



## 600-660 Elizabeth Street

Land and Housing Corporation

Traffic Impact Assessment

Final Report | 1

26 February 2020



## 600-660 Elizabeth Street

Project No: IA180700  
 Document Title: Traffic Impact Assessment  
 Document No.: Final Report  
 Revision: 1  
 Date: 26 February 2020  
 Client Name: Land and Housing Corporation  
 Client No: -  
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 File Name: J:\IE\Projects\04\_Eastern\IA180700\02 Documents\Traffic Impact Assessment\Traffic Impact Assessment - 600 Elizabeth Street (final).docx

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### Document history and status

Revision	Date	Description	By	Review	Approved
0	08/03/2019	Draft Report	RB	SR	SR
1	22/03/2019	Draft Report – Response to comments	RB	SR	SR
2	12/06/2019	Draft Report incorporating reference design	RB	PT	PT
3	09/08/2019	Draft Report – Response to additional comments	RB	SR	SR
4	26/02/2020	Final Report – Update to City of Sydney planning pathway	MM	CM	CM

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## Executive summary

### Background

Jacobs (Group) Australia Pty Ltd has been commissioned by the Land and Housing Corporation (LAHC) to undertake a traffic and transport impact assessment for the proposed development at 600-660 Elizabeth Street in Redfern.

This report describes the proposal and provides an assessment of the existing traffic and transport environment and the impact of the proposed development on the traffic and transport network. The assessment was completed under the traffic and transport study requirements for the SSP that was prepared by the Department of Planning and Environment with the City of Sydney and in consultation with relevant State agencies. The report has been updated to conform with the City of Sydney Planning Proposal Lodgement Checklist and to incorporate the change in the floor space ratio and dwelling number requested by Council to reduce the height of the buildings and impact on the surroundings.

### The proposal

On 6 July 2018, the NSW Government announced the Redfern site as the pilot for Communities Plus build-to-rent. The project provides an opportunity for the private sector, in partnership with the not-for-profit sector, to fund, design, develop and manage the buildings as rental accommodation under a long-term lease.

The project was prepared to formulate and assess a suitable suite of planning controls to guide the redevelopment of the Redfern site. A design, technical analysis and consultation process was undertaken to prepare a reference scheme which indicates how the future public domain, building form and connections could be delivered. The reference scheme balances the challenges and opportunities of the site, particularly the desire to deliver high-quality urban design while providing new and modern social housing in an integrated mixed tenure environment.

The proposed planning framework has regard to:

- Accessibility and connectivity of the Redfern site to public transport, employment, shops, education and other services,
- The site and local area's rich history and cultural significance,
- The surrounding urban form and context, and
- Environmental and servicing considerations, including flooding, stormwater, traffic, utilities, noise, air quality and wind.

As the planning and approving authority, the City of Sydney has requested several design changes to the planning proposal to be made. They are described as below:

- A maximum Floor Space Ratio (FSR) of 2.75:1 that may be exceeded by 10% to 3.025 subject to adoption of Council's design competition bonus. The additional FSR is not subject of this application and will be dealt with at a future DA stage.
- Buildings with a predominant height of 5-7 storeys on Elizabeth Street and 5-6 storeys on Walker Street with a single tower up to 14 storeys at the corner of Walker and Kettle Street
- New public spaces on Kettle and Phillip Streets activated by shops, cafes, community space and other services
- Some supporting retail and communal floor space to support the incoming population.

### Traffic impact assessment

Key findings of the traffic and transport impact assessment of the reference scheme are:

- Access is to be provided on Walker Street as it will have the least impact on the road network.

- Parking provision for most modes is consistent with Category B rates defined in Sydney LEP 2012 and should be as follows:
  - 200 parking spaces (maximum) for residents, 10 of which are accessible parking spaces
  - 360 parking spaces (minimum) for bicycles
  - 8 parking spaces (minimum) for service vehicles
  - 17 parking spaces (minimum) for motorcycles
  - 3 car share parking spaces
- Car share parking spaces would need to be accessible to the general public, and service vehicle bays would need to be accessible for City of Sydney's standard garbage trucks.
- Provision of an access driveway for the development on Walker Street and closing Kettle Street west of Walker Street to traffic to accommodate a public square would result in the loss of around 14 on-street parking spaces, including two disabled parking spaces. Opportunities to off-set these lost parking spaces should be investigated as the project progresses to a final design.
- Key intersections surrounding the site would continue to operate at an acceptable level.
- Bus and train services accessible from the development are currently operating close to or at capacity. The additional public transport trips generated by the development would be less than 40 trips for work related trips in the AM peak hour. With the future Waterloo Station and potential extension of Sydney Metro West to Zetland public transport capacity in this area would be significantly enhanced.
- Pedestrian and cycle activity surrounding the site would increase. Pedestrian and cyclist amenity would improve on Kettle Street due to its upgrade to a public square. This would improve pedestrian and cyclist safety, improve a key pedestrian desire line to and from Redfern Oval, and activate the area by making it more appealing, thereby promoting more active travel, a key objective of the Liveable Green Network. There are opportunities to improve amenity along Elizabeth Street, Walker Street and Phillip Street through landscaping and tree planting.
- During construction, access to the site would be from Kettle Street or Walker Street to reduce potential conflict between construction vehicles and general traffic on Elizabeth and Philip street which have more restrictive frontage due to higher volume of traffic and activities. The implementation of work zones on these streets would also reduce the amount of on-street parking.
- A Transport Access Guide would be developed during the Development Application stage.

## 1. Introduction

### 1.1 Background

Jacobs (Group) Australia Pty Ltd has been commissioned by the Land and Housing Corporation (LHC) to undertake a traffic and transport impact assessment for the proposed development at 600-660 Elizabeth Street in Redfern. The site was nominated as a State Significant Precinct (SSP) in January 2018 and design process commenced based on the Department of Planning guidelines. In November 2019 the Minister of Planning and Public Spaces declared that the Redfern project would change from a State Significant Precinct (SSP) planning pathway to a Council led Planning Proposal pathway. It should be noted that the requirements from the SSP pathway are still relevant and the study has been augmented to conform with City of Sydney Planning Proposal checklist.

This report describes the proposal and provides an assessment of the existing traffic and transport environment and the impact of the proposed development on the traffic and transport network based on Council's Planning Proposal's checklist.

### 1.2 Study area

The site is located at 600-660 Elizabeth Street in Redfern and is bound by Elizabeth Street, Phillip Street, Walker Street and Kettle Street. The site currently consists of mostly vacant land with the exception of a Police Citizens Youth Club (PCYC) located at the south western corner of the site. Figure 1-1 shows the location of the site and the surrounding area.

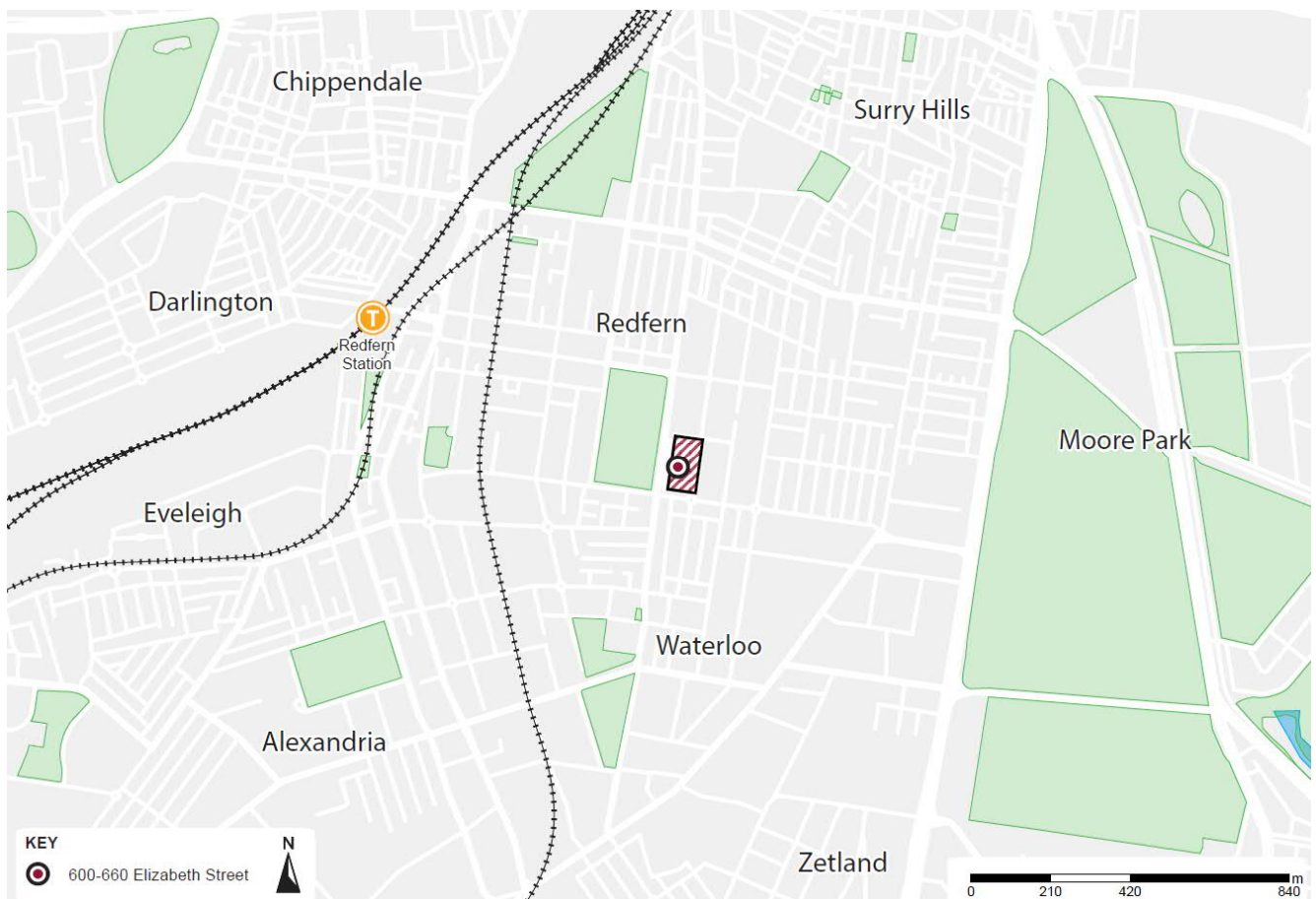


Figure 1-1: Site location

### 1.3 Assumptions and limitations

A number of assumptions were made to complete the traffic impact assessment including engineering judgement and consultation with LAHC. There are also a number of limitations encountered due to the concept nature of the proposed development. These assumptions and limitations include:

- Intersection were modelled using Sidra intersection program to assess the performance of the surrounding intersections and the local roads. These intersections were assessed in isolation rather than as a network as their spacing and no observed queue spill did not necessitate modelling the intersections as a network.
- Category B rates from the City of Sydney's Local Environmental Plan 2012 (LEP) have been adopted to determine the number of off-street car parking spaces required.
- Assessment of a reference scheme, with refinement as the project progresses to a final design.
- Most of the City of Sydney's Development Control Plan (DCP) 2012 and Council's Planning Proposal requirements for a Transport Impact Study have been addressed, with the development of a Transport Access Guide to be completed during the Development Application Stage of the proposal.

### 1.4 Study requirements

The NSW Department of Planning and Environment (DPE) issued study requirements for the project in January 2018. This report addresses all requirements of Item 9 of the DPE and the City of Sydney Planning Proposal checklist which are described in Table 1-1.

Table 1-1: City of Sydney Planning Proposal Checklist

Study requirement	Where addressed
<b>Traffic and Transport</b> Prepare a transport impact assessment to understand the transport network context, service and network limitations. The assessment should include <ul style="list-style-type: none"> <li>• existing and future land use and transport context</li> <li>• Public transport routes and services</li> <li>• Cycling routes and bicycle parking</li> <li>• Pedestrian networks and distribution</li> <li>• Sustainable transport options and initiatives</li> </ul>	2.1 & 2.4 2.2 2.3 & 3.2 2.3 2.1
The current mode share of the site and future mode share target	4.1
Access to key destinations, trip generators and infrastructure in the local area	3.3, 3.4 & 4.1
Performance of the existing and future cycling, public transport and road network surrounding the precinct	2.1, 4.3, 4.4
Trip generation potential associated with the proposal, with reference to existing trip generation of uses on the site	4.1
Consideration for cumulative growth of the surrounding area based on committed and planned developments and proposed infrastructure	4.0
Anticipated loading and servicing demands associated with the proposal, with recommended on-site service vehicle parking rates and loading zone capacity to enable the development to meet all servicing needs without on-street parking (whether in line with or beyond the requirements of DCP Section 7.8)	3.6
An assessment of the impact of additional travel demands (across all modes) on the transport network serving the site, using benchmarks from existing development sites of a similar scale and geographic context	4.1 & 4.2



Study requirement	Where addressed
SIDRA intersection models to demonstrate the safe operation and functionality of key intersections	2.1 & 4.1
Consideration of the role of shared vehicles in managing travel demand and provide recommendations for implementation of shared vehicle solutions	2.1 & 3.2
Recommended parking rates to result in no net additional traffic impact on the local road network	3.2 & 4.2
Identification of current and planned cycling routes identified in the City of Sydney Cycling Strategy and Action Plan 2018-2030, with recommendations for building access that will maximise easy connections for cyclists and avoid conflicts with vehicles	2.3 & 4.4

## 1.5 Report structure

The remainder of this report is structured as follows:

- Chapter 2: Describes existing conditions of the study area and includes the road network, public transport, active transport and land use and traffic generation.
- Chapter 3: Provides a description of the proposed development.
- Chapter 4: Assesses the traffic and transport impacts of the proposed development during construction and operation of the project.
- Chapter 5: Presents a summary and conclusion of the traffic impact assessment.

## 2. Existing conditions

### 2.1 Road network

#### 2.1.1 Arterial road network

The broader study area is surrounded by arterial roads that operate close to capacity. These include the M1 Eastern Distributor, Cleveland Street, Botany Road and Bourke Street.

- The M1 Eastern Distributor is a motorway that is part of the Sydney Orbital Network and provides access to Sydney CBD and North Sydney to the north and Sydney Airport to the south. The road is currently tolled for southbound traffic only. Access for northbound traffic is via an entry ramp north of Cleveland Street from South Dowling Street. Southbound access is available south of O'Dea Avenue. Exit ramps are provided for northbound traffic at O'Dea Avenue and southbound at Lachlan Street.
- Cleveland Street is an arterial road north of the site that links City Road to Anzac Parade. There are generally two lanes in each direction. Cleveland Street provides access between the inner west suburbs and eastern suburbs and bypasses the Sydney CBD. The number of buses and right turns along Cleveland Street often causes high delays in the peak periods.
- Botany Road is an arterial road that connects the Sydney CBD to Green Square, Rosebery, Botany and Sydney Airport. It is generally two lanes in each direction with clearways during the peak periods.
- Bourke Street is a collector road that runs north-south and crosses Botany Road to become Bourke Road. There are separated cycleways north of Phillip Street. Traffic congestion is common around Lachlan Street where traffic accesses the M1 Eastern Distributor and the Eastern Suburbs.

#### 2.1.2 Local road network

The site is bound by Kettle Street, Walker Street, Phillip Street and Elizabeth Street. The street network is generally a grid network; however, Kettle Street and Walker Street are closed where they meet Elizabeth Street and Phillip Street, respectively. This has reduced the volume of through traffic and restricts Kettle Street and Walker Street to local access only, making them suitable for cycling and walking.

The character of the local streets surrounding the site are:

- Walker Street is a local road that runs from Cleveland Street to Wellington Street. It is generally restricted to local traffic with low traffic volumes.
- Kettle Street is a local road that connects Morehead Street to Walker Street.
- Elizabeth Street functions as a sub-arterial road that bifurcates north of Redfern Street to form a one-way pair with Chalmers Street. North of Phillip Street, there are three lanes in each direction with a provision of kerbside parking. South of Phillip Street, there are two lanes in each direction with a provision of kerbside parking.
- Phillip Street is a collector road that links Cope Street to Bourke Street. Phillip Street becomes a shared zone for one-way traffic west of Cleveland Street.

The local road network surrounding the proposed development is shown in Figure 2-1.



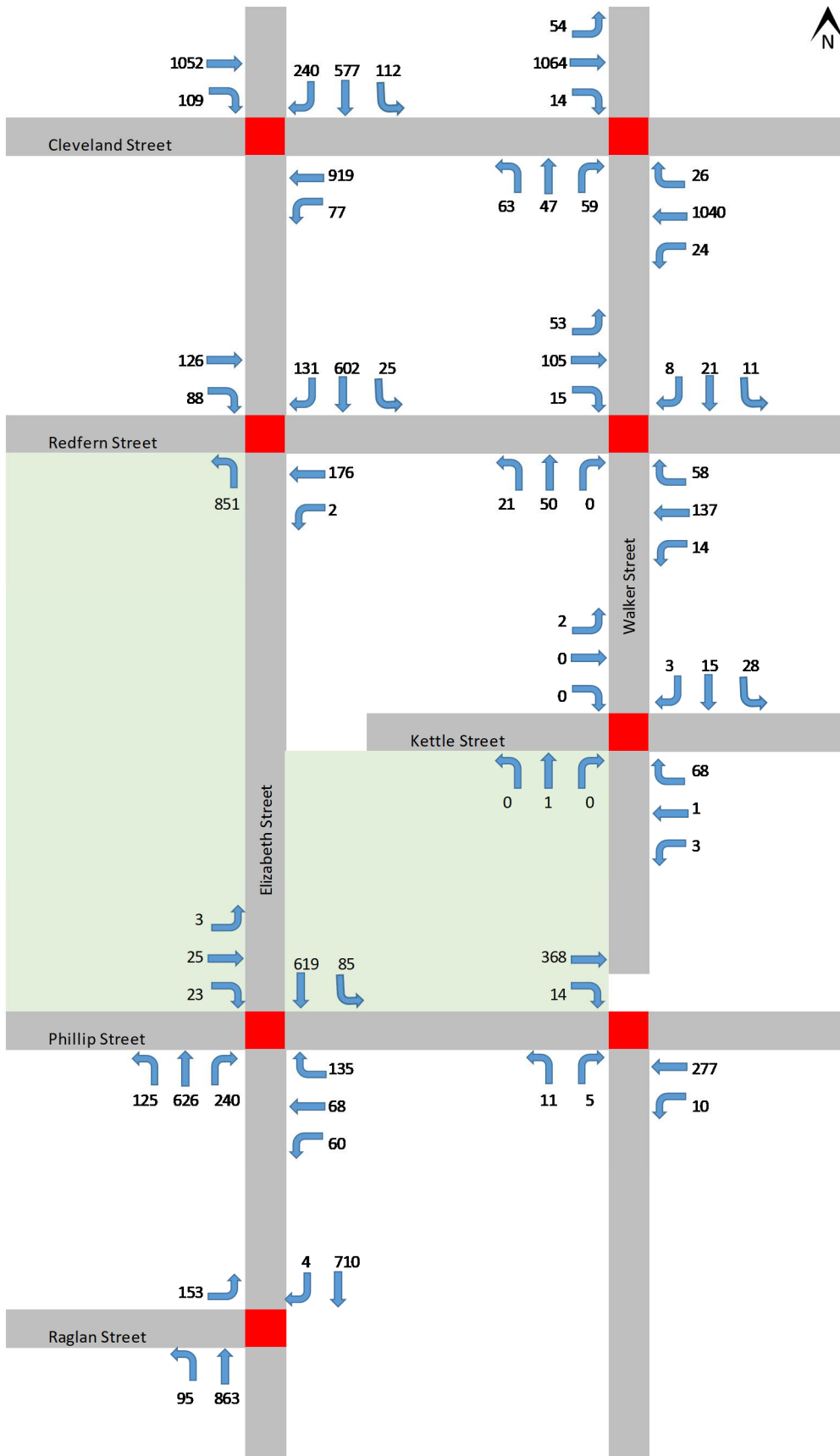


Figure 2-2: Morning peak hour turning movement volumes

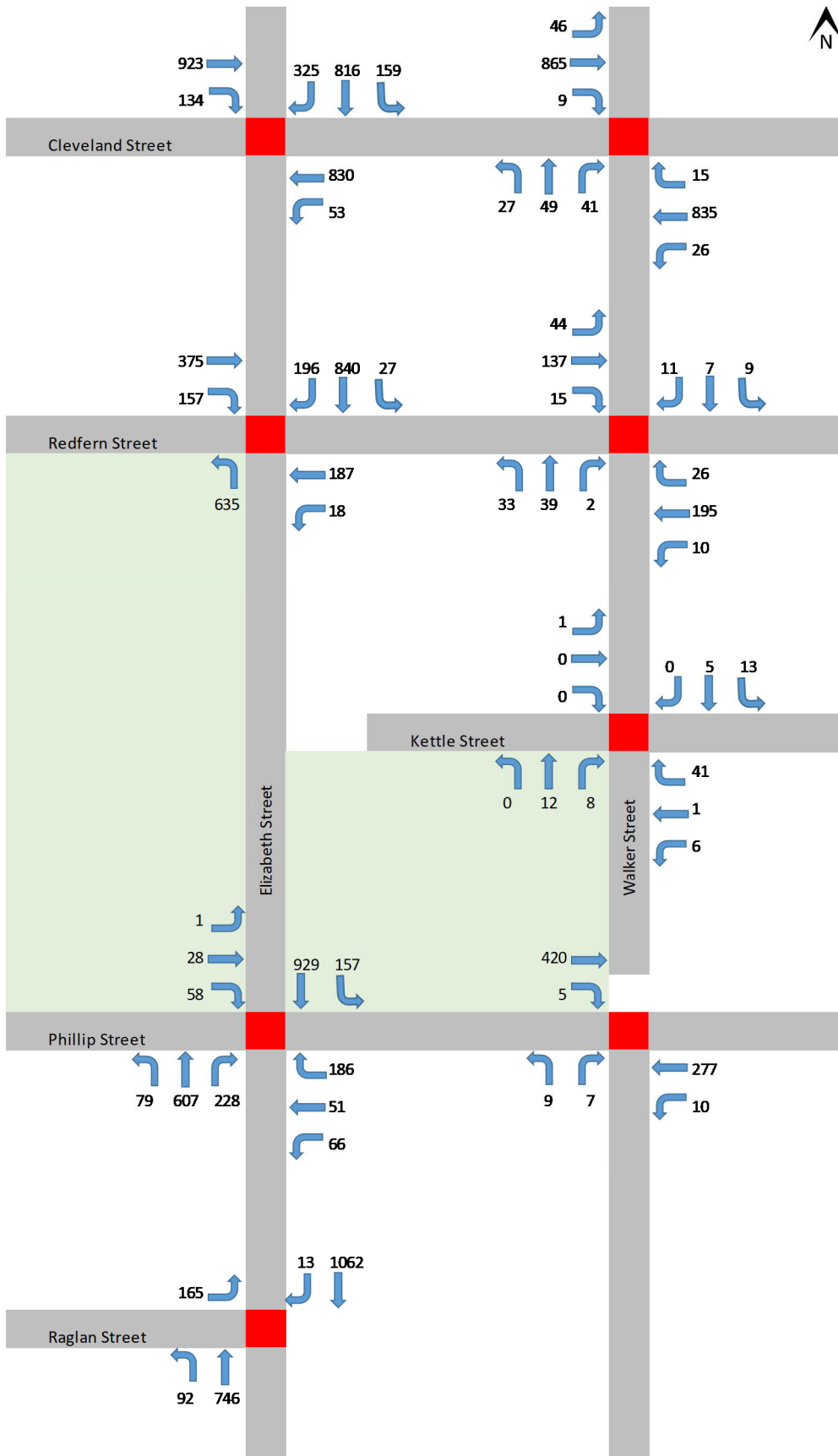


Figure 2-3: Evening peak hour turning movement volumes

### 2.1.4 Intersection performance

The assessment of intersection performance is based on criteria outlined and defined in the *Guide to Traffic Generating Developments* (Roads and Traffic Authority 2002). The average delay assessed for signalised intersections is for all movements, and for priority (sign-controlled) intersections is for the worst movement and is expressed in seconds per vehicle. Table 2-1 shows the criteria adopted for the intersection performance assessment.

