Appendix D

Road traffic and transport impact assessment

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Green Square to Ashmore Connector Road
City of Sydney Council
12-Nov-2020

Green Square to Ashmore Connector Road

Traffic and Transport Impact Assessment

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Traffic and Transport Impact Assessment

Client: City of Sydney Council

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Abbreviations

Abbreviation	Meaning
A2MP	Alexandria to Moore Park Connectivity Upgrade
ASL	Above Sea Level
ATC	Automatic Traffic Count
CBD	Central Business District
Council	The City of Sydney's elected representatives
The City / City of Sydney	The City of Sydney organisation
CRU	Construction Regulation Unit
CTMP	Construction Traffic Management Plan
DCP	Development Control Plan
DOS	Degree of Saturation
EP&A Act	NSW Environmental Planning and Assessment Act 1979
GS2AC	Green Square to Ashmore Connector
GSC	Greater Sydney Commission
GSTC / the Town Centre	Green Square Town Centre
GSURA	Green Squad Urban Renewal Area
km	Kilometres
LGA	Local Government Area
LOS	Level of Service
LTTMP	Long Term Transport Master Plan
m	Metres
NSW BSA	NSW Bureau of Statistics and Analytics
REF	Review of Environmental Factors
ROL	Road Occupancy Licences
RL	Raised Level
Roads & Maritime	Roads & Maritime Services
Sqm	Square metres
TCP	Traffic Control Plan
TfNSW	Transport for New South Wales
TMAP	Transport Management and Accessibility Plan
TMC	Turning Movement Counts
TMP	Traffic Management Plan
the proposal	Green Square to Ashmore Connector

Executive Summary

The City of Sydney (the City) is currently undertaking the project delivery of Green Square Town Centre (GSTC) Essential Infrastructure and Public Domain (EIPD) works which are located in the City of Sydney Local Government area. The Green Square Town Centre is the core of the broader Green Square Renewal Area which involves the development of a large range of new infrastructure including, key roads, transport and community amenities to service a proposed 50,000 resident population and 20,000 workforce over a 20 year period up to 2030.

The proposed Green Square to Ashmore Connector (GS2AC) forms a significant part of the Green Square transport infrastructure strategy and will provide access for residents from the broader renewal area and the adjacent Ashmore Precinct to public amenities such as the Town Centre, library and aquatic centre. The Proposal will provide a new east-west link between Bourke Road and Botany Road (linking Bowden Street to Geddes Avenue) and includes the introduction two new and one augmented signalised intersection, just south of the Green Square rail station. The road will provide one bus lane in each direction as well as a separated bi-directional cycleway.

The City engaged AECOM to prepare a Traffic and Transport Impact Assessment (TTIA) report for the GS2AC in support of the Review of Environmental Factors. The TTIA report assess key transport and traffic design, construction and operation issues to ensure that the proposed road operates in a safe and efficient manner. The preparation of the TTIA report has involved consultation with Transport for New South Wales (formerly Roads and Maritime) as well as key internal divisions within the City including City Access and City Infrastructure Traffic Operations.

The GS2AC has long been considered as a key corridor to improve local transport access to, and support the growth of, the Green Square Town Centre (GSTC). Once complete, the GS2AC is predicted to improve multiple traffic and transport aspects within the vicinity of the site. The anticipated benefits include improvements to active transport and public transport.

The GS2AC provides an opportunity to significantly enhance pedestrian and cyclist safety and accessibility by providing two new signalised crossings at O'Riordan Street and Bourke Road, as well as the connection with the existing crossing at Botany Road through to Geddes Avenue. These crossings will allow pedestrians and cyclists to cross each road safely and conveniently and will assist in improving the east-west connectivity to the GSTC.

The assessments have identified the GS2AC will operate efficiently in the opening year 2022 and future year 2032 and will serve its function of improving accessibility for all active transport users to the proposed Green Square Town Centre. Furthermore, it is likely that the GS2AC will not impact on the existing road network, namely the state roads of Botany Road and O'Riordan Street which are already severely congested during the peak periods. In addition to the separated bi-directional cycleway, the end state configuration for the GS2AC envisages a bus lane in each direction, allowing only local traffic access to the developments proposed to access from the GS2AC. Potential future restraints have been identified as the banning of right turn movements into GS2AC from its intersections with O'Riordan Street and Botany Road.

The construction of the GS2AC is anticipated to take up to 18 months to complete, starting in Q3 2021 to late 2022. Given the number of daily construction vehicles, overall the construction works could not be expected to significantly impact intersection operations external to the site. As maintaining existing operation of the surrounding road network and active/ public transport throughout the construction of the GS2AC remaining a top priority, measures will be set in place to minimise disruptions. Mitigation measures include partial road closures, specific working hours, vehicle and pedestrian diversions, alternate access arrangements to properties, and appropriate signage.

The assessments have also identified that the GS2AC to will operate in a safe and efficient manner to improve accessibility to the proposed Green Square Town Centre during the opening year 2022 and future year 2032.

1.0 Introduction

This Traffic and Transport Impact Assessment (TTIA) has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of the City of Sydney (the City) to assess a proposed transport corridor connecting Botany Road to Bowden Street, Alexandria (the Site), known as the Green Square to Ashmore Precinct Connector Road (GS2AC) (the Proposal).

The City is the proponent for the proposed connector road and is also the "determining authority" for the Proposal under Part 5 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Overview of the Proposal

1.1.1 Background

The GS2AC has long been considered as a transport solution to improve access to the Green Square Town Centre for pedestrians, cyclists and buses.

The road was originally investigated in the Green Square Street Structural Masterplan 1997 and throughout the 2000's where a preliminary route alignment was suggested. In 2008, the Green Square Transport Management and Accessibility Plan further identified the proposed connector road to improve road access to the Town Centre. The proposed connector road is currently identified in the Sydney Development Control Plan 2012.

In 2017, a Review of Environmental Factors (REF) , *Green Square to Ashmore Connector Road between Botany Road and Bowden Street, Alexandria REF* (City of Sydney, 2017) (the 2017 REF) was prepared by the City and, following exhibition and consideration of issues raised in submissions, the REF was self-determined by the City under Division 5.1 *Environmental Planning and Assessment Act 1979* (EP&A Act) in December 2018.

In April 2019, the proposed design for the Proposal was taken to the City of Sydney Design Advisory Panel (DAP) for review. The DAP made several design recommendations, requiring amendments to the concept design presented in the 2017 REF.

A consistency assessment undertaken by AECOM identified the prepare a new REF consistent with the amended concept design.

1.1.2 Key features of the Proposal

The GS2AC comprises a 380m road from Botany Road to Bowden Street via O'Riordan Street and Bourke Road with two (2) signalised intersections and upgrade works to the existing Botany Road / Geddes Avenue intersection.

Key features of the Proposal include:

- Single lane traffic in each direction with a public transport corridor (bus lanes) preventing through traffic in each section
- Minor amendment to the southern boundary of the Site, on the Western block, with the footprint extending an approximate two metres further into Ausgrid owned property to allow for a landscape buffer along the boundary of the proposed road. Adjustment to adjoining property fence as required.
- Removal of trees affected by the proposed road
- Relocation of utilities and services as required
- Property access and service driveways for sites including 15 O'Riordan Street (Ausgrid) 330 – 338 Botany Road (Preferred affordable housing provider) and 338 Botany Road (Preferred community housing provider) and 9-13 O'Riordan Street (A2B Australia)
- Other ancillary works as required to deliver the road.

Key road infrastructure relating to the proposal include:

- Service infrastructure (stormwater, connection of the Green Square Stormwater Trunk Drain, and lighting)
- Provision for electrical, telecommunications and gas infrastructure and other utilities required in the deliverance of the proposal
- Establishment of recycled water main to cater for the proposed affordable housing developments adjacent to the road corridor
- Landscaping and tree planting as well as street furniture
- Signage.

A bus route is yet to be formalised at this location (pending decision by TfNSW) and in the interim a staged approach is proposed comprising:

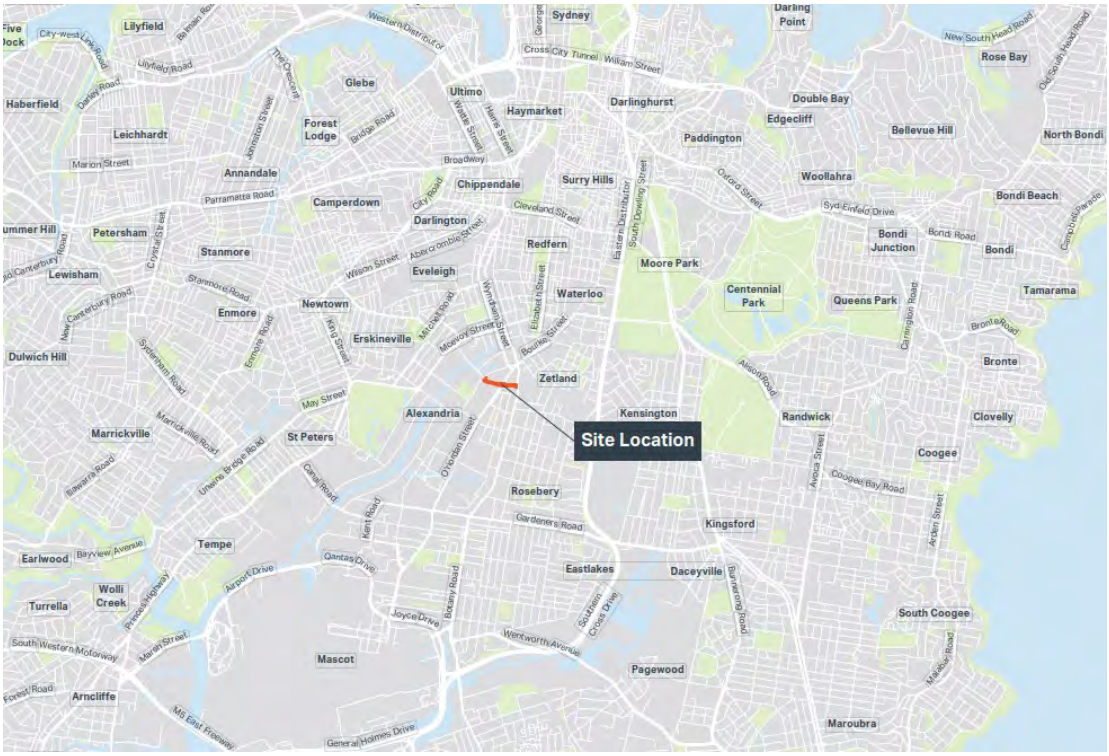
- Stage 1: Closure of the eastern ends of each block to ensure roadways only used for local access (closure would entail a continuous raised footpath treatment and kerb lines along O'Riordan Street and Botany Road, prior to any operating bus route along the corridor).
- Stage 2: Opening of eastern ends and implementation of a bus lane (but allowing only local access within each block) once the bus route has been formalised.

1.2 Location of the Proposal

The Proposal is located within the City of Sydney Local Government Area (LGA) and within the Green Square Precinct, spanning the suburbs of Alexandria and Zetland. The Proposal runs east to west, bounded by Bourke Road in the west and Botany Road in the east.

The regional context of the Proposal is illustrated in Figure 1.

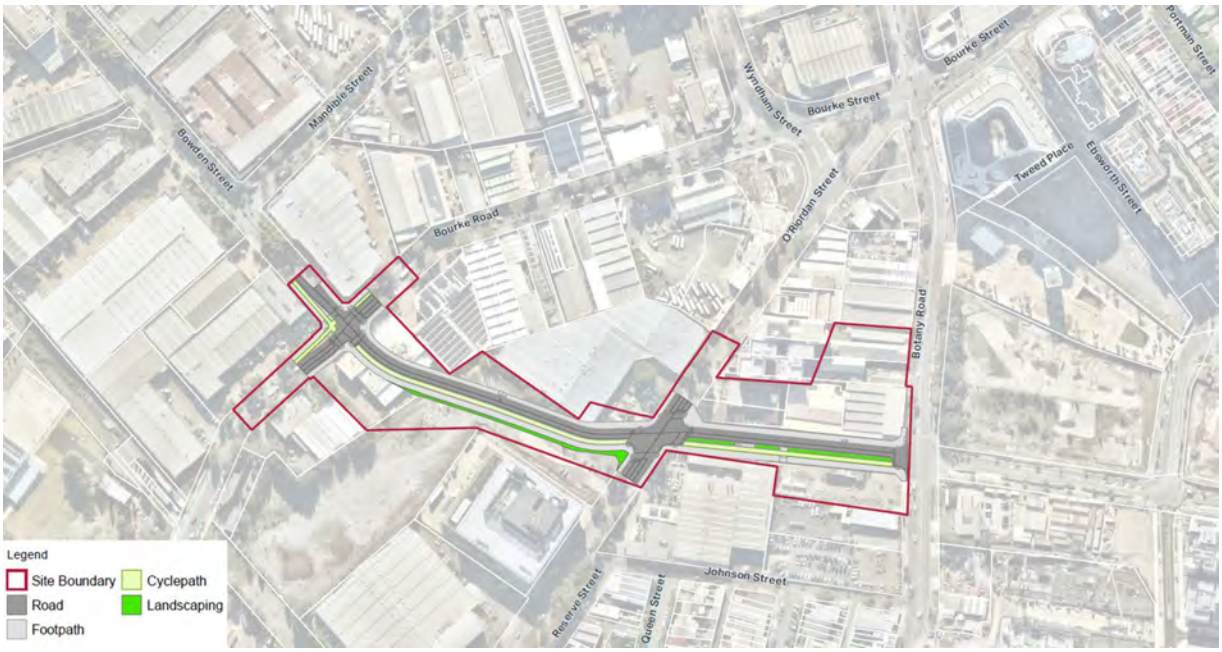
Figure 1 Regional context of proposed Green Square to Ashmore Connector Road



1.2.1 Proposal Area

The Proposal Area includes all areas where works would be undertaken and the locations of all ancillary facilities, including temporary construction material laydown areas. The Proposal Area is shown in Figure 2.

Figure 2 Green Square to Ashmore Connector Road location



1.3 Road network for updated planning

In April 2019, the proposed design for the Proposal was taken to the City of Sydney Design Advisory Panel (DAP) for review. The DAP made several design recommendations, requiring amendments to the concept design.

2017 REF Concept Design

The 2017 REF concept plan proposed an east-west connector between Green Square Town Centre and the Ashmore Precinct comprising a local access road which provides for access for all transport modes (including private vehicles). The 2017 REF proposal included:

- Two main travel lanes and typically minimum of two lanes on approach to intersections in the Western block (between Bourke Road and O'Riordan Street); and
- A four lane corridor (with two travel lanes and two parking) and typically minimum of two lanes on approach to intersections in the Eastern block (between O'Riordan Street and Botany Road).

Whilst including significant public transport benefits in relation to provisions for buses, cyclists and pedestrians, the Proposal description as provided in the 2017 REF makes clear that the Proposal would provide for all modes including private vehicles. This is demonstrated in the concept design (travel lanes and parking lanes) and text in various sections of the 2017 REF, which includes references to the road catering for up to 2,000 vehicles per day on operation.

Current Concept Design

Following design recommendations from the DAP it is understood that the proposed design for the Proposal has changed to focus primarily on public and active transport provisions. This includes:

- Keeping a single lane in each direction with a public transport corridor (bus lanes) to prevent through traffic in each section.
- A bus route is yet to be formalised at this location (pending decision by TfNSW) and in the interim a staged approach is proposed comprising:

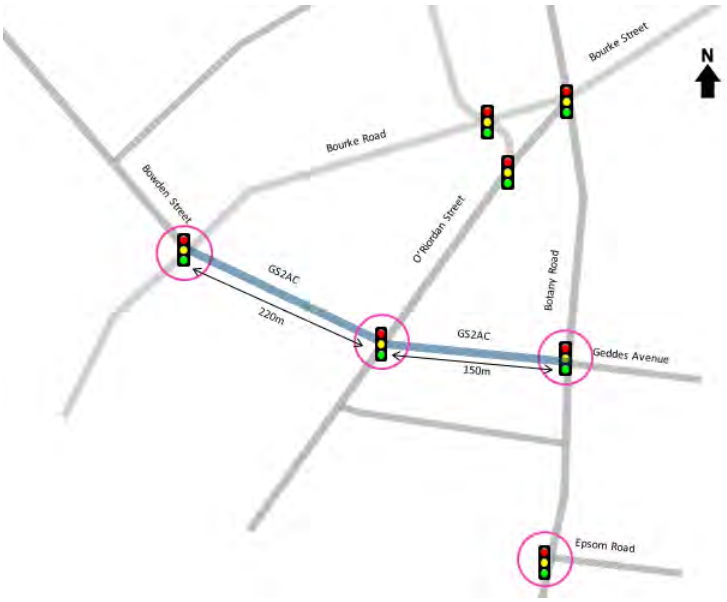
- Stage 1: Closure of the eastern ends of each block to ensure roadways only used for local access (closure would entail a continuous raised footpath treatment and kerb lines along O'Riordan Street and Botany Road, prior to any operating bus route along the corridor).
- Stage 2: Opening of eastern ends and implementation of a bus lane (but allowing only local access within each block) once the bus route has been formalised.

It is also understood that a minor amendment may potentially occur to the southern boundary of the Site on the Western block with the footprint extended some 2-3 metres further into Ausgrid owned land.

1.3.1 Study Area

The study area includes two existing intersections (Bourke Road / Bowden Street and Botany Road / Geddes Avenue) to which the connector road will tie-in, future intersection at O'Riordan Street and the existing Botany Road / Epsom Road intersection as shown in Figure 3.

Figure 3 Study Area



1.4 Purpose of this report

This Traffic and Transport Impact Assessment Report (TTIA) has been developed to support the REF being prepared by the City, which provides an environmental impact assessment of the proposal.

The purpose of this report is to:

- Provide an assessment of the operational impacts of the proposal on the transport network including:
  - Road network performance
  - Walking and cycling
  - Public transport
- Provide a strategic level assessment of the anticipated impacts of the proposal to the transport network during construction.

1.5 Structure of the report

This report has been structured into the following sections:

- **Section 2** outlines the State and Local Government planning and policy context for the area
- **Section 3** provides an overview of existing traffic and transport conditions

- **Section 4** provides a summary of the future transport context of the area
- **Section 5** outlines the proposal
- **Section 6** provides details of an appraisal of operational impacts of the proposal on the transport network including to active transport, public transport and road network performance
- **Section 7** provides a qualitative appraisal of likely construction impacts of the proposal
- **Section 8** provides an overview of the assessment, including key messages and outcomes.

2.0 Planning and policy context

2.1 NSW Government plans and policies

2.1.1 NSW Making it Happen

The recently released *NSW Making it Happen* is the NSW Government's plan for making NSW a better place to live. Thirty different priorities are identified to:

- Grow the economy
- Deliver infrastructure
- Improve health, education and other services.

The relevant priorities include building infrastructure, ensuring on-time running of public transport and improving road travel reliability: each of which are relevant to, and aligned with, the GS2AC Proposal.

2.1.2 NSW Long Term Transport Master Plan

The *NSW Long Term Transport Master Plan* (LTTMP) is a comprehensive and integrated strategy for all modes of transport across NSW released by Transport for NSW in December 2012. The LTTMP identifies a clear direction for transport over the next 20 years by addressing key challenges around population growth, job creation and the need for a transport network that maximises the benefits to the economy and aligns with land use. The Plan also has a number of supporting documents including regional transport plans, modal plans and access strategies including most notably:

- Sydney's Walking Future
- Sydney's Cycling Future
- Sydney's Bus Future
- Sydney's Rail Future
- NSW Freight and Ports Strategy.

Any proposed transport interventions specific to the Green Square area are highlighted as relevant in this report. The LTTMP recognises the future transport challenges in meeting the needs of the future residents and employees located in the area, highlighting that improved road and public transport access will be required to enable the economic and social benefits arising from the development. The GS2AC Proposal has been identified and developed to help meet these needs.

2.1.3 Green Square Urban Renewal Area: Updated Transport Management and Accessibility Plan

In 2012, Transport for NSW also led the development of an update to the 2008 *Transport Management and Accessibility Plan* (TMAP) for the Green Square Urban Renewal Area (GSURA). The TMAP included a comprehensive assessment of the transport needs to support the growth of the GSTC, with a focus on sustainable transport modes.

2.1.4 A Plan for Growing Sydney

A Plan for Growing Sydney was released in December 2014 by the Department of Planning and Environment and is the NSW Government's 20-year plan for the Sydney Metropolitan Area. It provides direction for Sydney's productivity, environmental management, and liveability; and for the location of housing, employment, infrastructure and open space. The Plan's vision is to maintain Sydney's position as a strong global city and a great place to live.

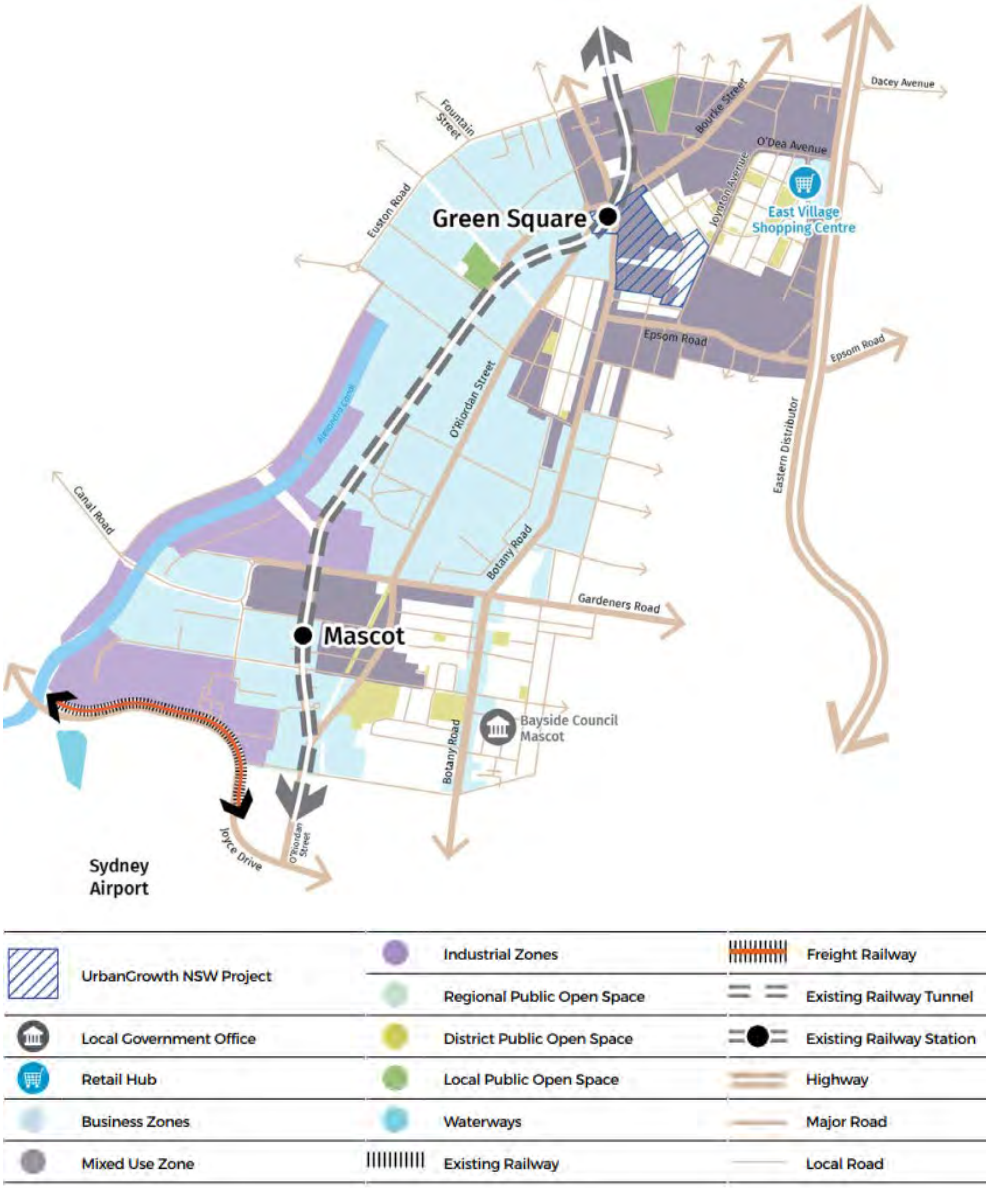
The Plan reinforces the role of Green Square in Sydney's growth: identifying Green Square as a 'Strategic Centre' with a role in accommodating metropolitan-significant levels of urban renewal. The Plan identifies a key action to work with the City to provide capacity for additional mixed-use development in Green Square including offices, retail, services and housing. The nominated action specific to the GSTC is to facilitate delivery of around 4,000 dwellings and 90,000m^2 of commercial and retail area.

