# Traffic and Transport Assessment

## Concept Plan Modification Application

## 6-30 Artarmon Road and 15 Richmond Avenue, Willoughby

Ref: 1192r02v4
2/04/2020

Info@asongroup.com.au | +61 2 9083 6601 | Suite 5.02, Level 5, 1 Castlereagh Street. Sydney, NSW 2000

# Document Control

**Project No:** 1192

**Project:** 6-30 Artarmon Road & 15 Richmond Avenue, Willoughby

**Client:** Mirvac

**File Reference:** AG1192r02v4 Modification Application TTA; 6-30 Artarmon Rd and 15 Richmond Ave, Willoughby; Issue IV

# Revision History

| Revision | Date | Details | Author | Approved by |
|---|---|---|---|---|
| - | 09/03/20 | Draft | T. Lehmann | A. Reisch |
| V1 | 24/03/20 | Issue I | T. Lehmann | A. Reisch |
| V2 | 27/03/20 | Issue II | T. Lehmann | A. Reisch |
| V3 | 31/03/20 | Issue III | T. Lehmann | T. Lehmann |
| V4 | 02/04/20 | Issue IV | T. Lehmann | T. Lehmann |

# Executive Summary

The Channel Nine Campus at 6-30 Artarmon Road, Willoughby is subject to an existing Concept Plan Approval for redevelopment of the site into 460 residential dwellings across nine buildings along with small-scale non-residential uses. Mirvac are proposing a modification to the Concept Plan to include the TX Australia site and permit one additional 5 storey building (Building K) on the site whilst maintaining the 460 residential dwelling cap. No amendments to the already approved road layout and vehicle access points are proposed as part of this modification.

This report assesses any potential impact the proposed modification may have against the current Concept Plan Approval of 460 dwellings, and the Traffic & Parking Assessment prepare by McLaren Traffic Engineers in 2017 (TPIA 2017) for 510 dwellings submitted as part of the Concept Plan application.

Based on assessment of local traffic conditions, parking requirements and expected traffic generation, the proposed modification is deemed to be substantially consistent with the existing Concept Plan Approval and the intersection traffic modelling of the TPIA 2017. Ason Group has therefore determined that the inclusion of Building K into the Concept Plan is supportable on traffic and transport planning grounds.

# Table of Contents



# Appendices

# 1 Introduction

## 1.1 Overview

The Channel Nine Campus at 6-30 Artarmon Road, Willoughby is subject to a Part 3A Concept Plan Approval (MP10_0198 MOD 2) (herein referred to as the Mod 2 Master Plan for ease of reference) that was approved by the Minister for Planning on 31 January 2019. The Mod 2 Master Plan provides for redevelopment of the site into 460 residential dwellings across nine buildings along with small-scale non-residential uses.

In February 2020 Mirvac entered into an agreement with Euro Properties and Lotus Property Fund No.8 (LEPC9) to acquire the Channel Nine Campus site. Mirvac simultaneously entered into a separate agreement with TX Australia Pty Ltd to acquire the approximate 2,132 $m^2$ site directly to the south of the Channel Nine Campus known as Lot 11 DP1162507 at 15 Richmond Avenue, Willoughby that currently accommodates a 233m tall transmission tower.

Mirvac are applying to the NSW Department of Planning, Industry & Environment to modify the current the Mod 2 Master Plan to incorporate the transmission tower site to permit redevelopment into a tenth residential building while maintaining the existing 460 residential dwelling approval.

The Mod 2 Master Plan amendment will include removal of the existing transmission tower and redevelopment of Lot 11 & 12 into a five-storey residential flat building. The building height, scale and open space across the Channel Nine Campus site at 6-30 Artarmon Road is proposed to remain consistent with the existing Mod 2 Master Plan.

In this regard, Ason Group has been engaged by Mirvac to prepare a Traffic and Transport Assessment (TTA) in regard to a mixed-use development (the Proposal) at the former Channel 9 Studios, 6-30 Artarmon Road, and the Transmission Tower Site at 15 Richmond Avenue, Willoughby (collectively referred to as the Site). The modified Proposal provides for:

- 10 residential buildings;
- Up to 460 residential units;
- Up to 300 $m^2$ of ancillary retail gross floor area (GFA);
- Retention and adaptive reuse of No 6 Artarmon Road for retail/commercial purposes (within existing GFA of 1,050 $m^2$)
- New internal roadways and other infrastructure work to support the development
- Publicly accessible open space and through site link
- On-site parking and service areas; and

- End-of-trip facilities including bicycle rails suitable for visitors.

Importantly, this TTA considers the Proposal in the context of the development of the whole Site in accordance with MP10_0198 as per the Mod 2 Master Plan, as this approved Master Plan essentially provides a benchmark against which the Proposal can be measured.

## 1.2 Transport Assessment Tasks

This TTA provides an assessment of the relevant access, traffic and parking characteristics of the Proposal, and the potential impacts of the Proposal on the local road and parking environment. This has included a detailed assessment of:

- Existing local road network conditions, and the operation of key local intersections providing access to the Site;
- Public and active transport services and infrastructure, and sustainable transport strategies proposed to reduce the future (vehicular) trip generation of the Site;
- The trip generation and distribution of the Proposal, and the potential impact of those trips on the key local intersections;
- Parking requirements and provision; and
- The design of access driveways; parking aisles and spaces; and servicing areas.

## 1.3 Reference Documents

In preparing this TA, Ason Group has referenced the following Willoughby Council (Council) development controls, and other relevant transport and parking guidelines and standards:

- Willoughby Council Development Control Plan 2012 (Willoughby DCP 2012).
- Willoughby Council Local Environmental Plan 2012 (Willoughby LEP 2012).
- Roads and Maritime Services (RMS) Guide to Traffic Generating Developments (RMS Guide).
- RMS Guide to Traffic Generating Developments – Updated Traffic Survey (RMS Guide Update).
- Integrated Public Transport Service Planning Guidelines prepared by TfNSW (TfNSW Guidelines).
- Australian Standard 2890.1: Parking Facilities – Off-Street Car Parking (AS 2890.1).
- Australian Standard 2890.2: Parking Facilities – Off-Street Commercial Vehicle Facilities (AS 2890.2).
- Australian Standard 2890.6: Parking Facilities – Off-Street Parking for People with a Disability (AS 2890.6).

This TTA also references the most recent planning approvals for the development of the Site including the following documents:

- Updated Traffic & Parking Impact Assessment for the Modification Application for Approved Residential Development at Artarmon Road, Willoughby dated 30th March 2017 prepared by McLaren Traffic Engineering (TPIA 2017).
- *Modification of Minister's Approval MP10_0198 MOD 1* dated 31st January 2019 prepared by the Department of Planning and Environment (Mod 2).

# 2 Existing Conditions

## 2.1 Site Location

The Site is located approximately 6.5km north of the Sydney CBD, and approximately 2km south-east of Chatswood CBD. The Site has a combined area of 3.2ha and is currently zoned SP2 Infrastructure in LEP 2012, and is located within a primarily low to medium density residential area.

The Site is shown in its local context in **Figure 1**, which also shows key roads in the vicinity of the Site (as discussed further below).

## 2.2 Road Hierarchy

- **Willoughby Road:** A classified Main Road (MR641), Willoughby Road generally runs in a north-south direction to the east of the Site. It provides 1 traffic lane in each direction, with kerbside lanes providing additional traffic capacity further to Clearway restrictions in AM peak period (southbound towards the Sydney CBD) and during the PM peak period (northbound towards Mowbray Road). Outside of the Clearway hours, 1-hour limit parking is provided in the kerbside lanes. Willoughby Road has a posted speed limit of 60k/h.
- **Artarmon Road:** A local road that runs in an east-west direction and forms the northern boundary of the Site. In the vicinity of the Site, Artarmon Road provides 1 traffic lane in each direction and kerbside lanes providing unrestricted parking dispersed between No Parking and No Stopping zones. Artarmon Road currently provides an access driveway into the Site, and has a posted speed limit of 50km/hr.
- **Scott Street:** A local road that generally runs in a north-south direction along the eastern boundary of the Site, Scott Street provides 1 traffic lane in each direction, and unrestricted on-street parking along its western side of Scott Street, and $90^0$ angled parking along its eastern side which is private parking for the Site. Scott Street has a local street speed limit of 50km/h.
- **Richmond Avenue:** A local road that runs in a north-south along the western boundary of the Site, Richmond Avenue provides 1 traffic lane in each direction and unrestricted kerbside parking on both sides of the road. Richmond Road has a local speed limit of 50km/h.


