ARUP

NSW Department of Education

New High School for Googong

Transport Assessment

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Job number 297286

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		Name	JG	AK	TKG

Issue Document Verification with Document ✓

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Executive Summary

This Transport Assessment provides a review of the design and assessment of the traffic, parking and transport impacts of the proposed development of the new high school for Googong. The school is proposed to have a capacity of 700 students and 55 staff.

The transport strategy for the site prioritises active transport and public transport over private vehicle travel for both staff and students. This is consistent with NSW state government policy and the NSW Department of Education's (DOE) ongoing commitment to promote sustainable travel for its schools.

The transport strategy to date has been presented to Colliers, SINSW, Queanbeyan-Palerang Regional Council and Transport for NSW (TfNSW) in three Transport Working Group (TWG) meetings held on 18 October 2023, 3 November 2023 and 31 October 2024. A Preliminary Construction Traffic Management Plan (PCTMP) has been prepared alongside this Transport Assessment.

Key findings of this Transport Assessment are:

- The majority of students (83%) will live within walking or cycling distance of the school, highlighting the potential for a high active transport mode share. Adequate footpath widths and safe crossing facilities will be required to realise this potential.
- Most students in the Googong Township live too close to school to be eligible for free travel under the School Student Transport Scheme (SSTS), however they can apply for a School Term Bus Pass for discounted travel. There is potential to divert existing bus routes in Googong to stop at the high school and to introduce a shuttle bus service for north-eastern neighbourhoods of Googong who live outside walking distance. These public transport improvements are subject to further discussions with TfNSW.
- Traffic modelling based on a desktop assessment of traffic flows near the site indicates that adjacent intersections will operate at or above Level of Service B.

The school will provide measures to encourage sustainable travel through three scenarios with set targets for mode share, as well as formal bicycle parking for staff and students, improved crossings and footpaths.

This activity includes the following:

- Five raised pedestrian crossings on roads adjacent to the school. This includes two crossings on Wellsvale Drive, one on Observer Street, one on Glenrock Drive and one on Harvest Street.
- Footpath widening to support safe pedestrian movements at the Bus Zone and Kiss and Drop on Glenrock Drive.
- 17 formal Kiss and Drop spaces located on Glenrock Drive. This is located around 90m away from Observer Street to minimise conflicts at the intersection.
- One car parking space per staff will be provided on-site (55 spaces total) to ensure parking demand is contained on-site. However, staff will be encouraged to walk, cycle, use public transport and carpool where possible.
- Waste collection and servicing will be undertaken within the school boundary, with access via the staff car park driveway off Wellsvale Drive.
- Deliveries to the school will be undertaken within the school boundary, with access via a driveway off Observer Street.

This Transport Assessment determines that the proposed activity will not have a significant effect on the environment. All impacts assessed can be adequately mitigated through recommended measures.

1. Introduction

This Transport Assessment has been prepared by Arup on behalf of the NSW Department of Education (DoE) to inform a Review of Environment Factors (REF) for the proposed construction of a new high school for Googong (the activity) located at 200 Wellsvale Drive, Googong, NSW (the site).

The activity relates to the construction and operation of a new educational establishment to serve the needs of the growing Googong township by accommodating up to 700 students from years 7 – 12. Specifically, the activity includes the following:

- Building A, a three to four-storey building in the northern portion of the site, fronting Glenrock Drive, which will accommodate learning spaces and administrative functions of the school.
- Building B, a three-storey building in the north-west portion of the site, fronting Observer Street, which will accommodate learning spaces and administrative functions of the school.
- Building C, fronting Glenrock Drive, which will accommodate a school hall / gymnasium and canteen.
- Outdoor recreation areas, cricket nets, playing court and playing field.
- Main pedestrian entry established from Glenrock Drive.
- Car park and accessible pedestrian entry from Wellsvale Drive.
- Service entry from Observer Street.
- Associated civil works, earthworks, servicing and landscaping.
- Associated off-site works such as the construction of pedestrian crossings, drop off and pick up bays and a bus stop.
- School identification and wayfinding signage.

The REF describes the activity, documents the examination and consideration of all matters affecting, or are likely to affect, the environment, and details safeguards to be implemented to mitigate impacts.

The Department of Education is the determining authority for the project under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The site is identified in Figure 1 and the activity is shown in Figure 2.

Figure 1. Site Location Plan (Source: Mecone)

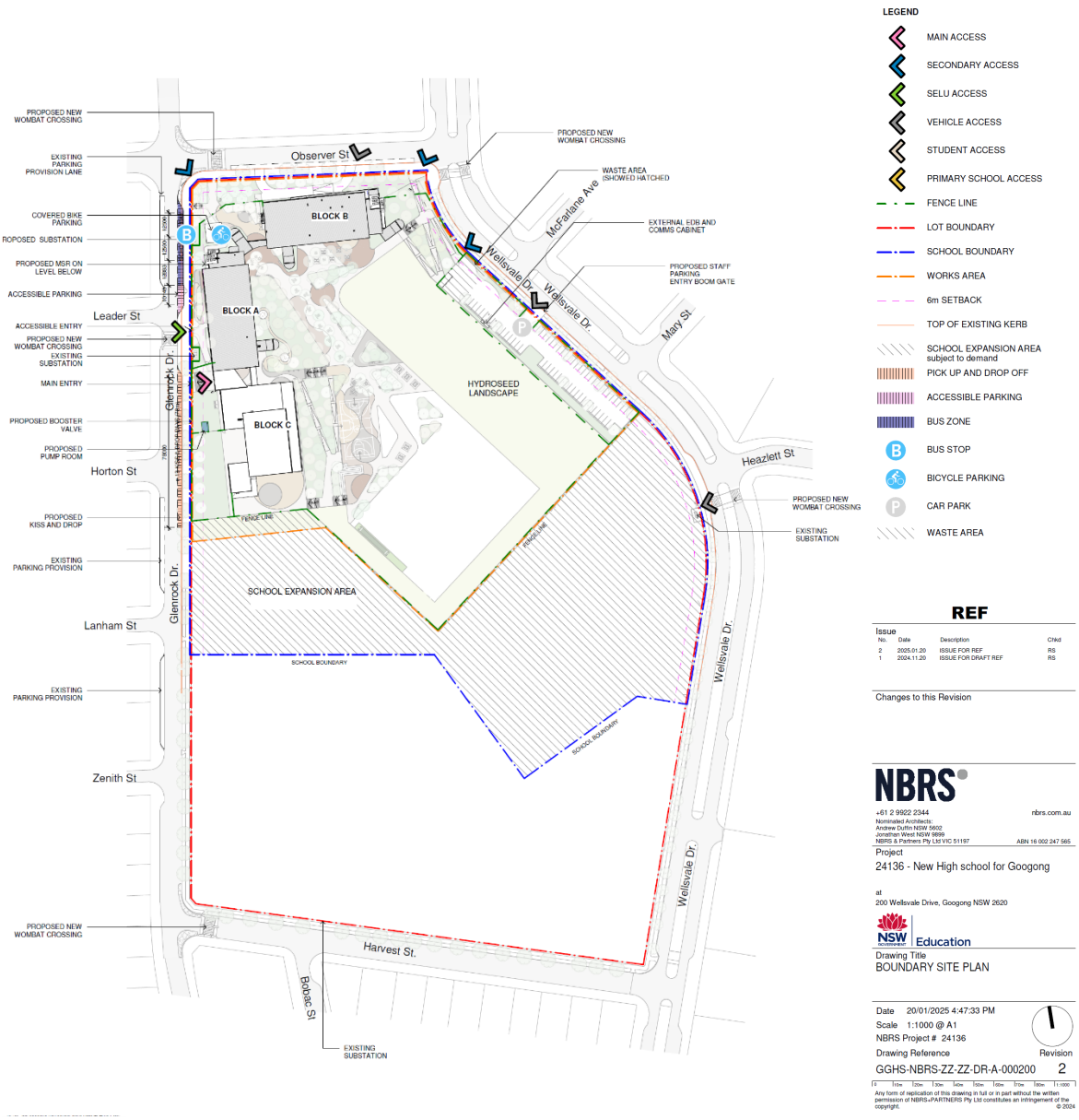


Figure 2. New high school for Googong – indicative Site Plan, subject to detailed design (Source: NBRS, 20/01/2025).

Googong is a new release area within the Queanbeyan-Palerang Local Government Area (LGA), located approximately eight kilometres south of Queanbeyan and 17 kilometres southeast of the Canberra Central Business District (CBD). Googong Reservoir, a significant waterbody, is located approximately 3 kilometres east of the subject site. Canberra Airport is located approximately 12 kilometres north of the subject site.

The site is legally described as Lot 829 in Deposited Plan 1277372. The proposed new high school site within this Lot has an area of approximately 5.84 hectares.

The site is currently zoned as R1 General Residential in the Queanbeyan-Palerang Local Environmental Plan (LEP) 2022 and is located within Neighbourhood 2 of the Googong Masterplan, within the Googong DCP 2010.

The site is surrounded by low-density residential development, recreational areas and a future local centre adjoining the site to the north.

The site is currently vacant with no existing structures and has been cleared of all trees and native vegetation. The site has an approximately 12-metre fall from the southwest corner of the site at RL ~763.550m Australian Height Datum AHD to the northeast at RL ~751.570m AHD.

2. Strategic context

This section reviews the staging and timeline for the school's development, alongside relevant state and local policy documents, including the Queanbeyan-Palerang Regional Council Integrated Transport Strategy, the Googong Development Control Plan (DCP), the Neighbourhood 2 Township Traffic Report, and the Googong Masterplan.

These documents outline the road hierarchy, cross-sections of road designs, as well as proposed public transport routes that service the masterplan area.

2.1 Education rationale and planning pathway

Growth in the NSW region of the Queanbeyan-Palerang anticipates the 2035 population of Googong to be approximately 16,000 people with 5,550 dwellings added to the Urban Release Area. This requires the development of new educational facilities to accommodate the growing population and their families. This includes the recently opened Jerrabomberra High School and future schools in Googong and Bungendore. Googong is currently serviced by the newly completed Googong Public School and one private primary school. The new high school for Googong will be the first public high school to accommodate years 7 – 12 within the township.

The development of the school provides an opportunity to explore placemaking opportunities to strengthen the identity of Googong and surrounding areas. Schools are an important public asset whose facilities are used by the wider community, providing residents with a sense of social place and belonging through delivery of quality social infrastructure.

The project is currently in the Transport Assessment stage, highlighted in Figure 3 below.

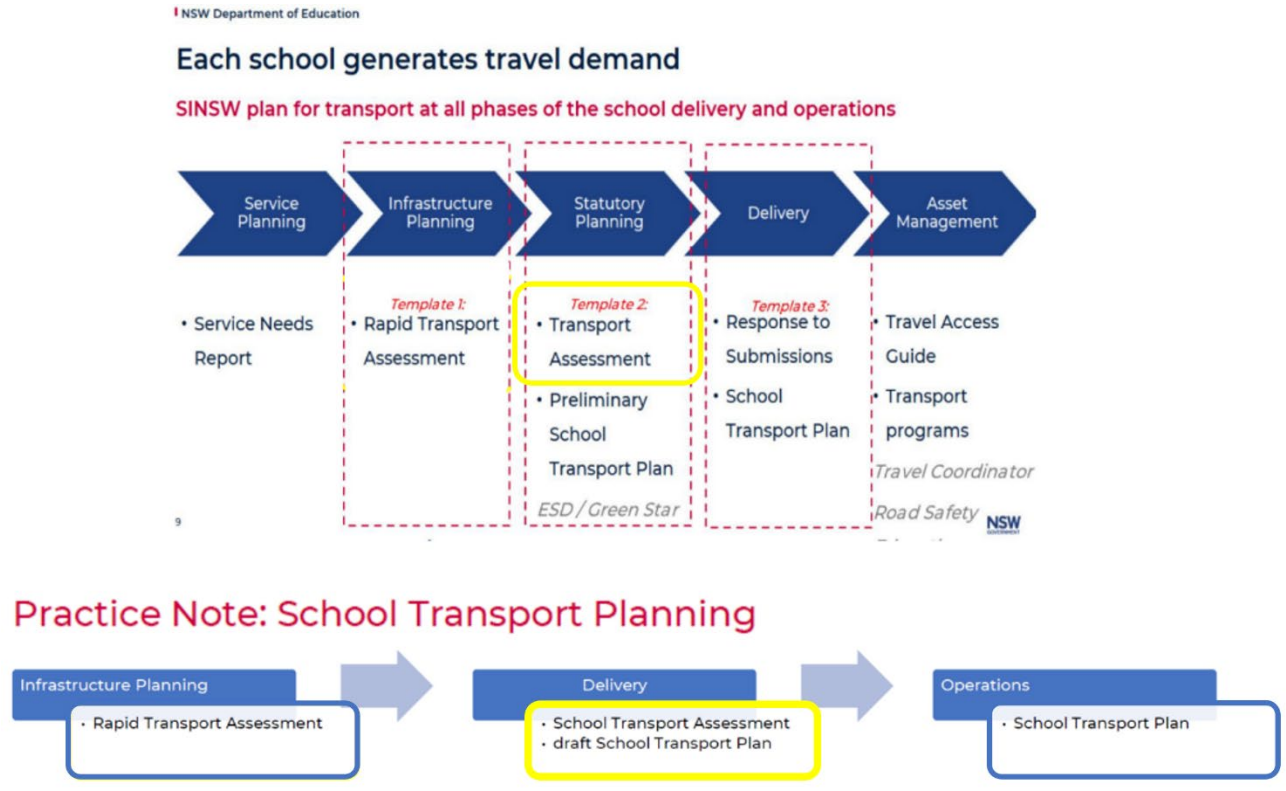
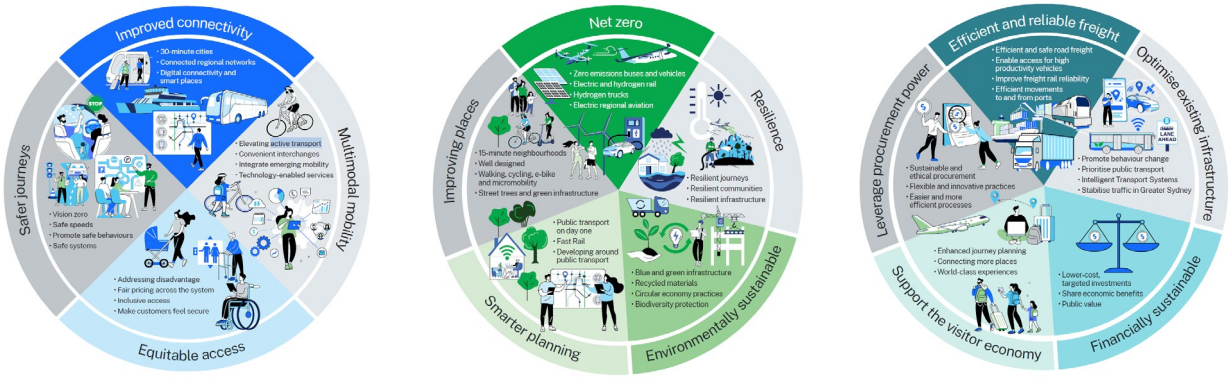


Figure 3. NSW DoE School Transport Planning Pathway

2.2 Planning context

2.2.1 Future Transport Strategy (Transport for NSW, 2022)

The Future Transport Strategy identifies actions to achieve three strategic outcomes shown in Figure 4.



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Transport is committed to connecting our customers' whole lives.

Successful places for communities –
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Enabling economic activity – Transport will support NSW to achieve its economic potential.

Figure 4. NSW Future Transport Strategy strategic outcomes (Source: Future Transport for NSW, 2022).

The strategy outlines the following objectives relevant to travel to schools:

- Provide safer streets which allow more children to walk or cycle to school
- Improve neighbourhood liveability and reduce road congestion alongside new housing
- Provide new walking connections to schools and safe infrastructure for cycling
- Improve parking provision and management to encourage sustainable travel behaviour

2.2.2 Active Transport Strategy (Transport for NSW, 2022)

The Active Transport Strategy outlines the following walking and cycling objectives:

- Improve safe walking and bike riding options for travel to and from school
- Double the number of children walking or riding to school through behaviour change interventions
- Trial Active Travel to School Program in collaboration with NSW Department of Health and the NSW Department of Education in more than 50 schools by 2028
- Trial behaviour change interventions including campaigns that encourage sustainable mode shift by 2028
- Provide a network of safe walking and cycling routes and low-speed zones in new neighbourhoods which should reach across each school's catchment from its day of opening

The document notes that the Department of Education will work with Transport for NSW and NSW Health to develop an Active and Healthy Travel to Schools Program. The purpose of the Program will be to offer schools a range of free resources, tools and incentives to actively travel to school, including:

- Pilot infrastructure and traffic management initiatives, including temporary restricted vehicle access on roads adjacent to schools
- Ensure safe walking and cycle training is available in schools on an ongoing basis
- Improve safe walking, cycling and public transport access to schools
- Provide active transport end-of trip facilities in schools and educational institutions.

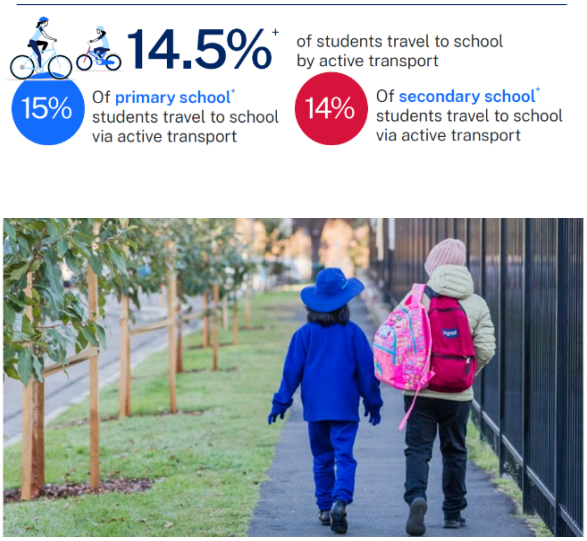


Figure 5. Active Transport Strategy (Source: Active Transport Strategy, Transport for NSW, 2022).

2.2.3 Road User Space Allocation Policy (Transport for NSW, 2024)

The policy outlines mandatory principles for allocating road space to ensure safety, equity, and alignment with movement and place objectives. It applies to all public road reserves, covering proposed, new, and existing classified roads in regional and metropolitan NSW. The policy advises to:

- Give active travel the highest priority when reallocating of road space
- Consider the allocation of space in terms of infrastructure, AM and PM peak school hours, and location.

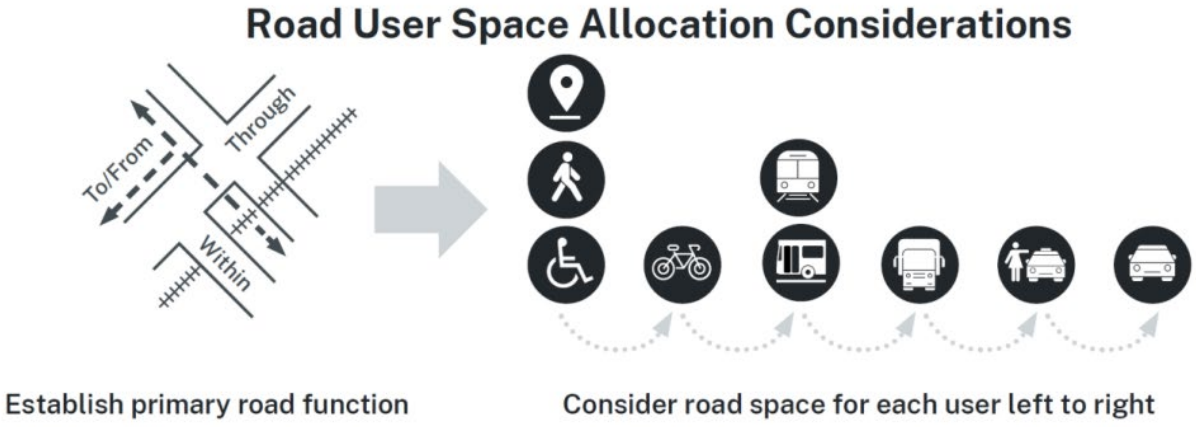


Figure 6. Road User Space Allocation Policy process (Source: CP21000.1, TfNSW 2024).

2.2.4 Movement and Place Framework, (Transport for NSW, 2023)

Movement and Place is a multi-disciplinary, place-based approach to the planning, design, delivery and operation of transport networks. It recognises and seeks to optimise the network of public spaces formed by roads and streets and the spaces they adjoin and impact.

Figure 7. Relative priority of different modes in different street environments (Source: Movement and Place Framework (Transport for NSW, 2023).

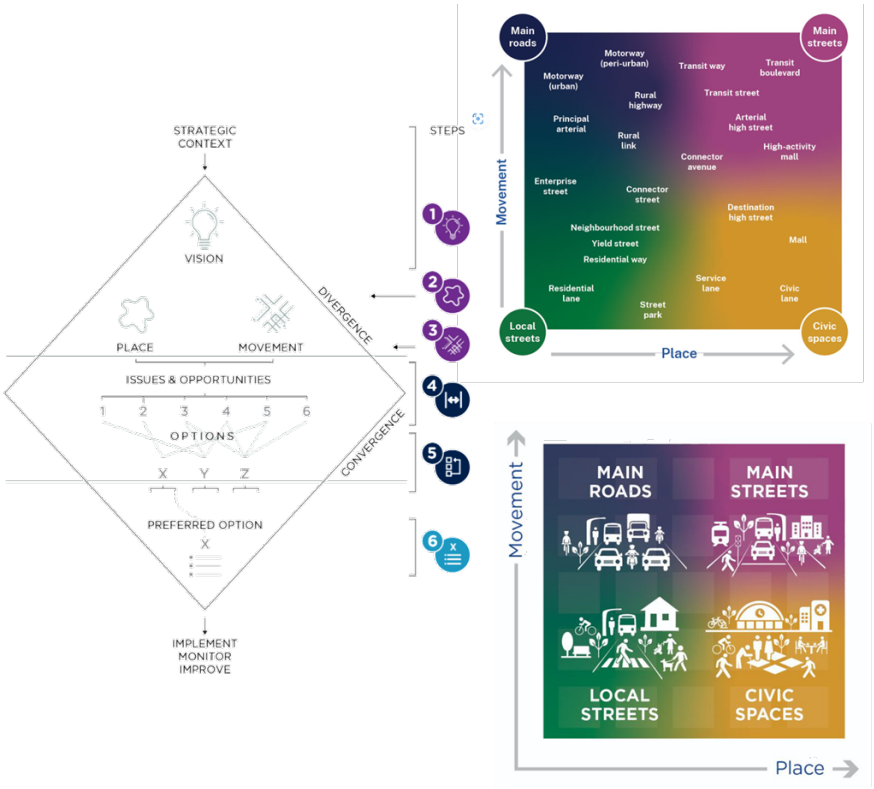


Figure 8. The movement and place process (Left) and classification of streets (Right) Source: Movement and place framework (Transport for NSW, 2023).

2.2.5 Queanbeyan-Palerang Regional Integrated Transport Strategy, (Queanbeyan-Palerang Regional Council, 2020).

The Queanbeyan-Palerang Regional Integrated Transport Strategy documents opportunities and QPRC's commitments for the development of the transport network. It notes that around 8,000 new households are expected in the region, of which more than half will be in Googong.

Documented opportunities and commitments relevant to the new high school for Googong include:

- Duplicate Old Cooma Road from Googong to Ellerton Drive extension shown in Figure 11 (Stage 2 completed in 2020)
- Construct on-road cycling and off-road shared path facilities along Old Cooma Road to improve connectivity between Googong and Queanbeyan (completed in 2020)
- Investigate new bus services and park and ride facilities to service Googong and Jerrabomberra directly into the ACT
- A park and ride facility connecting to Queanbeyan and Canberra should be considered adjacent to the proposed school and the Googong Commons within Neighbourhood 2 (NH2). The car parking for Googong Commons could be largely used by park and ride travellers during the week and recreation users on weekends.
- Improve pedestrian and cyclist crossings especially kerb ramps near schools and child-care centres.
- Provide additional footpaths for children to walk and ride bikes, especially around schools.
- Identify schools as a key target for improvements to pedestrian networks to support children walking and cycling to school.

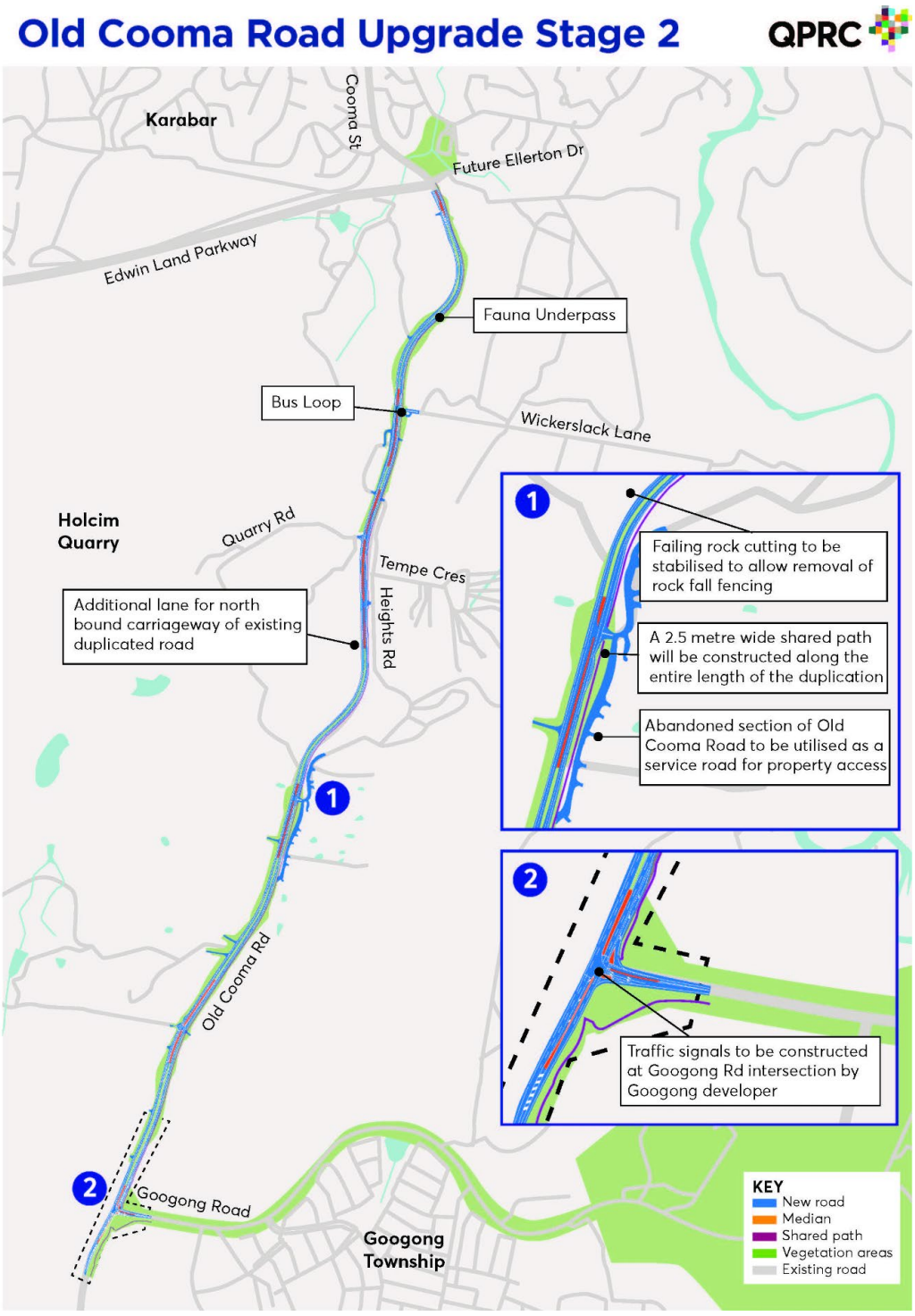


Figure 9. Old Cooma Road Upgrade Stage 2
(Source: Queanbeyan-Palerang regional integrated transport strategy, Queanbeyan-Palerang Regional Council, 2020, https://www.qprc.nsw.gov.au/Major-Works-Projects/COMPLETED-Old-Cooma-Road).

2.2.6 Googong Development Control Plan (DCP) 2010 (Queanbeyan-Palerang Regional Council, 2010)

The Googong township is divided into five neighbourhoods as shown in the Googong master plan. The new high school for Googong is located in Neighbourhood 2 of Googong township. A town centre is planned to the north of the school site which will contribute to local place making but also add to pedestrian and vehicle demand.

Figure 10 shows the master plan with indicative road layout and street types.