Table 2-1: Intersection performance criteria

Level of Service	Average delay per vehicles (seconds per vehicle)	Traffic signals and roundabouts	Give-way and stop sign
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity, and accident study required
E	57 to 70	At capacity; at signals, incidents will cause delays. Roundabouts require other control mode.	At capacity, required other control mode
F	Over 70	Extra capacity required	Extreme delay, traffic signal or other major treatment required

Source: *Guide to Traffic Generating Developments* (RMS, version 2.2, 2002)

Key intersections were modelled using *Sidra Intersection* modelling software. *Sidra Intersection* is a micro-analytical tool for evaluation of intersection performance in terms of capacity, degree of saturation, level of service, average delay and queue length, and is an appropriate tool for modelling individual intersections. The intersections assessed are:

- Cleveland Street / Elizabeth Street
- Elizabeth Street / Redfern Street
- Elizabeth Street / Phillip Street
- Phillip Street / Walker Street
- Walker Street / Cleveland Street
- Walker Street / Redfern Street
- Walker Street / Kettle Street

The performance of these intersections based on the Sidra modelling is shown in Table 2-2. The modelled intersection layouts and Sidra outputs for the base models are provided in Appendix A and Appendix B.

Table 2-2: Existing intersection performance

Intersection	Period	Degree of Saturation	Average delay (seconds per vehicle)	Level of Service
Cleveland Street / Elizabeth Street	Morning peak hour	0.68	33	C
	Evening peak hour	0.68	35	C
Elizabeth Street / Redfern Street	Morning peak hour	0.53	26	B
	Evening peak hour	0.52	29	C
Elizabeth Street / Phillip Street	Morning peak hour	0.72	28	B
	Evening peak hour	0.83	29	C
Phillip Street / Walker Street	Morning peak hour	0.24	8	A
	Evening peak hour	0.27	8	A
Walker Street / Cleveland Street	Morning peak hour	0.45	11	A
	Evening peak hour	0.35	9	A
Walker Street / Redfern Street	Morning peak hour	0.12	9	A
	Evening peak hour	0.12	10	A
Walker Street / Kettle Street	Morning peak hour	0.07	5	A
	Evening peak hour	0.04	5	A

The results indicate that the road network within the immediate vicinity of the site are operating at Level of Service C or better. This aligns with the on-site observations of short delays and queue lengths. The existing surrounding network appears to have spare capacity to accommodate additional post-development traffic demands.

### 2.1.5 Car share

There are currently a number of car share ‘pods’ available within walking distance of the site. There are 10 cars within a 400-metre radius of the site. The location of GoGet share cars is shown in Figure 2-4. Provision of off-street car share spaces is also part of the City for Sydney’s policy with the LEP and DCP. Car share spaces are located in areas accessible to the general public.

Car share usage (number of trips per car share bay) increases when car share cars are located in a dedicated on-street parking space or in public places. Car share members generally walk approximately 50 to 100 metres to a car share pod, highlighting the need or desire to locate car share pods within close proximity to users.

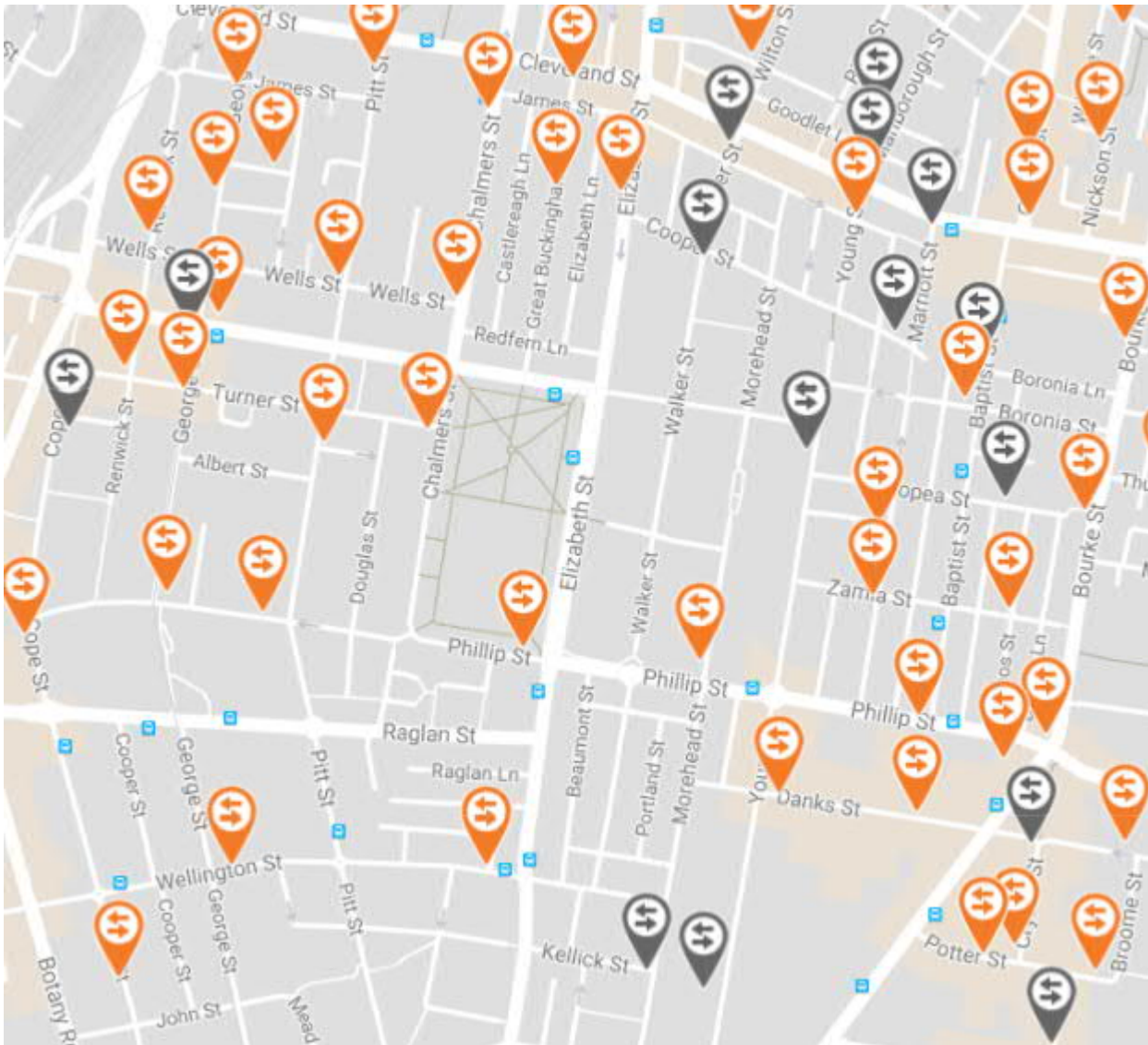


Figure 2-4: Car share locations

## 2.2 Public transport network

### 2.2.1 Bus network

The site has excellent access to buses with bus stops located on Elizabeth Street and Phillip Street, adjacent to the site. There is a midblock pedestrian crossing linking the site to citybound buses operating on Elizabeth Street. The bus services which cover both north-south and east-west routes include:

- M20 – Gore Hill to Botany
- 301 – Eastgardens to Redfern via Mascot
- 302 – Eastgardens to Redfern via Kingsford
- 303 – San Souci to Redfern via Mascot
- 343 – Chatswood to Kingsford
- 355 – Marrickville Metro to Bondi Junction via Moore Park

These buses operate at relatively high frequencies during peak and inter-peak periods. The indicative bus service frequencies in each direction are shown in Table 2-3.



Table 2-3: Bus service frequencies

Bus route	Morning peak	Inter-peak	Evening peak	Evening
M20	<10 minutes	15 minutes	<10 minutes	20 minutes
301	30 minutes	30 minutes	15 minutes	30 minutes
302, 303	15 minutes	30 minutes	20 minutes	30 minutes
343	<10 minutes	10 minutes	<10 minutes	10 minutes
355	30 minutes	30 minutes	30 minutes	30 minutes

Bus routes 310X and X93 also travel within the study area along Elizabeth Street. These are express services that only operate during the morning and evening weekday peak periods and do not pick-up or drop off passengers between Green Square Station and Central Station. Figure 2-5 shows the bus network surrounding the site.

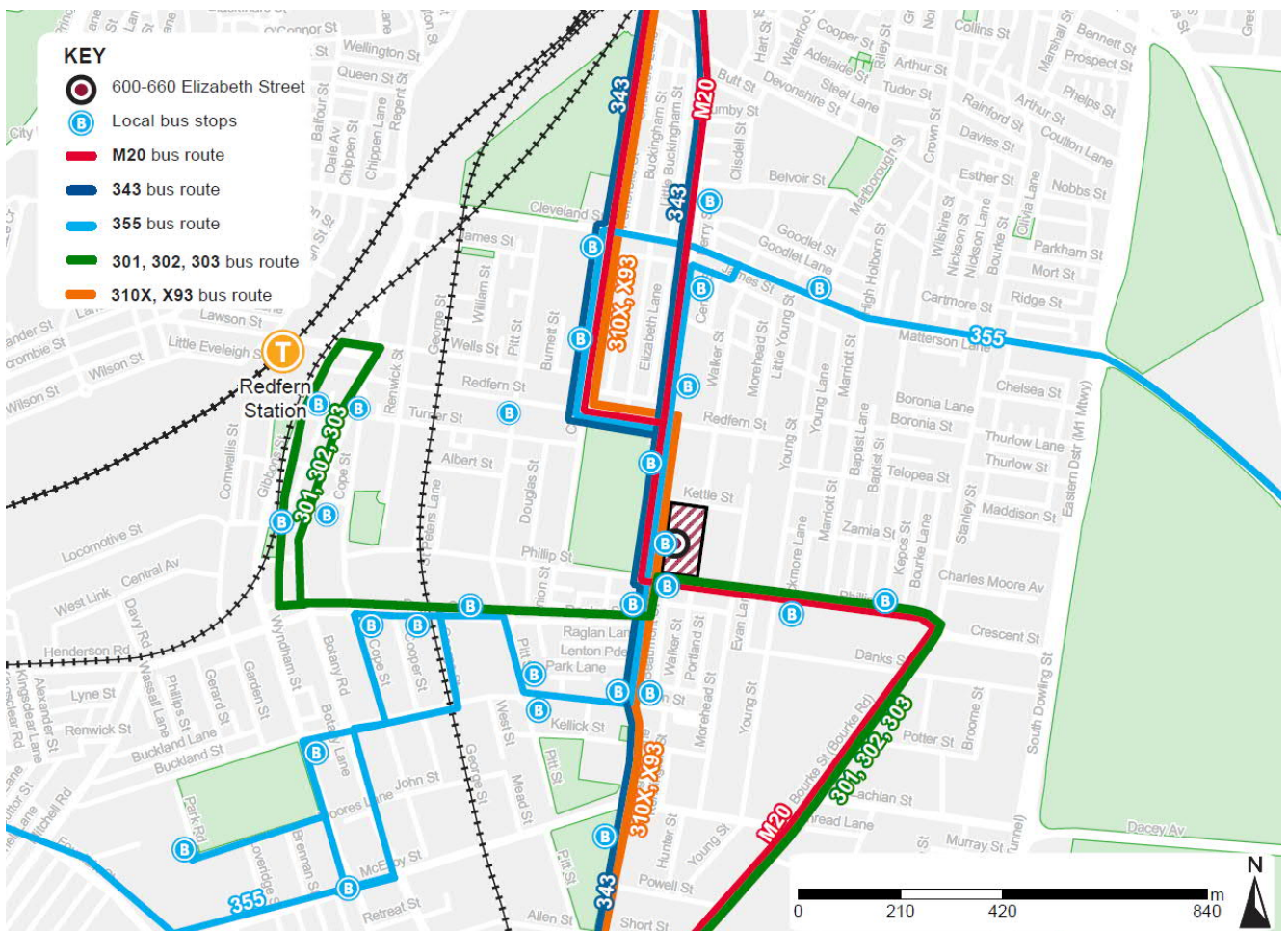


Figure 2-5: Key bus routes

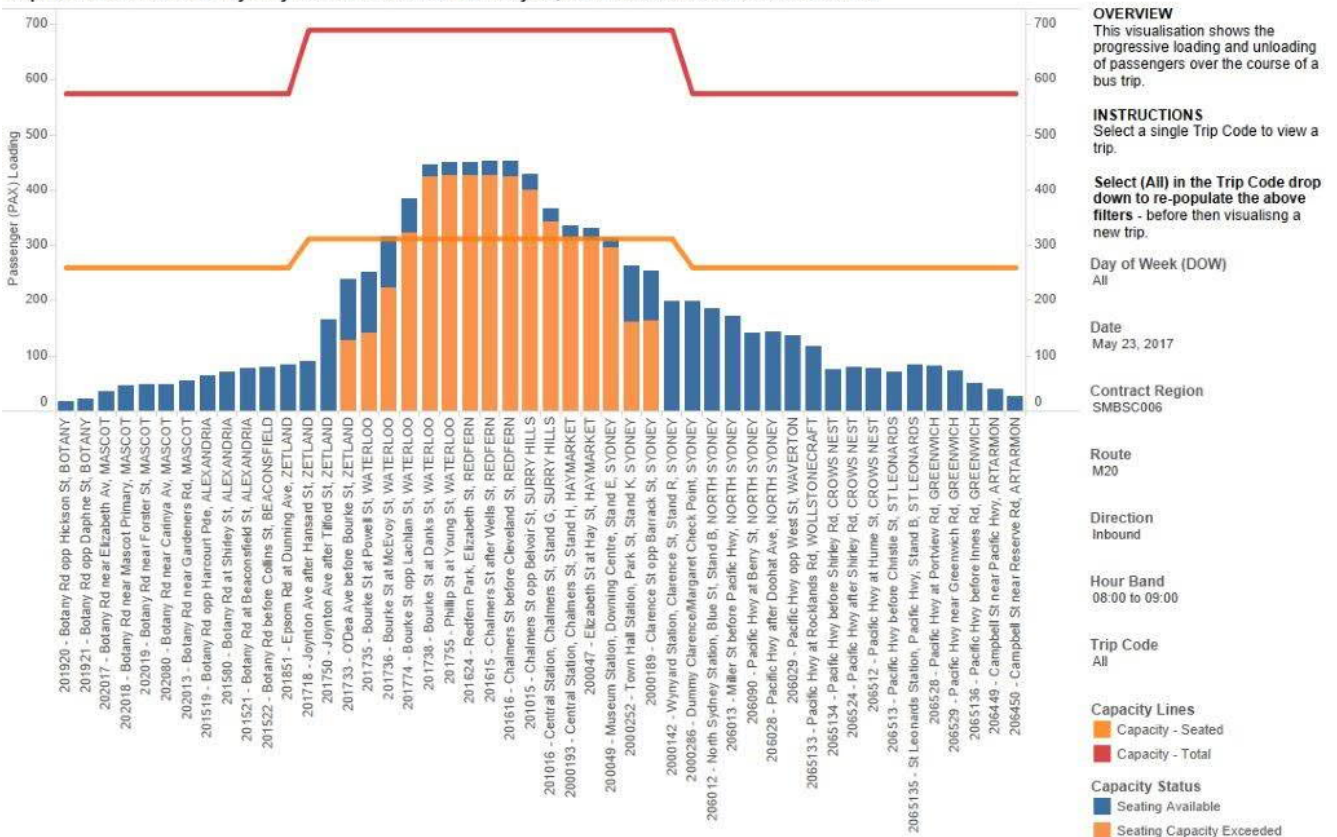
### Planned bus improvements

Bus routes are predicted to be at or over capacity by 2036 for travel towards Sydney CBD. Route M20 is already over capacity, driven in part by ongoing residential developments at Green Square. Buses were observed on site to have all seats taken as they passed the site. Future increases in demand for public transport by developments around Green Square may not be met by increased bus services due to the high frequencies required and would probably need high capacity public transport such as rail.

This is confirmed by Opal data (see Figure 2-6) collected from May 2017 which shows that seating capacity on the citybound M20 bus is exceeded between Zetland and the Sydney CBD.

## Bus Passenger Loading - By Scheduled Bus Trip

TripID: All - Route: M20 - Sydney Buses - Inbound - All - May 23, 2017 - COMPLETED OPAL COUNTS



Inbound Trips are visualised at the time the service arrives at the final (destination) transit stop. Outbound & Loop are from the time the service departs from the starting transit stop. Blank trips, negative values, changes in capacity lines and other issues can occur where underlying Opal data is incomplete/missing (see Read Me: Data Issues).

Figure 2-6: M20 opal data

### 2.2.2 Heavy rail network

The nearest train station is Redfern Station, with a walking distance of 950 metres from the site. This is outside the typically defined walking catchment of 800 metres but is still within a reasonable distance for people to walk. Redfern Station provides access to the majority of Sydney’s suburban rail network and intercity services.

The walking connection to the station is along well-defined pedestrian paths through Redfern Park and on Redfern Street with some shelter provided by shop awnings along Redfern Street. The topography of the area is also flat which further promotes active transport.

Train load surveys were undertaken across the rail network in 2016. The surveys indicate that trainloads at Redfern Station are at capacity. Table 2-4 provides an overview of the train loading services at Redfern Station.

Table 2-4: Train capacity at Redfern Station

Train Line	Morning peak (inbound)	Evening peak (outbound)
T1 Western Line	Most trains over 135% capacity from 8:00am to 9:30am	Three trains overcapacity from 5:20pm to 6:00pm
T2 Inner West Line	One train over capacity at 8:30am	No trains over 135% capacity
T3 Bankstown Line	Four trains over capacity from 8:00am to 9:00am	No trains over 135% capacity
T4 Illawarra Line	All trains overcapacity from 7:45am to 9:00am	Four trains overcapacity between 5:00pm and 6:15pm

The data shows that in the morning:

- Citybound trains on the T1 Western, T3 Bankstown and T4 Illawarra Lines are over capacity in the peaks with standing room only.
- The T2 Inner West Line has the most capacity for additional passengers in the morning peak period.

**Planned rail improvements**

*Sydney Metro City and Southwest*

A new metro station will be delivered at Waterloo as part of Sydney Metro, which is currently being constructed. As part of Stage 2 of the project, called Sydney Metro City and Southwest, Waterloo Station will be located on Botany Road between Raglan Street and Wellington Street. Once Stage 2 is operational, customers at Waterloo Station would be able to access the Sydney Trains network via interchanges in the Sydney CBD.

The new metro station is not expected to reduce demand for the bus services that serve the Redfern site as it is outside the catchment of the proposed Waterloo Station.

*Sydney Metro West*

Sydney Metro West will connect Westmead to the Sydney CBD with potential extension to Zetland.

It is possible that new stations may be provided between the Sydney CBD and Zetland and the site may be within the catchment for a new station. This would support the additional capacity that is currently not met by bus services and may ease the demand for bus services that service the Redfern site.

Figure 2-7 shows the proposed route for Sydney Metro West.

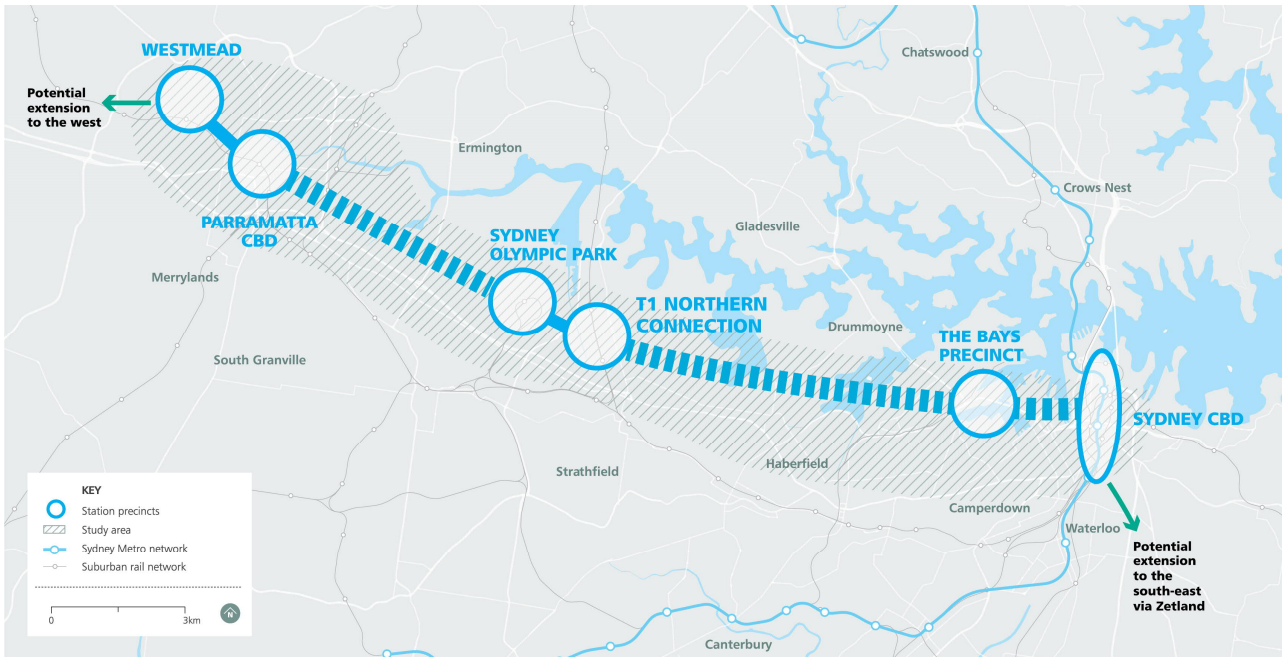


Figure 2-7: Sydney Metro West route

### 2.2.3 Light rail network

The site is not within the catchment of any light rail stops currently under construction. The City of Sydney has undertaken a study titled “Green Square Light Rail – Options Analysis and Needs Study” (January 2016). The Green Square light rail route under investigation could potentially use either Crown Street and Baptist Street to the east of the site or Botany Road to the west. Either of these two locations would have catchments that include the subject site and may ease the existing capacity constraints on the bus network. Transport for NSW are undertaking further investigations regarding future extensions to the currently planned light rail network.