**Figure 1: Site Location**

## 2.3 Traffic Conditions

### 2.3.1 Traffic Surveys

On 5th February 2020, intersection surveys were undertaken to provides an assessment of the current operation of the following key intersections during the weekday peak periods using the SIDRA intersection model, noting that these are the same intersections as assessed in transport assessments supporting earlier Site approvals:

- Willoughby Road & Artarmon Road & Small Street;
- Artarmon Road & Scott Street; and
- Artarmon Road & Richmond Avenue.

### 2.3.2 SIDRA Analysis

The SIDRA intersection model provides a range of performance measures, including:

- **Degree of Saturation (DOS):** DOS is defined as the ratio of demand (arrival) flow to capacity. The DOS is used to measure the performance of intersections where a value of 1.0 represents an intersection at theoretical capacity, above 1.0 represent over-saturated conditions (demand flows exceed capacity) and degrees of saturation below 1.0 represent under-saturated conditions (demand flows are below capacity). As the performance of an intersection approaches DOS of 1.0, queue lengths and delays increase rapidly. It is usual to attempt to keep DOS to less than 0.9, with satisfactory intersection operation generally achieved with a DOS below 0.8.
- **Average Vehicle Delay (AVD):** AVD (or average delay per vehicle in seconds) for intersections also provides a measure of the operational performance of an intersection and is used to determine an intersection's Level of Service (see below). For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority (Give Way, Stop & Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.
- **Level of Service (LOS):** LOS is a comparative measure that provides an indication of the operating performance, based on AVD. For signalised and roundabout intersections, LOS is based on the average delay to all vehicles, while at priority-controlled intersections LOS is based on the worst approach delay.

**Table 1** below provides a summary of the SIDRA LOS criteria which references the RMS Guide.

**Table 1: SIDRA Level of Service Summary**

| 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 & spare capacity | Acceptable delays & spare capacity |
| C | 29 to 42 | Satisfactory | Satisfactory, but accident study required |
| D | 43 to 56 | Operating near capacity | Near capacity & accident study required |
| E | 57 to 70 | At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode | At capacity, requires other control mode |
| F | More than 70 | Unsatisfactory and requires additional capacity. | Unsatisfactory and requires other control mode or major treatment. |

**Table 2** provides a summary of the SIDRA intersection analysis during the weekday peak period.

**Table 2: Existing Intersection Performance**

| Intersection | Control Type | Period | Degree of Saturation | Average Vehicle Delay | Level of Service |
|---|---|---|---|---|---|
| Willoughby Rd / Artarmon Rd / Small St | Signals | Weekday AM | 1.034 | 42.7 sec | D |
| | | Weekday PM | 0.784 | 25.7 sec | B |
| Artarmon Rd / Scott St | Priority Control | Weekday AM | 0.514 | 9 sec | A |
| | | Weekday PM | 0.206 | 8.2 sec | A |
| Artarmon Rd / Richmond Ave | Priority Control | Weekday AM | 0.224 | 7.7 sec | A |
| | | Weekday PM | 0.198 | 7.4 sec | A |

With reference to **Table 2** the key intersections all currently operate within acceptable parameters with a LOS of D or better during all peak periods.

The detailed SIDRA outputs are attached in **Appendix A**.

## 2.4 Public and Active Transport

The public and active transport services and infrastructure available to the Site are shown in **Figure 2**, and discussed further in sections below.

### 2.4.1 Bus Services

The TfNSW Guidelines states that bus services influence the travel mode choices of areas within 400m (approximately a 5 minute walk) of a bus stop, noting that bus stops are available within 400m of the Site in Willoughby Road (as shown in **Figure 2**). The bus routes operating through these bus stops are detailed in **Table 3**.

**Table 3: Bus Services**

| Bus Number | Route | Frequency |
|---|---|---|
| 257 | Chatswood to Balmoral via Crows Nest | AM Peak: 15 mins<br>Off-Peak: 30 mins<br>PM Peak: 15 mins |
| 272 | North Willoughby to Wynyard | AM Peak: 10 mins<br>Off-Peak: No Service<br>PM Peak: 10 mins |
| 340 | Bondi Junction to Chatswood | AM Peak: 10 mins<br>Off-Peak: 20 mins<br>PM Peak: 10 mins |
| 343 | Chatswood to Kingsford | AM Peak: 10 mins<br>Off-Peak: 10 mins<br>PM Peak: 10 mins |

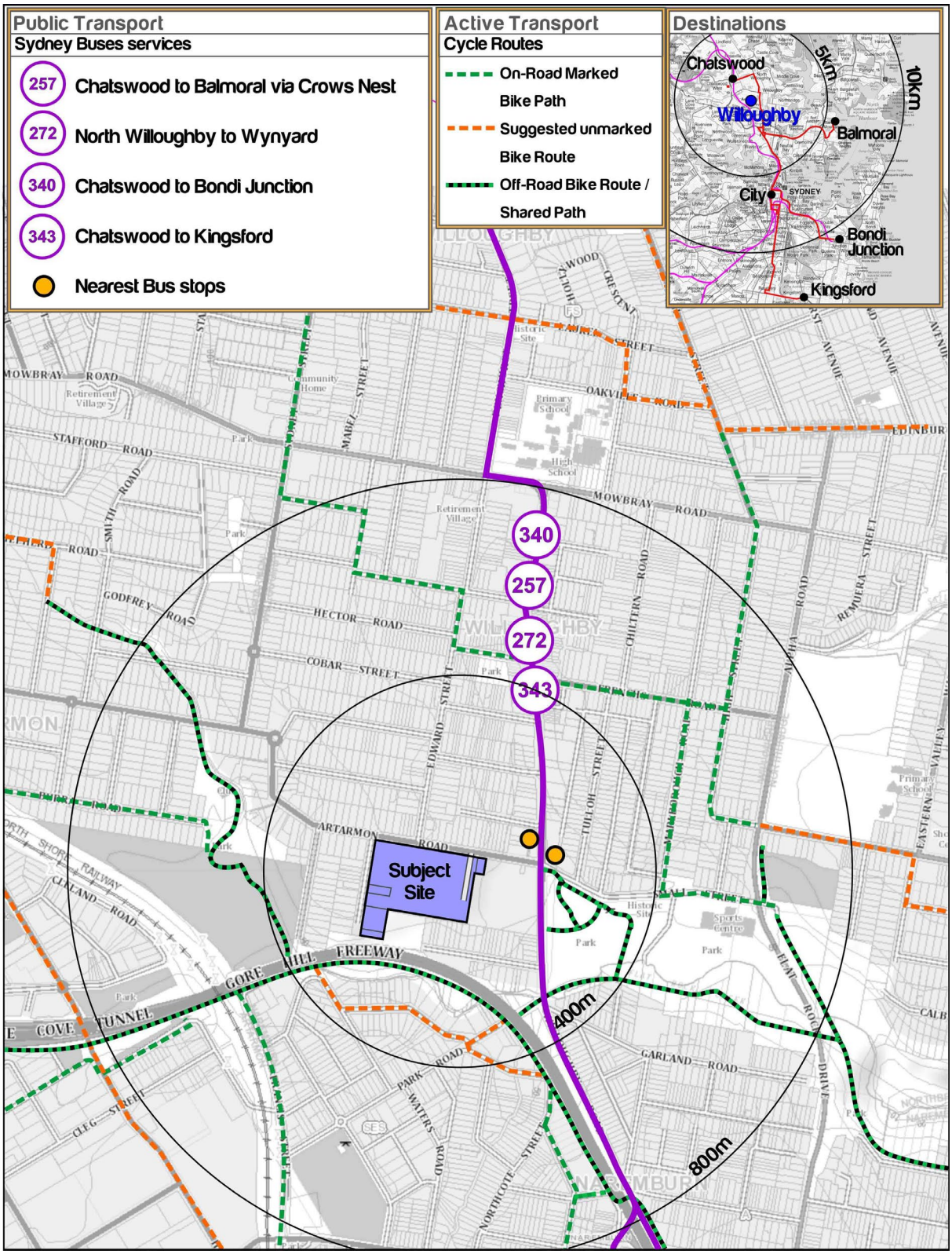


**Figure 2: Public and Active Transport Options**

### 2.4.2 Pedestrian Accessibility

The Site is well serviced in terms of pedestrian infrastructure, with footpaths and appropriate crossings available on all nearby roads; wide pedestrian footpaths on both sides of each road; and signalised pedestrian crossings intersection of Willoughby Road & Artarmon Road & Small Street.

### 2.4.3 Cycle Routes

As shown in **Figure 2**, there are multiple cycling routes within close proximity to the Site, including on and off-road paths, providing access to the sub-regional cycling network. These routes provide access to key destinations such as Chatswood, North Sydney and the Sydney CBD.

