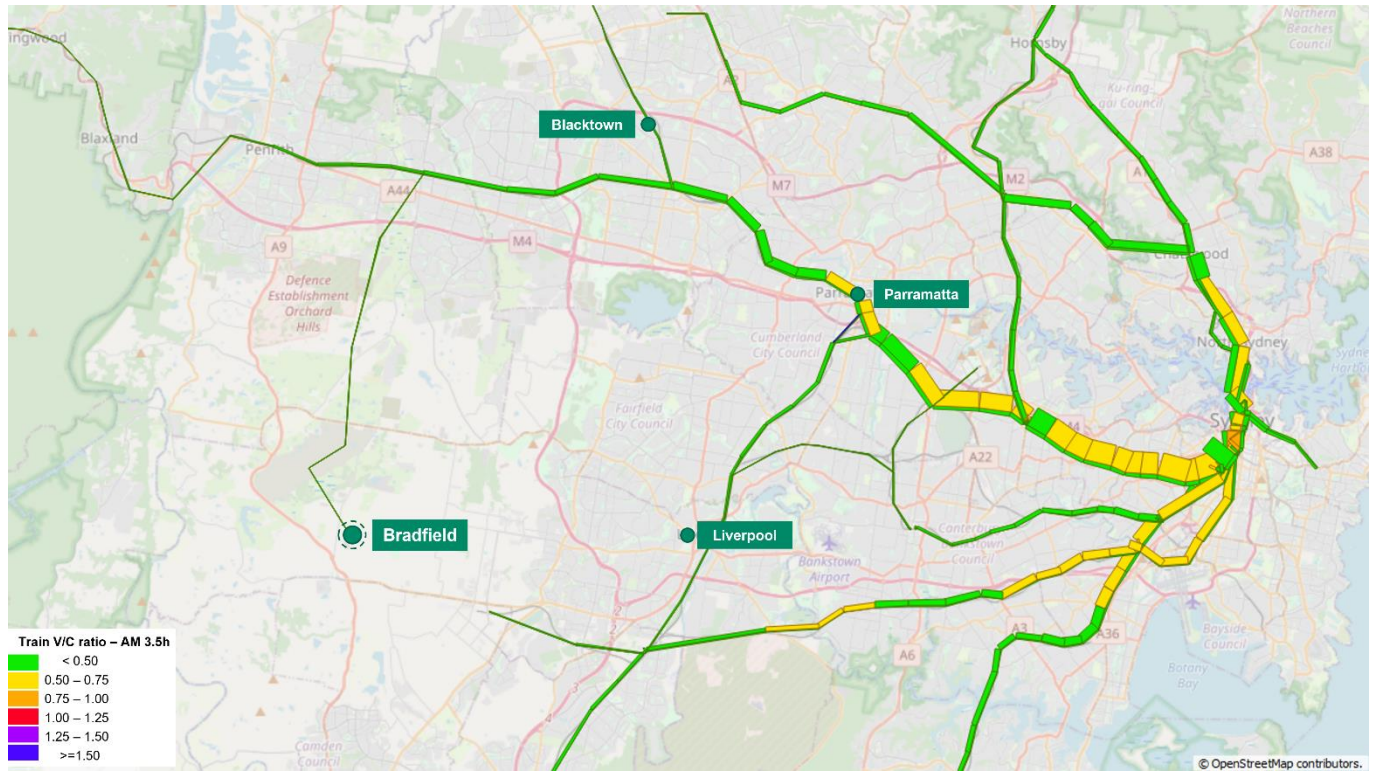


Figure 47 Plot of volume to capacity ratios for train and metro trips – 2036 AM 3.5hr

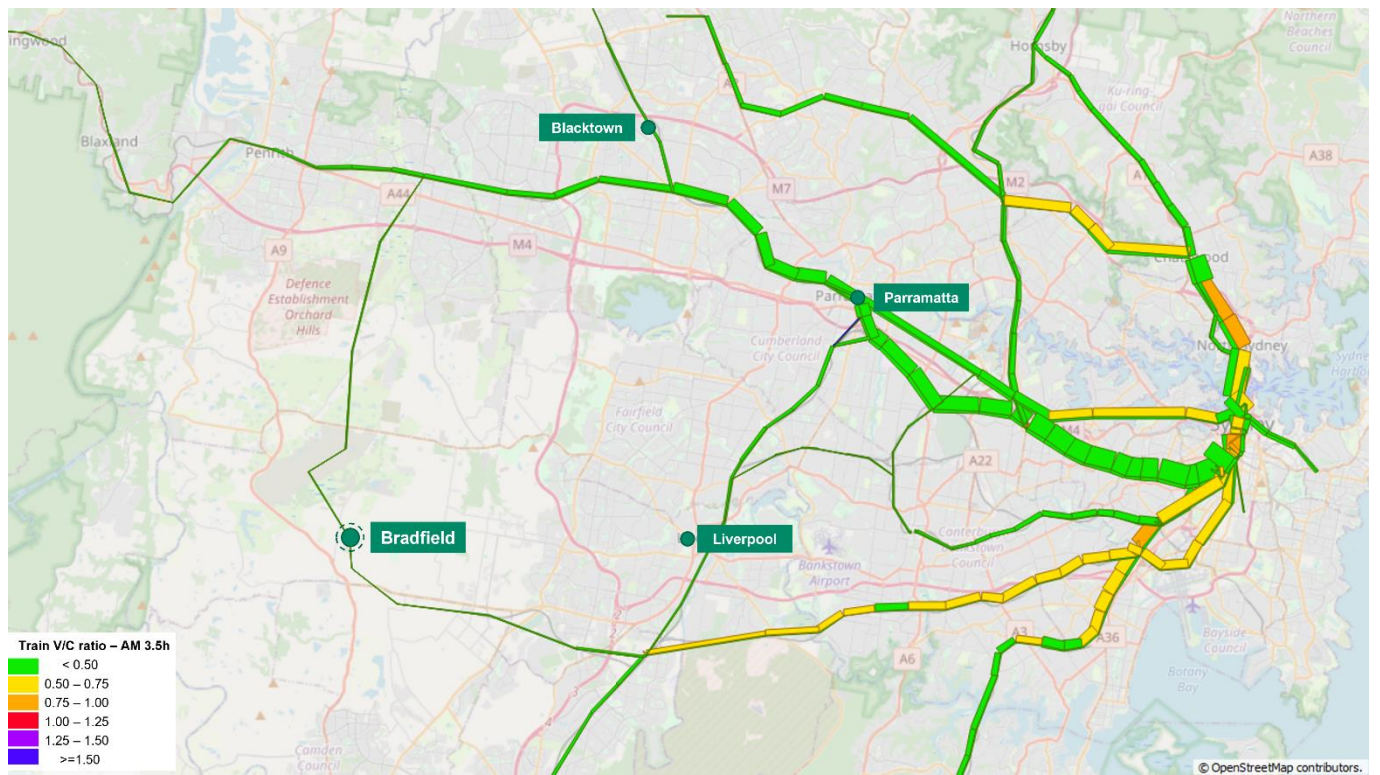
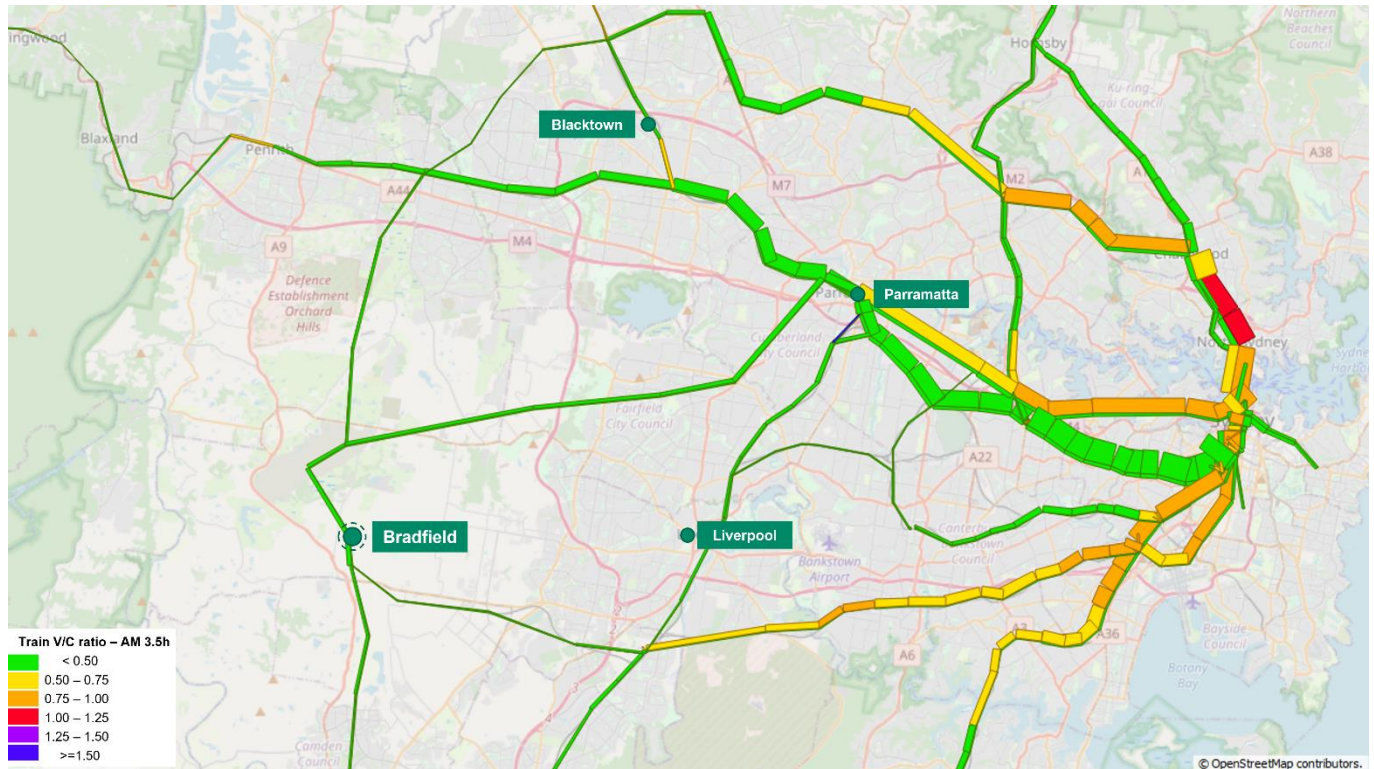


Figure 48 Plot of volume to capacity ratios for train and metro trips – 2056 AM 3.5hr



Source: PTPM v5 modelling (AECOM, 2022)

6.8.2 Aerotropolis (Bradfield) Metro Station Precinct

PTPM AM 3.5 hour demand at Aerotropolis (Bradfield) Metro station, which services Bradfield City Centre is presented in **Table 28** and **Figure 49**. Results show the estimated access and egress demand at Aerotropolis station in the AM peak 3.5 hour period is expected to grow from 300 in 2026, to about 2,100 in 2036 and about 11,000 in 2056 (note: the modelling assumes there will be an express rail service to Parramatta in 2056).

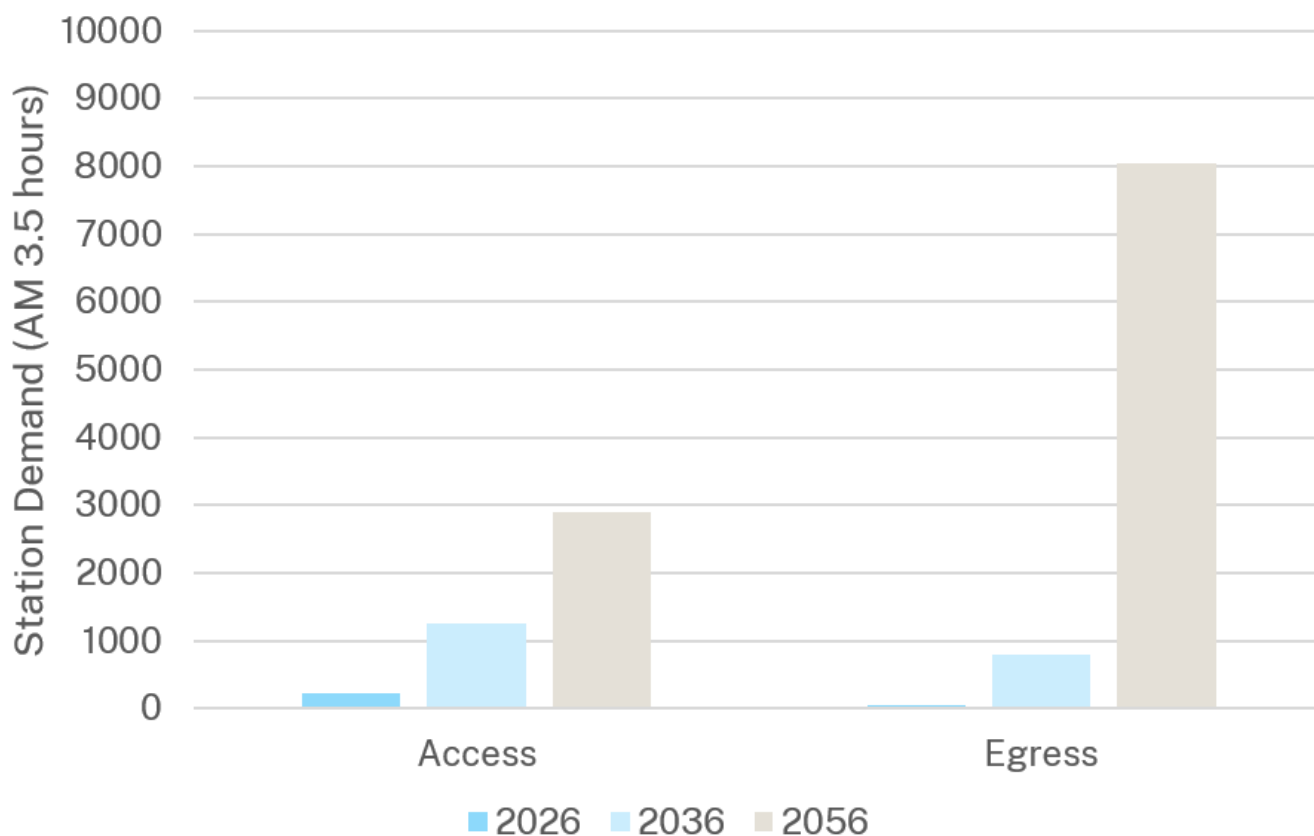
In 2026 and 2036, there are more persons accessing Aerotropolis station in the AM peak than egressing, however by 2056 it is expected that there will be more than twice as many people exiting Aerotropolis station than entering in the AM peak as a result of the densification of the city centre with increases in employment land uses within the Aerotropolis Precinct.

Table 28 PTPM AM 3.5hr access and egress demand - Aerotropolis Metro station

Station	Movement	PTPM AM 3.5hr access / egress		
		2026	2036	2056
Aerotropolis	Access	240	1,260	2,910
	Egress	60	800	8,040
	Total	300	2,060	10,950

Source: PTPM v5 modelling (AECOM, 2022)

Figure 49 PTPM AM 3.5hr access and egress demand - Aerotropolis Metro station



Source: PTPM v5 modelling (AECOM, 2022)

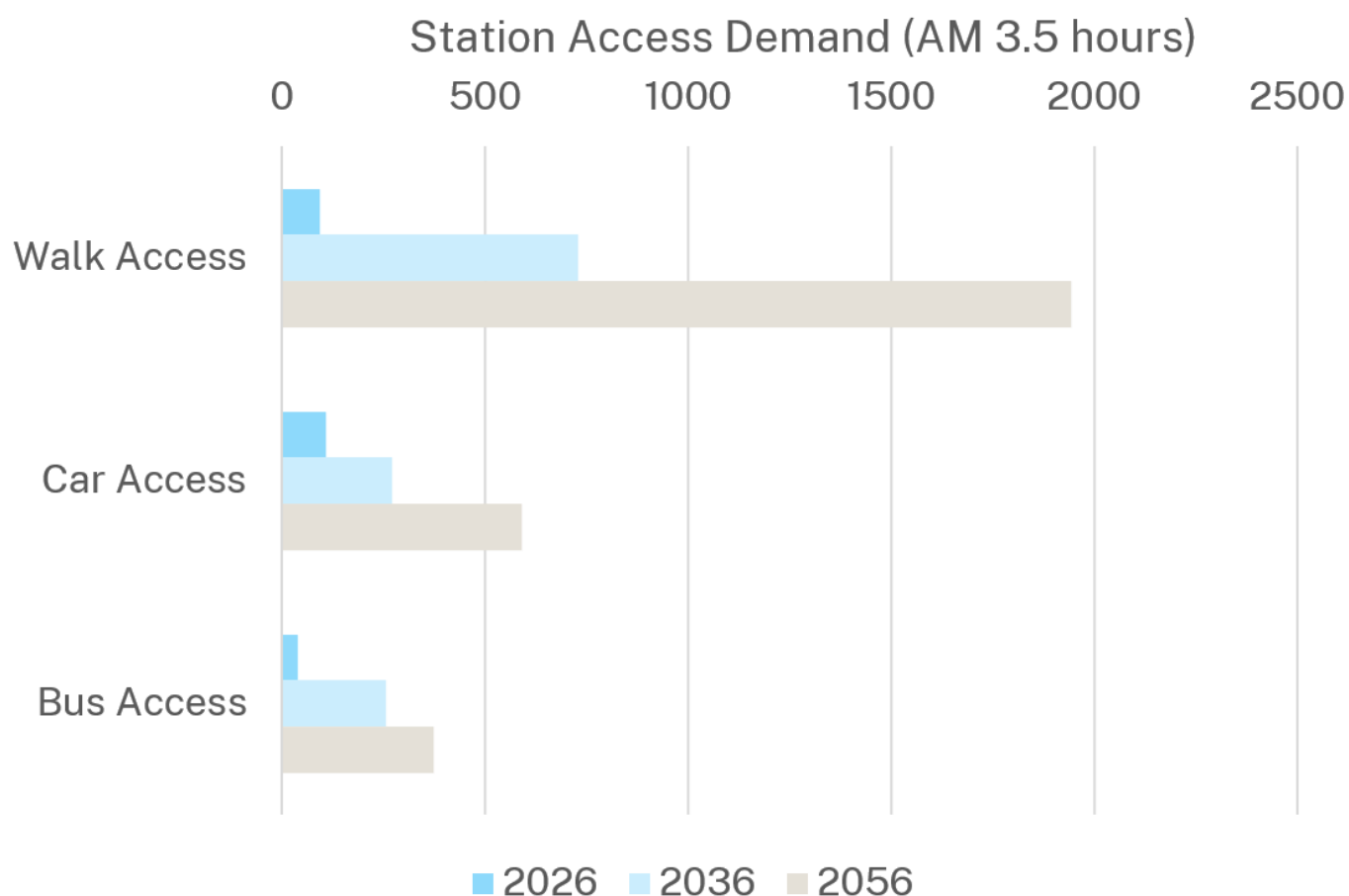
The number of persons entering the Aerotropolis station by access mode (walk, car, and bus) in the AM peak 3.5 hour period are shown in Figure 50. The access mode shares are shown in **Table 29**. Results show that the access mode split is expected to change as the Bradfield City Centre is developed. In 2026, most trips access Aerotropolis station via car, followed by walk and bus. However, in 2036 and 2056, most trips access Aerotropolis station by walking, followed by car and bus.

Table 29 Access Mode Shares for 2026, 2036 and 2056 – Bradfield / Aerotropolis Station

Location	Year	PTPM Access Mode Shares (%)		
		Walk Access	Car Access	Bus Access
Bradfield / Aerotropolis Station	2026	39%	45%	16%
	2036	58%	22%	20%
	2056	67%	20%	13%

Source: PTPM modelling undertaken by AECOM (2022)

Figure 50 PTPM AM 3.5hr station access by mode - Aerotropolis and Bringelly stations



Source: PTPM v5 modelling (AECOM, 2022)

6.8.3 Bus trips

The future year PTPM 3.5hr AM peak bus-only trips, for the Bradfield City Centre (Travel Zone 3622), and for the Aerotropolis Precinct (Travel Zones 3612, 3617, 3618, 3622, 3623, 3629), are presented in Table 30.

Results show that there is a large increase in bus trips in 2036 as Bradfield and Aerotropolis Precinct land use intensifies, improved public transport provisions and bus frequencies, and with the application of the Precinct Parking Module (PPM) in PTPM. In 2056, there is a significant increase in bus trips as a result of further land use intensification and an interconnected bus network with increases to bus service frequencies to accommodate future growth and higher sustainable mode shares to public transport in the long term.

