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Walker Corporation

Appin and North Appin Precincts

Strategic Transport Assessment

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October 2022

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Appin and North Appin Precincts
Strategic Transport Assessment

Walker Corporation

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Approved by:	D. Hutchison	24/10/2022	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

Table of contents

List of tables

List of figures

List of appendices

1 Background

1.1 The Appin Project

Greater Sydney's population is projected to grow to approximately 6.1 million by 2041 – over a million more people than currently live in the region.

The NSW Government has identified Growth Areas as major development areas that will assist in accommodating this growth. The Greater Macarthur Growth Area (GMGA) is one such growth area and is a logical extension of the urban form of south-west Sydney. The GMGA is divided into precincts. The Appin Precinct and North Appin Precinct are the southernmost land release precincts of the GMGA. The goal is to deliver 21,000+ dwellings.

The land is to be rezoned and released for development to achieve this goal. A submission has been prepared by Walker Corporation Pty Limited and Walker Group Holdings Pty Limited (the Proponent) to rezone 1,378 hectares of land (the site) within the Appin Precinct from *RU2 Rural Landscape* to the following zones:

Urban Development Zone

Zone 1 Urban Development (UD)

Special Purposes Zone

Zone SP2 Infrastructure (SP2)

Conservation Zone

Zone C2 Environmental Conservation (C2)

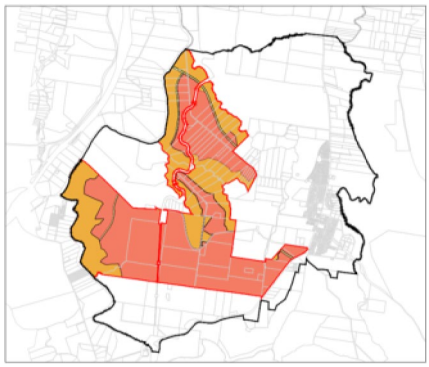
The zonings are shown on the Appin (Part) Precinct Plan (the precinct plan). 'The precinct plan' will be incorporated into the *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* and contain the provisions (clauses and maps) that will apply to 'the site.' 'The precinct plan' envisages the delivery of 12,000+ new homes.

A structure plan has been prepared for the site and is shown on the Appin (Part) Precinct Structure Plan (the structure plan). It identifies staging and the first stage to be developed – Release Area 1. Release Area 1 is anticipated to deliver 3,500+ dwellings.

The submission is aligned with strategic land use planning, State and local government policies and infrastructure delivery. The development potential is tempered by a landscape-based approach that protects the environment and landscape values, shaping the character of new communities. A series of residential neighbourhoods are to be delivered within the landscape corridors of the Nepean and Cataract Rivers, supported by local amenities, transit corridors and community infrastructure.

The submission includes a hierarchy of plans. The plans and their purpose are summarised in Table 1.1.

Table 1.1 Title and Purpose of Plans

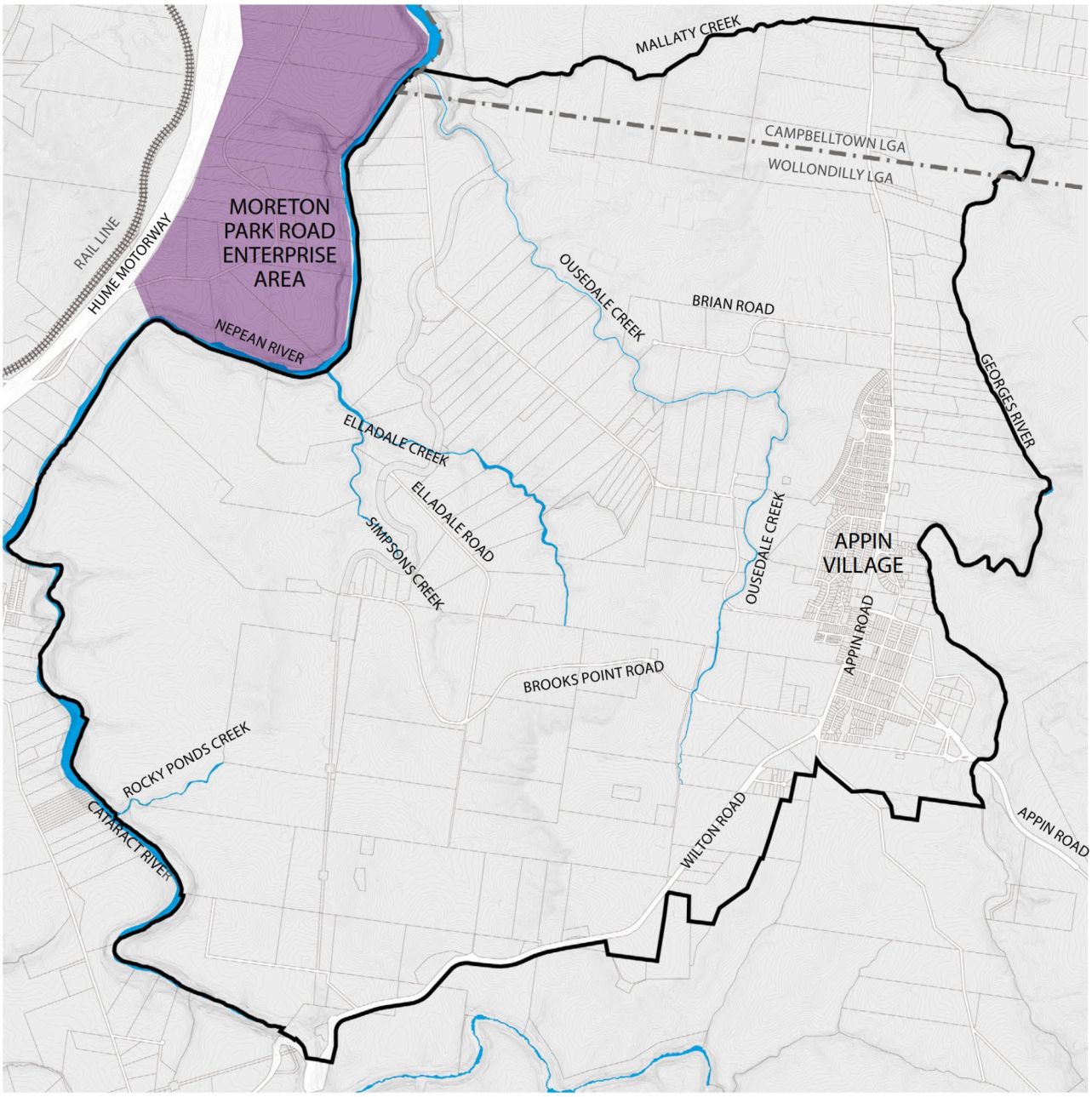
1. Appin & North Appin Precincts Indicative Plan	2. Appin (Part) Precinct Plan (the Precinct Plan)	3. Appin (Part) Precinct Structure Plan (the Structure Plan)
Broader context & for information purposes only. It has no statutory weight. It identifies: — Higher-order transport network — Centres hierarchy — School sites — Conservation areas — Residential areas — Cultural sites and connections.	It shows the land proposed to be rezoned (the site) and incorporated into a new schedule in the Western Parkland City SEPP 2021. The precinct plan contains the development provisions (clauses and maps) applicable to the site and is used in assessing development applications.	Structure plan for the site, showing staging of release areas. It illustrates land use components including (but not limited to): — Low and medium-density residential — Retail and employment centres — School — Open space — Drainage network/basins — Transport network.
 **(21,000+ dwellings)**	 **(12,000+ dwellings)**	 **(12,000+ dwellings) inc. Release Area 1 - 3,500+ dwellings**

1.2 Introduction

WSP Australia have been engaged by the Proponent to prepare a Strategic Transport Assessment to support the Appin and North Appin Precincts Indicative Plan.

The Appin and North Appin Precincts are the southernmost land release areas of the Greater Macarthur Growth Area (**GMGA**) – refer to Figure 1.1 and Table 2 for key features of the precincts.

The Appin and North Appin Precincts immediately neighbour the suburbs of Gilead to the north, Wilton to the south and Douglas Park to the west. Dharawal National Park, a large protected national park, is located to the east. The precincts are predominately bound by waterways, with Mallaty Creek to the north, George's River to the east, Nepean River to the west and Cataract River to the south.



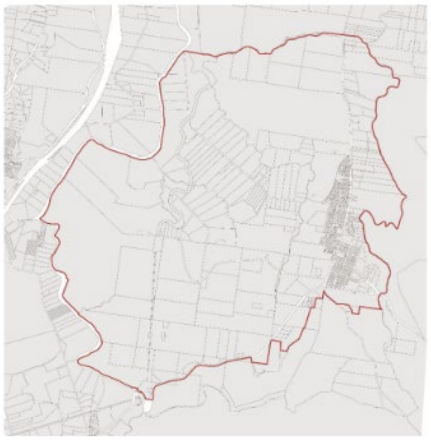
APPIN & NORTH APPIN PRECINCTS

DATE: 06-10-22
REVISION NO: B

Source: Walker Corporation, 6 October 2022

Figure 1.1 Boundary of Appin and North Appin Precincts

Table 1.2 Summary of Appin and North Appin Precincts key attributes

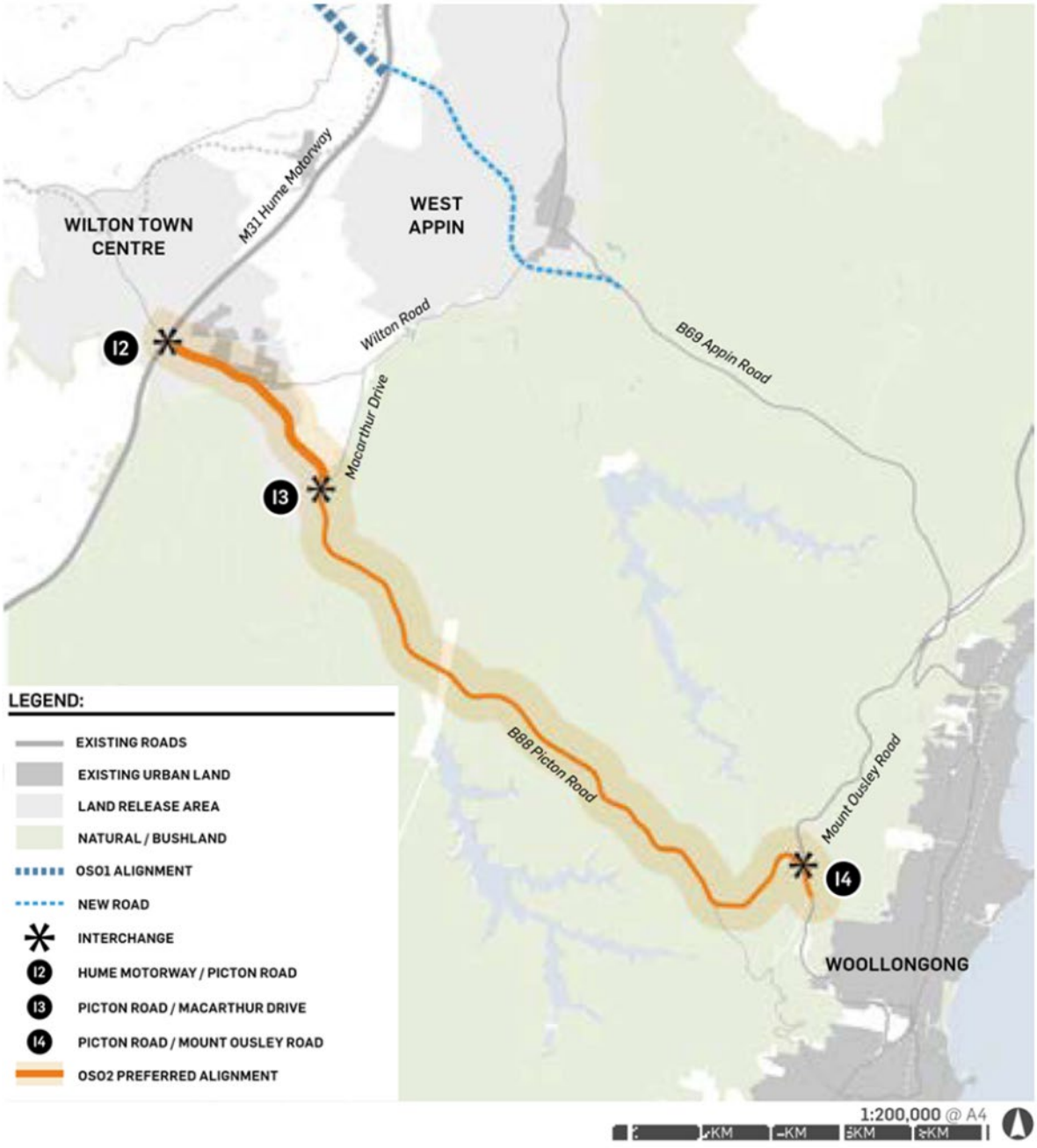
Location		Key Attributes	
Appin and North Appin Precincts		**Area**	3,826 ha
		LGA	Part Wollondilly Part Campbelltown
		Proposed Dwellings	21,000+
		Proposed Population	65,000+

1.3 Previous traffic modelling

In 2020 and 2021, Walker Corporation commissioned WSP to undertake strategic modelling using a copy of Transport for NSW's Sydney Traffic Forecasting Model (STFM) to determine the capacity requirements and timing of the regional road network in the Greater Macarthur Growth Area and how they can support the transport needs of the Appin and North Appin Precinct development along with regional traffic passing through the site. The results of this analysis were documented in *West Appin Strategic Network Assessment* (WSP, March 2021). Subsequently, the development layout and assumptions within the March 2021 report have changed due to further detailed investigations and are now superseded by this report.

The March 2021 assessment was also used to demonstrate Picton Road as the preferred route for the Outer Sydney Orbital Stage 2 (OSO2) between south-western Sydney and the Illawarra due to its current status and preferred topography for freight vehicles accessing Port Kembla and benefits to more trips than the Bulli-Appin Road alternative. The Walker Corporation submission, *Walker OSO2 Submission, Outer Sydney Orbital (OSO) Stage 2 Corridor Options* (Urbis, January 2021) concluded that:

1. The alignment of the OSO2 Motorway along Picton Road is the only economically viable OSO2 option.
2. The OSO2 route was better suited to Picton Road as it:
   - **a** Delivers on Movement and Place objectives
   - **b** Builds off an existing freight corridor between Port Kembla and Hume Motorway
   - **c** Minimises disruption to existing and future communities.
3. The Appin and North Precinct is not a suitable location for a Motorway. The place impacts of a motorway through the heart of a future community are inconsistent with the Movement and Place principles. Impacts including community severance and amenity (noise, air quality, visual etc) are significant considerations and should be equally weighted against the movement outcomes.
4. The dual role of Appin and Picton roads, shown in Figure 1.2, is:
   - **a** Picton Road provides the most direct connection between Port Kembla and Western Sydney and has a freight and people movement function.
   - **b** Appin Road connects Greater Macarthur Growth Area to the Illawarra-Shoalhaven region. Its function is for people movement and local freight servicing the Appin and North Appin Precinct. It is not appropriate for high frequency freight movements across the region.



Source: Walker OSO2 Submission, Outer Sydney Orbital (OSO) Stage 2 Corridor Options (Urbis, January 2021)

Figure 1.2 OSO2 Recommended Strategic Alignment

1.4 Purpose of this report

This report summarises the strategic transport infrastructure to be considered for the Appin and North Appin Precinct. The objectives of the report are:

- Present the results of strategic transport modelling assessing the impact of the Appin and North Appin Precinct
- Assess the performance of the existing transport network and the future internal road network
- Review the public transport and active transport elements of the transport network to reduce reliance on private vehicle travel
- Recommend an infrastructure plan.

This technical assessment of the strategic transport infrastructure demonstrates that the transport network planned for the development can support the planned yields, and that there is a plan to mitigate the impact of the development on the surrounding transport network. The assessment addresses the Transport for NSW and the Department of Planning and Environment (DPE) requirement that a viable staged infrastructure plan be identified to cater for the needs of the Appin and North Appin Precinct as well as regional transport passing through and immediately adjacent to the site.

Conclusions:

This strategic assessment recommends an overarching transport plan for the Precinct that includes:

1	Spring Farm Parkway extension	New four lane road by 2026 (by others).
2	Appin Road	Widen to four lanes between Gilead and Spring Farm Parkway extension by 2026 (by others).
3	Appin Road	Widen to four lanes between South Gilead and Gilead by 2029 (by others).
4	Wilton Road access intersection	Construct new access intersection to Stage 1.
5	Appin Road/Church Street intersection	upgrade intersection to traffic signals by the 1,051st residential lot.
6	Appin Road	Widen to four lanes between North Appin and South Gilead by the 3,001st residential lot.
7	Transit Corridor	New two lane road (plus future public transport lanes) between Neighbourhoods 1 and 2A/Appin Road by the 3,001st residential lot.
8	East-West Connection Road	New four lane road between Neighbourhood 2 and Hume Motorway by the 8,001st residential lot.
9	East-West Connection Road	New four lane road between Neighbourhood 2 and Bulli-Appin Road by the 14,000 residential lot.
10	Transit Corridor	New two lane road plus public transport lanes north of North Appin (depends on timing of other developments).
11	Transit Corridor	New two lane road plus public transport lanes to Moreton Park Road (Douglas Park).

An alternative to the delivery of #5 Transit Corridor between Neighbourhoods 1 and 2A/Appin Road is the widening of Appin Road through Appin township and Wilton Road.

It is envisaged that a more detailed assessment of the transport network will be undertaken at the development application stage to inform the design of the proposed master-planned community.

The Proposal can be supported in its current form.

2 Existing situation

2.1 Mode share

The Appin area is currently rural in nature and has minimal pedestrian connectivity outside of the more recent residential subdivision developments, resulting in very low levels of active transport. The existing mode share from the 2016 Census Journey to Work data shows:

- Car as driver 76 per cent
- Car as passenger 6 per cent
- Public Transport 14 per cent
- Walk/Cycle/Did not travel 4 per cent.

The 2016 Census Journey to Work results shown in Figure 2.1 indicate that some nearby areas like Englorie Park are achieving greater active and public transport mode share. This demonstrates that, with increased population density and improvements in public transport and the active transport network, there is potential to achieve higher public and active transport mode shares in the Appin and North Appin Precinct.

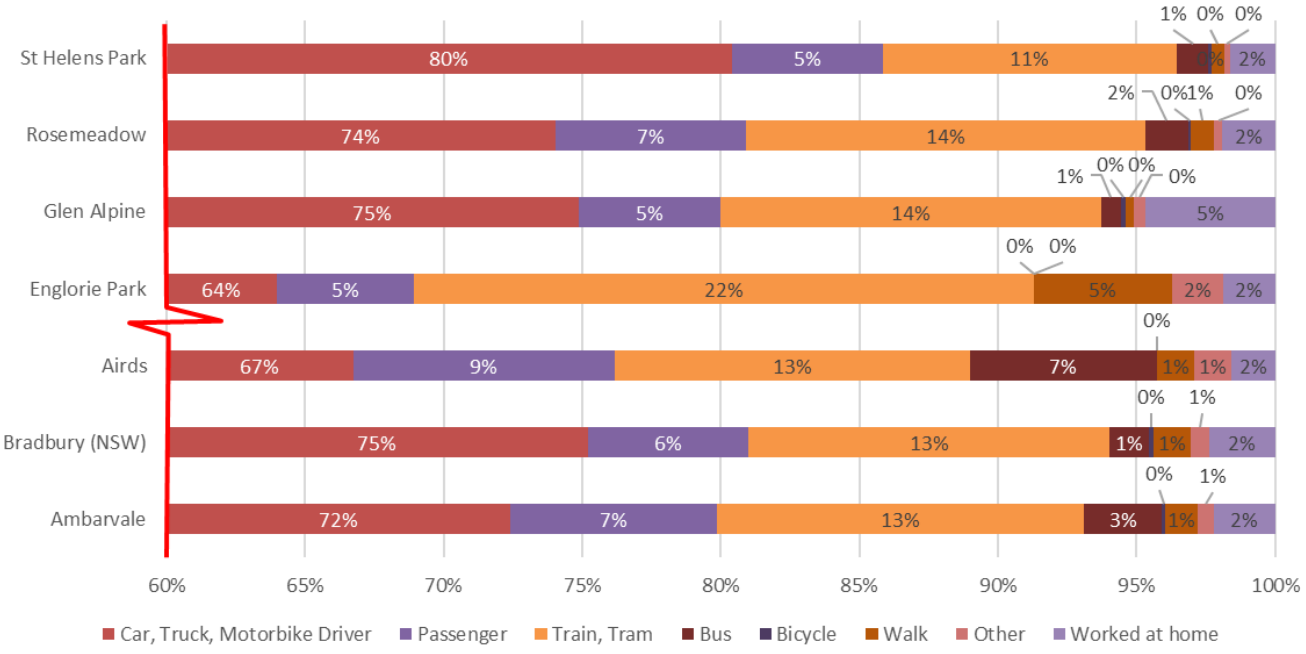


Figure 2.1 2016 Census Journey to Work mode share (adjacent suburbs)

2.2 Road network

The existing road network is sparse and rural in nature and existing intersections are priority-controlled. The existing roads in the vicinity of the Appin and North Appin Precinct are summarised in Table 2.1.