2.1.5 Draft Central District Plan

A Plan for Growing Sydney nominates 6 districts of Sydney, the district plans for which have recently been developed and released in draft, by the Greater Sydney Commission (GSC), to the public for consultation.

The *Draft Central District Plan* (GSC, 2016) sets out priorities and actions for the Central District. The Plan conveys the key messages that Green Square is a centre that will grow as a major new retail, community, cultural and residential centre, whilst Mascot is planned to grow as a mixed commercial employment hub around Mascot Station. A key priority in the Plan is to facilitate economic and jobs growth in the Green Square-Mascot 'Strategic Centre', setting a target to grow employment from 59,500 in 2016 to 75,000-80,000 by 2036 (25% to 35% increase). The identified planning activities in the Plan are illustrated in Figure 4.

Figure 4 Green Square-Mascot strategic centre



Source: Greater Sydney Commission (2016)

2.2 City of Sydney strategies and policies

2.2.1 Sustainable Sydney 2030

Sustainable Sydney 2030 is the principal strategic plan and policy document that applies to the City of Sydney LGA. *Sustainable Sydney 2030* contains Five Big Moves, 10 Strategic Directions and 10 Project Ideas that provide for the future planning of the LGA up to 2030. The relevant Big Moves, Strategic Directions and Project Ideas include:

- Big Move 2 – Integrated Transport
- Big Move 5 – Sustainable Renewal
- Direction 3 – Integrated transport for a connected City
- Direction 4 – A City for pedestrians and cyclists
- Direction 9 – Sustainable development, renewal and design
- Idea 8 – Housing for diverse population
- Idea 7 – Connecting Green Square
- Idea 8 – Affordable Housing.

To achieve the plans set out in the document, the GSURA, and the Town Centre in particular, should be better connected to the wider region, including towards the Inner West of Sydney. The GS2AC will help provide this connection. Furthermore, the GS2AC will provide the opportunity for a new bus link that will increase the public transport accessibility of an area which has limited cross-regional connections.

2.2.2 Connecting our City

Connecting our City (2012) was prepared by the City to establish a world-class transport system through the development of more sustainable transport options over the next 20 years. Whilst the Strategy focuses on the Sydney CBD, a number of action plans relate to transport and access in the Green Square Town Centre and broader GSURA. The strategy largely focuses on sustainable transport options such as walking and cycling and managing the volume of cars in the street.

The Strategy also focuses on achieving a travel demand shift to public transport and active transport to respond to the ever-increasing transport demands in the LGA.

Relevant objectives of the Strategy include:

- Move No.2 – An integrated inner Sydney transport network including new sustainable transport connecting Inner Sydney Central Sydney and the City's villages.
- Move No.3 – A Liveable Green Network of continuous green corridors integrated with liveable streets and dedicated pedestrian and cycleway networks.
- Move No.4 – Centres as a focus for the City's Village community and transport.

Relevant elements of the Strategy include:

- Giving more priority to pedestrians and providing safer and more enticing streets in which to walk
- Improving the environment for cyclists through safe and accessible bike paths and routes
- Managing the volume of cars using our streets while maintaining access for commercial and delivery vehicles.

In particular, *Connecting Our City* aims to develop the cycle routes between Green Square and the Sydney CBD. Enhanced walking and cycling choices to the Green Square Town Centre will enhance its vitality and connection to the surrounding areas. The principles have been used to drive the design of GS2AC.

2.2.3 Walking Strategy and Action Plan

The *Walking Strategy and Action Plan* released by the City in 2015 recognises that walking plays a major role in the local economy. With over 30 percent of residents currently walking to work, the City understands the importance of creating better walking environments through the provision of extra walking space and new connections through street blocks. The City aims to accommodate the forecasted doubling in the number of pedestrians between 2006 and 2030 by:

- Making walking quick, convenient and easy
- Making walking inviting and interesting
- Making walking safe and comfortable
- Creating a strong walking culture.

In line with the walking targets and strategy set out in the document, the Green Square Town Centre and broader Green Square Urban Renewal Area is looking to enhance the pedestrian environment in the region. The GS2AC assists this by reducing walking times and creating a safe walking route.

2.2.4 Cycle Strategy and Action Plan

The City's *Cycle Strategy and Action Plan* aims to ensure a more safe and comfortable cycling environment that encourages more people to cycle daily. It defines infrastructure and social initiatives to implement between 2007 and 2017, with some already in place. The City aims to make cycling a feasible transport choice for most residents, workers and visitors by 2017 by:

- Creating and maintaining a comfortable and bicycle friendly environment in Sydney to encourage more residents, visitors and workers onto bicycles
- Improving cycling safety
- Promoting the benefits of cycling
- Increasing the number of trips made by bicycle in Sydney.

The Strategy and Action Plan contains specific targets to increase cycle use as a percentage of total trips. Provision of cycleways that connect to the GSTC, such as the GS2AC, will assist in increasing cycle mode share.

3.0 Existing Conditions

3.1 Land Use

The route alignment of the proposed GS2AC goes through hardstand industrial areas and vacant employment generating land. The route goes through seven properties each of which are zoned for B7 'Business Park' land use (see Figure 5), of which only three are presently in use. These are located at 336-338 Botany Road, 9-13 O'Riordan Street and 44 Bourke Road. The properties are generally considered to be low intensity in terms of travel demand generation.

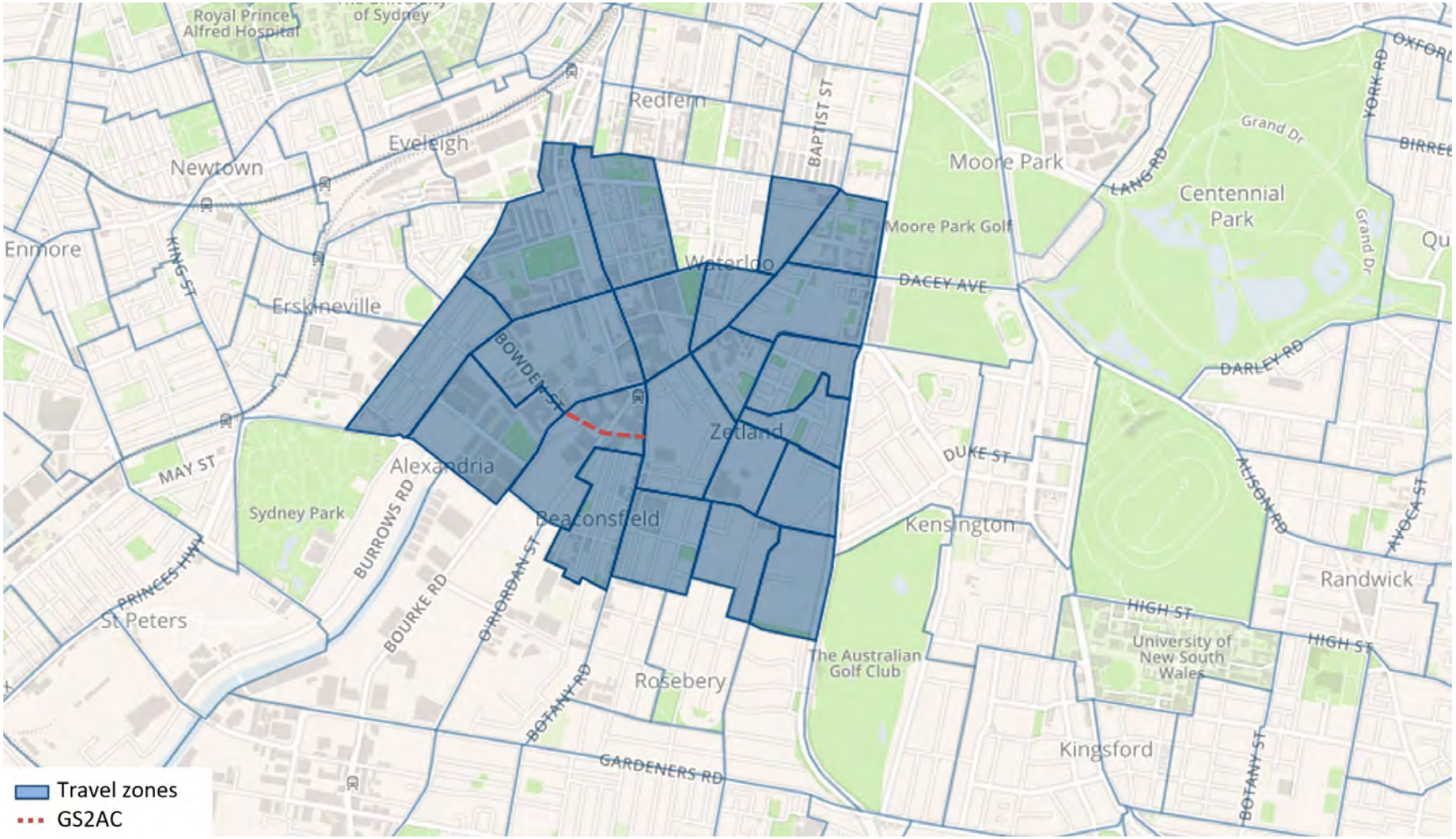
Other local land uses include R1 'General Residential' and B6 'Enterprise Corridor'. Areas coloured white along the eastern boundary of Botany Road represent the Green Square Town Centre which is understood to currently be predominantly zoned for B4 'Mixed Use'.

Figure 5 Existing land use zoning

Source: City of Sydney, modified by AECOM

The Green Square Development Area comprises approximately 21 travel zones as defined by the NSW Bureau of Statistics and Analytics (NSW BSA) (see Figure 6). Collectively, the data indicates the defined area had an estimated residential population of 28,615 in 2016.

Figure 6 Travel Zones that comprise the Green Square Development Area



Source: NSW BSA, Travel Zone Explorer, Modified by AECOM 2020

3.2 Active transport

3.2.1 Walking

Local demand for walking has been observed to be relatively low, which is reflective of the local land uses, and reflected in the available infrastructure. The main local generator of walking trips is the Green Square Station, and most roads in the local catchment have footpaths on either side which provides a reasonable element of pedestrian safety. However, the pedestrian environment suffers due to poor public domain and a lack of alternative route choice to key nodes due to the predominance of busy north-south oriented roads.

There is also a lack of safe pedestrian crossings at the key north-south roads in the area, especially for O'Riordan Street which has a 750 metre gap between existing pedestrian crossings near the Green Square Train Station and Collins Street. The same applies to Bourke Road, which has an 800 metre gap between existing pedestrian crossings at the Green Square Train Station and Collins Street. Under each scenario pedestrians are either forced to walk an additional 500 metres or more to cross safely at a signalised pedestrian crossing or cross each road against oncoming traffic, which comes with great personal risk. The distance between crossings is less acute along Botany Road, where there is a pedestrian crossing at Epsom Road. This is located approximately in the middle between the crossing near the Green Square Train Station and at Collins Street. In addition, a new intersection is currently being created at Geddes Avenue and is expected to be open by late 2017.

With the exception of the O'Riordan Street / Collins Street and Botany Road / Epsom Road intersections, pedestrian crossings are not provided at any intersections south of the existing pedestrian crossings near the Green Square Train Station.

3.2.2 Cycling

Green Square is connected to Sydney's cycle network with a dedicated on-road separated cycleway which runs along Bourke Road and Bowden Street. These cycleways mainly provide linkages to the CBD in the north and Mascot and the airport to the south. The cycleway is also linked to bicycle friendly roads to the west. Linkages to the M1 and Kensington to the east are also provided from Green Square by a mixture of bicycle friendly roads and dedicated cycling lanes. Figure 7 shows the cycle network near the Green Square Town Centre.

However, similar to the pedestrian environment there is a lack of safe crossings across key roads, poor route choices to key nodes, and a lack of safe and efficient east-west cycle links. This commonly results in cyclists using existing footpaths on Botany Road and O'Riordan Street, with impacts on pedestrian safety.

Figure 7 Current cycle network near Green Square

Source: City of Sydney, 2020

3.3 Public transport

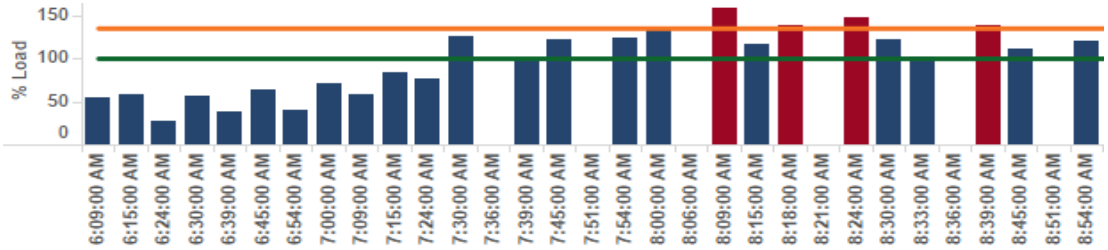
3.3.1 Train

Green Square Station is located at the intersection of Botany Road / O'Riordan Street / Bourke Road. The station is on the T2 Airport Line for services between Town Hall and Macarthur. In peak periods, trains run every 3 to 9 minutes depending on the direction of travel. Interchange from bus is available, bike facilities and a taxi rank are close by, however no kiss and ride or commuter parking are provided.

The train station is operated by the Airport Link Company. Between its opening in 2000 and 2011, a station access fee was applied to passengers, in addition to their normal fare. Since 2011, the access fee was removed following an agreement from the State Government to pay the fee on behalf of the passengers.

As noted in the NSW LTTMP, the T2 line was approaching seating capacity between Green Square and Central stations when the document was published in 2012. This is reinforced by 2016 AM line loading data (see Figure 12) which shows that all services operating during the AM peak hour are over seating capacity (100% loading) at Green Square Station whilst some are in excess of seating plus nominal standing capacity (135% loading).

Figure 8 T2 Airport Line 2016 AM peak line loading at Green Square Station



Source: Transport for NSW, 2016

3.3.2 Bus

Green Square is well served by district and local buses with Routes 309, 309x, 310x, and 370 running along Botany Road. To the east of Botany Road, Routes 301, 343 and 348 also run along Joynton Avenue. The bus routes are illustrated in Figure 9. The majority of these bus routes provide access towards the CBD as well as to the south to Botany, Mascot and Eastlakes; and also Kensington to the east. They also provide some degree of cross-regional (east-west) public transport functionality as well as rail interchange opportunities - such as at Green Square Station which has bus stops immediately adjacent at Botany Road.

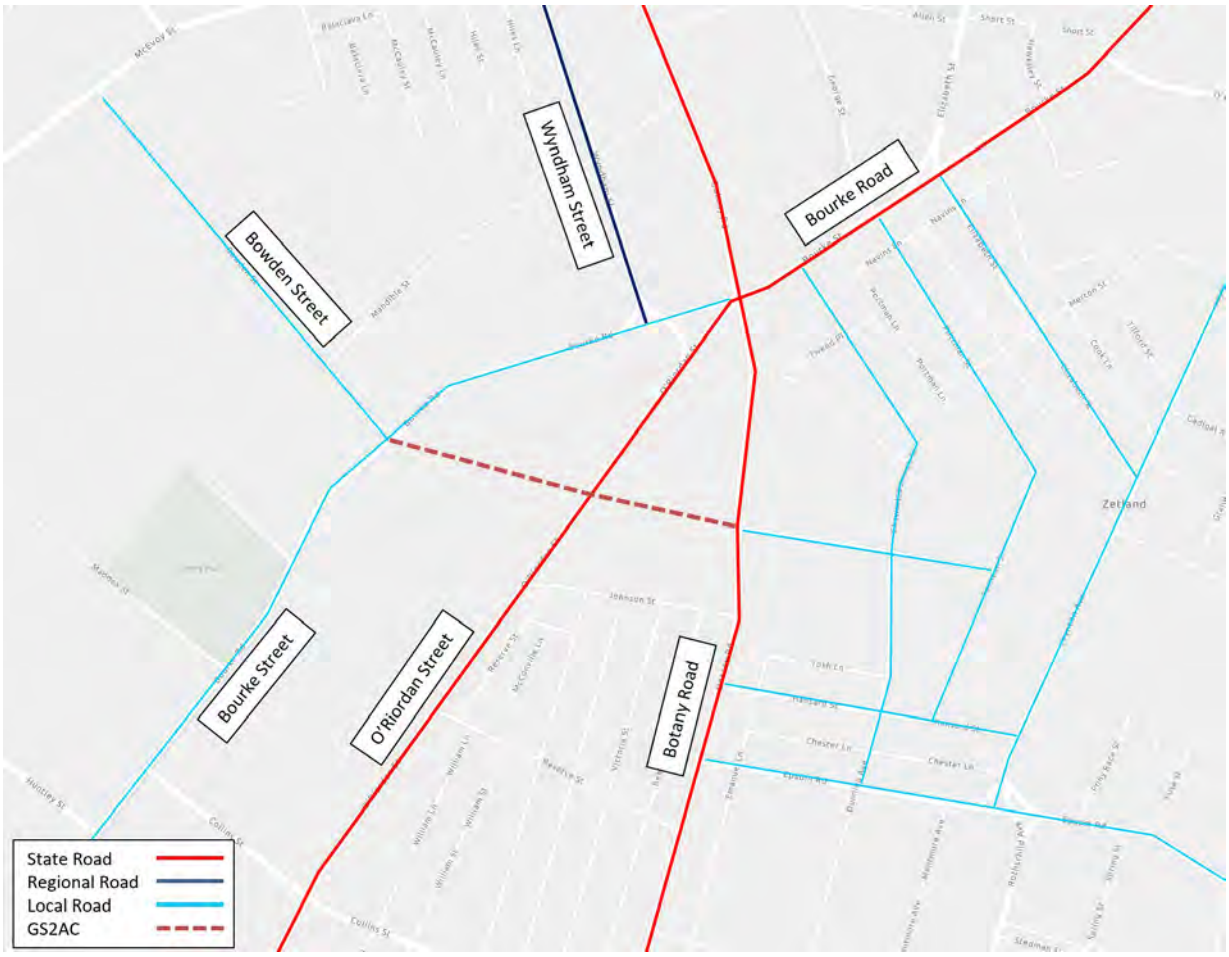
Figure 9 Bus network near Green Square

Source: Sydney Buses, 2020

3.4 Road network

Key roads within the study area include Botany Road, O'Riordan Street, Bourke Road and Bowden Street. Figure 10 outlines the classification of the surrounding road network, with a detailed discussion on the key roads included below.

Figure 10 Green Square surrounding road network



Source: City of Sydney, modified by AECOM in accordance with RMS Schedule of Classified Roads and Unclassified Regional Road

3.4.1 Key roads

Botany Road

Botany Road is a national freight corridor and forms part of a route linking Sydney CBD with Sydney Airport and Port Botany terminals. Botany Road provides four lanes of undivided carriageways with two traffic lanes in each direction to accommodate high volumes of traffic during the peak periods. 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'. During peak periods, clearway restrictions are effective for the peak directional flow along Botany Road. In the vicinity of the study area Botany Road is signposted at 50km/h.

In the immediate vicinity of the proposed GS2AC corridor, Botany Road has "No Stopping" restrictions on the kerbside lane in both directions. A bus stop exists on the western side. On the eastern side there is an access driveway to the former Waverley Council Depot (now owned by the City) and two access driveways to 336 and 338 Botany Road. The road contains a footpath on either side with electricity light poles and wires.

Typical features along Botany Road are presented in Figure 11.

Figure 11 Botany Road typical features (looking north near the proposed GS2AC)

Source: Google Street View

O'Riordan Street

O'Riordan Street provides a similar level of functionality to Botany Road, in that it provides an arterial connection from central/eastern Sydney to Sydney Airport and Port Botany. In the vicinity of the study area, O'Riordan Street is signposted at 60km/h. O'Riordan Street is characterised by two lane approach and departure lanes in both directions of travel. During AM and PM peak periods, clearway restrictions are in place with limited kerbside parking being effective outside of the peak periods. As illustrated in Figure 12, the corridor has limited bus functionality in the GSTC area.

At the point where the GS2AC is proposed to cross O'Riordan Street, there are three driveways on the western side (two at 9-13 O'Riordan Street and one at 15 O'Riordan Street). On the eastern side there is one access driveway to 20 O'Riordan Street and one access to 22 O'Riordan Street. Established trees also line each side of the carriageway.

Figure 12 O'Riordan Street typical features (looking north near the proposed GS2AC)

Source: City of Sydney

Bourke Road

Bourke Road is a collector road, aligned parallel to O'Riordan Street and provides access to commercial and industrial properties along the corridor as well as adjacent roads. Between O'Riordan Street and Gardeners Road, traffic is accommodated on a single traffic lane in each direction with a separated bi-directional bicycle lane along the western side of the road and kerbside parking along the eastern side of the corridor. Bourke Road has a sign posted speed of 50km/h.

There are also street tree plantings along most sections of the road. Electricity light poles and wires also dominate the streetscape along Bourke Road.

Figure 13 Bourke Street typical features (looking south near the proposed GS2AC)

Source: City of Sydney

Bowden Street

Bowden Street is a local east-west road providing connection between the higher order roads of Bourke Road and McEvoy Street. It provides two directional lanes with parking allowed only on the northern side. The sign-posted speed limit is 50 km/h. The road also has a separated on-road cycleway. There are street tree plantings along most section of the road with a footpath either side.

