

## Transport Impact Assessment

Residential Development Planning Proposal  
10 - 12 Boondah Road, Warriewood

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# 1 Introduction

## 1.1 Background

Ason Group has been engaged by Henroth Group to prepare a Transport Impact Assessment (TIA) to support a Planning Proposal for a residential development (the Proposal) at 10-12 Boondah Road, Warriewood (the Site). The Proposal seeks changes to planning controls to achieve approximately 120 residential units and an expansion to the existing playing fields next to Warriewood Square shopping centre. Located within the Northern Beaches Council (Council) Local Government Area (LGA) the Site is therefore subject to that Council's controls.

The Site is located to the northeast of Warriewood Square and is legally described as Lot 3 and Lot 4 in DP26902. It has an area of some 20,000m<sup>2</sup> and currently zoned as RU2 - Rural Landscape under the Pittwater LEP 2014. Applicable planning controls are summarised below.

▪ Local Environmental Plans	Pittwater Local Environmental Plan 2014 (pub. 30-5-2014)
▪ Land Zoning	RU2 - Rural Landscape: (pub. 30-5-2014)
▪ Height of Building	8.5 m
▪ Floor Space Ratio	NA
▪ Minimum Lot Size	10,000 m <sup>2</sup>

The Site is shown in its local context in **Figure 1**.

## 1.2 Transport Impact Assessment Tasks

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

- Existing Site and local road network conditions, including the trip generation and distribution of the site and the operation of key local intersections providing access to the Site;
- Parking requirements;
- Peak period trip generation and distribution of the Site further to the Proposal and the potential impact of those trips on the key local intersections; and



**Figure 1: Site Location**

### 1.3 Document References

In preparing this TIA, Ason Group has referenced key Council documents including:

- Pittwater Local Environmental Plan 2014 (Pittwater LEP 2014)
- Pittwater 21 Development Control Plan (Pittwater DCP)
- Northern Beaches Council, Warriewood Valley Roads Masterplan 2018

This TIA also references general access, traffic and parking guidelines, including:

- Roads and Maritime Services Guide to Traffic Generating Developments (RMS Guide)
- Roads and Maritime Services Guide to Traffic Generating Developments – Updated Traffic Surveys TDT 2013/04a (RMS Guide Update)
- Roads and Maritime Services, Trip Generation Surveys, Medium Density Residential Dwellings, GTA, 2013
- 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)

## 2 Overview of Proposal

### 2.1 Summary of the Planning Proposal

The Planning Proposal seeks the following amendments to relevant planning controls.

**Table 1: Summary of Changes to Planning Controls**

Control	Existing	Proposed
Land-use	RU2 – Rural Landscape	R3 – Medium Density Residential
Floor-space-ratio (FSR)	n/a	n/a

Clause 6.1 of the PLEP 2014 uses number of dwellings as the relevant density control for the Warriewood Valley Land Release Area — the subject site being noted as part of the “Southern Buffer Area”. In this regard, a density of 60 dwellings per hectare is proposed for the subject site.

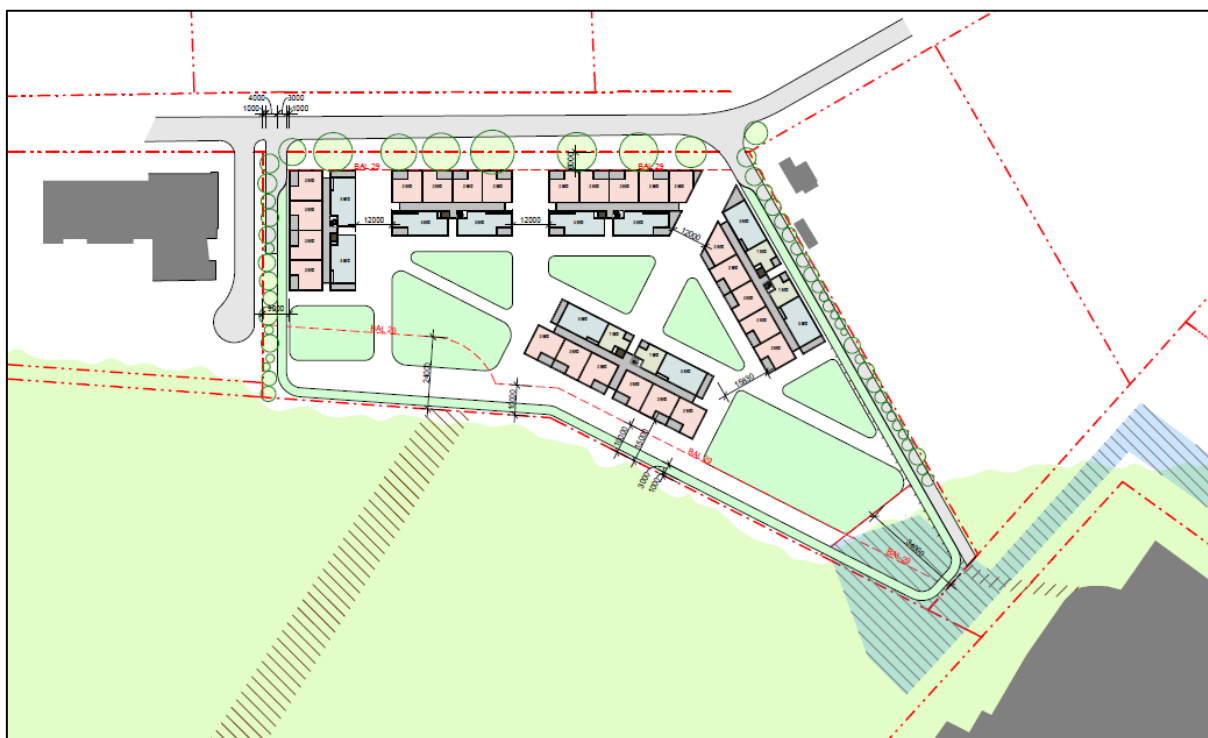
### 2.2 Indicative Development Potential

A concept plan has been developed by to explore the development potential of the Site, subject to the above changes to planning controls, to inform assessment of the Proposal. In summary, the concept plan envisages a 4-storey residential development including:

- A total of 120 residential units, including:
  - 24 one-bedroom units,
  - 72 two-bedroom units,
  - 24 three-bedroom units.
- Basement car parking with circa 202 car parking spaces, including 24 visitor parking spaces.
- An expansion to the existing playing fields next to Warriewood Square shopping centre.