The rail network, including Sydney Metro and potential light rail options are shown in Figure 2-8.



Figure 2-8: Rail network including potential light rail options

## 2.3 Active transport network

### 2.3.1 Pedestrian network

The pedestrian network surrounding the site is generally well-developed with footpaths along the majority of roads and controlled pedestrian crossings at most signalised intersections. Pedestrian facilities immediately surrounding the site include the following:

- Signalised pedestrian crossings on all four approaches of the Elizabeth Street / Redfern Street intersection.
- Signalised pedestrian crossings on all four approaches of the Elizabeth Street / Phillip Street intersection, and a zebra crossing along the southbound left turn slip lane.
- Signalised mid-block crossing on Elizabeth Street, connecting the western end of Kettle Street with Redfern Park.
- Pedestrian refuge islands on the east-west approaches of the Phillip Street / Walker Street roundabout.
- Formal footpaths on both sides of the road on Elizabeth Street, Redfern Street, Kettle Street, Walker Street and Phillip Street.

Preliminary investigations identified key walking connections serving 600 – 660 Elizabeth Street are provided in Table 2-5 for locations within the walking catchment. It is noted that the Journey to Work data indicates a high proportion of people who walk to work and therefore people walking to the Sydney CBD should also be considered.

Table 2-5: Key walking connections serving the site

Connection	Role / Function	Route
From the development to Redfern Station and shops	Commuter and recreational trips via Redfern Park	Through Redfern Park via the midblock pedestrian crossing and along the shopping strip to Redfern Station
From the development to the Danks Street precinct	Recreational access to shops and café area	Along Phillip Street
From the development to Cleveland Street	Commuter – shopping recreational	Along Walker Street or Elizabeth Street

The 800-metre walking catchment for the site is shown in Figure 2-9. It shows that the site is within the catchment for the proposed Waterloo Station and just outside the catchment for Redfern Station. The Danks Street shopping and café area is within the 800-metre catchment.

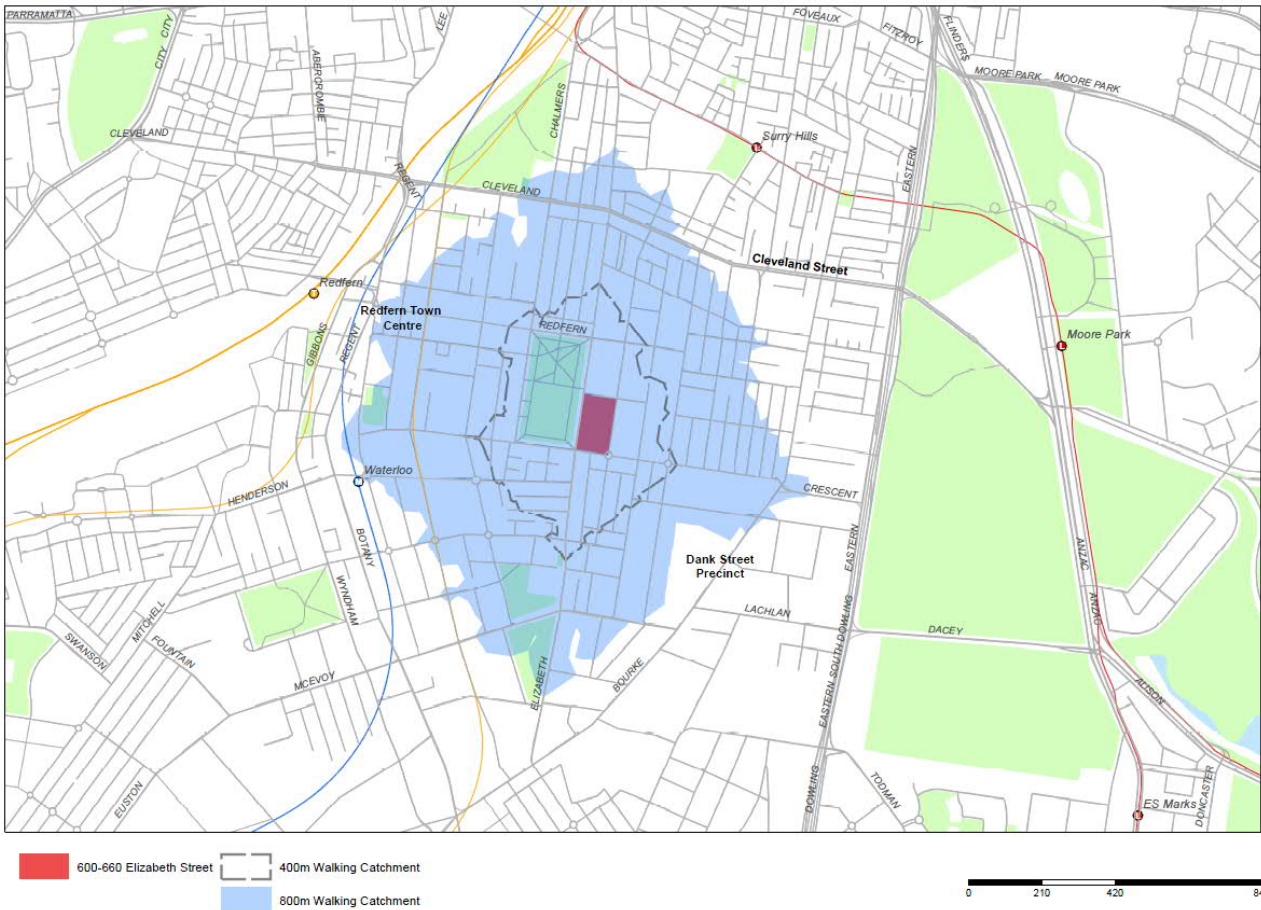


Figure 2-9: 800 metre walking catchment

### 2.3.2 Bicycle network

The City of Sydney has a well-developed network of on-road and off-road bicycle routes that serve commuter and recreational bicycle trips. The key existing bicycle routes are shown in Figure 2-10.

Key north-south regional routes run along Bourke Street and George Street, with provision of the following:

- The Bourke Street corridor to the east of the site provides a continuous separated cycleway from Waterloo to Woolloomooloo. The route features separate bicycle lanes with bike phases at signalised intersections.
- George Street comprises sections of separated cycleway and on-street cycling. The route links Bourke Street to Prince Alfred Park near Central Station.

In the east-west direction, the site is served by a sign-posted route that utilises Redfern Park. Redfern Street has a 40 km/h speed limit and bicycle logos marked in the centre of traffic lanes. South of the site, a marked on-road cycle route exists along Wellington Street and Buckland Street.



Figure 2-10: Existing bicycle network

#### Bike share

Recent innovations in dockless bike share schemes have seen an increasing number of dockless bikes in Sydney. However, there have been issues with the safe placement of bicycles and vandalism associated with these schemes. Observations on site indicate that a high number of the bikes have been vandalised and were not in working order. To overcome some of these issues the City of Sydney has adopted the Inner Sydney Bike Share guidelines which came into effect on 22 December 2017. The guidelines address safety, bicycle placement, distribution and redistribution of bikes, damaged or misplaced bikes, legal and insurance matters and data sharing.

There are no specific guidelines for the provision of dockless bikes for developments, however, the provision of bicycle parking areas, available to the general public, that do not block footpaths and have adequate passive and active surveillance may reduce some of the unfavourable outcomes of dockless bikes and increase ridership.

**Liveable Green Network strategy**

The ‘Liveable Green Network’ is a part of the Sustainable Sydney 2030 initiatives to improve pedestrian and bicycle networks. The aim of the project is to make short trips by walking or cycling a viable alternative to private motor vehicles and address some of the key targets for the Sustainable Sydney 2030 that include:

- TARGET 7 – By 2030, at least 10 per cent of City trips will be made by bicycle and 50 per cent by pedestrian movement.
- TARGET 8 – By 2030, every resident will be within a 10 minute (800m) walk to fresh food markets, childcare, health services and leisure, social, learning and cultural infrastructure.
- TARGET 9 – By 2030, every resident in the City of Sydney will be within a three-minute walk (250m) of continuous green links that connect to the Harbour Foreshore, Harbour Parklands, Moore or Centennial or Sydney Parks.

The site falls within the City Wide Network. The City Wide Network provides convenient and direct connections to major destinations across the City and Inner Sydney. The main links for the City Wide Network are shown in Figure 2-11. The City of Sydney has provided advice that Phillip Street is no longer part of the Liveable Green Network priority route but is still shown on maps and Council’s website. Kettle Street is part of the priority network. As planning of the development progresses, the location of driveways and provision of street furniture and landscaping should be considered to improve pedestrian and cyclist amenity.

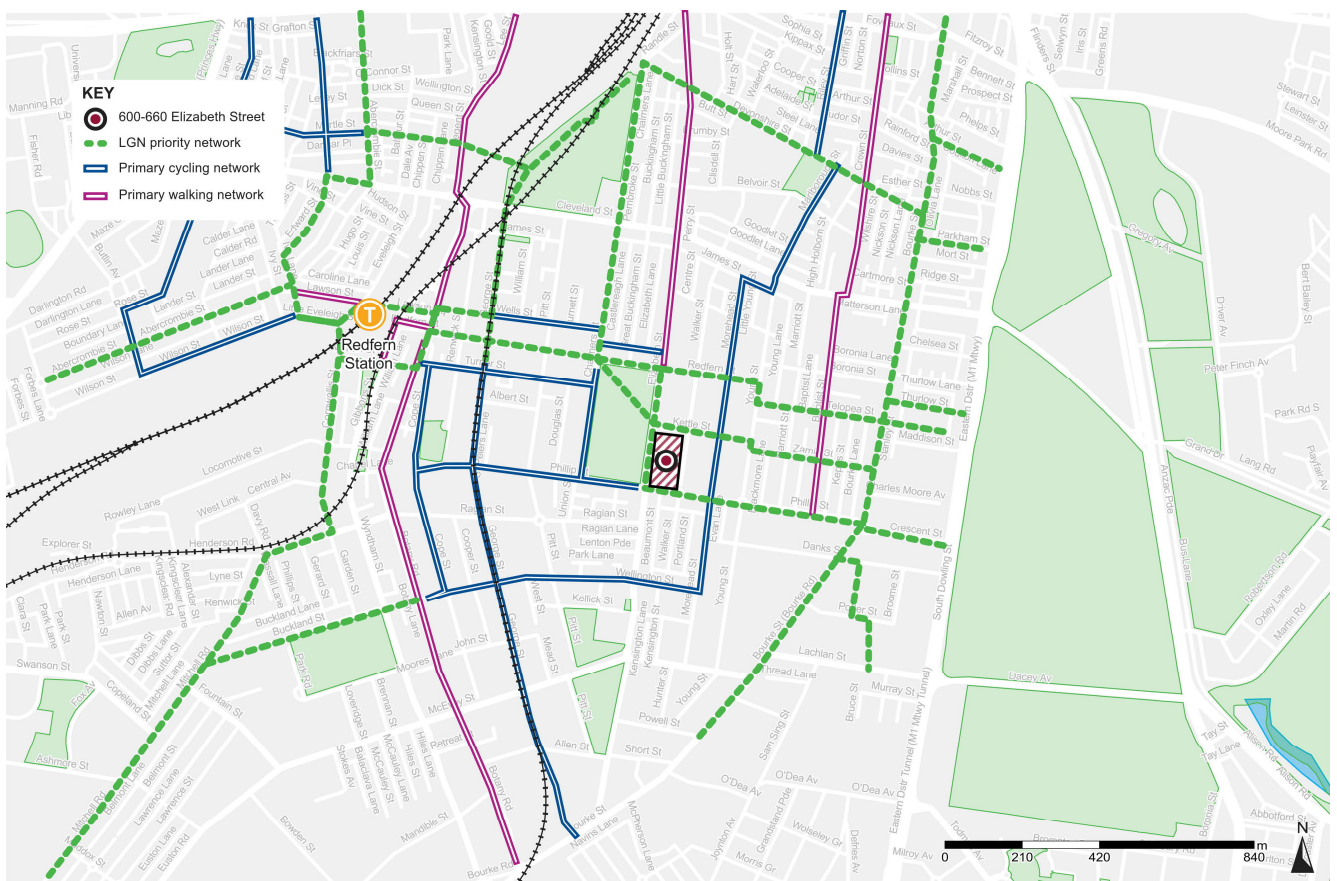


Figure 2-11: Liveable Green Network



## 2.4 Land use and traffic generation

The site is currently occupied by a PCYC which is located on the southern portion of the site. Traffic volumes generated by the PCYC are relatively low and generally would not occur during the commuter peak periods. Activities within the PCYC are likely to attract people in the evenings and on weekends, outside of the commuter peaks. Activities at the centre are held seven days a week and include aerobics classes, basketball, karate, boxing, weight lifting, after school drop-in, gym and fitness training. There are 10 off-street parking spaces accessed from Phillip Street for PCYC vehicles, as shown in Figure 2-12.



Figure 2-12: Off-street parking provision at the existing PCYC

## 3. The proposal

### 3.1 Reference scheme

600-660 Elizabeth Street, Redfern will be transformed into a market-leading build-to-rent redevelopment featuring contemporary urban and architectural design and creating a high-quality integrated community of social, affordable and private housing.

#### 3.1.1 Communities Plus build-to-rent

Communities Plus is a key program under the NSW Government's *Future Directions for Social Housing in NSW* (Future Directions), delivering integrated social, affordable and private housing by partnering with the private and not for profit sectors including registered Tier 1 or Tier 2 Community Housing Providers.

The Redfern SSP project aligns with Future Directions, by providing innovative options for private sector investment in social housing under a long-term lease. The project presents an opportunity to renew and increase social housing in a well-located integrated community with good access to education, training, local employment, and close to community facilities such as shopping, health services and transport.

On 6 July 2018, the NSW Government announced the Redfern SSP as the pilot for Communities Plus build-to-rent. The objective of the project included opportunity for the private sector, in partnership with the not-for-profit sector, to fund, design, develop and manage buildings as rental accommodation under a long-term lease. In November 2019 the Minister of Planning and Public Spaces declared that the Redfern project would change from a State Significant Precinct (SSP) planning pathway to a Council led Planning Proposal pathway. Project objective remains unchanged despite the change in the way the project will be assessed.

Build-to-rent is a new residential housing delivery framework that is capable of providing access to broader housing choices. Established in overseas markets such as the UK and the USA, locally, build-to-rent has significant scope to provide increased rental housing supply and the opportunity for investment in residential housing in NSW.

#### 3.1.2 Vision, reference scheme and planning framework

The project has been prepared to formulate and assess a suitable suite of planning controls to guide the redevelopment of the Redfern site. A design, technical analysis and consultation process was undertaken to prepare a reference scheme which indicates how the future public domain, building form and connections could be delivered. The reference scheme (shown in Figure 3-1 and Figure 3-2) balances the challenges and opportunities of the Redfern site, particularly the desire to deliver high quality urban design while providing new and modern social housing in an integrated mixed tenure environment.

The reference scheme was prepared to indicate how the Redfern site could, rather than will, be redeveloped and has been used as a basis to prepare draft amendments to the Sydney Local Environmental Plan 2012 (Sydney LEP 2012) (including zoning, height, floor space ratio and car parking controls) and the development of a new site specific DCP which will guide the detailed design of this site.

The proposed planning framework has regard to:

- Accessibility and connectivity of the Redfern site to public transport, employment, shops, education and other services,
- The site and local area's rich history and cultural significance,
- The surrounding urban form and context, and
- Environmental and servicing considerations, including flooding, stormwater, traffic, utilities, noise, air quality and wind.

The proposed planning framework will guide future development applications for the site which are anticipated to achieve the following:

- Approximately 327 dwellings, with a maximum Floor Space Ratio (FSR) of 2.75:1. This may be exceeded by 10% subject to adoption of Council’s design competition bonus that will be dealt with at a future DA stage.
- Buildings with a predominant height of 6-7 storeys with a single tower up to 14 storeys
- New public spaces on Kettle and Phillip Streets activated by shops, cafes, community space and other services
- Some supporting retail and communal floor space to support the incoming population.

The assumed dwelling types are shown in Table 3-1 in order to estimate parking provision for the development. The tenure and bedroom mix assumptions are estimates only and are based on the overall project objectives of providing a mix of dwellings types including social and affordable housing with the balance as private market housing.

It is envisaged that the development would include some 1200 square metres Gross Floor Area (GFA) for retail and remainder for a ground floor communal use.

Table 3-1: Assumed dwelling mix and type

Dwelling type	Total Apartments
Studio (19%)	63
1 bedroom (22%)	72
2 bedrooms (52%)	173
3 bedrooms (5%)	16
4 bedrooms (2%)	3
Total	327
Retail/ non-residential (GFA)	1200m <sup>2</sup> 700m <sup>2*</sup>

- Allocated for ground floor communal uses

It is expected the Redfern site will be developed over a period of three years once it has been rezoned.

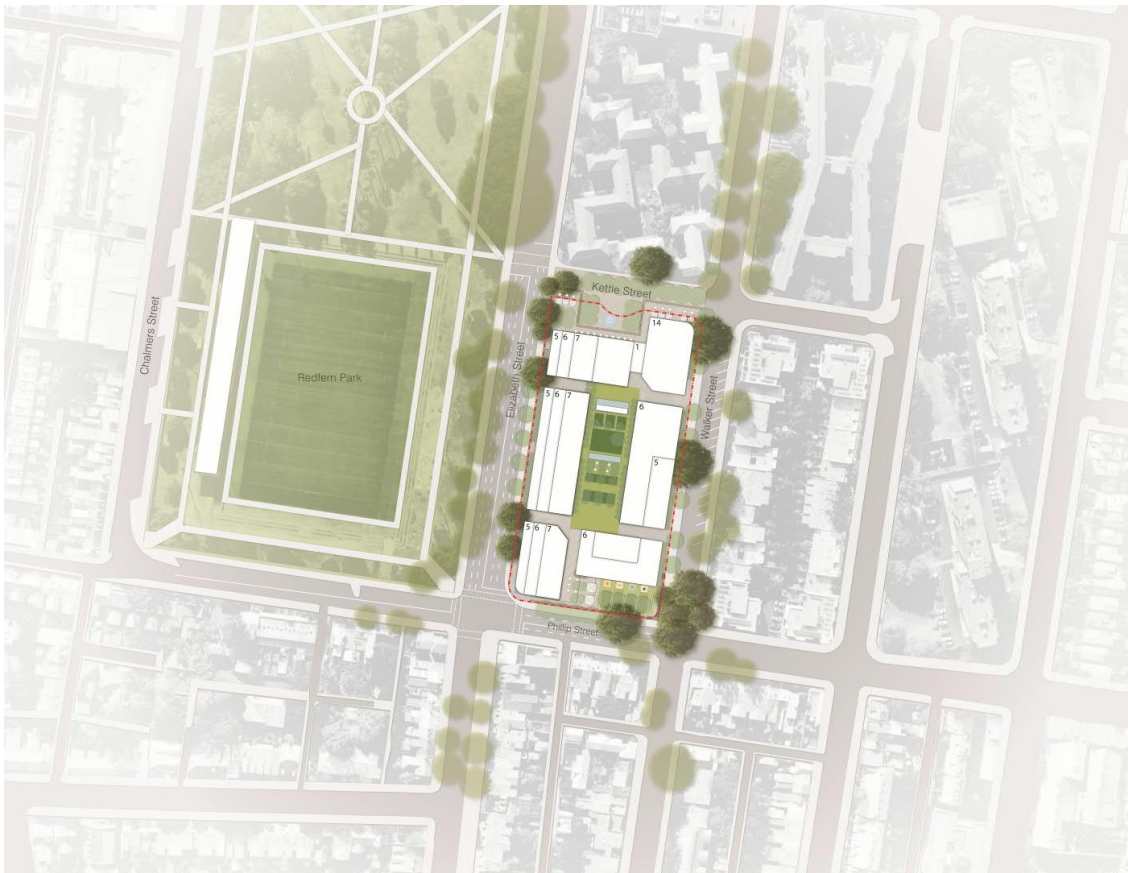


Figure 3-1: 600-660 Elizabeth St, Redfern, reference scheme plan view

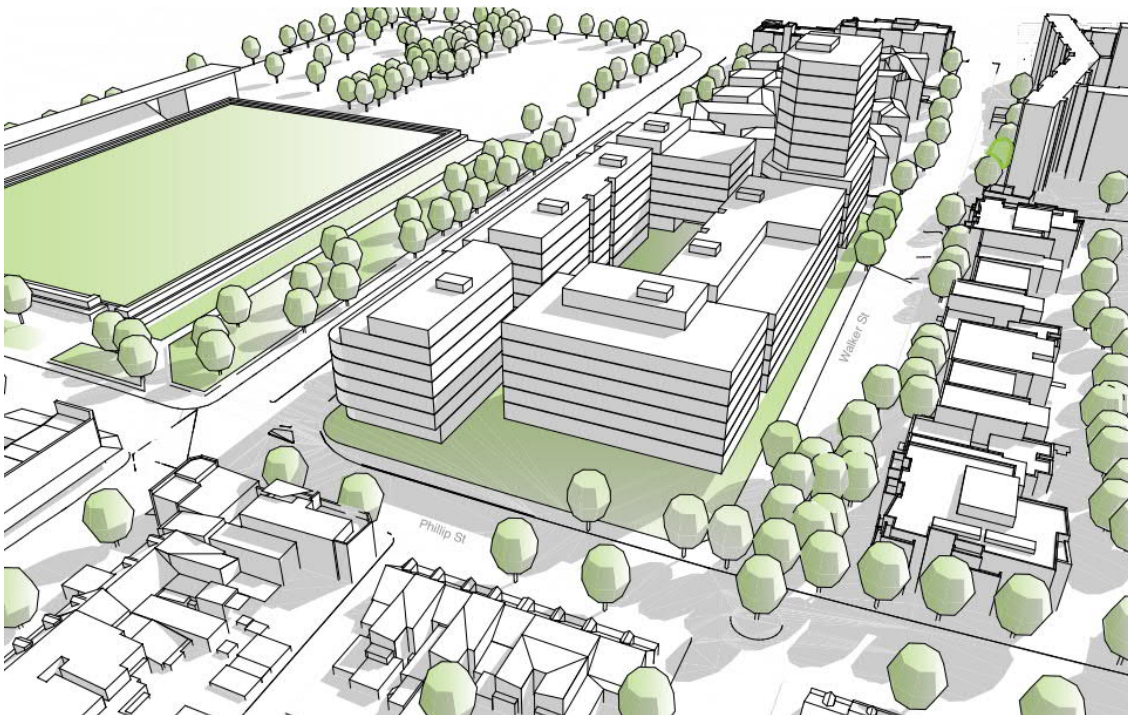


Figure 3-2: 600-660 Elizabeth St, Redfern, reference scheme profile view

### 3.2 Parking provision

#### 3.2.1 Off-street parking

The City of Sydney restricts the number of parking spaces for developments, with parking rates outlined in Sydney LEP 2012 and DCP 2012. Category B rates have been adopted to determine parking provision for the Redfern SSP as shown in Table 3-2 and Table 3-3, based on an indicative mix of dwelling types.

