Waterloo Metro Quarter State Significant Precinct

UrbanGrowth NSW Development Corporation

Transport Study

Final Report

18 October 2018

Waterloo Metro Quarter State Significant Precinct

Project No:	IA146000
Document Title:	Transport Study
Revision:	2.4 Final Report
Date:	18 October 2018
Client Name:	UrbanGrowth NSW Development Corporation
Client No:	4487/16
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File Name:	\\jacobs.com\anz\IE\Projects\04_Eastern\IA146000\02 Documents\Metro Quarter Stage 2\20180928 Metro Quarter Transport Study_v.2.4.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
0.1	25/05/2018	First draft for issue to UrbanGrowth NSW	CA, RB, CS	CS	CS
0.2	25/06/2018	Response to first draft comments	CA, RB	CS	-
1.0	25/06/2018	Final draft	RB, CS	CS	CS
1.1	11/07/2018	Response to final draft comments	CA, RB	CS	
2.0	11/07/2018	Revised final draft for issue to UrbanGrowth NSW	RB	CA	CS
2.1	18/07/2018	Final Report	CA	CS	CS
2.2	13/09/2018	Revised Final Report	CA	CS	CS
2.3	20/09/2018	Revised Final Report - updated	CA	CS	CS
2.4	18/10/2018	Revised Final Report – Sydney Metro/DPE/CoS updates	CA	CS	CS

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Glossary of terms and acronyms

Term/acronym	Definition
Adaptable dwelling	Housing which is designed and constructed in such a way that it can be modified easily in the future to become accessible to both occupants and visitors with disabilities or progressive frailties
Adaptable parking space	A parking space provided for an adaptable dwelling which can be modified easily in the future to become an accessible parking space
Aimsun	A traffic modelling software, performing traditional static macroscopic modelling to more detailed dynamic mesoscopic and microscopic simulation modelling.
AM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average peak hour in the morning peak period between 7am and 9am on a normal working weekday.
ATP	Australian Technology Park
CBD	Central Business District
CTMP	Construction Traffic Management Plan
DCP	Development Control Plan
Do Minimum	A model scenario that does not incorporate the proposed project infrastructure
EIS	Environmental Impact Statement
Fruin Level of Service	John Fruin developed a set of planning principles to assess pedestrian crowding and is documented in his 1987 book *Pedestrian Planning and Design*. These principles have since been adopted as the global industry standard approach to planning for pedestrians. This methodology is used to interpret the performance of space and how people move and interact under certain conditions
Heavy vehicles	A heavy vehicle is classified as a Class 3 vehicle (a two-axle truck) or larder, in accordance with the Austroads Vehicle Classification System.
HTS	Household Travel Survey
IAP	Interchange Access Plan
JTW	Journey to Work
LAHC	Land and Housing Corporation
Legion	A pedestrian modelling software used to simulate pedestrian movements within a defined space, taking into account how individuals interact with each other and physical obstacles within their environment.
LEP	Local Environment Plan
LGA	Local Government Area
LOS	Level of Service
Midblock	A general location on a road between two intersections
Mode	A type or method of transport movement
NSW	New South Wales

Term/acronym	Definition
PCL	Pedestrian Comfort Level
PM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average peak hour in the evening peak period between 4pm and 6pm on a normal working weekday.
PTPM	Public Transport Project Model A multi-modal model developed by TPA that forecasts patronage and demand related impacts of public transport projects and policies.
REF	Review of Environmental Factors
Roads and Maritime	NSW Roads and Maritime Services (formerly NSW Roads and Traffic Authority)
Roundabout	An intersection where all traffic travels in one direction clockwise around a central island
SEIFA	Socio-Economic Indexes for Areas Developed by the Australian Bureau of Statistics that ranks areas in Australia according to relative socio-economic advantage and disadvantage
SIDRA	An intersection and network modelling software used to evaluate intersection performance.
SSP	State Significant Precinct
TfNSW	Transport for New South Wales
TPA	Transport Performance and Analytics
TZ	Travel Zone The smallest standard geography used for a number of transport datasets in New South Wales, representing geographical areas that are used in origin-destination transport modelling.
TZP	Travel Zone Projection These are land use projections (population, workforce and employment) produced by TPA and developed to support a strategic view of Sydney and represent the most likely urban future based on current data, trends and an understanding of policy/structural changes that may impact the future.
UrbanGrowth NSW	Urban Growth New South Wales Development Corporation
VKT	Vehicle Kilometres Travelled
Waterloo SSP	The Waterloo State Significant Precinct bound by Phillip Street, Pitt Street, McEvoy Street and Botany Road. It also includes one block east of Pitt Street bordered by Wellington Street, Gibson Street and Kellick Street
Waterloo Precinct	Refers to the land within the Waterloo State Significant Precinct boundary. Also refers to the zones defined by the Australian Bureau of Statistics and Transport for New South Wales that fall within the Waterloo State Significant Precinct boundary.

Executive Summary

Waterloo State Significant Precinct – Background

The Minister for Planning has determined that parts of Waterloo are of State planning significance which should be investigated for rezoning through the State Significant Precinct (SSP) process. Study Requirements for such investigations were issued by the Minister on 19 May 2017.

Investigation of the Precinct is being undertaken by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW), in partnership with the Land and Housing Corporation (LAHC). The outcome of the State Significant Precinct process will be new planning controls that will enable future development applications for the renewal of the Precinct.

The Precinct includes two separate but contiguous and inter-related parts:

- The Waterloo Metro Quarter (the Metro Quarter)
- The Waterloo Estate (the Estate)

While this report therefore provides comprehensive baseline investigations for the entire Precinct, it only assesses the proposed Planning amendments and indicative Concept Proposal for the Metro Quarter.

Waterloo State Significant Precinct – Objectives

The delivery of a new Metro Station has provided the catalyst for transit oriented urban renewal of the Waterloo SSP. The Metro Station also provides an extraordinary opportunity to redevelop the Waterloo SSP into one of Sydney's most engaging and liveable contemporary neighbourhoods. This would be facilitated through a high quality interchange providing connectivity to the metro line and bus services, and supporting a higher-density neighbourhood with a diverse range of people and uses.

The following are UrbanGrowth NSW and LAHC's objectives for renewal of the Precinct:

- **Housing**: A fully integrated urban village of social, private and affordable housing
- **Services and amenities**: New and improved services, facilities and amenities to support a diverse community
- **Culture and design**: A safe and welcoming place to live and visit
- **Open Space and environment**: High quality public spaces and a sustainable urban environment
- **Transport and connectivity**: A well connected inner city location

Waterloo State Significant Precinct – Strategic analysis

Figure ES.1 compares resident mode share for Waterloo, selected benchmark suburbs and the Sydney metropolitan area.

Compared to average Journey to Work (JTW) mode share across the Sydney metropolitan area, Waterloo and the selected benchmark suburbs have significantly lower car mode share. Mode share for public and active transport combined is much higher than the Sydney average. Car mode share is particularly low in areas with high quality mass transit links and close proximity to Sydney CBD.

This comparison highlights the impact on travel mode choices of densely located land uses, activities and attractors typical of inner city locations. The availability of high quality public transport infrastructure and services, permeable and connected street networks, and high quality walking and cycling facilities are also

important and complimentary. Therefore, the Metro Quarter seeks to ensure that future residents and workers have the benefit of choice, not only for their travel model, but for when and where they wish to travel to live, work and for play activities.

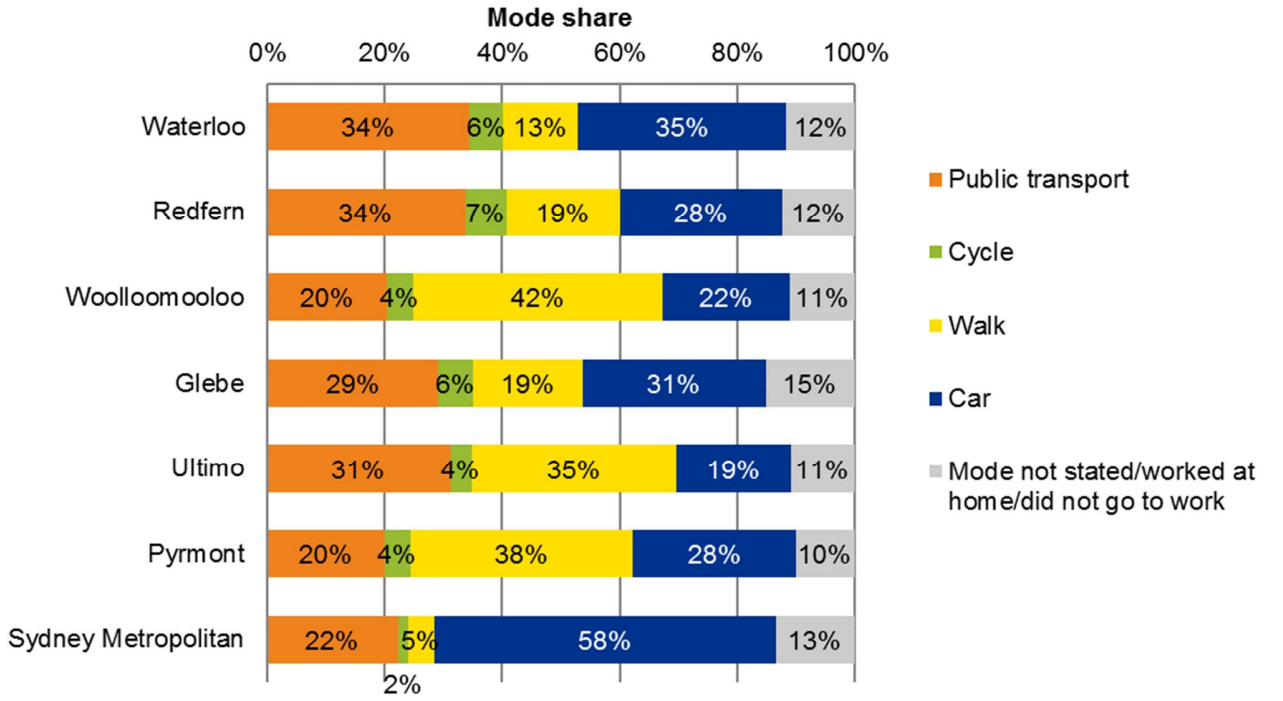

Figure ES.1 : Resident mode share

Sydney Metro

Sydney Metro is a new standalone metro rail network identified in Transport for NSW's *Sydney's Rail Future*. A component of Sydney Metro is Sydney Metro City & Southwest which is planned from Chatswood to Sydney CBD and Bankstown, due to commence operating in 2024. Services on the new line will run at a minimum of every 4 minutes in each direction, with an ultimate capacity for trains to carry up to 46,000 people per hour in one direction. Sydney Metro City & Southwest will remove T3 Bankstown line trains from the City Circle, providing congestion relief and greater capacity for T8 Airport, Inner West and South line trains. This will result in a moderate increase in train capacity stopping at Redfern Station from 2024. Preliminary forecasts for the 2036 AM peak hour indicate that around 3,700 customers would be entering and around 2,350 customers would be exiting the Waterloo Station (Chatswood to Sydenham EIS, 2016).

The Sydney Metro network is shown in Figure ES.2.

FigureES.2 : The Sydney Metro network

Source: Transport for NSW, 2018

Access to Waterloo Station would be located at the northern end of the station on the corner of Raglan Street and Cope Street, with a second entry off Cope Street. Some existing bus stops around the Metro Quarter may be relocated to better integrate with the station entry and provide convenient interchange between the metro and bus network. In addition, point to point facilities and a taxi rank would be provided on Cope Street, further improving the amenities available to customers of the metro network.

Future mode share targets

An assessment of the potential future mode shares has been undertaken in consultation with Transport for NSW, Roads and Maritime and City of Sydney and is based on existing data and the strategic opportunities for the Waterloo SSP. The mode share targets in the AM peak for all trip purposes are outlined in Figure ES.3.

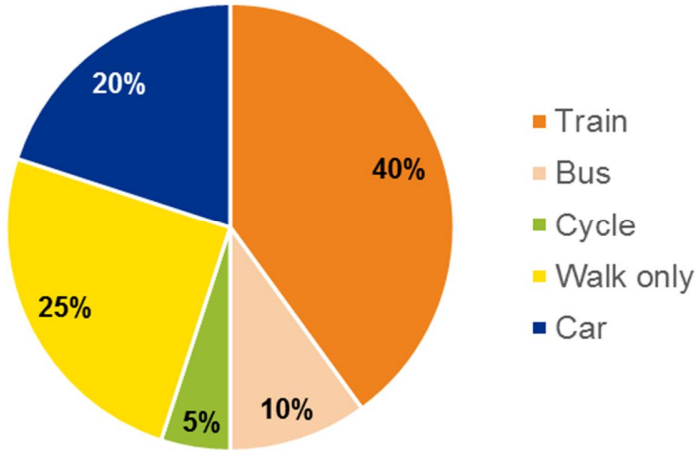

Figure ES.3 : Metro Quarter future mode share targets

These targets are based on a number of factors, including:

- Proximity to Sydney Metro Waterloo Station, which will provide access to high quality mass transit services on Sydney Metro City & Southwest
- Densely located land uses, activities and attractors as well as proximity to Sydney CBD and Green Square, enabling shorter trip lengths more conducive to walking and cycling
- Low existing traffic generation rates in recent high density developments in Waterloo and Redfern, and high (81 per cent) AM peak non-car mode share observed at the Redfern traffic generation survey site (detailed further in Chapter 7)
- Enhancements to the bus network to strengthen east-west routes, enabled by Sydney Metro City & Southwest, and improved cycling connections with key surrounding destinations.
- Consideration of Category A rates outlined in City of Sydney's DCP requirements to represent best practice in the provision of transport facilities appropriate for the Metro Quarter.

The Waterloo Metro Quarter

Proposed planning framework

The existing and proposed planning controls for the Metro Quarter are shown in Table ES.1.

Table ES.1 : Planning framework

	Existing	Proposed
Zoning	B4 mixed use	B4 mixed use
Height of buildings	Part 12, Part 15 metres	Part RL 115.3 (AHD) – North Part RL 104.2 (AHD) – Central Part RL 96.9 (AHD) – South
Floor Space Ratio	1.75:1	6.1:1 (including Metro Station)

Indicative Concept Proposal

The indicative Concept Proposal for the Metro Quarter ISD comprises:

- Approximately 69,000 square metres of gross floor area (GFA), comprising:
  - approximately 56,500 square metres GFA of residential accommodation, providing for approximately 700 dwellings, including up to 10 per cent affordable housing and 10 per cent social housing;
  - approximately 4,000 square metres of GFA for retail premises and entertainment facilities
  - approximately 8,500 square metres of GFA for business and commercial premises and community and recreation facilities (indoor).
- A three storey mixed-use non-residential podium, including a free standing building located within a public plaza of approximately 1,400 square metres.
- Three residential buildings of 23, 25 and 29 storeys, and four mid-rise buildings of up to 10 storeys above the approved Metro Station infrastructure.
- Parking for approximately 65 cars, 700 residential bicycles and 520 public bicycles.
- Two east-west, mid-block pedestrian connections.

Approval has already been separately granted for a Sydney Metro Station on the site, which will comprise approximately 8,415 square metres of GFA. The total GFA for the ISD, including the Metro Station GFA is approximately 77,500 square metres. Transport interchange facilities including bus stops on Botany Road and point to point facilities on Cope Street will be provided under the existing CSSI Approval.

The existing heritage listed Waterloo Congregational Church does not form part of the SSP Study Area.

Proposal assessment

A detailed traffic and transport assessment of the proposal has been undertaken and considers the following key areas:

- Public transport – assesses the bus, heavy rail and metro networks, including proposed infrastructure, service frequency, bus route and stop coverage and service accessibility
- Active transport – assesses the pedestrian and cycling networks including footpath and shared path widths, pedestrian crossings, and access to and availability of pedestrian and cycle infrastructure
- Parking and demand management – assesses the number of parking spaces required to accommodate the Metro Quarter and surrounding area including on-road and off-road parking environments
- Road network – assesses the immediate and wider road network through microsimulation and intersection modelling to determine the performance of the road network in terms of average vehicle delay and Level of Service
- Vehicle access – assesses the proposed access points to and from the Metro Quarter and the function of surrounding streets

Findings from the assessment support the development of the implementation plan and strategy which is outlined in Figure ES.4.

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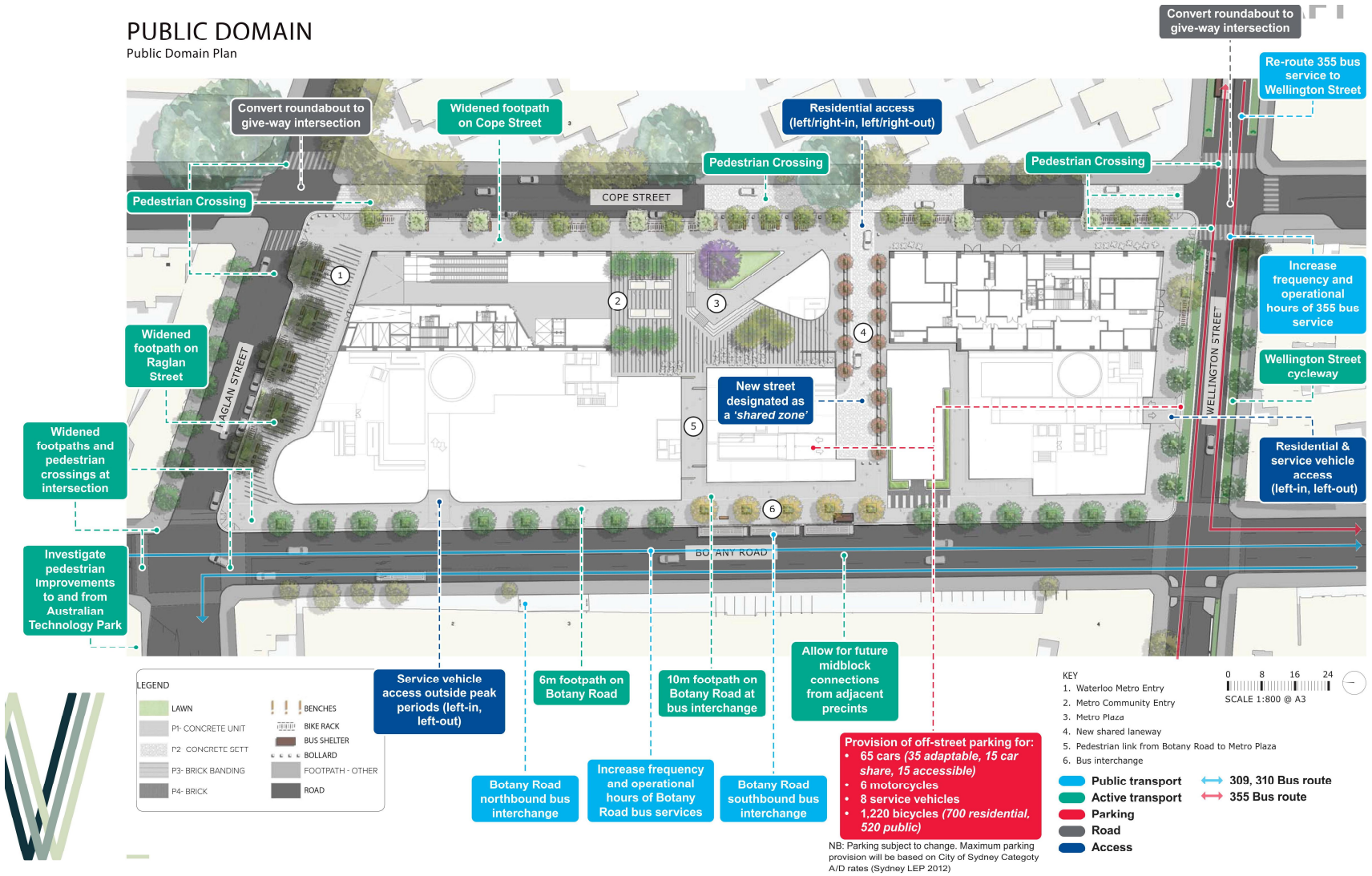


Figure ES.4 : Proposed future transport network around the Metro Quarter

1. Introduction

The Minister for Planning has determined that parts of Waterloo (the Precinct) are of State planning significance which should be investigated for rezoning through the State Significant Precinct (SSP) process. Study Requirements for such investigations were issued by the Minister on 19 May 2017.

