STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

UPDATED TRANSPORT IMPACT ASSESSMENT

PROPOSED MIXED-USE DEVELOPMENT
26 – 42 EDEN STREET & 161 – 179 PRINCES HIGHWAY
ARNCLIFFE

PREPARED FOR ARNCLIFFE EDEN PROPERTY PTY. LTD.
OUR REF: 20-171-10

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https://drive.google.com/file/d/11vVbjLJXHU5ZTOHAVKV6c-sZ5pIh3kgq/view?usp=sharing

1. INTRODUCTION

1.1 Scope of Assessment

This Updated Transport Impact Assessment is submitted to the Department of Planning, Industry and Environment (DPIE) in support of a State Significant Development Application (SSDA-11429726) for the development of land identified at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe (the subject subject) for the purposes of a mixed-use precinct with open space, retail, and residential uses, comprising social and market housing as part of the NSW Land and Housing Corporation (LAHC)'s 'Communities Plus' program.

SSDA-11429726 seeks approval for the following development:

- Demolition of all existing buildings and structures on the site;
- Site preparation works, excavation and tree removal;
- The construction of a mixed-use development comprising:
  - 744 apartments across four (4) buildings between 19 – 23 storeys in height, including:
    - 186 market housing apartments in Building A;
    - 202 market housing apartments in Building B;
    - 180 social housing apartments in Building C; and
    - 176 market housing apartments in Building D;
  - 3,113m^2 gross floor area of retail premises;
  - 240m^2 of a future child care centre;
  - 3,706m^2 of communal open space;
  - 813 spaces of lower ground and basement car parking; and
  - 4,870m^2 of publicly accessible open space including a 4,000m^2 park, an 870m^2 public plaza (meeting space), and through site link connecting Eden Street and Princes Highway.

The aim of this assessment is to investigate and report upon the potential parking and traffic consequences of the proposal and to recommend appropriate ameliorative measures where required. This report provides the following scope of assessment:

- Section 1 provides a summary of the site location, details, existing and surrounding land-uses;
- Section 2 describes the proposed development;
- Section 3 assesses the adequacy of the proposed site access arrangements with reference to relevant Australian Standard specifications and the specific operational requirements of the development;

- Section 4 assesses the proposed vehicular, motorcycle and bicycle parking with reference to relevant Council and Transport for NSW (TfNSW, formally Roads & Maritime Services) specifications;

- Section 5 assess the adequacy of the proposed internal circulation and manoeuvrability of the proposed development with reference to relevant Australian Standard specifications and the specific operational requirements of the development;

- Section 6 assesses the existing traffic, parking and transport conditions surrounding and servicing the subject development site including a description of the surrounding road network, traffic demands, operational performance and available public transport infrastructure;

- Section 7 describes the existing travel behaviour in the surrounding precinct;

- Section 8 estimates the projected traffic generating ability of the proposed development and assesses the ability or otherwise of the surrounding road network to be capable of accommodating the altered demand in a safe and efficient manner; and

- Section 9 provides an indicative assessment of the traffic and pedestrian management measures likely to be implemented during the construction phases of the development.

The report has been prepared pursuant to State Environmental Planning Policy (Infrastructure) 2007.

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), the Secretary's Environmental Assessment Requirements (SEARs) for SSDA-11429726 were issued on 18 December 2020. To assist, **Table 1** overleaf specifies which section or sections of this report address each of the SEARs with respect to Transport, Traffic, Parking and Access (Operation and Construction).

TABLE 1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS TRANSPORT, TRAFFIC, PARKING AND ACCESS (OPERATION AND CONSTRUCTION)	
Requirement	**Section/s of Report Addressing Item**
The predicted transport mode share split for the development.	Section 6, 7, 8 and separate Green Travel Plan
An analysis of the existing traffic network, including the road hierarchy, current daily and peak hour vehicle movements and existing performance levels of nearby intersections.	Section 6
A forecast of additional daily and peak hour vehicle movements as a result of the proposal (using SIDRA modelling or similar a 5-year intervals) and identification of potential traffic impacts on road capacity, intersection performance and road safety (including pedestrian and cycle conflict).	Section 8
Proposals to mitigate and traffic impacts, including intersection upgrades to achieve acceptable performance.	Section 2 and 8
Details of car parking provision, having regard to relevant parking rates, specifications and standards.	Section 4
Details of proposed vehicular access, loading, deliveries and servicing arrangements, and any proposed infrastructure improvements or measures to reduce potential conflicts with pedestrians and cyclists.	Section 3 and 5
Proposals to improve walking and cycling, such as connections into existing walking and cycling networks, high quality end-of-trip facilities and adequate bicycle parking for visitors, employees and residents (provided in accordance with the relevant rates, specifications and standards).	Section 2, 3.3 and 8.4 and separate Green Travel Plan
Measures to promote sustainable travel choices for employees, residents or visitors, such as minimising car parking provision, encouraging car share and public transport, cycling and walking, implemented a green travel plans and providing trip end facilities.	Sections 2, 4 and separate Green Travel Plan
A Construction Traffic Management and Pedestrian Management Plan providing details of predicted construction traffic movements, routes, and access arrangements, and outline how construction traffic impacts on existing traffic pedestrian and cycle networks would be appropriately managed and mitigated.	Section 9

1.2 Background

A State Significant Development Application (SSDA-11429726) was lodged in 2021 with respect to land identified as 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe for the purposes of a mixed-use precinct with open space, retail, and residential uses, comprising social and market housing as part of the NSW Land and Housing Corporation (LAHC)'s 'Communities Plus' program.

Stanbury Traffic Planning prepared a Transport Impact Assessment dated July 2021 in support of the subject development application.

Following a review of the application, submissions were provided by both TfNSW and Bayside Council requesting additional analysis.

Following receipt of the above submissions and subsequent liaison with both TfNSW and Bayside Council, a number of alterations have been made to the application, including but not limited to, the following:

- The introduction of an ingress only access from Princes Highway northbound carriageway to the development, being assisted by a deceleration lane;
- The rationalisation of the development access / egress from / to Eden Street into a single access roadway, facilitating both passenger and heavy vehicle access, forming a T-junction with Eden Street being governed by 'Stop' signage control, with Eden Street forming the priority route;
- Alterations to the internal circulation, parking and servicing arrangements, primarily associated with the abovementioned altered site access / egress arrangements, but also to ensure compliance with Council's Development Control Plan and site-specific requirements; and
- Minor alterations to the Eden Street public domain, primarily associated with the altered site access arrangements, including but not limited to, the introduction of a 40km/h High Pedestrian Activity Area speed limit.

The above amendments are detailed with updated architectural plans prepared by Group GSA, reduced scale copies of a selection of which are attached as **Appendix 1**.

This report forms an Updated Transport Impact Assessment to reflect and address the amended proposal.

1.3 Reference Documents

Reference is made to the following documents throughout this report:

- TfNSW's *Guide to Traffic Generating Developments*;
- TfNSW's *Guide to Transport Impact Assessments*;
- Bayside Council's *Rockdale Development Control Plan* (RDCP 2011);
- Bayside Council's *Rockdale Technical Specification Traffic, Parking and Access*;
- Bayside Council's Rockdale *Technical Specification Waste Minimisation and Managemen*t;
- Bayside Council's *Rockdale Technical Specification Stormwater Management*;

- Bayside Council's *Arncliffe and Banksia Public Domain Plan & Technical Manual*;

- Bayside Council's *Arncliffe and Banksia Local Infrastructure Contribution Plan 2020 – Revision 1*;

- AECOM Arncliffe and Banksia Priority Precincts, Strategic Transport Plan (2015);

- AECOM Cooks Cove Strategic Transport Study (Oct 2016)

- DPIE's *Bayside West Precincts 2036: Arncliffe, Banksia and Cooks Cove*;

- The following Australian Standards for *Parking Facilities:*

  - *Part 1: Off-Street Car Parking* (AS2890.1:2004);
  - *Part 2: Off-Street Commercial Vehicle Facilities* (AS2890.2:2002);
  - *Part 3: Bicycle Parking* (AS2890.3:2015);
  - *Part 6: Off-Street Parking for People with Disabilities* (AS2890.6:2009).

- *State Environmental Planning Policy (Affordable Rental Housing) 2009* (hereafter referred to as the 'ARH SEPP').

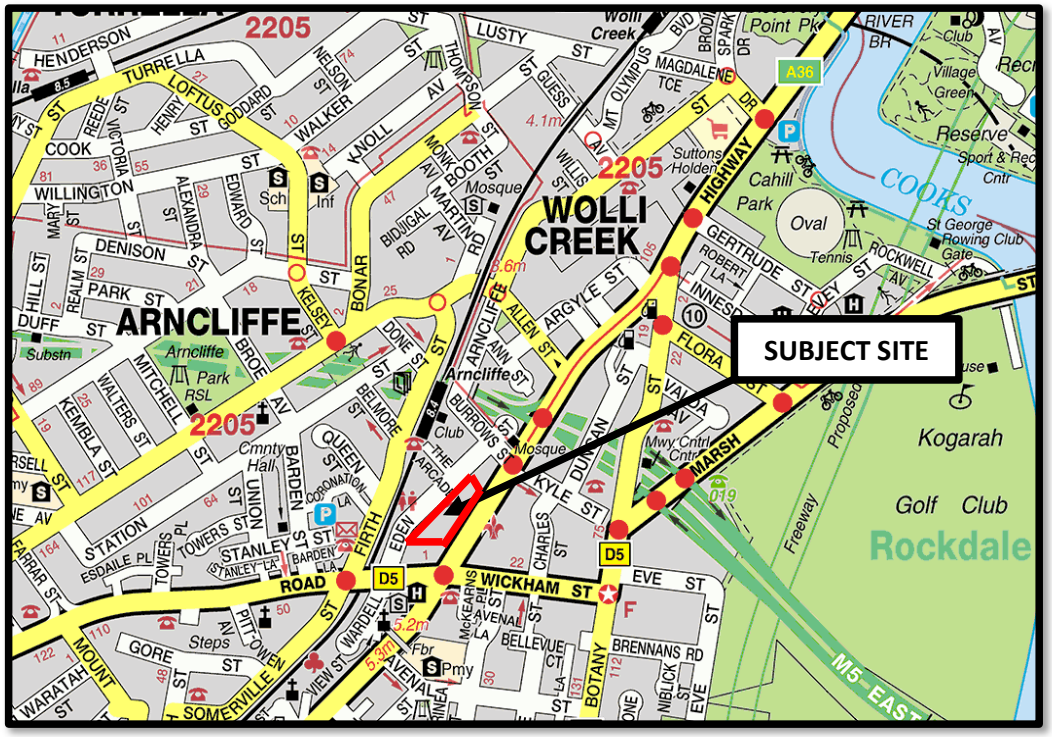
Architectural plans have been prepared by Group GSA, reduced copies of a selection of which are attached as **Appendix 1**.

1.4 Site Details

1.4.1 Site Location

The subject site is located on the western side of Princes Highway and the eastern side of Eden Street, approximately midway between Forest Road to the south and Burrows Street to the north, Arncliffe. The site location is illustrated in the following pages within a local an aerial context by **Figure 1** and **Figure 2**, respectively.

FIGURE 1
SITE LOCATION WITHIN A LOCAL CONTEXT



Source: UBD Australian City Streets – Version 8

FIGURE 2
SITE LOCATION WITHIN AN AERIAL CONTEXT



Source: Group GSA

1.4.2 Site Description

The site forms a number of allotments as follows:

- Lots 1 - 3 and 7 - 12 DP 23701;
- Lot 1 DP 447649; and
- Lot 1 DP 1094906.

Collectively, the allotments provide a street address of 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe.

The site forms an irregularly shaped parcel of land, providing approximate frontages of 190m and 165m to Eden Street and Princes Highway, respectively.

The total site area is approximately 13,440m^2.

1.4.3 Existing Use

The subject site currently accommodates 14 residential apartment buildings containing approximately 140 apartments.

The three storey buildings are serviced by a series of off-street car parking areas, containing 29 formalised spaces, being serviced by a total of eight (8) vehicular driveways connecting with Eden Street.

No vehicular access is currently provided between the site and Princes Highway.

A series of pedestrian access paths connect with both Eden Street and Princes Highway, however no formalised through site pedestrian connectivity between the two frontage roads is provided.

1.4.4 Surrounding Land Uses

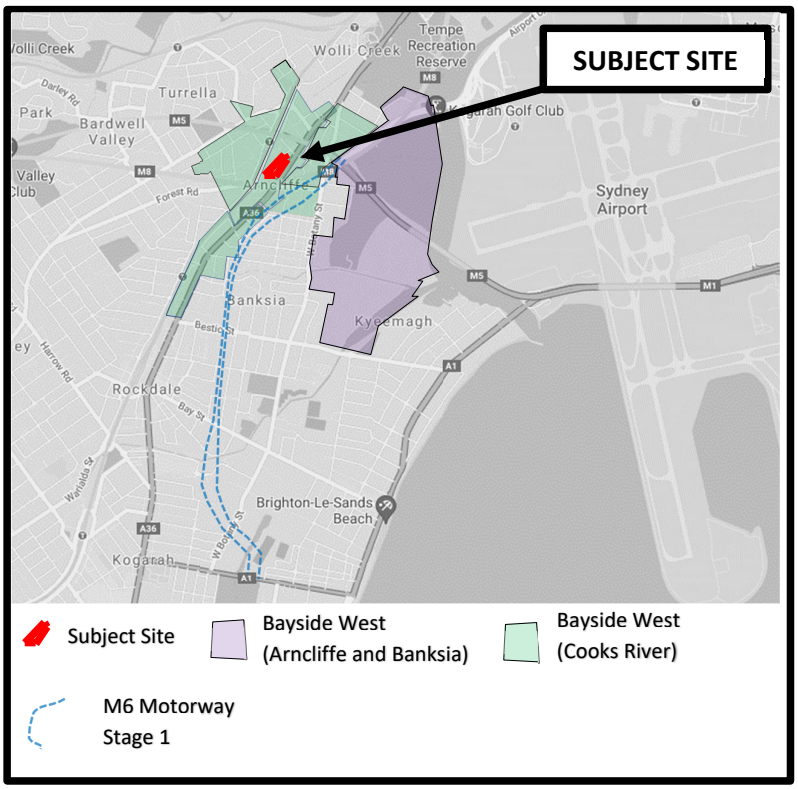
The site is surrounded by a mix of land-uses as follows:

- A series of detached residential dwellings occupy land to the south, fronting Forest Road and Eden Street;
- Medium density residential apartment buildings are situated to the north, fronting Princes Highway, Burrows Street and Eden Street;
- A mix of medium density residential apartment buildings and detached dwellings are situated to the west, on the opposite side of Eden Street; and
- A mixed of high density residential developments and highway service commercial uses occupy land to the east, on the opposite side of Princes Highway.

1.4.5 Strategic Context

A number of infrastructure projects and planning documents are likely to directly influence the access to the proposed development site and of the wider area. A summary of the major projects proposed or under investigation are shown in **Figure 3**.

FIGURE 3
MAJOR PROJECTS PROPOSED IN RELATION TO THE SITE



1.4.5.1 Bayside West Precincts

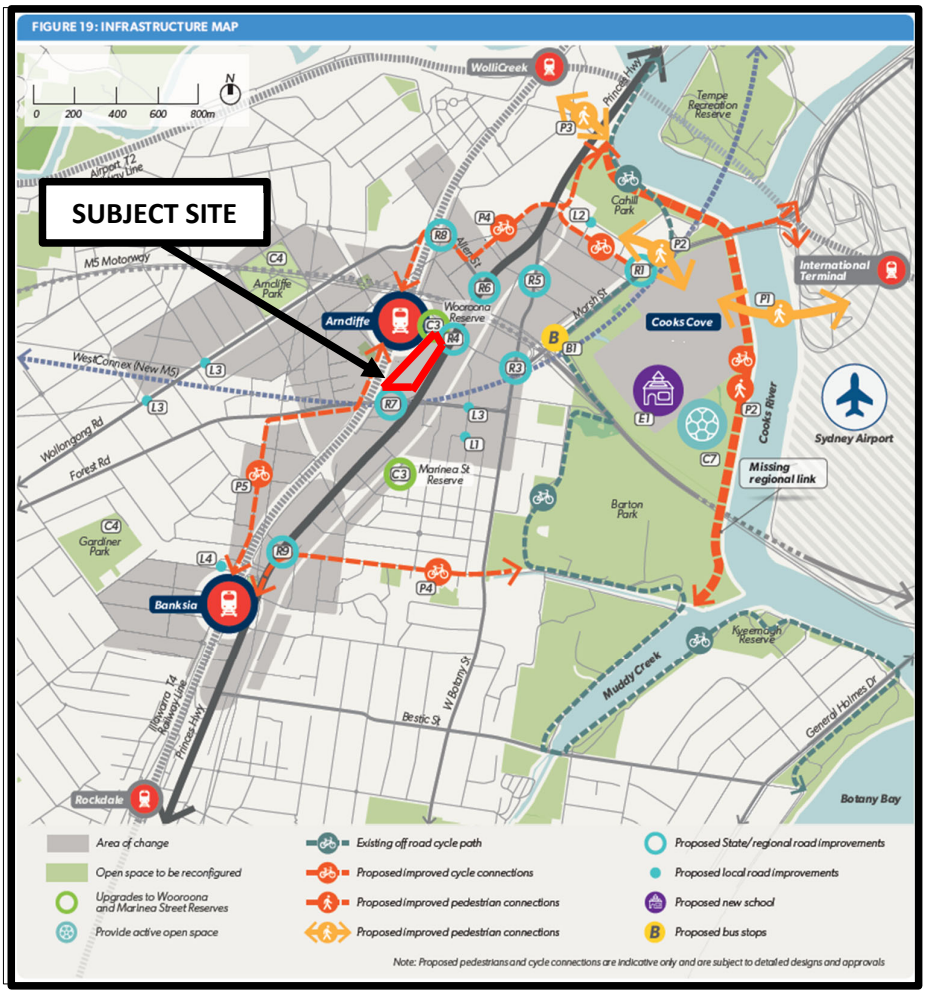
As outlined in the NSW Government Report *"Bayside West Precincts 2036 Arncliffe, Banksia and Cooks Cove"* dated August 2018, Arncliffe, Banksia and Cooks Cove were nominated for the Planned Precincts program by the former Rockdale City Council (now Bayside Council). The NSW Government endorsed the nomination in July 2014 (Arncliffe and Banksia) and 2015 (Cooks Cove). In the Arncliffe and Banksia precincts, there is the opportunity to provide around 5,000 new dwellings by 2036. Some of the infrastructure upgrades proposed to facilitate this as identified in Section 7 of the Infrastructure Strategy include:

- R1 - New major intersections on Marsh Street to provide access to Cooks Cove;
- R2 - Improvements to Marsh Street and Airport Drive. Including improved pedestrian connections to the Giovanni Bridge and upgraded pedestrian crossing of Marsh Street (potential pedestrian over pass);
- R3 - Upgrades to the Kyle Street / West Botany Street intersection;
- R4 - Upgrade to the existing signalised intersection at Princes Highway / Burrows Street;
- R5 - Review configuration of Duncan and West Botany Street intersections;

- R6 - Upgrade the Allen Street / Princes Highway intersection;
- R7 - Upgrades to the intersection of Forest Road at Firth and Eden Streets;
- R8 - Review intersection treatments on either side of the railway underpass between Allen Street and Wollongong Road;
- R9 - Upgrade to the Spring Street / Princes Highway intersection;
- P1 - Investigate provision of a new walking and cycling bridge over the Cooks River to the Sydney Airport;
- P2 - A direct foreshore bicycle/pedestrian path along the Cooks River;
- P3 - New and improved cycle and pedestrian crossing of the Princes Highway from Cahill Park to Brodie Spark Drive. Consider pedestrian over pass;
- L1 – Charles Street realignment;
- L2 – Gertrude Street extension; and
- L3 – Intersection upgrades at:
    - Wolli Creek Road / Wollongong Road;
    - Fripp Street / Wollongong Road;
    - Dowling Street / Wollongong Road; and
    - Wickham Street / Charles Street.

These and other proposed upgrades are shown overleaf in **Figure 4**.

FIGURE 4
INFRASTRUCTURE UPGRADES PROPOSED FOR THE BAYSIDE WEST PRECINCTS



1.4.5.2 M6 Motorway

Stage 1 of the M6 motorway design and construction contract was announced on 24/5/2021 and is planned to connect the M8 Motorway (Westconnex) with President Avenue at Kogarah.

The AECOM report titled *F6 Extension Stage 1 from New M5 Motorway at Arncliffe to President Avenue at Kogarah Appendix D: Traffic and Transport Technical Report* Table 9-1 identifies the following:

- Princes Highway, immediately south of Bay Street, in 2026 following completion of Stage 1, is expected to see a 7% reduction in daily traffic in a northbound direction and a 5% reduction in daily traffic in a southbound direction;

- The M6 Motorway is expected to improve the operation of the intersection of Princes Highway / Wickham Street / Forest Road with a reduction of 9 seconds of average delay in the weekday AM peak hour and 10 seconds of average delay in the PM peak hour;

- All intersections analysed during the weekday AM and PM peak hours indicate that in 2026 following the completion of the M6 Motorway that all intersections will either approximately maintain their projected 2026 operation or improve operation; and

- Heavy vehicles on Princes Highway immediately south of Bay Street estimated to reduce by around 40% following the opening of the M6 Motorway Stage 1.

2. PROPOSED DEVELOPMENT

2.1 Built Form

The subject proposal (SSDA-11429726) seeks consent for the demolition of existing site structures, site preparation works, excavation and tree removal and the construction of a mixed-use development comprising:

- 744 apartments across four (4) buildings between 19 – 23 storeys in height, including:
  - 186 market housing apartments in Building A;
  - 202 market housing apartments in Building B;
  - 180 social housing apartments in Building C; and
  - 176 market housing apartments in Building D;

- 3,113m^2 gross floor area of retail premises, contained at lower and upper ground levels across all four buildings;

- A 40-place child care centre situated within Building D providing 240m^2 of floor space;

- Parking areas contained within lower ground and three basement levels, comprising:

  - 813 car parking spaces;
  - 394 bicycle parking spaces; and
  - 67 motorcycle parking space;

- A dedicated loading area containing six (6) marked loading bays capable of accommodating vehicles up to and including 14.5m long Articulated Vehicles (AV); and

- 4,870m^2 of public open space, including:

  - A 4,000m^2 publicly accessible parking; and
  - An 870m^2 public plaza (meeting space) and through site link.

2.1.1 Market Residential Apartments

The subject application proposes the development include three market residential apartment buildings. Buildings A, B and D are proposed to comprise a total of 564 standard residential apartments, comprising the following:

- 223 x one-bedroom dwellings;

- 199 x two-bedroom dwellings; and

- 142 x three-bedroom dwellings.

The market residential apartments are proposed to be serviced by parking contained within the lower ground and three basement levels comprising:

- 564 resident car spaces;
- 75 visitor car spaces;
- 372 bicycle spaces; and
- 50 motorcycle spaces.

2.1.2 Social Housing Apartments

Building C is proposed to comprise 180 social housing apartments in accordance with the Affordable Housing SEPP, comprising:

- 9 x studio apartments;
- 100 x one-bedroom dwellings;
- 63 x two-bedroom dwellings; and
- 8 x three-bedroom dwellings.

The social residential apartments are proposed to be serviced by parking contained within three basement levels, comprising:

- 80 resident car spaces; and
- 12 motorcycle spaces.

2.1.3 Retail Tenancies

A total of 19 separate retail tenancies are proposed to be provided within the lower and upper ground levels of all four buildings, providing a total floor area of 3,113m^2, whereby the tenancies range in size between 27m^2 and 501m^2.

The retail floor space is proposed to be serviced by parking contained within basement level 1 comprising 78 passenger vehicle parking spaces, 18 bicycle parking spaces and 5 motorcycle spaces.

2.1.4 Child Care Centre

A child care centre is proposed to be contained within Building D and is to be capable of accommodating up to 40 children and provide a floor area of 240m^2.

The child care centre is proposed to be serviced by a small parking area situated within the lower ground floor level below building B, with six parking spaces (including one adaptable space) and four bicycle parking spaces.

2.1.4.1 Child Care Centre Operation

The child care centre is proposed to accommodate up to 40 children as follows:

- 15 children aged between zero and two years of age;
- 15 children aged between two and three years of age; and
- 10 children aged between three and five years of age.

The centre is required to employ a minimum of eight staff in accordance with the current *Children (Education and Care Services) National Law (NSW)* requirements, as follows:

- Four staff associated with the children aged between zero and two years of age;
- Three staff associated with the children aged between two and three years of age; and
- One staff associated with the children aged between three and five years of age.

The centre is proposed to operate between 7:00am and 6:00pm Monday to Friday.

2.1.5 Passenger Vehicle Access

Passenger vehicle access is proposed as follows:

- A development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site, facilitating unrestricted turning movements; and
- Passenger vehicle access is also to be provided via an approximately 55m long deceleration lane adjacent to the northbound Princes Highway carriageway assisting ingress only movements from Princes Highway to the first basement level parking area via a connecting ramp.

2.1.6 Service Vehicle Access

Service vehicle access is proposed between the dedicated on-site loading area and Eden Street, via the abovementioned development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site.

No service vehicle / heavy vehicle access is proposed between the site and Princes Highway.

2.1.7 Pedestrian Access / Links

Pedestrian connectivity between the development and the eastern Eden Street footpath and the western Princes Highway footpath is proposed via a series of paths linking directly with the development buildings.

Through site pedestrian links are proposed between Eden Street and Princes Highway adjacent to the northern boundary via a dedicated pedestrian link as well as central to the site via the public park.

2.1.8 External Works

The following external works are proposed adjacent to and in the immediate vicinity of the site in order to ensure the development integrates into the precinct in a safe and efficient manner:

- A raised marked pedestrian crossing over Eden Street directly adjacent to The Arcade to facilitate safe and efficient connectivity between Princes Highway, the site and Arncliffe Railway Station;
- The modification of the existing pedestrian refuge within Eden Street at Forest Road to prohibit right turn movements to and from Eden Street;
- The provision of a dual lane bicycle lane within Eden Street along the western kerb alignment, between Forest Road and Burrows Street; and
- The provision of a shared pedestrian / cycle path along the western Princes Highway footway, between Forest Road and Burrows Street.

Detailed discussion / assessment of the above external works is contained within subsequent sections of this report.

3. SITE ACCESS ARRANGEMENTS

3.1 Passenger Vehicle Access

Passenger vehicle access is proposed as follows:

- A development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site, facilitating unrestricted turning movements; and

- Passenger vehicle access is also to be provided via an approximately 55m long deceleration lane adjacent to the northbound Princes Highway carriageway assisting ingress only movements from Princes Highway to the first basement level parking area via a connecting ramp.

The following sub-sections of this report provide discussion / assessment with respect to the above proposed passenger vehicle access arrangements with respect to location, design and sight distance.

3.1.1 Eden Street Access

3.1.1.1 Planned Eden Street Configuration and Management

Bayside Council's *Arncliffe and Banksia Public Domain Plan & Technical Manual* sets out the planned configuration of Eden Street, as follows:

- A reduction in the vehicular trafficable pavement width from 12.1m to 9.1m facilitating the provision of one through travel lane in each direction in conjunction with an indented parallel parking lane along the eastern kerb alignment (also providing landscaping within regularly spaced islands);

- The removal of kerb-side parking and the provision of a 2.8m wide on-road dual lane bicycle path along the western alignment;

- The widening of the western verge from 3.7m to 4.0m to incorporate a 2.5m wide footpath and a 1.5m tree zone; and

- A reduction in the width of the eastern verge from 4.5m to 3.1m, accommodating a 2.8m wide footpath.

Further to the above, AECOM's *Arncliffe and Banksia Priority Precincts Strategic Transport Plan* and Bayside Council's *Arncliffe and Banksia Local Infrastructure Contribution Plan 2020* recommend alterations to the junction of Forest Road and Eden Street, respectively, as follows:

- The prohibition of right turn movements between Forest Road and Eden Street; and

- Improvement to pedestrian access and mobility over Eden Street at Forest Road by way of an enlarged triangular shaped pedestrian refuge, which will also reinforce the abovementioned prohibition of right turn movements.

3.1.1.2 Proposed Eden Street Speed Limit Reduction

The proposed altered function of Eden Street to provide a high pedestrian activity environment via the introduction of through-site pedestrian links and infrastructure, supports the governing of vehicular traffic flow by a reduced speed limit of 40km/h. This is expected to take the form of a 40km/h High Pedestrian Activity Area speed limit along the full length of Eden Street (and potentially beyond into Burrows Street and Arncliffe Street), in a similar manner to that already governing traffic on the western side of the railway line within Firth Street.

It is expected that the reduced speed limit will be self-enforcing following the implementation of the previously described pedestrian management and traffic calming measures including the pedestrian refuge over Eden Street at Forest Road and the raised marked pedestrian crossing over Eden Street at The Arcade.

3.1.1.3 Driveway Location

The proposed development access location, within the south-western portion of the subject site, has been specifically formulated in response to the following:

- The requirement to provide a substantial and meaningful 4,000m^2 public park within the subject site;

- The requirement to provide a pedestrianised precinct within the northern part of Eden Street in the vicinity of The Arcade, to facilitate safe and efficient connectivity between the subject development, the new public park, Princes Highway and Arncliffe Railway Station by virtue of through-site pedestrian connections. This pedestrianisation includes the provision of a raised and marked pedestrian crossing over Eden Street adjacent to The Arcade; and

- The effort to maximise sight distance provisions between exiting traffic from the site and Eden Street.

3.1.1.4 Eden Street Access Roadway Design

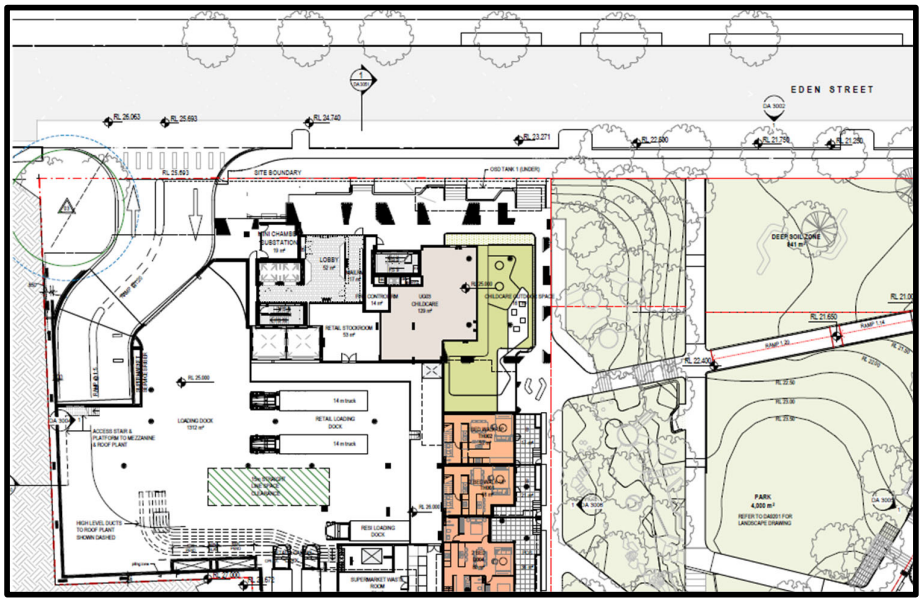
AS2890.1:2004 provides driveway design specifications based on the proposed primary land use, the functional order of the access road and the number of spaces the driveway is to serve. Based on the development providing a part residential / part retail land-use, the local (non-arterial) functional order of Eden Street and the development providing a total of 813 car parking spaces, AS2890.1:2004 specifies, at minimum, a Category 4 type driveway is required. A Category 4 type driveway involves minimum 6m wide ingress and egress laneways, being divided by a minimum 1m wide separation island.

Notwithstanding the above, following liaison with Council officers, it is desirable that a Category 5 type driveway be provided, whereby the development access

forms a pseudo public road junction approach to Eden Street. The proposed access roadway connecting with Eden Street is accordingly to be provided via a standard T-junction arrangement operating under 'Stop' signage control, providing a 6m wide ingress lane and 4.7m wide egress lane, being separated by a 1.0m wide central island.

The Eden Street access roadway as depicted within the architectural plans is shown in **Figure 5**.

FIGURE 5
EDEN STREET ACCESS ROADWAY



It is acknowledged that some minor alterations are recommended with respect to the access intersection control and management including the provision of appropriate intersection 'Stop' signage and pavement marking in conjunction with the diversion of pedestrian crossing movements over the access roadway slightly to the east to minimise the crossing distance. These recommendations are shown in red within the set of swept path plans prepared by this Practice contained within **Appendix 2**.

The Eden Street access roadway design shown in **Figure 5** also includes the following in accordance with the planned Eden Street configuration as detailed within the *Arncliffe and Banksia Public Domain Plan & Technical Manual*:

- Two 3.5m wide through travel lanes within Eden Street and an indented parking lane along the eastern kerb alignment to the north of the proposed site access roadway;

- The removal of kerb-side parking and the provision of a 2.8m wide on-road dual lane bicycle path along the western kerb alignment;

- A 4.0m wide western verge to incorporate a 2.5m wide footpath and a 1.5m tree zone;

- A 3.1m wide eastern verge accommodating a 2.8m wide footpath; and

- A marked pedestrian crossing across the development access roadway setback approximately 3.2m from the eastern Eden Street kerb alignment.

It should also be acknowledged that the ingress lane of the access roadway has been designed to be capable of accommodating passing directly inside the property boundary in the unlikely event that a vehicle may breakdown within the development access roadway.

To further demonstrate the suitability of the proposed passenger vehicle access to Eden Street, this Practice has prepared several swept path plans, copies of which of which are attached as **Appendix 2**. These paths have been prepared utilising the architectural plans as a base, the Autoturn program and B99 passenger vehicles manoeuvring specifications obtained from AS2890.1:2004. These swept paths illustrate that the passenger vehicles can enter and exit the site via the above-described passenger vehicle access roadway in a safe and efficient manner.

The safety and efficiency of the access / egress movements are also proposed to be assisted by the provision of a relatively level (maximum of 1:20) grade for at least 20m inside the property boundary. It is further noted that sight distance between exiting vehicles and pedestrians within the eastern Eden Street footway is not proposed to be impeded by any obstructions to visibility in accordance with Figure 3.1 of AS2890.1:2004. In consideration of this and the above discussion, the proposed passenger vehicle access design is satisfactory.

3.1.1.5 Sight Distance

AS2890.1:2004 specifies a minimum sight distance requirement between a frontage road governed by a sign posted speed limit of 40km/h and a driveway of 55m.

The consistent vertical and horizontal alignment of Eden Street to the north of the development access roadway results in extensive sight distance between southbound Eden Street traffic flow and the development access location (being greater than 150m), thereby readily exceeding the minimum sight distance provisions of AS2890.1:2004.

The variable horizontal alignment of Eden Street to the south however limits sight distance between northbound Eden Street traffic flow and the development access location to 55m. Whilst this sight distance provision is somewhat limited, it should be acknowledged that the extent of sight distance adequately complies with the desirable specifications contained within AS2890.1:2004 based on the proposed reduced speed limit of 40km/h governing Eden Street.

The proposed extent of sight distance facilitated between the passenger vehicle access movements and abutting through Eden Street traffic flow is therefore considered to be appropriate. Notwithstanding the compliant sight distance provisions, it is proposed that the eastern Eden Street kerb-side parking be prohibited to the south of the site in order to further facilitate / improve sight

distance between the proposed site access roadway and to the south along Eden Street.

3.1.1.6 Queueing Assessment

A queueing analysis in accordance with Section 3.4 of AS2890.1:2004 has been provided with respect to the queueing area provisions associated with the vehicular access roadway that connects with Eden Street.

The Eden Street access roadway provides an approximately 50m long queueing area between the site boundary and the control point of the lower ground level parking area.

Table 3.3 within Section 3.4 of AS2890.1:2004 presents, that the queueing area required on approach to a control point is to be based upon the capacity of the car park and the peak hourly in-flow of traffic. As the development is proposed to provide two access points, it may be assumed that the Eden Street access roadway is to service half of the on-site parking provision. On this basis, it is considered that the Eden Street access roadway is to service approximately 407 parking spaces (being half of the total on-site parking provision). Additionally, it is considered that the hourly traffic generating ability of the site will not reach 75% of the capacity of the car park (see Section 8.1.2).

On the basis of the above, it is considered that the Eden Street access roadway is required to provide capacity for seven queued vehicles between the site boundary and the control point of the car park in accordance with Section 3.4 of AS2890.1:2004, equating to a queue length of 42m.

The provided approximate queuing capacity between the Eden Street property boundary and the internal development control point of 50m is accordingly considered to be satisfactory.

3.1.2 Princes Highway Deceleration Lane Access

3.1.2.1 Deceleration Lane Design

A deceleration lane connecting to an access ramp on the eastern boundary of the site is proposed adjacent to the northbound carriageway of Princes Highway to facilitate passenger vehicle ingress only to the on-site basement parking area. A concept sketch of the deceleration lane design has been prepared by BG&E, a copy of which is attached as **Appendix 3**.

The deceleration lane is proposed to commence approximately 80m to the north of the Forest Road and Princes Highway signalised intersection, equating to approximately four seconds of travel speed at 70km/h in accordance with specific requirements provided by TfNSW staff.

The proposed deceleration lane is therefore to provide the following design parameters in accordance with Austroads specifications:

- The total deceleration lane length (including diverge taper) is to be 55m in accordance with a maximum deceleration rate of 3.5m/s^2 and approach travel speed of 70km/h; and

- The deceleration lane diverge taper length is to be 12m, being calculated based on an approach travel speed of 70km/h and a deceleration lane width of 3m.

With respect to the above, it is considered that the use of a maximum deceleration rate of 3.5m/s^2 rather than the comfortable rate of 2.5m/s^2 is appropriate in this instance due to the following:

- The deceleration lane will not accommodate heavy vehicles;

- The development access lane arrangement provides for an additional length of approximately 25m to 30m past the end of the deceleration lane prior to turning towards the underground parking area; and

- The approach speed utilised has been 70km/h whereby the actual speed limit of Princes Highway is 60km/h.

In addition to the above, the following design elements are provided in association with the proposed deceleration lane adjacent to the northbound carriageway of Princes Highway:

- To appropriately account for the crossfall of Princes Highway in the subject site vicinity which is towards the western kerb alignment, two new drainage inlet pits are proposed at the outer edge of the deceleration lane;

- Heavy duty strip drains are proposed at the top and bottom of the access ramp to ensure water does not flow from Princes Highway into the basement parking area;

- At the completion of the deceleration lane, a slight alignment change is provided within the vehicular access ramp allowing appropriate separation between the northbound Princes Highway kerb-side lane and the basement access ramp, facilitating the accommodation of a crash cushion on approach to the Type F barrier which is to separate the access ramp from the northbound highway travel lanes;

- A similar barrier is to be provided on the western side of the access ramp to effectively separate vehicular access movements from pedestrian movements along the western Princes Highway footpath; and

- The access ramp will drop below the western Princes Highway footpath as it continues in a northerly direction into the basement parking area thereby ensuring unimpeded pedestrian movements within the western Prince Highway footpath and no conflict between pedestrians and vehicles accessing the site.

Notwithstanding the above, the specific elements with respect to the formulation of the design of the deceleration lane connecting with Princes Highway are subject to detailed design, which can reasonably be imposed as a condition of consent. Further, it is acknowledged that TfNSW will require the deceleration design to be subject to an independent Road Safety Audit.

3.1.2.2 Queueing Assessment

Similar to that presented within Section 3.1.1.6 of this report, a queueing analysis in accordance with Section 3.4 of AS2890.1:2004 has also been provided with respect the vehicular access lane that connects the deceleration lane and the basement parking area.

The access lane connecting with the declaration lane provides approximately 54m long queueing area between the site boundary and the control point of the lower ground level parking area, taking into account that the access lane widens to form two lanes on approach to the boom gate within the first basement level parking area. Such an extent of queuing readily complies with the minimum required queuing area of 42m as presented within Section 3.1.1.6 of this report and accordingly, is accordingly considered to be satisfactory.

It is also noted that although that there is a distance of 54m inside the property, there is also an additional 75m (55m deceleration lane plus approximately 20m from the end of the deceleration lane to the property boundary) which provides a total of approximately 125m between the control point and Princes Highway.

To further minimise the risk of queuing within the site prior to the control point, it is recommended that Automatic License Place Recognition be implemented across the site. The automatic nature of the system means that vehicles either do not have to stop or only have to pause for a short time when entering a car park. An example video showing a vehicle entering a car park using license place recognition is shown in the following link youtube.com/watch?v=Upc7Lzn6zCE.

Surveys undertaken at other sites utilising license place recognition by staff at this Practice have shown a capacity of greater than 600 vehicles per lane for ingress traffic. Utilising queuing theory as outlined in Austroads guide to traffic generating development Part 2 and conservatively assuming a capacity of 800 vehicles per hour (400 vehicles per lane), and an inbound flow of 200 vehicles per hour, results in a 98th percentile queue of 3 vehicles.

This Practice has also prepared a SIDRA model to confirm the analysis undertaken which shows that based on all vehicles having to come to a complete stop, a 95th percentile queue is expected.

This analysis confirms that the queuing length which accords with AS2890.1:2004 is considered satisfactory and the development is not expected to impact Princes Highway from vehicles entering the basement.

3.2 Service Vehicle Access

In order to address Council's concerns with respect to pedestrian safety and the previously proposed separate service vehicle and passenger vehicle access driveways, development access to Eden Street has been rationalised into a single access roadway shown in **Figure 5**. In this regard, service vehicle access is proposed between the dedicated on-site loading area and Eden Street via the previously presented development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site. The rationalisation of the loading area and the passenger vehicle accesses reduces effectively the width of roadway crossings pedestrians within Eden Street are required to negotiate.

AS2890.2:2018 provides driveway design specifications based on the largest vehicle required to be serviced and the functional order of the access road. On the basis of Eden Street providing a minor (non-arterial) function and the development being expected to accommodate vehicles up to and including AVs, Figure 3.1 of AS2890.2:2018 specifies, at minimum, a 12.5m wide combined ingress / egress driveway be provided.

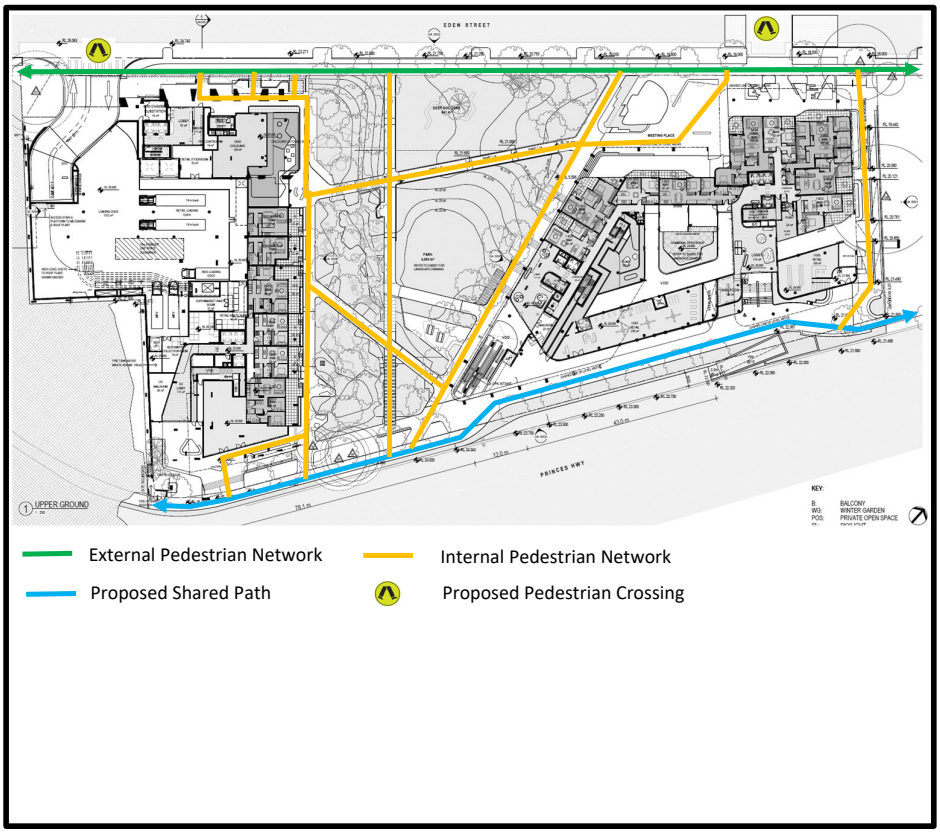
The proposed access roadway connecting with Eden Street provided via a standard T-junction arrangement operating under 'Stop' signage control, is to provide a total width of 12.8m, being measured at the property boundary.

Notwithstanding the above, in order to undertake a functional assessment of the suitability or otherwise of the access arrangements, a series of swept path plans have been prepared, copies of which are included as **Appendix 2**. These plans indicate that the largest vehicles required to service the site (14.5m long AVs) are capable of entering and exiting the site via the movements previously described without unreasonable encroachment on driveway extents, internal development obstructions and potential adjoining public road kerb-side parking, whereby a 'No Left Turn: Vehicles Under 9m Long Excepted' restriction applies to exiting vehicles. In consideration of this and the abovementioned discussion, the proposed service vehicle access design is satisfactory.

3.3 Pedestrian Access

Pedestrian connectivity between the development and the eastern Eden Street footpath and the western Princes Highway footpath is proposed via a series of paths linking directly with the development buildings which are shown in **Figure 6**.

FIGURE 6
PROPOSED PEDESTRIAN CONNECTIVITY



As shown in **Figure 6**, a pedestrian crossing within the property boundary across the access roadway connecting with Eden Street is also proposed to facilitate safe pedestrian connectivity across the development access roadway.

Through site pedestrian links are proposed between Eden Street and Princes Highway adjacent to the northern boundary via a dedicated pedestrian link as well as central to the site via the public park.

Further to the above, the following external works are proposed adjacent to and in the immediate vicinity of the site in order to ensure the development integrates into the precinct in a safe and efficient manner:

- A raised marked pedestrian crossing over Eden Street directly adjacent to The Arcade to facilitate safe and efficient connectivity between Princes Highway, the site and Arncliffe Railway Station; and

- The provision of a shared pedestrian / cycle path along the western Princes Highway footway, between Forest Road and Burrows Street.

4. PARKING CONSIDERATIONS

4.1 Market Resident Vehicular Parking Provision

The market residential buildings are proposed to be serviced by a shared basement parking area providing a resident parking yield of 564 spaces.

4.1.1 Council's Requirements

Bayside Council relies of the following off-street resident parking rates for market residential flat buildings within RDCP 2011:

1 space per 1 or 2 bedroom dwelling
2 spaces per 3 or more bedroom dwelling

Table 2 identifies the off-street parking required to satisfy RDCP 2011.

TABLE 2
OFF-STREET MARKET RESIDENT PARKING REQUIREMENTS
ROCKDALE DEVELOPMENT CONTROL PLAN 2011

Measure	No. Dwellings	Spaces Required
1 bedroom	223	223
2 bedroom	199	199
3 bedroom	142	284
	Total	**706**

Table 2 indicates that according to RDCP 2011 the proposed development requires a minimum of 706 off-street market resident spaces.

The proposed market resident parking provision of 564 resident spaces represents a parking shortfall of 142 parking spaces in accordance with RDCP 2011.

4.1.2 Discussion on Requirements

The previous sub-section of this report presents that the development provides a market resident parking shortfall of 142 spaces in accordance with RDCP 2011. The RDCP 2011 market resident parking requirements are significantly in excess of other local government areas. The Bayside Local Government Area is large and contains a great variety of development scale and density and similarly, provides varying accessibility to public transport infrastructure. The higher requirement for market residential parking is acknowledged and supported in areas with poor accessibility to public transport, however the subject site is provided within extremely accessible walking distance to Arncliffe Railway Station. Further, a number of bus routes operate within 200m walking distance of the site, providing connectivity to regular, frequent and varied modes of public transport within the context of the Local Government Area. A more detailed discussion in regards to proximity to public transport is contained within Section 6.4 of this report.

In regard to the above, the Department of Planning & Environment's *Apartment Design Guide* provides consistent planning and design standards for apartments across the State. It provides design criteria and general guidance about how development proposals can achieve the design quality principles identified in SEPP 65 *(State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development)*.

Objective 3J-1 of the *Apartment Design Guide* specifies that development within 800m of a railway station or light rail stop in the Sydney metropolitan area are to use the minimum car parking requirement for residential developments as set out in TfNSW' *Guide to Traffic Generating Developments*, or the car parking requirement prescribed by the relevant council, whichever is less.

Table 3 below provides the market resident parking requirements for high density residential flat buildings located within Metropolitan Sub-Regional Centres contained within section 5.4.3 of *TfNSW' Guide to Traffic Generating Developments*.

TABLE 3
OFF-STREET MARKET RESIDENT PARKING REQUIREMENTS
TfNSW'S GUIDE TO TRAFFIC GENERATING DEVELOPMENTS

Item	Rate	Yield	Spaces Required
1 bedroom dwellings	0.6 spaces per dwelling	223	134
2 bedroom dwellings	0.9 spaces per dwelling	199	180
3/4 bedroom dwellings	1.4 spaces per dwelling	142	199
		Total	**513**

As the site is located within 800m of Arncliffe Railway Station, the minimum parking requirements applicable to the development are those specified by TfNSW' *Guide to Traffic Generating Developments*. Application of the abovementioned rates to the development results in a parking requirement of 513 market resident spaces. The proposed parking provision of 564 resident spaces therefore accords with this requirement and accordingly, is considered to be satisfactory.

4.2 Market Residential Visitor Vehicular Parking Provision

The market residential buildings are proposed to be serviced by a shared basement parking area providing 75 residential visitor parking spaces.

4.2.1 Council's Requirements

Bayside Council relies of the following off-street residential visitor parking rates for market residential flat buildings within RDCP 2011:

1 space per 5 dwellings

On the basis of 564 market residential dwellings, RDCP 2011 requires a minimum of 113 off-street visitor space to satisfy the control plan.

The proposed market residential visitor parking provision of 75 resident spaces represents a parking shortfall of 38 parking spaces in accordance with RDCP 2011.

4.2.2 Discussion on Requirements

The previous sub-section of this report presents that the development provides a market residential visitor parking shortfall of 38 spaces in accordance with RDCP 2011. The previous discussion with respect to a market resident parking reduction being appropriate within the subject site, given the proximity of the site to public transport infrastructure, also applies to the market residential visitor demands.

In regard to the above, Objective 3J-1 of the *Apartment Design Guide* relied upon by SEPP 65 *(State Environmental Planning Policy No 65 - Design Quality of Residential Apartment Development)*, specifies that development within 800m of a railway station within the Sydney metropolitan area may apply parking rates for visitors as set out within TfNSW's *Guide to Traffic Generating Developments*. This publication provides the following with respect to visitor parking for high density developments:

> *The recommended minimum number of off-street visitor parking spaces is one space for every 5 to 7 dwellings. Councils may wish to reduce this requirement for buildings located in close proximity to public transport, or where short-term unit leasing is expected.*

The immediate proximity of the site to Arncliffe Railway Station, combined with the potential for mixed use trips associated with the retail component of the development is such that it is appropriate to apply a reduced market residential visitor parking rate to the subject development. In this regard, the proposed visitor parking provision of 75 spaces required to service a total of 564 market dwellings equates to approximately one visitor parking space per 7.5 dwellings, thereby according with the abovementioned intent of TfNSW's *Guide to Traffic Generating Developments*.

4.3 Social Resident Vehicular Parking Provision

The social housing building is proposed to be serviced by basement parking containing 80 off-street passenger vehicle parking spaces. These spaces are to be specifically allocated to residents.

4.3.1 ARH SEPP Requirements

The ARH SEPP provides state wide relevant parking requirements for in fill affordable housing. Clause 14(2)(a)(ii) of the ARH SEPP states the following with respect to car parking:

14. Standards that cannot be used to refuse consent

(2) A consent authority must not refuse consent to development to which this Division applies on any of the following grounds:

(a) parking if:

(i) in the case of a development application made by a social housing provider for development on land in an accessible area – at least 0.4 parking spaces are provided for each dwelling containing 1 bedroom, at least 0.5 parking spaces are provided for each dwelling containing 2 bedrooms and at least 1 parking space is provided for each dwelling containing 3 or more bedrooms.

(ii) In any other case, at least 0.5 parking spaces are provided for each dwelling containing 1 bedroom, at least 1 parking space is provided for each dwelling containing 2 bedrooms and at least 1.5 parking spaces are provided for each dwelling containing 3 or more bedrooms.

Clause 4(1) of the ARH SEPP defines 'accessible area' as *land that is within:*

(a) 800 metres walking distance of a public entrance to a railway station or a wharf from which a Sydney Ferries ferry service operates, or

(b) 400 metres walking distance of a public entrance to a light rail station or, in the case of a light rail station with no entrance, 400 metres walking distance of a platform of the light rail station, or

(c) 400 metres walking distance of a bus stop used by a regular bus service (within the meaning of the Passenger Transport Act 1990) that has at least one bus per hour servicing the bus stop between 06.00 and 21.00 each day from Monday to Friday (both days inclusive) and between 08.00 and 18.00 on each Saturday and Sunday.

Table 4 below provides the social resident parking requirements applicable to the development as the social housing component of the development is to be provided for a social housing provider (LAHC) and is located within 800m walking distance of Arncliffe Railway Station.

TABLE 4
OFF-STREET SOCIAL RESIDENT PARKING REQUIREMENTS
ARH SEPP

Item	Rate	Yield	Spaces Required
1 bedroom dwellings	0.4 spaces per dwelling	100	40
2 bedroom dwellings	0.5 spaces per dwelling	63	32
3/4 bedroom dwellings	1.0 space per dwelling	8	8
		Total	**80**

Table 4 indicates that the development cannot be refused on the grounds of parking in the event that 80 social resident parking spaces are provided.

The proposed social resident parking provision of 80 spaces therefore complies with the minimum requirements of the ARH SEPP and accordingly is considered to be satisfactory.

4.4 Retail Vehicular Parking Provision

The retail component of the development is proposed to be serviced by a shared parking area situated at lower ground level providing 78 retail spaces.

4.4.1 Council's Requirements

Bayside Council relies of the following off-street resident parking rates for retail and commercial developments within RDCP 2011:

1 space per 40m^2 GFA

Based on 3,113m^2 retail floor space being proposed, the following calculation is provided with respect to the abovementioned RDCP 2011 requirement:

(3,113m^2 / 40m^2) = 77.8 (adopt 78 spaces)

RDCP 2011 therefore requires the provision of 78 vehicular parking spaces to service the retail component of the development.

The proposed retail passenger vehicle parking provision of 78 spaces is accordingly considered to be satisfactory.

4.5 Child Care Centre Vehicular Parking Provision

The child care centre component of the development is proposed to be serviced by six (6) spaces within the lower ground floor level, comprising four (4) child care centre staff parking spaces and two (2) child care centre visitor parking spaces.

4.5.1 Council's Requirements

Bayside Council relies of the following off-street resident parking rates for child care centres within RDCP 2011:

1 space per 20 children
1 space per two members of staff

Based on a 40-place child care centre requiring eight staff members, the following calculation is provided with respect to the abovementioned RDCP 2011 requirement:

(40 / 20) + (8 / 2) = 6 spaces

RDCP 2011 therefore requires the provision of six (6) vehicular parking spaces to service the child care centre component of the development.

The proposed child care centre passenger vehicle parking provision of six (6) spaces with four (4) spaces allocated to staff of the centre and two (2) spaces allocated to visitors is accordingly considered to be satisfactory.

4.6 Other Vehicular Parking Provision

4.6.1 Car Wash

Section 7.5.5 of *The Rockdale Technical Specification Stormwater Management* indicates that the development is required to provide car wash bays at a rate of 1 bay per 60 units and are to be dimensioned as 3.5m wide bays. Council has specified that a number of car wash bays may be shared as a visitor parking space.

One the basis of the above and a total residential yield of 744 dwellings, the development is required to provide 12.4 (adopt 13) car wash bays.

Accordingly, 14 car wash bays are proposed within the third basement level, each providing a width of 3.5m and being shared with a residential visitor parking space.

The proposed car wash bay provision is considered to be satisfactory.

4.6.2 Car Share

RDCP 2011 does not provide car share requirements relevant to the proposed development. Notwithstanding this, it is considered desirable that a development of this size provide convenient access to car share infrastructure. Council has accordingly required that car share parking spaces be provided at a rate of 1 space per 100 market housing dwellings.

Additionally, Council officers have specified the requirement for all car share spaces to pe located internally within the development site and not to be provided on-street.

Therefore, it is accordingly proposed that six (6) car share spaces be provided, within the basement parking area, comprising approximately one car share bay per 94 market dwellings.

4.6.3 Electric Charge Points

RDCP 2011 does not provide electric charge point requirements relevant to the proposed development. Notwithstanding this, Council has specified that 20% of all required parking spaces are to be equipped with electric charging facilities.

Whilst it is considered desirable that a development of the subject scale provide some level of convenient access to electric car charging infrastructure. There are however no known specifications which provide developers with directions on what the extent of charging infrastructure is appropriate. Indeed, Council does not provide electric car charge point requirements within its planning policy. In this regard, the noted Council requirement of a flat 20% rate across all parking spaces doesn't appear to be based upon any established government policy.

Electric car sales account for approximately 1.5% of all car sales in Australia to date in 2021 (up to August 2021). Whilst it is acknowledged that the market share has increased in recent times, with electric cars accounting for approximately 0.2% in 2018 in Australia, the provision of dedicated infrastructure for 20% of all off-street car parking spaces accordingly appears excessive.

According to a parking provision of 78 retail parking spaces and 719 residential parking spaces, 16 retail and 144 residential parking spaces are to be equipped with electric charge points to accord with Council's site-specific requirements.

Whilst it has been proposed that six retail parking spaces and 10 residential visitor parking spaces are to be specifically fitted with electric charging facilities, an allowance has been provided for the potential to fit out the 144 residential parking spaces with electric charging capabilities as required. It is therefore considered that residents who require electric charging for their vehicle will have the ability to fit out their specific parking space with charging capabilities through contacting the development management.

4.6.3 Service Vehicle Parking

The proposed primary ground floor loading area is proposed to provide the following servicing vehicle accommodation areas:

- Two bays capable of accommodating vehicles up to and including 14.5m long AVs;
- One bay capable of accommodating vehicles up to and including 12.5 long HRVs; and
- Three bays capable of accommodating vehicles up to and including 8.8m long MRVs.

Notwithstanding the above generous off-street heavy vehicle accommodation areas, it is acknowledged that Council officers have raised specific concerns with respect to the ability of deliveries to Towers A and B, given their separation from the at-grade designed loading area. In order to address these concerns the development has been amended to provide four designated van loading bays within the northern and southern portions of the first basement level. It is considered that these additional loading bays appropriately address Council's concerns and are therefore satisfactory.

4.7 Bicycle Parking

RDCP 2011 provides the following bicycle parking requirements relevant to the subject development:

1 space per 10 market residential dwellings

1 space per 200m^2 of retail floor space, with 15% of these to be accessible to visitors

1 space per 10 children associated with the child care centre

The following calculations are accordingly provided with respect to RDCP 2011:

Market Resident Bicycle Parking Demand
(564 / 10) = 57 spaces

Retail Bicycle Parking Demand
(3,353m^2 / 200m^2) = 17 spaces, 4 of which are to be accessible to visitors

Child Care Centre Bicycle Parking Demand
(40 / 10) = 4 spaces

RDCP 2011 therefore requires a minimum of 74 bicycle parking spaces to service the development, comprising 57 resident spaces, 13 retail staff spaces, four (4) retail customer spaces and four (4) child care centre spaces.

Notwithstanding this, Council officers have required a site-specific bicycle parking provision for market residential dwellings of one space per two dwellings. Incorporating these site-specific requirements, the DCP resident bicycle parking requirement of 57 spaces increases to 282 spaces.

The development provides the following minimum bicycle parking provision:

- 372 resident storage cages, which are capable of accommodating bicycles, within the basement parking levels;
- 18 bicycle parking spaces dedicated to the retail component of the development provided within the lower ground parking area and in close proximity to appropriate end of trip facilities; and
- Four bicycle parking spaces dedicated to the child care centre component within the lower ground floor parking area and in close proximity to appropriate end of trip facilities.

Whilst it is acknowledged that Council has raised concerns with respect to the parking of resident bicycles within storage cages, the proposed arrangements are considered to be satisfactory for the following reasons:

- The storage of bicycle within individual cages provides a greater level of security than designated bicycle storage rooms;
- The use of apartment storage cages for bicycle storage is consistent with other Council requirements; and
- Oversize storage cages are provided to ensure that the potential accommodation of bicycles does not impact the normal requirement for storage volume (a schedule demonstrating such is provided by others under separate cover).

The proposed total minimum bicycle parking provision of 394 parking spaces is accordingly compliant with or readily exceeds the relevant RDCP 2011 and Council's site-specific parking requirements and is accordingly considered to be satisfactory.

4.8 Motorcycle Parking

RDCP 2011 provides the following motorcycle parking requirements relevant to the subject development:

1 space per 15 market residential dwellings

1 space per 20 retail car spaces

The following calculations are accordingly provided with respect to RDCP 2011:

Market Resident Demand
(564 / 15) = 38 spaces
Retail Parking Demand
(78 / 20) = 3.9 (adopt 4) spaces

RDCP 2011 therefore requires a minimum of 42 motorcycle parking spaces to service the development, comprising 38 resident spaces and four (4) retail spaces.

The development provides the following motorcycle parking provision:

- 50 market resident motorcycle spaces within the lower ground and basement parking levels;
- 12 social resident motorcycle spaces within the basement parking levels; and
- Five (5) retail spaces within the lower ground parking area.

The proposed motorcycle parking provision is accordingly compliant with or exceeds the relevant RDCP 2011 parking requirements and is accordingly considered to be satisfactory.

5. INTERNAL CIRCULATION & MANOEUVRABILITY

5.1 Passenger Vehicle Parking Areas

Upon entry into the site via either the access roadway connecting with Eden Street or the deceleration lane access from Princes Highway, passenger vehicles will travel in a forward direction to immediately access either of the following:

- The retail customer parking area situated within the first basement level; or
- The child care centre parking area within the upper ground parking area; or
- The residential parking areas throughout all parking levels.

The passenger vehicle parking levels comprise a series of parking aisles, primarily servicing standard rows of 90-degree parking spaces, although a small number of parallel parking spaces are also proposed. The passenger vehicle within the parking areas have been designed to accord with the following minimum dimensions in accordance with the requirements of AS2890.1:2004 and AS2890.6:2009:

- 90-degree resident, residential visitor and child care centre staff parking space width = 2.4m;
- 90-degree child care centre visitor parking space width = 2.6m;
- 90-degree retail customer parking space width = 2.7m;
- 90-degree disabled parking space width = 2.4m (with adjoining 2.4m wide shared area);
- 90-degree small parking space width = 2.3m;
- Parallel parking space width = 2.1m;
- Additional vehicular space width where parking spaces adjoins an obstruction = 0.3m;
- Standard and disabled 90-degree vehicular parking space length = 5.4m;
- Parallel parking space length = 6.6m;
- Vehicular parking aisle width adjoining 90-degree residential and child care centre parking spaces = 5.8m;
- Vehicular parking aisle width adjoining 90-degree retail parking spaces = 6.2m;
- One-way straight roadway / ramp width = 3m;

- Two-way straight roadway / ramp width = 5.5m;
- Minimum separation of one-way roadways = 0.6m;
- Parking aisle extension past dead end parking bays = 1.0m;
- Headroom = 2.2m;
- Headroom above disabled parking spaces and adjoining shared areas = 2.5m;
- Maximum ramp grade servicing residential parking areas = 1:4;
- Maximum ramp grade servicing retail parking areas = 1:5;
- Maximum change in grade = 1:8; and
- Maximum grade within 6m of the property boundary = 1:20.

Safe and efficient internal manoeuvring and parking space accessibility is anticipated to result, taking into consideration the above compliance with the relevant AS2890.1:2004 and AS2890.6:2009 specifications.

In order to demonstrate the internal passenger vehicle manoeuvrability within the vicinity of these areas and generally throughout the overall parking areas, this Practice has prepared a number of swept path plans which are included as **Appendix 2**. The turning paths provided on the plans have been generated using Autoturn software and derived from B85 and B99 vehicle specifications provided within AS2890.1-2004.

Section B4.4 of AS2890.1-2004 states the following with regard to the use of templates to assess vehicle manoeuvring:

'Constant radius swept turning paths, based on the design vehicle's minimum turning circle are not suitable for determining the aisle width needed for manoeuvring into and out of parking spaces. Drivers can manoeuvre vehicles within smaller spaces than swept turning paths would suggest.'

It would therefore appear that whilst the turning paths provided within AS 2890.1 - 2004 can be utilised to provide a 'general indication' of the suitability or otherwise of internal parking and manoeuvring areas, vehicles can generally manoeuvre more efficiently than the paths indicate. Notwithstanding this, the swept path plans illustrate that passenger vehicles can manoeuvre throughout vehicle parking areas, incorporating minor amendments to the submitted design plans as highlighted within the swept path plans. Safe and efficient internal manoeuvring and parking space accessibility is anticipated to result, taking into consideration the above compliance with the relevant Australian Standards.

Further to the above, internal intersection priority will be required to appropriately govern opposing and / or conflicting turning movements.

5.2 Service Vehicle Areas

The subject site is anticipated to generate the requirement for the following heavy vehicle servicing:

- Regular residential waste collection by Council's 9.64m long refuse collection vehicle;
- Delivery and removalist activity associated with the residential dwellings by vehicles up to and including 8.8m long Medium Rigid Vehicles (MRVs);
- Retail delivery and waste collection by private contractor vehicles up to and including 14.5m long AVs.

All heavy vehicle servicing of the site is proposed to occur within the dedicated servicing area located at upper ground level, accessed via the access roadway forming an intersection with Eden Street. It is proposed that vehicles over 9m in length will be required to turn right out of the site from the site access roadway through appropriate 'No Left Turn – Vehicles Under 9m Long Excepted' signage at the access roadway connection to Eden Street.

The servicing area is proposed to provide the following dedicated loading bays:

- Two bays capable of accommodating 14.5m long AVs;
- One bay capable of accommodating Council's 9.64m long refuse collection vehicle or a 12.5m long HRV; and
- Three bays capable of accommodating MRVs.

The internal servicing area is proposed to provide the following design characteristics according with AS2890.2:2018:

- Minimum two-way roadway width = 12.5m;
- Maximum grade within 6m of the site boundary = 1:20;
- Loading bay width = 3.5m;
- AV loading bay length = 14.5m;
- Council refuse collection vehicle loading bay length = 12.5m;
- MRV loading bay length = 9m; and
- Clearance = 4.5m.

Further to the above, a series of swept path plans have been prepared and included as **Appendix 2** which demonstrate the manoeuvring of the largest vehicles expected to service the site. These paths indicate that the proposed site design is capable of accommodating the manoeuvring requirements of heavy

vehicles to and from the loading area. In consideration of this and the above discussion, the subject development design is considered to be capable of accommodating the largest vehicles expected to service the site in a safe and efficient manner.

It is considered that further details with respect to governing the management of the loading area operation may be provided through the preparation of a Loading Dock Management Plan. The preparation of this Plan could reasonably be imposed as a condition of consent.

5.3 Bicycle Parking Areas

The bicycle storage cages / parking rails provide the following minimum design parameters in accordance with the relevant specifications of AS2890.3:2015:

- Double sided open bicycle rail length = 1.8;
- Open bicycle rail separation = 1.0m;
- Aisle width adjoining open bicycle rails = 1.5m;
- Enclosed storage cage width = 0.7m;
- Enclosed storage cage length = 1.8m; and
- Aisle width adjoining enclosed storage cages = 2m.

5.4 Motorcycle Parking Areas

The motorcycle parking spaces within the development have been designed to accord with the following base dimensions in accordance with AS2890.1:2004:

- Space width = 1.2m;
- Space length = 2.5m; and
- Minimum aisle width = 5.8m.

6. EXISTING TRANSPORT CONDITIONS

6.1 Surrounding Road Network

The following provides a description of the surrounding road network:

- **Princes Highway** performs a State Road function under the care and control of TfNSW. Within the Sydney metropolitan area context, Princes Highway provides a major north-south connection between King Street and Sydney Park Road at Newtown in the north and Old Princes Highway / Acacia Road at Kirrawee in the south.

  Princes Highway, in the vicinity of the subject site, primarily provides three lanes in each direction. Pavement widening and a raised concrete median is provided on approach to major junctions to facilitate exclusive turning lanes.

  Clearway parking restrictions apply along the northbound and southbound kerb-side travel lanes during the morning peak period (6:00am – 10:00am) and the afternoon peak period applies for the northbound kerb-side travel lane (3:00pm – 7:00pm) on weekdays to facilitate three unobstructed traffic lanes.

  Princes Highway forms an intersection with Burrows Street approximately 100m to the north of the subject site, operating under traffic signal control. The right turn movement from the southbound Princes Highway onto Burrows Street is restricted via the extension of the concrete median into the intersection. Further, Kyle Street is restricted to an entry-only one-way eastbound function at the intersection, and through movements from Burrows Street to Kyle Street are prohibited.

  Princes Highway forms an intersection with Forest Road and Wickham Street approximately 30m to the south of the site, also operating under traffic signal control. Left turn movements at this intersection are facilitated through slip lanes at each approach, with the left turn movement from Forest Road to the Highway being signalised. Right turn movements from Forest Road and Wickham Street to Princes Highway are prohibited. Dedicated right turn lanes within the northbound and southbound Princes Highway approaches to this intersection provide tidal lane lengthening by virtue of removable bollards within the travel lanes, being further indicated through the provision of adjustable signage indicating the number of operational through lanes. During the morning peak period, the right turn lane on the northbound approach is lengthened from approximately 75m to 225m. Conversely, during the afternoon, the right turn lane on the southbound approached in lengthened from approximately 100m to 200m.

  Traffic flow on Princes Highway within the vicinity of the site is governed by a sign posted speed limit of 60km/h.

- **Forest Road** performs a State Road function under the care and control of TfNSW, providing a north-east / south-west alignment and facilitating connectivity between Princes Highway / Wickham Street in the immediate vicinity of the site and Croydon Road at Hurstville in the south-west.

  In the vicinity of the site, Forest Road provides a pavement width of approximately 12.8m, generally facilitating two through lanes of traffic in each direction. Clearway parking restrictions apply along the westbound and eastbound kerb-side travel lanes during the morning peak period (6:00am – 10:00am) and the afternoon peak period (3:00pm – 7:00pm) on weekdays to facilitate two unobstructed traffic lanes.

  Forest Road forms a cross intersection with Firth Street and Somerville Street operating under traffic signal control. Right turn movements from Somerville Street to Forest Road and from Forest Road to Somerville Street are prohibited. Left turn movements form Firth Street to Forest Road are facilitated through a slip lane.

  Forest Road forms T-junctions with a series of lower order access roads within the precinct, such as Eden Street, Wardell Street and Barden Street operating under major / minor priority control with Forest Road forming the priority route in each instance.

  Traffic flow within Forest Road is governed by a speed limit of 60km/h; however, a 40km/h speed limit applies adjacent to the subject site during prescribed school start and finish times associated with St Francis Xavier's Catholic Primary School.

- **Eden Street** performs an access function, providing a north-south alignment between Forest Road in the south and Burrows Street in the north.

  Eden Street provides a 12.8m wide pavement, generally providing one through lane of traffic in each direction in conjunction with unrestricted kerb-side parking along both kerb alignments.

  Eden Street forms an intersection with Burrows Street to the north of the site, operating under 'Give Way' signage control with Burrows Street forming the priority route.

  Traffic flow within Eden Street is governed by a 50km/h speed limit and an undesignated load limit.

- **Burrows Street** performs a minor collector function between Princes Highway in the east and Arncliffe Street in the west. Burrows Street provides a primary access to a commuter car parking area situated directly to the east of the Arncliffe Railway Station.

  Burrows Street forms a 14m wide pavement between Princes Highway and Eden Street, providing two eastbound approach lanes to the Highway and one departure lane from the Highway, in conjunction with parallel parking along the southern kerb alignment. To the west of Eden Street, Burrows Street

widens to provide a 16m wide pavement providing one through lane of traffic in each direction in conjunction with 90-degree and parallel parking along the northern and southern kerb alignments, respectively.

Traffic flow within Burrows Street is governed by a 50km/h speed limit.

- **Arncliffe Street** performs a minor collector road function to the north of Allen Street and otherwise performs a local access road function to the south of Allen Street. Arncliffe Street provides a north-south alignment facilitating a connection between Brodie Spark Drive in the north and Burrows Street in the south. To the north of Guess Avenue, Arncliffe Street provides a one-way northbound traffic function.

  Arncliffe Street provides a variable wide pavement width, facilitating the provision of one through lane of traffic in each direction in conjunction to sections of parallel parking along one or both kerb alignments.

  Arncliffe Street forms an intersection with Allen Street and Wollongong Road, operating under one lane circulating roundabout control. Left turn movements from the northern Arncliffe Street approach are facilitated by the provision of a left turn slip lane.

  Arncliffe Street forms T-junctions with a series of low order access roads in the vicinity of the site including Guess Avenue, Willis Street and Ann Street, operating under major / minor priority control with Arncliffe Street forming the priority route in each instance.

  Traffic flow within Arncliffe Street is governed by a speed limit of 50km/h.

- **Brodie Spark Drive,** performs a collector road function under the care and control of Bayside Council, facilitating connectivity between the Wolli Creek residential precinct to west and Princes Highway.

  Brodie Spark Drive provides a varying pavement width, widening on approach to the Princes Highway, facilitating the provision of four lanes on approach to the Highway, being separated from two lanes on departure from the Highway, by a vegetated median. Further, parallel parking is provided along the northern kerb alignment of Brodie Spark Drive is provided via indented parking bays, on approach to the Princes Highway.

  Directly to the west of Princes Highway, Brodie Spark Drive forms a roundabout controlled intersection with Magdalene Terrace and Arncliffe Street, being governed by roundabout control. As Magdalene Terrace provides a one-way eastbound traffic function, turning movements into Magdalene Terrace are prohibited.

- **Firth Street** performs a minor collector road function between Forest Road in the south and Wollongong Road in the north. Firth Street forms an 11m wide pavement, generally providing one through lane of traffic in each direction in conjunction with kerb-side parking along both alignments.

Firth Street forms a T-junction with Wollongong Road at its northern road extremity, operating under roundabout control.

Traffic flow within Firth Street is governed by a speed limit 40km/h speed limit consistent with the high pedestrian activity area speed limit associated with Arncliffe Railway Station.

6.2 Existing Traffic Volumes

This Practice has commissioned the undertaking of morning and afternoon peak period traffic surveys of the following junctions in order to accurately ascertain existing traffic demands within the immediate precinct:

- The signalised junction of Princes Highway and Brodie Spark Drive;
- The roundabout-controlled intersection of Brodie Spark Drive, Arncliffe Street and Magdalene Terrace;
- The roundabout-controlled intersection of Arncliffe Street, Allen Street and Wollongong Road;
- The roundabout-controlled junction of Wollongong Road and Firth Street;
- The signage-controlled intersection of Burrows Street and Eden Street;
- The signalised intersection of Burrows Street, Princes Highway and Kyle Street;
- The signalised intersection of Princes Highway, Forest Road and Wickham Street;
- The signage-controlled intersection of Forest Road, Eden Street and Wardell Street; and
- The signalised intersection of Forest Road, Firth Street and Somerville Street.

Surveys were undertaken between 7:00am – 9:30am and 4:00pm – 6:00pm on Tuesday, the 30th of March 2021 in order to capture the peak weekday operational periods. Surveys were also undertaken between 11:00am – 1:00am on Saturday, the 24th of April 2021.

It is acknowledged that Council has raised concerns regarding the validity of the above traffic counts due to the prevailing impacts of the COVID-19 pandemic on travel behaviours throughout Sydney and the greater metropolitan area. This is however disputed as there was no lockdowns or COVID-19 travel restrictions in effect during the specific period within March and April 2021, when the traffic counts occurred according health.nsw.gov.au. Further, TfNSW have undertaken detailed analysis / peer review of the submitted road network analysis and have not raised any concerns with respect to the validity of the surveyed traffic volume data.

Table 5 below provides a summary of the surveyed peak hour traffic demands throughout the surrounding public road network for each period, being 7:45am – 8:45am on weekday mornings, 5:00pm – 6:00pm on weekday afternoons and 11:45am – 12:45pm on Saturdays, whilst more detailed summaries are provided as **Appendix 3**. It should be noted, for the purpose of this assessment, Princes Highway has been considered to provide a northbound and southbound traffic function.