Table 3-2: Assumed residential parking provision

Dwelling type	Number of dwellings	Maximum parking rate	Maximum number of parking spaces
Studio	63	0.2	12
1 bedroom	72	0.4	29
2 bedrooms	173	0.8	138
3 or more bedrooms	19	1.1	21
Residents	327		200*
Visitors		0.05	16
<b>Total</b>	<b>327</b>		<b>216</b>

\*Note: 10 of these parking spaces are to be accessible. See Table 3-3.

Table 3-3: Parking provision for other modes/types

Parking type	Dwellings/GFA/car spaces	Minimum parking rate	Number of parking spaces
Car share	200 residential car spaces	1 space for every 60 car spaces	3 to 4
Bicycle	327 dwellings	1 space per dwelling for residents plus 1 space per 10 dwellings for visitors	360 (residents/visitors)
	1200 m <sup>2</sup> GFA for retail	1 space per 250 square metres GFA for retail employees plus 2 spaces plus 1 space for 100 square metres over 100 square metres GFA for retail customers	18 (retail employees/customers)
Service vehicle	327 dwellings	1 space for first 50 dwellings plus 0.5 spaces for every 50 dwellings thereafter for residents	4 (residential)
	1200m <sup>2</sup> GFA for retail	1 space per 350 square metres GFA, up to 2000 square metres	4 (retail)
Motorcycle	200 residential car spaces	1 space for every 12 car parking spaces	17
Accessible	200 residential car spaces	1 space for every 20 car parking spaces to be accessible	10

In addition, secure bicycle parking facilities are to be provided, with bike lockers for residents, bike facilities for employees and bike rails for visitors.

Car share parking spaces are required to be accessible to the general public. This may require the provision of a separate car park for car share vehicles. Service vehicle bays are required to be accessible for the City of Sydney’s standard garbage trucks.

As outlined in Chapter 2.4, the existing PCYC has about 10 off-street car parking spaces. It is assumed that the number of car parking spaces for PCYC users would be retained, with parking arrangements to be determined in consultation with the PCYC and the City of Sydney.

### 3.2.2 On-street parking

City of Sydney's *Neighbourhood Parking Policy* manages on-street parking supply and demand using a range of parking controls and a parking permit scheme. The proposed developments fall within the Redfern (Area 41) permit zone. The recommended controls and permit scheme conditions relevant to a new development have been used to develop the on-street parking approach for the proposal. This includes permitting short-stay on-street parking on local streets. Permit holders would be prohibited from using these spaces for longer stays. Exceptions may be granted to care workers in accordance with the City of Sydney's policies. New developments are proposed to be ineligible for parking permits, including residents and businesses, in line with the City of Sydney's *Neighbourhood Parking Policy*.

To provide appropriate access to the development and improve the active transport network surrounding the development, up to four on-street parking spaces would need to be removed on Walker Street and up to 10 parking spaces would be removed on Kettler Street. This includes two disabled parking spaces.

### 3.3 Access arrangements

Access to the development is proposed on Walker Street to minimise impacts to the road network. The other roads surrounding the development are not preferred due to the following:

- Kettle Street is part of the Liveable Green Network and forms part of a major desire line to and from Redfern Station. Vehicle movements in this area would be inappropriate and counter to the objectives of a Green Network
- Phillip Street in the section fronting the proposed development has a signalised intersection and a roundabout at either end with a bus stop on both sides of this road making an access to the development from it unsafe and disruptive
- Elizabeth Street is a sub-arterial road carrying a higher volume of traffic (including a number of buses) compared to the other roads. Direct access to developments from sub-arterials is discouraged where alternatives are available.

Vehicle access would be designed in accordance with Australian Standards 2890 and any relevant City of Sydney guidelines, and be above the probable maximum flood level. Service vehicle areas are to be separate from the car park and include a minimum vertical clearance of four metres as per the Australian Standards and City of Sydney's DCP.

The access proposed on Walker Street would be a shared access driveway for residents and service vehicles, located about 40 metres south of the intersection of Walker Street and Kettle Street. The driveway would be designed to ensure that turning widths are sufficient for all vehicle types and can accommodate vehicles entering and exiting the property at the same time in forward direction.

Figure 3-3 shows the indicative basement access location for the development.



Figure 3-3: Indicative ground floor layout

### 3.4 Transport Access Guide

A Transport Access Guide would be prepared and developed during the Development Application stage of the proposal. This guide would be developed following the requirements outlined in the City of Sydney’s DCP and LEP. The aim of the guide is to provide all residents, employees or visitors of the development their available transport options for all travel modes including by car, public transport, bicycle and walking.

### 3.5 Infrastructure preservation and capital costing

There is no requirement for land acquisition external to the precinct to provide the proposed transport infrastructure. All works can be implemented within the boundaries of the Redfern site. Capital costing of transport items and assignment of funding responsibilities has not been undertaken and will be determined at a later date as the proposal progresses.

### 3.6 Reference scheme summary

A summary of the reference scheme is outlined in Table 3-4.

Table 3-4: Reference scheme summary items

Reference scheme item	Recommendation	Comments
Access	Access to be provided on Walker Street	<ul style="list-style-type: none"> <li>Most suitable road that surrounds the site</li> </ul>

Reference scheme item	Recommendation	Comments
		<ul style="list-style-type: none"> <li>To be designed in accordance with relevant standards and guidelines</li> </ul>
Parking spaces for residents	A maximum of 200 car parking spaces, with 10 to be accessible	<ul style="list-style-type: none"> <li>Complies with Category B rates in City of Sydney's DCP</li> </ul>
Parking spaces for bicycles	A minimum of 360 bicycle parking spaces, comprising 327 spaces for residents, 33 spaces for visitors, 18 for retail	<ul style="list-style-type: none"> <li>Complies with City of Sydney's DCP</li> </ul>
Parking spaces for service vehicles	A minimum of 8 service vehicle parking spaces, comprising 4 spaces for residents and 4 spaces for retail	<ul style="list-style-type: none"> <li>Complies with City of Sydney's DCP</li> <li>Service vehicle areas will be separate from the car park and include a minimum vertical clearance of four metres and be able to accommodate City of Sydney's standard garbage trucks</li> </ul>
Parking spaces for motorcycles	A minimum of 17 motorcycle parking spaces	<ul style="list-style-type: none"> <li>Complies with City of Sydney's DCP</li> </ul>
Parking spaces for car share vehicles	A minimum of 3-4 car share parking spaces	<ul style="list-style-type: none"> <li>Complies with Category B rates in City of Sydney's DCP</li> <li>Car share parking spaces are to be accessible to the general public</li> </ul>



## 4. Traffic and transport impacts

### 4.1 Impacts to road network

#### 4.1.1 Mode share

To develop a suitably robust ‘picture’ of how people would travel to and from the future development, a number of travel zones surrounding the site were identified that reflect the likely demographic and travel characteristics of the development. The travel zones selected are shown in Figure 4-1.

The existing Journey to Work (JTW) mode shares for the site are provided in Table 4-1 from the 2016 census data. It is noted from the mode shares summarised in Table 4-1 show that 11 per cent of people ‘worked at home / did not go to work’ on the day of the census. For the process adopted, it is important that these people were considered to discount their trips in the subsequent steps.

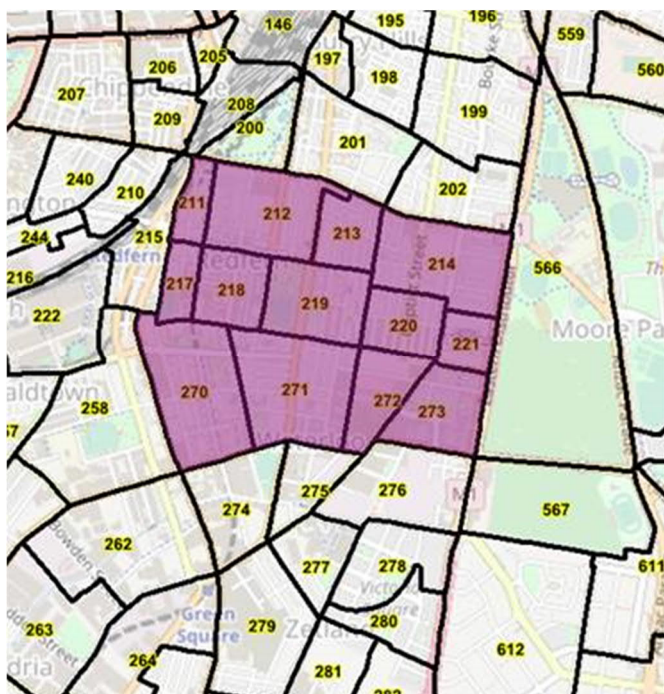


Figure 4-1: Journey to Work Travel Zones

Table 4-1: Existing mode share for Redfern 2016

Mode	Employees	Residents
Train	29%	20%
Bus	6%	17%
Vehicle driver	38%	24%
Vehicle passenger	3%	2%
Bicycle	2%	5%
Walked only	8%	17%
Mode not stated	2%	3%
Worked at home/did not go to work	11%	11%
Total	100%	100%

When discussing mode shares, transport professionals generally exclude those who ‘worked at home/did not go to work’. To aid understanding, mode shares excluding ‘worked at home/did not go to work’ are provided in Table 4-2 and have been compared to the Sydney regional average from the Household Interview Transport Survey (HITS).

Table 4-2: Mode share comparison

Mode	Residents	Sydney average
Train	23%	6%
Bus	19%	6%
Vehicle driver	27%	48%
Vehicle passenger	2%	21%
Bicycle	6%	-
Walked only	19%	17%
Mode not stated	4%	2%
Total	100%	100%

As shown above, car mode share is substantially lower in the study area compared to the Sydney average with only 29 per cent as a car driver or passenger. With future upgrades to public transport, improvements to the walking and cycling network, increased congestion on the road network and greater awareness and community acceptance of importance of sustainable transport, the future car mode share should be expected to decline over time. The work undertaken by Jacobs for the *Waterloo Precinct Study* estimated that mode share for vehicle drivers would decrease further if a target mode share of 20 per cent car drivers was adopted and improvements to alternative modes are provided. A similar target mode share is proposed for the 600-660 Elizabeth St proposed development. This would mean a 7 per cent decrease in car mode share. The target mode share for resident’s post-development is shown in Table 4.3.

Table 4-3: Target mode share

Mode	Existing	Target
Train	23%	25%
Bus	19%	21%
Vehicle driver	27%	20%
Vehicle passenger	2%	3%
Bicycle	6%	7%
Walked only	19%	21%
Mode not stated	4%	4%
Total	100%	100%

#### 4.1.2 Trip generation

JTW data was used to estimate trip generation from the future development for consistency purposes. It is recognised that journey to work trips only make up a proportion of peak travel but constitute a useful and readily available data source to broadly understand key peak period travel desire lines.

Key inputs used to calculate the number of trips generated by the proposed development using JTW data were:

- Number of dwellings: 327
- Dwelling size: 1.9 persons per dwelling
- Proportion of total population engaged in the workforce: 60 per cent
- Proportion of daily commute trips during the AM peak hour: 25 per cent

Using the inputs listed above, the projected residential population is calculated as 620 persons, generating 93 person trips. This was then applied to the target mode shares outlined in Chapter 4.1.1 to determine the number of trips by mode. Table 4-4 shows the JTW trips originating from the development by mode.

Table 4-4: Number of trips by mode

Mode	Target mode share*	Number of trips
Train	22%	20
Bus	19%	18
Vehicle driver	18%	17
Vehicle passenger	3%	3
Bicycle	5%	5
Walked only	19%	17
Mode not stated	4%	3
Worked at home/did not go to work	11%	10
Total	100%	93

\*Note: The target mode shares include the “Worked at home/did not go to work” mode which was not considered in the target mode shares presented in Table 4-3.

Trip generation rates may also be determined by using rates outlined in Roads and Maritime’s *Guide to Traffic Generating Developments TDT 2013/04a*.

A comparison of these rates and traffic generation surveys undertaken at two sites in Waterloo and Redfern are shown in Figure 4-2.

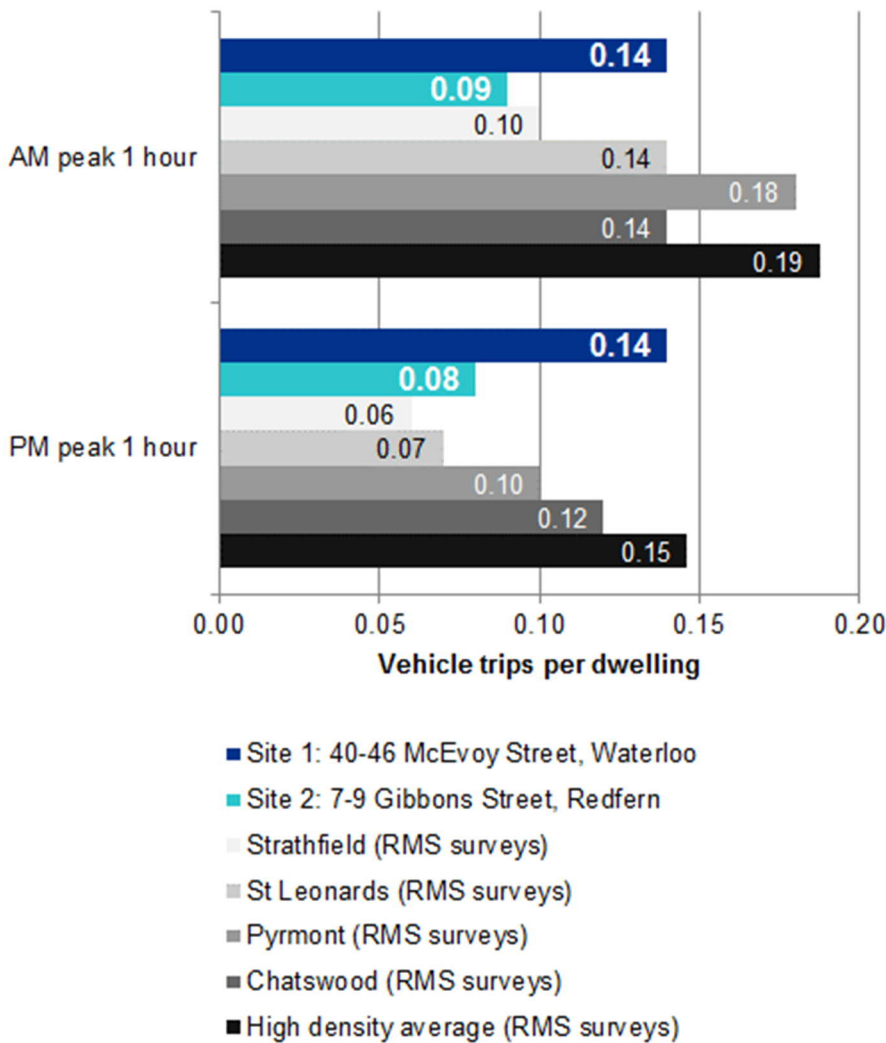


Figure 4-2: Comparison of traffic generation rates

The trip generation rates from the two surveyed sites ranged from 0.09 to 0.14 trips per dwelling, which is lower than the average of the RMS surveyed sites. Therefore, a trip generation rate of 0.14 trips per dwelling has been adopted. Given that 327 dwellings are proposed, this corresponds to 45 car trips per hour, which includes trips for all purposes, and not just work trips. Assuming the 55 per cent of total car trips during the AM peak hour are for work purposes, this corresponds to 25 work trips per hour, higher than the 17 car trips per hour calculated using the JTW data in Table 4-4. To be conservative, 45 trips per hour generated by the proposed development has been assumed for the remainder of the road network impact assessment.

It is acknowledged that the provision of social housing for the development would result in a lower trip generation rate for residents in these dwellings. As discussed above, since the trip generation rate calculated from the two surveyed sites is lower than the Sydney average, adopting a trip generation of rate of 0.14 trips per dwelling provides a conservative assessment of the impact of vehicular traffic to the road network due to the development.

### 4.1.3 Traffic distribution

The additional 45 car trips were distributed throughout the road network based on JTW data via the following process:

- Calculate number of trips by mode (Table 4-4).
- Identify top destinations for JTW travel originating from the future development travel zone at the Standard Area 3 (SA3) and Standard Area 2 (SA2) level.
- Estimate the proportion of JTW trips by mode for the top destination originating from the future development travel zone.

At the SA3 level, the top destinations originating from the future development are shown in Table 4-5. These destinations account for 92 per cent of all JTW trips.

Table 4-5: Top SA3 JTW destinations from the proposed development

Destination	Key destinations	Proportion of trips
Sydney Inner City	Sydney CBD	69%
Eastern Suburbs	Bondi Junction	6%
Botany	Sydney Airport, Port Botany	4%
North Sydney – Mosman	North Sydney CBD	4%
Eastern Suburbs South	UNSW, Prince of Wales Hospital	4%
No fixed address	-	3%
Ryde – Hunters Hill	Macquarie Park	2%

The top destination for work trips from the proposed development is Sydney Inner City, which accounts for 69 per cent of total work trips. These trips can then be further refined by destination within the Sydney Inner City region at the SA2 level as shown in Table 4-6.

Table 4-6: Top SA2 JTW destinations within Sydney Inner City from the proposed development

Destination	Proportion of trips
Sydney – Haymarket – The Rocks	33%
Waterloo – Beaconsfield	12%
Surry Hills	6%
Pymont – Ultimo	4%
Erskineville – Alexandria	3%
North Sydney – Lavender Bay	3%
No fixed address	3%
Potts Point – Woolloomooloo	3%
Redfern – Chippendale	3%
Darlinghurst	3%

Figure 4-3 which outlines the proportion of trips at the SA2 and SA3 levels shows that a third of all trips are to the Sydney CBD, with two-thirds of trips within the Sydney Inner City travel zone (which includes the Sydney CBD). Most trips are contained within a seven-kilometre radius from the site.

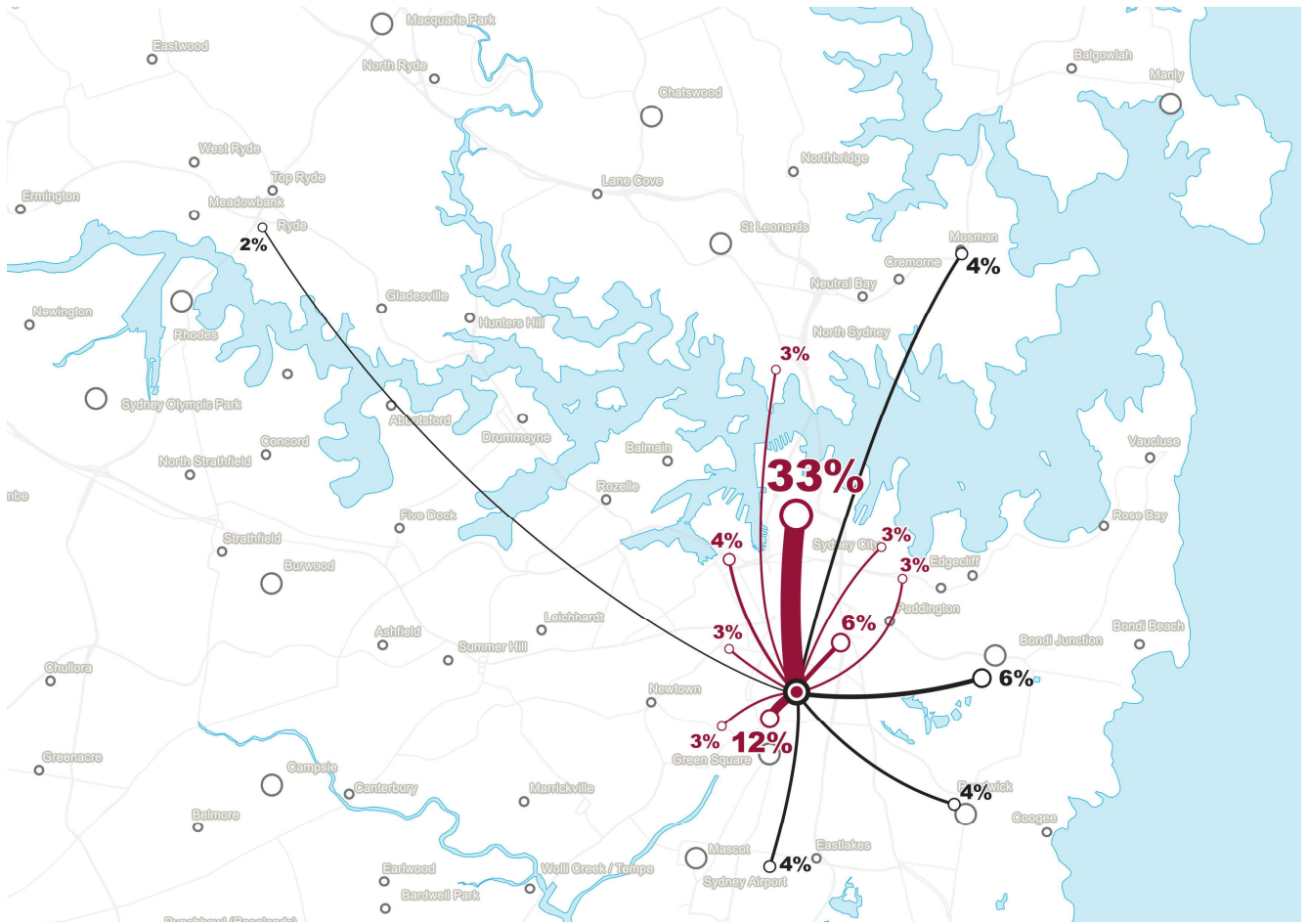


Figure 4-3: Top destinations originating from Redfern

Traffic was distributed throughout the local road network as shown in Figure 4-4.

Based on the reference scheme, it was assumed that vehicular access would be from Walker Street as this would be consistent with its role as a local access street and is the most suitable due to:

- Elizabeth Street functioning as a sub-arterial road and should not provide direct access to developments.
- Phillip Street although a collector road any access from this development would be too near to the traffic signal at Elizabeth Street and the roundabout at Philip Street making it hazardous and disruptive to other users including pedestrians.
- Kettle Street is part of the Liveable Green Network.