Investigation of the Precinct is being undertaken by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW), in partnership with NSW Land and Housing Corporation (LAHC) and Sydney Metro. The outcome of the State Significant Precinct process will be new planning controls that will enable development applications for renewal of the Precinct.

The Precinct includes two separate, but adjoining and inter-related parts:

- The Waterloo Metro Quarter (the Metro Quarter)
- The Waterloo Estate (the Estate)

While the study requirements for the Precinct were provided as separate requirements for the Metro Quarter and for the Estate, comprehensive baseline investigations have been prepared for the entire Precinct. However, lodgement of a separate SSP study for the Metro Quarter in advance of the SSP Study for the Estate is proposed to allow construction of Over Station Development (OSD) within the Metro Quarter to be delivered concurrently with the Metro Station, as an Integrated Station Development (ISD).

While this report therefore provides comprehensive baseline investigations for the entire Precinct, it only assesses the proposed Planning Framework amendments and Indicative Concept Proposal for the Metro Quarter.

1.1 Overall precinct objectives

The following are the objectives for renewal of the Precinct:

Housing: A fully integrated urban village of social, private and affordable housing

A place that meets the housing needs of people with different background, ages, incomes, abilities and lifestyles – a place where everyone belongs. New homes for social, affordable and private residents that are not distinguishable and are modern, comfortable, efficient, sustainable and adaptable.

Services and Amenities: New and improved services, facilities and amenities to support a diverse community

A place that provides suitable and essential services and facilities so that all residents have easy access to health, wellbeing, community support, retail and government services.

Culture & Design: A safe and welcoming place to live and visit

A place where there is activity day and night, where people feel safe, at ease and part of a cohesive and proud community. A place that respects the land and Aboriginal people by showcasing and celebrating Waterloo's culture, history and heritage.

Open Space & Environment: High quality public spaces and a sustainable urban environment

A place that promotes a walkable, comfortable and healthy lifestyle with high quality, well designed and sustainable buildings, natural features and safe open spaces for everyone to enjoy, regardless of age, culture or ability

Transport and Connectivity: A well connected inner city location

Integrate the new Metro Station and other modes of transport in such a way that anyone who lives, works or visits Waterloo can get around easily, safely and efficiently.

1.2 Waterloo State Significant Precinct

The Precinct is located approximately 3.3km south-south-west of the Sydney CBD in the suburb of Waterloo (refer Figure 1.1). It is located entirely within the City of Sydney Local Government Area (LGA).

It is bordered by Phillip Street to the north, Pitt Street to the east, McEvoy Street to the south and Botany Road to the west. It also includes one block east of Pitt Street bordered by Wellington, Gibson and Kellick Streets. The Precinct has an approximate gross site area of 20.03 hectares (ha) (including road reserves) and comprises two separate but adjoining parts:

1) The Waterloo Estate (the Estate); and
2) The Waterloo Metro Quarter (the Metro Quarter).

A map of the Precinct and relevant boundaries is at Figure 1.2.

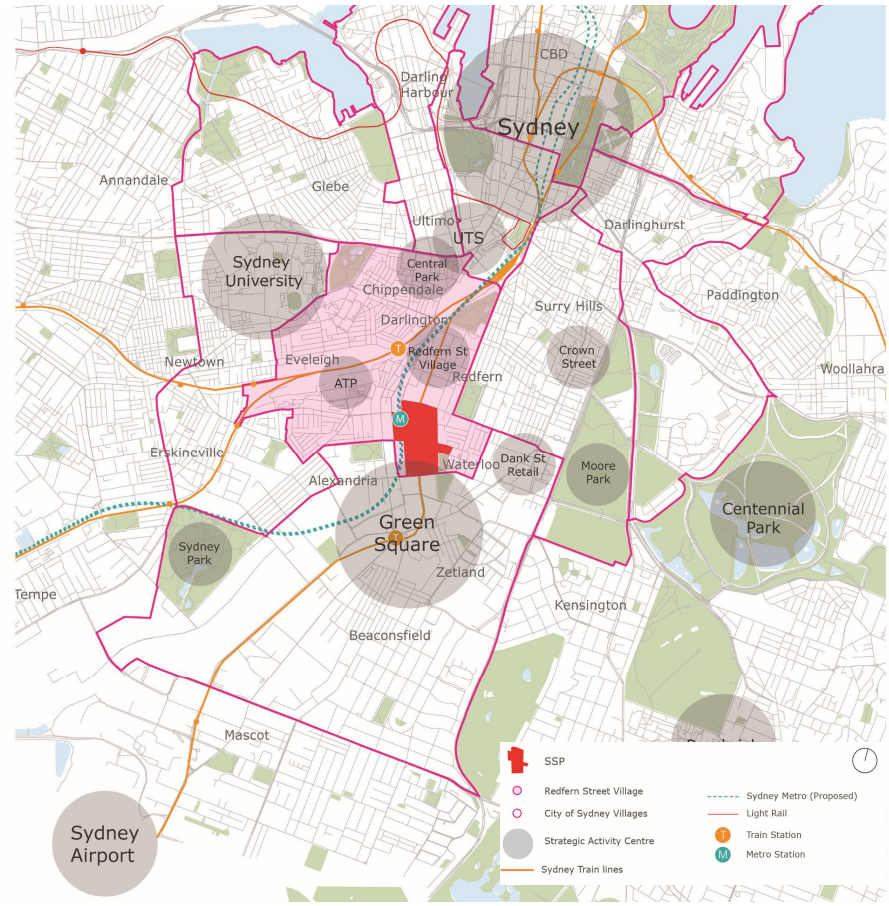


Figure 1.1 : Location and site plan of the Precinct

Source: Turners Studio

Figure 1.2 : Aerial photograph

Source: Ethos Urban & Nearmap

1.3 The Metro Quarter

The Metro Quarter comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street. It has an approximate gross site area of 1.91ha and a developable area of 1.28ha. The heritage listed Waterloo Congregational Church located at 103–105 Botany Road is located within the Precinct. However, there are no proposals for physical works or changes to the planning framework applicable to the church.

Formerly privately owned, all land in the Metro Quarter was purchased by the NSW Government to facilitate construction of the Waterloo Metro Station and associated over station development.

1.3.1 Approved metro rail infrastructure

The Waterloo Metro station will be constructed within the eastern side of the Metro Quarter as part of the Sydney Metro City & Southwest - Chatswood to Sydenham. This section of the Sydney Metro project received planning approval in January 2017 (SSI 15_7400), with construction led by Sydney Metro. While most of the Metro Station will be located beneath finished ground level, two substantial entry/plant structures, with heights equivalent to a 5 storey residential building (up to 20 metres), will protrude above finished ground level; one along the northern end of Cope Street, the other along the southern end of Cope Street.

Demolition of existing buildings has been completed and excavation of the Waterloo Metro Station is underway

1.4 Purpose

The purpose of this report is to address the relevant Study Requirements detailed in Chapter 2.

1.5 Report structure

The remainder of this report is structured as follows:

- Chapter 2 outlines the study requirements and notes where they have been addressed in the report
- Chapter 3 summarises the strategic planning context of the Waterloo SSP
- Chapter 4 details the existing land use and transport context of the Waterloo SSP
- Chapter 5 outlines a strategic analysis of the traffic and transport network
- Chapter 6 describes the Waterloo Metro Quarter proposal
- Chapter 7 describes the assessment of the Waterloo Metro Quarter proposal
- Chapter 8 outlines an implementation plan and strategy for the proposal

2. Study requirements

On 19 May 2017 the Minister for Planning issued Study Requirements for the nominated SSP. Of relevance to this study are the requirements shown in Table 2.1.

Table 2.1 : Study requirements

Reference	Study requirement	Where addressed in report
1 Vision, strategic context and justification		
1.2	Outline the strategic planning context for the proposal including an assessment of relevant State planning documents such as: · NSW Long Term Transport Masterplan December 2012	Chapter 3
1.4	Consideration of Transport for New South Wales strategies and reports including, but not limited to: · Sydney's Rail Future 2013 · Sydney's Bus Future 2013 · Sydney's Light Rail Future 2013 · Sydney's Cycling Future 2013 · Sydney's Walking Future 2013 · Sydney City Centre Access Strategy 2013	Section 3.1.1. Future Transport supersedes these documents
1.5	Consideration of City of Sydney planning documents, strategies and policies including, but not limited to: · Cycle Strategy and Action Plan 2007-2017 · Walking Strategy and Action Plan	Throughout report
1.6	Consideration of other relevant strategies, reports, policies and guides including, but not limited to: · Guide to Traffic Generating Developments and TDT 2013/04a	Throughout report
5 Transport		
5.1	Prepare a comprehensive transport impact assessment to understand the transport network context, service and network limitations, opportunities for improving customer experience and transport solutions that will accommodate planned growth through integrating land use and transport and better managing travel demand Hold a scoping meeting to agree upon an acceptable methodology with Transport for NSW, Roads and Maritime Services and the City of Sydney Council.	Whole report
5.2	The assessment should consider, but not be limited to: · a broad review of the existing and future land use and transport context within the study precinct, access and connectivity with assessment of the overall precinct and its relationship to the surrounding transport network and land uses	Chapters 4 and 5
	· appraisal of current site travel mode share including walking, cycling, public transport and private vehicles, including shared vehicles	Section 5.1

Reference	Study requirement	Where addressed in report
	· how the transport outcomes and the effect of the transport network will support the urban and place-making outcomes for the precinct	Section 5.5.3 and Chapter 7
	· the needs of different customers within the precinct	Section 5.5 and Chapter 7
	· access to key destinations and infrastructure in the local area, in particular, schools, community facilities and other local services	Chapter 4 and 5
	· the safety of all road users, in particular, pedestrians and cyclists	Chapter 7.7 – 7.9
	· performance of the existing and future cycling, public transport and road network surrounding the Waterloo Estate, and in addition map the agreed public transport initiatives linked to the development of the Waterloo Metro Quarter, the Central to Eveleigh Urban Transformation Strategy (noting that the study area must be agreed with TfNSW and RMS) and WestConnex and associated projects	Chapter 5
	· existing trip generation by mode based on the current land use and transport context including walking, cycling, public transport, taxi, ride share (e.g. Uber) and private vehicles	Sections 5.1
	· review the trip generating potential for all modes and purposes (including education) associated with the proposal. Trip generation rates are to be prepared specifically for the precinct based on evidence-based review of standard rates, intended urban form and travel characteristics of the precinct and consultation with key stakeholders. Trip generation rates are to be agreed by TfNSW, Roads and Maritime Services and the City of Sydney	Section 7.7.3
	· cumulative growth of surrounding area based on committed and planned developments such as Australian Technology Park and proposed infrastructure (such as WestConnex, and associated projects)	Chapter 5 and 7
	· impact of additional travel demands (across all modes) on the transport network serving the site	Chapter 7
	· benchmark the travel mode share and trip generation profile through undertaking trip generation surveys for all modes of a development site of similar scale and geographic context	Sections 7.3 and 7.7.3
	· provide an understanding of the travel behaviours and patterns (across all modes) of future residents, workers and visitors of the proposal through benchmarking, forecast modelling tools and other sources of evidence	Section 5.1 and Chapter 7
	· develop a traffic model to determine the road network improvements required to support the proposal (scope, parameters and methodology to be agreed with Roads and Maritime Services and should be carried out in accordance with RMS Traffic Modelling Guidelines 2013) including street	Section 7.7

Reference	Study requirement	Where addressed in report
	hierarchy and spatial provision for all modes of travel	
	· consider the role of shared vehicles in managing travel demand and provide any recommendations for implementation of shared vehicle solutions	Sections 7.6 and 8.3
	· benchmark and provide recommendations for land use mix profile that will ensure customer outcomes are met and assist in management of travel demand and create a walkable neighbourhood	Chapter 7 and 8
	· benchmark and provide recommendations on the provision of bicycle parking and end trip facilities (showers, lockers etc) to help promote alternative travel choices including walking, cycling and public transport	Sections 7.5, 7.6, 8.2 and 8.3
	· provide recommendations for car parking rates to reduce private vehicle travel demand and that help promote sustainable travel choices such as walking, cycling and public transport	Sections 7.5 and 7.6
	· detail the, access and egress requirements in accordance with RMS and City of Sydney guidelines and relevant Australian Standards	Section 7.8
	· detail the transport infrastructure and servicing improvements, including identification of both the land (corridor preservation) and capital components to support the proposal including costings and funding responsibilities	Section 7.10 No capital costing is included
	· establish a flexible and resilient system of access corridors (that considers the City's Liveable Green Network) within the precinct (streets, walkways, open spaces) to connect and serve the precinct and local area, including demonstrating how integrated solutions are achieved for connecting the Metro Station with the surrounding community	Section 7.5.5 and 7.7.5
	· prepare a staging plan that has trigger points for potential future development based on the delivery of transport infrastructure and service improvements	Chapter 8
	· prepare a Travel Plan detailing all modes of transport available to future residents, visitors and employees of the site and proposed mechanisms for maximising travel by walking, cycling and public transport	Section 7.6.3
	· prepare the required DCP provisions	Covered in statutory planning reports
5.3	Review the Interchange Access Plan (IAP) for Waterloo Station and demonstrate how integrated solutions are achieved for connecting the Metro Station with the surrounding communities and the planned major active transport corridors (the City's 'Liveable Green Network'). Indicate how provision for interchange with bus stops, provision of bicycle parking, kerbside areas for 'point to point' and taxis are located and provide customer comfort	Section 7.11

Reference	Study requirement	Where addressed in report
	and good customer experience outcomes. This requirement is also reflected in section 2.13.	
5.4	Review the provision of public bicycle parking for use by future metro customers to allow for multi modal trips to deliver fully integrated world class facilities.	Section 7.6
5.5	Provide an overview of potential impacts of construction traffic on potential future development. Identify a strategic construction approach, including identification of potential staging that broadly outlines the construction footprint and construction related traffic access.	Section 7.9

3. Strategic planning context

3.1 Alignment with transport policies and plans

The Waterloo SSP supports a number of strategic plans including:

- *Future Transport Strategy 2056* (2018)
- *Building Momentum – State Infrastructure Strategy* 2018-2038 (2018)
- *A Metropolis of Three Cities – The Greater Sydney Region Plan* (2018)
- *Central to Eveleigh Urban Transformation Strategy* (2016)

These plans and their relationship to the Waterloo SSP are detailed below.

3.1.1 Future Transport Strategy 2056

The *Future Transport Strategy 2056* (Future Transport) is an update of the *NSW Long Term Transport Master Plan* and is a 40-year strategy for mobility for Sydney and regional NSW. It sets out a vision, strategic directions and customer outcomes with a focus on technology and innovation across the transport system to transform the customer experience, improve communities and boost economic performance.

The strategy supports the development of liveable communities such as the Waterloo SSP, where transport is vital to mobility as a 'placemaker'. The project would integrate with the Sydney Metro City & Southwest network, improving the liveability and character of the precinct. This would lead to the achievement of wider benefits from investment and encourages more desirable patterns of development, fulfilling a desired outcome identified in the strategy.

3.1.2 Building Momentum – State Infrastructure Strategy 2018-2038

Building Momentum - State Infrastructure Strategy 2018-2038 (SIS) is a 20-year strategy that identifies and prioritises the delivery of critical public infrastructure to drive productivity and economic growth. Infrastructure NSW's assessment of the State's existing infrastructure highlighted critical deficiencies in Sydney's road capacity. The SIS identifies strategic infrastructure options to meet the challenges of growth in travel demand and substantial increases in freight volumes.

Specifically, the SIS identifies Waterloo as a strategic urban renewal corridor required to accommodate the expected growth in housing and employment in the area. The strategy also recognises the importance of Urban Growth's role in delivering a commercially feasible, high-quality urban development in Waterloo, balancing housing supply against the consideration of urban design and place-making.

3.1.3 A Metropolis of Three Cities – The Greater Sydney Region Plan

A Metropolis of Three Cities – The Greater Sydney Region Plan establishes a 40-year strategic land use plan for Sydney. The plan was developed concurrently with Future Transport and the SIS, aiming to deliver better connections for people across Greater Sydney. The land use vision for Greater Sydney is a metropolis of three cities (Eastern Harbour City, Central River City and Western Parkland City). Consistent with Future Transport, one of the key elements of the plan is the vision of a 30-minute city regardless of location. The goal for this vision is to provide transport infrastructure that allows people to reach their nearest Metropolitan or Strategic Centre within 30 minutes, seven days a week.

Waterloo is identified in the plan as part of the Eastern Harbour City where urban renewal driven by Sydney Metro City & Southwest would occur. The project in conjunction with Sydney Metro and other projects would therefore complement Greater Sydney Commission's framework for a liveable, productive and sustainable Eastern Harbour City. Potential indicators to deliver the plan that would be relevant to Waterloo include:

- Increased 30-minute access to a metropolitan centres and clusters
- Increased use of public resources such as open space and community facilities
- Increased walkable access to local centres
- Increased housing completions
- Increased access to open spaces
- Increased jobs in metropolitan and strategic centres
- Increased urban tree canopy

3.1.4 Central to Eveleigh Urban Transformation Strategy

Waterloo Precinct is one of several precincts that form part of the *Central to Eveleigh* (C2E) Urban Transformation Corridor. The Corridor covers an area of 80 hectares and stretches 3 kilometres. The Corridor includes Central, Redfern, Macdonaldtown and Erskineville stations, the Australian Technology Park (ATP), and Eveleigh Rail Yards. *The Central to Eveleigh Urban Transformation Strategy* was finalised in November 2016 and is now being implemented via a number of separate projects, including Waterloo SSP.

The strategy is underpinned by *A Plan for Growing Sydney* and City of Sydney's *Sustainable Sydney 2030* strategies. The vision for C2E includes a range of related transport and land use considerations, categorised in four key areas:

- **Living**: Providing 14,000 new dwellings, including social and affordable housing, an expanded cycleway network, well-connected neighbourhoods, new public spaces, and jobs close to homes.
- **Community**: Redevelopment of Redfern Station, new Sydney Metro Waterloo Station, enhanced connectivity and access, and 400 metre walk to public open spaces.
- **Working**: Providing 21,000 new jobs (including knowledge intensive and innovation industries), new links improving connectivity between work and education hubs, world class cultural infrastructure, and a creative hub promoting distributed workplaces.
- **Environment**: Providing 73,000 square metres of new public open space, 23 per cent uptake in car share, and higher public and active transport mode share.

3.1.5 Connecting our City – City of Sydney Transport Strategies

Connecting our City is the City of Sydney's vision for a world class transport network to support a strong and growing economy and a more sustainable environment. The Waterloo Metro Quarter is closely aligned with the objectives of this long term transport plan. Key objectives from the plan such as the integration of land use and transport, improving efficiency and amenity and enhancing access will all be met through the development of the Metro Quarter.

4. Land use and demographics

This chapter details the existing land use environment and provides the local and regional context within which this assessment has been undertaken.

4.1 Centres, population and employment

Several key centres are located near Waterloo including Green Square, Mascot and the ATP. In addition, the metropolitan centre of Sydney CBD is located around 2.8km to the north. Figure 4.1 illustrates the hierarchy of centres and strategic public transport network surrounding Waterloo.

