

asongroup



Tuggerah Gateway Precinct Rezoning

Pre-Gateway - Transport Assessment

Cnr Tonkiss Street & Wyong Road, Tuggerah

24/05/2023

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contents

Glossary

1	Introduction	1
1.1	Overview	1
1.2	Key References	1
1.3	Consultation	1
2	Existing Conditions	3
2.1	Site Details	3
2.2	Road Network	5
2.3	Road Safety	8
2.4	Public Transport	9
2.5	Active Transport Connectivity	13
2.6	Travel Pattern Assessment	14
3	Strategic Context	17
3.1	Central Coast Regional Plan 2036	17
3.2	Central Coast Council Local Strategic Planning Statement (Draft, 2020)	17
3.3	Tuggerah to Wyong Economic Corridor Transport Study (2020)	18
3.4	Tuggerah Gateway Voluntary Planning Agreement (VPA)	19
4	Planning Proposal Summary	21
4.1	Tuggerah Gateway Precinct Structure Plan	21
5	Movement and Place Framework	30
6	Traffic Assessment	32
6.1	Generation Rates	32
6.2	Traffic Generation Assessment	35
6.3	Distribution	36
6.4	Future Year Growth	37
6.5	Modelling Scenarios	38
6.6	Intersection Geometry	39
6.7	Results and Outcomes	40
7	Summary & Conclusions	43
7.1	Key Findings	43
7.2	Recommendations	43
7.3	Conclusion	44

contents continued

Figures

Figure 1: Site Context	3
Figure 2: Existing Land Use	4
Figure 3: Location & Road Hierarchy	5
Figure 4: Key Intersections - Wyong Rd / Tonkiss St	6
Figure 5: Crash Locations	8
Figure 6: Public Transport Connectivity	12
Figure 7: Existing Cycle Network	13
Figure 8: Existing Wyong Rd Shoulder Cycle Lane	14
Figure 9: Travel Mode Share	15
Figure 10: Travel By Purpose - HTS 2018/19	16
Figure 11: Central Coast 2036 Strategic Direction	17
Figure 12: Precinct Targets 2036 - Tuggerah to Wyong Economic Corridor Strategy (2019)	18
Figure 13: Site Context in Tuggerah-Wyong Corridor Strategy	19
Figure 14: Left-In/Left-Out junction to Wyong Road	20
Figure 15: Signalised configuration for Wyong Road / Tonkiss Road intersection	20
Figure 16: Concept Structure Plan	22
Figure 17: Indicative Development Staging	24
Figure 18: Road Sections	25
Figure 19: Potential Shuttle Service Connectivity	26
Figure 20: Proposed Route Amendments	27
Figure 21: Precinct Collector Road Street Section	27
Figure 22: Proposed Active Transport Corridor	28
Figure 23: Proposed Westfield Access (Indicative only)	29
Figure 24: Travel by Purpose - HTS 2018/19	33
Figure 25: JTW 2016 Distribution	36
Figure 26: Detailed Distribution IN	37
Figure 27: Detailed Distribution OUT	37
Figure 28: (Left) Existing Configuration and (Right) Signalised Configuration	39
Figure 29: Options Study - Upgraded Configuration	40

Tables

Table 1: Road Hierarchy	5
Table 2: Level Of Service	7
Table 3: Modelling Results – Existing base case	7
Table 4: Crash History	8
Table 5: Railway Services	9
Table 6: Bus Connections	10
Table 7: Bus Services	10
Table 8: Precinct Yield – long term	23
Table 9: Potential Bus Services for reroute	26
Table 10: Movement & Place Objectives	30
Table 11: TFNSW Traffic Generation Rates	32
Table 12: HTS Peak Assessment	34
Table 13: Discounted Rate Assessment	35
Table 14: Traffic Generation	35
Table 15: Modelling Scenarios Summary	38
Table 16: Modelling Results - Scenario 1	40
Table 17: Modelling Results - Scenario 2	41
Table 18: Modelling Results - Scenario 3	42

APPENDICES

Appendix A. SIDRA Results

Glossary

Acronym	Description
AGRД	Austrоads Guide to Road Design
AGTM	Austrоads Guide to Traffic Management
CC	Construction Certificate
Council	Central Coast Council
DA	Development Application
DCP	Development Control Plan
DoS	Degree of Saturation
DPIE	Department of Planning, Industry and Environment
FSR	Floor space ratio
GFA	Gross Floor Area
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
MOD	Section 4.55 Modification (also referred as a S4.55)
NHVR	National Heavy Vehicle Regulator
OC	Occupation Certificate
TfNSW Guide	Transport for NSW (formerly Roads and Traffic Authority), Guide to Traffic Generating Developments, 2002
S4.55	Section 4.55 Modification (also referenced as MOD)
S96	Section 96 Modification (former process terminology for an S4.55)
TDT 2013/04a	TfNSW Technical Direction, Guide to Traffic Generating Developments – Updated traffic surveys, August 2013
TfNSW	Transport for New South Wales
TIA	Transport Impact Assessment
TIS	Transport Impact Statement
veh/hr	Vehicle movements per hour (1 vehicle in & out = 2 movements)

1 Introduction

1.1 Overview

On behalf of Scentre Group, this Transport Assessment (TA) supports a Planning Proposal and Structure Plan prepared by Urbis. The Planning Proposal facilitates the proposed amendment to the Local Environmental Plan at the Tuggerah Gateway Site, known as Lot 2 DP1056960 and Lot 3 DP1084221, which will enable residential, mixed-use and recreational land uses.

The site is approximately 41.6 hectares and is currently zoned RU6 Transition, B4 Mixed Use and E2 Environmental Conservation.

The Planning Proposal seeks to rezone land comprising (part) Lot 2 in DP 1056960 and Lot 3 in DP 1084221 from RU6 Transition to R1 General Residential. The B4 Mixed Use zone in the north-east of the site and E2 Environmental Conservation zone in the south-east is to be retained.

The long-term development yield capable of being accommodated on the site comprises of 2,112 dwellings including a mix of detached housing lots, medium density townhouses/terraces, apartments and seniors living. Consistent with the Structure Plan, the future development of the site is to be staged in accordance with market demand and infrastructure requirements. In the short-term employment uses in the form of bulky goods / large format retailing will be prioritised in part of the B4 Mixed Use zone. In the longer term this area is envisaged as a mixed-use precinct.

1.2 Key References

In preparation of this TA, Ason Group has referenced the following key planning documents, some of which are described further in section 3:

- Central Coast Council, *Central Coast Regional Plan 2036*; 2019
- Central Coast Council, *Local Strategic Planning Statement*; 2020
- GTA Consultants, *Tuggerah to Wyong Economic Corridor Transport Study*; 2020

In addition, this TA also references general traffic and transport guidelines, including:

- Transport for NSW (previously Roads and Traffic Authority), *Guide to Traffic Generation Developments 2002* (TfNSW Guide)
- Transport for NSW, *Technical Direction TDT 2013/04a* 2013

1.3 Consultation

The project team has engaged with both Transport for NSW (TfNSW) and Council for detailed consultation with reference to several key outcomes for the Site. Full details are provided separately by Urbis.

However, it is important to note that TfNSW have subsequently been provided with key development details associated with the subject proposal so that these can be used to inform the Integrated Transport Plan (ITP) currently being undertaken on behalf of TfNSW for the wider locality and anticipated to be completed in Q3 of 2021.

As such, this assessment is intended to provide a preliminary assessment of localised impacts, with the view that the broader network infrastructure upgrades following cumulative uplift in the area will be identified by that ITP study.

2 Existing Conditions

2.1 Site Details

2.1.1 Site Location

The site is located at 60 Wyong Road and 68 Tonkiss Street, Tuggerah and is legally described as:

- Lot 3 / DP1084221, and
- Lot 2 / DP1056960

It is located on the southern side of Wyong Road, between Tuggerah Westfield and the M1 Pacific Motorway, as shown below.



Figure 1: Site Context

There are two existing accesses to the Site – a crossover to the Sites' south-east, and an access gate without a crossover to the north-east.

2.1.2 Existing Land Use

Currently, the Site sits largely unoccupied — with no existing on-site development — and is used for grazing purposes. As such, the site in its current form generates negligible traffic volumes.

The majority of the site is zoned RU6 Transition zone. However, in 2015, the north-eastern section of the Lot was rezoned to B4 Mixed Use. The southeast edge of the site is zoned E2 Conservation.

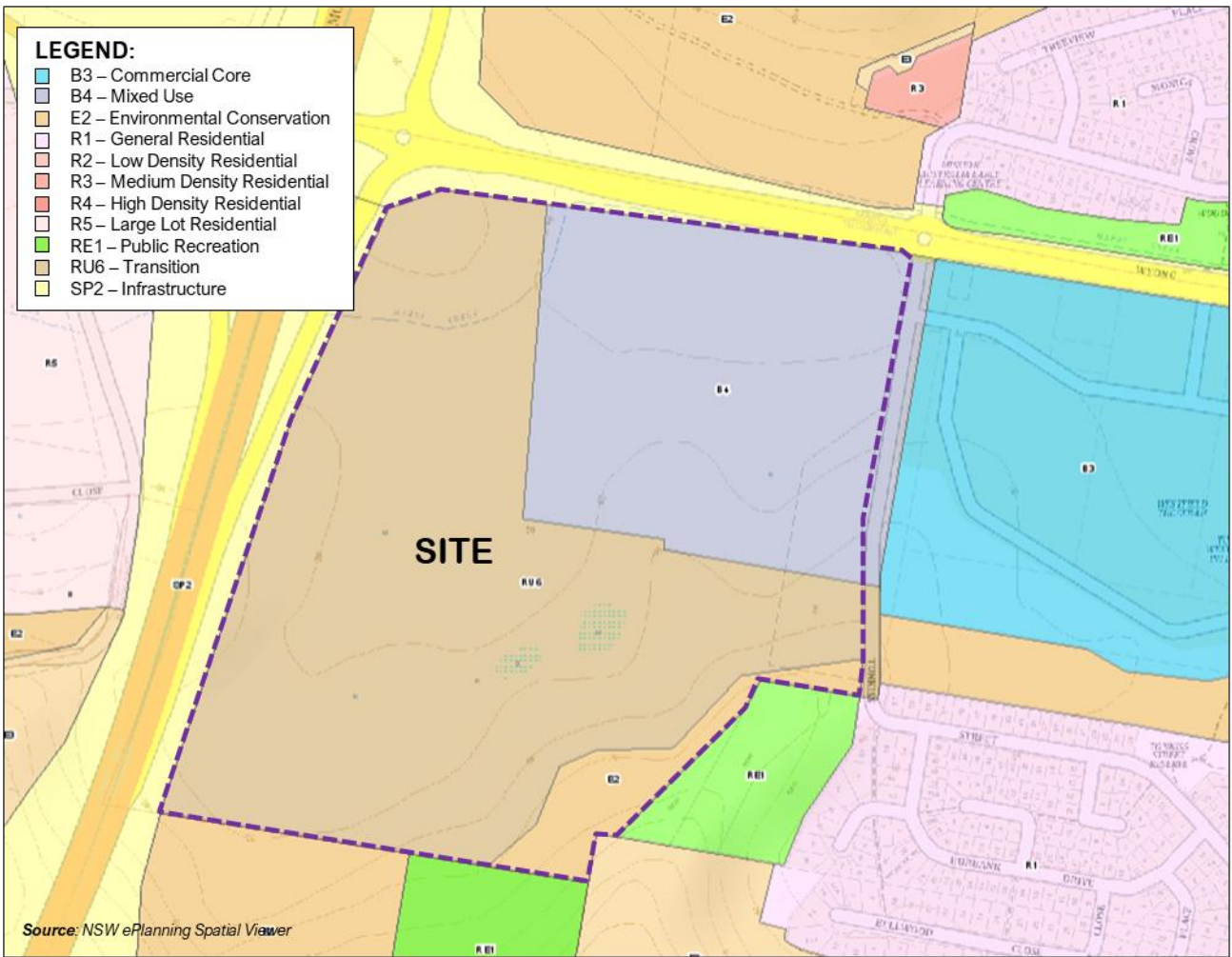


Figure 2: Existing Land Use

A Voluntary Planning Agreement (VPA) was entered into as part of the previous B4 rezoning; details of which are discussed further in Section 3.4.

2.2 Road Network

2.2.1 Road Hierarchy

The key roads in proximity of the site are summarised in **Table 1** with reference to the site plan and road hierarchy in **Figure 3** below.

TABLE 1: ROAD HIERARCHY			
Road Name	Road Classification	AADT ² (vpd) ¹	Speed Limit ⁴
Pacific Motorway ²	Classified - Highway	~ 65,000 vpd	110 km/h
Wyong Road ³	Classified - Arterial	~ 15,000 – 30,000 vpd	70 km/h
Tonkiss Street ³	Local / Collector	~ 4,000 vpd	50 km/h

- Notes:
- 1) vpd = two-way vehicles per day
 - 2) M1 volumes from Station F3FWY006
 - 3) Assumed through extrapolation of network peak volumes.
 - 4) Signposted speed limit. Actual speeds may vary.

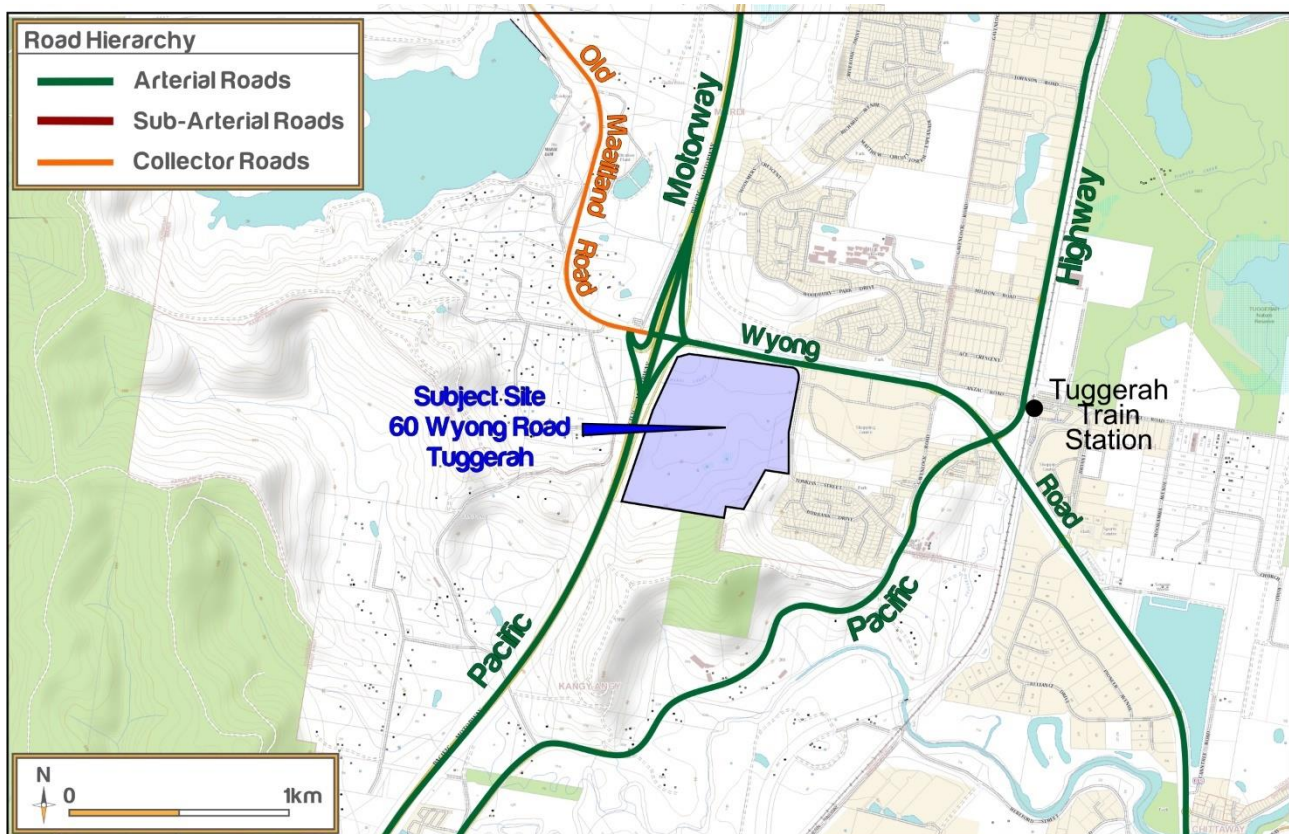


Figure 3: Location & Road Hierarchy

2.2.2 Key Intersections

The Wyong Rd / Tonkiss St / Woodbury Park Dr roundabout (refer below) is located at the north-east corner of the site and is anticipated to form a primary junction for access to the subject Site. It provides access to a residential area to the north, as well as entry to Westfield Tuggerah via Tonkiss Street. Wyong Road forms one of the primary connecting routes between the Pacific Motorway and Tuggerah.



Figure 4: Key Intersections - Wyong Rd / Tonkiss St

2.2.3 Existing Intersection Performance

The performance of the key intersections has been analysed using the SIDRA Intersection computer program. 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 & 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 following table provides a recommended baseline for assessment as per the TfNSW Guide:

TABLE 2: LEVEL OF SERVICE			
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

Baseline modelling assessment for the key intersection considers performance in its currently existing roundabout configuration. Existing traffic movements have been captured as part of surveys undertaken during April 2021.

The existing scenario (scenario 1a) results are summarised below.

TABLE 3: MODELLING RESULTS – EXISTING BASE CASE					
Scenario	Intersection	Control Type	Period	Intersection Delay	Level of Service
1a	Wyong Rd / Tonkiss St / Woodbury Park Dr	Roundabout	AM Peak	17.2 (N approach)	B
			PM Peak	25.7 (E approach)	C
			Weekend Peak	16.7 (E approach)	B

2.3 Road Safety

According to the TfNSW Centre for Road Safety, there have been a total of 8 recorded crash occurrences within the vicinity of the Site over the 5-year period, between 2015 and 2019. A summary of locations and crash typology is provided below.

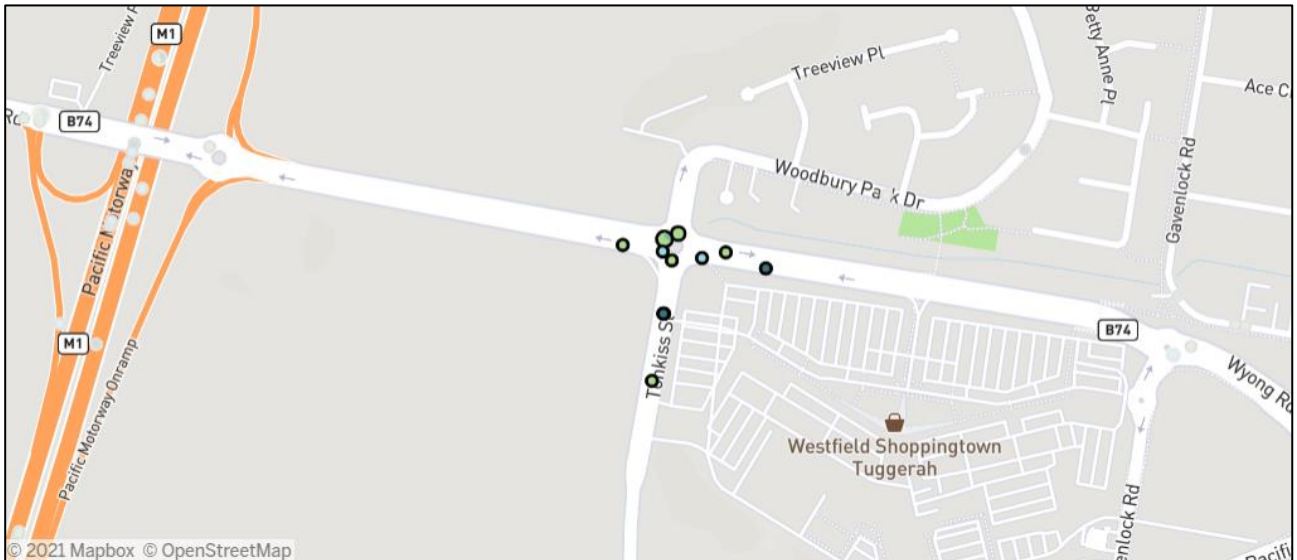


Figure 5: Crash Locations

TABLE 4: CRASH HISTORY						
Year	Crash ID	Degree of Crash	RUM - Description	Type of Location	Natural Lighting	No. Injured
2015	1056247	Non-casualty (towaway)	Right through	2-way undivided	Daylight	-
	1057965	Non-casualty (towaway)	Cross traffic	Roundabout	Dusk	-
	1082866	Non-casualty (towaway)	Lane sideswipe	Divided Road	Daylight	-
	1084337	Serious Injury	Rear end	Divided Road	Daylight	2
2016	1099128	Non-casualty (towaway)	Emerging from drive	2-way undivided	Dusk	-
	1110191	Non-casualty (towaway)	Cross traffic	Roundabout	Daylight	-
2017	1145808	Serious Injury	Emerging from drive	2-way undivided	Darkness	2
	1157116	Non-casualty (towaway)	Right through	Roundabout	Daylight	-
2018	1164780	Minor/Other Injury	On road-out of cont.	Roundabout	Daylight	1
	1172014	Non-casualty (towaway)	Rear end	Roundabout	Dusk	-
	1178905	Non-casualty (towaway)	Other same direction	Divided Road	Daylight	-
	1184546	Non-casualty (towaway)	Rear end	Roundabout	Daylight	-

TABLE 4: CRASH HISTORY

Year	Crash ID	Degree of Crash	RUM - Description	Type of Location	Natural Lighting	No. Injured
	1192087	Moderate Injury	Rear end	Roundabout	Daylight	1
2019	1194198	Non-casualty (towaway)	Off rd left => obj	Divided Road	Daylight	-
	1218247	Minor/Other Injury	Rear end	Divided Road	Daylight	2

Of the incidences recorded in proximity of the junction, 8 incidences are associated with the roundabout and are predominantly characterized by rear-end or merging accidents.