A copy of the Site Plan is provided below for context.





**Figure 2: Proposed Site Plan (Residential Development)**

## 3 Existing Conditions

### 3.1 Active Transport Network

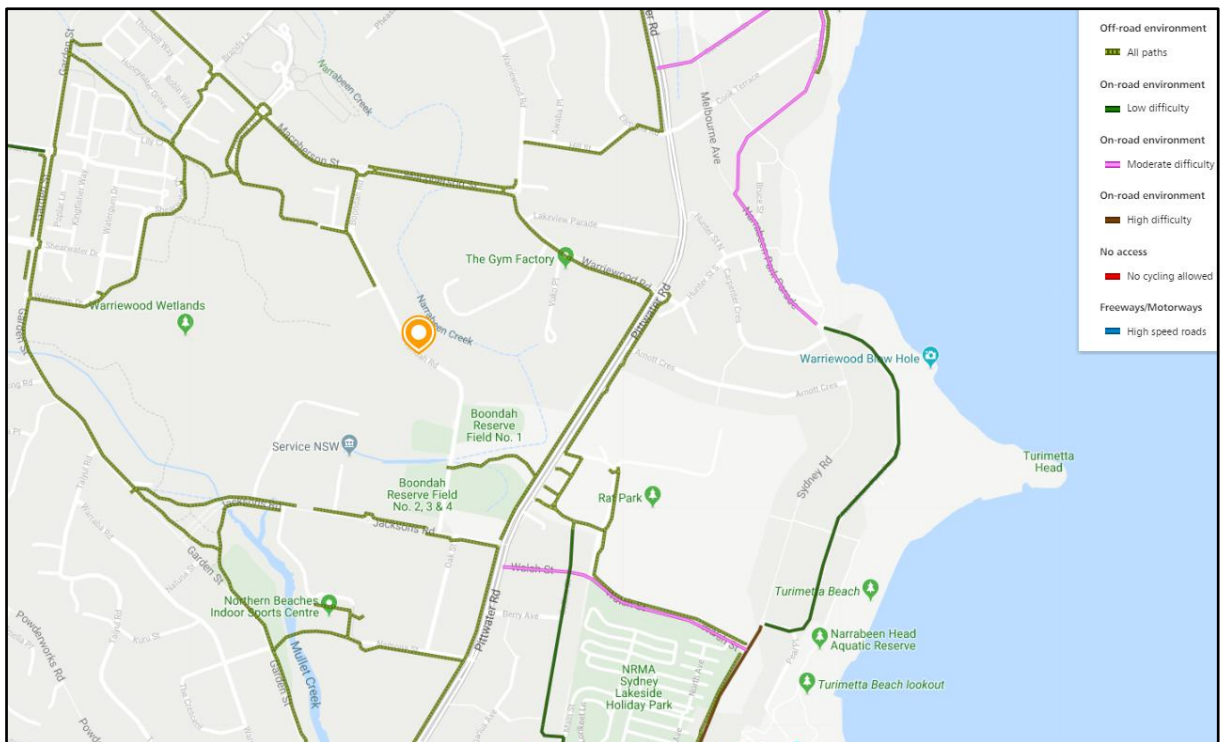
#### 3.1.1 Pedestrian Network

Council is currently working from the adopted footpath and Pedestrian Mobility and Access Plans developed by the former Councils prior to the amalgamation to inform where new footpaths are built.

The soon-to-be-developed Northern Beaches Walking Plan will integrate these former plans into one document and will provide a priority footpath schedule to lead future footpath program ultimately seeking to provide a connected footpath network which supports people walking as a preferred mode of travel, encourage walking as a form of transport.

#### 3.1.2 Bicycle Network

Existing bicycle network connections surrounding the Site are shown in **Figure 3**. The relatively flat surrounds and connecting cycleways of Warriewood and the surrounding suburbs make it relatively easy to travel by bicycle.