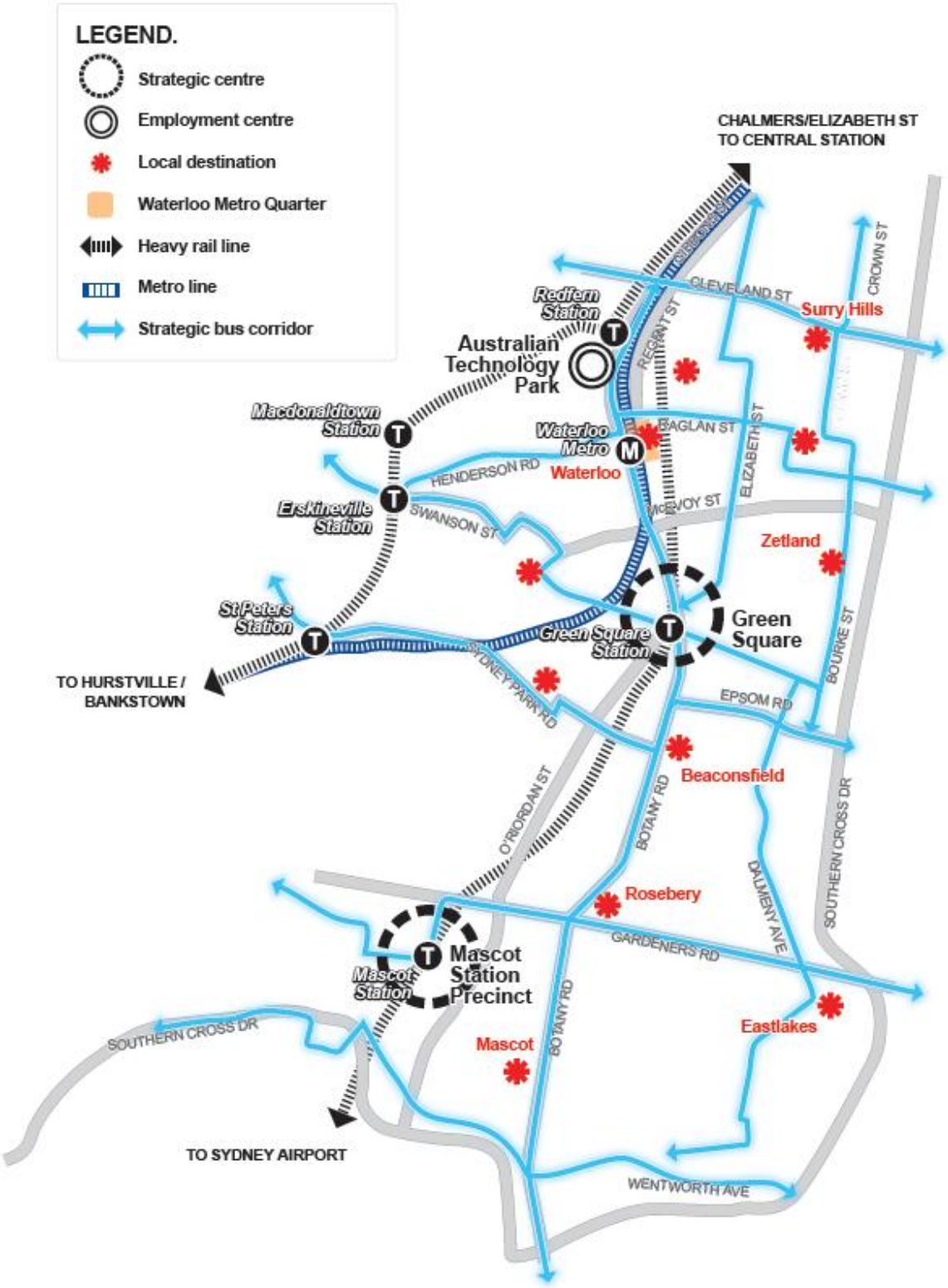


Figure 4.1 : Centres and strategic traffic and transport network surrounding Waterloo

The emerging Green Square strategic centre is located around 1km to the south, focussed around Green Square Station and the future Green Square Town Centre. This will be a major retail, commercial and employment hub in the future. ATP and Mascot strategic centre, located west and south of Waterloo, respectively, are key employment nodes. Stretching between Waterloo and Mascot is the Southern Sydney Employment Lands.

Future transport networks will need to consider options for connecting the hierarchy of centres within the region. Sydney Metro City & Southwest will provide connections from Waterloo to the Sydney CBD while connections to key centres at Green Square, Redfern and Mascot will need to be provided by alternative options.

School and community facilities located near the Waterloo Precinct include Our Lady of Mount Carmel Primary School, Alexandria Park Community School and Green Square School (see Figure 4.2). Safe access to these destinations is an important component of the Waterloo SSP given the number of vulnerable pedestrians using these facilities. The pedestrian trips generated by these users may also involve the crossing of roads carrying high traffic volumes such as Botany Road and McEvoy Street.

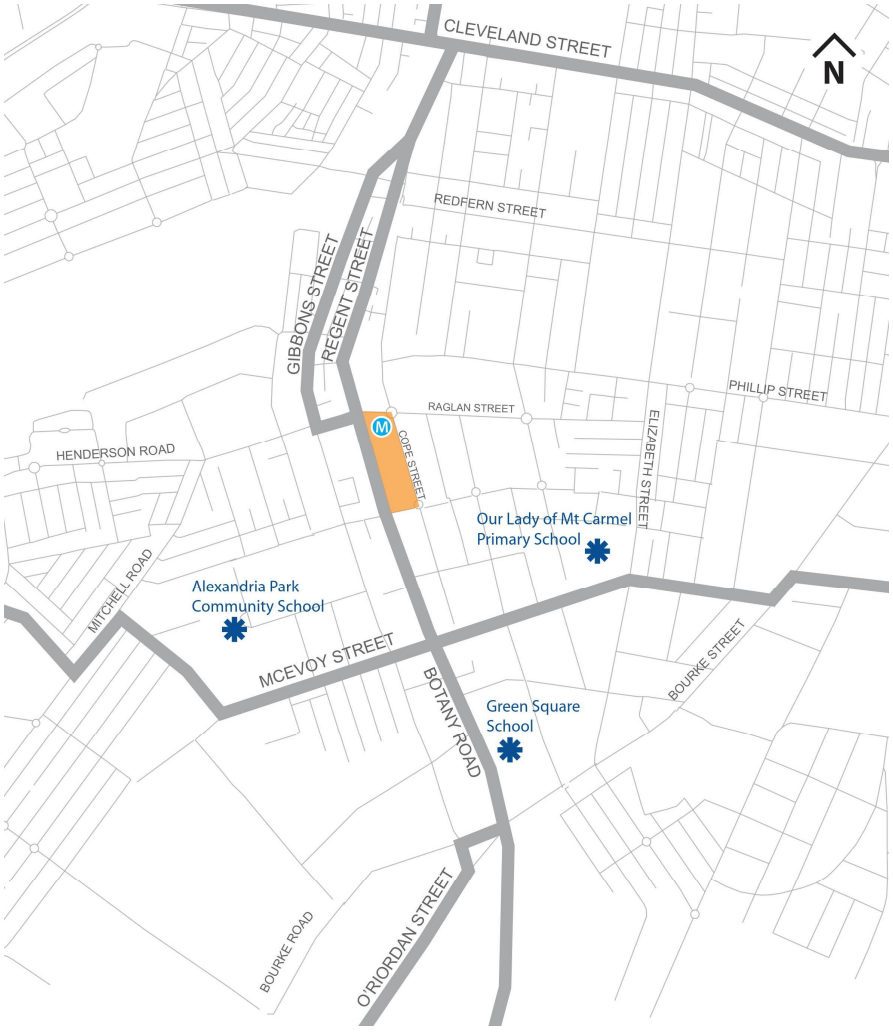


Figure 4.2 : Local schools in the vicinity of the Metro Quarter

Table 4.1 shows the existing and future population and employment distribution for the broader Southern Sydney region based on Transport for NSW projections for 2036 (TZP16[1]).

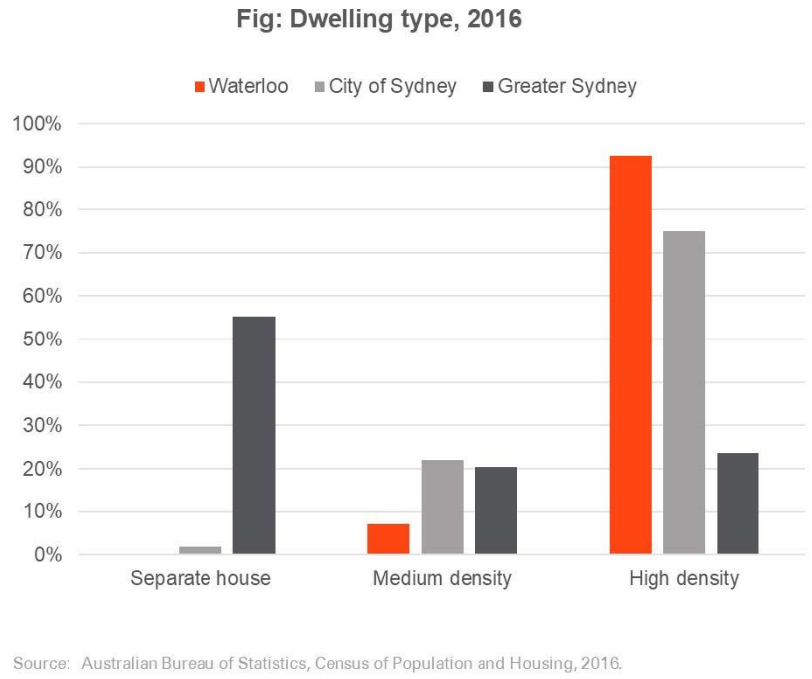
The base case projections for the region show that from 2016 to 2036, the population is projected to almost double from 76,000 to 134,000 residents. During the same period, employment will grow from 80,000 to 105,000 jobs.

Table 4.1 : Population and employment comparison

Area	2016		2036	
	Population	Employment	Population	Employment
Redfern / Waterloo	25,000	14,000	42,000	22,000
Green Square / Alexandria	26,000	36,000	54,000	48,000
Mascot / Eastlakes	25,000	30,000	38,000	35,000
Total	**76,000**	**80,000**	**134,000**	**105,000**

4.2 Character

Waterloo is currently characterised by a mix of medium and high density development, consisting of townhouses, terraces, several high rise residential towers and some detached dwelling houses. Figure 4.3 shows the mix of dwellings in the Waterloo Precinct compared to the City of Sydney LGA and Greater Sydney region.



Source: Australian Bureau of Statistics, Census of Population and Housing, 2016.

Figure 4.3 : Dwelling types

[1] TZP16 is the 2016 Travel Zone projection by TPA used to represent the most likely urban future based on current data, trends and an understanding of policy/structural changes that may impact the future.

4.3 Demographics

4.3.1 Age

The age profile of residents in the Waterloo Precinct, City of Sydney LGA and Greater Sydney region is shown in Figure 4.4.

Waterloo Precinct has an older resident population, with just under a third of residents aged over 65 years compared to 8 per cent for City of Sydney. This is likely to be related to the significant proportion of social housing within the precinct, with many residents living there for a significant period of time.

Renewal in the precinct is likely to result in a shifting age profile, with a younger demographic moving into new housing stock. As a significant proportion of housing will still be reserved for social housing, there is still likely to be a slightly older age profile than other areas of City of Sydney. This will need to be considered in the development of networks, particularly local connections to key services such as hospitals.

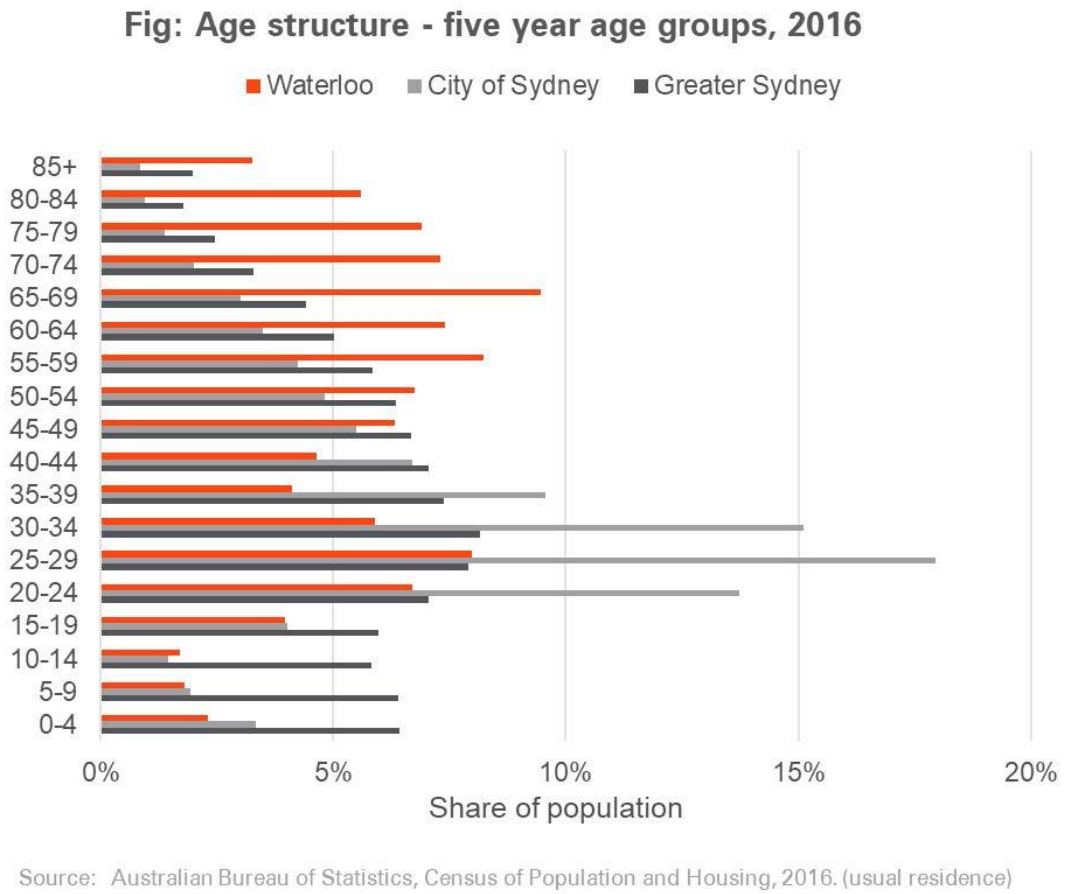


Figure 4.4 : Age profile

4.3.2 Employment

Figure 4.5 shows employment rates for the Waterloo Precinct, City of Sydney LGA and Greater Sydney region.

In Waterloo Precinct, the unemployment rate is 18.6 per cent for those in the labour force, compared to 6 per cent in City of Sydney LGA. This trend is strongly linked to the existing social housing provision in Waterloo. A shifting demographic profile and a younger professional workforce is likely to move into new housing stock alongside existing social housing tenants. The transport network will be required to serve the needs of all of these residents as well as workers and visitors to the Metro Quarter. Employed residents will require efficient connections to the employment centres such as the CBD whilst older residents and social housing tenants are likely to have a stronger reliance on local services connecting to community, health and retail areas.

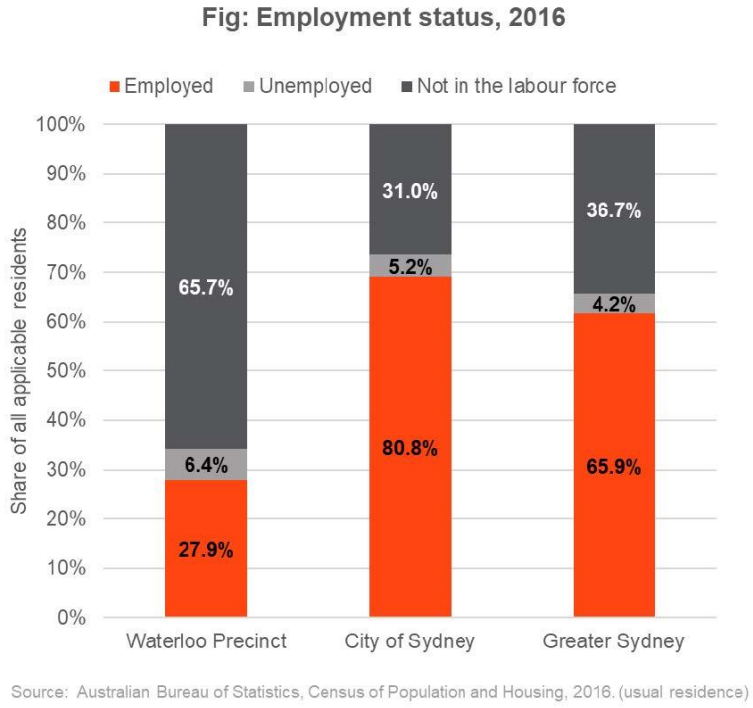


Figure 4.5 : Employment and labour force status

5. Strategic network analysis

5.1 Travel behaviour

5.1.1 Mode share

Three areas have been used to investigate existing and potential mode share for the Waterloo SSP:

- **Waterloo Precinct:** A single Travel Zone (TZ), representative of the Waterloo SSP
- **Waterloo Suburb:** The extent of the suburb of Waterloo
- **Waterloo-Redfern Wider Area:** A wider area for understanding travel patterns.

Key characteristics and the TZ's representing these areas is shown in Table 5.1

Waterloo Suburb and Waterloo-Redfern Wider Area have been included to provide regional context to current travel patterns in Waterloo Precinct. Key travel characteristics for these areas are also compared to the City of Sydney Local Government Area (LGA), Randwick LGA and Sydney Metropolitan Area in order to understand similarities and differences in travel behaviour relative to other parts of Sydney.

Table 5.1 : Assumed travel zones and key characteristics

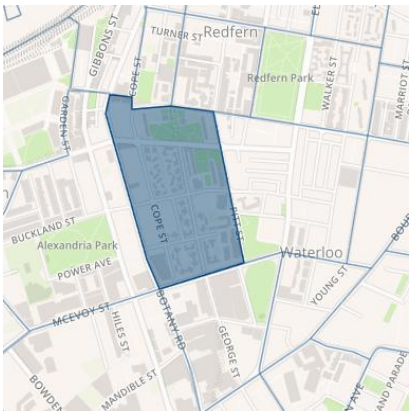
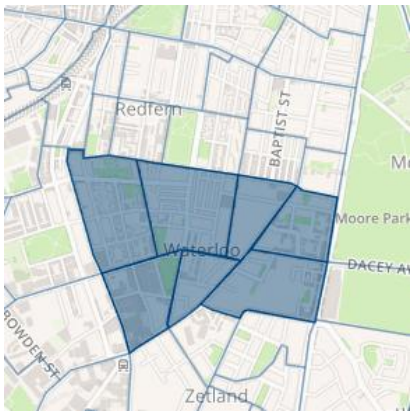
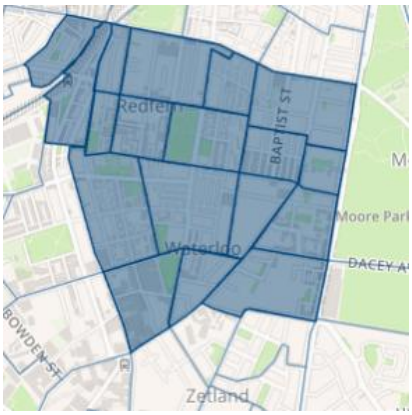
Waterloo Precinct	Waterloo suburb	Waterloo-Redfern wider area
		
Travel zone: 270	**Travel zones:** 270, 271, 272, 273, 274, 275, 276	**Travel zones:** 210, 211, 212, 213, 214, 215, 217, 218, 219, 220, 221, 270, 271, 272, 273, 274, 275, 276
Employed residents: 535	**Employed residents:** 4,586	**Employed residents:** 11,129
Jobs: 580	**Jobs:** 5,457	**Jobs:** 11,650

Table 5.2 compares current Journey to Work (JTW) mode share for resident travel out of the Waterloo Precinct, Waterloo Suburb area and the Waterloo-Redfern Wider Area.