Table 2.1 Existing road characteristics

Road	Function	Standard	Posted speed	No. lanes
Hume Highway	North-south inland interstate connection from Sydney to Melbourne	Motorway standard, limited access, divided carriageway	110 km/h	2 lanes per direction
Moreton Park Road	North-south local connection supporting farmland access east of Hume Motorway	Rural road, undivided carriageway with direct property access and no shoulders	80 km/h	1 lane per direction
Appin Road	Intra-regional connection from Campbelltown to Appin and Appin to Princes Highway near Bulli and Wollongong	Rural highway, undivided carriageway with some direct property access and priority-controlled intersections	80 km/h (Campbelltown to Appin) 90 km/h (Appin to Bulli)	1 lane per direction Overtaking lanes provided (Appin to Bulli)
Wilton Road–Appin Road	Intra-regional connection from Wilton to Campbelltown via Appin	Rural highway, undivided carriageway	80 to 100 km/h. 50 km/h through Appin town centre	1 lane per direction

2.3 Traffic patterns

Limited traffic count data is available for the existing road network in the vicinity of the Appin and North Appin Precinct development. Available traffic counts are summarised in Table 2.2. Additional count data is provided within the Sydney Traffic Forecasting Model (STFM) on modelled links although the source of these counts is not available.

Table 2.2 Existing traffic counts

Road	Location	Date	Count Data (%heavy vehicles)
Appin Road	North of Church Street	Hourly from 2007 to 2019	ATC; summary data for 28 November 2018 (daily) — Northbound 4,011 veh/day — Southbound 4,285 veh/day
Appin Road	South of Church Street	March 2018	3,083 (9% HV) average annual daily traffic (AADT) 3,120 (10% HV) average weekday traffic (AWDT)
Appin Road	Intersection with Church Street	March 2018	AM 2-hours: — Appin Road North 1,843 veh (5% HV) — Appin Road South 398 veh (8% HV) — Church Street West 1,667 veh (5% HV)

Road	Location	Date	Count Data (%heavy vehicles)
Appin Road	North of Princes Highway	Hourly, intermittently from 2006 to 2019	ATC; summary data for 12 September 2017 (daily) — Westbound 5,255 veh/day — Eastbound 5,483 veh/day
Picton Road	South of Macarthur Drive	Hourly from 2015 to 2019	ATC; summary data for 16 March 2019 (daily) — Westbound 10,560 veh/day (27% HV) — Eastbound 10,814 veh/day (28% HV)
M31 Hume Motorway	South of Picton Road	Hourly from 2010 to 2019	ATC; summary data for 14 March 2019 (daily) — Northbound 18,019 veh/day — Southbound 18,268 veh/day

The available traffic counts confirm that the majority of traffic on Appin Road heading through Appin is to/from Church Street rather than further south on Appin Road, heading towards the east coast rather than inland. It also shows that the majority of truck traffic uses Picton Road rather than Appin Road.

Existing traffic patterns may not be representative of future traffic patterns as the type of land use development will change significantly from rural to suburban with town centre facilities, schools and adjacent industrial employment centres.

3 Future planning

3.1 Land use

3.1.1 Appin and North Appin Precinct development

The latest structure plan information for the Appin and North Appin Precinct development, contains a total of approximately 21,000+ residential lots with a total employment of approximately 4,130 jobs. The current expectations for residential lot and employment numbers detailed in Table 3.1 show the distribution across the Appin and North Appin Precinct development. The neighbourhoods and road network are shown spatially in the indicative plan shown in Figure 3.1 and the staging is shown in Figure 3.2. A breakdown of the dwelling size and retail floorspace is shown in Table 3.2.

Table 3.1 Lots, Jobs, and Staging for Appin and North Appin Precinct development

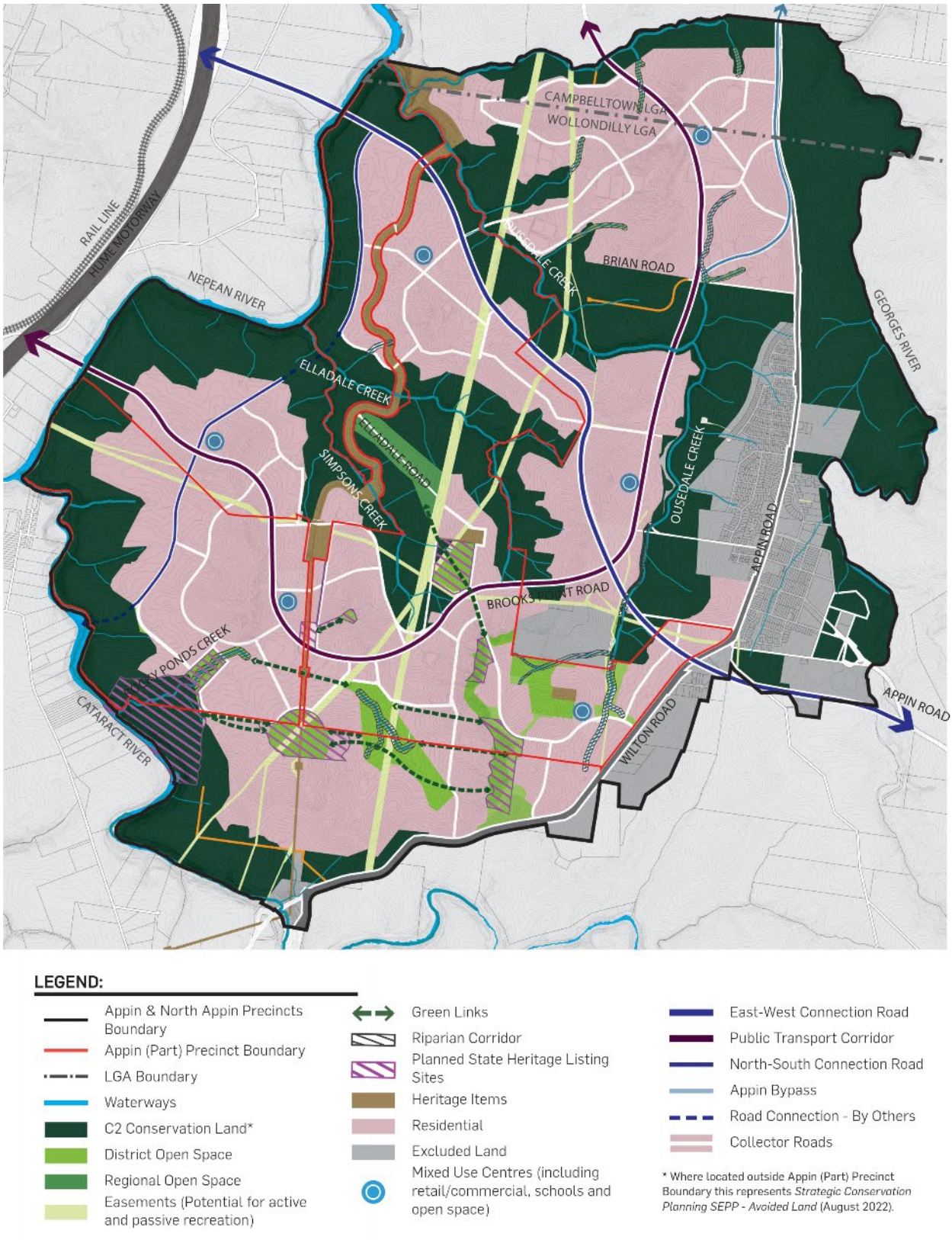
Neighbourhood	Total lots	% House completions			Total jobs	% Job completions		
		2026	2036	2056		2026	2036	2056
1	3,405	12%	100%	100%	420	0%	100%	100%
2	3,468	0%	100%	100%	400	0%	100%	100%
2A	4,354	0%	86%	100%	300	0%	0%	100%
3	3,361	0%	0%	100%	500	0%	0%	100%
3A	2,290	0%	0%	100%	2,110	0%	0%	100%
4	2,798	0%	0%	100%	0	0%	0%	100%
4A	630	0%	0%	100%	0	0%	0%	100%
5	1,559	0%	0%	100%	400	0%	0%	100%
	21,865	2% 408 lots	49% 10,633 lots	100% 21,865 lots	**4,130**	0%	20% 820 jobs	100% 4,130 jobs

Source: Walker Corporation 24 May 2022

Table 3.2 Breakdown of indicative dwelling size within the Appin and North Appin Precinct development

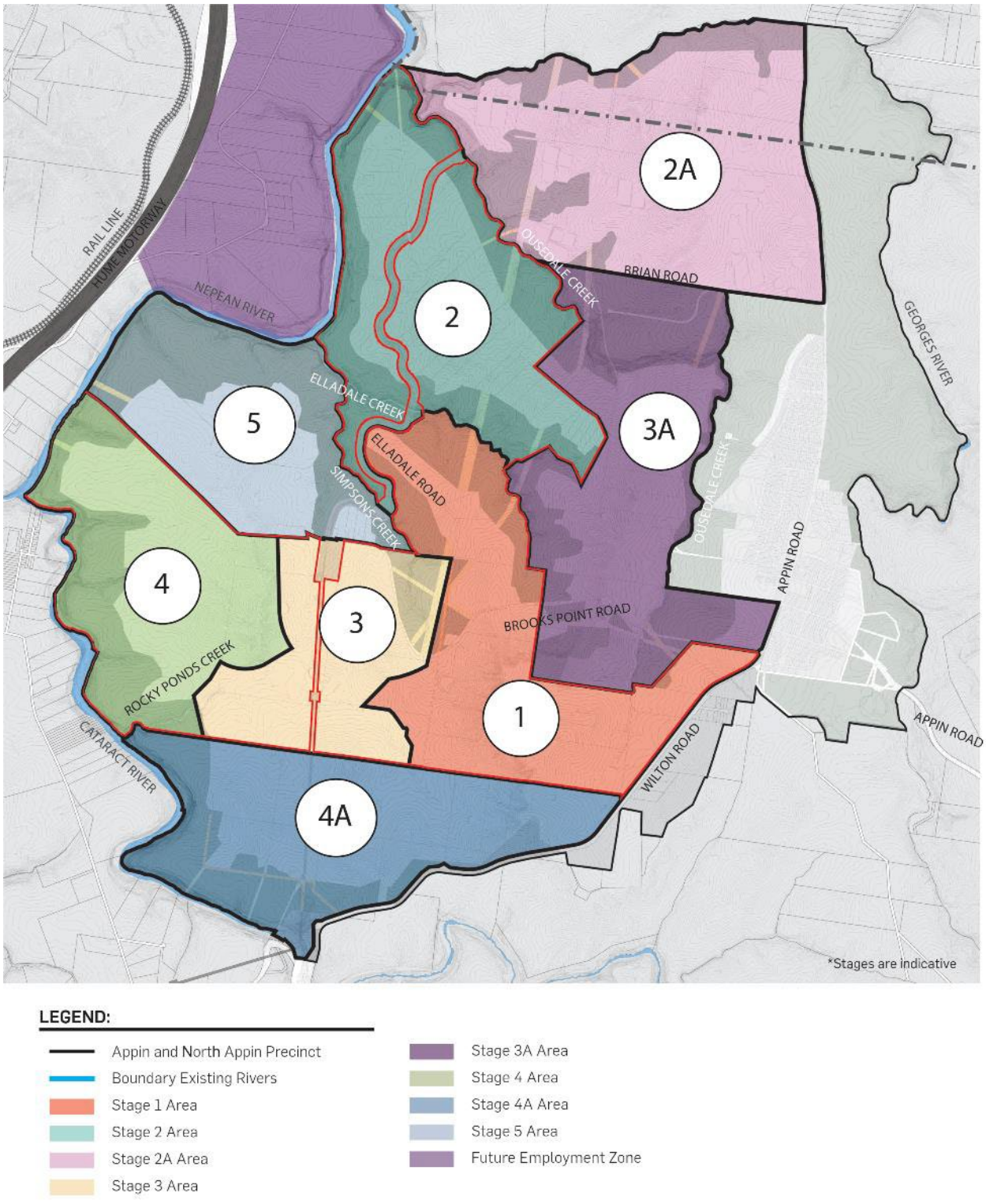
Stage	Retail GFA	Dwellings	Dwelling size					
			Apartments	Medium density	Traditional lots	Large lots	Rural lots	Total
1	3,000	3,405	0%	34%	62%	4%	0%	100%
2	3,000	3,468	0%	13%	87%	0%	0%	100%
2A	3,000	4,354	0%	4%	87%	9%	0%	100%
3	3,000	3,351	3%	59%	33%	5%	0%	100%
3A	30,000	2,300	13%	41%	39%	7%	0%	100%
4	0	2,798	0%	7%	85%	8%	0%	100%
4A	0	630	0%	15%	56%	10%	19%	100%
5	3,000	1,559	0%	0%	94%	6%	0%	100%
Total	**45,000**	**21,865**	**2%**	**23%**	**69%**	**5%**	**1%**	**100%**

Source: Walker Corporation 24 May 2022



Source: *Walker Corporation, 06 October 2022*

Figure 3.1 Indicative Structure Plan



LEGEND:

- Appin and North Appin Precinct
- Boundary Existing Rivers
- Stage 1 Area
- Stage 2 Area
- Stage 2A Area
- Stage 3 Area
- Stage 3A Area
- Stage 4 Area
- Stage 4A Area
- Stage 5 Area
- Future Employment Zone

APPIN AND NORTH APPIN PRECINCT - STAGING PLAN

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0 500 1000 1500 2000

DATE: 06-10-22
REVISION NO: -

Source: Walker Corporation, 06 October 2022

Figure 3.2 Draft staging plan

The West Appin Retail and Centres Strategy Report (Urbis, October 2020) estimated that about half of the employment demand from the future residents of the Appin and North Appin Precinct could be served by jobs within the Appin and North Appin Precinct Town Centre and the neighbourhood centres. Urbis identified that the remaining employment demand could be served by the major employment nodes (business parks and industrial precincts) beyond the primary trade area.

3.1.2 Greater Macarthur Growth Area developments

Development is planned throughout the Greater Macarthur Growth Area. The strategic land use forecasts for the developments to the north, west and south are outlined in Table 3.3. The areas considered are shown in Figure 3.3.

Table 3.3 Surrounding area population and employment forecasts

Travel zones	Description	Local council area	Population				Jobs			
			2019	2026	2036	2056	2019	2026	2036	2056
3206, 3207, 3301, 3302, 3303, 3304, 3306	St Helens Park, Glen Alpine, Rosemeadow	Campbelltown	21,003	22,107	23,947	38,419	1,925	2,148	2,419	2,915
3127, 3128, 3129, 3130	Spring Farm	Camden	7,468	11,246	14,544	47,807	1,039	1,130	1,317	1,819
3300, 3305, 3005	Menangle, Menangle Park	Campbelltown	1,209	4,040	7,655	8,364	699	1,641	2,505	4,757
3307	Gilead	Campbelltown	453	2,812	9,738	11,785	301	437	552	767
3009	Appin	Wollondilly	2,843	4,172	16,472	43,472	1,971	3,819	5,418	11,092
3007	Douglas Park	Wollondilly	1,420	1,463	1,519	2,247	725	1,197	1,632	2,414
3008, 3010	Wilton	Wollondilly	3,924	7,687	16,237	20,740	968	1,852	2,601	7,921
Total			**38,320**	**53,527**	**90,112**	**172,835**	**7,628**	**12,225**	**16,443**	**31,684**

Source: Transport for NSW Population and Employment Forecasts 2016 v1.51

Notes See Table 3.1 for Zone 3009 forecasts

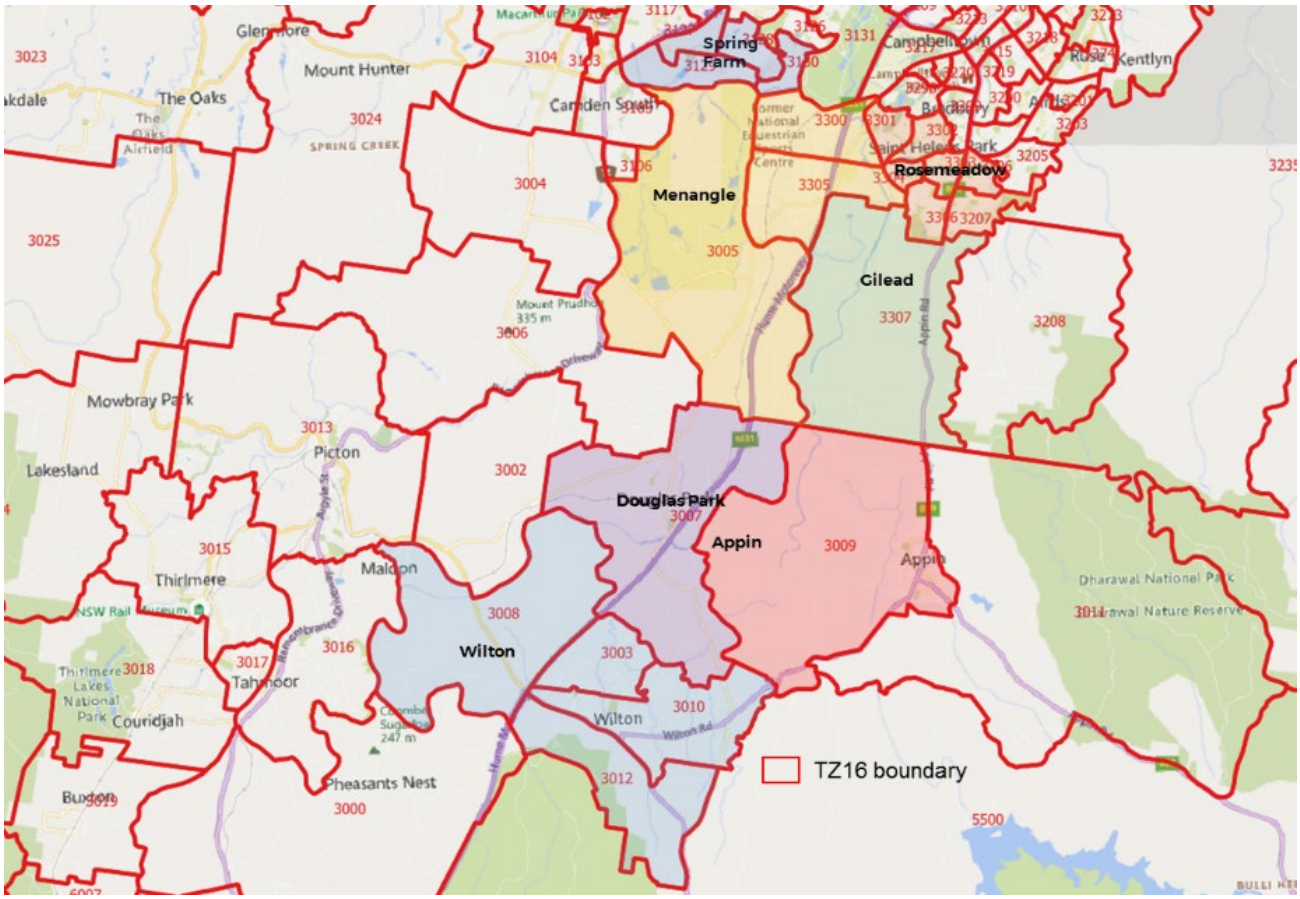


Figure 3.3 STM TZ16 Travel zones

3.2 Road network

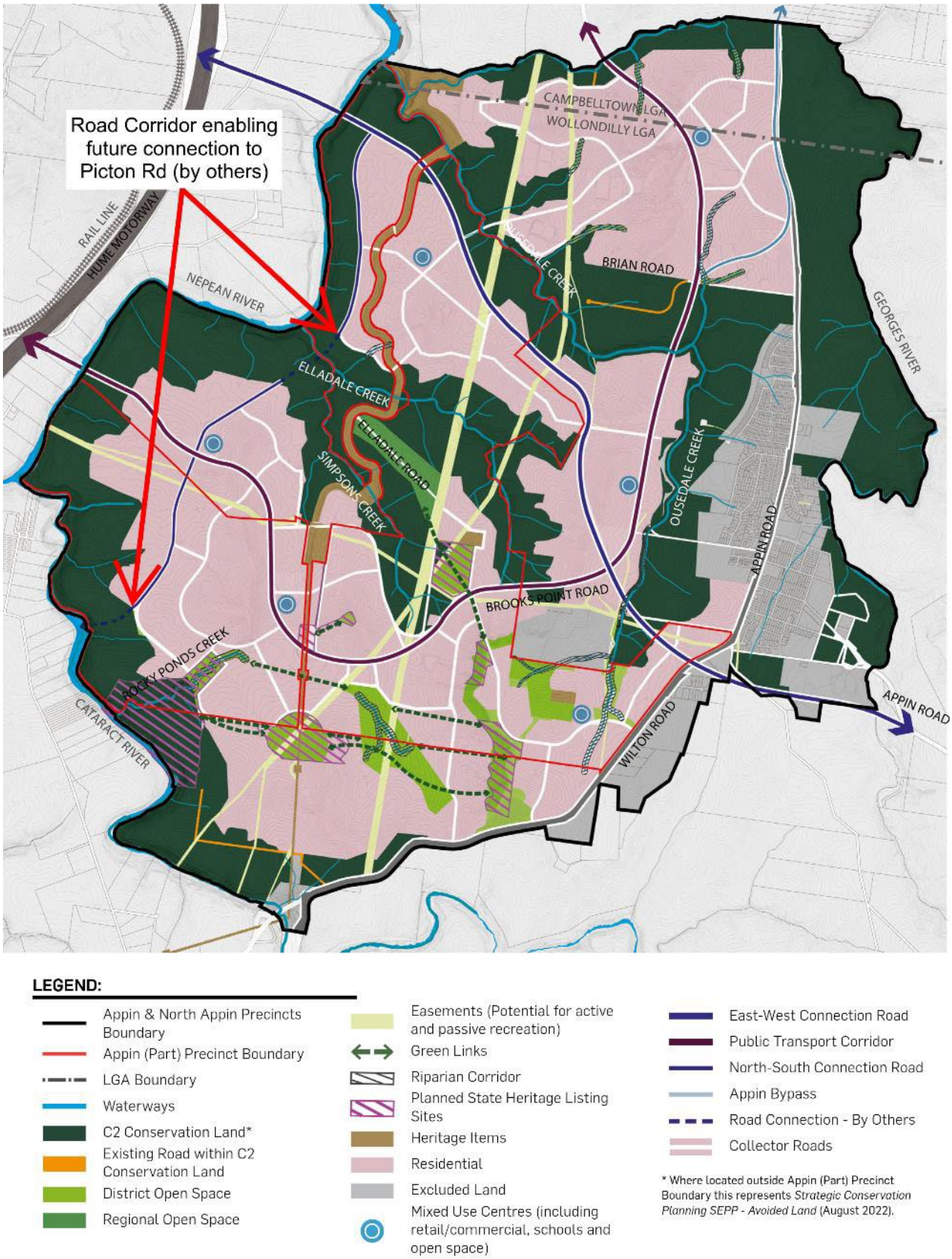
3.2.1 M9 Outer Sydney Orbital

In addition to the planned transport network for the Appin and North Appin Precinct and Greater Macarthur Growth Area, Transport for NSW has considered the need to protect land for the Outer Sydney Orbital within the Greater Macarthur Growth Area.