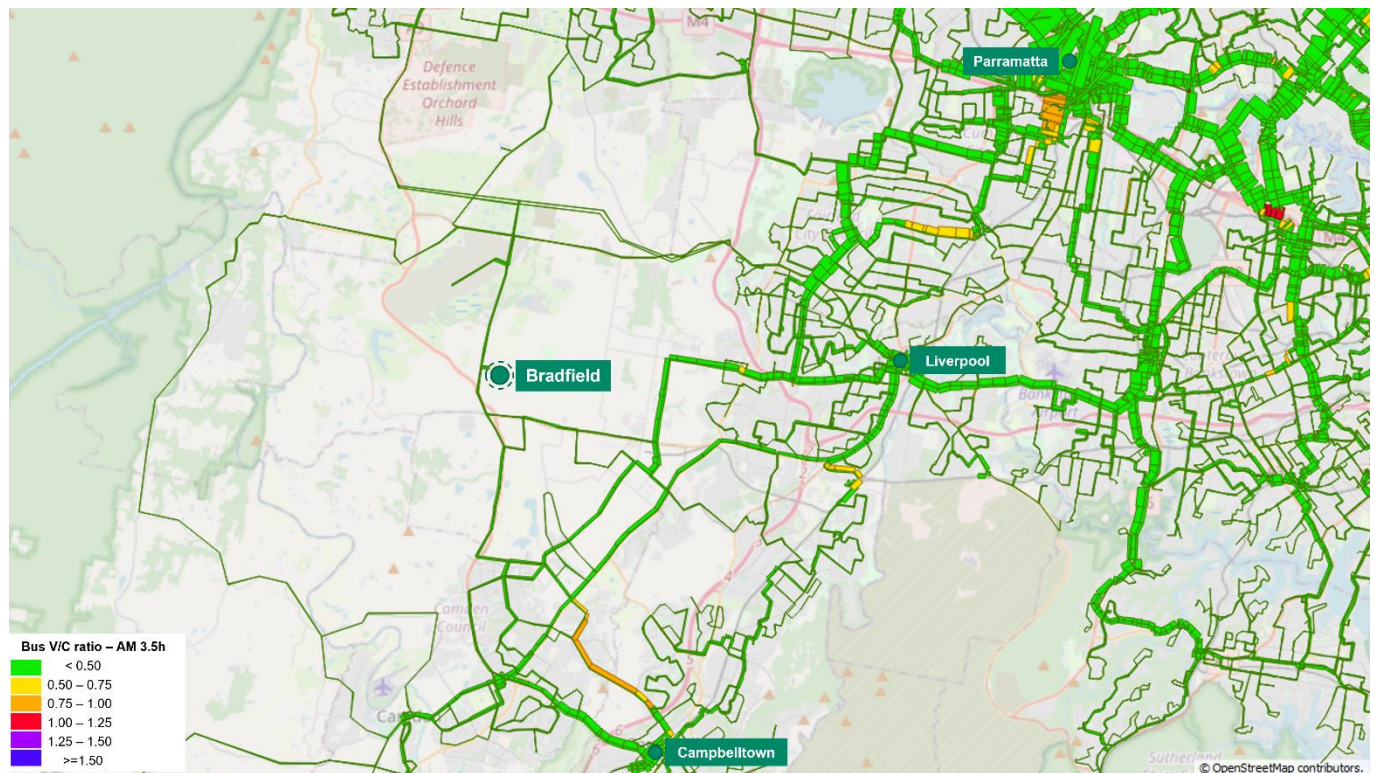
Table 30 PTPM bus trips - Bradfield and Aerotropolis Precinct (AM 3.5hr)

Year	PTPM AM 3.5hr trips		
	2026	2036	2056
Bradfield - TZ 3622	20	320	2,310
Aerotropolis Precinct TZs 3612, 3617, 3618, 3622, 3623, 3629	70	640	3,430

Source: PTPM v5 modelling (AECOM, 2022)

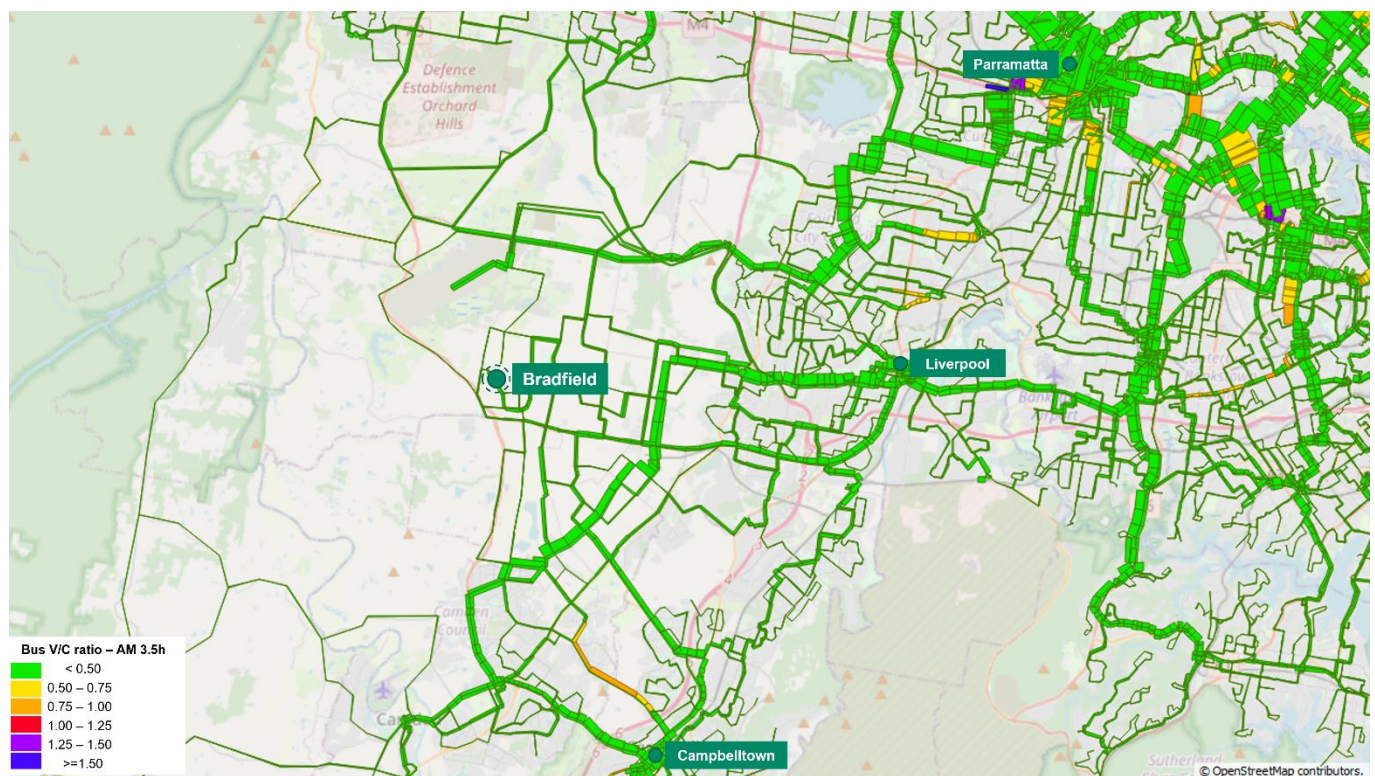
Figure 51, Figure 52 and Figure 53 below show the passenger volume to capacity ratios on the bus lines for forecast years 2026, 2036 and 2056.

Figure 51 Plot of volume to capacity ratios for bus – 2026 AM 3.5hr



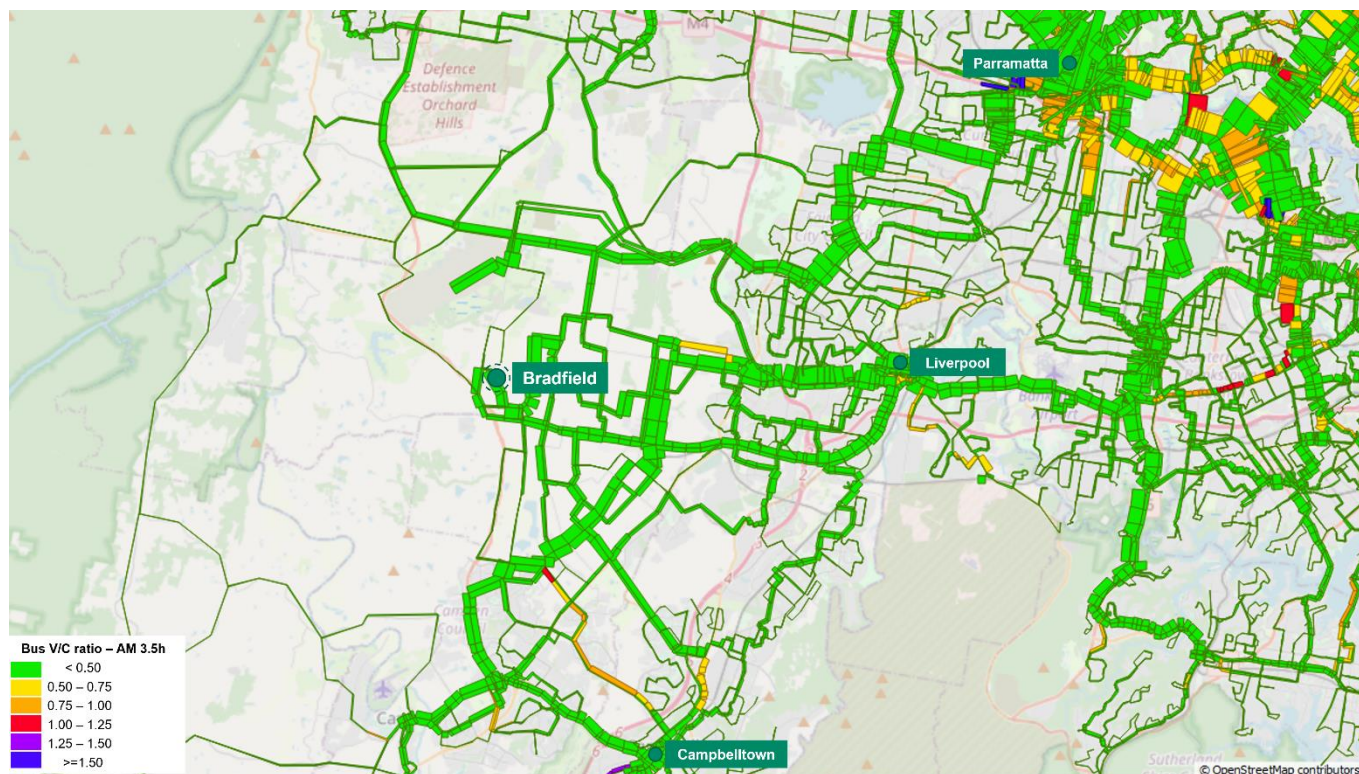
Source: PTPM v5 modelling (AECOM, 2022)

Figure 52 Plot of volume to capacity ratios for bus – 2036 AM 3.5hr



Source: PTPM v5 modelling (AECOM, 2022)

Figure 53 Plot of volume to capacity ratios for bus – 2056 AM 3.5hr



Source: PTPM v5 modelling (AECOM, 2022)

6.9 Traffic Modelling Results

Operational traffic modelling for the TMAP involved mesoscopic simulation using the WSAGA Traffic Model. This operational model further refines the strategic modelling to reflect the impact of capacity constraints on the road network within and surrounding Bradfield City Centre. It allows for true dynamic equilibrium assignment where vehicles can select their optimal travel routes. The following details some key parameters agreed and endorsed by TfNSW (AAI) as part of the operational traffic modelling for the TMAP:

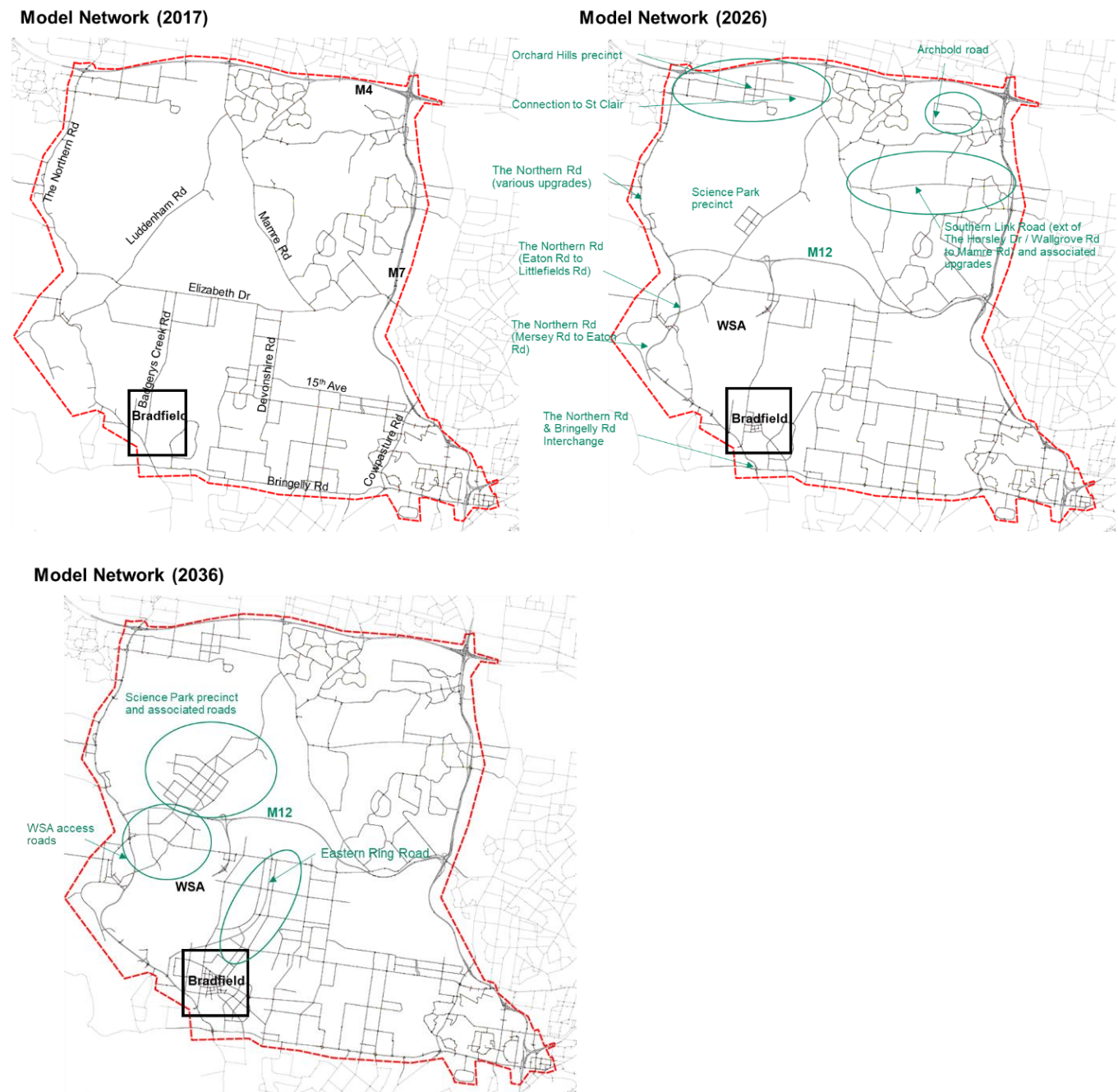
- Adopt the WSAGA Mesoscopic Traffic Model provided by TfNSW AAI (based on the most recent M12 Motorway study) as the basis for traffic modelling and the overall TMAP road network assessment.
- Align the 2036 road network with the network as coded in the TfNSW's Dynameq model, provided by TfNSW AAI, and align the 2026 road network with the network as coded in PTPM (2026), provided by TfNSW AAI.
- Extract cordon traffic demand matrices from PTPM for input to WSAGA Mesoscopic modelling.
- For Bradfield City Centre, adopt the Master Plan road network developed by WPCA and traffic demand based on First Principles benchmarking traffic generation analysis.

This section provides details on the key traffic modelling assumptions underpinning the WSAGA traffic modelling for this project.

6.9.1 Staging of road network

The WSAGA model covers the road network in the Western Sydney area. The wider road network coded in the WSAGA model for the future years is shown in **Figure 54**.

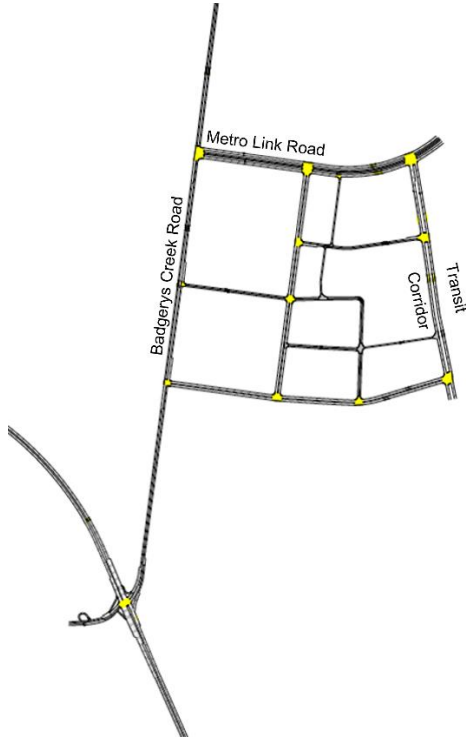
Figure 54 WSAGA - updated wider road network used for traffic modelling



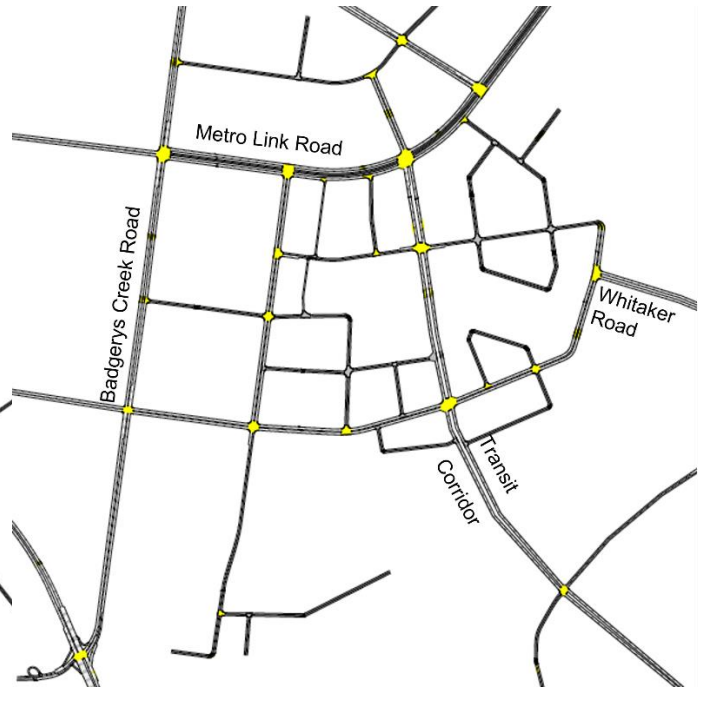
Within Bradfield City Centre, the road network has been coded in the WSAGA model to represent the broad network as shown in the Bradfield City Centre Master Plan. The future year road networks coded in the WSAGA model for 2026, 2036 and 2056 are shown in **Figure 55**.

Figure 55 WSAGA – internal road network used for traffic modelling

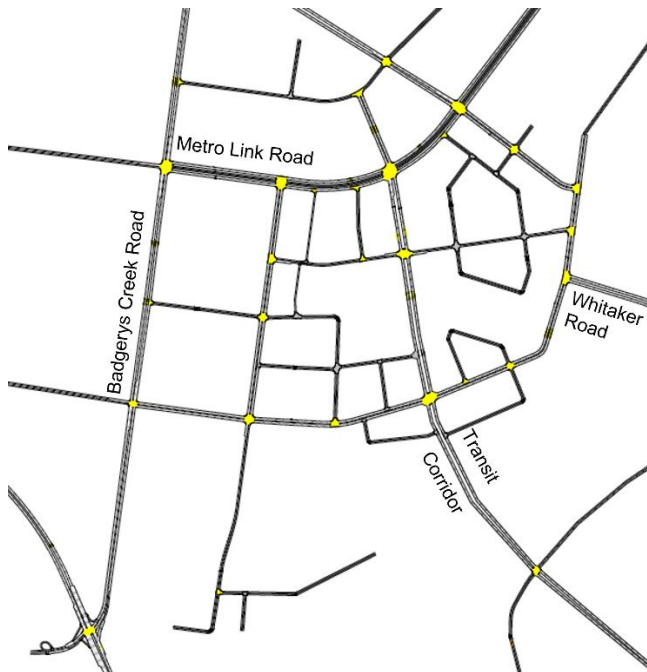
2026 Bradfield Road Network



2036 Bradfield Road Network



2056 Bradfield Road Network



Source: Based on the Master Plan street network

6.9.2 Road network performance

Mesoscopic traffic modelling for horizon years 2026, 2036 and 2056 have been developed to provide the traffic modelling and assessment for the Bradfield City Centre Master Plan. The modelling outputs that show the performance of the Bradfield City Centre road network are provided below.

The assessment of intersection performance is based on criteria shown in **Table 31** below and defined in the Guide to Traffic Generating Developments (RTA, now TfNSW, 2002). Road network performance extracted from the WSAGA Mesoscopic traffic model also includes parameters such as mid-block density, mid-block level of service etc.

Table 31 Level of Service criteria for intersections

Level of Service	Average delay (seconds / vehicle)	Traffic signals and roundabouts	Priority
A	14 or less	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause delays	At capacity; requires other control mode
F	Greater than 70	Extra capacity required	At capacity; requires other control mode

Source: RTA, now TfNSW's Guide to Traffic Generating Developments (2002)

This section focuses on the assessment of the traffic and road network performance. It reflects the mode share targets identified in **Section 6.5**.

