WATERLOO METRO QUARTER OVER STATION DEVELOPMENT

Environmental Impact Statement
Appendix I - Transport, Traffic and Parking Impact Assessment

SSD-10437 Southern Precinct

Detailed State Significant Development
Development Application

Prepared for **Waterloo Developer Pty Ltd**

30 September 2020

Reference	Description
Applicable SSD Applications	SSD-10437 Southern Precinct
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ptc.

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1. Glossary and abbreviations

Reference	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ADG	Apartment Design Guide
AHD	Australian height datum
AQIA	Air Quality Impact Assessment
BC Act	Biodiversity Conservation Act 2016
BCA	Building Code of Australia
BC Reg	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
CEEC	critically endangered ecological community
CIV	capital investment value
CMP	Construction Management Plan
Concept DA	A concept DA is a staged application often referred to as a 'Stage 1' DA. The subject application constitutes a detailed subsequent stage application to an approved concept DA (SSD 9393) lodged under section 4.22 of the EP&A Act.
Council	City of Sydney Council
CPTED	Crime Prevention Through Environmental Design
CSSI approval	critical State significant infrastructure approval
CTMP	Construction Traffic Management Plan
DA	development application
DPIE	NSW Department of Planning, Industry and Environment
DRP	Design Review Panel
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPA Regulation	Environmental Planning and Assessment Regulation 2000

Reference	Description
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESD	ecologically sustainable design
FSMP	Freight & Servicing Management Plan
GANSW	NSW Government Architect's Office
GFA	gross floor area
HIA	Heritage Impact Assessment
IAP	Interchange Access Plan
LGA	Local Government Area
NCC	National Construction Code
OSD	over station development
PIR	Preferred Infrastructure Report
POM	Plan of Management
PSI	Preliminary Site Investigation
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SEPP 65	State Environmental Planning Policy No. 65 - Design Quality of Residential Apartment Development
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2009
SREP Sydney Harbour	State Regional Environmental Plan (Sydney Harbour Catchment) 2005
SSD	State significant development
SSD DA	State significant development application
SLEP	Sydney Local Environmental Plan 2012

Reference	Description
Transport for NSW	Transport for New South Wales
TIA	Traffic Impact Assessment
The proposal	The proposed development which is the subject of the detailed SSD DA
The site	The site which is the subject of the detailed SSD DA
TTPIA	Transport, Traffic & Parking Impact Assessment
VIA	Visual Impact Assessment
WMQ	Waterloo Metro Quarter
WMP	Waste Management Plan
WSUD	water sensitive urban design

2. Executive summary

This Transport, Traffic and Parking Impact Assessment has been prepared by **ptc.** to accompany a detailed State significant development (SSD) development application (DA) for the Southern Precinct over station development (OSD) at the Waterloo Metro Quarter site.

This report has been prepared to address the relevant conditions of the concept SSD DA (SSD 9393) and the Secretary's Environmental Assessment Requirements (SEARs) issued for the detailed SSD DA (SSD 10437).

This report has also been prepared to accompany the Amended DA and the individual SSD DAs for the key components of the development being:

- SSD-10438 - Basement,
- SSD-10439 - Central Precinct, and
- SSD-10440 - Northern Precinct.

Parking will be provided within the shared Basement car park which is accessible via Cope Street and the proposed Church Square shared zone. The proposed parking provisions associated with the Southern Precinct comprises:

- 8 car parking spaces;
- 1 motorcycle space;
- 184 bicycle parking spaces; and
- End of trip facilities including 2 lockers and 1 shower/change cubicle.

The Southern loading dock accommodates one MRV bay. In addition, five courier bays accommodating B99 car-derived vans/utes are provided within the Basement car park. The shared use of the proposed service bays will be managed through the implementation of a Freight & Servicing Management Plan (appended to this report).

A review of the bicycle parking and service vehicle facilities have been undertaken with reference to AS2890.2:2018 and AS2890.3:2015 and found the proposal to be capable of complying with or meeting the intent of the relevant standards. Any non-standard elements within the design are able to be revisited and adjusted during the detailed design stage to ensure full compliance prior to issue of Construction Certification.

Traffic modelling has been undertaken for the proposed development, including growth to 2036. The modelling indicates that the external road network will continue operate with no change to the levels of service. Therefore, the development is anticipated to have no detrimental impact on the network operation, over and above the approved scheme.

This report concludes that the proposed Southern Precinct OSD is suitable in relation to traffic outcome and parking provision.

3. Introduction

This report has been prepared to accompany a detailed State significant development (SSD) development application (DA) for the Southern Precinct over station development (OSD) at the Waterloo Metro Quarter site. The detailed SSD DA is consistent with the concept approval (SSD 9393) granted for the maximum building envelope on the site, as proposed to be modified.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (DPIE) for assessment.

The detailed SSD DA seeks development consent for the design, construction and operation of:

- 25-storey residential building (Building 3) comprising student accommodation, to be delivered as a mixture of studio and twin rooms with approximate capacity of 474 students
- 9-storey residential building (Building 4) above the southern station box to accommodate 70 social housing dwellings
- ground level retail tenancies including Makerspace and gymnasium lobby, and loading facilities
- level 1 and level 2 gymnasium and student accommodation communal facilities
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 8 April 2020 and issued for the detailed SSD DA. Specifically, this report has been prepared to respond to the SEARs requirements summarised in the following table.

Item	Description of requirement	Section reference (this report)
9	**Traffic, Parking and Access (Construction and Operation)** The EIS shall include a traffic, parking and access assessment that provides, but is not limited to, the following:	
	Details on the current and likely estimated future mode share for the various land uses (workers, visitors, etc) accessing the proposed development.	Section 7.5 Section 12

Item	Description of requirement	Section reference (this report)
	Details of the current and likely estimated future daily and peak hour vehicle, public transport, point to point transport, pedestrian and bicycle movements to/from the site, including an indication of whether it relates to the station or OSD, and any associated impacts.	Section 9 Section 10
	Measures to mitigate impacts of the proposed development on the operation of existing and future traffic, public transport, pedestrian and bicycle networks, including any required upgrades.	Section 8 Section 9
	Justification for the car parking provision with measures to encourage users of the development to make sustainable travel choices, including a green travel plan, walking, cycling, public transport and car sharing, adequate provision of bicycle parking and end of trip facilities and the minimisation of private car trips.	Section 8 Section 11
	Modelling and analysis of pedestrian and cyclist access to the proposed development in consultation with TfNSW, taking into account the existing and planned Sydney Bike Network	Section 10 Section 11
	An assessment and details of proposed service vehicle access arrangements, including service vehicle parking, a draft Freight and Servicing Management Plan detailing loading dock and servicing provision, adequacy and management with consideration of precinct wide shared loading docks and/or remote or off-site loading zone hub facilities, ensuring all servicing and loading occurs on-site and does not rely on kerbside controls.	Section 8.1.5 Section 13.2.2
	Detailed queuing analysis to show that vehicles would not queue onto Botany Road from the loading dock.	Access to the loading dock to be managed through the implementation of the Freight & Servicing Management Plan (refer to Appendix 6 - Freight & Servicing Management Plan)
	Details of measures to segregate hostile vehicles from public transport users and areas of people congregation.	Section 13.3

Item	Description of requirement	Section reference (this report)
	Demonstrate how pedestrian safety and amenity will be provided along Raglan Street, the shared laneway located between Raglan Street and Cope Street plaza will be designed to prioritise pedestrian movements, including any measures to protect pedestrians entering and exiting the building and retail outlets	Section 13.3
	A draft Construction Pedestrian and Traffic Management Plan to demonstrate the proposed management of impact. This Plan needs to include works zone location, vehicle routes, number of trucks, hours of operation, indicative construction program, access arrangements and traffic control measures for all demolition/construction activities.	Section 14

Table 1 - SEARs requirements SSD 10437)

3.1 Conditions of Concept Approval (SSD 9393)

This report has also been prepared in response to the Conditions of Consent issued for the concept SSD DA (SSD 9393) for the OSD as summarised in Table 2.

Item	Description of Requirement	Section Reference (this report)
B8	Future development applications shall reduce total car parking provision to reduce private car ownership and promote use of active and public transport. Future development applications must demonstrate compliance with:	
(a)	The maximum number of car spaces to be provided for all residential accommodation within the development is limited to 170 spaces, including residents' spaces and residential car share spaces but excluding visitor spaces and service vehicle spaces.	Section 8
(b)	The allocation of residential car parking spaces, up to the maximum of 170 spaces must not exceed the following maximum rates: (i) 0.1 space per studio dwelling (ii) 0.3 parking spaces per 1 bedroom dwelling (iii) 0.7 parking spaces per 2 bedroom dwelling (iv) 1 parking space per 3 bedroom or more dwelling (v) Residential car share parking rate of 1 space per 50 residential car parking spaces provided	Section 8

Item	Description of Requirement	Section Reference (this report)
(c)	Non-residential car parking to be provided in accordance with the following: (i) A maximum of 1 space for 435m^2 of GFA for any commercial uses (ii) A maximum of 2 spaces for use of the Waterloo Congregational Church **(iii)** Non-residential car share parking at rate of 1 space per 30 non-residential car parking spaces.	Section 8
B9	Future development applications must include a Car Parking Strategy and Management Plan adopting maximum residential parking cap and allocation rates above and demonstrate compliance with the following:	Section 8 A Car Park Management Plan has also been prepared separately to address Condition B9 (refer to Appendix 5 of TTPIA WMQ-BMNT-PTC-TF-RPT-001)
(a)	Accessible car parking spaces provided as per Sydney DCP 2012 rates	Section **8.1.4**
(b)	Motorcycle parking spaces provided as per Sydney DCP 2012 rates	Section 8.1.6
B10	Bicycle parking and end-of-trip facilities for the OSD shall be in accordance with the rates specified within the Sydney DCP 2012 for the final land use mix in the future development application.	Section 8.1.7 Section 8.1.8 Section 8.1.9 Section 8.1.10
B15	Future development applications shall be accompanied by a Traffic and Transport Impact Assessment	This report addresses Condition B15
B16	Future development applications shall include a Construction Traffic and Pedestrian Management Plan (CTMP) prepared in consultation with the Sydney Coordination Office and City of Sydney, and to the satisfaction of the relevant road authorities. The CTMP shall include, but not be limited to: (a) construction car parking strategy (b) haulage movement numbers/ routes including contingency routes (c) detailed travel management strategy for construction vehicles including staff movements	Section 14 (CPTMP has been prepared separately)

Item	Description of Requirement	Section Reference (this report)
	(d) maintaining property accesses (e) maintaining bus operations including routes and bus stops (f) maintaining pedestrian and cyclist links/ routes (g) independent road safety audits on construction related traffic measures (h) measures to account for any cumulative activities/ work zones operating simultaneously.	
B17	Independent road safety audits are to be undertaken for all stages of further design development involving road operations and traffic issues and cognisant of all road users. Any issues identified by the audits will need to be closed out in consultation with Sydney Coordination Office, RMS and/or City of Sydney to the satisfaction of the relevant roads authorities.	Independent road safety audits will be conducted (by a suitably qualified consultant) in due course when required in further design development involving road operations and traffic issues, cognisant of all road users.

Table 2 - Conditions of Concept Approval (SSD 9393)

4. The site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated about 3.3 kilometres south of Sydney CBD and eight kilometres northeast of Sydney International Airport within the suburb of Waterloo.

The Waterloo Metro Quarter site comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street (refer to Figure 1). The heritage-listed Waterloo Congregational Church at 103-105 Botany Road is within this street block but does not form a part of the Waterloo Metro Quarter site boundaries.

The Waterloo Metro Quarter site is a rectangular shaped allotment with an overall site area of approximately 1.287 hectares.

The Waterloo Metro Quarter site comprises the following allotments and legal description at the date of this report. Following consolidation by Sydney Metro (the Principal) the land will be set out in deposited plan DP1257150.

- 1368 Raglan Street (Lot 4 DP 215751)
- 59 Botany Road (Lot 5 DP 215751)
- 65 Botany Road (Lot 1 DP 814205)
- 67 Botany Road (Lot 1 DP 228641)
- 124-128 Cope Street (Lot 2 DP 228641)
- 69-83 Botany Road (Lot 1, DP 1084919)
- 130-134 Cope Street (Lot 12 DP 399757)
- 136-144 Cope Street (Lots A-E DP 108312)
- 85 Botany Road (Lot 1 DP 27454)
- 87 Botany Road (Lot 2 DP 27454)
- 89-91 Botany Road (Lot 1 DP 996765)
- 93-101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)
- 156-160 Cope Street (Lot 31 DP 805384)
- 107-117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 170-174 Cope Street (Lot 2 DP 205942).

The detailed SSD DA applies to the Southern Precinct (the site) of the Waterloo Metro Quarter site. The site has an area of approximately 4830sqm. The subject site comprises the following allotments and legal description at the date of this report.

- 130-134 Cope Street (Lot 12 DP 399757) (Part)
- 136-144 Cope Street (Lots A-E DP 108312) (Part)
- 93-101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891) (Part)

- 156-160 Cope Street (Lot 31 DP 805384)
- 107-117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)
  170-174 Cope Street (Lot 2 DP 205942).

The boundaries of the overall site are identified at Figure 1, and the subject site of the detailed SSD DA is identified at Figures 2 and 3. The site is reasonably flat with a slight fall to the south.

The site previously included three to five storey commercial, light industrial and shop top housing buildings. All previous structures except for an office building at the corner of Botany Road and Wellington Street have been demolished to facilitate construction of the new Sydney Metro Waterloo station. As such the existing site is predominately vacant and being used as a construction site. Construction of the Sydney metro is currently underway on site in accordance with critical State significant infrastructure approval (CSSI 7400).

Figure 1 - Aerial image of the site
Source: Urbis

The area surrounding the site consists of commercial premises to the north, light industrial and mixed-use development to the south, residential development to the east and predominantly commercial and light industry uses to the west.

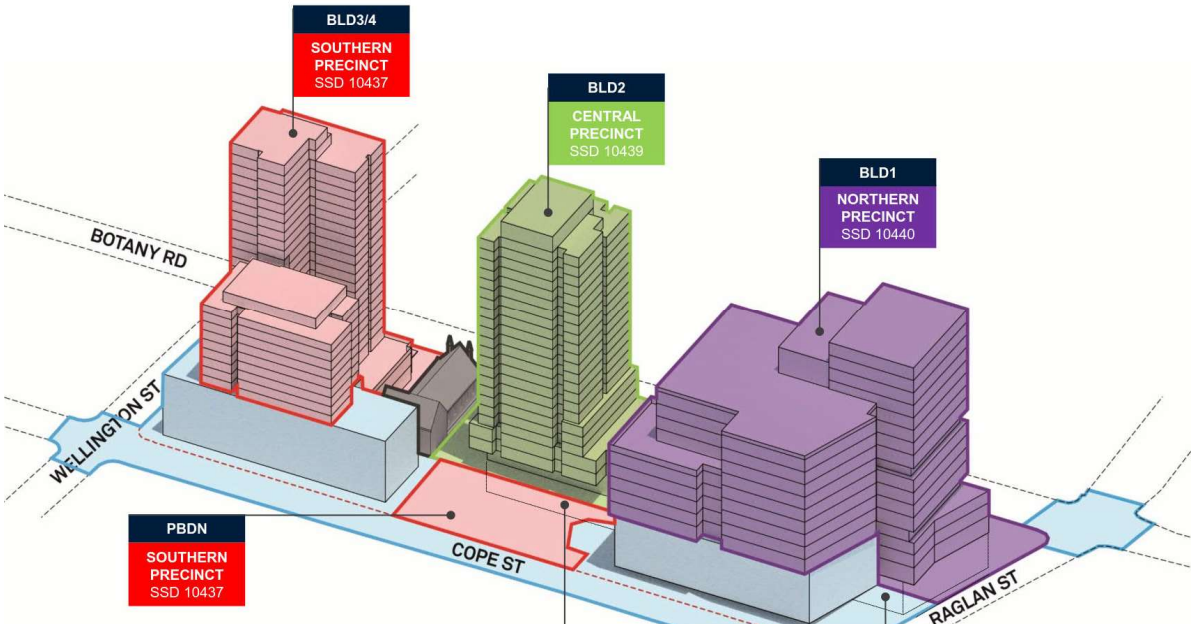


Figure 2 - Waterloo Metro Quarter site, with sub-precincts identified
Source: HASSELL

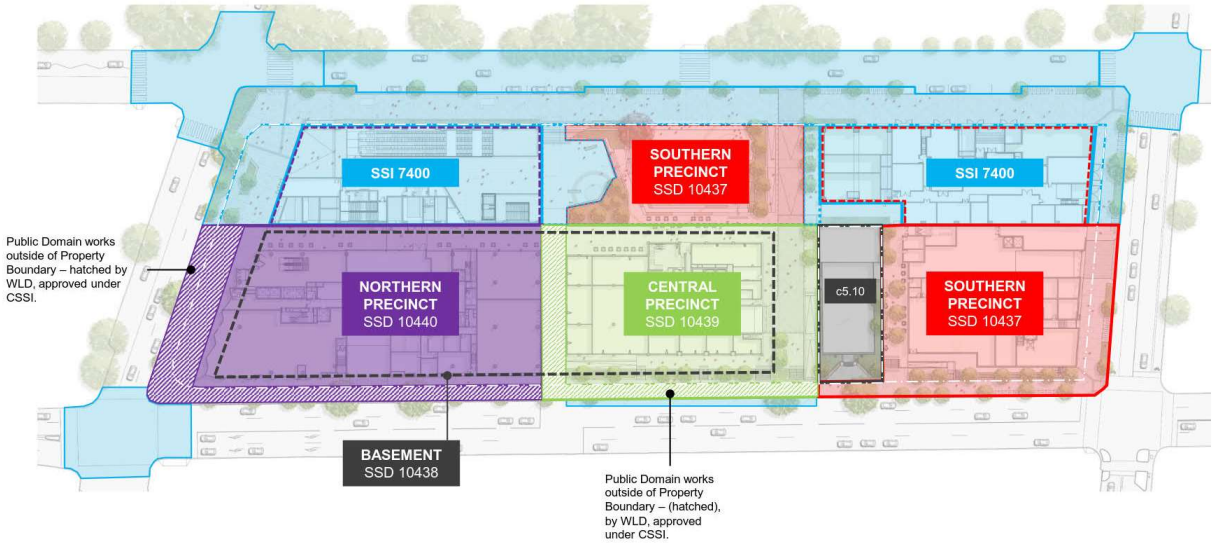


Figure 3 - Waterloo Metro Quarter site, with sub-precincts identified
Source: Waterloo Developer Pty Ltd

5. Background

5.1 About Sydney Metro

Sydney Metro is Australia's biggest public transport project. Services started in May 2019 in the city's North West with a train every four minutes in the peak. A new standalone railway, this 21st century network will revolutionise the way Sydney travels.

There are four core components:

5.1.1 Sydney Metro North West

This project is now complete and passenger services commenced in May 2019 between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and $1 billion under budget.

5.1.2 Sydney Metro City & Southwest

Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of Metro Northwest at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition, it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.

5.1.3 Sydney Metro West

Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs.

The locations of seven proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.

The NSW Government is assessing an optional station at Pyrmont and further planning is underway to determine the location of a new metro station in the Sydney CBD.

5.1.4 Sydney Metro Greater West

Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service.

The Australian and NSW governments are equal partners in the delivery of this new railway.

The Sydney Metro project is illustrated below.

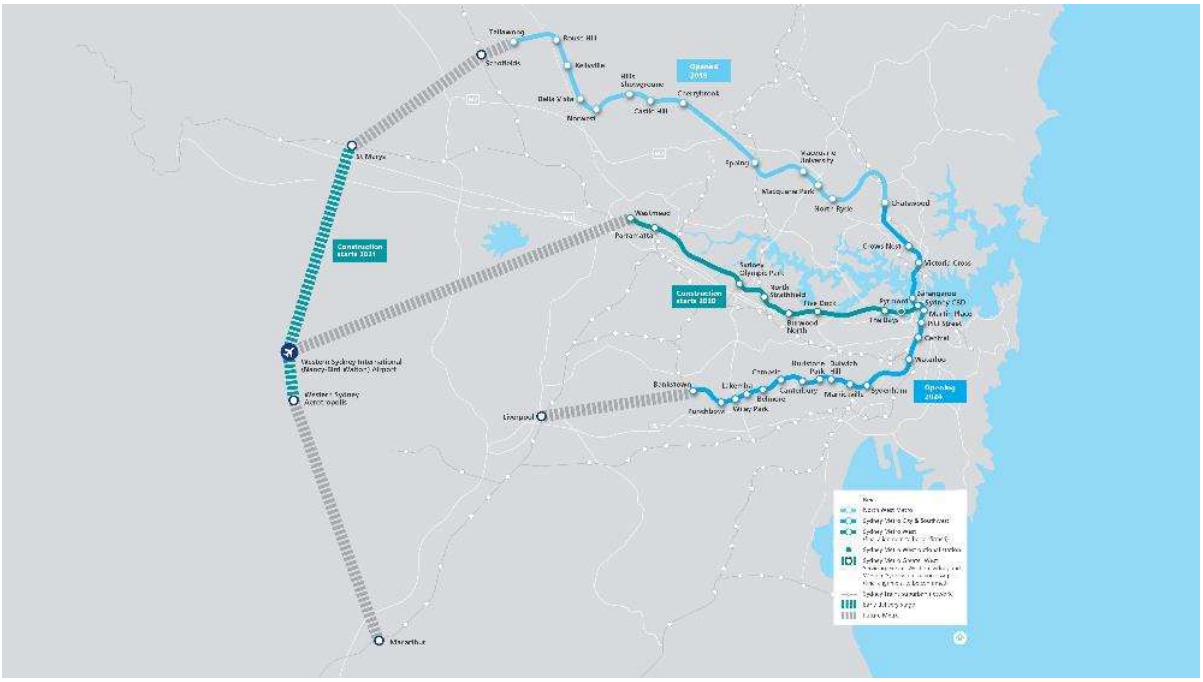


Figure 4 - Sydney Metro alignment map
Source: Sydney Metro

5.2 Sydney Metro CSSI Approval (SSI 7400)

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a critical State significant infrastructure (CSSI) project (reference SSI 7400) (CSSI approval). The terms of the CSSI approval includes all works required to construct the Sydney Metro Waterloo Station. The CSSI approval also includes the construction of below and above ground works within the metro station structure for appropriate integration with the OSD.

With regards to CSSI related works, any changes to the 'metro station box' envelope and public domain will be pursued in satisfaction of the CSSI conditions of approval and do not form part of the scope of the concept SSD DA or detailed SSD DA for the OSD.

Except to the extent described in the EIS or Preferred Infrastructure Report (PIR) submitted with the CSSI application, any OSD buildings and uses do not form part of the CSSI approval and will be subject to the relevant assessment pathway prescribed by the EP&A Act.

The delineation between the approved Sydney Metro works, generally described as within the two 'metro station boxes' and surrounding public domain works, and the OSD elements are illustrated in Figure 5.

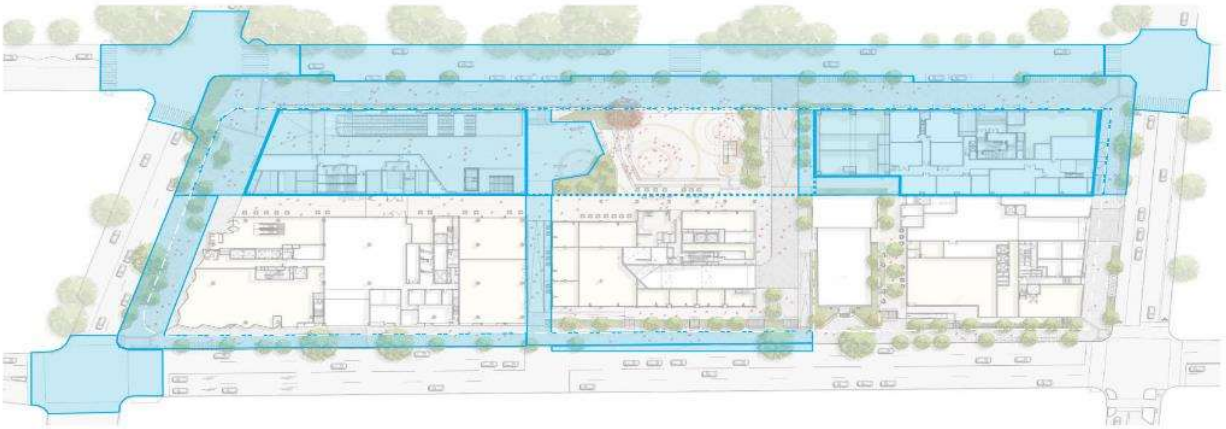


Figure 5 - CSSI Approval scope of works
Source: WL Developer Pty Ltd

5.3 Concept Approval (SSD 9393)

As per the requirements of clause 7.20 of the *Sydney Local Environmental Plan 2012* (SLEP), as the OSD exceeds a height of 25 metres above ground level (among other triggers), development consent is first required to be issued in a concept DA (formerly known as Stage 1 DA).

Development consent was granted on 10 December 2019 for the concept SSD DA (SSD 9393) for the Waterloo Metro Quarter OSD including:

- a maximum building envelope for podium, mid-rise and tower buildings
- a maximum gross floor area of 68,750sqm, excluding station floor space
- conceptual land use for non-residential and residential floor space
- minimum 12,000sqm of non-residential gross floor area including a minimum of 2,000sqm of community facilities
- minimum 5% residential gross floor area as affordable housing dwellings
- 70 social housing dwellings
- basement car parking, motorcycle parking, bicycle parking, and service vehicle spaces.

The detailed SSD DA seeks development consent for the OSD located within the Southern Precinct of the site, consistent with the parameters of this concept approval. Separate SSD DAs have been prepared and will be submitted for the Central Precinct, Northern Precinct and Basement proposed across the Waterloo Metro Quarter site.

A concurrent amending concept SSD DA has been prepared and submitted to the DPIE which proposed to make modifications to the approved building envelopes at the northern precinct and

central building. This amending concept SSD DA does not impact the proposed development within the southern precinct.

As outlined in Section 3.1, this TTPIA also addresses the Conditions B8, B9, B10, B15 and B16 of the Concept Approval (SSD 9393).

6. Proposed development

6.1 Waterloo Metro Quarter Development

The Waterloo Metro Quarter OSD comprises four separate buildings, a basement carpark and public domain works adjacent to the Waterloo Metro station.

Separate SSD DAs will be submitted concurrently for the design, construction and operation of each building in the precinct;

- Southern Precinct SSD-10437 (subject SSD DA),
- Basement Car Park SSD-10438,
- Central Precinct SSD-10439, and
- Northern Precinct-SSD-10440.

An overview of the Development is included below for context. This detailed SSD DA seeks development consent for the design, construction and operation of the Southern Precinct.

6.1.1 Southern Precinct [Subject DA]

The Southern Precinct comprises:

- 25-storey residential building (Building 3) comprising student accommodation, to be delivered as a mixture of studio and twin rooms with approximate capacity of 474 students
- 9 storey residential building (Building 4) above the southern station box to accommodate 70 social housing dwellings
- ground level retail tenancies including Makerspace and gymnasium lobby, and loading facilities
- level 1 and level 2 gymnasium and student accommodation communal facilities
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington Streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

An overview of the Southern Precinct SSD 10437 DA is provided below:

User Type	Units / GFA	Quantity
Residential - Student Accommodation	Studio Rooms	435 rooms (474 student beds)
Residential - Social Housing	Studio	26 Units
	1 Bedroom	2 Units
	2 Bedroom	34 Units
	3 Bedroom	8 Units
Retail	GFA	1,273m^2

Table 3- Summary of Southern Precinct SSD (SSD 10437)

- The car parking provision for the Southern Precinct (Buildings 3 and 4) is located within the shared basement of the Northern and Central Precincts as illustrated in Figure 6. This car park is accessed via Cope Street and the shared zone on Church Street.
- The development also includes a shared loading dock within the ground floor, accessed off Wellington Street as shown in Figure 7.

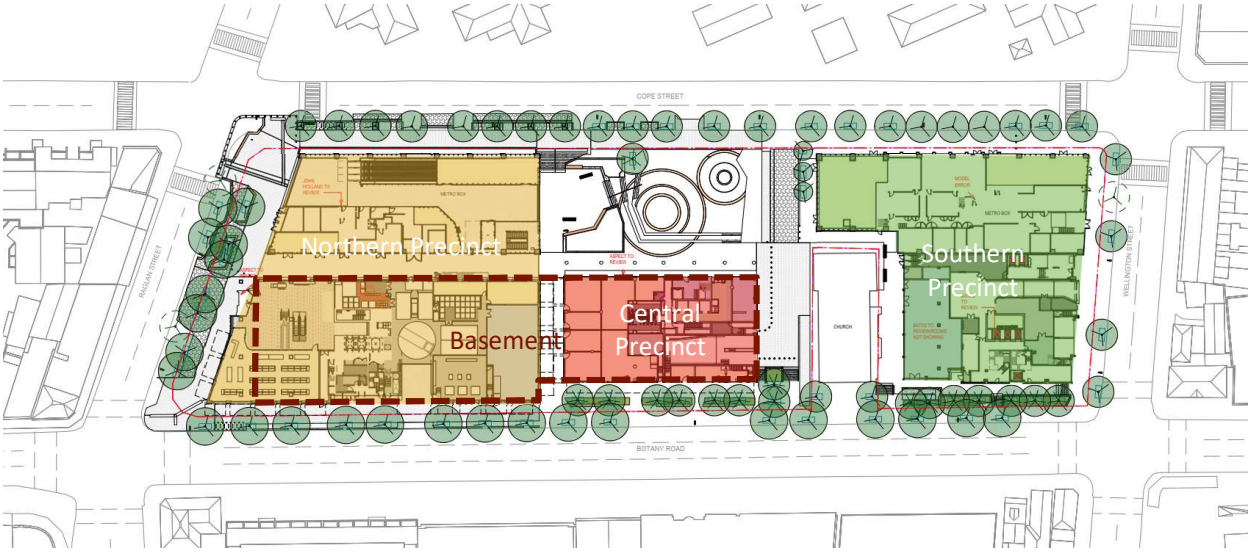


Figure 6 - Key Components of the WMQ Site

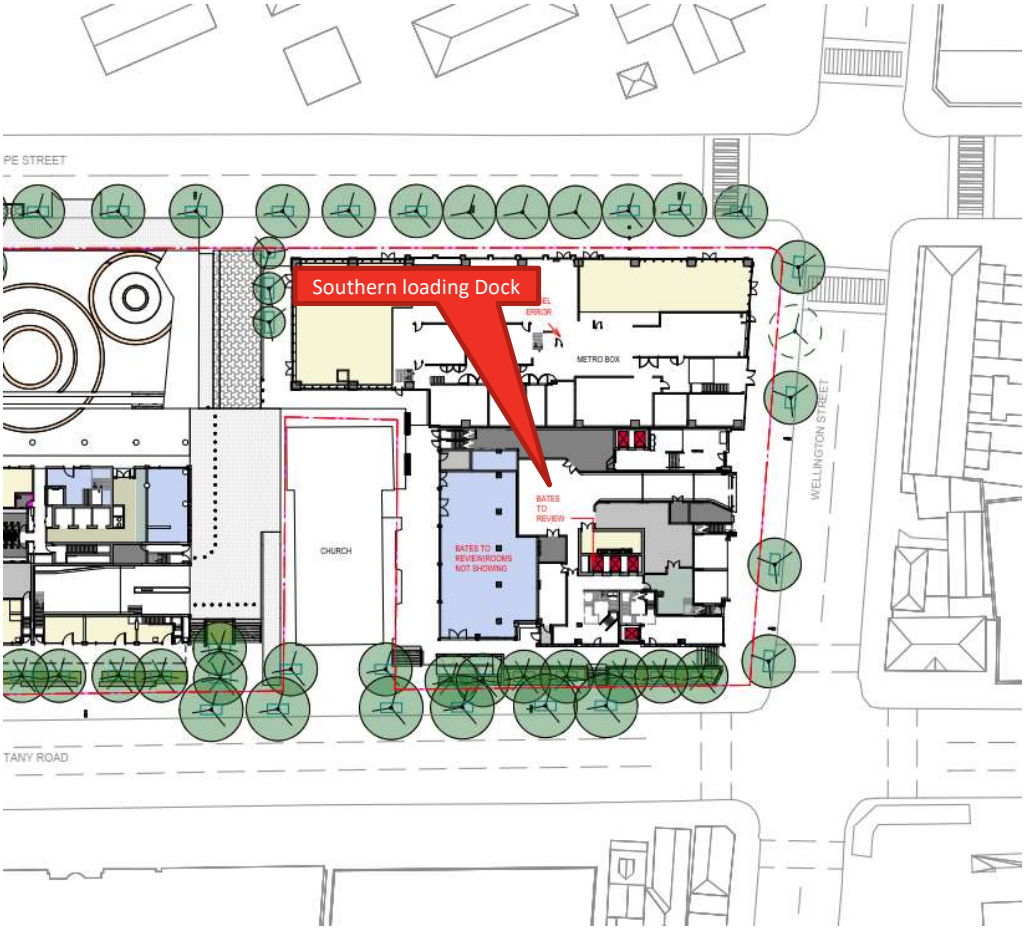


Figure 7 - Vehicular Access to Southern Loading Dock

6.1.2 Basement Car Park

The Basement Car Park comprises:

- 2-storey shared basement car park and associated excavation comprising
- Ground level structure
- Carparking for the Commercial Building 1, Residential Building 2, social housing Building 4, Waterloo Congregational Church and Sydney Metro
- Service vehicle bays
- commercial end of trip and bicycle storage facilities
- Retail end of trip and bicycle storage facilities
- residential storage facilities
- shared plant and services.

6.1.3 Central Precinct

The Central Precinct comprises:

- 24-storey residential building (Building 2) comprising approximately 126 market residential and 24 affordable housing apartments, to be delivered as a mixture of 1 bedroom, 2 bedroom and 3 bedroom apartments
- Ground level retail tenancies, community hub, precinct retail amenities and basement car park entry
- level 1 and level 2 community facilities (as defined in the SLEP) intended to be operated as a childcare centre
- landscaping and private and communal open space at roof top levels to support the residential accommodation
- new public open space including the delivery of the Church Square, including vehicle access to the basement via a shared way from Cope Street, expanded footpaths and public domain upgrades on Botany Road
- external licensed seating areas
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

6.1.4 Northern Precinct

The Northern Precinct comprises:

- 17-storey commercial building (Building 1) comprising Commercial floor space, with an approximate capacity of 4000 workers
- ground level retail tenancies, loading dock facilities serving the northern and central precinct including Waterloo metro station
- landscaping and private open space at podium and roof top levels to support the commercial tenants
- new public open space including the delivery of the Raglan Street Plaza, Raglan Walk and expanded footpaths on Raglan Street and Botany Road and public domain upgrades
- external licensed seating areas
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

7. Existing Transport Facilities

7.1 Road Hierarchy

The subject site is located in the suburb of Waterloo and is primarily serviced by Botany Road which is classified as a State Road. The road network servicing the area comprises a number of State Roads, making the site easily accessible from different regions of the metropolitan area. The road network in this area also comprises several local streets providing direct access to the surrounding retail, commercial and residential land-uses.

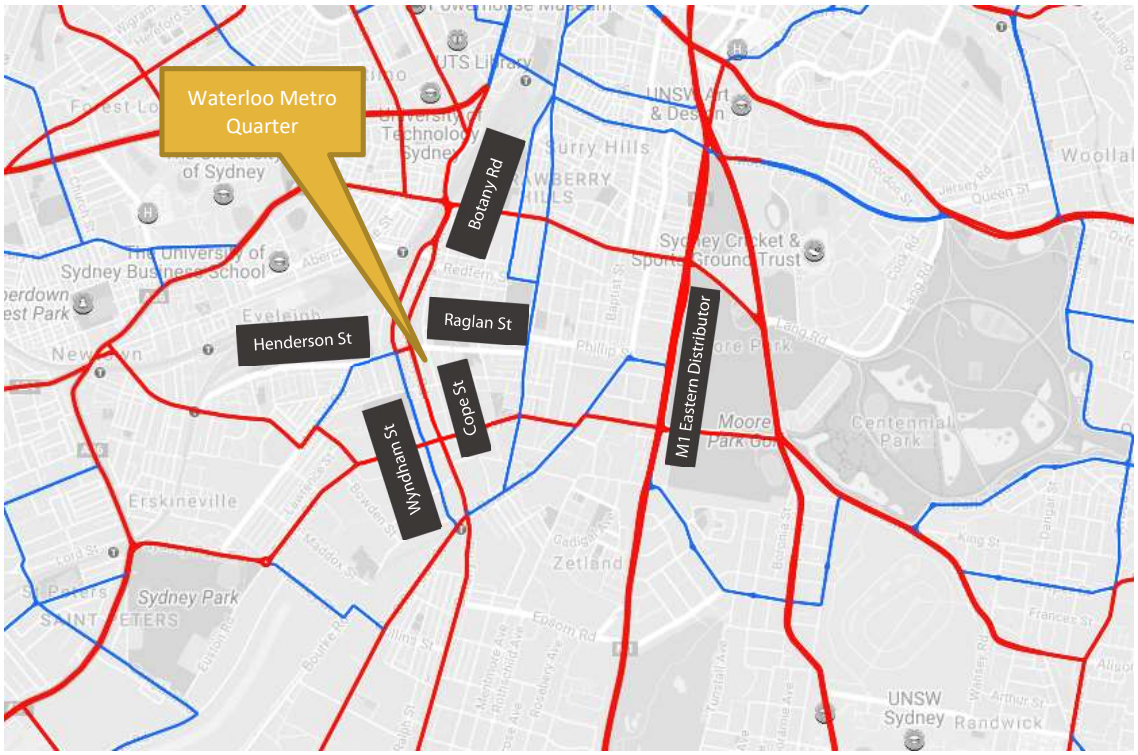


Figure 8 - Road Hierarchy

The NSW administrative road hierarchy comprises the following road classifications, which align with the generic road hierarchy as follows:

- State Roads — Freeways and Primary Arterials (RMS Managed)
- Regional Roads — Secondary or sub arterials (Council Managed, Part funded by the State)
- Local Roads — Collector and local access roads (Council Managed)

A summary of the existing road network is shown in the following tables and figures.

Botany Road	
Road Classification	State Road
Alignment	North - South
Number of Lanes	2 lanes in each direction
Carriageway Type	Undivided
Carriageway width	12m (6m in each direction)
Speed Limit	50 km/hr
School Zone	Yes, north of the Botany Road / Bourke Street intersection
Parking Controls	Time restricted on-street parking, with clearways in operation during peak periods
Forms Site Frontage	Yes

Table 4 - Existing Road Network - Botany Road

Figure 9 - Botany Road (south bound from Henderson Street)

Cope Street	
Road Classification	Local Road
Alignment	North - South
Number of Lanes	1 lane in each direction
Carriageway Type	Undivided
Carriageway width	12m (6m in each direction)
Speed Limit	50 km/hr
School Zone	No
Parking Controls	Typically unrestricted parking along site frontage
Forms Site Frontage	Yes

Table 5 - Existing Road Network - Cope Street

Figure 10 - Cope Street (south bound from Raglan Street)

Raglan Street	
Road Classification	Local Road
Alignment	East-west
Number of Lanes	2 lanes in each direction
Carriageway Type	Undivided
Carriageway width	12m (6m in each direction)
Speed Limit	60km/hr
School Zone	No
Parking Controls	Typically 1P parking along site frontage; Loading Zone on northern side of carriageway
Forms Site Frontage	Yes

Table 6 - Existing Road Network - Raglan Street

Figure 11 - Raglan Street (west bound from Cope Street)

Wellington Street	
Road Classification	Local Road
Alignment	East - West
Number of Lanes	1 lane in each direction
Carriageway Type	Divided
Carriageway Width	12m (6m in each direction)
Speed Limit	50 km/hr
School Zone	No
Parking Controls	Typically varies between unrestricted parking, '1P', and 'Loading Zone'.
Forms Site Frontage	Yes

Table 7 - Existing Road Network - Wellington Street

Figure 12 - Wellington Street (west bound from Cope Street)

7.2 Public Transport

The subject site was assessed for its potential accessibility via modes of existing public transport likely to be utilised by prospective residents, employees and visitors of the proposed development. When defining accessibility, the NSW Guidelines to Walking & Cycling (2004) suggest that 400m-800m is a comfortable walking distance.

7.2.1 Metro

With reference to Section 5.1, the Waterloo Metro Station is expected to commence operation in 2024 which will provide a convenient public transport option for prospective residents, employees and visitors of Waterloo Metro Quarter. Once completed, Sydney Metro will have the ultimate capacity for a metro train every two minutes in each direction under the city, a level of service never seen before in Sydney.

7.2.2 Trains

The development site is located less than 650 metres walking distance from Redfern Station, to the north and 900 meters from Green Square Station, to the south.

These stations operate the following services:

Line	Coverage
T1 - North Shore & Western Line	North Shore, Western and Richmond
T2 - Inner West & Leppington Line	City, Inner West and Leppington
T3 - Bankston Line	City, Liverpool and Lidcombe
T4 - Eastern Suburbs & Illawarra Line	Eastern Suburbs, Illawarra and Cronulla
T8 - Airport & South Line	City and South
T9 - Northern Line	Gordon and Northern

Table 8 - Train Service Summary

Redfern station is also served by regional lines including Blue Mountains line, Central Coast & Newcastle line and South Coast line.

7.2.3 Buses

A number of bus stops have been identified within walking distance of the development, as shown in Figure 13 and Figure 14. The Routes servicing these stops are summarised in Table 9.

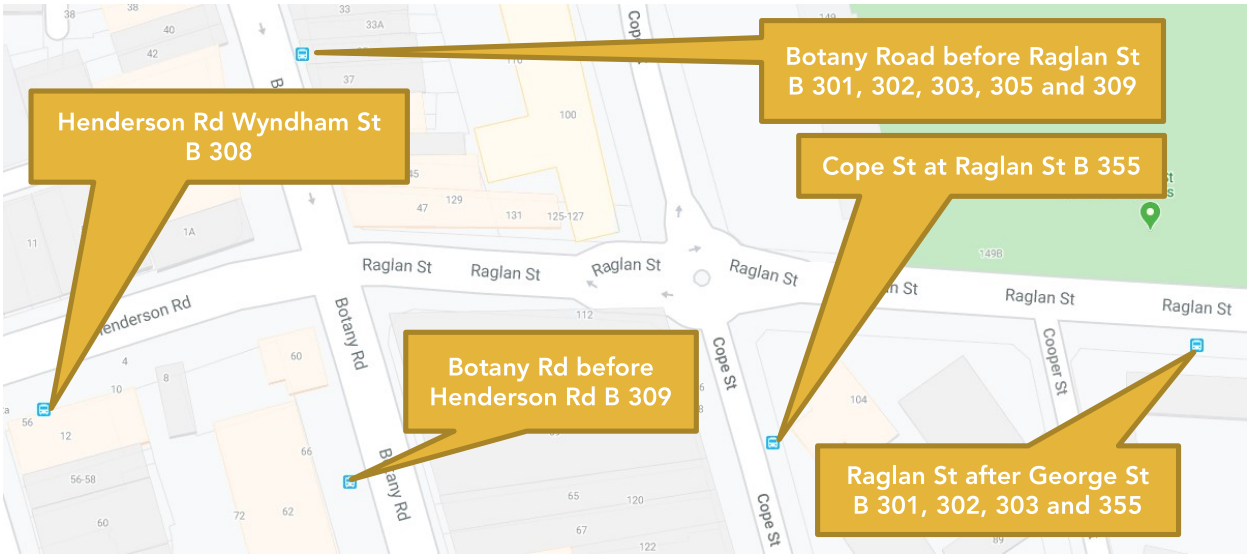


Figure 13 - Local Bus Stops

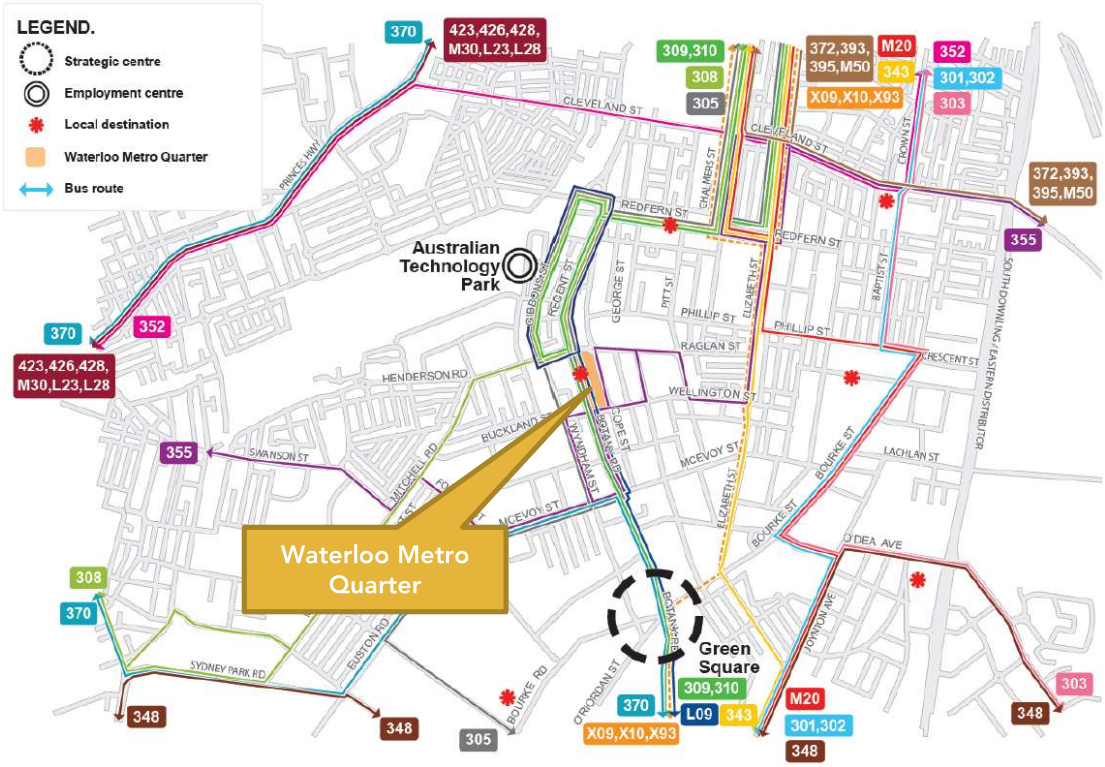


Figure 14 - Bus Network in the Vicinity of the Development

Bus Route	Coverage	Operation
301	City to Eastgardens	Operates all week. 10 minute peak headway, 20-30minute off-peak headway.
302	City to Eastgardens	Operates all week. 60 minute headway.
303	City to Sans Souci	Operates all week. 5-10 minute peak headway, 20-30minute off-peak headway.
305	Railway Square to Mascot	Weekday-only service with a 20 minute headway in the peak direction.
308	Marrickville Metro to Central Eddy Ave via Redfern (Loop Service)	Operates all week. 15 minute peak headways.
309	Railway Square to Port Botany	Operates all week. 10 minute peak headways.
355	Bondi Junction to Marrickville Metro	Operates all week. Typical 30 minute headway.

Table 9 - Bus Services Summary

In consideration of the number of existing public transport options, their combined coverage throughout the Sydney metropolitan region and medium to high frequency headways, the site is very well placed in the context of public transport, with the potential to significantly reduce car-mode travel.

7.3 Active Travel

7.3.1 Bicycle Network

The regional cycle network surrounding Waterloo is shown in Figure 19.
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: 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 15 - Existing and Planned Cycle Network

7.4 Proposed Public Transport Upgrades

In addition to the development of the Waterloo Metro Station, as outlined in Section 5.1.2, as part of the development of the nearby Green Square Town Centre (GSTC), the Green Square Urban Renewal Area (GSURA) Transport Management & Accessibility Plan (TMAP Volume 2, 2008) identifies a number of measures intended to increase public transport usage as part of the vision to achieve a "no car growth" scenario over the next 25 years. It is acknowledged that a draft TMAP was produced in 2012, and is yet to be publicly released, however, it is assumed that the following major upgrades are still relevant:

- Action plans to progress the goal of establishing/improving a number of transit corridors, including the Botany Road Transit Corridor and the new Eastern Transit corridor, with the intention of establishing the "Green Loop" to connect Green Square with Redfern Station, Central Station and Surry Hills through high frequency services via dedicated buses (short term), which are to be eventually replaced by a new light rail service (see Figure 16);
- Upgrades to Green Square Train Station capacity, to achieve 20 trains/hour/way during peak commuter hours. This will be largely controlled by the progress of the Sydney Metro project;
- Forecasting and implementation of additional bus services and route changes to manage population growth; and
- Fleet upgrades.

The TMAP has identified that in the context of the overall GSURA, the GSTC has the potential to instigate significant shifts towards non-car mode shares. This potential arises from low-density industrial and manufacturing employment areas being redeveloped into high-density commercial and retail precincts, providing greater opportunities for public transport.

It is understood that many of the upgrades identified within the TMAP (2008) have not yet been implemented, but that a Green Square Transport Working Group (chaired by CoS) and Green Square Steering Committee (chaired by UrbanGrowth NSW) has been established to provide cross-agency coordination in the planning and implementation of these upgrades.

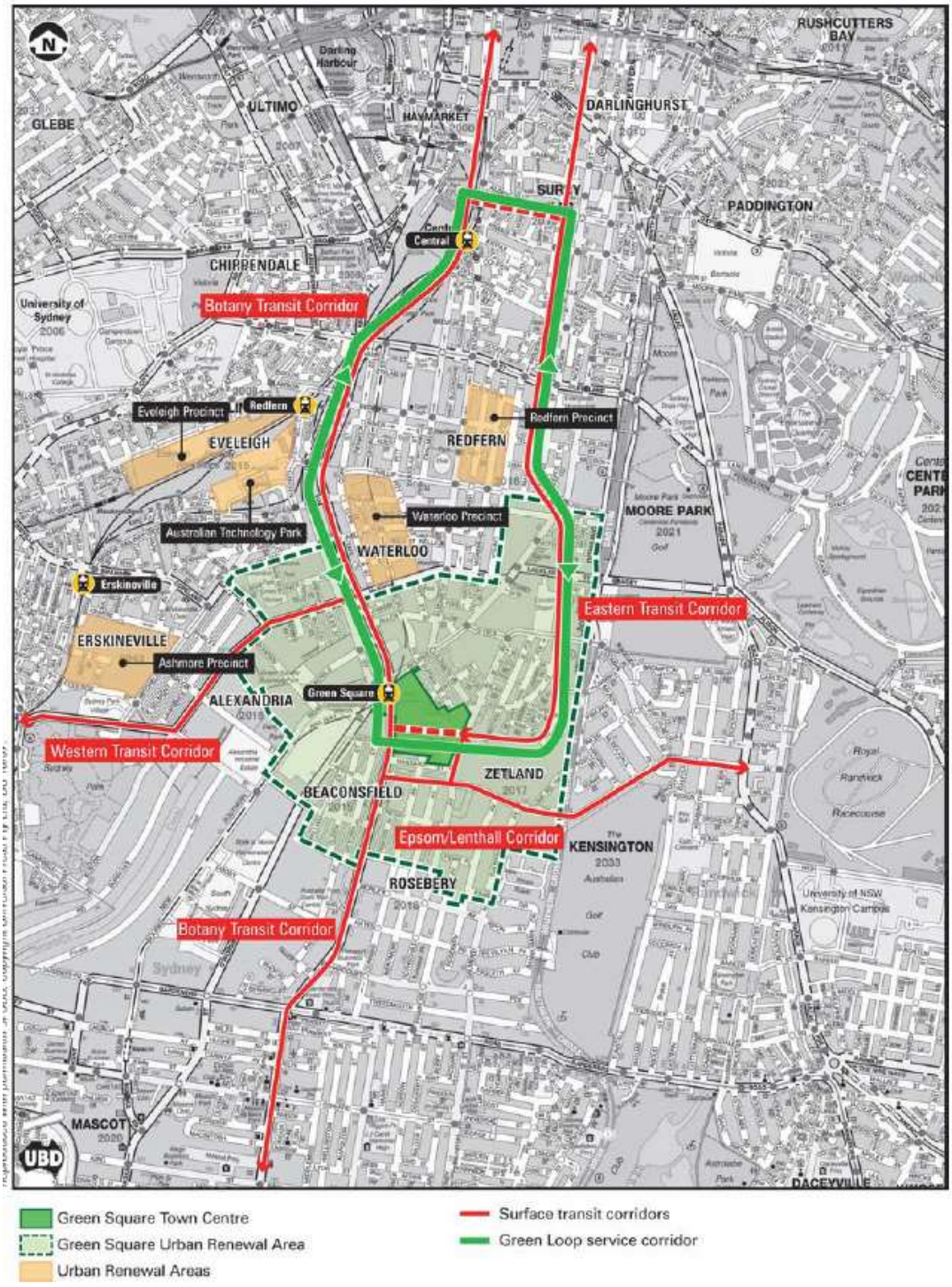


Figure 16 - Potential Transport Network

7.5 Existing Travel Behaviour

An assessment of the existing travel behaviour within the suburb of Waterloo has been undertaken in relation to the following:

- Travel to work, Waterloo as a place of work
- Travel to work, Waterloo as a place of residence

The data has been taken from the Australian Bureau of Statistics 2016 Census and is summarised in Table 10 and Table 11.

Travel to Work (Waterloo as a place of work)	
Mode of Travel	**Percentage (%)**
Train	17.18%
Bus	5.96%
Ferry	0.05%
Tram	0.02%
Car (as driver)	55.91%
Car (as passenger)	3.43%
Bicycle	1.51%
Walked only	5.53%
Other mode	0.42%
Worked at home	3.66%
Did not go to work	5.66%
Not stated	0.84%

Table 10 - Existing Travel behaviour - Travel to Work, Waterloo as a place of work

Travel to Work (Waterloo as a place of residence)	
Mode of Travel	**Percentage (%)**
Train	19.59%
Bus	20.92%
Ferry	0%
Tram	0.06%
Car (as driver)	32.40%
Car (as passenger)	3.63%
Bicycle	3.49%
Walked only	8.38%
Other mode	0.63%
Worked at home	3.36%
Did not go to work	6.74%
Not stated	0.80%

Table 11 - Existing Travel behaviour - Travel to Work, Waterloo as a place of residence

In summary, when travelling to Waterloo as a place of work, approximately 59% of staff travel to work by car, 23% travel to work via public transport and 7% travel by an active mode of travel.

When travelling to work from Waterloo, approximately 36% travelled by car, 41% travel to work via public transport and 12% travel by an active mode of travel.

8. Parking Provision

8.1 Planning Policy

The proposed development is subject to the parking requirements stipulated in the City of Sydney Local Environmental Plan 2012, City of Sydney Development Control Plan 2012, RMS Guide to Traffic Generating Developments and SSD 9393, Conditions of Consent, issued by the Department of Planning, Industry and Environment on 10th December 2019.

Reference has also been made to the Waterloo Metro Quarter Design and Amenity Guidelines, in particular Design Criteria 3O - Car Parking and Access and Criteria 3P - Service Vehicles and Waste Collection. Furthermore, the Waterloo Metro Quarter Design and Amenity Guidelines encourage the reduction of on-site parking as per the aforementioned design objectives.

In accordance with the City of Sydney Local Environmental Plan, 2012, the development site is classified as Category A for residential land uses and Category D for non-residential land uses.

In accordance with Clause 11 of the State Environmental Planning Policy State and Regional Development 2011 (SRD SEPP), the provisions of the Sydney Development Control Plan 2012 (SDCP) do not apply to this development (unless specified by the Concept Approval Conditions of Consent). Notwithstanding this, the SDCP 2012 has been considered as a parking rate reference point for the detailed design of the proposed developments.

A summary of the permissible and proposed parking provisions for the Southern Precinct (Buildings 3 and 4) of the development is summarised in Table 12. The parking provisions associated with the Southern Precinct will be provided within the shared basement car park for the entire WMQ site.

Refer to the separate TTPIA prepared for the Basement (SSD 10438) for details relating to the parking provision assessment.

Southern Precinct (Building 3)				
User Type	**Units / GFA / Spaces**	**LEP/DCP/RMS Parking Rate[1]**	**Maximum Permissible Spaces**	**Proposed Parking Spaces**
Student Accommodation - Studio	435 rooms (474 beds)	0.1 spaces per room[2]	44	0
Student Accommodation Visitors	435 rooms (474 beds)	-	-	0

[1] Parking rate is a maximum rate, unless otherwise specified.
[2] Design amenity rate for reference in relation to student accommodation (boarding houses)

Southern Precinct (Building 3)				
User Type	**Units / GFA / Spaces**	**LEP/DCP/RMS Parking Rate[1]**	**Maximum Permissible Spaces**	**Proposed Parking Spaces**
Retail	1,273m^2	1 Space per 435m^2 GFA	3	0
Total Permissible Car Spaces (Maximum)			**47**	**0**
Service Bays - Residential	435 rooms (474 beds)	No requirement	-	1*
Total Required Service Spaces (Minimum)*			**-**	**1***

**** Although there is no service vehicle parking requirement for student accommodation, ptc. have reviewed schemes for Iglu and Urbanest and the proposed loading and servicing of 1 MRV bay is consistent with these schemes.***

Southern Precinct (Building 4)				
User Type (Social Housing)	**Units / GFA / Spaces**	**LEP/DCP Parking Rate[3]**	**Maximum Permissible Spaces**	**Proposed Parking Spaces**
Studio	26 units	0.1 spaces per unit	3	
One-bed unit	2 units	0.3 spaces per unit	1	
Two-bed unit	34 units	0.7 spaces per unit	24	
Three-bed + unit	8 units	1 space per unit	8	
Residential - Social Housing	**70 units**	**Combined**	**36**	**8**
Residential - Social Housing Visitors	70 units	-	-	0
Car Share - Residential (Social Housing)	8 spaces	1 per 50 spaces	0	0
Total Permissible Car Spaces (Maximum)			**36**	**8**

[3] Parking rate is a maximum rate, unless otherwise specified.

Southern Precinct (Building 4)				
User Type (Social Housing)	**Units / GFA / Spaces**	**LEP/DCP Parking Rate[3]**	**Maximum Permissible Spaces**	**Proposed Parking Spaces**
Service Bays	70 units	1 space for 1st 50 units & 0.5 spaces per 50 units + (DCP min)	2 (min)	1**
Total Required Service Bays (Minimum)			**2 (min)**	**1****

***** 1 MRV service bay is provided within the southern loading dock and the development also utilises 5 service bays located within the basement car park. This is to be managed by the Freight & Servicing Management Plan (refer to Appendix 6 - Freight & Servicing Management Plan)***

Table 12 - Parking Provision Summary (Southern Precinct)

8.1.1 Student Accommodation Parking Provision

The provision of zero parking spaces for the Student accommodation is considered appropriate for the following reasons:

- The scheme will be located above Waterloo Metro station with high frequency train services. Furthermore, Redfern Station is within close proximity;
- Students are likely to walk to their main commuting destination (education campuses), particularly given that University of Sydney and the University of Technology, Sydney are likely to be the predominant places of study and are both within easy walking distance to the site;
- Students are typically less likely to own cars than regular residential occupants;
- Public transport use, walking and cycling will be promoted through green travel plan initiatives;
- The provision of no car parking is consistent with the planning controls across city of Sydney which provide maximum rather than minimum controls for on-site car parking; and
- The exclusion of on-site car parking is consistent with other student housing facilities located in the City of Sydney.

8.1.2 Student Accommodation Service Vehicle Provision

The student accommodation rooms are offered on a furnished basis whilst also being managed by a single owner operator. The loading and servicing requirements are therefore deemed to be very low and can be adequately managed through access to the single loading dock MRV space located under Building 3. This is consistent with other similar operated facilities in the City of Sydney. Management of loading docks will be guided by the Freight and Servicing Management Plan (refer to Appendix 6 - Freight & Servicing Management Plan).

8.1.3 Retail Parking Provision

The zero parking provision for the retail premises is on the basis that these facilities are expected to be utilised by residential occupants of the development, therefore, would be undertaken as part of a combined trip, utilising parking already provided within the development or by public transport.

8.1.4 Accessible and Adaptable Parking Provision

With reference to Section 7.8.5 - Accessible Car Parking Spaces of the DCP, the following accessible car parking provision is required:

- One accessible car parking space is to be provided for every adaptable residential unit.
- One space for every 20 car parking spaces or part thereof is to be allocated as accessible visitor parking

The development includes the provision of 13 residential accessible/adaptable car spaces (included within the total provision 77 residential car spaces[4] within the shared basement car park for the whole WMQ). Of the 13 residential accessible/adaptable spaces, there are 2 residential accessible spaces allocated to visitors.

The proposed number of accessible spaces is based on the rationale for accessible/adaptable parking provision rates advised by Morris Goding Access Consultants (refer to DDA Assessment - Appendix S of the subject SSD DA EIS).

8.1.5 Loading Dock Service Bay Provision

Access to the loading docks will be managed by a Freight & Servicing Management Plan (refer to Appendix 6 - Freight & Servicing Management Plan) which will set the process and procedures for vehicles using the docks.

8.1.6 Proposed Motorcycle Provision

The DCP stipulates a minimum motorcycle parking requirement of 1 motorcycle space for every 12 car parking spaces. With 10 car parking spaces proposed, this results in a minimum motorcycle parking requirement amounting to the area of 1 motorcycle bay.
The proposed development provides 1 motorcycle space (residential), therefore meeting the minimum requirement of the DCP.

8.1.7 Proposed Bicycle Provision

To promote active transport, the DCP (residential) as required by Concept Approval Condition of Consent B10, State Environmental Planning Policy (Affordable Rental Housing[6]) 2009 (AH SEPP) and the City of Sydney Cycling Strategy and Action Plan (gym and community spaces), which outlines the minimum bicycle parking requirements that cater for residents, employees and visitors cycling to and from the site.

[4] Parking provision includes all components of the development in all precincts of the WMQ. Figure has been calculated based on the combined requirement for all precincts rather than for each precinct for simplicity.
[6] No specific parking rate is stipulated within the DCP for student housing. Therefore, the most appropriate rate is considered to be the bicycle parking rate for boarding houses outlined within the AH SEPP despite the SLEP not requiring the application of the AH SEPP for the Waterloo Metro Quarter site.

The bicycle parking requirements and provisions are set out in Table 13.

Use Type	Units/GFA/ Staff	Bicycle Parking Requirement	Required Spaces	Provided Spaces	Class
Residential - Social Housing	70 units	1 space per unit	70	70	Class 2
Residential - Student Accommodation	435 rooms (474 beds)	1 space per 5 rooms	87	87	Class 2
Retail Staff	1,273 m^2	1 space per 250m^2	5	5	Class 2
Retail Visitors	1,273 m^2	2 + 1 / 100m^2 over 100m^2	14	15	Class 3
Residential Social Housing - Visitors	70 units	0.1 spaces per unit	7	7	Class 3
Residential Student Accommodation - Visitors	435 rooms (474 beds)	No Requirement	0	0	
TOTAL			**183**	**184**	

Table 13 - Proposed Bicycle Parking Provision (Southern Precinct)

Secure bike parking facilities are to be provided in accordance with the following:

- Class 1 (Class A AS2890.3) bike lockers for occupants of residential buildings;
- Class 2 (Class B AS2890.3) bike facilities for staff/employees of any land use; and
- Class 3 (Class C AS2890.3) bike rails for visitors of any land use

Bicycle facility security levels should be a minimum as follows:

- Class A - An individual locker with a high security locking mechanism
- Class B - A secure room or structure, protected from the weather, containing bicycle parking devices that allow users to lock the bicycle frame and both wheels.
- Class C - A bicycle parking space, where the frame and both wheels can be locked to a bicycle parking device using the owners own locking device.

8.1.8 Student Accommodation Bicycle Provision

The Concept Approval conditions for SSD 9393 require the SDCP rates to apply for bicycle parking. It is noted that the SDCP does not provide a specific bicycle parking rate for student accommodation and therefore, the most appropriate rate is considered to be the bicycle parking rate outlined within the State Environmental Planning Policy (Affordable Rental Housing) 2009 (AH SEPP), despite the SLEP not requiring the application of the AH SEPP for the Waterloo Metro Quarter site.

In light of the above, the bicycle provision for the Residential - Student Accommodation, has been calculated using the AH SEPP, which stipulates that *'1 bicycle space shall be provided for every 5 boarding rooms*'. This is consistent with a large number of student accommodation developments recently constructed within the City of Sydney LGA.

It should also be noted that surveys undertaken on four student accommodation sites within the City of Sydney, at Central, Central Park, Redfern and Broadway, indicated the following:

Location	Number of Units	Bicycle Parking Provision	Maximum Bike Parking Usage	Bike Space Usage (% of units)
Central	98	32	5	5.1%
Central Park	770	179	32	4.2%
Broadway	271	36	7	2.6%
Redfern	370	154	13	3.5%

Table 14 - Student Accommodation Bicycle Occupation Surveys

As indicated, in Table 14, the usage of the bicycle parking provided within the sampled student accommodation sites is a maximum of 5.1% and therefore well below the proposed 1 bicycle space per 5 units (20%) proposed for this development and therefore the proposed provision of 87 resident bicycle spaces deemed appropriate for the development.

8.1.9 Proposed Bicycle and End of Trip Facility Provision Allocation

As outlined in 8.1.7, Bicycle parking and EoTF provisions are proposed according to the requirements of each user group.

Table 15 outlines the location of the bicycle parking and EoTF throughout the development.

Use Type	Class	Quantity	Location	EoTF Y/N	Quantity (refer to Table 16)
Residential - Social Housing	1	70	Building 3 - Ground Floor, Mezzanine and Level 1	N	N/A
Residential - Student Accommodation	1	87	Building 3 - Ground Floor, Mezzanine and Level 1	N	N/A
Retail Staff	2	5	Basement Level 1	Y	Lockers - 5 Showers - 1
Retail Visitors	3	14	Southern Precinct	N	N/A
Residential - Student Accommodation Visitors	3	0	N/A	N	N/A
Residential Social Housing - Visitors	3	7	Southern Precinct	N	N/A
TOTAL		**183**			

Table 15 - Proposed Bicycle Parking and EoTF Allocation

a

8.1.10 End of Trip Facilities (EoTF)

As required by the concept approval conditions for non-residential uses, the following facilities for bike parking are to be provided at the following rates in accordance with the SDCP:

(a) 1 personal locker for each bike parking space;
(b) 1 shower and change cubicle for up to 10 bike parking spaces;
(c) 2 shower and change cubicles for 11 to 20 or more bike parking spaces are provided;
(d) 2 additional showers and cubicles for each additional 20 bike parking spaces or part thereof;
(e) showers and change facilities may be provided in the form of shower and change cubicles in a unisex area in both female and male change rooms; and
(f) locker, change room and shower facilities are to be located close to the bike parking area, entry and exit points and within an area of security camera surveillance where there are such building security systems.

In accordance with the DCP requirements the following EoTF are proposed:

Use Type	Bicycle Spaces Provided	Lockers Provided	Shower and Change Cubicles Provided
Retail Staff	5	4	1

Table 16 - EoTF

These are located of the EoTFs are outlined in Table 15.

9. Development Traffic Assessment

The development traffic assessment has been undertaken for the whole WMQ site and outlined in Section 10 of the Amending Concept SSD DA (SSD 10441) TTPIA (WMQ-SITE-PTC-TF-RPT-001). The following sections summarise the existing and development traffic activity for the whole WMQ site but also outlines the traffic generation for the Southern Precinct.

9.1 Proposed Development Traffic Assessment

The proposed development traffic impact assessment has been undertaken with reference to the RMS Guide to Traffic Generating Developments (2002), and intersection survey data collected on Tuesday 12th March 2020.

9.1.1 Existing Traffic Generation

The development is proposed on land which is currently vacant and therefore does not generate any traffic activity. However, construction works are being undertaken within the site and the traffic activity associated with construction would be captured within the traffic surveys for the development traffic assessment (refer to Section 9.1.2).

9.1.2 Existing Traffic Volumes and Distribution

To determine the current traffic volumes within the vicinity of the development site, intersection surveys were conducted on Tuesday 12th March 2020, between 7.30am - 9.30am and 4.00pm - 7.00pm at the following intersections:

- Henderson Road and Wyndham Street (4 arm signalised intersection)
- Botany Road, Henderson Road and Raglan Street (4 arm signalised intersection)
- Raglan Street and Cope Street (4 arm roundabout)
- Cope Street and Wellington Street (4 arm roundabout) and
- Botany Road, Buckland Street and Wellington Street (4 arm signalised intersection).

It should be noted that the traffic surveys were undertaken prior to any restrictions placed on movement (on 22nd March 2020) by the Covid-19 outbreak.

The intersection location surveys are shown in Figure 17.