During 2020 and 2021, Transport for NSW exhibited options for Outer Sydney Orbital Stage 2-Sector 1, with a preferred corridor announced in August 2021.

During the Appin TAP process and presentation of technical studies in late 2021 and early 2022, it was clear that the preferred corridor would have impacts on the cultural landscape, koala corridors and housing provision in accordance with the existing strategic and statutory planning framework.

In this context, Transport for NSW advised the TAP that an alternative road configuration and corridor within the Appin and North Appin Precinct, shown in Figure 3.4, be protected for a north south connection to Picton Road. The Transport network identified in Greater Macarthur 2040 aligns with this strategy.



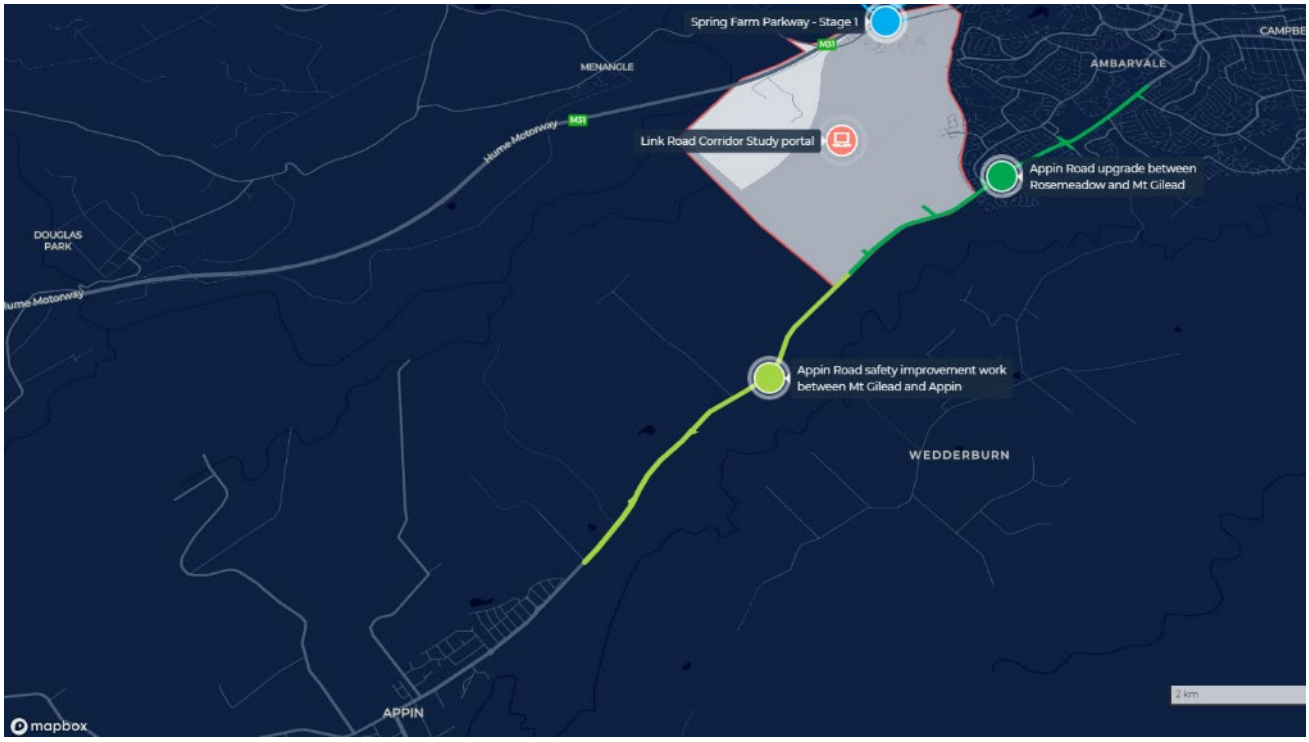
Source: Walker Corporation, 06 October 2022

Figure 3.4 Draft structure plan with road corridor provision for future connection to Picton Road

3.2.2 Appin Road to Bulli

Currently carrying about 10,900 vehicles per day[1], Appin Road will continue to be a key intra-regional road connecting Campbelltown CBD to the southern developments and also connecting these developments to the east coast. Appin Road Improvements Project has progressed to detailed design phase in the areas highlighted in Figure 3.5. The section between Gilead and Rosemeadow is planned to be widened to four lanes. Between Gilead and Appin, improvements to the road to improve safety are being planned including:

- Wider lanes and shoulder widths, increased clear zones and improved road surface
- New sections of roadside safety barriers and sections of painted median with safety barriers
- A new overtaking lane for northbound traffic
- Installation of new right turn bays with U-turn facilities for residents entering and exiting driveways
- Realignment of a road curve with painted median and safety barrier.



Source Transport for NSW MapBox 2020

Figure 3.5 Detailed Design Works for Appin Road

3.2.3 Supporting road network

The draft structure plan shown in Figure 3.2 shows the proposed internal road network within the Appin and North Appin Precinct along with the East-West Connection Road. The function and connectivity of these roads is summarised in Table 3.4. All local and collector roads are to provide for and encourage active transport modes through wide footpaths and controlled pedestrian crossings at signalised junctions.

[1] Transport for NSW Traffic Volume Viewer – Site 07.759 Appin Road 350 m north of Princes Motorway, 2021 AADT

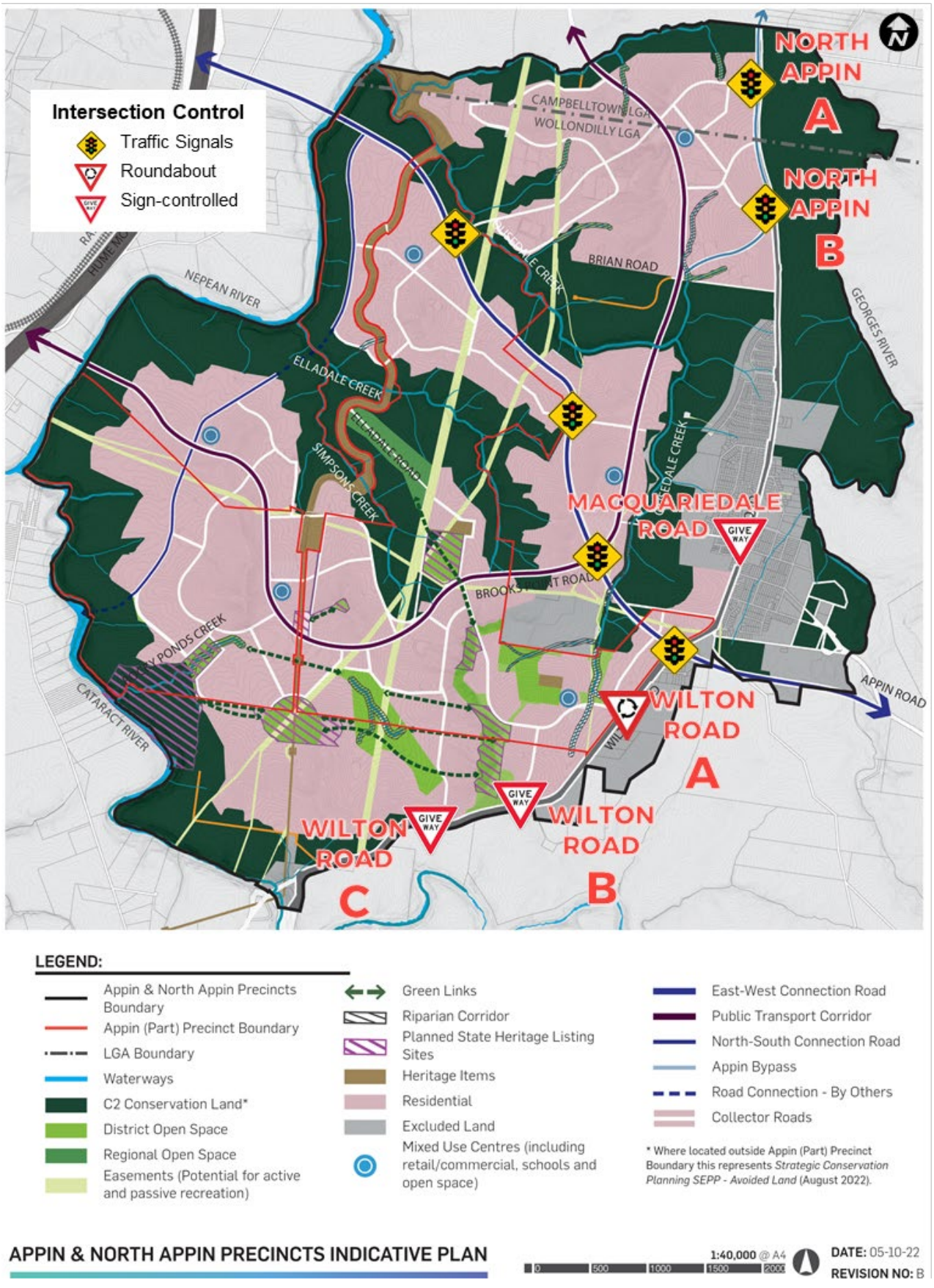
Table 3.4 Supporting road network

Road	Function	Connectivity	Notes
East-West Connection Road	Connection road for Appin and North Appin Precinct and regional traffic between Appin Road and the Hume Motorway	Interchange with Hume Motorway, Appin and North Appin Precinct local town centre, off-set interchange at Appin Road.	Potential to develop in stages. Local roads provide access in interim.
Transit Corridor	Public transport route Internal collector/distributor road parallel to Appin Road and Wilton Road	At-grade intersections to local roads, connects to each neighbourhood. Continues north to Macarthur and west to Douglas Park (future)	Central to enabling development of the neighbourhoods. Timing for full corridor to Macarthur requires other developments further north to be constructed
Local roads	Local access within each neighbourhood Some shorter sections of collector roads	Connect properties to collector/distributor roads.	Developed as lots are activated.

As the development progresses, new access intersections are proposed to Appin Road and Wilton Road, as outlined in Table 3.5 and shown in Figure 3.6. The use of the existing Macquariedale Road and Brooks Point Road (existing public roads) is to maintain multiple access points to development stages for flexibility, especially for those close to bushland (in the event of a bushfire).

Table 3.5 Appin and Wilton road accesses

Access	Serving neighbourhoods	Approximate timing based on delivery staging	Configuration
North Appin A	2, 2A	2030	Signalised intersection/roundabout
North Appin B	3, 3A	2034	Signalised intersection/roundabout
Macquariedale Road	Existing Appin township to Stage 3A	Existing	Traffic calming at western end to minimise impact and use
Wilton Road A	1, 3, 4, 5	2026	Signalised intersection/roundabout
Wilton Road B	4A	2051	Priority Sign
Wilton Road C	4A	2051	Priority Sign



Source: Walker Corporation, 06 October 2022

Figure 3.6 Access location and indicative intersection control

4 Traffic modelling

4.1 Methodology

4.1.1 Traffic model source

Traffic modelling for this assessment was carried out within the Sydney Traffic Forecasting Model (STFM) using EMME 4.3.7. The road network and trip matrices for the STFM were provided by Transport for NSW with the STFM trip assumption inputs and the models use illustrated in Figure 4.1.

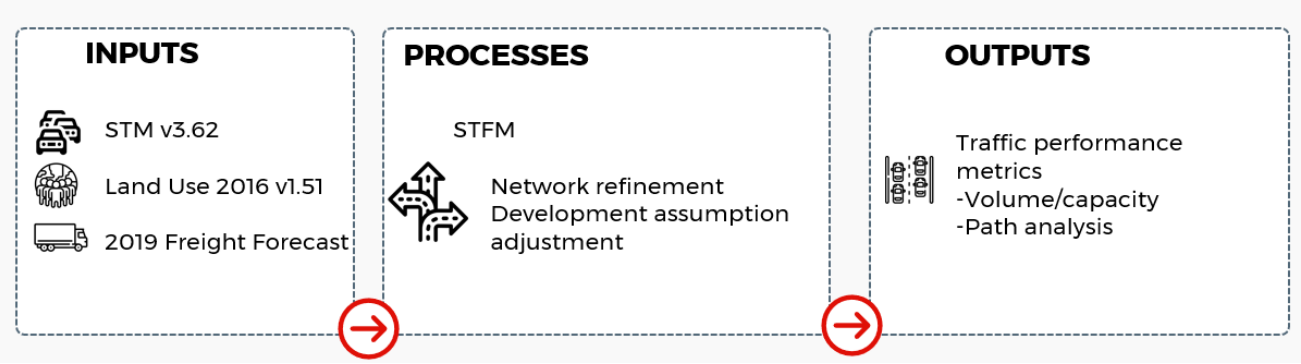


Figure 4.1 STFM modelling process

4.1.2 Traffic modelling approach

A review of the base year STFM was undertaken to confirm the level of suitability for the strategic assessment of the Appin and North Appin Precinct development. The review included interrogating the road network in and around Appin and a review of the modelled volumes against available traffic counts. The review concluded the model was suitable for a strategic level assessment but would require further refinement, particularly to traffic demands and zone loading, if the model was to proceed to more a detailed study or to inform a mesoscopic model. The traffic demands were calibrated against link flows which is suitable for the intended purpose of this study.

To capture the internal road network and reflect the land use assumptions provided within the structure plan, the Appin area was disaggregated (split) into nine zones to reflect each precinct. The structure plan was used to inform the demographic inputs for each precinct in the form of number of households and employment.

Trip rates based on number of households and employment were back-calculated from two nearby zones (Wollondilly and Campbelltown) with similar land use to that of the ultimate development. Trip assignment patterns on the road network were a blend of travel patterns from these two zones as they were considered a reasonable representation of future patterns based on the level of development and land use types.

The resulting trips from these calculations were re-entered into the STFM and assigned to the network to undertake a performance assessment.

4.1.3 Modelling assumptions

4.1.3.1 Trip rate assumptions

Trip rates were modified over time to reflect the transition from an existing rural land use to a future suburban land use.

Traditional single dwelling lots

Commencement of Development (2026):

The trip rate assumptions used in the strategic network assessment for the 2026 model horizon were derived by:

- Calculating trip generation rates based on trip rates per person derived from those in the STFM. The persons per household for trip rate was calculated on Walker's development forecast, dated 21 December 2020, to reflect the number of households and population.
- Note that the trip rates from the STFM are lower than the Roads and Maritime Services *Technical Direction TDT13/04a Guide to Traffic Generating Developments Updated traffic surveys* and the trip distribution from the STFM appears to be missing local trips to local schools, shops and employment which are typically shorter and often intra-zonal trips.
- Adjusting the trip rates from the STFM to include more internal trips, resulting in higher trip generation rates overall:
  - 0.84 trips per single dwelling in the AM peak hour
  - 0.94 trips per single dwelling in the PM peak hour'
- Applying in/out directional splits of:
  - 70 per cent out/30 per cent in during the AM peak hour
  - 30 per cent out/70 per cent in during the PM peak hour.

Mid-development (2036):

The trip rate assumptions used in the strategic network assessment for the 2036 model horizon were derived by:

- Using demographic projections associated with people per household of the reference zone and the increase in local trips:
  - 0.88 trips per single dwelling in the AM peak hour
  - 0.99 trips per single dwelling in the PM peak hour
- Applying in/out directional splits of:
  - 70 per cent out/30 per cent in during the AM peak hour
  - 30 per cent out/70 per cent in during the PM peak hour.

Ultimate Development (2056)

The trip rate assumptions used in the strategic network assessment for the 2056 model horizon were derived by:

- Using demographic projections associated with people per household of the reference zone and the increase in local trips and assumed change in public transport usage from the STFM:
  - 0.74 trips per single dwelling in the AM peak hour
  - 0.81 trips per single dwelling in the PM peak hour
- Applying in/out directional splits of:
  - 70 per cent out/30 per cent in during the AM peak hour
  - 30 per cent out/70 per cent in during the PM peak hour.

Medium density dwellings

Based on the Roads and Maritime Services *Technical Direction TDT13/04a Guide to Traffic Generating Developments Updated traffic surveys* the trip generation for medium density dwellings is estimated as:

- 0.55 trips per single dwelling in the AM peak hour
- 0.55 trips per single dwelling in the PM peak hour.

This equates to 62 per cent of the traditional single-dwelling trip generation rate.

Apartments

The trip generation rate for apartments is also based on the Roads and Maritime Services *Technical Direction TDT13/04a Guide to Traffic Generating Developments Updated traffic surveys*:

- 0.53 trips per single dwelling in the AM peak hour
- 0.32 trips per single dwelling in the PM peak hour.

This equates to 49 per cent of the traditional single-dwelling trip generation rate.

The modelling undertaken in 2021 was based on an assumption of 20,000 single-dwelling lots in the Appin and North Appin Precinct, with 5,000 in North Appin and 15,000 in the rest of Appin Precinct. The current Structure Plan has slightly adjusted the location of dwellings and introduced a mix of traditional single-dwelling, medium density and apartments.

Using the above trip generation rates, the dwelling numbers from Table 3.1 and the breakdown of the dwelling size and in Table 3.2, it is estimated that the currently proposed total of 21,865 dwellings (including 400 apartments and 4,828 medium density dwellings) equates to approximately 19,826 traditional single-dwellings, i.e. the impact of the development at completion is expected to be similar to that assessed in 2021.

4.1.3.2 Trip assignment patterns

To maintain consistency with the existing strategic modelling of the Greater Macarthur region, the trip distribution for the Appin and North Appin Precinct development was based on nearby areas in the model that contain developments with similar features to those planned for the Appin and North Appin Precinct. Rosemeadow was identified as a mature development with similar land use patterns and the trip distribution was applied from this zone. This was combined with the distribution from Wollondilly Shire to recognise the convenient access to the North-West future employment areas around Western Sydney Airport and the Aerotropolis as well as employment opportunities in Wollongong, a 30-minute drive away.

The internal trip containment was estimated from the STFM and then overlaid with additional local trips to the proposed Town Centre and employment precincts at Douglas Park on the western side of the Nepean River.

Figure 4.2 shows the resulting trip distributions by peak period. The internal trip percentages are shown in dark blue. The remaining percentage of trips were distributed based on the blended trip patterns from Rosemeadow and Wollondilly. These trips are shown in red.