TABLE 5
EXISTING MORINING AND AFTERNOON PEAK HOUR TRAFFIC VOLUMES

Road	Weekday AM Peak			Weekday PM Peak			Saturday Peak		
	NB / EB	SB / WB	Total	NB / EB	SB / WB	Total	NB / EB	SB / WB	Total
Princes Highway									
North of Brodie Spark Dr	3,127	1,203	4,330	1,758	2,875	4,633	2,308	2,053	4,361
South of Brodie Spark Dr	2,863	1,208	4,071	1,867	2,697	4,564	2,236	1,887	4,123
North of Burrows St	1,948	733	2,681	980	2,316	3,296	1,294	1,366	2,660
South of Burrows St	1,963	866	2,829	998	2,450	3,448	1,307	1,548	2,855
North of Forest Rd	1,902	870	2,772	965	2,449	3,414	1,284	1,543	2,827
South of Forest Rd	2,152	652	2,804	971	1,777	2,748	1,321	1,116	2,437
Forest Road									
East of Princes Hwy	1,625	766	2,391	1,028	1,105	2,133	1,105	756	1,861
West of Princes Hwy	1,369	978	2,347	1,014	1,769	2,783	1,053	1,168	2,221
East of Eden St	1,372	989	2,361	1,003	1,763	2,766	1,040	1,162	2,202
West of Eden St	1,365	911	2,276	1,003	749	1,752	1,053	1,138	2,191
East of Firth St	1,366	914	2,280	1,003	1,748	2,751	1,048	1,120	2,168
West of Firth St	1,262	787	2,049	953	1,609	2,562	1,012	1,038	2,050
Brodie Spark Drive									
West of Princes Hwy	588	319	907	453	740	1,193	559	653	1,212
East of Arncliffe St	600	319	919	433	738	1,171	560	654	1,214
West of Arncliffe St	225	128	353	186	276	462	203	242	445
Burrows Street									
West of Princes Hwy	180	36	216	182	33	215	221	30	251
West of Eden St	217	73	290	192	59	251	205	52	257
Eden Street									
North of Burrows St	5	2	7	8	1	9	9	17	26
South of Burrows St	58	55	113	55	30	85	46	21	67
North of Forest Rd	50	34	84	41	26	67	41	15	56
South of Forest Rd	27	82	109	33	32	65	6	17	23
Arncliffe Street									
South of Brodie Spark Dr	-	318	318	-	714	714	-	606	606
North of Allen St	187	257	444	187	507	694	160	435	595
South of Allen St	81	228	309	67	182	249	66	209	275
Firth Street									
South of Wollongong Rd	260	133	393	217	136	353	236	160	396
North of Forest Rd	237	206	443	232	194	426	249	215	464
South of Forest Rd	125	117	242	74	125	199	89	101	190

Note: EB = Eastbound NB = Northbound
WB = Westbound SB = Southbound

Table 5 indicates the following approximate peak hour traffic demands:

- Princes Highway accommodates:
  - Two directional demands of between 2,400 – 4,600 vehicles during the morning, afternoon and Saturday peak hours;

- Forest Road accommodates:
  - Two directional demands of approximately 2,300 vehicles during the morning peak hour; and
  - Two directional demands of approximately 1,800 – 2,800 vehicles during the afternoon and Saturday peak hours.

- Burrows Street accommodates:
  - Two directional demands of approximately 250 vehicles during the morning, afternoon and Saturday peak hours.

- Eden Street accommodates:
  - Two directional demands of up to 100 vehicles during the morning, afternoon and Saturday peak hours.

- Arncliffe Street accommodates:
  - Two directional demands of between 200 – 700 vehicles during the morning, afternoon and Saturday peak hours.

- Firth Street accommodates:
  - Two directional demands of between 200 – 500 vehicles during the morning, afternoon and Saturday peak hours.

6.3 Existing Road Network Operation

6.3.1 Modelling Approach

The surveyed public road junctions have been analysed utilising the SIDRA computer intersection analysis program in order to objectively assess the operation of the nearby public road network.

Traffic surveys of the study intersections were undertaken between 7:00am – 9:30am and 4:00pm – 6:00pm on Tuesday 30 March 2021 and between 11:00am – 1:00am on Saturday 24 April 2021.

As previously identified, neither of the survey days were significantly affected by COVID-19 restrictions or case numbers in the week preceding the surveys with zero locally acquired cased in the week preceding the weekday surveys and 3 locally acquired cases, on a single day, prior to the Saturday surveys[1].

The approach to the modelling has been to prepare Sidra models which approximated the existing conditions on the day of the surveys and to provide useful models to enable the comparison between the post development scenarios based on the TfNSW Modelling Guidelines.

[1] Covidlive.com.au – Accessed 4/2/22

Data provided by TfNSW for SCATS operation at study intersections, for example, a 2.5 second all red time for some phases at modelled intersections was not able to be input because Sidra requires whole integers.

Some of the offset and phasing information input into the model, while potentially slightly different to the SCATS operation on the day of the surveys, were kept the same between the future models, reported later in this report, the purpose of which was to enable a comparison for simpler assessment.

SIDRA is a computerised traffic arrangement program which, when volume and geometrical configurations of an intersection are imputed, provides an objective assessment of the operation efficiency under varying types of control (i.e. signs, signal and roundabouts). Key indicators of SIDRA include level of service where results are placed on a continuum from A to F, with A providing the greatest intersection efficiency and therefore being the most desirable by the Roads and Maritime Services.

SIDRA uses detailed analytical traffic models coupled with an iterative approximation method to provide estimates of the abovementioned key indicators of capacity and performance statistics. Other key indicators provided by SIDRA are average vehicle delay, the number of stops per hour and the degree of saturation. Degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Degree of saturation is a useful and professionally accepted measure of intersection performance.

The relevant criteria are listed in **Table 6** and the calibration procedures undertaken by this Practice.

TABLE 6 LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS PRIORITY CONTROLLED JUNCTIONS	
Detail	**Adopted Modelling Parameters and Assumptions**
Getting Started	• The latest version of Sidra Intersection 9 (version 9.0.3.9771) was used.
Input	• Data was input for a 60-minute period with a maximum peak flow period of 30 minutes
Geometry	• All intersection geometry was based on measurements taken on-site and measured through aerial photography from Nearmap. • Short lanes and parking present on site and within the influence zone of the intersections were coded accordingly
Saturation Flow	• The default saturation flow was adopted for all lanes with the exception of the intersection of Princes Highway / Forest Road where the following saturation flow rates were adjusted to allow the models to more closely match the observed operation and degree of saturation. ○ Right turns on the north and south approach – 2,200 tcu ○ Through movements on the north and east approaches – 2,100 tcu
Volumes	• Total vehicles were input with a value of 4% Heavy Vehicles and 1% Large Trucks for all movements; • A peak flow factor of 95% was adopted for all vehicle movements; • Pedestrian volumes were counted for the busiest intersection for pedestrians within the study area (Princes Highway / Brodie Spark Drive) and added to the network; and • Other intersections within the network were reviewed via the survey videos; however, the default number of pedestrians were kept within the model as they appeared to be higher than the observed number of pedestrians.

TABLE 6 (CONTINUED) LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS PRIORITY CONTROLLED JUNCTIONS	
Detail	**Adopted Modelling Parameters and Assumptions**
Movement Data	• Approach and exit speed were updated as per the posted speed limit signs observed, including the school zone within Forest Road to the west of Princes Highway during the AM peak hour and the 40km/h high pedestrian activity zone within Brodie Spark Drive and Firth Street during all peak periods; and • SIDRA default arrival types were applied to all other movements with the exception of the following movements: - All scenarios - South approach of Princes Highway / Brodie Spark Drive during the AM peak hour and the north approach during the PM peak hour, arrival type 4 for through movements; - All scenarios - South approach of Princes Highway /Forest road during the AM peak hour, arrival type 4 for through movements; - All scenarios - West approach of Forest Road / Firth Road during the AM peak hour, arrival type 4 for through movements; and - For Existing and Scenario 1-2 – North approach of Princes Highway / Burrows Street during the PM peak hour, arrival type 4 for through movements.
Priorities	• Priority was given to pedestrian crossing over the turning movements for the signalised intersections and at the zebra crossing where they existed.
Gap Acceptance	• The Sidra default gap acceptance values were adopted with the exception of: - Intersection of Forest Road / Eden Street – south and north approach, critical gaps for through and right turn movements during all peak hours were reduced to 5 seconds to reflect observed delays.
Pedestrians	• Pedestrian crossing distances were measured utilising aerial images via Nearmap and input into the model for all signalized pedestrian crossings; and • A pedestrian crossing speed of 1.2 m/sec was adopted for all sites.
Phasing and Timing	• Based on information provided by TfNSW all intersections were set to a user-given cycle time of 140 seconds for all scenarios; and • During the scenario analysis, Sidra was set to choose the phase times and intersection offsets. The same offsets and phase times which were generated for Scenario 1 were applied to all scenario where possible to allow a better comparison of the impacts of each scenario.
Model Settings	• Default values were applied.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 7** below (being the TfNSW NSW method of calculation of Level of Service).

TABLE 7 LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS		
Level of Service	**Average Delay per Vehicle (secs/veh)**	**Expected Delay**
SIGNALISED INTERSECTIONS AND ROUNDABOUTS		
A	Less than 14	Little or no delay
B	15 to 28	Minimal delay and spare capacity
C	29 to 42	Satisfactory delays with spare capacity
D	43 to 56	Satisfactory but near capacity
E	57 to 70	At capacity, incidents will cause excessive delays
F	> 70	Extreme delay, unsatisfactory
PRIORITY CONTROLLED INTERSECTIONS		
A	Less than 14	Good
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Near capacity
E	57 to 70	At capacity and requires other control mode
F	> 70	Unsatisfactory and requires other control mode

The existing conditions have been modelled utilising the peak hour traffic volumes presented within **Appendix 4**.

Table 8 overleaf provides a summary of the SIDRA output data whilst more detailed summaries are included as **Appendix 5**.

TABLE 8 SIDRA OUTPUT EXISTING PEAK HOUR PERFORMANCE	AM	PM	SAT
Princes Hwy & Brodie Spark Dr			
Delay	18.2	22.2	24.5
Degree of Saturation	0.84	0.70	0.71
Level of Service	B	B	B
Brodie Spark Dr & Arncliffe St			
Delay	10.9	11.1	11.3
Degree of Saturation	0.52	0.58	0.55
Level of Service (Worst Movement)	A	A	A
Princes Hwy & Allen St			
Delay	30.5	6.8	9.3
Degree of Saturation	0.85	0.85	0.40
Level of Service (Worst Movement)	C	A	A
Allen St & Arncliffe St			
Delay	12.8	12.6	12.0
Degree of Saturation	0.60	0.44	0.38
Level of Service (Worst Movement)	A	A	A
Firth St & Wollongong Rd			
Delay	12.7	11.8	10.9
Degree of Saturation	0.73	0.43	0.41
Level of Service (Worst Movement)	A	A	A
Burrows St & Eden St			
Delay	6.7	6.3	6.7
Degree of Saturation	0.07	0.09	0.07
Level of Service (Worst Movement)	A	A	A
Princes Hwy & Burrows St			
Delay	5.4	130.3	29.2
Degree of Saturation	0.51	1.16	0.62
Level of Service	A	F	C
Princes Hwy & Forest Rd			
Delay	90.2	106.7	39.3
Degree of Saturation	1.19	1.10	0.85
Level of Service	F	F	C
Forest Rd & Eden St			
Delay	131	230.3	65.8
Degree of Saturation	0.62	0.86	0.37
Level of Service (Worst Movement)	F	F	E
Forest Rd & Firth St			
Delay	57.1	24.4	24.2
Degree of Saturation	1.03	0.78	0.75
Level of Service	E	B	B

Table 8 indicates the following:

- The signalised junction of Princes Highway and Brodie Spark Drive operates with a level of service 'B' during all peak periods, representing good to satisfactory performance;

- The roundabout-controlled intersections of Brodie Spark Drive / Arncliffe Street, Allen Street / Arncliffe Street and Firth Street / Wollongong Road

operate with a level of service 'A', representing good performance with spare capacity;

- The signage-controlled intersection of Burrows Street and Eden Street operates with a level of service 'A', representing good performance with spare capacity;

- The signalised intersection of Burrows Street, Princes Highway and Kyle Street, operates with a level of service 'A' and 'C' during weekday morning and Saturday peak periods, representing good and satisfactory performance, respectively reducing to 'F' during the weekday evening periods, representing poor performance;

- The signalised intersection of Princes Highway, Forest Road and Wickham Street, operates with a level of service 'F' during weekday commuter peak periods, representing poor performance, improving to 'C' during weekend periods, representing satisfactory performance;

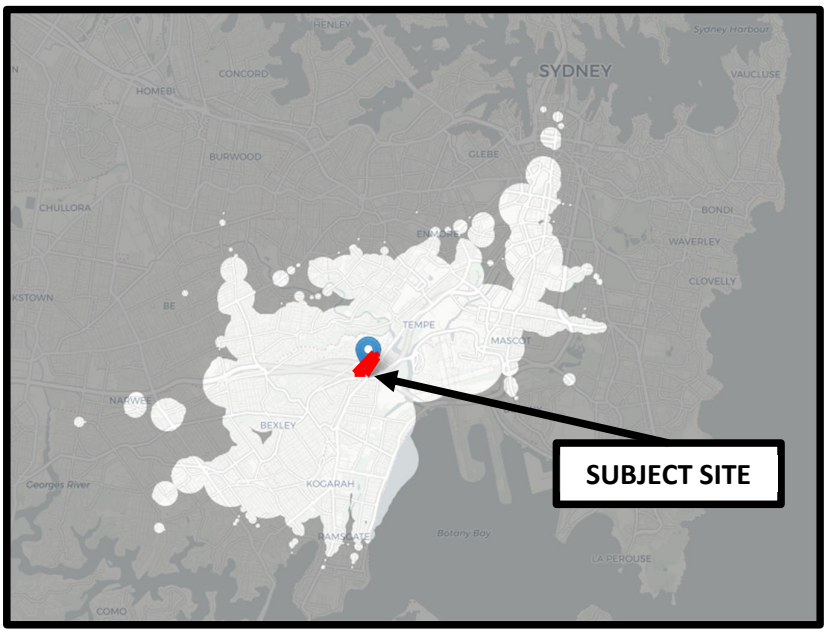
- The signage-controlled intersection of Forest Road, Eden Street and Wardell Street operates with a level of service 'F' during the weekday peak hours and level of service E during the Saturday peak hour, representing poor performance for the worst movement; and

- The signalised intersection of Forest Road, Firth Street and Somerville Street, operates with a level of service 'B' during weekday evening and Saturday peak periods, representing good performance, reducing to 'E' during the weekday morning periods, representing operation near capacity.

6.4 Public Transport

Figure 7 overleaf shows the approximate distance that you can reach within approximately 30 minutes on public transport from the subject site.

FIGURE 7
APPROXIMATE 30 MINUTE TRAVEL ON PUBLIC TRANSPORT



Source: https://www.mapnificent.net/sydney

Figure 7 indicates that the Sydney CBD, the major jobs centre of the Eastern Harbour City can mostly be reached within half an hour from the subject site. Suburbs such as Kogarah, Bexley, Narwee and the Sydney Airport can also be reached within 30 minutes on public transport.

6.4.1 Heavy Rail

The site is located approximately 150m to the south-east of the Arncliffe Railway Station. Arncliffe Railway Station provides access to train services which operate along the T4 (Eastern Suburbs & Illawarra Line) and South Coast Line.

Services along the T4 and South Coast Line provide efficient connectivity between Kiama Station in the south and the Sydney City CBD.

The frequency of the services is summarised in **Table 9**.

TABLE 9
JOURNEY TO WORK MODE SHARE FROM ARNCLIFFE AND BANKSIA

Service	Weekday AM 7:30am to 8:30am	Weekday PM 5:00pm to 6:00pm	Saturday 11:00am to 12:00pm
T4 Towards Central	6 services	6 Services	2 services
T4 Away from Central	6 services	7 Services	2 services

6.4.2 Buses

Sydney buses operate the following bus services in the immediate vicinity of the site:

- Route 473 – Rockdale to Campsie;
- Route 420 – Eastgardens to Burwood via Sydney Airport and Rockdale;
- Route N10 – Sutherland to City Town Hall (Night Service);
- Route N11 – Cronulla to City Town Hall (Night Service); and
- Route 720S – St George Girls High to Campsie Station.

Routes N10 and N11 operate along Princes Highway with the closest stop being situated within approximately 50m walking distance to the north-east of the site. Routes N10 and N11 provide a collective service frequency of every 15 minutes between 1:00am and 4:45am on weekdays and Saturdays and provides an hourly service between 1:00am and 4:00am on Sundays and public holidays.

Route 473 operates along Firth Street and Wollongong Road and provides a bus stop at approximately 200m walking distance to the west of the site. Route 473 provides a service frequency of every 30 minutes during the morning and afternoon peak hours and an hourly frequency during weekday business hours and on weekends and public holidays.

Route 420 operates along Princes Highway in the vicinity of the site and provides a bus stop at approximately 250m walking distance from the site on Wickham Street, west of Princes Highway. Route 420 provides a service frequency approximately every 15 minutes during the weekday morning and afternoon peaks and on weekend and public holidays.

6.5 Pedestrians / Cyclists

The following pedestrian and cyclist access and mobility infrastructure surrounds the subject site:

- Footpaths are provided along both kerb alignments of Princes Highway, Eden Street, Burrows Street, Arncliffe Street to the south of Allen Street, Firth Street, Forest Road and Brodie Spark Drive;
- Signalised pedestrian crossings are provided over the southern and western approaches to the intersection of Brodie Spark Drive and Princes Highway;
- Marked pedestrian crossings are provided over Magdalene Terrace and Arncliffe Street to the south and west of the roundabout controlled intersection;
- Signalised pedestrian crossings are provided over the northern and western approaches to the intersection of Princes Highway and Burrows Street;

- Signalised pedestrian crossings are provided over all approaches of the intersection of Princes Highway and Forest Road, including marked pedestrian crossings over the left turn slip lanes;

- Signalised pedestrian crossings are provided across all approaches of the intersection of Forest Road and Firth Street, including a marked pedestrian crossing across the left turn slip lane on the northern approach;

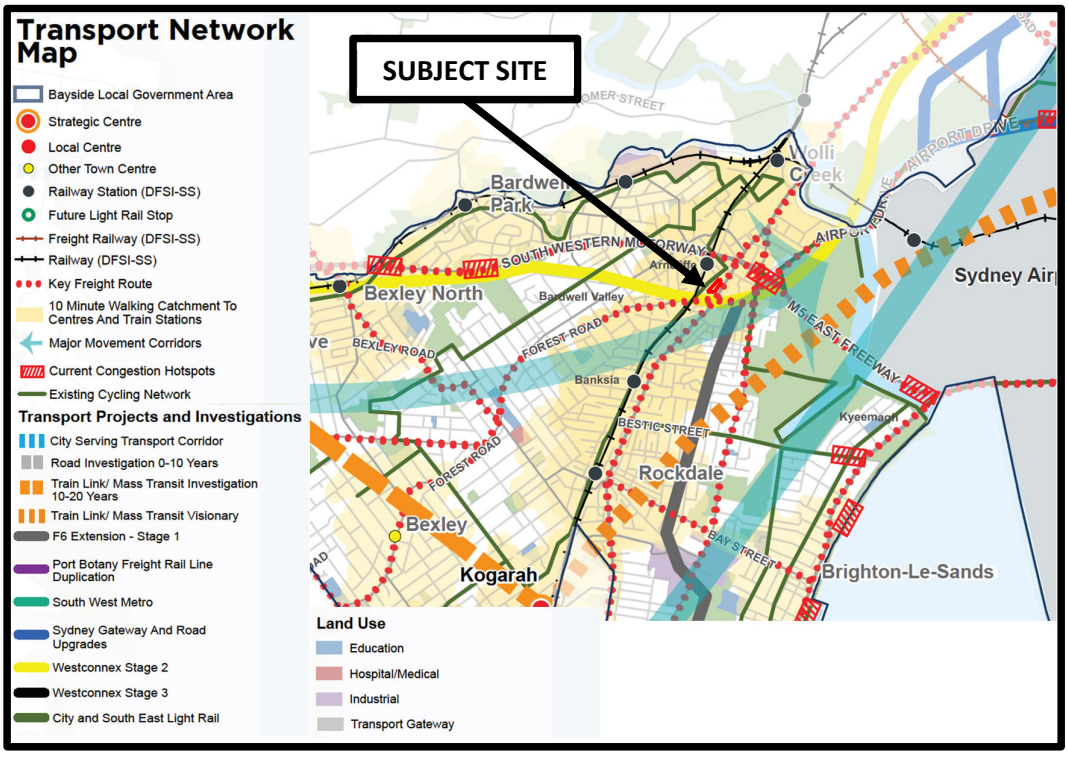
- The Arcade forms an east-west pedestrian link between Eden Street and Arncliffe Railway Station, situated directly to the west of the site;

- Raised and marked pedestrian crossings are provided across Firth Street, providing pedestrian access to Arncliffe Railway Station; and

- Eden Street and Arncliffe Street form on-road bicycle-friendly routes.

The existing bicycle routes within the vicinity of the subject site are shown in the Bayside Council Local Strategic Policy Statement (LSPS). An extract of the Transport Network Map from the LSPS is provided in **Figure 8**.

FIGURE 8
BAYSIDE COUNCIL LSPS TRANSPORT NETWORK MAP



Source: Bayside Council Local Strategic Planning Statement

7. EXISTING TRAVEL BEHAVIOUR IN THE AREA

The choice of travel mode varies depending on the range of transport services available, car availability, the length of the journey, parking provision and the reason for travelling.

The Journey to Work mode share for trips originating within Arncliffe and Banksia in 2016 are shown in **Table 10**.

TABLE 10
JOURNEY TO WORK MODE SHARE FROM ARNCLIFFE AND BANKSIA

Mode of Transport	Percentage of Residents	Sydney Average
Train	33.2%	16.2%
Bus	1.9%	6.1%
Vehicle as driver	47.5%	54.3%
Vehicle as passenger	4.8%	4.1%
Bicycle	0.4%	0.7%
Walked only	2.2%	4.0%
Worked at home	3.0%	4.4%
Did not go to work	7.0%	7.8%

Note: 'Not stated' and 'other' was removed

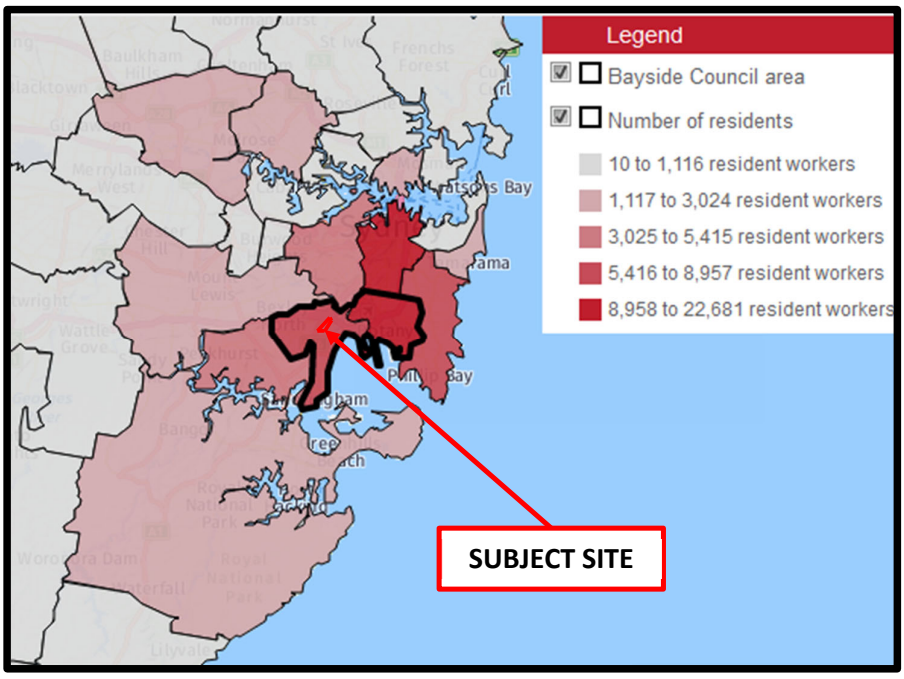
Source: id.com.au

Table 10 indicates that approximately 50 percent of trips are by private vehicle (less than the Sydney average) and approximately 33% percent are by train (more than the Sydney average). Buses are not highly utilised in the area. Similarly, a very low number of commuters use bicycles to get to work.

Figure 9 overleaf illustrates that journey to work trips (all modes) from the Bayside Council LGA to the top five LGAs are distributed as follows:

- 30% to the Sydney LGA and;
- 11.8% to the Botany Bay LGA;
- 11.4% to the Rockdale LGA;
- 7.2% to the Randwick LGA; and
- 5.8% to the Georges River LGA.

FIGURE 9
JOURNEY TO WORK TRIP DISTRIBUTION FROM BAYSIDE COUNCIL LGA



Source: https://profile.id.com.au/baysidensw/residents?WebID=110

8. PROJECTED TRANSPORT CONDITIONS

8.1 Passenger Vehicle Traffic Generation

Traffic generation rates for various land-uses have been established through extensive surveys undertaken throughout NSW and published within TfNSW's *Guide to Traffic Generating Developments* and the more recently released *Technical Direction TDT 203/04a*. The following sub-sections provide a summary of the traffic generating potential of the existing and proposed site uses.

The following traffic generation rates for high density residential flat dwellings and child care centres, relevant to the existing and proposed subject site, have been established through extensive surveys undertaken throughout NSW as published within their *Guide to Traffic Generating Developments* and the more recently released *Technical Direction TDT 203/04a:*

High Density Residential Flat Dwellings:
AM Peak hour: 0.19 trips per unit
PM Peak hour: 0.15 trips per unit
Saturday Peak hour: 0.23 trips per unit (Rockdale Survey)

Child Care Centres:
0.8 vehicle trips per child during the morning weekday peak hour
0.7 vehicle trips per child during the evening weekday peak hour

Additionally, surveys have recently been completed by Bitzios Consulting in November 2018 whereby the traffic generation of small suburban shopping centres throughout New South Wales has been investigated. The following traffic generation rates for a suburban shopping centre with a similar GLFA of the proposed retail component of the development relevant to the existing and proposed subject site, have been established through the extensive surveys undertaken:

Shopping Centre providing ~ 3,500m^2 of GLFA:
AM Peak hour: 1.74 trips per retail parking space
PM Peak hour: 2.09 trips per retail parking space
Saturday Peak hour: 2.51 trips per retail parking space

The following sub-sections provide a summary of the traffic generating potential of the previous and proposed site uses with respect to those rates established by TfNSW.

8.1.1 Previous Site Use

Section 1.3.3 of this report presents that the subject site currently accommodates 140 apartments within 14 buildings.

TfNSW's *Technical Direction TDT 203/04a* specifies average traffic generation rates of 0.19 peak hour vehicle movements per unit during the morning peak and 0.15 peak hour vehicle movements per unit during the evening peak.

The existing site use is therefore capable of generating up to 27, 21 and 33 vehicle trips to and from the site during weekday AM, weekday PM and weekend peak hours, respectively.

8.1.2 Proposed Development

The proposed mixed-use development provides accommodation for a total of 744 apartments and 3,113m^2 gross floor area of retail premises, contained at lower and upper ground levels across all four buildings and providing a total of 78 dedicated retail user parking spaces.

Application of the presented traffic generation rates to the proposed development results in the following peak hour traffic generation:

High Density Residential Flat Dwellings
AM Peak: (0.19 x 744) = 141.4 (adopt 141) trips
PM Peak: (0.15 x 744) = 111.6 (adopt 112) trips
Saturday Peak: (0.23 x 744) = 171.1 (adopt 171) trips

Child Care Centre
AM peak: (0.8 x 40) = 32 trips
PM peak: (0.7 x 40) = 28 trips

Retail
AM Peak: (1.74 x 78 parking spaces) = 135.7 (adopt 136) trips
PM Peak: (2.09 x 78 parking spaces) = 163 trips
Saturday Peak: (2.51 x 78 parking spaces) = 195.8 (adopt 196) trips

The peak hour traffic generating ability of the proposed development is accordingly estimated to be 309, 303 and 367 vehicle movements during the weekday AM, weekday PM and weekend peak hours, respectively.

8.2 Passenger Vehicle Trip Assignment

For the purposes of this assessment, the residential peak hour vehicle movements have been split between inbound and outbound movements during each peak period according to the following:

- The morning peak hour trips have been split between 20% inbound trips and 80% outbound movements, resulting in 28 inbound movements and 113 outbound movements;
- The afternoon peak hour trips have been split between 80% inbound movements and 20% outbound movements, resulting in 90 inbound movements and 22 outbound movements; and
- The Saturday peak hour trips have been evenly split between inbound and outbound trips, resulting in 85 inbound movements and 86 outbound movements.

For the purposes of this assessment, the child care centre peak hour vehicle movements have been split between inbound and outbound movements during each peak period according to the following:

- The weekday morning peak hour trips have been evenly split between inbound and outbound movements, resulting in 16 inbound movements and 16 outbound movements; and

- The weekday afternoon peak hour trips have been evenly split between inbound and outbound movements, resulting in 14 inbound movements and 14 outbound movements.

Additionally, the retail peak hour vehicle movements have been split between inbound and outbound movements during each peak period according to the following:

- The morning peak hour trips have been split between 80% inbound trips and 20% outbound movements, resulting in 109 inbound movements and 27 outbound movements;

- The afternoon peak hour trips have been evenly split between inbound and outbound movements, resulting in 81 inbound movements and 82 outbound movements; and

- The Saturday peak hour trips have been evenly split between inbound and outbound movements, resulting in 98 inbound movements and 98 outbound movements.

Accordingly, the development, in total, has been assessed to produce 153 inbound trips and 156 outbound trips during the morning peak hour, 185 inbound trips and 118 outbound trips during the evening peak hour and 183 inbound trips and 184 outbound trips during the Saturday peak hour.

Traffic has been assigned to / from the development block as follows, being adopted from 2016 census journey to work data, AECOM's *Arncliffe and Banksia Priority Precincts, Strategic Transport Plan* and existing traffic patterns derived from recent traffic surveys as illustrated within **Appendix 3**.

The morning and Saturday peak hour trips have been assigned as follows:

- 14% of trips travel **from** the north via Princes Highway;

- 48% of trips travel **to** the north via Princes Highway;

- 3% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street;

- 5% of trips travel **to** the north via Arncliffe Street and thence Brodie Spark Drive;

- 21% of trips travel **from** the south via Princes Highway (these trips will utilise the deceleration lane connecting with Princes Highway to access the site);
- 25% of trips travel **to** the south via Princes Highway;
- 31% of trips travel **from** the west via Forest Road;
- 5% of trips travel **to** the west via Forest Road;
- 31% of trips travel **from** the west via Wollongong Road;
- 15% of trips travel **to** the west via Wollongong Road; and
- 2% of trips travel **to** the east via Wickham Road.

The afternoon peak hour trips have been assigned as follows:

- 30% of trips travel **from** the north via Princes Highway;
- 26% of trips travel **to** the north via Princes Highway;
- 8% of trips travel **from** the north via Brodie Spark Drive and thence Arncliffe Street;
- 3% of trips travel **to** the north via Arncliffe Street and thence Brodie Spark Drive;
- 35% of trips travel **from** the south via Princes Highway (these trips will utilise the deceleration lane connecting with Princes Highway to access the site);
- 31% of trips travel **to** the south via Princes Highway;
- 14% of trips travel **from** the west via Forest Road;
- 10% of trips travel **to** the west via Forest Road;
- 13% of trips travel **from** the west via Wollongong Road;
- 29% of trips travel **to** the west via Wollongong Road; and
- 1% of trips travel **to** the east via Wickham Road.

The above trip assignment and associated traffic distribution has been provided taking into account the proposed restriction of right turn movements at the junction of Eden Street and Forest Road, as previously described.

8.3 Projected Road Network Performance

8.3.1 Extent of Additional Traffic

Section 8.1.2 of this report indicates that the development is expected to generate up to approximately 3 vehicles per minute inbound and outbound during the road network peak hours.

When consideration is given to the multiple ways into and out of the subject site via the regional road network, the amount of traffic potentially at each intersection is considered a minimal increase and in-line with the daily variation that could be experienced at the study intersections.

A graphical representation of the net increase in the development vehicles on top of the existing vehicles served at signalised study intersections is provided in **Figure 10** to **Figure 13**. It is also important to note that this does not include consideration of the site's existing traffic generated by the existing uses on the site.

FIGURE 10
ADDITIONAL DEVELOPMENT TRAFFIC AT THE JUNCTION OF PRINCES HIGHWAY / BRODIE SPARK DRIVE

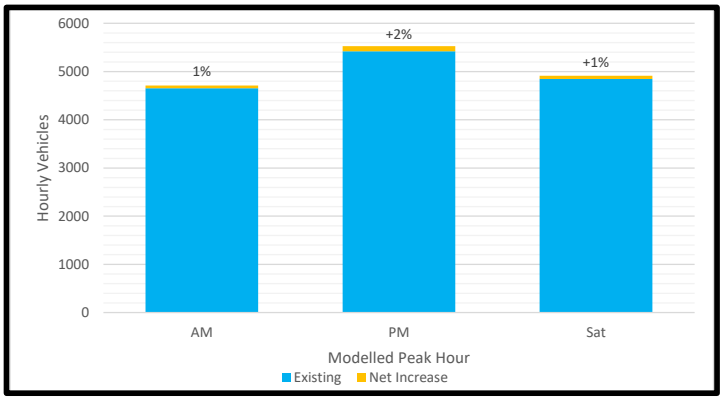


FIGURE 11
ADDITIONAL DEVELOPMENT TRAFFIC AT THE JUNCTION OF PRINCES HIGHWAY / BURROWS STREET

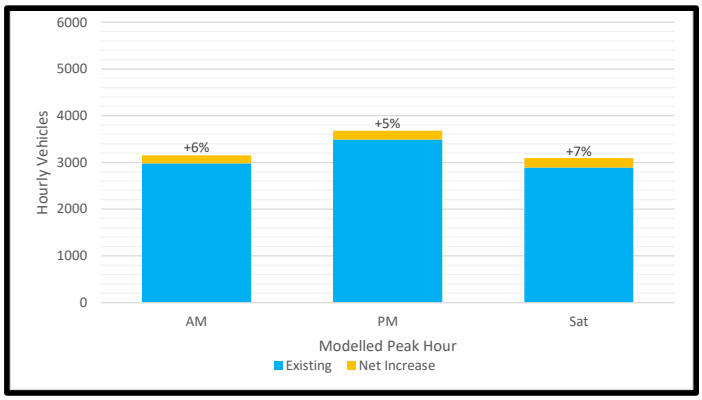


FIGURE 12
ADDITIONAL DEVELOPMENT TRAFFIC AT THE INTERSECTION OF PRINCES HIGHWAY / FOREST ROAD

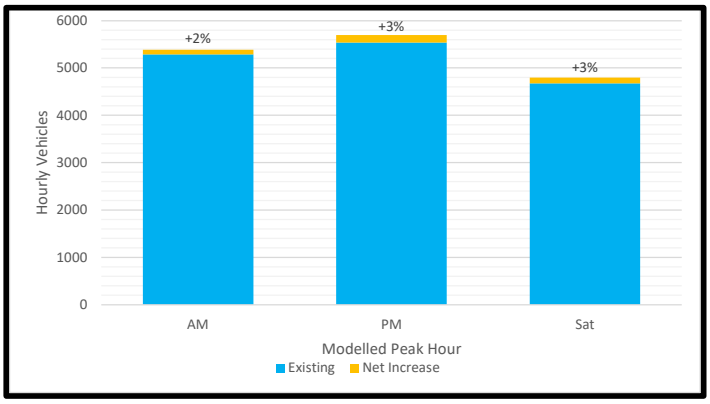


FIGURE 13
ADDITIONAL DEVELOPMENT TRAFFIC AT THE INTERSECTION OF PRINCES HIGHWAY / FIRTH STREET

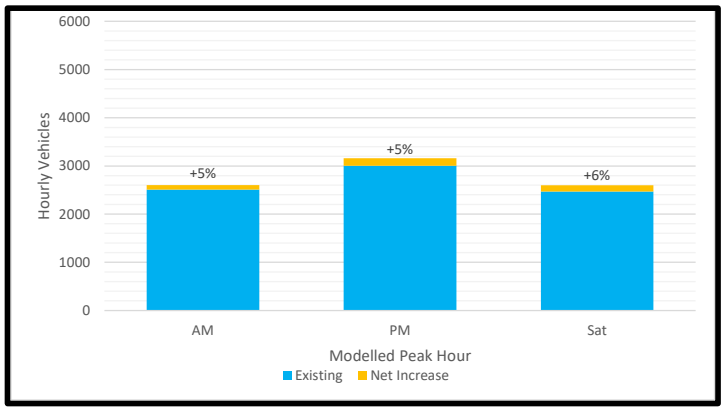


Figure 10 to **Figure 13** indicate that at the critical intersection of Princes Highway / Forest Road, the anticipated development traffic accounts for an increase of between 2% and 3% of the current traffic at the intersection. At the junction of Princes Highway / Burrows Street, traffic is expected to increase by 5% to 7% depending on the road network peak hour.

8.3.2 Modelling Approach

Due to the complexity of the model, the best way to model the left turn into the site from Princes Highway was investigated in consultation with the Sidra Solutions support team. It was determined that the best way to model this was to remove the traffic from the subject intersections rather than add a separate left turn intersection into the model at the driveway location.

8.3.3 Modelling Results

The surrounding public road intersections have been modelled in order to estimate that likely impact on traffic safety and efficiency utilising the projected traffic volumes incorporating the proposed development. A summary of the most pertinent results is indicated overleaf within **Tables 11** and **12** whilst more detailed summaries are provided within **Appendix 6**.

TABLE 11 SIDRA OUTPUT WEEKDAY PEAK HOUR PERFORMANCE	Existing Conditions			Projected Conditions		
	AM	PM	SAT	AM	PM	SAT
Princes Hwy & Brodie Spark Dr						
Delay	18.2	22.2	24.5	18.4	22.4	24.6
Degree of Saturation	0.84	0.70	0.71	0.85	0.71	0.71
Level of Service	B	B	B	B	B	B
Brodie Spark Dr & Arncliffe St						
Delay	10.9	11.1	11.3	11	11.2	11.4
Degree of Saturation	0.52	0.58	0.55	0.55	0.58	0.56
Level of Service (Worst Movement)	A	A	A	A	A	A
Princes Hwy & Allen St						
Delay	30.5	6.8	9.3	32.5	6.9	9.5
Degree of Saturation	0.85	0.85	0.40	0.87	0.20	0.4
Level of Service (Worst Movement)	C	A	A	C	A	A
Allen St & Arncliffe St						
Delay	12.8	12.6	12.0	14.3	14	13.3
Degree of Saturation	0.60	0.44	0.38	0.7	0.51	0.5
Level of Service (Worst Movement)	A	A	A	A	A	A
Firth St & Wollongong Rd						
Delay	12.7	11.8	10.9	17.9	12.8	11.4
Degree of Saturation	0.73	0.43	0.41	0.86	0.44	0.40
Level of Service (Worst Movement)	A	A	A	B	A	A
Burrows St & Eden St						
Delay	6.7	6.3	6.7	9.5	8.6	11
Degree of Saturation	0.07	0.09	0.07	0.44	0.30	0.55
Level of Service (Worst Movement)	A	A	A	A	A	A
Princes Hwy & Burrows St						
Delay	5.4	130.3	29.2	8.3	99.9	26.3
Degree of Saturation	0.51	1.16	0.62	0.85	1.10	0.59
Level of Service	A	F	C	A	F	B
Princes Hwy & Forest Rd						
Delay	90.2	106.7	39.3	85.2	119.3	39.9
Degree of Saturation	1.19	1.10	0.85	1.19	1.15	0.88
Level of Service	F	F	C	F	F	C
Forest Rd & Eden St						
Delay	131	230.3	65.8	9.2	10.5	9.1
Degree of Saturation	0.62	0.86	0.37	0.4	0.40	0.41
Level of Service (Worst Movement)	F	F	E	A	A	A
Forest Rd & Firth St						
Delay	57.1	24.4	24.2	71.8	32.6	26.9
Degree of Saturation	1.03	0.78	0.75	1.07	0.86	0.87
Level of Service	E	B	B	F	C	B
Eden St & Site Access						
Delay	-	-	-	7.6	7.4	7.5
Degree of Saturation				0.16	0.12	0.18
Level of Service				A	A	A

TABLE 12 SIDRA OUTPUT – NETWORK AVERAGE VEHICLE SPEED (KM/H)		
Time Period	**Existing Conditions**	**Projected Conditions**
AM	24.9	24.8
PM	19.3	19.5
Saturday	32.0	34.1

Tables 11 and **12** indicate the following:

- Overall, there is minimal difference to average vehicle speed within the modelled network when the existing results are compared to the projected post development results. This is because the banning of the right turn movements into and out of Eden Steet / Wardell Street from Forest Road combined with the additional development traffic represent minimal changes to the road network where some intersections carry over 5,000 vehicles per hour;

- The performance at the junction of Forest Road and Eden Street is expected to be significantly improved through the proposed prohibition of right turn movements to and from Eden Street / Wardell Street. The removal of the right turn movements from Forest Road into Eden Street / Wardell Street are expected to also result in improvements to the nearby signalised Forest Road intersection with Princes Highway / Wickham Street through the elimination of potential impedance to through traffic flow within Forest Road at this location. This intersection treatment was identified in the Arncliffe and Banksia Priority Precincts, Strategic Transport Plan and the modelling assumed that all traffic that currently turns right from Forest Road into Eden Street will be transferred to turn right into Firth Street. The concentration of right turn movements allows them to be controlled at a signalised intersection;

- The intersection of Forest Road and Firth Street is expected to change from level of service 'E' to 'F' during the weekday morning peak hour. In addition to development traffic, this is a result of the closure of Eden Street to right turning vehicles from Forest Road and transfer to turning right into Firth Street. The safety benefits that this closure will bring need to be considered along with the changes in level of service at the intersection. Indeed, changes in SCATS operation may be able to improve the operation of this intersection which were not considered as part of this modelling;

- The signalised junction of Princes Highway and Brodie Spark Drive is projected to continue to operate with a level of service 'B', representing good performance;

- The roundabout-controlled intersections of Brodie Spark Drive / Arncliffe Street / Magdalene Terrace, Allen Street / Arncliffe Street and Firth Street / Wollongong Road are projected to continue to operate with a level of service 'A' / 'B', representing good performance with spare capacity;

- The signage-controlled intersection of Burrows Street and Eden Street is projected to continue to operate with a level of service 'A', representing good performance with spare capacity;

- The junction of Princes Highway and Burrows Street remains at level of service 'A' during the weekday morning peak hour;

- The Princes Highway intersections with Burrows Street and Forest Road influence each other and during the weekday evening peak period, when the

average vehicle delay is added together, the results are largely unchanged and the intersections continue to operate at Los F; and

- The junction of Eden Street and the site access roadway is projected to operate with a level of service 'A' during all peak periods representing good performance with spare capacity.

8.3.4 Summary of Recommended Road Network Upgrade

The modelling undertaken suggests that no additional road network treatments are required on the classified road network to support the proposed development. However, the recommended network treatment, primarily to improve pedestrian safety, is to provide a new left turn ingress into the subject site from Princes Highway for northbound traffic.

This treatment is expected to improve the northbound traffic along Princes Highway at Burrows Street when compared to no road network changes by reducing the amount of traffic turning left into Burrows Street from Princes Highway and to Eden Street from Burrows Street. The largest improvement is expected to be on a Saturday.

On the local road network, the recommended treatment is to provide access to the basement and the loading dock via a combined site access driveway.

8.4 Pedestrian Impacts

Assuming an average of 2.5 people per dwelling, the 744 dwellings could result in an additional total of 1,510 people living in the development. Based on the **Table 10**, 2.2% of people could be expected to walk to work during the weekday AM peak. This equates to an additional 34 people.

The notable pedestrian access and mobility infrastructure within the immediate vicinity (see Section 6.5 of this report) is such that pedestrians are provided with a particularly good level of service and connectivity throughout the surrounding precinct, which is readily capable of accommodating additional demand.

Notwithstanding the above, it is acknowledged that Princes Highway somewhat forms an impediment to east-west pedestrian desire lines within the immediately precinct. Safe and efficient pedestrian crossing movements over Princes Highway is facilitated within 200m of the site both to the north and south via signalised crossings at Burrows Street and Forest Road, respectively.

The proposal involves a through site link facilitating access between Princes Highway and Arncliffe Railway Station situated on Firth Street by virtue of the public park area situated within the central portion of the site, Additionally, a marked and raised pedestrian crossing is proposed across Eden Street providing direct and adjacent access to The Arcade. The proposed development is accordingly expected to result in significant improvements to existing local pedestrian access and mobility.

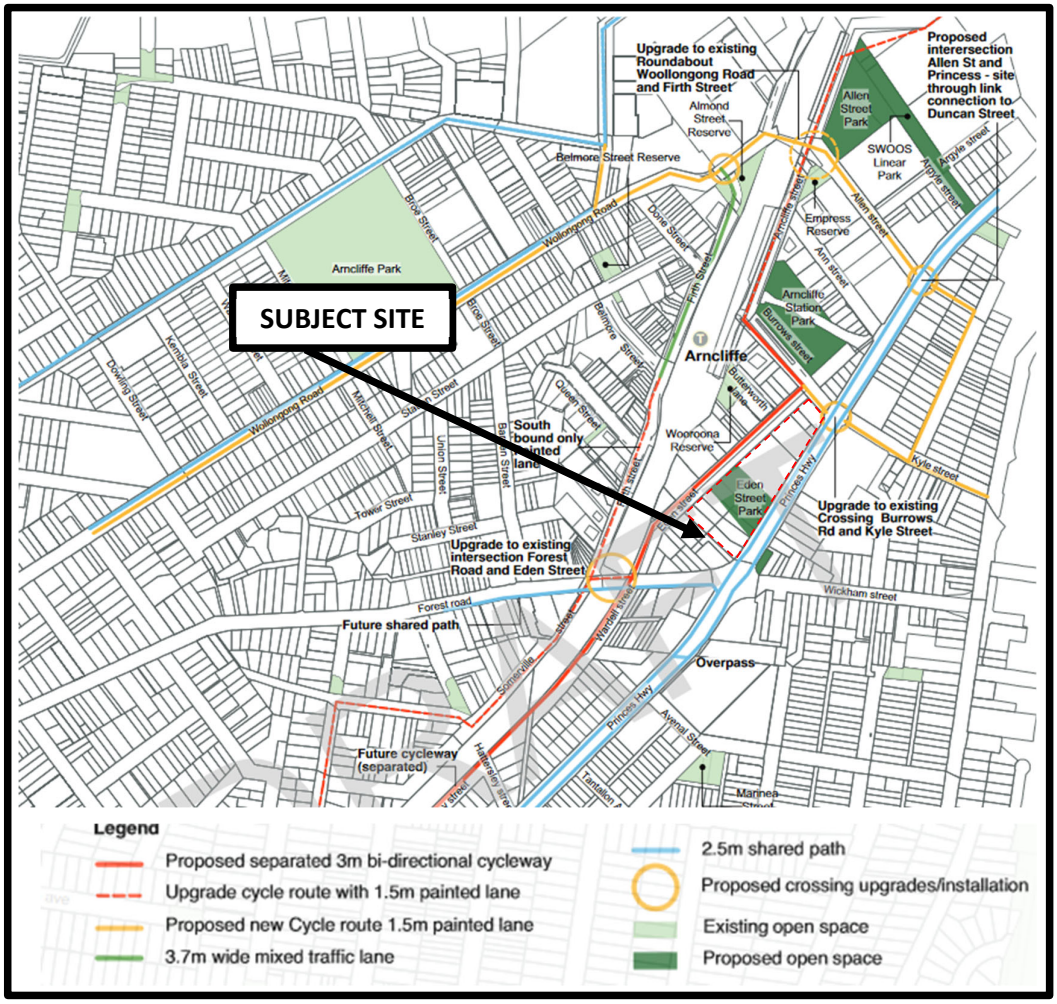
It is also acknowledged that the proposal may generate further pedestrian movements across Forest Road at Eden Street, in accordance with the pedestrian desire line between the development site, Arncliffe Station and the school situated on the other side of Forest Road. It is however considered that Council's S.94 Contributions Plan involves the implementation of pedestrian infrastructure to improve pedestrian access at the junction of Forest Road and Eden Street. It is envisaged that this infrastructure would include the provision of an embellished triangular island / pedestrian refuge within Eden Street and pedestrian fencing adjacent to the northern Forest Road footpath to direct pedestrian crossing movements to occur at the signalised crossings at Princes Highway and Firth Street.

8.4 Bicycle Impacts

Assuming an average of 2.5 people per dwelling, the 744 dwellings could result in an additional total of 1,510 people living in the development. Based on the Table 7, 0.4% of people could be expected to ride a bicycle during the weekday AM peak. This equates to 6 additional people taking riding a bicycle.

The proposed bicycle network is outlined in the draft Arncliffe and Banksia Public domain plan and Technical Manual Figure 3.17, an excerpt of which is provided as **Figure 14**.

FIGURE 14
PROPOSED CYCLE INFRASTRUCTURE



Source: Draft Arncliffe and Banksia Public domain plan and Technical Manual

Figure 14 indicates that the following changes are proposed in the vicinity of the subject site:

- Upgrade to the existing intersection of Forest Road / Eden Street;
- 3m bi-directional cycleway on Eden Street;
- 2.5m shared paths on both sides of Princes Highway; and
- New painted 1.5m lane on Kyle Street and Burrows Street to help the crossing over Princes Highway.

Based on the anticipated number of people cycling, the proposed bicycle network is considered satisfactory to cater for the development. Once complete, the proposed bicycle network is expected to offer the opportunity for more people to ride a bicycle to and from the development, reducing the reliance on private vehicle trips.

8.5 Public Transport Impacts

8.5.1 Heavy Rail Impacts

Assuming an average of 2.5 people per dwelling, the 744 dwellings could result in an additional total of 1,510 people living in the development. Based on the Table 7, 33.2% and 1.9% of people could be expected to take the train or bus to work during the weekday AM peak respectively. This equates to 502 additional people taking the train and 29 people taking the bus.

Information on the existing train passenger numbers has been sourced from the NSW Government Open Data Portal. The data is for the section Arncliffe to Wolli Creek, based on a 2019 audit and is summarised in **Table 13**.

TABLE 13
SUMMARY OF 2019 PEAK TRAIN CROWDING AT WOLLI CREEK STATION

Direction	AM Crowding	PM Crowding
Inbound to Sydney	70% (Medium)	20% (Low)
Outbound to Revesby	10% Low	70% (Medium)

Table 13 indicates that the AM peak (6am to 10am) inbound towards Central Station and the PM peak (3pm to 7pm) outbound from Central Station peak at an average of 70% occupancy.

Information on the Open Data website indicates that a train has typically has a seating capacity of 896 and an occupancy of 135% is where there are 5 people standing on each level with 15 people in the vestibule. A level of 180% is considered the maximum capacity of the train.

On average, based on 6 trains in the peak hour as outlined in **Table 9**, there is sufficient capacity in the AM and PM peak to cater for the anticipated public transport demand at Arncliffe Station.

8.5.2 Bus Impacts

Information on the existing bus crowding has been sourced from the NSW Government Open Data Portal which is reproduced overleaf in **Figure 15** and **Figure 16**.

FIGURE 15
AM PEAK BUS CROWDING 6AM TO 10AM



FIGURE 16
PM PEAK BUS CROWDING 3PM TO 7PM



Figures 15 and **16** indicate that weekday AM and PM bus crowding in the vicinity of the site on average is low.

On average, based on 4 to 6 buses in the peak hour as outlined in Section 6.4.2, there is sufficient capacity in the AM and PM peak to cater for the anticipated public transport for buses in the vicinity of the site.

9. PRELIMINARY CONSTRUCTION MANAGEMENT PLAN

9.1 Introductory Statement

This Section of the report constitutes a preliminary Construction Traffic Management Plan (CTMP) addressing the traffic access and safety issues associated with demolition and construction works associated with the proposal. CTMPs are generally prepared at Construction Certificate stage following the commissioning of a builder thereby allowing a greater appreciation of the likely construction methodology and therefore the required traffic management measures to be implemented.

The terms of the initiatives contained within the following subsections of this report are therefore somewhat generic and some modifications may be needed by or on behalf of the successful builder / civil contractor at Construction Certificate stage depending on their feasibility taking into consideration all project requirements.

9.2 Traffic Management

The demolition and construction works are likely to be undertaken within three separate stages as follows:

- Stage 1 – demolition;
- Stage 2 – excavation and shoring; and
- Stage 3 – construction of new site structures.

The scale of the development is such that the construction works will encompass a significant majority of the site. Notwithstanding this, a portion of the site adjacent to the northern boundary is proposed to remain available for construction vehicles to occupy during loading / unloading activities.

A crane located approximately central to the site will transport construction materials between the construction vehicles within the abovementioned internal construction vehicle loading / unloading area and the remainder of the site.

Site sheds are proposed to be located along the northern boundary of the site.

Class A Hoarding will be installed along the eastern and western site boundaries adjoining Princes Highway and Eden Street.

Construction fencing is proposed to define the northern and southern boundaries.

An application to Council will be made in relation to the installation of hoarding and use of a crane, including the payment of appropriate fees.

9.3 Safe Ingress and Egress of Construction Traffic

An internal construction vehicle loading / unloading compound is proposed to be established adjacent to the western site boundary, approximately central to the site frontage to Eden Street. Forward construction vehicle access to the site is to be obtained directly via Eden Street via the installation of a temporary construction ingress driveway situated approximately 50m to the south of the northern site boundary.

This internal construction vehicle loading / unloading compound is proposed to accommodate construction vehicles up to and including 19m long articulated vehicles (AVs), including standing, loading / unloading and manoeuvring. Following the completion of off-street loading / unloading activities, the construction vehicles are to exit the site to Eden Street in a froward direction via a further temporary construction gutter crossing situated approximately 70m north of the southern site boundary.

All site ingress and egress movements will be undertaken in a forward manner. Trucks are not (at any time) allowed to reverse onto the site from the road for safety reasons (unless specific approval as a one-off occasion is obtained from the Bayside Council).

All such site ingress and egress movements are to be strictly controlled by appropriately qualified traffic controllers. Traffic controllers are not to stop traffic on the public street to allow trucks to exit the site, they must wait until a suitable gap in traffic flows allows them to assist construction vehicles to exit.

No queuing / marshalling of construction vehicles is to occur in any public road.

Further to the large construction vehicles described above, construction employee / tradesperson passenger vehicles are to be accommodated within the basement car parking area when constructed. Access / egress associated with this passenger vehicle parking function is to occur the ultimate development driveway connection to Eden Street situated in the south-western corner of the site. These movements are to occur in a forward direction at all times.

No construction vehicle access / egress is proposed to occur via Princes Highway.

9.4 Construction Vehicle Transport Routes

Construction vehicles are to access and vacate the subject site utilising Princes Highway and M5 Motorway as the main approach / departure route. The following provides a description of the construction vehicle transit routes:

Inbound Route

Princes Highway from the south, left turn into Burrows Street, left turn to Eden Street and thence a left turn directly into the subject site.

Outbound Route

Forward right turn movement from the site to Eden Street Road, right turn to Burrows Street, left turn to Wickham Street, left turn to West Botany Street, right turn to Marsh Street and thence a left or right turn to M5 Motorway.

Princes Highway provides good connectivity to the site from the south, with connectivity from the west and north-west also being facilitated by King Georges Road.

The M5 Motorway provides good connectivity from the site to the Sydney metropolitan area via links with the M1 to the east and Bexley Road, King Georges Road, Fairford Road and M7 Motorway to the west.

The above immediate connectivity of the site to the surrounding State Road network thereby allows construction vehicles are able to access and depart the site creating very little disturbance to surrounding local road traffic flow, being limited to Eden Street and Burrows Street only.

The multiple directional traffic lanes of the approach and departure routes are such that heavy vehicle manoeuvring is able to occur without any unreasonable encroachment on opposing travel lanes, kerbs and / or parking lanes.

9.5 Parking Control

Prior to the construction of the basement parking area, a dedicated on-site construction personnel parking area is to be established to ensure no construction parking occurs within the surrounding public roads. Notwithstanding this, construction workers / tradespersons will accordingly be encouraged to do either of the following when travelling to the site in order to minimise the extent of parking demand:

- Utilise public transport to the site (the site is well serviced by previously presented rail and bus services operating within the subject vicinity); and / or

- Car pool with other construction workers.

The above transport options will form part of the conditions of commissioning when engaging the relevant site workers and as such form part of any site induction process.

Following the construction of the basement parking area, construction personnel are to park within this area, once again ensuring that no construction personnel park within the surrounding local road network.

It is considered that further detail / direction regarding the parking location of construction workers during the time of construction could be provided through the preparation and implementation of a Construction Parking Management Plan. The formulation of this Plan could be reasonably be imposed as a condition of consent.

9.6 Construction Traffic Generation

The construction works are likely to generate a maximum of six heavy vehicles servicing the site during peak hourly periods, such as concrete pours.

In general, however, the construction activities are projected to generate considerably less traffic than the existing and proposed future uses, thereby indicating suggesting that impacts will be minimal. During periods of more heavy construction vehicle generation, drivers are to be instructed by radio when to arrive at the site to ensure that there is no vehicle queuing or parking within the adjoining road network. This is to be strictly adhered to.

9.7 Traffic Impact

The recent traffic investigations of the adjoining road network and the analysis contained within previous sections of this report have indicated that whilst traffic demands within the surrounding State Road network are considerable during weekday commuter peak periods, traffic demands are notably reduced outside of commuter peak periods. During these periods, motorists are provided with a reasonable level of service within the immediately adjoining public road network. It is therefore considered that the limited traffic generation associated with the construction activities, particularly when compared against the traffic generating capability of the existing and proposed site uses, can be accommodated without any unreasonable impacts on adjoining vehicle movements considering the previously mentioned maximum hourly traffic generation. It is accordingly recommended that construction vehicle movements to and from the site be minimised and eliminated where possible during road network peak periods (7:00am – 9:00am and 4:00pm – 6:00pm).

9.8 Impacts on Pedestrians

Pedestrian demands along Eden Street immediately adjacent to the site are reasonably low, with pedestrian demands generally being accommodated along the western footway commensurate with its connectivity to The Arcade and thence Arncliffe Railway Station. Notwithstanding this, pedestrian movements within the eastern Eden Street footway adjacent to the site are to occur in an unimpeded fashion during all periods of construction.

Vehicular site access and egress movements are to be supervised by qualified traffic controllers, ensuring that pedestrian movements within Eden Street continue to occur in a safe and efficient manner.

Pedestrian demands along Princes Highway have also been observed to be reasonably low, despite a bus stop being situated to the north of the site. In any case, pedestrian movements within the western Princes Highway footway adjacent to the site are to occur in an unimpeded fashion during all periods of construction.

Further to the above, unimpeded pedestrian access to adjoining developments will be maintained at all times.

Boundary hoarding will protect pedestrians from dust and debris.

No unreasonable impacts on the safety or mobility of pedestrians are therefore anticipated during the construction works associated with the subject development.

10. CONCLUSION

This updated report assesses the potential transport implications associated with a mixed-use development containing 744 dwellings, approximately 3,100m^2 retail floor space and a 40-place child care centre at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe. Based on this assessment, the following conclusions are now made:

- The proposed site access arrangements are projected to result in motorists being capable of entering and exiting the subject site in a safe and efficient manner;

- The proposed deceleration lane adjacent to the northbound carriageway of Princes Highway providing access to the subject site has been designed in accordance with Austroads' *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* specifications and is therefore satisfactory;

- The proposed vehicular parking provision is considered to be satisfactory with respect to the requirements of RDCP 2011, TfNSW's Guide to Traffic Generating Developments and the ARH SEPP;

- The internal vehicle circulation arrangements are capable of providing for safe and efficient internal manoeuvring;

- Automatic License Plate Recognition is recommended to be implemented across the site at all car parking control points to minimise the delays to vehicles upon entry and exit to the site;

- The internal queuing distance of 50m from the basement car parking control point to the property boundary on Princes Highway (and a total distance of approximately 125m) exceeds the requirements of AS2890.1:2004, the 98th percentile queue of 3 vehicles as calculated using Queueing Theory from Austroads Guide to Traffic Theory Part 2 and the 95th percentile queue calculated via Sidra. Accordingly, queues from vehicles entering the site are not expected to impact Princes Highway and the location of the ingress control point from Princes Highway is considered satisfactory;

- The Sidra modelling undertaken suggests that no additional road network treatments are required on the classified road network to support the proposed development. However, the recommended network treatment, primarily to improve pedestrian safety, is to provide a new left turn ingress into the subject site from Princes Highway for northbound traffic;

- On the local road network, the recommended treatment is to provide access to the basement and the loading dock via a combined site access roadway, intersecting with Eden Street under 'Stop' signage control;

- The subject development has been projected to generate up to 308 and 369 weekday and weekend peak hour vehicle trips to and from the subject site;

- Based on the Sidra modelling undertaken, it is considered that the adjoining road network is capable of accommodating the traffic projected to be generated by the subject development; and

- There is sufficient capacity in the existing heavy rail and bus network in the vicinity of the site to cater for the anticipated peak public transport generation and existing and future public transport services will not be materially impacted by the trips generated by the subject development.

It is considered, based on the contents of this report and the conclusions contained herein, there are no traffic, public transport or parking related issues that should prevent approval of the subject application. This action is therefore recommended.

APPENDIX 1



1 UPPER GROUND
1 : 250

KEY:

B:	BALCONY
WG:	WINTER GARDEN
POS:	PRIVATE OPEN SPACE
SL:	SKYLIGHT

North Point

DA SUBMISSION

7/10/2020 2:32:32 PM

Plotted and checked by PDS

Verified PDS Approved LMC

Drawing Created (date) Drawing Created (by) JK, SM, AR, EC, AF

22/10/2020

Scale	Project No	Drawing No	Issue
1 : 250	180319	DA 2005	D

Amendments

Issue	Description	Date
8	ISSUED FOR INFORMATION	08/03/2021
9	ISSUED FOR INFORMATION	19/03/2021
10	ISSUED FOR GANSW 03	24/03/2021
11	ISSUED FOR INFORMATION	07/04/2021
12	ISSUED FOR CONSULTANTS	16/04/2021
13	ISSUED TO BASIX	28/04/2021
14	ISSUED FOR CONSULTANTS	10/05/2021
A	ISSUED FOR DA	28/05/2021
B	ISSUED FOR DA	01/07/2021
C	ISSUED FOR REVIEW	08/11/2021
D	ISSUED FOR DA	22/12/2021

Amendments

Issue	Description	Date

Consultant
Structural Engineer / Civil
Level 6, 73 Miller Street, North Sydney NSW 2060
TTW

Consultant
Mechanical / Acoustic / Fire Engineer
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Consultant
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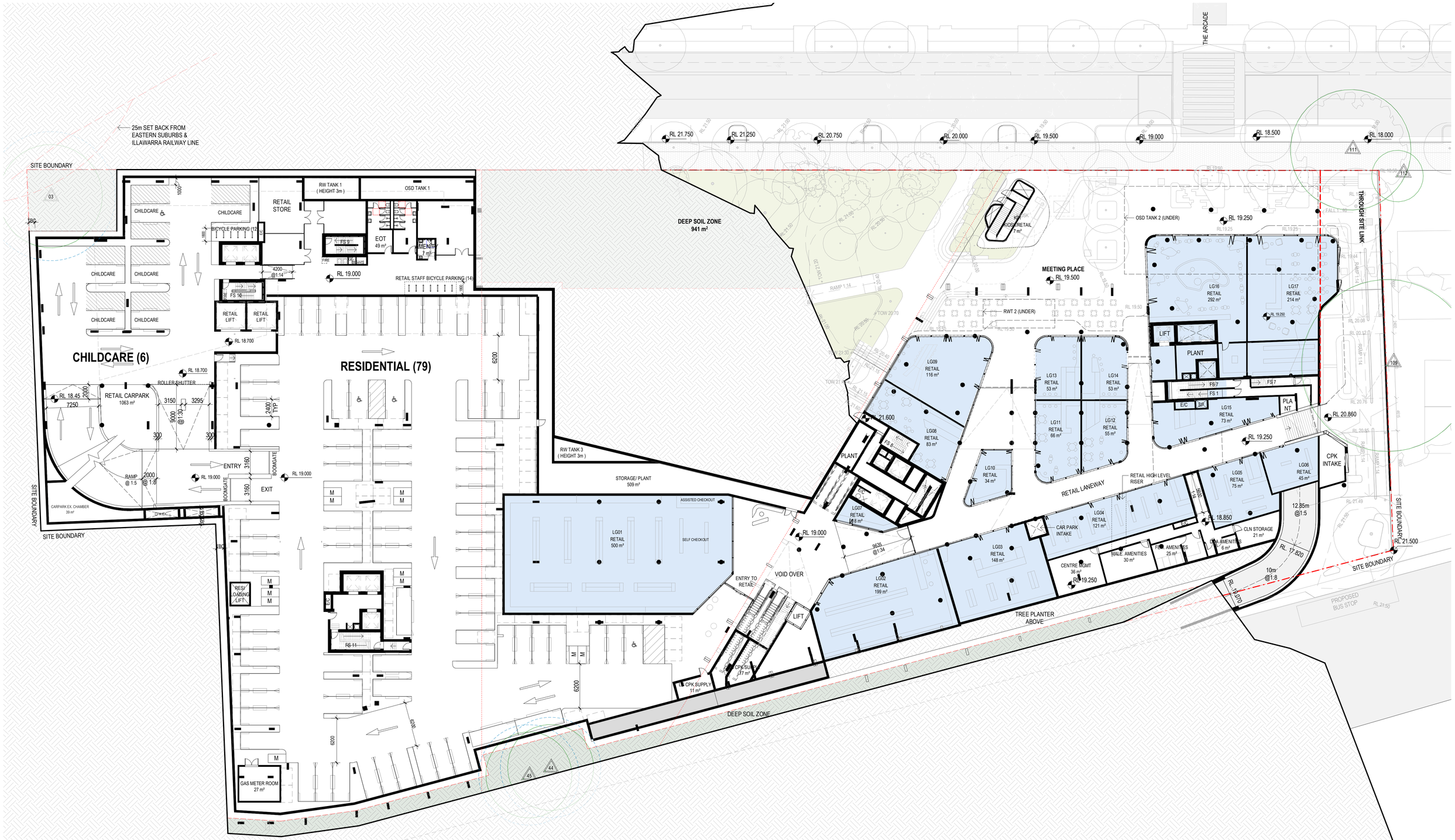
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architecture interior design urban design landscape
nom architect Lisa-Maree Carrigan 7568

Project Title
Eden Street Arncliffe

Drawing Title
UPPER GROUND LEVEL

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1 LOWER GROUND
1 : 250

North Point

DA SUBMISSION

7/02/2022 2:01:31 PM

Amendments

Issue	Description	Date
10	ISSUED FOR GANSW 03	24/03/2021
11	ISSUED FOR INFORMATION	07/04/2021
12	ISSUED FOR CONSULTANTS	16/04/2021
13	ISSUED TO BASIX	28/04/2021
14	ISSUED FOR CONSULTANTS	10/05/2021
15	ISSUED FOR INFORMATION	18/05/2021
16	ISSUED FOR INFORMATION	21/05/2021
A	ISSUED FOR DA	28/05/2021
B	ISSUED FOR DA	01/07/2021
C	ISSUED FOR REVIEW	08/11/2021
D	ISSUED FOR DA	22/12/2021

Amendments

Issue	Description	Date

Consultant
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Consultant
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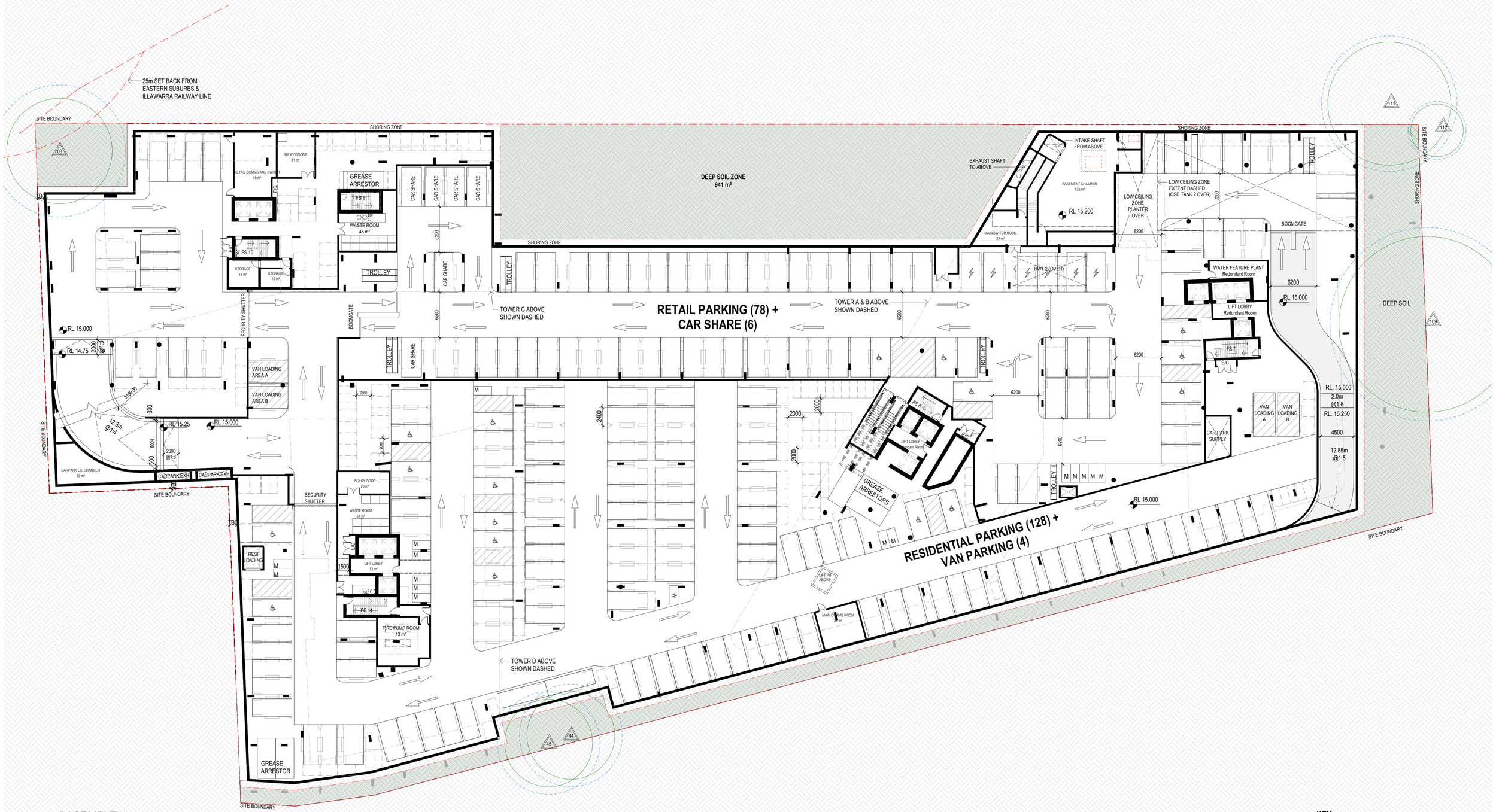
Project Title
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Drawing Title
LOWER GROUND LEVEL

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Verified	PDS	Approved	LMC
Drawing Created (date)		Drawing Created (by)	JK, SM, AR, EC, AF
			22/10/2020

Scale	Project No	Drawing No	Issue
1 : 250	180319	DA 2004	D



1 BASEMENT 1
1 : 250

KEY

M : MOTERCYCLE
V : VISITOR
W: WASHBAY
: ACCESSIBLE
: EV CHARGE

North Point

DA SUBMISSION

Amendments

Issue	Description	Date
8	ISSUED FOR INFORMATION	19/03/2021
9	ISSUED FOR GANSW 03	24/03/2021
10	ISSUED FOR CLIENT'S SIGN OFF	06/04/2021
11	ISSUED FOR INFORMATION	07/04/2021
12	ISSUED FOR CONSULTANTS	16/04/2021
13	ISSUED TO BASIX	28/04/2021
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A	ISSUED FOR DA	28/05/2021
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C	ISSUED FOR REVIEW	08/11/2021
D	ISSUED FOR DA	22/12/2021

Amendments

Issue	Description	Date

Consultant
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Project Title
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Drawing Title
BASEMENT LEVEL 1

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Verified PDS Approved LMC

Drawing Created (date) 22/10/2020 Drawing Created (by) JK, SM, AR, EC, AF.