**Figure 3: Bicycle Network Surrounding the Site**

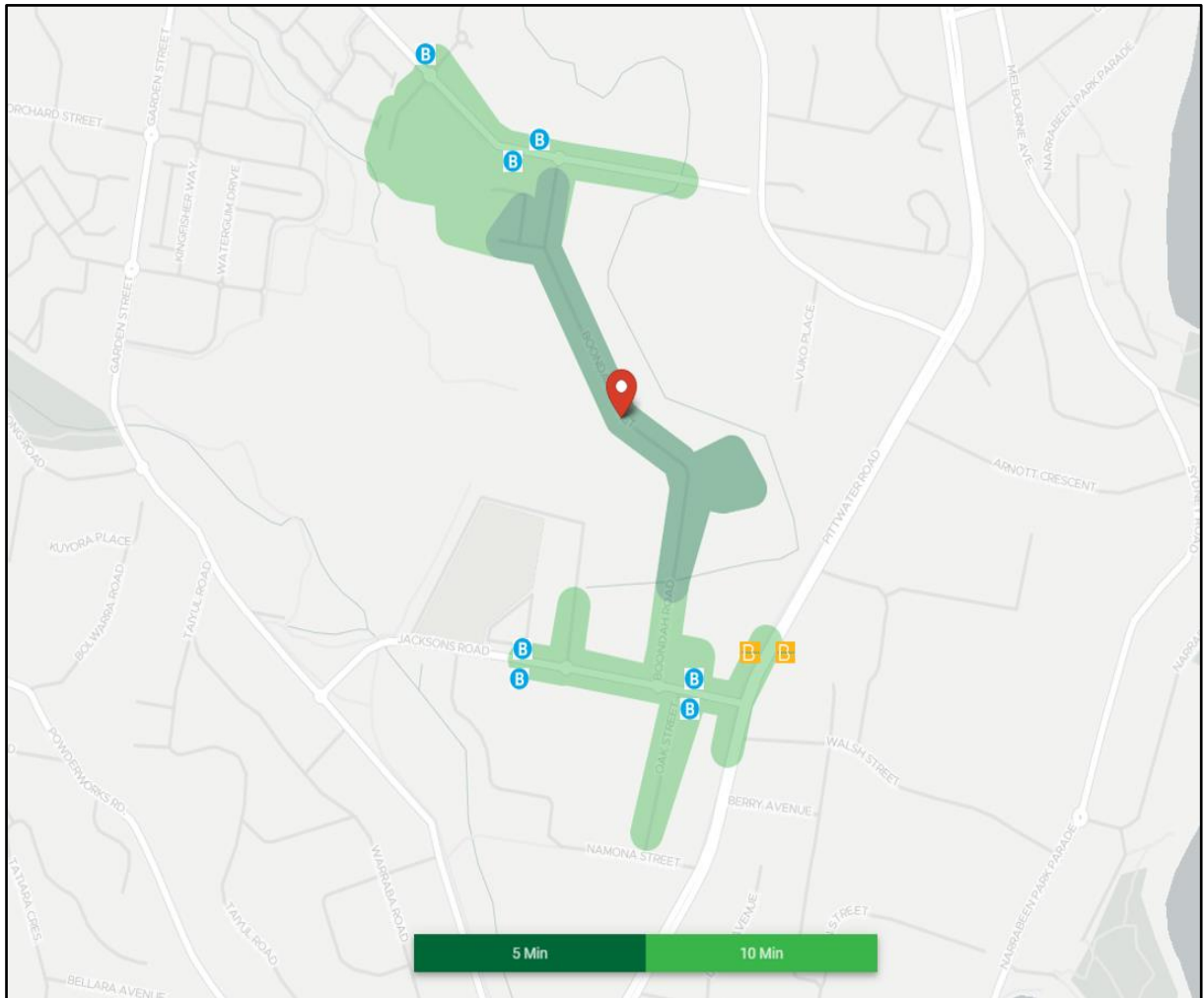
## 3.2 Public Transport

### 3.2.1 Bus Services

Having regard to the standard bus travel, the *Integrated Public Transport Service Planning Guidelines* state that bus services influence the travel mode choices of sites within 400 metres (approximately 5 minutes) of a bus stop. However, TfNSW data shows there is an average of 17,600 trips each weekday on B-Line buses—which represents around 30 per cent of all trips on the Northern Beaches and Lower North Shore bus networks—and overall there has been an approximate 10 per cent increase in patronage across bus services on the Northern Beaches in 2018. It can be argued that these increases, combined with the peak period ‘turn-up-and-go’ frequency of 2–7 minutes, attributes the B-line service with characteristics similar to a heavy or metro rail service.

Accordingly, it is reasonable to suggest that the influence of travel mode choices would also be similar to train services as identified in the *Integrated Public Transport Service Planning Guidelines* i.e. within 800 metres walking distance (approximately 10 minutes).

The Site is well serviced by nine bus stops within 10 minutes walking distance on Pittwater Road, Jacksons Road and Macpherson Street, as shown in **Figure 4**—including two B-line stops. In reality, walking times to B-line services on Pittwater Road and likely better than indicated in the figure, with an ability to use the Boondah Reserve Fields to cross directly to the northbound B-line stop.



**Figure 4: Existing Public Transport Accessibility to the Site**

**Table 2** summaries the bus routes serviced by the bus stops in **Figure 4** and their frequencies during the morning and evening peak periods.

**Table 2: Bus Frequency**

Bus Route	Description	Direction	Frequency	
			AM Peak	PM Peak
182	Mona Vale to Narrabeen	Northbound	Every 1 hour	Every 1 hour
		Southbound	Every 1 hour	Every 1 hour
185	Mona Vale to Warringah Mall	Northbound	Every 30 mins	Last service at 16:20
		Southbound	First service at 8:55	Every 30 mins
E85	Mona Vale to City Wynyard (Express)	Northbound	no service	Every 15-20 mins
		Southbound	Every 15 mins	no service
151	Mona Vale to City QVB	Northbound	no service	no service
		Southbound	no service	no service
188	Mona Vale to City Wynyard	Northbound	no service	no service
		Southbound	no service	no service
199	Palm Beach to Manly	Northbound	Every 15 mins	Every 15 mins
		Southbound	Every 15 mins	Every 15 mins
<b>B1</b>	<b>Mona Vale to City Wynyard</b>	<b>Northbound</b>	<b>Every 8-12 mins</b>	<b>Every 2-7 mins</b>
		<b>Southbound</b>	<b>Every 2-7 mins</b>	<b>Every 8-12 mins</b>
E54	Mona Vale to Milsons Point	Northbound	Every 30 mins	Every 15 mins
		Southbound	Every 15 mins	Every 15 mins
E60	Mona Vale to Chatswood (Express)	Northbound	no service	Every 30 mins
		Southbound	Every 20 mins	no service
E88	North Avalon Beach to City Wynyard	Northbound	no service	Every 10 mins
		Southbound	Every 10 mins	no service
E89	Avalon Beach to City Wynyard	Northbound	no service	Every 30 mins
		Southbound	Every 20 mins	no service
L90	Palm Beach to City Wynyard	Northbound	no service	no service
		Southbound	no service	Every 1 hour

### 3.3 Private Transport

#### 3.3.1 Traffic Generation

The Site is currently occupied by a single residential dwelling and several sheds. Vehicular access is provided directly from Boondah Road.

The Site is currently used to store several cars and caravans. However, these are unlikely to generate an appreciable amount of weekday morning and evening peak trips.

#### 3.3.2 Road Network

The key roads within study area are:

- **Pittwater Road:** a state road which runs along the Pittwater Peninsular from Manly in the south to Palm Beach in the north. Near the Site, Pittwater Road provides 6 traffic lanes for two-way traffic (3 lanes per direction) including dedicated southbound bus lane during morning peak periods and dedicated northbound bus lane during evening peak periods. It has a posted speed limit of 70km/hr.
- **Jacksons Road:** a local road which runs west-east to the south of the Site. It generally provides 2 traffic lanes for two-way traffic (1 lane per direction). Temporary on-street parking spaces are permitted on part of the road. Jacksons Road has posted speed limit of 50km/hr.
- **Boondah Road:** a local road which generally runs north-south to the east of the Site. It provides 2 traffic lanes for two-way traffic (1 lane per direction).
- **Macpherson Street:** a local road which runs west-east to the north of the Site, connecting to Warriewood Road to the east. It should be noted that north approach of the Warriewood Road / Macpherson Street roundabout is currently closed for construction work. Therefore, it is expected that a significant number of southbound trips generated from the residential area to the north of Macpherson Street are redirected to Garden Street and Boondah Road.

