JMT Consulting

# Tidapa

*Transport Assessment*

Prepared for:

**O'Grady Family**

1 September 2020

***Document History***

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# 1 Introduction

## 1.1 Background

JMT Consulting was engaged by the O'Grady Family to prepare a transport assessment for the proposed rezoning of land in Cobbitty known as 'Tidapa', within the Camden Local Government Area (LGA).

The report assesses the transport implications of the proposed rezoning and is set out as follows:

- Chapter 1 provides an introduction to the report and overview of the Planning Proposal
- Chapter 2 discusses the existing conditions including site context and the current and planned transport environment
- Chapter 3 assesses the transport implications of the proposal
- Chapter 4 summarises the findings of road network assessment and traffic modelling undertaken for the proposal
- Chapter 5 presents a summary of the assessment.

## 1.2 Description of the proposal

The Planning Proposal seeks to amend the Camden Local Environmental Plan (LEP) 2010 to enable the redevelopment of the site for residential purposes, public open space and environmental conservation.

The objective of the proposal is to provide a well-design residential neighbourhood that responds to the natural and cultural characteristics of the site and the surrounding urban development and provides a transition in density to rural lands located to the west of the site. This is to be achieved through the rezoning of the subject site to provide zoning and minimum lot size controls that will facilitate future residential development that is appropriate for the site's context.

The proposal seeks to amend the Camden LEP 2010 to rezone the site from RU1 Primary Production to R2 Low Density Residential, R5 Large Lot Residential, E4 Environmental Living, E2 Environmental Conservation, B2 Local Centre and RE1 Public Recreation to facilitate future residential development. Initial planning undertaken for the Planning Proposal envisages the development of between 700 and 800 residential lots. This will be confirmed during detailed planning for the site to be undertaken following the rezoning process.

The proposed structure plan for the site is shown in Figure 1.

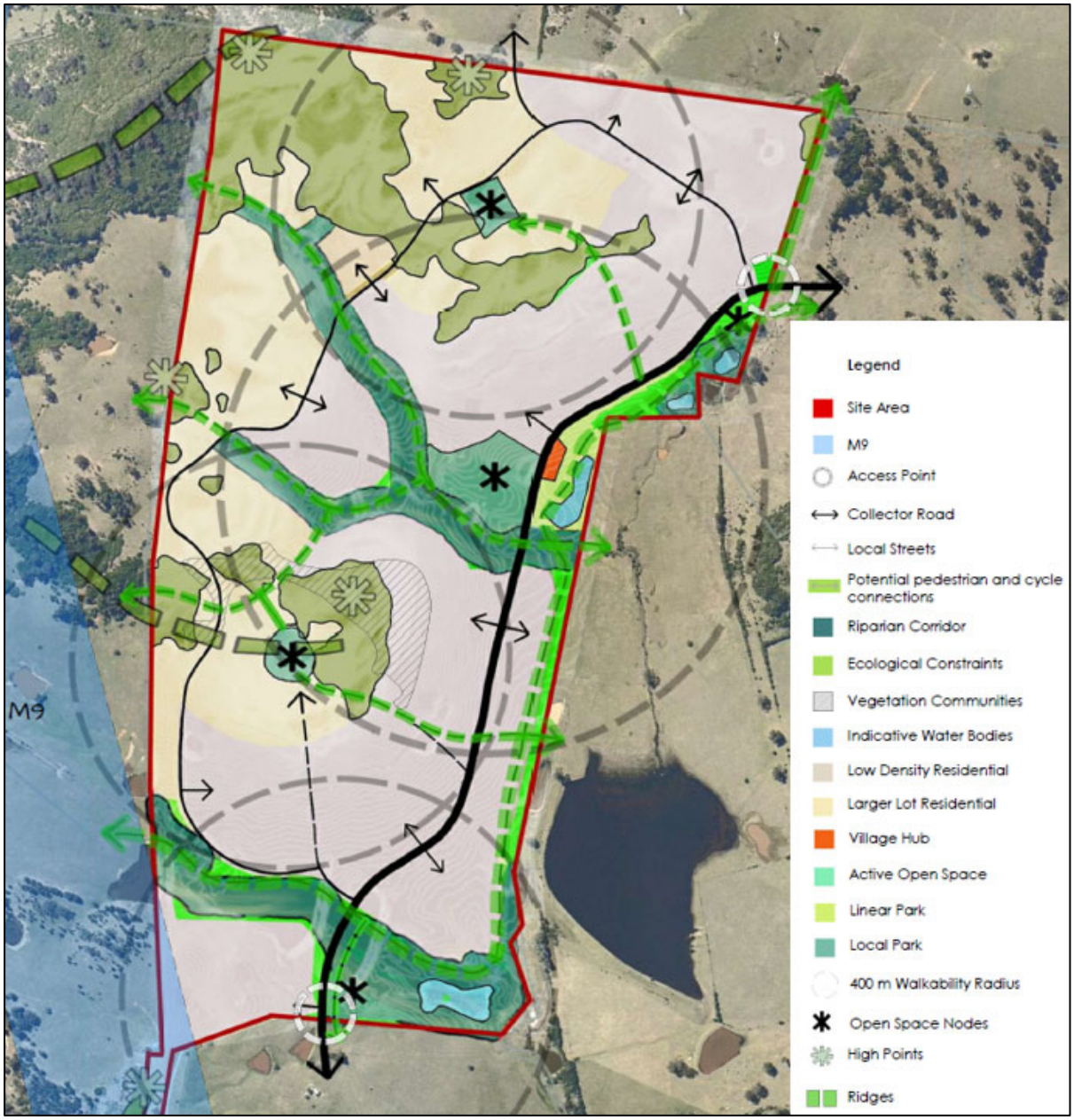


Figure 1 Proposed structure plan

# 2 Existing Context

## 2.1 Site description

The site (Lots 2--5 DP 239612) is located in Camden LGA at Cobbitty, north of Cobbitty Road on the Cumberland Plain. It is currently zoned RU1 (primary production) and is located to the east of the Oran Park precinct. The 147 hectare site is bounded by Cobbitty Creek to the east and south and the 'Western Hills" to the west and north that form the boundary of Cobbitty Creek Catchment. Cobbitty Creek flows to the Nepean River, the main drainage line for the Camden region. The site location in the context of the broader area is shown in Figure 2.

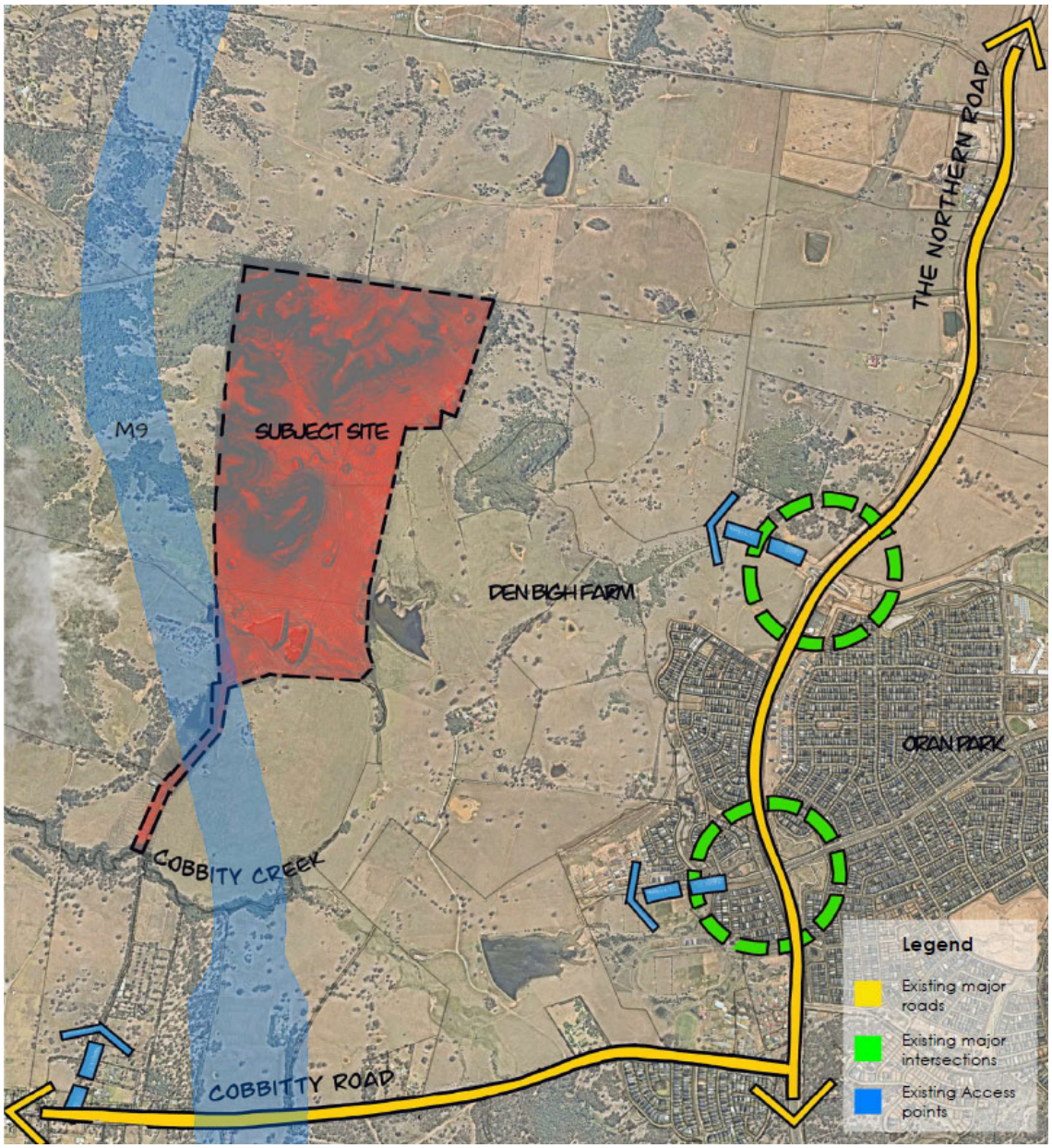


Figure 2 Site context

## 2.2 Existing road network

The road network in the vicinity of the site is illustrated in Figure 3 and consists of the following:

**Northern Road –** The Northern Road is a State Road function under the control of Transport for NSW (TfNSW), providing a connection between the M4 Motorway at Penrith to the north and Narellan Road to the south. In the vicinity of the site, The Northern Road currently provides one through lane of traffic in each direction. The road is currently being upgraded to include two through lanes of traffic in each direction separated by a central median, with allowances for future widening to six lanes. There are a number of existing and planned signalised intersections along The Northern Road.

