# TRANSPORT AND ACCESSIBILITY IMPACT ASSESSMENT

**Green Square Integrated Community Facility and School (SSDA 10381)**
**3 Joynton Avenue, Zetland**

Reference: 20.163r02v07
Date: October 2021

TRAFFIX
TRAFFIC & TRANSPORT PLANNERS

Suite 2.08, 50 Holt St
Surry Hills, NSW 2010

t: (02) 8324 8700
w: www.traffix.com.au

# DOCUMENT VERIFICATION

| Job Number | 20.163 | | | |
|---|---|---|---|---|
| **Project** | Green Square Integrated Community Facility and School | | | |
| **Client** | School Infrastructure NSW | | | |
| **SSD No.** | 10381 | | | |
| Revision | Date | Prepared By | Checked By | Signed |
| v07 | 20/10/2021 | Shenara Wanigasekera | Ben Liddell |  |

# CONTENTS

## Appendices

# 1. INTRODUCTION

TRAFFIX has been commissioned by the NSW Department of Education to undertake a Transport and Accessibility Impact Assessment in support of a State Significant Development Application (SSD-10381) relating to the proposed Green Square integrated community facility and school development at 3 Joynton Avenue, Zetland.

As part of the State Significant Development Application process, the Secretary's Environmental Assessment Requirements (SEARs) have been issued for the proposal. This Transport and Accessibility Impact Assessment has been prepared to assess the traffic and access impacts of the proposal and respond to the relevant SEARs.

Under Clause 57 of *State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017*, the proposed development is of a scale and size that warrants referral to Transport for NSW (former Roads and Maritime Services). In addition, the SEARs process will require consultation with Council.

The report is structured as follows:

- Section 2: Addresses the SEARs that apply to the proposal.
- Section 3: Describes the site and its location.
- Section 4: Describes the proposed development.
- Section 5: Provides strategic context for the site.
- Section 6: Documents the network and operations.
- Section 7: Presents the transport uses.
- Section 8: Assesses the site transport infrastructure.
- Section 9: Assesses the to-site transport infrastructure.
- Section 10: Discusses the traffic and transport impacts.
- Section11: Discusses the access and internal design aspects.
- Section 12: Summaries the mitigation measures.
- Section 13: Outlines the consultation undertaken.
- Section 14: Presents the Draft School Transport Plan.
- Section 15: Presents the overall study conclusions.

# 2. SEARS RESPONSES

A response to each relevant requirement of the Secretary's Environmental Assessment Requirements (SEARs) is provided below, including references to sections of this report where applicable. Reference should also be made to the SEARs and the below matters relate specifically to Item 8:

***Item 8: Transport and Accessibility***

| SEARS Requirements | Reference |
|---|---|
| Include a transport and accessibility impact assessment, which details, but not limited to the following: | |
| • Accurate details of the current daily and peak hour vehicle, existing and future public transport networks and pedestrian and cycle movement provided on the road network located adjacent to the proposed development. | **Refer to Section 6** |
| • Details of estimated total daily and peak hour trips generated by the proposal for all modes of travel, including vehicle (car driver and car passenger), public transport, pedestrian, and bicycle trips. | **Refer to Section 10.5** |
| • The adequacy of existing public transport or any future public transport infrastructure within the vicinity of the site, pedestrian and bicycle networks and associated infrastructure to meet the likely future demand of the proposed development with an appreciation of the cumulative impacts of proposed and approved developments in the area and identification of any upgrades required. | **Refer to Section 9** |
| • The identification of infrastructure measures required to integrate the development with the existing/future public transport and active transport network. | **Refer to Section 9** |
| • The impact of trips generated by the development on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for, and details of, upgrades or road improvement works, if required (Traffic modelling is to be | **Refer to Section 10** |

| | |
|---|---|
| undertaken using SIDRA network modelling for current and future years) to the satisfaction of Transport for NSW and Transport for NSW (Roads and Maritime Services). Specifically, the following intersections are to be examined/modelled:<br>– Joynton Avenue / Future Zetland Avenue<br>– Portman Street / Future Zetland Avenue | |
| • The identification of infrastructure required to address any impacts on traffic efficiency and road safety impacts associated with the proposed development, including details on improvements required to affected intersections, additional school bus routes along bus capable roads (i.e. minimum 3.5m wide travel lanes), additional bus stops or bus bays. | **Refer to Sections 9 and 10** |
| • Details of travel demand management measures to minimise the impact on general traffic and bus operations, including details of a location-specific sustainable travel plan (Green Travel Plan and specific Workplace travel plan) and the provision of facilities to increase the non-car mode share for travel to and from the site. | **Refer to Sections 10.6, 12.2 and 14** |
| • The proposed walking and cycling access arrangements and connections to public transport services and bicycle networks. | **Refer to Section 9** |
| • The proposed access arrangements, including car and bus pick-up/drop-off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones. | **Refer to Section 8 and Section 9** |
| • Proposed bicycle parking provision, including end of trip facilities, in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance. | **Refer to Section 8** |
| • Proposed number of car parking spaces that is consistent with modal targets for the site that prioritise Sustainable Transport such as Public Transport and Active Transport (cycling and walking) and reduce car dependence. | **Refer to Section 8** |
| • An assessment of the cumulative on-street parking impacts of cars and bus pick-up/drop-off, staff parking and any other parking demands associated with the development. | **Refer to Section 8** |

| | |
|---|---|
| • An assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures and personal safety in line with CPTED. | **Refer to Section 9. CPTED aspects to be addressed by others.** |
| • Emergency vehicle access, service vehicle access, delivery an loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times). | **Refer to Sections 8.6 and 14** |
| • Details of existing and proposed freight and servicing vehicle access arrangements, including a Delivery Service Plan detailing loading dock and servicing provision, adequacy and management ensuring all servicing and loading occurs on-site and does not rely on kerbside controls. | **Refer to Sections 8.6 and 13** |
| • In relation to construction traffic:<br>– *detail vehicle routes, peak hour and daily truck movements, hours of operation, access arrangements, works zone location, haulage routes, construction program and traffic control measures for all demolition / construction activities;*<br>– *an assessment of road safety at key intersections and locations subject to pedestrian / vehicle / bicycle conflicts;*<br>– *details of temporary cycling and pedestrian access and end of trip facilities during construction;*<br>– *an assessment of the likely construction traffic impacts, such as required road / lane closures and diversions, impacts on bus and 'point to point' transport, impacts on pedestrian and cycle movement, and taking into account other construction activities;*<br>– *details of proposed mitigation measures should any impacts be identified, the duration of the impacts and measures proposed to mitigate any associated general traffic, public transport, pedestrian and cyclist impacts should be clearly identified; and*<br>– *preparation of a draft Construction Pedestrian and Traffic Management Plan to demonstrate the proposed management of impact. This Plan needs to include works zone location, vehicle routes, number of trucks, hours of operation, indicative* | **Refer to the Preliminary Construction and Pedestrian Traffic Management Plan (Ref: 20.163r03v04 dated 4 August 2021)** |

| | |
|---|---|
| *construction program, access arrangements and traffic control measures for all demolition/construction activities.* | |
| • Relevant Policies and Guidelines:<br>– Guide to Traffic Generating Developments (Roads and Maritime Services)<br>– EIS Guidelines – Road and Related Facilities (DoPI)<br>– Cycling Aspects of Austroads Guides<br>– NSW Planning Guidelines for Walking and Cycling<br>– Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development<br>– Australian Standard AS 2890.3:2015 Parking Facilities Part 3: Bicycle Parking Facilities.<br>– 'Austroads Bicycle Parking Facilities: Guidelines for Design and Installation'<br>– Green Square Town Centre DCP 2012. | **The relevant policies and guidelines are referenced as applicable throughout this assessment.** |

# 3. LOCATION AND SITE

The site is located at 3 Joynton Avenue, Zetland and is a joint project between School Infrastructure NSW and the City of Sydney. More specifically, it is located north of the existing Green Square Community Hall and west of the Waranara Early Education Centre within the Green Square Community and Cultural Precinct. In a regional context, it is situated approximately 4.4 kilometres south of the Sydney CBD and approximately 450 metres southeast of the Green Square Railway Station.

The site has an irregular configuration and has a total site area of approximately 4,697m$^2$. It has an eastern frontage to Joynton Avenue, a northern frontage to Zetland Avenue (future road), a western street frontage to Portman Street and a southern frontage to a shared one-way driveway.

Vehicular access to the site is currently provided via Portman Street along the western site boundary.

An early childcare centre is also located at 3 Joynton Avenue, Zetland and is located directly adjacent to the site. The childcare centre provides priority access for children with additional support needs, children from Aboriginal and Torres Strait Islander backgrounds, children from low-income families and children who speak a language at home other than English. The centre offers 74 places for children within the Green Square Town Centre Precinct and operates between 7:00am and 6:30pm on weekdays.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**. Reference should also be made to the Photographic Record presented in **Appendix A** which provides an appreciation of the general character of roads and other key attributes in proximity to the site.


**Figure 1: Location Plan**

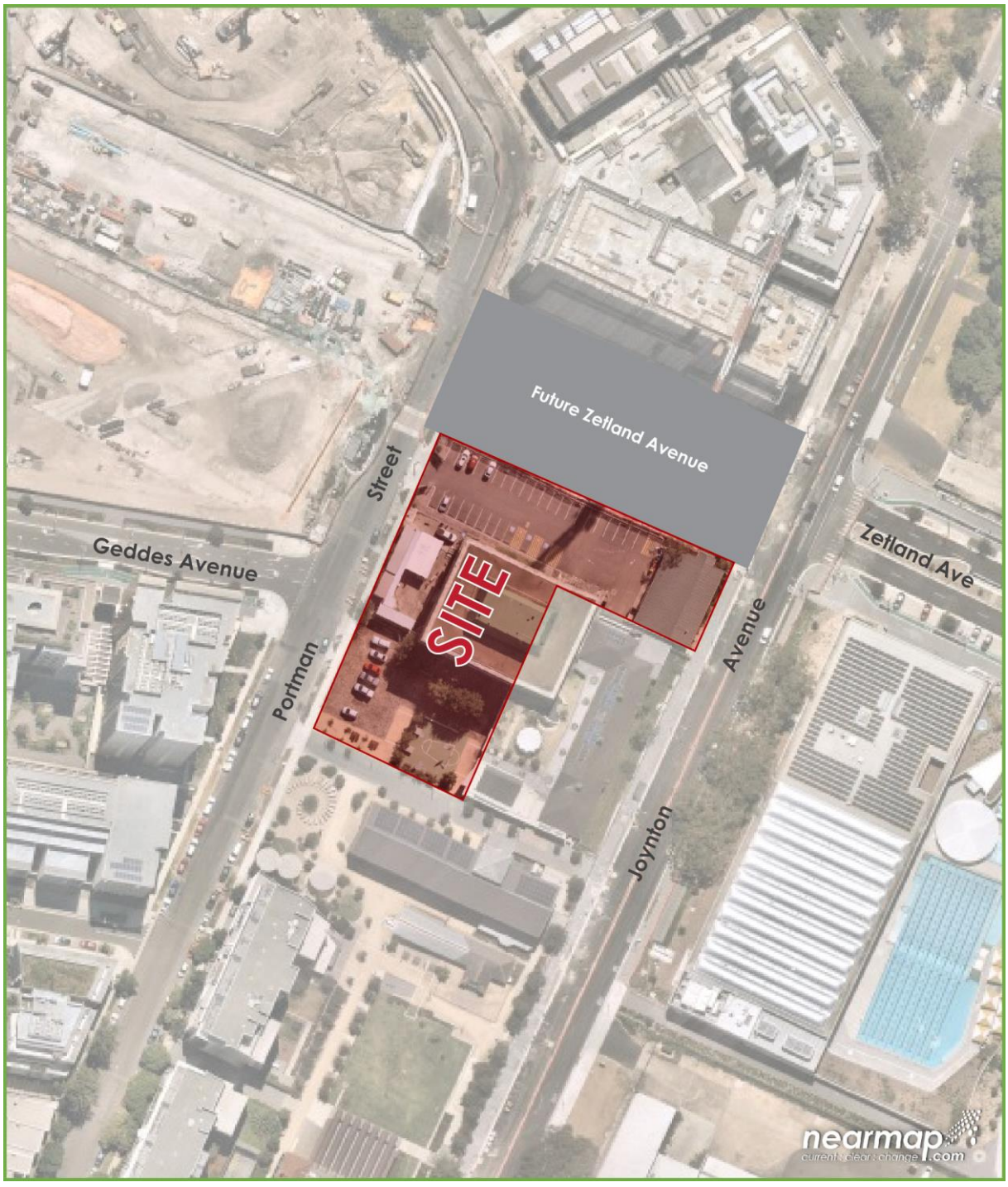



**Figure 2: Site Plan**

# 4. DESCRIPTION OF PROPOSAL

## 4.1 Proposed Development

A detailed description of the proposed development is provided in the Environmental Impact Statement prepared separately. In summary, the development for which approval is now sought is the Green Square Integrated Community Facility and School located at 3 Joynton Avenue, Zetland.

The development will comprise a four-storey building made up of various indoor and outdoor functional spaces including:

- Primary education facilities for up to 600 kindergarten to year 6 students
  - Indoor and outdoor learning spaces
  - Administration and staff rooms
  - Library and School community hall
- Shared multi-function spaces within for school and community use
  - 2 x Multipurpose community facilities rooms to be operated solely by City of Sydney
  - 2 x Multipurpose rooms to be shared by the City of Sydney and the primary school
- At ground level there is:
  - Play spaces which will be a shared use between school and community
  - Multipurpose games court

Reference should be made to the architectural plans submitted in a separate document to the Department of Planning, Industry and Environment and Council which are presented at reduced scale in **Appendix B**.

## 4.2 Proposed Enrolment Boundaries

The NSW Department of Education has provided three (3) potential enrolment boundaries for the proposed school. These enrolment boundaries have been overlaid and presented in **Figure 3**. The 'overlaid' boundary extent has been utilised throughout this report, providing an assessment area which covers all scenarios.

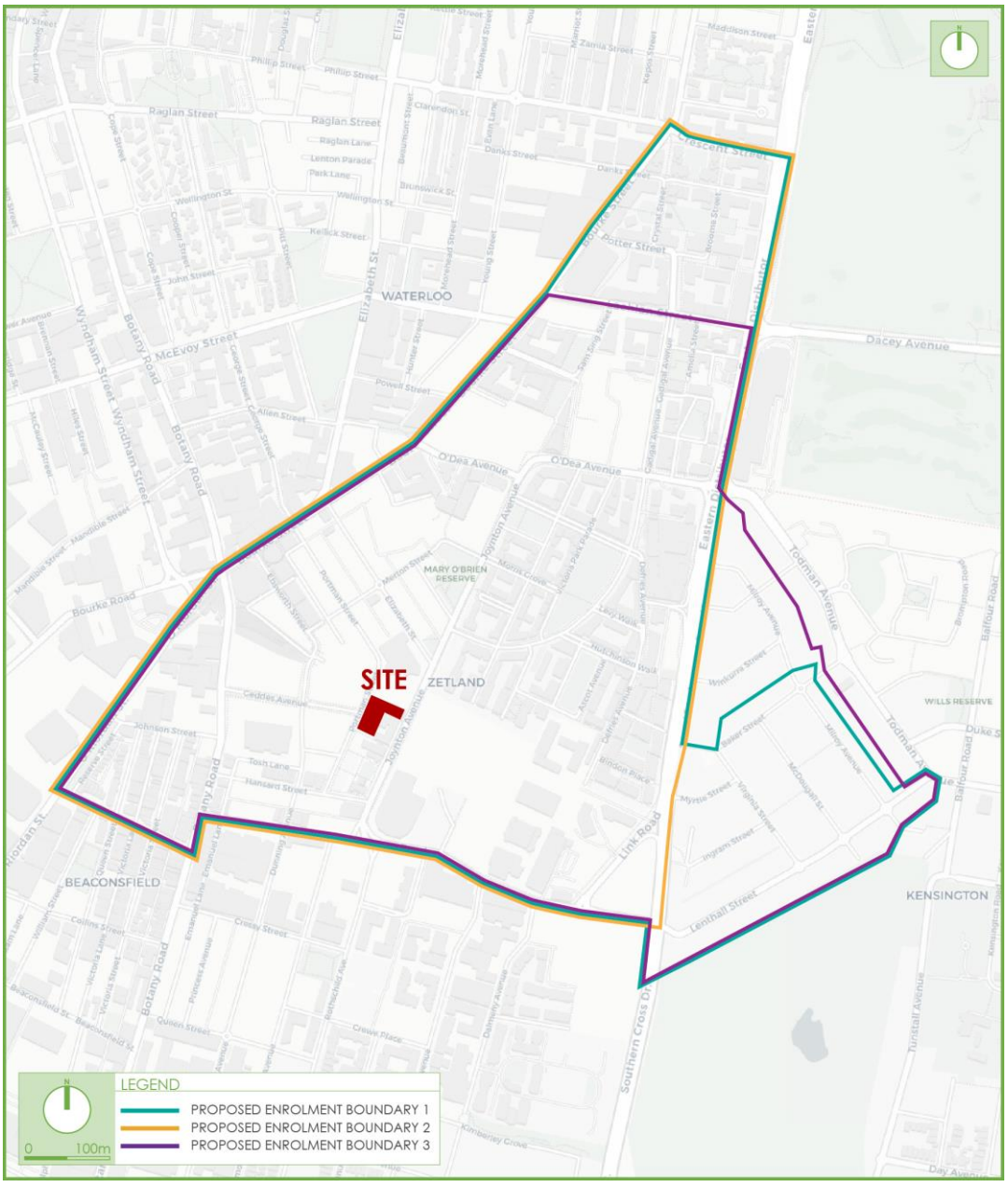



**Figure 3: Proposed Enrolment Boundary Options**

# 5. STRATEGIC CONTEXT

## 5.1 Local Transport Plans/Reports

### 5.1.1 Sydney's Cycling Future 2013

Sydney's Cycling Future presents a focus planning, prioritising and providing for cycling in Sydney. It aims to make cycling a more feasible transport option through the following:

- Investing in separated cycleways and providing connected bicycle networks to major centres and transport interchanges.
- promoting better use of our existing network.
- engaging with our partners across government, councils, developers and bicycle users.

The strategic document states the intent for state government to prioritise bicycle infrastructure investments and state priority corridors to safely link inner Sydney customers to Sydney's CBD. This includes connections to Green Square.

The development aims to encourage cycling as a major mode of transport to and from the school. The existing cycling facilities are examined within Section 6.10.

### 5.1.2 Sydney's Walking Future 2013

Sydney's Walking Future recognises the importance of this key mode of transport and aims to improve the experience of walking and encourages more pedestrian activity to connect Sydney's communities. These aims are proposed to be achieved via:

- Promoting walking for transport.
- Connecting people to places through safe walking networks around centres and public transport interchanges.
- Engaging with partners across government, with councils, non-government organisations and the private sector to maximise our effectiveness.

With relevance to the subject site located within the Green Square Town Centre, Sydney's Walking Future states within the pillar of connecting people to places through infrastructure, safe infrastructure developments for walking at Green Square Station are aimed to be provided.

### 5.1.3 Sydney's Bus Future 2013

Sydney's Bus Future aims to deliver a modern and customer-based system by approaching the system as a whole to deliver simpler, faster and better bus services. The plan aims to improve and create new routes, simplify timetables and make interchanges more convenient.

The plan aims to attract more customers to use bus services throughout Sydney by ensuring routes are direct and reducing duplicates, ensuring faster bus networks and ensuring the network is efficient, modern and the fleet comfortable.

### 5.1.4 Green Square Town Centre – Essential Infrastructure and Public Domain Report

AECOM prepared a report for the City of Sydney assessing the anticipated performance of intersections within the Green Square Town Centre due to planned urban renewal developments. The modelling conducted of the Green Square Town Centre took into consideration a timeline up to 2031, taking into account numerous planned developments to accurately reflect the performance of the future road network.

This previous strategic modelling conducted of Green Square Town Centre is critical and traffic impacts of the proposed development have been assessed with consideration of the previous assumptions made to conduct traffic modelling within this report. The AECOM report is presented In **Appendix C**.

## 5.2 State Transport or Infrastructure Plans

### 5.2.1 The Greater Sydney Regional Plan, A metropolis of three cities

This transport strategy presents a vision and innovative actions for managing Greater Sydney's growth. It is prepared concurrently with *Future Transport 2056* and the State Infrastructure Strategy and aims to re-shape Greater Sydney as three unique and connected cities. These three cities are described as follows:

- The Western Parkland City.
- The Central River City.
- The Eastern Harbour City.

The transport initiatives within this Plan are sourced from the Future Transport Strategy 2056. The Green-Square and Mascot Precinct falls within the bounds of the Eastern Harbour City.

Generally, this strategy encourages a city supported by infrastructure with an indicator being access to metropolitan centres/clusters within 30 minutes and a collaborative city that would involve an increased use of public resources such as open spaces and community facilities.

### 5.2.2 Future Transport Strategy 2056

This transport strategy document presents a vision for the transport system that revolves around growing Sydney as a metropolis driven by major placed-based planning and investment around the new Western Sydney Airport and Badgerys Creek Aerotropolis. Planning for Greater Sydney will focus on the concept of three cities, that being the Western Parkland City, the Central River City and the Eastern Harbour City. The future transport strategy for Greater Sydney aims to enable most customers to travel to their nearest strategic centre within 30 minutes of their residence by public or active transport.

This aim will ultimately be achieved through a focus into an integrated network of corridors which will facilitate these movements. These corridors are summarised below:

- City-shaping corridors – major trunk road and public transport corridors providing higher speed and volume connections between our cities and centres that shape locational decisions of residents and businesses.
- City-serving corridors – higher density corridors within 10km of metropolitan centres providing high frequency access to metropolitan cities/centres with more frequent stopping patterns.
- Centre-serving corridors – local corridors that support buses, walking and cycling, to connect people with their nearest centre and transport interchange.

### 5.2.3 State Infrastructure Strategy 2018 – 2038 Building the Momentum

The State Infrastructure Strategy is a 20-year infrastructure plan for the NSW Government which provides recommendations to best grow the State's economy, enhance productivity and improve living standards.

Specifically, in relation to integrating land use and infrastructure planning the strategy identifies that aligning decisions about the provision and use of infrastructure with the Greater Sydney Commission's three cities vision and the 10 Regional Plans is critical to maximising the effectiveness, efficiency and endurance of both new and existing infrastructure. A summary of the key recommendations is presented below:

- Link integrated strategic land use and infrastructure planning.
- Support efficient development through shared-use corridors.
- Identify and protect corridors.
- Strengthen government planning processes.

In summary this document serves to support the three cities vision that is envisaged by the Future Transport Strategy 2056, looking beyond current projects and identifies policies and strategies that are required to provide infrastructure that will meet the demands of a growing population and economy.

## 5.3 Local Land Use Planning

### 5.3.1 Local Environmental Plans (LEPs)

The LEPs that are relevant to the site are as follows:

- South Sydney Local Environmental Plan No 114; and
- South Sydney Local Environmental Plan 1998.

### 5.3.2 Development Control Plans (DCPs)

The applicable DCPs for the subject site are a s follows:

- Green Square Town Centre Development Control Plan 2012;
- City of Sydney Access Development Control Plan 2004;
- City of Sydney Heritage Development Control Plan 2006; and
- South Sydney DCP No. 11 Transport Guidelines for Development 1996.

## 5.4 State and Local Programs

### 5.4.1 The School Student Transport Scheme

The School Student Transport Scheme (SSTS) is an initiative that provides eligible school students with free or subsidised travel between their place of residence and school on public transport during the school term. The scheme also includes subsidised travel to and from school in private vehicles in areas where no public transport is available and free travel on NSW TrainLink Regional Services and long-distance coaches for boarding school students.

The eligibility requirements for primary school aged students are described as follows.

> *To be eligible for a free school travel pass the student must be a resident of NSW, at least 4 years and 6 months of age and enrolled as one of the following:*
>
> - *An infant student (K –2) regardless of the distance between their home and school*

- *A primary student (Years 3–6) who lives more than 1.6 km (straight line distance) from school, or 2.3 km or more by the most direct practical walking route to the nearest entry point to the school*

### 5.4.2 Assisted School Travel Program

The Department of Education Assisted School Travel Program (ASTP) provides free specialised transport to and from school for eligible students with a disability where parents and carers are unable to provide or arrange travel for the student.

### 5.4.3 Wayfinding and Signs

The City of Sydney have developed a pedestrian wayfinding strategy with an aim to ensure this signage is consistent and legible to aid pedestrians to arrive at their desired destination. This initiative has included the rollout of a network of tactile signs at every signalised pedestrian crossing throughout the City of Sydney LGA increasing safety and accessibility for pedestrians.

### 5.4.4 Cycling Courses

The City of Sydney offers cycling courses ranging from beginner levels to allow riders to develop skills and confidence in bike riding and courses specific to cycling in the city targeted at children over the age of 12 to adults. Council also offers course on bike care and maintenance encouraging more people to consider this as a daily mode of transport.

### 5.4.5 Active Travel to School Toolkit

This document published by the City of Sydney encourages schools, parents and students to consider active modes of travel to and from their school. Specifically, it educated schools about putting into place an effective program in terms of active travel. This resource suggests methodology in terms of educating parents and staff, picking suitable travel routes, ensuring that the school is conducive to active travel and traffic management strategies that may be introduced to reduce traffic movements near the school.

# 6. TRANSPORT NETWORK AND OPERATIONS

## 6.1 Existing and Future Road Network

The road hierarchy in the vicinity of the site is shown in **Figure 4** and **Figure 5** with the following roads of particular interest:

- Botany Road: a Transport for NSW (TfNSW) State Road (MR 170) that traverses north-south between Regent Street in the north and Bunnerong Road in the south. Botany Road is subject to a 50 km/h speed limit and accommodates two (2) traffic lanes in either direction within an undivided carriageway. Clearway restrictions operate along its length during the morning and evening peak periods.
- Epsom Road: a local road that traverses east-west between Southern Cross Drive in the east and Botany Road in the west. In the vicinity of the site, Epsom Road is subject to a 50km/h speed limit and accommodates a single lane of traffic in either direction within an undivided carriageway. On-street kerbside parking is permitted along either side of the road, subject to timed, unrestricted, and bus zone parking restrictions.
- Joynton Avenue: a local road that that generally traverses north-south between O'Dea Avenue in the north and Epsom Road in the south. In the vicinity of the site, Joynton Avenue accommodates a single lane of traffic in either direction within an undivided carriageway. On-street kerbside parking is permitted along either side of the road, subject to timed, unrestricted, and bus zone parking restrictions.
- Zetland Avenue: a future road that traverses east-west between Southern Cross Drive in the east and the newly constructed Paul Street in the west. Planned to accommodate two (2) lanes of traffic and a single parking lane in either direction within a divided carriageway, Zetland Avenue will provide a vital link to the Green Square Town Centre.
- Portman Street: a local road that traverses north-south between Bourke Street in the north and Hansard Street in the south. In the vicinity of the site, Portman Street is subject to a 40km/h speed limit and accommodates a single lane of traffic in either direction within an undivided carriageway. On-street kerbside parking is permitted along either side of the road, subject to time restrictions.

- Hansard Street: a local road that traverses east-west between Joynton Avenue in the east and Botany Road in the west. Hansard Street is subject to a 40km/h speed limit and accommodates a single lane of traffic within an undivided carriageway. A "No Trucks 3t and over" restriction operates along Hansard Street and left out only restrictions are in place at the Hansard Street and Botany Road intersection. On-street kerbside parking is permitted along either side of the road.
- Geddes Street: a local road that traverses east-west between Portman Street in the east and Botany Road in the west. Geddes Street generally accommodates a single lane of traffic in either direction and is subject to a 40km/h speed zoning. On-street parking is not permitted along either side of the road.
- Paul Street: a local road that traverses north-south between Barker Street in the north and Tosh Lane in the south. Paul Street generally accommodates two-way flow of traffic and is subject to a 40km/h speed zoning. On-street parking is permitted along either side of the road.

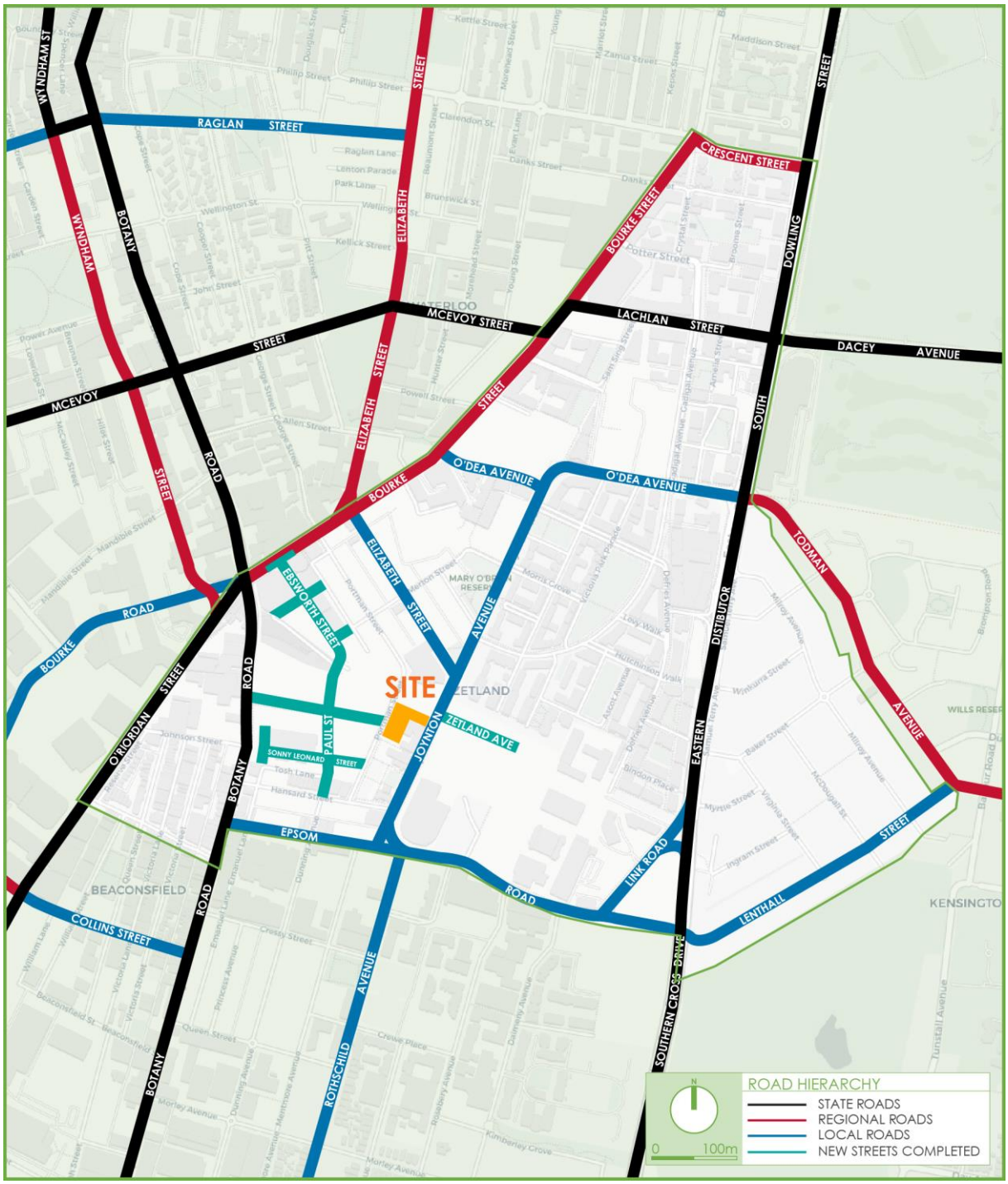



**Figure 4: Existing Road Hierarchy within Enrolment Boundary**

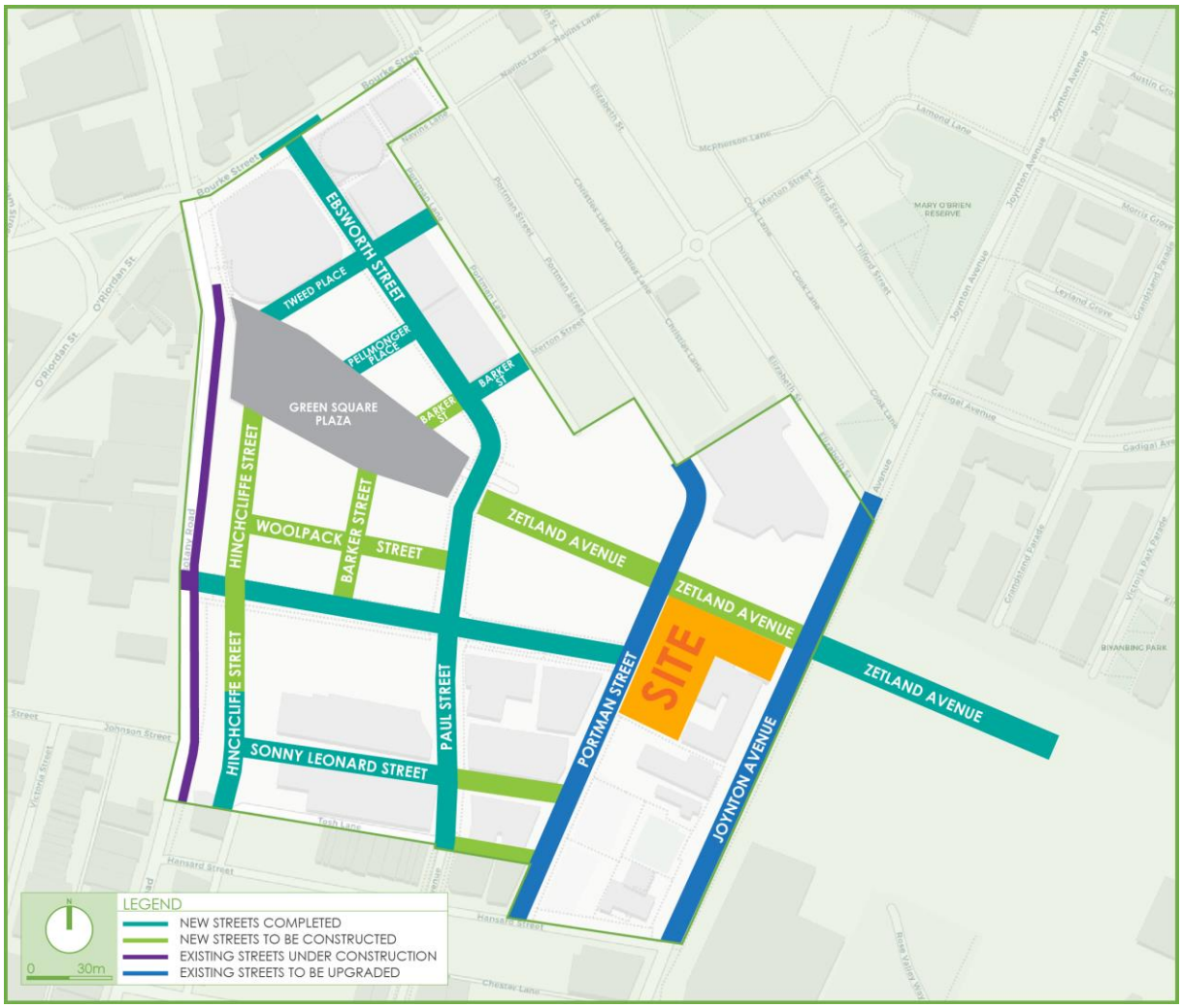



**Figure 5: Future Green Square Road Layout**

## 6.2 Speed Zoning

### 6.2.1 Existing Speed Zones

The existing speed zoning within the proposed enrolment boundaries is presented in **Figure 6**. As can been seen, the roads surrounding the proposed development are currently subject to a 40km/h speed zoning, noting some roads are still subject to construction zone speed limits.

### 6.2.2 Proposed Speed Zones

Noting the nature of the proposed development, it is expected that roads surrounding the school will be subject to future 40km/h School Zone between the standard times of 8:00-9:30am and 2:30-4:00pm, the implementation and extent of which would be subject to a school zone assessment undertaken by Transport for NSW.

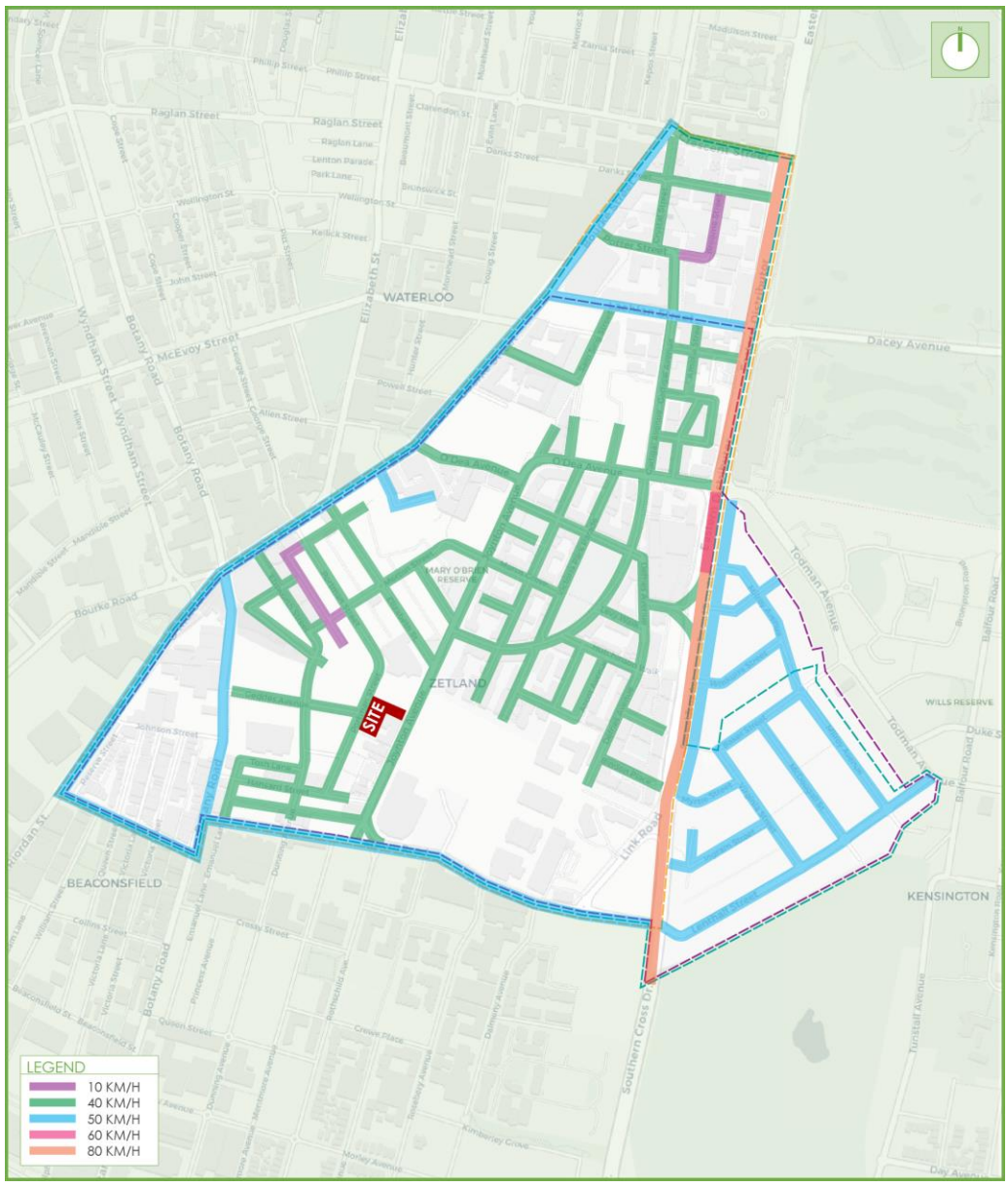



**Figure 6: Existing Speed Zoning within Enrolment Boundary**

## 6.3 Speed Control Devices

As noted in the previous section, all streets surrounding the school are a designated 40km/h zone. These roads would remain at this speed limit under future school zone restrictions. The existing and future low speed characteristics of the surrounding streets suggest that no additional speed control measures (speed humps etc.) are required. Of course, a thorough investigation (vehicle speed surveys etc.) could be undertaken by Council should an issue be raised or identified.

## 6.4 Traffic Volumes

### 6.4.1 Peak Hour Volumes

As previously mentioned, the key intersections of Zetland Avenue/Joynton Avenue and Zetland Avenue/Portman Street have not been constructed. Therefore, reliance is on the future intersection volumes outlined in the AECOM Green Square Town Centre report. The report provides the following volumes:

- Zetland Avenue/Joynton Avenue 2,538 vehicles/hr in the AM peak
- Zetland Avenue/Joynton Avenue 2,039 vehicles/hr in the PM peak
- Zetland Avenue/Portman Street 965 vehicles/hr in the AM peak
- Zetland Avenue/Portman Street 812 vehicles/hr in the PM peak

### 6.4.2 Daily Volumes

It should be noted that in accordance with *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management*, peak hour volumes are approximately 8 to 10% of the Average Annual Daily Traffic (AADT) for urban situations. Therefore, the following daily volumes can be derived from the peak hour (greater of AM and PM volumes) surveys:

- Zetland Avenue/Joynton Avenue 25,380 – 31,725 vehicles/day
- Zetland Avenue/Portman Street 9,650 – 12,063 vehicles/day

## 6.5 Key Intersections

The key intersections in the vicinity of the site are shown in **Figures 7** and **8** below and provide an understanding of the future road geometry and alignment in the locality. It is expected that these intersections will be fully operational by the time the school is operational. **Figures 9** and **10** also provide a visual representation of all existing and proposed signalised intersections.

### 6.5.1 Joynton Avenue and Future Zetland Avenue

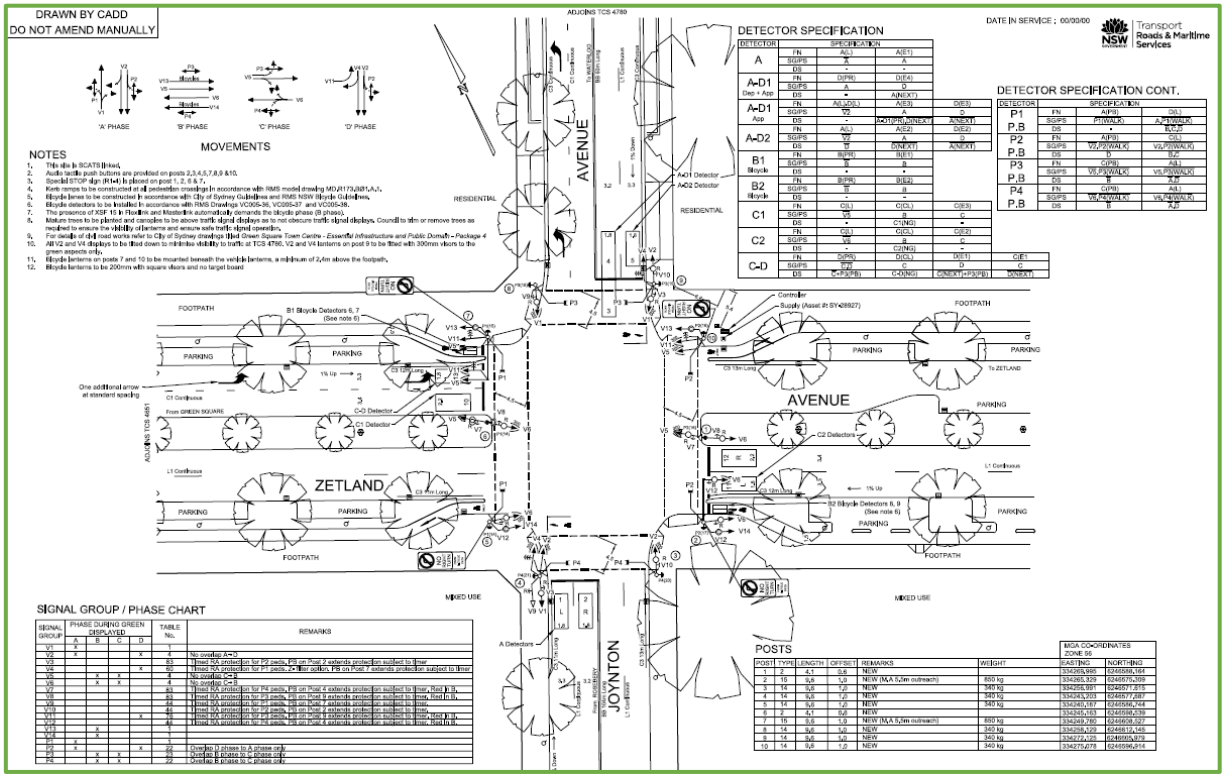



**Figure 7: Intersection of Joynton Avenue and Future Zetland Avenue**

It can be seen from Figure 7 that the intersection of Joynton Avenue and Future Zetland Avenue is a four-legged signalised intersection. All four (4) legs provide signalised pedestrian crossings. The main attributes of each approach are outlined below.

- Joynton Avenue (north and south legs):
  - The northbound approach provides two (2) through lanes.
  - The southbound approach provides two (2) through lanes.
- Zetland Road (east and west leg):

- The eastbound approach provides a single through lane and a single left turn lane with right turns prohibited from the bicycle path.
- The westbound approach provides two (2) through lanes with right turns prohibited from the bicycle path.

### 6.5.2 Portman Street and Future Zetland Avenue

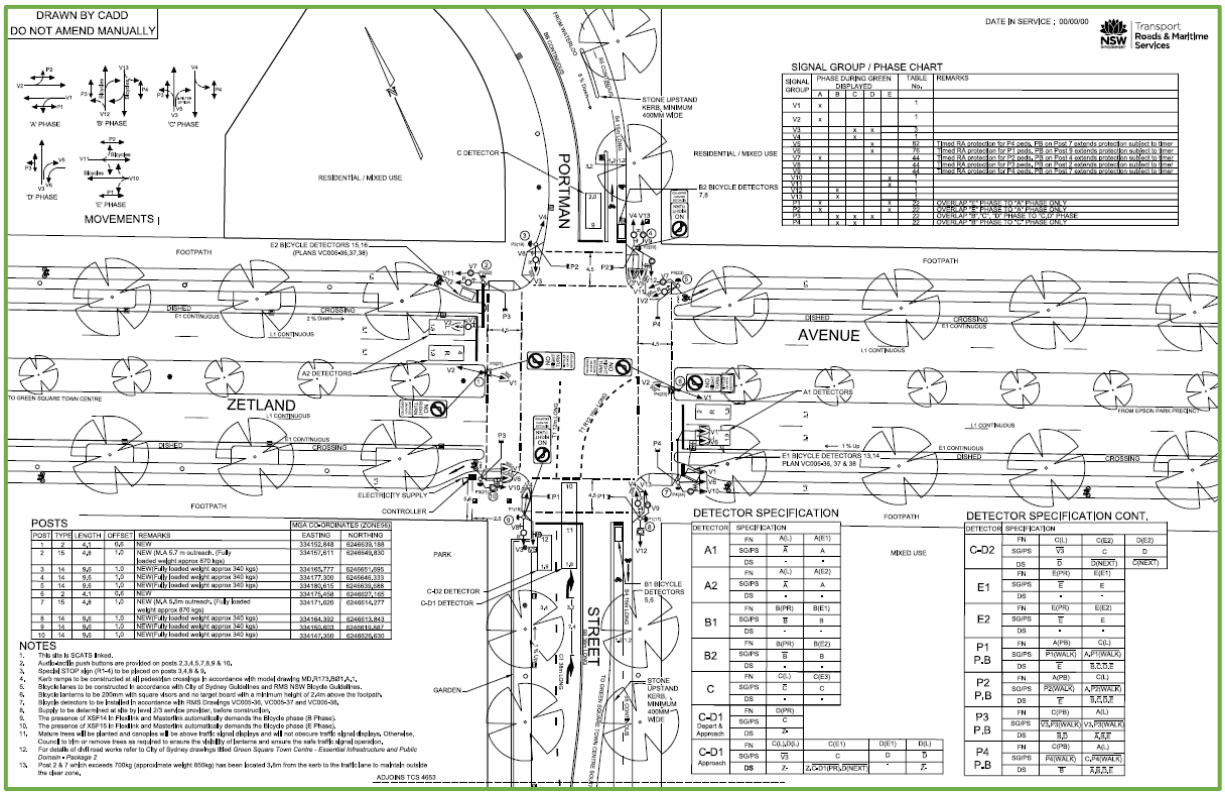



**Figure 8: Intersection of Portman Street and Future Zetland Avenue**

It can be seen from Figure 8 that the intersection of Portman Street and Future Zetland Avenue is a four - legged signalised intersection. All four (4) legs provide signalised pedestrian crossings. The main attributes of each approach are outlined below.

- Portman Street (north and south legs):
  - The northbound approach provides a single through lane and a single right turn lane.
  - The southbound approach provides a single through lanes with right turns prohibited.
- Zetland Road (east and west leg):
  - The eastbound approach provides two (2) through lanes with right turns prohibited.
  - The westbound approach provides two (2) through lanes with right turns prohibited.