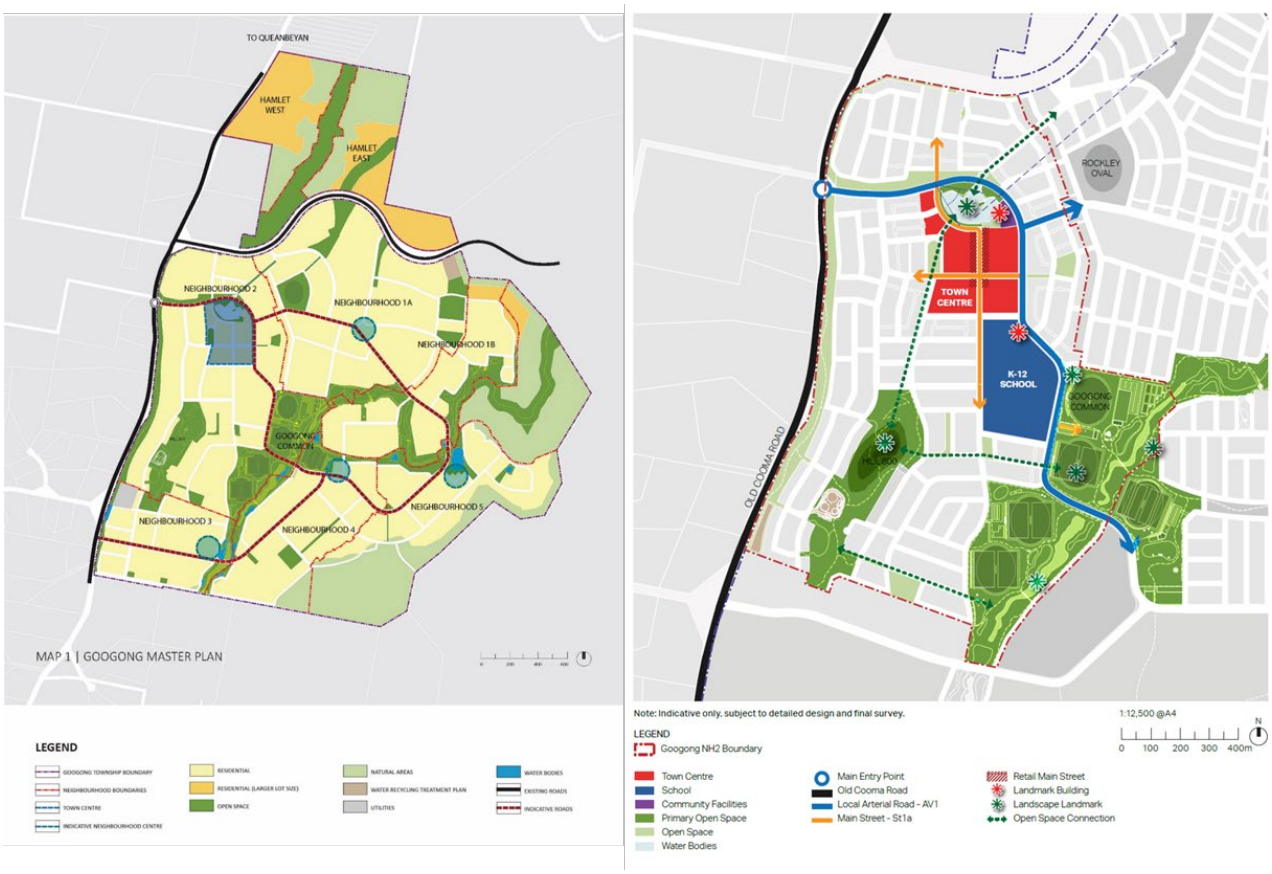


Figure 10. Googong Development Control Plan 2010 (Source: Queanbeyan-Palerang Regional Council, 2010).

The Googong DCP identified the following walking and cycling facilities bordering the site, also shown in Figure 11.

- Four pedestrian crossings at Wellsvale Drive and Glenrock Drive (to date, two pedestrian refuges delivered on Wellsvale Drive, no crossing facilities on Glenrock Drive delivered).
- 2.5-metre shared path on Wellsvale Drive frontage which connects to Googong Common (2-metre width delivered).
- A 2-metre wide footpath along Glenrock Drive (delivered).
- On-road bicycle lane on both sides of Wellsvale Drive connecting to the site (delivered).

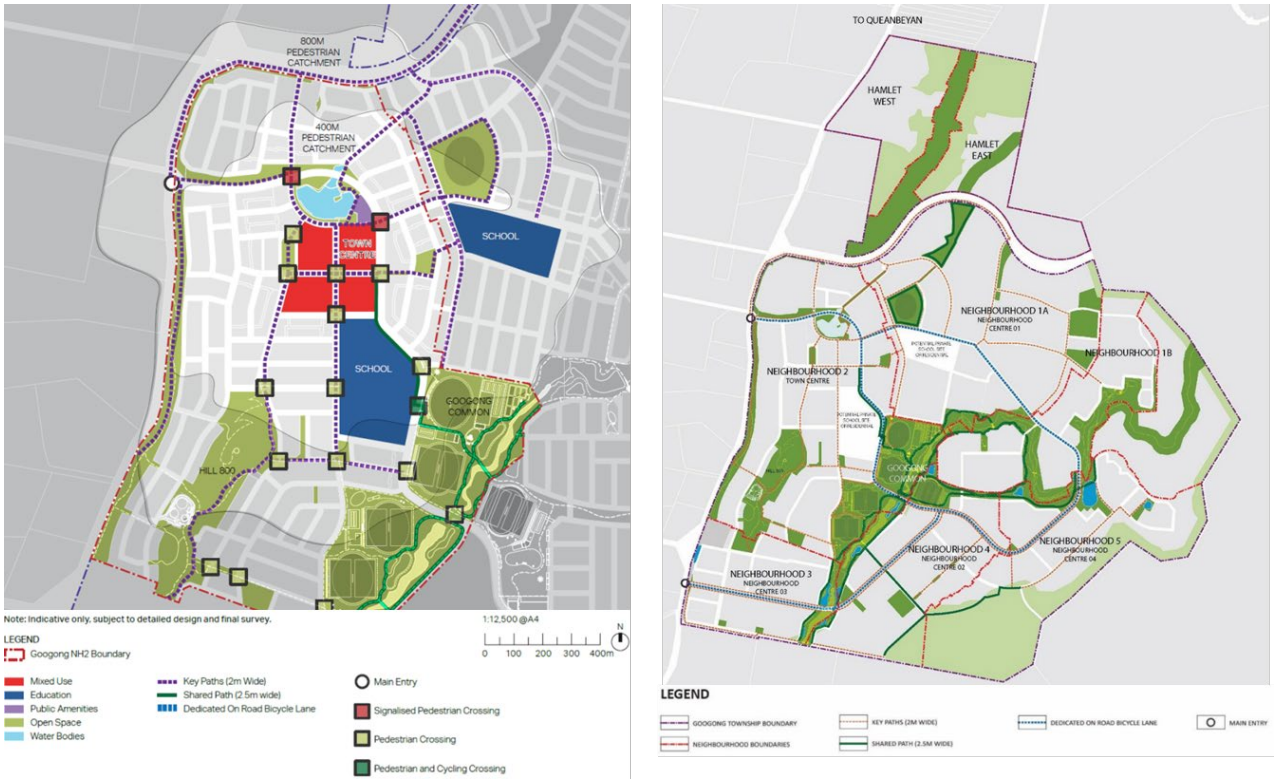


Figure 11. Googong Development Control Plan 2010 pedestrian and cycling facilities (Queanbeyan-Palerang Regional Council, 2010).

The Googong DCP identified the following public transport infrastructure and services:

- A new bus stop at the eastern frontage of the new high school for Googong on Wellsvale Drive.
- Various bus routes connecting to each neighbourhood, as shown in Figure 12.

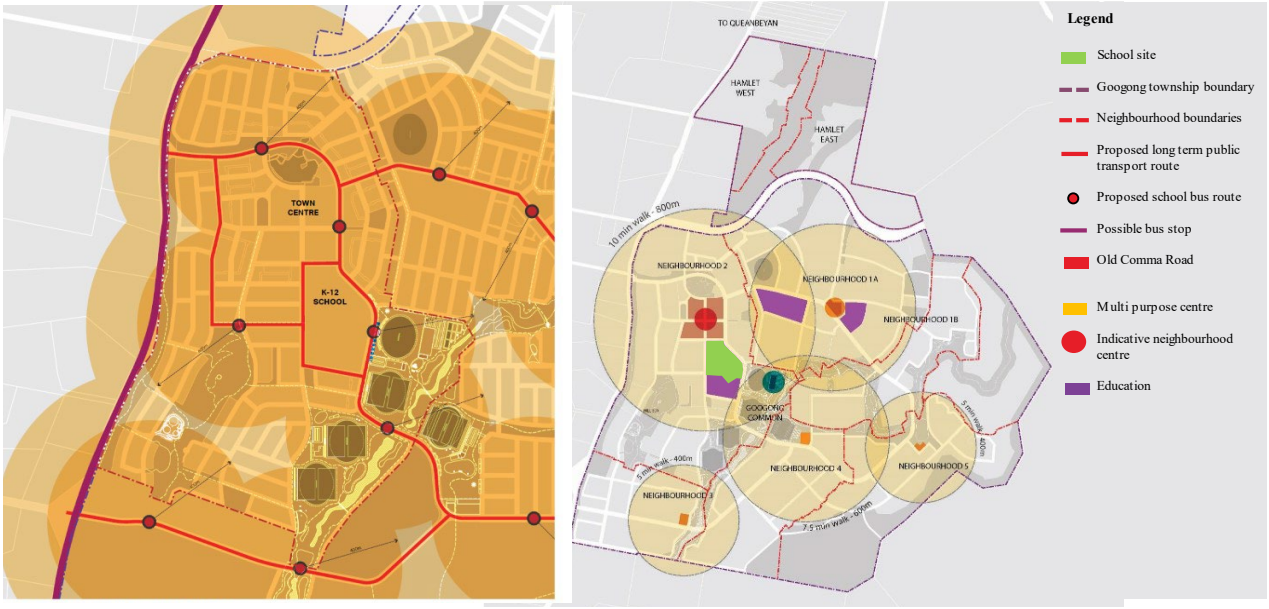


Figure 12. Googong Development Control Plan 2010 public transport and community facilities (Queanbeyan-Palerang Regional Council, 2010)

2.2.7 Googong Neighbourhood 2 Township Traffic Report (Calibre Consulting, 2017)

Figure 15 shows the road hierarchy, carriageway widths and reserve widths of roads surrounding the site. Figure 16 shows the typical cross section of a Street Type One, which includes Observer Street and Glenrock Avenue

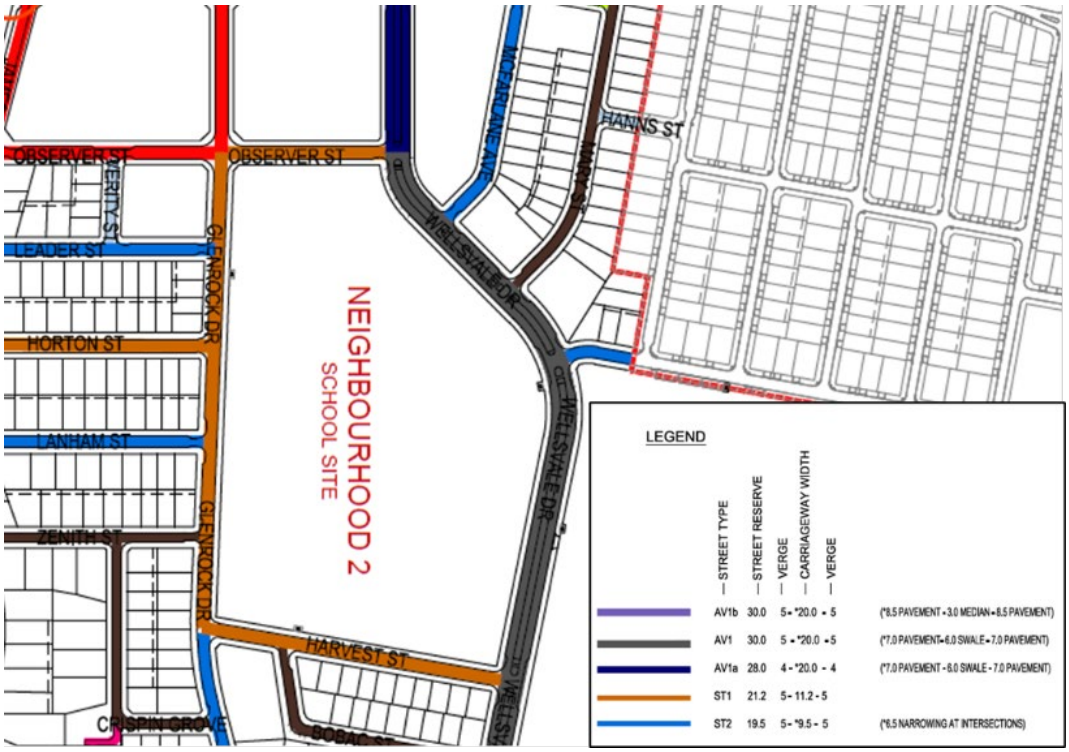


Figure 13. Road hierarchy plan of neighbourhood 2 (Source: Googong Neighbourhood 2 Traffic Report, 2019).

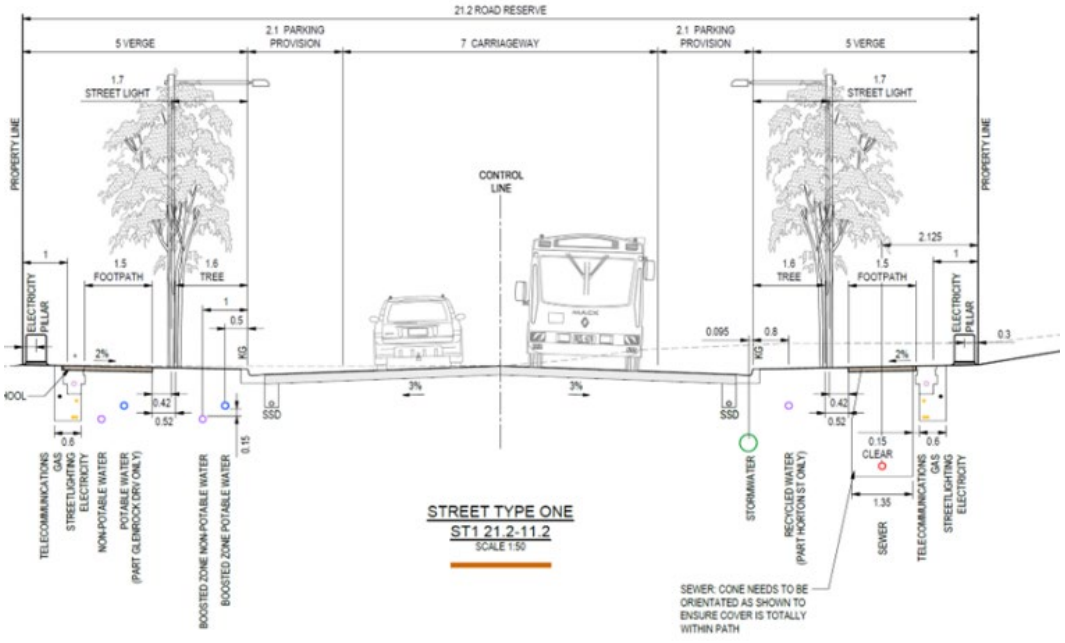


Figure 14. Proposed road section at Observer Street, Glenrock Drive, Harvest Street, and Horton Street (Googong Neighbourhood 2 Traffic Report, 2019).

2.2.8 Googong Masterplan

The masterplan layout in Figure 17 was used to understand the locations of various Neighbourhoods, as well as their staging in terms of development. Neighbourhoods 1 – 3 would be completed by the time the new high school for Googong is in operation.

Figure 15. (Left) Googong Master Plan (Source: PEET & Mirvac), (right) Googong neighbourhood 2 township traffic report (Source: Calibre Consulting, 2017).

2.2.9 Googong High School Rapid Transport Assessment (Arup, August 2024)

The key findings from the Rapid Transport Assessment (RTA) are summarised below.

Walking and cycling

- Footpath on built roads around the school range from 1.5m to 2.0m. On-road cycleways are provided along Wellsvale Drive in both directions.
- The baseline student mode share scenario references Jerrabomberra High School transport plan, as no hands-up survey of Jerrabomberra HS had been conducted at the time.
- Cycling mode share in the 'reach' scenario was set at 20% following TWG feedback and benchmarking against other schools. This was a reduction from 35% previously considered.

Vehicle access and parking

- Throughout the RTA, various locations for the staff car park were explored, including on Observer Street and Wellsvale Drive.
- Various access arrangements to the staff car park on Wellsvale Drive were considered. The driveway was located to avoid vehicle conflict at McFarlane Avenue and preserve the left in / left out driveway access.

Kiss and Drop and bus access

- Both are located on Glenrock Drive. The bus zone is positioned closer to Observer Street, while the Kiss and Drop is provided further south on Glenrock Drive, after the bus zone.

3. Existing site context

This section details the road environment of the completed roads around the site and the existing provision for people walking, cycling and using public transport.

3.1 Location Overview

The new high school for Googong would be located in Googong Township, around seven kilometres south of Queanbeyan (Figure 16). There are four nearby high schools that are partly or fully operational.

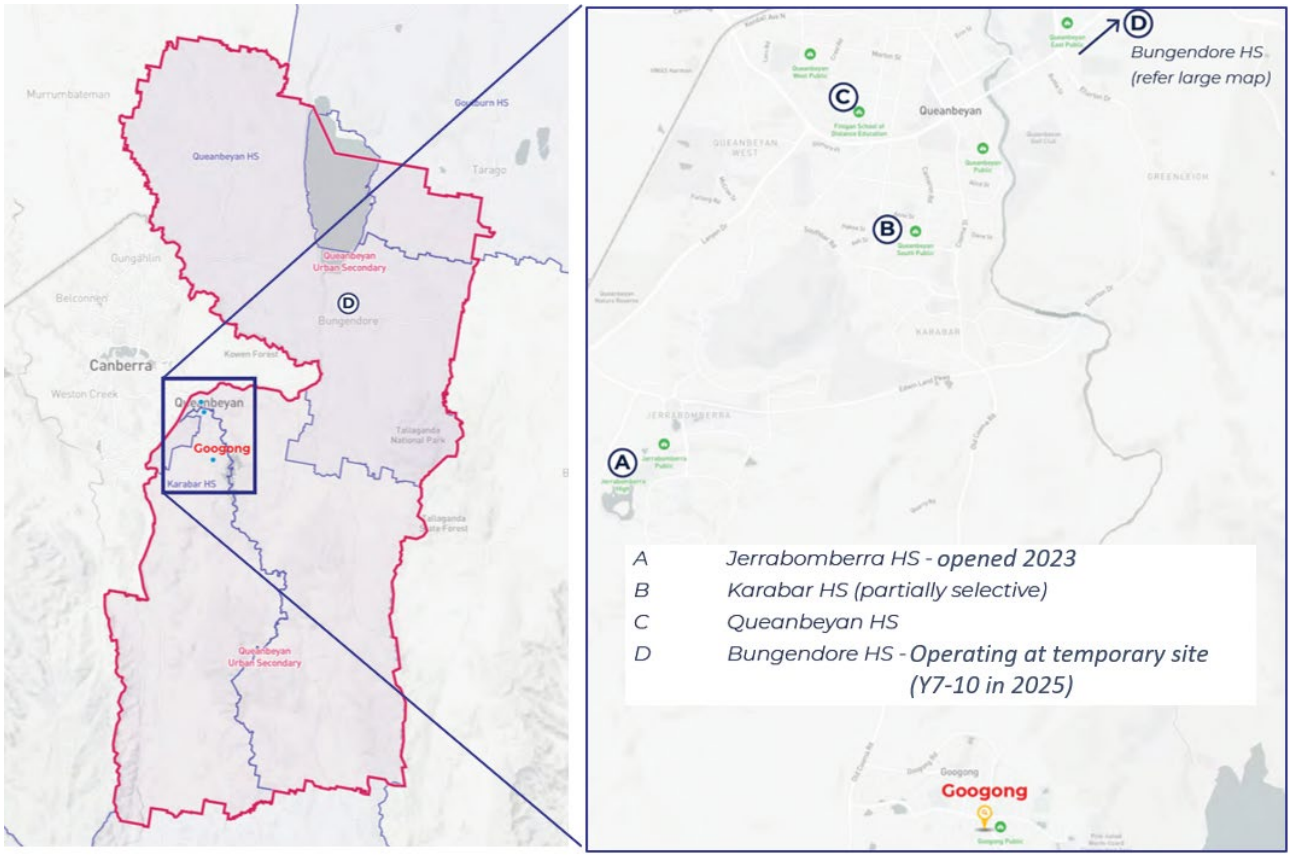


Figure 16. Location of the new high school for Googong and nearby schools

3.2 Active transport – walking environment

The observed walking environment is summarised in Figure 19.

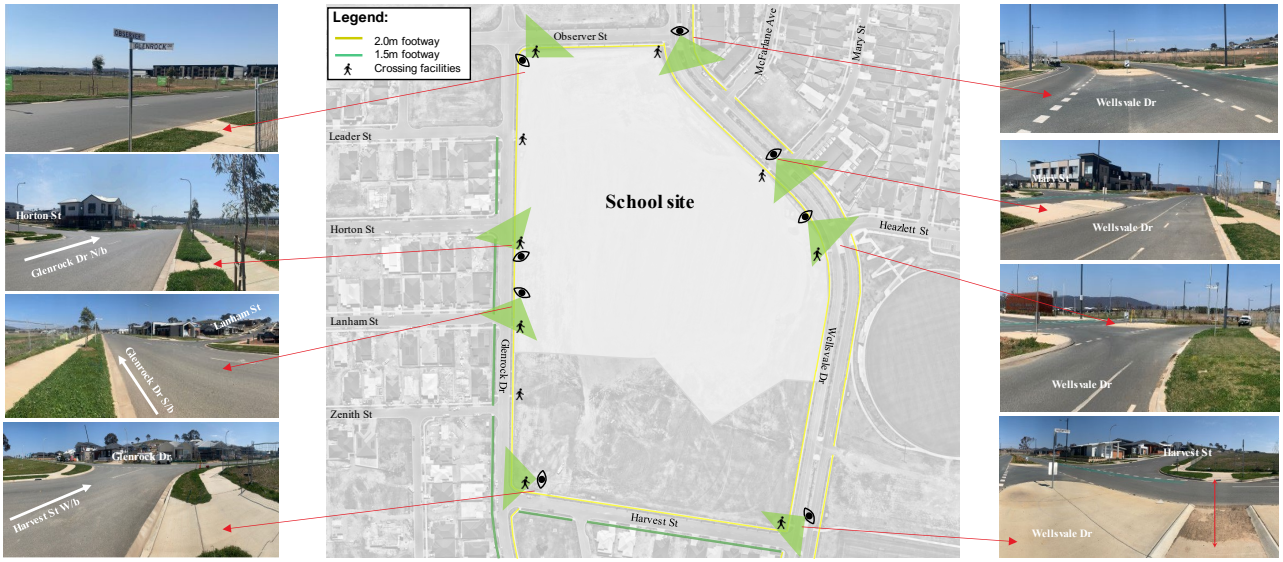


Figure 17. Observed walking environment.

3.3 Active transport – cycling environment

The observed cycling environment is summarised in Figure 20 and consists mainly of on-road bicycle lanes. According to the Cycleway Design Toolbox (TfNSW, 2020), on-road bicycle lanes are not suitable for priority cycling routes.

Children under the age of 16 years are legally permitted to ride on footpaths, and older students may do so if accompanying a child under the age of 16 with adult supervision. In this context, shared paths are preferred as they accommodate both cycling and walking, providing a safer and more accessible option for students.

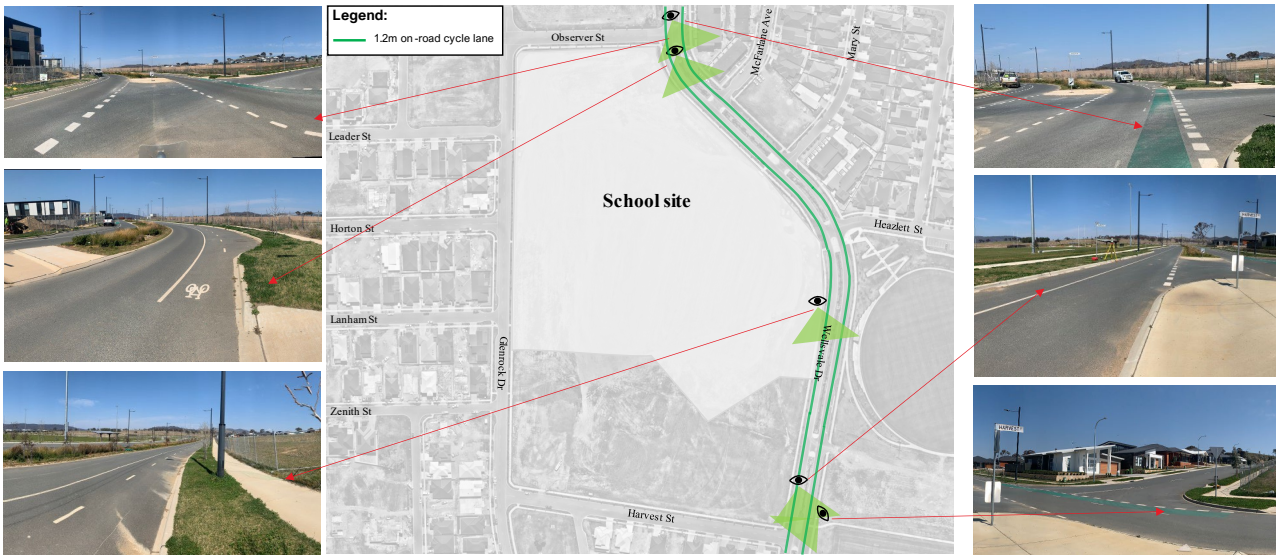


Figure 18. Observed cycling environment.

3.4 Road network

Old Cooma Road is a Regional Road that serves as the main arterial road that connects Googong to Queanbeyan, with a signposted speed limit of 80km/h. All other roads, including Wellsvale Drive, Observer Street, Glenrock Drive and Harvest Street are local roads with a posted speed limit of 50km/h. The road hierarchy is defined by the Googong DCP in Figure 21, and imagery of key roads is shown in Figure 20.

The kerbside parking on roads surrounding the school is unrestricted at the time of writing (February 2025).

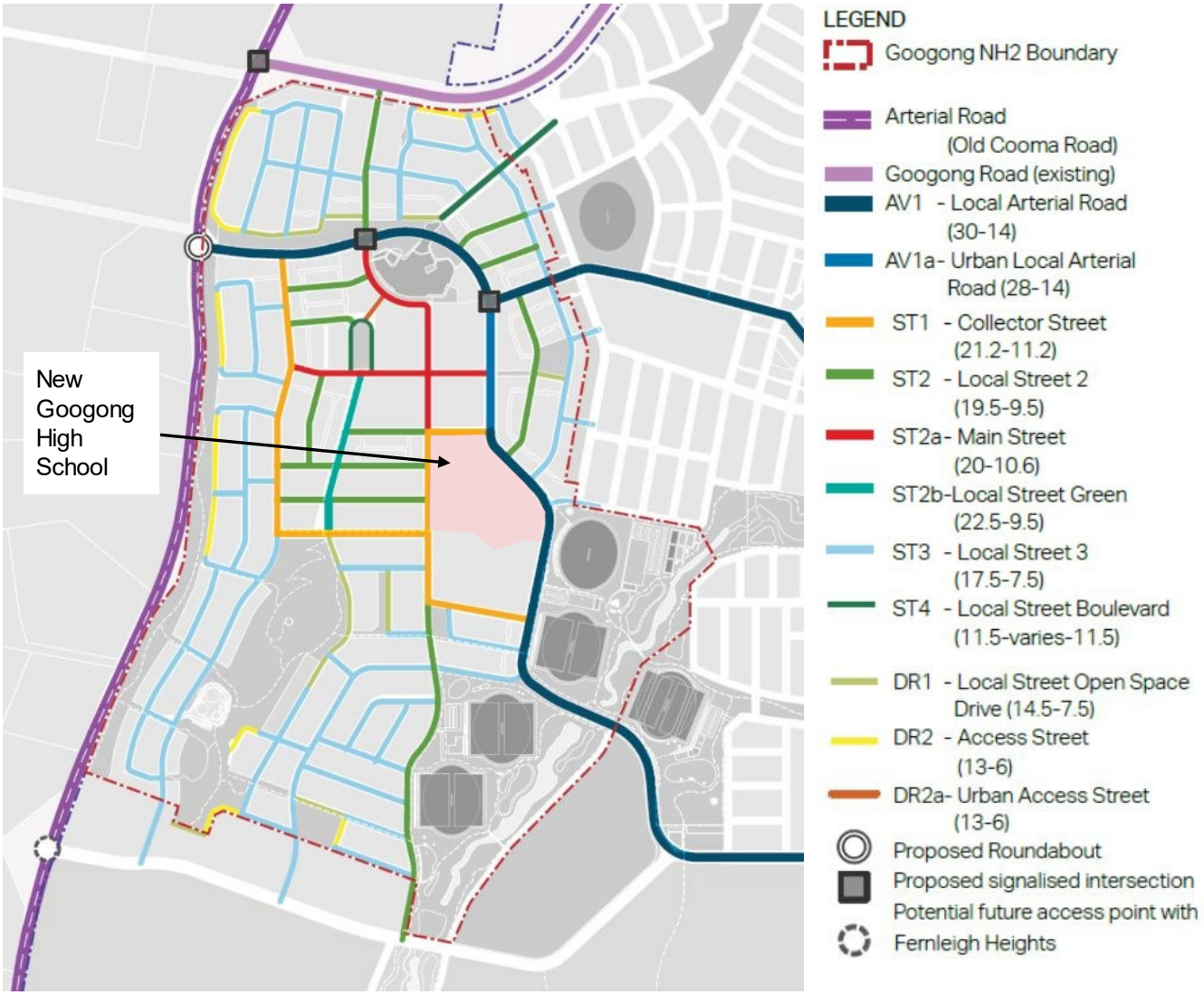


Figure 19. Road hierarchy for Neighbourhood 2 (Source: Googong development control plan 2010 (Queanbeyan-Palerang Regional Council, 2010)

Glenrock Drive (east of school)

Single-lane, two-way local road with on-street parking opportunities

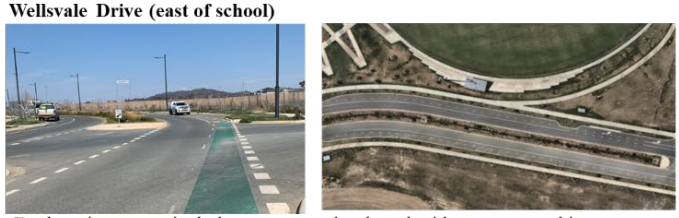
Observer Street (north of school)

Single-lane, two-way local road with on-street parking opportunities

Harvest Street (south of school)

Single-lane, two-way local road with on-street parking opportunities

Wellsvale Drive (east of school)



Dual carriageway, single-lane two-way local road with on-street parking, vegetated median, on-street cycle lanes and turning lanes

Figure 20. Roads surrounding the site.

3.5 Public transport

Googong is serviced by two public bus routes (Route 830 and 840X) and several school bus routes. Recommendations for adjustments to bus routes will form the basis for discussions with TfNSW and are outlined in Section 4.6. Existing school bus routes focus on connecting neighbouring rural suburbs with Googong town centre and the two existing primary schools.

Stopping times for school bus routes in the AM and PM peaks are given in Table 1 and Table 2 respectively.

Bus routes are mapped in Figure 21 and Figure 22.

School bus routes 216 and 217 travel to Googong from Queanbeyan and Jerrabomberra. Outside of the Googong Township itself, they do not service the enrolment area for the new high school for Googong. As such, they have not been considered in the following assessment.