# 3 Existing Site Approvals

## 3.1 Summary of Approved Development

The original Part 3A Concept Plan Approval was granted by the (then) Planning Assessment Commission (PAC) in December 2014, and allowed for the development of up to 400 apartments across the Channel Nine Studio site at 6-30 Artarmon Road in a mix of residential buildings and townhouses.

This approval was subsequently modified by the Independent Planning Commission in January 2019 to allow for the Mod 2 Master Plan with the following components:

- Up to 460 residential units;
- Up to 300 $m^2$ of ancillary retail GFA;
- Retention and adaptive reuse of No 6 Artarmon Road for retail/commercial purposes (within existing GFA of 1,050 $m^2$)
- The retention of the existing Scott Street alignment;
- Two (2) driveways within the internal roadway (Park Avenue); and
- A revised open space network.

## 3.2 Mod 2 Master Plan Approval – Traffic Conditions

With regard to traffic conditions, the Mod 2 Master Plan approval was largely based on the assessment provided in TPIA 2017, which considered not only the traffic generation of the Site (based on the above components) but also broader traffic flow changes in the local road network. Particular consideration was given to the intersection of Willoughby Road & Artarmon Road & Small Street, which had also been the subject of specific assessment in earlier Site development proposals.

For context, **Table 4** and **Table 5**, and below detail the results of the SIDRA intersection analysis detailed in TPIA 2017 further to the development of the Site in accordance with the January 2019 approval. It should also be noted that while TPIA 2017 assessed a development yield of 495 dwellings, a total of 510 dwellings was adopted in the traffic modelling, i.e. a total yield well in excess of the 460 dwellings approved as part of the Mod 2 Master Plan and the proposed modification for which this TTA relates to.

**Table 4: Weekday AM Peak – Level of Service Results**

| Intersection Leg | Existing | 510 Dwellings |
|---|---|---|
| Willoughby Road (north) | B | B |
| Artarmon Road (west) | D | D |
| Willoughby Road (south) | B | B |
| Small Street (east) | D | D |
| **Overall** | **B** | **B** |

**Table 5: Weekday PM Peak – Level of Service Results**

| | Existing | | | 510 Dwellings | | |
|---|---|---|---|---|---|---|
| **Movement** | **LT** | **T** | **RT** | **LT** | **T** | **RT** |
| Willoughby Road (north) | B | B | B | C | C | D |
| Artarmon Road (west) | E | D | E | F | E | F |
| Willoughby Road (south) | B | B | N/A | B | B | N/A |
| Small Street (east) | E | E | E | E | E | F |
| **Overall** | | **B** | | | **C** | |

As is evident from the above tables in a 510 dwelling scenario from the TPIA 2017, the key intersections in the vicinity of the Site were found to operate within acceptable parameters – without the requirement for upgrades – during the weekday peak periods.

As such, TPIA 2017 concluded that no upgrades to the intersection of Willoughby Road & Artarmon Road & Small Street were required to accommodate development in accordance with the Mod 2 Master Plan.

## 3.3 Mod 2 Master Plan Approval and Conditions of Consent

The Mod 2 Master Plan application was subsequently approved by the PAC and the Signed Manner of Approval was received on the 31st January 2019 specifically permitting a maximum of 460 units (Condition of Consent A6 (a)). Schedule 3 of that approval document sets out the key traffic related Conditions of Consent, which are summarised below.

*A6. The maximum number of dwellings shall not exceed 460 dwellings (including affordable housing).*

*11. Future Development Application/s for Stage 2 shall incorporate the provision of a roundabout at the intersection of Artarmon Road and Richmond Avenue (or alternatively at the intersection of Artarmon Road and Scott Street if agreed by Willoughby City Council). The roundabout is to be constructed by the proponent to the requirement of Council.*

*16a. Future Development Application/s for Stage 1 shall provide appropriate treatment on the western side of Richmond Avenue, opposite the new site vehicle egress, to mitigate against vehicle headlights impacting on adjacent residences, such as through landscaping. The cost of the work is to be borne by the proponent and designed and constructed to the satisfaction of Council and in consultation with nearby affected residents.*

*17. Future Development Application/s for Stage 2 shall incorporate the provision of a raised pedestrian crossing on Artarmon Road, to council requirements unless it is demonstrated that warrants are not met for a pedestrian crossing, in which case a speed hump is to be provided. The delivery of the crossing/speed hump is to be negotiated with Council and may either be provided as works-in-kind by the proponent or constructed by council and funded by the proponent.*

***Car Parking***

*29: Future Development Applications shall provide on-site car parking at the following rates: (a) 0.5 space per studio apartment, (b) 1 space per 1 bedroom or 2 bedroom apartment , (c) 1.25 spaces per 3 bedroom apartment, (d) 1 visitor space per 4 apartments , (e) retail/recreation and bicycle parking are to be provided in accordance with the Willoughby Development Control Plan*

*30: Visitor parking required by condition 29 shall be provided where possible as kerbside parking at street level. In this regard all streets are to incorporate visitor kerbside parking.*

*31: Future Development Applications shall incorporate the provision of a Car Share Scheme on the site.*

*32: Future Development Applications shall include an assessment of any potential impacts to bus services (including school bus services) and pedestrian access to public transport infrastructure as a result of construction vehicles and construction works. Should any impacts be identified, the*

*duration of the impacts and the measures proposed to mitigate these impacts must be clearly explained.*

# 4 The Proposal

A detailed description of the Proposal is provided in the Environmental Impact Assessment (EIA) which this TTA accompanies, but in summary the amended Proposal provides for:

- 10 residential buildings.
- 460 residential units, including:
- 300 $m^2$ of ancillary non-residential GFA.
- Retention and adaptive reuse of No 6 Artarmon Road for retail/commercial purposes (within existing GFA of 1,050 $m^2$).
- On-site parking and service areas, including:
    - End-of-trip facilities include bicycle rails suitable for visitors.
    - Additional on-street parking spaces on Artarmon Road and the Scott Street extension.
    - The construction of the Scott Street extension.

It is important to note that the Proposal provides an additional residential building on the Transmission Tower Site (Building K), which will result in a proportional increase in GFA across Site; however the existing residential dwelling limit of 460 will remain, achieved by providing a higher portion of 2 and 3-bedroom apartments than previously considered.

**Figure 3** shows the proposed Site Plan with the Transmission Tower Site included.


**Figure 3: Site Plan**

# 5 Parking & Servicing Requirements

## 5.1 Car Parking

Car parking for the Proposal has been assessed with reference to the existing approval dated 31 January 2019. **Table 6** details the parking rates and requirements in accordance with the specified rates; any car parking requirements that resulted in a fraction were rounded down to the nearest whole number in accordance with Willoughby DCP 2012.

**Table 6: Approved Master Plan Parking Rates**

| Land Use | Yield / Area | Parking Rate | Parking Requirement |
|---|---|---|---|
| *Residential* | | | |
| Studio | 2 units | 0.5 space per unit | 1 |
| 1 Bedroom | 91 units | 1 space per unit | 91 |
| 2 Bedroom | 239 units | 1 space per unit | 239 |
| 3 Bedroom | 128 units | 1.25 space per unit | 160 |
| Visitors | 460 units | 1 space per 4 units | 115 |
| *Retail* | | | |
| Retail | 300 $m^2$ | 1 space per 25 $m^2$ | 12 |
| | **Total** | | 618 spaces |

With reference to **Table 6**, based on an indicative unit mix the Proposal requires 618 parking spaces. These spaces would be provided subject to future Development Applications to achieve full compliance with the existing approval with the ability to adapt spaces in the future if required.

The applicable parking requirements for accessible, car share, motorcycle, and bicycles are approved by the Concept Plan. It is expected that the requirements can be accommodated in the basement / on-street subject to future Development Application.

# 6 Traffic Assessment

## 6.1 Trip Rates

### 6.1.1 Trip Rate Per Unit

The trip rates adopted in the TPIA 2017 (upon which the existing approval is based) are:

- Weekday AM & PM Peak Periods: 1 trip per 0.32 units per hour

Based on the provision of 460 units, the traffic generation during the key peak periods is estimated as:

- Weekday AM & PM Peak Periods: 147 trips per hour

### 6.1.2 Trip Rate Per Parking Spaces

As discussed in Section 4, the Proposal provides an additional residential building on the Transmission Tower Site, which will result in a proportional increase in GFA across the Site, however the existing residential dwelling limit of 460 is proposed to remain, this is achieved by providing a higher portion of larger 2 and 3-bedroom apartments.