#### 3.3.3 Traffic Volumes

The existing traffic on the surrounding road network was surveyed during the road network weekday morning and evening peaks on Thursday, 06 June 2019. Resultant weekday peak traffic volumes are shown in **Figure 5**.

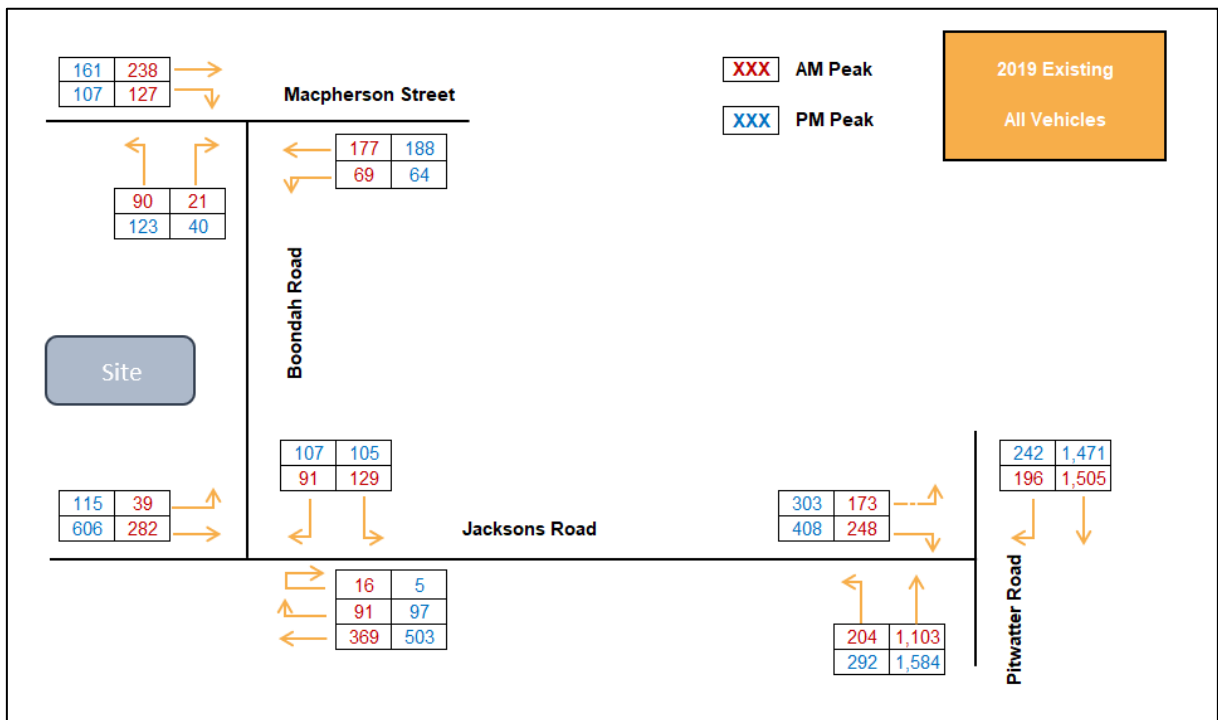


Figure 5: Weekday Peak Traffic Volumes

### 3.3.4 Intersection Performance

The performance of the above key intersection has been analysed using the SIDRA Intersection modelling software. SIDRA modelling outputs a range of performance measures, in particular:

- **Average Vehicle Delay (AVD)** – The 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 and Roundabout controlled) intersections, the AVD reported is that for the movement with the highest AVD.
- **Level of Service (LOS)** – This is a comparative measure that provides an indication of the operating performance, based on AVD.

The **Table 3** provides a recommended baseline for assessment as per the RMS Guide:

**Table 3: RMS 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 and 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.

The local network performance is provided in **Table 4** which presents the SIDRA intersection modelling results of the key intersections under the existing “baseline” scenario:

**Table 4: Existing Intersection Performance**

Intersection	Period	Average delay, seconds (Level of Service)
Pittwater Rd / Jacksons Rd	AM	24.3 (B)
	PM	37.7 (C)
Boondah Rd / Jacksons Rd <sup>2</sup>	AM	8.4 (A)
	PM	111.5 (F)
Macpherson St / Boondah Rd	AM	9.3 (A)
	PM	9.4 (A)

Notes: 1) Results based on ‘network’ modelling results

2) If modelled in isolation, ignoring downstream queuing effects, roundabout operates at LoS A during weekday peak periods.

The modelling indicates that:

- Macpherson Street / Boondah Road is operating with a good Level of Service A.
- Pittwater Rd / Jacksons Rd operates satisfactorily with LoS B and C during peak periods. Having regard for signal timing — giving preference to Pittwater Road corridor traffic — longer queuing

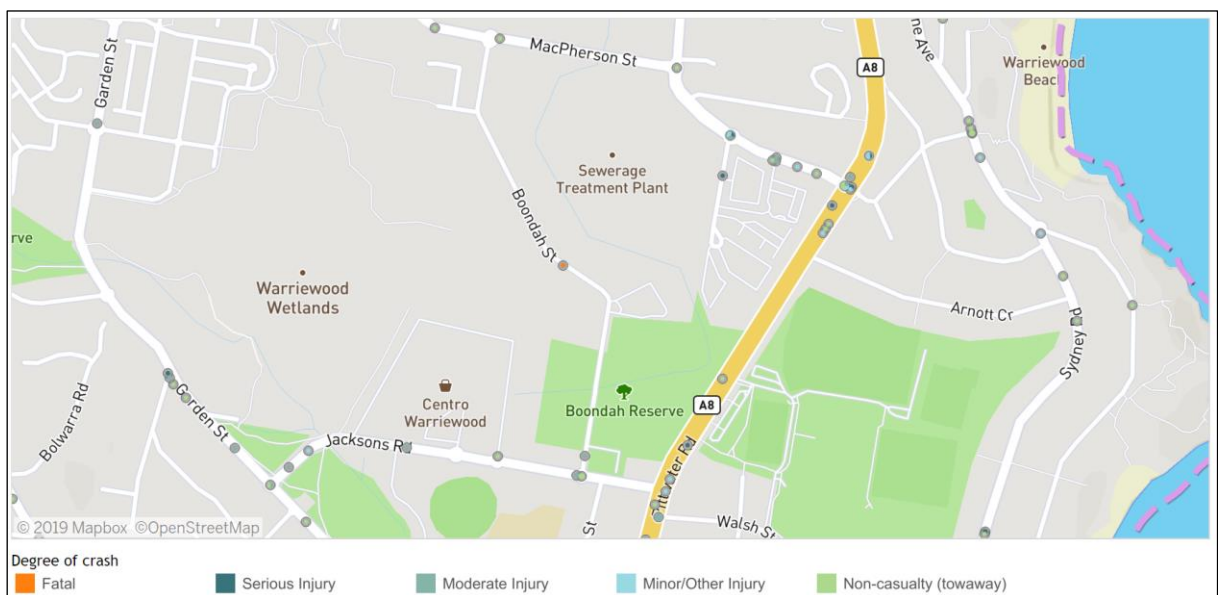


was observed within Jacksons Road. Nevertheless, this is commonplace where local Council roads intersect with major urban arterial roads such as Pittwater Road.