Table 1. Public transport - Bus routes (AM)

Route	Route Description	Service start time	Arrival time at Googong
S229	From Burra to Googong Public School	7:36 am	8:35 am
S212	From Jerrabomberra to The Anglican School Googong	7:19 am	8:11 am
S252	From Royalla to Queanbeyan	7:44 am	8:18 am
S273	From Michelago to Googong	7:33 am	8:18 am
830	Googong to Canberra CBD via Queanbeyan and Karabar	8:32 am	8:32 am
840X	Googong and Jerrabomberra to Canberra CBD	7:57 am	7:57 am

Table 2: Public transport - Bus routes (PM)

Route	Route Description	Departure time from Googong
S230	From Googong Public to Burra via Royalla	3:00 pm
S142	From The Anglican School Googong to Jerrabomberra	3:43 pm
S252	From The Anglican School Googong to Royalla	3:46 am
S273	From The Anglican School Googong to Michelago	3:46 pm
830	Canberra CBD to Googong via Queanbeyan and Karabar	3:25 pm
840X	Canberra CBD to Googong and Jerrabomberra	n/a

Figure 21. Public transport - school services (AM)

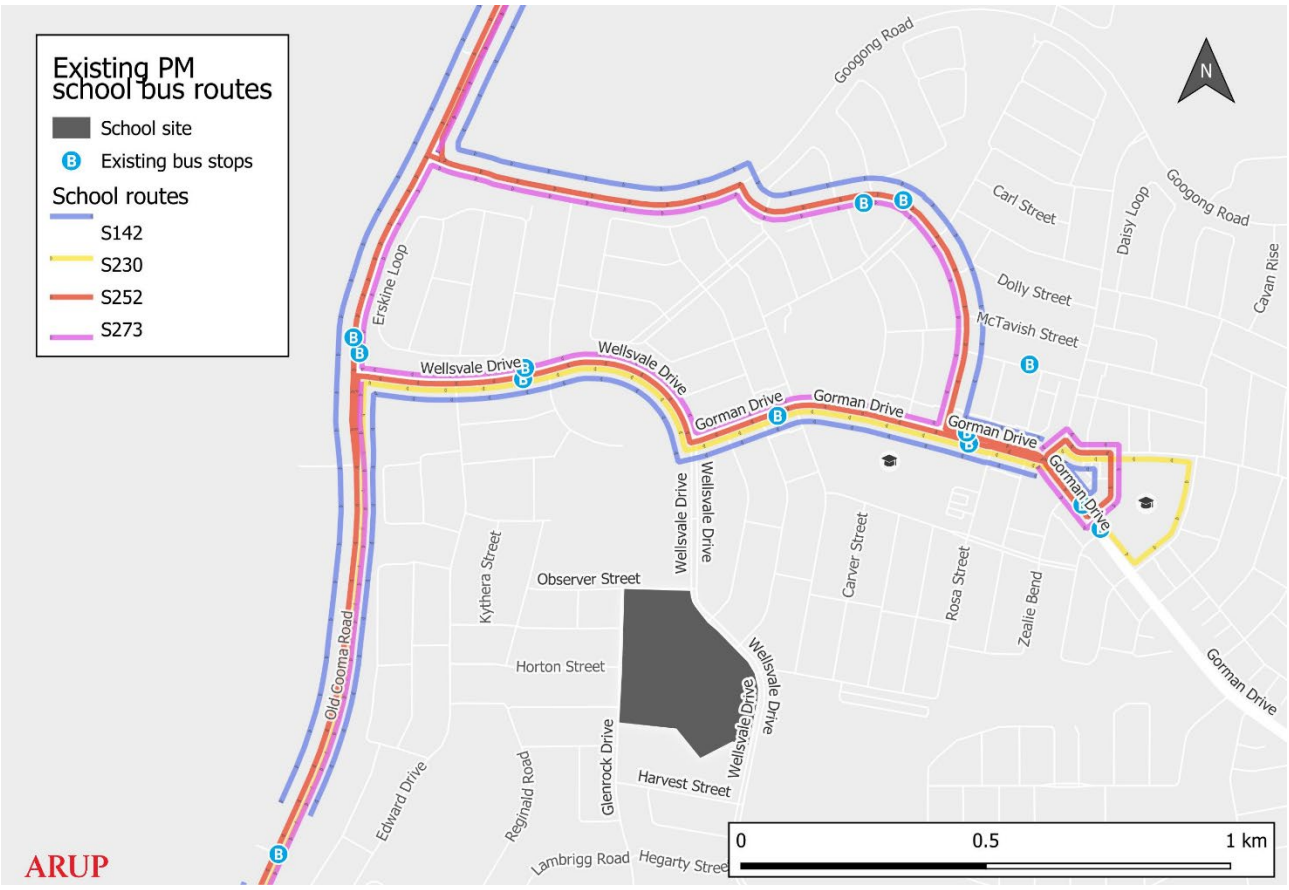


Figure 22: Public transport - school services (PM)

Bus route 830 which travels between Canberra and Googong via Queanbeyan and Route 840X travels between Canberra and Googong via Jerrabomberra. The inbound and outbound routes both travel along Wellsvale Drive onto Gorman Drive and could potentially be rerouted to stop at the proposed bus zone at the new high school for Googong.

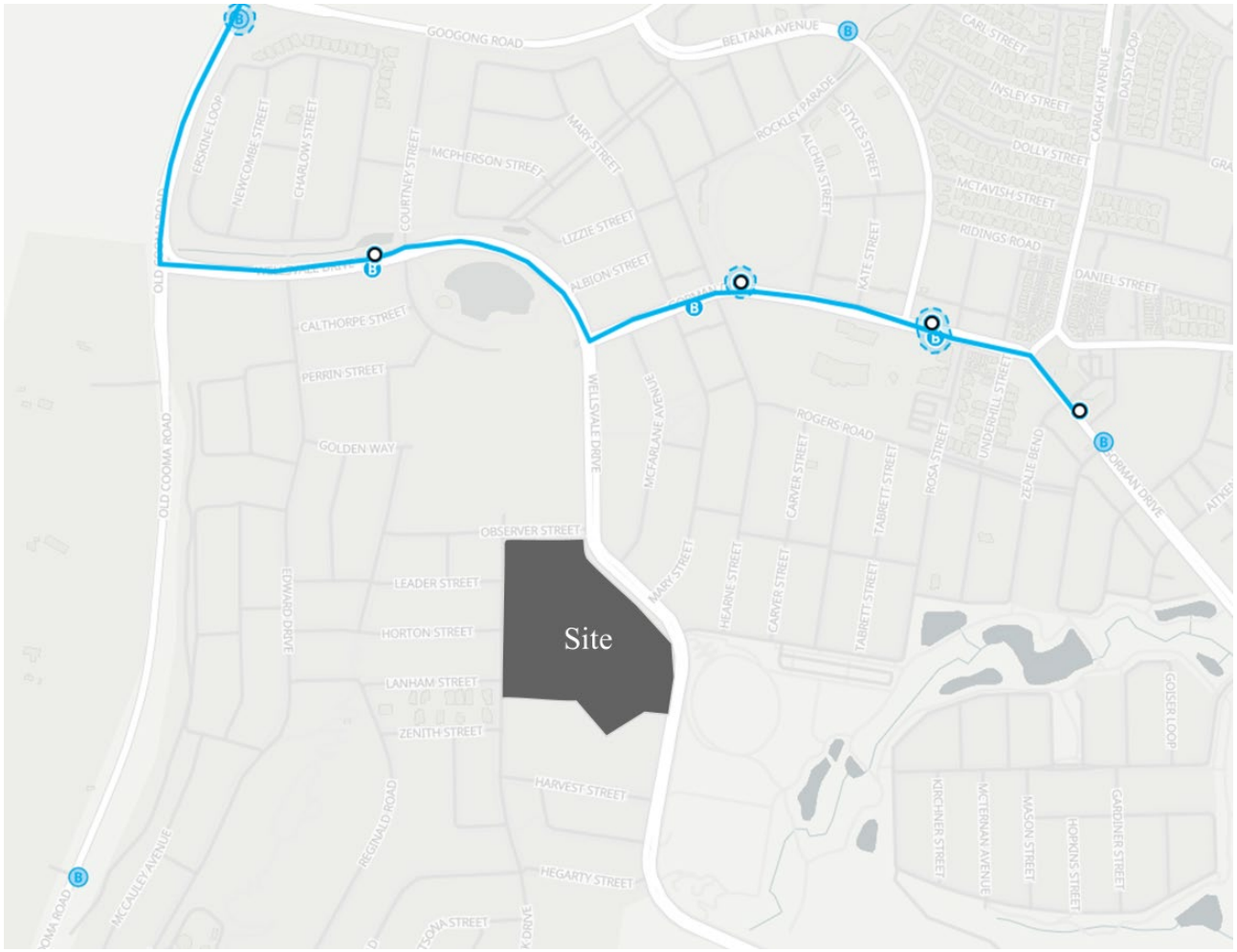


Figure 23 Route 830 and 840X (Base map source: Anytrip)

4. Transport analysis

This section looks at the planned transport network for people walking, cycling, using public transport or reaching the school by private vehicle.

- Section 4.1 sets out the school enrolment area and where students are likely to live.
- Section 4.2 and 4.3 consider the planned active travel network (as defined by the Googong Masterplan) to evaluate the cycling and walking reach from the new high school for Googong. These catchments were then overlaid with the expected home locations of future students to estimate the proportion of students likely to use active travel for school commutes.
- Section 4.4 assesses the current infrastructure on important walking and cycling routes, and highlights new crossings which will be delivered as part of this activity and build on top of the masterplan provisions to ensure students can safely walk and ride to school.
- Section 4.5 considers the catchment of existing bus routes to assess current coverage, identify gaps, and inform future bus planning. These catchment results are used to inform what mode share could be achieved in Scenario 3 'reach'.
- Section 4.6 highlights opportunities and options to improve access to the school by public transport, including how existing school buses could be re-routed to stop at the school, as well as the feasibility of a mini-bus route to provide public transport coverage to areas without current access to bus services.
- Section 4.7 assesses the availability of on-street parking and off-street parking for use by visitors to the school.

Traffic generation and intersection modelling are considered in Section 5 and Section 6 respectively, as they are dependent on the mode share scenarios developed in Section 5.

4.1 School enrolment area

The enrolment area for the new high school for Googong is shown in blue in Figure 24. The catchment extends beyond the Googong Township and includes rural areas such as Burra and Michelago.

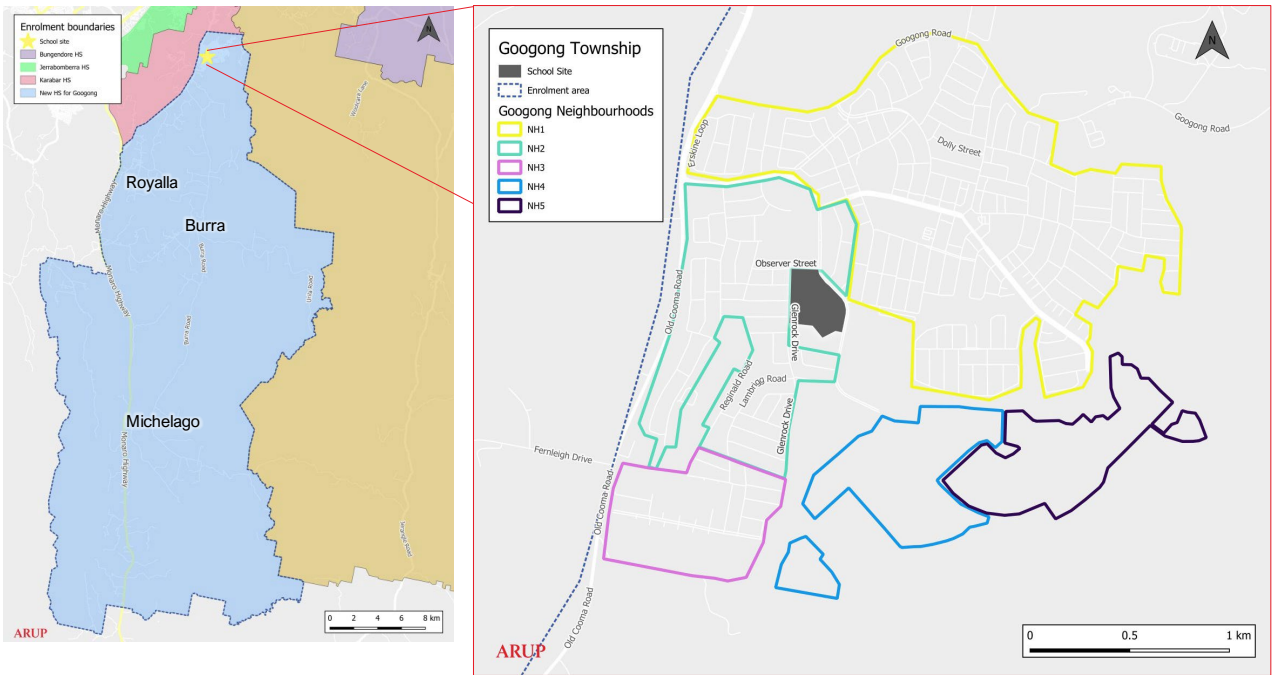


Figure 24. Googong enrolment area boundary (left) and Googong Neighbourhoods (right)

The expected home locations of future students were extrapolated from the existing enrolment and expected completion timelines of neighbourhoods in Googong Township.

Using 2023 depersonalised enrolment data of students from DoE key assumptions used are:

- The target enrolment capacity is 700 students.
- The opening year for the new high school for Googong is 2027. The QPRC Traffic Officer advised that Neighbourhoods 1, 2 and 3 are expected to be built out by 2027.
- The rural population outside the Googong Township (73 students) is assumed to remain constant at 2023 levels when the school is operating.
- As such, we anticipate that 627 students will live in Neighbourhoods 1, 2 and 3 (see right image in Figure 24).

4.2 Walking catchment

This section considers the number of students that are within walking distance of the new high school for Googong. The 400m, 800m and 1200m catchments are shown below in Figure 25 and the number of students within walking distance is shown in Table 3.

The analysis showed that:

- 38% of the student population will be within a 15-minute walk of the school access point on Glenrock Drive.
- 52% of students are further than a 15-minute walk from the new high school for Googong but less than 2.9km. These students are considered beyond walking distance but are also not eligible for subsidised public transport under the SSTS.

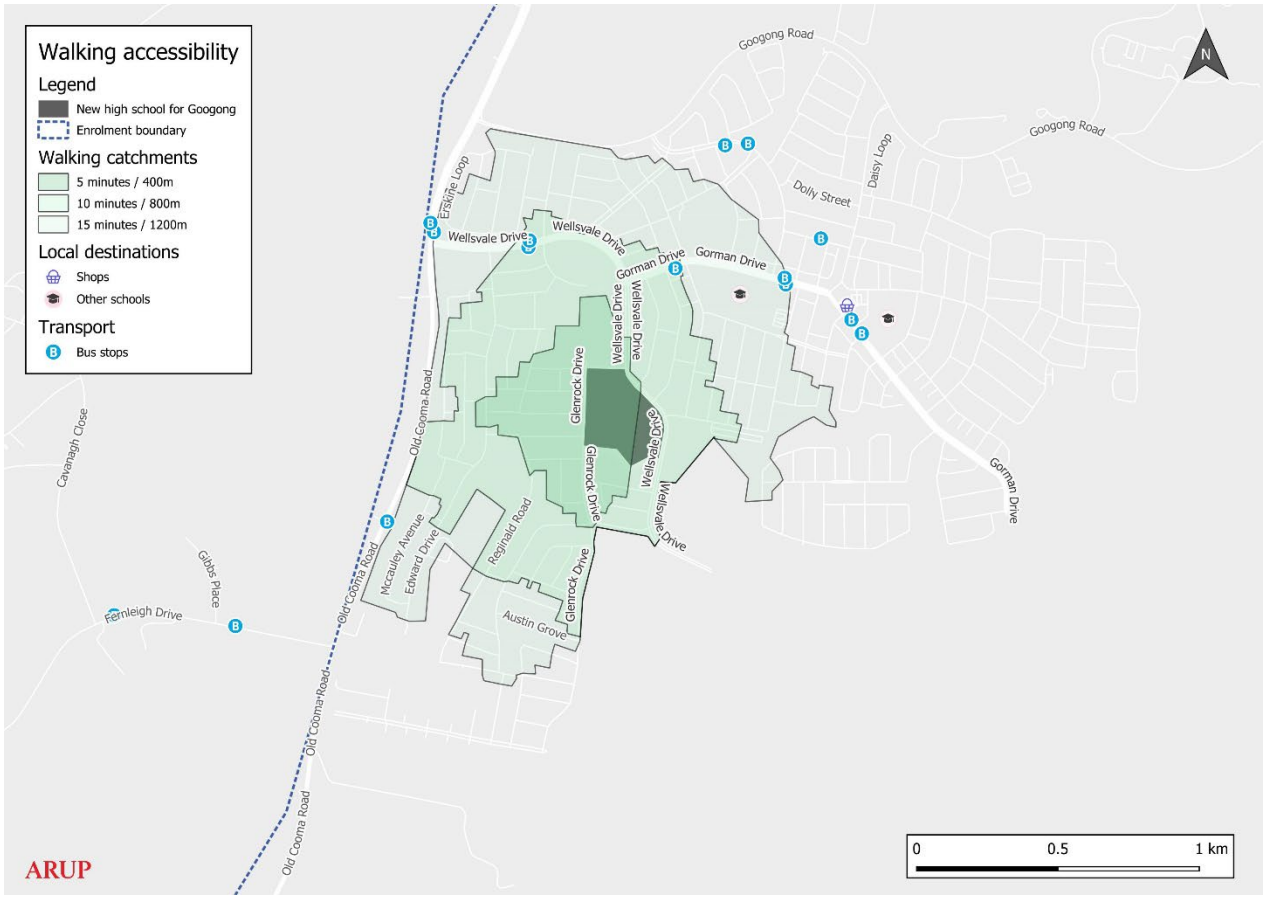


Figure 25. Walking accessibility

Table 3. Walking catchments – number of students

Walking catchments	No. of students	% of students
0 – 400m (5 min)	38	5%
401 – 800m (10 min)	101	14%
801 – 1200m (15 min)	125	18%
Total within 15 min walk	**264**	**38%**

4.3 Cycling catchment

This section considers the number of students within cycling distance of the new high school for Googong. The 2-kilometre and 3-kilometre catchments are shown below in Figure 26 and the number of students within cycling distance shown in Table 4.

The analysis showed that:

- The 10-minute cycling catchment covers almost the entirety of Googong Township, including the north-east area which is greater than a 15-minute walk from the new high school for Googong. This means most students within Googong Township who are too far away to walk to school can cycle or scoot.
- There are no safe active travel facilities or crossings on Old Cooma Road, which also forms the boundary of the school catchment. Active travel is likely to be contained within the new development without infrastructure improvements.
- 7% of students are expected to live within the 2 – 3 kilometre cycling distance from the site; these students primarily live to the north-east of Googong Neighbourhood 1 (as seen in Figure 26). While

eligible for free travel under the SSTS, these students would rely on cycling or car travel to get to school as there is no current public transport servicing this area.

- 10% of students live beyond 3 kilometres. These students live in rural areas, are eligible for free travel under SSTS, and would rely on public transport or car travel to get to school.

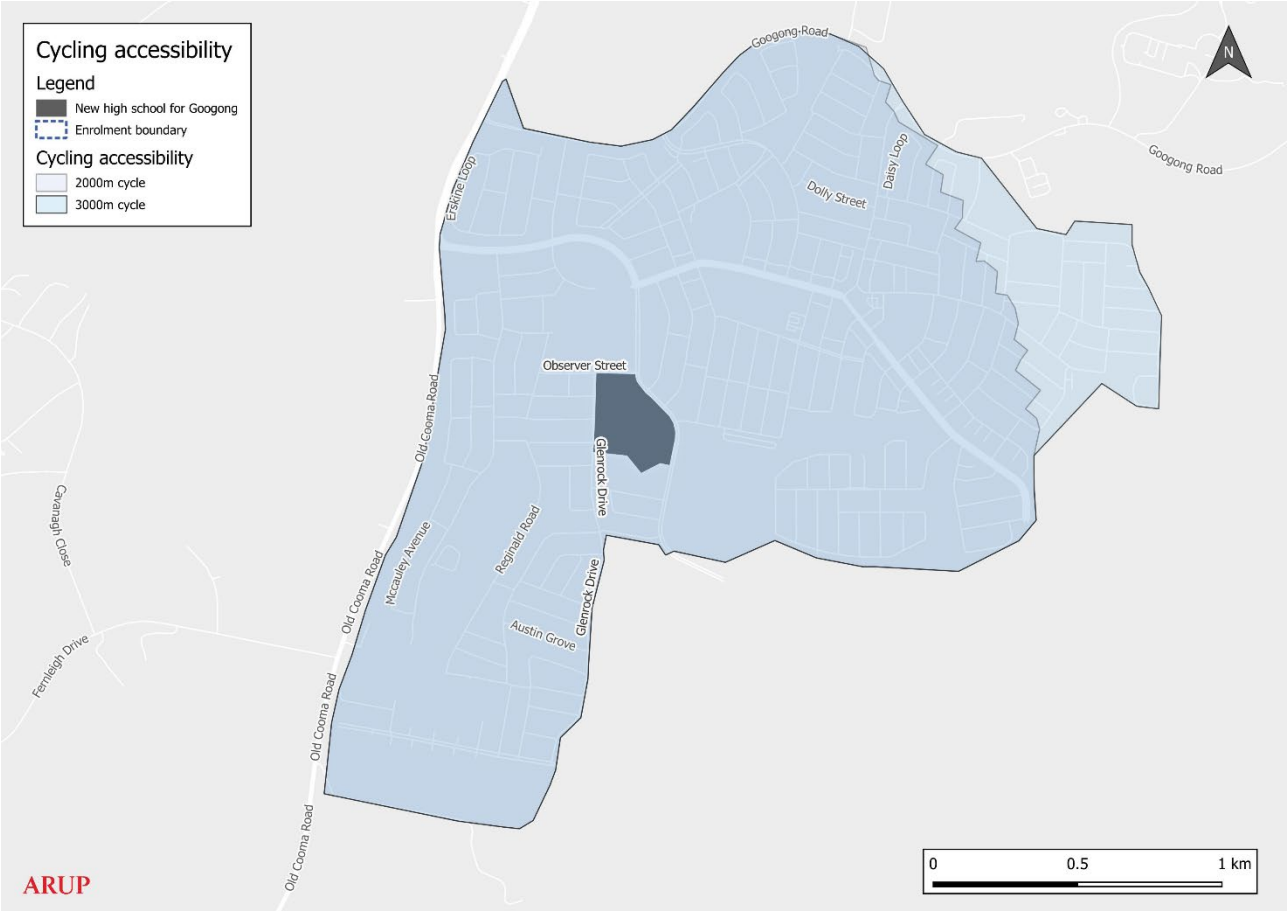


Figure 26. Cycling accessibility

Table 4. Cycling catchments – number of students

Cycling catchments	No. of students	% of students
2km (10 mins)	581	83%
3km (15 mins)	48	7%
Total within 15 min cycle	**629**	**90%**
Beyond 3km	71	10%

4.4 Walking and cycling routes

Figure 27 draws on path analysis to illustrate the likely paths that students from Neighbourhoods 1-3 will take when travelling to school upon its opening.

Key findings are:

- Demand is expected to originate to the south, east and north-east of the school where the majority of the development in Neighbourhoods 1-3 will have occurred.
- Many of the shortest routes converge on Glenrock Drive (collector road), Gorman Drive (local arterial road) and Wellsvale Drive (arterial road).

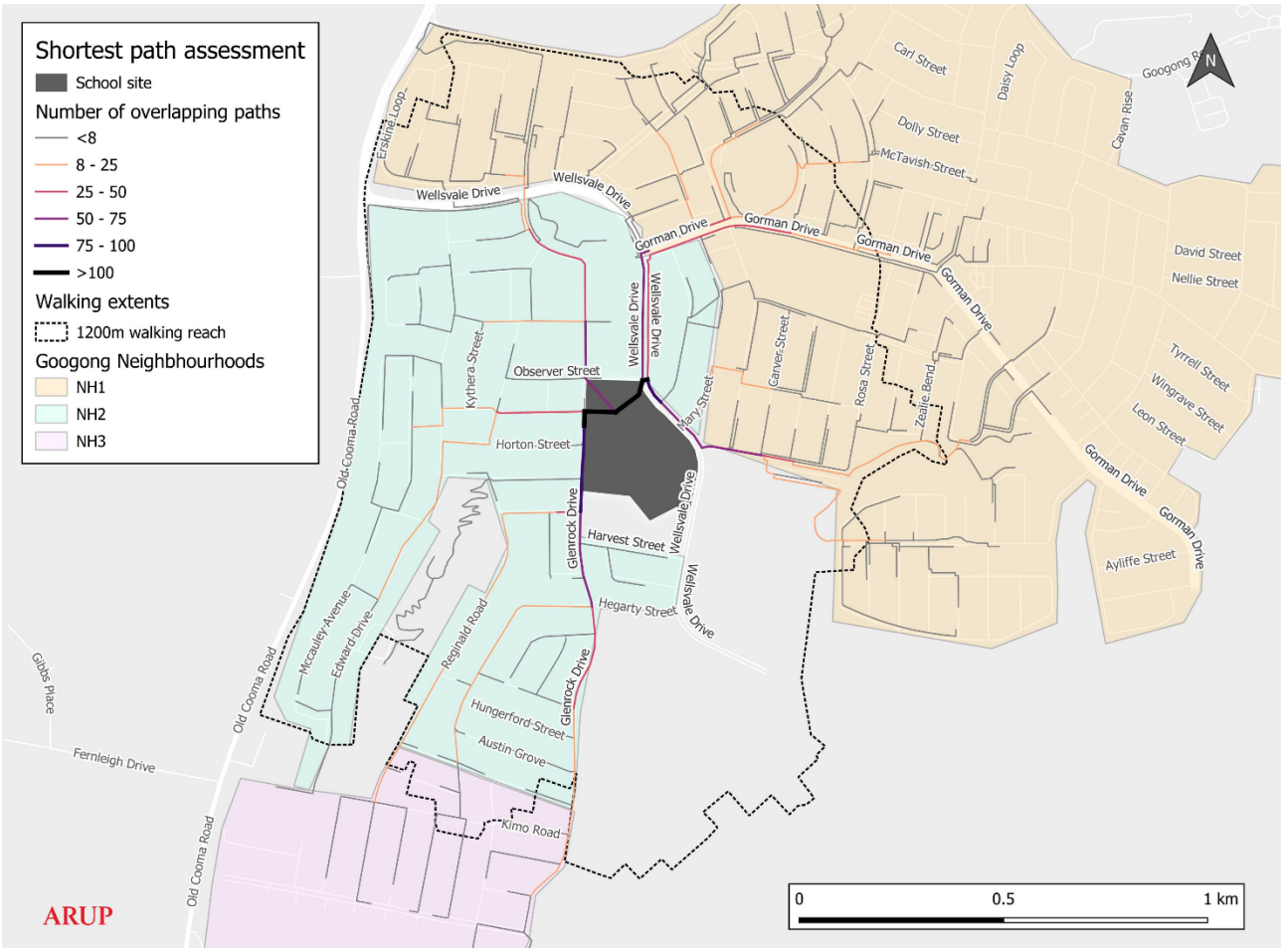


Figure 27. Shortest path assessment.

Results from the shortest path analysis were used to determine the top five walking routes with highest walking demand to the new high school for Googong. These are shown in Figure 28.

Five formal crossing facilities adjacent to school are proposed to be delivered as part of this activity, and have been labelled in pink and identified Figure 28 and in Section 8 – Mitigation Measures.

Other locations where students cross along these routes are on local roads. These generally have short crossing distances and low speeds. As Googong Township develops, community feedback will be valuable to assess where additional safety interventions may be required.

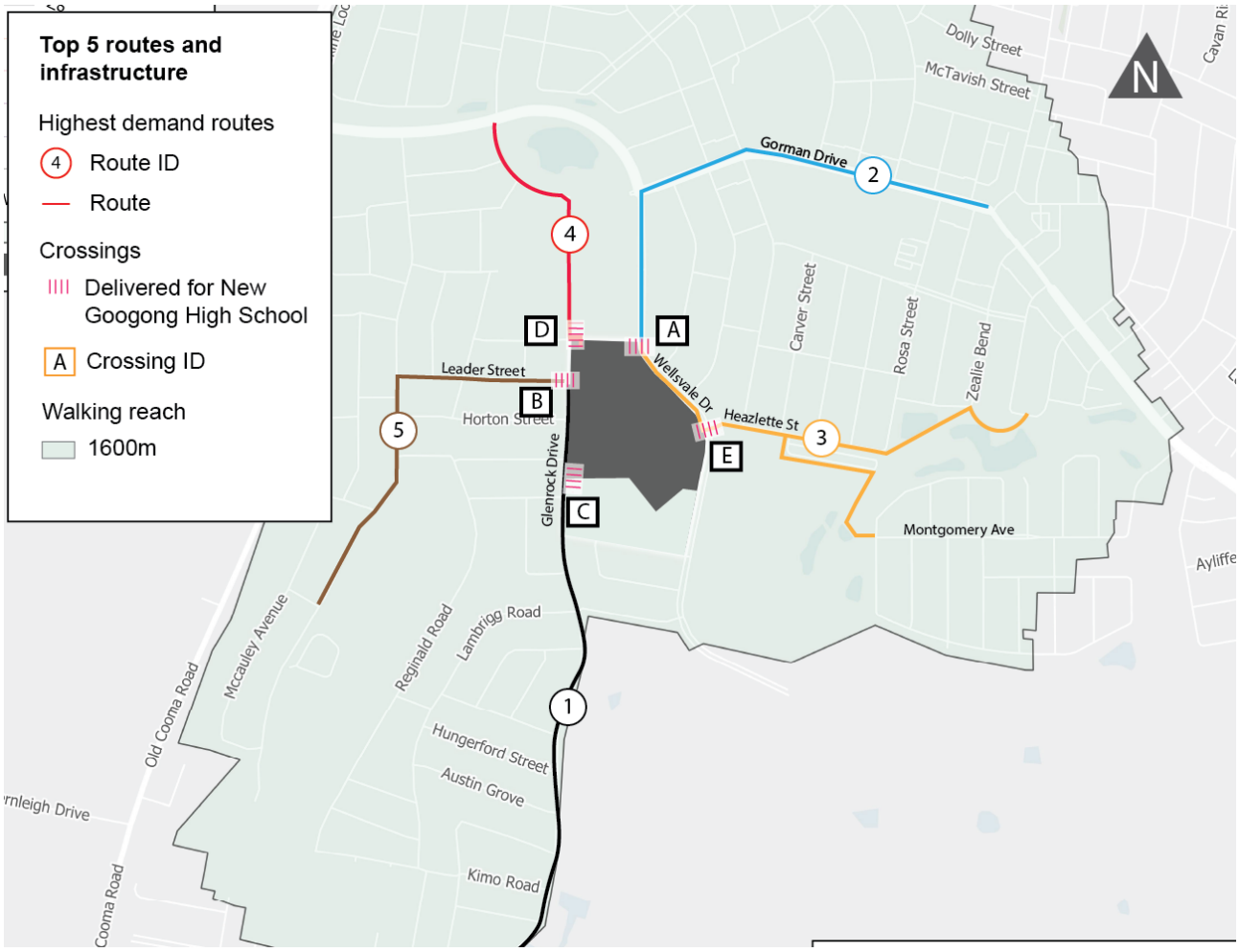


Figure 28. Top five routes by modelled demand

4.4.1 Pathway assessment

The table below identifies the existing path provision, path quality and shading conditions along each of the five shortest walking and cycling routes.