Figure 14 Bowden Street typical features (looking west near the proposed GS2AC)

Source: City of Sydney

Geddes Avenue

Geddes Avenue is a local east-west road providing connection between the higher order roads of Botany Road and Portman Street. It provides two directional lanes with parking not permitted on either side. The sign-posted speed limit is 50 km/h. The road also has a separated on-road cycleway. There are street tree plantings along most section of the road with a footpath either side.

Figure 15 Geddes Avenue typical features (looking west near the proposed GS2AC)

Source: Google Street View

3.4.2 Intersections

The immediately adjacent road network is illustrated in Figure 16 and comprises six intersections:

- Signalised intersections
  - Botany Road / Bourke Street / O'Riordan Street
  - Bourke Road / Wyndham Street
  - Botany Road / Geddes Avenue
- Priority-controlled intersections
  - Bourke Road / Bowden Street
  - O'Riordan Street / Johnson Street
  - Botany Road / Johnson Street

All movements are permitted at each intersection with the exception of the following right turns:

- From Bourke Road (eastbound) to O'Riordan Street (southbound)
- From O'Riordan Street (eastbound) to Botany Road (southbound)
- From Bourke Street (westbound) to Botany Road (northbound)
- From Botany Road (southbound) to O'Riordan Street or Bourke Road.

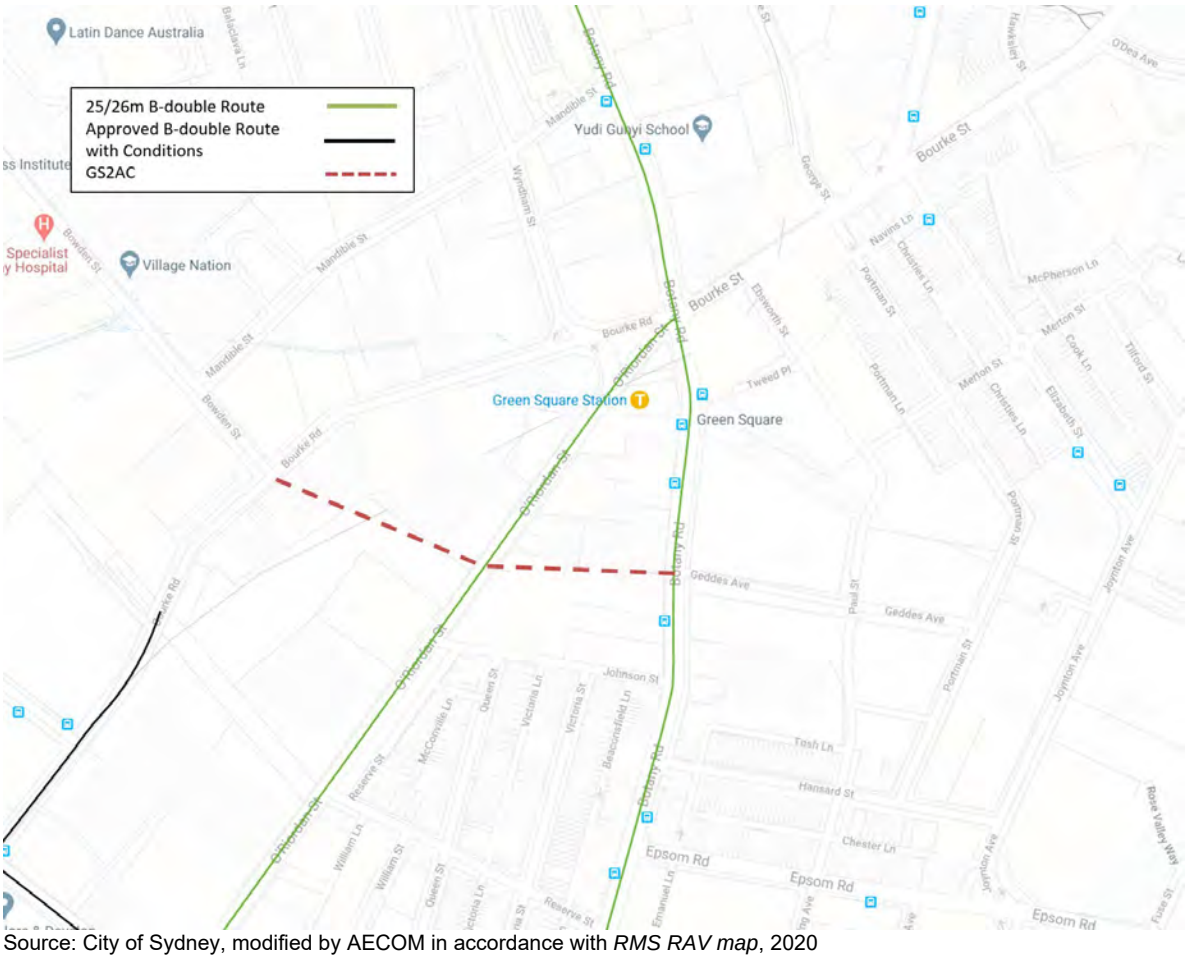
Figure 16 Key intersections

Source: City of Sydney modified by AECOM, 2017

3.4.3 B-Double Routes

The designated B-Double truck routes within the study area run along O'Riordan Street and Botany Road. Shown in Figure 20, these routes can accommodate trucks up to 25/26 metres in length. Sections of Collins Street and Bourke Street are also approved B-Double routes, subject to certain travel conditions.

Figure 17 Existing B-Double Routes in the Green Square area



Source: City of Sydney, modified by AECOM in accordance with *RMS RAV map*, 2020

3.4.4 Traffic volumes

A comprehensive suite of automatic traffic counts (ATC) and intersection turning movement count surveys (TMC) were completed in November 2018 to understand and analyse existing traffic volumes and patterns within the study area. Specifically, ATC tubes recorded classified hourly traffic volumes at the following two locations identified below over a one-week survey period and turning movement counts were undertaken on a typical weekday (20 November 2018) during the same week at three locations as described below.

- Site 1: Bourke Road/ Bowden Street - Turning Movement Counts
- Site 2: O'Riordan Street (north of Johnson Street) – Automatic Traffic Counts
- Site 3: Botany Road (north of Johnson Street) – Automatic Traffic Counts
- Site 4: Botany Road/ Epsom Road – Turning Movement Counts
- Site 5: Botany Road/ Geddes Avenue – Turning Movement Counts

The locations where the traffic counts were undertaken are highlighted in Figure 18.

Figure 18 Locations of ATC and TMC surveys

Source: Google maps, 2018 modified by AECOM

3.4.4.1 Turning Movement Counts (TMC)

Turning Movement Counts (TMC) were undertaken on 20 November 2018 (Tuesday), a typical weekday. Video surveys were undertaken from 06:30am to 09:30am and from 04:00pm to 07:00pm at three intersections as described in Section 3.3. Besides vehicle turning movements, pedestrian and cycle volumes at each intersection were also extracted using these videos. The peak hour turning movements are presented in Figure 19 and Figure 20.

3.4.4.1.1 Site 1: Bourke Road / Bowden Street

The traffic flow pattern observed at this intersection is summarised below:

- The AM peak hour for this intersection is observed to occur between 07:45am and 08:45am and the PM peak hour between 05:00pm and 06:00pm.
- The site is observed to handle 1,208 vehicles during AM peak hour and 1,094 vehicles during PM peak hour.
- During the AM peak, traffic flows are observed to be similar for all approaches. During the PM peak, Bourke Road is observed to account for the major share of traffic approaching the intersection.

3.4.4.1.2 Site 4: Botany Road / Epsom Road

The traffic flow pattern observed at this intersection is summarised below:

- The AM peak hour for this intersection is observed to occur between 08:00am and 09:00am and the PM peak hour between 04:15pm and 05:15pm.
- The site is observed to accommodate 2,448 vehicles during AM peak hour and 2,392 vehicles during PM peak hour.
- During the AM peak, south approach of Botany Road is the dominant approach with about 9% heavy vehicle flow. During the PM peak hour, north approach of Botany Road is observed to contribute the highest flow at this intersection.
- It is assumed that large proportion of heavy vehicles using this intersection is likely due to construction activities at Green Square.

3.4.4.1.3 Site 5: Botany Road / Geddes Avenue

The traffic flow pattern observed at this intersection is summarised below:

- The AM peak hour for this intersection is observed to occur between 08:00am and 09:00am and the PM peak hour is between 04:30pm and 05:30pm.
- The site is observed to handle 2,010 vehicles during AM peak hour and 1,995 vehicles during PM peak hour.
- The traffic flows on Geddes Avenue are observed to be very low during both peak periods.
- During the AM peak hour, south approach of Botany Road is the dominant approach with about 9% heavy vehicle flow while during the PM peak hour north approach of Botany Road is observed to contribute the highest flow at this intersection.

It is also observed that there is a sudden drop in traffic approaching the intersection from the north approach of Botany Road during the PM peak. This may be attributed to heavy congestion at the upstream intersection resulting in reduced throughput.

Figure 19 Turning movements during AM peak hour (Source: Matrix Traffic & Transport Surveys, 2018)

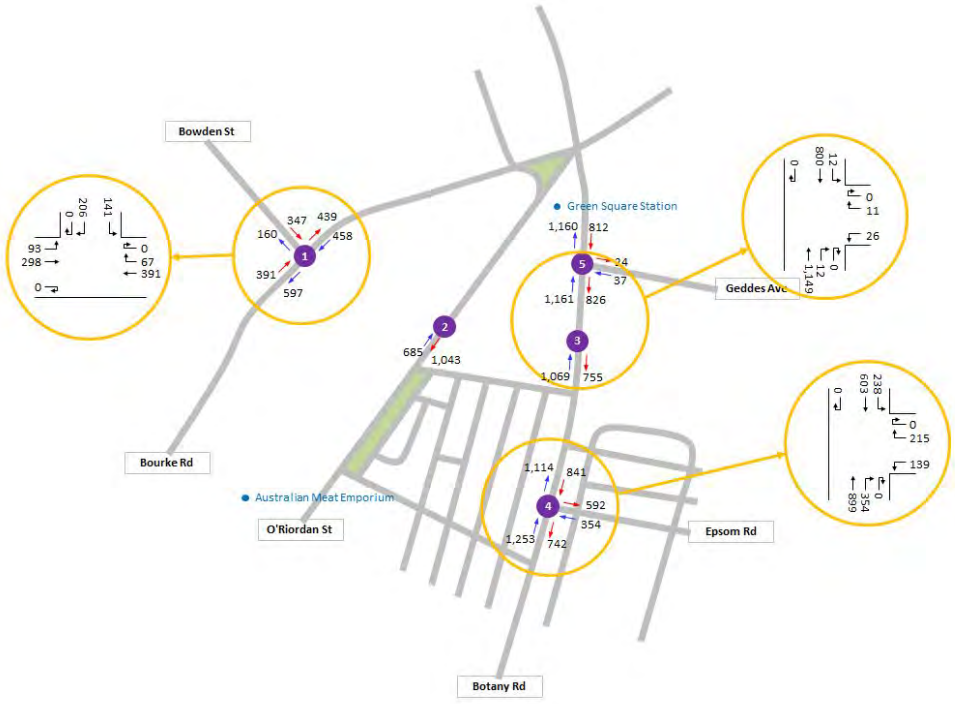
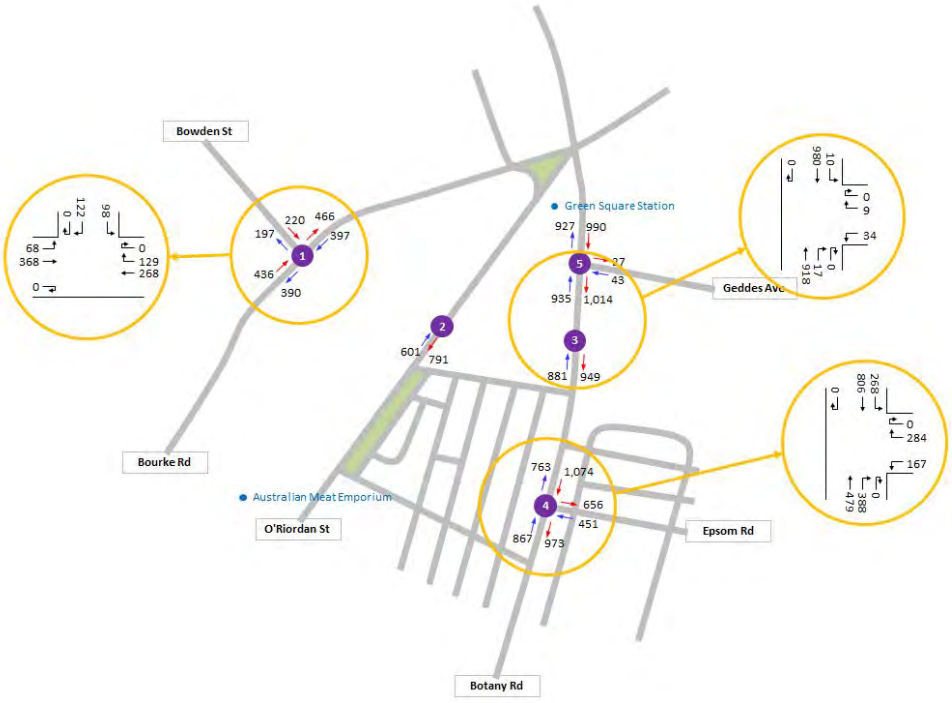


Figure 20 Turning movements during PM peak hour (Source: Matrix Traffic & Transport Surveys, 2018)



3.4.4.2 Automatic Traffic Counts (ATC)

Automatic traffic counts (ATC) were undertaken over a week starting on 20 November 2018. The counts were undertaken using tubes for 24 hours a day at the two locations described above.

Site 2 counts were used to estimate approach flows along O'Riordan Street for the future intersection and Site 3 counts were used to review traffic pattern and compare turning movement counts at Site 5 and Site 4.

The survey data for 20 November 2018 has been specifically assessed in this report as the turning movement counts and site visit were undertaken on the same day.

3.4.4.3 Site 2: O'Riordan Street (north of Johnson Street)

The traffic flow pattern observed at Site 2 is summarised below:

- On a typical weekday, the AM peak hour is between 8:00am and 9:00am with a two-way flow of 1,728 vehicles while the PM peak hour is between 3:00pm and 4:00pm with a two-way flow of 1,635 vehicles.
- Northbound flows on 20 November 2018 was observed to contain several crests and troughs throughout the day with a sudden drop immediately preceding the PM peak hour. This is assumed due to an incident that might have occurred at an upstream location reducing flow towards this site.
- The highest hourly traffic flow occurs during AM peak.
- Based on traffic flow data observed at Site 2, AM peak hour occurs during the similar period during weekdays, however, PM peak hour is observed to vary during the week.

The peak hour traffic flow observed at Site 2 on a typical weekday is detailed in Table 1.

Table 1 Peak hour traffic flows at Site 2

Peak Hour	Southbound (veh)	Northbound (veh)	Two–way (veh)
AM (08:00am-09:00am)	1,043	685	1,728
PM (03:00pm-04:00pm)	881	754	1,635

3.4.4.4 Site 3: Botany Road (north of Johnson Street)

The traffic flow pattern observed at Site 3 is summarised below:

- Distinct peaks are observed during both AM and PM peak periods at Site 3.
- On a typical weekday, the AM peak hour is during 8:00am to 9:00am with a two-way flow of 1,824 vehicles while the PM peak hour is during 04:00pm to 05:00pm with a two-way flow of 1,777 vehicles.
- Both AM and PM peak hours occur during the similar period during weekdays.
- The southbound flow was observed to remain steady after the AM peak hour with a sudden spike during the PM peak hour.

The peak hour traffic flow observed at Site 3 on a typical weekday is shown in Table 2.

Table 2 Peak hour traffic flow at Site 3

Peak Hour	Southbound (veh)	Northbound (veh)	Two–way (veh)
AM (08:00am-09:00am)	755	1,069	1,824
PM (04:00pm-05:00pm)	962	815	1,777

Graphs showing the 24-hour traffic volumes for Tuesday 20-November, the weekday average and the seven-day average are shown below.