**Cobbitty Road –** Cobbitty Road is a local road under the control of Camden Council and provides an east-west connection from the Northern Road through to the Cobbitty local centre. It provides one traffic lane in each direction plus a narrow shoulder, as shown in Figure 4 on the following page.

**Chittick Lane –** Chittick Lane is a local road that provides direct access to the site. It is a low traffic road with vehicles travelling in opposite directions required to give way to one another to allow passing movements.

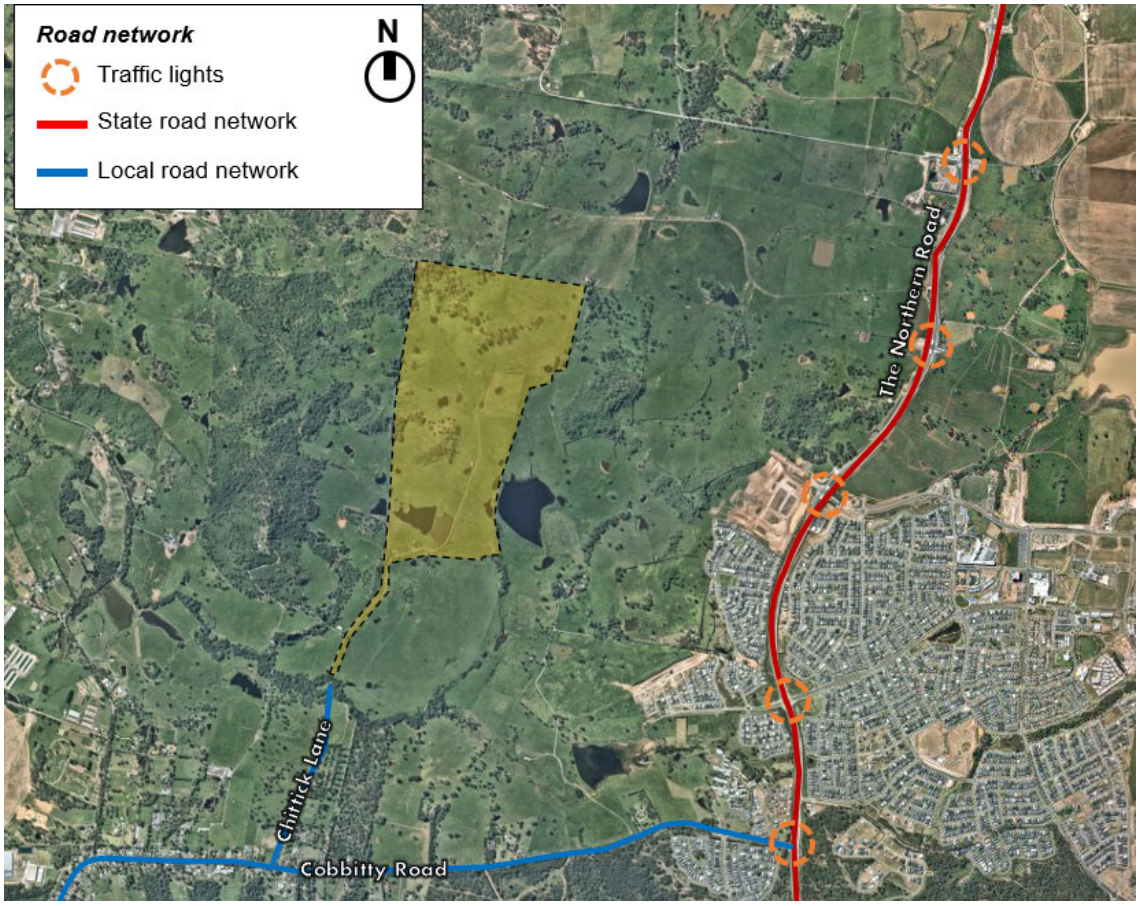


Figure 3 Road network in vicinity of the site

Figure 4 Cobbitty Road

Figure 5 Chittick Lane

## 2.3 Existing travel patterns

Journey to Work 2016 Census data was used to analyse the existing travel behaviours of Oran Park residents, which will likely have similar characteristics to those of the future site.

The existing mode share of residents travelling to work is summarised below, which is heavily car dependent given the limited public transport services in the area. With the advent of improved public transport infrastructure (see Section3.4) it could be expected there will a reduced level of car dependency as a means of travelling to work.

- Car driver – 88%
- Car passenger – 1%
- Bus – 1%
- Train – 10%

Figure 6 illustrates the relative distribution of employment destinations of existing Oran Park residents. This indicates the majority of residents travel to areas within the Camden and Campbelltown LGAs to work, with a smaller proportion travelling east to centres such as Liverpool, Parramatta and the Sydney CBD.

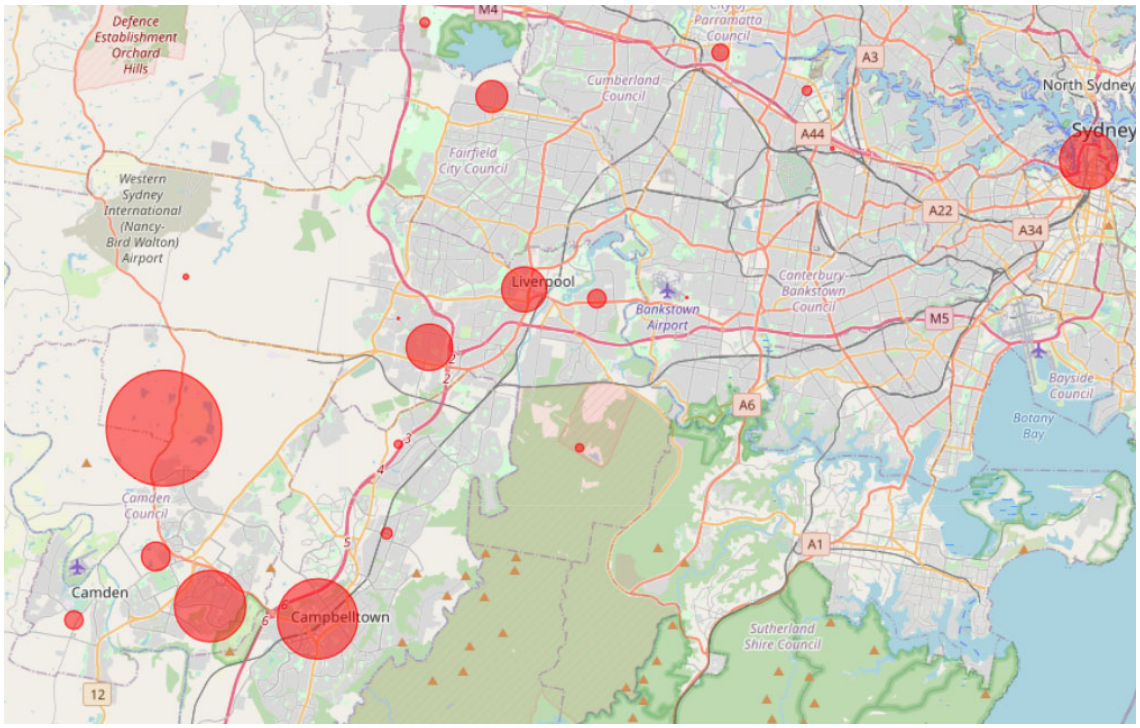


Figure 6 Employment destinations of existing Oran Park residents

## 2.4 Public transport

The closest rail station to the site is Leppington Station which is the terminus of the south-west rail line. Leppington Station is located approximately 12 km north-east of the subject site. Leppington Station is located on the T2 Inner West and Leppington Line and T5 Cumberland Line, which provide direct connectivity to a number of Sydney's key commercial, and population centres including Liverpool, Parramatta, Strathfield, and the Sydney CBD.

The Northern Road upgrade includes the provision of bus lanes in either direction. Currently, no bus services operate on The Northern Road in proximity to the site, however as the South West Growth Area is developed increased population densities may encourage the introduction of new bus routes in the region.

## 2.5 Active transport

The Northern Road upgrade in the vicinity of the site has provided for an improved active transport network by providing for a 3m wide shared pedestrian and cyclist path on the eastern side of the roadway. This shared path extends the full length of the upgraded roadway.

All intersections controlled by traffic lights on The Northern Road also provide for formal pedestrian crossing opportunities.