2.4 Public Transport

Key rail and bus services local to the Site are summarised below and in **Figure 6** and discussed further below.

2.4.1 Railway Services

Having regard for the Integrated Public Transport Service Planning Guidelines – Sydney Metropolitan Area (TfNSW, December 2013), rail services within 800 metres (approximately 10-minute walk) influence modal travel for the Site. Whilst there are no immediate train stations within this proximity, Tuggerah Station is situated approximately 1.2km to the east, which is serviced by the Central Coast & Newcastle Line, providing connectivity between Newcastle, Gosford and Sydney CBD. Service frequencies are demonstrated in the table below.

TABLE 5: RAILWAY SERVICES

Direction	Destination	Duration	Frequency
South	Gosford	15 – 20 mins	3-5 services during peak periods
	Sydney CBD	90 – 120 mins	3-5 services during peak periods
North	Newcastle	60 – 75 mins	3-5 services during peak periods

Tuggerah Station provides connectivity to business centres in the north and south with moderate frequency.

Furthermore, the planned implementation of a fast rail service for the Central Coast area — between Sydney and Newcastle — nominates the rail line as a key travel mode to support future infrastructure in the Tuggerah and Wyong areas.

2.4.2 Bus Services

The *Integrated Public Transport Service Planning Guidelines* provide similar guidance to the above with regard for bus services within 400m (5-minutes walk) of the Site. In this proximity, the Tuggerah Westfield Centre's bus exchange is ideally situated to the Site, with further connectivity planned as part of the proposal to further improve and encourage bus ridership. A summary of connectivity to key locations is provided below, with the full list of routes associated with the interchange is provided in **Table 7**.

TABLE 6: BUS CONNECTIONS

Connection	Available Bus Routes	Frequency
Westfield Interchange to Tuggerah Station	17 connecting routes	Moderate Frequency per hour (4 – 8 services)
Interchange to Wyong Station	17 connecting routes	Moderate Frequency per hour (4 – 8 services)
Interchange to Gosford Station	3 connecting routes	Several services only, hourly

TABLE 7: BUS SERVICES

Bus	Provider	Service Route	Frequency
10	Hunter Valley Buses	Warnervale to Tuggerah via Wyee	Limited services during weekdays only.
11	Hunter Valley Buses	Lake Haven to Tuggerah via Warnervale	Limited services during weekdays only.
12	Hunter Valley Buses	Dooralong to Tuggerah via Dicksons Road	Limited services during weekdays only.
13	Hunter Valley Buses	Tuggerah to Dooralong via Jilliby Road	Limited services during weekdays only.
16	Red Bus Services	The Entrance to Wyong	2 trips during peak periods.
19	Red Bus Services	Gosford to Wyong	2 trips during peak periods.
24	Red Bus Services	The Entrance to Wyong	Early morning and night rider only.
25	Red Bus Services	The Entrance to Wyong	3 trips during peak periods.
26	Red Bus Services	The Entrance to Wyong	2 trips during peak periods.
30	Red Bus Services	Wyong to Tuggerah	Limited services only
47	Red Bus Services	Tuggerah to Ourimbah	Limited services only
36	Busways Central Coast	Gosford - Narara - Niagara Park - Ourimbah - Tuggerah	Hourly during weekday and weekends. No trips during AM Peak period.

TABLE 7: BUS SERVICES

Bus	Provider	Service Route	Frequency
37	Busways Central Coast	Gosford - Lisarow - Settlers Park - Ourimbah - Tuggerah	Hourly during weekday and weekends. No trips during AM Peak period.
78	Busways Central Coast	Lake Haven to Tuggerah via Sparks Rd, Warnervale & Wadalba	4 trips during weekday peak periods, hourly weekend.
79	Busways Central Coast	Lake Haven to Tuggerah via Woongarah, Hamlyn Terrace & Wattanobi	4 trips during weekday peak periods, hourly weekend.
80	Busways Central Coast	Lake Haven to Tuggerah via Lake Haven Dr & Pacific Hwy	5 trips during weekday peak periods, hourly weekend.
81	Busways Central Coast	Lake Haven to Tuggerah via Kanwal, Wyongah & Wadalba	4 trips during weekday peak periods, hourly weekend.
82	Busways Central Coast	Lake Haven to Tuggerah via Wyongah, Tuggerawong & Tacoma	4 trips during weekday peak periods.
93	Busways Central Coast	Noraville to Tuggerah via Wyong & Toukley	Limited services only
94	Busways Central Coast	Budgewoi to Tuggerah via San Remo & Wyong	Limited services only

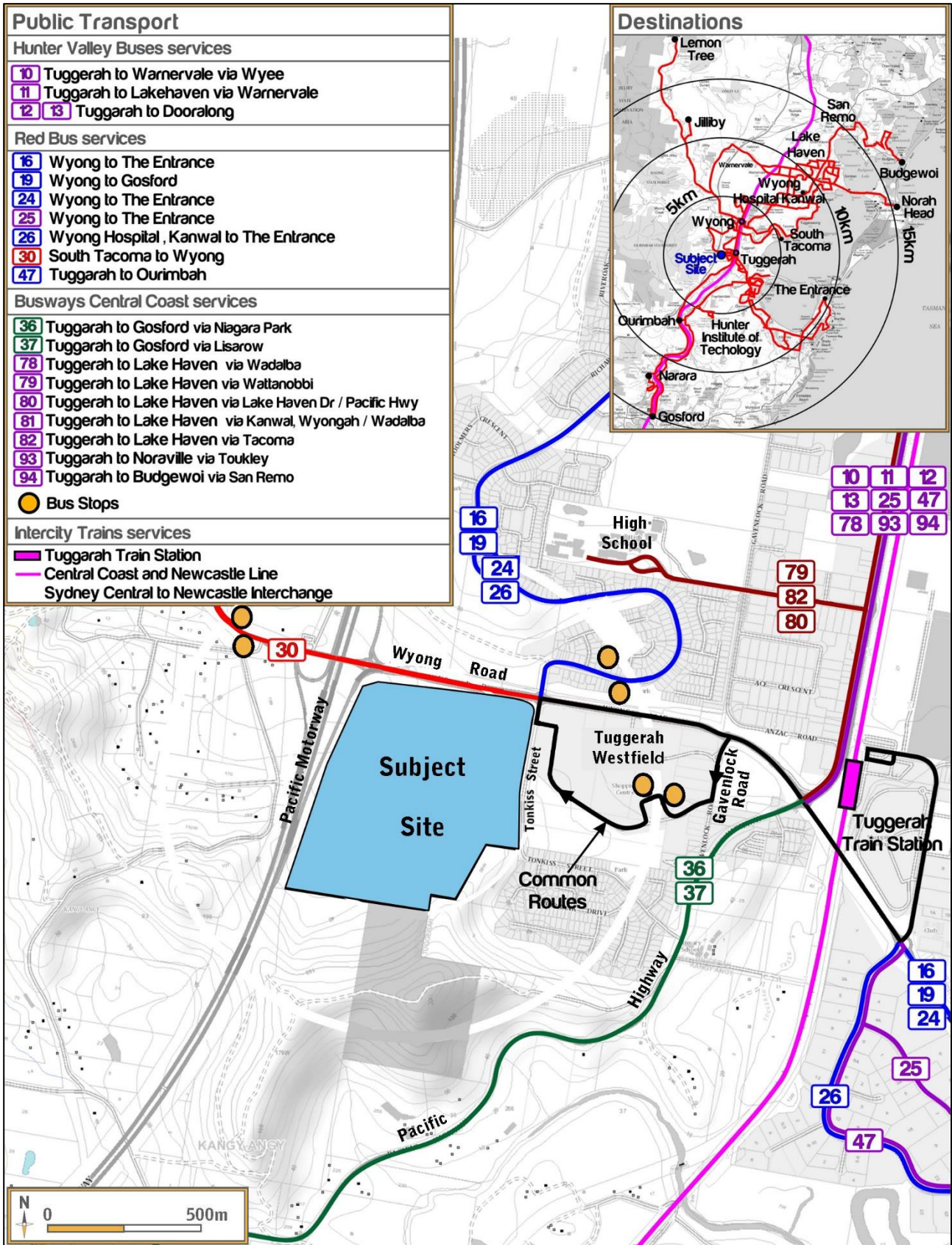


Figure 6: Public Transport Connectivity

2.5 Active Transport Connectivity

There are currently no footpaths adjacent to the subject site.

Shoulder cycle lanes are provided along Wyong Road, as shown below.

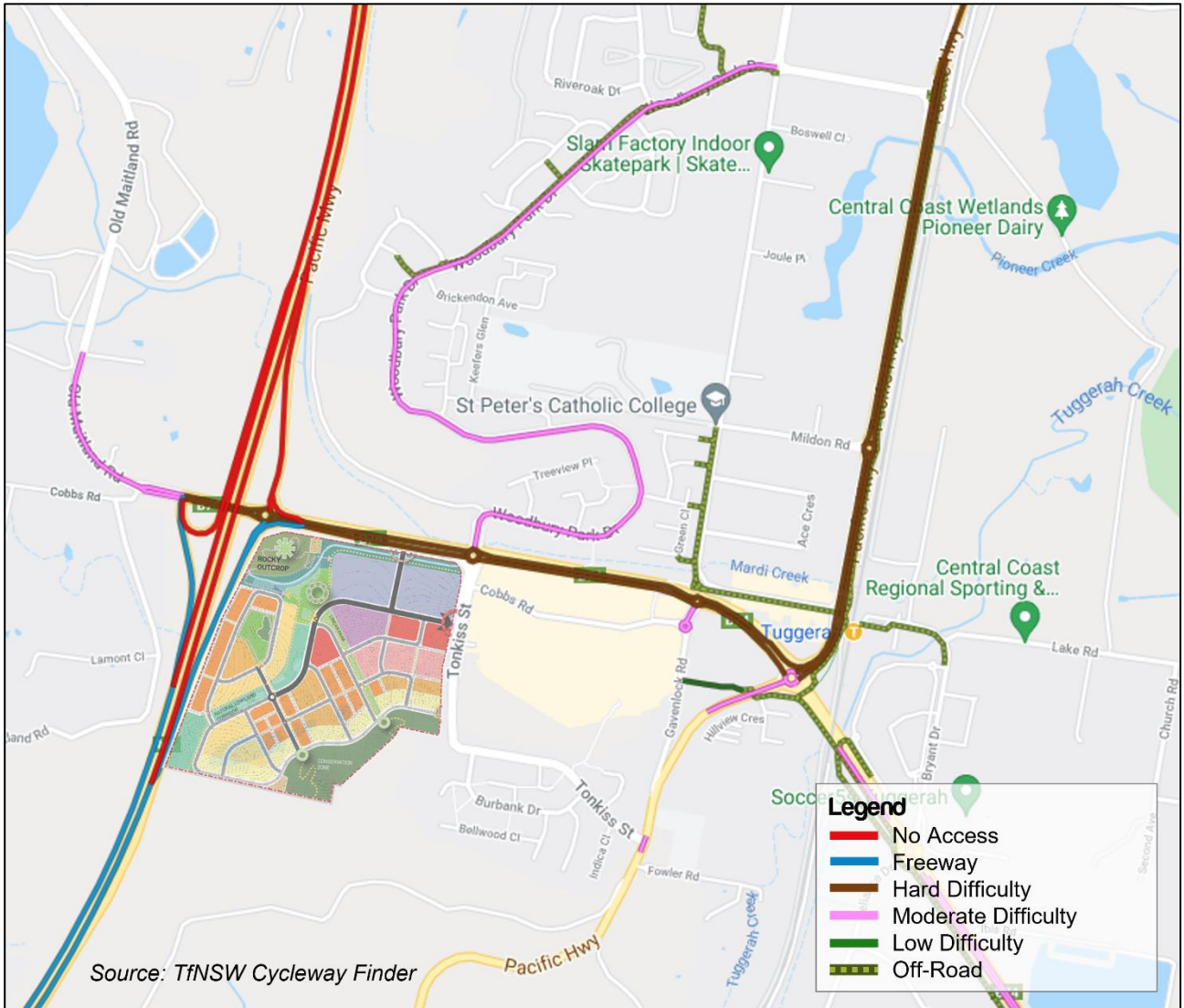


Figure 7: Existing Cycle Network



Figure 8: Existing Wyong Rd Shoulder Cycle Lane

2.6 Travel Pattern Assessment

Based on census information for the Tuggerah – Kangy Angy and Wyong areas, results from the Journey-to-work (JTW) and Household Travel Survey (HTS) datasets have been assessed to establish traffic movement and behavioural patterns for the locality and inform this assessment.

2.6.1 Travel Mode Share

An assessment of modal travel in the region demonstrates a high reliance on private vehicle use, capturing approximately 81% of total vehicle trips (vehicle driver and passenger combined), with public transport accounting for approximately 9%. In consideration of work-related trips derived from the JTW data, private vehicle ridership increases to 97%, while public transport for work purposes decreases to 3% as demonstrated in **Figure 9**.

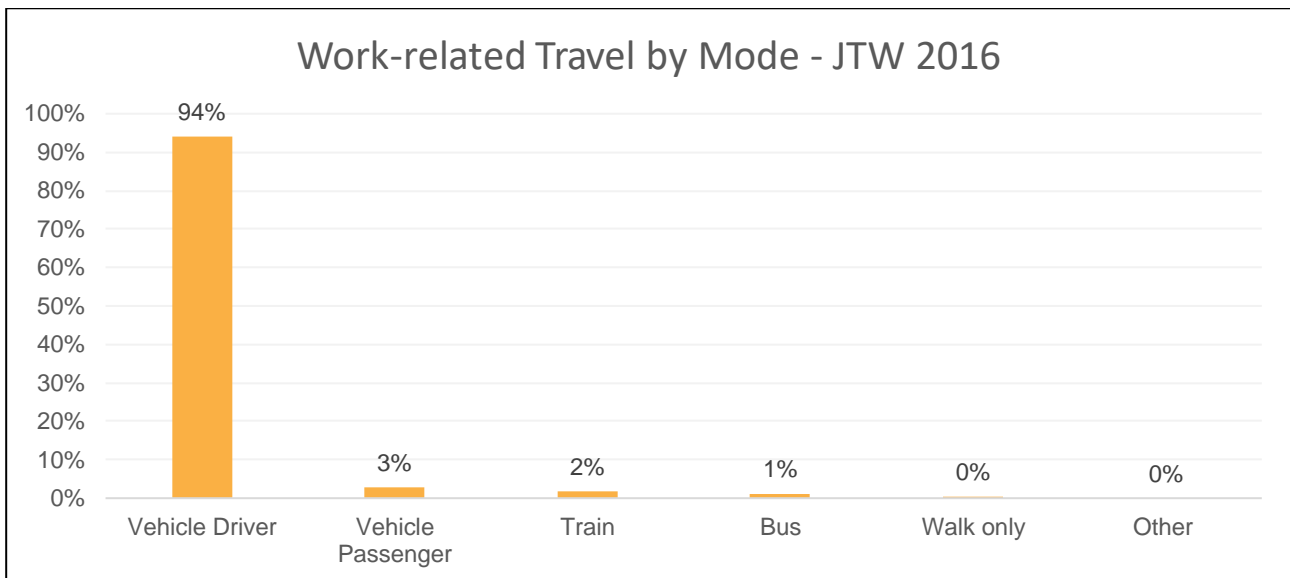
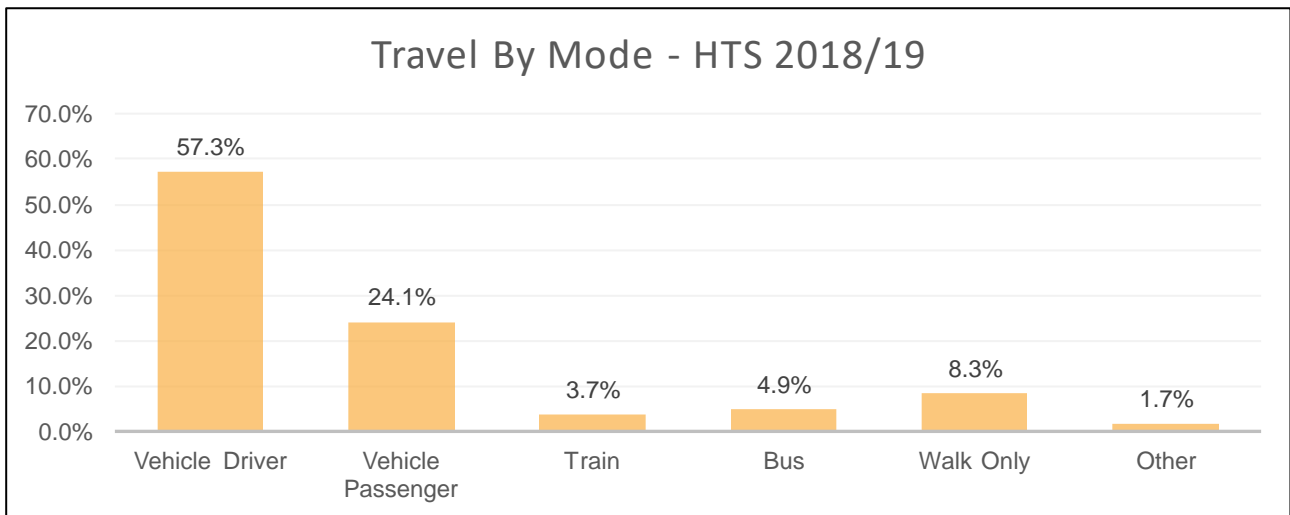


Figure 9: Travel Mode Share

The relatively low dependency on public transport in the region indicates opportunity to increase public transport dependency, particularly with consolidation of connectivity to the train and bus networks. Specifically, the locale is suitably located to facilitate shifting towards higher-capacity public travel schemes in order to facilitate strategic employment growth in the future.

2.6.2 Travel By Purpose

It is worthwhile noting that 'commuting' represents only a proportion of total trips on the network.

For the Wyong area, **Figure 10** provides a breakdown of total trips by purpose with reference to data from the HTS 2018/2019. It should be considered that this breakdown forms the underlying basis for the trip generation discount exercise undertaken for the traffic assessment in section 6.1.1 which takes into consideration the proximity of the site to substantial regional shopping and social/recreational opportunities afforded by the adjoining Tuggerah Westfield.