Figure 21 Site 2 Southbound flow

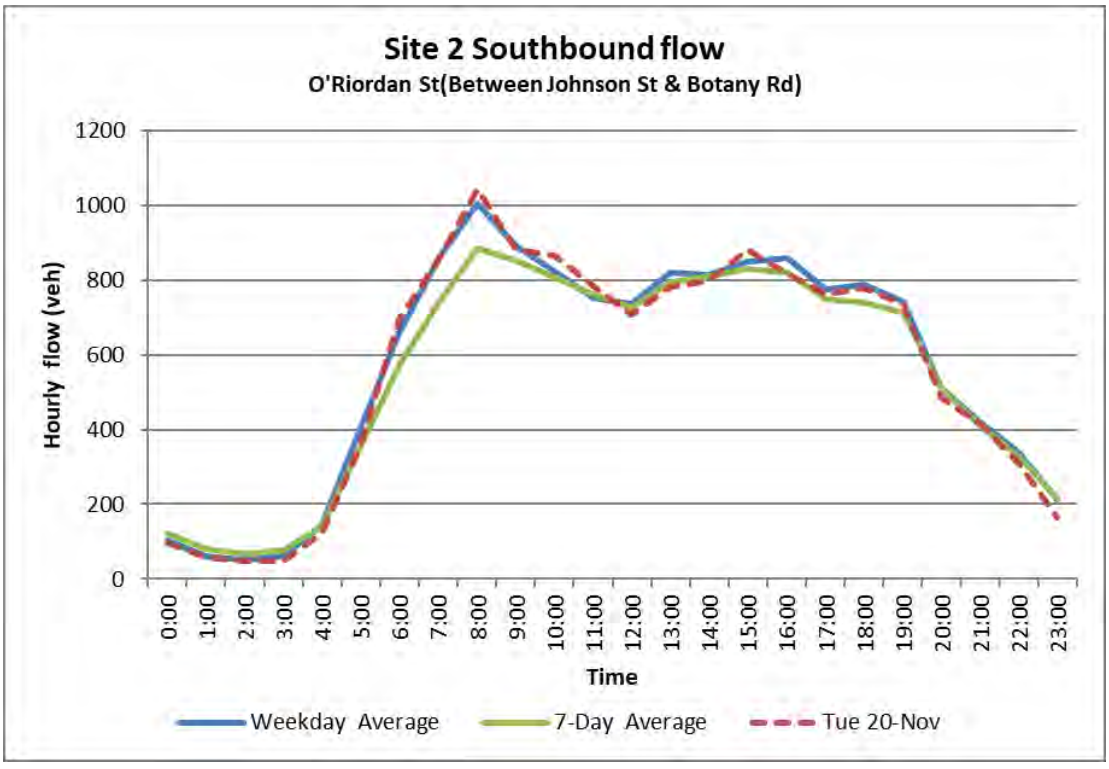


Figure 22 Site 2 Northbound flow

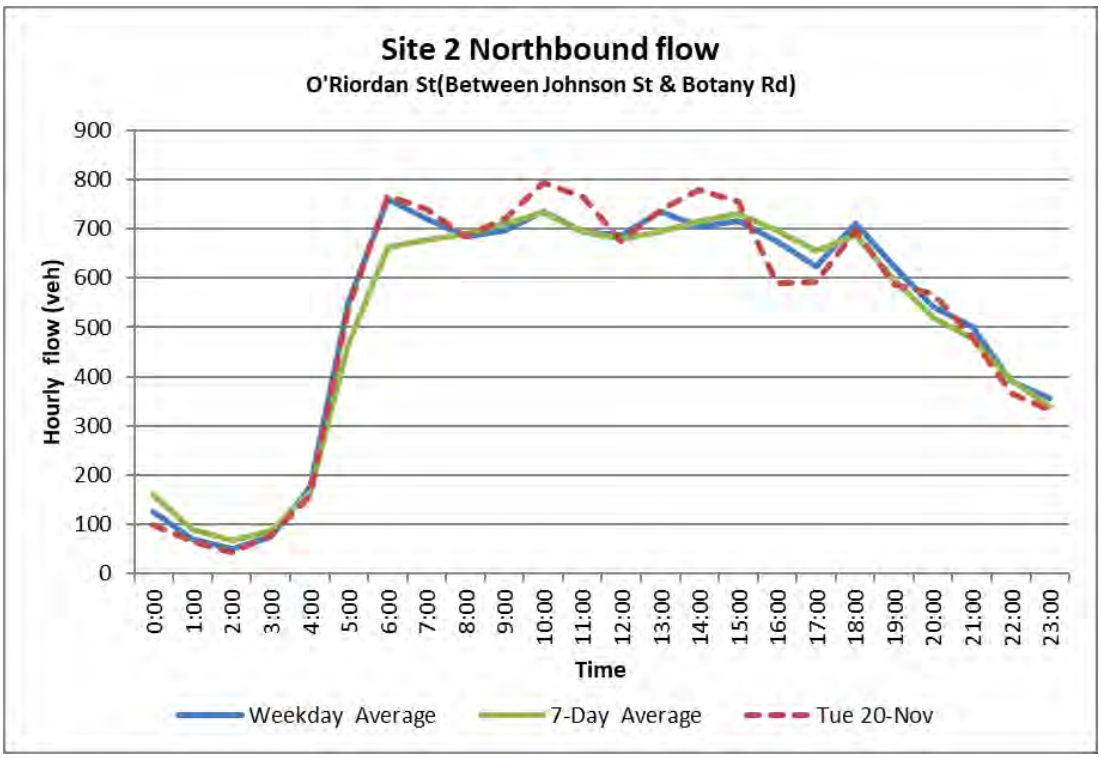


Figure 23 Site 3 Southbound flow

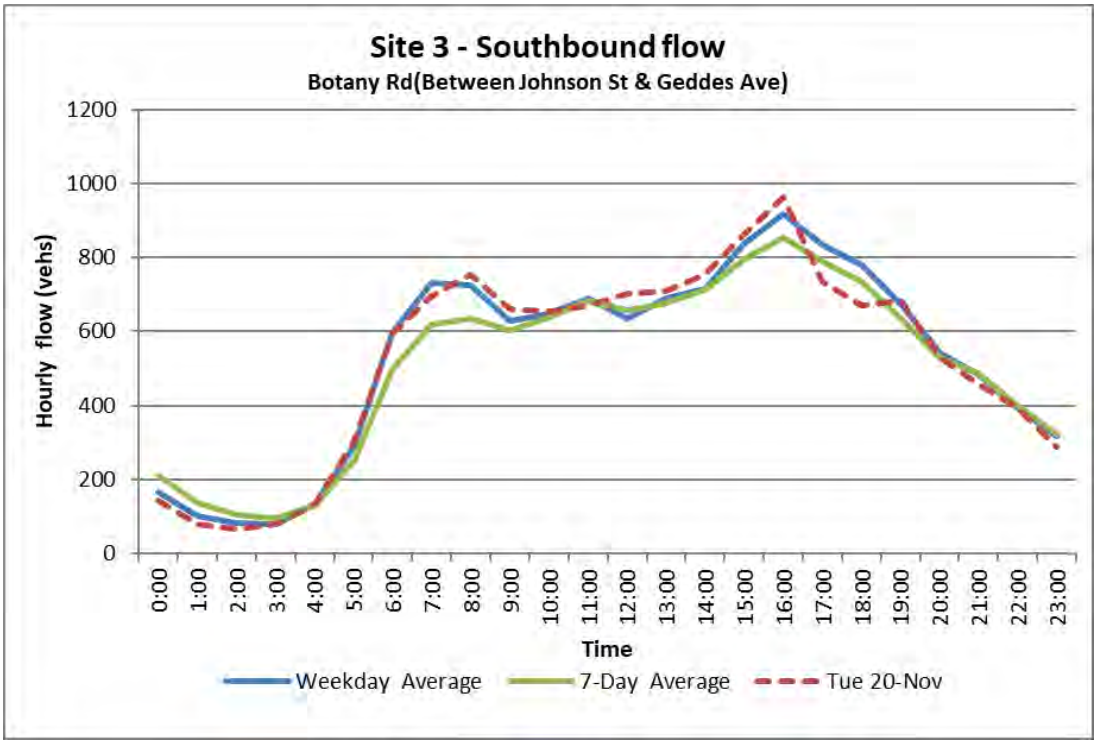
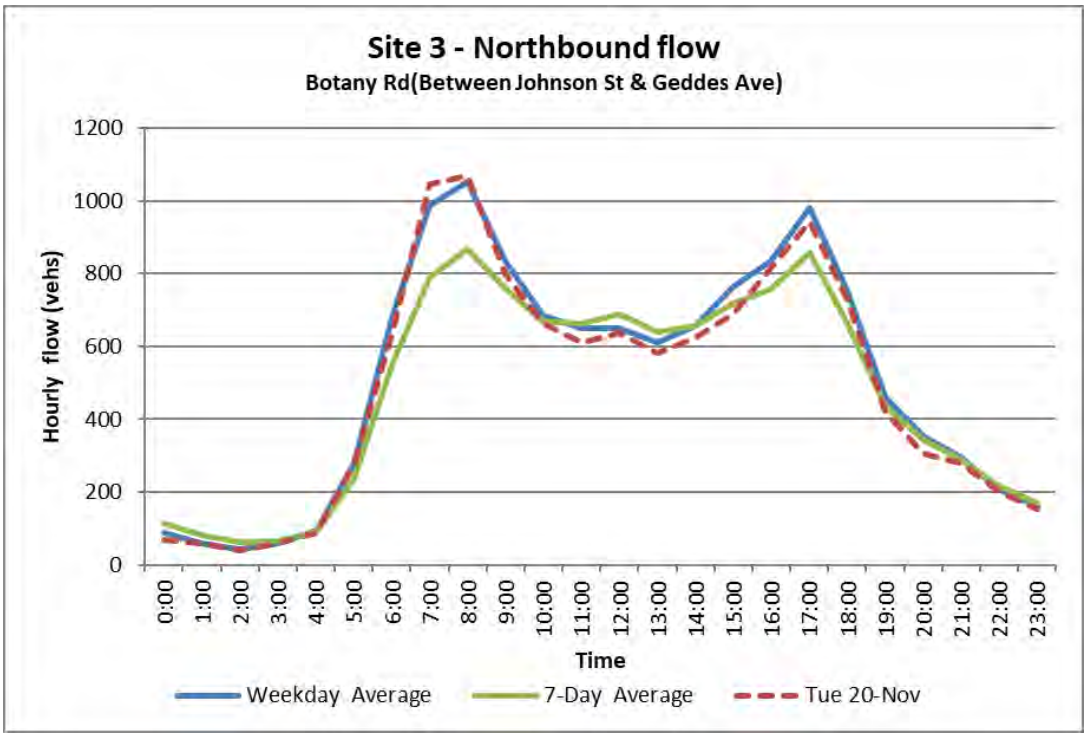


Figure 24 Site 3 Northbound flow



3.4.5 Base year operational performance

SIDRA INTERSECTION models for the base year (2018) were developed to assess the three existing intersections – Bowden Street / Bourke Road, Botany Road / Geddes Avenue and Botany Road / Epsom Road.

In order to evaluate whether the model predictions are realistic, a comparison was made between the queues observed on site and those predicted by the SIDRA models. The comparison indicated that about 70% of the queue lengths predicted by the models are within 10% of the values observed on site and therefore suggests that SIDRA models provide a realistic prediction of site operational conditions. This is also demonstrated by the blockage probability predicted by the models along north and south approaches of Botany Road, which are similar to observations made on site.

The operational performance of the three intersections during the base year (Table 3) are summarised below:

- All approaches of the Bowden Street / Bourke Street intersection operate well with Level of Service (LOS) C or better.
- The intersection of Botany Road / Geddes Avenue performs well, with LOS A. The Geddes Avenue approach is the worst performing approach (LOS D). However, due to the low degree of saturation (DOS), the performance of this approach would not impact the traffic movements at this approach.
- The intersection of Botany Road / Epsom Road performs at LOS C. Epsom Road and the north leg of Botany Road performs at LOS D due to high degree of saturation and longer delays.

The operational performance of the three intersections during the PM peak of base year (Table 3) are summarised below:

- All approaches at the Bowden Street / Bourke Street intersection operate satisfactorily at LOS B or better.
- The intersection of Botany Road / Geddes Avenue performs at LOS A. The Geddes Avenue approach is the worst performing approach (LOS D). However, due to the low degree of saturation (DOS), the performance of the approach does not cause an impact on the traffic movements.

- The intersection of Botany Road / Epsom Road performs at LOS D. The Epsom Road and the south leg of Botany Road performs at LOS F and LOS E respectively. Poor level of service at the south leg of Botany Road is primarily due to parking along the kerbside lane during PM period, thereby reducing approach capacity at the intersection. Additionally, the model shows a 10% - 30% blockage probability at the north leg of Botany Road during the PM period, which is in line with site observations.
- The model also indicates that the south leg of Botany Road is oversaturated with a DOS of 1.067 during the PM peak. This is primarily due to reduced capacity at this approach due to parking on the kerb side lane till about 100m from the intersection and exit blocking along Epsom Road for the right turning traffic from Botany Road.

Table 3 Operational assessments for base year (2018)

Intersection	Peak Hour	Volume (veh/hr)	Average Delay (s/veh)	Level of Service (LOS)	Degree of Saturation (DOS)	95th percentile back of Queue (m)
Bowden Street / Bourke Road	AM	1307	30.7*	LOS C*	0.779*	38*
	PM	1171	18.9*	LOS B*	0.443*	14*
Botany Road / Geddes Avenue	AM	2186	7.9	LOS A	0.455	155
	PM	2181	8.7	LOS A	0.509	129
Botany Road / Epsom Road	AM	2652	33.5	LOS C	0.892	228
	PM	2550	51.3	LOS D	1.067	325

*Note: As Bowden Street / Bourke Street is a priority intersection, the results shown are for the critical movement, which was observed to be the right turn from Bowden Street to Bourke Street.

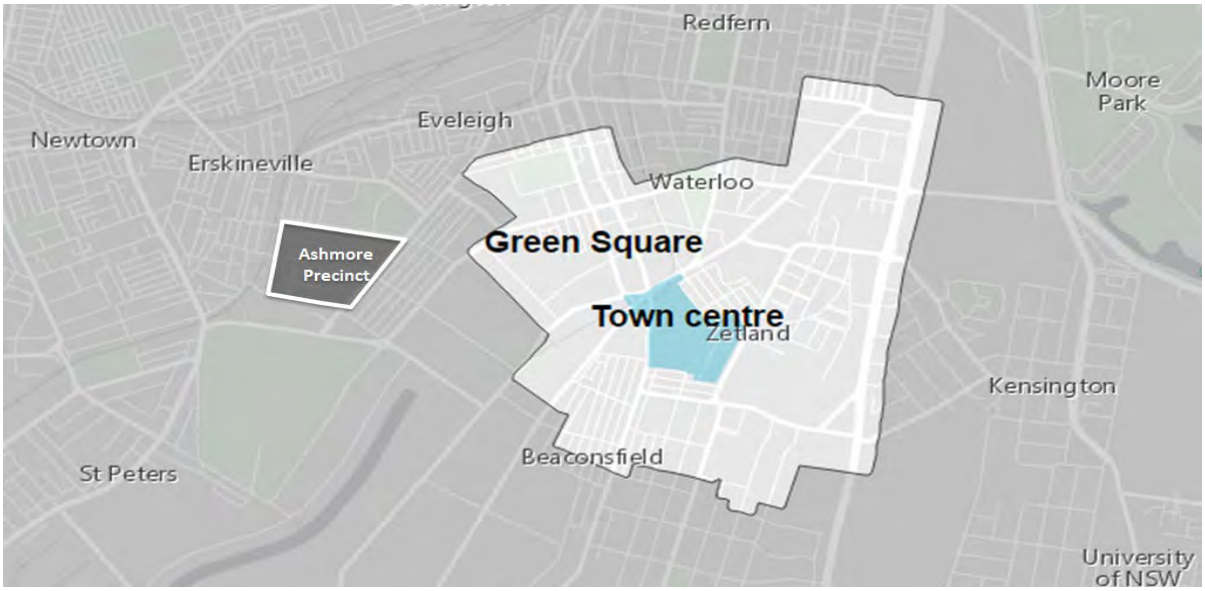
4.0 Future context

4.1 Land use

Of particular note in the context of the Proposal, are the focal growth areas of Green Square, including its Town Centre, and the Ashmore Precinct (see Figure 25). The **Ashmore Precinct** is one of the City's biggest urban development projects and will eventually be home to approximately 6,000 residents, as development is staged over the next seven years to 2027[1]. **Green Square** is proposed to introduce 30,500 new dwellings by 2030, accommodating an additional 61,000 residents. The **Green Square Town Centre** includes 4,000 proposed new dwellings and 6,000 new jobs and was completed in 2019[2]. The significant increase in local development to support this growth will significantly increase travel demand on local transport infrastructure and services, for all modes, as well as increasing the need for property access away from key "movement" corridors (e.g. Botany Road).

The City is also currently seeking to undertake the sustainable renewal of the **Northern Investigation Area** (NIA) precinct (20 hectares) at Alexandria (west of the Green Square Town Centre) to provide potential opportunities for private as well as affordable housing mixed with existing and future employment uses and public domain upgrades. A key strategic planning aim for the precinct is to link the area with the Green Square Town Centre. The City is working on an access and circulation plan for the NIA project (including Bowden Street, Bourke Street, McEvoy Street and Wyndham Street) to accommodate up to 1,500 people over a 10-year period. The proposed GS2AC will help link the NIA precinct to the Green Square Town Centre.

Figure 25 Green Square, Green Square Town Centre and Ashmore Precincts



Source: City of Sydney, modified by AECOM, 2017

4.2 Active transport

The *Draft Central District Plan* (GSC, 2016) identifies a principal cycling network, providing a metropolitan-wide strategic cycling plan to focus planning and investment in cycling infrastructure. In the study area however, the Plan identifies no new 'principal' links in the immediate area.

More locally, construction has commenced on important new bike links to Green Square. New cycleways planned by the City for the GSTC area are illustrated in Figure 26. It is noted the G2SAC forms part of the planned Marrickville to Randwick route.

[1] http://www.cityofsydney.nsw.gov.au/vision/better-infrastructure/major-projects/ashmore-precinct
[2] http://www.cityofsydney.nsw.gov.au/vision/green-square/construction

The GSTC development will include additional cycling infrastructure, including notably a separated on-road cycleway along Geddes Avenue. The intersection of Geddes Avenue / Botany Road (see Figure 30) also provides new crossing opportunities.

Figure 26 Proposed regional bike network – Green Square area

Source: City of Sydney, 2016

4.3 Public transport

In regard to rail, customers travelling to and from Sydney Airport will benefit from more than 200 extra services per week in non-peak times on the T2 Airport Line in response to the noted significant recent increase in passenger demand[3],

The construction of Sydney Metro City and Southwest will remove the T3 Bankstown Line from the City Circle in Sydney CBD. This will unlock additional capacity on the City Circle, allowing more services on the T2 Airport, Inner West and South Line into Sydney CBD. The additional services would help reduce forecast passenger loading issues, and increase capacity for development in Green Square. Growing demand for rail services, driven by future development, will increase the importance of good accessibility to train services – particularly for pedestrians, cyclists as well as buses.

Sydney's Bus Future (Transport for NSW, 2012) identifies Bourke Street and Botany Road as part of Sydney's 'Suburban bus routes' network, flagging the opportunity for new bus priority measures along Botany Road to improve travel times.

4.4 Road network

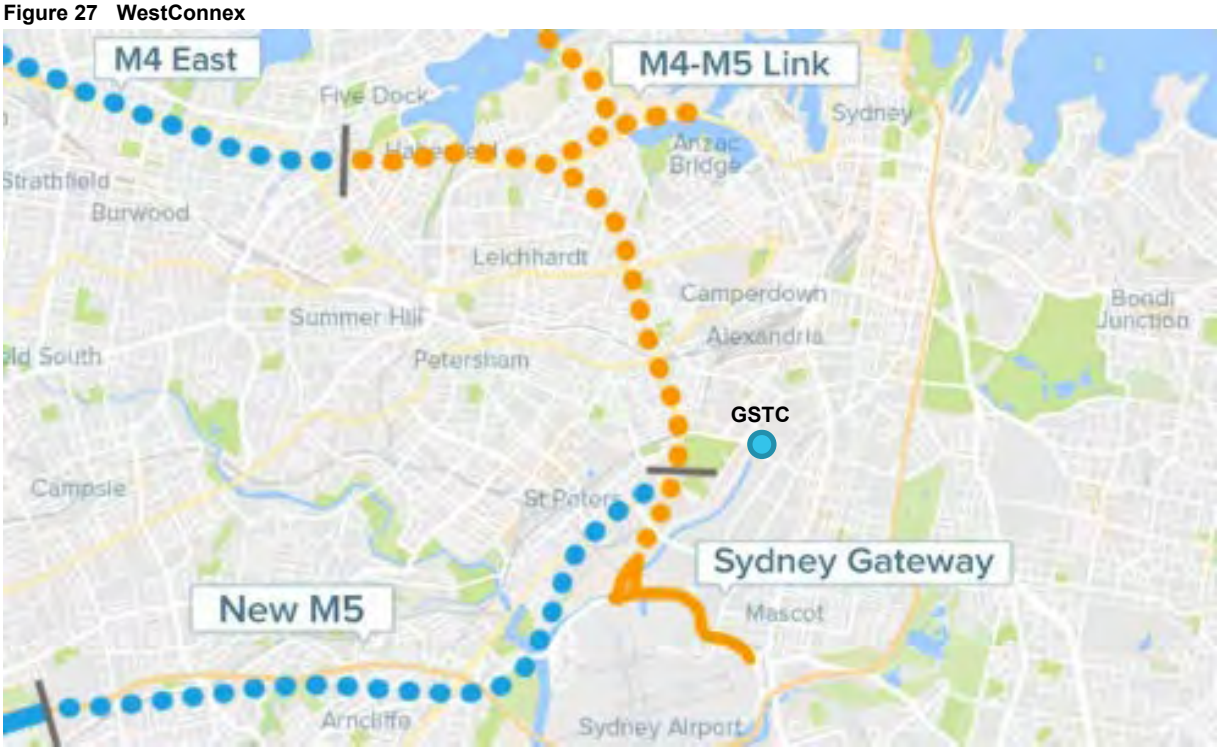
4.4.1 WestConnex

The WestConnex project (see Figure 27), in particular Stage 2 (New M5 Motorway) and Stage 3 (M4-M5 Link) of the proposed motorway network, are anticipated to significantly affect regional traffic patterns in the area. The M4-M5 Link will perform a parallel function with key local routes including the M1 and Botany Road. However, the presence of an interchange at St Peters may increase traffic flows on certain road links in the local area. Traffic forecasts produced to assess the impacts of WestConnex indicate that traffic volumes on nearby corridors such as Euston Road / McEvoy Street may significantly increase. This has been validated by subsequent Roads and Maritime traffic modelling showing traffic volumes on Euston Road north of Maddox Street will go from around 20,000 vehicles a day in 2016 to 40,000

[3] More Trains, More Services Sydney Airport Line fact sheet, Transport for NSW (May 2017)

vehicles a day in 2021[4]. The New M5 was completed and opened in early 2020 and renamed to the M8 Motorway, with the remaining WestConnex project is programmed for completion in 2023.

Figure 27 WestConnex



Source: Roads and Maritime Services, 2017

4.4.2 Alexandria to Moore Park Connectivity Upgrade

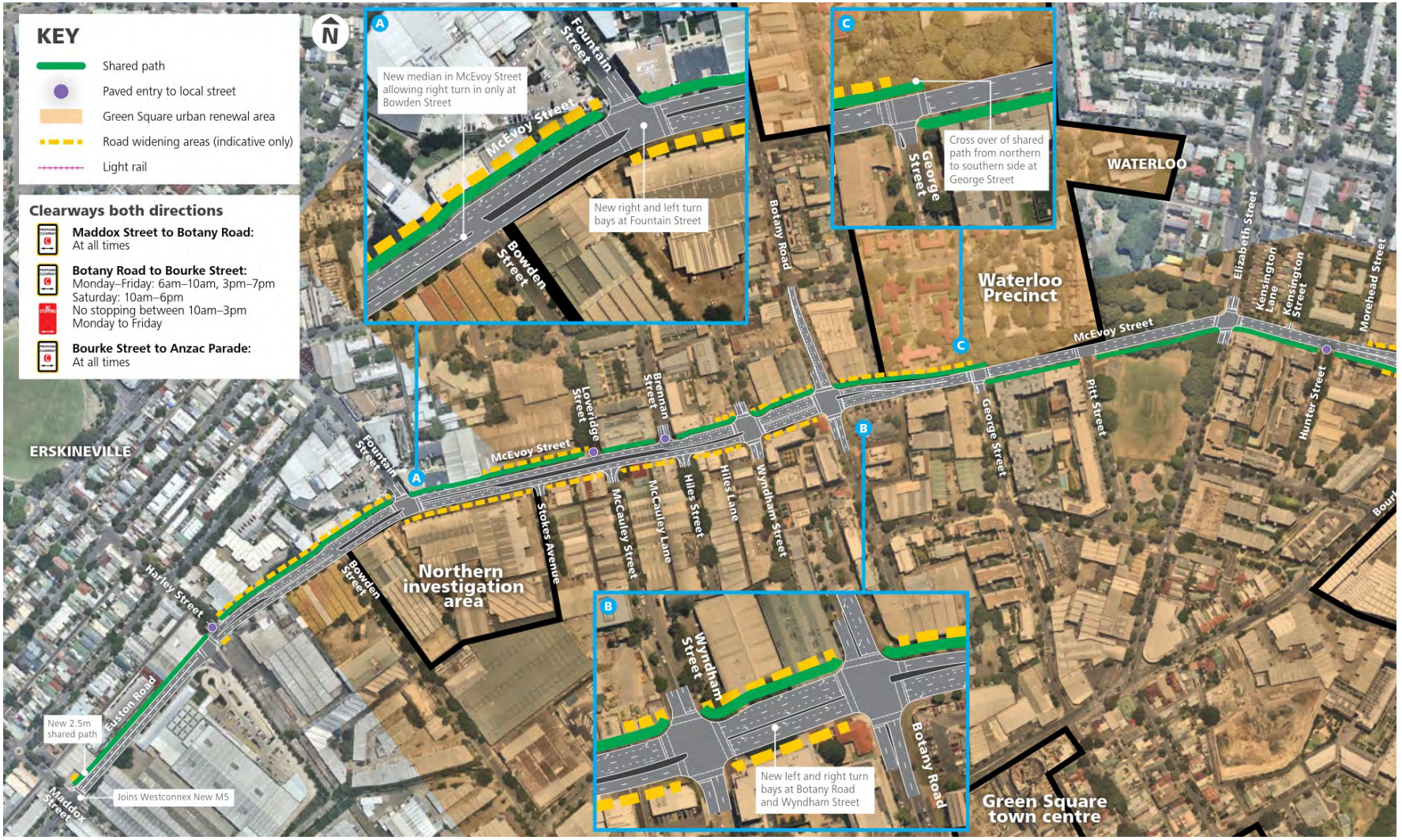
TfNSW is investigating potential local road network and pedestrian and cyclist facility improvements as part of the Alexandria to Moore Park Connectivity (A2MP) Upgrade project. The upgrade works are being planned to integrate with the CBD and South East Light Rail and New M5 Motorway projects. Figure 28 illustrates the preliminary concept design of the proposal.

As illustrated by inset A of Figure 28, the study area includes proposed works at the McEvoy Street / Bowden Street intersection. The proposed works include construction of a new median in McEvoy Street allowing right turn in only at Bowden Street. Notably, the proposed median would also physically restrict right turn movements out of Bowden Street. The impact of the respective works may hence increase southbound traffic volumes on Bowden Street, but decrease northbound volumes. It is considered that existing traffic using the right turn from Bowden Street to McEvoy Street would be displaced on to the parallel corridors of Maddox Street or Wyndham Street, depending on the origin and destination of impact trips.

It is also noted that the proposal does not yet demonstrate integration with the City's planned cycleway facilities along Bowden Street, which should be addressed or considered in future iterations of the design development of A2MP. It is understood the project is currently under implementation and will be completed by mid- 2021.

[4] Alexandria to Moore Park Connectivity Upgrade Community Update – June 2017, Roads and Maritime Services

Figure 28 Proposed Alexandria to Moore Park Connectivity Upgrade



Source: Roads and Maritime, 2017

Figure 29 presents the Stage 1 works being undertaken as part of the Alexandria to Moore Park Project.

Figure 29 Stage 1 works – Alexandria to Moore Park Project

Source: Roads and Maritime, 2019

4.4.3 Green Square Town Centre works

As construction continues and development grows in the GSTC, the supporting street network is also expected to increase providing additional capacity. Figure 30 illustrates the planned street network by current status of works. Critical to the context of the G2SAC is the alignment of Geddes Avenue, proposed to connect to and integrate with the G2SAC.

Figure 30 Proposed Green Square Town Centre street delivery plan

Source: City of Sydney, 2015, modified by AECOM, 2020

4.5 Consequence of no action

Our review of the performance of existing road network indicates that some key intersections on the State road network are currently operating at or near capacity. Further, the evidence reviewed indicates that traffic volumes in the area will increase in the future. This is irrespective of, but varying depending on, the successful implementation of travel demand management interventions that encourage sustainable transport use and discourage private vehicle use.