Figure 17 - Location of Intersection Surveys

9.1.3 Existing Peak Hour Traffic Volumes

The peak hour for the corresponding intersections has been determined as follows:

- Henderson Road and Wyndham Street — 7.45am to 8.45 am - 2812 vehicles; 5.15pm to 6.15pm - 2995 vehicles
- Botany Road, Henderson Road and Raglan Street — 7.45am to 8.45am - 3162 vehicles; 5.45pm to 6.45pm - 3272 vehicles
- Raglan Street and Cope Street — 8.15am to 9.15am - 732 vehicles; 5.30pm to 6.30pm - 806 vehicles
- Cope Street and Wellington Street — 8.30am to 9.30am - 487 vehicles; 5.15pm to 6.15pm - 510 vehicles
- Botany Road, Buckland Street and Wellington Street — 7.45am to 8.45am - 2376 vehicles; 5.15pm to 6.15pm - 2303 vehicles

Tabulated results of the traffic surveys are shown in Table 17 to Table 21.

Approach	Wyndham St				Henderson Rd				Wyndham St				Henderson Rd				Grand Total
Time Period	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	
7:30 to 8:30	384	36	15	435	1,403	91	8	1,502	0	0	1	1	670	44	7	721	2,659
7:45 to 8:45	402	36	22	460	1,519	77	10	1,606	0	0	1	1	697	42	6	745	2,812
8:00 to 9:00	400	33	27	460	1,500	93	10	1,603	0	0	1	1	677	52	8	737	2,801
8:15 to 9:15	384	29	24	437	1,457	101	9	1,567	0	0	0	0	696	50	9	755	2,759
8:30 to 9:30	368	23	20	411	1,468	117	8	1,593	0	0	1	1	695	57	8	760	2,765
AM Totals	**752**	**59**	**35**	**846**	**2,871**	**208**	**16**	**3,095**	**0**	**0**	**2**	**2**	**1,365**	**101**	**15**	**1,481**	**5,424**
16:00 to 17:00	421	12	3	436	1,633	59	13	1,705	0	0	1	1	552	15	3	570	2,712
16:15 to 17:15	445	9	4	458	1,640	56	14	1,710	0	0	1	1	565	14	4	583	2,752
16:30 to 17:30	453	9	5	467	1,640	50	16	1,706	0	0	0	0	598	13	4	615	2,788
16:45 to 17:45	461	9	8	478	1,648	43	15	1,706	0	0	2	2	649	11	2	662	2,848
17:00 to 18:00	477	8	11	496	1,624	41	18	1,683	0	0	2	2	671	9	7	687	2,868
17:15 to 18:15	449	7	10	466	1,700	37	26	1,763	0	0	2	2	747	8	9	764	2,995
17:30 to 18:30	439	8	14	461	1,724	35	26	1,785	0	0	3	3	716	9	9	734	2,983
17:45 to 18:45	420	9	10	439	1,719	39	26	1,784	0	0	1	1	671	8	11	690	2,914
18:00 to 19:00	421	9	8	438	1,686	36	21	1,743	0	0	1	1	643	8	7	658	2,840
PM Totals	**1,319**	**29**	**22**	**1,370**	**4,943**	**136**	**52**	**5,131**	**0**	**0**	**4**	**4**	**1,866**	**32**	**17**	**1,915**	**8,420**

Table 17 - Henderson Road and Wyndham Street, Peak Hour Traffic Volumes

Approach	Botany Rd				Raglan St				Botany Rd				Henderson Rd				Grand Total
Time Period	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	
7:30 to 8:30	739	51	3	793	196	13	4	213	1,644	121	9	1,774	253	13	5	271	3,051
7:45 to 8:45	767	43	4	814	235	10	4	249	1,690	125	10	1,825	258	12	4	274	3,162
8:00 to 9:00	744	47	4	795	238	15	2	255	1,664	122	11	1,797	261	12	4	277	3,124
8:15 to 9:15	710	48	3	761	236	20	2	258	1,627	131	9	1,767	270	14	6	290	3,076
8:30 to 9:30	705	51	3	759	234	20	1	255	1,564	153	9	1,726	271	12	2	285	3,025
AM Totals	1,444	102	6	1,552	430	33	5	468	3,208	274	18	3,500	524	25	7	556	6,076
16:00 to 17:00	632	29	2	663	281	11	4	296	1,851	96	22	1,969	223	6	4	233	3,161
16:15 to 17:15	648	24	0	672	293	12	5	310	1,858	88	19	1,965	213	4	4	221	3,168
16:30 to 17:30	656	25	1	682	290	9	4	303	1,864	77	22	1,963	223	5	4	232	3,180
16:45 to 17:45	651	24	1	676	297	8	5	310	1,868	65	20	1,953	216	4	1	221	3,160
17:00 to 18:00	705	22	1	728	291	8	3	302	1,777	56	31	1,864	248	2	5	255	3,149
17:15 to 18:15	742	22	1	765	284	5	9	298	1,800	54	38	1,892	266	2	6	274	3,229
17:30 to 18:30	770	19	2	791	292	7	11	310	1,794	58	36	1,888	267	0	7	274	3,263
17:45 to 18:45	734	19	2	755	288	8	12	308	1,843	62	36	1,941	259	0	9	268	3,272
18:00 to 19:00	687	16	2	705	284	8	13	305	1,900	62	26	1,988	226	1	9	236	3,234
PM Totals	2,024	67	5	2,096	856	27	20	903	5,528	214	79	5,821	697	9	18	724	9,544

Table 18 - Botany Road, Henderson Road and Raglan Street, Peak Hour Traffic Volumes

Approach	Cope St				Raglan St				Cope St				Raglan St				Grand Total
Time Period	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	
7:30 to 8:30	74	2	37	113	157	12	17	186	67	3	8	78	257	12	4	273	650
7:45 to 8:45	80	1	39	120	187	15	16	218	74	2	10	86	267	11	3	281	705
8:00 to 9:00	84	1	42	127	182	18	12	212	79	2	16	97	274	12	2	288	724
8:15 to 9:15	84	3	36	123	177	21	8	206	83	2	17	102	283	16	2	301	732
8:30 to 9:30	80	3	29	112	175	21	5	201	78	2	16	96	298	18	1	317	726
AM Totals	154	5	66	225	332	33	22	387	145	5	24	174	555	30	5	590	1,376
16:00 to 17:00	62	3	7	72	201	10	6	217	102	2	14	118	251	11	2	264	671
16:15 to 17:15	59	2	6	67	214	11	6	231	100	3	26	129	239	11	2	252	679
16:30 to 17:30	69	2	8	79	209	9	4	222	101	3	38	142	246	13	2	261	704
16:45 to 17:45	80	1	10	91	195	7	4	206	106	2	50	158	245	11	2	258	713
17:00 to 18:00	87	1	11	99	178	7	3	188	115	2	61	178	275	11	10	296	761
17:15 to 18:15	89	1	16	106	182	5	4	191	111	1	67	179	306	10	10	326	802
17:30 to 18:30	89	0	16	105	184	8	8	200	109	0	66	175	307	7	12	326	806
17:45 to 18:45	79	1	14	94	188	9	9	206	102	1	64	167	290	10	11	311	778
18:00 to 19:00	72	1	14	87	193	9	10	212	91	1	52	144	267	9	6	282	725
PM Totals	221	5	32	258	572	26	19	617	308	5	127	440	793	31	18	842	2,157

Table 19 - Raglan Street and Cope Street, Peak Hour Traffic Volumes

Approach	Cope St				Wellington St				Cope St				Wellington St				Grand Total
Time Period	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	
7:30 to 8:30	31	0	6	37	60	1	10	71	37	1	8	46	144	6	53	203	357
7:45 to 8:45	32	0	9	41	67	1	9	77	41	3	10	54	183	7	68	258	430
8:00 to 9:00	36	0	10	46	81	1	12	94	41	3	9	53	204	4	81	289	482
8:15 to 9:15	37	0	12	49	87	0	13	100	32	4	10	46	211	8	70	289	484
8:30 to 9:30	43	0	10	53	86	0	11	97	31	5	10	46	219	11	61	291	487
AM Totals	**74**	**0**	**16**	**90**	**146**	**1**	**21**	**168**	**68**	**6**	**18**	**92**	**363**	**17**	**114**	**494**	**844**
16:00 to 17:00	55	1	4	60	109	5	16	130	53	2	18	73	118	4	15	137	400
16:15 to 17:15	54	1	6	61	130	4	18	152	49	3	28	80	118	3	12	133	426
16:30 to 17:30	54	0	5	59	137	3	23	163	51	3	37	91	140	3	14	157	470
16:45 to 17:45	54	0	4	58	144	0	28	172	48	3	47	98	146	3	14	163	491
17:00 to 18:00	44	0	4	48	150	1	28	179	51	3	50	104	159	2	16	177	508
17:15 to 18:15	38	0	6	44	149	2	26	177	56	2	50	108	158	3	20	181	510
17:30 to 18:30	34	0	6	40	139	2	22	163	52	2	53	107	146	2	18	166	476
17:45 to 18:45	32	0	7	39	116	2	21	139	56	4	45	105	132	3	13	148	431
18:00 to 19:00	33	0	9	42	105	1	18	124	46	3	35	84	116	5	12	133	383
PM Totals	**132**	**1**	**17**	**150**	**364**	**7**	**62**	**433**	**150**	**8**	**103**	**261**	**393**	**11**	**43**	**447**	**1,291**

Table 20 - Cope Street and Wellington Street, Peak Hour Traffic Volumes

Approach	Botany Rd				Wellington St				Botany Rd				Buckland St				Grand Total
Time Period	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	Lights	Heavies	Cyclists	Total	
7:30 to 8:30	748	50	4	802	49	2	13	64	1,145	90	6	1,241	95	4	54	153	2,260
7:45 to 8:45	797	48	6	851	62	4	21	87	1,138	99	7	1,244	122	6	66	194	2,376
8:00 to 9:00	780	48	7	835	77	4	24	105	1,100	91	10	1,201	134	5	72	211	2,352
8:15 to 9:15	719	50	7	776	84	4	29	117	1,060	94	9	1,163	149	7	61	217	2,273
8:30 to 9:30	759	54	7	820	88	4	26	118	1,001	108	8	1,112	161	8	55	224	2,274
AM Totals	**1,507**	**104**	**11**	**1,622**	**137**	**6**	**39**	**182**	**2,146**	**193**	**14**	**2,353**	**256**	**12**	**109**	**377**	**4,534**
16:00 to 17:00	598	26	2	626	134	7	33	174	1,104	71	11	1,186	85	3	17	105	2,091
16:15 to 17:15	612	24	2	638	143	6	42	191	1,145	63	8	1,216	87	3	13	103	2,148
16:30 to 17:30	662	23	3	688	155	4	51	210	1,146	54	14	1,214	106	1	14	121	2,233
16:45 to 17:45	656	26	4	686	166	3	63	232	1,163	47	12	1,222	119	2	13	134	2,274
17:00 to 18:00	718	23	3	744	175	4	60	239	1,128	39	13	1,180	105	1	13	119	2,282
17:15 to 18:15	762	20	4	786	184	4	54	242	1,100	36	14	1,150	106	2	17	125	2,303
17:30 to 18:30	748	20	5	773	161	5	49	215	1,090	42	9	1,141	84	4	14	102	2,231
17:45 to 18:45	727	18	4	749	145	5	42	192	1,105	42	12	1,159	75	4	12	91	2,191
18:00 to 19:00	667	15	5	687	122	3	33	158	1,135	43	12	1,190	77	6	11	94	2,129
PM Totals	**1,983**	**64**	**10**	**2,057**	**431**	**14**	**126**	**571**	**3,367**	**153**	**36**	**3,556**	**267**	**10**	**41**	**318**	**6,502**

Table 21 - Botany Road, Buckland Street and Wellington Street Peak Hour Traffic Volumes

9.1.4 Existing Traffic Distribution

Based on the traffic volumes from the traffic surveys, the network AM and PM peak were observed to be 7:45am - 8:45am and 5:15pm - 6:15pm respectively. The existing traffic distribution, based on the traffic survey data is as shown in Figure 18 and Figure 19.

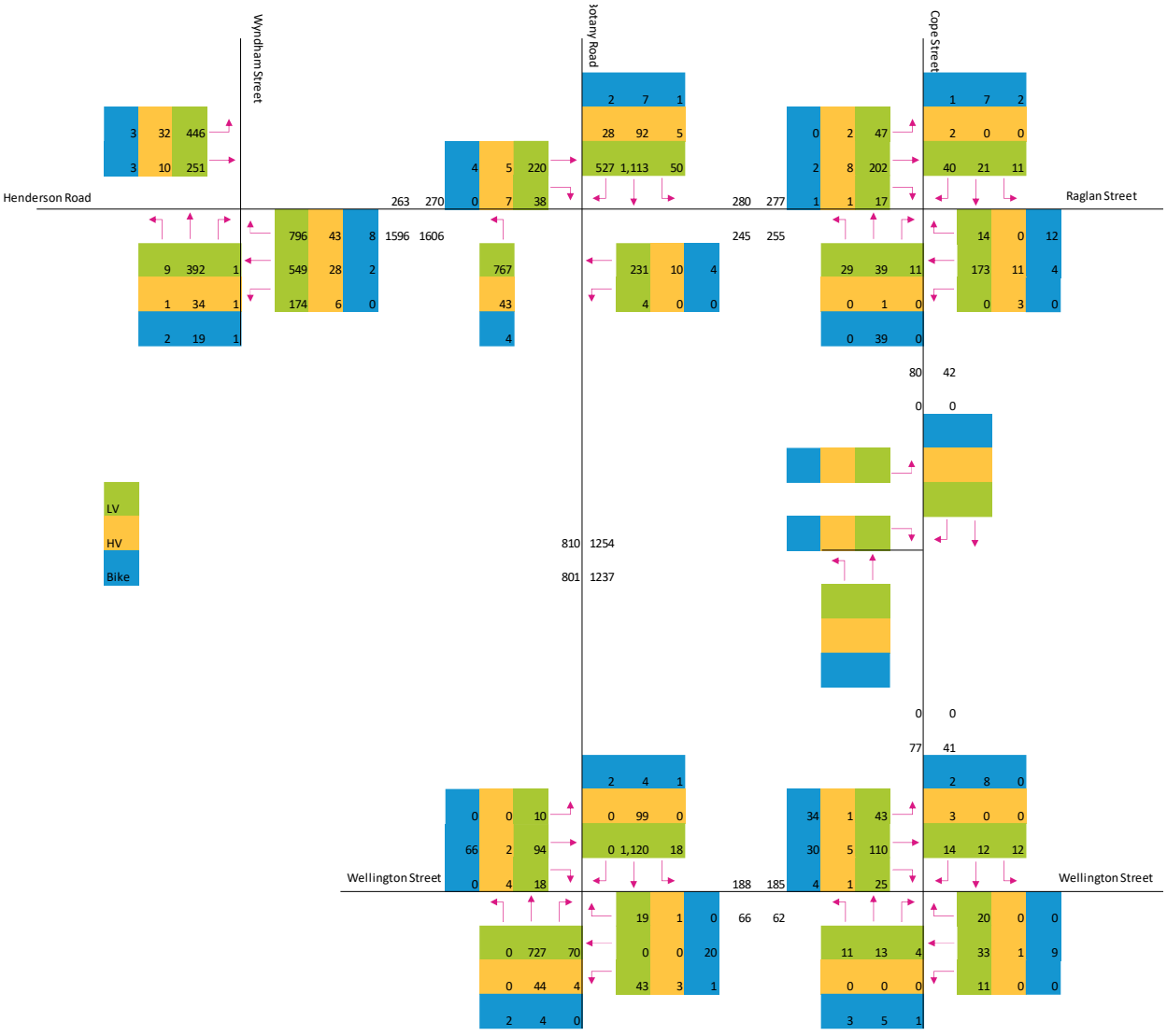


Figure 18 - Existing Traffic Distribution AM Peak

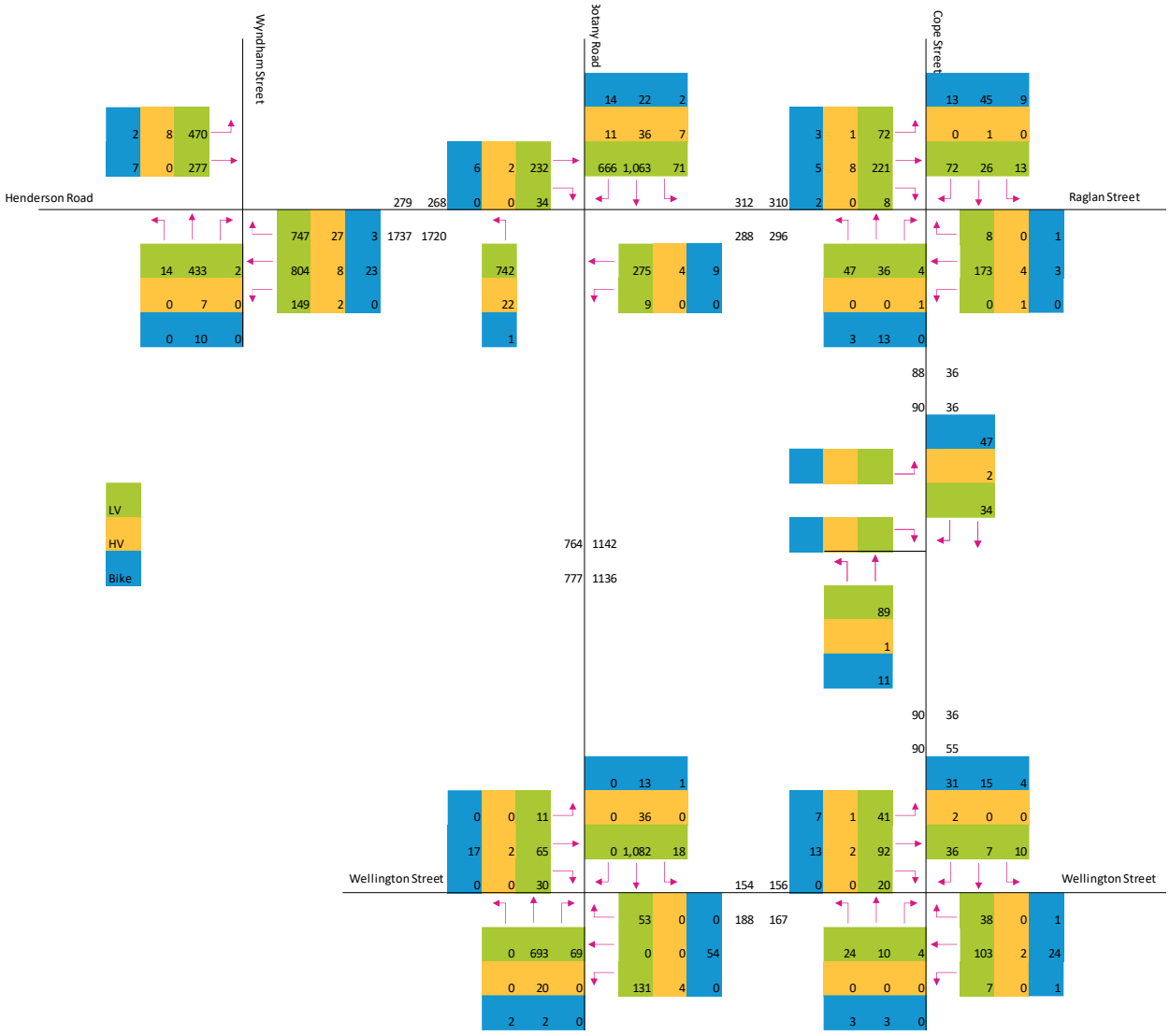


Figure 19 - Existing Traffic Distribution PM Peak

9.1.5 Existing Network Operation

From the survey data, a volume analysis was performed using SIDRA Intersection 8.0 software, a micro-analytical tool for individual intersections and whole-network modelling. The models are based on the collected traffic survey data. SIDRA provides a number of performance indicators, outlined below:

- Degree of Saturation - The total usage of the intersection expressed as a factor of 1 with 1 representing 100% use/saturation. (e.g. 0.8=80% saturation)
- Average Delay - The average delay encountered by all vehicles passing through the intersection. It is often important to review the average delay of each approach as a

side road could have a long delay time, while the large free flowing major traffic will provide an overall low average delay.

- Level of Service (LoS) - This is a categorization of average delay, intended for simple reference. The RMS adopts the following bands:
- 95% Queue Lengths (Q95) - is defined to be the queue length in metres that has only a 5-percent probability of being exceeded during the analysis time period. It transforms the average delay into measurable distance units.

Level of Service is a good indicator of overall performance for individual intersections, with each level summarised in Table 22.

Level of Service	Average Delay (secs/vehicle)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Extra capacity required	Extreme delay, major treatment required

Table 22 - Intersection Performance - Levels of Service

The SIDRA 8.0 results for each intersection are shown in Table 23.

Intersection	Period	Level of Service	Average Delay (sec)	Degree of Saturation	95% Queue Length (m)
Henderson Street and Wyndham Street	AM	D	43.8	0.986	136.3
	PM	C	40.8	0.995	143.9
Botany Road and Raglan Street	AM	C	39.6	0.960	217.9
	PM	D	44.1	0.984	235.0
Cope Street and Raglan Street	AM	A	4.7	0.236	8.7
	PM	A	4.7	0.276	9.4

Cope Street and Wellington Street	AM	A	4.1	0.195	5.5
	PM	A	4.6	0.152	5.4
Botany Road, Wellington Street	AM	A	13.1	0.528	140.4
	PM	B	14.6	0.481	120.1

Table 23 - Summary of Existing Intersection Modelling

9.1.6 Proposed Traffic Generation

Typically, the traffic activity associated with a development or land-use can be derived through reference to published data, for example the RMS Guide to Traffic Generating Developments.

This form of traffic projection is useful where the development has unconstrained on-site parking provision. However, the development site has a restricted on-site parking provision which is in accordance with the local planning control and the proposed development traffic generation has been derived on this basis.

9.1.7 Proposed Development Traffic Generation (Proposed Parking)

Reference has been made to the RMS Guide to Traffic Generating Developments (GtTGD), RMS Technical Direction 2013/04 (TD13-04a) and the rates outlined for the approval of the Concept DA SSD 9393. The proposed parking provisions for the development are set out in Table 24. The highlighted sections in red provide details relating to the specific traffic generation associated with the Southern Precinct.

User	Units / GFA / spaces		Peak hr generation per space / GFA	Total peak hour trip generation[7]	NOTES -
Market Residential & Affordable Housing	67	spaces	0.12	8.04	Trip generation 0.12 per car space-based Site 10 (Pyrmont) Appendix B3 TD13-04a
Residential - Social Housing	8	spaces	0.12	0.96	Trip generation 0.12 per car space-based Site 10 (Pyrmont) Appendix B3 TD13-04a
Residential - Student Accommodation	0	spaces	0	0	Zero parking spaces therefore zero trip generation

[7] Includes all user group traffic generation including visitors as survey data does not differentiate between user groups

User	Units / GFA / spaces		Peak hr generation per space / GFA	Total peak hour trip generation[7]	NOTES -
Non- residential - Commercial	33,843	m^2	0.0014	47.38	Trip generation 0.14 trips per 100m^2. Reference, Appendix D2 - OB1 North Sydney) & pro rata at 0.88 (providing 0.88 of allowable parking spaces)
Non-residential - Retail	0	spaces	0	0	Zero spaces therefore zero traffic generation. Assumed residents or commercial staff use, or public transport
Non-residential - Child Care	1	spaces	0	0	One space provided as a long-term visitor space. Therefore, traffic generation during the peak hour has been determined to be zero. Assumed residents or commercial staff use, or use of public transport.
Total Trip Generation				**56.38**	

Table 24 - Proposed Development Parking Generation (Proposed Parking)

As shown Table 24, the estimated traffic generation associated with the Southern Precinct development is approximately 1 trip in the peak hour.

It is noted that the proposed detailed design scheme (for all precincts within the WMQ site) comprises a total of 655 residential units/rooms[8] which is lower than what is assumed by the concept DA, therefore generating less traffic from the residential component than what is assessed under the Concept DA.

[8] Comprising 220 residential units and 435 student accommodation rooms

9.1.8 Proposed Traffic Distribution

The proposed traffic distribution, based on the traffic survey data is as shown in Figure 20 and Figure 21.

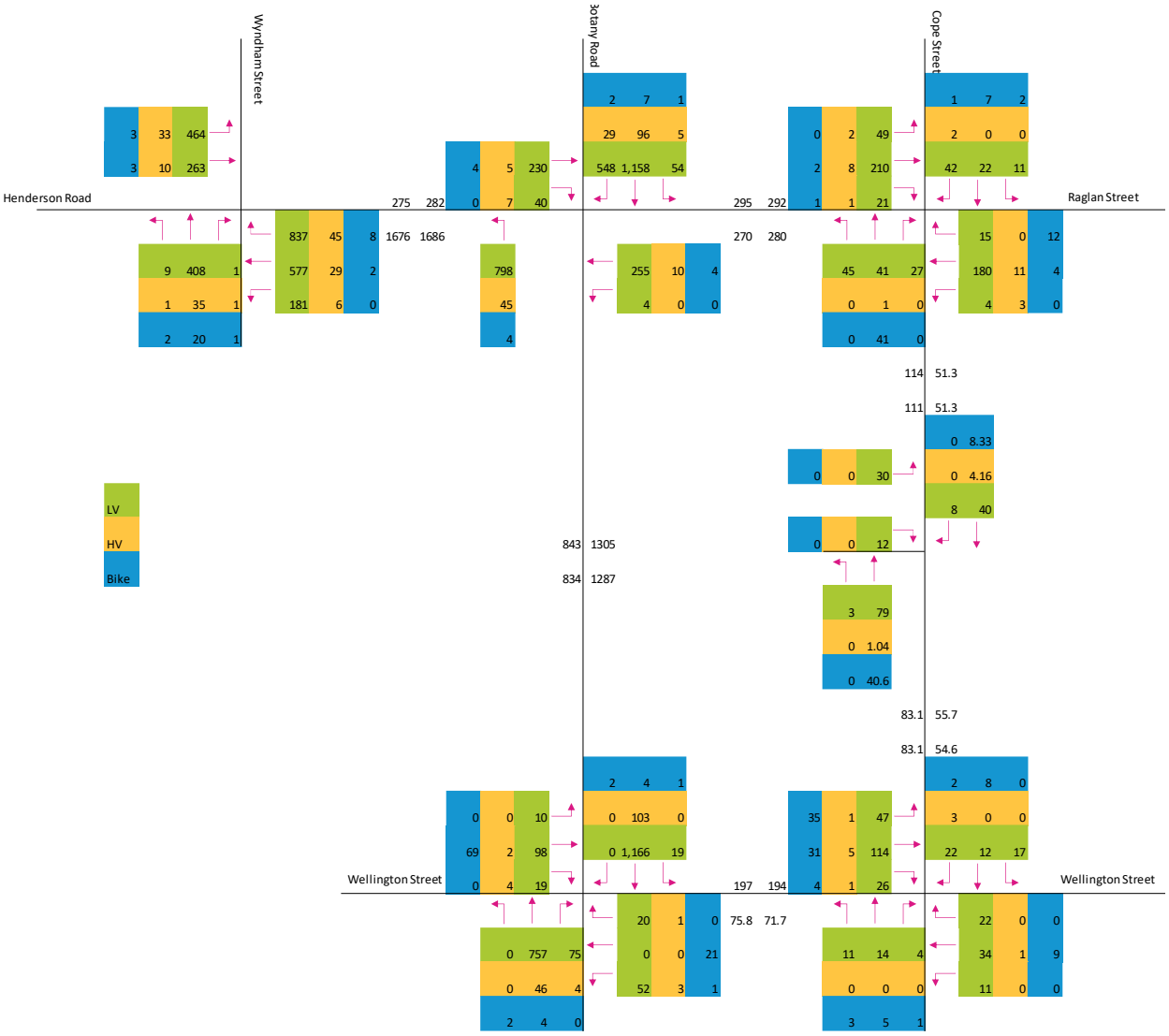


Figure 20 - Proposed Traffic Distribution AM Peak

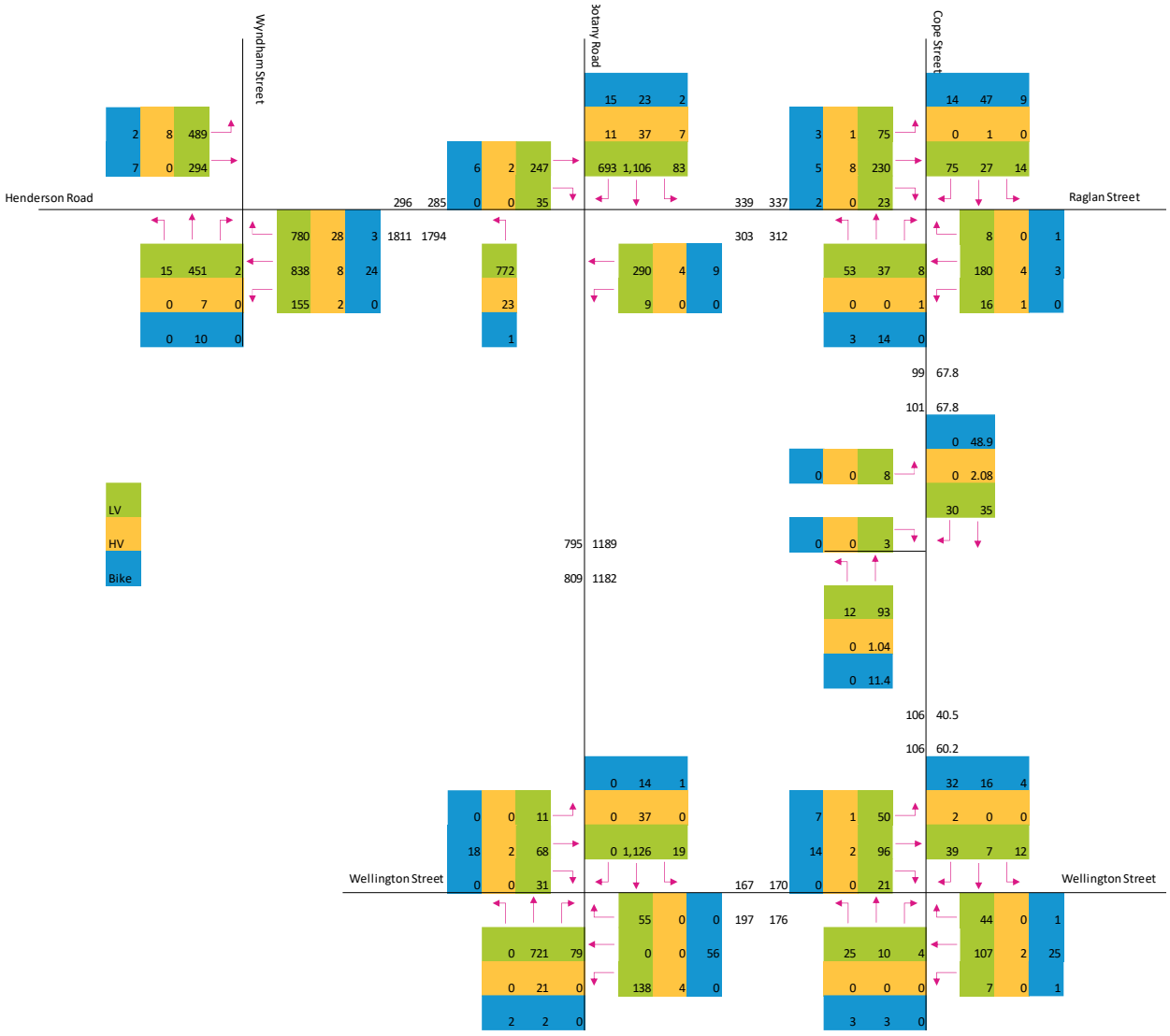


Figure 21 - Proposed Traffic Distribution PM Peak

9.1.9 Proposed Network Operation

The proposed traffic assessment was undertaken using SIDRA modelling software for the following scenarios:

- 2019 Base
- 2036 No Development - This includes Waterloo Station but no Metro Quarter development
- 2036 Proposed Development - This includes Waterloo Station and the proposed development with the proposed parking for the development.

Table 25 shows the summary of the development scenarios, outlined above.

Intersection		2019 Base		2036 No Development		2036 Proposed Development	
		Ave Delay	LOS	Ave Delay	LOS	Ave Delay	LOS
Henderson Street and Wyndham Street	AM	43.8	D	54.3	D	54.6	D
	PM	40.8	C	50.9	D	50.9	D
Botany Road and Raglan Street	AM	39.6	C	45.3	D	45.9	D
	PM	44.1	D	57.3	E	57.9	E
Cope Street and Raglan Street	AM	4.7	A	8.4*	A	8.5*	A
	PM	4.7	A	8.9*	A	8.7*	A

Intersection		2019 Base		2036 No Development		2036 Proposed Development	
Cope Street and Wellington Street	AM	4.1	A	7.6*	A	7.6*	A
	PM	4.6	A	7.9*	A	7.9*	A
Botany Road, Wellington Street	AM	13.1	A	13.4	A	13.5	A
	PM	14.6	B	15.5	B	15.9	B
Cope Street, Shared Zone	AM					5.1*	A
	PM					5.2	A

Table 25 - Summary of Intersection Modelling

The traffic modelling undertaken shows that with the proposed development, including growth to 2036, the external road network will continue to operate at acceptable levels of service and experiences no change in the level of service associated with the traffic generated purely by the development. Therefore, the development is not anticipated to have any detrimental effect on the network operation.

9.1.10 Proposed Network Operation (Including Metro Upgrades)

We understand that as part of the Metro development of the site, upgrades are proposed to both the Raglan Street / Cope Street and Wellington Street / Cope Street intersections.

To complete the traffic modelling assessment, analysis is required of the new intersection configurations as part of the network modelling.

At this stage, the design and modelling undertaken as part of the Metro development is unavailable and this modelling will be undertaken and provided as soon as the base data is available.

10. Development Pedestrian Assessment

Modelling and analysis of the existing and future pedestrian and cyclist movement, connectivity and circulation within the extent of the site and to surrounding areas having regard to any nearby approved developments in the area has been undertaken by WSP (WMQ-SITE-WSP-PD-RPT-001) and this report can be found in Appendix 2 - Pedestrian Modelling Report.

With reference to SEARs Item 9 (point 8) in Section 3, pedestrian safety and amenity has been taken into consideration in the design of the development along Raglan Street and the Church Square shared zone has been designed to prioritise pedestrian movements. Refer to separate architectural package for design details and measures to protect pedestrians entering and exiting the building and retail outlets.

This report assesses the pedestrian demand for the Waterloo Metro Quarter precinct consisting of the following four key components.

- Demand related to the proposed metro station
- Demand related to the proposed over station development
- Demand related to existing land uses in the wider area, referred to as background demand
- Demand related to the Botany Road bus stops

The report concludes that:

The pedestrian flows for the Waterloo Metro Quarter precinct has been assessed and summarised in this document to confirm the provisions of pedestrian infrastructure within and around the precinct. A summary of the precinct performance and its compliance to project requirements is shown in Table 26.

Overall, the precinct design is compliant with the project requirements.

Location	Assessment Scenarios	
	2056 AM	2056 AM Resilience
Precinct Connectivity		
Internal Walkways	✓	✓
External Footpaths	✓	✓
Queuing at Intersections	✓	✓
Botany Road Bus Stop (southbound)		
Bus Customers (waiting)	✓	✓
Non-bus Customers (those travelling along Botany Road)	✓	✓

Table 26 - WMQ Streetscape Performance Summary
Source: WMQ-SITE-WSP-PD-RPT-001

11. Development Cyclist Assessment

11.1 Existing Cyclist Demand

The existing travel mode split for cyclists are approximately 1.5% when travelling to Waterloo for work and 3.5% for travelling from Waterloo for work (refer to Section 7.5).

11.2 Proposed and Future Target Cycling Demand

The development proposes approximately 1,278m^2 of non-residential space and 70 residential units and 435 student rooms.

Based on the BCA rate of 10m^2 per employee within the gym and community maker component, it is reasonable to calculate that the non-residential uses could accommodate approximately 128 people and based on the existing mode split for cyclists of 1.5% this would generate 2 cycle trips.

Based on the existing travel to work (from Waterloo) mode split of 3.5%, it is calculated that the residential portion of the development would generate 18 cycle trips.

Taking into consideration the future mode share target of 5% cycle trips, outlined in Section 12, the target cycle trips would be 7 for staff and 26 trips for residents.

As outlined in Section 7.3.1, there is a substantial existing and proposed cycle network in the vicinity of the development and it is deemed that an increase in 33 cycle trips would not have a detrimental impact on the operation of the cycle provisions within the vicinity of the site in the context of the existing and proposed cyclist activity.

It should also be noted that the development proposes 164 residential and 19 non-residential bicycle parking spaces and that these facilities can accommodate the future mode share target bicycle trips, as outlined above.

12. Green Travel

12.1 Future Mode Share Targets

With reference to the Traffic Impact Assessment report prepared by Jacobs as part of SSD 9393 consent, an assessment of the potential future mode shares has been undertaken in consultation with TfNSW, RMS and City of Sydney and is based on existing data and the strategic opportunities for the Waterloo concept SSD.

The mode share targets agreed for the AM peak for all trip purposes are shown in Figure 22.

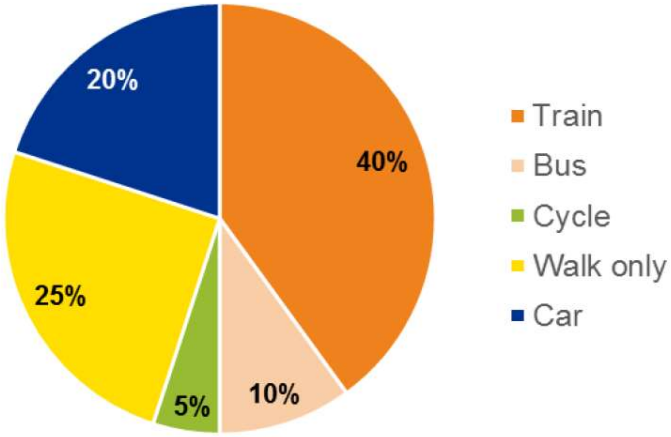


Figure 22 - Future Mode Share Targets

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

- Proximity to Sydney Metro's 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.
- 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 development.

12.2 Green Travel Plan

The Green travel plan sets objectives and targets, including S.M.A.R.T mode share targets:

- outlines potential measures to encourage a modal shift away from car usage
- set key actions to align with key objectives and targets,
- set out a systematic approach to measure the impact of the travel plan, including commitment of resources to allow for implementation, monitoring, review and continual improvement of the travel plan

A Green Travel Plan has been prepared for SSD 10437 as part of the EIS and can be found in Appendix 4 - Green Travel Plan (Building 3) and Appendix 5 - Green Travel Plan (Building 4).

A Travel Access Guide (TAG) has also been prepared, providing a concise presentation outlining how to reach a site via sustainable modes of transport - e.g. public transport, walking or cycling. This can also be found in Appendix 4 - Green Travel Plan (Building 3) and Appendix 5 - Green Travel Plan (Building 4).

The TAG provided as an A4 leaflet, suitable to be provided to residential and non-residential tenants of the development.

13. Access and Car Parking Assessment

As outlined in Section 8, the proposed car parking and service vehicle provisions for the Southern Precinct is as follows:

13.1 Southern Precinct - Building 3

- Residential Student Accommodation: Nil
- Residential Student Car Share Nil
- Student Accommodation Visitor Nil
- Gym Nil
- Retail - Community (Maker) Space Nil
- Residential Service Bays 1 MRV service bay

13.2 Southern Precinct - Building 4

- Social Housing 8 car spaces
- Residential Car Share 1 car space
- Residential Service Bays 1 MRV service bay
- Residential Motorcycle 1 motorcycle bay

The assessment of the car parking and motorcycle parking has been undertaken as part of a separate DA for the Basement (SSD 10438).

A preliminary assessment of the bicycle and the service bays associated with the Southern Precinct has been conducted. The proposed parking and servicing arrangements generally meet the requirements of the relevant Australian Standards and are capable of complying with *AS2890.2:2018 Off-street Commercial Vehicle Facilities* and *AS2890.3:2015 Bicycle Parking*. A detailed assessment of the proposed arrangements will be undertaken prior to Construction Certification.

In accordance with design criteria 3P in the Waterloo Design and Amenity Guidelines, service vehicles and refuse collection vehicles shall access and egress the site in a forward direction. This will be facilitated through the provision of mechanical turntables within loading areas in the Northern and Southern loading docks. Further details for service vehicle access and parking is outlined in Section 13.2.2.

The key findings of the assessment are outlined as follows:

13.2.1 Bicycle Parking

The bicycle parking arrangements have been designed in accordance with the requirements of AS2890.3. The bicycle parking has been provided as a combination of horizontal spaces and provisions within storage cages and the space requirements for each are listed below:

- Horizontal spaces 1.8m length, 0.5m width, 1.5m wide access aisle
- Vertical spaces 1.2m length, 0.5m width, 1.5m wide access aisle
- Within storage cages 1.8m length, 0.5m width, 2.0m wide access aisle (between storage cages)

It should be noted that the residential bicycle parking (Class 1) has been provided within the basement car park area within the residential storage cages or garages, and the retail staff spaces and visitors (Class 2) have been provided within a secure bicycle parking area on the ground floor adjacent to the end of trip facilities.

An assessment of the bicycle spaces, including aisle widths and access has been undertaken and in this regard the bicycle parking provisions generally meets or is capable of complying with the requirements of AS2890.3.

13.2.2 Service Vehicles Parking

The proposed service vehicle area has been designed in accordance with AS2890.2, Councils 'Policy for Waste Minimisation in New Developments' and performance tested through swept path analysis.

It has been determined that the service vehicle area within Building 3/4 can independently accommodate the following vehicles:

- One 8.8m Medium Rigid Vehicles (MRV)

It should be noted that the MRV spaces are sized to accommodate the City of Sydney 9.25m waste collection vehicle.

The Southern (Building 3/4) loading dock includes the provision of a 9.0m turntable (30 tonne capacity) with a 600mm clearance zone. The provision of the turntable ensures that all vehicles can access and egress the loading docks in a forward movement.

The driveway leading to the Building 3/4 dock is 3.6 metres wide. Swept path analysis has been undertaken on both driveways and indicates that these widths function on a performance basis, are suitable for use and meet the intent of the standards.

The service area is at a level grade, with a minimum 4.0 metre height clearance, in accordance with Councils 'Policy for Waste Minimisation in New Developments', is maintained throughout the areas in the loading dock accessed by trucks.

In addition, separate parking spaces are provided for service vehicles (B99 car-derived vans and utes) within the shared Basement car park. These spaces are dedicated to service vehicles and are not shared with parking provided for any other purpose.

Access to the loading dock will be managed by a Freight & Servicing Management Plan (refer to Appendix 6 - Freight & Servicing Management Plan prepared as part of the EIS) which will set the process and procedures for vehicles using the dock.

The swept path analysis undertaken on the driveway and service areas is shown in Appendix 3 - Loading Dock & Bicycle Parking Assessment.

13.3 Church Square Shared Zone

Church Square provides access and egress to the basement car park (subject to separate approval under SSD 10438) and is to be provided as a 'Shared Zone', in accordance with RMS TTD 2016/001 'Design and implementation of shared zones including provision for parking'. The Church Square shared zone connects to Cope Street (subject to separate SSD 10437).

The shared zone will be a Category 1 shared zone and is designed to specifically provide non-vehicular priority in the area.

General design principles:

- The road space will be devoid of delineation and kerbs to enhance the sense of pedestrian priority.
- The entrance to the zone (at the intersection with Cope Street) will provided in the form of a 'Continuous Footpath Treatment' in accordance with RMS TD 2013/05.
- Regulatory traffic signs, in accordance with TTD 2016/001 will be provided on both sides of the entry to the zone, to enhance the change in environment and priority.
- The pavement surface will clearly distinguishable in texture, colour and material, to highlight the difference in environment, in accordance with City of Sydney requirements.

14. Construction Traffic Management

The construction traffic management plan associated with the construction activity of the project aims to ensure the safety of all workers and road users within the vicinity of the construction site, with the following primary objectives:

- To minimise the impact of the construction vehicle traffic on the overall operation of the road network;
- To ensure continuous, safe and efficient movement of traffic (pedestrian and vehicular) for both the general public and construction workers;
- Installation of appropriate advance warning signs to inform users of the changed traffic conditions;
- To provide a description of the construction vehicles and the volume of these construction vehicles accessing the construction site; and
- To provide information regarding the changed access arrangements and also a description of the proposed external routes for construction vehicles accessing and exiting the site.

A concept CTMP has been prepared for the Southern Precinct and this can be found in Appendix J of the EIS. This concept CTMP details of the construction traffic activities, vehicular access arrangements and proposed pedestrian and traffic management measures proposed during the construction phase of the development.

15. Conclusion

This Transport, Traffic and Parking Impact Assessment has been prepared by **ptc.** to accompany a detailed State significant development (SSD) development application (DA) for the Southern Precinct over station development (OSD) at the Waterloo Metro Quarter site.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the detailed SSD DA (SSD 10437).

This report has also been prepared to be used as reference to the amending concept SSD DA for the Waterloo Metro Quarter OSD (SSD 10441).

The proposed bicycle and service vehicle parking arrangements have been assessed and is capable of complying with the requirements stipulated within the relevant Australian Standards and guidelines. Any minor non-conformities will be finalised in the detailed design stage prior to Construction Certification.

Traffic modelling has been undertaken for the proposed development, including growth to 2036. The modelling indicates that the external road network will continue operate with no change to the levels of service. Therefore, the development is anticipated to have no detrimental impact on the network operation, over and above the approved scheme.

This report concludes that the proposed Southern Precinct OSD is suitable in relation to traffic outcome and parking provision.

16. Appendices

16.1 Appendix 1 - Traffic Modelling

MOVEMENT SUMMARY

Site: TCS055 [1. AM Existing Henderson Road / Wyndham Street]

Network: N101 [AM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	13	8.3	13	8.3	0.966	88.6	LOS F	17.7	128.3	0.98	1.22	1.59	22.7
2	T1	468	7.6	468	7.6	0.966	84.2	LOS F	18.7	136.3	0.98	1.22	1.58	23.1
3	R2	3	33.3	3	33.3	0.966	88.0	LOS F	18.7	136.3	0.98	1.22	1.58	15.4
Approach		484	7.8	484	7.8	0.966	84.3	LOS F	18.7	136.3	0.98	1.22	1.58	23.1
East: Henderson Rd (E)														
4	L2	189	3.3	189	3.3	0.324	9.7	LOS A	4.3	31.2	0.22	0.41	0.22	41.8
5	T1	609	4.8	609	4.8	0.324	3.3	LOS A	4.3	31.2	0.16	0.21	0.16	45.6
6	R2	892	5.1	892	5.1	0.847	32.6	LOS C	15.7	114.2	0.96	0.92	1.12	27.5
Approach		1691	4.8	1691	4.8	0.847	19.5	LOS B	15.7	114.2	0.59	0.61	0.67	33.6
West: Henderson Rd (W)														
10	L2	506	6.7	506	6.7	0.986	90.6	LOS F	18.4	135.7	0.89	1.08	1.48	22.2
11	T1	278	3.8	278	3.8	0.470	36.1	LOS C	13.1	94.3	0.86	0.73	0.86	25.3
Approach		784	5.6	784	5.6	0.986	71.3	LOS F	18.4	135.7	0.88	0.96	1.26	22.8
All Vehicles		2959	5.5	2959	5.5	0.986	43.8	LOS D	18.7	136.3	0.73	0.80	0.98	26.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. AM Existing Base Botany Road / Raglan Street]

Network: N101 [AM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	857	5.3	857	5.3	0.960	76.0	LOS F	37.3	271.9	1.00	1.09	1.40	9.1
Approach		857	5.3	857	5.3	0.960	76.0	LOS F	37.3	271.9	1.00	1.09	1.40	9.1
East: Raglan St (E)														
4	L2	4	0.0	4	0.0	0.787	62.9	LOS E	7.7	55.4	0.98	0.91	1.21	4.6
5	T1	258	4.1	258	4.1	0.787	58.2	LOS E	7.9	56.4	0.98	0.91	1.21	4.6
Approach		262	4.0	262	4.0	0.787	58.3	LOS E	7.9	56.4	0.98	0.91	1.21	4.6
North: Botany Rd (N)														
7	L2	59	8.9	59	8.9	0.477	11.5	LOS A	15.2	112.8	0.44	0.43	0.44	41.8
8	T1	1276	7.6	1276	7.6	0.477	5.9	LOS A	15.2	112.8	0.41	0.39	0.41	42.9
9	R2	586	5.0	586	5.0	0.631	47.4	LOS D	15.3	111.7	0.94	0.84	0.94	21.9
Approach		1921	6.8	1921	6.8	0.631	18.7	LOS B	15.3	112.8	0.58	0.53	0.58	33.3
West: Henderson Rd (W)														
11	T1	241	2.2	241	2.2	0.797	51.5	LOS D	8.9	62.5	0.96	0.79	1.00	5.4
12	R2	47	15.6	47	15.6	0.797	66.4	LOS E	7.6	56.2	1.00	0.86	1.12	4.5
Approach		288	4.4	288	4.4	0.797	53.9	LOS D	8.9	62.5	0.96	0.81	1.02	5.2
All Vehicles		3328	6.0	3328	6.0	0.960	39.6	LOS C	37.3	271.9	0.75	0.73	0.88	20.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. AM Existing Cope Street / Raglan Street]

Network: N101 [AM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	31	0.0	31	0.0	0.127	5.5	LOS A	0.7	3.7	0.45	0.53	0.45	29.6
2	T1	83	1.3	83	1.3	0.127	4.0	LOS A	0.7	3.7	0.45	0.53	0.45	38.0
3	R2	12	0.0	12	0.0	0.127	8.3	LOS A	0.7	3.7	0.45	0.53	0.45	43.3
Approach		125	0.8	125	0.8	0.127	4.8	LOS A	0.7	3.7	0.45	0.53	0.45	37.8
East: Raglan St (E)														
4	L2	4	75.0	4	75.0	0.187	5.2	LOS A	1.1	7.8	0.28	0.46	0.28	42.6
5	T1	198	5.9	198	5.9	0.187	4.2	LOS A	1.1	7.8	0.28	0.46	0.28	42.6
6	R2	27	0.0	27	0.0	0.187	6.0	LOS A	1.1	7.8	0.28	0.46	0.28	42.2
Approach		229	6.4	229	6.4	0.187	4.4	LOS A	1.1	7.8	0.28	0.46	0.28	42.5
North: Cope St (N)														
7	L2	14	0.0	14	0.0	0.087	5.2	LOS A	0.5	3.6	0.43	0.56	0.43	43.0
8	T1	29	0.0	29	0.0	0.087	4.6	LOS A	0.5	3.6	0.43	0.56	0.43	40.6
9	R2	45	4.7	45	4.7	0.087	8.3	LOS A	0.5	3.6	0.43	0.56	0.43	40.6
Approach		88	2.4	88	2.4	0.087	6.6	LOS A	0.5	3.6	0.43	0.56	0.43	41.2
West: Raglan St (W)														
10	L2	52	4.1	52	4.1	0.236	4.1	LOS A	1.2	8.7	0.21	0.46	0.21	44.0
11	T1	223	3.8	223	3.8	0.236	4.1	LOS A	1.2	8.7	0.21	0.46	0.21	44.9
12	R2	20	5.3	20	5.3	0.236	7.2	LOS A	1.2	8.7	0.21	0.46	0.21	28.0
Approach		295	3.9	295	3.9	0.236	4.3	LOS A	1.2	8.7	0.21	0.46	0.21	44.5
All Vehicles		738	4.0	738	4.0	0.236	4.7	LOS A	1.2	8.7	0.30	0.48	0.30	42.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. AM Existing Cope Street / Wellington Street]

Network: N101 [AM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	15	0.0	15	0.0	0.033	3.9	LOS A	0.2	0.9	0.22	0.45	0.22	40.6
2	T1	19	0.0	19	0.0	0.033	3.5	LOS A	0.2	0.9	0.22	0.45	0.22	40.6
3	R2	5	0.0	5	0.0	0.033	6.6	LOS A	0.2	0.9	0.22	0.45	0.22	43.2
Approach		39	0.0	39	0.0	0.033	4.0	LOS A	0.2	0.9	0.22	0.45	0.22	41.2
East: Wellington St (E)														
4	L2	12	0.0	12	0.0	0.064	4.2	LOS A	0.3	2.2	0.21	0.47	0.21	45.0
5	T1	45	2.3	45	2.3	0.064	3.6	LOS A	0.3	2.2	0.21	0.47	0.21	42.0
6	R2	21	0.0	21	0.0	0.064	7.1	LOS A	0.3	2.2	0.21	0.47	0.21	42.0
Approach		78	1.4	78	1.4	0.064	4.6	LOS A	0.3	2.2	0.21	0.47	0.21	42.7
North: Cope St (N)														
7	L2	13	0.0	13	0.0	0.049	4.8	LOS A	0.3	1.8	0.34	0.50	0.34	42.7
8	T1	21	0.0	21	0.0	0.049	3.6	LOS A	0.3	1.8	0.34	0.50	0.34	38.9
9	R2	20	15.8	20	15.8	0.049	7.5	LOS A	0.3	1.8	0.34	0.50	0.34	25.5
Approach		54	5.9	54	5.9	0.049	5.4	LOS A	0.3	1.8	0.34	0.50	0.34	38.4
West: Wellington St (W)														
10	L2	82	1.3	82	1.3	0.195	3.2	LOS A	0.9	5.5	0.12	0.44	0.12	27.1
11	T1	153	3.4	153	3.4	0.195	3.5	LOS A	0.9	5.5	0.12	0.44	0.12	42.4
12	R2	32	3.3	32	3.3	0.195	6.6	LOS A	0.9	5.5	0.12	0.44	0.12	43.0
Approach		266	2.8	266	2.8	0.195	3.8	LOS A	0.9	5.5	0.12	0.44	0.12	41.2
All Vehicles		437	2.7	437	2.7	0.195	4.1	LOS A	0.9	5.5	0.17	0.45	0.17	41.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. AM Existing Botany Road / Wellington Street / Buckland Street]

Network: N101 [AM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.528	11.4	LOS A	19.2	140.4	0.53	0.48	0.53	34.7
2	T1	816	5.7	816	5.7	0.528	10.4	LOS A	19.2	140.4	0.54	0.50	0.54	38.7
3	R2	78	5.4	78	5.4	0.528	20.1	LOS B	7.2	52.8	0.63	0.63	0.63	34.1
Approach		896	5.6	896	5.6	0.528	11.3	LOS A	19.2	140.4	0.55	0.52	0.55	38.2
East: Wellington St (E)														
4	L2	49	6.4	49	6.4	0.150	48.9	LOS D	2.5	17.9	0.88	0.73	0.88	22.6
5	T1	21	0.0	21	0.0	0.120	46.7	LOS D	2.1	10.6	0.89	0.69	0.89	17.8
6	R2	21	5.0	21	5.0	0.120	51.0	LOS D	2.1	10.6	0.89	0.69	0.89	4.8
Approach		92	4.6	92	4.6	0.150	48.9	LOS D	2.5	17.9	0.88	0.71	0.88	18.6
North: Botany Rd (N)														
7	L2	20	0.0	20	0.0	0.514	10.7	LOS A	11.7	87.3	0.34	0.32	0.34	36.1
8	T1	1287	8.1	1287	8.1	0.514	7.0	LOS A	13.7	102.5	0.37	0.34	0.37	44.0
9	R2	2	0.0	2	0.0	0.514	9.6	LOS A	13.7	102.5	0.40	0.36	0.40	31.8
Approach		1309	8.0	1309	8.0	0.514	7.0	LOS A	13.7	102.5	0.37	0.34	0.37	44.0
West: Buckland St (W)														
10	L2	11	0.0	11	0.0	0.333	47.9	LOS D	9.0	48.7	0.90	0.73	0.90	21.2
11	T1	171	1.2	171	1.2	0.333	43.4	LOS D	9.0	48.7	0.90	0.73	0.90	21.2
12	R2	23	18.2	23	18.2	0.089	49.1	LOS D	1.1	9.2	0.86	0.71	0.86	29.6
Approach		204	3.1	204	3.1	0.333	44.3	LOS D	9.0	48.7	0.89	0.73	0.89	22.5
All Vehicles		2501	6.6	2501	6.6	0.528	13.1	LOS A	19.2	140.4	0.49	0.45	0.49	38.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: TCS055 [1. PM Existing Henderson Road / Wyndham Street]

Network: N101 [PM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	15	0.0	15	0.0	0.995	102.5	LOS F	19.2	134.7	0.99	1.28	1.71	21.3
2	T1	474	1.6	474	1.6	0.995	97.7	LOS F	20.6	143.9	0.99	1.28	1.70	21.4
3	R2	2	0.0	2	0.0	0.995	102.0	LOS F	20.6	143.9	0.99	1.29	1.69	13.9
Approach		491	1.5	491	1.5	0.995	97.8	LOS F	20.6	143.9	0.99	1.28	1.70	21.4
East: Henderson Rd (E)														
4	L2	159	1.3	159	1.3	0.395	16.0	LOS B	14.7	103.0	0.57	0.59	0.57	37.7
5	T1	879	1.0	879	1.0	0.395	8.4	LOS A	14.7	103.0	0.46	0.44	0.46	40.9
6	R2	818	3.5	818	3.5	0.730	19.7	LOS B	11.5	82.7	0.83	0.81	0.83	33.3
Approach		1856	2.1	1856	2.1	0.730	14.0	LOS A	14.7	103.0	0.63	0.62	0.63	36.9
West: Henderson Rd (W)														
10	L2	505	1.7	505	1.7	0.977	86.1	LOS F	17.9	126.6	0.90	1.06	1.45	22.8
11	T1	299	0.0	299	0.0	0.502	37.2	LOS C	14.4	99.3	0.88	0.75	0.88	24.9
Approach		804	1.0	804	1.0	0.977	67.9	LOS E	17.9	126.6	0.89	0.95	1.24	23.3
All Vehicles		3151	1.7	3151	1.7	0.995	40.8	LOS C	20.6	143.9	0.75	0.80	0.95	27.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. PM Existing Botany Road / Raglan Street]

Network: N101 [PM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	805	2.9	805	2.9	0.962	81.4	LOS F	32.8	235.0	1.00	1.07	1.40	8.6
Approach		805	2.9	805	2.9	0.962	81.4	LOS F	32.8	235.0	1.00	1.07	1.40	8.6
East: Raglan St (E)														
4	L2	9	0.0	9	0.0	0.984	105.1	LOS F	11.3	78.6	0.98	1.23	1.81	2.7
5	T1	303	1.4	303	1.4	0.984	97.9	LOS F	14.0	97.4	0.97	1.22	1.76	2.8
Approach		313	1.3	313	1.3	0.984	98.2	LOS F	14.0	97.4	0.97	1.22	1.76	2.8
North: Botany Rd (N)														
7	L2	84	8.8	84	8.8	0.479	15.4	LOS B	17.2	122.8	0.54	0.52	0.54	38.1
8	T1	1180	3.2	1180	3.2	0.479	9.1	LOS A	17.2	122.8	0.50	0.47	0.50	39.8
9	R2	727	1.6	727	1.6	0.766	44.3	LOS D	22.7	159.1	0.95	0.89	1.01	22.6
Approach		1992	2.9	1992	2.9	0.766	22.2	LOS B	22.7	159.1	0.66	0.62	0.69	31.2
West: Henderson Rd (W)														
11	T1	253	0.8	253	0.8	0.617	29.6	LOS C	6.2	42.9	0.66	0.54	0.67	8.6
12	R2	36	0.0	36	0.0	0.617	56.5	LOS E	6.2	42.9	0.96	0.77	0.97	5.3
Approach		288	0.7	288	0.7	0.617	32.9	LOS C	6.2	42.9	0.70	0.57	0.70	8.0
All Vehicles		3398	2.5	3398	2.5	0.984	44.1	LOS D	32.8	235.0	0.78	0.78	0.96	18.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. PM Existing Cope Street / Raglan Street]

Network: N101 [PM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	53	0.0	53	0.0	0.146	5.5	LOS A	0.6	3.7	0.45	0.56	0.45	30.6
2	T1	52	0.0	52	0.0	0.146	4.6	LOS A	0.6	3.7	0.45	0.56	0.45	41.2
3	R2	5	20.0	5	20.0	0.146	8.9	LOS A	0.6	3.7	0.45	0.56	0.45	43.4
Approach		109	1.0	109	1.0	0.146	5.2	LOS A	0.6	3.7	0.45	0.56	0.45	39.1
East: Raglan St (E)														
4	L2	1	100.0	1	100.0	0.276	5.9	LOS A	1.0	7.1	0.36	0.49	0.36	43.3
5	T1	189	2.2	189	2.2	0.276	4.5	LOS A	1.0	7.1	0.36	0.49	0.36	43.3
6	R2	9	0.0	9	0.0	0.276	7.3	LOS A	1.0	7.1	0.36	0.49	0.36	45.5
Approach		200	2.6	200	2.6	0.276	4.6	LOS A	1.0	7.1	0.36	0.49	0.36	43.5
North: Cope St (N)														
7	L2	23	0.0	23	0.0	0.238	4.8	LOS A	1.2	6.3	0.46	0.57	0.46	39.1
8	T1	76	1.4	76	1.4	0.238	3.7	LOS A	1.2	6.3	0.46	0.57	0.46	37.0
9	R2	89	0.0	89	0.0	0.238	8.0	LOS A	1.2	6.3	0.46	0.57	0.46	37.0
Approach		188	0.6	188	0.6	0.238	5.9	LOS A	1.2	6.3	0.46	0.57	0.46	37.4
West: Raglan St (W)														
10	L2	80	1.3	80	1.3	0.250	3.9	LOS A	1.3	9.4	0.18	0.44	0.18	43.7
11	T1	246	3.4	246	3.4	0.250	3.9	LOS A	1.3	9.4	0.18	0.44	0.18	45.0
12	R2	11	0.0	11	0.0	0.250	6.6	LOS A	1.3	9.4	0.18	0.44	0.18	28.4
Approach		337	2.8	337	2.8	0.250	4.0	LOS A	1.3	9.4	0.18	0.44	0.18	44.6
All Vehicles		835	2.0	835	2.0	0.276	4.7	LOS A	1.3	9.4	0.32	0.50	0.32	41.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. PM Existing Cope Street / Wellington Street]

Network: N101 [PM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	28	0.0	28	0.0	0.044	4.8	LOS A	0.2	1.4	0.38	0.51	0.38	41.6
2	T1	14	0.0	14	0.0	0.044	4.3	LOS A	0.2	1.4	0.38	0.51	0.38	41.6
3	R2	4	0.0	4	0.0	0.044	7.8	LOS A	0.2	1.4	0.38	0.51	0.38	45.2
Approach		46	0.0	46	0.0	0.044	4.9	LOS A	0.2	1.4	0.38	0.51	0.38	42.1
East: Wellington St (E)														
4	L2	8	0.0	8	0.0	0.152	4.2	LOS A	0.8	5.4	0.27	0.47	0.27	43.8
5	T1	136	1.6	136	1.6	0.152	3.8	LOS A	0.8	5.4	0.27	0.47	0.27	41.6
6	R2	41	0.0	41	0.0	0.152	7.2	LOS A	0.8	5.4	0.27	0.47	0.27	41.6
Approach		185	1.1	185	1.1	0.152	4.6	LOS A	0.8	5.4	0.27	0.47	0.27	41.8
North: Cope St (N)														
7	L2	15	0.0	15	0.0	0.096	4.0	LOS A	0.5	2.8	0.30	0.52	0.30	38.8
8	T1	23	0.0	23	0.0	0.096	2.6	LOS A	0.5	2.8	0.30	0.52	0.30	34.5
9	R2	73	2.9	73	2.9	0.096	6.3	LOS A	0.5	2.8	0.30	0.52	0.30	24.1
Approach		111	1.9	111	1.9	0.096	5.2	LOS A	0.5	2.8	0.30	0.52	0.30	32.4
West: Wellington St (W)														
10	L2	52	2.0	52	2.0	0.143	3.9	LOS A	0.6	4.2	0.15	0.46	0.15	27.2
11	T1	113	1.9	113	1.9	0.143	3.6	LOS A	0.6	4.2	0.15	0.46	0.15	43.5
12	R2	21	0.0	21	0.0	0.143	6.8	LOS A	0.6	4.2	0.15	0.46	0.15	44.7
Approach		185	1.7	185	1.7	0.143	4.1	LOS A	0.6	4.2	0.15	0.46	0.15	42.4
All Vehicles		527	1.4	527	1.4	0.152	4.6	LOS A	0.8	5.4	0.24	0.48	0.24	40.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. PM Existing Botany Road / Wellington Street / Buckland Street]

Network: N101 [PM Existing]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.469	12.6	LOS A	16.8	120.1	0.53	0.48	0.53	34.3
2	T1	753	2.8	753	2.8	0.469	11.6	LOS A	16.8	120.1	0.55	0.51	0.55	37.7
3	R2	73	0.0	73	0.0	0.469	19.6	LOS B	7.8	55.6	0.61	0.60	0.61	34.6
Approach		827	2.5	827	2.5	0.469	12.3	LOS A	16.8	120.1	0.55	0.52	0.55	37.4
East: Wellington St (E)														
4	L2	142	3.0	142	3.0	0.477	47.6	LOS D	7.1	51.2	0.90	0.78	0.90	23.1
5	T1	57	0.0	57	0.0	0.235	41.7	LOS C	5.4	26.2	0.87	0.73	0.87	18.6
6	R2	56	0.0	56	0.0	0.235	46.0	LOS D	5.4	26.2	0.87	0.73	0.87	5.3
Approach		255	1.7	255	1.7	0.477	46.0	LOS D	7.1	51.2	0.88	0.76	0.88	19.5
North: Botany Rd (N)														
7	L2	20	0.0	20	0.0	0.481	10.3	LOS A	9.4	67.1	0.29	0.28	0.29	36.6
8	T1	1191	3.2	1191	3.2	0.481	6.6	LOS A	11.3	80.9	0.32	0.30	0.32	44.2
9	R2	1	0.0	1	0.0	0.481	9.3	LOS A	11.3	80.9	0.35	0.32	0.35	31.9
Approach		1212	3.1	1212	3.1	0.481	6.7	LOS A	11.3	80.9	0.32	0.30	0.32	44.1
West: Buckland St (W)														
10	L2	12	0.0	12	0.0	0.193	43.3	LOS D	4.6	29.4	0.84	0.67	0.84	23.4
11	T1	88	2.4	88	2.4	0.193	38.8	LOS C	4.6	29.4	0.84	0.67	0.84	23.4
12	R2	32	0.0	32	0.0	0.123	49.3	LOS D	1.6	11.0	0.87	0.72	0.87	29.6
Approach		132	1.6	132	1.6	0.193	41.7	LOS C	4.6	29.4	0.84	0.69	0.84	25.4
All Vehicles		2425	2.7	2425	2.7	0.481	14.6	LOS B	16.8	120.1	0.49	0.44	0.49	37.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: TCS055 [1. AM Base Henderson Road / Wyndham Street]

Network: N101 [AM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	13	8.3	13	8.3	1.013	115.2	LOS F	21.9	158.9	1.00	1.36	1.79	19.4
2	T1	487	7.6	487	7.6	1.013	110.8	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
3	R2	3	33.3	3	33.3	1.013	114.7	LOS F	23.2	169.0	1.00	1.36	1.78	12.6
Approach		503	7.7	503	7.7	1.013	111.0	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
East: Henderson Rd (E)														
4	L2	197	3.2	197	3.2	0.337	9.7	LOS A	4.5	32.4	0.22	0.41	0.22	41.8
5	T1	634	4.8	634	4.8	0.337	3.3	LOS A	4.5	32.4	0.16	0.21	0.16	45.6
6	R2	927	5.1	927	5.1	0.882	36.9	LOS C	15.7	114.2	0.98	0.95	1.20	26.1
Approach		1758	4.8	1758	4.8	0.882	21.7	LOS B	15.7	114.2	0.60	0.62	0.72	32.5
West: Henderson Rd (W)														
10	L2	526	6.6	526	6.6	1.028	118.8	LOS F	23.4	172.7	1.00	1.20	1.76	18.8
11	T1	288	3.6	288	3.6	0.487	36.3	LOS C	13.7	98.4	0.87	0.74	0.87	25.2
Approach		815	5.6	815	5.6	1.028	89.6	LOS F	23.4	172.7	0.95	1.04	1.45	19.9
All Vehicles		3076	5.5	3076	5.5	1.028	54.3	LOS D	23.4	172.7	0.76	0.85	1.08	24.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. AM Base Botany Road / Raglan Street]