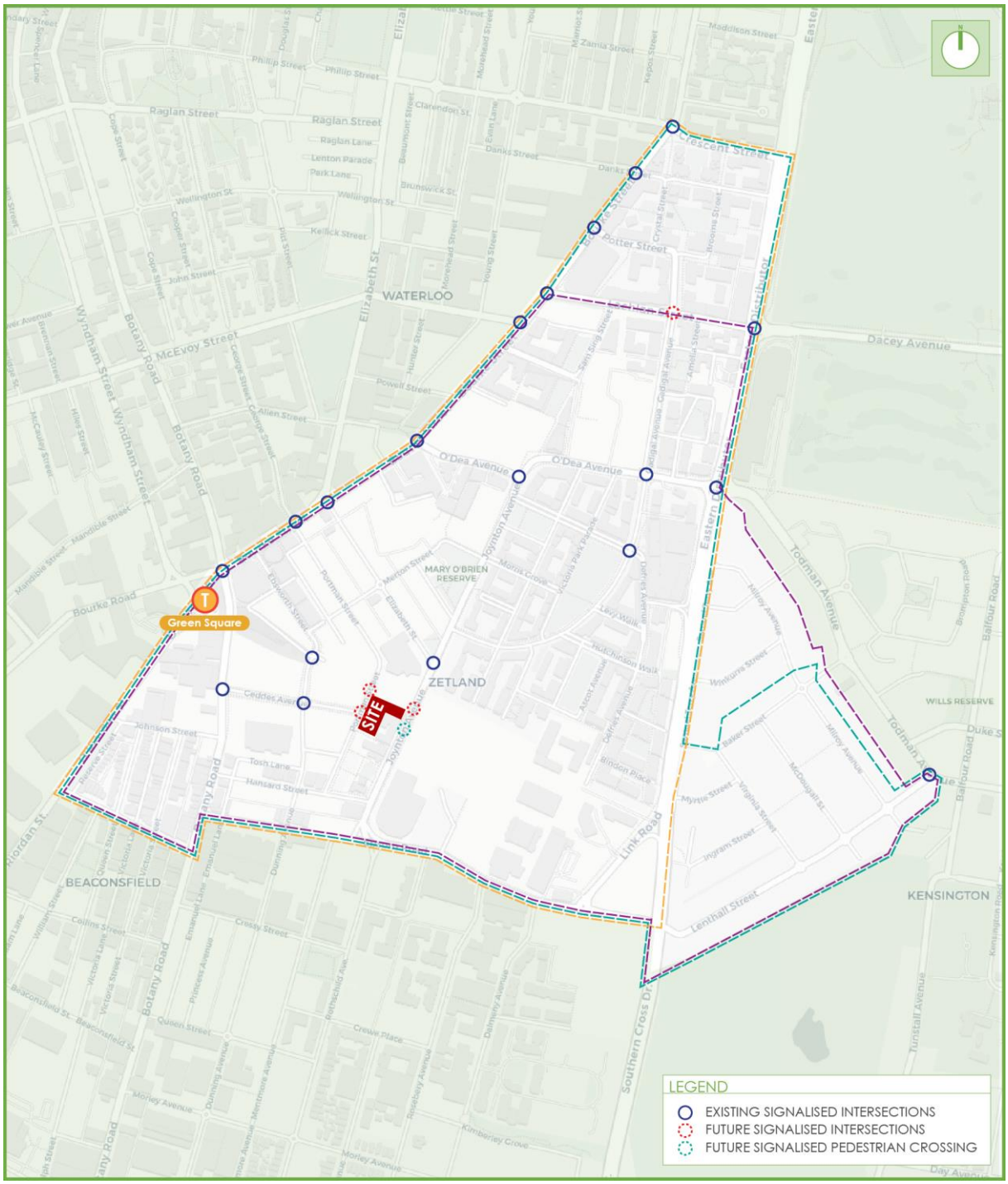



**Figure 9: Existing and Future Signalised intersections within Enrolment Boundary**

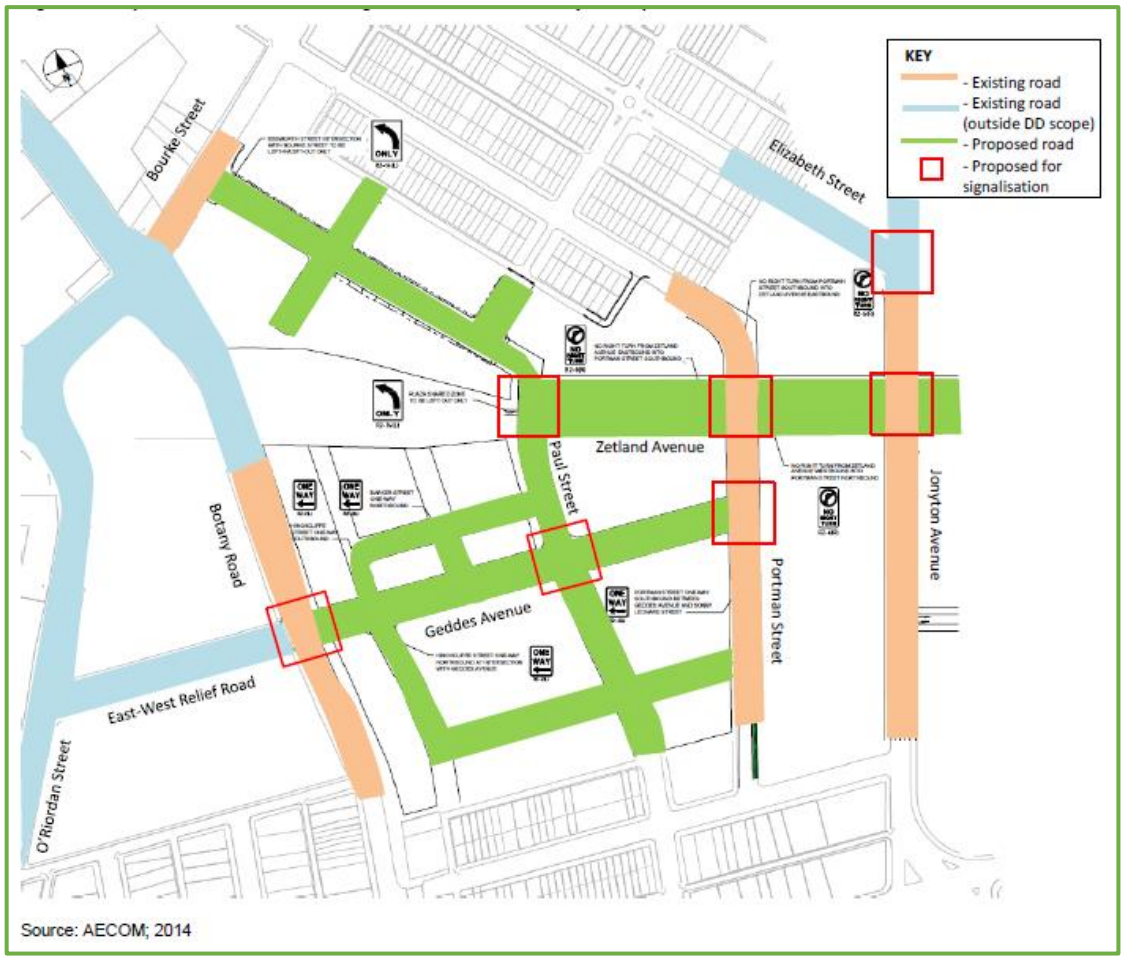



**Figure 10: Future Street Network and Signalised Intersections (Source: AECOM; 2014)**

## 6.6 Public Transport

### 6.6.1 Existing Bus Services

The existing bus services that operate in the locality are shown in **Figure 11**. Standard transport planning guidelines state that a development is advantageously located to benefit bus services if it is within 400 metres walking distance of a bus stop. It is evident that the site benefits from good bus services with 14 bus stops located within 400 metres of the site. These services provide connections to the Eastern Suburbs and Sydney Central Business District. These bus services are summarised as follows:

- 301 - Eastgardens to Redfern
- 302 – Eastgardens to Redfern
- 303 – San Souci to Redfern
- 304 – Rosebery to City Circular Quay
- 309 - Banksmeadow to Central Railway Square
- 309X - Port Botany to Central Railway Station
- 310X - Banksmeadow to Central Railway Square
- X93 - Little Bay to Central Railway Square
- 320 - Mascot to Gore Hill
- 343 - Kingsford to City Circular Quay
- 348 - Wolli Creek to Bondi Junction
- 370 - Leichhardt Marketplace to Coogee

The frequencies of the bus services that are located in close proximity of the school are presented in the **Table 1** below.

**Table 1: Bus Frequencies**

| Bus Route | Frequency between 7:30am-8:30am | Frequency between 2:30pm-3:30pm |
|---|---|---|
| 301 | Hourly | Every Half Hour |
| 320 | Every 10 minutes | Every 15 minutes |
| 343 | Every 3-5 minutes | Every 10 minutes |
| 348 | Every 15 minutes | Every 20 minutes |

### 6.6.2 Existing Rail Services

In addition, the subject site is also located within 450 metres of the Green Square Railway Station. Green Square Railway Station services the T8 Airport and South Line providing staff connections to major centres such as Central Station, Wolli Creek, Revesby and Campbelltown. Services are relatively frequent, arriving/departing every 10 minutes during peak periods.


**Figure 11: Public Transport within Enrolment Boundary**

### 6.6.3 Proposed Bus Routes

The Green Square Town Centre precinct is anticipated to be traversed by three (3) bus routes once the precinct is developed. Reference is made to the AECOM report which discusses the potential routes for which all traverse around the boundary of the proposed school. These routes are as follows:

- M20 – Gore Hill to Mascot
- 370 - Leichhardt to Coogee (via UNSW)
- 348 - Bondi Junction to Wolli Creek (via UNSW)

The preferred route for these three (3) services would see the buses travel along Zetland Avenue, Paul Street and Geddes Avenue.

## 6.7 School Student Transport Scheme

Reference is made to the eligibility requirements for the School Student Transport Scheme (SSTS) provided within Section 5.4.1. These eligibility requirements are also summarised for convenience below.

The eligibility requirements for primary school aged students are described as follows.

> *To be eligible for a free school travel pass the student must be a resident of NSW, at least 4 years and 6 months of age and enrolled as one of the following:*

- *An infant student (K –2) regardless of the distance between their home and school*
- *A primary student (Years 3–6) who lives more than 1.6 km (straight line distance) from school, or 2.3 km or more by the most direct practical walking route to the nearest entry point to the school.*

It should be noted that the SSTS eligibility requirements listed above extend beyond the proposed school enrolment boundaries. In addition to this, survey information from Bourke Street Public School (comparable development discussed below in Section 7) suggests that limited students will utilise bus services to travel to/from the proposed development. This would likely be the case in this situation noting that Green Square will become one of the most densely populated areas within Australia, suggesting the Town Centre will accommodate a large portion of the population within walking/cycling distance from the school.

## 6.8 Pedestrian Infrastructure

### 6.8.1 Green Square Town Centre

The Green Square Town Centre is undergoing significant development in relation to pedestrian infrastructure. The AECOM report details proposed pedestrian infrastructure in the vicinity of the school, notably a signalised pedestrian crossing was included in the modelling halfway between Epsom Road/Joynton Avenue and Zetland Avenue/Joynton Avenue. This crossing was deemed important due to the large number of children anticipated to use the facility, with proposed childcare and recreational facilities located in the vicinity. This crossing would also in turn be utilised by school students from the proposed primary school.

In addition to this, signalised pedestrian crossing will be provided on each approach for every signalised intersection and lower cycle times will be adopted within the precinct to minimise delays for pedestrians. This is due to the high pedestrian demand that is anticipated within the Green Square Town Centre. Signalised pedestrian crossings would therefore be provided at several intersection surrounding the site, being the intersection of Joynton Avenue and Zetland Avenue, Portman Street and Zetland Avenue and Portman Street and Geddes Street.

Figure 9 shows the planned signalised intersection in the vicinity of the site (of which all legs provide signalised pedestrian crossings), some of which have already been constructed or are currently undergoing construction as part of continued development of the Green Square Town Centre.

### 6.8.2 Within Proposed Enrolment Boundaries

A gap analysis within the proposed school enrolment boundaries has demonstrated that the vast majority of streets already accommodate concrete pedestrian footpaths. The majority of priority-controlled intersections also provide pedestrian kerb ramps. The findings of the gap analysis are presented in more detail within Section 9.3 and 9.4 below.

## 6.9 School Crossing Supervisor

The NSW school crossing supervisor program was contacted to determine the requirement for an application for a school crossing supervisor adjacent to the school. The School Crossing Supervisor Program assesses the nominated site against a set criterion. For a site to be eligible for a school crossing supervisor it must meet the following criteria:

- The site must have an existing children's crossing, pedestrian crossing (zebra) or combined crossing (children's and zebra).
- The crossing must be used by infant and/or primary school children.
- The site must be located within a 40km/h school zone.
- In the morning or afternoon, the crossing must register counts of either:
  - 50 or more unaccompanied infant and/or primary school children, or
  - 300 or more passenger car units (heavy vehicles over three tonnes unladen are counted as two passenger car units).
- The site must be considered a safe working environment for a school crossing supervisor.

It is noted that the adjacent intersection will provide signalised pedestrians crossings (not being an existing children's crossing, pedestrian (zebra) crossing or combined (zebra and children's) crossing), thus will not be eligible for a crossing supervisor, based on the criteria listed above.

## 6.10 Cycling Infrastructure

The site is also located in proximity to separated bicycle lanes, off-road shared paths and bicycle friendly roads available throughout the area. These cycleways can be used concurrently with other bicycle routes to provide connections to various areas. It is also noted that primary school aged children are permitted to cycle on pedestrian footpaths. The existing cycling facilities and those that are proposed to be constructed in the future are presented in **Figure 12**, with the cycleways summarised as follows:

- Separated Bicycle Lanes: Geddes Avenue, Zetland Avenue, Epsom Road, George Street, Allen Street and Mandible Street accommodate dedicated cycle lanes. These lanes provide access to Alexandria, Redfern, Waterloo and Roseberry.
- Low-Traffic On-road Routes: Portman Street, Hansard Street, Victoria Street and William Street accommodate low-traffic on-road routes. These routes provide access to areas such as Beaconsfield, Alexandria, Waterloo and Redfern.
- Wayfinding Signage Routes: George Street, Portman Street, Dunning Avenue, Allen Street and Mandible Street accommodate routes with wayfinding signage. These routes provide access to areas such as Beaconsfield, Alexandria, Waterloo and Redfern.

Additionally, the AECOM report presents the proposed cycleways for the Green Square Town Centre precinct. The subject site is ideally positioned with proposed cycleways located along two (2) of the site frontages. The proposed cycleways in the vicinity of the site are described below:

- Zetland Avenue: Uni-directional separated cycleway traversing east-west between Green Square Station and Epsom Precinct
- Portman Street: Bi-directional cycleway along the eastern side of Portman Street, traversing north-south and providing a connection to Sydney CBD.

The above cycleway infrastructure which is expected to complete construction before the school is operational, along with existing cycling infrastructure will help promote active modes of travel for staff and students and aid to reduce the number of vehicles trips to/from the site.

It should also be noted that primary school aged children are permitted to cycle on pedestrian footpaths. Therefore, in areas where separated cycleways are not available, students would be able to utilise pedestrian infrastructure.

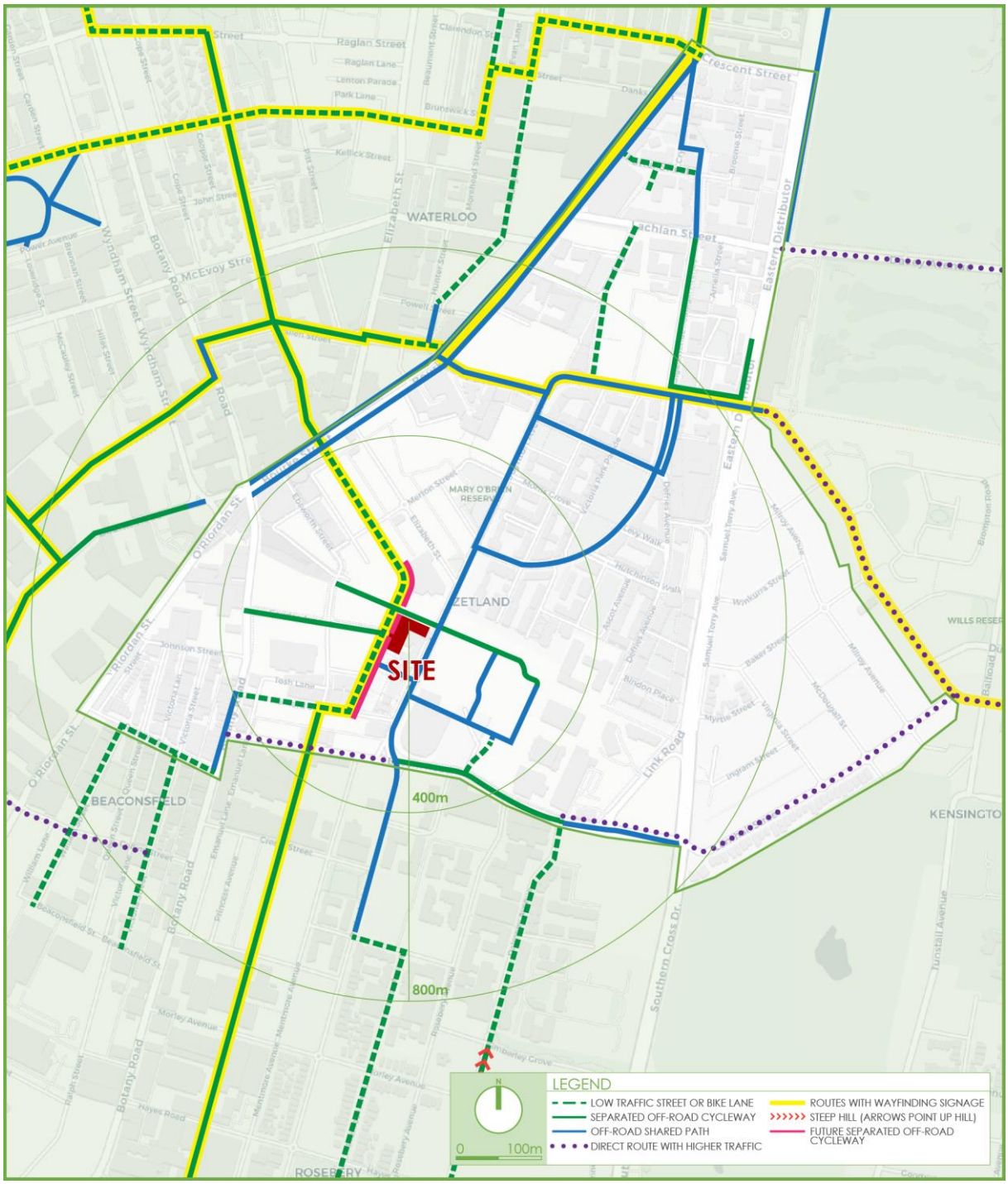



**Figure 12: Existing and Future Cycleways within Enrolment Boundary**

## 6.11 On-Site Provisions

**Figure 13** below presents the on-site transport provisions associated with the proposed development including the following:

- Building entries;
- Bicycle and scooter parking;
- School drop-off, pick-up and parking (kiss & ride); and
- Delivery and waste management servicing areas.

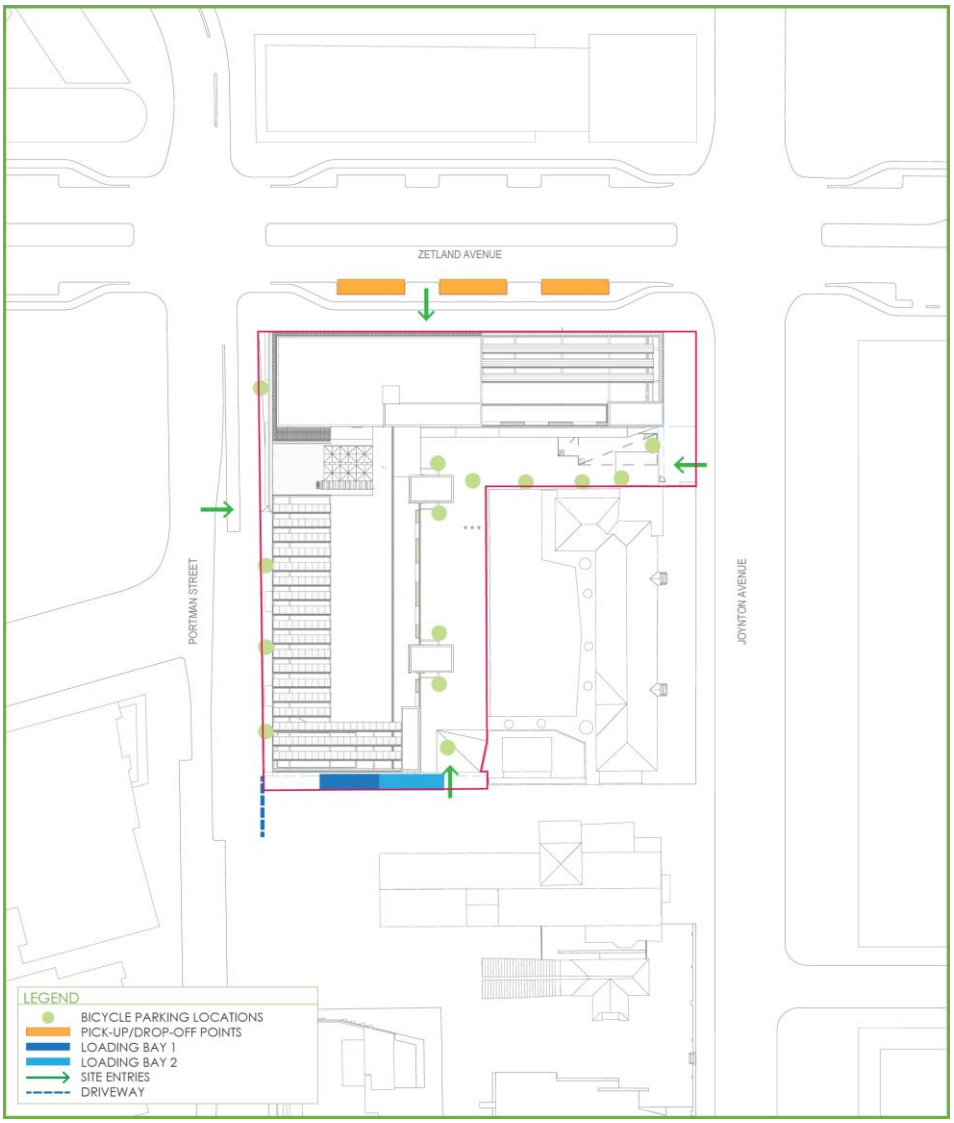



**Figure 13: On-Site Transport Provisions**

## 6.12 Catchment Analysis

In order to undertake a catchment analysis and determine travel patterns/travel demands, depersonalised student data within the proposed enrolment boundaries was mapped. This included students currently enrolled at Kensington Public School, Gardeners Road Public School, Bourke Street Public School and Eastlakes Public School. The number of students within the 400/800/1200m or 5/10/15min walking catchments and 1200/2400/3600m or 5/10/15min cycling catchments was then determined. A summary of the existing student numbers is presented in **Table 2** below:

**Table 2: Catchment Analysis**

| Catchment | No. Students | % |
|---|---|---|
| **Walking** | | |
| 1-400m (5-min walk) | 23 | 23.2% |
| 401-800m (10-min walk) | 19 | 19.2% |
| 801-1200m (15-min walk) | 22 | 22.2% |
| >1200m (15-min walk) | 35 | 35.4% |
| **Cycling** | | |
| 1-1200m (5-min cycle) | 64 | 64.6% |
| 1201-2400m (10-min cycle) | 35 | 35.4% |
| 2401-3600m (15-min cycle) | 0 | 0% |
| **SSTS** | | |
| 1.6km Straight Line Radius | 0 | 0% |
| 2.3km Walking Route | 0 | 0% |

It can be seen from Table 2 above, the majority of students within the proposed enrolment boundaries live within a 15-minute walk (64.6%) or 10-minute cycle (100%) from the proposed school. Due to the size of the proposed enrolment boundaries, no students (years 3-6) are eligible for the School Student Transport Scheme. The 5/10/15min walking catchments and 5/10/15min cycling catchments (to the ultimate enrolment boundary extents) are presented in **Figure 14** below.

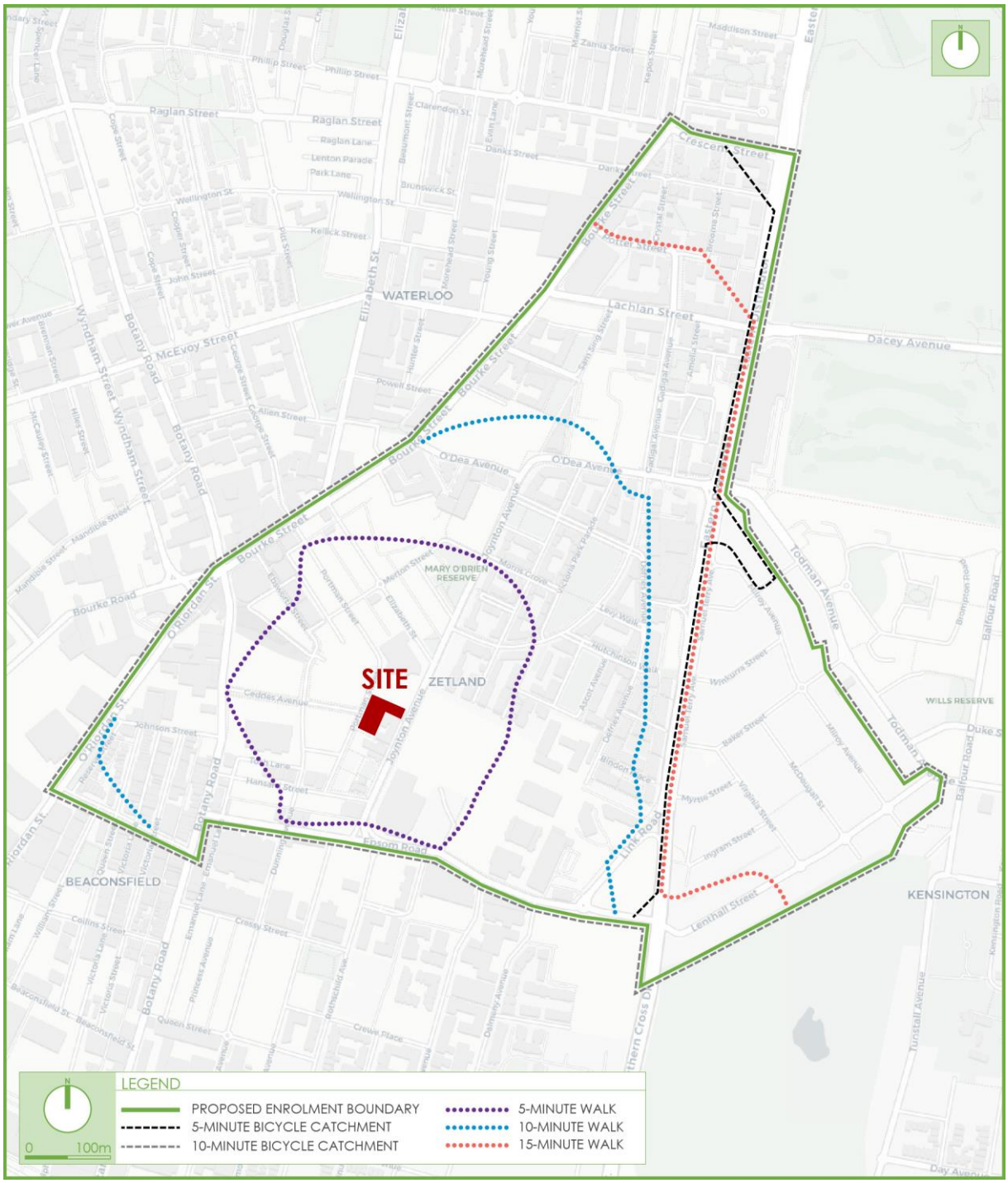



**Figure 14: Walking and Cycling Catchments**

# 7. TRANSPORT USE

## 7.1 Base Case Scenario

In order to predict the expected travel characteristics of the proposed school development, online travel mode questionnaire surveys were prepared by TRAFFIX and distributed to Bourke Street Public School, an inner-city primary school with similar characteristics to the proposed school development. The questionnaire survey was prepared in coordination with SINSW.

The online questionnaire was open for responses for a seven-day period from 22 March 2021 to 26 March 2021. A sample rate of approximately 53% of students and 17% of staff was collected and completed. The survey included a range of questions which were primarily aimed to gain an understanding of average car occupancies and travel modes in the morning and afternoon school peak periods of a typical inner city school development.

### 7.1.1 Staff Travel Characteristics

**Table 3**, **Table 4** and **Table 5** presents the staff travel modes, arrival and departure times during the AM and PM school peak periods.

**Table 3: Staff Travel Modes – AM and PM School Peak Periods**

| Travel Modes | AM Peak | PM Peak |
|---|---|---|
| By Car (as driver) – Parked nearby | 33% | 33% |
| By Car (as passenger – dropped off/picked up) | 0% | 17% |
| By Car (as passenger – carpool with other staff who park at/near school) | 0% | 0% |
| Public Transport - Bus | 0% | 0% |
| Public Transport - Train | 17% | 0% |
| Walk | 33% | 33% |
| Cycle | 17% | 17% |

Based on the above survey results; approximately 33% of staff at Bourke Street Public School utilise private vehicles to travel to/from the school with the remaining staff utilising other modes of transport (including public transport and walking).

Table 4: Arrival Times of Staff at Bourke Street Public School

| Arrival Time | AM Proportion |
|---|---|
| Prior to 6:15am | 0.0% |
| 6:15am – 6:30am | 16.7% |
| 6:30am – 6:45am | 0.0% |
| 6:45am – 7:00am | 0.0% |
| 7:00am – 7:15am | 16.7% |
| 7:15am – 7:30am | 0.0% |
| 7:30am – 7:45am | 16.7% |
| 7:45am – 8:00am | 16.7% |
| 8:00am – 8:15am | 16.7% |
| 8:15am – 8:30am | 0.0% |
| 8:30am – 8:45am | 0.0% |
| 8:45am – 9:00am | 16.7% |
| After 9:00am | 0.0% |

Table 5: Departure Times of Staff at Bourke Street Public School

| Departure Time | PM Proportion |
|---|---|
| Prior to 2:45am | 0.0% |
| 2:45am – 3:00am | 0.0% |
| 3:00am – 3:15am | 33.3% |
| 3:15am – 3:30am | 0.0% |
| 3:30am – 3:45am | 16.7% |
| 3:45am – 4:00am | 0.0% |
| 4:00am – 4:15am | 0.0% |
| 4:15am – 4:30am | 33.3% |
| 4:30am – 4:45am | 0.0% |
| 4:45am – 5:00am | 0.0% |
| 5:00am – 5:15am | 16.7% |
| 5:15am – 5:30am | 0.0% |
| After 5:30am | 0.0% |

The key findings from the staff travel mode surveys are summarised below:

- 33% of staff drive a car in the AM period and 33% of staff drive a car in the PM period.
- 17% of staff utilise public transport to the school and 0% from the school.
- 33% of staff walk to the school and 33% walk from the school.
- For the purpose of reviewing trip arrival patterns, 16.7% of staff arrived at the school between the hours of 6:00am and 7:00am, 50.1% of staff arrived at the school between 7:00am and 8:00am and 33.4% between 8:00am and 9:00am.
- In relation to departure trips, 50% of staff leave the school between the hours of 3:00pm and 4:00pm, 33.3% leave between 4:00pm and 5:00pm and 16.7% leave between 5:00pm and 6:00pm.

### 7.1.2 Student Travel Characteristics

The result of the travel questionnaires completed by parents of students in Kindergarten to Year 6 at Bourke Street Public School are outlined in the tables below. **Table 6**, **Table 7**, **Table 8** and **Table 9** presents the surveyed travel mode splits, arrival and departure times and vehicle occupancy of the students at the comparable development.

**Table 6: Student Travel Modes (K to Year 6) – AM and PM School Peak Periods**

| Travel Modes | AM Peak | PM Peak |
|---|---|---|
| By Car (as a passenger – car driven by parent/guardian and parked nearby) | 25.8% | 28.8% |
| By Car (as a passenger – dropped off with driver not staying) | 6.8% | 2.3% |
| Motorcycle/Motor-scooter | 0.0% | 0.0% |
| Bus | 0.0% | 0.0% |
| Public Transport - Train | 0.8% | 0.8% |
| Walk | 53.0% | 53.8% |
| Cycle or other rideable | 13.6% | 14.3% |

Table 6 demonstrates that 32.6% of students at Bourke Street Public School arrive by private vehicle in the morning and 31.1% are picked up in the afternoon. 53% of students walk to school in the morning and 53.8% walk from school in the afternoon and a portion of students, 13.6% cycle or use another rideable to arrive at school in the morning, with 14.3% departing school using this form of transport.

Table 7: Private Vehicle Occupancy of Students (K to Year 6) at Bourke Street Public School

| Private Vehicle Occupancy | AM | PM |
|---|---|---|
| | Proportion | Proportions |
| 1 | 29.9% | 9.0% |
| 2 | 65.7% | 65.7% |
| 3 | 4.5% | 25.4% |

Table 8: Arrival Times of Students at Bourke Street Public School

| Arrival Time | AM Proportion |
|---|---|
| Prior to 6:15am | 0.0% |
| 6:15am – 6:30am | 1.5% |
| 6:30am – 6:45am | 0.0% |
| 6:45am – 7:00am | 0.0% |
| 7:00am – 7:15am | 1.5% |
| 7:15am – 7:30am | 2.3% |
| 7:30am – 7:45am | 0.8% |
| 7:45am – 8:00am | 2.3% |
| 8:00am – 8:15am | 3.8% |
| 8:15am – 8:30am | 10.6% |
| 8:30am – 8:45am | 35.6% |
| 8:45am – 9:00am | 39.4% |
| After 9:00am | 2.3% |

**Table 9: Departure Times of Students at Bourke Street Public School**

| Departure Time | PM Proportion |
|---|---|
| Prior to 2:45am | 0.0% |
| 2:45am – 3:00am | 6.5% |
| 3:00am – 3:15am | 77.4% |
| 3:15am – 3:30am | 5.6% |
| 3:30am – 3:45am | 2.4% |
| 3:45am – 4:00am | 0.0% |
| 4:00am – 4:15am | 1.6% |
| 4:15am – 4:30am | 0.8% |
| 4:30am – 4:45am | 0.8% |
| 4:45am – 5:00am | 1.6% |
| 5:00am – 5:15am | 0.8% |
| 5:15am – 5:30am | 1.6% |
| After 5:30am | 0.8% |

The key findings of the student travel mode surveys for students in K to Year 6 are as follows:

- 25.8% of students get dropped off in the morning with 70.2% of these students arriving in the same vehicle in groups of 2 or more, and 28.8% of students get picked up in the afternoon with 91.1% of these students departing in the same vehicle in groups of 2 or more.
- 89.4% of students arrive at school between 8:00am and 9:00am and 91.9% of students depart school between 2:45pm and 3:45pm.
- 53% of students walk to school in the morning and 53.8% of students walk from school in the afternoon.
- 13.6% of students cycle or use another form of rideable to arrive at school in the morning and 14.3% of students cycle or use a rideable to depart from school in the afternoon.

## 7.2 Transport Scenarios

The Base Case (existing transport usage), Moderate, and Reach Target scenarios are presented in **Table 10** and **Table 11** below. To provide context, the following scenarios are applicable for the school's transport targets:

- Base Case Scenario — The base case scenario is informed by the existing mode shares for the Bourke Street Public School discussed in Section 7.1 above.

- Moderate Scenario — The moderate scenario would see a reduction in private vehicle trips and an uptake of sustainable transport options such as walking/cycling. This scenario lies between the base case and reach scenario.
- Reach Scenario — The reach scenario or maximum potential transport use is derived from the Catchment Analysis undertaken in Section 6.12. It should be noted that the reach target cannot exceed the geographic cover of the transport network and student population unless additional network or infrastructure is costed and implemented.

It should be noted that the depersonalised staff data was not provided, as such, the number of staff within the 400/800/1200m or 5/10/15min walking catchments and 1200/2400/3600m or 5/10/15min cycling catchments have not been mapped. Nevertheless, it is expected that any staff member that resides within the school enrolment boundary would walk/cycle to/from the school, noting the 15-minute walk distance extends to the intersection of Lachlan Street/Eastern Distributor in the north and Virginia Street/Lenthall Street in the east.

**Table 10: Transport Scenarios – Staff**

| Travel Modes | Base Case – Ave. Data | | Moderate Case | |
|---|---|---|---|---|
| | No. Staff | Mode Share | No. Staff | Mode Share |
| By Car (as driver) – Parked nearby | 20 | 33% | 0 | 0% (-33) |
| By Car (as passenger – dropped off/picked up) | 5 | 8.5% | 3 | 5% (-3.5) |
| By Car (as passenger – carpool with other staff who park at/near school) | 0 | 0% | 0 | 0% |
| Public Transport - Bus | 0 | 0% | 0 | 0% |
| Public Transport - Train | 5 | 8.5% | 5 | 8.5% |
| Walk | 20 | 33% | 32 | 52.5% (+19.5) |
| Cycle | 10 | 17% | 20 | 34% (+17) |
| **TOTAL** | **60** | **100%** | **60** | **100%** |

Table 11: Transport Scenarios – Students

| Travel Modes | Base Case – PM Data | | Moderate | | Reach Target | |
|---|---|---|---|---|---|---|
| | No. Students | Mode Share | No. Students | Mode Share | No. Students | Mode Share |
| By Car (as a passenger – car driven by parent/guardian and parked nearby) | 187 | 31.1% | 65 | 10.8% | 0 | 0% |
| By Car (as a passenger – dropped off with driver not staying) | | | | | | |
| Motorcycle/Motor-scooter | - | - | - | - | - | - |
| Bus | - | - | - | - | - | - |
| Public Transport - Train | 5 | 0.8% | 0 | 0% | 0 | 0% |
| Walk | 323 | 53.8% | 375 | 62.6% | 388 | 64.6% |
| Cycle or other rideable | 86 | 14.3% | 160 | 26.6% | 212 | 35.4% |
| **TOTAL** | **600** | **100%** | **600** | **100** | **600** | **100%** |

***Student numbers have been normalised to the enrolment capacity** of 600 students

As discussed in Section 6.12 above, the majority of students within the proposed enrolment boundaries live within a 15-minute walk (64.6%) or 10-minute cycle (100%) from the proposed school. As such, this is reflected in the moderate scenario mode shares which see 62.6% of students walking and 26.6% of students cycling to/from school. As also mentioned above, Green Square will become one of the most densely populated areas within Australia, suggesting the Town Centre will accommodate a large portion of the population within walking/cycling distance from the school.

The supporting infrastructure for the staff and student scenarios is discussed in the following sections.

# 8. SITE TRANSPORT INFRASTRUCTURE

## 8.1 Car Parking

### 8.1.1 Primary School

The site is a "deferred matter" in the Sydney Local Environmental Plan 2012 (SLEP 2012), Sydney Local Environmental Plan (Green Square Town Centre - Stage 2) 2013 and the South Sydney Local Environmental Plan 1998. The South Sydney Local Environmental Plan 114 (SSLEP 114) is therefore the applicable Environmental Planning Instrument applicable to the site.

The SSLEP 114 states the following in relation to Transport and Access:

> *Parking provision and management in Green Square is to acknowledge travel demand management principles, discourage excessive car ownership and usage levels by residents, and discourage car travel by commuters and other users. The location and intensity of development is to be oriented towards maximum potential for use of public transport.*

It does not specify a parking rate for primary school developments. Therefore, reference is made to the South Sydney DCP No. 11 Transport Guidelines for Development 1996 which is still applicable to this site. This DCP states parking requirements for primary school developments which are summarised in **Table 12** below:

**Table 12: DCP Parking Rates and Provision**

| Type | No. | Parking Rate | Spaces Permitted* | Spaces Provided |
|---|---|---|---|---|
| **Child Education and Care – Primary Schools** | | | | |
| Staff | 60 staff | ½ staff numbers | 30 | 0 |
| Parent Drop-off and Pick-up | | ¼ staff numbers (on- street considered) | 15 | 6 (on-street spaces) |
| | | **Total** | **45** | **6** |

*The permissible number of car parking spaces is to be rounded to the nearest whole number.

As can been seen from Table 12 above, the proposed development is permitted to provide up to 30 off-street staff parking spaces and up to 15 on-street drop-off/pick-up spaces. In response, the development

provides no formal off-street staff parking spaces and six (6) on-street drop-off and pick-up parking spaces are provided along the future Zetland Avenue frontage for use by parents/guardians to safely drop-off/pick-up students. It is noted that two (2) loading bays are proposed along the southern frontage and this area will be managed by the school as required. The on-street parking spaces within the public roadway have been assessed (in terms of geometry etc.) by the City of Sydney.

The proposed parking arrangements are considered acceptable for the following reasons:

- Council's strategy regarding car parking provision and the encouragement of active and public transport modes has intensified since this older DCP was published. Indeed, more recent LEPs (not applicable to this specific site), applicable to the surrounding area state maximum car parking rates in an effort to reduce overall parking provision in new developments.
- Green Square and the City South is expected to grow from 51,930 in the year 2021 to 82,135 by the year 2041 with the area becoming one of the densest communities located in Australia. Significant upgrades in relation to the surrounding public transport network and cycleway network are planned for implementation in the next five years. These improvements in infrastructure will be available for use by future students to arrive at the school. Notably a number of separated cycleways and signalised pedestrian crossings are proposed to be constructed or have been recently constructed in the vicinity of the school.
- Travel Mode Surveys were conducted at a comparable inner city primary school, Bourke Street Public School. The surveys as presented in Section 7 conclude that 32.6% of students arrive to school by car and 31.1% depart school by car. The survey found that a large number of students use active modes of travel to commute. With 13.6% of students cycling to school, 14.3% cycling home and 53% of students walking to school and 53.8% students walking home.

### 8.1.2 Drop-off/Pick-up Provision

A total of six (6) on-street drop-off and pick-up spaces area proposed along the northern boundary of the school on the future Zetland Avenue. It is noted that outside of school drop-off and pick-up periods, these six spaces are comprised of four (4) standard spaces and two (2) accessible parking spaces. The student travel characteristics from Bourke School Public School have been adopted, not taking into account the unique characteristics of the site to determine a worst-case scenario of anticipated vehicle arrivals for drop-off and pick-up. Noting that the pick-up period is the more critical period, as morning drop-off period is considered to be a more 'random' arrival event whereas cars will often wait prior to bell times for pick-up, therefore resulting in more potential for queuing. A detailed explanation of how the traffic generation for vehicles is derived is presented in Section 10.3 and the queuing analysis is presented in **Appendix D**.

### 8.1.3 Assessment of Provision

A queuing analysis has been conducted of the proposed provision of drop-off and pick-up spaces. The analysis concluded that the 98th percentile queue is able to be contained within the six (6) spaces for the critical afternoon pick-up period. This is assuming, an afternoon pick-up period which allows for a staggered finish, spreading the number of trips over two half hour periods.

In summary the following assumptions were made for the critical afternoon pick-up period:

- 114 vehicle arrivals in the afternoon pick-up period;
- Two (2) staggered pick-up periods allowing for a total pick-up period of one-hour. The proposed arrangements of this staggered pick-up period are detailed in **Section 9.2.2**; and
- A pick-up of duration of 100 seconds per space resulting in an average waiting time of 17 seconds and a service rate of 216 vehicles per hour.

This results in a 98th percentile queue of six (6) cars, all of which can be contained within the provision of pick-up and set-down spaces. Therefore, this arrangement is considered sufficient to accommodate the demands of the school with the appropriate management strategies as detailed within **Section 14.7.1**. It should also be noted that whilst the assessment is considered a conservative assessment based on travel modes from Bourke Street Public School, the overall provision will provide a 'buffer' on days when parents/caregivers are more likely to drive their child/children to school, such a rainy or excessively hot days.

### 8.1.4 Communal Hall/Multi-purpose Rooms

The SSLEP 114 requires places of public worship and entertainment facilities (considered a comparable land use) to provide parking at the maximum rates outlined in **Table 13** below:

**Table 13: SSLEP Parking Rates and Provision**

| Type | Area | No. of Seats | Maximum Parking Rate | Maximum Spaces Permitted* | Spaces Provided |
|---|---|---|---|---|---|
| **Places of public worship/Entertainment facilities** | | | | | |
| Communal Hall/Multi-purpose Spaces | 1,254.2m² | 536 | 1 space for every 10 seats, or<br>1 space for every 30m² of GFA | 54 | 0 |

*The maximum number of car parking spaces is to be rounded to the nearest whole number.

It is evident from Table 13 that the proposed development is permitted to provide up to 54 car parking spaces under Council's SSLEP. In response, the development does not provide any off-street parking spaces. Accordingly, the proposed car parking provision complies with the requirements of Council's SSLEP and is considered acceptable, reflecting the parking objectives of the Sydney LEP and Green Square Town Centre DCP. This is acceptable in the circumstances for the following reasons:

- A high percentage of users of the community hall are envisaged to arrive from the surrounding Green Square Town Centre Precinct. This would result in a large portion of users using active modes of travel such as walking or cycling.
- The subject site is located 450m south of the Green Square Railway station. Community users of the communal hall and multi-purpose spaces would likely utilise the surrounding public transport system including rail and bus services.
- A comprehensive Green Travel Plan (GTP) for all users of the communal hall and multipurpose spaces may be developed at a later stage. This would intend to encourage the use of public transport and alternative modes of travel.
- The restricted provision of parking reflects on sound sustainable policy that will drive behavioural change.

### 8.1.5 Sports Court

The Sydney LEP or DCP does not provide car parking rates for indoor/outdoor sports facilities. In this regard, a first principles approach derived from the operational details for the facility is considered more appropriate for establishing parking demands. In order to derive an appropriate car parking rate, the following key user aspects we considered and documented in **Table 14** below:

- Target cliental/user groups;
- Average number of users per court;
- Average number of spectators per user;
- Private vehicle modal split and access to public transport;
- Car occupancy rates;
- Event change over factor; and
- 85th percentile demand factor.

**Table 14: Sports Court Parking Provision**

| Use | Players | Spectators | Total | Private Vehicle Arrivals[1] | Car Occupancy [2] | Change over Factor[3] | 85%ile Design |
|---|---|---|---|---|---|---|---|
| Indoor Court | 20 | 20 | 40 | 24 | 11 | 14 | 12 |

1 60% private vehicle modal split
2 2.2 car occupancy rate
3 30% change over factor

As can be seen from Table 14, the sports court is expected to see an 85th percentile demand of 12 car parking spaces. This assessment is based on a 60% private vehicle modal split and a 30% change over factor, which assumes that the majority of visitors will have left the site between court sessions during critical peak operating times. This is considered a reasonable assumption, noting that a 10-15 minute break occurs between sessions, to allow visitors to leave the site and allow the next session to arrive. Should issues arise with the session overlaps, any future operator may be required to stagger court times (staggered events) to ensure satisfactory operation.

### 8.1.6 Overall Parking Requirements

A summary of the parking requirements is outlined in **Table 15** below:

**Table 15: Overall Parking Requirements**

| Use | Maximum Parking Permitted | Comment |
|---|---|---|
| **School Hours** | | |
| Primary School | 45 | SSLEP |
| **Outside School Hours** | | |
| Communal Hall/Multi-purpose Spaces | 54 | SSLEP |
| Sports Court | 12 | First Principles Assessment |

It is evident from Table 15 above, that the proposal is permitted to provide up to 45 spaces for the school during school hours and up to 66 spaces for out of school hours events that may occur on-site. In response, the proposed development does not provide any dedicated off-street car parking spaces which complies with the requirements of Council's SSLEP and is considered acceptable, reflecting the parking objectives of the Sydney SSLEP and Green Square Town Centre DCP.

## 8.2 Accessible Parking

The South Sydney DCP No. 11 Transport Guidelines for Development 1996 states that car parking should be provided in accordance with Table C1 of AS 2890.1, however, the particular standard that is referenced in this DCP has been superseded by AS 2890.6 (2009) which states in relation to the provision of accessible car parking spaces, where a total number of car spaces is between 1-20, not less than one (1) accessible space is to be provided.

The proposed development does not provide any off-street parking spaces; thus, no accessible parking spaces are required.

## 8.3 Bicycle/Scooter Parking

### 8.3.1 Parking Provision

Reference is made to the South Sydney DCP No. 11 Transport Guidelines for Development 1996 which is still applicable to this site. Section 2 and 3 specifies a bicycle parking rate for primary school developments. These rates are outlined in **Table 16** below:

**Table 16: DCP Parking Rates**

| Type | Staff/Student No. | Bicycle Parking Rate |
|---|---|---|
| **Educational Facility** | | |
| School | 60 Staff | 1 space per 10 staff |
| | 600 Students | 1 space per 10 students over year 4 |

*If the minimum number of bicycle parking spaces is to be rounded to the nearest whole number.

Application of the above rates to the proposed staff and student numbers requires the development to provide six (6) staff spaces and an unconfirmed number of student spaces under the DCP. However, it should be noted that surveys of Bourke Street Public School (comparable development) suggest that, at a minimum, the proposed development would have 14.3% of student ride/scooter under the base case scenario and up 26.6% of students under the moderate scenario. Staff cycling to work is expected to range between 17% under the base case scenario and 34% under the moderate scenario.

This equates to 160 students or 80 U-rail bicycle parking racks and 20 staff or 10 U-rail bicycle parking racks. Scooter helmet storage should be provided at a rate of 10% or 16 students in accordance with SINSW advice. In summary, under the moderate transport scenario, the development would eventually require

up to 180 bicycle parking spaces or 90 U-rails. In response, the proposed development provides 180 bicycle parking spaces, meeting this requirement.

The above bicycle parking provision will also serve the community uses of the development, noting that the use of the community spaces on-site will not coincide with school hours. Therefore, this provision is expected to readily accommodate any demand for bicycle parking from the community facilities, noting the modal splits discussed in Section 10.3.2.

### 8.3.2 Location of Spaces

The bicycle parking spaces have been provided in convenient and accessible areas in proximity to the main building entrances as shown in **Figure 13**. Noting the location of spaces along the public domain frontage, it is expected that sufficient lighting is provided and that a good level of passive surveillance is provided. Spaces within the site are also expected to be well lit.

### 8.3.3 End of Trip Facilities

Unisex shower cubicles with change rooms should be provided at a rate of 1 per 50 staff members as per SINSW advice. Application of this rate to the 60 staff members requires two (2) unisex shower cubicles and two (2) change rooms.

## 8.4 Motorcycle Parking

Neither the SSLEP 2012 nor the South Sydney DCP No. 11 Transport Guidelines for Development 1996 specifies a parking rate in relation to motorcycles. The Bourke Street Public School surveys also indicate that no staff members utilise motorcycles to travel to/from the school. Accordingly, no motorcycle parking is proposed for the development, and this is considered acceptable.

## 8.5 Refuse Collection and Servicing

The development provides two (2) loading/service bays on the southern boundary of the site, accessed via the internal roadway that runs between Portman Street in the west and Joynton Avenue in the east. The loading/service bays will be accessed by both Council's waste collection vehicles (contractor) and private servicing vehicles. As the internal roadway runs in a one-way direction in the eastbound direction, all vehicles will access the service bays from Portman Street only. Additional vehicle access controls may also be installed at the Portman Street entrance to control vehicle movements through the site.

A Draft School Transport Plan is presented in **Section 14** which provides more information with regards to the anticipated servicing arrangements.

Swept path analysis has been conducted using a standard 8.8m long medium rigid vehicle, which is considered the largest vehicle to access the bays. The swept path analysis is presented in **Appendix E** and shows satisfactory vehicle movements.

## 8.6 Preliminary Delivery Service Plan

A Preliminary Delivery Service Plan is outlined below, noting that the exact servicing requirements and frequencies are unknown at this stage of the project.

