Multi-Trades and Digital Technology Hub

TAFE NSW Meadowbank
Transport and Accessibility Impact Assessment

Prepared by: GTA Consultants (NSW) Pty Ltd for TAFE NSW
on 14/10/19
Reference: N172560
Issue #: D

GTAconsultants

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Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	16/09/19	Final	Mansee Sachdeva	Brett Maynard	Brett Maynard	Brett Maynard
B	09/10/19	Final – updated following TOA	Mansee Sachdeva	Brett Maynard	Brett Maynard	Brett Maynard
C	10/10/19	Final – SSDA consistency updates	Mansee Sachdeva	Brett Maynard	Brett Maynard	Brett Maynard
D	14/10/19	Final – SSDA consistency updates	Mansee Sachdeva	Brett Maynard	Brett Maynard	

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EXECUTIVE SUMMARY

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A new multi-trades and digital technology hub is proposed on the TAFE NSW Meadowbank campus. The proposal involves a six-storey building in the north-eastern corner of the Meadowbank TAFE campus. The building will include workshops, workspace and leading spaces, as well as a two-level basement car park. Vehicle access will be from an internal laneway/ easement connecting with See Street, while primary pedestrian access will be from See Street. Existing north-south pedestrian through site access will also be improved by minor upgrade works (subject to a separate approval process). Bicycle end-of-trip facilities are located in the basement car park and accessed via the vehicle entry ramp.

The proposal contributes to an overall campus strategy that facilitates growth in annual enrolments from 13,559 students (2019) to 16,603 students (2032), with a corresponding increase in staff. Surveys indicate that peak daily campus activity peaks at a population around 1,600 staff and students, which is anticipated to grow to around 2008 people on-site at any given time by 2032.

The proposed multi-trades and digital technology hub building is sited on an existing at-grade car park that has capacity for about 200 vehicles. The basement car park of the proposed building would provide 200 parking spaces, replacing the existing 212 spaces displaced by the building footprint. An additional 100 parking spaces have recently become available as part of a separate approval in a new at-grade car park in the southwestern corner of the campus.

The proposal generates an additional parking requirement of 104 car parking spaces by 2032. Taking into consideration the existing parking displaced by the building footprint and new car parking being provided elsewhere on campus via a separate approval, it is estimated that the proposal will result in a net parking increase of approximately 88 spaces. This represents a minor shortfall of 16 spaces against the Ryde DCP 2014 guidance. This minor shortfall is within the day-to-day variation in parking demand and tolerance of future staff and student estimates. The proposed parking supply is therefore considered acceptable, noting that travel planning and management initiatives are also proposed to reduce future parking demand.

Travel surveys of existing staff and students indicate that private vehicles are the most common mode of travel to the site for both staff (74 per cent) and students (42 per cent), with travel via train also comprising a significant portion of travel to and from the campus, given its location next to Meadowbank Railway Station.

The additional 258 (2022) and 408 (2032) staff/ students anticipated on-site at any one time is expected to result in an additional 70 vehicle trips per hour in 2022 and 120 vehicle trips per hour in 2032. The road network as a whole is expected to operate satisfactorily for the anticipated 2022 traffic conditions when considering the additional traffic generated by the TAFE and proposed Meadowbank Education and Employment Schools Project (MEESP) (which is expected to be delivered concurrently). Victoria Road is unable to accommodate 2032 background traffic growth and therefore a corridor upgrade strategy needs to be developed in conjunction with Roads and Maritime Services and TfNSW, as part of broader precinct master planning work.

A Travel Plan has been prepared separately to this report which targets initiatives to reduce staff and student reliance on private vehicle travel and increase travel via more sustainable modes such as public and active transport. Some of the key initiatives include:

- ensuring adequate bicycle parking is provided to meet the demand of the campus
- providing lockers to allow students and staff to carry a change of clothes
- developing a map showing public transport routes and key pedestrian and cyclist routes to the campus
- allocating priority parking spaces for car-poolers.

With such initiatives, it is expected that the combined mode share for public transport, walking and cycling could increase to 35 per cent for staff and 65 per cent for students.

In the lead-up to and during construction, regular communication would alert staff and students to the reduced on-site car parking available during the construction period and reinforce the alternative options of public transport, active transport and/or a shuttle bus from satellite parking at the TAFE NSW West Ryde campus. Every effort will be made to minimise additional on-street parking demand during the construction program.

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1. INTRODUCTION

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1.1. Background and Proposal

This Transport Impact Assessment has been prepared by GTA Consultants (GTA) on behalf of TAFE NSW (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 10349) for the new multi-trades and digital technology hub on the TAFE NSW Meadowbank campus.

The proposal involves a six-storey building in the north-eastern corner of the Meadowbank TAFE campus. The building will include workshops, workspace and learning spaces, as well as a two-level basement car park. Vehicle access will be from an internal laneway/ easement connecting with See Street, while primary pedestrian access will be from See Street. Existing north-south pedestrian through site access will also be improved by minor upgrade works (subject to a separate approval process). Bicycle end-of-trip facilities are located in the basement car park and accessed via the vehicle entry ramp.

The new facilities will allow for overall enrolments to grow from the existing 13,559 enrolments in 2019 to 15,366enrolments by 2022 and 16,603enrolments by 2032. The multi-trades and digital technology hub will tie in with the future master plan of the campus and surrounding Meadowbank Education and Employment Precinct.

1.2. Purpose of this Report

The purpose of this Transport Impact Assessment is to identify the anticipated transport implications of the proposal.

The remainder of this report is structured as follows:

- **Section 2** provides an overview of the strategic context.
- **Section 3** presents the existing conditions of the surrounding transport network.
- **Section 4** provides an overview of the proposal and the key transport infrastructure proposed for the campus.
- **Section 5** assesses of the car parking provision and impact of the proposal.
- **Section 6** summarises the loading arrangements for the campus.
- **Section 7** provides an estimate on the number of person-trips per mode of transport to the campus.
- **Section 8** assesses the public and active mode transport impact and provides proposed mitigation and management measures for the existing transport network.
- **Section 9** assesses the traffic impact and provides proposed mitigation and management measures for the surrounding road network.
- **Section 10** provides a preliminary construction traffic management plan for the proposal.
- **Section 11** presents the conclusions for the report.

A separate Travel Plan for TAFE addressing both staff and student travel has been prepared to support the proposal. This report provides details of travel demand management measures to minimise the impact on the surrounding road network, as well as initiatives to encourage sustainable travel to and from the campus to increase the non-car travel mode share.

1.3. Response to SEARs

The Transport Impact Assessment is required by the SEARs for SSD 10349. Table 1.1 identifies the SEARs and relevant reference within this report.

Table 1.1: SEARs and relevant report reference

SEAR detail	Report reference
Policies Address the relevant planning provisions, goals and strategic planning objectives in the following: • NSW State Priorities; • The Greater Sydney Regional Plan, A Metropolis of three cities; • Future Transport Strategy 2056; • State Infrastructure Strategy 2018 – 2038 Building the Momentum; • Sydney's Cycling Future 2013; • Sydney's Walking Future 2013; • Sydney's Bus Future 2013; • Crime Prevention Through Environmental Design (CPTED) Principles; • Healthy Urban Development Checklist (NSW Health, 2009); • Better Placed – an integrated design policy for the build environment of NSW (Government Architect NSW (GANSW), 2017); and • Ryde Development Control Plan 2014.	Section 2
Operation Provide details of the existing and proposed operations, including staff and student numbers, and hours of operation.	Section 3.3, 4, 7
Transport and Accessibility Include a transport and accessibility impact assessment, which details, but not limited to the following: • accurate details of the current daily and peak hour vehicle, existing and future public transport networks and pedestrian and cycle movement provided on the road network located adjacent to the proposed development	Section 3.2, 3.4, 3.8, 3.9
• details of estimated total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips based on surveys of existing TAFE facilities and similar schools within the local area	Section 7
• existing car parking capacity and utilisation on streets within a 400 metre radius from the site on a typical weekday covering at least one hour before and after the proposed hours of operation (including night classes)	Section 3.6
• cumulative impacts of all trips generated by the development and the proposed Meadowbank Primary and Secondary Schools, particularly during school drop-off and pick-up periods	Section 8 and 9
• the adequacy of existing public transport services or any future public transport infrastructure within the vicinity of the site, pedestrian and bicycle networks and associated infrastructure within the vicinity of the site to meet the likely future demand of the proposed development	Section 3.7, 3.8, 3.9
• measures to integrate the development with the existing/future public transport network	Section 11.3
• the impact of the existing TAFE building(s) which are currently being refurbished, including the potential increase in student population and increase in traffic and parking demands	Section 5, 9
• the impact of trips generated by the development on the area-wide network, with consideration of the cumulative impacts from other proposed and / or approved developments in the vicinity, and the need/associated funding for, and details of, upgrades or road improvement works, if required (Traffic modelling is to be undertaken using SIDRA network modelling for current and future years)	Section 9
• the identification of infrastructure and services required to ameliorate any impacts on traffic flow efficiency and road user safety impacts associated with the proposed development, including details on improvements required to affected intersections, additional bus routes along bus capable roads (i.e. minimum 3.5 m wide travel lanes), additional bus stops or bus bays	Section 9
• details of travel demand management measures to minimise the impact on general traffic and bus operations, including details of a location-specific sustainable travel plan (Green Travel Plan and	See corresponding Travel Plan

SEAR detail	Report reference
specific Workplace Travel Plan) and the provision of facilities to increase the non-car mode share for travel to and from the site	
• the future pedestrian and cyclist desire lines, the proposed walking and cycling access arrangements and connections to public transport services	Section 8.1, 8.2
• the proposed access arrangements, including car and bus pick-up/drop-off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones	Section 4.4, 8
• proposed bicycle parking provision, including end of trip facilities, insecure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance	Section 5.3
• identify the loss of existing on site parking as a result of the development and the recent reduction in area of the TAFE site	Section 5.1.2
• proposed number of on-site car parking spaces for staff, students and visitors and corresponding compliance with existing parking codes (i.e. City of Ryde Development Control Plan) and justification for the level of car parking provided on-site and an assessment of the impact on the on-street capacity and utilisation;	Section 5.1.2
• the short term reduction of existing car parking spaces for staff, students and visitors due to the proposed construction works and the proposed location, operational and functional characteristics of the re-allocated staff, students and visitors car parking area	Section 10.3.5
• an assessment of the cumulative on-street parking impacts of cars and bus pick-up/drop-off, staff parking and any other parking demands associated with the development and provide any associated recommendations to ameliorate any such impacts;	Section 4.4
• an assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures and personal safety in line with CPTED;	Section 8
• emergency vehicle access, service vehicle access, delivery and location and loading arrangements including swept path diagrams of the largest design vehicle showing forward inbound and forward outbound movements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times);	Section 6
• the preparation of a preliminary Construction Traffic and Pedestrian Management Plan to demonstrate the proposed management of the impact in relation to construction traffic addressing the following: ○ assessment of cumulative impacts associated with other construction activities (if any); ○ how these impacts will be mitigated for any associated traffic, pedestrian, cyclists, parking and public transport service; ○ an assessment of road safety at key intersection and locations subject to heavy vehicle construction traffic movements and high pedestrian activity; ○ details of construction program detailing the anticipated construction duration and highlighting significant and milestone stages and events during the construction process; ○ details of anticipated peak hour and daily construction vehicle movements to and from the site; ○ details of on-site car parking and access arrangements of construction vehicles, construction workers to and from the site, emergency vehicles and service vehicle; and details of temporary cycling and pedestrian access during construction.	Section 10.2, 10.3, 3.10

1.4. References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds undertaken on 28 March 2019, during the morning peak period
- City of Ryde Council Development Control Plan (DCP) 2014
- Roads and Maritime Services (Roads and Maritime) Guide to Traffic Generating Developments October 2002
- Roads and Maritime Guide to Traffic Generating Developments – Technical Direction August 2013
- New South Wales Government Planning Guidelines for Walking and Cycling 2004

- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2018
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- traffic and car parking surveys undertaken by Matrix Traffic and Transport Data as referenced in the context of this report
- plans for the proposal prepared by Gray Puksand (September 2019)
- other documents and data as referenced in this report.

2. STRATEGIC CONTEXT

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2.1. Future Transport 2056 and Supporting Plans

Reviews have been completed for the following supporting plans:

- Future Transport Strategy 2056
- Greater Sydney Services and Infrastructure Plan
- Regional NSW Services and Infrastructure Plan
- Road Safety Plan (Towards Zero).

To support the land use vision for Greater Sydney, the NSW Government developed a vision for the transport system that will enable people and goods to move conveniently around the city. It will enable people within each city to access their nearest metropolitan and strategic centre within 30 minutes by public transport, seven days a week using:

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

Some of the key initiatives of this vision include:

- Sydney Growth Trains (part of More Trains, More Services program), which is committed within the next 10 years.
- Trial of on-demand bus services on selected local bus routes, which is committed within the next 10 years.
- Introduction of higher frequency transport services across Greater Sydney, which is under investigations between now and the next 20 years.

Within the 10-kilometre area around metropolitan centres, city-serving corridors will be able to support higher frequency, reliable on-street transport as key, city-shaping motorways will divert major traffic away from centres. This is the vision for the integrated network around the Harbour CBD where the network of new motorways, including WestConnex and Western Harbour Tunnel, will enable busy surface roads, such as Parramatta Road, Victoria Road and Military Road, to support more on-street public transport In the Central River City. This includes the investigation of strategic public transport links around Greater Parramatta to improve 30-minute access, including the prioritisation of on-road public transport and bus service improvements.

The More Trains, More Services initiative includes a service capacity upgrade program designed to transform the existing rail system using changes in technology and innovation to create integrated, automated, high capacity turn up and go services for our customers. This program aims to transform Sydney's busiest train lines over the next 10 years and beyond, through digital systems, advanced signalling and infrastructure upgrades.

As relevant to the proposal, initiatives include exploring further investments in north-south transport links near Greater Parramatta to improve access and support the creation and renewal of great places. These include:

- Parramatta to Norwest mass transit/ train link
- mass transit/ train link Macquarie Park to Hurstville via Rhodes
- Central City strategic road corridor.

2.2. Sydney's Cycling Future

The Sydney's Cycling Future 2013 has identified schools/ education as part of the major neighbourhood destinations where links to these destinations should be prioritised.

Transport for NSW (TfNSW) is developing a range of customer initiatives that will raise the profile of bicycle riding as a fun, healthy, easy and flexible transport option. TfNSW will provide information to customers on how to plan a safe riding route to their destination. TfNSW will also introduce initiatives to improve compliance with the bicycle related road rules when riding or driving on the road.

- TfNSW will support programs designed for everyday destinations to inform customers of their travel choices and provide incentives for them to ride. These programs will help ease congestion around key destinations at peak times.
- TfNSW will work with the Ministry of Health and the Office for Preventive Health on programs such as the Healthy Children Initiative, Active Travel to School and Healthy Workers Initiative. TfNSW will also continue to support a range of existing programs run by non-governmental organisations that encourage people to choose cycling as their transport choice.

2.3. Sydney's Walking Future

TfNSW will create a culture of walking as a viable and attractive transport choice to reduce the pressure on our road network and public transport system.

The three pillars of Sydney's walking future include promoting benefits and providing information to increase walking trips through programs that encourage more sustainable transport. TfNSW will encourage more people to walk during peak times to ease congestion on roads and free up capacity on public transport, particularly around schools, workplaces and universities as well as promoting the physical, emotional and social benefits of walking.

2.4. Sydney's Bus Future 2013

TfNSW has introduced more than 4,900 extra weekly bus services over the past two years, in urban growth areas, on high demand routes and as extra school services. Local services will continue to provide peak express and limited stop services, school services, local shopping services, CBD shuttles, special event access and late-night services.

2.5. Greater Sydney Commission Central City District Plan

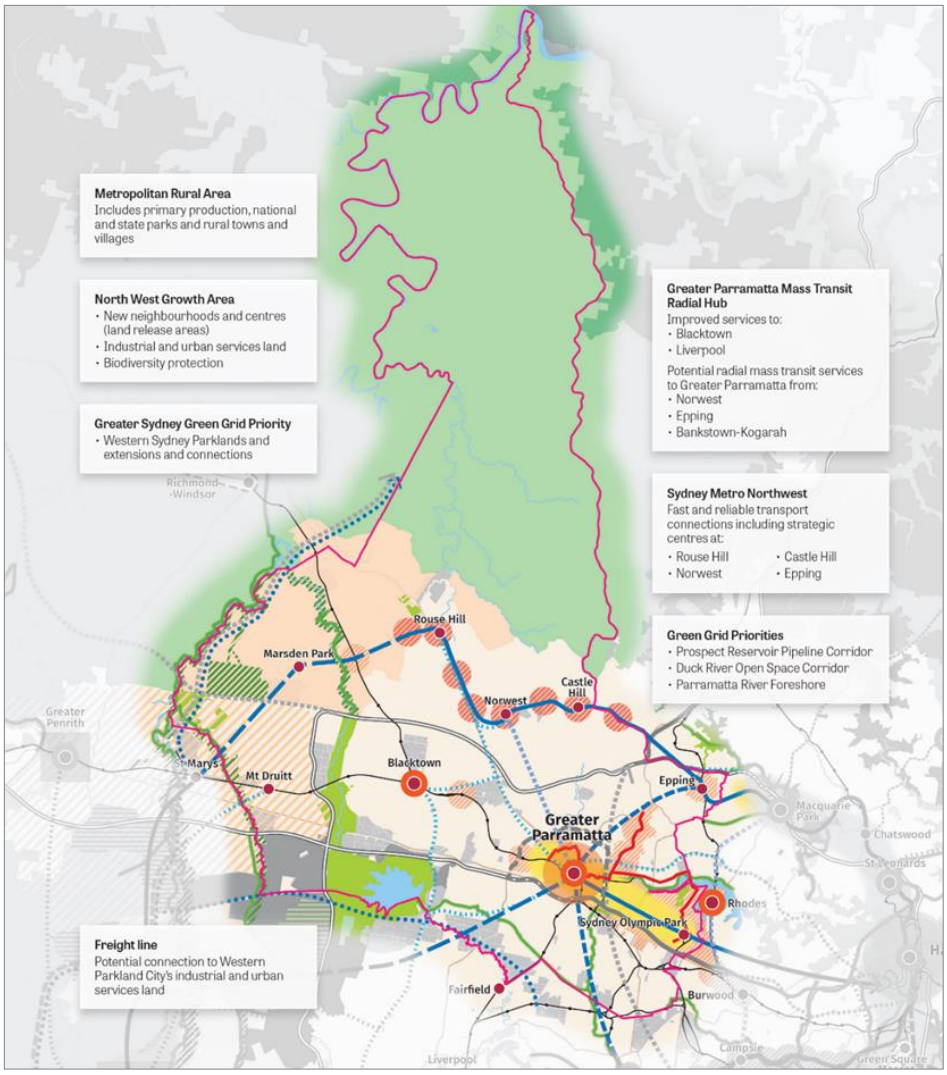
The vision for Greater Sydney as a metropolis of three cities – the Western Parkland City, the Central River City and the Eastern Harbour City and a 30-minute city – means residents in the Central City District will have quicker and easier access to a wider range of jobs, housing types and activities as part of the overall transformation. The vision will improve the District's lifestyle and environmental assets.