In this regard, a secondary traffic generation assessment has been undertaken with consideration for the proposed parking provision. The TPIA 2017 details a parking requirement of 674 for the 510 units. With consideration for the trip generation rate per unit detailed above, the TPIA 2017 assessed the following traffic generation:

- Weekday AM & PM Peak Periods: 163 vehicles per hour

Application of this traffic generation to the calculated parking provision of 674 spaces corresponds to the following trip per parking space rates:

- Weekday AM & PM Peak Periods: 1 trip per 0.24 parking spaces per hour

Therefore, based on the provision of 618 parking spaces, the traffic generation during the key peak periods is estimated as:

- Weekday AM & PM Peak Periods: 149 trips per hour

## 6.2 Traffic Impacts

### 6.2.1 Site Master Plan

The TPIA 2017 assessment has been used as the benchmark to provide a comparison against the Proposal. **Table 7** provides a comparison of the Proposal's traffic generation and the previously approved traffic generation of the Site using the trip per parking space rate detailed above.

**Table 7: Master Plan Traffic Generation Comparison – Trips per Space**

| Master Plan | Yield | Weekday Traffic Generation |
|---|---|---|
| Proposed | 618 parking spaces | 149 veh/hr |
| TPIA 2017 Report | 674 parking spaces | 163 veh/hr |
| **Difference** | | -14 |

With reference to **Table 7**, the Modified Proposal would generate 14 vehicle trips fewer than the TPIA 2017 in the weekday peak periods.

For the existing development, Scott Street provides a key access point to vehicles accessing the Site. In this regard, the existing traffic generation of the Site using Scott Street is as follows:

- AM Peak: 68 total vehicles: 56 in, 12 out
- PM Peak: 68 total vehicles: 4 in, 64 out

With consideration to the traffic generated by the Proposal detailed in **Table 7**, the following details the net traffic increase:

- AM Peak: 81 total vehicles: -26 in, 107 out
- PM Peak: 81 total vehicles: 115 in, -34 out

It should be noted that the negative volumes detailed above indicate that there would be a net reduction in these movements i.e. there would be 26 fewer vehicles arriving at the Site during the AM Peak period and 34 fewer vehicles departing the Site during the PM Peak periods under the Proposal.

***Trip Distribution***

Utilising the surveyed traffic volumes, the future traffic movements of the Proposal within the study network can be established.

The following In/Out directional split of traffic has been adopted:

- AM Peak: 20% in, 80% out
- PM Peak: 80% in, 20% out

Application of the existing traffic movements and the above directional split with consideration for the net traffic changes has been used to determine the AM and PM peak periods trip distribution and is detailed in **Figure 4** and **Figure 5** respectively.

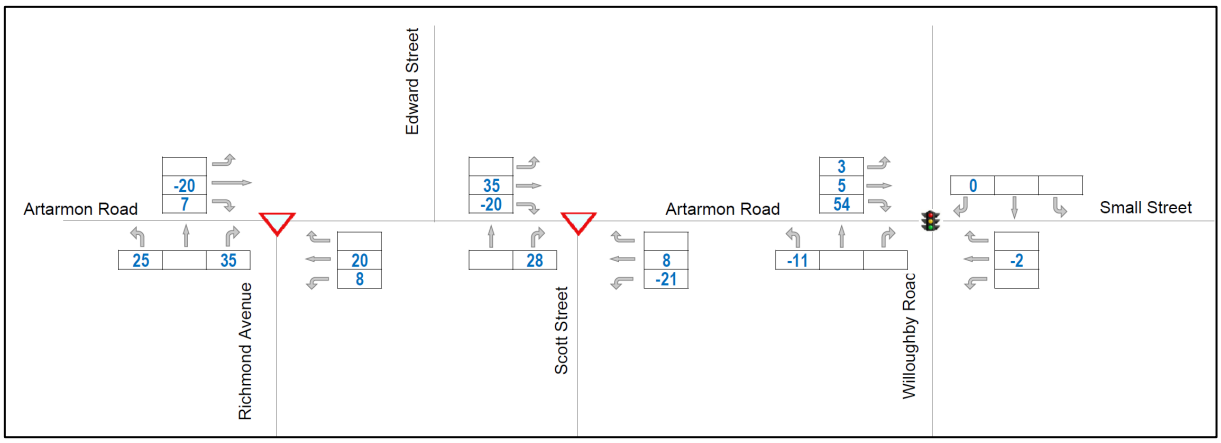


**Figure 4: AM Trip Distribution**

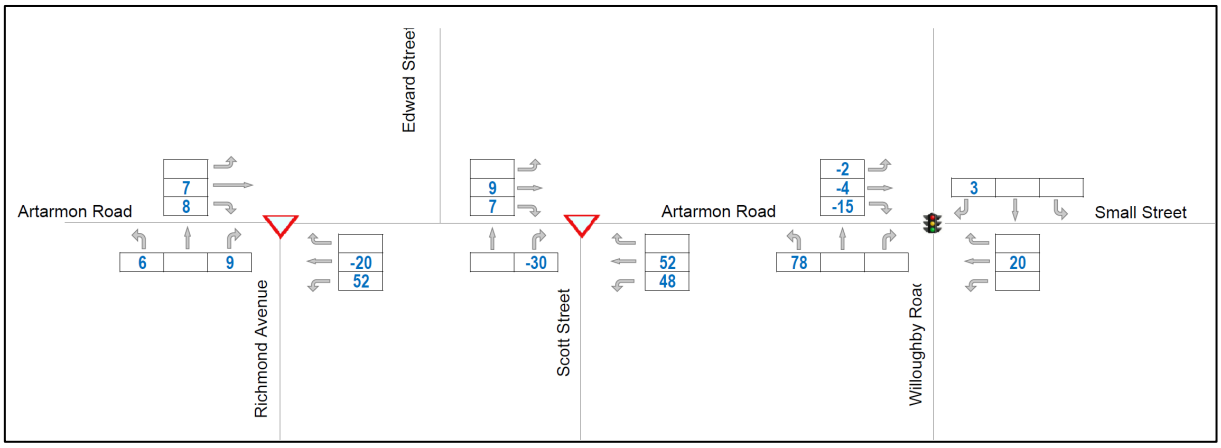


**Figure 5: PM Trip Distribution**

Utilising the surveyed traffic volumes, the future traffic movements of the Proposal within the study network can be established.

### 6.2.2 Future Intersection Operation

**Table 8** details the results of the SIDRA intersection analysis of the above intersections during the weekday peak period.

**Table 8: Future Intersection Performance**

| Intersection | Control Type | Period | Degree of Saturation | Average Vehicle Delay | Level of Service |
|---|---|---|---|---|---|
| Willoughby Rd / Artarmon Rd / Small St | Signals | Weekday AM | **0.950** | 45.7 sec | D |
| | | Weekday PM | 0.876 | 29.8 sec | C |
| Artarmon Rd / Scott St | Priority Control | Weekday AM | 0.529 | 9.5 sec | A |
| | | Weekday PM | 0.262 | 8.6 sec | A |
| Artarmon Rd / Richmond Ave | Priority Control | Weekday AM | 0.218 | 8 sec | A |
| | | Weekday PM | 0.217 | 7.6 sec | A |

With reference to **Table 8** the key intersections all currently operate within acceptable parameters with a LOS of D or better during all peak periods. For the signalised intersection of Willoughby Road & Artarmon Road & Smith Street, an increase of 3 seconds and 4.1 seconds would occur during the AM and PM peak periods respectively with a change in Level of Service during the PM peak from B to C.

Detailed SIDRA outputs are detailed in **Appendix B**.

## 6.3 Traffic Assessment Summary

The SIDRA intersection modelling indicates that the key intersections in the local road network would continue to operate as currently occur with minimal increases to the existing Average Vehicle Delay and with no changes to the Level of Service during the AM and PM peak periods.

Furthermore, given that the trip generation of the Site further to the Modification Application is lower than the approved Site trip generation detailed in the TPIA 2017 (which was shown to have an acceptable impact on the operation of key local intersections), it is our conclusion that the Proposal is therefore inherently supportable on traffic grounds.

# 7 Design Commentary

## 7.1 Site Access

Noting that consideration of the broader Site has informed the design of the car park, two (2) basement access locations are proposed as shown in **Figure 3**, including:

- Proposed relocation of existing Scott Street access under Building G (the Building G Access).
- Proposed new access via the Scott Street Extension underneath Building C & D (the Building C&D Access). Access to Building K basement carparking is proposed via this access point.

These access points are consistent with the approved Mod 2 Masterplan and no changes are proposed. The design of these access points would be required to comply with all relevant Australian Standards, prior to the issue of a Construction Certificate.

## 7.2 Car Park Design & Internal Layout

The internal basement car park will be required to comply with all relevant Australian Standards, prior to the issue of a Construction Certificate.