6.9.3 2026 traffic and road network performance

The estimated traffic volumes during the AM and PM peak hours for Bradfield City Centre in 2026 are shown for in **Figure 56**. In 2026, traffic volumes on Badgerys Creek Road are expected to exceed 600 vehicles per hour in the peak direction during the AM and PM peak hours. Badgerys Creek Road provides two key access points for vehicles to access Bradfield City Centre – via the intersections of Metro Link Road and the Southern Loop Road. Each rapid bus route (from Penrith, Liverpool, and Campbelltown) is expected to service the city centre via Metro Link Road and the Transit Corridor at a headway of 15 mins during the peak hours.

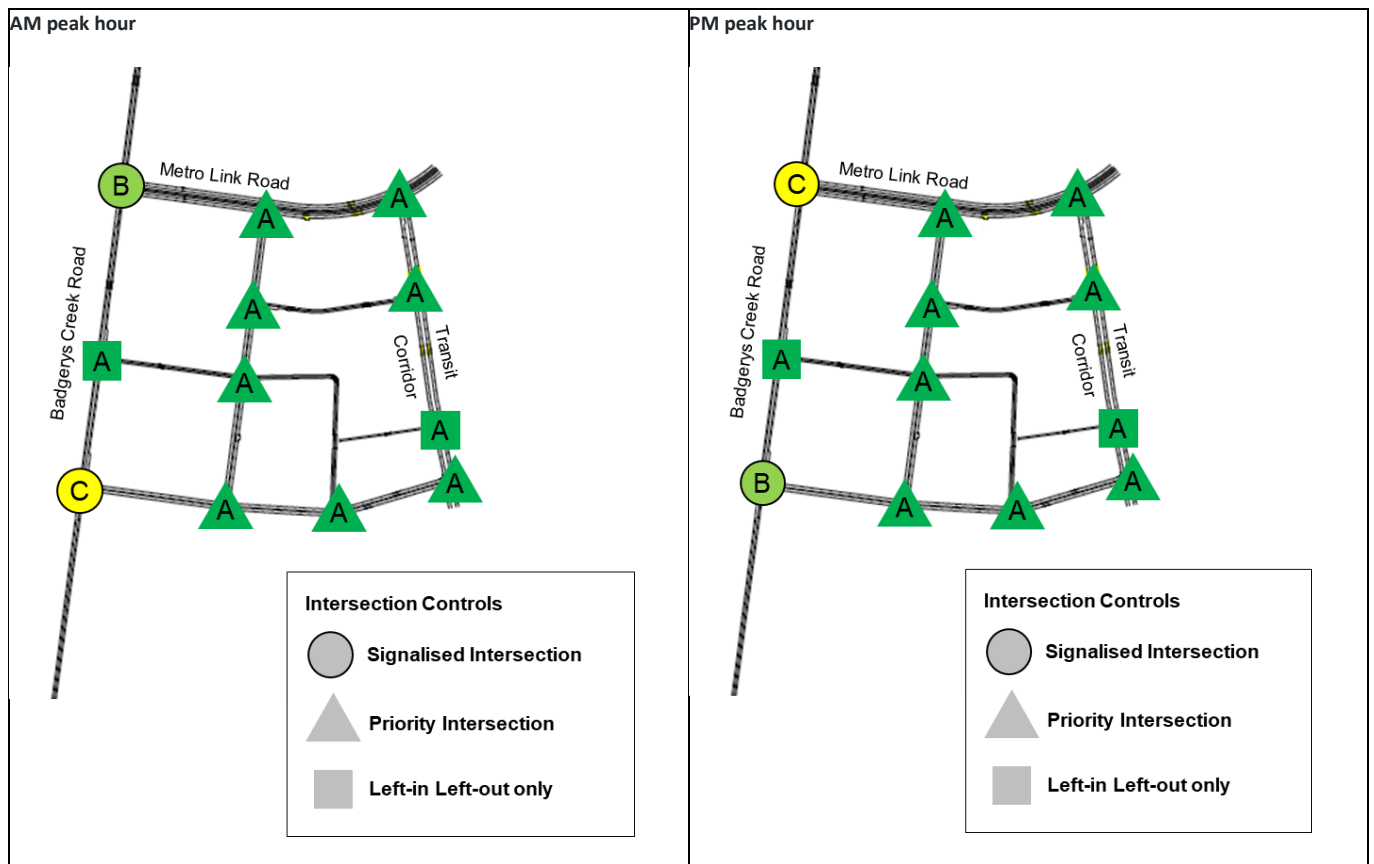
Figure 56 WSAGA Traffic Assignment – Peak hour traffic flows for 2026



Source: WSAGA modelling undertaken by AECOM (2022)

The level of service (LoS) of the intersections for the road network surround the Bradfield City Centre during the AM and PM peak hours in model year 2026 is shown for in **Figure 57**.

Figure 57 Intersection LoS for 2026 Bradfield



Source: WSAGA modelling undertaken by AECOM (2022)

In 2026, all the intersections within and surrounding the Bradfield City Centre street network are expected to perform at a LoS of C or better, indicating a satisfactory level of service.

6.9.4 2036 traffic and road network performance

The estimated traffic volumes during the AM and PM peak hours for Bradfield City Centre in 2036 is shown **Figure 58**. In 2036, a number of new roads will provide additional access points for vehicles and buses to access the Bradfield City Centre. These include Badgerys Creek Road, Metro Link Road, Whitaker Road, and the Transit Corridor.

A significant proportion of traffic accessing and egressing Bradfield is still expected to use Badgerys Creek Road. The section on Badgerys Creek Road just north of The Northern Road intersection is expected to have 600 vehicles travelling northbound towards Bradfield during the AM peak hour and nearly 900 vehicles travelling southbound during the PM peak hour.

Peak hour traffic volumes on Metro Link Road, Whitaker Road and the Transit Corridor are around 200-300 vehicles per hour in 2036. Each rapid bus route (from Penrith, Liverpool, and Campbelltown) is expected to service the city centre via the Metro Link Road and the Transit Corridor at a headway of 10 minutes during the peak hours in 2036.

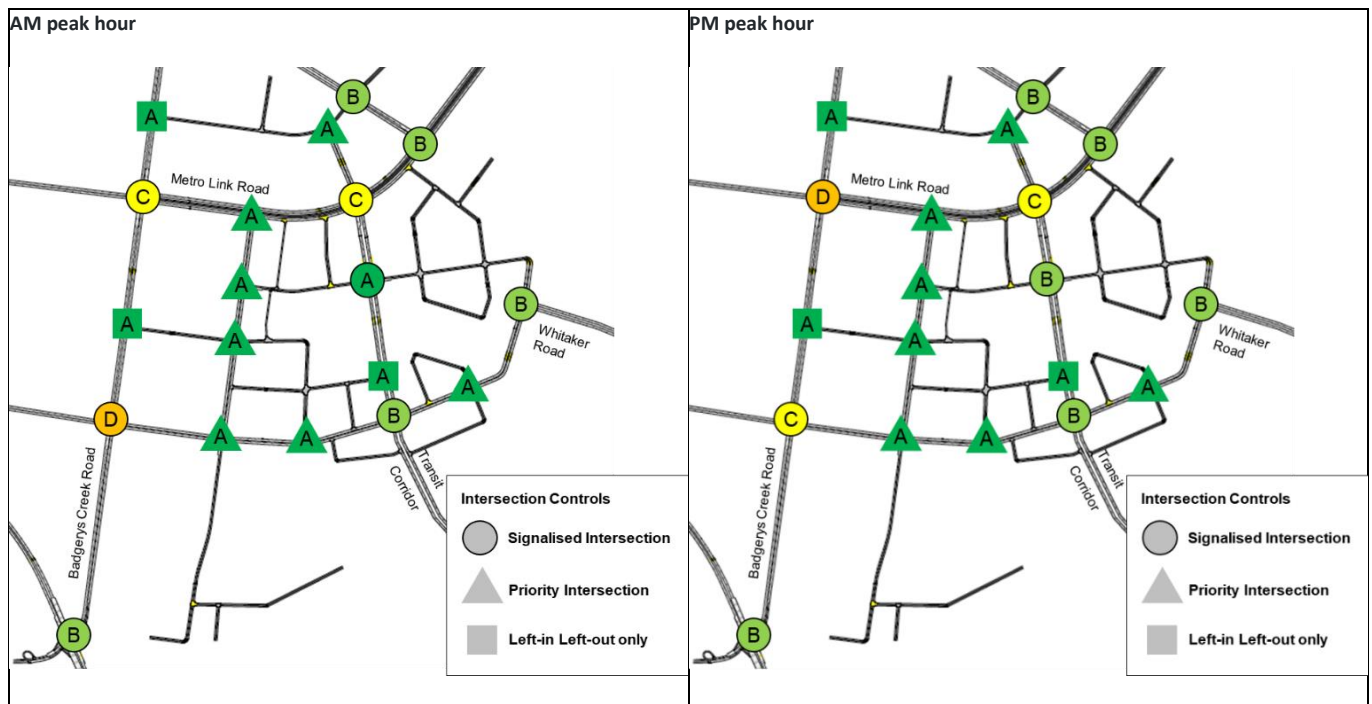
Figure 58 WSAGA Traffic Assignment – Peak hour traffic flows for 2036



Source: WSAGA modelling undertaken by AECOM (2022)

The level of service (LoS) of the intersections for the road network surround the Bradfield City Centre during the AM and PM peak hours in model year 2036 is shown for in **Figure 59**.

Figure 59 Intersection LoS for 2036 Bradfield



Source: WSAGA modelling undertaken by AECOM (2022)

Trip generation and traffic activities are expected to increase in 2036 (comparing to 2026) and the intersections at Badgerys Creek Road and Metro Link Road are expected to perform at a LoS of C or D respectively. It is generally accepted that the target LoS for new intersection performance should be LoS D or better which is met by the Bradfield street network in 2036

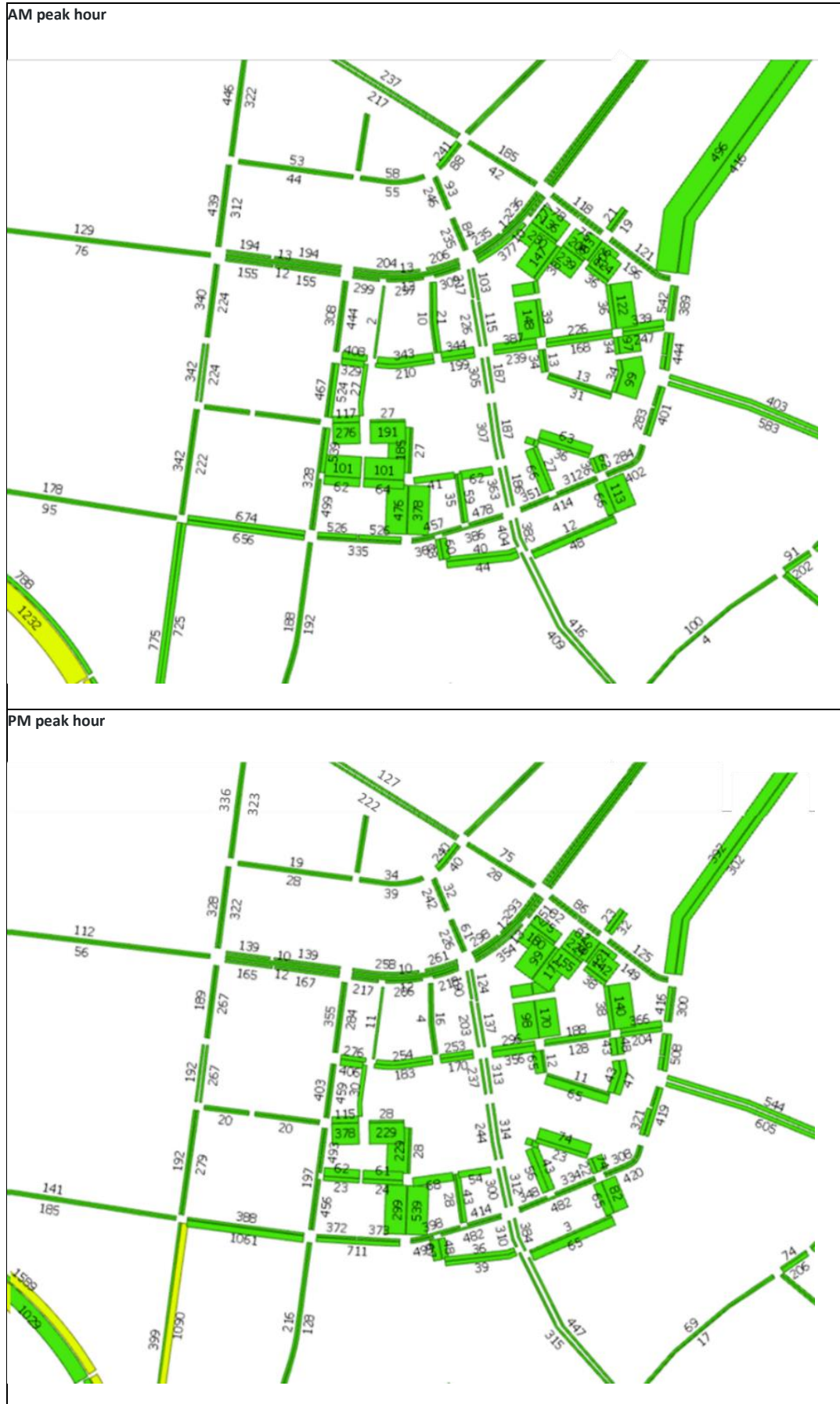
6.9.5 2056 traffic and road network performance

The estimated traffic volumes during the AM and PM peak hours for Bradfield City Centre in 2056 is shown in **Figure 60**. In 2056, the road network will further evolve providing additional access points for vehicles and buses to access Bradfield City Centre. These include Badgerys Creek Road, Metro Link Road, Whitaker Road, the Transit Corridor, and the extension of Southern Loop Road.

A significant proportion of traffic accessing and egressing Bradfield is still expected to use Badgerys Creek Road. The section on Badgerys Creek Road just north of The Northern Road intersection is expected to have nearly 800 vehicles travelling northbound towards Bradfield during the AM peak hour and nearly 1,100 vehicles travelling southbound during the PM peak hour.

Peak hour traffic volumes on Metro Link Road are expected to be approximately 400 vehicles per hour in the peak direction which can be easily accommodated in one general traffic lane in each direction. Approximately 600 vehicles per hour in the peak direction are expected on Whitaker Road; and nearly 500 vehicles per hour are expected to be on the Transit Corridor in 2056. Each rapid bus route (from Penrith, Liverpool, and Campbelltown) is expected to service the city centre via Metro Link Road and the Transit Corridor at a headway of 5 minutes during the peak hours in 2056.

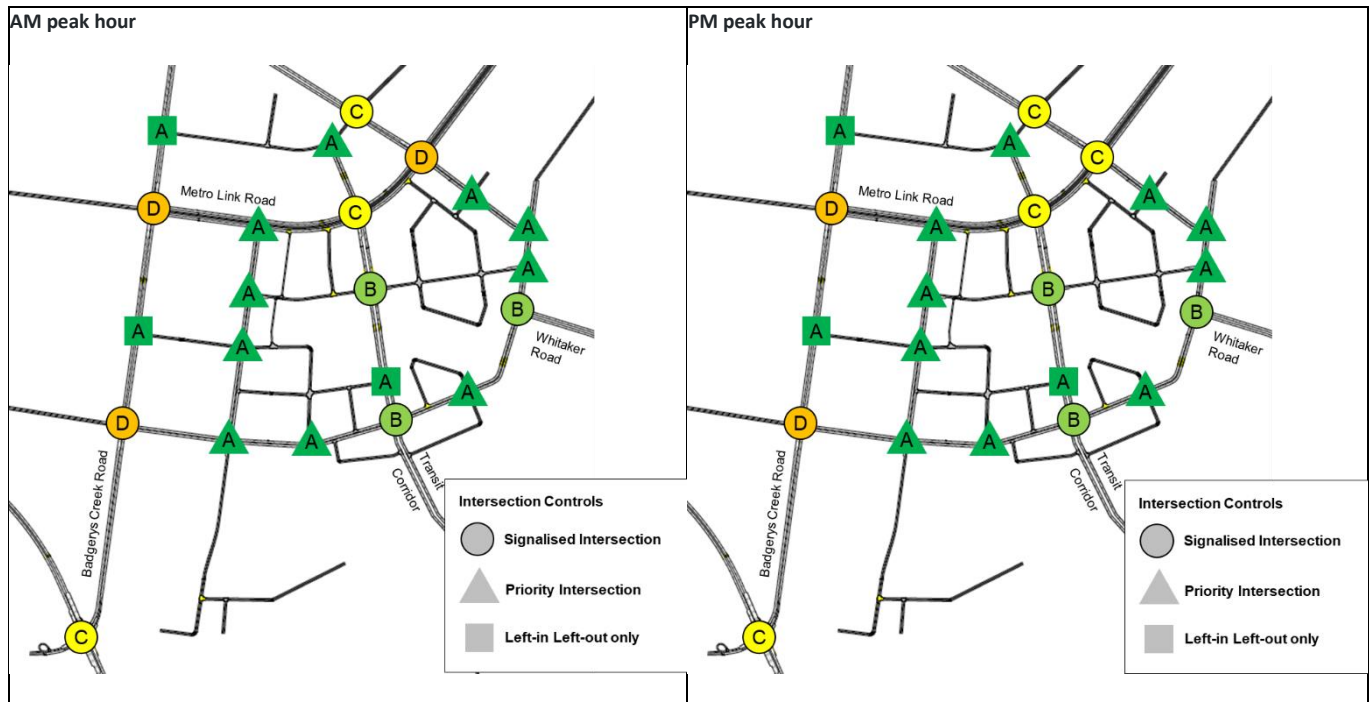
Figure 60 WSAGA Traffic Assignment – Peak hour traffic flows for 2056



Source: WSAGA modelling undertaken by AECOM (2022)

The level of service (LoS) of the intersections for the road network surround the Bradfield City Centre during the AM and PM peak hours in model year 2056 is shown for in Figure 61. All intersections by 2056 will operate at an acceptable level of service within and surrounding the Bradfield City Centre.

Figure 61 Intersection LoS for 2056 Bradfield



Source: WSAGA modelling undertaken by AECOM (2022)

Summary of traffic results

In 2026, the intersections surrounding the Bradfield City Centre are expected to perform at a LoS of C or better, indicating a satisfactory level of service. Trip generation and traffic activities are expected to increase in 2036 and 2056 and the intersections at Badgerys Creek Road and Metro Link Road are expected to perform at a LoS of C or D.

Trip generation and traffic activities are expected to increase in 2056 (comparing to 2036 and 2026) and the intersections at Badgerys Creek Road and Metro Link Road are expected to perform at a LoS of D, indicating they would be operating near capacity particularly along Badgerys Creek Road.

6.10 Freight and servicing

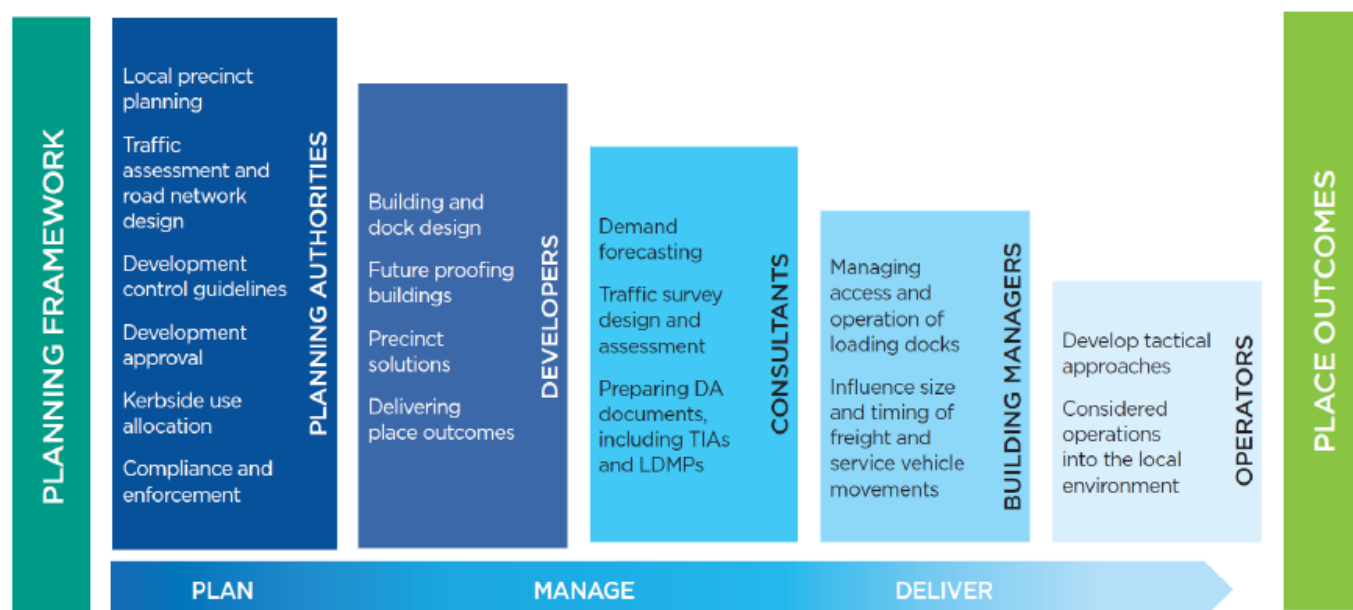
Recognising that successful precincts generate large amounts of freight proportional to the land use intensity and temporal land use, a freight and servicing last mile toolkit has been developed for the Bradfield City Centre Master Plan. The goal of developing the last mile toolkit is to influence key stakeholders to better plan for and adopt last mile freight practices that supports successful cities, places, economic activity, and communities. The development of the last mile TfNSW toolkit, the target audience, and the guiding principles are shown below.