The Central City District is the central and major component of the Central River City. The Central City District will grow substantially, capitalising on its location close to the geographic centre of Greater Sydney. Unprecedented public and private investment is contributing to new transport and other infrastructure leading to major transformation.

New safe walking and cycling connections will be provided between parks, bushland, playgrounds and waterways. The Plan puts emphasis on developing the economy with jobs and skills growth from infrastructure investment. The Central District will be supported by cohesive and socially dynamic communities with new social infrastructure like schools and community services, new cultural and sporting facilities.

The Central City District is shown in Figure 2.1.

Figure 2.1: The Central City District



Source: https://gsc-public-1.s3-ap-southeast-2.amazonaws.com/central-district-plan-0318_0.pdf dated March 2018

2.6. Meadowbank Education and Employment Precinct Masterplan

To ensure the most efficient use of public infrastructure, the GSC is coordinating the planning of education, infrastructure and employment projects in the Meadowbank Education and Employment Precinct. The GSC is developing a Masterplan to ensure the precinct is an integrated, accessible and liveable place.

The (preliminary) Masterplan sets out sets out a precinct-level strategic framework for the future land uses and key developments within the Precinct, including the multi-trades and digital technology hub and the new Meadowbank Education and Employment Schools Project (MEESP).

The key objectives and considerations for the precinct, as outlined in the draft Master Plan, include:

- the successful operation of the schools and improved TAFE within the community
- mobility through the precinct
- a new east-west public pedestrian connection linking to the precinct
- pedestrian and cycle access improvements to serve both the community and the MEESP

- bus routes for schools, TAFE and public services
- student drop-off locations for the schools and TAFE students
- street modifications to improve vehicle access in and out of the precinct
- public domain improvements
- interface opportunities between the schools, TAFE and the community
- renewal and reuse options for recreation, community, and employment uses of the Sydney Water site and the area surrounding Meadowbank Railway Station
- transformation of the employment lands to closely integrate with the expansion of the TAFE program on the Meadowbank Campus.

The draft Masterplan will also deliver on the GSC's District Plan priorities in relation to infrastructure and collaboration, liveability, productivity and sustainability.

3. EXISTING CONDITIONS

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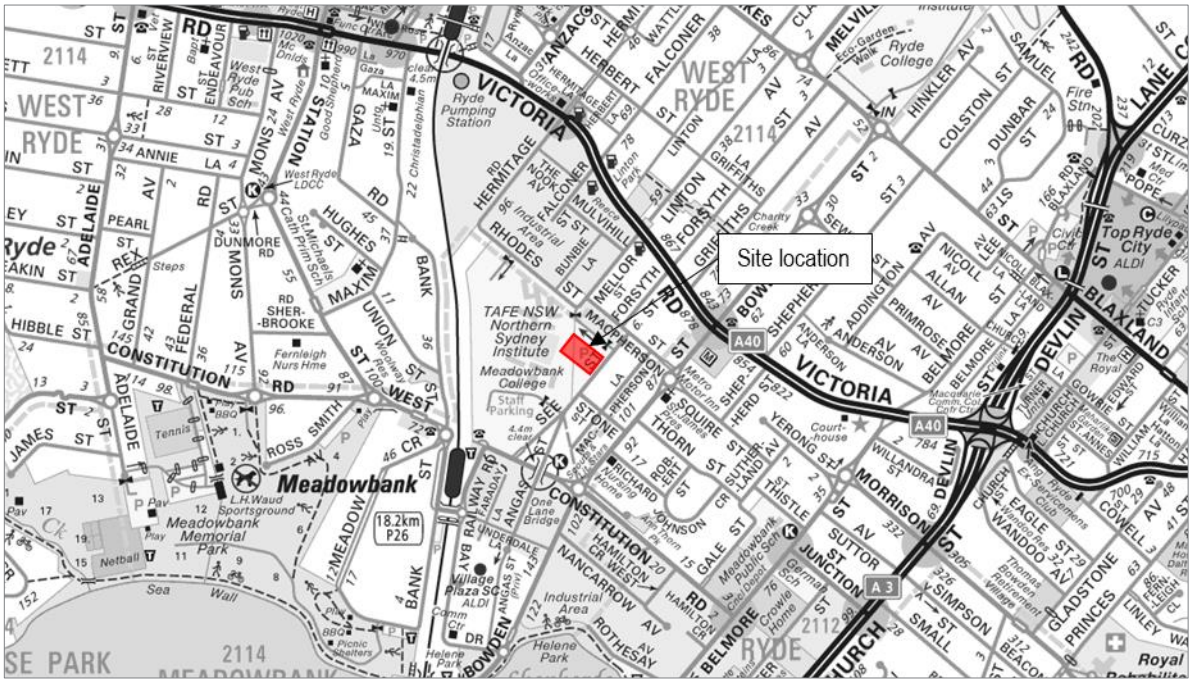
3.1. Site Location and Local Context

The TAFE NSW Meadowbank campus (herein referred to as Meadowbank TAFE) is located approximately 15 kilometres north west of Sydney CBD. The proposed new multi-trades and digital technology hub building will occupy the north eastern corner of the existing Meadowbank TAFE campus, which presently contains an at-grade car parking area. The Meadowbank TAFE campus is bounded by Macpherson Street and an Ausgrid substation to the north, See Street to the east and the rail corridor to the west. Meadowbank Railway Station is located at the southern boundary of the site.

The site location is illustrated in Figure 3.1. This proposed development site has a primary frontage to See Street. Surrounding properties largely consist of light industrial, low density residential and educational uses.

Figure 3.1: Subject site and environs



Base image source: Sydway

3.2. Road Network

This section provides an understanding of the current road network surrounding the campus in terms of characteristics and operational performance.

3.2.1. Road Hierarchy

Roads are classified according to the functions they perform. The main purpose of defining a road's functional class is to provide a basis for establishing the policies which guide the management of the road according to their intended service or qualities.

In terms of functional road classification, State roads are strategically important as they form the primary network used for the movement of people and goods between regions within Sydney, and throughout the State. Roads and Maritime is responsible for funding, prioritising and carrying out works on State roads. State roads generally include roads classified as freeways, state highways, and main roads under the 1993 Roads Act, and the regulation to manage the road system is stated in the Australian Road Rules (1999).

Roads and Maritime defines four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

Arterial Roads

Arterial roads are controlled by Roads and Maritime, typically no limit in flow and designed to carry vehicles long distance between regional centres.

Sub-Arterial Roads

Sub-arterial roads are managed by either Council or Roads and Maritime under a joint agreement. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their purpose is to carry through traffic between specific areas in a sub region or provide connectivity from arterial road routes (regional links).

Collector Roads

Collector roads provide connectivity between local sites and the sub-arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.

Local Roads

Local roads provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

3.2.2. Surrounding Road Network

See Street

See Street functions as a local road and near the campus is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Kerbside parking is permitted on both sides of the road. Parking is generally unrestricted on the eastern side, with a short section of 15-minute time restriction from 8am to 5:30pm, Monday to Friday. On the western side of See Street, the following parking restrictions apply:

- Two-hour time restriction between Macpherson Street and Stone Street, from 8:00am to 9:00pm, Monday to Friday (permit holders excepted)
- 15-minute time restriction between Stone Street and Angas Street, from 7:00am to 5:00pm, Monday to Friday.

Two-hour time restriction between Angas Street and Constitution Road, from 8am to 9pm, Monday to Friday (permit holders excepted).

Rhodes Street

Rhodes Street functions as a collector road and is aligned in an east-west direction. It is a two-way road configured with one traffic lane and one parking lane in each direction within a 11-metre wide carriageway.

Kerbside parking is permitted on both sides of the road. Rhodes Street carries around 1,100 vehicles per day in the eastbound direction and 1,400 vehicles per day in the westbound direction.

Rhodes Street is shown in Figure 3.2 and Figure 3.3.

Figure 3.2: Rhodes Street (looking east)

Figure 3.3: Rhodes Street (looking east)

Hermitage Road

Hermitage Road functions as a collector road and is aligned in a north south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within a 10-metre wide carriageway. Kerbside parallel parking is permitted on both sides of the road. Hermitage Road intersects Victoria Road at a signalised intersection, permitting all turning movements.

Hermitage Road carries around 1,700 vehicles per day in the southbound direction and 1,900 vehicles per day in the northbound direction.

Hermitage Road is shown in Figure 3.4.

Victoria Road

Victoria Road is a classified State Road (Roads and Maritime controlled) and is aligned in an east-west direction. Near the campus, it is a two-way road configured with three travel lanes in each direction. Kerbside parking is not permitted on both sides of the road. The road carriageway is around 20 metres wide.

Victoria Road is shown in Figure 3.5.

Figure 3.4: Hermitage Road (looking south)

Figure 3.5: Victoria Road (looking east)

Bowden Street

Bowden Street functions as a collector road and is aligned in a north south direction. It is a two-way road configured with one travel lane in each direction within a 12-metre wide carriageway. Bowden Street intersects Victoria Road at a signalised intersection, permitting all turning movements.

Kerbside parking is permitted on both sides of the road, subject to a one to two-hour time restrictions during weekdays between 7:00am and 5:00pm. On the southern approach to Victoria Road, Bowden Street is subject to clearway restrictions along the western side of the road, extending back to the intersection with Macpherson Street.

Bowden Street carries around 4,200 vehicles per day in the northbound direction and 4,700 vehicles per day in the southbound direction.

Bowden Street is shown in Figure 3.6.

Macpherson Street

Macpherson Street functions as a local road and near the campus is aligned in an east-west direction. It is a two-way road configured with one travel lane and one parking lane in each direction within a 10-metre wide carriageway. Kerbside parking is permitted on both sides of the road, subject to a two-hour time restriction during weekdays between 8:00am and 9:00pm.

Macpherson Street is shown in Figure 3.7.

Figure 3.6: Bowden Street (looking north)

Figure 3.7: Macpherson Street (looking east)

Mellor Street

Mellor Street functions as a local road and near the campus is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Mellor Street provides left-in/ left-out access to Victoria Road.

Kerbside parking is permitted on both sides of the road, and is generally unrestricted, with a short section of two-hour time restriction between Mulvihill Street and Victoria Road from 8:30am to 6:00pm, Monday to Friday and from 8:30am to 12:30pm on Saturdays.

Forsyth Street

Forsyth Street functions as a local road and near the campus is aligned in a north-south direction. It is a two-way road configured with one travel lane and one parking lane in each direction within an 11-metre wide carriageway. Forsyth Street provides left-in/ left-out access to Victoria Road.

Kerbside parking is permitted on both sides of the road, subject to a two-hour time restriction on the western side from 8:00am to 9:00pm, Monday to Friday (permit holders excepted). Kerbside parking on the eastern side is unrestricted.

Constitution Road

Constitution Road functions as a local road and near the campus is aligned in an east-west direction. It is a two-way road configured with one travel lane in each direction within a 10-metre wide carriageway. No stopping is permitted on Constitution Road, between Railway Road and Bowden Street.

3.2.3. Surrounding Intersections

The following intersections currently exist near the Meadowbank TAFE campus:

- Victoria Road/ Hermitage Road (signalised)
- Macpherson Street/ Rhodes Street (unsignalised)
- Macpherson Street/ See Street (unsignalised)
- Macpherson Street/ Bowden Street (unsignalised)
- Bowden Street / Stone Street (unsignalised)
- Bowden Street/ Squire Street (unsignalised - roundabout)
- Bowden Street/ Victoria Road (signalised)
- Bowden Street/ Constitution Road (unsignalised - roundabout)
- Railway Road/ Bay Drive/ Bank Street (unsignalised - roundabout)
- Church Street/ Morrison Road (signalised)
- Belmore Street/ Constitution Road (signalised).

3.3. Existing Operation

Meadowbank TAFE currently operates during the following hours, which will continue following the opening of the multi-trades and digital technology Hub:

- Monday to Thursday 7:00am to 10:30pm
- Friday 7:00am to 7:00pm
- Saturday 8:00am to 5:30pm.

The Meadowbank campus currently has approximately 13,559 enrolments and 595 staff.

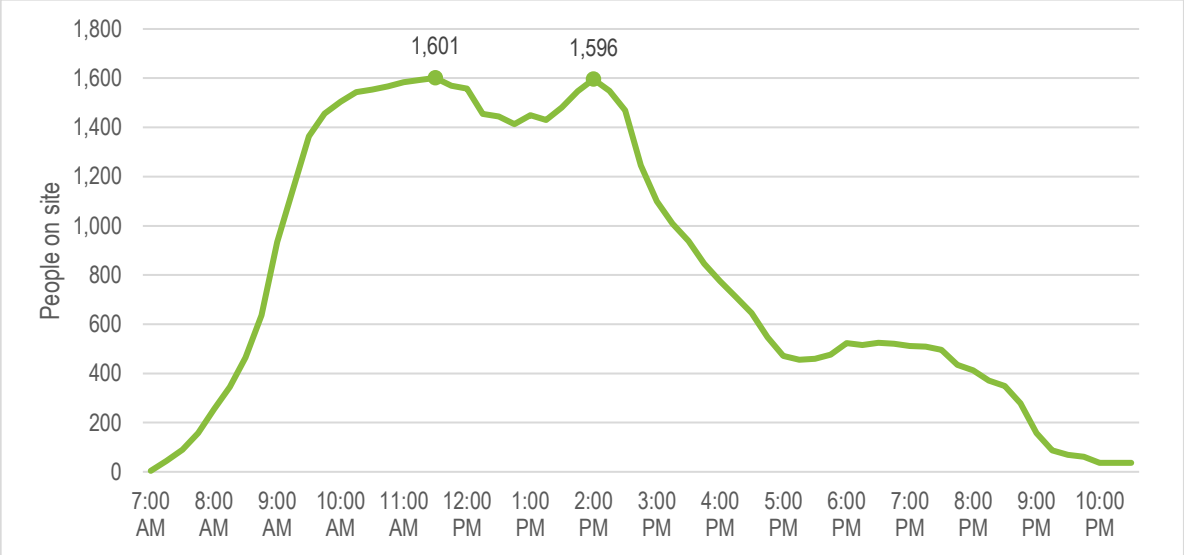
GTA commissioned pedestrian and vehicle counts at all access points into the Meadowbank TAFE campus on Tuesday 20 August 2019 to understand the existing visitation profile throughout the day. The survey was completed from 6:30am to 10:30pm, with the access points shown in Figure 3.8. Surveys were completed on a Tuesday as this is considered the busiest day at the Meadowbank TAFE campus.

Figure 3.8: Surveyed campus access points

Base image source: Nearmap

A summary of the total campus visitation throughout the day is shown in Figure 3.9.

Figure 3.9: Meadowbank TAFE daily campus visitation



The survey data indicates that the peak number of people on-site at one time is estimated to be around 1,600 which occurred around 11:30am and again around 2pm. It is estimated that this includes around 300 staff and 1,300 students. Further to this, it was found that the greatest number of people movements per hour (inbound and outbound) occurred between 8:30am and 9:30am with approximately 1,137 people movements per hour, while the PM peak hour occurred around 2:15pm to 3:15pm with 809 people movements per hour.

3.4. Traffic Volumes

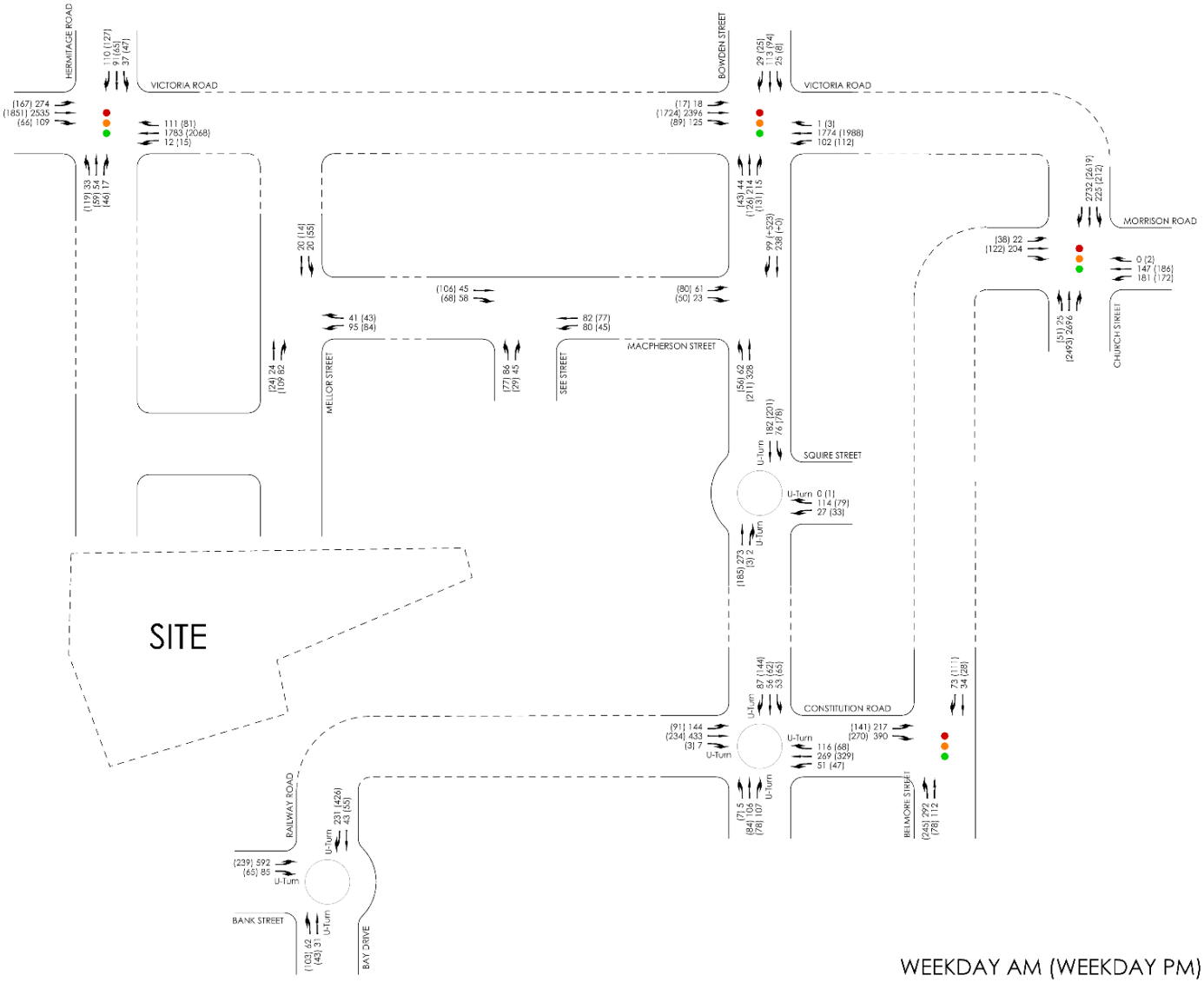
To respond to the requirements outlined in the SEARs, GTA commissioned additional traffic movement counts on Thursday 28 June 2018 and Wednesday 15 May 2019, between 7:00am and 9:30am and between 2:00pm and 4:30pm, at the following intersections:

- Hermitage Road/ Victoria Road
- Bowden Street/ Victoria Road
- Church Street/ Morrison Road
- Macpherson Street/ Bowden Street
- Macpherson Street/ See Street
- Macpherson Street/ Mellor Street
- Bowden Street/ Squire Street
- Constitution Road/ Bowden Street
- Belmore Street/ Constitution Road
- Railway Road/ Bay Drive/ Bank Street.