# 8 Conclusions

Further to a detailed assessment of the access, traffic and parking characteristics of the Proposal, Ason Group has determined the following:

- Parking requirements for the Site have been assessed with reference to the parking rates stipulated by the existing Concept Approval, resulting in a requirement for 618 parking spaces. These will be provided within basement parking. Accessible, motorcycle, and bicycle parking are capable of being accommodated with a combination of basement and on-street parking spaces.
- The existing Site approval (the Mod 2 Master Plan) provides for the development of 460 residential units across the Site. A comparison of traffic generation with the approved Mod 2 Master Plan as assessed in TPIA 2017 indicates that the amended Proposal would result in a reduction of 14 and 10 trips during the key AM and PM peak periods respectively. SIDRA intersection modelling was undertaken with consideration for the amended Proposal's traffic generation and surveys undertaken February 2020 and determined that there would be no change to the Level of Service and minimal increase to the Average Vehicle Delay.
- Furthermore, the TPIA 2017 assessed a total development yield of 510 units, and determined that the local road network could accommodate this level of additional traffic generation. Given the subsequent approval of the Mod 2 Master Plan, it is inherently the case that amended Proposal which generates fewer trips than the approved Master Plan must be acceptable with regard to future traffic conditions.
- The internal configuration of the Site (including the vehicular access points, loading bays and waiting bays) will be designed with reference to the appropriate Australian Standards.

**Further to the above, Ason Group has therefore determined that the Proposal is supportable on traffic and transport planning grounds**.

# Appendix A

## SIDRA Detailed Outputs – Existing

# MOVEMENT SUMMARY

## Site: 101 [[EX AM] Artarmon Road x Richmond Avenue]

## Network: 1 [Existing AM]

Site: Artarmon Road x Richmond Avenue
Scenario: Existing
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Richmond Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 3 | 0.0 | 3 | 0.0 | 0.017 | 5.2 | LOS A | 0.0 | 0.2 | 0.42 | 0.62 | 0.42 | 36.2 |
| 3 | R2 | 9 | 0.0 | 9 | 0.0 | 0.017 | 7.7 | LOS A | 0.0 | 0.2 | 0.42 | 0.62 | 0.42 | 32.5 |
| Approach | | 13 | 0.0 | 13 | 0.0 | 0.017 | 7.1 | LOS A | 0.0 | 0.2 | 0.42 | 0.62 | 0.42 | 33.7 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 4 | 0.0 | 4 | 0.0 | 0.120 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 48.6 |
| 5 | T1 | 228 | 0.9 | 228 | 0.9 | 0.120 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.8 |
| Approach | | 233 | 0.9 | 233 | 0.9 | 0.120 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.8 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 425 | 1.7 | 425 | 1.7 | 0.224 | 0.0 | LOS A | 0.0 | 0.1 | 0.01 | 0.01 | 0.01 | 49.5 |
| 12 | R2 | 4 | 0.0 | 4 | 0.0 | 0.224 | 5.5 | LOS A | 0.0 | 0.1 | 0.01 | 0.01 | 0.01 | 46.8 |
| Approach | | 429 | 1.7 | 429 | 1.7 | 0.224 | 0.1 | NA | 0.0 | 0.1 | 0.01 | 0.01 | 0.01 | 49.4 |
| All Vehicles | | 675 | 1.4 | 675 | 1.4 | 0.224 | 0.2 | NA | 0.0 | 0.2 | 0.01 | 0.02 | 0.01 | 49.1 |

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

# MOVEMENT SUMMARY

## Site: 101 [[EX AM] Artarmon Road x Scott Street]

## Network: 1 [Existing AM]

Site: Artarmon Road x Scott Street
Scenario: Existing
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Scott Street | | | | | | | | | | | | | | |
| 1 | L2 | 7 | 0.0 | 7 | 0.0 | 0.020 | 5.4 | LOS A | 0.0 | 0.2 | 0.38 | 0.59 | 0.38 | 30.0 |
| 3 | R2 | 5 | 0.0 | 5 | 0.0 | 0.020 | 9.0 | LOS A | 0.0 | 0.2 | 0.38 | 0.59 | 0.38 | 30.0 |
| Approach | | 13 | 0.0 | 13 | 0.0 | 0.020 | 6.9 | LOS A | 0.0 | 0.2 | 0.38 | 0.59 | 0.38 | 30.0 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 31 | 0.0 | 31 | 0.0 | 0.159 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 0.00 | 47.1 |
| 5 | T1 | 276 | 0.8 | 276 | 0.8 | 0.159 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 0.00 | 47.7 |
| Approach | | 306 | 0.7 | 306 | 0.7 | 0.159 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 0.00 | 47.6 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 525 | 1.2 | 525 | 1.2 | 0.514 | 0.2 | LOS A | 0.2 | 1.3 | 0.06 | 0.03 | 0.08 | 48.3 |
| 12 | R2 | 28 | 0.0 | 28 | 0.0 | 0.514 | 6.2 | LOS A | 0.2 | 1.3 | 0.06 | 0.03 | 0.08 | 46.2 |
| Approach | | 554 | 1.1 | 554 | 1.1 | 0.514 | 0.5 | NA | 0.2 | 1.3 | 0.06 | 0.03 | 0.08 | 48.1 |
| All Vehicles | | 873 | 1.0 | 873 | 1.0 | 0.514 | 0.6 | NA | 0.2 | 1.3 | 0.05 | 0.05 | 0.05 | 47.7 |

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [[EX AM] Artarmon Road x Willoughby Road x Small Street]

## Network: 1 [Existing AM]

Site: Artarmon Road x Willoughby Road x Small Street
Scenario: Existing

Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 125 seconds (Site User-Given Phase Times)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Willoughby Road | | | | | | | | | | | | | | |
| 1 | L2 | 247 | 0.0 | 247 | 0.0 | 0.427 | 20.0 | LOS B | 9.4 | 66.8 | 0.58 | 0.65 | 0.58 | 30.0 |
| 2 | T1 | 946 | 4.8 | 946 | 4.8 | 0.898 | 36.1 | LOS C | 29.8 | 216.6 | 0.88 | 0.92 | 0.99 | 30.8 |
| 3 | R2 | 25 | 0.0 | 25 | 0.0 | 0.898 | 48.4 | LOS D | 29.8 | 216.6 | 0.98 | 1.01 | 1.12 | 23.3 |
| Approach | | 1219 | 3.7 | 1219 | 3.7 | 0.898 | 33.1 | LOS C | 29.8 | 216.6 | 0.82 | 0.87 | 0.91 | 30.6 |
| East: Small Street | | | | | | | | | | | | | | |
| 4 | L2 | 77 | 1.4 | 77 | 1.4 | 0.480 | 65.6 | LOS E | 2.9 | 20.2 | 0.99 | 0.77 | 0.99 | 17.8 |
| 5 | T1 | 55 | 1.9 | 55 | 1.9 | 0.367 | 60.1 | LOS E | 2.2 | 15.6 | 0.98 | 0.75 | 0.98 | 10.2 |
| 6 | R2 | 5 | 0.0 | 5 | 0.0 | 0.367 | 64.7 | LOS E | 2.2 | 15.6 | 0.98 | 0.75 | 0.98 | 20.8 |
| Approach | | 137 | 1.5 | 137 | 1.5 | 0.480 | 63.3 | LOS E | 2.9 | 20.2 | 0.99 | 0.76 | 0.99 | 15.3 |
| North: Willoughby Road | | | | | | | | | | | | | | |
| 7 | L2 | 18 | 0.0 | 18 | 0.0 | 0.728 | 24.3 | LOS B | 21.6 | 154.5 | 0.77 | 0.71 | 0.77 | 36.6 |
| 8 | T1 | 1635 | 2.7 | 1635 | 2.7 | 0.728 | 19.1 | LOS B | 21.8 | 156.1 | 0.78 | 0.72 | 0.78 | 40.2 |
| Approach | | 1653 | 2.7 | 1653 | 2.7 | 0.728 | 19.1 | LOS B | 21.8 | 156.1 | 0.78 | 0.72 | 0.78 | 40.2 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 10 | L2 | 31 | 3.4 | 31 | 3.4 | 1.034 | 128.0 | LOS F | 16.6 | 117.7 | 1.00 | 1.26 | 1.82 | 11.1 |
| 11 | T1 | 46 | 2.3 | 46 | 2.3 | 1.034 | 123.4 | LOS F | 16.6 | 117.7 | 1.00 | 1.26 | 1.82 | 8.0 |
| 12 | R2 | 486 | 0.9 | 486 | 0.9 | 1.034 | 128.0 | LOS F | 16.6 | 117.2 | 1.00 | 1.24 | 1.82 | 9.4 |
| Approach | | 563 | 1.1 | 563 | 1.1 | 1.034 | 127.6 | LOS F | 16.6 | 117.7 | 1.00 | 1.24 | 1.82 | 9.4 |
| All Vehicles | | 3572 | 2.7 | 3572 | 2.7 | 1.034 | 42.7 | LOS D | 29.8 | 216.6 | 0.84 | 0.85 | 0.99 | 26.5 |