The GSURA TAMP (Transport for NSW, 2012) highlights that the renewed Green Square would generate in the order of 13,050 to 19,450 additional car trips in the 2031 morning peak hour, depending on the degree to which mode share targets can be achieved. Whilst higher order road infrastructure proposed in the area as part of WestConnex may significantly decrease traffic volumes along certain corridors, forecasts indicate that traffic volumes on nearby corridors such as Euston Road / McEvoy Street may significantly increase. This is anticipated to place significant pressure on a road network already at capacity in several key locations.

Overall, the following are considered key issues should no action be taken in terms of a transport response:

- Land use
  - Should additional road connectivity and capacity not be provided, typical negative urban outcomes associated with congestion could be expected such as: reduced amenity, accessibility, and land desirability and value
  - Accessibility between Green Square and destinations or origins to the west such as Ashmore, Erskineville and Newtown will be constrained, potentially impacting growth and development of the precinct
- Active transport
  - The existing barriers to east-west movement in the area would continue, including to planned regional east-west cycle connections
- Public transport
  - Congestion of the road network, without suitable implementation of necessary bus priority measures, could lead to reduced journey times and reliability to passengers
  - Whilst rail services would continue to operate as per planned on the rail network, reduced accessibility to the train station could be expected for road-based modes, including buses and taxis
- Road network
  - Congestion of the road network could impact function of the local and regional road network in the area, forming a barrier not just to local residents but to broader east-west and north-south functionality of the higher order road network
  - Opportunities for east-west connectivity and distribution of vehicle demand between critical higher order north-south corridors will be limited
  - Direct access to proposed development will be limited to that provided by the existing road network, which in the vicinity of the GS2AC is comprised heavily of busy State roads.

5.0 Proposal description

5.1 The Proposal

As described in Section 1.1.2, the primary feature of the Proposal involves the construction and operation of a new roadway, running east to west from Botany Road to Bowden Street via O'Riordan Street and Bourke Road. The proposal includes two (2) signalised intersections and upgrade works to the existing Botany Road / Geddes Avenue intersection. The roadway is focused on providing public and active forms of transport.

The GS2AC will operate as an east-west transport link between Bowden Street and the proposed Geddes Avenue. The purpose of the GS2AC is to improve local connectivity between the proposed GSTC and Ashmore Precinct.

The GS2AC will provide additional east-west permeability and route choice for pedestrians, cyclists and buses. Pedestrian time savings will also be obtained through the increased efficiency of road crossings. It is recognised that the existing north-south roads of Botany Road, Bourke Road and O'Riordan Street provide important strategic and local functions. Therefore, the GS2AC has been developed to support and maintain the importance of these aforementioned roads.

General features of the Proposal include:

- Three new or augmented traffic signals proposed at the following intersections, connected by a two-way carriageway:
  - Bowden Street / Bourke Road / GS2AC
  - O'Riordan Street / GS2AC
  - Botany Road / Geddes Avenue / GS2AC
- A separated bi-directional cycleway.

Details of the works being undertaken in those sections are outlined in the following section.

5.1.1 Scope of works

The following works would be undertaken:

- Construction of new road for approximately 380m from the proposed Botany Road/Geddes Avenue intersection to the existing Bourke Road/Bowden Street to be designed in accordance with Australian and City standards
- Incorporation of a western arm to the signalised intersection at Botany Road – Geddes Avenue
- New signalised intersection at O'Riordan Street to include the eastern and western approaches of the proposed Connector Road
- New signalised intersection at Bourke Road / Bowden Street to include an eastern approach from the proposed Connector Road. This intersection will provide interchange between the north-south cyclepath on Bourke Road and the east-west cyclepath on Bowden Street
- On-road two-way cyclepath located on the southern side of the proposed Connector Road to connect the existing east-west cyclepaths on Bowden Street and Geddes Avenue
- Batters, mounds and retaining walls to provide the structural support to the road and required interfaces to adjacent properties
- Stormwater connections to the Green Square Stormwater Drain
- Street lighting of all roads to meet required statutory requirements with increased illumination at proposed pedestrian crossing facilities
- Road signage and directional signage
- Provision for electrical, telecommunications and gas infrastructure and other utilities for required for the Proposal

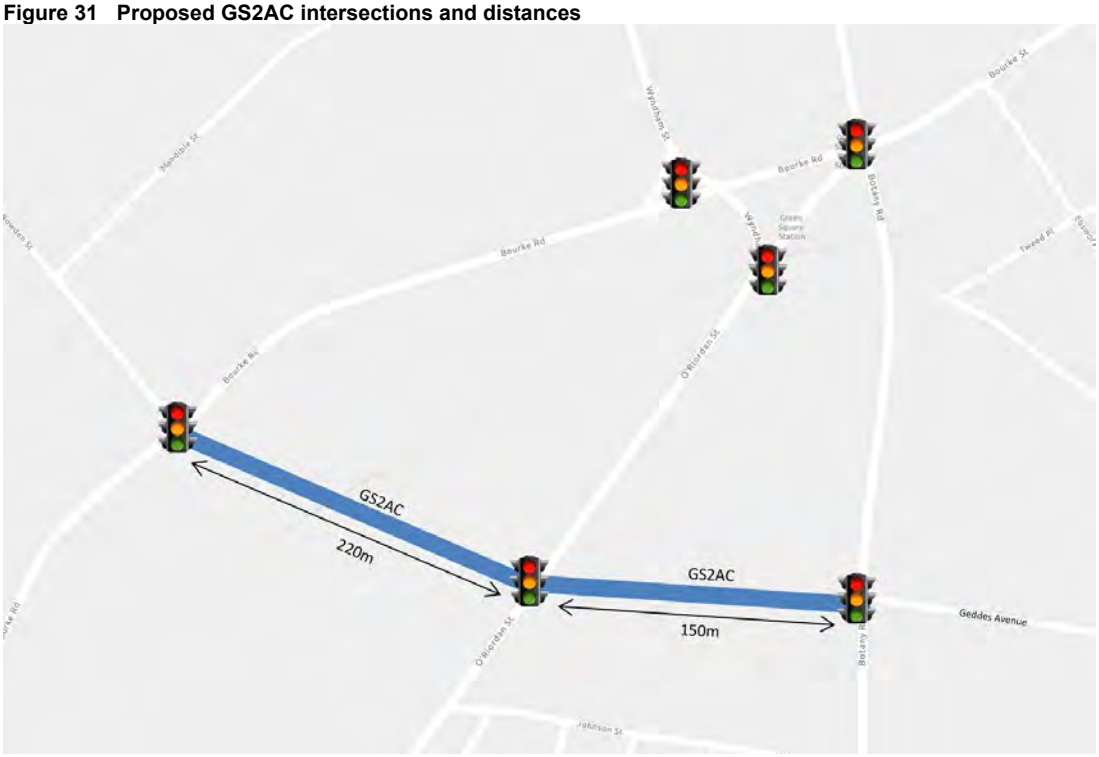
- Provision of a recycled water main to service proposed affordable housing developments located between Botany Road and O'Riordan Street and potentially future developments in the Northern Investigation Area and Ashmore Precinct.
- Landscaping and tree planting as well as street furniture
- Removal of trees affected by the proposed road
- Excavation and export of contaminated material
- Installation of marker layer and capping layer above contaminated material remaining onsite
- Minor amendment to the southern boundary of the Site, on the Western block, with the footprint extending an approximate 2m further into Ausgrid owned property to allow for a landscape buffer along the boundary of the proposed road. Adjustment to adjoining property fence as required Relocation of services as required
- Provision of a service driveway to allow the servicing and maintenance of existing telecommunications tower on site at 15 O'Riordan Street (Ausgrid)
- Construction of future service driveways to adjoining development within the road corridor
- Property access and service driveways for sites including 15 O'Riordan Street (Ausgrid) 330 – 338 Botany Road (Preferred affordable housing provider) and 338 Botany Road (Preferred community housing provider) and 9-13 O'Riordan Street (A2B Australia).

5.2 Design

The GS2AC is designed as a two-way street with a design speed of 60km/hr, but sign posted at 50km/hr. The western section of the GS2AC runs between Bourke Road and O'Riordan Street and the eastern section runs between O'Riordan Street and Botany Road. The lengths of these sections of the road are approximately 220 metres and 150 metres, respectively.

Figure 31 highlights the extent of the network and the relative distance between the intersections.

Figure 31 Proposed GS2AC intersections and distances



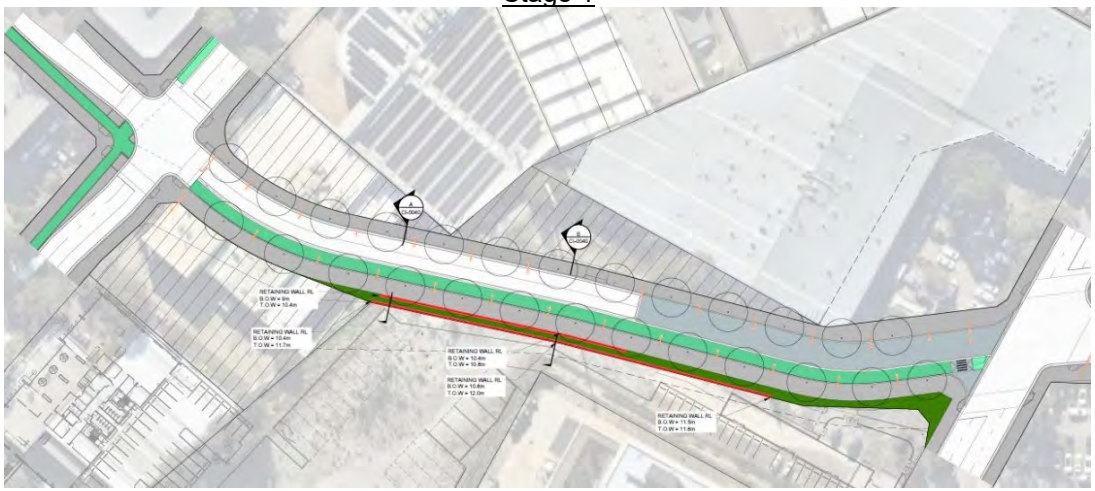
Source: City of Sydney, modified by AECOM

The GS2AC geometry and alignment have been designed in accordance with Austroads' *Guide to Road Design* and associated TfNSW guidelines. The road reserve width is generally consistent with the width adopted for the proposed Geddes Avenue. Travel lanes are approximately 3.5 metres wide to facilitate buses (during Stage 2). However, at Stage 1, the eastern ends of each block (O'Riordan Street/GS2AC and Botany Road/GS2AC) will be closed to ensure roadways only used for local access prior to any operating bus route along the corridor. The separated bi-directional cycleway will tie-in to the existing cycleway on Geddes Avenue and the existing separated cycleway that exists on Bowden Street and Bourke Road.

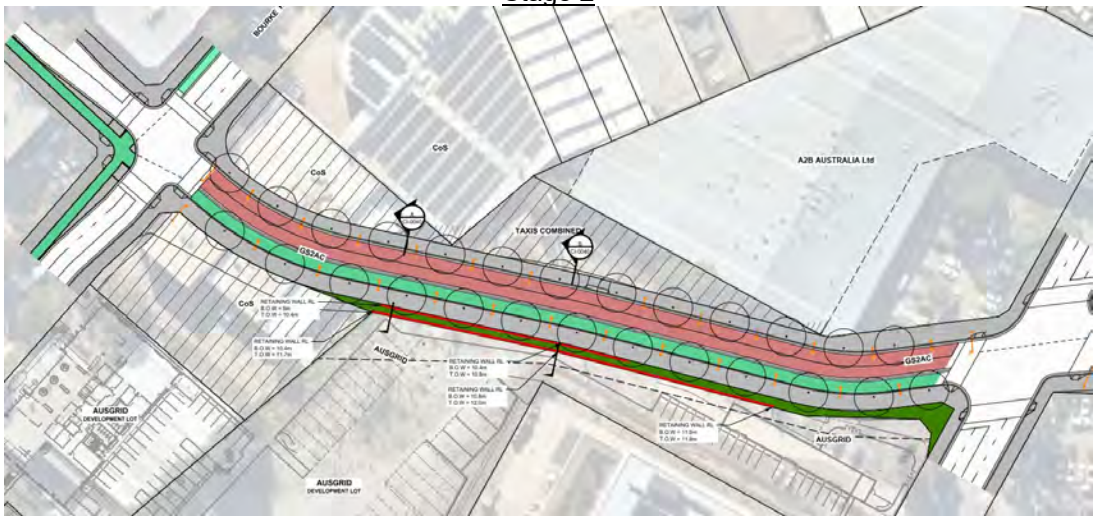
Figure 32 illustrates the GS2AC road design between Bourke Road / O'Riordan Street for Stages 1 and 2. Figure 32 illustrates the GS2AC design between O'Riordan Street / Botany Road for Stages 1 and 2.

Figure 32 GS2AC West Layout Concept

Stage 1

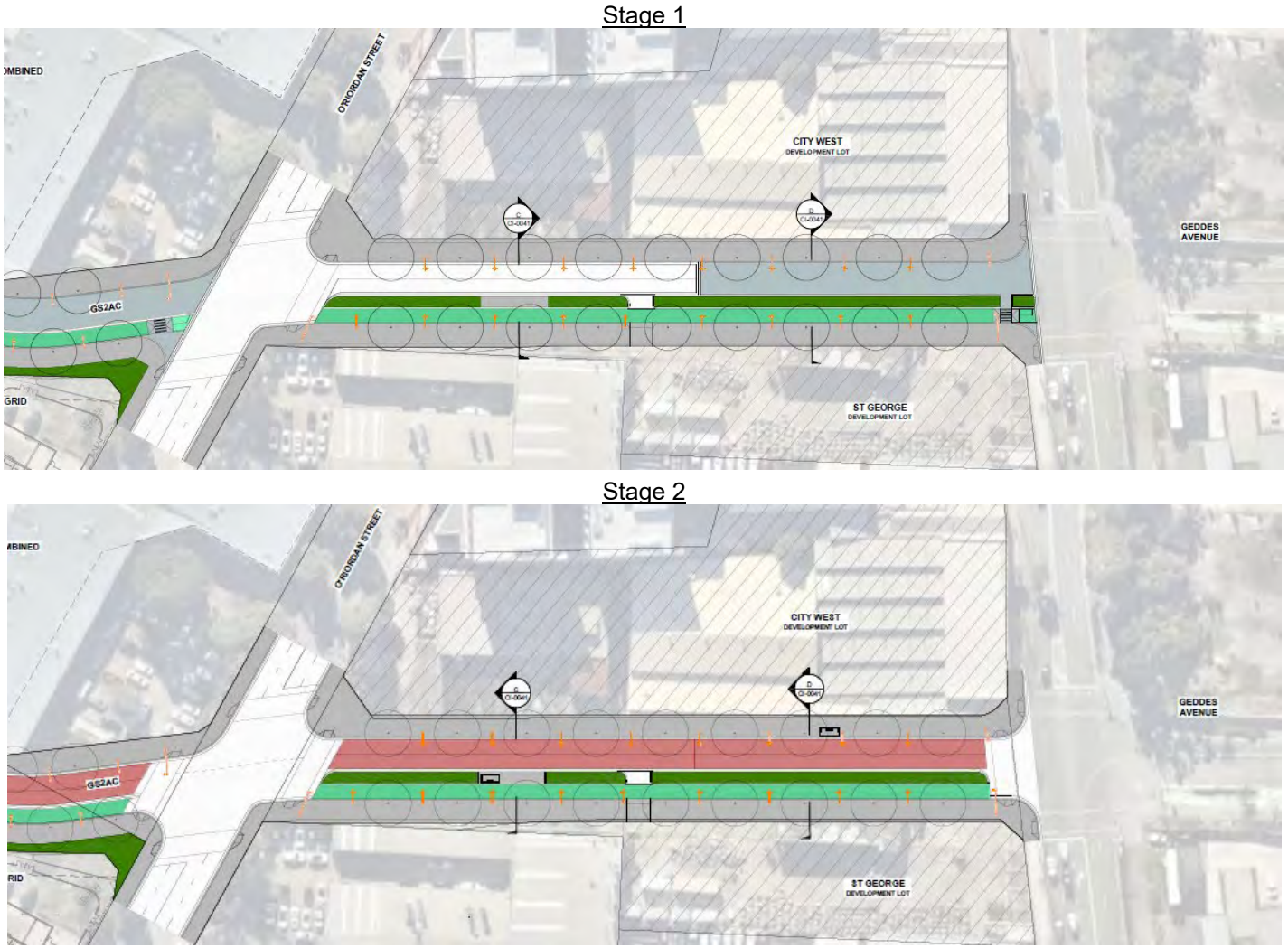


Stage 2



Source: AECOM, 2020

Figure 33 GS2AC East Layout Concept



Source: AECOM, 2020

5.3 Function and route strategy

The function and the purpose of this corridor is to provide easy and direct east-west connectivity for cyclists and pedestrians. Additionally, it only provides local access to private vehicles and it is not designed for through traffic flow. In the end state, the route will have bus lanes in both directions and allowing local access using these bus lanes, within each block.

A bus route is yet to be formalised along this route (pending decision by TfNSW) and in the interim a staged approach is proposed comprising:

- Stage 1: Closure of the eastern ends of each block to ensure the roadway is only used for local access (closure would entail a continuous raised footpath treatment and kerb lines along O' Riordan Street and Botany Road, prior to any operating bus route along the corridor). Right turns from GS2AC onto Bourke Road and O'Riordan Street will not be permitted. Figure 34 illustrates the road closures and turn movement restrictions along GS2AC during Stage 1.
- Stage 2: Opening of eastern ends and implementation of a bus lane (but allowing only local access within each block) once the bus route has been formalised. Right turns from GS2AC onto Bourke Road, O'Riordan Street and Botany Road will not be permitted. In addition, right turns from O'Riordan Street and Botany Road onto GS2AC will also not be permitted. Figure 35 illustrates the turn movement restrictions during Stage 2.

Figure 34 Road closures and turn movement restrictions during Stage 1

Source: AECOM, 2020

Figure 35 Turn movement restrictions during Stage 2

Source: AECOM, 2020

5.4 Local access traffic

The GS2AC is proposed to only provide local access for residents to the three development lots proposed adjacent to this route. The development lots that are proposed to access using GS2AC are:

- City West Development (eastern section)
- St George Development (eastern section)
- A2B Australia Site (western section).

During Stage 1, only local traffic forecast to be generated from the three development lots is expected to use GS2AC. Once Stage 2 is operational, in addition to the local traffic forecast to be generated from these development lots, public transport bus services will also be using the corridor.

5.4.1 Traffic generation

The traffic likely to be generated by the two lots along the eastern section of GS2AC was estimated using Roads and Maritime Services Guide to Traffic Generating Developments, Updated Traffic Surveys (TDT 2013/04a) and the development yields as obtained from the respective DAs. Both these development lots are proposed for residential use, with 73 parking spaces proposed to be provided for the City West Development and 33 parking spaces for the St George development site.

However, as the A2B Australia site is an existing development site, traffic generation surveys were undertaken on site during the peak hours. This site is proposed to have an additional access and egress point along the western section of GS2AC. The existing entry and exit points will be continue to be used, primarily by the traffic using O'Riordan Street destined to / originating from the airport. Traffic generation surveys were undertaken during the peak hours on 28th Nov 2019 (between 08:00am and 09:00 during the AM peak and 04:00pm and 5:00pm during the PM peak). Based on the observations made during the trip generation surveys, about 50% traffic is likely to be destined towards the airport. It is therefore anticipated that, once the GS2AC is opened, only the traffic heading west or north will be expected to use the new access point on GS2AC, with the rest assumed to use the existing entry and exit points.

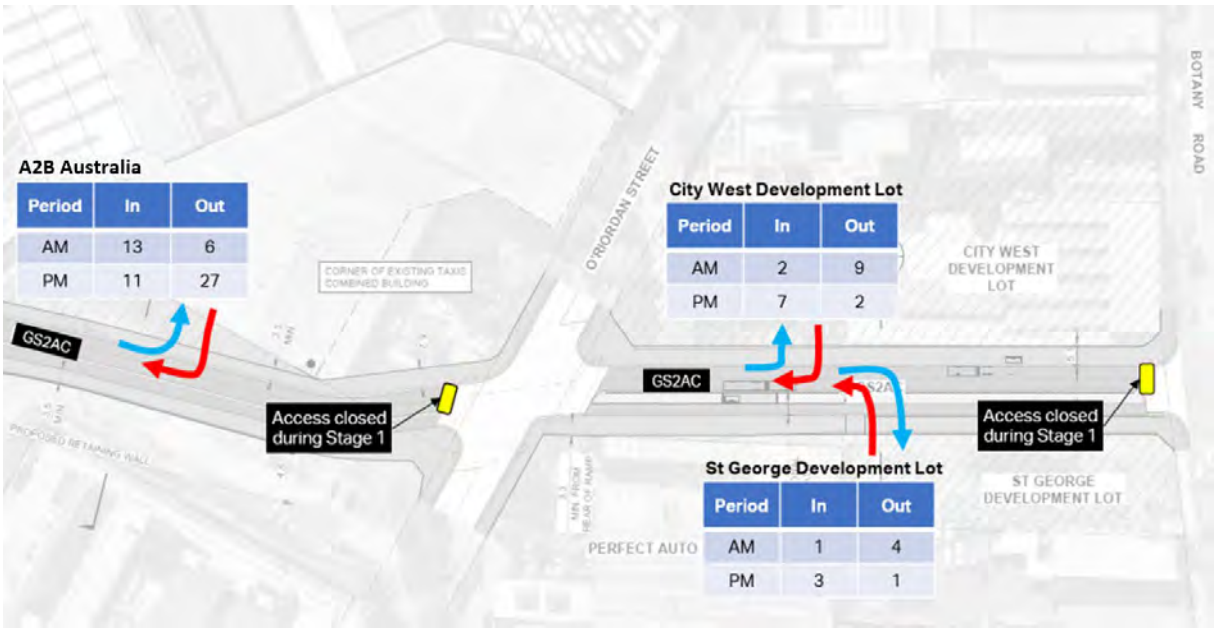
The forecast mid-block traffic volumes along both sections of GS2AC during Stage 1 are shown in Table 4. Traffic during Stage 2 is expected to be similar to the numbers presented in Table 4, with the addition of peak hour bus services that will use the GS2AC corridor.

Table 4 Mid-block Traffic Volumes

Section	Two-way Traffic Volume (veh/hr)	
	AM	PM
GS2AC West – between Bourke Road and O'Riordan Street	19	38
GS2AC East – between O'Riordan Street and Botany Road	16	13

The traffic volumes forecast to be generated by each site during the AM and PM peak hours are shown in Figure 36.

Figure 36 Traffic generation during peak hours



5.4.2 Traffic distribution

In order to assess the impact of the local access traffic on the adjacent roads, an assumed distribution of traffic has been considered. The traffic distribution was derived using first principles and detailed as below.