Differences of up to 50 vehicles were noted between 2018 and 2019 traffic count data. Such differences are expected as part of day-to-day variation, given surveys are for a single day. The differences have not been adjusted and the survey data has been used as observed.

Based on the peak person trips shown in Section 3.3, the critical peak hours considered for this assessment has been taken as 8:00am to 9:00am for the AM peak hour and 2:30pm to 3:30pm for the PM peak hour as it will align with the peak hours for the adjacent proposed K – 12 school (MEESP) which is expected to have a much higher traffic generation than the multi trades and digital technology hub (as identified in Section 9), while also being very similar to the AM and PM peak hours for Meadowbank TAFE.

Figure 3.10: Existing AM/ PM peak hour traffic volumes



3.5. Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA Intersection[1], a computer-based modelling package which calculates intersection performance. Traffic modelling approach is discussed in detail in Section 9.

3.5.1. Model Development

The base models are representative of the existing road and travel conditions. Intersection survey counts were used to develop the traffic demand for the models for the following two peak hours:

- 8:00 am to 9:00 am
- 2:30 pm to 3:30 pm.

The model calibration process was carried out to ensure that models are a close representation of reality. Model calibration is presented in detail in Appendix A.

In summary to replicate existing conditions, the following default parameters were changed in the models at intersections along Victoria Road:

- *Gap acceptance factor* – this factor is used to adjust the critical gap that a vehicle may accept before making the manoeuvre. The default value is set to 1. The factor below 1 indicates that vehicles will accept shorter gaps to make their movement and a factor above 1 indicates that vehicles are more cautious and wait for comfortable gaps to make the movement.
- *Lane Utilisation Ratio* – this parameter is used to determine the reduced flow rate of an underutilised lane. For intersections with shared through and turning lanes, a shared lane maybe underutilised as there might be turning vehicles stopped in the lane. In such instances, vehicle mostly use the other lane to bypass. Such behaviour was observed at both intersections along Victoria Road at Bowden Street and Hermitage Road.

3.5.2. Performance Criteria

The commonly used measure of intersection performance, as defined by Roads and Maritime, is vehicle delay. SIDRA Intersection determines the average delay that vehicles encounter and provides a measure of the level of service. A level of service of D or better with a degree of saturation of less than 0.85 is generally considered acceptable operation.

Table 3.1 shows the criteria that SIDRA Intersection adopts in assessing the level of service.

[1] Program used under license from Akcelik & Associates Pty Ltd.

Table 3.1: SIDRA Intersection level of service criteria

Level of Service	Average delay per vehicle (secs/ veh)	Traffic signals, roundabout	Give way, stop sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

3.5.3. Intersection Performance

Table 3.2 and Table 3.3 presents a summary of the existing operation of the intersection. The following intersections were modelled using SIDRA Network to determine the cumulative operation of the road network:

- Victoria Road/ Hermitage Road
- Macpherson Street/ Rhodes Street
- Macpherson Street/ See Street
- Macpherson Street/ Bowden Street
- Bowden Street/ Squire Street
- Bowden Street/ Stone Street
- Bowden Street/ Victoria Road.

The following intersections were modelled in isolation using SIDRA Intersection:

- Railway Road/ Bay Drive/ Bank Street
- Church Street/ Morrison Road
- Belmore Street/ Constitution Road.

Table 3.2: Existing operating conditions – AM peak

Intersection	Control	Degree of Saturation	Average delay (seconds)	95th percentile queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.06	5	1	A
Macpherson Street/ See Street	Priority	0.06	5	1	A
Macpherson Street/ Bowden Street	Priority	0.15	7	1	A
Bowden Street/ Squire Street	Roundabout	0.14	8	3	A
Constitution Road/ Bowden Street	Priority	0.37	11	7	A
Victoria Road/ Bowden Street	Signals	0.90	15	105	B
Victoria Road/ Hermitage Road	Signals	0.91	26	295	B
Bowden Street / Stone Street	Priority	0.18	32	5	C
Constitution Road/ Belmore Street	Signals	0.7	17	51	B
Church Street/ Morrison Road	Signals	1.00	17	165	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.26	8	5	A

Table 3.3: Existing operating conditions – PM peak

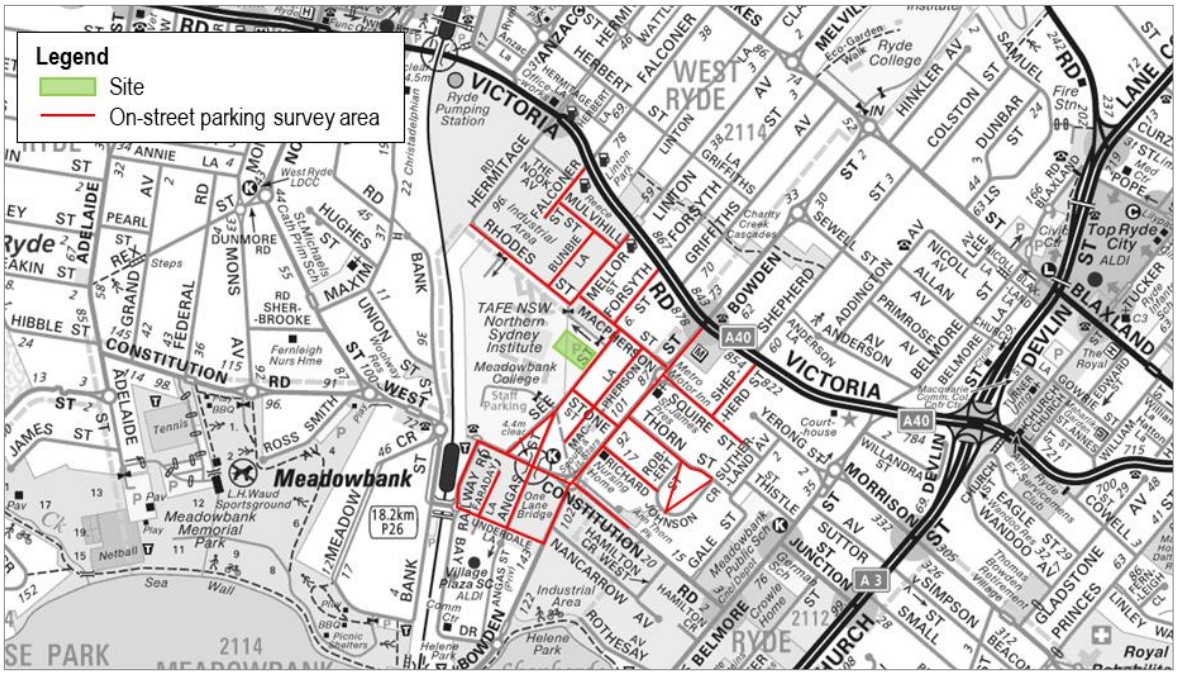
Intersection	Control	Degree of Saturation	Average delay (seconds)	95th percentile queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.06	5	1	A
Macpherson Street/ See Street	Priority	0.05	5	1	A
Macpherson Street/ Bowden Street	Priority	0.17	7	2	A
Bowden Street/ Squire Street	Roundabout	0.16	8	4	A
Constitution Road/ Bowden Street	Priority	0.26	10	5	A
Victoria Road/ Bowden Street	Signals	0.99	20	166	B
Victoria Road/ Hermitage Road	Signals	0.94	27	289	B
Bowden Street / Stone Street	Priority	0.19	29	5	C
Constitution Road/ Belmore Street	Signals	0.62	22	34	B
Church Street/ Morrison Road	Signals	0.95	15	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.39	7	8	A

All intersections assessed currently operate at a satisfactory LoS C or better with spare capacity during both AM and PM peak hours. However, intersections along some movements at intersections along Victoria Road are operating close to capacity with degree of saturation nearing one (~1.0).

3.6. On-Street Parking

GTA compiled an inventory of publicly available on-street and off-street car parking within an approximately 400 metre radius of the campus, as indicated in Figure 3.11. A summary of the on-street parking supply and restrictions is provided in Table 3.4.

Figure 3.11: Car parking survey area



Base image source: Sydway

Table 3.4: Existing on-street parking supply and restrictions

Parking area	Restriction	Supply	Street total
Falconer Street, eastern side	No Restriction	14	31
Falconer Street, western side	No Restriction	17	
Mulvihill Street, northern side	No Restriction	4	25
Mulvihill Street, southern side	No Restriction	21	
Bunbie Lane, eastern side	No Restriction	0	18
Bunbie Lane, western side	No Restriction	18	
Mellor Street, eastern side	No Restriction P2 (8:30am-6:00pm Mon-Fri, 8:30am-12:30pm Sat)	17	34
Mellor Street, western side	No Restriction P2 (8:30am-6:00pm Mon-Fri, 8:30am-12:30pm Sat)	17	
Rhodes Street, northern side	No Restriction	14	51
Rhodes Street, southern side	No Restriction Loading Zone	37	
Macpherson Street, northern side	2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	26	47
Macpherson Street, southern side	2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	21	
Forsyth Street, eastern side	2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	18	44
Forsyth Street, western side	2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	26	
Bowden Street, eastern side	1P (7:00am-5:00pm Mon-Fri) 2P No Restriction	43	95
Bowden Street, western side	No Stopping (6am-9am, 3:30pm-7pm Mon-Fri) 2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8) 1P (8:00am-9pm Mon-Fri, 8:30am-12:30pm Sat)	52	

Parking area	Restriction	Supply	Street total
	No Parking (5:00am-11:00am Mon Waste Vehicles Expected) Work Zone (7:00am-7:00pm Mon-Fri, 8:00am-4:00pm Sat)		
Shepherd Street, western side	No Restriction	15	31
Shepherd Street, eastern side	No Restriction	16	
Squire Street, northern side	No Restriction	27	57
Squire Street, southern side	No Restriction	30	
See Street, eastern side	No Restriction 1/4P (8:00am-5:30pm Mon-Fri)	42	88
See Street, western side	1/4P (8:00am-5:30pm Mon-Fri) 2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	46	
Richard Johnson Crescent, northern side	No Restriction	17	47
Richard Johnson Crescent, southern side	No Restriction 2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	30	
Robert Street, eastern side	No Restriction	11	11
Robert Street, western side	No Stopping	0	
Thorn Street, northern side	No Restriction	29	53
Thorn Street, southern side	No Restriction	24	
Stone Street, northern side	No Restriction	9	22
Stone Street, southern side	2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	13	
Macpherson Lane, eastern side	No Restriction	21	21
Macpherson Lane, western side	No Restriction	0	
Angas Street, eastern side	No Restriction Disabled 1/4P (8:00am-5:30pm Mon-Fri) 2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8) Work Zone (7:00am-7:00pm Mon-Fri, 8:00am-4:00pm Sat)	41	50
Angas Street, western side	No Restriction 2P (8:00am-9:00pm Mon-Fri Permit Holders Excepted Zone 8)	9	
Constitution Road, northern side	No Restriction	7	10
Constitution Road, southern side	No Restriction	3	
Railway Road, eastern side	1/4P (8:30am-6pm Mon-Fri, 8:30am-12:30pm Sat) 1/2P (8:30am-6pm Mon-Fri, 8:30am-12:30pm Sat)	9	17
Railway Road, western side	1/2P (8:30am-6pm Mon-Fri, 8:30am-12:30pm Sat)	8	

Parking demand surveys were undertaken by Matrix Traffic and Transport Data within the nominated area during on Tuesday 20 August 2019 from 6:00am to 11:30pm.

The parking survey results are summarised in Table 3.5.

Table 3.5: On-street car parking demand

Parking Area	Supply	6:00 AM	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM	9:00 PM	10:00 PM	11:00 PM	11:30 PM
Falconer Street	31	30	30	28	29	30	30	30	31	30	30	27	29	29	29	28	28	27	26	26
Mulvihill Street	25	24	24	24	25	25	25	25	25	25	24	23	23	23	24	24	24	23	23	23
Bunbie Lane	18	15	15	16	17	16	16	16	17	17	17	16	14	14	13	14	14	13	13	13
Mellor Street	34	28	29	30	33	33	33	31	29	32	27	22	29	31	29	23	20	19	19	19
Rhodes Street	51	38	45	46	47	49	49	49	49	48	46	41	32	37	36	30	24	19	17	17
Macpherson Street	47	12	23	28	28	36	38	38	34	34	30	18	22	35	37	29	16	14	14	14
Forsyth Street	44	22	20	18	21	28	31	31	22	24	23	14	17	30	33	27	15	13	13	14
Bowden Street	95	34	39	46	52	56	60	64	55	55	31	29	27	46	40	33	21	20	23	23
Shepherd Street	31	16	15	11	25	27	24	24	26	23	16	14	13	16	16	15	13	17	14	14
Squire Street	57	13	13	28	52	56	55	55	55	53	47	28	23	17	13	11	15	16	15	16
See Street	88	36	44	53	74	76	79	74	63	76	66	50	64	75	70	56	19	10	11	10
Richard Johnson Crescent	47	34	34	30	40	42	45	43	42	40	35	29	25	20	18	16	14	11	10	10
Robert Street	11	4	4	4	11	11	11	11	11	11	11	8	6	3	2	3	3	3	3	3
Thorn Street	53	17	15	38	48	50	51	46	49	49	49	27	21	26	21	18	21	16	16	16
Stone Street	22	5	6	14	17	19	20	20	18	18	17	13	18	20	17	6	5	4	4	3
Macpherson Lane	21	8	8	8	8	11	13	12	12	13	9	7	7	11	9	8	5	4	4	4
Angas Street	50	28	36	34	37	38	43	44	41	40	35	35	33	40	41	40	25	24	22	23
Constitution Road	10	8	8	8	8	9	9	8	7	7	8	7	8	6	7	7	6	7	8	8
Railway Road	17	9	11	6	11	7	10	10	10	7	6	7	10	11	12	12	4	1	1	1
Total	**752**	**381**	**419**	**470**	**583**	**619**	**642**	**631**	**596**	**602**	**527**	**415**	**421**	**490**	**467**	**400**	**292**	**261**	**256**	**257**
Occupancy	-	51%	56%	63%	78%	82%	85%	84%	79%	80%	70%	55%	56%	65%	62%	53%	39%	35%	34%	34%

Table 3.5 indicates that existing on-street car parking demands in the nominated area are relatively high throughout the day, particularly along the key roads (including See Street, Macpherson Street and Stone Street) immediately surrounding the Meadowbank TAFE campus.

Surveys were also completed on 28 March 2019 for on-site car parks. The surveys indicate that there are currently 212 spaces in the main car park for use by staff and visitors, while 77 spaces are located in the staff car park adjacent to Block J. These car parks were observed to be fully occupied by 9am and closed off to stop any additional vehicles entering the car parks.

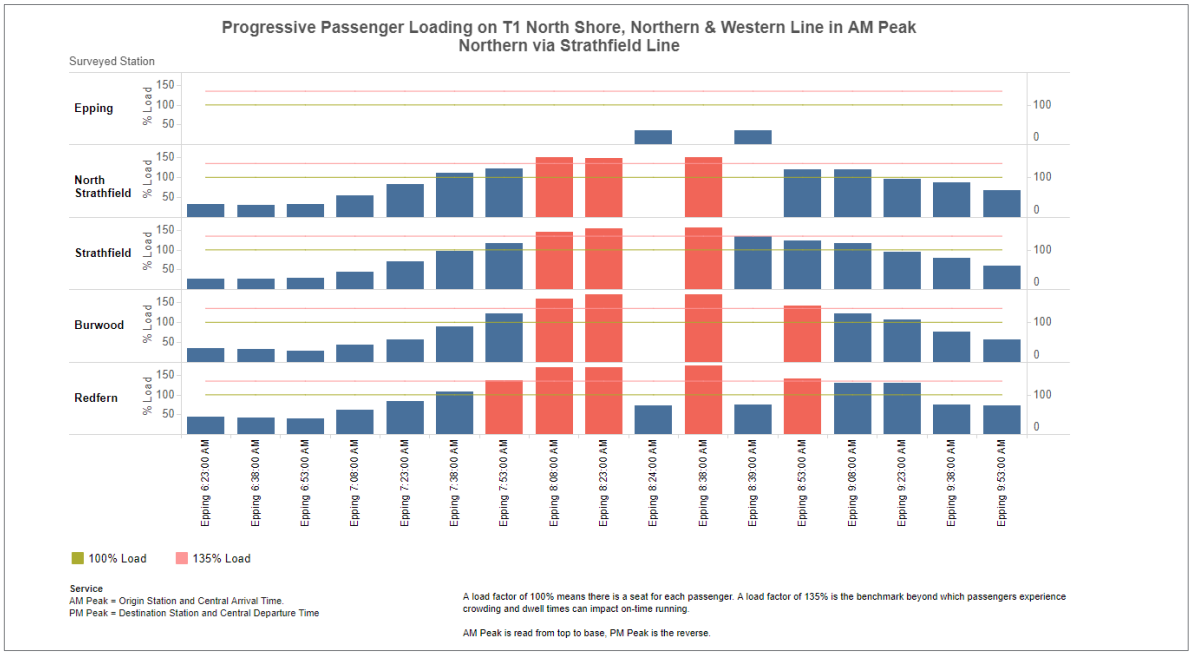
3.7. Public Transport

3.7.1. Train Services

Meadowbank Railway Station and West Ryde Station are located around 350 metres southwest and 830 metres northwest from the Meadowbank TAFE campus, respectively. Both Meadowbank and West Ryde stations are on the T9 Northern Line, with services running from Epping to Central every 30 minutes.

TfNSW has published train load data by line during the AM and PM peak periods from March 2016 surveys. Figure 3.12 illustrates the AM peak period loading, which indicates the trains passing through Meadowbank Station are exceeding capacity between 8:00am and 9:00am.

Figure 3.12: Train Loads Survey for T1 Line



Source: https://www.transport.nsw.gov.au/data-and-research/passenger-travel/train-patronage/train-loads/train-loads-by-line, access 27 August 2019

3.7.2. Bus Services

Bus route 507 operates near the campus with the nearest stop located at Meadowbank Railway Station. Bus routes 520, 524, 534 and M52 operate along Victoria Road. The surrounding bus network services are detailed in Table 3.6 and shown indicatively in Figure 3.13.