Scale	Project No	Drawing No	Issue
1 : 250	180319	DA 2003	D

2020/22/12 10:10:07 PM



1 BASEMENT 2
1 : 250

KEY

M : MOTERCYCLE
V : VISITOR
W: WASHBAY
: ACCESSIBLE
: EV CHARGE

North Point

DA SUBMISSION

7/02/2022 2:00:47 PM

Amendments

Issue	Description	Date
6	ISSUED FOR INFORMATION	19/03/2021
7	ISSUED FOR GANSW 03	24/03/2021
8	ISSUED FOR CLIENT'S SIGN OFF	06/04/2021
9	ISSUED FOR INFORMATION	07/04/2021
10	ISSUED FOR CONSULTANTS	16/04/2021
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B	ISSUED FOR DA	01/07/2021
C	ISSUED FOR REVIEW	08/11/2021
D	ISSUED FOR DA	22/12/2021

Amendments

Issue	Description	Date

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BASEMENT LEVEL 2

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22/10/2020

Scale	Project No	Drawing No	Issue
1 : 250	180319	DA 2002	D



1 BASEMENT 3
1 : 250

SITE AREA
13,440 m²

DEEP SOIL REQ
7% OF THE SITE AREA = 941 m²

TOTAL PARKING PROVIDED

PARKING SCHEDULE	
LEVEL	CARPARK
BASEMENT 3	255
BASEMENT 2	257
BASEMENT 1	216
LG CARPARK	85
TOTAL: 813	(INCL. ACCESSIBLE)

ACCESSIBLE
CAR PARK
26
26
27
4
TOTAL: 83

MOTORCYCLE
RESI : 62
RETAIL : 5

BICYCLE
RESI : 372
RETAIL : 8
RETAIL STAFF: 14
CHILDCARE : 4

KEY
M : MOTERCYCLE
V : VISITOR
W: WASHBAY
: ACCESSIBLE
: EV CHARGE

North Point

Amendments

Issue	Description	Date
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6	ISSUED FOR CLIENT'S SIGN OFF	06/04/2021
7	ISSUED FOR INFORMATION	07/04/2021
8	ISSUED FOR CONSULTANTS	16/04/2021
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10	ISSUED FOR CONSULTANTS	10/05/2021
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A	ISSUED FOR DA	28/05/2021
B	ISSUED FOR DA	01/07/2021
C	ISSUED FOR REVIEW	08/11/2021
D	ISSUED FOR DA	22/12/2021

Amendments

Issue	Description	Date

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Project Title
Eden Street Arncliffe

Drawing Title
BASEMENT LEVEL 3

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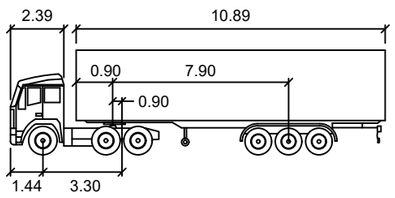
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Verified PDS Approved LMC
Drawing Created (date) 22/10/2020 Drawing Created (by) JK, SM, AR, EC, AF

Scale	Project No	Drawing No	Issue
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APPENDIX 2



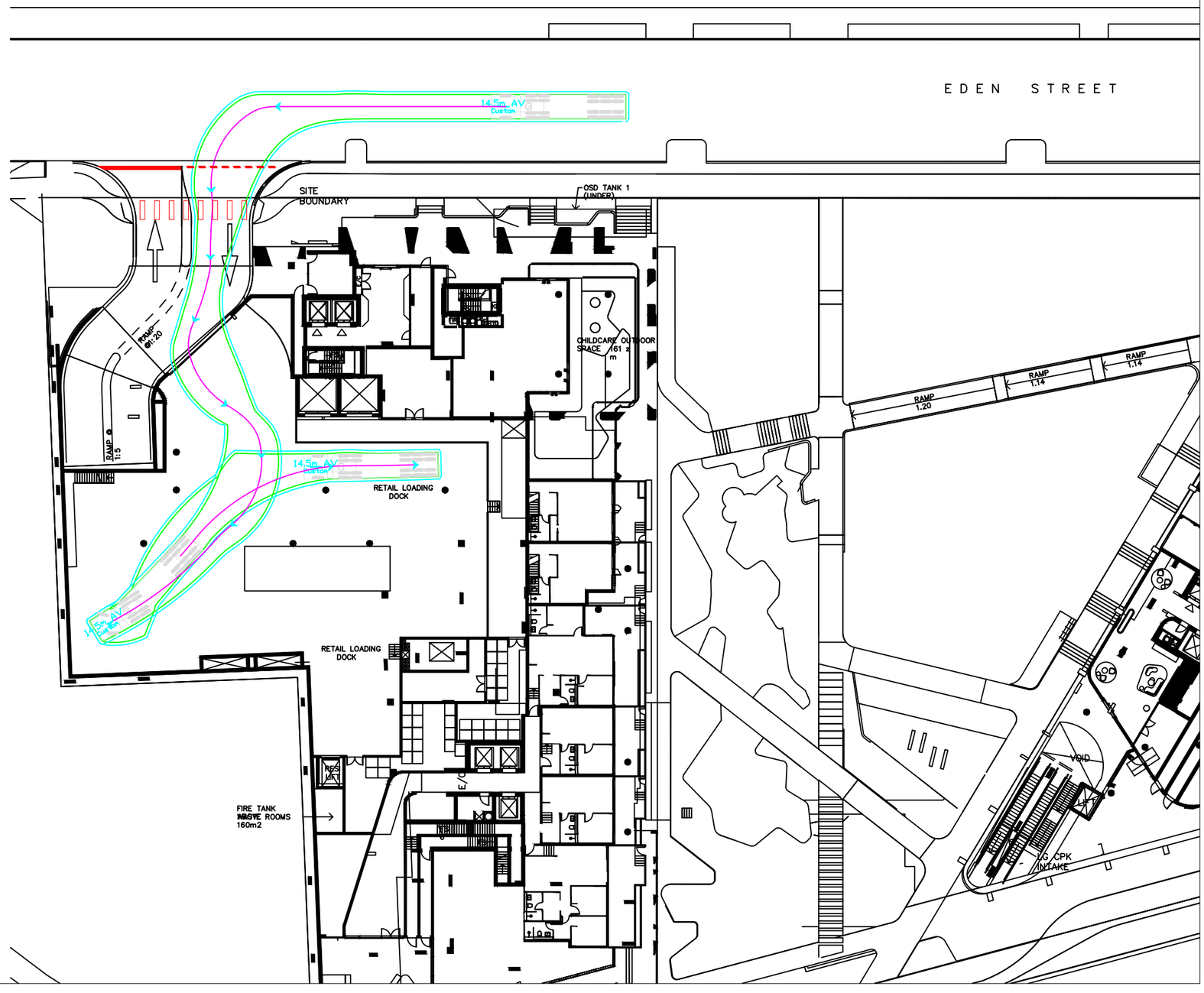
14.5m AV

	meters
Tractor Width	: 2.50
Trailer Width	: 2.50
Tractor Track	: 2.50
Trailer Track	: 2.42
Lock to Lock Time	: 6.0
Steering Angle	: 22.6
Articulating Angle	: 70.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

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14.5m TRUCK SWEPT PATHS

INTERNAL LOADING BAY INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

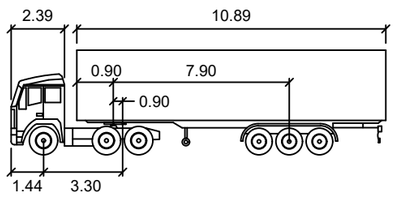
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SUPERSEDES SHEET/ISSUE -

ISSUE A

DATE: 9/02/2022

SHEET 1



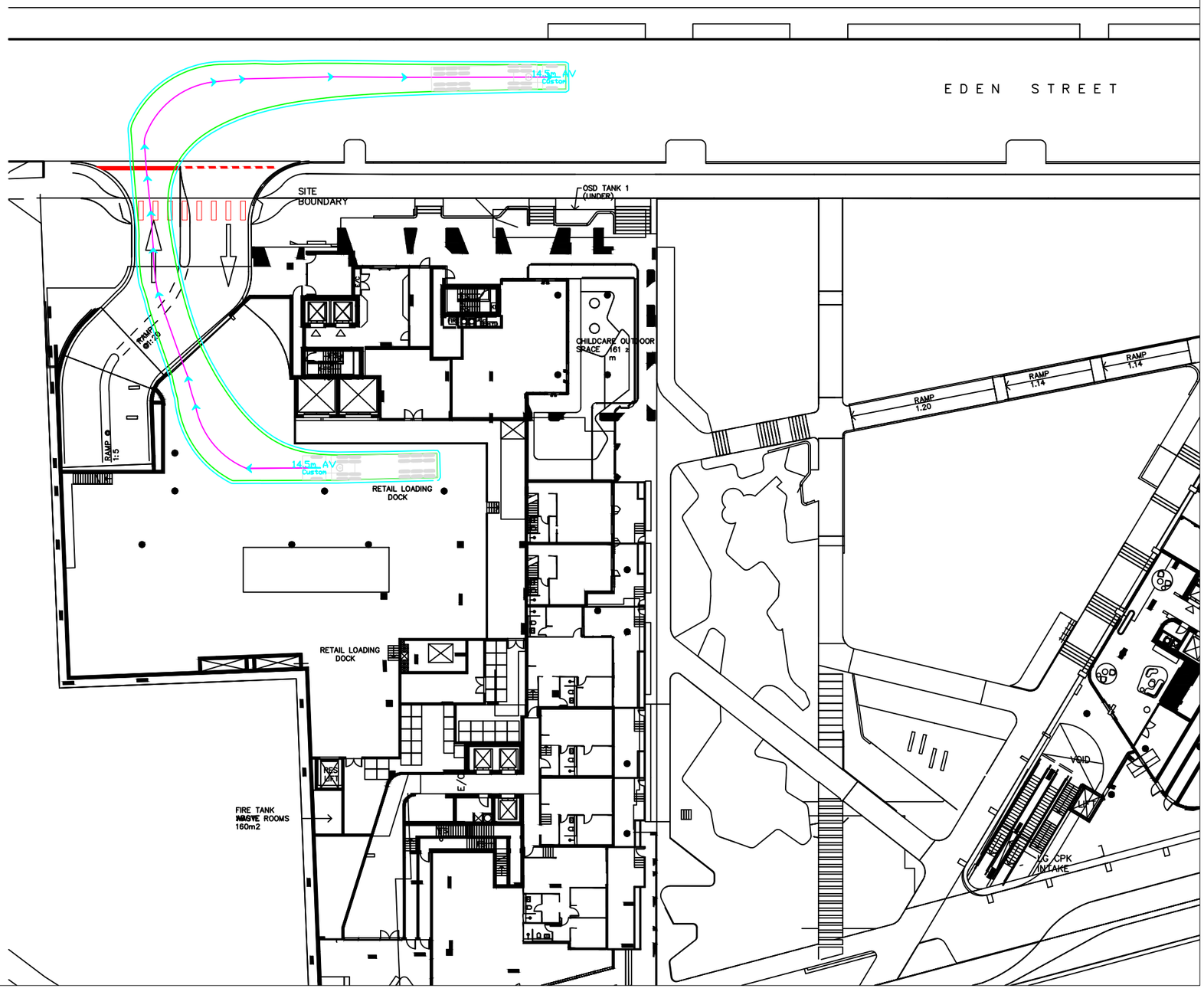
14.5m AV

	meters
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Lock to Lock Time	: 6.0
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LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

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STANBURY TRAFFIC PLANNING

14.5m TRUCK SWEPT PATHS

INTERNAL LOADING BAY EGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

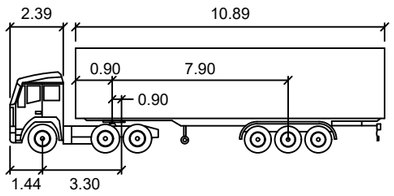
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 2



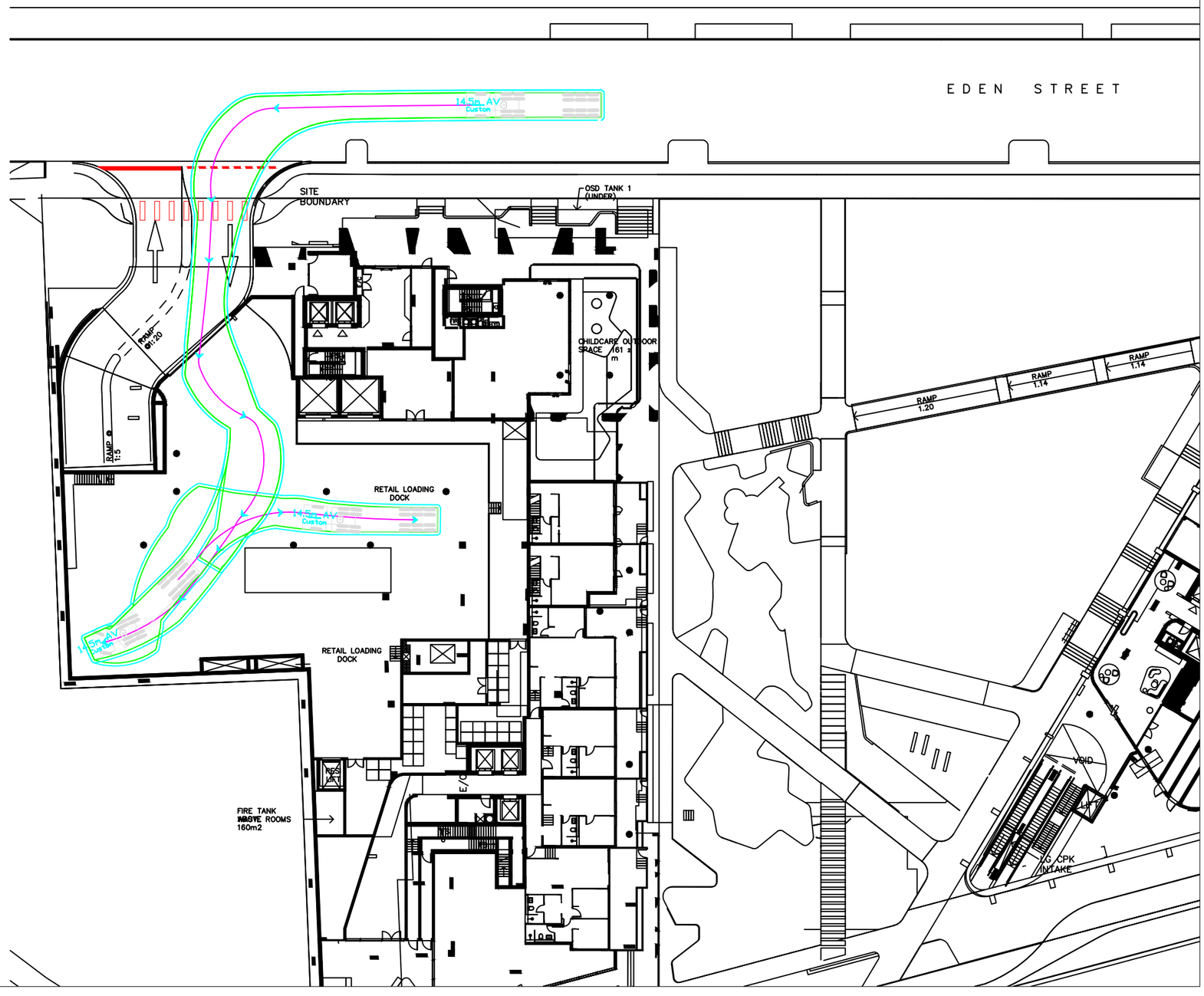
14.5m AV

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LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

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STANBURY TRAFFIC PLANNING

14.5m TRUCK SWEPT PATHS

INTERNAL LOADING BAY INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

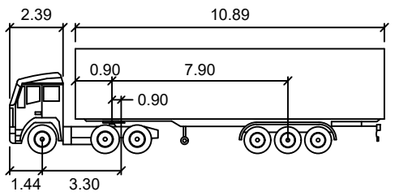
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 3



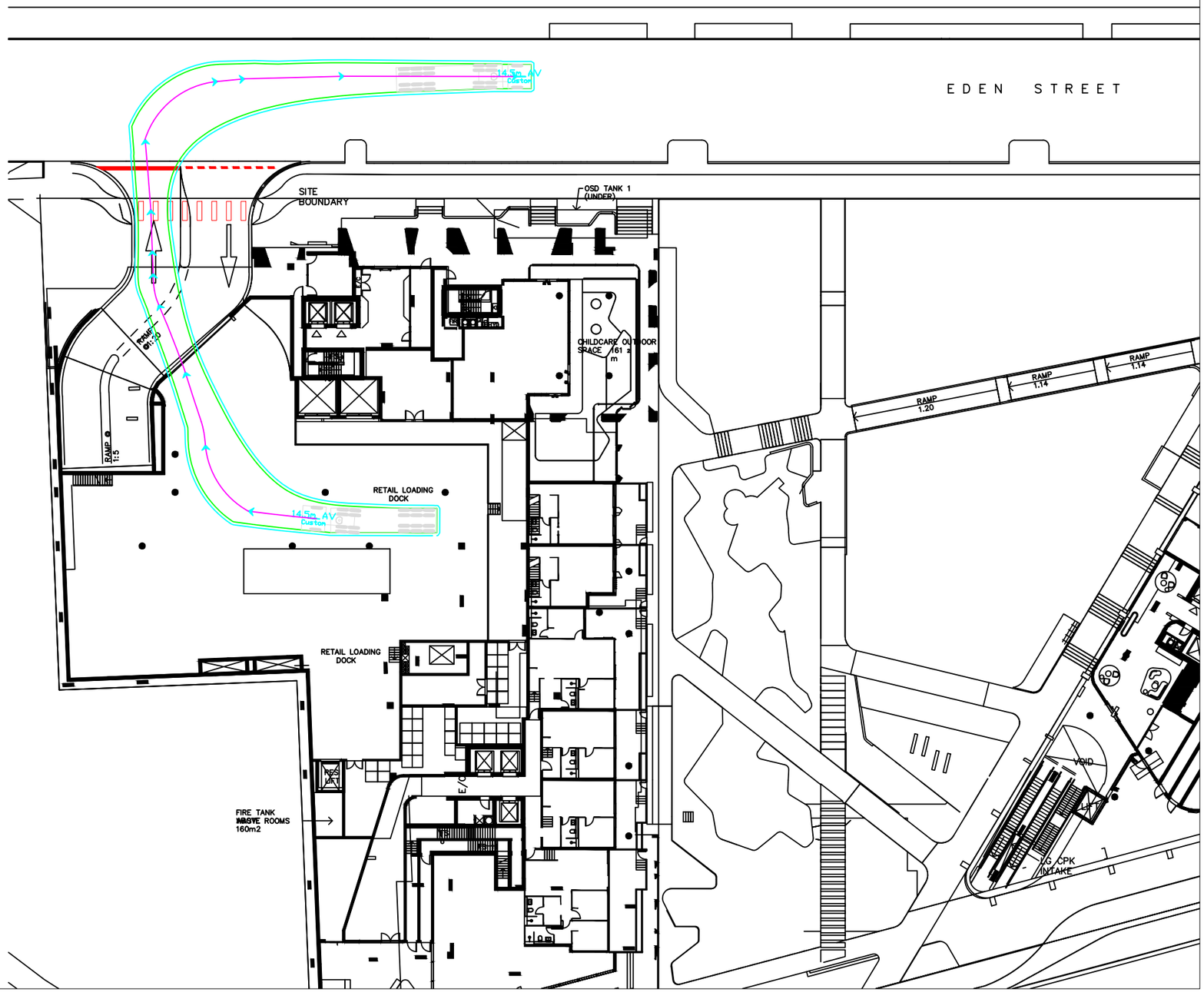
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Tractor Width	: 2.50
Trailer Width	: 2.50
Tractor Track	: 2.50
Trailer Track	: 2.42
Lock to Lock Time	: 6.0
Steering Angle	: 22.6
Articulating Angle	: 70.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

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2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH MANOEUVRING SPECIFICATIONS FOR A 14.5m TRUCK.

STANBURY TRAFFIC PLANNING

14.5m TRUCK SWEPT PATHS

INTERNAL LOADING BAY EGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

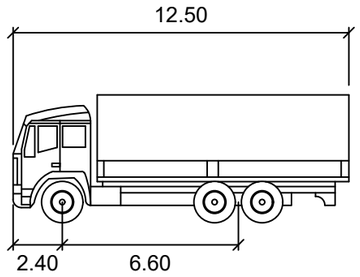
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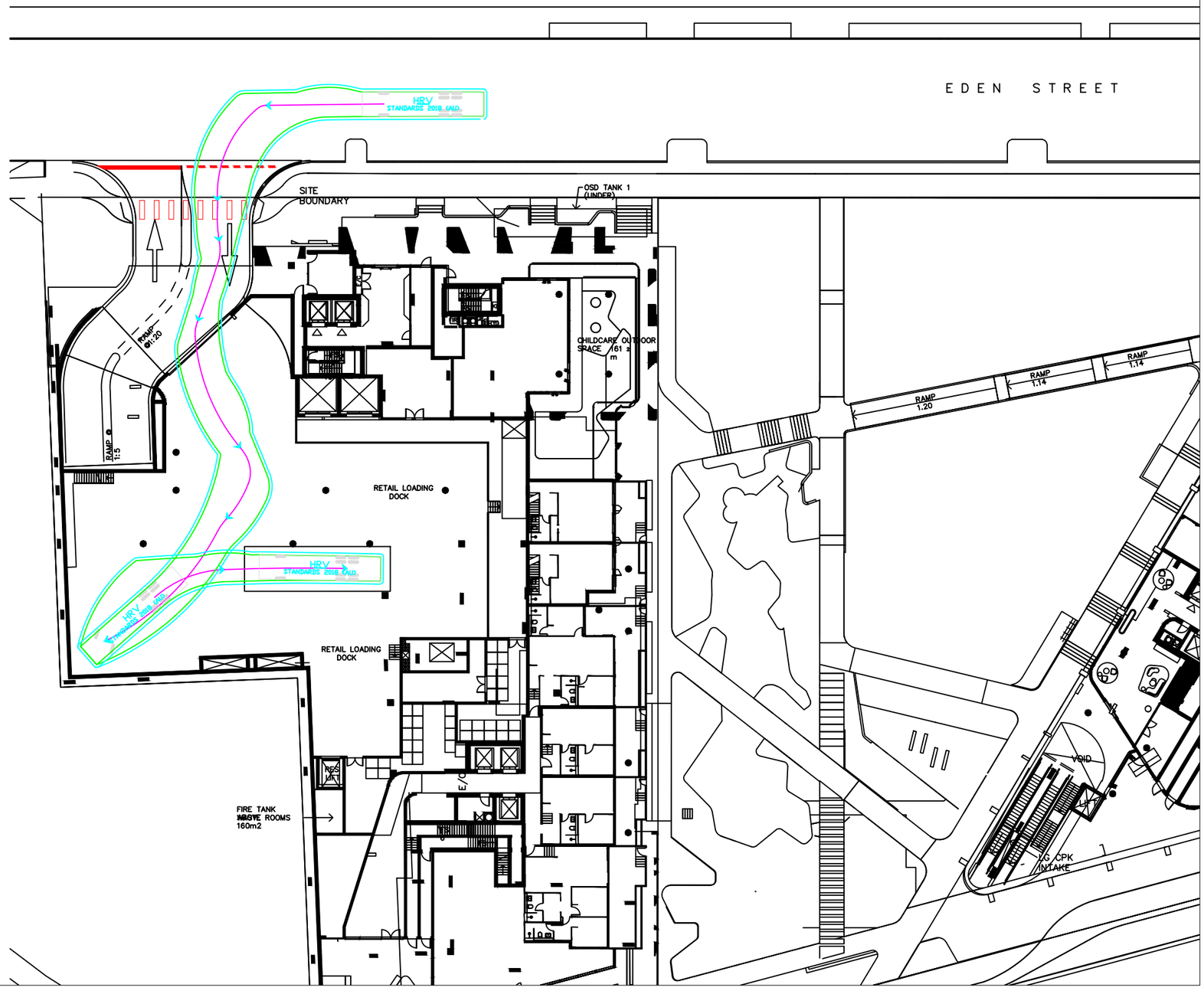
HRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 35.2

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

HEAVY RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

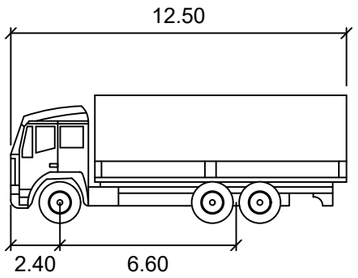
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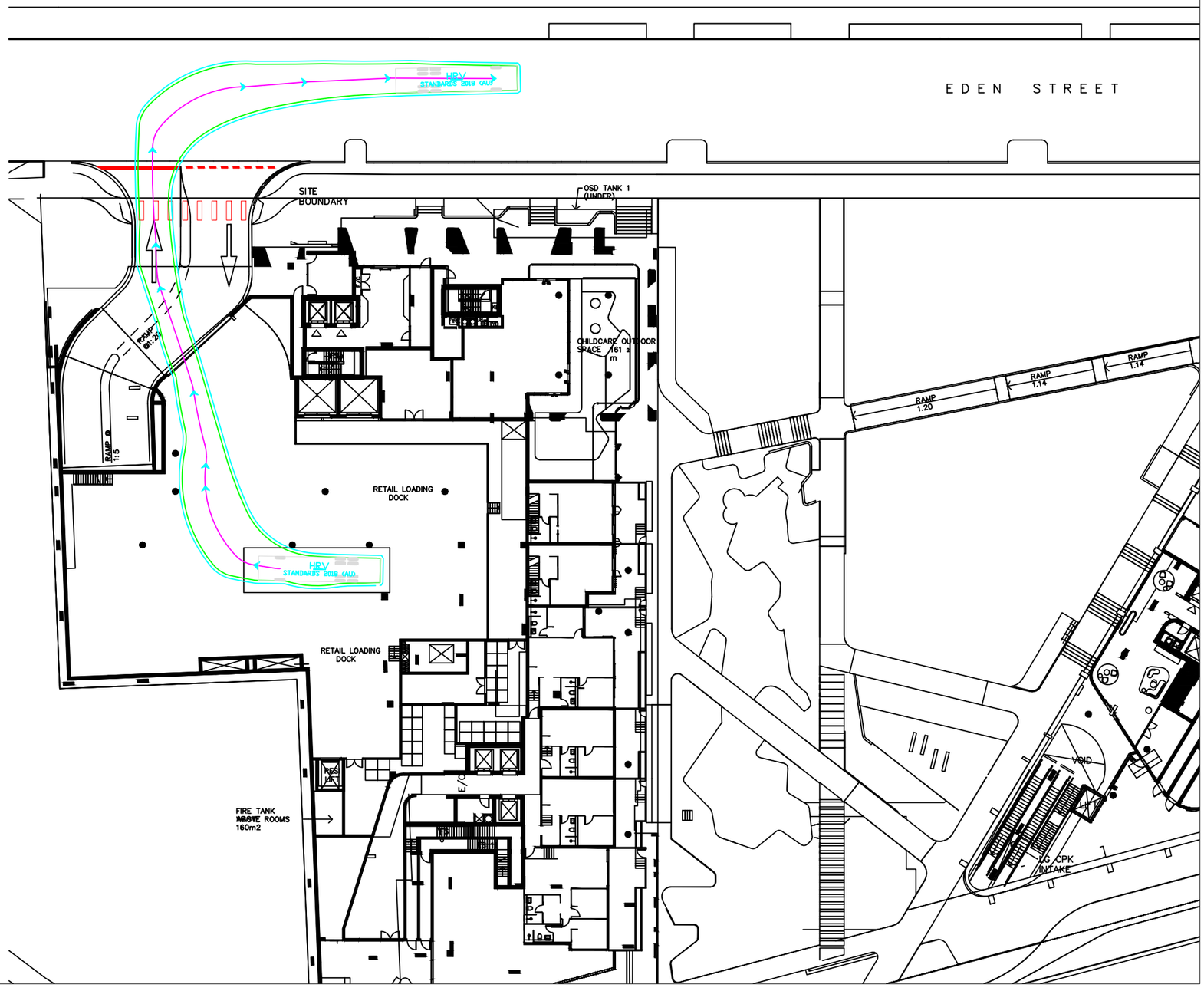
HRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 35.2

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

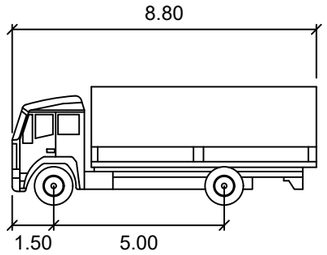
HEAVY RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY EGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3		ISSUE A
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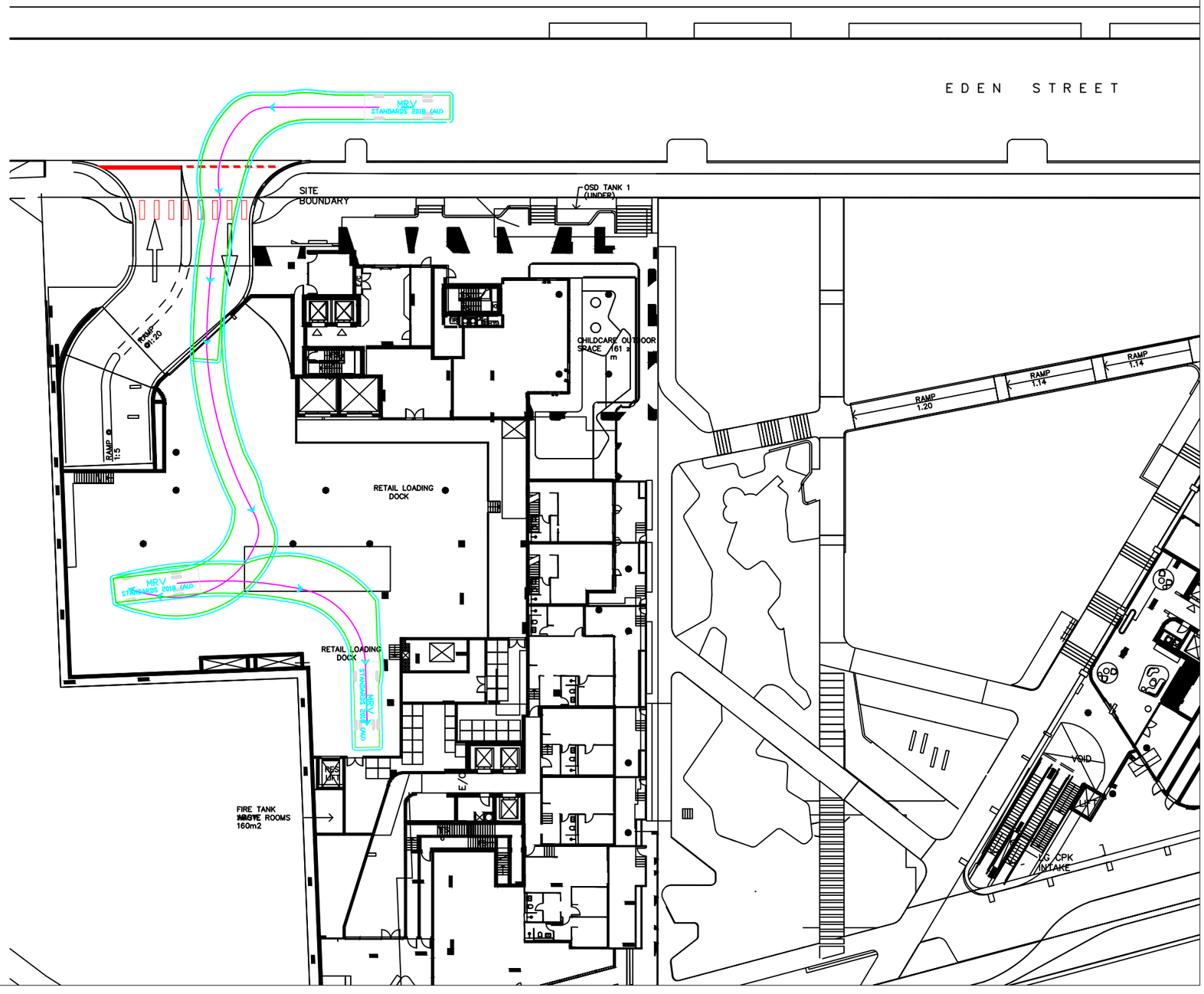
MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

MEDIUM RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

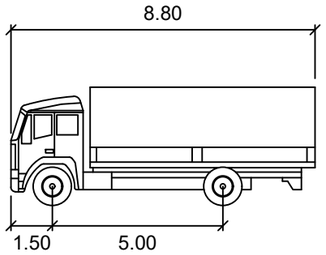
FILE: 20-171

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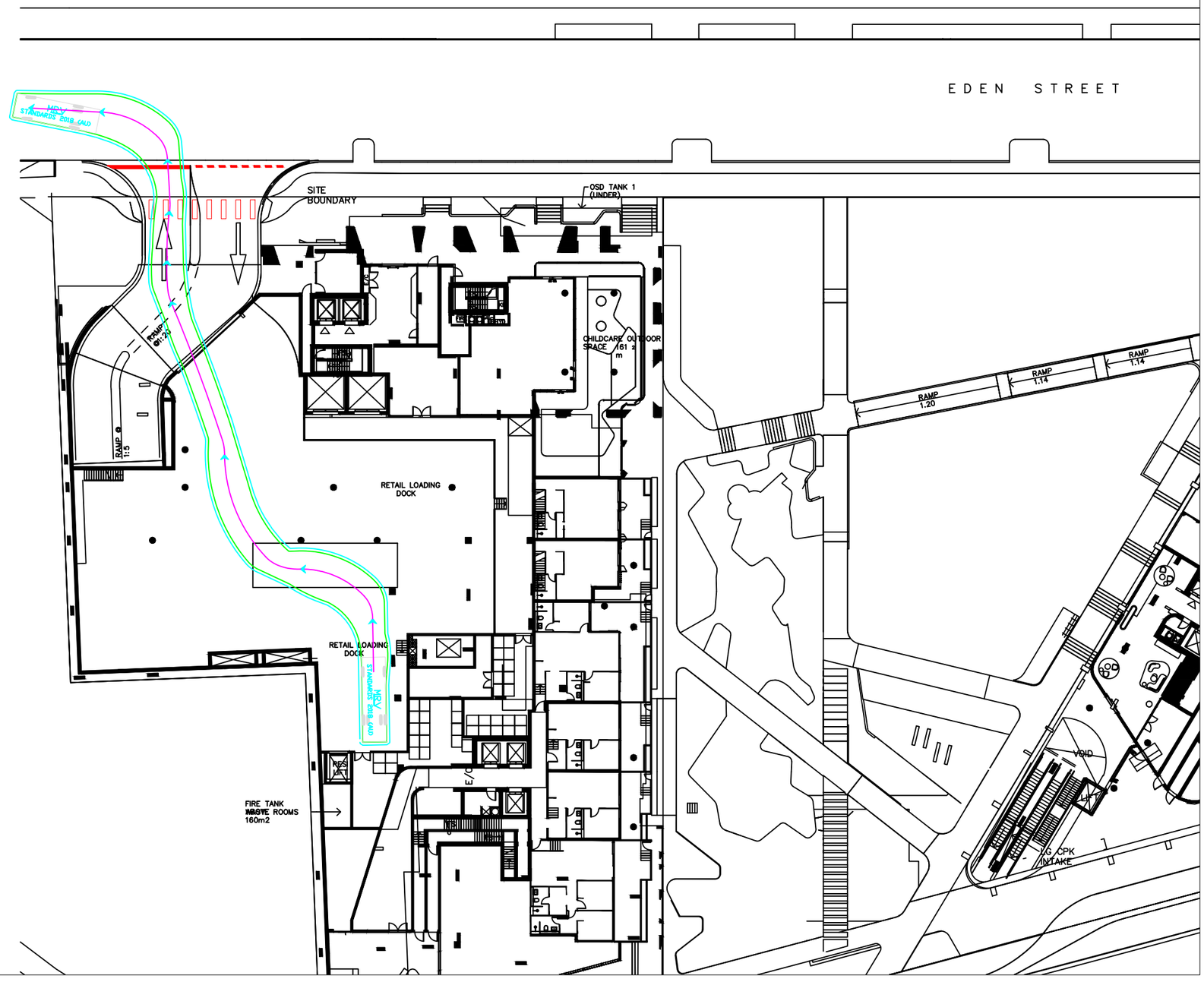
MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING

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STANBURY TRAFFIC PLANNING

MEDIUM RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY EGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

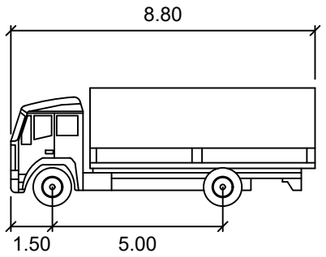
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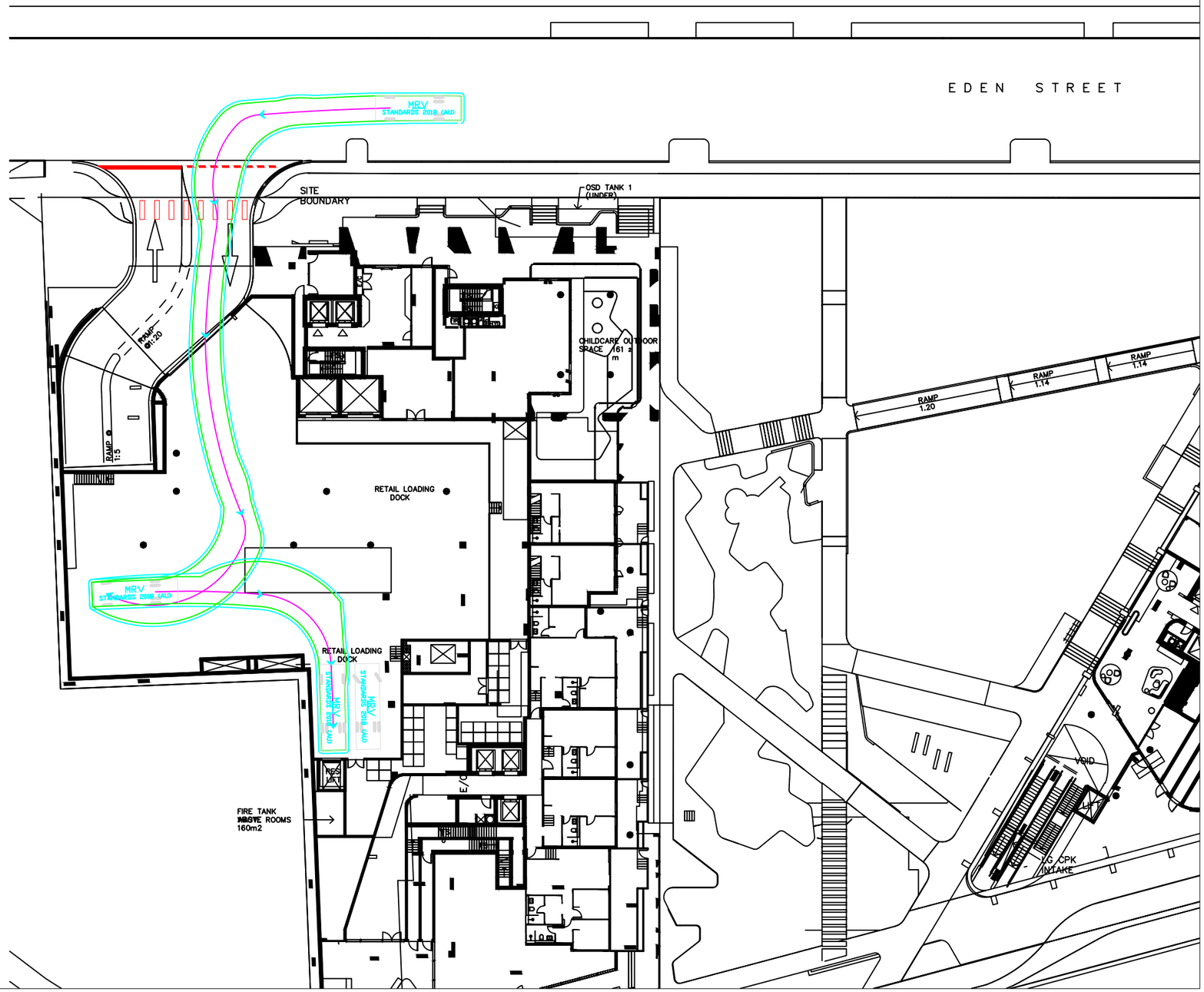
MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

MEDIUM RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

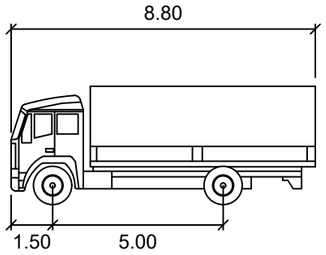
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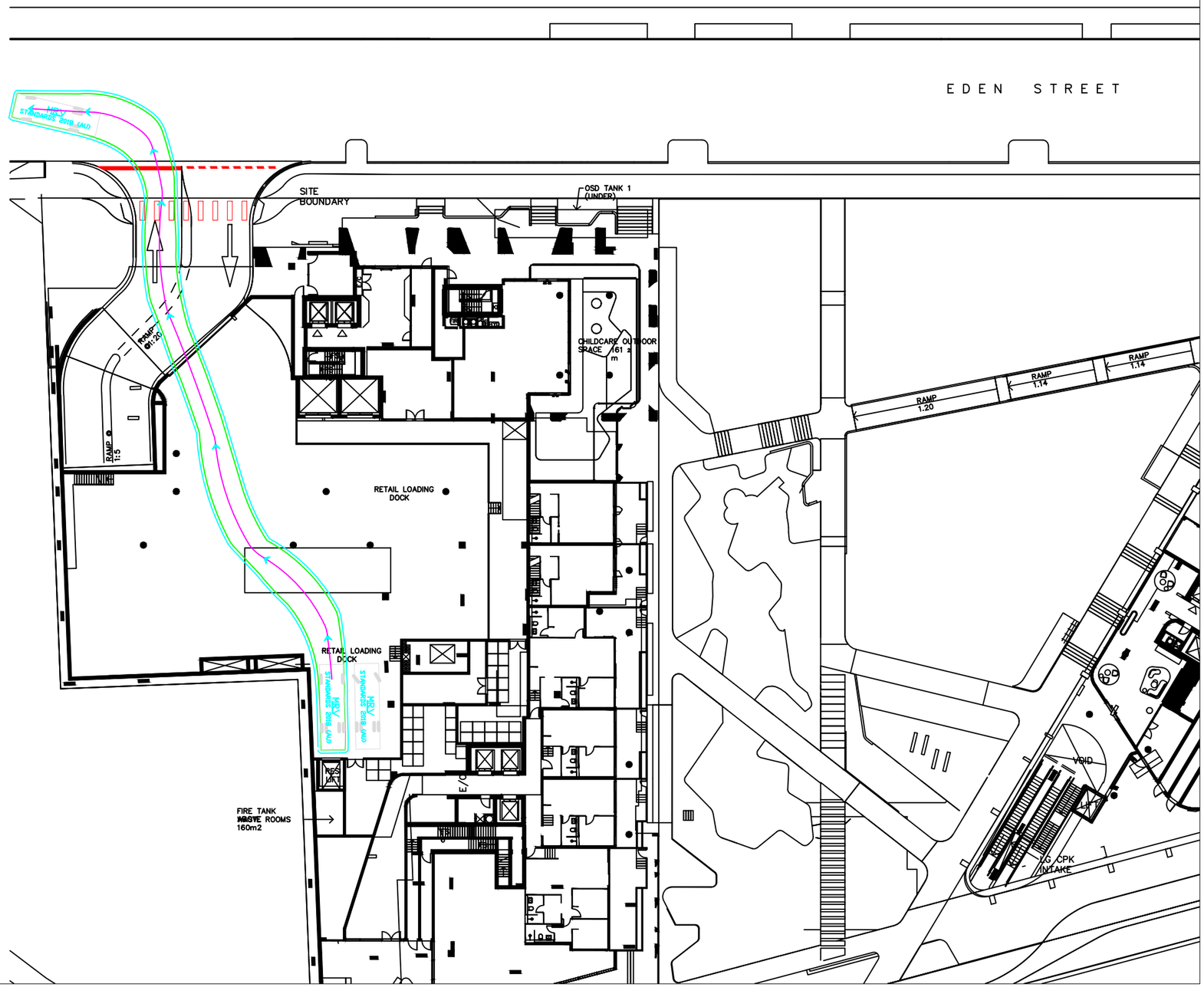
MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING

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STANBURY TRAFFIC PLANNING

MEDIUM RIGID VEHICLE SWEPT PATHS

INTERNAL LOADING BAY EGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

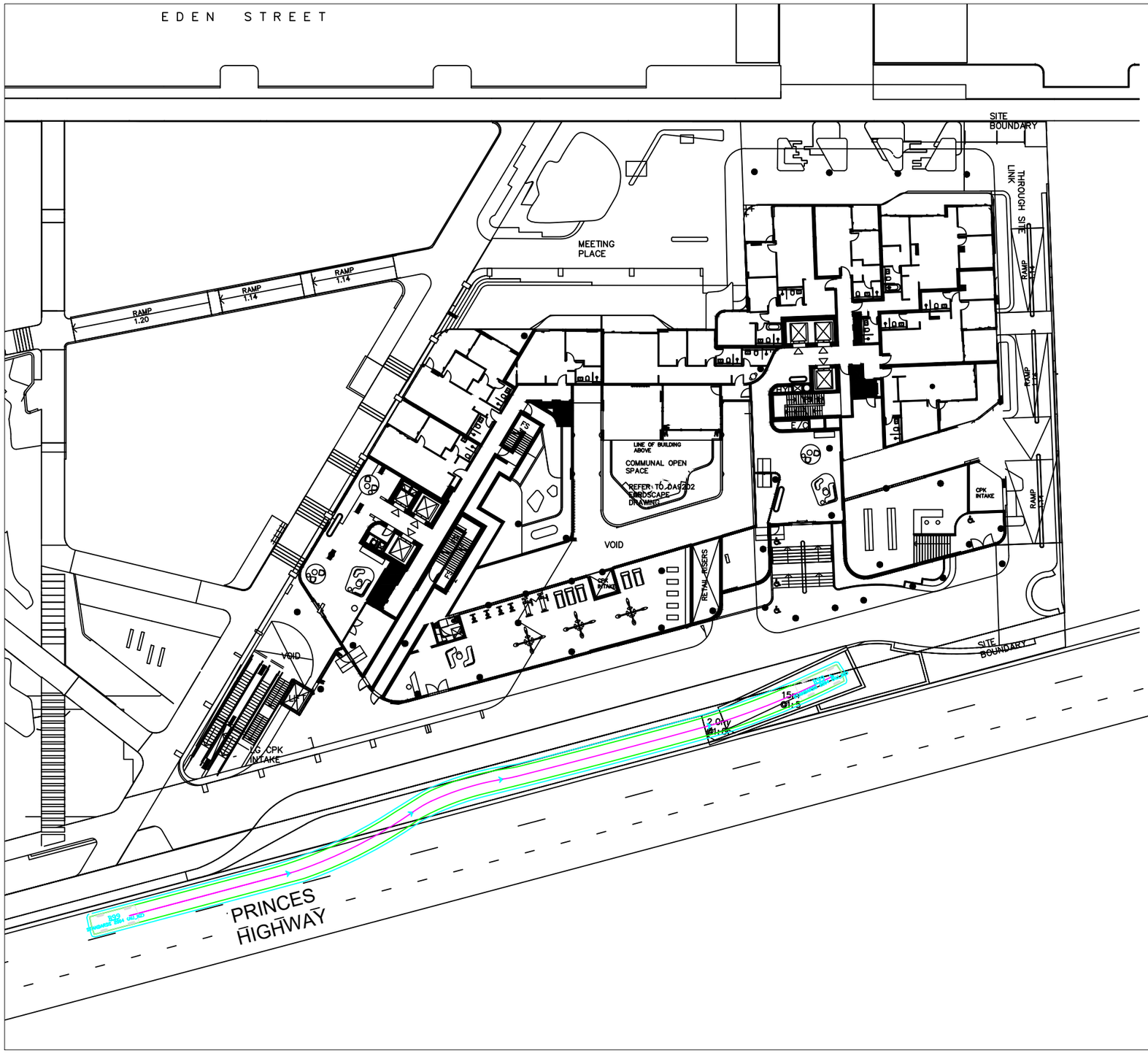
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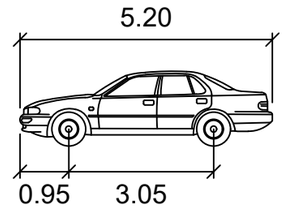
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SHEET 10





B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

SITE INGRESS MOVEMENT

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

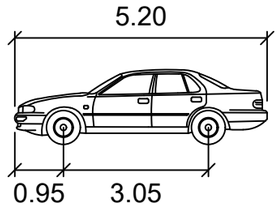
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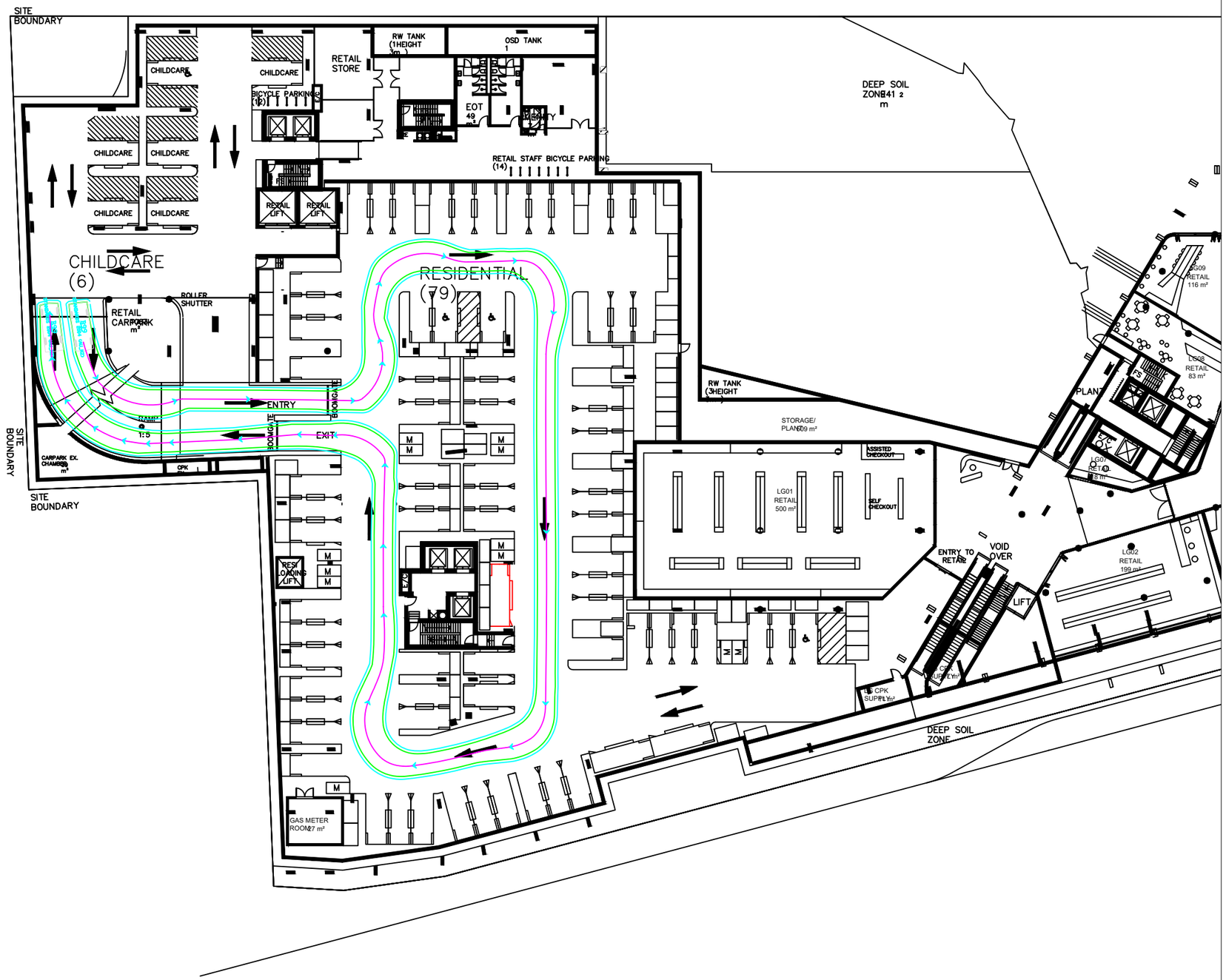
B99

		meters
Width	:	1.94
Track	:	1.84
Lock to Lock Time	:	6.0
Steering Angle	:	33.9

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL MANOEUVRING - LOWER GROUND LEVEL

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

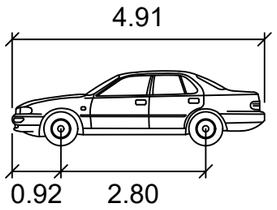
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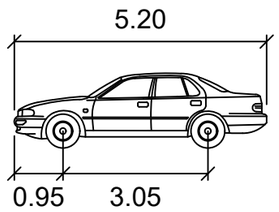
DATE: 9/02/2022

SHEET: 12



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1



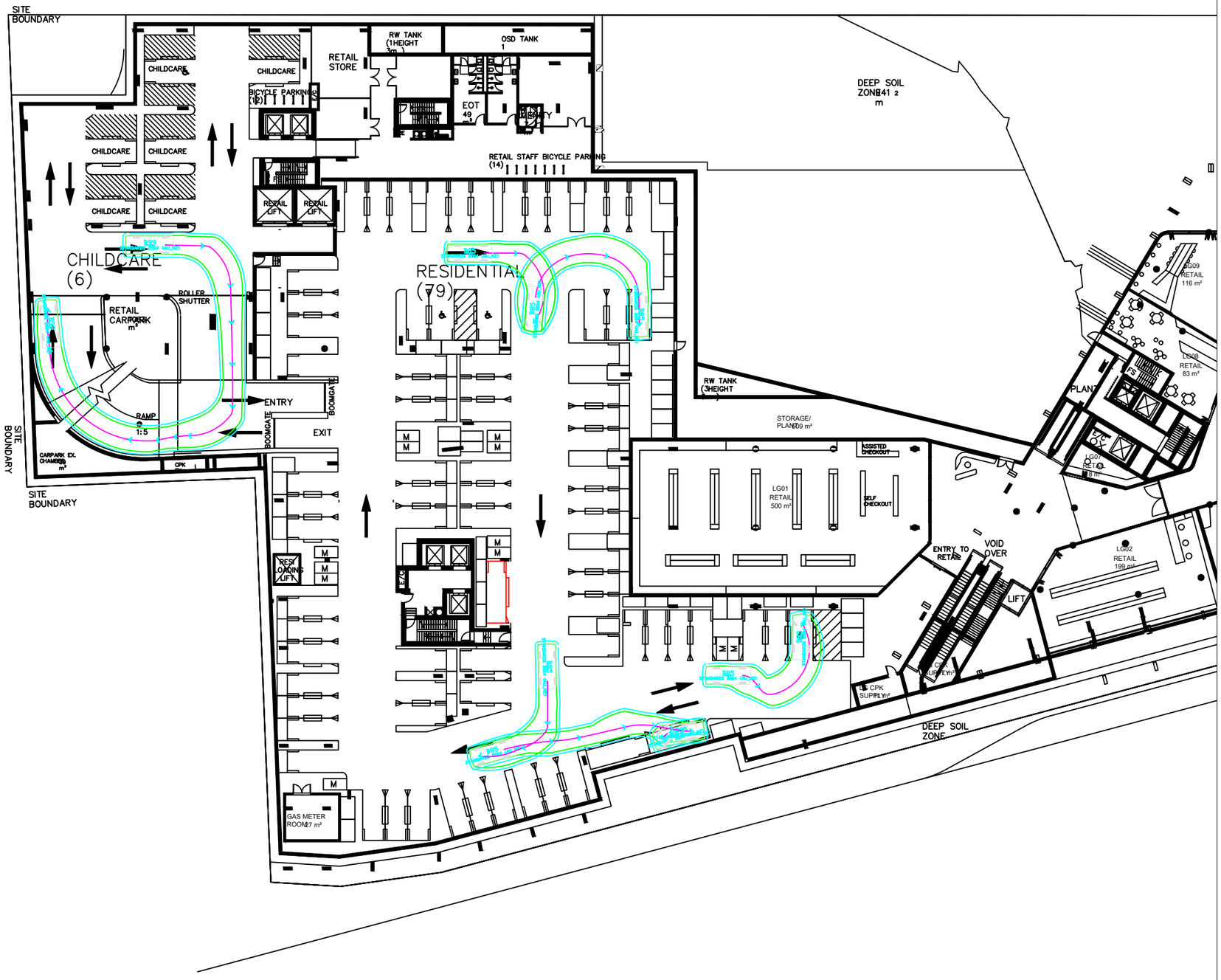
B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

INTERNAL & PARKING SPACE MANOEUVRING - LOWER GROUND LEVEL

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

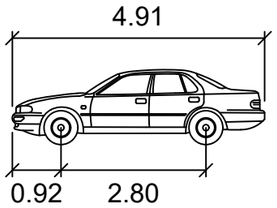
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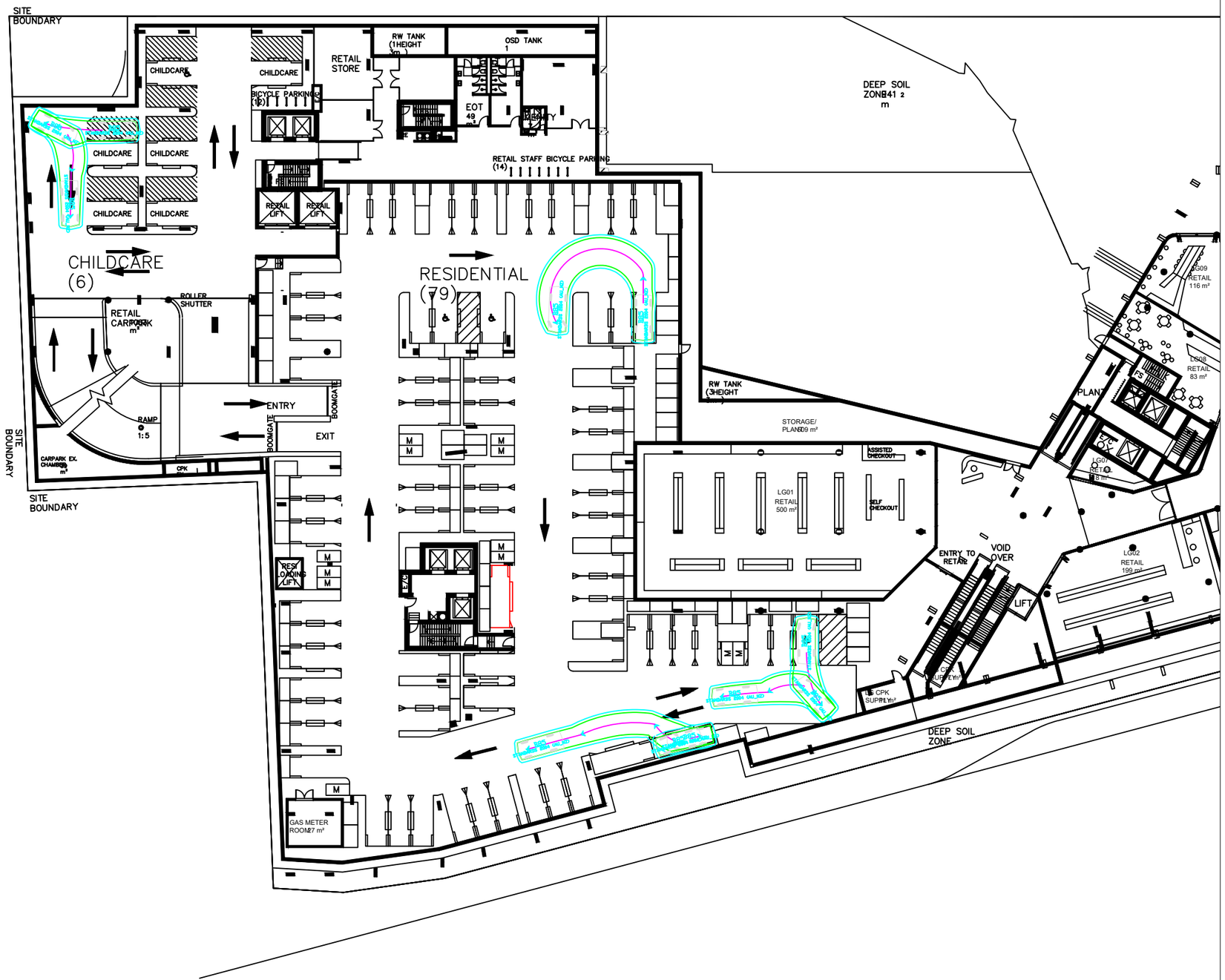
B85

		meters
Width	:	1.87
Track	:	1.77
Lock to Lock Time	:	6.0
Steering Angle	:	34.1

LEGEND

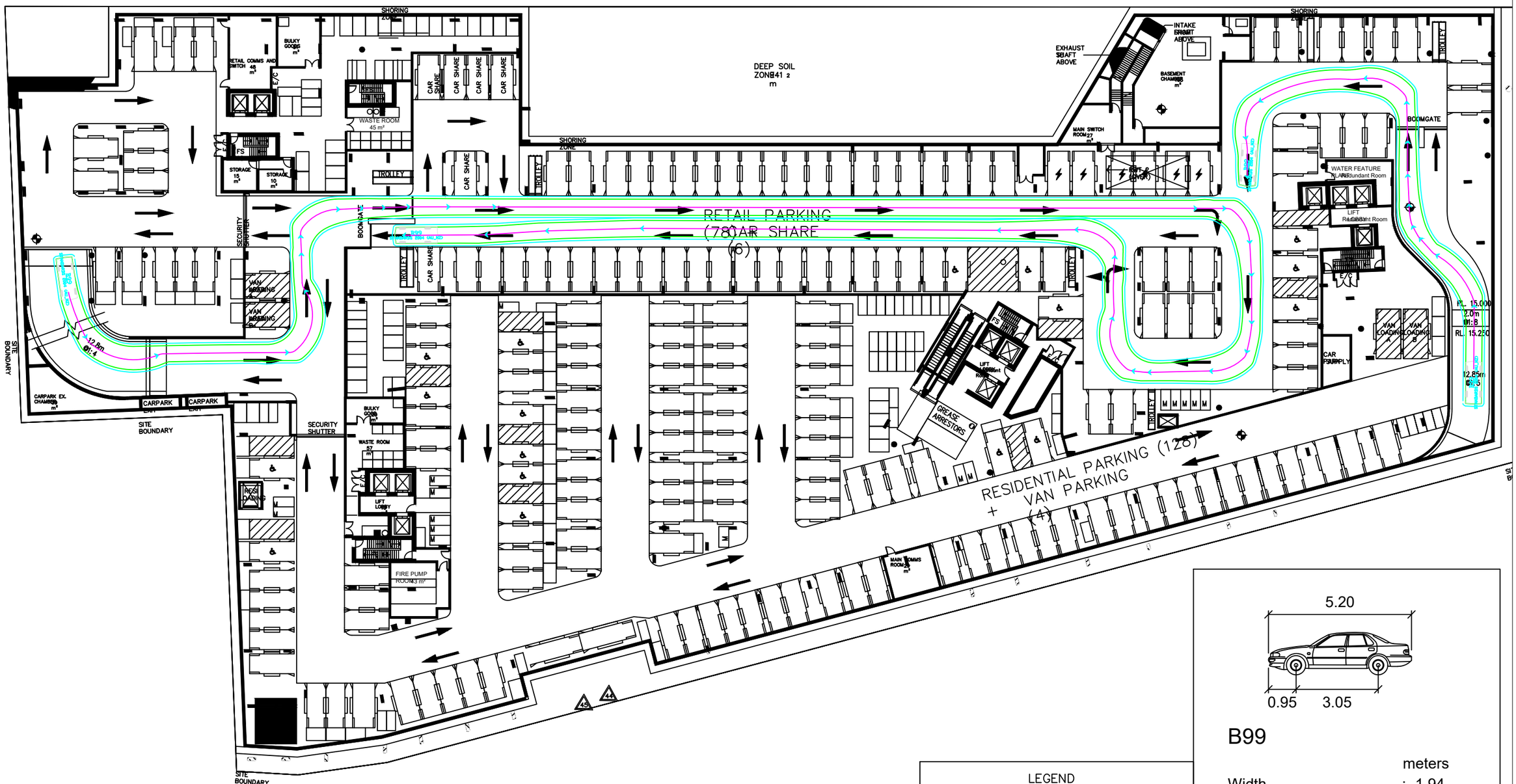
VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)



STANBURY TRAFFIC PLANNING	NOTES:	STANBURY TRAFFIC PLANNING
ADDRESS: 401/380 HARRIS STREET, PYRMONT	1. THIS PLAN IS BASED ON ARCHITECTURAL PLANS PREPARED BY GROUP GSA.	PASSENGER VEHICLE SWEPT PATHS
PH: (02) 8971 8314	2. THE SWEPT PATHS PROVIDED ON THIS PLAN HAVE BEEN GENERATED UTILISING AUTOTURN PRO VERSION 11 IN CONJUNCTION WITH B85 PASSENGER VEHICLE MANOEUVRING SPECIFICATIONS IN ACCORDANCE WITH THE AUSTRALIAN STANDARD FOR PARKING FACILITIES PART 1: OFF-STREET CAR PARKING (AS2890.1:2004).	PARKING SPACE EGRESS MOVEMENTS - LOWER GROUND LEVEL
MOB: 0410 561 848		PROPOSED MIXED USE DEVELOPMENT
EMAIL: info@stanburytraffic.com.au		26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE
WEBSITE: www.stanburytraffic.com.au		SCALE: 1:500 AT A3 · ISSUE A · FILE: 20-171 · SUPERSEDES SHEET/ISSUE - · DATE: 9/02/2022 · SHEET 14

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LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

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PH: (02) 8971 8314
MOB: 0410 561 848
EMAIL: info@stanburytraffic.com.au
WEBSITE: www.stanburytraffic.com.au

NOTES:

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 1 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

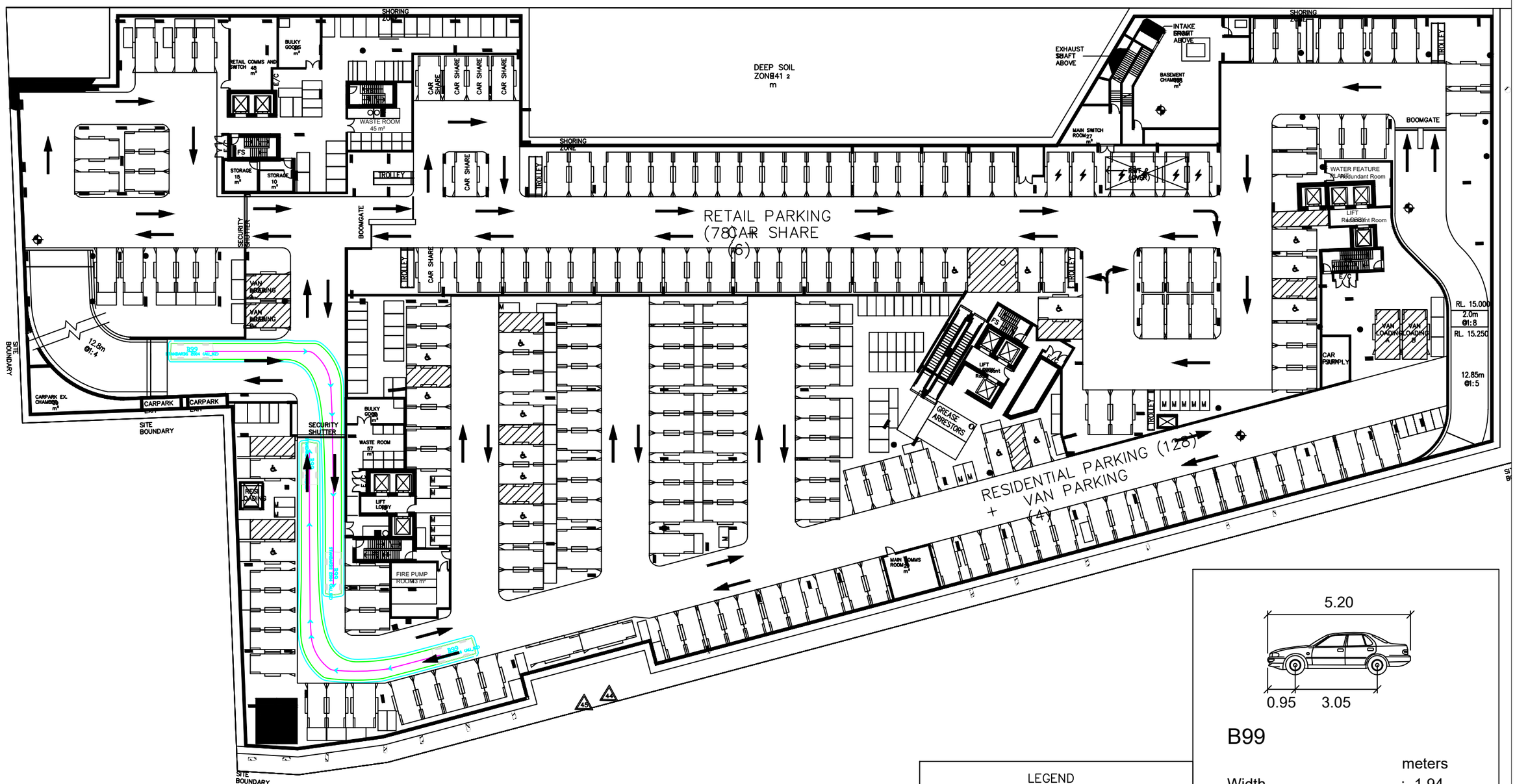
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 15



LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 1 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

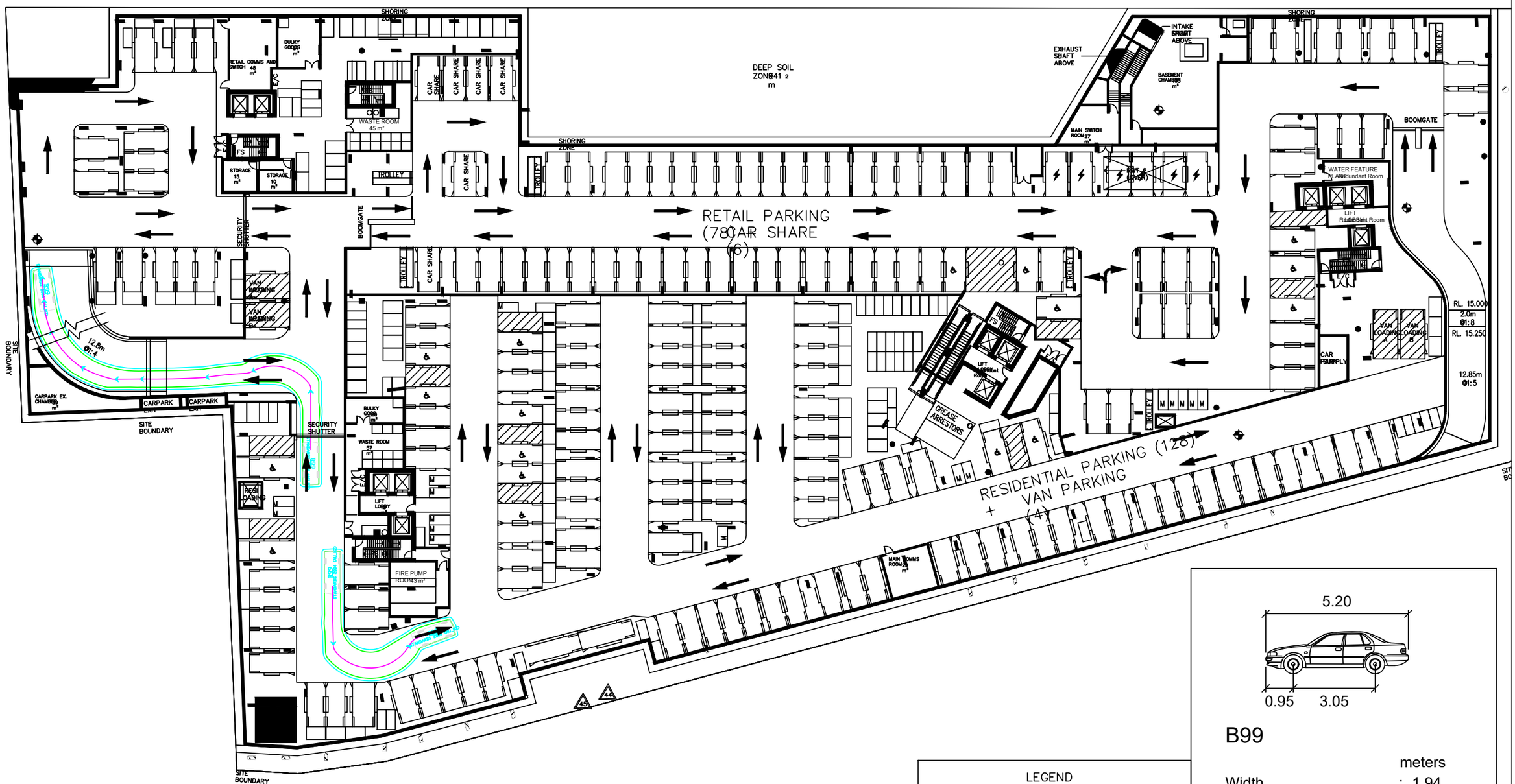
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 16



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 1 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

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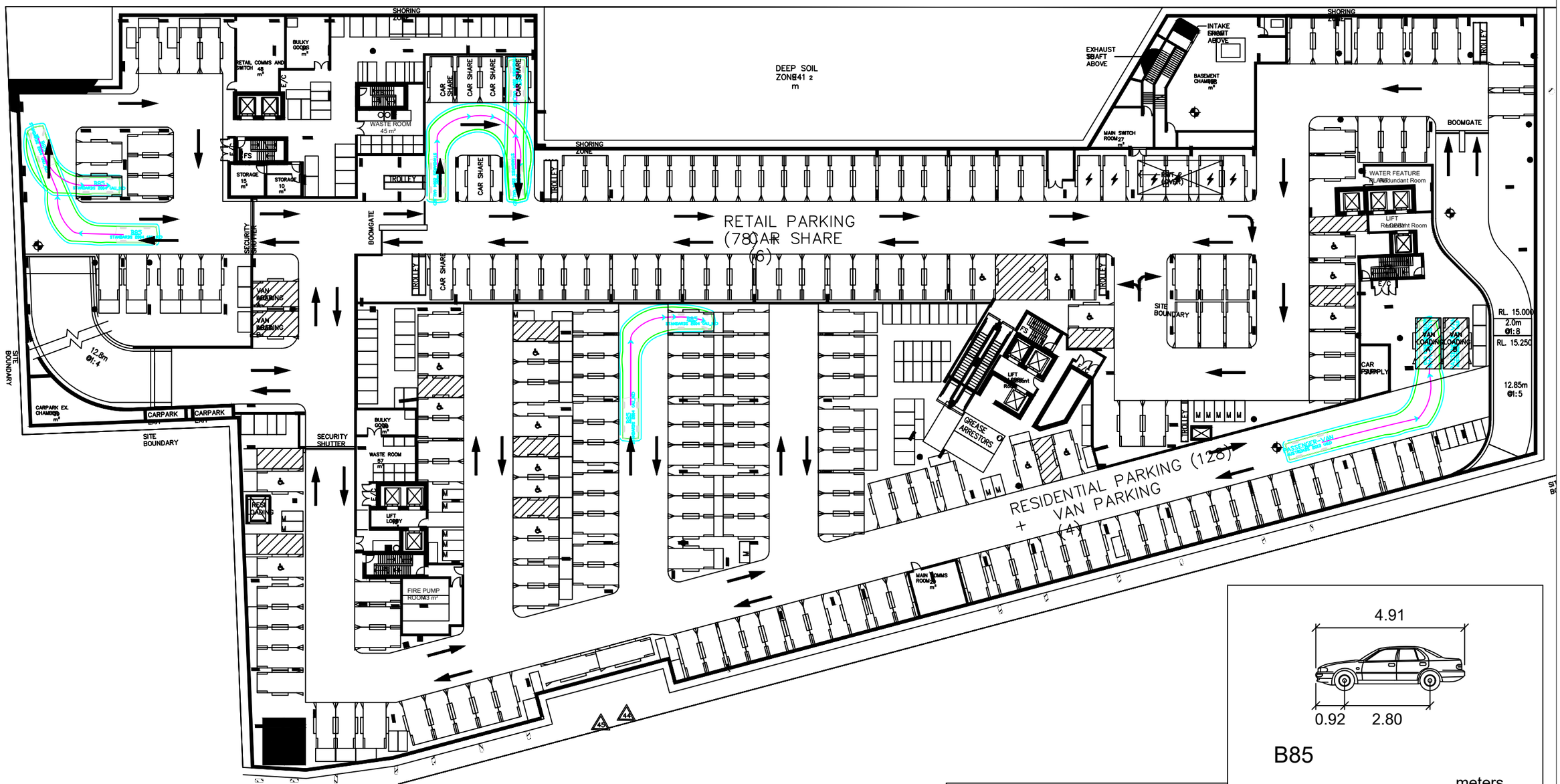
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 17



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 1 PARKING SPACE INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

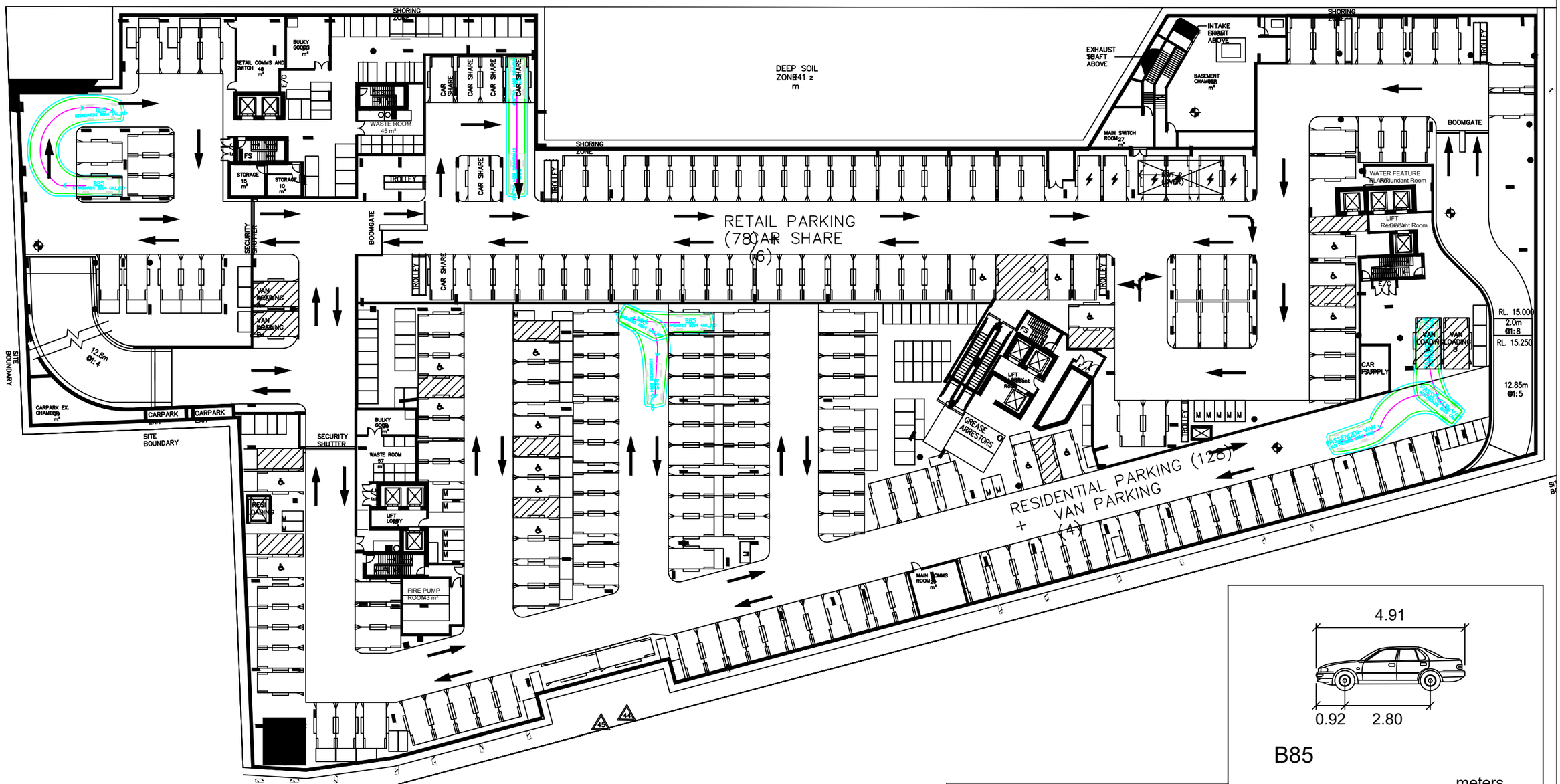
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 18



LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 1 PARKING SPACE EGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