For the A2B Australia site, the assumptions are described below:

- For the outbound trips during both Stages 1 and 2, all the vehicles are assumed to go to the west. The majority of vehicles heading westbound will travel through to Bowden Street and be distribution into the road network. Some westbound vehicles will turn left onto Bourke Street. All northbound vehicles will travel through onto Bowden Street and later turn right at McEvoy Street.
- A similar distribution is assumed for the inbound trips to this site.

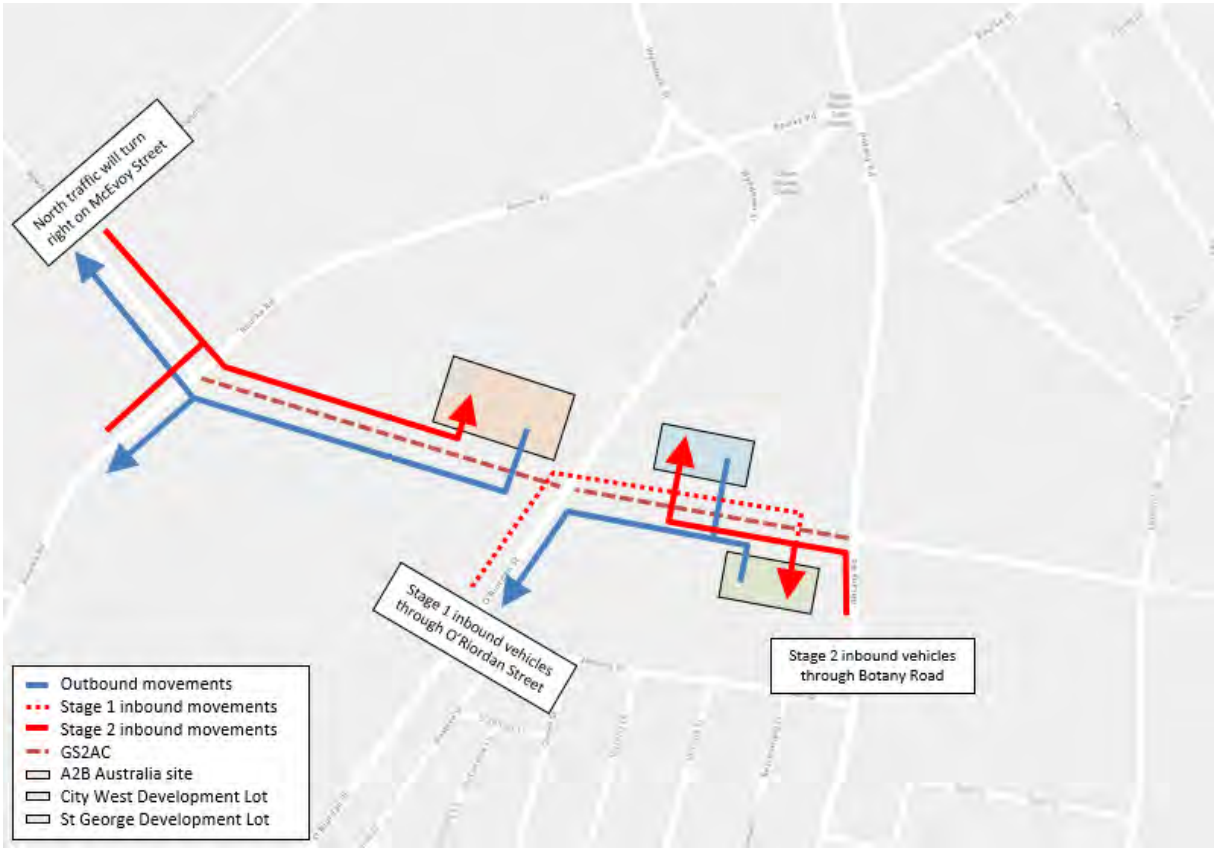
For the other two sites between O'Riordan Street and Botany Road, the assumptions are as follows:

- **During Stage 1**
  - Outbound trips - All the vehicles from City West Development Lot and St George Development Lot are required to go to the west due to road closures to the east. 100% of these vehicles are assumed head south and therefore turn left onto the O'Riordan Street.
  - Inbound trips - All the vehicles to City West Development Lot and St George Development Lot are required to arrive from the west and 100% are expected to turn right onto GS2AC for O'Riordan Street.

- **During Stage 2**
  - Outbound trips - All the private vehicles from City West Development Lot and St George Development Lot are assumed to go the west and 100% of the flow turn left on to the O'Riordan Street.
  - Inbound trips - All the private vehicles to City West Development Lot and St George Development Lot are assumed from the east on Botany Road and 100% are expected to turn left onto GS2AC. This is due to the proposed right turn ban at the intersection of O'Riordan Street/GS2AC during Stage 2.

The traffic distribution for the developments along GS2AC is illustrated in Figure 37.

Figure 37 Traffic distribution for key developments along GS2AC



5.5 Bus routes during Stage 2

Bus routes through GS2AC are proposed to operate during Stage 2. After reviewing the existing bus routes passing through the study area around Green Square, it is assumed that two routes can be diverted to operate along GS2AC and serve GSTC. It is also assumed that these bus routes are likely to have a 10 minutes frequency during both AM and PM during Stage 2. It is noted that the bus routes that will operate through GS2AC are currently under review and consideration by TfNSW.

6.0 Operational impacts

6.1 Methodology

The operational impacts due to the proposed GS2AC corridor have been assessed using the following methodology:

- GS2AC is expected to open in 2022 with east-west connectivity for pedestrians and cyclists and only local vehicle traffic access allowed within each block. Road network performance analysis has been undertaken for opening year (2022) using SIDRA. A growth factor of 1.1% has been adopted to obtain future traffic along the key roads in the study, which is in line with assumptions agreed with TfNSW during the concept design stage. Traffic generation and distribution assumptions for local access traffic, as detailed in Section 5.1, has been included for traffic accessing GS2AC. No other forecast traffic data has been included to estimate future traffic flows.
- For the future year (2032) scenario, similar traffic growth assumptions have been applied. But, in addition to the local access traffic, bus operations along GS2AC have also been included as per the assumptions detailed in Section 5.3.
- The future intersection layouts have been modelled as per the proposed design layouts included in Appendix A.
- Phase time for cyclists have been set at 5 seconds green and 6 seconds intergreen. A 6 second delay has been included for vehicles from commencement of pedestrian phase.
- Bicycles volumes have been assumed at 50 cyclists an hour along the proposed side roads, and the bicycle lanes have been modelled to allow only through movements.
- Peak flow factor (PFF) for future models have been set at 95% for all movements.
- Future approach and exit speeds have been assumed as 50km/hr for vehicles and 20km/hr for bicycles along the GS2AC.

6.2 Performance criteria

The commonly used measure of intersection performance, as defined by TfNSW, is vehicle delay. SIDRA determines the average delay that vehicles encounter and provides an associated measure of the Level of Service (LOS).

Table 5 shows the criteria that SIDRA adopts in assessing the LOS based on average delay, in accordance with TfNSW practise. It is considered typical TfNSW practise to implement a minimum performance target of LOS D.

Table 5 Sidra Intersection - Level of Service Criteria – Average Delay

Level of Service (LOS)	Average delay per vehicle (seconds/vehicle)	Comment
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to 70	At capacity, at signals incidents will cause excessive delays
F	Greater than 70	Extra capacity required

In addition, Table 6 shows the criteria that SIDRA adopts for LOS with respect to Degree of Saturation (DOS) for a signalised intersection. The DOS represents the flow-to-capacity ratio for the most critical movement on each leg of the intersection. For signalised intersections, a DOS of around 0.95 is typically considered the 'acceptable' limit, as beyond this queues and delays increase disproportionately.

Table 6 SIDRA Intersection - Level of Service Criteria – Degree of Saturation

Level of Service	Degree of Saturation (DOS)	Comment
A	<=0.60	Excellent
B	0.60-0.70	Very Good
C	0.70-0.90	Good
D	0.90-0.95	Acceptable
E	0.95-1.00	Poor
F	>=1.0	Very Poor

6.3 Active transport

6.3.1 Walking

The GS2AC provides an opportunity to significantly enhance pedestrian safety and accessibility by providing two new signalised pedestrian crossings at O' Riordan Street and Bourke Road, as well as the connection with the existing crossing at Botany Road. These crossings will allow pedestrians to cross each road safely and conveniently and will assist in improving the east-west connectivity to the GSTC. Figure 38 provides an indication of the distance and time saved by using the GS2AC.

In addition to providing a shorter east-west route, the GS2AC will contribute to an enhanced pedestrian experience. Pedestrians walking along the GS2AC will be exposed to less traffic than on the existing Bourke Road / Botany Road route.

Figure 38 East-west pedestrian route with and without GS2AC

Source: City of Sydney, modified by AECOM

The proposed intersection crossings will also enhance pedestrian access to the Green Square Train Station, Green Square Town Centre and the nearby industrial and commercial land uses. Safe and efficient pedestrian access to these locations is paramount and is a key element of the GS2AC design, which incorporates pedestrian crossings on all approaches to ensure with improved pedestrian access. It will also enhance pedestrian access to and between public transport services.

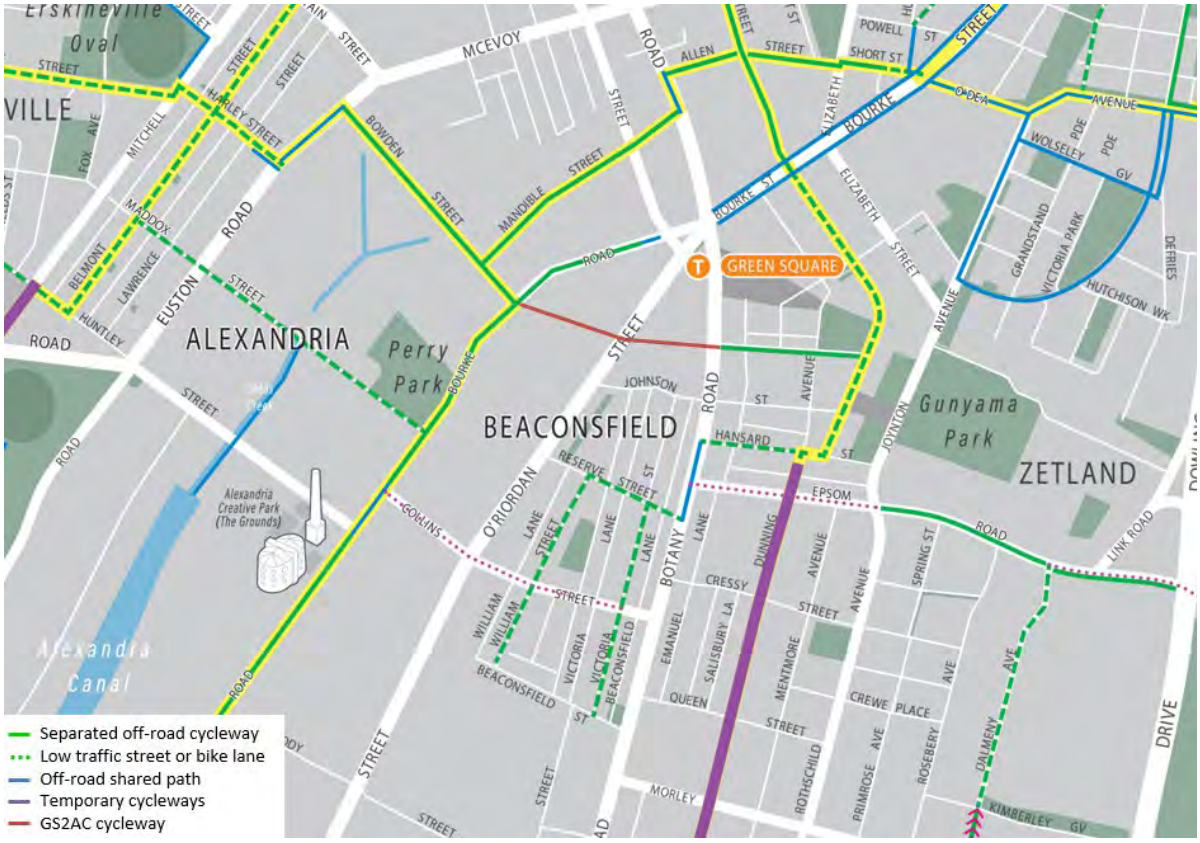
6.3.2 Cycling

Similar to the improvements in pedestrian accessibility, the GS2AC will enhance the east-west connectivity through the area. The GS2AC will encourage cycling by providing a separated two-way cycleway on the road. The infrastructure will also include bicycle crossings across the intersections with dedicated lights.

This route will be well linked to the surrounding local and strategic cycling network. The GS2AC cycleway is connected with the existing separated cycleways on Bourke Road and Bowden Street to the west, as well as the separated cycleway on Geddes Avenue to the east. Figure 39 shows the GS2AC cycleway in the context of existing cycleways and planned cycle paths from the City's proposed regional bike network.

As seen, the GS2AC cycleway will provide a strategic east-west link between two separate dedicated cycleways. The Bourke Road cycleway is a popular route for those travelling between the CBD and Mascot. Further, the route along Bowden Street will lead towards the Ashmore Precinct as well as to Newtown and the Inner West. Meanwhile, the cycleways on the eastern side will connect to the M1 Motorway and Kensington. The GS2AC cycleway will be vital in creating a safe route for cyclists and linking the Green Square Town Centre with the broader cycle network.

Figure 39 Existing and planned cycle network near Green Square



Source: City of Sydney, modified by AECOM

6.4 Public Transport

6.4.1 Train

The proposed GS2AC will have no direct impact on the train services provided at the Green Square Station. The broader GSTC development will increase rail patronage at the train station and the GS2AC will assist in facilitating improved access to the station from the interfacing surface transport network.

6.4.2 Bus

As discussed in Section 5.3, bus routes are under consideration by TfNSW during Stage 2 of GS2AC. It is proposed that two existing bus routes operating within the study area will be diverted to serve the GS2AC corridor. This may result in a slightly longer route for these services, however, the provision of bus lanes along GS2AC during Stage 2 is expected to improve reliability and efficiency of such routes operating to GSTC.

6.5 Road Network

As the GS2AC corridor is proposed to include only bus lanes in both directions and allows only local traffic access, the impacts on the road network in the vicinity of GS2AC is expected to be minimal. The operational impacts on the road network during the opening year (2022) and future year (2032) have been assessed using SIDRA INTERSECTION.

6.5.1 Opening year 2022 network performance

The SIDRA model for opening year (2022) has been built to assess operational performance of the intersections in the vicinity of GS2AC corridor.

The operational performance of scenarios both with and without GS2AC (Stage 1) (Table 7) are summarised below:

- The conversion of Bourke Road/Bowden St intersection from a priority-controlled intersection to signalised results in increased delays and queue lengths during 2022 with the opening of GS2AC. However, the intersection is forecast to operate at LOS C during both AM and PM peaks with additional spare capacity during both AM and PM peaks with GS2AC.
- The intersection of O'Riordan Street / GS2AC is forecast to operate at LOS A during both AM and PM peaks during 2022 with GS2AC.
- During the opening year, the intersection of Botany Road / Geddes Avenue / GS2AC is forecast to maintain LOS A with the opening of its connection with GS2AC during AM and PM. Minor increase in delays and queue lengths are forecast but is not expected to result in any significant impact.
- As the east end of GS2AC is closed to vehicular traffic at the intersection of Botany Road / Geddes Avenue / GS2AC during the opening year (2022), no additional traffic is forecast to use the intersection of Botany Road / Epsom Rd. Therefore, no changes to level of service is expected at this intersection during both AM and PM peaks.

Table 7 Opening year 2022 - Road Network Performance

Intersection	Peak Hour	Volume (veh/hr)	Level of Service	Degree of Saturation	Average Delay (sec/veh)	95% back of queue (m)
Bourke Road / Bowden Street / GS2AC						
Without GS2AC	AM	1,331	C	0.82	34.5	43
	PM	1,170	B	0.44	18.9	14
With GS2AC	AM	1,511	C	0.76	34.8	152
	PM	1,320	C	0.61	28.9	127

Intersection	Peak Hour	Volume (veh/hr)	Level of Service	Degree of Saturation	Average Delay (sec/veh)	95% back of queue (m)
O'Riordan Street / GS2AC						
Without GS2AC	AM	1,856	N/A*			
	PM	2,096	N/A*			
With GS2AC	AM	1,983	A	0.42	10.6	85
	PM	2,220	A	0.54	13.3	124
Botany Road / Geddes Avenue / GS2AC						
Without GS2AC	AM	2,245	A	0.45	7.7	130
	PM	2,200	A	0.53	8.8	139
With GS2AC	AM	2,353	A	0.57	10.8	159
	PM	2,307	A	0.73	12.3	138
Botany Road / Epsom Rd						
Without GS2AC	AM	2,722	D	1.29	51.3	280
	PM	2,666	F	1.27	86.1	498
With GS2AC	AM	2,722	D	1.22	51.2	266
	PM	2,666	F	1.25	84.3	488

* It is a mid-block free flow section in the without GS2AC scenario

6.5.2 Future year 2032 network performance

Operational performance of the four intersections in the study area was also assessed during a future year (2032). A growth factor of 1.1% has been adopted to obtain future traffic, except future bus volumes and traffic flow along GS2AC.

The operational performance of scenarios both with and without GS2AC (Stage 2) (Table 8) are summarised below:

- The intersection of Bowden Street / Bourke Road / GS2AC intersection is forecast to operate at LOS C during both AM and PM peak hours with GS2AC.
- The intersection of O'Riordan Street / GS2AC is forecast to operate at LOS A during both AM and PM peaks during 2032 with GS2AC.
- The intersection of Botany Road / Geddes Avenue / GS2AC intersection is forecast to operate at LOS B during 2032 with GS2AC.
- During both without and with GS2AC scenarios, the intersection of Botany Road / Epsom Road is forecast to operate at LOS F during AM and PM. This is due to the high background traffic volumes forecast to use this intersection during 2032. The addition of a small number of vehicles due to GS2AC is not forecast to result in a significant increase in delays or queue lengths at this intersection.

Table 8 Future year 2032 - Road Network Performance

Intersection	Peak Hour	Volume (veh/hr)	Level of Service	Degree of Saturation	Average Delay (sec/veh)	95% back of queue (m)
Bourke Road / Bowden Street / GS2AC						
Without GS2AC	AM	1,484	F	1.11	155.3	187
	PM	1,305	B	0.59	25.5	20
With GS2AC	AM	1,709	C	0.79	41.7	205
	PM	1,493	C	0.85	36.8	178
O'Riordan Street / GS2AC						
Without GS2AC	AM	2,071	N/A*			
	PM	2,338	N/A*			
With GS2AC	AM	2,233	A	0.43	9.1	93
	PM	2,489	A	0.46	8.7	104
Botany Road / Geddes Avenue / GS2AC						
Without GS2AC	AM	2,502	A	0.78	13.5	97
	PM	2,452	A	0.62	9.8	173
With GS2AC	AM	2,651	B	0.79	17.4	167
	PM	2,608	B	0.76	14.6	174
Botany Road / Epsom Rd						
Without GS2AC	AM	3,035	F	1.44	80.4	329
	PM	2,972	F	1.56	150.4	660
With GS2AC	AM	3,038	F	1.24	80.8	378
	PM	2,984	F	1.58	150.6	648

* It is a mid-block free flow section in the without GS2AC scenario

7.0 Preliminary Construction Assessment

7.1 Overview of construction activities

The following indicative construction staging is proposed for the purposes of the concept design. After site establishment the proposal would be implemented in the following ten stages, which are likely to be refined and determined during the detailed design phase and could be influenced by the availability of funding:

The Principal Contractor would be responsible for developing a detailed construction staging plan. However, for the purposes of the concept design it is anticipated that the works would be undertaken in the following key stages.

- Stage 1: Site set-up and establishment of environmental controls implement traffic management measures
- Stage 2: Survey and set out. Services identification
- Stage 3: Commence bulk earthworks. Sort, stockpile, load, transport material
- Stage 4: Excavate, cut and fill to design levels
- Stage 5: Install pipe drainage
- Stage 6: Import pavement material and compact.
- Stage 7: Pour kerbs, retaining walls, construct pavement sub-base, commence street trees, lighting and paving and traffic signals installation
- Stage 8: Install asphalt wearing course, line marking and signage
- Stage 9: Complete landscaping, street furniture and commission traffic signals
- Stage 10: Demobilise, site clean and remove traffic management and environmental controls

Plant and equipment required to undertake the works would likely consist of a combination of:

- Tracked excavators (10 tonnes, 15 tonnes and 30 tonnes)
- Tipper trucks
- Tree trimmers and mulchers
- Compaction equipment such as drum, vibrating rollers and plate compactors
- Air compressors
- Pumping equipment
- Crushing / screening plant
- Smaller tools and equipment such as concrete and paver cutting equipment, jack hammers and miscellaneous hand held tools.

7.2 Timing of construction activities

Construction of the GS2AC is anticipated to take up to 18 months to complete, starting in Q3 2021.

7.3 Concurrent works

It is understood that several other construction activities will also be carried out within the Green Square Town Centre concurrently with the subject works. The majority of the Town Centre construction works have been completed, or will have completed construction prior to the commencement of the GS2AC construction.

Construction work on the following sites is likely to occur concurrently with the subject works.

- 200 affordable housing development at northern side of GS2AC at 330-336 Botany Road
- 100 affordable housing development at southern side of GS2AC at 338 Botany Road
- 21,000m^2 commercial GFA development by Markham at 22 O'Riordan Street
- Ausgrid facility at 70 Bourke Road, 15 O'Riordan Street and 56-60 Bourke Road comprising of
  - Administration building of 3,860m^2 GFA
  - Service Vehicle Facility with workshop and warehouse space of 3,210m^2 GFA
  - Shop/Storage facility of 525m^2 GFA
- Future development on the A2B Australia taxi site

7.4 Construction traffic management

The overall principles of traffic management during the construction activity would include:

- provide an appropriate and convenient environment for pedestrians
- minimise the impact on pedestrian movements
- maintain appropriate capacity for pedestrians at all times on footpaths around the site
- maintain appropriate public transport access
- maintain permanent access to/ from the emergency hospital access point for ambulances
- restrict construction vehicle movements to designated routes to/ from the site
- manage and control construction vehicle activity in the vicinity of the site
- minimise impacts to general traffic in the vicinity of the site.

7.4.1 General requirements

In accordance with Transport for NSW (TfNSW) requirements, all vehicles transporting loose materials will be required to have the entire load covered and/or secured to prevent any large items, excess dust or debris being deposited onto the roadway during travel to and from the site. All subcontractors and suppliers must be inducted by the Principal Contractor(s) to ensure that the procedures are met for all vehicles entering and exiting the construction sites. The Principal Contractor(s) will monitor the roads leading to and from the site and take all necessary steps to clean any debris deposited by construction vehicles.

Vehicles operating to, and from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration.

No tracked vehicles will be permitted on any paved roads. Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.