Network: N101 [AM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
Approach		892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
East: Raglan St (E)														
4	L2	4	0.0	4	0.0	0.825	65.2	LOS E	8.2	58.9	0.98	0.95	1.28	4.4
5	T1	267	3.9	267	3.9	0.825	60.6	LOS E	8.3	59.9	0.98	0.95	1.28	4.4
Approach		272	3.9	272	3.9	0.825	60.6	LOS E	8.3	59.9	0.98	0.95	1.28	4.4
North: Botany Rd (N)														
7	L2	61	8.6	61	8.6	0.496	11.7	LOS A	16.1	120.0	0.45	0.44	0.45	41.6
8	T1	1327	7.6	1327	7.6	0.496	6.1	LOS A	16.1	120.0	0.42	0.40	0.42	42.8
9	R2	609	5.0	609	5.0	0.656	47.7	LOS D	16.1	117.0	0.95	0.84	0.95	21.8
Approach		1998	6.8	1998	6.8	0.656	18.9	LOS B	16.1	120.0	0.58	0.54	0.58	33.2
West: Henderson Rd (W)														
11	T1	251	2.1	250	2.1	0.850	52.3	LOS D	9.6	67.8	0.96	0.82	1.03	5.3
12	R2	49	14.9	49	14.9	0.850	68.8	LOS E	7.8	57.7	1.00	0.89	1.18	4.4
Approach		300	4.2	300	4.2	0.850	55.1	LOS D	9.6	67.8	0.97	0.83	1.06	5.1
All Vehicles		3461	6.0	3461	6.0	1.000	45.3	LOS D	44.3	323.3	0.76	0.76	0.93	18.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. AM Base Cope Street / Raglan Street]

Network: N101 [AM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	32	0.0	32	0.0	0.135	5.6	LOS A	0.7	4.0	0.46	0.53	0.46	29.5
2	T1	87	1.2	87	1.2	0.135	4.1	LOS A	0.7	4.0	0.46	0.53	0.46	37.9
3	R2	12	0.0	12	0.0	0.135	8.4	LOS A	0.7	4.0	0.46	0.53	0.46	43.3
Approach		131	0.8	131	0.8	0.135	4.8	LOS A	0.7	4.0	0.46	0.53	0.46	37.7
East: Raglan St (E)														
4	L2	4	75.0	4	75.0	0.195	5.3	LOS A	1.2	8.2	0.29	0.46	0.29	42.6
5	T1	205	5.6	205	5.6	0.195	4.2	LOS A	1.2	8.2	0.29	0.46	0.29	42.6
6	R2	28	0.0	28	0.0	0.195	6.1	LOS A	1.2	8.2	0.29	0.46	0.29	42.4
Approach		238	6.2	238	6.2	0.195	4.4	LOS A	1.2	8.2	0.29	0.46	0.29	42.6
North: Cope St (N)														
7	L2	14	0.0	14	0.0	0.091	5.2	LOS A	0.6	3.8	0.44	0.56	0.44	43.0
8	T1	31	0.0	31	0.0	0.091	4.7	LOS A	0.6	3.8	0.44	0.56	0.44	40.6
9	R2	47	4.4	47	4.4	0.091	8.3	LOS A	0.6	3.8	0.44	0.56	0.44	40.6
Approach		92	2.3	92	2.3	0.091	6.6	LOS A	0.6	3.8	0.44	0.56	0.44	41.2
West: Raglan St (W)														
10	L2	54	3.9	54	3.9	0.247	4.2	LOS A	1.3	9.2	0.22	0.47	0.22	44.0
11	T1	232	3.6	232	3.6	0.247	4.1	LOS A	1.3	9.2	0.22	0.47	0.22	44.9
12	R2	21	5.0	21	5.0	0.247	7.3	LOS A	1.3	9.2	0.22	0.47	0.22	28.0
Approach		306	3.8	306	3.8	0.247	4.3	LOS A	1.3	9.2	0.22	0.47	0.22	44.5
All Vehicles		766	3.8	766	3.8	0.247	4.7	LOS A	1.3	9.2	0.31	0.49	0.31	42.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. AM Base Cope Street / Wellington Street]

Network: N101 [AM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	15	0.0	15	0.0	0.034	3.9	LOS A	0.2	0.9	0.23	0.45	0.23	40.7
2	T1	20	0.0	20	0.0	0.034	3.5	LOS A	0.2	0.9	0.23	0.45	0.23	40.7
3	R2	5	0.0	5	0.0	0.034	6.6	LOS A	0.2	0.9	0.23	0.45	0.23	43.3
Approach		40	0.0	40	0.0	0.034	4.1	LOS A	0.2	0.9	0.23	0.45	0.23	41.3
East: Wellington St (E)														
4	L2	12	0.0	12	0.0	0.066	4.3	LOS A	0.3	2.3	0.21	0.47	0.21	45.0
5	T1	46	2.3	46	2.3	0.066	3.6	LOS A	0.3	2.3	0.21	0.47	0.21	42.0
6	R2	22	0.0	22	0.0	0.066	7.1	LOS A	0.3	2.3	0.21	0.47	0.21	42.0
Approach		80	1.3	80	1.3	0.066	4.7	LOS A	0.3	2.3	0.21	0.47	0.21	42.7
North: Cope St (N)														
7	L2	13	0.0	13	0.0	0.050	4.8	LOS A	0.3	1.9	0.34	0.50	0.34	42.6
8	T1	21	0.0	21	0.0	0.050	3.7	LOS A	0.3	1.9	0.34	0.50	0.34	38.9
9	R2	21	15.0	21	15.0	0.050	7.6	LOS A	0.3	1.9	0.34	0.50	0.34	25.4
Approach		55	5.8	55	5.8	0.050	5.4	LOS A	0.3	1.9	0.34	0.50	0.34	38.2
West: Wellington St (W)														
10	L2	85	1.2	85	1.2	0.203	3.2	LOS A	1.0	5.7	0.13	0.44	0.13	27.0
11	T1	158	3.3	158	3.3	0.203	3.5	LOS A	1.0	5.7	0.13	0.44	0.13	42.4
12	R2	33	3.2	33	3.2	0.203	6.6	LOS A	1.0	5.7	0.13	0.44	0.13	43.0
Approach		276	2.7	276	2.7	0.203	3.8	LOS A	1.0	5.7	0.13	0.44	0.13	41.1
All Vehicles		451	2.6	451	2.6	0.203	4.2	LOS A	1.0	5.7	0.18	0.45	0.18	41.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. AM Base Botany Road / Wellington Street / Buckland Street]

Network: N101 [AM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.566	11.8	LOS A	21.5	157.0	0.55	0.50	0.55	34.6
2	T1	849	5.7	849	5.7	0.566	10.9	LOS A	21.5	157.0	0.56	0.53	0.56	38.3
3	R2	81	5.2	81	5.2	0.566	21.8	LOS B	7.2	53.0	0.67	0.66	0.67	33.0
Approach		933	5.6	933	5.6	0.566	11.8	LOS A	21.5	157.0	0.57	0.54	0.57	37.8
East: Wellington St (E)														
4	L2	52	6.1	52	6.1	0.156	49.0	LOS D	2.6	18.6	0.88	0.73	0.88	22.6
5	T1	22	0.0	22	0.0	0.127	46.8	LOS D	2.2	11.1	0.89	0.70	0.89	17.8
6	R2	22	4.8	22	4.8	0.127	51.1	LOS D	2.2	11.1	0.89	0.70	0.89	4.8
Approach		96	4.4	96	4.4	0.156	49.0	LOS D	2.6	18.6	0.89	0.72	0.89	18.6
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.536	10.9	LOS A	12.6	93.7	0.35	0.33	0.35	35.9
8	T1	1340	8.1	1340	8.1	0.536	7.0	LOS A	14.4	107.6	0.37	0.35	0.37	44.0
9	R2	2	0.0	2	0.0	0.536	9.6	LOS A	14.4	107.6	0.40	0.37	0.40	31.8
Approach		1363	8.0	1363	8.0	0.536	7.1	LOS A	14.4	107.6	0.37	0.35	0.37	43.9
West: Buckland St (W)														
10	L2	11	0.0	11	0.0	0.346	48.0	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
11	T1	178	1.2	178	1.2	0.346	43.5	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
12	R2	24	17.4	24	17.4	0.093	49.1	LOS D	1.2	9.6	0.86	0.71	0.86	29.6
Approach		213	3.0	213	3.0	0.346	44.4	LOS D	9.4	50.7	0.90	0.73	0.90	22.5
All Vehicles		2604	6.6	2604	6.6	0.566	13.4	LOS A	21.5	157.0	0.51	0.46	0.51	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: TCS055 [1. PM Base Henderson Road / Wyndham Street]

Network: N101 [PM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	16	0.0	16	0.0	1.037	129.3	LOS F	23.5	164.6	1.00	1.41	1.90	18.3
2	T1	493	1.5	493	1.5	1.037	124.6	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
3	R2	2	0.0	2	0.0	1.037	128.9	LOS F	25.2	176.1	1.00	1.42	1.88	11.5
Approach		511	1.4	511	1.4	1.037	124.7	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
East: Henderson Rd (E)														
4	L2	165	1.3	161	1.3	0.399	15.7	LOS B	14.6	102.1	0.56	0.58	0.56	37.9
5	T1	915	0.9	891	0.9	0.399	8.8	LOS A	14.6	102.1	0.45	0.43	0.45	40.5
6	R2	851	3.5	828	3.4	0.738	22.2	LOS B	12.1	87.0	0.86	0.82	0.87	32.0
Approach		1931	2.1	1879 N1	2.1	0.738	15.3	LOS B	14.6	102.1	0.64	0.62	0.64	36.1
West: Henderson Rd (W)														
10	L2	525	1.6	525	1.6	1.021	114.1	LOS F	22.8	161.6	1.00	1.18	1.73	19.3
11	T1	311	0.0	311	0.0	0.522	37.5	LOS C	15.1	103.9	0.88	0.76	0.88	24.8
Approach		836	1.0	836	1.0	1.021	85.7	LOS F	22.8	161.6	0.96	1.02	1.41	20.4
All Vehicles		3277	1.7	3225 N1	1.7	1.037	50.9	LOS D	25.2	176.1	0.78	0.85	1.04	24.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. PM Base Botany Road / Raglan Street]

Network: N101 [PM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	838	2.9	838	2.9	1.046	128.0	LOS F	42.7	306.2	1.00	1.24	1.75	5.8
Approach		838	2.9	838	2.9	1.046	128.0	LOS F	42.7	306.2	1.00	1.24	1.75	5.8
East: Raglan St (E)														
4	L2	9	0.0	9	0.0	1.016	125.1	LOS F	13.3	92.5	1.00	1.30	1.95	2.3
5	T1	315	1.3	315	1.3	1.016	118.4	LOS F	15.3	106.1	1.00	1.31	1.91	2.3
Approach		324	1.3	324	1.3	1.016	118.6	LOS F	15.3	106.1	1.00	1.31	1.91	2.3
North: Botany Rd (N)														
7	L2	87	8.4	87	8.4	0.498	15.6	LOS B	18.2	130.0	0.55	0.53	0.55	38.0
8	T1	1227	3.2	1227	3.2	0.498	9.2	LOS A	18.2	130.0	0.51	0.48	0.51	39.7
9	R2	757	1.5	757	1.5	0.789	46.0	LOS D	24.2	169.7	0.96	0.90	1.04	22.2
Approach		2072	2.8	2072	2.8	0.789	22.9	LOS B	24.2	169.7	0.68	0.64	0.70	30.8
West: Henderson Rd (W)														
11	T1	262	0.8	262	0.8	0.835	24.2	LOS B	8.6	60.0	0.66	0.56	0.69	10.2
12	R2	37	0.0	37	0.0	0.835	74.8	LOS F	3.8	26.2	1.00	0.85	1.28	4.1
Approach		299	0.7	299	0.7	0.835	30.4	LOS C	8.6	60.0	0.71	0.59	0.76	8.5
All Vehicles		3533	2.5	3533	2.5	1.046	57.3	LOS E	42.7	306.2	0.78	0.84	1.07	15.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. PM Base Cope Street / Raglan Street]

Network: N101 [PM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	55	0.0	55	0.0	0.175	5.6	LOS A	0.6	3.9	0.46	0.57	0.46	30.5
2	T1	54	0.0	54	0.0	0.175	4.7	LOS A	0.6	3.9	0.46	0.57	0.46	41.1
3	R2	5	20.0	5	20.0	0.175	8.9	LOS A	0.6	3.9	0.46	0.57	0.46	43.3
Approach		114	0.9	114	0.9	0.175	5.3	LOS A	0.6	3.9	0.46	0.57	0.46	39.0
East: Raglan St (E)														
4	L2	1	100.0	1	100.0	0.355	6.0	LOS A	1.1	7.5	0.37	0.50	0.37	43.3
5	T1	197	2.1	197	2.1	0.355	4.5	LOS A	1.1	7.5	0.37	0.50	0.37	43.3
6	R2	9	0.0	9	0.0	0.355	7.4	LOS A	1.1	7.5	0.37	0.50	0.37	45.5
Approach		207	2.5	207	2.5	0.355	4.6	LOS A	1.1	7.5	0.37	0.50	0.37	43.4
North: Cope St (N)														
7	L2	24	0.0	24	0.0	0.287	4.9	LOS A	1.2	6.7	0.48	0.58	0.48	39.2
8	T1	79	1.3	79	1.3	0.287	3.8	LOS A	1.2	6.7	0.48	0.58	0.48	37.0
9	R2	94	0.0	94	0.0	0.287	8.1	LOS A	1.2	6.7	0.48	0.58	0.48	37.0
Approach		197	0.5	197	0.5	0.287	6.0	LOS A	1.2	6.7	0.48	0.58	0.48	37.4
West: Raglan St (W)														
10	L2	83	1.3	83	1.3	0.259	3.9	LOS A	1.4	9.9	0.19	0.44	0.19	43.7
11	T1	256	3.3	256	3.3	0.259	3.9	LOS A	1.4	9.9	0.19	0.44	0.19	45.0
12	R2	11	0.0	11	0.0	0.259	6.6	LOS A	1.4	9.9	0.19	0.44	0.19	28.4
Approach		349	2.7	349	2.7	0.259	4.0	LOS A	1.4	9.9	0.19	0.44	0.19	44.6
All Vehicles		867	1.9	867	1.9	0.355	4.8	LOS A	1.4	9.9	0.33	0.50	0.33	41.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. PM Base Cope Street / Wellington Street]

Network: N101 [PM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	29	0.0	29	0.0	0.045	4.9	LOS A	0.2	1.4	0.39	0.52	0.39	41.6
2	T1	14	0.0	14	0.0	0.045	4.3	LOS A	0.2	1.4	0.39	0.52	0.39	41.6
3	R2	4	0.0	4	0.0	0.045	7.9	LOS A	0.2	1.4	0.39	0.52	0.39	45.2
Approach		47	0.0	47	0.0	0.045	5.0	LOS A	0.2	1.4	0.39	0.52	0.39	42.1
East: Wellington St (E)														
4	L2	8	0.0	8	0.0	0.158	4.2	LOS A	0.9	5.7	0.27	0.47	0.27	43.8
5	T1	141	1.5	141	1.5	0.158	3.8	LOS A	0.9	5.7	0.27	0.47	0.27	41.6
6	R2	43	0.0	43	0.0	0.158	7.2	LOS A	0.9	5.7	0.27	0.47	0.27	41.6
Approach		193	1.1	193	1.1	0.158	4.6	LOS A	0.9	5.7	0.27	0.47	0.27	41.7
North: Cope St (N)														
7	L2	15	0.0	15	0.0	0.099	4.1	LOS A	0.6	2.9	0.31	0.52	0.31	38.7
8	T1	24	0.0	24	0.0	0.099	2.6	LOS A	0.6	2.9	0.31	0.52	0.31	34.3
9	R2	75	2.8	75	2.8	0.099	6.3	LOS A	0.6	2.9	0.31	0.52	0.31	24.1
Approach		114	1.9	114	1.9	0.099	5.2	LOS A	0.6	2.9	0.31	0.52	0.31	32.2
West: Wellington St (W)														
10	L2	54	2.0	54	2.0	0.150	3.9	LOS A	0.7	4.5	0.15	0.46	0.15	27.2
11	T1	118	1.8	118	1.8	0.150	3.6	LOS A	0.7	4.5	0.15	0.46	0.15	43.5
12	R2	22	0.0	22	0.0	0.150	6.8	LOS A	0.7	4.5	0.15	0.46	0.15	44.7
Approach		194	1.6	194	1.6	0.150	4.1	LOS A	0.7	4.5	0.15	0.46	0.15	42.4
All Vehicles		547	1.3	547	1.3	0.158	4.6	LOS A	0.9	5.7	0.25	0.48	0.25	40.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. PM Base Botany Road / Wellington Street / Buckland Street]

Network: N101 [PM Base (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.674	15.4	LOS B	22.1	157.9	0.67	0.61	0.67	33.5
2	T1	783	2.8	783	2.8	0.674	14.5	LOS B	22.1	157.9	0.68	0.63	0.68	35.6
3	R2	76	0.0	76	0.0	0.674	23.2	LOS B	9.9	70.4	0.72	0.70	0.74	32.4
Approach		861	2.6	861	2.6	0.674	15.3	LOS B	22.1	157.9	0.68	0.64	0.69	35.3
East: Wellington St (E)														
4	L2	147	2.9	147	2.9	0.534	47.8	LOS D	7.4	53.2	0.90	0.78	0.90	23.0
5	T1	59	0.0	59	0.0	0.330	42.9	LOS D	5.8	28.0	0.88	0.74	0.88	18.4
6	R2	58	0.0	58	0.0	0.330	47.2	LOS D	5.8	28.0	0.88	0.74	0.88	5.2
Approach		264	1.6	264	1.6	0.534	46.6	LOS D	7.4	53.2	0.89	0.76	0.89	19.3
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.501	10.4	LOS A	10.1	71.7	0.30	0.29	0.30	36.5
8	T1	1239	3.1	1239	3.1	0.501	6.3	LOS A	10.8	77.2	0.31	0.29	0.31	44.4
9	R2	1	0.0	1	0.0	0.501	8.5	LOS A	10.8	77.2	0.32	0.29	0.32	32.2
Approach		1261	3.1	1261	3.1	0.501	6.3	LOS A	10.8	77.2	0.31	0.29	0.31	44.4
West: Buckland St (W)														
10	L2	12	0.0	12	0.0	0.208	43.5	LOS D	4.9	30.8	0.84	0.68	0.84	23.3
11	T1	93	2.3	93	2.3	0.208	39.0	LOS C	4.9	30.8	0.84	0.68	0.84	23.3
12	R2	33	0.0	33	0.0	0.129	50.3	LOS D	1.6	11.5	0.88	0.72	0.88	29.3
Approach		137	1.5	137	1.5	0.208	42.1	LOS C	4.9	30.8	0.85	0.69	0.85	25.3
All Vehicles		2523	2.7	2523	2.7	0.674	15.5	LOS B	22.1	157.9	0.53	0.48	0.53	36.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: TCS055 [1. AM Base + Dev 1 Henderson Road / Wyndham Street]

Network: N101 [AM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	13	8.3	13	8.3	1.013	115.2	LOS F	21.9	158.9	1.00	1.36	1.79	19.4
2	T1	487	7.6	487	7.6	1.013	110.8	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
3	R2	3	33.3	3	33.3	1.013	114.7	LOS F	23.2	169.0	1.00	1.36	1.78	12.6
Approach		503	7.7	503	7.7	1.013	111.0	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
East: Henderson Rd (E)														
4	L2	197	3.2	197	3.2	0.341	9.5	LOS A	4.4	32.2	0.21	0.40	0.21	41.9
5	T1	645	4.7	645	4.7	0.341	3.3	LOS A	4.4	32.2	0.16	0.21	0.16	45.6
6	R2	945	5.0	945	5.0	0.898	39.6	LOS C	15.7	114.2	0.99	0.97	1.24	25.2
Approach		1787	4.7	1787	4.7	0.898	23.2	LOS B	15.7	114.2	0.60	0.63	0.74	31.8
West: Henderson Rd (W)														
10	L2	526	6.6	526	6.6	1.028	118.8	LOS F	23.4	172.7	1.00	1.20	1.76	18.8
11	T1	292	3.6	292	3.6	0.493	36.4	LOS C	13.9	99.7	0.87	0.74	0.87	25.2
Approach		818	5.5	818	5.5	1.028	89.4	LOS F	23.4	172.7	0.95	1.04	1.44	19.9
All Vehicles		3108	5.4	3108	5.4	1.028	54.8	LOS D	23.4	172.7	0.76	0.86	1.09	24.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. AM Base + Dev 1 Botany Road / Raglan Street]

Network: N101 [AM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
Approach		892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
East: Raglan St (E)														
4	L2	4	0.0	4	0.0	0.943	83.8	LOS F	10.6	75.9	0.99	1.13	1.61	3.4
5	T1	297	3.5	297	3.5	0.943	79.1	LOS F	10.8	77.1	0.99	1.13	1.61	3.4
Approach		301	3.5	301	3.5	0.943	79.1	LOS F	10.8	77.1	0.99	1.13	1.61	3.4
North: Botany Rd (N)														
7	L2	65	8.1	65	8.1	0.498	11.7	LOS A	16.2	120.4	0.46	0.44	0.46	41.6
8	T1	1327	7.6	1327	7.6	0.498	6.1	LOS A	16.2	120.4	0.42	0.40	0.42	42.8
9	R2	609	5.0	609	5.0	0.656	47.7	LOS D	16.1	117.0	0.95	0.84	0.95	21.8
Approach		2002	6.8	2002	6.8	0.656	18.9	LOS B	16.2	120.4	0.59	0.54	0.59	33.2
West: Henderson Rd (W)														
11	T1	254	2.1	254	2.1	0.894	53.1	LOS D	10.3	72.5	0.97	0.84	1.07	5.2
12	R2	49	14.9	49	14.9	0.894	72.1	LOS F	7.6	56.5	1.00	0.93	1.26	4.2
Approach		303	4.2	303	4.2	0.894	56.2	LOS D	10.3	72.5	0.98	0.85	1.10	5.0
All Vehicles		3498	5.9	3498	5.9	1.000	47.1	LOS D	44.3	323.3	0.76	0.78	0.96	18.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. AM Base + Dev 1 Cope Street / Raglan Street]

Network: N101 [AM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	60	0.0	60	0.0	0.214	5.7	LOS A	1.1	6.5	0.48	0.59	0.48	29.3
2	T1	87	1.2	87	1.2	0.214	4.2	LOS A	1.1	6.5	0.48	0.59	0.48	37.8
3	R2	43	0.0	43	0.0	0.214	8.5	LOS A	1.1	6.5	0.48	0.59	0.48	43.1
Approach		191	0.6	191	0.6	0.214	5.6	LOS A	1.1	6.5	0.48	0.59	0.48	38.2
East: Raglan St (E)														
4	L2	11	30.0	11	30.0	0.250	4.7	LOS A	1.2	8.6	0.30	0.47	0.30	42.6
5	T1	205	5.6	205	5.6	0.250	4.2	LOS A	1.2	8.6	0.30	0.47	0.30	42.6
6	R2	28	0.0	28	0.0	0.250	6.1	LOS A	1.2	8.6	0.30	0.47	0.30	42.4
Approach		244	6.0	244	6.0	0.250	4.5	LOS A	1.2	8.6	0.30	0.47	0.30	42.5
North: Cope St (N)														
7	L2	14	0.0	14	0.0	0.108	5.5	LOS A	0.6	3.8	0.48	0.58	0.48	42.9
8	T1	31	0.0	31	0.0	0.108	4.9	LOS A	0.6	3.8	0.48	0.58	0.48	40.4
9	R2	47	4.4	47	4.4	0.108	8.6	LOS A	0.6	3.8	0.48	0.58	0.48	40.4
Approach		92	2.3	92	2.3	0.108	6.9	LOS A	0.6	3.8	0.48	0.58	0.48	41.0
West: Raglan St (W)														
10	L2	54	3.9	54	3.9	0.263	4.4	LOS A	1.4	10.0	0.25	0.49	0.25	43.7
11	T1	232	3.6	232	3.6	0.263	4.3	LOS A	1.4	10.0	0.25	0.49	0.25	44.7
12	R2	27	3.8	27	3.8	0.263	7.5	LOS A	1.4	10.0	0.25	0.49	0.25	27.4
Approach		313	3.7	313	3.7	0.263	4.6	LOS A	1.4	10.0	0.25	0.49	0.25	44.1
All Vehicles		839	3.5	839	3.5	0.263	5.1	LOS A	1.4	10.0	0.34	0.52	0.34	42.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. AM Base + Dev 1 Cope Street / Wellington Street]

Network: N101 [AM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	15	0.0	15	0.0	0.034	4.0	LOS A	0.2	1.0	0.25	0.45	0.25	40.6
2	T1	20	0.0	20	0.0	0.034	3.6	LOS A	0.2	1.0	0.25	0.45	0.25	40.6
3	R2	5	0.0	5	0.0	0.034	6.7	LOS A	0.2	1.0	0.25	0.45	0.25	43.2
Approach		40	0.0	40	0.0	0.034	4.1	LOS A	0.2	1.0	0.25	0.45	0.25	41.2
East: Wellington St (E)														
4	L2	12	0.0	12	0.0	0.069	4.3	LOS A	0.4	2.4	0.23	0.48	0.23	44.9
5	T1	46	2.3	46	2.3	0.069	3.7	LOS A	0.4	2.4	0.23	0.48	0.23	41.9
6	R2	24	0.0	24	0.0	0.069	7.1	LOS A	0.4	2.4	0.23	0.48	0.23	41.9
Approach		82	1.3	82	1.3	0.069	4.8	LOS A	0.4	2.4	0.23	0.48	0.23	42.6
North: Cope St (N)														
7	L2	22	0.0	22	0.0	0.071	4.9	LOS A	0.4	2.8	0.35	0.53	0.35	42.5
8	T1	21	0.0	21	0.0	0.071	3.7	LOS A	0.4	2.8	0.35	0.53	0.35	38.7
9	R2	35	9.1	35	9.1	0.071	7.6	LOS A	0.4	2.8	0.35	0.53	0.35	25.0
Approach		78	4.1	78	4.1	0.071	5.8	LOS A	0.4	2.8	0.35	0.53	0.35	38.0
West: Wellington St (W)														
10	L2	88	1.2	88	1.2	0.206	3.3	LOS A	1.0	5.9	0.13	0.44	0.13	27.0
11	T1	158	3.3	158	3.3	0.206	3.5	LOS A	1.0	5.9	0.13	0.44	0.13	42.4
12	R2	33	3.2	33	3.2	0.206	6.7	LOS A	1.0	5.9	0.13	0.44	0.13	43.0
Approach		279	2.6	279	2.6	0.206	3.8	LOS A	1.0	5.9	0.13	0.44	0.13	41.1
All Vehicles		479	2.4	479	2.4	0.206	4.3	LOS A	1.0	5.9	0.19	0.46	0.19	41.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. AM Base + Dev 1 Botany Road / Wellington Street / Buckland Street]

Network: N101 [AM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.576	12.0	LOS A	22.2	161.9	0.56	0.51	0.56	34.5
2	T1	849	5.7	849	5.7	0.576	10.9	LOS A	22.2	161.9	0.57	0.53	0.57	38.3
3	R2	84	5.0	84	5.0	0.576	22.0	LOS B	6.9	50.7	0.67	0.68	0.67	32.7
Approach		936	5.6	936	5.6	0.576	11.9	LOS A	22.2	161.9	0.58	0.54	0.58	37.7
East: Wellington St (E)														
4	L2	65	4.8	65	4.8	0.196	49.4	LOS D	3.3	23.6	0.89	0.74	0.89	22.6
5	T1	22	0.0	22	0.0	0.127	46.8	LOS D	2.2	11.1	0.89	0.70	0.89	17.8
6	R2	22	4.8	22	4.8	0.127	51.1	LOS D	2.2	11.1	0.89	0.70	0.89	4.8
Approach		109	3.8	109	3.8	0.196	49.2	LOS D	3.3	23.6	0.89	0.73	0.89	19.1
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.536	10.8	LOS A	12.5	93.3	0.35	0.33	0.35	36.0
8	T1	1340	8.1	1340	8.1	0.536	7.0	LOS A	14.3	106.8	0.37	0.35	0.37	44.0
9	R2	2	0.0	2	0.0	0.536	9.5	LOS A	14.3	106.8	0.40	0.36	0.40	31.8
Approach		1363	8.0	1363	8.0	0.536	7.0	LOS A	14.3	106.8	0.37	0.35	0.37	44.0
West: Buckland St (W)														
10	L2	11	0.0	11	0.0	0.346	48.0	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
11	T1	178	1.2	178	1.2	0.346	43.5	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
12	R2	24	17.4	24	17.4	0.095	49.2	LOS D	1.2	9.6	0.86	0.71	0.86	29.5
Approach		213	3.0	213	3.0	0.346	44.4	LOS D	9.4	50.7	0.90	0.73	0.90	22.5
All Vehicles		2621	6.5	2621	6.5	0.576	13.6	LOS A	22.2	161.9	0.51	0.46	0.51	37.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [6. AM Base + Dev 1 Cope Street / Shared Zone]

Network: N101 [AM Base + Existing PP (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	6	0.0	6	0.0	0.054	3.8	LOS A	0.0	0.0	0.00	0.03	0.00	43.3
2	T1	127	0.8	127	0.8	0.054	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	42.1
Approach		134	0.8	134	0.8	0.054	0.2	NA	0.0	0.0	0.00	0.03	0.00	42.4
North: Cope St (N)														
8	T1	55	7.7	55	7.7	0.036	0.2	LOS A	0.1	0.6	0.10	0.14	0.10	41.5
9	R2	15	0.0	15	0.0	0.036	4.9	LOS A	0.1	0.6	0.10	0.14	0.10	46.5
Approach		69	6.1	69	6.1	0.036	1.2	NA	0.1	0.6	0.10	0.14	0.10	44.2
West: Shared Zone (W)														
10	L2	59	0.0	59	0.0	0.060	4.9	LOS A	0.2	1.6	0.20	0.52	0.20	43.7
12	R2	23	0.0	23	0.0	0.060	5.2	LOS A	0.2	1.6	0.20	0.52	0.20	43.7
Approach		82	0.0	82	0.0	0.060	5.0	LOS A	0.2	1.6	0.20	0.52	0.20	43.7
All Vehicles		285	1.8	285	1.8	0.060	1.8	NA	0.2	1.6	0.08	0.20	0.08	43.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS055 [1. PM Base + Dev 1 Henderson Road / Wyndham Street]

Network: N101 [PM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	16	0.0	16	0.0	1.037	129.3	LOS F	23.5	164.6	1.00	1.41	1.90	18.3
2	T1	493	1.5	493	1.5	1.037	124.6	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
3	R2	2	0.0	2	0.0	1.037	128.9	LOS F	25.2	176.1	1.00	1.42	1.88	11.5
Approach		511	1.4	511	1.4	1.037	124.7	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
East: Henderson Rd (E)														
4	L2	165	1.3	160	1.3	0.399	15.7	LOS B	14.6	101.8	0.56	0.58	0.56	38.0
5	T1	918	0.9	889	0.9	0.399	8.8	LOS A	14.6	101.8	0.45	0.43	0.45	40.6
6	R2	855	3.4	828	3.4	0.739	22.3	LOS B	12.1	87.1	0.86	0.82	0.87	31.9
Approach		1938	2.1	1877[N1]	2.1	0.739	15.3	LOS B	14.6	101.8	0.64	0.62	0.64	36.1
West: Henderson Rd (W)														
10	L2	525	1.6	525	1.6	1.021	114.1	LOS F	22.8	161.6	1.00	1.18	1.73	19.3
11	T1	322	0.0	322	0.0	0.542	37.7	LOS C	15.7	108.7	0.89	0.76	0.89	24.7
Approach		847	1.0	847	1.0	1.021	85.1	LOS F	22.8	161.6	0.96	1.02	1.41	20.4
All Vehicles		3296	1.7	3235[N1]	1.7	1.037	50.9	LOS D	25.2	176.1	0.78	0.85	1.04	24.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. PM Base + Dev 1 Botany Road / Raglan Street]

Network: N101 [PM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	838	2.9	838	2.9	1.046	128.4	LOS F	42.7	306.0	1.00	1.24	1.75	5.7
Approach		838	2.9	838	2.9	1.046	128.4	LOS F	42.7	306.0	1.00	1.24	1.75	5.7
East: Raglan St (E)														
4	L2	9	0.0	9	0.0	1.036	136.3	LOS F	14.3	99.4	1.00	1.35	2.03	2.1
5	T1	322	1.3	322	1.3	1.036	129.7	LOS F	15.3	106.1	1.00	1.36	1.99	2.1
Approach		332	1.3	332	1.3	1.036	129.9	LOS F	15.3	106.1	1.00	1.36	1.99	2.1
North: Botany Rd (N)														
7	L2	104	7.1	104	7.1	0.508	16.2	LOS B	18.8	134.3	0.56	0.55	0.56	37.4
8	T1	1227	3.2	1227	3.2	0.508	9.5	LOS A	18.8	134.3	0.52	0.49	0.52	39.4
9	R2	757	1.5	757	1.5	0.786	45.7	LOS D	24.1	168.8	0.96	0.90	1.03	22.2
Approach		2088	2.8	2088	2.8	0.786	23.0	LOS B	24.1	168.8	0.68	0.64	0.71	30.8
West: Henderson Rd (W)														
11	T1	275	0.8	275	0.8	0.866	24.4	LOS B	9.1	63.0	0.67	0.57	0.71	10.1
12	R2	37	0.0	37	0.0	0.866	75.4	LOS F	4.0	28.2	1.00	0.87	1.32	4.0
Approach		312	0.7	312	0.7	0.866	30.4	LOS C	9.1	63.0	0.71	0.61	0.78	8.5
All Vehicles		3569	2.5	3569	2.5	1.046	58.3	LOS E	42.7	306.0	0.79	0.84	1.08	15.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. PM Base + Dev 1 Cope Street / Raglan Street]

Network: N101 [PM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	62	0.0	62	0.0	0.199	5.6	LOS A	0.7	4.6	0.47	0.59	0.47	30.2
2	T1	54	0.0	54	0.0	0.199	4.7	LOS A	0.7	4.6	0.47	0.59	0.47	41.0
3	R2	13	8.3	13	8.3	0.199	8.7	LOS A	0.7	4.6	0.47	0.59	0.47	43.5
Approach		128	0.8	128	0.8	0.199	5.5	LOS A	0.7	4.6	0.47	0.59	0.47	39.0
East: Raglan St (E)														
4	L2	32	3.3	32	3.3	0.392	4.8	LOS A	1.3	9.1	0.41	0.53	0.41	43.2
5	T1	197	2.1	197	2.1	0.392	4.7	LOS A	1.3	9.1	0.41	0.53	0.41	43.2
6	R2	9	0.0	9	0.0	0.392	7.6	LOS A	1.3	9.1	0.41	0.53	0.41	45.4
Approach		238	2.2	238	2.2	0.392	4.8	LOS A	1.3	9.1	0.41	0.53	0.41	43.3
North: Cope St (N)														
7	L2	24	0.0	24	0.0	0.296	5.2	LOS A	1.3	7.0	0.51	0.60	0.51	39.1
8	T1	79	1.3	79	1.3	0.296	4.1	LOS A	1.3	7.0	0.51	0.60	0.51	36.8
9	R2	94	0.0	94	0.0	0.296	8.4	LOS A	1.3	7.0	0.51	0.60	0.51	36.8
Approach		197	0.5	197	0.5	0.296	6.3	LOS A	1.3	7.0	0.51	0.60	0.51	37.3
West: Raglan St (W)														
10	L2	83	1.3	83	1.3	0.284	4.0	LOS A	1.6	11.2	0.20	0.46	0.20	43.5
11	T1	256	3.3	256	3.3	0.284	3.9	LOS A	1.6	11.2	0.20	0.46	0.20	44.7
12	R2	40	0.0	40	0.0	0.284	7.0	LOS A	1.6	11.2	0.20	0.46	0.20	27.7
Approach		379	2.5	379	2.5	0.284	4.3	LOS A	1.6	11.2	0.20	0.46	0.20	44.0
All Vehicles		942	1.8	942	1.8	0.392	5.0	LOS A	1.6	11.2	0.36	0.52	0.36	41.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. PM Base + Dev 1 Cope Street / Wellington Street]

Network: N101 [PM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	29	0.0	29	0.0	0.046	4.9	LOS A	0.2	1.4	0.40	0.52	0.40	41.6
2	T1	14	0.0	14	0.0	0.046	4.4	LOS A	0.2	1.4	0.40	0.52	0.40	41.6
3	R2	4	0.0	4	0.0	0.046	8.0	LOS A	0.2	1.4	0.40	0.52	0.40	45.2
Approach		47	0.0	47	0.0	0.046	5.0	LOS A	0.2	1.4	0.40	0.52	0.40	42.1
East: Wellington St (E)														
4	L2	8	0.0	8	0.0	0.166	4.2	LOS A	0.9	6.0	0.28	0.48	0.28	43.8
5	T1	141	1.5	141	1.5	0.166	3.9	LOS A	0.9	6.0	0.28	0.48	0.28	41.5
6	R2	52	0.0	52	0.0	0.166	7.2	LOS A	0.9	6.0	0.28	0.48	0.28	41.5
Approach		201	1.0	201	1.0	0.166	4.7	LOS A	0.9	6.0	0.28	0.48	0.28	41.7
North: Cope St (N)														
7	L2	18	0.0	18	0.0	0.106	4.2	LOS A	0.6	3.2	0.31	0.52	0.31	39.3
8	T1	24	0.0	24	0.0	0.106	2.6	LOS A	0.6	3.2	0.31	0.52	0.31	34.3
9	R2	79	2.7	79	2.7	0.106	6.4	LOS A	0.6	3.2	0.31	0.52	0.31	24.1
Approach		121	1.7	121	1.7	0.106	5.3	LOS A	0.6	3.2	0.31	0.52	0.31	32.6
West: Wellington St (W)														
10	L2	67	1.6	67	1.6	0.162	4.0	LOS A	0.7	4.9	0.17	0.46	0.17	27.0
11	T1	118	1.8	118	1.8	0.162	3.7	LOS A	0.7	4.9	0.17	0.46	0.17	43.5
12	R2	22	0.0	22	0.0	0.162	6.8	LOS A	0.7	4.9	0.17	0.46	0.17	44.7
Approach		207	1.5	207	1.5	0.162	4.1	LOS A	0.7	4.9	0.17	0.46	0.17	42.1
All Vehicles		577	1.3	577	1.3	0.166	4.7	LOS A	0.9	6.0	0.26	0.49	0.26	40.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. PM Base + Dev 1 Botany Road / Wellington Street / Buckland Street]

Network: N101 [PM Base + Existing PP (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.714	16.1	LOS B	24.3	173.7	0.70	0.64	0.70	33.3
2	T1	783	2.8	783	2.8	0.714	15.7	LOS B	24.3	173.7	0.71	0.67	0.72	34.8
3	R2	89	0.0	89	0.0	0.714	27.8	LOS B	10.4	73.9	0.76	0.78	0.83	29.8
Approach		875	2.5	875	2.5	0.714	16.9	LOS B	24.3	173.7	0.71	0.68	0.73	34.2
East: Wellington St (E)														
4	L2	152	2.8	152	2.8	0.551	47.9	LOS D	7.7	54.8	0.90	0.78	0.90	23.0
5	T1	59	0.0	59	0.0	0.333	42.9	LOS D	5.8	28.0	0.88	0.74	0.88	18.4
6	R2	58	0.0	58	0.0	0.333	47.2	LOS D	5.8	28.0	0.88	0.74	0.88	5.2
Approach		268	1.6	268	1.6	0.551	46.7	LOS D	7.7	54.8	0.89	0.76	0.89	19.4
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.502	10.4	LOS A	10.1	71.8	0.30	0.29	0.30	36.5
8	T1	1239	3.1	1238	3.1	0.502	6.2	LOS A	10.8	77.0	0.31	0.29	0.31	44.4
9	R2	1	0.0	1	0.0	0.502	8.5	LOS A	10.8	77.0	0.32	0.29	0.32	32.2
Approach		1261	3.1	1261	3.1	0.502	6.3	LOS A	10.8	77.0	0.31	0.29	0.31	44.4
West: Buckland St (W)														
10	L2	12	0.0	12	0.0	0.209	43.5	LOS D	4.9	30.8	0.84	0.68	0.84	23.3
11	T1	93	2.3	93	2.3	0.209	39.0	LOS C	4.9	30.8	0.84	0.68	0.84	23.3
12	R2	33	0.0	33	0.0	0.130	50.3	LOS D	1.6	11.5	0.88	0.72	0.88	29.3
Approach		137	1.5	137	1.5	0.209	42.1	LOS C	4.9	30.8	0.85	0.69	0.85	25.3
All Vehicles		2541	2.7	2541	2.7	0.714	16.2	LOS B	24.3	173.7	0.54	0.50	0.55	36.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [6. PM Base + Dev 1 Cope Street / Shared Zone]

Network: N101 [PM Base + Existing PP (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	23	0.0	23	0.0	0.065	4.4	LOS A	0.0	0.0	0.00	0.10	0.00	46.8
2	T1	111	1.0	111	1.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	42.6
Approach		134	0.8	134	0.8	0.065	0.8	NA	0.0	0.0	0.00	0.10	0.00	45.1
North: Cope St (N)														
8	T1	91	2.3	91	2.3	0.073	0.4	LOS A	0.4	2.0	0.20	0.23	0.20	34.4
9	R2	59	0.0	59	0.0	0.073	5.0	LOS A	0.4	2.0	0.20	0.23	0.20	44.4
Approach		149	1.4	149	1.4	0.073	2.2	NA	0.4	2.0	0.20	0.23	0.20	41.5
West: Shared Zone (W)														
10	L2	15	0.0	15	0.0	0.016	4.8	LOS A	0.1	0.4	0.20	0.51	0.20	43.7
12	R2	6	0.0	6	0.0	0.016	5.4	LOS A	0.1	0.4	0.20	0.51	0.20	43.7
Approach		21	0.0	21	0.0	0.016	5.0	LOS A	0.1	0.4	0.20	0.51	0.20	43.7
All Vehicles		304	1.0	304	1.0	0.073	1.8	NA	0.4	2.0	0.11	0.19	0.11	42.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS055 [1. AM Base + Dev 2 Henderson Road / Wyndham Street]

Network: N101 [AM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	13	8.3	13	8.3	1.013	115.2	LOS F	21.9	158.9	1.00	1.36	1.79	19.4
2	T1	487	7.6	487	7.6	1.013	110.8	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
3	R2	3	33.3	3	33.3	1.013	114.7	LOS F	23.2	169.0	1.00	1.36	1.78	12.6
Approach		503	7.7	503	7.7	1.013	111.0	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
East: Henderson Rd (E)														
4	L2	197	3.2	193	3.2	0.342	9.4	LOS A	4.3	31.3	0.21	0.39	0.21	42.1
5	T1	665	4.6	652	4.6	0.342	3.2	LOS A	4.3	31.3	0.16	0.20	0.16	45.8
6	R2	974	4.9	955	4.9	0.907	41.1	LOS C	15.7	114.2	0.99	0.98	1.26	24.8
Approach		1836	4.6	1800 N1	4.6	0.907	23.9	LOS B	15.7	114.2	0.60	0.64	0.75	31.4
West: Henderson Rd (W)														
10	L2	526	6.6	526	6.6	1.028	118.8	LOS F	23.4	172.7	1.00	1.20	1.76	18.8
11	T1	297	3.5	297	3.5	0.501	36.5	LOS C	14.2	101.8	0.87	0.74	0.87	25.2
Approach		823	5.5	823	5.5	1.028	89.1	LOS F	23.4	172.7	0.95	1.03	1.44	19.9
All Vehicles		3162	5.3	3126 N1	5.4	1.028	55.1	LOS D	23.4	172.7	0.76	0.86	1.10	24.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. AM Base + Dev 2 Botany Road / Raglan Street]

Network: N101 [AM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	892	5.3	892	5.3	1.000	105.6	LOS F	46.6	340.2	1.00	1.20	1.63	6.9
Approach		892	5.3	892	5.3	1.000	105.6	LOS F	46.6	340.2	1.00	1.20	1.63	6.9
East: Raglan St (E)														
4	L2	4	0.0	4	0.0	1.106	177.8	LOS F	14.9	106.1	1.00	1.50	2.27	1.6
5	T1	345	3.0	345	3.0	1.106	173.2	LOS F	14.9	106.1	1.00	1.50	2.27	1.6
Approach		349	3.0	349	3.0	1.106	173.2	LOS F	14.9	106.1	1.00	1.50	2.27	1.6
North: Botany Rd (N)														
7	L2	73	7.2	73	7.2	0.502	12.1	LOS A	16.7	124.1	0.47	0.46	0.47	41.1
8	T1	1327	7.6	1327	7.6	0.502	6.3	LOS A	16.7	124.1	0.43	0.41	0.43	42.6
9	R2	609	5.0	609	5.0	0.656	47.7	LOS D	16.1	117.0	0.95	0.84	0.95	21.8
Approach		2009	6.8	2009	6.8	0.656	19.1	LOS B	16.7	124.1	0.59	0.54	0.59	33.1
West: Henderson Rd (W)														
11	T1	258	2.0	258	2.0	1.125	61.8	LOS E	14.1	99.1	1.00	0.93	1.21	4.5
12	R2	49	14.9	49	14.9	1.125	182.5	LOS F	8.3	63.0	1.00	1.19	2.15	1.7
Approach		307	4.1	307	4.1	1.125	81.3	LOS F	14.1	99.1	1.00	0.97	1.36	3.5
All Vehicles		3558	5.8	3558	5.8	1.125	61.3	LOS E	46.6	340.2	0.77	0.84	1.08	15.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. AM Base + Dev 2 Cope Street / Raglan Street]

Network: N101 [AM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	109	0.0	109	0.0	0.413	5.9	LOS A	1.8	11.5	0.52	0.65	0.52	28.9
2	T1	87	1.2	87	1.2	0.413	4.4	LOS A	1.8	11.5	0.52	0.65	0.52	37.7
3	R2	95	0.0	95	0.0	0.413	8.7	LOS A	1.8	11.5	0.52	0.65	0.52	42.9
Approach		292	0.4	292	0.4	0.413	6.4	LOS A	1.8	11.5	0.52	0.65	0.52	38.5
East: Raglan St (E)														
4	L2	24	13.0	24	13.0	0.387	4.5	LOS A	1.3	9.3	0.32	0.48	0.32	42.6
5	T1	205	5.6	205	5.6	0.387	4.3	LOS A	1.3	9.3	0.32	0.48	0.32	42.6
6	R2	28	0.0	28	0.0	0.387	6.2	LOS A	1.3	9.3	0.32	0.48	0.32	42.4
Approach		258	5.7	258	5.7	0.387	4.6	LOS A	1.3	9.3	0.32	0.48	0.32	42.5
North: Cope St (N)														
7	L2	14	0.0	14	0.0	0.150	5.9	LOS A	0.6	4.0	0.52	0.62	0.52	42.8
8	T1	31	0.0	31	0.0	0.150	5.3	LOS A	0.6	4.0	0.52	0.62	0.52	40.1
9	R2	47	4.4	47	4.4	0.150	9.0	LOS A	0.6	4.0	0.52	0.62	0.52	40.1
Approach		92	2.3	92	2.3	0.150	7.3	LOS A	0.6	4.0	0.52	0.62	0.52	40.8
West: Raglan St (W)														
10	L2	54	3.9	53	3.9	0.291	4.8	LOS A	1.6	11.3	0.31	0.52	0.31	43.4
11	T1	232	3.6	230	3.6	0.291	4.7	LOS A	1.6	11.3	0.31	0.52	0.31	44.3
12	R2	40	2.6	40	2.6	0.291	7.9	LOS A	1.6	11.3	0.31	0.52	0.31	26.5
Approach		325	3.6	323[N1]	3.6	0.291	5.1	LOS A	1.6	11.3	0.31	0.52	0.31	43.6
All Vehicles		966	3.1	964[N1]	3.1	0.413	5.6	LOS A	1.8	11.5	0.40	0.56	0.40	41.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 102 [4. AM Base + Dev 2 Cope Street / Wellington Street]

Network: N101 [AM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	15	0.0	15	0.0	0.035	4.1	LOS A	0.2	1.0	0.28	0.46	0.28	40.5
2	T1	20	0.0	20	0.0	0.035	3.7	LOS A	0.2	1.0	0.28	0.46	0.28	40.5
3	R2	5	0.0	5	0.0	0.035	6.9	LOS A	0.2	1.0	0.28	0.46	0.28	43.2
Approach		40	0.0	40	0.0	0.035	4.3	LOS A	0.2	1.0	0.28	0.46	0.28	41.1
East: Wellington St (E)														
4	L2	12	0.0	12	0.0	0.074	4.4	LOS A	0.4	2.6	0.27	0.50	0.27	44.8
5	T1	46	2.3	46	2.3	0.074	3.8	LOS A	0.4	2.6	0.27	0.50	0.27	41.8
6	R2	28	0.0	28	0.0	0.074	7.3	LOS A	0.4	2.6	0.27	0.50	0.27	41.8
Approach		86	1.2	86	1.2	0.074	5.0	LOS A	0.4	2.6	0.27	0.50	0.27	42.5
North: Cope St (N)														
7	L2	38	0.0	38	0.0	0.105	4.9	LOS A	0.6	4.3	0.36	0.55	0.36	42.3
8	T1	21	0.0	21	0.0	0.105	3.7	LOS A	0.6	4.3	0.36	0.55	0.36	38.6
9	R2	58	5.5	58	5.5	0.105	7.7	LOS A	0.6	4.3	0.36	0.55	0.36	24.8
Approach		117	2.7	117	2.7	0.105	6.1	LOS A	0.6	4.3	0.36	0.55	0.36	37.7
West: Wellington St (W)														
10	L2	95	1.1	95	1.1	0.212	3.4	LOS A	1.0	6.1	0.14	0.44	0.14	26.9
11	T1	158	3.3	158	3.3	0.212	3.5	LOS A	1.0	6.1	0.14	0.44	0.14	42.3
12	R2	33	3.2	33	3.2	0.212	6.7	LOS A	1.0	6.1	0.14	0.44	0.14	43.0
Approach		285	2.6	285	2.6	0.212	3.8	LOS A	1.0	6.1	0.14	0.44	0.14	41.0
All Vehicles		528	2.2	528	2.2	0.212	4.6	LOS A	1.0	6.1	0.22	0.47	0.22	40.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. AM Base + Dev 2 Botany Road / Wellington Street / Buckland Street]

Network: N101 [AM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.585	12.1	LOS A	22.7	165.8	0.56	0.52	0.56	34.5
2	T1	849	5.7	849	5.7	0.585	10.8	LOS A	22.7	165.8	0.57	0.53	0.57	38.4
3	R2	91	4.7	91	4.7	0.585	21.6	LOS B	6.7	49.2	0.67	0.68	0.67	32.8
Approach		942	5.6	942	5.6	0.585	11.9	LOS A	22.7	165.8	0.58	0.55	0.58	37.7
East: Wellington St (E)														
4	L2	89	3.5	89	3.5	0.288	50.1	LOS D	4.5	32.6	0.90	0.76	0.90	22.4
5	T1	22	0.0	22	0.0	0.127	46.8	LOS D	2.2	11.1	0.89	0.70	0.89	17.8
6	R2	22	4.8	22	4.8	0.127	51.1	LOS D	2.2	11.1	0.89	0.70	0.89	4.8
Approach		134	3.1	134	3.1	0.288	49.7	LOS D	4.5	32.6	0.90	0.74	0.90	19.6
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.533	10.8	LOS A	12.4	92.5	0.34	0.33	0.34	36.0
8	T1	1340	8.1	1334	8.1	0.533	6.4	LOS A	12.6	93.9	0.35	0.32	0.35	44.4
9	R2	2	0.0	2	0.0	0.533	8.5	LOS A	12.6	93.9	0.35	0.32	0.35	32.2
Approach		1363	8.0	1357 N1	7.9	0.533	6.5	LOS A	12.6	93.9	0.35	0.32	0.35	44.4
West: Buckland St (W)														
10	L2	11	0.0	11	0.0	0.346	48.0	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
11	T1	178	1.2	178	1.2	0.346	43.5	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
12	R2	24	17.4	24	17.4	0.102	51.1	LOS D	1.2	9.8	0.88	0.71	0.88	29.1
Approach		213	3.0	213	3.0	0.346	44.6	LOS D	9.4	50.7	0.90	0.73	0.90	22.4
All Vehicles		2652	6.5	2646 N1	6.5	0.585	13.7	LOS A	22.7	165.8	0.50	0.46	0.50	37.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [6. AM Base + Dev 2 Cope Street / Shared Zone]

Network: N101 [AM Base + Max Permissible (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	16	0.0	16	0.0	0.059	3.9	LOS A	0.0	0.0	0.00	0.07	0.00	43.4
2	T1	127	0.8	127	0.8	0.059	0.1	LOS A	0.0	0.0	0.00	0.07	0.00	40.8
Approach		143	0.7	143	0.7	0.059	0.5	NA	0.0	0.0	0.00	0.07	0.00	42.0
North: Cope St (N)														
8	T1	55	7.7	55	7.7	0.052	0.4	LOS A	0.2	1.5	0.18	0.24	0.18	37.6
9	R2	40	0.0	40	0.0	0.052	4.9	LOS A	0.2	1.5	0.18	0.24	0.18	45.5
Approach		95	4.4	94 N1	4.5	0.052	2.3	NA	0.2	1.5	0.18	0.24	0.18	43.5
West: Shared Zone (W)														
10	L2	160	0.0	160	0.0	0.165	4.9	LOS A	0.7	4.8	0.22	0.53	0.22	43.6
12	R2	63	0.0	63	0.0	0.165	5.4	LOS A	0.7	4.8	0.22	0.53	0.22	43.6
Approach		223	0.0	223	0.0	0.165	5.1	LOS A	0.7	4.8	0.22	0.53	0.22	43.6
All Vehicles		461	1.1	461	1.1	0.165	3.1	NA	0.7	4.8	0.15	0.33	0.15	43.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: TCS055 [1. PM Base + Dev 2 Henderson Road / Wyndham Street]

Network: N101 [PM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	16	0.0	16	0.0	1.037	129.3	LOS F	23.5	164.6	1.00	1.41	1.90	18.3
2	T1	493	1.5	493	1.5	1.037	124.6	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
3	R2	2	0.0	2	0.0	1.037	128.9	LOS F	25.2	176.1	1.00	1.42	1.88	11.5
Approach		511	1.4	511	1.4	1.037	124.7	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
East: Henderson Rd (E)														
4	L2	165	1.3	159	1.3	0.397	15.8	LOS B	14.7	102.6	0.56	0.58	0.56	37.9
5	T1	922	0.9	887	0.9	0.397	8.9	LOS A	14.7	102.6	0.46	0.44	0.46	40.5
6	R2	862	3.4	829	3.4	0.740	22.3	LOS B	12.2	87.4	0.86	0.82	0.87	31.9
Approach		1949	2.1	1875 N1	2.0	0.740	15.4	LOS B	14.7	102.6	0.64	0.62	0.65	36.0
West: Henderson Rd (W)														
10	L2	525	1.6	525	1.6	1.021	114.1	LOS F	22.8	161.6	1.00	1.18	1.73	19.3
11	T1	342	0.0	342	0.0	0.576	38.2	LOS C	16.9	117.0	0.90	0.78	0.90	24.6
Approach		867	1.0	867	1.0	1.021	84.2	LOS F	22.8	161.6	0.96	1.02	1.40	20.4
All Vehicles		3327	1.7	3253 N1	1.7	1.037	50.9	LOS D	25.2	176.1	0.78	0.85	1.04	24.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. PM Base + Dev 2 Botany Road / Raglan Street]

Network: N101 [PM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	838	2.9	838	2.9	1.051	132.2	LOS F	43.4	310.9	1.00	1.25	1.78	5.6
Approach		838	2.9	838	2.9	1.051	132.2	LOS F	43.4	310.9	1.00	1.25	1.78	5.6
East: Raglan St (E)														
4	L2	9	0.0	9	0.0	1.084	168.4	LOS F	15.2	106.1	1.00	1.45	2.23	1.7
5	T1	335	1.3	335	1.3	1.084	162.0	LOS F	15.3	106.1	1.00	1.47	2.20	1.7
Approach		344	1.2	344	1.2	1.084	162.2	LOS F	15.3	106.1	1.00	1.47	2.20	1.7
North: Botany Rd (N)														
7	L2	133	5.6	133	5.6	0.523	16.8	LOS B	19.6	140.3	0.58	0.58	0.58	36.8
8	T1	1227	3.2	1227	3.2	0.523	9.8	LOS A	19.6	140.3	0.53	0.50	0.53	39.1
9	R2	757	1.5	757	1.5	0.794	46.5	LOS D	24.4	171.2	0.96	0.91	1.05	22.0
Approach		2117	2.7	2117	2.7	0.794	23.4	LOS B	24.4	171.2	0.69	0.65	0.72	30.6
West: Henderson Rd (W)														
11	T1	294	0.7	294	0.7	0.907	25.2	LOS B	9.8	68.1	0.70	0.60	0.75	9.8
12	R2	37	0.0	37	0.0	0.907	76.7	LOS F	4.5	31.7	1.00	0.90	1.38	4.0
Approach		331	0.6	330	0.6	0.907	30.9	LOS C	9.8	68.1	0.73	0.63	0.82	8.4
All Vehicles		3629	2.4	3629	2.4	1.084	62.3	LOS E	43.4	310.9	0.79	0.87	1.11	14.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. PM Base + Dev 2 Cope Street / Raglan Street]

Network: N101 [PM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	74	0.0	74	0.0	0.238	5.7	LOS A	0.9	5.7	0.49	0.61	0.49	29.9
2	T1	54	0.0	54	0.0	0.238	4.8	LOS A	0.9	5.7	0.49	0.61	0.49	40.8
3	R2	26	4.0	26	4.0	0.238	8.6	LOS A	0.9	5.7	0.49	0.61	0.49	43.4
Approach		154	0.7	154	0.7	0.238	5.9	LOS A	0.9	5.7	0.49	0.61	0.49	39.1
East: Raglan St (E)														
4	L2	83	1.3	83	1.3	0.455	5.1	LOS A	1.7	12.1	0.47	0.57	0.47	43.0
5	T1	197	2.1	197	2.1	0.455	5.1	LOS A	1.7	12.1	0.47	0.57	0.47	43.0
6	R2	9	0.0	9	0.0	0.455	7.9	LOS A	1.7	12.1	0.47	0.57	0.47	45.3
Approach		289	1.8	289	1.8	0.455	5.2	LOS A	1.7	12.1	0.47	0.57	0.47	43.1
North: Cope St (N)														
7	L2	24	0.0	24	0.0	0.310	5.7	LOS A	1.4	7.6	0.56	0.63	0.56	38.9
8	T1	79	1.3	79	1.3	0.310	4.6	LOS A	1.4	7.6	0.56	0.63	0.56	36.5
9	R2	94	0.0	94	0.0	0.310	8.9	LOS A	1.4	7.6	0.56	0.63	0.56	36.5
Approach		197	0.5	197	0.5	0.310	6.8	LOS A	1.4	7.6	0.56	0.63	0.56	37.0
West: Raglan St (W)														
10	L2	83	1.3	83	1.3	0.325	4.1	LOS A	1.9	13.6	0.23	0.49	0.23	43.1
11	T1	256	3.3	256	3.3	0.325	4.0	LOS A	1.9	13.6	0.23	0.49	0.23	44.3
12	R2	88	0.0	88	0.0	0.325	7.2	LOS A	1.9	13.6	0.23	0.49	0.23	26.9
Approach		427	2.2	427	2.2	0.325	4.7	LOS A	1.9	13.6	0.23	0.49	0.23	43.0
All Vehicles		1067	1.6	1067	1.6	0.455	5.4	LOS A	1.9	13.6	0.40	0.55	0.40	41.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. PM Base + Dev 2 Cope Street / Wellington Street]

Network: N101 [PM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	29	0.0	29	0.0	0.046	5.0	LOS A	0.2	1.5	0.41	0.53	0.41	41.5
2	T1	14	0.0	14	0.0	0.046	4.5	LOS A	0.2	1.5	0.41	0.53	0.41	41.5
3	R2	4	0.0	4	0.0	0.046	8.1	LOS A	0.2	1.5	0.41	0.53	0.41	45.2
Approach		47	0.0	47	0.0	0.046	5.2	LOS A	0.2	1.5	0.41	0.53	0.41	42.0
East: Wellington St (E)														
4	L2	8	0.0	8	0.0	0.180	4.2	LOS A	1.0	6.6	0.29	0.50	0.29	43.8
5	T1	141	1.5	141	1.5	0.180	3.9	LOS A	1.0	6.6	0.29	0.50	0.29	41.5
6	R2	67	0.0	67	0.0	0.180	7.3	LOS A	1.0	6.6	0.29	0.50	0.29	41.5
Approach		217	1.0	217	1.0	0.180	5.0	LOS A	1.0	6.6	0.29	0.50	0.29	41.7
North: Cope St (N)														
7	L2	21	0.0	21	0.0	0.113	4.3	LOS A	0.7	3.5	0.32	0.52	0.32	39.7
8	T1	24	0.0	24	0.0	0.113	2.6	LOS A	0.7	3.5	0.32	0.52	0.32	34.3
9	R2	84	2.5	84	2.5	0.113	6.5	LOS A	0.7	3.5	0.32	0.52	0.32	24.1
Approach		129	1.6	129	1.6	0.113	5.4	LOS A	0.7	3.5	0.32	0.52	0.32	32.8
West: Wellington St (W)														
10	L2	91	1.2	91	1.2	0.184	4.1	LOS A	0.9	5.8	0.19	0.47	0.19	26.8
11	T1	118	1.8	118	1.8	0.184	3.8	LOS A	0.9	5.8	0.19	0.47	0.19	43.4
12	R2	22	0.0	22	0.0	0.184	6.9	LOS A	0.9	5.8	0.19	0.47	0.19	44.6
Approach		231	1.4	231	1.4	0.184	4.2	LOS A	0.9	5.8	0.19	0.47	0.19	41.5
All Vehicles		624	1.2	624	1.2	0.184	4.8	LOS A	1.0	6.6	0.27	0.50	0.27	40.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. PM Base + Dev 2 Botany Road / Wellington Street / Buckland Street]

Network: N101 [PM Base + Max Permissible (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.771	17.2	LOS B	28.0	199.9	0.75	0.70	0.75	32.9
2	T1	783	2.8	783	2.8	0.771	17.2	LOS B	28.0	199.9	0.76	0.72	0.78	33.9
3	R2	114	0.0	114	0.0	0.771	36.7	LOS C	11.3	79.9	0.81	0.89	0.99	25.8
Approach		899	2.5	899	2.5	0.771	19.7	LOS B	28.0	199.9	0.77	0.74	0.81	32.6
East: Wellington St (E)														
4	L2	157	2.7	157	2.7	0.570	48.1	LOS D	7.9	56.9	0.90	0.78	0.90	23.0
5	T1	59	0.0	59	0.0	0.336	42.9	LOS D	5.8	28.0	0.88	0.74	0.88	18.4
6	R2	58	0.0	58	0.0	0.336	47.2	LOS D	5.8	28.0	0.88	0.74	0.88	5.2
Approach		274	1.5	274	1.5	0.570	46.8	LOS D	7.9	56.9	0.90	0.77	0.90	19.4
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.502	10.4	LOS A	10.1	71.9	0.30	0.29	0.30	36.5
8	T1	1239	3.1	1238	3.1	0.502	6.2	LOS A	10.8	76.7	0.31	0.29	0.31	44.5
9	R2	1	0.0	1	0.0	0.502	8.4	LOS A	10.8	76.7	0.32	0.29	0.32	32.2
Approach		1261	3.1	1260 N1	3.1	0.502	6.3	LOS A	10.8	76.7	0.31	0.29	0.31	44.4
West: Buckland St (W)														
10	L2	12	0.0	12	0.0	0.209	43.5	LOS D	4.9	30.8	0.84	0.68	0.84	23.3
11	T1	93	2.3	93	2.3	0.209	39.0	LOS C	4.9	30.8	0.84	0.68	0.84	23.3
12	R2	33	0.0	33	0.0	0.132	50.4	LOS D	1.6	11.5	0.88	0.72	0.88	29.3
Approach		137	1.5	137	1.5	0.209	42.1	LOS C	4.9	30.8	0.85	0.69	0.85	25.3
All Vehicles		2571	2.6	2570 N1	2.6	0.771	17.2	LOS B	28.0	199.9	0.56	0.52	0.58	35.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [6. PM Base + Dev 2 Cope Street / Shared Zone]

Network: N101 [PM Base + Max Permissible (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	48	0.0	48	0.0	0.079	4.4	LOS A	0.0	0.0	0.00	0.17	0.00	46.4
2	T1	111	1.0	111	1.0	0.079	0.1	LOS A	0.0	0.0	0.00	0.17	0.00	39.4
Approach		159	0.7	159	0.7	0.079	1.4	NA	0.0	0.0	0.00	0.17	0.00	44.5
North: Cope St (N)														
8	T1	91	2.3	91	2.3	0.119	0.6	LOS A	0.6	3.7	0.26	0.33	0.26	33.1
9	R2	123	0.0	123	0.0	0.119	5.1	LOS A	0.6	3.7	0.26	0.33	0.26	44.0
Approach		214	1.0	214	1.0	0.119	3.2	NA	0.6	3.7	0.26	0.33	0.26	42.1
West: Shared Zone (W)														
10	L2	31	0.0	31	0.0	0.032	4.9	LOS A	0.1	0.8	0.20	0.52	0.20	43.7
12	R2	12	0.0	12	0.0	0.032	5.7	LOS A	0.1	0.8	0.20	0.52	0.20	43.7
Approach		42	0.0	42	0.0	0.032	5.1	LOS A	0.1	0.8	0.20	0.52	0.20	43.7
All Vehicles		415	0.8	415	0.8	0.119	2.7	NA	0.6	3.7	0.16	0.29	0.16	42.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS055 [1. AM Base + Dev 3 Henderson Road / Wyndham Street]

Network: N101 [AM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	13	8.3	13	8.3	1.013	115.2	LOS F	21.9	158.9	1.00	1.36	1.79	19.4
2	T1	487	7.6	487	7.6	1.013	110.8	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
3	R2	3	33.3	3	33.3	1.013	114.7	LOS F	23.2	169.0	1.00	1.36	1.78	12.6
Approach		503	7.7	503	7.7	1.013	111.0	LOS F	23.2	169.0	1.00	1.36	1.79	19.7
East: Henderson Rd (E)														
4	L2	197	3.2	197	3.2	0.339	9.6	LOS A	4.5	32.3	0.22	0.40	0.22	41.9
5	T1	640	4.8	640	4.8	0.339	3.3	LOS A	4.5	32.3	0.16	0.21	0.16	45.6
6	R2	937	5.1	937	5.1	0.891	38.2	LOS C	15.7	114.2	0.98	0.96	1.22	25.7
Approach		1774	4.7	1774	4.7	0.891	22.4	LOS B	15.7	114.2	0.60	0.63	0.73	32.1
West: Henderson Rd (W)														
10	L2	526	6.6	526	6.6	1.028	118.8	LOS F	23.4	172.7	1.00	1.20	1.76	18.8
11	T1	291	3.6	291	3.6	0.491	36.3	LOS C	13.8	99.3	0.87	0.74	0.87	25.2
Approach		817	5.5	817	5.5	1.028	89.5	LOS F	23.4	172.7	0.95	1.04	1.44	19.9
All Vehicles		3094	5.4	3094	5.4	1.028	54.6	LOS D	23.4	172.7	0.76	0.86	1.09	24.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. AM Base + Dev 3 Botany Road / Raglan Street]

Network: N101 [AM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
Approach		892	5.3	892	5.3	1.000	96.4	LOS F	44.3	323.3	1.00	1.16	1.55	7.5
East: Raglan St (E)														
4	L2	4	0.0	4	0.0	0.888	72.0	LOS F	9.3	66.3	0.99	1.03	1.44	4.0
5	T1	283	3.7	283	3.7	0.888	67.3	LOS E	9.4	67.3	0.99	1.03	1.43	4.0
Approach		287	3.7	287	3.7	0.888	67.4	LOS E	9.4	67.3	0.99	1.03	1.43	4.0
North: Botany Rd (N)														
7	L2	63	8.3	63	8.3	0.497	11.7	LOS A	16.2	120.2	0.45	0.44	0.45	41.6
8	T1	1327	7.6	1327	7.6	0.497	6.1	LOS A	16.2	120.2	0.42	0.40	0.42	42.8
9	R2	609	5.0	609	5.0	0.656	47.7	LOS D	16.1	117.0	0.95	0.84	0.95	21.8
Approach		2000	6.8	2000	6.8	0.656	18.9	LOS B	16.2	120.2	0.59	0.54	0.59	33.2
West: Henderson Rd (W)														
11	T1	252	2.1	252	2.1	0.862	52.5	LOS D	9.8	69.1	0.97	0.82	1.04	5.3
12	R2	49	14.9	49	14.9	0.862	69.6	LOS E	7.8	57.4	1.00	0.90	1.20	4.4
Approach		301	4.2	301	4.2	0.862	55.3	LOS D	9.8	69.1	0.97	0.84	1.07	5.1
All Vehicles		3480	6.0	3480	6.0	1.000	45.9	LOS D	44.3	323.3	0.76	0.76	0.94	18.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. AM Base + Dev 3 Cope Street / Raglan Street]

Network: N101 [AM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	47	0.0	47	0.0	0.173	5.7	LOS A	0.9	5.3	0.47	0.57	0.47	29.4
2	T1	87	1.2	87	1.2	0.173	4.1	LOS A	0.9	5.3	0.47	0.57	0.47	37.9
3	R2	28	0.0	28	0.0	0.173	8.4	LOS A	0.9	5.3	0.47	0.57	0.47	43.2
Approach		163	0.6	163	0.6	0.173	5.3	LOS A	0.9	5.3	0.47	0.57	0.47	38.0
East: Raglan St (E)														
4	L2	7	42.9	7	42.9	0.215	4.8	LOS A	1.2	8.4	0.29	0.47	0.29	42.6
5	T1	205	5.6	205	5.6	0.215	4.2	LOS A	1.2	8.4	0.29	0.47	0.29	42.6
6	R2	28	0.0	28	0.0	0.215	6.1	LOS A	1.2	8.4	0.29	0.47	0.29	42.4
Approach		241	6.1	241	6.1	0.215	4.5	LOS A	1.2	8.4	0.29	0.47	0.29	42.5
North: Cope St (N)														
7	L2	14	0.0	14	0.0	0.097	5.4	LOS A	0.6	3.8	0.46	0.57	0.46	43.0
8	T1	31	0.0	31	0.0	0.097	4.8	LOS A	0.6	3.8	0.46	0.57	0.46	40.5
9	R2	47	4.4	47	4.4	0.097	8.5	LOS A	0.6	3.8	0.46	0.57	0.46	40.5
Approach		92	2.3	92	2.3	0.097	6.8	LOS A	0.6	3.8	0.46	0.57	0.46	41.1
West: Raglan St (W)														
10	L2	54	3.9	54	3.9	0.255	4.3	LOS A	1.3	9.6	0.24	0.48	0.24	43.8
11	T1	232	3.6	232	3.6	0.255	4.2	LOS A	1.3	9.6	0.24	0.48	0.24	44.8
12	R2	24	4.3	24	4.3	0.255	7.4	LOS A	1.3	9.6	0.24	0.48	0.24	27.6
Approach		309	3.7	309	3.7	0.255	4.5	LOS A	1.3	9.6	0.24	0.48	0.24	44.3
All Vehicles		805	3.7	805	3.7	0.255	4.9	LOS A	1.3	9.6	0.33	0.50	0.33	42.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. AM Base + Dev 3 Cope Street / Wellington Street]

Network: N101 [AM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	15	0.0	15	0.0	0.034	3.9	LOS A	0.2	1.0	0.24	0.45	0.24	40.7
2	T1	20	0.0	20	0.0	0.034	3.6	LOS A	0.2	1.0	0.24	0.45	0.24	40.7
3	R2	5	0.0	5	0.0	0.034	6.7	LOS A	0.2	1.0	0.24	0.45	0.24	43.2
Approach		40	0.0	40	0.0	0.034	4.1	LOS A	0.2	1.0	0.24	0.45	0.24	41.2
East: Wellington St (E)														
4	L2	12	0.0	12	0.0	0.068	4.3	LOS A	0.4	2.3	0.22	0.48	0.22	45.0
5	T1	46	2.3	46	2.3	0.068	3.7	LOS A	0.4	2.3	0.22	0.48	0.22	42.0
6	R2	23	0.0	23	0.0	0.068	7.1	LOS A	0.4	2.3	0.22	0.48	0.22	42.0
Approach		81	1.3	81	1.3	0.068	4.7	LOS A	0.4	2.3	0.22	0.48	0.22	42.7
North: Cope St (N)														
7	L2	18	0.0	18	0.0	0.061	4.9	LOS A	0.4	2.4	0.35	0.52	0.35	42.5
8	T1	21	0.0	21	0.0	0.061	3.7	LOS A	0.4	2.4	0.35	0.52	0.35	38.8
9	R2	28	11.1	28	11.1	0.061	7.6	LOS A	0.4	2.4	0.35	0.52	0.35	25.2
Approach		67	4.7	67	4.7	0.061	5.7	LOS A	0.4	2.4	0.35	0.52	0.35	38.1
West: Wellington St (W)														
10	L2	87	1.2	87	1.2	0.205	3.3	LOS A	1.0	5.8	0.13	0.44	0.13	27.0
11	T1	158	3.3	158	3.3	0.205	3.5	LOS A	1.0	5.8	0.13	0.44	0.13	42.4
12	R2	33	3.2	33	3.2	0.205	6.6	LOS A	1.0	5.8	0.13	0.44	0.13	43.0
Approach		278	2.7	278	2.7	0.205	3.8	LOS A	1.0	5.8	0.13	0.44	0.13	41.1
All Vehicles		466	2.5	466	2.5	0.205	4.2	LOS A	1.0	5.8	0.19	0.46	0.19	41.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. AM Base + Dev 3 Botany Road / Wellington Street / Buckland Street]

Network: N101 [AM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.574	11.9	LOS A	22.0	160.6	0.55	0.51	0.55	34.5
2	T1	849	5.7	849	5.7	0.574	10.9	LOS A	22.0	160.6	0.57	0.53	0.57	38.3
3	R2	83	5.1	83	5.1	0.574	22.0	LOS B	7.0	51.3	0.67	0.67	0.67	32.8
Approach		935	5.6	935	5.6	0.574	11.9	LOS A	22.0	160.6	0.58	0.54	0.58	37.7
East: Wellington St (E)														
4	L2	59	5.4	59	5.4	0.178	49.2	LOS D	2.9	21.3	0.88	0.74	0.88	22.6
5	T1	22	0.0	22	0.0	0.127	46.8	LOS D	2.2	11.1	0.89	0.70	0.89	17.8
6	R2	22	4.8	22	4.8	0.127	51.1	LOS D	2.2	11.1	0.89	0.70	0.89	4.8
Approach		103	4.1	103	4.1	0.178	49.1	LOS D	2.9	21.3	0.89	0.72	0.89	18.9
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.536	10.9	LOS A	12.6	93.5	0.35	0.33	0.35	35.9
8	T1	1340	8.1	1340	8.1	0.536	7.0	LOS A	14.4	107.6	0.37	0.35	0.37	44.0
9	R2	2	0.0	2	0.0	0.536	9.6	LOS A	14.4	107.6	0.40	0.37	0.40	31.8
Approach		1363	8.0	1363	8.0	0.536	7.1	LOS A	14.4	107.6	0.37	0.35	0.37	43.9
West: Buckland St (W)														
10	L2	11	0.0	11	0.0	0.346	48.0	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
11	T1	178	1.2	178	1.2	0.346	43.5	LOS D	9.4	50.7	0.90	0.74	0.90	21.2
12	R2	24	17.4	24	17.4	0.094	49.1	LOS D	1.2	9.6	0.86	0.71	0.86	29.6
Approach		213	3.0	213	3.0	0.346	44.4	LOS D	9.4	50.7	0.90	0.73	0.90	22.5
All Vehicles		2614	6.6	2614	6.6	0.574	13.5	LOS A	22.0	160.6	0.51	0.46	0.51	37.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.