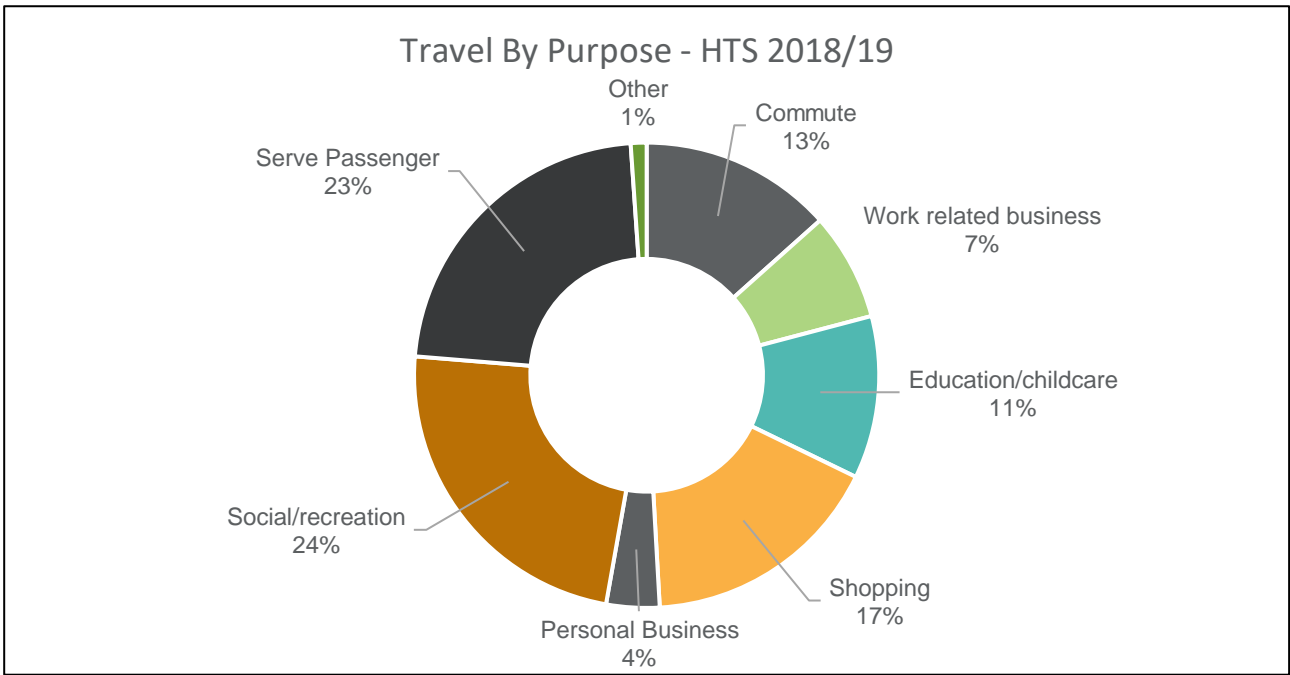


Figure 10: Travel By Purpose - HTS 2018/19

3 Strategic Context

3.1 Central Coast Regional Plan 2036

The Central Coast Regional Plan refers to the strategic development direction for the Central Coast region as referred by NSW DPIE. The Vision Statement for the document specifically highlights the desire for additional employment within the region, improvements to community connectivity and lifestyles – predominantly centred around the north-south corridor between Gosford – the current “CBD” area of the region – and Tuggerah. The key connecting corridors for the future involve the railway connection as well as Pacific Motorway to the South, as demonstrated in **Figure 11** below.

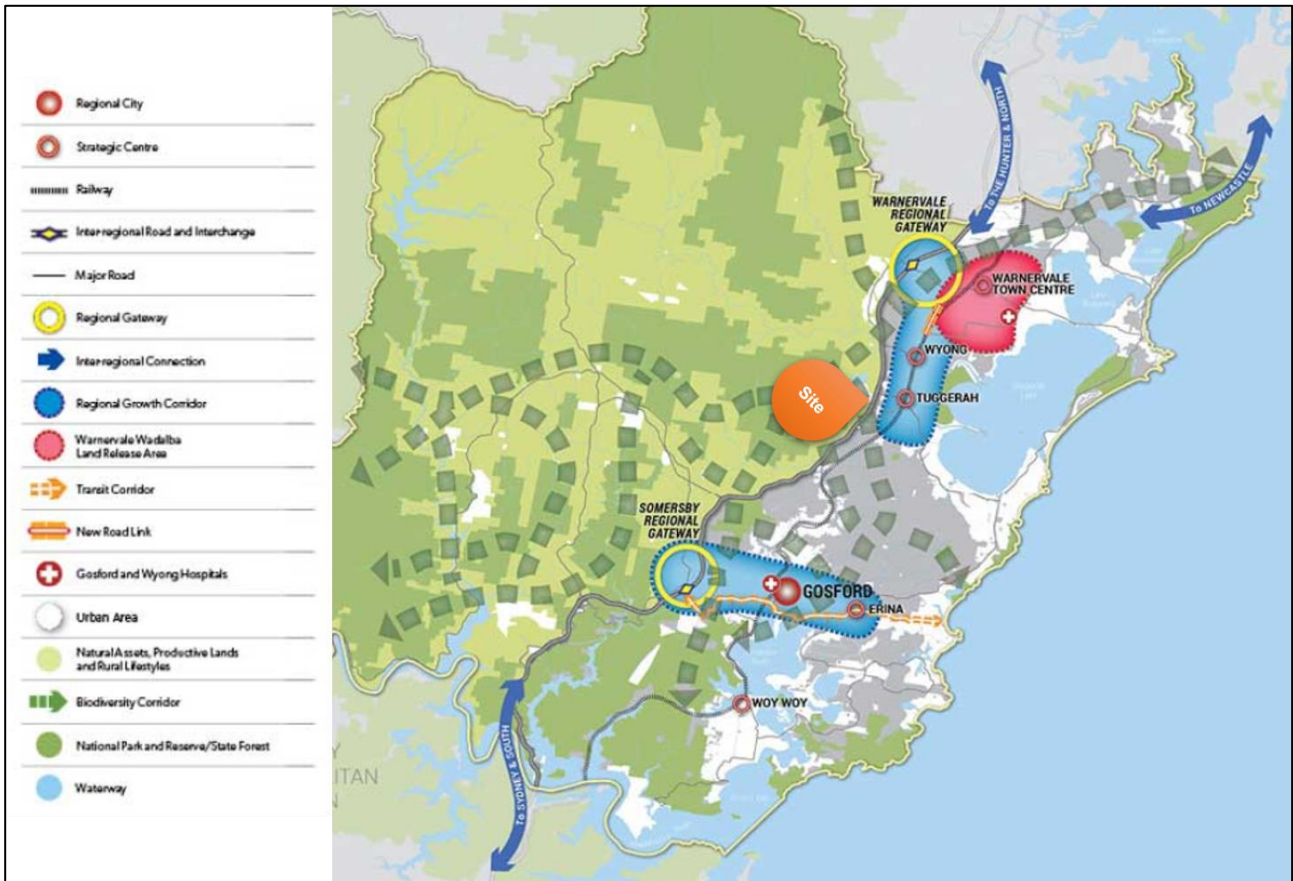


Figure 11: Central Coast 2036 Strategic Direction¹

3.2 Central Coast Council Local Strategic Planning Statement (Draft, 2020)

The Local Strategic Planning Statement (LSPS) refers to the future intent for the Central Coast region and forms a response to the NSW Governments’ *Coast Regional Plan 2036* document. With reference to the identified Tuggerah development corridor, the LSPS states an intention to reinforce the locale as a major retail and employment centre, improve local connectivity including a town centre focus to Anzac Road and the provision of an active link between Westfield and Tuggerah Railway Station.

¹ NSW DPIE, [Central Coast Regional Plan - Vision](#)

3.3 Tuggerah to Wyong Economic Corridor Transport Study (2020)

The Transport Study for the economic corridor has been undertaken by GTA Consultants on behalf of Council to address a key action relating to the *Tuggerah to Wyong Economic Corridor Strategy (2019)*² document. The aim of the transport study revolves around the enhancement of active transport options for workers and residents throughout the corridor and identify any land acquisitions that may be required to accommodate new roads and links.

The report makes reference to a long-term upgrade of the Pacific Highway section between Tuggerah and Wyong, specifically relating to upgrades to the Pacific Highway. This upgrade readily facilitates for the future strategic direction of the Tuggerah – Wyong development corridor. This is further consolidated by the anticipated implementation of the *Fast Rail Network Strategy 2019*, which anticipates upgrades to accommodate faster rail speeds within the northern corridor connecting Sydney to Port Macquarie via the Central Coast.

As part of the study, population and employment growth has been assessed for the Tuggerah-Wyong region from 2016 to 2036, demonstrating growth from 13,200 to 17,350 over the 20-year period. This equates to a compound growth rate of 1.38% as referred in the Economic Corridor Strategy document, indicating higher-than-average growth for the wider Central Coast area referenced in the Regional Plan at 1.06%. A snapshot of the Study is provided below.

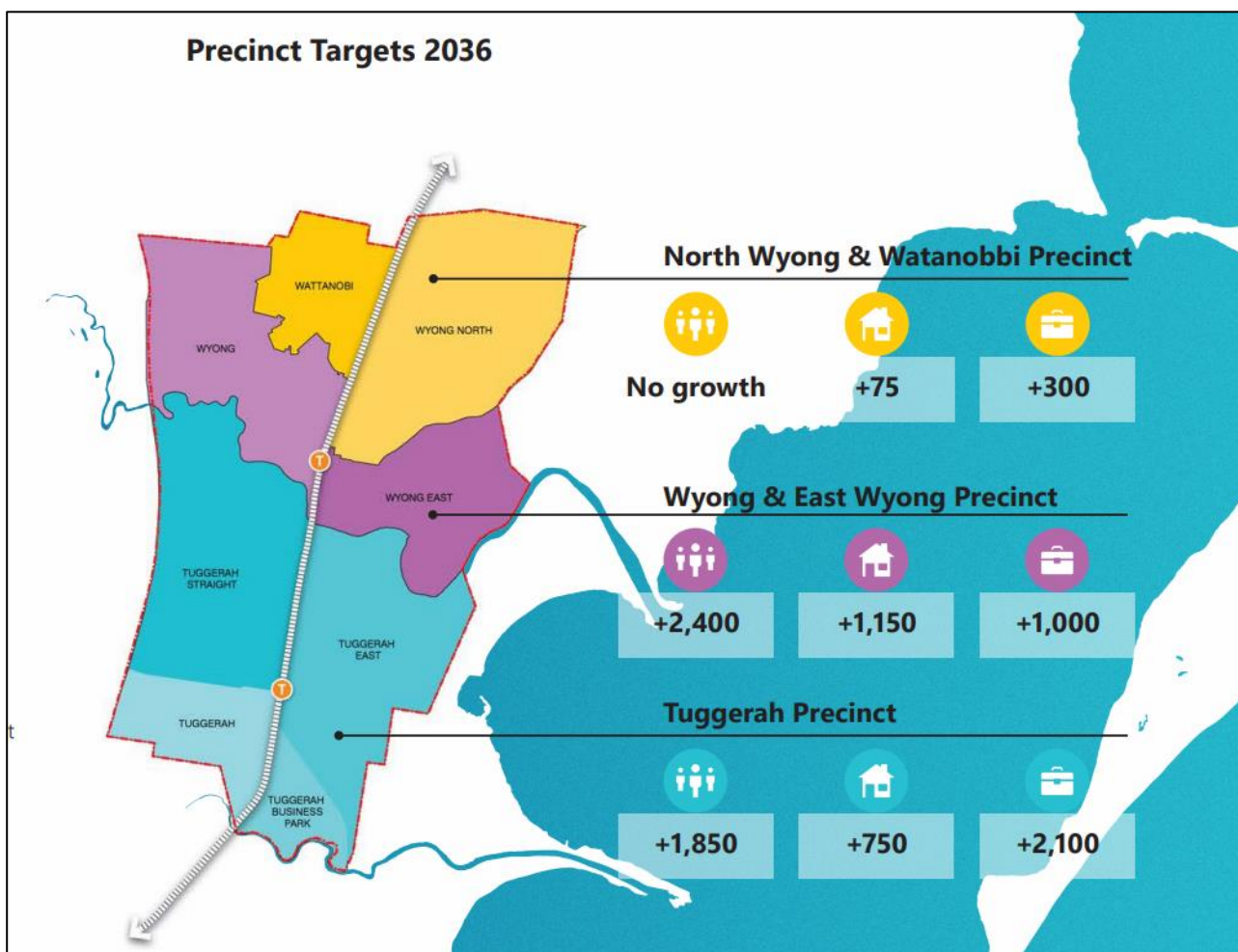


Figure 12: Precinct Targets 2036 - Tuggerah to Wyong Economic Corridor Strategy (2019)

² [Draft Tuggerah to Wyong Economic Corridor Strategy \(2019\)](#)

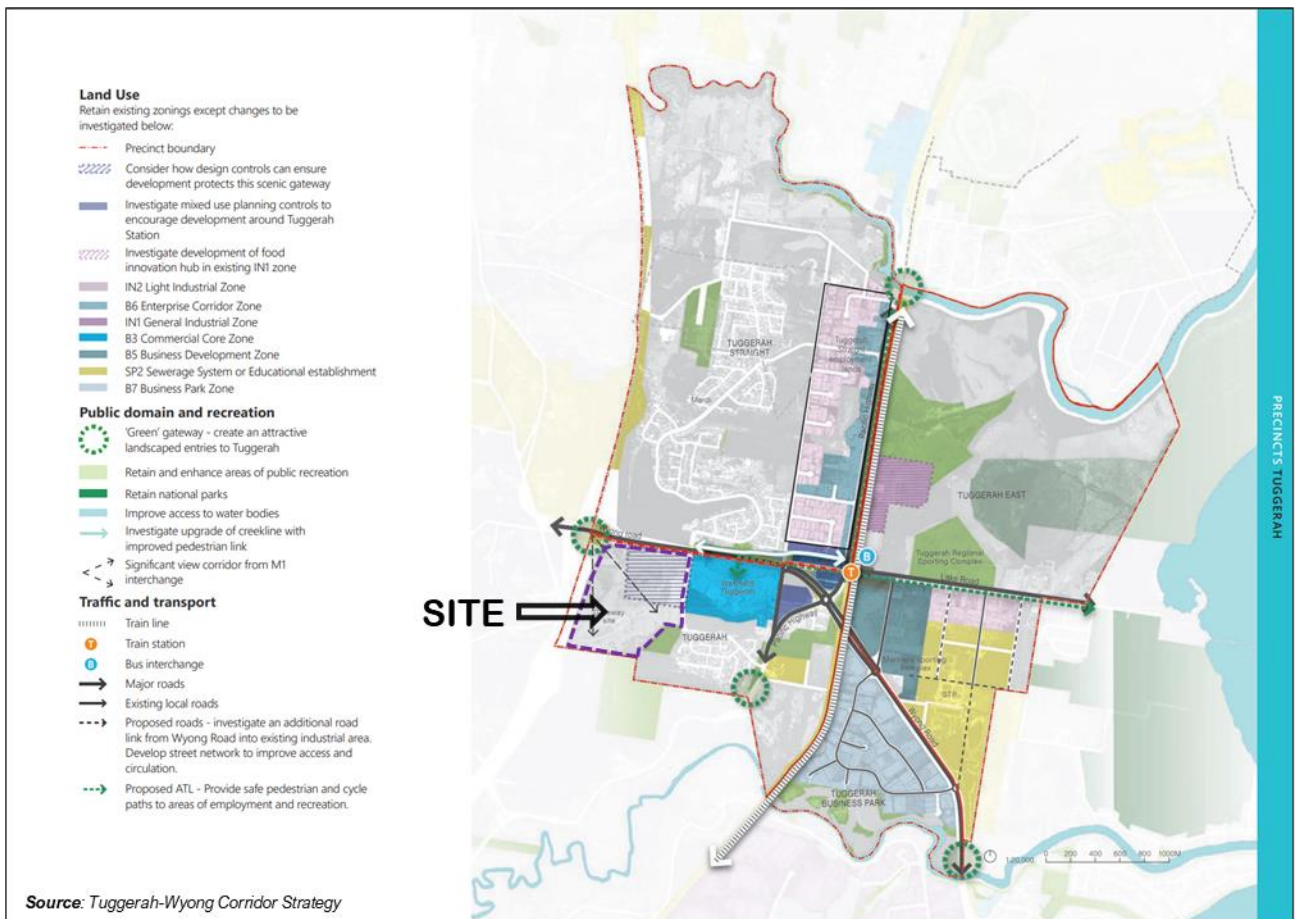


Figure 13: Site Context in Tuggerah-Wyong Corridor Strategy

3.4 Tuggerah Gateway Voluntary Planning Agreement (VPA)

In 2015, a voluntary planning agreement was established to develop the north-east portion of the site consistent with land uses consistent with a B4 mixed use zone, specifically for the purposes of bulky goods and associated parking, with the rest of the site – dubbed “deferred land” planned to be rezoned under a combination of transition, commercial core and general residential. The VPA was subsequently executed on the 26th October, 2015.

As part of the agreement, the development contributions associated with the Site involve the following modifications or additional traffic junctions supporting the Site, prior to the construction of any land within the land that will result in the total floor area on the Land being 14,000 m² or greater:

- Left-In/Left-Out Intersection; and
- Signalisation of the Wyong Road/Tonkiss Road intersection.

Schematic diagrams of the supported intersection configurations are provided in **Figure 14** and **Figure 15** to gain an appreciation for traffic conditions accompanying the proposed Structure Plan.