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

**Movement Performance - Pedestrians**

| Mov ID | Description | Demand Flow ped/h | Average Delay sec | Level of Service | Average Back of Queue Pedestrian ped | Distance m | Prop. Queued | Effective Stop Rate |
|---|---|---|---|---|---|---|---|---|
| P2 | East Full Crossing | 12 | 13.5 | LOS B | 0.0 | 0.0 | 0.46 | 0.46 |
| P3 | North Full Crossing | 84 | 51.3 | LOS E | 0.3 | 0.3 | 0.91 | 0.91 |
| P4 | West Full Crossing | 27 | 14.4 | LOS B | 0.0 | 0.0 | 0.48 | 0.48 |
| All Pedestrians | | 123 | 39.5 | LOS D | | | 0.77 | 0.77 |

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 [[EX PM] Artarmon Road x Richmond Avenue]

## Network: 2 [Existing PM]

Site: Artarmon Road x Richmond Avenue
Scenario: Existing
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Richmond Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 7 | 0.0 | 7 | 0.0 | 0.021 | 5.8 | LOS A | 0.0 | 0.2 | 0.44 | 0.63 | 0.44 | 36.6 |
| 3 | R2 | 11 | 0.0 | 11 | 0.0 | 0.021 | 7.4 | LOS A | 0.0 | 0.2 | 0.44 | 0.63 | 0.44 | 33.1 |
| Approach | | 18 | 0.0 | 18 | 0.0 | 0.021 | 6.7 | LOS A | 0.0 | 0.2 | 0.44 | 0.63 | 0.44 | 34.8 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 11 | 0.0 | 11 | 0.0 | 0.198 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 48.5 |
| 5 | T1 | 375 | 0.0 | 375 | 0.0 | 0.198 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.7 |
| Approach | | 385 | 0.0 | 385 | 0.0 | 0.198 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 49.7 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 244 | 0.0 | 244 | 0.0 | 0.126 | 0.0 | LOS A | 0.0 | 0.0 | 0.01 | 0.00 | 0.01 | 49.7 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.126 | 6.1 | LOS A | 0.0 | 0.0 | 0.01 | 0.00 | 0.01 | 46.9 |
| Approach | | 245 | 0.0 | 245 | 0.0 | 0.126 | 0.0 | NA | 0.0 | 0.0 | 0.01 | 0.00 | 0.01 | 49.7 |
| All Vehicles | | 648 | 0.0 | 648 | 0.0 | 0.198 | 0.3 | NA | 0.0 | 0.2 | 0.01 | 0.03 | 0.01 | 49.1 |

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

# MOVEMENT SUMMARY

## Site: 101 [[EX PM] Artarmon Road x Scott Street]

## Network: 2 [Existing PM]

Site: Artarmon Road x Scott Street
Scenario: Existing
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Scott Street | | | | | | | | | | | | | | |
| 1 | L2 | 27 | 0.0 | 27 | 0.0 | 0.085 | 6.0 | LOS A | 0.1 | 0.9 | 0.47 | 0.68 | 0.47 | 29.2 |
| 3 | R2 | 40 | 0.0 | 40 | 0.0 | 0.085 | 8.2 | LOS A | 0.1 | 0.9 | 0.47 | 0.68 | 0.47 | 29.2 |
| Approach | | 67 | 0.0 | 67 | 0.0 | 0.085 | 7.3 | LOS A | 0.1 | 0.9 | 0.47 | 0.68 | 0.47 | 29.2 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 3 | 0.0 | 3 | 0.0 | 0.206 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 48.1 |
| 5 | T1 | 399 | 0.0 | 399 | 0.0 | 0.206 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.8 |
| Approach | | 402 | 0.0 | 402 | 0.0 | 0.206 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.8 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 362 | 0.0 | 362 | 0.0 | 0.187 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.9 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.187 | 6.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 47.0 |
| Approach | | 363 | 0.0 | 363 | 0.0 | 0.187 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 49.9 |
| All Vehicles | | 833 | 0.0 | 833 | 0.0 | 0.206 | 0.6 | NA | 0.1 | 0.9 | 0.04 | 0.06 | 0.04 | 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [[EX PM] Artarmon Road x Willoughby Road x Small Street ]

## Network: 2 [Existing PM]

Site: Artarmon Road x Willoughby Road x Small Street
Scenario: Existing

Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 115 seconds (Site User-Given Phase Times)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Willoughby Road | | | | | | | | | | | | | | |
| 1 | L2 | 332 | 0.0 | 332 | 0.0 | 0.784 | 23.0 | LOS B | 22.5 | 158.9 | 0.79 | 0.78 | 0.79 | 28.3 |
| 2 | T1 | 1481 | 1.8 | 1481 | 1.8 | 0.784 | 17.7 | LOS B | 23.0 | 163.2 | 0.81 | 0.76 | 0.81 | 40.7 |
| Approach | | 1813 | 1.5 | 1813 | 1.5 | 0.784 | 18.7 | LOS B | 23.0 | 163.2 | 0.80 | 0.77 | 0.80 | 39.1 |
| East: Small Street | | | | | | | | | | | | | | |
| 4 | L2 | 106 | 1.0 | 106 | 1.0 | 0.670 | 63.1 | LOS E | 3.8 | 26.7 | 1.00 | 0.83 | 1.09 | 18.2 |
| 5 | T1 | 83 | 0.0 | 83 | 0.0 | 0.782 | 61.3 | LOS E | 4.7 | 32.6 | 1.00 | 0.91 | 1.22 | 9.9 |
| 6 | R2 | 43 | 0.0 | 43 | 0.0 | 0.782 | 65.8 | LOS E | 4.7 | 32.6 | 1.00 | 0.91 | 1.22 | 20.3 |
| Approach | | 233 | 0.5 | 233 | 0.5 | 0.782 | 63.0 | LOS E | 4.7 | 32.6 | 1.00 | 0.87 | 1.16 | 16.1 |
| North: Willoughby Road | | | | | | | | | | | | | | |
| 7 | L2 | 60 | 0.0 | 60 | 0.0 | 0.651 | 18.2 | LOS B | 10.3 | 73.5 | 0.59 | 0.55 | 0.59 | 40.7 |
| 8 | T1 | 909 | 2.9 | 909 | 2.9 | 0.651 | 15.3 | LOS B | 10.3 | 73.5 | 0.63 | 0.57 | 0.63 | 42.8 |
| 9 | R2 | 12 | 0.0 | 12 | 0.0 | 0.651 | 24.1 | LOS B | 9.1 | 65.2 | 0.68 | 0.60 | 0.68 | 32.8 |
| Approach | | 981 | 2.7 | 981 | 2.7 | 0.651 | 15.6 | LOS B | 10.3 | 73.5 | 0.63 | 0.57 | 0.63 | 42.6 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 10 | L2 | 45 | 0.0 | 45 | 0.0 | 0.777 | 59.8 | LOS E | 7.6 | 53.3 | 1.00 | 0.91 | 1.14 | 19.7 |
| 11 | T1 | 84 | 0.0 | 84 | 0.0 | 0.777 | 55.3 | LOS D | 7.6 | 53.3 | 1.00 | 0.91 | 1.14 | 14.8 |
| 12 | R2 | 295 | 0.0 | 295 | 0.0 | 0.777 | 59.9 | LOS E | 7.6 | 53.3 | 1.00 | 0.90 | 1.14 | 17.0 |
| Approach | | 424 | 0.0 | 424 | 0.0 | 0.777 | 59.0 | LOS E | 7.6 | 53.3 | 1.00 | 0.90 | 1.14 | 16.9 |
| All Vehicles | | 3451 | 1.6 | 3451 | 1.6 | 0.784 | 25.7 | LOS B | 23.0 | 163.2 | 0.79 | 0.74 | 0.82 | 33.7 |

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

**Movement Performance - Pedestrians**

| Mov ID | Description | Demand Flow ped/h | Average Delay sec | Level of Service | Average Back of Queue Pedestrian ped | Distance m | Prop. Queued | Effective Stop Rate |
|---|---|---|---|---|---|---|---|---|
| P2 | East Full Crossing | 2 | 11.8 | LOS B | 0.0 | 0.0 | 0.45 | 0.45 |
| P3 | North Full Crossing | 92 | 50.9 | LOS E | 0.3 | 0.3 | 0.94 | 0.94 |
| P4 | West Full Crossing | 28 | 12.7 | LOS B | 0.0 | 0.0 | 0.47 | 0.47 |
| All Pedestrians | | 122 | 41.3 | LOS E | | | 0.82 | 0.82 |