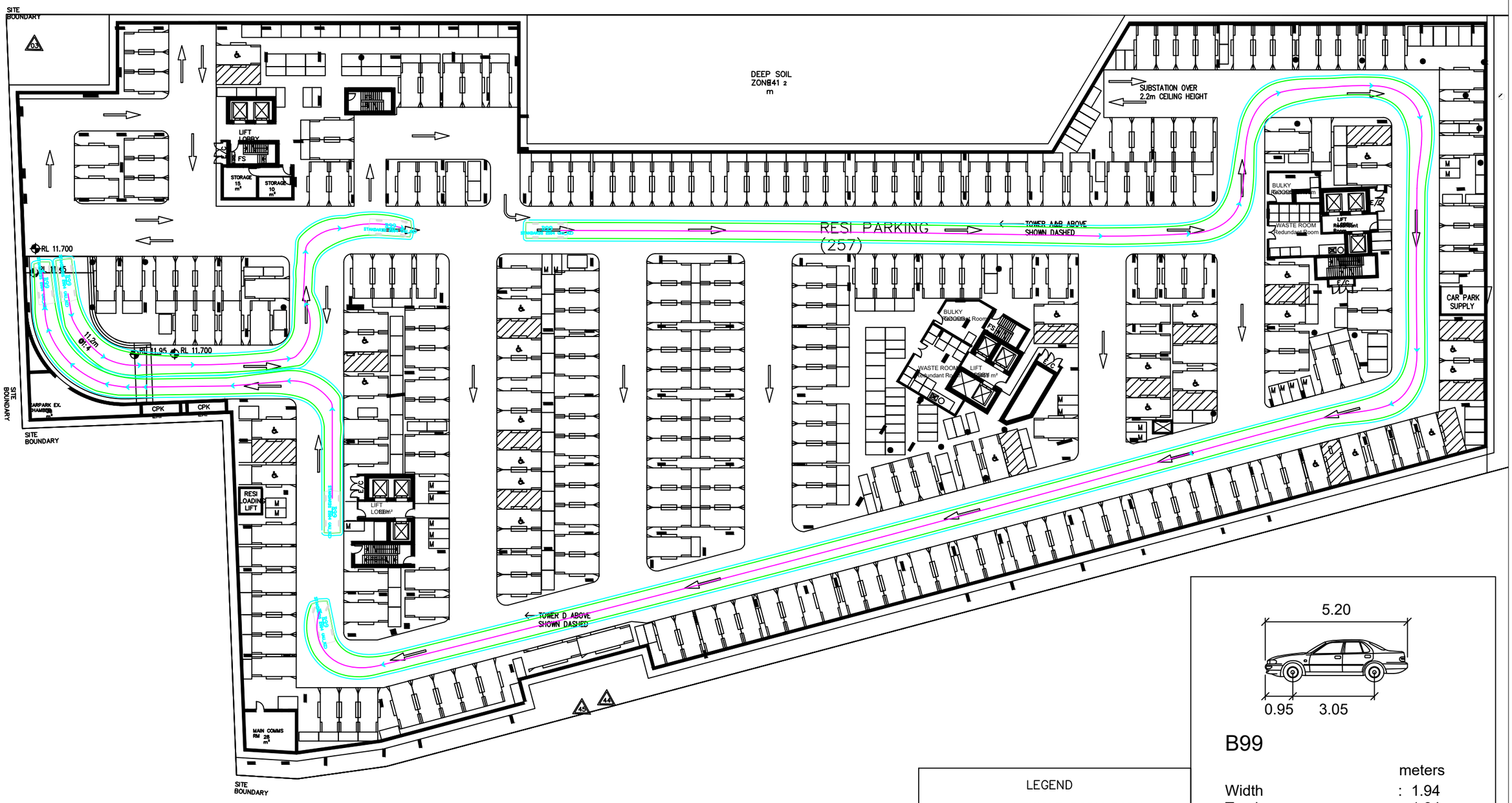
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 19



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 2 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

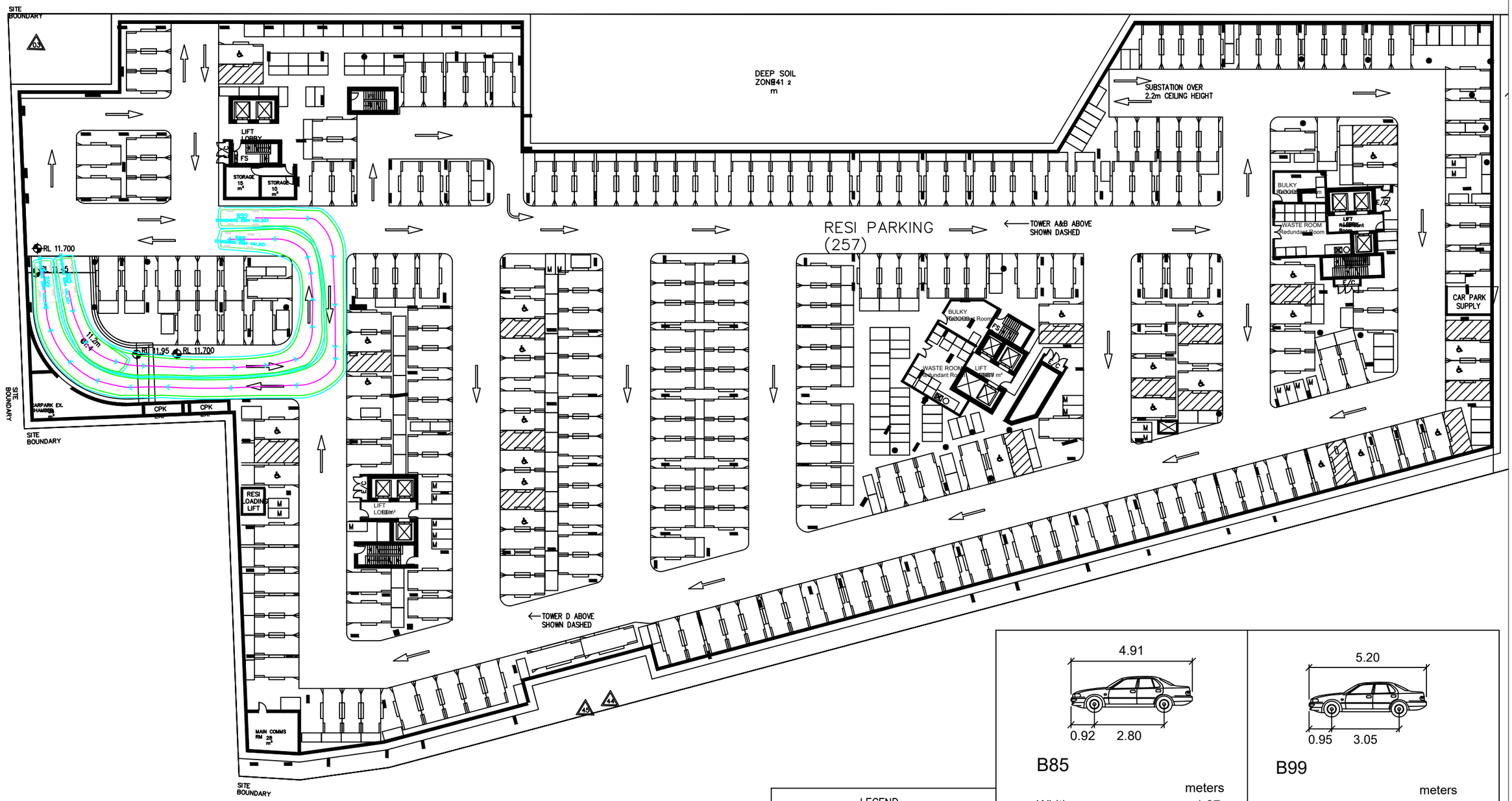
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

ISSUE A

DATE: 9/02/2022

SHEET 20



LEGEND

- VEHICLE BODY PATH (INCLUDING OVERHANG)
- MANOEUVRING CLEARANCE (300mm)

B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 2 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

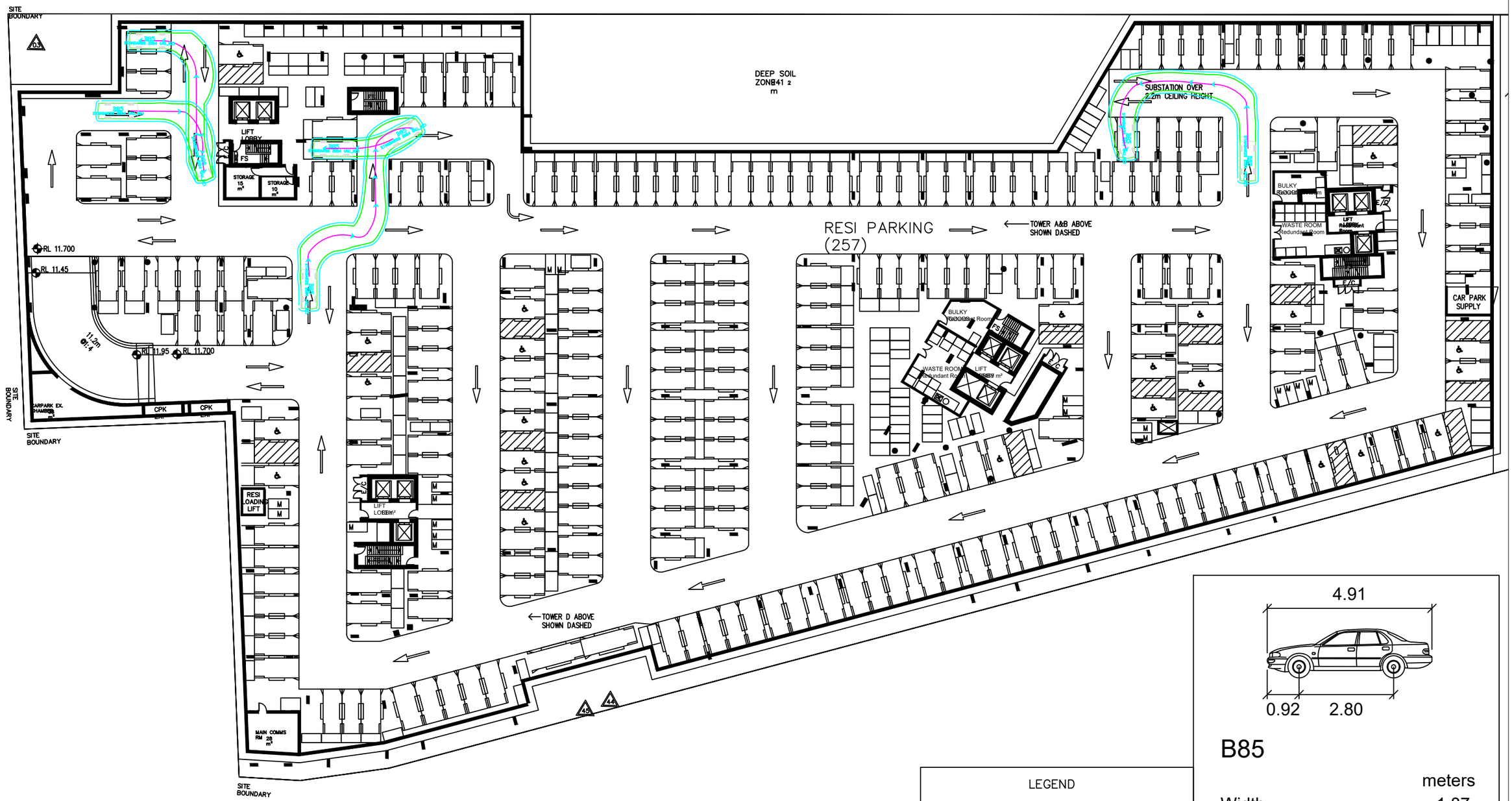
ISSUE: A

FILE: 20-171

SUPERSEDES SHEET/ISSUE: -

DATE: 9/02/2022

SHEET: 21



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 2 PARKING SPACE INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

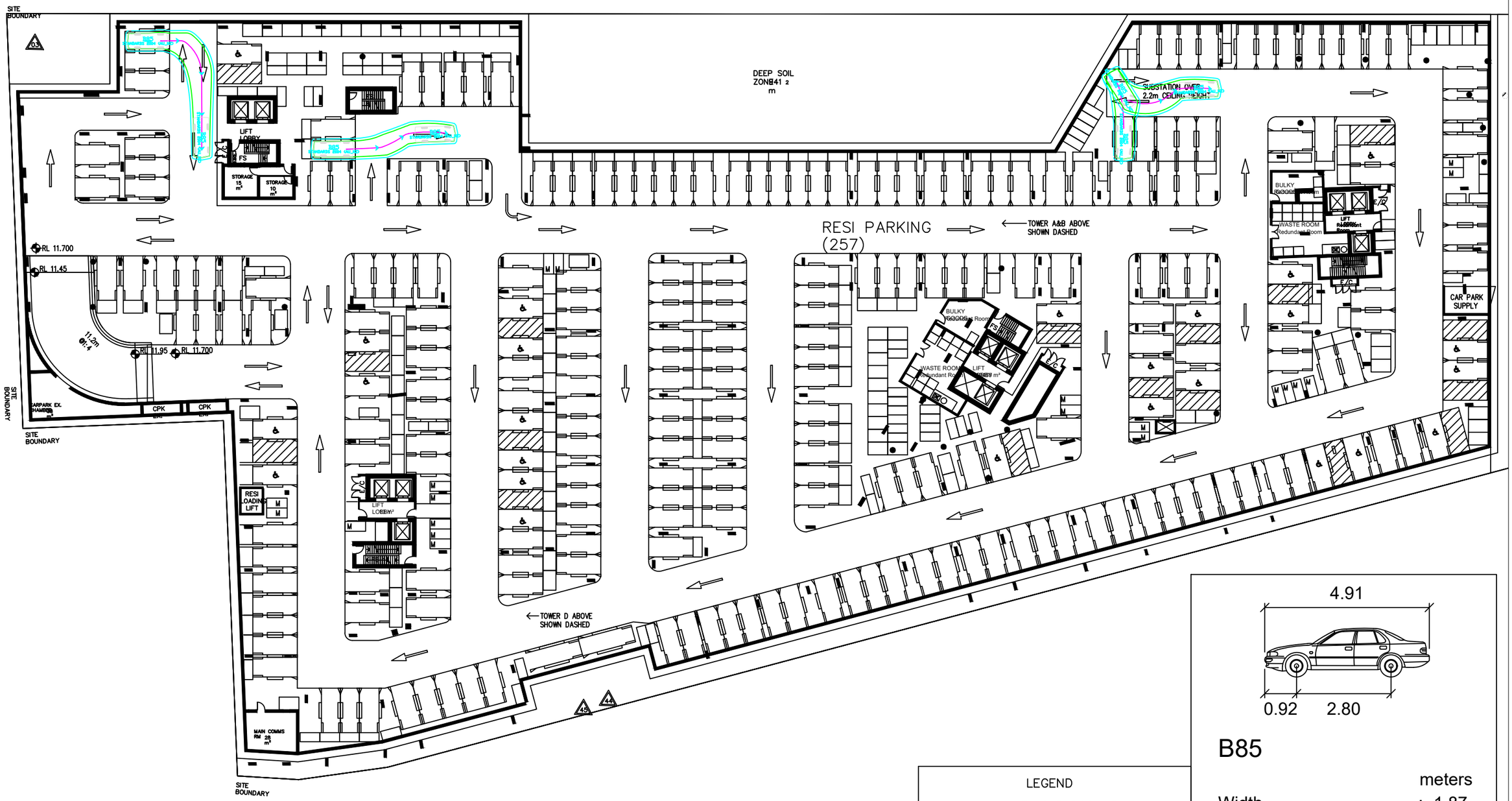
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 22



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 2 PARKING SPACE EGRESS MOVEMENTS

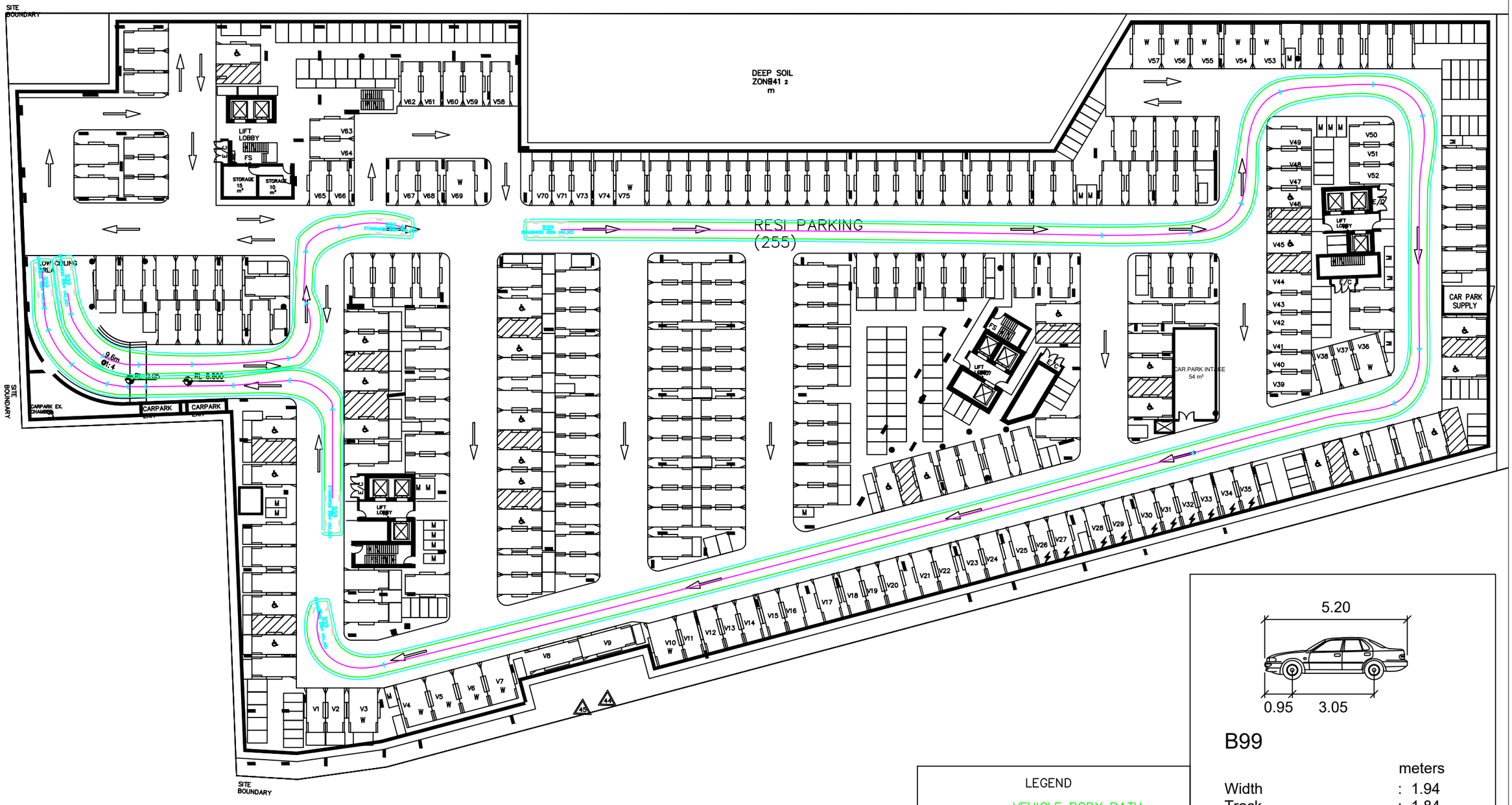
PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3 | ISSUE: A

FILE: 20-171 | SUPERSEDES SHEET/ISSUE: -

DATE: 9/02/2022 | SHEET: 23



LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 3 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

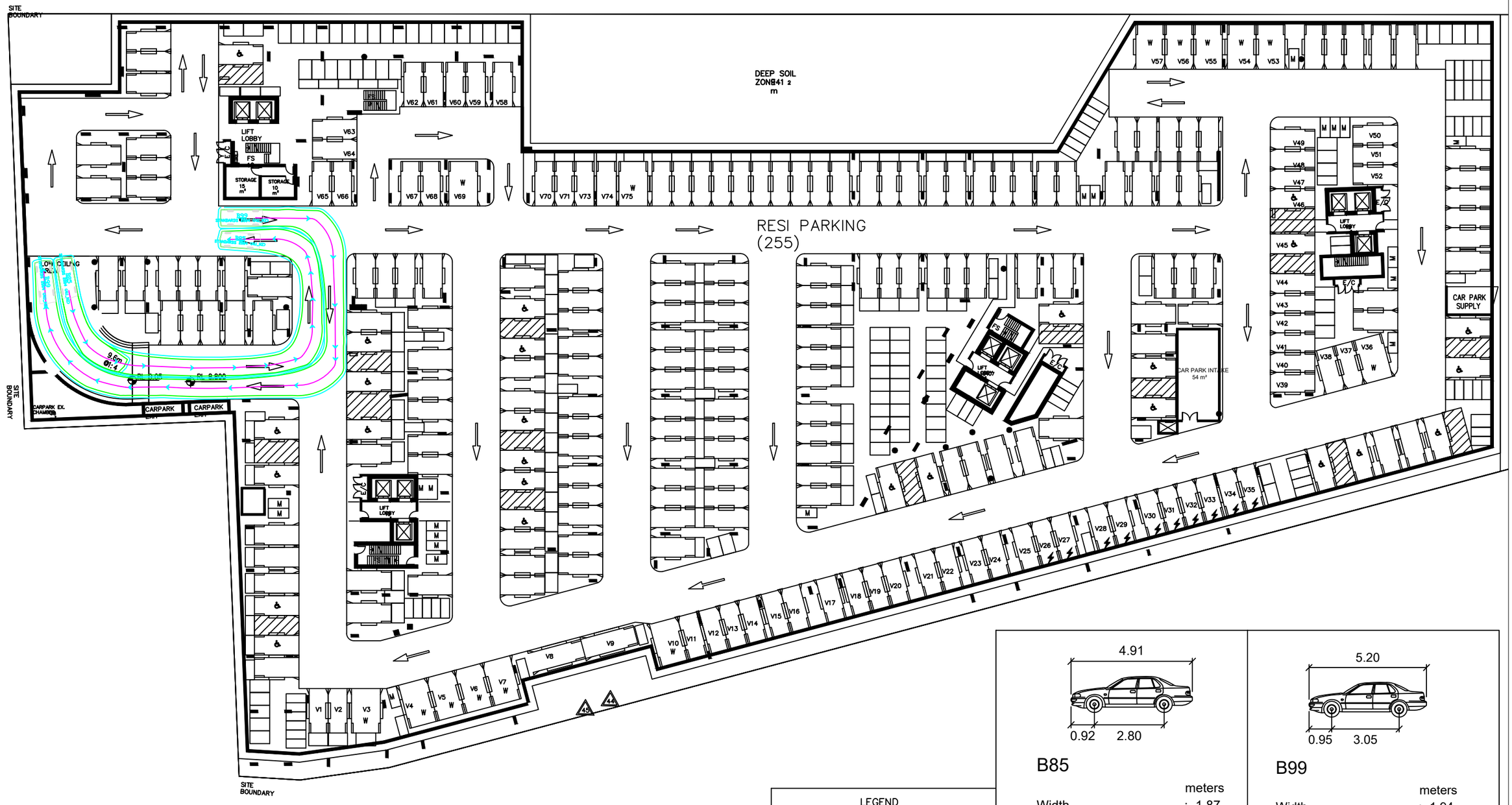
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 24



LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 3 INTERNAL MANOEUVRING

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

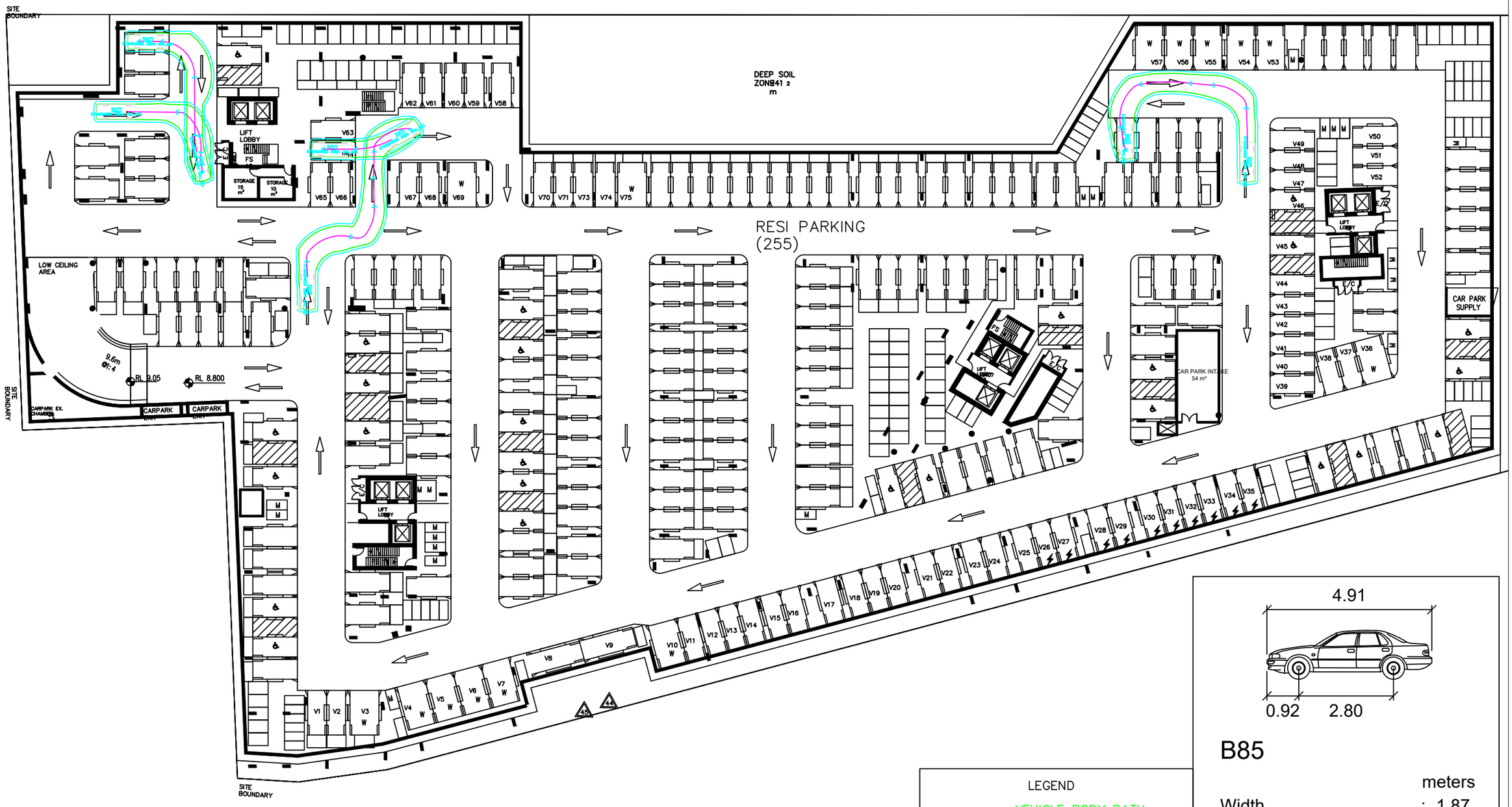
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SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 25



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 3 PARKING SPACE INGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

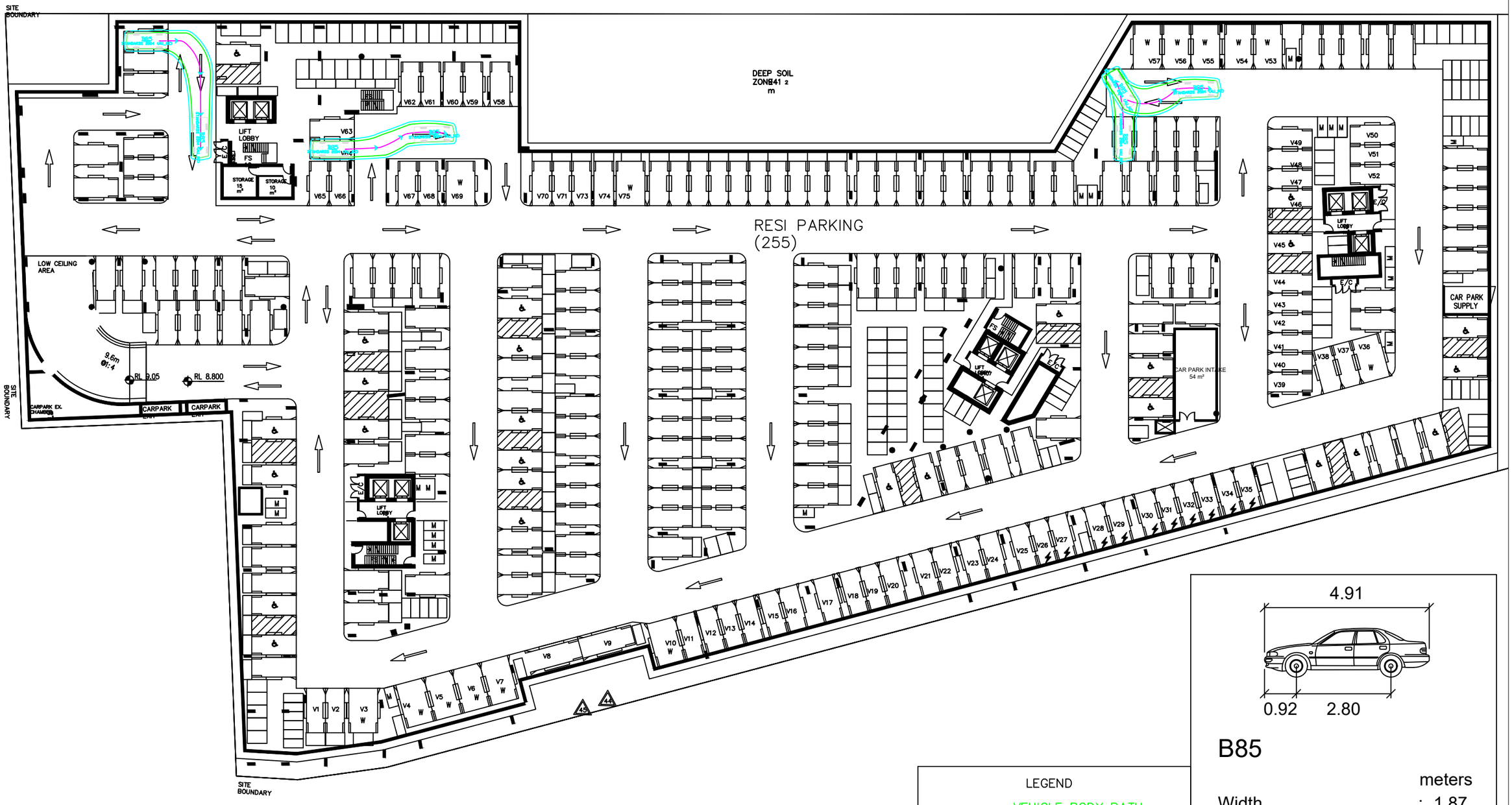
FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 26



LEGEND

VEHICLE BODY PATH (INCLUDING OVERHANG)

MANOEUVRING CLEARANCE (300mm)

B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

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STANBURY TRAFFIC PLANNING

PASSENGER VEHICLE SWEPT PATHS

BASEMENT LEVEL 3 PARKING SPACE EGRESS MOVEMENTS

PROPOSED MIXED USE DEVELOPMENT

26 - 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

SCALE: 1:500 AT A3

FILE: 20-171

SUPERSEDES SHEET/ISSUE -

DATE: 9/02/2022

ISSUE A

SHEET 27

APPENDIX 3



PLAN

SCALE 1:500

0 5 10 15 20 25 30m

SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REVISIONS

CLIENT

Sydney *Office —*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—

PROJECT

EDEN STREET
ARNCLIFFE NSW, 2205

STATUS

ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

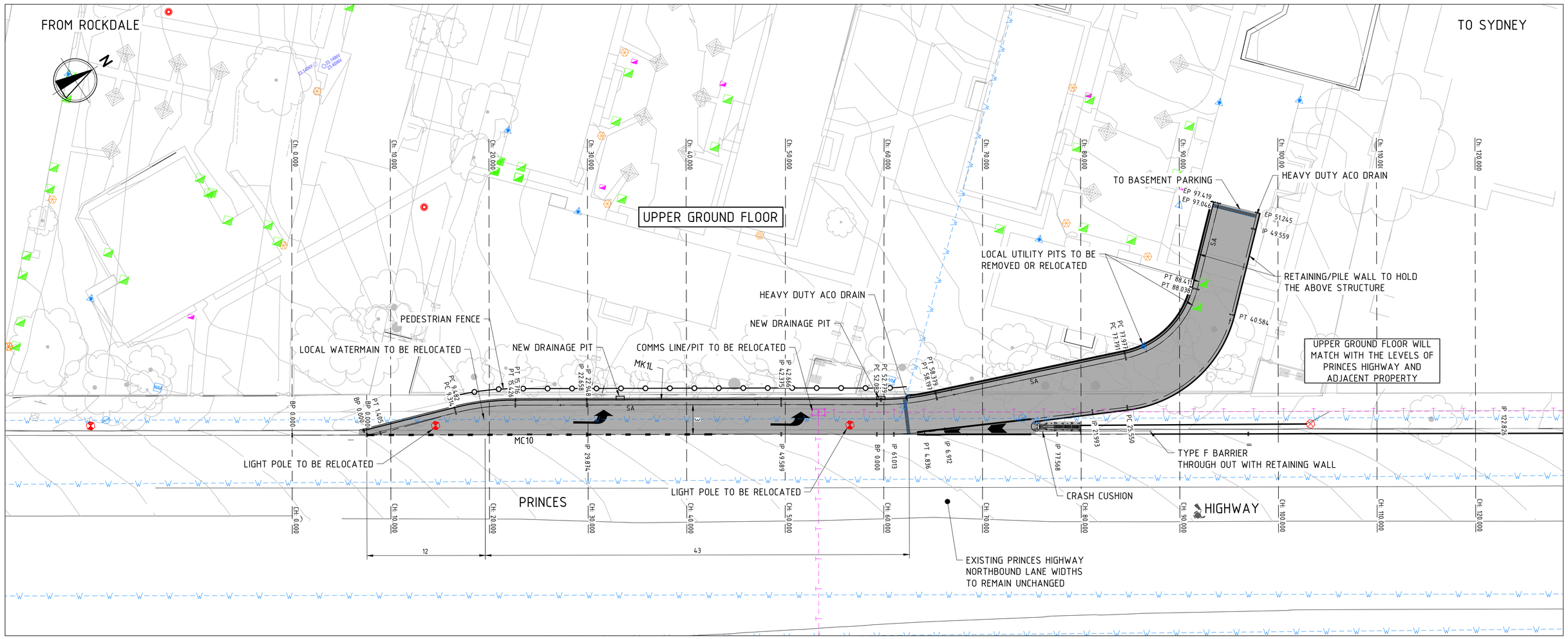
TITLE

DIVERGE LANE OPTION 1
LOCALITY PLAN

PROJECT No.	DRAWING No.	REV.
S21113	SK-C-1010	A

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PLAN

SCALE 1:200

0 2 4 6 8 10 12m

SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REVISIONS

CLIENT

Sydney *Office—*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E /* info@bgeeng.com
bgeeng.com—

PROJECT: EDEN STREET
ARNCLIFFE NSW, 2205

STATUS: ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

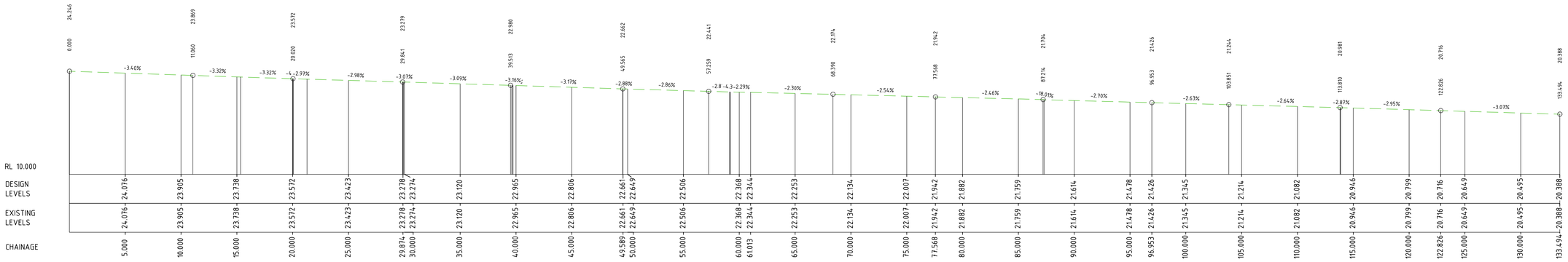
DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE: DIVERGE LANE OPTION 1
GENERAL ARRANGEMENT

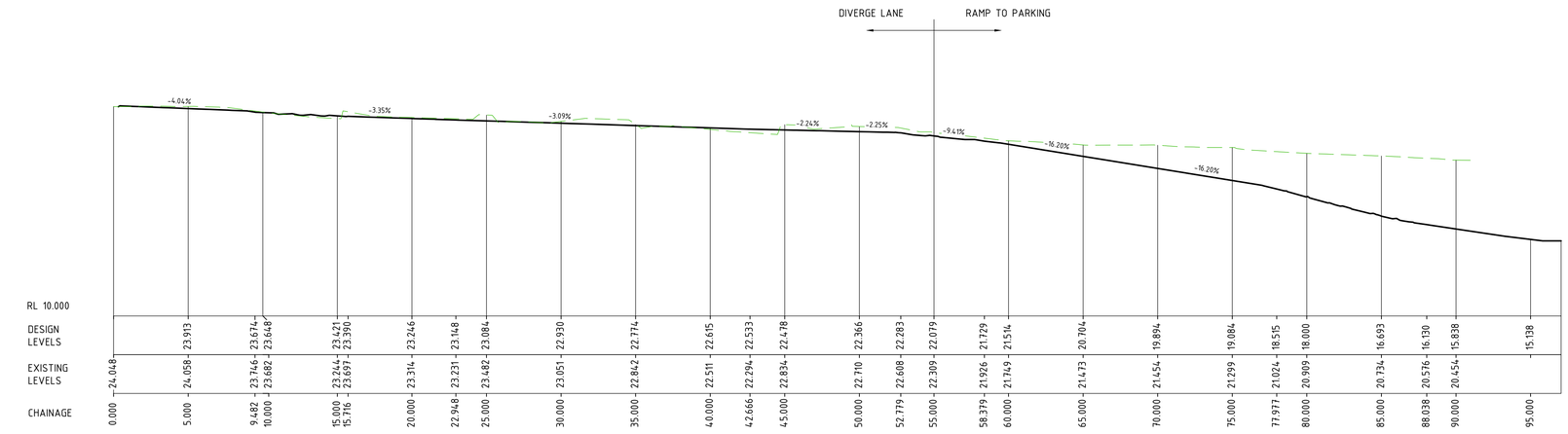
PROJECT No.	DRAWING No.	REV.
S21113	SK-C-1020	A

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LONGITUDINAL SECTION - MC10



LONGITUDINAL SECTION - MK1L (KERB LINE)

0 2 4 6 8 10 12m
SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT

Sydney *Office*—
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—

PROJECT
EDEN STREET
ARNCLIFFE NSW, 2205

STATUS
ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE
LONGITUDINAL SECTIONS
MC10 AND MK1L

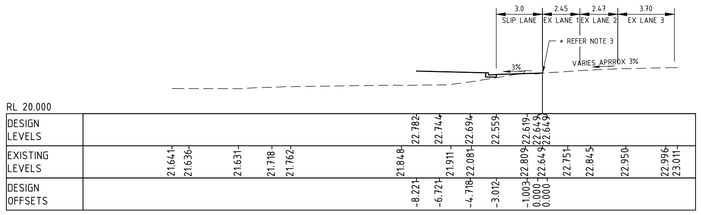
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S21113	SK-C-1030	A

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NOTES

1. EXISTING LANE WIDTHS ARE INDICATIVE ONLY.
2. EXISTING LANE WIDTHS TO REMAIN UNAFFECTED BY NEW WORKS.
3. MATCH EXISTING PAVEMENT LEVELS AND CROSSFALL AT CARRIAGEWAY EDGE.

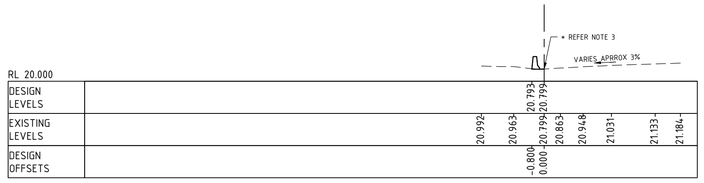


RL 20.000

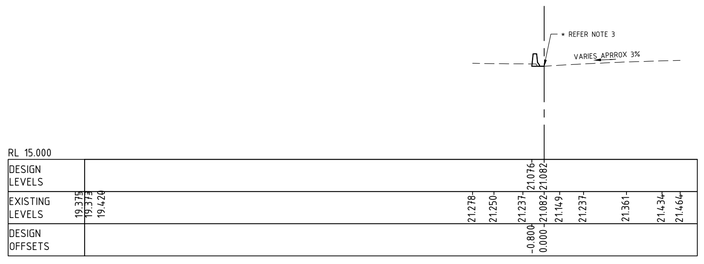
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NOTES

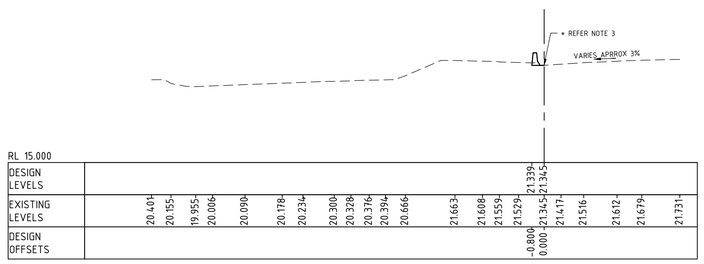
1. EXISTING LANE WIDTHS ARE INDICATIVE ONLY.
2. EXISTING LANE WIDTHS TO REMAIN UNAFFECTED BY NEW WORKS.
3. MATCH EXISTING PAVEMENT LEVELS AND CROSSFALL AT CARRIAGEWAY EDGE.



MC10 - SL 120.000



MC10 - SL 110.000



MC10 - SL 100.000

0 2 4 6 8 10 12m
SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT

Sydney *Office —*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E /* info@bgeeng.com
bgeeng.com —

PROJECT
EDEN STREET
ARNCLIFFE NSW, 2205

STATUS
ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE
CROSS SECTIONS - MC10
PRINCES HIGHWAY
SHEET 2

PROJECT No.	DRAWING No.	REV.
S21113	SK-C-1041	A

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APPENDIX 4

Arncliffe IC - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

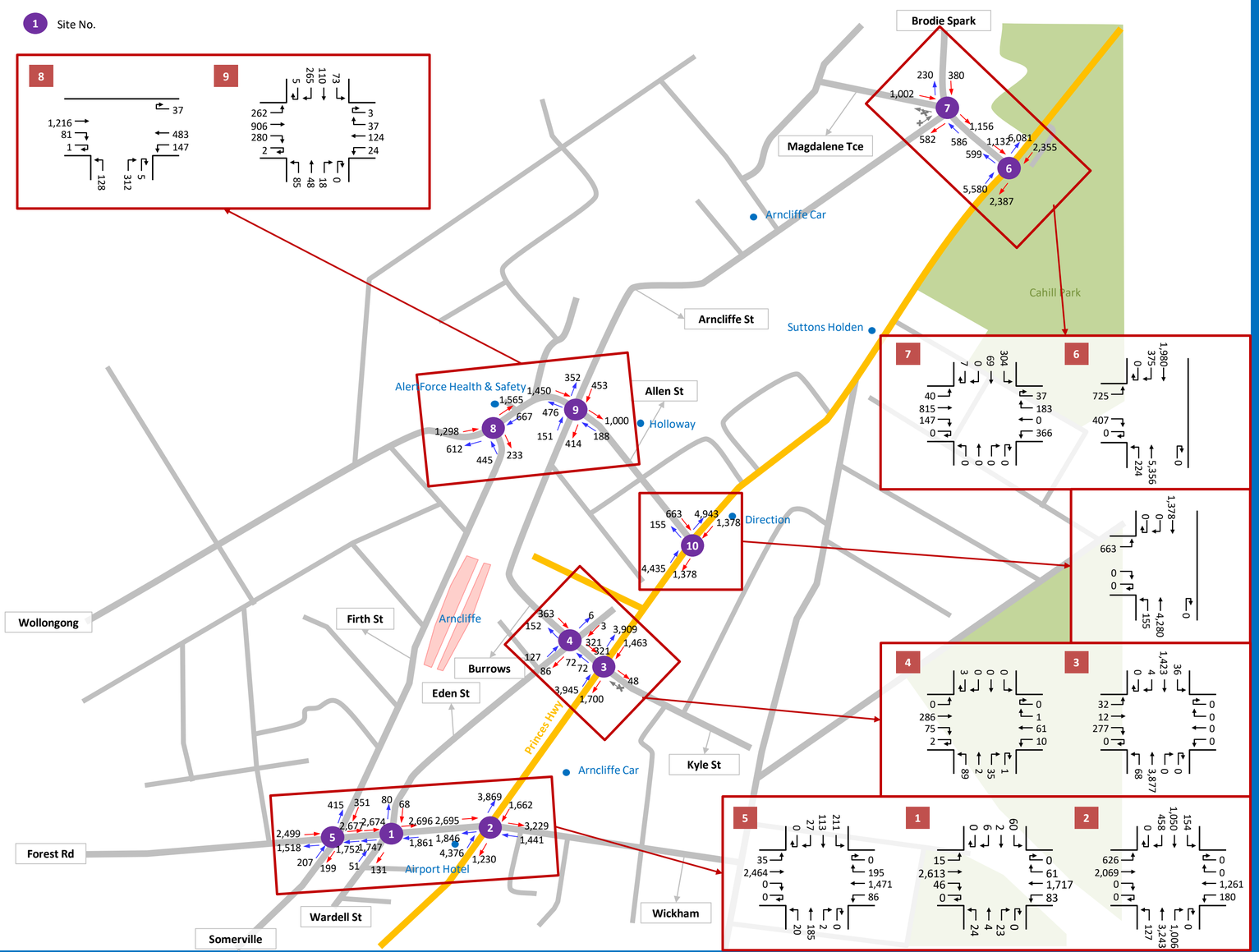
Day	Start Time	End Time	Classification
AM	7:00	9:00	All vehicles

Volume Forecasting

0 % * 0 = original survey data

(e.g. input 20 for volume increase 20% or -20 for volume decrease 20%)

1 Site No.



Arncliffe IC - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

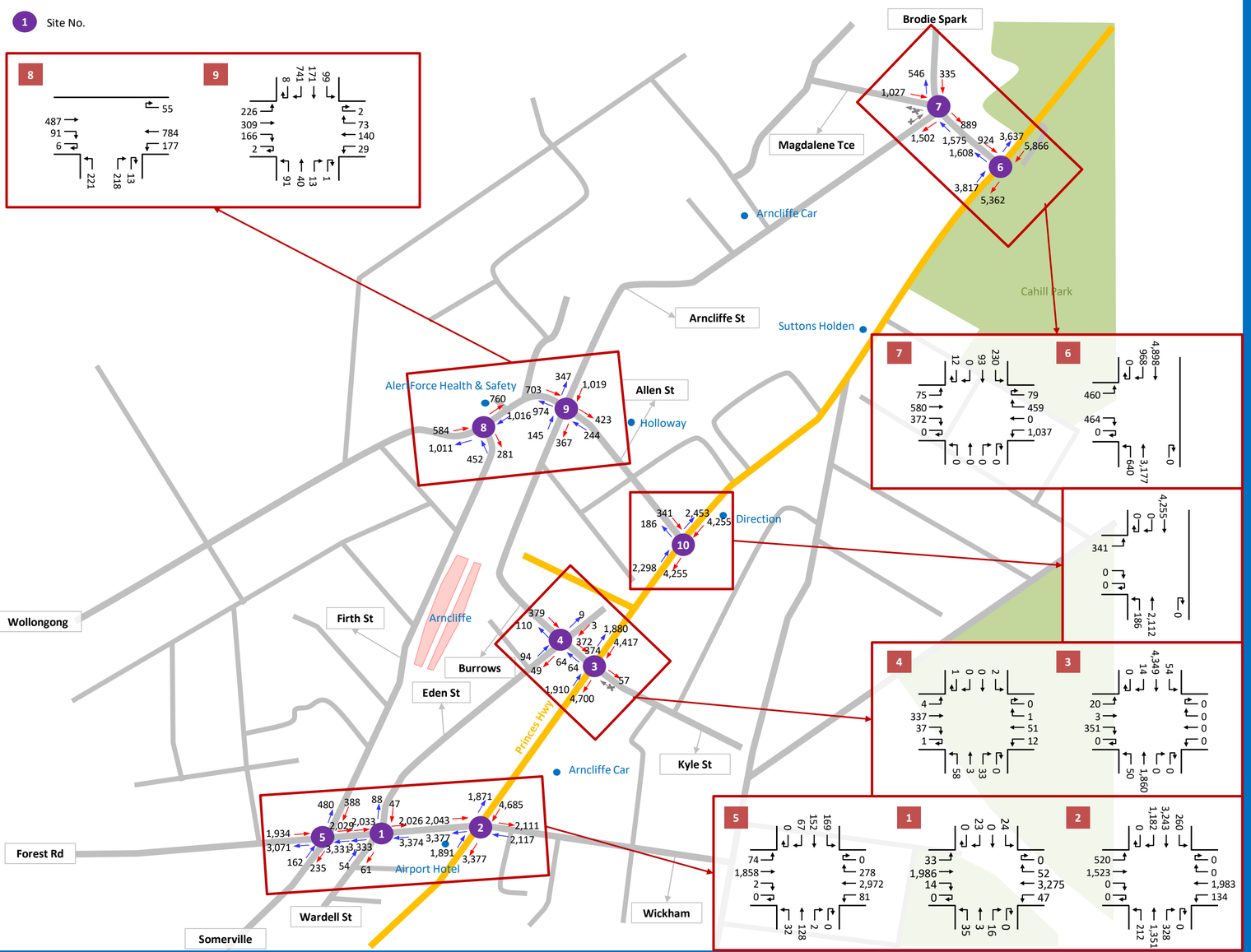
Day	Start Time	End Time	Classification
PM	16:00	18:00	All vehicles

Volume Forecasting

0 % * 0 = original survey data

(e.g. input 20 for volume increase 20% or -20 for volume decrease 20%)

1 Site No.



Arncliffe IC - Traffic Flows

MATRIX Traffic and Transport Data

Search By Time and Classfication

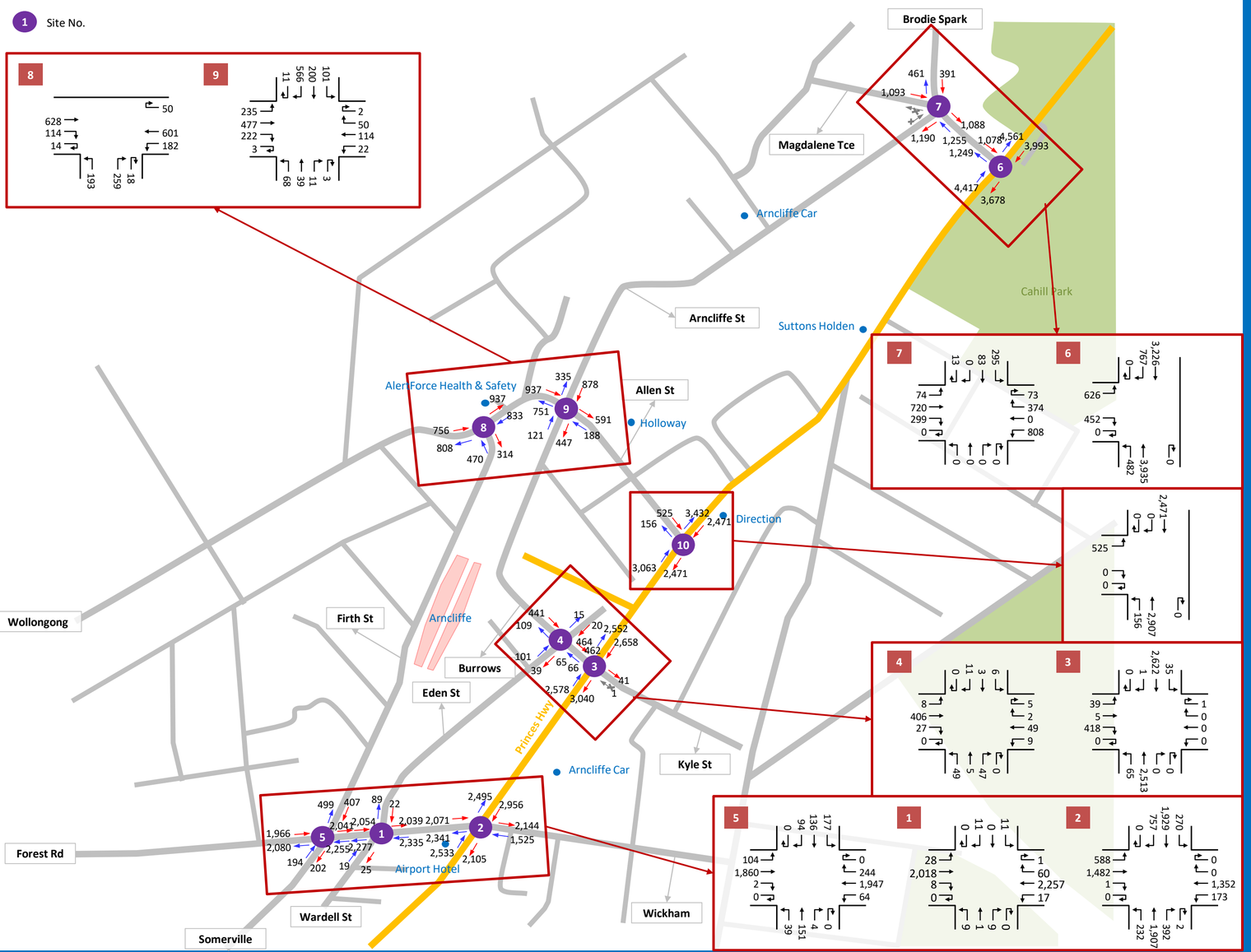
Day	Start Time	End Time	Classification
Sat_2hrs	11:00	13:00	All vehicles

Volume Forecasting

0 % * 0 = original survey data

(e.g. input 20 for volume increase 20% or -20 for volume decrease 20%)

1 Site No.



APPENDIX 5

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: AM Existing)]

Network: N101 [AM Existing North (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	225	5.0	225	5.0	0.170	3.1	LOS A	0.8	6.0	0.25	0.43	0.25	37.6
6	R2	113	5.0	113	5.0	0.126	6.3	LOS A	0.6	4.1	0.25	0.57	0.25	36.1
6u	U	28	5.0	28	5.0	0.126	7.7	LOS A	0.6	4.1	0.25	0.57	0.25	24.7
Approach		366	5.0	366	5.0	0.170	4.4	LOS A	0.8	6.0	0.25	0.48	0.25	36.8
North: Brodie Spark Dr North														
7	L2	175	5.0	175	5.0	0.345	6.1	LOS A	1.9	14.0	0.71	0.74	0.71	33.4
8	T1	46	5.0	46	5.0	0.345	5.7	LOS A	1.9	14.0	0.71	0.74	0.71	37.9
9u	U	6	5.0	6	5.0	0.345	10.9	LOS A	1.9	14.0	0.71	0.74	0.71	38.5
Approach		227	5.0	227	5.0	0.345	6.1	LOS A	1.9	14.0	0.71	0.74	0.71	35.1
West: Magdalene Terrace														
10	L2	28	5.0	28	5.0	0.522	3.3	LOS A	3.8	27.9	0.46	0.44	0.46	37.9
11	T1	429	5.0	429	5.0	0.522	2.9	LOS A	3.8	27.9	0.46	0.44	0.46	36.5
12	R2	81	5.0	81	5.0	0.522	6.7	LOS A	3.8	27.9	0.46	0.44	0.46	39.0
Approach		539	5.0	539	5.0	0.522	3.5	LOS A	3.8	27.9	0.46	0.44	0.46	37.2
All Vehicles		1133	5.0	1133	5.0	0.522	4.3	LOS A	3.8	27.9	0.44	0.51	0.44	36.8

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: AM Existing)]

Network: N101 [AM Existing North (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	129	5.0	129	5.0		0.120	17.8	LOS B	3.6	27.1	0.45	0.69	0.45	27.2
2	T1	2884	5.0	2884	5.0	*	0.844	10.6	LOS A	36.9	273.9	0.57	0.53	0.57	48.7
Approach		3014	5.0	3014	5.0		0.844	10.9	LOS A	36.9	273.9	0.56	0.54	0.56	48.2
North: Princes Hghwy North															
8	T1	1060	5.0	1060	5.0		0.264	7.4	LOS A	8.3	61.3	0.38	0.33	0.38	51.7
9	R2	206	5.0	206	5.0		0.338	58.7	LOS E	6.3	46.5	0.92	0.77	0.92	18.1
Approach		1266	5.0	1266	5.0		0.338	15.7	LOS B	8.3	61.3	0.47	0.40	0.47	42.3
West: Brodie Sparks Dr															
10	L2	407	5.0	407	5.0		0.432	46.8	LOS D	12.2	90.5	0.86	0.78	0.86	21.7
12	R2	212	5.0	212	5.0	*	0.837	81.4	LOS F	7.9	58.7	1.00	0.98	1.31	10.8
Approach		619	5.0	619	5.0		0.837	58.6	LOS E	12.2	90.5	0.91	0.85	1.01	17.7
All Vehicles		4899	5.0	4899	5.0		0.844	18.2	LOS B	36.9	273.9	0.58	0.54	0.59	40.4

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P11	Stage 1	145	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	145	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	235.7	222.8	0.95
All Pedestrians		343	64.5	LOS F	0.6	0.6	0.96	0.96	228.4	213.1	0.93

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: AM Existing)]

AM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street														
1	L2	66	5.0	69	5.0	0.316	6.9	LOS A	1.9	13.9	0.60	0.74	0.60	42.3
3	R2	191	5.0	201	5.0	0.316	9.5	LOS A	1.9	13.9	0.60	0.74	0.60	42.2
3u	U	3	5.0	3	5.0	0.316	10.9	LOS A	1.9	13.9	0.60	0.74	0.60	45.3
Approach		260	5.0	274	5.0	0.316	8.9	LOS A	1.9	13.9	0.60	0.74	0.60	42.3
East: Wollongong Road East														
4	L2	85	5.0	89	5.0	0.343	4.4	LOS A	2.6	19.3	0.27	0.46	0.27	44.2
5	T1	311	5.0	327	5.0	0.343	4.1	LOS A	2.6	19.3	0.27	0.46	0.27	40.2
6u	U	30	5.0	32	5.0	0.343	8.4	LOS A	2.6	19.3	0.27	0.46	0.27	38.5
Approach		426	5.0	448	5.0	0.343	4.5	LOS A	2.6	19.3	0.27	0.46	0.27	41.4
West: Wollongong Road West														
11	T1	661	5.0	696	5.0	0.732	8.3	LOS A	9.2	68.1	0.82	0.77	0.93	37.0
12	R2	45	5.0	47	5.0	0.732	11.3	LOS A	9.2	68.1	0.82	0.77	0.93	43.2
12u	U	1	5.0	1	5.0	0.732	12.7	LOS A	9.2	68.1	0.82	0.77	0.93	39.1
Approach		707	5.0	744	5.0	0.732	8.5	LOS A	9.2	68.1	0.82	0.77	0.93	37.7
All Vehicles		1393	5.0	1466	5.0	0.732	7.4	LOS A	9.2	68.1	0.61	0.67	0.66	40.0

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: AM Existing)] Network: N101 [AM Existing South (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	49	5.0	49	5.0	0.091	5.2	LOS A	0.5	3.5	0.46	0.57	0.46	41.3
2	T1	24	5.0	24	5.0	0.091	5.1	LOS A	0.5	3.5	0.46	0.57	0.46	45.8
3	R2	12	5.0	12	5.0	0.091	8.5	LOS A	0.5	3.5	0.46	0.57	0.46	40.7
3u	U	1	5.0	1	5.0	0.091	10.1	LOS A	0.5	3.5	0.46	0.57	0.46	45.4
Approach		86	5.0	86	5.0	0.091	5.7	LOS A	0.5	3.5	0.46	0.57	0.46	43.1
East: Allen St														
4	L2	14	5.0	14	5.0	0.142	6.1	LOS A	0.8	5.7	0.57	0.64	0.57	41.8
5	T1	78	5.0	78	5.0	0.142	6.0	LOS A	0.8	5.7	0.57	0.64	0.57	39.1
6	R2	26	5.0	26	5.0	0.142	9.4	LOS A	0.8	5.7	0.57	0.64	0.57	44.1
6u	U	2	5.0	2	5.0	0.142	10.9	LOS A	0.8	5.7	0.57	0.64	0.57	35.3
Approach		120	5.0	120	5.0	0.142	6.9	LOS A	0.8	5.7	0.57	0.64	0.57	41.1
North: Arncliff St South														
7	L2	45	5.0	45	5.0	0.048	6.0	LOS A	0.3	2.0	0.59	0.61	0.59	43.1
8	T1	63	5.0	63	5.0	0.312	7.9	LOS A	1.8	13.6	0.76	0.81	0.76	43.1
9	R2	160	5.0	160	5.0	0.312	11.3	LOS A	1.8	13.6	0.76	0.81	0.76	40.8
9u	U	2	5.0	2	5.0	0.312	12.8	LOS A	1.8	13.6	0.76	0.81	0.76	44.4
Approach		271	5.0	271	5.0	0.312	9.6	LOS A	1.8	13.6	0.73	0.78	0.73	41.8
West: Wollongong Rd														
10	L2	144	5.0	144	5.0	0.600	4.3	LOS A	5.8	43.2	0.38	0.48	0.38	43.4
11	T1	505	5.0	505	5.0	0.600	4.2	LOS A	5.8	43.2	0.38	0.48	0.38	31.1
12	R2	163	5.0	163	5.0	0.600	7.6	LOS A	5.8	43.2	0.38	0.48	0.38	42.6
12u	U	1	5.0	1	5.0	0.600	9.1	LOS A	5.8	43.2	0.38	0.48	0.38	38.8
Approach		814	5.0	814	5.0	0.600	4.9	LOS A	5.8	43.2	0.38	0.48	0.38	38.8
All Vehicles		1291	5.0	1291	5.0	0.600	6.1	LOS A	5.8	43.2	0.48	0.56	0.48	40.4

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: AM Existing)]

Network: N101 [AM Existing South (Network Folder: Existing)]

AM Existing Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	49	5.0	49	5.0	0.050	4.7	LOS A	0.2	1.2	0.08	0.52	0.08	44.9
2	T1	1	5.0	1	5.0	0.050	5.0	LOS A	0.2	1.2	0.08	0.52	0.08	41.4
3	R2	11	5.0	10	5.0	0.050	6.5	LOS A	0.2	1.2	0.08	0.52	0.08	42.1
Approach		61	5.0	60 N1	5.0	0.050	5.0	LOS A	0.2	1.2	0.08	0.52	0.08	44.6
East: Burrows St East														
4	L2	8	5.0	8	5.0	0.022	3.2	LOS A	0.0	0.1	0.02	0.12	0.02	40.1
5	T1	31	5.0	31	5.0	0.022	0.0	LOS A	0.0	0.1	0.02	0.12	0.02	48.6
6	R2	1	5.0	1	5.0	0.022	3.8	LOS A	0.0	0.1	0.02	0.12	0.02	23.8
Approach		40	5.0	40	5.0	0.022	0.8	NA	0.0	0.1	0.02	0.12	0.02	47.8
North: Eden St North														
7	L2	1	5.0	1	5.0	0.004	4.7	LOS A	0.0	0.1	0.33	0.49	0.33	24.9
8	T1	1	5.0	1	5.0	0.004	4.8	LOS A	0.0	0.1	0.33	0.49	0.33	24.9
9	R2	1	5.0	1	5.0	0.004	6.7	LOS A	0.0	0.1	0.33	0.49	0.33	41.1
Approach		3	5.0	3	5.0	0.004	5.4	LOS A	0.0	0.1	0.33	0.49	0.33	35.1
West: Burrows St West														
10	L2	1	5.0	1	5.0	0.069	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	43.5
11	T1	163	5.0	163	5.0	0.069	0.0	LOS A	0.3	2.1	0.03	0.08	0.03	48.5
12	R2	65	5.0	65	5.0	0.069	4.7	LOS A	0.3	2.1	0.12	0.34	0.12	44.2
Approach		229	5.0	229	5.0	0.069	1.4	NA	0.3	2.1	0.05	0.15	0.05	47.2
All Vehicles		334	5.0	333 N1	5.0	0.069	2.0	NA	0.3	2.1	0.06	0.22	0.06	46.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: AM Existing)]

Network: N101 [AM Existing South (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	14	5.0	14	5.0	0.616	50.4	LOS D	1.9	13.9	0.90	1.08	1.25	4.8
2	T1	1	5.0	1	5.0	0.616	126.0	LOS F	1.9	13.9	0.90	1.08	1.25	4.8
3	R2	14	5.0	14	5.0	0.616	131.0	LOS F	1.9	13.9	0.90	1.08	1.25	4.8
Approach		28	5.0	28	5.0	0.616	92.0	LOS F	1.9	13.9	0.90	1.08	1.25	4.8
East: Forest Rd East														
4	L2	58	5.0	57	5.0	0.368	3.4	LOS A	0.0	0.0	0.00	0.05	0.00	39.8
5	T1	943	5.0	924	5.0	0.368	3.3	LOS A	3.5	26.3	0.19	0.05	0.24	28.4
6	R2	40	5.0	39	5.0	0.368	23.9	LOS B	3.5	26.3	0.44	0.07	0.56	21.1
Approach		1041	5.0	1020 N1	5.0	0.368	4.1	NA	3.5	26.3	0.19	0.05	0.24	28.9
North: Eden St														
7	L2	33	5.0	33	5.0	0.281	12.4	LOS A	1.2	9.0	0.75	0.90	0.83	25.4
8	T1	1	5.0	1	5.0	0.281	87.2	LOS F	1.2	9.0	0.75	0.90	0.83	28.4
9	R2	2	5.0	2	5.0	0.281	85.9	LOS F	1.2	9.0	0.75	0.90	0.83	25.4
Approach		36	5.0	36	5.0	0.281	19.0	LOS B	1.2	9.0	0.75	0.90	0.83	25.5
West: Forest Rd West														
10	L2	12	5.0	12	5.0	0.403	3.2	LOS A	8.8	65.3	0.00	0.01	0.00	39.4
11	T1	1398	5.0	1398	5.0	0.403	0.6	LOS A	8.8	65.3	0.07	0.01	0.09	33.7
12	R2	27	5.0	27	5.0	0.403	13.6	LOS A	8.8	65.3	0.15	0.02	0.19	35.9
Approach		1437	5.0	1437	5.0	0.403	0.9	NA	8.8	65.3	0.07	0.01	0.09	33.8
All Vehicles		2542	5.0	2521 N1	5.0	0.616	3.4	NA	8.8	65.3	0.14	0.06	0.18	27.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: AM Existing)] **Network: N101 [AM Existing South (Network Folder: Existing)]**

AM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	12	5.0	12	5.0		0.795	76.9	LOS F	9.5	70.2	1.00	0.94	1.20	29.6
2	T1	119	5.0	119	5.0	*	0.795	73.5	LOS F	9.5	70.2	1.00	0.94	1.20	24.3
Approach		131	5.0	131	5.0		0.795	73.8	LOS F	9.5	70.2	1.00	0.94	1.20	24.9
East: Forest Rd East															
4	L2	49	5.0	48	5.0		0.545	5.3	LOS A	8.4	62.7	0.17	0.18	0.17	38.4
5	T1	801	5.0	785	5.0		0.545	2.9	LOS A	8.4	62.7	0.18	0.19	0.18	38.9
6	R2	112	5.0	109	5.0	*	0.545	69.0	LOS E	7.9	59.0	0.98	0.96	0.98	18.3
Approach		962	5.0	943 N1	5.0		0.545	10.7	LOS A	8.4	62.7	0.27	0.28	0.27	36.3
North: Firth St															
7	L2	127	5.0	127	5.0		0.706	57.1	LOS E	8.4	62.0	0.96	0.87	1.06	19.5
8	T1	74	5.0	74	5.0		0.460	66.8	LOS E	4.9	36.5	0.99	0.76	0.99	23.6
9	R2	16	5.0	16	5.0		0.291	82.1	LOS F	1.2	8.5	1.00	0.67	1.00	26.5
Approach		217	5.0	217	5.0		0.706	62.2	LOS E	8.4	62.0	0.97	0.82	1.03	22.1
West: Forest Rd West															
10	L2	19	5.0	19	5.0		1.028	91.2	LOS F	74.5	552.6	1.00	1.36	1.53	25.9
11	T1	1309	5.0	1309	5.0	*	1.028	87.5	LOS F	74.5	552.6	1.00	1.36	1.53	22.2
Approach		1328	5.0	1328	5.0		1.028	87.5	LOS F	74.5	552.6	1.00	1.36	1.53	22.3
All Vehicles		2638	5.0	2618 N1	5.0		1.028	57.1	LOS E	74.5	552.6	0.74	0.90	1.02	26.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: AM Existing)]

Network: N101 [AM Existing South (Network Folder: Existing)]

AM Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	66	5.0	66	5.0	0.440	5.7	LOS A	0.0	0.0	0.00	0.05	0.00	57.6
2	T1	2405	5.0	2405	5.0	0.440	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	59.4
Approach		2472	5.0	2472	5.0	0.440	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.3
North: Princes Hwy North														
8	T1	726	5.0	726	5.0	0.132	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		726	5.0	726	5.0	0.132	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Allen St														
10	L2	354	5.0	354	5.0	0.853	30.5	LOS C	8.6	63.8	0.93	1.63	2.87	26.2
Approach		354	5.0	354	5.0	0.853	30.5	LOS C	8.6	63.8	0.93	1.63	2.87	26.2
All Vehicles		3552	5.0	3552	5.0	0.853	3.2	NA	8.6	63.8	0.09	0.17	0.29	51.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: AM Existing)]

Network: N101 [AM Existing South (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	37	5.0	37	5.0	*	0.511	8.0	LOS A	6.7	49.9	0.15	0.17	0.15	51.0
2	T1	2169	5.0	2169	5.0		0.511	1.6	LOS A	6.7	49.9	0.10	0.10	0.10	54.1
Approach		2206	5.0	2206	5.0		0.511	1.7	LOS A	6.7	49.9	0.10	0.10	0.10	54.0
North: Princes Hghwy North															
7	L2	14	5.0	14	5.0		0.185	9.0	LOS A	4.6	34.1	0.29	0.27	0.29	43.5
8	T1	768	5.0	768	5.0		0.185	4.6	LOS A	4.6	34.2	0.29	0.25	0.29	43.9
Approach		782	5.0	782	5.0		0.185	4.7	LOS A	4.6	34.2	0.29	0.25	0.29	43.9
West: Burrows Street															
10	L2	17	5.0	17	5.0		0.255	65.4	LOS E	3.3	24.1	0.95	0.75	0.95	2.6
12	R2	126	5.0	126	5.0		0.460	66.9	LOS E	6.0	44.8	0.97	0.77	0.97	2.6
Approach		143	5.0	143	5.0		0.460	66.7	LOS E	6.0	44.8	0.97	0.77	0.97	2.6
All Vehicles		3132	5.0	3131 N1	5.0		0.511	5.4	LOS A	6.7	49.9	0.19	0.17	0.19	43.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	230.8	216.5	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: AM Existing)]

Network: N101 [AM Existing South (Network Folder: Existing)]

AM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	64	5.0	64	5.0	0.064	16.6	LOS B	1.7	12.6	0.45	0.65	0.45	44.9
2	T1	1771	5.0	1771	5.0	0.814	36.6	LOS C	34.8	258.1	0.87	0.80	0.89	34.2
3	R2	582	5.0	582	5.0	* 1.195	228.9	LOS F	68.9	511.1	1.00	1.43	2.29	12.1
Approach		2417	5.0	2417	5.0	1.195	82.4	LOS F	68.9	511.1	0.89	0.95	1.22	22.1
East: Wickham St														
4	L2	96	5.0	96	5.0	0.086	8.9	LOS A	1.4	10.2	0.27	0.62	0.27	52.1
5	T1	673	5.0	673	5.0	0.666	41.7	LOS C	19.5	144.6	0.89	0.78	0.89	19.4
Approach		768	5.0	768	5.0	0.666	37.6	LOS C	19.5	144.6	0.82	0.76	0.82	24.3
North: Princes Hghwy North														
7	L2	87	5.0	87	5.0	0.136	37.3	LOS C	4.3	31.5	0.77	0.72	0.77	28.3
8	T1	598	5.0	598	5.0	* 0.714	50.6	LOS D	19.5	144.4	0.94	0.81	0.94	33.2
9	R2	236	5.0	236	5.0	1.077	159.8	LOS F	26.4	195.8	1.00	1.22	1.85	5.2
Approach		921	5.0	921	5.0	1.077	77.3	LOS F	26.4	195.8	0.94	0.90	1.16	22.8
West: Forest Rd														
10	L2	323	5.0	323	5.0	0.982	76.9	LOS F	21.8	161.8	0.73	0.95	1.10	5.3
11	T1	1137	5.0	1137	5.0	* 1.094	156.5	LOS F	22.0	163.2	0.97	1.50	1.79	8.3
Approach		1460	5.0	1460	5.0	1.094	138.9	LOS F	22.0	163.2	0.92	1.38	1.64	8.0
All Vehicles		5566	5.0	5566	5.0	1.195	90.2	LOS F	68.9	511.1	0.90	1.03	1.26	17.9

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: PM Existing)]

Network: N101 [PM Existing North (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	580	5.0	580	5.0	0.481	4.1	LOS A	3.4	25.0	0.42	0.53	0.42	37.1
6	R2	238	5.0	238	5.0	0.303	7.4	LOS A	1.6	12.0	0.38	0.64	0.38	35.4
6u	U	43	5.0	43	5.0	0.303	8.8	LOS A	1.6	12.0	0.38	0.64	0.38	23.6
Approach		861	5.0	861	5.0	0.481	5.3	LOS A	3.4	25.0	0.41	0.56	0.41	36.5
North: Brodie Spark Dr North														
7	L2	119	5.0	119	5.0	0.251	6.3	LOS A	1.6	12.0	0.75	0.75	0.75	33.2
8	T1	47	5.0	47	5.0	0.251	5.9	LOS A	1.6	12.0	0.75	0.75	0.75	37.7
9u	U	7	5.0	7	5.0	0.251	11.1	LOS A	1.6	12.0	0.75	0.75	0.75	38.3
Approach		174	5.0	174	5.0	0.251	6.4	LOS A	1.6	12.0	0.75	0.75	0.75	35.4
West: Magdalene Terrace														
10	L2	44	5.0	44	5.0	0.575	5.0	LOS A	5.6	41.4	0.73	0.63	0.73	37.0
11	T1	347	5.0	347	5.0	0.575	4.6	LOS A	5.6	41.4	0.73	0.63	0.73	35.2
12	R2	195	5.0	195	5.0	0.575	8.4	LOS A	5.6	41.4	0.73	0.63	0.73	38.3
Approach		586	5.0	586	5.0	0.575	5.9	LOS A	5.6	41.4	0.73	0.63	0.73	36.8
All Vehicles		1621	5.0	1621	5.0	0.575	5.6	LOS A	5.6	41.4	0.56	0.61	0.56	36.5

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: PM Existing)]

Network: N101 [PM Existing North (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	316	5.0	316	5.0		0.553	30.1	LOS C	13.5	99.8	0.68	0.77	0.68	19.8
2	T1	1645	5.0	1645	5.0		0.652	26.6	LOS B	30.5	226.0	0.77	0.69	0.77	38.0
Approach		1961	5.0	1961	5.0		0.652	27.1	LOS B	30.5	226.0	0.76	0.71	0.76	36.1
North: Princes Hghwy North															
8	T1	2617	5.0	2617	5.0	*	0.694	5.5	LOS A	16.1	119.7	0.30	0.28	0.30	53.6
9	R2	591	5.0	591	5.0		0.646	55.7	LOS D	18.0	133.7	0.95	0.84	0.95	22.0
Approach		3207	5.0	3207	5.0		0.694	14.7	LOS B	18.0	133.7	0.42	0.38	0.42	44.8
West: Brodie Sparks Dr															
10	L2	288	5.0	288	5.0		0.196	31.1	LOS C	6.2	45.8	0.68	0.71	0.68	30.2
12	R2	249	5.0	249	5.0	*	0.696	70.1	LOS E	8.5	63.1	1.00	0.85	1.08	12.6
Approach		538	5.0	538	5.0		0.696	49.2	LOS D	8.5	63.1	0.83	0.77	0.86	20.9
All Vehicles		5706	5.0	5706	5.0		0.696	22.2	LOS B	30.5	226.0	0.57	0.53	0.58	38.7

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P11	Stage 1	155	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	155	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	66	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		376	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.4	0.93

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: PM Existing)]

PM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth St														
1	L2	109	5.0	115	5.0	0.315	7.7	LOS A	1.9	13.8	0.66	0.78	0.66	42.1
3	R2	117	5.0	123	5.0	0.315	10.4	LOS A	1.9	13.8	0.66	0.78	0.66	42.0
3u	U	9	5.0	9	5.0	0.315	11.8	LOS A	1.9	13.8	0.66	0.78	0.66	45.2
Approach		235	5.0	247	5.0	0.315	9.2	LOS A	1.9	13.8	0.66	0.78	0.66	42.2
East: Wollongong Rd East														
4	L2	91	5.0	96	5.0	0.425	4.5	LOS A	3.2	23.8	0.29	0.46	0.29	44.2
5	T1	411	5.0	433	5.0	0.425	4.2	LOS A	3.2	23.8	0.29	0.46	0.29	40.1
6u	U	26	5.0	27	5.0	0.425	8.6	LOS A	3.2	23.8	0.29	0.46	0.29	38.4
Approach		528	5.0	556	5.0	0.425	4.5	LOS A	3.2	23.8	0.29	0.46	0.29	41.2
West: Wollongong Rd West														
11	T1	240	5.0	253	5.0	0.288	5.0	LOS A	1.8	13.4	0.43	0.55	0.43	39.7
12	R2	45	5.0	47	5.0	0.288	7.9	LOS A	1.8	13.4	0.43	0.55	0.43	44.7
12u	U	4	5.0	4	5.0	0.288	9.3	LOS A	1.8	13.4	0.43	0.55	0.43	41.4
Approach		289	5.0	304	5.0	0.288	5.5	LOS A	1.8	13.4	0.43	0.55	0.43	41.1
All Vehicles		1052	5.0	1107	5.0	0.425	5.8	LOS A	3.2	23.8	0.41	0.56	0.41	41.5