Table 3.6: Bus service frequency[1]

Bus route number	Description	AM/ PM peak frequency	Off-peak frequency
507	Macquarie University to City Circular Quay via Putney	30 minutes/ 20 minutes	60 minutes
513	Carlingford to Meadowbank Wharf via West Ryde	30 minutes/ 60 minutes	60 minutes
520	Parramatta to City Circular Quay via West Ryde	30 minutes/ 60 minutes	Infrequent
524	Ryde to Parramatta via West Ryde	30 minutes/ 30 minutes	60 minutes
M52	Parramatta to City Circular Quay (limited stops)	12 minutes/ 10 minutes	15 minutes

Note:
1. Valid from 28 July 2019, sourced from https://transportnsw.info/routes/bus, accessed 26 August 2019

Figure 3.13: Surrounding bus network

Base image source: https://transportnsw.info/document/4247/state_transit_north_shore_and_west_network_map.pdf, dated 26 August 2019

3.8. Pedestrian Infrastructure

Pedestrian footpaths are generally provided along all the roads surrounding the campus. Footpaths are generally concrete paths with a width of 1.2 metres. The primary pedestrian link to Meadowbank Station is along See Street and Constitution Road or through the Meadowbank campus. There is no requirement for pedestrians to cross roads along this route to access the station.

Pedestrian footpaths are also provided on both sides of Forsyth Street, Bowden Street and Macpherson Street (between these two streets), providing safe connection to the bus stops on Victoria Avenue.

Safe crossing points are provided on the north-eastern, south-eastern and south-western legs of the Victoria Road/ Bowden Street intersection.

3.9. Cyclist Infrastructure

There are limited cyclist facilities located within the transport network surrounding the campus.

3.10. Crash Analysis

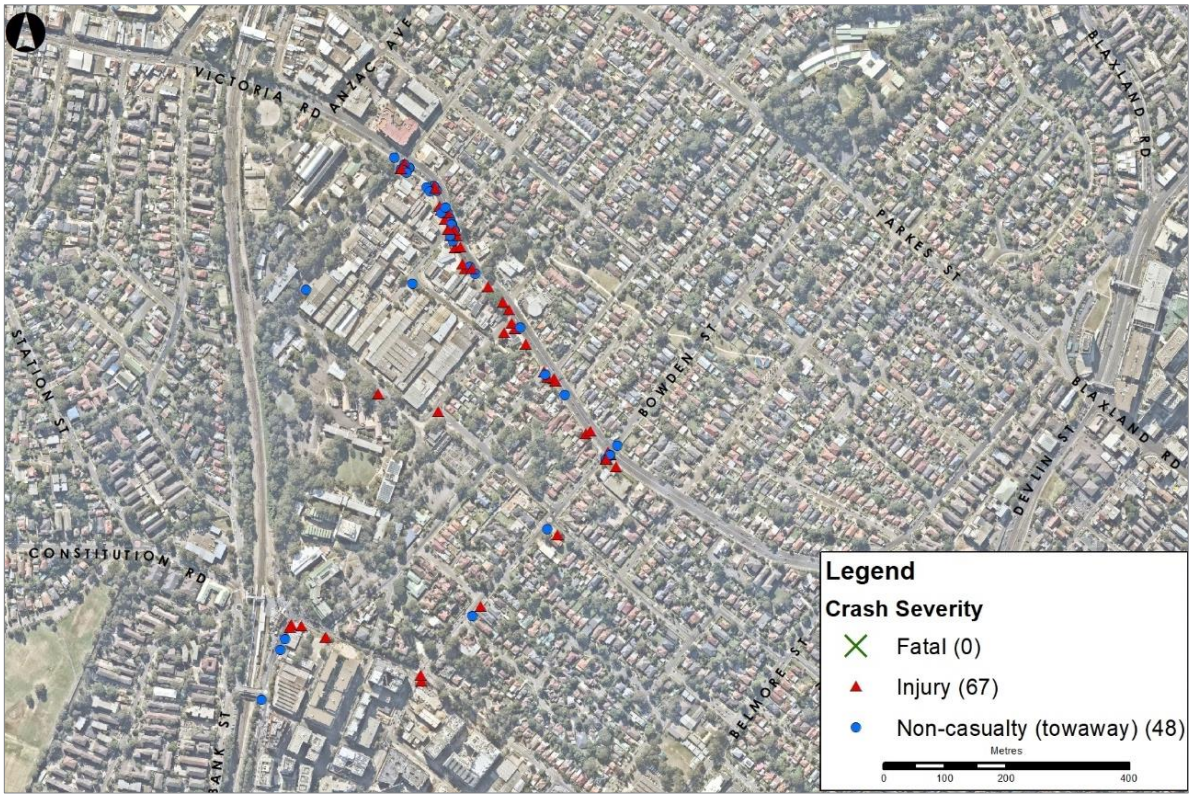
Historical crash data for the road network surrounding the campus was sourced for the periods from 1 January 2012 to 31 December 2016 and from 1 January 2017 to 28 June 2018 (provisional data for this period only). During this period 115 crashes occurred, including:

- 21 crashes resulting in serious injury
- 23 crashes resulting in moderate injury
- 21 crashes resulting in minor injury
- 2 crashes resulting in uncategorised injury
- 48 non-casualty crashes.

Of the 115 crashes that occurred, 95 crashes (82.6 per cent) occurred on Victoria Road. One crash involving a pedestrian occurred on Mellor Street, ten metres north of Macpherson Street. This crash involved a vehicle reversing out of a driveway and hitting a pedestrian, resulting in moderate injury.

Figure 3.14 illustrates the locations of the crashes that occurred between 1 January 2012 and 28 June 2018.

Figure 3.14: Historical crashes, 1 January 2012 to 28 June 2018



3.11. Existing Travel Patterns

Mode share surveys were completed at Meadowbank TAFE in October and November 2018 to understand how the existing staff and students travel to the campus. The survey results are summarised in Table 3.7.

Table 3.7: Existing Meadowbank TAFE mode share

Mode	Staff mode share (per cent)	Student mode share (per cent)
Car	74	42
Kiss-and-ride	0	3
Bus	1	4
Train	19	41
Ferry	0	1
Motorcycle	2	1
Cycle	1	0
Walk	3	8
Total	**100**	**100**

The mode share survey indicates private vehicles are the most common mode of transport to Meadowbank TAFE for both staff and students, followed by train. Vehicle occupancy surveys also completed at the campus indicate that average vehicle occupancy for staff and visitors parking on-site was around 1.05 people per vehicle.

4. DEVELOPMENT PROPOSAL

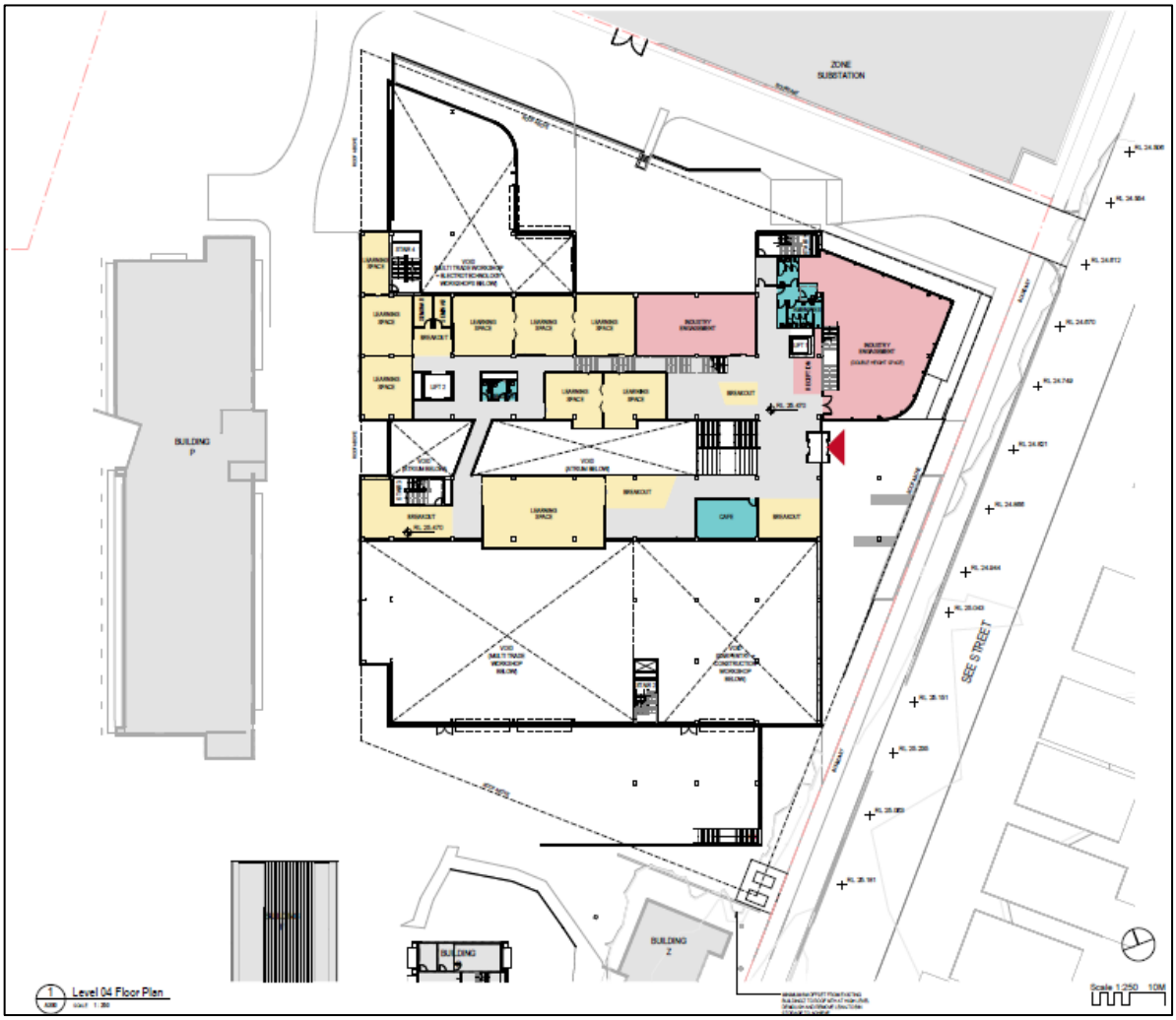
04

4.1. Land Uses

As previously outlined, the proposal is for a new six storey multi-trades and digital technology hub in the north-eastern corner of the Meadowbank TAFE campus. The building will include workshops, workspace and leading spaces, as well as a two-level car park.

The site plan for the See Street level is shown in Figure 4.1.

Figure 4.1: Level 4 site plan



Source: Gray Puksand, Project Number 219067, Drawing DA15 dated 09 September 2019

4.2. Vehicle Access

Vehicle access to the multi-trades building is proposed via See Street, with a new east-west internal laneway/ easement to run along the northern boundary of the site between the multi-trades and digital technology hub and the existing substation. Access to the two-level car park will be provided from the new internal laneway to the upper car park level. A loading dock will also be located along the internal laneway, east of the car park access.

Although the internal laneway is proposed to connect with Rhodes Street at its western end, bollards will be installed to the west of the car park access along the road to ensure all vehicles enter and exit via See Street.

Maintaining the through connection to Rhodes Street, however restricting regular access via bollards, will ensure greater flexibility for infrequent deliveries or maintenance activities by vehicles larger than 12.5 metre heavy rigid vehicles that are not able to use the proposed loading dock. Such activities would be completed outside peak times.

4.3. Car Parking

The proposal will provide a total of approximately 200 car parking spaces over two levels including four accessible spaces.

4.4. Pick-Up and Set-Down

A pick-up and set-down zone is proposed along the western side of See Street along the frontage of the site. The zone would extend from the existing 1/4P parking restriction on See Street (associated with the TAFE childcare pick-up and set-down area) to 10 metres south of the new internal laneway.

4.5. Pedestrian Facilities

Pedestrian access to the multi-trades and digital technology hub is proposed via See Street on the eastern side of the site, as well as along the western side of the building from the walkway between Block P and the new building.

4.6. Loading Facilities

A single off-street loading dock is proposed off the new internal laneway, with access provided on Level 3. The loading dock is designed to accommodate service vehicles up to 12.5 metre heavy rigid vehicles. The loading dock includes a turntable to allow service vehicles to enter and exit the building in a forward direction.

5. PARKING ASSESSMENT

05

5.1. Car Parking

5.1.1. Parking Requirements

Car parking guidance for different development types is set out in City of Ryde Development Control Plan 2014 (DCP 2014). Parking provision is based on staff and student numbers.

As mentioned in Section 3.3, there are currently 595 staff and 13,559 students enrolled at Meadowbank TAFE. Attendance surveys at the access points to campus indicate that the peak number of people on site at any one time is around 1,600 people. It is estimated that this includes approximately 300 staff and 1,300 students. Given there are no changes proposed to existing campus operations and Meadowbank TAFE is currently operating satisfactorily, it is not considered necessary to assess the existing on-site parking supply against the DCP.

By 2032, it is expected that enrolments will increase to approximately 16,603 students, an increase of around 25 per cent. Adopting this percentage increase to the daily peak number of people on-site suggests that there will be an increase of approximately 410 people on-site at any one time in 2032. This is estimated to include 75 staff and 330 students using the existing staff to student ratio. It should be noted that the growth in student enrolments and the corresponding staffing requirements is across all course offerings and not just trades-related courses. As such, existing parking usage (with an appropriate mode shift towards sustainable transport) is an appropriate basis for projecting future parking requirements.

Based on the above, the DCP 2014 car parking guidance for the proposal is summarised in Table 5.1.

Table 5.1: Ryde DCP 2014 car parking guidance

Use	Description	Size	Car parking rate	Car parking requirement
Educational Establishment – other than schools	Staff	75 staff	1 space/ two employees	38 spaces
	Students	330 students	1 space/ five students	66 spaces
Total				**104 spaces**

Based on the above, the proposal is required to provide an additional 104 car parking spaces by 2032.

5.1.2. Adequacy of Car Parking Supply

The new multi-trades and digital technology hub building will be located in the existing main car park area, requiring the removal of 212 parking spaces. The new building will include approximately 200 parking spaces, while an additional 100 spaces have recently become available on the western side of the campus following completion of existing construction works for a separate component of the Meadowbank TAFE redevelopment. This will result in a net increase of 88 spaces and therefore results in a minor shortfall of 16 spaces against the Ryde DCP 2014 guidance. This minor shortfall is within the day-to-day variation in parking demand and tolerance of future staff and student estimates. The proposed parking supply is therefore considered acceptable, noting that travel planning and management initiatives are also proposed to reduce future parking demand.

5.1.3. Car Parking Layout Review

The car park layout has been reviewed against the requirements of the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009). This assessment included a review of the following:

- bay and aisle width
- adjacent structures
- turnaround facilities

- circulation roads and ramps
- ramp grades
- parking for persons with disabilities.

This review indicates that the proposed car parking layout is expected to operate satisfactorily, subject to the adoption of recommendations discussed below.

A summary of the key elements of the proposed car park which are in line with the above-mentioned Australian Standards include:

- 2.6 metre x 5.4 metre regular car parking spaces
- 2.6 metre x 5.4 metre accessible car parking spaces with adjacent shared area of the same dimensions
- Minimum 5.8-metre-wide aisle width
- Turning bays are provided where bling aisles exceed six vehicles
- A minimum 1 metre extension is provided at the end of blind aisles
- An additional 300 millimetres clearance is provided when parking spaces and aisles are adjacent to high structures.

5.2. Disabled Parking

The Building Code of Australia (BCA) requirements have been referenced to determine the necessary disabled car parking.

The BCA specifically outlines requirements for the provision of car parking for people with disabilities for schools. The layout of disabled car parking spaces must also comply with AS2890.6:2009.

The BCA requires that disabled spaces be provided at a rate of one space for every 100 car parking spaces or part thereof. Based on the proposed parking provision of 200 spaces, at least two disabled spaces are required. This is met with the provision of four accessible spaces on Level 2.

5.3. Bicycle Parking

Bicycle parking guidance for different development types is also set out in DCP 2014. Bicycle parking for new buildings which exceed 600 square metres gross floor area is required to be provided at a rate equivalent to 10 per cent of the required car parking spaces of part thereof.

Considering the car parking provision of 104 spaces as calculated in Section 5.1, DCP 2014 would require 11 bicycle parking spaces to be provided. The proposed bicycle parking is consistent with the DCP guidance, with 11 spaces provided within a storage room on basement level 2.

6. LOADING FACILITIES

06

6.1. Proposed Loading and Waste Collection Arrangements

All garbage collection and loading activities related to deliveries, courier activity and maintenance vehicles would be carried out within the proposed loading dock on-site. It is noted that the loading areas would be generally used outside of the TAFE arrival and departure peak times. The loading area is proposed for use by service vehicles up to 12.5-metre heavy rigid vehicles. The loading dock would be fitted out with a turntable to allow vehicles to enter and exit the building in a forward direction.

The loading dock will accommodate loading and servicing associated with the multi-trades and digital technology hub, which currently takes place in another area on campus which is accessed via the existing southern driveway on See Street. Such activities include the delivery of materials associated with workshops, waste collection and general maintenance vehicles.

It is expected that there would be no more than four larger service vehicle movements per day. Given the expected infrequent use of the loading area, one loading bay is considered acceptable for the proposed schools (MEESP).

6.2. Vehicle Swept Path Analysis

Preliminary swept path analysis has been carried out for a 12.5-metre HRV. This analysis indicates that HRVs can enter and exit the multi-trades building in a forward direction. It is recommended that a loading dock management plan be implemented to manage ensure HRVs accessing the building should be restricted to outside of peak arrival and departure periods, due to potential conflicts with car parking and surrounding pedestrian activity associated with the TAFE and proposed schools (MEESP).

7. ANTICIPATED TRIPS

07

7.1. Trip Generation

In estimating the future trip generation, the current trip rate (students vs number of vehicles generated) was used. The following points were considered:

- Existing TAFE operation:
  - The Meadowbank campus currently has approximately 13,559 enrolments and 595 staff.
  - Surveys indicate the peak number of people on site at one time is around 1,600 people, including 300 staff and 1,300 students.
  - The AM site peak hour (8:30am to 9:30am) resulted in approximately 1,137 people movements per hour, while the PM site peak hour (2:15pm to 3:15pm) resulted in 809 people movements per hour.
  - Approximately 904 people movements per hour occurred in the Meadowbank Education Precinct AM peak hour (8:00am to 9:00am), while 805 people movements occurred in the Meadowbank Education Precinct PM peak hour (2:30pm to 3:30pm).
- Future TAFE operation:
  - It is anticipated that Meadowbank TAFE will accommodate 15,366 enrolments by 2022 and 16,603 enrolments by 2032.
  - Based on the enrolment growth rate, it is expected that the maximum number of people on site will increase to 1,858 (increase of 258 people from existing) and 2,008 people (increase of 408 people from existing) in 2022 and 2032 respectively.
  - Based on the enrolment growth rate, it is expected that the number of people trips will increase to 1,050 trips (increase of 146 trips from existing) in 2022 and 1,134 trips (increase of 230 trips from existing) in 2032 in the Meadowbank Education Precinct AM peak hour.
  - Based on the enrolment growth rate, it is expected that the number of people trips will increase to 1034 trips (increase of 130 trips from existing) in 2022 and 1,109 trips (increase of 205 trips from existing) in 2032 in the Meadowbank Education Precinct PM peak hour.