Figure 62 Development of the last mile toolkit

Aims	Contents	Presentation	Demonstrable Outcomes
- Last mile freight is a critical component of economic and societal activity and a growing challenge - Develop Better Outcomes - Approaches will enable efficient freight outcomes Share our knowledge and experiences developed from our work since 2014	- Positioning – FT / M&P etc - Guiding Principles - Measurement and Forecasting Tools - On & Off Street - Design and Management Solutions - On & Off Street - Precinct approaches - Future Approaches	- Short web introductory version - Summary version - Full Toolkit - Additional information and tools added when available	- Improved government consideration for freight - Improved facilities for freight - Actions and policies taken by key operators - We're leading the way and demonstrating innovation - Modifying regulations for better freight

Source: TfNSW (2022)

Figure 63 Toolkit target audience



Source: TfNSW (2022)

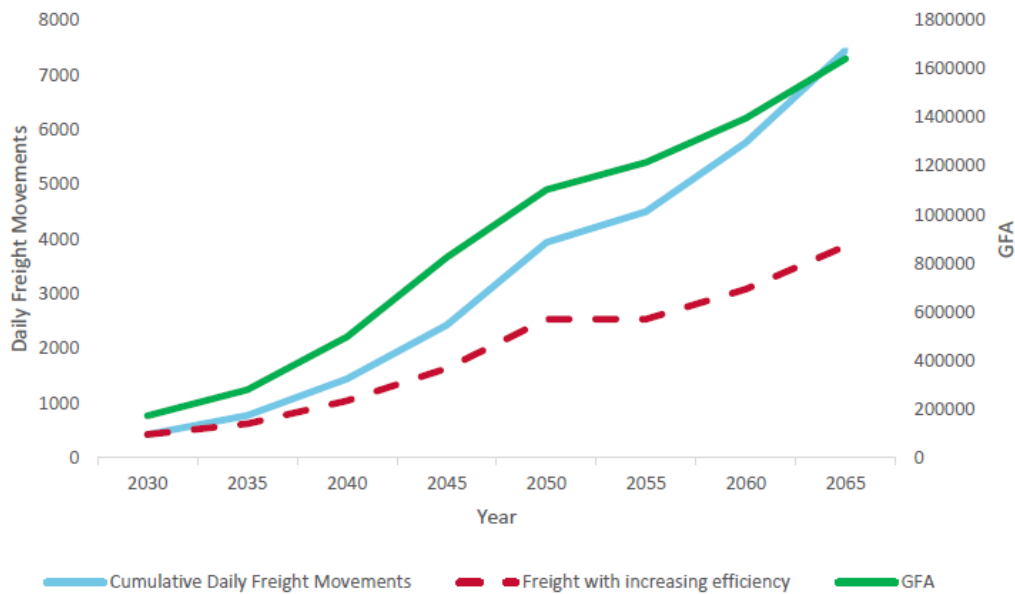
Figure 64 Toolkit guiding principles



Source: TfNSW (2022)

Based on the estimated land use projections at Bradfield City Centre, TfNSW estimated the last mile freight task to the urban centre. It is shown in **Figure 65**.

Figure 65 Last mile freight task



Freight with increasing efficiency

Year	2030	2035	2040	2045	2050	2055	2060	2065
Daily freight and servicing movements	424	623	1040	1634	2533	2534	3083	3871

Source: TfNSW, presented at TWG meeting #12 (Sept, 2021)

In **Figure 65**, two lines are depicted for freight activity:

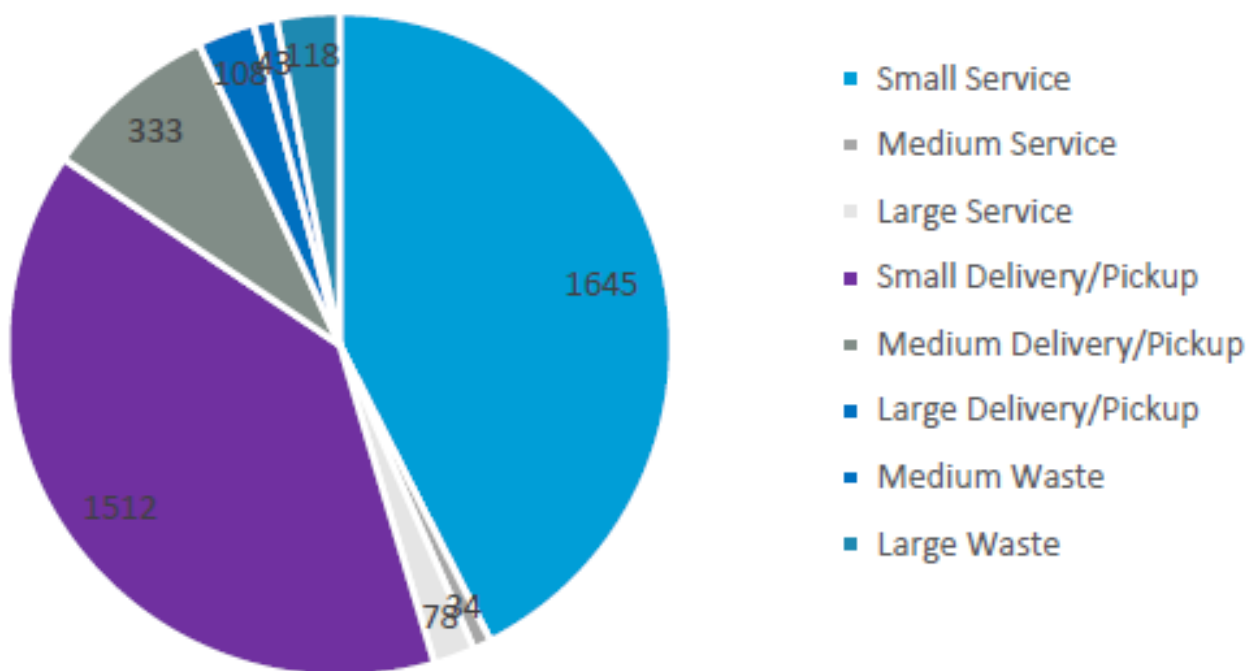
- Cumulative daily freight movements depict freight movements as if the product of each individual development is taken. This line therefore depicts the number of stops.
- Freight with increasing efficiency considers consolidation of freight activity: one truck will go to multiple destinations. Opportunities increase as the centre grows.

TfNSW also developed several provisions to accommodate future freight movements to be potentially considered for Bradfield City Centre. These include:

- Loading dock/zone spaces are needed to support freight and servicing task. Loading and servicing demand should be wholly accommodated within applicable sites and not reliant on kerbside space. This will be facilitated by clear guidance in LEPs and DCPs or by provision for them as part of public infrastructure.
- Projection infers dock spaces will be max 78% utilised during an average daily profile.
- Provision loading spaces is 70% for small vehicles –matched to demand. Higher percentage of larger spaces would offer greater flexibility.
- Micro-logistics solutions could/should be adopted but will need land space dedicated to the task. This may reduce the vehicles in circulation but will not significantly reduce parking space demands that are heavily influenced by service vehicles.

The freight and servicing vehicle profile in 2065 is shown in **Figure 66** below.

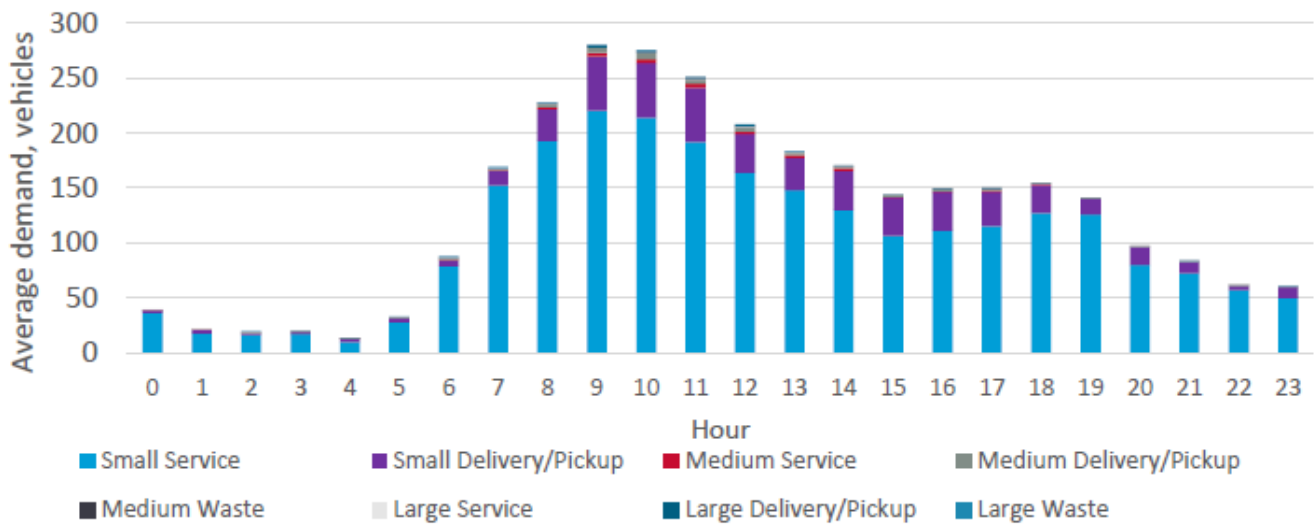
Figure 66 Freight and servicing vehicle profile 2065



Source: TfNSW, presented at TWG meeting #12 (Sept, 2021)

The loading space demand over a typical 24-hour day is shown by vehicle class in **Figure 67** below.

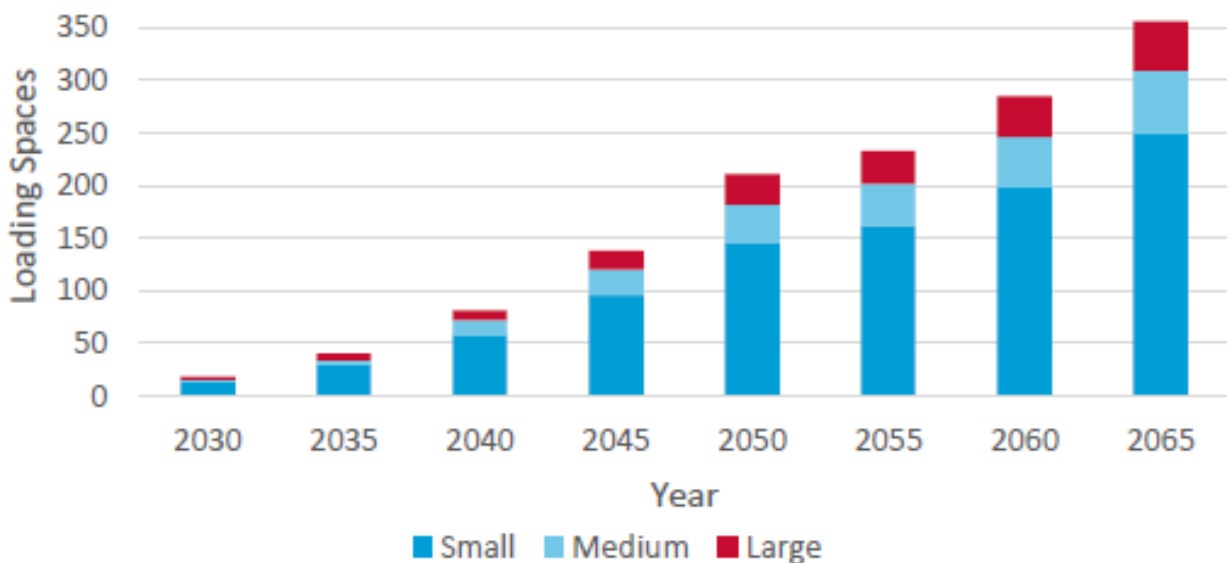
Figure 67 Typical 24-hour day loading space demand by vehicle class



Source: TfNSW, presented at TWG meeting #12 (Sept, 2021)

The provision of loading spaces from 2030 to 2065 is shown in **Figure 68** below.

Figure 68 Provision of loading spaces



Source: TfNSW, presented at TWG meeting #12 (Sept, 2021)

TfNSW have outlined the following considerations for the management of freight demand for Bradfield City Centre.

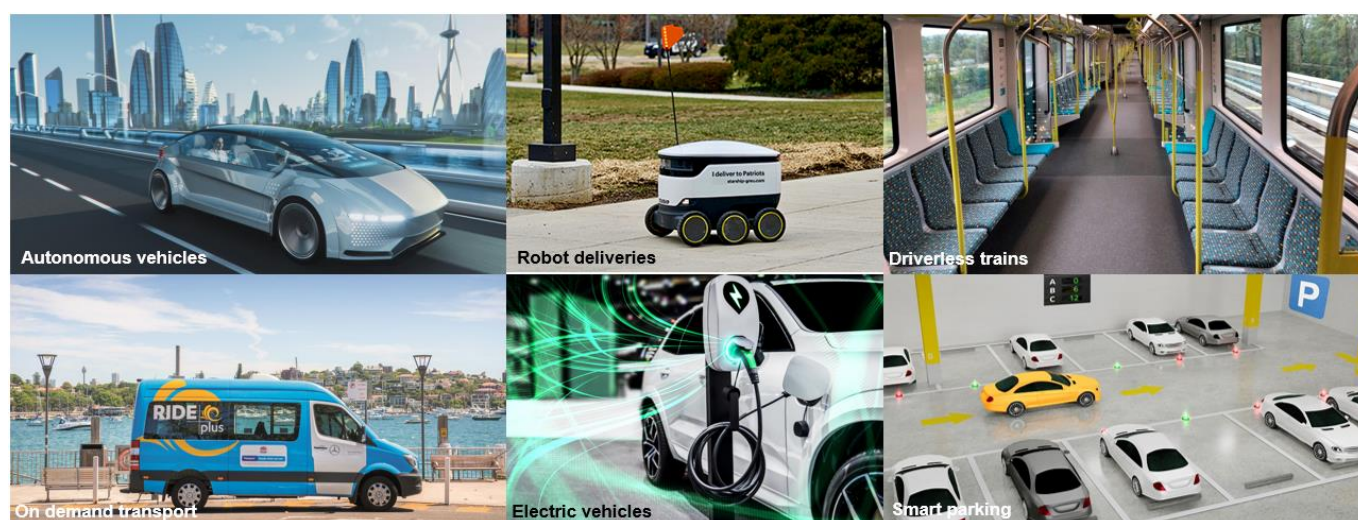
- Consolidation of freight activity to increase efficiency by using one truck to go to multiple destinations.
- Loading dock/zone spaces are needed to support freight and servicing tasks, and ideally, they should be provided within precinct developments. This will be facilitated by clear guidance in LEPs and DCPs or by provision for them as part of public infrastructure.
- Micro-logistics solutions could be adopted. This may reduce vehicular circulation but will not significantly reduce parking space demands that are heavily influenced by service vehicles.
- Freight management approaches have one or more of the following aims:
 - Re-time: Shift freight and servicing activities to outside peak times to create opportunities for greater efficiency
 - Re-route: Avoid using the CBD for through traffic, where feasible. Be aware of alternatives that can improve efficiency
 - Re-mode: Use modes of transport that are more efficient than trucks for CBD movements, where feasible
 - Reduce: Consolidate deliveries, improve vehicle utilisation, reduce trip numbers, procure sustainably, and develop buildings' delivery and service plans
- There is an expectation that freight, and servicing movements and freight desire lies will predominately be from the north-east and south-east of the Bradfield City Centre for the foreseeable future.

6.11 Technology and Innovation

The Bradfield City Centre will be Australia's first 22nd Century City. The Bradfield City Centre Master Plan aims to deliver a city for the future with a focus on technology and innovation; and world-leading research, skills, and education programs.

This means Bradfield is well positioned to embrace the emerging transport technologies and innovations shown in **Figure 69**.

Figure 69 Emerging transport technologies and innovation



7 Transport strategy

7.1 Future Transport Infrastructure and Services

7.1.1 Overview

This section outlines the transport infrastructure and services required to support the land use proposed in the master plan for Bradfield City Centre. 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 during the structure planning and precinct planning processes.

The transport infrastructure and services plan supports the design requirements and design guidelines outlined in the Western Sydney Street Design Guidelines; ensuring that street environments are designed for all users and go beyond the business-as-usual-approach often adopted throughout cities.

The following sub-sections outline the transport infrastructure and services proposed for Bradfield City Centre, outlined by mode. A movement and place assessment is also presented.

The proposed infrastructure and services for Bradfield City Centre is 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
- The provision of active and public transport infrastructure and services will drive a sustainable transport mode share that, considering the size and density of Bradfield, 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 Airport.

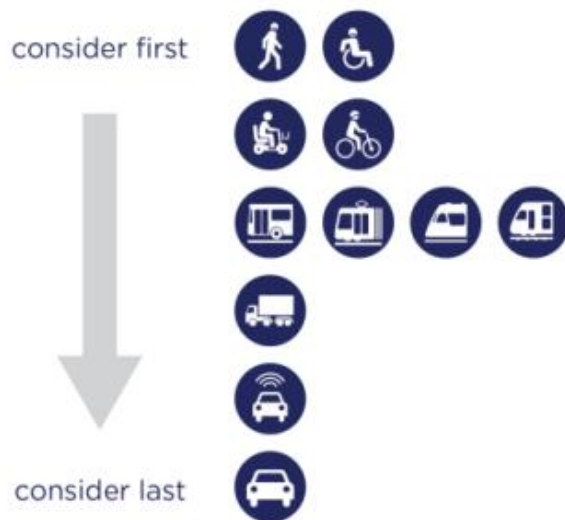
7.1.2 Modal access hierarchy

According to the TfNSW modal hierarchy, designing an efficient centre requires optimising the allocation of space to different users. This hierarchy aims to prioritise movement via more equitable and sustainable modes, such as walking and cycling, over vehicle-based modes, extending to the provision of supporting infrastructure. Design solutions will be safe and integrated, prioritising pedestrian movements throughout the precinct.

According to the TfNSW Road User Space Allocation Policy, allocating road user space is based on the network vision and road functions which considers all road users in order of: walking (including equitable access for people of all abilities); cycling (including larger legal micro-mobility devices); public transport; freight and deliveries; and point to point transport ahead of general traffic and on-street parking for private motorised vehicles. This hierarchy is presented in **Figure 70**.

Figure 70 Modal access hierarchy

Order of Road User Space Considerations



Source: Road User Space Allocation Policy (TfNSW, 2021)

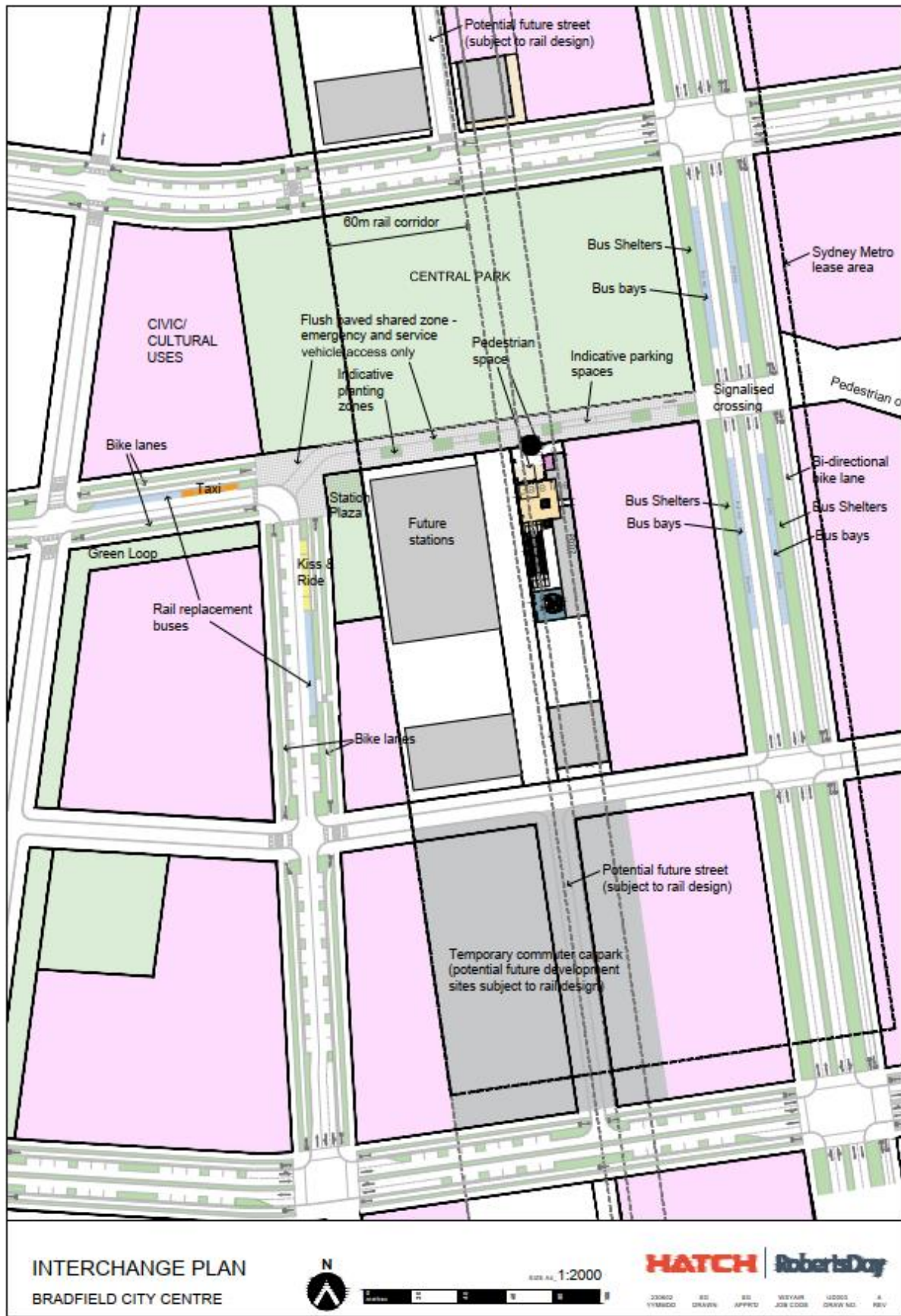
The modal access hierarchy is an important tool to prioritise user groups within close proximity of Bradfield Station. Clear definition of priorities will help to reduce potential conflict between user groups and improve safety outcomes.