# 3 Transport Assessment

## 3.1 Vehicle access and circulation

The structure plan proposes a new internal road that provides an external connection at the northern end of the site. This connection will ultimately link up with the future road network serving the broader area including the adjacent communities of South-West Creek and Lowes Creek Maryland. These future roads will provide multiple connection points through to the Northern Road as indicated in Figure 7 below.

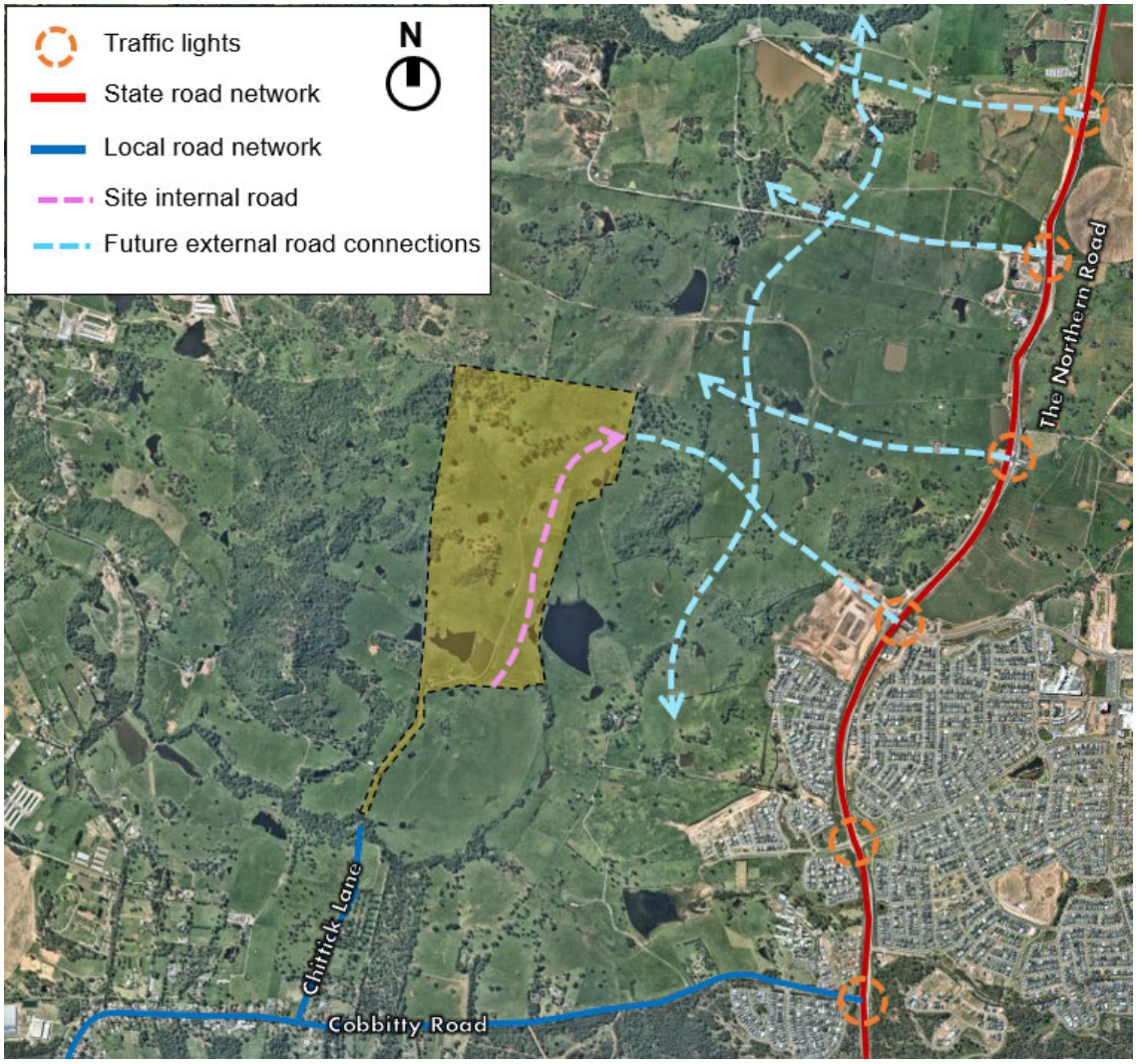


Figure 7 Vehicle access and circulation

## 3.2 Outer Sydney Orbital

The Outer Sydney Orbital (M9) has been identified by the NSW Government as a future project to support the long term transport needs of Western Sydney. The corridor will provide for a connection between Box Hill in the north and the Hume Motorway near Menangle in the south, running adjacent to the subject site (see Figure 8).

The Outer Sydney Orbital will provide significantly enhanced road access to the south-west of Sydney and improve accessibility for future residents of the area. There is the potential for an interchange at Cobbitty Road which will improve transport accessibility for future residents of Tidapa.

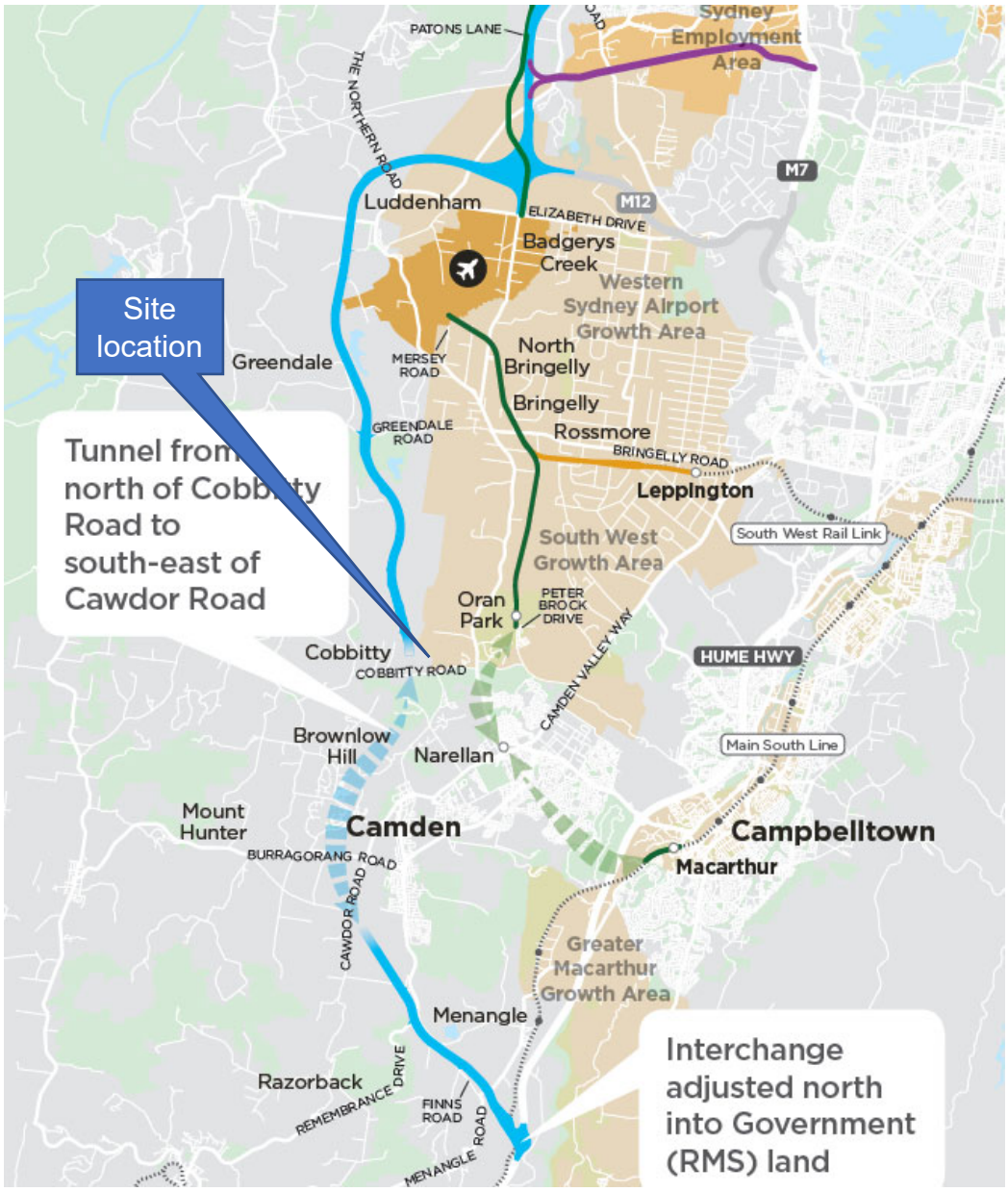


Figure 8 Outer Sydney Orbital corridor

Source: Transport for NSW

## 3.3 Internal road network

The structure plan includes a north-south collector road which will facilitate access to all local streets within the site. This collector road comprises of a 22m wide cross-section (as shown in Figure 9) which includes one traffic lane in each direction with adjacent on-street car parking. At or adjacent to internal intersections there is the ability to provide two traffic lanes by removing the on-street car parking in order to increase traffic capacity if required.