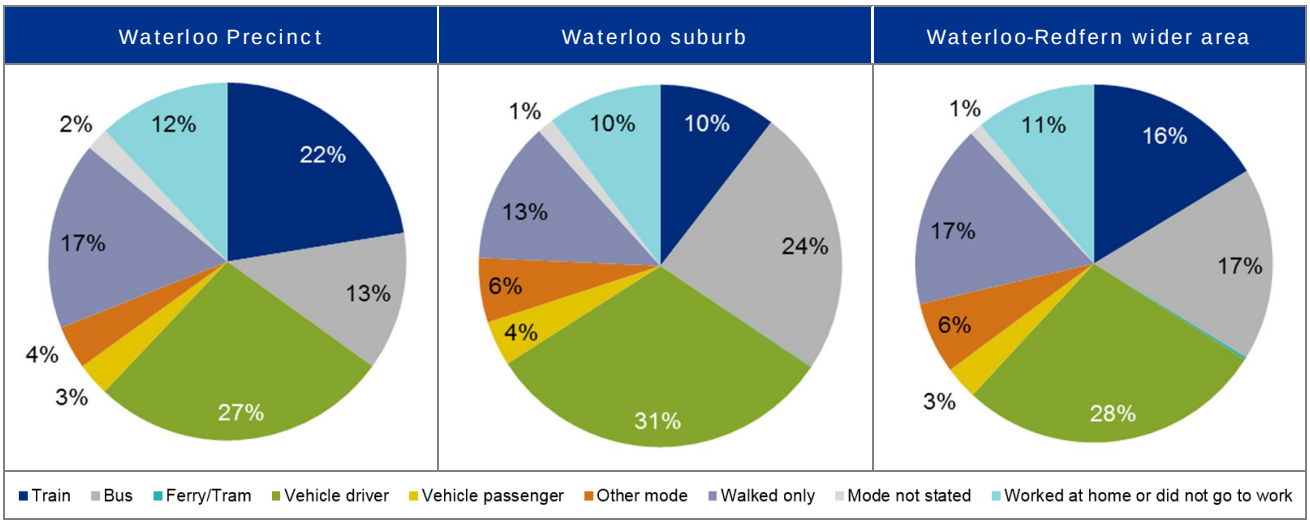
In all three areas the greatest number of work trips are undertaken by public transport, ranging from 33 to 35 per cent mode share. This is closely followed by private vehicles (30 to 35 per cent), and walking (13 to 17 per cent). Heavy rail and bus mode share are similar across all areas, while residents of the Waterloo Precinct were more likely to use heavy rail than in other areas. As all areas are within walking distance of either Green Square or

Redfern station, this may be due to the current demographics and employment characteristics in the Waterloo Suburb area.

Walking accounts for a relatively high proportion of trips to work; the walking mode share in Waterloo Precinct was similar to the wider Waterloo-Redfern Area (17 per cent), while it was slightly lower in Waterloo Suburb (13 per cent). Cycling trips (included in 'Other mode') accounted for up to 4 per cent of work trips in Waterloo Precinct, and up to 6 per cent of trips in other areas.

A significant proportion of people work at home (or did not travel to work on census day), ranging from 10 to 12 per cent mode share. This is highest in the Waterloo Precinct and lowest Waterloo Suburb, which may be reflective of the types of jobs worked by residents in these areas.

Table 5.2 : 2011 JTW mode share, resident travel out of Waterloo



Source: JTW Explorer 2011

Comparison to other areas

Resident mode share in the suburb of Waterloo has been compared to key inner city suburbs in City of Sydney LGA, including Redfern, Woolloomooloo, Glebe, Ultimo and Pyrmont.

These suburbs have been selected based on an extensive benchmarking process, based on a range of data sources including the 2011 SEIFA index[2], public transport timetable data, Census 2011 data, and JTW 2011 data.

Five suburbs were identified as broadly comparable in to Waterloo on the basis of:

- Socio-economic status
- Proportion of social and affordable housing
- Proportion of households with no motor vehicles
- Average public transport travel times to Sydney CBD, Parramatta CBD and Macquarie Park.

These locations are outlined in Table 5.3.

[2] The SEIFA Index ranks areas in Australia according to relative socio-economic advantage and disadvantage

Table 5.3 : Suburbs comparable to Waterloo for mode share benchmarking process

Location	2011 SEIFA index	Social and affordable housing (%)	Households with no motor vehicles (%)	Average public transport travel time, AM peak (8 – 9am) (mins)		
				Sydney CBD	Parramatta CBD	Macquarie Park
Waterloo (current)	*941*	*24%*	*29%*	*21*	*45*	*56*
Redfern	973	19%	35%	14	38	50
Woolloomooloo	945	18.%	38%	11	50	52
Glebe	1,001	16%	30%	25	50	55
Ultimo	974	8%	47%	22	50	55
Pyrmont	1,055	7%	26%	20	55	52

Greater than 60 mins 30 to 60 mins Less than 30 mins

Figure 5.1 compares resident mode share for Waterloo, selected benchmark suburbs and the Sydney metropolitan area.

Compared to average JTW mode share across the Sydney metropolitan area, Waterloo and the selected benchmark suburbs have significantly lower car mode share. Mode share for public and active transport combined is much higher than the Sydney average. Non-car mode share for the selected City of Sydney LGA benchmark suburbs ranges between 53 and 70 per cent, compared with 28 per cent on average across the Sydney metropolitan area. Car mode share is particularly low in areas with high quality mass transit links and close proximity to Sydney CBD.

This comparison highlights the impact on travel mode choices of densely located land uses, activities and attractors typical of inner city locations. The availability of high quality public transport infrastructure and services, permeable and connected street networks, and high quality walking and cycling facilities are also highly important and complimentary.

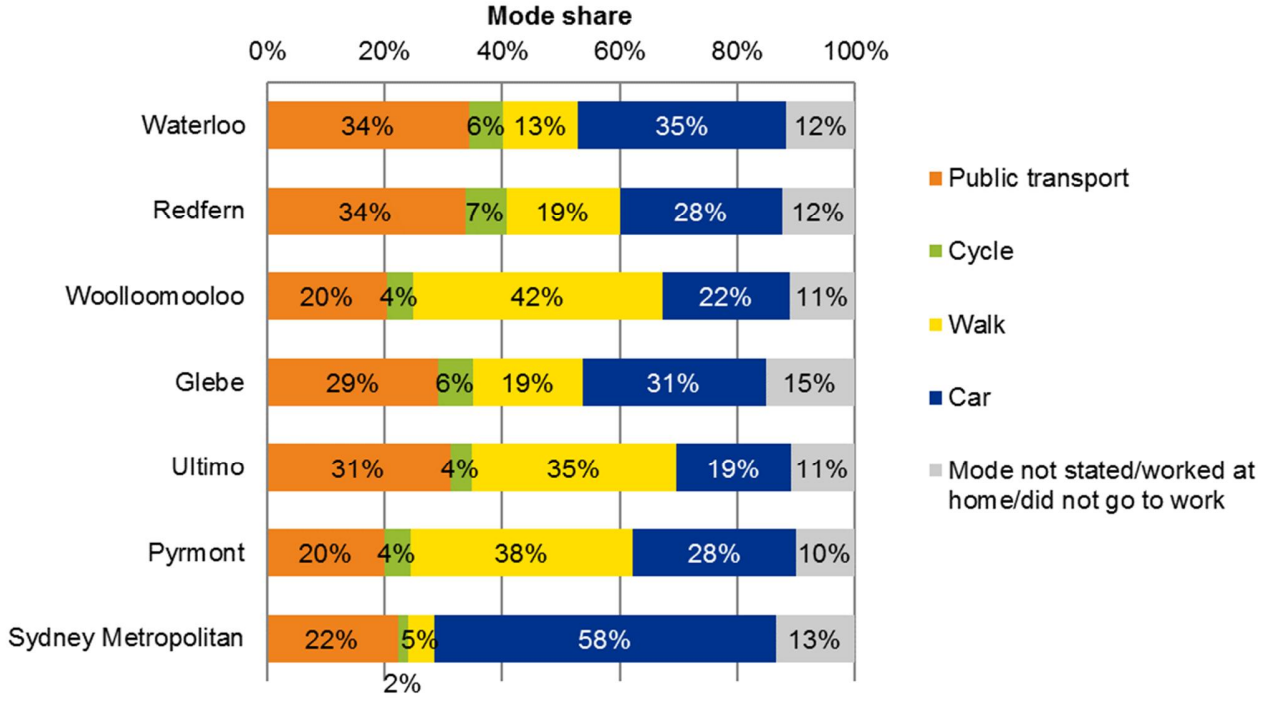


Figure 5.1 : Resident mode share[3]

Source: JTW Explorer 2011

5.1.2 Origins and destinations

Figure 5.2 and Figure 5.3 show the top origins and destinations into and out of the Waterloo Precinct. Sydney Inner City, which includes Sydney CBD is the most popular destination, accounting for over half of all work trips. This reinforces that Waterloo is an ideal location given its proximity to Sydney CBD and surrounding centres such as ATP. The focus of work trips will continue to be the Sydney CBD and the primary public and active transport networks should reflect this.

Similarly, trips from Sydney Inner City to the Waterloo Precinct represent the highest proportion of all work travel origins, followed by the Eastern Suburbs. This is due to employment in Waterloo comprising largely population serving industries such as retail, with a largely localised workforce. Future employment within the Waterloo Precinct is likely to continue to comprise this type of employment, and therefore a focus on mixed-use, local connectivity, and affordable housing provision should support this outcome.

[3] Note: under the defined JTW categories, the proportion of "other mode" trips have been assumed to represent cycle mode share

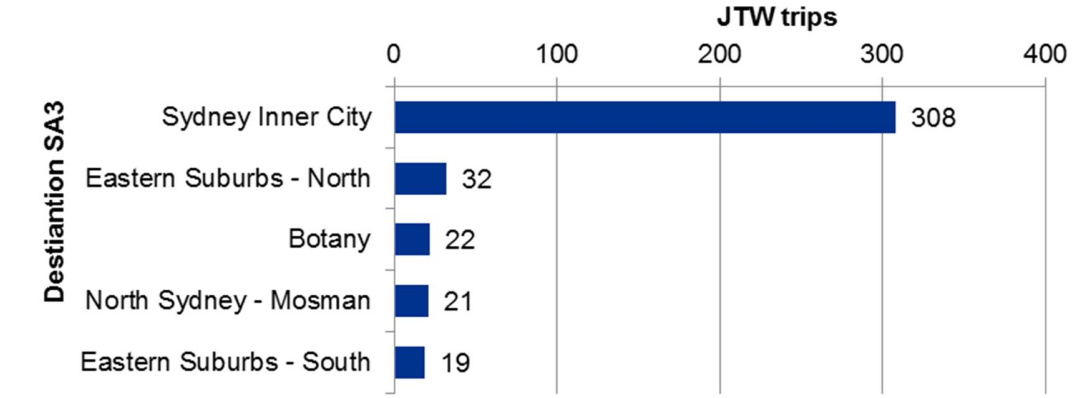


Figure 5.2 : Top five destinations (resident travel out of the Waterloo Precinct)

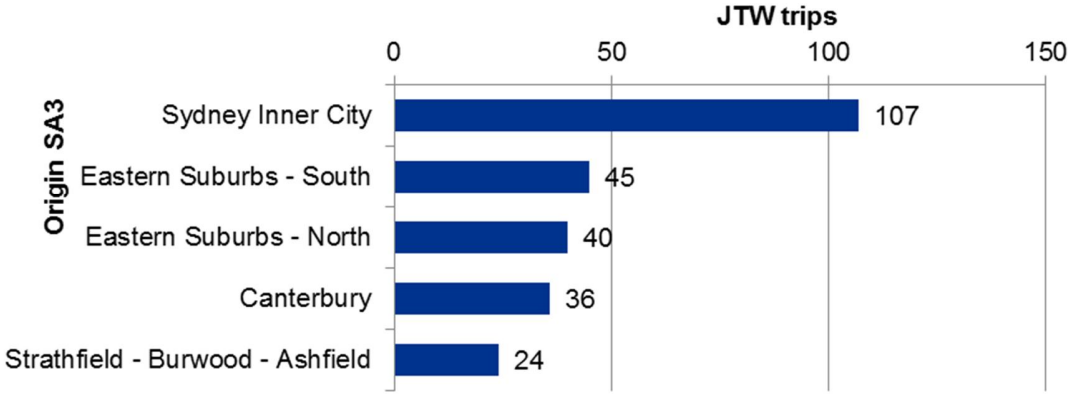


Figure 5.3 : Top five origins (employee travel into the Waterloo Precinct)

5.1.3 Trip purpose and length

Using 2014/15 Household Travel Survey (HTS) data, key trip characteristics in City of Sydney LGA (in which Waterloo Precinct is located), adjoining Randwick LGA and the Sydney metropolitan area have been compared. HTS data sample size only supports its effective use for analysis of larger areas, rather than the smaller areas able to be analysed with JTW data. As Waterloo is located within the City of Sydney LGA, it would tend to reflect the travel patterns of a central Sydney location.

Overall, the indicators below reflect the denser nature of activities and attractions in City of Sydney LGA, and to a lesser extent Randwick LGA, than across much of the Sydney metropolitan area. This results in a higher number of trips undertaken per person, but with shorter average trip lengths. Travel distances are shorter due to land use density and greater availability of alternative travel options including public transport, walking and cycling for many trips. There are also many more social and recreational trips made in City of Sydney LGA.

Trips per person

The number of weekday trips undertaken per person is greater in City of Sydney LGA than Randwick LGA, and both are greater than across the Sydney metropolitan area (Figure 5.4).

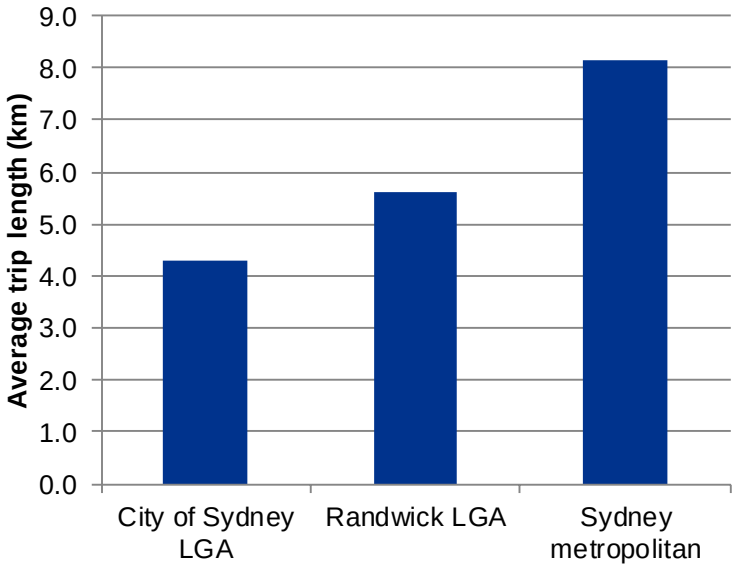


Figure 5.4 : Weekday trips per person

Average trip length

The average trip length in City of Sydney LGA is lower than in Randwick LGA, and significantly lower than across the Sydney metropolitan area (Figure 5.5).

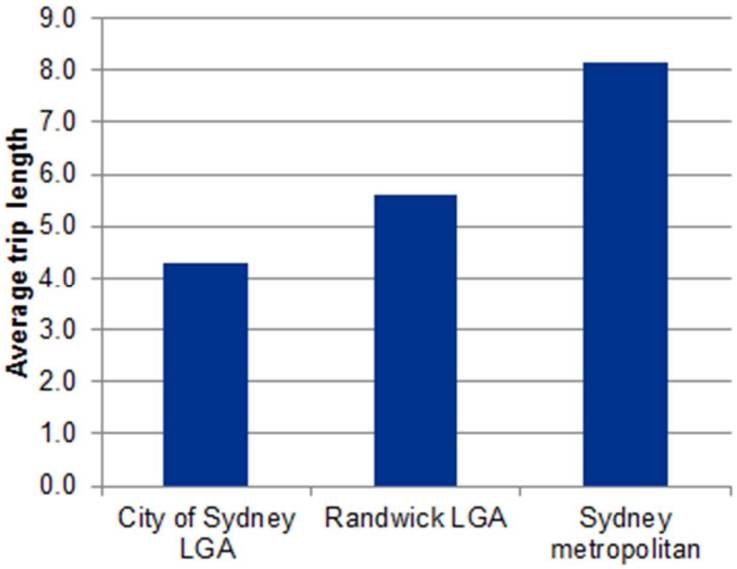


Figure 5.5: Average trip length

Vehicle kilometres travelled

Vehicle kilometres travelled (VKT) per person in City of Sydney LGA are lower compared with Randwick LGA, and less than half compared with the Sydney metropolitan area (Figure 5.6)

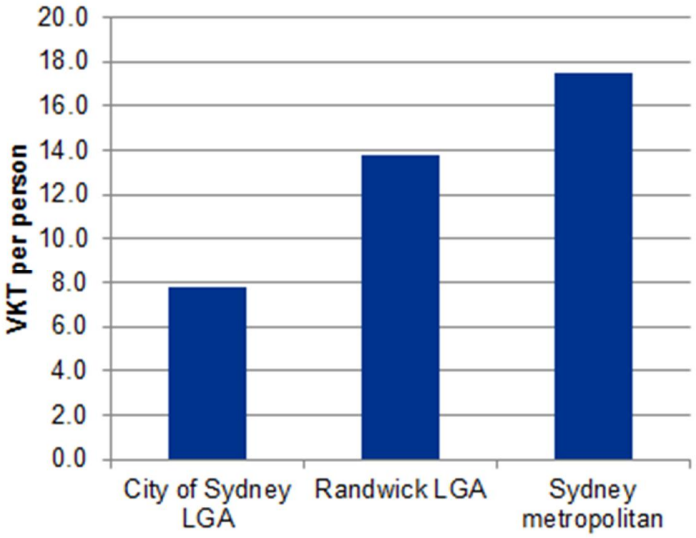


Figure 5.6: Vehicle kilometres travelled per person

Trip purpose

The purpose of trips undertaken in area differs noticeably. Commute trips account for a larger proportion of trips than in Randwick LGA and metropolitan Sydney. Social recreation trips are much higher in City of Sydney LGA and Randwick LGA than metropolitan Sydney. Shopping and personal business trips are much less common in City of Sydney LGA and Randwick LGA than across metropolitan Sydney (Figure 5.7).

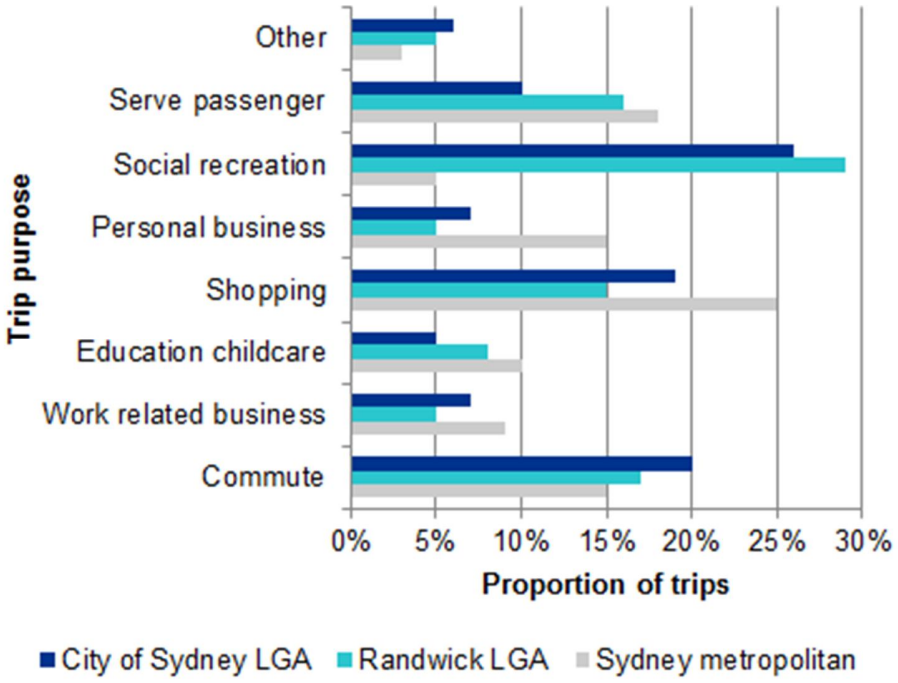


Figure 5.7: Trip purpose[4]

5.1.4 Existing trip generation

The existing site contains no off-street parking and traffic surveys of surrounding intersections indicate that the site generates a negligible number of car trips. Trips by non-car modes to/from the existing site have not been analysed in detail however the surrounding land uses and roadside environment are not conducive to any significant level of active transport.