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	47	5.0	47	5.0	0.112	7.0	LOS A	0.6	4.6	0.63	0.69	0.63	40.0
2	T1	27	5.0	27	5.0	0.112	6.9	LOS A	0.6	4.6	0.63	0.69	0.63	44.9
3	R2	8	5.0	8	5.0	0.112	10.3	LOS A	0.6	4.6	0.63	0.69	0.63	39.0
3u	U	1	5.0	1	5.0	0.112	11.9	LOS A	0.6	4.6	0.63	0.69	0.63	44.3
Approach		84	5.0	84	5.0	0.112	7.4	LOS A	0.6	4.6	0.63	0.69	0.63	42.2
East: Allen St														
4	L2	16	5.0	16	5.0	0.199	7.7	LOS A	1.2	8.6	0.70	0.75	0.70	40.7
5	T1	89	5.0	89	5.0	0.199	7.6	LOS A	1.2	8.6	0.70	0.75	0.70	37.5
6	R2	33	5.0	33	5.0	0.199	11.0	LOS A	1.2	8.6	0.70	0.75	0.70	43.1
6u	U	2	5.0	2	5.0	0.199	12.6	LOS A	1.2	8.6	0.70	0.75	0.70	33.3
Approach		140	5.0	140	5.0	0.199	8.5	LOS A	1.2	8.6	0.70	0.75	0.70	39.8
North: Arncliff St South														
7	L2	44	5.0	44	5.0	0.035	4.2	LOS A	0.2	1.3	0.33	0.49	0.33	44.4
8	T1	97	5.0	97	5.0	0.445	5.1	LOS A	2.9	21.3	0.54	0.66	0.54	44.4
9	R2	395	5.0	395	5.0	0.445	8.5	LOS A	2.9	21.3	0.54	0.66	0.54	42.3
9u	U	5	5.0	5	5.0	0.445	10.1	LOS A	2.9	21.3	0.54	0.66	0.54	45.5
Approach		541	5.0	541	5.0	0.445	7.6	LOS A	2.9	21.3	0.52	0.65	0.52	42.9
West: Wollongong Rd														
10	L2	117	5.0	117	5.0	0.286	4.1	LOS A	1.8	13.4	0.28	0.49	0.28	43.8
11	T1	162	5.0	162	5.0	0.286	4.0	LOS A	1.8	13.4	0.28	0.49	0.28	31.9
12	R2	81	5.0	81	5.0	0.286	7.4	LOS A	1.8	13.4	0.28	0.49	0.28	43.0
12u	U	1	5.0	1	5.0	0.286	9.0	LOS A	1.8	13.4	0.28	0.49	0.28	39.4
Approach		361	5.0	361	5.0	0.286	4.8	LOS A	1.8	13.4	0.28	0.49	0.28	41.1
All Vehicles		1126	5.0	1126	5.0	0.445	6.8	LOS A	2.9	21.3	0.47	0.62	0.47	42.1

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Existing Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	37	5.0	35	5.0	0.056	4.7	LOS A	0.2	1.2	0.08	0.52	0.08	44.8
2	T1	1	5.0	1	5.0	0.056	4.8	LOS A	0.2	1.2	0.08	0.52	0.08	41.2
3	R2	18	5.0	17	5.0	0.056	6.3	LOS A	0.2	1.2	0.08	0.52	0.08	41.8
Approach		56	5.0	53 N1	5.0	0.056	5.2	LOS A	0.2	1.2	0.08	0.52	0.08	44.1
East: Burrows St East														
4	L2	6	5.0	6	5.0	0.019	3.3	LOS A	0.0	0.1	0.03	0.11	0.03	40.7
5	T1	27	5.0	27	5.0	0.019	0.0	LOS A	0.0	0.1	0.03	0.11	0.03	48.7
6	R2	1	5.0	1	5.0	0.019	3.9	LOS A	0.0	0.1	0.03	0.11	0.03	23.9
Approach		35	5.0	35	5.0	0.019	0.7	NA	0.0	0.1	0.03	0.11	0.03	48.0
North: Eden St North														
7	L2	2	5.0	2	5.0	0.006	4.6	LOS A	0.0	0.1	0.25	0.49	0.25	25.8
8	T1	1	5.0	1	5.0	0.006	4.6	LOS A	0.0	0.1	0.25	0.49	0.25	25.8
9	R2	1	5.0	1	5.0	0.006	6.3	LOS A	0.0	0.1	0.25	0.49	0.25	41.5
Approach		4	5.0	4	5.0	0.006	5.0	LOS A	0.0	0.1	0.25	0.49	0.25	34.3
West: Burrows St West														
10	L2	3	5.0	3	5.0	0.093	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	43.4
11	T1	180	5.0	180	5.0	0.093	0.0	LOS A	0.1	1.1	0.03	0.07	0.03	48.7
12	R2	24	5.0	24	5.0	0.093	4.7	LOS A	0.1	1.1	0.05	0.12	0.05	47.7
Approach		207	5.0	207	5.0	0.093	0.6	NA	0.1	1.1	0.03	0.07	0.03	48.5
All Vehicles		302	5.0	300 N1	5.0	0.093	1.5	NA	0.2	1.2	0.04	0.16	0.04	47.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	28	5.0	28	5.0	0.729	67.9	LOS E	1.5	11.3	0.89	1.16	1.50	4.9
2	T1	1	5.0	1	5.0	0.729	156.9	LOS F	1.5	11.3	0.89	1.16	1.50	4.9
3	R2	9	5.0	9	5.0	0.729	158.2	LOS F	1.5	11.3	0.89	1.16	1.50	4.9
Approach		39	5.0	39	5.0	0.729	92.3	LOS F	1.5	11.3	0.89	1.16	1.50	4.9
East: Forest Rd East														
4	L2	29	5.0	27	5.0	0.483	4.6	LOS A	11.3	83.5	0.00	0.02	0.00	46.5
5	T1	1777	5.0	1632	5.0	0.483	0.8	LOS A	19.2	142.2	0.08	0.02	0.10	43.8
6	R2	31	5.0	28	5.0	0.483	18.6	LOS B	19.2	142.2	0.16	0.02	0.21	39.2
Approach		1837	5.0	1687 N1	5.0	0.483	1.1	NA	19.2	142.2	0.08	0.02	0.10	43.8
North: Eden St														
7	L2	14	5.0	14	5.0	0.861	132.8	LOS F	2.0	15.1	0.91	1.24	1.78	6.2
8	T1	1	5.0	1	5.0	0.861	228.4	LOS F	2.0	15.1	0.91	1.24	1.78	8.0
9	R2	15	5.0	15	5.0	0.861	230.3	LOS F	2.0	15.1	0.91	1.24	1.78	6.2
Approach		29	5.0	29	5.0	0.861	185.0	LOS F	2.0	15.1	0.91	1.24	1.78	6.3
West: Forest Rd West														
10	L2	18	5.0	18	5.0	0.384	3.4	LOS A	0.0	0.0	0.00	0.02	0.00	48.0
11	T1	1079	5.0	1079	5.0	0.384	1.5	LOS A	8.8	65.0	0.08	0.01	0.10	33.1
12	R2	11	5.0	11	5.0	0.384	32.0	LOS C	8.8	65.0	0.13	0.01	0.16	37.0
Approach		1107	5.0	1107	5.0	0.384	1.8	NA	8.8	65.0	0.07	0.01	0.09	33.4
All Vehicles		3013	5.0	2863 N1	5.3	0.861	4.5	NA	19.2	142.2	0.10	0.05	0.14	29.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: PM Existing)] **Network: N101 [PM Existing South (Network Folder: Existing)]**

PM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	17	5.0	17	5.0		0.476	72.0	LOS F	5.0	37.4	0.99	0.77	0.99	31.7
2	T1	58	5.0	58	5.0		0.476	68.7	LOS E	5.0	37.4	0.99	0.77	0.99	24.6
Approach		75	5.0	75	5.0		0.476	69.4	LOS E	5.0	37.4	0.99	0.77	0.99	26.4
East: Forest Rd East															
4	L2	46	5.0	43	5.0		0.708	7.3	LOS A	8.8	65.3	0.32	0.46	0.32	43.6
5	T1	1615	5.0	1484	5.0		0.708	12.4	LOS A	8.8	65.3	0.48	0.61	0.48	36.3
6	R2	156	5.0	143	5.0	*	0.708	32.2	LOS C	8.8	65.3	0.85	0.97	0.85	29.9
Approach		1817	5.0	1670 N1	5.0		0.708	13.9	LOS A	8.8	65.3	0.51	0.64	0.51	36.0
North: Firth St															
7	L2	82	5.0	82	5.0		0.107	13.2	LOS A	2.1	15.5	0.44	0.59	0.44	32.2
8	T1	86	5.0	86	5.0	*	0.601	67.7	LOS E	5.8	43.3	1.00	0.79	1.02	24.9
9	R2	35	5.0	35	5.0		0.378	76.2	LOS F	2.4	18.0	1.00	0.73	1.00	29.7
Approach		203	5.0	203	5.0		0.601	47.2	LOS D	5.8	43.3	0.77	0.70	0.78	27.8
West: Forest Rd West															
10	L2	39	5.0	39	5.0		0.779	35.1	LOS C	39.2	291.2	0.90	0.82	0.90	37.5
11	T1	1024	5.0	1024	5.0	*	0.779	33.3	LOS C	39.2	291.2	0.89	0.83	0.91	36.0
Approach		1063	5.0	1063	5.0		0.779	33.4	LOS C	39.2	291.2	0.89	0.83	0.91	36.0
All Vehicles		3158	5.0	3011 N1	5.2		0.779	24.4	LOS B	39.2	291.2	0.68	0.71	0.68	35.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	99	5.0	99	5.0	0.225	5.6	LOS A	0.0	0.0	0.00	0.14	0.00	54.2
2	T1	1159	5.0	1159	5.0	0.225	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.1
Approach		1258	5.0	1258	5.0	0.225	0.5	NA	0.0	0.0	0.00	0.05	0.00	58.9
North: Princes Hwy North														
8	T1	2339	5.0	2339	5.0	0.852	1.3	LOS A	0.0	0.0	0.00	0.00	0.00	55.6
Approach		2339	5.0	2339	5.0	0.852	1.3	NA	0.0	0.0	0.00	0.00	0.00	55.6
West: Allen St														
10	L2	174	5.0	174	5.0	0.198	6.8	LOS A	0.9	6.3	0.47	0.66	0.47	43.0
Approach		174	5.0	174	5.0	0.198	6.8	LOS A	0.9	6.3	0.47	0.66	0.47	43.0
All Vehicles		3771	5.0	3770	5.0	0.852	1.2	NA	0.9	6.3	0.02	0.05	0.02	55.9

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

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	28	5.0	28	5.0	*	0.248	9.8	LOS A	4.5	33.7	0.22	0.23	0.22	46.1
2	T1	1022	5.0	1022	5.0		0.248	2.2	LOS A	4.5	33.7	0.12	0.12	0.12	52.1
Approach		1051	5.0	1051	5.0		0.248	2.4	LOS A	4.5	33.7	0.12	0.12	0.12	51.9
North: Princes Hghwy North															
7	L2	33	5.0	33	5.0		1.162	195.3	LOS F	42.9	318.2	1.00	1.81	2.10	5.3
8	T1	2399	5.0	2399	5.0	*	1.162	189.3	LOS F	42.9	318.2	1.00	1.82	2.10	3.7
Approach		2432	5.0	2432	5.0		1.162	189.4	LOS F	42.9	318.2	1.00	1.82	2.10	3.7
West: Burrows Street															
10	L2	9	5.0	9	5.0		0.825	80.2	LOS F	7.4	54.8	1.00	0.97	1.33	2.2
12	R2	180	5.0	179	5.0		0.825	80.4	LOS F	7.4	54.8	1.00	0.97	1.34	2.2
Approach		189	5.0	189	5.0		0.825	80.4	LOS F	7.4	54.8	1.00	0.97	1.34	2.2
All Vehicles		3672	5.0	3671 N1	5.0		1.162	130.3	LOS F	42.9	318.2	0.75	1.29	1.49	5.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	231.0	216.7	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: PM Existing)]

Network: N101 [PM Existing South (Network Folder: Existing)]

PM Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	106	5.0	106	5.0	0.255	43.7	LOS D	5.4	39.8	0.80	0.73	0.80	31.7
2	T1	748	5.0	748	5.0	0.939	77.2	LOS F	28.0	208.0	0.98	1.04	1.29	23.2
3	R2	167	5.0	167	5.0	0.293	30.8	LOS C	6.3	46.6	0.82	0.77	0.82	40.6
Approach		1022	5.0	1022	5.0	0.939	66.1	LOS E	28.0	208.0	0.94	0.96	1.16	26.3
East: Wickham St														
4	L2	76	5.0	76	5.0	0.067	14.1	LOS A	1.8	13.6	0.38	0.62	0.38	48.8
5	T1	1087	5.0	1087	5.0	* 1.095	137.8	LOS F	73.0	541.4	1.00	1.48	1.75	7.5
Approach		1163	5.0	1163	5.0	1.095	129.7	LOS F	73.0	541.4	0.96	1.42	1.66	8.9
North: Princes Hghwy North														
7	L2	115	5.0	113	5.0	0.125	14.2	LOS A	2.7	19.7	0.43	0.66	0.43	41.5
8	T1	1795	5.0	1765	5.0	* 1.076	150.8	LOS F	52.6	390.0	1.00	1.51	1.79	17.4
9	R2	668	5.0	657	5.0	* 1.060	122.6	LOS F	52.6	390.0	1.00	1.20	1.70	5.7
Approach		2578	5.0	2535 N1	5.0	1.076	137.5	LOS F	52.6	390.0	0.97	1.39	1.70	15.1
West: Forest Rd														
10	L2	267	5.0	267	5.0	0.721	47.2	LOS D	14.4	106.5	0.83	0.81	0.85	8.2
11	T1	800	5.0	800	5.0	0.800	47.9	LOS D	22.0	163.2	0.93	0.86	0.99	21.2
Approach		1067	5.0	1067	5.0	0.800	47.7	LOS D	22.0	163.2	0.90	0.84	0.96	18.6
All Vehicles		5831	5.0	5788 N1	5.0	1.095	106.7	LOS F	73.0	541.4	0.95	1.22	1.46	15.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing North (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	434	5.0	434	5.0	0.349	3.7	LOS A	2.1	15.5	0.35	0.49	0.35	37.4
6	R2	214	5.0	214	5.0	0.251	7.0	LOS A	1.3	9.6	0.34	0.61	0.34	35.8
6u	U	41	5.0	41	5.0	0.251	8.3	LOS A	1.3	9.6	0.34	0.61	0.34	24.2
Approach		688	5.0	688	5.0	0.349	5.0	LOS A	2.1	15.5	0.35	0.53	0.35	36.6
North: Brodie Spark Dr North														
7	L2	163	5.0	163	5.0	0.307	6.5	LOS A	2.0	15.0	0.77	0.77	0.77	33.0
8	T1	43	5.0	43	5.0	0.307	6.1	LOS A	2.0	15.0	0.77	0.77	0.77	37.6
9u	U	7	5.0	7	5.0	0.307	11.3	LOS A	2.0	15.0	0.77	0.77	0.77	38.2
Approach		214	5.0	214	5.0	0.307	6.6	LOS A	2.0	15.0	0.77	0.77	0.77	34.8
West: Magdalene Terrace														
10	L2	34	5.0	34	5.0	0.553	4.7	LOS A	5.2	38.7	0.68	0.59	0.68	37.2
11	T1	385	5.0	385	5.0	0.553	4.3	LOS A	5.2	38.7	0.68	0.59	0.68	35.5
12	R2	161	5.0	161	5.0	0.553	8.1	LOS A	5.2	38.7	0.68	0.59	0.68	38.4
Approach		580	5.0	580	5.0	0.553	5.3	LOS A	5.2	38.7	0.68	0.59	0.68	36.8
All Vehicles		1482	5.0	1482	5.0	0.553	5.4	LOS A	5.2	38.7	0.54	0.59	0.54	36.5

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: SAT Existing)]

Network: N101 [SAT Existing North (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	271	5.0	271	5.0		0.266	21.6	LOS B	9.1	67.8	0.54	0.73	0.54	24.4
2	T1	2083	5.0	2083	5.0	*	0.681	19.7	LOS B	34.6	256.4	0.71	0.65	0.71	42.0
Approach		2354	5.0	2354	5.0		0.681	19.9	LOS B	34.6	256.4	0.69	0.66	0.69	40.8
North: Princes Hghwy North															
8	T1	1744	5.0	1744	5.0		0.457	11.0	LOS A	18.1	134.1	0.50	0.46	0.50	48.4
9	R2	417	5.0	417	5.0	*	0.684	65.6	LOS E	13.7	101.4	0.99	0.84	1.01	19.8
Approach		2161	5.0	2161	5.0		0.684	21.6	LOS B	18.1	134.1	0.60	0.53	0.60	40.1
West: Brodie Sparks Dr															
10	L2	346	5.0	346	5.0		0.303	41.6	LOS C	8.8	65.4	0.80	0.76	0.80	26.4
12	R2	242	5.0	242	5.0	*	0.706	71.4	LOS F	8.3	61.9	1.00	0.85	1.09	12.4
Approach		588	5.0	588	5.0		0.706	53.8	LOS D	8.8	65.4	0.88	0.80	0.92	20.1
All Vehicles		5103	5.0	5103	5.0		0.706	24.5	LOS B	34.6	256.4	0.67	0.62	0.68	37.3

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P11	Stage 1	168	64.6	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	168	64.6	LOS F	0.6	0.6	0.96	0.96	226.4	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	68	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		405	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.3	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	34	5.0	34	5.0	0.074	6.1	LOS A	0.4	2.9	0.56	0.62	0.56	40.7
2	T1	19	5.0	19	5.0	0.074	6.0	LOS A	0.4	2.9	0.56	0.62	0.56	45.4
3	R2	6	5.0	6	5.0	0.074	9.4	LOS A	0.4	2.9	0.56	0.62	0.56	39.9
3u	U	2	5.0	2	5.0	0.074	10.9	LOS A	0.4	2.9	0.56	0.62	0.56	44.8
Approach		61	5.0	61	5.0	0.074	6.5	LOS A	0.4	2.9	0.56	0.62	0.56	42.8
East: Allen St														
4	L2	16	5.0	16	5.0	0.143	7.1	LOS A	0.8	6.0	0.65	0.70	0.65	41.3
5	T1	69	5.0	69	5.0	0.143	7.0	LOS A	0.8	6.0	0.65	0.70	0.65	38.3
6	R2	18	5.0	18	5.0	0.143	10.4	LOS A	0.8	6.0	0.65	0.70	0.65	43.6
6u	U	2	5.0	2	5.0	0.143	12.0	LOS A	0.8	6.0	0.65	0.70	0.65	34.4
Approach		105	5.0	105	5.0	0.143	7.7	LOS A	0.8	6.0	0.65	0.70	0.65	40.2
North: Arncliff St South														
7	L2	63	5.0	63	5.0	0.055	4.7	LOS A	0.3	2.1	0.42	0.53	0.42	44.0
8	T1	102	5.0	102	5.0	0.439	6.0	LOS A	2.6	19.4	0.63	0.73	0.63	44.1
9	R2	312	5.0	312	5.0	0.439	9.4	LOS A	2.6	19.4	0.63	0.73	0.63	41.9
9u	U	5	5.0	5	5.0	0.439	10.9	LOS A	2.6	19.4	0.63	0.73	0.63	45.2
Approach		482	5.0	482	5.0	0.439	8.1	LOS A	2.6	19.4	0.60	0.70	0.60	42.7
West: Wollongong Rd														
10	L2	131	5.0	131	5.0	0.376	4.0	LOS A	2.7	19.7	0.25	0.47	0.25	43.9
11	T1	273	5.0	273	5.0	0.376	3.9	LOS A	2.7	19.7	0.25	0.47	0.25	32.3
12	R2	105	5.0	105	5.0	0.376	7.3	LOS A	2.7	19.7	0.25	0.47	0.25	43.2
12u	U	1	5.0	1	5.0	0.376	8.8	LOS A	2.7	19.7	0.25	0.47	0.25	39.7
Approach		509	5.0	509	5.0	0.376	4.6	LOS A	2.7	19.7	0.25	0.47	0.25	40.6
All Vehicles		1158	5.0	1158	5.0	0.439	6.4	LOS A	2.7	19.7	0.45	0.60	0.45	41.9

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: SAT Existing)]

SAT Peak Existing
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth St														
1	L2	97	5.0	102	5.0	0.300	6.8	LOS A	1.8	13.1	0.60	0.73	0.60	42.5
3	R2	139	5.0	146	5.0	0.300	9.5	LOS A	1.8	13.1	0.60	0.73	0.60	42.5
3u	U	8	5.0	8	5.0	0.300	10.9	LOS A	1.8	13.1	0.60	0.73	0.60	45.5
Approach		244	5.0	257	5.0	0.300	8.5	LOS A	1.8	13.1	0.60	0.73	0.60	42.6
East: Wollongong Rd East														
4	L2	109	5.0	115	5.0	0.383	4.7	LOS A	2.8	20.4	0.34	0.49	0.34	43.9
5	T1	308	5.0	324	5.0	0.383	4.4	LOS A	2.8	20.4	0.34	0.49	0.34	39.8
6u	U	31	5.0	33	5.0	0.383	8.7	LOS A	2.8	20.4	0.34	0.49	0.34	37.9
Approach		448	5.0	472	5.0	0.383	4.8	LOS A	2.8	20.4	0.34	0.49	0.34	41.3
West: Wollongong Rd West														
11	T1	335	5.0	353	5.0	0.411	5.3	LOS A	2.9	21.3	0.52	0.59	0.52	39.2
12	R2	66	5.0	69	5.0	0.411	8.3	LOS A	2.9	21.3	0.52	0.59	0.52	44.4
12u	U	7	5.0	7	5.0	0.411	9.7	LOS A	2.9	21.3	0.52	0.59	0.52	41.0
Approach		408	5.0	429	5.0	0.411	5.9	LOS A	2.9	21.3	0.52	0.59	0.52	40.7
All Vehicles		1100	5.0	1158	5.0	0.411	6.0	LOS A	2.9	21.3	0.46	0.58	0.46	41.5

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Existing Peak
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	34	5.0	34	5.0	0.060	4.7	LOS A	0.2	1.7	0.08	0.53	0.08	44.6
2	T1	2	5.0	2	5.0	0.060	5.0	LOS A	0.2	1.7	0.08	0.53	0.08	40.9
3	R2	26	5.0	26	5.0	0.060	6.6	LOS A	0.2	1.7	0.08	0.53	0.08	41.4
Approach		62	5.0	62	5.0	0.060	5.5	LOS A	0.2	1.7	0.08	0.53	0.08	43.5
East: Burrows St East														
4	L2	5	5.0	5	5.0	0.020	3.3	LOS A	0.0	0.1	0.02	0.09	0.02	41.6
5	T1	29	5.0	29	5.0	0.020	0.0	LOS A	0.0	0.1	0.02	0.09	0.02	48.9
6	R2	1	5.0	1	5.0	0.020	4.1	LOS A	0.0	0.1	0.02	0.09	0.02	24.0
Approach		36	5.0	36	5.0	0.020	0.7	NA	0.0	0.1	0.02	0.09	0.02	48.2
North: Eden St North														
7	L2	1	5.0	1	5.0	0.004	4.6	LOS A	0.0	0.1	0.32	0.49	0.32	25.0
8	T1	1	5.0	1	5.0	0.004	4.8	LOS A	0.0	0.1	0.32	0.49	0.32	25.0
9	R2	1	5.0	1	5.0	0.004	6.6	LOS A	0.0	0.1	0.32	0.49	0.32	41.2
Approach		3	5.0	3	5.0	0.004	5.3	LOS A	0.0	0.1	0.32	0.49	0.32	35.2
West: Burrows St West														
10	L2	4	5.0	4	5.0	0.066	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	43.4
11	T1	221	5.0	221	5.0	0.066	0.0	LOS A	0.1	0.8	0.01	0.04	0.01	49.2
12	R2	14	5.0	14	5.0	0.066	4.7	LOS A	0.1	0.8	0.03	0.06	0.03	48.7
Approach		239	5.0	239	5.0	0.066	0.4	NA	0.1	0.8	0.02	0.04	0.02	49.1
All Vehicles		340	5.0	340	5.0	0.066	1.4	NA	0.2	1.7	0.03	0.14	0.03	47.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	4	5.0	4	5.0	0.307	18.3	LOS B	0.5	3.3	0.90	0.98	0.99	8.2
2	T1	1	5.0	1	5.0	0.307	65.3	LOS E	0.5	3.3	0.90	0.98	0.99	8.2
3	R2	8	5.0	8	5.0	0.307	65.8	LOS E	0.5	3.3	0.90	0.98	0.99	8.2
Approach		14	5.0	14	5.0	0.307	51.2	LOS D	0.5	3.3	0.90	0.98	0.99	8.2
East: Forest Rd East														
4	L2	5	5.0	5	5.0	0.370	4.6	LOS A	7.8	57.6	0.00	0.00	0.00	46.9
5	T1	1197	5.0	1197	5.0	0.370	1.1	LOS A	17.0	126.1	0.11	0.02	0.14	41.8
6	R2	37	5.0	37	5.0	0.370	16.7	LOS B	17.0	126.1	0.25	0.05	0.31	34.8
Approach		1239	5.0	1239	5.0	0.370	1.6	NA	17.0	126.1	0.11	0.02	0.14	41.6
North: Eden St														
7	L2	4	5.0	4	5.0	0.148	7.4	LOS A	0.2	1.8	0.83	0.85	0.83	21.5
8	T1	1	5.0	1	5.0	0.148	56.2	LOS D	0.2	1.8	0.83	0.85	0.83	25.0
9	R2	4	5.0	4	5.0	0.148	57.1	LOS E	0.2	1.8	0.83	0.85	0.83	21.5
Approach		9	5.0	9	5.0	0.148	34.9	LOS C	0.2	1.8	0.83	0.85	0.83	21.9
West: Forest Rd West														
10	L2	12	5.0	12	5.0	0.354	3.4	LOS A	0.0	0.0	0.00	0.01	0.00	48.6
11	T1	1100	5.0	1100	5.0	0.354	0.2	LOS A	8.8	65.3	0.02	0.01	0.02	46.2
12	R2	4	5.0	4	5.0	0.354	17.5	LOS B	8.8	65.3	0.03	0.00	0.04	43.7
Approach		1116	5.0	1116	5.0	0.354	0.3	NA	8.8	65.3	0.02	0.01	0.02	46.2
All Vehicles		2378	5.0	2378	5.0	0.370	1.4	NA	17.0	126.1	0.08	0.02	0.09	40.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	27	5.0	27	5.0		0.753	76.7	LOS F	8.4	62.6	1.00	0.89	1.15	30.9
2	T1	91	5.0	91	5.0	*	0.753	73.4	LOS F	8.4	62.6	1.00	0.89	1.15	23.9
Approach		118	5.0	118	5.0		0.753	74.1	LOS F	8.4	62.6	1.00	0.89	1.15	25.8
East: Forest Rd East															
4	L2	37	5.0	37	5.0		0.531	7.6	LOS A	8.8	65.3	0.34	0.34	0.34	44.1
5	T1	1029	5.0	1029	5.0		0.531	9.8	LOS A	8.8	65.3	0.46	0.45	0.46	44.9
6	R2	134	5.0	134	5.0	*	0.531	29.6	LOS C	8.8	65.3	0.80	0.80	0.80	27.6
Approach		1200	5.0	1200	5.0		0.531	11.9	LOS A	8.8	65.3	0.50	0.49	0.50	43.3
North: Firth St															
7	L2	97	5.0	97	5.0		0.138	12.7	LOS A	2.4	17.9	0.44	0.59	0.44	32.5
8	T1	74	5.0	74	5.0		0.497	66.8	LOS E	4.9	36.5	0.99	0.76	0.99	25.1
9	R2	38	5.0	38	5.0		0.640	83.2	LOS F	2.8	20.9	1.00	0.78	1.14	28.8
Approach		208	5.0	208	5.0		0.640	44.6	LOS D	4.9	36.5	0.73	0.68	0.76	28.1
West: Forest Rd West															
10	L2	65	5.0	65	5.0		0.737	32.2	LOS C	37.3	276.8	0.84	0.78	0.84	38.6
11	T1	1008	5.0	1008	5.0	*	0.737	28.1	LOS B	37.3	276.8	0.84	0.77	0.85	37.8
Approach		1074	5.0	1074	5.0		0.737	28.4	LOS B	37.3	276.8	0.84	0.77	0.85	37.8
All Vehicles		2600	5.0	2600	5.0		0.753	24.2	LOS B	37.3	276.8	0.68	0.64	0.69	38.3

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Existing
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	89	5.0	89	5.0	0.293	5.6	LOS A	0.0	0.0	0.00	0.10	0.00	55.8
2	T1	1555	5.0	1555	5.0	0.293	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.3
Approach		1644	5.0	1644	5.0	0.293	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.2
North: Princes Hwy North														
8	T1	1344	5.0	1344	5.0	0.249	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1344	5.0	1344	5.0	0.249	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Allen St														
10	L2	299	5.0	299	5.0	0.395	9.3	LOS A	2.5	18.4	0.62	0.85	0.78	40.5
Approach		299	5.0	299	5.0	0.395	9.3	LOS A	2.5	18.4	0.62	0.85	0.78	40.5
All Vehicles		3287	5.0	3287	5.0	0.395	1.0	NA	2.5	18.4	0.06	0.09	0.07	56.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	31	5.0	31	5.0	*	0.585	39.2	LOS C	24.4	181.0	0.86	0.77	0.86	18.5
2	T1	1345	5.0	1345	5.0		0.585	24.6	LOS B	24.4	181.0	0.67	0.59	0.67	22.8
Approach		1376	5.0	1376	5.0		0.585	24.9	LOS B	24.4	181.0	0.67	0.60	0.67	22.7
North: Princes Hghwy North															
7	L2	22	5.0	22	5.0		0.621	39.3	LOS C	25.3	187.8	0.84	0.75	0.84	20.3
8	T1	1415	5.0	1415	5.0	*	0.621	33.8	LOS C	25.4	188.2	0.84	0.75	0.84	16.2
Approach		1437	5.0	1437	5.0		0.621	33.9	LOS C	25.4	188.2	0.84	0.75	0.84	16.2
West: Burrows Street															
10	L2	17	5.0	17	5.0		0.143	25.8	LOS B	4.4	32.9	0.61	0.69	0.61	6.1
12	R2	215	5.0	215	5.0		0.143	25.9	LOS B	4.5	33.1	0.61	0.69	0.61	6.1
Approach		232	5.0	232	5.0		0.143	25.9	LOS B	4.5	33.1	0.61	0.69	0.61	6.1
All Vehicles		3044	5.0	3044	5.0		0.621	29.2	LOS C	25.4	188.2	0.75	0.68	0.75	18.5

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	230.8	216.5	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: SAT Existing)]

Network: N101 [SAT Existing South (Network Folder: Existing)]

SAT Peak Existing
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	132	5.0	132	5.0	0.208	21.3	LOS B	4.3	31.9	0.55	0.69	0.55	41.8
2	T1	1036	5.0	1036	5.0	* 0.846	59.0	LOS E	28.6	212.2	0.97	0.95	1.12	27.1
3	R2	222	5.0	222	5.0	* 0.816	74.7	LOS F	15.8	117.3	1.00	0.90	1.16	28.1
Approach		1389	5.0	1389	5.0	0.846	58.0	LOS E	28.6	212.2	0.94	0.91	1.07	28.2
East: Wickham St														
4	L2	94	5.0	94	5.0	0.087	6.8	LOS A	0.8	6.2	0.18	0.60	0.18	53.5
5	T1	702	5.0	702	5.0	0.694	43.7	LOS D	21.2	157.4	0.92	0.80	0.92	18.9
Approach		796	5.0	796	5.0	0.694	39.3	LOS C	21.2	157.4	0.83	0.77	0.83	23.6
North: Princes Hghwy North														
7	L2	148	5.0	148	5.0	0.163	10.9	LOS A	1.7	12.3	0.18	0.60	0.18	44.5
8	T1	1080	5.0	1080	5.0	0.486	9.7	LOS A	8.8	65.6	0.31	0.27	0.31	52.0
9	R2	396	5.0	396	5.0	* 0.802	39.5	LOS C	15.2	112.8	1.00	0.87	1.03	17.0
Approach		1624	5.0	1624	5.0	0.802	17.1	LOS B	15.2	112.8	0.47	0.45	0.48	44.4
West: Forest Rd														
10	L2	316	5.0	316	5.0	* 0.841	52.8	LOS D	17.7	131.4	0.79	0.85	0.91	7.4
11	T1	793	5.0	793	5.0	0.808	46.8	LOS D	22.0	163.2	0.90	0.83	0.96	21.5
Approach		1108	5.0	1108	5.0	0.841	48.5	LOS D	22.0	163.2	0.87	0.83	0.94	18.0
All Vehicles		4918	5.0	4918	5.0	0.846	39.3	LOS C	28.6	212.2	0.75	0.72	0.81	30.0

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

APPENDIX 6

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: AM Projected Scenario North)]

Network: N101 [AM Projected Scenario North (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	231	5.0	231	5.0	0.173	3.1	LOS A	0.8	6.1	0.25	0.43	0.25	37.6
6	R2	113	5.0	113	5.0	0.127	6.3	LOS A	0.6	4.1	0.25	0.57	0.25	36.1
6u	U	28	5.0	28	5.0	0.127	7.7	LOS A	0.6	4.1	0.25	0.57	0.25	24.7
Approach		372	5.0	372	5.0	0.173	4.4	LOS A	0.8	6.1	0.25	0.48	0.25	36.9
North: Brodie Spark Dr North														
7	L2	175	5.0	175	5.0	0.358	6.2	LOS A	1.9	14.1	0.72	0.74	0.72	33.3
8	T1	46	5.0	46	5.0	0.358	5.8	LOS A	1.9	14.1	0.72	0.74	0.72	37.8
9u	U	6	5.0	6	5.0	0.358	11.0	LOS A	1.9	14.1	0.72	0.74	0.72	38.4
Approach		227	5.0	227	5.0	0.358	6.2	LOS A	1.9	14.1	0.72	0.74	0.72	35.1
West: Magdalene Terrace														
10	L2	28	5.0	28	5.0	0.545	3.3	LOS A	3.9	28.6	0.47	0.44	0.47	37.9
11	T1	438	5.0	438	5.0	0.545	2.9	LOS A	3.9	28.6	0.47	0.44	0.47	36.5
12	R2	81	5.0	81	5.0	0.545	6.8	LOS A	3.9	28.6	0.47	0.44	0.47	39.0
Approach		547	5.0	547	5.0	0.545	3.5	LOS A	3.9	28.6	0.47	0.44	0.47	37.2
All Vehicles		1146	5.0	1146	5.0	0.545	4.4	LOS A	3.9	28.6	0.45	0.51	0.45	36.7

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: AM Projected Scenario North)]

Network: N101 [AM Projected Scenario North (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	129	5.0	129	5.0		0.120	17.8	LOS B	3.6	27.1	0.45	0.69	0.45	27.2
2	T1	2907	5.0	2907	5.0	*	0.851	10.9	LOS A	38.0	281.7	0.58	0.54	0.58	48.5
Approach		3037	5.0	3037	5.0		0.851	11.2	LOS A	38.0	281.7	0.57	0.55	0.57	48.0
North: Princes Hghwy North															
8	T1	1082	5.0	1082	5.0		0.270	7.4	LOS A	8.5	62.9	0.38	0.34	0.38	51.7
9	R2	212	5.0	212	5.0		0.347	58.8	LOS E	6.4	47.7	0.93	0.77	0.93	18.0
Approach		1294	5.0	1294	5.0		0.347	15.8	LOS B	8.5	62.9	0.47	0.41	0.47	42.2
West: Brodie Sparks Dr															
10	L2	416	5.0	416	5.0		0.444	46.9	LOS D	12.6	93.3	0.86	0.78	0.86	21.6
12	R2	212	5.0	212	5.0	*	0.837	81.4	LOS F	7.9	58.7	1.00	0.98	1.31	10.8
Approach		627	5.0	627	5.0		0.837	58.5	LOS E	12.6	93.3	0.91	0.85	1.01	17.8
All Vehicles		4958	5.0	4958	5.0		0.851	18.4	LOS B	38.0	281.7	0.59	0.55	0.60	40.2

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P11	Stage 1	145	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	145	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	235.7	222.8	0.95
All Pedestrians		343	64.5	LOS F	0.6	0.6	0.96	0.96	228.4	213.1	0.93

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: AM Projected Scenario North)]

AM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street														
1	L2	66	5.0	69	5.0	0.414	7.3	LOS A	2.6	19.6	0.66	0.78	0.66	41.9
3	R2	264	5.0	278	5.0	0.414	10.0	LOS A	2.6	19.6	0.66	0.78	0.66	41.8
3u	U	3	5.0	3	5.0	0.414	11.4	LOS A	2.6	19.6	0.66	0.78	0.66	45.0
Approach		333	5.0	351	5.0	0.414	9.5	LOS A	2.6	19.6	0.66	0.78	0.66	41.9
East: Wollongong Road East														
4	L2	96	5.0	101	5.0	0.369	4.4	LOS A	3.0	22.4	0.29	0.46	0.29	44.1
5	T1	334	5.0	352	5.0	0.369	4.1	LOS A	3.0	22.4	0.29	0.46	0.29	40.1
6u	U	30	5.0	32	5.0	0.369	8.5	LOS A	3.0	22.4	0.29	0.46	0.29	38.4
Approach		460	5.0	484	5.0	0.369	4.5	LOS A	3.0	22.4	0.29	0.46	0.29	41.4
West: Wollongong Road West														
11	T1	708	5.0	745	5.0	0.858	15.0	LOS B	16.2	120.5	1.00	1.11	1.46	30.9
12	R2	45	5.0	47	5.0	0.858	17.9	LOS B	16.2	120.5	1.00	1.11	1.46	39.3
12u	U	1	5.0	1	5.0	0.858	19.3	LOS B	16.2	120.5	1.00	1.11	1.46	33.7
Approach		754	5.0	794	5.0	0.858	15.2	LOS B	16.2	120.5	1.00	1.11	1.46	31.8
All Vehicles		1547	5.0	1628	5.0	0.858	10.8	LOS A	16.2	120.5	0.72	0.84	0.94	37.1

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	85	5.0	85	5.0	0.139	5.3	LOS A	0.8	5.6	0.49	0.59	0.49	41.4
2	T1	33	5.0	33	5.0	0.139	5.2	LOS A	0.8	5.6	0.49	0.59	0.49	45.9
3	R2	12	5.0	12	5.0	0.139	8.6	LOS A	0.8	5.6	0.49	0.59	0.49	40.8
3u	U	1	5.0	1	5.0	0.139	10.1	LOS A	0.8	5.6	0.49	0.59	0.49	45.5
Approach		131	5.0	131	5.0	0.139	5.6	LOS A	0.8	5.6	0.49	0.59	0.49	43.0
East: Allen St														
4	L2	14	5.0	14	5.0	0.159	7.1	LOS A	0.9	6.6	0.64	0.71	0.64	41.2
5	T1	78	5.0	78	5.0	0.159	7.1	LOS A	0.9	6.6	0.64	0.71	0.64	38.2
6	R2	26	5.0	26	5.0	0.159	10.5	LOS A	0.9	6.6	0.64	0.71	0.64	43.5
6u	U	2	5.0	2	5.0	0.159	12.0	LOS A	0.9	6.6	0.64	0.71	0.64	34.2
Approach		120	5.0	120	5.0	0.159	7.9	LOS A	0.9	6.6	0.64	0.71	0.64	40.3
North: Arncliff St South														
7	L2	45	5.0	45	5.0	0.049	6.0	LOS A	0.3	2.1	0.61	0.61	0.61	43.1
8	T1	68	5.0	68	5.0	0.382	9.4	LOS A	2.4	17.9	0.87	0.88	0.87	42.3
9	R2	160	5.0	160	5.0	0.382	12.7	LOS A	2.4	17.9	0.87	0.88	0.87	39.8
9u	U	2	5.0	2	5.0	0.382	14.3	LOS A	2.4	17.9	0.87	0.88	0.87	43.6
Approach		276	5.0	276	5.0	0.382	10.8	LOS A	2.4	17.9	0.82	0.84	0.82	41.0
West: Wollongong Rd														
10	L2	144	5.0	144	5.0	0.699	4.6	LOS A	8.3	61.4	0.49	0.51	0.49	42.8
11	T1	505	5.0	505	5.0	0.699	4.5	LOS A	8.3	61.4	0.49	0.51	0.49	29.8
12	R2	291	5.0	291	5.0	0.699	7.9	LOS A	8.3	61.4	0.49	0.51	0.49	41.8
12u	U	1	5.0	1	5.0	0.699	9.4	LOS A	8.3	61.4	0.49	0.51	0.49	37.6
Approach		941	5.0	941	5.0	0.699	5.5	LOS A	8.3	61.4	0.49	0.51	0.49	38.6
All Vehicles		1467	5.0	1467	5.0	0.699	6.7	LOS A	8.3	61.4	0.57	0.59	0.57	39.9

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	94	5.0	94	5.0	0.444	5.7	LOS A	1.5	11.2	0.14	0.58	0.17	42.7
2	T1	1	5.0	1	5.0	0.444	7.6	LOS A	1.5	11.2	0.14	0.58	0.17	38.4
3	R2	134	5.0	134	5.0	0.444	9.5	LOS A	1.5	11.2	0.14	0.58	0.17	38.5
Approach		228	5.0	228	5.0	0.444	7.9	LOS A	1.5	11.2	0.14	0.58	0.17	40.8
East: Burrows St East														
4	L2	8	5.0	8	5.0	0.022	3.2	LOS A	0.0	0.1	0.02	0.12	0.02	40.1
5	T1	31	5.0	31	5.0	0.022	0.0	LOS A	0.0	0.1	0.02	0.12	0.02	48.6
6	R2	1	5.0	1	5.0	0.022	3.8	LOS A	0.0	0.1	0.02	0.12	0.02	23.8
Approach		40	5.0	40	5.0	0.022	0.8	NA	0.0	0.1	0.02	0.12	0.02	47.8
North: Eden St North														
7	L2	1	5.0	1	5.0	0.005	4.8	LOS A	0.0	0.1	0.40	0.53	0.40	22.6
8	T1	1	5.0	1	5.0	0.005	5.9	LOS A	0.0	0.1	0.40	0.53	0.40	22.6
9	R2	1	5.0	1	5.0	0.005	8.7	LOS A	0.0	0.1	0.40	0.53	0.40	39.9
Approach		3	5.0	3	5.0	0.005	6.5	LOS A	0.0	0.1	0.40	0.53	0.40	33.3
West: Burrows St West														
10	L2	1	5.0	1	5.0	0.128	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	43.5
11	T1	163	5.0	163	5.0	0.128	0.0	LOS A	0.6	4.6	0.01	0.03	0.01	49.4
12	R2	197	5.0	197	5.0	0.128	4.7	LOS A	0.6	4.6	0.13	0.50	0.13	42.0
Approach		361	5.0	361	5.0	0.128	2.6	NA	0.6	4.6	0.07	0.29	0.07	45.1
All Vehicles		633	5.0	633	5.0	0.444	4.4	NA	1.5	11.2	0.10	0.39	0.11	43.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	28	5.0	28	5.0	0.037	6.4	LOS A	0.2	1.2	0.52	0.59	0.52	26.5
Approach		28	5.0	28	5.0	0.037	6.4	LOS A	0.2	1.2	0.52	0.59	0.52	26.5
East: Forest Rd East														
4	L2	58	5.0	57	5.0	0.287	3.4	LOS A	0.0	0.0	0.00	0.05	0.00	39.8
5	T1	1005	5.0	995	5.0	0.287	0.0	LOS A	3.0	22.6	0.00	0.02	0.00	39.2
Approach		1063	5.0	1052 N1	5.0	0.287	0.2	NA	3.0	22.6	0.00	0.03	0.00	39.3
North: Eden St														
7	L2	47	5.0	47	5.0	0.175	9.2	LOS A	1.7	12.9	0.63	0.79	0.63	31.2
Approach		47	5.0	47	5.0	0.175	9.2	LOS A	1.7	12.9	0.63	0.79	0.63	31.2
West: Forest Rd West														
10	L2	61	5.0	61	5.0	0.398	3.2	LOS A	8.8	65.3	0.00	0.04	0.00	37.7
11	T1	1425	5.0	1425	5.0	0.398	0.0	LOS A	8.8	65.3	0.00	0.02	0.00	38.8
Approach		1486	5.0	1486	5.0	0.398	0.1	NA	8.8	65.3	0.00	0.02	0.00	38.7
All Vehicles		2625	5.0	2614 N1	5.0	0.398	0.4	NA	8.8	65.3	0.02	0.04	0.02	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	12	5.0	12	5.0		0.795	76.9	LOS F	9.5	70.2	1.00	0.94	1.20	29.6
2	T1	119	5.0	119	5.0	*	0.795	73.5	LOS F	9.5	70.2	1.00	0.94	1.20	24.3
Approach		131	5.0	131	5.0		0.795	73.8	LOS F	9.5	70.2	1.00	0.94	1.20	24.9
East: Forest Rd East															
4	L2	49	5.0	49	5.0		0.557	3.9	LOS A	3.3	24.7	0.06	0.09	0.06	39.5
5	T1	801	5.0	793	5.0		0.557	0.8	LOS A	3.3	24.7	0.06	0.09	0.06	39.7
6	R2	188	5.0	187	5.0	*	0.855	78.6	LOS F	8.8	65.3	1.00	1.17	1.20	17.0
Approach		1039	5.0	1028 N1	5.0		0.855	15.0	LOS B	8.8	65.3	0.23	0.28	0.27	34.8
North: Firth St															
7	L2	127	5.0	127	5.0		0.706	57.1	LOS E	8.4	62.0	0.96	0.87	1.06	19.5
8	T1	74	5.0	74	5.0		0.476	66.8	LOS E	4.9	36.5	0.99	0.76	0.99	23.6
9	R2	27	5.0	27	5.0		0.504	83.2	LOS F	2.0	15.0	1.00	0.71	1.03	26.4
Approach		228	5.0	228	5.0		0.706	63.3	LOS E	8.4	62.0	0.97	0.81	1.03	22.4
West: Forest Rd West															
10	L2	19	5.0	19	5.0		1.067	118.9	LOS F	84.6	627.9	1.00	1.48	1.69	23.3
11	T1	1359	5.0	1359	5.0	*	1.067	115.3	LOS F	84.6	627.9	1.00	1.49	1.69	19.4
Approach		1378	5.0	1378	5.0		1.067	115.3	LOS F	84.6	627.9	1.00	1.49	1.69	19.5
All Vehicles		2776	5.0	2765 N1	5.0		1.067	71.8	LOS F	84.6	627.9	0.71	0.96	1.09	23.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	66	5.0	66	5.0	0.445	5.7	LOS A	0.0	0.0	0.00	0.05	0.00	57.6
2	T1	2428	5.0	2428	5.0	0.445	0.1	LOS A	0.0	0.0	0.00	0.01	0.00	59.4
Approach		2495	5.0	2495	5.0	0.445	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.3
North: Princes Hwy North														
8	T1	748	5.0	748	5.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		748	5.0	748	5.0	0.136	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Allen St														
10	L2	354	5.0	354	5.0	0.867	32.5	LOS C	9.1	67.4	0.94	1.68	3.03	25.4
Approach		354	5.0	354	5.0	0.867	32.5	LOS C	9.1	67.4	0.94	1.68	3.03	25.4
All Vehicles		3597	5.0	3597	5.0	0.867	3.3	NA	9.1	67.4	0.09	0.18	0.30	51.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghway South															
1	L2	37	5.0	37	5.0	*	0.511	7.9	LOS A	6.5	48.1	0.15	0.16	0.15	51.3
2	T1	2169	5.0	2169	5.0	*	0.511	1.5	LOS A	6.5	48.1	0.10	0.10	0.10	54.4
Approach		2206	5.0	2206	5.0		0.511	1.6	LOS A	6.5	48.1	0.10	0.10	0.10	54.4
North: Princes Hghway North															
7	L2	14	5.0	14	5.0		0.190	9.1	LOS A	4.8	35.3	0.29	0.27	0.29	43.5
8	T1	791	5.0	791	5.0		0.190	4.7	LOS A	4.8	35.3	0.29	0.26	0.29	43.9
Approach		804	5.0	804	5.0		0.190	4.7	LOS A	4.8	35.3	0.29	0.26	0.29	43.9
West: Burrows Street															
10	L2	96	5.0	96	5.0		0.479	67.5	LOS E	6.3	46.8	0.98	0.78	0.98	2.5
12	R2	171	5.0	171	5.0		0.852	78.1	LOS F	7.5	55.5	1.00	0.94	1.27	2.2
Approach		266	5.0	266	5.0		0.852	74.3	LOS F	7.5	55.5	0.99	0.88	1.16	2.3
All Vehicles		3277	5.0	3277	5.0		0.852	8.3	LOS A	7.5	55.5	0.22	0.20	0.23	37.2

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghway North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	230.8	216.5	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: AM Projected Scenario South)]

Network: N101 [AM Projected Scenario South (Network Folder: Projected Scenario)]

AM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	64	5.0	64	5.0	0.062	15.3	LOS B	1.6	11.8	0.42	0.65	0.42	45.8
2	T1	1804	5.0	1804	5.0	0.830	37.8	LOS C	36.4	270.0	0.88	0.82	0.91	33.7
3	R2	582	5.0	582	5.0	* 1.195	228.9	LOS F	68.9	511.1	1.00	1.43	2.29	12.1
Approach		2451	5.0	2451	5.0	1.195	82.6	LOS F	68.9	511.1	0.90	0.96	1.23	22.1
East: Wickham St														
4	L2	96	5.0	96	5.0	0.087	9.2	LOS A	1.4	10.6	0.28	0.62	0.28	52.0
5	T1	673	5.0	673	5.0	0.599	40.6	LOS C	20.7	153.6	0.87	0.76	0.87	19.7
Approach		768	5.0	768	5.0	0.599	36.7	LOS C	20.7	153.6	0.80	0.74	0.80	24.7
North: Princes Hghwy North														
7	L2	91	5.0	91	5.0	0.141	39.0	LOS C	4.6	34.5	0.81	0.73	0.81	27.6
8	T1	639	5.0	639	5.0	* 0.762	46.0	LOS D	20.4	151.6	0.94	0.83	0.97	34.7
9	R2	279	5.0	279	5.0	1.042	133.1	LOS F	28.1	208.4	1.00	1.14	1.68	6.2
Approach		1008	5.0	1008	5.0	1.042	69.5	LOS E	28.1	208.4	0.94	0.91	1.15	24.1
West: Forest Rd														
10	L2	323	5.0	323	5.0	0.983	78.0	LOS F	22.0	163.2	0.74	0.95	1.12	5.2
11	T1	1137	5.0	1137	5.0	* 1.094	139.4	LOS F	22.0	163.2	0.98	1.45	1.72	9.2
Approach		1460	5.0	1460	5.0	1.094	125.8	LOS F	22.0	163.2	0.93	1.34	1.59	8.7
All Vehicles		5687	5.0	5687	5.0	1.195	85.2	LOS F	68.9	511.1	0.90	1.02	1.25	18.6

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: PM Projected Scenario North)]

Network: N101 [PM Projected Scenario North (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	596	5.0	596	5.0	0.494	4.1	LOS A	3.5	26.1	0.42	0.53	0.42	37.1
6	R2	238	5.0	238	5.0	0.305	7.5	LOS A	1.6	12.1	0.39	0.64	0.39	35.4
6u	U	43	5.0	43	5.0	0.305	8.8	LOS A	1.6	12.1	0.39	0.64	0.39	23.5
Approach		877	5.0	877	5.0	0.494	5.3	LOS A	3.5	26.1	0.41	0.57	0.41	36.5
North: Brodie Spark Dr North														
7	L2	119	5.0	119	5.0	0.252	6.4	LOS A	1.6	12.1	0.75	0.75	0.75	33.1
8	T1	47	5.0	47	5.0	0.252	6.0	LOS A	1.6	12.1	0.75	0.75	0.75	37.7
9u	U	7	5.0	7	5.0	0.252	11.2	LOS A	1.6	12.1	0.75	0.75	0.75	38.3
Approach		174	5.0	174	5.0	0.252	6.5	LOS A	1.6	12.1	0.75	0.75	0.75	35.4
West: Magdalene Terrace														
10	L2	44	5.0	44	5.0	0.579	5.0	LOS A	5.6	41.9	0.73	0.63	0.73	37.0
11	T1	352	5.0	352	5.0	0.579	4.6	LOS A	5.6	41.9	0.73	0.63	0.73	35.2
12	R2	195	5.0	195	5.0	0.579	8.4	LOS A	5.6	41.9	0.73	0.63	0.73	38.3
Approach		591	5.0	591	5.0	0.579	5.9	LOS A	5.6	41.9	0.73	0.63	0.73	36.8
All Vehicles		1641	5.0	1641	5.0	0.579	5.6	LOS A	5.6	41.9	0.56	0.61	0.56	36.5

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: PM Projected Scenario North)]

Network: N101 [PM Projected Scenario North (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	316	5.0	316	5.0		0.558	30.1	LOS C	13.5	99.8	0.68	0.77	0.68	19.8
2	T1	1682	5.0	1682	5.0		0.667	26.8	LOS B	31.5	233.7	0.78	0.70	0.78	37.9
Approach		1998	5.0	1998	5.0		0.667	27.4	LOS B	31.5	233.7	0.77	0.71	0.77	36.0
North: Princes Hghwy North															
8	T1	2676	5.0	2676	5.0	*	0.709	5.6	LOS A	17.1	127.1	0.31	0.29	0.31	53.5
9	R2	606	5.0	606	5.0		0.663	55.9	LOS D	18.6	138.0	0.95	0.84	0.95	21.9
Approach		3282	5.0	3282	5.0		0.709	14.9	LOS B	18.6	138.0	0.43	0.39	0.43	44.7
West: Brodie Sparks Dr															
10	L2	293	5.0	293	5.0		0.199	31.2	LOS C	6.3	46.5	0.68	0.71	0.68	30.2
12	R2	249	5.0	249	5.0	*	0.696	70.1	LOS E	8.5	63.1	1.00	0.85	1.08	12.6
Approach		542	5.0	542	5.0		0.696	49.1	LOS D	8.5	63.1	0.83	0.77	0.86	20.9
All Vehicles		5822	5.0	5822	5.0		0.709	22.4	LOS B	31.5	233.7	0.58	0.54	0.59	38.6

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P11	Stage 1	155	64.5	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	155	64.5	LOS F	0.6	0.6	0.96	0.96	226.3	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	66	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		376	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.4	0.93

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: PM Projected Scenario North)]

PM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth St														
1	L2	109	5.0	115	5.0	0.444	8.7	LOS A	3.0	22.3	0.74	0.85	0.78	41.3
3	R2	202	5.0	213	5.0	0.444	11.4	LOS A	3.0	22.3	0.74	0.85	0.78	41.1
3u	U	9	5.0	9	5.0	0.444	12.8	LOS A	3.0	22.3	0.74	0.85	0.78	44.5
Approach		320	5.0	337	5.0	0.444	10.5	LOS A	3.0	22.3	0.74	0.85	0.78	41.3
East: Wollongong Rd East														
4	L2	117	5.0	123	5.0	0.471	4.5	LOS A	3.9	28.9	0.32	0.46	0.32	44.1
5	T1	445	5.0	468	5.0	0.471	4.3	LOS A	3.9	28.9	0.32	0.46	0.32	40.0
6u	U	26	5.0	27	5.0	0.471	8.6	LOS A	3.9	28.9	0.32	0.46	0.32	38.2
Approach		588	5.0	619	5.0	0.471	4.5	LOS A	3.9	28.9	0.32	0.46	0.32	41.3
West: Wollongong Rd West														
11	T1	266	5.0	280	5.0	0.354	5.8	LOS A	2.3	17.4	0.57	0.63	0.57	38.9
12	R2	45	5.0	47	5.0	0.354	8.7	LOS A	2.3	17.4	0.57	0.63	0.57	44.3
12u	U	4	5.0	4	5.0	0.354	10.1	LOS A	2.3	17.4	0.57	0.63	0.57	40.7
Approach		315	5.0	332	5.0	0.354	6.2	LOS A	2.3	17.4	0.57	0.63	0.57	40.3
All Vehicles		1223	5.0	1287	5.0	0.471	6.5	LOS A	3.9	28.9	0.49	0.61	0.50	41.1

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	111	5.0	111	5.0	0.205	7.3	LOS A	1.2	8.9	0.68	0.73	0.68	39.9
2	T1	32	5.0	32	5.0	0.205	7.2	LOS A	1.2	8.9	0.68	0.73	0.68	44.8
3	R2	8	5.0	8	5.0	0.205	10.6	LOS A	1.2	8.9	0.68	0.73	0.68	38.9
3u	U	1	5.0	1	5.0	0.205	12.1	LOS A	1.2	8.9	0.68	0.73	0.68	44.2
Approach		152	5.0	152	5.0	0.205	7.5	LOS A	1.2	8.9	0.68	0.73	0.68	41.4
East: Allen St														
4	L2	16	5.0	16	5.0	0.230	9.1	LOS A	1.4	10.4	0.78	0.82	0.78	39.6
5	T1	89	5.0	89	5.0	0.230	9.0	LOS A	1.4	10.4	0.78	0.82	0.78	35.9
6	R2	33	5.0	33	5.0	0.230	12.4	LOS A	1.4	10.4	0.78	0.82	0.78	42.1
6u	U	2	5.0	2	5.0	0.230	14.0	LOS A	1.4	10.4	0.78	0.82	0.78	31.6
Approach		140	5.0	140	5.0	0.230	9.9	LOS A	1.4	10.4	0.78	0.82	0.78	38.5
North: Arncliff St South														
7	L2	44	5.0	44	5.0	0.035	4.2	LOS A	0.2	1.3	0.33	0.49	0.33	44.4
8	T1	113	5.0	113	5.0	0.511	6.1	LOS A	3.5	25.9	0.67	0.74	0.67	44.0
9	R2	395	5.0	395	5.0	0.511	9.5	LOS A	3.5	25.9	0.67	0.74	0.67	41.8
9u	U	5	5.0	5	5.0	0.511	11.0	LOS A	3.5	25.9	0.67	0.74	0.67	45.1
Approach		557	5.0	557	5.0	0.511	8.4	LOS A	3.5	25.9	0.64	0.72	0.64	42.5
West: Wollongong Rd														
10	L2	117	5.0	117	5.0	0.374	4.2	LOS A	2.6	19.5	0.32	0.53	0.32	43.2
11	T1	162	5.0	162	5.0	0.374	4.1	LOS A	2.6	19.5	0.32	0.53	0.32	30.7
12	R2	197	5.0	197	5.0	0.374	7.5	LOS A	2.6	19.5	0.32	0.53	0.32	42.3
12u	U	1	5.0	1	5.0	0.374	9.0	LOS A	2.6	19.5	0.32	0.53	0.32	38.3
Approach		477	5.0	477	5.0	0.374	5.5	LOS A	2.6	19.5	0.32	0.53	0.32	40.8
All Vehicles		1325	5.0	1325	5.0	0.511	7.4	LOS A	3.5	25.9	0.54	0.66	0.54	41.5

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected -1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	104	5.0	104	5.0	0.302	4.7	LOS A	0.8	6.2	0.10	0.55	0.10	44.0
2	T1	1	5.0	1	5.0	0.302	6.2	LOS A	0.8	6.2	0.10	0.55	0.10	40.0
3	R2	88	5.0	88	5.0	0.302	8.1	LOS A	0.8	6.2	0.10	0.55	0.10	40.5
Approach		194	5.0	194	5.0	0.302	6.3	LOS A	0.8	6.2	0.10	0.55	0.10	42.8
East: Burrows St East														
4	L2	6	5.0	6	5.0	0.019	3.3	LOS A	0.0	0.1	0.03	0.11	0.03	40.7
5	T1	27	5.0	27	5.0	0.019	0.0	LOS A	0.0	0.1	0.03	0.11	0.03	48.7
6	R2	1	5.0	1	5.0	0.019	3.9	LOS A	0.0	0.1	0.03	0.11	0.03	23.9
Approach		35	5.0	35	5.0	0.019	0.7	NA	0.0	0.1	0.03	0.11	0.03	48.0
North: Eden St North														
7	L2	2	5.0	2	5.0	0.007	4.6	LOS A	0.0	0.1	0.30	0.51	0.30	23.9
8	T1	1	5.0	1	5.0	0.007	5.7	LOS A	0.0	0.1	0.30	0.51	0.30	23.9
9	R2	1	5.0	1	5.0	0.007	8.6	LOS A	0.0	0.1	0.30	0.51	0.30	40.6
Approach		4	5.0	4	5.0	0.007	5.9	LOS A	0.0	0.1	0.30	0.51	0.30	32.6
West: Burrows St West														
10	L2	3	5.0	3	5.0	0.128	4.6	LOS A	0.0	0.0	0.00	0.01	0.00	43.4
11	T1	180	5.0	180	5.0	0.128	0.1	LOS A	0.7	4.9	0.04	0.14	0.04	47.4
12	R2	156	5.0	156	5.0	0.128	4.7	LOS A	0.7	4.9	0.12	0.38	0.12	43.7
Approach		339	5.0	339	5.0	0.128	2.2	NA	0.7	4.9	0.08	0.25	0.08	45.6
All Vehicles		572	5.0	572	5.0	0.302	3.5	NA	0.8	6.2	0.08	0.34	0.08	44.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	39	5.0	39	5.0	0.141	10.5	LOS A	0.4	3.2	0.64	0.78	0.64	24.6
Approach		39	5.0	39	5.0	0.141	10.5	LOS A	0.4	3.2	0.64	0.78	0.64	24.6
East: Forest Rd East														
4	L2	29	5.0	23	5.0	0.401	4.6	LOS A	8.0	59.0	0.00	0.02	0.00	46.6
5	T1	1866	5.0	1453	5.0	0.401	0.0	LOS A	18.4	136.5	0.00	0.01	0.00	49.3
Approach		1896	5.0	1476 N1	5.0	0.401	0.1	NA	18.4	136.5	0.00	0.01	0.00	49.2
North: Eden St														
7	L2	15	5.0	15	5.0	0.041	8.0	LOS A	0.1	0.7	0.55	0.64	0.55	38.3
Approach		15	5.0	15	5.0	0.041	8.0	LOS A	0.1	0.7	0.55	0.64	0.55	38.3
West: Forest Rd West														
10	L2	45	5.0	45	5.0	0.304	3.4	LOS A	0.7	5.6	0.00	0.04	0.00	46.4
11	T1	1089	5.0	1089	5.0	0.304	0.0	LOS A	8.8	65.3	0.00	0.02	0.00	48.1
Approach		1135	5.0	1135	5.0	0.304	0.1	NA	8.8	65.3	0.00	0.02	0.00	48.0
All Vehicles		3084	5.0	2664 N1	5.8	0.401	0.3	NA	18.4	136.5	0.01	0.03	0.01	47.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	17	5.0	17	5.0		0.476	72.0	LOS F	5.0	37.4	0.99	0.77	0.99	31.7
2	T1	58	5.0	58	5.0		0.476	68.7	LOS E	5.0	37.4	0.99	0.77	0.99	24.6
Approach		75	5.0	75	5.0		0.476	69.4	LOS E	5.0	37.4	0.99	0.77	0.99	26.4
East: Forest Rd East															
4	L2	46	5.0	35	5.0		0.672	7.0	LOS A	8.8	65.3	0.29	0.44	0.29	43.9
5	T1	1615	5.0	1236	5.0		0.672	14.9	LOS B	8.8	65.3	0.44	0.57	0.44	35.5
6	R2	245	5.0	188	5.0	*	0.672	58.0	LOS E	8.8	65.3	1.00	1.08	1.00	22.3
Approach		1906	5.0	1459 N1	5.0		0.672	20.3	LOS B	8.8	65.3	0.51	0.63	0.51	34.2
North: Firth St															
7	L2	82	5.0	82	5.0		0.161	18.5	LOS B	2.6	19.4	0.54	0.63	0.54	29.9
8	T1	86	5.0	86	5.0	*	0.673	68.6	LOS E	5.9	43.8	1.00	0.83	1.09	24.8
9	R2	62	5.0	62	5.0		0.814	82.6	LOS F	4.6	34.4	1.00	0.94	1.35	28.8
Approach		231	5.0	231	5.0		0.814	54.5	LOS D	5.9	43.8	0.83	0.79	0.97	27.4
West: Forest Rd West															
10	L2	39	5.0	39	5.0	*	0.861	41.8	LOS C	43.8	324.7	0.94	0.92	1.01	36.1
11	T1	1052	5.0	1052	5.0		0.861	41.8	LOS C	43.8	324.7	0.94	0.95	1.05	33.6
Approach		1091	5.0	1091	5.0		0.861	41.8	LOS C	43.8	324.7	0.94	0.95	1.05	33.7
All Vehicles		3302	5.0	2855 N1	5.8		0.861	32.6	LOS C	43.8	324.7	0.71	0.77	0.76	33.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
* Critical Movement (Signal Timing)
N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	99	5.0	99	5.0	0.231	5.6	LOS A	0.0	0.0	0.00	0.14	0.00	54.3
2	T1	1196	5.0	1196	5.0	0.231	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	59.1
Approach		1295	5.0	1295	5.0	0.231	0.5	NA	0.0	0.0	0.00	0.05	0.00	58.9
North: Princes Hwy North														
8	T1	2398	5.0	2398	5.0	0.655	0.3	LOS A	4.9	36.1	0.00	0.00	0.00	58.8
Approach		2398	5.0	2398	5.0	0.655	0.3	NA	4.9	36.1	0.00	0.00	0.00	58.8
West: Allen St														
10	L2	174	5.0	174	5.0	0.201	6.9	LOS A	0.9	6.5	0.48	0.67	0.48	42.9
Approach		174	5.0	174	5.0	0.201	6.9	LOS A	0.9	6.5	0.48	0.67	0.48	42.9
All Vehicles		3866	5.0	3866	5.0	0.655	0.7	NA	4.9	36.1	0.02	0.05	0.02	57.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	28	5.0	28	5.0	0.248	10.6	LOS A	6.2	46.0	0.30	0.30	0.30	44.1
2	T1	1022	5.0	1022	5.0	0.248	2.6	LOS A	6.2	46.0	0.15	0.14	0.15	50.9
Approach		1051	5.0	1051	5.0	0.248	2.8	LOS A	6.2	46.0	0.15	0.15	0.15	50.7
North: Princes Hghwy North														
7	L2	33	5.0	33	5.0	1.100	137.7	LOS F	42.9	318.2	1.00	1.57	1.79	7.2
8	T1	2458	5.0	2458	5.0	* 1.100	135.2	LOS F	42.9	318.2	1.00	1.59	1.81	5.1
Approach		2491	5.0	2491	5.0	1.100	135.3	LOS F	42.9	318.2	1.00	1.59	1.81	5.1
West: Burrows Street														
10	L2	42	5.0	42	5.0	1.051	151.5	LOS F	7.5	55.5	1.00	1.27	1.94	1.1
12	R2	219	5.0	219	5.0	* 1.051	153.7	LOS F	7.5	55.5	1.00	1.28	1.97	1.1
Approach		261	5.0	261	5.0	1.051	153.3	LOS F	7.5	55.5	1.00	1.28	1.96	1.1
All Vehicles		3802	5.0	3802	5.0	1.100	99.9	LOS F	42.9	318.2	0.77	1.17	1.36	6.7

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.5	214.8	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	231.0	216.7	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: PM Projected Scenario South)]

Network: N101 [PM Projected Scenario South (Network Folder: Projected Scenario)]

PM Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	106	5.0	106	5.0		0.242	42.1	LOS C	5.3	39.0	0.78	0.72	0.78	32.2
2	T1	817	5.0	817	5.0		0.948	78.2	LOS F	30.9	229.4	0.98	1.06	1.30	23.0
3	R2	167	5.0	167	5.0		0.286	29.7	LOS C	6.0	44.6	0.82	0.76	0.82	41.1
Approach		1091	5.0	1091	5.0		0.948	67.2	LOS E	30.9	229.4	0.94	0.98	1.17	26.0
East: Wickham St															
4	L2	76	5.0	76	5.0		0.068	14.9	LOS B	1.9	14.2	0.40	0.63	0.40	48.3
5	T1	1087	5.0	1087	5.0	*	1.143	178.2	LOS F	79.9	592.7	1.00	1.64	1.97	5.9
Approach		1163	5.0	1163	5.0		1.143	167.6	LOS F	79.9	592.7	0.96	1.57	1.86	7.1
North: Princes Hghwy North															
7	L2	115	5.0	115	5.0		0.125	16.0	LOS B	3.3	24.7	0.52	0.69	0.52	40.0
8	T1	1834	5.0	1834	5.0	*	1.065	136.0	LOS F	52.6	390.0	1.00	1.43	1.67	18.7
9	R2	727	5.0	727	5.0	*	1.147	185.0	LOS F	52.6	390.0	1.00	1.34	2.01	4.1
Approach		2676	5.0	2676	5.0		1.147	144.2	LOS F	52.6	390.0	0.98	1.37	1.72	14.4
West: Forest Rd															
10	L2	267	5.0	267	5.0		0.796	56.1	LOS D	17.2	127.4	0.95	0.87	1.04	7.0
11	T1	801	5.0	801	5.0		0.864	58.0	LOS E	22.0	163.2	0.98	0.95	1.11	18.6
Approach		1068	5.0	1068	5.0		0.864	57.5	LOS E	22.0	163.2	0.98	0.93	1.09	16.3
All Vehicles		5998	5.0	5998	5.0		1.147	119.3	LOS F	79.9	592.7	0.97	1.26	1.53	14.4

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

MOVEMENT SUMMARY

Site: 101 [Brodie Spark Dr and Arncliffe St (Site Folder: SAT Projected Scenario North)]

Network: N101 [SAT Projected Scenario North (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Brodie Spark Dr East														
4	L2	439	5.0	439	5.0	0.353	3.7	LOS A	2.1	15.8	0.35	0.49	0.35	37.4
6	R2	214	5.0	214	5.0	0.252	7.0	LOS A	1.3	9.6	0.34	0.61	0.34	35.8
6u	U	41	5.0	41	5.0	0.252	8.3	LOS A	1.3	9.6	0.34	0.61	0.34	24.2
Approach		694	5.0	694	5.0	0.353	5.0	LOS A	2.1	15.8	0.35	0.53	0.35	36.6
North: Brodie Spark Dr North														
7	L2	163	5.0	163	5.0	0.311	6.6	LOS A	2.1	15.3	0.78	0.78	0.78	32.9
8	T1	43	5.0	43	5.0	0.311	6.2	LOS A	2.1	15.3	0.78	0.78	0.78	37.6
9u	U	7	5.0	7	5.0	0.311	11.4	LOS A	2.1	15.3	0.78	0.78	0.78	38.1
Approach		214	5.0	214	5.0	0.311	6.7	LOS A	2.1	15.3	0.78	0.78	0.78	34.8
West: Magdalene Terrace														
10	L2	34	5.0	34	5.0	0.561	4.7	LOS A	5.4	39.7	0.69	0.59	0.69	37.2
11	T1	395	5.0	395	5.0	0.561	4.3	LOS A	5.4	39.7	0.69	0.59	0.69	35.5
12	R2	161	5.0	161	5.0	0.561	8.1	LOS A	5.4	39.7	0.69	0.59	0.69	38.4
Approach		589	5.0	589	5.0	0.561	5.4	LOS A	5.4	39.7	0.69	0.59	0.69	36.8
All Vehicles		1497	5.0	1497	5.0	0.561	5.4	LOS A	5.4	39.7	0.54	0.59	0.54	36.5

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

MOVEMENT SUMMARY

Site: 101 [Princes Hwy and Brodie Sparks Dr (Site Folder: SAT Projected Scenario North)]

Network: N101 [SAT Projected Scenario North (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghway South															
1	L2	271	5.0	271	5.0		0.266	21.6	LOS B	9.1	67.8	0.54	0.73	0.54	24.4
2	T1	2111	5.0	2111	5.0	*	0.689	19.9	LOS B	35.3	262.1	0.72	0.66	0.72	41.9
Approach		2381	5.0	2381	5.0		0.689	20.1	LOS B	35.3	262.1	0.70	0.66	0.70	40.7
North: Princes Hghway North															
8	T1	1772	5.0	1772	5.0		0.465	11.1	LOS A	18.5	137.2	0.51	0.46	0.51	48.3
9	R2	422	5.0	422	5.0	*	0.692	65.9	LOS E	13.9	103.1	1.00	0.84	1.02	19.7
Approach		2194	5.0	2194	5.0		0.692	21.6	LOS B	18.5	137.2	0.60	0.53	0.61	40.0
West: Brodie Sparks Dr															
10	L2	356	5.0	356	5.0		0.311	41.7	LOS C	9.1	67.4	0.80	0.76	0.80	26.4
12	R2	242	5.0	242	5.0	*	0.706	71.4	LOS F	8.3	61.9	1.00	0.85	1.09	12.4
Approach		598	5.0	598	5.0		0.706	53.7	LOS D	9.1	67.4	0.88	0.80	0.92	20.2
All Vehicles		5173	5.0	5173	5.0		0.706	24.6	LOS B	35.3	262.1	0.68	0.62	0.68	37.3

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghway South											
P11	Stage 1	168	64.6	LOS F	0.6	0.6	0.96	0.96	228.0	212.5	0.93
P12	Stage 2	168	64.6	LOS F	0.6	0.6	0.96	0.96	226.4	210.3	0.93
West: Brodie Sparks Dr											
P4	Full	68	64.3	LOS F	0.3	0.3	0.96	0.96	235.5	222.6	0.95
All Pedestrians		405	64.5	LOS F	0.6	0.6	0.96	0.96	228.6	213.3	0.93

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

MOVEMENT SUMMARY

Site: 101 [Wollongong Rd and Firth St (Site Folder: SAT Projected Scenario North)]

SAT Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth St														
1	L2	97	5.0	102	5.0	0.396	7.3	LOS A	2.5	18.7	0.67	0.77	0.67	42.1
3	R2	208	5.0	219	5.0	0.396	10.0	LOS A	2.5	18.7	0.67	0.77	0.67	42.0
3u	U	8	5.0	8	5.0	0.396	11.4	LOS A	2.5	18.7	0.67	0.77	0.67	45.1
Approach		313	5.0	329	5.0	0.396	9.2	LOS A	2.5	18.7	0.67	0.77	0.67	42.1
East: Wollongong Rd East														
4	L2	122	5.0	128	5.0	0.417	4.7	LOS A	3.2	23.9	0.37	0.49	0.37	43.9
5	T1	336	5.0	354	5.0	0.417	4.4	LOS A	3.2	23.9	0.37	0.49	0.37	39.7
6u	U	31	5.0	33	5.0	0.417	8.8	LOS A	3.2	23.9	0.37	0.49	0.37	37.8
Approach		489	5.0	515	5.0	0.417	4.8	LOS A	3.2	23.9	0.37	0.49	0.37	41.2
West: Wollongong Rd West														
11	T1	392	5.0	413	5.0	0.513	6.2	LOS A	3.9	28.9	0.66	0.67	0.66	38.4
12	R2	66	5.0	69	5.0	0.513	9.1	LOS A	3.9	28.9	0.66	0.67	0.66	44.0
12u	U	7	5.0	7	5.0	0.513	10.5	LOS A	3.9	28.9	0.66	0.67	0.66	40.3
Approach		465	5.0	489	5.0	0.513	6.7	LOS A	3.9	28.9	0.66	0.67	0.66	39.9
All Vehicles		1267	5.0	1334	5.0	0.513	6.6	LOS A	3.9	28.9	0.55	0.63	0.55	41.1

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Arncliffe St (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Arncliff St South														
1	L2	77	5.0	77	5.0	0.138	6.2	LOS A	0.8	5.7	0.59	0.65	0.59	40.7
2	T1	28	5.0	28	5.0	0.138	6.1	LOS A	0.8	5.7	0.59	0.65	0.59	45.4
3	R2	6	5.0	6	5.0	0.138	9.5	LOS A	0.8	5.7	0.59	0.65	0.59	40.0
3u	U	2	5.0	2	5.0	0.138	11.1	LOS A	0.8	5.7	0.59	0.65	0.59	44.9
Approach		114	5.0	114	5.0	0.138	6.5	LOS A	0.8	5.7	0.59	0.65	0.59	42.5
East: Allen St														
4	L2	16	5.0	16	5.0	0.163	8.4	LOS A	1.0	7.1	0.73	0.77	0.73	40.3
5	T1	69	5.0	69	5.0	0.163	8.3	LOS A	1.0	7.1	0.73	0.77	0.73	36.9
6	R2	18	5.0	18	5.0	0.163	11.7	LOS A	1.0	7.1	0.73	0.77	0.73	42.7
6u	U	2	5.0	2	5.0	0.163	13.3	LOS A	1.0	7.1	0.73	0.77	0.73	32.6
Approach		105	5.0	105	5.0	0.163	9.0	LOS A	1.0	7.1	0.73	0.77	0.73	39.0
North: Arncliff St South														
7	L2	63	5.0	63	5.0	0.055	4.7	LOS A	0.3	2.1	0.43	0.53	0.43	44.0
8	T1	107	5.0	107	5.0	0.500	7.6	LOS A	3.4	25.1	0.74	0.83	0.80	43.2
9	R2	312	5.0	312	5.0	0.500	11.0	LOS A	3.4	25.1	0.74	0.83	0.80	40.9
9u	U	5	5.0	5	5.0	0.500	12.5	LOS A	3.4	25.1	0.74	0.83	0.80	44.5
Approach		487	5.0	487	5.0	0.500	9.4	LOS A	3.4	25.1	0.70	0.79	0.75	41.9
West: Wollongong Rd														
10	L2	131	5.0	131	5.0	0.476	4.1	LOS A	3.9	28.9	0.31	0.51	0.31	43.3
11	T1	273	5.0	273	5.0	0.476	4.0	LOS A	3.9	28.9	0.31	0.51	0.31	31.0
12	R2	237	5.0	237	5.0	0.476	7.4	LOS A	3.9	28.9	0.31	0.51	0.31	42.4
12u	U	1	5.0	1	5.0	0.476	9.0	LOS A	3.9	28.9	0.31	0.51	0.31	38.5
Approach		641	5.0	641	5.0	0.476	5.3	LOS A	3.9	28.9	0.31	0.51	0.31	40.4
All Vehicles		1347	5.0	1347	5.0	0.500	7.2	LOS A	3.9	28.9	0.51	0.64	0.53	41.2