The Bradfield Station Precinct provides for convenient access to, from and between Sydney Metro, future rail, bus, taxi and kiss and ride. These interchange functions are framed around Central Park.

Importantly, emergency and service vehicles are accommodated in a shared zone which is integrated with Central Park on its southern edge. Shared zones provide service vehicle access to the infrastructure pods on both sides of the station box.

The Bradfield Station Precinct is shown in **Figure 71**.

Figure 71 Bradfield Station Precinct

Source: Hatch Roberts Day, 2nd June 2023

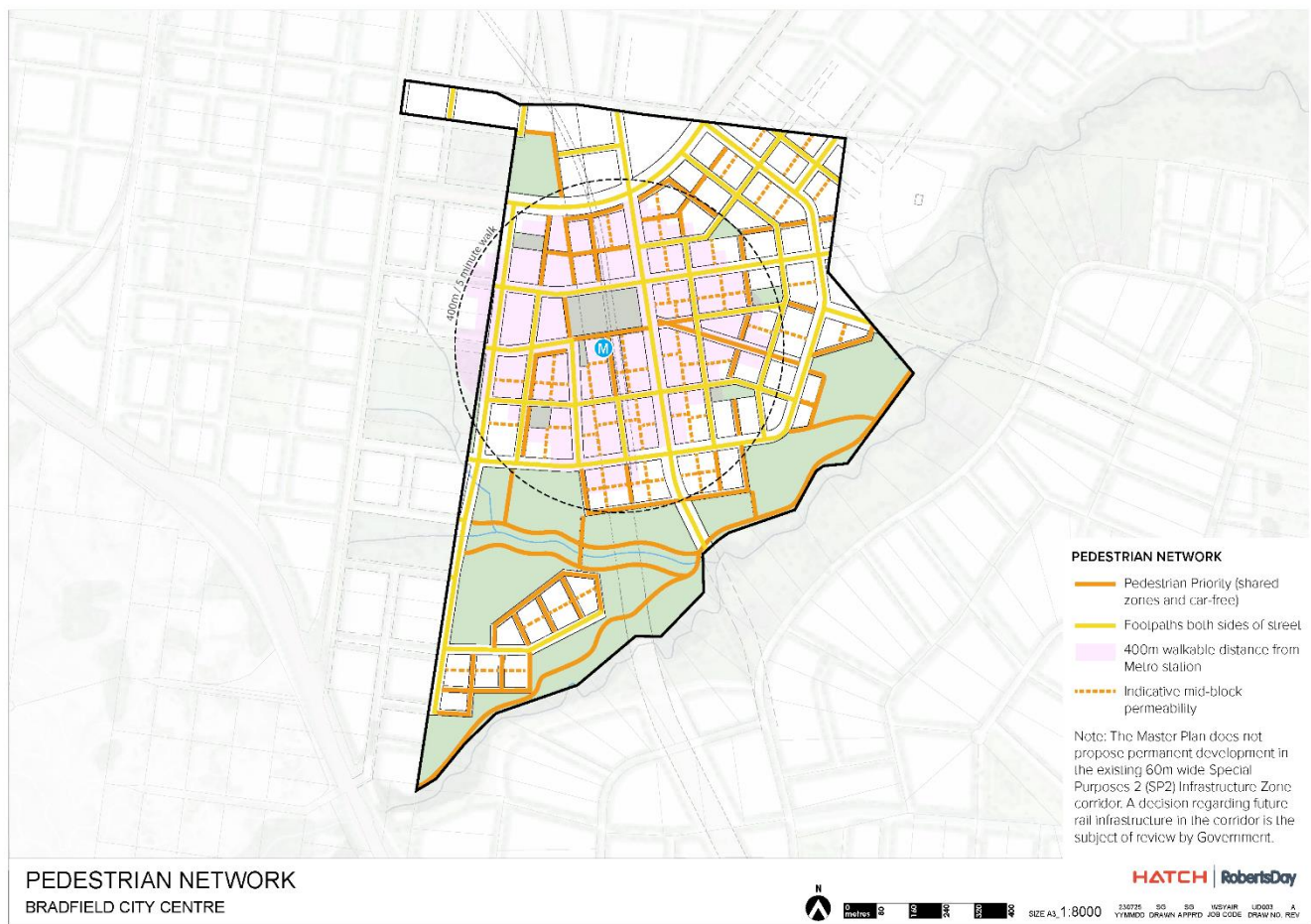
7.1.3 Walking

The quality of the pedestrian network will be extremely high with intersections designed for safe and convenient crossings, extensive tree canopy cover throughout the public domain and high-quality public realm, street furniture and lighting.

The pedestrian network will continue along Moore Gully and Thompsons Creek to the broader Wianamatta-South Creek corridor, as well as provide strategic connections to the surrounding urban areas.

Figure 72 shows the Bradfield City Centre pedestrian network. Continuous pedestrian paths are provided along all streets and major corridors including a highly permeable network of shared zones and pedestrian/cycle only links within the City Centre.

Figure 72 Bradfield City Centre pedestrian network



Source: Hatch Roberts Day, 16th August 2023

7.1.4 Cycling

The Bradfield City Centre cycling network 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 centres and provide a genuine alternative to private vehicle travel. Greater use of cycling as a transport mode will result in healthier communities and aligns with the Aerotropolis vision of contributing to a sustainable, well connected Western Parkland City.

The Cycleway Design Toolbox identifies a hierarchy of safe cycleways that will enable the identification and prioritisation of projects within Bradfield:

1. **Priority Routes** – highly used routes that connect to major destinations, on cycleways that are separate from motor vehicles and pedestrians and offer a high Level of Service and safety to bicycle riders.

Figure 73 Cycleway facility selection tool - Priority Routes

Street typology (Movement and Place)	Civic space	Local street	Main street	Main road
Motor vehicle speed	≤10 km/h	≤30 km/h	≤50 km/h	>50 km/h
Motor vehicles / day	n/a	≤2,000	>2,000	n/a
<u>Bicycle path</u> (One and two-way)				
<u>Quietway</u>				
<u>Shared path</u> (Low pedestrian activity and low cross-cycleway movement)				
<u>Shared path</u> (High pedestrian activity or high cross-cycleway movement)				
<u>Shared zone</u>				

 Required for priority routes
  Suitable, but not preferred for priority routes

Source: Cycleway Design Toolbox, 2020

2. **Local Routes** – lower use routes that connect to priority corridors and neighbourhood destinations within catchments. Help to connect residential destinations and local services in low traffic environments.

Figure 74 Cycleway facility selection tool - Local Routes

Street typology (Movement and Place)	Civic space	Local street	Main street	Main road
Motor vehicle speed	≤10 km/h	≤30 km/h	≤50 km/h	>50 km/h
Motor vehicles / day	n/a	≤2,000	>2,000	n/a
<u>Bicycle path</u> (One and two-way)				
<u>Quietway</u>				
<u>Shared path</u> (Low pedestrian activity and low cross-cycleway movement)				
<u>Shared path</u> (High pedestrian activity or high cross-cycleway movement)				
<u>Shared zone</u>				

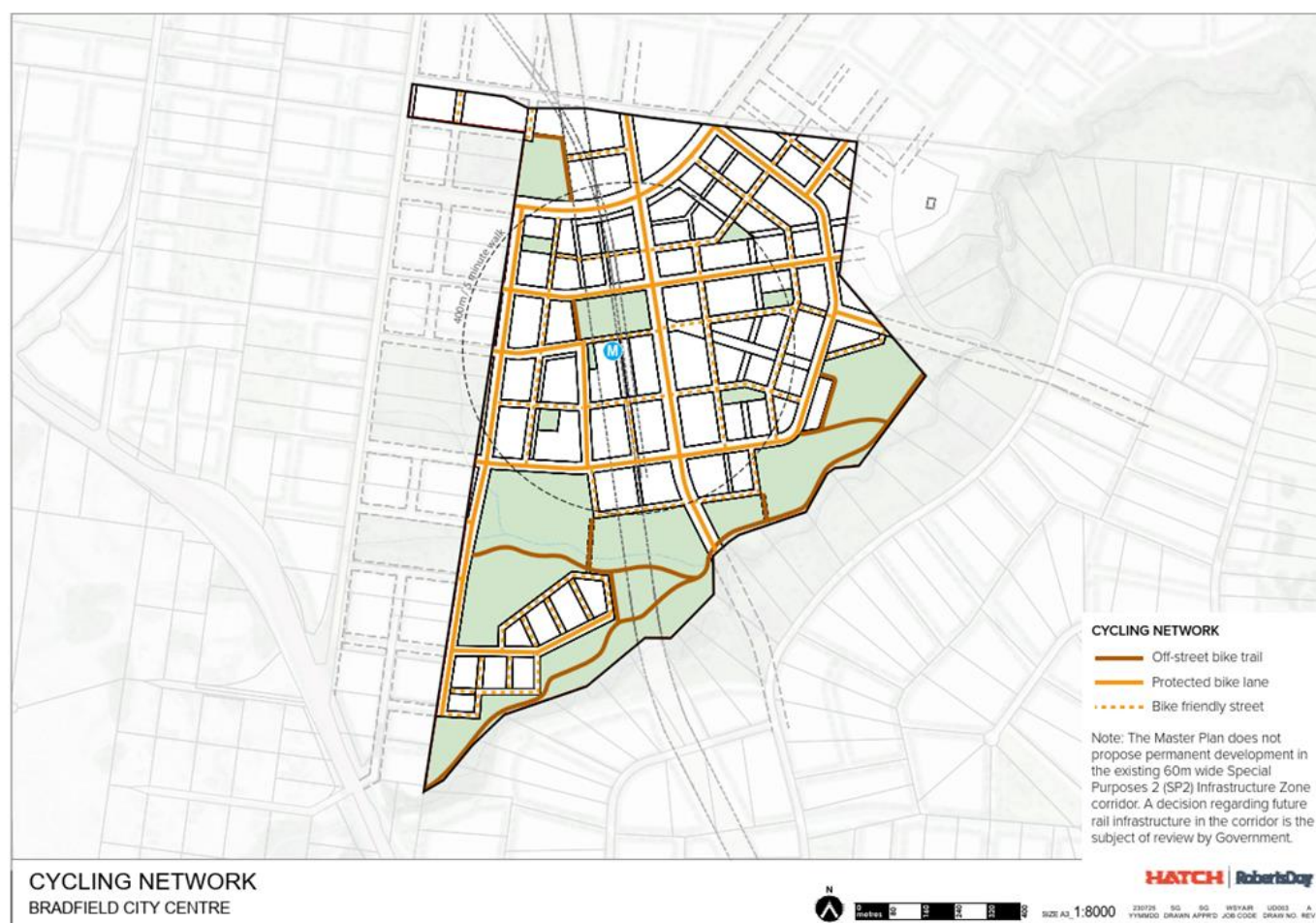
 Required for priority routes
  Suitable, but not preferred for priority routes

Source: Cycleway Design Toolbox, 2020

All streets within Bradfield City Centre (except local shared zones) will provide separated cycleways and a network of shared zones and pedestrian/cycle only links are proposed within the superblocks. **Figure 75** shows the Bradfield City Centre cycling network. Separated cycle paths (that could potentially be identified as Priority Routes using the Cycleway Design Toolbox) provide strong east-west and north-south connectivity for cyclists. This enhances cycling as a viable travel option both within the Bradfield City Centre and from adjacent neighbourhoods in the Western Sydney Aerotropolis (such as Bradfield South and Rossmore to the east).

Slow speed shared zones and pedestrian/cycle only links (which could potentially be identified as Local Routes using the Cycleway Design Toolbox) facilitate direct connectivity to places of work, living, entertainment and recreation within the Bradfield City Centre. Similarly, the principal regional cycle paths leverage the blue-green grid to optimise cycling as a recreational activity for people to live in, work in and visit the Bradfield City Centre.

Figure 75 Bradfield City Centre cycling network



Source: Hatch Roberts Day, 26th July 2023

The Bradfield City Centre will have sufficient provision of bike parking, delivered by proponents in accordance with the WSA DCP Phase 2, as well as complimentary facilities such as charging stations, tyre pumps and end-of-trip facilities to encourage and support the take up of cycling.

The WSA DCP Phase 2 provides guidance for bicycle parking provision within the Western Sydney Aerotropolis. Bicycle parking rates are shown in **Table 32**.

Table 32 WSA DCP Phase 2 bicycle parking rates

Proposed use	Residents / employees	Customers / visitors
Residential		
Residential accommodation	1 space / dwelling	1 space / 10 dwellings
Tourist and visitor accommodation		
Hotel, motel, or serviced apartments	1 space / 4 staff	1 space / 20 rooms
Backpackers' accommodation		1 space / 10 beds
Commercial		
Office or business premises	1 space / 150m ² GFA	1 space / 400m ² GFA
Bulky goods premises	1 space / 600m ² GFA	1 space / 1,000m ² GFA
Shop, restaurant, or café	1 space / 25m ² GFA	2 spaces plus 1 space / 100m ² over 100m ² GFA
Shopping centre	1 space / 200m ² GFA	1 space / 300m ² sales GFA
Pub	1 space / 100m ² GFA	1 space / 100m ² GFA
Entertainment facility	N/A	Whichever is greater:
Place of public worship	N/A	1 space / 15 seats; or 1 space / 40m ² GFA
Hospital	1 space / 15 beds	1 space / 30 beds
Industry		
Industry or warehouse	1 space / 10 staff	N/A
Distribution centre		
Community		
Community centre	1 space / 10 staff	2 spaces plus 1 space / 1,000m ² GFA
Childcare centre	1 space / 10 staff	2 spaces / centre
Primary school	1 space / 20 staff	1 space / 5 students
Secondary school		
Tertiary educational institution	1 space / 10 staff	1 space / 10 students
Medical centre or health consulting rooms	1 space / 5 practitioners	1 space / 200m ² GFA
Swimming pool	1 space / 10 staff	2 spaces / 15m ² of pool area
Library	1 space / 10 staff	2 spaces plus 1 space / 200m ² GFA
Art gallery or museum	1 space / 1,000m ² GFA	1 space / 200m ² GFA

Note: The minimum number of bicycle parking spaces is to be rounded up to the nearest whole number. GFA = Gross Floor Area

7.1.5 Metro and Passenger Rail

Sydney Metro - Western Sydney Airport (St Marys – Bradfield City Centre)

Sydney Metro - Western Sydney Airport is a 23-kilometre new railway which will connect to the existing T1 Western Line at St Marys and service the future Western Sydney International Airport and Bradfield Metropolitan Centre of Bradfield.

Sydney Metro will have no fixed timetables, instead operating with turn up and go services. Initially, the railway will be able to move up to 7,740 people an hour in each direction and up to 12 trains per hour in the peak. This capacity and frequency will grow as the customer demand within the Western Parkland City continues to develop. In the future, the railway will have an ultimate capacity to move more than 22,000 people an hour in each direction, up to 20 trains per hour and increasing to 30 trains per hour should the line be extended north to Schofields / Tallawong and south to Macarthur.

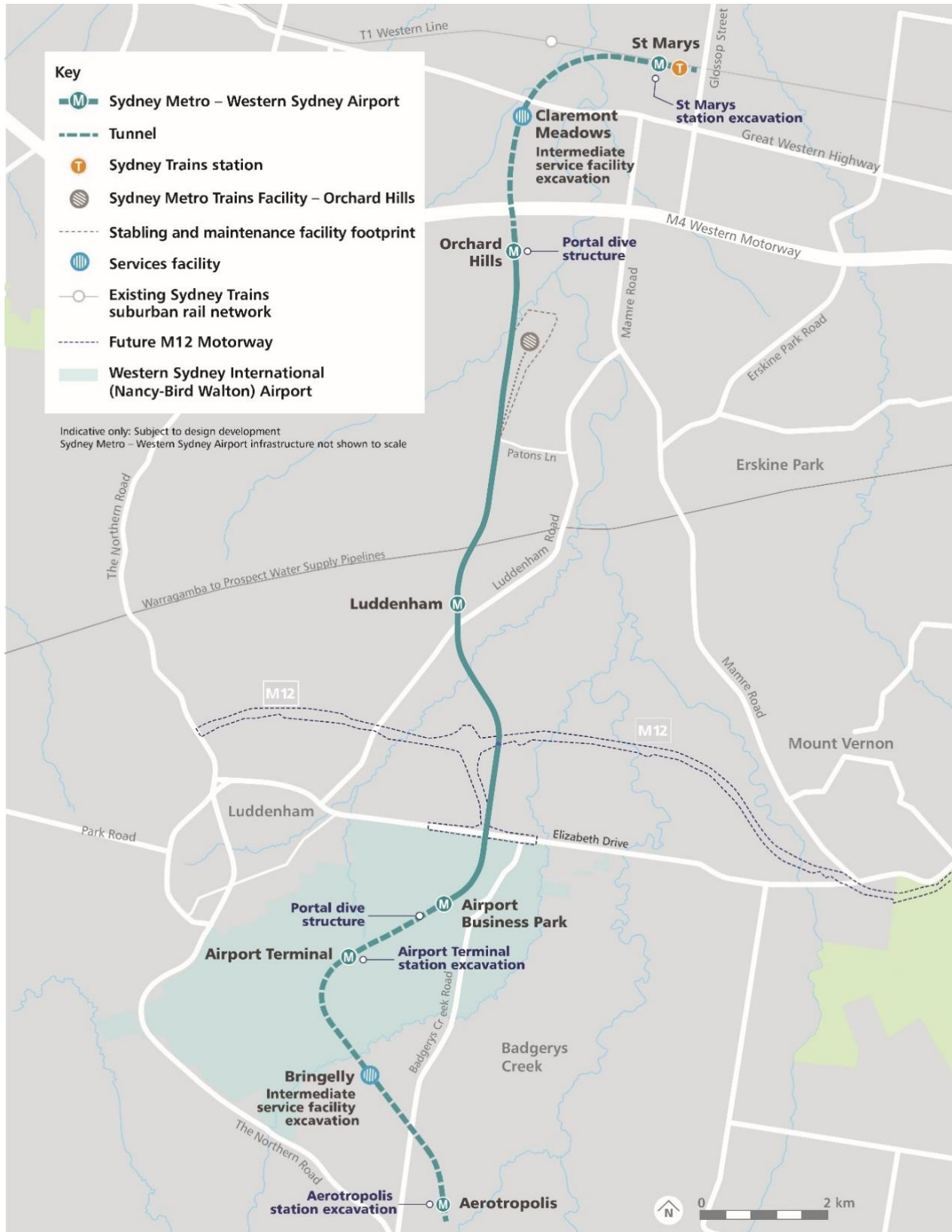
When operational, the journey between St Marys and Bradfield will take 20 minutes, and pass through the following six stations, with the alignment presented in **Figure 76**:

- St Marys – interchanging with the existing suburban railway station and connecting customers with the rest of Sydney’s rail system
- Orchard Hills – to service a future commercial and mixed-use precinct
- Luddenham – to service a future education, innovation, and commercial precinct
- Western Sydney International Airport – two stations to service the terminal and the business park
- Bradfield – to service the commercial heart of the Western Sydney Aerotropolis.

The Metro is expected to remove about 110,000 vehicle journeys off local roads every day from 2056.

The railway is scheduled to open in late 2026 to support the operations of the Western Sydney International Airport.