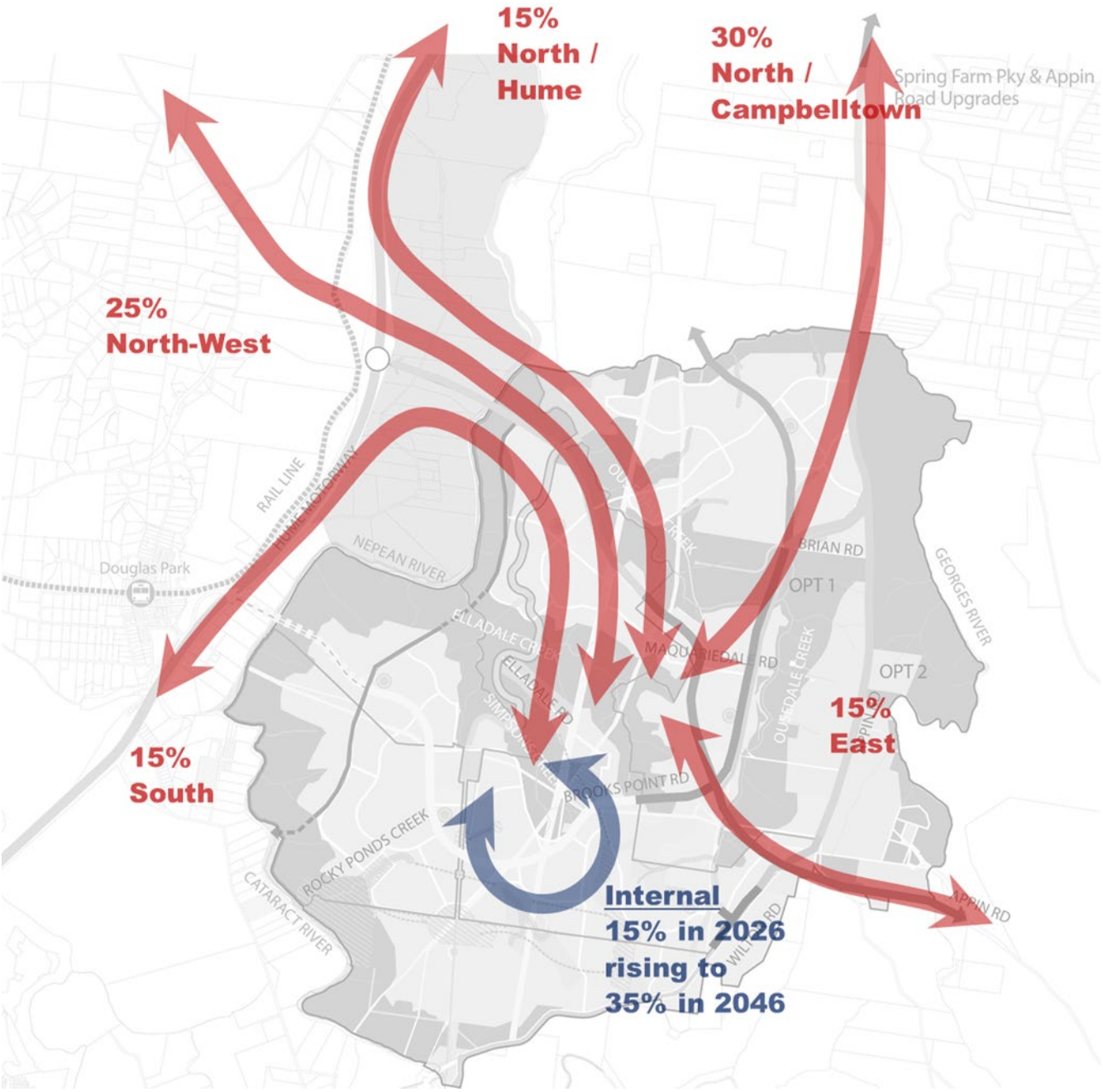


Figure 4.2 Appin and North Appin Precinct trip distribution by direction and peak period

4.1.3.3 Network configuration

The STFM was updated to reflect the latest structure plan and is coded for the ultimate 2056 strategic road network as shown Figure 4.3. The 2056 strategic road network includes:

- Spring Farm Parkway a four-lane arterial road connecting Appin Road to the Hume Highway north of Gilead (currently under construction).
- Appin Road upgraded to four-lanes north of Appin Village to Campbelltown.
- East-West Connection Road coded with four lanes connecting Appin Road to the Hume Motorway.
- The proposed Transit Corridor is coded and assumed to be a four-lane collector standard road.
- A four-lane connector road connecting Appin Road and Moreton Park Road (Link Road A).

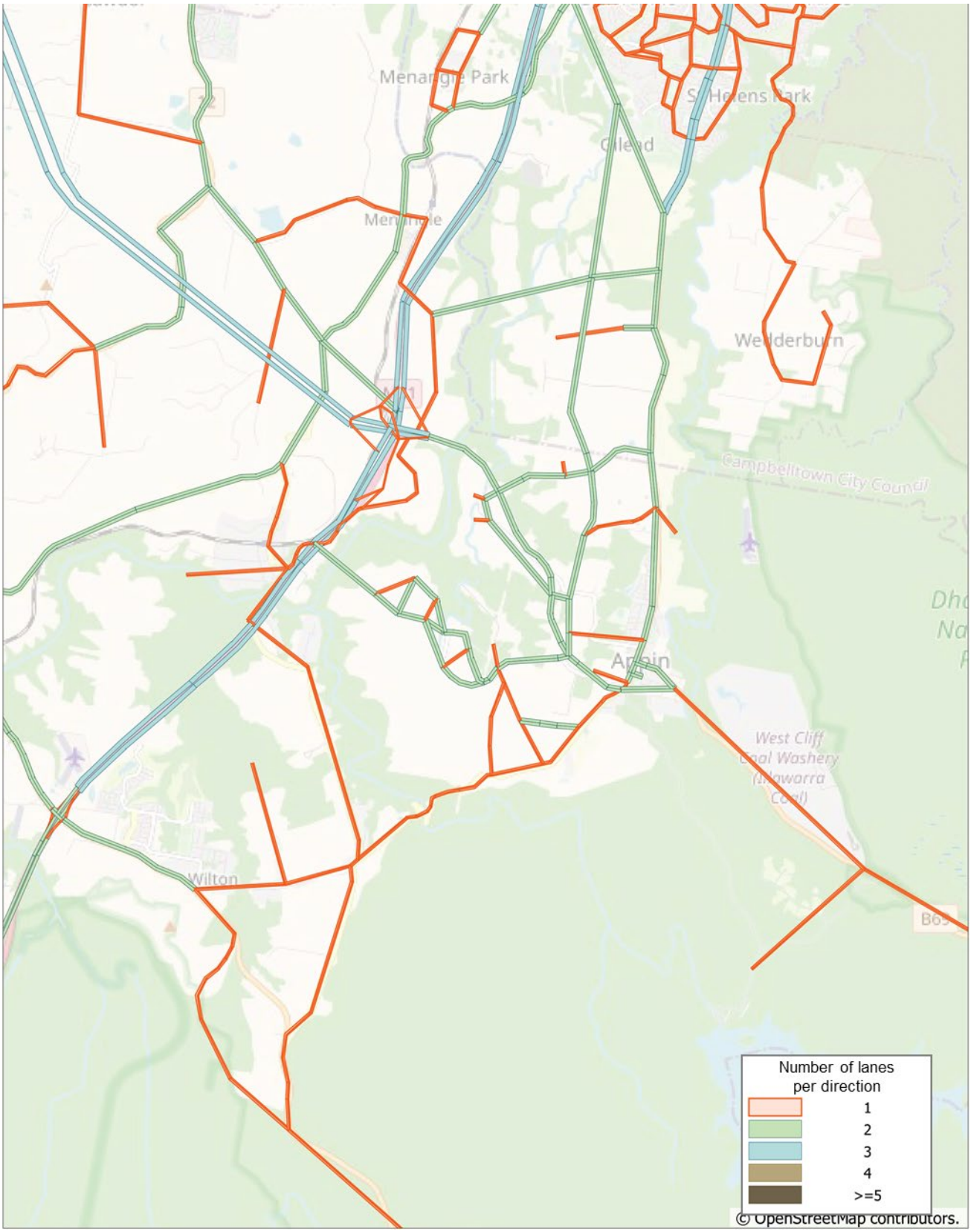
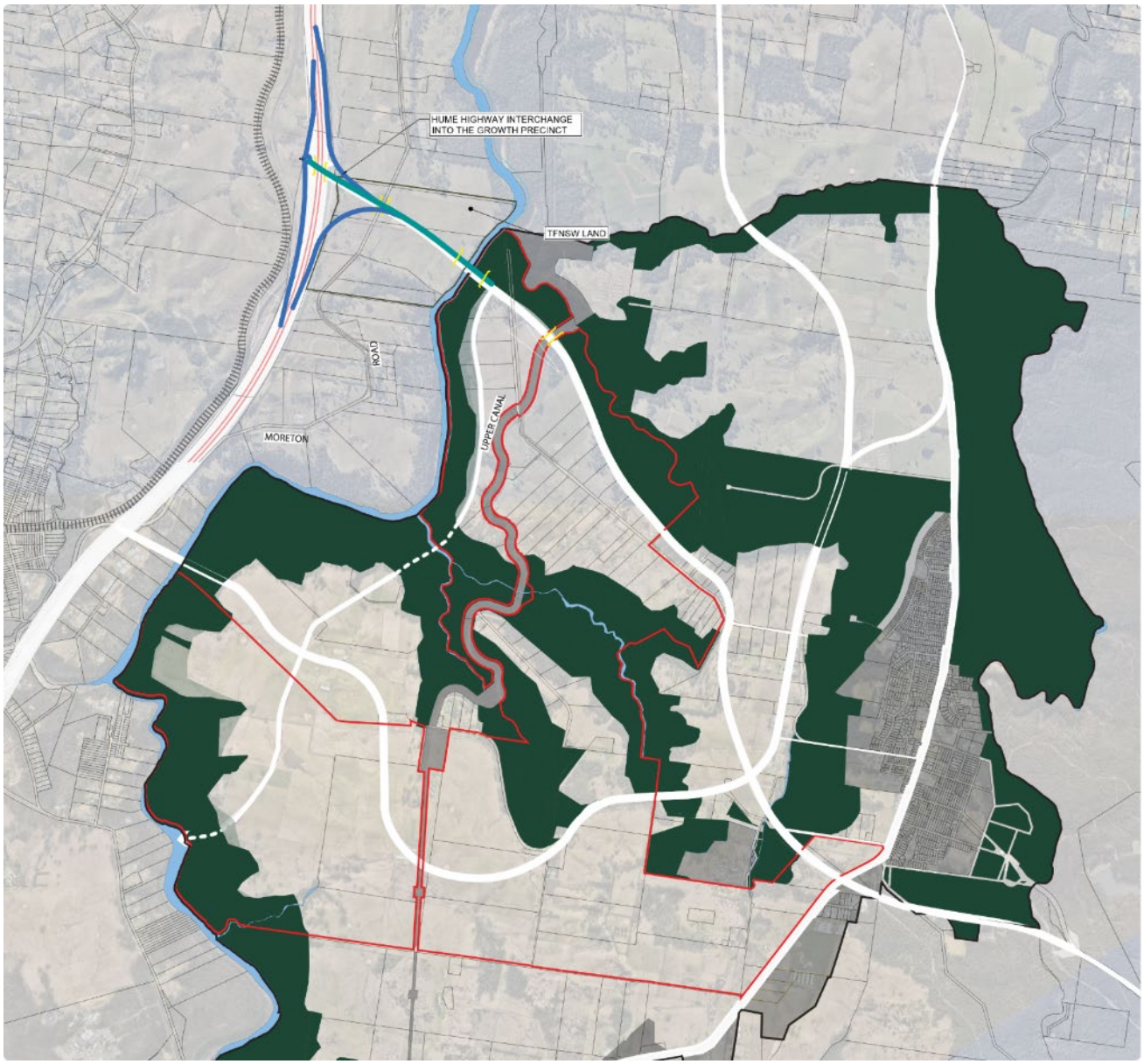


Figure 4.3 STFM Plot illustrating number of lanes by 2056

For the purpose of the strategic transport modelling, a connection (interchange) between the Hume Motorway and East-West Connection Road was included in the model. The modelled layout, shown in Figure 4.4, provides connection to/from the Hume Motorway to the north and south. It would also facilitate a future connection between the Outer Sydney Orbital Stage 1 (M9 Motorway). The final layout will be determined by Transport for NSW, subject to further consultation with relevant stakeholders.



Source: Walker Corporation, 06 October 2022

Figure 4.4 Modelled layout of Hume Motorway and East-West Connection Road interchange

4.2 Findings

4.2.1 Road requirements

The 2026, 2036 and 2056 traffic models were developed to understand the road requirements based on the likely staging of the land release. The results highlighted the PM peak period to be more critical for informing infrastructure needs and staging requirements. Therefore these are discussed in relation to the PM peak period.

The traffic modelling results in Figure 4.5 show that by 2026 the road network is sufficient to cater for the forecast traffic demands. The opening of the Spring Farm Parkway extension will relieve traffic congestion on Narellan Road through Campbelltown and the Hume Motorway, and the northern part of Appin Road.

The 2036 traffic modelling showed that some additional sections of Appin Road require upgrading to four-lanes north of Appin Township or alternatively around Appin Township. Figure 4.6 shows that the connection of Stages 2 and 2A to the Hume Motorway via the first part of the East-West Connection Road is required to divert the impact on Appin Road to Campbelltown and the Hume Motorway.

It is noted that developments further north along Appin Road, such as South Gilead, are anticipated to have to upgrade the section of Appin Road between their access and the currently proposed widening to Gilead.

By 2056, the ultimate strategic road network supports the proposed Appin and North Appin Precinct as well as regional travel needs, as shown in Figure 4.7, with only a short segment of Appin Road approaching capacity.

Given the nature of the strategic model, localised intersection upgrades are unable to be readily identified with additional detailed traffic modelling required to understand trigger points for these.

Detailed plots of modelled traffic volumes are provided in Appendix A.

4.2.2 Containment within the Appin and North Appin Precinct, and Greater Macarthur

As the STFM is not a four-step model with trip generation, distribution and mode choice elements, the amount of containment of trips within the Appin and North Appin Precinct area is a fixed input as is the mode choice. It was assumed that the maximum containment that could be achieved given the amount of employment and number of residential lots would be 30 per cent during the AM period and 23 per cent during the PM period. This is slightly lower than previous studies which assumed a containment of up to 35 per cent.

Measures to realise a higher level of self-containment would increase the potential for active and public trips and would reduce the longer-distance car trips assumed. Together, these would reduce the road network requirements for the Appin and North Appin Precinct.

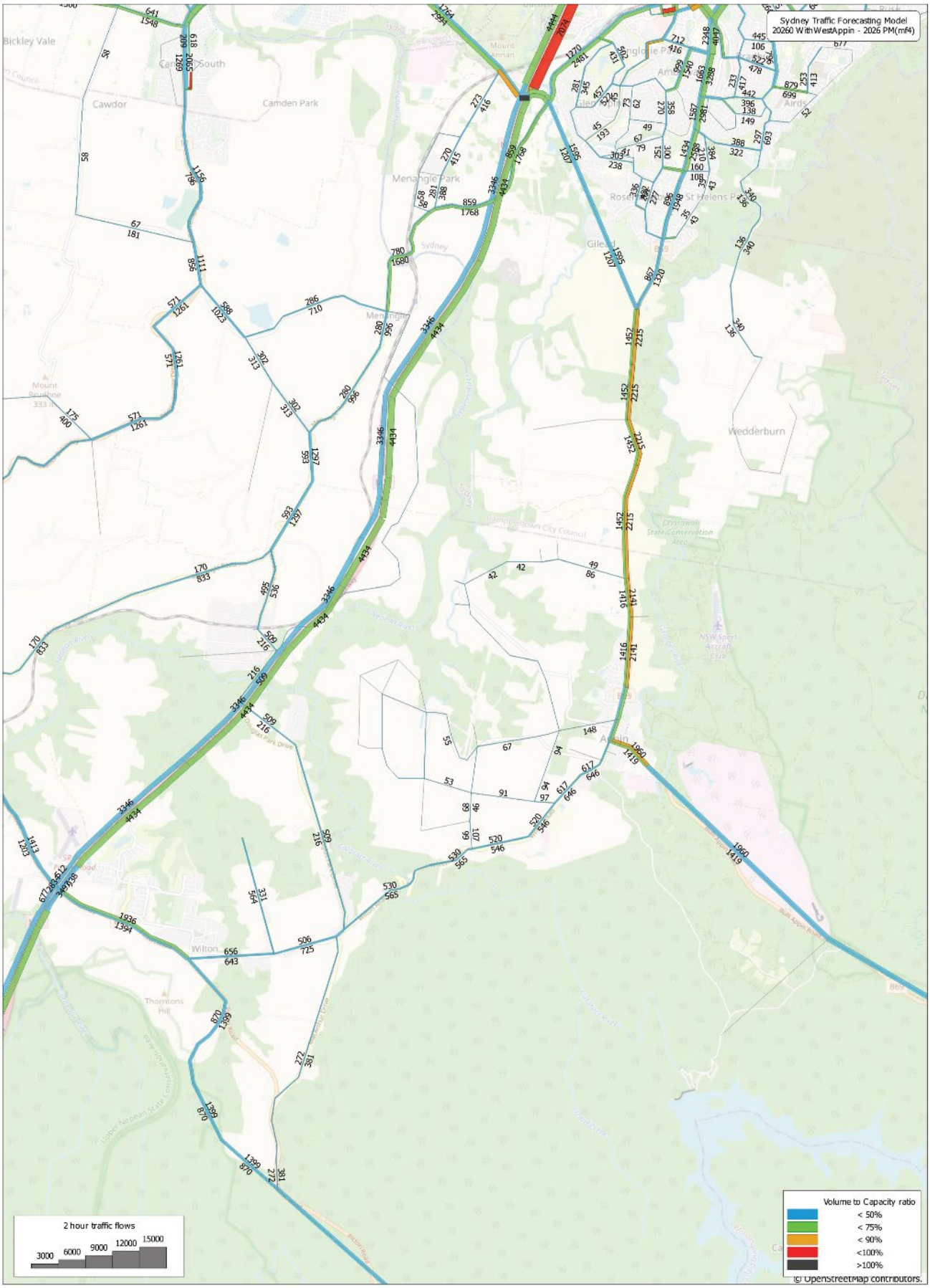


Figure 4.5 2026 PM peak forecast traffic volumes (2-hour peak) and volume to capacity ratio

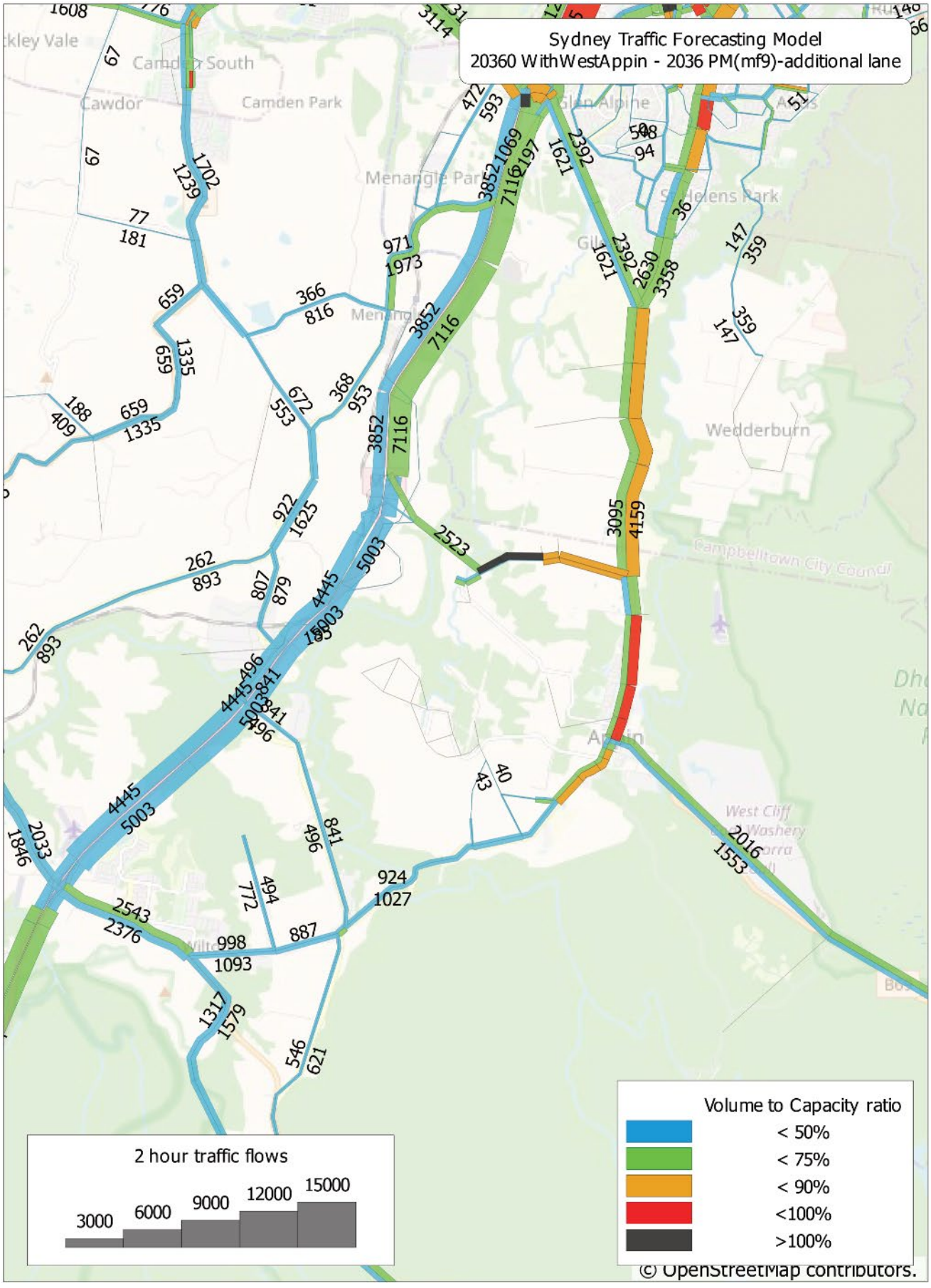


Figure 4.6 2036 PM peak forecast traffic volumes (2-hour peak) and volume to capacity ratio