Considering the above, Table 7.1 sets out the anticipated mode share of the additional 258 people and 408 people on-site at any one time in 2022 and 2032 respectively, while Table 7.2 and Table 7.3 sets out the anticipated increase on people trips for staff and students respectively and Table 7.4 sets out the anticipated increase in private vehicle trips.

This conservatively assumes the same mode share as captured in the 2018 surveys which was completed before the divestment of land to School Infrastructure NSW. Since the available parking supply on-site has decreased from when these travel surveys were completed, it is likely there would have been a mode shift away from private vehicle travel to more sustainable modes.

Table 7.1: Number of new staff and students by mode

Mode	Staff mode share (per cent)	Student mode share (per cent)	2022		2032	
			Staff	Students	Staff	Students
Car	74	42	37	88	56	139
Dropped off	0	3	0	6	0	10
Bus	1	4	1	8	1	13
Train	19	41	10	86	14	135
Ferry	0	1	0	2	0	3
Motorcycle	2	1	1	2	2	3
Cycle	1	0	1	0	1	0
Walk	3	8	2	17	2	26
		Total	**52**	**209**	**76**	**329**

Table 7.2: Peak hour and daily person trips (staff)

Mode	Mode share (per cent)	2022			2032		
		AM peak hour trips	PM peak hour trips	Daily trips	AM peak hour trips	PM peak hour trips	Daily trips
Car (as driver) [1]	74	16	15	70	27	24	107
Car (as passenger) [1]	-	1	1	4	1	1	5
Dropped off	0	0	0	0	0	0	0
Bus	1	0	0	2	0	0	2
Train	19	4	4	20	7	6	28
Ferry	0	0	0	0	0	0	0
Motorcycle	2	0	0	2	1	1	4
Cycle	1	0	0	2	0	0	2
Walk	3	1	1	4	1	1	4
Total		**22**	**21**	**104**	**37**	**33**	**152**

[1] Assumes 1.05 people per vehicle

Table 7.3: Peak hour and daily person trips (students)

Mode	Mode share (per cent)	2022			2032		
		AM peak hour trips	PM peak hour trips	Daily trips	AM peak hour trips	PM peak hour trips	Daily trips
Car (as driver) [2]	42	39	34	168	66	59	265
Car (as passenger) [2]	-	2	2	8	3	3	13
Dropped off	3	3	3	12	5	4	20
Bus	4	4	3	16	7	6	26
Train	41	40	35	172	68	60	270
Ferry	1	1	1	4	2	1	6
Motorcycle	1	1	1	4	2	1	6
Cycle	0	0	0	0	0	0	0
Walk	8	8	7	34	13	12	52
Total		**98**	**86**	**418**	**166**	**146**	**658**

[2] Assumes 1.05 people per vehicle

Table 7.4: Car based trips

User	2022			2032		
	AM peak hour	PM peak hour	Daily trips	AM peak hour	PM peak hour	Daily trips
Staff	16	15	70	27	24	107
Student	45	40	192	76	67	305
Total	**61**	**55**	**262**	**103**	**91**	**412**

Note: Drop offs equate to two trips (inbound and outbound)

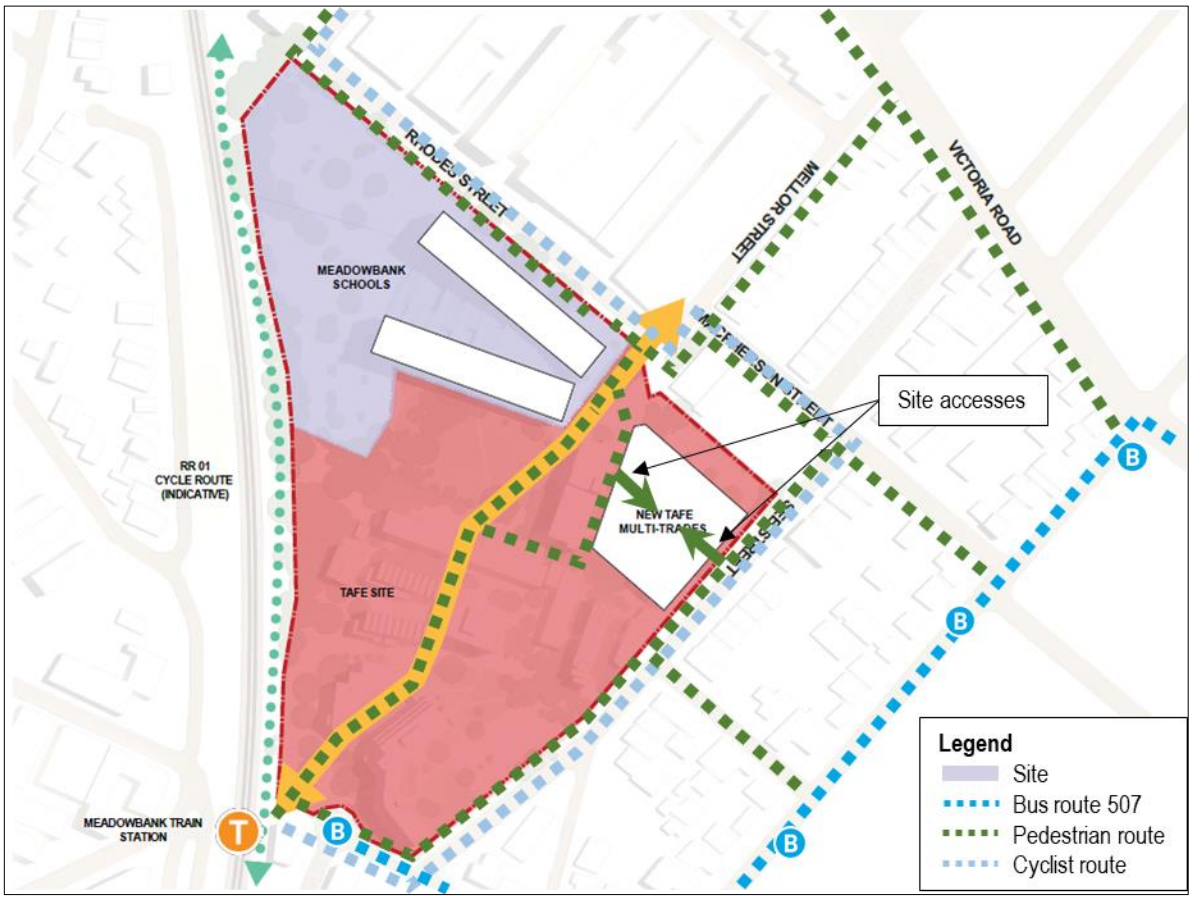
8. PUBLIC AND ACTIVE TRANSPORT ASSESSMENT

08

8.1. Pedestrian Access

The new multi-trades and digital technology hub building will have accesses from See Street as well as along on its western side from an internal pathway. Figure 8.1 illustrates the key pedestrian routes, noting that the existing north-south pedestrian through site access will be improved by minor upgrade works (subject to a separate approval process) as highlighted in orange.

Figure 8.1: Key pedestrian access routes



Source: Woods Bagot

Based on the mode shares detailed in Section 7, the number of estimated additional student walking trips in 2032 as a result of the proposal is summarised in Table 8.1. This assumes 50 per cent of walking trips go to/ from the north of the campus and 50 per cent of walk only trips go to/ from the south.

Table 8.1: Peak additional pedestrian (students) movements by direction

Peak pedestrian volume	to/ from north of campus		to/ from south of campus	
	AM	PM	AM	PM
Walk only	7	6	7	6
Train and walk	0	0	68	60
Bus and walk	7	6	0	0
Total	**14**	**12**	**75**	**66**

As shown above, it is expected that the majority of pedestrian trips will come from/ go to the south, with around 75 additional pedestrians expected in the peak hour, or around one additional pedestrian a minute. This is considered minimal and could be accommodated with the existing infrastructure. Notwithstanding, the proposed improvements to the existing through site access will assist with alleviating pedestrian movements along See Street which currently only contains an approximately 1.2 metre wide footpath.

8.2. Cyclist Access

Based on the analysis in Section 7, it is not expected that the proposal will result in an increase in cycling trips due to only a limited number of staff and students at the Meadowbank campus currently cycling to work.

Similar to the MEESP however, it is recommended that the Department of Education and TAFE continue to work with City of Ryde Council and Transport for NSW to deliver the following to encourage a mode shift towards cycling:

- A continuation of the existing Hermitage Road shared path from the Sydney Water driveway to the Rhodes Street site access.
- Regional Route 01 along the rail corridor, as documented in the local bike plan.
- Local Route 14 along Parkes Street (north of Victoria Road), as documented in the local bike plan.

8.3. Public Transport Access

Meadowbank Railway Station will provide a key transport mode to support the proposed schools (MEESP). Under existing conditions, the rail services operating through this station are over capacity, particularly during the morning peak period. The NSW Government's More Trains, More Services program is targeting capacity increases and upgrades to improve peak hour crowding on rail services. The NSW Government will explore further investments in north-south transport links near Greater Parramatta to improve access and support the creation and renewal of local centres, including a potential mass transit/ train link from Macquarie Park to Hurstville via Rhodes.

Based on the analysis in Section 7, it is anticipated that an additional 68 and 60 people will catch the train in the AM and PM peak hours respectively in 2032, while around seven additional people will catch the bus to the TAFE. This number of trips is considered minimal and could not be expected to compromise the existing bus or train networks.

Improvements to the capacity and reliability of the T1 Northern Line will be critical for encouraging and facilitating public transport use for the proposed schools, noting that the Sydney Metro CBD and Southwest currently under construction is expected to relieve some pressures on the T1 Northern Line.

As noted in Section 3.7.2, high-frequency bus services, including the M52, operate along Victoria Road. It is understood that there is sufficient capacity on these existing services to accommodate the increase in travel demand. Available bus stops are generally within a five-minute walk of the campus, with existing footpaths provided along Mellor Street.

9. TRAFFIC IMPACT ASSESSMENT

09

9.1. Modelling Approach

This section provides details of the traffic modelling approach used to assess the impacts of the proposal on the existing network.

9.1.1. Modelling Methodology

SIDRA Intersections 8 was used to model the intersections surrounding the campus, with isolated intersection models used to assess the operation of the following intersections:

- Railway Road/ Bay Drive/ Bank Street (roundabout)
- Church Street/ Morrison Road (signalised)
- Belmore Street/ Constitution Road. (signalised).

9.1.2. Modelling Scenarios

It is noted that 2022 and 2032 are typical future modelling years for which background traffic forecasts are available. As such, the anticipated additional TAFE traffic in the opening year for the proposed multi-trades and digital technology hub building (2022) and the 10-year planning horizon of 2032 have been added to 2022 and 2032 background traffic forecasts (to avoid minor interpolations).

To ensure the most efficient use of public infrastructure, the GSC is coordinating the planning of education, infrastructure and employment projects in the Meadowbank Education and Employment Precinct. As part of this, the MEESP is expected to be delivered concurrently and therefore operational at 2 Rhodes Street (north of the campus) by early 2022, and the traffic generation arising from that development has been included in the relevant models for a cumulative assessment. A summary of the estimated car trips for the new schools is provided in Table 9.1.

Table 9.1: Schools anticipated trip generation

Year	Peak Hour	Staff		Secondary Students		Primary Students	
		Occupancy	Car Trips	Occupancy	Car Trips	Occupancy	Car Trips
2022	AM	1.0	28	1.7	169	2.0	24
	PM	1.0	10	1.7	101	2.0	120
2032	AM	1.0	41	1.7	293	2.0	116
	PM	1.0	15	1.7	164	2.0	187

Three scenarios are modelled, as outlined below:

- **Base** – existing conditions as explored in Section 3.3
- **Future Base** – future (2022, 2032) conditions with background growth
- **Future with Development** – future (2022,2032) conditions with background growth, schools and TAFE redevelopment traffic.

A comparison between the **Future Base** and **Future with Development** scenarios will provide the potential impacts of the proposal.

9.1.3. Base

This scenario models the existing conditions. The modelled network layout and layout of the three (3) individual intersections are presented in Figure 9.1 to Figure 9.4.

Figure 9.1: Existing intersections layout- SIDRA Network

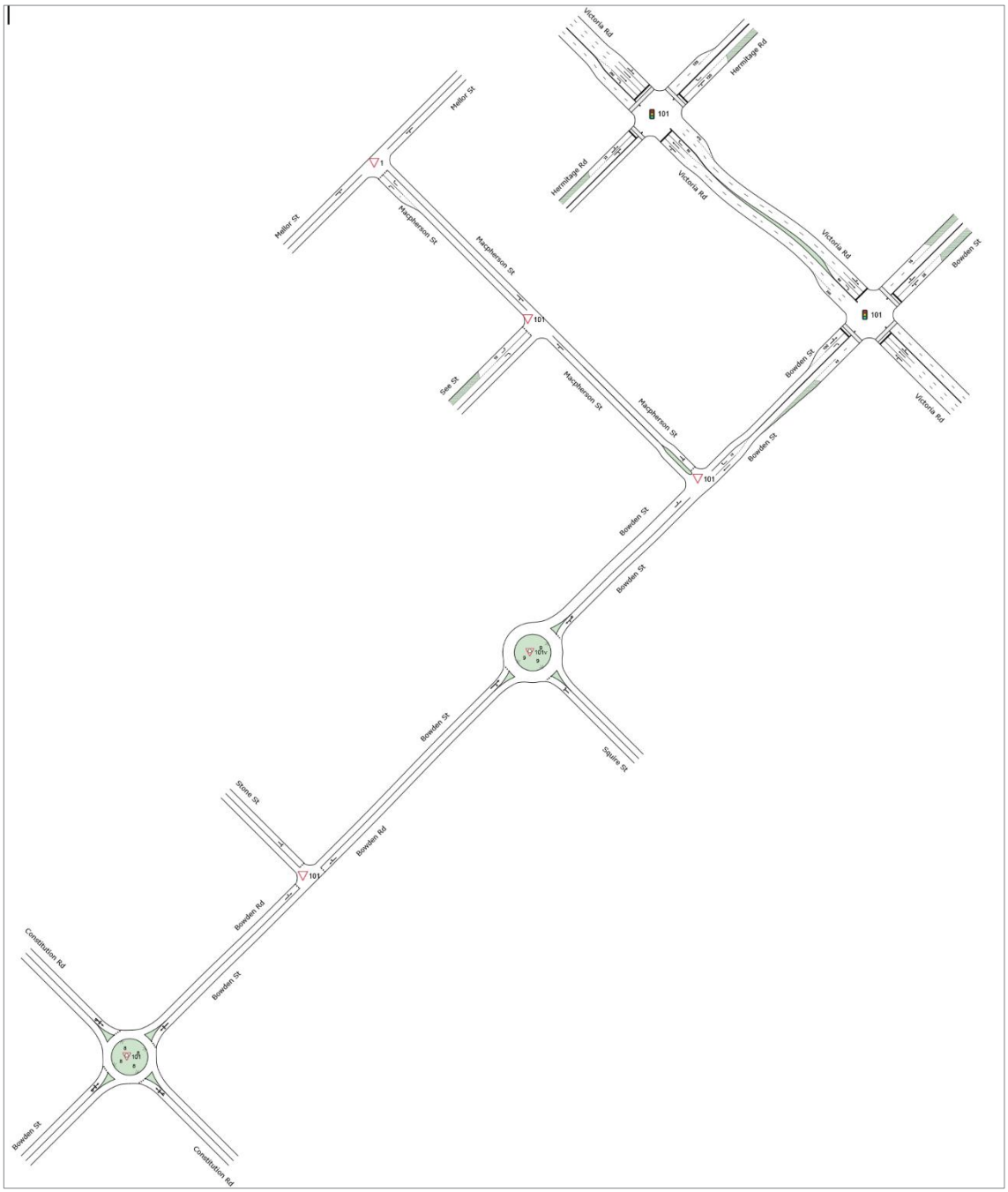


Figure 9.2: Existing intersections layout at Railway Road/ Bay Drive/ Bank Street