MOVEMENT SUMMARY

Site: 101 [6. AM Base + Dev 3 Cope Street / Shared Zone]

Network: N101 [AM Base + Prop Dev (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	3	0.0	3	0.0	0.052	3.8	LOS A	0.0	0.0	0.00	0.02	0.00	43.3
2	T1	127	0.8	127	0.8	0.052	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	42.6
Approach		131	0.8	131	0.8	0.052	0.1	NA	0.0	0.0	0.00	0.02	0.00	42.7
North: Cope St (N)														
8	T1	55	7.7	55	7.7	0.032	0.2	LOS A	0.1	0.4	0.06	0.10	0.06	43.2
9	R2	8	0.0	8	0.0	0.032	4.9	LOS A	0.1	0.4	0.06	0.10	0.06	47.0
Approach		63	6.7	63	6.7	0.032	0.8	NA	0.1	0.4	0.06	0.10	0.06	44.8
West: Shared Zone (W)														
10	L2	32	0.0	32	0.0	0.032	4.9	LOS A	0.1	0.8	0.20	0.51	0.20	43.7
12	R2	13	0.0	13	0.0	0.032	5.1	LOS A	0.1	0.8	0.20	0.51	0.20	43.7
Approach		44	0.0	44	0.0	0.032	4.9	LOS A	0.1	0.8	0.20	0.51	0.20	43.7
All Vehicles		238	2.2	238	2.2	0.052	1.2	NA	0.1	0.8	0.05	0.13	0.05	43.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS055 [1. PM Base + Dev 3 Henderson Road / Wyndham Street]

Network: N101 [PM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wyndham St (S)														
1	L2	16	0.0	16	0.0	1.037	129.3	LOS F	23.5	164.6	1.00	1.41	1.90	18.3
2	T1	493	1.5	493	1.5	1.037	124.6	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
3	R2	2	0.0	2	0.0	1.037	128.9	LOS F	25.2	176.1	1.00	1.42	1.88	11.5
Approach		511	1.4	511	1.4	1.037	124.7	LOS F	25.2	176.1	1.00	1.41	1.89	18.3
East: Henderson Rd (E)														
4	L2	165	1.3	160	1.3	0.399	15.7	LOS B	14.6	101.8	0.56	0.58	0.56	38.0
5	T1	916	0.9	889	0.9	0.399	8.8	LOS A	14.6	101.8	0.45	0.43	0.45	40.6
6	R2	854	3.5	828	3.4	0.739	22.3	LOS B	12.1	87.2	0.86	0.82	0.87	31.9
Approach		1935	2.1	1877 N1	2.1	0.739	15.3	LOS B	14.6	101.8	0.64	0.62	0.64	36.1
West: Henderson Rd (W)														
10	L2	525	1.6	525	1.6	1.021	114.1	LOS F	22.8	161.6	1.00	1.18	1.73	19.3
11	T1	317	0.0	317	0.0	0.533	37.6	LOS C	15.4	106.5	0.89	0.76	0.89	24.7
Approach		842	1.0	842	1.0	1.021	85.3	LOS F	22.8	161.6	0.96	1.02	1.41	20.4
All Vehicles		3287	1.7	3230 N1	1.7	1.037	50.9	LOS D	25.2	176.1	0.78	0.85	1.04	24.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: TCS047 [2. PM Base + Dev 3 Botany Road / Raglan Street]

Network: N101 [PM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	838	2.9	838	2.9	1.046	128.8	LOS F	42.8	306.6	1.00	1.24	1.76	5.7
Approach		838	2.9	838	2.9	1.046	128.8	LOS F	42.8	306.6	1.00	1.24	1.76	5.7
East: Raglan St (E)														
4	L2	9	0.0	9	0.0	1.026	130.4	LOS F	13.8	96.0	1.00	1.32	1.99	2.2
5	T1	319	1.3	319	1.3	1.026	123.8	LOS F	15.3	106.1	1.00	1.34	1.95	2.2
Approach		328	1.3	328	1.3	1.026	124.0	LOS F	15.3	106.1	1.00	1.34	1.95	2.2
North: Botany Rd (N)														
7	L2	97	7.6	97	7.6	0.504	16.1	LOS B	18.7	133.5	0.56	0.55	0.56	37.5
8	T1	1227	3.2	1227	3.2	0.504	9.5	LOS A	18.7	133.5	0.52	0.49	0.52	39.4
9	R2	757	1.5	757	1.5	0.786	45.7	LOS D	24.1	168.8	0.96	0.90	1.03	22.2
Approach		2081	2.8	2081	2.8	0.786	23.0	LOS B	24.1	168.8	0.68	0.64	0.71	30.8
West: Henderson Rd (W)														
11	T1	268	0.8	268	0.8	0.851	24.6	LOS B	8.9	62.1	0.67	0.57	0.70	10.0
12	R2	37	0.0	37	0.0	0.851	75.0	LOS F	3.9	27.1	1.00	0.86	1.30	4.0
Approach		305	0.7	305	0.7	0.851	30.7	LOS C	8.9	62.1	0.71	0.60	0.78	8.5
All Vehicles		3553	2.5	3553	2.5	1.046	57.9	LOS E	42.8	306.6	0.79	0.84	1.08	15.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [3. PM Base + Dev 3 Cope Street / Raglan Street]

Network: N101 [PM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	59	0.0	59	0.0	0.188	5.6	LOS A	0.7	4.3	0.47	0.58	0.47	30.3
2	T1	54	0.0	54	0.0	0.188	4.7	LOS A	0.7	4.3	0.47	0.58	0.47	41.0
3	R2	9	11.1	9	11.1	0.188	8.7	LOS A	0.7	4.3	0.47	0.58	0.47	43.5
Approach		122	0.9	122	0.9	0.188	5.4	LOS A	0.7	4.3	0.47	0.58	0.47	39.0
East: Raglan St (E)														
4	L2	18	5.9	18	5.9	0.374	4.7	LOS A	1.2	8.3	0.39	0.51	0.39	43.2
5	T1	197	2.1	197	2.1	0.374	4.6	LOS A	1.2	8.3	0.39	0.51	0.39	43.2
6	R2	9	0.0	9	0.0	0.374	7.5	LOS A	1.2	8.3	0.39	0.51	0.39	45.4
Approach		224	2.3	224	2.3	0.374	4.8	LOS A	1.2	8.3	0.39	0.51	0.39	43.4
North: Cope St (N)														
7	L2	24	0.0	24	0.0	0.291	5.1	LOS A	1.3	6.9	0.49	0.59	0.49	39.1
8	T1	79	1.3	79	1.3	0.291	4.0	LOS A	1.3	6.9	0.49	0.59	0.49	36.9
9	R2	94	0.0	94	0.0	0.291	8.3	LOS A	1.3	6.9	0.49	0.59	0.49	36.9
Approach		197	0.5	197	0.5	0.291	6.1	LOS A	1.3	6.9	0.49	0.59	0.49	37.3
West: Raglan St (W)														
10	L2	83	1.3	83	1.3	0.272	4.0	LOS A	1.5	10.6	0.19	0.45	0.19	43.6
11	T1	256	3.3	256	3.3	0.272	3.9	LOS A	1.5	10.6	0.19	0.45	0.19	44.8
12	R2	26	0.0	26	0.0	0.272	6.9	LOS A	1.5	10.6	0.19	0.45	0.19	28.0
Approach		365	2.6	365	2.6	0.272	4.1	LOS A	1.5	10.6	0.19	0.45	0.19	44.2
All Vehicles		908	1.9	908	1.9	0.374	4.9	LOS A	1.5	10.6	0.34	0.51	0.34	41.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [4. PM Base + Dev 3 Cope Street / Wellington Street]

Network: N101 [PM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	29	0.0	29	0.0	0.045	4.9	LOS A	0.2	1.4	0.39	0.52	0.39	41.6
2	T1	14	0.0	14	0.0	0.045	4.4	LOS A	0.2	1.4	0.39	0.52	0.39	41.6
3	R2	4	0.0	4	0.0	0.045	7.9	LOS A	0.2	1.4	0.39	0.52	0.39	45.2
Approach		47	0.0	47	0.0	0.045	5.0	LOS A	0.2	1.4	0.39	0.52	0.39	42.1
East: Wellington St (E)														
4	L2	8	0.0	8	0.0	0.162	4.2	LOS A	0.9	5.8	0.28	0.48	0.28	43.8
5	T1	141	1.5	141	1.5	0.162	3.8	LOS A	0.9	5.8	0.28	0.48	0.28	41.5
6	R2	47	0.0	47	0.0	0.162	7.2	LOS A	0.9	5.8	0.28	0.48	0.28	41.5
Approach		197	1.1	197	1.1	0.162	4.7	LOS A	0.9	5.8	0.28	0.48	0.28	41.7
North: Cope St (N)														
7	L2	17	0.0	17	0.0	0.103	4.1	LOS A	0.6	3.0	0.31	0.52	0.31	39.2
8	T1	24	0.0	24	0.0	0.103	2.6	LOS A	0.6	3.0	0.31	0.52	0.31	34.3
9	R2	77	2.7	77	2.7	0.103	6.4	LOS A	0.6	3.0	0.31	0.52	0.31	24.1
Approach		118	1.8	118	1.8	0.103	5.3	LOS A	0.6	3.0	0.31	0.52	0.31	32.5
West: Wellington St (W)														
10	L2	61	1.7	61	1.7	0.156	3.9	LOS A	0.7	4.7	0.16	0.46	0.16	27.1
11	T1	118	1.8	118	1.8	0.156	3.7	LOS A	0.7	4.7	0.16	0.46	0.16	43.5
12	R2	22	0.0	22	0.0	0.156	6.8	LOS A	0.7	4.7	0.16	0.46	0.16	44.7
Approach		201	1.6	201	1.6	0.156	4.1	LOS A	0.7	4.7	0.16	0.46	0.16	42.2
All Vehicles		563	1.3	563	1.3	0.162	4.6	LOS A	0.9	5.8	0.25	0.48	0.25	40.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS137 [5. PM Base + Dev 3 Botany Road / Wellington Street / Buckland Street]

Network: N101 [PM Base + Prop Dev (2036)]

Traffic Surveys 12/03/2020
AM Peak: 7:45 - 8:45
PM Peak: 17:15 - 18:15
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 120 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Botany Rd (S)														
1	L2	2	0.0	2	0.0	0.697	15.8	LOS B	23.3	166.6	0.68	0.63	0.68	33.3
2	T1	783	2.8	783	2.8	0.697	15.1	LOS B	23.3	166.6	0.70	0.65	0.70	35.2
3	R2	83	0.0	83	0.0	0.697	25.4	LOS B	10.2	72.2	0.74	0.74	0.78	31.1
Approach		868	2.5	868	2.5	0.697	16.1	LOS B	23.3	166.6	0.70	0.66	0.71	34.7
East: Wellington St (E)														
4	L2	149	2.8	149	2.8	0.543	47.8	LOS D	7.5	54.0	0.90	0.78	0.90	23.0
5	T1	59	0.0	59	0.0	0.332	42.9	LOS D	5.8	28.0	0.88	0.74	0.88	18.4
6	R2	58	0.0	58	0.0	0.332	47.2	LOS D	5.8	28.0	0.88	0.74	0.88	5.2
Approach		266	1.6	266	1.6	0.543	46.6	LOS D	7.5	54.0	0.89	0.76	0.89	19.4
North: Botany Rd (N)														
7	L2	21	0.0	21	0.0	0.501	10.4	LOS A	10.1	71.7	0.30	0.29	0.30	36.5
8	T1	1239	3.1	1239	3.1	0.501	6.3	LOS A	10.8	77.1	0.31	0.29	0.31	44.4
9	R2	1	0.0	1	0.0	0.501	8.5	LOS A	10.8	77.1	0.32	0.29	0.32	32.2
Approach		1261	3.1	1261	3.1	0.501	6.3	LOS A	10.8	77.1	0.31	0.29	0.31	44.4
West: Buckland St (W)														
10	L2	12	0.0	12	0.0	0.209	43.5	LOS D	4.9	30.8	0.84	0.68	0.84	23.3
11	T1	93	2.3	93	2.3	0.209	39.0	LOS C	4.9	30.8	0.84	0.68	0.84	23.3
12	R2	33	0.0	33	0.0	0.130	50.3	LOS D	1.6	11.5	0.88	0.72	0.88	29.3
Approach		137	1.5	137	1.5	0.209	42.1	LOS C	4.9	30.8	0.85	0.69	0.85	25.3
All Vehicles		2533	2.7	2532[N1]	2.7	0.697	15.9	LOS B	23.3	166.6	0.53	0.49	0.54	36.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P2	East Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P3	North Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
P4	West Full Crossing	53	54.3	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		211	54.3	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

MOVEMENT SUMMARY

Site: 101 [6. PM Base + Dev 3 Cope Street / Shared Zone]

Network: N101 [PM Base + Prop Dev (2036)]

New Site
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Cope St (S)														
1	L2	13	0.0	13	0.0	0.060	4.4	LOS A	0.0	0.0	0.00	0.06	0.00	47.0
2	T1	111	1.0	111	1.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	44.6
Approach		123	0.9	123	0.9	0.060	0.5	NA	0.0	0.0	0.00	0.06	0.00	45.7
North: Cope St (N)														
8	T1	91	2.3	91	2.3	0.053	0.3	LOS A	0.2	1.1	0.14	0.17	0.14	35.6
9	R2	32	0.0	32	0.0	0.053	4.9	LOS A	0.2	1.1	0.14	0.17	0.14	44.8
Approach		122	1.7	122	1.7	0.053	1.5	NA	0.2	1.1	0.14	0.17	0.14	40.9
West: Shared Zone (W)														
10	L2	8	0.0	8	0.0	0.009	4.8	LOS A	0.0	0.2	0.19	0.51	0.19	43.7
12	R2	3	0.0	3	0.0	0.009	5.2	LOS A	0.0	0.2	0.19	0.51	0.19	43.7
Approach		12	0.0	12	0.0	0.009	5.0	LOS A	0.0	0.2	0.19	0.51	0.19	43.7
All Vehicles		257	1.2	257	1.2	0.060	1.2	NA	0.2	1.1	0.08	0.13	0.08	42.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

16.2 Appendix 2 - Pedestrian Modelling Report

Project Name:

Sydney Metro City & Southwest Waterloo Integrated Station Development

Document Name:

Pedestrian Modelling Report – Streetscape Extract

Document Number:

WMQ-SITE-WSP ANZ-PD-RPT-0001

Current Revision: **B**

Date: **28.07.2020**

Current Version

Revision	Date	Suitability Code
B	28.07.2020	Final

Approved Record

Function	Position	Name	Date
Prepared By	Senior Transport Modeller	Nita Hutapea	28.07.2020
Technical Checker	Senior Transport Engineer	Ravi Kaberwal	28.07.2020
Reviewed By	Technical Executive	John Webster	28.07.2020
Approved By	Technical Executive	John Webster	28.07.2020

Amendment Record

By Name	Revision	Amendment Description	Date
Nita Hutapea & Ravi Kaberwal	A	Draft (extract from SMCSWSWL-WSP-SWL-TF-REP-000001)	26.06.2020
Ravi Kaberwal	B	Final (with updated design and yield)	28.07.2020

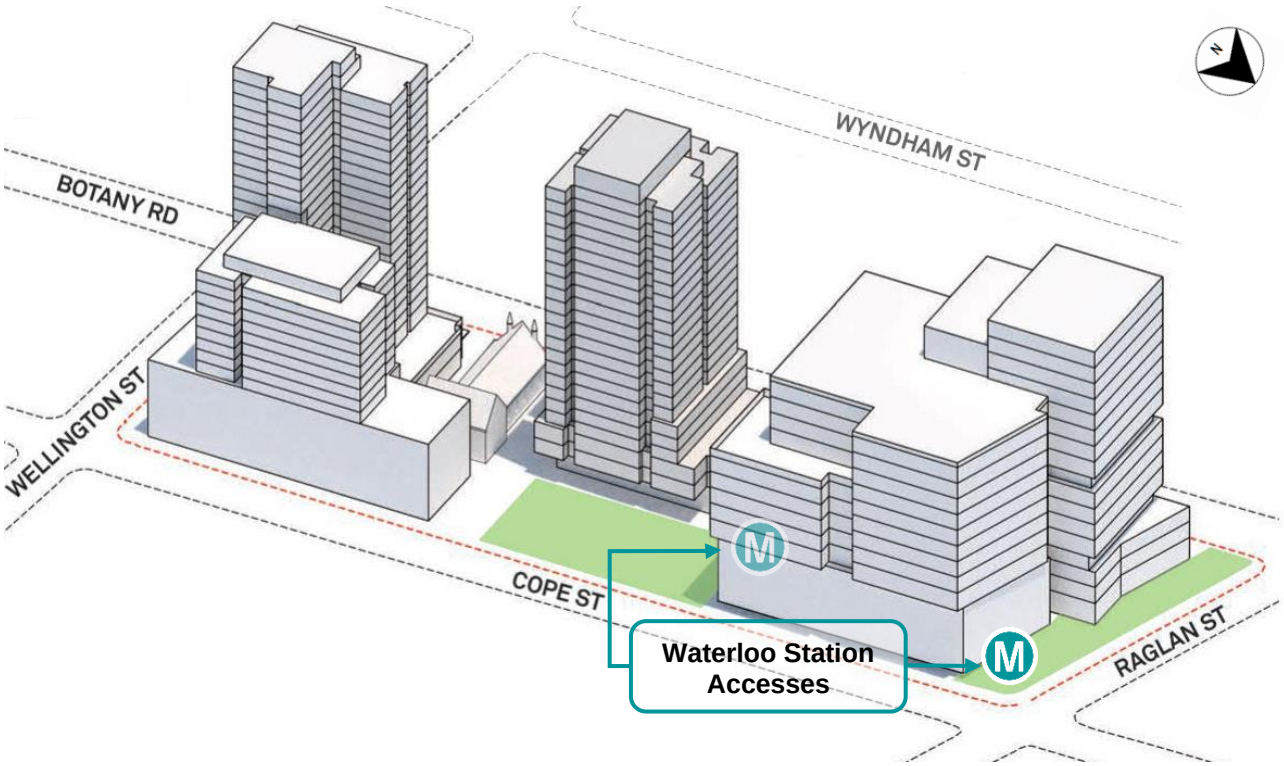
Table of contents

1 Introduction

1.1 Precinct overview

Waterloo Metro Quarter (henceforth referred to as the 'precinct') is the proposed redevelopment site bounded by Botany Road, Raglan Street, Cope Street and Wellington Street. The precinct includes the proposed metro station, with station access from the corner of Cope Street and Raglan Street or within the precinct on the southern side of the building (as illustrated in Figure 1.1).

Figure 1.1 Waterloo Metro Quarter overview – proposed development



In addition to the proposed metro station, precinct customers can also access the bus network at the adjacent stops on Botany Road, and Sydney Trains (Redfern Station) is approximately 750m to the north via Wyndham Street (as illustrated in Figure 1.2).

1.1.1 Station overview

The metro station itself is located beneath the precinct, with the access at the corner of Cope Street and Raglan Street. The station configuration is illustrated in Figure 1.3, with the following key infrastructure:

- Single station entry at the corner of Raglan Street at Cope Street – integrated with the over station development
- Customer movements between levels are accommodated by:
  - Street Level and Concourse Level: 3 escalators and 2 lifts
  - Concourse Level and Platform Level: 4 escalators and 2 lifts
- Customer access and egress through 11 standard gates and 2 wide access gates (WAG) at Concourse Level.

Figure 1.2 Waterloo Station access and interchange diagram (Source: Waterloo Station Reference Design Report)

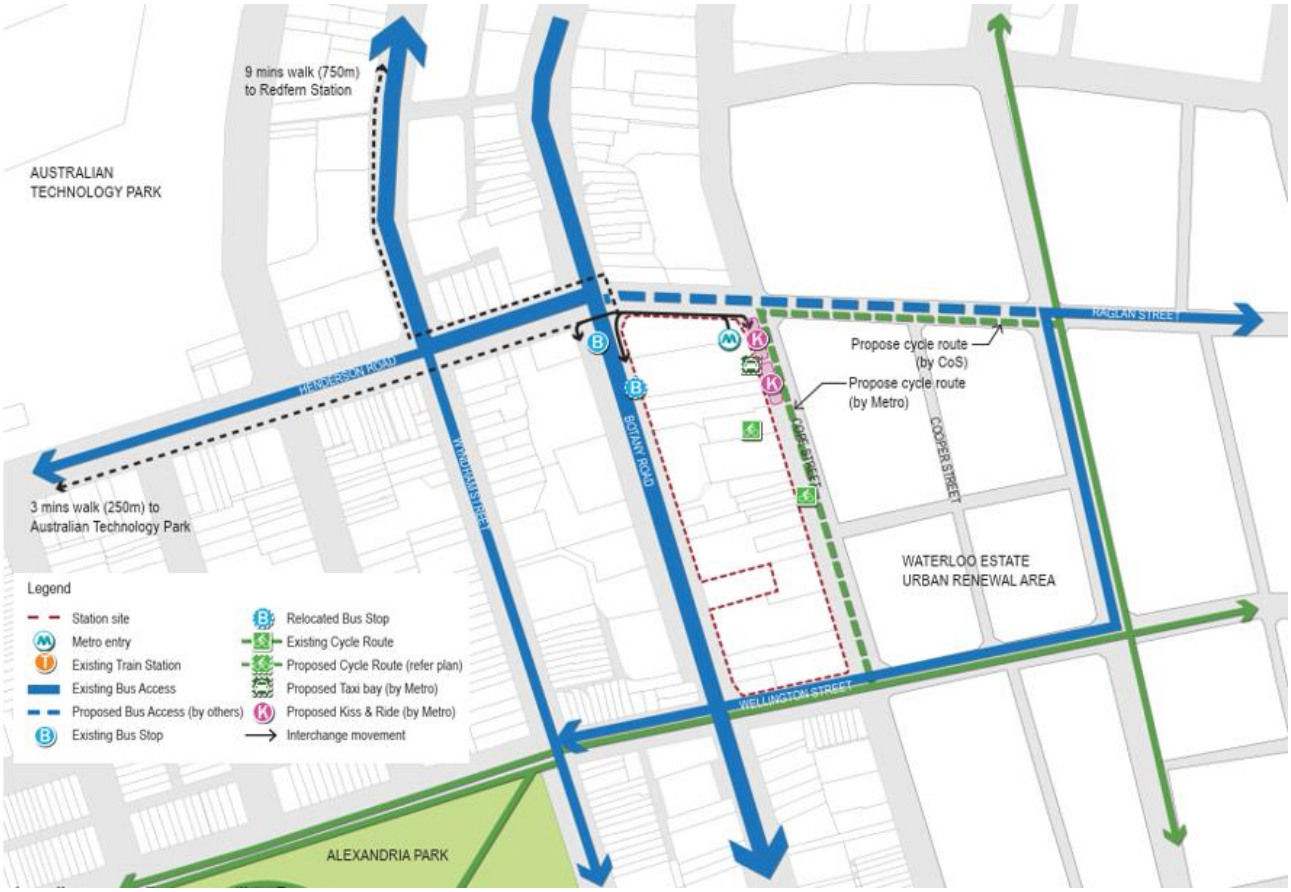
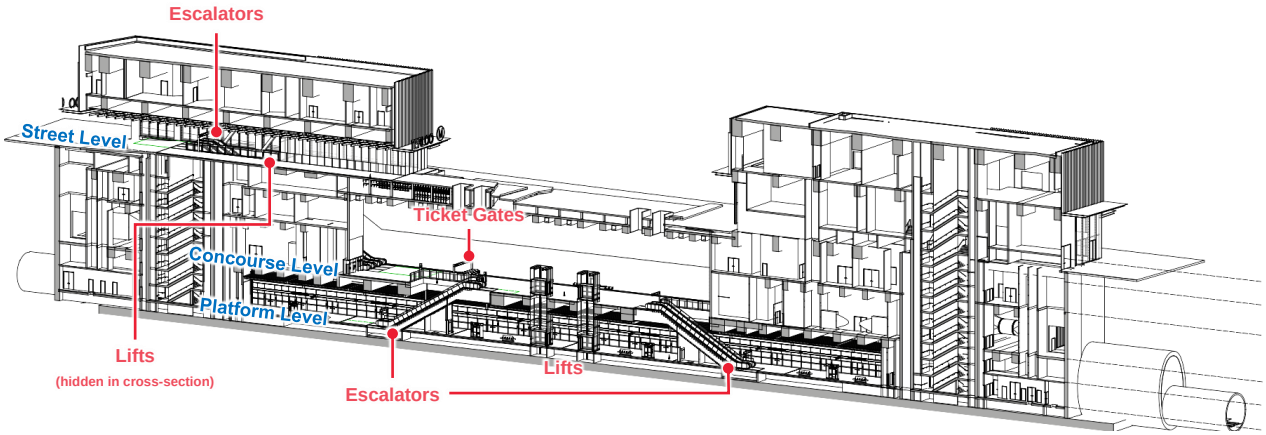


Figure 1.3 Waterloo Station overview



1.2 Purpose of document

This document (WMQ-SITE-WSP-PD-RPT-001), is an extract of the overall pedestrian modelling report (SMCSWSWL-WSP-SWL-TF-REP-000001) which documents both the outcomes of the pedestrian static analysis and dynamic modelling completed for the precinct and within the station.

This extract focuses on the results of the assessment for the streetscape, including walkways within the precinct and surrounding footpaths.

The station assessment considered the adequacy of the platform, vertical transport provisions, and ticket gate provisions. Whilst the precinct, or streetscape, modelling has been undertaken to consider the adequacy of footpaths and thoroughfares within and on the boundary of the precinct.

2 Pedestrian Demand

The pedestrian demands for the Waterloo Metro Quarter precinct consist of four key components:

- Demand related to the proposed metro station
- Demand related to the proposed over station development
- Demand related to existing land uses in the wider area, referred to as background demand
- Demand related to the Botany Road bus stops

There is an overlap between the four components, such as metro customers who are accessing the OSD or nearby land-uses and vice-versa.

The following sections summarise the source of the data and the process undertaken to define the forecast pedestrian demand for each of the above components.

The forecast demand has been defined for two design years:

- Initial design year (2026) – the requirement for the capacity to be provided from the start of operations
- Ultimate design year (2056) – the requirement for the capacity to be safeguarded to allow for long term patronage growth.

2.1 Waterloo Station

2.1.1 Demand

The peak 1-hour customer demands at Waterloo Station summarised in Table 2.1 and Table 2.2 were provided in the document *Sydney Metro City & Southwest, Station Delivery Deed, Schedule C1 - Scope of works and technical criteria, Appendix A2.3 – service and system performance requirements*. The demands are based on 6 and 8 car sets.

It is noted the demand forecasts include an assumed level of development within the precinct, and consequently include pedestrian volumes associated with these developments. However, it is unknown how much proposed development was assumed in the forecast. Consequently, as a conservative assumption for assessing the precinct, the over station development (OSD) has been calculated separately (refer to Section 2.2) and added to the station peak hour passenger demands to forecast the total precinct demand (refer to Section 2.5)

Table 2.1 2026 AM Peak Pedestrian Demand (rounded to nearest 5)

2026 AM Peak hour 6 car set (no OSD)		Destination			
		Northbound	Southbound	Exit	Total
Origin	Northbound	-	-	565	565
	Southbound	-	-	1,445	1,445
	Entry	3,125	175	0	3,300
	Total	3,125	175	2,010	5,310

Table 2.2 2056 AM Peak Pedestrian Demand (rounded to nearest 5)

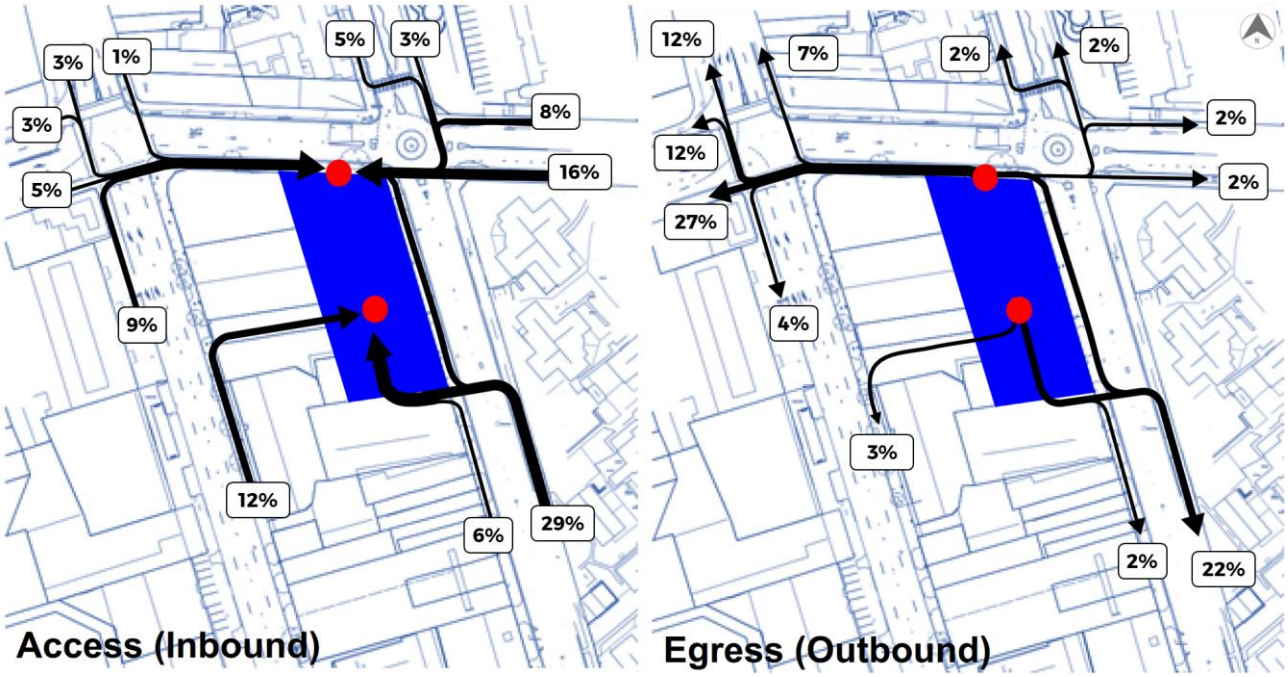
2056 AM Peak hour 8 car set (no OSD)		Destination			
		Northbound	Southbound	Exit	Total
Origin	Northbound	-	-	700	700
	Southbound	-	-	1,800	1,800
	Entry	3,600	200		3,800
	Total	3,600	200	2,500	6,300

Demand forecasts provided are limited to the AM peak, therefore to determine the approximate demand for the PM peak, the above matrices have been transposed and multiplied by a factor of 0.91. This factor has been retained from previous Sydney Metro City & Southwest reports and is based on historical observation of the flatter customer profile during the PM peak period.

2.1.2 Distribution

The peak 1-hour customer demands for Waterloo Station have been assigned to the street network based on the distributions in Figure 2.1. The distributions are based on the those provided by Sydney Metro Authority, with demand splits converted to a percentage of access or egress demand.

Figure 2.1 Waterloo Station pedestrian demand distribution – AM peak hour



Source: METRON 2036 distribution data provided by Sydney Metro Authority

The distribution of customer demand to and from the OSD has been excluded from the above figures, as it is assumed the OSD demand is in addition to the station demand matrix provided. The quantum and distribution of OSD demand is discussed in Section 2.2.

Similarly, the interchange between metro and the Botany Road bus stops is not shown in the above distribution. The proportion of demand and split for the bus stops is discussed in Section 2.4.2.

2.2 Over Station Development

2.2.1 Overview

As illustrated in Figure 2.2, four Over Station Developments (OSDs) are proposed within the precinct. Building 1 is predominantly commercial, Buildings 2, 3 and 4 are predominately residential and includes affordable housing, social housing and student accommodation.

Figure 2.2 Waterloo Metro Quarter overview – proposed over station development

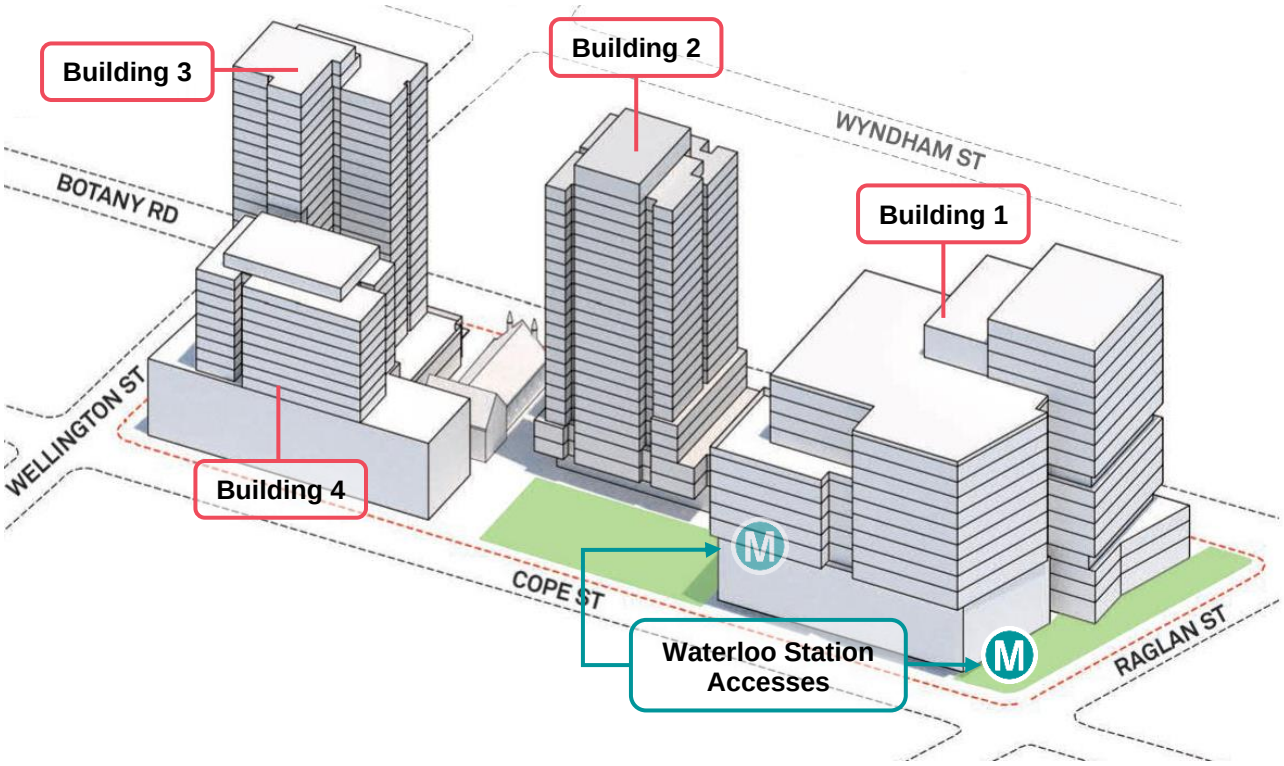


Table 2.3 summarises the proposed development by location and their respective size which have been adopted for the modelling.

Table 2.3 Proposed precinct development adopted for modelling

Building	Land Use	Yield					
		GFA (m^2)	NLA (m^2)	1 Bed[1]	2 Bed	3 Bed	4 Bed
1	Commercial	33,220	31,400				
2	Residential	-		82	69	10	
	Community	2,040					
3	Student housing	-		383	41		
4	Social housing	-		28	34	7	1
Precinct wide	Retail	2,415	1,932				
	Community	810[2]					
Total				**493**	**144**	**17**	**1**

1. Includes studio apartments
2. Inclusive of 630m^2 of PDA and 180 m^2 potential additional

It is noted that the precinct and building designs are evolving, and hence it is expected there may be some changes in gross areas or the ratio between residential apartment sizes. As summarised in Table 2.4, the changes in area or provisions are comparatively minor, and hence do not materially change the outcomes of this assessment.

Table 2.4 Changes in proposed development between modelled and currently proposed

Land Use		Yield or provision		
		Modelled	Current	Change
Commercial		33,220 m^2	34,116 m^2	3%
Residential, social and student housing	Studio/1 Bed	493	492	~0% total beds
	2 Bed	144	149	
	3 Bed	17	11	
	4 Bed/Penthouse	1	3	
	Total Beds	836	835	
Community		810 m^2	812 m^2	~0%
Retail		2,415 m^2	2,185 m^2	-10%

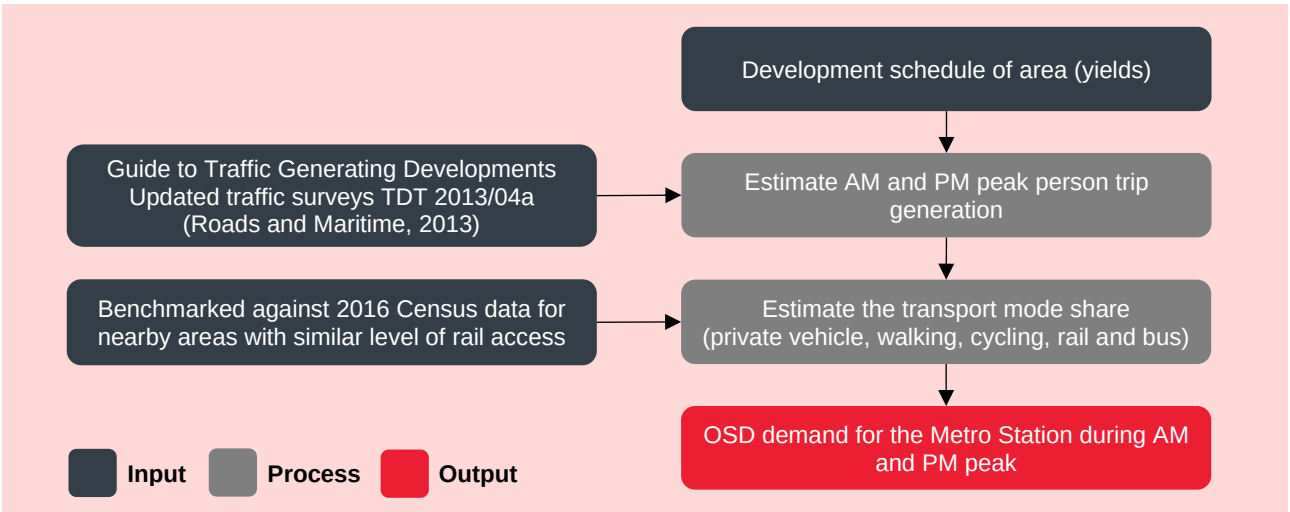
Source: WMQ Yield Schedule (28 July 2020)

2.2.2 Demand generation overview

The Over Station Development (OSD) demand for the station during the AM and PM peak hours was estimated using the methodology and inputs summarised in Figure 2.3, including:

1. Review the proposed development yields for the various land uses
2. Estimate the AM and PM peak person trip generation for each of the proposed land uses
3. Estimate the future mode share split for the person trips based on benchmarking against nearby areas with a similar level of rail access
4. Estimate the OSD's future peak period demand for the station.

Figure 2.3 Methodology to estimate the OSD's demand for the station



2.2.3 Person trip generation rates

The Guide to Traffic Generating Developments Updated traffic surveys TDT 2013/04a (Roads and Maritime, 2013) presents person trip generation rates which were surveyed at several sites across Sydney and NSW. An average of the person trip rates for the relevant Sydney sites were adopted (Table 2.5).

Table 2.5 Peak hourly person trip generation rates

Land use	Peak hourly person trip generation rates			
	AM	PM	Unit	Source and rationale
Residential	0.325	0.288	Per bedroom	TDT 2013/04a Appendix B3 (RMS, 2013) - average of the RMS surveyed sites at locations with good public transport access (St Leonards, Chatswood, Parramatta and Strathfield).
Commercial	2.49	1.85	Per 100m2 GFA	TDT 2013/04a Appendix D3 (RMS, 2013) - Average of the RMS surveyed sites in Sydney
Retail	0.89	1.86	Per 100m2 GLFA	TDT 2013/04a Appendix F2 (RMS, 2013) - Average of the RMS surveyed sites in Sydney Applied a 75% reduction factor to account for a large proportion of linked trips during the peak hour
Community	2.49	1.85	Per 100m2 GFA	TDT 2013/04a Appendix D3 (RMS, 2013) - Average of the RMS surveyed sites in Sydney Assumes that the community uses would only generate staff during the peak hours

In addition to the person trip generation rates in Table 2.5, an additional sensitivity or resilience scenario was considered for the commercial development proposed within the precinct.

The surveyed sites, and hence trip generation rates, reflect typical commercial buildings within the Sydney Greater Metropolitan Area. Though it is noted there is an aspiration for the commercial development to be occupied at a higher density than those surveyed, which consequently may increase the peak hour trip generation (Table 2.6).

Table 2.6 Commercial peak hourly person trip generation rates – resilience scenario

Land use	Density	Peak hourly person trip generation rates			
		AM	PM	Unit	Source and rationale
Commercial	~1:20 to 1:30	2.49	1.85	Per 100m^2 GFA	TDT 2013/04a Appendix D3 (RMS, 2013) - Average of the RMS surveyed sites in Sydney
Commercial - resilience scenario	1:10	7.04	4.95	Per 100m^2 NLA	TDT Average factored to the higher proposed density

It is noted that a higher 1:8 density has been adopted in other studies to assess the resilience of the commercial building infrastructure. However, as discussed in Section 2.1.1 the metro demand forecasts already include some OSD demand. Hence the adoption of the 1:8 density would result in an overly onerous scenario for the precinct and footpaths. Therefore the 1:10 scenario (intended commercial occupancy) has been used with metro demand matrix, noting there is still a level of conservatism in this scenario.

2.2.4 Mode share split

The future mode share split for the OSD was benchmarked against the mode share split for other nearby areas, which have a similar level of rail access. The analysed data was adopted from the 2016 Census data (Australian Bureau of Statistics) for place of residence and place of employment. These mode share splits are considered to be suitable for the OSD's residents and employees or visitors, respectively.

It is noted that the available level of information for places of employment is less detailed than that available for the place of residence. Therefore, the data interrogated for locations of employment was limited to Redfern, Chippendale, which generally includes employment located near Redfern Station such as the nearby Australian Technology Park.

The analysed mode share split data for the locations used in the benchmarking exercise and the mode share splits that were adopted for the OSD are summarised in Table 2.7 for residents and Table 2.8 for employees and visitors.

Table 2.7 Mode share split for residents

Location	Mode share for place of residence (per cent)					
	Rail	Bus	Private vehicle	Bicycle	Walk	Other
Alexandria	39	6	38	5	11	1
Beaconsfield	36	7	46	3	7	1
Redfern	33	11	26	6	21	3
Mascot	34	8	48	1	8	1
Eveleigh	40	5	34	4	14	3
Average	36	7	38	4	12	3
Adopted for OSD	**40**	**5**	**35**	**5**	**15**	**0**

Table 2.8 Mode share split for visitors and employees

Location	Mode share for place of employment (per cent)					
	Rail	Bus	Private vehicle	Bicycle	Walk	Other
Redfern-Chippendale	42	4	36	3	10	5
Adopted for OSD	**45**	**5**	**35**	**5**	**10**	**0**

2.2.5 Resultant OSD demand

The OSD related demand for the metro station is summarised in Table 2.9 including:

- 1,188 customers, with 515 utilising the station during the AM peak
- 943 customers, with 400 utilising the station during the AM peak

It is noted, for the assessment of the PM peak period, a conservative assumption was adopted. In place of adopting the 400 customers as per the generation rates, a value of 468 customers was assumed based on the transposition of the AM peak movements multiplied by a factor of 0.91 for consistency with the methodology proposed in Section 2.1.1.

Table 2.9 OSD related station demand

Land use	Yield	Unit	Total person trip generation (person)		Station demand (person)	
			AM	PM	AM	PM
Residential	493	1 bedroom units	160	142	64	57
	144	2 bedroom units	94	83	37	33
	17	3 bedroom units	17	15	7	6
	1	4 bedroom units	1	1	1	0
Commercial	33,220	GFA m^2	828	613	372	276
Retail	1,932	GLA m^2	17	36	2	4
Community	2,850	GFA m^2	71	53	32	24
Total	**-**	**-**	**1,188**	**943**	**515**	**400**

The OSD related station demand has been factored by the respective inbound and outbound directional splits as per Table 2.10 to determine the respective boarding and alighting demand for the metro station.

Table 2.10 OSD related station demand – directional split

Location	AM				PM			
	In	Out	In	Out	In	Out	In	Out
Residential	20%	80%	22	87	80%	20%	77	19
Commercial	80%	20%	298	74	20%	80%	55	221
Retail	50%	50%	1	1	50%	50%	3	1
Community	80%	20%	26	6	20%	80%	5	19
Total	**-**	**-**	**347**	**168**	**-**	**-**	**140[1]**	**260[1]**

1. As noted previously, a conservative estimate based on the factored transpose of the AM peak period has been used to be consistent with overall methodology.

For the resilience scenario, the OSD related pedestrian demand for the metro station is summarised in Table 2.11 including:

- 2,572 customers, with 1,138 utilising the station during the AM peak
- 1,884 customers, with 823 utilising the station during the AM peak

Table 2.11 OSD's station demand – resilience scenario

Land use	Yield	Unit	Total person trip generation (person)		Station demand (person)	
			AM	PM	AM	PM
Commercial	31,400	NLA m2	2,212	1,555	995	700
Other	-	-	360	329	142	123
Total	**-**	**-**	**2,572**	**1,884**	**1,138**	**823**

The resultant metro boarding and alighting demand for the resilience scenario are summarised in Table 2.12.

Table 2.12 OSD related station demand – directional split

Location	AM				PM			
	In	Out	Alight	Board	In	Out	Alight	Board
Commercial	80%	20%	910	228	20%	80%	165	658
Other	-	-	49	94	-	-	83	41
Total	**-**	**-**	**959**	**322**	**-**	**-**	**248**	**699**

2.3 Background

The background pedestrian demand consists of pedestrians who are travelling between existing land uses in the wider area, but not accessing the metro station, over station development or bus stops.

This demand has been estimated based on a combination of historical counts undertaken in the region. Table 2.13 summarises the years for which pedestrian counts were available and used by location.

Table 2.13 Pedestrian count locations

Location	2016	2018	2020
Henderson Road and Wyndham Street		✓	✓
Botany Road and Henderson Road	✓	✓	✓
Raglan Street and Cope Street	✓		✓
Cope Street and Wellington Street			✓
Botany Road and Wellington Street		✓	✓

From the above pedestrian count data, an annual growth rate of 2.1% was adopted. This conservative growth rate compared to the 1.3% per annum rate adopted for the City and Southwest Station forecasts reflects the increasing densification of Waterloo and its surrounding regions.

Table 2.14 summarises the forecast growth for the future design years based on the 2.1% per annum growth rate.

Table 2.14 Forecast growth – background pedestrian demand

Forecast year	2020	2026	2036	2056
Percentage growth	-	+15%	+40%	+110%

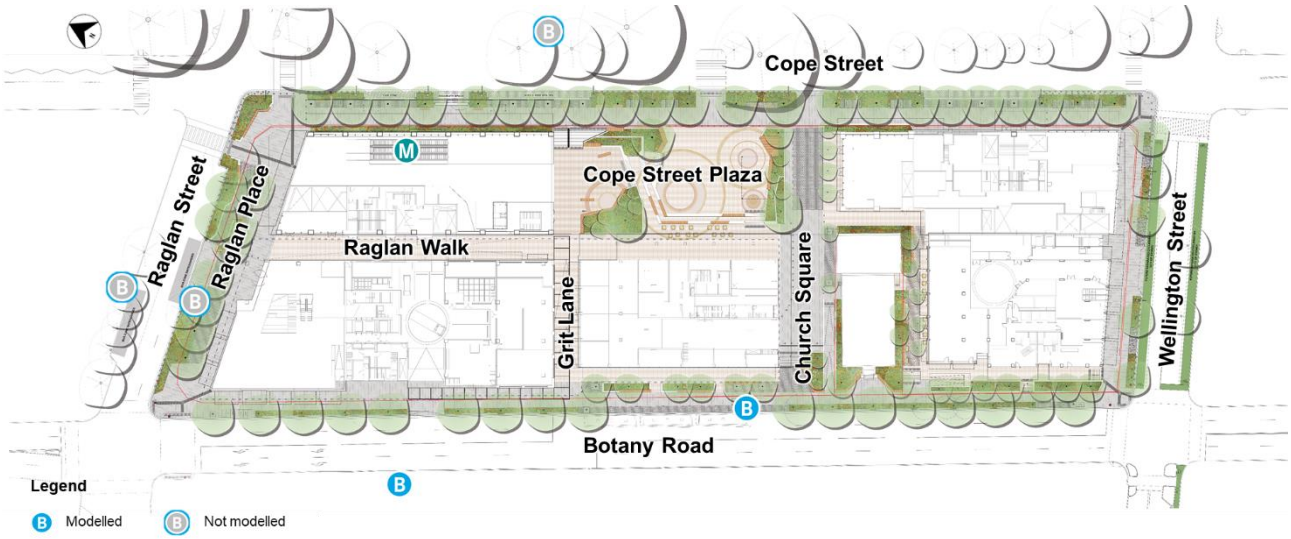
It is noted the growth rate results in a higher increase from existing demand to 2036 when compared to the 30% increase adopted by the previous study (Waterloo Interchange Planning Technical Note, Sydney Metro 2018). Hence this assessment represents a conservative scenario for the future scenarios, including 2056, by which time it is noted travel patterns may have significantly changed due to surrounding land uses.

2.4 Botany Road bus stop

2.4.1 Stop locations

In addition to the metro station, customers from the precinct and the surrounding region can access bus services from Botany Road. As shown in Figure 2.4, the northbound Botany Road bus stop has been retained, whilst the southbound stops have been consolidated and relocated to a stop between Grit Lane and Church Square.

Figure 2.4 Waterloo precinct – bus stop locations



In addition to the two Botany Road stops, the precinct design safeguards two stops on Raglan Street and does not preclude the use of the existing Cope Street stop. These three locations have not been included in the pedestrian modelling. All bus demand was consolidated to the two Botany Road stops, which represents the worst-case scenario for the Botany Road stops.

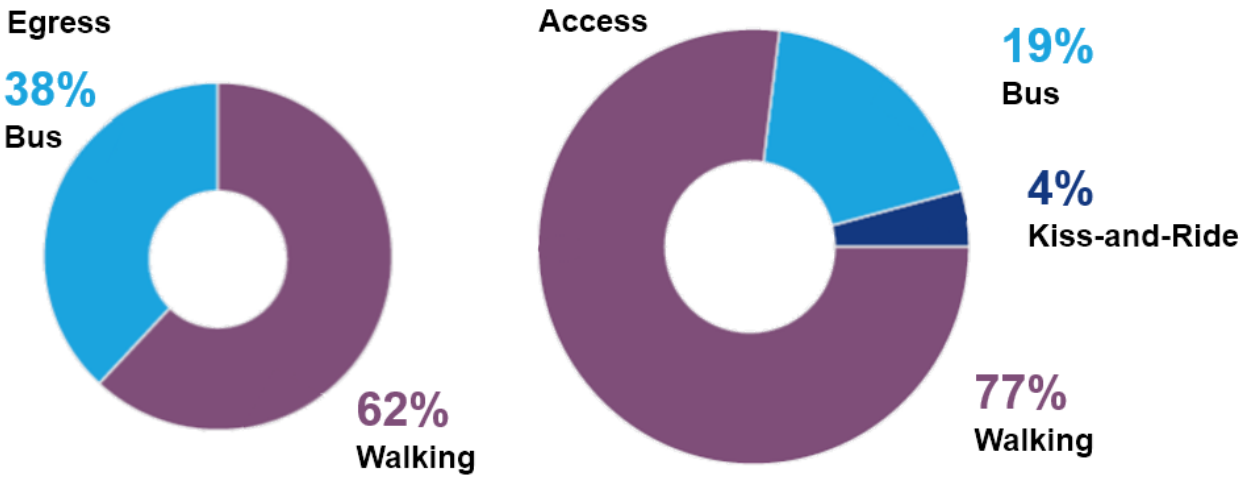
If in future, the bus stops are installed at Raglan Street, it is envisaged some bus routes would be reconfigured to serve these stops hence reducing the loading on Botany Road. The southern footpath of Raglan Street (referred to as Raglan Walk) is a sizeable thoroughfare, and already accommodates a proportion of the Botany Road bus stop customer demand and so should be able to accommodate the additional bus stop activity.

2.4.2 Demand

No forecast demand was provided for the bus stop; hence the stop demand has been developed based on:

- Metro station mode split as per Figure 2.5 which defines the interchange between metro and buses as a proportion of the total metro demand. Based on the demand from Section 2.1.1, Table 2.15 summarises the bus and metro interchange demand.
- OSD mode split of 5% as per Table 2.7 for residents and Table 2.8 for employees
- Nominal loading of 200/per hour customers (on and off) customers from the surrounding land use. It is noted existing bus customers are already accounted for background counts (Section 2.3), however to simulate bus stop interaction a nominal demand has been included in addition to the background demand. This demand has been:
  - Factored up to the design year consistent with the background customers
  - Assigned to street network based on the distributions in Figure 2.1

Figure 2.5 Waterloo station access and egress mode-split



Source: Sydney Metro (PTPM4.1 City and Southwest Final Business Case 2036 Project LUTI Scenario - Run 144)

Table 2.15 Metro and bus interchange

Scenario	Total station demand		Interchange	
	Entry	Exit	Bus to Metro	Metro to Bus
2026 AM	3,300	2,010	625	765
2056 AM	3,800	2,500	720	950

To accommodate the above demand a bus frequency of 15 per hour in each direction has been adopted for both 2026 and 2056 based on advice from Sydney Metro. In addition to the equal frequency, an equal distribution of customer demand between the northbound and southbound stop has also been adopted.

Table 2.16 Botany Road bus stop loading - estimates

Scenario	Estimated hourly demand		Estimated per service demand	
	On	Off	On	Off
2026 AM	1,015	895	34	30
2056 AM	1,390	1,180	46	39
2056 Resilience	1,405	1,235	47	41

Should the distribution be biased toward a certain direction depending on the peak period (potentially northbound during AM peak and southbound in PM peak) it envisaged that the bus stop frequency would also be biased which would tend to keep the estimated per service demand in Table 2.14 close to the values adopted.

2.5 Demand summary

2.5.1 Design Scenario

The total customer demand during the AM peak hour through the precinct and along the surrounding footpaths are summarised in Figure 2.6 and Figure 2.7 based on the four key sources of demand discussed.

Figure 2.6 2026 AM Waterloo Metro Quarter precinct demand – total

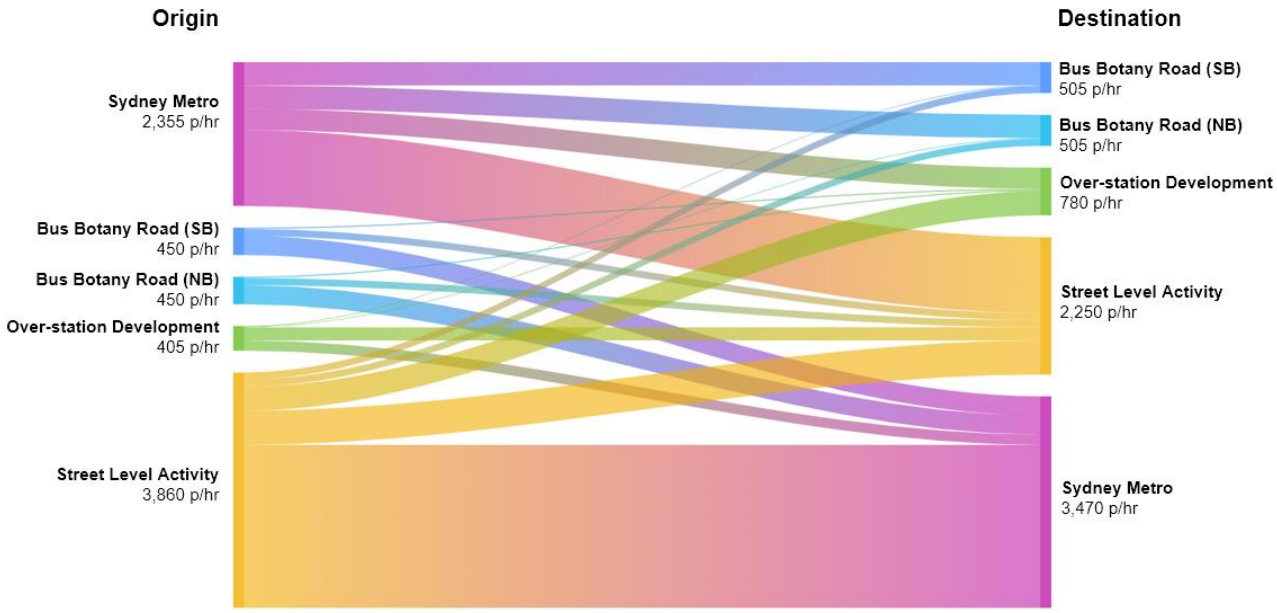
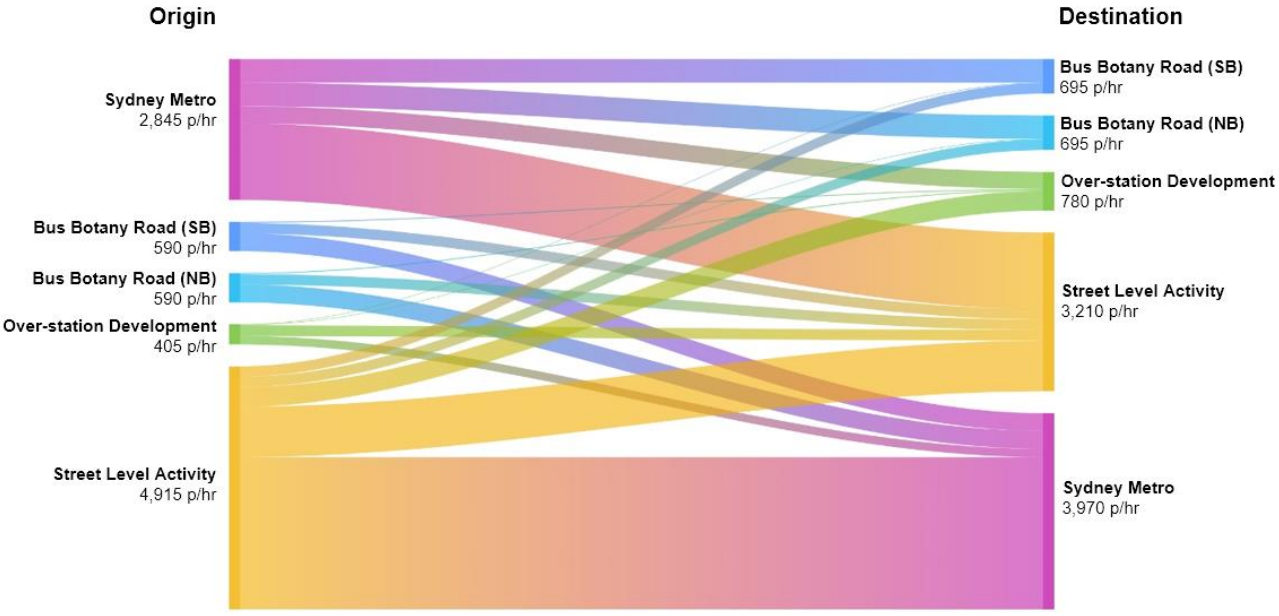


Figure 2.7 2056 AM Waterloo Metro Quarter precinct demand – total



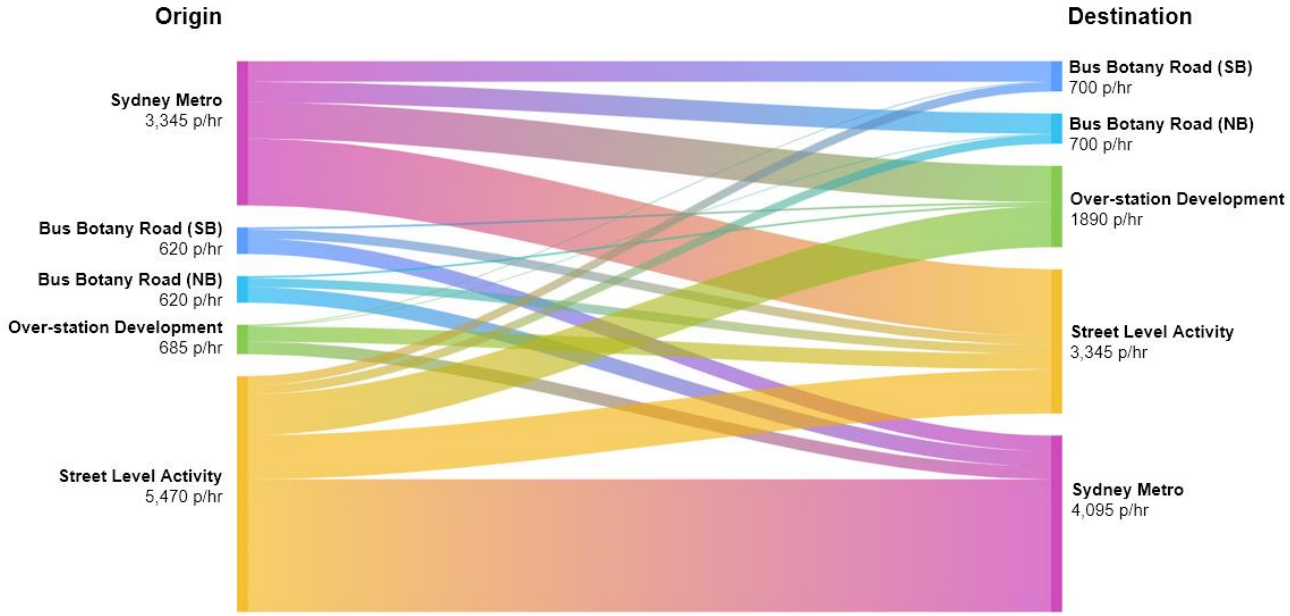
The transpose of the above customer movements are assumed during the PM peak hour, albeit reduced by a 91% factor to reflect the flatter customer profile during the PM peak period as discussed in Section 2.1.1.