As discussed in Section 3.3, cycling infrastructure in Googong primarily consists of shared paths and on-road bicycle lanes on major roads such as Wellsvale Drive. On-road bicycle lanes are not considered suitable for children, due to potential conflict with vehicles at intersections and alongside parked cars and it is anticipated that most students who cycle would use footpaths.

Table 5. Top 5 shortest routes

Route ID	Significance	Expected demand (students per peak hour)	Number of crossings (minor, major)	Existing infrastructure	Proposed upgrades (refer to Table 6)
1	Connects developments on the south of the site to the school. Type 2 path (Walking Space Guide)	90	1 major road crossing 9 minor road crossings	100% of the 1.3km route has footpaths on at least one side of the street completed, and 70% has footpaths on both sides. Footpath width is generally 1.8m. Pavement is new and surface in good quality. No current shading but young trees have been planted in the verge. No existing or planned cycleways or shared paths along this route.	Upgrade crossing at Glenrock Drive / Harvest Street (Location C)
2	Connects developments on the north-east of the site to the school. Type 2 path (Walking Space Guide)	90	3 major road crossings 3 minor road crossings	100% of the 1km route has footpaths on both sides of the street. Footpath width is generally 1.8m. Pavement is new and surface in good quality. No current shading, but young trees have been planted in the verge. Existing on-road bicycle lane available along both sides of Wellsvale Drive and Gorman Drive.	Upgrade crossing at Wellsvale Drive / Observer Street (Location A)
3	Two potential footpaths along Route 3 capture developments on the east of the site and offer connections between to the school and sports facilities. Type 2 path (Walking Space Guide)	60	1 major road crossing 5 minor road crossings	100% of the 1km route has complete footpaths on both sides of the street. Footpath width is generally 2.3m. Excellent pavement surface quality. 30% of the route has partial shading offered by small trees. Existing on-road bicycle lane available along both sides of Wellsvale Drive.	Upgrade crossing at Wellsvale Drive / Heazlett Street (Location E)

Route ID	Significance	Expected demand (students per peak hour)	Number of crossings (minor, major)	Existing infrastructure	Proposed upgrades (refer to Table 6)
4	Connects neighbourhood centre to the north of the site to the school. Type 2 path (Walking Space Guide)	40	1 major road crossing 2 minor road crossings	Approx. 40% of the 500m route has footpaths on both sides of the street. This is because Glenrock Drive is incomplete but will be completed when future development occurs. Footpath width is generally 1.5m and 2.0m. Completed sections have excellent pavement surface quality. No current shading but young trees have been planted in the verge. No existing or planned cycleways or shared paths along this route.	Upgrade crossing at Observer Street / Glenrock Drive (Location D)
5	Connects developments on the south-west of the site to the school. Type 2 path (Walking Space Guide)	20	1 major road crossing 2 minor road crossings	Length of route is 860m. 100% of the route has footpaths on at least one side of the street completed, and 60% has footpath on both sides. Footpath width is generally 1.5m. No shading is currently available along this route with only sparse availability of young trees planted along the route. Completed sections have excellent pavement surface quality. No existing or planned cycleways or shared paths along this route.	Upgrade crossing at Glenrock Drive / Leader Street (Location B)

4.4.2 Crossing improvements

The table below identifies crossing improvements along each of the five shortest routes. All items would be delivered as part of this activity (see Section 8 – Mitigation Measures). Location names are as per Figure 28.

Table 6. Crossing improvements along the top 5 routes

Location	Expected demand (students per peak hour) (see note)	Actual infrastructure	Recommended infrastructure	Rationale
A - Wellsvale Drive / Observer Street	137	Pedestrian refuge (in road median)	Pedestrian crossing – raised/wombat crossing	The existing refuge does not give priority to pedestrians or slow down vehicle speeds. Local arterial road with high student demand. A raised crossing would improve safety by increasing visibility and calming traffic.
B - Glenrock Drive / Leader Street	69	No crossing infrastructure	Pedestrian crossing – raised/wombat crossing	The crossing opposite the main entrance to the school services the desire line for students living to the west of the school.
C - Harvest Street / Glenrock Drive	67	No crossing infrastructure	Pedestrian crossing – raised/wombat crossing with kerb build out	This is the main route for students living in Neighbourhoods 2 and 3. A formal crossing provides safety and improves connectivity.
D - Observer Street / Glenrock Drive	58	No crossing infrastructure	Pedestrian crossing – raised/wombat crossing with kerb build out	This crossing will facilitate students and residents moving towards Neighbourhood 2 town centre. A raised crossing with kerb build-out would improve pedestrian safety and visibility.
E - Wellsvale Drive / Heazlett Street	56	Pedestrian refuge (in road median)	Pedestrian crossing – raised/wombat crossing	Wellsvale Drive classed as a local arterial road, and a priority crossing would help students navigate safely. This route is a key access point to Brooks Oval and Googong Neighbourhood 1. A raised crossing would enhance safety and pedestrian priority.

Note: *Pedestrian Crossing Guideline (TS 00043:1.0)* suggests a minimum pedestrian demand of 20 pedestrians per hour during two separate one-hour periods on a typical day. Vulnerable pedestrians, such as children or elderly, are counted as two pedestrians each.

4.5 Public transport catchment

Public transport access in rural areas cannot be estimated using the same methods that apply in urban areas. Existing SSTS subscription data will indicate student bus ridership but has not been available for this assessment. Eligibility for SSTS requires high school student to live beyond a 2 kilometre straight-line distance or 2.9 kilometres on path to qualify for free travel.

The analysis showed that:

- 10% of students are projected to be eligible for free public transport travel through the SSTS.
- All students who reside within the Googong Township are ineligible for free travel through the SSTS (as they do not live further than 2 / 2.9 kilometres). These students have the option to purchase a School Term Bus Pass from TfNSW for discounted travel.

Catchments around bus stops are shown in Figure 29 and the proportion of students who live within 2km straight-line of the school site is shown in Table 7.

While Transport for NSW was consulted during the TWG process (see Section 9), detailed information on the future bus network was not yet available.

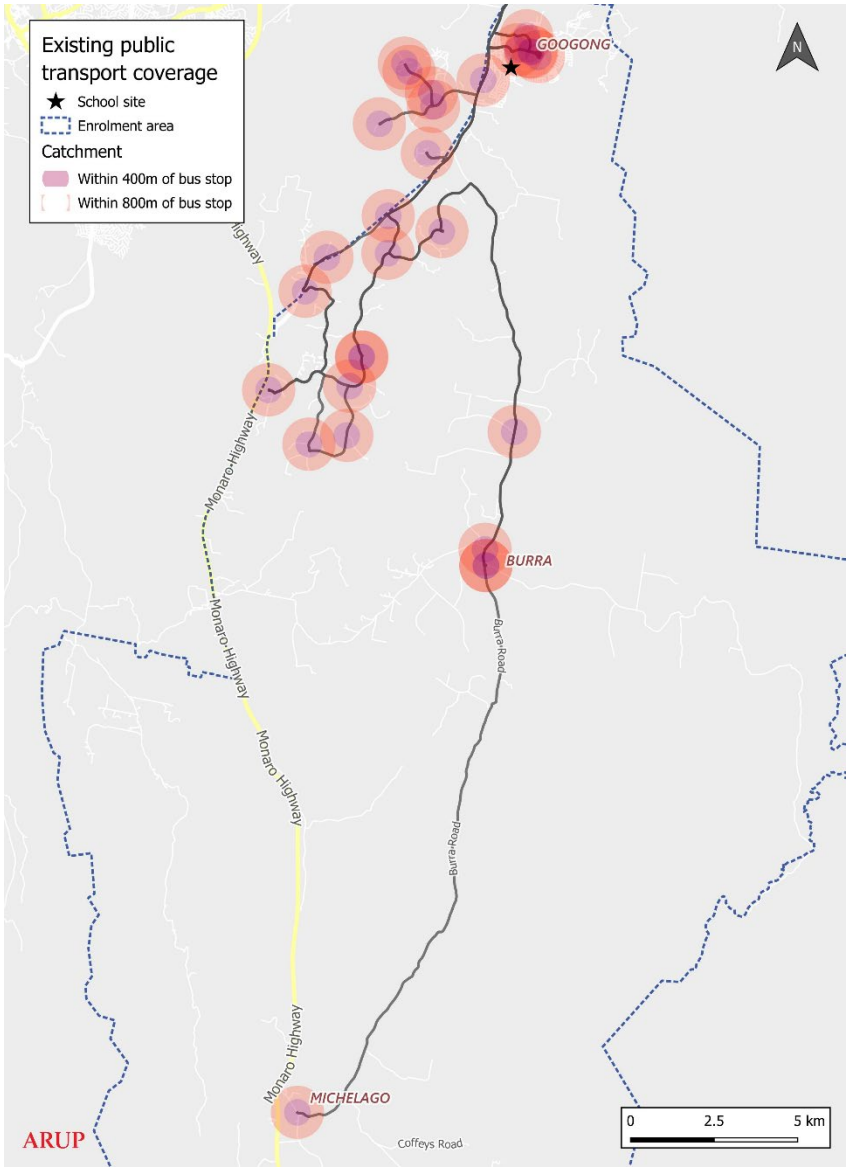


Figure 29. Public transport - bus accessibility

Table 7. Public transport catchments - total number of students.

Eligible for free public transport	No. of students	% of students
Within 2km straight line distance	627	90%
Beyond 2km straight line distance	73	10%

4.6 Public transport opportunities

All opportunities (future public transport services, school routes, mini-bus routes) are subject to TfNSW service planning process, which would typically occur closer to the school opening. Recommendations in this report can help inform initial considerations for that process.

There are three key opportunities to improve public transport access to the new high school for Googong:

1. Divert existing bus services
2. Advocate for proposed masterplan bus route
3. Provide a minibus service to north-eastern neighbourhoods.

Divert existing bus services

Existing school bus routes listed in Section 3.5 and route 830 could be diverted to stop at the new bus zone on Glenrock Drive outside the new high school for Googong (see Figure 30). Should bus timetables remain unchanged, this would impact the route 830 service departing Googong North Village Centre at 8:32am and the service arriving at Googong North Village Centre at 15:25pm.

Diversion of school bus routes would primarily benefit students living in rural areas. Diversion of route 830 would benefit students living in or near Googong North Village Centre.

As Neighbourhood 2 approaches completion, further route planning and timetabling of bus services is expected to occur (Transport for NSW, bus operator). This should consider:

- Aligning the arrival and departure times of existing school bus routes close to start and end bell times, without significantly compromising the operational cost or attractiveness of the service.

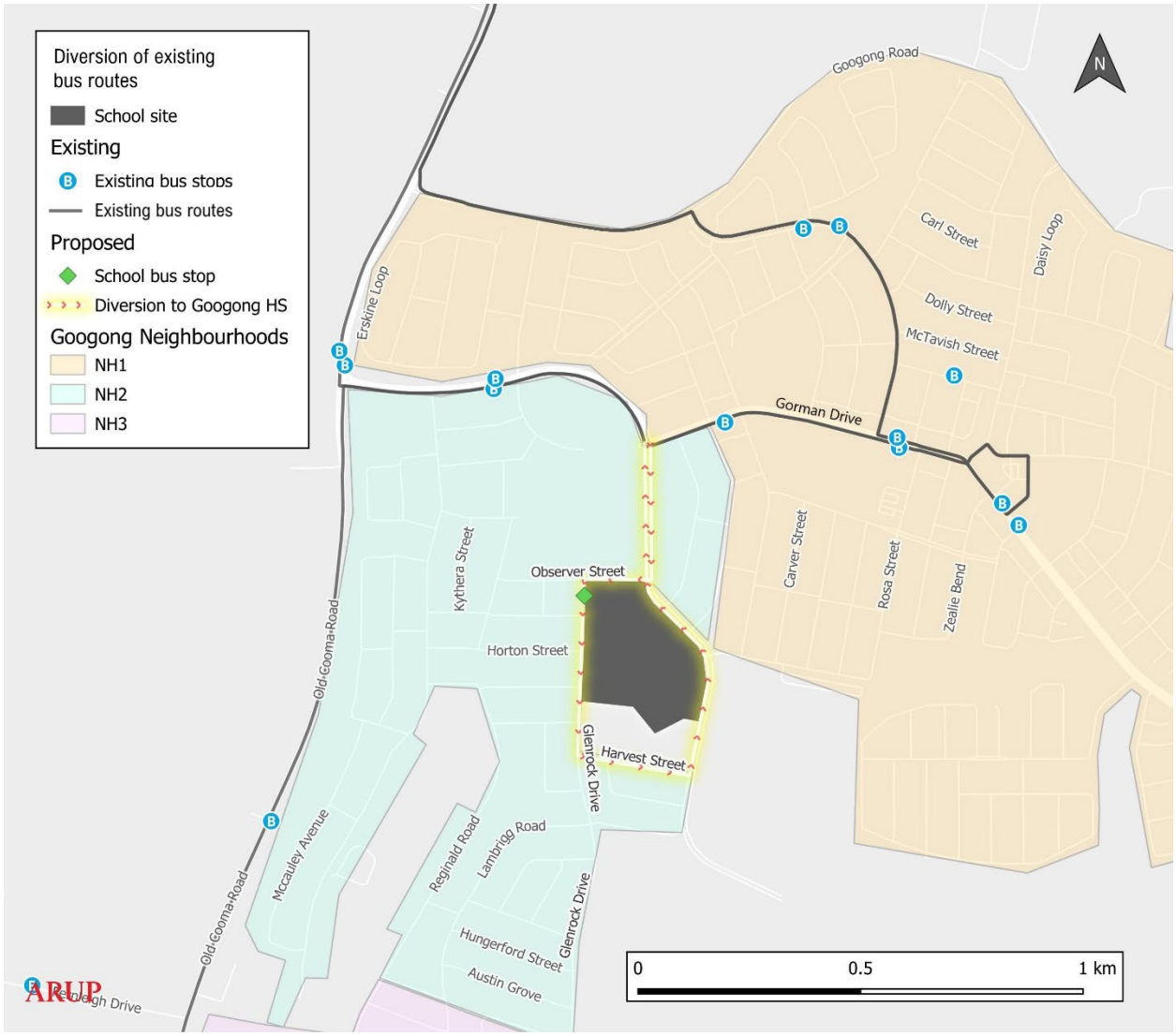


Figure 30. Potential diversion of existing bus services

Masterplan bus route and stops

The full extent of Gorman Drive has been designed to support a bus route that loops around the Googong area. However, it is expected to be completed alongside Neighbourhoods 3-5 and will not be completed prior to Day One of the new high school for Googong.

The proposed new roads (highlighted in yellow) and the bus stops suggested in the masterplan would provide public transport options for students living beyond walking distance from the school. This bus route should be considered in future service planning activities.

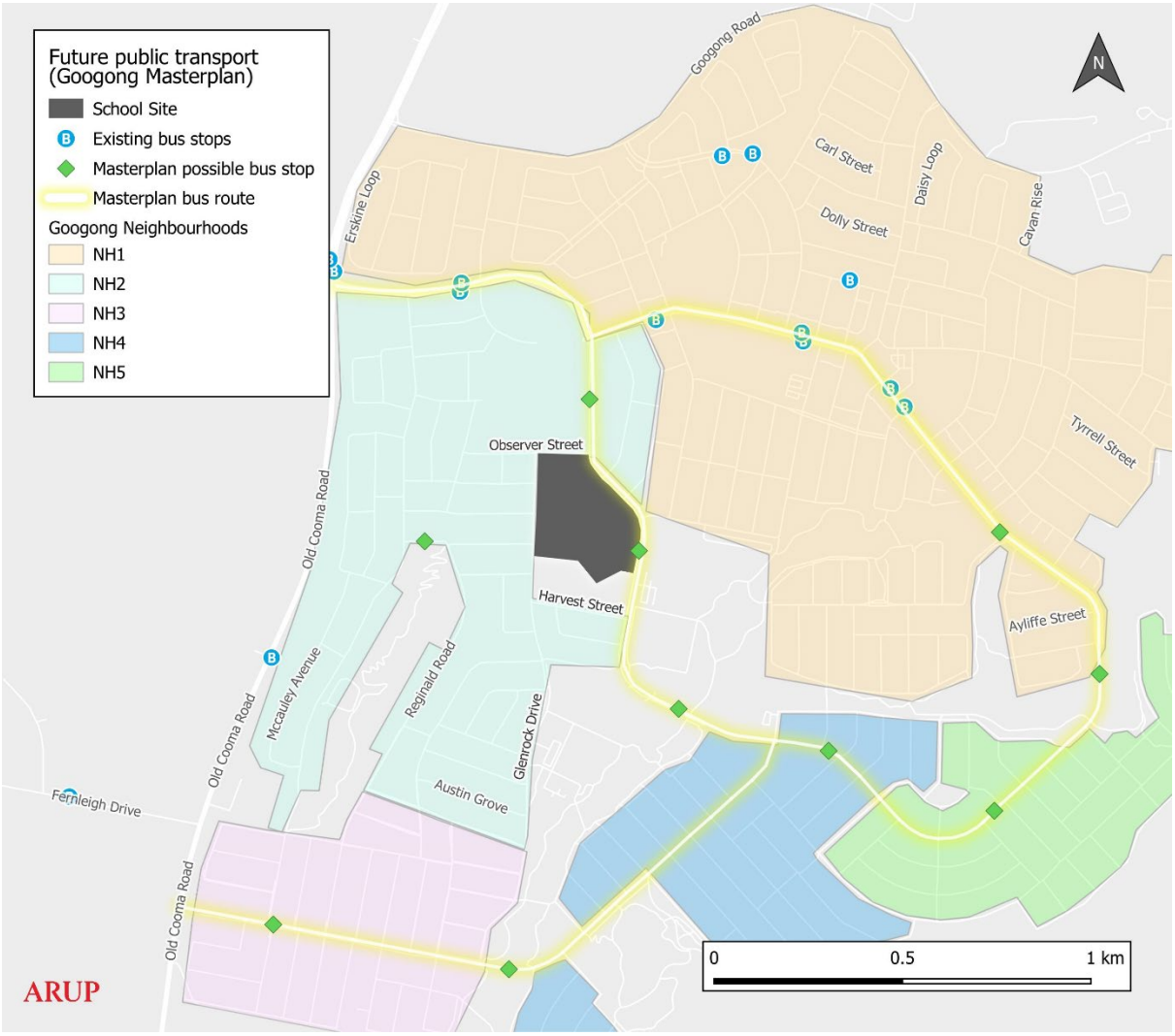


Figure 31. Future public transport (Master Plan bus routes and stops)

North-eastern minibus service

Due to the narrow streets in Neighbourhood 1, regular-length school buses are limited to looping around North Googong town centre, as manoeuvrability constraints and insufficient space prevent them from traveling further east. As a result, a large section of Neighbourhood 1 lacks public transport access.

A 7m mini-bus would be able to loop around Duncan Fields to service the area north-east and east of the school. One bus could complete 3 loops in one hour, transporting a maximum of 90 students (~12% of 700 students).

A potential route is shown in Figure 32. Turning paths show that a typical 7m long minibus (seated capacity of 16 to 20 people) shown in Figure 31, may make all the turns on this route.

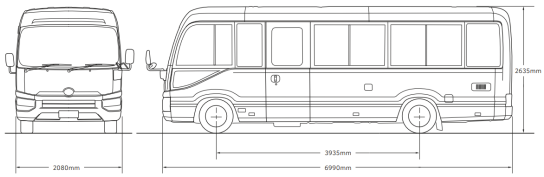


Figure 32 Typical 7m minibus

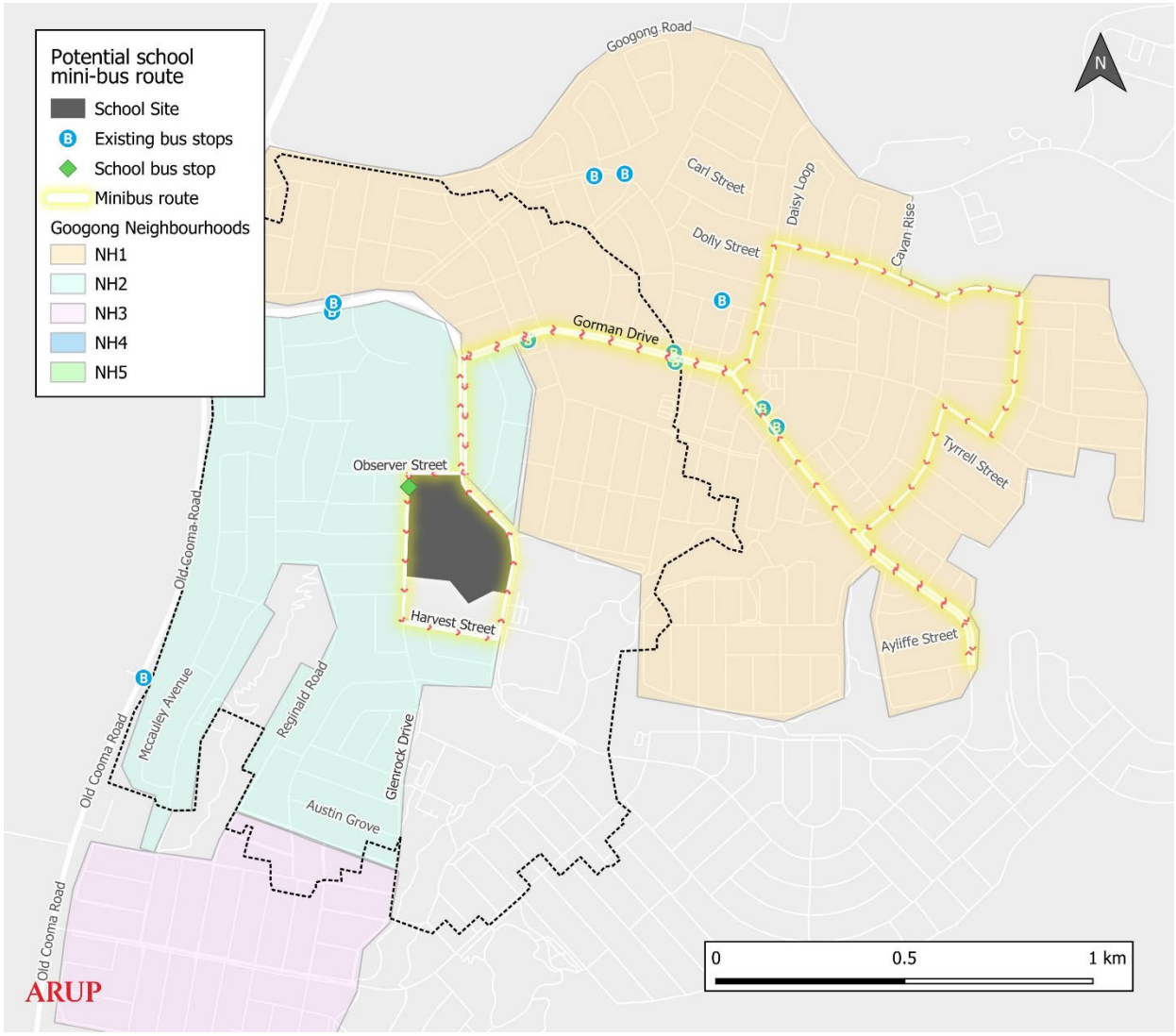


Figure 33. Proposed mini-bus route

4.7 Visitor parking

This section reviews capacity for streets near the new high school for Googong to accommodate school visitor parking. During the RTA, QPRC raised the availability of on-street parking as a potential constraint.

Parking for students and visitors will not be provided on school grounds and they will be encouraged to use alternative modes.

The assessment below finds that sufficient on-street parking capacity is expected to be available during peak visitor demand for the school, minimising the risk of overflow into surrounding streets.

Nearby parking provision

On-street parking in the surrounding streets serves multiple land uses with different demand profiles, including the new high school for Googong, nearby residential developments, and Brooks Oval.

There are three multi-dwelling residential developments within 400 metres of the new high school for Googong on or near Wellsvale Drive. These are shown in Figure 34. Across these three developments, 527 parking spaces were provided. These meet the required parking as set out in Googong DCP 2012. As part of the planning approvals for these three developments, 25 visitor parking spaces for Lot 564 were relegated to on-street parking along their Wellsvale Drive and McFarlane Avenue frontages. Combined, these have capacity for approximately 40 spaces.

Therefore, residential parking demand is expected to be accommodated on-site, reducing the likelihood of overflow into surrounding streets. Peak residential parking activity is expected in the evening and on weekends, outside of school hours, minimising any potential conflict with school-related demand.

In addition, Brooks Oval has 221 on-site parking spaces.

A site visit conducted in September 2023 confirmed the availability of on-street parking along Wellsvale Drive.

During TWG #3 for the RTA, QPRC suggested that the Kiss and Drop zone on Glenrock Drive be reallocated to short-stay visitor parking when the Kiss and Drop is not operating. However, there is relatively high parking availability near the school and this may present a risk that drivers will overstay parking time limits and disrupt Kiss and Drop operations. As such, it is recommended that visitor parking demand be monitored for 12 months after Day One of school operations to evaluate whether this measure is required. The location of preferred visitor parking locations (including Wellsvale Drive and the western side of Glenrock Drive) should be clearly communicated to parents, carers and other school visitors.

Figure 34. Surrounding sites with significant parking demand

Table 8. Surrounding development total parking provision.

Lot	Total dwellings	Total resident	Total visitor	Total parking
539	13	23	3 on site	26
564	123	215	25 on street	240
566	138	233	28 on site	261
Total	**274**	**471**	**56**	**527**

Residential Flat Buildings and Shop Top Housing	
Number of car spaces (minimum)	1 bed- 1 space 2 bed – 2 spaces 3 bed or more – 2 spaces 1 disabled space for each adaptable dwelling
Visitor parking	3-5 dwellings – 1 space 6-10 dwellings – 2 spaces 11-15 dwellings – 3 spaces For every 5 units thereafter – 1 additional space

Figure 35 Parking rates for residential flat buildings and shop top housing (Source: Googong DCP 2012, Part 7, Table 3)

Parking utilisation at different times of day (Table 9) summarises the expected on-street parking demand. The primary users of on-street parking are expected to be local residents living in single-occupancy dwellings and school visitors. Greatest demand for residential on-street parking is expected to occur in the evenings when residents return home. In contrast, school-related office visits are more evenly spread throughout the morning and day during school and office hours.

Table 9. Anticipated on-street parking demand (developed by Arup)

	7 – 9am	9am – 4pm	4pm – Evening
Residential	Medium	Low	High
School/office visits	Medium	Medium	Low

For large events, such as parent-teacher evenings, parking at Brooks Oval is a reasonable alternative. This would need to be coordinated with the Council to schedule large school events on days without sporting activities (Table 10).

Additionally, the school frontage on Wellsvale Drive can accommodate up to 75 on-street parking spaces (Figure 36).

As such, provision of dedicated visitor parking for the new high school for Googong is not expected to be required.

Table 10. Anticipated on-site parking demand at Brooks Oval (developed by Arup)

	Typical weekday evening	Special school events evening
Sporting activities (weekends and evenings)	High	Low
Parent teacher evening	None	High

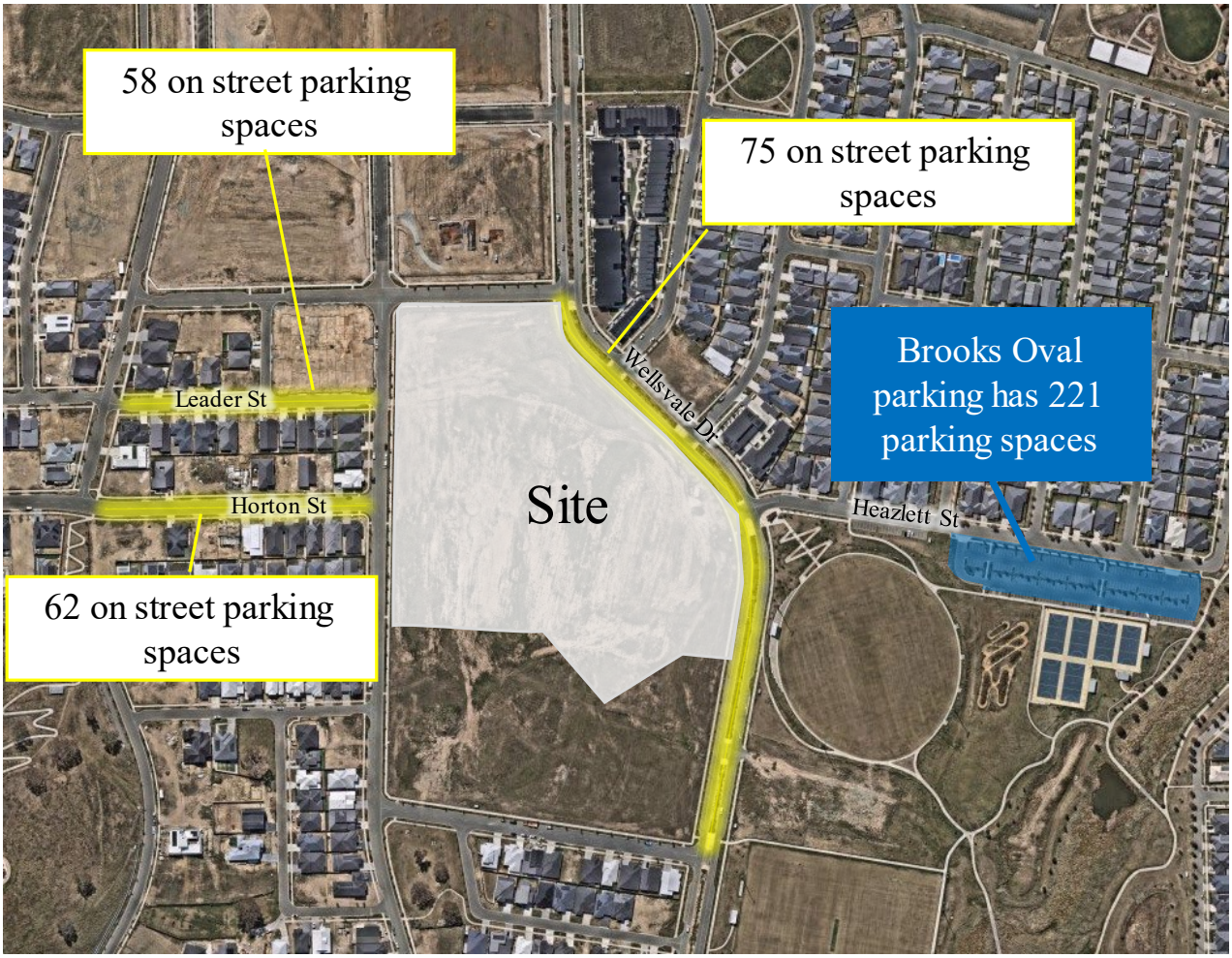


Figure 36. Nearby parking availability

5. Travel demand and mode share

This section presents the expected travel demand and mode share targets for students and staff at the new high school for Googong.