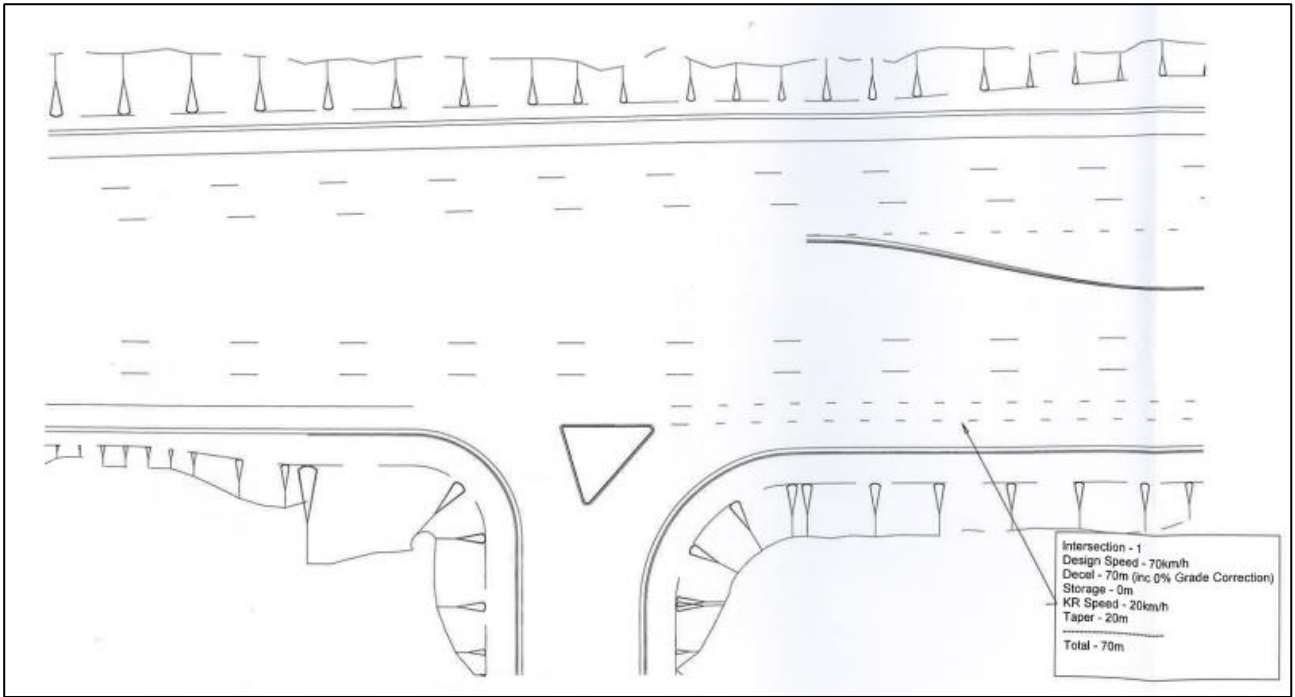


Figure 14: Left-In/Left-Out junction to Wyong Road

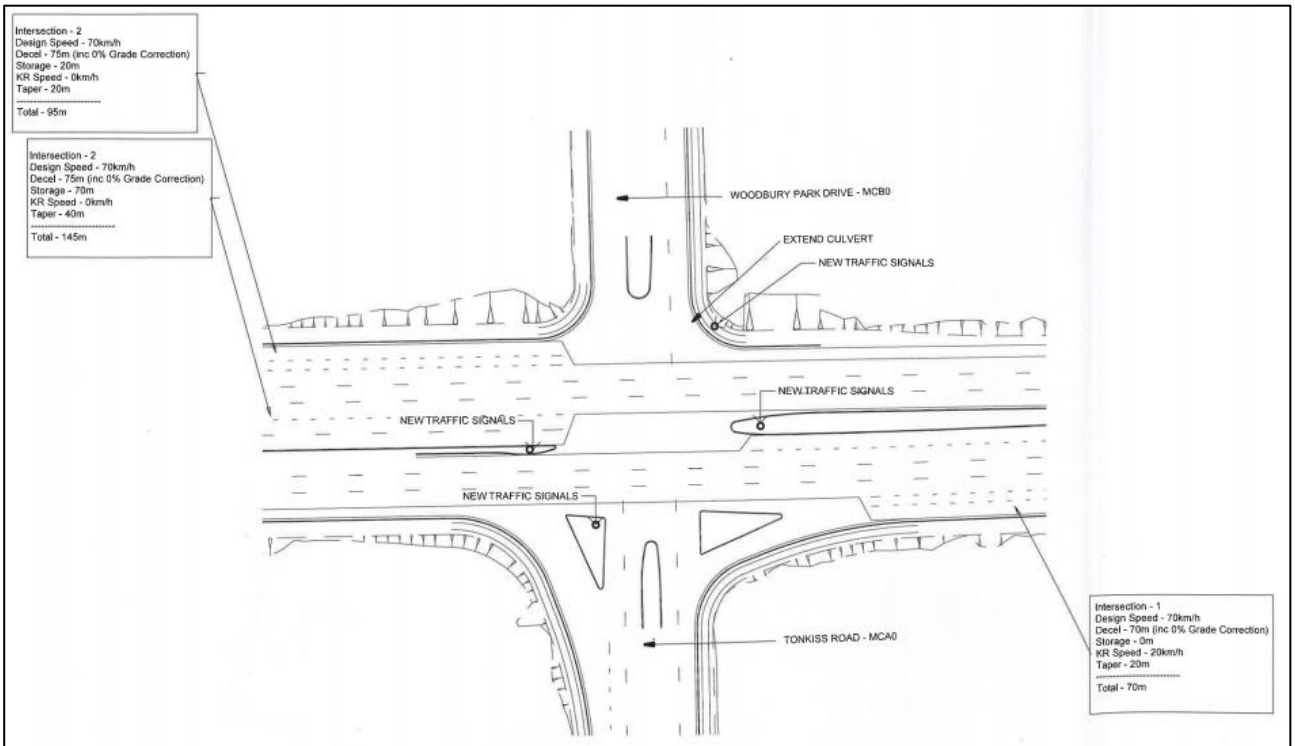


Figure 15: Signalised configuration for Wyong Road / Tonkiss Road intersection

As outlined above, the trigger for signalisation of Wyong Road / Tonkiss Street 14,000m² under the existing VPA. However, it is understood that the final yield was in the order of the 23,000m².

4 Planning Proposal Summary

The Planning Proposal seeks to rezone land comprising (part) Lot 2 in DP 1056960 and Lot 3 in DP 1084221 from RU6 Transition to R1 General Residential. The B4 Mixed Use zone in the north-east of the site and E2 Environmental Conservation zone in the south-east is to be retained.

The long-term development yield capable of being accommodated on the site comprises of 2,112 dwellings including mixed detached housing lots, medium density townhouses/terraces, apartments and seniors living. Consistent with the Structure Plan, the future development of the site is to be staged in accordance with market demand and infrastructure requirements. In the short-term employment uses in the form of bulky goods / large format retailing will be prioritised in part of the B4 Mixed Use zone. In the longer term this area is envisaged as a mixed-use precinct.

Details of the Structure Plan following development by the project team is described below as it relates to traffic and transport elements.

4.1 Tuggerah Gateway Precinct Structure Plan

The Tuggerah Gateway Precinct envisions a predominantly residential neighbourhood with integrated community elements and connectivity to the Tuggerah Westfield Site to the east. The intention of the precinct is to provide hyperlocal outcomes benefitting from its proximity to key urban centres in the Tuggerah Wyong region and is planned to be supported by infrastructure and public transport upgrades for the locality.

The longer-term vision for the Structure Plan is predominantly residential, however it is considered that the current B4 zone will be retained, recognising the retention of employment land uses in the short term to medium term.

The area places itself as a key element of the Tuggerah-Wyong Economic Growth Strategy supported by the NSW Government and Central Coast Council.

A preliminary Structure Plan is provided for context in **Figure 16** below, with further details accompanying the Proposal.

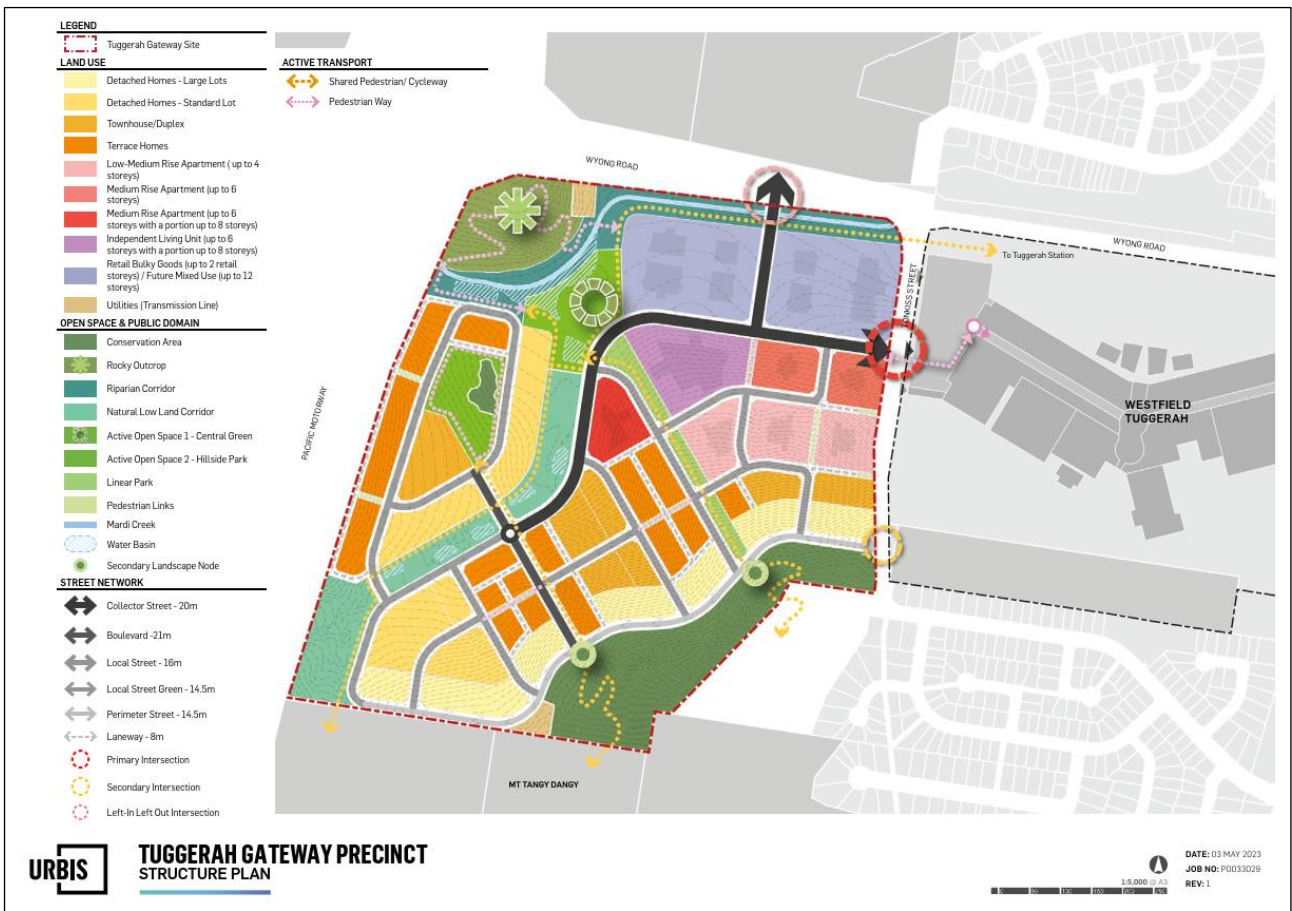


Figure 16: Concept Structure Plan

4.1.1 Proposed Yields

As it relates to traffic generation for the Site, the Structure Plan envisions a sum of residential dwellings distributed between different densities and configurations, as well as a mixed-use retail area at the Site's northern frontage (Wyong Road) supporting the higher-density residential pocket. Details of the concept yields are provided below.

TABLE 8: PRECINCT YIELD – LONG TERM

Land Use		Description	Dwellings Yield	Non-Resi GFA
Residential	Low Density	Detached STD or large format	86 units	n/a
	Medium Density	Townhouses, duplexes, terraces	298 units	n/a
	High Density	Walk up, low rise and high density apartments	1,502 units	n/a
	Independent Living Unit	Retirement Living, apartments	226 units	n/a
Retail	Future Mixed Use	Bulky Goods	n/a	1,877 m ²
Total			2,112	1,877 m²

The mixed-use land as part of the site frontage area is planned to adopt bulky goods usage for the short to medium-term, consistent with that of the previous rezoning. It is envisaged that following the housing delivery projections up to 2036, the mixed-use land may then be redeveloped to provide additional residential development capacity past 2036, albeit with a reduction in the non-residential GFA at that time.

4.1.2 Precinct Staging

Staging of the development will be subject to market demand analysis and detailed in future Development Application submissions. Notwithstanding, indicative delivery timeframes for the full masterplan are anticipated within the 8-year horizon from submission of the first DA, with indicative staging shown below.

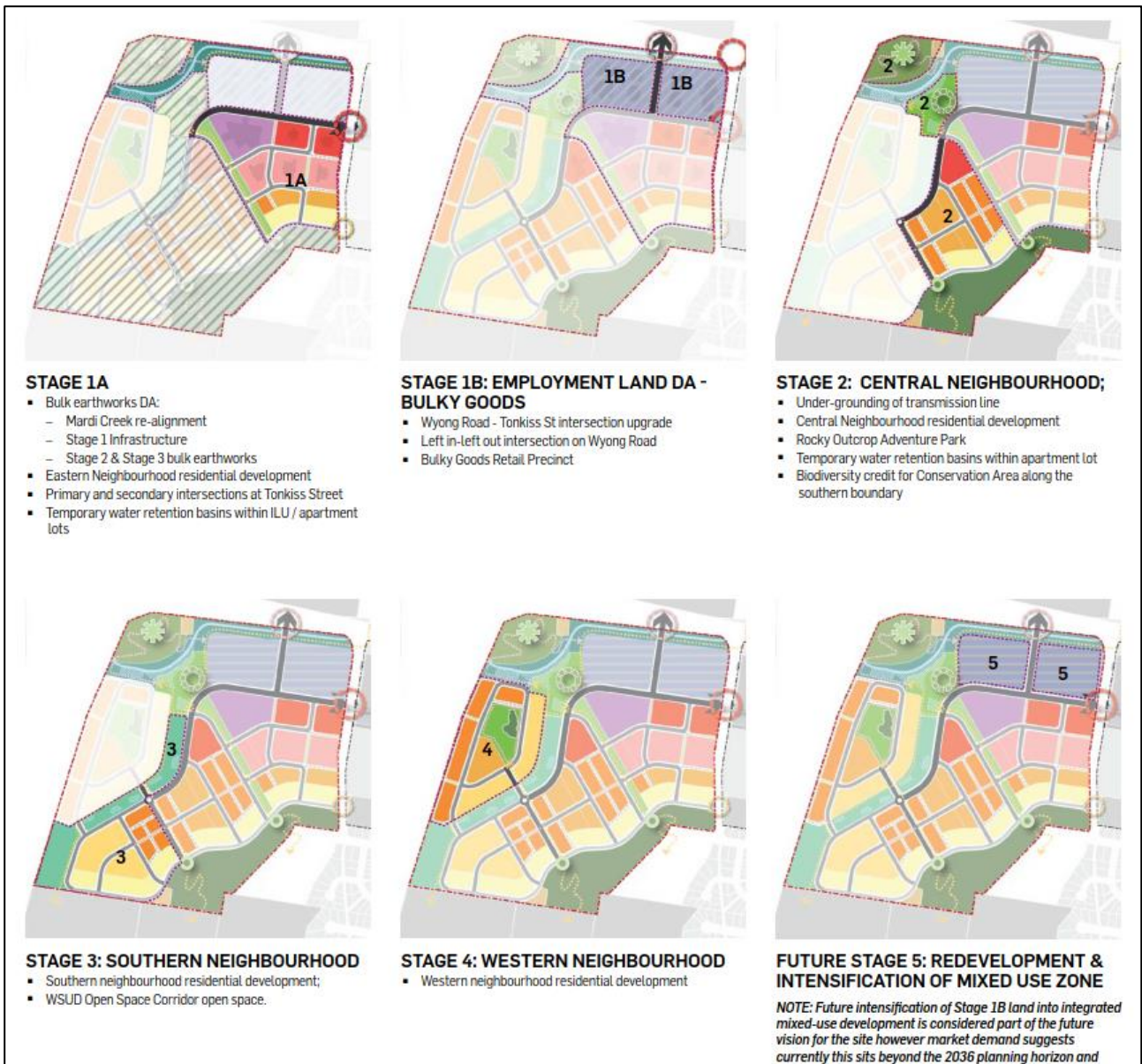


Figure 17: Indicative Development Staging

4.1.3 Access locations

With reference to **Figure 16** above, 3 access intersections are proposed to support the Structure Plan, inclusive of the Left-in / Left-out junction approved as part of the previous Site VPA referred in section 3.4. The junctions are defined below.

- 1) Tonkiss Road Primary Access

The proposed intersection between the main internal corridor road and Tonkiss Street anticipates to form one of the two primary access points to the Site, the other being the left in/left out junction on Wyong Road (discussed below).

The intersection is anticipated to take the form of a signalised intersection, supporting pedestrian connectivity and direct access to the Tuggerah Westfield Site to the east.

- 2) Wyong Road Access (Left-In/Left-Out)

The left-in/Left-out intersection forms direct access to the main corridor of the Site from the East, and supports movements travelling west, north and south towards the Gosford and Sydney metropolitan areas, as well as Newcastle. The intersection was originally approved as part of the VPA with its existing configuration anticipated to be retained.

- 3) Tonkiss Street Secondary Access (Left-In/Left-Out)

The proposed intersection between Tonkiss Street and the Perimeter Road takes the form of a left in/Left Out connection at the Sites' south-eastern corner. It is anticipated that this intersection would form a minor access road only, specifically for the southern portion of the neighbourhood, and acts as a perimeter fire trail providing separation for the conservation zone to the south.

4.1.4 Internal Road Design

Preliminary road cross sections have been included as part of the Structure Plan to underpin the internal layout of the precinct. The project team are in consultation with Council to determine adequate requirements that satisfy the intent for the precinct with a focus on walkability and public transport access.

Accordingly, the road hierarchy proposed for the Site features typical road sections with pedestrian paths on both sides of the carriageway (except where one side is for open space), with Shared Paths provided for off-road cyclist connectivity on key corridors.

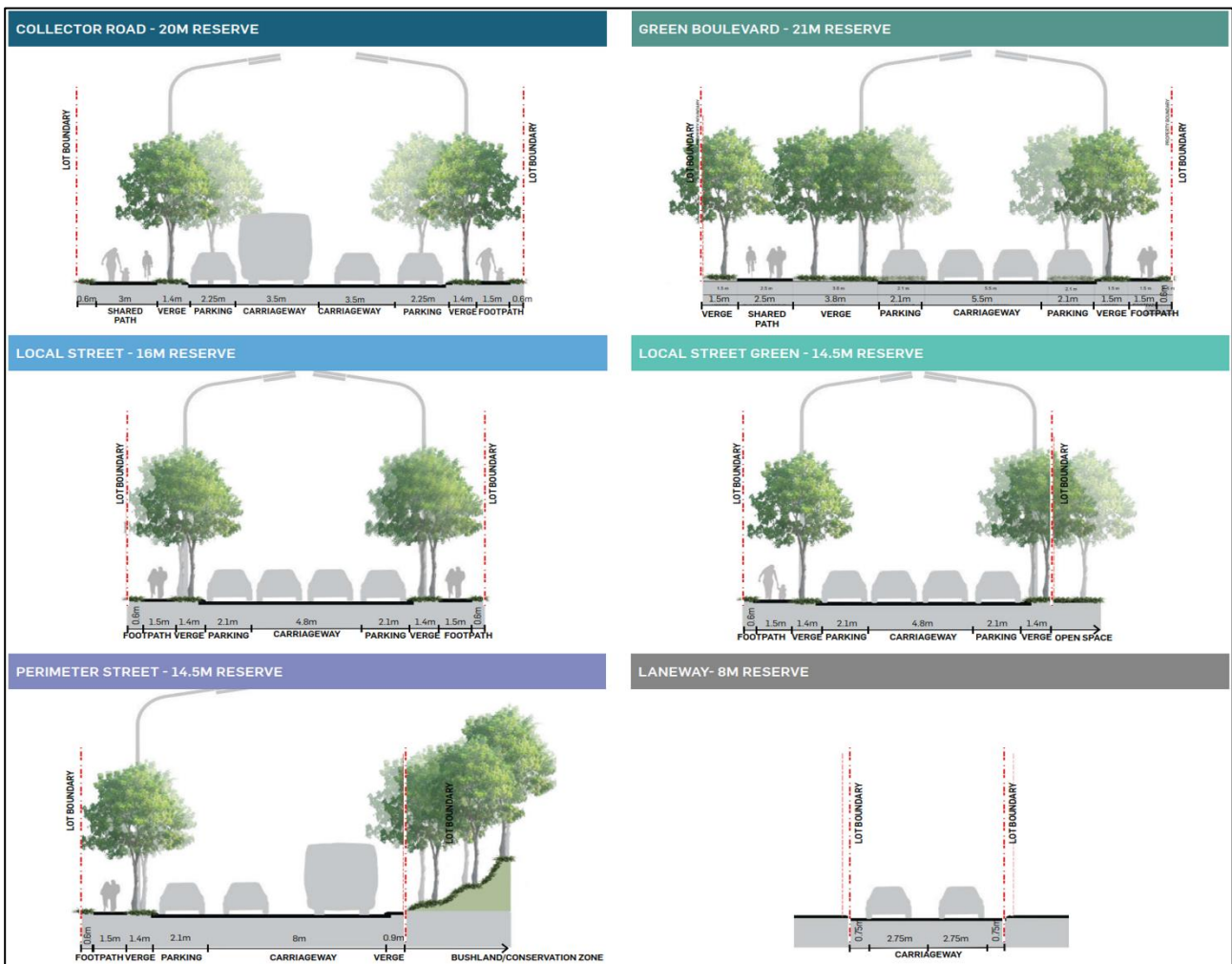


Figure 18: Road Sections

4.1.5 Bus Serviceability

The Precinct will provide bus serviceability through the Site via the Site’s collector roads with the intention to interlink the neighbourhood with the bus interchange in Tuggerah Westfield and Tuggerah Station. The bus stop location is anticipated to be located more centrally to the neighbourhood, providing adequate catchment access, and specifically in closer proximity of the senior living apartments.