2.5.2 Precinct reliance scenario

Customer demand for precinct during the OSD resilience scenario is summarised in In this scenario, the trip generation for the commercial development (Building 1) is significantly increased during the peak periods.

Figure 2.8. In this scenario, the trip generation for the commercial development (Building 1) is significantly increased during the peak periods.

Figure 2.8 2056 AM Waterloo Metro Quarter precinct demand – resilience scenario



3 Design Criteria

The planning and design criteria used to assess the station design are summarised from the documents:

- Sydney Metro City & Southwest, Station Delivery Deed, Schedule C1 - Scope of works and technical criteria
- Appendix B1.1 – Station and Buildings Spatial and Functional Requirements
- Appendix B1.4 - Station Precincts and Public Domain Spatial and Functional Requirements.

3.1 Streetscape assessment

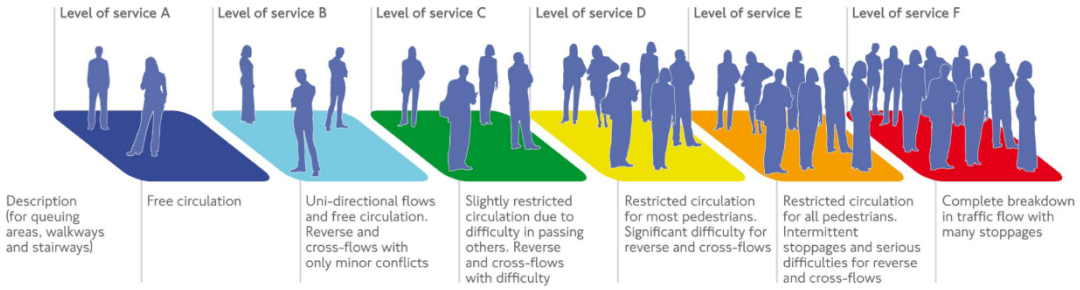
The following criteria have been prescribed for the design of the precinct streetscape:

- In the station precinct, design pedestrian spaces and thoroughfares are to deliver a minimum Level of Service (LoS) C
- Streets must be designed as urban places with a high level of pedestrian amenity, allowance for street trees and inherent traffic calming measures.

Based on these requirements, the assessment uses the Fruin LoS criterion is summarised in Figure 3.1. Typically, in a transport environment, such as an over station development site, the walkway interchange criterion is adopted.

However, to facilitate a 'high level of pedestrian amenity', the more onerous walkway criteria has been adopted. The walkway street criteria typically reflects the level of comfort customers expect when traversing footpaths in a retail or community environment.

Figure 3.1 Fruin pedestrian Level of Service (LoS) definitions



	LoS A	LoS B	LoS C	LoS D	LoS E	LoS F
Walkway - Street						
Average Flow (p/m/m)	13 or less	13 - 23	23 - 33	33 - 49	49 - 82	Variable
Average Density (m^2/p)	6 or more	3.7 - 6.0	2.2 - 3.7	1.4 - 2.2	0.6 - 1.4	0.6 or less
Average Speed (m/s)	1.32 or more	1.26 - 1.32	1.22 - 1.26	1.14 - 1.22	0.76 - 1.14	0.76 or less
Walkway - Interchange						
Average Flow (p/m/m)	23 or less	23 - 33	33 - 49	49 - 66	66 - 82	Variable
Average Density (m^2/p)	3.3 or more	2.3 - 3.3	1.4 - 2.3	0.9 - 1.4	0.5 - 0.9	0.5 or less
Average Speed (m/s)	1.32 or more	1.26 - 1.32	1.14 - 1.26	1.12 - 1.14	0.63 - 1.12	0.63 or less
Queueing						
Average Density (m^2/p)	1.2 or more	0.9 - 1.2	0.7 - 0.9	0.3 - 0.7	0.2 - 0.3	0.2 or less
Ave interpersonal space (m)	1.2	1.1 - 1.2	0.9 - 1.1	0.6 - 0.9	0.6 or less	Close contact

Adapted from: Fruin (1971); Bowman, Fruin and Zegeer (1989); London Underground: Station Planning Standards and Guidelines 2012 edition.

4 Dynamic Modelling

4.1 Modelling software

The microsimulation model was undertaken using PTV Viswalk, version 11.00-11. Viswalk is a module built into PTV Vissim used for pedestrian modelling. It is a microscopic, behaviour-based simulation model developed to reproduce the human walking behaviour realistically and reliably.

The outputs of the 3D microsimulation have been used to:

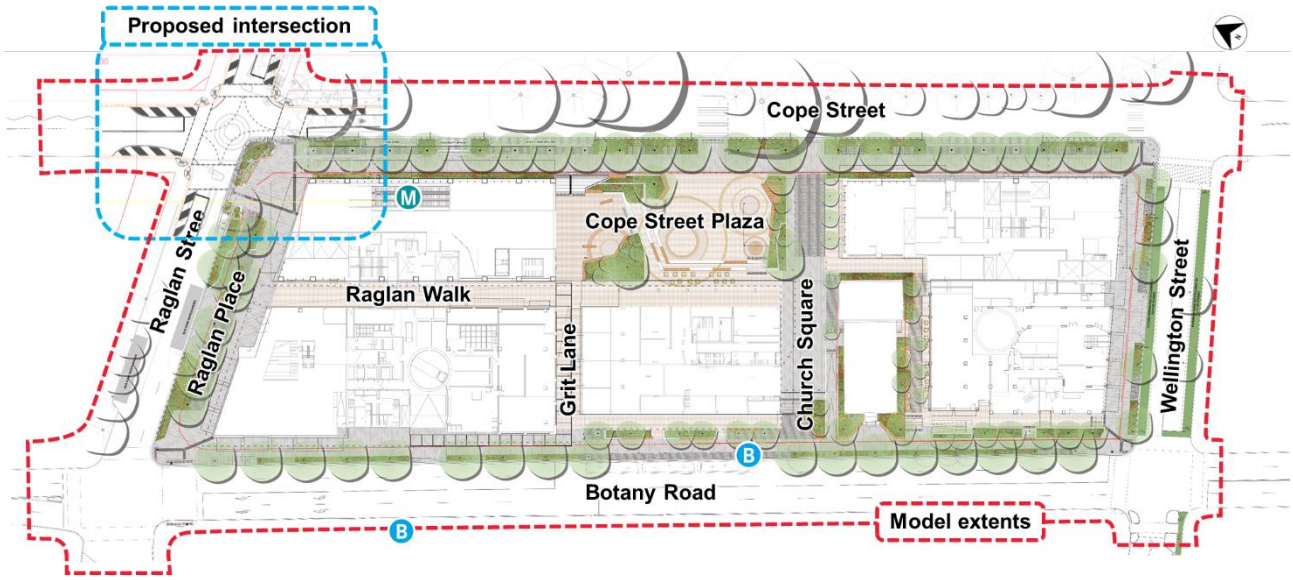
- Observe the customer movements and interactions
- Highlight key opportunities or constraints in the design
- Confirm if provisions for queueing and walkable space are satisfactory
- Produce a visual animation of the design and precinct operations for engagement.

4.2 Model development

The precinct model (Figure 4.1) has been developed based on precinct and station designs developed during the precinct concept design, including:

- Urban design plans dated 11 May 2020 for the precinct
- Architectural plans dated 5 February 2020 for the station design and integration with street level
- Intersection design dated 28 May 2020 for the proposed signalised crossing at Raglan Street and Cope Street.

Figure 4.1 Precinct model overview – reflective of design adopted for modelling



It is noted that designs have been updated since the modelling was undertaken. The updated design do not significantly change the layout or operation of the precinct from a pedestrian movement perspective. Key changes include:

- Design and layout of the Raglan Street and Cope Street signalised intersection focuses on road and lane allocation, hence pedestrian capacity is relatively unchanged. The kerb build-out on the south-west corner (closest to the metro station) is reduced. However this was already modelled as non-usable space (planter boxes), hence the impact to the pedestrian assessment is minimal.

- Location of north-south zebra crossing at the priority intersection of Cope Street and Wellington Street from the western side to the eastern side. This change does not change pedestrian crossing capacity. Pedestrians can still access the desire line to the south-east, albeit from a different side of the street.

Based on the above comparison of key changes, the results of this assessment are still applicable to the precinct.

4.2.1 Inputs and assumptions

In addition to the assumptions adopted for the station model (refer to SMCSWSWL-WSP-SWL-TF-REP-000001 for more information), the following assumptions have been adopted for the streetscape elements of the model:

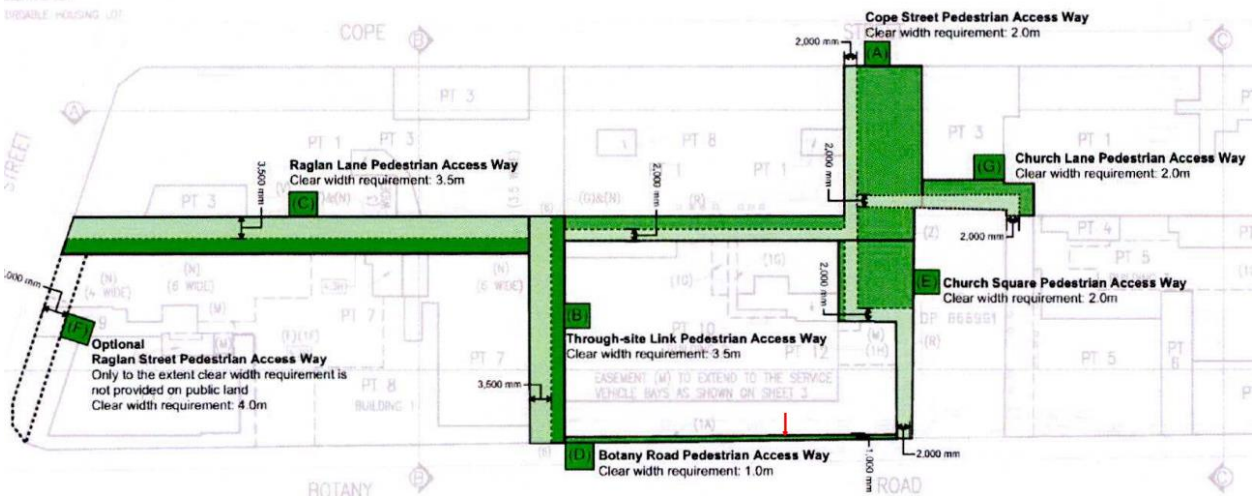
- Modelling has been undertaken for the worst-case scenario to confirm the provisions of the pedestrian infrastructure. This includes the 2056 AM peak hour design scenario and 2056 resilience scenario as per Section 2.5
- Level of Service (LoS) heatmaps are based on the Fruin LoS definitions in Figure 3.1 and represent the density averaged over 5 consecutive minutes from the 15 minutes peak
- Implementation of partial dynamic pedestrian route choice (where possible) based on a combination of shortest path and fastest route
- Walking speeds in the model assume a linear distribution for customers as per Table 4.1

Table 4.1 Customer walking speeds in model

Customer	Lower Bound	Upper Bound	Average
Male	1.0 m/sec	1.6 m/sec	1.3 m/sec
Female	0.7 m/sec	1.2 m/sec	1.0 m/sec

- Edge effects of 0.3m have been manually added to reflect that customers do not tend to walk close to the edge of the footpath, kerbside or against a wall.
- Within the precinct, clear widths have been modelled as per Figure 4.2. The figure denotes the clear width provided along Raglan Lane, Grit Lane and through Cope Street Plaza (light green). The remainder (dark green) reflects areas that may be used by retail outlets for outdoor furniture and hence have not been included in the modelling as walkable areas. It is noted that Raglan Lane has been modelled as contiguous through Grit Lane (although Figure 4.2 does not illustrate this).

Figure 4.2 Precinct thoroughfare clear width requirements



Source: MQD Design Parameters Extract provided by Mirvac

- Existing signal phasing has been retained at:
  - Botany Road and Raglan Street
  - Botany Road and Wellington Street
- Signal phasing for the new signalised crossing at Raglan Street and Cope Street has been based on a 110 second cycle time (based on the nearby intersections) and adopts the minimum green-and clearance time requirements for pedestrians based on the crossing lengths.
- Proposed zebra crossing across Cope Street near Cope Street Plaza has not been included in the model. By excluding this crossing where pedestrians crossing is prioritised, pedestrians instead use the signalised crossings at Raglan Street and Wellington Street, which reflects the worst-case scenario for the footpath on the precinct side of Cope Street and the queueing areas at each signalised intersection.

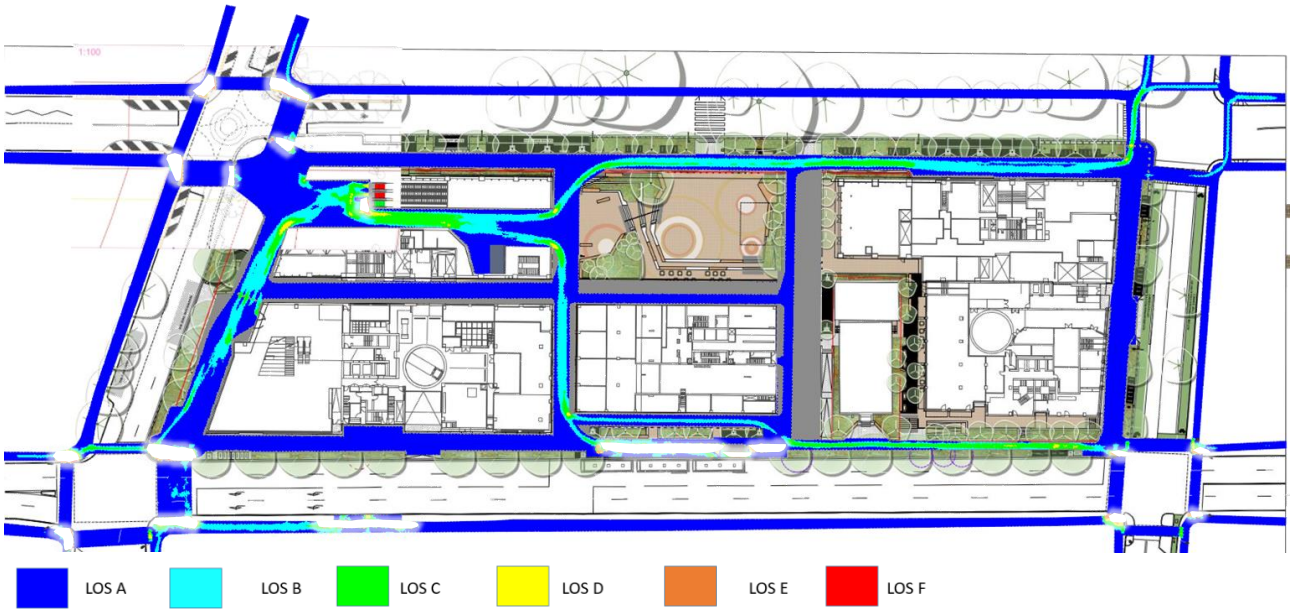
4.3 Assessment results

4.3.1 2056 AM peak

Overview

As illustrated in Figure 4.3, during the 2056 AM peak period, level of service (LoS) C or better is achieved throughout the precinct and surrounding footpaths. Locations where customer queueing is expected have been blanked out as these locations are instead based on the queueing LoS (refer to Figure 4.4).

Figure 4.3 Pedestrian LoS Walkways (Street) – 2056 AM

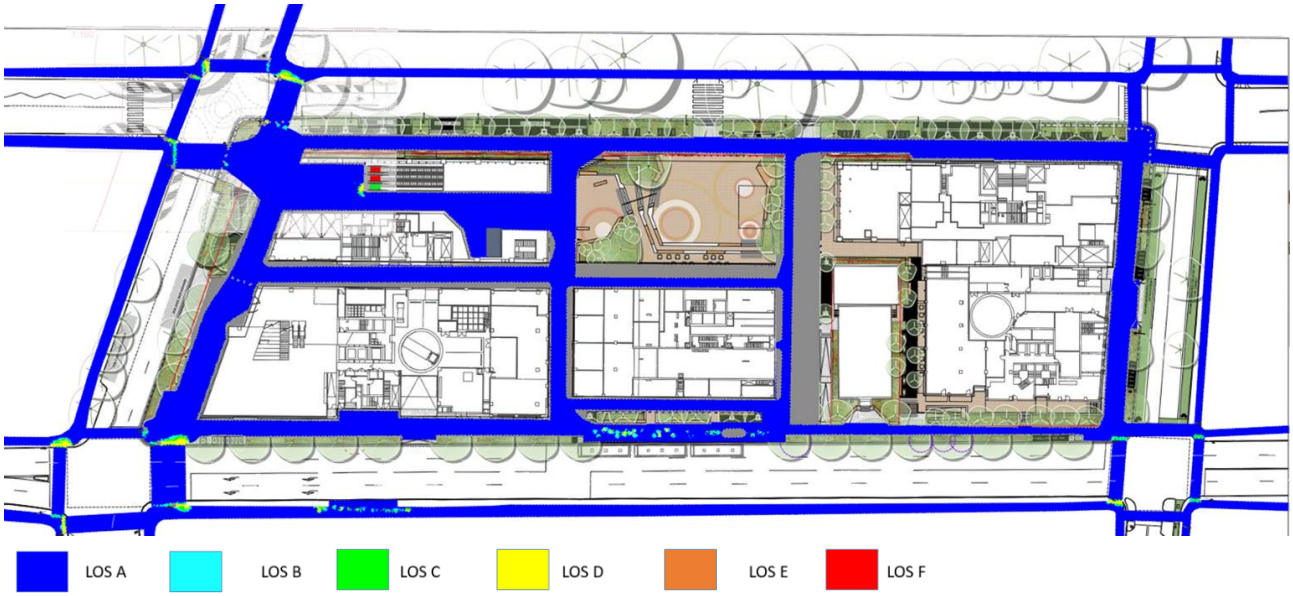


In light of current conditions due to COVID-19, the introduction of physical distancing requirements has placed additional scrutiny on densely populated pedestrian environments. The current recommendation of 4 square metres per person, equates to a walkways (street) LoS B (approaching LoS C). Although this physical distancing requirement is currently targeted at indoor environments, it can be seen that majority of the walkways could safely accommodate pedestrians at this spatial requirement should a similar situation arise in the future.

Furthermore, government advice encourages travelling outside of peak periods which is likely to flatten the peak hour profile. This will likely reduce pedestrian demand intensity, and further contribute to walkways (street) LoS B being achievable throughout the precinct.

Locations where customer queueing is expected, such as the kerbside for signalised crossings, escalator run-off and the Botany Road bus stop. At these locations, pedestrians are generally more tolerant of an increased density for a short time. This increased tolerance is reflected by the queueing LoS criteria and illustrated in Figure 4.4.

Figure 4.4 Pedestrian LoS Queueing – 2056 AM



Overall, the precinct operates at a satisfactory LoS (C or better) with some pockets of LoS D. These locations are discussed in more detail in subsequent figures.

Raglan Place

Raglan Place accommodates one of the highest pedestrian flows within the precinct, including movements:

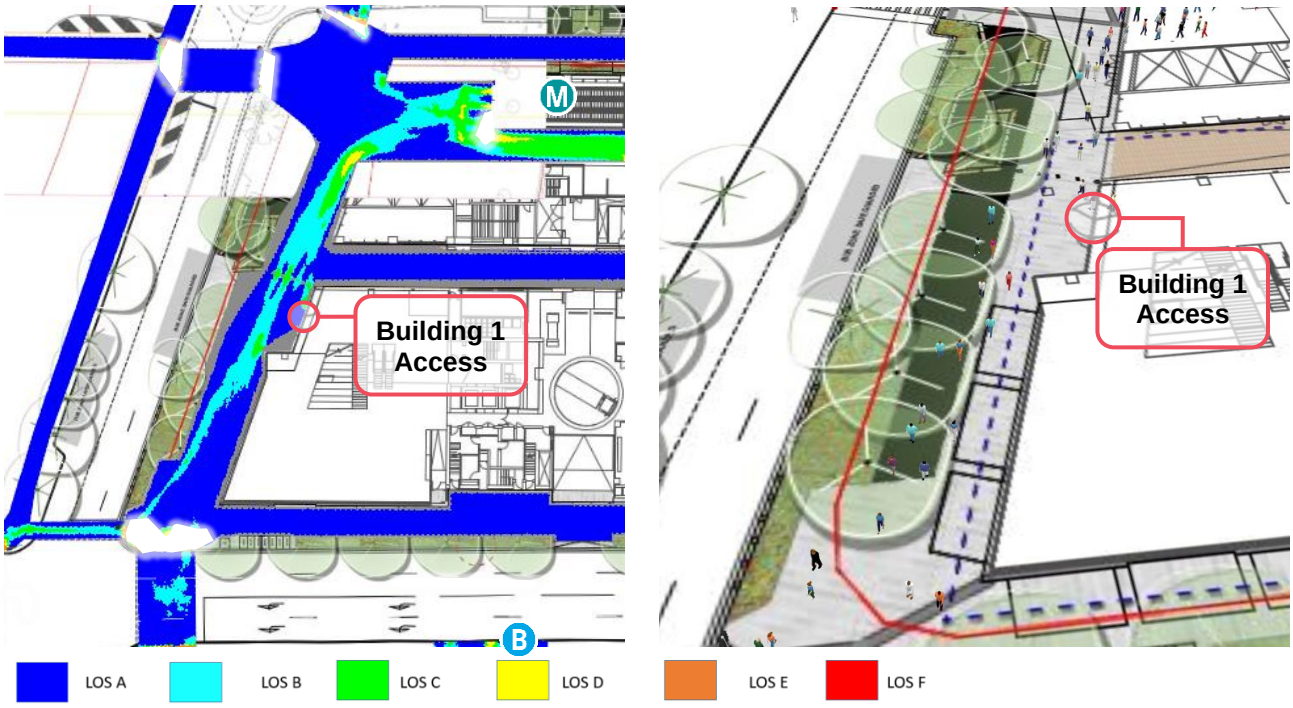
- Between metro station and other land uses locations north and west of the precinct
- To and from Building 1.

As illustrated in Figure 4.5, enough width has been provided to accommodate these pedestrian flows at a comfortable level of service (LoS C or better). Pockets of LoS D are observed where pedestrians change their direction including corners. This temporary increased density is expected as pedestrians compress and slow down to manoeuvre and change direction.

Several security bollards are included in the design along Raglan Place near the entry to Building 1. These bollards do not significantly impact pedestrian movement and flow. South of these bollards, the walkable area widens to accommodate the entry to Building 1. It is evident with the proposed footpath width, the Building 1 pedestrian flows (which are included in modelling) and the revolving door do not impede the east-west desire line along Raglan Place.

As discussed in Section 2.2.3, Building 1 is predominately commercial land use, hence Raglan Place near Building 1 is the most impacted by the increased commercial trip generation considered in the resilience scenario. Consequently, Raglan Place is also assessed for the resilience scenario in Section 4.3.2.

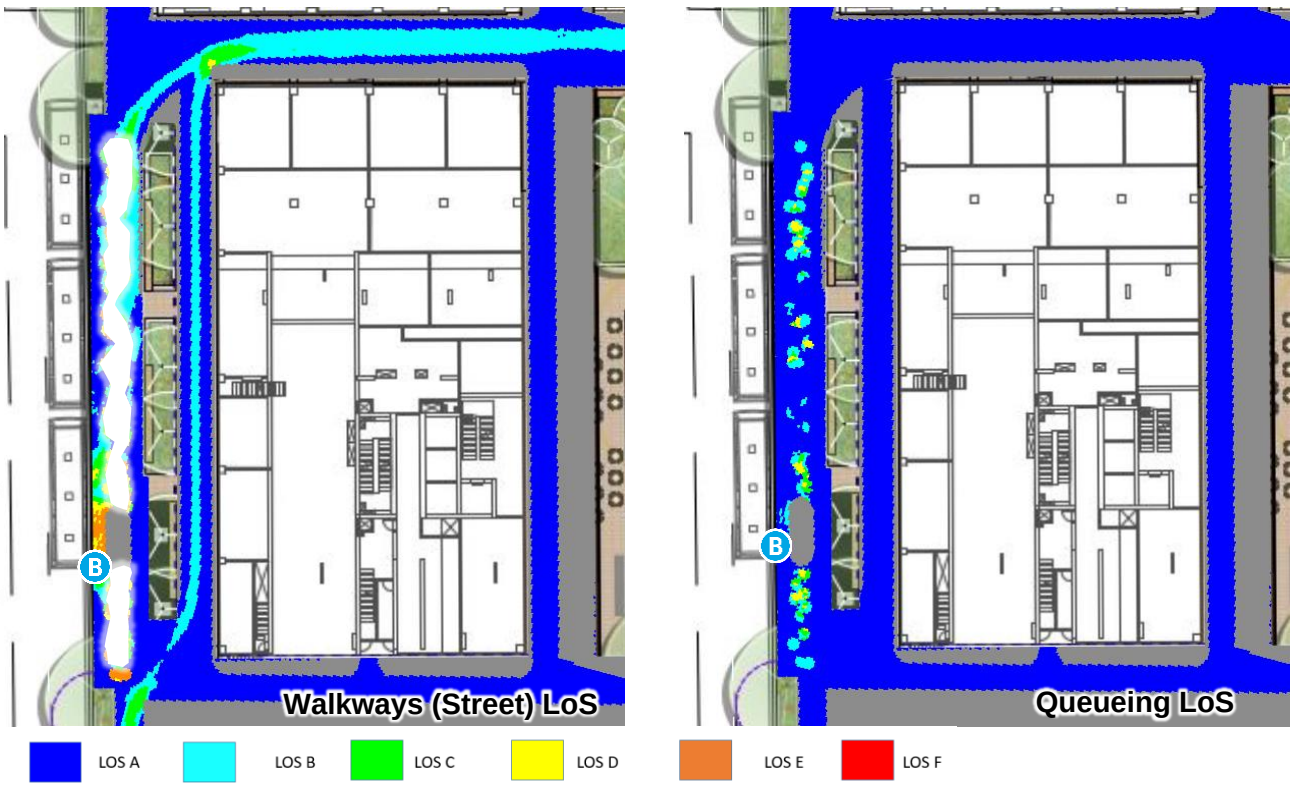
Figure 4.5 Pedestrian LoS and animation – 2056 AM – Raglan Place



Botany Road Bus Stop (southbound)

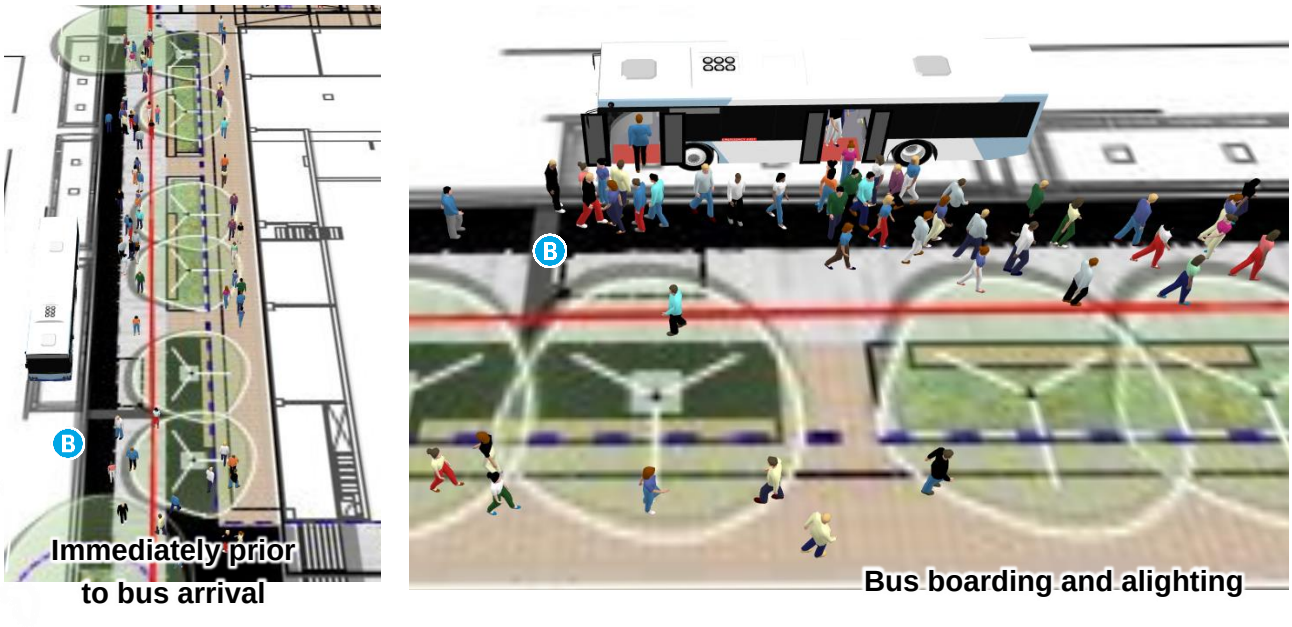
As illustrated in Figure 4.6, clear width has been maintained either side of the bus stop and planter boxes to allow unhindered access for through pedestrians, including those travelling north-south on Botany Road or accessing Grit Lane. This access is maintained immediately before the bus arriving and as pedestrian board and alight the bus, which reflects the busiest period, as shown in Figure 4.7.

Figure 4.6 Pedestrian LoS – 2056 AM – Botany Road bus stop (southbound)



For customers queueing (or waiting) for the bus, small pockets of LoS D (Figure 4.6) are observed. This is typical of pedestrians waiting for a bus service as some individuals choose to wait in groups, and it is evident there is enough space available to queue at LOS B/C if required.

Figure 4.7 Pedestrian Animation – 2056 AM – Botany Road bus stop (southbound)



Signalised intersections

At the intersections of Raglan Street and Botany Road and Raglan Street and Cope Street, some queueing is observed as shown in Figure 4.8 and Figure 4.9. This queuing is consistent with typical behaviour at an intersection where pedestrians are observed to queue “comfortably” at 0.65-0.75 m^2/person in urban environments (LoS C/D).

The queueing does not preclude or block other pedestrian movements (refer to red arrows), which ensures pedestrians who are not utilising the pedestrian crossing are not hindered.

Figure 4.8 Pedestrian queueing LoS and animation - 2056 AM – Intersection of Botany Road and Raglan Street

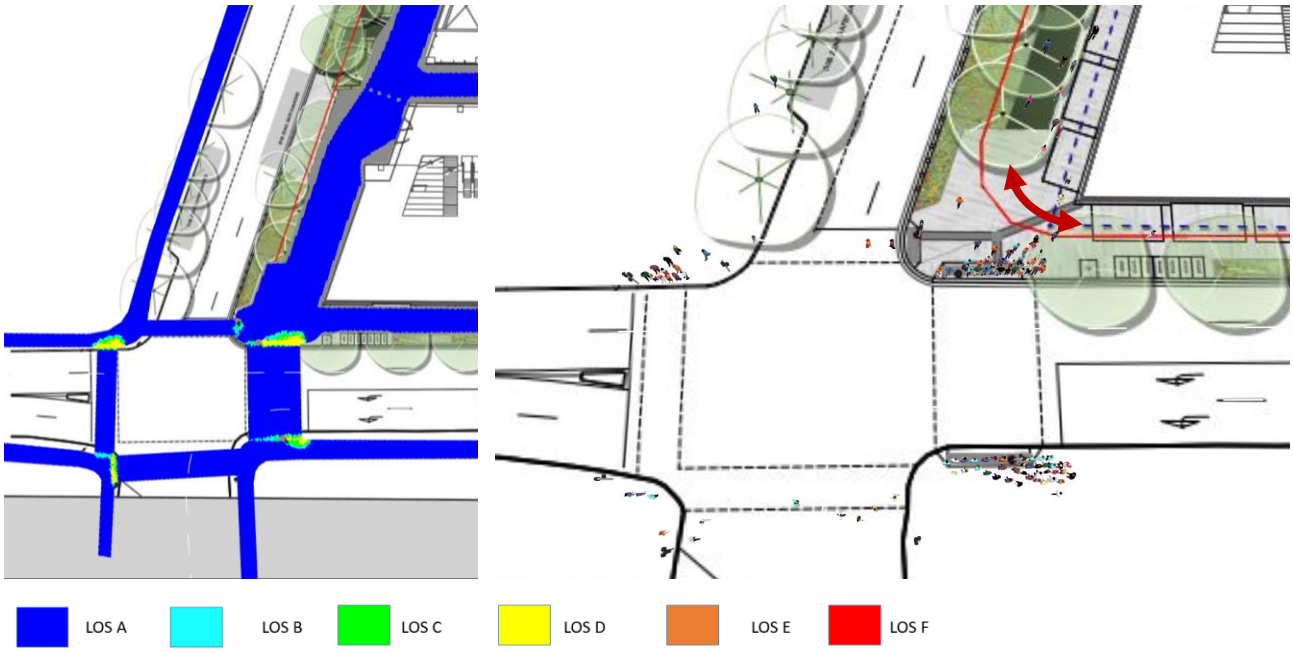
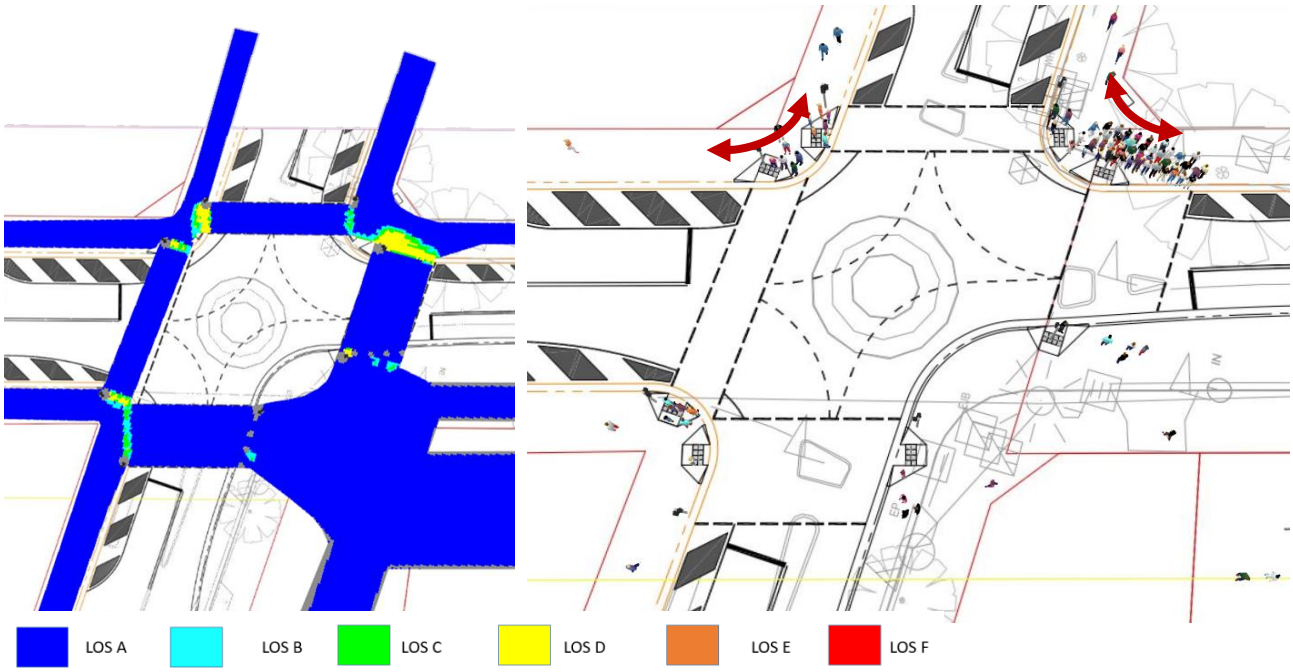


Figure 4.9 Pedestrian queueing LoS and animation - 2056 AM – Intersection of Raglan Street and Cope Street



4.3.2 2056 Resilience

As illustrated in Figure 4.10, during the resilience scenario (with increased commercial trip generation), level of service (LoS) C or better is still achieved throughout the precinct and surrounding footpaths. The main visible change in the level of service occurs at Raglan Place and Raglan Lane (Figure 4.11).

Figure 4.10 Pedestrian LoS Walkways (Street) – 2056 AM Resilience

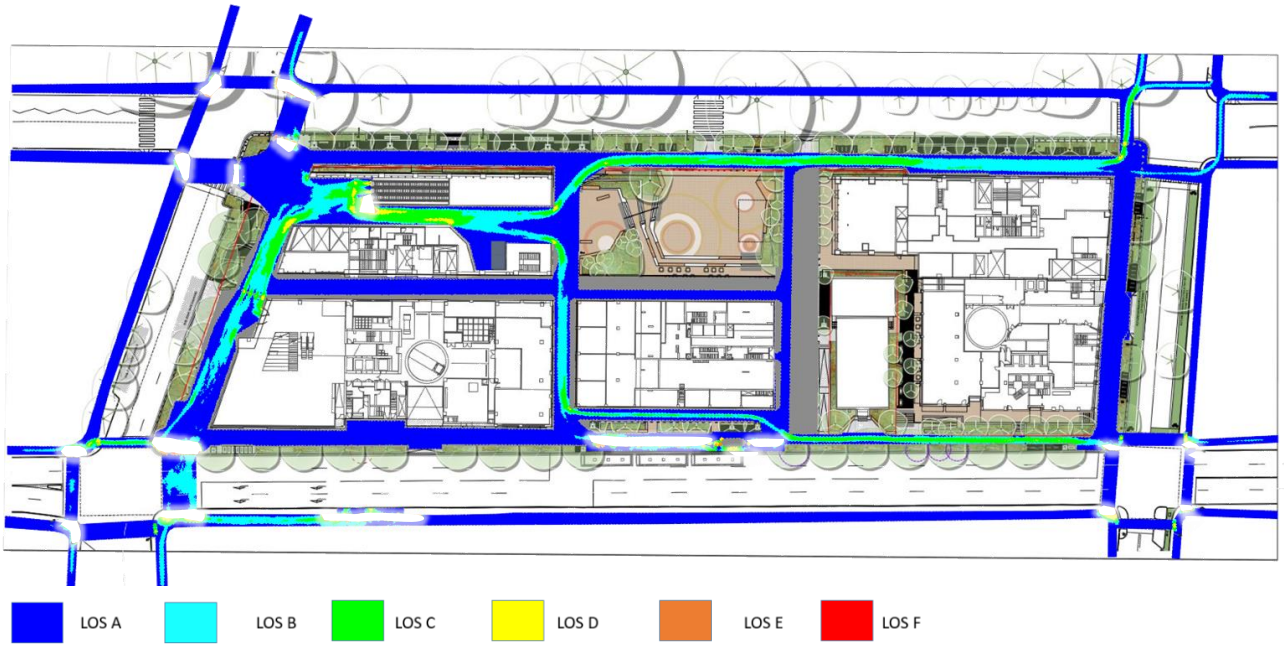
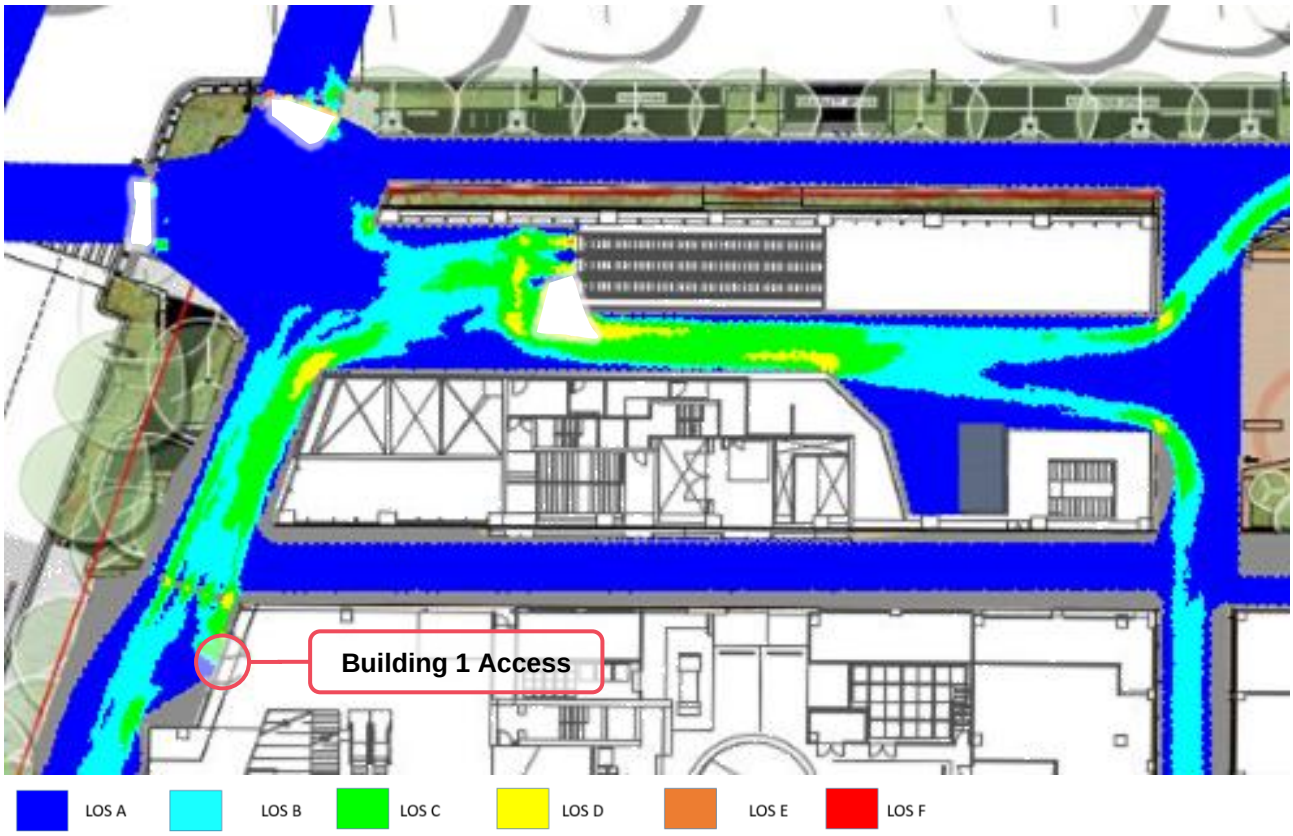


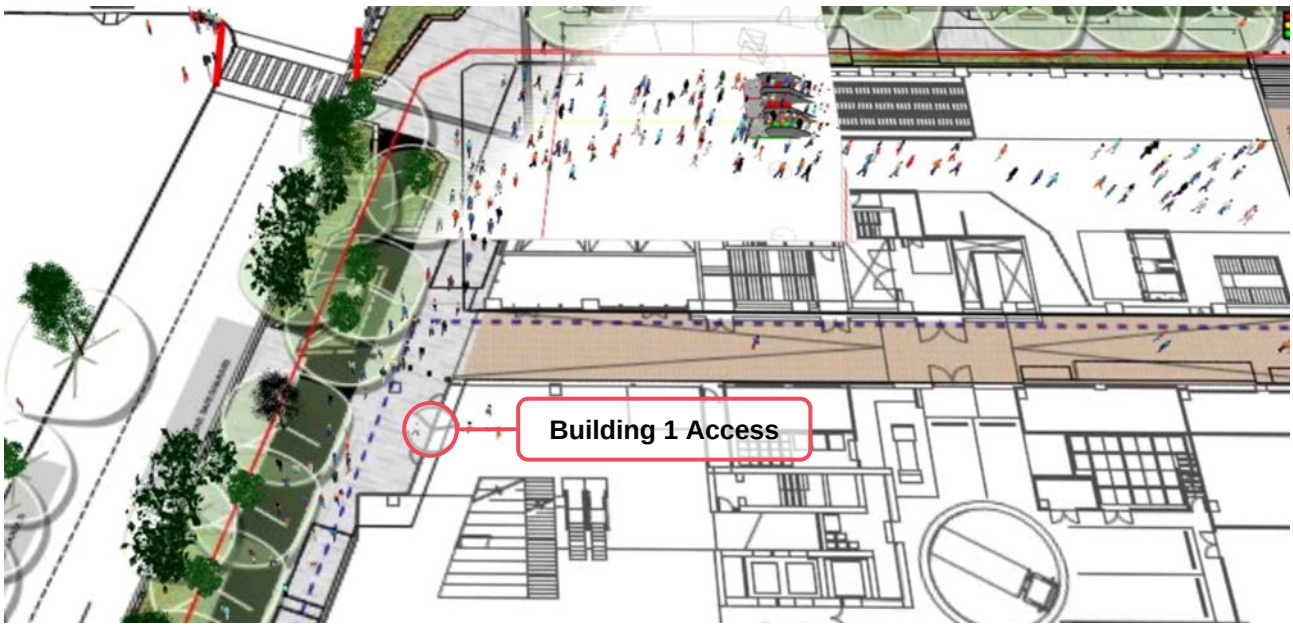
Figure 4.11 Pedestrian LoS Walkways (Street) – 2056 AM Resilience – Raglan Place and Raglan Lane



As evident in Figure 4.11, the pedestrian LoS deteriorates on Raglan Place and Raglan Lane compared to the 2056 AM scenario. However, a comfortable LoS C or better is maintained, with some pockets of LoS D near the escalator run-offs, building corners and bollards.

At each of these locations this temporary decrease in LoS is expected, as pedestrians slow and compress to manoeuvre around the obstacles or pedestrians travelling in a conflicting direction. As illustrated in Figure 4.12, space is available for customers to safely manoeuvre whilst providing space for pedestrians to temporarily pause or re-orient themselves.

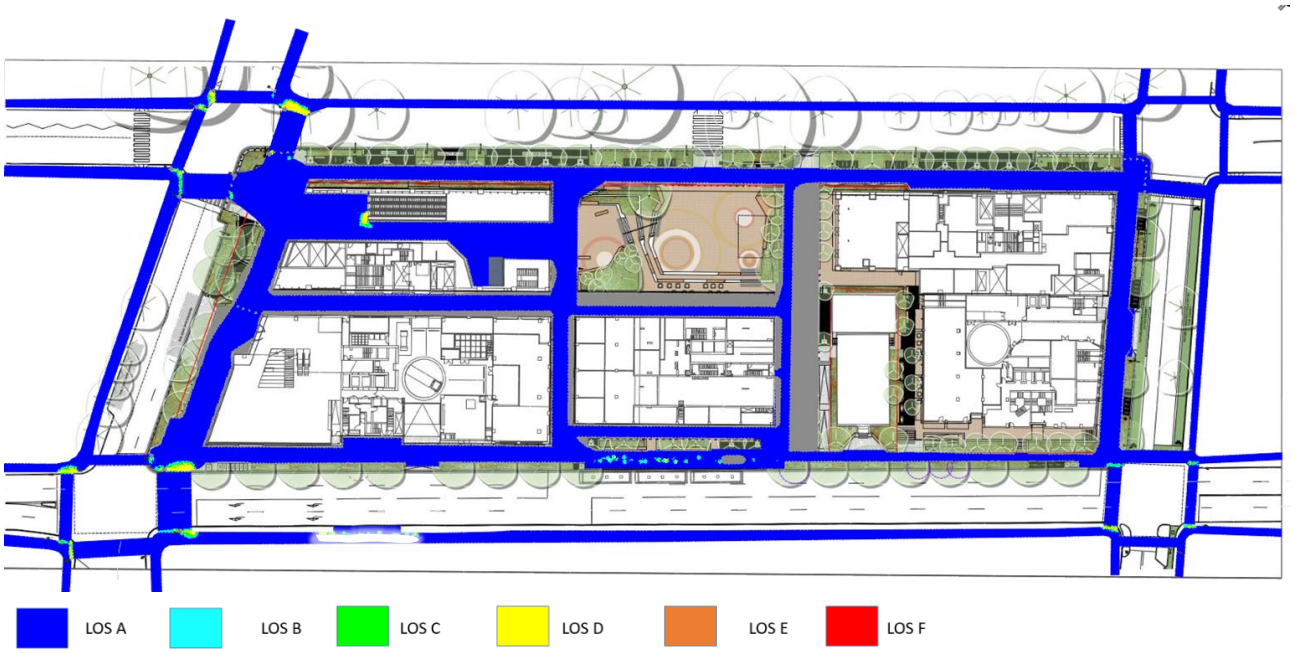
Figure 4.12 Pedestrian animation – 2056 Resilience – Raglan Place and Raglan Lane



As per the 2056 AM scenario, the Building 1 pedestrian flows and the revolving door itself do not impede the east-west pedestrian flow along Raglan Place.

Limited change is observed at queueing locations as illustrated in Figure 4.13. At these locations the queueing does not preclude or block other pedestrian movements, which ensures pedestrians who are not utilising the pedestrian crossing are not hindered.

Figure 4.13 Pedestrian LoS Queueing – 2056 AM Resilience



5 Conclusions

The pedestrian flows for the Waterloo Metro Quarter precinct has been assessed and summarised in this document to confirm the provisions of pedestrian infrastructure within and around the precinct.

A summary of the precinct performance and its compliance with project requirements is shown in Table 5.1. Overall, the precinct design is compliant with the project requirements.

Table 5.1 WMQ streetscape performance summary

Location	Assessment scenarios	
	2056 AM	2056 AM Resilience
Precinct connectivity		
Internal walkways	✓	✓
External footpaths	✓	✓
Queueing at intersections	✓	✓
Botany Street Bus Stop (southbound)		
Bus customers (waiting)	✓	✓
Non-bus customers (those travelling along Botany Road)	✓	✓

Legend ✓ Compliant ✗ Non-compliant

16.3 Appendix 3 - Loading Dock & Bicycle Parking Assessment

comments

A3

Horizontal Bike Space

Double Stacked Bike Space

Vertical Bike Space

3 social bike spaces

1800 1915

15 student bike spaces

1810 1800

2358 (15 horizontal)

500

1500

4100

5100

8850

Ø9200

Bulky Waste 8m²

Bulky Waste 15m²

Gas Meter 11.4m²

Community Space WC

Community Space 300.1m²

Turntable 9.25m Refuse

Building 4 Waste Loading

Social Housing Lobby 72.6m²

Platform Lift

Fire Booster

Entry

FCC

In ground water tank pump

In ground grease arrestor

In ground diesel bulk tank 27.5m³

In ground water tank

Commercial Waste Loading

Student Accommodation

Student Accommodation Bike Store

Student Accommodation Laundry 22.3m²

Void Above

Switch Room 31.4m²

Substation 23.1m²

Substation 21.2m²

Fire Control Room 14.9m²

NBN/PDH 7.4m²

Gym Lobby 68.6m²

Stair from mezzanine

1 : 20 Ramp

RL. 16.380

RL. 16.550

RL. 15.600

RL. 15.610

RL. 15.670

+ RL 15.200 (tbc)

15.44

15.39

WELLINGTON STREET

BICYCLE LANE

3.5M PRIMARY SETBACK

BOUNDARY

Outline of Awnings Above

FOR PUBLIC DOMAIN REFER TO LANDSCAPE ARCHITECTS DRAWINGS

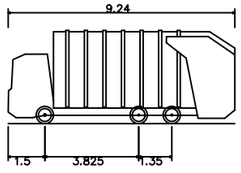
6 Bike Spaces

L01 Building Outline

APPROVED BUILDING 3 PODIUM ENVELOPE - 9393

WMQ-BLD-BSA-AR-DRG-DA143

WMQ-BLD-BSA-AR-DRG-DA145



City of Sydney 9.24m Refuse Vehicle

Overall Length	9.240m
Overall Width	2.100m
Overall Body Height	3.800m
Min Body Ground Clearance	0.216m
Track Width	2.000m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10.500m

The turning paths illustrated in this drawing have been prepared using the Autotrack vehicle modelling software in conjunction with AutoCAD. The vehicle model was prepared by Analytico Pty Ltd based upon vehicle data provided by Austroads. While this modelling represents a conservative assessment of the vehicles ability, it is not possible to account for all vehicle types/characteristics or driver ability.

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ptcconsultants.co

rev	date	comment / description	drawn	reviewed
2	14/08/20	DA Assessment	SW	AM
1	28/07/20	Preliminary Assessment	SW	AM

project
Waterloo Metro
Southern Precinct

drawing title
Building 3
Ground Floor Assessment

client	Mirvac
drawing #	Bld3-001
project #	2789
scale	1:200

rev 2

67 social bike spaces

1500 1200 1800 1500 1200 1500 1200 1500

Building 4 Waste Room Below

Social Housing
Bike Locker B
67 bikes spaces
(10 Horizontal + 57 vertical)

RL. 20.200

1690 1600 500 1800

1989

+ RL 16.380

Turntable
9.25m SRV

FOR PUBLIC DOMAIN REFER TO LANDSCAPE ARCHITECTS DRAWINGS

CHURCH YARD

+ RL 16.350 (tbc)
1 : 20 Ramp
+ RL 16.550 (tbc)
+ RL 16.550 (tbc)
1 : 12 Ramp
+ RL 15.930 (tbc)
1 : 20 Ramp
+ RL 15.66 (tbc)

Diesel Pump
Electric Pump
Fire Pump Room
43.2m²
Relay Pump

WELLINGTON STREET

Student Accommodation Comms below

Waste Loading Below

Water Meter

Substation below

Substation below

Community Space below

Switchroom below

3.5M PRIMARY SETBACK

BOUNDARY

Outline of Awnings Above

Student Accommodation Lobby below

Gym Lobby below

Outline of Awnings Above

FOR PUBLIC DOMAIN REFER TO LANDSCAPE ARCHITECTS DRAWINGS

L01 Building Outline

STAGE 01 DA PODIUM ENVELOPE

+ RL 15.040 (tbc)

BOTANY ROAD

+ RL 15.210 (tbc)

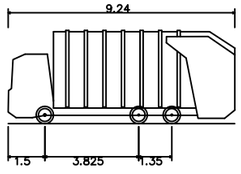
comments

A3

Horizontal Bike Space

Double Stacked Bike Space

Vertical Bike Space



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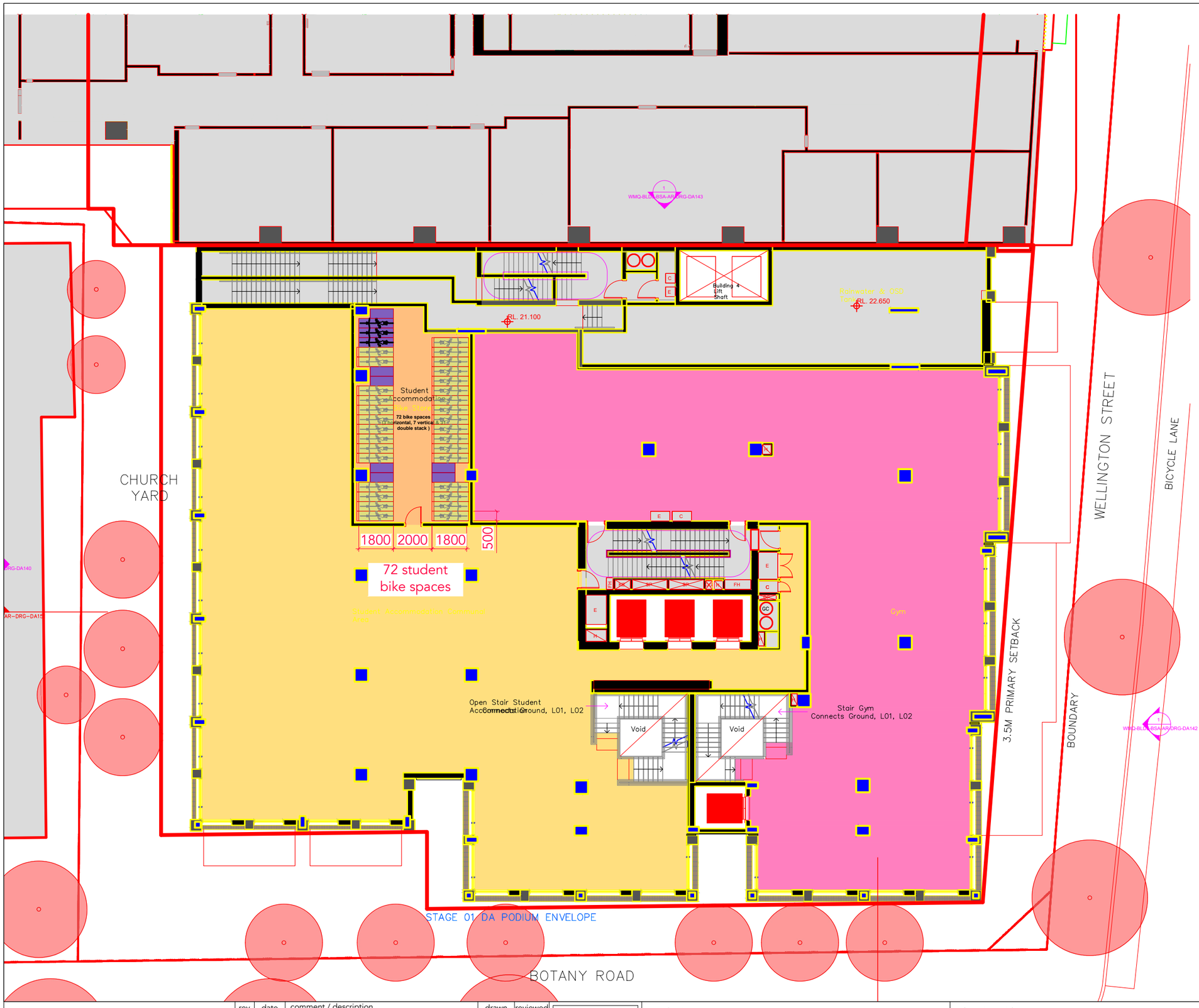
rev	date	comment / description	drawn	reviewed
2	14/08/20	DA Assessment	SW	AM
1	28/07/20	Preliminary Assessment	SW	AM

project
Waterloo Metro
Southern Precinct

drawing title
Building 3
Mezzanine Assessment

client	Mirvac
drawing #	Bld3-002
project #	2789
scale	1:200

rev 2



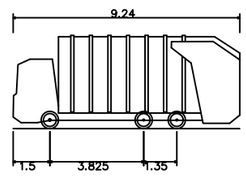
comments

A3

Horizontal Bike Space

Double Stacked Bike Space

Vertical Bike Space



City of Sydney 9.24m Refuse Vehicle	
Overall Length	9.240m
Overall Width	2.100m
Overall Body Height	3.800m
Min Body Ground Clearance	0.216m
Track Width	2.000m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10.500m

The turning paths illustrated in this drawing have been prepared using the Autotrack vehicle modelling software in conjunction with AutoCAD. The vehicle model was prepared by Analytico Pty Ltd based upon vehicle data provided by Austroads. While this modelling represents a conservative assessment of the vehicles ability, it is not possible to account for all vehicle types/characteristics or driver ability.

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rev	date	comment / description	drawn	reviewed
2	14/08/20	DA Assessment	SW	AM
1	28/07/20	Preliminary Assessment	SW	AM

project
Waterloo Metro
Southern Precinct

drawing title
Building 3
First Floor Assessment

client	Mirvac
drawing #	Bld3-003
project #	2789
scale	1:200

rev 2

16.4 Appendix 4 - Green Travel Plan (Building 3)

WATERLOO METRO QUARTER OVER STATION DEVELOPMENT

Environmental Impact Statement
Appendix I – Transport, Traffic and Parking Assessment
Appendix 4 – Green Travel Plan

SSD-10437 Southern Precinct
Building 3

Detailed State Significant Development
Development Application

Prepared for **Waterloo Developer Pty Ltd**

[30 September] 2020

Reference	Description
Applicable SSD Applications	SSD-10437 Southern Precinct
Author	**ptc.** Steve Wellman
Reviewed	Waterloo Developer Pty Ltd Perry Milledge Simon Joseph
Document Number	WMQ-BLD3-PTC-TF-RPT-004
Status	Final
Version	4
Date of Issue	10 August 2020

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1. Glossary and abbreviations

Reference	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ADG	Apartment Design Guide
AHD	Australian height datum
AQIA	Air Quality Impact Assessment
BC Act	Biodiversity Conservation Act 2016
BCA	Building Code of Australia
BC Reg	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
CEEC	critically endangered ecological community
CIV	capital investment value
CMP	Construction Management Plan
Concept DA	A concept DA is a staged application often referred to as a 'Stage 1' DA. The subject application constitutes a detailed subsequent stage application to an approved concept DA (SSD 9393) lodged under section 4.22 of the EP&A Act.
Council	City of Sydney Council
CPTED	Crime Prevention Through Environmental Design
CSSI approval	critical State significant infrastructure approval
CTMP	Construction Traffic Management Plan
DA	development application
DPIE	NSW Department of Planning, Industry and Environment
DRP	Design Review Panel
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPA Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESD	ecologically sustainable design

Reference	Description
GANSW	NSW Government Architect's Office
GFA	gross floor area
HIA	Heritage Impact Assessment
IAP	Interchange Access Plan
LGA	Local Government Area
NCC	National Construction Code
OSD	over station development
PIR	Preferred Infrastructure Report
POM	Plan of Management
PSI	Preliminary Site Investigation
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SEPP 65	State Environmental Planning Policy No. 65 – Design Quality of Residential Apartment Development
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2009
SREP Sydney Harbour	State Regional Environmental Plan (Sydney Harbour Catchment) 2005
SSD	State significant development
SSD DA	State significant development application
SLEP	Sydney Local Environmental Plan 2012
Transport for NSW	Transport for New South Wales
TIA	Traffic Impact Assessment
The proposal	The proposed development which is the subject of the detailed SSD DA
The site	The site which is the subject of the detailed SSD DA
VIA	Visual Impact Assessment

Reference	Description
WMQ	Waterloo Metro Quarter
WMP	Waste Management Plan
WSUD	water sensitive urban design

2. Introduction

This report has been prepared to accompany a detailed State significant development (SSD) development application (DA) for the Southern Precinct over station development (OSD) at the Waterloo Metro Quarter site. The detailed SSD DA is consistent with the concept approval (SSD 9393) granted for the maximum building envelope on the site, as proposed to be modified.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (DPIE) for assessment.

The detailed SSD DA seeks development consent for the design, construction and operation of:

- 23-storey residential building (Building 3) comprising student accommodation, to be delivered as a mixture of studio and twin apartments with approximate capacity of 475 students
- ground level retail tenancies, Makerspace, and loading facilities
- level 1 and level 2 gymnasium and student accommodation communal facilities
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 8 April 2020 and issued for the detailed SSD DA. Specifically, this report has been prepared to respond to the SEARs requirements summarised below.

Item	Description of requirement	Section reference (this report)
9	**Traffic, Parking and Access (Construction and Operation)** The EIS shall include a traffic, parking and access assessment that provides, but is not limited to, the following:	
	Justification for the car parking provision with measures to encourage users of the development to make sustainable travel choices, including a **green travel plan**, walking, cycling, public transport and car sharing, adequate provision of bicycle parking and end of trip facilities and the minimisation of private car trips.	Green Travel Plan addressed in this report

Table 1 - SEARs requirements SSD 10437)

3. The site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated about 3.3 kilometres south of Sydney CBD and eight kilometres northeast of Sydney International Airport within the suburb of Waterloo.

The Waterloo Metro Quarter site comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street (refer to Figure 1). The heritage-listed Waterloo Congregational Church at 103–105 Botany Road is within this street block but does not form a part of the Waterloo Metro Quarter site boundaries.

The Waterloo Metro Quarter site is a rectangular shaped allotment with an overall site area of approximately 1.287 hectares.

The Waterloo Metro Quarter site comprises the following allotments and legal description at the date of this report. Following consolidation by Sydney Metro (the Principal) the land will be set out in deposited plan DP1257150.

- 1368 Raglan Street (Lot 4 DP 215751)
- 59 Botany Road (Lot 5 DP 215751)
- 65 Botany Road (Lot 1 DP 814205)
- 67 Botany Road (Lot 1 DP 228641)
- 124-128 Cope Street (Lot 2 DP 228641)
- 69-83 Botany Road (Lot 1, DP 1084919)
- 130-134 Cope Street (Lot 12 DP 399757)
- 136-144 Cope Street (Lots A-E DP 108312)
- 85 Botany Road (Lot 1 DP 27454)
- 87 Botany Road (Lot 2 DP 27454)
- 89-91 Botany Road (Lot 1 DP 996765)
- 93-101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)
- 156-160 Cope Street (Lot 31 DP 805384)
- 107-117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 170-174 Cope Street (Lot 2 DP 205942).

The detailed SSD DA applies to the Southern Precinct (the site) of the Waterloo Metro Quarter site. The site has an area of approximately 4830sqm. The subject site comprises the following allotments and legal description at the date of this report.

- 130–134 Cope Street (Lot 12 DP 399757) (Part)
- 136–144 Cope Street (Lots A-E DP 108312) (Part)
- 93–101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891) (Part)
- 156–160 Cope Street (Lot 31 DP 805384)
- 107–117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)

170–174 Cope Street (Lot 2 DP 205942).

The boundaries of the overall site are identified at Figure 1, and the subject site of the detailed SSD DA is identified at Figures 2 and 3. The site is reasonably flat with a slight fall to the south.

The site previously included three to five storey commercial, light industrial and shop top housing buildings. All previous structures except for an office building at the corner of Botany Road and Wellington Street have been demolished to facilitate construction of the new Sydney Metro Waterloo station. As such the existing site is predominately vacant and being used as a construction site. Construction of the Sydney metro is currently underway on site in accordance with critical State significant infrastructure approval (CSSI 7400).

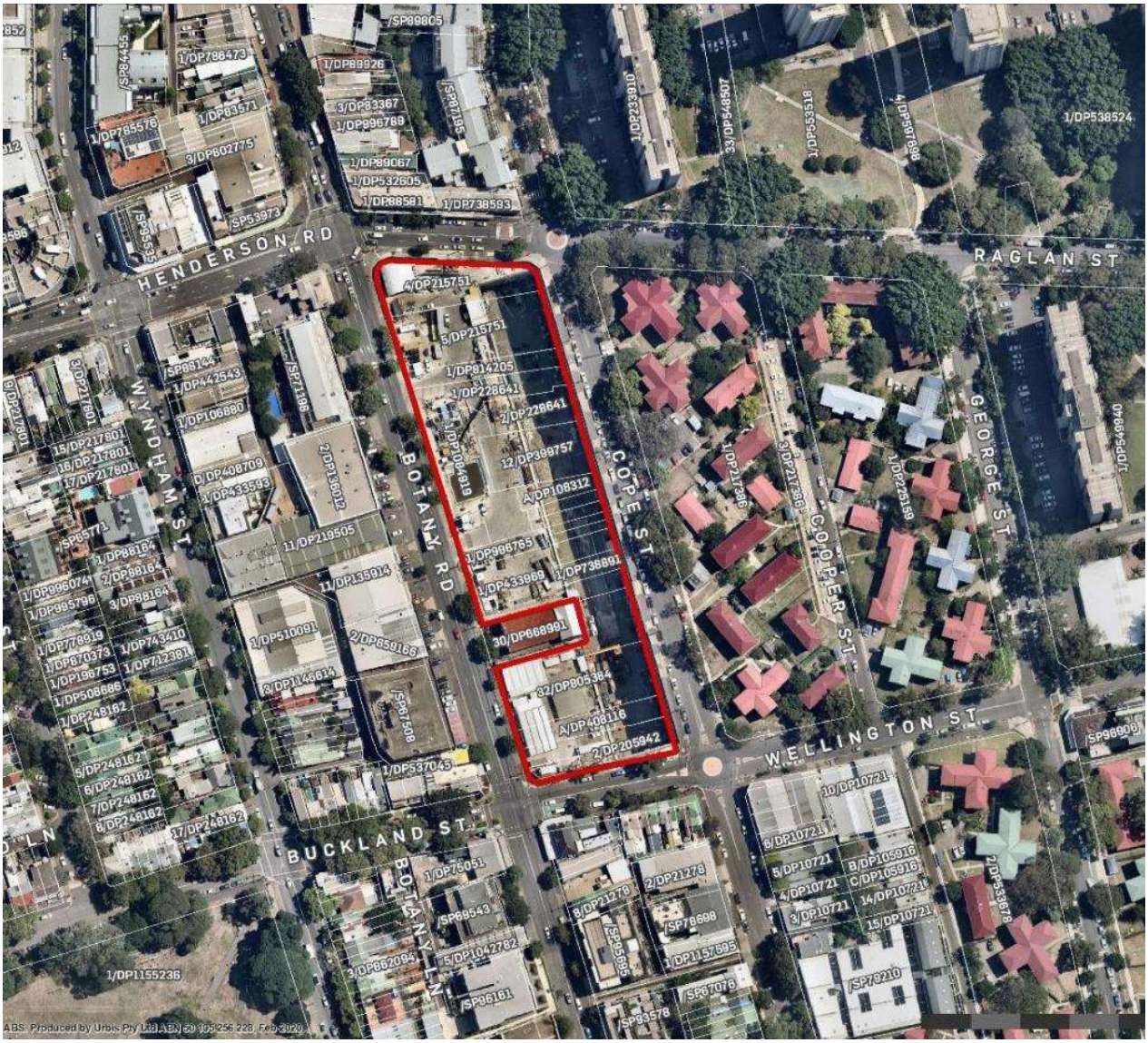


Figure 1 - Aerial image of the site
Source: Urbis

The area surrounding the site consists of commercial premises to the north, light industrial and mixed-use development to the south, residential development to the east and predominantly commercial and light industry uses to the west.