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

MOVEMENT SUMMARY

Site: 101 [Burrows St and Eden St (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
1	L2	86	5.0	86	5.0	0.551	6.9	LOS A	2.3	17.0	0.14	0.61	0.21	41.6
2	T1	2	5.0	2	5.0	0.551	9.0	LOS A	2.3	17.0	0.14	0.61	0.21	36.8
3	R2	167	5.0	167	5.0	0.551	11.0	LOS A	2.3	17.0	0.14	0.61	0.21	36.7
Approach		256	5.0	256	5.0	0.551	9.6	LOS A	2.3	17.0	0.14	0.61	0.21	39.0
East: Burrows St East														
4	L2	5	5.0	5	5.0	0.020	3.3	LOS A	0.0	0.1	0.03	0.09	0.03	41.6
5	T1	29	5.0	29	5.0	0.020	0.1	LOS A	0.0	0.1	0.03	0.09	0.03	48.9
6	R2	1	5.0	1	5.0	0.020	4.1	LOS A	0.0	0.1	0.03	0.09	0.03	24.0
Approach		36	5.0	36	5.0	0.020	0.7	NA	0.0	0.1	0.03	0.09	0.03	48.2
North: Eden St North														
7	L2	1	5.0	1	5.0	0.006	4.9	LOS A	0.0	0.1	0.43	0.54	0.43	22.4
8	T1	1	5.0	1	5.0	0.006	5.9	LOS A	0.0	0.1	0.43	0.54	0.43	22.4
9	R2	1	5.0	1	5.0	0.006	8.8	LOS A	0.0	0.1	0.43	0.54	0.43	39.8
Approach		3	5.0	3	5.0	0.006	6.5	LOS A	0.0	0.1	0.43	0.54	0.43	33.1
West: Burrows St West														
10	L2	4	5.0	4	5.0	0.112	4.6	LOS A	0.4	3.0	0.00	0.01	0.00	43.5
11	T1	221	5.0	221	5.0	0.112	0.0	LOS A	0.6	4.3	0.01	0.05	0.01	49.1
12	R2	152	5.0	152	5.0	0.112	4.7	LOS A	0.6	4.3	0.12	0.47	0.12	42.5
Approach		377	5.0	377	5.0	0.112	2.0	NA	0.6	4.3	0.05	0.22	0.05	46.1
All Vehicles		672	5.0	672	5.0	0.551	4.8	NA	2.3	17.0	0.09	0.36	0.11	42.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Forest Rd and Eden St (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Wardell St														
1	L2	13	5.0	13	5.0	0.041	9.1	LOS A	0.1	0.7	0.59	0.68	0.59	26.3
Approach		13	5.0	13	5.0	0.041	9.1	LOS A	0.1	0.7	0.59	0.68	0.59	26.3
East: Forest Rd East														
4	L2	5	5.0	5	5.0	0.344	4.6	LOS A	2.6	19.4	0.00	0.00	0.00	46.9
5	T1	1261	5.0	1261	5.0	0.344	0.0	LOS A	14.9	110.8	0.00	0.00	0.00	49.7
Approach		1266	5.0	1266	5.0	0.344	0.0	NA	14.9	110.8	0.00	0.00	0.00	49.7
North: Eden St														
7	L2	17	5.0	17	5.0	0.038	6.5	LOS A	0.1	0.6	0.44	0.57	0.44	40.1
Approach		17	5.0	17	5.0	0.038	6.5	LOS A	0.1	0.6	0.44	0.57	0.44	40.1
West: Forest Rd West														
10	L2	72	5.0	72	5.0	0.407	3.4	LOS A	0.0	0.0	0.00	0.09	0.00	42.7
11	T1	1104	5.0	1104	5.0	0.407	0.0	LOS A	8.8	65.3	0.00	0.03	0.00	47.3
Approach		1176	5.0	1176	5.0	0.407	0.2	NA	8.8	65.3	0.00	0.03	0.00	47.0
All Vehicles		2472	5.0	2472	5.0	0.407	0.2	NA	14.9	110.8	0.01	0.02	0.01	48.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: FF [Forest Rd and Firth St (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Somerville St															
1	L2	27	5.0	27	5.0		0.753	76.7	LOS F	8.4	62.6	1.00	0.89	1.15	30.9
2	T1	91	5.0	91	5.0	*	0.753	73.4	LOS F	8.4	62.6	1.00	0.89	1.15	23.9
Approach		118	5.0	118	5.0		0.753	74.1	LOS F	8.4	62.6	1.00	0.89	1.15	25.8
East: Forest Rd East															
4	L2	37	5.0	37	5.0		0.592	6.1	LOS A	8.8	65.3	0.22	0.22	0.22	45.6
5	T1	1029	5.0	1029	5.0		0.592	9.6	LOS A	8.8	65.3	0.35	0.36	0.35	45.0
6	R2	206	5.0	206	5.0	*	0.592	47.8	LOS D	8.8	65.3	1.00	1.05	1.00	22.5
Approach		1273	5.0	1273	5.0		0.592	15.7	LOS B	8.8	65.3	0.45	0.47	0.45	41.3
North: Firth St															
7	L2	97	5.0	97	5.0		0.151	14.3	LOS A	2.6	19.4	0.47	0.60	0.47	31.7
8	T1	74	5.0	74	5.0		0.518	66.8	LOS E	4.9	36.5	0.99	0.76	0.99	25.1
9	R2	52	5.0	52	5.0		0.871	88.2	LOS F	4.0	29.7	1.00	0.96	1.48	28.1
Approach		222	5.0	222	5.0		0.871	48.9	LOS D	4.9	36.5	0.76	0.74	0.88	27.8
West: Forest Rd West															
10	L2	65	5.0	65	5.0		0.778	33.2	LOS C	40.8	302.9	0.87	0.81	0.87	38.4
11	T1	1068	5.0	1068	5.0	*	0.778	30.2	LOS C	40.8	302.9	0.87	0.81	0.89	37.1
Approach		1134	5.0	1134	5.0		0.778	30.4	LOS C	40.8	302.9	0.87	0.81	0.89	37.2
All Vehicles		2746	5.0	2746	5.0		0.871	26.9	LOS B	40.8	302.9	0.67	0.65	0.70	37.2

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Somerville St											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
East: Forest Rd East											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	228.6	213.6	0.93
North: Firth St											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	227.1	211.7	0.93
West: Forest Rd West											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
All Pedestrians		211	64.3	LOS F	0.2	0.2	0.96	0.96	228.1	213.0	0.93

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

MOVEMENT SUMMARY

Site: 101 [Allen St and Princes Hwy (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hwy South														
1	L2	89	5.0	89	5.0	0.298	5.6	LOS A	0.0	0.0	0.00	0.10	0.00	55.8
2	T1	1582	5.0	1582	5.0	0.298	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.3
Approach		1672	5.0	1672	5.0	0.298	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.2
North: Princes Hwy North														
8	T1	1372	5.0	1372	5.0	0.250	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1372	5.0	1372	5.0	0.250	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Allen St														
10	L2	299	5.0	299	5.0	0.403	9.5	LOS A	2.5	18.7	0.63	0.87	0.81	40.3
Approach		299	5.0	299	5.0	0.403	9.5	LOS A	2.5	18.7	0.63	0.87	0.81	40.3
All Vehicles		3342	5.0	3342	5.0	0.403	1.0	NA	2.5	18.7	0.06	0.09	0.07	56.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: B [Princes Hwy and Burrows St (Site Folder: Sat Projected Scenario)]

Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]

SAT Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South															
1	L2	31	5.0	31	5.0	*	0.548	36.5	LOS C	23.5	174.5	0.83	0.75	0.83	19.6
2	T1	1345	5.0	1345	5.0		0.548	20.2	LOS B	23.5	174.5	0.58	0.51	0.58	25.7
Approach		1376	5.0	1376	5.0		0.548	20.5	LOS B	23.5	174.5	0.58	0.52	0.58	25.5
North: Princes Hghwy North															
7	L2	22	5.0	22	5.0		0.593	36.2	LOS C	24.6	182.8	0.81	0.72	0.81	21.5
8	T1	1442	5.0	1442	5.0	*	0.593	30.7	LOS C	24.7	183.2	0.81	0.72	0.81	17.3
Approach		1464	5.0	1464	5.0		0.593	30.8	LOS C	24.7	183.2	0.81	0.72	0.81	17.4
West: Burrows Street															
10	L2	109	5.0	109	5.0		0.248	30.3	LOS C	7.5	55.5	0.68	0.73	0.68	5.3
12	R2	263	5.0	263	5.0		0.248	29.8	LOS C	7.5	55.5	0.67	0.73	0.67	5.4
Approach		373	5.0	373	5.0		0.248	29.9	LOS C	7.5	55.5	0.68	0.73	0.68	5.4
All Vehicles		3213	5.0	3213	5.0		0.593	26.3	LOS B	24.7	183.2	0.70	0.64	0.70	19.4

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	232.4	218.6	0.94
West: Burrows Street											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
All Pedestrians		105	64.3	LOS F	0.2	0.2	0.96	0.96	230.8	216.5	0.94

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

MOVEMENT SUMMARY

Site: F [Princes Hwy and Forest Rd (Site Folder: Sat Projected Scenario)] **Network: N101 [SAT Projected Scenario South (Network Folder: Projected Scenario)]**

SAT Projected - 1
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 140 seconds (Network User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Princes Hghwy South														
1	L2	132	5.0	132	5.0	0.214	22.8	LOS B	4.5	33.4	0.57	0.70	0.57	40.9
2	T1	1076	5.0	1076	5.0	* 0.878	63.5	LOS E	31.1	230.5	0.98	0.99	1.18	26.0
3	R2	222	5.0	222	5.0	0.775	71.7	LOS F	15.4	114.1	1.00	0.87	1.10	28.7
Approach		1429	5.0	1429	5.0	0.878	61.0	LOS E	31.1	230.5	0.94	0.95	1.11	27.4
East: Wickham St														
4	L2	94	5.0	94	5.0	0.088	7.7	LOS A	1.1	8.3	0.23	0.61	0.23	52.9
5	T1	702	5.0	702	5.0	0.682	44.1	LOS D	22.0	163.1	0.92	0.79	0.92	18.8
Approach		796	5.0	796	5.0	0.682	39.8	LOS C	22.0	163.1	0.83	0.77	0.83	23.4
North: Princes Hghwy North														
7	L2	148	5.0	148	5.0	0.161	10.9	LOS A	1.7	12.6	0.19	0.60	0.19	44.5
8	T1	1128	5.0	1128	5.0	0.511	11.6	LOS A	12.5	92.6	0.37	0.32	0.37	50.7
9	R2	423	5.0	423	5.0	* 0.883	44.4	LOS D	17.6	130.7	1.00	0.91	1.10	15.6
Approach		1700	5.0	1700	5.0	0.883	19.7	LOS B	17.6	130.7	0.51	0.49	0.53	42.7
West: Forest Rd														
10	L2	316	5.0	316	5.0	* 0.868	51.8	LOS D	17.4	129.3	0.78	0.84	0.90	7.5
11	T1	809	5.0	809	5.0	0.846	40.4	LOS C	22.0	163.2	0.87	0.81	0.93	23.5
Approach		1125	5.0	1125	5.0	0.868	43.6	LOS D	22.0	163.2	0.84	0.82	0.92	19.4
All Vehicles		5051	5.0	5051	5.0	0.883	39.9	LOS C	31.1	230.5	0.76	0.74	0.83	29.9

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

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Princes Hghwy South											
P1	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	238.3	226.3	0.95
East: Wickham St											
P2	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.2	214.4	0.94
North: Princes Hghwy North											
P3	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	237.0	224.6	0.95
West: Forest Rd											
P4	Full	53	64.3	LOS F	0.2	0.2	0.96	0.96	229.6	214.9	0.94
P4B	Slip/Bypass	53	64.3	LOS F	0.2	0.2	0.96	0.96	221.9	204.9	0.92
All Pedestrians		263	64.3	LOS F	0.2	0.2	0.96	0.96	231.2	217.0	0.94

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

MOVEMENT SUMMARY

Site: 101v [Basement Car Park Entry - All way stop (Site Folder: Princes Highway Basement Entry Gate)]

All Way Stop
Basement Gate
Site Category: (None)
Stop (All-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Basement Car Park Entry														
1	L2	200	0	211	0.0	0.439	10.7	LOS A	2.0	13.9	0.94	2.51	2.58	7.9
Approach		200	0	211	0.0	0.439	10.7	LOS A	2.0	13.9	0.94	2.51	2.58	7.9
East: Dummy Leg														
5	T1	1	0	1	0.0	0.002	7.4	LOS A	0.0	0.0	0.79	2.00	1.79	8.6
Approach		1	0	1	0.0	0.002	7.4	LOS A	0.0	0.0	0.79	2.00	1.79	8.6
All Vehicles		201	0	212	0.0	0.439	10.7	LOS A	2.0	13.9	0.93	2.51	2.58	7.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101vv [Basement Car Park Entry - Stop (Site Folder: Princes Highway Basement Entry Gate)]

Basement Gate
Reduced Lane Capacity
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Basement Car Park Entry														
1	L2	200	0	211	0.0	0.585	0.3	LOS A	0.0	0.0	0.00	0.00	0.00	9.8
Approach		200	0	211	0.0	0.585	0.3	NA	0.0	0.0	0.00	0.00	0.00	9.8
All Vehicles		200	0	211	0.0	0.585	0.3	NA	0.0	0.0	0.00	0.00	0.00	9.8

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

MOVEMENT SUMMARY

Site: 101 [Eden St & Site Access (Site Folder: General)]

AM Peak - Option 1
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
2	T1	11	5.0	12	5.0	0.033	0.4	LOS A	0.2	1.1	0.24	0.36	0.24	35.9
3	R2	39	5.0	41	5.0	0.033	3.9	LOS A	0.2	1.1	0.24	0.36	0.24	31.7
Approach		50	5.0	53	5.0	0.033	3.2	NA	0.2	1.1	0.24	0.36	0.24	33.3
East: Site Access														
4	L2	32	5.0	34	5.0	0.158	7.1	LOS A	0.6	4.3	0.20	0.92	0.20	27.0
6	R2	124	5.0	131	5.0	0.158	7.6	LOS A	0.6	4.3	0.20	0.92	0.20	32.8
Approach		156	5.0	164	5.0	0.158	7.5	LOS A	0.6	4.3	0.20	0.92	0.20	32.1
North: Eden St North														
7	L2	82	5.0	86	5.0	0.074	3.4	LOS A	0.0	0.0	0.00	0.30	0.00	37.5
8	T1	45	5.0	47	5.0	0.074	0.0	LOS A	0.0	0.0	0.00	0.30	0.00	37.4
Approach		127	5.0	134	5.0	0.074	2.2	NA	0.0	0.0	0.00	0.30	0.00	37.5
All Vehicles		333	5.0	351	5.0	0.158	4.8	NA	0.6	4.3	0.13	0.60	0.13	34.4

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Eden St & Site Access (Site Folder: General)]

PM Peak - Option 1
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
2	T1	17	5.0	18	5.0	0.040	0.3	LOS A	0.2	1.4	0.20	0.33	0.20	36.3
3	R2	47	5.0	49	5.0	0.040	3.8	LOS A	0.2	1.4	0.20	0.33	0.20	32.4
Approach		64	5.0	67	5.0	0.040	2.9	NA	0.2	1.4	0.20	0.33	0.20	34.0
East: Site Access														
4	L2	24	5.0	25	5.0	0.117	6.9	LOS A	0.4	3.1	0.11	0.95	0.11	26.9
6	R2	94	5.0	99	5.0	0.117	7.4	LOS A	0.4	3.1	0.11	0.95	0.11	32.8
Approach		118	5.0	124	5.0	0.117	7.3	LOS A	0.4	3.1	0.11	0.95	0.11	32.0
North: Eden St North														
7	L2	73	5.0	77	5.0	0.051	3.4	LOS A	0.0	0.0	0.00	0.38	0.00	36.8
8	T1	14	5.0	15	5.0	0.051	0.0	LOS A	0.0	0.0	0.00	0.38	0.00	36.8
Approach		87	5.0	92	5.0	0.051	2.9	NA	0.0	0.0	0.00	0.38	0.00	36.8
All Vehicles		269	5.0	283	5.0	0.117	4.8	NA	0.4	3.1	0.09	0.62	0.09	34.0

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Eden St & Site Access (Site Folder: General)]

SAT Peak - Option 1
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Eden St South														
2	T1	11	5.0	12	5.0	0.037	0.4	LOS A	0.2	1.2	0.23	0.37	0.23	35.9
3	R2	46	5.0	48	5.0	0.037	3.9	LOS A	0.2	1.2	0.23	0.37	0.23	31.7
Approach		57	5.0	60	5.0	0.037	3.2	NA	0.2	1.2	0.23	0.37	0.23	33.0
East: Site Access														
4	L2	37	5.0	39	5.0	0.183	6.9	LOS A	0.7	5.1	0.12	0.95	0.12	26.9
6	R2	147	5.0	155	5.0	0.183	7.5	LOS A	0.7	5.1	0.12	0.95	0.12	32.7
Approach		184	5.0	194	5.0	0.183	7.4	LOS A	0.7	5.1	0.12	0.95	0.12	32.0
North: Eden St North														
7	L2	99	5.0	104	5.0	0.068	3.4	LOS A	0.0	0.0	0.00	0.39	0.00	36.7
8	T1	16	5.0	17	5.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.39	0.00	36.7
Approach		115	5.0	121	5.0	0.068	3.0	NA	0.0	0.0	0.00	0.39	0.00	36.7
All Vehicles		356	5.0	375	5.0	0.183	5.3	NA	0.7	5.1	0.10	0.68	0.10	33.7

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

UPDATED GREEN TRAVEL PLAN

PROPOSED MIXED USE DEVELOPMENT
26 – 42 EDEN STREET & 161 – 179 PRINCES HIGHWAY
ARNCLIFFE

PREPARED FOR ARNCLIFFE EDEN PROPERTY PTY. LTD.
OUR REF: 20-171-2

FEBRUARY 2022

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1. **Transport Access Guide**

1. INTRODUCTION

Stanbury Traffic Planning has been commissioned by Arncliffe Eden Property Pty. Ltd. to prepare a Green Travel Plan to accompany a State Significant Development Application (SSDA-11429726) for a mixed-use development at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe (the subject site).

The SSDA-11429726 seeks approval for the following development:

- Demolition of all existing buildings and structures on the site;
- Site preparation works, excavation and tree removal;
- The construction of a mixed-use development comprising:
  - 744 apartments across four (4) buildings between 19 – 23 storeys in height, including:
    - 186 market housing apartments in Building A;
    - 202 market housing apartments in Building B;
    - 180 social housing apartments in Building C; and
    - 176 market housing apartments in Building D;
  - 3,113m^2 gross floor area of retail premises;
  - 240m^2 of a future child care centre;
  - 3,706m^2 of communal open space; and
  - 4,870m^2 of publicly accessible open space including a 4,000m^2 park, an 870m^2 public plaza (meeting space), and through site link connecting Eden Street and Princes Highway.

The mixed-use development is proposed to be serviced by two levels of basement parking containing a total of 813 vehicle parking spaces, 394 bicycle parking spaces and 67 motorcycle parking spaces.

Passenger vehicle access to the site is proposed as follows:

- A development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site, facilitating unrestricted turning movements; and
- Passenger vehicle access is also to be provided via an approximately 55m long deceleration lane adjacent to the northbound Princes Highway carriageway assisting ingress only movements from Princes Highway to the first basement level parking area via a connecting ramp.

An on-site dedicated loading area containing five (5) marked loading bays capable of accommodating vehicles up to and including 14.5m long Articulated Vehicles is proposed to be provided in the south-western corner of the site. Service vehicle access is proposed between the dedicated on-site loading area and Eden Street, via the abovementioned development access roadway intersecting with Eden Street via a standard T-junction operating under 'Stop' signage control within the south-western corner of the site.

No service vehicle / heavy vehicle access is proposed between the site and Princes Highway.

Pedestrian connectivity between the development and the eastern Eden Street footpath and the western Princes Highway footpath is proposed via a series of paths linking directly with the development buildings.

Through site pedestrian links are proposed between Eden Street and Princes Highway adjacent to the northern boundary via a dedicated pedestrian link as well as central to the site via the public park.

The following external works are proposed adjacent to and in the immediate vicinity of the site in order to ensure the development integrates into the precinct in a safe and efficient manner:

- A raised marked pedestrian crossing over Eden Street directly adjacent to The Arcade to facilitate safe and efficient connectivity between Princes Highway, the site and Arncliffe Railway Station;

- The modification of the existing pedestrian refuge within Eden Street at Forest Road to prohibit right turn movements to and from Eden Street;

- The provision of a dual lane bicycle lane within Eden Street along the western kerb alignment, between Forest Road and Burrows Street; and

- The provision of a shared pedestrian / cycle path along the western Princes Highway footway, between Forest Road and Burrows Street.

2. GREEN TRAVEL PLAN

2.1 Introduction

Transport is an unavoidable factor in modern society and a major contributor to emissions in Australia. However, the effects of transport associated with new developments can be managed through the implementation of travel plans, which provide an opportunity to reduce harmful vehicle emissions. In conjunction with striving to provide more efficient environmental outcomes, providing a range of travel choices with a focus on walking, cycling and public transport will result in major public health advantages to the proposed mixed development at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe.

The proximity of the subject site to various forms of public transport including rail and various bus routes forms a major part of the initiatives to encourage reductions in vehicle transport use. The Green Travel Plan will ensure that the transport infrastructure, services and policies within and outside the site are tailored to the future site users, being coordinated to achieve sustainable outcomes.

2.2 Green Travel Plan Definition

This Green Travel Plan provides a series of measures aimed at promoting and encouraging sustainable travel by development users and reducing reliance on the private car. The aim of the Plan is to achieve travel behaviour change through raising awareness of alternatives to private motor vehicle use. The development of a site-based Plan focuses on providing information, offering incentives and mode specific actions to optimise the use of sustainable travel (public transport, cycling and walking).

This Green Travel Plan specifically examines how future site users can travel to and from the site and what can be done to replace single occupancy motor vehicle trips with sustainable trips. As a trip generator, the mixed-use development can enhance the choices available to both residents and staff in a way that promotes health, safety and environmentally sustainable outcomes.

The potential to change site-based travel is affected by several factors including car parking provision, site user interest in changing, the provision of support for change and the availability of various forms of public transport in the immediate vicinity.

2.3 Green Travel Plan Benefits and Objectives

This Green Travel Plan provides a wide range of benefits to site users in conjunction with the environment including:

- Decreasing vehicle emissions;
- Promoting the mixed-use development and surrounding area as an innovative and environmentally aware location;

- Improving health and fitness of development users through increased cycling and walking activity;
- Reducing traffic congestion and car parking problems;
- Fostering a sense of community; and
- Reducing general living expenses.

The main objectives of this Green Travel Plan are to:

- Reduce vehicle kilometres travelled (VKT) to and from the development, particularly single occupancy resident vehicle trips;
- Increase resident and staff use of sustainable transport modes (walking, cycling, public transport and car share);
- Promote the use of electric vehicles where possible through increased awareness and access to vehicle charging infrastructure;
- Ensure that resident and staff are informed on the opportunities and benefits of using sustainable transport; and
- Promote the subject site and area as an innovative and environmentally aware location.

2.4 Green Travel Plan Structure

The Green Travel Plan will capitalise on the availability of described sustainable transport options such that modal share which does not involve a private vehicle is expected to be relatively high.

The Plan itself takes the structure of a package of easy-to-understand travel information to be included in a new resident or staff information pack.

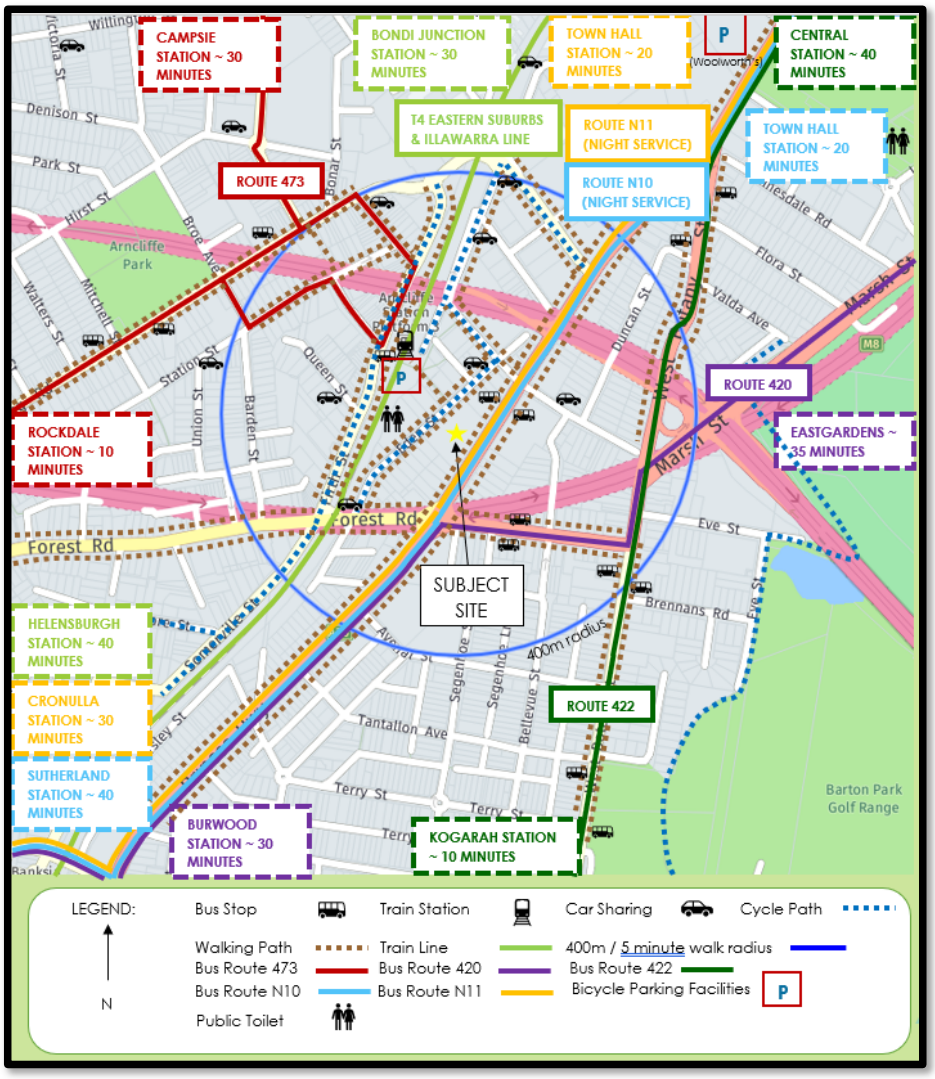
The information pack also includes a Transport Access Guide (contained within **Attachment 1)**. This Guide provides a site centred customised travel information for site users with respect to sustainable forms of transport including walking, cycling and public transport. It provides a simple visual review of the subject locality containing easy to recognise relationships between the site and bus stops and routes, the nearby train stations, cycle routes, internal and external pedestrian links and internal / external car share pods.

2.5 Existing and Proposed Nearby Sustainable Transport Options

The site within which the mixed-use development is proposed is well serviced by a series of sustainable (or active) transport options available for future residents and staff. **Figure 1** overleaf illustrates the sustainable transport options within easy walking distance of the subject site.

Subsequent sub-sections of this report provide a detailed description of each of the surrounding sustainable transport options.

FIGURE 1
TRANSPORT OPTIONS IN THE VICINITY OF THE SUBJECT SITE



2.5.1 Bus

Table 1 overleaf indicates the location of bus stops located within a five-minute walk (400m) from the site.

TABLE 1 BUS STOPS WITHIN THE VICINITY OF THE SITE			
Road / Street	**Side (of street)**	**Direction from Site**	**Distance from Site**
Princes Highway	Western	North-East	50m
	Eastern	North-East	150m
Wickham Street	Northern	South-East	200m
	Southern	South-East	220m
Firth Street	Eastern	North-West	175m
W Botany Street	Eastern	South-East	400m
	Western	South-East	400m

The stops within Princes Highway service the following routes:

- Route N10 – Sutherland to City Town Hall (Night Service); and
- Route N11 – Cronulla to City town Hall (Night Service).

The stops within Wickham Street service:

- Route 420 – Eastgardens to Burwood via Sydney Airport & Rockdale.

The stops within Firth Street service:

- Route 473 – Rockdale to Campsie.

The stops within W Botany Street service:

- Route 422 –Kogarah to Central Pitt Street.

Table 2 overleaf provides a summary of the frequencies of the above bus routes.

TABLE 2 BUS SERVICE FREQUENCIES					
Route No.	**Origin / Destination**	**Frequency**			
		Weekday Peak	**Weekday Business**	**Weekend**	**Night**
N10	Sutherland to City Town Hall (Night Service)	-	-	-	30 mins (Thursday and Friday) 60 mins (Saturday – Wednesday)
N11	Cronulla to City town Hall (Night Service)	-	-	-	60 mins
420	Eastgardens to Burwood via Sydney Airport & Rockdale	10-15 mins	15-20 mins	20 mins	-
422	Kogarah to Central Pitt Street	15 mins	15 mins	20-30 mins	-
473	Rockdale to Campsie	30 mins	60 mins	60 mins	-

2.5.2 Heavy Rail

The site is located approximately 150m to the south-east of the Arncliffe Railway Station. Arncliffe Railway Station provides access to train services which operate along the T4 (Eastern Suburbs & Illawarra Line) and South Coast Line.

Services along the T4 and South Coast Line provide efficient connectivity between Kiama Station in the south and the Sydney City CBD.

The frequency of the services is summarised in **Table 3**.

TABLE 3 JOURNEY TO WORK MODE SHARE FROM ARNCLIFFE AND BANKSIA			
Service	**Weekday AM 7:30am to 8:30am**	**Weekday PM 5:00pm to 6:00pm**	**Saturday 11:00am to 12:00pm**
T4 Towards Central	6 services	6 Services	2 services
T4 Away from Central	6 services	7 Services	2 services

2.5.3 Existing Pedestrian Infrastructure

The following pedestrian access and mobility infrastructure surrounds the subject site:

- Footpaths are provided along both kerb alignments of Princes Highway, Eden Street, Burrows Street, Arncliffe Street to the south of Allen Street, Firth Street, Forest Road and Brodie Spark Drive;
- Signalised pedestrian crossings are provided over the southern and western approaches to the intersection of Brodie Spark Drive and Princes Highway;
- Marked pedestrian crossings are provided over Magdalene Terrace and Arncliffe Street to the south and west of the roundabout controlled intersection;
- Signalised pedestrian crossings are provided over the northern and western approaches to the intersection of Princes Highway and Burrows Street;
- Signalised pedestrian crossings are provided over all approaches of the intersection of Princes Highway and Forest Road, including marked pedestrian crossings over the left turn slip lanes;
- Signalised pedestrian crossings are provided across all approaches of the intersection of Forest Road and Firth Street, including a marked pedestrian crossing across the left turn slip lane on the northern approach;
- The Arcade forms an east-west pedestrian link between Eden Street and Arncliffe Railway Station, situated directly to the west of the site; and
- Raised and marked pedestrian crossings are provided across Firth Street, providing pedestrian access to Arncliffe Railway Station.

Figure 1 illustrates the pedestrian infrastructure within the immediate vicinity of the site.

2.5.4 Proposed Pedestrian Infrastructure

Further to the above existing pedestrian infrastructure, the following additional infrastructure is proposed as part of the subject development in order to ensure the development integrates into the precinct in a safe and efficient manner:

- A raised marked pedestrian crossing over Eden Street directly adjacent to The Arcade to facilitate safe and efficient connectivity between Princes Highway, the site and Arncliffe Railway Station; and
- The provision of through site pedestrian links between Eden Street and Princes Highway adjacent to the northern boundary via a dedicated pedestrian link as well as central to the site via the public park.

2.5.5 Existing Cycle Routes / End of Trip Facilities

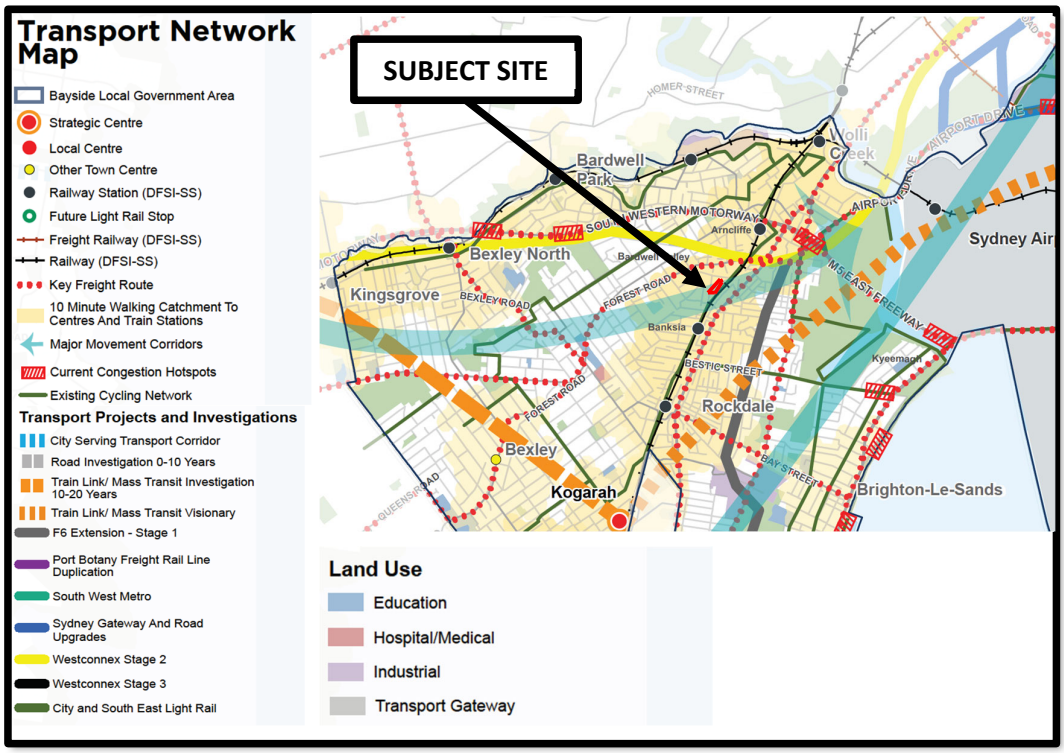
Figure 1 provides a graphical representation of on and off-road cycleways within the immediate vicinity of the subject site. The various types of cycle paths available within the vicinity of the site have been identified below, as follows:

- Eden Street, Firth Street and Arncliffe Street form on-road bicycle-friendly routes; and

- A network of off-road cycle paths is provided to the south-east of the site within Riverine Park.

The existing bicycle routes within the vicinity of the subject site are shown in the Bayside Council Local Strategic Policy Statement (LSPS). An extract of the Transport Network Map from the LSPS is provided in **Figure 2**.

FIGURE 2
BAYSIDE COUNCIL LSPS TRANSPORT NETWORK MAP



Source: Bayside Council Local Strategic Planning Statement

Additionally, the surrounding precinct provides the following end of trip facilities for cyclists:

- A public bicycle parking rack is provided on the eastern side of Arncliffe Railway Station, located at the western end of The Arcade;

- A public bicycle parking rack is provided at the entrance of the Wolli Creek Woolworth's situated to the north of the site;

- A public toilet is provided at the southern end of Cahill Park to the north-east of the site; and

- A public toilet is provided on the western side of Arncliffe Railway Station.

2.5.6 Proposed Cycle Routes / End of Trip Facilities

Further to the above existing cyclist infrastructure, the following additional infrastructure is proposed as part of the subject development in order to ensure the development integrates into the precinct in a safe and efficient manner:

- The provision of a dual lane bicycle lane within Eden Street along the western kerb alignment, between Forest Road and Burrows Street; and

- The provision of a shared pedestrian / cycle path along the western Princes Highway footway, between Forest Road and Burrows Street.

Additionally, the proposed development is to provide the following end of trip facilities for cyclists:

- 372 resident storage cages, which are capable of accommodating bicycles, within the basement parking levels;

- 18 bicycle parking spaces dedicated to the retail customers and staff of the development provided within the lower ground parking area and in close proximity to appropriate end of trip facilities including lockers, showers and toilets; and

- Four bicycle parking spaces dedicated to the child care centre visitors and staff of the development within the lower ground floor parking area and in close proximity to appropriate end of trip facilities including lockers, showers and toilets.

2.5.7 Car Share

Car Share is a concept by which members join a car ownership club, select a rate plan and pay an annual fee. The fees cover fuel, insurances, maintenance and cleaning. The vehicles range from small hatchbacks to vans. Each vehicle has a home location, referred to as a 'pod', either in a public street, private road or off-street parking area. The number of pods within a particular area vary depending on the density of the population. Members reserve a vehicle by internet or telephone and use a key card to access and operate the vehicle.

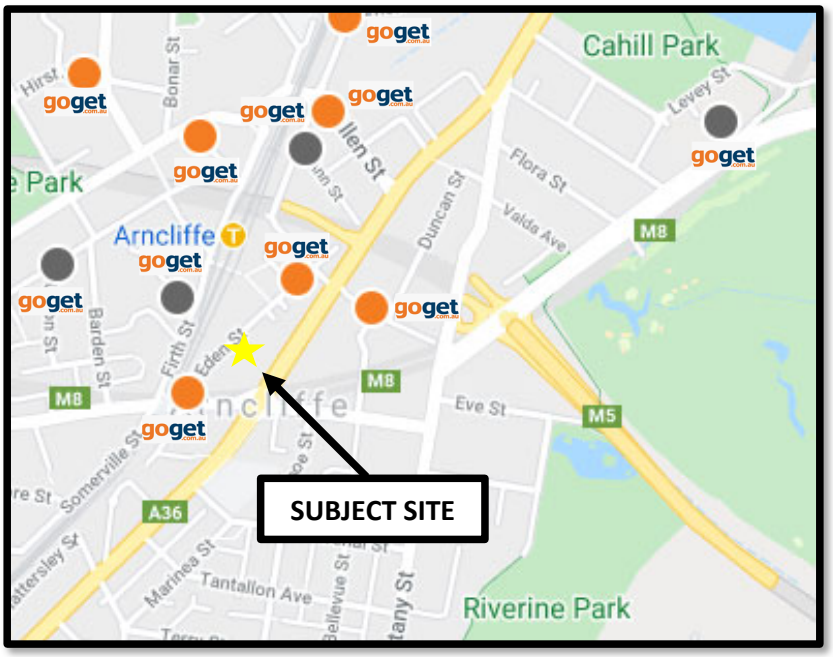
Studies into car share use have reported that car share spaces replace a significant number (up to 12) of car parking spaces, depending on the location and surrounding community density. Car share spaces should therefore reduce the parking demand within and adjoining the site but also the traffic generated.

The GoGet car club has seven pods located within five minutes walking distance of the site, and significantly more within a 10-minute walk. **Figure 1** provides a graphical illustration of the car share pods within the vicinity of the site.

In addition to the car share pods illustrated in **Figure 1**, **Figure 3** provided overleaf indicates the locations of all of the 11 GoGet car share pods within the immediate vicinity of the site, taken directly from the GoGet Care Share website. At the time of writing this report, seven (7) of the 11 car share pods were available.

Further to the above, it is proposed that six (6) car share spaces be provided, within the basement parking area of the subject development, comprising approximately one car share bay per 94 market dwellings.

FIGURE 3
GOGET CAR SHARE PODS IN THE VICINTIY OF THE SITE



2.5.8 Proposed Electric Vehicle Charging Points

The proposed subject development is to provide a total parking provision of 78 retail parking spaces and 719 residential parking spaces. Of this parking provision, 16 retail and 144 residential parking spaces are to be equipped with electric charge points to accord with Council's site-specific requirements.

Whilst it has been proposed that six retail parking spaces and 10 residential visitor parking spaces are to be specifically fitted with electric charging facilities, an allowance has been provided for the potential to fit out the 144 residential parking spaces with electric charging capabilities as required. It is therefore considered that residents who require electric charging for their vehicle will have the ability to fit out their specific parking space with charging capabilities through contacting the development management.

3. MODE SHIFT INITIATIVES

3.1 Introduction

The previously described proximity of the site to a wide range of sustainable transport modes is an important attribute in the justification of the proposed mixed-use development. The residents, visitors and staff of the development are expected to capitalise upon these links.

This Green Travel Plan involves the implementation of a series of measures to influence future site users' travel behaviours to encourage modal shift away from private cars.

A Green Travel Plan Coordinator is to be established by the building manager to implement the initiatives incorporated within this Plan and to develop further initiatives to ensure that sustainable travel modes are selected by the residents, visitors and staff of the site. The coordinator shall facilitate the initial implementation of the Plan as well as subsequent periodic guidance in the ongoing review of the Plan.

The following sub-sections provide a summary of these measures to promote sustainable transport for residents, visitors and staff of the subject development. The measures are to be in place from the initial occupancy of the development and are expected to establish lasting habits from this time.

3.2 Site Specific Measures

3.2.1 Development Design

- The development is to provide a reduction of passenger vehicle parking from the maximum on-site car parking provision as allowed by the Bayside Council DCP, whereby the proposed parking provision aims to minimise resident, visitor and staff private vehicle use;

- Whilst the Bayside Council DCP requires a minimum of 74 bicycle parking spaces to service the development, the proposed development provides 394 bicycle parking spaces which exceeds the bicycle parking requirements by approximately 5 times, thereby encouraging bicycling as a main form of transportation for residents and visitors of the development;

- The development is to provide motorcycle parking at a rate that greatly exceeds that required in accordance with the Bayside Council DCP, providing an alternative to passenger vehicle use;

- The proposed pedestrian infrastructure including the pedestrian through-site links create clear and efficient connectivity between the site and the adjacent pedestrian public road network to encourage cycling and walking;

- Six of the proposed retail customer parking spaces, representing approximately 7.5% of the total provision, and 10 of the proposed residential visitor parking spaces, representing approximately 13% of the total provision, are to be fitted with electric charge points to promote the current and future use of electric vehicles; and

- The provision of good quality, accurate and useful internal development directional signage to promote walking and cycling, stating times and distances to surrounding destinations.

3.2.2 Information and Encouragement

Information	Provide information on travel options available to residents and staff of the development through noticeboards, newsletters, real time travel updates through the implementation of updating screens, common area displays etc.
Factsheets	Develop factsheets on the benefits of walking, cycling, public transport, carpooling and working from home (where possible).
Access Guide	Produce a Transport Access Guide illustrating surrounding connectivity to walking and cycling routes as well as bus, train and car share pods.

3.2.3 Promote Cycling

Information	Provide: • Cycling maps. • Factsheets on the benefits of cycling.
Cycling Infrastructure	• Provide secure bicycle parking and signage to indicate where bicycle parking is located. • Provide end of trip facilities and signage to indicate where end of trip facilities can be accessed.
Skills Development	• Increase cycle confidence by providing information on cycle skills training for residents / staff who are learning to cycle or who haven't ridden for a long period of time. • Provide information on bicycle maintenance workshops.
Establish a bicycle pool	• Provide factsheets on the benefits of cycling.
Cycling Champions	• Organise recreational group rides for the residents / staff of the development. • Identify residents / staff who cycle to work or recreationally and encourage them to motivate others to join them.
Bicycle Group	• Match less confident cyclists with a 'cycle buddy' for cycle trips. • Organise recreational group rides for residents / staff.
Events	Encourage participation in: • Ride to Work Day. • Bike Week. • World Move for Health.

3.2.4 Promote Walking

Information	Provide: • Walking maps. • Factsheets on the benefits of walking.
Walking Infrastructure	• Ensure that walking paths within the site are well maintained with adequate lighting.
Walking Champions	• Identify residents / staff who walk to work or recreationally and encourage them to motivate others to join them.
Walking Group	• Establish a 'walking club' along a designated route where residents / staff who want to walk recreationally can meet up with others.
Events	Encourage residents / staff to participate in: • 10,000 steps program. • Walk to Work Day • Diabetes Day.

3.2.5 Promote Public Transport

Information	Provide: • Bus / train timetables. • Display maps detailing public transport to / from the subject site. • Real-time display through the implementation of televisions in residential lobbies and commercial areas. • Provision of Opal cards within the new resident / staff information pack with some pre-paid credits.
Public Transport Champions	• Identify residents /staff that use public transport and encourage them, to motivate others to join them.
Events	• Host a site Public Transport Month. • World Environment Day

3.2.6 Promote Car Pooling / Sharing

Information	Provide: • Car share parking spaces within the development and appropriate information on how to access car share vehicles and where to park once trip is finished. • Guidelines on car-pooling. • Factsheets on the benefits of car-pooling. • Display maps of surrounding car share pods. • Provision of Go-Get membership cards within the new resident / staff information pack with some pre-paid credits.
Car Pooling Champions	• Identify residents / staff who car pool / share and encourage them to motivate others to join them.
Events	• Establish a resident / staff car pool register. • To facilitate car-pool matching, host regular breakfast / afternoon teas at the development.

4. MODE SHARE TARGETS

4.1 Existing Mode Share Data

Table 4 below provides a summary of Arncliffe 2016 journey to work data as published by the Australian Bureau of Statistics.

TABLE 4 2016 JOURNEY TO WORK DATA		
Travel Mode	**Number**	**Percentage**
Car as Driver	2,178	43.8
Car as passenger	233	4.7
Train	1,688	33.9
Bus	91	1.8
Walk	117	2.4
Cycle	26	0.5
Other	117	2.4
Worked at home / Did not go to work / Not stated	525	10.5
TOTAL	**4,975**	**100**

4.2 Mode Share Targets

It is the intention that the implementation of the package of measures provided within this Green Travel Plan and the excellent connections to existing sustainable transport links will assist towards a higher non-car use by residents and staff of the development.

Table 5 provides a summary of the mode share targets for resident / staff of the development, with respect to both the 2016 Census journey to work data and targets contained within Sustainable Sydney 2030.

TABLE 5 SITE SPECIFIC JOURNEY MODE SHARE TARGETS	
Travel Mode	**Percentage of Total**
	Residents
Car as Driver	30
Car as Passenger (Car Pool / Share)	10
Public Transport	40
Walk	10
Cycle / Motorcycle	10
TOTAL	**100**

5. GREEN TRAVEL PLAN MONITORING

A Green Travel Plan is a dynamic document which will change over time depending on the environment and circumstances of the subject development. Accordingly, monitoring, evaluating and reviewing the Plan is important as it will guide ongoing efforts to reduce vehicle kilometres travelled and encourage the use of sustainable transport.

Monitoring and evaluation is an ongoing process which involves fine tuning. There is no standard methodology for the monitoring of a Green Travel Plan however, generally speaking, residents and staff of the development of the should be regularly surveyed as to their travel behaviour to ascertain the areas in which the Travel Plan is successful and those which require altered or improved initiatives. It is therefore proposed that residents and staff will be surveyed 6 months after occupation of the development with the main focus of the surveys to establish travel patterns including mode share of trips to and from the site. This information will also help inform the Plan for subsequent stages of the development, as necessary.

It is important to understand people's reasons for travelling the way they do, any barriers to changing their behaviour and their propensity to change. This will enable the most effective initiatives to be identified, and conversely less effective initiatives to be modified or replaced to ensure the best outcomes are achieved.

It will be necessary to provide feedback to residents and staff to ensure that they can see the benefits of sustainable transport. It is proposed that this occurs through the provision of survey results within the development noticeboards.

6. SUMMARY

A Green Travel Plan is to be implemented within the proposed mixed-use development at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe. The Plan aims to encourage the use of alternative transport choices to single car use and encourage a shift towards public transport, car share, cycling and / or walking through the implementation of the measures contained within Section 3.2 of this Plan, including:

- The implementation of development design initiatives such as the limiting of private car parking spaces, the provision of bicycle / motorcycle parking facilities exceeding that which is required, the provision of on-site parking spaces that are to fitted with electric charge points to promote the current and future use of electric vehicles, in conjunction with clear and efficient internal pedestrian and cycle networks and signage;

- The provision of clear and concise information to the residents, visitors and staff of the development detailing the surrounding available sustainable transport infrastructure and encouraging the use of transport modes other than the private car, including a Transport Access Guide; and

- The promotion of non-car travel through the provision of pre-paid Opal cards and occasional car share memberships to new development residents / staff.

Residents and staff are to be provided with information with respect to the Green Travel Plan within a welcome pack and up-to-date information with respect to the initiatives of the Plan are to be displayed within the development.

Monitoring of the implementation of the Green Travel Plan is to be undertaken six months following the occupation of development through the undertaking of travel mode surveys of residents and staff. The results of these surveys and details with respect to whether or not the mode share targets contained within this Plan are being met are to be made available to the development community.

ATTACHMENT 1

STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

TRANSPORT ACCESS GUIDE

Your guide for accessing:

26 – 42 EDEN STREET & 161 - 179 PRINCES HIGHWAY, ARNCLIFFE

Getting To and From the Site:

Walking

Footpaths are provided along both sides of Princes Highway, Eden Street, Burrows Street, Arncliffe Street to the south of Allen Street, Firth Street and Forest Road.

Marked pedestrian crossings are provided over Magdalene Terrace and Arncliffe Street to the south and west of the roundabout.

Signalised pedestrian crossings are provided over the northern and western approaches to the intersection of Princes Highway and Burrows Street.

Signalised pedestrian crossings are provided over all approaches of the intersection of Princes Highway and Forest Road.

The Arcade forms an east-west pedestrian link between Eden Street and Arncliffe Railway Station, situated directly to the west of the site.

Raised and marked pedestrian crossings are provided across Firth Street, providing pedestrian access to Arncliffe Railway Station.

The development also proposes a marked pedestrian crossing over Eden Street and through site links between Princes Highway and Eden Street.

Cycling

On and off-road cycleways are provided within the immediate vicinity of the site at the following locations:

On – Road

- Eden Street, Firth Street and Arncliffe Street form on-road bicycle-friendly routes.

Off – Road

- A network of off-road cycle paths is provided to the south-east of the site within Riverine Park.

The development also proposes dual lane on-road bicycle lanes within Eden Street and a shared path along Princes Highway adjacent to the site.

Bus Routes

The previously described pedestrian and cyclist infrastructure provide connectivity to the following bus stops, located within a 5-minute walk from the site:

- Bus stops are located on both sides of Princes Highway, Wickham Street, Firth Street and W Botany Street

The above bus stops service the following routes:

- Route N10 – Sutherland to City Town Hall (Night Service)
- Route N11 – Cronulla to City town Hall (Night Service)
- Route 420 – Eastgardens to Burwood via Sydney Airport & Rockdale
- Route 473 – Rockdale to Campsie
- Route 422 – Kogarah to Central Pitt Street

Wheelchair Accessibility

Sydney Buses offer wheelchair accessible services at limited times. Look for the accessibility symbol on the bus operator's timetable to identify these services.

Heavy Rail

Arncliffe Station is located within a 5-minute walk from the site.

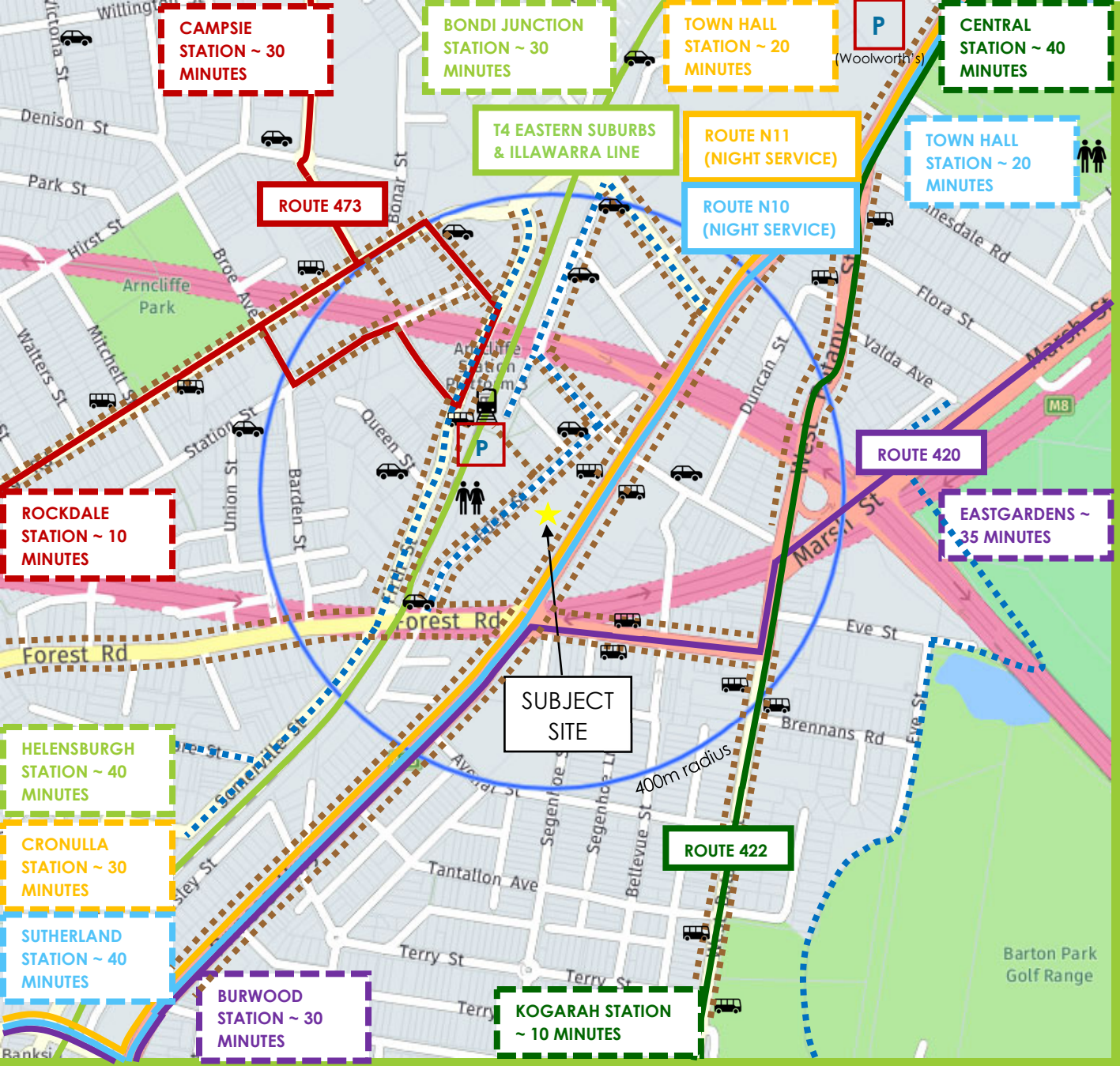
Services along the T4 (Eastern Suburbs & Illawarra Line) provides connectivity to the remainder of the Sydney metropolitan rail network via interchanges at locations such as Sutherland, Wolli Creek, Sydenham, Redfern and The City.

Car Share

The GoGet car club has seven pods located within five minutes walking distance of the site, and significantly more within a 10-minute walk.

There are two GoGet car share pods located on the opposite (western) side of Eden Street to the north and south of the site.

A further pod is proposed within Eden Street associated with the subject development.



LEGEND:

N

Bus Stop | Train Station | Car Sharing | Cycle Path

Walking Path | Train Line | 400m / 5 minute walk radius

Bus Route 473 | Bus Route 420 | Bus Route 422

Bus Route N10 | Bus Route N11 | Bicycle Parking Facilities (P)

Public Toilet

STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

Planning your Trip

It is recommended that you contact the Transport Information Line to plan your trip and get the latest timetable, fare and wheelchair accessible information.

131500.com.au Transport Info
Information for people on the move

Other useful references:

- http://www.transdevsydney.com.au
- http://transportnsw.info
- https://www.bayside.nsw.gov.au/
- http://roads-waterways.transport.nsw.gov.au/roads/bicycles/cycleway-finder.html

Disclaimer

The information contained in this brochure is current as of August 2021 and is provided as a guide. The brochure has been prepared in reliance on information provided by third parties and accordingly no guarantee, warranty or promise, express of implied, concerning the content or accuracy of information is provided. Readers should refer to the Transport Information Line, local bus companies or the local Council to obtain updated information referred to in this brochure.

STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

9 February 2022

Department of Planning, Industry and Environment
Locked Bag 5022
Parramatta NSW 2124

Attention: Mr. Jim Betts, Secretary

Dear Sir,

PARKING AND TRAFFIC ASSESSMENT
STATE SIGNIFICANT DEVELOPMENT
PROPOSED MIXED USE DEVELOPMENT
26 – 42 EDEN STREET AND
161 – 179 PRINCES HIGHWAY, ARNCLIFFE

Reference is made to a letter from Transport for NSW's (TfNSW) Brendan Pegg to the Department of Planning, Industry and Environment dated 25 August 2021, subsequent liaison and correspondence between this Practice and TfNSW, and a submission from Bayside Council in response to the Exhibition of an Environmental Impact Statement with regard to State Significant Development Application (SSDA-11429726) relating to a proposed mixed-use development located at 26 – 42 Eden Street and 161 – 179 Princes Highway, Arncliffe.

Stanbury Traffic Planning prepared a Transport Impact Assessment dated July 2021 in support of the subject development application.

Following receipt of the above correspondence / submission and subsequent liaison with both TfNSW and Bayside Council, a number of alterations have been made to the application, including but not limited to, the following:

- The introduction of an ingress only access from Princes Highway northbound carriageway to the development, being assisted by a deceleration lane;

- The rationalisation of the development access / egress from / to Eden Street into a single access roadway, facilitating both passenger and heavy vehicle access, forming a T-junction with Eden Street being governed by 'Stop' signage control, with Eden Street forming the priority route;

- Alterations to the internal circulation, parking and servicing arrangements, primarily associated with the abovementioned altered site access / egress arrangements, but also to ensure compliance with Council's Development Control Plan and site-specific requirements; and

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Pyrmont NSW 2009
info@stanburytraffic.com.au
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ph : 02 8971 8314
abn : 23 613 111 916

- Minor alterations to the Eden Street public domain, primarily associated with the altered site access arrangements, including but not limited to, the introduction of a 40km/h High Pedestrian Activity Area speed limit.

The above amendments are detailed with updated architectural plans prepared by Group GSA, full copies of which are submitted under separate cover. The original Transport Impact Assessment has also been updated to reflect and address the amended proposal and is dated January 2022, a copy of which is now enclosed. This updated Assessment includes additional information including amended swept path plans, SIDRA modelling assessment and a Green Travel Plan.

This correspondence provides response to those items raised within the abovementioned TfNSW correspondence and Bayside Council submission, with reference to the abovementioned updated Assessment. Responses from this Practice (STP) are provided following each comment.

TFNSW LETTER DATED 25 AUGUST 2021

Traffic Generation and Proposed Mitigation Measures

TfNSW Comment:
After review of the SIDRA modelling files, TfNSW has identified some potential impacts to the surrounding classified road network, including the Motorway but also the local road networks.

TfNSW Recommendation:
TfNSW advises that the applicant should consider assessing whether signalising the intersection of Princes Highway / Allen Street would mitigate the impacts to the surrounding classified and local road networks, improving accessibility to the site.

Allen Street provides east / west connectivity between Princes Highway and the larger Arncliffe / Turrella residential / retail / industrial precincts i.e. railway underpass. This could enhance safe connectivity for pedestrians in the precinct and would contribute to supporting active transport in the area.

As such, TfNSW recommends the applicant models this in SIDRA and provides the electronic copy to TfNSW for review and comment as part of the 'Response to Submissions'.

STP Comment:
In direct response to the above comment from TfNSW, this Practice (STP) was commissioned by the applicant to review and update the SIDRA modelling. The surrounding road network was remodelled in a network configuration utilising model parameters obtained from TfNSW within subsequent correspondence dated 12 October 2021.

The network was analysed under the following scenarios:

- Existing Conditions;

- Scenario 1 – Post Development, no changes to the road network;

- Scenario 2 – Post Development, new right turn signal phase from Princes Highway to Burrows Street;

- Scenario 3A – Post Development, new traffic signal control at the junction of Princes Highway to Allen Street, including a new right turn lane within the Highway servicing Allen Street and pedestrian crossings on all approaches; and

- Scenario 3b – Post Development, Scenario 3a, no pedestrian crossing on the southern Princes Highway approach.

The findings of the analysis were reported within correspondence to TfNSW dated 1 November 2021, a copy of which is appended as **Attachment 1**.

Following review of the abovementioned submission, a meeting was held with TfNSW officers on 7 December 2021 and correspondence received on the same date (a copy of which is appended as **Attachment 2**), specifying the following:

- TfNSW would not support the provision of a right turn phase from Princes Highway to Burrows Street, assessed as Scenario 2 above;

- TfNSW would not support signalisation of Princes Highway and Allen Street, assessed as Scenario 3a and 3b above;

- Direct left turn ingress only access from Princes Highway to the development would be considered, pending satisfactory provision of a deceleration lane to support such movements; and

- Investigation should be undertaken with respect to the feasibility of or a combination of the following alterations / upgrades to the surrounding public road network:

    - The duplication of the existing right turn lane within Princes Highway servicing Forest Road; and
    - The introduction of a right turn phase from Wickham Road to Princes Highway.

A subsequent meeting was held with TfNSW on 14 December 2021, during which a preliminary design for direct development access from Princes Highway northbound carriageway via a deceleration lane was presented, and the additional network assessment scope was defined.

An additional submission dated 21 December 2021 was prepared by STP detailing findings the additional requested investigation, a copy of which is appended as **Attachment 3**.

A property assessment indicated there is not available land to duplicate the right turn lane within Princes Highway servicing Forest Road, rendering this network alteration / upgrade unfeasible.

The surrounding network was modelled under the following scenarios:

- Existing Conditions;

- Scenario 1 – Post Development, no changes to road network;
- Scenario 4 – Post Development, direct left turn into the site from Princes Highway; and
- Scenario 6 – Scenario 4 plus a right turn lane from Wickham Road to Princes Highway. A total of 50 right turn vehicles were added to this movement and no other movements were changed.

The updated modelling analysis indicated the following:

- Whilst there is available land to provide a right turn lane and signal phase within Wickham Road, servicing Princes Highway access movements, the SIDRA modelling concluded that the necessary reduction in green time available to existing signal phases as a result of the introduction of a new right turn phase from Wickham Road resulted in undesirable impacts on the overall performance of the intersection of Princes Highway, Forest Road and Wickham Road. Scenario 6 was accordingly discounted.
- The junction of Princes Highway and Brodie Spark Drive showed increased average delay incorporating the development, however the Level of Service remained at 'B' for all modelled scenarios;
- Whilst post development modelling illustrates a slight reduction in the level of service at the intersection of Forest Road and Firth Street, this is most notably a result of the deletion of right turn movements at the junction of Forest Road and Eden Street, which is supported by both Bayside Council and TfNSW on safety grounds;
- The introduction of the direct left turn development access from Princes Highway results in a slight improvement to the operation of the junction of Princes Highway and Burrows Street when compared with the non-provision of direct Highway development access; and
- There is minimal difference to overall vehicle speed within the entire network when the existing conditions are compared to post development scenarios.

Overall, the modelling results suggest that no additional road network treatments are required on the classified road network to support the proposed development, other than the provision of direct left turn access from Princes Highway to the site.

Following a review of the updated modelling analysis and submission, TfNSW provided correspondence dated 25 January 2022 (a copy of which is Appended as **Attachment 4**), indicating the following:

- TfNSW support, in principle, the proposed deceleration lane as a left-in only arrangement from Princes Highway to the subject development, subject to the assessment of appropriate civil design and road safety investigations;
- Unrestricted access / egress between the site and Eden Street is supported;
- The removal of right turn movements between Forest Road and Eden Street is supported.

The original Transport Impact Assessment has accordingly been updated to reflect the above analysis and correspondence between STP and TfNSW, a copy of which is now enclosed.

TfNSW Comment:
TfNSW supports Left-in, left-out (LILO) arrangement at the intersection Forest Road and Eden Street, however notes that there is not sufficient space for a median island on Forest Road.

TfNSW Recommendation:
It is recommended to redesign the existing island on Eden Street to reinforce LILO arrangement. As Eden Street is under the care and control of Council, any mitigation works shall be to the satisfaction of Council.

As there is no sufficient width for Median Island on Forest Road, consideration should be given to the redesign of the existing island on site road and appropriate signposting to enforce LILO movements only.

STP Comment:
Specific design of the junction of Forest Road and Eden Street is to be prepared by others and presented under separate cover. Appropriate design of the junction can be reasonably imposed by as a Condition of Consent.

Proposed Princes Highway Civil Works

TfNSW Comment:
TfNSW has reviewed the plans and notes that the vehicular access to the proposed development is via Eden Street (local road network), which is supported by TfNSW.

It should be noted that there is several redundant vehicles crossovers that will need to be replaced with kerb and guttering to match existing on the Princes Highway frontage of the development.

TfNSW Recommendation:
The applicant will need to obtain concurrence under section 138 of the Roads Act 1993 from TfNSW separate to the application for these civil works and will need to enter into a Works Authorisation Deed with TfNSW.

STP Comment:
Please refer to Sections 3.1 Passenger Vehicle Access and 3.2 Service Vehicle Access of the Updated Transport Impact Assessment. Appropriate removal of redundant vehicular crossings may reasonably be imposed as condition of consent.

Active Transport

TfNSW Comment:
TfNSW supports the proposed upgrades to the surrounding footways of the proposed development on the local road network to improve pedestrian and cyclist connectivity to the Arncliffe Transport Interchange.

TfNSW Recommendation:
The developed options should be discussed with Council and TfNSW.

STP Comment:
Please refer to Section 3.3 Pedestrian Access of the Updated Transport Impact Assessment.

Bicycle and Car Parking Rates

TfNSW Comment:
Details of the proposed number of car and bicycle parking spaces and compliance with appropriate parking codes and justification for the level of car parking provided on the development site should be provided as per Council's requirements.

STP Comment:
Please refer to Section 4. Parking Considerations of the Updated Transport Impact Assessment.

Green Travel Plan (GTP)

TfNSW Comment:
Transport for NSW (TfNSW) has reviewed the Green Travel Plan (GTP) and has a number of recommendations to improve the GTP and proposed initiatives to encourage sustainable transport to the site. TfNSW would welcome further discussions with the proponent regarding these matters to ensure their delivery and can be contacted directly at development.sco@transport.nsw.gov.au.

TfNSW Recommendations:
Prior to occupancy, the proponent is to provide a Green Travel Plan for TfNSW's consideration that:

- *Details the number and location of end of trip facilities for staff and casual bicycle parking for retail and visitors, and what other resources will be available for cyclists (bike stand, pumps, tools and spare tubes for example)*
- *Provides a communication strategy and an updated TAG which includes*
    - *a map of the site with access points, active transport paths, bike parking and EOT facilities*
    - *recommended walking / cycling routes to key destinations nearby e.g. the airport, local shops*
- *Clarifies what will be provided as part of the "Establish a bicycle pool initiative" and what is meant by "School community inductions"; and whether the proponent is considering partnering with local schools to achieve this*
- *Considers including real time information as part of the common area displays*

STP Comment:
Please refer to the enclosed Green Travel Plan prepared by this Practice.

In addition to the above, this correspondence provides response to the items raised within the abovementioned Council correspondence, with reference to the abovementioned updated Assessment:

COUNCIL SUBMISSION IN RESPONSE TO THE EIS

Council Comment:
Traffic modelling based on traffic counts from March 2021 do not accurately represent traffic conditions due to changes in behaviour associated with Covid-19.

STP Comment:
This is disputed as there were no prevailing lockdowns or travel restrictions associated with COVID-19 imposed during the time of the traffic counts. Please refer to Section 6.2 Existing Traffic Volumes of the Updated Transport Impact Assessment.

Council Comment:
The traffic intersection modelling results presented are averages of all directions. This implies better performance than reality. For example, the report identifies Princes Highway and Brodie Spark Drive achieving a level of service (LOS) B. when reviewing the detail in Appendix 4, this is clearly not the case. In the PM peak, the intersection of Princes Highway & Brodie Spark (R2) achieves a LOS F, which will worsen due to this development, as there are no alternative ways to enter the site when travelling from the north.

STP Comment:
All results of the SIDRA modellings analysis, including the output for each movement of each intersection assessed, has been provided within **Appendix 5** of the Updated Transport Impact Assessment. Please refer to **Appendix 5** of the Updated Transport Impact Assessment.

Council Comment:
The modelling shows an increase in traffic in the PM peak from 416 and 439 vehicles/hr. This predicted increase doesn't appear to be appropriate, given the limited alternatives to enter the site.

STP Comment:
Please refer to Section 8.2 Passenger Vehicle Trip Assignment of the Updated Transport Impact Assessment.

Council Comment:
The reporting from the modelling appears to be selectively used. This development will make an existing problem area worse, and Council has no way to resolve the problem, as the main access roads are State Roads. Modelling must be peer reviewed.

STP Comment:
The SIDRA modelling associated with the projected traffic impacts on the surrounding road network have been updated and are provided within Section 8.3 Projected Road Network Performance of the Updated Transport Impact Assessment. The modelling has been submitted to TfNSW on multiple

occasions for review. Transport for New South Wales does not dispute the updated modelling that has been prepared.

Council Comment:
The applicant needs to liaise with TfNSW to determine the modelling requirements and appropriate design requirements for the intersection of Princes Highway with Allen or Burrows Street, to accommodate southbound right-turn movements for this proposed development.

Vehicular access to this development is significantly impaired due to the lack of right turn movements at various intersections along Princes Highway and Forest Road on approach to the site. This, combined with modifications to the intersection of Eden Street with Forest Road to be left-in / left-out only (prohibiting right turn movements into Eden Street) results in the only southbound right turn access to the development being via the intersection of Brodie Spark Drive and Princes Highway.

The intersection of Brodie Spark Drive and Princes Highway (southbound right turn movements) and the road network of Wolli Creek cannot accommodate the additional traffic generation from this development. Wolli Creek is a high pedestrian area, and this intersection has poor intersection performance (F – for turning right off Princes Highway).

This Development triggers the need for additional right turn movements at Allen Street or Burrows Road from the Princes Highway to provide connection to this development that avoids vehicles using Brodie Spark Drive. The applicant needs to liaise with Transport for NSW (TfNSW) to determine an appropriate design at the intersection of Allen or Burrows Street to accommodate southbound right-turn movements.

STP Comment:
Please refer to Section of the Updated Transport Impact Assessment and **Attachment 1** of this correspondence. The submitted SIDRA modelling of the projected conditions depicting the introduction of both alternative scenarios, including the introduction of a right turn at Burrows Street or Allen Street, resulted in little to no improvement of the road network. TfNSW has reviewed the alternative scenarios and the respective SIDRA files / results and is not supportive of implementing either scenario.

Council Comment:
Modifying the Eden Street intersection also has the potential to negatively impact the Firth Street / Forest Road intersection, which needs to be assessed and investigated to understand what impacts will be created.

STP Comment:
Please refer to Section 8.3 Projected Road Network Performance of the Updated Transport Impact Assessment.

Council Comment:

The proposed vehicular access design to Eden Street involves three driveways. These three driveways all placed adjacent to each other result in an excessively large 29m wide driveway that has significant determinantal impacts upon the public domain and is not supported. Furthermore, these three driveways are all located at a significant bend of Eden Street, where sight distances are significantly constrained.

STP Comment:

This concern has been addressed through the provision of amended plans prepared by Group GSA. Please refer to set of amended plans. Additionally, please refer to Sections 1.2 Background and 3.1.1 Eden Street Access of the Updated Transport Impact Assessment.

Council Comment:

This excessively large driveway width (29m) needs to be reduced in size whilst still functioning correctly as per Australian Standards. To achieve this, the design of the parking facility needs to be amended to facilitate the movements of service vehicles to the loading dock via the same driveway as the basement vehicular access.

STP Comment:

Please refer to amended plans prepared by GSA Group and Section 3.1.1.4 Eden Street Access Roadway Design of the Updated Transport Impact Assessment.

Council Comment:

Given the sight distance constraints identified in the traffic report associated with the bend in Eden Street's alignment, a Category 4 driveway access is not considered appropriate for the development and instead, a Category 5 vehicular access driveway (i.e. intersection) must be provided for this development. This aspect is already acknowledged in the traffic report. However, the current design of the intersection is not supported as it does not appropriately resemble an intersection.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 3.1.1.4 Eden Street Access Roadway Design of the Updated Transport Impact Assessment.

Council Comment:

The vehicular access needs to be entirely redesigned to properly reflect an intersection design as per AS/NZ2890.1:2004 section 3.1.1. this will require some opening up of the area and building around the intersection and the provision of a far longer length with a flatter gradient. Additionally, the intersection needs to be set back as far as feasibly possible from the bend in Eden Street. A safety concern is raised regarding the location of the southernmost driveway within close proximity to the bend on Eden Street. The sight distance of 50m to the south is inadequate and less than the required 69m, and the seagull treatment (s1.3.6) proposed does not fully mitigate risks.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 3.1.1.5 Sight Distance of the Updated Transport Impact Assessment.

Council Comment:

The applicant hasn't provided detail to demonstrate whether the road width is adequate for the changes proposed, including provision of seagull treatment and the proposed bi-directional separated cycle path (as per Arncliffe and Banksia Public Domain Plan).

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 3.1.1 Eden Street Access of the Updated Transport Impact Assessment.

Council Comment:

The treatment appears to show movement from the south (right turn) into the building is only to the private vehicle parking area (not loading zone). The swept path plans only show movements to and from the site via the north. There is no swept path diagram for heavy vehicles exiting the site to the south. This plan shows vehicles existing to the north only. If there are restrictions on exiting to north only signage must be clear to prevent inappropriate left turns to south.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 5.2 Service Vehicle Areas of the Updated Transport Impact Assessment. It is considered that exiting left turns from the subject site from the access Roadway intersecting with Eden Street are to be prohibited for vehicles over 9m. Therefore, 'No Left Turn Vehicles Under 9m Excepted' signage is to be positioned within the subject site facing the egress lane of the access roadway.

Council Comment:

There are two driveways (resident and commercial) next to each other. It will no doubt be a very large driveway and must have signals/warning systems for exiting drivers alerting pedestrians on the footpath.

STP Comment:

Please refer to amended plans prepared by Group GSA Group and Section 3.1.1.4 Eden Street Access Roadway Design of the Updated Transport Impact Assessment. A pedestrian crossing is proposed to be provided within the property boundary in order to facilitate safe pedestrian movements across the proposed access roadway.

Council Comment:

It is recommended that entry to the basement lower parking levels should include a setback area at street level in case a vehicle breaks down and totally blocks access into or out of the development.

STP Comment:

Please refer to amended plans prepared by Group GSA, **Appendix 2** of the Updated Transport Impact Assessment and Section 3.1.1.4 Eden Street Access Roadway Design of the Updated Transport Impact Assessment.

Council Comment:

The loading dock should be completely redesigned so that it does not rely on a separate vehicular crossing. Furthermore, the seagull intersection needs to be carefully designed to ensure it meets Australian Standards, Austroads and Council requirements. To ensure it is designed well, some road widening may be necessary.

STP Comment:

Please refer to amended plans prepared by Group GSA, Section 1.2 Background and Section 3.2 Service Vehicle Access of the Updated Transport Impact Assessment.

Council Comment:

Swept paths depicted on sheet 14 and 15 (pages 88 & 89) of the Traffic Report indicate further issues with the design of the vehicular access and seagull intersection. The design forces vehicles to drive in the oncoming lane at poor angles in order to enter / exit the driveway. This permanent arrangement is dangerous and will not be supported. These swept paths indicate that right turn entering / exiting the site will be particularly difficult for motorists and not conducive to a safe intersection.

STP Comment:

Please refer to amended plans prepared by Group GSA and **Appendix 2** of the Updated Transport Impact Assessment.

Council Comment:

The swept paths on sheet 16 (page 90) do not accurately reflect the architectural plans (near the bicycle parking). They must be revised to accurately reflect the architectural plans.

STP Comment:

Please refer to **Appendix 2** of the Updated Transport Impact Assessment.

Council Comment:

It needs to be demonstrated that the painted seagull intersection treatment will feasibly work within the road carriageway of Eden Street. The developer will be responsible for all costs associated with constructing this seagull intersection.

STP Comment:

Please refer to amended plans prepared by Group GSA, Section 1.2 Background and 3.1.1 Eden Street Access of the Updated Transport Impact Assessment.

Council Comment:

A queuing analysis / assessment must be undertaken in accordance with Australian Standards for the vehicular entry.

STP Comment:

Please Section 3.1.2.2 and Section 3.1.1.6 Queueing Assessment of the Updated Transport Impact Assessment.

Council Comment:
Intersection performance must be assessed for the developments required intersection with Eden Street.