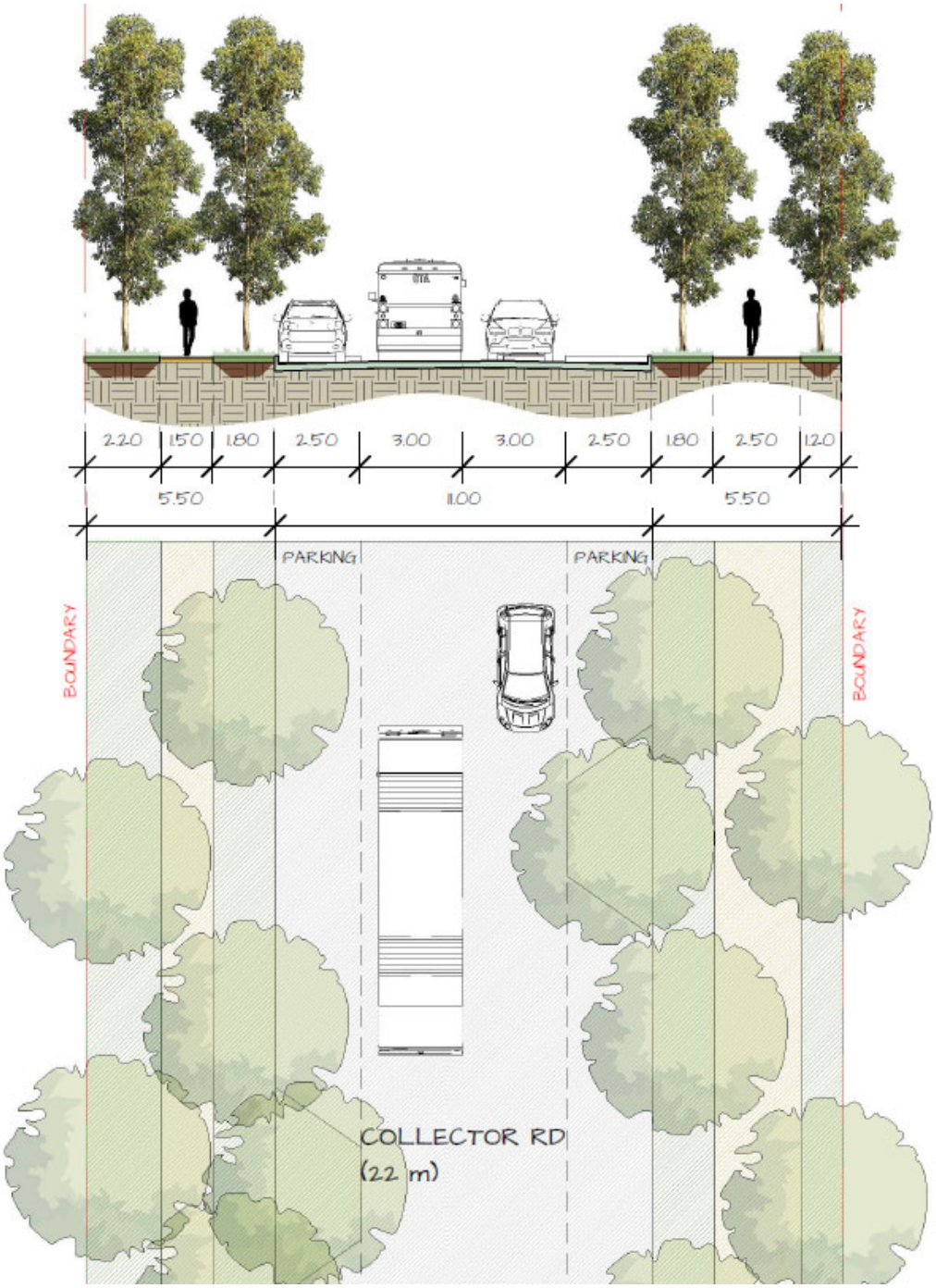


Figure 9 Collector road cross section

The cross section for a local street within the site is shown in Figure 10 which includes a 9m wide carriageway which provides the ability for two-way movements as well as adjacent on-street car parking.

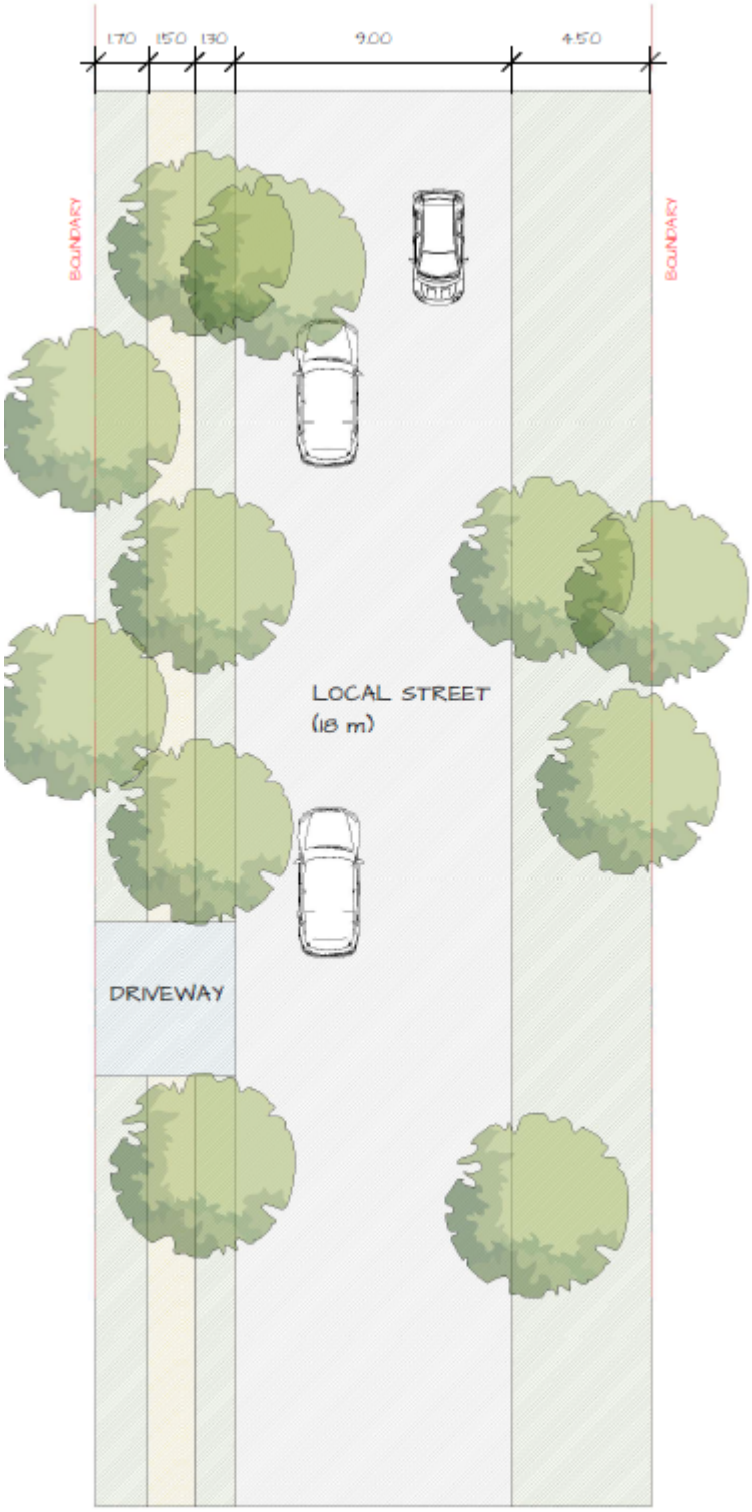


Figure 10 Local street cross section

## 3.4 Public transport

In order to accommodate the rapid population growth of Western Sydney, planning is ongoing for the new North South rail line. This new rail link will provide for a passenger rail connection between the Main West Line near St Marys and the Main South Line near Macarthur.

Oran Park near the subject site has been identified by the NSW Government as one of the core stations within this new rail link. This new infrastructure will enhance public transport accessibility for future residents of the area including those within the Tidapa site.

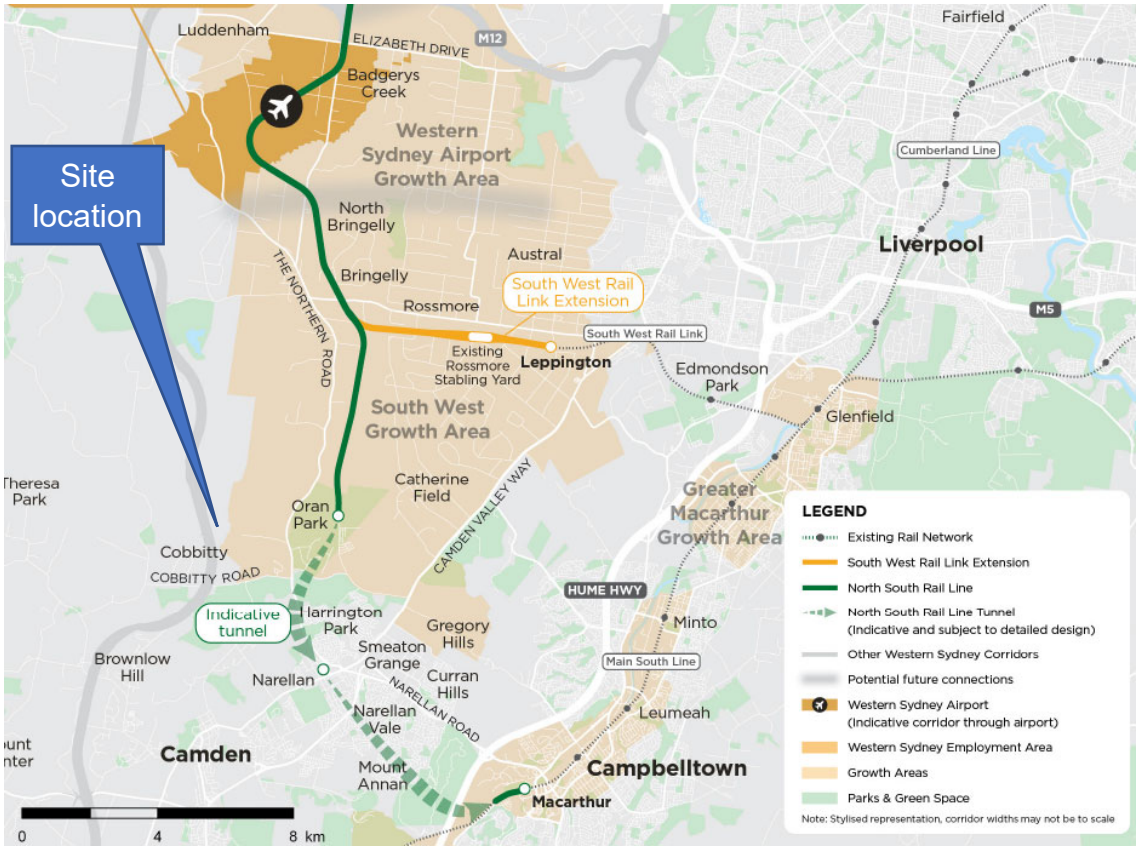


Figure 11 South-West Rail Link extension map

Source: Transport for NSW

## 3.5 Parking

The Camden Council Development Control Plan (DCP) notes the following minimum parking rates for dwelling houses:

- 1 car parking space for dwellings with 1 to 2 bedrooms; and
- 2 car parking spaces for dwellings with more than 2 bedrooms

The proposed residential lots are of sufficient sizes to entirely accommodate the parking needs of future dwellings within the respective lot boundaries. While the exact number of parking spaces will be outlined in subsequent Development Applications lodged for the site, rates of car parking will generally be in accordance with the DCP controls.

The internal streets have been designed to allow for on-street car parking to be provided throughout the site, which will complement the dedicated car parking for each residential lot.

## 3.6 Active transport

The internal street design within the site will facilitate good quality connections for pedestrians and cyclists. All streets will include footpaths on at least one side and potentially provide the opportunity for the introduction of shared user paths (bicycles and pedestrians). Provision for pedestrians and cyclists will be outlined in further detail in subsequent Development Applications to be lodged for the site.

# 4 Traffic Analysis

## 4.1 Traffic generation

The forecast level of traffic generated from the rezoning of the site has been based off the rates outlined in the *RMS Guide to Traffic Generating Developments* document. The rates applicable to low density / large lot residential dwellings are as follows:

- AM peak hour (8am – 9am): 0.99 vehicles / dwelling
- PM peak hour (5pm – 6pm): 0.95 vehicles / dwelling

The expected directions of travel for vehicles, based again off guidance within the *RMS Guide to Traffic Generating Developments* document, is as follows:

- AM peak hour (8am – 9am): 80% departing, 20% arriving
- PM peak hour (5pm – 6pm): 20% departing, 80% arriving

Based on a conservative estimate that 800 lots can be developed within the site, the peak hour traffic generation arising from the full development of the site is summarised in Table 1 below.

Table 1 Forecast traffic generation

| Peak Hour | No. of dwellings | Traffic Generation Rate | Number of vehicle trips | | |
|---|---|---|---|---|---|
| | | | Into site | Out of site | Total |
| AM Peak Hour | 800 | 0.95 | 152 | 608 | 760 |
| PM Peak Hour | 800 | 0.99 | 634 | 158 | 792 |

## 4.2 Traffic distribution

As previously noted in Section 3.1 the north-south internal road will ultimately link up with a number of external road connections to the east of the site that provide access to traffic lights along The Northern Road. As a conservative assumption, it is assumed that approximately 80% of traffic associated with the Tidapa site will travel through The Northern Road / Dick Johnson Drive intersection – that being the closest signalised intersection to the site. The remaining 20% of vehicles will utilise other road connections and traffic lights along The Northern Road corridor.

Based on the current travel patterns and behaviours of the Oran Park residents as previously described in Section 2.3 of this document, the forecast traffic distribution from the site is illustrated in Figure 12 and noted below:

- 40% to the north along The Northern Road
- 15% to the east through Oran Park
- 45% to the south along The Northern Road

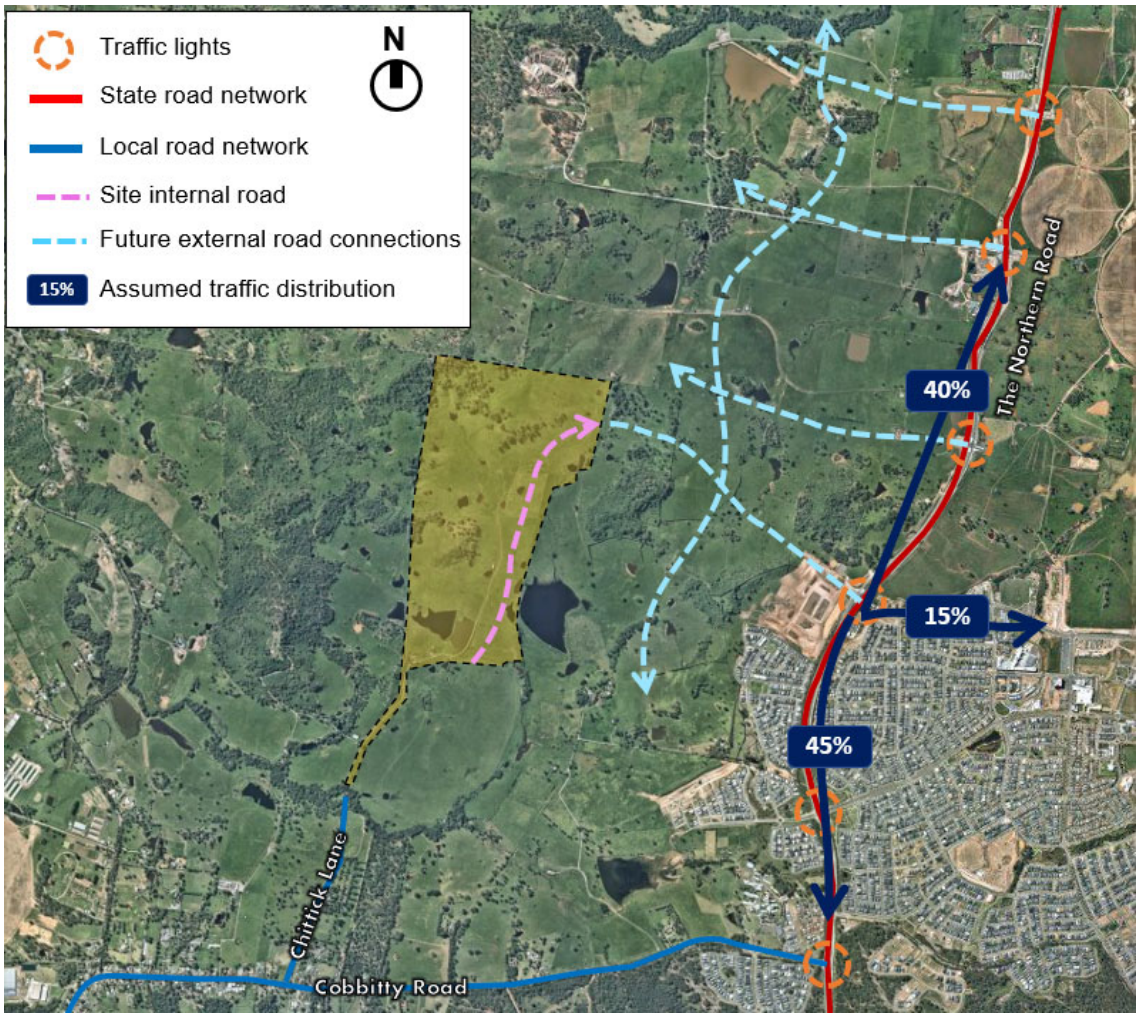


Figure 12 Forecast traffic distribution

## 4.3 Future traffic flows

Based on the traffic generation and distribution assumptions, the additional traffic flows generated by the rezoning of the site can be calculated. These additional traffic movements through The Northern Road / Dick Johnson Drive intersection are shown in Figure 13 below. There will also be additional traffic movements at other intersections along The Northern Road corridor however these will be relatively minor given the additional traffic movements will be dispersed across a number of locations.