Figure 76 Alignment of Sydney Metro - Western Sydney Airport



Source: Sydney Metro, 2021

Sydney Metro possible future extensions

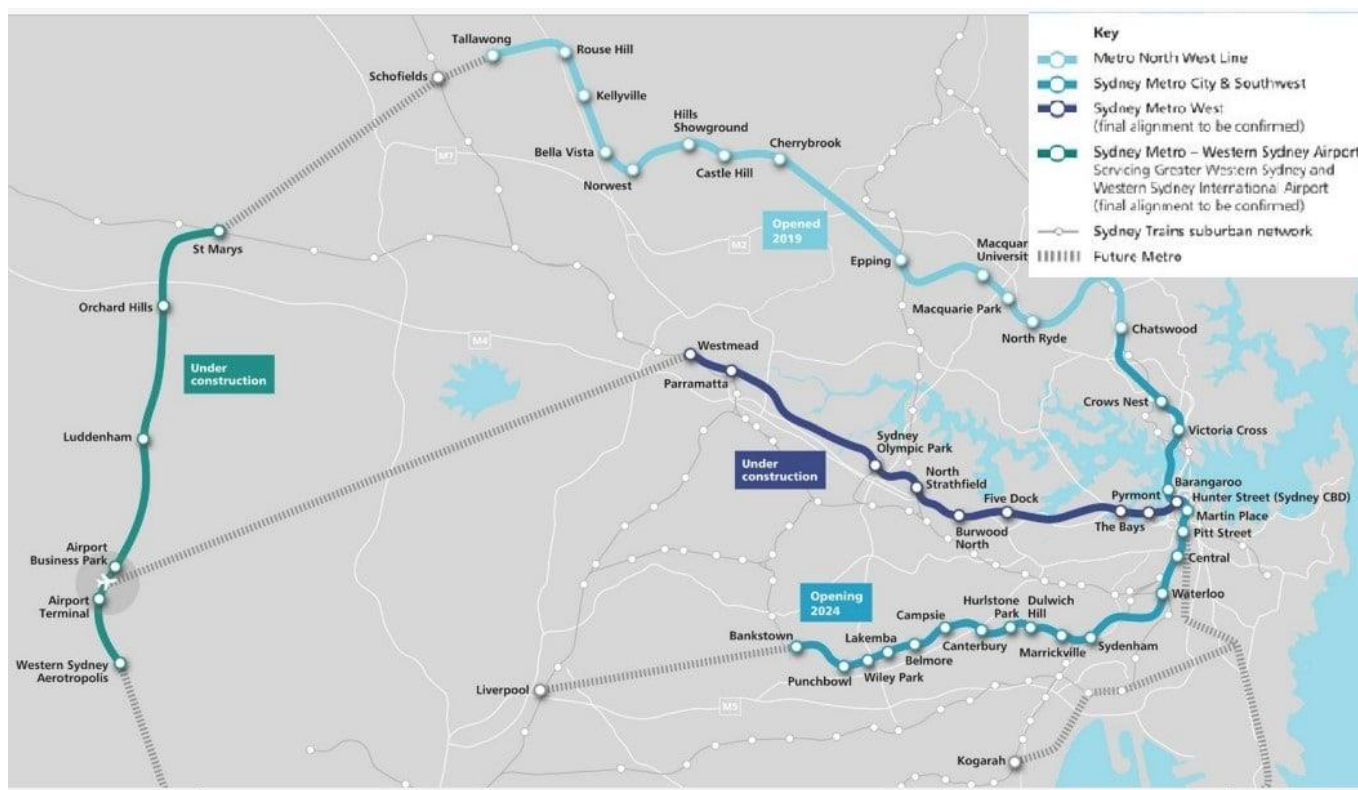
Sydney Metro will potentially be extended beyond Sydney Metro - Western Sydney Airport, connecting the northern terminus of St Marys to Schofields / Tallawong in the north and the southern terminus of Bradfield to Macarthur in the south.

With these possible future extensions, the railway will serve as the primary north – south connection within the Western Parkland City, connecting the Metropolitan Clusters of Bradfield and Campbelltown – Macarthur, and the Strategic Centres of Marsden Park, Narellan, and St Marys. In addition, the complete alignment would allow for greater accessibility between three Growth Areas of Greater Sydney; North West, South West and Greater Macarthur.

These possible future extensions will connect Sydney Metro - Western Sydney Airport and its surrounding catchments beyond the T1 Western Line at St Marys to the T5 Cumberland Line at Schofields, Sydney Metro Northwest at Tallawong and to the T8 Airport and South Line at Macarthur, shown in **Figure 77**. Future stations which are likely to be key interchanges include Bradfield, Schofields, St Marys, and Macarthur.

The land for this corridor has been gazetted.

Figure 77 Future strategic rail connections of Greater Sydney



Source: Sydney Metro, 2023

East-West Rail Link (Parramatta to Bradfield)

The East West Rail Link is a proposed future mass transit rail line connecting Greater Parramatta, Bradfield, and the Western Sydney International Airport. This future transport link will form a critical part of the *Western Sydney Aerotropolis Plan* by ensuring communities in the Central River City are connected to the Western Parkland City and the Western Sydney Airport.

The East West Rail Link has been proposed in two stages, with the corridor shown in **Figure 78**:

- Stage 1 is between the Aerotropolis and Kemps Creek
- Stage 2 is between Kemps Creek and Greater Parramatta.

Figure 78 East West Rail Line corridor



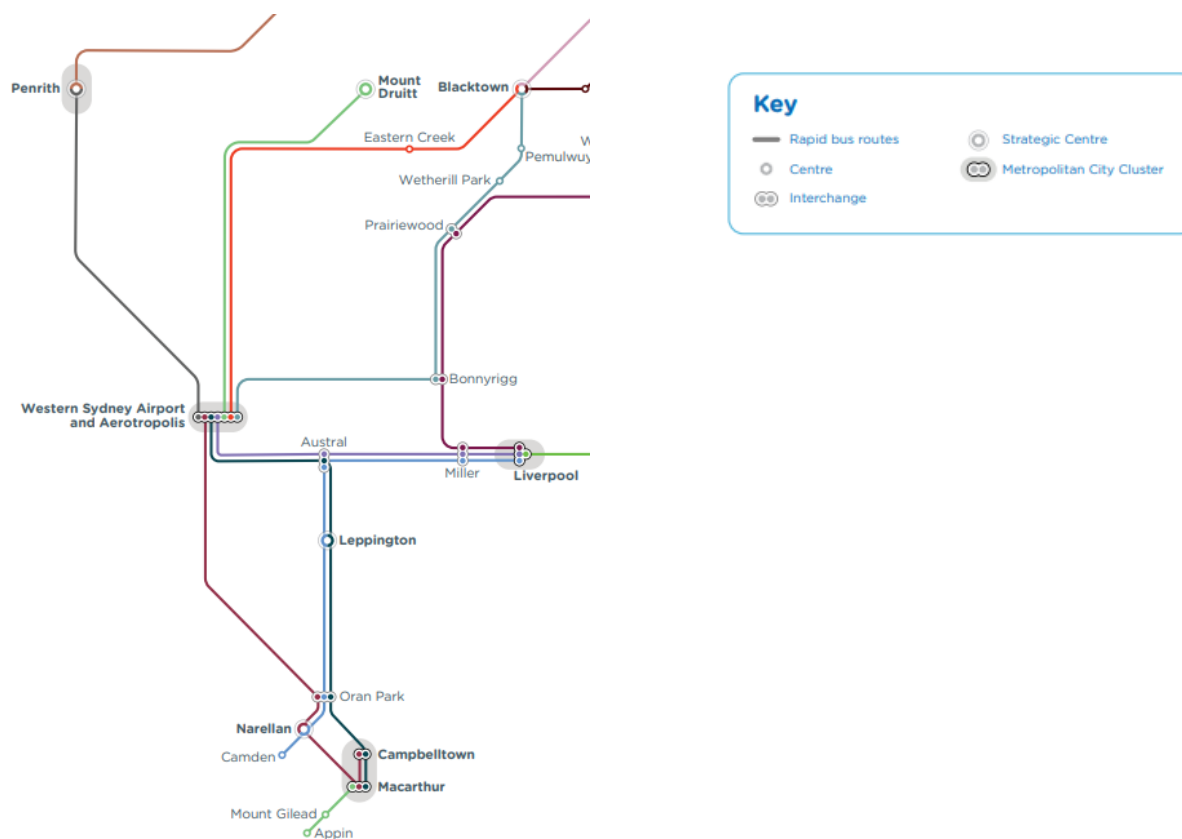
Source: Transport for NSW, 2021

7.1.6 Bus

Achieving the 30-minute city vision 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. 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. Stops are often of high quality, with stop spacings farther apart to facilitate faster journey speeds. The Western Sydney Rapid Bus Program will connect Bradfield City Centre with Metropolitan Clusters such as Campbelltown-Macarthur, Liverpool, and Penrith, as well as Western Sydney Airport. Figure 79 illustrates the future Rapid bus routes within and surrounding Bradfield City Centre under Future Transport 2056.
- **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. Services are on average every five minutes, depending on individual route needs and passenger demand. Frequent bus routes will provide strong connectivity between Bradfield City Centre, other parts of the Western Sydney Aerotropolis, and Strategic Centres and Local Centres in the Western Parkland City.
- **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 within the Bradfield City Centre with nearby centres (such as Bradfield South and Rossmore) and/or other public transport connections such as rapid bus routes and Sydney Metro.

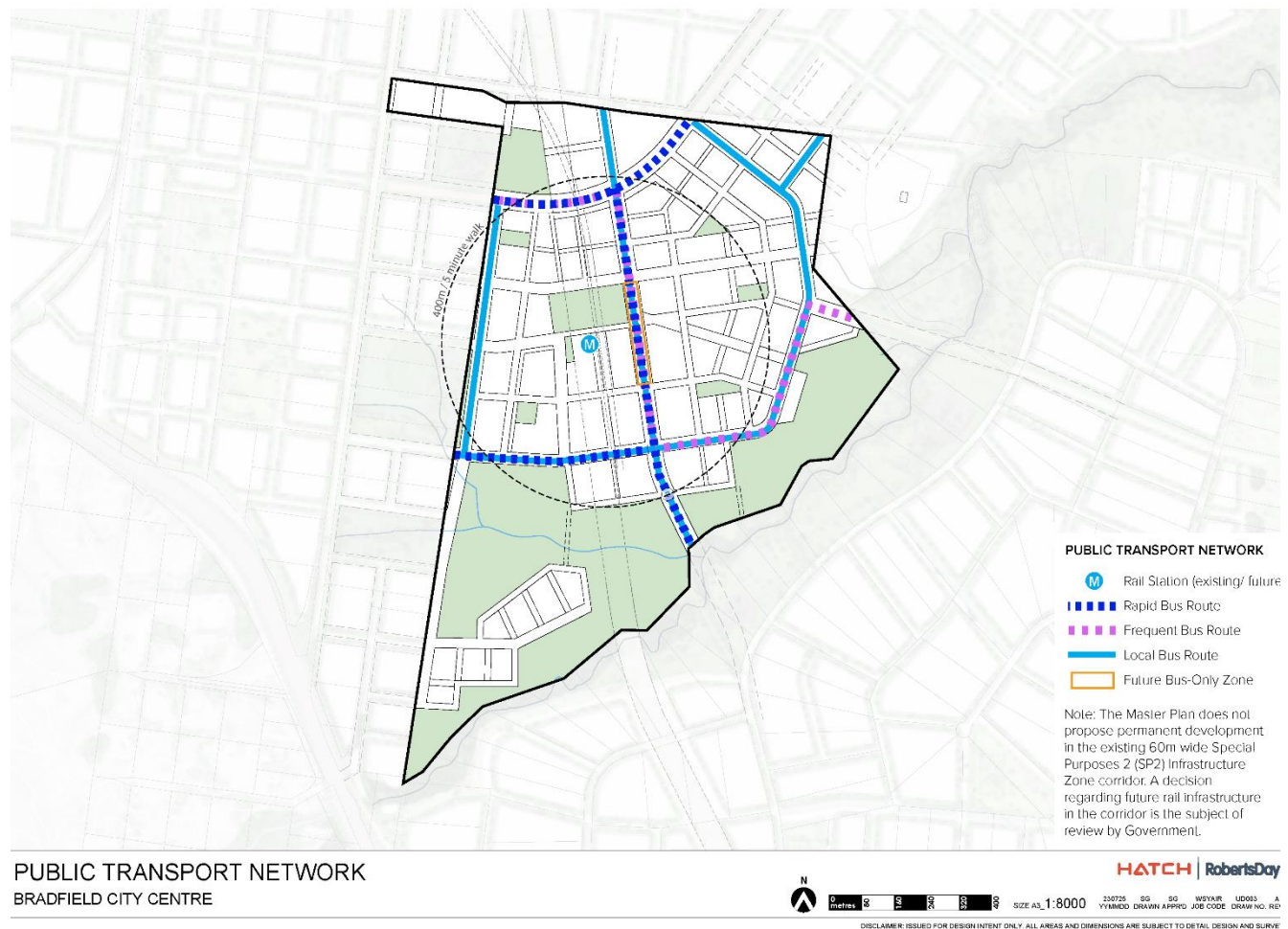
Figure 79 Future Rapid bus routes within and surrounding western Parkland City



Source: Transport for NSW, 2021

The Bradfield City Centre bus network (shown in **Figure 80**) represents a beyond business-as-usual approach to bus network planning in Western Sydney. The bus network reflects the three tiers of bus service:

Figure 80 Bradfield bus network



Source: Hatch Roberts Day, 16th August 2023

7.1.7 Road

Planning for different movements using the Movement and Place hierarchy considers local networks that pass-through centres, such as Bradfield City Centre, and that link places where people want to go, as well as freight and movement bypass networks to pass centres and directly link people and goods to the wider network.

Main Roads (Arterial roads)

Within and immediately adjacent to the Bradfield City Centre there are three primary arterial roads: Bringelly Road, Fifteenth Avenue and The Northern Road. Primary arterial roads provide an arterial function, focusing on the efficient movement of people and freight. Fifteenth Avenue is also an identified rapid bus corridor.

Main Streets (Sub-arterial roads)

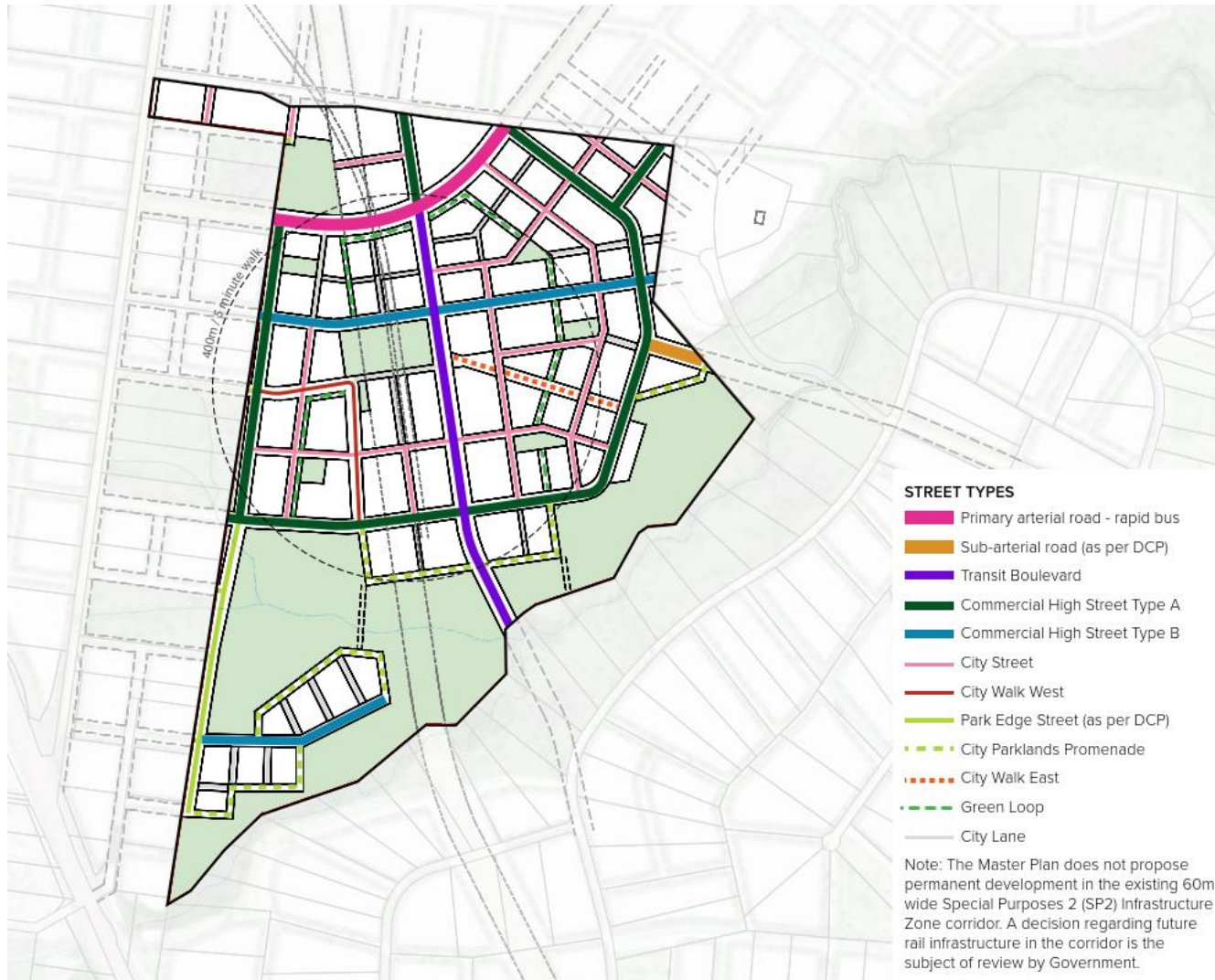
Badgerys Creek Road and Whitaker Road are the two sub-arterial roads within and immediately adjacent to the Bradfield City Centre. Sub-arterial roads provide space for all modes between Bradfield, Bradfield South, and other communities in the Western Parkland City.

Local Roads (Collector roads)

The majority of streets that enable vehicle circulation in the Bradfield City Centre are collector streets. These streets comprise trees, dedicated cycleways and wide footpaths that enable a diversity of alfresco uses (such as outdoor dining and street furniture) that enhance urban life. Some will be future proofed to enable future conversion to general traffic lanes (if required) and where appropriate.

The Bradfield city centre street network is shown in **Figure 81**.

Figure 81 Bradfield street network

Source: Hatch Roberts Day, 26th July 2023

7.1.8 Freight network

The *NSW Freight and Ports Plan 2018-2023* outlines that the safe, productive, and sustainable 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 between ports and warehouses.

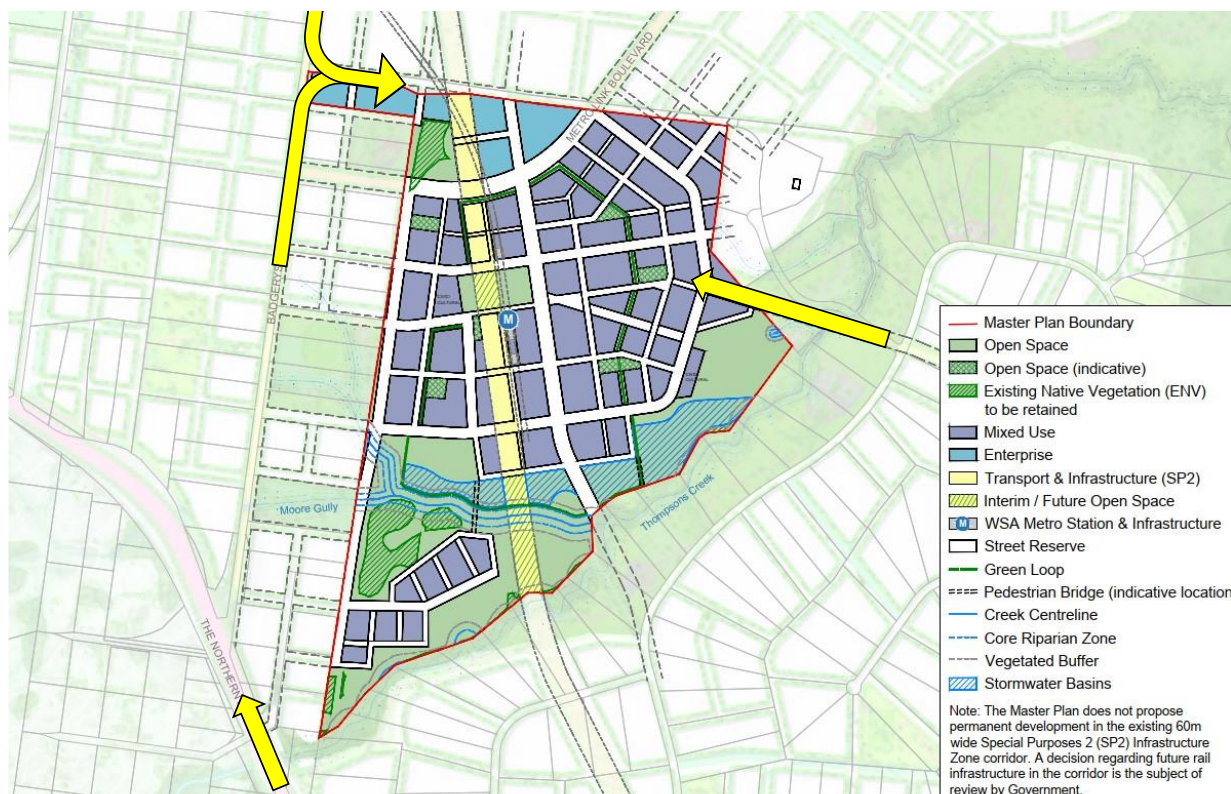
Roads have a variety of roles, functions, and users. Conflicts often arise when trying to meet the needs of all road users. Hierarchies can assist in defining the function of the road and in balancing the needs of various road users and allocating priorities. The freight network hierarchy is used to plan for and manage freight vehicle traffic, including the provision of safe and efficient freight routes. 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.

This hierarchy is particularly important in the wider Western Sydney Aerotropolis, with the Western Sydney 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.

Potential freight network access points were identified by Transport for NSW and are shown in **Figure 82**. It is anticipated that Badgerys Creek Road, Fifteenth Avenue, Whitaker Road, and The Northern Road will help to facilitate deliveries and servicing within the Bradfield City Centre.