5.2 Public transport

5.2.1 Heavy rail

The Waterloo SSP is located approximately 1km from both Redfern Station and Green Square Station. Redfern Station is one of the busiest stations on the Sydney Trains network which provides very frequent services to a large range of destinations, including Sydney CBD. Green Square Station is served by the T8 Airport Line, providing access to Sydney CBD and Kingsford Smith Airport.

Redfern Station is constrained by a single concourse to the north of the station and narrow platforms which are accessed via a single set of stairs each. Only one platform is fully accessible with provision of a lift, and serves the T4 Eastern Suburbs & Illawarra Line.

[4] Note: 'Serve passenger' applies to trips undertaken for the purposes of accompanying another person undertaking a trip, for example a carer accompanying a person requiring assistance.

5.2.2 Sydney Metro

Sydney Metro is a new standalone metro rail network identified in Transport for NSW's *Sydney's Rail* Future. A component of Sydney Metro is Sydney Metro City & Southwest which is planned from Chatswood to Sydney CBD and Bankstown, due to commence operating in 2024. Services on the new line will run at a minimum of every 4 minutes in each direction, with an ultimate capacity for trains to carry up to 46,000 people per hour in one direction. Sydney Metro City & Southwest will remove T3 Bankstown line trains from the City Circle, providing congestion relief and greater capacity for T8 Airport, Inner West and South line trains. This will result in a moderate increase in train capacity stopping at Redfern Station from 2024. Preliminary forecasts for the 2036 AM peak hour indicate that around 3,700 customers would be entering and around 2,350 customers would be exiting the Waterloo Station (Chatswood to Sydenham EIS, 2016).

The Sydney Metro network is shown in Figure 5.8, while Figure 5.9 shows the rail network around Waterloo including Sydney Metro City & Southwest.

Figure 5.8: The Sydney Metro network

Source: Transport for NSW, 2018

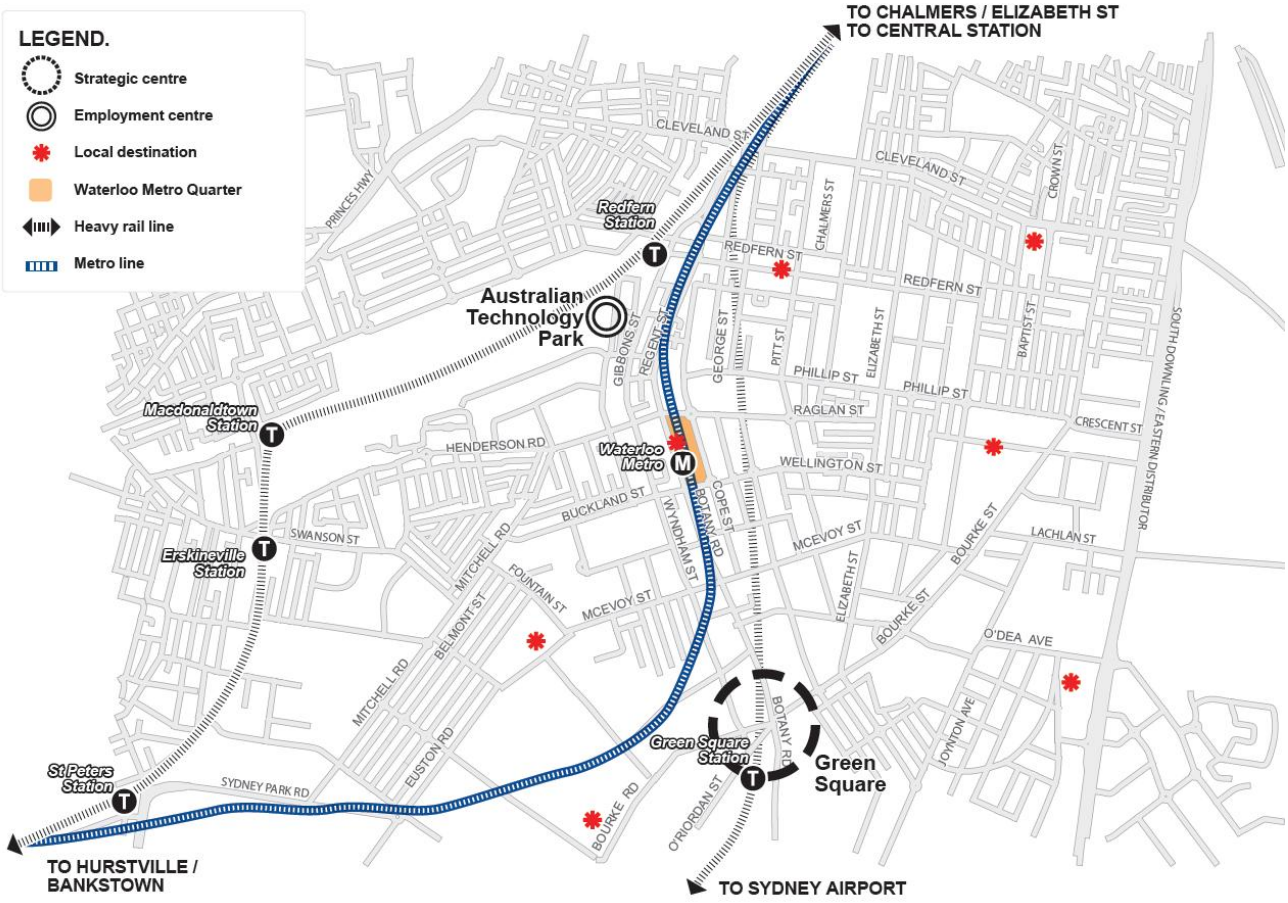


Figure 5.9 : Rail network around Waterloo

Access to Waterloo Station would be located at the northern end of the station on the corner of Raglan Street and Cope Street, with a second entry off Cope Street. Changes to bus stops have been identified during the Sydney Metro EIS process and include the relocation of the southbound Botany Road stop further north to integrate with the Metro Station entrance. In addition, point to point facilities and a taxi rank would be provided on Cope Street, further improving the amenities available to customers of the metro network.

The forecast mode of arrival during the 2036 morning peak hour as identified in the Sydney Metro EIS is presented in Figure 5.10. The majority of customers are anticipated to walk to the station from the local area while around 19 per cent of customers are expected to interchange between bus services and the metro network. These forecasts also account for cumulative growth in the broader area, including redevelopment of the Waterloo Precinct.

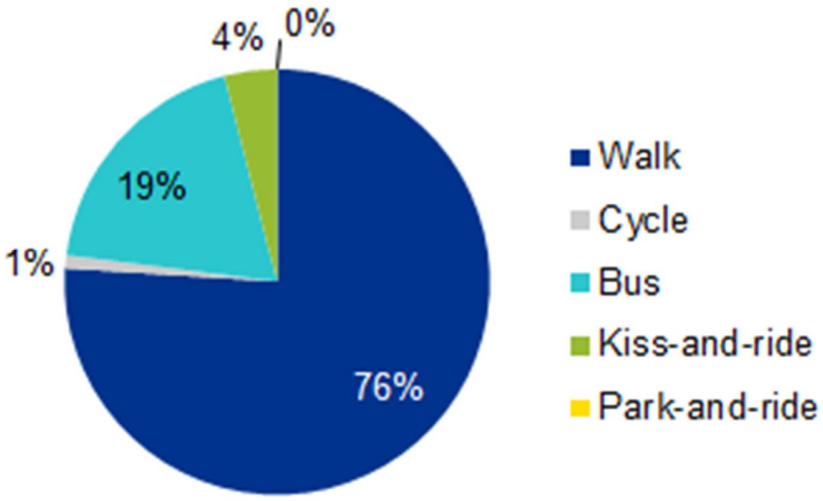


Figure 5.10 : Forecast morning peak arrival mode at Waterloo Station

Source: Sydney Metro EIS Technical Paper 1: Traffic and Transport (May 2016)

5.2.3 Bus services

Today, the bus network in and around Waterloo is heavily focussed on north-south travel, particularly for access to Sydney CBD (as shown in Figure 5.11). Botany Road is a key bus corridor for these services which connects Sydney CBD with Redfern, Waterloo, Alexandria, Green Square, Mascot and Botany. These north-south routes are typically frequent and operate a wide span of hours. Bus services also operate east-west routes, linking Randwick, Coogee, Bondi Junction, Moore Park and Kingsford to the east with Glebe, Newtown, Marrickville and Sydenham to the west.

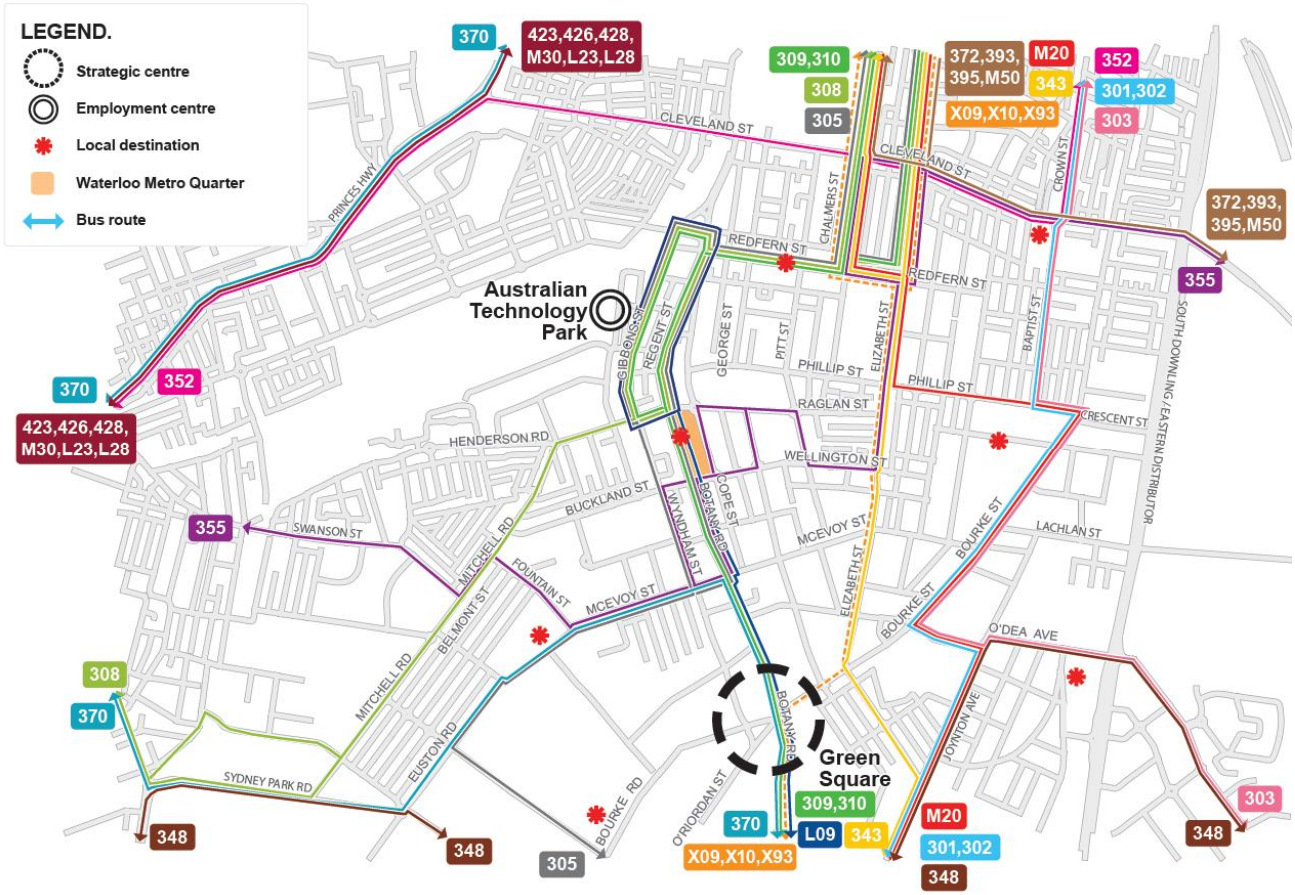


Figure 5.11 : Existing bus network around Waterloo

5.3 Active transport

5.3.1 Cycle network

The regional cycle network surrounding Waterloo is shown in Figure 5.12.

The cycle network currently provides access to a range of key destinations including the University of Sydney, Redfern Station, Sydney CBD, Newtown and Moore Park. East-west movement is constrained by the existing heavy rail corridor to the west, which limits access to the north of the rail line and to Carriageworks and the University of Sydney (USYD). There are limited and sparsely located crossing opportunities, including Lawson Street at Redfern Station.

City of Sydney Council, as part of its cycle network strategy, has identified 10 priority cycle routes across the inner city including through Waterloo Precinct. Key routes include:

- City North to Green Square: Running north-south through Waterloo Precinct, complete as far as Green Square with a separated cycleway on George Street, Waterloo. This route would be the most direct north-south connection to the Waterloo Station
- Sydney Park to Central Park: Running east-west through Waterloo Precinct, upgrades are identified on Buckland, Wellington, Morehead and Phillip Streets, Waterloo. This route would be the most direct east-west connection to the Waterloo Station

- Newtown to Bondi Junction: Running east-west through Redfern on Wells and Turner Streets, upgrades currently in progress
- USYD to University of New South Wales (UNSW): Running east west through Alexandria
- Sydney Harbour to Botany Bay: Running north-south along Bourke Street, complete with separated cycleway for much of its length.

As part of the Alexandria to Moore Park Connectivity Upgrade, a shared path is proposed along the northern side of McEvoy Street west of George Street, continuing on the southern side of McEvoy Street east of George Street. Cyclists would be required to cross McEvoy Street at its intersection with George Street. If approved, the upgrade would facilitate east-west movements to and from the Waterloo Precinct.

Figure 5.12 : Existing and planned cycle connectivity around Waterloo

5.3.2 Pedestrian network

The existing structure of the street network in and around the Waterloo Metro Quarter is generally well suited to walking. A clear grid pattern of streets allows for direct connections to be made and provides good legibility for people walking. The topography of the precinct begins to rise immediately east of the Metro Quarter. In addition, the footpaths surrounding the Metro Quarter are cracked and show signs of wear and tear, requiring resheeting to improve pedestrian safety.

The provision of pedestrian facilities at each intersection surrounding the Metro Quarter include:

- Signalised pedestrian crossings on all approaches of the Botany Road / Raglan Street / Henderson Road intersection.
- Signalised pedestrian crossings on all approaches of the Botany Road / Wellington Street / Buckland Street intersection.
- A marked pedestrian crossing on the north approach of the Cope Street / Raglan Street roundabout. A median is available on all other approaches for pedestrians wishing to cross the road.
- A median on all approaches, allowing pedestrians to undertake a staged crossing if required.

Although crossing opportunities are provided at each intersection surrounding the Metro Quarter, upgrades to pedestrian facilities at the two roundabouts may be necessary to accommodate the large pedestrian demand expected on Raglan Street and Cope Street due to the metro line accessible at Waterloo Station.

Ensuring high quality urban design and streetscape outcomes for the development of the Metro Quarter would be required to enhance the pedestrian network and major roads such as Botany Road and McEvoy Street which form a barrier to pedestrian movements and access across these streets would need to be carefully planned.

5.4 Road network

5.4.1 Key roads

The road network in and around the Waterloo Precinct is fairly constrained. Most local streets in the area have 50km/h speed limits and are two lanes wide, with some streets 40km/h zones including George Street and Redfern Street. Major arterial roads include Botany Road, Wyndham Street, and Henderson Road.

Traffic data collected in May 2017 indicate traffic volumes greater than 1,000 vehicles per hour during the peak hour on Botany Road, Elizabeth Street, Henderson Road and McEvoy Street. Botany Road and Wyndham Street operate as a north-south one-way pair between Cleveland Street and Henderson Road providing a key link between Sydney Airport and its surrounding suburbs to the Sydney CBD and inner west. McEvoy Street and Henderson Road both run east-west, providing links between the inner-southern suburbs and the Sydney CBD or eastern suburbs. Key roads and current peak hour volumes are outlined in Table 5.4.

Table 5.4 : Traffic volumes (bi-directional) and heavy vehicle proportions

Road	Morning peak hour (8-9am)		Evening peak hour (5-6pm)	
	Volume (vehicles)	Proportion of heavy vehicles	Volume (vehicles)	Proportion of heavy vehicles
Botany Road between Wellington Street and Raglan Street	1,860	7%	1,820	5%
Wyndham Street between Buckland Street and Henderson Road	610	10%	590	3%
Henderson Road between Wyndham Street and Botany Road	1,950	5%	2,110	2%
Raglan Street between Botany Road and Cope Street	580	4%	580	1%
McEvoy Street between Wyndham Street and Botany Road	1,710	9%	1,690	3%

Road	Morning peak hour (8-9am)		Evening peak hour (5-6pm)	
	Volume (vehicles)	Proportion of heavy vehicles	Volume (vehicles)	Proportion of heavy vehicles
McEvoy Street between Botany Road and George Street	1,190	8%	1,050	2%
Elizabeth Street between Raglan Street and Wellington Street	1,660	8%	1,970	4%
Wellington Street between Botany Road and Cope Street	370	3%	330	3%
Cope Street between Raglan Street and Wellington Street	170	5%	160	3%

Figure 5.13 shows the key regional roads surrounding Waterloo.

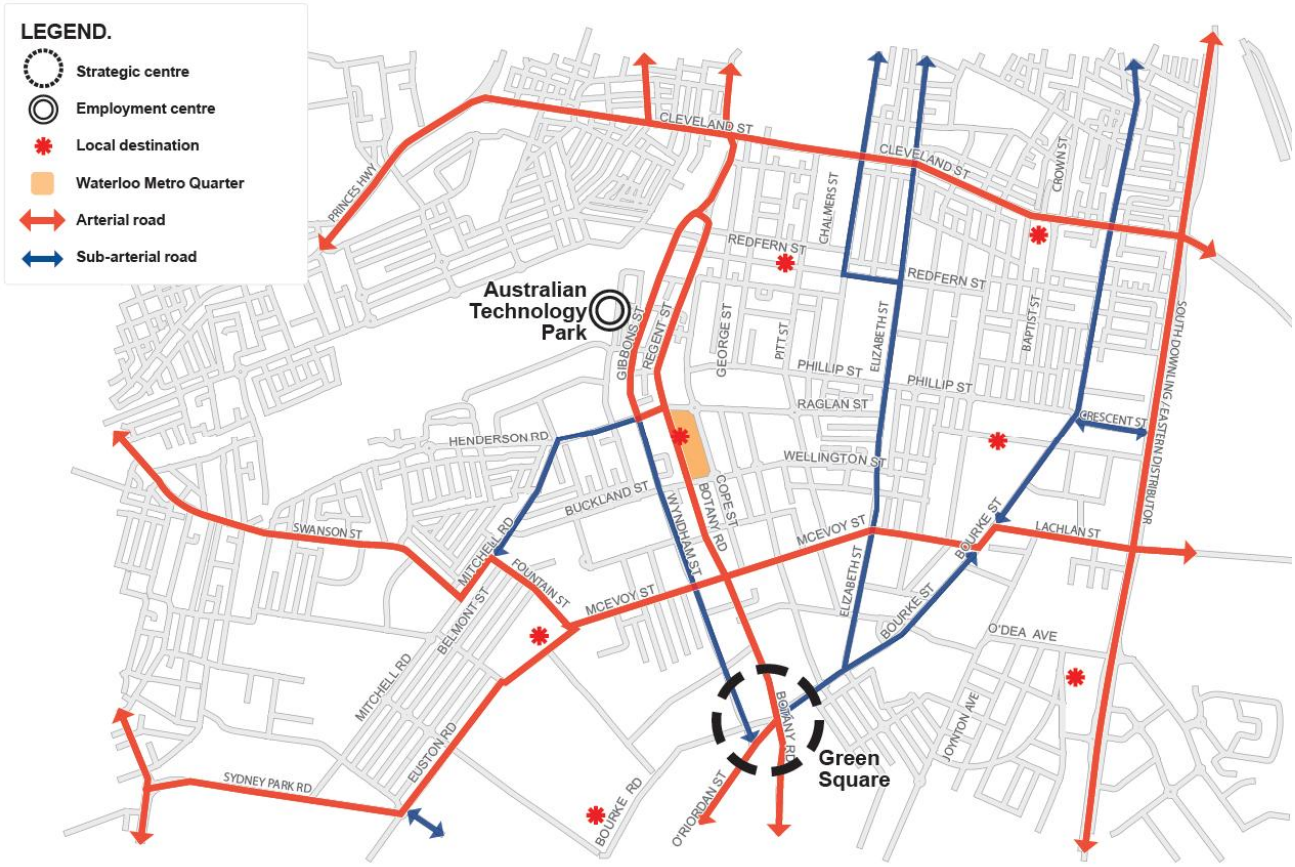


Figure 5.13 : Arterial road network around Waterloo

5.4.2 Alexandria to Moore Park Connectivity Upgrade

Roads and Maritime Services has developed concept designs for the Alexandria to Moore Park Connectivity Upgrade, which will involve upgrades along the corridor between the WestConnex interface at Euston Road and Anzac Parade. This includes intersection improvements and clearways on McEvoy Street, to the south of Waterloo Precinct, realignment of the intersection of Bourke, McEvoy and Lachlan Streets to the east, and widening of Lachlan Street. Additional capacity created by these works has the potential to reduce demand on lower order east-west corridors through the Waterloo Precinct such as Henderson Road, Raglan Street and Wellington Street. A Review of Environmental Factors (REF) for the connectivity upgrade is expected to be exhibited in mid-2018.