STP Comment:
Please refer to Section 8.3 Projected Road Network Performance of the Updated Transport Impact Assessment.

Council Comment:
Suitable stop / give way signage must be incorporated into the design of the intersection.

STP Comment:
Please refer to amended plans prepared by Group GSA and Section 3.1.1 Eden Street Access of the Updated Transport Impact Assessment.

Council Comment:
Current swept path design of service vehicles into the site is not supported.

It needs to be demonstrated that it is feasible for an articulated vehicle (AV) to reach this site. Swept path analysis (complying with Australian Standards) must be provided for assessment along the entire inbound and outbound travel path through the local road network form the State Roads. It is noted that a 14.5m long AV does not comply with AS2890.2:2018, which states that AVs typically have a length of 20m.

STP Comment:
Please refer to **Appendix 2** of the Updated Transport Impact Assessment.

Council Comment:
This proponent should consider providing an easement for vehicular access through the basement that benefits the properties of 181 Princes Highway and 7 Forest Road (including designing the basement to facilitate a future breakthrough). This will enable these sites to utilise this development's basement to achieve vehicular access to Eden Street (local road network) in their future re-development. Otherwise, when redeveloped, these sites will be forced to provide a driveway to the classified road network in a very poor location.

STP Comment:
The provision of an easement providing access to the properties at 181 Princes Highway and 7 Forest Road has been investigated and has been determined not feasible.

Council Comment:
The site is located within 800m of Arncliffe Station, which means that the RTA Guide to Traffic Generating Development Rates (Metropolitan Sub-Regional Centres) are applicable to the development, not the RDCP 2011 parking rates. The development provides residential "market" parking in accordance with this parking rate and is supported. The social housing dwellings are provided with car parking spaces that meet the requirements of the ARH SEPP, which is supported.

STP Comment:
Please refer to Section 4. Parking Considerations of the Updated Transport Impact Assessment.

Council Comment:
The Rockdale DCP 2011 bicycle parking rates are very low and outdated. The development should revise to provide an increased bicycle parking provision at a rate of 1 space per 2 dwellings as a sustainability measure. Bicycle parking should be provided for the non-residential component at a rate of 1 space per 150m^2 GFA, with suitable end of trip facilities.

Section 4.7 of the traffic report indicates that the development does not comply with the Rockdale DCP 2011 bicycle parking rate provision, because there is sufficient area in the residential storage cages for bicycles. The applicant's proposed use of the storage cages for bicycle parking is not supported. All bicycle parking spaces should be provided in a dedicated secured bicycle parking area (monitored by CCTV) and the bicycle parking spaces designed in accordance with AS2890.1.3:2015 for the applicable user class.

STP Comment:
Please refer to Section 4.7 Bicycle Parking of the Updated Transport Impact Assessment. Details regarding the storage requirements and capacity is to be provided by others under separate cover.

Council Comment:
The development is also required to provide car wash bays at a rate of 1 per 60 units, dimensioned 3.5m wide and bunded with all run-off going only to the sewer (Rockdale Technical Specification Stormwater Management section 7.5.5). It may be considered to have some car wash bays shared with visitor parking spaces.

STP Comment:
Please refer to Section 4.6.1 Car Wash of the Updated Transport Impact Assessment.

Council Comment:
The childcare parking spaces must be clearly shown on the plans. The parent pick-up / drop-off spaces are to be at least 2.6m wide and have separated access directly to the childcare facility (so that parents and children do not have to walk through the car parking aisle).

STP Comment:
Please refer to amended plans prepared by Group GSA and Section 5.1 Passenger Vehicle Parking Areas of the Updated Transport Impact Assessment.

Council Comment:

Providing retail parking at the Rockdale DCP 2011 rate is acceptable however, all 78 spaces need to be provided for use by retail visitors (not 66). Staff parking can be provided separately. The parking spaces for retail visitors will need to be secured via boom gate and have a limited timed period of free parking, to deter all day commuter / residential parking not associated with the retail component of the development.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 4.4 Retail Vehicular Parking Provision of the Updated Transport Impact Assessment.

Council Comment:

Car share spaces can only be provided internally within the development site, not on-street.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 4.6.2 Car Share of the Updated Transport Impact Assessment.

Council Comment:

The proposed loading & unloading provision within the loading dock (2 AV loading spaces, 1 Council waste collection bay and 3 MRV loading bays) is considered acceptable. However, the ability for loading / unloading to occur for residents in Towers A & B is questioned due to how far away the loading dock is from Towers A & B. To ameliorate this issue, a few van loading / unloading spaces could be provided in locations as close as possible to the lift lobby for Towers A & B within the basement.

STP Comment:

Please refer to amended plans prepared by Group GSA and Section 4.6.3 Service Vehicle Parking of the Updated Transport Impact Assessment.

Council Comment:

All waste must be able to be adequately transported up to the loading dock for collection within the loading dock, as on-street waste collection is not permitted, and bins are not permitted to be presented to the street for collection. A loading dock management plan is required to be provided.

STP Comment:

Please refer to Section 5.2 Service Vehicle Areas of the Updated Transport Impact Assessment. The preparation of a Loading Dock Management Plan may reasonably be imposed as a condition of consent.

Council Comment:

S9.4 Construction assumes all inbound construction traffic is from the south. This assessment is only acceptable if there is a restriction on all construction vehicles to only enter from certain streets.

STP Comment:

Please refer to Section 9.4 Construction Vehicle Transport Routes of the Updated Transport Impact Assessment. It is considered that all construction vehicles are to access the site as specified within the provided CTMP during CC Stage. Construction workers must comply with the transport routes as specified.

Council Comment:

The report identifies all materials from the site will be removed using the roads Eden Street / Forest Road / Wickham Street / West Botany Street / Marsh Street and finally the M5, but it does not describe how heavy vehicles will access the site. It appears the Traffic Assessment and CTMP are deliberately avoiding the access to this site as the only access to this site from the north will be via Princes Highway / Brodie Spark Drive / Arncliffe Street / Burrows Road, and finally, into Eden Street.

STP Comment:

Please refer to Section 9,4 Construction Vehicle Transport Routes of the Updated Transport Impact Assessment. It is considered that all construction vehicles are to access the site as specified within the provided CTMP during CC Stage. Construction workers must comply with the transport routes as specified.

Council Comment:

Construction vehicle access must be limited to entry and exit via Eden Street / Forest Road intersection or Burrows Road / Princes Highway intersection. No access to construction vehicles to Burrow Road west of Eden Street, Brodie Spark Drive and Arncliffe Street.

STP Comment:

This is acknowledged. Please refer to Section 9.4 Construction Vehicle Transport Routes of the Updated Transport Impact Assessment. It is considered that all construction vehicles are to access the site as specified within the provided CTMP during CC Stage. Construction workers must comply with the transport routes as specified.

Council Comment:

The CTMP also states all worker vehicles will be contained on site in the basement parking levels. This would not occur for at least 12 months while these lower parking levels are constructed.

The applicant must provide a Parking Management Plan for construction workers. The Parking Management Plan must consider parking away from the site and transport of workers to the site. The plan must reflect the number of workers at various stages of construction. The plan is not to rely on construction workers parking in nearby residential streets due to the impact on residential amenity in the adjoining area.

STP Comment:
Please refer to Section 9.5 Parking Control of the Updated Transport Impact Assessment. It is considered that the preparation of a Parking Management Plan may reasonably be imposed as a condition of consent during the CC stage of the development.

Council Comment:
The amount of car spaces equipped with electric vehicle (EV) charging facilities shall be increased to be a minimum of 20% of all proposed car parking spaces within the development (with the 20% being split proportionally between all uses in the development). The EV charging points shall be provided as 'Level 2' charging infrastructure with a power range of 7kW – 22kW, as defined by NSW Electric and Hybrid Vehicle Plan, Future Transport 2056. The designs and allocation of EV charging points is to comply with the following:

i. *Privately available spaces shall be designed with 'Level 2' slow charging points – single phase with 7kW power;*
ii. *Publicly available spaces shall be designed with 'Level 2' fast charging points – three-phase with 11-22kW power;*
iii. *The development shall provide either buried cables or cable trays sufficient to accommodate the electric circuitry to each car space required to provide EV charging points. Electrical load management requirements shall be identified, and it shall be confirmed that there is an adequate distribution board size provided for the electric vehicle charging point system;*
iv. *The loading dock of the development shall also implement an EV charging point suitable for an EV truck;*
v. *Nominated car share spaces operated by a commercial car share operator, car share spaces shall be provided at a rate of 1 space per 100 dwellings. These car share spaces shall be in a publicly accessible area within the development, and*
    - *Provision of residential bicycle parking at a rate of 1 space per 2 dwellings.*
    - *Provision of commercial bicycle parking (at a rate of 1 space per 150m^2 GFA) and appropriately designed end of trip facilities to match the scale of the development and bicycle parking provision*

STP Comment:
Please refer to Section 4.6 Other Vehicle Parking Provision of the Updated Transport Impact Assessment.

Council Comment:
Pedestrian movements across Forest Road from this site will significantly increase to Wardell Street and the school and Arncliffe Youth Centre with no safe pedestrian passage. Fencing is strongly recommended along the entire Forest Road frontage between Princes Highway and Firth Street to encourage vulnerable pedestrians to use traffic signals either at Princes Highway or Firth Street.

STP Comment:
Please refer to Section 8.4 Pedestrian Impacts of the Updated Transport Impact Assessment.

It would be appreciated if the Department of Planning, Industry and Environment could consider the additional information contained within and attached to this correspondence to assist in its ongoing assessment of the subject development application.

Submitted for your consideration.

Yours sincerely,



Morgan Stanbury
Director
Traffic Engineer

Enclosed:

1. STP submission dated 1 November 2021.
2. TfNSW correspondence dated 7 December 2021.
3. STP submission dated 21 December 2021.
4. TfNSW correspondence dated 25 January 2022.

ATTACHMENT 1

STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

1ST November, 2021

Transport for New South Wales
PO Box 793
Parramatta
NSW 2124

Attention: Brendan Pegg, Senior Land Use Planner

Your reference: SYD20/01395/04

Dear Sir,

SIDRA MODELLING ASSOCIATED WITH
PROPOSED MIXED-USE DEVELOPMENT AT
26 – 42 EDEN STREET AND
161 – 179 PRINCES HIGHWAY, ARNCLIFFE

Reference is made to your correspondence dated the 25 August 2021 which provided comments on SIDRA modelling previously completed for the proposed development at 26 – 42 Eden Street and 161 – 170 Princes Highway, Arncliffe. Additional comments were also provided by Transport for New South Wales (TfNSW) via an email received 12 October 2021 which is provided in **Attachment 1** of this letter.

Stanbury Traffic Planning was engaged by the applicant to review the comments and update the SIDRA modelling based on the comments contained within correspondence received by TfNSW.

As advised by TfNSW, the network previously analysed under isolated intersection operation was used to re-analyse the proposed development under the following scenarios:

- Existing Conditions;
- Scenario 1 – Post Development, no changes to road network;
- Scenario 2 – Post Development, new right turn signal phase from Princes Highway to Burrows Street;
- Scenario 3a – Post Development, new traffic signal control at the junction of Princes Highway to Allen Street, including a new right turn lane within the Highway servicing Allen Street and pedestrian crossings on all approaches; and
- Scenario 3b – Post Development, Scenario 3a, no pedestrian crossing on the southern Princes Highway approach.

401/380 Harris Street,
Pyrmont NSW 2009
info@stanburytraffic.com.au
www.stanburytraffic.com.au
ph : 02 8971 8314
abn : 23 613 111 916

Each of the abovementioned scenarios have been modelled using Sidra 9 and the models include updated model parameters based on the comments provided by TfNSW in the email received 12/10/21.

The previous modelling submitted to TfNSW was undertaken using isolated intersections. While no comments regarding this approach were provided by TfNSW, in order to provide a more robust assessment, the analysed intersections were analysed within two connected networks.

The purpose of the modelling was to compare the scenarios, to determine whether the introduction of a southbound right turn at Burrows Street or Allen Street provides overall less delay to the surrounding road network.

A summary of the modelling approach is provided in **Table 1**.

TABLE 1 SUMMARY OF MODELLING APPROACH AND KEY PARAMATERS	
Detail	**Adopted Modelling Parameters and Assumptions**
Getting Started	• The latest version of Sidra Intersection 9 (version 9.0.3.9771) was used. • The Level of Service method was set to RTA NSW;
Input	• Data was input for a 60-minute period with a maximum peak flow period of 30 minutes.
Geometry	• Geometry was reviewed from Nearmap, Google Street View, videos from traffic surveys and through observations from site inspections undertaken by this Practice; and • Short lanes and parking present on site and within the influence zone of the intersections were coded accordingly
Saturation Flow	• The default saturation flow was adopted for all lanes with the exception of the northbound and southbound right turn movements at Forest Road and Princes Highway which was increased to 2200 tcu/h based upon observations of the intersection operation and measured phase times.
Volumes	• Total vehicles were input with a value of 4% Heavy Vehicles and 1% Large Trucks for all movements; • A peak flow factor of 95% was adopted for all vehicle movements; • Pedestrian volumes were counted for the busiest intersection for pedestrians within the study area (Princes Highway / Brodie Spark Drive) and added to the network; and • Other intersections within the network were reviewed via the survey videos; however, the default number of pedestrians were kept within the model as they appeared to be higher than the observed number of pedestrians.
Movement Data	• Approach and exit speed were updated as per the posted speed limit signs observed, including the school zone within Forest Road to the west of Princes Highway during the AM peak hour and the 40km/h high pedestrian activity zone within Brodie Spark Drive and Firth Street during all peak periods; and • SIDRA default arrival types were applied to all other movements with the exception of the following movements: • All scenarios - South approach of Princes Highway / Brodie Spark Drive during the AM peak hour and the north approach during the PM peak hour, arrival type 4 for through movements; • All scenarios - South approach of Princes Highway /Forest road during the AM peak hour, arrival type 4 for through movements; • All scenarios - West approach of Forest Road / Firth Road during the AM peak hour, arrival type 4 for through movements; • For Existing and Scenario 1-2 – North approach of Princes Highway / Burrows Street during the PM peak hour, arrival type 4 for through movements; and • For Scenario 3a and 3b – North approach of Princes Highway / Allen Street during the PM peak hour, arrival type 4 for through movements.
Priorities	• Priority was given to pedestrian crossing over the turning movements for the signalised intersections and at the zebra crossing where they existed.

TABLE 1 CONTINUED SUMMARY OF MODELLING APPROACH AND KEY PARAMATERS	
Detail	**Adopted modelling parameters and assumptions**
Gap Acceptance	• The Sidra default gap acceptance values were adopted with the exception of: • Intersection of Forest Road / Eden Street – south and north approach, critical gaps for through and right turn movements during the all peak hours were reduced to 5 seconds to reflect observed delays.
Pedestrians	• Pedestrian crossing distances were measured utilising aerial images via Nearmap and input into the model for all signalized pedestrian crossings; and • A pedestrian crossing speed of 1.2 m/sec was adopted for all sites.
Phasing and Timing	• Based on information provided by TfNSW all intersections were set to a user-given cycle time of 140 seconds for all scenarios; and • The phase times were determined by Sidra.
Model Settings	• Default parameters used.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 2** (being the TfNSW NSW method of calculation of Level of Service).

TABLE 2 LEVEL OF SERVICE CRITERIA FOR SIGNALISED INTERSECTIONS, ROUNDABOUTS AND PRIORITY CONTROLLED JUNCTIONS			
Level of Service	**Average Delay per Vehicle (secs/veh)**	**Traffic Signals, Roundabout**	**Give Way and Stop Signs**
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory
D	43 to 56	Operating near capacity	Near capacity
E	57 to 70	At capacity; at signals, incidents will cause excessive delays At roundabouts, another control mode required	At capacity and requires other control mode
F	> 70	Extra capacity required	Unsatisfactory and requires other control mode

To estimate the future southbound right turn volume from Princes Highway to Burrows Street or Allen Street the following methodology was followed:

- Development traffic was distributed to the surrounding road network based on a review of existing traffic patterns, anticipated development access routes and census journey to work data which was determined by AECOM's Arncliffe and Banksia Priority Precincts Strategic Transport Plan.

- For Scenario 2, involving the introduction of a southbound right turn into Burrows Street, the volume of development traffic utlising the right turn to access Burrows Street was estimated

to be 21 during the weekday AM peak hour, 55 during the weekday PM peak hour and 55 during the Saturday midday peak hour;

- For Scenario 3, involving the introduction of a southbound right turn into Allen Street, the volume of development traffic utlising the right turn to access Allen Street was estimated to be 26 during the weekday AM peak hour, 68 during the weekday PM peak hour and 68 during the Saturday midday peak hour;

- It is accordingly expected that there could be redistribution of traffic in the area with the introduction of a new right turn to the road network (being at either Burrows Street or Allen Street) as there are currently limited opportunities for southbound vehicles to turn right from Princes Highway. Therefore, to understand the potential operation of the two scenarios, an estimation of the volume of non-development vehicles turning right at either Burrows Street or Allen Street has been provided. In order to provide this estimation, this Practice reviewed in particular the intersection of Allen Street / Arncliffe Street.

- Based upon existing traffic volumes and the existing road network, it was estimated that there was a relatively high percentage of southbound vehicles on Princes Highway that had turned right at Brodie Spark Drive that continue to travel along Arncliffe Street, then turn right onto Allen Street in order to ultimately access Wollongong Road. Based on this assessment, it was estimated that 40% of the vehicles that currently utilise Brodie Spark Drove to access Wollongong Road (and beyond) via a southbound right turn at the intersection of Arncliffe Street and Allen Street, could transfer to either Burrows Street or Allen Street with the introduction of Scenario 2 and 3, respectively. This was estimated to be 61 vehicles during the AM peak hour, 150 vehicles during the weekday PM peak hour and 118 vehicles during the Saturday midday peak hour.

- This Practice also acknowledged that a percentage of existing vehicles wishing to access Wollongong Road and areas to the west of the rail line via a right turn from Princes Highway onto Forest Road and a right turn onto Firth Street, will transfer to Burrows Street / Allen Street with the introduction of Scenario 2 and 3, respectively. Therefore, this Practice has reviewed the percentage of westbound right turning traffic from Forest Road into Firth Street that originated from Princes Highway in order to determine the vehicles that had taken the route involving a right turn from Princes Highway onto Forest Road and then turning right into Firth Street.

- Once the percentage of westbound traffic within Forest Road that had previously turned right from Princes Highway was determined, it was estimated that 50% of that traffic could transfer to turn right at either Burrows Street or Allen Street instead of turning right from Princes Highway into Forest Road. This was estimated to be 13 vehicles during the AM peak hour, 27 vehicles during the weekday PM peak hour and 20 vehicles during the Saturday midday peak hour.

- Scenario 3 involves the introduction of a right turn from Allen Street to Princes Highway. To account for the volume of traffic that could utilise this right turn to access Princes Highway, it has been assume that 50% of the traffic that currently turns right at Burrows Street to access Princes Highway is to be transferred to Allen Street. This was estimated to be 60 vehicles during the AM peak hour, 86 vehicles during the weekday PM peak hour and 102 vehicles during the Saturday midday peak hour.

The estimated post development traffic volumes have been modelled utilising the peak hour traffic volumes presented within **Attachment 2** of this letter.

Each of the comments provided by TfNSW in the letter dated 25 August 2021 and 12 October 2021 has been reproduced including this Practice's response within **Tables 3** to **5** contained within the following pages.

As previously mentioned, the intersections included in this assessment were previously modelled as individual intersections. Modelling for the updated assessment was completed using two network models which are shown in **Figures 1** and **Figure 2**.

FIGURE 1: NORTH NETWORK

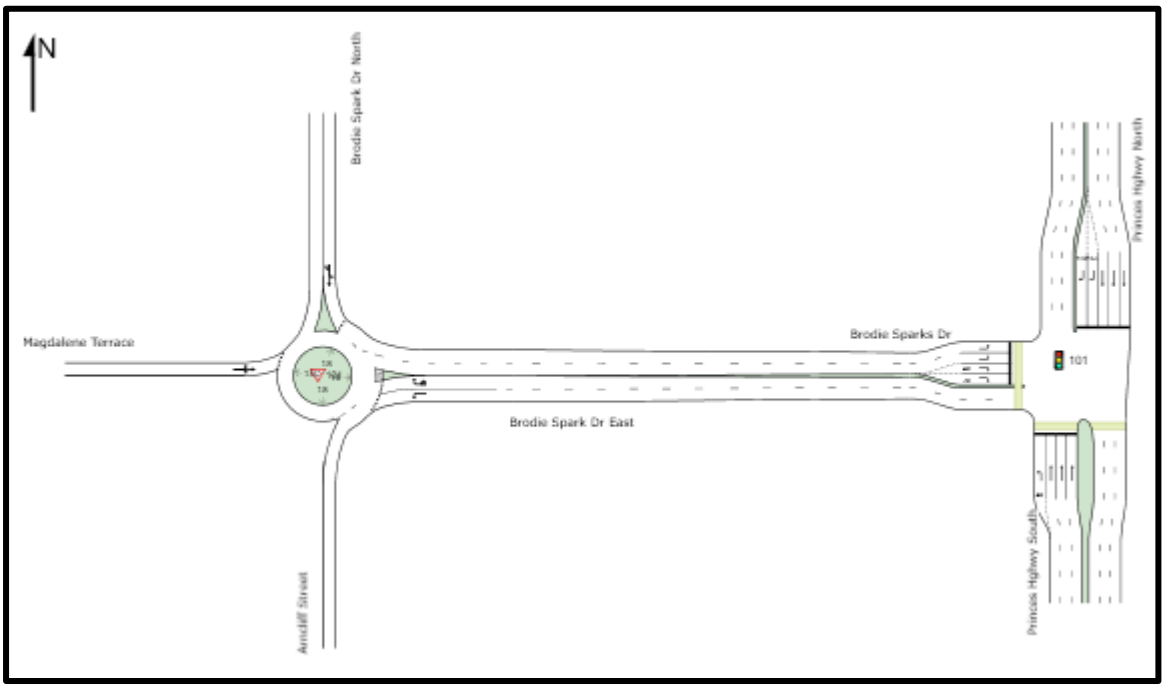


Figure 1 displays that the North Network contains the following intersections:

- Princes Highway / Brodie Spark Drive; and
- Brodie Spark Drive / Magdalene Terrace / Arncliffe Street.

FIGURE 2: SOUTH NETWORK

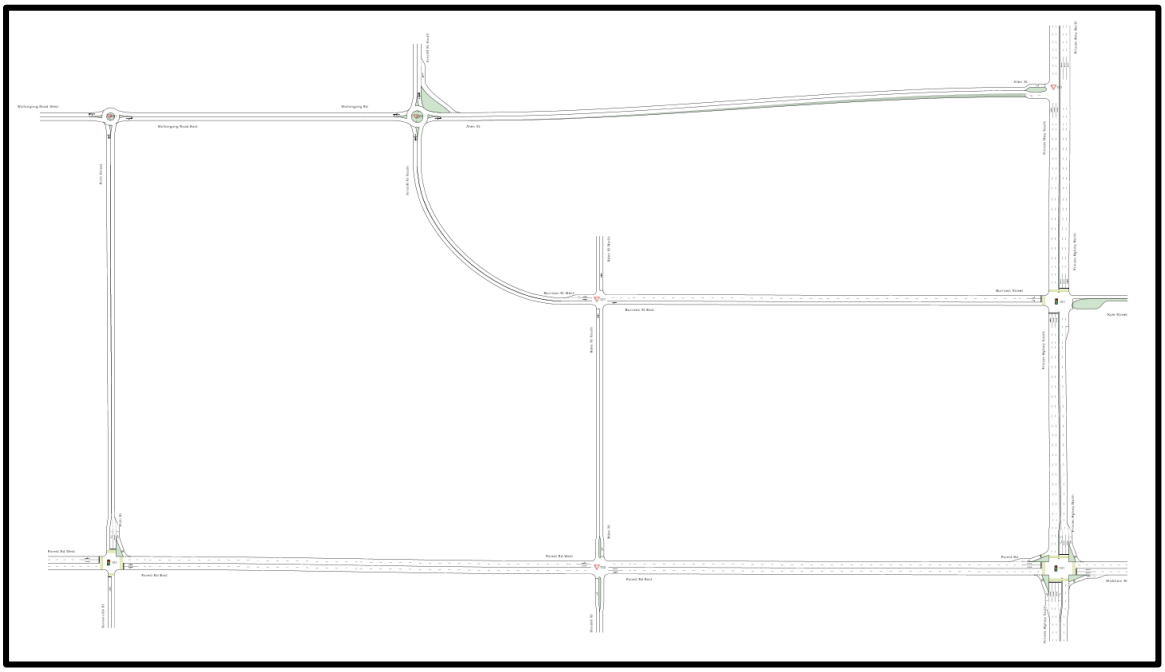


Figure 2 displays that the South Network contains the following intersections:

- Princes Highway / Allen Street;
- Princes Highway / Burrows Street / Kyle Street;
- Princes Highway / Forest Road / Wickham Street;
- Forest Road / Eden Street / Wardell Street;
- Forest Road / Firth Street / Somerville Street;
- Allen Street / Arncliffe Street / Wollongong Road;
- Burrows Street / Eden Street; and
- Firth Street / Wollongong Road.

The layout of the proposed right turn at Burrows Street and Allen Street was based on concept plans previously prepared by the Applicant and presented to TfNSW. The high-level concept plans are provided in **Attachment 3** of this letter.

TFNSW'S COMMENTS AND ASSOCIATED RESPONSES

TABLE 3: GENERAL COMMENTS	
TfNSW Comment	**STP Response**
"Comment: *After review of the SIDRA modelling files, TfNSW has identified some potential impacts to the surrounding classified road network, including the Motorway but also the local road networks.* *Recommendation:* *TfNSW advises that the applicant should consider assessing whether signalising the intersection of Princes Highway / Allen Street would mitigate the impacts to the surrounding classified and local road networks, impacting accessibility to the site.* *Allen Street provides east / west connectivity between Princes Highway and the larger Arncliffe / Turrella residential / retail / industrial precincts i.e. railway underpass. This would enhance safe connectivity for pedestrians in the precinct and would contribute to supporting active transport in the area.* *As such, TfNSW recommends the applicant models this in SIDRA and provides the electronic copy to TfNSW for review and comment as part of the 'Response to Submissions'."*	Noted Noted, this has been completed and is reported later in this letter, with the additional scenario of the introduction of a right turn signal phase at the intersection of Princes Highway and Burrows Street as discussed separately with TfNSW
"Comment: *TfNSW supports Left-in, left-out (LILO) arrangement at the intersection Forest Road and Eden Street, however notes that there is not sufficient space for a median island on Forest Road.* *Recommendation:* *It is recommended to redesign the existing island on Eden Street to reinforce LILO arrangement. As Eden Street is under the care and control of Council, any mitigation works shall be to the satisfaction of Council.* *As there is no sufficient width for median Island on Forest Road, consideration should be given to the redesign of the existing island on site road and appropriate signposting to enforce LILO movements only."*	This has been addressed in a separate letter dated 01/11/21 provided to Bayside Council.
"Comment: *TfNSW has reviewed the plans and notes that the vehicular access to the proposed development is via Eden Street (local road network), which is support by TfNSW.* *It should be noted that there is several redundant vehicle crossovers that will need to be replaced with kerb and guttering to match existing on the Princes Highway frontage of the development.* *Recommendation:* *The applicant will need to obtain concurrence under section 138 of the roads Act 1993 from TfNSW separate to this application for these civil works and will need to enter into a Works Zone Authorisation Deed with TfNSW."*	Noted.

TABLE 3 CONTINUED: GENERAL COMMENTS	
TfNSW Comment	**STP Response**
"Comment: *TfNSW supports the proposed upgrades to the surrounding footways of the proposed development on the local road network to improve pedestrian and cyclist connectivity to the Arncliffe Transport Interchange.* *Recommendation:* *The developed option should be discussed with Council and TfNSW."*	Noted. Discussions with Council are ongoing.
"Comment: *Details of the proposed number of car and bicycle parking spaces and compliance with appropriate parking codes and justification for the level of car parking provided on the development site should be provide as per Council's requirements."*	Noted.

"Comment:
TfNSW has reviewed the Green Travel Plan (GTP) and has a number of recommendation to improve the GTP and proposed initiates to encourage sustainable transport to the site. TfNSW would welcome further discussions with the proponent regarding these matters to ensure their delivery and can be contacted directly at development.sco@transport.nsw.gov.au.
 	
Recommendation:
Prior to occupancy, the proponent is to provide a Green Travel Plan for TfNSW's consideration that:
• *Details the number and location of end of trip facilities for staff and casual bicycle parking for retail and visitors, and what other resources will be available for cyclists (bike stand, pumps, tools and spare tubes for example)*
• *Provides a communication strategy and an updates TAG which includes*
  ○ *A map of the site with access points, active transport paths, bike parking and EOT facilities*
  ○ *Recommended walking/cycling routes to key destinations nearby e.g. the airport, local shops*
• *Clarifies what will be provided as part of the "Establish a bicycle pool initiative" and what is meant by "School community inductions"; and whether the proponent is considering partnering with local schools to achieve this.*
• *Considers including real time information as part of the common area displays*
	Noted.

TABLE 4: SIDRA DEFAULT VALUE CHECKLIST	
TfNSW Comment	**Stanbury Traffic Planning Response**
Grades *"Correct grades affect adjusted saturation flow calculations."*	This has been updated in the model.
Pedestrians *"Minimum Walk Time needs review."* *"Clearance Times needs review."*	This Practice contacted TfNSW to provide more information however no information was provided in time. Based on this, the default values were used.
"Pedestrian Volumes correct volumes are preferred."	Pedestrian volumes were counted for the busiest intersection for pedestrians within the study area (being Princes Highway / Brodie Spark Drive) and included in the model. Other intersections within the network were reviewed via the survey videos; however, the default number of pedestrians were kept within the model as they appeared to be higher than the observed number of pedestrians.

TABLE 5: MODEL SETUP CHECKLIST	
TfNSW Comment	**Stanbury Traffic Planning Response**
Crossing Distance Distances are incorrect. Recommend entering the distance manually	All pedestrian crossings were input manually.
Minimum Walk Times Pedestrian minimum times are less than SCATS	This Practice contacted TfNSW regarding model inputs but did not hear back in time and as such the default values were used for all models.
Large Trucks Princes Hwy would see vehicles over the default SIDRA heavy vehicle length of 10m. Switch on 'Large Truck' user class and allocate a small/reasonable percentage of the heavy vehicle volume. *Custom User Class* Turn on Large Vehicles	The previous modelling included 5% heavy vehicles. The models have been updated to include 1% large trucks and 4% heavy based on TfNSW comments. It is noted that the Sidra default 'heavy vehicle' value already includes an average heavy vehicle based on the following: • 42% light/medium rigid trucks; • 10% medium rigid trucks; • 3% heavy trucks; • 19% heavy articulated trucks; and • 15% buses. The addition of a further 1% heavy vehicles is considered a conservative assessment.
Pedestrian Protection Need 8s for left into Burrows.	Updated for all models.
Approach and Exit Cruise Speeds Side street speeds have not been set	Updated for all models.
Queue Space and Vehicle Length for Heavy Vehicles Check vehicle length for Large Vehicles is reasonable	Updated for all models.
Maximum Green Times Maximum side street splits are OK. However, with the addition of the RT movement/new phase 30s is taken from citybound vehicles in the AM and 40s in the PM.	Noted
Late Starts 2s late start for Burrows in B phase.	Updated for all models.
Phase Sequence M5 should run A, C, B sequence	Noted
Red Time Burrows red time should be increased to 3s	Updated for all models.
User Given Cycle Time Existing and future scenarios switch between 130 and 140s. Use 140s for all.	Updated for all models.
Common signal controllers *No information provided by TfNSW*	This Practice requested information from TfNSW however no information was provided in time.

SUMMARY OF RESULTS

A summary of the Level of Service (Los) for each intersection on the classified road network for each scenario is provided within in **Table 6 to Table 8**.

TABLE 6 WEEKDAY AM LoS RESULTS					
INTERSECTION	**Scenario**				
	Ex	**1**	**2**	**3a**	**3b**
Princes Highway / Brodie Spark Drive	B	B	B	B	
Princes Highway / Allen Street	B	B	B	B	B
Princes Highway / Burrows Street	A	A	A	A	A
Princes Highway / Forest Road / Wickham Street	F	F	F	F	F
Forest Road / Eden Street / Wardell Street	F	A	A	A	A
Forest Road / Firth Road / Somerville Street	C	D	D	D	D

Table 6 indicates no change to the modelled intersection Level of Service during the weekday AM peak hour except at the intersection of Forest Road / Firth Road / Somerville Street which changes from LoS C to LoS D under all modelled scenarios.

TABLE 7 WEEKDAY PM 2 LoS RESULTS					
INTERSECTION	**Scenario**				
	Ex	**1**	**2**	**3a**	**3b**
Princes Highway / Brodie Spark Drive	B	B	B	B	
Princes Highway / Allen Street	A	A	A	E	B
Princes Highway / Burrows Street	F	F	F	F	F
Princes Highway / Forest Road / Wickham Street	F	F	F	F	F
Forest Road / Eden Street / Wardell Street	F	B	B	A	A
Forest Road / Firth Road / Somerville Street	C	C	C	C	C

Table 7 indicates that under Scenario 3a, the proposed southbound right turn at Allen Street results in the intersection operating at LoS E. Under Scenario 3b, the removal of the pedestrian crossing on the southern approach results in the intersection operating at LoS B.

The previous modelling provided to TfNSW which was undertaken using isolated intersections identified the intersection of Princes Highway / Burrows Street as LoS A. **Table 7** indicates that the updated modelling indicates that Princes Highway / Burrows Street currently operates at LoS F and would continue to do so under each of the modelled scenarios.

TABLE 8 WEEKEND MIDDAY LoS RESULTS					
INTERSECTION	**Scenario**				
	Ex	**1**	**2**	**3a**	**3b**
Princes Highway / Brodie Spark Drive	B	B	B	B	
Princes Highway / Allen Street	A	A	A	C	C
Princes Highway / Burrows Street	C	B	B	B	B
Princes Highway / Forest Road / Wickham Street	C	D	D	C	C
Forest Road / Eden Street / Wardell Street	E	A	A	A	A
Forest Road / Firth Road / Somerville Street	B	B	B	B	B

Table 8 indicates that there are no major differences between the modelled levels of service between all scenarios.

Whilst not specifically identified within total intersection LoS output presented within **Tables 6**, **7** and **8**, detailed review of the SIDRA output indicates that Scenarios 2 and 3 are expected to improve the operational performance of the Princes Highway intersections with Brodie Spark Drive and Forest Road / Wickham Street, whereby right turn demands from the Highway are expected to be reduced.

The analysis has indicated that the weekday PM peak hour is the critical modelling hour that needs to be investigated in order to determine the best option for the road network based on the additional proposed development traffic.

A summary of the average network travel speed and vehicle travel speeds on modelled routes northbound and southbound along Princes Highway within the modelled network for each scenario is provided within **Table 9** and **Table 10** which compare the following statistics:

- Route travel speed – the average travel speed for all vehicles within the routes input into the South Network which include:
    - Northbound along Princes Highway during the weekday AM peak hour and Saturday midday peak hour;
    - Southbound along Princes Highway during the weekday PM peak hour and Saturday midday peak hour; and
- Network travel speed – the average travel speed for all vehicles within the two modelled networks.

TABLE 9 NETWORK SOUTH – MODELLED ROUTE AVERAGE TRAVEL SPEED RESULTS (KM/H)						
PEAK HOUR	**ROUTE DIRECTION**	**Scenario**				
		Ex	**1**	**2**	**3a**	**3b**
Weekday AM	Northbound	45.7	45.2	44.1	41.7	41.7
Weekday PM	Southbound	16.9	14.7	13.9	16.4	18.5
Saturday Midday	Northbound	37.2	38.4	35.0	28.7	28.7
	Southbound	42.2	45.3	46.4	41.2	41.2

Table 9 indicates the following:

- During the weekday AM peak hour, Scenario 1 followed by Scenario 2 provide the fastest overall network performance.

- During the weekday PM peak hour, Scenario 3b provides the fastest overall network performance. Compared to Scenario 3a, the removal of the southern pedestrian crossing results in an average travel speed increase along the southbound route of 2.1km/h.

- On a Saturday, the fastest travel time is Scenario 2.

TABLE 10 NETWORK SOUTH - AVERAGE TRAVEL SPEED FOR ALL VEHICLES (KM/H)					
PEAK HOUR	Scenario				
	Ex	1	2	3a	3b
Weekday AM	30.7	29.7	29.8	29.4	29.4
Weekday PM	23.3	20.8	20.2	22.1	23.2
Saturday Midday	36.9	36.9	36.0	33.0	33.0

Table 10 indicates in two out of the three modelled networks, Scenario 2 performed better with the proposed right turn at Burrows Street than the proposed right turn at Allen Street. During the weekday PM peak hour, Scenario 3b performed the best with an average network speed 3km/h faster than Scenario 2.

During the Saturday midday peak hour, Scenario 1 performed the best with Scenario 2 performing the best when looking at the right turn options.

CONCLUDING STATEMENT

Due to the impacts of COVID-19, people now have the ability to delay, defer or remove their trips which did not exist in the past. The improvements to online delivery and working at home that have occurred in the past two years have seen a step-change in how people approach work, shopping and travelling across Sydney.

Businesses that had not previously thought of working at home were forced to innovate and this is likely to change how people in Arncliffe will work, live and play in the future. Most importantly it also provides, for example, the ability for many people currently driving along Princes Highway or Forest Road through Arncliffe to delay their trip so that they don't have to drive in the peak hour. This ability is envisaged to impact traffic patterns across Greater Sydney into the future.

There is already a signalised intersection at the Princes Highway / Burrows Street. The introduction of a right turn movement at this intersection was shown to perform best out of the right turn options (Scenario 2, 3a and 3b) for the weekday AM and Saturday peak hours.

The reason that the right turn performs best at Burrows Street in two out of the three modelled time periods is that the introduction of another set of signals at Allen Street was shown to have an overall worse affect is because it would be another stopping point on Princes Highway that does not currently exist. The introduction of a right turn movement at Burrows Street is already at a place where vehicles stop and as there is no pedestrian crossing on the southern approach, which means that the right turn movements can run with the through movements on Princes Highway.

The new right turn movement performed best during the weekday PM peak hour. More detailed signal analysis would be required to determine the best offsets between intersections, however based on the modelling undertaken, a right turn at Burrows Street post development performed best for two out of the three modelled peak hours.

It would be appreciated if TfNSW could review the additional information contained within and attached to this correspondence and the SIDRA modelling files to assist in its ongoing assessment of the subject development application as soon as possible.

A link to the Sidra files is provided
https://drive.google.com/file/d/11jQSM0EYKEgNVujeU5vnod17p7QG9PIk/view?usp=sharing.

If you have any questions during the assessment, please do not hesitate to contact me.

Submitted for your consideration.

Yours sincerely,



Morgan Stanbury
Director
Traffic Engineer

APPENDIX 1

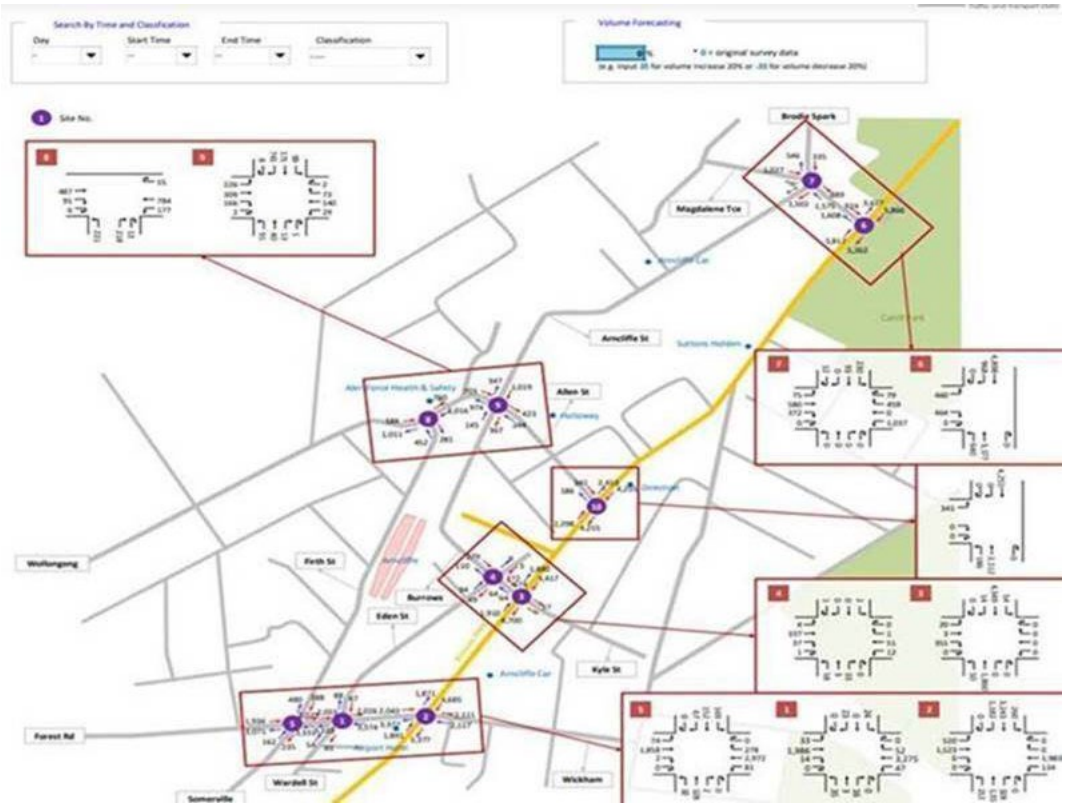
From: Divna Cvetojevic
To: Matthew Houlden
Subject: FW: TfNSW Advise - SYD20/01395/04 - Additional Background Info and Meeting request
Date: Tuesday, 12 October 2021 10:56:49 AM
Attachments: image002.png
image003.png
Eden Street Development - SIDRA Checklist.pdf

Hi Matt

As per our conversation, based on the previous modelling submitted to TfNSW for the subject development and our teams assessment of the current and future corridor performance, concerns have been raised in relation to the required capacity of the right turn bay to accommodate right turn movements into Burrows Street, in proximity to the intersection Princes Highway / M5 Motorway and extent of the queue on Princes Highway.

I attached for you the summary of the TfNSW initial comments on the submitted model, we discussed at the meeting, and could you please review the model, amend accordingly and undertake additional modelling for the required improvements at the intersection Allan Street / Princes Hwy to accommodate generating flow from the development, creating access to the development area at that location and ensuring safe pedestrian and vehicle movements (please note, figures in your table below are coming from the non-calibrated model).

The extents of the model previously undertaken for the solution of upgrade of the intersection Princes Highway / Burrows Street – extracted below, are sufficient to the needs of the future modelling exercise, including improvements at the intersection Allan Street / Princes Highway.
The same intersections should be included in your future works:



In relation to the required future modelling, TfNSW can obtain the required traffic data and please find

enclosed email address: SCATS.Traffic.Signal.Data@transport.nsw.gov.au

Upon receiving the electronic copy of the modelling undertaken, TfNSW will be able to review and advise on any appropriate amelioration.

Please contact me if any question or additional information are required.

Thank you
Regards

Divna Cvetojevic
Development Assessment Officer
Planning and Programs
Greater Sydney
Transport for NSW

M 0455 515 259
Level 6, 27 Argyle Street, Parramatta NSW2150

From: Matthew Houlden <matthew@stanburytraffic.com.au>
Sent: Tuesday, 21 September 2021 1:31 PM
To: development.sydney@transport.nsw.gov.au
Cc: 'Divna Cvetojevic' <Divna.Cvetojevic@transport.nsw.gov.au>
Subject: RE: TfNSW Advise - SYD20/01395/04 - Additional Background Info and Meeting request

Hi Divna,
Thank you very much for the conversation and information you provided the other day. The email for traffic volume data will be very useful for this and other projects to obtain traffic data for the whole industry.
I just wanted to check a couple of things after going back to our report following our discussion. This Development Application only proposes minor additional right turn demands from existing intersection from Princes Highway. There is a concurrent Planning Proposal for the site which has the potential to generate considerably greater right turn demands from the Highway however that is completely separate to this Development Application, which is fully compliant with the current LEP zoning.
There aren't any intersection upgrades in the current Section 94 (7.11 plan) for the southbound right turn from Princes Highway at either Burrows Street or Allen Street.
The existing and proposed Sidra results at the intersection of Burrows Street are summarised in Table 1.

Peak Period	**Queue on the North Approach at Princes Highway / Burrows Street**	
	Existing	**Post Development**
AM	30.0m	30.9m
PM	140.0m	142.3m
Saturday	64.4m	65.8m

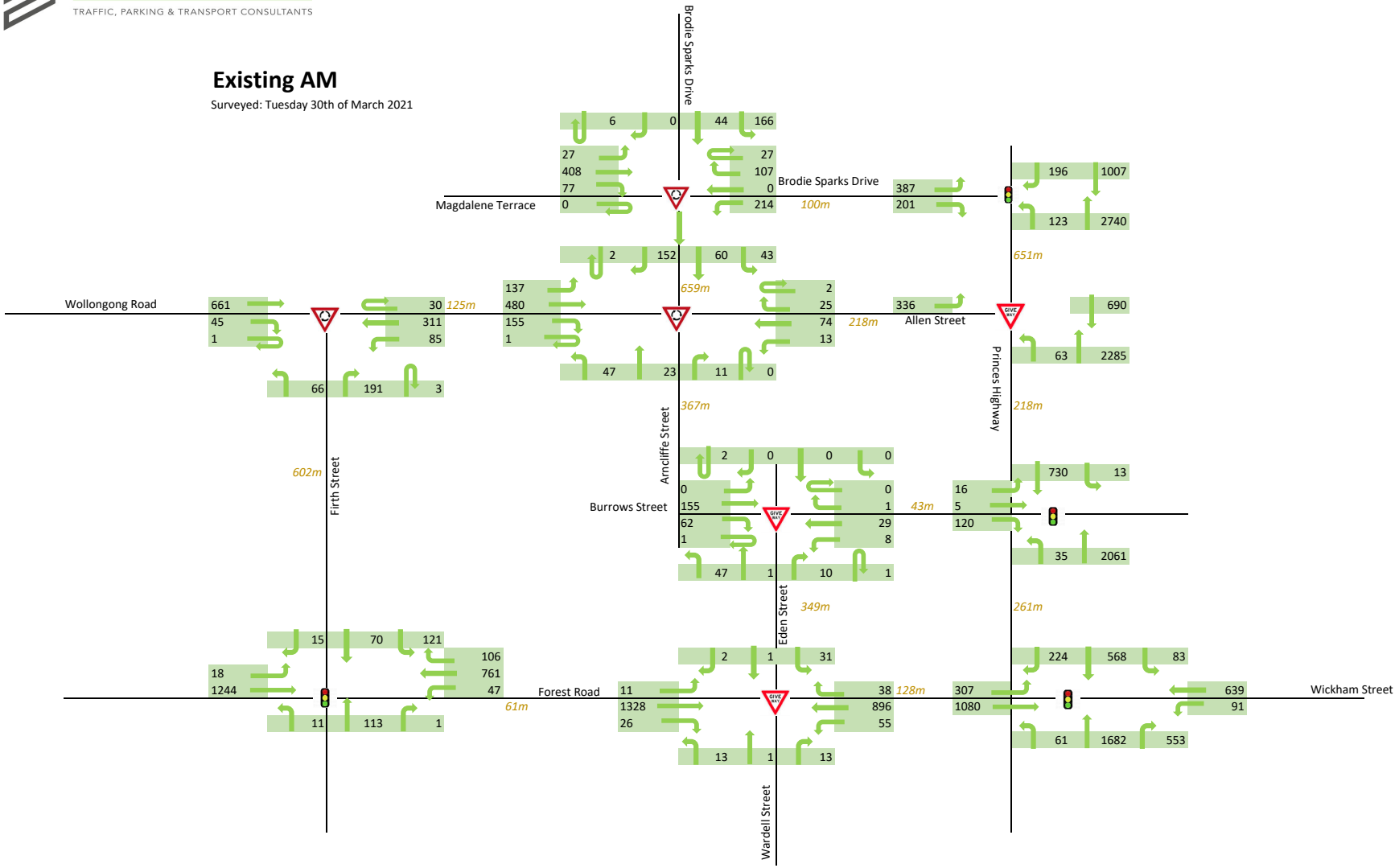
I just wanted to clarify whether this was the queueing that was of concern to TfNSW on the northern approach of Burrows Street across the M5 Motorway specifically as part of this Development Application assessment?
Kind regards,
Matthew Houlden

APPENDIX 2

STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

Existing AM

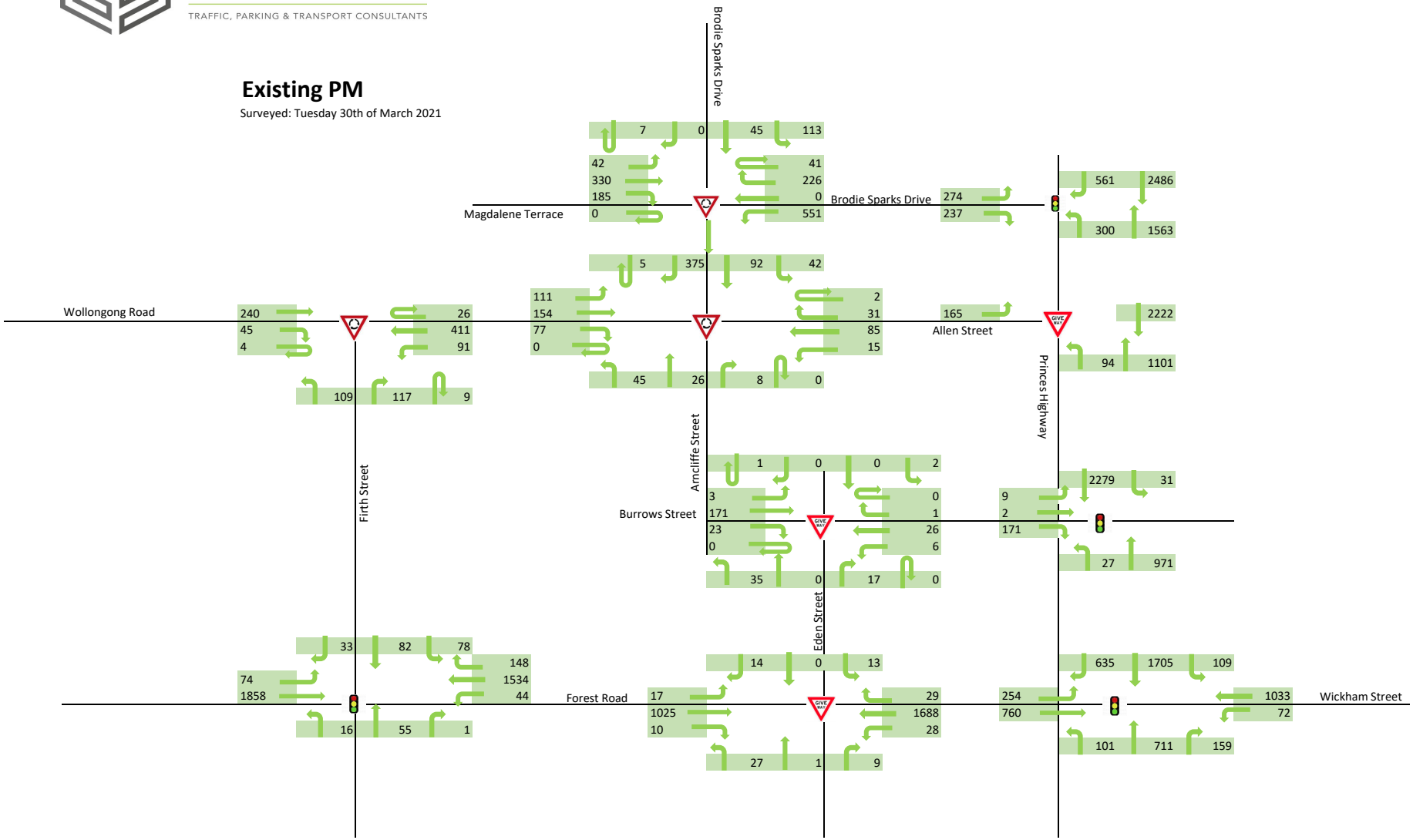
Surveyed: Tuesday 30th of March 2021



STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

Existing PM

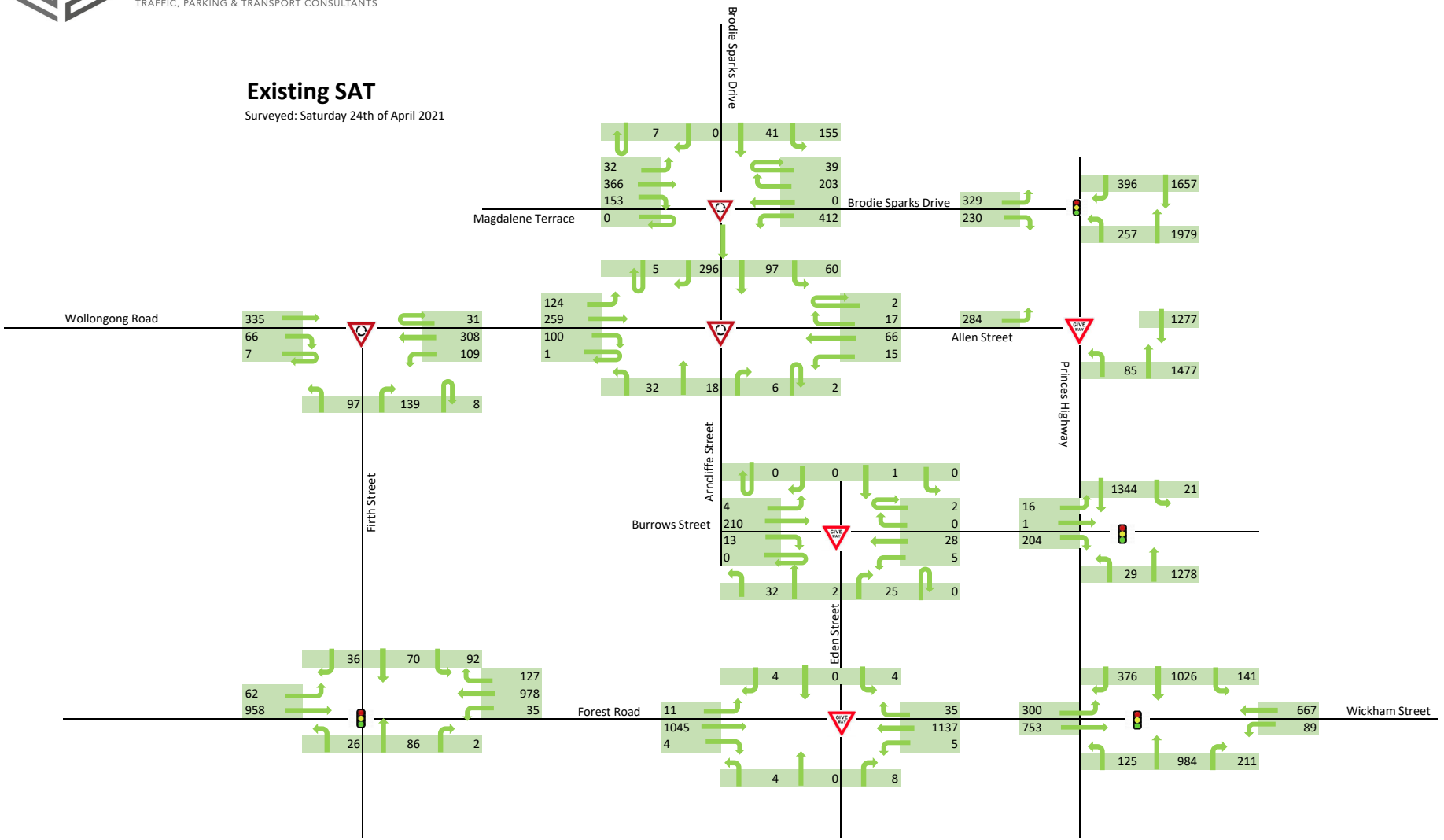
Surveyed: Tuesday 30th of March 2021



STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

Existing SAT

Surveyed: Saturday 24th of April 2021



STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

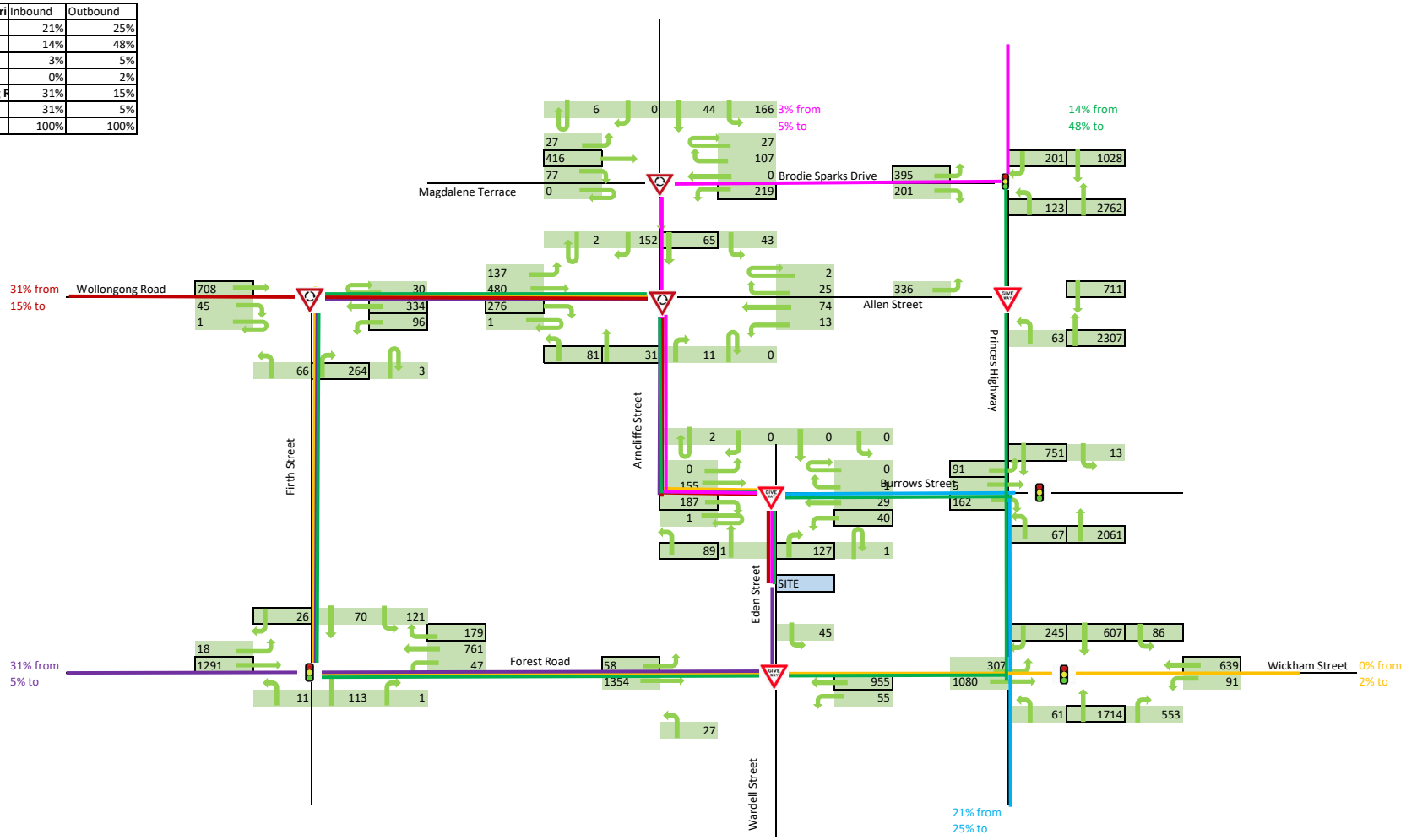
AM Traffic **Scenario 1 - no change**

Total traffic generation **309**

Inbound **153**

Outbound **156**

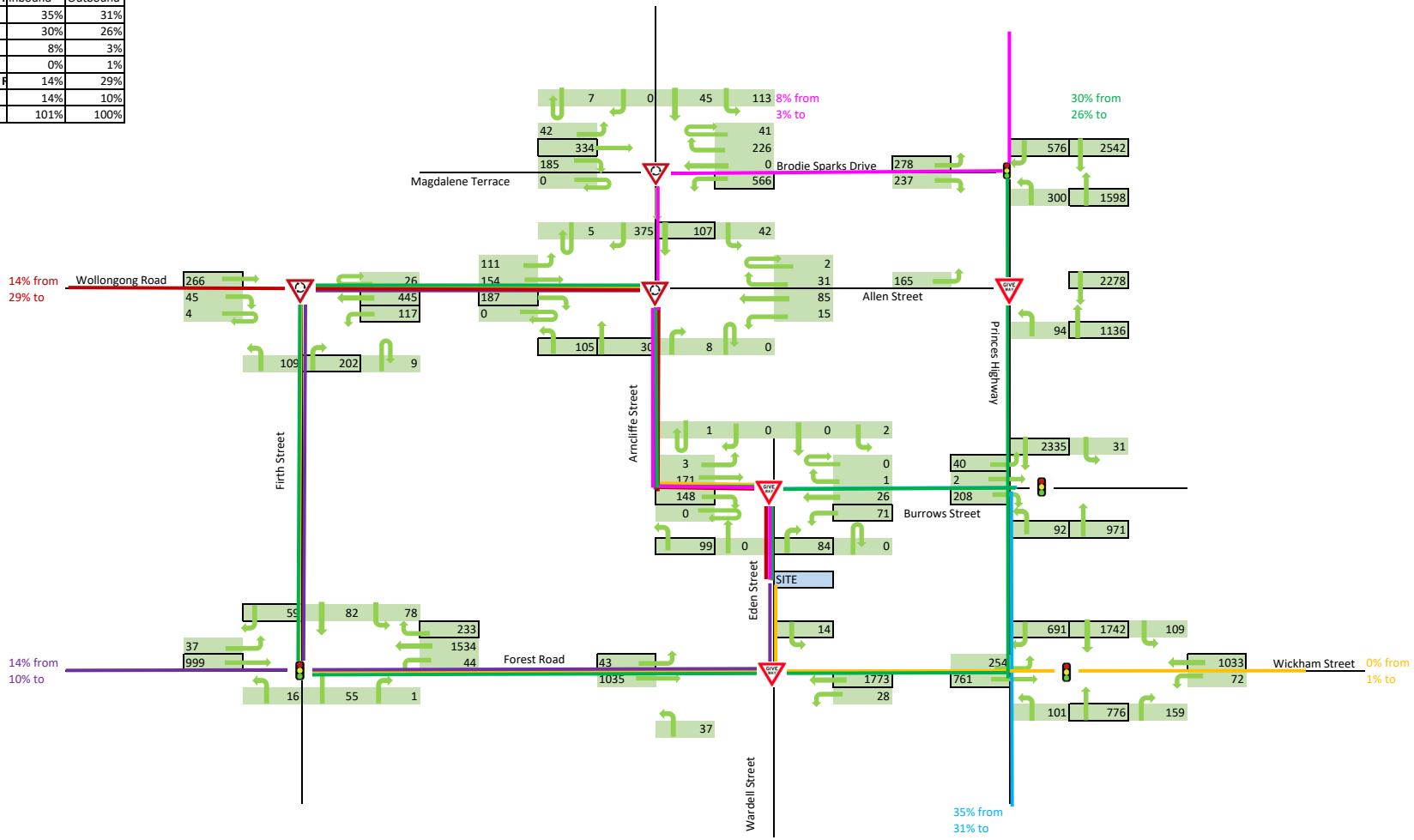
Development Traffic Distri	Inbound	Outbound
South (Princes Hwy)	21%	25%
North (Princes Hwy)	14%	48%
North (Arncliffe St)	3%	5%
East (Wickham St)	0%	2%
North-West (Wollongong F	31%	15%
West (Forst Road)	31%	5%
	100%	100%



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

PM Traffic **Scenario 1 - no change**
Total traffic generation **303**
Inbound **185**
Outbound **118**

Development Traffic Distri	Inbound	Outbound
South (Princes Hwy)	35%	31%
North (Princes Hwy)	30%	26%
North (Arncliffe St)	8%	3%
East (Wickham St)	0%	1%
North-West (Wollongong F	14%	29%
West (Forst Road)	14%	10%
	101%	100%

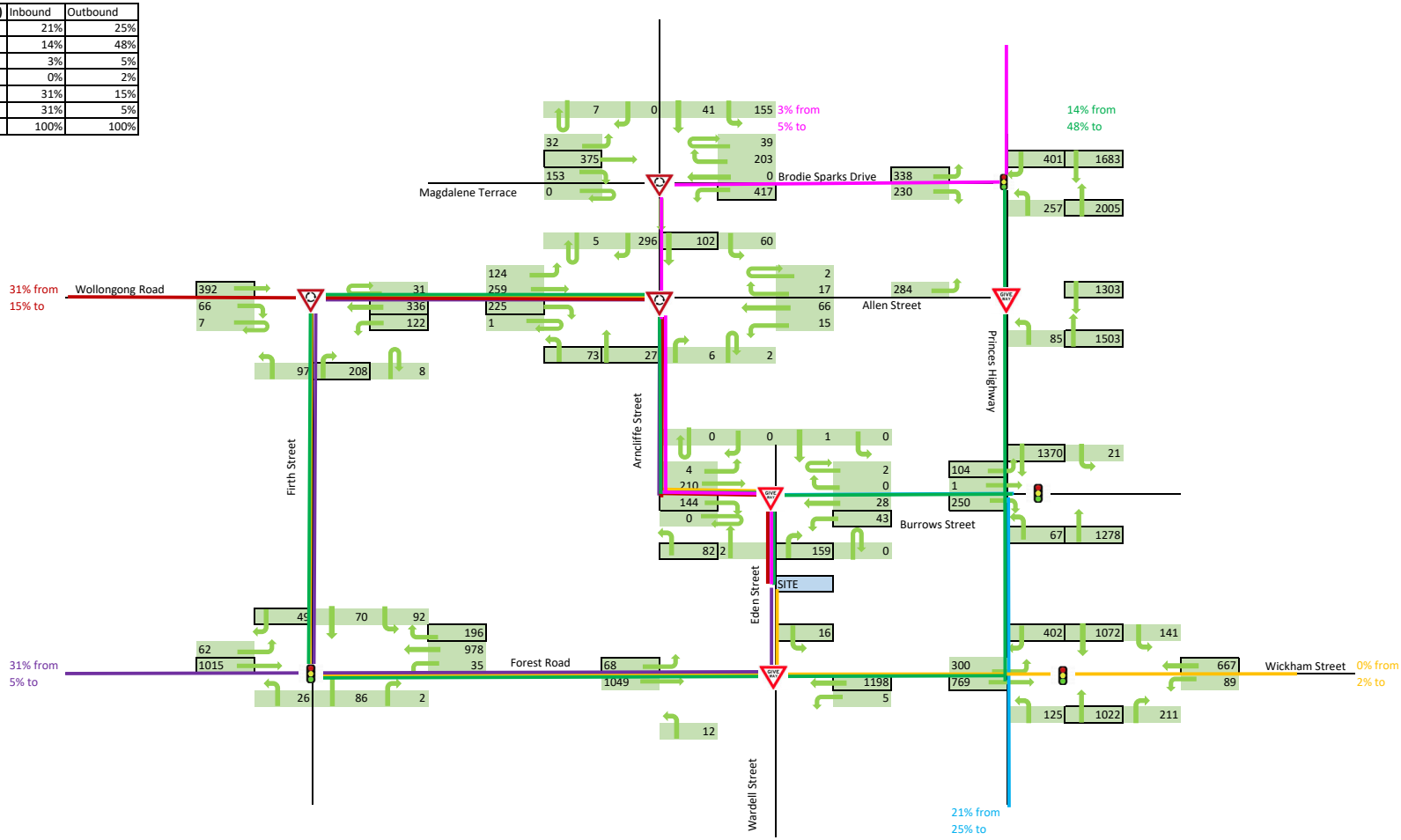


STANBURY TRAFFIC PLANNING

TRAFFIC, PARKING & TRANSPORT CONSULTANTS

SAT Traffic	**Scenario 1 - no change**
Total traffic generation	**367**
Inbound	**183**
Outbound	**184**

Development Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	21%	25%
North (Princes Hwy)	14%	48%
North (Arncliffe St)	3%	5%
East (Wickham St)	0%	2%
North-West (Wollongong Road)	31%	15%
West (Forst Road)	31%	5%
	100%	100%

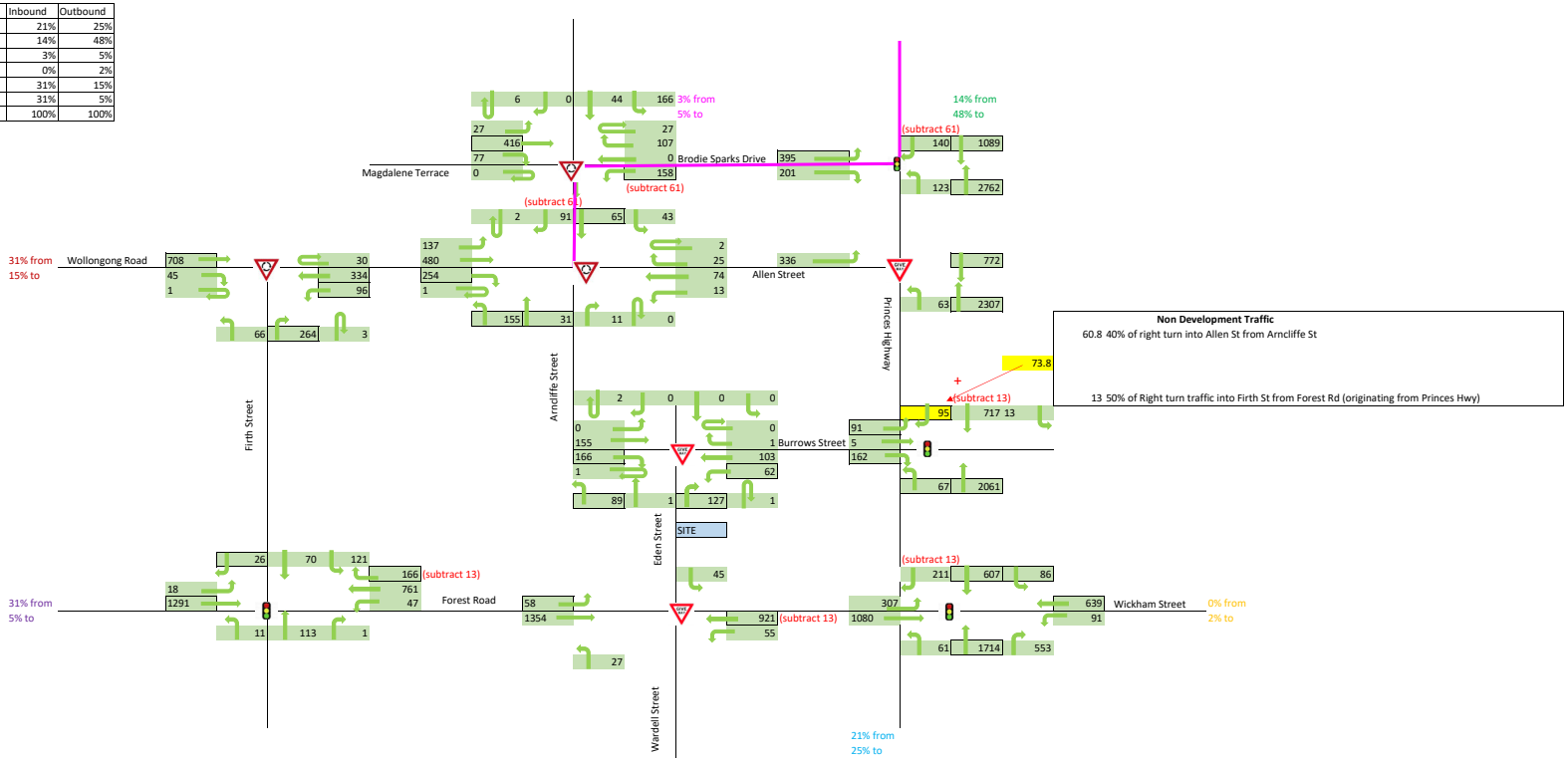


STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

AM Traffic — **Scenario 2 - Right Turn at Burrows**

Total traffic generation 309
Inbound 153
Outbound 156

Development Traffic Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	21%	25%
North (Princes Hwy)	14%	48%
North (Arncliffe St)	3%	5%
East (Wickham St)	0%	2%
North-West (Wollongong Road)	31%	15%
West (Forst Road)	31%	5%
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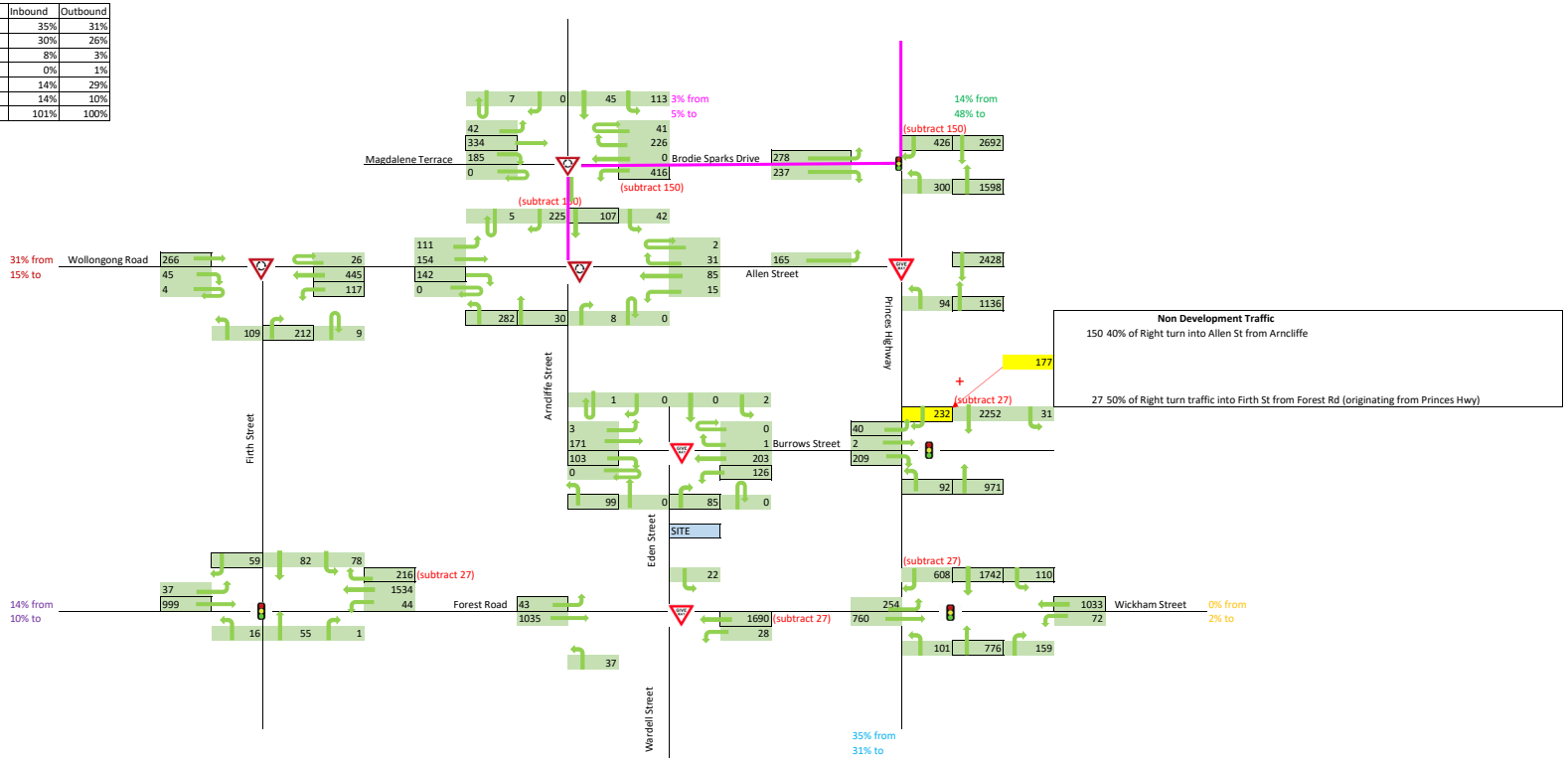


STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

PM Traffic — **Scenario 2 - Right Turn at Burrows**

Total traffic generation	**303**
Inbound	**185**
Outbound	**118**

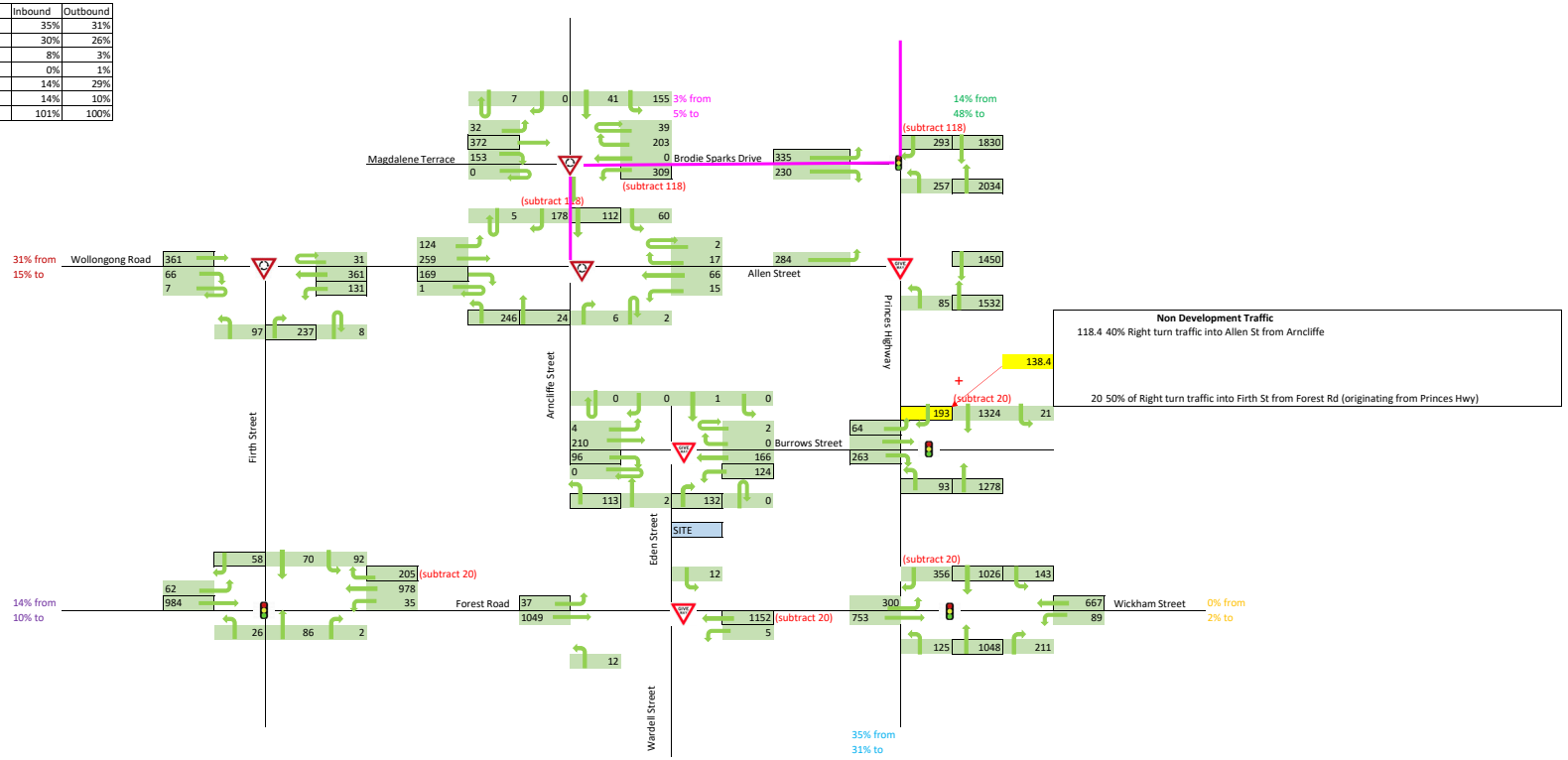
Development Traffic Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	35%	31%
North (Princes Hwy)	30%	26%
North (Arncliffe St)	8%	3%
East (Wickham St)	0%	1%
North-West (Wollongong Road)	14%	29%
West (Forst Road)	14%	10%
	101%	100%



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

SAT Traffic	Scenario 2 - Right Turn at Burrows
Total traffic generation	367
Inbound	183
Outbound	184

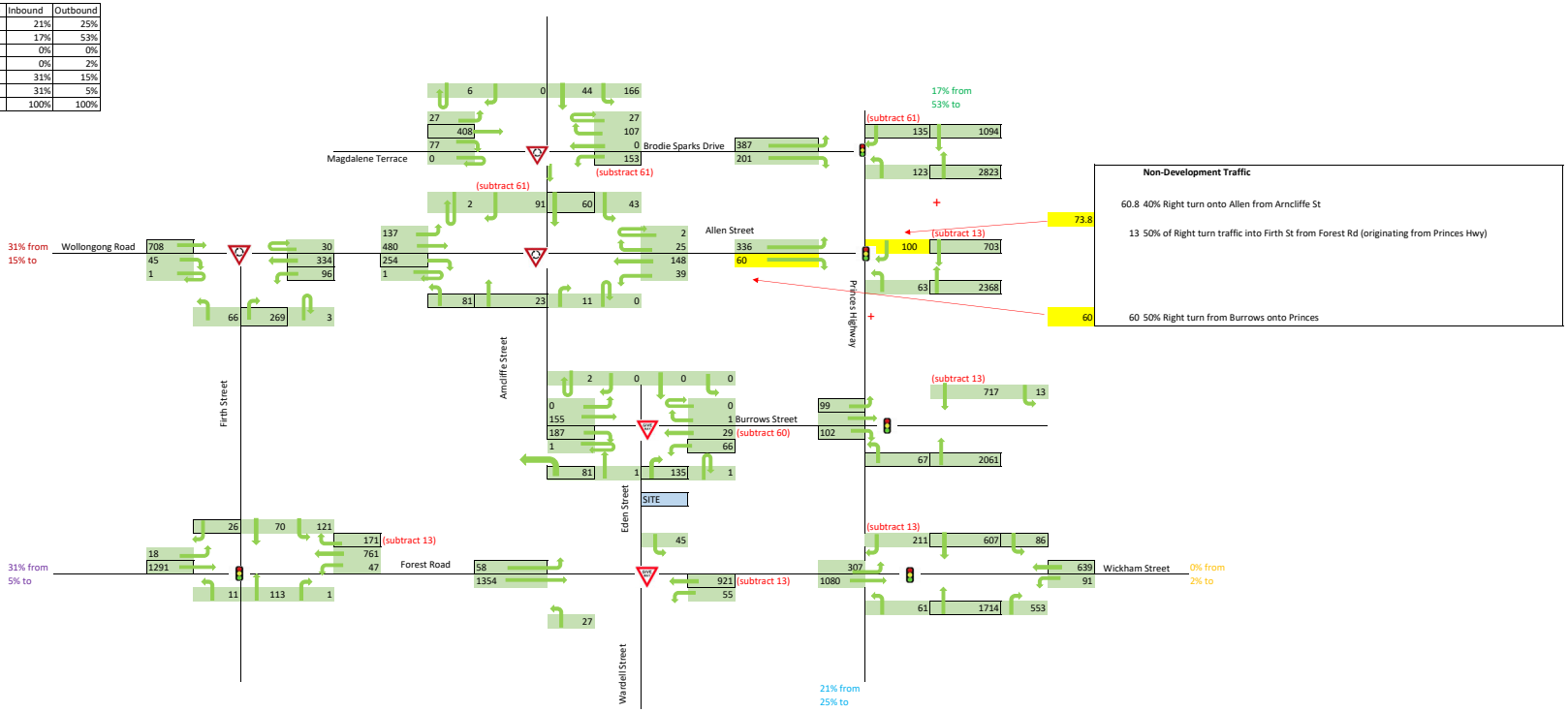
Development Traffic Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	35%	31%
North (Princes Hwy)	30%	26%
North (Arncliffe St)	8%	3%
East (Wickham St)	0%	1%
North-West (Wollongong Road)	14%	29%
West (Forst Road)	14%	10%
	101%	100%



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

AM Traffic	**Scenario 3 - Signals at Allen**
Total traffic generation	**309**
Inbound	**153**
Outbound	**156**

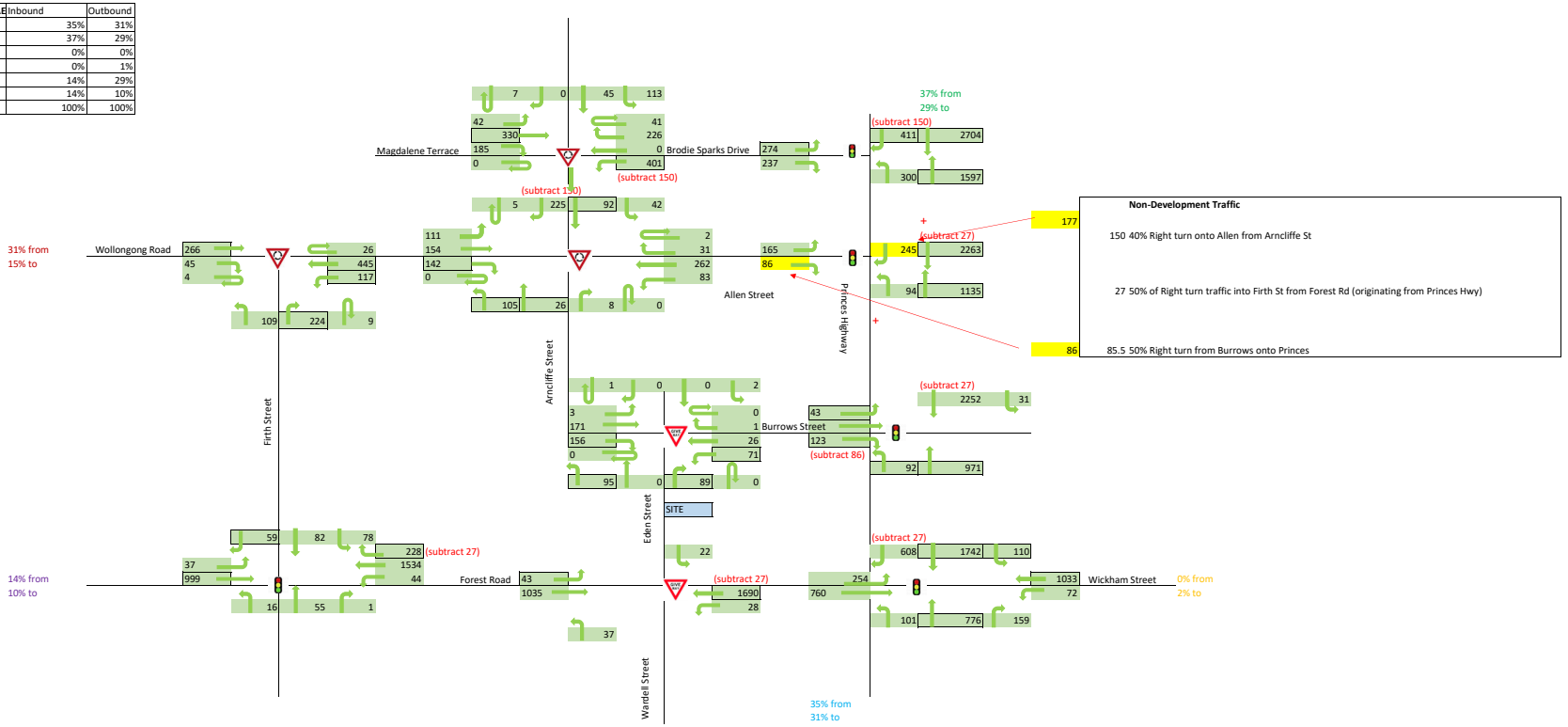
Development Traffic Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	21%	25%
North (Princes Hwy)	17%	53%
North (Arncliffe St)	0%	0%
East (Wickham St)	0%	2%
North-West (Wollongong Road)	31%	15%
West (Forst Road)	31%	5%
	100%	100%



STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

PM Traffic	Scenario 3 - Signals at Allen
Total traffic generation	303
Inbound	185
Outbound	118

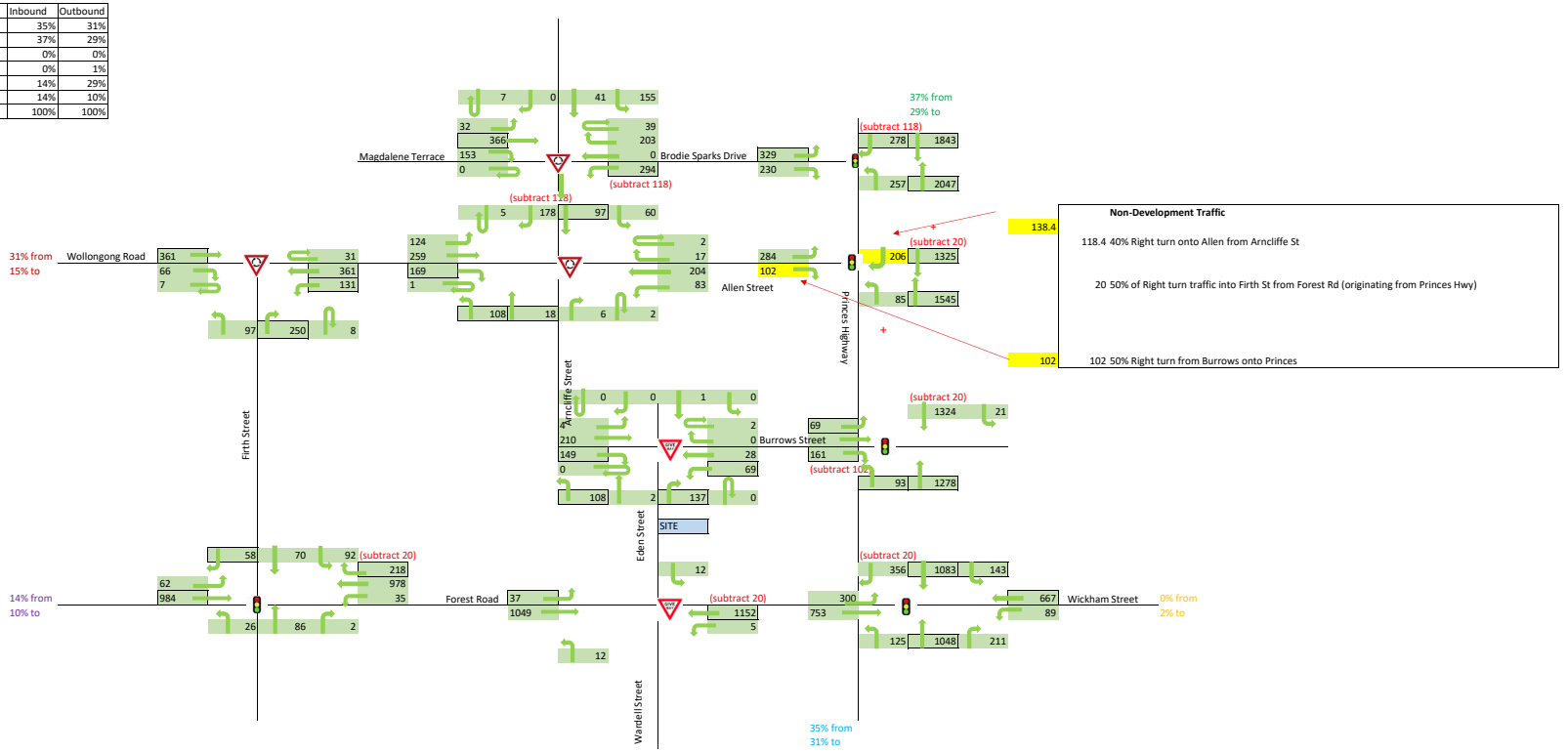
Development Traffic Distribution (AE	Inbound	Outbound
South (Princes Hwy)	35%	31%
North (Princes Hwy)	37%	29%
North (Arncliffe St)	0%	0%
East (Wickham St)	0%	1%
North-West (Wollongong Road)	14%	29%
West (Forst Road)	14%	10%
	100%	100%



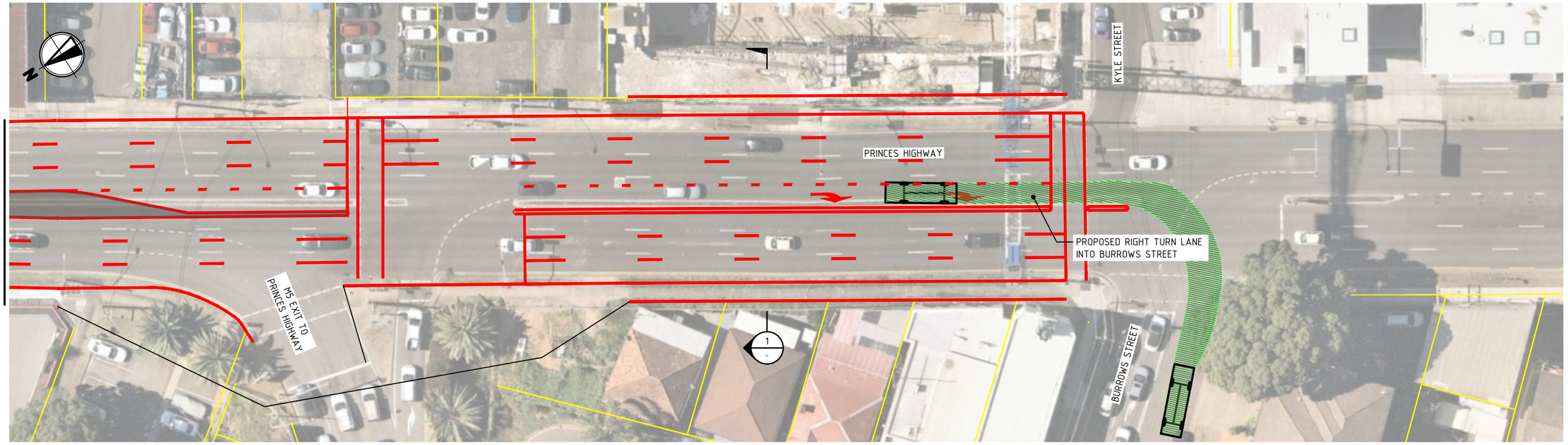
STANBURY TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

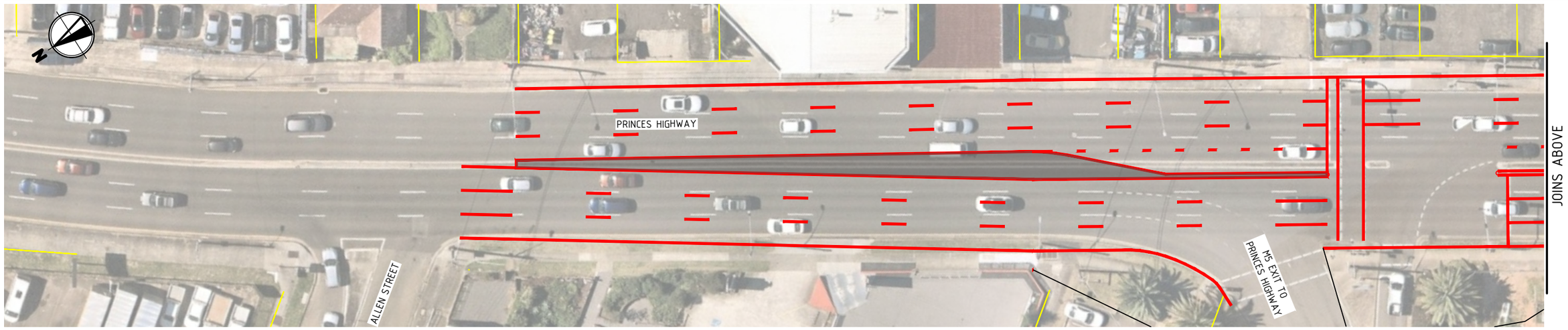
SAT Traffic	**Scenario 3 - Signals at Allen**
Total traffic generation	**367**
Inbound	**183**
Outbound	**184**

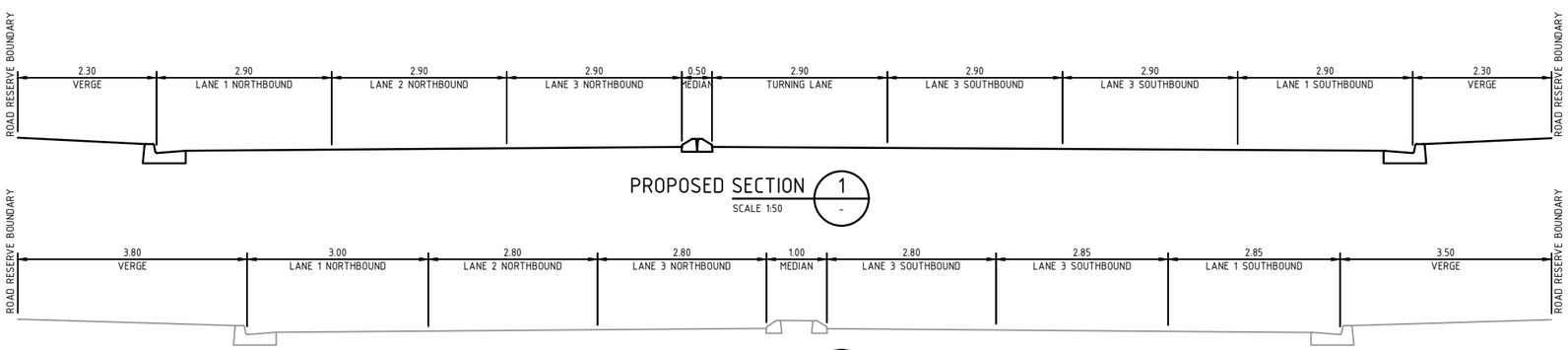
Development Traffic Distribution (AECOM)	Inbound	Outbound
South (Princes Hwy)	35%	31%
North (Princes Hwy)	37%	29%
North (Arncliffe St)	0%	0%
East (Wickham St)	0%	1%
North-West (Wollongong Road)	14%	29%
West (Forst Road)	14%	10%
	100%	100%



APPENDIX 3







PROPOSED SECTION 1 / - SCALE 1:50

EXISTING CASE SECTION 1 / - SCALE 1:50

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A	05.05.2021	ISSUED FOR INFORMATION	TW

REVISIONS

CLIENT –

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INCOMPLETE REVISION

	NAME	SIGNATURE	DATE
MARK-UP			
DRAFTING			
CHECK			

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Sydney *Office* –
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com –

PROJECT
EDEN STREET
ARNCLIFFE, NSW, 2205

STATUS: ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

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LM	LM	TW	

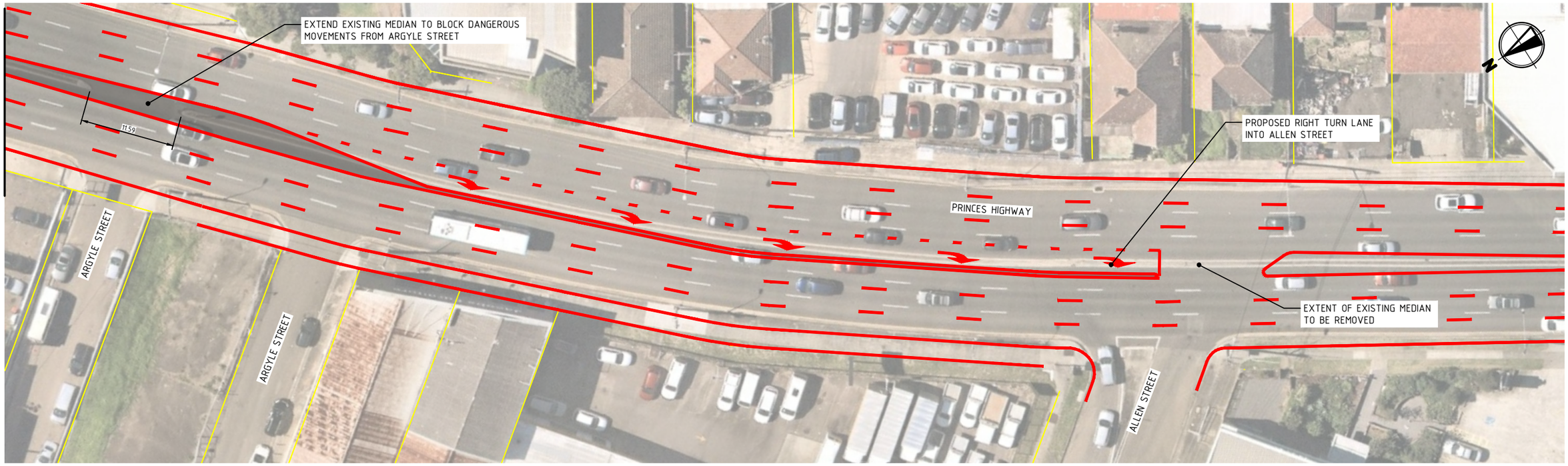
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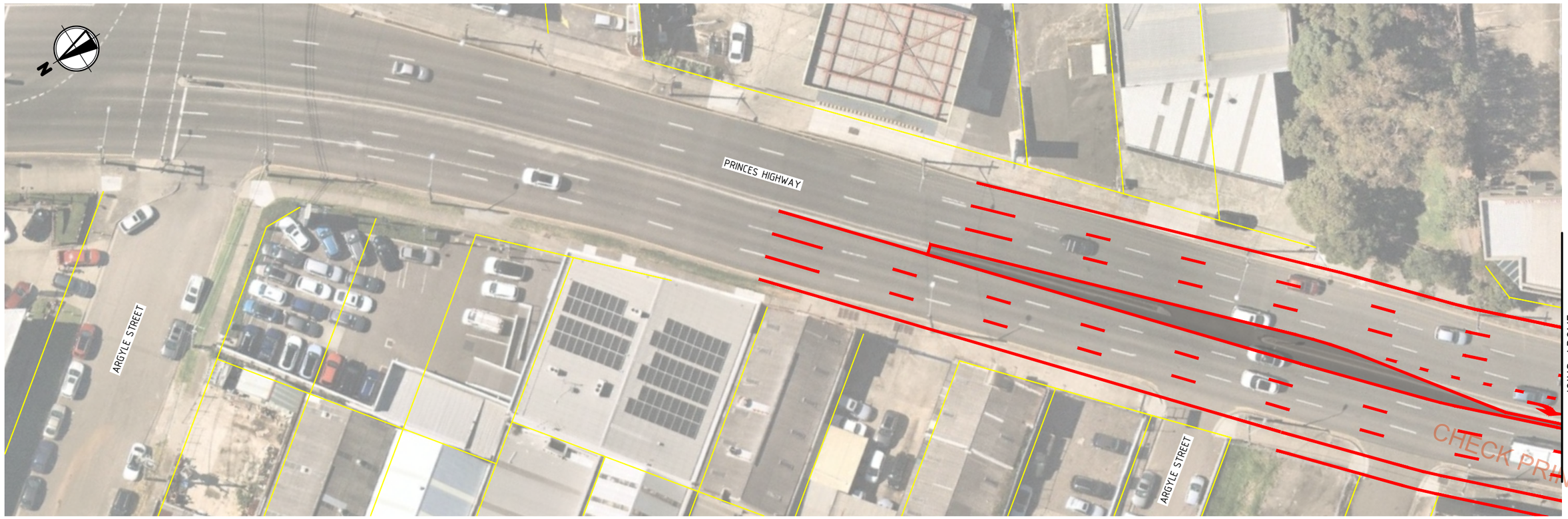
TITLE
BURROWS STREET
RIGHT TURNING LANE OPTION

PROJECT No.	DRAWING No.	REV.
–	SK-C-0111	A

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REV	DATE	DESCRIPTION	RVD
A	05.05.2021	ISSUED FOR INFORMATION	TW

REVISIONS

CLIENT

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Sydney *Office*—
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Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—

PROJECT
EDEN STREET
ARNCLIFFE, NSW, 2205

STATUS
ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
LM	LM	TW	

DATUM	GRID	SCALE	
AHD	MGA	1:250	AT A1 SIZE

TITLE
ALLEN STREET
RIGHT TURNING LANE OPTION

PROJECT No.	DRAWING No.	REV.
–	SK-C-0112	A

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BG&E Pty Limited

ATTACHMENT 2

From: Divna Cvetojevic <Divna.Cvetojevic@transport.nsw.gov.au>
Date: 7 December 2021 at 5:41:34 pm AEDT
To: Matthew Houlden <matthew@stanburytraffic.com.au>, Murray Cleaver <Murray.A.CLEAVER@transport.nsw.gov.au>, Natalie Gulliver <Natalie.GULLIVER@transport.nsw.gov.au>, Ennio Morson <Ennio.MORSON@transport.nsw.gov.au>, Brett Morrison <Brett.Morrison4@transport.nsw.gov.au>, David Glasgow <David.Glasgow@planning.nsw.gov.au>, jmurray@ethosurban.com, rodney.garrett@dpie.nsw.gov.au, Silvio.Falato@planning.nsw.gov.au, Amy.Watson@planning.nsw.gov.au, jeremy.dwyer@planning.nsw.gov.au, Saul Moran <saul.moran@billbergia.com.au>
Cc: Brendan Pegg <brendan.j.pegg@transport.nsw.gov.au>
Subject: SYD20/01395/04 - Meeting Discussion - TfNSW Advises / Position

Hi All,

Following TfNSW SIDRA modelling review and our internal considerations of the alternative options to mitigate impacts of the proposed development in regards to the surrounding classified road network safety and efficiency, please find enclosed below set of our findings and recommended vehicle access options, presented at our today's meeting, for proponents further consideration / actions:

1. Left-in, left out (LILO) arrangement at the intersection Forest Road / Eden Street is supported.

2. Access from Eden Street, accommodating all movements is supported.

3. The left-in only access from Princes Highway can be considered subject to the provision of the following:

   - Capacity / length of deceleration lane should be modelled with particular regard to the existing tidal flow on Princes Highway and its operation; if there is an traffic overflow to Princes Highway, mitigation options to be developed
   - The proposal should consider internal parking redesign ensuring connectivity between Eden Street and Princes Highway accesses
   - Deceleration lane design requirements / parameters:
     - Decel lane would need to be suitable for a 70km/h design speed and designed as per Austroads Part 4A.
     - Suggest that there would need to be a distance equal to 4 secs of travel between the left turn lane from Forest Road onto the highway and the start of the decel lane.
     - The design of the decel lane and the following ramp into the car park would need to consider the grade (and therefore the length) of the ramp, vertical clearance at the portal, the size of vehicles accessing the car park and the appropriate sight distance over the crest where the decel lane ends and the ramp starts.
     - Assess the required width and the length for the decel lane and the ramp when offsets, grades etc are taken into consideration.

   - Construction delivery comments:
     - Consideration would have to be given as to how this traffic facility could be constructed as impacts to the surrounding classified network would need to be addressed.

4. Consider the provision of an exclusive right turn lane/phase in Wickham Street turning into the Princes Highway northbound. This additional movement would allow access to the site from the north from either Marsh Street or Princes Highway bridge crossings via West Botany Street

   - The implementation of an additional phase with the development traffic at the Princes Highway and Wickham Street intersection is likely to require further improvement measures to maintain the same level of delay. One possible measure could include the removal of the southbound right turn tidal flow arrangement in the Princes Highway to Forest Road. This could be replaced with a double right turn southbound.

5. TfNSW would not support signalisation of Princes Highway and Alan Street intersection, based on the further data collection and the results of further modelling

6. TfNSW is not in support of the right turn movement from Princes Hwy into Burrows Street based on the modelling results and further traffic assessment as it would have significant impact on the safe and efficient traffic operation on Princes Hwy and M5.

7. TfNSW suggests Burrows Street One Way traffic (One way out of Burrows into Princes Hwy) option to be considered, however will need to be explored with Council as Burrows Street is under the care and control of Council.

8. Further consideration to be given to the improvements at the intersection Burrows Street / Eden Street, as result of the additional traffic generated by development.

In addition to the suggested access options and mitigation measures above, TfNSW would welcome other potential options for consideration by the proponent, noting the limitations of what can be considered via the classified network at this location.

TfNSW is committed to work with the proponent's traffic consultant and its modellers, ensuring agreement is reached on the Base Model prior any testing / modelling of different scenarios is undertaken.

TfNSW will also provide property information for the relevant areas / sections of Prices Highway, required for the development of some options.

Regards

Divna Cvetojevic
Development Assessment Officer
Planning and Programs
Greater Sydney
Transport for NSW

M 0455 515 259
Level 6, 27 Argyle Street, Parramatta NSW2150

ATTACHMENT 3

STANBURY
TRAFFIC PLANNING
TRAFFIC, PARKING & TRANSPORT CONSULTANTS

21 December 2021

Transport for New South Wales
PO Box 793
Parramatta
NSW 2124

Attention: Brendan Pegg, Senior Land Use Planner

Your reference: SYD20/01395/04

Dear Sir,

PROPOSED MIXED-USE DEVELOPMENT AT
26 – 42 EDEN STREET AND
161 – 179 PRINCES HIGHWAY, ARNCLIFFE

Reference is made to correspondence received 7 December 2021 which provided comments on SIDRA modelling previously completed for the proposed development at 26 – 42 Eden Street and 161 – 170 Princes Highway, Arncliffe. Additional comments were also provided by Transport for New South Wales (TfNSW) via meetings held on 7 and 14 December 2021.

Stanbury Traffic Planning was engaged by the Applicant to review the comments and update the SIDRA modelling based on the comments contained within correspondence received by TfNSW and discussed at the meetings.

As discussed in our meeting on 14 December 2021, the following scenarios were considered:

- Existing Conditions;
- Scenario 1 – Post Development, no changes to road network;
- Scenario 4 – Post Development, left turn into the site from Princes Highway;
- Scenario 5 – Scenario 4 plus a second right turn lane from Princes Highway to Forest Road;
- Scenario 6 – Scenario 4 plus a right turn lane from Wickham Road to Princes Highway. A total of 50 right turn vehicles were added to this movement and no other movements were changed; and
- Scenario 7 – Second right turn lane from Princes Highway to Forest Road and a right turn lane from Wickham Road to Princes Highway.

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Pyrmont NSW 2009
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abn : 23 613 111 916

An excerpt of the information provided by TfNSW for the formal land reservation at the intersection of Princes Highway / Forest Road is provided in **Figure 1**.

FIGURE 1
LAND RESERVATION AT THE INTERSECTION OF FOREST ROAD / PRINCES HIGHWAY



Figure 1 indicates that there is a 'green' zoning at the property on the north-east corner of the intersection. This property measures approximately 35m along Princes Highway and is zoned "Public Reserve". There is a small section to the north being shown with 'blue stripes', which is "Sold Surplus Property". The section of 'green' zoned land is not long enough to provide a double right turn lane. Based on this, Scenario 5 and Scenario 7 were removed from consideration as they cannot be delivered.

There appears to be sufficient land on the southern side of Wickham Street to construct a right-turn lane from Wickham Street to Princes Highway. Scenario 6, which considered this, was modelled with the results summarised later in this letter.

Each of the abovementioned scenarios was be modelled using Sidra 9. The purpose of the modelling was to compare the scenarios and to determine the relative impact on the classified road network. The modelling approach is summarised in the following section.

TFNSW'S COMMENTS AND ASSOCIATED RESPONSES

Each of the comments provided by TfNSW in the email received 7/12/21 with our response are provided in **Table 1**.

TABLE 1 GENERAL COMMENTS	
TfNSW Comment	**STP Response**
1. *Left-in, left out (LILO) arrangement at the intersection Forest Road / Eden Street is supported.*	Noted.
2. *Access from Eden Street, accommodating all movements is supported.*	Noted but see response to TfNSW Comment 3.
3. *The left-in only access from Princes Highway can be considered subject to the provision of the following:* - *Capacity / length of deceleration lane should be modelled with particular regard to the existing tidal flow on Princes Highway and its operation; if there is a traffic overflow to Princes Highway, mitigation options to be developed*	Modelling was undertaken that includes the tidal flow arrangement. Summary results are provided later in this letter.
- *The proposal should consider internal parking redesign ensuring connectivity between Eden Street and Princes Highway accesses*	A concept sketch is provided in **Attachment 1** of this letter. The attached concept sketch has considered these design requirements along with the site constraints. A more detailed design would be developed following 'in-principle' support from TfNSW.
- *Deceleration lane design requirements / parameters:* ▪ *Decel lane would need to be suitable for a 70km/h design speed and designed as per Austroads Part 4A.*	
▪ *Suggest that there would need to be a distance equal to 4 secs of travel between the left turn lane from Forest Road onto the highway and the start of the decel lane.*	
▪ *The design of the decel lane and the following ramp into the car park would need to consider the grade (and therefore the length) of the ramp, vertical clearance at the portal, the size of vehicles accessing the car park and the appropriate sight distance over the crest where the decel lane ends and the ramp starts.*	
4. *Assess the required width and the length for the decel lane and the ramp when offsets, grades etc are taken into consideration.*	

TABLE 1 (CONTINUED) GENERAL COMMENTS	
TfNSW Comment	**STP Response**
- *Construction delivery comments:* ▪ *Consideration would have to be given as to how this traffic facility could be constructed as impacts to the surrounding classified network would need to be addressed.*	Noted. Such impacts would be addressed via a Construction Traffic Management Plan, the requirement for which can reasonably be imposed by a condition of consent.
5. *Consider the provision of an exclusive right turn lane/phase in Wickham Street turning into the Princes Highway northbound. This additional movement would allow access to the site from the north from either Marsh Street or Princes Highway bridge crossings via West Botany Street* ▪ *The implementation of an additional phase with the development traffic at the Princes Highway and Wickham Street intersection is likely to require further improvement measures to maintain the same level of delay. One possible measure could include the removal of the southbound right turn tidal flow arrangement in the Princes Highway to Forest Road. This could be replaced with a double right turn southbound.*	Modelling of this scenario was undertaken as Scenario 6. While it will improve access to the site for vehicles from the south and east, the results, summarised later in this letter indicate that, the proposed option results in increased delay for all vehicles at this intersection. This is because the north approach and east approach are already close to capacity and removing green time for the new movement increases average delays at this intersection.
6. *TfNSW would not support signalisation of Princes Highway and Allan Street intersection, based on the further data collection and the results of further modelling*	Noted.
7. *TfNSW is not in support of the right turn movement from Princes Hwy into Burrows Street based on the modelling results and further traffic assessment as it would have significant impact on the safe and efficient traffic operation on Princes Hwy and M5.*	Noted.
8. *TfNSW suggests Burrows Street One Way traffic (One way out of Burrows into Princes Hwy) option to be considered, however will need to be explored with Council as Burrows Street is under the care and control of Council.*	We have considered this option. While it could have some merit to improve traffic exiting Burrows Street, we do not consider that it is required as a result of this development. Further discussion would be required by TfNSW to initiate this option with Council regarding the impact to the local road network, which is considered substantial, particularly with respect to access to Arncliffe Railway Station.

TABLE 1 (CONTINUED) GENERAL COMMENTS	
TfNSW Comment	**STP Response**
9. Further consideration to be given to the improvements at the intersection Burrows Street / Eden Street, as result of the additional traffic generated by development. – *In addition to the suggested access options and mitigation measures above, TfNSW would welcome other potential options for consideration by the proponent, noting the limitations of what can be considered via the classified network at this location.*	The operation of this intersection is not expected to impact the classified road network. Further discussion with Council is currently ongoing regarding the local road network and vehicle access implications.
TfNSW is committed to work with the proponent's traffic consultant and its modellers, ensuring agreement is reached on the Base Model prior any testing / modelling of different scenarios is undertaken.	A link to the modelling files is provided later in this letter.
TfNSW will also provide property information for the relevant areas / sections of Prices Highway, required for the development of some options.	This was received for the intersection of Princes Highway / Forest Road (See excerpt in **Figure 1**).

DEVELOPMENT TRAFFIC VOLUMES

Although the development is expected to be constructed with buildings of up to 23 storeys, consideration needs to be given to the scale of inbound and outbound traffic that is anticipated to be generated in the context of the surrounding road network, which is summarised in **Table 2**.

TABLE 2 DEVELOPMENT PEAK HOUR TRAFFIC VOLUMES			
DIRECTION	**AM PEAK HOUR**	**PM PEAK HOUR**	**SATURDAY PEAK HOUR**
Inbound	153	185	183
Outbound	156	118	184

Table 1 indicates that the development is expected to generate up to approximately 3 vehicles per minute inbound and outbound during the road network peak hours.

When consideration is given to the multiple ways into and out of the subject site via the regional road network, the amount of traffic potentially at each intersection is considered a minimal increase and in-line with the daily variation that could be experienced at the study intersections.

A graphical representation of the net increase in the development vehicles on top of the existing vehicles served at each signalised study intersection is provided in **Figure 2** to **Figure 5**.

FIGURE 2
NET DEVELOPMENT TRAFFIC AT THE JUNCTION OF PRINCES HIGHWAY / BRODIE SPARK DRIVE

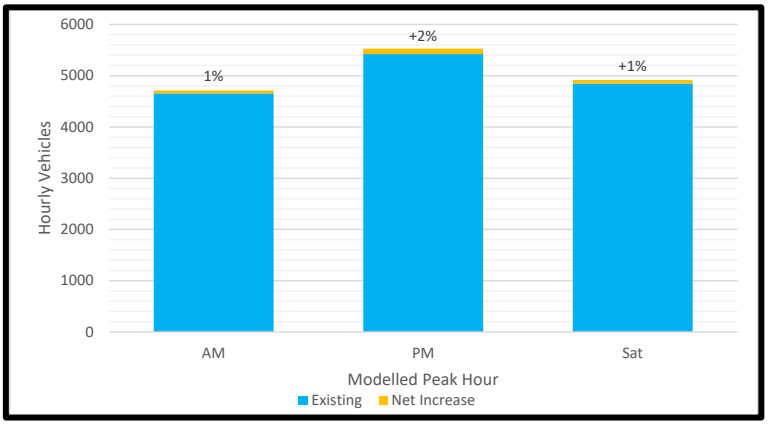


FIGURE 3
NET DEVELOPMENT TRAFFIC AT THE JUNCTION OF PRINCES HIGHWAY / BURROWS STREET

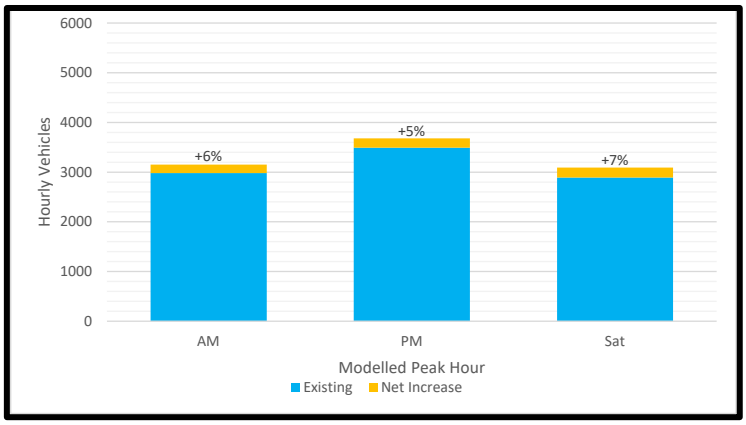


FIGURE 4
NET DEVELOPMENT TRAFFIC AT THE INTERSECTION OF PRINCES HIGHWAY / FOREST ROAD

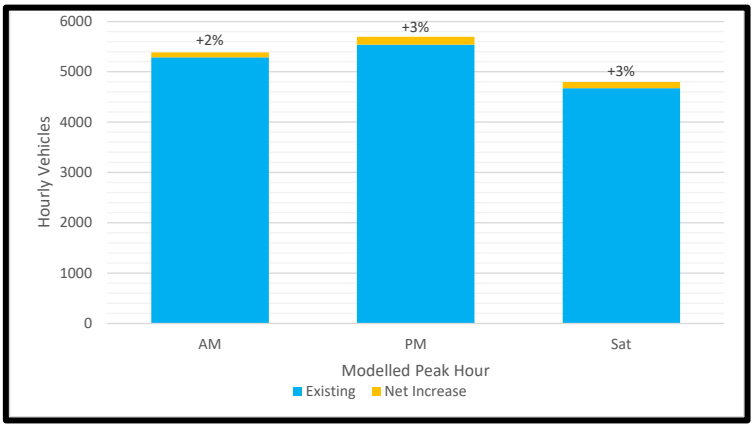


FIGURE 5
NET DEVELOPMENT TRAFFIC AT THE INTERSECTION OF PRINCES HIGHWAY / FIRTH STREET

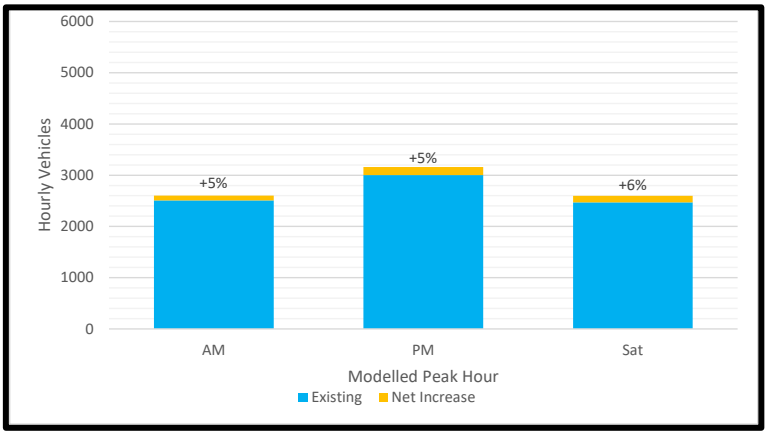


Figure 2 to Figure 5 indicate that at the critical intersection of Princes Highway / Forest Road, the anticipated development traffic accounts for an increase of between 2% and 3% of the current traffic at the intersection. At the junction of Princes Highway / Burrows Street, traffic is expected to increase by 5% to 7% depending on the road network peak hour.

MODELLING APPROACH

Traffic surveys of the study intersections were undertaken between 7:00am – 9:30am and 4:00pm – 6:00pm on Tuesday 30 March 2021 and between 11:00am – 1:00am on Saturday 24 April 2021. Neither of the survey days were significantly affected by COVID-19 restrictions or case numbers in the week preceding the surveys with zero locally acquired cased in the week preceding the weekday surveys and 3 locally acquired cases, on a single day, prior to the Saturday surveys[1].

The approach to the modelling has been to prepare Sidra models which approximated the existing conditions on the day of the surveys and to provide useful models to enable the comparison between the post development scenarios based on the TfNSW Modelling Guidelines.

Data provided by TfNSW for SCATS operation at study intersections, for example, a 2.5 second all red time for some phases at modelled intersections was not able to be input because Sidra requires whole integers.

Some of the offset and phasing information input into the model, while potentially slightly different to the SCATS operation on the day of the surveys, are the same between models, the purpose of which is to enable a comparison between the options for easier assessment by TfNSW.

The difference between Scenario 1 and Scenario 4 was the left turn into the subject site from Princes Highway. Due to the complexity of the network model, the best way to model this was determined in consultation with the Sidra Solutions modelling support team. It was determined that the best way to model this was to remove the traffic from the subject intersections rather than add a separate left turn intersection into the model at the driveway location. So although the networks look identical, the volumes at intersections within the model are different.

1 https://covidlive.com.au/report/daily-source-overseas/nsw - Accessed 20/12/21

SIDRA MODELLING RESULTS

The modelling results suggest that the introduction of a right turn lane from Wickham Street to Princes Highway results in a worsening of the intersection operation. This is because any green time taken away from southbound traffic or southbound right turn traffic results in a reduction in intersection capacity. The NSW modelling guidelines 2013 sets out the method which should be followed for Sidra modelling. The relevant criteria are listed in **Table 3** and the calibration procedures undertaken by this Practice.

TABLE 3
LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS
PRIORITY CONTROLLED JUNCTIONS

Detail	Adopted Modelling Parameters and Assumptions
Getting Started	• The latest version of Sidra Intersection 9 (version 9.0.3.9771) was used.
Input	• Data was input for a 60-minute period with a maximum peak flow period of 30 minutes
Geometry	• All intersection geometry was based on measurements taken on-site and measured through aerial photography from Nearmap. • Short lanes and parking present on site and within the influence zone of the intersections were coded accordingly
Saturation Flow	• The default saturation flow was adopted for all lanes with the exception of the intersection of Princes Highway / Forest Road where the following saturation flow rates were adjusted to allow the models to more closely match the observed operation and degree of saturation. o Right turns on the north and south approach – 2,200 tcu o Through movements on the north and east approaches – 2,100 tcu
Volumes	• Total vehicles were input with a value of 4% Heavy Vehicles and 1% Large Trucks for all movements; • A peak flow factor of 95% was adopted for all vehicle movements; • Pedestrian volumes were counted for the busiest intersection for pedestrians within the study area (Princes Highway / Brodie Spark Drive) and added to the network; and • Other intersections within the network were reviewed via the survey videos; however, the default number of pedestrians were kept within the model as they appeared to be higher than the observed number of pedestrians.

TABLE 3 (CONTINUED) LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS PRIORITY CONTROLLED JUNCTIONS	
Detail	**Adopted Modelling Parameters and Assumptions**
Movement Data	• Approach and exit speed were updated as per the posted speed limit signs observed, including the school zone within Forest Road to the west of Princes Highway during the AM peak hour and the 40km/h high pedestrian activity zone within Brodie Spark Drive and Firth Street during all peak periods; and • SIDRA default arrival types were applied to all other movements with the exception of the following movements: - All scenarios - South approach of Princes Highway / Brodie Spark Drive during the AM peak hour and the north approach during the PM peak hour, arrival type 4 for through movements; - All scenarios - South approach of Princes Highway /Forest road during the AM peak hour, arrival type 4 for through movements; - All scenarios - West approach of Forest Road / Firth Road during the AM peak hour, arrival type 4 for through movements; and - For Existing and Scenario 1-2 – North approach of Princes Highway / Burrows Street during the PM peak hour, arrival type 4 for through movements.
Priorities	• Priority was given to pedestrian crossing over the turning movements for the signalised intersections and at the zebra crossing where they existed.
Gap Acceptance	• The Sidra default gap acceptance values were adopted with the exception of: - Intersection of Forest Road / Eden Street – south and north approach, critical gaps for through and right turn movements during all peak hours were reduced to 5 seconds to reflect observed delays.
Pedestrians	• Pedestrian crossing distances were measured utilising aerial images via Nearmap and input into the model for all signalized pedestrian crossings; and • A pedestrian crossing speed of 1.2 m/sec was adopted for all sites.
Phasing and Timing	• Based on information provided by TfNSW all intersections were set to a user-given cycle time of 140 seconds for all scenarios; and • During the scenario analysis, Sidra was set to choose the phase times and intersection offsets. The same offsets and phase times which were generated for Scenario 1 were applied to all scenario where possible to allow a better comparison of the impacts of each scenario.
Model Settings	• Default values were applied.

SIDRA provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 4** (being the TfNSW NSW method of calculation of Level of Service).

TABLE 4 LEVEL OF SERVICE CRITERIA FOR SIGNALISED INTERSECTIONS, ROUNDABOUTS AND PRIORITY CONTROLLED JUNCTIONS			
Level of Service	**Average Delay per Vehicle (secs/veh)**	**Traffic Signals, Roundabout**	**Give Way and Stop Signs**
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory
D	43 to 56	Operating near capacity	Near capacity
E	57 to 70	At capacity; at signals, incidents will cause excessive delays At roundabouts, another control mode required	At capacity and requires other control mode
F	> 70	Extra capacity required	Unsatisfactory and requires other control mode

Table 5 and **Table 6** provide a summary of the SIDRA output data. A link to the Sidra files is provided https://drive.google.com/file/d/11t1MXHlCuQYVM87V_pwPp7DPxoxx5VKf/view?usp=sharing.

TABLE 5 SIDRA OUTPUT – PEAK HOUR PERFORMANCE												
	AM PEAK HOUR				PM PEAK HOUR				SATURDAY PEAK HOUR			
	EXISTING	Sc1	Sc4	Sc6	EXISTING	Sc1	Sc4	Sc6	EXISTING	Sc1	Sc4	Sc6
INTERSECTION OF PRINCES HIGHWAY / BRODIE SPARK DRIVE												
Total Intersection												
Delay (seconds / vehicle)	18.2	18.4			22.2	22.4			24.5	24.6		
Degree of Saturation	0.84	0.85			0.70	0.71			0.71	0.71		
Level of Service	B	B			B	B			B	B		
95th Percentile Queue	273.9m	281.7m			226m	233.7m			256.4m	262.1m		
INTERSECTION OF PRINCES HIGHWAY / BURROWS STREET / KYLE STREET												
Total Intersection												
Delay (seconds / vehicle)	5.4	8.4	8.3	12.7	130.3	98.4	99.9	158.6	29.2	30.2	26.3	27.2
Degree of Saturation	0.51	0.85	0.85	1.08	1.16	1.10	1.10	1.18	0.62	0.63	0.59	0.59
Level of Service	A	A	A	A	F	F	F	F	C	C	B	B
95th Percentile Queue	49.9m	57.9m	55.5m	55.5m	318.2m	318.2m	318.2m	318.2m	188.2m	193.1m	183.2m	183.6m
INTERSECTION OF PRINCES HIGHWAY / FOREST ROAD / WICKHAM STREET												
Total Intersection												
Delay (seconds / vehicle)	90.2	85.2	85.2	163.6	106.7	119.3	119.3	139.0	39.3	39.6	39.9	56.9
Degree of Saturation	1.19	1.19	1.19	1.16	1.10	1.15	1.15	1.10	0.85	0.88	0.88	0.98
Level of Service	F	F	F	F	F	F	F	F	C	C	C	E
95th Percentile Queue	511.1m	511.1m	511.1m	631.5m	541.4m	592.7m	592.7m	506.7m	212m	230.5m	230.5m	283m
JUNCTION FOREST ROAD / FIRTH STREET / SOMMERVILLE STREET												
Total Intersection												
Delay (seconds / vehicle)	57.1	71.8	71.8	15.9	24.4	32.6	32.6	30.4	24.2	26.9	26.9	26.6
Degree of Saturation	1.03	1.07	1.07	0.80	0.78	0.86	0.86	0.81	0.75	0.87	0.87	0.87
Level of Service	E	F	F	B	B	C	C	C	B	B	B	B
95th Percentile Queue	552.6m	627.9m	627.9m	474.2m	291.2m	324.7m	324.7m	305.6m	276.8m	302.9m	302.9m	302.9m

Note: Brodie Spark Drive was not modelled for Scenarios 4 and 6 as there is no difference to Scenario 1.

TABLE 6 SIDRA OUTPUT – NETWORK AVERAGE VEHICLE SPEED (KM/H)				
TIME PERIOD	SCENARIO			
	EXISTING	1	4	6
AM	24.9	24.8	24.8	20.2
PM	19.3	19.5	19.5	16.5
Saturday	32.0	33.7	34.1	31.4

Table 5 and **Table 6** indicate the following:

- Princes Highway / Brodie Spark Drive showed increased average delay however the LoS remained at 'B' for all modelled scenarios. Brodie Spark Drive was not modelled for Scenarios 4 and 6 as there is no difference to Scenario 1
- Princes Highway / Burrows remains at Los A for all AM scenarios with Scenario 4 showing a slight improvement when compared to Scenario 1.
- The intersections of Princes Highway / Burrows Street and Princes Highway / Forest Road influence each other and during the weekday PM peak hour, when added together, the average delays are largely unchanged and the intersections continue to operate at Los F. During the Saturday peak hour, Scenario 4 shows a slight improvement when compared to Scenario 1 as a result of the left turn into the subject site from Princes Highway.
- Forest Road / Firth Street is expected to change from LoS E to LoS F during the weekday AM peak hour under Scenario 1 and 4. In addition to development traffic, this is a result of the closure of Eden Street to right turning vehicles from Forest Road and transfer to turning right into Firth Street. The safety benefits that this closure will bring need to be considered along with the changes in LoS at the intersection. As previously stated, the changes in SCATS operation may be able to improve the operation of this intersection. This was was not considered to allow for easy comparison between the options modelled.
- Overall there is minimal difference to overall vehicle speed within the entire networks when the existing is compared to Scenario 1 where there are no changes to the road network;
- There are no changes between average vehicle speeds in between Scenario 1 and Scenario 4 on the during the weekday AM and PM peak hours with a slight improvement in travel speed from 33.7 to 34.1km/h as a result of the left turn into the subject site.
- Scenario 6 results in slower average travel speeds for all scenarios when compared to Scenario 4 and accordingly is not recommended.

SUMMARY OF SIDRA MODELLING METHODOLOGY AND RECOMMENDED CLASSIFIED ROAD NETWORK UPGRADE

The modelling results suggest that no additional road network treatments are required on the classified road network to support the proposed development. However, the recommended network treatment, primarily to improve pedestrian safety, is to provide a new left turn ingress into the subject site from Princes Highway for northbound traffic.

This treatment is expected to improve the northbound traffic along Princes Highway at Burrows Street when compared to road network changes by reducing the amount of traffic turning left into Burrows Street from Princes Highway. The largest improvement is shown on the modelled Saturday, as shown in **Table 5**, where the intersection LoS improved from C in Scenario 1 (no road network changes) to LoS B (left turn into the site from Princes Highway).

A concept plan for this ingress is provided in **Attachment 1** of this letter with a summary provided in **Figure 6**.

FIGURE 6
CONCEPT PLAN FOR INGRESS FROM PRINCES HIGHWAY

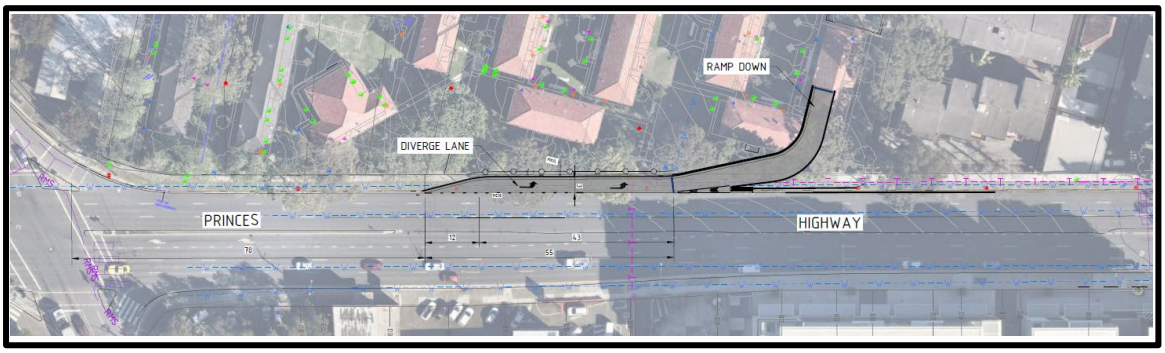


Figure 6 indicates the following:

- A distance of 78m between Forest Road and the start of the diverge lane;
- A 12m taper;
- A distance of 43m between the end of the taper and the start of the diverge into the subject site;
- Two new inlet pits are accordingly proposed at the outer edge of the deceleration lane and heavy duty strip drains are proposed at the top and bottom of the access ramp to ensure water does not flow from the Highway into the car parking area;
- At the completion of the deceleration lane, a slight alignment change is provided in the vehicular access ramp allowing appropriate separation between the northbound Highway kerb-side lane and the basement access ramp, facilitating the accommodation of a crash cushion on approach to Type F barrier, which will separate the access ramp from the northbound Highway travel lanes;
- Complete grade separation between pedestrians, cyclists and vehicles along the frontage of the site; and
- A pedestrian fence adjacent to the deceleration lane to provide protection to pedestrians and cyclists.

A distance of 78m equates to a travel time of approximately 4.7 seconds travelling at 60km/h (the posted speed limit) or 4 seconds travelling at 70km/h.

The deceleration lane taper length is 12m, being calculated based on formula provided by Part 4A of Austroads Guide to Road Design, based on approach travel speed of 70km/h and deceleration lane width of 3m.

Based on a design speed of 60km/h (the posted speed limit), the minimum deceleration lane distance of 40m with a downgrade correction ratio of 1.35 for (3-4% downgrade) results in a requirement of 54m as per the Austroads Guide to Road Design Part 4A Table 5.2 and Table 5.3.

The use of maximum deceleration rate of 3.5m/s^2 rather than a comfortable rate of 2.5m/s^2 is considered appropriate as:

- The lane will not accommodate heavy vehicles;
- The access lane arrangements provides a further length of approximately 25 – 30m past the end of the deceleration lane prior to turning towards the underground parking area; and
- The approach speed limit along the Highway is 60km/h.

It is expected that, following approval-in-principle to the deceleration lane concept, TfNSW will require the design to be subject to an independent Road Safety Audit.

CONCLUDING STATEMENT

The purpose of the Sidra modelling undertaken by this Practice was to enable a simple comparison between the options by TfNSW. SCATS has the ability to adjust offsets, phase and cycle times to respond to changing traffic and optimise the road network, which was not fully included within this modelling. As such, the post development scenario modelling is considered conservative.

The amount of traffic generated by the proposed development equates to around 3 vehicles per minute inbound and outbound. When compared to the amount of traffic on the classified road network in the vicinity of the site, the additional traffic generated by the proposed development represents a 2% to 3% increase at the intersection of Forest Road / Princes Highway, which is the critical intersection within the nearby classified road network.

The recommended treatment of a left turn into the site for vehicles from Princes Highway was shown to improve the northbound traffic on Princes Highway adjacent to the site and also improve safety by completely separating the conflict between pedestrian and cyclist path along the frontage of the site.

This means that vehicles entering the site northbound along Princes Highway do not have to turn left into Burrows Street, then left into Eden Street and then left into an at-grade site driveway. The removal of three at-grade turns and conflict points between pedestrians and vehicles is considered a good outcome for safety of pedestrians and vehicles that currently and are expected to use these intersections.

It would be appreciated if TfNSW could review the additional information contained within and attached to this correspondence and the SIDRA modelling files to assist in its ongoing assessment of the subject development application as soon as possible.

A link to the Sidra files is provided
https://drive.google.com/file/d/11t1MXHlCuQYVM87V_pwPp7DPxoxx5VKf/view?usp=sharing.

If you have any questions during the assessment, please do not hesitate to contact me.

Submitted for your consideration.

Yours sincerely,



Morgan Stanbury
Director
Traffic Engineer

Enclosed:

Attachment 1: Concept Design for left turn entry to the subject site from Princes Highway

APPENDIX 1



PLAN

SCALE 1:500

0 5 10 15 20 25 30m

SCALE 1:500 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REVISIONS

CLIENT

Sydney *Office —*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E* / info@bgeeng.com
bgeeng.com—

PROJECT

EDEN STREET
ARNCLIFFE NSW, 2205

STATUS

ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

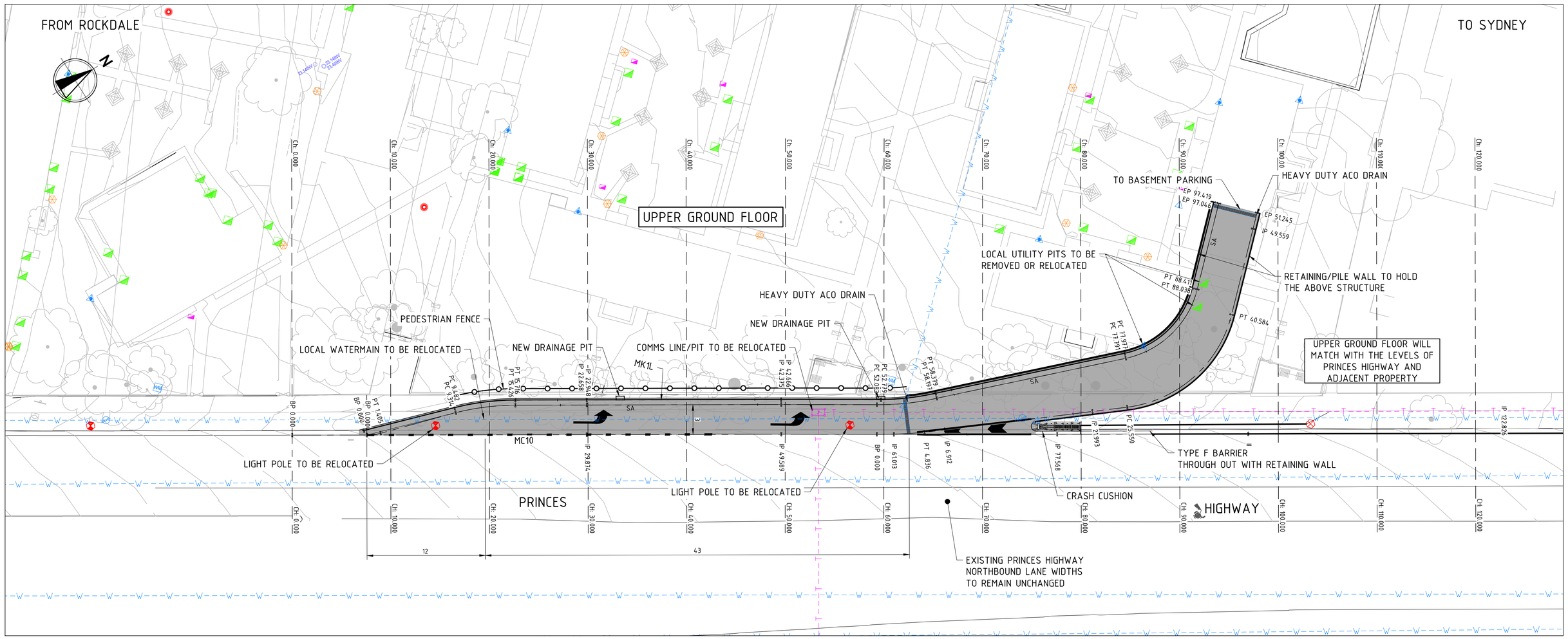
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DIVERGE LANE OPTION 1
LOCALITY PLAN

PROJECT No.	DRAWING No.	REV.
S21113	SK-C-1010	A

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PLAN

SCALE 1:200

0 2 4 6 8 10 12m

SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REVISIONS

CLIENT

Sydney *Office—*
L2, 8 Windmill St
Sydney NSW 2000
P / +61 2 9770 3300 *E /* info@bgeeng.com
bgeeng.com—

PROJECT: EDEN STREET
ARNCLIFFE NSW, 2205

STATUS: ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

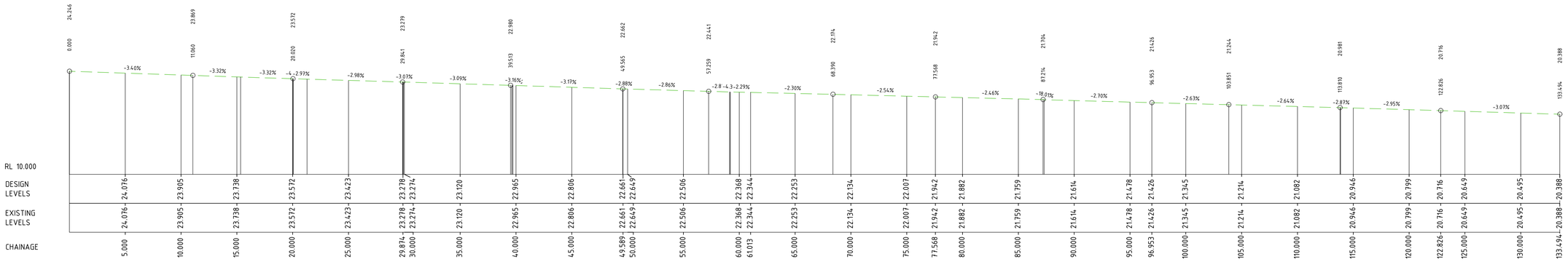
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AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE: DIVERGE LANE OPTION 1
GENERAL ARRANGEMENT

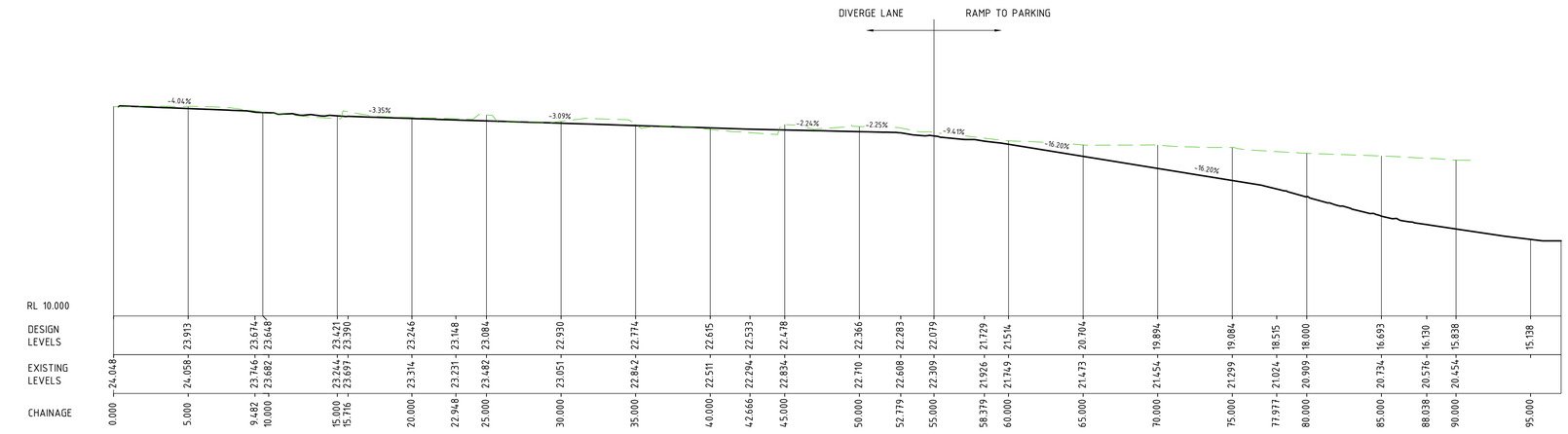
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LONGITUDINAL SECTION - MC10



LONGITUDINAL SECTION - MK1L (KERB LINE)

0 2 4 6 8 10 12m
SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

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REV	DATE	DESCRIPTION	RVD

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PROJECT
EDEN STREET
ARNCLIFFE NSW, 2205

STATUS
ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE
LONGITUDINAL SECTIONS
MC10 AND MK1L

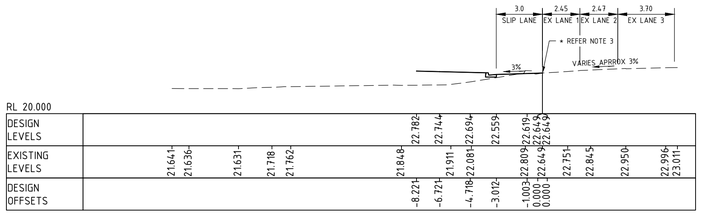
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S21113	SK-C-1030	A

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NOTES

1. EXISTING LANE WIDTHS ARE INDICATIVE ONLY.
2. EXISTING LANE WIDTHS TO REMAIN UNAFFECTED BY NEW WORKS.
3. MATCH EXISTING PAVEMENT LEVELS AND CROSSFALL AT CARRIAGEWAY EDGE.

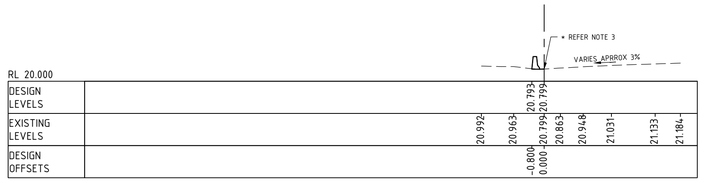


RL 20.000

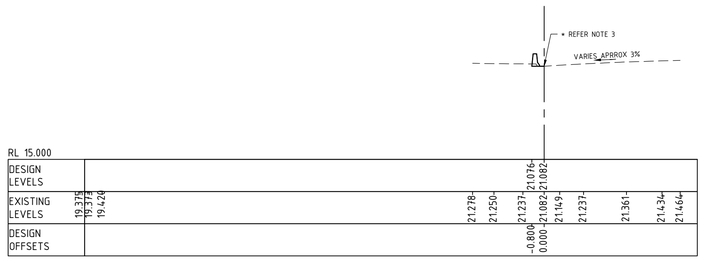
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NOTES

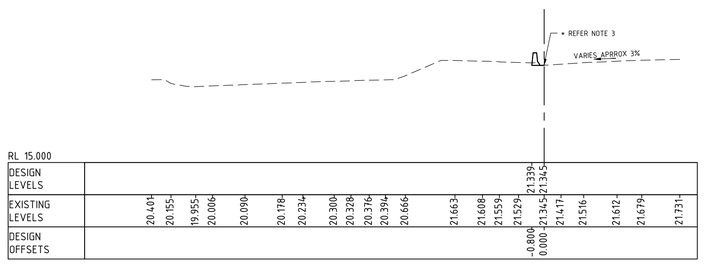
1. EXISTING LANE WIDTHS ARE INDICATIVE ONLY.
2. EXISTING LANE WIDTHS TO REMAIN UNAFFECTED BY NEW WORKS.
3. MATCH EXISTING PAVEMENT LEVELS AND CROSSFALL AT CARRIAGEWAY EDGE.



MC10 - SL 120.000



MC10 - SL 110.000



MC10 - SL 100.000

0 2 4 6 8 10 12m
SCALE 1:200 AT A1 SIZE

REV	DATE	DESCRIPTION	RVD
A	20.12.21	ISSUED FOR INFORMATION	TW

REVISIONS

REV	DATE	DESCRIPTION	RVD

REVISIONS

CLIENT

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PROJECT
EDEN STREET
ARNCLIFFE NSW, 2205

STATUS
ISSUED FOR INFORMATION
NOT TO BE USED FOR CONSTRUCTION

DRAWN	DESIGNED	CHECKED	APPROVED
CB	ML	TW	

DATUM	GRID	SCALE	
AHD	MGA20/56	AS SHOWN	AT A1 SIZE

TITLE
CROSS SECTIONS - MC10
PRINCES HIGHWAY
SHEET 2

PROJECT No.	DRAWING No.	REV.
S21113	SK-C-1041	A

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ATTACHMENT 4

STANBURY TRAFFIC PLANNING

Morgan Stanbury <morgan@stanburytraffic.com.au>

TfNSW Response - SYD20/01395/04 - Meeting Discussion - TfNSW Advises / Position

3 messages

Divna Cvetojevic <Divna.Cvetojevic@transport.nsw.gov.au> Tue, Jan 25, 2022 at 12:53 PM
To: Matthew Houlden <matthew@stanburytraffic.com.au>, Morgan Stanbury <morgan@stanburytraffic.com.au>
Cc: "rodney.garrett@dpie.nsw.gov.au" <rodney.garrett@dpie.nsw.gov.au>, Brendan Pegg <brendan.j.pegg@transport.nsw.gov.au>

Hi Matt

Thank you for forwarding to us the amended access options, SIDRA modelling and responding to TfNSW previous advice. After review TfNSW advises the following:

- TfNSW would support, in principal, the proposed deceleration lane and associated supporting civil works, as an 'left-in only' arrangement from the Princes Highway to the subject development.

As part of the response to submissions (RtS), TfNSW will seek further clarification on the deceleration lane design and operation requirements which include:

  - Capacity / length of deceleration lane to be modelled with particular regard to the existing tidal flow on Princes Highway and its operation and if there is a traffic overflow to Princes Highway, mitigation options to be developed.

    SIDRA model to add a separate left turn intersection into the model at the driveway location and highlight any potential overflow to Princes Highway and the impact on the existing tidal flow system.

  - Deceleration lane need to be suitable for a 70km/h design speed and designed as per Austroads Part 4A.

  - There would need to be a distance equal to 4 secs of travel between the left turn lane from Forest Road onto the highway and the start of the deceleration lane.

  - The design of the deceleration lane and the following ramp into the car park would need to consider the grade (and therefore the length) of the ramp, vertical clearance at the portal, the size of vehicles accessing the car park and the appropriate sight distance over the crest where the deceleration lane ends and the ramp starts.

  - Assess the required width and the length for the deceleration lane and the ramp when offsets, grades etc are taken into consideration.

  - Independent Road Safety Audit (RSA) is to be undertaken for the deceleration lane concept design including the proposed grade separation of deceleration lane and pedestrians path / movement with any recommendations incorporated into the concept design.

- Access from Eden Street, accommodating all movements in/out from the property would be required. As Eden Street is a local road under the care and control of Council, this design should be to the satisfaction of Council.

- Left-in, left out (LILO) arrangement at the intersection Forest Road / Eden Street would be required and as Forest Road, at this location, is a classified road the design shall be to TfNSW satisfaction.

- TfNSW would not support right turn movement from Princes Highway into Burrows Street.

- Consultation with Council to be undertaken regarding any required improvements to the local network / intersections surrounding development.

- Construction delivery consideration should be given in an early stage, as to how the proposed traffic mitigation measures can be constructed, considering the nature of the transport network at this location and how impacts to the classified network will be mitigated.

Note: It is emphasised that the comments provided above are informal and of a pre-submission nature, they are not to be interpreted as binding upon TfNSW and may change following formal assessment of a submitted response from the appropriate consent authority.

If you have any further question please contact me.

Kind regards,

Divna Cvetojevic

Development Assessment Officer

Planning and Programs

Greater Sydney

Transport for NSW

M 0455 515 259 **E** divna.cvetojevic@transport.nsw.gov.au

transport.nsw.gov.au

27-31 Argyle Street

Parramatta NSW 2150



Transport
for NSW



I acknowledge the Aboriginal people of the country on which I work, their traditions, culture and a shared history and identity. I also pay my respects to Elders past and present and recognise the continued connection to country.

Please consider the environment before printing this email.

OFFICIAL

From: Matthew Houlden [mailto:matthew@stanburytraffic.com.au]
Sent: Tuesday, 21 December 2021 4:17 PM
To: Brett Morrison <Brett.Morrison4@transport.nsw.gov.au>
Cc: Divna Cvetojevic <Divna.Cvetojevic@transport.nsw.gov.au>
Subject: Re: SYD20/01395/04 - Meeting Discussion - TfNSW Advises / Position

CAUTION: This email is sent from an external source. Do not click any links or open attachments unless you recognise the sender and know the content is safe.

Hi Brett,

There is a link in the letter as it is too large to email. We incorporated some of the info you sent but wasn't able to incorporate all the info.

We also made some estimates of the MF as without increasing it the intersection wasn't close to a DoS of 1. We tried to explain the modelling approach in the letter but if you have any questions while reviewing please let me know and I am happy to answer.