Figure 82 Freight network access to Bradfield City Centre



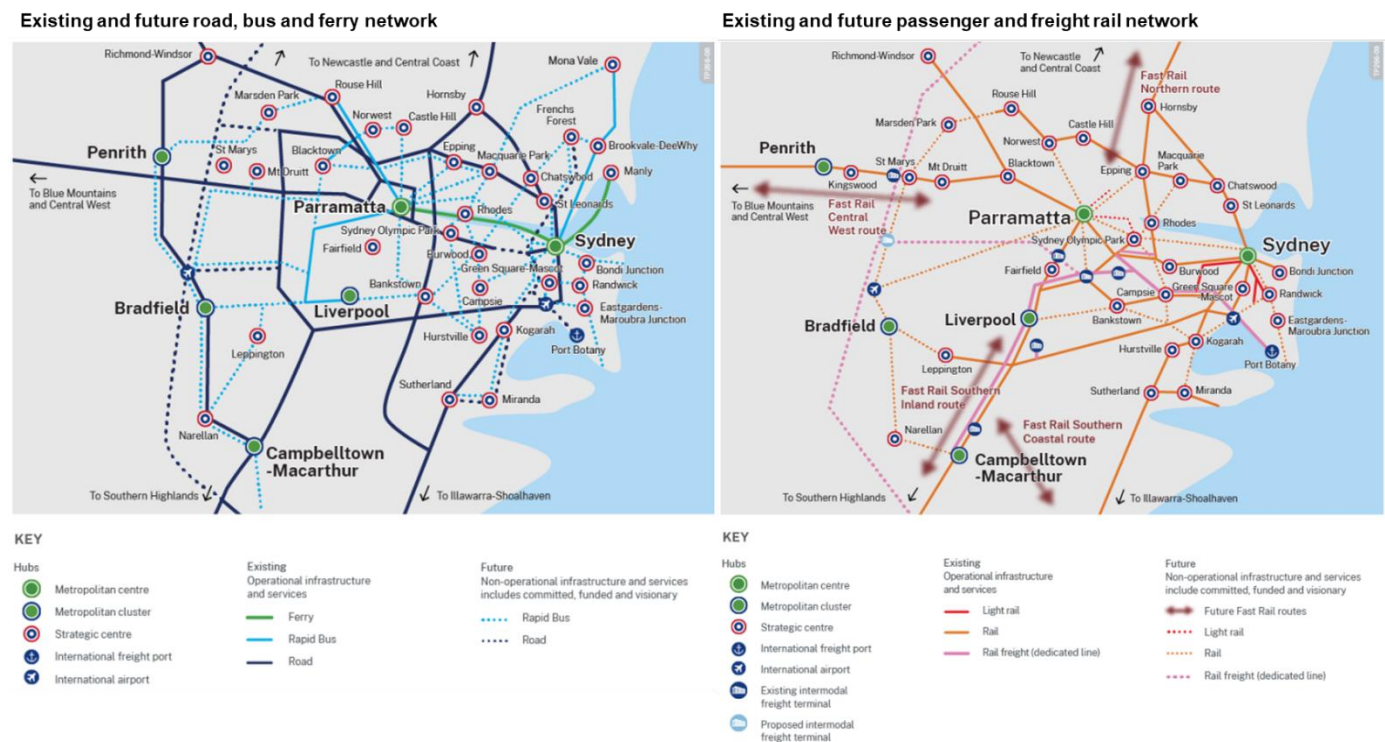
Source: Transport for NSW, 2021 and Hatch Roberts Day, 26th July 2023

Key infrastructure within the 24/7 freight network which will support the function of Bradfield City Centre, the Western Sydney Airport and the wider Western Sydney Aerotropolis include:

- **Road connections:** M12 Motorway, Outer Sydney Orbital, The Northern Road, Eastern Ring Road, and parts of Elizabeth Drive
- **Rail connections:** Outer Sydney Orbital and Western Sydney Freight Line
- **Freight nodes:** Moorebank Intermodal Precinct, St Marys Freight Hub, and the Western Sydney Intermodal Terminal.

The existing and future road and freight rail network in the Eastern Harbour City, Central River City and Western Parking City, as included as part of the TfNSW's *Future Transport Strategy: Our vision for transport in NSW*, is shown in **Figure 83** below.

Figure 83 Existing and Future Road and Freight Rail Network



Source: Future Transport Strategy: Our vision for transport in NSW (TfNSW, 2022)

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 of Bradfield City Centre, but its needs are to be considered in further planning processes in the future.

Freight management

There are four potential freight management approaches which could mitigate the impact of freight on the road network. These are:

- **Retime:** Shift freight and servicing activities to outside peak times to create opportunities for greater efficiency. An example is Pitt Street Mall, where vehicle access is permitted between 3:00am and 8:00am for deliveries, tradespeople, and services.
- **Reroute:** Avoid using Bradfield City Centre for through traffic, where feasible. Be aware of alternatives that can improve efficiency.
- **Remode:** Use modes of transport that are more efficient than trucks for Bradfield City Centre movements, where feasible. An example is the Goulburn Street courier hub, where Sydney City Centre deliveries are completed by cyclists.
- **Reduce:** Consolidate deliveries, improve vehicle utilisation, reduce trip numbers, procure sustainably, and develop delivery and service plans for buildings

Potential way forward

The freight task approach will change over time as the Bradfield City Centre evolves. A critical mass of activity will influence the use of more efficient approaches (such as Micro-Logistics). A three-stage approach is provided below to influence the freight task:

- Short Term (predominately planning and policy decisions)
 - Expectation of some on-street access and individual loading docks. Blocks are designed for future interconnectivity.
 - Reserve space on the fringe of Bradfield City Centre for light industrial/local distribution premises
 - Plan for future automation, on-road, and on-footpath (involve industry in automation projects)
 - Investigate Building Improvement District (BID) style approaches to freight and servicing
 - Design environmental/sustainable approaches for precinct
 - Adopt low speeds within the Bradfield City Centre
- Medium Term
 - Encourage major developments to be precinct approaches (Public, Private or Public-Private Partnership)
 - Aim for relative decrease in provision of more on-street spaces. Maintain healthy tension on spaces.
 - Incentives for Micro-Logistics approaches from Bradfield city centre fringe
 - Support uptake of automation
- Long Term
 - Expectation of micro-logistics
 - Expect to maintain some access for vehicles on street
 - Off street facilities can accommodate freight and servicing task
 - Out of hours peak hours access is the main alternative to off-street and Micro-logistics

7.2 Bradfield Travel Demand Management Strategy

7.2.1 Aim

The Travel Demand Management Strategy defines a framework to achieve the sustainable transport mode share target for Bradfield City Centre, outlined in **Section 5.4**.

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 Bradfield City Centre.

7.2.2 Objectives

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

7.2.3 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.

Parking

The provision of parking can influence mode choice. Initiatives such as time-limited parking and paid parking have been proven to encourage people to consider the use of other modes of transport such as public transport, walking and cycling.

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, it is an effective way to free up capacity on the transport system and reduce congestion in centres.

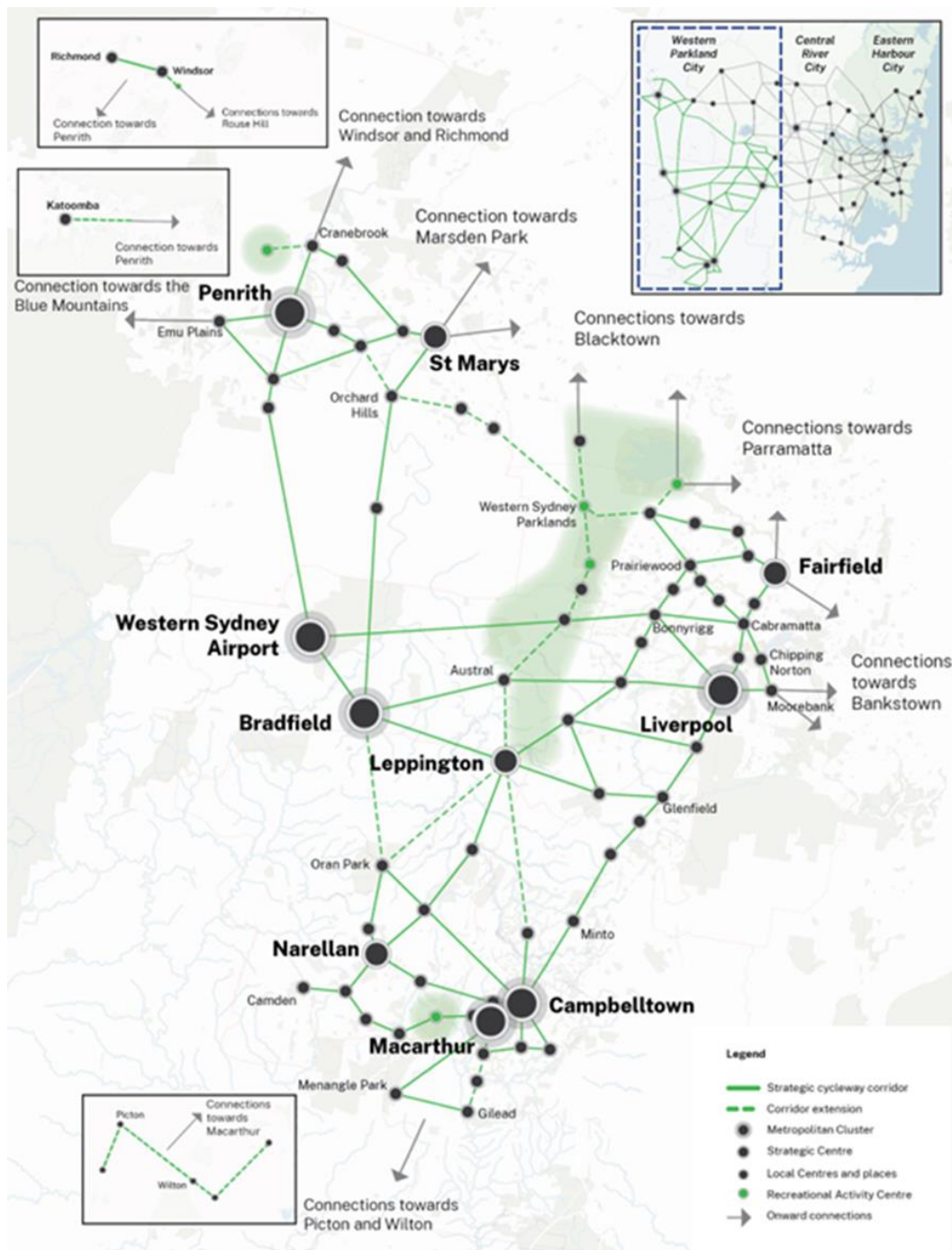
The quality of the walking environment within two kilometres of key destinations will influence walking as an option for residents, workers, and visitors within Bradfield City Centre. In addition, the quality of the walking environment within 400 metres of local bus stops and 800 metres of Rapid Bus stops will influence the uptake of public transport as a mode of travel within the wider Aerotropolis. Furthermore, the road speed has a direct impact on a pedestrian's sense of safety within an environment.

The provision of a high-quality walking environment within Bradfield City Centre will result in a greater use of active modes of transport, assisting in the shift towards sustainable mode share goals outlined in **Section 5.4** (Scenario 3).

Cycling environment

Cycling is an ideal mode of transport for short distances within 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. **Figure 84** illustrates the future strategic cycle network within and surrounding Bradfield City Centre.

Figure 84 Future Strategic Cycle network within and surrounding Bradfield City Centre



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, as well as providing local connections to retail, dining and open spaces for recreation and exercise."

The quality of the cycling environment within ten kilometres of Bradfield City Centre 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 Bradfield City Centre:

- Separated infrastructure – cyclists must be separated from high volume traffic and pedestrians, both at junctions and on the stretches of road between them
- Connections – routes must connect with each other forming a wider network

- Quick and direct – routes must be direct, logical, and intuitive to all users
- 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
- Facilities – end of trip facilities should be provided to encourage cycling for commuting
- 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 Bradfield City Centre will result in a greater use of active modes of transport, assisting in the shift towards sustainable mode share goals outlined in **Section 5.4**.

7.2.4 Measures and Impacts

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

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 connect employers, employees, and government agencies to mitigate traffic congestion challenges through a variety of travel measures. A number of travel intervention measures identified earlier in the Section 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.

Table 33 presents a summary of the measures and assess the impacts of Travel Demand within Bradfield City Centre to assist in achieving the sustainable mode share target.

Table 33 Transport Management Associations summary table

Potential measure	Comments
Travel choice	• Increase in basic transport options and choice
Limit vehicle trips	• Reduction in overall vehicle travel by more
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
Potential application	
• Cluster of multiple employers	
Business	• Education • Community

Note: A dot next to business, education and/or community denotes potential application for this user type for all tables in Section 7.2.4 and Section 7.2.5.

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 34 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 34 Travel plan summary table

Potential measure	Comments
Limit vehicle trips	• Reduction in overall vehicle travel through targets and data • Travel Plan for Development Applications should incorporate TDM measures to limit vehicle trips
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
Potential application	
• Inclusion in the Aerotropolis Development Control Plan for new development applications • Government, business, school, and other developments to develop green travel plans and an overall evaluation process to review walking, cycling and public transport usage	
Business	• Education • Community

Provision of bicycle parking and 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.

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. Responding to this, the *Western Sydney Aerotropolis Development Control Plan* goes 'beyond the business as

usual' approach which is currently in place.

Table 35 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 35 Provision of bicycle parking and end of trip facilities summary table

Potential measure	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
Potential application	
Inclusion in <i>Western Sydney Aerotropolis Development Control Plan</i> for new development applications	
Business	- Education - Community

Parking Provision

The adoption of maximum parking rates in the *Western Sydney Aerotropolis Development Control Plan* would encourage early investors and developers in Bradfield City Centre to adhere to a Development Control Plan parking provision.

The *Western Sydney Aerotropolis Development Control Plan* will be consistently applied throughout land within Bradfield City Centre with specifications for different types of land use. However, 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.

The adoption of the parking rates outlined in the *Western Sydney Aerotropolis Development Control Plan* will encourage more compact transit-orientated design within Bradfield City Centre 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. The DCP maximum parking rates also contribute to the core theme of sustainability outlined in the *Western Sydney Aerotropolis Plan*.

Table 36 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 36 Maximum parking provision summary table

Potential measure	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
Potential application	

- Inclusion in the *Western Sydney Aerotropolis Development Control Plan* for new development applications

Business



Education



Community



Traffic calming and 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 Bradfield City Centre it is recommended the focus is on roads with vulnerable users with options explored in detailed design for kerb extensions, raised crossings, pavement treatments, 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 Bradfield City Centre will assist in creating a safer environment for a shift to a greater uptake of active transport for travel to and from locations.

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 educational facilities
- Integration with other improvements – traffic calming complements other Travel Demand Management measures and when implemented together, can increase the effectiveness
- 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, such as speed hump and chicane impacts. Not all roads are suitable for traffic calming. This would need to be assessed on a case by case basis. It should also note that traffic calming devices should not be implemented on arterial or sub-arterial road network and be limited to local streets and civic spaces.

Table 37 presents a summary of traffic calming and speed reduction measures within Bradfield City Centre.

Table 37 Traffic calming and speed reduction summary table

Potential measure	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

Potential 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					
Business	•	Education	•	Community	•

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.

By shifting to last mile freight distribution for the majority of e-commerce deliveries by cargo bike, white vans within Bradfield City Centre 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. **Table 38** presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre. The measure needs to be tailored to the conditions and implemented alongside the provision for maintenance and service vehicles.

Table 38 Urban freight consolidation centre summary table

Potential measure	Comments
Limit vehicle trips	• Direct reduction in vehicle use and congestion in urban areas
Travel choice	• Cargo bikes increase 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
Potential 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 • 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	
•	

Provision of car share parking

The provision of ample and centrally located car share parking to serve Bradfield City Centre 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. **Table 39** presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 39 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
Potential application	
• Successful adoption of car share programs throughout Greater Sydney • Businesses utilising car share programs for fleet vehicles	
Business	• Education Community •

7.2.5 Interventions and impacts

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 or family commitments.

Table 40 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 40 Alternative work schedules summary table

Potential measure	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
Potential 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	
Business	• Education Community

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.

Table 41 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 41 Active transport training and guides

Potential measure	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
Potential application	
Tailored application to specific study areas; precincts or the catchment areas of schools	
Business	Education Community

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.

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 42 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 42 Carpooling program summary table

Potential measure	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
Potential 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	
Business	• Education
•	• Community

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 43 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 43 Combined travel behaviour campaigns summary table

Potential measure	Comments
Limit vehicle trips	Reduction in vehicle traffic 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
Potential application	
- Partnership with Local Governments - Combination of Travel Demand Management measures	
Business	• Education
•	• Community

Commuter financial incentives

Commuter financial incentives are financial incentives offered to commuters to use alternative modes of travel. 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.

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 44 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 44 Commuter financial incentives summary table

Potential measure	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
Potential application	
Most effective in areas with urban areas and suburban centres with greater mode choice	
Business	Education Community

Cycling education for school children

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 45 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 45 Education summary table

Potential measure	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
Potential application	
• Tailored application to the target age group through curriculum development	
Business	Education • Community

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 46 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 46 Events and challenges summary table

Potential measure	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
Potential 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	
Business •	Education • Community •

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 Bradfield City Centre 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.

Table 47 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 47 Navigation and journey planning tools summary table

Potential measure	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	• Suitable provision 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
Potential application	
• Include uses that attract significant visitation • Most effective in areas with diverse travel options available	
Business	• Education
	• Community

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.

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 48 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 48 Safe Routes to School summary table

Potential measure	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
Potential application	
• Progressive application in Bradfield 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	
Business	Education • Community

Investigate 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 49 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 49 Staggered school start times summary table

Potential measure	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
Potential 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	
Business	Education • Community

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 more widely adopted across Australia, with business and educational institutions now equipped to work online.

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 50** presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 50 Telework summary table

Potential measure	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
Potential 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	
Business •	Education Community

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 51 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 51 Walking and cycling to school bus summary table

Potential measure	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
Potential 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	
Business	Education
•	
Community	

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. Wayfinding would also be updated regularly to display changes. Wayfinding offers numerous benefits, including efficient navigation, improved accessibility, enhanced safety, stress reduction, and positive user experiences. By providing clear guidance and visual cues, it helps people move through spaces easily, and enhances the overall travel experience.

Table 52 presents a summary of the measures and assess the impacts of Travel Demand Management within Bradfield City Centre.

Table 52 Wayfinding summary table

Potential measure	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
Potential application	
	- Applied most often in urban areas and business parks - Low cost to implement within precincts - Real time information at bus stops
Business	• Education
	Community •

7.2.6 Bradfield Parking Strategy

The specification of maximum car parking rates caps the number of parking spaces that can be provided within developments, which reduces the reliance of future residents and employees on private vehicles; leading to a greater uptake in alternative means of travel such as sustainable modes.

The implementation of parking measures directly supports the mode share aspirations of a site, particularly the shift to beyond business as usual with a greater proportion of trips to be made by sustainable modes. Such short-term measures have a direct impact on the long-term vision and the behaviours required to meet the desired end state.

The Aerotropolis Development Control Plan (DCP) applies to the five initial precincts of Western Sydney Aerotropolis. It also guides the preparation of masterplans and Development Applications for the Aerotropolis Core City Centre. The Aerotropolis DCP aims to achieve connectivity, liveability, productive and sustainability.

The Aerotropolis DCP outlines controls relating to Car Parking, Access, and Servicing, with the objectives, performance outcomes and rates detailed for car parking below, which inform parking within Bradfield City Centre.

Objectives

The following objectives have been identified for parking rates within Western Sydney Aerotropolis, including Bradfield City Centre:

- Provide and manage car parking and end of trip facilities to ensure that trips generated by the development meet mode share targets
- To prioritise the use of public and alternative transport modes including walking and cycling
- To encourage ride share
- To minimise the reliance on private car usage
- To encourage the use of bicycles as an environmentally beneficial form of transport and an alternative to the use of private motor vehicles.

Performance outcomes

Table 53 outlines the performance outcomes for the parking rates control within Western Sydney Aerotropolis.