A shuttle strategy has been proposed below, in consideration of providing a route with access to both the Westfield Bus interchange and the Tuggerah Station.



Figure 19: Potential Shuttle Service Connectivity

In addition to the shuttle strategy, it is noted that a number of existing bus services could be rerouted to capture additional demands from the precinct through deviation of existing arrangements. The routes nominated below demonstrate existing connectivity to the Westfield Site, with alternative connections proposed in **Figure 20**. These routes were selected based on their moderate peak hour frequency and service accessibility to the Precinct.

TABLE 9: POTENTIAL BUS SERVICES FOR REROUTE		
Bus	Provider	Service Route
16	Red Bus Services	The Entrance to Wyong
19	Red Bus Services	Gosford to Wyong
25	Red Bus Services	The Entrance to Wyong
26	Red Bus Services	The Entrance to Wyong
30	Red Bus Services	Wyong to Tuggerah



Figure 20: Proposed Route Amendments

Having regard for bus carriageway requirements, the *Central Coast Council Design Guideline 2018* outlines a minimum carriageway width of 11m for collector roads designed for bus routes. To this effect, it is considered that a bus stop location situated centrally to the Site can readily be serviced by existing bus routes through the Site’s anticipated collector corridors. The figure below indicates the internal road section for the proposed collector roads within the Site, having consideration that localised widening may be required to fully accommodate bus stop locations.

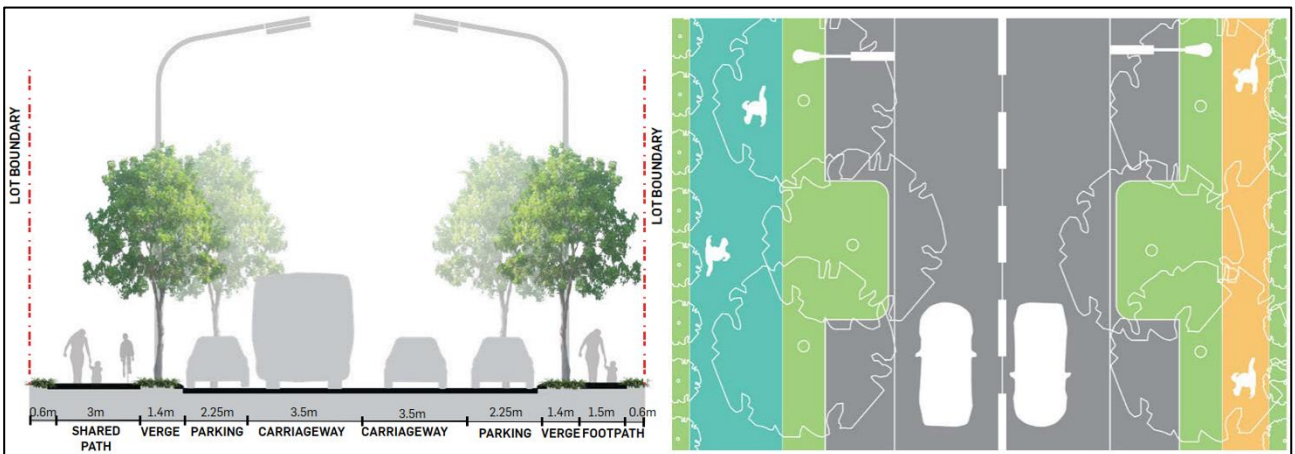


Figure 21: Precinct Collector Road Street Section

4.1.6 Active Transport Connectivity

To further promote the Precincts' integrated connectivity with Tuggerah Westfield and the train station, active transport connectivity is a key priority for the internal road connections. These active connections are anticipated to link not only towards the urban and development centres to the north and east, but also to existing recreational areas south of the Site towards Mt Tangy Dangy.

Specifically, key locations for pedestrian connectivity are proposed at the upgraded Wyong Road / Tonkiss Street intersection, as well as the proposed Tonkiss Street Primary Access, with minor changes within the Westfield car park to facilitate improved pedestrian access to the Centre.

To support the Sites' permeability with the wider area, it is noted that the Tuggerah-Wyong Corridor Strategy envisages an active travel corridor between the Tonkiss Street and Tuggerah Station as demonstrated below. It is expected that this development may contribute towards those works to provide for improved accessibility to the Station from the Site.

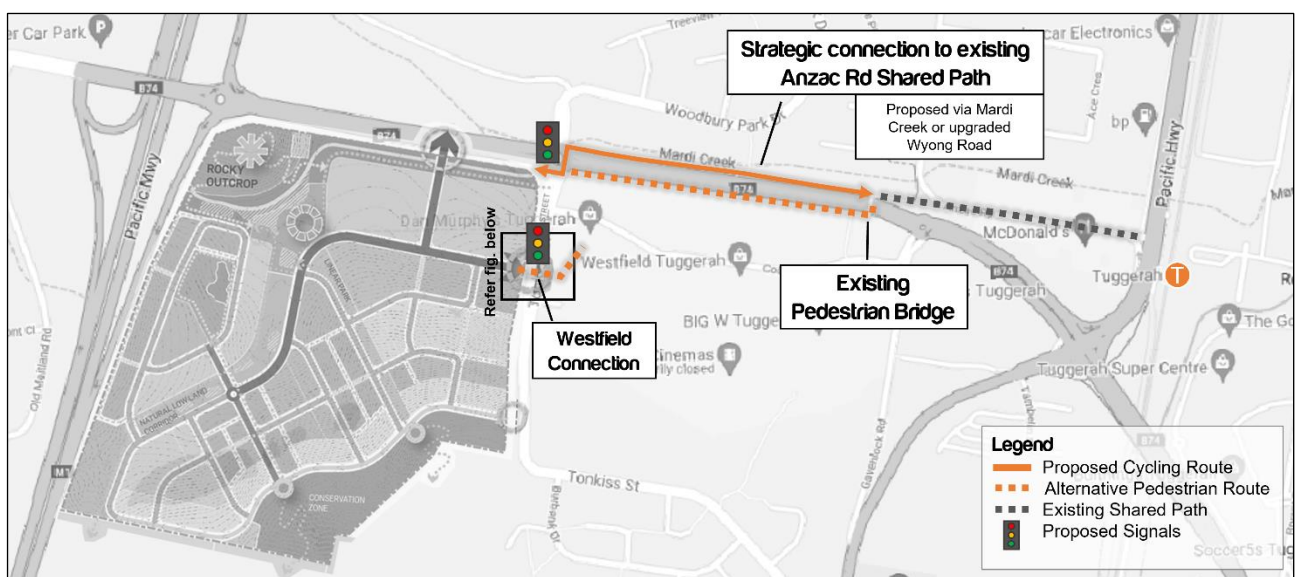


Figure 22: Proposed Active Transport Corridor

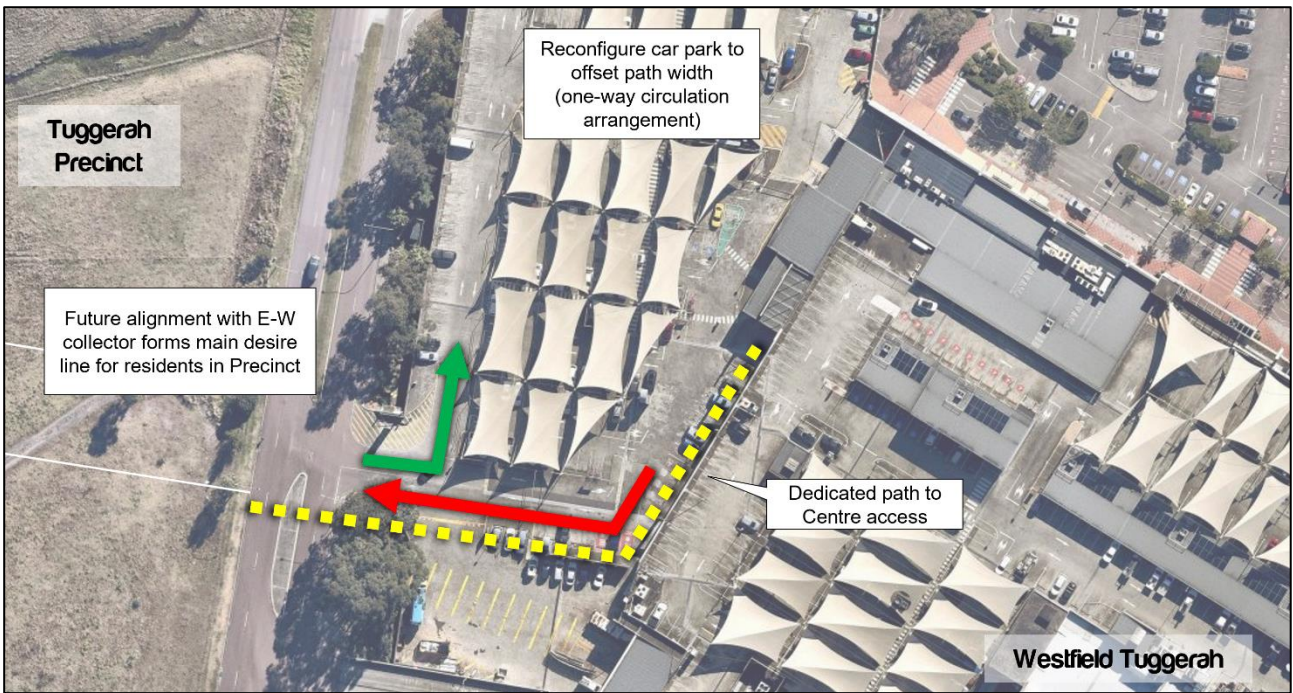


Figure 23: Proposed Westfield Access (Indicative only)

The corridor demonstrates connectivity with the existing shared path on Anzac Road via the northern side of Wyong Road, with an alternative pedestrian route proposed to the Tuggerah Westfield frontage, connecting with the existing pedestrian bridge over Wyong Road.

Additionally, as part of the VPA agreement, a dedicated cycling lane has been indicated and approved as part of the signalised upgrade package. It is anticipated that the cycling network, forming part of the future Wyong Road capacity upgrades, supports the Precinct with direct accessibility.

5 Movement and Place Framework

The Movement and Place framework has been established by the NSW Government in consultation with DPIE and Government Architect NSW to provide context to future planning across the wider spectrum of developments. The framework defines and connects the relationship between 'place' defined as urban or activity centres, with 'movement' – the coverage and provision of transport network options between places, for the benefit and amenity of people and goods.

The below tables provides a preliminary response by the Proposal to the contextual prompts by Movement and Place framework as they relate to transport-related considerations.

TABLE 10: MOVEMENT & PLACE OBJECTIVES		
Element	Objective	Project Response
1.3	Can residents access all their daily needs such as shops, schools, and jobs without a car?	The project can be defined as an urban centre with the provision of residential amenities intended to be located on-site and in support of the neighbouring Westfield Site, which readily captures commercial and employment demands. Several key connections are proposed as part of the Structure Plan, as identified in section 4.1.
1.4	Is there a precinct-wide strategy for loading and deliveries, (delivery bots, cargo bikes, freight consolidation, laneways, rideshare pick up), parking, and kerbside activities?	A precinct-wide Integrated Transport Plan is being prepared by TfNSW separately. Detailed design and planning for on-site loading, parking and kerbside activities shall be considered in further detail as part of any future development application for the internal road network design.
3.2	Are there sufficient end-of-trip facilities to serve the place: parking, deliveries, passenger and parcel loading, bicycle parking, bus waiting space and slimline departure bus shelters? Are they balanced to the desired mode share?	Per above, provision of on-site facilities is a detailed matter for future development applications submissions. However, the draft Structure Plan makes provision of bus circulation (be that a dedicated shuttle or deviation of a public bus route) and Shared Paths on key internal roads to facilitate and promote the use of non-car travel modes.
4.1	Is the intended speed zone for key roads safe for all users of that road? Does the physical design fit that design speed? Is the speed zone the default urban speed limit of 50km/h or less?	This shall be considered as part of internal precinct layout and road design. Council has expressed a desire for a 30 km/h internal speed limit which is generally support and will encourage an improved amenity (and safety) for non-car users.
5.1	Does the project contribute to an increase in public transport patronage, walking or cycling? Were public transport operators consulted and any new services/routes required being provided?	An urban residential precinct of this scale will induce a degree of trips to and from the broader Tuggerah area. A number of measures are proposed to encourage the use of non-car travel modes, such as: - improved cycle connections between the site and Tuggerah Station, as proposed in Figure 22 ,

TABLE 10: MOVEMENT & PLACE OBJECTIVES

Element	Objective	Project Response
		<ul style="list-style-type: none"> - safe pedestrian crossing facilities on Tonkiss Street to promote pedestrian access to/form the Tuggerah Westfield - lobby TfNSW and bus operators for deviation of existing routes within the subject site.
5.2	Does the street environment support walking to local attractors along key desire lines Is walking priority delivered-by-design (e.g. filtered permeability, pedestrian priority streets)? Are ambient qualities like air quality and noise conducive to walking?	The Tuggerah-Wyong Corridor Strategy envisages opportunity to provide a pedestrian link between Woodbury Park Drive (northern side of Tonkiss Street) and the existing Shared Path on Anzac Road.
5.3	Are existing strategies / plans for cycling embedded in the project, particularly the principal bicycle network and key council routes? Are there any gaps in the bicycle grid?	<p>The project team has considered cycling connectivity from the Site to key locations in the region, which benefits from proximity to them. These significant places include the Westfield, Tuggerah Station, and Tuggerah CBD area.</p> <p>An active transport corridor is nominated in Figure 22 which will support the existing and future pedestrian and cycling networks.</p>
5.4	Does the project deliver greater transport choice, particularly on most-travelled routes (such as top 3 origins / destinations by car)?	<p>Noting that Tuggerah Westfield is the major retail destination serving the region, the colocation of development will promote access to the Centre via walking.</p> <p>Furthermore, future improvements to connections between the subject site and Tuggerah Station will improve access to the broader public transport network.</p>
6.13	Is there a target overall journey time between key origins and destinations? Are travel times well-matched to speed zones, prevailing road conditions, and the speed of other modes? Has time “saved” while reducing variability been “spent” on places – e.g. crossing time and speed? (TCS plans reviewed, demonstrate precinct priorities)	<p>Key destinations within the region include:</p> <ul style="list-style-type: none"> - Gosford to the south, accessible within 30 minutes via a combination of cycling and train services - Tuggerah Westfield, accessible by walking due to close proximity (<10min) - other future Tuggerah employment areas — Pacific Highway corridor and Tuggerah Business Park — each within 10 minute cycle

6 Traffic Assessment

6.1 Generation Rates

In line with the proposed land uses on Site, a detailed traffic generation rate assessment has been undertaken based upon the TfNSW Guide and TfNSW TDT 2013/04a documents. These rates are provided below, with the assessment adopting surveyed sites with reasonably similar travel mode share to the Wyong region. The assumptions for each of the land uses are provided below.

TABLE 11: TfNSW TRAFFIC GENERATION RATES				
Land Use		Traffic Generation Rates		
		AM	PM	Weekend
Residential (trips per unit)	Low Density	0.73	0.77	0.83
	Medium Density	0.58	0.58	0.63
	High Density	0.53	0.32	0.58
	Senior Living		0.28	0.32
Retail (trips per 100 m ² GFA)	Bulky Goods	2.7	2.7	3.9

Key assumptions underpinning each of the land uses are provided below.

- Low Density Residential** – of the Sites surveyed as part of the survey areas undertaken in TDT 2013/04a, Sites 7, 8, 9 and 10 (Coffs Harbour, Lismore, Orange, Wagga Wagga) were adopted based on Public Transport accessibility score and general site similarity to Tuggerah. It should be noted that Site 11 – despite being within the same PT score, exhibited lower-than-average traffic generation and was excluded to maintain a conservative rate.
- Medium Density Residential** – based from the median range described in the TfNSW Guide 2002 for larger format units and town houses, between 0.5 and 0.65 vehicle trips per dwelling. The weekend rate was adopted as the AM rate multiplied at a factor of 1.1. This factor generally reflects the increase between peak weekday period and peak weekend period for low density residential.
- High Density Residential** – of the Sites surveyed as part of the TDT 2013/04a, Sites 8 and 9 (Charlestown, Wollongong) demonstrated reasonable similarity to the Site. Accordingly, the rates reflect the average between the two Sites.
- Senior Living** – Rates are based on surveys for non-metropolitan areas of NSW that typically exhibit higher vehicle trips per dwelling.
- Retail** – Obtained from the TfNSW Guide. It has been considered that the broader development horizon beyond residential housing delivery is anticipated to capture a wider scope of retail land uses allowable as part of the approved B4 mixed use zone, however at this stage, Bulky Goods retention has been defined for the shorter to medium term.

6.1.1 Discounted Rates Assessment

As the Site intends to perform part of a wider, hyperlocal precinct accompanied by the adjacent Tuggerah Westfield shopping Centre to the sites' east, it is anticipated that the proposed nature, typology and proximity to retail, commercial and business will impact the composition of vehicle trips from the Precinct. Accordingly, a discount assessment has been undertaken for the Site to explore allowable discount rates applicable for the Precinct in consultation with TfNSW. The assessment has been summarised below.

As referred in section 2.6.2, the Household Travel Survey (HTS) provides clarity for the basis of discounting trip assessments based on the breakdown of trips by purpose. For the Wyong area, the below figure provides a breakdown of total trips by purpose as at 2018/2019.

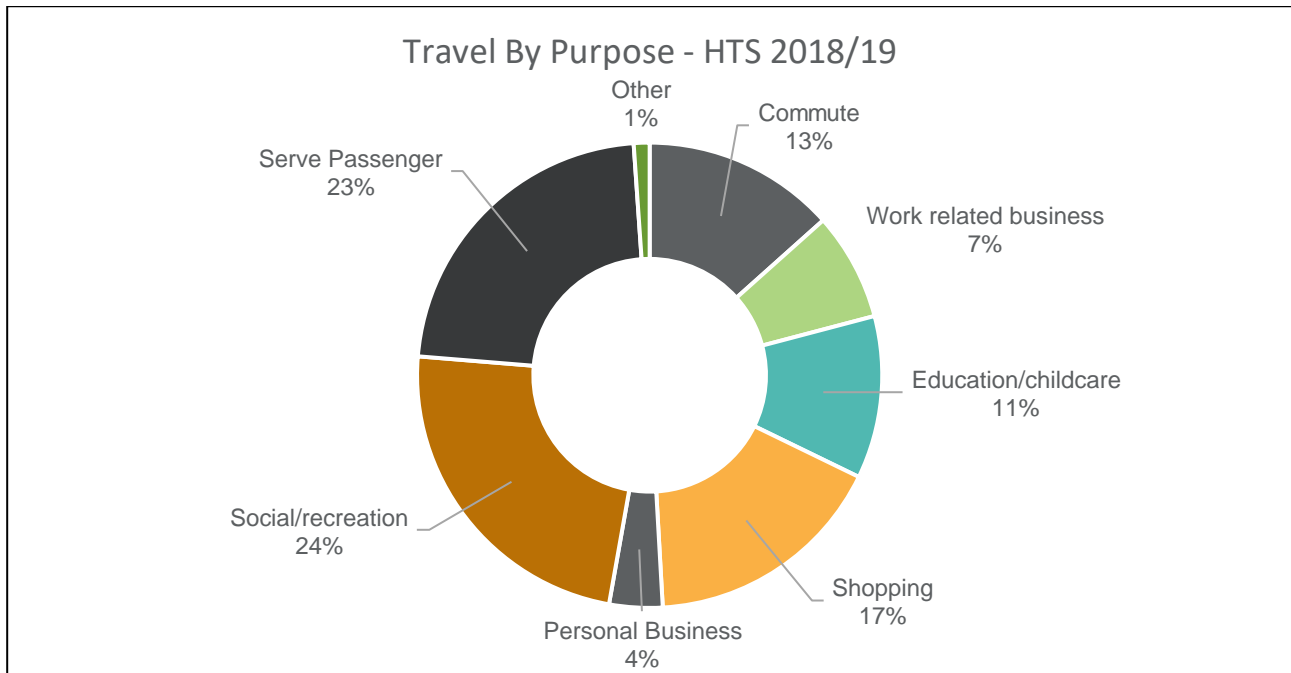


Figure 24: Travel by Purpose - HTS 2018/19

The HTS profile forms the baseline profile to gain indicative profiles for the AM, PM and weekend peak periods. This has been done by adjusting trips related to purposes for work and education/childcare based on typical observations made for a residential multi-use project in Ryde (the Ivanhoe development) previously approved, with the remaining purposes rebalanced based on the HTS profile. These assumptions are captured below:

- AM Peak: 40% for work-related trips, 25% for education/childcare
- PM Peak: 40% for work-related trips, 15% for education/childcare
- Weekend Peak: 10% for work-related trips, 0% for education/childcare

Accordingly, these have been adopted in **Table 12**, with the additional trips rebalanced towards the other trip purposes.