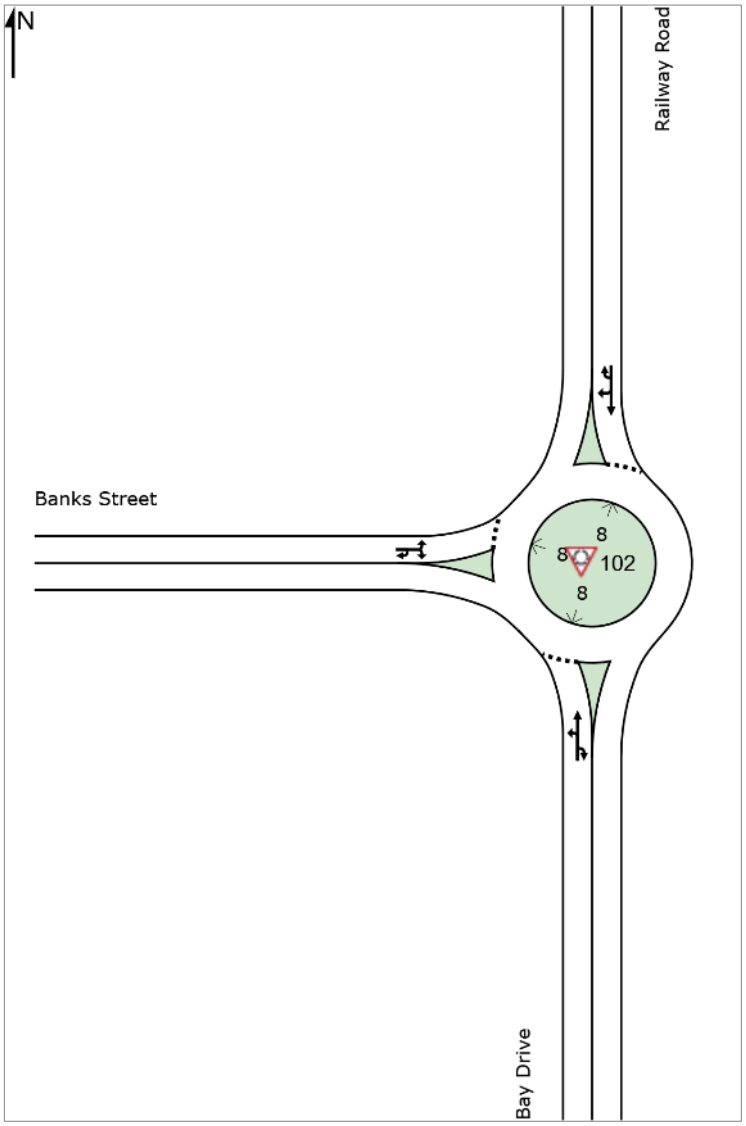


Figure 9.3: Existing intersection layout at Belmore Street/ Constitution Road

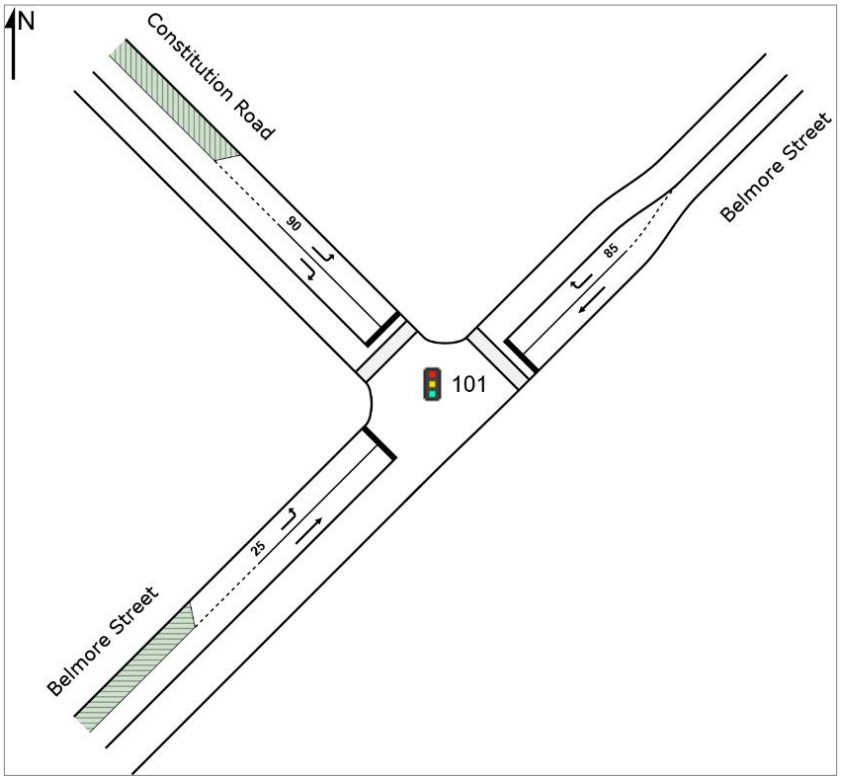
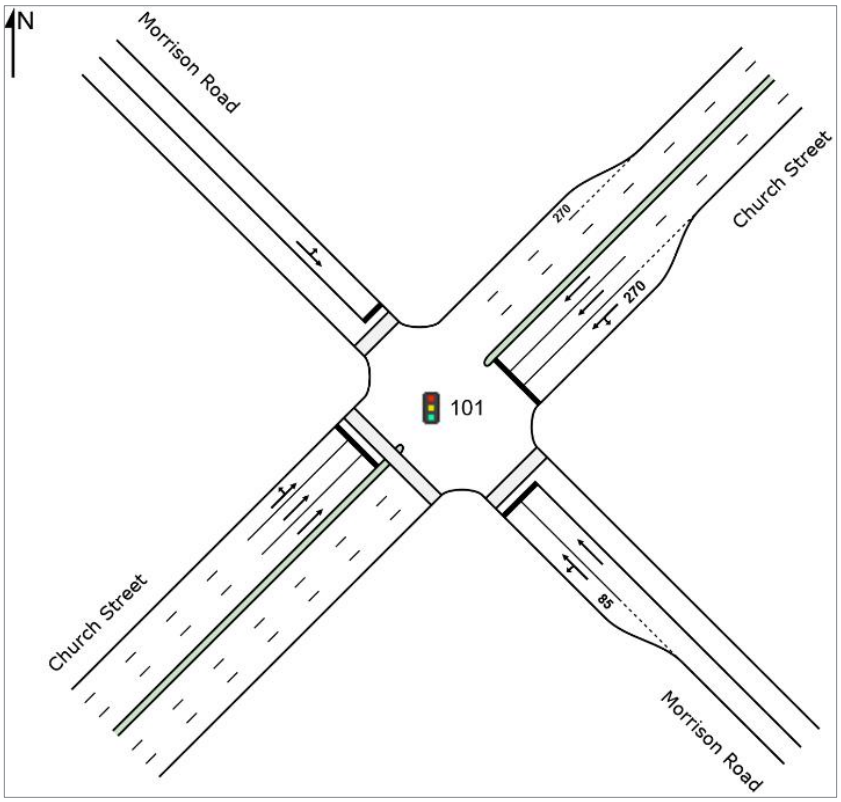


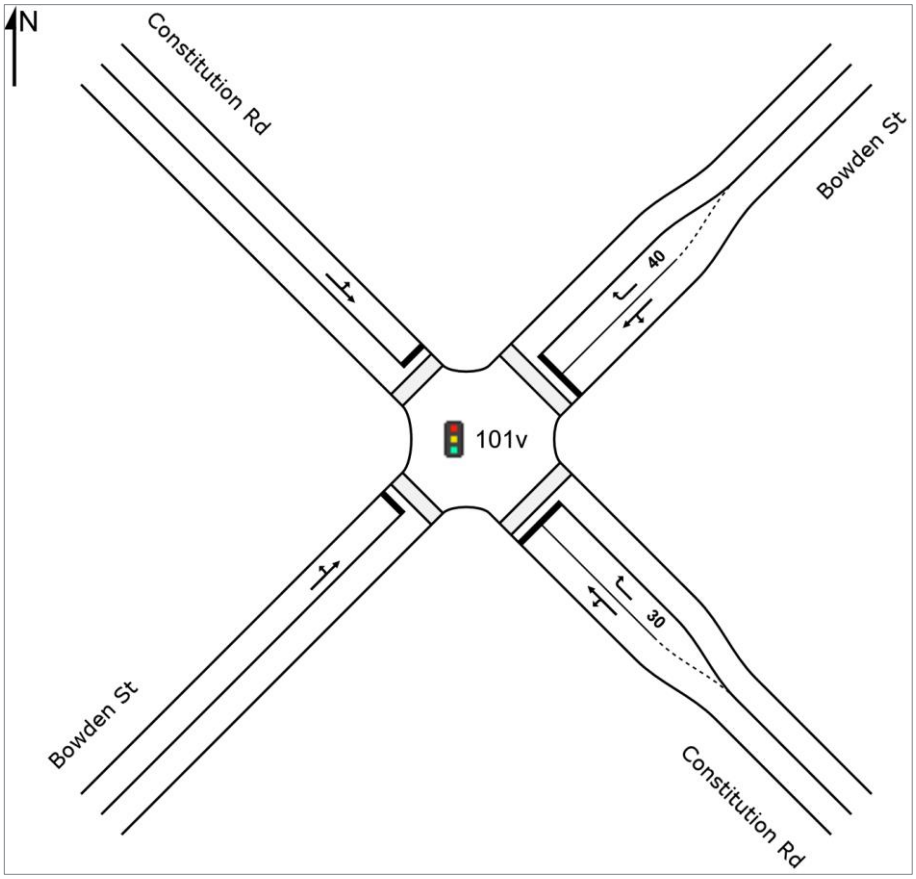
Figure 9.4: Existing intersection layout at Church Street/ Morrison Road



9.1.4. Future Base

This scenario models the 2022 and 2032 traffic conditions with background growth only. The layout at each intersection is assumed to be the same as existing layouts except at Constitution Road/ Bowden Street. This priority intersection is proposed to be upgraded to a signalised intersection (by others) as part of the Shepherds Bay development (confirmed by City of Ryde Council as being a consent condition). The proposed signalised layout at this intersection is presented in Figure 9.5.

Figure 9.5: Proposed intersection layout at Constitution Road/ Bowden Street



9.1.5. Future with Development

This scenario models the 2022 and 2032 traffic conditions including background growth and the additional traffic generated by both schools and the proposed multi-trade and digital technology hub at TAFE. The layout of all intersections are unchanged from the Future Base scenario as per Section 9.1.3.

9.1.6. Modelling Assumptions

In addition to the trip generation and mode share assumptions outlined in Section 7, the following assumptions have been made for the impact assessment:

- The traffic surveys used are for two different years and have been used as such. No adjustments have been made to the traffic.
- Bowden Street and Hermitage Road are the two key access points to/from Victoria Road due to these intersections being the closest signalised intersections to the campus allowing for all movements to/ from Victoria Road. Therefore, the majority of the traffic would arrive and depart via these two roads.

In reality, some vehicles would use alternative roads such as Mellor Street, Falconer Street and Belmore Street. The approach taken is robust yet conservative and provides a good indication of the impacts on the existing infrastructure.

- Future years 2022 (opening year) and 2032 (10 years after school opening) has been assessed. The background growth for year both future years have been extracted from the STFM (Strategic Traffic Forecasting Model), maintained and developed by Roads and Maritime.
- It is understood that Shepherds Bay development[2] has been approved and will directly impact the study area. It is assumed that this development and any other such developments in the vicinity of the study area have been included in the STFM models. Therefore, background growth from the STFM model should include all approved projects in the study area.
- Only peak hour assessment has been carried out in SIDRA, with AM peak hour being 8am to 9am and PM peak hour being 2:30pm to 3:30pm. These correspond to the expected peak hours of schools and TAFE campus.
- It is assumed that in the AM peak hour all traffic (100%) is inbound only as students are not expected to leave within the hour of arrival. For the PM peak hour 20% is assumed to be inbound and 80% outbound. This is based on the survey data.

9.1.7. Model Limitations

It should be noted that, like any other modelling tool, SIDRA has certain limitations, especially in a network environment where care needs to be given to coordination of signals, phase times, offsets and the actual traffic volume. For highly congested networks operating over capacity (such as Victoria Road), delays can increase at an exponential level with a minor increase in traffic. As such, the results produced by the SIDRA assessment should only be used for relative comparison purposes which is encompassed in the scope of this study. Fit for study purpose models were developed by calibrating the models to existing conditions. This is discussed in detail in Section 3.5.1.and calibration details are provided in Appendix A

9.2. Traffic Generation

The anticipated traffic generation of the proposed multi trade hub has been derived based on the future mode shares and trip generation assumptions as discussed in Section 7.

The peak hour traffic generation has been calculated and summarised in Table 9.2 and used for the SIDRA assessment.

Table 9.2: Peak hour additional traffic generation

User	2022			2032		
	AM peak hour	PM peak hour	Daily trips	AM peak hour	PM peak hour	Daily trips
Staff	16	15	70	27	24	107
Student	45	40	192	76	67	305
Total	**61**	**55**	**262**	**103**	**91**	**412**

Note: Drop offs equate to two trips (inbound and outbound)

[2] https://majorprojects.accelo.com/public/093d6af2dcbbf94152db9c0007aab829/MP09_0216%20MOD3_%20Shepherds%20Bay%20IPC%20Statement%20of%20Reasons%20for%20Decision.pdf

9.3. Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposal will be influenced by a number of factors, including the:

1. configuration of the arterial road network in the immediate vicinity of the campus
2. existing operation of intersections providing access between the local and arterial road network
3. the staff and student catchment areas
4. likely distribution of staff and student home/ work locations in relation to the campus
5. configuration of access points to the campus.

Based on the above, Figure 9.6 and Figure 9.7 have been prepared to show the estimated increase in turning movements near the campus once during peak hours when full student and staff population is achieved (i.e. 2032).

Figure 9.6: AM peak hour site generated traffic volumes -2032

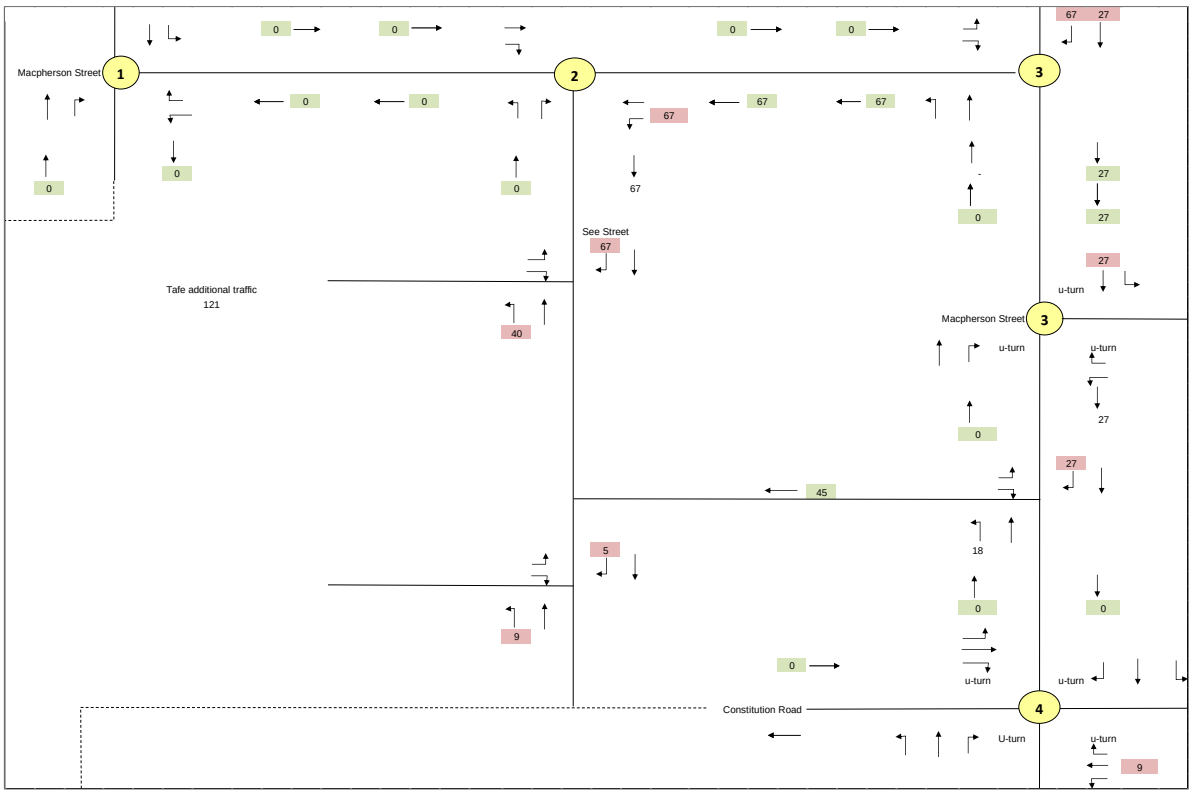
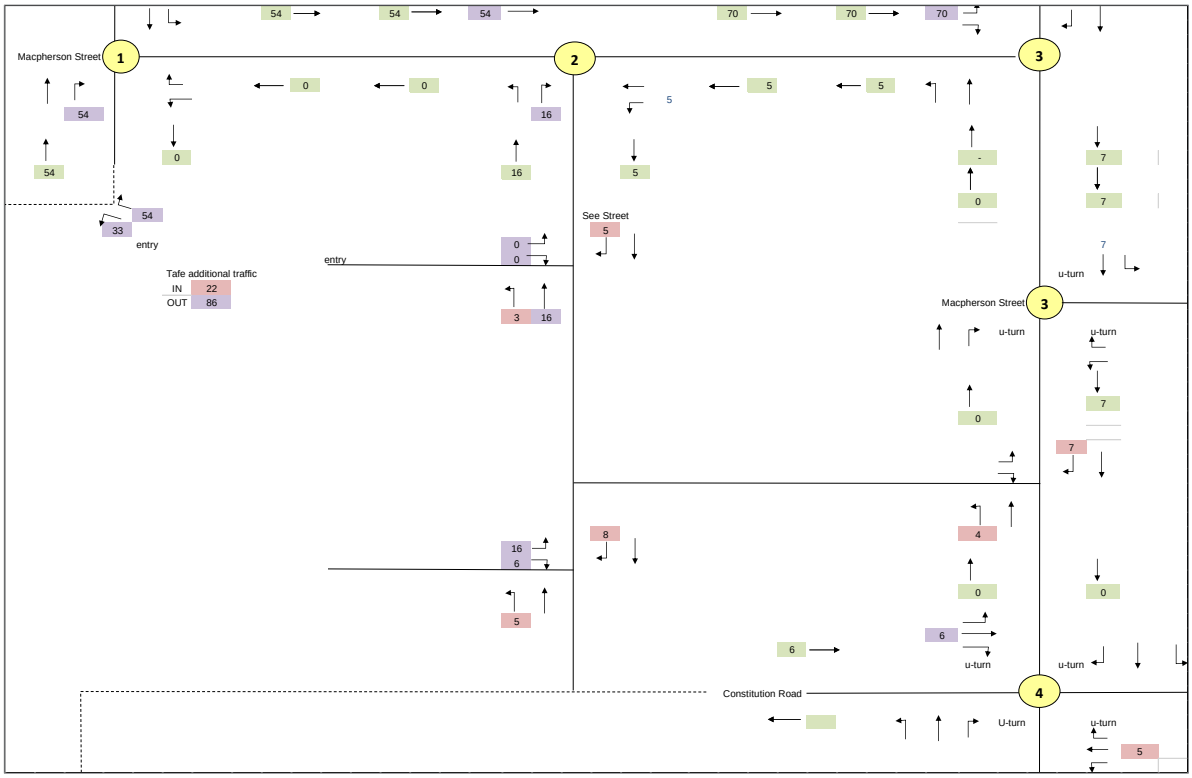


Figure 9.7: PM peak hour site generated traffic volumes – 2032



9.4. Traffic Impact

Based on the traffic generation and distribution estimates, all intersections were modelled in SIDRA. It should be noted that signal timings for all scenario were specified as *"user given"*. These users given phase times were calculated from the SCATS phasing information. It is our understanding that all signalised intersections along Victoria Road are part of a sub system that is optimised by SCATS to get the optimal network performance. As the scope of the study area does not include external networks which may influence the optimal signal timing, it was deemed fit to utilise the average SCATS timings rather than let SIDRA optimise the signal timings. This approach provides consistency in comparison of results.

The SIDRA modelling results for the Future Base (with schools Traffic) scenario, i.e. including background growth including additional traffic generated by the schools, is provided in Table 9.3 to Table 9.6.