- The Boondah Road / Jacksons Road roundabout is modelled to operate at LoS “F” in the evening peak. Critical delay for roundabout level of service assessment is defined as the worst movement delay—and, in this instance, is actually caused by the limited downstream capacity as a result of queuing on approach to the Jacksons Road / Pittwater Road signals which extend west past the roundabout. Given the congested conditions, interaction of traffic at the roundabout occurs at a low speed, largely mitigating several safety aspects associated with LoS “F” performance.

### 3.4 Road Safety

A summary of crashes in the immediate locality is presented in Figure 6, with summary of key crashes in Table 5.



**Figure 6: Historic Crash Data in Locality**

**Table 5: Crash Summary - Boondah Road and connecting intersections**

Year	Severity	Injuries	RUM Code	Conditions
2014	Non-injury	nil	11— right far	Daylight
2016	Non-injury	nil	39— other same direction	Daylight
	Fatal	1 fatality, 1 injured	85— off road, left bend	Darkness
	Non-injury	nil	30— rear end	Daylight
	Injury	1 injured	30— rear end	Daylight
2017	Injury	1 injured	44— parking vehicles	Daylight

Crashes in Boondah Road and connecting intersections are varied in nature and not suggestive of a particular trend for which special consideration is required.

It is also noteworthy that a number of upgrades are planned for Boondah Road and the intersection of Pittwater Road / Jacksons Road which should present improved safety outcomes. These improvements are discussed further in the section 4.1.

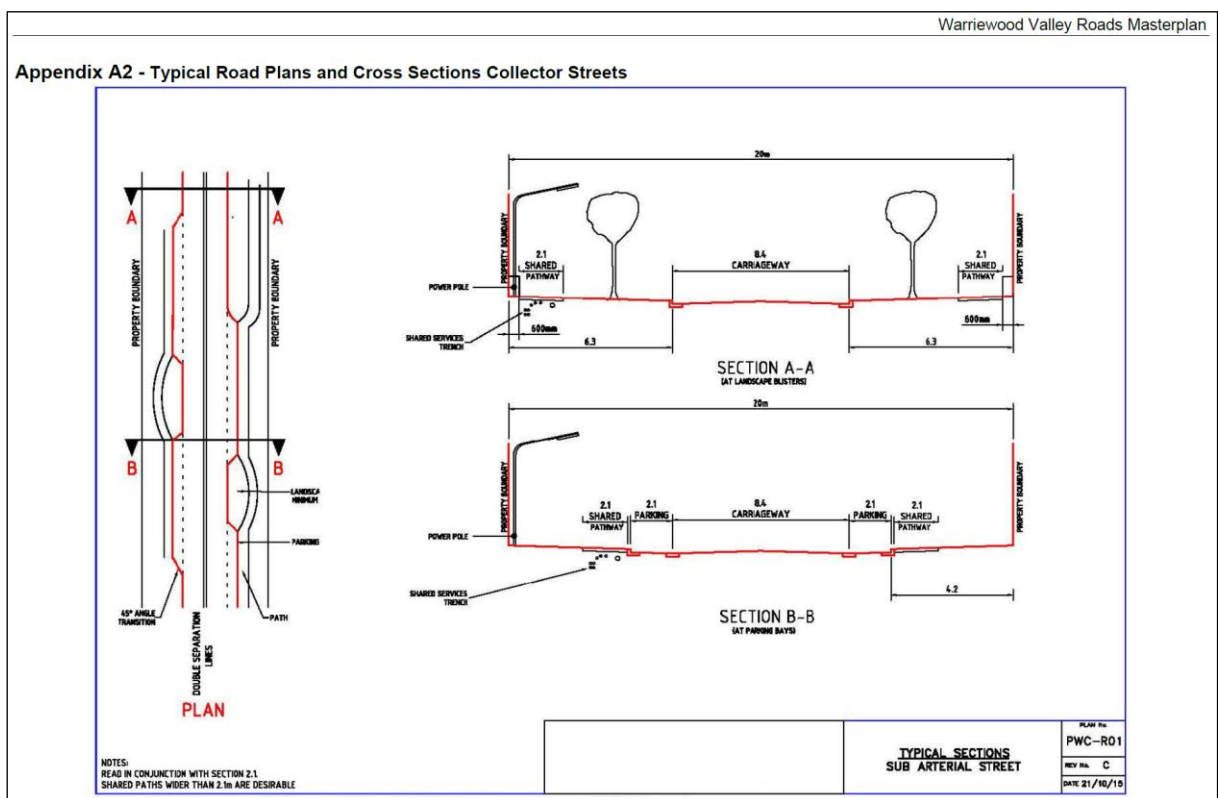
## 4 Future Context (without Proposal)