TABLE 12: HTS PEAK ASSESSMENT

Travel By Purpose	% Total Trips (HTS Profile)	Extrapolated AM Peak	Extrapolated PM Peak	Extrapolated Weekend Peak
Commuter	13.4%	40%	40%	10%
Work related business	7.5%			
Education/childcare	11.3%	25%	15%	0%
Shopping	16.9%	9%	11%	22%
Personal Business	3.7%	2%	2%	5%
Social/recreation	23.5%	12%	16%	31%
Serve Passenger	22.6%	12%	15%	30%
Other	1.1%	1%	1%	1%

Based on the above, further factors have been considered for the total amount of shopping and social/recreation trips associated with the Tuggerah Westfield centre. It is considered that these factors would account for a reduction in vehicle trips to the centre, indicating a switch to more convenient travel modes such as walking or cycling instead. These factors are described below:

- For shopping purposes, it can be reasonably assumed that 60% of total trips for shopping can be accommodated for by Westfield Tuggerah, and a further 20% of total social/recreational trips.
- For retail opportunities within the precinct, it can be considered that the number of internal trips to the bulky goods centres is directly proportionate to the purposes of shopping demonstrated above, while the AM Peak would exhibit a 90% discount due to hours of operations not coinciding with the network AM period.
- As travel patterns for seniors are indicated to demonstrate large variance to the HTS profiles, the proposed traffic generation rates have not been discounted.

These discounts have been summarised and applied to the traffic generation rates in the below table.

TABLE 13: DISCOUNTED RATE ASSESSMENT

	Adjusted AM Rates	Adjusted PM Rates	Adjusted Weekend Rates
Discounts to Residential Trips	8%	10%	20%
Low Density	0.68	0.69	0.67
Medium Density	0.53	0.52	0.51
High Density	0.49	0.29	0.47
Discounts to Retail	60%	11%	22%
Bulky Goods	1.08	2.40	3.03

6.2 Traffic Generation Assessment

Having regard for the above, the anticipated traffic generation for the site is summarised below.

TABLE 14: TRAFFIC GENERATION

Land Use	Yield	Traffic Generation (trips)		
		AM Peak	PM Peak	WE Peak
Low Density	86 units	58	60	57
Medium Density	298 units	158	154	151
High Density	1,502 units	747	441	711
Independent Living Unit	226 units	-	66	67
Total Residential	2,112 units	964	722	985
Future Mixed Use ¹	1,877 m ²	20	45	57
Total Precinct		984	767	1,042

Notes: 1) For the purposes of this assessment, bulky goods use has been assumed

It is noted that the traffic assessment undertaken has assumed the full delivery of the Structure Plan by the 2036 future development year to inform a comprehensive study of the traffic impacts on the road network. Notwithstanding, reference should be made to the indicative staging plans referenced in section 4.1.2 that accompany the submission.

6.3 Distribution

Distribution for traffic associated with the Site as a predominantly residential precinct is based on JTW 2016 data for the Tuggerah-Wyong area. **Figure 25** demonstrates the percentage breakdown of movements from the locality towards other urban centres, as well as contained movements within the area.

The dataset indicates a moderate proportion of trips heading externally from the Tuggerah-Wyong area, specifically towards Gosford and Sydney. Inversely, an almost equal proportion of trips are demonstrated to occur internal to the area, with places of work defined within the Tuggerah, Wyong and Chittaway areas accounting for approximately 49% of trips.

From the above, distributions for the traffic network local to the Site have been assumed and defined in **Figure 26** and **Figure 27**. based on these figures, the following assumptions are made in the contexts of a comprehensive preliminary assessment –

- The full extents of development traffic are concentrated between the Wyong Road left-in/left-out junction and the Wyong Road / Tonkiss Street intersection. The assessment makes the assumption that no traffic from the Site will permeate southwards along the Tonkiss Street connection, enforced by the left-in / left-out configuration.
- Entry to the Precinct from the east are assumed to be split 50/50 between the left-in from the intersection and the left-in/left-out junction.

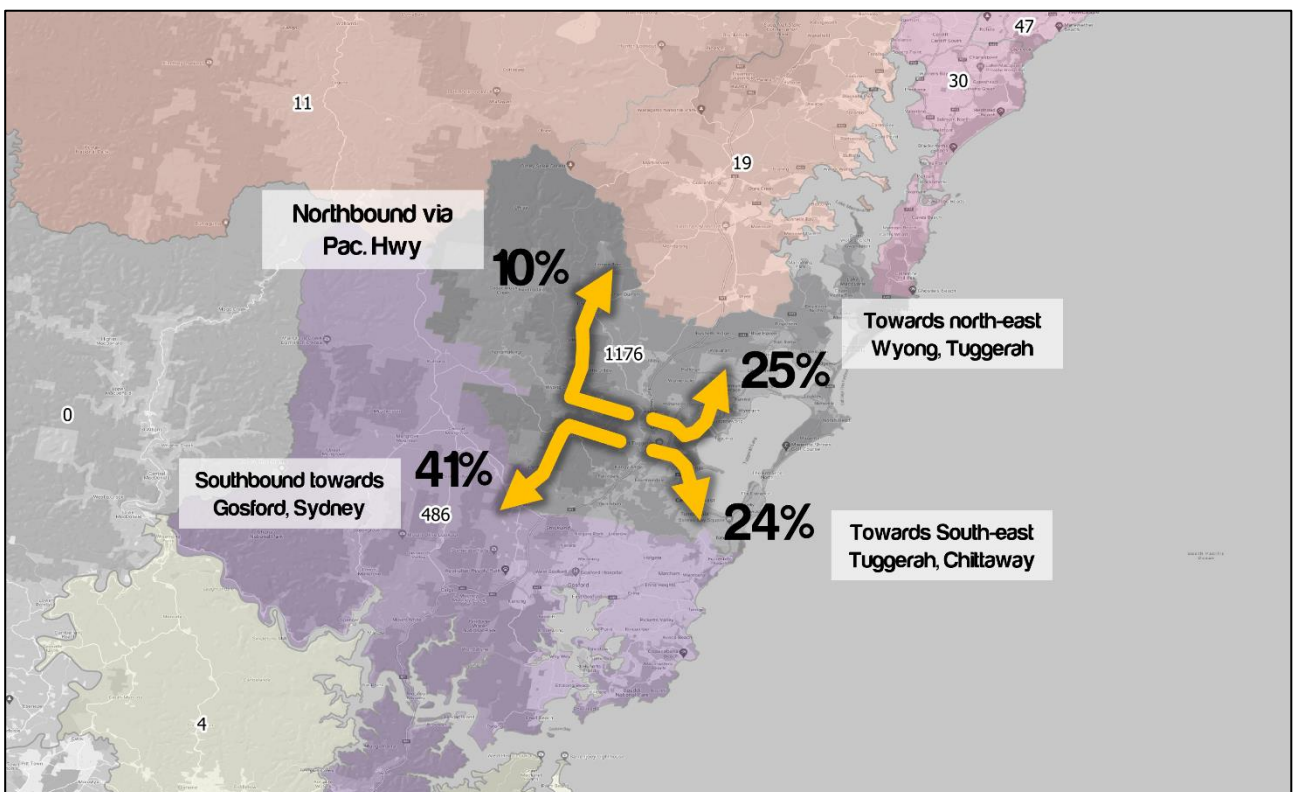


Figure 25: JTW 2016 Distribution

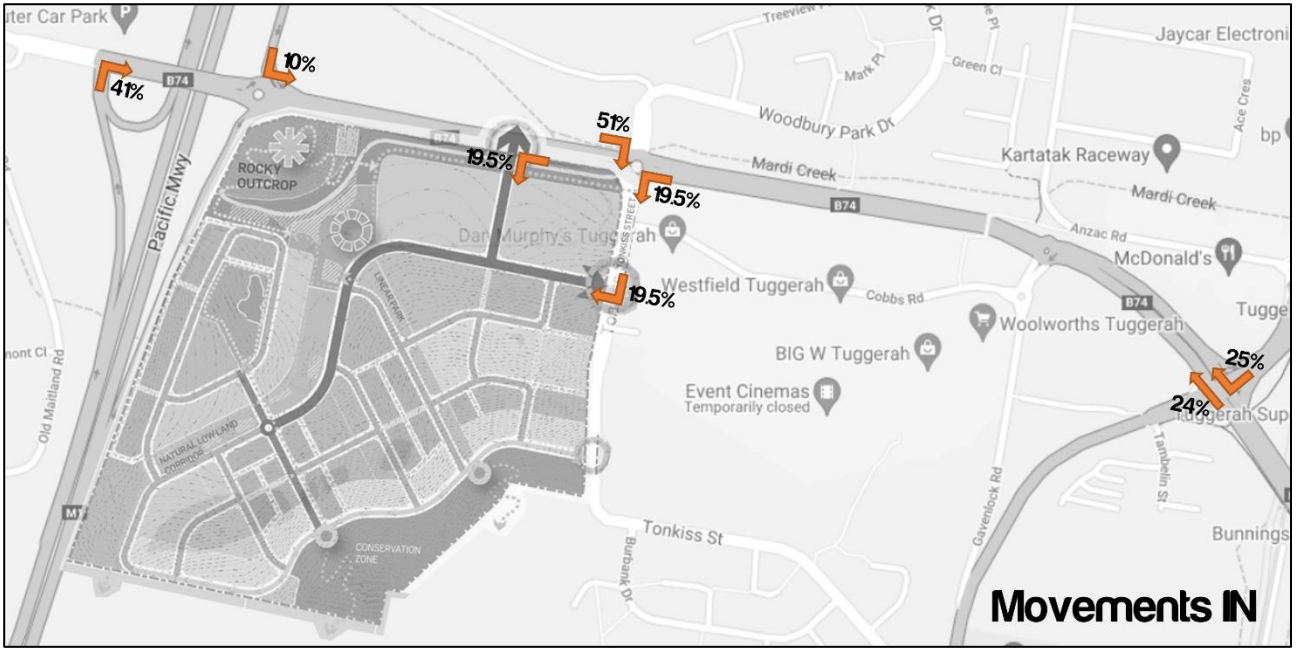


Figure 26: Detailed Distribution IN

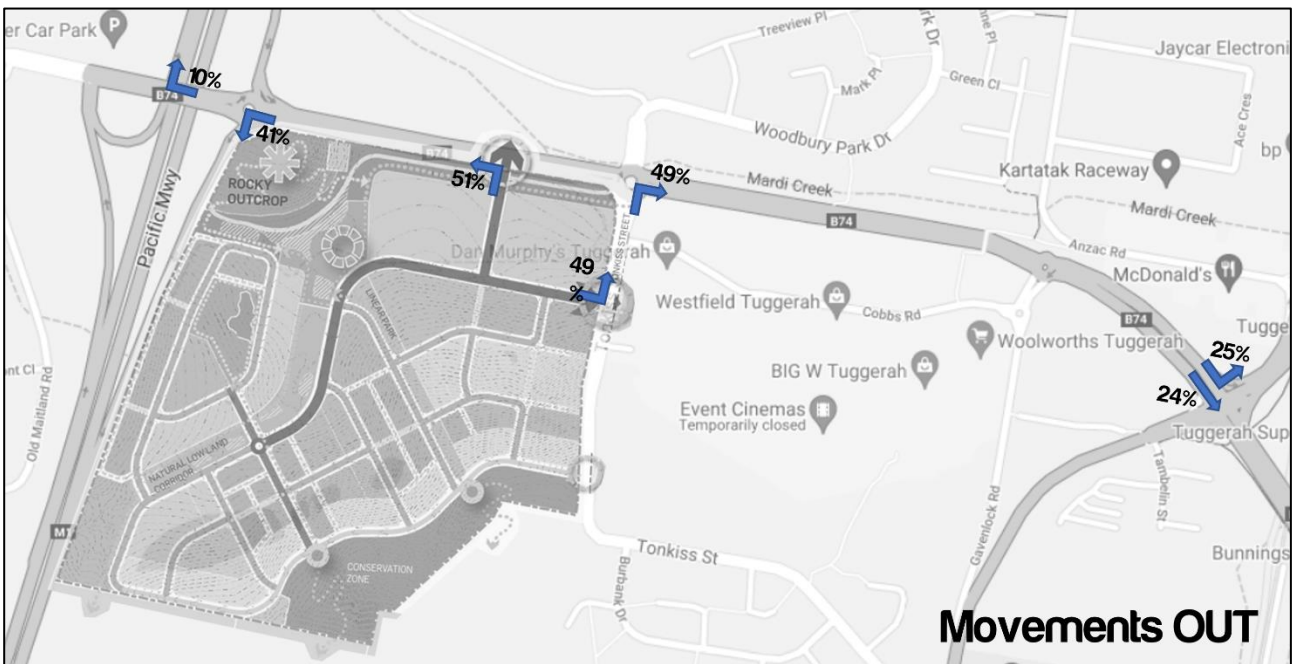


Figure 27: Detailed Distribution OUT

6.4 Future Year Growth

Annual growth for future year modelling has been derived from the *Tuggerah to Wyong Economic Corridor Strategy (2020)* indicating a population increase from 13,200 to 17,350 between 2016 and 2036, resulting in

an indicative annual population growth rate of 1.38%. The modelling has adopted the population growth rate as the traffic growth rate to assume the starting basis of discussion with TfNSW.

It is noted that that the economic corridor strategy report demonstrates higher-than-nominal growth for the Tuggerah Wyong areas over the wider Central Coast LGA, which demonstrates a growth rate of 1.06% between 2016 and 2036 as referred in the *Central Coast Regional Plan*. Accordingly, the variation between the two captures focuses on the Tuggerah Wyong areas as key urban development centres for the region.

6.5 Modelling Scenarios

In consideration of the abovementioned information, a total of three scenarios have been assessed in SIDRA intersection modelling to gain a preliminary appreciation of the traffic impacts associated with the Wyong Road / Tonkiss Street intersection. It is expected that wider, detailed network modelling will be undertaken following pre-gateway approval, in consultation with TfNSW.

The modelling scenarios are summarised below, with reference to the results provided for Scenario 1a in section 2.2.3.

TABLE 15: MODELLING SCENARIOS SUMMARY						
Scenario	Year	Description	Background Growth	Intersection Layout	Signal Pattern	Development
1a	2021	Existing Case	0%	Roundabout (Existing)	n/a	n/a
1b	2036	Future Baseline	1.38%	Signalised (Approved VPA)	TfNSW Double Diamond	n/a
2	2036	Future Project	1.38%	Signalised (Approved VPA)	TfNSW Double Diamond	Full Development
3	2036	Options Testing	1.38%	Upgraded (Option Testing)	TfNSW Double Diamond	Full Development

It should be noted that (conservatively) higher traffic volumes have been modelled in this SIDRA assessment than stated in Section 6.2. A comparison between site traffic generation and modelled demands is presented in **Table 16** below.

TABLE 16: TRAFFIC GENERATION – ACTUAL VS. ASSESSED		
Peak Period	Projected Development (Actual)	Modelled Demand (Adopted)
AM	984 trips	987 trips
PM	767 trips	774 trips
WE	1,042 trips	1,065 trips

Details of the intersection geometries adopted in SIDRA, as well as modelling results are shown in the following sections.

6.6 Intersection Geometry

Under scenario 1a, the existing scenario has utilised the current roundabout layout geometry. Scenarios 1b and 2 assume that the adopted VPA layout as per the agreement will have been implemented by that point. Both configurations are provided in **Figure 28** below.

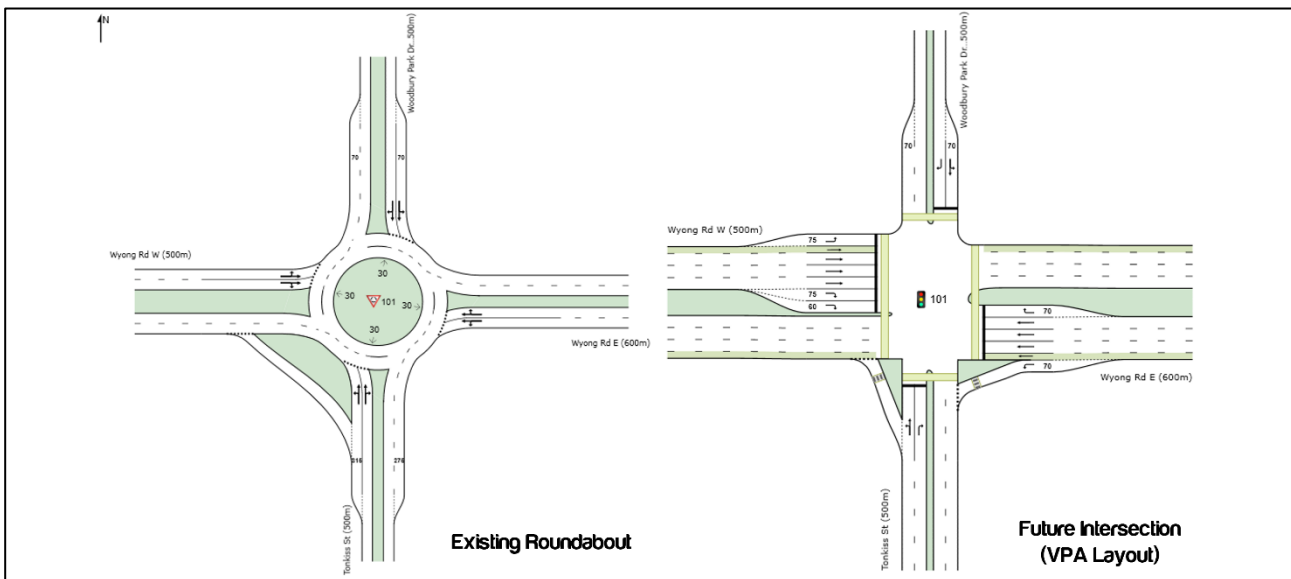


Figure 28: (Left) Existing Configuration and (Right) Signalised Configuration

The upgraded signalised layout captures the extents of a 3-lane upgrade planned for Wyong Road inferred as part of the VPA package, as well as a dedicated bicycle shoulder. This configuration retains the existing Street and Woodbury Park Drive approaches, with 2 approach lanes and a slip lane from Tonkiss Street to Wyong Road.

In addition, a further Option has been assessed (Scenario 3) with upgrades to the signalised configuration to improve approach capacity for the intersection. It is characterised by upgrades to the southern approach including dual right-turn lanes, and two short lanes for left-turn and through movements as shown below.