Table 9.3: Intersection performance for Future Base scenario – 2022 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	1	A
Macpherson Street/ See Street	Priority	0.05	5	1	A
Macpherson Street/ Bowden Street	Priority	0.26	15	2	B
Bowden Street/ Squire Street	Roundabout	014	9	2	A
Constitution Road/ Bowden Street	Signals	0.79	23	105	B
Victoria Road/ Bowden Street	Signals	1.27	48	379	D
Victoria Road/ Hermitage Road	Signals	1.21	51	490	D
Bowden Street/Stone Street	Priority	0.22	51	7	D
Constitution Road/ Belmore Street	Signals	0.76	18	63	B
Church Street/ Morrison Road	Signals	1.12	21	164	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.11	11	2	A

Table 9.4: Intersection performance for Future Base scenario – 2022 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	1	A
Macpherson Street/ See Street	Priority	0.03	6	1	A
Macpherson Street/ Bowden Street	Priority	0.27	12	2	A
Bowden Street/ Squire Street	Roundabout	0.13	10	0.3	A
Constitution Road/ Bowden Street	Signals	0.82	24	55	B
Victoria Road/ Bowden Street	Signals	0.83	23	231	B
Victoria Road/ Hermitage Road	Signals	1.34	46	467	D
Bowden Street/Stone Street	Priority	0.30	57	10	E
Constitution Road/ Belmore Street	Signals	0.90	29	66	C
Church Street/ Morrison Road	Signals	0.98	17	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.19	11.4	3	A

Table 9.5: Intersection performance for Future Base scenario – 2032 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	1	A
Macpherson Street/ See Street	Priority	0.05	5	1	A
Macpherson Street/ Bowden Street	Priority	0.31	19	2	B
Bowden Street/ Squire Street	Roundabout	0.92	11	15	A
Constitution Road/ Bowden Street	Signals	0.85	38	216	C
Victoria Road/ Bowden Street	Signals	1.45	71	376	E
Victoria Road/ Hermitage Road	Signals	1.50	74	548	F
Bowden Street/Stone Street	Priority	0.85	19	81	B
Constitution Road/ Belmore Street	Signals	1.24	26	215	B
Church Street/ Morrison Road	Signals	0.12	11	2	A
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.04	5	1	A

Table 9.6: Intersection performance for Future Base scenario – 2032 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	5	1	A
Macpherson Street/ See Street	Priority	0.03	6	1	A
Macpherson Street/ Bowden Street	Priority	0.27	13	2	A
Bowden Street/ Squire Street	Roundabout	0.14	10	2	A
Constitution Road/ Bowden Street	Signals	0.87	37	100	C
Victoria Road/ Bowden Street	Signals	0.99	36	335	C
Victoria Road/ Hermitage Road	Signals	2.17	98	550*	F
Bowden Street/ Stone Street	Priority	1.01	42	109	C
Constitution Road/ Belmore Street	Signals	1.08	20	153	B
Church Street/ Morrison Road	Signals	0.20	12	4	A
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.04	5	1	A

* Average back of queue calculation has been restricted to the available queue storage space

Based on the traffic generation and distribution estimates, the SIDRA modelling results for the Future with Development scenario, i.e. including background growth, the additional traffic generated by the schools and the TAFE campus, is provided in Table 9.7 to Table 9.9.

Table 9.7: Intersection performance for Future with Development scenario - 2022 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	6	1	A
Macpherson Street/ See Street	Priority	0.08	6	1	A
Macpherson Street/ Bowden Street	Priority	0.34	18	2	B
Bowden Street/ Squire Street	Roundabout	0.26	9	2	C
Constitution Road/ Bowden Street	Signals	0.83	24	106	B
Victoria Road/ Bowden Street	Signals	1.3	54	390	D
Victoria Road/ Hermitage Road	Signals	1.21	63	588	E
Bowden Street/Stone Street	Priority	0.25	41	8	C
Constitution Road/ Belmore Street	Signals	0.76	17	63	B
Church Street/ Morrison Road	Signals	1.12	21	164	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.11	11	2	A

Table 9.8: Intersection performance for Future with Development scenario - 2022 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	6	1	A
Macpherson Street/ See Street	Priority	0.05	6	1	A
Macpherson Street/ Bowden Street	Priority	0.40	14	4	A
Bowden Street/ Squire Street	Roundabout	0.22	8	1	A
Constitution Road/ Bowden Street	Signals	0.81	26	62	B
Victoria Road/ Bowden Street	Signals	1.02	27	253	B
Victoria Road/ Hermitage Road	Signals	1.14	45	499	D
Bowden Street/Stone Street	Priority	0.31	51	10	D
Constitution Road/ Belmore Street	Signals	0.76	17	63	B
Church Street/ Morrison Road	Signals	0.98	17	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.19	11	3	A

Table 9.9: Intersection performance for Future with Development scenario - 2032 AM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.04	6	1	A
Macpherson Street/ See Street	Priority	0.10	6	1	A
Macpherson Street/ Bowden Street	Priority	0.54	28	4	B
Bowden Street/ Squire Street	Roundabout	0.97	19	30	B
Constitution Road/ Bowden Street	Signals	0.99	47	227	D
Victoria Road/ Bowden Street	Signals	1.5	88	433	F
Victoria Road/ Hermitage Road	Signals	2.3	129	777	F

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Bowden Street/Stone Street	Priority	0.29	44	10	D
Constitution Road/ Belmore Street	Signals	0.85	19	81	B
Church Street/ Morrison Road	Signals	1.25	26	217	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.12	11	2	A

Table 9.10 Intersection performance for Future with Development scenario - 2032 PM

Intersection	Control	Degree of Saturation	Average delay (seconds)	Average queue (metres)	Level of Service
Macpherson Street/ Mellor Street	Priority	0.05	6	1	A
Macpherson Street/ See Street	Priority	0.16	6	2	A
Macpherson Street/ Bowden Street	Priority	0.59	20	7	B
Bowden Street/ Squire Street	Roundabout	0.14	10	2	A
Constitution Road/ Bowden Street	Signals	0.89	42	123	C
Victoria Road/ Bowden Street	Signals	1.12	38	312	C
Victoria Road/ Hermitage Road	Signals	1.7	100	550*	F
Bowden Street/Stone Street	Priority	0.36	61	14	E
Constitution Road/ Belmore Street	Signals	1.01	43	112	D
Church Street/ Morrison Road	Signals	1.09	21	153	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	0.21	12	4	A

* Average back of queue calculation has been restricted to the available queue storage space

A comparative summary of Level of service for all scenarios is presented in Table 9.11 and Table 9.12.

Table 9.11: Intersection performance Level of Service Summary - AM

Intersection	Control	Future Base	Future with Development	Future Base	Future with Development
		2022	2022	2032	2032
Macpherson Street/ Mellor Street	Priority	A	A	A	A
Macpherson Street/ See Street	Priority	A	A	A	A
Macpherson Street/ Bowden Street	Priority	A	B	B	B
Bowden Street/ Squire Street	Roundabout	A	A	A	B
Constitution Road/ Bowden Street	Signals	B	B	C	D
Victoria Road/ Bowden Street	Signals	D	D	E	F
Victoria Road/ Hermitage Road	Signals	D	E	F	F
Bowden Street/Stone Street	Priority	D	C	E	D
Constitution Road/ Belmore Street	Signals	B	B	B	B
Church Street/ Morrison Road	Signals	B	B	B	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	A	A	A	A

Table 9.12: Intersection performance Level of Service Summary - PM

Intersection	Control	Future Base	Future with Development	Future Base	Future with Development
		2022	2022	2032	2032
Macpherson Street/ Mellor Street	Priority	A	A	A	A
Macpherson Street/ See Street	Priority	A	A	A	A
Macpherson Street/ Bowden Street	Priority	A	A	A	B
Bowden Street/ Squire Street	Roundabout	A	A	A	A
Constitution Road/ Bowden Street	Signals	B	B	C	C
Victoria Road/ Bowden Street	Signals	B	B	C	C
Victoria Road/ Hermitage Road	Signals	D	D	F	F
Bowden Street/Stone Street	Priority	E	D	F	E
Constitution Road/ Belmore Street	Signals	B	B	C	D
Church Street/ Morrison Road	Signals	B	B	B	B
Banks Street/ Bay Drive/ Railway Road	Roundabout	A	A	A	A

From the results presented above the following can be observed:

- For the 2022 Future Base traffic conditions including background growth only in 2022:
  - all intersections are observed to perform at an acceptable level of service D or better, except for the Victoria Road and Hermitage Road intersection in the AM peak hour.
  - the phasing at Victoria Road and Hermitage Road is set as single diamond overlap with through movements at Hermitage Road running in one phase with filtered right turns. With the additional traffic, the right turn (southbound) into Victoria Road is observed to experience a high delay and queues.
  - a high degree of saturation (>1) is observed at Victoria Road and Bowden Street intersection for AM peak traffic conditions indicating that this intersection is operating at capacity.
- For the 2032 Future Base conditions, all intersections are observed to perform at an acceptable level of service D or better except for the following intersections:
  - Victoria Road and Hermitage Road.
  - Victoria Road and Bowden Street.
- With the additional schools and TAFE traffic, the key access intersections on Victoria Road at Hermitage Road and Bowden Street experience higher delays and queue lengths compared to future base scenario results for both future years assessed.
- The modelling indicates that the intersection of Bowden Street and Stone Street would improve with the additional traffic. However, this intersection is impacted by the upstream and downstream queues at Bowden Street and the highest delay movement is reported. Slow moving traffic and Bowden street provides opportunities for turning traffic to find gaps and therefore intersection operation would be consistent with or without the schools and TAFE.
- Church Street and Morrison Road operates satisfactorily at level of service B however a high degree of saturation (~1) indicates that some movements are operating at capacity.
- The future traffic signals at the intersection of Constitution Road and Bowden Street operates at an acceptable LoS D or above for both future years.

From the above results it can be observed that the schools and TAFE traffic does have a marginal impact on critical intersections along Victoria Road. The network as a whole is observed to operate at satisfactory levels for the 2022 traffic conditions with the additional traffic generated by TAFE.

It is noted that Victoria Road is currently operating at capacity and any further increase in traffic may cause an increase in delays and queue lengths. The side streets along Victoria Road perform poorly as they do not get enough green time to clear the traffic. The results also indicate that while local street network has capacity to accommodate the additional traffic generated by the schools and TAFE, however, the key access points at Victoria Road are unable to accommodate 2031/ 32 background growth. As such, it is recommended that the true impacts of the proposal at the ultimate year and the potential mitigation works required can only be quantified by assessing an upgraded Victoria Road. This corridor upgrade needs to be developed in conjunction with Roads and Maritime Services and TfNSW.

9.5. Mitigating Measures and Intersection Works

Victoria Road currently has very limited spare capacity to accommodate any significant growth as observed from the existing conditions assessment (Section3.3). However, development has been planned and approved in the region such as the Shepherds Bay Development.

At this stage it is not clear how road authorities plan to accommodate this growth. It is recommended that mitigation measures be developed in conjunction with other development projects in the vicinity. Direction from Roads and Maritime is required as to what upgrades can be assumed at Victoria Road to accommodate the background growth.

The intersection of Victoria Road and Hermitage Road and Victoria Road and Bowden Street operates at a high degree of saturation under 2022 AM peak traffic conditions with the schools and TAFE traffic. Victoria Road is a major arterial road which carries high volume of traffic and the efficient movement of the through traffic is important Roads and Maritime. A mitigation measure was tested to improve the performance of these two intersections, being, additional phase at Hermitage Road and Bowden Street to clear traffic queues on these side streets. The proposed phasing at Hermitage Road and Bowden Street intersections is shown in Figure 9.8 and Figure 9.9.

Figure 9.8: Proposed Mitigation (phasing) at Victoria Road and Hermitage Road intersection

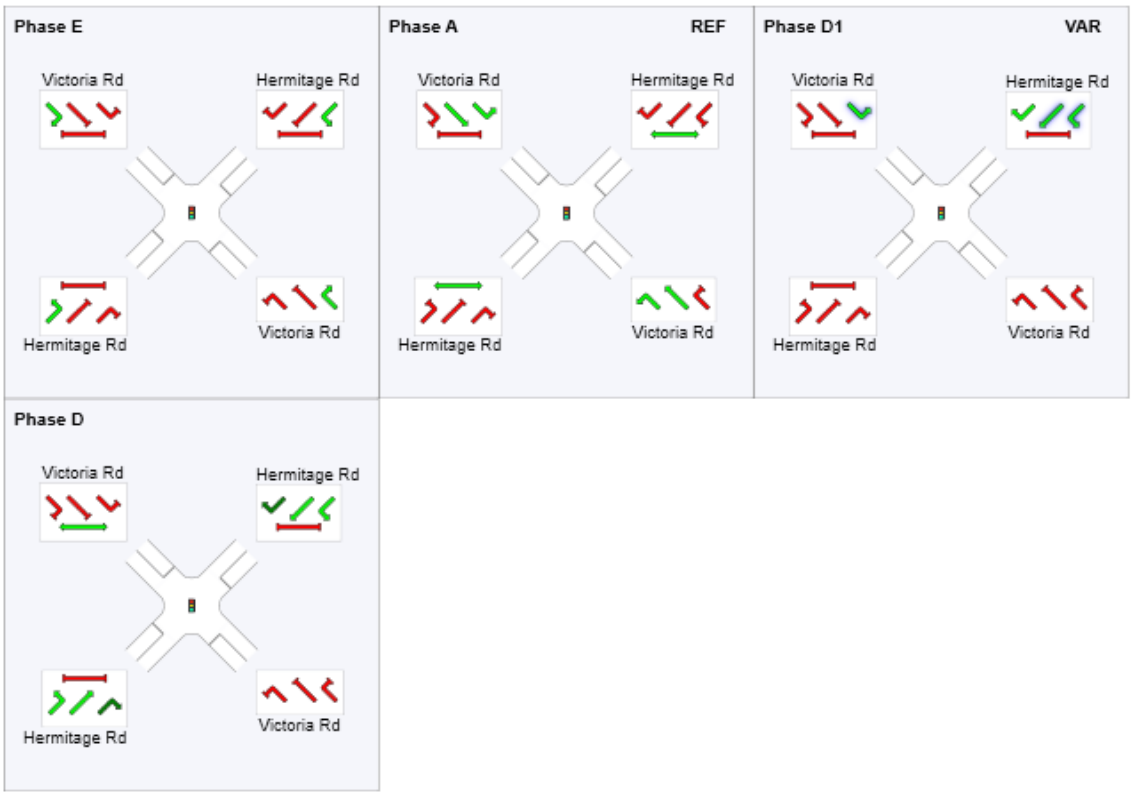
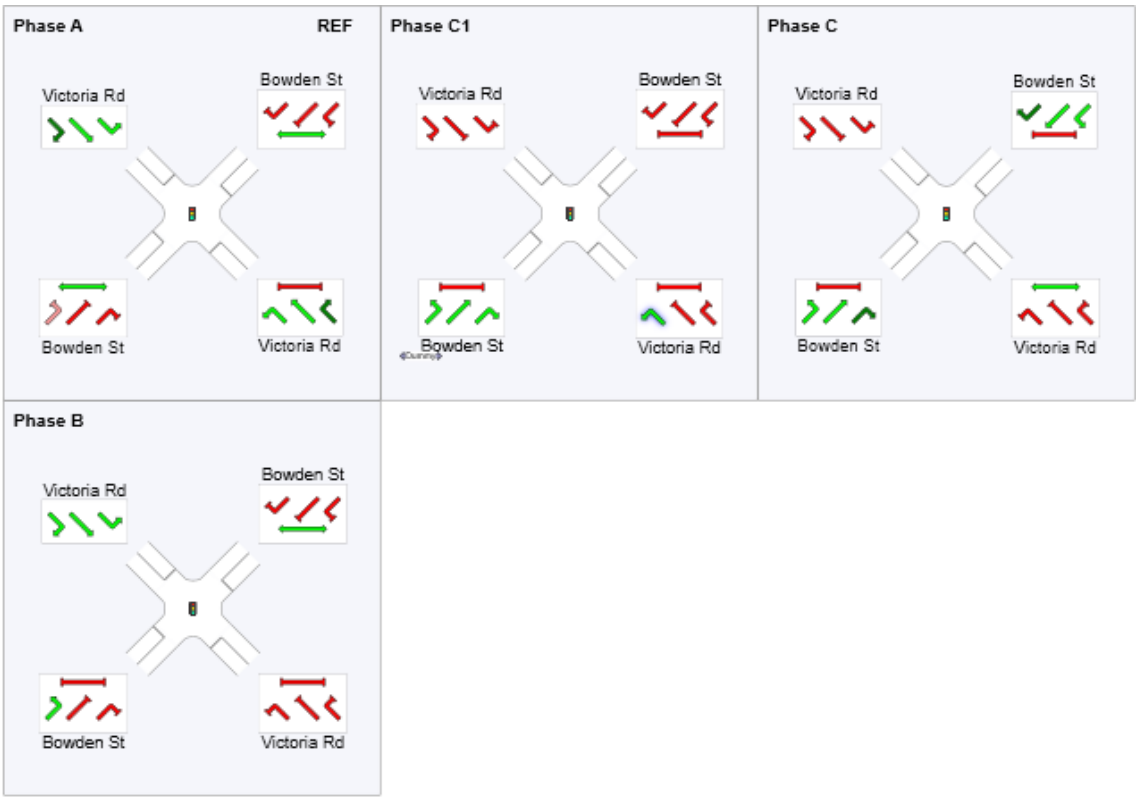


Figure 9.9: Proposed Mitigation (phasing) at Victoria Road and Bowden Street intersection



With the proposed mitigation, the degree of saturation reduces from 1.2 to close to 1.0 for the 2022 AM peak traffic conditions. As such there is benefit in implementing additional leading right turn phases for the side streets to cater for the additional traffic generated by the schools and TAFE. SIDRA Network estimates that the queues on Victoria Road are marginally impacted (increases by approximately 30 vehicles in westbound direction), while the overall performance of the network is better when compared to original phasing results.

10. PRELIMINARY CONSTRUCTION TRAFFIC MANAGEMENT PLAN

10

10.1. Introduction

This preliminary Construction Traffic Management Plan (CTMP) provides an overview of the initiatives to be implemented as part of the construction works. Specifically, the preliminary CTMP considers the following:

- construction site access arrangements
- anticipated truck volumes during construction stages
- truck routes to/ from the site
- requirements for works zones
- pedestrian and cyclist access
- site personnel parking
- traffic control measures
- overview of CTMP requirements.

A detailed CTMP will need to be prepared prior to the issue of the construction certificate and contain confirmed construction details with the awarded contractor.

The general principles of traffic management during construction activities are as follows:

- minimise the impact on pedestrian and cyclist movements
- maintain appropriate public transport access
- minimise the loss of on-street parking
- minimise the impact on adjacent and surrounding buildings
- maintain access to/ from adjacent buildings
- restrict construction vehicle movements to designated routes to/ from the site
- manage and control construction vehicle activity near the site
- carry out construction activity in accordance with approved hours of works.

10.2. Overview of Activities

10.2.1. Description of Construction Activities

The expected duration of the construction works is approximately 20 months, with some overlap between stages. Assuming commencement in Mid-2020, completion is anticipated in early 2022. A broad breakdown of the work stages is detailed in Table 10.1.

Table 10.1: Construction work stages

Stage	Description	Dates
1	Contractor Procurement (ECI)	October to Late December 2019
2	Early Works Package	Early to Mid 2020
3	Commence construction of new buildings	Mid 2020
4	Commissioning commences	Late 2021 and is ongoing until completion
5	Multi-Trades and Digital Technology Hub completed and operational	Early 2022
6	Demobilisation from site	Early 2022

10.2.2. Work Hours

Construction work would be undertaken in accordance with development consent conditions. The typical work hours are expected to be:

- Monday to Friday: 7:00am to 7:00pm
- Saturday: 8:00am to 4:00pm
- Sundays and public holidays: No work.