### 4.1 Committed Upgrades and Services

#### 4.1.1 Road Network Improvements

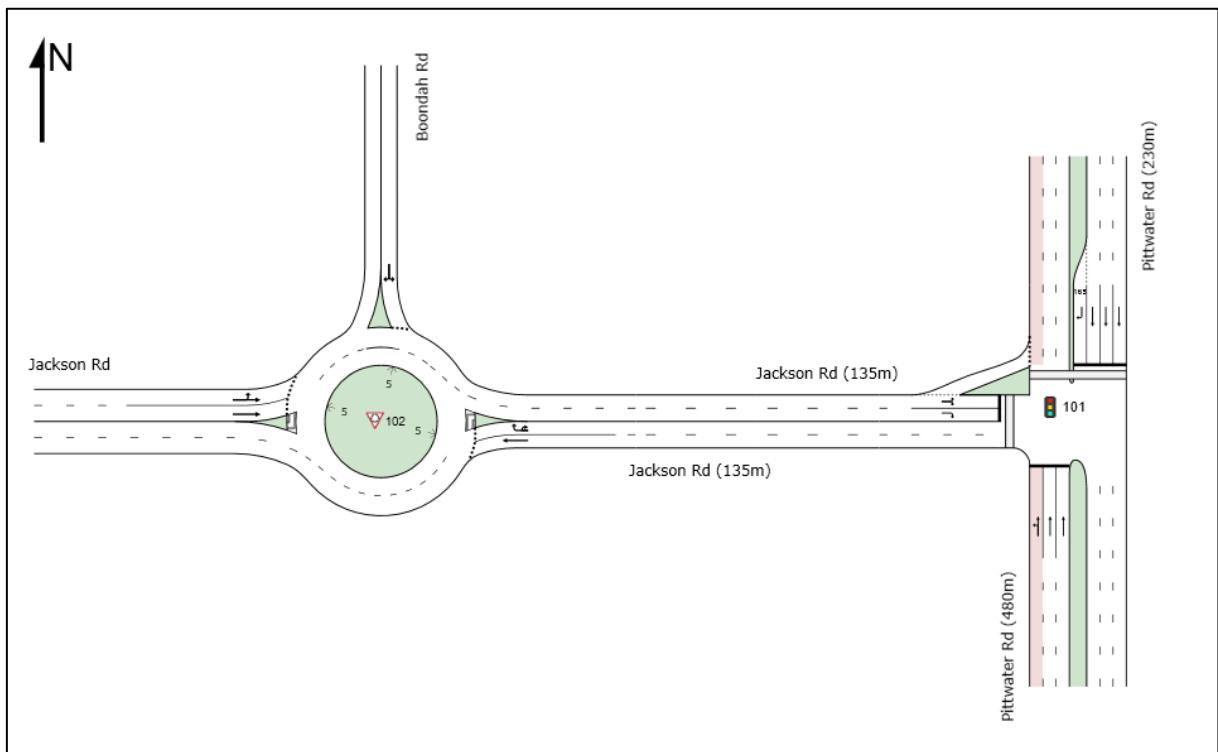
The Northern Beaches Council, *Warriewood Valley Roads Masterplan*, August 2018 (WVRM) documents the technical requirements for traffic management measures for implementation in the Warriewood Valley Urban Release Area. The report was prepared by Northern Beaches Council to reflect the updated land-use data applicable to Warriewood Valley and the associated amended transport network requirements.

Boondah Road is designated as a Collector Street in the WVRM and subject to widening to accommodate the below cross-section.



**Figure 7: Warriewood Valley Roads Masterplan - Collector Road Cross Section**

Section 3.9.1 of WVRM also identifies that the signalised intersection of Pittwater Road and Jacksons Road is to be upgraded and Council has advised that a concept plan for that upgrade is currently with RMS for approval. The concept plan includes the addition of a left turn slip lane and two right turn lanes out of Jacksons Road onto Pittwater Road, assumed to be similar to that presented below.



**Figure 8: SIDRA Layout of Upgrades to Pittwater Rd / Jacksons Rd**

The increased capacity provided by this upgrade in conjunction with reconfiguration of signal phasing will significantly improve the capacity and level of service when compared to the existing configuration. Future performance of this intersection is discussed separately below.

#### 4.1.2 Pedestrian & Active Transport Improvements

At the council meeting held on 16 April 2019, Council adopted the Northern Beaches Walking Plan. The plan provides the priority schedule for the delivery of new footpaths across the area and as well as a number of actions to improve pedestrian access and connectivity. It is noteworthy that future plans for Boondah Road, as shown in Figure 7 above, includes provision of a shared path.

## 4.2 Future Network Performance

Preliminary assessment of this future upgrade to Pittwater Road / Jacksons Road has also been undertaken to explore future performance in the longer term. The results demonstrated that the upgraded intersection would exceed capacity prior to 2036 when adopting a nominal 2% annual growth rate, as presented below.

**Table 6: 2036 Intersection Performance — Future Base Case (with future upgrades)**

Intersection	Period	Average delay, seconds (Level of Service)
Pittwater Rd / Jacksons Rd	AM	26.2 (B)
	PM	135.7 (F)
Boondah Rd / Jacksons Rd	AM	8.7 (A)
	PM	14.6 (B)
Macpherson St / Boondah Rd	AM	9.8 (A)
	PM	10.0 (A)

However, it is expected that the ultimate design and signal phasing approved by RMS would be able to satisfactorily accommodate forecast traffic volumes beyond this horizon year with regard to appropriate growth rates that consider reasonable mode splits. In this regard, future traffic growth on Pittwater Road — a governing factor in the network performance — may be less than assessed in light of increased demand being accommodate by non-car travel such as the B-line services. Nevertheless, this is a matter for RMS in terms of corridor planning generally and the most relevant use of this Future Base Case scenario is to assess the relative impact of the Proposal which is discussed in section 5.

## 5 Operational Traffic Impacts (with Proposal)

### 5.1 Active Transport

Provision of bicycle parking and end-of-trip facility is a matter for the DA stage. PDCP states that for residential development (other than a dwelling house, dual occupancy, secondary dwellings, exhibition homes and rural workers' dwellings), secure bicycle storage facilities must be provided within the building at the rate of 1 bicycle rack per 3 dwellings.

### 5.2 Public Transport

The public transport network for the Site provides connectivity to a range of key employment centres within the local and regional area, giving options for the future residents.

The scope of work completed at Warriewood for B-line services includes:

- a new multi-deck car park replacing the previous at-grade car park adjacent to Pittwater Road at North Narrabeen Reserve, providing approximately 249 additional car parking spaces.
- new bike storage and improvements to bicycle and pedestrian links.
- new northbound and southbound bus stops on Pittwater Road including weather protection, seating and real-time information.

### 5.3 Private Transport

Parking provision are discussed separately in section 6, with operational traffic generation and impacts discussed below.

#### 5.3.1 Trip Generation and Distribution

The traffic impacts of the Planning Proposal have been assessed having regard to Roads and Maritime Services, *Trip Generation Surveys, Medium Density Residential Dwellings*, GTA, 2013 Accordingly, the following traffic generation rates were adopted for the analysis—based on the average 'site peak hour' between 6:00-9:00AM and 4:00-7:00PM:

- AM peak 0.40 trips per dwelling
- PM peak 0.48 trips per dwelling
- Daily 3.17 trips per dwelling

It is noteworthy that these rates are considered conservative in the context of the subject site which is located within close proximity to high-frequency B-line services.