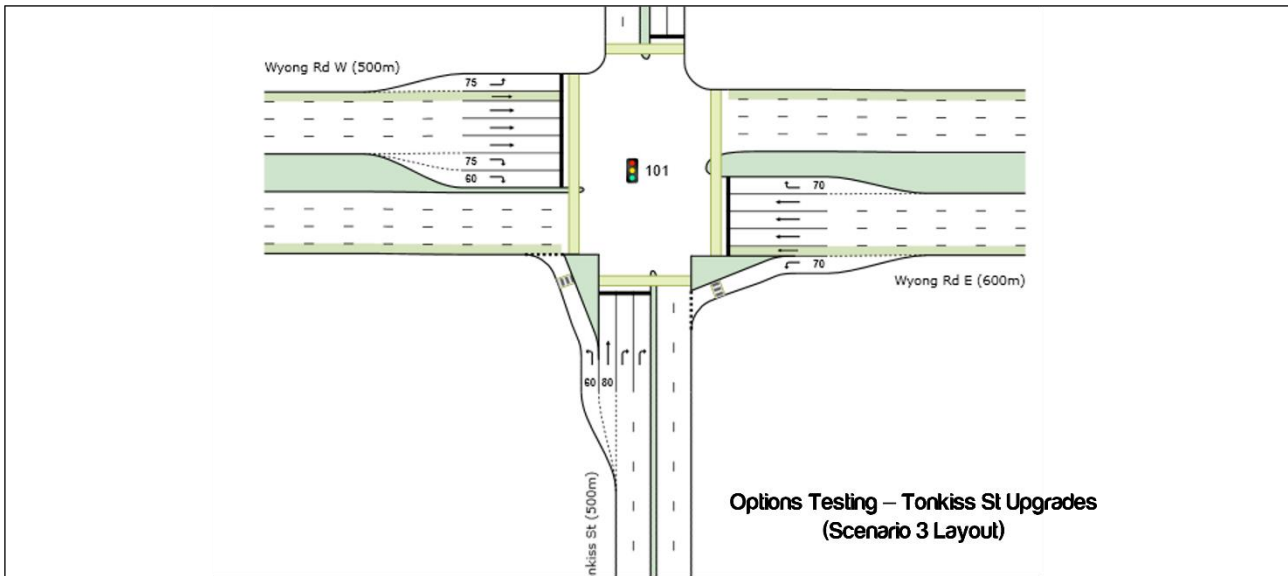


Figure 29: Options Study - Upgraded Configuration

6.7 Results and Outcomes

A summary of the SIDRA results for the existing and baseline modelling (scenario 1a and 1b) is provided below to provide context for underlying performance of the intersection, both in existing and future cases based on indicative growth assessed above.

TABLE 17: MODELLING RESULTS - SCENARIO 1					
Intersection	Period	Scenario 1a (2021 Existing)		Scenario 1b (2036 Baseline)	
		LoS	Avg. Delay	LoS	Avg. Delay
Wyong Road / Tonkiss Street / Woodbury Park Drive	AM	B	17.2	C	29.2
	PM	C	25.7	D	45.4
	WE	B	16.7	D	45.9

Scenario 1a results demonstrate adequate performance of the roundabout configuration, with the worst performing period (LoS C) observed during the PM Peak period. However, there is a notable decrease in intersection performance in comparison to the scenario 1b results, with worst performing period (LoS D) occurring during the weekend peak. This can be predominantly attributed to background growth as well as inherent delays introduced as part of the signals upgrade.

With the inclusion of the development traffic associated with the proposal, it becomes evident – as demonstrated in **Table 18** below – that the increase in vehicular traffic will exceed the nominal capacity of the intersection.

TABLE 18: MODELLING RESULTS - SCENARIO 2

Intersection	Period	Scenario 2 (2036 Project Case)	
		LoS	Avg. Delay
Wyong Road / Tonkiss Street / Woodbury Park Drive	AM	D	50.5
	PM	E	65.2
	WE	F	93.5

The above demonstrates deteriorating performance across for all periods, in particular during the weekend, exhibiting a decrease in performance from LoS D to F. This level of traffic the intersection is experiencing capacity issues, negatively impacting performance.

Accordingly, an Options study (scenario 3) has additionally been undertaken to address the abovementioned issues and improve performance. Reference is made to the approach upgrade described in Section 6.6, with the results of the study summarised below.

TABLE 19: MODELLING RESULTS - SCENARIO 3

Intersection	Period	Scenario 3 (2036 Options Testing)	
		LoS	Avg. Delay
Wyong Road / Tonkiss Street / Woodbury Park Drive	AM	D	38.0
	PM	D	44.9
	WE	D	46.3

As a result of recommended upgrades to the Tonkiss Street approach, the capacity upgrades to the intersection demonstrate improved intersection-wide performance, denoting moderate gains to average delay and bringing the results closer in line with the Future Baseline performance (scenario 1b) without project traffic.

The modelling for the Site demonstrates that while the approved intersection design potentially indicates capacity requirements to provide for the development, it should be considered that there is reasonable scope in terms of intersection capacity upgrades to readily capture the full yields and extents of the development.

With further integration of development goals relating to active travel, and meaningful strategies to employ in consideration of movement and place, it can be determined that the Wyong / Tonkiss intersection and Wyong Road Corridor upgrades can appropriately provide for the Precinct.

7 Summary & Conclusions

7.1 Key Findings

Key Findings of this Transport Assessment are as follows:

- On behalf of Scentre Group, this Transport Assessment supports a Planning Proposal and Structure Plan prepared by Urbis. The Planning Proposal facilitates the proposed amendment to the Local Environmental Plan at the Tuggerah Gateway Site, known as Lot 2 DP1056960 and Lot 3 DP1084221, which will enable residential, mixed-use and recreational land uses.
- The Planning Proposal seeks to rezone land comprising (part) Lot 2 in DP 1056960 and Lot 3 in DP 1084221 from RU6 Transition to R1 General Residential. The B4 Mixed Use zone in the north-east of the site and E2 Environmental Conservation zone in the south-east is to be retained.
- Currently, the Site benefits from moderate accessibility to public transport networks, including the Tuggerah Westfield bus interchange as well as to the Tuggerah Station.
- It is noted that there are several infrastructure changes under investigation for the region to improve public transport service and accessibility and support strategic economic growth. An example includes the planned fast rail service for the Central Coast area.
- Active transport infrastructure such as pedestrian and Shared Paths and dedicated cycleways are not prevalent within the locality to support active travel movements. Notwithstanding, as part of the Proposal – in conjunction with Tuggerah Westfield – are in the process of developing strategic active connections between the sites and improve access to Tuggerah Station.
- An assessment of travel patterns and movements based from census data demonstrates that the wider region, inclusive of the Tuggerah and Wyong areas, have historically relied upon private vehicles for both leisure and commuting, with a substantially smaller reliance on public and active transport.
- While in the shorter term this generally indicates increases to traffic generation for the near future, this also infers that as urban densification in line with Council strategic direction emerges, the demand for improved active transport connectivity will increase to accommodate higher density areas and improve connectivity between these areas with urban centres.
- With regard for traffic assessment of the Site, a comprehensive study in consultation with TfNSW has been undertaken to determine appropriate future year growth, trip rates, distributions and modal share goal for the Precinct.
- Future year modelling for 2036 has been undertaken based upon assumption that the Wyong Road / Tonkiss Street intersection will be present in its signalised form as per the VPA.
 - Based on the project modelling (scenario 2) with the uptick in associated traffic, the intersection is demonstrated to perform at LoS D, E and F for the respective AM, PM and Weekend Peaks. The weekend result in particular demonstrates a requirement for further capacity upgrades to be required to support full development.
 - Localised widening on the southern side of the intersection (scenario 3) will result in improved performance across the board, with the intersection performing at a maximum LoS D across the peak periods. This brings the results closer in line with the future baseline intersection performance without associated precinct traffic.

7.2 Recommendations

Based on the key findings above, this TA proposes a series of recommendations to support the traffic elements related to the development. These recommendations predominantly address strategic access and connectivity concerns for the precinct, with regard for its' strategic proximity to urban centres in and key public transit connections in the locality.

7.2.1 Road Infrastructure

With reference to the future road network, it should be considered that the planned road upgrades to the road network underpinning the VPA are anticipated to support the full extents of the Precinct. Accordingly, this involves the following:

- Provision of the left-in/left-out access to Wyong Road - to alleviate pressure on the Wyong Road / Tonkiss Road intersection, which forms a key intersection for the development and Site access. In addition, this intersection would be a primary accessway for the commercial, mixed-use portion of the Site, envisioned to provide predominantly bulky goods retail.
- Signalisation of the Wyong Road / Tonkiss Road intersection – in anticipation of the development, the signalised configuration provides improved capacity and safety for road users, particularly for the development. In addition, the planned upgrades inferred as part of the VPA include dedicated on-road cycling lanes, as well as full movement for pedestrian crossings, to provide additional connectivity to active transport infrastructure.
- Signalised Access on Tonkiss Street – subject to TfNSW approval, a signalised access is being sought for the main access to the Site. Signals at this location are anticipated to improve safety for vehicle interactions at the location, as well to provide an additional connection for active transport. To this effect, this pedestrian connection aims to support integrated connectivity goals between the precinct and the Tuggerah Westfield Centre.

7.2.2 Active Transport Infrastructure

To promote an active and walkable residential centre, the development aims to establish key connections for pedestrians and cyclist between the Site and the two key interchanges in proximity, being the Westfield Bus Interchange and Tuggerah Station.

7.2.3 Public Transport

As referred in section 2.4.2, the Tuggerah Westfield Bus interchange demonstrates a high degree of connectivity for the wider Tuggerah – Wyong area, as well as southwards towards Gosford. Accordingly, the following recommendations are made to provide better integration with the Site:

- Lobby with Transport for NSW for the amendment of key bus routes to provide additional accessibility through the Precinct. This can be more readily implemented with existing routes currently accessing bus stop locations on Woodbury Park Drive to the north.
- In addition to the above, the Site demonstrates potential for the investigation of a community bus or shuttle serviceability, primarily intended to provide for the Aged Care ILU's proposed for the Site.

7.3 Conclusion

Having regard for the abovementioned key points, the transport planning merits of the proposal are supportable. The proposed development is located within close proximity to one of the major urban centres formed by the Tuggerah Westfield to promote localised movement by walking and cycling. For residents that do need to travel more regionally, the site is conveniently located adjacent to the M1 Motorway and thus minimises impacts on other roads within the broader Tuggerah Precinct.

While further traffic investigations are being undertaken assess regional growth for Tuggerah region more broadly, the preliminary modelling accompanying this pre-gateway submission demonstrates that the intersection adjacent to the development has capacity to readily provide for the precinct.

Appendix A. SIDRA Results

Scenario 1a

MOVEMENT SUMMARY

 Site: 101 [[scen.01a AM] Wyong / Woodbury Park / Tonkiss (Site Folder: 2021 Existing (Scenario 01a))]

Config: Existing
 Traffic: 2021 Existing
 Site Category: (None)
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Tonkiss St (500m)														
1	L2	56	1	59	1.8	0.076	4.9	LOS A	0.4	2.6	0.69	0.71	0.69	52.8
2	T1	20	0	21	0.0	0.055	4.8	LOS A	0.3	1.9	0.70	0.68	0.70	46.8
3	R2	19	1	20	5.3	0.055	10.4	LOS B	0.3	1.9	0.70	0.68	0.70	52.9
Approach		95	2	100	2.1	0.076	6.0	LOS A	0.4	2.6	0.70	0.70	0.70	51.4
East: Wyong Rd E (600m)														
4	L2	61	1	64	1.6	0.532	7.9	LOS A	3.9	29.5	0.68	0.71	0.74	53.1
5	T1	883	100	929	11.3	0.532	8.3	LOS A	3.9	29.5	0.69	0.75	0.76	60.7
6	R2	40	8	42	20.0	0.532	14.8	LOS B	3.8	29.5	0.70	0.79	0.78	54.8
Approach		984	109	1036	11.1	0.532	8.5	LOS A	3.9	29.5	0.69	0.75	0.76	59.9
North: Woodbury Park Dr (500m)														
7	L2	95	3	100	3.2	0.282	8.4	LOS A	1.6	11.1	0.86	0.90	0.86	51.9
8	T1	61	0	64	0.0	0.282	8.3	LOS A	1.6	11.1	0.86	0.90	0.86	46.8
9	R2	124	1	131	0.8	0.342	17.2	LOS B	1.7	12.2	0.84	0.97	0.95	46.4
Approach		280	4	295	1.4	0.342	12.3	LOS B	1.7	12.2	0.85	0.93	0.90	48.3
West: Wyong Rd W (500m)														
10	L2	67	3	71	4.5	0.700	5.5	LOS A	7.9	57.6	0.46	0.46	0.46	52.9
11	T1	1575	82	1658	5.2	0.700	5.7	LOS A	7.9	57.6	0.48	0.48	0.48	61.9
12	R2	257	3	271	1.2	0.700	11.5	LOS B	7.9	57.0	0.50	0.52	0.50	54.5
Approach		1899	88	1999	4.6	0.700	6.5	LOS A	7.9	57.6	0.48	0.49	0.48	60.6
All Vehicles		3258	203	3429	6.2	0.700	7.6	LOS A	7.9	57.6	0.58	0.61	0.61	58.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

MOVEMENT SUMMARY

Site: 101 [[scen.01a PM] Wyong / Woodbury Park / Tonkiss (Site Folder: 2021 Existing (Scenario 01a))]

Config: Existing
 Traffic: 2021 Existing
 Site Category: (None)
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Tonkiss St (500m)														
1	L2	322	4	339	1.2	0.609	10.0	LOS A	4.4	31.3	0.94	1.05	1.18	49.6
2	T1	65	0	68	0.0	0.454	8.6	LOS A	3.0	21.0	0.92	1.01	1.04	44.6
3	R2	161	2	169	1.2	0.454	14.1	LOS B	3.0	21.0	0.92	1.01	1.04	50.5
Approach		548	6	577	1.1	0.609	11.0	LOS B	4.4	31.3	0.93	1.03	1.12	49.2
East: Wyong Rd E (600m)														
4	L2	146	0	154	0.0	0.884	18.2	LOS B	16.2	115.4	1.00	1.24	1.75	47.9
5	T1	1281	35	1348	2.7	0.884	18.6	LOS B	16.2	115.4	1.00	1.26	1.78	53.6
6	R2	71	3	75	4.2	0.884	25.7	LOS C	15.2	109.3	1.00	1.30	1.82	48.3
Approach		1498	38	1577	2.5	0.884	18.9	LOS B	16.2	115.4	1.00	1.26	1.78	52.7
North: Woodbury Park Dr (500m)														
7	L2	51	2	54	3.9	0.223	8.2	LOS A	1.3	9.3	0.89	0.91	0.89	51.9
8	T1	55	0	58	0.0	0.223	8.7	LOS A	1.3	9.3	0.89	0.91	0.89	46.6
9	R2	66	0	69	0.0	0.223	14.9	LOS B	1.1	7.9	0.86	0.94	0.86	48.0
Approach		172	2	181	1.2	0.223	11.0	LOS B	1.3	9.3	0.88	0.92	0.88	48.7
West: Wyong Rd W (500m)														
10	L2	81	3	85	3.7	0.766	9.5	LOS A	10.7	78.5	0.87	0.81	1.03	51.0
11	T1	1103	67	1161	6.1	0.766	9.8	LOS A	10.7	78.5	0.88	0.83	1.04	59.2
12	R2	430	6	453	1.4	0.766	16.1	LOS B	10.6	76.0	0.89	0.87	1.07	51.2
Approach		1614	76	1699	4.7	0.766	11.5	LOS B	10.7	78.5	0.88	0.84	1.05	56.5
All Vehicles		3832	122	4034	3.2	0.884	14.3	LOS B	16.2	115.4	0.93	1.04	1.34	53.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

MOVEMENT SUMMARY

Site: 101 [[scen.01a WE] Wyong / Woodbury Park / Tonkiss (Site Folder: 2021 Existing (Scenario 01a))]

Config: Existing
 Traffic: 2021 Existing
 Site Category: (None)
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h HV] veh/h		DEMAND FLOWS [Total veh/h HV] %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh Dist] m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	262	0	276	0.0	0.346	5.1	LOS A	2.0	13.8	0.77	0.75	0.77	52.6
2	T1	46	0	48	0.0	0.320	5.3	LOS A	1.8	12.9	0.80	0.86	0.80	45.9
3	R2	179	0	188	0.0	0.320	10.7	LOS B	1.8	12.9	0.80	0.86	0.80	52.1
Approach		487	0	513	0.0	0.346	7.2	LOS A	2.0	13.8	0.78	0.80	0.78	51.7
East: Wyong Rd E (600m)														
4	L2	179	1	188	0.6	0.652	10.6	LOS B	6.3	45.2	0.83	0.92	1.03	52.4
5	T1	862	31	907	3.6	0.652	10.4	LOS B	6.3	45.2	0.83	0.95	1.05	59.6
6	R2	97	3	102	3.1	0.652	16.7	LOS B	6.0	43.5	0.84	0.98	1.07	53.5
Approach		1138	35	1198	3.1	0.652	11.0	LOS B	6.3	45.2	0.83	0.95	1.05	57.8
North: Woodbury Park Dr (500m)														
7	L2	64	4	67	6.3	0.189	6.3	LOS A	1.0	7.2	0.78	0.77	0.78	52.7
8	T1	68	0	72	0.0	0.189	6.8	LOS A	1.0	7.2	0.78	0.79	0.78	47.2
9	R2	79	0	83	0.0	0.189	12.5	LOS B	0.9	6.4	0.78	0.90	0.78	49.7
Approach		211	4	222	1.9	0.189	8.8	LOS A	1.0	7.2	0.78	0.83	0.78	49.8
West: Wyong Rd W (500m)														
10	L2	23	0	24	0.0	0.551	6.9	LOS A	4.5	32.2	0.68	0.62	0.69	51.9
11	T1	723	27	761	3.7	0.551	7.1	LOS A	4.5	31.6	0.68	0.64	0.69	60.7
12	R2	407	2	428	0.5	0.551	13.2	LOS B	4.5	31.6	0.69	0.76	0.72	52.3
Approach		1153	29	1214	2.5	0.551	9.3	LOS A	4.5	32.2	0.69	0.68	0.70	57.4
All Vehicles		2989	68	3146	2.3	0.652	9.6	LOS A	6.3	45.2	0.76	0.81	0.85	56.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Scenario 1b

MOVEMENT SUMMARY

Site: 101 [[scen.01b AM] Wyong / Woodbury Park / Tonkiss (Signallised) (Site Folder: 2036 Future Baseline (Scenario 01b))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	69	1	73	1.4	0.309	30.8	LOS C	3.4	24.0	0.88	0.74	0.88	38.7
2	T1	25	0	26	0.0	0.309	26.4	LOS C	3.4	24.0	0.88	0.74	0.88	35.7
3	R2	23	1	24	4.3	* 0.310	79.2	LOS E	1.7	12.4	1.00	0.71	1.00	27.1
Approach		117	2	123	1.7	0.310	39.4	LOS D	3.4	24.0	0.90	0.74	0.90	34.9
East: Wyong Rd E (600m)														
4	L2	75	1	79	1.3	0.056	8.7	LOS A	0.9	6.2	0.22	0.63	0.22	52.8
5	T1	1086	123	1143	11.3	0.517	32.2	LOS C	19.8	152.0	0.79	0.69	0.79	44.9
6	R2	49	10	52	20.4	* 0.630	83.0	LOS F	3.7	30.8	1.00	0.78	1.10	26.7
Approach		1210	134	1274	11.1	0.630	32.8	LOS C	19.8	152.0	0.77	0.69	0.77	44.0
North: Woodbury Park Dr (500m)														
7	L2	117	4	123	3.4	0.629	63.3	LOS E	13.0	92.6	0.98	0.82	0.98	30.4
8	T1	75	0	79	0.0	* 0.629	58.7	LOS E	13.0	92.6	0.98	0.82	0.98	27.3
9	R2	152	1	160	0.7	0.571	65.0	LOS E	10.3	72.8	0.98	0.81	0.98	28.5
Approach		344	5	362	1.5	0.629	63.1	LOS E	13.0	92.6	0.98	0.81	0.98	28.9
West: Wyong Rd W (500m)														
10	L2	83	4	87	4.8	0.062	10.3	LOS B	1.3	9.8	0.25	0.66	0.25	49.8
11	T1	1936	101	2038	5.2	* 0.645	19.8	LOS B	32.1	234.6	0.70	0.64	0.70	52.1
12	R2	316	4	333	1.3	0.501	37.0	LOS D	6.5	45.6	0.95	0.80	0.95	36.8
Approach		2335	109	2458	4.7	0.645	21.8	LOS C	32.1	234.6	0.72	0.66	0.72	49.4
All Vehicles		4006	250	4217	6.2	0.645	29.2	LOS C	32.1	234.6	0.76	0.69	0.76	44.6