7.4.2 Working hours

It is understood that construction activity would be restricted to the standard hours of construction as follows:

- Monday to Friday: 7:30am to 5:30pm
- Saturdays: 7:30am to 3:30pm
- Sundays or public holidays: no work permitted

The Principal Contractor(s) will be responsible for instructing and controlling all sub-contractors regarding the hours of work. Any work outside the proposed construction hours will be subject to specific prior approval from the appropriate authorities.

7.4.3 Construction worker parking

It is anticipated that there will be a limited quantity of parking provided within the work site for accommodation of construction worker's vehicles. It is assumed that the parking location would be varied during the works to keep the parking clear of active worksites, e.g. excavation, remediation and roadwork sites, truck access routes, etc.

Given the site's proximity to high frequency public transport services, all workers are to be encouraged to use public transport to access the site, with appropriate tool/ equipment drop-off arrangements made. This will be incorporated into the site induction program. Workers will be directed not to use on-street parking within the vicinity of the site. The Principal Contractor(s) is to take appropriate action if informed of this activity occurring.

As such, there would be no impact on existing on-street parking, which would remain available for existing users.

7.4.4 Access arrangements

Access to the works sites will be directly from Bourke Street, O'Riordan Street and Botany Road. It is anticipated that the following conditions will be placed on theses access:

GS2AC West (Bourke Road to O'Riordan Street)

- Bourke Road: All movements
- O'Riordan Street: Left-in/ Left-out

GS2AC East (O'Riordan Street to Botany Road)

- O'Riordan Street: Left-in/ Left-out
- Botany Road: Left-in/ left or right out (signalised)

The signalised intersection of Geddes Avenue / Botany Road is currently operational. Due to traffic volumes on Botany Road and potential safety issues associated with priority control turn arrangements, it is proposed that this intersection is utilised to provide safe and controlled access from the road network to the eastern section of GS2AC construction site.

7.4.5 Construction traffic volumes

Traffic generated by the construction works includes construction worker light vehicles (including utility vans), as well as heavy vehicles for periodic delivery and removal of materials, including plant and equipment. Vehicle types and sizes would vary depending on the required use, but include medium and large rigid vehicles and articulated vehicles for import of bulk materials or minor spoil removal, as well as concrete trucks.

Although the level of construction vehicle activity is unknown at this stage, the volumes are expected to be up to 60 vehicles per day (120 one-way trips).

A summary of the anticipated traffic generation per stage of works is presented in Table 9.

Table 9 Construction traffic generation

Name	Duration (weeks)	Start	Finish	Vehicle Trips (Duration)	Vehicle Trips (per day)
GS2AC East	54	01/07/21	22/12/22		
Remediation and Excavation and in-ground services other than trunk	16	17/11/21	07/03/22	750	9
Retaining wall/batters	12	24/03/22	17/06/22	450	7
Sub-grade	8	18/06/22	16/08/22	600	14
Kerb & gutter	8	17/08/22	12/10/22	400	9
Footpaths	6	15/10/22	22/11/22	700	21

Name	Duration (weeks)	Start	Finish	Vehicle Trips (Duration)	Vehicle Trips (per day)
Pavement Lanes Surfacing	4	26/11/22	22/12/22	600	28
GS2AC West	54	01/07/21	22/12/22		
Remediation and Excavation	16	17/11/21	07/03/22	700	8
Retaining wall/batters	12	24/03/22	17/06/22	450	7
Sub-grade	8	18/06/22	16/08/22	600	14
Kerb & gutter	8	17/08/22	12/10/22	400	9
Footpaths	6	15/10/22	22/11/22	700	21
Pavement Lanes Surfacing	4	26/11/22	22/12/22	600	28

7.4.6 Haulage routes

The origin and destination of truck movements is currently not known. Generally, construction vehicles will have origins and destinations from a wide variety of locations throughout Sydney. However, all construction vehicles are to be restricted to the State and Regional Road network, where possible. No construction vehicles are to use Geddes Avenue, Wyndham Street, Johnson Street or Maddox Street to Access the site. In addition, construction traffic must not access the site via Elizabeth Street, Hansards Street and Joynton Avenue.

As such, likely construction vehicle routes have been developed with the aim to provide the shortest distances to/from the arterial road network, whilst minimising the impact of construction traffic on streets in the vicinity of the site. Alternative routes would not be used without specific prior approval from the appropriate stakeholders.

In general, construction vehicle routes via Bourke Street will not be supported. Vehicles routed should generally be via Lachlan Street, McEvoy Street, Botany Road and Epsom Road.

It is noted that during the early bulk earthworks and materials phases some of the exported material may be used at the Green Square Aquatic Centre Development. Vehicles accessing this site will do so via Collins Street/ Botany Road, Epsom Road and Johnston Avenue.

7.5 Construction impacts

7.5.1 Traffic

Given the number of daily construction vehicles, overall the construction works could not be expected to significantly impact intersection operation external to the site.

This includes the Botany Road, O'Riordan Street and the arterial network more broadly. This also assumes that construction vehicle activity outside typical weekday AM and PM peak hours.

Any works on weekends would not present significant traffic related impacts, with no known specific restrictions limiting access and/ or the work hours as specified.

All works within the site and associated vehicle movements will be restricted to the permitted working hours of the site.

7.5.2 Signalised intersection works

The installation of two new signalised intersections (Bourke Road/ GS2AC and O'Riordan Street) as well as modification to the signalised intersection at Botany Road/ Geddes Avenue will require works to be completed within the completed road reserve. This includes fitting and connection of loop detectors as well as painting of linemarking. These works would likely require the closure of two trafficable lanes at any one time. The closure of two lanes should allow the remaining two open lanes to facilitate traffic in both directions. This will require a contraflow operation. If the lane closures occupy either both the northbound or southbound lanes. It is anticipated that these works would be carried out as night works for a short period of time to minimise the impact on these roads.

7.5.3 Active transport

Existing pedestrian footpaths on Bourke Road, Botany Road and O'Riordan Street form part of the construction of GS2AC and pedestrians would also need to be diverted to temporary pedestrian paths whilst the upgrades are undertaken.

During the closure, it is expected that pedestrians use the temporary pedestrian footpaths which would be provided at all street interfaces to maintain pedestrian connectivity. Further to this, the appointed contractor is to ensure that appropriate wayfinding/detour signage is installed so pedestrians are informed of the temporary closures and are directed to a safe, alternate crossing point during construction hours. Truck drivers should be alerted to the need to give way to pedestrians crossing the footpath at site access locations.

Approval from the City and TfNSW will be obtained for Temporary Works on the public way and Road Opening Permits prior to work being undertaken on site. These applications will include associated Traffic Control Plans (TCPs). The TCP will ensure that existing pedestrian access routes are maintained at all times.

Cyclists are permitted to travel in a traffic lane on Botany Road and O'Riordan Street. The separated cycleway on Burke Road is to be maintained. Temporary diversion or closure for short periods of time may be required during the works, at which time a suitable alternative facility would be provided.

Traffic controllers are required on site to monitor and supervise the safe movements for trucks, pedestrian and cyclists past the median worksites, provide priority for emergency services or monitor access to the driveways opposite.

7.5.4 Public transport

It is not anticipated that bus services in the vicinity of the study area will be impacted upon during construction of the proposal. Minor impacts may occur on Bourke Road, O'Riordan Street and Botany Road as a result of traffic lane closures during off peak times which could result in reduced speeds on those roads. However, changes in bus routes or bus stops are not expected to be required. In the scenario where bus movements will be impacted by construction works, the State Transit Authority will require notification.

7.5.5 Property access

Minimising the impact of construction works on, and maintaining the amenity of, businesses in and around the GS2AC is a top priority for the City. Throughout the construction period, vehicle access will be maintained at all times to properties within the vicinity of the works.

Affected property access locations adjacent to the proposed work site includes:

- 13 CABS, 9-13 O'Riordan Street
- Perfect Auto Body, 22 O'Riordan Street.

Both properties have alternate access points which with minor adjustments, will be able to service both inbound and outbound movements. If required, staged construction within the affected area is a possibility. It is understood that the City will consult with both 13 CABS and Perfect Auto Body to come to an agreement regarding maintaining access to both businesses. As such, property access would be maintained at all times, and any impacts would be short-term.

7.6 Contractor requirements

7.6.1 Construction traffic management plan

Prior to the commencement of construction, a detailed Construction Traffic Management Plan (CTMP) is to be prepared by the Principal Contractor. The CTMP would include the guidelines, general requirements and procedures to be used when activities or areas of work have a potential impact on existing traffic arrangements. The approval of the CTMP is to be sort by the appropriate authorities.

The CTMP, at a minimum, will address the following:

- consultation with the consent Authorities and relevant approvals
- the likely construction vehicle numbers and frequency
- approach and departure routes
- anticipated special out of hours or escorted deliveries
- parking access arrangements during construction
- construction work zone locations
- site entry and exit points
- proposed traffic control signage
- proposed traffic management at critical locations
- provision of acceptable pedestrian management measures.

The Principal Contractor will implement, update and maintain the CTMP throughout the construction period and until completion.

7.6.2 Staff induction

All workers and subcontractors engaged on-site would be required to undergo a site induction. The induction should include permitted access routes to and from the construction site for all vehicles, as well as standard environmental, WHS, driver protocols and emergency procedures. Additionally, the Principal Contractor will organise regular scheduled site inductions as required)

Any workers required to undertake works or traffic control within the public domain would be suitably trained and covered by adequate and appropriate insurances. All traffic control personnel would be required to hold TfNSW accreditation in accordance with Section 8 of Traffic Control at Work Sites.

7.6.3 Contact details of the site manager (s)

Contact details should be provided by the Principal Contractor as part of their CTMP for the Proposal.

7.6.4 Occupational health and safety

Any workers required to undertake works or traffic control within the public domain shall be suitably trained and will be covered by adequate and appropriate insurances. All traffic control personnel will be required to hold TfNSW accreditation in accordance with Section 8 of ‘Traffic Control at Worksites’.

7.7 Authority approvals

7.7.1 Sydney City Council

Bourke Street is controlled by the City, the following principles in relation to traffic control plans and road occupancy licences are outlined below:

- A "Traffic Control Plan" must be prepared by a suitably qualified TfNSW accredited work site traffic designer for all works that are carried out in or adjacent to a public road. The Plan must satisfy all the requirements of AS 1742.3 – 2002 and City of Sydney’s Guide and Standard Requirements (attached in Appendix A).

- It is the sole responsibility of the Principle Contractor(s) to have in place and maintain traffic facilities, i.e. barricades, signs, lights, etc, at all times, day and night, seven (7) days a week for the duration of the works in accordance with the Plan.
- These traffic facilities must be installed and maintained by appropriately qualified TfNSW accredited work site traffic controllers.
- If it comes to the attention of the City that Traffic Control Devices are insufficient or inoperable (particularly in an after-hours situation), then the City may arrange to reinstate the Traffic Control Devices and recoup the costs from the Contractor.
- Any changes to the approved Traffic Control Plan must be approved by the City before implementation.
- The contractor will apply to the City to organise appropriate approvals for any partial or temporary road closures.
- All regional and local road closures require separate applications and approval from the City's Traffic Works Coordinator.
- Night works require approval from the City's Construction Regulation Unit (CRU) under a road opening permit and Road Occupancy Licences (ROL).

7.7.2 Transport for NSW / Transport Management Centre

O'Riodan Street and Botany Road are classified State Roads. Any impacts on these roads would require TfNSW approval / road occupancy licence (Form D) and speed zone authorisation, in accordance with TfNSW Transport Management Centre, Road Occupancy Manual, January 2012. A minimum of 10 working days for processing an application is required.

In accordance with the TfNSW manual, "The proponent has a responsibility to undertake a risk assessment of the activities described in the road occupancy application, per the Occupational Health and Safety Act 2000.

Some of the risks that may be taken into account are listed below. If any of these risks are applicable, please address them in "The Traffic Management Plan (TMP)" (page 9).

- Proximity of work site to live traffic.
- Speed and volume of traffic.
- Type of traffic (clear lane width is applicable to traffic flow).
- Noise levels (Office of Environment & Heritage has certain restrictions / requirements).
- Heavy weather and other delays to project programming.

Note: TfNSW assesses these risks from the viewpoint of potential impacts on traffic, not from the viewpoint of the proponents risk management. However, TfNSW will reject plans that are unprofessionally prepared or poorly presented. As a minimum, applications for road occupancy would be submitted by the contractor and include:

- Brief details of the works to be undertaken.
- Design drawings of the works, where relevant.
- Program of the works.
- TCPs (Reference to TfNSW standard TCPs and/ or modified/ design TCP to suit particular works).
- Speed zoning authorisation application, as applicable.
- Nominated site contact person.
- Evidence of any agreement, where consultation with adjoining businesses residents and emergency service providers has been undertaken.

A copy of the ROL must be provided to the City.

7.8 Communications

The Principal Contractor(s) is to prepare a communication plan to manage and provide updates to businesses and residents on in the immediate vicinity throughout the works. Appropriate site, warning and wayfinding signage are to be provided as necessary and existing businesses and residents at to be notified of the upcoming works potentially impacting on access.

The Principal Contractor(s) is to provide a designated person(s) as a point of contact at all times prior to and during the works, which would permit residents and others to advise of any particular concerns and/or access requirements. This would be undertaken prior to the proposed road occupancy or speed restriction application, which would, by implication, require consultation and notifications in excess of 10 days prior to the proposed start of works.

A summary of the key notifications and timeframes follows:

- Notifying emergency services and relevant sections of the community and transport industry:
  - For works, which result in significant traffic disruption, such as stop/go operation and diversions, an appropriate advertisement would be placed in local newspapers 1 week prior to the works. The timing of the notice would be dependent on authority approvals / agreement that the works may proceed.
  - This may be supplemented by VMS notifying of upcoming works, where warranted.
  - Emergency service providers would be notified, once road occupancy approval is granted. The local Police Traffic Officer would be advised on the any traffic changes and speed zoning authorisations, in particular. For works with more significant traffic impacts, prior consultation with ambulance service, fire brigade and Police would be undertaken to confirm agreement and any particular requirements, before submitting the road occupancy application.
- Notifying residents and businesses affected by disruption to property access or by night works:
  - For works adjacent to roads but not affecting access, a letter box-drop at least three working days before the proposed date.
  - For works restricting access, requiring detours or temporary pedestrian paths, a letter box drop at least 5-10 working days before the proposed date.
  - Notifications would detail the dates and times of the proposed access restrictions and a designated contact.
- Lodging any road occupancy licence application and speed zoning authorisation, as early as possible (not less than 10 working days before the work) for any major works.
  - Noting, however, there may be exemptions for emergencies and hazards requiring an initial response, prior to emergency services arriving on site.
- Promptly advising the City/TMC of any unexpected delays or incidents affecting Bourke Street.

7.9 Implications of concurrent works

The implications of concurrent works in the local area during the proposed construction period, is to be confirmed by the Principal Contractor(s), once the works program / scheduling of roadworks is known.

7.10 Construction traffic mitigation measures

Prior to the commencement of construction, a detailed Construction Traffic Management Plan (CTMP) would be prepared by the Principal Contractor. The CTMP would include the guidelines, general requirements and procedures to be used when activities or areas of work have a potential impact on existing traffic arrangements. The approval of the CTMP is to be sort by the appropriate authorities. The Principal Contractor will implement, update and maintain the CTMP throughout the construction period and until completion.

The CTMP, at a minimum, would address the following:

- consultation with the consent Authorities and relevant approvals;
- the likely construction vehicle numbers and frequency;
- approach and departure routes;
- anticipated special out of hours or escorted deliveries;
- parking access arrangements during construction;
- construction work zone locations;
- site entry and exit points;
- proposed traffic control signage;
- proposed traffic management at critical locations; and
- provision of acceptable pedestrian management measures.

The Principal Contractor would communicate with surrounding businesses and residents throughout the works and inform them of any upcoming works impacting them within a reasonable timeframe.

Construction vehicles are to be restricted to the State and Regional Road network, where possible. No construction vehicles should use Geddes Avenue, Wyndham Street, Johnson Street Maddox Street, Elizabeth Street, Hansards Street or Joynton Avenue to access the site.

Due to the high frequency public transport services, workers are to be encouraged to use public transport to access the site, with appropriate tool/ equipment drop-off arrangements made, to minimise impacts on existing on-street parking.

Vehicles operating to, from and within the site should do so in a manner which does not create unreasonable or unnecessary noise or vibration.

No tracked vehicles would be permitted to travel on paved roads. Public roads and access points should not be obstructed by any materials, vehicles, refuse skips or the like.

All traffic control personnel would be required to hold RMS accreditation in accordance with Section 8 of Traffic Control at Work Sites.

8.0 Conclusion

This report has been prepared to assess the traffic operations, safety and access issues affecting the construction and operation of the Green Square to Ashmore Connector (GS2AC), a new road to be located between Botany Road and Bowden Street in Alexandria, just south of Green Square Rail Station.

The GS2AC has long been considered as an option to improve local transport access to, and support the growth of, the Green Square Town Centre. Once complete, the GS2AC is predicted to improve multiple traffic and transport aspects within the vicinity of the site. The GS2AC provides an opportunity to significantly enhance pedestrian and cyclist safety and accessibility by providing two new signalised crossings at O'Riordan Street and Bourke Road, as well as the connection with the existing crossing at Botany Road.

The assessment has confirmed that the GS2AC is consistent with key State and local transport planning strategy and policy including Sustainable Sydney 2030. The design of the road also complies with relevant Australian standards such as Austroads and Transport for NSW requirements.

The assessment has determined, in line with the objectives of the connector, that the GS2AC will fulfil its local access function without significantly impacting the north-south movements in the area (i.e. proposed intersections operate within capacity, and have minimal impacts to north-south through movements). To ensure GS2AC functions as a multi-modal east-west connection improving transport access to the Green Square Town Centre, without attracting broader cross-regional (east-west through) trips, a route strategy was developed. This includes limiting access to private vehicles to serve local access within each block and restricting certain turning movements at each of the intersections.

The proposed separated bi-directional cycleway will be well linked to the surrounding local and strategic cycling network. The GS2AC cycleway is connected with the existing separated cycleways on Bourke Road and Bowden Street to the west, as well as the cycleway on Geddes Avenue to the east. The proposed GS2AC cycleway therefore provides a vital link in the network.

Further approvals will be obtained from TfNSW to enable the integration and approval of the proposed two signalised intersections as well as approvals from other utility agencies to provide key services within the GS2AC road reservation. Construction mitigation measures will also be implemented and will include the preparation of a traffic management plan.

The preparation of the Traffic and Transport Impact Assessment report has identified that the GS2AC to will operate in a safe and efficient manner to improve accessibility to the proposed Green Square Town Centre.

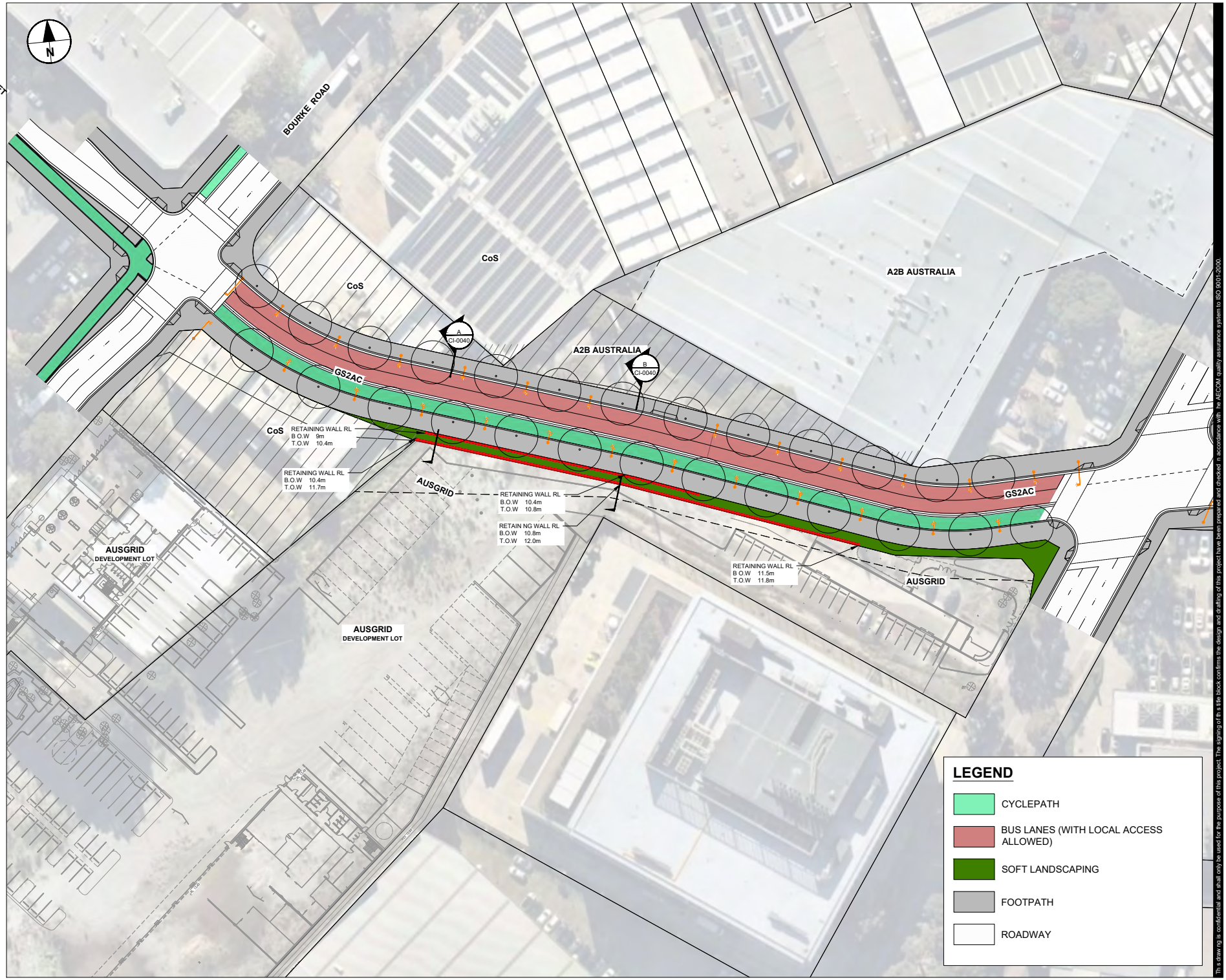
9.0 References

The following references have been used as part of the preparation of this transport impact assessment for the Green Square to Ashmore Connector road

- Sydney Local Environmental Plan 2012 (Green Square Town Centre) 2013 (City of Sydney, 2012)
- Sydney Local Environmental Plan 2012 (City of Sydney, 2012)
- Green Square Town Centre Town Centre Development Control Plan (City of Sydney, 2012)
- Sydney Development Control Plan 2012 (City of Sydney, 2012)
- Traffic Modelling Guidelines (TfNSW, 2013)
- SIDRA INTERSECTION 8 User Guide (SIDRA), Guide to Traffic Generating Developments, Issue 2.2 (Roads and Maritime Services, 2002)