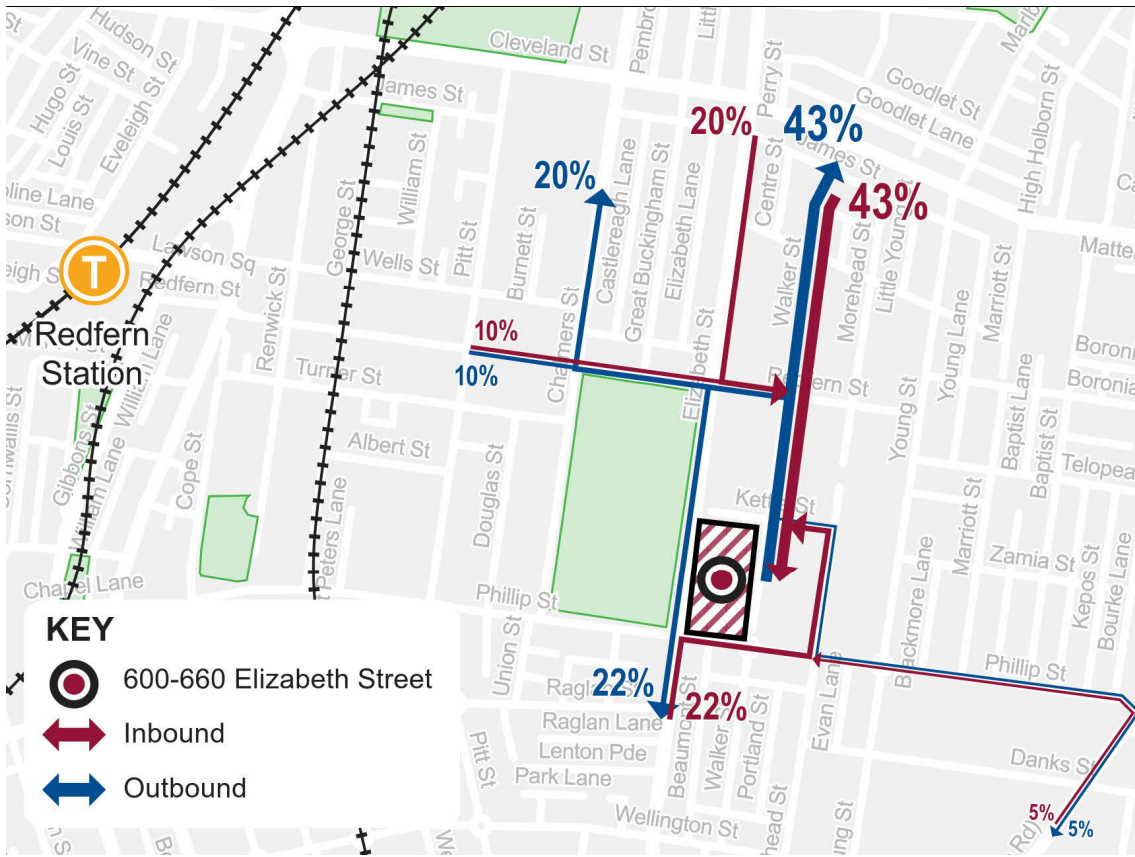


Figure 4-4: Traffic distribution

4.1.4 Intersection performance

Impacts to the road network due to vehicular traffic generated from the proposed development were quantified by modelling the intersections assessed in Chapter 2.1.4 with development traffic. Results of the intersection modelling assessment are provided in Table 4-7. Sidra outputs for the future scenario are provided in Appendix C.

Table 4-7: Future intersection performance with proposed development

Intersection	Period	Degree of Saturation	Average delay (seconds per vehicle)	Level of Service
Cleveland Street / Elizabeth Street	Morning peak hour	0.68	33	C
	Evening peak hour	0.68	35	C
Elizabeth Street / Redfern Street	Morning peak hour	0.56	27	B
	Evening peak hour	0.53	29	C
Elizabeth Street / Phillip Street	Morning peak hour	0.69	28	B
	Evening peak hour	0.84	30	C
Phillip Street / Walker Street	Morning peak hour	0.24	8	A
	Evening peak hour	0.28	8	A
Walker Street / Cleveland Street	Morning peak hour	0.47	13	A
	Evening peak hour	0.35	10	A

Intersection	Period	Degree of Saturation	Average delay (seconds per vehicle)	Level of Service
Walker Street / Redfern Street	Morning peak hour	0.14	10	A
	Evening peak hour	0.12	11	A
Walker Street / Kettle Street	Morning peak hour	0.07	5	A
	Evening peak hour	0.06	5	A

The modelling showed that the additional traffic from the development would have very little impact on the local road network due to the low trip generation of the development proposed and available spare capacity at the nearby intersections. All intersections modelled would operate at Level of Service ‘C’ or better.

#### 4.1.5 Capacity assessment

Within the ‘RTA Guide to Traffic Generating Developments’ there are guidelines for environmental capacities for roads. Although roads may function adequately in terms of network efficiency an increase in traffic may affect the environmental amenity of the street due to increases in noise, pollution and a potential impact on road safety. Increases in traffic also affect pedestrian connections with higher traffic volumes reducing the ability to cross roads.

Environmental capacities are applicable to local and collector roads that have direct access to residential properties. These are shown in Table 4-8.

Road capacity is expressed in terms of the maximum peak hour volumes in both directions.

Table 4-8: Environmental capacities

Road class	Road type	Maximum speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
Local	Street	40	200 (environmental goal) 300 (maximum)
Collector	Street	50	300 (environmental goal) 500 (maximum)

Source: Guide to Traffic Generating Developments (RMS, version 2.2, 2002)

Elizabeth Street is a sub-arterial road and the environmental capacity is not applicable to the road.

Phillip Street currently carries in the order of 700 vehicles per hour and exceeds the environmental capacity for a collector road. The forecast addition of 10 vehicles per hour from this site would have an imperceptible impact on Phillip Street.

Walker Street has relatively low traffic volumes in the order of 120 vehicles per hour in the peak periods. The addition of 45 vehicles although concentrated near the site it would not exceed the 200 vehicles per hour environmental goal. Traffic in this section of the road is low speed due to the short block.

Kettle Street functions as an access street west of Walker Street with fewer than 10 vehicles per hour. East of Walker Street, Kettle Street also has low traffic volumes in the order of 100 vehicles per hour. The forecast additional traffic of around 45 vehicles per hour from this site once split between Kettle and Philip Street would have no perceptible impact on either Kettle Street or Walker Street north of Kettle Street.



## 4.2 Impacts to parking

The recommended number of parking spaces is not anticipated to degrade the performance of the road network to an unacceptable level, as shown in Section 4.1.4. Adoption of Category B parking rates found in City of Sydney's LEP 2012 and DCP 2012 for residential car parking, car share, service vehicles, motorcycles and bicycles would sufficiently support the dwelling types proposed for the development. Due to the mix of dwellings for the development, a site specific DCP is recommended to reduce the number of bicycle spaces provided (see Section 3.2.1).

As discussed in Section 3.2.2, provision of an access driveway to the development would likely necessitate the removal of about four on-street parking spaces on the western side of Walker Street. In addition, the closure of Kettle Street to traffic, allowing off-road pedestrian and cyclist movements would result in the removal of up to 10 on-street parking spaces. Therefore, there would be a net decrease of up to 14 on-street parking spaces, including two disabled spaces, to accommodate the development.

There is limited available on-street parking capacity on the local road network. Parking on Walker Street would remain and may off-set some of these lost parking spaces. Other opportunities including the possibility of retaining some of the on-street parking spaces in Kettle Street within the Green Network could be investigated as the project progresses to a final design.

## 4.3 Impacts to public transport network

The site would generate additional demand of about 18 bus passengers and about 20 train passengers. Bus stops are currently provided on Elizabeth Street and Phillip Street. There is the potential to improve bus shelter infrastructure along these streets. As noted earlier, the M20 and service route 343 already experience high patronage, while on the train network services on citybound trains on the T1 Western, T3 Bankstown and T4 Illawarra lines are overcapacity during peak periods. Additional bus services appear to be required due to an already high level of demand and not as a direct result of this development. The future Waterloo Station and potential extension of Sydney Metro West to Zetland is expected to result in changes to bus network particularly long distance buses where some of this demand is likely to shift to rail.

## 4.4 Impacts to active transport network

Kettle Street is part of the Liveable Green Network and the reference scheme envisages it would be closed to traffic and upgraded to a public square. This allows for off-road pedestrian and cyclist movements on Kettle Street between Walker Street and Elizabeth Street. The proposal would improve pedestrian and cyclist safety by removing existing potential conflicts between vehicles on Kettle Street and active transport users. This is particularly important as Kettle Street forms part of a key pedestrian desire line to and from Redfern Oval. In addition, the conversion of the street to a public square would make it Kettle Street an activate area that would be more appealing and promote more active travel, a key objective of the Liveable Green Network.

There is also the opportunity to improve pedestrian amenity along Elizabeth Street, Walker Street and Phillip Street through landscaping and tree planting.

## 4.5 Impacts during construction

Construction impacts would be assessed as part of the Construction Traffic Management Plan (CTMP). The CTMP would outline the guidelines, general requirements and specific procedures to be used for any works that may have an impact on traffic operation. The plan would be prepared in accordance with the City of Sydney's *Appendix A: Standard Requirements for Construction Traffic Management Plan*.

Items to be addressed would include but not be limited to:

- The safety of all road users
- Details of routes and roads to be used by construction vehicles
- Construction vehicle access arrangements

- Construction vehicle types
- Any temporary adjustments to existing traffic and transport infrastructure that may be required
- Details of any applications required to organise appropriate approvals for work zones and/or road closures, use of driveways, cranes, barricades or hoarding, and consent of construction hours
- Management of traffic including the use of traffic controllers to direct vehicles, pedestrians or cyclists.

Construction would generate a number of vehicle trips during the various stages of construction and include:

- Haulage trucks to remove spoil from the site during excavations.
- Trucks delivering building material to the site.
- Concrete trucks.

Elizabeth Street currently has a bus stop and no parking zones that are active during the peak traffic periods. Therefore, access to the site from Kettle Street or Walker Street may be required.

Potential haulage routes for trucks are shown in Figure 4-5. Work zones in Walker Street and Kettle Street would reduce the amount of on-street parking during construction.

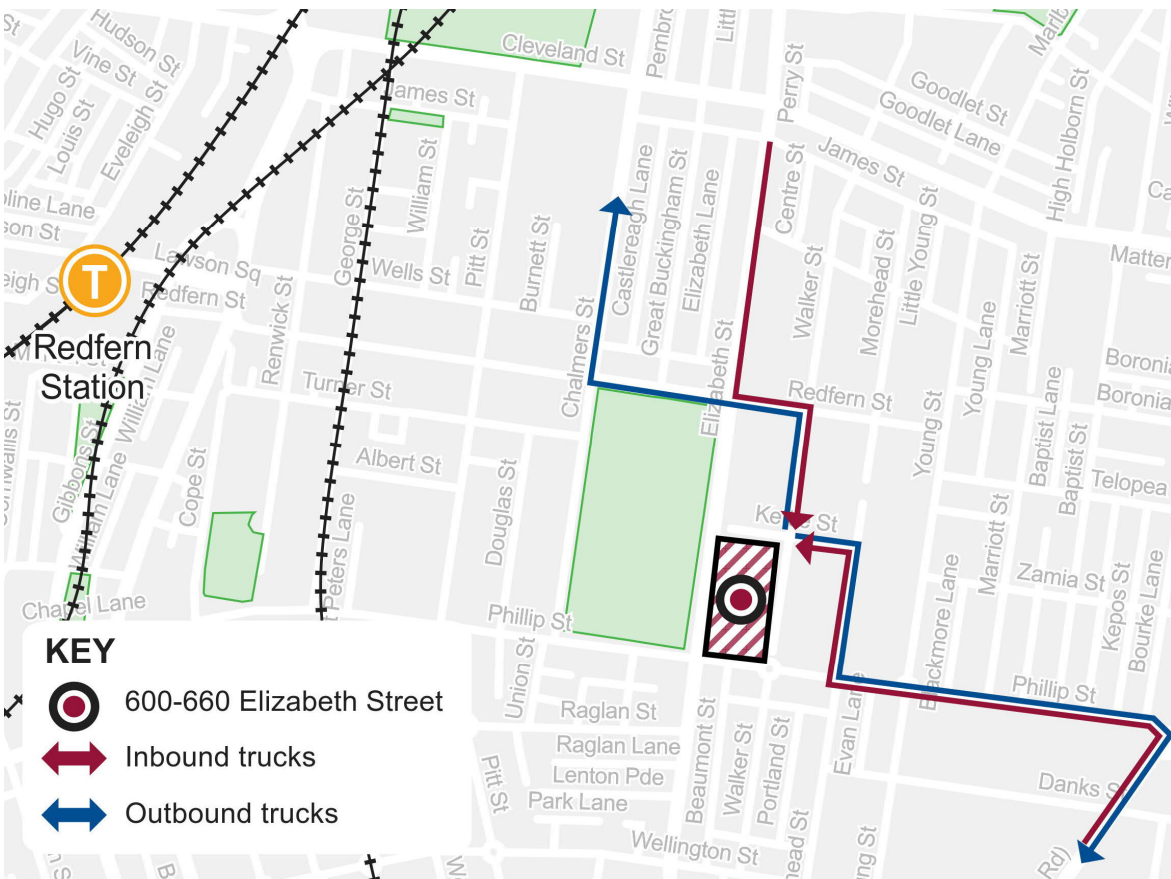


Figure 4-5: Potential haulage routes during construction

## 5. Conclusion

The reference scheme which has been developed to inform proposed development controls for the 600-660 Elizabeth Street site in Redfern comprise the following:

- Approximately 1200 square metres GFA for retail and 700 square metres GFA for communal resident facilities.
- Approximately 327 dwellings comprising a mix of affordable, social apartments and the balance as private market apartments.

The assessment of the reference scheme addresses the traffic and transport study requirements that were originally intended for the SSP prepared by the Department of Planning and Environment, and updated to conform with the City of Sydney Planning Proposal checklist.

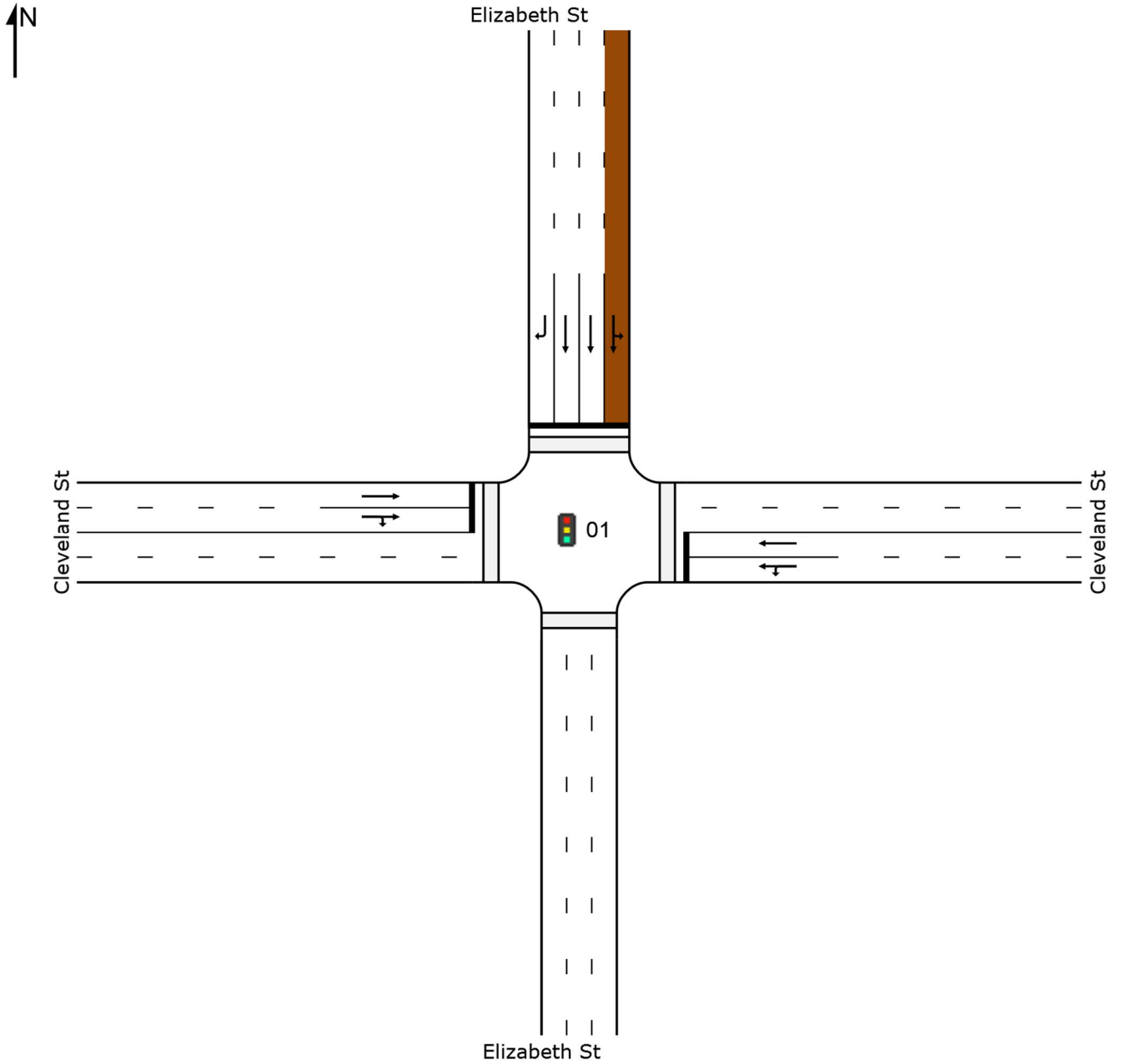
Key findings of the traffic and transport impact assessment are:

- Access to the development via Walker Street would have the least impact on the road network.
- Parking provision for most modes is consistent with Category B rates defined in Sydney LEP 2012 and should be as follows:
  - 200 parking spaces (maximum) for residents, 10 of which are accessible parking spaces
  - 327 bicycle parking spaces (minimum) for resident's and 33 for their visitors
  - 8 parking spaces (minimum) for service vehicles
  - 17 parking spaces (minimum) for motorcycles
- Car share parking spaces would need to be accessible to the general public, and service vehicle bays would need to be accessible for City of Sydney's standard garbage trucks.
- Provision of an access driveway for the development on Walker Street and closing Kettle Street west of Walker Street to traffic to accommodate a public square would result in the loss of around 14 on-street parking spaces, including two disabled parking spaces. Opportunities to off-set these lost parking spaces should be investigated as the project progresses to a final design.
- Key intersections surrounding the site would continue to operate at an acceptable level.
- Bus and train services accessible from the development are already operating close to or at capacity. The future Waterloo Station and potential extension of Sydney Metro West to Zetland is expected to improve public transport capacity and therefore the projected additional public transport trips generated by the development would be readily accommodated.
- Pedestrian and bicycle activity surrounding the site would increase. Pedestrian and cyclist amenity are expected to improve on Kettle Street due to its upgrade to a public square. This would improve pedestrian and cyclist safety, improve a key pedestrian desire line to and from Redfern Oval, and activate the area by making it more appealing, thereby promoting more active travel, a key objective of the Liveable Green Network. There are opportunities to improve amenity along Elizabeth Street, Walker Street and Phillip Street through landscaping and tree planting.
- During construction, access to the site would be from Kettle Street or Walker Street to reduce potential conflict between construction vehicles and general traffic. The implementation of work zones on these streets would also reduce the amount of on-street parking.
- A Transport Access Guide should be developed during the Development Application stage.