5.1 Student mode share

Three mode share scenarios have been developed:

- Scenario 1: Baseline (Do Nothing)
- Scenario 2: 'Medium' active/ public transport mode share
- Scenario 3: 'Reach' active / public transport mode share.

These are described further below. The following sections describe how these targets have been set; using catchment analysis and other locational factors (Section 0) and summarise the selected targets (Section 5.1.2).

Table 11 Description of mode share scenarios

Scenario 1 Baseline (Do Nothing)	Scenario 2 'Medium' active and public transport mode share	Scenario 3 'Reach' active and public transport mode share
Reference made to existing mode share of comparable schools	Inclusion of active transport (e.g. bike bus) and carpool programmes to reduce Kiss and Drop demand Improvement of walking environment, including addition of wombat crossings, complete footpaths along popular routes to provide a safe environment for active travel Introduce local recruitment strategy, travel training and staff recognition programs to encourage use of active and public transport	Encourage parenting community that support children walk and ride to school Provision of enhanced school bus services to further reduce Kiss and Drop demand Behavioural change measures to encourage active transport Car pooling system for staff to reduce car usage Parking management scheme which would discourage the use of single occupant car travel to the site while incentivising employees to travel by alternative modes of transport.

5.1.1 Student mode share benchmarking

Baseline mode share targets were established using a survey conducted at a comparable school – Jerrabomberra High School – in December 2024 as well as other available travel data and active transport catchments.

Jerrabomberra High School Hand-Up Survey

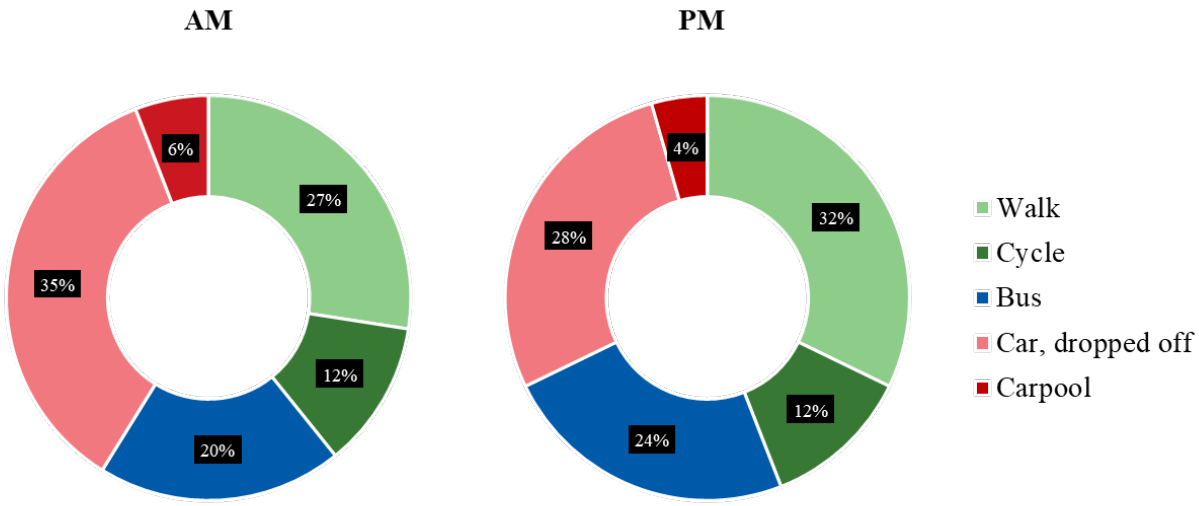


Figure 37. Hands-up survey in December 2024 conducted by Jerrabomberra High School (Arup, 2024).

A 'hands-up' survey was undertaken at Jerrabomberra High School on the week of 2 December 2024. There was around ~86% attendance of full class size which can be considered a good representation of typical conditions. The results reflected Years 7-9 which are the only cohorts operated at the high school in 2024.

The reported bus mode share is quite high, noting that there is one dedicated school bus service in the AM and PM school peak periods that services surrounding residential areas.

Carpooling / car occupancy is low given that only years 7 – 9 were surveyed, this is expected to be greater when the full school population of years 7 – 12 are present. Some students who were dropped off in the AM appear to walk or take the bus back home in the PM.

What this tells us

Older students (years 10 –12) can travel more independently than younger students, and therefore, are more likely to use active transport and public transport. On this basis, the car mode share for all years (Years 7 – 12) are expected to be slightly higher than the survey results. While older students (17+) may choose to drive themselves, these students would not use the Kiss and Drop facility.

Compared to Jerrabomberra, a greater proportion of students at Googong High School live within a 15-minute walk of the school, and walking infrastructure in Googong is generally of a higher standard. In addition, at opening, most students of Googong High School will not have access to a subsidised school bus. As such, Googong High School is expected to have a higher potential walking mode share and lower bus mode share than Jerrabomberra High School.

Active transport accessibility

The proportion of students within walking distance (0 – 1.2 kilometres) and cycling distance (0 – 3 kilometres) are shown in Figure 41. The images on this graph are an indication of whether cycling or walking might be considered most convenient at each distance.

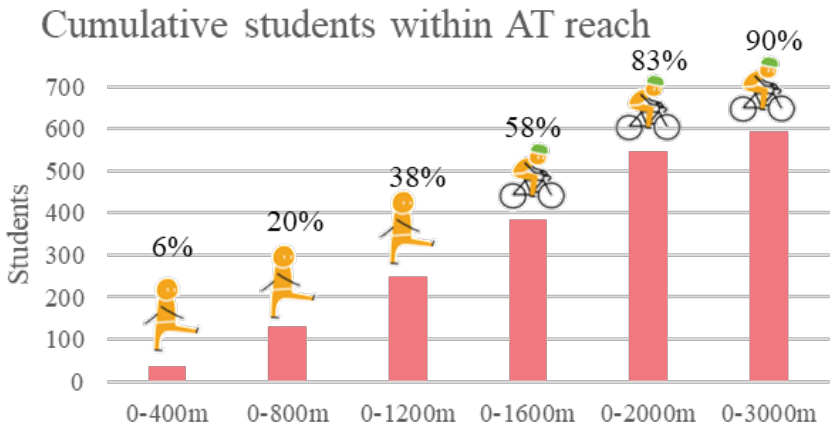
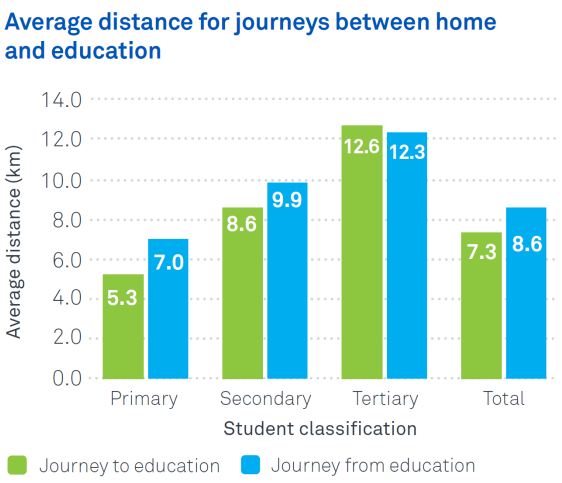


Figure 38. Cumulative students within walking and cycling distance of the new high school for Googong

Travel in the ACT – Queanbeyan Household Travel Survey 2017[1]

Results from the 2017 Household Travel Survey indicated that the region-average distance for a trip to high school was 8–10 kilometres. The most common mode for education trips (all education, including but not limited to high schools) was by car. This included 55% of trips where students were dropped off by car; likely to be primary school and high school students. On average, 15% of students walked or cycled to their place of education.

The new high school for Googong has significant potential to exceed this average, as the majority of future students are located within a 15-minute cycling distance (3 kilometres) of the school.



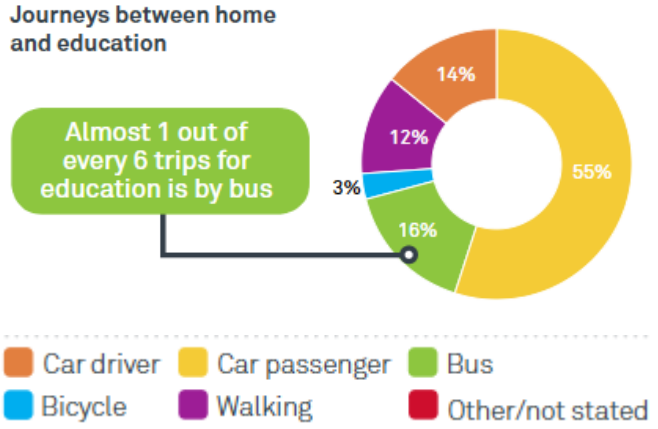


Figure 39. Distance and mode share for education journeys in ACT and Queanbeyan-Palerang Household Travel Survey 2017 (Transport Canberra, 2017).

[1] The 2017 Household Travel Survey has been used in lieu of the 2022 Household Travel Survey as it provides a finer breakdown of distance and mode share for home to education trips.

Benchmarking summary

Rationale for the baseline and 'reach' mode share targets for the new high school for Googong are detailed in Table .

Table 12: Mode share assumptions and rationale used.

Mode	Time period	Jerrabom-berra HS survey results (AM / PM)	New High School for Googong Baseline mode share (AM / PM)	New High School for Googong 'Reach' mode share (AM / PM)	Comparison between Jerrabomberra and Googong	Rationale
Walking	AM	27%	27%	38%	The Jerrabomberra residential area has many through-site links; however, the high school is located in the western corner of the town, with lower walking accessibility compared to Googong.	Most streets in the Googong masterplan are planned to include footpaths, whereas some residential streets in Jerrabomberra lack footpaths. Therefore, the walking mode share in Jerrabomberra has been set as the baseline for Googong. With improvements to crossings and a complete path network, The new high school for Googong is expected to achieve a higher walking mode share in the 'reach' scenario.
	PM	32%	32%	40%		
Cycling	AM	12%	15%	20%	The residential land in Jerrabomberra is slight more spread out than in Googong. Furthermore, Jerrabomberra is steep in some directions, while Googong is mostly flat.	Cycling in Googong is easier (newer paths, flatter terrain) therefore the baseline mode share has been set higher than the Jerrabomberra survey results. Jerrabomberra High School and Bungendore High School, whose cycling catchment are similar to the new high school for Googong, have set out higher 'reach' cycling mode share targets (35% and 23% respectively) than the Googong RTA. In the last TWG meeting for the RTA, stakeholder feedback was to reduce the 'reach' cycling mode share to 20% (see Section 10 for more details).
	PM	12%	15%	20%		
Bus	AM	20%	10%	20%	Jerrabomberra High School has a dedicated school bus service that covers most of the residential area.	The baseline mode share is based on the existing public transport catchment, consisting of bus services connecting students in rural areas (10%). This assumes that all students

Mode	Time period	Jerrabom-berra HS survey results (AM / PM)	New High School for Googong Baseline mode share (AM / PM)	New High School for Googong 'Reach' mode share (AM / PM)	Comparison between Jerrabomberra and Googong	Rationale
	PM	24%	10%	22%	Googong currently lacks a dedicated service that loops through all the neighbourhoods.	with access to free or subsidised school travel will make use of it. The 'reach' mode share scenario includes a shuttle service looping around the Googong masterplan area (explained in later slides), potentially transporting up to 90 students which would increase the public transport mode share by + 12%.
Car	AM	41%	48%	22%	A conservative mode share assumption has been adopted for the purposes of assessment.	The AM baseline mode share has been set to match the Jerrabomberra High School car mode share (41% inclusive of carpooling and drop off). The PM mode share has been set at 5% lower than the AM baseline mode share; the balance of bus trips has been transferred to car, acknowledging lack of certainty around future provision of bus routes. The 'reach' mode share is calculated based on increases in other modes and the corresponding reduction in car usage.
	PM	32%	43%	18%		

5.1.2 Student mode share scenarios

Figure 42 shows the AM and PM student mode share targets across the baseline, moderate and 'reach' scenarios. The moderate scenario is calculated as an average of the baseline and 'reach' scenarios, based on the rationale presented in Table 12.

Between baseline and 'reach' cases, there is reduction in car mode share of approximately 30%. This is offset by significant increases in walking and cycling mode share due to both infrastructure improvements and community support programs

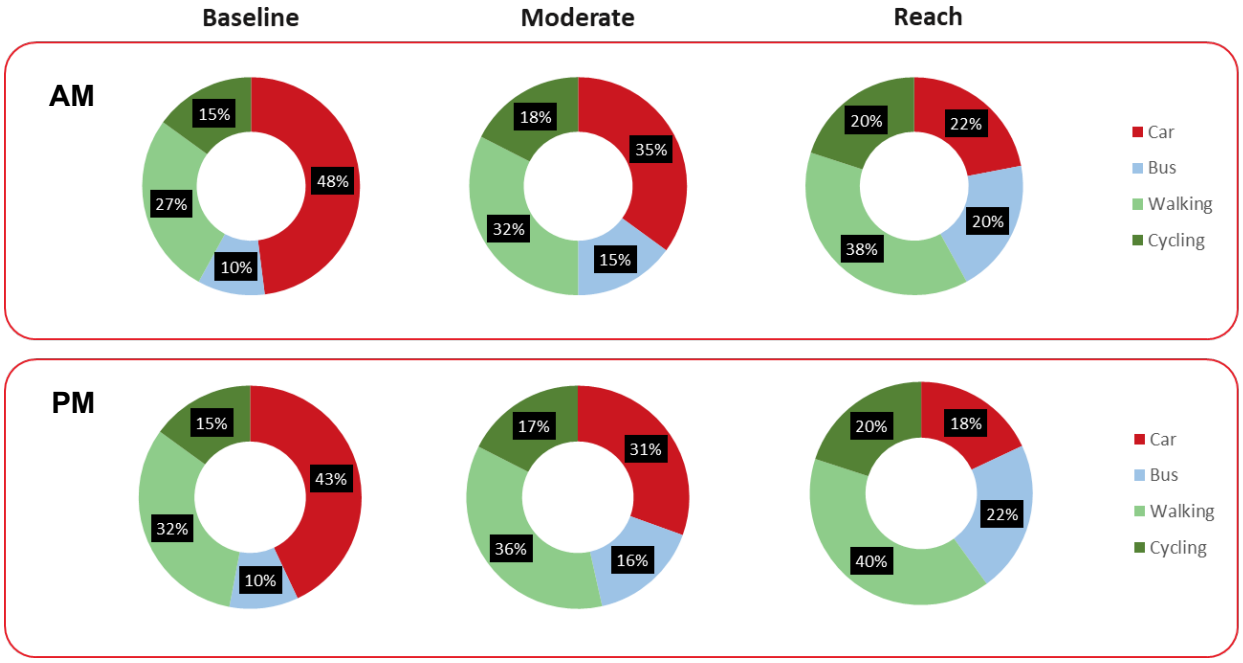


Figure 40. AM and PM mode share targets and scenarios

5.2 Staff mode share

5.2.1 Staff mode share benchmarking

Staff mode share targets are based on 2016 Journey to Work data and a travel survey of Jerrabomberra High School staff undertaken in December 2024.

These were found to be generally comparable, noting that there were higher rates of carpooling for teachers and staff compared with general workplaces. This suggests that carpooling initiatives can be an effective initiative for staff commuting to the new high school for Googong.

Table 13. Comparable mode share using journey to work data and travel survey for Jerrabomberra High School staff (ABS Census, 2016).

Mode	2016 Journey to Work mode	Jerrabomberra High School
Vehicle driver	87%	82%
Carpooled	5%	9%
Public transport	2%	6%
Walking	6%	3%
Bicycle	1%	-
Total	**100%**	**100%**

5.2.2 Staff mode share scenarios

Figure 43 shows the staff mode share targets. The walking, cycling and bus mode shares are based on journey to work data, noting that planning of future bus routes servicing Googong is still underway. The expected vehicle driver and carpool mode share are expected to be similar to the Jerrabomberra HS staff survey.

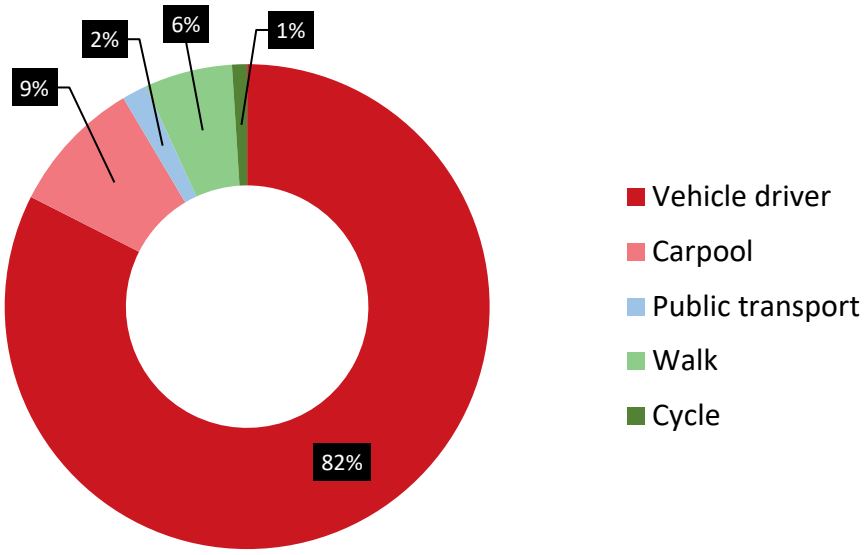


Figure 41 Staff mode share targets for all scenarios.

5.3 Trip generation

The school student and staff population is set out in Table 12.

Table 14. Student enrolment target and staffing requirement for the new high school for Googong (Source: DoE).

Students	Staff	Total
700	55	755

It has been assumed that all staff and students arrive shortly before school starts, and depart shortly after school ends, with peak times set out in Table 15.

Table 15 Peak times for school trips

	AM	PM
Peak 1-hour	08:00 – 09:00	14:30 – 15:30
Peak 30-minutes	08:30 – 09:00 (assuming 09:00 bell time)	2:45 – 15:15 (assuming 15:00 bell time)

However, it should be noted that behaviours would spread the arrival and departure profiles and as such, the assumed profile is relatively conservative. These include:

- Staff beginning work early or leaving work later
- Formal and informal before/after school activities
- Special events such as school excursions.

The trip generation for a typical day is set out in Table 16. This considers a typical school day and it does not explicitly consider other special events such as school concerts, awards evening or school tours which may generate additional trips by parents or carers.

Table 16 Trip generation (all modes)

All trips	AM peak 1hr (08:00 – 09:00)		PM peak 1hr (14:30 – 15:30)		Daily trips	
	In	Out	In	Out	In	Out
Staff	55	0	0	55	55	55
Students	700	0	0	700	700	700
Total	**755**	**0**	**0**	**755**	**755**	**755**

Vehicle trip generation is calculated using the baseline mode share scenarios, that is:

- Students – 48% AM vehicle mode share and 43% PM vehicle mode share. It is assumed that 25 vehicles (9% of AM demand) is generated by students driving (with Provisional P1 licenses), in line with the regional location. An average vehicle occupancy of 1.2 students per vehicle is assumed across both Kiss and Drop and students driving. Kiss and Drop trips generate a vehicle trip both in and out in each peak. This means the total trips recorded differ from those outlined in Table 16.
- Staff – 91% vehicle mode share. This comprises staff that drive or carpool.

Table 17 Vehicle trip generation

Vehicle trips		AM peak 1hr (08:00 – 09:00)		PM peak 1hr (14:30 – 15:30)		Daily trips	
		In	Out	In	Out	In	Out
Staff	Drive self/carpool	50	0	0	50	50	50
Students	Kiss and Drop	255	255	226	226	481	481
	Drive self/carpool	25	0	0	25	25	25
Total		**330**	**255**	**226**	**301**	**555**	**555**

6. Proposed activity

This section outlines the infrastructure provisions and arrangement planned as part of the school development, focusing on active transport facilities, car parking, bike parking and End of Trip (EoT), Kiss and Drop, and site access. Included are explanations of which relevant standards and provision rates were used to calculate the final infrastructure requirements, such as Green Star, Austroads, or mode share targets.

6.1 On-site active transport provision

There are multiple standards available to calculate parking requirements for bicycles and scooters. The selected calculation method and the resulting parking provisions that this activity will deliver are highlighted in green in Table 15 (bicycle and scooter parking) and Table 16 (EoT facilities).

Table 18. Bicycle / e-scooter parking provision rate.

No.	Standard	Provision rate	Spaces
55 staff	Green Star	Parking spaces for 7.5% of staff	5
	Austroads	N/A	-
	Mode share	Bicycle parking based on mode share target 1%	1
700 students	Green Star	Parking spaces for 40% of students (over grade 4)	280
	Austroads	1 per 20 secondary student (5%)	35
	Mode share	Bicycle parking based on Scenario 3 ('Reach') mode share target of 20%	140

Notes:

DCP: No bicycle parking provisions mentioned in either Googong DCP 2010 or Queanbeyan DCP 2012.

Greenstar: Design & As Built v1.3 indicates that secure bike parking for 40% of students over grade 4 should be provided. Secure bicycle parking for 7.5% of total regular staff should be provided

Austroads: Austroads Guide to Traffic Management Part 11 provides a suggested rate of 1 per 20 high school students, however these rates are only examples.

Standards Australia: Bike parking space has been allowed as per Figure B5 in AS2890.3 2015. A U-Rail can accommodate 2 bike spaces. Vertical wall mounted bicycle parking not suitable for student bike parking.

Figure 42 U bike racks provide secure and flexible bike parking for school students (Source: NSW Government)

Table 19. EoT provision rate.

EoT	Standard	Provision rate	Quantity
Locker	Green Star	1 per 1.2 staff bicycle parking	5
	NSW Government	1 per 3 staff bicycle parking	1
Shower	Green Star	4 showers for 50-149	4
	NSW Government	4 unisex showers for 50-149 staff	4

Notes:

NSW Government Planning Guidelines: for Walking & Cycling 2004 Table 3 shows a lower rate of locker provision than Green Star. Shower requirement same as Green Star.

Green Star: Design & As Built v1.3 released in 2019 is a **newer** than NSW guidelines and calls for a higher number of lockers.

6.2 Car parking provision

6.2.1 Kiss and Drop

The estimated Kiss and Drop requirements are set out below in Table 17. Each Kiss and Drop space will be 6.5m long to enable independent manoeuvring in and out of parking spaces. Dwell times are consistent with other schools. Dwell times differ between drop-off and pick-up, as students take longer to locate their parents' (or carers') cars in the afternoon. We note that the assumed dwell time of 2 minutes (in the PM) is relatively conservative given that the age and relative independence of high school students.

A car occupancy rate of 1.2 students per car aligns with site observations completed by PTC consultants[2] for drop-off operations in other schools.

The proposed Kiss and Drop capacity has been designed to accommodate the Baseline scenario. This represents a worst-case demand without significant mode shift towards active travel and public transport. With the implementation of committed measures supporting active transport and the achievement of Moderate to 'Reach' mode share targets, demand for Kiss and Drop spaces is expected to decrease as shown in Figure 45. This approach provides flexibility and sufficient capacity, preventing overflow and queuing caused by Kiss and Drop activity if mode shift occurs more gradually than expected.

Table 20. Kiss and Drop provision.

	AM	PM
Total number of students	700	700
Car mode share based on Scenario 1 Baseline	48%	43%
No of students being driven	336	301
Car occupancy	1.2 students/ car	1.2 students/ car
Dwell time at kerb (conservative estimate for sizing)	1.5 mins (drop-off)	2 mins (pick-up)
Peak window for car arrivals	30 minutes	30 minutes
Number of Kiss and Drop spaces[1]	14 (91m)	17 (111m)
Note: Accessible Kiss and Drop space to be designed as per AS/NZS 2890.6-2009.		

A probabilistic queueing assessment has been undertaken on the Kiss and Drop zone (Section 7.1), with more detailed discussion of the above parameters.

[2] Transport and traffic assessment - New Primary School in Edmondson Park, (ptc consultants, 2021)

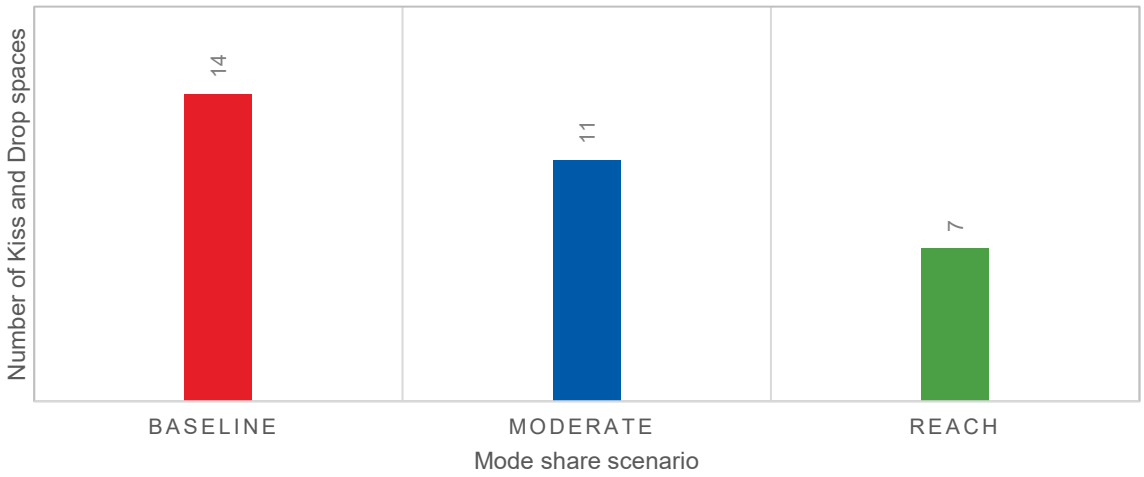


Figure 43: Comparison of Kiss and Drop space requirements depending on mode share target achieved

It is recommended that the Kiss and Drop zone be marked in paint along the kerb to supplement signage and clearly indicate to drivers where they may stop (example shown in Figure 44).

Figure 44 Blue paint along the Kiss and Drop zone reinforces signage at Jerrabomberra Public School (Source: Google Street view)

6.2.2 Car parking

As the Googong DCP does not provide car parking rates for schools, the rate of 1 car parking space per staff was agreed on during a previous Googong RTA TWG meeting.

According to National Construction Code (NCC) Section D Part D3, one accessible parking space out of 100 needs to be an accessible space.

No student car parking is proposed as DoE does not provide on-site car parking for students and the staff car parking would be access controlled (requires staff to scan their access fob).

Students with provisional licenses (that is, some Year 12 students) who choose to drive will need to use on-street parking. As assessed in Section 6.2.2, a site visit confirmed the availability of on-street parking, and an

analysis of nearby land use indicates that parking demand during school hours is unlikely to overlap with peak residential demand.

Table 21. Car parking provision on-site.

No.	Car parking Rate	Required	Proposed
55 staff	1 space per staff (inc. 1 accessible space)	55	55

6.3 Site access provisions

The figures on the following pages summarise the proposed provision for people walking and cycling (Figure 46) and people driving or using public transport (Figure 47) to the new high school for Googong.

6.3.1 Access provision for people walking and cycling

Wombat crossing with kerb blisters

5 wombat crossings will be delivered as part of this activity.

Kerb blisters are recommended on Harvest St and Observer St to narrow the traffic lanes so that pedestrians are more visible by drivers to enhance safety. S wept paths attached in the Appendix demonstrate car and bus access is not impacted.

All wombat crossings are to be well illuminated with street lighting designed according to AS/NZS1158.4.