For the purposes of this assessment, it is assumed that traffic generated by the development shall be consistent with the traditional 80% / 20% inbound and outbound.

Application of the above to the indicative yield of 120 units, results in the following peak hourly traffic generation.

**Table 7: Traffic Generation Summary**

Period	In	Out	Total
AM Peak	10	38	48
PM Peak	46	12	58
Daily	190	190	380

### 5.3.2 Trip Assignment

The Site's trip distribution to/from external origins and destinations has been determined with reference to the following:

- 2016 Journey to Work (JTW) Data.
- Travel patterns evident from the existing traffic flows within the study area.

Traffic volumes have been assigned to the surrounding road network with consideration of the catchment area and likely traffic routes considering minimum travel time (using Google Maps). Accordingly, the likely traffic assignment for the Proposal is illustrated in **Figure 9**.



**Figure 9: Trip Assignment**

### 5.3.3 Traffic Volume Forecasts

Having regard for the above, the resultant traffic volumes on the surrounding road network are presented below.



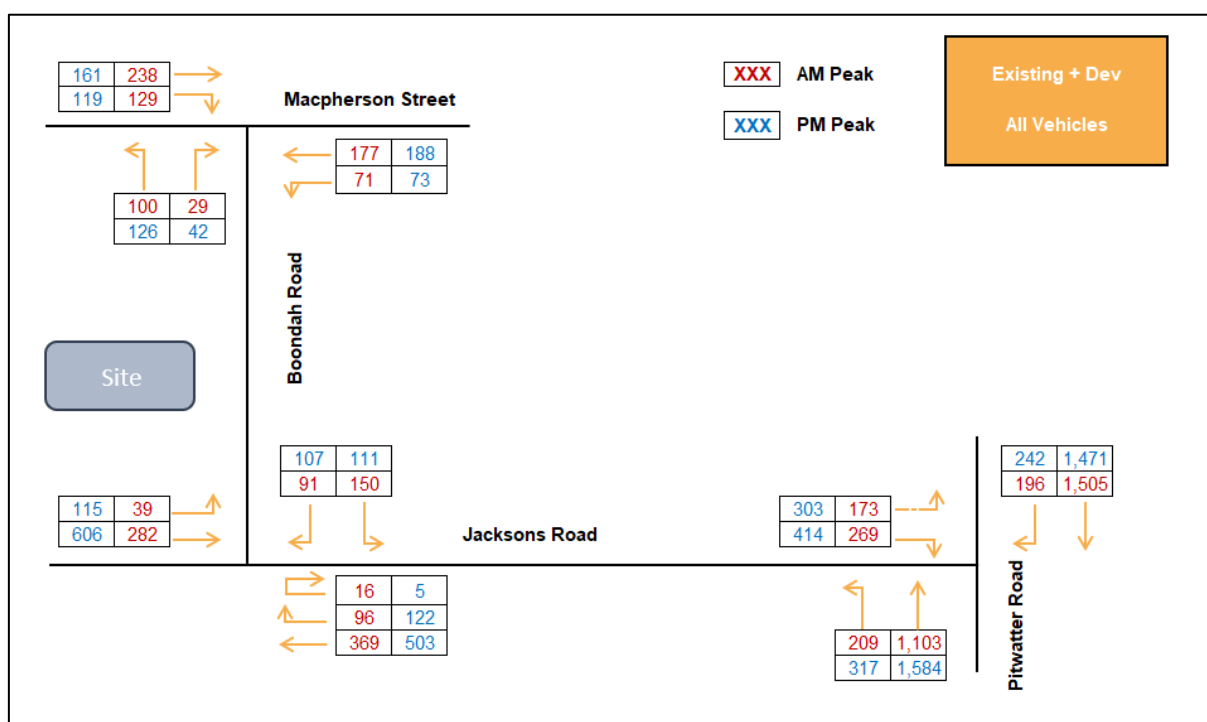


Figure 10: Weekday Peak Traffic Volumes

#### 5.3.4 Capacity and Level of Service

A SIDRA analysis of the intersections within the study area was undertaken for the weekday peak periods and the results in **Table 8**. Existing queues at Jacksons Road / Pittwater Road—an issue for existing network performance—continue to adversely affect the operation of the Boondah Road / Jacksons Road roundabout.

Table 8: 2021 Intersection Performance with Proposal

Intersection	Period	Average delay, seconds (Level of Service)	
		Existing	Existing + Dev
Pittwater Rd / Jacksons Rd	AM	24.3 (B)	25.2 (B)
	PM	37.7 (C)	37.3 (C)
Boondah Rd / Jacksons Rd	AM	8.4 (A)	8.4 (A)
	PM	111.5 (F)	152.5 (F)
Macpherson St / Boondah Rd	AM	9.3 (A)	9.4 (A)
	PM	9.4 (A)	9.4 (A)

Similar to the existing performance, delays at Boondah Road / Jacksons Road are a result of downstream queuing in Jacksons Road on approach to Pittwater Road.

With the future improvements planned at the Pittwater Road / Jacksons Road intersection, network delays will improve substantially, as summarised below.

**Table 9: 2036 Intersection Performance with Proposal (with future upgrades)**

Intersection	Period	Average delay, seconds (Level of Service)	
		Existing	Existing + Dev
Pittwater Rd / Jacksons Rd	AM	26.2 (B)	26.8 (B)
	PM	135.7 (F)	136.6 (F)
Boondah Rd / Jacksons Rd	AM	8.7 (A)	8.7 (A)
	PM	14.6 (B)	15.4 (B)
Macpherson St / Boondah Rd	AM	9.8 (A)	9.8 (A)
	PM	10.0 (A)	10.0 (A)

Planned upgrades will substantially improve local network performance—importantly addressing issues at the Boondah Road / Jacksons Road roundabout. The minor increase in traffic as a result of the Proposal will have only a minor impact the performance of the key intersections.

Operation of the Pittwater Road corridor more generally is an ongoing matter for TfNSW and Council in terms of managing growth in private vehicle usage along the peninsular more generally. It can be seen from above that future intersection performance of Pittwater Road / Jacksons Road could exceed capacity in the longer term. Nevertheless, the modelling demonstrates that the subject Proposal will have only minor impact to delays at that intersection.