5.5 Strategic Opportunities

The strategic analysis has highlighted characteristics of the existing travel behaviour and transport network that can be built upon for the Waterloo SSP. The main strategic opportunities that will inform the principles and assessment process for the Waterloo SSP, including the Metro Quarter are highlighted below.

5.5.1 Proximity to Sydney Trains Network and future metro will provide excellent rail access

Sydney Metro City & Southwest will directly improve public transport access between Waterloo Precinct and a range of destinations, including Sydney CBD, North Sydney, Chatswood, Macquarie Park, Sydenham and Bankstown. It will also indirectly provide improved travel times and connections with other parts of Sydney by interchanging with other public transport services at key locations. Sydney Metro will operate a wide span of hours, from early in the morning to late at night, seven days a week. This will provide a high level of service and access into and out of Waterloo Precinct across the whole day, supporting 24/7 activity.

The new Sydney Metro Station at Waterloo provides a unique opportunity to support low private vehicle demand in the Waterloo Precinct. Together with the existing rail access provided at Redfern Station and Green Square Station there would be a significantly diminished need to use motor vehicles for most travel into and out of Waterloo Precinct in the future. This would result in less traffic on local streets, less added traffic on the wider road network, and would provide greater accessibility and mobility for residents without the need to service the significant cost of a vehicle.

5.5.2 Improved public transport to local destinations

Acting as the key north-south link through Waterloo Precinct, Sydney Metro will be a catalyst for improving the local public transport network. The Metro offers the opportunity of building a denser network with more frequent services (in all directions) to serve the subregion surrounding Waterloo. In particular, there is an opportunity to enable stronger east-west connections, providing cross-regional links and feeding major rail lines.

Currently, bus services provide frequent north-south connections, however east-west connections are often infrequent and with lengthy routes. With Sydney Metro, greater emphasis could be placed on east-west bus connections which feed into heavy rail and metro hubs. The east-west bus network services origin-destinations that have a strong relationship such as Newtown, Green Square, Surry Hills, Glebe, the University of Sydney and the University of New South Wales.

Services on Botany Road will also continue to be important as they provide access to the Southern Sydney Employment Lands and interchange to the metro to access CBD destinations. This second factor would be particularly attractive for people wishing to access mid-CBD and northern CBD areas, including North Sydney.

5.5.3 Street network structure and traffic management to limit impacts in and around Waterloo

In order to achieve good transport and land use outcomes and minimise traffic impacts on Waterloo Precinct, it is necessary to set a strategic framework to ensure any subsequent proposals are consistent with the future role and function of a particular street. This framework is a vital step in transport planning for Waterloo Precinct and is heavily influenced by the land use plans. In turn, the framework informs the land use and can create opportunities or constraints for the type of land use that can occur along a particular street.

The framework defines the future function of the street network on the basis of land use and transport objectives and desired outcomes for Waterloo Precinct. The roads within and around the Precinct provide two primary functions for transport customers:

- **Movement:** The ability to travel between places
- **Place:** The ability to access origins and destinations of travel.

An understanding of the two functions of a street are vital when the two functions are competing, such as through increased movement requirements or improved place amenity. The movement and place function of a street informs planning for the level of access across each of the transport modes.

The Waterloo Precinct is bounded on two sides by Botany Road and McEvoy Street, both busy arterial road corridors with significant movement functions. In the vicinity of the Precinct, Botany Road also has a place function due to the presence of retail and commercial land uses fronting the road.

Within Waterloo Precinct Cope Street and Raglan Street east of Cope Street will have a prioritised place function, given the proximity of the proposed Sydney Metro Waterloo Station entrance is this area. This would shift the focus of these streets to minimise the movement function and prioritise access for people instead.

5.5.4 An urban form that promotes walking and cycling

Active transport will play a significant role in short and medium distance trips to, from and within Waterloo Precinct.

As shown in Figure 5.14, the density of land uses and permeability of the street network results in the 800 metre walking catchments of Redfern Station, the future Sydney Metro Waterloo Station, and Green Square Station overlapping one another. This indicates significant potential for walking for many trips, particularly in combination with mass transit.

Dedicated north-south cycle facilities are currently provided on George Street. This provides strong connections to jobs, retail and leisure activities in Sydney CBD and Green Square, the latter set to grow significantly in the future with the development of Green Square Town Centre. A priority regional cycle route from Sydney Park to Central Park, one of 10 identified in City of Sydney's regional cycling network, pass through Waterloo Precinct in an east-west direction. Upgrades are identified on Buckland, Wellington, Morehead and Phillip Streets.

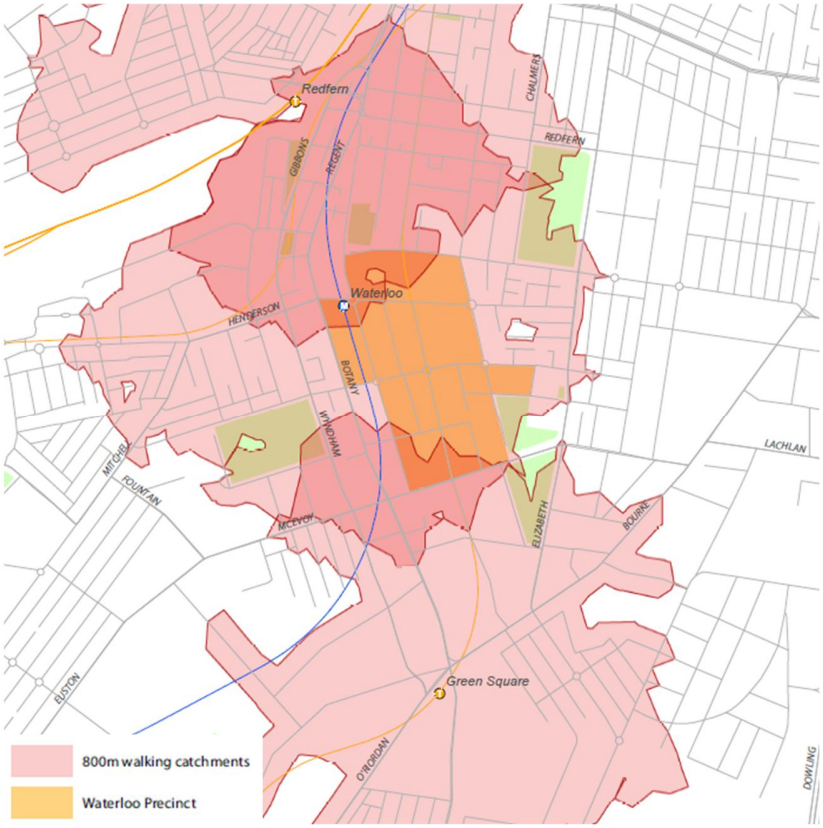


Figure 5.14 : 800m walking catchments; Redfern Station, Waterloo Station and Green Square Station

5.5.5 Appropriate parking rates

Parking for residential, commercial and retail uses could be reduced to below the legislated maximum parking rates permitted in Sydney LEP 2012 (SLEP 2012). This would put downward pressure on private vehicle mode share and trip generation.

Under SLEP 2012 the Waterloo Precinct is currently located in Category B for residential car parking. Reducing parking provision would be appropriate considering Waterloo's inner city location, proximity to Sydney CBD and future access with Sydney Metro. Category A rates from SLEP 2012, which are more restrictive and generally apply to dense inner city areas close to Sydney CBD are a more appropriate starting point for the Metro Quarter. Maximum residential parking rates per dwelling for Category A and Category B are shown in Table 5.5.

Table 5.5 : Maximum residential parking rates per dwelling (SLEP 2012)

Dwelling type	Category A rate	Category B rate
Studio	0.1 spaces	0.2 spaces
1 bedroom	0.2 spaces	0.4 spaces
2 bedrooms	0.7 spaces	0.8 spaces
3 or more bedrooms	1 space	1.1 spaces

5.5.6 Self-containment

A greater level of trip self-containment could be achieved in the Waterloo Precinct and surrounds with the right balance and mix of land uses. This could involve providing more opportunities to work, shop, and engage in recreational pursuits in and around the Precinct.

5.6 Future mode share targets

An assessment of the potential future mode shares has been undertaken in consultation with Transport for NSW, Roads and Maritime and City of Sydney and is based on existing data and the strategic opportunities for the Waterloo SSP. The mode share targets in the AM peak for all trip purposes are outlined in Figure 5.15.

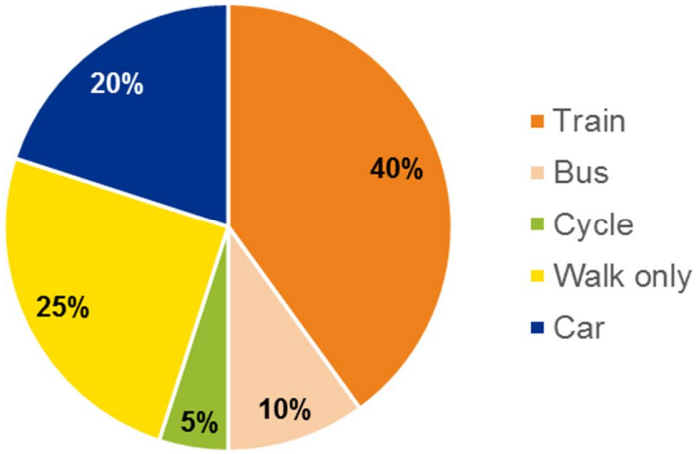


Figure 5.15 : Metro Quarter future mode share targets

These targets are based on a number of factors, including:

- Proximity to Sydney Metro Waterloo Station, which will provide access to high quality mass transit services on Sydney Metro City & Southwest
- Densely located land uses, activities and attractors as well as proximity to Sydney CBD and Green Square, enabling shorter trip lengths more conducive to walking and cycling
- Low existing traffic generation rates in recent high density developments in Waterloo and Redfern, and high (81 per cent) AM peak non-car mode share observed at the Redfern traffic generation survey site (detailed further in Chapter 7)
- Enhancements to the bus network to strengthen east-west routes, enabled by Sydney Metro City & Southwest, and improved cycling connections with key surrounding destinations.
- Consideration of Category A rates outlined in City of Sydney's DCP requirements to represent best practice in the provision of transport facilities appropriate for the Metro Quarter.

6. Proposal

This report relates to:

- An SSP Study to create a new suite of planning controls; and
- an Indicative Concept Proposal

for the Waterloo Metro Quarter ISD.

6.1 Proposed planning framework

The existing and proposed planning controls for the Metro Quarter are shown in Table 6.1.

Table 6.1 : Planning framework

	Existing	Proposed
Zoning	B4 mixed use	B4 mixed use
Height of buildings	Part 12, Part 15 metres	Part RL 116.9 (AHD) – North Part RL 104.2 (AHD) – Central Part RL 96.9 (AHD) – South
Floor Space Ratio	1.75:1	6.1:1 (including Metro Station)

6.2 Indicative concept proposal

The Indicative Concept Proposal for the Metro Quarter ISD comprises:

- Approximately 69,000 sqm of gross floor area (GFA), comprising:
  - approximately 56,500 sqm GFA of residential accommodation, providing for approximately 700 dwellings, including 5 to 10% affordable housing and 70 social housing dwellings;
  - approximately 4,000 sqm of GFA for retail premises and entertainment facilities.
  - approximately 8,500 sqm GFA for business and commercial premises and community, health and recreation facilities (indoor).
- Publicly accessible plazas fronting Cope Street (approximately 1,400 sqm) and Raglan Street (580sqm).
- A three storey mixed-use, non-residential podium, including a free standing building within the Cope Street Plaza.
- Three taller residential buildings of 23, 25 and 29 storeys, and four mid-rise buildings of four to ten storeys above the podium and/or the approved metro station infrastructure.
- Parking for approximately 65 cars, 700 residential bicycles and 520 public bicycles.
- Two east-west, through-block pedestrian connections.

Approval has already been separately granted for a Sydney Metro station on the site, which will comprise approximately 8,415 sqm of GFA. The total GFA for the ISD, including the metro station GFA is approximately 77,500 sqm. Transport interchange facilities including bus stops on Botany Road and kiss and ride facilities on Cope Street will be provided under the existing CSSI Approval. With regard to bicycle parking we note that the CSSI includes a 100 bicycle storage facility and 80 public domain spaces. These 80 public domain spaces form part of the 1320 spaces provided with the Precinct.

The above figures are deliberately approximate to accommodate detailed design resolution.

While the existing heritage listed Waterloo Congregational Church is within the SSP Study Area, there are no proposals for physical works or changes to the planning framework applicable to the church.

Three dimensional drawings of the Concept Proposal are shown in Figure 6.1 and Figure 6.2.

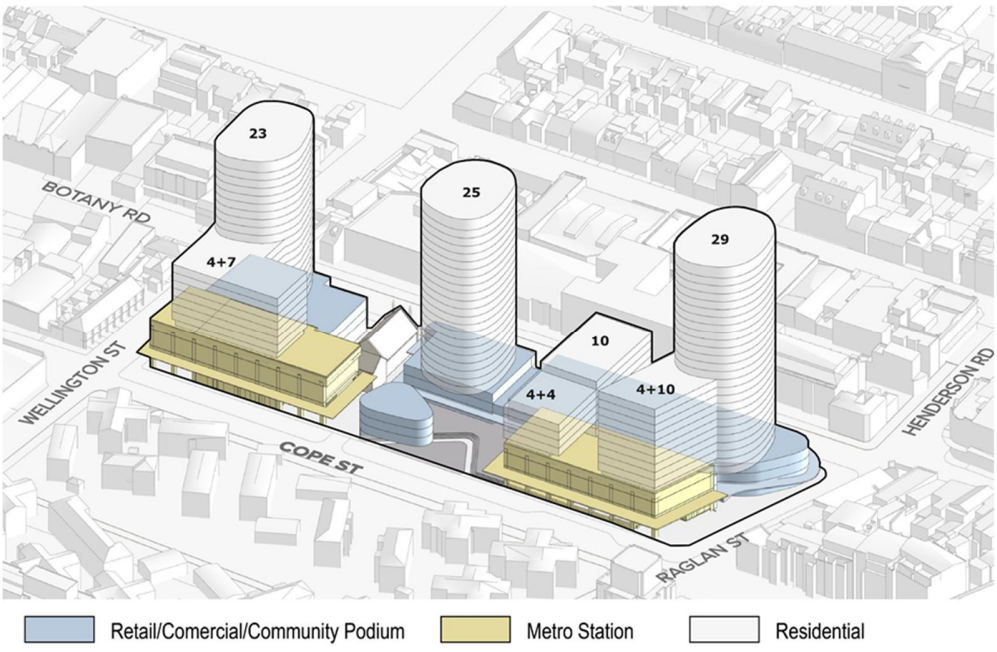


Figure 6.1 : Three-dimensional drawing of the Indicative Concept Proposal, viewed from the east

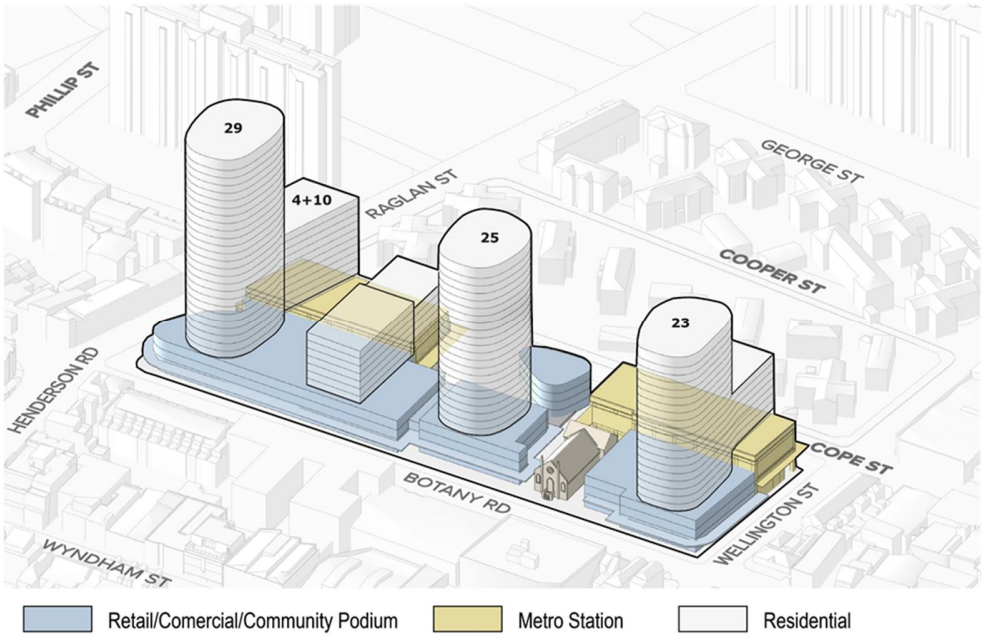


Figure 6.2 : Three-dimensional drawing of the Indicative Concept Proposal, viewed from the west

7. Proposal assessment

7.1 Overview

This chapter presents a traffic and transport assessment of the Metro Quarter proposal. The additional demands on the transport network as a result of the Metro Quarter proposal have been quantified and the impacts to all transport modes has been assessed. Mitigation measures have been proposed where required in order to maximise the safety and efficiency of all road and public transport users.

Scoping meetings were held with RMS and TfNSW to confirm the methodology of this assessment on 2 May 2017 and 27 July 2017.

Other transport related issues have been investigated including on and off-street parking provision, bicycle facilities and vehicle access considerations.

Figure 7.1 shows the proposed public domain plan which has informed the assessment of the Metro Quarter proposal.