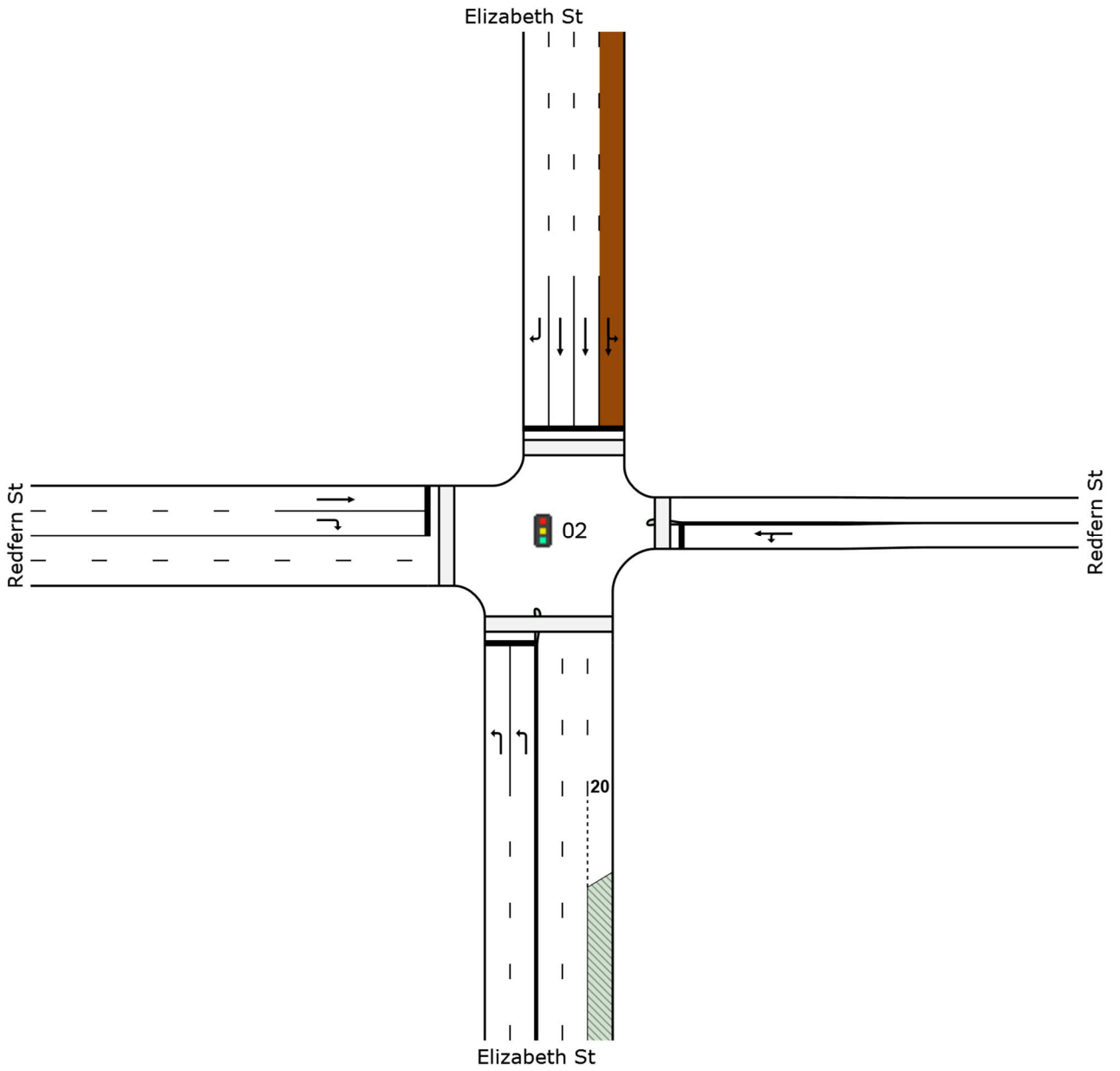
## Appendix A. Modelled intersection layouts

## Layouts

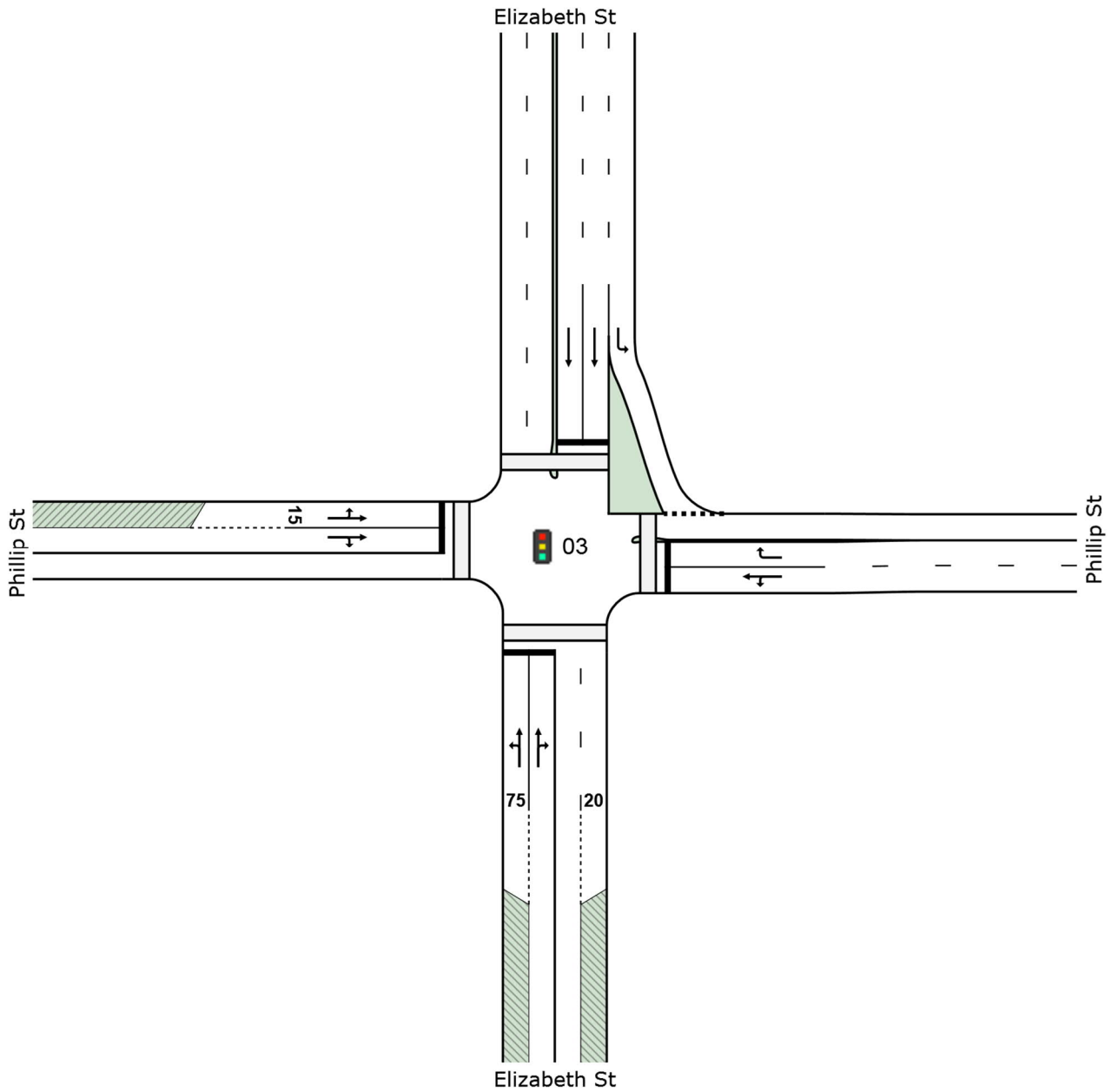
### Cleveland Street / Elizabeth Street



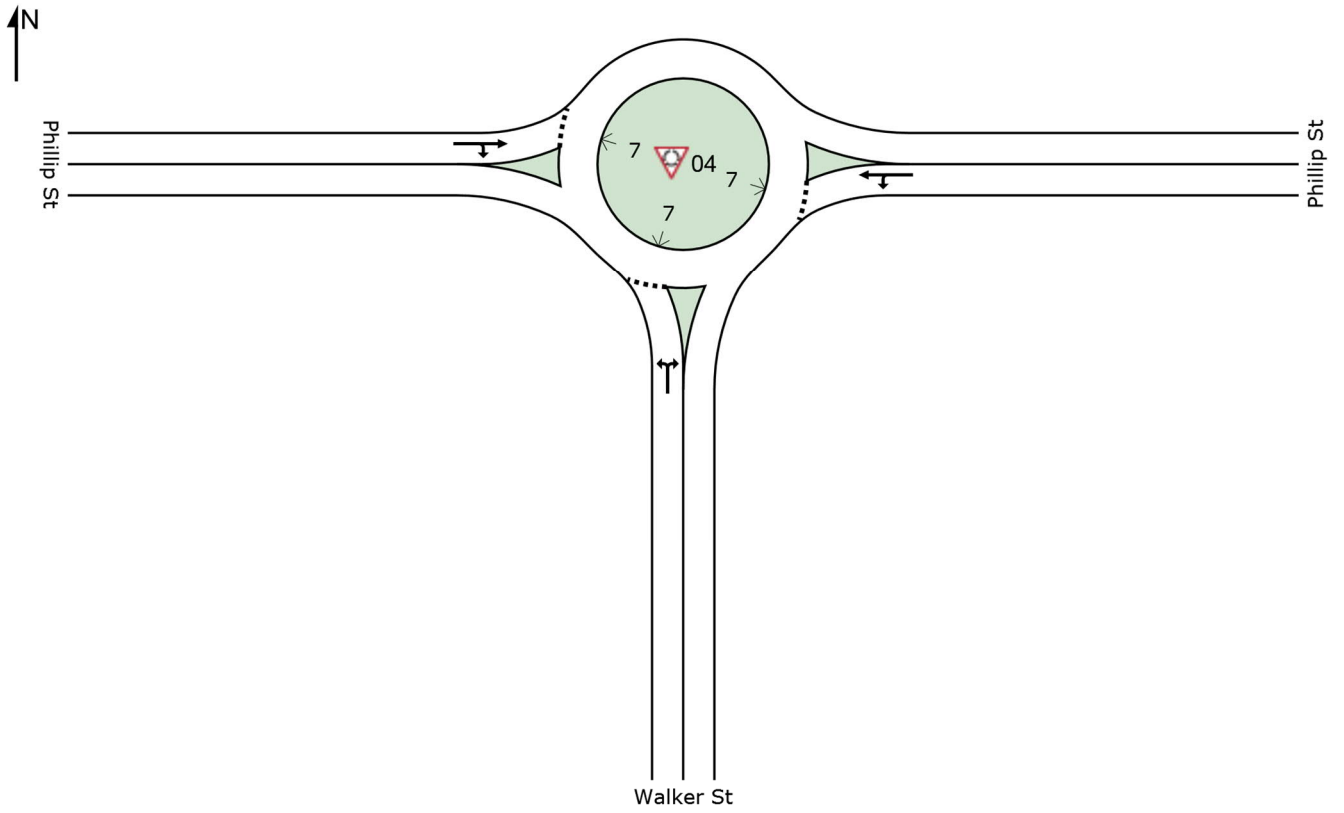
Elizabeth Street / Redfern Street



Elizabeth Street / Phillip Street

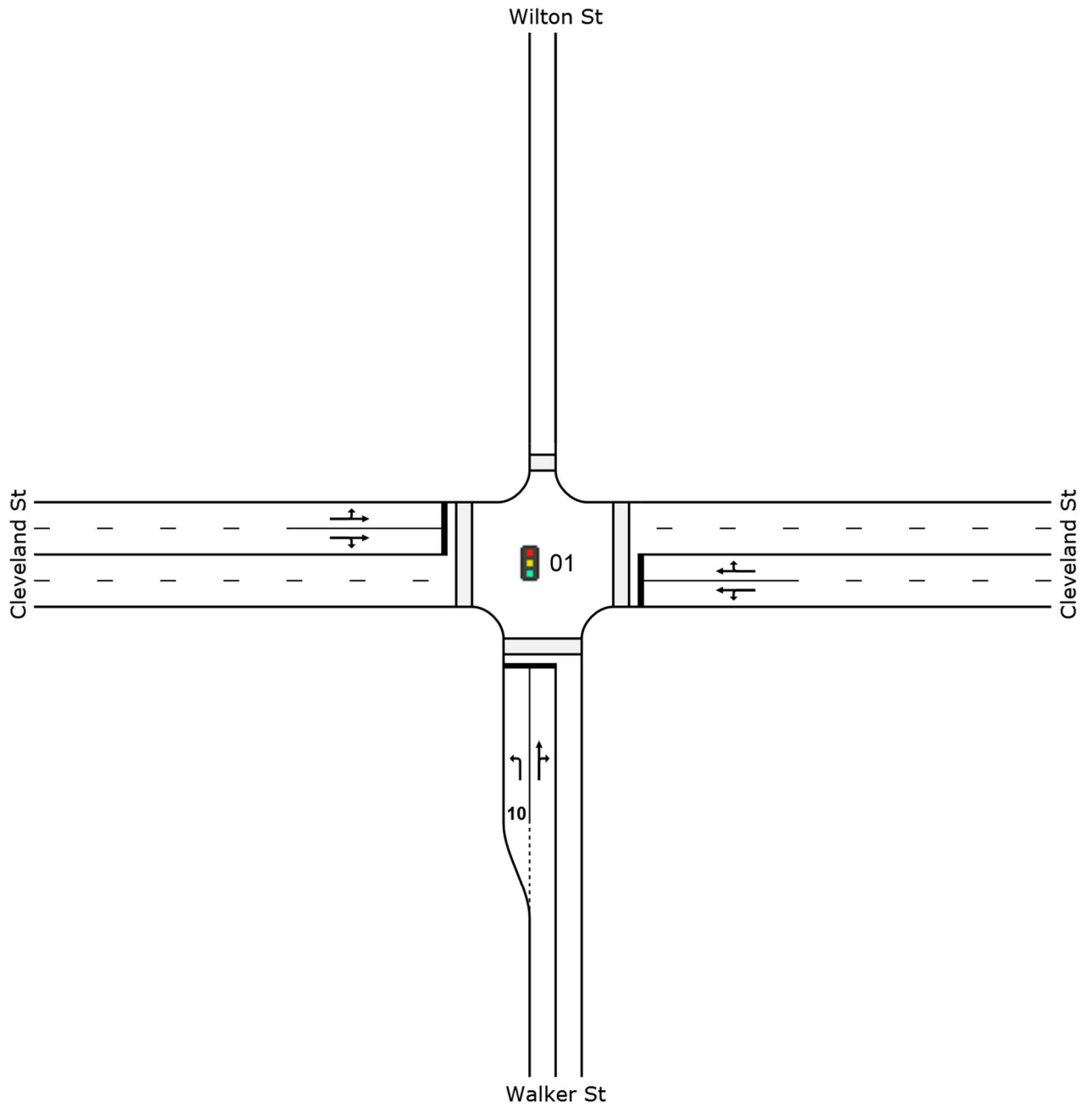


Phillip Street / Walker Street

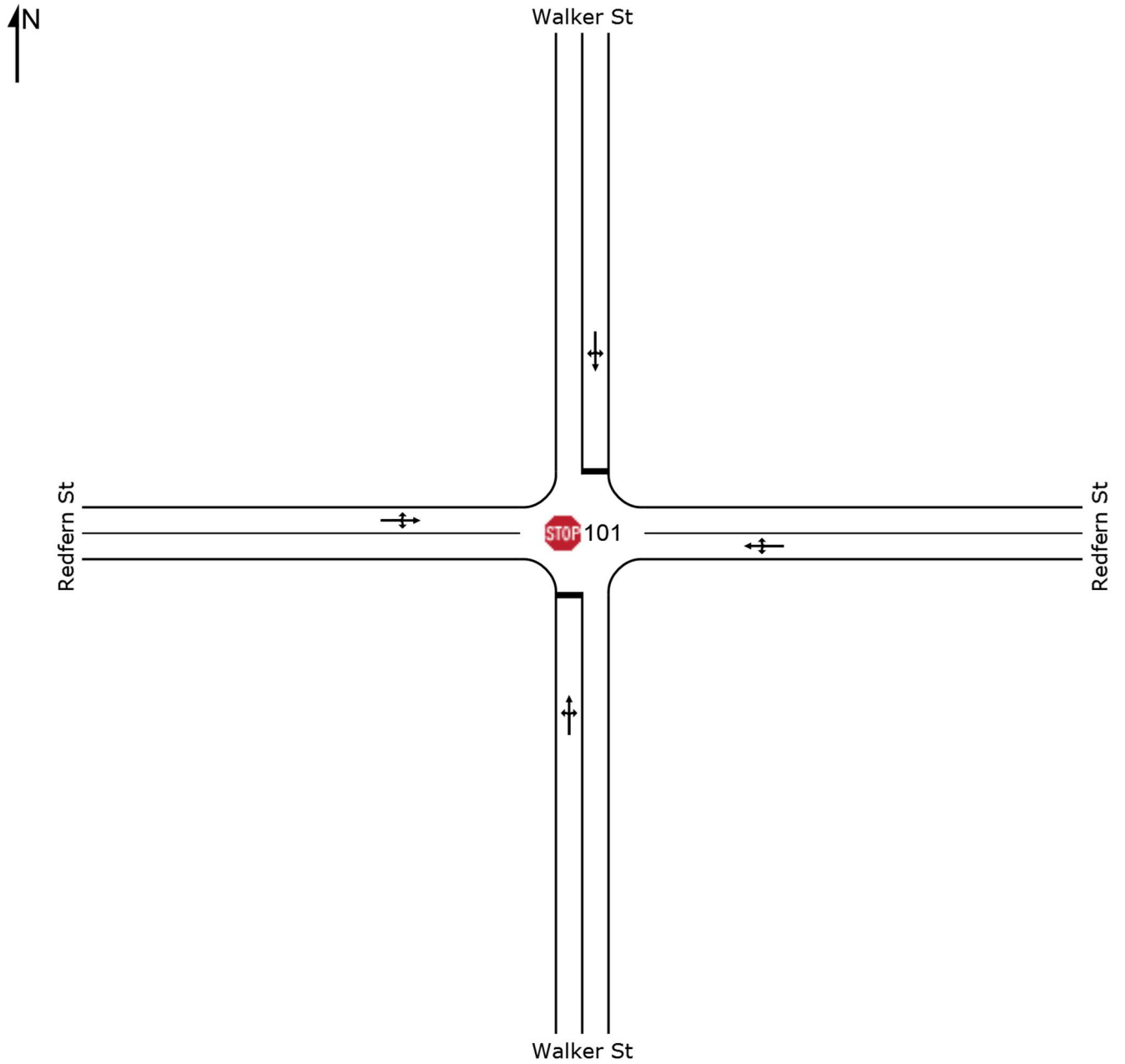




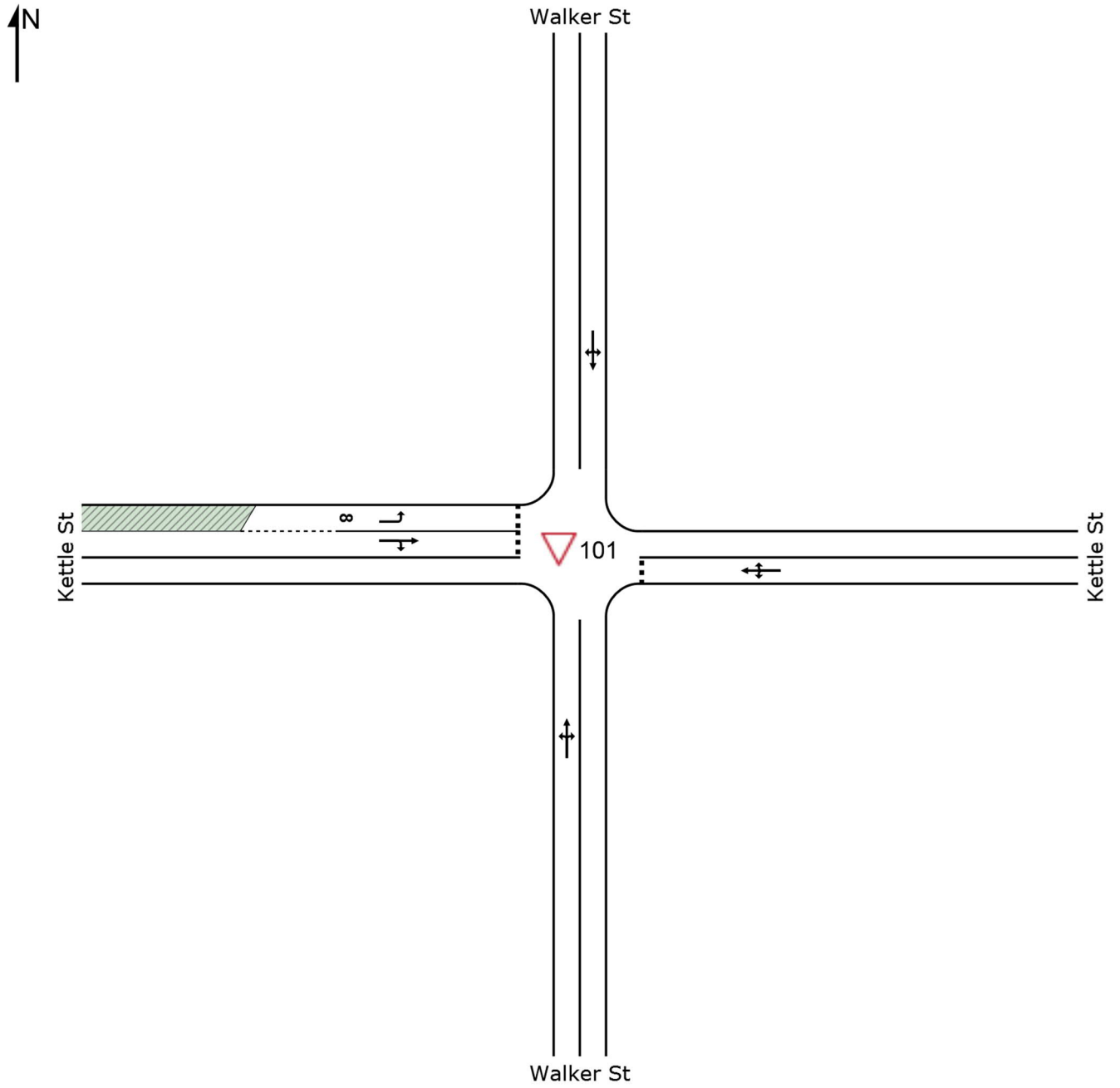
Walker Street / Cleveland Street



**Walker Street / Redfern Street**



Walker Street / Kettle Street



## Appendix B. Sidra modelling outputs (base)

## Base

### Cleveland Street / Elizabeth Street

## MOVEMENT SUMMARY

#### Site: 01 [Base AM Elizabeth St & Cleveland St]

Elizabeth St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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 per veh	Average Speed km/h
East: Cleveland St											
4	L2	77	5.2	0.681	37.7	LOS C	23.6	170.1	0.90	0.80	29.0
5	T1	919	2.9	0.681	32.7	LOS C	24.6	176.7	0.89	0.79	27.5
Approach		996	3.1	0.681	33.1	LOS C	24.6	176.7	0.89	0.80	27.7
North: Elizabeth St											
7	L2	112	18.8	0.557	51.3	LOS D	10.4	81.9	0.95	0.80	22.9
8	T1	577	9.5	0.557	43.7	LOS D	12.8	96.8	0.93	0.79	30.5
9	R2	240	3.3	0.662	53.1	LOS D	13.2	94.9	0.98	0.83	26.4
Approach		929	9.0	0.662	47.1	LOS D	13.2	96.8	0.95	0.80	28.6
West: Cleveland St											
11	T1	1052	2.1	0.671	19.2	LOS B	29.9	212.9	0.72	0.65	33.7
12	R2	109	2.8	0.671	48.6	LOS D	16.6	118.3	0.96	0.83	29.1
Approach		1161	2.2	0.671	21.9	LOS B	29.9	212.9	0.74	0.67	33.0
All Vehicles		3086	4.5	0.681	33.1	LOS C	29.9	212.9	0.85	0.75	29.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 01 [Base PM Elizabeth St & Cleveland St]

Elizabeth St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
East: Cleveland St											
4	L2	53	5.7	0.680	41.0	LOS C	21.6	156.2	0.92	0.81	28.0
5	T1	830	3.7	0.680	36.0	LOS C	22.6	162.9	0.92	0.81	26.4
Approach		883	3.9	0.680	36.3	LOS C	22.6	162.9	0.92	0.81	26.5
North: Elizabeth St											
7	L2	159	12.6	0.629	47.5	LOS D	14.9	112.4	0.94	0.82	24.0
8	T1	816	5.4	0.629	40.2	LOS C	17.6	128.8	0.93	0.80	31.5
9	R2	325	0.6	0.680	48.0	LOS D	17.2	121.4	0.96	0.84	27.6
Approach		1300	5.1	0.680	43.1	LOS D	17.6	128.8	0.94	0.81	29.7
West: Cleveland St											
11	T1	923	0.9	0.657	20.9	LOS B	29.1	205.4	0.75	0.68	32.8
12	R2	134	0.0	0.657	49.9	LOS D	15.1	106.1	0.96	0.83	28.7
Approach		1057	0.8	0.657	24.6	LOS B	29.1	205.4	0.78	0.70	31.9
All Vehicles		3240	3.3	0.680	35.2	LOS C	29.1	205.4	0.88	0.77	29.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Elizabeth Street / Redfern Street

### MOVEMENT SUMMARY

**Site: 02 [Base AM Elizabeth St & Redfern St]**

Elizabeth St & Redfern St Signalised Intersection  
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows Total	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
<b>South: Elizabeth St</b>											
1	L2	851	6.2	0.522	17.3	LOS B	9.1	67.5	0.76	0.79	32.2
Approach		851	6.2	0.522	17.3	LOS B	9.1	67.5	0.76	0.79	32.2
<b>East: Redfern St</b>											
4	L2	2	0.0	0.524	53.7	LOS D	9.6	67.3	0.96	0.78	22.5
5	T1	176	0.0	0.524	49.2	LOS D	9.6	67.3	0.96	0.78	19.0
Approach		178	0.0	0.524	49.2	LOS D	9.6	67.3	0.96	0.78	19.1
<b>North: Elizabeth St</b>											
7	L2	25	0.0	0.073	24.9	LOS B	2.0	14.3	0.61	0.56	32.8
8	T1	602	7.1	0.338	22.6	LOS B	10.6	79.1	0.69	0.59	33.8
9	R2	131	9.2	0.530	57.6	LOS E	7.3	55.3	0.98	0.80	19.0
Approach		758	7.3	0.530	28.7	LOS C	10.6	79.1	0.73	0.63	30.5
<b>West: Redfern St</b>											
11	T1	126	0.8	0.144	20.5	LOS B	4.3	30.0	0.62	0.51	29.8
12	R2	88	2.3	0.214	45.5	LOS D	4.2	30.0	0.85	0.75	21.0
Approach		214	1.4	0.214	30.8	LOS C	4.3	30.0	0.72	0.61	25.2
All Vehicles		2001	5.5	0.530	25.9	LOS B	10.6	79.1	0.76	0.71	29.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 02 [Base AM Elizabeth St & Redfern St]

Elizabeth St & Redfern St Signalised Intersection  
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Elizabeth St											
1	L2	851	6.2	0.522	17.3	LOS B	9.1	67.5	0.76	0.79	32.2
Approach		851	6.2	0.522	17.3	LOS B	9.1	67.5	0.76	0.79	32.2
East: Redfern St											
4	L2	2	0.0	0.524	53.7	LOS D	9.6	67.3	0.96	0.78	22.5
5	T1	176	0.0	0.524	49.2	LOS D	9.6	67.3	0.96	0.78	19.0
Approach		178	0.0	0.524	49.2	LOS D	9.6	67.3	0.96	0.78	19.1
North: Elizabeth St											
7	L2	25	0.0	0.073	24.9	LOS B	2.0	14.3	0.61	0.56	32.8
8	T1	602	7.1	0.338	22.6	LOS B	10.6	79.1	0.69	0.59	33.8
9	R2	131	9.2	0.530	57.6	LOS E	7.3	55.3	0.98	0.80	19.0
Approach		758	7.3	0.530	28.7	LOS C	10.6	79.1	0.73	0.63	30.5
West: Redfern St											
11	T1	126	0.8	0.144	20.5	LOS B	4.3	30.0	0.62	0.51	29.8
12	R2	88	2.3	0.214	45.5	LOS D	4.2	30.0	0.85	0.75	21.0
Approach		214	1.4	0.214	30.8	LOS C	4.3	30.0	0.72	0.61	25.2
All Vehicles		2001	5.5	0.530	25.9	LOS B	10.6	79.1	0.76	0.71	29.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.