### 8.6.1 Loading/Servicing Provision

The proposed development provides two (2) loading service bays along the southern boundary of the site. The bays are positioned parallel to the building line are situated between the multi-purpose 2 pedestrian access doors and the southern entrance gate. The provision of two (2) bays is considered an appropriate provision for the scale and nature of the proposed development and significant consultation between the City of Sydney and SINSW has been undertaken to derive the proposed layout. It is expected that the vehicle movements to/from the bays will be scheduled to ensure that no loading occurs during school drop-off and pick-up times and servicing would generally occur outside of school hours and to ensure no conflicts between waste collection and deliveries.

### 8.6.2 Vehicle Size and Type

Waste collection for the school and community facilities will be conducted by a private waste vehicle, being limited to a maximum size of an 8.8 metre Medium Rigid Vehicle.

### 8.6.3 Vehicle Movements and Access Control

The internal roadway joining Portman Street and Joynton Avenue along which the loading bay is located, is restricted to one-way vehicular movements in an eastbound direction. All vehicles will enter and exit the loading bays in a forward direction, minimising potential for any vehicular or pedestrian conflicts adjacent to the school. The access will be controlled using a bollard system to ensure the area is only utilised by authorised vehicles.

### 8.6.4 Times of Servicing/Deliveries

Waste collection for the development will occur outside of school hours. Deliveries during school hours will be limited and will occur outside of drop-off and pick-up periods. All vehicle movement to and from the service bays will be scheduled to ensure no conflicts occur.

### 8.6.5 Estimated Servicing Frequencies

Reference is made to the Operational Waste Management report prepared by Elephant Foot which assumes that all bins are collected three times a week with no more than three (3) days between collections. Other serving requirements associated with the school and community uses are expected to be minimal (estimated 1-2 times per day).

### 8.6.6 Operational Arrangements

The Operational Waste Management report prepared by Elephant Foot also discusses the general operational arrangements that are expected to occur to facilitate waste collection. This is described as follows:

On the day of servicing, after school hours, the cleaner will transport the 1100L bins to be service from the Bin Room to the Bin Presentation Area adjacent to the gate.

> *"The private waste collection vehicle will enter the site from Portman St via the access way and park in the loading bay, adjacent to the Bin Presentation Area. The collections staff will be given access to the side gate.*
>
> *The bins will be collected directly from the Bin Presentation Area via an arrangement where the waste collection staff wheels a full from the Bin Presentation Area to the collection vehicle and returns the empty bin, then repeats the process until all relevant bins are emptied.*
>
> *Once the bins are serviced, the collection vehicle will exit the site onto Joynton Avenue in a forward direction.*
>
> *In the morning, or as soon as possible, cleaners, grounds keepers or other nominated staff will return the empty bins to the Bin Room."*

These operational arrangements will be refined at a later stage prior to CC stage, once the exact servicing requirements and frequencies are known.

## 8.7 Coach/Bus Parking

It is noted that the school may require bus or coach access for external school events such as school camps, excursions, sporting events etc. As an on-site parking area is not feasible in this situation, an on-street solution will be required. Two (2) bus zones are provided on Joynton Avenue, adjacent to the subject site and are considered acceptable for bus/coach parking as permitted under NSW Road Rule 183.

## 8.8 Emergency Vehicles

Emergency vehicles are expected to utilise the on-street parking spaces or kerb lane along the Zetland Avenue or Joynton Street respectively, noting that emergency vehicles are exempt from parking restrictions etc. under NSW Road Rule 306.

# 9. TO-SITE TRANSPORT INFRASTRUCTURE

## 9.1 Staff Travel

### 9.1.1 Long-term Parking

A reduction in staff parking nearby is expected and will be encouraged, noting the limited long term on-street and off-street parking within the proximity of the site. Whilst the number of staff within the 5/10/15min walking and cycling zones is unknown, it is expected that staff living within these zones will utilise alternative modes of travel. The proximity of the Green Square Railway Station also provides a practical travel option for staff living near the T8 line.

### 9.1.2 Drop-off/Pick-up Parking

The drop-off and pick-up spaces on Zetland Avenue could be utilised by the limited number of staff getting dropped-off or picked-up. The queuing analysis discussed in Section 8.1 demonstrates that the spaces will operate satisfactorily in the critical PM peak period. No improvements are required in this regard.

### 9.1.3 Public Transport

The base case data demonstrated that no staff members at the comparable site travelled to/from the school using buses and only 8.5% utilised trains. Whilst it is difficult to predict the location and preferred travel modes of future staff members, it is assumed that this modal split will be similar to the subject development. Section 9.3 of the report provides locations of bus stops without pedestrian shelters; therefore, it is recommended that Council explores options to improve bus stop amenity at these locations.

### 9.1.4 Walking Infrastructure

An increase in walking modal split (moderate scenario) results in 32 staff members travelling to/from the school from the surrounding area. It is noted that the vast majority of roads provide concrete footpaths with kerb ramps at each intersection as demonstrated by **Figure 15**. Proposed signalised intersections within the Town Centre provide signalised pedestrian crossings on each leg. This in-turn provides safe and convenient access for staff members living within the immediate area. The low staff pedestrian volumes would not have any significant impacts to pedestrian infrastructure, noting staff typically arrive/leave

school before/after peak student/parent/carer movements. In addition, staff movements would generally be distributed around the site at numerous pedestrian desire lines.

### 9.1.5 Cycling Infrastructure

An increase in cycling modal split (moderate scenario) results in 20 staff members travelling to/from the school from the surrounding area. It is noted that a substantial bicycle network (on-road and off-road) is available within the Green Square area as detailed in **Figure 12**. In addition, staff are able to utilise the general traffic lanes should they choose in accordance with NSW Road Rules. The low staff cyclist volumes would not have any significant impacts to pedestrian infrastructure, noting staff typically arrive/leave school before/after peak student/parent/carer movements. In addition, staff movements would generally be distributed around the site.

## 9.2 Student Travel

### 9.2.1 Long-term Parking

A reduction in parents/caregivers parking nearby is expected and will be encouraged, noting the limited long term on-street and off-street parking within the proximity of the site. As discussed in Section 7.2, 64.6% of students live within a 15-minute walk of the site and 100% of students live within a 10-minute cycle ride. As such, it is expected that parents/caregivers/students within these zones will utilise alternative modes of travel and will actively avoid parking on nearby streets.

### 9.2.2 Drop-off/Pick-up Parking

A 10.8% modal split (moderate case) of short-term on-street parking is expected, noting the limited options for long term parking in the area. It should also be noted that whilst students may live in the immediate area, their parents may work in areas not easily accessible by public transport. As such, it is expected that some student may still be dropped-off/picked-up by parents/caregivers on their way to/from work. The queuing analysis discussed in Section 8.1 demonstrates that the spaces will operate satisfactorily in the critical PM peak period. No improvements are required in this regard. In addition, it is recommended that the school adopt staggered start/finish times to distribute the predicted traffic volumes over a longer period. The details of the staggered times are presented below for each relevant group.

- Years Kindergarten - 2
  - Start time of 9:15am; and
  - Departure time of 3:15pm.

- Years 3 - 6
  - Start time of 8:45am; and
  - Departure time of 2:45pm.

### 9.2.3 Public Transport

The base case data demonstrated that no parents/caregivers/students at the comparable site travelled to/from the school using buses and only 0.8% utilised trains. Noting the extent of the proposed enrolment boundary options, it is assumed that this modal split for public transport will be zero. No improvements to public transport options are required in this regard.

### 9.2.4 Walking Infrastructure

A 62.6% modal split (moderate case) of walking results in 375 students travelling to/from the school from the surrounding area. It is noted that the vast majority of roads provide concrete footpaths with kerb ramps at each intersection as demonstrated by Figure 15. Proposed signalised intersections within the Town Centre provide signalised pedestrian crossings on each leg and pedestrian movements are prioritised by consecutive phases with pedestrian movements. Nevertheless, a number of intersections have been identified to provide minimal or no pedestrian infrastructure whilst other intersections provide sub-standard infrastructure. These facilities are discussed in further detail in Section 9.4. In addition to infrastructure upgrades, additional school wayfinding signage should be explored by Council under the City's wayfinding strategy for the overall town centre area.

### 9.2.5 Cycling Infrastructure

A 26.6% modal split (moderate case) of cycling results in 160 students travelling to/from the school from the surrounding area. The majority of students located within optimal riding distance (>1200m from site) live within the area bound by the Eastern Distributer, Todman Avenue and Lenthall Street. Students living within this area would be required to travel north to O'Dea Avenue or south to Lenthall Street to cross the Eastern Distributor. Noting that students are permitted to ride on footpaths in accordance with NSW Road Rule 250, a higher level of bicycle usage along existing narrow footpaths may be difficult especially with existing and future pedestrian movements. As such, a number of pedestrian facilities within the proposed enrolment boundaries have been identified for potential upgrades and this is discussed in further detail in Section 9.4.

## 9.3 Infrastructure Gap Analysis

A review of pedestrian infrastructure within the proposed enrolment boundaries has been conducted. The findings are presented in **Table 17** and **Figure 15** below.

**Table 17: Pedestrian Infrastructure Gap Analysis Summary**

| Reference No. | Type | Location | LGA* |
|---|---|---|---|
| 1 | Missing Bus Shelter | Epsom Road near Dunning Avenue | CoS |
| 2 | | Epsom Road near Link Road | CoS |
| 3 | | Gadigal Avenue near Levy Walk | CoS |
| 4 | | Gadigal Avenue near Hutchinson Walk | CoS |
| 5 | | Elizabeth Street near Merton Street | CoS |
| 6 | | Elizabeth Street near Bourke Street | CoS |
| 7 | | Bourke Street near Powell Street | CoS |
| 8 | Missing Kerb Ramps | Merton Street and Christie Lane | CoS |
| 9 | | Merton Street and Cook Lane | CoS |
| 10 | | Merton Street and Lemond Lane | CoS |
| 11 | | Archibald Avenue and Sam Sing Street | CoS |
| 12 | | Lenthall Street under overpass | RCC/ CoS |
| 13 | Signalised Intersection with Missing Pedestrian Leg | Joynton Avenue and O'Dea Avenue | CoS |
| 14 | | Botany Road and O'Riordan Street | CoS |
| 15 | | Bourke Street and McEvoy Street | CoS |
| 16 | | Bourke Street and Lachlan Street | CoS |
| 17 | | Lenthall Street and Todman Avenue | RCC |
| 18 | No Pedestrian Infrastructure | Lenthall Street and Virginia Street | RCC |
| 19 | | Lenthall Street and McDougall Street | RCC |
| 20 | | Epsom Road and Link Road | CoS |
| 21 | | Epsom Road and Rosebery Avenue | CoS |
| 22 | Sub-standard Pedestrian Infrastructure | Joynton Avenue and Gadigal Avenue | CoS |
| 23 | | Gadigal Avenue and Victoria Park Parade | CoS |
| 24 | | Lenthall Street Footpath between Epsom Road and Todman Avenue | RCC |
| 25 | | Botany Road and Johnson Street | CoS |

* City of Sydney (CoS)/Randwick City Council (RCC)

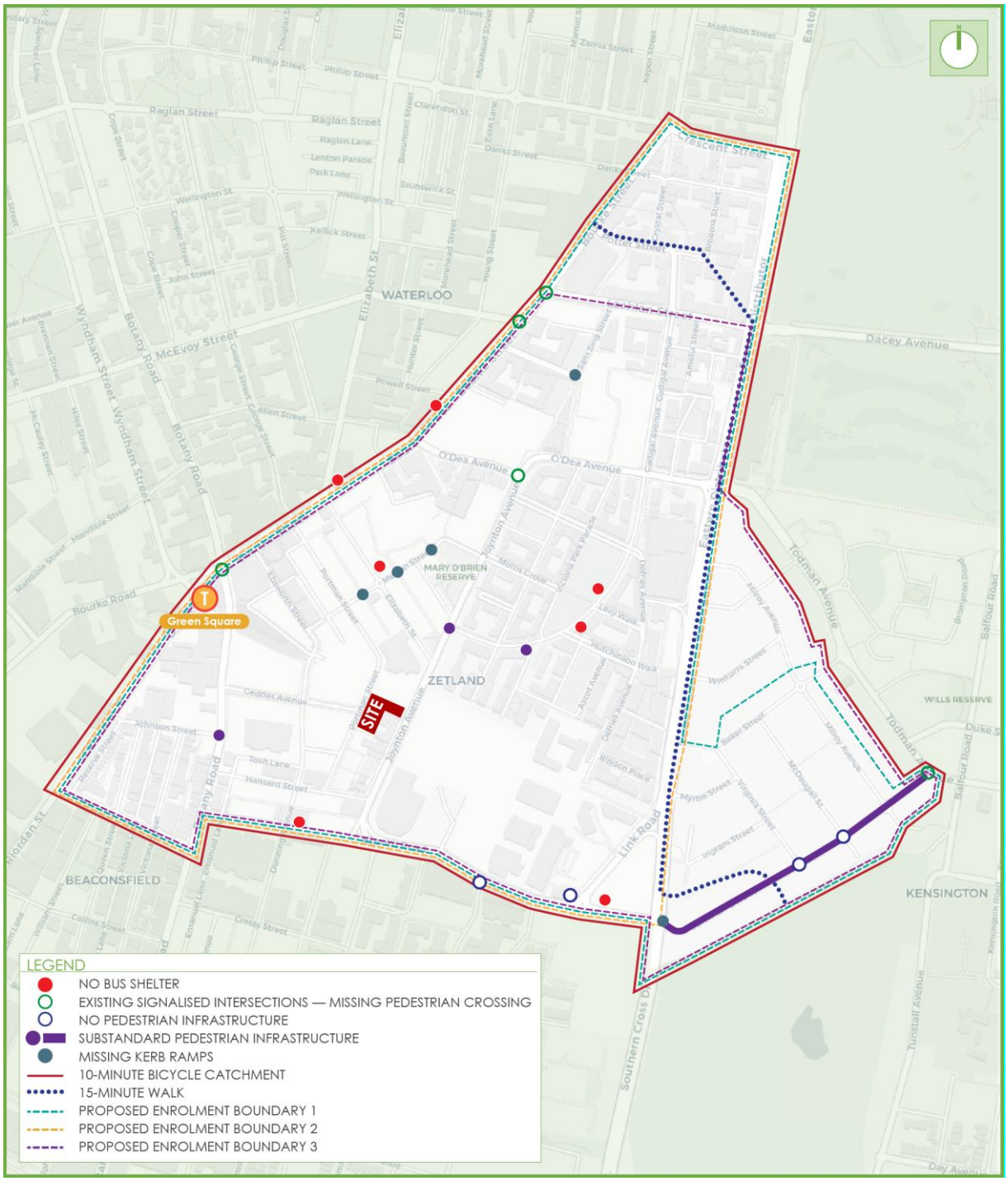



**Figure 15: Gap Analysis of Pedestrian Infrastructure within the Enrolment Boundary**

## 9.4 Recommendations for Infrastructure Upgrades

As discussed in Section 9.2 above, there are a number of intersections along pedestrian/cyclist desire lines that do not provide any pedestrian crossing facilities and also a number of existing facilities that are considered sub-standard, especially for students riding bicycles. TRAFFIX proposes that the following infrastructure improvements be considered by the City of Sydney and Randwick City Council to facilitate improved pedestrian and cycling connections to the proposed school. The priority of these works is to be determined by the Transport Working Group, however TRAFFIX suggests the following prioritisation:

1. Epsom Road/Link Road: This intersection does not provide any pedestrian/cyclist crossing infrastructure on any legs. Noting the number of potential students living east of the Eastern Distributor and the fact that Epsom Road is the only east-west connection to the school at this locality, students walking or riding to school would require a safe crossing point along the Link Road leg. In addition to this, the existing car dealership on the corner provides a vehicle crossing at the pedestrian desire line, further increasing risks to students. The provision a pedestrian crossing facility is recommended at this intersection to improve student safety when travelling to/from the proposed school. This intersection is located within the City of Sydney LGA.

2. Epsom Road/Rosebery Avenue: This intersection does not provide any pedestrian/cyclist crossing infrastructure, in particular a pedestrian refuge. Noting the number of potential students living east of the Eastern Distributor and the fact that Epsom Road is the only east-west connection to the school at this locality, students walking or riding to school would require a safe crossing point along the Rosebery Avenue leg. In addition, the Rosebery Avenue leg is substantially wide, increasing the on-road travel distance for students walking or cycling. The provision a pedestrian crossing facility, such as a pedestrian refuge is recommended at this intersection to improve student safety when travelling to/from the proposed school. This intersection is located within the City of Sydney LGA.

3. Joynton Avenue/Gadigal Avenue: This intersection provides a sub-standard pedestrian refuge, measuring approximately 1.2m wide. AS1742.10 (2009) requires pedestrian refuges to have a desirable width of 3.0m in high pedestrian volumes areas or with significant numbers of cyclists. This width can be reduced to 2.0m in other cases. Noting Joynton Avenue provides a direct north-south connection to the proposed school, it is recommended that upgrade measures are explored to improve student safety at this location. This intersection is located within the City of Sydney LGA.

4. Gadigal Avenue/Victoria Park Parade: This intersection provides a sub-standard pedestrian refuge, measuring approximately 1.2m wide. AS1742.10 (2009) requires pedestrian refuges to have a desirable width of 3.0m in high pedestrian volumes areas or with significant numbers of cyclists. This width can be reduced to 2.0m in other cases. Noting Gadigal Avenue provides connection to a substantial residential area, it is recommended that upgrade measures are explored to improve student safety at this location. This intersection is located within the City of Sydney LGA.

5. Lenthall Street Footpath: Lenthall Street provides a vital cycling connection for potential students living east of the Eastern Distributor. The existing footpath on the northern side of Lenthall Street is approximately 1.2m wide and is likely to service students residing north of Lenthall Street. The existing road alignment also creates a sharp bend along the footpath adjacent to 35 Lenthall Street, creating a potential conflict point with other footpath users. As such, it is recommended that upgrade measures are explored to widen the footpath along Lenthall Street to improve student connectivity and safety. This footpath is located within the Randwick City Council LGA.

6. Lenthall Road/Virginia Street: This intersection does not provide any pedestrian/cyclist crossing infrastructure, in particular a staged refuge crossing. Noting the number of potential students living

| | |
|---|---|
| | east of the Eastern Distributor and the fact that Lenthall Street is the only east-west connection to the school at this locality, students walking or riding to school would require a safe crossing point. The provision a pedestrian crossing facility, such as a pedestrian refuge is recommended at this intersection to improve student safety when travelling to/from the proposed school. This intersection is located within the Randwick City Council LGA. |
| 7. Lenthall Road/McDougall Street: | This intersection does not provide any pedestrian/cyclist crossing infrastructure, in particular a staged refuge crossing. Noting the number of potential students living east of the Eastern Distributor and the fact that Lenthall Street is the only east-west connection to the school at this locality, students walking or riding to school would require a safe crossing point. The provision a pedestrian crossing facility, such as a pedestrian refuge is recommended at this intersection to improve student safety when travelling to/from the proposed school. This intersection is located within the Randwick City Council LGA. |
| 8. Lenthall Street: | Lenthall Street provides a staged pedestrian refuge under the Eastern Distributor overpass. Whilst this refuge has been designed to facilitate cyclist movements between the off-road and on-road cycling paths, students may mistakenly utilise this refuge as a crossing point along Lenthall Street. This is compounded by the fact that there is no safe pedestrian crossing point between the northern and southern sides of Lenthall Street and that Link Road does not provide any pedestrian facilities. In addition, the northern side of the refuge does not provide a pedestrian/cyclist kerb ramp. As such, it is recommended that upgrades be explored to provide a safe crossing point at the existing refuge or provision of another refuge along Lenthall Street. This refuge is located on the City of Sydney/Randwick City Council LGA boundary. |

## 9.5 Encouragement Programs

A number of transport engagement programs could be explored by the school including the following:

### 9.5.1 SSTS "Tap on"

Transport for NSW run a campaign to educate students about the conditions of the School Pass Terms and the Student Codes of Conduct which require students to be in possession of their School Opal card when travelling and being required to tap on and off every time they use public transport.

### 9.5.2 New starter kit

A new starter kit may be implemented by the school which details transport policies and transport access options for student induction. This starter kit may include the provision of a TAG to better inform students of their transport options.

### 9.5.3 Independent Travel Training

The school may implement a program to allow primary school aged students to learn how to walk or ride to and from school through the use of a buddy system (after year 4).

### 9.5.4 Walking/Riding to School Programs

Special events may be run by the school to encourage awareness and promote active modes of transport such as walk to school day, ride to school day and a "walk part way to school" program. A 'walking bus' program could be implemented where a group of students would walk to and from school with one or more adults. This program would assist in changing the mind-set of students and parents, as well as encourage active travel habits outside school.

### 9.5.5 Ride2School Day

A national date to encourage students to ride, walk skate, or scoot to school. The school can implement additional on-site activities such as obstacle courses, host a healthy breakfast, bike education, fundraise and many other activities to inspire students to embrace a heathier lifestyle and try walking/riding to school themselves.

### 9.5.6 Ride Score

The RideScore Program encourages children to become more active by riding or scooting to school, assisting with reducing traffic congestion around schools. Children earn scoot and pedal points along the way and the digital notifications received by parents or carers, provide peace of mind.

# 10. TRAFFIC AND TRANSPORT IMPACTS

## 10.1 Construction Traffic Impacts

Reference should be made to the Preliminary Construction Traffic Management Plan (CTMP) prepared by Traffix (Ref: 20.163r02v04) in relation to the expected construction traffic measures, noting that a comprehensive CTMP will be prepared once a builder is appointed and the construction methodology is finalised.

## 10.2 Traffic Generation in Existing Planning Documents

### 10.2.1 Overview

Traffic impacts relating to the Green Square Town Centre (GSTC) development have been addressed in the Green Square Town Centre – Essential Infrastructure and Public Domain 2031 Traffic Modelling Synopsis report prepared by AECOM Australia Pty Ltd and should be referenced accordingly. This assessment includes a traffic generation assessment of the GSTC which assesses portions of land based on assumed retail, commercial and residential land uses. In summary, the ACOM report assumed the following yields in the GSTC:

- 67,204m$^2$ Commercial GFA;
- 12,760m$^2$ Retail GFA; and
- 330,784m$^2$ GFA or 4,218 dwellings.

It is assumed that the above yields were endorsed by the City of Sydney and that the traffic volumes derived for the assessment were indicative of the GSTC in its "end-state". That is, the volumes take into consideration a level of development on surrounding lots and that no further cumulative assessment of surrounding developments is required. As can be seen, the GSTC has a total of 330,784m$^2$ GFA or 4,218 dwellings. This equates to an average dwelling area of 78.4m$^2$.

The GSTC DCP identifies the subject site as "13A" and the AECOM report assumed the following land uses and yields for the purposes of traffic modelling:

- 1,438m$^2$ Commercial GFA; and
- 25,705m$^2$ Residential GFA.

Adoption of the average dwelling area of 78.4m$^2$, results in the subject site providing approximately 328 dwellings. The traffic generation for each component outlined in the AECOM report is calculated in the following sections:

### 10.2.2 Residential Use

The RMS Technical Direction TDT 2013/04a presents an average Sydney weekday trip rates for high density residential dwellings of 0.19 trips per unit in the morning peak and 0.15 trips per unit in the evening peak. As per AECOM's report, a directional split of 10:90 has been assumed for the morning peak period, with the inverse assumed for the evening peak period. The calculated traffic generation for the approximated 328 residential dwellings is presented below:

- 62 vehicle trips per hour in the morning peak period (6 in, 56 out); and
- 49 vehicle trips per hour in the evening peak period (44 in, 5 out).

### 10.2.3 Commercial Use

The AECOM report adopts a trip generation rate of 0.55 trips per 100m$^2$ GFA for commercial area in both the morning and evening peak periods. The directional split adopted was an 80:20 in the morning peak period, with the inverse assumed for the evening peak period. The traffic generation for the 1,438m$^2$ GFA of commercial use is presented below:

- 8 vehicle trips per hour in the morning peak period (6 in, 2 out); and
- 8 vehicle trips per hour in the evening peak period (2 in, 6 out).

### 10.2.4 Net Traffic Generation in AECOM Model

- 70 vehicle trips per hour in the morning peak period (12 in, 58 out); and
- 57 vehicle trips per hour in the evening peak period (46 in, 11 out).

## 10.3 Development Trip Generation

The impacts of the proposed school development have been assessed having regard for the indicative yield scenarios as summarised in Section 4 above. The result of this assessment is summarised below.

### 10.3.1 School

**Worst-Case Scenario Based on Survey Data (Not Factored)**

The RMS Guideline to Traffic Generating Developments (2002) does not provide a traffic generation rate for educational developments. As such a first principles method has been utilised to assess the traffic generation of the proposed development.

TRAFFIX has undertaken a travel mode survey of primary school students at Bourke Street Public School between 12 March 2021 to 18 March 2021, the findings of these surveys are presented in Section 7. Bourke Street Public School is a primary school that is located within a dense enrolment area within the inner city. The travel mode data allows for the establishment of travel mode splits and car occupancy rates of both staff and students. The key data points are reproduced in **Table 18** for ease of reference.

**Table 18: Private Vehicle Modal Share & Occupancy Rates**

| Questionnaire Data | Morning | Afternoon |
|---|---|---|
| Private Vehicle Modal Share (%) | 32.6% | 31.1% |
| Car Occupancy (children/vehicle) | 1.56 | 1.63 |

Application of the above percentages and car occupancy rates to the proposed student population (600 students) results in the following vehicle trips:

- 250 vehicle trips per hour in the morning peak period (125 in, 125 out); and
- 228 vehicle trips per hour in the afternoon peak period (114 in, 114 out).

It is important to note that the above traffic generations are based on the worst-case scenario. It is considered that active transport initiatives and infrastructure will greatly improve throughout the area in the near future and therefore reliance on private vehicles would be reduced.

**School Traffic Generation with Site Specific Factoring**

Noting that Green Square will become one of the most densely populated areas in Australia and that 64.6% of the estimated enrolment population (based on student data from surrounding schools) is located within a 15-minute walk of the site and 100% is located within a 10-minute cycle ride from the site, it is reasonable to assume that the private vehicle modal share for students would be significantly less than that of the Bourke Street Public School. Private vehicle trips are also expected to decrease as key infrastructure is constructed within the GSTC. This includes future bus routes, pedestrian walking paths and on-road cycle ways. Therefore, it is assumed that the private vehicle mode share would be approximately

one third of the Bourke Street Public School catchment and this reflects the 'moderate transport scenario' discussed in Section 7.2 above.

**Table 19: Revised Private Vehicle Modal Share & Occupancy Rates**

| Questionnaire Data | Morning | Afternoon |
|---|---|---|
| Private Vehicle Modal Share (%) | 10.8% | 10.4% |
| Car Occupancy (children/vehicle) | 1.56 | 1.63 |

Application of the above percentages and car occupancy rates to the proposed student population (600 students) results in the following vehicle trips:

- 84 vehicle trips per hour in the morning peak period (42 in, 42 out); and
- 76 vehicle trips per hour in the afternoon peak period (38 in, 38 out).

It is also noted that trips to primary schools are typically 'linked trips' whereby a driver already accounted for on the network (travelling to a destination such as work or a school for an older sibling) will simply divert to the school either to pick-up or drop-off a child. As such, external traffic impact will be reduced, as will the impacts on any one intersection in the vicinity of the site.

#### Staff Vehicle Trips

A first-principles approach has been adopted for the trip generation of staff taking into consideration the off-street parking provisions, timed on-street parking restrictions, staff population, the proximity to bus services/Green Square Railway Station and the population density of the Green Square area generally. Noting these factors, it is expected that the majority of staff will access the site via public transport or active modes of travel and would avoid driving to school. Furthermore, it is considered that staff are likely to arrive before and depart after the peak period of the site. Therefore, due to the negligible vehicle trips expected, staff trips have been omitted from this assessment.

### 10.3.2 Other External Uses – PM Peak

During a typical weekday evening, the facility will also accommodate several different activities simultaneously and thus will draw a variety of users at any time, including court users, communal hall users and multi-purpose room users. Accordingly, the trip rates and assumptions for each user is provided below.

- Court Users/Spectators: It is assumed that the sports court will attract 20 players and 20 spectators that will arrive to the site between 6pm and 6:30pm in the worst-case scenario that arrivals coincide with the evening peak period. It is expected that 60% of users/spectators will arrive by private vehicle due to the limited parking availability on site and the proximity to Green Square Railway Station. These sessions are understood to last for approximately 1-hour.
- Communal Hall: The communal hall will attract up to 200 users that will arrive to the site between 6pm and 6:30pm. It is expected that visitors will utilise public transport and private vehicle to travel to/from the site, and a 50:50 modal split is assumed.
- Multi-purpose Rooms: The multi-purpose rooms will be utilised for various uses including community meetings, dance, yoga, birthday parties etc. It is expected that these spaces will accommodate up to 150 users at any one time and may be as low as 10, depending on the event/activity. It is expected that users will utilise public transport and private vehicle to travel to from the site, and a 50:50 modal split is assumed.

These trip rates and assumptions have been applied for each user in **Table 20**, in order to estimate the maximum trip generation of the proposed development during the weekday evening peak.

**Table 20: Trip Generation – Typical Weekday PM**

| Use | No. | Car Occupancy | Private Vehicle Usage | Arrival Time | PM Peak Trips |
|---|---|---|---|---|---|
| **Sports Courts** | | | | | |
| Users and Spectators | 40 | 2.2 | 60% | 6:00pm - 6:30pm | 11<br>(11 in, 0 out) |
| **Communal Hall** | | | | | |
| Users | 200 | 2.5 | 50% | 6:00pm - 6:30pm | 40<br>(40 in, 0 out) |
| **Multi-purpose Spaces** | | | | | |
| Users | 336 | 2.5 | 50% | 6:00pm - 7:00pm | 67<br>(67 in, 0 out) |

Based on the above, the PM peak hour occurs between 6:00pm–7:00pm. Accordingly, the peak period traffic generation during typical weekday is estimated to be:

- 118 vehicle trips per hour during the PM peak period: (118 in and 0 out)

The above is considered a 'worse-case' scenario and assumes that every seat is occupied.

## 10.4 Traffic Impacts (End-State)

With respect to the AECOM modelling of the surrounding road network, the changes to the use of the site from commercial/retail to a school development results in the following additional traffic generation during the AM and PM peak network periods.

- +14 vehicle trips per hour during the AM peak period: (+30 in and -16 out)
- +61 vehicle trips per hour during the PM peak period: (+72 in and -11 out)

As can be seen from above, the school development generates approximately 14 additional vehicles in the AM peak and 61 additional vehicles in the PM peak, compared to the land use traffic generation assessed by AECOM. This equates to an additional vehicle trip every four (4) minutes in the AM peak and an additional vehicle trip per minute during the PM peak.

## 10.5 Summary of Daily and Peak Hour Trips

Taking into account the moderate travel modes scenario discussed in detail within Section 7.2 for staff and students and the assumptions made in Section 10.3.2 for community uses, **Tables 21**, **22**, **23** and **24** below outline the estimated peak hour trips and the estimated daily trips for each respective travel mode respectively.

### Table 21: Estimated Peak Hour Trips – AM Network Peak

| Travel Modes | Staff | | Students | | Total AM Peak Hour Trips per Mode Share |
|---|---|---|---|---|---|
| | No. Staff | Mode Share | No. of Students | Mode Share | |
| By Car (as driver) – Parked nearby | 0 | 0% | 0 | N/A | 0 |
| By Car (as passenger – dropped off/picked up) | 3 | 5% | 65 | 10.80% | 68 |
| By Car (as passenger – carpool) | 0 | 0% | N/A | N/A | 0 |
| Public Transport - Bus | 0 | 0% | 0 | 0 | 0 |
| Public Transport - Train | 5 | 8.50% | 0 | 0 | 5 |
| Walk | 32 | 52.50% | 376 | 62.60% | 408 |
| Cycle | 20 | 34% | 160 | 26.60% | 180 |

### Table 22: Estimated Peak Hour Trips – Afternoon Pick-Up Peak

| Travel Modes | Staff | | Students | | Total Afternoon Pick-Up Peak Hour Trips per Mode Share |
|---|---|---|---|---|---|
| | No. Staff | Mode Share | No. of Students | Mode Share | |
| By Car (as driver) – Parked nearby | 0 | 0% | 0 | N/A | 0 |
| By Car (as passenger – dropped off/picked up) | 3 | 5% | 65 | 10.80% | 68 |
| By Car (as passenger – carpool) | 0 | 0% | N/A | N/A | 0 |
| Public Transport - Bus | 0 | 0% | 0 | 0 | 0 |
| Public Transport - Train | 5 | 8.50% | 0 | 0 | 5 |
| Walk | 32 | 52.50% | 376 | 62.60% | 408 |
| Cycle | 20 | 34% | 160 | 26.60% | 180 |

### Table 23: Estimated Peak Hour Trips – PM Network Peak

| Travel Modes | Sports Court | | Communal Hall | | Multi-Purpose Spaces | | Total Network PM Peak Hour Trips per Mode Share |
|---|---|---|---|---|---|---|---|
| | No. of Users | Mode Share | No. of Users | Mode Share | No. of Users | Mode Share | |
| By Car (as driver) – Parked nearby | 11 | 28% | 40 | 20% | 67 | 20% | 118 |
| By Car (as passenger – dropped off/picked up) | N/A | N/A | N/A | N/A | N/A | N/A | 0 |
| By Car (as passenger – carpool) | 13 | 33% | 60 | 30% | 101 | 30% | 174 |
| Public Transport - Bus | 2 | 5% | 10 | 5% | 17 | 5% | 29 |
| Public Transport - Train | 2 | 5% | 10 | 5% | 17 | 5% | 29 |
| Walk | 8 | 20% | 50 | 25% | 84 | 25% | 142 |
| Cycle | 4 | 10% | 30 | 15% | 50 | 15% | 84 |

### Table 24: Estimated Daily Trips

| Travel Modes | Staff | | Students | | Sports Court | | Communal Hall | | Multi-Purpose Spaces | | Total Daily Trips per Mode Share |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. Staff | Mode Share | No. of Students | Mode Share | No. of Users | Mode Share | No. of Users | Mode Share | No. of Users | Mode Share | |
| By Car (as driver) – Parked nearby | 0 | 0% | 0 | N/A | 44 | 28% | 80 | 20% | 134 | 20% | 258 |
| By Car (as passenger – dropped off/picked up) | 6 | 5% | 259 | 10.80% | N/A | N/A | N/A | N/A | N/A | N/A | 265 |
| By Car (as passenger – carpool) | 0 | 0% | 0 | N/A | 32 | 33% | 120 | 30% | 202 | 30% | 354 |
| Public Transport - Bus | 0 | 0% | 0 | 0 | 32 | 5% | 40 | 5% | 67 | 5% | 139 |
| Public Transport - Train | 10 | 8.50% | 0 | 0 | 128 | 5% | 40 | 5% | 67 | 5% | 245 |
| Walk | 64 | 52.50% | 1502 | 62.60% | 64 | 20% | 200 | 25% | 336 | 25% | 2166 |
| Cycle | 40 | 34% | 638 | 26.60% | 160 | 10% | 120 | 15% | 202 | 15% | 1160 |
| Number of Inbound and Outbound Movements[1] | 2 | | 2 | | 4 | | 2 | | 2 | | |

[1] The assumed number of sessions for each community use is as follows: Sports Hall – 2 sessions, Communal Hall – 1 session, Multi-Purpose Hall – 1 session.

## 10.6 Sustainable Travel Plans

### 10.6.1 Workplace Travel Plan/Green Travel Plan

A comprehensive Workplace Travel Plan (WTP) and Green Travel Plan (GTP) is proposed for staff and visitors of the Green Square Integrated Community Facility and school and this can be conditioned to be prepared prior to any Construction Certificate. These plans are intended to encourage the use of public transport and alternative modes of transportation, with the primary objectives outlined as follows:

- Promote the use of sustainable transport methods, thus reducing congestion and pollution in the local area;
- Promote the development as an innovative and environmentally friendly development; and
- Provide an active environment by encouraging healthier travel options for residents, such as walking and cycling.

A comprehensive WTP/GTP is considered to be an important part of managing the transport demand generated by the development. These plans would provide relevant transport and access information, including:

- Local bus facilities and network maps;
- Local walking and cycling routes; and
- On-site bicycle/scooter parking details.

It is also noted that WTPs and GTPs are generally more effective for new developments, prior to the establishment of regular travel behaviours. Consequently, the travel targets in this case will be designed to encourage alternative modes of transport as facilities in the area improve for non-car modes.

### 10.6.2 Travel Demand Management

It is envisaged that the reductions in car-based travel modes to achieve any future nominated targets could be facilitated by a Transport Access Guide (TAG) which is considered to be a useful travel tool to encourage travel by alternative means other than private cars. This TAG would illustrate the public transport routes operating in the locality and is envisaged to be distributed to staff of the development.

## 10.7 SIDRA Modelling Requirements

Reference is made to the SEAR's Requirements within Item 8 which requires the following:

> *"the impact of trips generated by the development on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for, and details of, upgrades or road improvement works, if required (Traffic modelling is to be undertaken using SIDRA network modelling for current and future years) to the satisfaction of Transport for NSW and Transport for NSW (Roads and Maritime Services). Specifically, the following intersections are to be examined/modelled:*
>
> - *Joynton Avenue / Future Zetland Avenue*
> - *Portman Street / Future Zetland Avenue*

In reference to the above requirement, TRAFFIX requested the SIDRA models prepared by AECOM in their Green Square Town Centre assessment from the City of Sydney (intellectual property owner). The volume and turning distribution data from these models are intended to form the 'base case' data and the additional traffic volumes associated with the proposed development would be distributed onto each intersection to provide a 'base case plus development' scenario. The 2031 strategic modelling prepared by AECOM and others before is acknowledged to account for a level of development within the Green Square Town Centre, and as such the cumulative impacts of surrounding developments are captured within the 'base case' 2031 volumes.

SIDRA files received from AECOM contained several scenarios for the intersection of Joynton Avenue and Zetland Avenue, showing different volumes and variations in distributions within each scenario. Therefore, the worst-case scenario containing the largest volumes was used to form the 'base case' volumes of the SIDRA modelling for this assessment.

The approved TCS plan layouts were adopted for the SIDRA model layouts for the two critical intersections. It is expected that these critical intersections will be fully operational before school activities commence.

## 10.8 Traffic Distributions

The existing data relating student enrolments at neighbouring schools was used to determine that the future student population within the enrolment boundary would be evenly spread. This is reflected in the morning network peak trip distributions presented in **Figure 16**.

It is reiterated that the student pick-up period does not coincide with the network PM peak and therefore the evening community uses are taken into consideration when determining the traffic distribution of the

development. It is assumed that unlike the morning peak period, where all vehicles would access Zetland Avenue where the drop-off and pick-up area is located, vehicles would be distributed along all road frontages for parking and dropping off passengers. This is reflected in the traffic distribution diagram for the evening peak presented in **Figure 17**.

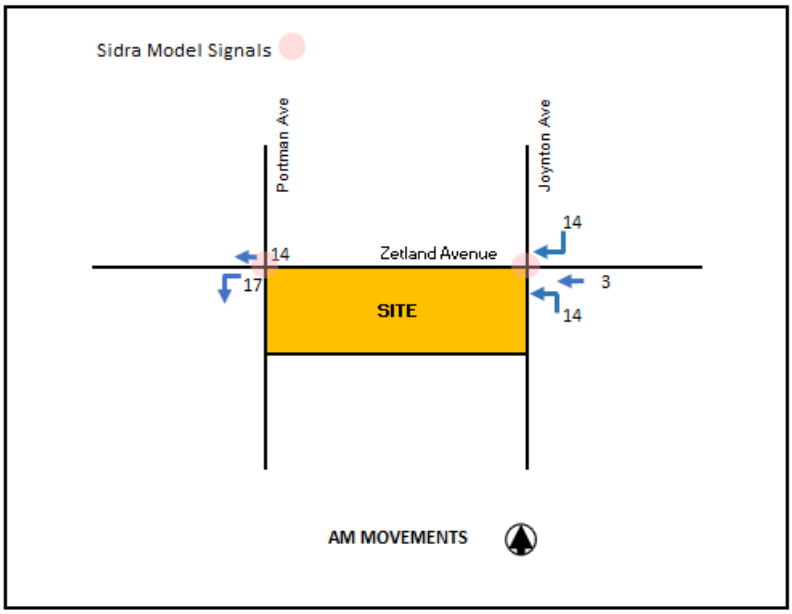



**Figure 16: AM Network Peak Traffic Distributions**

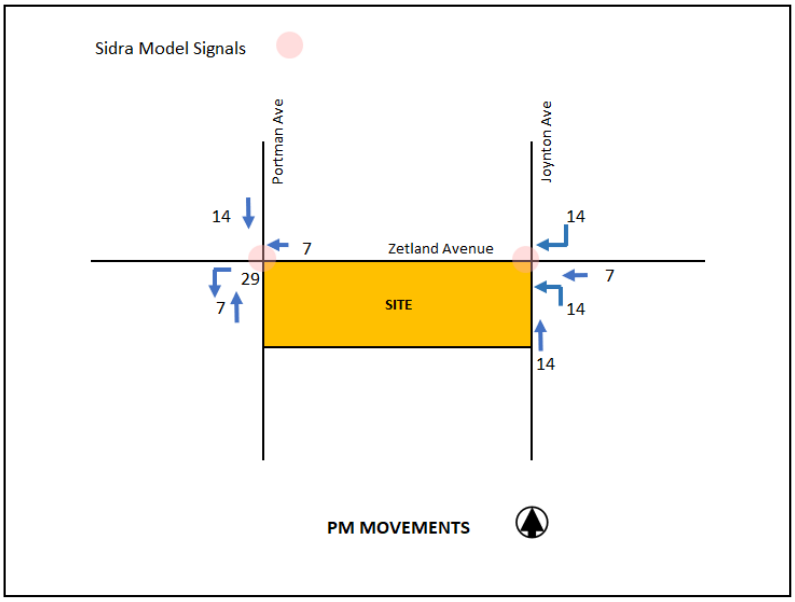



**Figure 17: PM Network Peak Traffic Distributions**

## 10.9 Peak Period Intersection Performance

As discussed in Section 10.7, the SIDRA files provided by AECOM were interrogated to gather the base traffic volumes for the two key intersections relevant to the proposed development.

This data forms the 'base case' volumes for software modelling undertaken to assess intersection performance characteristics. The SIDRA Intersection 9 model produces a range of outputs, the most useful of which are the Degree of Saturation (DoS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LoS) criteria. These performance measures can be interpreted using the following explanations:

**DoS** - the DoS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DoS approaches 1, it is usual to attempt to keep DoS to less than 0.9. When DoS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. In this regard, a practical limit at 1.1 can be assumed. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DoS of 0.8 or less.

**AVD** - the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).

**LoS** - this is a comparative measure which provides an indication of the operating performance of an intersection.

**Table 25: RMS Level of Service Criteria for Intersections**

| Level of Service | Average Delay per Vehicle (secs/veh) | Traffic Signals, Roundabout | Give Way and Stop Signs |
|---|---|---|---|
| A | <14 | 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 & accident study required |
| E | 57 to 70 | At capacity, at signals, incidents will cause excessive delays Roundabouts require other control mode | At capacity, requires other control mode |

A summary of the modelled results is provided below in **Table 26**. Reference should also be made to the SIDRA outputs provided in **Appendix F** which provide detailed results for individual lanes and approaches.

**Table 26: Base Case and Proposed Intersection Performance**

| Intersection | Control | Period | Scenario | Degree of Saturation (DoS) | Average Delay | Level of Service |
|---|---|---|---|---|---|---|
| Joynton Avenue and Future Zetland Avenue | Signal | AM | Base | 0.666 | 29.3 | C |
| | | | Base + Development | 0.807 | 29.7 | C |
| | | PM | Base | 0.592 | 26.4 | B |
| | | | Base + Development | 0.686 | 29.1 | C |
| Portman Street and Future Zetland Avenue | Signal | AM | Base | 0.419 | 28.8 | C |
| | | | Base + Development | 0.432 | 29.1 | C |
| | | PM | Base | 0.368 | 32.5 | C |
| | | | Base + Development | 0.512 | 34.3 | C |

It can be seen from Table 26 above that the intersection of Joynton Avenue and Future Zetland Avenue experiences minor increases in average delay in both the morning and evening peak periods, with the largest increase being 2.7 seconds in the evening peak period. This results in a change in the level of service from a 'B' to a 'C', however the change to the average delay is minor and the intersection will continue to operate with spare capacity. Similarly, the intersection of Portman Street and Future Zetland Avenue also experiences minor increases in average delay, the largest being an increase of 1.8 seconds in the evening peak period. There is no change in the level of service between scenarios and the intersection operates with spare capacity in the morning and evening network peak periods.

As seen from the above SIDRA modelling results, the traffic impact during the morning and evening network peaks are minor. Additionally, it is noted that the school is critical community infrastructure for the GSTC, and like any school within Sydney region, will have moderate impacts to the surrounding network for a short period of time associated with student drop-off/pick-up. Whilst the expected traffic impacts have been assessed as an increase over 'base-line' conditions, the school and community facilities will have significant benefits to the community in general and provides a significant and much needed community facility.

Noting the points discussed above, the proposed development is considered supportable from a traffic planning perspective, and no external road or intersection improvements are required to support scheme.

# 11. ACCESS AND INTERNAL DESIGN ASPECTS

## 11.1 Vehicular Access

### 11.1.1 Access

The development proposes a total of two (2) loading bays with access onto Portman Street, a local access road. It will therefore require a Category 1 driveway under AS 2890.1 (2004), being a combined entry and exit width of 3.0 to 5.5 metres. In response, the existing 6.0 metre wide driveway will be utilised for this parking area, and this is considered compliant with the minimum requirements of AS 2890.1 (2004).

A swept path analysis of all design vehicles entering and exiting the proposed development, including the service vehicle, has been included in **Appendix E**, demonstrating satisfactory operation of the proposed Portman Street access.

### 11.1.2 School Drop-Off/Pick-Up

Six (6) drop-off and pick-up spaces are proposed along the future Zetland Avenue frontage. These spaces are expected to be designed in accordance with AS 2890.5, noting that Council has stated that the spaces have been lengthened to provide easy ingress/egress by parents/guardians dropping-off or picking-up students.

## 11.2 Internal Design

The internal car park complies with the requirements of AS 2890.1 (2004), AS 2890.2 (2018) and AS 2890.6 (2009), and the following characteristics are noteworthy:

- All spaces located adjacent to obstructions of greater than 150mm in height are provided with an additional width of 300mm.
- A minimum clear head height of 2.2m is provided for all areas within the at-grade car park as required by AS 2890.1 (2004).
- The service bay has been designed in accordance with AS 2890.2 (2018) for the maximum length vehicle permissible on-site being an 8.8m long medium rigid vehicle.
- A minimum clear head height of 4.5 metres is to be provided above all loading areas in accordance with AS 2890.2 (2018).
- Bicycle parking spaces are to be designed in accordance with AS 2890.3 (2015).

## 11.3 Summary

In summary, the internal configuration of the car park has been designed in accordance with AS 2890.1 (2004), AS 2890.2 (2018) and AS 2890.6 (2009). It is however envisaged that a standard condition of consent would be imposed requiring compliance with these standards and as such any minor amendments considered necessary (if any) can be dealt with prior to the release of any Construction Certificate.

# 12. SUMMARY OF RECOMMENDED MITIGATION MEASURES

## 12.1 Infrastructure Upgrades

The recommended infrastructure upgrades for the Transport Working Group to consider have been detailed in Section 9.4. In summary, eight (8) infrastructure upgrades have been identified on key pedestrian/cycling routes to/from the site. The recommended infrastructure improvements range in scope and a summary is provided below:

| | |
|---|---|
| Epsom Road/Link Road | Missing pedestrian infrastructure |
| Epsom Road/Rosebery Avenue | Missing pedestrian infrastructure |
| Joynton Avenue/Gadigal Avenue | Sub-standard pedestrian infrastructure |
| Gadigal Avenue/Victoria Park Parade | Sub-standard pedestrian infrastructure |
| Lenthall Street Footpath | Sub-standard pedestrian infrastructure |
| Lenthall Road/Virginia Street | Missing pedestrian infrastructure |
| Lenthall Road/McDougall Street | Missing pedestrian infrastructure |
| Lenthall Street | Sub-standard pedestrian infrastructure |

## 12.2 Other Measures

As discussed in Section 9.1/9.3 and shown in Figure 15, there are seven (7) existing bus stops that do not have shelters. Whilst the stops will unlikely be utilised by students (most students live within walking/cycling distance), they may be utilised by staff and visitors to the community uses. Therefore, it is recommended that Council explores options to improve bus stop amenity at these locations, noting improvements may already be planned in Council's current capital works program/s.

As discussed in Section 9.2, a high percentage of students are expected to walk to/from the school. In addition to the infrastructure upgrades listed above, it is recommended that Council explore installing school wayfinding signage under the City's wayfinding strategy.

As discussed in Section 9.2.2, the school could explore the feasibility of adopting staggered start and finish times to distribute traffic over a longer period. Potential start/finish times include the following:

- Years Kindergarten - 2
  - Start time of 9:15am; and
  - Departure time of 3:15pm.
- Years 3 - 6
  - Start time of 8:45am; and
  - Departure time of 2:45pm.

# 13. CONSULTATION WITH GOVERNMENT BODIES

## 13.1 City of Sydney

A number of meetings have occurred with the City of Sydney in relation to on-site parking and servicing provisions. The following meetings have occurred with Council:

- 15/05/2020 Meeting to discuss site contamination.
- 18/06/2020 Meeting to discuss Early Works CTMP requirements
- 07/04/2021 Meeting to discuss the Southern Interface.
- 14/04/2021 Meeting to discuss the Operational Waste Management Plan.
- 13/05/2021 Meeting to discuss the Southern Interface.
- 16/06/2021 Pre-DA Meeting

## 13.2 SINSW

The following meetings have occurred with SINSW:

- 23/02/2021 Meeting to discuss the Draft Traffic Report.
- 10/03/2021 Meeting to discuss the status of the updated Traffic Report.
- 12/05/2021 Meeting to discuss the updated Traffic Report.

## 13.3 TfNSW

The following meetings have occurred with TfNSW:

- 30/04/2021 Meeting to discuss the SDIRA Modelling requirements.