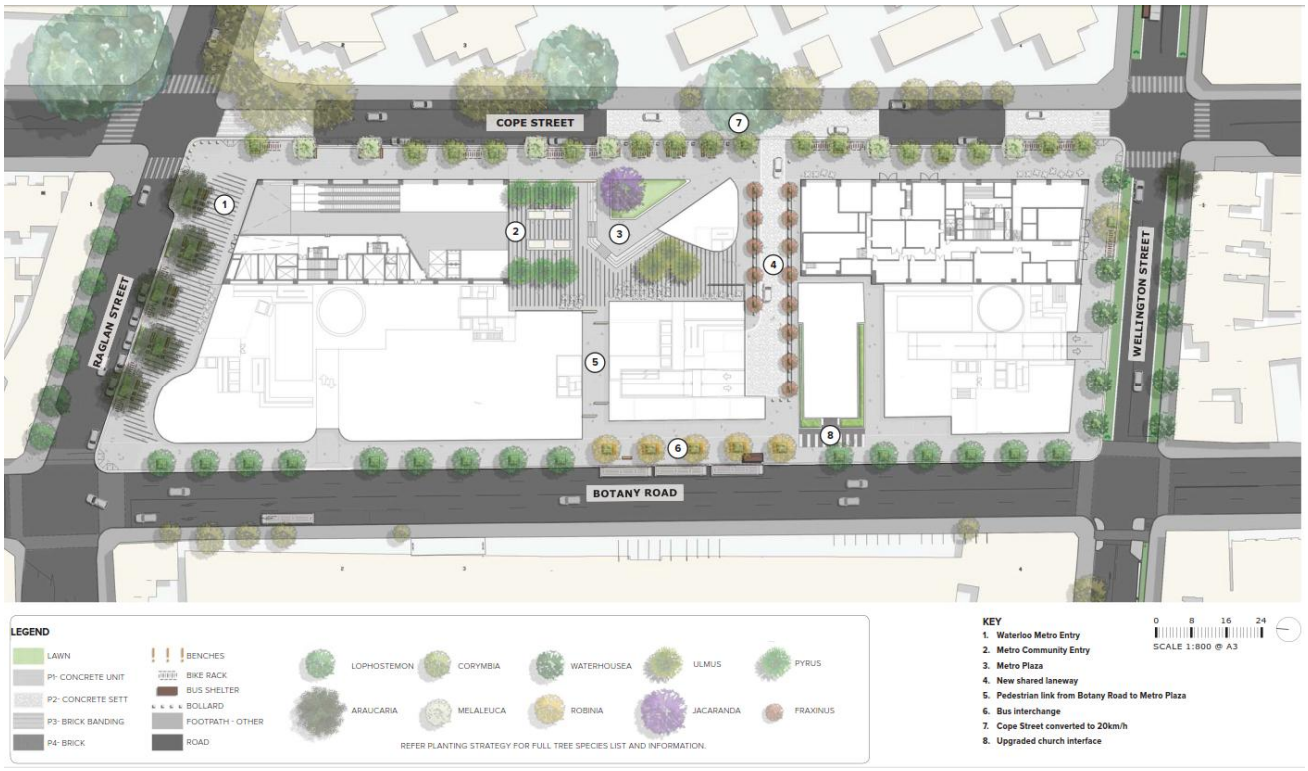


Figure 7.1 : Proposed public domain plan

Source: Turf and Turner Studio

7.2 Guiding transport principles

The planning of the transport network for Metro Quarter has been informed by a guiding set of principles. These principles seek to ensure that the future residents and workers of the Metro Quarter will have the benefit of choice, not only for their travel mode, but for when and where they wish to travel for live, work and play activities. The principles build on the strategic opportunities for the precinct identified in Section 5.5. These principles have been reviewed by Transport for NSW, Roads and Maritime Services, and City of Sydney during the planning process.

Principle 1: Support the development of transport networks that provide 24 hour / 7 days a week access

Ensure that residents and workers are provided with multiple high quality transport options to reach a variety of destination/s for live, work and play activities in a 24 hour/7 day a week economy and to support connections to the metro system.

Principle 2: Encourage access by public transport, walking and cycling to reduce car dependence

Provide high quality public and active transport linkages and sustainable approaches to parking provision that encourages residents to live car independent lifestyles if they choose to do so.

Principle 3: Support walkable urban environments

Ensure an integrated land use and transport outcome that supports walkable streets and high quality urban outcomes within the precinct, including active street frontages, fine-grained development pattern and a connected, permeable street network.

Principle 4: Strengthen east-west connections

Take advantage of the north-south connectivity provided by the metro by strengthening east-west connections, particularly for active transport and buses.

Principle 5: Minimise impacts to regional connections

Ensure that any impacts to regional connections for public transport and freight, such as Botany Road, are minimised where possible.

Principle 6: Support a hierarchy of access based on time of day

Develop and implement a hierarchy of access that prioritises access for people and goods based on time of day using the movement and place approach.

7.3 Future transport demand

The transport demand generated by the Metro Quarter development has been calculated based on the future mode share targets outlined in Section 5.6 and an analysis of total travel demand based on trip generation surveys. Metro quarter demand as well as background movements have also been informed by an assessment of the cumulative impacts of known surrounding developments such as Australian Technology Park and infrastructure interventions including Alexandria to Moore Park and WestConnex.

Roads and Maritime's *Guide to Traffic Generating Developments – Updated traffic surveys* (TDT 2013/04a) provides data on the number of person trips per dwelling for 8 high density sites in the Sydney metropolitan area, within walking distance of mass transit. This data, combined with the additional surveys undertaken for this

study (see Section 7.7) reveals an average rate of 0.71 person trips (all modes) per dwelling in the peak hour. This trip rate accounts for all trip purposes.

Considering the 700 dwellings in the Metro Quarter development and applying the assumed mode shares leads to the trip volumes shown in Table 7.1. Proposed non-residential uses in the Metro Quarter precinct are small in scale. As such it is assumed that there will be limited associated vehicle traffic generation from these uses and that traffic generated will be outside the peak hour or undertaken as part of multi-purpose trips by residents.

Table 7.1: Metro Quarter AM peak 1-hour trip generation by mode

Trips per dwelling (all modes)	Metro Quarter dwellings	Metro Quarter trips (AM peak-hour)					
		All modes	Rail (40%)	Bus (10%)	Cycling (5%)	Walk (25%)	Car (20%)
0.71	700	497	199	50	25	124	99

These demands have been used as the basis of the transport assessment presented in the remainder of this section.

7.4 Public transport

7.4.1 Rail

During the morning peak hour, 43 suburban trains heading towards Central Station stop at Redfern Station. In addition, a limited number of intercity trains also stop at Redfern Station during the morning peak hour. Average spare capacity on inbound trains during the morning peak period and outbound trains during the evening peak period at Redfern Station is limited. This is particularly evident on the T1 Western Line during the morning peak period and the T4 Illawarra Line during the evening peak period (refer to Figure 7.2 and Figure 7.3) where the majority of services operate at a load factor above 100 per cent. In these instances, there are not enough seats for every passenger. A load factor greater than 135 per cent , represented by the red column indicates that passengers experience crowding and dwell times may impact on the on-time running performance of the service.

Similarly, spare capacity on inbound train services stopping at Green Square Station during the morning peak period, particularly between 7:30am and 9am, is limited as shown in Figure 7.4. During the morning peak hour, 10 trains stop at Green Square Station for travel towards Central Station.

The introduction of Sydney Metro would increase the capacity of the rail network in Sydney. The metro line is anticipated to have a target capacity of 46,000 customers per hour in one direction (*Sydney Metro City & Southwest Final Business Case Summary*, October 2016). The capacity of the Sydney Metro is almost double that of an existing heavy rail line. As such, capacity issues evident on services passing through or stopping at Redfern Station and Green Square Station are likely to be relieved once Sydney Metro is operational as existing customers at these two stations would have the opportunity to use metro services at Waterloo Station. A service capacity of 46,000 customers per hour in one direction combined with the existing heavy rail network is therefore considered sufficient to cater for forecast demand (199 peak hour trips) generated by the Metro Quarter, including the cumulative demand from future developments in the vicinity of the Metro Quarter such as at Australian Technology Park.

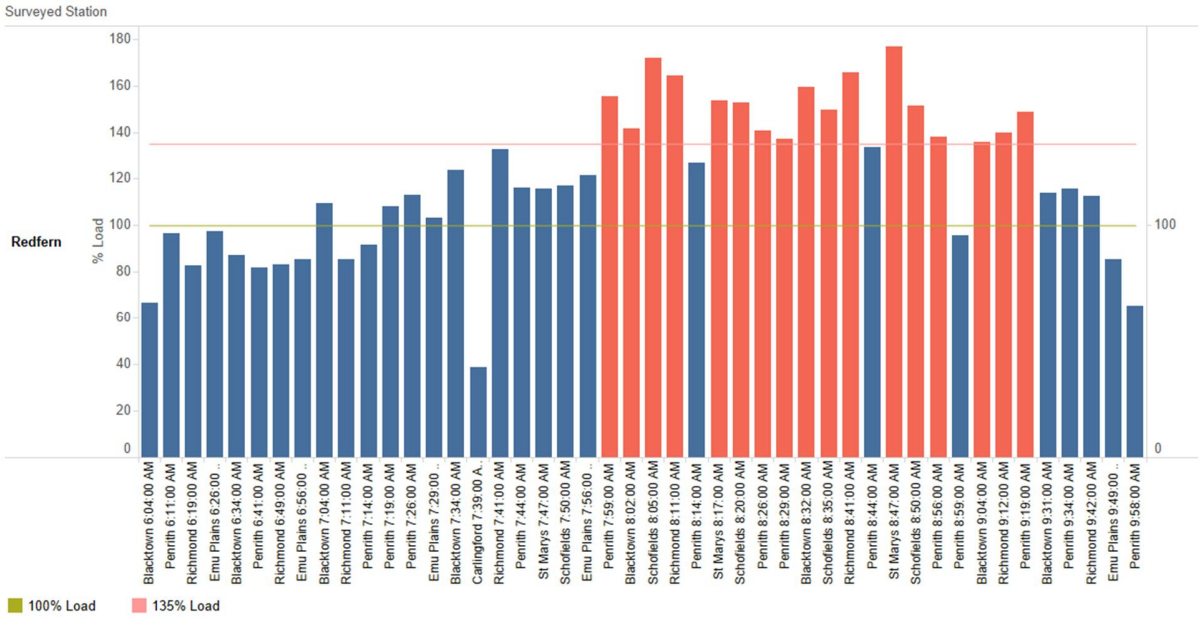


Figure 7.2: Passenger loading on the T1 Western Line at Redfern Station during the morning peak period (inbound)

Source: Transport for NSW – Train loads (March 2016)

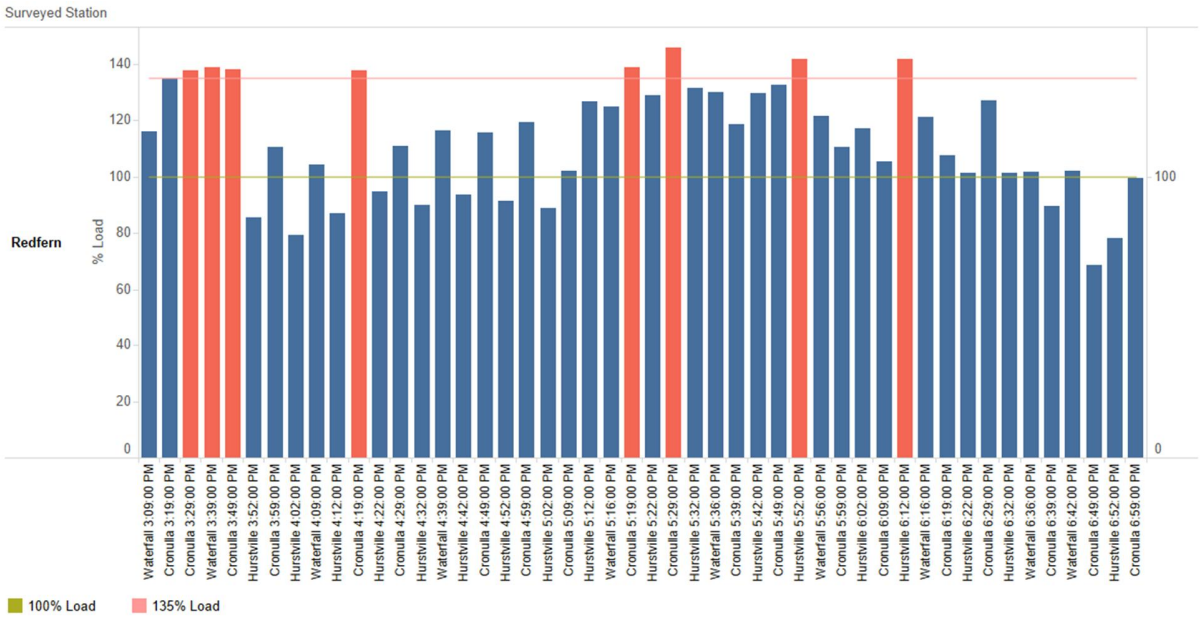


Figure 7.3: Passenger loading on the T4 Illawarra Line at Redfern Station during the evening peak period (outbound)

Source: Transport for NSW – Train loads (March 2016)

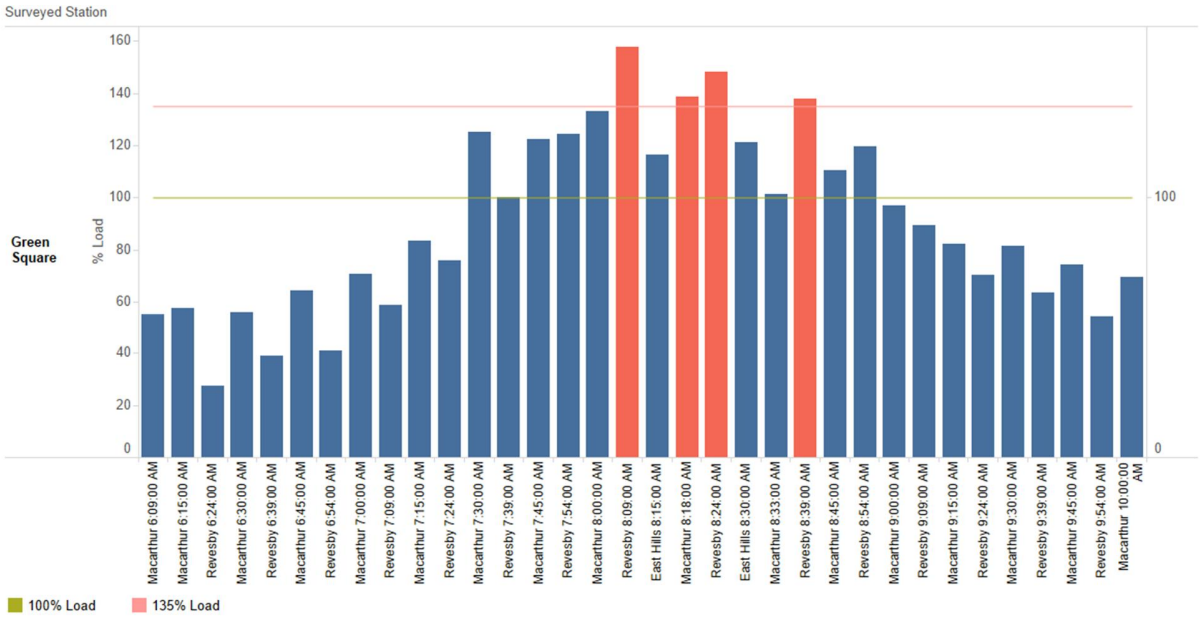


Figure 7.4: Passenger loading on the T8 Airport Line at Green Square Station during the morning peak period (inbound)

Source: Transport for NSW – Train loads (March 2016)

7.4.2 Bus

Figure 7.5 and Figure 7.6 shows loading on two key routes serving the Metro Quarter. Citybound route 309 services operating along Botany Road exceed seated capacity on some services in the AM peak hour. However, many of these customers alight services at Green Square Station leaving capacity available once services reach Waterloo.

Bus route 355 serving east-west trips in the area via Raglan / Wellington Street has spare capacity available on all services. The 355 also serves a vital social function by providing access for many social housing tenants in the estate; particularly those that are mobility impaired.

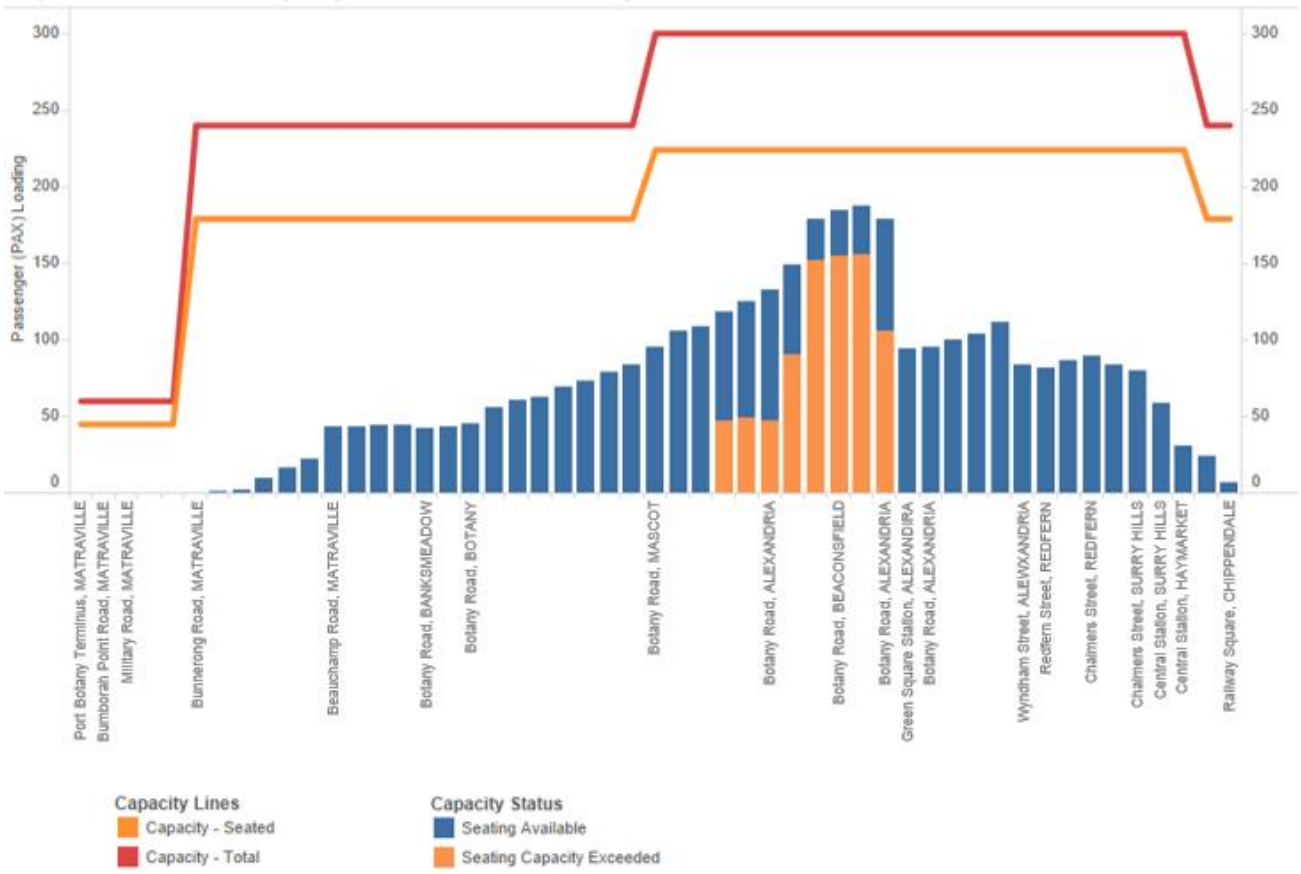


Figure 7.5 : Bus service passenger loading on the 309 during the morning peak period (inbound)

Source: Opal data (May 2017)

Figure 7.6 : Bus service passenger loading on the 355 during the morning peak period (inbound)

Source: Opal data (May 2017)

With the introduction of the Sydney Metro Waterloo Station, some localised changes to the bus network may be appropriate. These changes could also benefit the future residents within the Waterloo Metro Quarter. Two primary changes could be:

- Route 355: Bondi Junction to Marrickville Metro via Waterloo. Increase frequency / span of hours to match metro operation and re-route via Wellington Street to more directly serve the Waterloo Station.
- Route 309/310: Port Botany to Central, via Botany Road. Increase frequency and span of hours to match metro operation and serve significant bus-rail interchange demand.

Whilst future residents of the Metro Quarter will have a range of transport needs, the key requirements of various customer groups have been considered in the above analysis. Mass transit connections to key employment centres such as Sydney Metro and the existing heavy rail network will help to serve the needs of the working age residents undertaking trips for employment. The needs of older residents, social housing tenants and school age children will be primarily met by improved local bus services connecting to community, health and retail facilities.