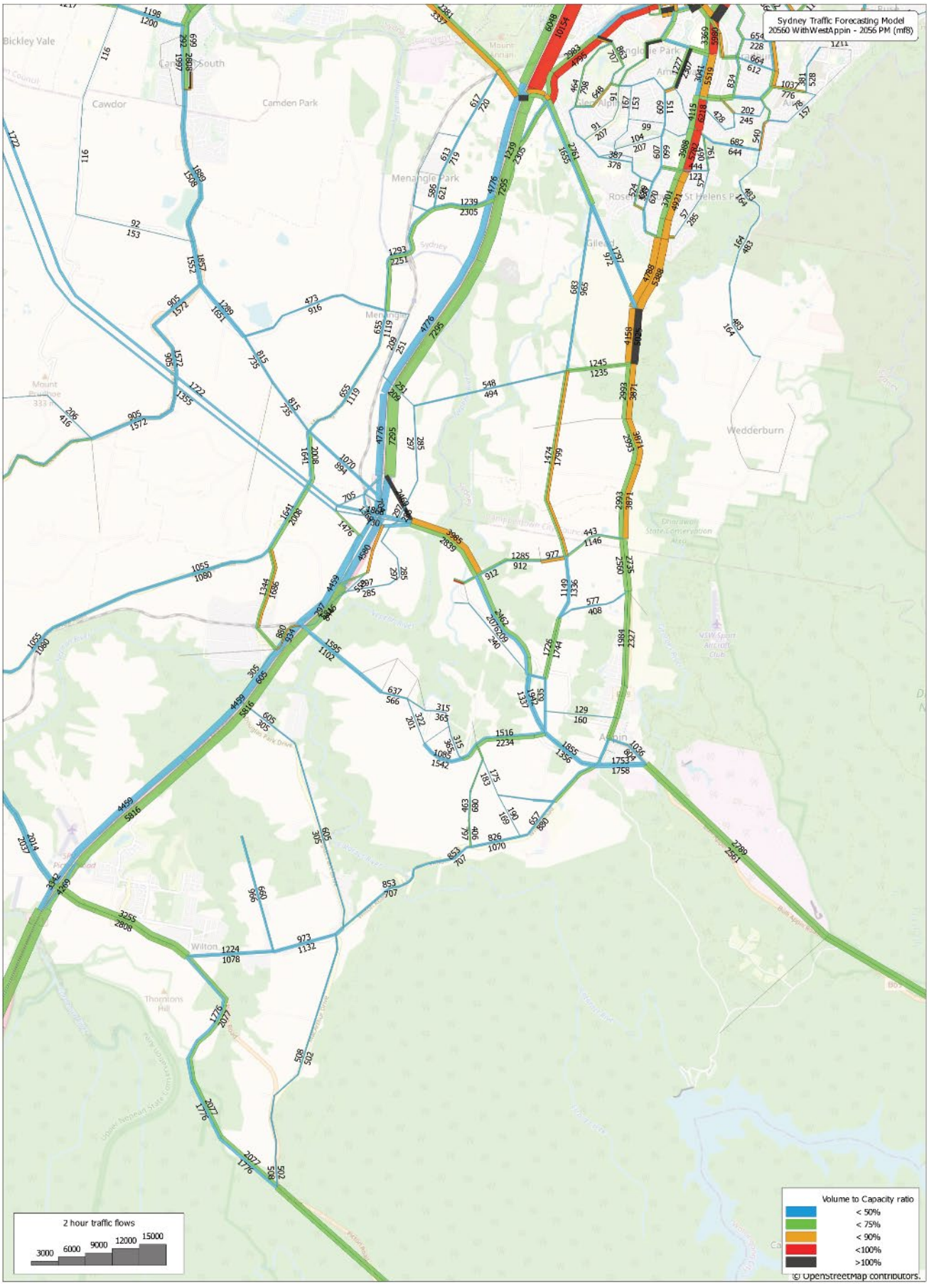
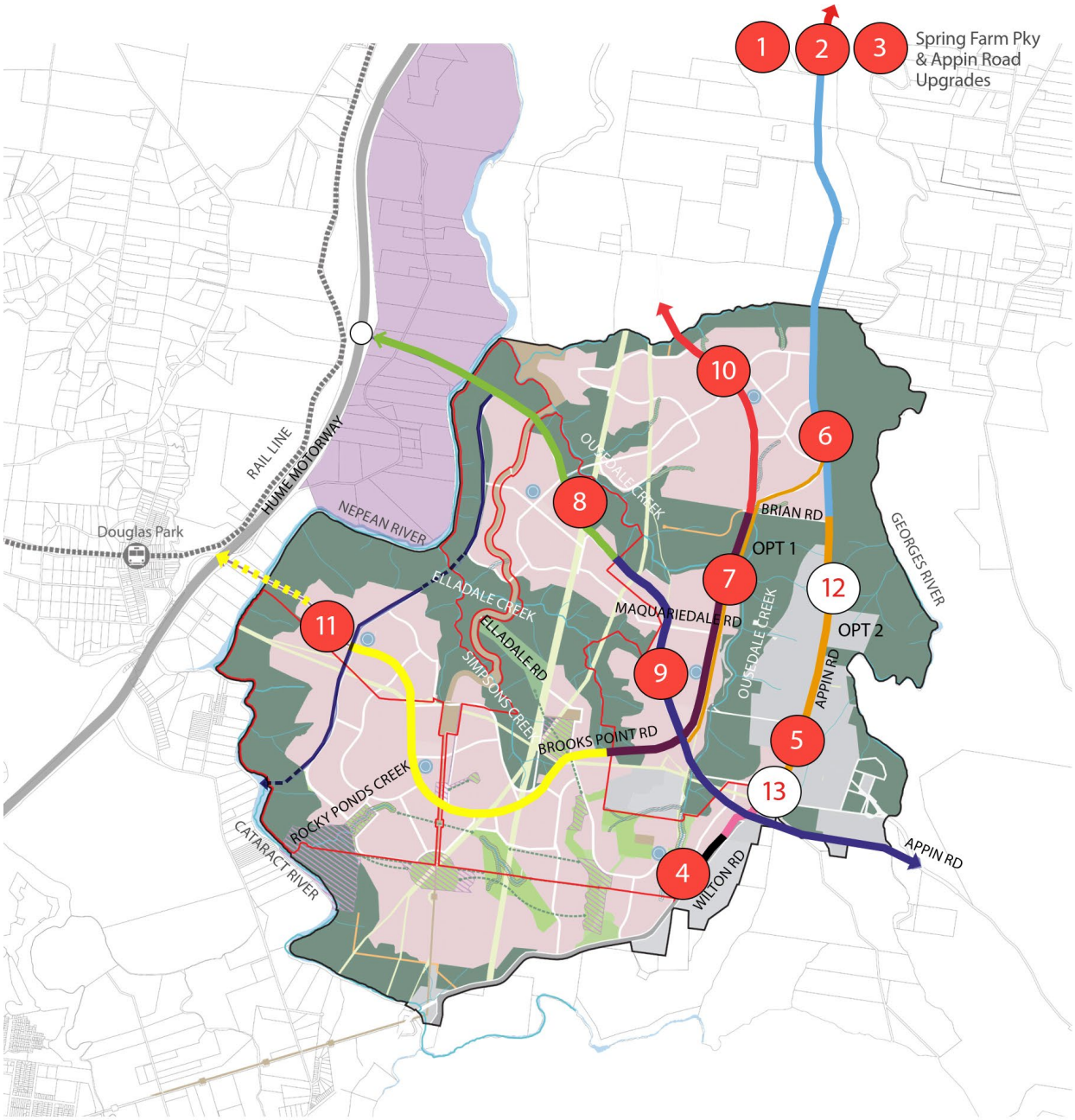


Figure 4.7 2056 PM peak forecast traffic volumes (2-hour peak) and volume to capacity ratio

4.3 Road network upgrades and timing

Based on the results of the strategic traffic modelling, a possible sequencing of the commencement of development and the timing of road upgrades is recommended to support the growth in regional traffic, traffic from other developments and traffic from the Appin and North Appin Precinct. A map of the road upgrades to be considered is shown in Figure 4.8. This excludes development roads that are required for that development only and wider regional road upgrades such as the widening of the Hume Motorway, M9 Motorway Stages 1 and 2 and the upgrading of Picton Road (by others). Figure 4.9 outlines the investment decisions and staging of road upgrades to support regional and development growth traffic. Changes in the release in timing of lots in the development, market conditions, access to land parcels and decisions about road upgrades would alter this sequencing.



LEGEND:

- Appin & North Appin Precincts Boundary
- Appin (Part) Precinct Boundary
- Appin Road Upgrade (Sth Gilead- Nth Appin)
- Transit Corridor (St 3A & St S2)
- Transit Corridor (St 1 & St S2)
- Transit Corridor (St 5 & Moreton Pk)
- East-West Connection Rd (Hume Hwy & St 2)
- East-West Connection Rd (St 2 & Appin Rd)
- North-South Connection Road
- Road Connection (by others)
- Spring Farm Parkway & Appin Road Upgrade (North of Appin - by others)
- Appin Road Upgrade / Bypass Options
- Wilton Road Upgrade - Bypass Option
- Wilton Road Intersection Upgrade
- Hume Highway Interchange

APPIN & NORTH APPIN PRECINCTS
STRATEGIC ROAD NETWORK UPGRADES

1:40,000 @ A4
0 500 1000 1500 2000

DATE: 24-10-22
REVISION NO: B

Notes See Figure 4.9 and Table 4.1 for further explanation of upgrade reference numbers

Figure 4.8 Map of road upgrades

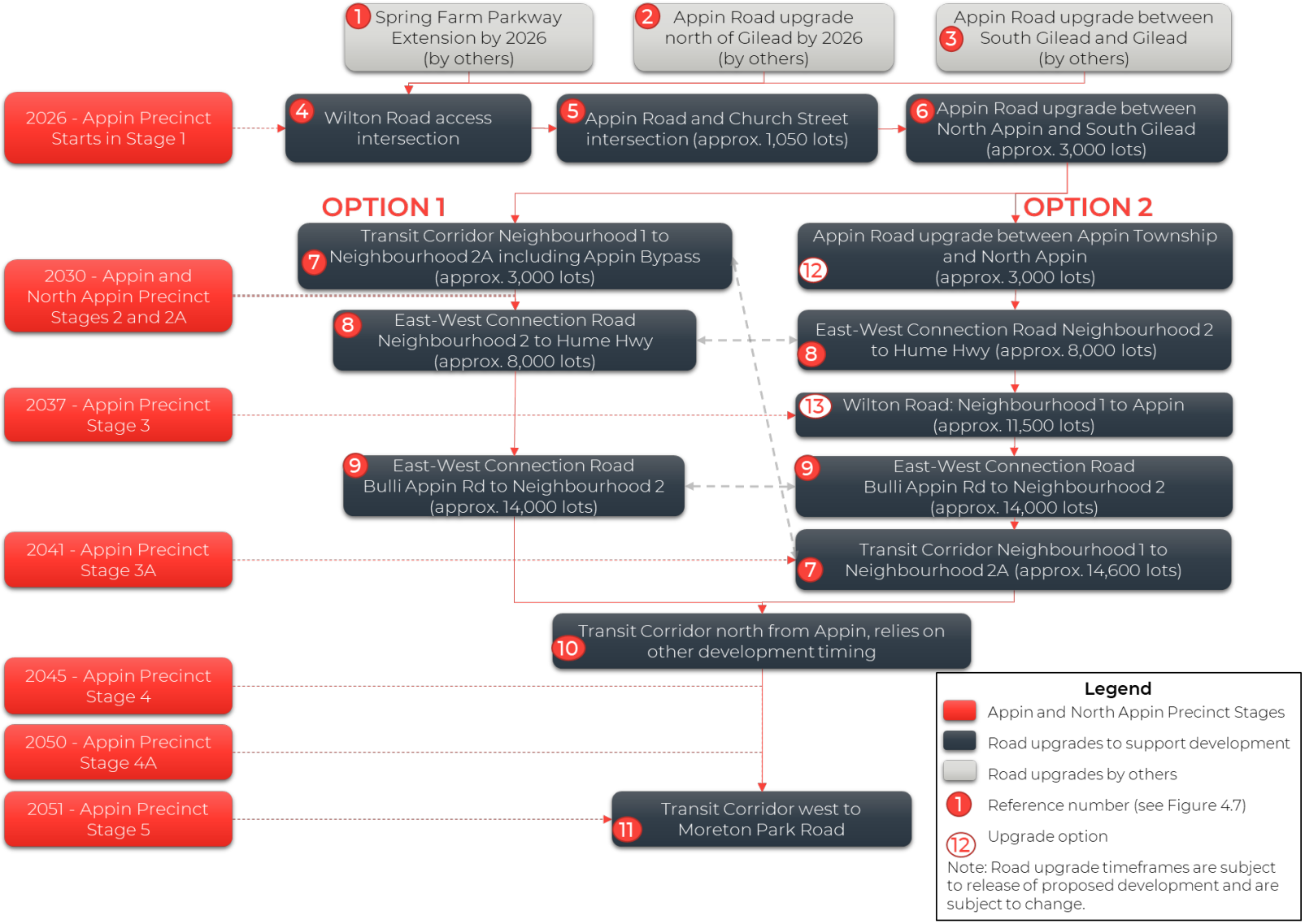


Figure 4.9 Road network upgrade staging

The timing of key road network upgrade is summarised in Table 4.1. These regional roads will cater for both regional traffic and traffic from the Appin and North Appin Precinct development.

Table 4.1 Reginal network requirements

Network element	Current form	Future form	Timing or Appin and North Appin Precinct staging	Comment
1. Spring Farm Parkway	Under construction	2 lanes per direction	By 2026 (by others)	Relieves Appin Road through existing residential areas Stage 1 under construction
2. Appin Road north of Gilead	1 lane per direction	2 lanes per direction	By 2026 (by others)	Staged widening as Gilead development proceeds south
3. Appin Road north of South Gilead	1 lane per direction	2 lanes per direction	By 2029 (by others)	Mount Gilead executed a VPA commits to delivery of this road section
4. Wilton Road access intersection	-	Roundabout/traffic signals (1 lane in each direction)	Access for Stage 1	Stage 1 access intersection
5. Appin Road intersection with Church Street	Stop-sign controlled intersection	Traffic signals	By the 1,051st residential lot registered	Accommodates current regional traffic and new development traffic
6. Appin Road north of North Appin	1 lane per direction	2 lanes per direction	By the 3,001st residential lot registered	Staged widening as development proceeds south
Option 1:				
7. Transit Corridor – Part 1: Neighbourhood 1 to Neighbourhood 2 and Appin Bypass	Not built	2 lanes per direction, transit corridor	By the 3,001st residential lot registered	Relieves Appin Road north of North Appin
8. East-West Connection Road Part 1 Neighbourhood 2 to Hume Motorway	Not built	2 lanes per direction	By the 8,001st residential lot registered	Relieves pressure on Appin Road, additional access to development, improved flexibility
9. East-West Connection Road Part 2 Bulli-Appin Road to Neighbourhood 2	Not built	2 lanes per direction	By the 14,001st residential lot registered	Relieves pressure on Appin Road through Appin.
Option 2:				
12. Appin Road north of Appin	1 lane per direction	2 lanes per direction	By the 3,001st residential lot registered	Staged widening as development proceeds south

Network element	Current form	Future form	Timing or Appin and North Appin Precinct staging	Comment
8. East-West Connection Road Part 1 Neighbourhood 2 to Hume Motorway	Not built	2 lanes per direction	By the 8,001st residential lot registered	Relieves pressure on Appin Road, additional access to development, improved flexibility
13. Wilton Road, Neighbourhood 1 to Appin	1 lane per direction	2 lanes per direction	By the 11,501st residential lot registered	Not required if the Transit Corridor is open within site
9. East-West Connection Road Part 2 Bulli-Appin Road to Neighbourhood 2	Not built	2 lanes per direction	By the 14,001st residential lot registered	Relieves pressure on Appin Road through Appin.
7. Transit Corridor – Part 1: Neighbourhood 1 to Neighbourhood 2	Not built	2 lanes per direction, transit corridor	By the 14,601st residential lot registered	Relieves Appin Road through Appin
10. Transit Corridor Part 2: Neighbourhood 2A north	Not built	2 lanes per direction, transit corridor	By the 14,601st residential lot registered, sections north depend on the timing of other developments	Enables high quality/efficient public transport services to operate to Macarthur Station
11. Transit Corridor Part 3: Neighbourhood 5 to Moreton Park Road	Not built	2 lanes per direction, transit corridor	Approx. 21,000 residential lots	Enables public transport services to extend to Douglas Park Station

Notes Road upgrade timeframes are subject to actual release of proposed development and are therefore subject to change.

4.4 Discussion

4.4.1 Appin township

Development in the Appin and North Appin Precinct land release is planned around a permeable road network with road connections to the east, north, south and west. However, during the early stages of development, road connections are likely to be limited to the areas in which development has commenced – alongside Wilton Road to the southwest of Appin. This will mean that the traffic impact of the initial stages will be concentrated on Wilton Road and Appin Road, including the section through Appin township.

The assessment of the future road performance has indicated that Appin Road will require upgrading north of Appin to Gilead. Option 1 constructs part of the North South Transit Corridor from Neighbourhood 1 traffic to act as a bypass of Appin township. Option 2 requires the widening of Appin Road from Church Street north through Appin township.

The construction of the East-West Connection Road and Appin bypass may reduce the volume of regional trips passing through Appin Township sufficiently to delay or avoid the need to widen Appin Road through the town.

4.4.2 Comparison to previous results

This strategic road network assessment was undertaken using the traffic generation and distribution assumptions within Transport for NSW's STFM. The STFM is a strategic traffic model that represents average workday traffic volumes and is calibrated against reported and validated against observed traffic count data. The STFM quantifies aggregate travel across regional areas and is intended for use in transport planning studies.

This produces different results to the AIMSUN model produced for the Greater Macarthur Area by Jacobs which uses the *Roads and Maritime Services Technical Direction TDT13/04a Guide to Traffic Generating Developments Updated traffic surveys*. This Technical Direction yields higher traffic generation rates as it looks at individual site traffic generation for peak times. It does not consider how these times vary across a week nor the potential for trip-chaining which reduces total traffic volumes on a network. AIMSUN models are more typically used to inform traffic engineering design.

The road network upgrade staging recommended in the Jacobs Greater Macarthur Investigation Area Strategic Transport Infrastructure Study included the following:

Infrastructure recommendations – by 2026:

- Spring Farm Parkway Extension: New arterial road with two lanes in each direction with Hume Motorway Interchange
- Appin Road – Gilead to Rosemeadow: Widened to two lanes in each direction
- Transit corridor – Gilead to Rosemeadow: New corridor with segregated transit and one traffic lane in each direction.

Infrastructure recommendations – by 2036:

- East-West Connection Road – Widened to three lanes in each direction and extended to Finns Road with Hume Motorway Interchange
- Appin Road – Gilead to Rosemeadow: Widened to three lanes in each direction
- Appin Road – Appin to Gilead: Widened to two lanes in each direction
- Transit corridor – Appin and North Appin Precinct to Gilead: New corridor with segregated transit and one traffic lane in each direction. Bridge and connection to Douglas Park.