# 14. DRAFT SCHOOL TRANSPORT PLAN

## 14.1 Aim

The aim of the Draft School Transport Plan is to increase sustainable transport uptake, decrease the mental and social impacts of commuting and encourage the uptake of healthier active transport options. The assessment process is guided by 8 principles:

1. Students achieve daily physical activity requirements through active travel to school;
2. Prioritise multi-modal transport planning and infrastructure provision to school;
3. Consult with transport stakeholders early and regularly;
4. Install supporting infrastructure to the school and on-site;
5. Minimise traffic disruption to the school and community during construction;
6. Implement and commit to a visible, funded, feasible Travel Plan;
7. Monitor and evaluate the School Transport Plan process to revise and improve the process to achieve outcomes; and
8. Increase consistency and quality of deliverables.

## 14.2 Vision and Objectives

The vision and objectives of the Draft School Transport Plan are as follows:

a. To proactively identify and meet school travel demand safely, efficiently and sustainably to deliver transport infrastructure to meet school travel demand.
b. To maximise the use of active and public transport modes to reduce car traffic before and after school day start and end times.
c. To decongest the road networks around schools.
d. To increase active travel to and from school in a safe transport environment.
e. To enhance connectedness to neighbourhood and community through safe travel to and from school.
f. To empower children and young people to be safe road users now and into the future.
g. To capitalise on the Covid-19 increase in walking to school by parents/carers who have gained time due to working from home (CWPS decrease from 70% drive to school to 50%).
h. To meet the DoE's duty of care of students which extends beyond the school boundary, if there's foreseeable risk of injury or harm to students as they travel to and from school https://education.nsw.gov.au/inside-the-department/legal-services/legal-topics/staff/duty-of-care-and-behaviour-management.

i. To "reduce the administrative burden" on a school principal (managing kiss-and-drop behaviour, parent and community complaints, calling bus companies etc) by reducing the time and effort for schools/principals coordinate and liaise with council, TfNSW to create a safe, connected transport environment around their school.

These objectives must be agreed with the school leadership through the Consultation Workstream 3. This is required to achieve "buy in" as these objectives will be communicated by the school leadership and must reflect plausible transport access and potential usage achievement.

## 14.3 Green Building Council Australia Requirements

Reference is made to the documentation requirements outline by the Green Building Council Australia in regard to credit 17 Sustainable Transport-Performance Pathway using the SINSW Schools Transport Assessment progress. The following documentation is required in the GBCA submission:

- A copy of the 'transport Assessment: Template' document.
- A summary of the project specific School Travel Plan.
- Evidence that the School Transport Plan framework has been completed as per the 'Transport Assessment: Template' including excerpts from the Plan documenting; transport goals, policies and procedures, information on the school transport operations, the communications plan, the collection of data and monitoring and adherence to the governance framework.
- Evidence documenting the consultation process i.e., excerpts from meeting minutes, actions and amendments to the transport assessment/school travel plan.
- Evidence that the School Transport Plan has been implemented and that the recommendations made in the Plan have/will be reflected in the design of the building's facilities, ongoing operational processes and communications.
- A verification from the Project Applicant/Transport Project Director that the transport assessment and plan has been conducted and delivered as per the EFSG and 'Transport Assessment: Template'.
- A copy of this response.

## 14.4 SEARs Requirement

Reference is also made to the SEAR's Requirements within Item 8 which requires the following:

> *"Details of travel demand management measures to minimise the impact on general traffic and bus operations, including details of a location-specific sustainable travel*

*plan (Green Travel Plan and specific Workplace travel plan) and the provision of facilities to increase the non-car mode share for travel to and from the site."*

It is noted that under the SINSW Transport Assessment Template, the School Transport Plan Section combines the requirements of the former Green Travel Plan (GTP) and Operation Traffic Management Plan (OTMP) conditions typically applied to school projects by DPIE, Councils and TfNSW. As such, reference should be made to the School Transport Plan in this regard.

## 14.5 Mode Share Targets

The mode share targets for the base case are discussed in Section 7.1. These targets are reproduced for both staff and students below for ease of reference.

**Table 27: Transport Scenarios – Staff**

| Travel Modes | Base Case – Ave. Data | | Moderate Case | |
|---|---|---|---|---|
| | No. Staff | Mode Share | No. Staff | Mode Share |
| By Car (as driver) – Parked nearby | 20 | 33% | 0 | 0% (-33) |
| By Car (as passenger – dropped off/picked up) | 5 | 8.5% | 3 | 5% (-3.5) |
| By Car (as passenger – carpool with other staff who park at/near school) | 0 | 0% | 0 | 0% |
| Public Transport - Bus | 0 | 0% | 0 | 0% |
| Public Transport - Train | 5 | 8.5% | 5 | 8.5% |
| Walk | 20 | 33% | 32 | 52.5% (+19.5) |
| Cycle | 10 | 17% | 20 | 34% (+17) |

As limited parking is provided on-site, it is anticipated that future travel modes for staff would involve increased uptake of active modes of transport and potentially public transport.

Staff are a minor portion of the target population in relation to the changes to travel mode behaviours and limited information is available with the location of future staff difficult to predict therefore no 'reach target' has been set in relation to staff travel modes.

Table 28: Transport Scenarios – Students

| Travel Modes | Base Case – PM Data | | Moderate | | Reach Target | |
|---|---|---|---|---|---|---|
| | No. Students | Mode Share | No. Students | Mode Share | No. Students | Mode Share |
| By Car (as a passenger – car driven by parent/guardian and parked nearby) | 187 | 31.1% | 65 | 10.8% | 0 | 0% |
| By Car (as a passenger – dropped off with driver not staying) | | | | | | |
| Motorcycle/Motor-scooter | - | - | - | - | - | - |
| Bus | - | - | - | - | - | - |
| Public Transport - Train | 5 | 0.8% | 0 | 0% | 0 | 0% |
| Walk | 323 | 53.8% | 375 | 62.6% | 388 | 64.6% |
| Cycle or other rideable | 86 | 14.3% | 160 | 26.6% | 212 | 35.4% |
| **TOTAL** | **600** | **100%** | **600** | **100** | **600** | **100%** |

*Student numbers have been normalised to the enrolment capacity of 600 students

It is expected that the uptake of active transport modes such as walking would increase from 53.8% to 62.6% for the moderate case and that cycling would increase from 14.3% to 26.9% in the moderate case. This is considered achievable through the implementation of the strategies discussed in Sections 9.5 and 14.

## 14.6 Policies and Procedures

The key school policies relating to sustainable transport could include:

- To increase active and public transport use to/from the school by staff and students;
- To promote healthier lifestyle choices for staff and students;
- To promote internal and external active travel programs, such as 'ride to work day';
- To promote road safety education;
- To meet the 5-star Green Star Requirements; and
- To manage risks.

## 14.7 School Transport Operation Plan

### 14.7.1 Day-to-Day School Operations

*Off-Street Parking*

No formal off-street parking spaces are provided within the school grounds. It is noted that the school will provide two (2) loading bays, and these will be managed by the school as required. No on-site parking is proposed for parents or caregivers.

*On-Street Parking*

A total of six (6) on-street pick-up and drop-off spaces are proposed within an indented bay on Zetland Avenue along the northern frontage of the school. Of these six (6) pick-up and drop-off spaces, two (2) are proposed to be accessible parking spaces. However, during the pick-up and drop-off times, all six (6) spaces will be available for use.

*Staggered Start and End Times - Pick-Up and Drop Off*

The school is to allow for staggered start and end times to allow for a greater spread of peak traffic generation. The details of the staggered start times are presented below for each relevant group.

- Years Kindergarten - 2
  - Start time of 9:15am; and
  - Departure time of 3:15pm.
- Years 3 - 6
  - Start time of 8:45am; and
  - Departure time of 2:45pm.

*Operational Management Arrangements*

In order to increase the efficiency of the pick-up and drop-off area, the following operational management arrangements are proposed:

- Deployment of supervisors to monitor arrivals of parents, based on the schools capacity to provide adequate resources;
- The school actively promotes road safety to parents, carers and visitors of the school through the newsletter and other forms of media.

All parents are to adhere to the following procedures:

- All parents picking up children via car are to enter the pick-up and drop-off spaces located along the northern boundary of the site on Zetland Road from Joynton Avenue. If there is insufficient space to enter the pick-up and drop-off bay, parents are to continue to circulate in an anticlockwise direction onto Portman Street then left onto Hansard Street and left onto Joynton Avenue to arrive back at the pick-up and drop-off bays. This will prevent any queuing of cars past these dedicated bays near the signalised intersection.
- Parents are to follow all directions of staff on-site in order to maintain safe and efficient traffic flow. This may include being asked to move on if their vehicle is resulting in queuing.

The above procedure is illustrated in **Figure 18** below.


**Figure 18: Drop-off/Pick-up Traffic Procedure**

*Bicycle Facilities*

A total of 180 bicycle parking spaces are proposed within the school grounds.

*Emergency Vehicles*

Emergency Vehicles are exempt from parking restrictions and therefore would be permitted to park along any of the school frontages.

*Servicing and Waste Collection*

All waste collection and servicing activities associated with deliveries will be carried out within the service bays along the southern boundary of the site. It is noted that waste collection and servicing activities would generally occur outside of school hours and arrivals will be scheduled to ensure that servicing or loading does not occur on-street. The service bays accessed via Portman Street can accommodate up to an 8.8m long Medium Rigid Vehicle. Access to the service will be controlled via an intercom and removable bollards. Vehicle utilising this space will include a private waste contractor vehicle and general servicing vehicles.

It is proposed that waste collection would occur outside of school hours. However, servicing for the school including food deliveries for the canteen may occur during school hours.

Reference is made to the Operational Waste Management Plan prepared by Elephants Foot which is assumes that all bins are collected three times weekly with no more than three days between collections.

All waste will be stores within a bin room located close to the servicing bay, the building manager will grant the private waste contractor access to this room and bins will be wheeled to the service bay to be emptied.

### 14.7.2 Community Operations

*On-Street Parking*

A total of six (6) on-street drop-off and pick-up spaces area proposed along the northern boundary of the school on the future Zetland Avenue. It is noted that outside of school drop-off and pick-up periods, these six spaces are comprised of four (4) standard spaces and two (2) accessible parking spaces. These spaces will be available to all road users, however, are expected to be mainly utilised by members of the community attending the development.

*Operational Management Arrangements*

Generally, community uses are expected to generate lower traffic volumes and random arrivals therefore no management procedure is proposed for community uses. In the event that any significant traffic issues are encountered once operational, this may be reviewed, and additional management measures proposed for community uses.

*Bicycle Facilities*

A total of 180 bicycle parking spaces are proposed within the school grounds.

*Emergency Vehicles*

Emergency Vehicles are exempt from parking restrictions and therefore would be permitted to park along any of the school frontages.

*Servicing and Waste Collection*

Waste from the community centre would be combined with school waste and stored in a bin room along the southern boundary of the site. Therefore, waste collection arrangements are as outlined in the day-to-day school operations.

## 14.8 Transport Encouragement Programs

### 14.8.1 SSTS "Tap on"

Transport for NSW run a campaign to educate students about the conditions of the School Pass Terms and the Student Codes of Conduct which require students to be in possession of their School Opal card when travelling and being required to tap on and off every time they use public transport.

### 14.8.2 New starter kit

A new starter kit may be implemented by the school which details transport policies and transport access options for student induction. This starter kit may include the provision of a TAG to better inform students of their transport options.

#### 14.8.3 Independent Travel Training

The school may implement a program to allow primary school aged students to learn how to walk or ride to and from school through the use of a buddy system (after year 4).

#### 14.8.4 Walking/Riding to School Programs

Special events may be run by the school to encourage awareness and promote active modes of transport such as walk to school day, ride to school day and a "walk part way to school" program. A 'walking bus' program could be implemented where a group of students would walk to and from school with one or more adults. This program would assist in changing the mind-set of students and parents, as well as encourage active travel habits outside school.

#### 14.8.5 Ride2School Day

A national date to encourage students to ride, walk skate, or scoot to school. The school can implement additional on-site activities such as obstacle courses, host a healthy breakfast, bike education, fundraise and many other activities to inspire students to embrace a heathier lifestyle and try walking/riding to school themselves.

#### 14.8.6 Ride Score

The RideScore Program encourages children to become more active by riding or scooting to school, assisting with reducing traffic congestion around schools. Children earn scoot and pedal points along the way and the digital notifications received by parents or carers, provide peace of mind.

## 14.9 Communication Plan

#### 14.9.1 Channels

Communications with parents will be maintained through the school website and newsletter informing parents about the management measure that are to be put in place for drop-off and pick-up and promoting active modes of travel for students.

Information may also be updated within a new student/parent and staff starter kit, the skoolbag app, any official school Facebook groups and during P&F or P&C meetings.

### 14.9.2 Messages

Generally, the information provided on these channels should include but is not limited to the following:

- School Hours.
- OOSH Hours.
- Transport Goals and Expectations.
- Information regarding any programs that promote active travel or road safety for students.
- On-site transport access.
- Contact information for governance committee.

### 14.9.3 Travel Access Guide

To assist in promoting the use of alternative travel modes, a Transport Access Guide (TAG) has been prepared for the development, which includes details of public transport services within the vicinity of the site. Accordingly, the TAG is provided in **Appendix G** for information purposes only, noting that the TAG would be required to be updated once additional public transport services, school buses and walking/cycling routes are completed and confirmed in the surrounding area.

The provision of this information would therefore assist staff, students and visitors of Green Square Public School to make informed decisions about travelling to and from the site based on the available services connecting the school to their place of residence.

## 14.10 Data Collection and Monitoring

### 14.10.1 Data Collection

An annual school travel mode questionnaire is to be completed to allow for data to be collected and the program to be evaluated. The allocated Travel Coordinator for the school will then utilise this data to assess the progress on mode share targets and help evolve the plan as appropriate.

This student data is to be depersonalised to ensure privacy and can then be used to create GIS maps showing information regarding student travel modes with respect to approximate location.

### 14.10.2 Program Evaluation

The gathered mode share data will be compared to the assumptions made in the Traffic Assessment and the targeted mode shares.

In summary the data will be used to gauge the following:

- Usage of the Travel Access Guide
- Engagement with school transport articles and links
- The progress of mode share targets
- Car park occupancy and on-street parking
- Public bus network and operations

### 14.10.3 Report Findings

The yearly collection of travel mode data will be documented in an annual travel mode review report which would then be used by the Travel Coordinator to review the effectiveness of the proposed measures and review their effectiveness. The data would also be provided to SINSW, Council and TfNSW to demonstrate the effectiveness of this approach or issues that may be encountered. Actions from this report may include the following:

- Adopt or revise programs to increase sustainable transport use.
- Install additional infrastructure to accommodate sustainable transport demand.
- Web tools or apps for the school community to report transport issues/missing links.

## 14.11 Governance Framework

### 14.11.1 Travel Coordinator

A travel coordinator will be allocated by the Department during the construction and fist-year of occupancy of the school. This role is initially funded by the project, one year after occupation subsequent arrangements will be made between SINSW, DET and TfNSW.

### 14.11.2 Roles and Responsibilities

The travel coordinator is responsible for liaising between the school to whom parents may report any issues to and the external stakeholders including Council and TfNSW.

The responsibilities of this role include:

- Communicating transport options to staff and assisting with educating the wider community.
- Collaborating with internal and external stakeholders and monitoring.
- Evaluating the progress of the targeted and actual mode shares.

### 14.11.3 Internal School Working Group

The internal school working group is formed within the school community prior to the school opening and will act as a sounding board for the Travel Coordinator and school leadership. This group will consist of the Road Safety Education Officer, AMU and WHS.

### 14.11.4 External Transport Working Group

The external stakeholder group will govern transport issues and opportunities during the implementation of the Travel Plan. The School Travel Coordinator will liaise with the external transport working groups if any issues arise in relation to student transport. The external transport group may implement additional public transport services or infrastructure improvements or commission a road safety audit to respond to various issues. This group would be required to meet quarterly to discuss any issues.

Data collected through an annual travel mode survey and feedback from the school community would be used to confirm changes to annual transport demands and report transport usage. The group would be required to inform any updates to the School Travel Plan, seek funding for any missing links or operational issues and collaborate to respond to any key issues that arise.

# 15. CONCLUSIONS

The following is noteworthy:

- The State Significant Development Application seeks approval to construct an integrated community facility and school development at 3 Joynton Avenue, Zetland. The proposal will accommodate education facilities for up to 600 kindergarten to year 6 students and will provide shared multi-function spaces within the development for community and school uses.
- This Transport and Accessibility Impact Assessment has been prepared in accordance with the SINSW 'Transport Assessment Template'. The report demonstrates that the project meets Environmentally Sustainable Design (ESD) and Green Star requirements for transport planning and responds to the SEARS provided by the Department of Planning, Industry and Environment. The report also presents a Draft School Transport Plan which includes the former GTP and OTMP components.
- The subject site is well connected to the active transport network with established pedestrian infrastructure and a number of separated cycleways constructed or to be constructed in the vicinity of the school. This is anticipated to be the primary mode of transport for a majority of students due to the small enrolment boundary and the planned development for Green Square Town Centre. Additionally, the site is also located within walking distance of bus and rail services which offers convenient access to public transport, in particular for staff and community users.
- The NSW Department of Education provided three (3) potential enrolment boundaries, of which the outermost extent of all three (3) boundaries was used to create an 'overlaid' boundary extent. The existing infrastructure systems present within this boundary was examined including public transport, speed zonings, cycling infrastructure and a gap analysis of pedestrian infrastructure.
- Student and staff travel mode surveys were conducted of a similar inner city primary school development, Bourke Street Public School. The travel mode surveys concluded that approximately 33% travel to school by car with the remainder using active travel or public transport. The survey also found that approximately 53% of students walk to and from school, approximately 14% of student cycle to and from school and approximately 26%-29% of students travel to school by car. The results of the staff and student travel mode surveys were used to aid the analysis of parking, drop-off and pick-up, anticipated traffic generation and the draft transport plan for the school.
- The proposed development provides no formal off-street staff parking spaces, in compliance with the SSLEP. This provision reflects state and local government policies/objectives to reduce reliance on private vehicles. It is expected that students/staff and general visitors will make use of the excellent public transport and active travel infrastructure that will be constructed in the Green Square Town Centre, notably a number of separated cycleways and signalised pedestrian crossings are proposed

to be constructed or have been recently constructed in the vicinity of the site. An additional high capacity on-street drop-off/pick-up area is also provided along the future Zetland Avenue.

- The development also provides two (2) loading/service bays at the southern boundary of the site accessed via Portman Street. Waste collection for the site will be conducted using Council's Waste Collection vehicle (contractor). The service bay will also be utilised by private servicing vehicles up to an 8.8m Medium Rigid Vehicle.
- The traffic generation arising from the development has been assessed as a net change over modelled conditions and factored to account for the unique characteristics of the site, equating to an additional 14 vehicle trips in the AM peak period and an additional 61 vehicle trips in the PM peak period. It is noted that the proposed school development is critical community infrastructure and as with any school within the Sydney region, will have moderate impacts to the surrounding road network for short periods of time during drop-off and pick-up. Of the percentage of students arriving by private vehicle, a number are expected to be 'linked trips' whereby a driver is already accounted for in the network. Generally, private vehicle trips are expected to decrease as key infrastructure is constructed within the Green Square Town Centre.
- AECOM previously prepared a report for the City of Sydney assessing the impact of planned urban renewal development within the Green Square Town Centre. The strategic modelling conducted within this report is critical to the planned infrastructure upgrades to the area and the traffic impacts of the proposed school development have been assessed with consideration of the previous assumptions that were made to conduct traffic modelling within the precinct.
- The AECOM traffic models are critical to the traffic impact assessment of the subject intersections as they are an amalgamation of numerous assumption strategic studies and input from transport consultants over 5+ years. The intersections are currently under construction and therefore no survey data can be gathered as per the usual methodology to assess intersections in SIDRA. As such, SIDRA Intersection models have been prepared by adopting the approved TCS layouts and 'worse case' volumes assessed by AECOM. The SIDRA modelling demonstrated that the key intersections will experience minor increases in average delay (under 3 seconds) during the AM and PM network peaks and that both intersections will continue to operate at a LoS 'B' or 'C' with spare capacity. No external infrastructure/intersection upgrades are required to accommodate the proposed development.
- The access arrangements, parking spaces and service bay have been assessed to comply with AS 2890, thereby ensuring safe and efficient operation.
- A Draft School Transport Plan is provided in Section 14 and provides mode share targets for the proposed school and discusses transport encouragement programs, policies and procedure to reach the targeted mode shares. Policies and procedures for the proposed 'day-to-day 'operations and

community operations are presented. The plan also discusses the communication channels that are expected to be used to communicate these goals and strategies and the method by which data collection and monitoring would occur. This section also outlines the roles of each relevant stakeholder for implementation of this plan.

This traffic impact assessment therefore demonstrates that the proposed school development is considered supportable from a traffic planning perspective and will provide the GSTC with a crucial community service. TRAFFIX anticipates an ongoing involvement during the development approval process.

# APPENDIX A

Photographic Records

View looking west from Joynton Avenue towards subject site

View looking west from Joynton Avenue towards future Zetland Avenue Alignment

View looking east at subject site from Portman Street

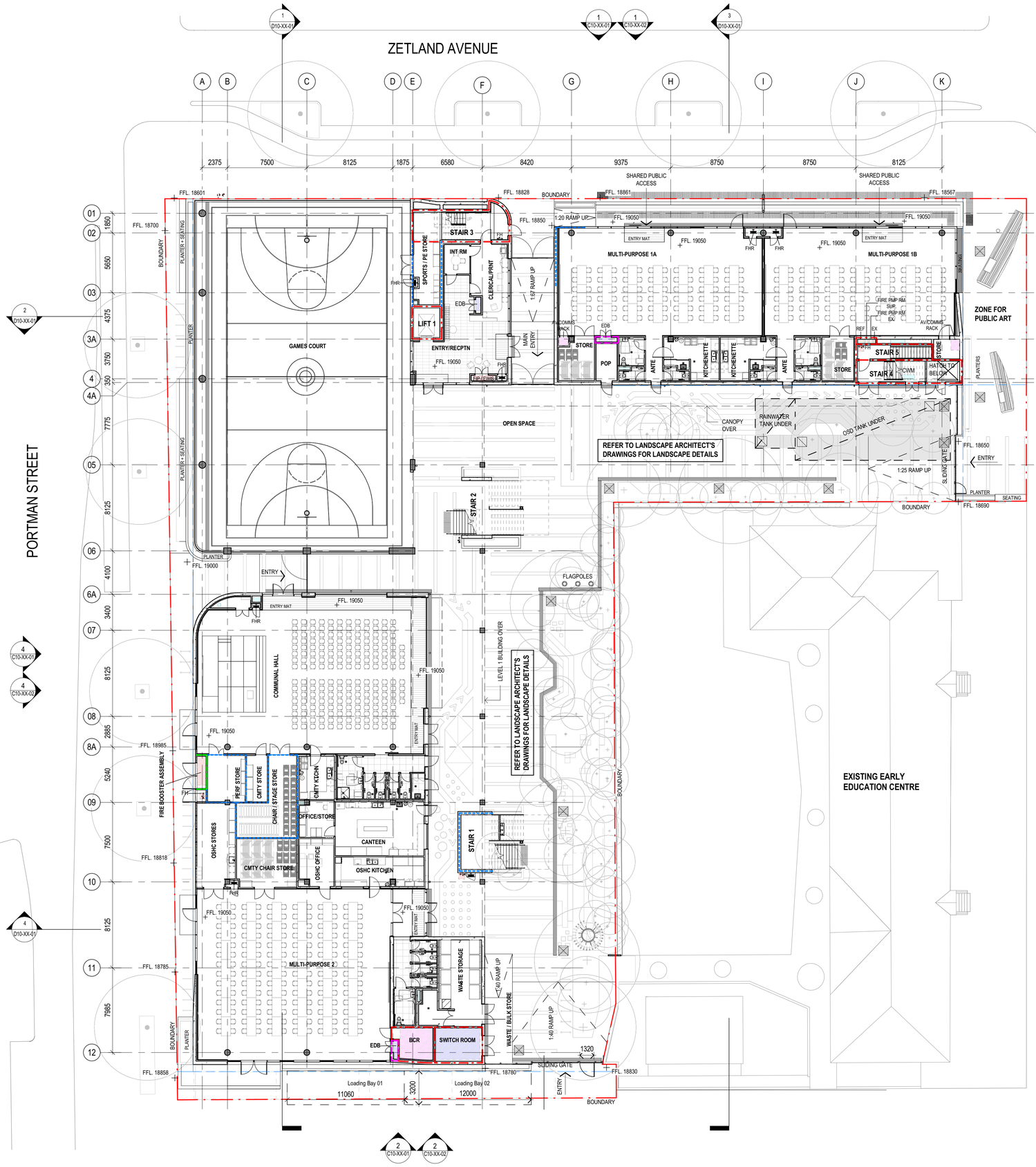
View looking east at subject site from Portman Street

View looking west at intersection of Geddes Avenue and Portman Street

View looking east at Shared Access from Portman Street

# APPENDIX B

Reduced Plans




**FIRE RATED WALLS**

- 1 HOUR
- 1.5 HOUR
- 2 HOUR
- 1 HOUR & SMOKE SEALED

**FIRE SERVICES ABBREVIATIONS**

| | |
|---|---|
| **FHR** | FIRE HOSE REEL |
| **FH** | FIRE HYDRANT |

**SERVICES DISCIPLINES**

- MECHANICAL SERVICES
- FIRE SERVICES
- ELECTRICAL SERVICES
- COMMS SERVICES
- HYDRAULIC SERVICES

**SERVICES ABBREVIATIONS**

| | |
|---|---|
| **BCR** | BUILDING COMMS ROOM |
| **EDB** | ELECTRICAL DISTRIBUTION BOARD |
| **EX** | EXHAUST |
| **GE** | GARBAGE ROOM EXHAUST |
| **KE** | KITCHEN EXHAUST |
| **MCR** | MAIN COMMS ROOM |
| **REF** | REFRIGERANT PIPEWORK |
| **TE** | TOILET EXHAUST |


BVN

NSW ARCHITECTS REGISTRATION BOARD / NOMINATED ARCHITECTS
9356 NINOTSCHKA TITCHKOSKY
7115 JULIAN ASHTON
7053 MATHEW BLAIR
7151 PHILLIP ROSSINGTON
4937 JAMES GROSE

Telephone +61 2 8297 7200
Facsimile +61 2 8297 7299
www.bvn.com.au




NOTE

CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO COMMENCEMENT OF WORK OR PREPARATION OF SHOP DRAWINGS. DO NOT SCALE THIS DRAWING

| ISSUE | DATE | FOR |
|---|---|---|
| 1 | 12/03/21 | FOR INFORMATION |
| 2 | 19/03/21 | 50% DESIGN DEVELOPMENT |
| 3 | 14/04/21 | FOR INFORMATION |
| 4 | 21/04/21 | 75% DESIGN DEVELOPMENT |
| 5 | 20/05/21 | 75% DD REV A |

STRUCTURAL AND CIVIL ENGINEER
MEINHARDT BONACCI
+61 2 8247 8400

BUILDING SERVICES
STANTEC
+61 2 9493 9700

ESD & GREEN STAR
NDY
+61 2 9928 6800

LANDSCAPE ARCHITECT
TURF DESIGN
+61 2 8394 9990

BCA AND DDA
PHILLIP CHUN
+61 2 9412 23202

PROJECT MANAGER
COLLIERS INTERNATIONAL
+61 2 9257 0222

END USER
CITY OF SYDNEY
+61 2 9265 9333

END USER
NSW DEPARTMENT OF EDUCATION
1300 679 332

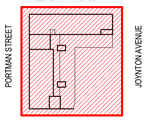
CLIENT

SCHOOL INFRASTRUCTURE NSW
PROJECT

GREEN SQUARE INTEGRATED COMMUNITY FACILITY AND SCHOOL
ZETLAND AVENUE, GREEN SQUARE 2017

BVN PROJECT NUMBER
1908014.000

DRAWING KEY




TRUE NORTH PROJECT NORTH

GRAPHIC SCALE
0 4000 10000

SCALE
1 : 200@A1

STATUS
DESIGN DEVELOPMENT

DRAWING
GA PLAN - GROUND LEVEL

AR-B10-00-00 | ISSUE 5

C:\REVIT_LOCAL2020\AR_1908014_ICFS_BUILDING FILE_2020_john_walsh.rvt 20/05/2021 5:55:55 PM

# APPENDIX C

AECOM Traffic Report

City of Sydney Council
07-Nov-2014

# Green Square Town Centre - Essential Infrastructure and Public Domain

## 2031 Traffic Modelling Synopsis

# Green Square Town Centre - Essential Infrastructure and Public Domain

2031 Traffic Modelling Synopsis

Client: City of Sydney Council

ABN: 22 636 550 790

Prepared by

**AECOM Australia Pty Ltd**
Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

07-Nov-2014

Job No.: 60300384

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

# Quality Information

Document Green Square Town Centre - Essential Infrastructure and Public Domain

Ref 60300384

Date 07-Nov-2014

Prepared by Seamus Christley

Reviewed by Andy Yung

Revision History

| Revision | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| A | 7-July-2014 | Incorporating City Projects Comments | Rob Mason Principal Engineer | |
| B | 16-Jul-2014 | Incorporating City Projects Comments | Rob Mason Principal Engineer | |
| C | 18-Jul-2014 | Incorporating City Projects Comments | Rob Mason Principal Engineer | |
| D | 07-Nov-2014 | Incorporating RMS Comments | Rob Mason Principal Engineer | |

# Table of Contents

# 1.0 Introduction

## 1.1 Background

AECOM have been commissioned by the City of Sydney to progress the approved Essential Infrastructure DA through approval and construction.

As part of Phase 1 (site wide design development) works, the operational performance of intersections across the Green Square Town Centre (GSTC) precinct and surrounding road network are required to be assessed. This need emanates from Roads and Maritime Services (Roads and Maritime) DA (D/2012/1175) response, dated 21st February 2013.

Roads and Maritime Services stated in their correspondence that the modelling horizon must capture 2031 network demands and provide intersection performance statistics for the following intersections:

- Bourke Street / Portman Street;
- Zetland Avenue / Joynton Avenue;
- Zetland Avenue / Paul Street;
- Botany Road / Geddes Avenue;
- Botany Road / Bourke Street / O'Riordan Street / Wyndham Street; and
- Botany Road / East-West Boulevard (Civic Plaza).

Since Roads and Maritime issued their initial comments the proposed operation of the precinct no longer supports a signalised intersection at Botany Road / East-West Boulevard (Civic Plaza). All other intersections are still proposed to be signalised with the exception of Bourke Street / Portman Street which has been signalised and is currently in operation.

## 1.2 Study Context

The Green Square development area is the largest urban renewal development in Australia. It has been the focus of planning and development for many decades and is now approaching a start date with regards to construction. City of Sydney Council is committed to building world class community facilities and infrastructure for the precinct.

A key component of that infrastructure includes provision of a safe and efficient transportation network in which the needs of the residents, retail and commercial users of the precinct can be satisfied. This includes road, bus users, cyclists and pedestrians with future plans including the incorporation of light rail into the precinct. Ensuring that the future road network caters effectively for all the aforementioned road users is the focal point of this assessment.

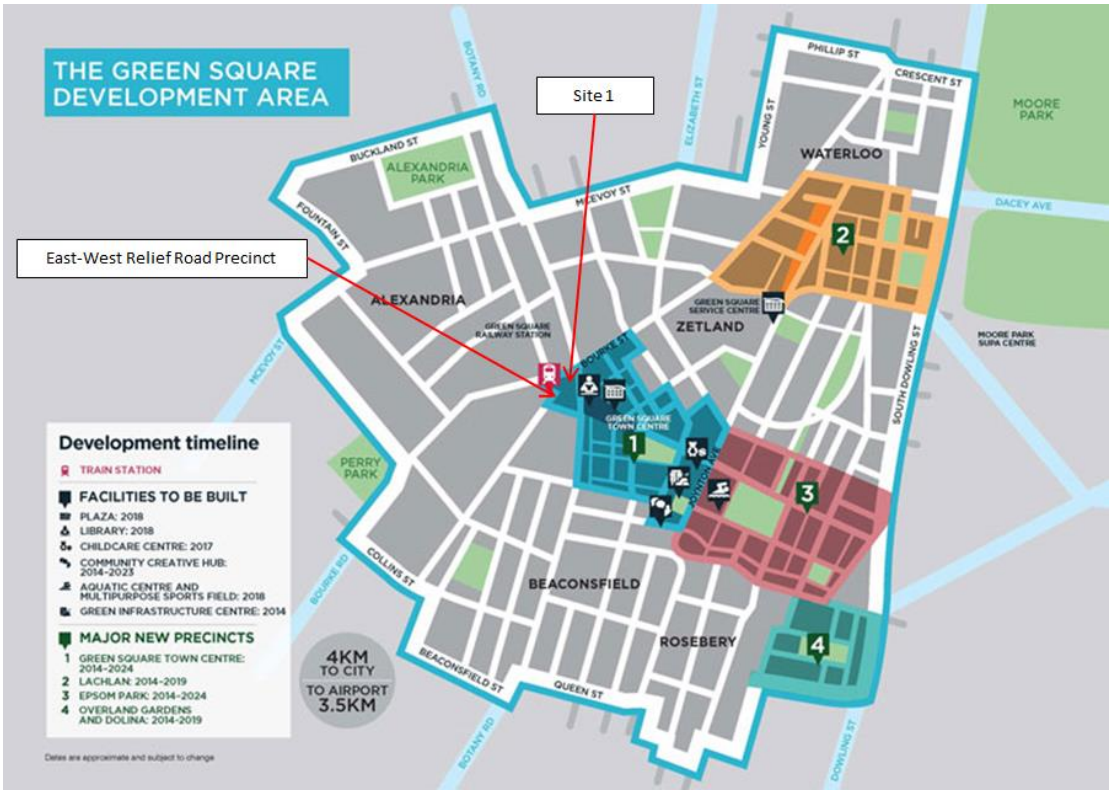
To cater for all of the abovementioned road users there are several key stakeholders involved in the project. **Table 1.1** provides a summary of these organisations and their role within the project.

**Table 1.1 Stakeholder Summary**

| Stakeholder | Role |
|---|---|
| City of Sydney Council | Project sponsor and client responsible for the overall delivery and outcomes of the GSTC |
| Roads and Maritime Services | Approval authority for signalised intersections and speed zones within and surrounding the GSTC (See **Section 6**) |
| Transport for NSW | State authority with respect to delivery of public transportation services which will service the GSTC (See **Section 6.2**). |
| UrbanGrowth NSW | State development authority charged with the redevelopment of Site 1. Primarily concerned with the concept design of the H-Intersection which does not form part of the scope of this study (See **Section 4.1.4**). |

The Green Square development area, discussed above, is highlighted in **Figure 1.1** which indicates the location of the GSTC, Site 1, East-West Relief Road (EWRR) Precinct and Epsom Precinct. **Section 4** discusses these developments in greater detail.

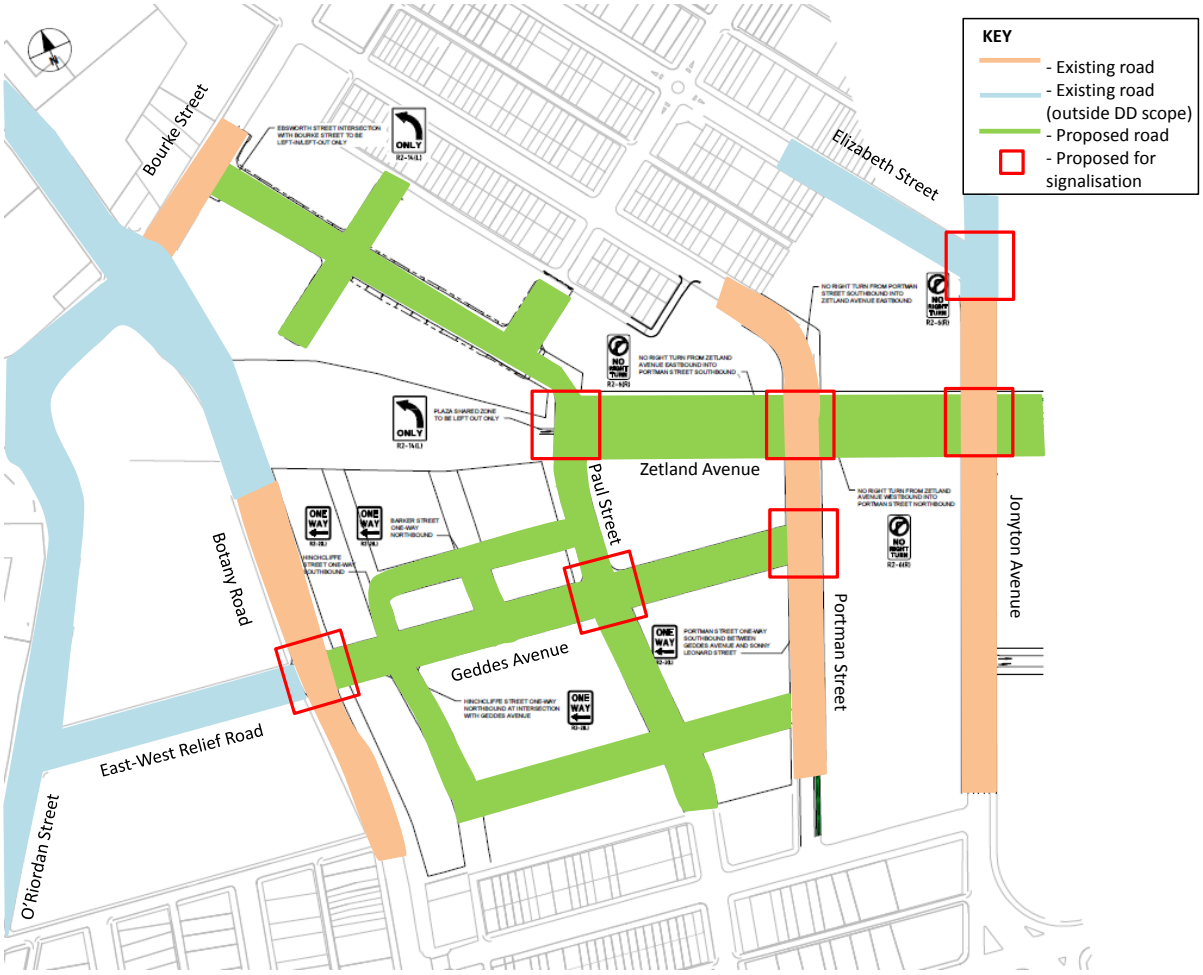
**Figure 1.1 Green Square Development Area**




Source: City of Sydney; 2014, modified by AECOM; 2014

At the writing of this document, AECOM's scope with respect to the Green Square development area centres on progressing the approved Essential Infrastructure DA through approval and construction for the GSTC only. There is an interface with the AECOM project team undertaking the H-Intersection concept design to ensure consistency across both projects however any project work, implications or outcomes that relate to the H-Intersection are not considered within the scope of the GSTC project. The scope of the project is limited to that highlighted in **Figure 1.2** which references the existing street network, proposed street network and recommended intersections for signalisation within the relevant project area. This includes the modelling component of the EWRR which connects Bourke Road, O'Riordan Street and Botany Road.

**Figure 1.2 Proposed Street Network and Signalised Intersection – Project Scope**




Source: AECOM; 2014

## 1.3 Objectives

This report seeks to achieve the following objectives:

- Provide an overview of future public and active transport infrastructure within the GSTC;
- Demonstrate the underlying assumptions behind the completed microsimulation (Paramics) modelling;
- Detail the proposed intersection layouts, phasing, turn restrictions and speed controls that are proposed for the GSTC; and
- Provide a clear indication of the operational performance of the key internal and surrounding external intersections from the perspective of average delay and level of service.

## 1.4 Report Structure

The report is structured as follows:

- Section 1, as outlined above, provides an introduction to the background, purpose and context of the study;
- Section 2 underlines the timeline and process associated with the development of the future year models to date;
- Section 3 details the existing network performance characteristics;
- Section 4 outlines the network impacts of the development scenarios and proposed modifications;
- Section 5 describes the methodology and assumptions used to develop the future models;
- Section 6 discusses the proposed road and active based transport for the GSTC precinct as well as detailing proposed speed restrictions, intersection layouts and proposed phasing at signalised intersections;
- Section 7 summarises the future operational performance of the road network; and
- Section 8 provides a summary and outlines the project next steps.

# 2.0 Project Development Timeline

## 2.1 Key Milestones

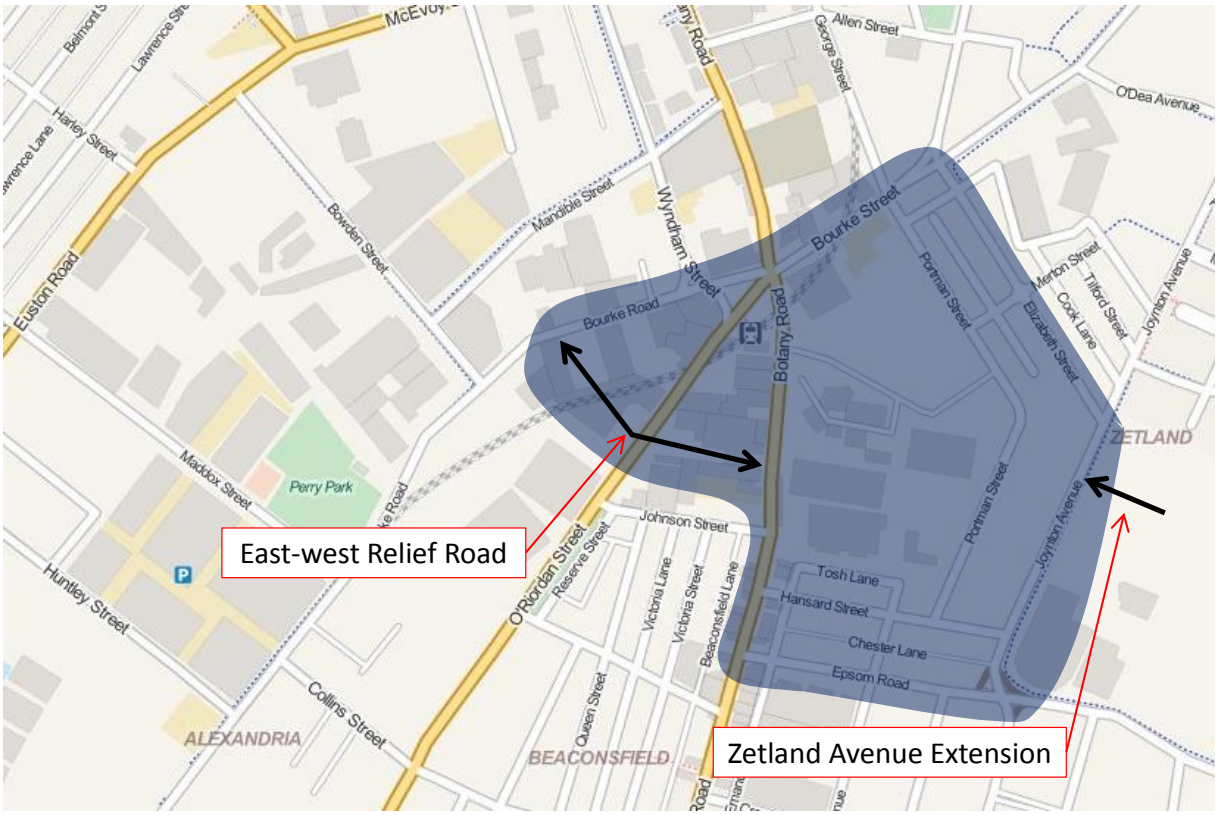
### 2.1.1 9th September 2013

On 9th September 2013 the Green Square Town Centre Traffic Control Group (TCG) comprising of City of Sydney Council, Roads and Maritime Services, Transport for NSW and AECOM met at Council's offices to discuss various issues relating to the progression of the approved Green Square Town Centre Essential Infrastructure DA through construction certificate (CC) approval and construction. From the perspective of traffic and transport these issues related to Roads and Maritime's previous comments with respect to the development which were tabled in a letter dated 21st February 2013.

It was agreed that the Paramics modelling for the Green Square Town Centre project would consider a horizon of 2031. Due to the large scale of development and existing capacity constraints of the surrounding road network it was subsequently agreed that, where intersection performance on the surrounding network was a constraint, background growth would be applied to the affected extent only in the event that the proposed development traffic did not result in the model reaching capacity.

The model extent that was agreed for the assessment of the precinct is presented in **Figure 2.1**.

**Figure 2.1 Agreed Paramics Model Extent**




Source: Openstreetmap; 2013, modified by AECOM; 2014

Paramics was supported as the proposed modelling tool as it enables the impacts of signal interaction, and resultant queuing implications on a highly congested network, to be accurately represented when compared against static intersection modelling packages such as SIDRA and LinSig. It was decided that when undertaking the modelling SIDRA and LinSig would be used to guide the determination of appropriate phase times and offsets for intersections within Paramics. In addition a previously undertaken base and future model of the GSTC, developed by Bitzios Consulting as part of a 2013 study entitled 'Green Square Parking and Traffic Study' would be used as the starting point from which to develop the 2031 model.

### 2.1.2 28th October 2013

On 28th October 2013 a meeting was undertaken between Roads and Maritime, UrbanGrowth NSW, City of Sydney Council and AECOM at Roads and Maritime's offices in Parramatta. The aim of the meeting was to assess the progress of the required network modelling and confirm the models underlying assumptions. Key points of this meeting were:

- The intersection of Joynton Avenue / Zetland Avenue recorded an operational performance of level of service F. This result was also based on the removal of a pedestrian crossing on the northern arm.
- Roads and Maritime felt that the six second pedestrian delay applied to the H-intersection (Botany Road / Bourke Street / Bourke Road and O'Riordan Street / Wyndham Street / Bourke Road) was too low to justify the probable pedestrian demand.
- Intergreen lengths should be updated to reflect three seconds red and three seconds amber for the intergreen period.
- Discussion on the need to provide right turn bays on Botany Road (northern and southern approaches) at the intersection of Botany Road / Geddes Avenue as detailed in the Roads and Maritime DA response.

As a result of the discussions AECOM updated the intergreens to reflect Roads and Maritime comments and increased the pedestrian delay at the intersection of Botany Road / Bourke Road / Bourke Street to 10 seconds for all approaches.

### 2.1.3 4th March 2014

On 14th March 2014 a meeting at City of Sydney Council's offices was undertaken between Roads and Maritime, UrbanGrowth NSW, City of Sydney Council and AECOM to assess the progress of the required network modelling. Transport for NSW provided their apologies as they were unable to attend. Key points of this meeting were:

- An investigation was undertaken into trip generation rates to investigate the likelihood and impacts of lowering the 0.25 trips per dwelling rate that had been applied. This was due to the poor level of service figures of E and F that were noted across the precinct and pedestrian crossing facilities not being achieved at all signalised intersections. The investigation centred on a discussion around using either the trip rates identified in the Roads and Maritime Guide to Traffic Generating Developments Updated Traffic Surveys Technical Direction (August 2013) or rates identified from subsequent surveys of developments located with the City of Sydney Council Local Government Area. Following the meeting the survey results tabled by City of Sydney Council were not accepted by Roads and Maritime and it was resolved to use the Roads and Maritime Guide to Traffic Generating Developments Updated Traffic Surveys Technical Direction (August 2013) to establish future trip generation for the precinct.
- Roads and Maritime do not support a signalised crossing on Botany Road due to safety and spacing issues due to the proximity to the H-intersection.
- It was noted that in the event that the future bus route was aligned to Geddes Avenue and not the Plaza then there is scope for extension along the East-West relief road.

### 2.1.4 22nd May 2014

The final scoping meeting with all key stakeholders was undertaken at City of Sydney Council's offices on the 22nd May 2014 in which all intersections were evaluated with the following key outcomes noted:

- A dual right turn out of the Epsom Precinct at the intersection of Joynton Avenue / Zetland Avenue is not likely to be achievable. Upon further investigation this intersection layout was not pursued.
- A signalised intersection is proposed at the intersection of Geddes Avenue / Portman Street to cater for pedestrian / cycle / vehicular conflicts and address safety issues associated with sight distance and conflicting road user movements.
- Right turn bays shall be added to the north and southern approaches at the intersection of Paul Street / Geddes Avenue to ensure right turning vehicles do not prevent the throughput of left / through vehicles.

### 2.1.5 23rd June 2014

AECOM, City of Sydney and Transport for NSW met on the 23rd June 2014 to assess the modelling of bus route options within the GSTC. This was following the provision of two technical notes to Transport for NSW based on draft modelling results detailing the impact of the proposed bus routes on the GSTC. The following two routes were presented and demonstrated with a live microsimulation model viewing:

- Route 1: Zetland Avenue, Paul Street and Geddes Avenue; and,
- Route 2: Zetland Avenue and Civic Plaza.

Route 1 was nominated as the preferred route alignment and supported by Transport for NSW. This was formally documented in correspondence dated 9th July 2014.

### 2.1.6 7th November 2014

The final version of the report was issued to cater for the inclusion of comments on the draft report from Roads and Maritime. A comments register outlining responses to each issue raised can be found in **Appendix A**.

In addition, the 7th November 2014 version of the report provides a technical addendum which addresses alterations to the proposed phasing arrangement at the following intersections:

- Zetland Avenue / Portman Street; and
- Geddes Avenue / Portman Street.

The resultant operational performance of the two intersections is also presented. The addendum is located in **Appendix B**.

# 3.0 Existing Operational Performance

As previously discussed the existing network performance statistics have been taken from the Bitzios developed 2012 base models which were approved by City of Sydney and Roads and Maritime as fit for purpose to use as base models for this assessment.

The capacity of an urban road network is controlled by the throughput of traffic at intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with Level of Service (LoS) used as an index. A summary of the LoS index is shown in **Table 3.1**.