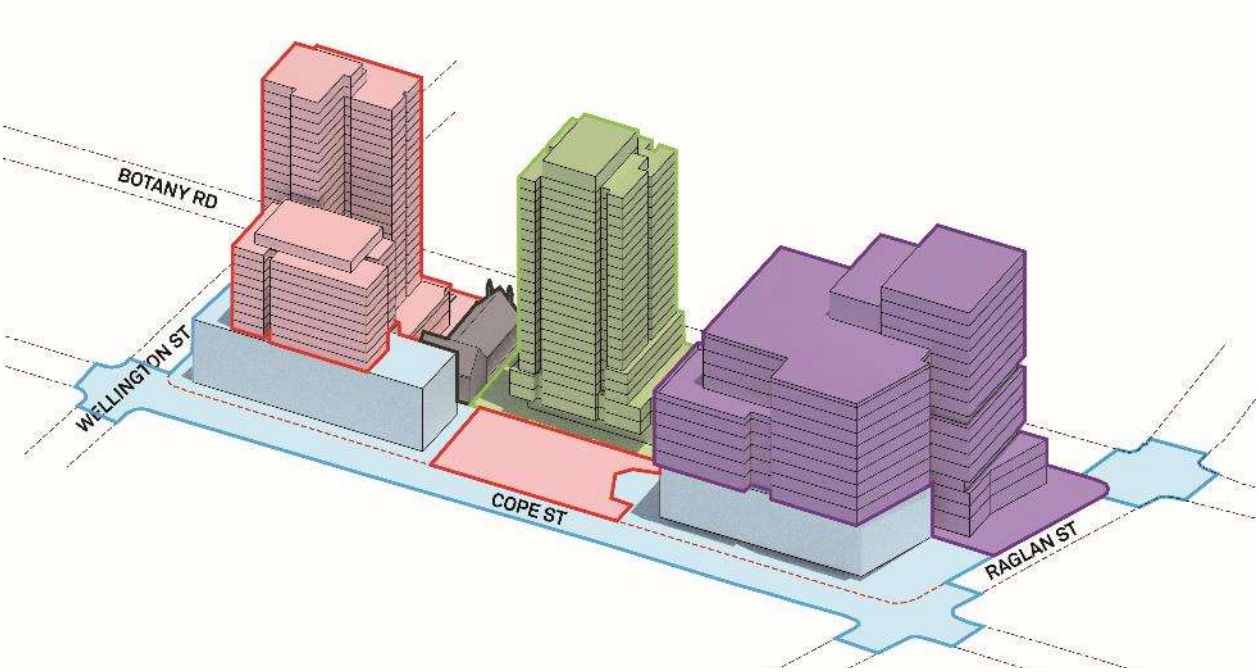


Figure 2 - Waterloo Metro Quarter site, with sub-precincts identified
Source: HASSELL

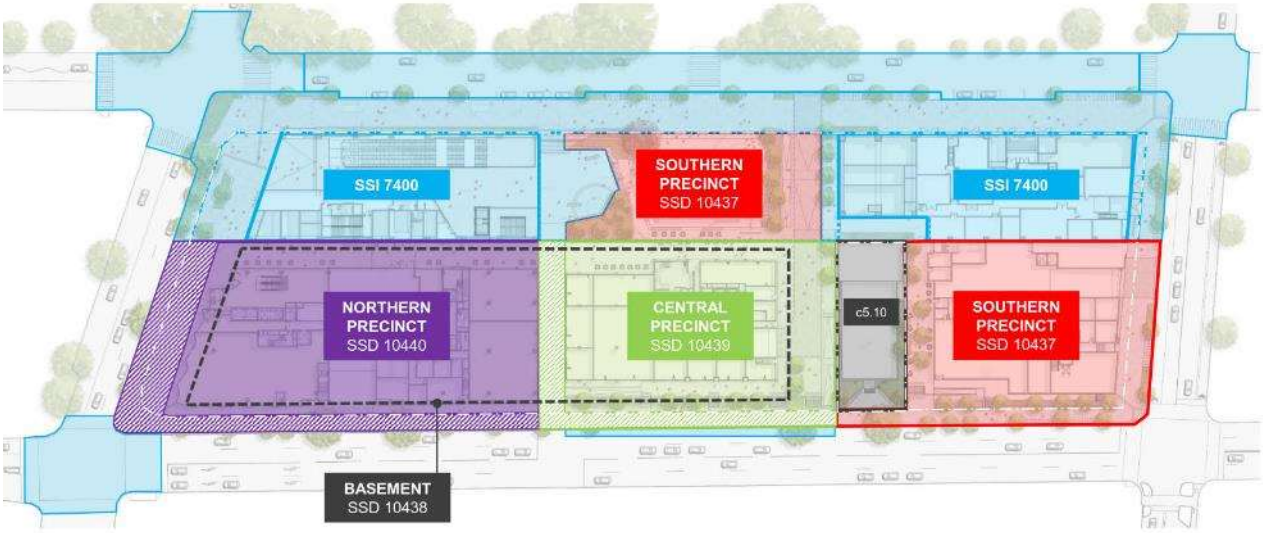


Figure 3 - Waterloo Metro Quarter site, with sub-precincts identified
Source: Waterloo Developer Pty Ltd

4. Background

4.1 About Sydney Metro

Sydney Metro is Australia's biggest public transport project. Services started in May 2019 in the city's North West with a train every four minutes in the peak. A new standalone railway, this 21st century network will revolutionise the way Sydney travels.

There are four core components:

4.1.1 Sydney Metro Northwest

This project is now complete and passenger services commenced in May 2019 between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and $1 billion under budget.

4.1.2 Sydney Metro City & Southwest

Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of Metro Northwest at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition, it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.

4.1.3 Sydney Metro West

Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs.

The locations of seven proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.

The NSW Government is assessing an optional station at Pyrmont and further planning is underway to determine the location of a new metro station in the Sydney CBD.

4.1.4 Sydney Metro Greater West

Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service.

The Australian and NSW governments are equal partners in the delivery of this new railway.

The Sydney Metro project is illustrated below.

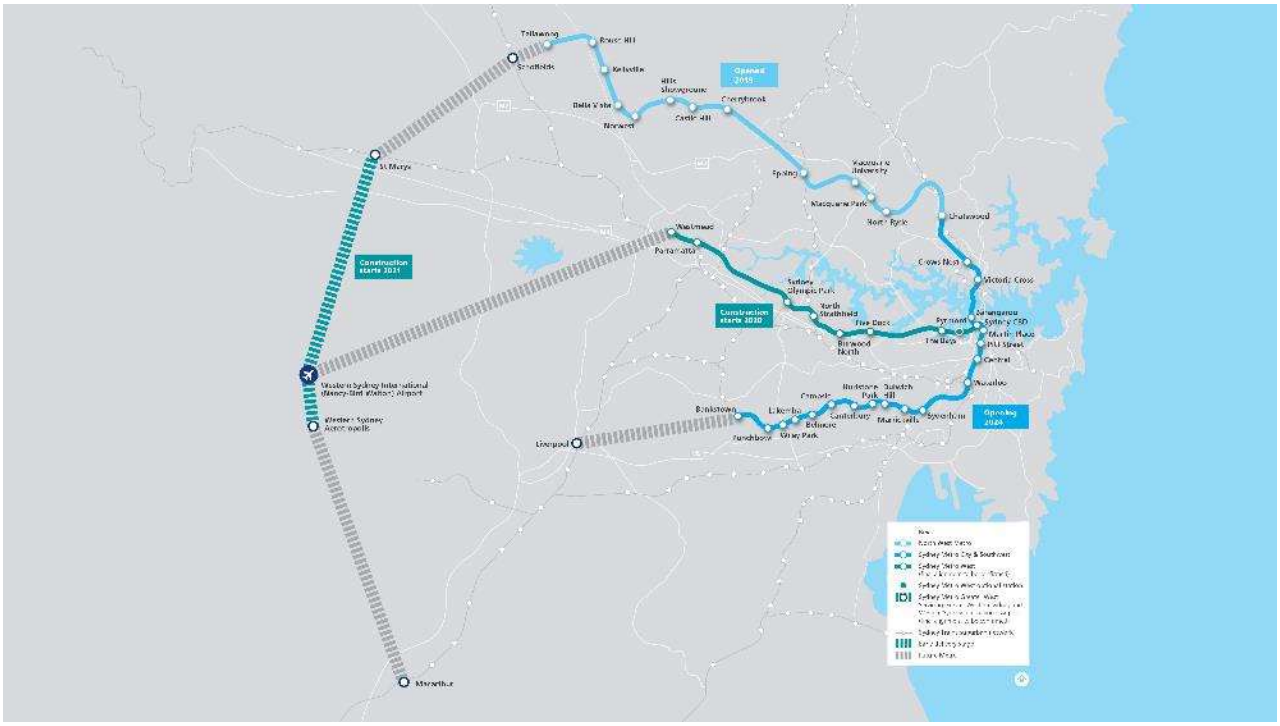


Figure 4 - Sydney Metro alignment map
Source: Sydney Metro

5. Proposed development

The detailed SSD DA seeks development consent for the design, construction and operation of:

- 23-storey residential building (Building 3) comprising student accommodation, to be delivered as a mixture of studio and twin apartments with approximate capacity of 475 students
- ground level retail tenancies, Makerspace and loading facilities
- level 1 and level 2 gymnasium and student accommodation communal facilities
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington Streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).
- The car parking provision for the Southern Precinct (Buildings 3 and 4) is located within the shared basement of the Northern and Central Precincts as illustrated in Figure 5. This car park is accessed via Cope Street and the shared zone on Church Street.
- The development also includes a shared loading dock within the ground floor, accessed off Wellington Street as shown in Figure 6.

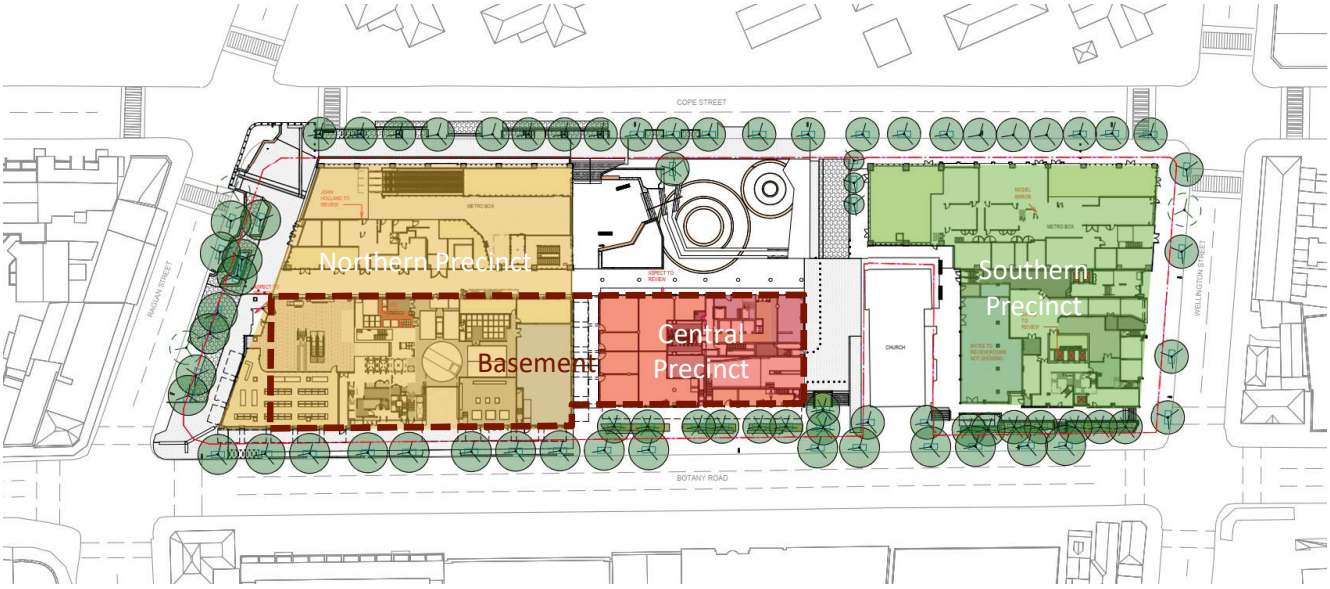


Figure 5 – Key Components of Separable Portions

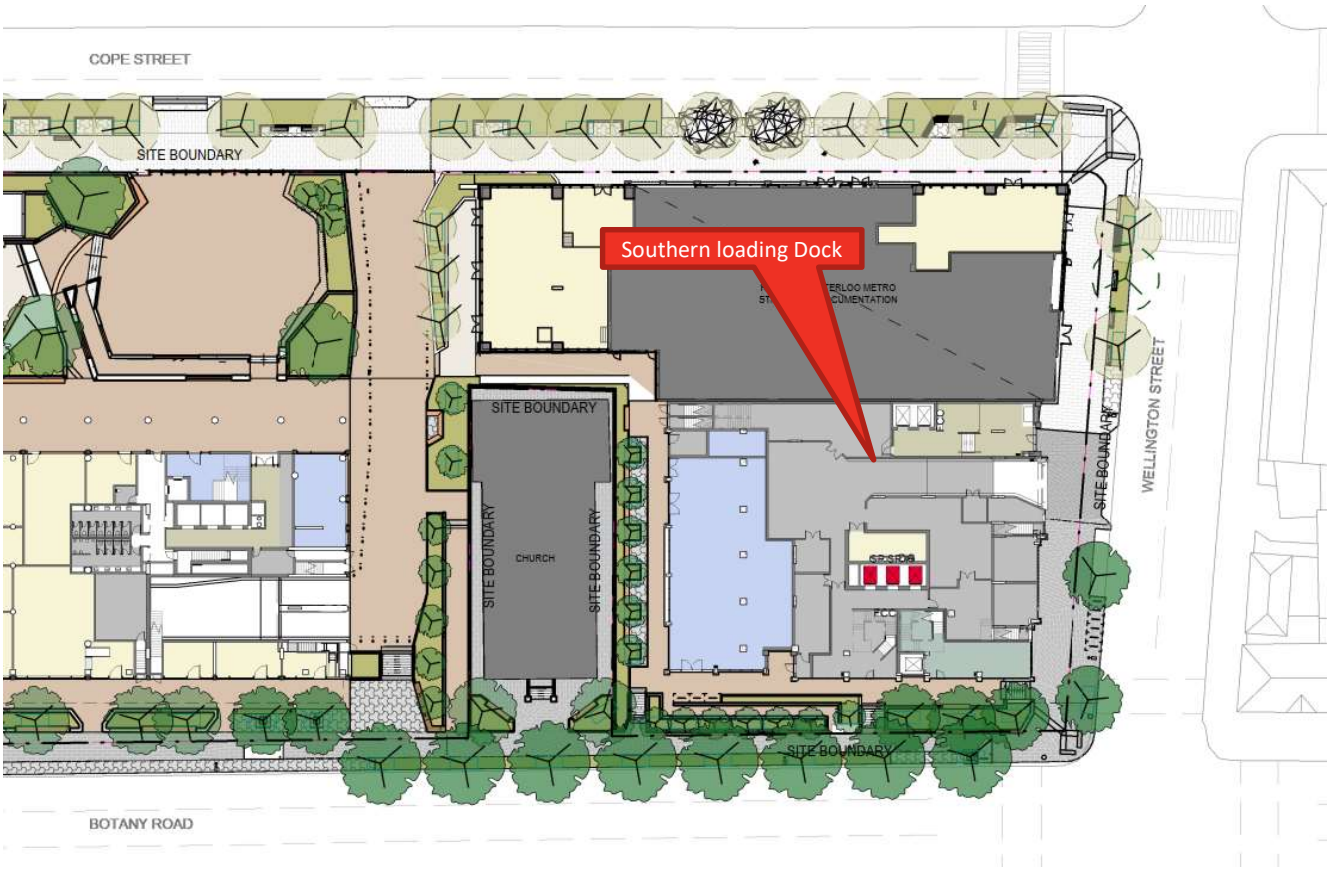


Figure 6 – Vehicular Access to Southern Loading Dock

6. Green Travel Plan

6.1 Council Policy

Through its Sustainable Sydney 2030 policy, the City of Sydney encourages that all new developments within the LGA are to incorporate active transport and promote public transport as part of their designs. The policy aims include:

- To continue to implement the Liveable Green Network to enhance pedestrian access throughout the City and to encourage walking, especially for shorter trips and trips to local amenities.
- To work with the State Government to introduce measures to improve pedestrian safety and priority, including 40 kilometres per hour speed limits throughout the City Centre, changes to traffic light timings and wider footpaths.
- To complete its Cycle Strategy and Action Plan, which involves 200 kilometres of cycleways, together with programs to encourage cycling as the most sustainable and healthy form of travel for medium length (1-5 km) trips.
- To continue to support car share as it provides an additional option for people to reduce their ownership and use of private cars, in conjunction with greater use of walking, cycling and public transport.

6.2 What is a Green Travel Plan?

A Green Travel Plan (GTP) is a document that outlines how a development intends to make travel to and from the site safer and more sustainable for residents and their visitors. The GTP addresses local traffic issues around the site and encourages active, safe and sustainable travel methods, such as walking, cycling, scooting, public transport or car sharing. A GTP correlates with the development's overall aspirations and is a document that is monitored and reviewed regularly.

A GTP is not just the installation bike racks or provision of end-of-trip facilities. A good GTP aims to promote and maximise the use of more sustainable modes of travel via a range of actions, promotional campaigns and incentives. The plan includes site management tools that encourage residents, staff and visitors to make more sustainable transport choices. A GTP requires ongoing implementation, monitoring and review. As such, nominating an individual or a team to oversee the implementation of a travel plan is a crucial component of success.

An effective GTP can offer many benefits such as reduced parking costs, less congestions on the public road networks, health and environmental benefits.

6.3 Why a Green Travel Plan is required?

Development of a GTP is widely accepted as one of the best ways to increase active travel around the site. A successful GTP offers many benefits for the community, including:

- Building confidence and improving social interaction by walking and/or cycling;
- Assists in implementation of health, fitness and wellbeing programs;
- Improving social interaction with others to be more interested and involved in the with the precinct as they walk or cycle;
- Improving safety by reducing traffic and local road congestion;

- Improving the environment by reducing air pollution from private vehicles;
- Creating opportunities for healthier lifestyles and more vibrant, cohesive and accessible communities; and
- Providing individuals with leadership opportunities.
- It is likely that residents with good understanding of an active and sustainable mode of transport will follow a healthy and active lifestyle, care about the environment and prioritise location and lifestyle over car ownership.

6.4 The Purpose of a Green Travel Plan

The purpose of the GTP is to provide a package of measures with the aim at promoting and reducing the reliance of private car usage and encourage and support the uptake of daily business in a more sustainable way. This may be achieved through the review of existing policies and identifying programmes to encourage residents, visitors and employees to adopt more active and sustainable forms of transport. This document identifies the following:

- Review of existing public transport infrastructure and future transport options;
- Assessment of existing travel patterns within the area;
- A modal share target for the development;
- A framework to identify and respond to travel demand from the development and surrounding area;
- Strategies to implement prior and during occupancy; and
- The monitoring strategy to track performance of the GTP.

6.5 Relevant priorities from the NSW State Plan (NSW Health, 2011)

- Increase walking and cycling,
- Increase the number of people participating in physical activity,
- Improve health in the community,
- Increase share of journey to work trips on a safe and reliable public transport system,
- Improve the efficiency of the road network,
- Increase the number of jobs closer to home,
- Tackle climate change,
- Improve air quality.

6.6 Potential Outcomes

- Successful negotiations with private transport providers (if necessary) to provide increased public transport services to the precinct.
- Improvements to cycle and walking infrastructure, if required.
- Recommendations for any relevant policy changes will be made to management (e.g. flexible work and work from home/hub policies).
- Campaign promoting the health and other benefits of non-car modes of travel will be implemented for residents.

- End-of-Trip infrastructure provided within the WMQ site, including lockers to leave items overnight (avoids carrying heavy items home, which can be a deterrent for active transport).
- Team up with a local bike shop to provide bike servicing within the Waterloo locality (this can be extended to the broader community too).
- Evaluation and Monitoring:
    - Online surveys (mode of travel to work)
    - Carpooling use (number of new users)
    - Private car-park usage
    - Feedback from public transport providers
    - Patronage on any new commuter public transport services
    - Number of Transport Access Guides downloaded/hard copies used.

7. Steps to Set Up a Green Travel Plan

To develop a GTP, there are five key steps to follow to commence its operation as illustrated in Figure 7:

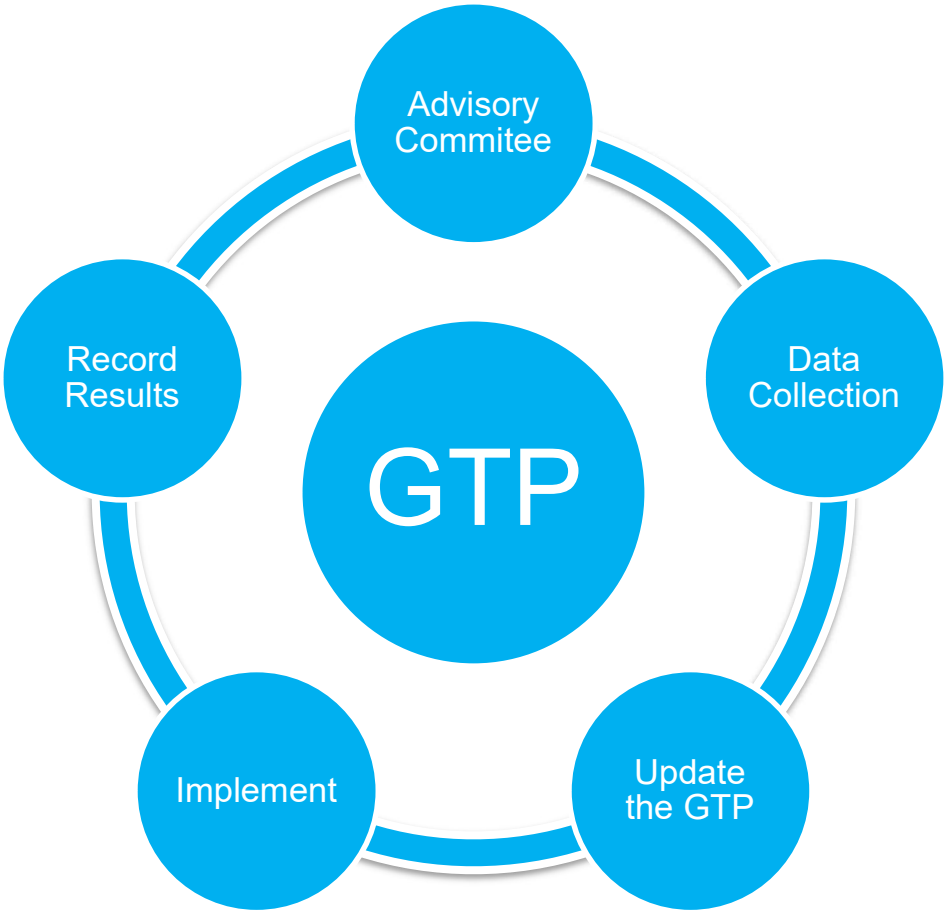


Figure 7 – Steps in developing a GTP

7.1 Step 1 – Set up an Advisory Committee

- Appoint an individual to coordinate specific actions and to track the progress of this work;
- Develop a working group that involves representatives from the precinct community
- Identify ways how the whole community will be involved and informed of the work (e.g. regular articles in the precinct website / social media).

7.2 Step 2 – Data Collection & Review Existing Situation

As part of the development, it is expected that there will be a new residents, visitors and employees travelling to and from the building on a daily basis. To identify how residents living in the Waterloo area travel elsewhere for work or shopping etc. and/or for people coming to Waterloo area to work, shop or to eat, an initial survey should be conducted to identify the travel behaviour of residents, staff and visitors. This may be conducted as an online survey or an intercept survey of those accessing the site.

As a minimum the following questions should be considered:

- Are you are resident/visitor to the site? Yes/No
- Did you park on site today? If so where?

Resident Only Questions

- If you are a resident, do you have an allocated parking space within the Site?
- If you are a resident, where do you work?
- How do you currently travel to work and the distance of their travel?
- Based on the public transport and other sustainable travel options available, which would be their preferred mode of travel?
- Walk/run
- Bicycle
- Bus
- Train
- Combination of bus and train
- Drive car
- Passenger in car
- Cycle
- other ____
- Is your workplace in an area not serviced by any of the identified transport options?
- Do you need to drive to work for another reason? Why and how often this would occur (eg. Dropping off or collecting children from school/childcare, etc)

Staff Only Questions

- If you are a staff member, do you have an allocated parking space within the WMQ precinct?
- How do you currently travel to work and the distance of their travel?
- Based on the public transport and other sustainable travel options available, which would be their preferred mode of travel?
    - Walk/run
    - Bicycle
    - Bus
    - Drive car
    - Passenger in car
    - Other
- Is your residence in an area not serviced by any of the identified transport options?
- Do you need to drive to work for another reason? Why and how often this would occur (i.e. shift work).

Visitors Only Questions

- If you are a visitor, where did you travel from today?
- What mode of transport did you use?
- Why did you use this particular method of travel mode?

All Users

- Have you heard of car share? If this was readily available to you, would you use if you did not have a car parking is unavailable?
- If not, what are the barriers to you using car share to travel to and from site?
- What would make you consider using car share to access the site?
- Any suggestion/recommendations to encourage sustainable mode of transport etc;

Once the survey findings are available, methods to achieve specific targets can be identified with proposed time frames. This could include adopting strategies outlined in Section 11. These methods and targets are then available to be monitored (refer to Section 12).

7.3 Step 3 – Prepare the Green Travel Plan

Based on the data, an overall vision for the modal travel should be considered with clear objectives. The GTP should be prepared based on those objectives, notably:

- Build a precinct culture that supports active travel by motivating and encouraging the community to get involved
- Set specific SMART (Specific, Measurable, Achievable, Relevant, Timed) targets
- Develop an action plan that lists activities and strategies that eliminates the community's barriers to active travel to meet the objectives
- Estimate the budget required to meet the objectives, identify funding source and develop implementation strategies
- Review and consult with the community

7.4 Step 4 - Deliver & Implement

Once developed launch the GTP and carry out regular monitoring (every 12 months is recommended) as part of the implementation strategy. Travel mode data should be collected and reviewed each quarter.

7.5 Step 5 - Recognise Progress

The successes of the GTP should be celebrated regularly, for example at key community events. The plan should regularly be reviewed and include new ideas, targets and benchmarks.

7.6 Waterloo Metro Quarter Progress

A summary of the required actions and current progress of the GTP process is outlined in Table 2.

Actions Required	Progress
Step 1 – Set up an Advisory Committee	To be undertaken following completion of the WMQ Precinct
Step 2 – Data Collection & Review Existing Situation	To be undertaken following completion of the WMQ Precinct
Step 3 – Prepare the travel plan	✓
Step 4 - Deliver & Implement	To be undertaken following completion of the WMQ Precinct
Step 5 – Record Results / Recognise Process	Ongoing once the GTP is in place

Table 2 - Summary of Required Actions and GTP Progress

8. Existing Transport Infrastructure

8.1 Public Transport

The WMQ Precinct has been assessed for its potential accessibility via modes of existing public transport likely to be utilised by prospective residents, employees and visitors of the proposed development. When defining accessibility, the NSW Guidelines to Walking & Cycling (2004) suggest that 400m-800m is a comfortable walking distance.

The existing bus stops and train/metro stations situated within the 400m and 800m walking catchments are illustrated in Figure 8.

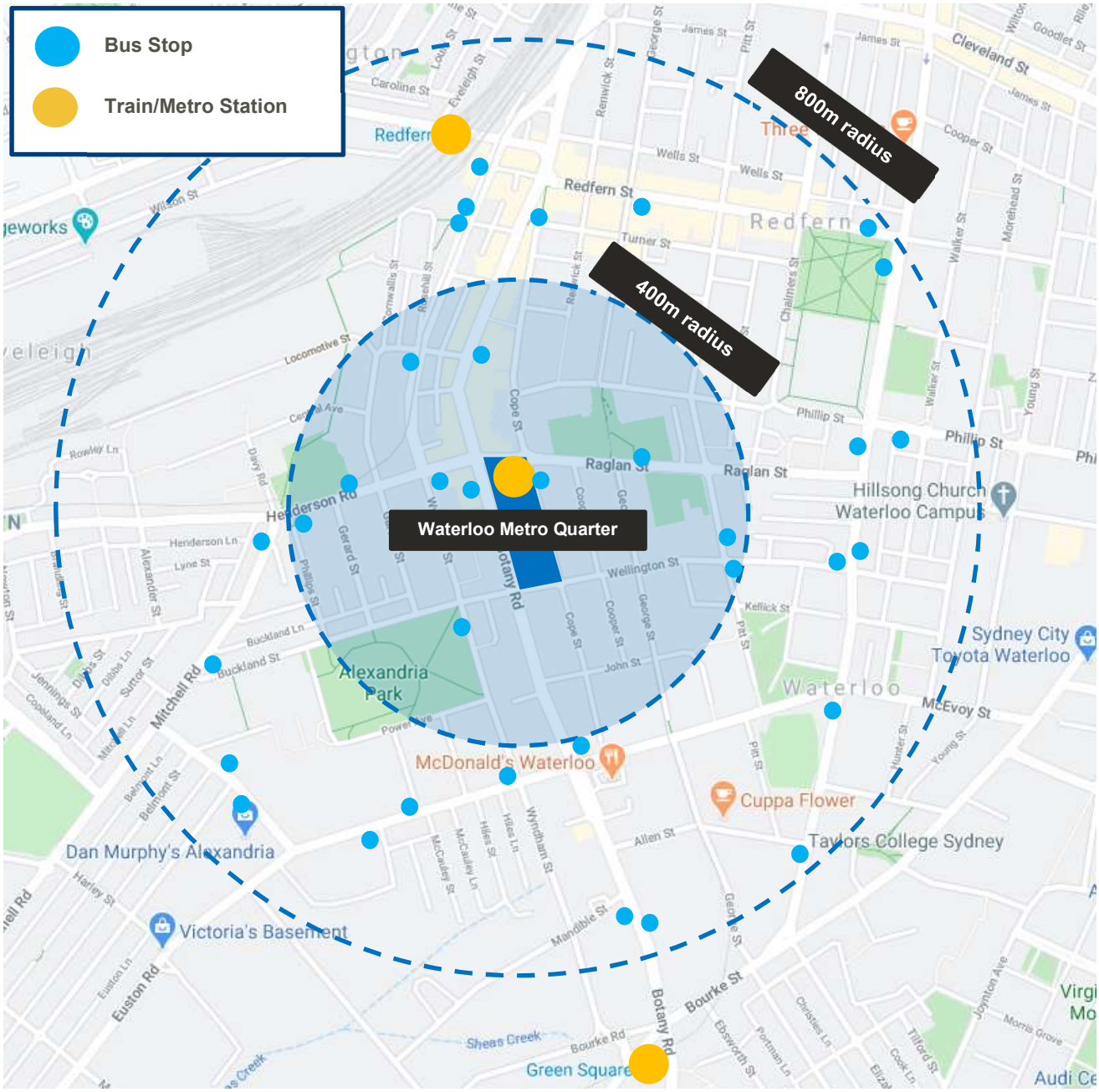


Figure 8 - Public Transport Accessibility

8.1.1 Metro

The NSW Government is implementing 'Future Transport Strategy 2056', a 40-year strategy to transform and modernise Sydney's transport network so that it can grow with the city's population and meet the needs of customers in the future (Transport for NSW, 2018). Sydney Metro is a new stand-alone rail network identified in Future Transport Strategy 2056.

Sydney Metro is Australia's biggest public transport project. As a new stand-alone railway, Sydney Metro will currently deliver 31 metro stations and more than 66 kilometres of new metro rail revolutionising the way Australia's biggest city travels. Sydney Metro Northwest services commenced in May 2019, and Sydney Metro City & Southwest is due to open in 2024. Sydney Metro West is currently being planned and is proposed to be delivered by the second half of the 2020s. Planning is also underway for a new metro line serving Greater Western Sydney, linking the Western Sydney International (Nancy Bird Walton) Airport and the Aerotropolis with the rest of the city.

Sydney Metro City & Southwest is an extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown.

The project also involves the delivery of six new metro stations including a new station at **Waterloo**, together with new underground platforms at Central Station. Once completed, Sydney Metro will have the ultimate capacity for a metro train every two minutes in each direction under the city, a level of service never seen before in Sydney.

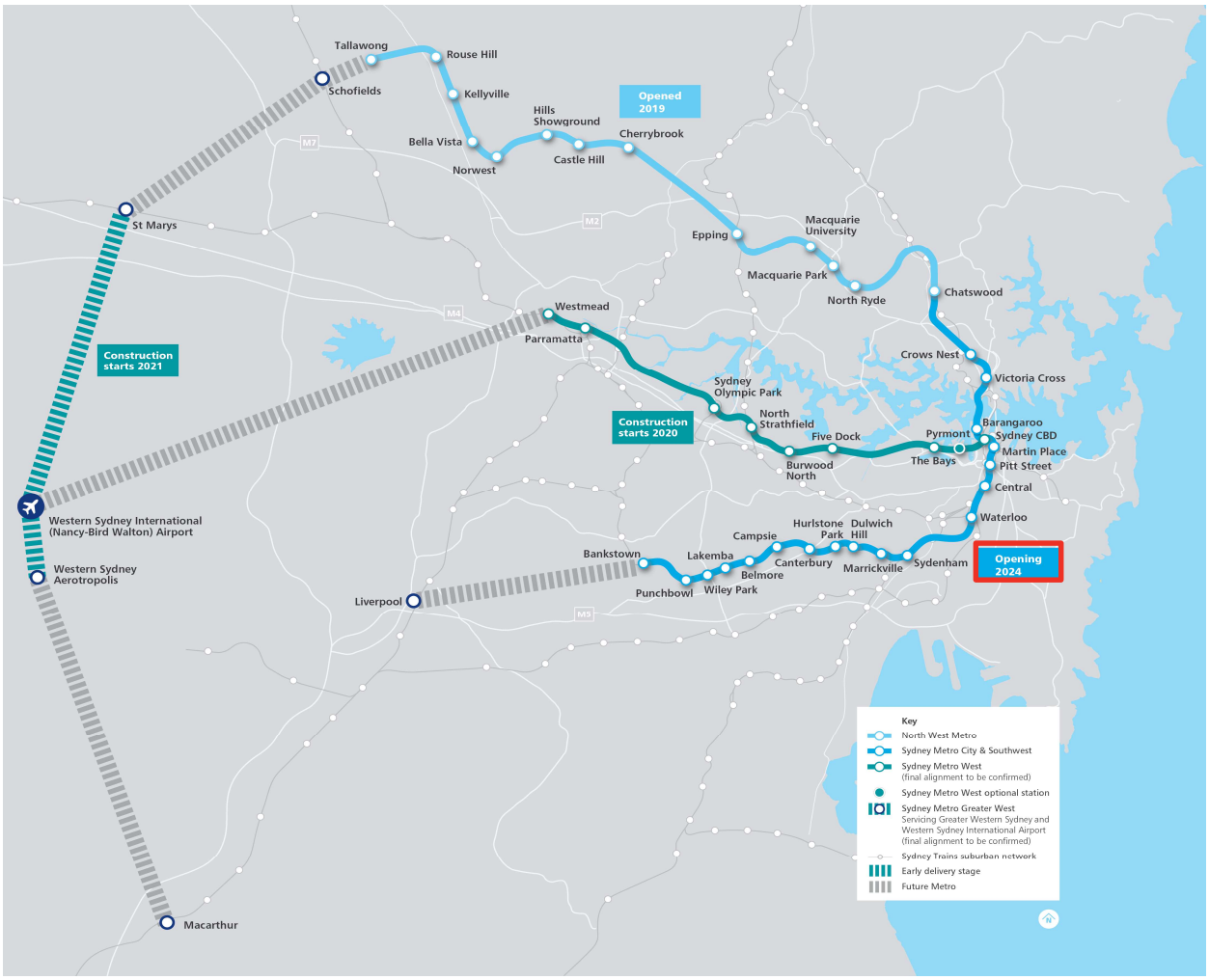


Figure 9 - Sydney Metro alignment map
Source: Sydney Metro

8.1.2 Trains

The development site is located less than 650 metres walking distance from Redfern Station, to the north and 900 meters from Green Square Station, to the south.

These stations operate the following services:

Line	Coverage
T1 – North Shore & Western Line	North Shore, Western and Richmond
T2 - Inner West & Leppington Line	City, Inner West and Leppington
T3 – Bankston Line	City, Liverpool and Lidcombe
T4 – Eastern Suburbs & Illawarra Line	Eastern Suburbs, Illawarra and Cronulla
T8 – Airport & South Line	City and South

Line	Coverage
T9 – Northern Line	Gordon and Northern

Redfern station is also served by regional lines including Blue Mountains line, Central Coast & Newcastle line and South Coast line.

8.1.3 Buses

A number of bus stops have been identified within walking distance of the development, as shown in Figure 10 and Figure 11.

The Routes servicing these stops are summarised in Table 3.

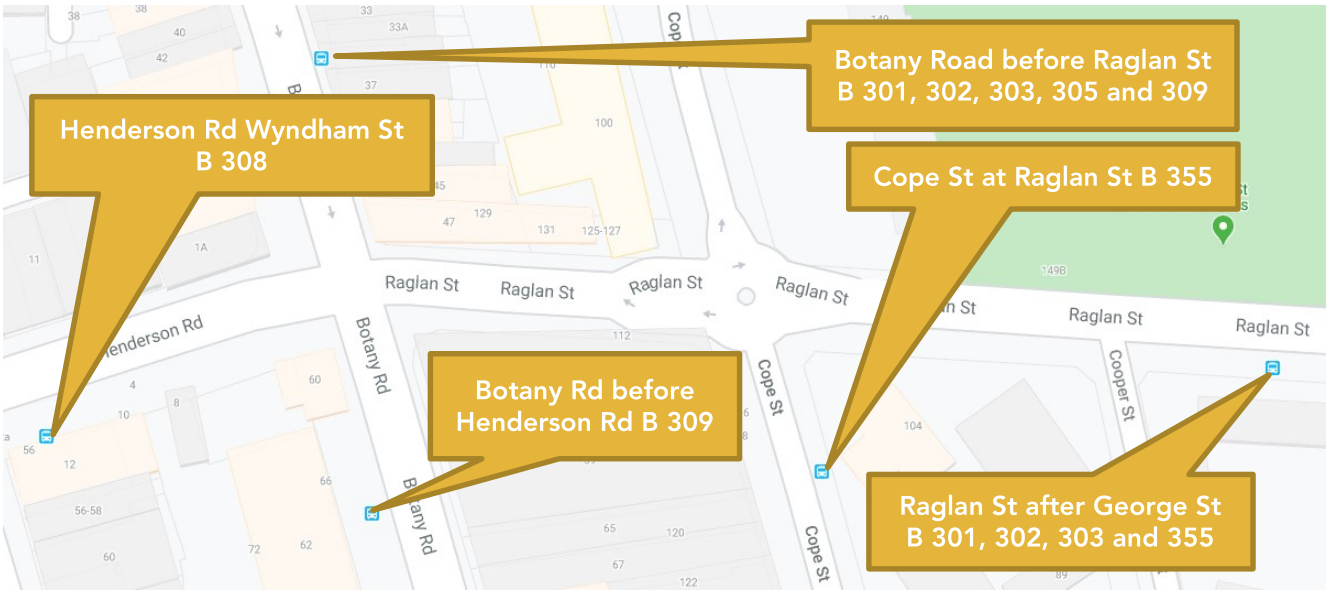


Figure 10 – Local Bus Stops

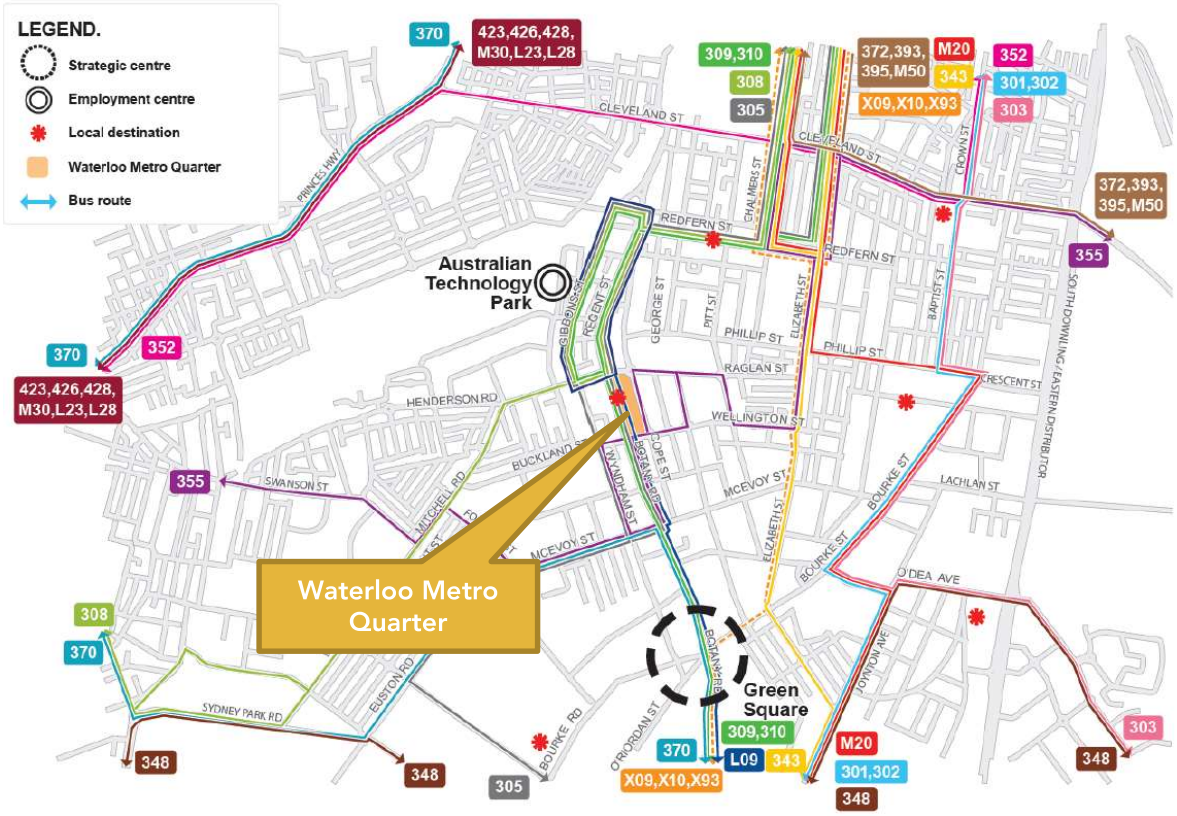


Figure 11 – Bus Network in the Vicinity of the Development

Bus Route	Coverage	Operation
301	City to Eastgardens	Operates all week. 10 minute peak headway, 20-30minute off-peak headway.
302	City to Eastgardens	Operates all week. 60 minute headway.
303	City to Sans Souci	Operates all week. 5-10 minute peak headway, 20-30minute off-peak headway.
305	Railway Square to Mascot	Weekday-only service with a 20 minute headway in the peak direction.
308	Marrickville Metro to Central Eddy Ave via Redfern (Loop Service)	Operates all week. 15 minute peak headways.
309	Railway Square to Port Botany	Operates all week. 10 minute peak headways.
355	Bondi Junction to Marrickville Metro	Operates all week. Typical 30 minute headway.

Table 3 – Bus Services Summary

In consideration of the number of existing public transport options, their combined coverage throughout the Sydney metropolitan region and medium to high frequency headways, the site is very well placed in the context of public transport, with the potential to significantly reduce car-mode travel.

8.2 Active Travel

The locality has also been reviewed for features that would attract active transport trips (walking and cycling). As indicated in Figure 8, the site is located within comfortable walking distance to Redfern Station and local centres comprising of supermarkets, health care, banks and small businesses. The following subsections outline the existing pedestrian and cycling infrastructure within the vicinity of the WMQ Precinct.

8.2.1 Pedestrian Infrastructure

There is generally a high level of pedestrian amenity within the vicinity of the WMQ Precinct. Footpaths and kerb ramps are present on both sides of surrounding streets and footpaths are generally wide.

Signalised pedestrian crossings are provided at the intersections of Botany Road/Raglan Street, Botany Road/Wellington Street immediately adjacent to the precinct. Signalised pedestrian crossings are also provided along Botany Road, Regent Street and along Gibbons Street which provides safe connection to access the Sydney Trains network.

Street lighting is typically provided on both sides of the surrounding streets which allows for safe travel at night time.

Some suggested pedestrian routes for access to public transport facilities within an 800m walking catchment is illustrated in Figure 12.

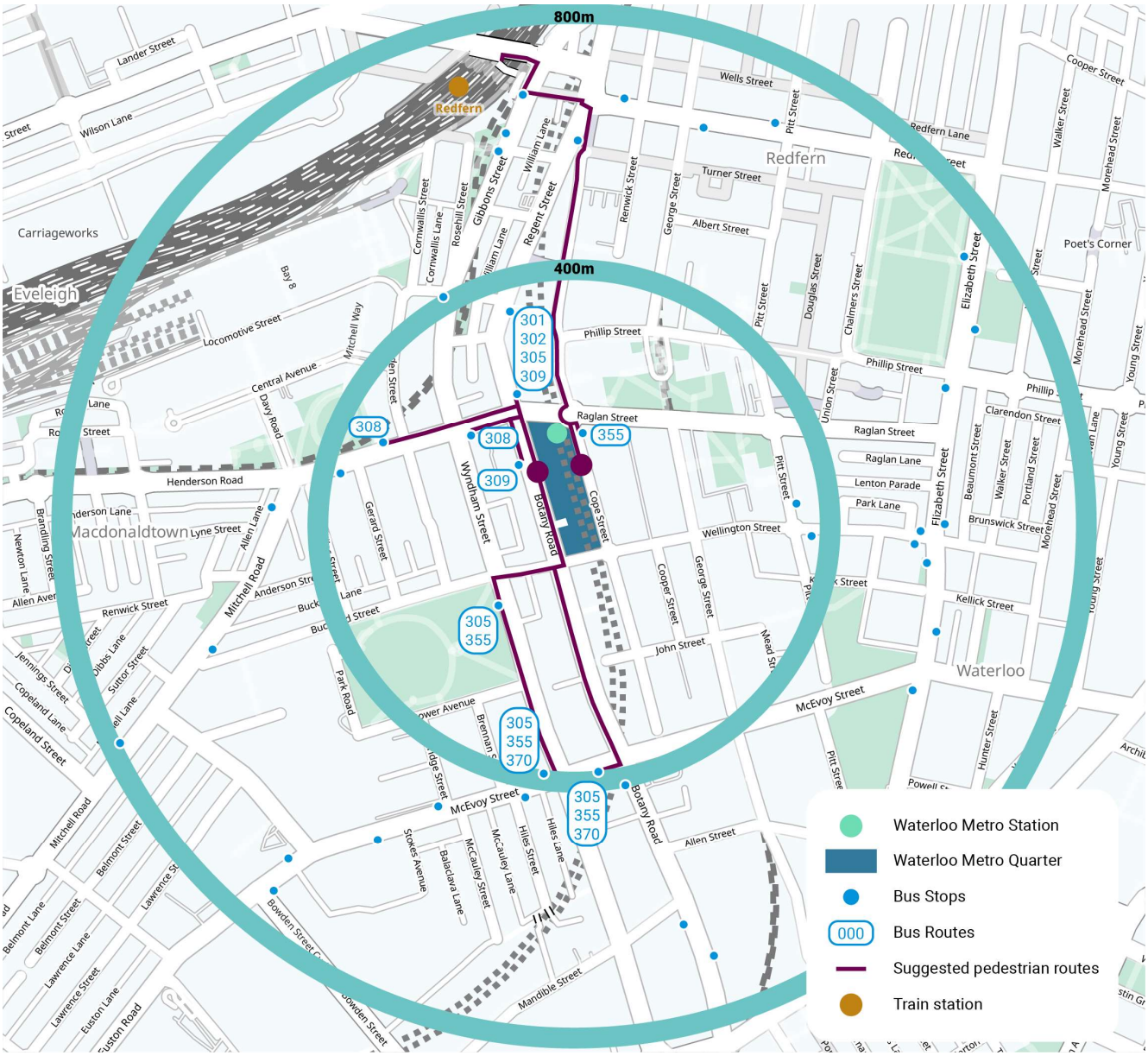


Figure 12 – Suggested Pedestrian Routes

8.2.2 Bicycle Network

The regional cycle network surrounding Waterloo is shown in Figure 19.

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: 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 13 – Existing and Planned Cycle Network

8.3 Car Share

The City of Sydney encourages car sharing as it is a sustainable transport option for employees and residents. Car share allows for efficient use of available parking spaces, allowing a single vehicle to be used by a larger number of people. Car share offers numerous community and health benefits including:

- Encourage use of alternative transport options to private vehicle usage (which are typically single occupancy trips for commuters)
- Reduced private vehicle ownership
- Reduced dependence on fossil fuels and lower greenhouse gas emissions
- Provides affordable access to a vehicle for the local community

The development proposes to provide one residential car share bay located within the shared basement car park for shared use amongst residents within Building 3. Furthermore, there are a large number of car share pods situated within 800m walking distance from the WMQ precinct as shown in Figure 14.

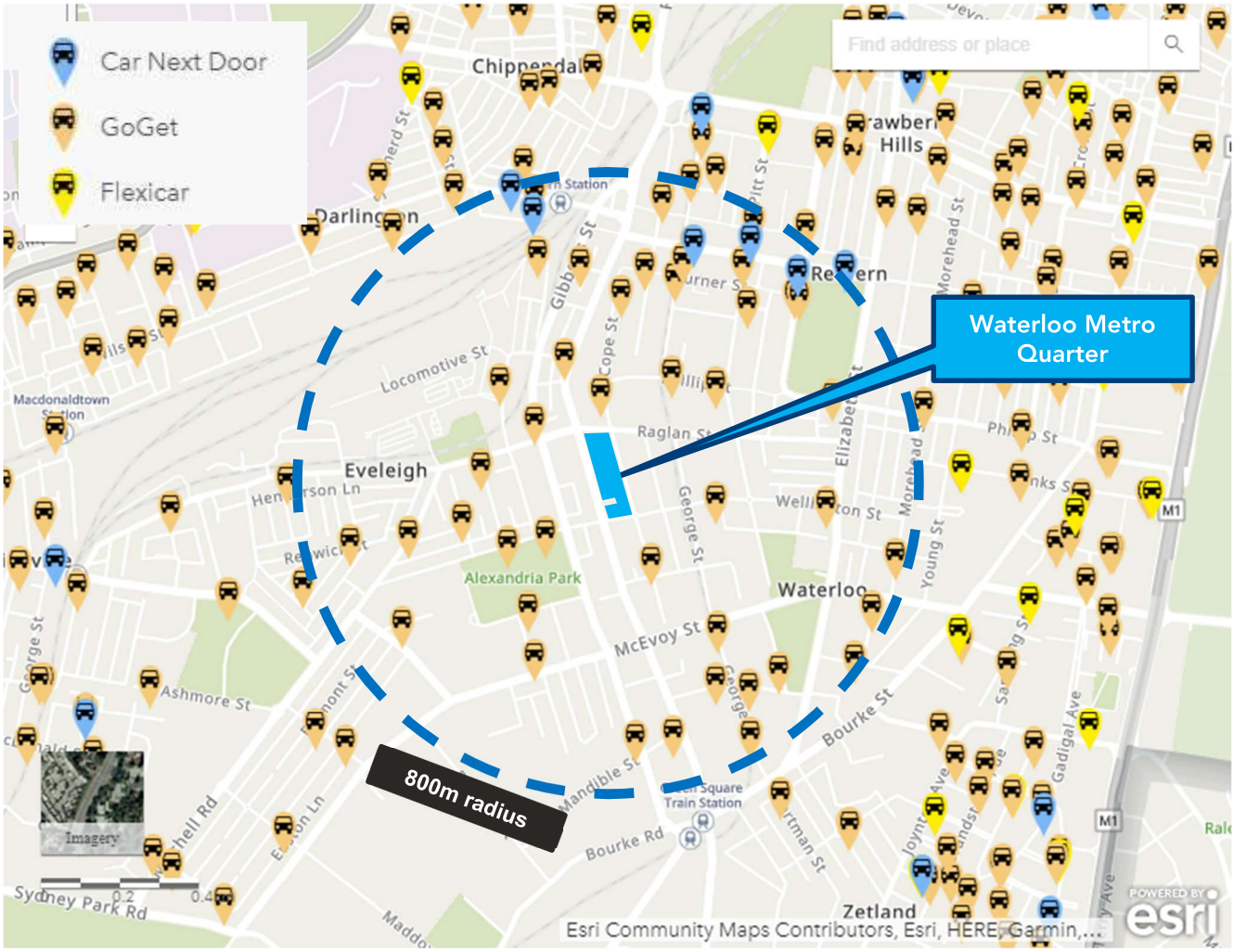


Figure 14 - Car Share Pods situated within 800m walking catchment from the WMQ Precinct (Source: City of Sydney)

8.4 Proposed Public Transport Upgrades

In addition to the development of the Waterloo Metro Station, as outlined in Section 4.2.2, as part of the development of the nearby Green Square Town Centre (GSTC), the Green Square Urban Renewal Area (GSURA) Transport Management & Accessibility Plan (TMAP Volume 2, 2008) identifies a number of measures intended to increase public transport usage as part of the vision to achieve a "no car growth" scenario over the next 25 years. It is acknowledged that a draft TMAP was been produced in 2012, and is yet to be publicly released, however, it is assumed that the following major upgrades are still relevant:

- Action plans to progress the goal of establishing/improving a number of transit corridors, including the Botany Road Transit Corridor and the new Eastern Transit corridor, with the intention of establishing the "Green Loop" to connect Green Square with Redfern Station, Central Station and Surry Hills through high frequency services via dedicated buses (short term), which are to be eventually replaced by a new light rail service (see Figure 18);
- Upgrades to Green Square Train Station capacity, to achieve 20 trains/hour/way during peak commuter hours. This will be largely controlled by the progress of the Sydney Metro project;
- Forecasting and implementation of additional bus services and route changes to manage population growth; and
- Fleet upgrades.

The TMAP has identified that in the context of the overall GSURA, the GSTC has the potential to instigate significant shifts towards non-car mode shares. This potential arises from low-density industrial and manufacturing employment areas being redeveloped into high-density commercial and retail precincts, providing greater opportunities for public transport.

It is understood that many of the upgrades identified within the TMAP (2008) have not yet been implemented, but that a Green Square Transport Working Group (chaired by CoS) and Green Square Steering Committee (chaired by UrbanGrowth NSW) has been established to provide cross-agency coordination in the planning and implementation of these upgrades.

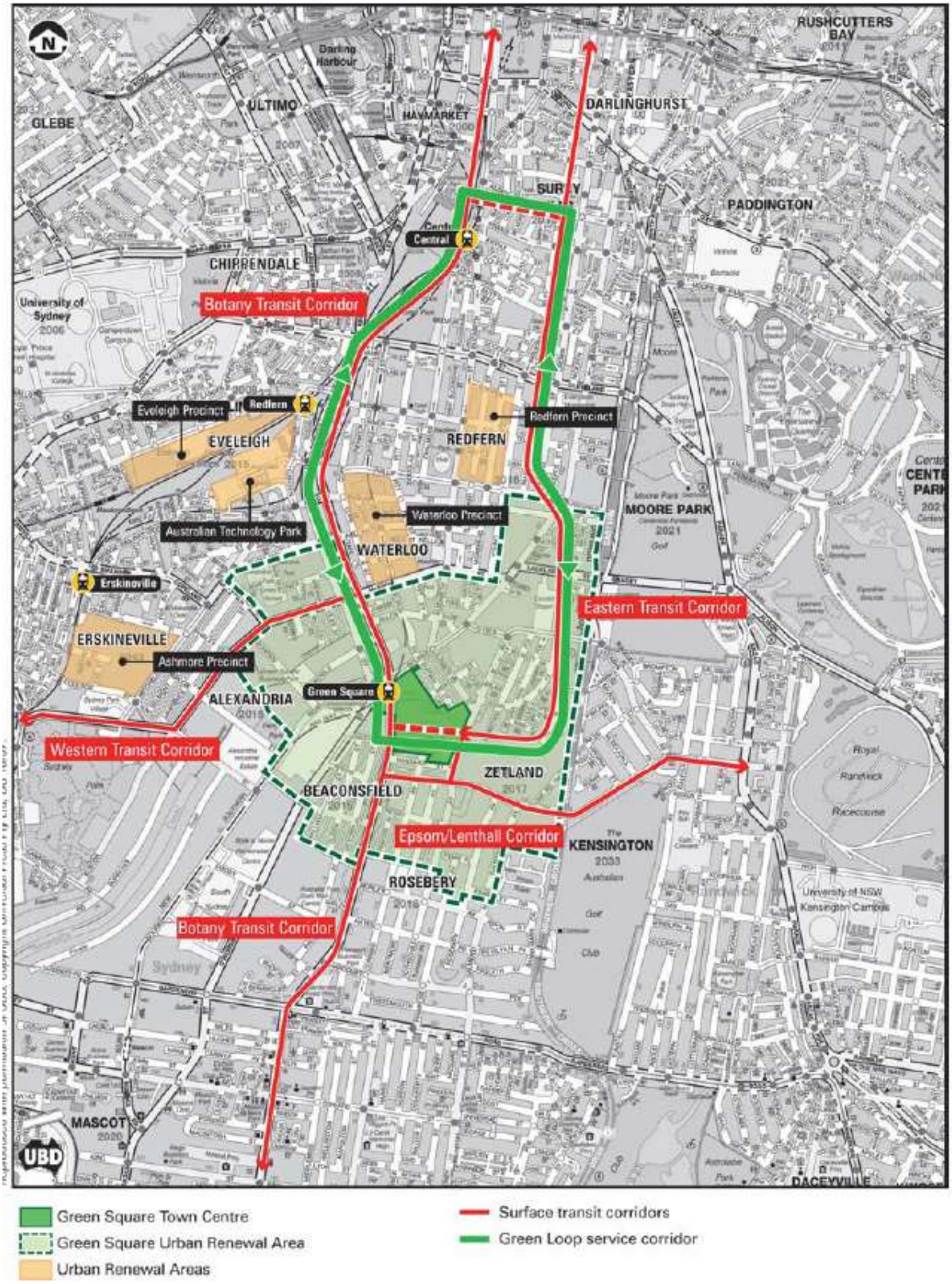


Figure 15 – Potential Transport Network

9. Existing Travel Behaviour

An assessment of the existing travel behaviour within the suburb of Waterloo has been undertaken in relation to the following:

- Travel to work, Waterloo as a place of work
- Travel to work, Waterloo as a place of residence

As this is a new development, there are currently no travel statistics available for the WMQ Precinct. In lieu of specific mode share statistical information for the precinct, data has been collected from the Australian Bureau of Statistics 2016 Census and is summarised in Table 4 and Table 5.

Travel to Work (Waterloo as a place of work) - 2016	
Mode of Travel	**Percentage (%)**
Train	17.18%
Bus	5.96%
Ferry	0.05%
Tram	0.02%
Car (as driver)	55.91%
Car (as passenger)	3.43%
Bicycle	1.51%
Walked only	5.53%
Other mode	0.42%
Worked at home	3.66%
Did not go to work	5.66%
Not stated	0.84%

Table 4 – Existing Travel behaviour – Travel to Work, Waterloo as a place of work

Based on the ABS travel mode statistics outlined in Table 4, the majority of staff who travel to Waterloo for work purposes travel by car (approximately 59%) and by train (which accounts for 17.2% of mode share). Active travel modes such as walking and cycling currently only form a small proportion of the travel mode share (approximately 7% walking and cycling combined); these transport modes can be better leveraged given the available pedestrian and cycling infrastructure within the locality.

Travel to Work (Waterloo as a place of residence) - 2016	
Mode of Travel	**Percentage (%)**
Train	19.59%
Bus	20.92%
Ferry	0%
Tram	0.06%
Car (as driver)	32.40%
Car (as passenger)	3.63%
Bicycle	3.49%
Walked only	8.38%
Other mode	0.63%
Worked at home	3.36%
Did not go to work	6.74%
Not stated	0.80%

Table 5 – Existing Travel behaviour – Travel to Work, Waterloo as a place of residence

For residents living in Waterloo, the majority of residents travel to work by car (36%) and by public transport (accounting for approximately 40.5% of mode share). On the other hand, walking and cycling comprised 11.9% of mode share, which indicates that active travel modes are not currently highly utilised.

10. Proposed Action Items

In developing the GTP, it may not be possible to implement all action items at the same time, therefore a stage implementation should be considered. There may be some crucial actions that can be implemented immediately, while others might take longer to plan and develop.

Before implementing any actions, relevant stakeholders must be consulted to approve the changes.

The following travel mode hierarchy is proposed for this GTP:

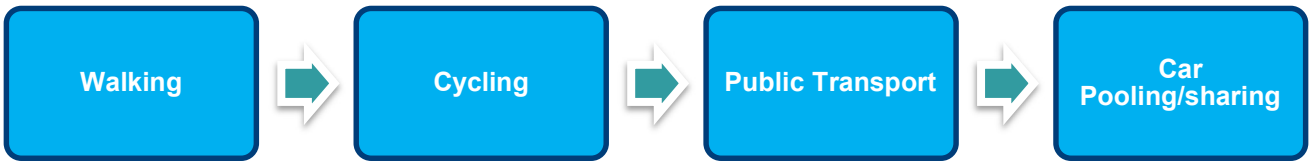


Figure 16 - Mode Hierarchy

There are a number of actions which can be employed to encourage non-car modes of transport to and from the WMQ Precinct. The following sections outline potential strategies that can be adopted in achieving future transport targets.

10.1 Walking

As stated in Section 8.2.1, the existing pedestrian connectivity is generally good in all directions. The following tasks are recommended to increase walk trips to/from the site:

- Employees living within 1km of the site could be targeted to walk to the site;
- Residents could be encouraged to utilise the numerous public transport options available through promotional material to raise awareness of these transport options;
- A working partnership could be established with City of Sydney to determine whether there are opportunities to improve the pedestrian connectivity to the site;
- Staff could be encouraged to implement the '10,000 steps per day initiative', whereby, employees are provided with trackers that measure the step number they have walked. Staff members who have achieved the 10,000 steps goal over 80% days of a month could be awarded with free/ discounted gym membership; and
- Staff could be encouraged to celebrate 'Walk to Work' day on an annual basis.

Walking is also the most space efficient mode of transport for short trips and presents the highest benefits. Co-benefits where walking replaces a motorised trip include improved health for the individual, reduced congestion on the road network and reduced noise and emission pollution. A review of the existing pedestrian infrastructure has found that the footpath networks and crossing points between the adjoining precincts are generally adequate.

10.2 Cycling

To improve the future bike usage by residents as well as retail staff, the development will include:

- Residential occupants (Building 3) use:
  - 87 residential bicycle parking spaces;
- Retail (shared with Northern and Central Precincts, located in basement car park) use:
  - 11 bicycle spaces;
  - 11 lockers; and
  - 3 showers (inclusive of 1 accessible shower).
- Retail visitors (shared with Northern, Central and Southern Precincts) use:
  - 32 bicycle parking spaces.

Bicycle parking provisions and end of trip facilities for the retail staff (gym and maker spaces) are located in the basement of the central precinct.

Figure 17 – Example of an End of Trip Facility

10.3 Public Transport

The subject site is well connected by public transport within a comfortable walking distance. To increase the public transport uptake by residents, employees and visitors, the following measures could be considered:

- Create a map identifying the location of bus stops and routes and make this available to all users;
- Improved wayfinding signage between the site and nearby public transport interchanges could be discussed with City of Sydney; and
- Promote the use of apps for public transport connectivity.

As aforementioned in Section 8.1.1, Waterloo Metro Station will be located within the WMQ Precinct and is anticipated to be operational by 2024. This will be a convenient form of transportation for

residents, employees and visitors as it will provide connection to the Sydney CBD and the wider Sydney Region.

10.4 Carpooling

A carpooling forum could be developed to encourage employees to travel in groups. This type of forum would provide a platform for employees travelling on the same route to the precinct, to form groups and travel together. Existence of the forum could be provided through brochures, noticeboards and social media which is an effective publishing tool in modern days.

11. Strategies

11.1 Transport Access Guide (TAG)

To encourage residents, employees and visitors to adopt alternative sustainable transport options, a Transport Access Guide (TAG) should be developed to summarise available transport options identified. A TAG is a concise presentation of how to reach the site using low-energy, sustainable and active forms of transport.

The aim of a TAG is to make sure people know how to get to the subject development by walking, cycling or public transport (as well as by car).

A TAG can take many forms, such as a map printed on the back of business cards or invitations to more comprehensive information provided to prospective employees as part of their induction kit. TAGs may be incorporated into stationery, brochures and sales literature and provided electronically on the web site and in emails. An electronic version can be kept on a computer and produced as needed. Reception and enquiry staff should be familiar with the content so they can advise callers about easy transport alternatives to car travel.

TAGs should be included in Green Travel Plans and should comply with RMS guidelines. A TAG has been prepared for the WMQ Precinct and is included in Annexure 1 – Transport Access Guide (TAG).

11.2 Promotion and Marketing Strategy

Once the plan has been adopted, it is essential to maintain interest in the scheme. Each new initiative in the plan will need to be publicised with effective marketing. Actions are the core of a GTP, therefore, the GTP needs to have a variety of actions that guide strategies relating to promotion, facilities and policies to create incentives for sustainable travel behaviour. If actions are to be staged, a staging strategy should be outlined in the plan.

Strategic promotion of travel plans and associated initiatives tend to result in higher uptake of sustainable travel modes. It is imperative to ensure that all users are aware of the initiatives. From time to time, assistance should be sought from the City of Sydney, Bicycle NSW, Pedestrian Council Australia, TfNSW and other stakeholders.

Another way to promote non-vehicle mode of transport is to print a map on the back of business cards or brochures. Best practice suggests that the information should be as concise, simple and site specific as possible. If instructions are too complex, residents, staff members and visitors are likely to ignore them.

12. Monitoring and Evaluation

A travel plan should not simply be a list of actions. Monitoring and reviewing a travel plan are one of the most critical components of the travel planning process. It is crucial to understand whether and how the travel plan is having an impact on the mode share. An annual review of the GTP is recommended to identify how mode share has changed over time. This will assist in understanding whether progress is being made.

The monitoring strategy should ensure that the GTP is achieving the desired benefits. As stated in Section 7.2, it is essential to undertake the initial data collection of the existing mode share to establish targets and overall goal. Surveys will help to identify which actions are having an impact on occupant's travel behaviour and whether some are more effective than others. It may also help to identify ongoing or unresolved issues and barriers that are preventing greater improvement.

The overall success of the GTP will depend on good communication. It will be necessary to explain the reason for adopting the plan, promote benefits and provide information about alternatives to driving. It will also be necessary to provide feedback to employees and tenants to ensure that they can see the benefits of sustainable transport.

Once data are updated, the targets and actions of the travel plan will need to be reviewed. The review should consider:

- Are the targets still realistic? Are they still ambitious? Should they be updated?
- Are residents or employees struggling to achieve particular targets? What are the likely reasons for this?
- Are there any gaps with regards to actions?
- What is preventing further improvement on mode share and how can this be addressed?

The steps outlined above should not be considered as a linear process, rather be an ongoing cycle. Travel planning requires regular review and adjustment which may reveal the need to reconsider objectives or targets or to add new actions to create greater incentives for the uptake of sustainable transport choices.