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 B

## SIDRA Detailed Outputs – Future

# MOVEMENT SUMMARY

## Site: 101 [[FU AM] Artarmon Road x Richmond Avenue]

## Network: 3 [Future AM]

Site: Artarmon Road x Richmond Avenue
Scenario: Future
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Richmond Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 29 | 0.0 | 29 | 0.0 | 0.093 | 5.4 | LOS A | 0.1 | 0.9 | 0.41 | 0.66 | 0.41 | 36.3 |
| 3 | R2 | 46 | 0.0 | 46 | 0.0 | 0.093 | 8.0 | LOS A | 0.1 | 0.9 | 0.41 | 0.66 | 0.41 | 32.7 |
| Approach | | 76 | 0.0 | 76 | 0.0 | 0.093 | 7.0 | LOS A | 0.1 | 0.9 | 0.41 | 0.66 | 0.41 | 34.4 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 13 | 0.0 | 13 | 0.0 | 0.135 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 48.3 |
| 5 | T1 | 249 | 0.8 | 249 | 0.8 | 0.135 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 49.5 |
| Approach | | 262 | 0.8 | 262 | 0.8 | 0.135 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 0.00 | 49.4 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 404 | 1.8 | 404 | 1.8 | 0.218 | 0.0 | LOS A | 0.0 | 0.3 | 0.03 | 0.02 | 0.03 | 48.5 |
| 12 | R2 | 12 | 0.0 | 12 | 0.0 | 0.218 | 5.7 | LOS A | 0.0 | 0.3 | 0.03 | 0.02 | 0.03 | 46.5 |
| Approach | | 416 | 1.8 | 416 | 1.8 | 0.218 | 0.2 | NA | 0.0 | 0.3 | 0.03 | 0.02 | 0.03 | 48.4 |
| All Vehicles | | 754 | 1.3 | 754 | 1.3 | 0.218 | 0.9 | NA | 0.1 | 0.9 | 0.06 | 0.08 | 0.06 | 46.7 |

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [[FU AM] Artarmon Road x Scott Street]

## Network: 3 [Future AM]

Site: Artarmon Road x Scott Street
Scenario: Future

Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Scott Street | | | | | | | | | | | | | | |
| 1 | L2 | 28 | 0.0 | 28 | 0.0 | 0.125 | 5.5 | LOS A | 0.1 | 0.9 | 0.43 | 0.67 | 0.43 | 28.6 |
| 3 | R2 | 35 | 0.0 | 35 | 0.0 | 0.125 | 9.5 | LOS A | 0.1 | 0.9 | 0.43 | 0.67 | 0.43 | 28.6 |
| Approach | | 63 | 0.0 | 63 | 0.0 | 0.125 | 7.7 | LOS A | 0.1 | 0.9 | 0.43 | 0.67 | 0.43 | 28.6 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 8 | 0.0 | 8 | 0.0 | 0.151 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 47.9 |
| 5 | T1 | 284 | 0.8 | 284 | 0.8 | 0.151 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.3 |
| Approach | | 293 | 0.7 | 293 | 0.7 | 0.151 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 49.2 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 562 | 1.2 | 562 | 1.2 | 0.529 | 0.1 | LOS A | 0.0 | 0.4 | 0.02 | 0.01 | 0.02 | 49.6 |
| 12 | R2 | 7 | 0.0 | 7 | 0.0 | 0.529 | 6.0 | LOS A | 0.0 | 0.4 | 0.02 | 0.01 | 0.02 | 46.9 |
| Approach | | 569 | 1.1 | 569 | 1.1 | 0.529 | 0.1 | NA | 0.0 | 0.4 | 0.02 | 0.01 | 0.02 | 49.5 |
| All Vehicles | | 925 | 0.9 | 925 | 0.9 | 0.529 | 0.7 | NA | 0.1 | 0.9 | 0.04 | 0.06 | 0.04 | 47.6 |

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

# MOVEMENT SUMMARY

## Site: 101 [[FU AM] Artarmon Road x Willoughby Road x Small Street]

## Network: 3 [Future AM]

Site: Artarmon Road x Willoughby Road x Small Street
Scenario: Future

Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 150 seconds (Site Practical Cycle Time)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Willoughby Road | | | | | | | | | | | | | | |
| 1 | L2 | 236 | 0.0 | 236 | 0.0 | 0.446 | 24.0 | LOS B | 11.9 | 84.8 | 0.60 | 0.65 | 0.60 | 27.0 |
| 2 | T1 | 946 | 4.8 | 946 | 4.8 | 0.937 | 51.5 | LOS D | 37.8 | 274.9 | 0.90 | 0.96 | 1.04 | 25.6 |
| 3 | R2 | 25 | 0.0 | 25 | 0.0 | 0.937 | 68.8 | LOS E | 37.8 | 274.9 | 1.00 | 1.07 | 1.20 | 18.3 |
| Approach | | 1207 | 3.7 | 1207 | 3.7 | 0.937 | 46.5 | LOS D | 37.8 | 274.9 | 0.84 | 0.90 | 0.96 | 25.6 |
| East: Small Street | | | | | | | | | | | | | | |
| 4 | L2 | 77 | 1.4 | 77 | 1.4 | 0.905 | 96.1 | LOS F | 3.9 | 27.9 | 1.00 | 0.99 | 1.49 | 13.6 |
| 5 | T1 | 53 | 1.9 | 53 | 1.9 | 0.667 | 81.6 | LOS F | 2.8 | 19.5 | 1.00 | 0.80 | 1.12 | 8.0 |
| 6 | R2 | 5 | 0.0 | 5 | 0.0 | 0.667 | 86.2 | LOS F | 2.8 | 19.5 | 1.00 | 0.80 | 1.12 | 17.1 |
| Approach | | 135 | 1.5 | 135 | 1.5 | 0.905 | 90.1 | LOS F | 3.9 | 27.9 | 1.00 | 0.91 | 1.33 | 11.9 |
| North: Willoughby Road | | | | | | | | | | | | | | |
| 7 | L2 | 15 | 0.0 | 15 | 0.0 | 0.742 | 29.5 | LOS C | 26.5 | 189.8 | 0.80 | 0.74 | 0.80 | 33.6 |
| 8 | T1 | 1635 | 2.7 | 1635 | 2.7 | 0.742 | 24.2 | LOS B | 26.7 | 191.3 | 0.80 | 0.74 | 0.80 | 37.0 |
| Approach | | 1649 | 2.7 | 1649 | 2.7 | 0.742 | 24.3 | LOS B | 26.7 | 191.3 | 0.80 | 0.74 | 0.80 | 37.0 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 10 | L2 | 34 | 3.2 | 34 | 3.2 | 0.950 | 91.5 | LOS F | 16.6 | 117.8 | 0.96 | 1.05 | 1.36 | 14.5 |
| 11 | T1 | 52 | 2.1 | 52 | 2.1 | 0.950 | 86.9 | LOS F | 16.6 | 117.8 | 0.96 | 1.05 | 1.36 | 10.6 |
| 12 | R2 | 543 | 0.8 | 543 | 0.8 | 0.950 | 91.6 | LOS F | 16.6 | 117.3 | 0.96 | 1.03 | 1.36 | 12.5 |
| Approach | | 628 | 1.0 | 628 | 1.0 | 0.950 | 91.2 | LOS F | 16.6 | 117.8 | 0.96 | 1.03 | 1.36 | 12.4 |
| All Vehicles | | 3620 | 2.7 | 3620 | 2.7 | 0.950 | 45.7 | LOS D | 37.8 | 274.9 | 0.85 | 0.85 | 0.97 | 25.5 |

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

**Movement Performance - Pedestrians**

| Mov ID | Description | Demand Flow ped/h | Average Delay sec | Level of Service | Average Back of Queue Pedestrian ped | Distance m | Prop. Queued | Effective Stop Rate |
|---|---|---|---|---|---|---|---|---|
| P2 | East Full Crossing | 12 | 16.3 | LOS B | 0.0 | 0.0 | 0.47 | 0.47 |
| P3 | North Full Crossing | 84 | 49.8 | LOS E | 0.3 | 0.3 | 0.82 | 0.82 |
| P4 | West Full Crossing | 27 | 17.3 | LOS B | 0.1 | 0.1 | 0.48 | 0.48 |
| All Pedestrians | | 123 | 39.4 | LOS D | | | 0.71 | 0.71 |

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 [[FU PM] Artarmon Road x Richmond Avenue]