**Table 3.1 Level of Service (LoS) criteria for intersections**

| Level of Service | Average Delay/ Vehicle (secs/veh) | Traffic Signals \| Roundabout | Give Way \| Stop Signs |
|---|---|---|---|
| A | Less than 14 | 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 excessive delays<br>Roundabouts require other control mode | At capacity; requires other control mode |
| F | >70 | At capacity; at signals incidents will cause excessive delays<br>Roundabouts require other control mode | At capacity; requires other control mode |

Source: Guide to Traffic Generating Developments, Roads and Maritime, 2002

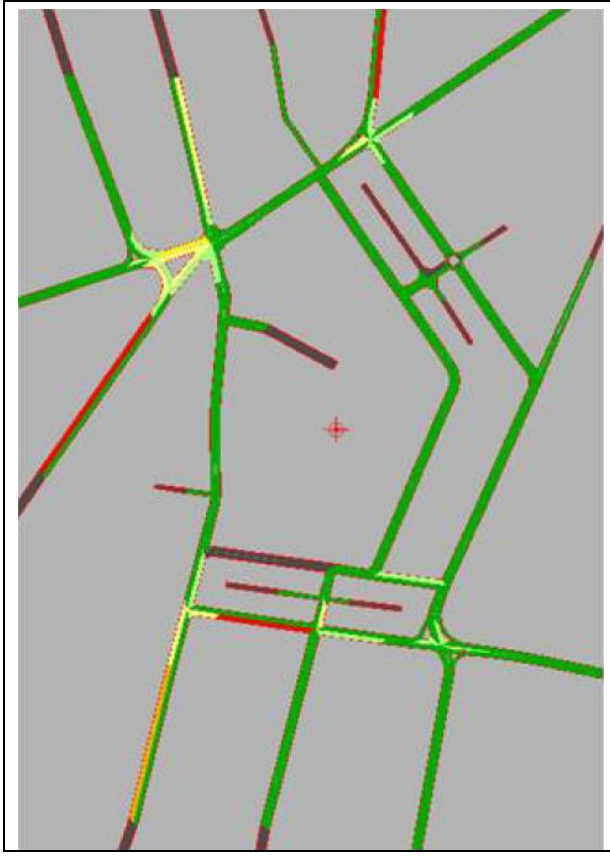
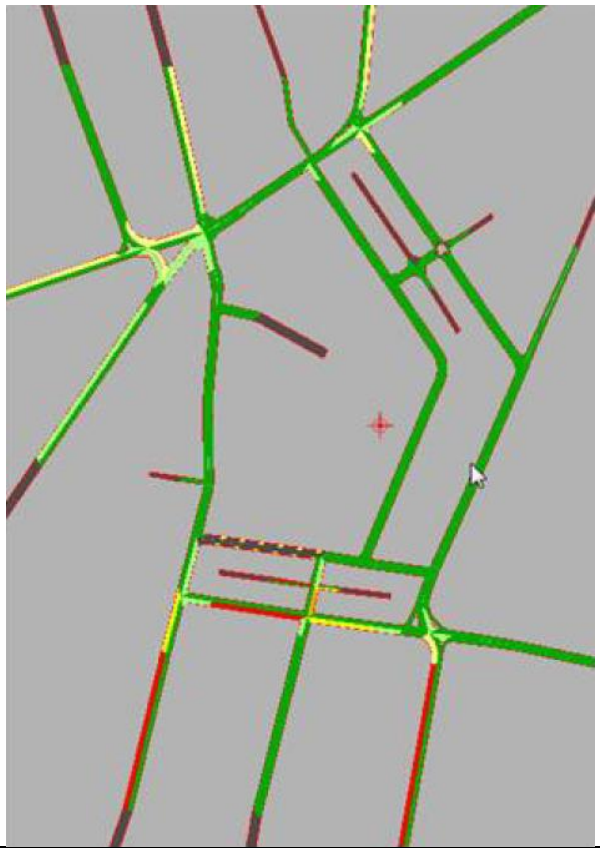
## 3.1 Existing Network Performance

Existing network performance results for the GSTC road network are documented in the 2013 Bitzios Report 'Green Square Town Centre Parking and Traffic Study'. It should be noted that in the abovementioned report the network performance was presented on an area wide basis and not at an intersection level as documented in **Section 7.0**. AECOM have not modified the base models performance reporting structure developed by Bitzios for the preparation of this report and as such existing performance in provided only on a network basis. This is shown graphically in **Table 3.2** with the LoS bandings for the various links across the network demonstrated in **Table 3.3**.

In the AM peak hour period modelling indicates that the majority of links within the network operate at LoS A, B or C. Exceptions to this are the south western approach to the intersection of O'Riordan Street / Wyndham Street, southern and eastern approaches to the intersection of Botany Road / Epsom Road and northern approach to the intersection of Elizabeth Street / Bourke Street, all of which operate at either LoS E of F.

In the PM peak hour, as was noted in the AM peak hour, the majority of network links are shown by the undertaken modelling to perform at LoS A, B or C. Exceptions to this are southern and eastern approaches to the intersection of Botany Road / Epsom Road and southern approach to the intersection of Epsom Road / Joynton Avenue, both of which operate at LoS F.

**Table 3.2 Existing Level of Service (LoS) Network Performance**

| AM Peak Hour | PM Peak Hour |
|---|---|
|  |  |

Source: Bitzios; 2013

**Table 3.3 Level of Service (LoS) Bandings**

| Level of Service | Minimum (Seconds) | Maximum (Seconds) | Colour Gradation |
|---|---|---|---|
| A | 0 | 14 | |
| B | 15 | 28 | |
| C | 29 | 42 | |
| D | 43 | 56 | |
| E | 57 | 70 | |
| F | 70 | - | |

Source: Bitzios; 2013

# 4.0 Proposed Development

## 4.1 Summary of Future Development

In developing the Green Square Town Centre Precinct model numerous planned developments were incorporated into the 2031 future modelling scenario to accurately reflect the road network's future performance. These are listed below along with a brief summary pertaining to their characteristics. Refer to **Figure 1.1** for an illustration of the precincts locations.

### 4.1.1 Green Square Town Centre Precinct

The Green Square Town Centre Precinct is the focal point of the study area. Extending between Botany Road and Joynton Avenue the development is the most advanced, from a planning perspective, to be incorporated into the model. The size of the development is presented in **Table 4.1**. A detailed summary of the developments comprising the various stages of the GSTC development can be found in **Appendix C**.

**Table 4.1 Proposed Green Square Town Centre Precinct Overview**

| | Dwellings | Commercial GFA ($m^2$) | Retail GFA ($m^2$) |
|---|---|---|---|
| Summary | 4,218 | 67,204 | 12,760 |

Source: City of Sydney Council, 2013

### 4.1.2 Epsom Precinct

The Epsom Precinct is situated to the east of Joynton Avenue and bounded by Victoria Park precinct to the north, Link Road to the east and Epsom Road to the south. A summary of the site characteristics, from the perspective of dwellings and commercial land use, is provided in **Table 4.2**. A detailed summary of the land uses and areas comprising the Epsom Precinct can be found in **Appendix C**.

**Table 4.2 Proposed Epsom Precinct Overview**

| | Dwellings | Commercial GFA ($m^2$) |
|---|---|---|
| Summary | 2,886 | 19,678 |

Source: City of Sydney Council, 2013

### 4.1.3 East West Relief Road Precinct

The East West Relief Road (EWRR) precinct is situated to the west of Botany Road. It is bounded by Botany Road, the EWRR and O'Riordan Street. A summary of the site characteristics, from the perspective of dwellings and commercial land use, is provided in **Table 4.2**. A detailed summary of the EWRR can be found in **Appendix C**.

**Table 4.3 Proposed EWRR Precinct Overview**

| | Dwellings | Commercial GFA ($m^2$) |
|---|---|---|
| Summary | 58 | 75,434 |

Source: City of Sydney Council, 2013

### 4.1.4 Site 1 (H-Intersection)

The H-intersection is located to the north of the study and is the terminology used to describe the interrelationship between the two intersections of Botany Road / Bourke Street / Bourke Road and O'Riordan Street / Wyndham Street / Bourke Road. The land to the south of the intersection is known as Site 1 and is owned by UrbanGrowth. The proposed development on Site 1 is outlined in **Table 4.4** and is anticipated to provide 150 parking spaces. A detailed summary of floor space associated with Site 1 can be found in **Appendix D**.

**Table 4.4 Proposed Site 1 Development Overview**

| | Retail GFA ($m^2$) | Commercial GFA ($m^2$) |
|---|---|---|
| Summary | 160 | 27,130 |

Source: UrbanGrowth, 2014

# 5.0 Modelling Assumptions

## 5.1 2031 Modelling Assumptions

The following assumptions were applied in the development and assessment of the 2031 Green Square Town Centre Paramics microsimulation models.

### 5.1.1 Intersection Cycle Times

In consultation with Roads and Maritime all signalised intersections within the GSTC have been modelled with a 90 second cycle time to balance operational efficiency between all modes. This includes the following locations:

- Geddes Avenue / Paul Street;
- Paul Street / Zetland Avenue;
- Zetland Avenue / Portman Street; and
- Portman Street / Geddes Avenue.

Intersections which interface with the existing external road network, and are exposed to higher volumes of through traffic, have been modelled with a 120 second cycle time. This includes the following locations:

- Botany Road / Geddes Avenue; and
- Joynton Avenue / Zetland Avenue.

Cycle times at the abovementioned intersections shall be determined by RMS following assessment of road constraints and detailed signal designs.

### 5.1.2 Pedestrian / Cyclist Phasing Impacts

Cycleways and pedestrianised environments play a key role in the functionality of the GSTC precinct. Their impact on the operation of signalised intersections has been modelled as follows:

- An 11 second phase time has been provided to cyclists (Five seconds green time with a six second intergreen) at each signalised intersection where provision is made for a dedicated cycleway. No conflicting vehicular movements are possible during this time period.
- A minimum six second delay to vehicles has been applied at the commencement of a pedestrian phase. No conflicting vehicle movements are possible during this time period. Due to the cycle way movement running at the same time as the pedestrian movement the associated delay is frequently the default 11 second delay applied as a result of cyclists. The following locations, where the cycle way is not run as a parallel movement, have had the minimum delay of six seconds extended to cater for additional anticipated pedestrian demands:
    - Paul Street / Zetland Avenue (10 second delay); and
    - Botany Road / Bourke Street / Bourke Road (10 second delay for north-south movement and east-west movement).

It is noted that all pedestrian and cycle protection timings will be agreed by Roads and Maritime prior to operation of any signalised intersection constructed as part of the Green Square development area. The cycle times currently used in the modelling reflect timings agreed with Roads and Maritime at a strategic level.

### 5.1.3 Parking Restrictions

Due to the impact on the road network of future growth (background and development) parking availability on the corridor has been reduced from its current provision through restrictions in peak periods at the following locations:

- Geddes Avenue (at the intersection of Geddes Avenue / Botany Road);
- Botany Road;
- Joynton Avenue between Gadigal Avenue and Epsom Road; and
- Epsom Road between Link Road and Botany Road with the exception of:
    - Eastbound between Botany Road and Dunning Avenue; and
    - Westbound between Mentmore Avenue and Dunning Avenue.

### 5.1.4 Traffic Generation

The following assumptions were made with respect to traffic generation:

- The applied residential traffic generation rate has been revised down from 0.25, as per the initial Bitzios model, to 0.19 trips per unit (AM peak) and 0.15 trips per unit (PM peak) in accordance with the Roads and Maritime Services 'Guide to Traffic Generating Developments Updated Traffic Surveys' (TDT2013/04).

Retail and commercial trip generation rates have been maintained in accordance with the rates identified in the 2013 'Green Square Parking and Traffic Study'. These are as follows:

- Retail AM/PM Peak 3.53 trips per 100m$^2$ of GFA
- Commercial AM/PM Peak 0.55 trips per 100m$^2$ of GFA

#### *5.1.4.1 Site 1 Traffic Generation*

Site 1 is unique in that it is centred above the Green Square Railway Station and is fronted by a designated high frequency bus corridor on Botany Road. Calculation of Site 1's traffic generation based on the rates specified in **Section 5.1.4** equated to a projected number of trips that is greater than the proposed parking spaces to be provided. In practice this is not a feasible outcome and as such the traffic generation for Site 1 was reduced based on the ratio of the traffic generation relative to the number of parking spaces available at the site location compared against the site's overall land use and size. Developments of similar commercial land uses across Sydney, as noted in the Roads and Maritime 'Guide to Traffic Generating Developments Updated Traffic Surveys' (TDT2013/04), were used as the basis for the calculation. Calculations based on commercial land uses in the Sydney suburbs of North Sydney, Chatswood, Hurstville, Macquarie Park and Parramatta indicated that for each parking space there was a peak hour trip generation of 0.7 trips in the AM peak and 0.5 trips in the PM peak. So as not to underestimate demand for the site the projected trip generation rates, based on the rates outlined in **Section 5.1.4** were reduced by these ratios to more accurately reflect the likely demand experienced in the AM and PM peak hours.

### 5.1.5 Traffic Distribution

Traffic distribution is based on that provided in the Bitzios modelling and outlined in the 2013 report 'Green Square Parking and Traffic Study'. This bases trip distribution on the 2012 Green Square Transport Management and Accessibility Plan. The directional distribution of such trips is highlighted in **Table 5.1**. With respect to the differing land uses in the model it is assumed that 90 per cent of residential trips exit the precinct in the AM peak with 10 per cent of trips entering the precinct. The inverse of this is applied in the PM peak. For commercial trips 80 per cent of traffic is assumed to enter the precinct in the AM peak with 20 per cent of traffic egressing the precinct. As was noted with the residential land use component the inverse of the AM peak is also applied during the PM peak for commercial land use trips. Retail trips are split 50/50 with respect to inbound and outbound trips.

**Table 5.1 Trip Distribution**

| Direction of travel (From/To) | AM Peak Hour | | PM Peak Hour | |
|---|---|---|---|---|
| | Inbound (%) | Outbound (%) | Inbound (%) | Outbound (%) |
| Botany Road (North) | 19 | 15 | 15 | 19 |
| Elizabeth Street | 1 | - | - | 1 |
| Bourke Street | 29 | 0 | 21 | 0 |
| Joynton Avenue | 24 | 48 | 18 | 22 |
| Epsom Road | 10 | 30 | 40 | 41 |
| Botany Road (South) | 11 | 1 | 1 | 11 |
| Bourke Road | 6 | 6 | 6 | 6 |

Source: Bitzios, 2013

The scope of this study does not include detailed assessment of the road network within the adjacent Epsom Precinct. However, linkages from the Epsom Precinct to Link Road and Epsom Road are anticipated to reduce the demand from the precinct at the intersection of Joynton Avenue / Zetland Avenue and as such it was assumed that only 25 per cent of trips from the precinct would use the previously mentioned intersection. In the future this assumption may need to be reviewed once the road network of the Epsom Precinct is assessed in further detail.

### 5.1.6 Background Growth Application

Background growth has been applied to the 2031 microsimulation models in accordance with the direction provided in discussions with Roads and Maritime. Roads and Maritime indicated at the stakeholder meeting on 9 September 2013 that modelling undertaken internally of the AM peak suggested the road network surrounding the GSTC would reach capacity in 2018. This was further supported by Bitzios modelling of the GSTC road network which indicated capacity would be reached in 2022 in the AM peak and 2018 for the PM peak. However, the previously undertaken Bitzios models were based on a superseded concept design for the proposed H-intersection. This concept design did not operate as efficiently as the current H-intersection concept design that has been included in the AECOM model due to the following factors:

- A right turn movement was included for eastbound traffic from Bourke Road to Botany Road. This has been removed in the current UrbanGrowth NSW concept design (Developed by AECOM), and
- A single slip lane was provided for westbound traffic from Bourke Street to O'Riordan Street. This is a dominant movement at the intersection which has been provided with a dual lane signalised slip in the UrbanGrowth NSW concept design (Developed by AECOM).

These changes result in an increase in throughput within the study area and it was not considered applicable to directly use the Bitzios background growth matrixes to represent future growth within the study area. As a result routes which travel through the H-intersection from key local area network links such as Bourke Road, O'Riordan Street, Botany Road and Wyndham Street have had background growth applied to 2031 in accordance with the growth rate of 1.1 per cent per annum as specified in the 2013 Bitzios Report 'Green Square Town Centre Parking and Traffic Study'.

As noted above in **Section 5.1.5** the traffic distribution for the precinct is primarily focused on the eastern portion of the road network, specifically Epsom Road and Joynton Avenue. As a result no background growth has been assumed in these locations of the network to account for the high levels of anticipated future traffic volumes. This should also be noted in the context that the AECOM modelling has included a higher number of developments than those included by Bitzios such as the Epsom Precinct and East-West Relief Road Precinct.

### 5.1.7 H-Intersection Layout

The intersections of Botany Road / Bourke Road / Bourke Street / O'Riordan Street and Wyndham Street / Bourke Road / O'Riordan Street form the colloquially termed H-intersection. The intersection is currently undergoing a concept design which will re-align the current intersection into two separate four way intersections. This concept design and associated review of environmental factors (REF) is being undertaken by AECOM as part of a separate commission engaged by UrbanGrowth NSW. The concept design utilised in the modelling is Revision 1, issue date 12th June 2014. A copy of this design can be found in **Appendix B**.

While the future configuration of this intersection is considered in the modelling informing the GSTC this is not the focal point of this study. Separate traffic modelling will be undertaken to support the concept design and REF of the H-Intersection.

### 5.1.8 Civic Plaza Bus Sensitivity Test

At the request of Transport for NSW a sensitivity test regarding public transport utilising the Civic Plaza was assessed however was not pursued. The detailed outcomes of this assessment are provided in Section 6.2.1. Assumptions made relating to this sensitivity test were as follows:

- Buses will traverse the plaza at 10km/h; and
- The dwell time at bus stops within the GSTC was specified by Transport for NSW to be 60 seconds.

# 6.0 Green Square Town Centre

## 6.1 Road Hierarchy

The following roads, both surrounding and internal to the GSTC, play a critical role in the functionality of the precinct from a transport perspective.

#### 6.1.1.1 Botany Road

Botany Road is a key sub-arterial route that provides connectivity to the Sydney CBD to the north and Sydney Airport and Port Botany to the south. The corridor has been identified as a key transport corridor with plans to develop a Botany Road transit corridor noted in City of Sydney Council's 'Sustainable Sydney 2030'.

#### 6.1.1.2 Joynton Avenue

Joynton Avenue is a collector road providing a lower priority north-south route on the eastern side of the precinct. It connects to Epsom Road in the south and O'Dea Avenue in the north. The road is currently utilised by the Route M20 bus service and is anticipated to experience a large increase in traffic volumes associated with the development of the GSTC / Green Square development area.

#### 6.1.1.3 Geddes Avenue

Geddes Avenue provides a collector road function linking the GSTC to Botany Road on the western side of the precinct. It is the key internal transport linkage within the GSTC providing a direct connection for residents of the Epsom Precinct and GSTC to the proposed EWRR. It is also proposed to utilise Geddes Avenue, between Botany Road and Paul Street, to operate future bus services through the GSTC.

#### 6.1.1.4 Paul Street

Paul Street is a local road which extends north-south between the Civic Plaza at its northern end to Epsom Road in the south. It is proposed to utilise the section of Paul Street between Geddes Avenue and Zetland Avenue to operate bus services through the GSTC.

#### 6.1.1.5 Zetland Avenue

Zetland Avenue provides an east-west corridor connecting the Civic Plaza to Joynton Avenue. The road is earmarked as a future potential Light Rail corridor in the future and as such is being designed to accommodate provision if required. It is proposed to cater for buses servicing the GSTC in the interim. Zetland Avenue allows an alternate east-west route when considered in parallel with Geddes Avenue.

## 6.2 Public and Active Transport

### 6.2.1 Bus Services

Accessibility to high levels of established public transport is one of the most advantageous transport elements to underpin the GSTC. Not only is the precinct located close to Green Square Railway Station, Botany Road has been identified as a high frequency strategic bus corridor. The precinct itself is anticipated to be traversed by three bus routes which are detailed, along with proposed frequencies, in **Table 6.1**.

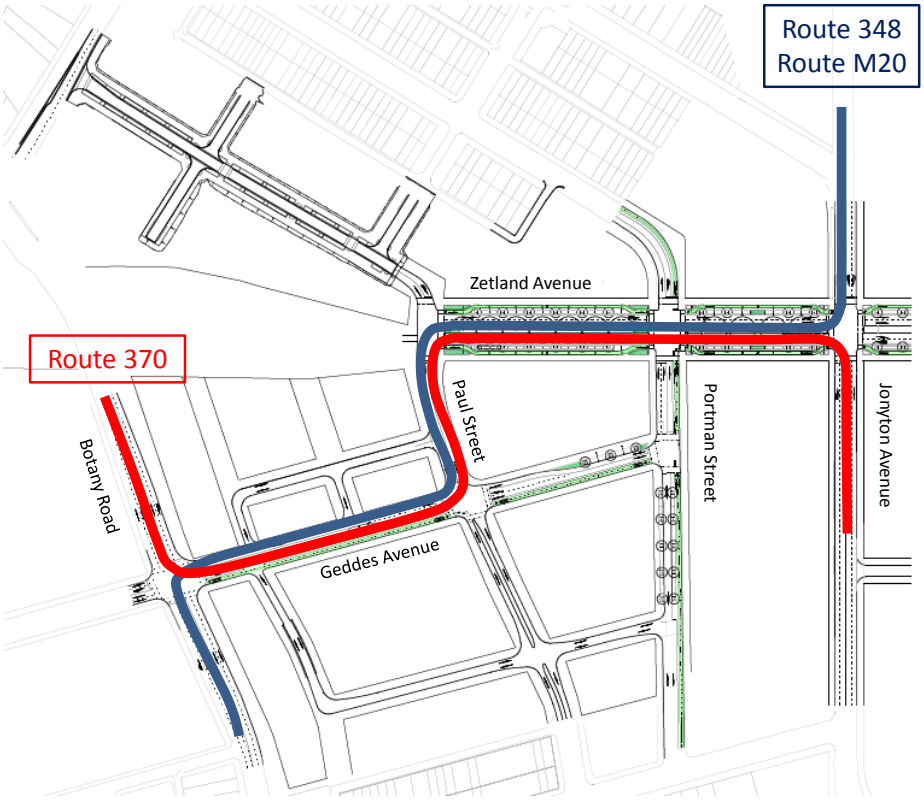
**Table 6.1 Bus Service Frequency GSTC**

| Service | Direction of Travel | AM Peak hour Frequency | PM Peak hour Frequency |
|---|---|---|---|
| Route M20 – Gore Hill to Mascot | Gore Hill to Mascot | 6 | 6 |
| | Mascot to Gore Hill | 6 | 6 |
| Route 370 – Leichhardt to Coogee (via UNSW) | Coogee to Leichhardt | 6 | 7 |
| | Leichhardt to Coogee | 8 | 6 |
| Route 348 – Bondi Junction to Wolli Creek (via UNSW) | Bondi Junction to Wolli Creek | 3 | 3 |
| | Wolli Creek to Bondi Junction | 3 | 3 |

Source: Transport for NSW; 2013

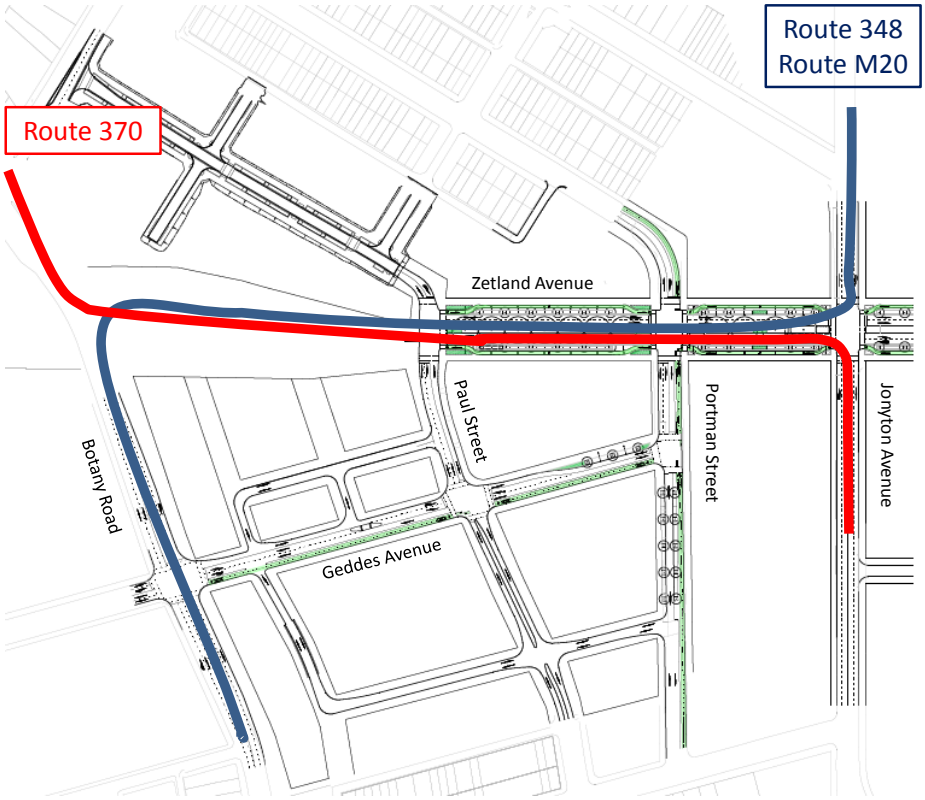
Initial discussions between Transport for NSW and City of Sydney Council centred on two alternate routes on which buses would traverse the GSTC. These routes focused on using either the proposed street network or operating bus services through the Civic Plaza as a shared zone. Graphical illustrations of the two proposed routes are identified in **Figure 6.1** and **Figure 6.2.** At a meeting between Transport for NSW and City of Sydney Council on 23rd June 2014 'Route 1 (Geddes Avenue)' was nominated as the preferred route. This route sees buses traverse the following route through the precinct: Geddes Avenue <> Paul Street <> Zetland Avenue.

**Figure 6.1 Potential Bus Route Options for GSTC Precinct – Route 1 (Geddes Avenue)**




Source: AECOM; 2014

**Figure 6.2 Potential Bus Route Options for GSTC Precinct – Route 2 (Civic Plaza)**




Source: AECOM; 2014

The decision of the preferred route was based on the following rationale:

- City of Sydney's preference to enable and support the activation of the Plaza;
- Ensure the proposed bus route servicing the GSTC stops in proximity to the Plaza as well as providing access to the Green Square Railway Station; and
- A travel time comparison of the two alternative routes using the microsimulation model, to provide analysis regarding operational performance for buses.

The results of this travel time analysis can be seen in **Table 6.2** which demonstrates that for all services, with the exception of the Route 370 'outbound' service the Geddes Avenue Route records a faster travel time.

**Table 6.2 Bus Travel Time Comparison – GSTC**

| Route | Direction | Model Distance (km) | Average Speed (km/h) | Travel Time (min:sec) | Average Speed (km/h) | Travel Time (min:sec) |
|---|---|---|---|---|---|---|
| | | | AM Peak Hour | | PM Peak Hour | |
| **Route 1:** Route M20 / 348 – Geddes Route | City | 1.45 | 12.1 | 07:11 | 9.1 | 09:31 |
| | Outbound | | 12.6 | 06:53 | 10.3 | 08:27 |
| **Route 1:** Route M20 / 348 – Plaza Route | City | 1.53 | 9.65 | 09:31 | 10.1 | 09:04 |
| | Outbound | | 10.9 | 08:27 | 8.5 | 10:45 |
| **Route 2:** 370 – Geddes Route | City | 1.33 | 8.3 | 09:40 | 7.1 | 11:16 |
| | Outbound | | 8.5 | 09:23 | 8.8 | 09:02 |
| **Route 2:** 370 – Plaza Route | City | 1.1 | 5.6 | 11:16 | 5.7 | 11:37 |
| | Outbound | | 7.3 | 09:02 | 7.1 | 09:14 |

Source: AECOM; 2014

Modelling indicates that both bus alignment options were not able to achieve Transport for NSW's desired average speed metric of 18-25 km/ across the route (inclusive of time spent at stops). One of the reasons for this is due to the length of time services spend at bus stops on the network. For example the M20 city bound service has been assumed to stop for one minute within the GSTC and for 30 seconds at all bus stops. This equates to a total stop time of three minutes out of the approximately seven minuets

In addition this assessment only considers travel times during the AM and PM peaks and a subsection of each desired route in question. The subsection of the route considered is particularly relevant given that the road network surrounding the Green Square Town Centre would arguably be one of the most congested sections on each bus route. Therefore the desired speed may still be able to be reached when considering the total route travel time.

Although the travel times for 'Route 1: Geddes Route' have been demonstrated to be faster than 'Route 2: Plaza Route' it is acknowledged that the difference between the two routes is not substantial. However, 'Route 1: Geddes Route' is considered to provide a number of additional benefits including:

- Improved urban design and pedestrian accessibility outcomes for the Civic Plaza;
- Improved safety;
- Alignment with future EWRR; and
- No conflict with the proposed future Light Rail terminus.

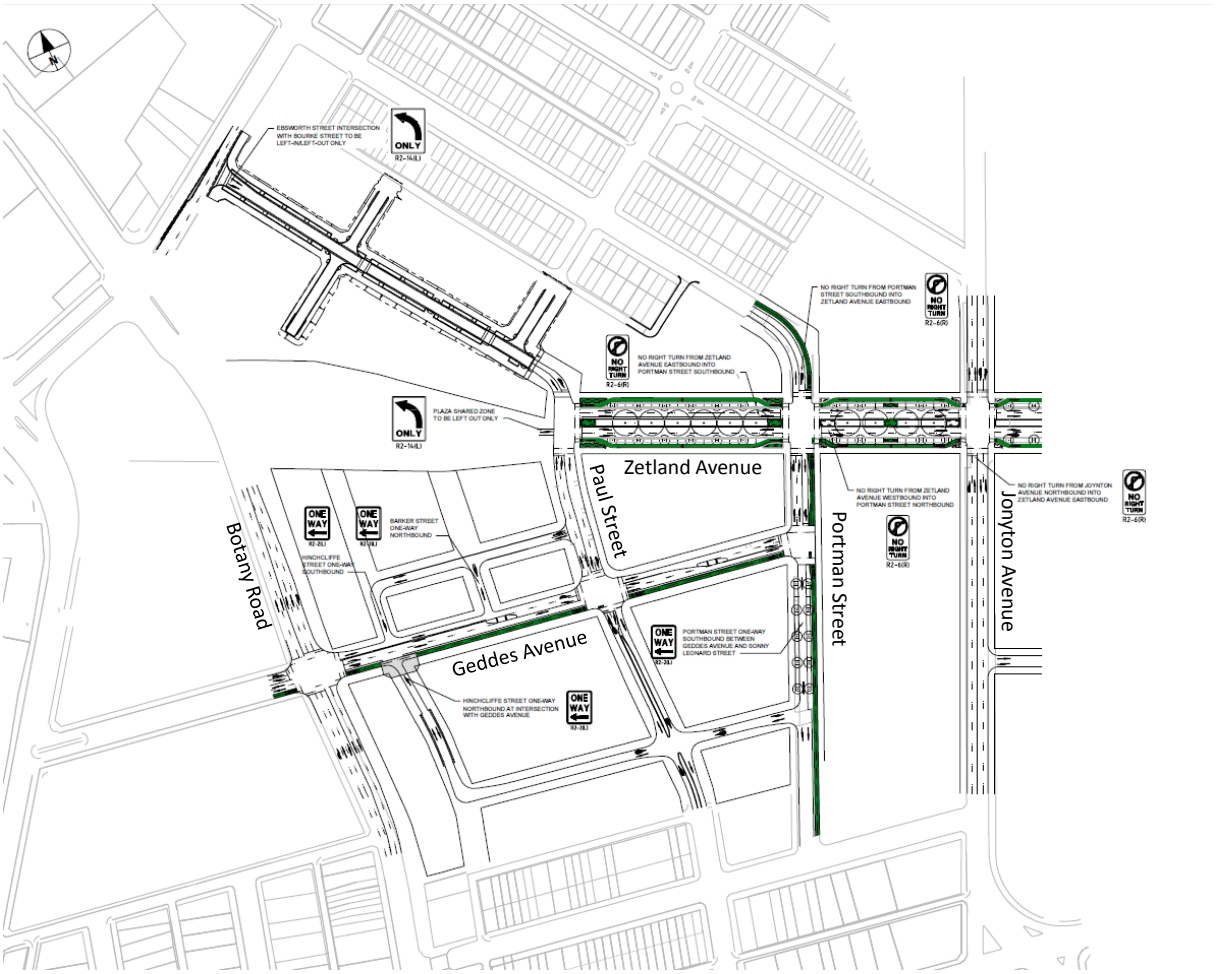
Transport for NSW accepted Route 1 as the preferred route in a meeting on 23/6/2014 and documented this formally in correspondence dated 9/7/2014.

### 6.2.2 Cycleway Facilities

Cycle facility innovation and provision is at the forefront of the GSTC precinct design. An 11 second dedicated phase time has been applied for cyclist movements at signalised intersections. The following dedicated separated cycleways are proposed for inclusion in the precinct:

- Zetland Avenue: Provides a uni-directional separated east-west connection from the Civic Plaza/Green Square Train Station to Epsom Precinct.
- Portman Street: A bi-directional cycleway is provided on the northern / eastern side of Portman Street providing access for cyclists accessing/egressing the Sydney CBD. This route is nominated as a regional cycle route.
- Geddes Avenue: A bi-directional cycleway is provided on the southern side of Geddes Avenue providing access for cyclists between Portman Street and destinations west of the GSTC.

**Figure 6.3 Proposed Cycleway Network - GSTC**




Source: AECOM; 2014

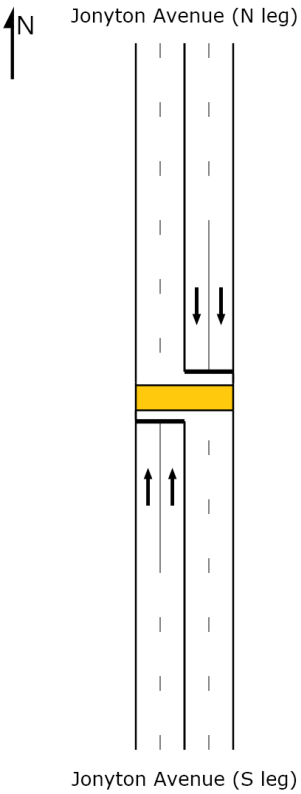
### 6.2.3 Pedestrian Facilities

Pedestrian facilities, as was noted with cyclist infrastructure, are a key element behind the design of the GSTC precinct. Pedestrian crossings are provided on each approach of each signalised intersection and lower cycle times within the precinct have been adopted to aid in minimising delays for pedestrians.

#### *6.2.3.1 Joynton Avenue Signalised Pedestrian Crossing*

A signalised pedestrian crossing facility has been included in the modelling approximately halfway between the intersections of Epsom Road / Joynton Avenue and Zetland Avenue / Joynton Avenue to facilitate the movement of individuals between the GSTC and Epsom Precinct. The crossing is of particular importance due to the large number of children anticipated to use the facility to access the proposed child care centre and community/recreational facilities which border Joynton Avenue to the east and the west. The intersection of Elizabeth Street / Joynton Avenue is not included in the Roads and Maritime DA response however was proposed by Bitzios (2013) for signalisation in the 'Green Square Parking and Traffic Study'. Due to future demands on Joynton Avenue the level of gap acceptance available to right turning vehicles from Elizabeth Street to Joynton Avenue is not available resulting in large queues on Elizabeth Street. The signalised intersection shall be co-ordinated with the intersection of Zetland Avenue / Joynton Avenue to ensure the efficient movement of traffic along Joynton Avenue. The proposed intersection design maintains the two lane approach and departure on Joynton Avenue. The intersection is illustrated graphically in **Figure 6.4**.

**Figure 6.4 Joynton Avenue Signalised Pedestrian Crossing**




Source: AECOM; 2014

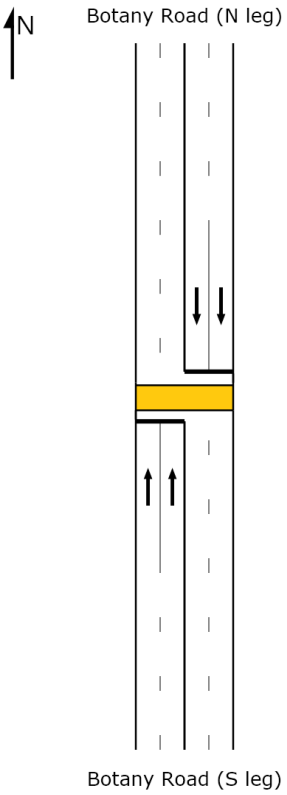
### *6.2.3.2 Botany Road Signalised Pedestrian Crossing*

Provision of a signalised pedestrian crossing at the intersection of the Plaza and Botany Road was discussed at a number of the meetings with Roads and Maritime. In each instance Roads and Maritime reiterated their comments included in their response to the DA noting that they do not support the provision of a signalised crossing in this location, sighting implications for traffic efficiency on Botany Road and that the warrants for this location may necessitate grade separation.

City of Sydney has advised that they will pursue this matter further at a later date and as such, this potential facility has not been included in the traffic modelling described in this report. If the signalised pedestrian crossing is pursued, it will need to be coordinated with the H-intersection design.

A potential schematic lane configuration for the crossing, maintaining the two lane approach and departure, is presented in **Figure 6.5**.

**Figure 6.5 Botany Road Signalised Pedestrian Crossing**



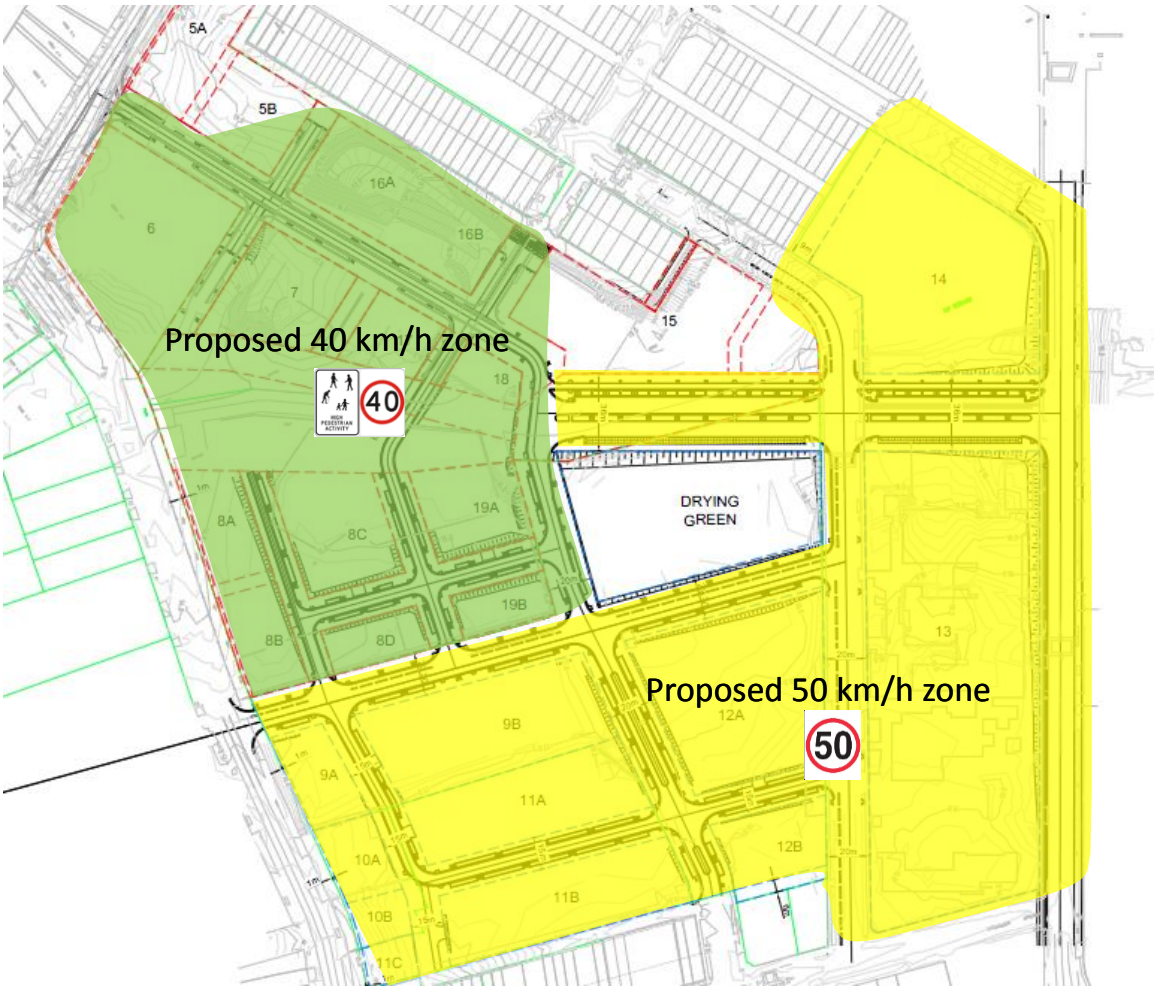

Source: AECOM; 2014

## 6.3 Speed Limits

**Figure 6.6** illustrates the speed zones proposed within the GSTC precinct. The high density pedestrian activated precinct to the north of the site is demarcated as 40 km/h whilst the remainder of the precinct with key transport arteries such as Geddes Avenue, Zetland Avenue and Paul Street (south of Geddes Avenue) proposed to be 50km/h. This is particularly relevant for Geddes Avenue which provides a central east-west spine allowing access to the GSTC precinct, EWRR precinct and Epsom Precinct.

This is in line with Roads and Maritime comments that were noted on 9th October 2013 which stated that a 40km/h speed limit is generally better suited to retail areas with residential areas likely to require speed limits of 50 km/h.

**Figure 6.6 Proposed Speed Zoning within GSTC Precinct**




Source: AECOM; 2014

## 6.4 Turn Restrictions

One of the underlying principles in designing the GSTC precinct road network was to provide a high degree of functionality with respect to the level of movements permitted at intersections across the precinct. As a result the turn restrictions proposed across the precinct are minimal and have been done so on the grounds of safety and operational efficiency. These restrictions are detailed in **Table 6.3**.

**Table 6.3 Turn Restrictions – GSTC Precinct**

| Intersection | Banned Movement | From | To |
|---|---|---|---|
| Zetland Avenue / Portman Street | Right turn | Zetland Avenue (E leg) | Portman Street (N leg) |
| | Right turn | Zetland Avenue (W leg) | Portman Street (S leg) |
| | Right turn | Portman Street (N leg) | Zetland Avenue (W leg) |

Source: AECOM; 2014

## 6.5 Intersection Layouts

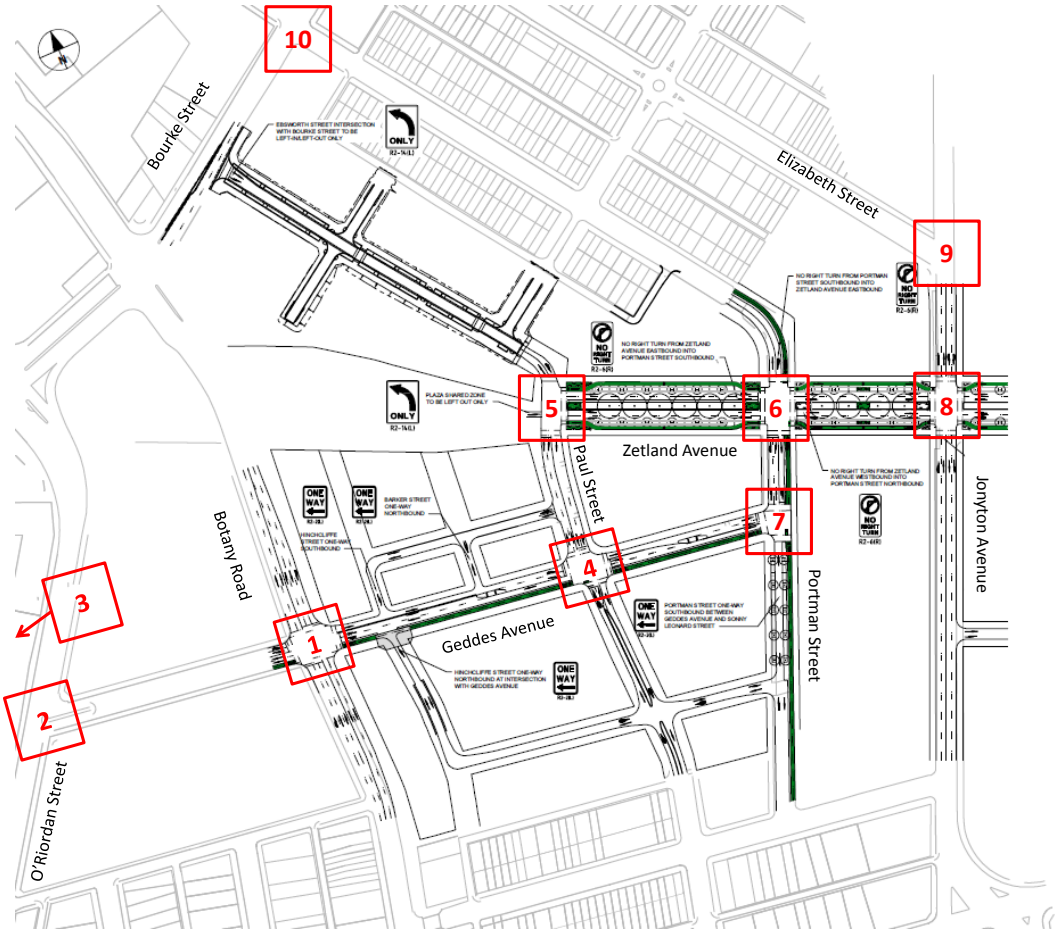
The following illustrations provide a geometrical representation of the proposed intersection layouts across the key intersections of the internal GSTC road network and also the interface with the surrounding road network.

The following three key elements were used in the determination of the proposed intersection designs:

- Physical space availability and upper limit lane configuration ability;
- Turn bay length availability within road reserve (existing or as defined by relevant Development Control Plans); and
- Traffic demands.

An illustration of the locations of the relevant intersections for assessment is shown in **Figure 6.7**.

**Figure 6.7 Overview of Intersection Locations**



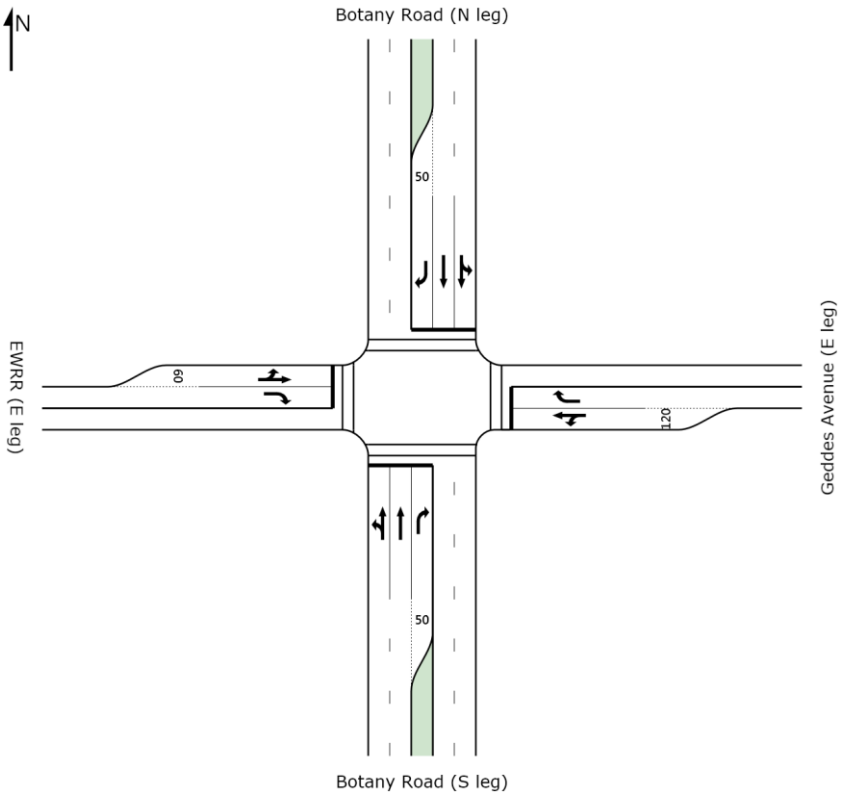

Source: AECOM; 2014

### 6.5.1 Botany Road / Geddes Avenue / EWRR (Figure Reference 1)

The intersection of Botany Road / Geddes Avenue / EWRR was nominated for investigation by Roads and Maritime in their correspondence dated 21st February 2013. It is a new intersection on Botany Road characterised by the following attributes and illustrated in **Figure 6.8**:

- North and southbound right turn bays on Botany Road;
- Two approach / departure lanes for the through movement on Botany Road;
- Two lanes on approach and one lane on departure for the Geddes Avenue and EWRR approaches; and
- A dedicated bi-directional cycleway on the southern side of the intersection on Geddes Avenue / EWRR.

**Figure 6.8 Botany Road / Geddes Avenue / EWRR**

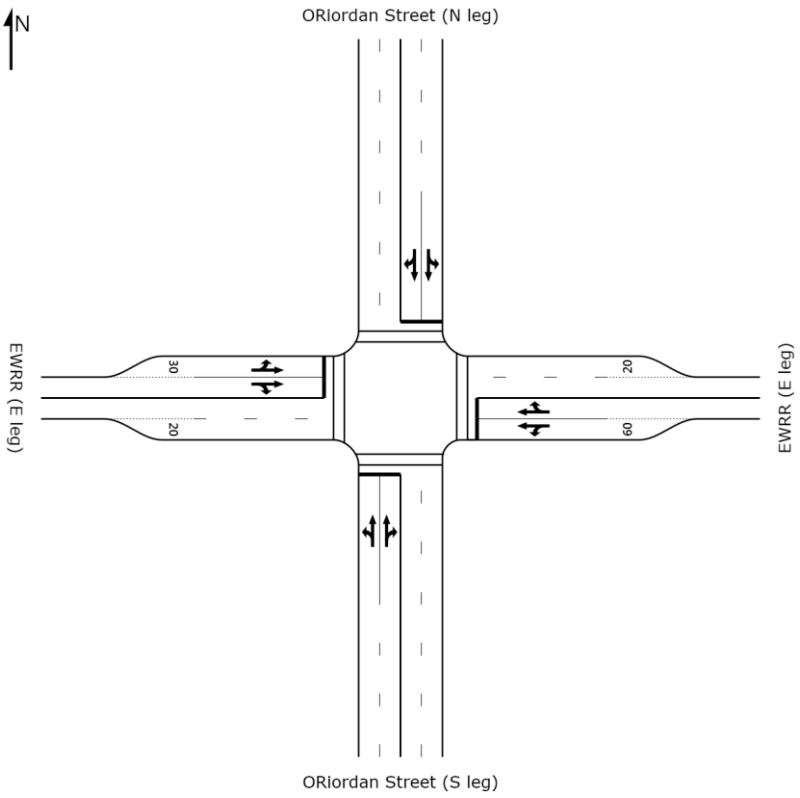



Source: AECOM; 2014

### 6.5.2 O'Riordan Street / EWRR (Figure Reference 2)

The intersection of O'Riordan Street / EWRR is based on the concept layout for the EWRR. It is characterised by a continuation of the existing two lane approach and departure on O'Riordan Street and a single lane on EWRR flaring to provide an additional short lane on the approach to the intersection. This is illustrated graphically in **Figure 6.9**.