Infrastructure recommendations – by 2051

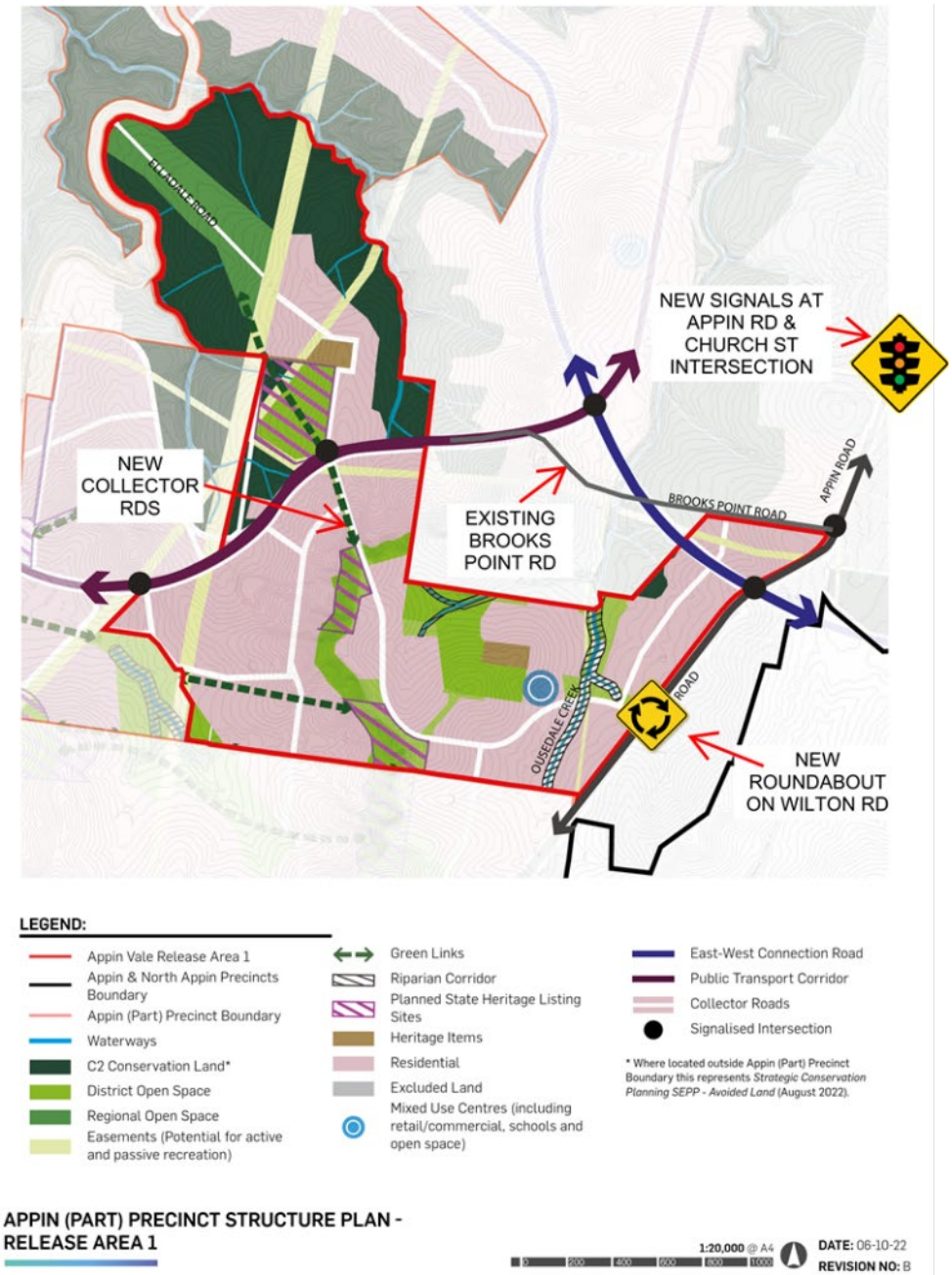
- Link Road A – Appin Road to Hume Motorway: New East-West Connection Road linking Menangle and Appin Road. Two lanes in each direction
- Transit corridor – Douglas Park to Macarthur: widened to two traffic lanes in each direction and transit connected to Douglas Park
- Spring Farm Parkway – Appin Road to Hume Motorway widened to three lanes in each direction east of Hume Motorway
- Broughton Pass: New bridge over Broughton Pass.

The need for the bridge at Broughton Pass is reduced by the East-West Connection Road and the connection of the Transit Corridor to Moreton Park Road. These other connections can provide the connectivity needed to the south-west. The traffic signals at the existing one-lane bridge would increase its capacity until these new connections are built.

5 Road layout

5.1 Stage 1 access

The Release Area 1 road network, shown in Figure 5.1, consists of a new access intersection on Wilton Road, with a new collector road extending west (one lane per direction). New local roads would connect to this new collector road.
An upgraded Brooks Point Road (one lane per direction – existing public road) would act as an interim second connection for release area 1, connecting back to Wilton Road/Appin Road. It would provide to the external road network in case of a blockage on the main connection. The new collector road would service approximately two-thirds of the 3,400 lots in this stage, with Brooks Point Road serving the remaining third.



Source: Walker Corporation, 06 October 2022

Figure 5.1 Stage 1 access arrangements

As Stage 1 develops, development will occur westwards from Wilton Road. The collector road will be adjoined by a planned neighbourhood centre and school site. It is proposed that the street design in the vicinity of the school and neighbourhood centre will change to create a street environment that supports slower speeds, improved crossing opportunities and a higher place-function.

The collector road should be constructed with a reserve width of 22.8 m (based on Wollondilly Council's Development Control Plan specifications) with a road carriageway of between 10.6 m. The surrounding retail development may be staged to create activity on one side of the collector street before the neighbourhood centre matures and retail development expands to both sides. The street design may also include treatments integrated within the streetscape to calm traffic, including street narrowings, marked pedestrian crossings, street trees, etc.

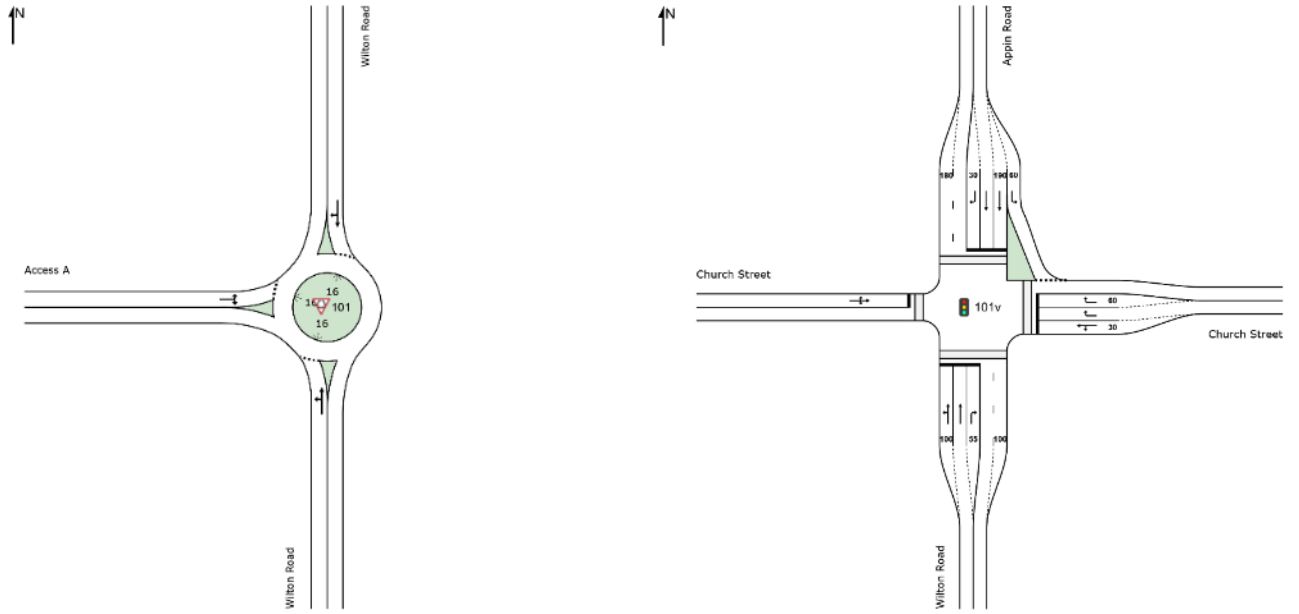
5.2 Stage 1 access intersections

The proposed main access intersection would consist of a one-lane roundabout. This is required to be constructed by the 3,000th residential lot. The intersection of Appin Road and Church Street would require an upgrade to traffic signals to accommodate the forecast traffic volumes on Appin Road as well as the development traffic on Wilton Road. The intersection performance is summarised in Table 5.1 for the potential intersection layouts shown in Figure 5.2. Based on the assessment of the existing layout and projected traffic volumes, it is estimated that the intersection of Appin Road and Church Street will require upgrading after the release of approximately 1,050 lots.

Table 5.1 SIDRA Intersection modelling results of Stage 1

Intersection	AM peak				PM peak			
	D/S	Ave. delay (sec/veh)	LoS	95th %ile Queue length (m)	D/S	Ave. delay (sec/veh)	LoS	95th %ile Queue length (m)
Appin Road and Church Street, Appin*	0.84	26	B	160 (south Wilton Road)	1.00	35	C	507 m (north Appin Road)
Wilton Road Access A	0.91	30	C	156 m (Access A)	0.79	24	B	108 m (north Wilton Road)

Notes * Assumes upgrade of intersection of Appin Road and Church Street to traffic signals



Wilton Road and development access

Appin Road and Church Street

Figure 5.2 Potential intersection layouts for Stage 1

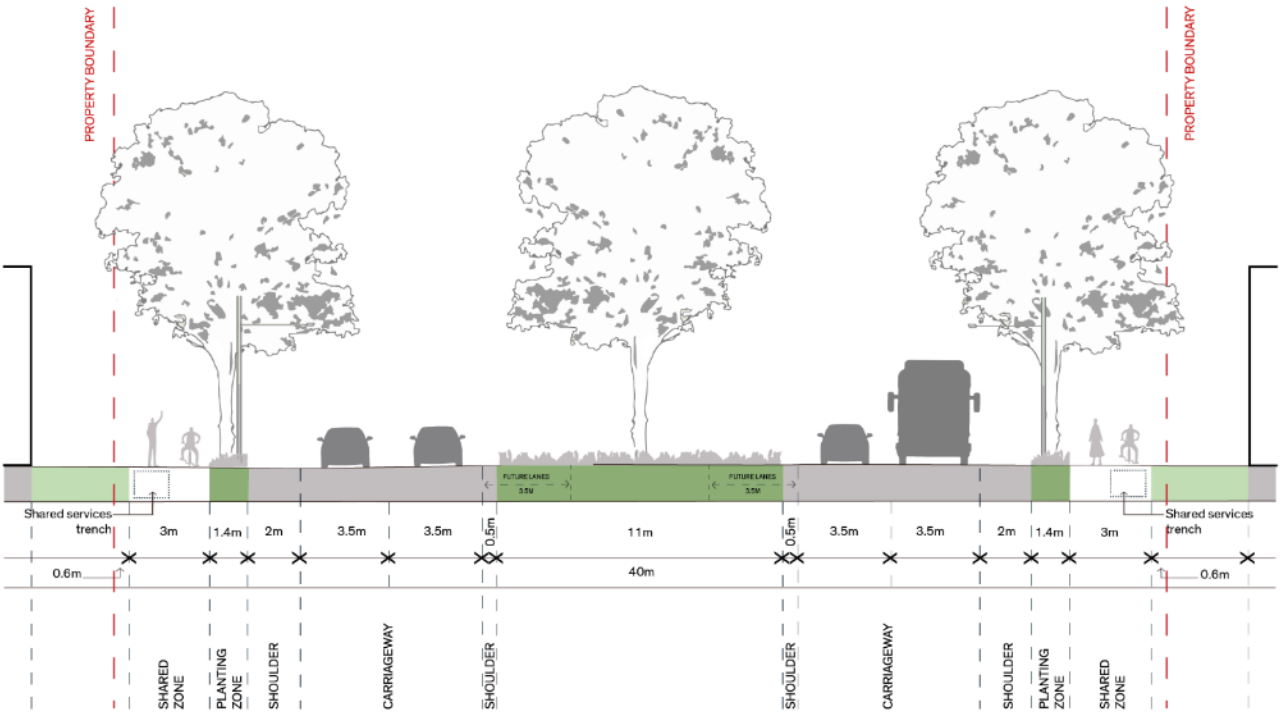
Notes Intersection layout for Appin Road and Church Street shows situation before optional upgrade outlined in section 4.2.1.

5.3 Road configurations

There is provision for future construction of new roads/upgrades of existing roads required by the development, including:

- Upgrade of Appin Road north of Appin to South Gilead assuming a corridor width of 40 m which provides for two lanes in each direction with the potential to be widened to three lanes in the future if required. Refer to Figure 5.3.
- The East-West Connection Road connecting the M31 Hume Motorway to Appin Road as identified in the Greater Macarthur Growth Area 2040 Plan. The Appin and North Appin Precinct Structure Plan has allowed for the preservation of this corridor (40.0 m wide) which provides for two lanes in each direction with the potential to be widened to three lanes in the future if required. Refer to Figure 5.3.
- The road connection from the M31 Hume Motorway to Picton Road across Elladale Creek linking Macquariedale Road and Appin and North Appin Precinct to provide for a bypass of Wilton (as described in section 3.2.1).

These road connections will facilitate a future connection between the M31 Hume Motorway to Appin Road, M31 Hume Motorway to Picton Road and between Appin and Wilton (refer to Figure 1.2).



Source: Walker Corporation, 06 October 2022

Figure 5.3 Appin Road and East-West Connection Road typical cross-section

The Appin and North Appin Precinct Structure Plan has allowed for the preservation of this corridor (31.2 m wide) which is sufficient to allow two lanes in each direction whilst retaining an urban streetscape. This preservation is a recent request from Transport for NSW and hence was not included in the infrastructure recommendations adopted in the Greater Macarthur Growth Area 2040 Plan. The 31.2 m wide corridor will allow for two lanes of traffic in each direction, a central landscape median and verges (refer to Figure 5.4). Initial feedback from Transport for NSW suggests that this new access connection will be connected to the East-West Connection Road (at its northern end at Macquariedale Road) with an at-grade signalised intersection, and then traverse Elladale Creek, across the Cataract River to the south with the Transport for NSW strategy to connect to Picton Road in the long term.

Source: Walker Corporation, 06 October 2022

Figure 5.4 North-South connection road typical cross-section

6 Public transport

The existing suburbs south of Campbelltown have a public transport (train and bus) mode share of approximately 14 per cent, as outlined in section 2.1. This includes people who walk to the station, drive and park at the station or catch a bus to the station, or those who catch a bus to their destination.

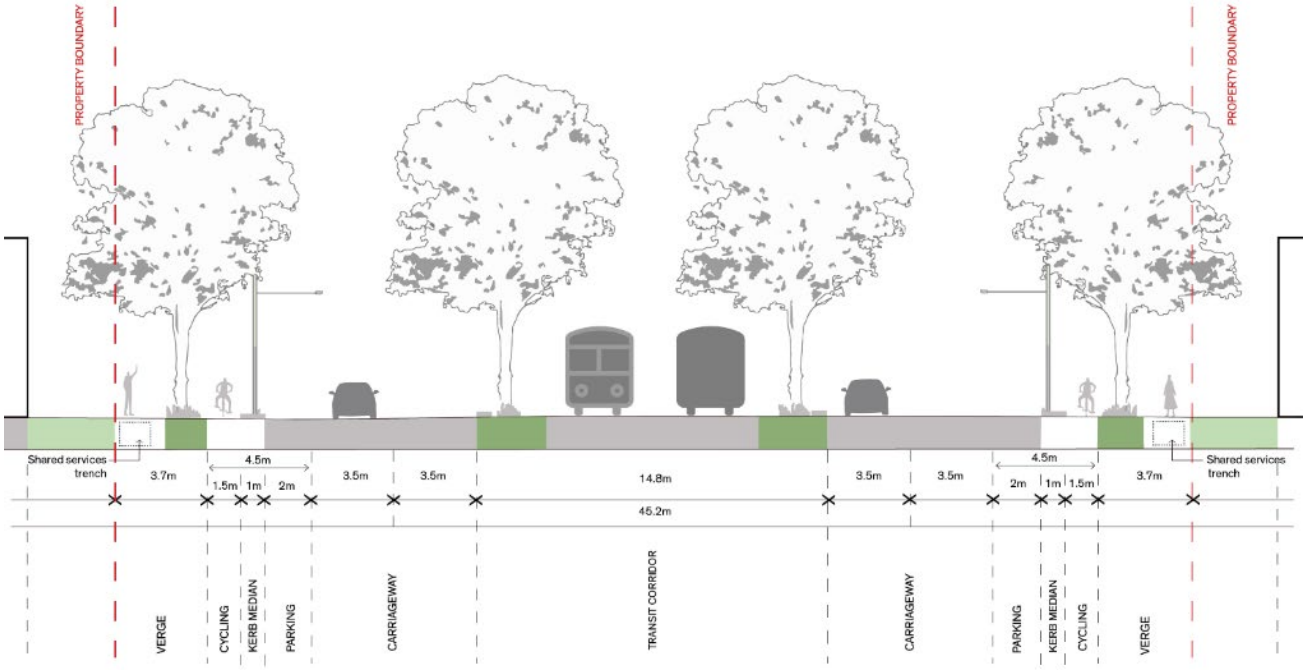
The Appin and North Appin Precinct is further away from the South Rail Line, and therefore connections to it will be less convenient. However, if the Transit Corridor can provide a high-quality service, the convenience will be improved. This will increase the chance of the Appin and North Appin Precinct population choosing public transport for their journey as opposed to private car, reducing the pressure on the road network.

6.1 Public transit corridor

To provide an efficient service capable of attracting passengers to the service it is envisaged that the corridor would include:

- Cross-section in line with the Greater Macarthur 2040 plan (45.2 m wide corridor)
- Bus lanes or equivalent in each direction
- Turn bays for turning vehicles to allow buses to bypass vehicle queues
- Bus stops or equivalent with shelter, seating, bicycle locking and next bus arrival displays
- A frequent service with a minimum of 5 minute headway
- Buses (or equivalent transport vehicles) in standard 12.5 m length or higher capacity (articulated) as the service patronage increases.

An indicative layout of the public transport corridor based on that shown in Greater Macarthur 2040 An interim plan for the Greater Macarthur Growth Area (NSW Department of Planning and Environment, November 2018) is shown in Figure 6.1. The number of lanes and parking would be subject to further planning during the Master Plan process.



Source: Walker Corporation, 06 October 2022

Figure 6.1 Greater Macarthur Transit Corridor typical section

Delivery of the transit corridor will occur in stages as development progresses, commencing with Stage 1. The timing of the whole corridor to Greater Macarthur will be dependent on the timing of other developments proposed within the area. The early delivery of this infrastructure asset would require early Government funding and acquisition of various land parcels under multiple ownership. Bringing this asset forward would provide additional benefits of higher adoption of public transport services.

6.2 Public transport network

To support a range of different public transport service types, it is envisaged that the network would include:

- High capacity (trunk) service from the Appin and North Appin Precinct to Macarthur along the Transit Corridor
- Local services connecting each neighbourhood to Stage 3A (new town centre)
- Services to Douglas Park Station when the Transit Corridor is extended during the construction of Neighbourhood 5.

6.3 Frequency

The approximate frequency of services has been estimated using the following assumptions:

- 14 per cent public transport mode share, including 4 per cent park and ride at a station and the remaining 10 per cent bus to train or bus only journeys.
- Standard buses accommodate 40 passengers per bus on average
- Articulated buses accommodate 80 passengers per bus on average
- Transition from standard buses to articulated buses as demand for the trunk service increases.

Based on these assumptions and the population of 65,000 people in approximately 22,000 dwellings it is estimated that a network comprising a local service with 10 services per hour and a trunk service with a bus every 2 to 3 minutes is required.

7 Active transport

The long distances between existing developments in the study area and limited facilities, means that walking and cycling trips comprise a relatively small share of the overall transport task and are typically restricted to short distances. However, as development proceeds within the Appin and North Appin Precincts there is an opportunity to provide a network of paths and infrastructure that supports higher use of walking and cycling for a range of local movement.

Although there is no formal cycling infrastructure in the study area, the Wollondilly Shire Council Shared Cycleway Plan contains principles that can be applied in the development of these shared cycleway routes within the Appin and North Appin Precinct, including:

- Connecting logical start and end points (e.g. schools to residential areas, towns to each other, etc.).
- Maximising/using off road routes wherever feasible.
- On road routes along major connecting roads may be considered in rural areas to reduce construction costs and increase useability.
- Target known future land release areas for off road routes.
- Link tourist and other places of interest to encourage visitors and residents into recreational cycling.

The Wollondilly Bike Plan (GHD, May 2011) prioritises shared paths for short distance recreational use within Appin township.

The City of Campbelltown Bike Plan (GTA, 2010) recommends a separated off-road path along the east side of Appin Road to Appin. In the short term, it recommends shoulder widening to enable a bicycle shoulder lane treatment to be implemented along the length of Appin Road.

7.1 Cycle network

Cycleway and shared pathway routes will be proposed within Appin and North Appin Precinct including a mixture of shared paths, mixed traffic and on-street cycle lanes. This will be done to avoid mixing cyclists with traffic on the streets with the highest traffic volumes, where possible.

In addition, the following routes would provide cycleways to and from Appin village and the wider study area:

- Appin to Campbelltown via Appin Road.
- Appin to Wilton (and beyond) via Wilton Road.
- Appin to Douglas Park via Wilton Road and Douglas Park Drive.
- Appin to Baden Powell Drive via Appin Bulli Road.
- Douglas Park to Menangle via Moreton Park Road.