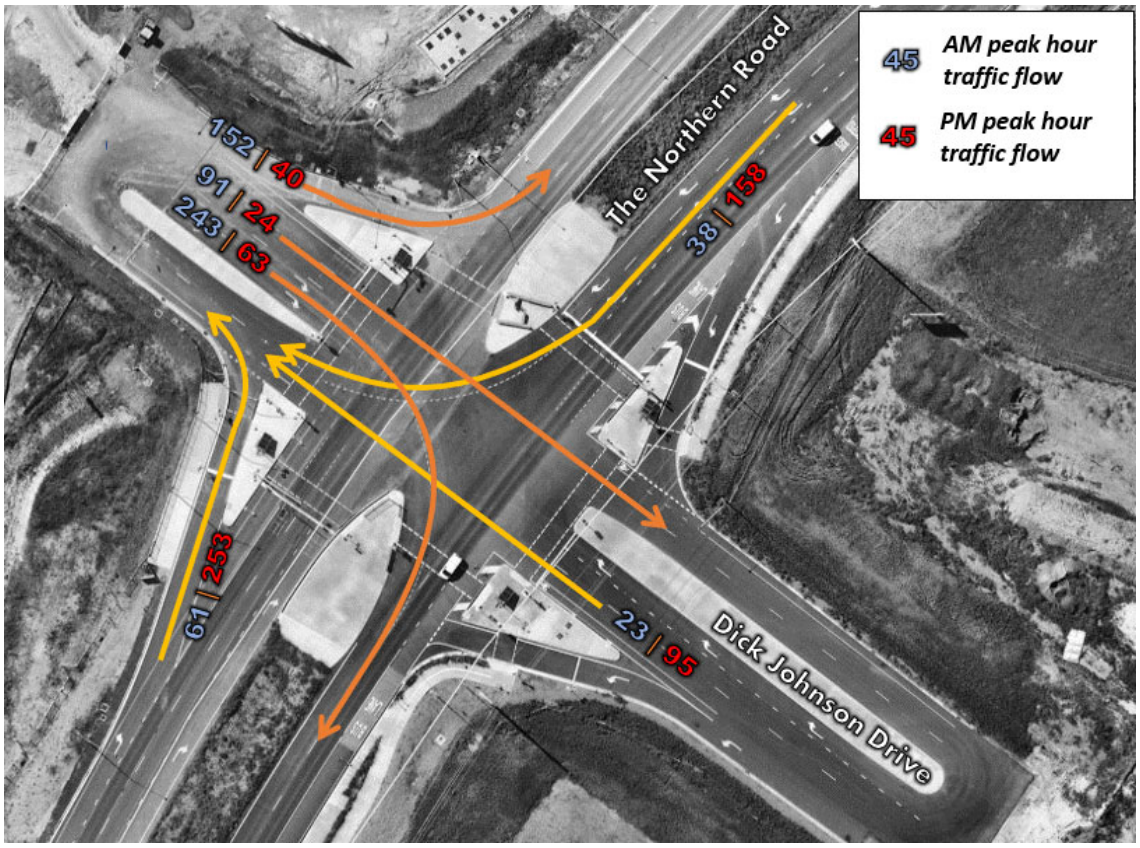


Figure 13 Forecast traffic flows – The Northern Road / Dick Johnson Drive

## 4.4 Road network capacity

### 4.4.1 Mid-block capacity

Mid-block capacity requirements (for interrupted flow conditions) for the primary roadway within the site have been based on Austroads Guide to Traffic Management. These are outlined in Table 2 below.

Table 2 Mid-Block capacities of urban roads

| Lane Type (interrupted flow conditions) | | One-way mid-block capacity (veh/hour) |
|---|---|---|
| Median or inner lane | Divided road | 1,000 |
| | Undivided road | 900 |
| Middle lane | Divided road | 1,000 |
| | Undivided road | 900 |
| Kerbside lane | Adjacent to parking lane | 900 |
| | Occasional parked vehicles | 600 |
| | Clearway conditions | 900 |

### 4.4.2 Intersection capacity

The performance of intersections in an urban environment is measured in terms of its Level of Service (LoS). Level of service ranges from A (very good) to F (over capacity with significant delays). This is described in the *RTA Guide to Traffic Generating Developments* as summarised in Table 3. In peak hours at intersections controlled by traffic signals on key regional and arterial routes, a LoS D is generally acceptable.

Table 3 Intersection level of service

| Level of Service | Average Vehicle Delay (seconds) | Traffic Signals and Roundabouts | Priority Intersections ('Stop' and "Give Way') |
|---|---|---|---|
| A | < 14 | Good operation | Good operation |
| B | 15 to 28 | Good with acceptable delays and spare capacity | Acceptable delays and spare capacity |
| C | 29 to 42 | Satisfactory | Satisfactory, but accident study required |
| D | 43 to 56 | Operating near capacity | Near capacity and accident study required |
| E | 57 to 70 | At capacity. At signals, incidents will cause excessive delay. Roundabouts require other control mode | At capacity, requires other control mode |
| F | > 71 | Unsatisfactory with excessive queuing | Unsatisfactory with excessive queuing; |

## 4.5 Road network performance

The future performance of the road network has been considered in the context of the following:

- Operation of The Northern Road / Dick Johnson Drive intersection; and
- Operation of internal road network within the site

### 4.5.1 The Northern Road / Dick Johnson Drive intersection

The future operation of The Northern Road / Dick Johnson Drive has been assessed using SIDRA INTERSECTION 8.0, a computer-based modelling package which assesses intersection performance under prevailing traffic conditions. SIDRA modelling has been undertaken for the following two scenarios:

- Scenario 1 – 2036 base case
- Scenario 2 – 2036 base case with proposed rezoning

The ultimate design of the intersection is noted in relevant documentation previously published by Roads and Maritime / Transport for NSW, and is illustrated in Figure 14.

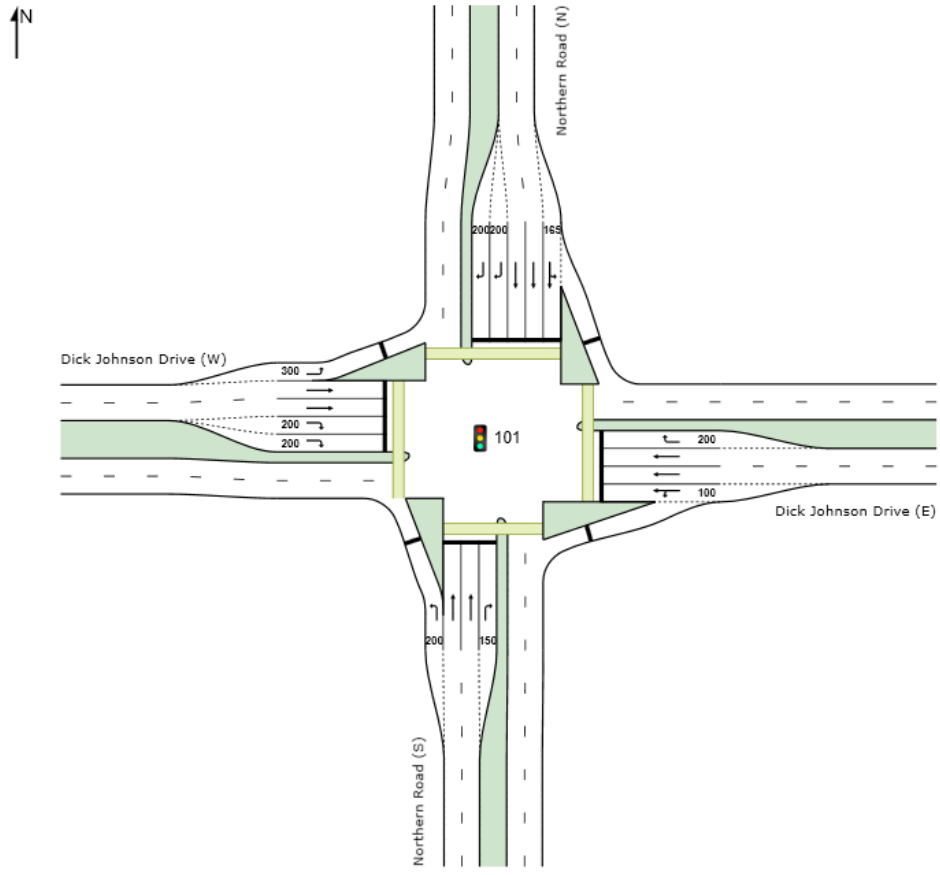


Figure 14 The Northern Road / Dick Johnson Drive intersection layout

The forecast volume of traffic travelling through The Northern Road / Dick Johnson Drive in the future year 2036 has been based off the assumptions contained within the traffic report supporting the nearby Oxley Ridge Neighbourhood Centre. This study has considered the cumulative growth in the surrounding future development traffic based on the forecast contained in the Roads and Maritime Services Strategic Traffic Forecasting Model (STFM) for the year 2036 AM and PM peak hours.

The estimated traffic volumes under both scenarios were applied to the intersection for both the AM and PM peak hours. The outcomes of the SIDRA modelling are summarised in Table 4 below, with detailed outputs provided in Appendix A.

Table 4 Traffic modelling results – Dick Johnson Drive / The Northern Road

| Peak Hour | 2036 base case (Scenario 1) | | | 2036 base case + rezoning proposal (Scenario 2) | | |
|---|---|---|---|---|---|---|
| | AVD (sec) | DOS | LOS | AVD (sec) | DOS | LOS |
| AM Peak Hour (8am – 9am) | 36 | 0.83 | C | 60 | 0.95 | E |
| PM Peak Hour (5pm – 6pm) | 32 | 0.79 | C | 36 | 0.82 | C |

AVD – Average vehicle delay DOS – Degree of Saturation LOS – Level of Service

The analysis indicates that the intersection continues to perform at acceptable levels following the rezoning of the site and the development of up to 800 residential lots. This analysis is considered conservative given:

- 80% of traffic from the site has been assumed to travel through the Dick Johnson Drive / Northern Road intersection, where in likelihood this proportion will be lower given the number of signalised interactions available along The Northern Road.
- The analysis has considered an overall dwelling yield of 800 lots, which is the maximum number of lots that are likely to be developed on the site. The Planning Proposal envisages that anywhere between 700 and 800 lots could be provided on the site.

Therefore it is concluded that the proposal would have acceptable impacts on the adjacent road network.

### 4.5.2 Internal road capacity

As previously noted in Table 2 traffic lanes within the site would have capacity to accommodate up to 900 vehicles per hour travelling in the one direction. The traffic generation analysis previously undertaken indicates that traffic flows on the site's internal collector road may reach up to 634 vehicles during the PM peak hour – well below this operational capacity of 900 vehicles per hour. Therefore the site's internal road network will be capable of accommodating the expected traffic movements associated with the proposal.