**Figure 6.9 O'Riordan Street / EWRR**

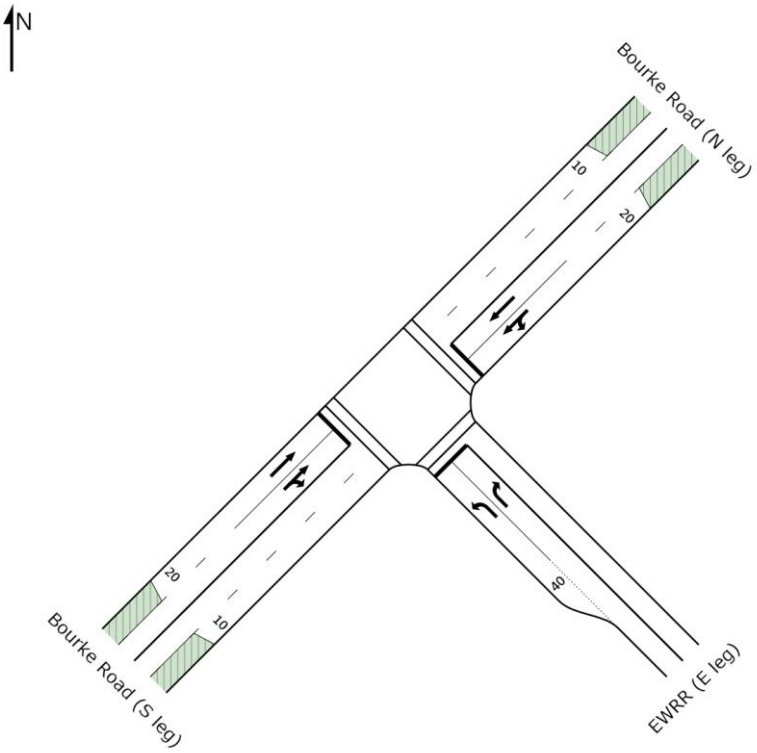



Source: AECOM; 2014

### 6.5.3 Bourke Road / EWRR (Figure Reference 3)

The intersection of O'Riordan Street / EWRR is based on the concept layout for the EWRR and reference to Roads and Maritime guidance relating to the design of signalised intersections.

**Figure 6.10 Bourke Road / EWRR**



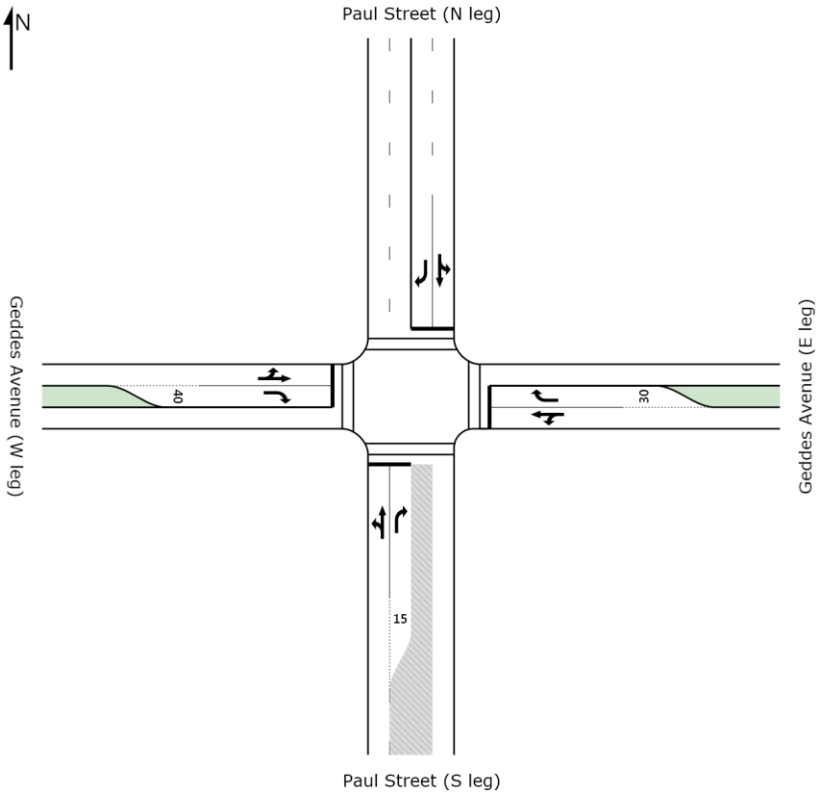

Source: AECOM; 2014

### 6.5.4 Geddes Avenue / Paul Street (Figure Reference 4)

The intersection of Geddes Avenue / Paul Street is not identified in the Roads and Maritime DA response as requiring signalisation however analysis indicates such a form of control is required. This is based on the competing needs of pedestrians, cyclists, buses and private vehicles who will traverse the intersection and the inherent safety concerns for all users in the event that the intersection operates in an uncontrolled manor. The proposed design is characterised by two approach lanes and a single departure lane on each approach of the intersection with the exception of the northern approach which has two lanes on departure from the intersection. This is shown graphically in **Figure 6.11**.

The dedicated bi-directional cycleway passes through the southern side of the intersection and, without signalisation, would provide safety concerns for cyclists travelling along Geddes Avenue and motorists accessing Paul Street (south leg). In designing the precinct and the interaction between the cycleway and the road network modifications have been made, where possible, to remove such conflicts. For example, turning movements have been restricted and the cycleway repositioned at the intersection of Geddes Avenue / Hinchcliffe Street. Such modifications are not possible at this location due to the role which the intersection plays in the distribution of traffic throughout the precinct. In addition to the cycleway safety concerns the intersection is on the primary access route for the proposed bus network and requires priority to be given to buses to facilitate the right turn from Paul Street (north leg) to Geddes Avenue. The location also provides pedestrian crossing opportunities to cater for the desire line from the residential precinct to the Civic Plaza and Green Square train station. The number of traffic lanes on Geddes Avenue prohibits priority pedestrian crossing at this location.

**Figure 6.11 Geddes Avenue / Paul Street**

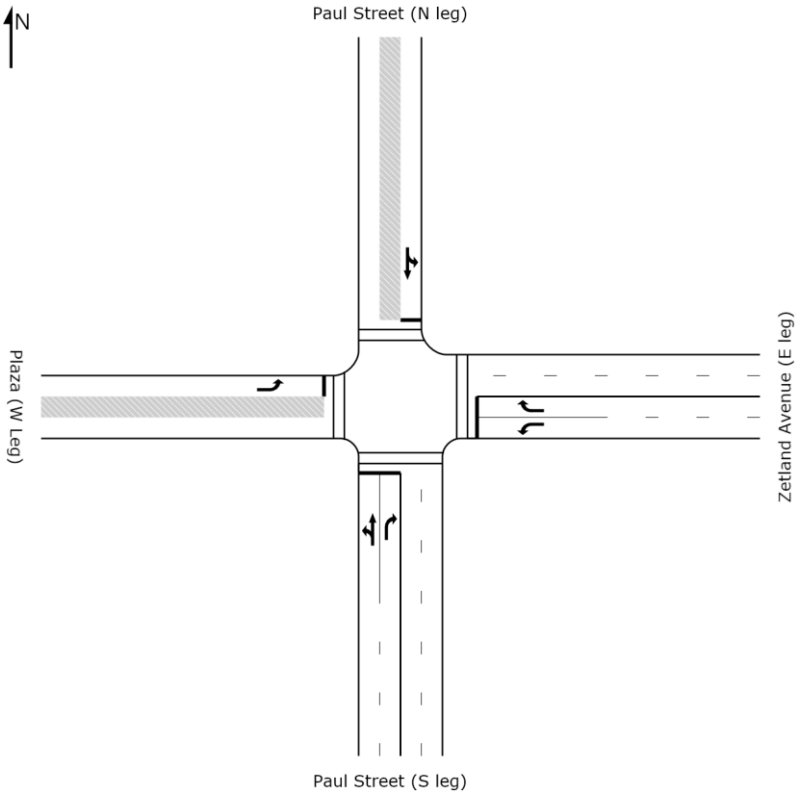



Source: AECOM; 2014

### 6.5.5 Zetland Avenue / Paul Street (Figure Reference 5)

The intersection of Zetland Avenue / Paul Street is nominated for assessment in the Roads and Maritime DA response. The proposed signalised intersection caters for both cyclists, in the form of uni-directional cycleways which run from the Civic Plaza to Zetland Avenue, and access from the plaza is proposed temporarily until the delivery of Barker Street. The intersection is also strategic from the perspective of public transport as the Route 370, Route M20 and Route 348 are proposed to utilise the right turn from Paul Street (South leg) and the left turn from Zetland Avenue. A schematic of the intersection, excluding cycleways, is provided in **Figure 6.12**.

**Figure 6.12 Zetland Avenue / Paul Street**




Source: AECOM; 2014

### 6.5.6 Zetland Avenue / Portman Street (Figure Reference 6)

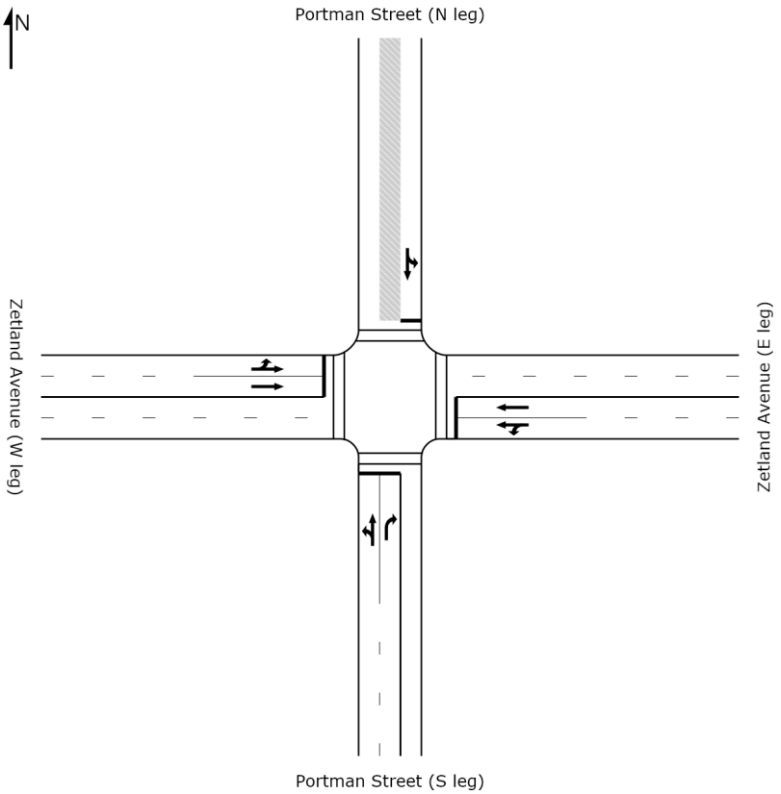
The intersection of Zetland Avenue / Portman Street is not required for signalisation or assessment in the Roads and Maritime DA response however is considered one of the most significant signalised intersections within the GSTC. The intersection has dedicated cyclist provision on all four arms and is the intersection of both a key north-south and east-west cycleway. Hook turns are permitted for cyclist at the intersection in order to achieve the desired movements. There is anticipated to be high pedestrian demand due to the park and community/recreational facilities which border the intersection to the south west and south east. Lastly, signalisation is warranted to ensure a balance of priority can be achieved between Zetland Avenue and Joynton Avenue for vehicles wishing to access Joynton Avenue.

The proposed intersection consists of the following characteristics:

- No right turn movements are permitted from the north, east and western approaches;
- The northern approach has a single lane approach / departure; and
- The eastern and western approaches consist of a dual lane approach and departure with future plans for a light rail to operate in the median lane; and
- The southern leg has a dual lane approach to facilitate the large right turn demand to Zetland Avenue and a single lane departure.

The intersection is represented graphically in **Figure 6.13**

**Figure 6.13 Zetland Avenue / Portman Street**




Source: AECOM; 2014

### 6.5.7 Geddes Avenue / Portman Street (Figure Reference 7)

A number of configurations have been investigated for the Geddes Avenue / Portman Street intersection. Key considerations for the layout of this intersection are:

- A strong desire line for pedestrians tracking through the intersection between the Plaza / Drying Green and the community facilities located on the South Sydney Hospital site;
- Intersection of the proposed cycle paths on Portman Street and Geddes Avenue; and
- Dominant traffic movement tracking from Geddes Avenue into Portman Street and then Zetland Avenue.

Due to the strong pedestrian desire, the provision of marked footway crossings was initially considered as the intersection does not meet warrants for a signalised intersection. In addition Roads and Maritime had previously identified concerns around signalisation of this intersection in our first meeting due to the close proximity to the signalised intersection of Zetland Avenue / Portman Street (approximately 45m to the north).

Review of warrants for marked footway crossings indicated that this location would meet the required pedestrian and traffic volumes. Potential configurations of marked footway crossings at this intersection were laid out to confirm the feasibility of this treatment, this exercise identified a number of constraints including:

- Pedestrian crossings could only feasibly be achieved on two of the three arms;
- Potential sight line constraints for traffic turning right from Portman Street north into Geddes Avenue;
- Pedestrians needing to cross both cycle paths to access the South Sydney Hospital Site from the Drying Green; and
- Restrictions to movements at the intersection from not being able to provide a right turn bays where marked footway crossings will require only one-lane in each direction.

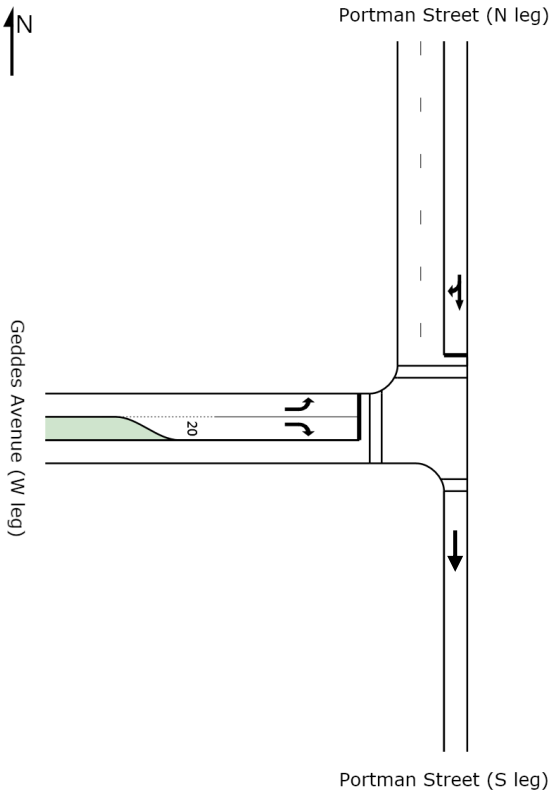
Based on these constraints in using marked footway crossings, potential signalisation the intersection of Geddes Avenue / Portman Street was reviewed and is considered the preferred intersection treatment based on the following rationale:

- It provides widespread functionality for cyclists connecting from the north-south bi-directional cycleway on Portman Street to the dedicated east-west bi-directional cycleway on Geddes Avenue;
- Pedestrian crossings are able to be provided on all three approaches as opposed to two under a marked footway crossing layout. In addition, in the event that the intersection is signalised pedestrians do not need to cross two road and cycleway crossings with priority control;
- Signalisation overcomes the sight distance issue for vehicles with locating a pedestrian crossing on Geddes Avenue and facilitating an uncontrolled right turn movement from Portman Street;
- Roads and Maritime warrants make allowance for signalisation of intersections which do not meet numbers for signalised pedestrian crossing, but which do meet the warrants for a marked footway crossing and where the layout would result in safety concerns (as it would in this instance);
- Concerns regarding ‘see-through effects’ due to the close proximity of signals can be mitigated by making Portman Street south of the intersection one-way southbound, meaning that there is no northbound through movement. On the southbound approach, ‘see-though effects’ will be mitigated by the topography of the road with the approach to Zetland Avenue signals being on a steep down-hill at approximately 1 in 12 (or 8%) while the approach to the Geddes Avenue signals is at approximately 1 in 100 (or 1%). This will also be managed through signal phasing on this southbound movement and louvres on signal lanterns where applicable. It should be noted that the horizontal geometry will also impede the sight line for vehicles travelling southbound on Portman Street and restrict the ability for motorists to see signal lanterns at the intersection of Geddes Avenue / Portman Street. Operation of the above intersection in conjunction with the signalised intersection of Zetland Avenue / Portman Street could also provide favourable phasing to reduce ‘see-through effect’ implications.
- The high anticipated pedestrian demands have the potential to disrupt the flow of traffic on Geddes Avenue and Portman Street for a marked footway configuration. Due to the projected high traffic demand and limited storage space available it is felt that operating a short cycle time (90 seconds) and minimising delays to both vehicles and pedestrians and cyclists provides the greatest outcome to the precinct as well as removing conflicts between pedestrians and cyclists.

It is noted that the signalisation of Geddes Avenue / Portman Street and surrounding issues should resolved prior to approval of signal plans.

As noted above, the proposed design includes a single southbound lane approach and departure on Portman Street with a short 20m right turn bay on Geddes Avenue facilitating access to the one-way only southbound component of Portman Street (South leg). Geddes Avenue also has a single dedicated left turn lane which is illustrated graphically in **Figure 6.14**.

**Figure 6.14 Geddes Avenue / Portman Street**



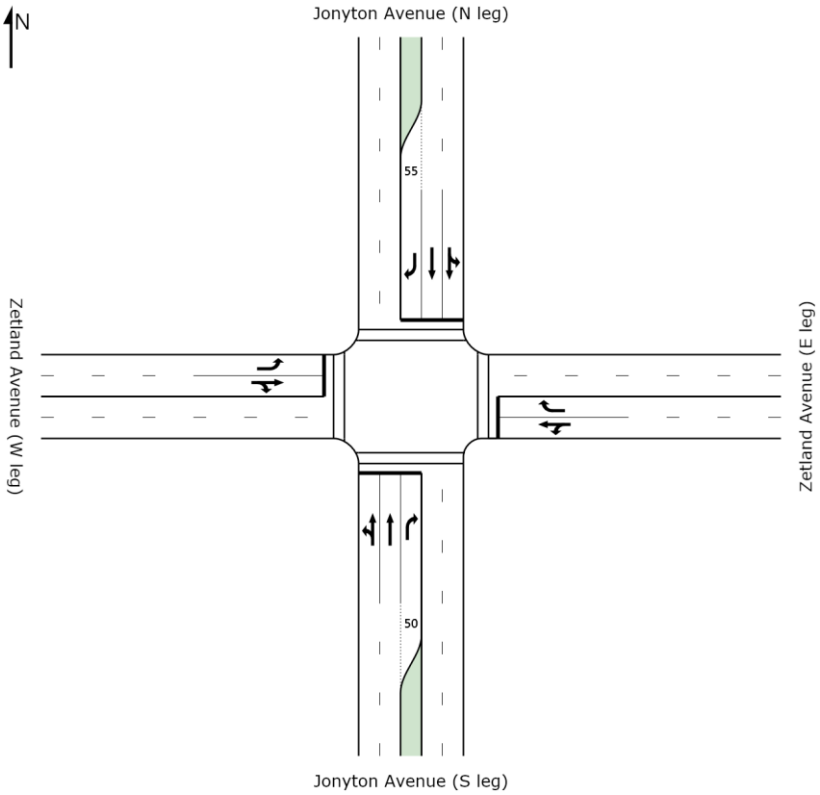

Source: AECOM; 2014

### 6.5.8 Zetland Avenue / Joynton Avenue (Figure Reference 8)

The intersection of Zetland Avenue / Joynton Avenue is nominated in the Roads and Maritime DA response for signalisation and analysis. The ultimate configuration contains right turn bays on the north and south approaches however this is proposed to be staged and is discussed in further detail in **Section 6.5.8.1**. The Zetland Avenue approaches are characterised by two lanes on approach and departure with uni-directional separated cycleways provided for both the eastbound and westbound direction of travel.

A schematic of the proposed intersection is provided in **Figure 6.15**.

**Figure 6.15 Zetland Avenue / Joynton Avenue**




Source: AECOM; 2014

#### *6.5.8.1 Staging of Zetland Avenue / Joynton Avenue Upgrade*

The development of the intersection of Zetland Avenue / Joynton Avenue will be staged in accordance with the development of the GSTC and Epsom Precinct (located to the east of the intersection). The proposed northern and southern approach right turn bays will be incorporated during the build out of these precincts when required by traffic demands. Sensitivity analysis has been undertaken in SIDRA regarding the approximate time period at which the right turn bays need to be implemented. This analysis focuses primarily on queuing on the northern approach due to its proximity to the intersection of Elizabeth Street / Joynton Avenue and the impacts which queues extending back to the intersection have on the aforementioned intersection. The distance in which queuing must be contained on the northern approach is approximately 60m.

The 2031 peak hour which modelling indicates will experience the greatest level of queuing at the intersection of Joynton Avenue / Zetland Avenue is the AM peak. Analysis indicates that queuing in the PM peak is satisfactory and does not impede on the operation of the intersection of Elizabeth Street / Joynton Avenue. In the AM peak, at the full development of GSTC and Epsom Precinct (2031), the number of vehicles anticipated to turn right from the northern approach is 295. These vehicles impede southbound through traffic as they wait for an appropriate level of gap acceptance to filter across the intersection when not provided with a dedicated turn phase.

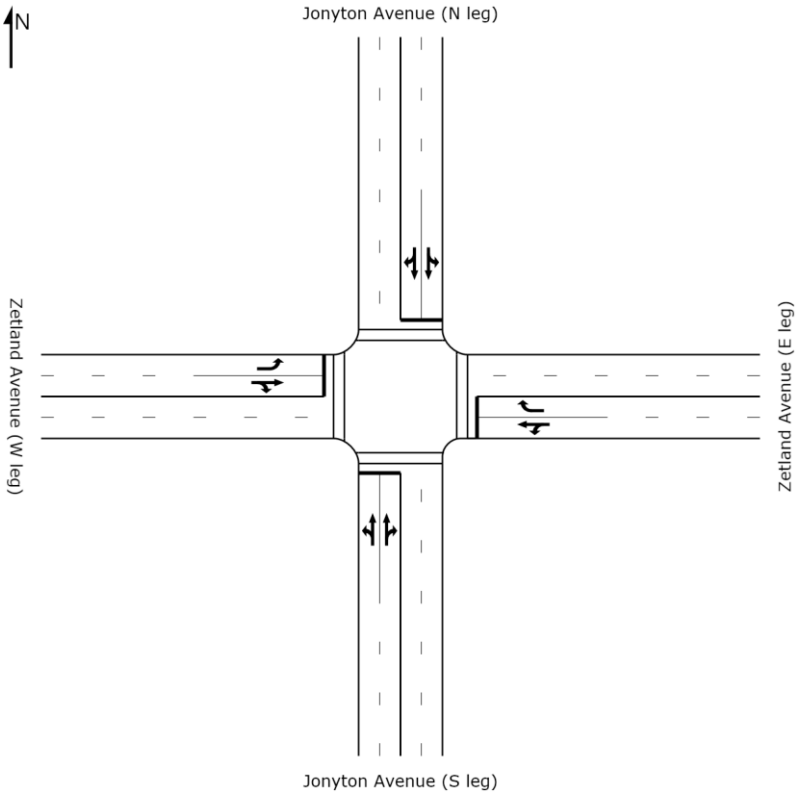
Analysis indicates that in 2031 the queue from right turning vehicles on the northern approach will extend to a length of approximately 70m (95$^{th}$ percentile). Sensitivity analysis indicates that the queue remains above the

desired 60m distance when the GSTC development exceeds a total GFA of approximately 240,000m$^2$. Analysis indicates that the right turn bay is required to be implemented nearing completion of the development of lots 8A, 8B, 8C and 8D. These developments, which are due for construction by 2022, are anticipated to generate a total of 108 trips (53 inbound and 55 outbound) towards Joynton Avenue (north) in the AM peak.

This assessment has maintained the level of trips anticipated from the Epsom Precinct as constant during this assessment. Further investigation as to the timing of this alteration to the intersection will be confirmed during detailed planning of the Epsom Precinct and the implementation of the proposed right turn bays is recommended to be revisited at the indicated timeframe to re-evaluate the need for their installation given the state of progress regarding development of the GSTC and Epsom Precinct.

An illustration of the interim layout for the intersection of Joynton Avenue / Zetland Avenue is provided in **Figure 6.16**.

**Figure 6.16 Zetland Avenue / Joynton Avenue**



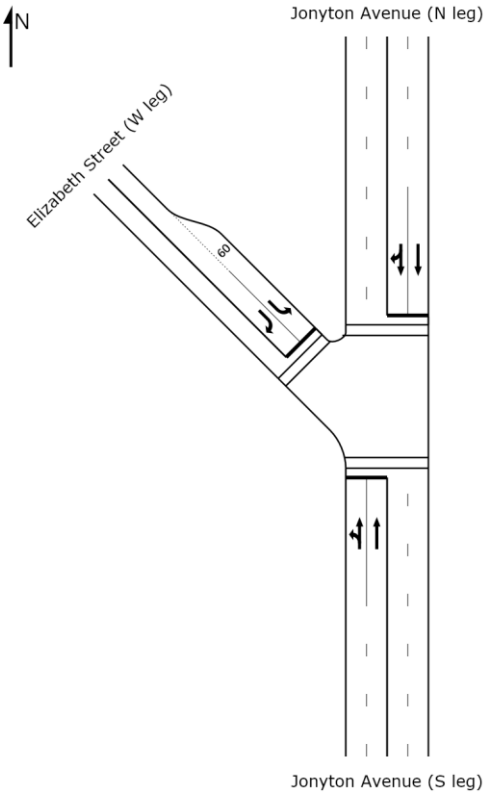

Source: AECOM; 2014

### 6.5.9 Elizabeth Street / Joynton Avenue (Figure Reference 9)

The intersection of Elizabeth Street / Joynton Avenue is not included in the Roads and Maritime DA response however was proposed by Bitzios (2013) for signalisation in the 'Green Square Parking and Traffic Study'. Due to future demands on Joynton Avenue the level of gap acceptance available to right turning vehicles from Elizabeth Street to Joynton Avenue is reduced resulting in large queues on Elizabeth Street. The signalised intersection shall be co-ordinated with the intersection of Zetland Avenue / Joynton Avenue to ensure the efficient movement of traffic along Joynton Avenue. The proposed intersection design maintains the two lane approach and departure on Joynton Avenue. The intersection is illustrated graphically in **Figure 6.17**.

The timing for the proposed signalised intersection is documented by Bitzios in the 2013 'Green Square Parking and Traffic Study' as by 2025. Noting that the revised GSTC modelling considers a reduced traffic generation rate however also provides for a greater number of developments it is recommended that appropriate investigations into the provision of a signalised intersection at this location be re-evaluated in 2022 in accordance with the proposed staging of the Joynton Avenue / Zetland Avenue intersection upgrade.

**Figure 6.17 Elizabeth Street / Joynton Avenue**

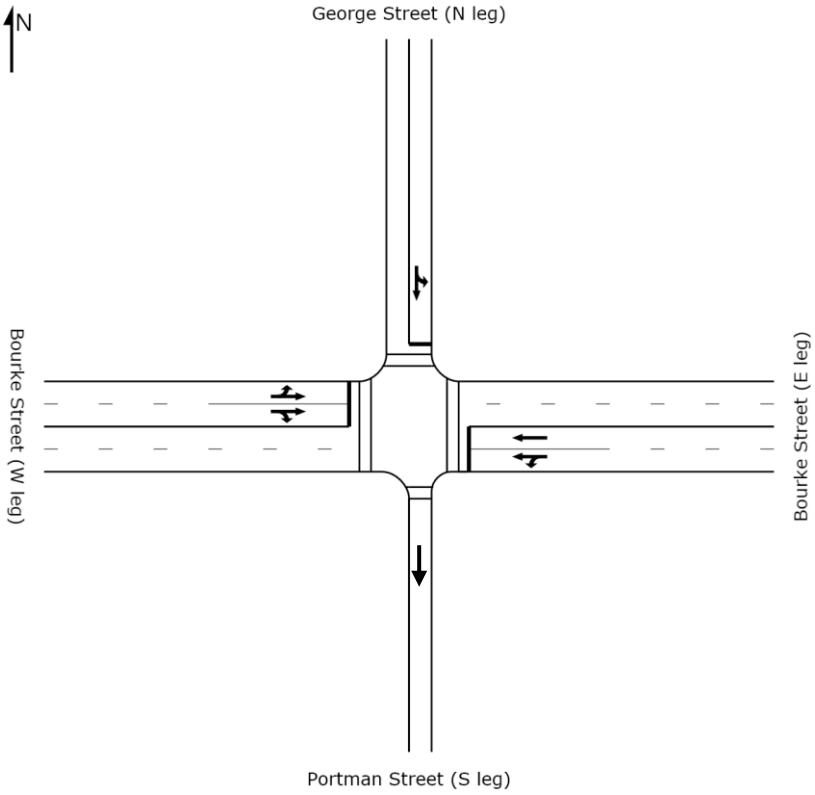



Source: AECOM; 2014

### 6.5.10 Bourke Street / Portman Street (Figure Reference 10)

The intersection of Bourke Street / Portman Street is nominated for assessment in the Roads and Maritime DA response. Signalisation of the intersection occurred part way through the assessment of the GSTC and it has been included appropriately in the modelling. Performance statistics for the intersection are provided in **Section 7.1**. The current intersection design is illustrated graphically in **Figure 6.18**.

**Figure 6.18 Bourke Street / Portman Street**

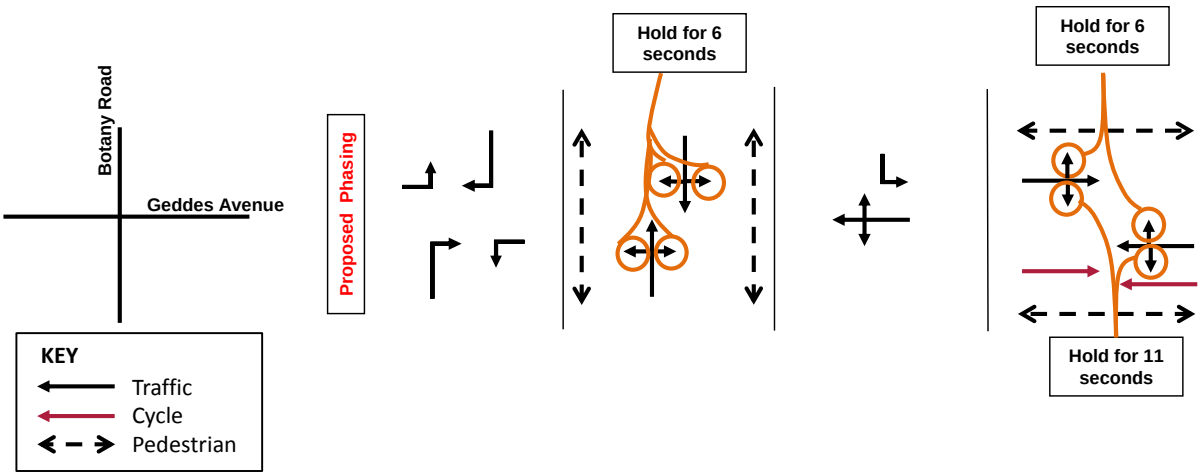



Source: AECOM; 2014

## 6.6 Intersection Phasing

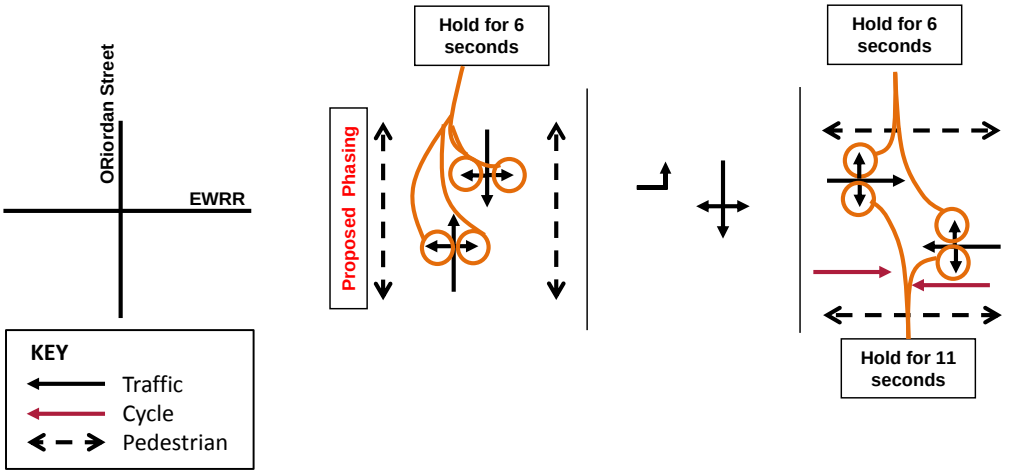
The following illustrations provide a graphical representation of the phasing operated at each of the intersections outlined above in **Section 6.5**. Phasing used in the operation of the below intersections shall be determined in conjunction with Roads and Maritime Services.

### 6.6.1 Botany Road / Geddes Avenue / East West Relief Road



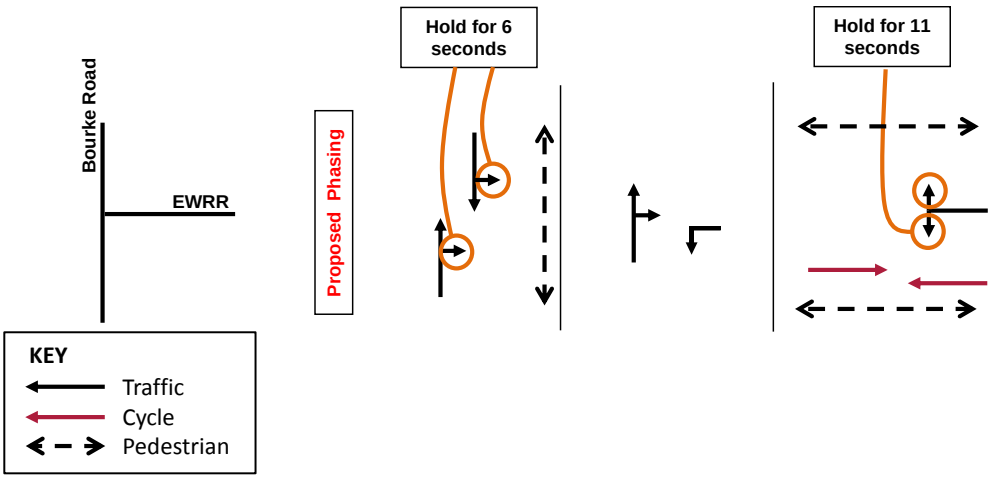

Source: AECOM; 2014

### 6.6.2 O'Riordan Street / East West Relief Road



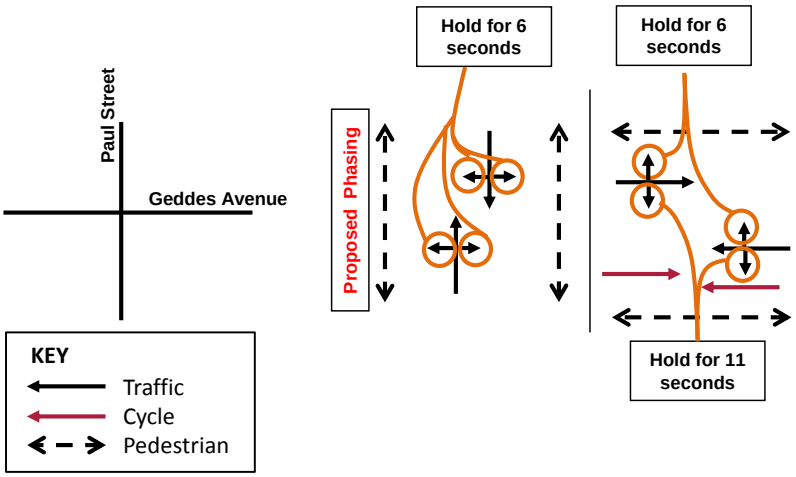

Source: AECOM; 2014

### 6.6.3 Bourke Road / East West Relief Road



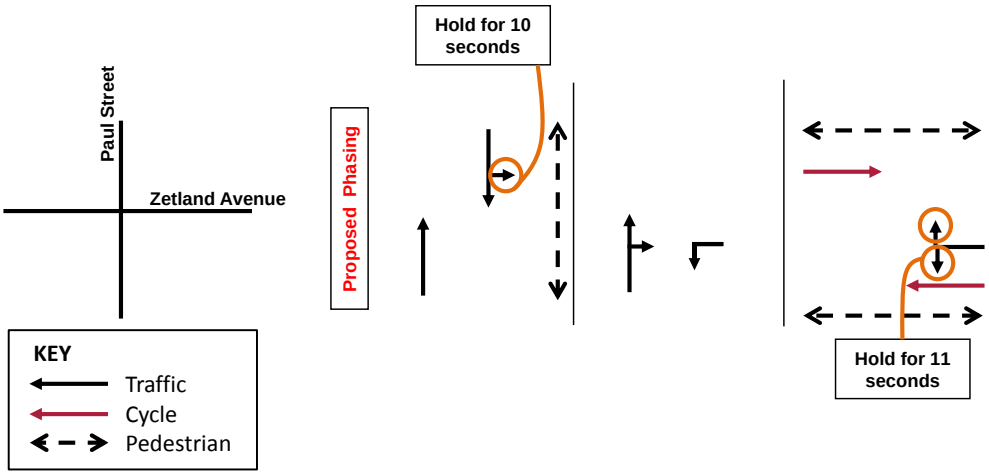

Source: AECOM; 2014

### 6.6.4 Geddes Avenue / Paul Street



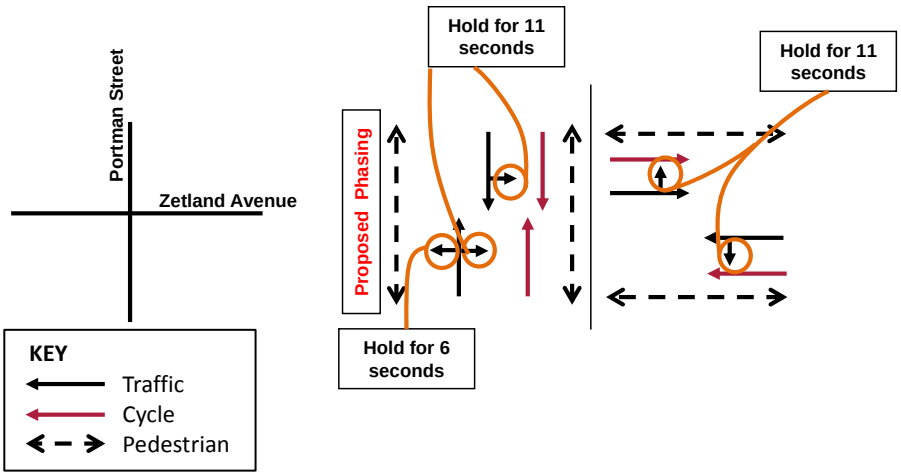

Source: AECOM; 2014

### 6.6.5 Zetland Avenue / Paul Street



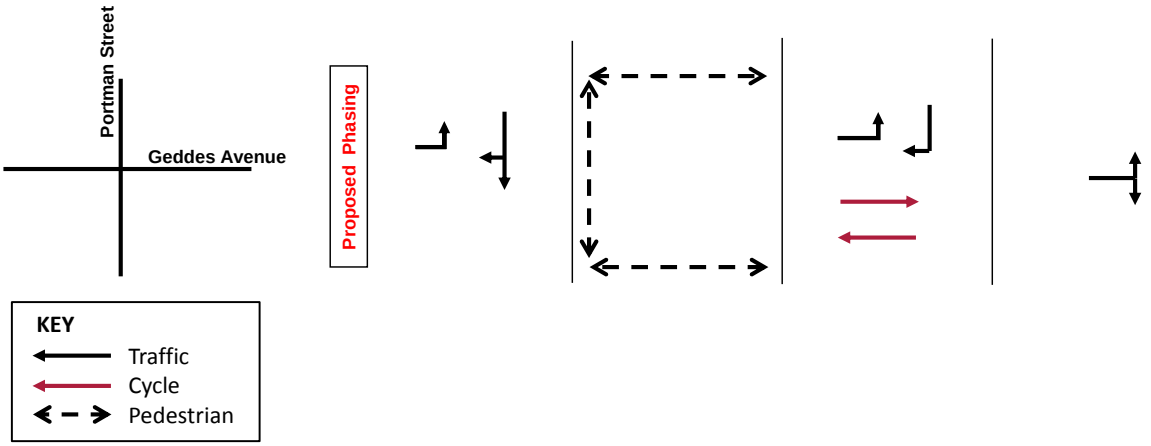

Source: AECOM; 2014

### 6.6.6 Zetland Avenue / Portman Street



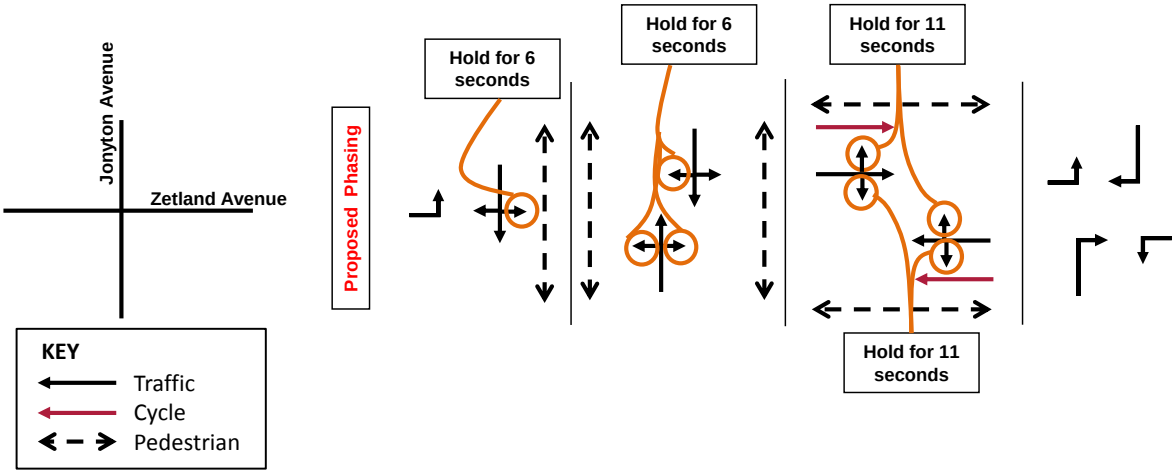

Source: AECOM; 2014

### 6.6.7 Geddes Avenue / Portman Street



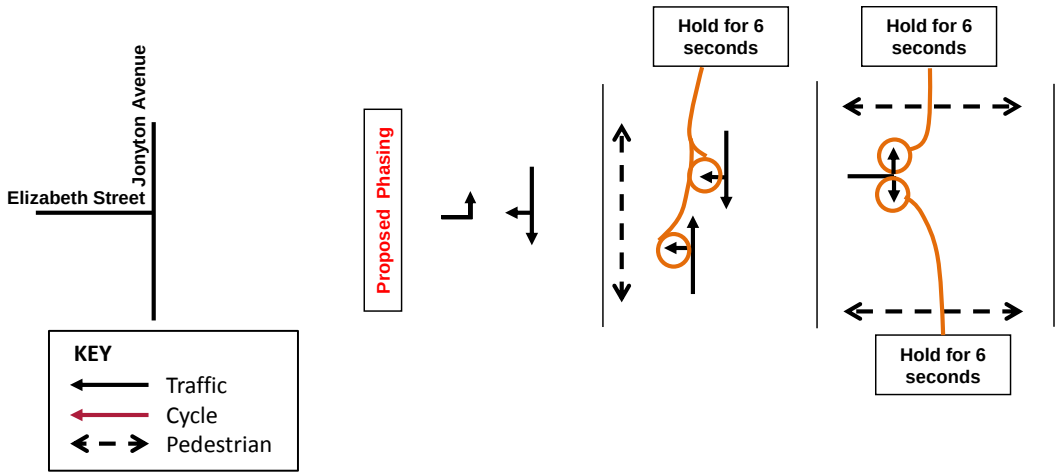

Source: AECOM; 2014

### 6.6.8 Zetland Avenue / Joynton Avenue




Source: AECOM; 2014

### 6.6.9 Elizabeth Street / Joynton Avenue




Source: AECOM; 2014

# 7.0 Future Intersection Performance

## 7.1 2031 Modelling Results

Intersection microsimulation modelling results for the 2031 AM and PM peak periods indicate the network is operating at an acceptable LoS in both the AM and PM peak periods, with the exception of the H-intersection and Bourke Street / Elizabeth Street, which operates at LoS E and/or F during the AM and PM peak hour. Modelled results are provided below in **Table 7.1**.

When interpreting the intersection performance results it is important to note that intersection delay is measured only to an upstream or downstream intersection and as such network queuing is also an important consideration to observe the potentially compounding effect across the network. This is particularly relevant on the external road network surrounding the GSTC due to the close spacing of signalised intersections. AM and PM peak hour illustrations of queuing extending from the H-intersection and impacting on surrounding intersections are noted in **Figure 7.1** and **Figure 7.2**, respectively. It can be seen that despite the H-intersection showing LoS E the impacts across the network are much greater due to the extensive queuing and associated delay which are transferred to the surrounding intersections. Intersections whose average delay is impacted upon by queueing are denoted with a marking in **Table 7.1**. In the case of Bourke Street / Elizabeth Street it is noted that even if capacity improvements were provided to relieve queuing at the H-intersection capacity issues would still be present. This is due to the competing demands between Elizabeth Street and Bourke Road.

The modelling queue lengths illustrated in **Figure 7.1** and **Figure 7.2** are representative of the maximum queue length seen during the AM and PM peak hours, providing a worst case assessment. In practice queues build across the peak hour as the volume of traffic increases on the road network. Following the peak hour these queues then dissipate as demands across the network decline. The intersection performance figures shown in **Table 7.1** represent the average delay across the peak hour, thereby providing an overall figure of performance. This difference between the two performance metrics is important to consider when comparing the outputs.

In undertaking the required modelling priority has been provided to Botany Road in accordance with discussions with Roads and Maritime which noted that delays were preferential to occur on the local (collector) road network.

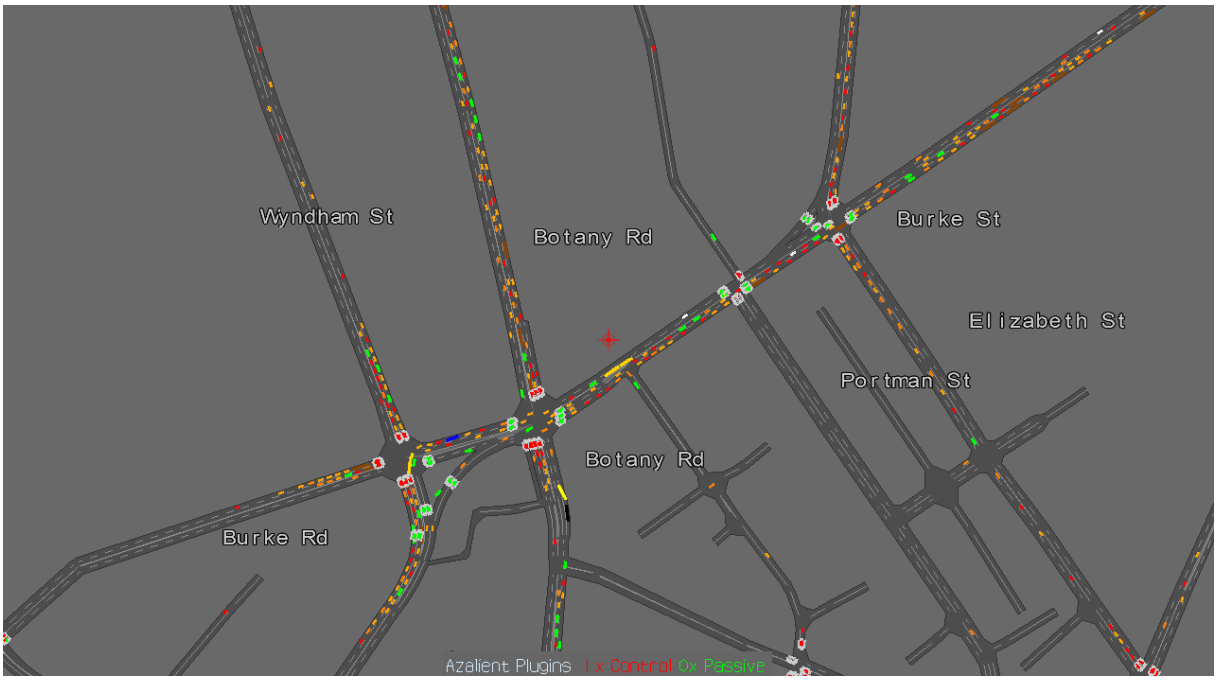
**Table 7.1 2031 AM and PM Peak Hour Intersection Performance – GSTC Precinct**

| Intersection | Vehicles | Average | Level of | Vehicles | Average | Level of |
|---|---|---|---|---|---|---|
| | AM Peak Hour | | | PM Peak Hour | | |
| Botany Road / Geddes Avenue / EWRR | 2,985 | 40.7 | C | 2,960 | 30.9 | C* |
| Zetland Avenue / Paul Street | 346 | 28.3 | C | 404 | 26.3 | B |
| Geddes Avenue / Paul Street | 1,025 | 20.2 | B | 1,307 | 25.3 | B |
| Zetland Avenue / Joynton Avenue | 2,538 | 49.3 | D | 2,039 | 33.0 | C |
| Joynton Avenue / Elizabeth Street | 2,302 | 23.8 | B | 1,989 | 23.4 | B |
| Zetland Avenue / Portman Street | 965 | 33.5 | C | 812 | 22.3 | B |
| O'Riordan Street / EWRR | 2,710 | 28.7 | C | 2,881 | 37.7 | C* |
| Bourke Road / EWRR | 1,142 | 13.2 | A | 1,150 | 13.6 | A |
| Botany Road / Bourke Road (H-intersection east) | 4,180 | 52.2 | D | 4,308 | 62.8 | E |
| Wyndham Street / O'Riordan Street (H-intersection west) | 2,462 | 65.1 | E | 2,475 | 52.3 | D |
| Bourke Street / Portman Street | 2,367 | 19.1 | B* | 2,586 | 20.3 | B* |
| Geddes Avenue / Portman Street | 580 | 8.9 | A | 512 | 7.2 | A |
| Bourke Street / Elizabeth Street | 3,293 | 101.6 | F* | 3,460 | 67.1 | E* |

* = Average delay impacted upon by queuing extending from adjacent intersection

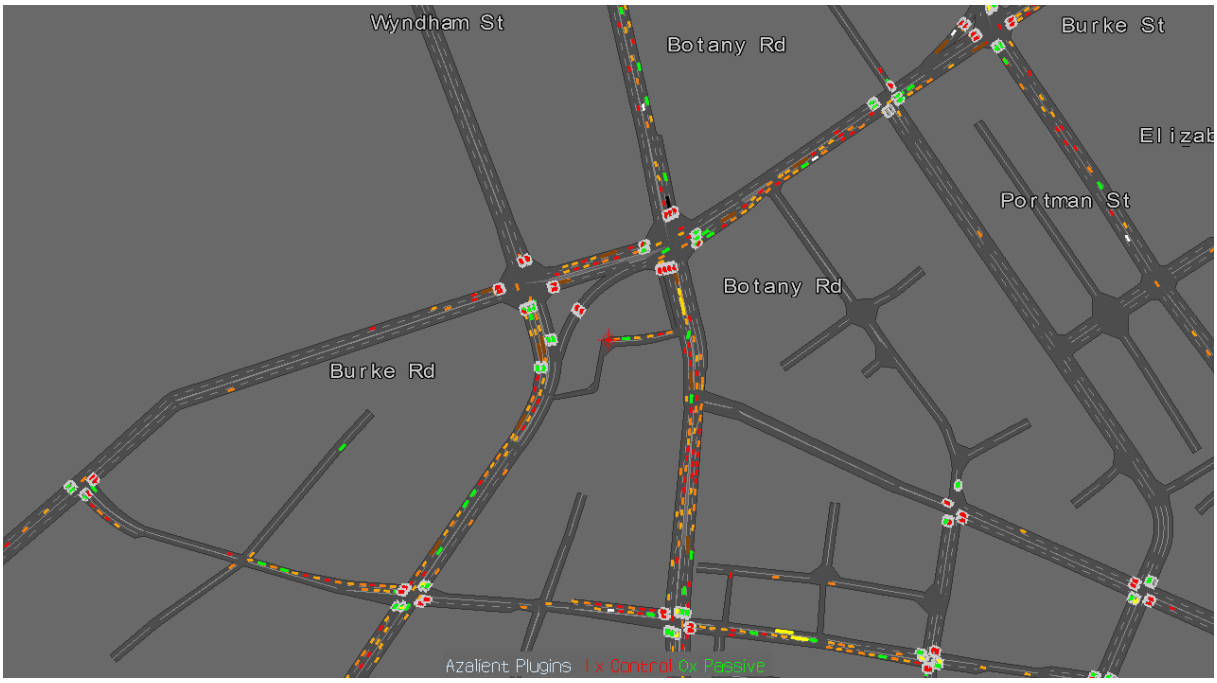
Source: AECOM; 2014

**Figure 7.1 2031 GSTC AM Peak Road Network – Network Queuing**




Source: AECOM; 2014

**Figure 7.2 2031 GSTC PM Peak Road Network – Network Queuing**




Source: AECOM; 2014

# 8.0 Summary

## 8.1 Summary

This report has provided a summary of the process, assumptions and results of the GSTC network modelling during the AM and PM peak hour periods in 2031. Detailed stakeholder consultation with Council's City's Transport Strategy and Traffic Operations Units, Roads and Maritime and Transport for NSW has been a key element during the model development process and the final outcomes reflect this collaboration in relation to the successful development of the GSTC.