Table 53 Parking rates performance outcome

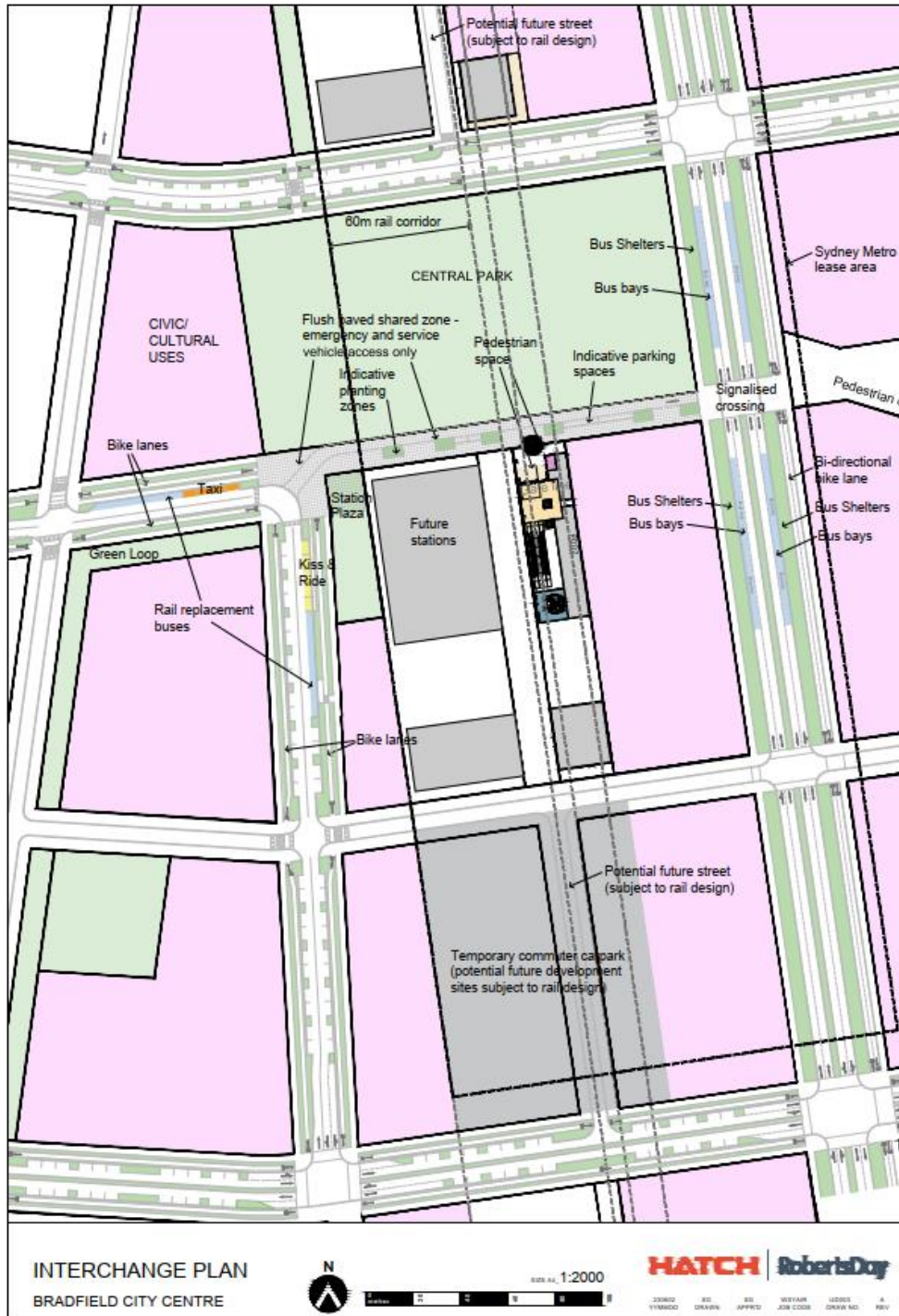
Performance Outcome	
PO1	Rate of parking is in accordance with function of development.

Commuter carpark

A temporary at-grade commuter carpark is planned to support access to Sydney Metro's Aerotropolis Station. The temporary at-grade commuter carpark would be delivered from day one of passenger services to provide customers who don't have readily available public transport options to access Aerotropolis Station. It will provide approximately 300 Park and Ride spaces for commuters.

The location of the Bradfield temporary at-grade commuter carpark is shown in **Figure 85**.

Figure 85 Bradfield temporary-at grade commuter carpark



Source: Hatch Roberts Day, 2nd June 2023

Car parking rates

The maximum on-site car parking rates, including visitor parking, for residential and non-residential developments within Western Sydney Aerotropolis, including Bradfield City Centre are outlined in **Table 54**. No minimum car parking rates currently apply to developments within Western Sydney Aerotropolis.

Table 54 Maximum on-site parking rate

Proposed Use	Land Use Zone	Within 800m walking distance of a metro station	Greater than 800m walking distance of a metro station	
Industry				
Light industry or warehouse	All	1 space / 200m ²	1 space / 200m ²	1 space / 100m ²
Distribution centre	All	1 space / 250m ²	1 space / 250m ²	1 space / 100m ²
Residential				
Attached housing	All	Studio or 1 bedroom – 1 space / dwelling (all areas)		
		2 bedroom – 1 space / dwelling	2 bedroom – 1 space / dwelling	2 bedroom – 1.5 space / dwelling
		3 or more bedrooms – 1.5 spaces / dwelling	3 or more bedrooms – 1.5 spaces / dwelling	3 or more bedrooms – 2 spaces / dwelling
Multi-dwelling housing	All	Studio or 1 bedroom – 1 space / dwelling (all areas)		
		2 bedroom – 1 space / dwelling	2 bedroom – 1 space / dwelling	2 bedroom – 1.5 space / dwelling
		3 or more bedrooms – 1.5 space / dwelling	3 or more bedrooms – 1.5 space / dwelling	3 or more bedrooms – 2 space / dwelling
		Visitor – 0.25 spaces / dwelling with a minimum of 1 space		
		Provision of a car washing space if there are more than 4 dwellings		
Residential flat buildings Shop-top housing	Mixed Use	Studio or 1 bedroom – 0.5 spaces / dwelling	Studio or 1 bedroom – 0.5 spaces / dwelling	Studio or 1 bedroom – 0.5 spaces / dwelling
				1 bedroom – 1 space / dwelling
		2 bedrooms – 1 space / dwelling		
		3 or more bedrooms – 1space / dwelling	3 or more bedrooms – 1 space / dwelling	3 or more bedrooms – 1.5 space / dwelling
		Motorcycle parking – 1 space / 10 car spaces		
		Provision of a car washing space for developments with more than 4 dwellings		
Tourist and Visitor Accommodation (Hotel, motel, or serviced apartments)	All	1 space / 5 apartments or rooms, plus 1 space per 5 employees.	1 space / 5 apartments or rooms, plus 1 space per 5 employees.	1 space / 3 apartments or rooms, plus 1 space per 5 employees.

Proposed Use	Land Use Zone	Within 800m walking distance of a metro station	Greater than 800m walking distance of a metro station	
Commercial				
Office or business premises	All	1 space / 100m ² GFA		
Bulky good premises		1 space / 100m ² GFA	1 space / 100m ² GFA	1 space / 75m ² GFA
Shop, restaurant, or café		1 space / 90m ² GFA	1 space / 90m ² GFA	1 space / 45m ² GFA
Supermarkets		1 space / 200m ² GFA	1 space / 200m ² GFA	1 space / 50m ² GFA
Shopping centre		1 space / 400m ² GFA	1 space / 400m ² GFA	1 space / 50m ² GFA
Entertainment facility ¹		1 space / 100m ² GFA	1 space / 100m ² GFA	1 space / 25m ² GFA
Hospital		1 space / 6 beds plus 1 space / 4 staff.	1 space / 6 beds plus 1 space / 4 staff.	1 space / 4 beds plus 1 space / 4 staff.
Place of public worship		1 space / 100m ² GFA	1 space / 100m ² GFA	1 space / 25m ² GFA
Community				
Childcare centre	All	1 space / 2 employees with a maximum of 3 spaces plus: 2 spaces if less than 24 enrolment places; or 3 spaces if 24 enrolment places and above.	1 space / 2 employees with a maximum of 3 spaces plus: 2 spaces if less than 24 enrolment places; or 3 spaces if 24 enrolment places and above.	1 space / employee with a maximum of 6 spaces plus 1 space / 10 children in enrolment.
Educational		1 space / 6 staff	1 space / 6 staff	1 space / 4 staff
Medical centre or health consulting rooms		1 space / 200m ² Proposals for medical centres must include a traffic report accurately predicting traffic generation based on similar sized medical centres.	1 space / 200m ² Proposals for medical centres must include a traffic report accurately predicting traffic generation based on similar sized medical centres.	1 space / 75m ² Proposals for medical centres must include a traffic report accurately predicting traffic generation based on similar sized medical centres.
Recreational facilities		5 spaces / 100m ²	5 spaces / 100m ²	7 spaces / 100m ²
Swimming pool		5 spaces / 100m ²	5 spaces / 100m ²	7 spaces / 100m ²
Other				
All uses not listed above ²	Neighbourhood Centre	1 space / 100m ² non-residential GFA	1 space / 100m ² non-residential GFA	1 space / 75m ² non-residential GFA
	Enterprise Zone	1 space / 250m ² non-residential GFA	1 space / 250m ² non-residential GFA	1 space / 150m ² non-residential GFA
	Mixed Use	1 space / 200m ² non-residential GFA	1 space / 200m ² non-residential GFA	1 space / 125m ² non-residential GFA

Proposed Use	Land Use Zone	Within 800m walking distance of a metro station	Greater than 800m walking distance of a metro station
Non-residential development	All	Motorcycle parking – 1 space / 10 car spaces	
Accessible Parking			
Residential	All	1 space / adaptable dwelling	
		1 space / 20 visitor spaces	
Non-residential		1% of all spaces	

dw = dwelling, GFA = Gross Floor Area

Application of DCP parking rates to 2056 Bradfield City Centre Master Plan development yields

The overall outcome of this assessment is detailed in **Table 55**, which presents a breakdown of the number of car parking spaces by year, land use category and the development scenario. Overall, the Bradfield City Centre Master Plan has a parking provision of 12,534 spaces permitted by the DCP.

Table 55 Indicative total parking spaces by year, development yield and land use category

Land use category	Proposed land use	2026 parking spaces	2036 parking spaces	2056 parking spaces
Commercial	Office or business premises	475	1,690	4,708
Retail	Shop, restaurant, or café	11	278	1,069
Accommodation	Hotel, motel, or serviced apartments	0	85	290
Cultural Centre	Entertainment facility	0	50	209
Education	Educational	0	17	85
Residential	Residential flat buildings	0	1,553	6,173
Total		486	3,672	12,534

Parking principles and indicative parking locations

The following parking principles support the implementation of the Bradfield Parking Strategy. These principles were also used to inform indicative parking locations for the Bradfield City Centre:

- Locate parking at fringes of lots to minimise need for cars in city
- Use consolidated access points to minimise interruption to pedestrians and bike lanes
- Promote shared parking independent of land use to consolidate location and manage traffic
- Parking to be in basements
- First/last mile freight facility to be provided to reduce heavy vehicles in the city
- All on-street parking for drop-off/pick up (for ride services and future autonomous vehicles), short term bays for last mile deliveries and disabled parking

- Minimum 20-40% off-street parking provided with Electric Vehicle charging (both residential and commercial)
- Generally no on-street Electric Vehicle charging due to obstructions, trip hazards, and not suited to long term parking

8 Recommendations

8.1 Mobility

This TMAP supports the Bradfield City Centre Master Plan and outlines the need to prioritise the use of sustainable transport modes and people over private vehicles. This is critical to the approach to mitigate impacts identified in the implementation plans.

8.2 Prioritising measures and initiatives

The reference column in the following tables reflects the prioritisation of each measure or initiative for each modal grouping (walking and cycling, public transport and the road network). Prioritisation has been undertaken using the modal access hierarchy (detailed in Section 8.1.2). The modal access hierarchy aligns with the intention of the Western Sydney Aerotropolis Precinct Plan to embrace a ‘beyond business-as-usual approach,’ which prioritises the use of sustainable transport modes such as walking, cycling and public transport over private vehicles. Implementation plan

An implementation plan has been prepared for walking and cycling, public transport and the road network over each of the following time-horizons:

- Short term (present-2026) detailed in **Table 56**
- Medium term (2026-2036), detailed in **Table 58**
- Long term (2036-2056), detailed in **Table 59**

Each implementation plan aims to define an impact, challenge or issue for walking and cycling, public transport and the road network in the Bradfield City Centre. A corresponding proposed measure or initiative is outlined to address the impact, challenge, or issue. The proposed measure or initiative is then allocated to a lead stakeholder with partners identified to assist with delivery.

Note: The initiatives mentioned below are contingent on funding availability.

Table 56 Implementation plan for short term (present-2026)

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Walking and cycling				
1	Network of footpaths	Provide pedestrian connectivity to planned buildings, places and public transport infrastructure and services for people walking and cycling	WPCA	Liverpool City Council, TfNSW, Sydney Metro
2	Network of dedicated cycling infrastructure	Encourage sustainable travel options early by delivering dedicated cycling infrastructure to cater for all types of users	WPCA	Liverpool City Council, TfNSW, Sydney Metro
Public transport				
1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver Sydney Metro - Western Sydney Airport • Deliver Western Sydney Rapid Bus Program including routes such as Penrith to Aerotropolis, Liverpool to Aerotropolis and Campbelltown to Aerotropolis • Deliver planned frequent and local bus routes such as Aerotropolis to Mount Druitt • Bus priority measures along other parts of the Bradfield City Centre including the Transit Boulevard to be considered in TfNSW's Access and Servicing Plan	Sydney Metro and TfNSW	WPCA, Liverpool City Council
Road network				
1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver planned upgrades to higher order arterial road network	TfNSW	WPCA, Liverpool City Council
2	Connectivity within Bradfield City Centre limits	• Develop an overarching Travel Demand Management Strategy for Bradfield City Centre • Deliver Bradfield City Centre local street network in line with Bradfield City Centre Master Plan staging • Consider implementing travel demand management measures (identified in Section 7.2) to reduce car usage	TfNSW	WPCA, Liverpool City Centre
3	Coordination of street intersection designs and bus stop locations to developed in consultation with TfNSW	• Consultation with TfNSW in the development of street network/ design within Bradfield City Centre • Street intersection designs and bus stop locations to be subject	TfNSW	WPCA, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
		to future detailed design as part of on-going approvals Intersection arrangements will be subject to further approval by TfNSW and should be informed by an access and servicing strategy. Further modelling as part of this application utilising SDTA model outputs may be required to confirm intersection arrangement and design		
4	Develop an Access and Servicing Plan for the Western Sydney Aerotropolis and Bradfield City Centre as part of future planning	- Develop an Access and Servicing Plan for the Bradfield City Centre within 12-18 months of an approved Master Plan. The scope of the plan will be developed by TfNSW with key stakeholders and will include, as minimum: - The refinement of road designs to inform subsequent planning applications - Consideration of intersection treatments - Bus servicing and operational needs (local and rapid services) to ensure identified roads are bus capable in line with TfNSW standards - Freight Access and Loading - Active transport connections - Network prioritisation and staging elements - Consideration of future speed zones - The conversion of the transit boulevard to bus only - Development of individual Green Travel Plans for future development sites post-TMAP and Master Plan to examine how mode share targets can be achieved - Integration of public transport and land use for accommodating bus stops on BLMR if high-density development is to be adequately served by public transport - Examine potential to convert the Transit Boulevard Bus Zone to bus only as it may not be feasible to operate with mixed traffic from day one	TfNSW	WPCA, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
		- Review street designs, tree canopy priorities and street carriageway space to ensure efficient bus and city centre traffic operations and pedestrian friendly environments - Review the need and options for service vehicles access to the Metro station		
Parking				
1	Demand for parking	- Explore use of undeveloped blocks for temporary parking stations to support the interim movement functions and growth of Bradfield City Centre, whilst not contradicting the long-term vision and desire mode share outcomes - Prioritise delivery of off-street parking over on-street parking to future proof for electric vehicles and their charging requirements	WPCA	TfNSW, Liverpool City Council
2	Demand for Park and Ride	Restrict the number of commuter carparks and encourage use of sustainable transport modes	Sydney Metro	WPCA, TfNSW, Liverpool City Council
Freight and servicing				
1	Demand for servicing and loading	Provide sufficient off-street and on-street space to optimise servicing and loading arrangements.	WPCA	TfNSW, Liverpool City Council

Table 57 Implementation plan for medium term (2026-2036)

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Walking and cycling				
1	Disconnected network of footpaths	Optimise pedestrian connectivity to planned buildings, places and public transport infrastructure and services for people walking and cycling	WPCA	Liverpool City Council, TfNSW, Sydney Metro
2	Disconnected network of dedicated cycling infrastructure	Embed sustainable travel options early by delivering dedicated cycling infrastructure to cater for all types of users	WPCA	Liverpool City Council, TfNSW, Sydney Metro
3	Enable access to blue-green grid for recreational walking and cycling	Optimise pedestrian and cyclist connectivity to blue-green grid to build on city-making place qualities	WPCA	Liverpool City Council, TfNSW
Public transport				

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver rail extensions to Bradfield via Western Sydney Airport • Deliver rail extension from Bradfield to Glenfield • Deliver Fifteenth Avenue (Bradfield Metro Link Road) Upgrade for rapid bus • Deliver planned frequent and local bus routes such as Aerotropolis to Science Park • Bus priority measures along other parts of the Bradfield City Centre including the Transit Boulevard to be considered in TfNSW's Access and Servicing Plan	Sydney Metro and TfNSW	WPCA, Liverpool City Council

Road network

1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver planned upgrades to arterial road network such as the Outer Sydney Orbital Stage 1 and the Eastern Ring Road	TfNSW	WPCA, Liverpool City Council
2	Connectivity within Bradfield City Centre limits	• Develop an overarching Travel Demand Management Strategy for Bradfield City Centre • Deliver Bradfield City Centre street network in line with Bradfield City Centre Master Plan staging • Street intersection designs and bus stop locations to be subject to future detailed design as part of on-going approvals • Intersection arrangements will be subject to further approval by TfNSW and should be informed by an access and servicing strategy. Further modelling as part of this application utilising SDTA model outputs may be required to confirm intersection arrangement and design • Consider implementing travel demand management measures (identified in Section 7.2) to reduce car usage to, from and within Bradfield City Centre	WPCA	TfNSW, Liverpool City Council

Parking

1	Demand for parking	• Explore use of undeveloped blocks for temporary parking stations to support the interim movement functions and growth	WPCA	TfNSW, Liverpool City Council
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Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
		of Bradfield City Centre, whilst not contradicting the long-term vision and desire mode share outcomes Prioritise delivery of off-street parking over on-street parking to future proof for electric vehicles and their charging requirements		
2	Demand for Park and Ride	Continue to restrict the number of commuter carparks and encourage use of sustainable transport modes	Sydney Metro	WPCA, TfNSW, Liverpool City Council
Freight and servicing				
1	Demand for servicing and loading	Provide sufficient off-street and on-street space to optimise servicing and loading arrangements.	WPCA	TfNSW, Liverpool City Council
2	Travel Demand Management for freight and servicing	Increase efficiency by consolidating freight activity – for example, each truck can service multiple destinations	WPCA	TfNSW, Liverpool City Council
3	Freight Hubs	Recommend implementing freight hubs to consolidate freight activity for Bradfield.	WPCA	TfNSW, Liverpool City Council

Table 58 Implementation plan for long term (2036-2056)

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Walking and cycling				
1	Disconnected network of footpaths	Optimise pedestrian connectivity to planned buildings, places and public transport infrastructure and services, and other communities outside the Bradfield City Centre (such as other parts of the Western Sydney Aerotropolis) for people walking and cycling	WPCA	Liverpool City Council, TfNSW, Sydney Metro
2	Disconnected network of dedicated cycling infrastructure	Embed sustainable travel options early by delivering dedicated cycling infrastructure to connect with other communities outside the Bradfield City Centre (such as other parts of the Western Sydney Aerotropolis) to cater for all types of users	WPCA	Liverpool City Council, TfNSW, Sydney Metro
3	Enable access to blue-green grid for recreational walking and cycling	Optimise pedestrian and cyclist connectivity to blue-green grid to build on city-making place qualities	WPCA	TfNSW, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Public transport				
1	Connectivity to Bradfield City Centre from other parts of Western Parkland City and Greater Sydney	• Deliver rail extensions to Campbelltown-Macarthur and Schofields • Deliver rail extensions to Bradfield via Western Sydney Airport • Deliver planned increase in service frequencies for rapid, frequent, and local bus routes • Bus priority measures along other parts of the Bradfield City Centre including the Transit Boulevard to be considered in TfNSW's Access and Servicing Plan • Deliver a street network and associated bus infrastructure to support operation of high-quality bus services	Sydney Metro and TfNSW	WPCA, Liverpool City Council
Road network				
1	Connectivity within Bradfield City Centre limits	• Develop an overarching Travel Demand Management Strategy for Bradfield City Centre • Deliver Bradfield City Centre street network in line with Bradfield City Centre Master Plan staging • Street intersection designs and bus stop locations to be subject to future detailed design as part of on-going approvals • Intersection arrangements will be subject to further approval by TfNSW and should be informed by an access and servicing strategy. Further modelling as part of this application utilising SDTA model outputs may be required to confirm intersection arrangement and design • Consider implementing travel demand management measures (identified in Section 7.2) to reduce car usage to, from and within Bradfield City Centre	WPCA	TfNSW, Liverpool City Council

Reference	Impact/Challenge/Issue	Proposed Measure/Initiative	Lead Stakeholder	Partners
Parking				
1	Demand for parking	Prioritise delivery of off-street parking over on-street parking to future proof for electric vehicles and their charging requirements	WPCA	TfNSW, Liverpool City Council
2	Demand for Park and Ride	Reallocate and repurpose commuter carparks out of Bradfield City Centre and encourage use of sustainable transport modes	Sydney Metro	WPCA, TfNSW, Liverpool City Council
Freight and servicing				
1	Demand for servicing and loading	Provide sufficient off-street and on-street space to optimise servicing and loading arrangements.	WPCA	TfNSW, Liverpool City Council
2	Travel Demand Management for freight and servicing	Increase efficiency by consolidating freight activity – for example, each truck can service multiple destinations	WPCA	TfNSW, Liverpool City Council
3	Freight Hubs	Recommend implementing freight hubs to consolidate freight activity for Bradfield.	WPCA	TfNSW, Liverpool City Council