Appendix A

GS2AC Concept Design



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ISSUE/REVISION

I/R	DATE	DESCRIPTION
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SHEET TITLE

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SHEET NUMBER

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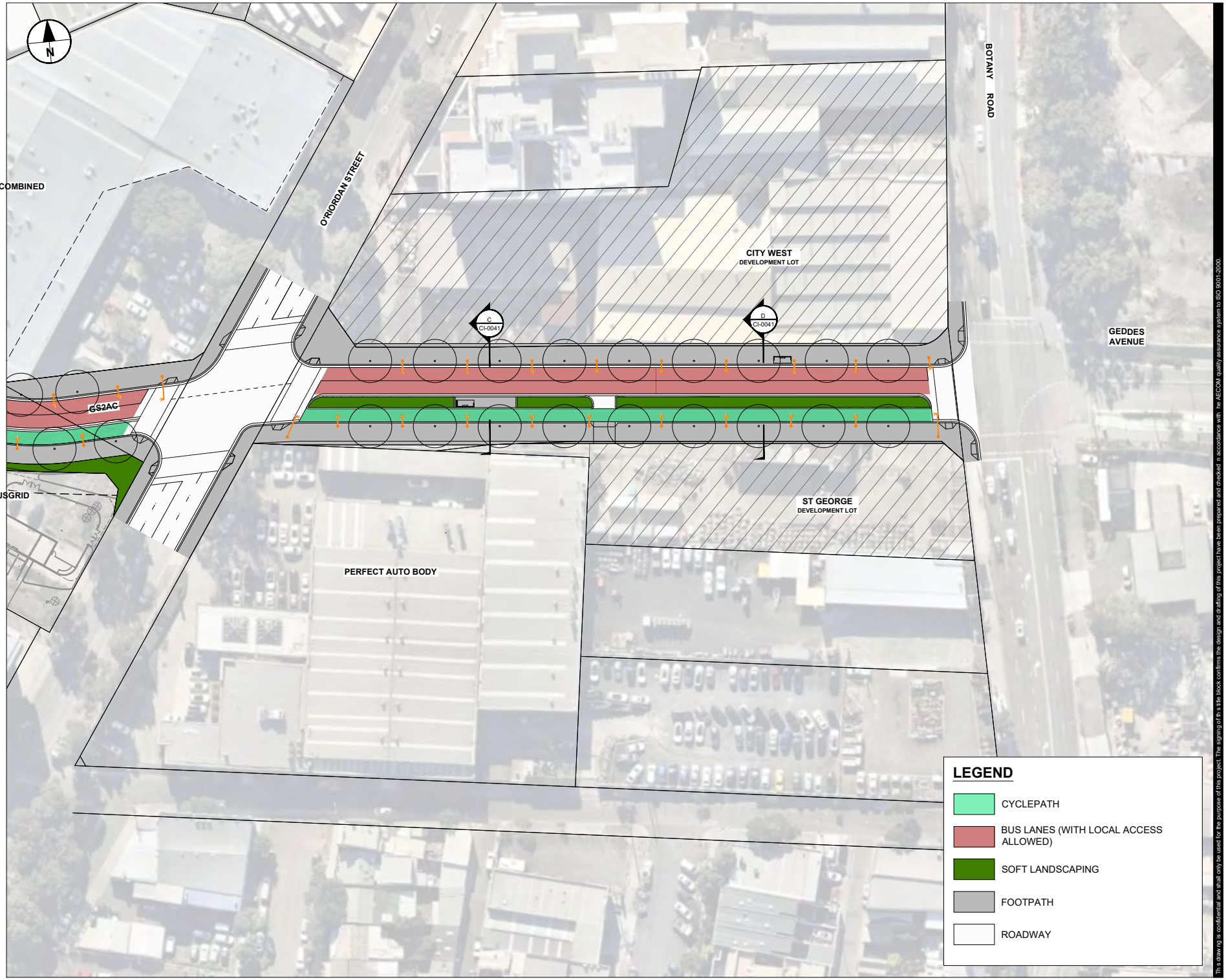

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KEY PLAN

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GS2AC
EASTERN SECTION - FULL BUS ROUTE
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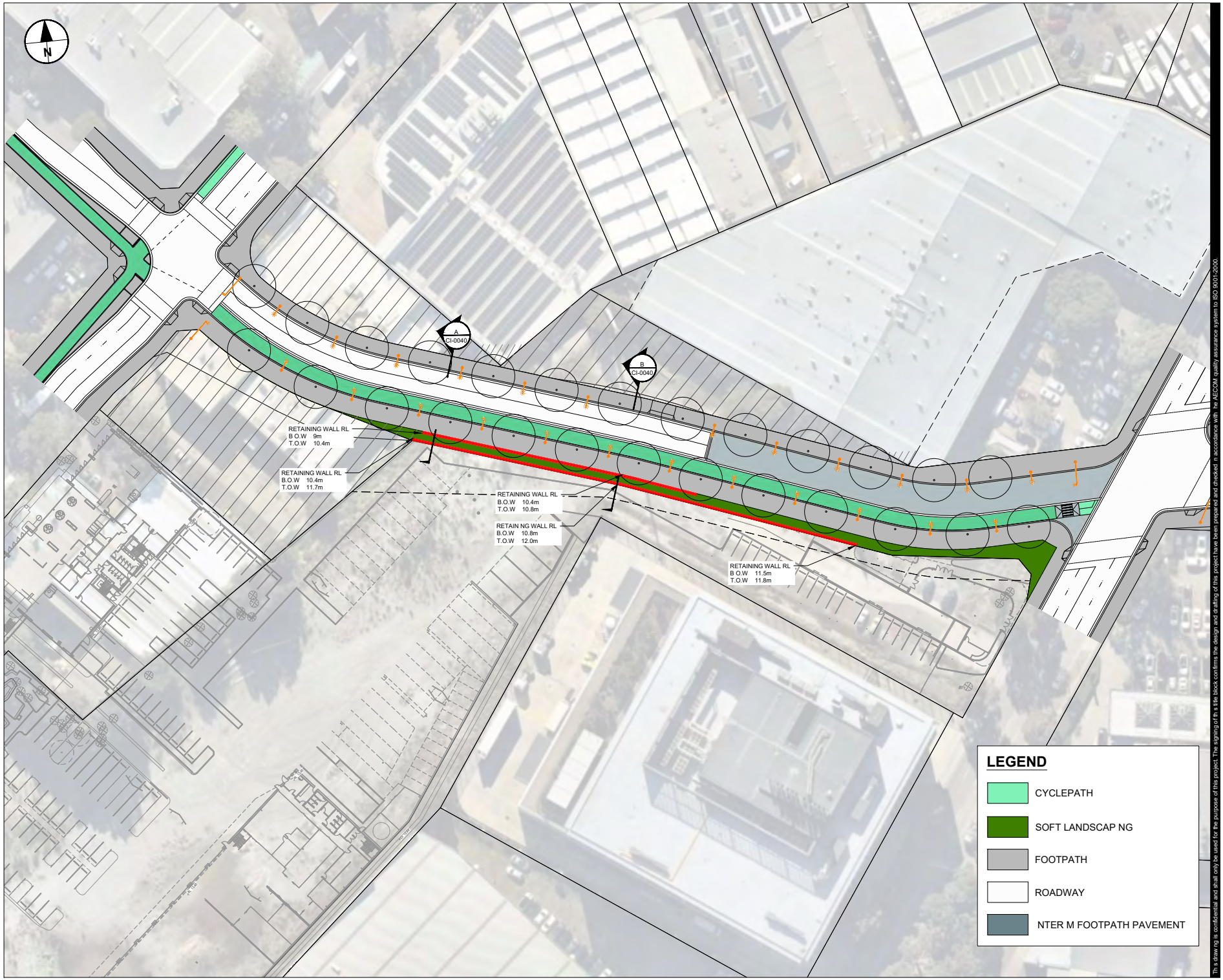

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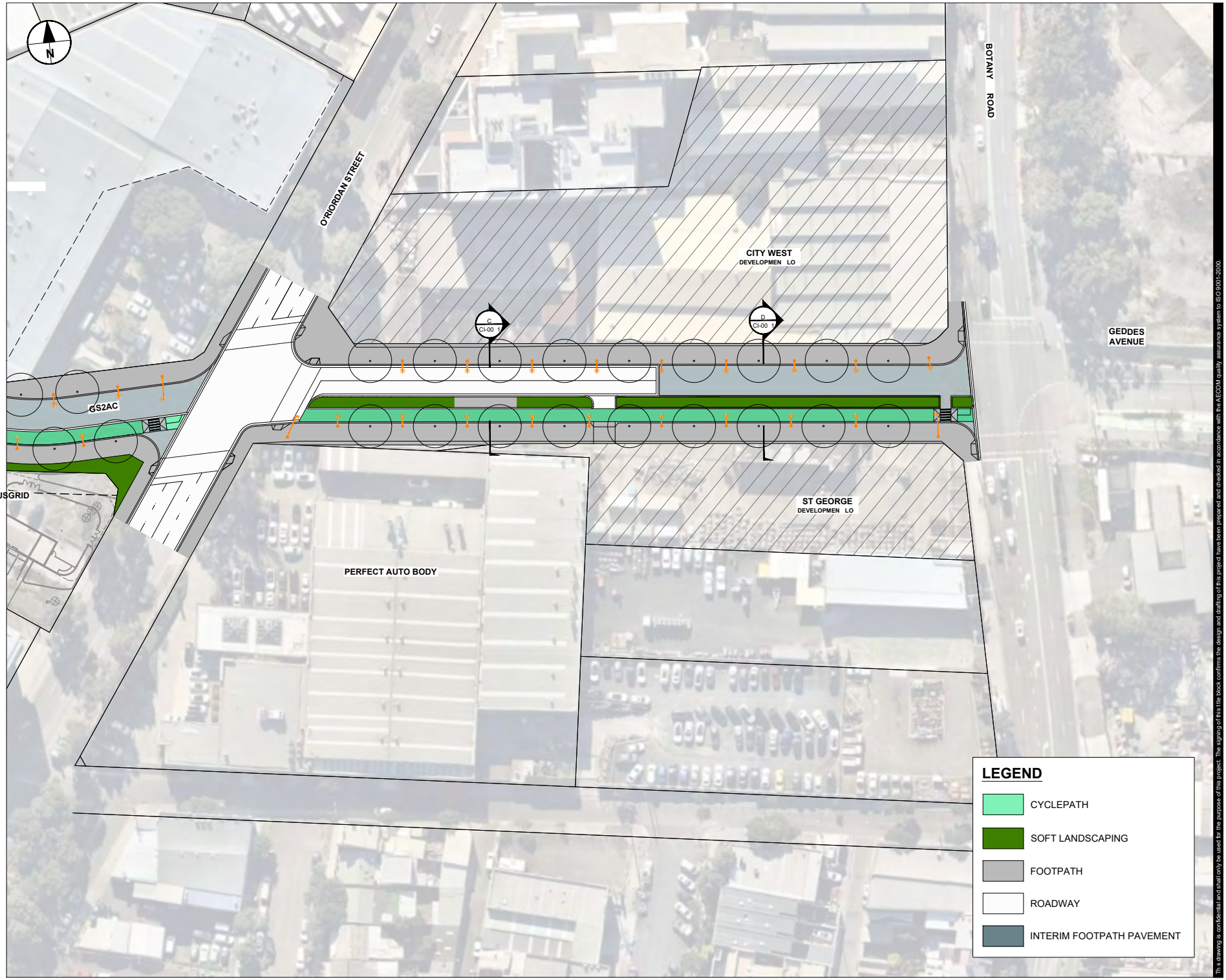

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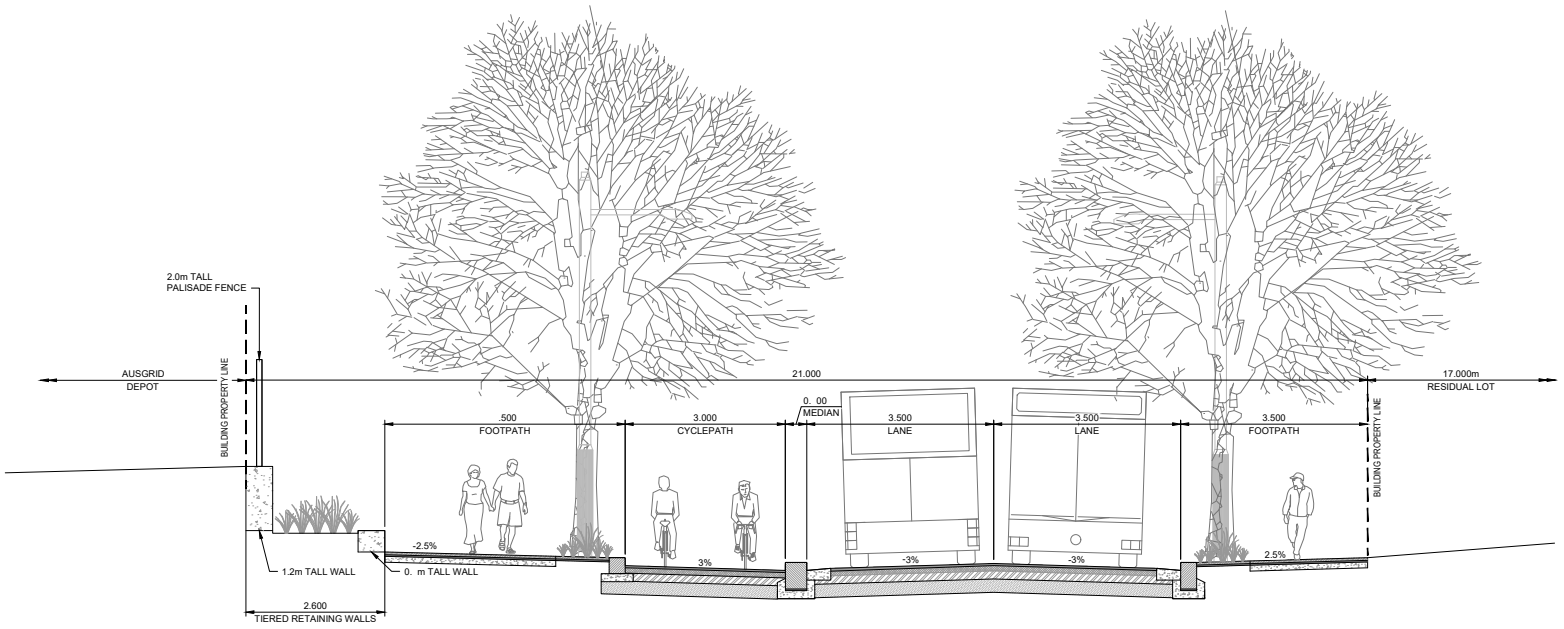

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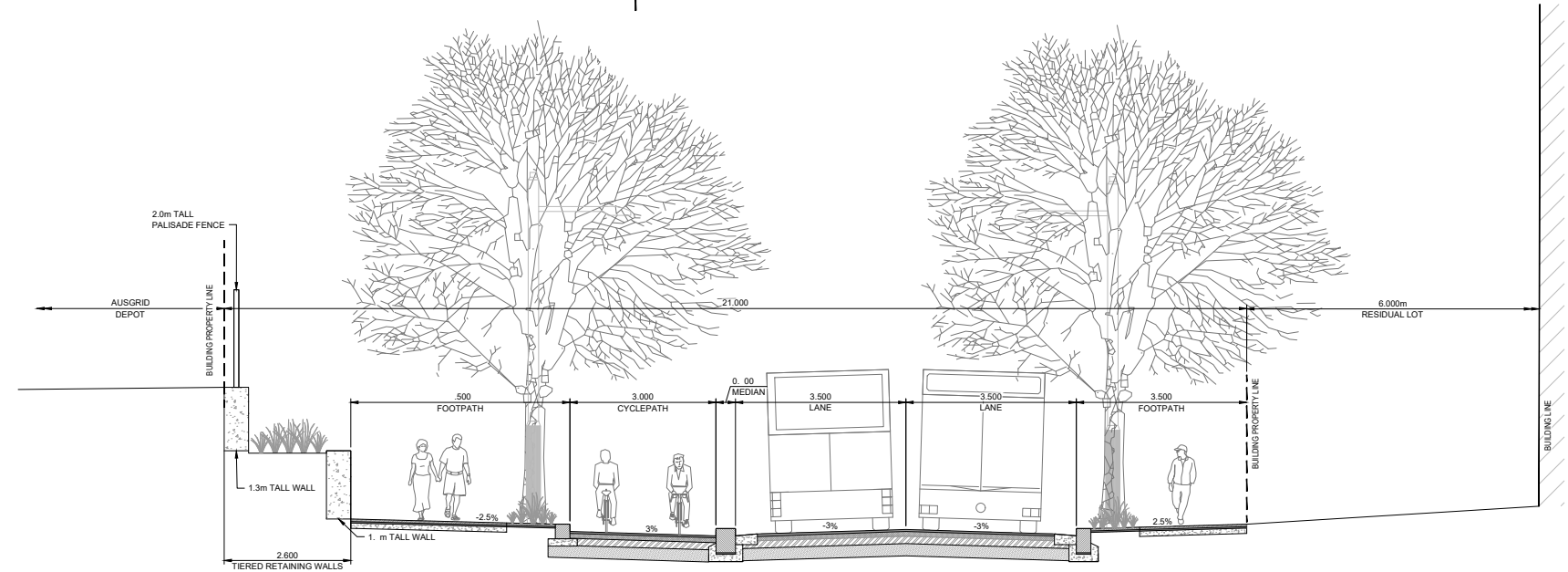

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DESIGN
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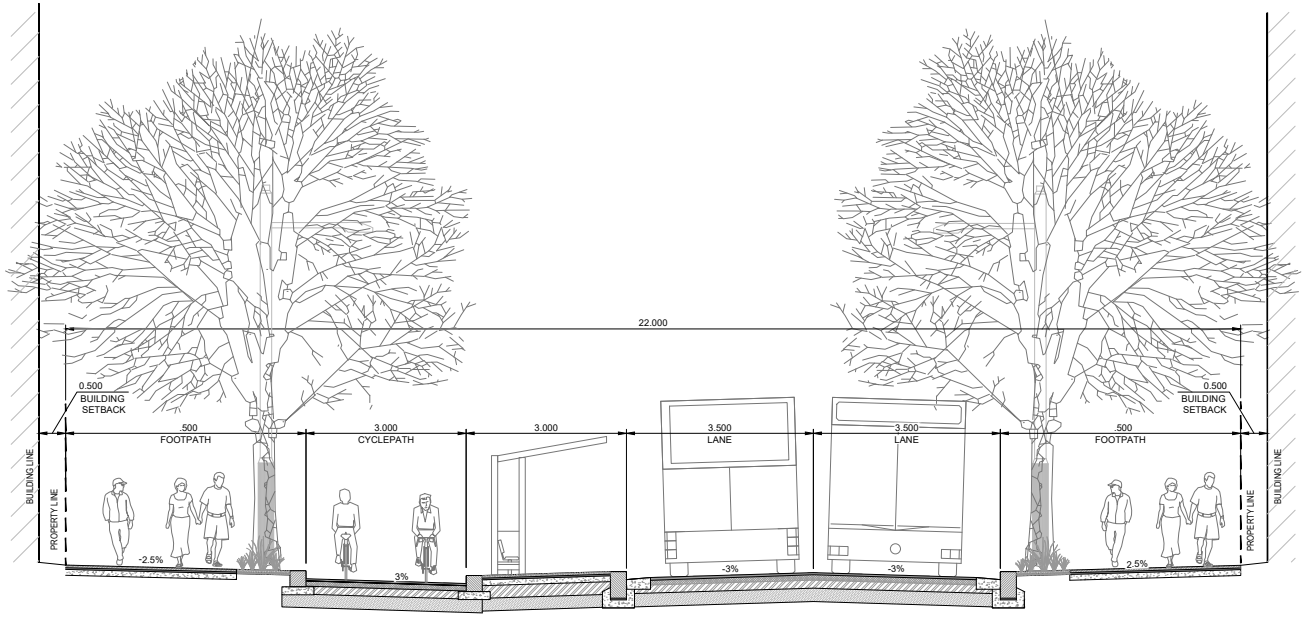

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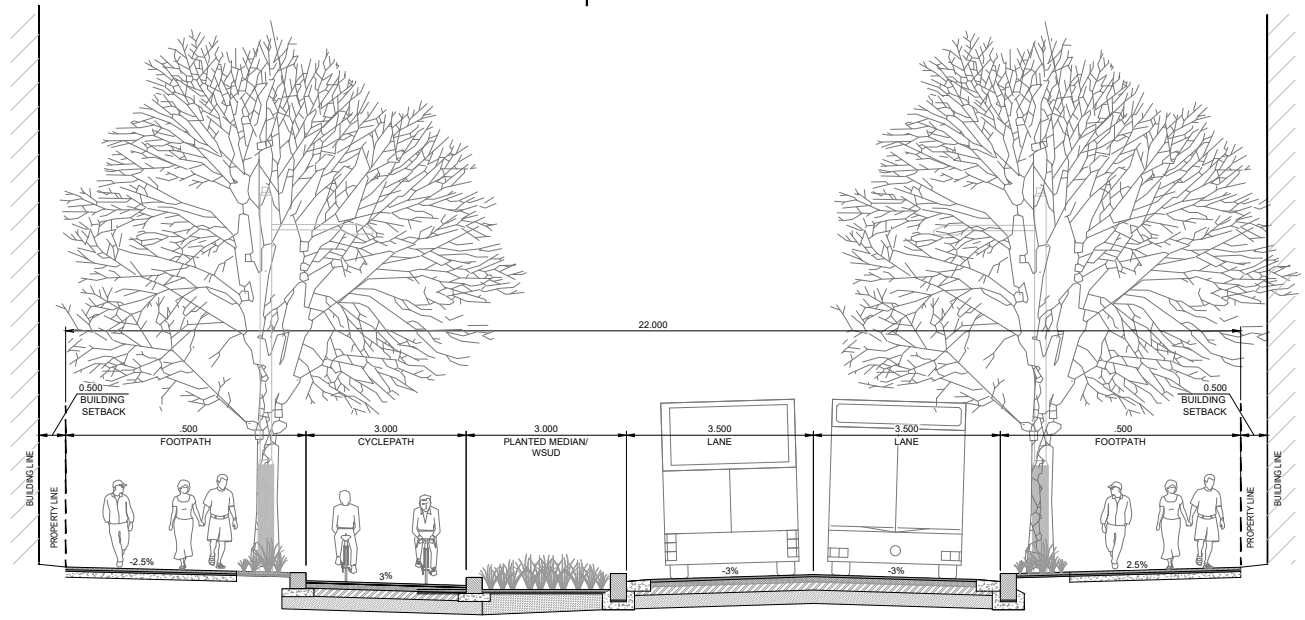

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SHEET TITLE

GS2AC
DESIGN
TYPICAL SECTION - SHEET 2

SHEET NUMBER

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