# 5 Summary

This transport assessment has been prepared by JMT Consulting to support the proposed rezoning of land in Cobbitty known as 'Tidapa'. The Planning Proposal seeks to amend the current RU1 zoning to facilitate the development of between 700 to 800 residential lots on the site. Key findings of the transport assessment are as follows:

- A north-south collector road is proposed within the site that will facilitate connections with the future road network serving the broader area including the adjacent communities of South-West Creek and Lowes Creek Maryland.
- Planning is ongoing for major improvements to the transport network in the immediate vicinity of the site, including the Outer Sydney Orbital and North-South rail line. These projects will significantly improve transport accessibility to the site.
- Parking for residential uses will be provided in accordance with rates documented in the Camden Council Development Control Plan.
- Detailed traffic modelling has been undertaken based on a conservative assumption of 800 residential lots being developed on the site. The modelling has confirmed that:
    - The closest intersection to the site along The Northern Road (at Dick Johnson Drive) continues to perform at acceptable levels with the additional traffic flows associated with the rezoning; and
    - Peak traffic demands along the internal collector road will be well below the operational capacity of up to 900 vehicles per hour.

Based on the above key findings, it is considered that the proposal's impact on the transport network will be acceptable.

# Appendix A: Traffic Modelling Outputs

# MOVEMENT SUMMARY

## Site: 101 [AM 2036 (Site Folder: Dick Johnson Drive)]

Oran Park Link Road 2 - Northern Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

**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: Northern Road (S) | | | | | | | | | | | | | | |
| 1 | L2 | 96 | 5.0 | 96 | 5.0 | 0.087 | 18.0 | LOS B | 2.8 | 20.3 | 0.43 | 0.66 | 0.43 | 45.8 |
| 2 | T1 | 1527 | 5.0 | 1527 | 5.0 | * 0.833 | 34.5 | LOS C | 48.0 | 350.3 | 0.92 | 0.85 | 0.93 | 38.4 |
| 3 | R2 | 50 | 2.0 | 50 | 2.0 | * 0.683 | 89.0 | LOS F | 3.9 | 28.0 | 1.00 | 0.80 | 1.15 | 24.3 |
| Approach | | 1673 | 4.9 | 1673 | 4.9 | 0.833 | 35.2 | LOS C | 48.0 | 350.3 | 0.90 | 0.84 | 0.90 | 38.1 |
| East: Dick Johnson Drive (E) | | | | | | | | | | | | | | |
| 4 | L2 | 119 | 2.0 | 119 | 2.0 | 0.287 | 57.1 | LOS E | 7.2 | 51.1 | 0.87 | 0.78 | 0.87 | 30.8 |
| 5 | T1 | 35 | 5.0 | 35 | 5.0 | * 0.063 | 59.2 | LOS E | 1.1 | 8.0 | 0.89 | 0.64 | 0.89 | 30.6 |
| 6 | R2 | 42 | 5.0 | 42 | 5.0 | * 0.195 | 42.1 | LOS C | 1.9 | 13.6 | 0.94 | 0.73 | 0.94 | 35.3 |
| Approach | | 196 | 3.2 | 196 | 3.2 | 0.287 | 54.3 | LOS D | 7.2 | 51.1 | 0.89 | 0.74 | 0.89 | 31.7 |
| North: Northern Road (N) | | | | | | | | | | | | | | |
| 7 | L2 | 73 | 2.0 | 73 | 2.0 | 0.116 | 19.5 | LOS B | 3.9 | 28.3 | 0.46 | 0.56 | 0.46 | 46.3 |
| 8 | T1 | 1305 | 5.0 | 1305 | 5.0 | 0.578 | 21.2 | LOS B | 28.6 | 208.7 | 0.68 | 0.62 | 0.68 | 44.6 |
| 9 | R2 | 101 | 5.0 | 101 | 5.0 | 0.235 | 71.0 | LOS F | 3.4 | 24.8 | 0.94 | 0.75 | 0.94 | 27.6 |
| Approach | | 1479 | 4.9 | 1479 | 4.9 | 0.578 | 24.5 | LOS B | 28.6 | 208.7 | 0.69 | 0.63 | 0.69 | 42.9 |
| West: Dick Johnson Drive (W) | | | | | | | | | | | | | | |
| 10 | L2 | 216 | 5.0 | 216 | 5.0 | 0.531 | 60.7 | LOS E | 13.9 | 101.7 | 0.93 | 0.82 | 0.93 | 29.9 |
| 11 | T1 | 20 | 5.0 | 20 | 5.0 | 0.036 | 58.7 | LOS E | 0.6 | 4.6 | 0.88 | 0.61 | 0.88 | 30.7 |
| 12 | R2 | 220 | 5.0 | 220 | 5.0 | * 0.767 | 84.3 | LOS F | 8.5 | 61.8 | 1.00 | 0.87 | 1.17 | 25.0 |
| Approach | | 456 | 5.0 | 456 | 5.0 | 0.767 | 72.0 | LOS F | 13.9 | 101.7 | 0.96 | 0.83 | 1.05 | 27.4 |
| All Vehicles | | 3804 | 4.8 | 3804 | 4.8 | 0.833 | 36.4 | LOS C | 48.0 | 350.3 | 0.82 | 0.75 | 0.84 | 37.6 |

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

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. ped/h | 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: Northern Road (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 50 | 69.3 | LOS F | 0.2 | 0.2 | 0.96 | 0.96 | 100.4 | 40.5 | 0.40 |
| East: Dick Johnson Drive (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 50 | 69.3 | LOS F | 0.2 | 0.2 | 0.96 | 0.96 | 103.0 | 43.8 | 0.43 |
| North: Northern Road (N) | | | | | | | | | | | | |

# MOVEMENT SUMMARY

## Site: 101 [AM 2036 w PP (Site Folder: Dick Johnson Drive)]

Oran Park Link Road 2 - Northern Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)

**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: Northern Road (S) | | | | | | | | | | | | | | |
| 1 | L2 | 157 | 5.0 | 157 | 5.0 | 0.143 | 18.5 | LOS B | 4.7 | 34.6 | 0.45 | 0.68 | 0.45 | 45.5 |
| 2 | T1 | 1527 | 5.0 | 1527 | 5.0 | *0.957 | 77.7 | LOS F | 71.0 | 518.4 | 1.00 | 1.15 | 1.30 | 26.5 |
| 3 | R2 | 50 | 2.0 | 50 | 2.0 | 0.683 | 89.0 | LOS F | 3.9 | 28.0 | 1.00 | 0.80 | 1.15 | 24.3 |
| Approach | | 1734 | 4.9 | 1734 | 4.9 | 0.957 | 72.6 | LOS F | 71.0 | 518.4 | 0.95 | 1.10 | 1.21 | 27.5 |
| East: Dick Johnson Drive (E) | | | | | | | | | | | | | | |
| 4 | L2 | 119 | 2.0 | 119 | 2.0 | 0.287 | 57.1 | LOS E | 7.2 | 51.1 | 0.87 | 0.78 | 0.87 | 30.8 |
| 5 | T1 | 58 | 5.0 | 58 | 5.0 | 0.105 | 59.8 | LOS E | 1.8 | 13.4 | 0.90 | 0.66 | 0.90 | 30.4 |
| 6 | R2 | 42 | 5.0 | 42 | 5.0 | *0.130 | 36.0 | LOS C | 1.6 | 11.9 | 0.87 | 0.72 | 0.87 | 37.5 |
| Approach | | 219 | 3.4 | 219 | 3.4 | 0.287 | 53.8 | LOS D | 7.2 | 51.1 | 0.88 | 0.73 | 0.88 | 31.8 |
| North: Northern Road (N) | | | | | | | | | | | | | | |
| 7 | L2 | 73 | 2.0 | 73 | 2.0 | 0.129 | 24.0 | LOS B | 4.5 | 32.6 | 0.53 | 0.59 | 0.53 | 43.9 |
| 8 | T1 | 1305 | 5.0 | 1305 | 5.0 | 0.645 | 27.7 | LOS B | 32.7 | 238.6 | 0.78 | 0.71 | 0.78 | 41.3 |
| 9 | R2 | 139 | 5.0 | 139 | 5.0 | 0.323 | 71.9 | LOS F | 4.7 | 34.6 | 0.96 | 0.76 | 0.96 | 27.5 |
| Approach | | 1517 | 4.9 | 1517 | 4.9 | 0.645 | 31.5 | LOS C | 32.7 | 238.6 | 0.78 | 0.71 | 0.78 | 39.6 |
| West: Dick Johnson Drive (W) | | | | | | | | | | | | | | |
| 10 | L2 | 368 | 5.0 | 368 | 5.0 | *0.905 | 83.0 | LOS F | 30.7 | 224.5 | 1.00 | 0.99 | 1.27 | 25.3 |
| 11 | T1 | 111 | 5.0 | 111 | 5.0 | 0.200 | 60.9 | LOS E | 3.6 | 26.2 | 0.92 | 0.70 | 0.92 | 30.2 |
| 12 | R2 | 463 | 5.0 | 463 | 5.0 | *0.922 | 94.7 | LOS F | 20.0 | 146.3 | 1.00 | 1.03 | 1.43 | 23.4 |
| Approach | | 942 | 5.0 | 942 | 5.0 | 0.922 | 86.1 | LOS F | 30.7 | 224.5 | 0.99 | 0.98 | 1.31 | 24.8 |
| All Vehicles | | 4412 | 4.8 | 4412 | 4.8 | 0.957 | 60.5 | LOS E | 71.0 | 518.4 | 0.90 | 0.92 | 1.07 | 30.2 |