Bicycle racks would be provided in the Town Centre, at neighbourhood centres, community centres and recreation facilities. Commercial buildings would be required to provide cyclist end of trip facilities, including bike locking and showers, as per the requirements of the Planning guidelines for walking and cycling.

A map will be provided with further detail at the development application stage.

7.2 Pedestrian network

Town centre

Appropriate urban design and traffic management measures are planned along the streets within the Town Centre to reinforce the high pedestrian activity area and improve pedestrian safety. Treatments proposed include entry thresholds (using textured pavement/pavers), road width changes, raised thresholds, street lighting and lower speed limits.

Local facilities

The pedestrian and cycle networks will be designed to have a greater level of permeability than provided to vehicles to further promote their greater use. Off-street shared paths are planned to complement Wollondilly and Campbelltown Council's cycle/pedestrian paths scheme and increase permeability for pedestrians and cyclists. All streets (except laneways) would have 1.2 m minimum footpaths, on one or both sides of the street. Footpaths and shared paths would be designed with regard to the Planning guidelines for walking and cycling.

Crossing opportunities

The pedestrian network would concentrate on connecting high trip generating land uses, such as retail centres, community and recreation facilities and schools. Paths will be safe and well lit, with pedestrian crossing treatments on strong pedestrian desire lines at road crossings.

8 Conclusions

The strategic road network assessment for the Appin and North Appin Precinct used Transport for NSW's STFM to understand the needs of regional traffic through the Appin and North Appin Precinct along with the development traffic of the Appin and North Appin Precinct and Greater Macarthur. Trip generation and distribution patterns form adjacent similar developments were applied to the Appin land release with some limitations noted in only having an assignment module:

- The attractiveness of increased development at the Western Sydney Airport and Aerotropolis may be under-estimated resulting in potentially longer distance employment trips.
- The total volume of short-distance education, shopping and recreation trips may be under-estimated in the strategic model as many of these are intra-zonal trips not assigned to the road network.
- Mode choice is unable to be tested for options to increase active and public transport trips although there is an implied increase in public transport use in the STFM for 2056.

The strategic road network assessment has recommended that the road upgrade requirements are:

1	Spring Farm Parkway extension	New four lane road by 2026 (by others).
2	Appin Road	Widen to four lanes between Gilead and Spring Farm Parkway extension by 2026 (by others).
3	Appin Road	Widen to four lanes between South Gilead and Gilead by 2029 (by others).
4	Wilton Road access intersection	Construct new access intersection to Stage 1.
5	Appin Road/Church Street intersection	Upgrade intersection to traffic signals by the 1,051st residential lot.
6	Appin Road	Widen to four lanes between North Appin and South Gilead by the 3,001st residential lot.
7	Transit Corridor	New two lane road (plus future public transport lanes) between Neighbourhoods 1 and 2A/Appin Road by the 3,001st residential lot.
9	East-West Connection Road	New four lane road between Neighbourhood 2 and Hume Motorway by the 8,001st residential lot.
12	East-West Connection Road	New four lane road between Neighbourhood 2 and Bulli-Appin Road by the 14,000 residential lot.
13	Transit Corridor	New two lane road plus public transport lanes north of North Appin (depends on timing of other developments).
14	Transit Corridor	New two lane road plus public transport lanes to Moreton Park Road (Douglas Park).

An alternative to the delivery of #5 Transit Corridor between Neighbourhoods 1 and 2A/Appin Road is the widening of Appin Road through Appin township and Wilton Road.

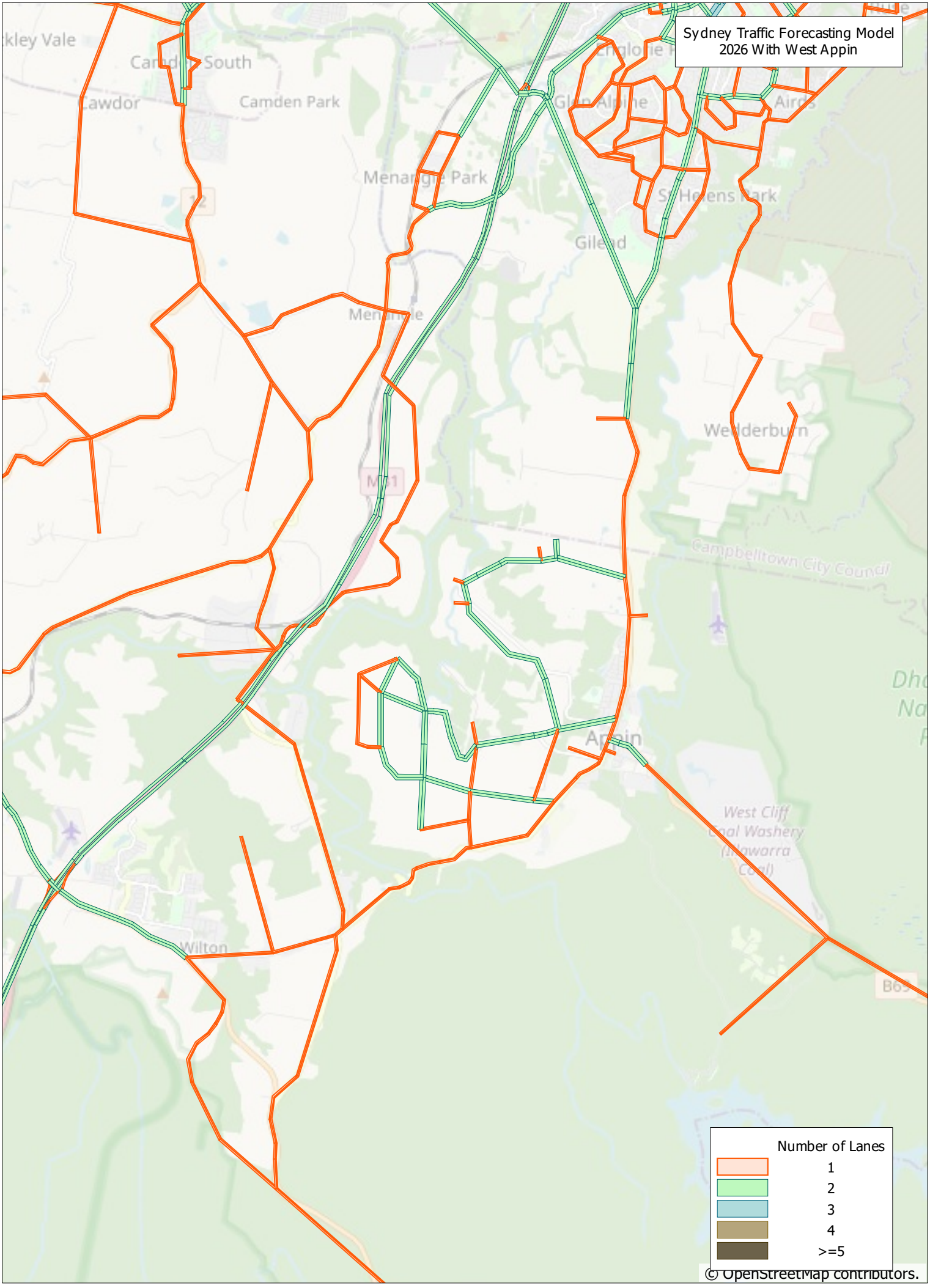
9 Limitations

The strategic modelling that informs this report has been undertaken with the following limitations and assumptions:

- The strategic model used was the STFM as received from Transport for NSW:
  - Background land use and road network assumptions influence regional traffic demand. No review of the timing and extent of these was undertaken.
  - Fixed mode choice and distribution mean testing of the strategic road network supporting the Appin and North Appin Precinct is purely a traffic reassignment process. Often major new road schemes such as the M9 OSO Stage 1 will see a change in traffic distribution as longer distance trips become more attractive due to additional regional capacity.
- Trip generation: based on existing trip making behaviour in the STFM. Fixed trip matrices mean the impact of more internal trips and increased active and public trips is not explicitly accounted for.
- Trip distribution: based on existing trip making behaviour in Rosemeadow and Wollondilly and may underestimate the impact of regionally significant developments such as the Western Sydney Airport and Aerotropolis. A full strategic model (i.e. with trip generation and distribution steps) is required to incorporate this impact.
- Mode choice: based on existing trip making behaviour in the STFM. Fixed trip matrices mean the impact of more internal trips and increased active and public trips is not explicitly accounted for.

Appendix A

Strategic Model Results


Sydney Traffic Forecasting Model
2026 With West Appin
Camden South
Camden Park
Menangle Park
Gilead
Wilton
Campbelltown City Council
Number of Lanes
1
2
3
4
>=5
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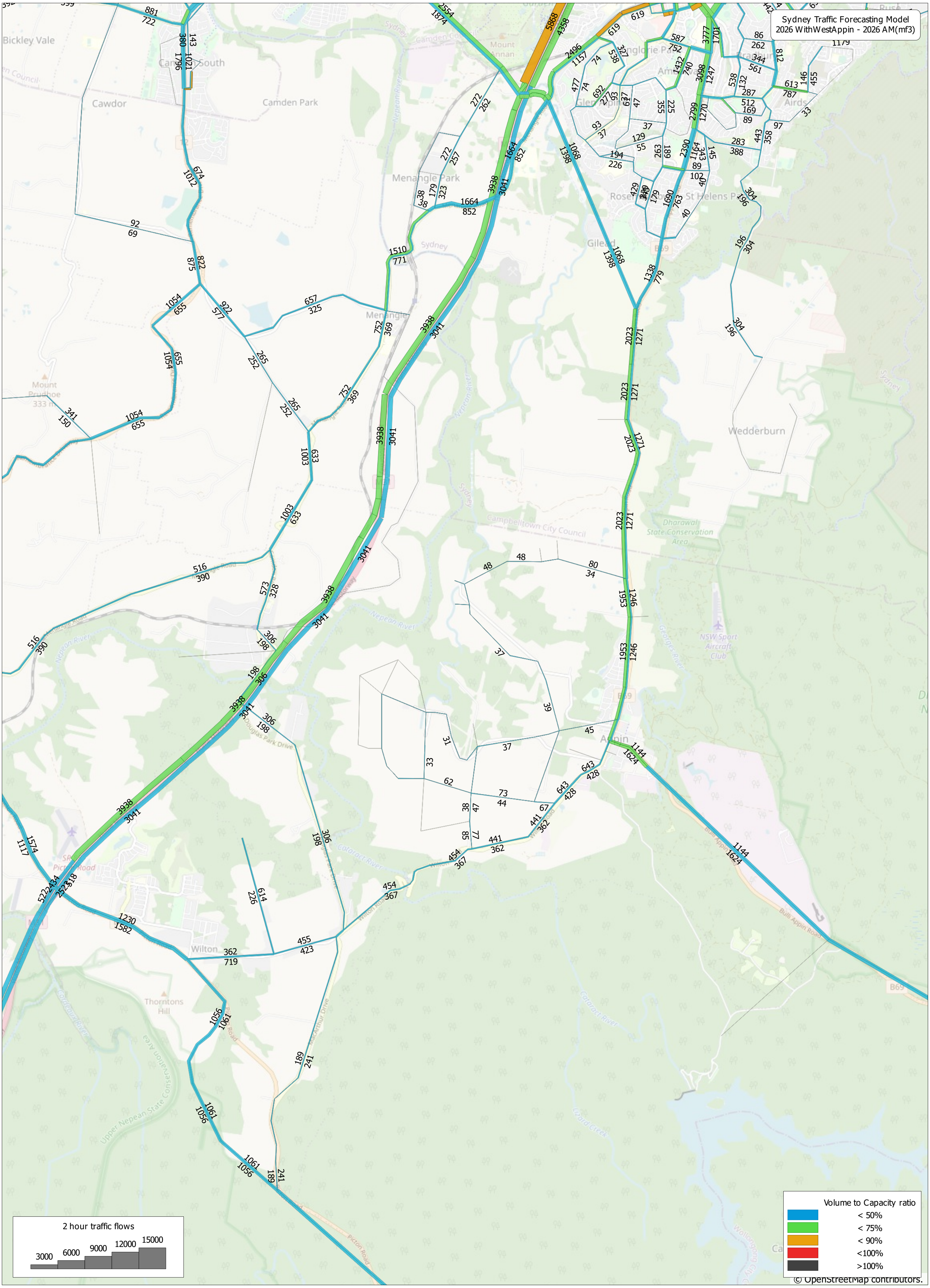
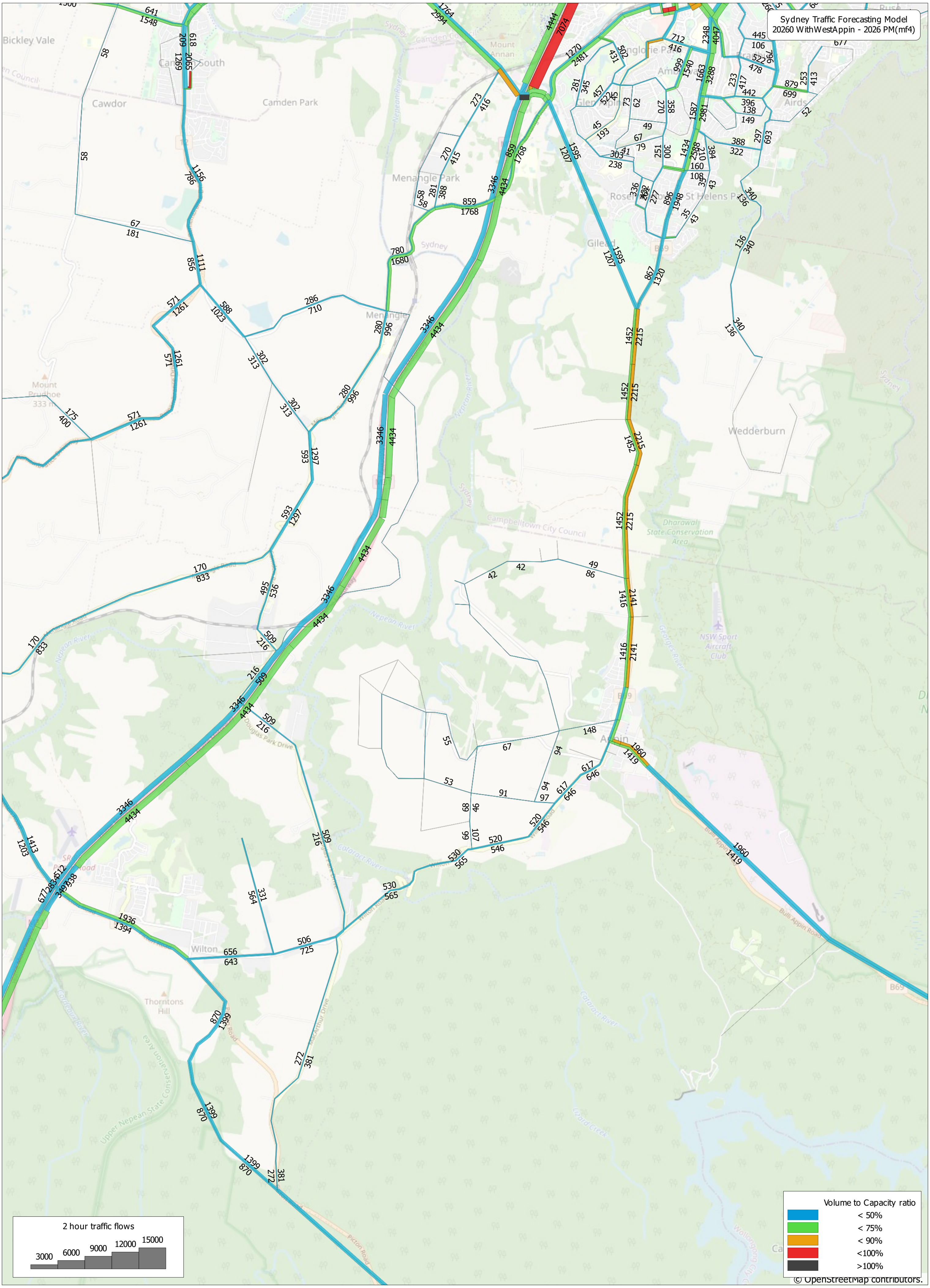
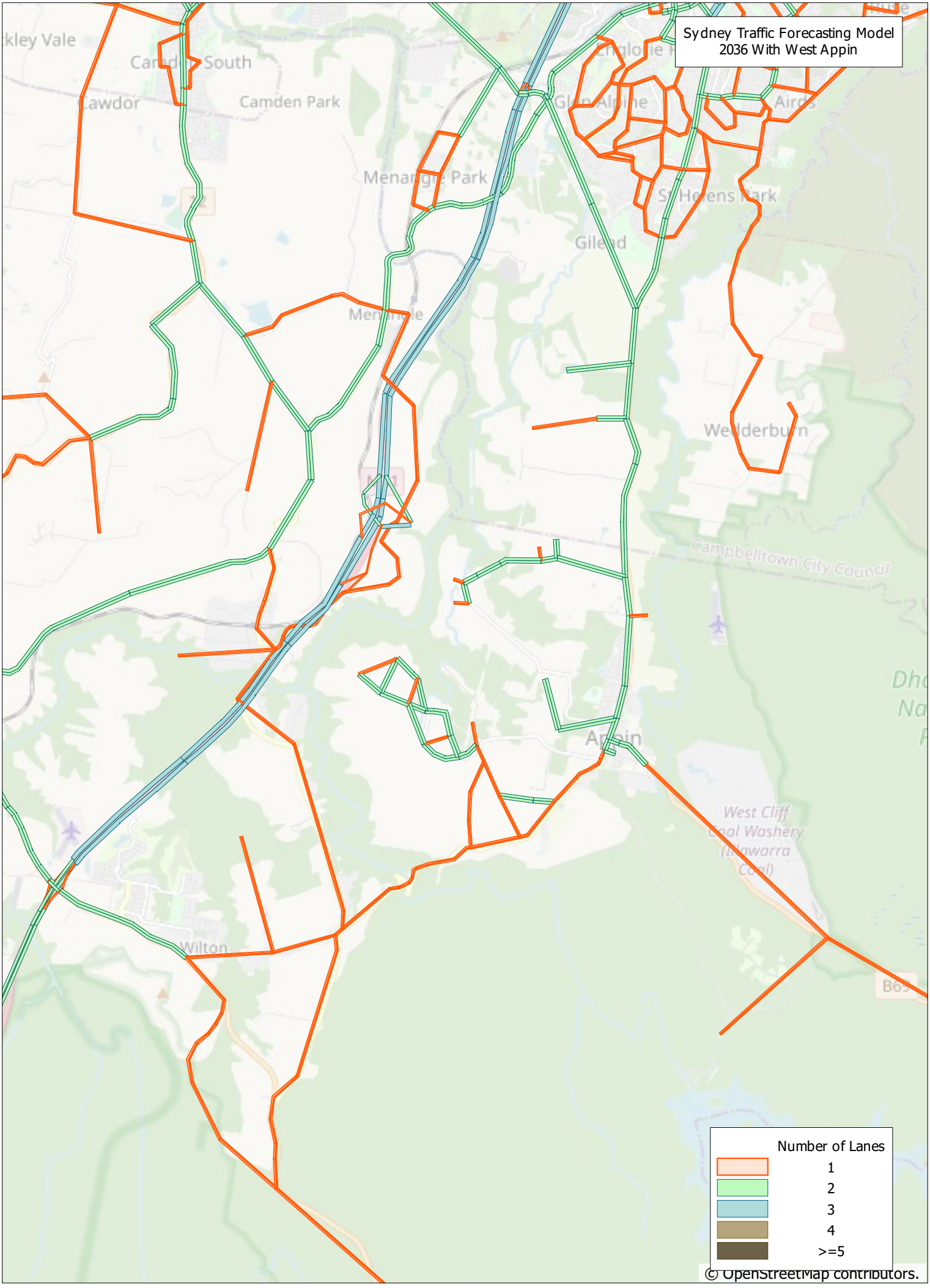
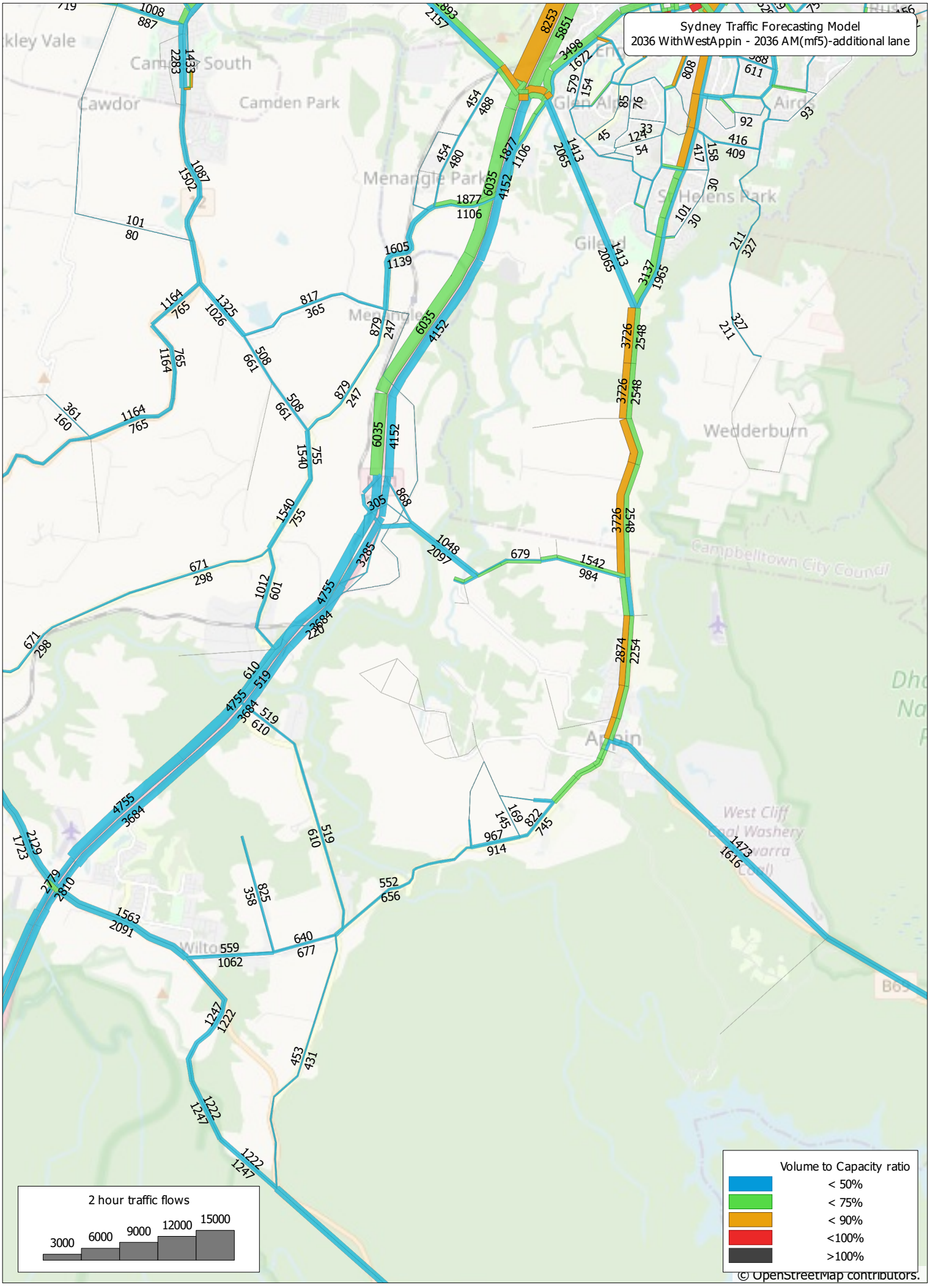
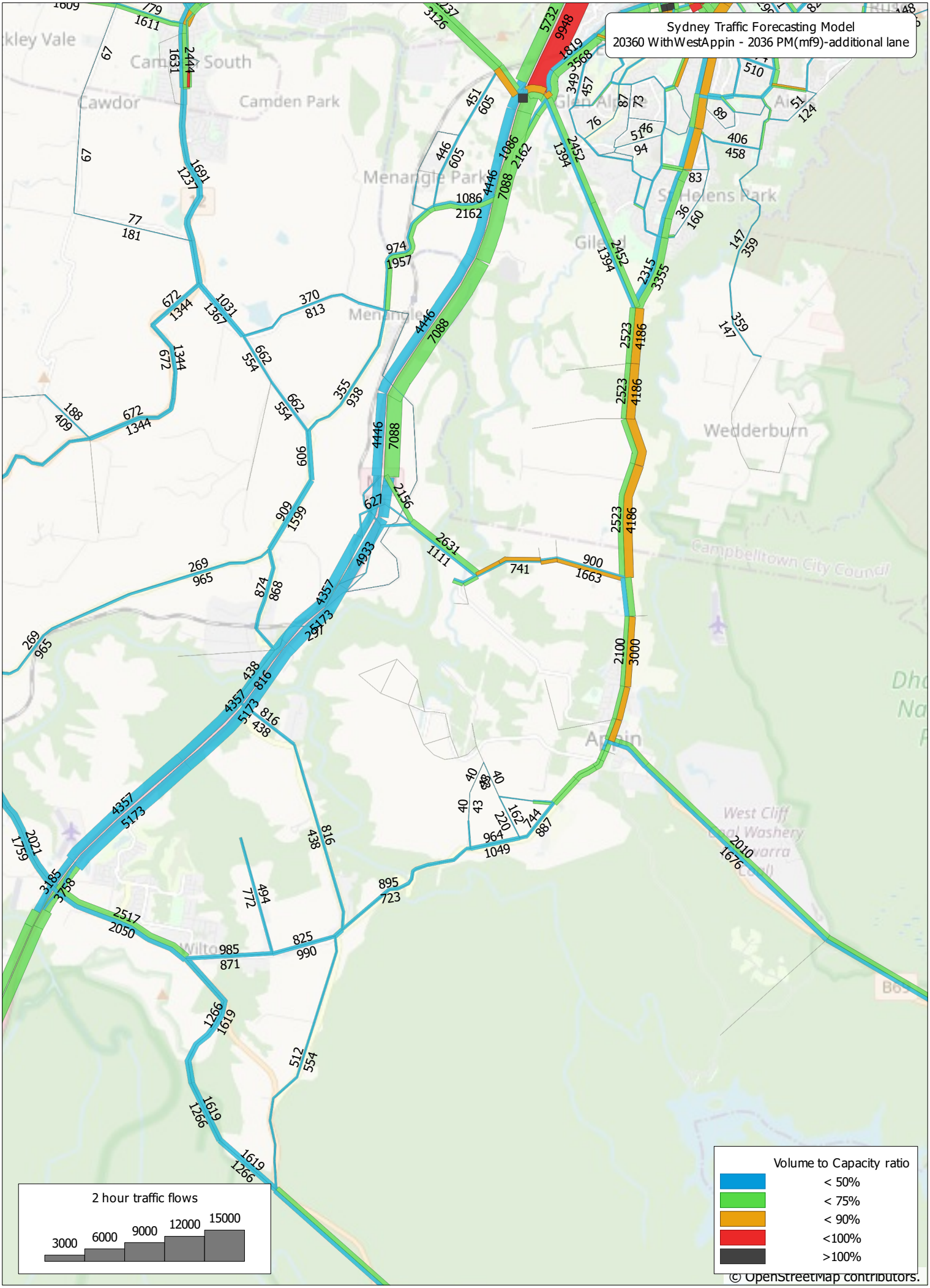