The GSTC precinct is proposed to be signposted as a 50km/h zone with the exception of the northern component which, due to the high level of retail and pedestrian activity, is designated as 40km/h. Signalised intersections, directly relating to the development of the GSTC and included in the scope of the development, are proposed at the following locations (subject to future application to and approval by Roads and Maritime):

- Botany Road / Geddes Avenue;
- Geddes Avenue / Paul Street;
- Paul Street / Zetland Avenue;
- Zetland Avenue / Portman Street;
- Geddes Avenue / Portman Street;
- Zetland Avenue / Joynton Avenue; and,
- Elizabeth Street / Joynton Avenue.

Due to the projected congestion levels and density of the GSTC it is anticipated that there will be a high level of pedestrian and cycle usage across the Precinct. This has been catered for in the design of the precinct with pedestrian crossings provided on all approaches at each signalised intersection and separated cycleways implemented on Zetland Avenue, Portman Street and Geddes Avenue. The Portman Street cycleway forms a regional connection which links Green Square to the Sydney Central Business District.

Provision for future bus routes through the town centre has been included in the 2031 model in line with allowances agreed with Transport for NSW.

At the beginning of the GSTC assessment process intersection performance metrics indicated poor levels of operation for intersections with a corresponding reduced level of pedestrian facility provision. As a result the previously agreed traffic generation rate was analysed and compared against revised Roads and Maritime guidelines (TD13-04). As a result a reduced traffic generation rate was agreed in alignment with the revised guidelines.

Modelling results indicate that the road network surrounding the GSTC will be constrained in future years as the network approaches capacity due to the GSTC, Epsom Precinct, EWRR and Site 1 developments. However, based on the revised model inputs and amendment to signal phasing agreed in collaboration with Roads and Maritime intersection delays for the road network surrounding the GSTC, excluding the H-intersection and Bourke Street / Elizabeth Street, are shown to fall within acceptable LoS parameters.

It should be noted that delays extending across multiple intersections exist and are frequently experienced in both peak periods with network queuing occurring as a result, as highlighted in **Section 7**. Analysis indicates that the surrounding road network is subject to congestion and sensitive to delay and changes in traffic patterns across the network. The road corridors of Botany Road, O'Riordan Street, Epsom Road and Bourke Road are key routes which provide permeability for regional traffic patterns. While outside the scope of the GSTC development, these routes play a key role in the functionality and performance of the road network within the GSTC.

The abovementioned sensitivity is not prevalent for intersections within the GSTC which record a LoS no worse than C during the AM and PM peak hour periods. The need for signalised intersections within the GSTC is driven by pedestrian demands, sight distance issues and safety requirements due to conflicts with cyclist movements.

The road environment on the road network surrounding the GSTC is constrained with respect to available upgrades. It is recommended that future upgrades, whilst not considered as part of this report, with the exception

of H-intersection, should be focused on the movement of individuals as opposed to vehicles to ensure and improve the efficiency of travel in the vicinity of the GSTC.

## 8.2 Next Steps

Following on from this report the following actions are recommended:

- Roads and Maritime to provide signoff on the outcomes of the modelling to allow the GSTC project team to progress with the traffic control signal (TCS) design for the precinct;
- Finalise intersection and road designs confirming to requirements of this report for CC approval by City of Sydney Council; and,
- Formalise 40km/h speed zone application for the northern high pedestrian activity component of the GSTC precinct.

Appendix A

# Comments Register

**Green Square Town Centre Essential Infrastructure and Public Domain: 2031 Traffic Modelling Synopsis - Comments and Action Register**

| Reference | Comment | Originator | Response | Actioned by |
|---|---|---|---|---|
| 1 | The report details minimum protection times for pedestrians and cyclists. Pedestrian and cyclist protection times will be determined by RMS. These times will be based on pedestrian, cycle, vehicular and geometry requirements. Net Ops would be reluctant to list minimum requirements for pedestrian and cycle protections based on this report alone. Detailed traffic signal designs would be required to be analysed before these times will be tabled. | Roads and Maritime Services (Road Network Operations) | It is noted that Roads and Maritime Services would determine the desired minimum requirements for pedestrian and cycle protection and the assumptions listed in the report have only been used as a guide. The following wording has been added to Section 5.1.2 of the report: *'It is noted that all pedestrian and cycle protection timings will be agreed by Roads and Maritime prior to operation of any signalised intersection constructed as part of the Green Square development area. The cycle times currently used in the modelling reflect timings agreed with Roads and Maritime at a strategic level.'* | AECOM / City of Sydney Council |
| 2 | It is noted within the report that the eastern portion of the road network will experience, "High levels of anticipated future traffic volumes" as a result of the GSTC development.<br>This should be taken into account in any future commitments with traffic studies and correspondence. | Roads and Maritime Services (Road Network Operations) | Noted | - |
| 3 | The report details cycle times. Cycle times to be solely determined by RMS. These cycle times will be based on pedestrian, cycle, vehicular geometry and co-ordination requirements. Net Ops would be reluctant to commit to minimum or maximum cycle times based on this report alone. Detailed traffic signal designs and road network constraints would be required to be analysed before these times will be tabled. | Roads and Maritime Services (Road Network Operations) | The following text has been added to **Section 5.1.1**. *'Cycle times at the abovementioned intersections shall be determined by RMS following assessment of road constraints and detailed signal designs.'* | AECOM / City of Sydney Council |
| 4 | The proposed mid-block crossing on Botany Road has been opposed by RMS since the beginning of the development. The current Green Square Rail Station allows for safe pedestrian access via an underground pathway. The proposed crossing appears to duplication an existing pedestrian pathway. Additionally, the crossing will cause a further detrimental effect on Botany Road may not be manageable. It is highly likely that queuing form this site will extend back through the intersection of Botany Road and O'Riordan Street to the north. Botany Road and O'Riordan Street are critical public transport corridors and possible further delays should be avoided at | Roads and Maritime Services (Road Network Operations) | Roads and Maritime's position is noted. A signalised pedestrian crossing on Botany Road providing access between Green Square Train Station and the proposed Civic Plaza is not subject to consideration in this modelling report | - |

| Reference | Comment | Originator | Response | Actioned by |
|---|---|---|---|---|
| | all costs. | | | |
| 5 | This proposed intersection should be measured against the warrants for new traffic signal sites. The report indicates the reason for signals at this site is due to, *"The competing needs of pedestrians, cyclists, buses and private vehicles who will traverse the intersection and the inherent safety concerns for all users in the event that the intersection operates in an uncontrolled manor."*<br>Council will need to clarify the levels of competing needs and the features of this intersection that makes in inherently unsafe if it were uncontrolled. | Roads and Maritime Services (Road Network Operations) | The comments provided by Roads and Maritime are noted and **Section 6.5.4** has been modified accordingly. | AECOM / City of Sydney Council |
| 6 | The close proximity of these signals to at Zetland Avenue and Portman Street are a significant concern for the "see through" issues. The suggestion that the existing grade of the road can mitigate the see through effect should be disregarded. This is absolute speculation and cannot be proven without review on site conditions. In addition, to make Portman Street one way southbound only addresses the northbound traffic. The Southbound motorists will still be confronted with 2 traffic signals site within 45m of each other and may confuse the signals. Furthermore, Council will need to detail how the see through effect is to "managed through signal phasing". Council also acknowledges that this site may not meet the warrants and details a cycle time of 90 seconds. As per previous comments RMS will determine the optimum cycle times based on various established factors rather that a "feeling". | Roads and Maritime Services (Road Network Operations) | The comments provided by Roads and Maritime are noted and **Section 6.5.7** has been modified accordingly. | AECOM / City of Sydney Council |
| 7 | The phasing details indicate a diamond phasing arrangement for Botany Road and a designated westbound phase on Geddes Road. It would appear that the diamond phasing is duplicating right turns that are currently in existence in nearby traffic signals. Northbound motorists wishing to turn right in Geddes Avenue can turn right at the existing right turn phase at Epsom Road and access the GSTC via a number of routes through Epsom Road. Southbound motorists can turn right at the existing right turn at Collins Street which will allow access to Both O'Riordan Street and Bourke Street. . Additionally, the westbound phase from Geddes Avenue requires further information. Network Operations would prefer to operate east and westbound traffic on Geddes Avenue in one phase with filter right | Roads and Maritime Services (Road Network Operations) | The phasing included in the model is in accordance with previous comments provided by Roads and Maritime at our meeting of 22 May 2014. Notwithstanding this AECOM / Council note that Roads and Maritime are responsible for the determination of phasing at signalised intersections. Accordingly, whilst the intersection has been shown to operate efficiently with the phasing noted in the report, should Roads and Maritime wish to alter the phasing during operation this is supported. The following sentence has been added to the report (Section 6.6) to illustrate this point: *'Phasing used in the operation of the below intersections shall be* | AECOM / City of Sydney Council |

| Reference | Comment | Originator | Response | Actioned by |
|---|---|---|---|---|
| | turns. | | *determined in conjunction with Roads and Maritime Services.'* | |
| 8 | The phasing arrangement details an exclusive pedestrian phase. Network Operation would prefer that the pedestrians cross parallel with traffic movements. In doing this, the traffic signals will operate more efficiently for all users of the intersection. Under an exclusive pedestrian phase the vehicle delays are significantly increased as during this phase there are no vehicle movements. Higher vehicle delays increase the cycle length consequently the pedestrian wait times will be increased. Operating pedestrians with vehicles will allow the signals to cycle at lower times and allow for less wait times for pedestrians. | Roads and Maritime Services (Road Network Operations) | The phasing included in the model is in accordance with previous comments provided by Roads and Maritime at our meeting of 22 May 2014. AECOM / Council note that Roads and Maritime are responsible for the determination of phasing at signalised intersections. Accordingly, whilst the intersection has been shown to operate efficiently with the phasing noted in the report, should Roads and Maritime wish to alter the phasing during operation this is supported. The following sentence has been added to the report (Section 6.6) to illustrate this point: *'Phasing used in the operation of the below intersections shall be determined in conjunction with Roads and Maritime Services.'* | AECOM / City of Sydney Council |
| 9 | It is noted within the report that, "The road network surrounding the GSTC will be constrained in future years as the network approaches capacity due to the GSTC, Epsom Precinct, EWRR and Site 1 developments", furthermore the report details, "It should be noted that delays extending across multiple intersections still exist and are frequently experienced in both peak periods with network queuing occurring as a result, as highlighted in Section 7. Analysis indicates that the surrounding road network is subject to congestion".<br>These statements list in the summary indicate that Council concede that the traffic conditions as a result of the development and changes to the nearby road network will significantly degrade the traffic conditions in this precinct. RMS should reiterate to Council that these increases and resulting congestion are cannot be alleviated by adjustments to traffic signal phasing or co-ordination. | Roads and Maritime Services (Road Network Operations) | During the development of the model and in consultations with RMS it has become clear that the operation of the surrounding road network shall be constrained in the future due to the limited available potential capacity upgrades. This has also been a major feedback from the community. | - |
| 10 | There needs to be some comment as to why the existing situation model is not reported in the same way as Table 7.1. | Roads and Maritime Services (Network Optimisation) | Modification to text in **Section 3.1** of the report to read, *'Existing network performance results for the GSTC road network are documented in the 2013 Bitzios Report 'Green Square Town Centre Parking and Traffic Study. It should be noted that in the abovementioned report the network performance was presented on an area wide basis and not at an intersection level as documented in* | AECOM / City of Sydney |

| Reference | Comment | Originator | Response | Actioned by |
|---|---|---|---|---|
| | | | ***Section 7.0****.AECOM have not modified the base models performance reporting structure developed by Bitzios for the preparation of this report and as such existing performance in provided only on a network basis.'* | |
| 11 | **Table 7.1** - if the results are from Paramics, we need to be sure that the delays reported are for the full extent of the queues developed, not just to the next intersection. If queues are transferred to adjacent intersection reporting this is not giving a true indication of performance. | Roads and Maritime Services (Network Optimisation) | Issue of reporting delays has been discussed with Chris Zito (Roads and Maritime). Noted that the ability to capture effect of delays across multiple intersections difficult due to various factors such as dead green time blocking versus general delays as a result of signal phasing. Decision was agreed to highlight each intersection whose calculation of average delay in the peak hour which is affected by downstream traffic impacts. In addition it was agreed that the report must identify which intersections would likely still perform poorly in the event that the capacity of the H-intersection was improved. **Section 7.1** has been updated to reflect these comments. | AECOM / City of Sydney |
| 12 | Bourke/Elizabeth isn't in **Table 7.1** | Roads and Maritime Services (Network Optimisation) | **Table 7.1** updated to reflect intersection performance results for Bourke / Elizabeth. | AECOM / City of Sydney |
| 13 | **Figures 7.1** and **7.2** don't seem consistent with **Table 7.1**. | Roads and Maritime Services (Network Optimisation) | Issue of reporting queues has been discussed with Chris Zito (Roads and Maritime). It was noted that the queues represent the maximum length reached over the peak period whilst intersection delay is presented as an average across the hour. **Section 7.1** has been updated to detail the differing methods of presentation output. | AECOM / City of Sydney |

Appendix B

# Revised Phasing Addendum

| | | | |
|---|---|---|---|
| Project | Green Square Town Centre | Job No: | 60300384 |
| Subject: | **GSTC Modelling Report – Technical Note Addendum** | | |
| Created by: | Seamus Christley | Date: | 07/11/2014 |
| Reviewed by: | Rob Mason | Date | 07/11/2014 |
| Approved by: | Rob Mason | Date | 07/11/2014 |

## 1.0 Introduction

AECOM have been commissioned by the City of Sydney to progress the approved Essential Infrastructure DA through CC approval and construction.

As part of early planning of Phase 1 (site wide strategies) and Phase 2 (CC stage) works the operation of signal phasing suggested for implementation on proposed signalised intersections within the GSTC Town Centre has been considered. All intersections have previously been evaluated as part the GSTC Modelling Report (2014), however, since the publication of this document alterations to signal phasing have been proposed as part of detailed design development at the following locations:

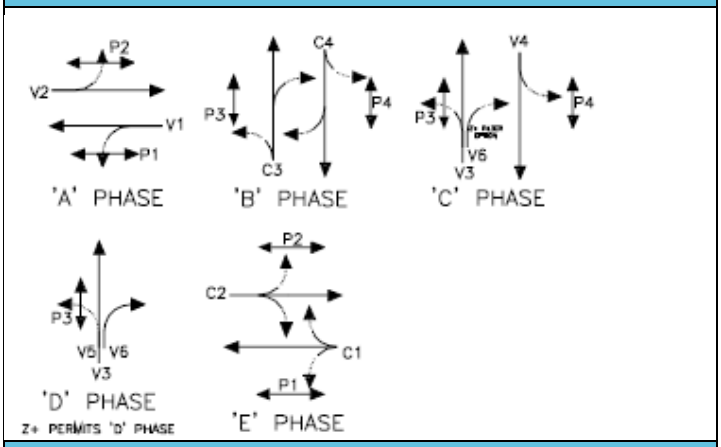
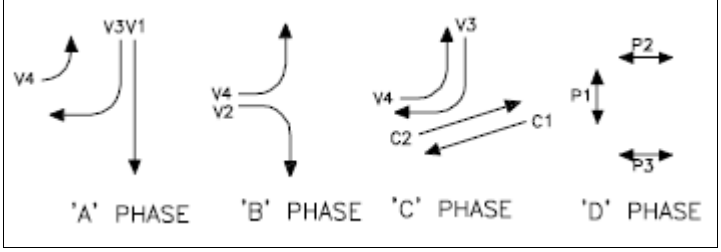
- Zetland Avenue / Portman Street
- Geddes Avenue / Portman Street

This technical note provides an overview of the performance of the revised intersection arrangements and is provided to support the assessment of the traffic control signal (TCS) plans for the abovementioned sites.

## 2.0 Revised Phasing Operation

**Table 1** provides an illustration of the revised phasing for the intersections of Zetland Avenue / Portman Street and Geddes Avenue / Portman Street as included in the signal plans issued to RMS as part of Phase 2 - Package 2. Roads and Maritime have suggested the potential operation of these intersections as a pair.

**Table 1 Revised Phasing – Traffic Control Signal Locations**

| Zetland Avenue / Portman Street |
|---|
|  |
| **Geddes Avenue / Portman Street** |
|  |

Source: AECOM; 2014

## 3.0 Operational Performance

**Table 3** provides a summary of the operational performance of the intersections of Zetland Avenue / Portman Street and Geddes Avenue / Portman Street under the proposed phasing arrangements presented in Section 2 during the AM and PM peak hour periods.

The capacity of an urban road network is controlled by the throughput of traffic at intersections within that network. Average delay is commonly used to assess the actual performance of intersections, with Level of Service (LoS) used as an index. A summary of the LoS index is shown in Table 2.

**Table 2 Intersection Performance Criteria**

| Level of Service | Average Delay/ Vehicle (secs/veh) | Traffic Signals \| Roundabout | Give Way \| Stop Signs |
|---|---|---|---|
| A | Less than 14 | 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 excessive delays<br>Roundabouts require other control mode | At capacity; requires other control mode |
| F | >70 | At capacity; at signals incidents will cause excessive delays<br>Roundabouts require other control mode | At capacity; requires other control mode |

Source: Guide to Traffic Generating Developments, Roads and Maritime, 2002

Modelling results indicate that the intersections both perform with a Level of Service no worse than D using the phasing presented in the signal plans. The increase in delay noted is as a result of the addition of dedicated cycling phasing which provides great safety and priority for cyclists. This in turn results in high delays to other road users such as vehicles which are used to determine the Level of Service parameters outlined below.

**Table 3 Intersection Performance Results**

| Intersection | Vehicles | Average Delay | Level of Service | Vehicles | Average Delay | Level of Service |
|---|---|---|---|---|---|---|
| | AM Peak Hour | | | PM Peak Hour | | |
| **Modelling Report Results (August 2014)** | | | | | | |
| Zetland Avenue / Portman Street | 965 | 33.5 | C | 812 | 22.3 | B |
| Geddes Avenue / Portman Street | 580 | 8.9 | A | 512 | 7.2 | A |
| **Revised Phasing Arrangement (November 2014)** | | | | | | |
| Zetland Avenue / Portman Street | 961 | 49.3 | D | 819 | 28.2 | B |
| Geddes Avenue / Portman Street | 586 | 20.8 | B | 520 | 6.9 | A |

Source: AECOM; 2014

## 4.0 Summary

Modelling indicates that the proposed phasing arrangements for the intersections of Zetland Avenue / Portman Street and Geddes Avenue / Portman Street perform efficiently and in line with Roads and Maritime Service guidelines upon completion of the GSTC.

It is noted that the phasing changes do not have any impact on the performance (Level of Service) of intersections on the external road network (Botany Road and Joynton Avenue).

Appendix C

# Development Characteristics

EPSOM PARK GFA - November 2013
( Reflects Rose Valley Way Realigned for SW)

| Lot | Area | Total | FSR | GFA sqm | Use | Commercial | Residential |
|---|---|---|---|---|---|---|---|
| 1 | 1,747 | 1,747 | 5 | 7,862 | Mixed | 393 | 7,468 |
| 2 | 1,527 | 1,527 | 4 | 6,108 | Mixed | 305 | 5,803 |
| 3 | 1,802 | 1,802 | 3 | 5,046 | Mixed | 252 | 4,793 |
| 4 | 4,377 | 4,377 | 3 | 14,882 | Mixed | 298 | 14,584 |
| 5 | 5,045 | 5,045 | 3 | 15,135 | Mixed | 303 | 14,832 |
| 6 | 9,122 | 9,122 | 1 | 11,859 | Community | 11,859 | 0 |
| 12 | 9,340 | 9,340 | 3 | 28,020 | Mixed | 1,401 | 26,619 |
| 13 | 6,110 | 6,110 | 2 | 14,053 | Mixed | 703 | 13,350 |
| 14 | 2,016 | 2,016 | 3 | 5,645 | Mixed | 282 | 5,363 |
| 15 | 5,215 | 5,215 | 2 | 11,734 | Mixed | 352 | 11,382 |
| 16 | 2,254 | 2,254 | 5 | 11,946 | Mixed | 597 | 11,349 |
| 17 | 1,188 | 1,188 | 3 | 3,089 | Residential | 0 | 3,089 |
| 18 | 4,731 | 4,731 | 3 | 12,301 | Mixed | 369 | 11,932 |
| 20 | 698 | 698 | 2 | 1,605 | Residential | 0 | 1,605 |
| 21 | 5,007 | 5,007 | 2 | 11,516 | Mixed | 345 | 11,171 |
| 23 | 3,773 | 3,773 | 4 | 13,583 | Residential | 0 | 13,583 |
| 24 | 2,101 | 2,101 | 3 | 6,093 | Residential | 0 | 6,093 |
| 25 | 1,293 | 1,293 | 3 | 3,750 | Residential | 0 | 3,750 |
| 26 | 2,105 | 2,105 | 6 | 12,209 | Mixed | 610 | 11,599 |
| 27 | 529 | 529 | 6 | 3,069 | Mixed | 153 | 2,915 |
| 28 | 6,749 | 6,749 | 3 | 17,547 | Residential | 0 | 17,547 |
| 30 | 4,249 | 4,249 | 3 | 14,447 | Mixed | 722 | 13,724 |
| 32 | 1,018 | 1,018 | 4 | 3,970 | Mixed | 199 | 3,772 |
| 33 | 2,014 | 2,014 | 5 | 10,674 | Mixed | 534 | 10,140 |
| | | | | 246,140 | 0 | 19,678 | 226,462 |

East West Relief Route Development Potential - GFA

| Lot | Area | Road | FSR | GFA sqm | Use | Commercial | Residential |
|---|---|---|---|---|---|---|---|
| 1 | 1,542 | | 2 | 3,084 | Business | 3,084 | 0 |
| 2 | | 1,602 | 2 | 0 | Road | 0 | 0 |
| 3 | 4,259 | | 2 | 8,519 | Business | 8,519 | 0 |
| 4 | 15,200 | | 2 | 30,400 | Mixed | 25,840 | 4,560 |
| 5 | | 2,468 | 2 | 0 | Road | 0 | 0 |
| 6 | 882 | | 2 | 1,763 | Business | 1,763 | 0 |
| 7 | | 698 | 2 | 0 | Road | 0 | 0 |
| 8 | 7,790 | | 2 | 15,580 | | 15,580 | 0 |
| 9 | 7,298 | | 2 | 10,947 | Business | 10,947 | 0 |
| 10 | | 97 | 2 | 145 | Business | 145 | 0 |
| 11 | | 1,233 | 2 | 0 | Road | 0 | 0 |
| 12 | | 155 | 2 | 0 | Road | 0 | 0 |
| 13 | | 304 | 2 | 0 | Road | 0 | 0 |
| 14 | | 52 | 2 | 0 | Road | 0 | 0 |
| 15 | 782 | | 2 | 1,173 | Business | 1,173 | 0 |
| 16 | 98 | | 2 | 147 | Business | 147 | 0 |
| 17 | | 8 | 2 | 0 | Road | 0 | 0 |
| 18 | | 29 | 2 | 0 | Road | 0 | 0 |
| 19 | 1,391 | | | 2,087 | Business | 2,087 | 0 |
| 20 | 1,848 | | 2 | 2,772 | Business | 2,772 | 0 |
| 21 | | 265 | 2 | 0 | Road | 0 | 0 |
| 22 | | 1,599 | 2 | 0 | Road | 0 | 0 |
| 23 | 2,252 | | 2 | 3,378 | Business | 3,378 | 0 |
| TOTAL | 43,342 | 8,509 | | 79,994 | | 75,434 | 4,560 |

## GSTC Development Figures

| Development Site Number | Commercial GFA (m²) | Retail GFA (m²) | Residential GFA (m²) | Total GFA (m²) |
|---|---|---|---|---|
| 5a | 267 | 1,414 | 19,108 | 20,789 |
| 5b | 0 | 455 | 6,129 | 6,584 |
| 6 | 4,334 | 0 | 31,466 | 35,800 |
| 7 | 385 | 1,800 | 12,080 | 14,265 |
| 10a | 619 | 0 | 5,126 | 5,745 |
| 10b | 351 | 0 | 2,173 | 2,524 |
| 11a | 0 | 0 | 13,534 | 13,534 |
| 11b | 0 | 0 | 7,029 | 7,029 |
| 11c | 344 | 0 | 2,776 | 3,120 |
| 16a | 0 | 493 | 6,600 | 7,093 |
| 16b | 0 | 490 | 6,636 | 7,126 |
| 17 | 399 | 621 | 7,028 | 8,048 |
| 8a | 28,557 | 911 | 0 | 29,468 |
| 8b | 20,049 | 809 | 0 | 20,858 |
| 8c | 0 | 2,352 | 21,570 | 23,922 |
| 8d | 0 | 630 | 6,045 | 6,675 |
| 19a | 184 | 1,631 | 14,543 | 16,358 |
| 19b | 188 | 271 | 5,765 | 6,224 |
| 20 | 3,300 | 0 | 0 | 3,300 |
| 9a | 1,027 | 0 | 9,781 | 10,807 |
| 9b | 920 | 0 | 19,614 | 20,534 |
| 12a | 672 | 0 | 28,794 | 29,466 |
| 12b | 0 | 0 | 5,234 | 5,234 |
| 13a | 1,438 | 0 | 25,705 | 27,142 |
| 13b | 1,923 | 0 | 0 | 1,923 |
| 13c | 403 | 0 | 9,000 | 9,403 |
| 14 | 672 | 0 | 24,201 | 24,873 |
| 15a | 456 | 0 | 13,442 | 13,898 |
| 15b | 469 | 0 | 7,245 | 7,714 |
| 15c | 0 | 659 | 9,565 | 10,224 |
| 15d | 0 | 0 | 2,467 | 2,467 |
| 18 | 247 | 224 | 8,128 | 8,599 |
| **GRAND RUNNING TOTAL** | **67,204** | **12,760** | **330,784** | **410,747** |

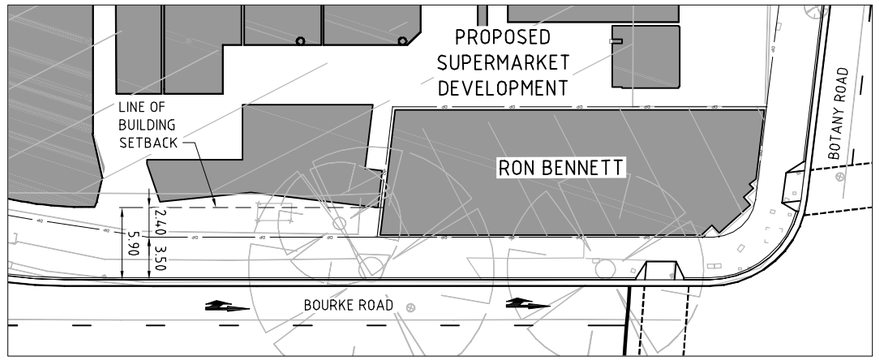
**Site 1 Characteristics**

| | Gross Floor Area (GFA) | | Net Leaseable Area (NFA) | | |
|---|---|---|---|---|---|
| **Level** | **Retail** | **Commercial** | **Retail** | **Commercial** | **Parking** |
| Basement 05 | | | | | 30 |
| Basement 04 | | | | | 30 |
| Basement 03 | | | | | 30 |
| Basement 02 | | | | | 30 |
| Basement 01 | | | | | 30 |
| Lower Ground | 0 | | 0 | | |
| Upper Ground | 160 | 250 | 145 | | |
| Level 1 | | 1960 | | 1800 | |
| Level 2 | | 1960 | | 1800 | |
| Level 3 | | 1960 | | 1800 | |
| Level 4 | | 1960 | | 1800 | |
| Level 5 | | 1960 | | 1800 | |
| Level 6 | | 1960 | | 1800 | |
| Level 7 | | 1960 | | 1800 | |
| Level 8 | | 1960 | | 1800 | |
| Level 9 | | 1400 | | 1280 | |
| Level 10 | | 1400 | | 1280 | |
| Level 11 | | 1400 | | 1280 | |
| Level 12 | | 1400 | | 1280 | |
| Level 13 | | 1400 | | 1280 | |
| Level 14 | | 1400 | | 1280 | |
| Level 15 | | 1400 | | 1280 | |
| Level 16 | | 1400 | | 1280 | |
| Total | 160 | 27130 | 145 | 24640 | 150 |

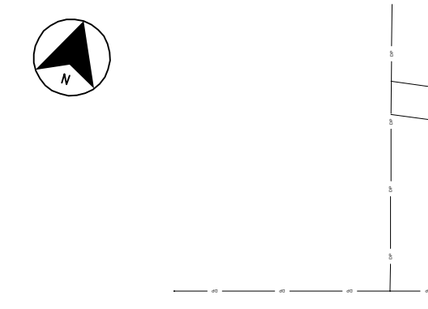
Appendix D

# H-Intersection Concept Design

AECOM




INSET A
SCALE 1:250




INSET B
SCALE 1:250




NOTE:
LANE WIDTH EXCLUDES 0.5m GUTTER

60316290-FIGURE-C-0301.dwg
13 Jun 14 - 11:34

REVISION - 01
ISSUE DATE - 12.06.14

5 0 5 10 15m
1 : 500 FULL SIZE A1

2.5 0 2.5 5 7.5m
1 : 250 FULL SIZE A1

O'RIORDAN STREET REALIGNMENT - CONCEPT DESIGN
GENERAL ARRANGEMENT
OPTION 4

60316290-FIGURE-C-0301

# APPENDIX D

Queuing Analysis

Green Square Public School - Queuing Calculations

PM Managed System fo Cars

| | |
|---|---|
| Vehicle Group Arrivals (veh/hr) | 114 |
| | |
| | |
| Pick up duration (sec) | 100 |
| Number of spaces | 6 |
| Total Average Time (sec) | 16.66667 |

| Queuing Theory Factors | | |
|---|---|---|
| average arrival rate (r) | 114.00000 | *r=(veh/hr) |
| average service rate (s) | 216.00000 | *s=3600/(Total Average Time) |
| utilisation factor (p) | 0.52778 | *p=r/s |
| mean queue (E(m)) | 0.58987 | *E(m)=(p/(1-p))-p |

| **System 1** | |
|---|---|
| 114 | 60mins |
| | |
| | |
| 114 | |
| Total | |

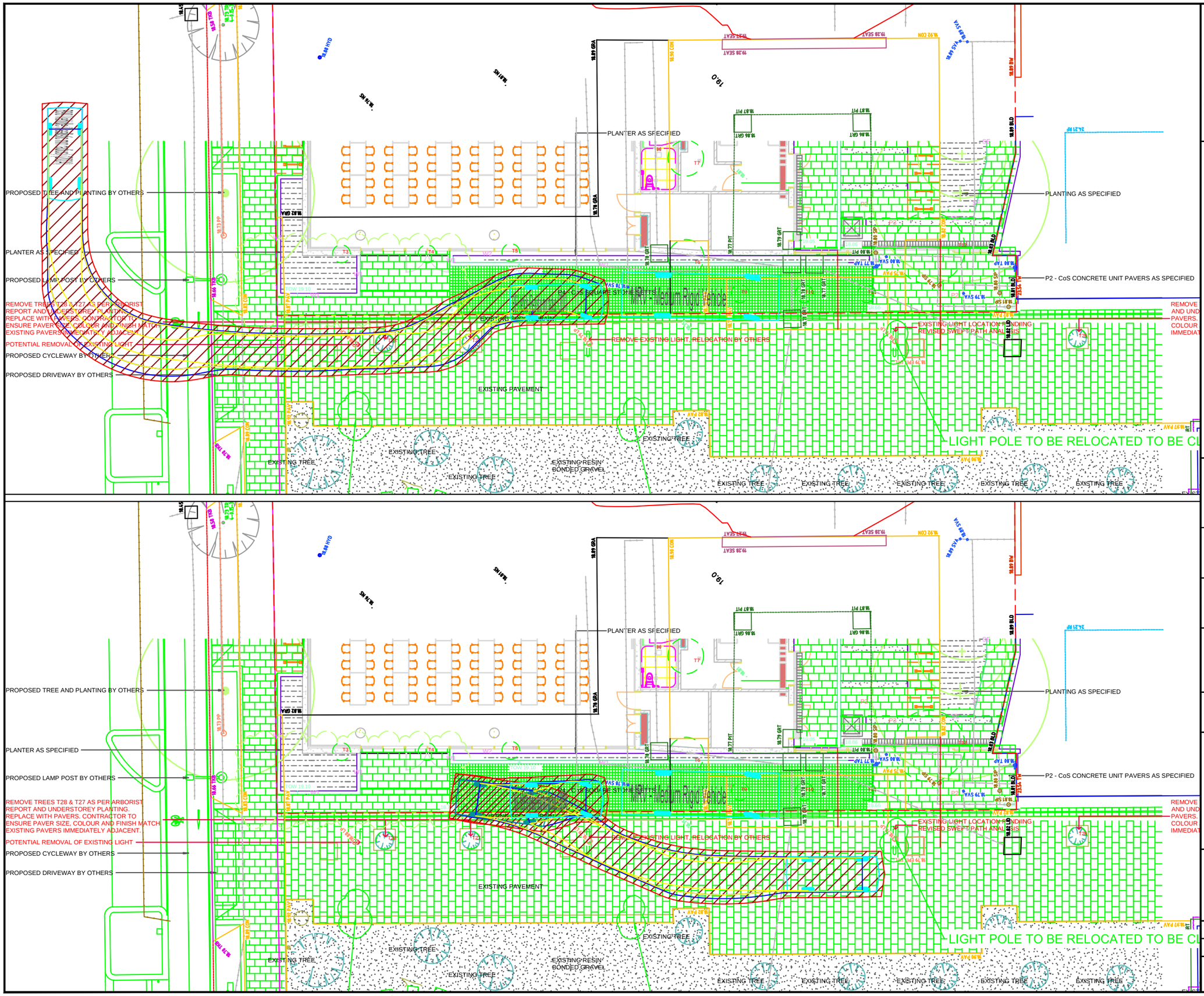
| Probability of Vehicles in System (P(n)) | | *P(n)=(1-p)p^n |
|---|---|---|
| No. Vehicle Groups in System (n) | Probability (%) | |
| 0 | 47.2% | 47.2% |
| 1 | 24.9% | 72.1% |
| 2 | 13.2% | 85.3% |
| 3 | 6.9% | 92.2% |
| 4 | 3.7% | 95.9% |
| 5 | 1.9% | 97.8% |
| 6 | 1.0% | 98.9% |
| 7 | 0.5% | 99.4% |
| 8 | 0.3% | 99.7% |
| 9 | 0.2% | 99.8% |
| 10 | 0.1% | 99.9% |
| 11 | 0.0% | 100.0% |
| 12 | 0.0% | 100.0% |
| 13 | 0.0% | 100.0% |
| 14 | 0.0% | 100.0% |
| 15 | 0.0% | 100.0% |
| 16 | 0.0% | 100.0% |
| 17 | 0.0% | 100.0% |
| 18 | 0.0% | 100.0% |
| 19 | 0.0% | 100.0% |
| 20 | 0.0% | 100.0% |
| 21 | 0.0% | 100.0% |

**Managed Queuing**

| | | |
|---|---|---|
| 114 | cars/30mins | |
| 114 | cars/hr with 100% using queuing systems | |
| | | |
| 114 | cars/system/hr for analysis purposes | |
| | | Length in metres |
| Max Queue | 36 | m |

# APPENDIX E

Swept Path Analysis




## Notes:

This drawing is prepared for information purposes only. It is not to be used for construction.

TRAFFIX is responsible for vehicle swept path diagrams and/or drawing mark-ups only. Base drawing prepared by others.

Vehicle swept path diagrams prepared using computer generated turning path software and associated CAD drawing platforms. Vehicle data based upon relevant Australian Standards (*AS/NZS 2890.1:2004 Parking facilities - Off-street car parking*, and/or *AS2890.2:2002 Parking facilities - Off-street commercial vehicle facilities*). These standards embody a degree of tolerance, however the vehicle characteristics in these standards represent a suitable design vehicle and do not account for all variations in vehicle dimensions / specifications and/or driver ability or behaviour.

| Rev. | Revision Note | By. | Date |
|---|---|---|---|
| A | Swept Path Analysis | SW | 07-06-21 |
| B | Swept Path Analysis | SW | 20-09-21 |
| C | Swept Path Analysis | SW | 27-09-21 |

Swept Path Legend

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

Architect
BVN

Client
School Infrastructure NSW

Scale / Plan Orientation
0 2 4 6 8m
1:200 @ A3

Project Description
Green Square Primary School
3 Joynton Avenue, Zetland

Drawing Prepared By

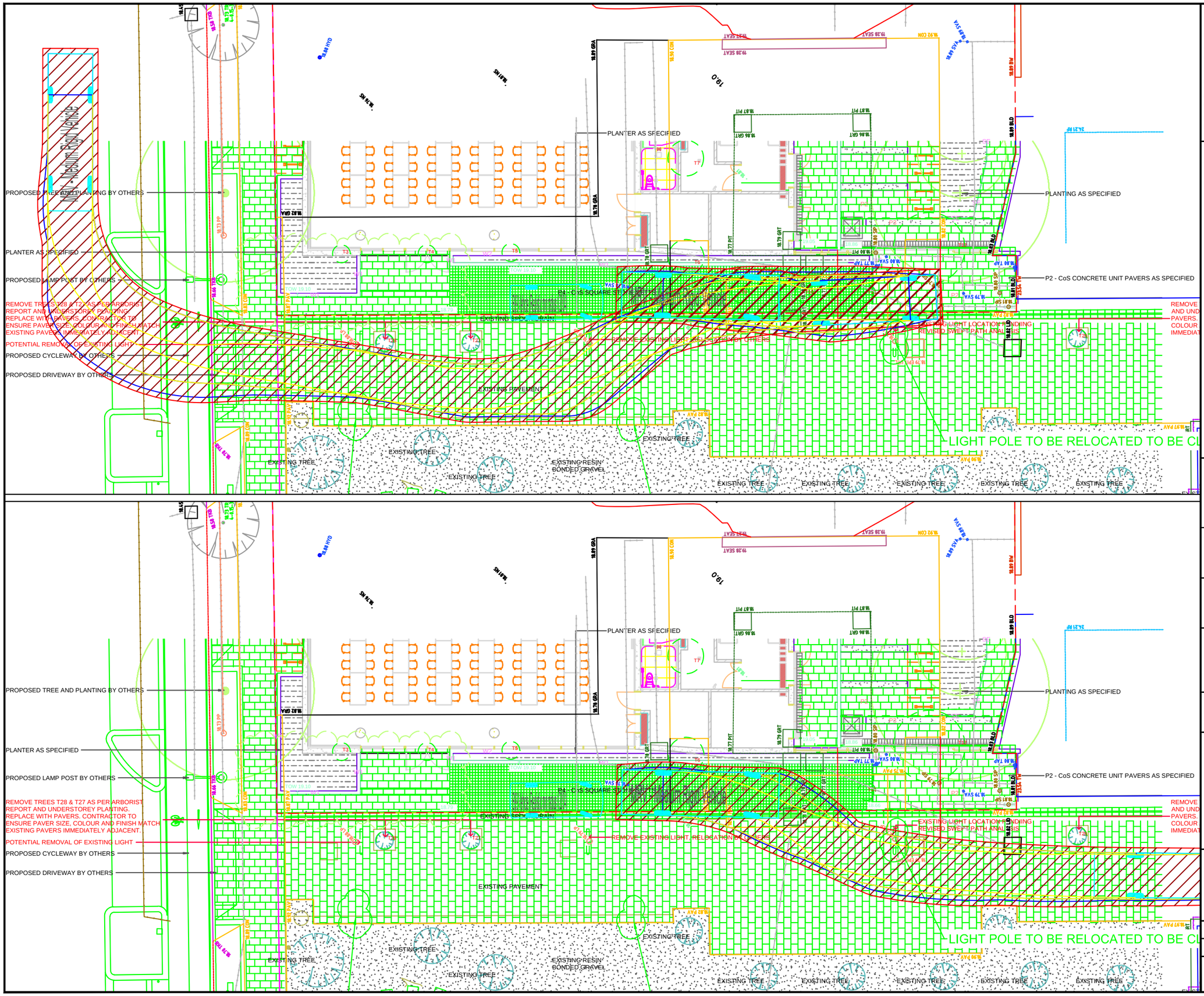
TRAFFIX
TRAFFIC & TRANSPORT PLANNERS
Suite 2.08, 50 Holt Street
Surry Hills, NSW 2010
PO Box 1124
Strawberry Hills, NSW 2012
t: +61 2 8324 8700
f: +61 2 9830 4481
w: www.traffix.com.au

Drawing Title
Swept Path Analysis
B99 Design Vehicle
Top: Entry Movement
Bottom: Exit Movement

| Drawn: | Checked: | Date: |
|---|---|---|
| SW | BL | 07-06-21 |

20.163d06v03 TRAFFIX [210916 Plans] Design Review.dwg

| Project No. | Drawing Phase | Drawing No. | Rev. |
|---|---|---|---|
| 20.163 | DA | TX.01 | C |




## Notes:

This drawing is prepared for information purposes only. It is not to be used for construction.

TRAFFIX is responsible for vehicle swept path diagrams and/or drawing mark-ups only. Base drawing prepared by others.