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

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. ped/h | 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: Northern Road (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 50 | 69.3 | LOS F | 0.2 | 0.2 | 0.96 | 0.96 | 100.4 | 40.5 | 0.40 |
| East: Dick Johnson Drive (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 50 | 69.3 | LOS F | 0.2 | 0.2 | 0.96 | 0.96 | 103.0 | 43.8 | 0.43 |
| North: Northern Road (N) | | | | | | | | | | | | |

# MOVEMENT SUMMARY

## Site: 101 [PM 2036 (Site Folder: Dick Johnson Drive)]

Oran Park Link Road 2 - Northern Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site Optimum Cycle Time - Minimum Delay)

**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: Northern Road (S) | | | | | | | | | | | | | | |
| 1 | L2 | 200 | 5.0 | 200 | 5.0 | 0.199 | 20.5 | LOS B | 6.1 | 44.7 | 0.53 | 0.71 | 0.53 | 44.4 |
| 2 | T1 | 1368 | 5.0 | 1368 | 5.0 | *0.791 | 31.5 | LOS C | 36.7 | 267.6 | 0.91 | 0.83 | 0.91 | 39.7 |
| 3 | R2 | 64 | 2.0 | 64 | 2.0 | *0.757 | 78.9 | LOS F | 4.4 | 31.5 | 1.00 | 0.85 | 1.26 | 26.0 |
| Approach | | 1632 | 4.9 | 1632 | 4.9 | 0.791 | 32.0 | LOS C | 36.7 | 267.6 | 0.87 | 0.81 | 0.88 | 39.4 |
| East: Oran Park Link Road (E) | | | | | | | | | | | | | | |
| 4 | L2 | 110 | 2.0 | 110 | 2.0 | 0.237 | 47.0 | LOS D | 5.5 | 39.3 | 0.84 | 0.76 | 0.84 | 33.7 |
| 5 | T1 | 46 | 5.0 | 46 | 5.0 | *0.075 | 49.8 | LOS D | 1.2 | 9.0 | 0.88 | 0.64 | 0.88 | 33.2 |
| 6 | R2 | 88 | 5.0 | 88 | 5.0 | *0.491 | 39.5 | LOS C | 3.5 | 25.5 | 0.99 | 0.77 | 0.99 | 36.2 |
| Approach | | 244 | 3.6 | 244 | 3.6 | 0.491 | 44.8 | LOS D | 5.5 | 39.3 | 0.90 | 0.74 | 0.90 | 34.5 |
| North: Northern Road (N) | | | | | | | | | | | | | | |
| 7 | L2 | 37 | 2.0 | 37 | 2.0 | 0.147 | 19.9 | LOS B | 4.6 | 33.1 | 0.51 | 0.49 | 0.51 | 47.2 |
| 8 | T1 | 1656 | 5.0 | 1656 | 5.0 | 0.736 | 22.5 | LOS B | 36.2 | 264.1 | 0.79 | 0.73 | 0.79 | 43.9 |
| 9 | R2 | 171 | 5.0 | 171 | 5.0 | 0.344 | 61.3 | LOS E | 5.0 | 36.6 | 0.95 | 0.77 | 0.95 | 29.8 |
| Approach | | 1864 | 4.9 | 1864 | 4.9 | 0.736 | 26.0 | LOS B | 36.2 | 264.1 | 0.80 | 0.73 | 0.80 | 42.1 |
| West: Oran Park Link Road (W) | | | | | | | | | | | | | | |
| 10 | L2 | 114 | 5.0 | 114 | 5.0 | 0.250 | 47.2 | LOS D | 5.8 | 42.0 | 0.84 | 0.77 | 0.84 | 33.6 |
| 11 | T1 | 35 | 5.0 | 35 | 5.0 | 0.057 | 49.6 | LOS D | 0.9 | 6.9 | 0.88 | 0.62 | 0.88 | 33.2 |
| 12 | R2 | 139 | 5.0 | 139 | 5.0 | *0.720 | 77.0 | LOS F | 4.7 | 34.6 | 1.00 | 0.83 | 1.19 | 26.3 |
| Approach | | 288 | 5.0 | 288 | 5.0 | 0.720 | 61.9 | LOS E | 5.8 | 42.0 | 0.92 | 0.78 | 1.01 | 29.6 |
| All Vehicles | | 4028 | 4.8 | 4028 | 4.8 | 0.791 | 32.1 | LOS C | 36.7 | 267.6 | 0.84 | 0.77 | 0.85 | 39.3 |

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

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. ped/h | 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: Northern Road (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 50 | 59.3 | LOS E | 0.2 | 0.2 | 0.96 | 0.96 | 90.4 | 40.5 | 0.45 |
| East: Oran Park Link Road (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 50 | 59.3 | LOS E | 0.2 | 0.2 | 0.96 | 0.96 | 93.0 | 43.8 | 0.47 |
| North: Northern Road (N) | | | | | | | | | | | | |

# MOVEMENT SUMMARY

## Site: 101 [PM 2036 w PP (Site Folder: Dick Johnson Drive)]

Oran Park Link Road 2 - Northern Road
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated  Cycle Time = 130 seconds (Site Optimum Cycle Time - Minimum Delay)

**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: Northern Road (S) | | | | | | | | | | | | | | |
| 1 | L2 | 453 | 5.0 | 453 | 5.0 | 0.450 | 23.3 | LOS B | 16.6 | 120.9 | 0.63 | 0.76 | 0.63 | 42.9 |
| 2 | T1 | 1368 | 5.0 | 1368 | 5.0 | *0.824 | 35.5 | LOS C | 39.4 | 287.9 | 0.94 | 0.87 | 0.97 | 38.1 |
| 3 | R2 | 64 | 2.0 | 64 | 2.0 | *0.757 | 78.9 | LOS F | 4.4 | 31.5 | 1.00 | 0.85 | 1.26 | 26.0 |
| Approach | | 1885 | 4.9 | 1885 | 4.9 | 0.824 | 34.0 | LOS C | 39.4 | 287.9 | 0.87 | 0.85 | 0.90 | 38.5 |
| East: Oran Park Link Road (E) | | | | | | | | | | | | | | |
| 4 | L2 | 110 | 2.0 | 110 | 2.0 | 0.237 | 47.0 | LOS D | 5.5 | 39.3 | 0.84 | 0.76 | 0.84 | 33.7 |
| 5 | T1 | 141 | 5.0 | 141 | 5.0 | *0.231 | 51.6 | LOS D | 3.9 | 28.7 | 0.91 | 0.71 | 0.91 | 32.7 |
| 6 | R2 | 88 | 5.0 | 88 | 5.0 | *0.425 | 37.8 | LOS C | 3.3 | 24.4 | 0.97 | 0.76 | 0.97 | 36.8 |
| Approach | | 339 | 4.0 | 339 | 4.0 | 0.425 | 46.5 | LOS D | 5.5 | 39.3 | 0.90 | 0.74 | 0.90 | 34.0 |
| North: Northern Road (N) | | | | | | | | | | | | | | |
| 7 | L2 | 37 | 2.0 | 37 | 2.0 | 0.151 | 21.0 | LOS B | 4.7 | 34.3 | 0.52 | 0.50 | 0.52 | 46.6 |
| 8 | T1 | 1656 | 5.0 | 1656 | 5.0 | 0.757 | 24.1 | LOS B | 37.4 | 273.4 | 0.82 | 0.75 | 0.82 | 43.1 |
| 9 | R2 | 329 | 5.0 | 329 | 5.0 | 0.663 | 64.8 | LOS E | 10.2 | 74.7 | 1.00 | 0.83 | 1.03 | 29.0 |
| Approach | | 2022 | 4.9 | 2022 | 4.9 | 0.757 | 30.7 | LOS C | 37.4 | 273.4 | 0.85 | 0.76 | 0.85 | 40.0 |
| West: Oran Park Link Road (W) | | | | | | | | | | | | | | |
| 10 | L2 | 154 | 5.0 | 154 | 5.0 | 0.338 | 48.3 | LOS D | 8.0 | 58.3 | 0.86 | 0.78 | 0.86 | 33.3 |
| 11 | T1 | 59 | 5.0 | 59 | 5.0 | 0.097 | 50.1 | LOS D | 1.6 | 11.7 | 0.88 | 0.65 | 0.88 | 33.1 |
| 12 | R2 | 202 | 5.0 | 202 | 5.0 | *0.814 | 77.8 | LOS F | 7.0 | 51.0 | 1.00 | 0.92 | 1.30 | 26.2 |
| Approach | | 415 | 5.0 | 415 | 5.0 | 0.814 | 62.9 | LOS E | 8.0 | 58.3 | 0.93 | 0.83 | 1.08 | 29.4 |
| All Vehicles | | 4661 | 4.9 | 4661 | 4.9 | 0.824 | 36.1 | LOS C | 39.4 | 287.9 | 0.87 | 0.80 | 0.89 | 37.7 |

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.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

**Pedestrian Movement Performance**

| Mov ID | Crossing | Input Vol. ped/h | 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: Northern Road (S) | | | | | | | | | | | | |
| P1 | Full | 50 | 50 | 59.3 | LOS E | 0.2 | 0.2 | 0.96 | 0.96 | 90.4 | 40.5 | 0.45 |
| East: Oran Park Link Road (E) | | | | | | | | | | | | |
| P2 | Full | 50 | 50 | 59.3 | LOS E | 0.2 | 0.2 | 0.96 | 0.96 | 93.0 | 43.8 | 0.47 |
| North: Northern Road (N) | | | | | | | | | | | | |