7.5 Active transport

7.5.1 Future pedestrian demands

The Metro Quarter forms part of an integrated station development, which includes pedestrian demand generated by the Metro Station. An assessment of the future pedestrian demands for the Metro Quarter and Metro Station is captured in this assessment. Refer to Appendix B for a further understanding of demand modelled as part of the Metro Quarter and Metro Station interchange appraisals. Pedestrian demand directly generated by the proposed Metro Quarter development has been calculated separately for the purposes of this study and is derived from the demands shown in Section 7.3. For the purposes of assessing the total pedestrian demand from the Metro Quarter development, all public transport and walk only trips have been combined.

Table 7.2 outlines the pedestrian demands from both the proposed Metro Quarter and Waterloo Station. Metro Station demands have been sourced from the *Sydney Metro EIS Technical Paper 1: Traffic and Transport* (May 2016).

Table 7.2: Metro Quarter and Sydney Metro pedestrian trip generation (AM peak hour - 2036)

	Pedestrian trips	Proportion (%)
Metro Quarter development	373	6%
Waterloo Station	6,050	94%
Total	**6,423**	**100%**

The impact of walking trips generated by the Metro Quarter on the precinct and surrounding road network is considered negligible in comparison to forecast growth within the precinct. Notwithstanding this, the assessment of pedestrian infrastructure included as part of section 7.5 and Appendix B has been carried out to ensure that the planning of the active transport environment is consistent with area plans, enables growth and offers a safe and efficient environment for promoting travel by walking, cycling and public transport.

7.5.2 Future pedestrian trip distribution and access

The expected future distribution of pedestrian trips to/from the Metro Station in the AM peak is shown in Figure 7.7. In addition, pedestrian access routes for the Metro Quarter is shown in Figure 7.8.

As shown in the figures below, a major pedestrian desire line would be to and from Waterloo Station via Henderson Road and Raglan Street. Investigations have highlighted that a, widened pedestrian crossing spanning Botany Road at the Botany Road/Henderson Road/Raglan Street intersection and widened footpaths on Raglan Street on approach to the intersection would be required to accommodate the anticipated volume of pedestrians.

Pedestrian crossings would also be required across Cope Street to cater to pedestrians travelling between the Waterloo Estate and the Metro Station.

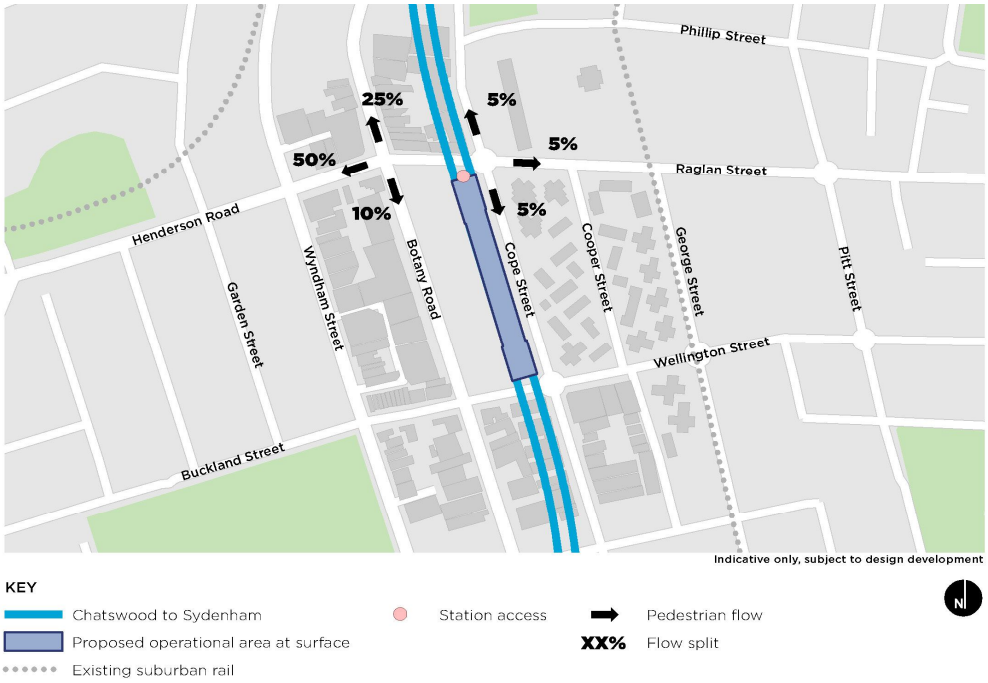


Figure 7.7: Expected distribution of future pedestrian trips

Source: Sydney Metro EIS Technical Paper 1: Traffic and Transport (May 2016)

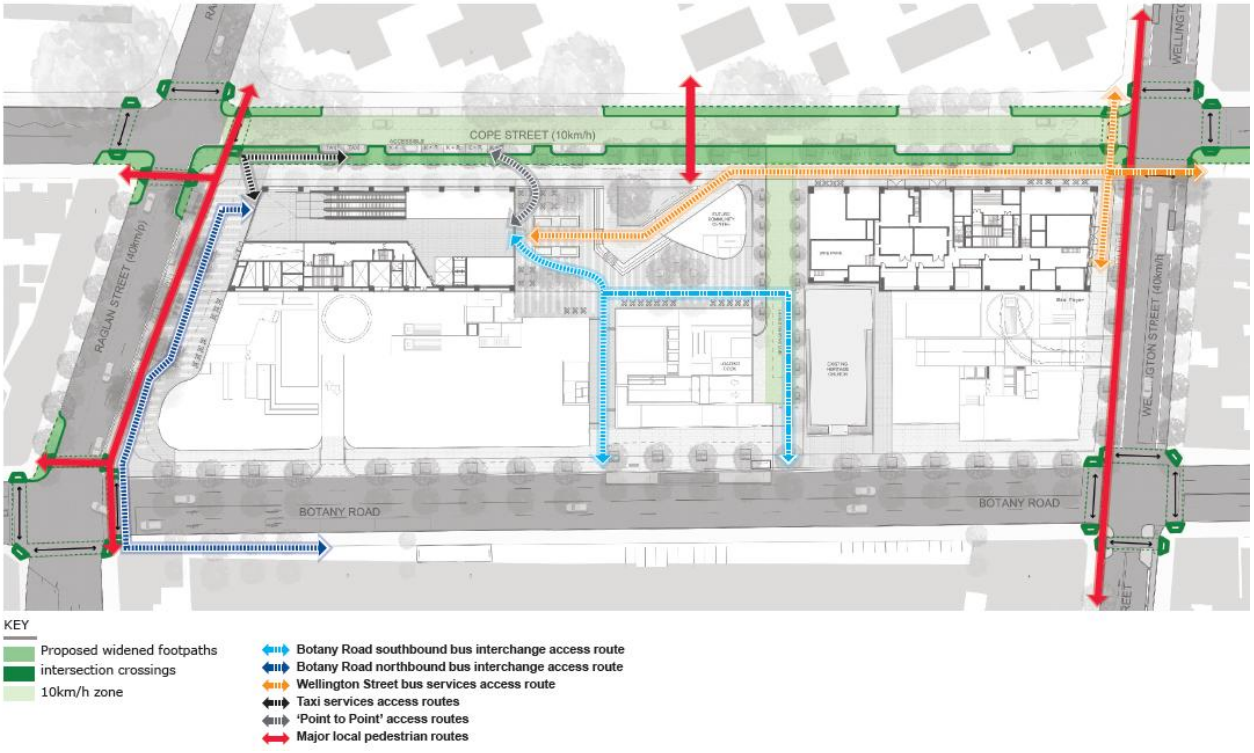


Figure 7.8 : Metro Quarter key pedestrian access routes

7.5.3 Botany Road southbound bus interchange

The southbound Botany Road interchange forms an integral part of the integrated transport network with a significant number of passengers expected to interchange between the bus and metro services. An assessment of the performance of the interchange has been undertaken via dynamic pedestrian modelling using Legion software.

The following assumptions were made for this analysis:

- 2036 AM and PM forecast year assuming full development of Metro Quarter
- 27 per cent of hourly movements occur during the peak 15-minute period – based on existing Green Square opal data
- 26 buses per hour AM. 17 buses per hour PM (as advised by TfNSW)
- All buses stop at head of stand only with 30 seconds of dwell time
- There is sufficient capacity in all buses to service all waiting passengers
- Volumes of boarding and alighting passengers derived from outputs of the Public Transport Project Model (PTPM)

Figure 7.9 outlines the extents of the Legion model developed and the key pedestrian interchange movements.

Figure 7.9 : Botany Road bus interchange and key movements

Source: Turf and Turner Studio

Results of the dynamic pedestrian modelling are presented in terms of Fruin Level of Service for queuing areas and walkways and based on *London Underground Station Planning Standards and Guidelines (2012)*. Figure 7.10 explains the level of service performance indicators.

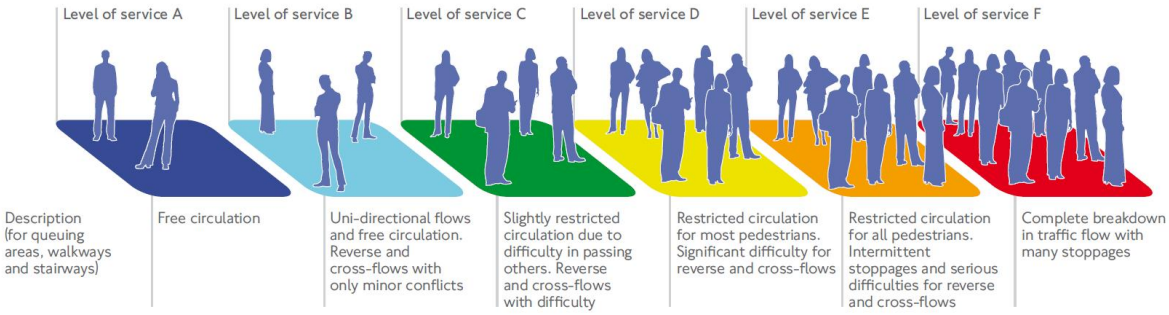


Figure 7.10 : Fruin Level of Service

Cumulative mean density (people per square metre) is used to calculate pedestrian level of service. Mean density plots are shown in Figure 7.11 for the 2036 morning and evening peak periods. Analysis of the mean density plots show that the majority of footpath and bus waiting area would operate at Level of Service A or B, indicating that the proposed footpath and bus waiting area is sufficiently wide to allow comfortable queuing conditions for bus passengers whilst also allowing 'through' pedestrians to easily pass through the area. There are some localised areas towards the head of the bus stand that are shown to operate at Level of Service D and E. However, these plots represent a worst case scenario where all passengers queue and board a bus at the head of stand. In reality, buses may arrive at similar times and hence passengers would spread further out along the footpath and within the waiting area. Even in a worst case scenario pedestrians travelling along the footpath will not be impeded by bus passengers.

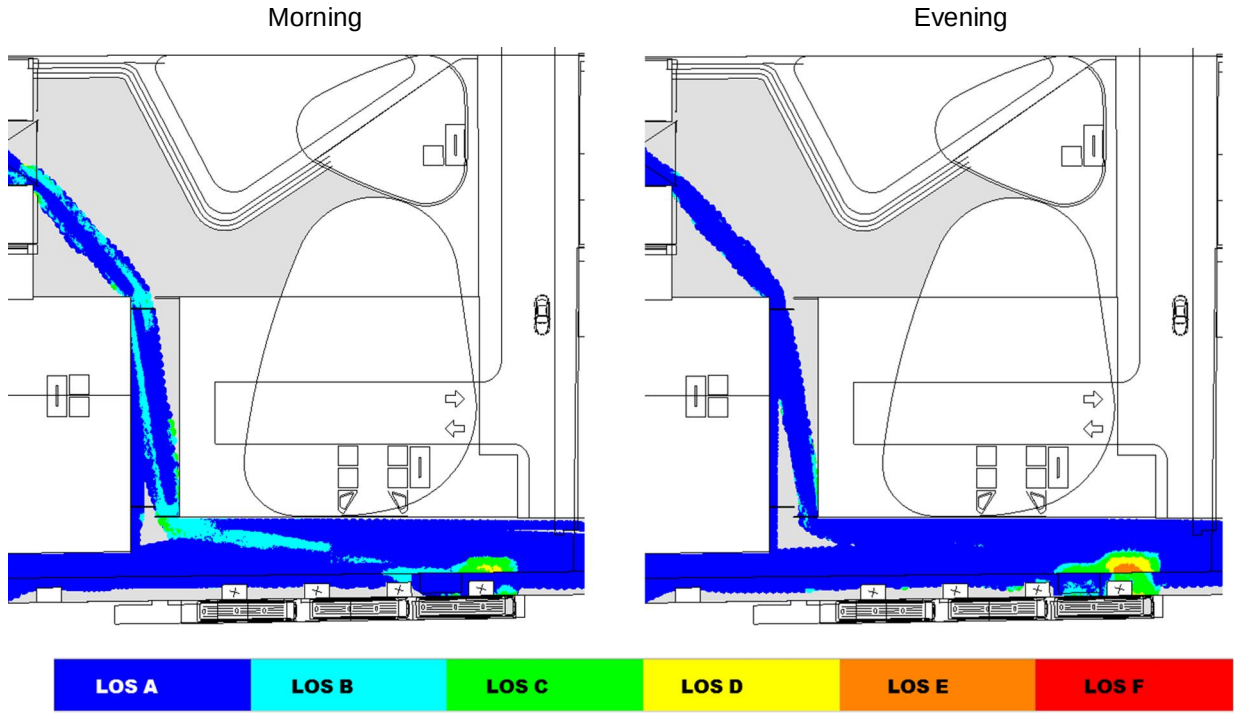


Figure 7.11 : 2036 morning and evening peak cumulative mean density plots

7.5.4 Cope Street and Raglan Street

A static assessment of footpath widths on Raglan Street and Cope Street has been undertaken to ensure the proposed facilities are sufficient to safely cater for the large number of expected pedestrians in the Metro Quarter.

The assessment was undertaken at locations shown in Figure 7.12.

Figure 7.12 : Cope Street and Raglan Street assessment locations

Source: Turf and Turner Studio

Pedestrian crowding was used as the metric for the static modelling undertaken, which is measured in pedestrians per metre of clear footway width per minute (ppmm). The crowding level (ppmm) is then categorised according to the Pedestrian Comfort Level (PCL) scale as shown in Figure 7.13.

Figure 7.13 : Pedestrian Comfort Level

Source: Transport for London Pedestrian Comfort Guidance

Results of the static modelling are presented in Table 7.3. It is noted that proposed footpaths on Raglan and Cope Street are sufficient to safely cater for expected pedestrian demand with PCLs of A and A-, respectively.

Table 7.3 : Raglan Street and Cope Street PCL

Street	Clear footway width (m)	People per hour	Pedestrian crowding (ppmm)	Pedestrian Comfort Level
Raglan Street	7.5	2,500	5.8	A
Cope Street	3.6	1,300	6.0	A-

7.5.5 Mid-block crossing of Botany Road

Movement and the proposed future performance outcomes of the network can be improved through the planning and implementation of additional pedestrian connections. The Metro Quarter allows for midblock connections between Cope Street and Botany Road, which is planned to serve access to precinct development and bus facilities situated on Botany Road. Spatial allowance has been allocated in the design for a future signalised midblock crossing on Botany Road between Raglan Street and Wellington Street. The implementation of this proposed improvement can be facilitated, but would be subject to adjacent land owners and the future planning of adjacent precincts to help establish an attractive pedestrian desire line for this type of facility.

7.5.6 Botany Road/Wellington Street crossing facilities

Metro Quarter Demand

It is noted in Table 7.2 the total trip generation (am peak hour – 2036) is 6,423. The EIS notes that 2,350 of these trips will be exiting the station. Figure 7.7 indicates 15% of the total (0.15 x 2350 = 352) moving southwards to Wellington Street. Assuming at the intersection of Wellington Street and Botany Road one third splits to proceed southwards, westwards and eastwards, 117 pedestrians would proceed westwards across Botany Road.

The .id Population Report (page 97) estimates 83 school aged children living in the Metro Quarter in 2036. Assuming a similar split (28) there is potential for a total of 145 pedestrians to proceed westwards across Botany Road via the northern leg of the Botany Road/Wellington Street intersection.

Estate Demand

It is noted that the approval process for the Metro Quarter SSP is separate from the Estate SSP, with the latter subject to its own traffic and transport assessment. Notwithstanding this, an initial high level assessment of potential pedestrian demand from the estate redevelopment has also been considered. A full assessment of active transport impacts will be provided in the Estate SSP Traffic and Transport Assessment

The estimated number of children aged 5 – 14 years in 2036 living on the Estate is 481 (Source: .id Population Report). It is assumed 30% will attend private schools (based on an analysis of census data) with the remaining 70% of students split evenly between Alexandria Park, and other schools. This will equate to approximately 168 children attending Alexandria Park.

Possible crossing locations for these students and an assumed distribution is presented below:

- Botany Road/Raglan Street southern leg – 10% (17 pedestrians)
- Botany Road/Wellington Street northern leg – 45% (76 pedestrians)
- Botany Road/Wellington Street southern leg – 40% (67 pedestrians)
- Botany Road/McEvoy Street northern leg – 5% (8 pedestrians)

The critical leg would therefore be the northern leg of Botany Road/Wellington Street with a combined estimated AM peak hour demand of 221 pedestrians (145 + 76). Assuming a cycle time of 120 seconds and an even distribution of trips, there would be an average of approximately 7 pedestrian trips per signal cycle. The pedestrian facilities at this intersection are considered sufficient to cater for this level of demand, particularly noting the proposed improved footpath provision on the north-east corner of the intersection as part of the Metro Quarter development.

7.5.7 Cycling

An overview of existing and potential future cycling routes was presented in Section 5.3.1. At a Metro Quarter precinct level, the cycling infrastructure to be provided to support Waterloo Station will be significant. Planned City of Sydney cycling upgrades including the Wellington Street cycleway, will greatly improve the safety and efficiency of cycling trips throughout the Metro Quarter precinct. The impact of cycling trips generated by the proposed Metro Quarter development is considered to be negligible considering the large number of trips expected to be generated by users of the Metro Station itself. Although the metro station will provide less dedicated bike spaces than the metro quarter, these spaces will have a higher turnover as people access the station daily and cannot store their bike for long periods in the metro bike hub.

Access between the Metro Quarter and the regional cycle network will be provided via Cope Street which will connect directly with the proposed Wellington Street cycleway. The Wellington Street cycleway will provide access to George Street which forms a major north-south cycling corridor providing connections to Sydney CBD to the north and Green Square/southern employment lands to the south.

Botany Road and Wellington Street have been identified in City of Sydney's *Liveable Green Network* as roads which are proposed to form part of an integrated pedestrian and cycling network throughout the City of Sydney. The Metro Quarter would help facilitate the aims of the Liveable Green network by providing direct access to the network and increase the attractiveness of active transport modes through improved urban amenity.

7.6 Parking and demand management

7.6.1 Off-street parking

Car

The Metro Quarter development recognises the link between parking and travel behaviour, and that it is a key element of the integrated strategy for the precinct. The high levels of accessibility and non-car options available to residents will mean that the risks normally associated with low parking provision are minimised.

Category A parking rates from SLEP 2012 discussed in Section 5.5.5 are proposed as the residential DCP control given that these rates are the most restrictive parking control in the City of Sydney. Category D rates are proposed to be applied to non-residential uses. Maximum parking provision allowed under Category A and D rates would be 427 total spaces, based on the currently assumed dwelling and non-residential mix.

The total off-street parking provision in the Metro Quarter precinct will also depend on the proportion of 'adaptable' dwellings provided. Based on City of Sydney's DCP 2012, the minimum requirement is 1 car space per adaptable dwelling. It has been assumed that 5 per cent of apartments within the Metro Quarter are adaptable, requiring an adaptable car space[5]. Table 7.4 outlines a breakdown of off-street parking spaces based on the indicative concept proposal presented in section 6.2. This indicative provision falls well below the proposed maximum rate.

[5] An adaptable car space is parking space provided for an adaptable dwelling which can be modified easily in the future to become an accessible parking space