MOVEMENT SUMMARY

 Site: 101 [[scen.01b PM] Wyong / Woodbury Park / Tonkiss (Signallised) (Site Folder: 2036 Future Baseline (Scenario 01b))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	396	5	417	1.3	0.704	36.3	LOS D	21.3	150.3	0.86	0.99	0.86	36.5
2	T1	80	0	84	0.0	* 0.704	32.0	LOS C	21.3	150.3	0.86	0.99	0.86	33.8
3	R2	197	2	207	1.0	0.623	62.3	LOS E	13.3	93.6	0.98	0.82	0.98	30.6
Approach		673	7	708	1.0	0.704	43.4	LOS D	21.3	150.3	0.90	0.94	0.90	34.1
East: Wyong Rd E (600m)														
4	L2	179	0	188	0.0	0.139	10.8	LOS B	3.2	22.6	0.31	0.66	0.31	51.4
5	T1	1574	43	1657	2.7	* 0.860	52.1	LOS D	39.2	280.8	0.99	0.96	1.09	36.7
6	R2	88	4	93	4.5	0.595	75.8	LOS E	6.4	46.2	1.00	0.79	1.01	28.0
Approach		1841	47	1938	2.6	0.860	49.2	LOS D	39.2	280.8	0.92	0.92	1.01	37.2
North: Woodbury Park Dr (500m)														
7	L2	62	2	65	3.2	0.640	70.4	LOS E	9.2	65.4	1.00	0.82	1.02	29.0
8	T1	68	0	72	0.0	0.640	65.8	LOS E	9.2	65.4	1.00	0.82	1.02	26.1
9	R2	81	0	85	0.0	* 0.795	82.0	LOS F	6.3	44.1	1.00	0.89	1.26	25.2
Approach		211	2	222	0.9	0.795	73.4	LOS E	9.2	65.4	1.00	0.85	1.11	26.6
West: Wyong Rd W (500m)														
10	L2	100	4	105	4.0	0.102	21.4	LOS C	3.2	23.4	0.49	0.71	0.49	43.3
11	T1	1355	82	1426	6.1	0.571	28.5	LOS C	24.7	181.5	0.77	0.68	0.77	46.8
12	R2	528	7	556	1.3	* 0.856	71.7	LOS E	19.7	139.7	0.99	0.92	1.19	27.3
Approach		1983	93	2087	4.7	0.856	39.6	LOS D	24.7	181.5	0.82	0.75	0.87	39.6
All Vehicles		4708	149	4956	3.2	0.860	45.4	LOS D	39.2	280.8	0.88	0.85	0.94	37.0

MOVEMENT SUMMARY

Site: 101 [[scen.01b WE] Wyong / Woodbury Park / Tonkiss (Signallised) (Site Folder: 2036 Future Baseline (Scenario 01b))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	322	0	339	0.0	0.507	23.4	LOS C	15.3	107.3	0.72	0.79	0.72	41.9
2	T1	56	0	59	0.0	0.507	19.1	LOS B	15.3	107.3	0.72	0.79	0.72	38.2
3	R2	220	0	232	0.0	* 0.665	62.1	LOS E	14.9	104.0	0.98	0.83	0.98	30.7
Approach		598	0	629	0.0	0.665	37.2	LOS D	15.3	107.3	0.82	0.80	0.82	36.4
East: Wyong Rd E (600m)														
4	L2	220	1	232	0.5	0.175	10.7	LOS B	4.0	28.0	0.32	0.67	0.32	51.5
5	T1	1060	38	1116	3.6	* 0.677	46.5	LOS D	22.9	165.5	0.94	0.81	0.94	38.7
6	R2	119	4	125	3.4	0.299	54.7	LOS D	7.1	51.0	0.87	0.78	0.87	32.9
Approach		1399	43	1473	3.1	0.677	41.6	LOS D	22.9	165.5	0.83	0.79	0.83	39.6
North: Woodbury Park Dr (500m)														
7	L2	79	5	83	6.3	0.679	68.6	LOS E	11.5	82.6	1.00	0.84	1.03	29.4
8	T1	84	0	88	0.0	* 0.679	64.0	LOS E	11.5	82.6	1.00	0.84	1.03	26.4
9	R2	97	0	102	0.0	0.635	74.1	LOS E	7.1	49.4	1.00	0.81	1.04	26.7
Approach		260	5	274	1.9	0.679	69.2	LOS E	11.5	82.6	1.00	0.83	1.03	27.4
West: Wyong Rd W (500m)														
10	L2	28	0	29	0.0	0.037	31.5	LOS C	1.2	8.1	0.61	0.70	0.61	38.7
11	T1	889	33	936	3.7	0.553	44.7	LOS D	17.9	129.1	0.90	0.77	0.90	39.4
12	R2	499	2	525	0.4	* 0.663	58.9	LOS E	16.2	113.5	0.95	0.83	0.95	30.2
Approach		1416	35	1491	2.5	0.663	49.5	LOS D	17.9	129.1	0.91	0.79	0.91	35.7
All Vehicles		3673	83	3866	2.3	0.679	45.9	LOS D	22.9	165.5	0.87	0.79	0.88	36.5

Scenario 2

MOVEMENT SUMMARY

Site: 101 [[scen.02b AM] Wyong / Woodbury Park / Tonkiss (Signallised) - Discounted Masterplan (Site Folder: 2036 Project (Scenario 02))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	69	1	73	1.4	0.234	26.7	LOS C	2.8	20.1	0.82	0.72	0.82	40.5
2	T1	25	0	26	0.0	0.234	22.3	LOS C	2.8	20.1	0.82	0.72	0.82	37.2
3	R2	407	1	428	0.2	* 0.889	71.3	LOS E	32.0	224.8	1.00	0.97	1.19	29.1
Approach		501	2	527	0.4	0.889	62.7	LOS E	32.0	224.8	0.97	0.92	1.12	30.5
East: Wyong Rd E (600m)														
4	L2	125	1	132	0.8	0.093	9.4	LOS A	1.8	12.9	0.27	0.64	0.27	52.6
5	T1	1136	123	1196	10.8	0.796	52.9	LOS D	26.8	205.1	0.98	0.90	1.04	36.3
6	R2	49	10	52	20.4	* 0.735	86.1	LOS F	3.9	31.7	1.00	0.82	1.23	26.1
Approach		1310	134	1379	10.2	0.796	50.0	LOS D	26.8	205.1	0.92	0.87	0.98	36.9
North: Woodbury Park Dr (500m)														
7	L2	117	4	123	3.4	0.892	82.8	LOS F	15.5	110.6	1.00	1.02	1.32	26.5
8	T1	75	0	79	0.0	* 0.892	78.2	LOS E	15.5	110.6	1.00	1.02	1.32	23.8
9	R2	152	1	160	0.7	0.343	50.6	LOS D	8.9	62.9	0.87	0.78	0.87	32.0
Approach		344	5	362	1.5	0.892	67.6	LOS E	15.5	110.6	0.94	0.91	1.12	27.9
West: Wyong Rd W (500m)														
10	L2	83	4	87	4.8	0.067	12.5	LOS B	1.7	12.3	0.31	0.67	0.31	48.3
11	T1	1936	101	2038	5.2	* 0.887	47.9	LOS D	50.3	368.2	0.97	0.96	1.08	38.2
12	R2	420	4	442	1.0	0.791	43.0	LOS D	9.4	66.0	1.00	0.87	1.12	34.8
Approach		2439	109	2567	4.5	0.887	45.9	LOS D	50.3	368.2	0.95	0.94	1.06	37.8
All Vehicles		4594	250	4836	5.4	0.892	50.5	LOS D	50.3	368.2	0.94	0.91	1.05	35.7

MOVEMENT SUMMARY

Site: 101 [[scen.02b PM] Wyong / Woodbury Park / Tonkiss (Signallised) - Discounted Masterplan (Site Folder: 2036 Project (Scenario 02))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	396	5	417	1.3	0.733	36.5	LOS D	21.5	152.0	0.89	0.95	0.89	36.4
2	T1	80	0	84	0.0	* 0.733	32.2	LOS C	21.5	152.0	0.89	0.95	0.89	33.7
3	R2	279	2	294	0.7	0.958	95.5	LOS F	25.1	177.0	1.00	1.09	1.44	24.6
Approach		755	7	795	0.9	0.958	57.9	LOS E	25.1	177.0	0.93	1.00	1.09	30.5
East: Wyong Rd E (600m)														
4	L2	327	0	344	0.0	0.278	15.4	LOS B	9.0	62.8	0.47	0.71	0.47	48.7
5	T1	1722	43	1813	2.5	* 0.998	99.4	LOS F	59.8	427.4	1.00	1.25	1.46	25.5
6	R2	88	4	93	4.5	0.510	73.0	LOS E	6.2	45.1	0.99	0.78	0.99	28.6
Approach		2137	47	2249	2.2	0.998	85.4	LOS F	59.8	427.4	0.92	1.15	1.29	27.7
North: Woodbury Park Dr (500m)														
7	L2	62	2	65	3.2	0.939	94.2	LOS F	11.1	79.1	1.00	1.09	1.52	24.8
8	T1	68	0	72	0.0	0.939	89.6	LOS F	11.1	79.1	1.00	1.09	1.52	22.3
9	R2	81	0	85	0.0	* 0.909	90.4	LOS F	6.7	46.9	1.00	1.00	1.51	23.9
Approach		211	2	222	0.9	0.939	91.3	LOS F	11.1	79.1	1.00	1.05	1.51	23.6
West: Wyong Rd W (500m)														
10	L2	100	4	105	4.0	0.097	19.5	LOS B	3.0	21.9	0.46	0.70	0.46	44.3
11	T1	1355	82	1426	6.1	0.552	24.9	LOS C	24.2	178.6	0.72	0.64	0.72	48.8
12	R2	837	7	881	0.8	* 1.002	84.3	LOS F	28.8	203.0	1.00	1.07	1.53	20.6
Approach		2292	93	2413	4.1	1.002	46.4	LOS D	28.8	203.0	0.81	0.80	1.01	33.0
All Vehicles		5395	149	5679	2.8	1.002	65.2	LOS E	59.8	427.4	0.88	0.98	1.15	29.9

MOVEMENT SUMMARY

Site: 101 [[scen.02b WE] Wyong / Woodbury Park / Tonkiss (Signallised) - Discounted Masterplan (Site Folder: 2036 Project (Scenario 02))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	322	0	339	0.0	0.506	28.6	LOS C	15.6	109.1	0.71	0.85	0.71	39.6
2	T1	56	0	59	0.0	0.506	24.3	LOS C	15.6	109.1	0.71	0.85	0.71	36.3
3	R2	481	0	506	0.0	* 1.049	139.7	LOS F	55.2	386.4	1.00	1.24	1.70	19.2
Approach		859	0	904	0.0	1.049	90.5	LOS F	55.2	386.4	0.87	1.07	1.26	24.4
East: Wyong Rd E (600m)														
4	L2	350	1	368	0.3	0.323	19.7	LOS B	11.8	82.7	0.53	0.73	0.53	46.4
5	T1	1190	38	1253	3.2	* 1.043	132.6	LOS F	45.9	330.2	1.00	1.33	1.70	20.8
6	R2	119	4	125	3.4	0.478	67.1	LOS E	8.0	57.7	0.97	0.80	0.97	29.9
Approach		1659	43	1746	2.6	1.043	104.1	LOS F	45.9	330.2	0.90	1.17	1.40	24.1
North: Woodbury Park Dr (500m)														
7	L2	79	5	83	6.3	0.997	115.3	LOS F	15.8	113.3	1.00	1.22	1.67	22.0
8	T1	84	0	88	0.0	* 0.997	110.7	LOS F	15.8	113.3	1.00	1.22	1.67	19.8
9	R2	97	0	102	0.0	0.635	74.1	LOS E	7.1	49.4	1.00	0.81	1.04	26.7
Approach		260	5	274	1.9	0.997	98.4	LOS F	15.8	113.3	1.00	1.06	1.44	22.6
West: Wyong Rd W (500m)														
10	L2	28	0	29	0.0	0.033	26.8	LOS C	1.0	7.2	0.55	0.69	0.55	40.7
11	T1	889	33	936	3.7	0.463	37.6	LOS D	16.3	118.0	0.83	0.71	0.83	42.3
12	R2	771	2	812	0.3	* 1.041	139.3	LOS F	47.6	333.8	1.00	1.16	1.71	18.0
Approach		1688	35	1777	2.1	1.041	83.9	LOS F	47.6	333.8	0.90	0.92	1.23	26.7
All Vehicles		4466	83	4701	1.9	1.049	93.5	LOS F	55.2	386.4	0.90	1.05	1.31	25.0

Scenario 3

MOVEMENT SUMMARY

Site: 101 [[scen.03b AM] Wyong / Woodbury Park / Tonkiss (Options Test) - Discounted Masterplan (Site Folder: 2036 Project Options Test (Scenario 03))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	69	1	73	1.4	0.108	23.3	LOS C	2.5	17.8	0.59	0.67	0.59	41.4
2	T1	25	0	26	0.0	0.312	74.4	LOS E	1.9	13.0	1.00	0.71	1.00	25.1
3	R2	407	1	428	0.2	* 0.762	70.6	LOS E	14.7	103.4	1.00	0.87	1.09	29.3
Approach		501	2	527	0.4	0.762	64.3	LOS E	14.7	103.4	0.94	0.84	1.02	30.1
East: Wyong Rd E (600m)														
4	L2	125	1	132	0.8	0.095	9.2	LOS A	1.8	12.6	0.26	0.64	0.26	52.7
5	T1	1136	123	1196	10.8	0.663	42.2	LOS D	23.8	181.8	0.91	0.79	0.91	40.3
6	R2	49	10	52	20.4	* 0.735	86.1	LOS F	3.9	31.7	1.00	0.82	1.23	26.1
Approach		1310	134	1379	10.2	0.735	40.7	LOS D	23.8	181.8	0.85	0.78	0.86	40.4
North: Woodbury Park Dr (500m)														
7	L2	117	4	123	3.4	0.757	70.2	LOS E	13.9	99.3	1.00	0.88	1.09	28.9
8	T1	75	0	79	0.0	* 0.757	65.6	LOS E	13.9	99.3	1.00	0.88	1.09	26.0
9	R2	152	1	160	0.7	0.461	45.5	LOS D	8.4	59.0	0.94	0.79	0.94	33.5
Approach		344	5	362	1.5	0.757	58.3	LOS E	13.9	99.3	0.97	0.84	1.02	30.0
West: Wyong Rd W (500m)														
10	L2	83	4	87	4.8	0.065	9.2	LOS A	0.9	6.3	0.28	0.66	0.28	50.5
11	T1	1936	101	2038	5.2	* 0.744	27.4	LOS C	38.5	281.7	0.82	0.75	0.82	47.5
12	R2	420	4	442	1.0	0.664	36.6	LOS D	7.5	53.2	0.98	0.82	0.98	37.4
Approach		2439	109	2567	4.5	0.744	28.4	LOS C	38.5	281.7	0.83	0.76	0.83	45.6
All Vehicles		4594	250	4836	5.4	0.762	38.0	LOS D	38.5	281.7	0.86	0.78	0.87	40.3

MOVEMENT SUMMARY

Site: 101 [[scen.03b PM] Wyong / Woodbury Park / Tonkiss (Options Test) - Discounted Masterplan (Site Folder: 2036 Project Options Test (Scenario 03))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	396	5	417	1.3	0.446	19.8	LOS B	14.7	104.1	0.62	0.73	0.62	43.1
2	T1	80	0	84	0.0	0.598	71.3	LOS E	5.8	40.9	1.00	0.78	1.02	25.6
3	R2	279	2	294	0.7	* 0.918	89.7	LOS F	11.6	81.9	1.00	1.04	1.44	25.5
Approach		755	7	795	0.9	0.918	51.1	LOS D	14.7	104.1	0.80	0.85	0.97	32.2
East: Wyong Rd E (600m)														
4	L2	327	0	344	0.0	0.287	14.9	LOS B	8.9	62.1	0.46	0.71	0.46	49.0
5	T1	1722	43	1813	2.5	* 0.901	57.7	LOS E	46.0	329.0	0.99	1.01	1.15	34.8
6	R2	88	4	93	4.5	0.446	70.5	LOS E	6.1	44.1	0.98	0.78	0.98	29.1
Approach		2137	47	2249	2.2	0.901	51.7	LOS D	46.0	329.0	0.91	0.96	1.04	36.1
North: Woodbury Park Dr (500m)														
7	L2	62	2	65	3.2	0.859	82.4	LOS F	10.3	72.8	1.00	0.98	1.31	26.8
8	T1	68	0	72	0.0	* 0.859	77.8	LOS E	10.3	72.8	1.00	0.98	1.31	24.0
9	R2	81	0	85	0.0	0.530	72.9	LOS E	5.8	40.5	1.00	0.78	1.00	26.9
Approach		211	2	222	0.9	0.859	77.3	LOS E	10.3	72.8	1.00	0.90	1.19	25.9
West: Wyong Rd W (500m)														
10	L2	100	4	105	4.0	0.084	14.2	LOS B	2.3	16.8	0.35	0.68	0.35	47.3
11	T1	1355	82	1426	6.1	0.489	19.4	LOS B	21.0	154.8	0.64	0.57	0.64	52.4
12	R2	837	7	881	0.8	* 0.939	58.6	LOS E	25.0	176.2	1.00	1.00	1.32	30.6
Approach		2292	93	2413	4.1	0.939	33.5	LOS C	25.0	176.2	0.76	0.73	0.88	41.9
All Vehicles		5395	149	5679	2.8	0.939	44.9	LOS D	46.0	329.0	0.83	0.84	0.96	37.1

MOVEMENT SUMMARY

Site: 101 [[scen.03b WE] Wyong / Woodbury Park / Tonkiss (Options Test) - Discounted Masterplan (Site Folder: 2036 Project Options Test (Scenario 03))]

Config: Proposed Signalised Intersection

Traffic: 2036 Growth

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Cycle Time)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV] veh/h veh/h		DEMAND FLOWS [Total HV] veh/h %		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. Dist] veh m		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Tonkiss St (500m)														
1	L2	322	0	339	0.0	0.456	29.2	LOS C	14.8	103.8	0.74	0.77	0.74	39.0
2	T1	56	0	59	0.0	0.419	69.9	LOS E	4.0	28.1	1.00	0.75	1.00	25.9
3	R2	481	0	506	0.0	* 0.821	71.9	LOS E	18.0	125.9	1.00	0.92	1.15	28.9
Approach		859	0	904	0.0	0.821	55.8	LOS E	18.0	125.9	0.90	0.85	0.99	31.6
East: Wyong Rd E (600m)														
4	L2	350	1	368	0.3	0.330	14.3	LOS B	9.1	63.9	0.45	0.71	0.45	49.4
5	T1	1190	38	1253	3.2	* 0.852	59.1	LOS E	30.6	219.8	0.99	0.96	1.12	34.4
6	R2	119	4	125	3.4	0.416	63.7	LOS E	7.8	55.9	0.94	0.79	0.94	30.6
Approach		1659	43	1746	2.6	0.852	50.0	LOS D	30.6	219.8	0.88	0.89	0.97	36.4
North: Woodbury Park Dr (500m)														
7	L2	79	5	83	6.3	0.808	76.0	LOS E	12.3	88.7	1.00	0.93	1.18	27.9
8	T1	84	0	88	0.0	* 0.808	71.4	LOS E	12.3	88.7	1.00	0.93	1.18	25.1
9	R2	97	0	102	0.0	0.363	45.9	LOS D	5.3	36.8	0.94	0.77	0.94	33.4
Approach		260	5	274	1.9	0.808	63.3	LOS E	12.3	88.7	0.98	0.87	1.09	28.6
West: Wyong Rd W (500m)														
10	L2	28	0	29	0.0	0.026	13.2	LOS B	0.5	3.5	0.43	0.67	0.43	48.0
11	T1	889	33	936	3.7	0.405	31.9	LOS C	15.0	108.5	0.76	0.66	0.76	45.1
12	R2	771	2	812	0.3	* 0.843	39.8	LOS D	16.3	114.6	1.00	0.91	1.12	36.3
Approach		1688	35	1777	2.1	0.843	35.2	LOS D	16.3	114.6	0.87	0.77	0.92	40.8
All Vehicles		4466	83	4701	1.9	0.852	46.3	LOS D	30.6	219.8	0.88	0.84	0.96	36.2