**Network: 4 [Future PM]**

Site: Artarmon Road x Richmond Avenue
Scenario: Future
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Richmond Avenue | | | | | | | | | | | | | | |
| 1 | L2 | 14 | 0.0 | 14 | 0.0 | 0.041 | 5.7 | LOS A | 0.1 | 0.4 | 0.44 | 0.65 | 0.44 | 36.4 |
| 3 | R2 | 20 | 0.0 | 20 | 0.0 | 0.041 | 7.6 | LOS A | 0.1 | 0.4 | 0.44 | 0.65 | 0.44 | 32.9 |
| Approach | | 34 | 0.0 | 34 | 0.0 | 0.041 | 6.9 | LOS A | 0.1 | 0.4 | 0.44 | 0.65 | 0.44 | 34.6 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 65 | 0.0 | 65 | 0.0 | 0.217 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 47.5 |
| 5 | T1 | 354 | 0.0 | 354 | 0.0 | 0.217 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 48.4 |
| Approach | | 419 | 0.0 | 419 | 0.0 | 0.217 | 0.7 | NA | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 48.3 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 252 | 0.0 | 252 | 0.0 | 0.137 | 0.1 | LOS A | 0.0 | 0.3 | 0.05 | 0.02 | 0.05 | 47.8 |
| 12 | R2 | 9 | 0.0 | 9 | 0.0 | 0.137 | 6.3 | LOS A | 0.0 | 0.3 | 0.05 | 0.02 | 0.05 | 46.2 |
| Approach | | 261 | 0.0 | 261 | 0.0 | 0.137 | 0.3 | NA | 0.0 | 0.3 | 0.05 | 0.02 | 0.05 | 47.7 |
| All Vehicles | | 714 | 0.0 | 714 | 0.0 | 0.217 | 0.9 | NA | 0.1 | 0.4 | 0.04 | 0.09 | 0.04 | 47.4 |

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

# MOVEMENT SUMMARY

## Site: 101 [[FU PM] Artarmon Road x Scott Street]

## Network: 4 [Future PM]

Site: Artarmon Road x Scott Street
Scenario: Future
Site Category: (None)
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Scott Street | | | | | | | | | | | | | | |
| 1 | L2 | 6 | 0.0 | 6 | 0.0 | 0.020 | 6.2 | LOS A | 0.0 | 0.2 | 0.48 | 0.64 | 0.48 | 28.8 |
| 3 | R2 | 8 | 0.0 | 8 | 0.0 | 0.020 | 8.6 | LOS A | 0.0 | 0.2 | 0.48 | 0.64 | 0.48 | 28.8 |
| Approach | | 15 | 0.0 | 15 | 0.0 | 0.020 | 7.5 | LOS A | 0.0 | 0.2 | 0.48 | 0.64 | 0.48 | 28.8 |
| East: Artarmon Road | | | | | | | | | | | | | | |
| 4 | L2 | 54 | 0.0 | 54 | 0.0 | 0.262 | 4.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.06 | 0.00 | 47.0 |
| 5 | T1 | 454 | 0.0 | 454 | 0.0 | 0.262 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.06 | 0.00 | 47.6 |
| Approach | | 507 | 0.0 | 507 | 0.0 | 0.262 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.06 | 0.00 | 47.5 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 11 | T1 | 372 | 0.0 | 372 | 0.0 | 0.198 | 0.1 | LOS A | 0.0 | 0.3 | 0.04 | 0.01 | 0.04 | 49.2 |
| 12 | R2 | 8 | 0.0 | 8 | 0.0 | 0.198 | 7.1 | LOS A | 0.0 | 0.3 | 0.04 | 0.01 | 0.04 | 46.6 |
| Approach | | 380 | 0.0 | 380 | 0.0 | 0.198 | 0.3 | NA | 0.0 | 0.3 | 0.04 | 0.01 | 0.04 | 49.1 |
| All Vehicles | | 902 | 0.0 | 902 | 0.0 | 0.262 | 0.5 | NA | 0.0 | 0.3 | 0.02 | 0.05 | 0.02 | 47.9 |

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

# MOVEMENT SUMMARY

## Site: 101 [[FU PM] Artarmon Road x Willoughby Road x Small Street]

## Network: 4 [Future PM]

Site: Artarmon Road x Willoughby Road x Small Street
Scenario: Future

Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

**Movement Performance - Vehicles**

| Mov ID | Turn | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | Aver. Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | | | km/h |
| South: Willoughby Road | | | | | | | | | | | | | | |
| 1 | L2 | 414 | 0.0 | 414 | 0.0 | 0.876 | 32.4 | LOS C | 27.1 | 191.7 | 0.91 | 0.93 | 1.01 | 22.4 |
| 2 | T1 | 1481 | 1.8 | 1481 | 1.8 | 0.876 | 27.2 | LOS B | 27.8 | 197.8 | 0.92 | 0.93 | 1.02 | 34.9 |
| Approach | | 1895 | 1.4 | 1895 | 1.4 | 0.876 | 28.3 | LOS B | 27.8 | 197.8 | 0.92 | 0.93 | 1.02 | 32.9 |
| East: Small Street | | | | | | | | | | | | | | |
| 4 | L2 | 106 | 1.0 | 106 | 1.0 | 0.583 | 53.5 | LOS D | 3.2 | 22.7 | 1.00 | 0.79 | 1.02 | 20.3 |
| 5 | T1 | 104 | 0.0 | 104 | 0.0 | 0.791 | 53.2 | LOS D | 4.8 | 33.3 | 1.00 | 0.93 | 1.24 | 11.1 |
| 6 | R2 | 43 | 0.0 | 43 | 0.0 | 0.791 | 57.8 | LOS E | 4.8 | 33.3 | 1.00 | 0.93 | 1.24 | 22.1 |
| Approach | | 254 | 0.4 | 254 | 0.4 | 0.791 | 54.1 | LOS D | 4.8 | 33.3 | 1.00 | 0.87 | 1.15 | 17.4 |
| North: Willoughby Road | | | | | | | | | | | | | | |
| 7 | L2 | 60 | 0.0 | 60 | 0.0 | 0.729 | 19.2 | LOS B | 10.6 | 76.2 | 0.66 | 0.61 | 0.66 | 39.9 |
| 8 | T1 | 909 | 2.9 | 909 | 2.9 | 0.729 | 17.9 | LOS B | 10.6 | 76.2 | 0.71 | 0.65 | 0.72 | 40.9 |
| 9 | R2 | 15 | 0.0 | 15 | 0.0 | 0.729 | 29.2 | LOS C | 8.9 | 63.9 | 0.78 | 0.71 | 0.81 | 29.1 |
| Approach | | 984 | 2.7 | 984 | 2.7 | 0.729 | 18.1 | LOS B | 10.6 | 76.2 | 0.71 | 0.65 | 0.72 | 40.7 |
| West: Artarmon Road | | | | | | | | | | | | | | |
| 10 | L2 | 43 | 0.0 | 43 | 0.0 | 0.726 | 51.4 | LOS D | 6.2 | 43.2 | 1.00 | 0.88 | 1.10 | 21.7 |
| 11 | T1 | 80 | 0.0 | 80 | 0.0 | 0.726 | 46.8 | LOS D | 6.2 | 43.2 | 1.00 | 0.88 | 1.10 | 16.5 |
| 12 | R2 | 279 | 0.0 | 279 | 0.0 | 0.726 | 51.4 | LOS D | 6.2 | 43.2 | 1.00 | 0.87 | 1.10 | 18.8 |
| Approach | | 402 | 0.0 | 402 | 0.0 | 0.726 | 50.5 | LOS D | 6.2 | 43.2 | 1.00 | 0.88 | 1.10 | 18.7 |
| All Vehicles | | 3535 | 1.5 | 3535 | 1.5 | 0.876 | 29.8 | LOS C | 27.8 | 197.8 | 0.88 | 0.84 | 0.96 | 31.4 |

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

**Movement Performance - Pedestrians**

| Mov ID | Description | Demand Flow ped/h | Average Delay sec | Level of Service | Average Back of Queue Pedestrian ped | Distance m | Prop. Queued | Effective Stop Rate |
|---|---|---|---|---|---|---|---|---|
| P2 | East Full Crossing | 2 | 12.5 | LOS B | 0.0 | 0.0 | 0.50 | 0.50 |
| P3 | North Full Crossing | 92 | 44.3 | LOS E | 0.2 | 0.2 | 0.94 | 0.94 |
| P4 | West Full Crossing | 28 | 13.5 | LOS B | 0.0 | 0.0 | 0.52 | 0.52 |
| All Pedestrians | | 122 | 36.6 | LOS D | | | 0.84 | 0.84 |

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.