13. Annexure

13.1 Annexure 1 – Transport Access Guide (TAG)

The Waterloo Metro station is part of Sydney Metro City & Southwest which is an extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown.

The Waterloo Metro Quarter is located within a 10min walk from Redfern Station and a 15min walk from Green Square Station.

Lines and Coverage

T1 North Shore & Western Line - North Shore, Western and Richmond

T2 Inner West & Leppington Line - City, Inner West and Leppington

T3 Bankstown Line - City, Liverpool and Lidcombe

T4 Eastern Suburbs & Illawarra Line - Eastern Suburbs, Illawarra and Cronulla

T8 Airport & South Line - City and South

T9 Northern Line - Gordon and Northern

Metro Line - expected to commence operation in 2024

The following bus routes are accessible from bus stops within 800m of the Waterloo Metro Quarter:

Route	Coverage and Operation
301	City to Eastgardens 10min peak headway
302	City to Eastgardens 60min headway
303	City to Sans Souci 5-10min peak headway
305	Railway Square to Mascot Weekday-only service, 20min peak headway
308	Marrickville Metro to Central Eddy Ave via Redfern 15min peak headway
309	Railway Square to Port Botany 10min peak headways
355	Bondi Junction to Marrickville Metro Typical 30min headway

Transport Access Guide

Waterloo Metro Quarter

Residents, staff and visitors are encouraged to use public and active transport when travelling to and from the Waterloo Metro Quarter.

Plan your journey by accessing transport.info, downloading the Opal app for smartphones or calling 131500 for Transport for NSW up-to-date timetables and maps.

There is excellent pedestrian infrastructure around the Waterloo Metro Quarter with public transport, supermarkets and shops located within a short walk.

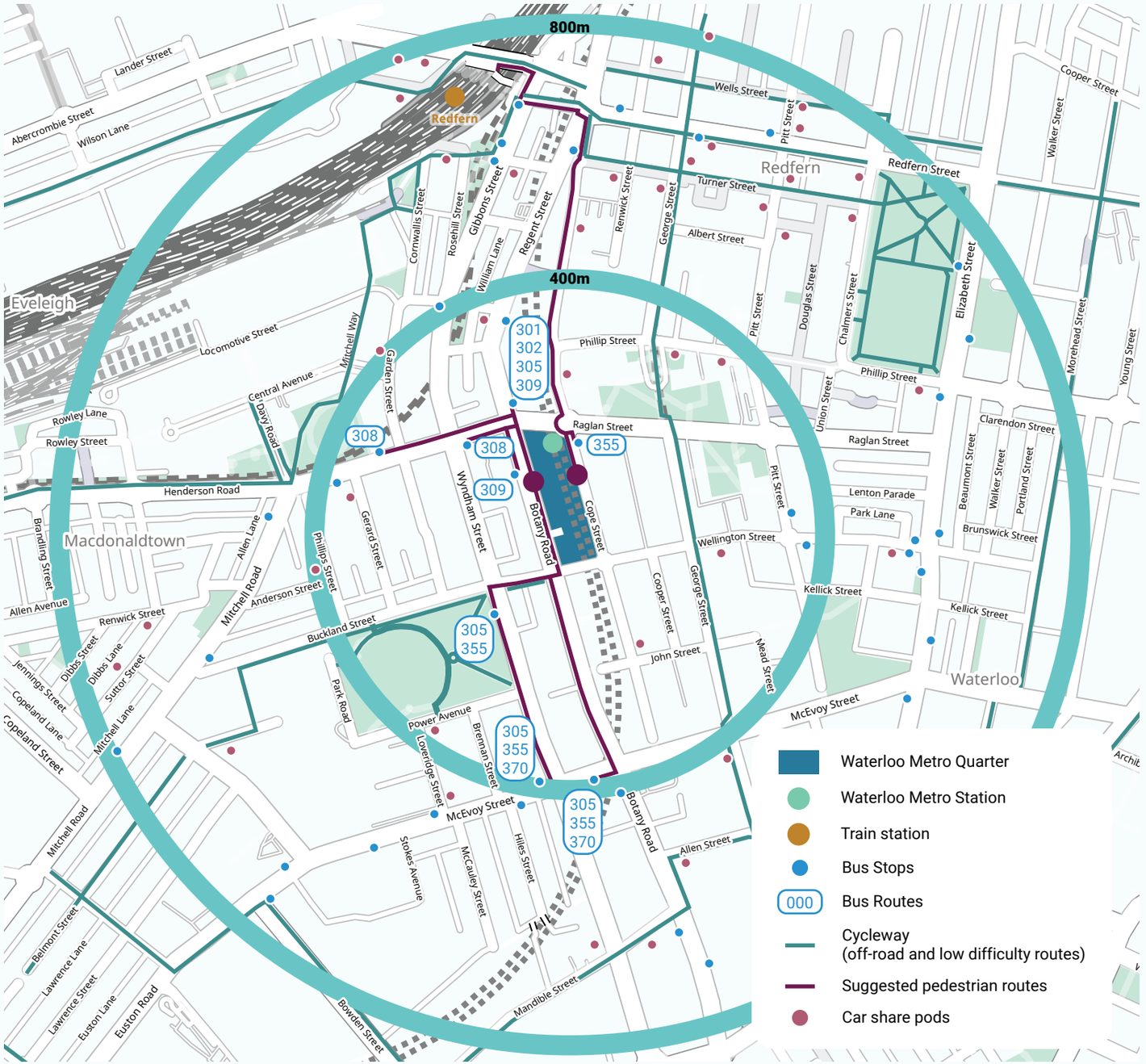
The cycle network surrounding Waterloo currently provides access to a range of key destinations including the University of Sydney, Redfern Station, Sydney CBD, Newtown and Moore Park.

In the vicinity of Waterloo Metro Quarter cyclists can navigate through off-road and low difficulty routes.

Bicycle parking and end-of-trip facilities are available within the various precincts for occupants, residents and visitors.

Waterloo Metro Quarter offers four car share bays located within the shared basement car park for shared use by occupants and residents.

Moreover, there are numerous car share pods from different service providers (such as GoGet, Flexicar and Car Next Door) within 800m of the Waterloo Metro Quarter.



16.5 Appendix 5 - Green Travel Plan (Building 4)

WATERLOO METRO QUARTER OVER STATION DEVELOPMENT

Environmental Impact Statement
Appendix I – Transport, Traffic and Parking Assessment
Appendix 5 – Green Travel Plan

SSD-10437 Southern Precinct
Building 4

Detailed State Significant Development
Development Application

Prepared for **Waterloo Developer Pty Ltd**

[30 September] 2020

Reference	Description
Applicable SSD Applications	SSD-10437 Southern Precinct
Author	**ptc.** Steve Wellman
Reviewed	Waterloo Developer Pty Ltd Perry Milledge Simon Joseph
Document Number	WMQ-BLD4-PTC-TF-RPT-001
Status	Final
Version	4
Date of Issue	10 August 2020

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1. Glossary and abbreviations

Reference	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ADG	Apartment Design Guide
AHD	Australian height datum
AQIA	Air Quality Impact Assessment
BC Act	Biodiversity Conservation Act 2016
BCA	Building Code of Australia
BC Reg	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
CEEC	critically endangered ecological community
CIV	capital investment value
CMP	Construction Management Plan
Concept DA	A concept DA is a staged application often referred to as a 'Stage 1' DA. The subject application constitutes a detailed subsequent stage application to an approved concept DA (SSD 9393) lodged under section 4.22 of the EP&A Act.
Council	City of Sydney Council
CPTED	Crime Prevention Through Environmental Design
CSSI approval	critical State significant infrastructure approval
CTMP	Construction Traffic Management Plan
DA	development application
DPIE	NSW Department of Planning, Industry and Environment
DRP	Design Review Panel
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPA Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ESD	ecologically sustainable design

Reference	Description
GANSW	NSW Government Architect's Office
GFA	gross floor area
HIA	Heritage Impact Assessment
IAP	Interchange Access Plan
LGA	Local Government Area
NCC	National Construction Code
OSD	over station development
PIR	Preferred Infrastructure Report
POM	Plan of Management
PSI	Preliminary Site Investigation
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SEPP 65	State Environmental Planning Policy No. 65 – Design Quality of Residential Apartment Development
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2009
SREP Sydney Harbour	State Regional Environmental Plan (Sydney Harbour Catchment) 2005
SSD	State significant development
SSD DA	State significant development application
SLEP	Sydney Local Environmental Plan 2012
Transport for NSW	Transport for New South Wales
TIA	Traffic Impact Assessment
The proposal	The proposed development which is the subject of the detailed SSD DA
The site	The site which is the subject of the detailed SSD DA
VIA	Visual Impact Assessment

Reference	Description
WMQ	Waterloo Metro Quarter
WMP	Waste Management Plan
WSUD	water sensitive urban design

2. Introduction

This report has been prepared to accompany a detailed State significant development (SSD) development application (DA) for the Southern Precinct over station development (OSD) at the Waterloo Metro Quarter site. The detailed SSD DA is consistent with the concept approval (SSD 9393) granted for the maximum building envelope on the site, as proposed to be modified.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (DPIE) for assessment.

The detailed SSD DA seeks development consent for the design, construction and operation of:

- 8–9-storey residential building (Building 4) above the southern station box to accommodate 70 social housing dwellings
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 8 April 2020 and issued for the detailed SSD DA. Specifically, this report has been prepared to respond to the SEARs requirements summarised below.

Item	Description of requirement	Section reference (this report)
9	**Traffic, Parking and Access (Construction and Operation)** The EIS shall include a traffic, parking and access assessment that provides, but is not limited to, the following:	
	Justification for the car parking provision with measures to encourage users of the development to make sustainable travel choices, including a **green travel plan**, walking, cycling, public transport and car sharing, adequate provision of bicycle parking and end of trip facilities and the minimisation of private car trips.	Green Travel Plan addressed in this report

Table 1 - SEARs requirements SSD 10437)

3. The site

The site is located within the City of Sydney Local Government Area (LGA). The site is situated about 3.3 kilometres south of Sydney CBD and eight kilometres northeast of Sydney International Airport within the suburb of Waterloo.

The Waterloo Metro Quarter site comprises land to the west of Cope Street, east of Botany Road, south of Raglan Street and north of Wellington Street (refer to Figure 1). The heritage-listed Waterloo Congregational Church at 103–105 Botany Road is within this street block but does not form a part of the Waterloo Metro Quarter site boundaries.

The Waterloo Metro Quarter site is a rectangular shaped allotment with an overall site area of approximately 1.287 hectares.

The Waterloo Metro Quarter site comprises the following allotments and legal description at the date of this report. Following consolidation by Sydney Metro (the Principal) the land will be set out in deposited plan DP1257150.

- 1368 Raglan Street (Lot 4 DP 215751)
- 59 Botany Road (Lot 5 DP 215751)
- 65 Botany Road (Lot 1 DP 814205)
- 67 Botany Road (Lot 1 DP 228641)
- 124-128 Cope Street (Lot 2 DP 228641)
- 69-83 Botany Road (Lot 1, DP 1084919)
- 130-134 Cope Street (Lot 12 DP 399757)
- 136-144 Cope Street (Lots A-E DP 108312)
- 85 Botany Road (Lot 1 DP 27454)
- 87 Botany Road (Lot 2 DP 27454)
- 89-91 Botany Road (Lot 1 DP 996765)
- 93-101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)
- 156-160 Cope Street (Lot 31 DP 805384)
- 107-117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 170-174 Cope Street (Lot 2 DP 205942).

The detailed SSD DA applies to the Southern Precinct (the site) of the Waterloo Metro Quarter site. The site has an area of approximately 4830sqm. The subject site comprises the following allotments and legal description at the date of this report.

- 130–134 Cope Street (Lot 12 DP 399757) (Part)
- 136–144 Cope Street (Lots A-E DP 108312) (Part)
- 93–101 Botany Road (Lot 1 DP 433969 and Lot 1 DP 738891) (Part)
- 156–160 Cope Street (Lot 31 DP 805384)
- 107–117A Botany Road (Lot 32 DP 805384 and Lot A DP 408116)
- 119 Botany Road (Lot 1 DP 205942 and Lot 1 DP 436831)

170–174 Cope Street (Lot 2 DP 205942).

The boundaries of the overall site are identified at Figure 1, and the subject site of the detailed SSD DA is identified at Figures 2 and 3. The site is reasonably flat with a slight fall to the south.

The site previously included three to five storey commercial, light industrial and shop top housing buildings. All previous structures except for an office building at the corner of Botany Road and Wellington Street have been demolished to facilitate construction of the new Sydney Metro Waterloo station. As such the existing site is predominately vacant and being used as a construction site. Construction of the Sydney metro is currently underway on site in accordance with critical State significant infrastructure approval (CSSI 7400).

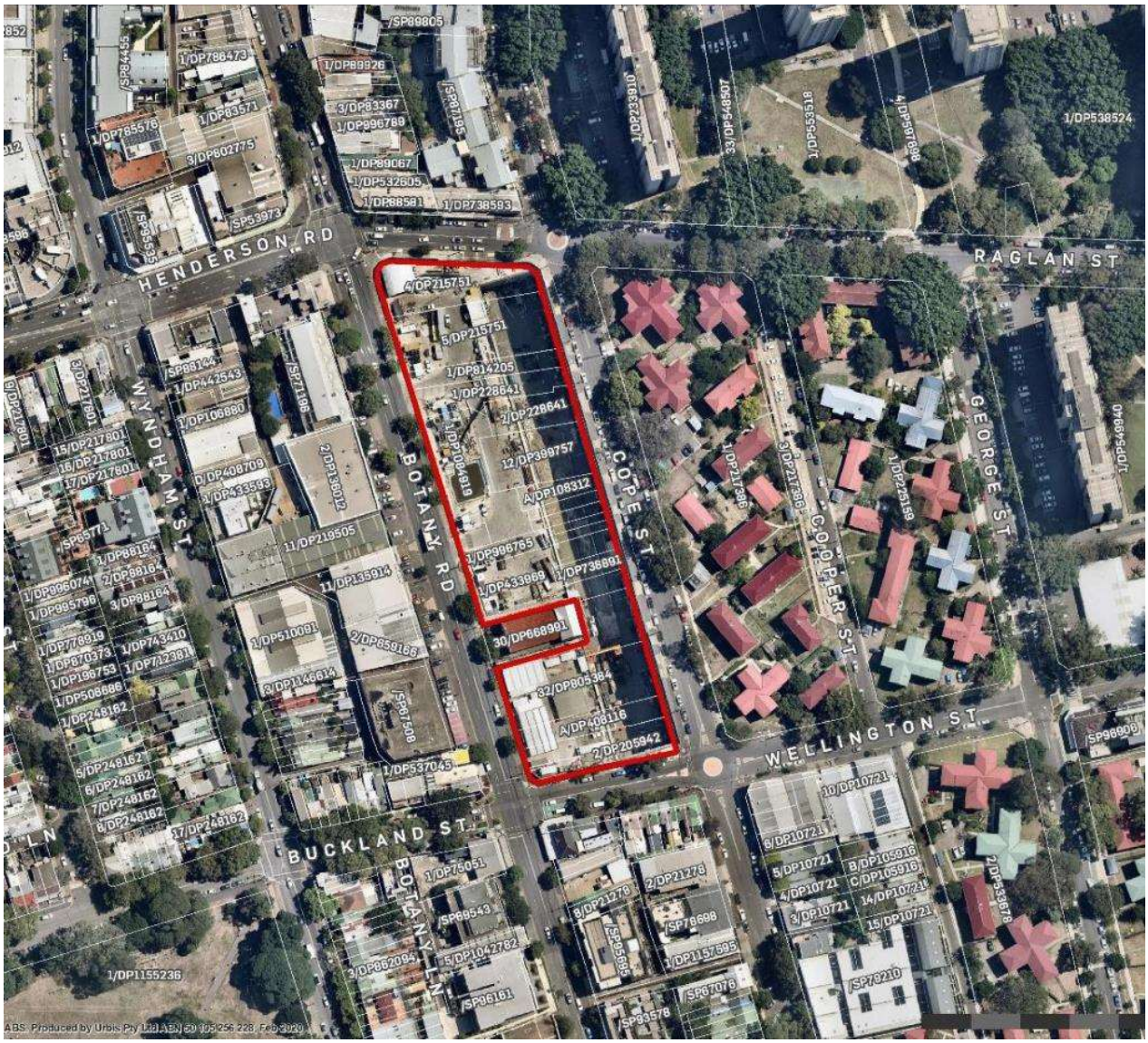


Figure 1 - Aerial image of the site
Source: Urbis

The area surrounding the site consists of commercial premises to the north, light industrial and mixed-use development to the south, residential development to the east and predominantly commercial and light industry uses to the west.

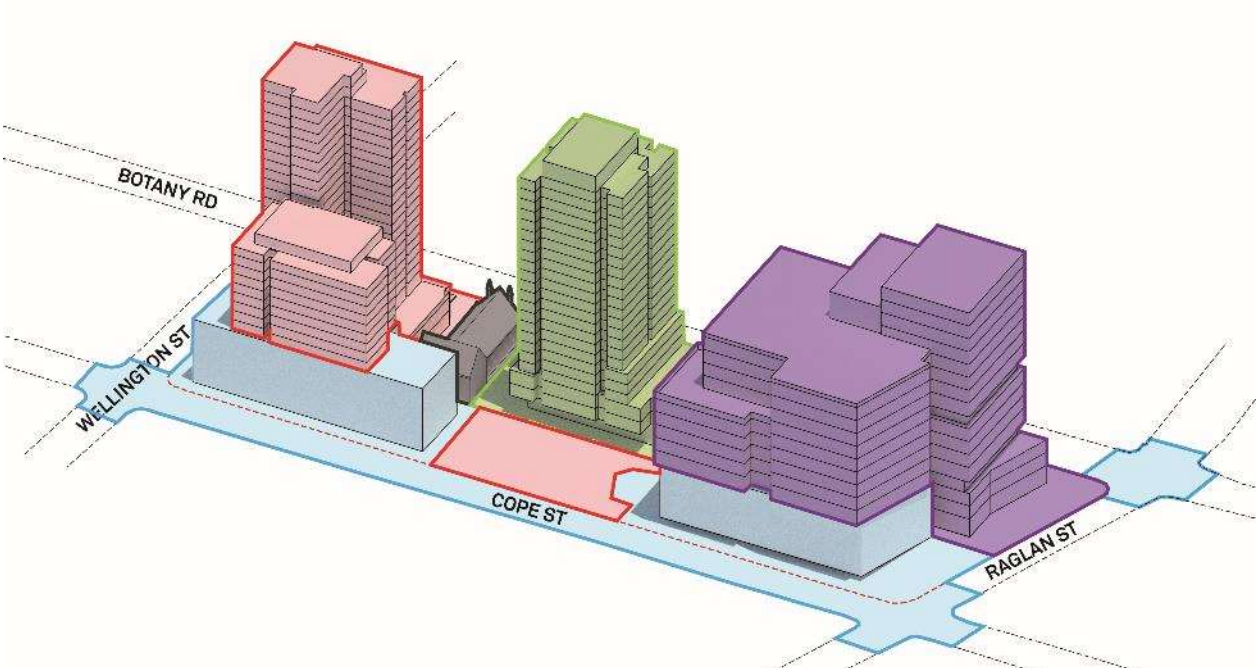


Figure 2 - Waterloo Metro Quarter site, with sub-precincts identified
Source: HASSELL

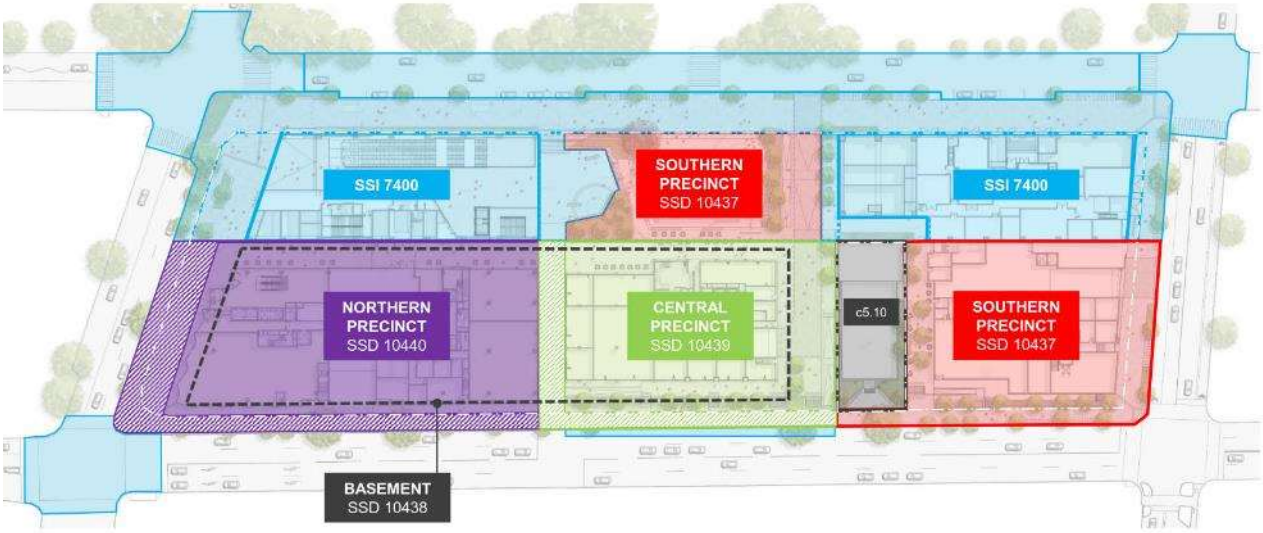


Figure 3 - Waterloo Metro Quarter site, with sub-precincts identified
Source: Waterloo Developer Pty Ltd

4. Background

4.1 About Sydney Metro

Sydney Metro is Australia's biggest public transport project. Services started in May 2019 in the city's North West with a train every four minutes in the peak. A new standalone railway, this 21st century network will revolutionise the way Sydney travels.

There are four core components:

4.1.1 Sydney Metro Northwest

This project is now complete and passenger services commenced in May 2019 between Rouse Hill and Chatswood, with a metro train every four minutes in the peak. The project was delivered on time and $1 billion under budget.

4.1.2 Sydney Metro City & Southwest

Sydney Metro City & Southwest project includes a new 30km metro line extending metro rail from the end of Metro Northwest at Chatswood, under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.

Sydney Metro City & Southwest will deliver new metro stations at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new underground metro platforms at Central Station. In addition, it will upgrade and convert all 11 stations between Sydenham and Bankstown to metro standards.

4.1.3 Sydney Metro West

Sydney Metro West is a new underground railway connecting Greater Parramatta and the Sydney CBD. This once-in-a-century infrastructure investment will transform Sydney for generations to come, doubling rail capacity between these two areas, linking new communities to rail services and supporting employment growth and housing supply between the two CBDs.

The locations of seven proposed metro stations have been confirmed at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays.

The NSW Government is assessing an optional station at Pyrmont and further planning is underway to determine the location of a new metro station in the Sydney CBD.

4.1.4 Sydney Metro Greater West

Metro rail will also service Greater Western Sydney and the new Western Sydney International (Nancy Bird Walton) Airport. The new railway line will become the transport spine for the Western Parkland City's growth for generations to come, connecting communities and travellers with the rest of Sydney's public transport system with a fast, safe and easy metro service.

The Australian and NSW governments are equal partners in the delivery of this new railway.

The Sydney Metro project is illustrated below.

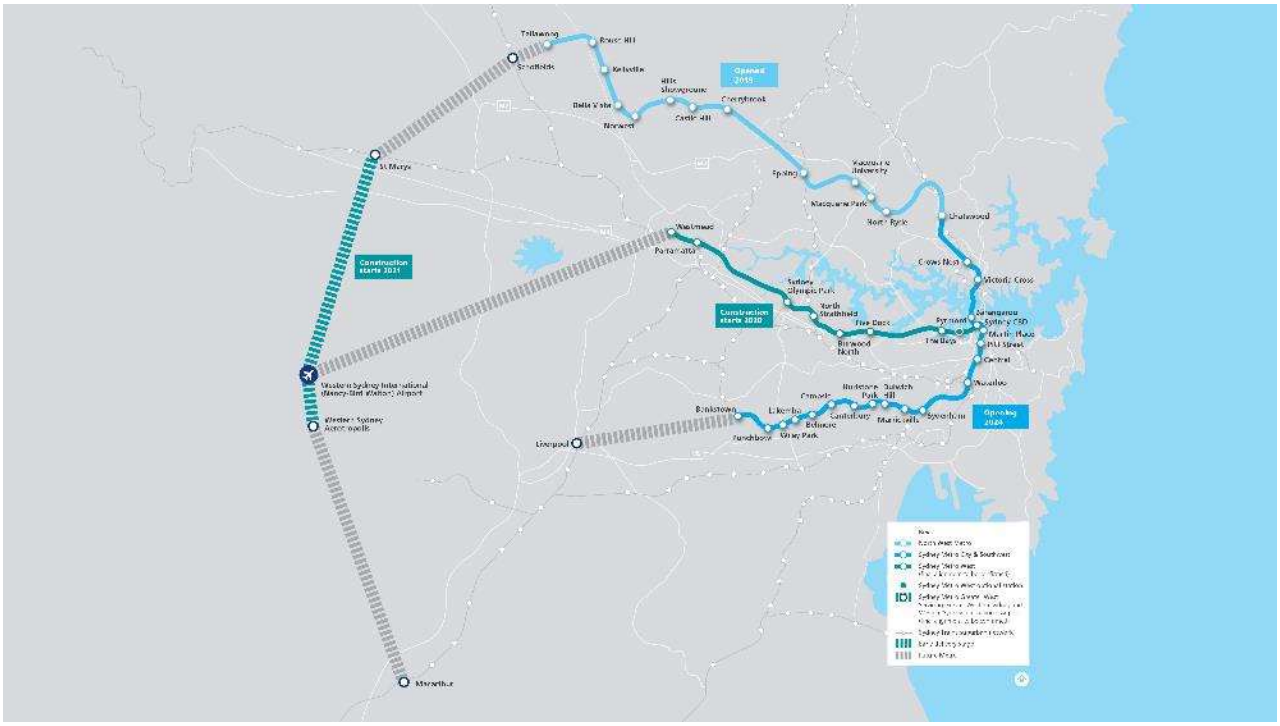


Figure 4 - Sydney Metro alignment map
Source: Sydney Metro

5. Proposed development

The detailed SSD DA seeks development consent for the design, construction and operation of:

- 8–9 storey residential building (Building 4) above the southern station box to accommodate 70 social housing dwellings
- landscaping and private and communal open space at podium and roof top levels to support the residential accommodation
- new public open space including the delivery of the Cope Street Plaza, including vehicle access to the site via a shared way from Cope Street, expanded footpaths on Botany and Wellington Streets and public domain upgrades
- signage zone locations
- utilities and service provision
- stratum subdivision (staged).
- The car parking provision for the Southern Precinct (Buildings 3 and 4) is located within the shared basement of the Northern and Central Precincts as illustrated in Figure 5. This car park is accessed via Cope Street and the shared zone on Church Street.
- The development also includes a shared loading dock within the ground floor, accessed off Wellington Street as shown in Figure 6.

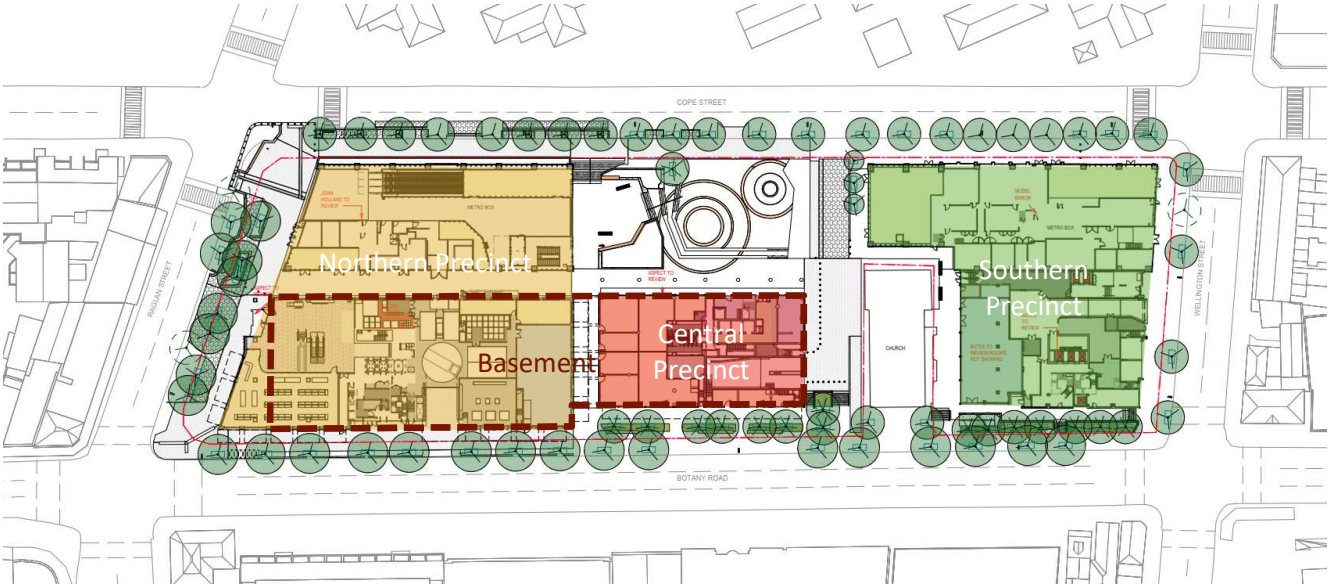


Figure 5 – Key Components of Separable Portions

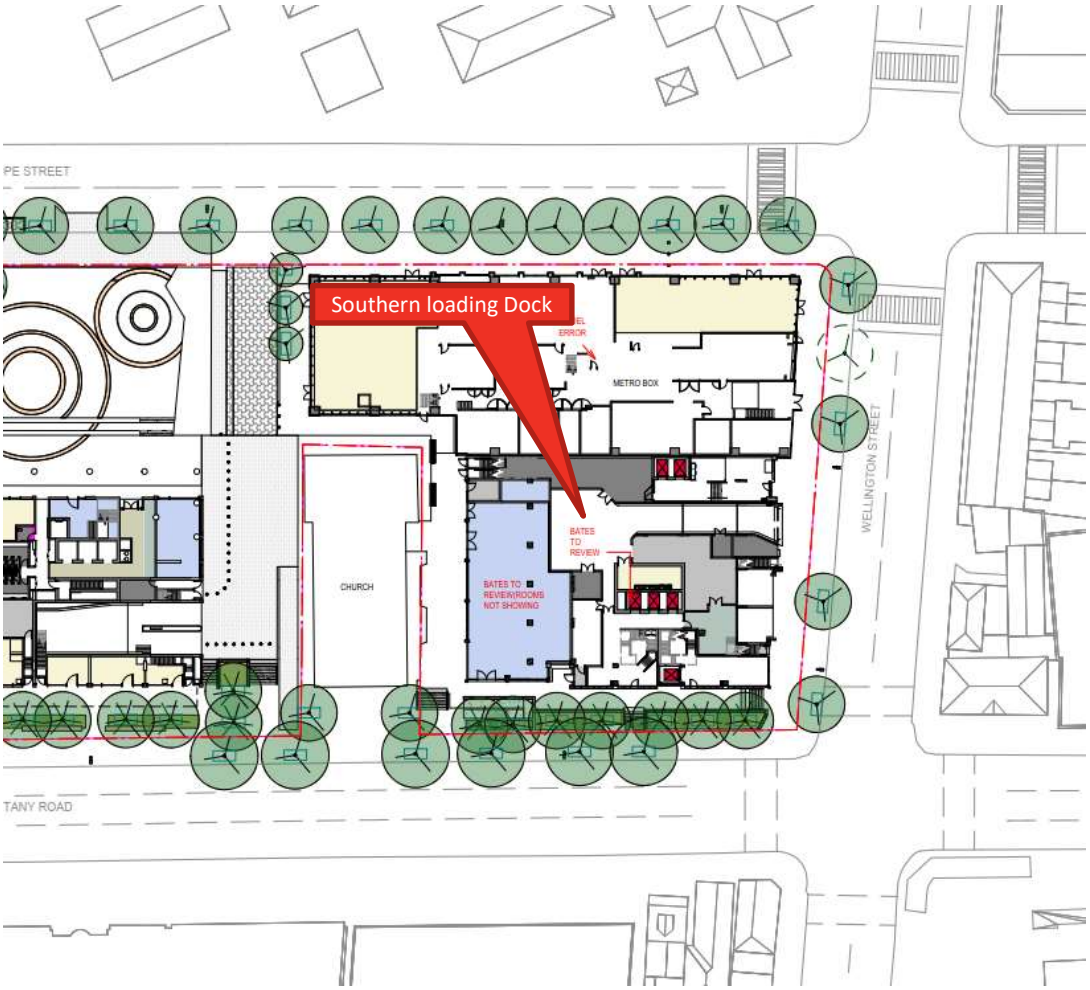


Figure 6 – Vehicular Access to Southern Loading Dock

6. Green Travel Plan

6.1 Council Policy

Through its Sustainable Sydney 2030 policy, the City of Sydney encourages that all new developments within the LGA are to incorporate active transport and promote public transport as part of their designs. The policy aims include:

- To continue to implement the Liveable Green Network to enhance pedestrian access throughout the City and to encourage walking, especially for shorter trips and trips to local amenities.
- To work with the State Government to introduce measures to improve pedestrian safety and priority, including 40 kilometres per hour speed limits throughout the City Centre, changes to traffic light timings and wider footpaths.
- To complete its Cycle Strategy and Action Plan, which involves 200 kilometres of cycleways, together with programs to encourage cycling as the most sustainable and healthy form of travel for medium length (1-5 km) trips.
- To continue to support car share as it provides an additional option for people to reduce their ownership and use of private cars, in conjunction with greater use of walking, cycling and public transport.

6.2 What is a Green Travel Plan?

A Green Travel Plan (GTP) is a document that outlines how a development intends to make travel to and from the site safer and more sustainable for residents and their visitors. The GTP addresses local traffic issues around the site and encourages active, safe and sustainable travel methods, such as walking, cycling, scooting, public transport or car sharing. A GTP correlates with the development's overall aspirations and is a document that is monitored and reviewed regularly.

A GTP is not just the installation bike racks or provision of end-of-trip facilities. A good GTP aims to promote and maximise the use of more sustainable modes of travel via a range of actions, promotional campaigns and incentives. The plan includes site management tools that encourage residents and visitors to make more sustainable transport choices. A GTP requires ongoing implementation, monitoring and review. As such, nominating an individual or a team to oversee the implementation of a travel plan is a crucial component of success.

An effective GTP can offer many benefits such as reduced parking costs, less congestions on the public road networks, health and environmental benefits.

6.3 Why a Green Travel Plan is required?

Development of a GTP is widely accepted as one of the best ways to increase active travel around the site. A successful GTP offers many benefits for the community, including:

- Building confidence and improving social interaction by walking and/or cycling;
- Assists in implementation of health, fitness and wellbeing programs;
- Improving social interaction with others to be more interested and involved in the with the precinct as they walk or cycle;
- Improving safety by reducing traffic and local road congestion;

- Improving the environment by reducing air pollution from private vehicles;
- Creating opportunities for healthier lifestyles and more vibrant, cohesive and accessible communities; and
- Providing individuals with leadership opportunities.
- It is likely that residents with good understanding of an active and sustainable mode of transport will follow a healthy and active lifestyle, care about the environment and prioritise location and lifestyle over car ownership.

6.4 The Purpose of a Green Travel Plan

The purpose of the GTP is to provide a package of measures with the aim at promoting and reducing the reliance of private car usage and encourage and support the uptake of daily business in a more sustainable way. This may be achieved through the review of existing policies and identifying programmes to encourage residents and visitors to adopt more active and sustainable forms of transport. This document identifies the following:

- Review of existing public transport infrastructure and future transport options;
- Assessment of existing travel patterns within the area;
- A modal share target for the development;
- A framework to identify and respond to travel demand from the development and surrounding area;
- Strategies to implement prior and during occupancy; and
- The monitoring strategy to track performance of the GTP.

6.5 Relevant priorities from the NSW State Plan (NSW Health, 2011)

- Increase walking and cycling,
- Increase the number of people participating in physical activity,
- Improve health in the community,
- Increase share of journey to work trips on a safe and reliable public transport system,
- Improve the efficiency of the road network,
- Increase the number of jobs closer to home,
- Tackle climate change,
- Improve air quality.

6.6 Potential Outcomes

- Successful negotiations with private transport providers (if necessary) to provide increased public transport services to the precinct.
- Improvements to cycle and walking infrastructure, if required.
- Recommendations for any relevant policy changes will be made to management (e.g. flexible work and work from home/hub policies).
- Campaign promoting the health and other benefits of non-car modes of travel will be implemented for residents.

- End-of-Trip infrastructure provided within the WMQ site, including lockers to leave items overnight (avoids carrying heavy items home, which can be a deterrent for active transport).
- Team up with a local bike shop to provide bike servicing within the Waterloo locality (this can be extended to the broader community too).
- Evaluation and Monitoring:
    - Online surveys (mode of travel to work)
    - Carpooling use (number of new users)
    - Private car-park usage
    - Feedback from public transport providers
    - Patronage on any new commuter public transport services
    - Number of Transport Access Guides downloaded/hard copies used.

7. Steps to Set Up a Green Travel Plan

To develop a GTP, there are five key steps to follow to commence its operation as illustrated in Figure 7:

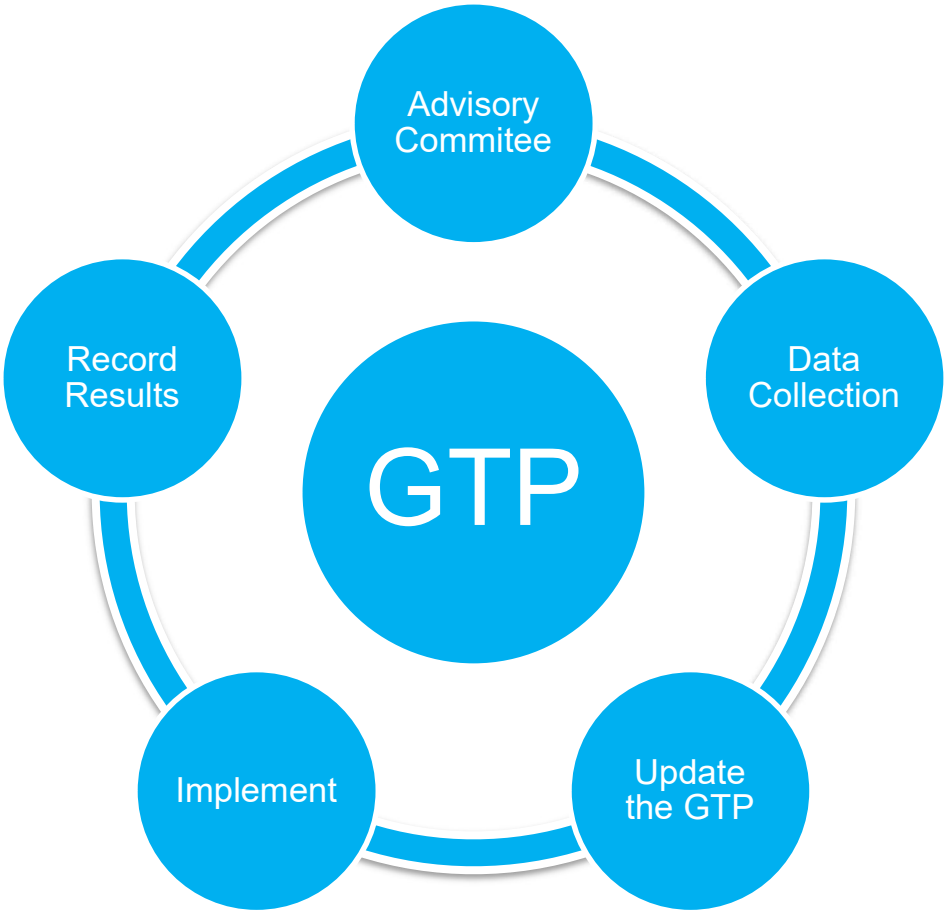


Figure 7 – Steps in developing a GTP

7.1 Step 1 – Set up an Advisory Committee

- Appoint an individual to coordinate specific actions and to track the progress of this work;
- Develop a working group that involves representatives from the precinct community
- Identify ways how the whole community will be involved and informed of the work (e.g. regular articles in the precinct website / social media).

7.2 Step 2 – Data Collection & Review Existing Situation

As part of the development, it is expected that there will be a new residents and visitors travelling to and from the building on a daily basis. To identify how residents living in the Waterloo area travel elsewhere for work or shopping etc. and/or for people coming to Waterloo area to work, shop or to eat, an initial survey should be conducted to identify the travel behaviour of residents and visitors. This may be conducted as an online survey or an intercept survey of those accessing the site.

As a minimum the following questions should be considered:

- Are you are resident/visitor to the site? Yes/No
- Did you park on site today? If so where?

Resident Only Questions

- If you are a resident, do you have an allocated parking space within the Site?
- If you are a resident, where do you work?
- How do you currently travel to work and the distance of their travel?
- Based on the public transport and other sustainable travel options available, which would be their preferred mode of travel?
- Walk/run
- Bicycle
- Bus
- Train
- Combination of bus and train
- Drive car
- Passenger in car
- Cycle
- other ____
- Is your workplace in an area not serviced by any of the identified transport options?
- Do you need to drive to work for another reason? Why and how often this would occur (eg. Dropping off or collecting children from school/childcare, etc)

Visitors Only Questions

- If you are a visitor, where did you travel from today?
- What mode of transport did you use?
- Why did you use this particular method of travel mode?

All Users

- Have you heard of car share? If this was readily available to you, would you use if you did not have a car parking is unavailable?
- If not, what are the barriers to you using car share to travel to and from site?
- What would make you consider using car share to access the site?
- Any suggestion/recommendations to encourage sustainable mode of transport etc;

Once the survey findings are available, methods to achieve specific targets can be identified with proposed time frames. This could include adopting strategies outlined in Section 11. These methods and targets are then available to be monitored (refer to Section 12).

7.3 Step 3 – Prepare the Green Travel Plan

Based on the data, an overall vision for the modal travel should be considered with clear objectives. The GTP should be prepared based on those objectives, notably:

- Build a precinct culture that supports active travel by motivating and encouraging the community to get involved
- Set specific SMART (Specific, Measurable, Achievable, Relevant, Timed) targets
- Develop an action plan that lists activities and strategies that eliminates the community's barriers to active travel to meet the objectives
- Estimate the budget required to meet the objectives, identify funding source and develop implementation strategies
- Review and consult with the community

7.4 Step 4 - Deliver & Implement

Once developed launch the GTP and carry out regular monitoring (every 12 months is recommended) as part of the implementation strategy. Travel mode data should be collected and reviewed each quarter.

7.5 Step 5 - Recognise Progress

The successes of the GTP should be celebrated regularly, for example at key community events. The plan should regularly be reviewed and include new ideas, targets and benchmarks.

7.6 Waterloo Metro Quarter Progress

A summary of the required actions and current progress of the GTP process is outlined in Table 2.

Actions Required	Progress
Step 1 – Set up an Advisory Committee	To be undertaken following completion of the WMQ Precinct
Step 2 – Data Collection & Review Existing Situation	To be undertaken following completion of the WMQ Precinct
Step 3 – Prepare the travel plan	✓
Step 4 - Deliver & Implement	To be undertaken following completion of the WMQ Precinct
Step 5 – Record Results / Recognise Process	Ongoing once the GTP is in place

Table 2 - Summary of Required Actions and GTP Progress

8. Existing Transport Infrastructure

8.1 Public Transport

The WMQ Precinct has been assessed for its potential accessibility via modes of existing public transport likely to be utilised by prospective residents and visitors of the proposed development. When defining accessibility, the NSW Guidelines to Walking & Cycling (2004) suggest that 400m-800m is a comfortable walking distance.

The existing bus stops and train/metro stations situated within the 400m and 800m walking catchments are illustrated in Figure 8.

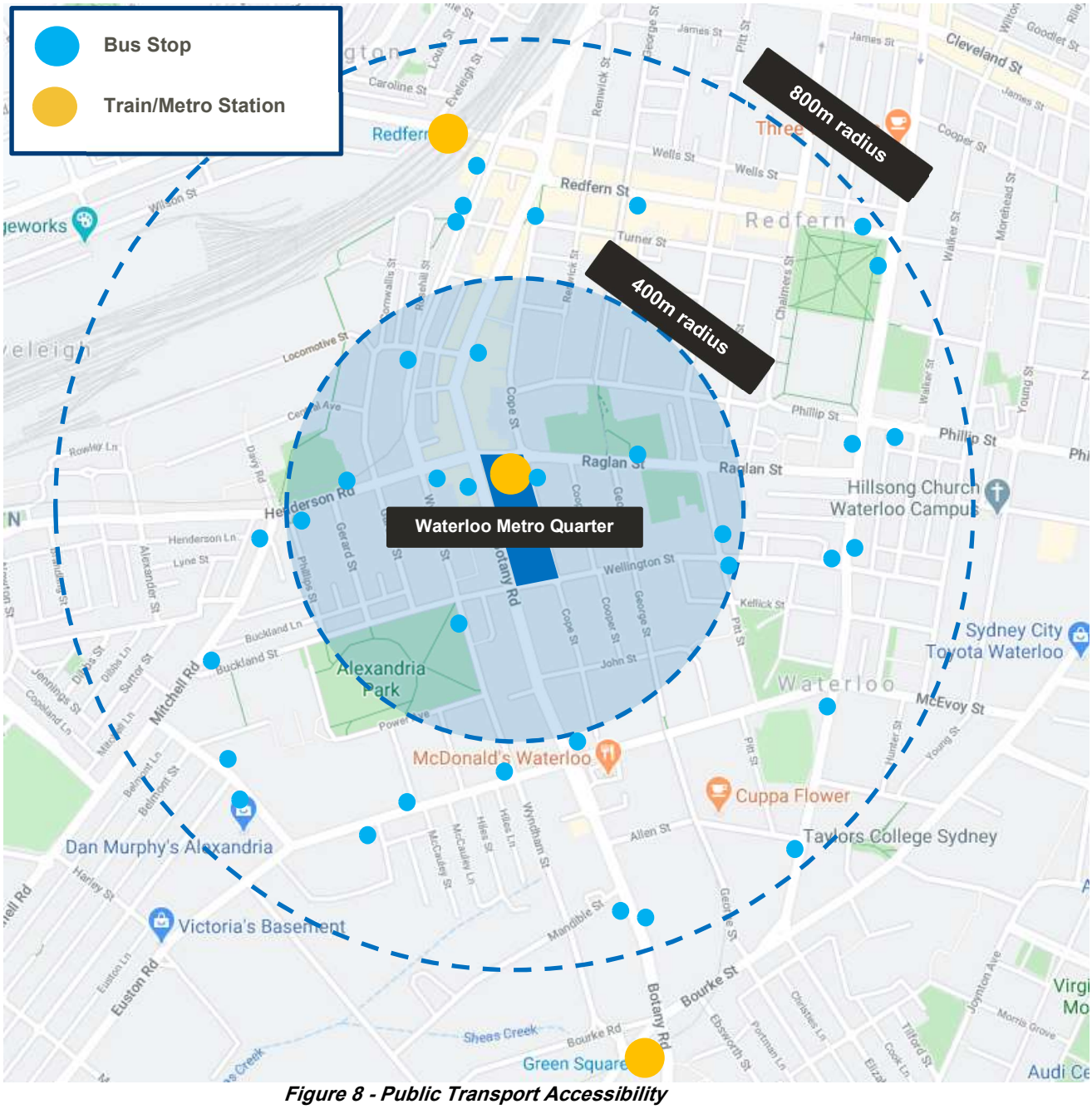


Figure 8 - Public Transport Accessibility

8.1.1 Metro

The NSW Government is implementing 'Future Transport Strategy 2056', a 40-year strategy to transform and modernise Sydney's transport network so that it can grow with the city's population and meet the needs of customers in the future (Transport for NSW, 2018). Sydney Metro is a new stand-alone rail network identified in Future Transport Strategy 2056.

Sydney Metro is Australia's biggest public transport project. As a new stand-alone railway, Sydney Metro will currently deliver 31 metro stations and more than 66 kilometres of new metro rail revolutionising the way Australia's biggest city travels. Sydney Metro Northwest services commenced in May 2019, and Sydney Metro City & Southwest is due to open in 2024. Sydney Metro West is currently being planned and is proposed to be delivered by the second half of the 2020s. Planning is also underway for a new metro line serving Greater Western Sydney, linking the Western Sydney International (Nancy Bird Walton) Airport and the Aerotropolis with the rest of the city.

Sydney Metro City & Southwest is an extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown.

The project also involves the delivery of six new metro stations including a new station at **Waterloo**, together with new underground platforms at Central Station. Once completed, Sydney Metro will have the ultimate capacity for a metro train every two minutes in each direction under the city, a level of service never seen before in Sydney.

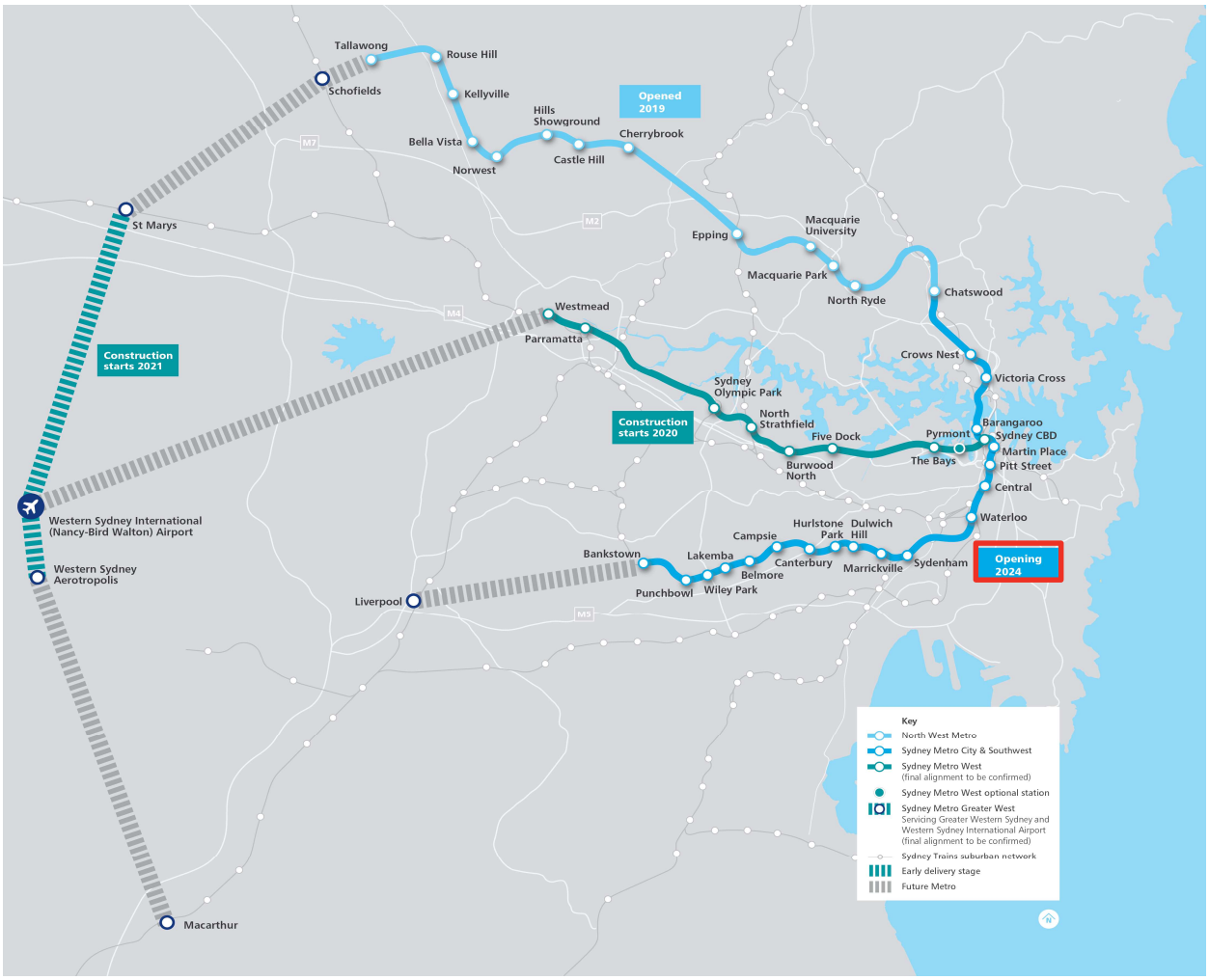


Figure 9 - Sydney Metro alignment map
Source: Sydney Metro

8.1.2 Trains

The development site is located less than 650 metres walking distance from Redfern Station, to the north and 900 meters from Green Square Station, to the south.

These stations operate the following services:

Line	Coverage
T1 – North Shore & Western Line	North Shore, Western and Richmond
T2 - Inner West & Leppington Line	City, Inner West and Leppington
T3 – Bankston Line	City, Liverpool and Lidcombe
T4 – Eastern Suburbs & Illawarra Line	Eastern Suburbs, Illawarra and Cronulla
T8 – Airport & South Line	City and South

Line	Coverage
T9 – Northern Line	Gordon and Northern

Redfern station is also served by regional lines including Blue Mountains line, Central Coast & Newcastle line and South Coast line.

8.1.3 Buses

A number of bus stops have been identified within walking distance of the development, as shown in Figure 10 and Figure 11.

The Routes servicing these stops are summarised in Table 3.

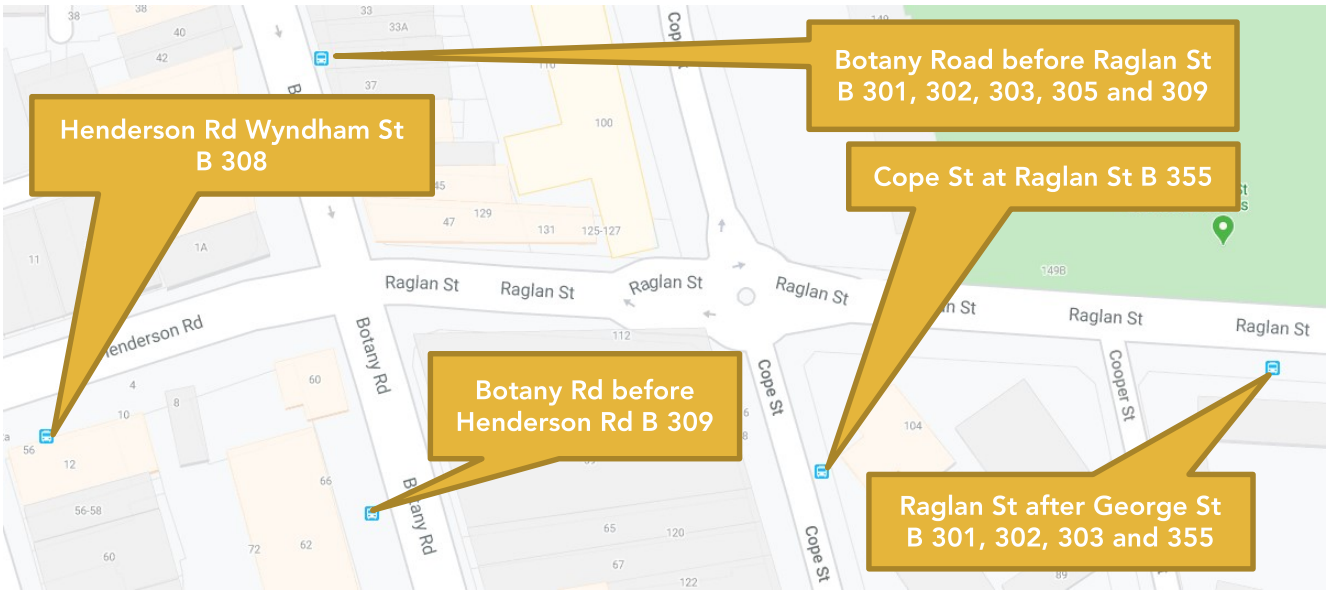


Figure 10 – Local Bus Stops

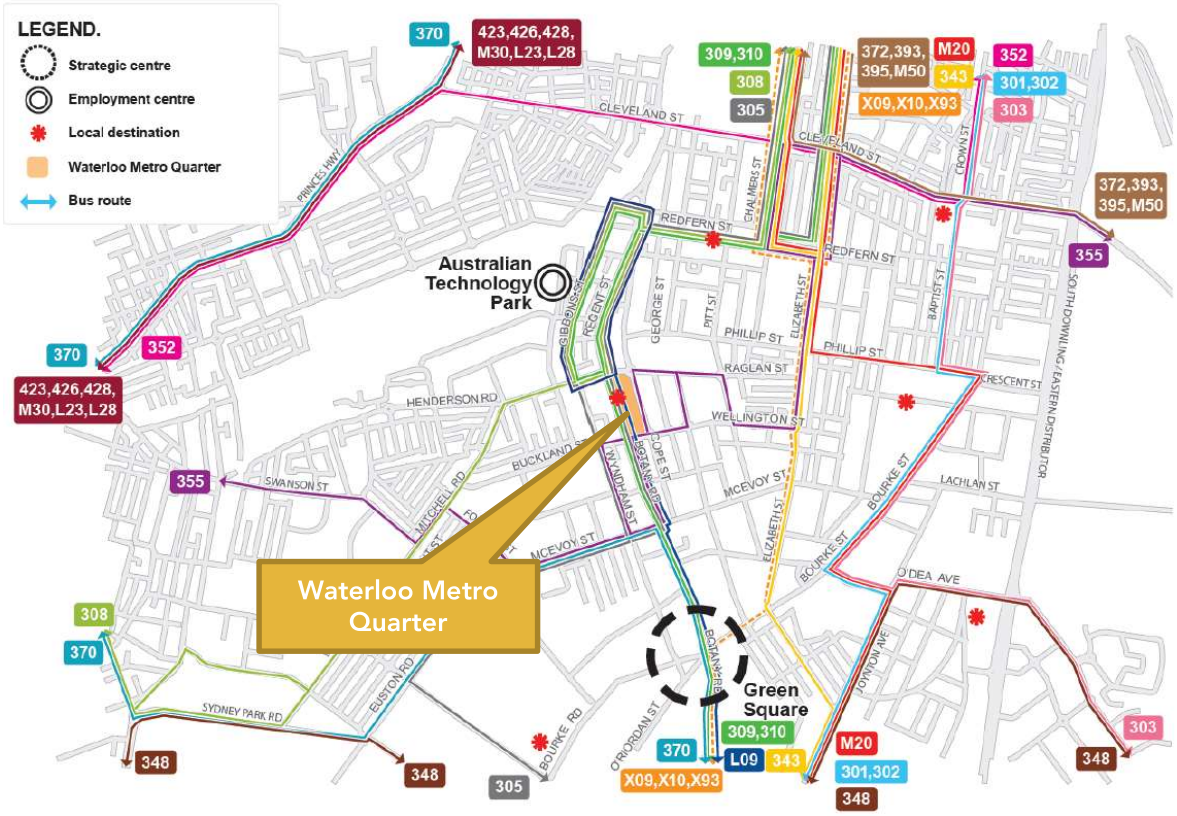


Figure 11 – Bus Network in the Vicinity of the Development

Bus Route	Coverage	Operation
301	City to Eastgardens	Operates all week. 10 minute peak headway, 20-30minute off-peak headway.
302	City to Eastgardens	Operates all week. 60 minute headway.
303	City to Sans Souci	Operates all week. 5-10 minute peak headway, 20-30minute off-peak headway.
305	Railway Square to Mascot	Weekday-only service with a 20 minute headway in the peak direction.
308	Marrickville Metro to Central Eddy Ave via Redfern (Loop Service)	Operates all week. 15 minute peak headways.
309	Railway Square to Port Botany	Operates all week. 10 minute peak headways.
355	Bondi Junction to Marrickville Metro	Operates all week. Typical 30 minute headway.
301	City to Eastgardens	Operates all week. 10 minute peak headway, 20-30minute off-peak headway.

Table 3 – Bus Services Summary

In consideration of the number of existing public transport options, their combined coverage throughout the Sydney metropolitan region and medium to high frequency

headways, the site is very well placed in the context of public transport, with the potential to significantly reduce car-mode travel.

8.2 Active Travel

The locality has also been reviewed for features that would attract active transport trips (walking and cycling). As indicated in Figure 8, the site is located within comfortable walking distance to Redfern Station and local centres comprising of supermarkets, health care, banks and small businesses. The following subsections outline the existing pedestrian and cycling infrastructure within the vicinity of the WMQ Precinct.

8.2.1 Pedestrian Infrastructure

There is generally a high level of pedestrian amenity within the vicinity of the WMQ Precinct. Footpaths and kerb ramps are present on both sides of surrounding streets and footpaths are generally wide.

Signalised pedestrian crossings are provided at the intersections of Botany Road/Raglan Street, Botany Road/Wellington Street immediately adjacent to the precinct. Signalised pedestrian crossings are also provided along Botany Road, Regent Street and along Gibbons Street which provides safe connection to access the Sydney Trains network.

Street lighting is typically provided on both sides of the surrounding streets which allows for safe travel at night time.

Some suggested pedestrian routes for access to public transport facilities within an 800m walking catchment is illustrated in Figure 12.

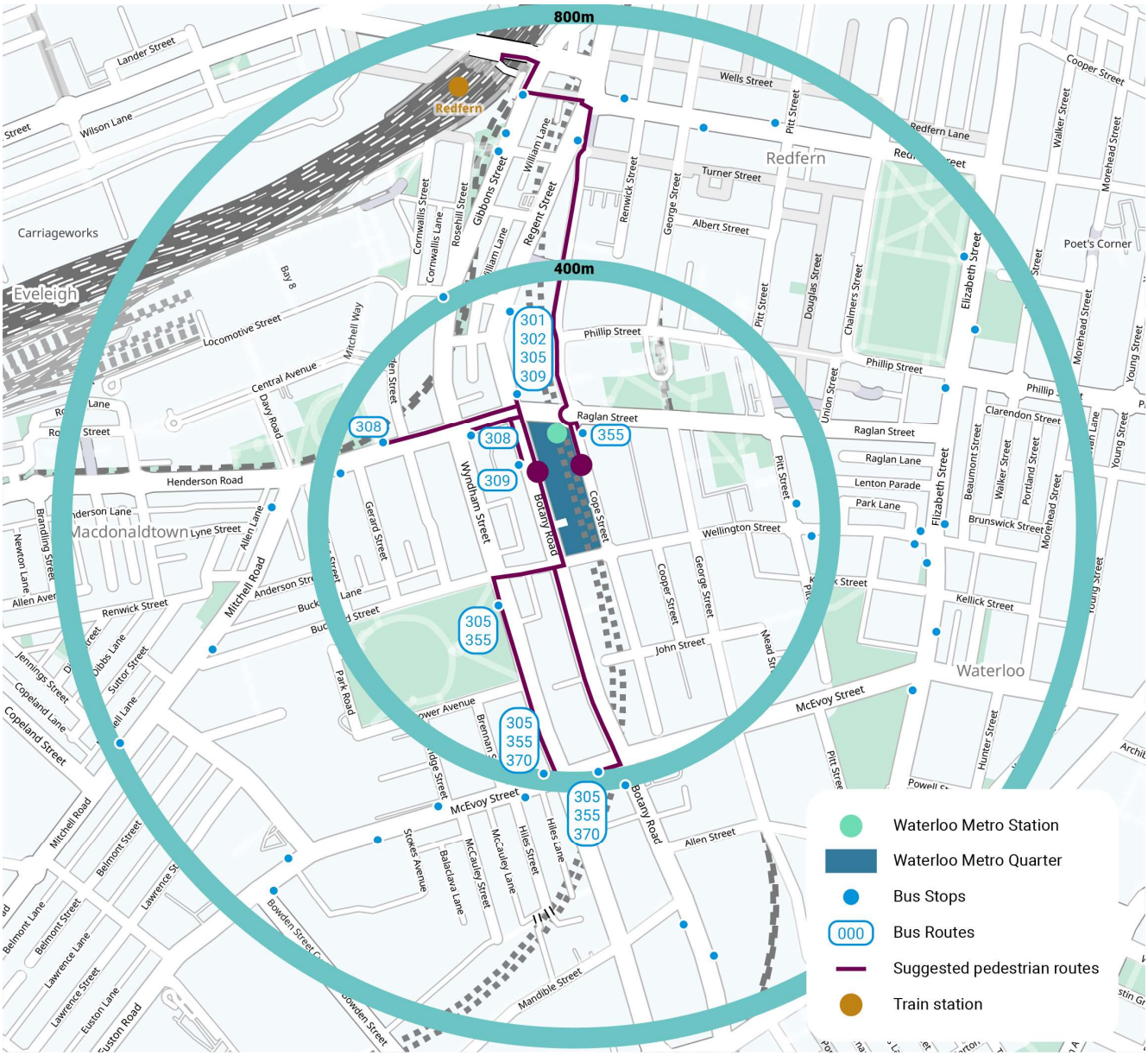


Figure 12 – Suggested Pedestrian Routes

8.2.2 Bicycle Network

The regional cycle network surrounding Waterloo is shown in Figure 13.

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: 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 13 – Existing and Planned Cycle Network

8.3 Car Share

The City of Sydney encourages car sharing as it is a sustainable transport option for residents. Car share allows for efficient use of available parking spaces, allowing a single vehicle to be used by a larger number of people. Car share offers numerous community and health benefits including:

- Encourage use of alternative transport options to private vehicle usage (which are typically single occupancy trips for commuters)
- Reduced private vehicle ownership
- Reduced dependence on fossil fuels and lower greenhouse gas emissions
- Provides affordable access to a vehicle for the local community

The development proposes to provide one residential car share bay located within the shared basement car park for shared use amongst residents within Building 4. Furthermore, there are a large number of car share pods situated within 800m walking distance from the WMQ precinct as shown in Figure 14.

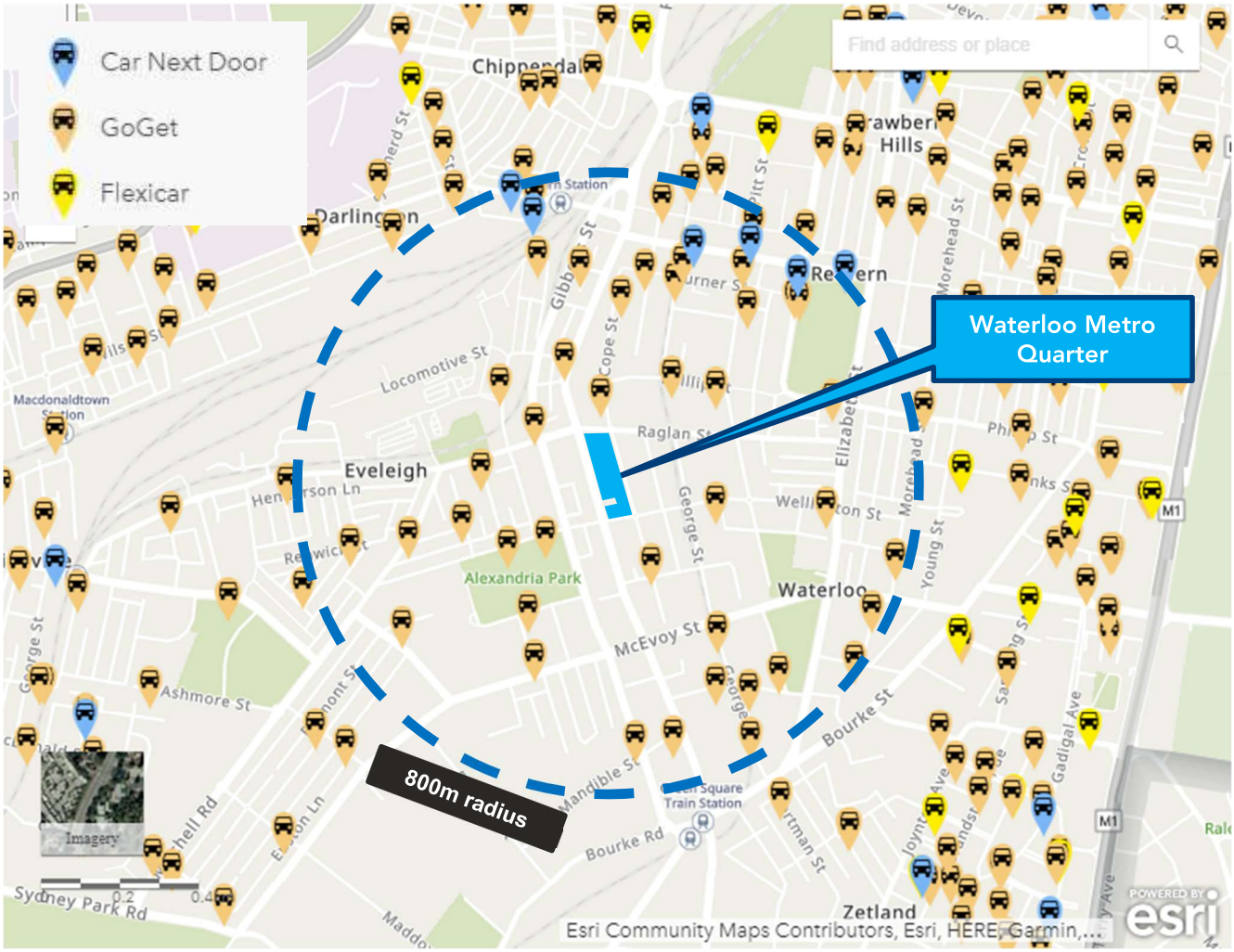


Figure 14 - Car Share Pods situated within 800m walking catchment from the WMQ Precinct (Source: City of Sydney)

8.4 Proposed Public Transport Upgrades

In addition to the development of the Waterloo Metro Station, as outlined in Section 4.2.2, as part of the development of the nearby Green Square Town Centre (GSTC), the Green Square Urban Renewal Area (GSURA) Transport Management & Accessibility Plan (TMAP Volume 2, 2008) identifies a number of measures intended to increase public transport usage as part of the vision to achieve a "no car growth" scenario over the next 25 years. It is acknowledged that a draft TMAP was been produced in 2012, and is yet to be publicly released, however, it is assumed that the following major upgrades are still relevant:

- Action plans to progress the goal of establishing/improving a number of transit corridors, including the Botany Road Transit Corridor and the new Eastern Transit corridor, with the intention of establishing the "Green Loop" to connect Green Square with Redfern Station, Central Station and Surry Hills through high frequency services via dedicated buses (short term), which are to be eventually replaced by a new light rail service (see Figure 15);
- Upgrades to Green Square Train Station capacity, to achieve 20 trains/hour/way during peak commuter hours. This will be largely controlled by the progress of the Sydney Metro project;
- Forecasting and implementation of additional bus services and route changes to manage population growth; and
- Fleet upgrades.