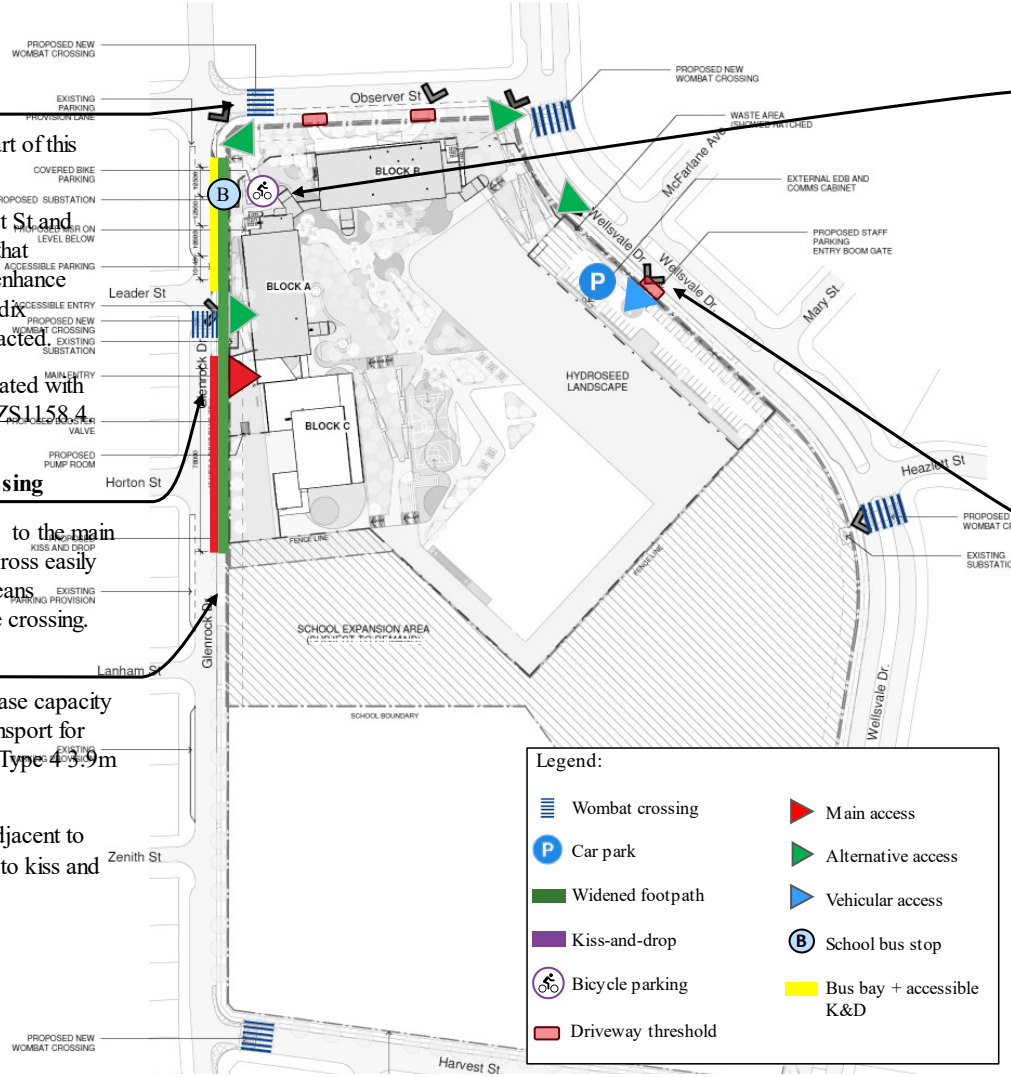
Main access aligned with wombat crossing

The wombat crossing is located close to to the main pedestrian access. This allows people to cross easily and safely, but the horizontal deflection means students are directed to slow down before crossing.

Wide footpath

Proposed along the west frontage to increase capacity for pedestrian movement and waiting. Transport for NSW's Walking Space Guide suggests a Type 4 3.9m wide footpath adjacent to schools.

The activity will deliver a 3.9m footpath adjacent to the bus zone, and 4.8m footpath adjacent to kiss and drop.



Bicycle parking

Secure bicycle/ scooter parking for students and staff.

Footprint as per Figure B4 in AS2890.3 2015. Requires approx. 132 m^2

140 spaces for students and 5 spaces for staff is proposed as part of this activity.

4 shower and 5 lockers in staff end of trip facilities would be required for staff under Green Star.

Driveway thresholds

Provide continuous footpath/threshold treatments across driveways into the school site at Wellsvale Drive and Observer Street. This design improves safety for students walking, cycling, or scooting by giving clear visual cues to drivers entering carparks about the presence of pedestrians and their right of way. This encourages slower, more cautious vehicle movements.

Figure 45. Pedestrian and cyclist site access and provisions. Layout plan dated 20/01/2025 is conceptual and subject to change

6.3.2 Access provision for people using public transport and driving

Please note that detailed cross sections for Glenrock Drive are provided in the Appendix to this report.

Deliveries

Via internal driveway off Observer Street for rigid vehicles up to 10.5m long, allowing goods to be dropped of at Block B. Large vehicles will be directed to use the waste servicing area to park. See appendix for swept paths.

School bus stop

Bus stop for school services to be provided at Glenrock Drive southbound near pedestrian access and High School access. This is separated from Kiss-and-ride to reduce conflict with queued traffic. A 30m long bus zone is required for a standard bus stop (NSW Gov, Road Rules 2014, Rule 195). Design shows 38m long bus zone planned.

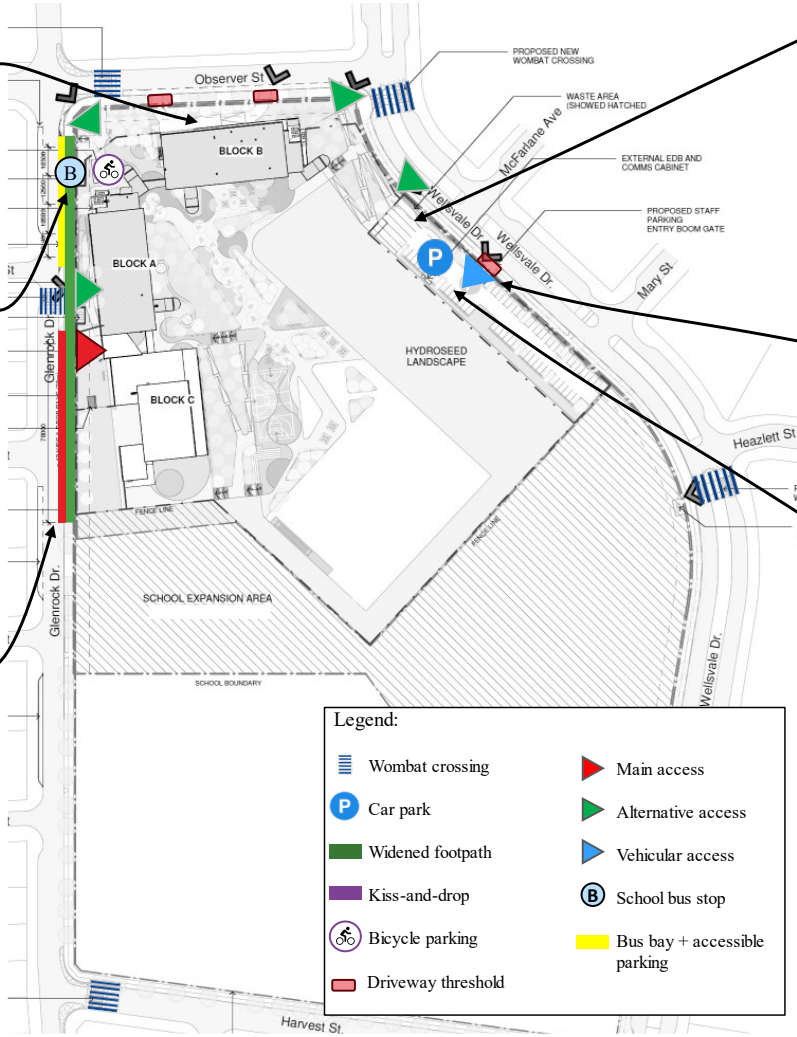
One 10m long accessible space for K&D has been allocated to the south of the bus zone.

Kiss-and-drop

17 kiss-and-drop bays (111m) are required be provided on Glenrock Dr S/B, with separation from the crossing. These bays should be 2.3m wide to meet AS2890.5:2020.

Kiss-and-drop provision according to travel demand of students in scenario 1 (baseline).

Note: There are approx. 40 kiss-and-drop bays (259m) available along Glenrock Drive S/B. As the kiss-and-drop space is unindented kerbside parking, this allows for an overflow of around 140m.



Waste servicing

Waste consolidation and collection area is located north-west of the staff car park. Waste vehicles would use the shared driveway to staff car parking on Wellsvale Drive. HRV sized waste vehicles would require widening of driveway*, while MRV sized waste vehicles are able to enter/exit without adjustments to the driveway.

Vehicular access

Staff parking, loading bay and service vehicle access serving high school is proposed at Wellsvale Drive, separated from pedestrian access.

Northern car park

55 staff parking spaces to be provided at the eastern end of the site with 1 car park per staff as detailed by TWG.

Footprint for each parking bay is 5400mm long by 2400mm wide**, aisles 5800mm wide (Overall footprint: approx. 1,602 m^2).

Layout plan is conceptual and subject to change
* See appendix for swept paths.
** Draft revision of AS2890.1 would increase standard parking bay dimensions. If this change is adopted before project planning approval, parking lot calculations may need to be revisited.

Layout plan (20/01/25) is conceptual and subject to change.

Figure 46. Vehicles and public transport site access and provisions. Layout plan dated 20/01/2025 is conceptual and subject to change.

Staff car park access

The car park entry is located on the northbound lane (western side) of Wellsvale Drive. The staff car park has left-in / left-out access to/from Wellsvale Drive (Figure 48). By locating the car park entry south of the Wellsvale Drive / McFarlane Avenue intersection, it:

- Eliminates potential conflict with turning movements at the Wellsvale Drive / McFarlane Avenue intersection
- Allows all turning movements at McFarlane Avenue to be maintained.

Route diversions will be required to replace the disallowed right-turn movements to/from the car park. These are illustrated in Figure 49 (right image).

- For staff accessing the car park from the north on Wellsvale Drive, this would require a diversion onto Mary Street. This is approximately 250m extra travel distance compared to a right-turn from Wellsvale Drive. Alternatively, they may complete a u-turn at Wellsvale Drive / Mary Street.
- For staff exiting the car park to the south, this would require a diversion via McFarlane Avenue, or via Observer Street, Glenrock Drive and Harvest Street. Either option is approximately 500m extra travel distance compared to a right-turn onto Wellsvale Drive. This would only impact staff that live in Neighbourhoods 4 and 5, noting that these are expected to be complete after Day One of the school operation. Alternatively, they may complete a u-turn at Wellsvale Drive / McFarlane Avenue.

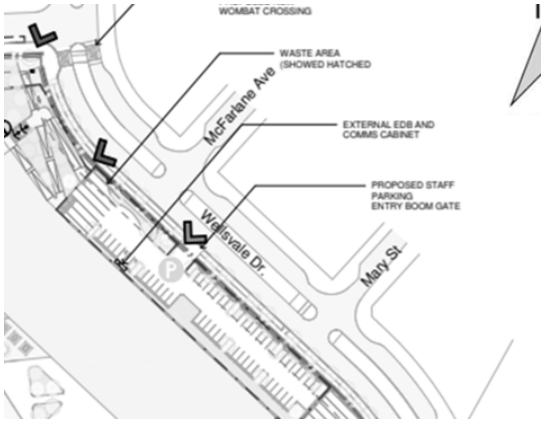


Figure 47 Staff car park access from Wellsvale Drive - extracted from NBRS Site Plan

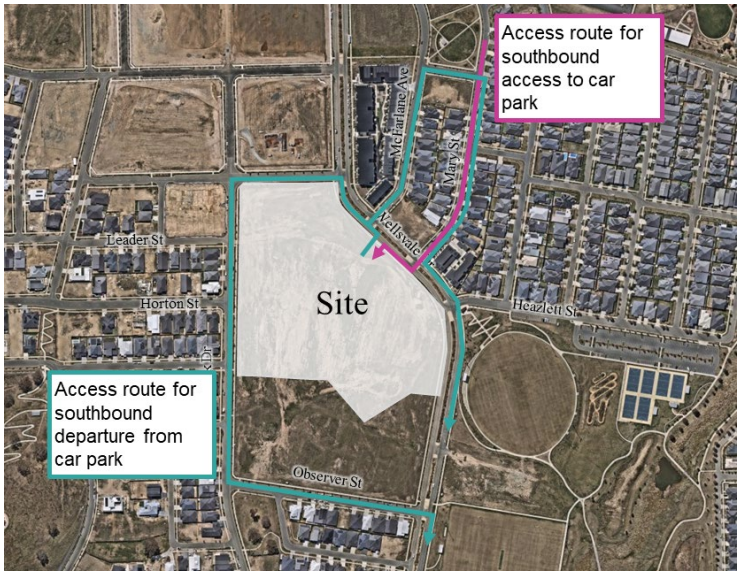


Figure 48 Right image showing alternative routes to replace right-turn access to/from the car park.

Delivery vehicle access

Deliveries to the school are expected to include:

- Twice-yearly deliveries to the woodworking workshop; this has been modelled using a 10.5-metre rigid truck
- Frequent (multiple per week) supermarket deliveries to the canteen; this has been modelled using an 8.8-metres Medium Rigid Vehicle.

The 10.5-metre rigid truck turning path analysis confirms that a left-in, left-out operation is feasible without vehicle wheels leaving the inner site driveway path. Swept paths have been provided in the Appendix.

Waste collection access

Longer HRV vehicles are typically used by council for waste collection. However, a smaller MRV sized waste collection vehicle could be considered if waste collection is undertaken by private contractor (subject to Council approval).

Swept path analysis was conducted for Heavy Rigid Vehicles (HRV, 12.5m) and Medium Rigid Vehicles (MRV, 8.8m) based on the 20/01/25 school site plan. The assessment found that HRV access could be accommodated with a 300mm widening of the car park driveway and that an MRV is capable of completing left-in, left-out movements without any modifications to the driveway. As of January 2025, the site plan includes a wider driveway that can accommodate the left-in movement of an HRV but does not provide sufficient space for a left-out movement without the vehicle encroaching onto the verge. To facilitate left-out movements for HRVs, a widened splay is required at the driveway. Swept path diagrams illustrating this are provided in the Appendix.

Emergency vehicle access

Ambulances and other small emergency vehicles are able to access the site through the northwest corner of the site. The Observer Street driveway can also be used for parking by emergency service vehicles.

Larger NSW Fire Service vehicles would need to park on Observer Street driveway, the bus zone or the Kiss and Drop facility on Glenrock Drive, or the staff car park. The location would depend on the specific nature and location of the emergency. A fire booster is located at the main entry forecourt.

6.4 Proposed construction access route

This section relates to the proposed access route during construction. The functional classification of surrounding roads is shown in Figure 19. Two potential access routes have been considered. These are:

- Option 1: Site access via Observer Street
- Option 2: Site access via Wellsvale Drive opposite McFarlane Avenue.

Both options use Old Cooma Road and Wellsvale Drive. These are both classified as arterial roads.

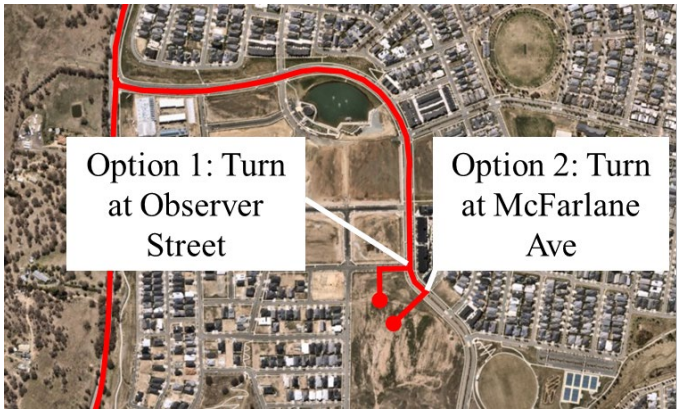


Figure 49. Construction route Options 1 and 2.

Swept path analysis showed that:

- Articulated vehicles can complete a right turn from Wellsvale Drive into Observer Street without issues.
- A right turn from Wellsvale Drive into Site from the median opening adjacent to McFarlane Street is feasible for a heavy rigid vehicle (HRV, 12.5m) but not for articulated vehicles (19m) without mounting the median.

As such, to accommodate articulated vehicles, it is recommended that the construction site entry be located on Observer Street (Option 1).

Swept paths are provided in the Appendix.

7. Cumulative Impact Assessment

Further residential, community, and mixed-use developments in both the immediate and broader vicinity of the school continue to reshape the landscape. The impact of this sustained development on the surrounding transport and traffic network is considered in conjunction with the operation of the proposed school.

This section outlines the cumulative impact of the proposed activity. Impacts listed in this assessment which are addressed by this activity are listed in Table 19. Additional recommendations for broader initiatives (which would be carried out by others) that would also benefit the school and Googong Township are listed in Project recommendations.

Table 22: Description of anticipated impacts of the school project.

Impact	Description
Road network performance at critical intersections reaching capacity.	Kiss and Drop operations at the school are expected to generate 255 vehicle trips in the AM peak and 226 vehicle trips during the PM peak period. Trips for Kiss and Drop activity have been considered as both in and out trips. Additionally, the high car mode share for journey-to-work trips in the LGA indicates that new residential subdivisions will contribute to increased traffic during the morning peak. SIDRA intersection analysis indicates that intersections continued to operate above LOS B on the addition of school trips to background traffic (see Section 7.1). Queues of up to 40m may form on the southern approach to the pedestrian crossing on Wellsvale Drive near Observer Street.
Parking demand	Daily parking demand will primarily be driven by school staff (55 in total) and small demand for visitor parking during the school day. Infrequent school events, such as parent-teacher evenings, are expected to also generate significant additional parking demand in the evenings which are likely to impact nearby streets and off-street uses such as at Brooks Oval.
Queuing at staff car parking entrance	Access to car park is via Wellsvale Drive, some staff travelling from the north travelling southbound on Wellsvale Drive would need to make a diversion or u-turn as described in Section 6.3.2.
Queuing associated with Kiss and Drop	In the AM peak, no significant queuing is anticipated at the Kiss and Drop facility (see Section 7.2) In the PM peak, using Base Case demand of 226 vehicles, a 95th percentile queue of 19 vehicles would impact on Bus Zone operations and the upstream intersection of Glenrock Drive / Observer Street. If pick-up times of 1.5 minutes per vehicle (a reduction from 2 minutes) can be achieved, no significant queuing is expected. It is noted that it is likely that some students may be picked up from other locations or following after-school activities. This demand reduction would also mean no significant queueing at the Kiss and Drop would be expected. In a high school environment, both of the above scenarios are considered to be feasible.
Walking and riding safety around school	With most students living close to the school, a high number of students are expected to walk or ride. This poses risks associated with the roadside environment, such as high vehicle speeds and insufficient crossing infrastructure. Students approaching from multiple directions increase the number of conflict points between pedestrians and vehicles, particularly at key intersections and along busy roads. The high level of activity around the school perimeter—including Kiss and Drop zones, school buses, and pedestrian movements—creates a complex environment for drivers.
Limited dedicated school bus routes	No current bus or school service routes pass near the new high school for Googong on Glenrock Drive. Collaboration with TfNSW and nearby schools will be needed to provide appropriate transport options.

Impact	Description
Waste truck impact on driveway	Waste truck (12.5m heavy rigid vehicle) likely to mount the kerb when exiting the car park onto Wellsvale Drive.

7.1 Traffic and intersection impacts

A traffic assessment was undertaken in SIDRA (version 9.1) for the AM and PM peak period.

The assessed intersections are shown in Figure 50 and were selected on the basis of the high traffic movements associated with school Kiss and Drop. The type of traffic control at each assessed intersection is described in Table 23.

Table 23: Description of assessed intersections

ID	Intersection	Traffic Control
1	Observer Street / Glenrock Drive	Priority controlled, Cross-intersection, Wombat crossing on east leg
2	Observer Street / Wellsvale Drive	Priority controlled, T-intersection, Wombat crossing on south leg
3	Wellsvale Drive / Heazlett Street	Priority controlled, T-intersection, Wombat crossing on south leg
4	Harvest Street / Wellsvale Drive	Priority controlled, T-intersection
5	Harvest Street / Glenrock Drive	Priority controlled, T-intersection, Wombat crossing on east leg

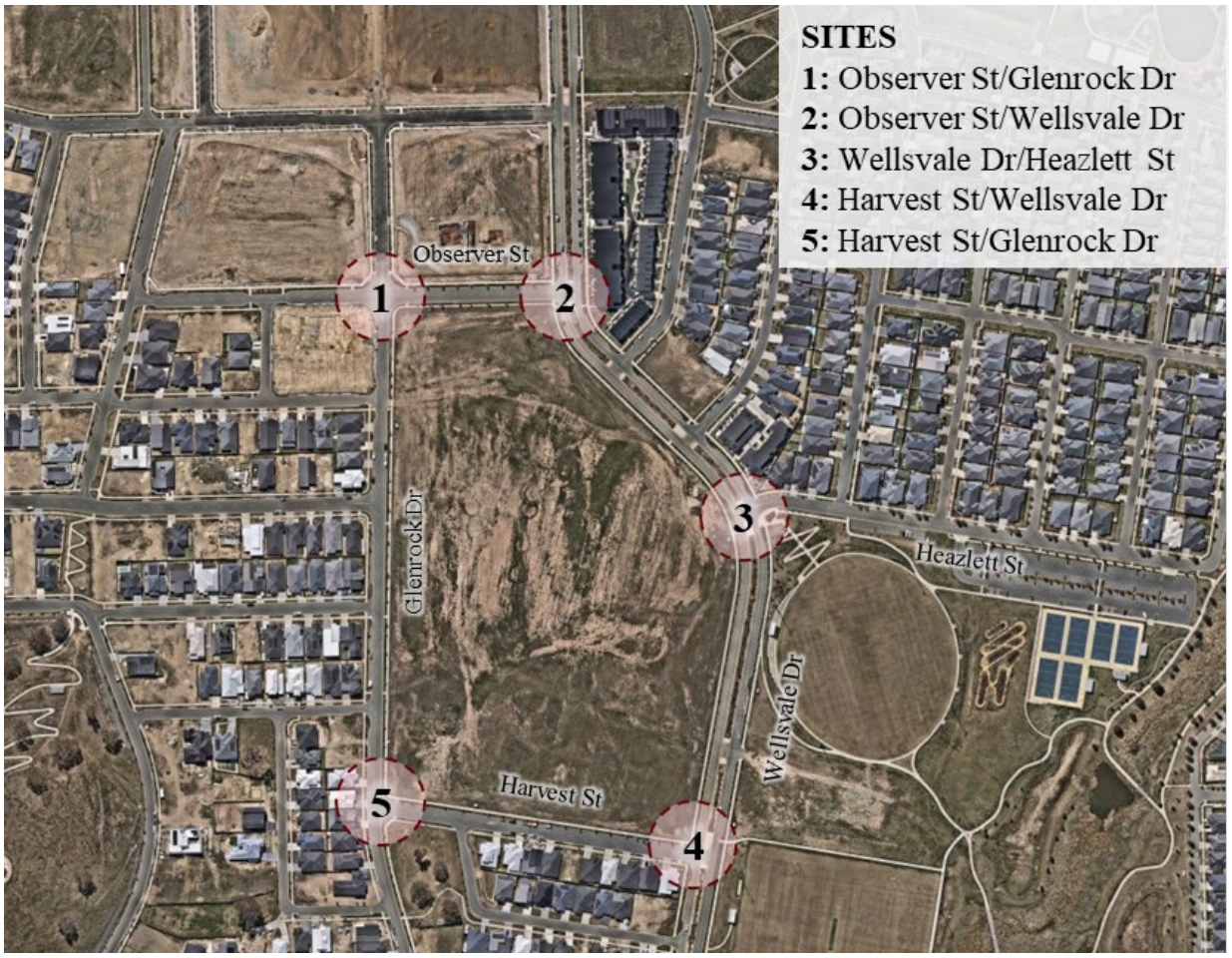


Figure 50. Location of assessed intersections

The input demands have been derived based on a combination of trip generation rates, number of residential dwellings, trips to / from the Town Centre and distribution assumptions. They consider full buildout of Neighbourhoods 1, 2 and 3 in the Googong Masterplan.

The resulting traffic volumes were compared with road link volumes within Googong as reported in Queanbeyan City Council's 2014 report *TRACKS Model South Jerrabomberra and Queanbeyan Traffic Analysis* to validate our traffic volume results. It was found that the overall outbound AM volumes and inbound PM volumes in this SIDRA assessment are higher than those in Queanbeyan City Council's 2014 report, indicating that this SIDRA assessment is more conservative.

Further details of the derivation process and comparison with the TRACKS model volumes can be found in Appendix A.2.

As part of the SIDRA assessment process, a conservative approach was adopted. The key elements of this approach are described below, with further details of model assumptions provided in Appendix A.2A.2.

- Intersection configuration
  - Intersections along Wellsvale Drive have been modelled as a single intersection and do not consider the storage capacity of the wide median. This impacts the modelling results by increasing queues and delays, in particular for right turn movements out from the minor leg as the critical gap acceptance is higher (i.e. must yield to both traffic lanes)
- Vehicle demands
  - For intersection turning movements which did not have any demand associated from the derivation process, a nominal 20 vehicles per hour have been added to account for background and potential construction traffic.
  - The peak flow factor has been adjusted from the default value to 50% to consider the profile of school operations (Kiss & Drop) for all movements. This adjustment assumes that instead of traffic arriving and exiting uniformly across an hour, the demand is concentrated in a 30-minute period. Therefore, all derived hourly demands input into SIDRA are effectively doubled as part of the assessment.
  - While predominantly servicing residential land use, an additional 5% heavy vehicles based on the total light vehicle volumes have been added for the through movements along Wellsvale Drive.
  - For this assessment, the AM peak period likely represents the worse performing peak as the school Kiss & Drop / arrivals generally coincides with commuter trips from 8 to 9 AM. In the PM peak, school dismissal generally occurs around 3-4PM, while commuter peak is 5-6PM. Both peaks have been assessed to determine if there are any issues with localised movements.
- Pedestrian demands
  - Pedestrian demands at four wombat crossings were included in the SIDRA assessment based on estimated volumes in Table 6.

The modelled SIDRA network is shown in Figure 51. The assigned volumes can be found in Figure 63 and Figure 64 in Appendix A.2.1.3.

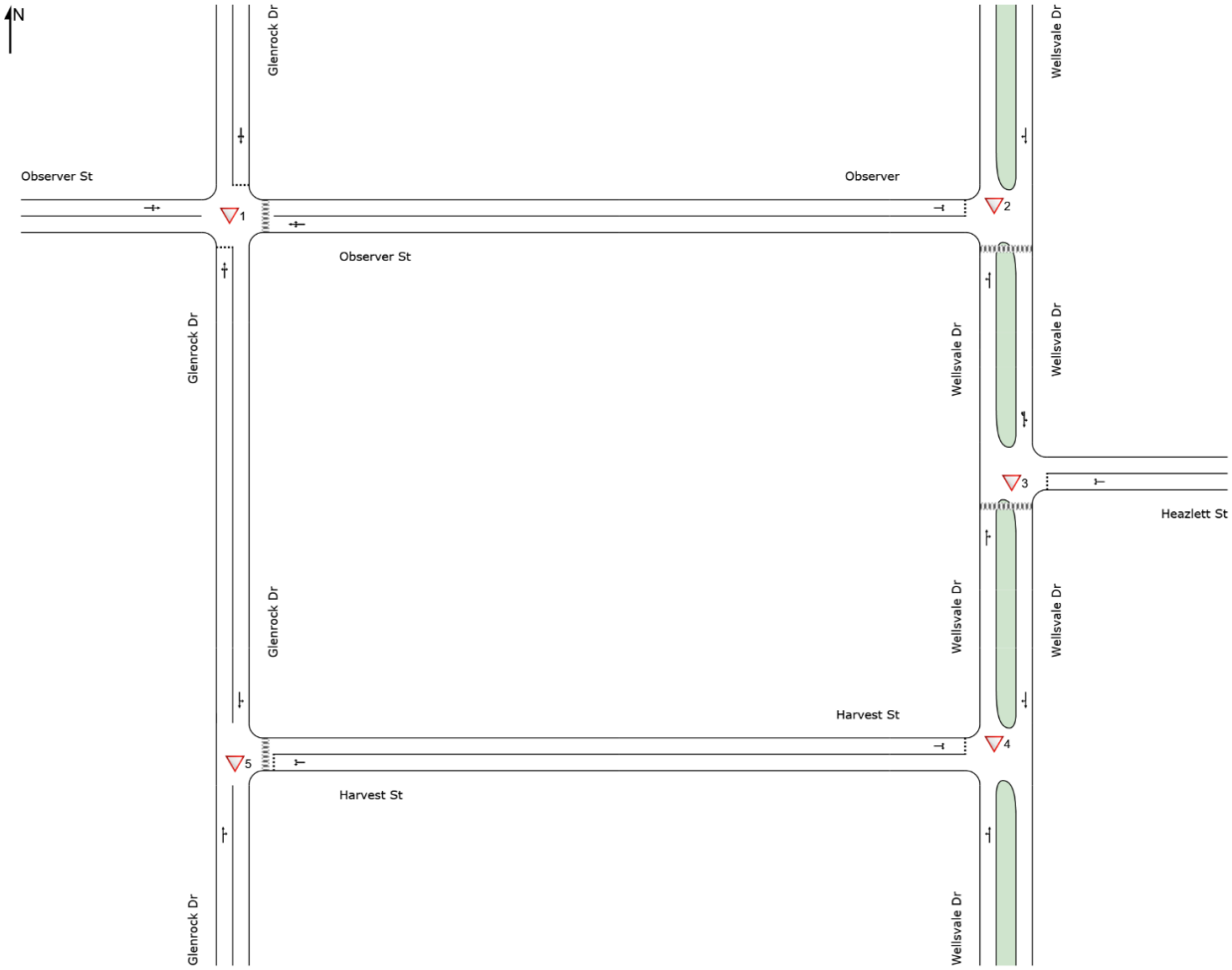


Figure 51: SIDRA modelled network

Assessment Metrics

The adopted intersection traffic performance criteria are described below. These performance criteria are considered industry standard in the absence of project specific requirements and represent a satisfactory functioning intersection.

- A minimum overall intersection Level of Service (LoS) of D for priority-controlled intersections (see Table 24.
- A Degree of Saturation (DoS) of no more than 0.85 for priority-controlled intersections.
- The 95th percentile queue lengths do not extend back to an upstream intersection.

Table 24. Level of Service definitions (Source: HCM 2010)

LoS	Priority Control Delay (s)
A	≤ 10
B	10 < d ≤ 15
C	15 < d ≤ 25
D	25 < d ≤ 35
E	35 < d ≤ 50
F	> 50

Results

A summary of the overall intersection performance results is provided in Table 25. The full results by approach and movement are provided in Appendix A.2.