Vehicle swept path diagrams prepared using computer generated turning path software and associated CAD drawing platforms. Vehicle data based upon relevant Australian Standards (*AS/NZS 2890.1:2004 Parking facilities - Off-street car parking*, and/or *AS2890.2:2002 Parking facilities - Off-street commercial vehicle facilities*). These standards embody a degree of tolerance, however the vehicle characteristics in these standards represent a suitable design vehicle and do not account for all variations in vehicle dimensions / specifications and/or driver ability or behaviour.

| Rev. | Revision Note | By. | Date |
|---|---|---|---|
| A | Swept Path Analysis | SW | 07-06-21 |
| B | Swept Path Analysis | SW | 20-09-21 |
| C | Swept Path Analysis | SW | 27-09-21 |

Swept Path Legend

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

Architect
BVN

Client
School Infrastructure NSW

Scale / Plan Orientation
0 2 4 6 8m
1:200 @ A3

Project Description
Green Square Primary School
3 Joynton Avenue, Zetland

Drawing Prepared By

TRAFFIX
TRAFFIC & TRANSPORT PLANNERS
Suite 2.08, 50 Holt Street
Surry Hills, NSW 2010
PO Box 1124
Strawberry Hills, NSW 2012
t: +61 2 8324 8700
f: +61 2 9830 4481
w: www.traffix.com.au

Drawing Title
Swept Path Analysis
8.8m Medium Rigid Vehicle
Top: Entry Movement
Bottom: Exit Movement

| Drawn: | Checked: | Date: |
|---|---|---|
| SW | BL | 07-06-21 |

20.163d06v03 TRAFFIX [210916 Plans] Design Review.dwg

| Project No. | Drawing Phase | Drawing No. | Rev. |
|---|---|---|---|
| 20.163 | DA | TX.02 | C |

# APPENDIX F

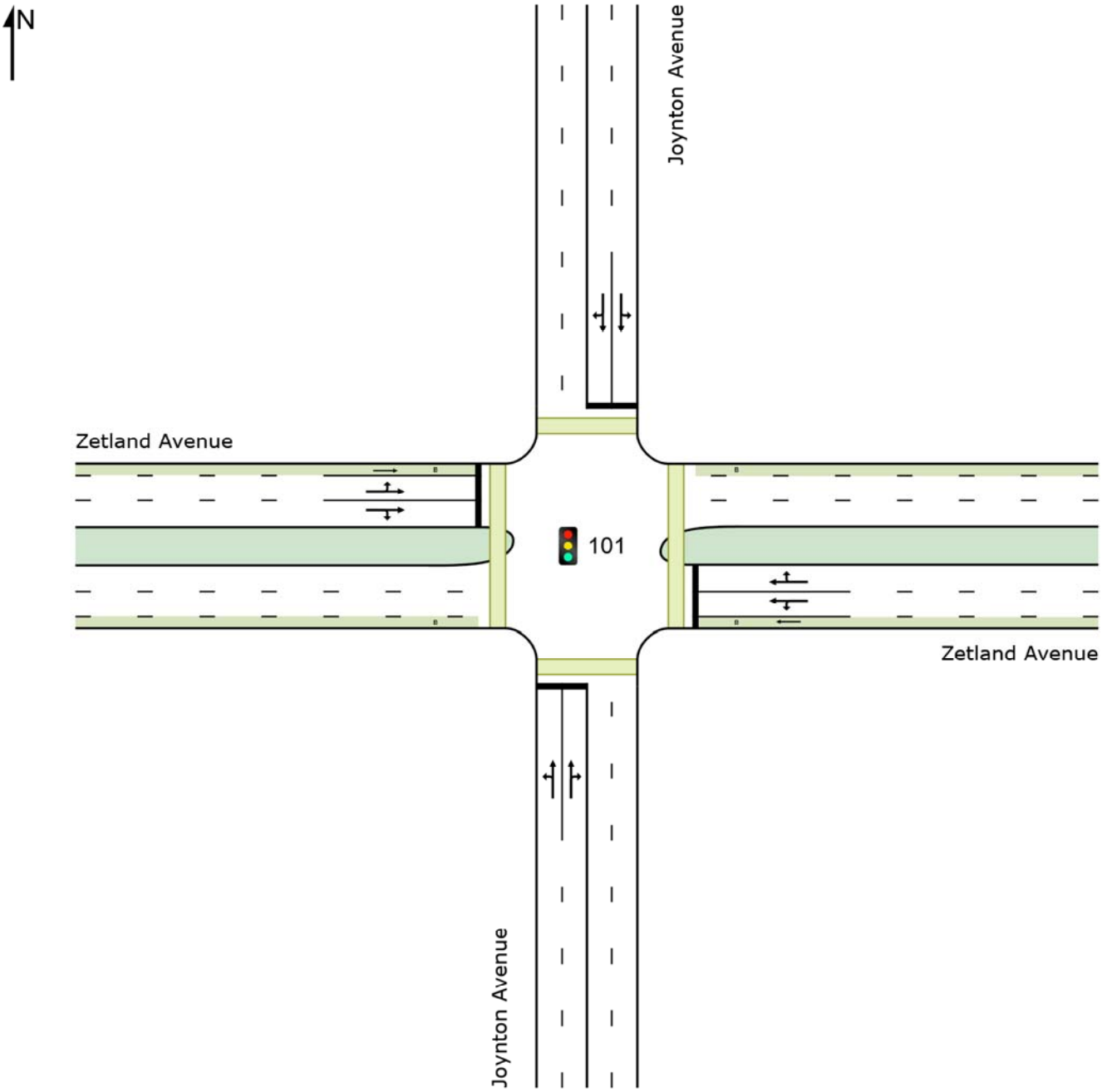
SIDRA Outputs

# SITE LAYOUT

## Site: 101 [101_EXAM_Joynton Ave x Zetland Ave (Site Folder: General)]

Joynton Avenue x Zetland Avenue
Existing
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# USER REPORT FOR SITE

## All Movement Classes

**Project: 20.163m01v02 Green Square Public School** **Template: Movement Summaries**

## Site: 101 [101_EXAM_Joynton Ave x Zetland Ave (Site Folder: General)]

Joynton Avenue x Zetland Avenue
Existing
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D**
**Output Phase Sequence: A, B, C, D**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Joynton Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 20 | 0 | 21 | 0.0 | *0.666 | 38.9 | LOS C | 22.3 | 156.4 | 0.91 | 0.80 | 0.91 | 13.1 |
| 2 | T1 | 801 | 0 | 843 | 0.0 | 0.666 | 35.5 | LOS C | 22.3 | 156.4 | 0.91 | 0.80 | 0.91 | 12.1 |
| 3 | R2 | 14 | 0 | 15 | 0.0 | 0.666 | 38.9 | LOS C | 21.2 | 148.2 | 0.91 | 0.80 | 0.91 | 16.2 |
| Approach | | 835 | 0 | 879 | 0.0 | 0.666 | 35.6 | LOS C | 22.3 | 156.4 | 0.91 | 0.80 | 0.91 | 12.2 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 41 | 0 | 43 | 0.0 | 0.226 | 46.1 | LOS D | 4.4 | 30.6 | 0.87 | 0.72 | 0.87 | 13.9 |
| 5 | T1 | 45 | 0 | 47 | 0.0 | *0.226 | 43.0 | LOS D | 4.4 | 30.6 | 0.87 | 0.71 | 0.87 | 13.5 |
| 6 | R2 | 60 | 0 | 63 | 0.0 | *0.613 | 67.5 | LOS E | 3.9 | 27.3 | 1.00 | 0.80 | 1.08 | 9.5 |
| Approach | | 146 | 0 | 154 | 0.0 | 0.613 | 53.9 | LOS D | 4.4 | 30.6 | 0.92 | 0.75 | 0.96 | 11.7 |
| North: Joynton Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 15 | 0 | 16 | 0.0 | 0.517 | 17.6 | LOS B | 20.1 | 140.6 | 0.62 | 0.56 | 0.62 | 24.2 |
| 8 | T1 | 566 | 0 | 596 | 0.0 | 0.517 | 14.2 | LOS A | 20.1 | 140.6 | 0.62 | 0.56 | 0.62 | 20.8 |
| 9 | R2 | 295 | 0 | 311 | 0.0 | *0.600 | 22.0 | LOS B | 8.7 | 60.9 | 0.91 | 0.82 | 0.91 | 15.8 |
| Approach | | 876 | 0 | 922 | 0.0 | 0.600 | 16.9 | LOS B | 20.1 | 140.6 | 0.72 | 0.65 | 0.72 | 19.0 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 384 | 0 | 404 | 0.0 | 0.492 | 27.6 | LOS B | 16.4 | 115.1 | 0.75 | 0.77 | 0.75 | 13.6 |
| 11 | T1 | 13 | 0 | 14 | 0.0 | 0.492 | 47.1 | LOS D | 16.4 | 115.1 | 0.93 | 0.77 | 0.93 | 12.5 |
| 12 | R2 | 109 | 0 | 115 | 0.0 | 0.492 | 52.1 | LOS D | 6.8 | 47.8 | 0.95 | 0.79 | 0.95 | 9.9 |
| Approach | | 506 | 0 | 533 | 0.0 | 0.492 | 33.4 | LOS C | 16.4 | 115.1 | 0.80 | 0.78 | 0.80 | 12.4 |
| All Vehicles | | 2363 | 0 | 2487 | 0.0 | 0.666 | 29.3 | LOS C | 22.3 | 156.4 | 0.81 | 0.74 | 0.82 | 14.0 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

## Site: 102 [102_PRAM_Joynton Ave x Zetland Ave (Site Folder: General)]

Joynton Avenue x Zetland Avenue
Existing + Development
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Phase Times)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times specified by the user**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D**
**Output Phase Sequence: A, B, C, D**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Joynton Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 34 | 0 | 36 | 0.0 | * 0.679 | 40.0 | LOS C | 22.8 | 159.6 | 0.91 | 0.81 | 0.91 | 13.1 |
| 2 | T1 | 801 | 0 | 843 | 0.0 | 0.679 | 35.7 | LOS C | 22.8 | 159.6 | 0.91 | 0.80 | 0.91 | 12.0 |
| 3 | R2 | 14 | 0 | 15 | 0.0 | 0.679 | 39.1 | LOS C | 21.7 | 152.0 | 0.91 | 0.80 | 0.91 | 16.2 |
| Approach | | 849 | 0 | 894 | 0.0 | 0.679 | 35.9 | LOS C | 22.8 | 159.6 | 0.91 | 0.80 | 0.91 | 12.1 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 41 | 0 | 43 | 0.0 | 0.232 | 45.3 | LOS D | 4.5 | 31.5 | 0.87 | 0.71 | 0.87 | 14.2 |
| 5 | T1 | 48 | 0 | 51 | 0.0 | * 0.232 | 42.2 | LOS C | 4.5 | 31.5 | 0.87 | 0.71 | 0.87 | 13.7 |
| 6 | R2 | 60 | 0 | 63 | 0.0 | * 0.807 | 73.3 | LOS F | 4.1 | 28.9 | 1.00 | 0.92 | 1.36 | 8.9 |
| Approach | | 149 | 0 | 157 | 0.0 | 0.807 | 55.6 | LOS D | 4.5 | 31.5 | 0.92 | 0.80 | 1.07 | 11.5 |
| North: Joynton Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 15 | 0 | 16 | 0.0 | 0.517 | 17.6 | LOS B | 20.1 | 140.6 | 0.62 | 0.56 | 0.62 | 24.2 |
| 8 | T1 | 566 | 0 | 596 | 0.0 | 0.517 | 14.2 | LOS A | 20.1 | 140.6 | 0.62 | 0.56 | 0.62 | 20.8 |
| 9 | R2 | 309 | 0 | 325 | 0.0 | * 0.633 | 23.1 | LOS B | 9.3 | 65.1 | 0.93 | 0.84 | 0.93 | 15.5 |
| Approach | | 890 | 0 | 937 | 0.0 | 0.633 | 17.3 | LOS B | 20.1 | 140.6 | 0.73 | 0.66 | 0.73 | 18.7 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 384 | 0 | 404 | 0.0 | 0.484 | 28.1 | LOS B | 16.5 | 115.2 | 0.75 | 0.77 | 0.75 | 13.4 |
| 11 | T1 | 13 | 0 | 14 | 0.0 | 0.482 | 48.5 | LOS D | 6.8 | 47.8 | 0.94 | 0.77 | 0.94 | 12.3 |
| 12 | R2 | 109 | 0 | 115 | 0.0 | 0.482 | 51.2 | LOS D | 6.8 | 47.8 | 0.94 | 0.79 | 0.94 | 10.0 |
| Approach | | 506 | 0 | 533 | 0.0 | 0.484 | 33.6 | LOS C | 16.5 | 115.2 | 0.80 | 0.78 | 0.80 | 12.3 |
| All Vehicles | | 2394 | 0 | 2520 | 0.0 | 0.807 | 29.7 | LOS C | 22.8 | 159.6 | 0.82 | 0.74 | 0.83 | 13.9 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

## Site: 103 [103_EXPM_Joynton Ave x Zetland Ave (Site Folder: General)]

Joynton Avenue x Zetland Avenue
Existing
PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D**
**Output Phase Sequence: A, B, C, D**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Joynton Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 74 | 0 | 78 | 0.0 | 0.592 | 30.4 | LOS C | 22.0 | 153.7 | 0.81 | 0.74 | 0.81 | 15.5 |
| 2 | T1 | 522 | 0 | 549 | 0.0 | 0.592 | 32.4 | LOS C | 22.0 | 153.7 | 0.85 | 0.75 | 0.85 | 12.7 |
| 3 | R2 | 34 | 0 | 36 | 0.0 | * 0.592 | 53.8 | LOS D | 9.0 | 63.1 | 0.97 | 0.80 | 0.97 | 12.8 |
| Approach | | 630 | 0 | 663 | 0.0 | 0.592 | 33.3 | LOS C | 22.0 | 153.7 | 0.85 | 0.75 | 0.85 | 13.0 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 12 | 0 | 13 | 0.0 | 0.100 | 54.3 | LOS D | 1.2 | 8.5 | 0.92 | 0.68 | 0.92 | 12.4 |
| 5 | T1 | 11 | 0 | 12 | 0.0 | * 0.100 | 51.4 | LOS D | 1.2 | 8.5 | 0.92 | 0.67 | 0.92 | 11.9 |
| 6 | R2 | 7 | 0 | 7 | 0.0 | * 0.112 | 69.1 | LOS E | 0.5 | 3.2 | 1.00 | 0.64 | 1.00 | 9.3 |
| Approach | | 30 | 0 | 32 | 0.0 | 0.112 | 56.7 | LOS E | 1.2 | 8.5 | 0.94 | 0.67 | 0.94 | 11.4 |
| North: Joynton Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 41 | 0 | 43 | 0.0 | 0.554 | 13.2 | LOS A | 21.3 | 149.0 | 0.54 | 0.51 | 0.54 | 27.5 |
| 8 | T1 | 718 | 0 | 756 | 0.0 | 0.554 | 10.4 | LOS A | 21.3 | 149.0 | 0.57 | 0.53 | 0.57 | 23.5 |
| 9 | R2 | 222 | 0 | 234 | 0.0 | * 0.554 | 22.4 | LOS B | 8.8 | 61.3 | 0.90 | 0.80 | 0.90 | 16.0 |
| Approach | | 981 | 0 | 1033 | 0.0 | 0.554 | 13.3 | LOS A | 21.3 | 149.0 | 0.64 | 0.59 | 0.64 | 21.5 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 275 | 0 | 289 | 0.0 | 0.561 | 41.6 | LOS C | 14.9 | 104.4 | 0.90 | 0.81 | 0.90 | 10.2 |
| 11 | T1 | 19 | 0 | 20 | 0.0 | 0.561 | 45.2 | LOS D | 14.9 | 104.4 | 0.93 | 0.79 | 0.93 | 12.8 |
| 12 | R2 | 90 | 0 | 95 | 0.0 | 0.561 | 59.7 | LOS E | 5.9 | 41.0 | 0.99 | 0.79 | 0.99 | 8.9 |
| Approach | | 384 | 0 | 404 | 0.0 | 0.561 | 46.0 | LOS D | 14.9 | 104.4 | 0.92 | 0.81 | 0.92 | 9.9 |
| All Vehicles | | 2025 | 0 | 2132 | 0.0 | 0.592 | 26.4 | LOS B | 22.0 | 153.7 | 0.76 | 0.68 | 0.76 | 14.9 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

## Site: 104 [104_PRPM_Joynton Ave x Zetland Ave (Site Folder: General)]

Joynton Avenue x Zetland Avenue
Existing + Development
PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site Optimum Cycle Time - Minimum Delay)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D**
**Output Phase Sequence: A, B, C, D**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Joynton Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 88 | 0 | 93 | 0.0 | 0.686 | 35.6 | LOS C | 28.7 | 200.8 | 0.87 | 0.79 | 0.87 | 14.0 |
| 2 | T1 | 536 | 0 | 564 | 0.0 | 0.686 | 36.8 | LOS C | 28.7 | 200.8 | 0.89 | 0.80 | 0.90 | 11.7 |
| 3 | R2 | 34 | 0 | 36 | 0.0 | * 0.686 | 65.8 | LOS E | 8.2 | 57.2 | 1.00 | 0.86 | 1.08 | 11.0 |
| Approach | | 658 | 0 | 693 | 0.0 | 0.686 | 38.1 | LOS C | 28.7 | 200.8 | 0.89 | 0.80 | 0.91 | 11.9 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 12 | 0 | 13 | 0.0 | 0.118 | 56.7 | LOS E | 1.7 | 12.0 | 0.91 | 0.69 | 0.91 | 12.3 |
| 5 | T1 | 18 | 0 | 19 | 0.0 | * 0.118 | 53.8 | LOS D | 1.7 | 12.0 | 0.91 | 0.68 | 0.91 | 12.1 |
| 6 | R2 | 7 | 0 | 7 | 0.0 | * 0.121 | 74.9 | LOS F | 0.5 | 3.4 | 1.00 | 0.64 | 1.00 | 8.8 |
| Approach | | 37 | 0 | 39 | 0.0 | 0.121 | 58.7 | LOS E | 1.7 | 12.0 | 0.93 | 0.67 | 0.93 | 11.4 |
| North: Joynton Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 41 | 0 | 43 | 0.0 | 0.557 | 13.5 | LOS A | 23.1 | 161.6 | 0.53 | 0.50 | 0.53 | 27.2 |
| 8 | T1 | 718 | 0 | 756 | 0.0 | 0.557 | 11.1 | LOS A | 23.1 | 161.6 | 0.55 | 0.52 | 0.55 | 22.9 |
| 9 | R2 | 236 | 0 | 248 | 0.0 | * 0.557 | 32.0 | LOS C | 9.5 | 66.4 | 0.90 | 0.87 | 0.90 | 12.6 |
| Approach | | 995 | 0 | 1047 | 0.0 | 0.557 | 16.2 | LOS B | 23.1 | 161.6 | 0.64 | 0.61 | 0.64 | 19.6 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 275 | 0 | 289 | 0.0 | 0.541 | 42.7 | LOS D | 15.7 | 109.9 | 0.88 | 0.81 | 0.88 | 10.0 |
| 11 | T1 | 19 | 0 | 20 | 0.0 | 0.541 | 47.2 | LOS D | 15.7 | 109.9 | 0.92 | 0.79 | 0.92 | 12.4 |
| 12 | R2 | 90 | 0 | 95 | 0.0 | 0.541 | 63.2 | LOS E | 6.3 | 43.8 | 0.99 | 0.79 | 0.99 | 8.5 |
| Approach | | 384 | 0 | 404 | 0.0 | 0.541 | 47.7 | LOS D | 15.7 | 109.9 | 0.90 | 0.80 | 0.90 | 9.7 |
| All Vehicles | | 2074 | 0 | 2183 | 0.0 | 0.686 | 29.7 | LOS C | 28.7 | 200.8 | 0.77 | 0.71 | 0.78 | 13.9 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

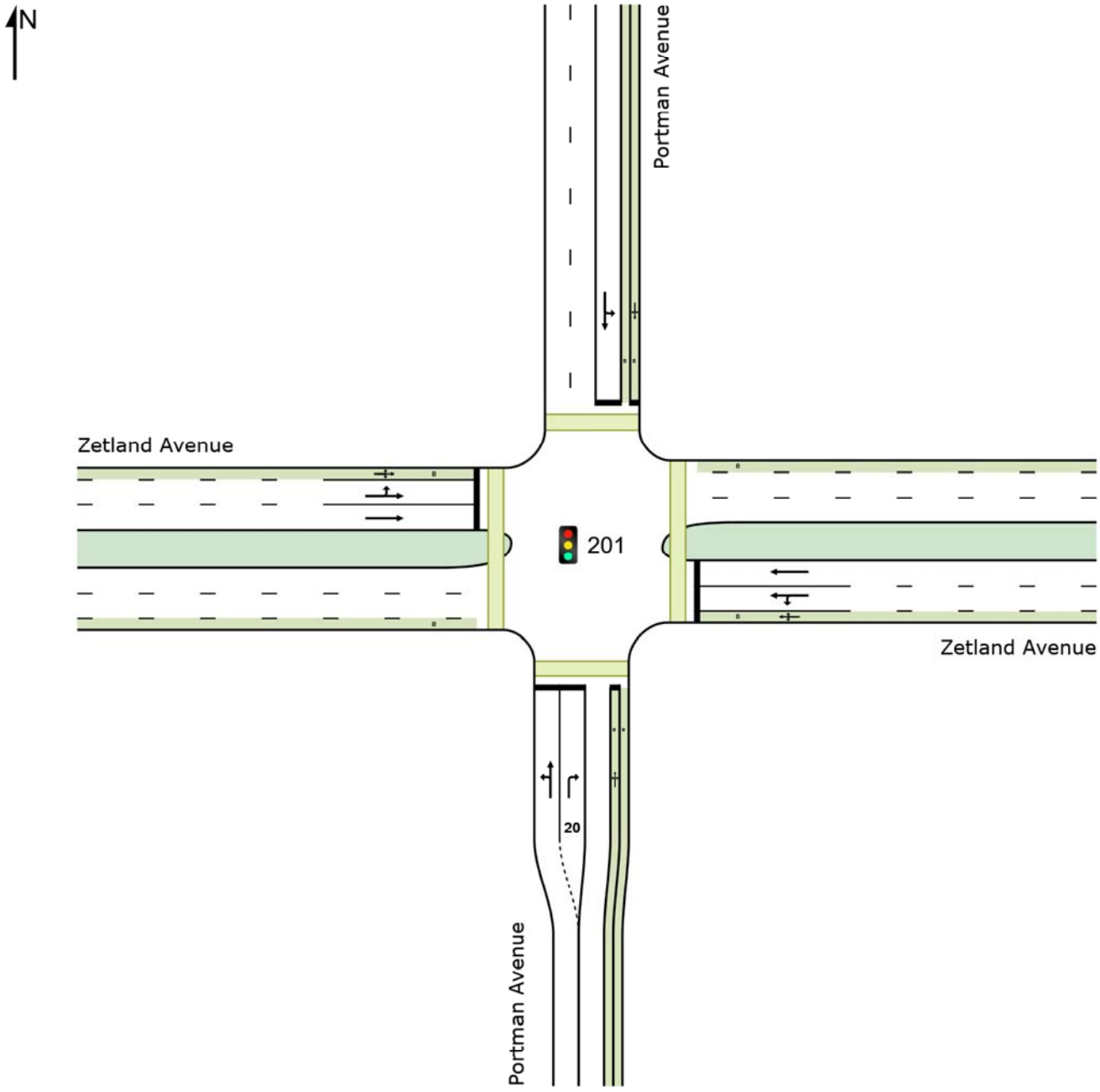
* Critical Movement (Signal Timing)

# SITE LAYOUT

## Site: 201 [201_EXAM_Portman Ave x Zetland Ave (Site Folder: General)]

Portman Avenue x Zetland Avenue
Existing
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



## Site: 201 [201_EXAM_Portman Ave x Zetland Ave (Site Folder: General)]

Portman Avenue x Zetland Avenue
Existing
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D, E**
**Output Phase Sequence: A, B, C, D, E**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Portman Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0 | 2 | 0.0 | 0.022 | 39.4 | LOS C | 0.4 | 2.9 | 0.72 | 0.48 | 0.72 | 21.4 |
| 2 | T1 | 16 | 0 | 17 | 0.0 | * 0.022 | 14.9 | LOS B | 0.4 | 2.9 | 0.49 | 0.36 | 0.49 | 32.1 |
| 3 | R2 | 154 | 0 | 162 | 0.0 | 0.202 | 22.4 | LOS B | 5.5 | 38.5 | 0.64 | 0.69 | 0.64 | 22.5 |
| Approach | | 172 | 0 | 181 | 0.0 | 0.202 | 21.9 | LOS B | 5.5 | 38.5 | 0.63 | 0.66 | 0.63 | 23.6 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 346 | 0 | 364 | 0.0 | * 0.419 | 17.2 | LOS B | 10.1 | 70.8 | 0.71 | 0.74 | 0.71 | 25.1 |
| 5 | T1 | 26 | 0 | 27 | 0.0 | * 0.101 | 50.1 | LOS D | 1.4 | 9.6 | 0.91 | 0.66 | 0.91 | 11.1 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.6 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 16.6 |
| Approach | | 373 | 0 | 393 | 0.0 | 0.419 | 19.6 | LOS B | 10.1 | 70.8 | 0.72 | 0.74 | 0.72 | 23.6 |
| North: Portman Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 33 | 0 | 35 | 0.0 | 0.408 | 50.9 | LOS D | 7.5 | 52.8 | 0.93 | 0.76 | 0.93 | 19.2 |
| 8 | T1 | 106 | 0 | 112 | 0.0 | * 0.408 | 47.3 | LOS D | 7.5 | 52.8 | 0.93 | 0.76 | 0.93 | 21.6 |
| 9 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 17.3 |
| Approach | | 140 | 0 | 147 | 0.0 | 0.408 | 48.2 | LOS D | 7.5 | 52.8 | 0.93 | 0.76 | 0.93 | 21.1 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 4 | 0 | 4 | 0.0 | 0.166 | 56.2 | LOS D | 2.3 | 15.9 | 0.94 | 0.67 | 0.94 | 18.8 |
| 11 | T1 | 80 | 0 | 84 | 0.0 | 0.166 | 50.5 | LOS D | 2.3 | 15.9 | 0.92 | 0.69 | 0.92 | 11.0 |
| 12 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 13.6 |
| Approach | | 85 | 0 | 89 | 0.0 | 0.166 | 50.9 | LOS D | 2.3 | 15.9 | 0.92 | 0.69 | 0.92 | 11.5 |
| All Vehicles | | 770 | 0 | 811 | 0.0 | 0.419 | 28.8 | LOS C | 10.1 | 70.8 | 0.76 | 0.72 | 0.76 | 21.3 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

## Site: 202 [202_PRAM_Portman Ave x Zetland Ave (Site Folder: General)]

Portman Avenue x Zetland Avenue
Existing + Development
AM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D, E**
**Output Phase Sequence: A, B, C, D, E**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Portman Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0 | 2 | 0.0 | 0.022 | 39.4 | LOS C | 0.4 | 2.9 | 0.72 | 0.48 | 0.72 | 21.4 |
| 2 | T1 | 16 | 0 | 17 | 0.0 | * 0.022 | 14.9 | LOS B | 0.4 | 2.9 | 0.49 | 0.36 | 0.49 | 32.1 |
| 3 | R2 | 154 | 0 | 162 | 0.0 | 0.201 | 22.9 | LOS B | 5.6 | 38.9 | 0.65 | 0.69 | 0.65 | 22.3 |
| Approach | | 172 | 0 | 181 | 0.0 | 0.201 | 22.3 | LOS B | 5.6 | 38.9 | 0.63 | 0.65 | 0.63 | 23.4 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 363 | 0 | 382 | 0.0 | * 0.432 | 17.0 | LOS B | 10.5 | 73.5 | 0.71 | 0.75 | 0.71 | 25.6 |
| 5 | T1 | 40 | 0 | 42 | 0.0 | * 0.158 | 50.5 | LOS D | 2.2 | 15.1 | 0.92 | 0.68 | 0.92 | 11.5 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.6 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 16.6 |
| Approach | | 404 | 0 | 425 | 0.0 | 0.432 | 20.4 | LOS B | 10.5 | 73.5 | 0.73 | 0.74 | 0.73 | 23.5 |
| North: Portman Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 33 | 0 | 35 | 0.0 | 0.428 | 52.0 | LOS D | 7.6 | 53.5 | 0.94 | 0.76 | 0.94 | 18.9 |
| 8 | T1 | 106 | 0 | 112 | 0.0 | * 0.428 | 48.3 | LOS D | 7.6 | 53.5 | 0.94 | 0.76 | 0.94 | 21.4 |
| 9 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 17.3 |
| Approach | | 140 | 0 | 147 | 0.0 | 0.428 | 49.3 | LOS D | 7.6 | 53.5 | 0.94 | 0.76 | 0.94 | 20.9 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 4 | 0 | 4 | 0.0 | 0.166 | 56.2 | LOS D | 2.3 | 15.9 | 0.94 | 0.67 | 0.94 | 18.8 |
| 11 | T1 | 80 | 0 | 84 | 0.0 | 0.166 | 50.5 | LOS D | 2.3 | 15.9 | 0.92 | 0.69 | 0.92 | 11.0 |
| 12 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 13.6 |
| Approach | | 85 | 0 | 89 | 0.0 | 0.166 | 50.9 | LOS D | 2.3 | 15.9 | 0.92 | 0.69 | 0.92 | 11.5 |
| All Vehicles | | 801 | 0 | 843 | 0.0 | 0.432 | 29.1 | LOS C | 10.5 | 73.5 | 0.77 | 0.72 | 0.77 | 21.2 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

## Site: 203 [203_EXPM_Portman Ave x Zetland Ave (Site Folder: General)]

Portman Avenue x Zetland Avenue
Existing
PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D, E**
**Output Phase Sequence: A, B, C, D, E**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Portman Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0 | 2 | 0.0 | 0.032 | 40.2 | LOS C | 0.9 | 6.3 | 0.73 | 0.49 | 0.73 | 20.9 |
| 2 | T1 | 32 | 0 | 34 | 0.0 | * 0.032 | 14.9 | LOS B | 0.9 | 6.3 | 0.50 | 0.38 | 0.50 | 31.9 |
| 3 | R2 | 220 | 0 | 232 | 0.0 | 0.289 | 24.0 | LOS B | 8.5 | 59.2 | 0.68 | 0.71 | 0.68 | 21.8 |
| Approach | | 254 | 0 | 267 | 0.0 | 0.289 | 23.0 | LOS B | 8.5 | 59.2 | 0.66 | 0.67 | 0.66 | 23.4 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 166 | 0 | 175 | 0.0 | * 0.335 | 21.3 | LOS B | 4.4 | 31.1 | 0.82 | 0.75 | 0.82 | 23.2 |
| 5 | T1 | 115 | 0 | 121 | 0.0 | * 0.335 | 44.8 | LOS D | 5.5 | 38.2 | 0.92 | 0.74 | 0.92 | 11.9 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.020 | 62.3 | LOS E | 0.2 | 0.5 | 0.97 | 0.61 | 0.97 | 16.7 |
| Approach | | 282 | 0 | 297 | 0.0 | 0.335 | 31.0 | LOS C | 5.5 | 38.2 | 0.86 | 0.74 | 0.86 | 17.8 |
| North: Portman Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 33 | 0 | 35 | 0.0 | 0.368 | 54.9 | LOS D | 5.4 | 37.9 | 0.95 | 0.75 | 0.95 | 18.3 |
| 8 | T1 | 64 | 0 | 67 | 0.0 | * 0.368 | 51.4 | LOS D | 5.4 | 37.9 | 0.95 | 0.75 | 0.95 | 20.8 |
| 9 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 17.3 |
| Approach | | 98 | 0 | 103 | 0.0 | 0.368 | 52.7 | LOS D | 5.4 | 37.9 | 0.95 | 0.75 | 0.95 | 19.9 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 2 | 0 | 2 | 0.0 | 0.094 | 56.2 | LOS D | 1.5 | 10.2 | 0.93 | 0.63 | 0.93 | 18.8 |
| 11 | T1 | 55 | 0 | 58 | 0.0 | 0.094 | 46.9 | LOS D | 1.5 | 10.2 | 0.89 | 0.65 | 0.89 | 11.6 |
| 12 | R2 | 1 | 0 | 1 | 0.0 | * 0.020 | 62.3 | LOS E | 0.2 | 0.5 | 0.97 | 0.61 | 0.97 | 13.7 |
| Approach | | 58 | 0 | 61 | 0.0 | 0.094 | 47.5 | LOS D | 1.5 | 10.2 | 0.89 | 0.65 | 0.89 | 12.0 |
| All Vehicles | | 692 | 0 | 728 | 0.0 | 0.368 | 32.5 | LOS C | 8.5 | 59.2 | 0.80 | 0.71 | 0.80 | 19.6 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

## Site: 204 [204_PRPM_Portman Ave x Zetland Ave (Site Folder: General)]

Portman Avenue x Zetland Avenue
Existing + Development
PM Peak
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 120 seconds (Site User-Given Cycle Time)

**Timings based on settings in the Site Phasing & Timing dialog**
**Phase Times determined by the program**
**Phase Sequence: TCS**
**Reference Phase: Phase A**
**Input Phase Sequence: A, B, C, D, E**
**Output Phase Sequence: A, B, C, D, E**

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Portman Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0 | 2 | 0.0 | 0.036 | 39.0 | LOS C | 1.0 | 6.9 | 0.71 | 0.48 | 0.71 | 22.4 |
| 2 | T1 | 39 | 0 | 41 | 0.0 | * 0.036 | 12.4 | LOS A | 1.0 | 6.9 | 0.46 | 0.36 | 0.46 | 33.9 |
| 3 | R2 | 220 | 0 | 232 | 0.0 | 0.262 | 22.0 | LOS B | 7.8 | 54.8 | 0.63 | 0.72 | 0.63 | 22.7 |
| Approach | | 261 | 0 | 275 | 0.0 | 0.262 | 20.7 | LOS B | 7.8 | 54.8 | 0.61 | 0.66 | 0.61 | 24.8 |
| East: Zetland Avenue | | | | | | | | | | | | | | |
| 4 | L2 | 195 | 0 | 205 | 0.0 | * 0.465 | 24.9 | LOS B | 6.5 | 45.7 | 0.88 | 0.78 | 0.88 | 22.3 |
| 5 | T1 | 122 | 0 | 128 | 0.0 | * 0.465 | 49.2 | LOS D | 6.5 | 45.7 | 0.96 | 0.77 | 0.96 | 11.2 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.6 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 16.6 |
| Approach | | 318 | 0 | 335 | 0.0 | 0.465 | 34.3 | LOS C | 6.5 | 45.7 | 0.91 | 0.78 | 0.91 | 17.2 |
| North: Portman Avenue | | | | | | | | | | | | | | |
| 7 | L2 | 33 | 0 | 35 | 0.0 | 0.512 | 58.8 | LOS E | 6.5 | 45.6 | 0.98 | 0.78 | 0.98 | 18.0 |
| 8 | T1 | 78 | 0 | 82 | 0.0 | * 0.512 | 55.3 | LOS D | 6.5 | 45.6 | 0.99 | 0.78 | 0.99 | 20.8 |
| 9 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 17.3 |
| Approach | | 112 | 0 | 118 | 0.0 | 0.512 | 56.4 | LOS D | 6.5 | 45.6 | 0.99 | 0.78 | 0.99 | 20.0 |
| West: Zetland Avenue | | | | | | | | | | | | | | |
| 10 | L2 | 2 | 0 | 2 | 0.0 | 0.127 | 59.5 | LOS E | 1.5 | 10.8 | 0.95 | 0.64 | 0.95 | 18.1 |
| 11 | T1 | 55 | 0 | 58 | 0.0 | 0.127 | 52.2 | LOS D | 1.5 | 10.8 | 0.93 | 0.68 | 0.93 | 10.7 |
| 12 | R2 | 1 | 0 | 1 | 0.0 | 0.022 | 63.5 | LOS E | 0.2 | 0.5 | 0.98 | 0.60 | 0.98 | 13.6 |
| Approach | | 58 | 0 | 61 | 0.0 | 0.127 | 52.7 | LOS D | 1.5 | 10.8 | 0.93 | 0.67 | 0.93 | 11.2 |
| All Vehicles | | 749 | 0 | 788 | 0.0 | 0.512 | 34.3 | LOS C | 7.8 | 54.8 | 0.82 | 0.73 | 0.82 | 19.5 |

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.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

# APPENDIX G

Travel Access Guide

# Green Square Public School

## Travel Access Guide

26/05/2021

## Project overview

Planning for a new primary school at Green Square on the former South Sydney Hospital site at Joynton Avenue is underway. The provision of facilities for shared use with the local community is included in the project planning.

## Active ways to get to school

### Walking is an active and healthy way to get to school

- Safe and accessible walking infrastructure is provided in the surrounding Green Square Town Centre Precinct, staff and students would be able to take advantage of the various facilities at Green Square Public School. Additional walking routes will be updated as additional infrastructure becomes available.

### Ride your bike

- Safe and accessible bicycle infrastructure is provided in the surrounding Green Square Town Centre Precinct, staff and students would be able to take advantage of the various facilities at Green Square Public School. Additional bicycle routes will be updated as additional infrastructure becomes available.

### Ride your scooter

- Include safety tips for local students.

## Kiss and drop expectations

- Reflect anything agreed in the School Transport Plan.
- Ensure consistency with NSW Education's road safety messaging: https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/road-safety-education/safe-travel

## Message from your Principal

- Insert text from Principal that lets the school community know they are becoming an active travel school.
- Principal message to include relevant safety information.
- Principal message may include their own commitment to active travel.

**For more information contact:**

School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

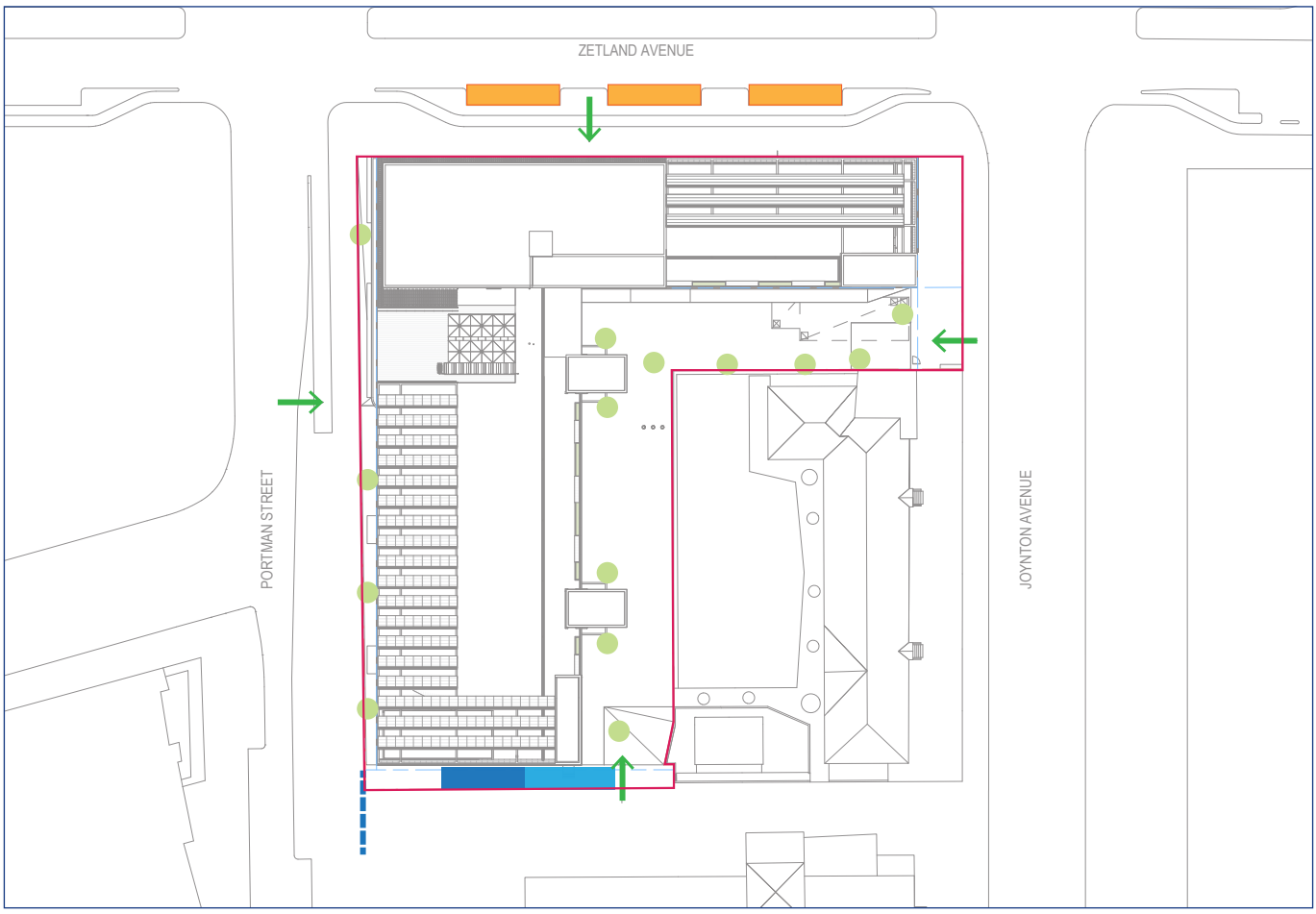
- Include Principal photo and signature block.

## Message from your P&C President

- Insert text from P&C President that outlines their support for becoming an active travel school.
- P&C message may include information about how changing the way you get to school even one day per week can make a 20% difference to local traffic congestion.
- Include P&C President photo and signature block.

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT




Site Boundary
Site Entries
Driveway
Pick-up/Drop-off Points
Loading Bay 1
Loading Bay 2
Bicycle Parking Locations

## Local map: Active Travel

### Must be included

- Graphic map of the school, showing all school entry points.
- Emphasise accessible entry points.
- Use icons to show which entry points are most suitable for walking, riding bikes and riding scooters.
- Show the 5, 10, 15, 20+ minute walk to school with single line rings of different colours (not shading).
- Include footpaths near the school, on both sides of all roads and near pedestrian crossings.
- Include pedestrian crossings and crossings with signals or Lollipop staff.
- Include nearby bus stops and bus routes, if relevant.

### Map details

- North is up.
- Include a scale, in metres.
- Show bike and scooter parking within the school grounds.
- Show steps and stairs that may make entrances harder to access.

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

## Something broken on the way to school?

Use the Snap Send Solve app or contact **council@cityofsydney.nsw.gov.au** to report issues to the people who can fix them.

Things like abandoned trolleys, broken footpaths or water leaks can all be reported in the Snap Send Solve app.

Download it today from the App Store or Google Play. Or visit **www.snapsendsolve.com**

## Initiatives for students and parents

### TRANSPORT INITIATIVES

Learning how to travel to school using active transport is a learning and resilience opportunity for students. We encourage parents to get involved in using active and public transport with your child.

### CITY OF SYDNEY INITIATIVES

**Cycling Courses**
The City of Sydney offers cycling courses ranging from beginner levels to allow riders to develop skills and confidence in bike riding. Council also offers course on bike care and maintenance encouraging more people to consider this as a daily mode of transport.

### THE SCHOOL STUDENT TRANSPORT SCHEME (SSTS)

The School Student Transport Scheme (SSTS) is an initiative that provides eligible school students with free or subsidised travel between their place of residence and school on public transport during the school term.

The eligibility requirements for primary school aged students are described as follows.

To be eligible for a free school travel pass the student must be a resident of NSW, at least 4 years and 6 months of age and enrolled as one of the following:

- An infant student (K–2) regardless of the distance between their home and school.
- A primary student (Years 3–6) who lives more than 1.6 km (straight line distance) from school, or 2.3 km or more by the most direct practical walking route to the nearest entry point to the school.

To Apply for the SSTS Scheme please visit **https://apps.transport.nsw.gov.au/ssts**.

## Tap on and tap off every time

Use your School Opal card every time you catch public transport to school.

It tells us how many people are using public transport to help us plan buses, trains and ferries to suit you.

## Plan your trip to school

You can plan ahead to make sure you get to school on time!

Visit transport.info or download an app to help:

- Trip View
- Next There

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT


# Green Square Public School

## Travel Access Guide

26/05/2021

## Project overview

Planning for a new primary school at Green Square on the former South Sydney Hospital site at Joynton Avenue is underway. The provision of facilities for shared use with the local community is included in the project planning.

## Using public transport to get to school

### School buses and public buses

- **301, 320, 348 -** near Joynton Avenue and Tilford Street.
- **302, 303, 304 -** near O'Dea Avenue and Sam Sing Street.
- **309, 309X, 310X -** near Johnson Street and Botany Road.
- **320, 370 -** near Epsom Road and Dunning Avenue.
- **343 -** near Joynton Avenue and Elizabeth Street.
- **X93 -** near Botany Road and Tweed Place.
- Include safety tips for local students.

### Trains | Ferries | Light Rail

- **Green Square Station -** near Botany Road and O'Riordan Street.
- Include safety tips for local students.

## Apply for a School Opal Card | School Term Bus Pass

- Include information about how to apply for any subsidised public transport programs available for students at this school.
- Student code of conduct
- Include information about expectations for students on public transport, for example offering seats to adults, no swearing or fighting, etc.

## Message from your Principal

- Insert text from Principal that lets the school community know they are becoming a public transport school.
- Principal message to include relevant safety information.
- Principal message may include their own commitment to public transport.
- Include Principal photo and signature block.

## Message from your P&C President

- Insert text from P&C President that outlines their support for becoming a public transport school.
- P&C message may include information about how changing the way you get to school even one day per week can make a 20% difference to local traffic congestion.
- Include P&C President photo and signature block.

**For more information contact:**

School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

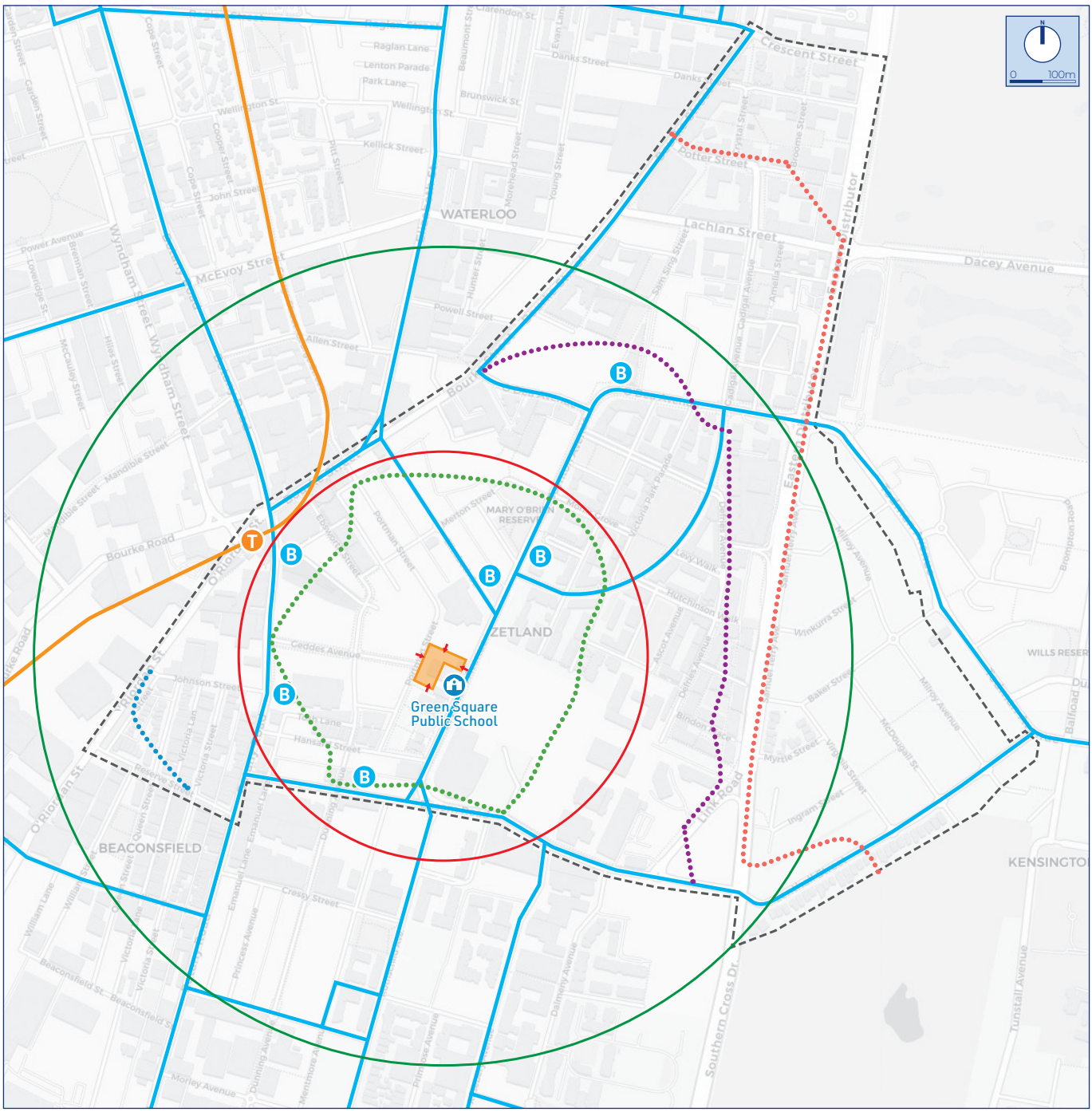
NSW GOVERNMENT

## Kiss and drop code of conduct

- Reflect anything agreed in the School Transport Plan.
- Ensure consistency with NSW Education's road safety messaging.

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

# NSW Department of Education – School Infrastructure




| | | |
|---|---|---|
| Bus | 400m | 5-Minute Walk |
| Train | 800m | 10-Minute Walk |
| | Site Entries | 15-Minute Walk |

**For more information contact:**

School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

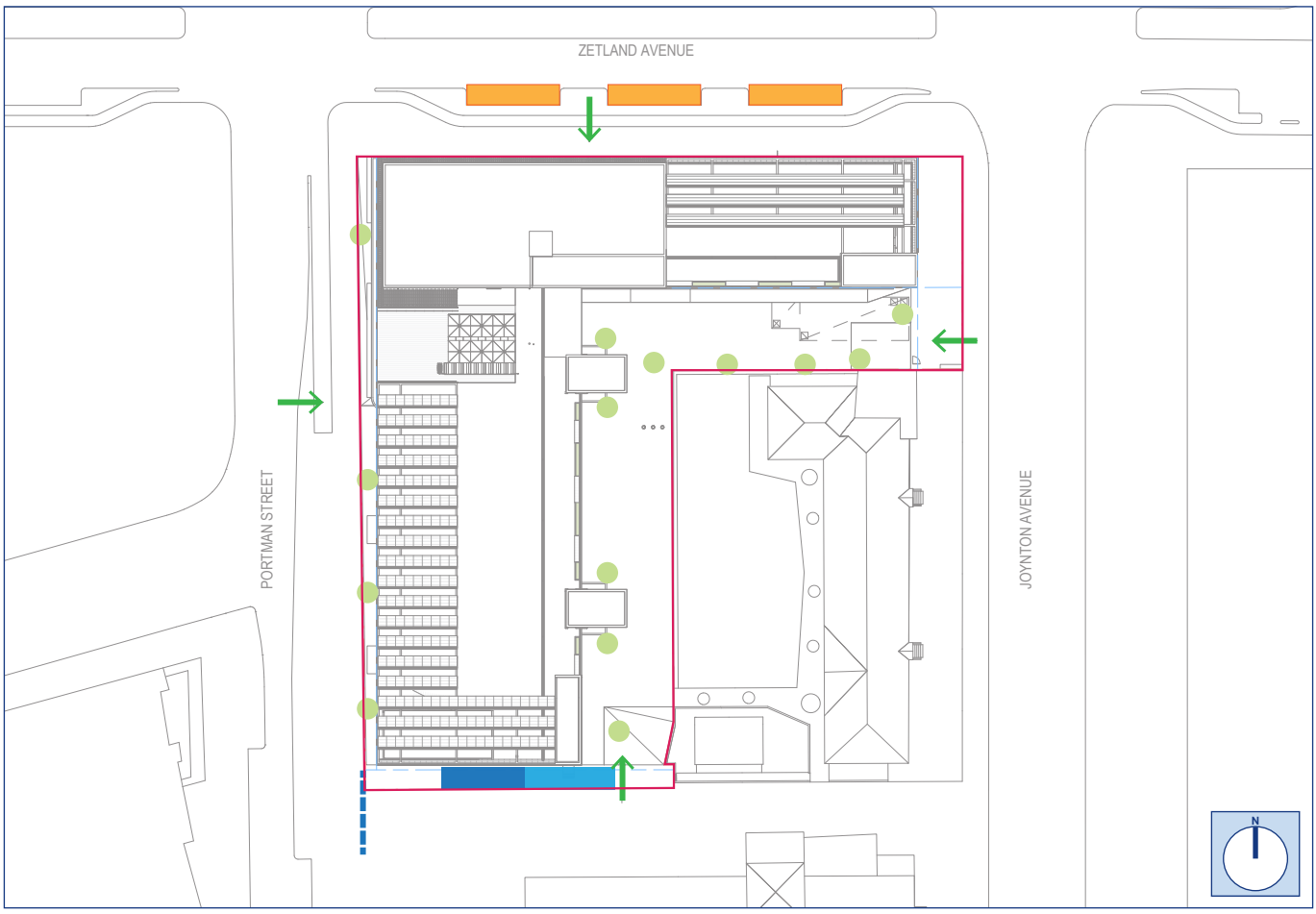
NSW GOVERNMENT

## Local map: Public transport

**Must be included**

- Graphic map of the school, showing all school entry points.
- Use icons to show the nearest bus, train, ferry and light rail stops to the school. Only use Transport for NSW icons for each type of transport.
- Show routes using colours to match the Transport for NSW icon colours, for example, orange for trains, blue for buses.
- Differentiate morning and afternoon stop locations.
- Show the 5, 10, 15, 20+ minute walk to school with single line rings of different colours (not shading).
- Show the walk to school from public transport stops.

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au




Site Boundary
Site Entries
Driveway
Pick-up/Drop-off Points
Loading Bay 1
Loading Bay 2
Bicycle Parking Locations

## Map details

- North is up.
- Include a scale, in metres.
- Emphasise accessible entry points.
- Show steps and stairs that may make entrances harder to access.
- Show bike and scooter parking within the school grounds.
- Include footpaths near the school, on both sides of all roads and near pedestrian crossings.
- Include pedestrian crossings and crossings with signals or Lollipop staff.

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT

## Something broken on the way to school?

Use the Snap Send Solve app or contact **council@cityofsydney.nsw.gov.au** to report issues to the people who can fix them.

Things like abandoned trolleys, broken footpaths or water leaks can all be reported in the Snap Send app.

Download it today from the App Store or Google Play. Or visit **www.snapsendsolve.com**

## Initiatives for students and parents

### TRANSPORT INITIATIVES

Learning how to travel to school using active transport is a learning and resilience opportunity for students. We encourage parents to get involved in using active and public transport with your child.

### CITY OF SYDNEY INITIATIVES

**Cycling Courses**
The City of Sydney offers cycling courses ranging from beginner levels to allow riders to develop skills and confidence in bike riding. Council also offers course on bike care and maintenance encouraging more people to consider this as a daily mode of transport.

### THE SCHOOL STUDENT TRANSPORT SCHEME (SSTS)

The School Student Transport Scheme (SSTS) is an initiative that provides eligible school students with free or subsidised travel between their place of residence and school on public transport during the school term.

The eligibility requirements for primary school aged students are described as follows.

To be eligible for a free school travel pass the student must be a resident of NSW, at least 4 years and 6 months of age and enrolled as one of the following:

- An infant student (K–2) regardless of the distance between their home and school.
- A primary student (Years 3–6) who lives more than 1.6 km (straight line distance) from school, or 2.3 km or more by the most direct practical walking route to the nearest entry point to the school.

To Apply for the SSTS Scheme please visit **https://apps.transport.nsw.gov.au/ssts**.

## Tap on and tap off every time

Use your School Opal card every time you catch public transport to school.

It tells us how many people are using public transport to help us plan buses, trains and ferries to suit you.

## Plan your trip to school

You can plan ahead to make sure you get to school on time!

Visit transport.info or download an app to help:

- Trip View
- Next There

**For more information contact:**
School Infrastructure NSW
Email: schoolinfrastructure@det.nsw.edu.au
Phone: 1300 482 651
www.schoolinfrastructure.nsw.gov.au

NSW GOVERNMENT