## Elizabeth Street / Phillip Street

### MOVEMENT SUMMARY

Site: 03 [Base AM Elizabeth St & Phillip St]

Elizabeth St & Phillip St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand 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 per veh	Average Speed km/h
South: Elizabeth St											
1	L2	125	2.4	0.723	14.9	LOS B	20.6	155.4	0.56	0.55	40.5
2	T1	626	10.4	0.723	13.4	LOS A	20.6	155.4	0.59	0.58	36.6
3	R2	240	1.7	0.723	52.5	LOS D	16.3	117.2	0.98	0.86	15.2
Approach		991	7.3	0.723	23.1	LOS B	20.6	155.4	0.68	0.64	30.5
East: Phillip St											
4	L2	60	3.3	0.300	45.6	LOS D	6.2	45.2	0.87	0.74	17.5
5	T1	68	5.9	0.300	41.0	LOS C	6.2	45.2	0.87	0.74	24.0
6	R2	135	5.9	0.527	54.4	LOS D	7.4	54.4	0.96	0.80	16.9
Approach		263	5.3	0.527	48.9	LOS D	7.4	54.4	0.91	0.77	18.9
North: Elizabeth St											
7	L2	85	11.8	0.066	6.6	LOS A	0.9	6.7	0.24	0.56	38.8
8	T1	619	10.8	0.676	29.1	LOS C	24.2	185.4	0.84	0.73	28.8
Approach		704	10.9	0.676	26.4	LOS B	24.2	185.4	0.76	0.71	29.5
West: Phillip St											
10	L2	3	33.3	0.029	46.2	LOS D	0.5	3.7	0.83	0.60	28.0
11	T1	25	4.0	0.143	42.6	LOS D	2.0	14.8	0.85	0.67	23.5
12	R2	23	8.7	0.143	47.8	LOS D	2.0	14.8	0.86	0.70	26.1
Approach		51	7.8	0.143	45.2	LOS D	2.0	14.8	0.85	0.68	25.1
All Vehicles		2009	8.3	0.723	28.2	LOS B	24.2	185.4	0.75	0.68	28.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 03 [Base PM Elizabeth St & Phillip St ]

Elizabeth St & Phillip St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Elizabeth St											
1	L2	79	0.0	0.651	14.0	LOS A	19.1	138.3	0.52	0.51	41.3
2	T1	607	4.8	0.651	9.5	LOS A	19.1	138.3	0.52	0.51	39.9
3	R2	228	0.0	0.818	64.1	LOS E	14.2	99.1	1.00	0.92	13.1
Approach		914	3.2	0.818	23.5	LOS B	19.1	138.3	0.64	0.61	30.2
East: Phillip St											
4	L2	66	3.0	0.275	45.3	LOS D	5.6	40.6	0.86	0.74	17.4
5	T1	51	3.9	0.275	40.7	LOS C	5.6	40.6	0.86	0.74	23.9
6	R2	186	5.9	0.802	63.9	LOS E	11.6	85.3	1.00	0.93	15.2
Approach		303	5.0	0.802	56.0	LOS D	11.6	85.3	0.95	0.85	17.0
North: Elizabeth St											
7	L2	157	4.5	0.120	7.6	LOS A	2.1	14.9	0.29	0.59	37.9
8	T1	929	5.3	0.830	28.2	LOS B	40.0	292.9	0.87	0.81	29.2
Approach		1086	5.2	0.830	25.2	LOS B	40.0	292.9	0.79	0.78	29.9
West: Phillip St											
10	L2	1	0.0	0.054	45.3	LOS D	1.0	7.0	0.83	0.61	28.7
11	T1	28	0.0	0.270	42.5	LOS D	3.4	23.9	0.85	0.65	23.8
12	R2	58	0.0	0.270	51.9	LOS D	3.4	23.9	0.91	0.75	24.7
Approach		87	0.0	0.270	48.8	LOS D	3.4	23.9	0.89	0.72	24.5
All Vehicles		2390	4.2	0.830	29.3	LOS C	40.0	292.9	0.76	0.72	27.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Phillip Street / Walker Street

### MOVEMENT SUMMARY



#### Site: 04 [Base AM Phillip St & Walker St]

Phillip St & Walker St Roundabout  
Roundabout

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	11	0.0	0.016	5.7	LOS A	0.1	0.5	0.41	0.57	37.7
3	R2	5	0.0	0.016	8.0	LOS A	0.1	0.5	0.41	0.57	36.2
Approach		16	0.0	0.016	6.4	LOS A	0.1	0.5	0.41	0.57	37.2
East: Phillip St											
4	L2	10	0.0	0.194	4.3	LOS A	1.0	7.4	0.08	0.44	40.6
5	T1	277	2.2	0.194	3.8	LOS A	1.0	7.4	0.08	0.44	35.6
Approach		287	2.1	0.194	3.8	LOS A	1.0	7.4	0.08	0.44	36.0
West: Phillip St											
11	T1	368	1.6	0.239	3.8	LOS A	1.5	10.9	0.05	0.45	19.8
12	R2	14	0.0	0.239	6.5	LOS A	1.5	10.9	0.05	0.45	41.5
Approach		382	1.6	0.239	3.9	LOS A	1.5	10.9	0.05	0.45	20.6
All Vehicles		685	1.8	0.239	3.9	LOS A	1.5	10.9	0.07	0.45	25.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: 04 [Base PM Phillip St & Walker St]

Phillip St & Walker St Roundabout  
Roundabout

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand 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 per veh	Average Speed km/h
South: Walker St											
1	L2	9	0.0	0.017	5.7	LOS A	0.1	0.6	0.41	0.58	37.5
3	R2	7	14.3	0.017	8.3	LOS A	0.1	0.6	0.41	0.58	35.7
Approach		16	6.3	0.017	6.9	LOS A	0.1	0.6	0.41	0.58	36.7
East: Phillip St											
4	L2	10	0.0	0.183	4.3	LOS A	1.0	7.0	0.04	0.45	40.8
5	T1	277	3.2	0.183	3.7	LOS A	1.0	7.0	0.04	0.45	36.0
Approach		287	3.1	0.183	3.7	LOS A	1.0	7.0	0.04	0.45	36.3
West: Phillip St											
11	T1	420	1.2	0.269	3.8	LOS A	1.8	12.7	0.07	0.44	19.7
12	R2	5	0.0	0.269	6.6	LOS A	1.8	12.7	0.07	0.44	41.5
Approach		425	1.2	0.269	3.9	LOS A	1.8	12.7	0.07	0.44	20.0
All Vehicles		728	2.1	0.269	3.9	LOS A	1.8	12.7	0.07	0.45	24.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Walker Street / Cleveland Street

### MOVEMENT SUMMARY

**Site: 01 [Base AM Walker St & Cleveland St]**

Walker St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Walker St											
1	L2	63	1.6	0.285	51.6	LOS D	3.2	22.9	0.90	0.74	27.8
2	T1	47	0.0	0.434	47.2	LOS D	5.5	39.2	0.92	0.75	29.0
3	R2	59	3.4	0.434	51.8	LOS D	5.5	39.2	0.92	0.75	24.2
Approach		169	1.8	0.434	50.5	LOS D	5.5	39.2	0.91	0.75	27.0
East: Cleveland St											
4	L2	24	0.0	0.447	12.0	LOS A	14.3	105.0	0.45	0.42	42.5
5	T1	1040	6.2	0.447	8.0	LOS A	14.3	105.0	0.46	0.43	41.5
6	R2	26	3.8	0.447	13.3	LOS A	12.7	93.1	0.48	0.45	40.4
Approach		1090	6.0	0.447	8.3	LOS A	14.3	105.0	0.46	0.43	41.5
West: Cleveland St											
10	L2	54	5.6	0.445	12.5	LOS A	14.4	105.6	0.46	0.44	43.5
11	T1	1064	5.9	0.445	7.9	LOS A	14.4	105.6	0.46	0.43	41.6
12	R2	14	0.0	0.445	12.4	LOS A	13.3	97.6	0.46	0.42	44.1
Approach		1132	5.8	0.445	8.1	LOS A	14.4	105.6	0.46	0.43	41.8
All Vehicles		2391	5.6	0.447	11.2	LOS A	14.4	105.6	0.49	0.46	39.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 01 [Base PM Walker St & Cleveland St ]

Walker St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
<b>South: Walker St</b>											
1	L2	27	0.0	0.087	50.3	LOS D	1.3	9.4	0.88	0.71	28.1
2	T1	49	0.0	0.332	47.8	LOS D	4.7	32.8	0.92	0.74	29.0
3	R2	41	0.0	0.332	52.4	LOS D	4.7	32.8	0.92	0.74	24.2
Approach		117	0.0	0.332	50.0	LOS D	4.7	32.8	0.91	0.73	27.3
<b>East: Cleveland St</b>											
4	L2	26	0.0	0.336	10.9	LOS A	9.5	69.2	0.39	0.37	43.4
5	T1	835	4.7	0.336	6.5	LOS A	9.5	69.2	0.40	0.37	42.8
6	R2	15	0.0	0.336	11.3	LOS A	9.0	65.1	0.40	0.37	42.1
Approach		876	4.5	0.336	6.7	LOS A	9.5	69.2	0.40	0.37	42.8
<b>West: Cleveland St</b>											
10	L2	46	0.0	0.345	11.3	LOS A	10.1	72.6	0.41	0.39	44.3
11	T1	865	3.8	0.345	6.5	LOS A	10.1	72.6	0.40	0.38	42.7
12	R2	9	0.0	0.345	10.9	LOS A	9.5	68.7	0.40	0.36	45.0
Approach		920	3.6	0.345	6.8	LOS A	10.1	72.6	0.40	0.38	42.9
All Vehicles		1913	3.8	0.345	9.4	LOS A	10.1	72.6	0.43	0.40	40.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Walker Street / Redfern Street

### MOVEMENT SUMMARY

Site: 101 [Base AM Walker St & Redfern St ]

Walker St & Redfern St Stop Priority  
Stop (Two-Way)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	21	4.8	0.082	8.2	LOS A	0.3	2.2	0.34	0.95	44.5
2	T1	50	2.0	0.082	9.4	LOS A	0.3	2.2	0.34	0.95	44.3
3	R2	1	0.0	0.082	9.4	LOS A	0.3	2.2	0.34	0.95	44.2
Approach		72	2.8	0.082	9.1	LOS A	0.3	2.2	0.34	0.95	44.4
East: Redfern St											
4	L2	14	7.1	0.116	5.1	LOS A	0.4	2.8	0.18	0.18	47.9
5	T1	137	0.7	0.116	0.2	LOS A	0.4	2.8	0.18	0.18	48.5
6	R2	58	0.0	0.116	5.1	LOS A	0.4	2.8	0.18	0.18	47.6
Approach		209	1.0	0.116	1.9	NA	0.4	2.8	0.18	0.18	48.2
North: Walker St											
7	L2	11	0.0	0.047	7.8	LOS A	0.2	1.2	0.31	0.93	44.6
8	T1	21	0.0	0.047	9.1	LOS A	0.2	1.2	0.31	0.93	44.3
9	R2	8	0.0	0.047	9.7	LOS A	0.2	1.2	0.31	0.93	44.2
Approach		40	0.0	0.047	8.9	LOS A	0.2	1.2	0.31	0.93	44.3
West: Redfern St											
10	L2	53	3.8	0.094	4.7	LOS A	0.1	1.0	0.07	0.20	48.1
11	T1	105	3.8	0.094	0.1	LOS A	0.1	1.0	0.07	0.20	48.6
12	R2	15	0.0	0.094	5.0	LOS A	0.1	1.0	0.07	0.20	47.7
Approach		173	3.5	0.094	1.9	NA	0.1	1.0	0.07	0.20	48.4
All Vehicles		494	2.0	0.116	3.5	NA	0.4	2.8	0.18	0.36	47.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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

**STOP Site: 101 [Base PM Walker St & Redfern St]**

Walker St & Redfern St Stop Priority  
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	33	0.0	0.083	8.2	LOS A	0.3	2.1	0.37	0.93	44.6
2	T1	39	0.0	0.083	9.6	LOS A	0.3	2.1	0.37	0.93	44.3
3	R2	2	0.0	0.083	9.7	LOS A	0.3	2.1	0.37	0.93	44.2
Approach		74	0.0	0.083	9.0	LOS A	0.3	2.1	0.37	0.93	44.4
East: Redfern St											
4	L2	10	0.0	0.124	5.1	LOS A	0.2	1.5	0.09	0.09	48.8
5	T1	195	1.0	0.124	0.1	LOS A	0.2	1.5	0.09	0.09	49.3
6	R2	26	0.0	0.124	5.2	LOS A	0.2	1.5	0.09	0.09	48.3
Approach		231	0.9	0.124	0.9	NA	0.2	1.5	0.09	0.09	49.1
North: Walker St											
7	L2	9	11.1	0.035	8.4	LOS A	0.1	0.9	0.34	0.92	44.2
8	T1	7	0.0	0.035	9.4	LOS A	0.1	0.9	0.34	0.92	44.1
9	R2	11	0.0	0.035	10.2	LOS A	0.1	0.9	0.34	0.92	44.0
Approach		27	3.7	0.035	9.4	LOS A	0.1	0.9	0.34	0.92	44.1
West: Redfern St											
10	L2	44	0.0	0.104	4.8	LOS A	0.1	1.0	0.08	0.16	48.4
11	T1	137	0.0	0.104	0.1	LOS A	0.1	1.0	0.08	0.16	48.9
12	R2	15	0.0	0.104	5.3	LOS A	0.1	1.0	0.08	0.16	47.9
Approach		196	0.0	0.104	1.5	NA	0.1	1.0	0.08	0.16	48.7
All Vehicles		528	0.6	0.124	2.7	NA	0.3	2.1	0.14	0.27	48.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.



## Walker Street / Kettle Street

### MOVEMENT SUMMARY

Site: 101 [Base AM Walker St & Kettle St]

Walker St & Kettle St Priority Intersection  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
		Total veh/h	HV %				Vehicles veh	Distance m				
South: Walker St												
1	L2	1	0.0	0.002	4.6	LOS A	0.0	0.0	0.09	0.34	47.3	
2	T1	1	0.0	0.002	0.1	LOS A	0.0	0.0	0.09	0.34	47.8	
3	R2	1	0.0	0.002	4.7	LOS A	0.0	0.0	0.09	0.34	46.9	
Approach		3	0.0	0.002	3.1	NA	0.0	0.0	0.09	0.34	47.3	
East: Kettle St												
4	L2	3	0.0	0.066	4.6	LOS A	0.2	1.6	0.10	0.53	46.4	
5	T1	1	0.0	0.066	3.3	LOS A	0.2	1.6	0.10	0.53	46.5	
6	R2	68	1.5	0.066	4.7	LOS A	0.2	1.6	0.10	0.53	46.0	
Approach		72	1.4	0.066	4.7	LOS A	0.2	1.6	0.10	0.53	46.0	
North: Walker St												
7	L2	28	3.6	0.025	4.6	LOS A	0.0	0.2	0.00	0.36	47.5	
8	T1	15	0.0	0.025	0.0	LOS A	0.0	0.2	0.00	0.36	48.0	
9	R2	3	0.0	0.025	4.6	LOS A	0.0	0.2	0.00	0.36	47.3	
Approach		46	2.2	0.025	3.1	NA	0.0	0.2	0.00	0.36	47.6	
West: Kettle St												
10	L2	2	0.0	0.001	4.6	LOS A	0.0	0.0	0.01	0.52	46.6	
11	T1	1	0.0	0.002	3.3	LOS A	0.0	0.0	0.09	0.49	46.9	
12	R2	1	0.0	0.002	4.7	LOS A	0.0	0.0	0.09	0.49	46.4	
Approach		4	0.0	0.002	4.3	LOS A	0.0	0.0	0.05	0.50	46.6	
All Vehicles		125	1.6	0.066	4.1	NA	0.2	1.6	0.07	0.46	46.6	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: 101 [Base PM Walker St & Kettle St]

Walker St & Kettle St Priority Intersection  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	1	0.0	0.011	4.6	LOS A	0.0	0.3	0.05	0.23	48.1
2	T1	12	0.0	0.011	0.0	LOS A	0.0	0.3	0.05	0.23	48.6
3	R2	8	0.0	0.011	4.6	LOS A	0.0	0.3	0.05	0.23	47.6
Approach		21	0.0	0.011	2.0	NA	0.0	0.3	0.05	0.23	48.2
East: Kettle St											
4	L2	6	0.0	0.042	4.6	LOS A	0.1	1.0	0.06	0.54	46.5
5	T1	1	0.0	0.042	3.3	LOS A	0.1	1.0	0.06	0.54	46.6
6	R2	41	0.0	0.042	4.7	LOS A	0.1	1.0	0.06	0.54	46.1
Approach		48	0.0	0.042	4.7	LOS A	0.1	1.0	0.06	0.54	46.1
North: Walker St											
7	L2	13	0.0	0.010	4.6	LOS A	0.0	0.1	0.01	0.39	47.3
8	T1	5	0.0	0.010	0.0	LOS A	0.0	0.1	0.01	0.39	47.8
9	R2	1	0.0	0.010	4.6	LOS A	0.0	0.1	0.01	0.39	47.1
Approach		19	0.0	0.010	3.4	NA	0.0	0.1	0.01	0.39	47.4
West: Kettle St											
10	L2	1	0.0	0.001	4.6	LOS A	0.0	0.0	0.05	0.51	46.5
11	T1	1	0.0	0.002	3.3	LOS A	0.0	0.0	0.10	0.48	46.9
12	R2	1	0.0	0.002	4.7	LOS A	0.0	0.0	0.10	0.48	46.4
Approach		3	0.0	0.002	4.2	LOS A	0.0	0.0	0.08	0.49	46.6
All Vehicles		91	0.0	0.042	3.8	NA	0.1	1.0	0.05	0.43	46.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Appendix C. Sidra modelling outputs (future)

## Future

### Cleveland Street / Elizabeth Street

## MOVEMENT SUMMARY

### Site: 01 [Future AM Elizabeth St & Cleveland St]

Elizabeth St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows 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 per veh	Average Speed km/h
East: Cleveland St											
4	L2	77	5.2	0.681	37.7	LOS C	23.6	170.1	0.90	0.80	29.0
5	T1	919	2.9	0.681	32.7	LOS C	24.6	176.7	0.89	0.79	27.5
Approach		996	3.1	0.681	33.1	LOS C	24.6	176.7	0.89	0.80	27.7
North: Elizabeth St											
7	L2	112	18.8	0.557	51.3	LOS D	10.4	81.9	0.95	0.80	22.9
8	T1	577	9.5	0.557	43.7	LOS D	12.8	96.8	0.93	0.79	30.5
9	R2	240	3.3	0.662	53.1	LOS D	13.2	94.9	0.98	0.83	26.4
Approach		929	9.0	0.662	47.1	LOS D	13.2	96.8	0.95	0.80	28.6
West: Cleveland St											
11	T1	1052	2.1	0.672	19.2	LOS B	29.9	213.4	0.72	0.66	33.7
12	R2	110	2.7	0.672	48.6	LOS D	16.6	118.3	0.96	0.83	29.1
Approach		1162	2.2	0.672	21.9	LOS B	29.9	213.4	0.74	0.67	33.0
All Vehicles		3087	4.5	0.681	33.1	LOS C	29.9	213.4	0.85	0.75	29.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 01 [Future PM Elizabeth St & Cleveland St]