Table 25. Summary of overall intersection performance

Intersection	LoS* | Avg Delay (seconds)	DoS	Longest 95th percentile queue length (m) | Approach
AM PEAK			
Observer Street / Glenrock Drive	A | 4	0.3	11 | East approach (Observer St)
Observer Street / Wellsvale Drive	A | 4	0.53	35 | South approach (Wellsvale Dr)
Wellsvale Drive / Heazlett Street	A | 4	0.2	5 | East approach (Heazlett St)
Harvest Street / Wellsvale Drive	A | 3	0.10	3 | West approach (Harvest St)
Harvest Street / Glenrock Drive	A | 3	0.12	4 | North approach (Glenrock Dr)
PM PEAK			
Observer Street / Glenrock Drive	A | 4	0.3	5 | East approach (Observer St)
Observer Street / Wellsvale Drive	A | 4	0.54	15 | North approach (Wellsvale Dr)
Wellsvale Drive / Heazlett Street	A | 3	0.19	1 | South approach (Heazlett St)
Harvest Street / Wellsvale Drive	A | 3	0.1	1 | West approach (Harvest St)
Harvest Street / Glenrock Drive	A | 3	0.15	2 | North approach (Glenrock Dr)

* SIDRA does define overall intersection and approach LoS for priority-controlled intersection. Specified LoS based on overall intersection delay.

In summary:

- All intersections in both peaks meet the adopted performance criteria.
- Northbound 95th percentile queues during the AM peak on Wellsvale Drive at Observer Street develop to approximately 40m as a result the high-volume pedestrians using the wombat crossing. The nearest upstream intersection is McFarlane Avenue which located approximately 55m south from Observer Street.
- Based on these outcomes, the intersections (with the wombat crossings) are likely able to accommodate the increased demands associated with the school.

The following should be noted:

- The SIDRA assessment does not consider any queuing / delay associated with Kiss and Drop operations on Glenrock Drive. Based on the analysis in Section 7.1, it is assumed that the proposed number of spaces (see Section 6.2.1) will be sufficient to accommodate the demand and not impact intersection operations.
- The proposed school development will include a wombat crossing across the south leg of the Leader Street / Glenrock Drive intersection. While this intersection has not been included as part of the SIDRA assessment, it can be inferred that based on similar through volumes (~250) across the wombat crossing and lower pedestrian demand (69 versus 137) in comparison to the Observer Street / Wellsvale Drive intersection, the Leader Street / Glenrock Drive intersection will likely perform similarly.

  As mentioned above, the 95th percentiles queues on Wellsvale Drive were approximately 40m in the AM peak and still performed adequately. Based on this and given the Observer Street / Glenrock Drive intersection is 70m north of the Leader Street / Glenrock Drive intersection, the queues / delays associated with the wombat crossing are unlikely to impact the Leader Street / Glenrock intersection. However, it is noted that the delays associated with Kiss and Drop operations on Glenrock Drive will likely be the key driver of performance along the road.

7.2 Queueing impacts at Glenrock Drive Kiss and Drop

The kerbside Kiss and Drop facility is located on the eastern side of Glenrock Drive (adjacent to the school), commencing south of Leader Street. Queue lengths greater than 40 metres (5 vehicles) would impact the Bus Zone on Glenrock Drive and queue lengths greater than 90 metres (14 vehicles) would impact on the operation of the Glenrock Drive / Observer Street intersection to the north. This assumes that approximately 1 vehicle space is taken up by the pedestrian crossing outside the school gate.

Queuing impacts at the Glenrock Drive Kiss and Drop facility were assessed using a spreadsheet model for a 30-minute Kiss and Drop period. The results indicate that to maintain a 95th percentile queue length of less than 5 vehicles, management strategies to reduce kerbside service times or diversion of around 20% of vehicles would be required.

Table 26 sets out a range of scenarios that vary the service time (i.e. the time taken to pick up or drop off a student once a vehicle is parked at the Kiss and Drop). The 95th percentile queue represents the queue length that would be exceeded for 5%, or 1.5 minutes during the 30-minute Kiss and Drop period.

The base scenarios assume that there are 25 students with P1 Provisional Licenses that drive to school and do not use the Kiss and Drop. It also adopts base assumptions that:

- No students have after school activities (formal or informal) that mean they are picked up after 3.30pm, or picked up from other locations.
- No students are picked up from other streets surrounding the school (e.g. Wellsvale Drive) that may be more convenient for parents/carers to access.
- Average occupancy of 1.2 students per vehicle.

Under these conditions:

- In the AM peak, the Kiss and Drop operates without queuing; this is largely driven by fast turnaround times at the kerb (1 minute)
- In the PM peak, the Kiss and Drop would have queues up to 19 vehicles that would cause severe delays at the Glenrock Drive / Observer Street intersection.

However, these base assumptions are unlikely to reflect actual school operations. Younger students (years 7 and 8) are most likely to use the Kiss and Drop. Older students, are more likely to be picked up from other locations or at other times to account for after-school activities. These may be formal activities such as sport at nearby Brooks Oval, or informal activity with other students at nearby parks or Googong Town Centre.

In addition, shorter kerbside pick-up times are possible. In a high school environment, students are relatively independent and able to locate their parents/carers vehicle on approach.

The sensitivity scenarios are also set out in the table below. The results indicate that the Kiss and Drop will operate without significant queueing if any of the following conditions are met:

- 25 vehicles are diverted either due to students being picked up from other locations at other times to account for after school activities (PM S1). This could also be achieved by increasing car occupancy from 1.2 to 1.35 students per vehicle to move the same number of students with fewer overall vehicles.
- Kerbside pick-up time is reduced to 1.5 minutes per vehicle (PM S2).

It should be noted that even at higher Kiss and Drop demand (PM S4), a shorter turnaround time of 1.5 minutes per vehicle results in short term impacts (less than 5 minutes) are expected on the Bus Zone, but no impacts are expected at the upstream intersection. If turnaround times of 1.2 minutes per vehicle are achieved (PM S5), no significant impacts are expected.

Summary

The sensitivity scenarios for the PM Kiss and Drop are considered reasonable given the relative independence of high school students. In these circumstances, excessive queuing is not anticipated at the Kiss and Drop in either the AM or PM peak.

A benchmarking survey against Kiss and Drop operations at a similar school, such as Jerrabomberra High School, would be valuable to validate these assumptions.

Table 26 Kiss and Drop sensitivity testing (grey cells indicate changes)

	Base AM demands	Base PM demands	PM S1 Additional 25 vehicles diverted	PM S2 Decreased processing time (1.5 min)	PM S3 Vehicle diversion (25 veh) and decreased processing (1.5 min)	PM S4 All students use K&D, with decreased processing time (1.5 min)	PM S5 All students use K&D with decreased processing time (1.2 min)
Inputs							
Time period (min)	30	30	30	30	30	30	30
Total arrivals (veh)	255	226	201	226	201	280	280
Service time (min/veh)	1.0	2.0	2.0	1.5	1.5	1.5	1.2
Number of Kiss and Drop bays	17	17	17	17	17	17	17
Outputs							
Utilisation	50%	89%	79%	66%	59%	82%	66%
95th Percentile Queue (veh)	0	19	7	1	0	9	1
Probability of queuing (%)	0< 1%	47%	21%	5%	2%	29%	5%
Average queue length (veh)	0.01	4.16	0.99	0.16	0.05	1.63	0.15
Average time in queue (min/veh)	0.0	0.55	0.15	0.02	0.01	0.17	0.02
Average time in system (min/veh)	1.00	2.55	2.15	1.52	1.51	1.67	1.22
Road network impacts	No significant impact anticipated in AM peak.	Significant impacts. 95th percentile queue impacts Bus Zone and upstream intersection	Moderate. 95th percentile queue impacts on bus zone. 85th percentile queue is 2 vehicles.	No significant impact; 95th percentile queue does not impact on Bus Zone	No significant impact; 95th percentile queue does not impact on Bus Zone	Moderate. 95th percentile queue impacts on bus zone. 85th percentile queue is < 5 vehicles.	No significant impact.

8. Mitigation Measures

The mitigation measures outlined in the table below are proposed as part of this activity. This Transport Assessment determines that all impacts assessed can be adequately mitigated through recommended measures.

Table 27: Mitigation measures to anticipated impacts of the school project.

Mitigation	Aspect	Mitigation Measure	Reason for mitigation measure
Footpath improvements	As part of site works	Widened footpath Glenrock Drive and Observer Street to accommodate students walking to/from, the school entrances. The footpath on Glenrock Drive will be widened to 4.8m at the Kiss and Drop area and 3.9m at the bus zone. Threshold treatments (continuous footpath) to be considered where feasible with regard to constructability and levels. These would be provided across staff car park driveway and delivery driveway on Observer Street.	Wider footpaths ensure there is sufficient capacity for students walking and riding to school, preventing spillover onto the kerb or roadway. This is especially critical near high-activity areas, like the Kiss and Drop zone, where safe and efficient movement is essential. Threshold treatments increase driver awareness and encourage giving way to students walking and riding on footpaths around the school.
Crossing improvements	As part of site works	Five raised crossings proposed on Wellsvale Drive, Observer Street and Glenrock Drive connecting to the school block. Kerb blister proposed on Observer Street / Glenrock Drive crossings. All wombat crossings are to be well illuminated with street lighting designed according to AS/NZS1158.4	To address risks related to walking and riding safety around the school by slowing traffic and improving driver awareness of crossing children. Five crossing points have been placed at gate entrances and along natural desire lines to ensure when students cross, a safe option available and convenient to use.
Verge treatments	As part of site works	Incorporate planting/landscaping treatments either side of marked crossing as part of the kerb build out at raised crossings. Reinforce no-stopping requirements on approach to raised crossings by incorporating low-height landscape treatments between the footpath and the carriageway. This would include: 20m the approach to the Wellsvale Drive crossing at Heazlett Street and along the widened kerb after (adjacent to site) 20m on approach to the Observer Street crossing at Glenrock Drive and along the corner kerb after (adjacent to site) 20m on approach to the Wellsvale Drive crossing at Observer Street and along the corner kerb after (adjacent to site). Monitor pedestrian crossing in the first 12 months of school operations for uncontrolled / unsafe crossings.	To direct pedestrians to cross at formal crossings and restrict uncontrolled/unsafe crossing.

Mitigation	Aspect	Mitigation Measure	Reason for mitigation measure
Kiss and Drop	As part of site works	17 Kiss and Drop spaces (111m) has been positioned further south on Glenrock Drive which is more optimal than placing it closer to the Observer Street intersection in the case there is queuing/waiting. Kiss and Drop demand and number of spaces have been adjusted to meet the base case (conservative), to ensure demand can be met. DoE typically provides traffic management personnel on-site during the first week of operation to manage behaviours around Kiss and Drop and bus zone. A survey of Kiss and Drop operations at Jerrabomberra High School is recommended to validate kerbside pick-up / drop-off times and utilisation of the Kiss and Drop compared to informal pick up locations. The Travel Access Guide and School Transport Plan will be finalised and promoted to students and parents to encourage use of walking, cycling and public transport and encourage safe and efficient Kiss and Drop behaviours.	Enables parents to drop off and pick up students at the designated location. The bus bay is located upstream of the Kiss and Drop, allowing buses to operate independently without being delayed by queuing cars. Monitoring required to validate estimated drop-off time parameter of 1.5 minutes. Promotion of sustainable travel behaviours reduces overall demand for Kiss and Drop facility and reduces the extent and duration of queuing and impacts on Bus Zone operations and adjacent intersections.
Staff vehicle parking and queuing	As part of site works	55 car parking spaces will be provided onsite for staff (1 space per staff) which was agreed to in the RTA TWG meeting. Routes to the car park will be included in the School Travel Plan and shared among staff to avoid the need to U-turn on Wellsvale Drive.	To ensure all staff have access to on-site parking without the need to park on-street. To minimise any queueing occurring on Wellsvale Drive and at road junctions to access school site.
Bike Parking and EoT	As part of site works	140 spaces for students calculated based on the ‘reach’ mode share; design of bike racks to be confirmed during design development. 5 spaces for staff (calculated by adopting Green Star requirements to provide bicycle parking for 7.5% of staff). 5 lockers, 4 showers provided for staff, based on Green Start requirements.	Reduce demand for vehicle access by providing, secure cycling storage and EoT facilities. Capacity has been based on the ‘reach’ mode share, allowing the active travel mode share to continue grow as initiatives, monitoring and improvements from the School Travel Plan takes place. Growth in students cycling to school also lessens Kiss and Drop demand and reduces the amount of traffic generated.
School bus zone	As part of site works	A 38m long bus zone provided on Glenrock Drive (before Kiss and Drop).	The bus zone provides the necessary infrastructure to accommodate dedicated school bus routes stopping at the new high school for Googong. Its inclusion supports discussions with TfNSW about re-routing existing services and introducing new routes. This will help achieve the 22% ‘reach’ mode share target for public transport.
School Travel Plan	Prior to operation	Prior to commencement of operations, a School Transport Plan (STP) must be prepared to the satisfaction of the NSW	The School Transport Plan set out objectives and strategies to assist in the development of transport goals, policies

Mitigation	Aspect	Mitigation Measure	Reason for mitigation measure
		Department of Education (DoE) Transport Planning team. The STP is to be reviewed on an annual basis and updated (if required) to the satisfaction of the DoE Transport Planning team to ensure active and sustainable travel measures are implemented. The total number of annual reviews required is to be confirmed with TfNSW.	and procedures for the school. These measures promote the use of sustainable travel modes. Sustainable travel also modes also reduces the amount traffic generated by Kiss and Drop and lessen the amount of traffic in Googong during morning and afternoon weekdays.
Visitor parking (School Travel Plan)	Prior to operation	Within the School Travel specify office visitation to occur in the morning – afternoon period when on-street parking in the neighbourhood is not as full. Prior to school events such as parent-teacher evenings, presentation evenings, communication portals such as apps and social media should be used to promote alternative travel modes to parents and carers and reduce reliance on surrounding parking. These could include carpooling, pick up/drop-off and walking. Monitor and collect parent feedback on demand for school visitor parking outside of school pick up and drop off times for first 12 months of school operation; this should be used to assess whether changes to parking controls in the Kiss and Drop zone are required to cater to demand for school visitor parking during the day.	To reduce traffic congestion and parking overflow during high-demand periods, particularly for large events. This would reduce the disruption by visitor parking on surrounding residents and land uses.
Staff carpark driveway design	Design development	The splay of the staff car park driveway to be reconfirmed during design development.	To ensure that the driveway can safely accommodate waste truck movements exiting the car park onto Wellsvale Drive.

9. Consultation with agencies

The transport strategy to date has been presented to Colliers, SINSW, Queanbeyan-Palerang Regional Council and TfNSW in three Transport Working Group (TWG) meetings:

- TWG 1 – 18 October 2023
- TWG 2 – 3 November 2023
- TWG 3 – 31 October 2024.

Items discussed and the design response are summarised below.

Table 28 Summary of items raised in consultation, and response in the TA

Meeting	Item raised	Response
TWG 1	Traffic calming measures to complement wombat crossings	Added kerb blisters around wombat crossings, providing stopping space for cars clear of intersections.
TWG 1	Maintaining bus access where kerb blisters are used at intersections	Assessed swept paths to for buses travelling anti-clockwise around the site and kerb blisters designed to suit.
TWG 1	Proposed changes to bus services	Contacted TfNSW for future public transport service plans, no response to date.
TWG 1	Safe provision of Kiss and Drop	Consideration of drop-off activity on Wellsvale Drive - relocated crossing to align with QPRC masterplan and minimise change to parking on Wellsvale Drive. Decision made to neither discourage nor encourage this behaviour through design. School access will be permitted to allow students to access the bus stop and the crossing to Googong Common. Amending the footpaths and street frontage would appear to endorse this activity on Wellsvale Drive and implicate school responsibility. Parents will be encouraged to use the Glenrock Drive facility, particularly for Primary School children.
TWG 1	Proposed parking provision	Staff parking provisions amended as advised by council – 1 parking space per staff member. Bicycle parking provisions checked against DCP and Green Star requirements.
TWG 1	Mode share scenarios	Weather (both hot and cold) is often cited as a reason to suppress active transport expectations. Experiences from parts of the world with colder weather shows cycling can be a legitimate option in these climates. The provision of safe infrastructure and positive community attitudes to cycling are far more significant factors in determining the propensity for people, particularly women and children, to ride bicycles. This would form part of the important community messaging that will be critical in achieving the target active transport mode share.
TWG 1	Lighting at wombat crossings	Confirmation of Lighting Standards for pedestrian crossings, PX1 is the highest category. Table 3.1 of AS 1158.4 shows PX2 as relevant in this case. Local collector or sub-arterial road (local road - traffic slowed), posted speed limit < 60km/h.
TWG 2	School enrolment number	School enrolment number increased to 700 students from 660 students in the previous submission.

Meeting	Item raised	Response
TWG 2	Staff parking access	New staff parking access arrangement from Wellsvale Drive and note that 62 additional on-street parking spaces are available along Wellsvale Drive northbound.
TWG 2	Updated mode share target	Cycling mode share reduced from 35% to 20% in response to feedback in TWG #1. This was endorsed by attendees. The 15% difference was primarily distributed to Bus and Walking trips, with a +2% increase to car mode share.
TWG 3	Travel demand and mode share	Travel demand and mode share presented by Arup was accepted by all present.
TWG 3	Updated layout	Relocation of driveway/staff car park further west to better separate pedestrian and vehicular movements. Colliers confirmed that lighting for wombat crossings have been considered. QPRC to provide as-built drawings to determine what is involved for an inground service point of view for Glenrock Drive widening. Bus bay location immediately before Kiss and Drop zone may block flow of buses as private vehicles to queue for the Kiss and Drop. CDC Bus requested NBRS design team to explore the option of swapping the bus bay with the Kiss and Drop.
TWG 3	Parking provisions	No student parking to be provided on-site. On-street parking will be used in lieu. Approximately 60 on-street parking spaces are available on surrounding roads. Concern for potential flow-on impacts to wider network of surrounding streets and competition from other developments. Arup performed audit and assessment of busy periods to assess the concern. QPRC advised that complaints have been received at Jerrabomberra High School for not providing visitor parking. Colliers investigating this issue at Jerrabomberra High School and to take into consideration for the new high school for Googong. Colliers will investigate option of short-term parking within the Kiss and Drop zone is possible outside of drop off hours. Left-in, left-out access to staff car park on Wellsvale Drive was agreed. Entry moved further south to avoid being directly opposite McFarlane Avenue.

Appendix

A.1 Parking calculations

A.1.1 Bicycle parking

Table 29. Bicycle parking – Scenarios

Scenario	Students cycling	Staff cycling	Two-sided rails equivalent
Scenario 1: Baseline	105	5	55
Scenario 2: 'Medium' active / public transport provision	123	5	64
Scenario 3: 'Reach' active or public transport provision	140	5	73

Table 30. Bicycle parking – 4-Star Green Star requirement

4-Star Green Star Requirement	Total	No. cycling	Two-sided rails equivalent
No. of Staff	55	5 (rounded up to nearest 1)	2
No of students	700	280	140

- Greenstar requirement: 7.5% of Staff and 40% of students over grade 4
- Queanbeyan DCP 2012 requirement: parking for schools as per the T&I SEPP 2021. However, there are no parking requirements specified for schools under the T&I SEPP.
- Bicycle parking to be provided based on mode share target.
- End of trip facilities will be provided for staff only

A.1.2 Kiss and Drop

Table 31 Kiss and Drop space assumptions

Component	AM	PM
Vehicle occupancy	1.2 students/ car	1.2 students/ car
Dwelling time per car	1.5 mins (1)	2 mins (2)
Total drop off window	30 mins	30 mins
Drop off bay length	6.5m (3)	6.5m

Table 32 Kiss and Drop space calculations for three scenarios

Scenario	AM		PM	
	Kiss and Drop student demand[(4)]	**No. of bays (m)**	**Kiss and Drop student demand**	**No. of bays (m)**
Scenario 1: Baseline	336	14 (91m)	301	17 (111m)
Scenario 2: 'Medium' active / public transport provision	245	11 (72m)	214	12 (78m)
Scenario 3: 'Reach' active or public transport provision	154	7 (46m)	126	7 (46m)

Note:

(1) Assuming students can walk straight into school, drop-off is quicker than pick-up

(2) Based on Leppington Ed Campus and Condell Park High School PM dwelling time

(4) Each Kiss and Drop space will be 6.5m long, based on similar Kiss and Drop operations at other high schools.

(4) Kiss and Drop student demand refers to the number of students travelling by car in the mode share target.

A.2 Traffic Modelling (SIDRA)

A.2.1.1 Traffic generation

The derived traffic demands are divided into five (5) categories:

- **Layer 1:** Trips to Kiss and Drop. This did not include vehicles associated with students driving themselves.
- **Layer 2:** Trips to/from on-street parking associated with students driving themselves.
- **Layer 3:** Trips from Kiss and Drop following pick-up or drop-off
- **Layer 4:** Background trips generated by Neighbourhoods 1, 2 and 3 within Googong Township. These were derived using rates outlined in Table 5.3 of the Guide to Transport Impact Assessment Version 1.1(TfNSW), 0.83 car trips per dwelling in the AM peak hour for regional low-density developments, which is the predominant residential typology. It was assumed that this traffic would be directed at Googong Town Centre, Queanbeyan or Canberra; that is, to the north of the school. Trips made to other developments, including the aquatic centre were not explicitly considered, but were accounted for using a factor of safety (see Section A2.1.3 SIDRA Modelling).
- **Layer 5:** Staff trips to/from the staff car park on Wellsvale Drive. This assumed that 5% of staff live in Neighbourhoods 2 and 3, and remaining 95% live in Googong North or elsewhere in Queanbeyan or the ACT (i.e. accessing the school from the north).

People living in rural townships outside Googong (such as Burra) were considered in the trips to school, but not as part of background traffic generation.

Table 33 Assumed number of dwellings for background trip generation and apportioning of school student trips

Neighbourhood	Dwellings	Source
Neighbourhood 1 (Googong North)	2,000	Peet[3]
Neighbourhood 2 (Googong Central)	1,800	Peet[4]
Neighbourhood 3 (Googong West)	778	Googong Township Pty Ltd[5] Count of masterplan lots; assumed yield of 100 dwellings per multi-dwelling apartment lot (benchmarked against [6]

Zones were created by their travel route to school, coloured in Figure 52 below. Approximate number of dwellings in each zone were calculated by apportioning the zones area out of the total Neighbourhood area. Rural areas to the south were included within Origin Zone 5 as they are most likely to enter Googong Township via the planned Old Cooma Road / Bunyip Drive intersection in Neighbourhood 3.

[3] https://www.peet.com.au/about-us/news-and-events/googong-unveils-%24143-million-town-centre

[4] https://www.peet.com.au/about-us/news-and-events/googong-unveils-%24143-million-town-centre

[5] https://www.googong.net/news-and-events/news/three-new-neighbourhoods

Figure 52 Zones for traffic distribution

A.2.1.2 Assumed routing

Each layer of traffic generated and their associated movements through the assessed intersections are illustrated from Figure 53 to Figure 62.

For Layer 1 and Layer 2 movements from origin 3 and 4, these represent traffic parking associated with Googong Central. For conservative analysis, it will be assumed 100% of these demands will continue south through the Observer Street / Glenrock Drive intersection (attributed to unavailable parking at Googong Central).

Figure 53. Layer 1 AM: Route to Kiss and Drop (no vehicles associated with Year 12 students)

Figure 54. Layer 1 PM: Route to Kiss and Drop (no vehicles associated with Year 12 students)

Table 34 Layer 1 AM: Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand (Kiss and Drop)	Split vehicle demand
1	1	100%	126	126
2	2	100%	6	6
3	3	100%	8	8
4	4	100%	4	4
5	5	100%	57	57
6	6	100%	0	0
7	7a	50%	53	27
7	7b	50%	53	27

Table 35 Layer 1 PM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand (Kiss and Drop)	Split vehicle demand
1	1	100%	126	126
2	2	100%	6	6
3	3	100%	8	8
4	4	100%	4	4
5	5	100%	57	57
6	6	100%	0	0
7	7a	50%	53	27
7	7b	50%	53	27

Figure 55. Layer 2 AM: Routes to parking associated with Year 12 students

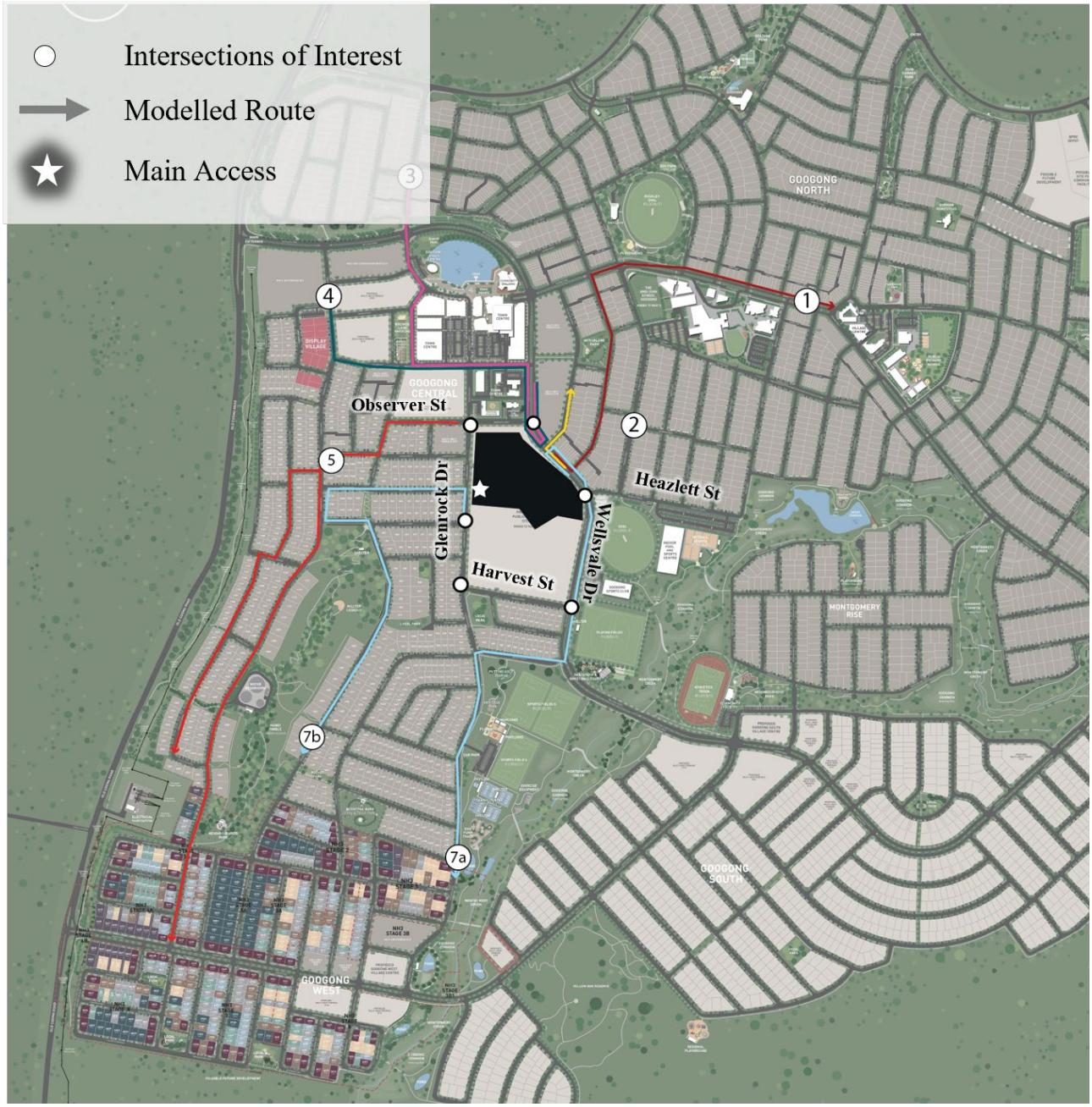


Figure 56. Layer 2 PM: Routes from parking associated with Year 12 students

Table 36 Layer 2 AM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	13	13
2	2	100%	1	1
3	3	100%	1	1
4	4	100%	0	0
5	5	100%	6	6
6	6	100%	0	0
7	7a	50%	5	3
7	7b	50%	5	3

Table 37 Layer 2 PM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	13	13
2	2	100%	1	1
3	3	100%	1	1
4	4	100%	0	0
5	5	100%	6	6
6	6	100%	0	0
7	7a	50%	5	3
7	7b	50%	5	3

Figure 57. Layer 3 AM: Routes from Kiss and Drop to home (excludes work)

Figure 58. Layer 3 PM: Routes from Kiss and Drop to home (excludes work)

Table 38 Layer 3 AM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	63	63
2	2	100%	3	3
3	3	100%	4	4
4	4	100%	2	2
5	5	100%	29	29
6	6	100%	0	0
7	7a	50%	27	14
7	7b	50%	27	13
8	8	100%	127	127

Table 39 Layer 3 PM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	63	63
2	2	100%	3	3
3	3	100%	4	4
4	4	100%	2	2
5	5	100%	29	29
6	6	100%	0	0
7	7a	50%	27	14
7	7b	50%	27	13
8	8	100%	0	0

For Layer 4 movement 7A and 7B (see image below) it is assumed that 80% would exit to Old Cooma Road towards the south instead of travelling north on Glenrock Drive. The remaining 20% is evenly distributed between 7A and 7B.