The TMAP has identified that in the context of the overall GSURA, the GSTC has the potential to instigate significant shifts towards non-car mode shares. This potential arises from low-density industrial and manufacturing employment areas being redeveloped into high-density commercial and retail precincts, providing greater opportunities for public transport.

It is understood that many of the upgrades identified within the TMAP (2008) have not yet been implemented, but that a Green Square Transport Working Group (chaired by CoS) and Green Square Steering Committee (chaired by UrbanGrowth NSW) has been established to provide cross-agency coordination in the planning and implementation of these upgrades.

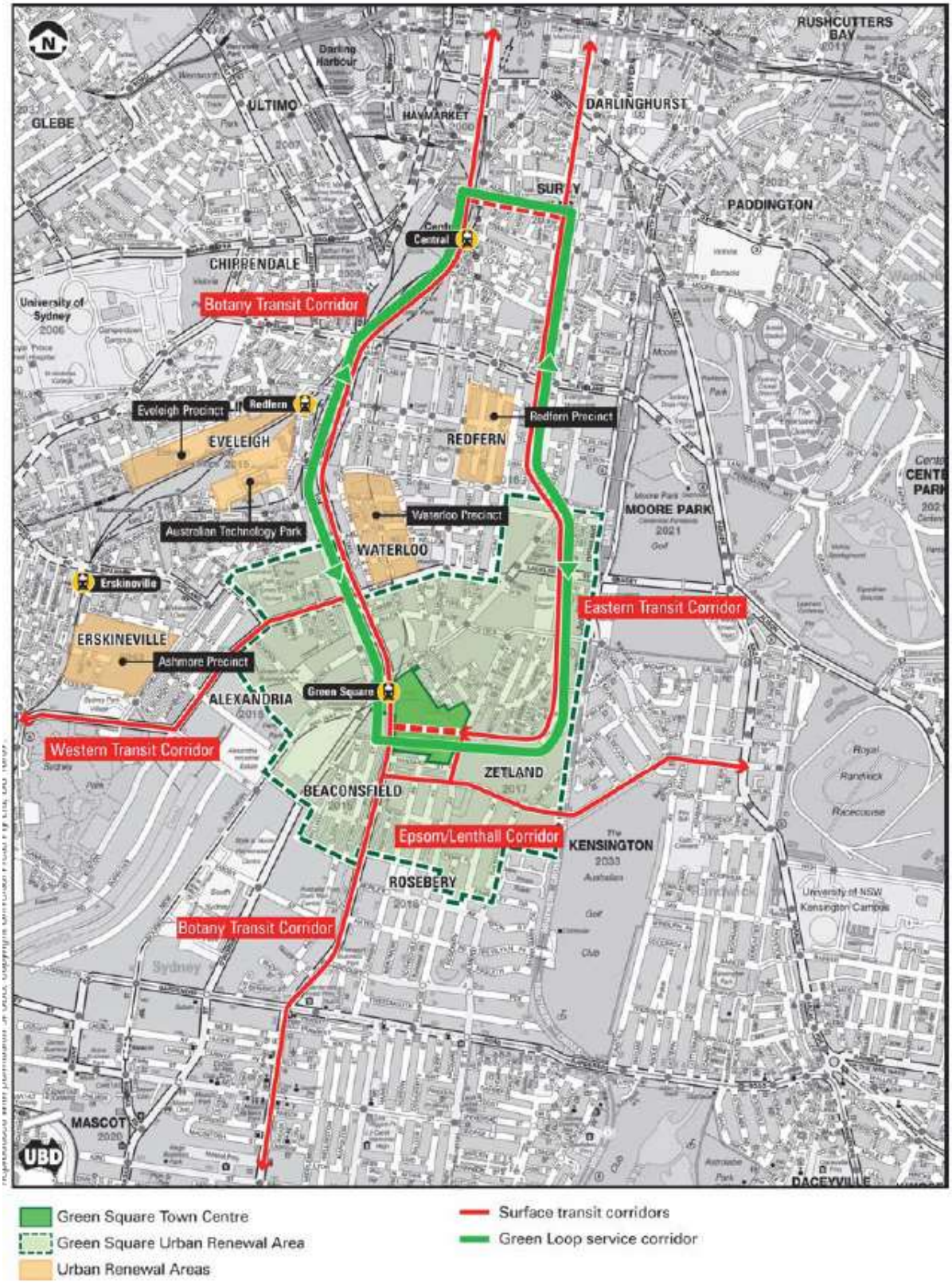


Figure 15 – Potential Transport Network

9. Existing Travel Behaviour

An assessment of the existing travel behaviour within the suburb of Waterloo has been undertaken in relation to the following:

- Travel to work, Waterloo as a place of residence

As this is a new development, there are currently no travel statistics available for the WMQ Precinct. In lieu of specific mode share statistical information for the precinct, data has been collected from the Australian Bureau of Statistics 2016 Census and is summarised in Table 4.

Travel to Work (Waterloo as a place of residence) - 2016	
Mode of Travel	**Percentage (%)**
Train	19.59%
Bus	20.92%
Ferry	0%
Tram	0.06%
Car (as driver)	32.40%
Car (as passenger)	3.63%
Bicycle	3.49%
Walked only	8.38%
Other mode	0.63%
Worked at home	3.36%
Did not go to work	6.74%
Not stated	0.80%

Table 4 – Existing Travel behaviour – Travel to Work, Waterloo as a place of residence

For residents living in Waterloo, the majority of residents travel to work by car (36%) and by public transport (accounting for approximately 40.5% of mode share). On the other hand, walking and cycling comprised 11.9% of mode share, which indicates that active travel modes are not currently highly utilised.

10. Proposed Action Items

In developing the GTP, it may not be possible to implement all action items at the same time, therefore a stage implementation should be considered. There may be some crucial actions that can be implemented immediately, while others might take longer to plan and develop.

Before implementing any actions, relevant stakeholders must be consulted to approve the changes.

The following travel mode hierarchy is proposed for this GTP:

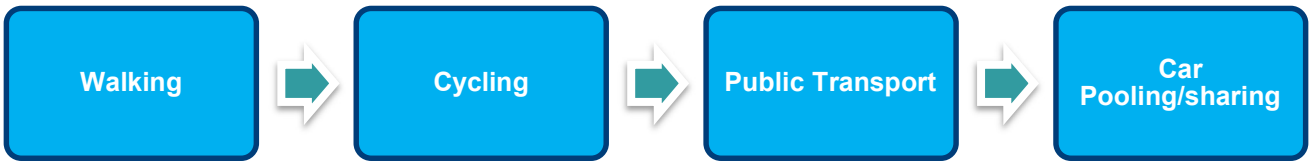


Figure 16 - Mode Hierarchy

There are a number of actions which can be employed to encourage non-car modes of transport to and from the WMQ Precinct. The following table outlines potential strategies that can be adopted in achieving future transport targets.

10.1 Walking

As stated in Section 8.2.1, the existing pedestrian connectivity is generally good in all directions. The following tasks are recommended to increase walk trips to/from the site:

- Residents could be encouraged to utilise the numerous public transport options available through promotional material to raise awareness of these transport options;
- A working partnership could be established with City of Sydney to determine whether there are opportunities to improve the pedestrian connectivity to the site;

Walking is also the most space efficient mode of transport for short trips and presents the highest benefits. Co-benefits where walking replaces a motorised trip include improved health for the individual, reduced congestion on the road network and reduced noise and emission pollution. A review of the existing pedestrian infrastructure has found that the footpath networks and crossing points between the adjoining precincts are generally adequate.

10.2 Cycling

To improve the future bike usage by residents and visitors, the development will include 77 bicycle parking spaces.

Figure 17 – Example of an End of Trip Facility

10.3 Public Transport

The subject site is well connected by public transport within a comfortable walking distance. To increase the public transport uptake by residents and visitors, the following measures could be considered:

- Create a map identifying the location of bus stops and routes and make this available to all users;
- Improved wayfinding signage between the site and nearby public transport interchanges could be discussed with City of Sydney; and
- Promote the use of apps for public transport connectivity.

As aforementioned in Section 8.1.1, Waterloo Metro Station will be located within the WMQ Precinct and is anticipated to be operational by 2024. This will be a convenient form of transportation for residents and visitors as it will provide connection to the Sydney CBD and the wider Sydney Region.

11. Strategies

11.1 Transport Access Guide (TAG)

To encourage residents and visitors to adopt alternative sustainable transport options, a Transport Access Guide (TAG) should be developed to summarise available transport options identified. A TAG is a concise presentation of how to reach the site using low-energy, sustainable and active forms of transport.

The aim of a TAG is to make sure people know how to get to the subject development by walking, cycling or public transport (as well as by car).

A TAG can take many forms; TAGs may be incorporated into stationery, brochures and and provided electronically on social media. An electronic version can be kept on a computer and produced as needed.

TAGs should be included in Green Travel Plans and should comply with RMS guidelines. A TAG has been prepared for the WMQ Precinct and is included in Annexure 1 – Transport Access Guide (TAG).

11.2 Promotion and Marketing Strategy

Once the plan has been adopted, it is essential to maintain interest in the scheme. Each new initiative in the plan will need to be publicised with effective marketing. Actions are the core of a GTP, therefore, the GTP needs to have a variety of actions that guide strategies relating to promotion, facilities and policies to create incentives for sustainable travel behaviour. If actions are to be staged, a staging strategy should be outlined in the plan.

Strategic promotion of travel plans and associated initiatives tend to result in higher uptake of sustainable travel modes. It is imperative to ensure that all users are aware of the initiatives. From time to time, assistance should be sought from the City of Sydney, Bicycle NSW, Pedestrian Council Australia, TfNSW and other stakeholders.

Another way to promote non-vehicle mode of transport is to print a map on the back of business cards or brochures. Best practice suggests that the information should be as concise, simple and site specific as possible. If instructions are too complex, residents and visitors are likely to ignore them.

12. Monitoring and Evaluation

A travel plan should not simply be a list of actions. Monitoring and reviewing a travel plan are one of the most critical components of the travel planning process. It is crucial to understand whether and how the travel plan is having an impact on the mode share. An annual review of the GTP is recommended to identify how mode share has changed over time. This will assist in understanding whether progress is being made.

The monitoring strategy should ensure that the GTP is achieving the desired benefits. As stated in Section 7.2, it is essential to undertake the initial data collection of the existing mode share to establish targets and overall goal. Surveys will help to identify which actions are having an impact on occupant's travel behaviour and whether some are more effective than others. It may also help to identify ongoing or unresolved issues and barriers that are preventing greater improvement.

The overall success of the GTP will depend on good communication. It will be necessary to explain the reason for adopting the plan, promote benefits and provide information about alternatives to driving. It will also be necessary to provide feedback to residents to ensure that they can see the benefits of sustainable transport.

Once data are updated, the targets and actions of the travel plan will need to be reviewed. The review should consider:

- Are the targets still realistic? Are they still ambitious? Should they be updated?
- Are residents struggling to achieve particular targets? What are the likely reasons for this?
- Are there any gaps with regards to actions?
- What is preventing further improvement on mode share and how can this be addressed?

The steps outlined above should not be considered as a linear process, rather be an ongoing cycle. Travel planning requires regular review and adjustment which may reveal the need to reconsider objectives or targets or to add new actions to create greater incentives for the uptake of sustainable transport choices.

13. Annexure

13.1 Annexure 1 – Transport Access Guide (TAG)

The Waterloo Metro station is part of Sydney Metro City & Southwest which is an extension of metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and south west to Bankstown.

The Waterloo Metro Quarter is located within a 10min walk from Redfern Station and a 15min walk from Green Square Station.

Lines and Coverage

T1 North Shore & Western Line - North Shore, Western and Richmond

T2 Inner West & Leppington Line - City, Inner West and Leppington

T3 Bankstown Line - City, Liverpool and Lidcombe

T4 Eastern Suburbs & Illawarra Line - Eastern Suburbs, Illawarra and Cronulla

T8 Airport & South Line - City and South

T9 Northern Line - Gordon and Northern

Metro Line - expected to commence operation in 2024

The following bus routes are accessible from bus stops within 800m of the Waterloo Metro Quarter:

Route	Coverage and Operation
301	City to Eastgardens 10min peak headway
302	City to Eastgardens 60min headway
303	City to Sans Souci 5-10min peak headway
305	Railway Square to Mascot Weekday-only service, 20min peak headway
308	Marrickville Metro to Central Eddy Ave via Redfern 15min peak headway
309	Railway Square to Port Botany 10min peak headways
355	Bondi Junction to Marrickville Metro Typical 30min headway

Transport Access Guide

Waterloo Metro Quarter

Residents, staff and visitors are encouraged to use public and active transport when travelling to and from the Waterloo Metro Quarter.

Plan your journey by accessing transport.info, downloading the Opal app for smartphones or calling 131500 for Transport for NSW up-to-date timetables and maps.

There is excellent pedestrian infrastructure around the Waterloo Metro Quarter with public transport, supermarkets and shops located within a short walk.

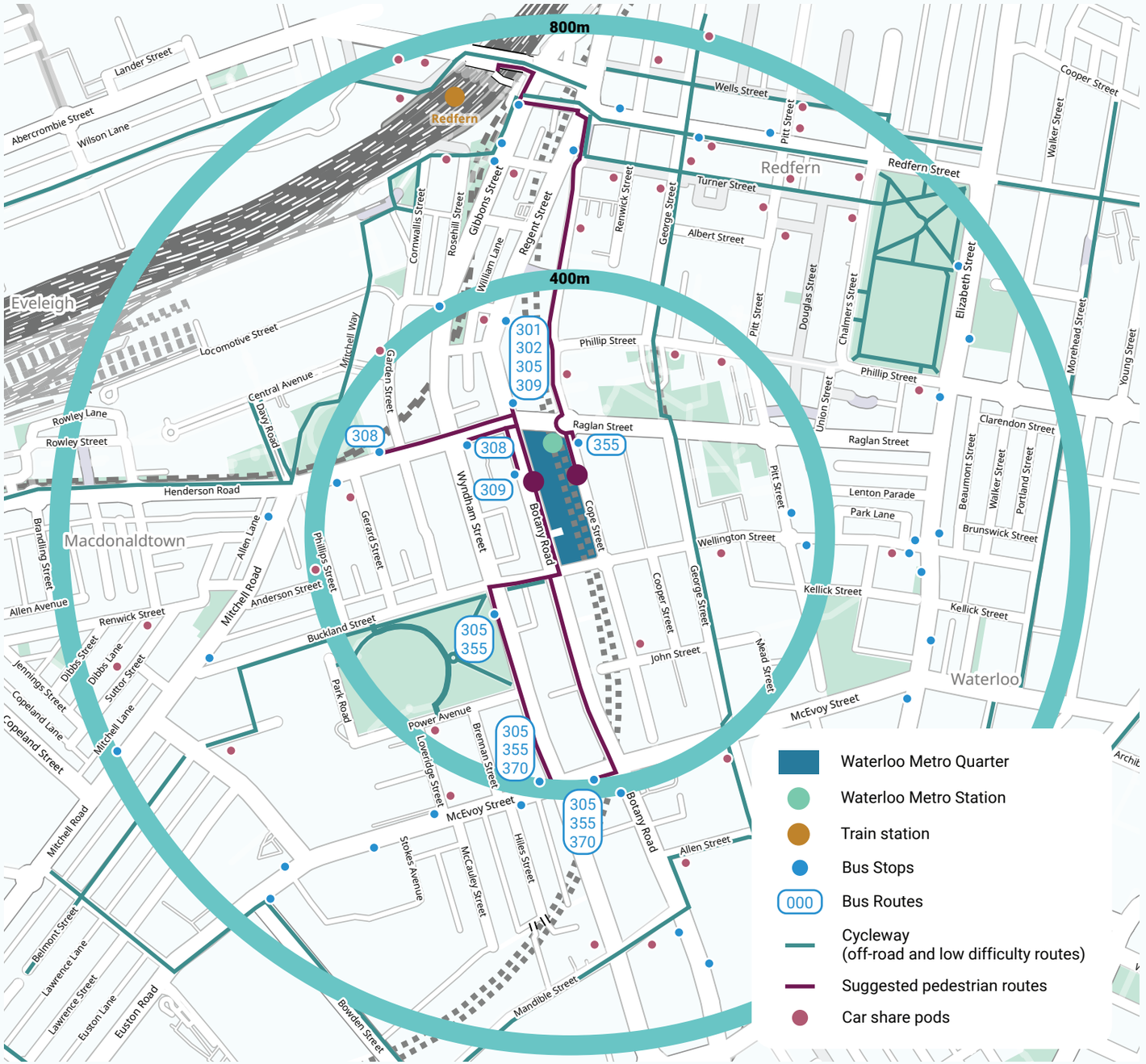
The cycle network surrounding Waterloo currently provides access to a range of key destinations including the University of Sydney, Redfern Station, Sydney CBD, Newtown and Moore Park.

In the vicinity of Waterloo Metro Quarter cyclists can navigate through off-road and low difficulty routes.

Bicycle parking and end-of-trip facilities are available within the various precincts for occupants, residents and visitors.

Waterloo Metro Quarter offers four car share bays located within the shared basement car park for shared use by occupants and residents.

Moreover, there are numerous car share pods from different service providers (such as GoGet, Flexicar and Car Next Door) within 800m of the Waterloo Metro Quarter.



16.6 Appendix 6 - Freight & Servicing Management Plan

WATERLOO METRO QUARTER OVERSTATION DEVELOPMENT

Environmental Impact Statement
Appendix I – Transport, Traffic and Parking Impact Assessment
Appendix 6 – Freight and Servicing Management Plan

SSD – 10437 Southern Precinct

State Significant Development,
Development Application

Prepared for **WL Developer Pty Ltd**

[30 September] 2020

Reference	Description
Applicable SSD Applications	SSD – 10437 Southern Precinct
Author	**ptc.** Steve Wellman
Reviewed	Waterloo Developer Pty Ltd Simon Joseph
Document Number	WMQ-BLD3-PTC-TF-RPT-003
Status	Final
Version	4
Date of Issue	10 August 2020

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1. Glossary and abbreviations

Reference	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ADG	Apartment Design Guide
AHD	Australian height datum
AQIA	Air Quality Impact Assessment
BC Act	Biodiversity Conservation Act 2016
BCA	Building Code of Australia
BC Reg	Biodiversity Conservation Regulation 2017
BDAR	Biodiversity Development Assessment Report
CEEC	critically endangered ecological community
CIV	capital investment value
CMP	Construction Management Plan
Concept DA	A concept DA is a staged application often referred to as a 'Stage 1' DA. The subject application constitutes a detailed subsequent stage application to an approved concept DA (SSD 9393) lodged under section 4.22 of the EP&A Act.
Council	City of Sydney Council
CPTED	Crime Prevention Through Environmental Design
CSSI approval	critical State significant infrastructure approval
CTMP	Construction Traffic Management Plan
DA	development application
DPIE	NSW Department of Planning, Industry and Environment
DRP	Design Review Panel
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPA Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999

Reference	Description
ESD	ecologically sustainable design
FSMP	Freight and Servicing Management Plan
GANSW	NSW Government Architect's Office
GFA	gross floor area
HIA	Heritage Impact Assessment
IAP	Interchange Access Plan
LGA	Local Government Area
NCC	National Construction Code
OSD	over station development
PIR	Preferred Infrastructure Report
POM	Plan of Management
PSI	Preliminary Site Investigation
RMS	Roads and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No 55—Remediation of Land
SEPP 65	State Environmental Planning Policy No. 65 – Design Quality of Residential Apartment Development
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2009
SREP Sydney Harbour	State Regional Environmental Plan (Sydney Harbour Catchment) 2005
SSD	State significant development
SSD DA	State significant development application
SLEP	Sydney Local Environmental Plan 2012
Transport for NSW	Transport for New South Wales
TIA	Traffic Impact Assessment

Reference	Description
The proposal	The proposed development which is the subject of the detailed SSD DA
The site	The site which is the subject of the detailed SSD DA
VIA	Visual Impact Assessment
WMQ	Waterloo Metro Quarter
WMP	Waste Management Plan
WSUD	water sensitive urban design

2. Introduction

This report has been prepared by ptc. to accompany a concept State significant development (SSD) development application (DA) for the Waterloo Metro Quarter over station development (OSD).

This Freight and Servicing Management Plan (FSMP) is submitted as part of the SSD DAs for the following precincts:

- SSD-10437 – Southern Precinct.

The intent of the FSMP is to ensure that the users and management of the loading and service areas understand the operational procedures of the Loading Dock and Service Bays, and their responsibilities.

The overall objectives of these recommendations are as follows:

- Increase safety around the Loading Dock between all user groups;
- Maintain a high level of access and efficiency of the Loading Dock and Service Bay facilities
- Minimise disruption to surrounding road network;
- Reduce conflicting occupancy within the Loading Dock and Service Bays; and
- Outline the rules associated with the use of the Loading Dock and Service Bays.

3. Proposed Development

3.1 The Development

The development of the Southern precinct involves the construction of two residential tower, retail, a gym, community space and a loading dock, located within the ground floor of the southern precinct.

A two-level basement car park is also provided beneath the northern and central precincts which accommodates service vehicle parking for use by the occupants of the Southern precinct.

Additionally, there is a loading dock located within the northern precinct and the operation of this is outlined in the FSMP accompanying SSD DA 10440.

The key components of the development are shown in Figure 1.

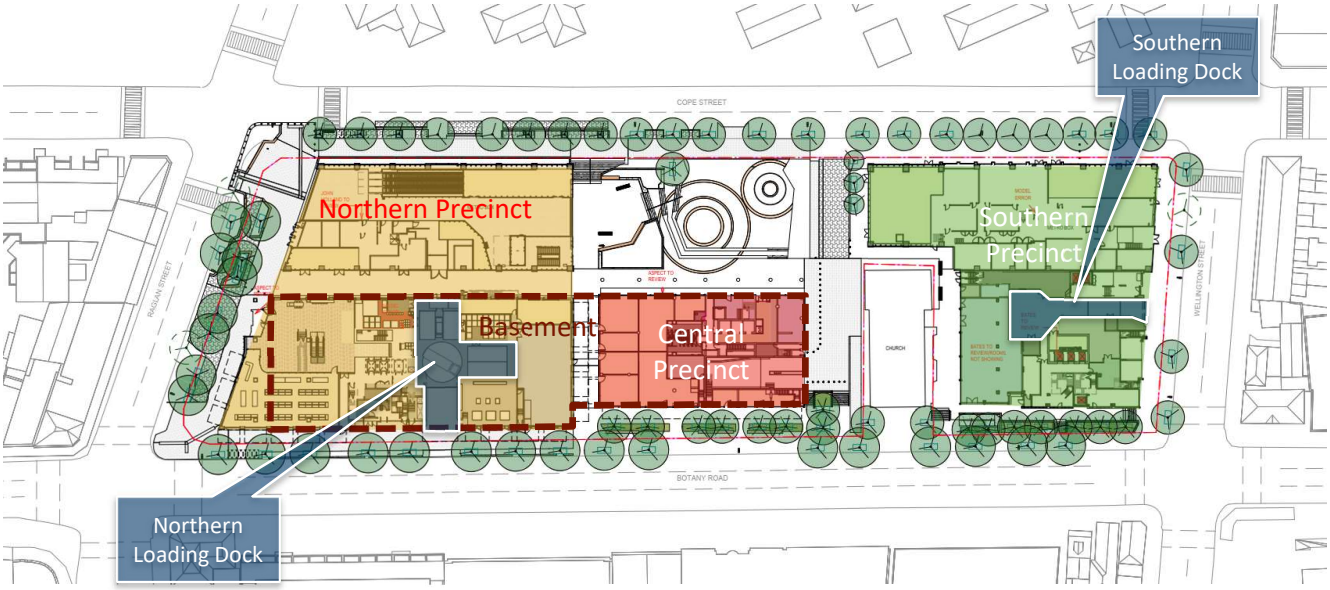


Figure 1 – Key Components of the Development

An overview of the Southern Precinct development is provided below:

User Type	Units / GFA
Southern Precinct – Residential (Social Housing)	70 Units
Southern Precinct – Residential (Student Accommodation)	435 Units (474 student beds)
Southern Precinct – Retail	1,273m^2 GFA

Table 1 – Summary of Development

3.2 Loading Docks and Service Vehicle Bays

As shown in Figure 1, the loading dock is located within the ground floor of the southern precinct and the basement car park is located beneath the northern and central precincts.

The loading dock is accessed from Wellington Street and the car park is accessed from Church Square as shown in Figure 3 and Figure 3.

Figure 2 – Vehicular Access to Southern Loading Dock

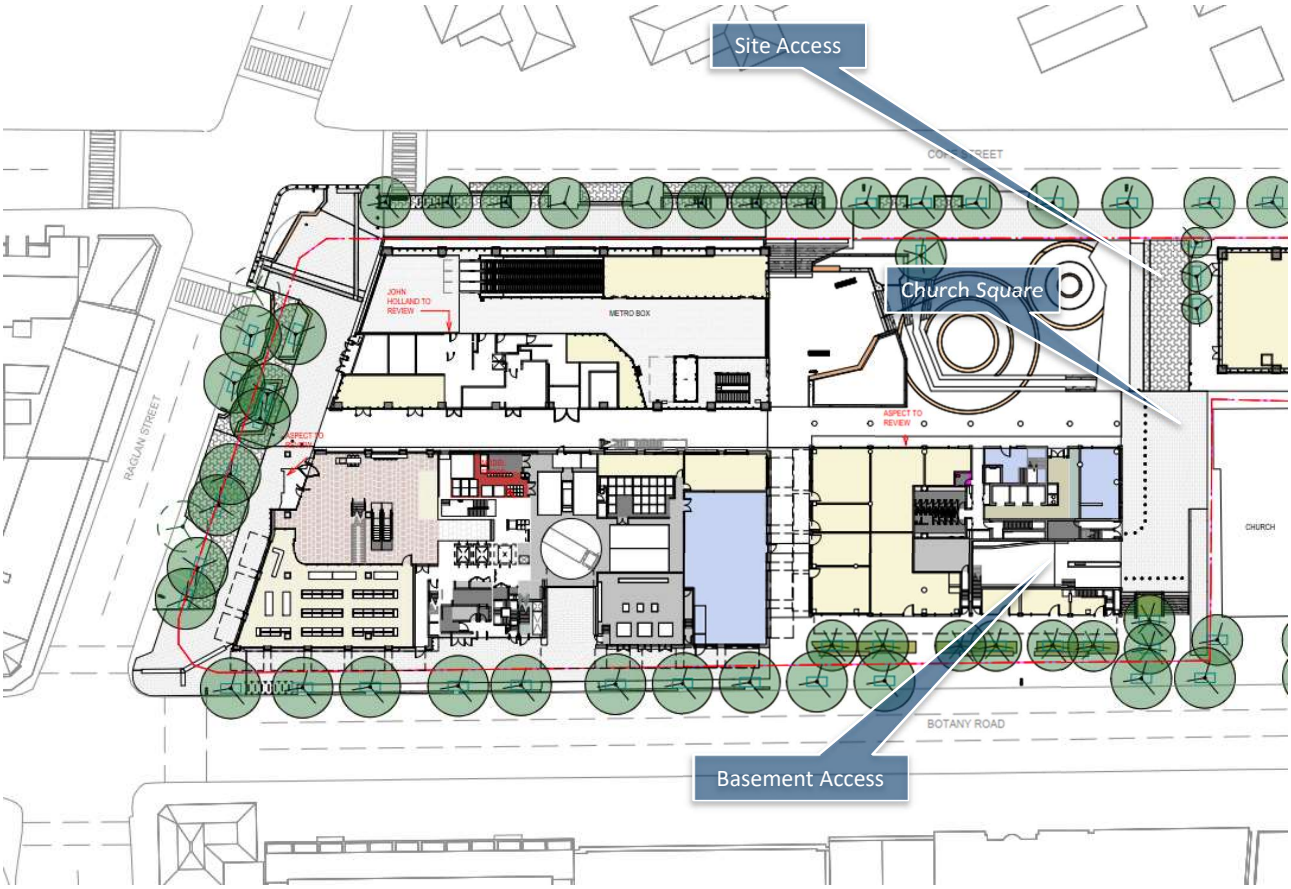


Figure 3 – Vehicular Access to Basement Car Park

3.2.1 The Southern Loading Dock

The southern loading dock consists of the following provisions:

- One 9.25m service bay (suitable for the City of Sydney waste collection vehicle)

Access to the loading dock is off Wellington Street via a 4.1 metre to 5.1 metre driveway and an internal 9.0 metre diameter turntable, which allows vehicles to enter and exit in a forward direction. The service bay is located on the turntable, which limits access to the dock to one vehicle at a time.

The Southern loading dock has a headroom clearance of 4.0 metres. The proposed headroom clearance of 4.0m is adequate for a standard 9.25m City of Sydney refuse collection vehicle, which requires a minimum headroom of 4.0m per the City of Sydney Guidelines for Waste Management in New Developments.

However, it is noted that AS2890.2 stipulates a minimum headroom clearance requirement of 4.5m for standard MRVs. Notwithstanding this, the proposed 4.0m headroom in the Southern loading dock would be able to accommodate service vehicles

up to 8.8m MRVs with a maximum body height of 3.7m (plus 300mm safety clearance to any overhead structures).

The layout of the southern loading dock is shown in Figure 4.

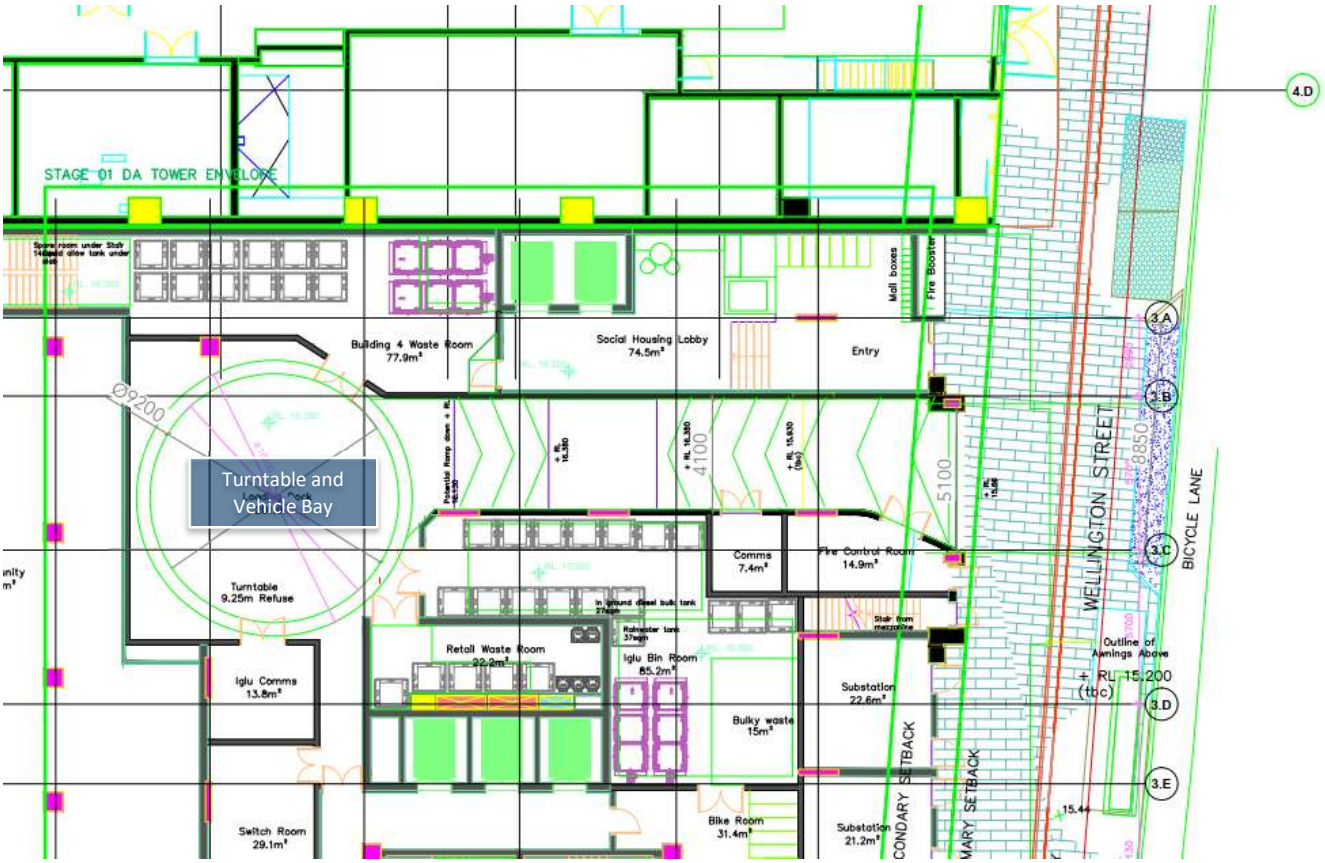


Figure 4 – Southern Loading Dock

3.2.2 Basement Service/Courier Bays

Within Level 1 of the basement car park (SSD-10438), five service/courier bays are provided, and these are located as shown in Figure 5.

The five bays are suitable for utes and car derived vans and are accessed from the Church Square via the 5.8 metre wide basement access ramp.

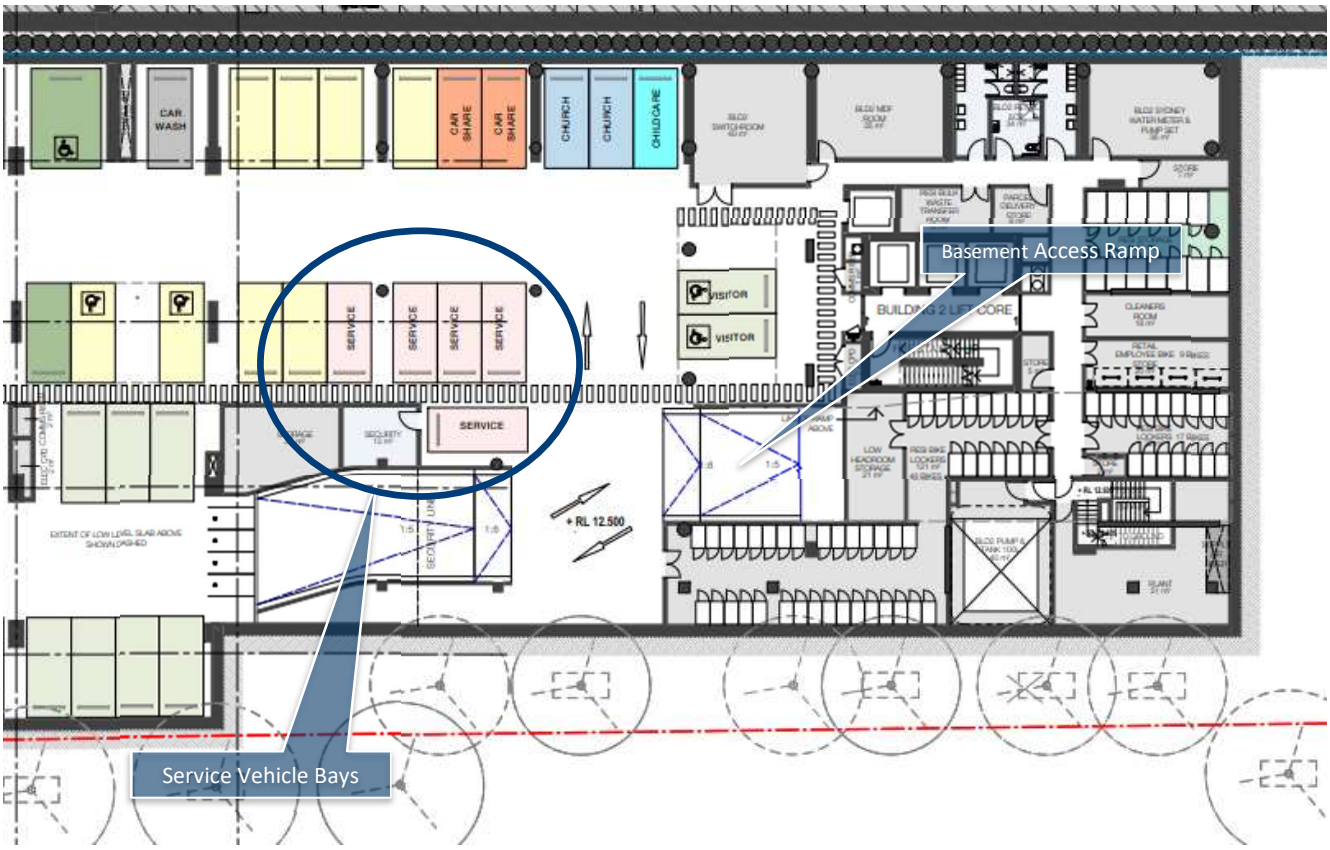


Figure 5 – Basement Service/Courier Bays

3.3 Purpose of the FSMP

The intent of the FSMP is to ensure that the users and management of the loading and service areas understand the operational procedures of the Loading Dock and Service Bays, and their responsibilities.

The overall objectives of these recommendations are as follows:

- Increase safety around the Loading Dock between all user groups;
- Maintain a high level of access and efficiency of the Loading Dock and Service Bay facilities
- Minimise disruption to surrounding road network;
- Reduce conflicting occupancy within the Loading Dock and Service Bays; and
- Outline the rules associated with the use of the Loading Dock and Service Bays.

4. Rules for Owners and Occupiers' using the Loading Dock and Service Bays

4.1 Users

The use of the loading docks and service bays are shared between the various tenants and residents of the Waterloo Metro Quarter and a summary of their requirements are outlined below.

4.1.1 Commercial and Retail Tenants

The commercial and retail tenants use of the loading docks and service vehicle bays is expected to be for maintenance, deliveries and waste collection and this is expected to be undertaken by a mix of utes/car derived vans, SRVs and MRVs, with waste collection undertaken by the City of Sydney 9.25m vehicle.

It is expected that waste collection will be undertaken two to three times a week and is assumed to be undertaken between 5am and 7am on weekdays (to be confirmed).

Maintenance and delivery activity would be predominately undertaken in general office hours (7am to 10pm) and the vehicle size and frequency would depend on the operations of the tenant.

4.1.2 Residential

Residential occupiers and tenants would utilise the loading dock and service bays for maintenance, removalists and waste collection and similar to the commercial tenants, it is expected that waste collection will be undertaken two to three times a week and is assumed to be undertaken between 5am and 7am on weekdays (to be confirmed).

Removalist activity would be restricted to weekends, with maintenance being undertaken on an ad hoc basis as required.

4.2 Appointments

- The Loading Dock will be available for the use by the Owners and Occupiers entitled to use the dock, by appointment only;
- Similarly, the Service Bays, within the basement car park, will be available for the use by the Owners and Occupiers entitled to use the bays, by appointment;
- Owners and Occupiers entitled to use the Loading Dock and Service Bays must only use these spaces during those times booked with a Building Manager;
- The Building Manager will be responsible for establishing and maintaining the booking schedule;
- For regular activities (at least once per week, such as refuse collection / retail deliveries), a regular time slot should be determined in coordination with the Managers and allocated within the booking system;

- It is anticipated that refuse collection will be required each day, with an additional weekly service for recycling. These services should be allocated a regular, fixed time slot, set during business off-peak periods, such as early mornings.
- Owners / Residents must be made aware of the loading dock regulations and booking system, as loading dock use will not be permitted for residents without appointment. Similarly, if engaging any general service providers that require use of the service parking bays in the basement, residents should still notify the Managers in advance to reserve parking, as access may be denied to these providers if no parking is available. This will be communicated in the Owner's Manual issued each resident upon moving in.
- Residents shall be encouraged to utilise smaller vehicles (B99 or smaller) for removalist activities. This will result in a reduction of loading dock usage as well as in more convenient positioning of the removalist vehicles in relation to the apartments. This will be communicated in the Owner's Manual issued each resident upon moving in.
- Bookings will be managed by an electronic 'app' based booking management system. This type of system allows the loading dock manager, tenants and vehicles using the dock to book in time slots and see in real time the availability of docks and bays for use. This would also allow tracking of vehicles on-route and allow for adjustments due to delays.
- Each individual bay would require a separate booking profile within the management app and regular timeslots for (waste collection etc.) would be allocated within the booking system. An example of the booking system is shown in Figure 6 and Figure 7.

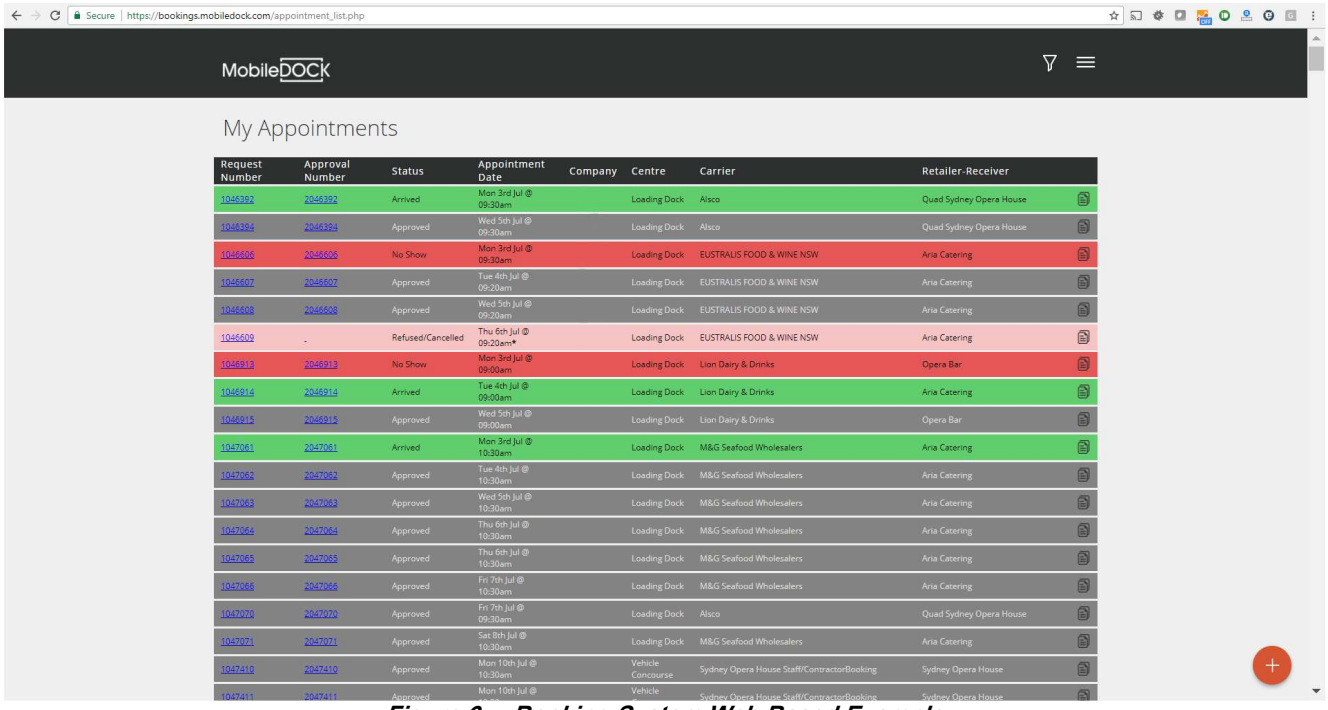


Figure 6 – Booking System Web Based Example
Source: Bestrane MobileDock™

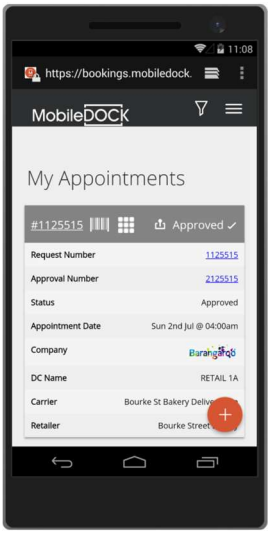


Figure 7 – Booking System, Mobile Based Example
Source: Bestrane MobileDock™

4.3 Management

The management of the Loading Dock shall be the responsibility of an appointed Building Manager.

The Building Manager shall be stationed within the student accommodation reception, during business hours to allow them to monitor and maintain the general operation of the Loading Dock and ground floor area. Outside of these hours the dock will be managed as and when required, in line with regular and scheduled appointments/deliveries. This includes, but is not limited to residential / commercial garbage collection, retail delivery / collection and removalist vehicle loading and unloading.

The Building Manager will also be responsible for the residential servicing requirements. This includes the supervision of removalist vehicle loading and unloading within the Loading Dock, as well as establishing and maintaining the booking schedule for the Service Bays.

As outlined in Section 4.2, an internet based management system is to be adopted to assist in this coordination.

The Loading Dock management office is located within the Loading Dock area. It is anticipated that the Loading Dock attendant and / or security guard will be positioned in the Loading Dock. A 24/7 security control room will be provided onsite and a guard will be positioned in the loading dock during peak operational times for the building. The site will be manned by 24/7 security who will assist with the management of the loading dock outside peak times.

The Loading Dock area will be under 24 hour CCTV surveillance.

- In addition to any standard managerial tasks, the Building Manager will be responsible for:
- Maintaining separate booking schedules for the use of the Loading Dock and Service Bays, and ensure all users have reasonable access respective to their needs, monitoring any changes in demand over time;

- Maintaining communications between each other, ensuring the needs of each building component is being satisfied;
- Ensure all equipment and traffic-control features (signage, line-marking, mirrors) are appropriately maintained and functioning;
- Ensure that the Loading Dock and Service Bays are being utilised in accordance with the procedures recommended within this FSMP;
- Keep a register of visitors to the Loading Dock area that will include vehicle details, contractor details and delivery details;
- Monitor major events or construction works in the local area, and plan services accordingly;
- Maintain the relevancy of the FSMP over time, updating it as required to maintain the principles of the FSMP stated in the previous section.

4.4 Times of Use

The Project requirements state that Metro must be provided 24/7 access:

'Provide access the Shared Loading Dock by the principal, the operator and retail tenants of the retail lot and all associated facilities 24 hours per day 7 days per week. The access may be provided partially as manned access and partially as an electronic management system to provide afterhours access'

Access to the dock would be generally restricted to waste collection vehicles between 10pm and 7am[1], to provide access for regular activities, with general access allowed between 7am and 10pm.

These restrictions are to be incorporated into the booking system and access outside of the dock opening hours (7am to 10pm) is to be managed by an electronic access system. It is noted that restriction times are indicative only and are to be confirmed prior to operation.

4.5 General Rules

All authorised users of the Loading Dock and Service Bays must obey the following general rules:

- Only use the Bay in accordance with this FSMP and any other rules determined by the Building Management Committee (BMC) from time to time;
- Adhere to the allocated time slot. The Manager has the right to terminate activities that overrun their allocated period, at their discretion. If the Manager perceives that the activity cannot be reasonably completed within the available time, they may refuse access;
- Use the Loading Dock only for garbage disposal, maintenance and deliver/collection purposes;
- Unauthorised personnel are strictly prohibited from entering the designated loading zone without supervision;
- The Loading Dock and Service Bays are strictly for the use of servicing the building. No vehicles are permitted to park within this area. No objects are to be stored in the Loading Dock and Service Bays or obstruct access to and from these areas;
- Only carry out the loading and unloading of goods wholly within the Loading Dock and Service Bay areas;
- Vehicles must be positioned within the designated areas to avoid obstructing other functions within the facility, unless specifically permitted otherwise by the Manager; and
- All hazards, accidents or 'near-misses' must be immediately reported to the relevant site personnel.
- All users of the loading dock must wear suitable PPE at all times;
- All vehicle must adhere to the 10 km/h speed limit within the loading dock and basement;

[1] Any time restrictions presented in this report are indicative only and are to be confirmed prior to operation of the loading dock

- All users must comply with requirements outlined in the 'Loading Dock Users Guide' (refer to Appendix 8.1)

If any damage to the Building occurs, the Building Manager or any person authorised by the Building Management Committee (BMC) may rectify such damage and the costs of carrying out such work may be a debt payable by the Owner or Occupier to the BMC.

4.6 Amendments

It may be necessary for Management to amend rules (either temporarily or permanently) and impose conditions in relation to the use of the Loading Dock and Service Bays, including:
The hours in which access is permitted;

- The manner in which large objects or deliveries to and from the Loading Dock are to be transported;
- Prohibitions on the use of trolleys or other moving devices;
- Insurance requirements; and
- Any other provisions which Management considers to be necessary.
- Provided that such rules and conditions will not adversely impact on the use and operation of the Lots.

In any case, the Management must not repeal this FSMP without the prior consent of Council.

5. Traffic Management of Loading Docks and Service Bays

5.1 Vehicular Access

Access to the Loading Dock has been designed to accommodate vehicles up to 9.25m in length (City of Sydney Refuse Vehicle) and the courier and service bays have been designed to accommodate utes / car derived vans.

5.1.1 Southern Loading Dock

The southern loading dock has a headroom clearance of 4.0 metres and a driveway width of 4.1 metres to 5.1 metres wide and therefore meets requirements of AS2890, for one way access and egress

A roller shutter is located at building frontage and shutter will be open during the peak hours of operation.

Vehicular access will be off Wellington Street and the driveway width allows singe vehicle access and egress.

Once in the loading dock, vehicles will proceed onto the turntable and the appropriately trained user will operate the turntable to rotate the vehicle.

Exiting vehicles will use the turntable in a similar manner.

Access and egress onto Wellington Street will be restricted to left in and left out.

The layout of the southern loading dock is shown in Figure 8.

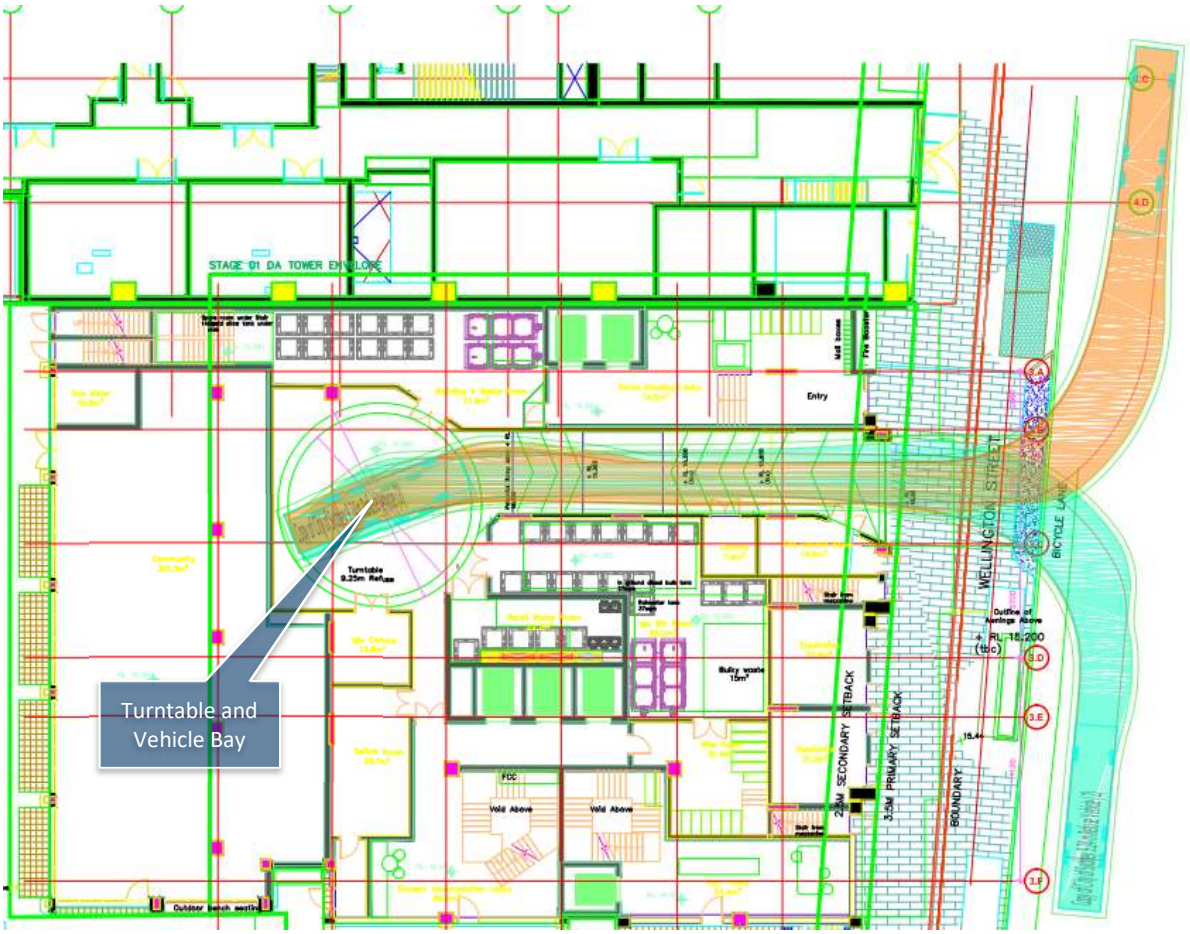


Figure 8 – Southern Loading Dock Layout

5.1.2 Service Bays – Basement 1

The basement car park as a headroom clearance of 2.2 metres and a driveway width of 5.8m and therefore meets requirements of AS2890.

A boom gate is located at the top of the access ramp, which will control access and egress to the basement car park, via an intercom back to the control room or dock manager.

Vehicular access will be off the Church Plaza and the driveway width allows an inbound vehicle to pass an outbound vehicle within the driveway.

Vehicles will enter the basement car park and turn right to access the service vehicles bays located as shown in Figure 9.

Exit from the service bays will be via the basement access ram and back onto the Church Square.

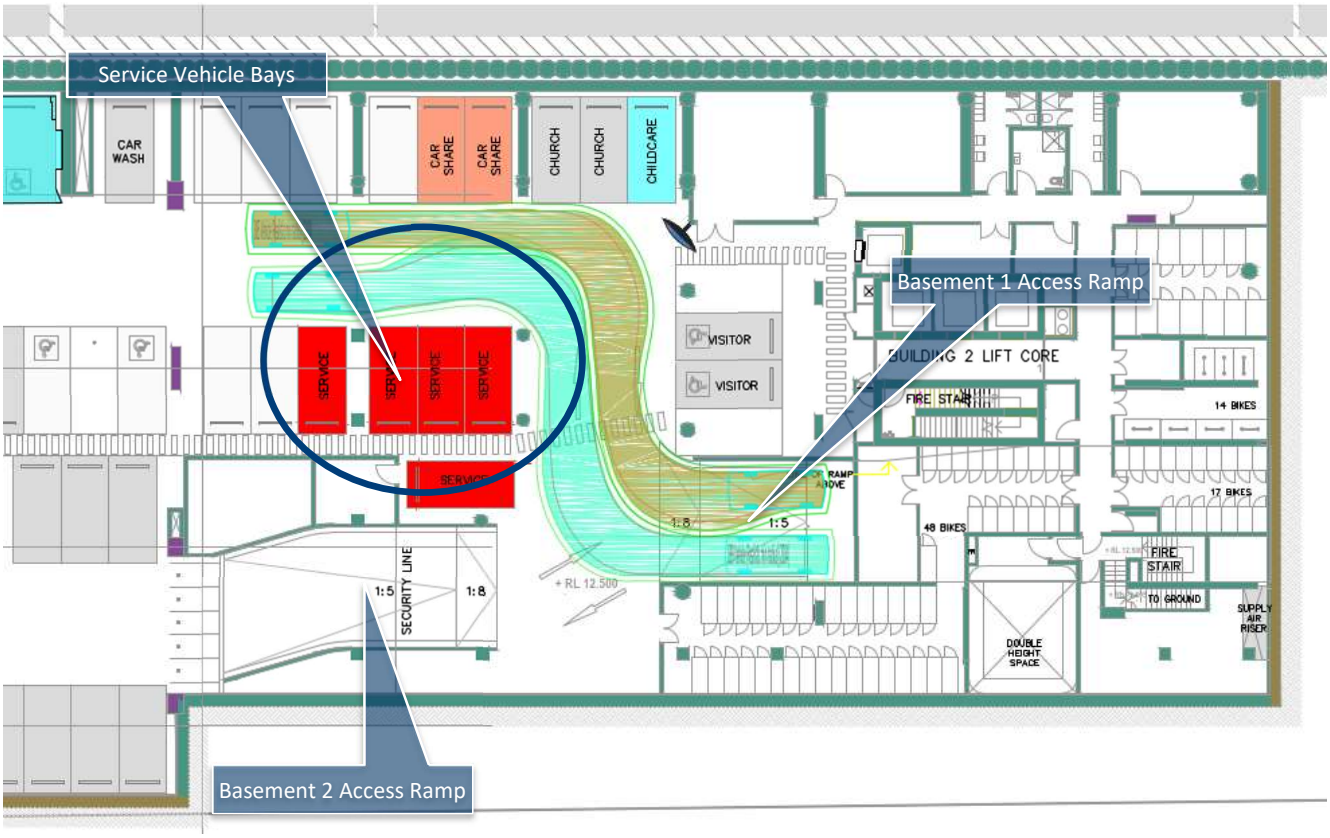


Figure 9 – Service Bay Layout

5.2 Use of Loading Docks and Service Bays

The loading dock and service bays are provided to service the various uses of the building. This involves but is not limited to:

- Deliveries to owners / occupiers / tenants;
- Refuse collection (general waste and recycling);
- Furniture removal / delivery;
- Maintenance services.

There are a number of different uses, therefore it is important that the traffic management rules set out are strictly enforced.

5.3 Loading Dock and Service Bay Operation

The Loading Dock Bays are generally used during the operating hours of the loading dock. 24/7 security will be provided onsite and will assist in managing the loading dock as required.

Access to the Loading Dock and the service bays is to be managed to ensure access / egress to the Service Bays is maintained and vehicles enter and exit the site in a forward direction. Each Service Bay is to be managed such that only one vehicle is permitted in each Service Bay at any one time.

Timed arrivals / departures will assist control access / egress to the Service Bays, to prevent:

- The attempted use of each Service Bay by two vehicles at the same time
- A vehicle being unable to access the Loading Dock because another vehicle is utilising the dock.
- An oversized vehicle attempting to use the vehicular ramp to access Basement 1.
- The following points are to be adopted to ensure single occupancy, efficiency and maintain safe access and egress to each dock or Service Bay.
- The docks and service bays will be limited to the use of a maximum vehicle size of a relevant to the specific dock or bay.
- Service Vehicles must park within the designated Service Bays.
- Refuse removal will involve the use of a typical refuse vehicle up to a length of 9.25 metres. All refuse collections are required to enter the car park during the times set out in the FSMP (or an agreed variation thereof) to minimise potential conflict with vehicle arrivals / departures.
- Use of the docks and service bays must be pre-booked with the Building Manager.

5.4 Loading Dock Bay and Service Bay Vehicle Limits

The following physical limits apply to the loading dock and service bay use:
The maximum vehicle size is limited to:

- 9.25m in length and 2.6m in width in the loading dock;
- 5.0m in length and 1.9m in width in courier/service bays.

The loading dock has a headroom restriction of 4.0m and the courier/service bays have a headroom restriction of 2.2m.

It is the responsibility of the Manager to inform users of these restrictions prior to confirmation of a booking.

6. Collection of Waste

6.1 Waste Collection

The process and responsibilities for the waste collection has been referenced from the Operational Waste Management Plans for SSD-10437 Southern Precinct, prepared by Elephants Foot Recycling Solutions.

6.1.1 Residential Waste

Residents will be supplied with a collection area in each unit to deposit waste suitable for two day's minimum storage and chutes are provided to transfer waste to the holding room in the basement.

The building manager is responsible for the transportation of bins and bulky waste from the respective holding rooms to the collection area prior to scheduled collection times, and returning them once emptied to resume operational use.

All residential waste generated by this development will be collected by Council with garbage being collected twice weekly and recycling on a weekly basis.

Bins are to be serviced directly from the residential waste holding room. Once all bins have been serviced, the vehicle will leave the site in a forward-facing direction.

6.1.2 Retail Waste

Tenants will be responsible for their own storage of general waste, food waste and recycling back of house (BOH) during daily operations. On completion of each trading day or as required, nominated retail staff or cleaners will transport their general waste, food waste and recycling to the portable general waste compactor and retail/commercial waste and recycling room to place into the appropriate collection bins.

Private waste contractors will collect waste from the retail facilities.

6.1.3 Commercial Waste

Contract cleaners will circulate around the workplace after normal office hours and perform cleaning tasks. At this time the cleaners will collect bagged waste and recyclables from each bin, within their cleaning carts.

The cleaners will be responsible for transporting waste to the portable general waste compactor and recycling to the commercial/retail waste and recycling room, placing items into appropriate bins or baler.

Private waste contractors will collect waste from the commercial facilities.

6.2 Collection Area

A rear-loading collection vehicle will be used to service this development.

The collection vehicle (and other trucks if required) can enter and exit the building in a forward direction. The final number of truck movements will depend on management of waste contract and the final configuration of waste.

All waste collection vehicle will access the site from Wellington Street as outlined in Section 5.

6.3 General

To ensure the proper management and disposal of waste, tenants must be made aware of the following practices:

- All garbage should be bagged and garbage bins should be plastic lined;
- Bagging of recyclables is not permitted;
- All interim waste storage is located BOH during operations;
- Individual recycling programs are recommended for retailers to ensure commingled recycling is correctly separated;
- Any food and beverage tenant will make arrangements for storing used and unused cooking oil in a bunded storage area;
- The operator or building management will organise grease interceptor trap servicing;
- A suitable storage area is provided and effectively bunded for chemicals, pesticides and cleaning products;
- Dry basket arrestors need to be provided to the floor wastes in the food preparation and waste storage areas; and
- All flattened cardboard will be collected and removed to the waste room recycling bins.

7. Other Considerations

7.1 Pedestrian Safety

Only authorised users shall be allowed within the Loading Dock area and will be required to wear high visibility safety gear at all times.

The entry shutter will be equipped with visual strobe lighting to warn pedestrians when the Loading Dock shutter is opening.

All vehicles must enter and exit the Loading Dock in a forward direction.

7.2 Cleanliness

The Loading Dock and Service Bays must be maintained in a clean condition. The cleaning up is the responsibility of the Occupier / Owner using the Loading Dock / Service Bays. If cleaning staff are required to clean up after the delivery of goods, the delivery company or the Occupier will be charged.

No goods or rubbish are to be left in the Loading Dock or Service Bays without approval from the managers. If goods or rubbish are left in these areas without approval, they will be removed from the area at the delivery company's or Occupier's / Owner's expense.

7.3 Maintenance

Stakeholders are expected to communicate with the Loading Dock attendant on issues that may impact on other Stakeholders and impact on the operation of the Loading Dock. Any matter relating to the cleaning or servicing of the onsite equipment needs to be communicated to the Loading Dock attendant so that access and alternative arrangements, where required, can be made.

All requests for maintenance for the Loading Dock should be placed to the appropriate manager.

8. Annexure

8.1 Annexure 1 – Loading Dock User Guide

Deliveries and collections

All deliveries and collections must book in a time slot via the loading dock booking app and any vehicle without an allocated slot will be refused access.

Place Holder

All vehicles must access the allocated dock/bay via the relevant access point (see map).

All deliveries and collections must report to Loading Dock staff for instructions.

1. Proceed to the turntable and reverse into allocated loading dock/bay.

2. Follow all guidance and instructions from Loading Dock staff during these manoeuvres.

3. A vehicle must not manoeuvre into or out of a loading bay if the adjacent bay has someone working at a vehicle.

Once parked, all drivers are to:

• Prepare their vehicle for loading / unloading;

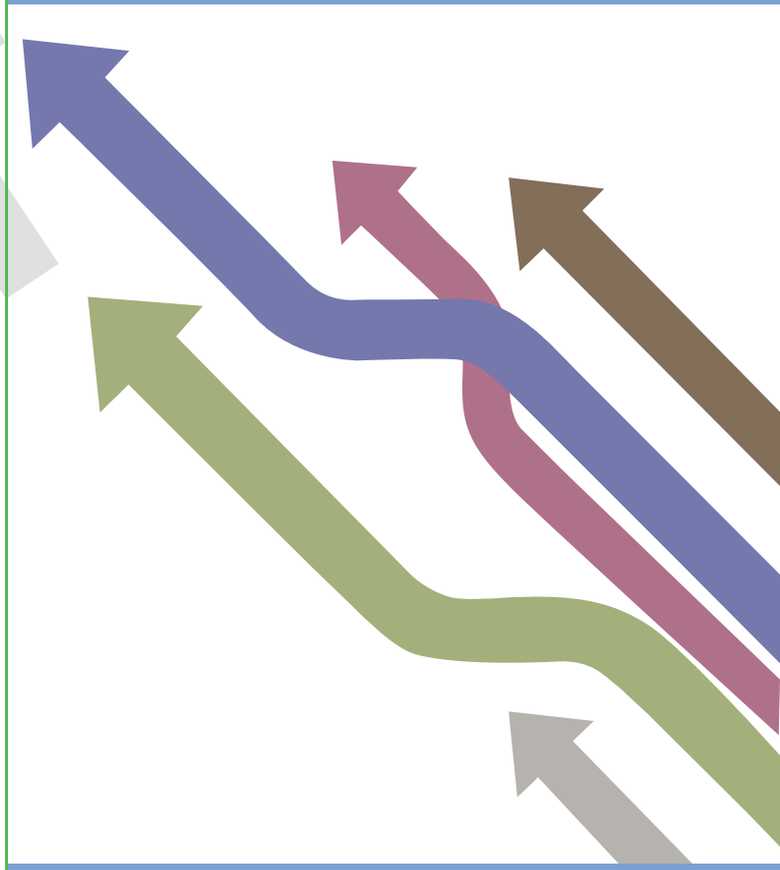
• Switch off their engine.

Incidents and emergencies

All incidents, near misses, hazards, faults, building or equipment damage must be reported to the Loading Dock Manager.

An audible and visual warning system will alert everyone within the building to an emergency and all users must follow instructions from the Loading Dock Manager.

Waterloo Metro Quarter



Loading Dock Users Information Sheet

Pedestrian regulations

1. ALL first-time users of the site must report to the Loading Dock Manager's Office for a Site Induction.

2. All staff must complete the online Loading Dock Induction.

3. All pedestrians are to travel along the designated pathways and crossings (painted, fenced etc).

4. Use of personal devices (mobile phones, tablets, Ipods etc) within the Loading Dock is strictly prohibited when driving and also when walking within the Dock.

5. All visitors and staff must wear appropriate PPE (e.g. vest and protective shoes) whilst in the loading dock. Vests will be provided if required.

Driver regulations

1. Drivers must obey all instructions from Loading Dock staff.

2. A speed limit of 10km/h applies to all vehicles.

3. All drivers must STOP at the entry to the Loading Dock.

4. All drivers are to adhere to the internal road rules of the site, dictated by the road signage and pavement/line markings.

5. Park / load / unload in marked bays only.

6. Vehicles must give way to pedestrians.

7. If approaching a forklift in operation, STOP and wait until the forklift has either left the general area, or has been switched off.