Elizabeth St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
<b>East: Cleveland St</b>											
4	L2	53	5.7	0.680	41.0	LOS C	21.6	156.2	0.92	0.81	28.0
5	T1	830	3.7	0.680	36.0	LOS C	22.6	162.9	0.92	0.81	26.4
<b>Approach</b>		883	3.9	0.680	36.3	LOS C	22.6	162.9	0.92	0.81	26.5
<b>North: Elizabeth St</b>											
7	L2	159	12.6	0.629	47.5	LOS D	14.9	112.4	0.94	0.82	24.0
8	T1	816	5.4	0.629	40.2	LOS C	17.6	128.8	0.93	0.80	31.5
9	R2	325	0.6	0.680	48.0	LOS D	17.2	121.4	0.96	0.84	27.6
<b>Approach</b>		1300	5.1	0.680	43.1	LOS D	17.6	128.8	0.94	0.81	29.7
<b>West: Cleveland St</b>											
11	T1	923	0.9	0.668	20.8	LOS B	29.9	211.0	0.75	0.68	32.8
12	R2	147	0.0	0.668	50.7	LOS D	15.2	107.0	0.97	0.83	28.4
<b>Approach</b>		1070	0.7	0.668	24.9	LOS B	29.9	211.0	0.78	0.70	31.8
<b>All Vehicles</b>		3253	3.3	0.680	35.3	LOS C	29.9	211.0	0.88	0.78	29.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Elizabeth Street / Redfern Street

### MOVEMENT SUMMARY

**Site: 02 [Future AM Elizabeth St & Redfern St]**

Elizabeth St & Redfern St Signalised Intersection  
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>												
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV %	v/c	sec		Vehicles	Distance		per veh	km/h	
		veh/h					veh	m				
<b>South: Elizabeth St</b>												
1	L2	851	6.2	0.552	18.6	LOS B	10.3	75.6	0.80	0.80	31.4	
Approach		851	6.2	0.552	18.6	LOS B	10.3	75.6	0.80	0.80	31.4	
<b>East: Redfern St</b>												
4	L2	16	0.0	0.541	50.7	LOS D	11.2	78.1	0.94	0.79	23.2	
5	T1	195	0.0	0.541	46.2	LOS D	11.2	78.1	0.94	0.79	19.7	
Approach		211	0.0	0.541	46.5	LOS D	11.2	78.1	0.94	0.79	20.0	
<b>North: Elizabeth St</b>												
7	L2	26	0.0	0.075	25.6	LOS B	2.0	14.5	0.61	0.57	32.4	
8	T1	602	7.1	0.345	23.3	LOS B	10.8	80.5	0.70	0.60	33.5	
9	R2	131	9.2	0.564	58.8	LOS E	7.4	56.0	0.99	0.80	18.7	
Approach		759	7.2	0.564	29.5	LOS C	10.8	80.5	0.74	0.63	30.2	
<b>West: Redfern St</b>												
11	T1	127	0.8	0.143	19.9	LOS B	4.2	29.8	0.61	0.50	30.2	
12	R2	88	2.3	0.241	48.3	LOS D	4.4	31.1	0.88	0.76	20.3	
Approach		215	1.4	0.241	31.5	LOS C	4.4	31.1	0.72	0.61	24.9	
All Vehicles		2036	5.5	0.564	26.9	LOS B	11.2	80.5	0.78	0.72	28.8	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 02 [Future PM Elizabeth St & Redfern St]

Elizabeth St & Redfern St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Elizabeth St											
1	L2	635	4.3	0.516	22.1	LOS B	7.9	57.4	0.85	0.80	29.6
Approach		635	4.3	0.516	22.1	LOS B	7.9	57.4	0.85	0.80	29.6
East: Redfern St											
4	L2	20	0.0	0.511	49.6	LOS D	10.8	75.8	0.93	0.78	23.5
5	T1	188	0.0	0.511	45.0	LOS D	10.8	75.8	0.93	0.78	20.0
Approach		208	0.0	0.511	45.4	LOS D	10.8	75.8	0.93	0.78	20.3
North: Elizabeth St											
7	L2	40	2.5	0.099	24.6	LOS B	2.7	19.6	0.61	0.59	32.8
8	T1	840	4.9	0.461	23.6	LOS B	15.9	115.6	0.73	0.64	33.4
9	R2	196	5.1	0.525	50.7	LOS D	10.3	75.5	0.94	0.81	20.5
Approach		1076	4.8	0.525	28.5	LOS C	15.9	115.6	0.76	0.67	30.6
West: Redfern St											
11	T1	381	0.0	0.442	24.7	LOS B	15.3	107.1	0.74	0.65	27.5
12	R2	157	1.3	0.487	53.5	LOS D	8.4	59.7	0.95	0.80	19.1
Approach		538	0.4	0.487	33.1	LOS C	15.3	107.1	0.80	0.69	24.2
All Vehicles		2457	3.3	0.525	29.3	LOS C	15.9	115.6	0.81	0.72	28.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Elizabeth Street / Phillip Street

### MOVEMENT SUMMARY

**Site: 03 [Future AM Elizabeth St & Phillip St]**

Elizabeth St & Phillip St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV	v/c	sec		Vehicles	Distance		per veh	km/h
		veh/h	%				veh	m			
<b>South: Elizabeth St</b>											
1	L2	125	2.4	0.687	12.7	LOS A	17.7	133.7	0.49	0.50	42.0
2	T1	626	10.4	0.687	12.0	LOS A	17.7	133.7	0.54	0.53	37.5
3	R2	242	1.7	0.687	48.8	LOS D	16.6	119.6	0.96	0.84	16.0
Approach		993	7.3	0.687	21.1	LOS B	17.7	133.7	0.64	0.60	31.5
<b>East: Phillip St</b>											
4	L2	60	3.3	0.351	49.5	LOS D	6.5	47.5	0.91	0.75	16.5
5	T1	68	5.9	0.351	44.9	LOS D	6.5	47.5	0.91	0.75	22.9
6	R2	135	5.9	0.648	59.7	LOS E	7.8	57.7	0.99	0.83	15.9
Approach		263	5.3	0.648	53.5	LOS D	7.8	57.7	0.95	0.79	17.9
<b>North: Elizabeth St</b>											
7	L2	85	11.8	0.067	6.8	LOS A	0.9	7.1	0.25	0.57	38.6
8	T1	633	10.6	0.676	28.5	LOS C	24.6	188.0	0.83	0.73	29.0
Approach		718	10.7	0.676	25.9	LOS B	24.6	188.0	0.76	0.71	29.7
<b>West: Phillip St</b>											
10	L2	3	33.3	0.035	50.0	LOS D	0.5	3.9	0.86	0.62	27.0
11	T1	25	4.0	0.175	47.2	LOS D	2.1	15.6	0.89	0.69	22.3
12	R2	23	8.7	0.175	52.7	LOS D	2.1	15.6	0.90	0.71	24.8
Approach		51	7.8	0.175	49.9	LOS D	2.1	15.6	0.89	0.69	23.8
All Vehicles		2025	8.2	0.687	27.7	LOS B	24.6	188.0	0.73	0.67	28.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 03 [Future PM Elizabeth St & Phillip St]

Elizabeth St & Phillip St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Elizabeth St											
1	L2	79	0.0	0.652	13.5	LOS A	18.5	134.5	0.51	0.50	41.7
2	T1	607	4.8	0.652	8.9	LOS A	18.5	134.5	0.51	0.50	40.3
3	R2	245	0.0	0.833	64.5	LOS E	15.4	107.5	1.00	0.94	13.1
Approach		931	3.1	0.833	23.9	LOS B	18.5	134.5	0.64	0.61	29.8
East: Phillip St											
4	L2	66	3.0	0.286	46.3	LOS D	5.7	41.1	0.87	0.74	17.2
5	T1	51	3.9	0.286	41.7	LOS C	5.7	41.1	0.87	0.74	23.7
6	R2	186	5.9	0.842	67.8	LOS E	12.0	88.6	1.00	0.97	14.6
Approach		303	5.0	0.842	58.7	LOS E	12.0	88.6	0.95	0.88	16.5
North: Elizabeth St											
7	L2	157	4.5	0.122	7.8	LOS A	2.1	15.6	0.30	0.59	37.7
8	T1	931	5.3	0.832	28.4	LOS B	40.3	294.6	0.87	0.81	29.1
Approach		1088	5.1	0.832	25.4	LOS B	40.3	294.6	0.79	0.78	29.8
West: Phillip St											
10	L2	1	0.0	0.057	46.2	LOS D	1.0	7.1	0.84	0.61	28.4
11	T1	28	0.0	0.283	43.4	LOS D	3.4	24.1	0.86	0.65	23.6
12	R2	58	0.0	0.283	52.9	LOS D	3.4	24.1	0.92	0.76	24.4
Approach		87	0.0	0.283	49.8	LOS D	3.4	24.1	0.90	0.72	24.2
All Vehicles		2409	4.2	0.842	29.9	LOS C	40.3	294.6	0.76	0.73	27.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Phillip Street / Walker Street

### MOVEMENT SUMMARY

Site: 04 [Future AM Phillip St & Walker St]

Phillip St & Walker St Roundabout  
Roundabout

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	11	0.0	0.016	5.7	LOS A	0.1	0.5	0.41	0.57	37.7
3	R2	5	0.0	0.016	8.0	LOS A	0.1	0.5	0.41	0.57	36.2
Approach		16	0.0	0.016	6.4	LOS A	0.1	0.5	0.41	0.57	37.2
East: Phillip St											
4	L2	10	0.0	0.194	4.3	LOS A	1.0	7.4	0.08	0.44	40.6
5	T1	277	2.2	0.194	3.8	LOS A	1.0	7.4	0.08	0.44	35.6
Approach		287	2.1	0.194	3.8	LOS A	1.0	7.4	0.08	0.44	36.0
West: Phillip St											
11	T1	370	1.6	0.240	3.8	LOS A	1.6	11.0	0.05	0.45	19.8
12	R2	14	0.0	0.240	6.5	LOS A	1.6	11.0	0.05	0.45	41.5
Approach		384	1.6	0.240	3.9	LOS A	1.6	11.0	0.05	0.45	20.6
All Vehicles		687	1.7	0.240	3.9	LOS A	1.6	11.0	0.07	0.45	25.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: 04 [Future PM Phillip St & Walker St]

Phillip St & Walker St Roundabout  
Roundabout

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand 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 per veh	Average Speed km/h
South: Walker St											
1	L2	9	0.0	0.017	5.7	LOS A	0.1	0.6	0.41	0.58	37.5
3	R2	7	14.3	0.017	8.3	LOS A	0.1	0.6	0.41	0.58	35.7
Approach		16	6.3	0.017	6.9	LOS A	0.1	0.6	0.41	0.58	36.7
East: Phillip St											
4	L2	10	0.0	0.183	4.3	LOS A	1.0	7.0	0.04	0.45	40.8
5	T1	277	3.2	0.183	3.7	LOS A	1.0	7.0	0.04	0.45	36.0
Approach		287	3.1	0.183	3.7	LOS A	1.0	7.0	0.04	0.45	36.3
West: Phillip St											
11	T1	437	1.1	0.279	3.8	LOS A	1.9	13.3	0.07	0.44	19.7
12	R2	5	0.0	0.279	6.6	LOS A	1.9	13.3	0.07	0.44	41.5
Approach		442	1.1	0.279	3.9	LOS A	1.9	13.3	0.07	0.44	20.0
All Vehicles		745	2.0	0.279	3.9	LOS A	1.9	13.3	0.07	0.45	24.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Walker Street / Cleveland Street

### MOVEMENT SUMMARY

**Site: 01 [Future AM Walker St & Cleveland St]**

Walker St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
<b>South: Walker St</b>											
1	L2	63	1.6	0.258	48.6	LOS D	3.1	22.1	0.88	0.74	28.5
2	T1	47	0.0	0.470	45.0	LOS D	6.8	48.1	0.91	0.76	29.5
3	R2	86	2.3	0.470	49.6	LOS D	6.8	48.1	0.91	0.76	24.7
Approach		196	1.5	0.470	48.2	LOS D	6.8	48.1	0.90	0.75	27.2
<b>East: Cleveland St</b>											
4	L2	27	0.0	0.465	13.4	LOS A	15.6	115.0	0.49	0.46	41.5
5	T1	1040	6.2	0.465	9.5	LOS A	15.6	115.0	0.50	0.47	40.3
6	R2	26	3.8	0.465	14.8	LOS B	13.7	101.1	0.52	0.48	39.3
Approach		1093	5.9	0.465	9.7	LOS A	15.6	115.0	0.50	0.47	40.3
<b>West: Cleveland St</b>											
10	L2	54	5.6	0.462	13.9	LOS A	15.6	115.0	0.50	0.48	42.6
11	T1	1064	5.9	0.462	9.5	LOS A	15.6	115.0	0.50	0.47	40.2
12	R2	14	0.0	0.462	14.3	LOS A	14.7	108.2	0.51	0.47	43.0
Approach		1132	5.8	0.462	9.8	LOS A	15.6	115.0	0.50	0.47	40.4
All Vehicles		2421	5.5	0.470	12.8	LOS A	15.6	115.0	0.54	0.49	38.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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 SUMMARY

### Site: 01 [Future PM Walker St & Cleveland St]

Walker St & Cleveland St Signalised Intersection

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Cycle Time)

<b>Movement Performance - Vehicles</b>											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
<b>South: Walker St</b>											
1	L2	27	0.0	0.087	50.3	LOS D	1.3	9.4	0.88	0.71	28.1
2	T1	49	0.0	0.344	47.9	LOS D	4.9	34.0	0.92	0.74	28.9
3	R2	44	0.0	0.344	52.5	LOS D	4.9	34.0	0.92	0.74	24.2
Approach		120	0.0	0.344	50.1	LOS D	4.9	34.0	0.91	0.74	27.2
<b>East: Cleveland St</b>											
4	L2	53	0.0	0.348	11.3	LOS A	10.1	73.4	0.41	0.40	42.8
5	T1	835	4.7	0.348	6.8	LOS A	10.1	73.4	0.41	0.39	42.5
6	R2	15	0.0	0.348	11.3	LOS A	9.4	68.3	0.41	0.37	42.1
Approach		903	4.3	0.348	7.1	LOS A	10.1	73.4	0.41	0.39	42.5
<b>West: Cleveland St</b>											
10	L2	46	0.0	0.346	11.3	LOS A	10.1	72.6	0.41	0.39	44.3
11	T1	865	3.8	0.346	6.5	LOS A	10.1	72.6	0.40	0.38	42.7
12	R2	9	0.0	0.346	10.9	LOS A	9.5	68.7	0.40	0.36	45.0
Approach		920	3.6	0.346	6.8	LOS A	10.1	72.6	0.40	0.38	42.9
All Vehicles		1943	3.7	0.348	9.6	LOS A	10.1	73.4	0.43	0.40	40.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

## Walker Street / Redfern Street

### MOVEMENT SUMMARY

Site: 101 [Future AM Walker St & Redfern St ]

Walker St & Redfern St Stop Priority  
Stop (Two-Way)

#### Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	54	1.9	0.142	8.1	LOS A	0.6	3.9	0.33	0.95	44.6
2	T1	77	1.3	0.142	9.5	LOS A	0.6	3.9	0.33	0.95	44.3
3	R2	1	0.0	0.142	9.6	LOS A	0.6	3.9	0.33	0.95	44.2
Approach		132	1.5	0.142	9.0	LOS A	0.6	3.9	0.33	0.95	44.4
East: Redfern St											
4	L2	14	7.1	0.116	5.1	LOS A	0.4	2.8	0.18	0.18	47.9
5	T1	137	0.7	0.116	0.2	LOS A	0.4	2.8	0.18	0.18	48.5
6	R2	58	0.0	0.116	5.1	LOS A	0.4	2.8	0.18	0.18	47.6
Approach		209	1.0	0.116	1.9	NA	0.4	2.8	0.18	0.18	48.2
North: Walker St											
7	L2	11	0.0	0.052	7.8	LOS A	0.2	1.3	0.32	0.94	44.5
8	T1	24	0.0	0.052	9.1	LOS A	0.2	1.3	0.32	0.94	44.3
9	R2	8	0.0	0.052	10.3	LOS A	0.2	1.3	0.32	0.94	44.1
Approach		43	0.0	0.052	9.0	LOS A	0.2	1.3	0.32	0.94	44.3
West: Redfern St											
10	L2	53	3.8	0.095	4.7	LOS A	0.2	1.1	0.08	0.21	48.0
11	T1	105	3.8	0.095	0.1	LOS A	0.2	1.1	0.08	0.21	48.6
12	R2	17	0.0	0.095	5.0	LOS A	0.2	1.1	0.08	0.21	47.6
Approach		175	3.4	0.095	2.0	NA	0.2	1.1	0.08	0.21	48.3
All Vehicles		559	1.8	0.142	4.1	NA	0.6	3.9	0.19	0.43	47.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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

**STOP Site: 101 [Future PM Walker St & Redfern St]**

Walker St & Redfern St Stop Priority  
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	36	0.0	0.090	8.2	LOS A	0.3	2.4	0.37	0.93	44.5
2	T1	42	0.0	0.090	9.8	LOS A	0.3	2.4	0.37	0.93	44.3
3	R2	2	0.0	0.090	10.1	LOS A	0.3	2.4	0.37	0.93	44.1
Approach		80	0.0	0.090	9.1	LOS A	0.3	2.4	0.37	0.93	44.4
East: Redfern St											
4	L2	10	0.0	0.124	5.1	LOS A	0.2	1.5	0.09	0.09	48.8
5	T1	195	1.0	0.124	0.1	LOS A	0.2	1.5	0.09	0.09	49.3
6	R2	26	0.0	0.124	5.2	LOS A	0.2	1.5	0.09	0.09	48.3
Approach		231	0.9	0.124	0.9	NA	0.2	1.5	0.09	0.09	49.1
North: Walker St											
7	L2	9	11.1	0.072	8.4	LOS A	0.3	1.8	0.40	0.95	44.2
8	T1	34	0.0	0.072	9.6	LOS A	0.3	1.8	0.40	0.95	44.1
9	R2	11	0.0	0.072	10.5	LOS A	0.3	1.8	0.40	0.95	43.9
Approach		54	1.9	0.072	9.6	LOS A	0.3	1.8	0.40	0.95	44.1
West: Redfern St											
10	L2	44	0.0	0.117	4.9	LOS A	0.3	2.1	0.15	0.18	48.0
11	T1	137	0.0	0.117	0.2	LOS A	0.3	2.1	0.15	0.18	48.5
12	R2	34	0.0	0.117	5.3	LOS A	0.3	2.1	0.15	0.18	47.6
Approach		215	0.0	0.117	2.0	NA	0.3	2.1	0.15	0.18	48.3
All Vehicles		580	0.5	0.124	3.2	NA	0.3	2.4	0.18	0.32	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.

**Walker Street / Kettle Street**

**MOVEMENT SUMMARY**

**Site: 101 [Future AM Walker St & Kettle St]**

Walker St & Kettle St Priority Intersection  
 Giveway / Yield (Two-Way)

<b>Movement Performance - Vehicles</b>												
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV %	v/c	sec		Vehicles	Distance		per veh	km/h	
		veh/h					veh	m				
<b>South: Walker St</b>												
1	L2	1	0.0	0.034	4.7	LOS A	0.0	0.2	0.02	0.04	49.2	
2	T1	61	0.0	0.034	0.0	LOS A	0.0	0.2	0.02	0.04	49.7	
3	R2	4	0.0	0.034	4.7	LOS A	0.0	0.2	0.02	0.04	48.7	
<b>Approach</b>		66	0.0	0.034	0.4	NA	0.0	0.2	0.02	0.04	49.6	
<b>East: Kettle St</b>												
4	L2	5	0.0	0.071	4.6	LOS A	0.2	1.7	0.16	0.54	46.3	
5	T1	1	0.0	0.071	3.6	LOS A	0.2	1.7	0.16	0.54	46.3	
6	R2	68	1.5	0.071	5.1	LOS A	0.2	1.7	0.16	0.54	45.8	
<b>Approach</b>		74	1.4	0.071	5.0	LOS A	0.2	1.7	0.16	0.54	45.9	
<b>North: Walker St</b>												
7	L2	28	3.6	0.027	4.6	LOS A	0.0	0.2	0.03	0.32	47.6	
8	T1	20	0.0	0.027	0.0	LOS A	0.0	0.2	0.03	0.32	48.1	
9	R2	3	0.0	0.027	4.7	LOS A	0.0	0.2	0.03	0.32	47.5	
<b>Approach</b>		51	2.0	0.027	2.8	NA	0.0	0.2	0.03	0.32	47.8	
<b>West: Kettle St</b>												
10	L2	2	0.0	0.001	4.7	LOS A	0.0	0.0	0.14	0.49	46.3	
11	T1	1	0.0	0.002	3.6	LOS A	0.0	0.0	0.19	0.48	46.7	
12	R2	1	0.0	0.002	4.9	LOS A	0.0	0.0	0.19	0.48	46.2	
<b>Approach</b>		4	0.0	0.002	4.5	LOS A	0.0	0.0	0.16	0.48	46.4	
<b>All Vehicles</b>		195	1.0	0.071	2.9	NA	0.2	1.7	0.08	0.31	47.6	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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: 101 [Future PM Walker St & Kettle St]

Walker St & Kettle St Priority Intersection  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %				Vehicles veh	Distance m			
South: Walker St											
1	L2	1	0.0	0.015	4.7	LOS A	0.0	0.3	0.10	0.19	48.2
2	T1	18	0.0	0.015	0.1	LOS A	0.0	0.3	0.10	0.19	48.6
3	R2	9	0.0	0.015	4.7	LOS A	0.0	0.3	0.10	0.19	47.7
Approach		28	0.0	0.015	1.7	NA	0.0	0.3	0.10	0.19	48.3
East: Kettle St											
4	L2	23	0.0	0.055	4.7	LOS A	0.2	1.4	0.15	0.52	46.3
5	T1	1	0.0	0.055	3.5	LOS A	0.2	1.4	0.15	0.52	46.4
6	R2	41	0.0	0.055	5.0	LOS A	0.2	1.4	0.15	0.52	45.9
Approach		65	0.0	0.055	4.8	LOS A	0.2	1.4	0.15	0.52	46.0
North: Walker St											
7	L2	13	0.0	0.034	4.6	LOS A	0.0	0.1	0.00	0.12	48.9
8	T1	51	0.0	0.034	0.0	LOS A	0.0	0.1	0.00	0.12	49.3
9	R2	1	0.0	0.034	4.6	LOS A	0.0	0.1	0.00	0.12	48.6
Approach		65	0.0	0.034	1.0	NA	0.0	0.1	0.00	0.12	49.2
West: Kettle St											
10	L2	1	0.0	0.001	4.6	LOS A	0.0	0.0	0.07	0.50	46.5
11	T1	1	0.0	0.002	3.5	LOS A	0.0	0.0	0.18	0.48	46.7
12	R2	1	0.0	0.002	5.0	LOS A	0.0	0.0	0.18	0.48	46.2
Approach		3	0.0	0.002	4.4	LOS A	0.0	0.0	0.14	0.49	46.5
All Vehicles		161	0.0	0.055	2.7	NA	0.2	1.4	0.08	0.30	47.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.