Importantly, the Proposal only contributes to 0.075% of the existing traffic at Jacksons Road / Pittwater Road. Therefore, the scale of development should not be considered to warrant the assumed improvement in isolation.

## 6 Parking Provisions

### 6.1 Car Parking

It is noted that the detailed parking demand / supply assessment is anticipated to be undertaken as part of the DA stage when the development yield and the development site plans are finalised. However, this Section of the TIA provides general guidance on the applicable DCP parking rates and will conclude a possible range for the parking requirement in accordance with the potential land uses on Site.

#### 6.1.1 General Provisions

It is expected that any future development shall provide car parking in accordance with the PDCP. Accordingly, the following parking rates would be applicable to the proposed land uses on the Site:

**Table 10: Parking Rates**

Multi Dwelling Housing	Rate
1 bedroom	1 space per dwelling
2 or more bedroom	2 spaces per dwelling

Application of the appropriate rates to the indicative yield results in a parking requirement of 216 spaces so as not to have any adverse impact on the availability of on-street parking. Separate visitor parking is to be provided at a rate of 1 space per 3 dwellings, rounded up.

#### 6.1.2 Accessible Parking

The PDCP requires the provision of parking for people with disabilities be provided at a rate of 3% of the required parking spaces, excluding parking required for Adaptable Housing.

### 6.2 Bicycle Parking

Provision of bicycle parking and end-of-trip facility is also a matter for the DA stage. However, for residential development (other than a dwelling house, dual occupancy, secondary dwellings, exhibition homes and rural workers' dwellings) the PDCP requires the provision of secure bicycle storage facilities within the building at the rate of 1 bicycle rack per 3 dwellings.

## 7 Design Commentary

As mentioned previously, detailed design of the development site plans is anticipated to occur at later stages of the project; during the DA phase. However, this section provides general guidance on the access crossover location and internal parking design specifications.

### 7.1 Relevant Design Standards

The Site access, car park and loading must generally be designed to comply with the following relevant Australian Standards:

- AS2890.1 for car parking areas;
- AS2890.2 for commercial vehicle loading areas;
- AS2890.3 for bicycle parking; and
- AS2890.6 for accessible (disabled) parking.

It is expected that any detailed development application or construction drawings in relation to the car park, site access or loading areas would comply with these Standards.

### 7.2 Access Location

Detailed design of the access point(s) shall occur as part of future DA phase design development. It is expected that on-site loading shall need to make provision for access by the appropriate design vehicles— large rigid vehicles (HRV) for fire appliance access at the ground level, including necessary on-site turning and passing facilities.

## 8 Summary of Findings & Conclusions

### 8.1 Key Findings

The key findings of this Traffic Impact Assessment are:

- The Planning Proposal generally seeks amendment to the following controls.

Control	Existing	Proposed
Land-use	RU2 – Rural Landscape	R3 – Medium Density Residential
Floor-space-ratio (FSR)	n/a	n/a <sup>1</sup>

Note: 1) Clause 6.1 of the Pittwater Local Environmental Plan (LEP) references permissible number of dwellings as density control within the Warriewood Valley Land Release Area. Density of 60 dwellings / hectare proposed for subject site.

- These changes are expected to facilitate development of a total of 120 residential units, including:
  - 24 one-bedroom units
  - 72 two-bedroom units
  - 24 three-bedroom units

The above has been developed to explore the impact of the Proposal and will be subject to further refinement as part of future Development Application submission, following planning approval.

- Operational characteristics of the B-line service is similar to a heavy or metro rail services in terms of frequency. Accordingly, it is reasonable to suggest that the influence of travel mode choices would also be similar to train services as identified in the *Integrated Public Transport Service Planning Guidelines* i.e. within 800 metres walking distance (approximately 10 minutes).
- The Site is well serviced by nine bus stops within 10 minutes walking distance including two B-line stops. As such, increased density on the Site—as proposed—seeks to maximise the potential of this public transport infrastructure.
- It is noteworthy that land to the north-west of the subject site — located further from B-line services — has already been amended to an R3 zoning. As such, it would be reasonable that the subject site, with improved accessibility to public transport, should be subject to similar controls (as a minimum).
- It is expected that the on-site parking provisions will be assessed as part of the Development Application (DA) stage of the project. However, it is anticipated that the Proposal will provide sufficient off-street parking to satisfy Council DCP requirements.

- Similarly, the design of any future site access and on-site parking shall also be subject to detailed assessment at DA stage. Site access and basement car parking areas shall be designed having regard for relevant Australian Standards (AS2890 series).
- A summary of the modelled intersection performance at key intersections is provided below.

Intersection	Period	Average delay, seconds (Level of Service)			
		Existing	Existing + Dev	2036 Base Case	2036 Project Case
Pittwater Rd / Jacksons Rd	AM	24.3 (B)	25.2 (B)	26.2 (B)	26.8 (B)
	PM	37.7 (C)	37.3 (C)	135.7 (F)	136.6 (F)
Boondah Rd / Jacksons Rd	AM	8.4 (A)	8.4 (A)	8.7 (A)	8.7 (A)
	PM	111.5 (F)	152.5 (F)	14.6 (B)	15.4 (B)
Macpherson St / Boondah Rd	AM	9.3 (A)	9.4 (A)	9.8 (A)	9.8 (A)
	PM	9.4 (A)	9.4 (A)	10.0 (A)	10.0 (A)

Note: a copy of SIDRA modelling files can be provided to Council / RMS, upon request.

- It is evident that:
  - Queuing on approach to Pittwater Road has impacts on network performance even under 'existing' conditions.
  - Additional development added to this congested network will increase delays and queues on the local road network. However, these delays will occur in a congested (slow speed) conditions and therefore not likely to present the safety issues traditionally associated with poor Level of Service.
  - There are plans for the Pittwater Road / Jacksons Road intersection which are expected to address queuing within Jacksons Road and provide increased capacity.
  - That increased capacity will improve network performance such that the minor increase in traffic as a result of the proposal will not have a material impact on the surrounding road network.

## 8.2 Conclusions

In summary, the scale of development envisaged for the Site does not have a material impact on road and public transport infrastructure and services. Subject to provision of regional transport infrastructure upgrades to support the Urban Release Area more generally, the Proposal will not have any unacceptable impacts on the surrounding road network.

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