A minor exception to the EPA construction noise guidelines is proposed in order to achieve alignment with the proposed neighbouring schools(MEESP) development delivery/ construction hours and to achieve a more timely completion of the Education Precinct. Higher noise generating activities would be kept within the EPA construction noise guideline periods.

Truck movements will be minimised during the surrounding road network peak hours (6:00am to 9:00am and 3:00pm to 7:00pm). The appointed contractor will be responsible for instructing and controlling all subcontractors regarding the hours of work. Any work outside the approved construction periods would be subject to specific prior approval from City of Ryde Council. Such work may include the delivery of cranes, large plant or equipment required to the site and non-noise generating activity.

10.2.3. Site Access

It is not yet clear whether construction site access will be feasible during the excavation stage. If site access is confirmed feasible, a through site link will likely be created where the future proposed internal will be located between the proposed new multi-trades and digital technology hub building and the existing substation, with vehicles entering via See Street and exiting via Rhodes Street. A pedestrian access will also be provided on See Street for construction worker access.

Figure 10.1 illustrates the proposed access locations to the construction site.

Figure 10.1: Proposed construction work site accesses

Source: Woods Bagot

10.2.4. Construction Staff Parking

The anticipated average and peak number of workers during the construction works is anticipated to be between 100 to 200 personnel per day. It is estimated that there will be approximately 200 car parking spaces available to construction workers related to the schools and multi-trades and digital technology hub up until July 2020.There would be limited opportunity for construction worker parking available on-site, however travel arrangements for construction workers will be refined once a contractor is appointed.

Notwithstanding this, given the site's proximity to high frequency public transport services, including Meadowbank Railway Station, all workers will be encouraged to use public transport to access the campus, with appropriate tool/ equipment drop-off arrangements made. This will be incorporated into the site induction program.

10.2.5. Heavy Vehicle Traffic Generation

It is anticipated that the site will be primarily serviced by vehicles of a size up to and including 12.5-metre HRVs with some deliveries expected to require use of 19 metre articulated vehicles. During peak construction activity, it is anticipated that the site will generate up to 80 trucks per day (160 two-way movements), or an average of nine trucks per hour (18 two-way movements). This activity is expected to occur during the demolition and excavation stage. Given that traffic modelling for post development scenarios has been completed and indicates that the surrounding intersections will operate satisfactorily with higher traffic volumes, the construction traffic impact is expected to be minor. Further to this, nine construction vehicles per hour would equate to less than one vehicle in every second traffic signal cycle.

Concrete pours during the building structure stage are expected to result in lower vehicle movements than the above, with approximately 50 vehicle movements per day or five vehicles per hour.

10.2.6. Heavy Vehicle Access Routes

Construction traffic will generally have origins and destinations to/ from the north and west of the TAFE campus. The proposed construction vehicle routes have been selected to minimise the use of local roads and use arterial roads where possible (illustrated in Figure 10.2). The proposed routes are as follows:

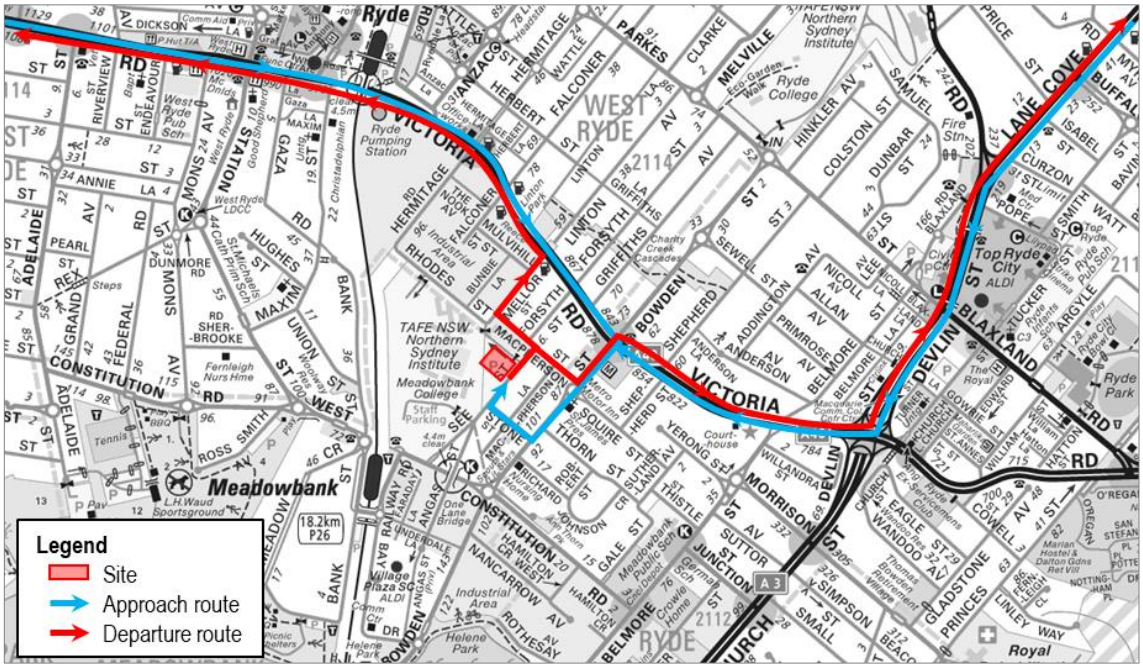
Approach

- From north:
  - Pennant Hills Road, Silverwater Road, Victoria Road, Bowden Street, Stone Street, See Street
  - Lane Cove Road, Victoria Road, Bowden Street, Stone Street, See Street.
- From west:
  - M4 Western Motorway, James Ruse Drive, Victoria Road, Bowden Street, Stone Street, See Street
  - Old Windsor Road, Cumberland Highway, James Ruse Drive, Victoria Road, Bowden Street, Stone Street, See Street.

Departure

- Towards north:
  - See Street, Macpherson Street, Mellor Street, Victoria Road, Silverwater Road, Pennant Hills Road
  - See Street, Macpherson Street, Bowden Street, Victoria Road, Lane Cove Road.
- Towards west:
  - See Street, Macpherson Street, Mellor Street, Victoria Road, James Ruse Drive, M4 Western Motorway
  - See Street, Macpherson Street, Mellor Street, Victoria Road, James Ruse Drive, Cumberland Highway, Old Windsor Road.

Figure 10.2: Construction vehicle approach routes



Base image source: Sydway

10.3. Construction Traffic Management

10.3.1. Traffic Guidance Scheme

A Traffic Control Plan (TCP) for the proposed construction works would be prepared once a contractor is appointed and submitted to the relevant authorities for approval.

Detailed information for work site operation is contained in the *Traffic Control at Work Sites* manual (Roads and Maritime, 2018). The control of traffic at work sites must be undertaken in accordance with WorkCover requirements and the appointed contractor's own workplace health and safety manuals.

The proposed TCP for the work site includes the following considerations and assumptions:

- Construction vehicle activity, including the loading/ unloading of trucks and all materials handling to be provided within the construction site boundaries at all times.
- Placement of accredited site personnel or traffic controllers to manage construction vehicle access to the site and designated work zones, minimising disruption to through traffic.
- Construction site accesses to provide appropriate sight distances and safe environment for all users.
- Clear definition of the work site boundary to be provided by erection of construction hoarding around the site boundaries adjacent to public roads.
- Pedestrians to be guided around the site via existing footpaths.
- Pedestrian safety to be maintained at all times.
- All signage will be clean, clearly visible and unobstructed.

10.3.2. Pedestrian and Cyclist Management

Pedestrian and cyclist movements will be maintained around the work site. Traffic controllers will be positioned at site accesses throughout the construction works to temporarily hold pedestrians in the event of vehicles entering and exiting the site. Class A hoarding will be installed around the perimeter of the site to prevent pedestrian access. Where overhead works are occurring over pedestrian areas, Class B hoarding will be installed to maintain pedestrian movement.

10.3.3. Public Transport

The construction work is not expected to impact existing bus services near the campus.

10.3.4. Traffic Impacts

The anticipated heavy vehicle volumes are not expected to have any notable impact on the surrounding road network. As part of any site induction, drivers should be specifically alerted to the pedestrian activity associated with the NSW TAFE campus, with appropriate care and safety at this location.

10.3.5. Parking Impacts

In the lead-up to and during construction, regular communication would alert staff and students to the reduced on-site car parking available during the construction period and reinforce the alternative options of public transport, active transport and/or a shuttle bus from satellite parking at the TAFE NSW West Ryde campus. Every effort will be made to minimise additional on-street parking demand during the construction program.

Consultation with TfNSW will be ongoing to also potentially increase the frequency of buses to Meadowbank Station (i.e. 507 bus route) during construction to help accommodate a likely mode shift away from private vehicle travel once the existing car park goes offline, while also preparing for the increase in patronage once the proposed multi-trades and digital technology hub and schools become operational.

The implementation of a work zone along the See Street frontage of the site would require temporary removal of approximately eight on-street parking space.

The use of on-street parking on the surrounding local road network by construction personnel will not be permitted. This restriction will be communicated during the induction of personnel and reinforced in toolbox talks.

The appointed contractor would be required to propose an appropriate approach for reducing construction worker travel by private car (including but not limited to use of public transport as noted above, carpooling, group transport and/or shuttle services from subcontractor premises or key transport nodes), as well as an on-street parking monitoring program with corrective actions as required.

10.3.6. Impacts to Neighbouring Properties

Surrounding property access is not expected to be affected during the construction of the new multi-trades building.

10.3.7. Emergency Vehicle Access

Emergency vehicle access to the site will be maintained.

Access to the neighbouring sites by emergency vehicles would not be affected by the proposed construction activity. Any such emergencies will also be treated with priority.

Emergency protocols on the site would include a requirement for accredited site personnel to assist with emergency access from the street. All truck movements to the site and/ or incident point would be suspended and cleared. Consequently, any potential impact on emergency access would be effectively managed throughout the works.

Liaison would be maintained with the police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

10.3.8. Existing and Future Developments

The schools are currently proposed to be under construction at the same time as the TAFE multi-trades and digital technology hub. No other existing or future developments are known to be occurring concurrently in the immediate area surrounding the campus.

10.3.9. Traffic Movements in Adjoining Council Areas

No adverse impact is expected from the movement of heavy vehicles through adjacent council areas.

10.3.10. Site Inspections and Record Keeping

The construction work would be monitored to ensure that it proceeds as set out in the Construction Management Plan provided by the appointed contractor. A daily inspection before the start of the construction activity should take place to ensure that conditions accord with those stipulated in the plan and there are no potential hazards. Any potential risks or non-conformances to the Construction Management Plan would be identified, recorded and dealt with if they arise.

10.3.11. Site Induction

All staff employed on the site by the appointed contractor (including sub-contractors) would be required to undergo a site induction.

The induction would include permitted access routes to and from the construction site for site staff and delivery vehicles, limited parking arrangements, as well as standard environmental, WHS, driver protocols and emergency procedures. The agreed work hours must be included as part of this induction.

11.CONCLUSION

11

11.1. Introduction

This proposal involves development of the north-eastern corner of the Meadowbank TAFE campus to accommodate a multi-trades and digital technology hub. The building will include workshops, workspace and learning spaces, as well as a two-level basement car park.

The new development will allow for enrolments to grow from the existing 13,559 enrolments in 2019 to 15,366 enrolments by 2022 and 16,603 enrolments by 2032. The multi-trades and digital technology hub will tie in with the future master plan of the site and surrounding Meadowbank Education and Employment Precinct.

11.2. Pedestrians and Cyclists

The growth in Meadowbank TAFE enrolments is likely to generate an increase in pedestrian volumes of about 75 pedestrians per hour including walking trips linked with train and bus trips. The main pedestrian movements will approach to/ from the south of the campus, given the surrounding residential catchment and the location of Meadowbank Railway Station.

Primary pedestrian access for the multi-trades and digital technology hub will be from See Street. The existing north-south pedestrian through site access will also be improved by minor upgrade works (subject to a separate approval process) This will provide a direct, connection to Meadowbank Station and represents an improvement over the existing on-street route.

There are limited cyclist provisions surrounding the campus, which is not considered sufficient to support the cyclist demand associated with the proposed schools and TAFE. It is recommended that shared paths are constructed along the key pedestrian and cyclist desire lines to support the broader precinct.

11.3. Public Transport

Meadowbank Railway Station will provide a key transport mode to support the proposal. Under existing conditions, the rail services operating through this station are over capacity. Under the NSW Government's Future Transport Strategy, the More Trains, More Services program is targeting capacity increases and upgrades to improve peak hour crowding on rail services. Improvements to the capacity and reliability of the T1 Northern Line will be critical for encouraging and facilitating public transport use for the proposed schools, noting that the Sydney Metro CBD and Southwest currently under construction is expected to relieve some pressures on the T1 Northern Line. On the above basis, it is expected that sufficient rail capacity will be available to service the requirements of the TAFE and schools.

High-frequency bus services, including the M52, currently operate along Victoria Road. It is understood that there is sufficient capacity on these existing services to accommodate the likely increase in patronage from the operation of the multi-trades and digital technology hub and schools. Available bus stops are generally within a five-minute walk of the multi-trades and digital technology hub, with existing footpaths along Forsyth Street and Mellor Street providing appropriate pedestrian accessibility.

11.4. Road Network

SIDRA Intersection and SIDRA Network modelling were used to assess the current operation of the surrounding road network. These results indicate that under existing traffic volumes, the intersections of Victoria Road/ Bowden Street, Victoria Road/ Hermitage Road and Church Street/ Morrison Road are operating at or close to capacity during the AM and PM peak hours. The remaining intersections assessed operate at acceptable levels of service of D or above during the AM and PM peak hours, with satisfactory delays and queue lengths.

Opening year (2022) results indicate that the network has some spare capacity to accommodate the background growth and the additional traffic generated by the proposed new schools and TAFE expansion.

The additional traffic can be accommodated with minor changes to the current phasing arrangements at the Victoria Road intersections with Hermitage Road and Bowden Street, with minimal impact on through traffic.

Forecast future 2032 traffic volumes (without the proposed new multi-trades building and/or schools) would result in Victoria Road intersections exceeding capacity. With the addition of the proposed schools and TAFE traffic, the two key precinct access intersections from Victoria Road at Hermitage Road and Bowden Street, operate at or above capacity. It is noted that the minor roads intersecting with Victoria Road experience existing and future delays (and do not necessarily clear queues in a single signal cycle) due to limited green time as a result of significant traffic volumes and congestion on Victoria Road. A corridor upgrade strategy needs to be developed in conjunction with Roads and Maritime Services and TfNSW, as part of broader precinct master planning work.

11.5. Car Parking

Car parking guidance based on the City of Ryde Council Development Control Plan 2014, results in the off-street parking requirement of 104 car parking spaces for the proposal. Taking into consideration the existing parking displaced by the building footprint and new car parking being provided elsewhere on campus via a separate approval, it is estimated that the proposal will result in a net parking increase of approximately 88 spaces. This represents a minor shortfall of 16 spaces against the Ryde DCP 2014 guidance which is considered acceptable, noting also that travel planning and management initiatives are proposed to reduce future parking demand.

11.6. Pick-Up and Set-Down Arrangements

It is proposed to convert the existing kerbside parking along the See Street frontage of the site to a pick-up and set-down area. This arrangement will require the removal of approximately eight on-street parking spaces. This proposal would allow for a formal pick-up and set-down for the TAFE, noting that the Meadowbank campus is currently lacking such facilities. The proposed location would also allow for adequate separation between the schools pick-up and set-down area which will be located on Rhodes Street, ensuring the cumulative impact between the two proposals is minimised.

11.7. Summary of Mitigation and Management Measures

Table 11.1: Summary of mitigation and management measures

Mitigation and management measure	Detailed design	Pre-construction	Construction	Operation
Complete minor upgrade works to the existing north-south pedestrian through site access	✓			
Install bicycle parking and end-of-trip facilities on the TAFE campus.	✓			
Finalise, implement and monitor a Travel Plan, addressing both staff and student travel.	✓			✓
Reschedule some classes outside of peak travel times and later at night.				✓
Adjust traffic signal phasing and timing at Victoria Rd intersections with Hermitage Rd and Bowden St.				✓
Introduce kerbside parking restrictions to facilitate pick-up and set-down activity during peak TAFE arrival and departure periods.				✓
Prepare, implement and maintain a detailed Construction Traffic Management Plan.		✓	✓	
Improve the capacity and reliability of the T1 Northern Line.				✓

A. MODEL CALIBRATION

A

A.1. Calibration

The role of the calibration process adopted for the project was to develop a model that is fit for purpose and produces results that can be used in the context of the overall study.

A.1.1. Site Inspection and Survey Videos

A site inspection was carried out by observing the videos collected as part of the classified intersection surveys. The observations are detailed below.

Victoria Road and Bowden Street Intersection

At Victoria Road, for the eastbound right turn into Bowden Street, vehicles accept smaller critical gap to make the turn. In many instances westbound through vehicles were observed to either nearly miss or slow down to allow the turning vehicle to complete their turn. An instance was observed at 8:00 am where the truck is still completing the right turn and a car is observed travelling in the westbound through direction and marginally misses the truck. This indicates that the truck accepted a smaller gap to make the turn (Figure A.1).

Figure A.1: Observed gap acceptance behaviour at Victoria Road

Bowden Street (north approach) has two lanes and both of them are shared lanes. It was observed that the right turning traffic, from Bowden Street to Victoria Road would block the second lane and vehicles would use the kerbside lane to travel straight through at Bowden Street. This behaviour was observed during both AM and PM peak hours and an instance of this during the PM period is presented in Figure A.2.

Figure A.2: Lane Utilisation at Bowden Street – southbound

A.1.2. Modelling Assumptions

The following outlines several adjustments made to model parameters and assumptions made during the process of model development and calibration:

- Initially SIDRA was allowed to optimise the signal timings, however the results were not matching the existing conditions. Therefore, to better match the existing delays and queues, fixed phase times were applied. These fixed phase times were calculated from the SCATS data provided by Roads and Maritime.
- Gap Acceptance factor at Victoria Road (eastbound) at the Bowden Street intersection has been changed from a default value of 1 to 0.5 to simulate the behaviour of vehicles accepting shorter gaps to make the turn.
- To simulate the observed behaviour at shared lanes, the default lane utilisation was changed at the following locations
    - Bowden Street (north approach) lane 2 – 60% for AM and PM Peak hour
    - Hermitage Road (north and south approach) lane 1 – 80% for AM Peak hour
    - Victoria Road at Victoria Road and Hermitage Road intersection at lane 1 – 70% for AM peak hour
    - Hermitage Road (south approach) lane 2 – 60% for PM Peak hour.

A.1.3. Calibration Results

Queue surveys were not collected as part of this study and hence average queues were visually compared to what was observed on site. Average SCATS timings have been used in SIDRA and with the calibration changes mentioned above, the models are now deemed to be representing observed conditions and are fit for our study purpose.

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