Sydney Traffic Forecasting Model
2026 WithWestAppin - 2026 AM(mf3)
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
2 hour traffic flows
3000
6000
9000
12000
15000
© OpenStreetMap contributors.
Bickley Vale
Camden South
Cawdor
Camden Park
Mount Annan
Menangle Park
Menangle
Mount Prudhoe
Gilead
Wedderburn
Campbelltown City Council
Dharawal State Conservation Area
NSW Sport Aircraft Club
Appin
Douglas Park Drive
Wilton
Thorntons Hill
Picton Road
Bulli Appin Road
Nepean River
Cataract River
St Helens Park
Upper Nepean State Conservation Area



Sydney Traffic Forecasting Model
20260 WithWestAppin - 2026 PM(mf4)
Bickley Vale
Cawdor
Camden Park
Menangle Park
Menangle
Mount Prudhoe
Mount Annan
Rosemeadow
St Helens Park
Gilead
Wedderburn
Dharawal State Conservation Area
Campbelltown City Council
NSW Sport Aircraft Club
Appin
Wilton
Thorntons Hill
Upper Nepean State Conservation Area
Nepean River
Cataract River
Douglas Park Drive
Bulli Appin Road
Picton Road
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
2 hour traffic flows
3000
6000
9000
12000
15000
© OpenStreetMap contributors.


Sydney Traffic Forecasting Model
2036 With West Appin
Number of Lanes
1
2
3
4
>=5
© OpenStreetMap contributors.


Sydney Traffic Forecasting Model
2036 WithWestAppin - 2036 AM(mf5)-additional lane
2 hour traffic flows
3000
6000
9000
12000
15000
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
© OpenStreetMap contributors.


Sydney Traffic Forecasting Model
20360 WithWestAppin - 2036 PM(mf9)-additional lane
Cawdor
Camden Park
Menangle Park
Wedderburn
Campbelltown City Council
2 hour traffic flows
3000
6000
9000
12000
15000
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
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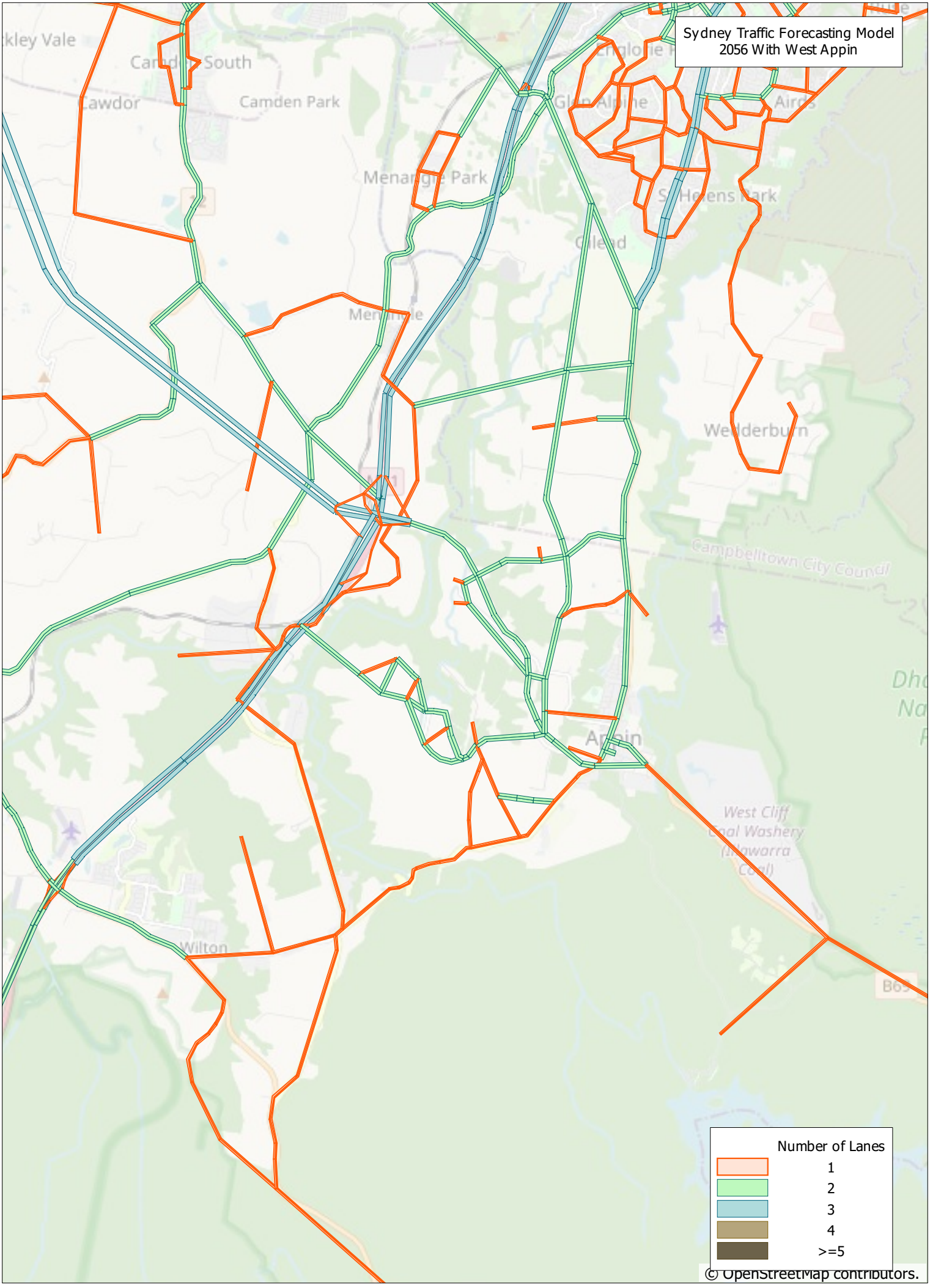
Sydney Traffic Forecasting Model
2056 With West Appin
Number of Lanes
1
2
3
4
>=5
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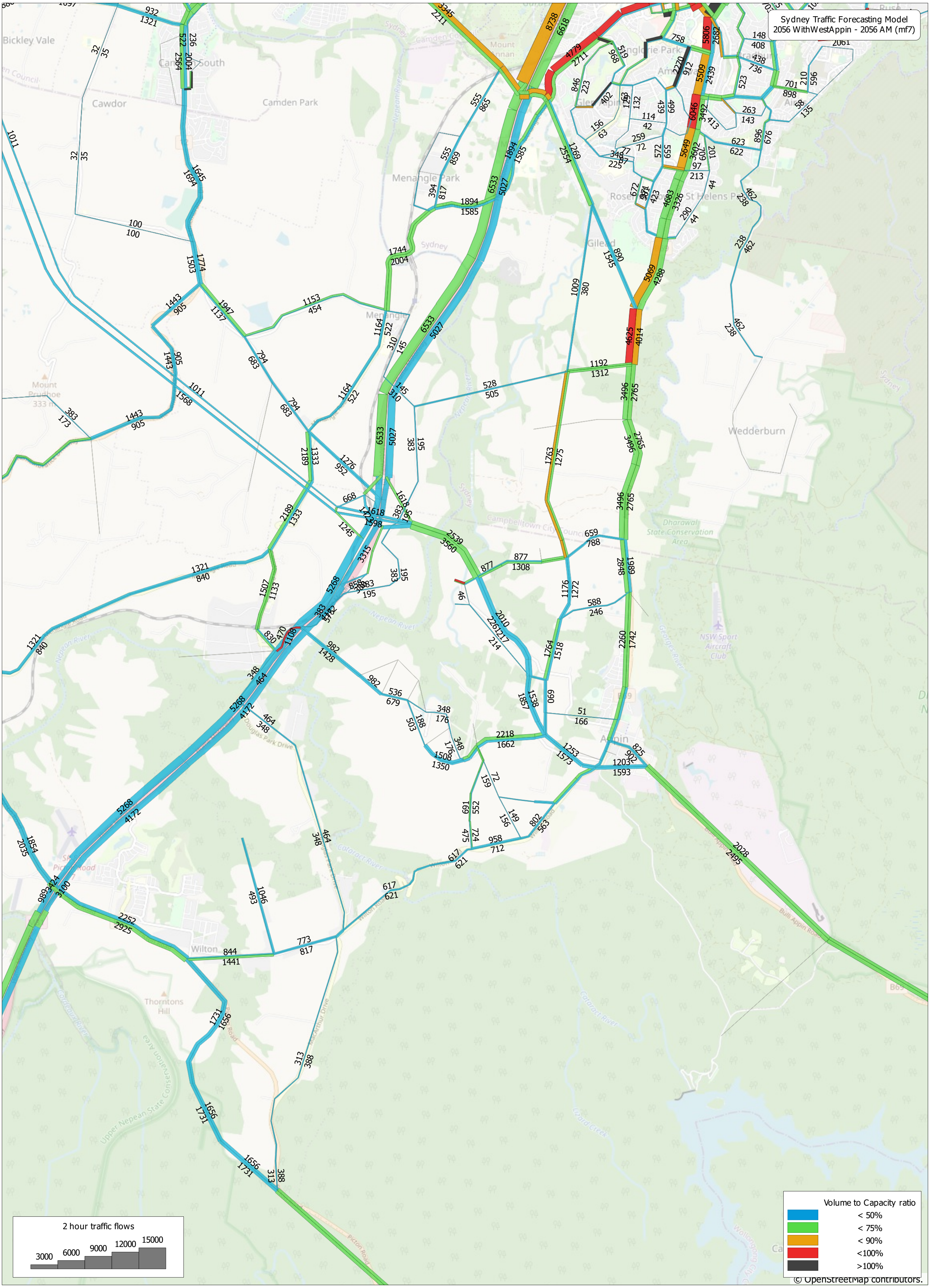

Sydney Traffic Forecasting Model
2056 WithWestAppin - 2056 AM (mf7)
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
2 hour traffic flows
3000
6000
9000
12000
15000
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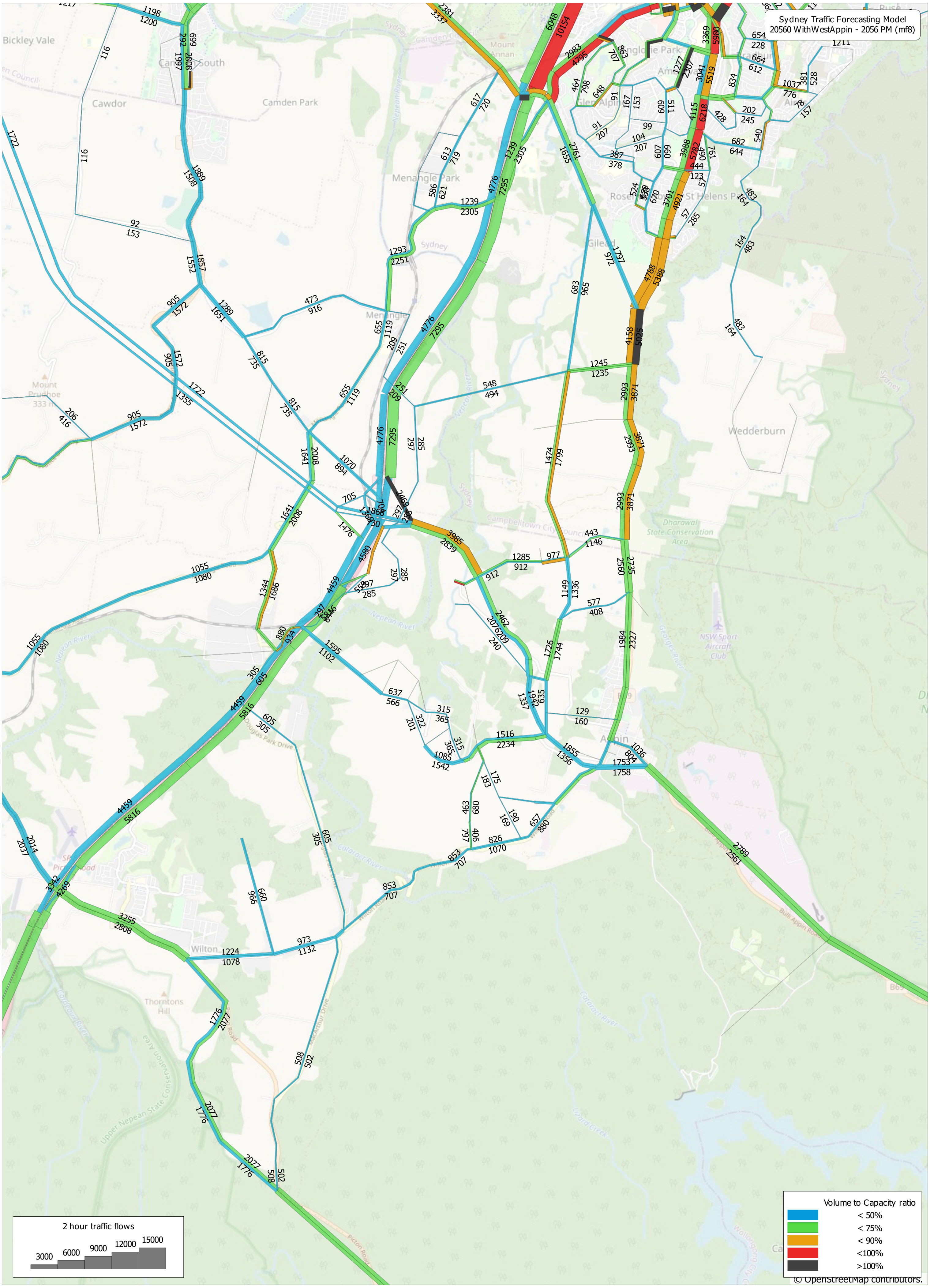
Bickley Vale
Cawdor
Camden Park
Menangle Park
Menangle
Mount Prudhoe
Gilead
Wedderburn
Dharawal State Conservation Area
NSW Sport Aircraft Club
Appin
Wilton
Thornton Hill
Upper Nepean State Conservation Area
Nepean River
Cataract River
Douglas Park Drive



Sydney Traffic Forecasting Model
20560 WithWestAppin - 2056 PM (mf8)
Volume to Capacity ratio
< 50%
< 75%
< 90%
<100%
>100%
2 hour traffic flows
3000
6000
9000
12000
15000
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Bickley Vale
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Menangle Park
Menangle
Mount Prudhoe
Gilead
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NSW Sport Aircraft Club
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Douglas Park Drive
Picton Road
Bulli Appin Road