Figure 59. Layer 4 AM: Routes from home to work (commuters to Queanbeyan)

Figure 60 Layer 4 PM Routes from work to home (commuters from Queanbeyan)

Table 40 Layer 4 AM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
2	2a	50%	318	159
2	2b	50%	318	159
4	4	100%	206	206
5	5	100%	546	546
6	6a	80%	105	84
6	6b	20%	105	21
7	7a	50%	799	40
7	7b	50%	799	40

Table 41 Layer 4 PM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
2	2a	50%	318	159
2	2b	50%	318	159
4	4	100%	206	206
5	5	100%	546	546
6	6a	80%	105	84
6	6b	20%	105	21
7	7a	50%	799	40
7	7b	50%	799	40

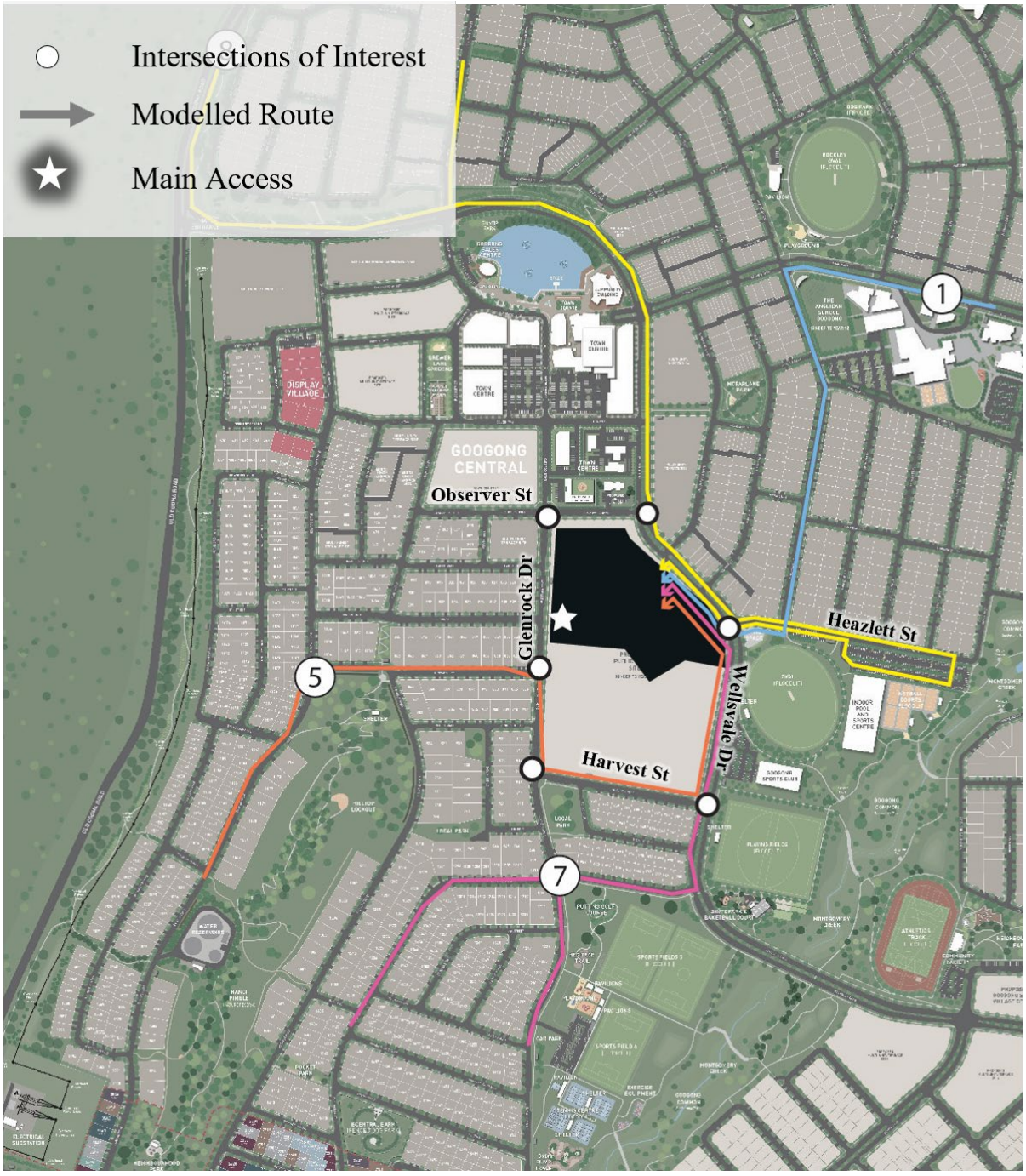


Figure 61. Layer 5 AM: Routes associated with school staff

For Layer 5 movement 8, it is assumed that staff will be able to perform a U-turn at Wellsvale Drive / Heazlett Street to access the Left in / Left out only school carpark.

Figure 62. Layer 5 PM: Routes associated with school staff

Table 42 Layer 5 AM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	3	3
2	2	100%	0	0
3	3	100%	0	0
4	4	100%	0	0
5	5	100%	1	1
6	6	100%	0	0
7	7	100%	1	1
8	8	100%	50	50

Table 43 Layer 5 PM - Vehicle volumes

Origin ID	Route ID	Proportion (if split)	Vehicle Demand	Split vehicle demand
1	1	100%	3	3
2	2	100%	0	0
3	3	100%	0	0
4	4	100%	0	0
5	5	100%	1	1
6	6	100%	0	0
7	7	100%	1	1
8	8	100%	50	50

A.2.1.3 SIDRA Modelling

General Information and Assumptions

- SIDRA INTERSECTION 9.1 was the modelling package selected for this assessment. Unless otherwise specified, the default model parameters (e.g. saturation flows and gap acceptance) were adopted for the assessment.
- The assessment was undertaken as a network (as opposed to isolated sites) due to the proximity of each site with respect to each other.
- The intersections on Wellsvale Drive (Observer Street, Heazlett Street and Harvest Street) are currently (and proposed) configured with a wide median opening (approximately 6m). This permits a single vehicle turning from each of the approaches to store in the median which reduces the critical gap acceptance for traffic turning out from the minor road (as only a gap in a single direction would need to be found).
- While this configuration was initially tested in SIDRA, it was determined for a conservative approach, the median storage will not be included as part of the assessment. This removes and storage for right turns into the minor road, while the minor road must find gaps in both directions of traffic.
- All wombat crossings have priority over vehicular movements
- Based on desktop measurements, all general traffic lanes have been modelled with a 5m width.
- While the bicycle lane on Wellsvale Drive has not been included in the SIDRA model, the increase carriageway width has been included as part of the 5m wide general traffic lane.
- The entire modelled network assumes maximum approach and exit speeds of 40 km/h (school zone).

Vehicular Demands

Using the routing decisions shown in the previous section, turning movements for each intersection are generated. As the traffic generation performed is considered high-level, the following assumptions were made as to route choice allocation and approach volume generation:

- Following the combination of all demand layers, some turning movements for the assessed intersections do not have volume. While it is not expected demand for these movements to be significant, for a conservative approach, an additional 20 light vehicles have been applied.
- The derived demands are all light vehicles area as the land use surrounding school is predominantly residential. To account for different traffic composition, it has been assumed that 5% of the light vehicles travelling on Wellsvale Drive in both directions are heavy vehicles. These heavy vehicles are subsequently added onto the light vehicle volume (i.e. total vehicle volume is 105% of initial light vehicle volume).
- Traffic generation assumed full build out of Neighbourhoods 1, 2 and 3 in Googong Township. More details can be found in Appendix A.2.1.1.

Given the context of the project primarily pertains to high school pick-up and drop-off demand, to better model the unique characteristics of this demand the following adjustments have been made to the model:

- A peak flow factor of 50% has been applied to all vehicle demands and effectively doubles the input hourly demands in SIDRA. This aims to simulate a demand profile associated with the majority of school pick up and drop offs occurring within a 30-minute period instead of being spread across full hour interval.
- This adjusted peak flow factor was applied globally to all demand layers. Realistically, this would only be applicable to demand associated with the school (i.e. Kiss and Drop, parking, etc) while background traffic would remain relatively uniform. Therefore, this assumption is considered conservative for the purposes of the assessment.

The turning volumes for the AM and PM peak are shown in Figure 63 and Figure 64 below.

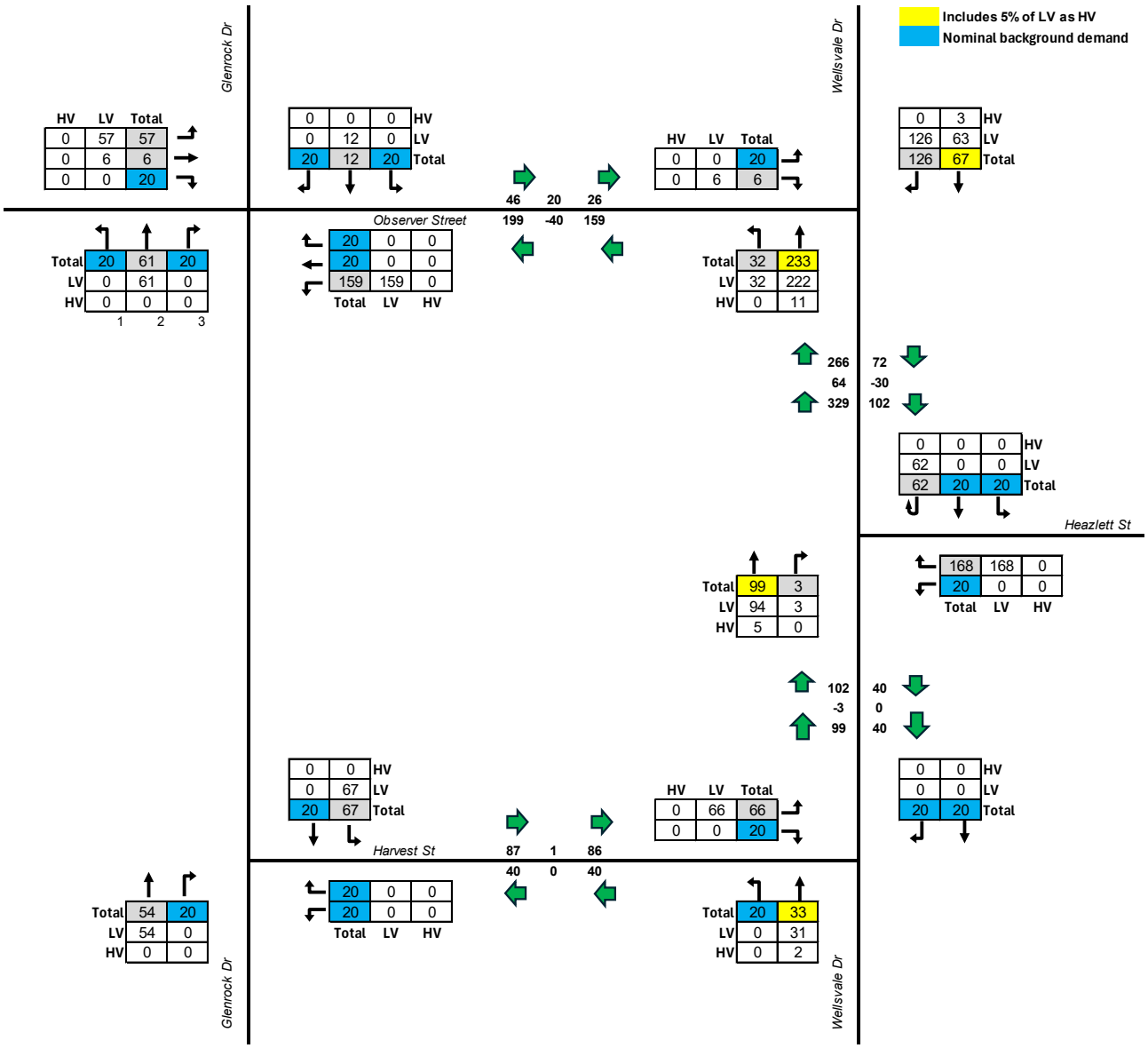


Figure 63. AM Peak Network Turning Movement Diagram

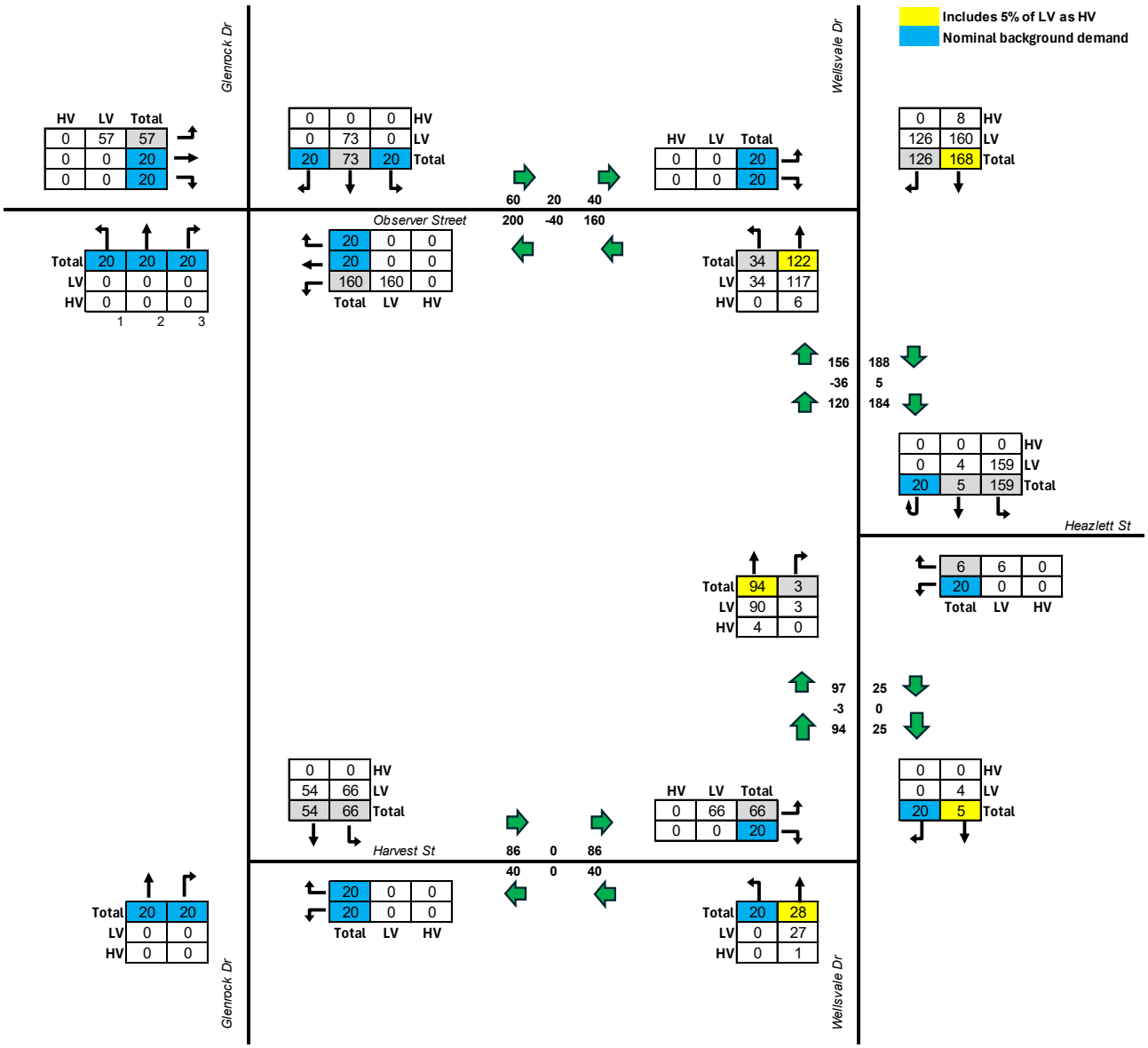


Figure 64. PM Peak Network Turning Movement Diagram

Pedestrian Demand

Using expected demand from Table 6, pedestrian volumes (hourly) were applied at each proposed wombat crossing (see Figure 45). The peak flow factor for these pedestrians remains as the SIDRA default (95%). All vehicular traffic must yield to these pedestrians.

Cycling demand has not been included in the SIDRA assessment.

Detailed results

The SIDRA outputs for each intersection in both peaks are provided below.

MOVEMENT SUMMARY

Site: 1 [1: Observer St / Glenrock Dr AM (Site Folder: GOOGONG HS AM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [School Network - AM (Network Folder: General)]

1: Observer St / Glenrock Dr AM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Glenrock Dr															
1	L2	All MCs	40	0.0	40	0.0	0.217	3.5	LOS A	0.9	6.3	0.33	0.45	0.33	36.0
2	T1	All MCs	122	0.0	122	0.0	0.217	4.5	LOS A	0.9	6.3	0.33	0.45	0.33	37.5
3	R2	All MCs	40	0.0	40	0.0	0.217	6.3	LOS A	0.9	6.3	0.33	0.45	0.33	35.4
Approach			202	0.0	202	0.0	0.217	4.6	LOS A	0.9	6.3	0.33	0.45	0.33	37.1
East: Observer St															
4	L2	All MCs	318	0.0	318	0.0	0.296	3.7	LOS A	1.6	11.0	0.21	0.41	0.21	30.6
5	T1	All MCs	40	0.0	40	0.0	0.296	0.5	LOS A	1.6	11.0	0.21	0.41	0.21	35.2
6	R2	All MCs	40	0.0	40	0.0	0.296	4.2	LOS A	1.6	11.0	0.21	0.41	0.21	36.8
Approach			398	0.0	398	0.0	0.296	3.4	NA	1.6	11.0	0.21	0.41	0.21	33.0
North: Glenrock Dr															
7	L2	All MCs	40	0.0	40	0.0	0.107	3.6	LOS A	0.4	2.8	0.29	0.46	0.29	36.4
8	T1	All MCs	24	0.0	24	0.0	0.107	5.0	LOS A	0.4	2.8	0.29	0.46	0.29	36.4
9	R2	All MCs	40	0.0	40	0.0	0.107	5.4	LOS A	0.4	2.8	0.29	0.46	0.29	36.6
Approach			104	0.0	104	0.0	0.107	4.6	LOS A	0.4	2.8	0.29	0.46	0.29	36.5
West: Observer St															
10	L2	All MCs	114	0.0	114	0.0	0.098	3.4	LOS A	0.4	2.9	0.23	0.44	0.23	36.9
11	T1	All MCs	12	0.0	12	0.0	0.098	0.9	LOS A	0.4	2.9	0.23	0.44	0.23	32.3
12	R2	All MCs	40	0.0	40	0.0	0.098	6.3	LOS A	0.4	2.9	0.23	0.44	0.23	32.3
Approach			166	0.0	166	0.0	0.098	3.9	NA	0.4	2.9	0.23	0.44	0.23	36.3
All Vehicles			870	0.0	870	0.0	0.296	3.9	NA	1.6	11.0	0.25	0.43	0.25	35.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 2 [2: Observer / Wellsvale Dr AM (Site Folder: GOOGONG HS AM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [School Network - AM (Network Folder: General)]

2: Observer / Wellsvale Dr AM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
1	L2	All MCs	64	0.0	64	0.0	0.531	4.9	LOS A	4.8	35.0	0.49	0.36	0.54	35.1
2	T1	All MCs	466	4.7	466	4.7	0.531	2.4	LOS A	4.8	35.0	0.49	0.36	0.54	38.4
Approach			530	4.2	530	4.2	0.531	2.7	NA	4.8	35.0	0.49	0.36	0.54	38.2
North: Wellsvale Dr															
8	T1	All MCs	132	4.5	132	4.5	0.381	1.7	LOS A	2.4	16.7	0.54	0.53	0.58	35.2
9	R2	All MCs	252	0.0	252	0.0	0.381	6.6	LOS A	2.4	16.7	0.54	0.53	0.58	35.2
Approach			384	1.6	384	1.6	0.381	4.9	NA	2.4	16.7	0.54	0.53	0.58	35.2
West: Observer															
10	L2	All MCs	40	0.0	40	0.0	0.069	5.2	LOS A	0.2	1.7	0.53	0.65	0.53	35.4
12	R2	All MCs	12	0.0	12	0.0	0.069	10.5	LOS B	0.2	1.7	0.53	0.65	0.53	26.6
Approach			52	0.0	52	0.0	0.069	6.4	LOS A	0.2	1.7	0.53	0.65	0.53	34.7
All Vehicles			966	2.9	966	2.9	0.531	3.8	NA	4.8	35.0	0.51	0.45	0.56	37.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 3 [3: Wellsvale Dr / Heazlett St AM (Site Folder: GOOGONG HS AM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [School Network - AM (Network Folder: General)]

3: Wellsvale Dr / Heazlett St AM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
2	T1	All MCs	104	5.1	104	5.1	0.098	0.4	LOS A	0.5	3.5	0.20	0.09	0.20	38.5
3	R2	All MCs	3	0.0	3	0.0	0.098	3.7	LOS A	0.5	3.5	0.20	0.09	0.20	39.0
Approach			107	4.9	107	4.9	0.098	0.5	NA	0.5	3.5	0.20	0.09	0.20	38.5
East: Heazlett St															
4	L2	All MCs	40	0.0	40	0.0	0.195	3.7	LOS A	0.7	5.2	0.29	0.48	0.29	36.4
6	R2	All MCs	177	0.0	177	0.0	0.195	4.3	LOS A	0.7	5.2	0.29	0.48	0.29	36.4
Approach			217	0.0	217	0.0	0.195	4.2	LOS A	0.7	5.2	0.29	0.48	0.29	36.4
North: Wellsvale Dr															
7	L2	All MCs	40	0.0	40	0.0	0.118	3.4	LOS A	0.6	4.3	0.24	0.43	0.24	38.2
8	T1	All MCs	40	0.0	40	0.0	0.118	0.6	LOS A	0.6	4.3	0.24	0.43	0.24	36.3
9u	U	All MCs	65	0.0	65	0.0	0.118	8.1	LOS A	0.6	4.3	0.24	0.43	0.24	36.3
Approach			145	0.0	145	0.0	0.118	4.7	NA	0.6	4.3	0.24	0.43	0.24	37.3
All Vehicles			469	1.1	469	1.1	0.195	3.5	NA	0.7	5.2	0.25	0.38	0.25	37.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 4 [4: Harvest St / Wellvale Dr AM (Site Folder: GOOGONG HS AM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [School Network - AM (Network Folder: General)]

4: Harvest St / Wellsvale Dr AM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
1	L2	All MCs	40	0.0	40	0.0	0.052	3.4	LOS A	0.0	0.0	0.00	0.18	0.00	38.5
2	T1	All MCs	66	6.1	66	6.1	0.052	0.0	LOS A	0.0	0.0	0.00	0.18	0.00	38.5
Approach			106	3.8	106	3.8	0.052	1.3	NA	0.0	0.0	0.00	0.18	0.00	38.5
North: Wellsvale Dr															
8	T1	All MCs	21	0.0	21	0.0	0.023	0.0	LOS A	0.1	0.7	0.19	0.24	0.19	38.4
9	R2	All MCs	21	0.0	21	0.0	0.023	3.8	LOS A	0.1	0.7	0.19	0.24	0.19	36.3
Approach			42	0.0	42	0.0	0.023	1.9	NA	0.1	0.7	0.19	0.24	0.19	37.8
West: Harvest St															
10	L2	All MCs	132	0.0	132	0.0	0.104	3.6	LOS A	0.4	3.0	0.16	0.44	0.16	34.1
12	R2	All MCs	21	0.0	21	0.0	0.104	3.7	LOS A	0.4	3.0	0.16	0.44	0.16	36.9
Approach			153	0.0	153	0.0	0.104	3.6	LOS A	0.4	3.0	0.16	0.44	0.16	34.8
All Vehicles			301	1.3	301	1.3	0.104	2.6	NA	0.4	3.0	0.11	0.32	0.11	36.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 5 [5: Harvest St / Glenrock Dr AM (Site Folder: GOOGONG HS AM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N101 [School Network - AM (Network Folder: General)]

5: Harvest St / Glenrock Dr AM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival 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	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Glenrock Dr															
2	T1	All MCs	108	0.0	108	0.0	0.079	0.0	LOS A	0.3	1.9	0.21	0.21	0.21	38.5
3	R2	All MCs	40	0.0	40	0.0	0.079	5.2	LOS A	0.3	1.9	0.21	0.21	0.21	38.5
Approach			148	0.0	148	0.0	0.079	1.4	NA	0.3	1.9	0.21	0.21	0.21	38.5
East: Harvest St															
4	L2	All MCs	40	0.0	40	0.0	0.068	3.7	LOS A	0.2	1.7	0.26	0.47	0.26	37.0
6	R2	All MCs	40	0.0	40	0.0	0.068	4.7	LOS A	0.2	1.7	0.26	0.47	0.26	33.6
Approach			80	0.0	80	0.0	0.068	4.2	LOS A	0.2	1.7	0.26	0.47	0.26	36.1
North: Glenrock Dr															
7	L2	All MCs	134	0.0	134	0.0	0.119	3.8	LOS A	0.5	3.8	0.18	0.36	0.18	36.6
8	T1	All MCs	40	0.0	40	0.0	0.119	0.0	LOS A	0.5	3.8	0.18	0.36	0.18	38.4
Approach			174	0.0	174	0.0	0.119	2.9	NA	0.5	3.8	0.18	0.36	0.18	37.3
All Vehicles			402	0.0	402	0.0	0.119	2.6	NA	0.5	3.8	0.21	0.33	0.21	37.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1 [1: Observer St / Glenrock Dr PM (Site Folder: GOOGONG HS PM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N102 [School Network - PM (Network Folder: General)]

1: Observer St / Glenrock Dr PM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Glenrock Dr															
1	L2	All MCs	40	0.0	40	0.0	0.137	3.5	LOS A	0.2	1.5	0.28	0.44	0.28	35.7
2	T1	All MCs	40	0.0	40	0.0	0.137	4.4	LOS A	0.2	1.5	0.28	0.44	0.28	37.3
3	R2	All MCs	40	0.0	40	0.0	0.137	7.3	LOS A	0.2	1.5	0.28	0.44	0.28	35.0
Approach			120	0.0	120	0.0	0.137	5.1	LOS A	0.2	1.5	0.28	0.44	0.28	36.3
East: Observer St															
4	L2	All MCs	320	0.0	320	0.0	0.298	3.7	LOS A	0.6	4.5	0.21	0.41	0.21	30.6
5	T1	All MCs	40	0.0	40	0.0	0.298	0.5	LOS A	0.6	4.5	0.21	0.41	0.21	35.2
6	R2	All MCs	40	0.0	40	0.0	0.298	4.4	LOS A	0.6	4.5	0.21	0.41	0.21	36.8
Approach			400	0.0	400	0.0	0.298	3.5	NA	0.6	4.5	0.21	0.41	0.21	32.9
North: Glenrock Dr															
7	L2	All MCs	40	0.0	40	0.0	0.267	3.8	LOS A	0.4	3.1	0.46	0.54	0.46	35.9
8	T1	All MCs	146	0.0	146	0.0	0.267	5.6	LOS A	0.4	3.1	0.46	0.54	0.46	35.9
9	R2	All MCs	40	0.0	40	0.0	0.267	5.3	LOS A	0.4	3.1	0.46	0.54	0.46	36.3
Approach			226	0.0	226	0.0	0.267	5.2	LOS A	0.4	3.1	0.46	0.54	0.46	36.0
West: Observer St															
10	L2	All MCs	114	0.0	114	0.0	0.123	3.4	LOS A	0.3	1.8	0.23	0.38	0.23	37.2
11	T1	All MCs	40	0.0	40	0.0	0.123	0.8	LOS A	0.3	1.8	0.23	0.38	0.23	33.0
12	R2	All MCs	40	0.0	40	0.0	0.123	6.2	LOS A	0.3	1.8	0.23	0.38	0.23	33.0
Approach			194	0.0	194	0.0	0.123	3.4	NA	0.3	1.8	0.23	0.38	0.23	36.4
All Vehicles			940	0.0	940	0.0	0.298	4.1	NA	0.6	4.5	0.28	0.44	0.28	35.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 2 [2: Observer / Wellsvale Dr PM (Site Folder: GOOGONG HS PM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N102 [School Network - PM (Network Folder: General)]

2: Observer / Wellsvale Dr PM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
1	L2	All MCs	68	0.0	68	0.0	0.308	4.1	LOS A	0.7	5.0	0.38	0.28	0.38	35.7
2	T1	All MCs	246	4.9	246	4.9	0.308	1.4	LOS A	0.7	5.0	0.38	0.28	0.38	38.6
Approach			314	3.8	314	3.8	0.308	2.0	NA	0.7	5.0	0.38	0.28	0.38	38.4
North: Wellsvale Dr															
8	T1	All MCs	336	4.8	336	4.8	0.535	2.6	LOS A	2.1	15.0	0.53	0.49	0.62	35.9
9	R2	All MCs	252	0.0	252	0.0	0.535	6.0	LOS A	2.1	15.0	0.53	0.49	0.62	35.9
Approach			588	2.7	588	2.7	0.535	4.0	NA	2.1	15.0	0.53	0.49	0.62	35.9
West: Observer															
10	L2	All MCs	40	0.0	40	0.0	0.131	4.2	LOS A	0.2	1.3	0.55	0.64	0.55	34.8
12	R2	All MCs	40	0.0	40	0.0	0.131	11.1	LOS B	0.2	1.3	0.55	0.64	0.55	25.1
Approach			80	0.0	80	0.0	0.131	7.7	LOS A	0.2	1.3	0.55	0.64	0.55	32.5
All Vehicles			982	2.9	982	2.9	0.535	3.7	NA	2.1	15.0	0.48	0.44	0.54	36.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 3 [3: Wellsvale Dr / Heazlett St PM (Site Folder: GOOGONG HS PM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N102 [School Network - PM (Network Folder: General)]

3: Wellsvale Dr / Heazlett St PM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
2	T1	All MCs	99	4.3	99	4.3	0.093	0.4	LOS A	0.2	1.3	0.20	0.09	0.20	38.5
3	R2	All MCs	3	0.0	3	0.0	0.093	4.7	LOS A	0.2	1.3	0.20	0.09	0.20	39.0
Approach			102	4.1	102	4.1	0.093	0.5	NA	0.2	1.3	0.20	0.09	0.20	38.5
East: Heazlett St															
4	L2	All MCs	40	0.0	40	0.0	0.032	3.6	LOS A	0.0	0.3	0.16	0.43	0.16	36.8
6	R2	All MCs	6	0.0	6	0.0	0.032	4.3	LOS A	0.0	0.3	0.16	0.43	0.16	36.8
Approach			46	0.0	46	0.0	0.032	3.7	LOS A	0.0	0.3	0.16	0.43	0.16	36.8
North: Wellsvale Dr															
7	L2	All MCs	318	0.0	318	0.0	0.190	3.4	LOS A	0.2	1.1	0.07	0.45	0.07	37.4
8	T1	All MCs	10	20.0	10	20.0	0.190	1.5	LOS A	0.2	1.1	0.07	0.45	0.07	34.0
9u	U	All MCs	21	0.0	21	0.0	0.190	9.1	LOS A	0.2	1.1	0.07	0.45	0.07	34.0
Approach			349	0.6	349	0.6	0.190	3.7	NA	0.2	1.1	0.07	0.45	0.07	37.3
All Vehicles			497	1.2	497	1.2	0.190	3.0	NA	0.2	1.3	0.11	0.38	0.11	37.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 4 [4: Harvest St / Wellvale Dr PM (Site Folder: GOOGONG HS PM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N102 [School Network - PM (Network Folder: General)]

4: Harvest St / Wellsvale Dr PM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Wellsvale Dr															
1	L2	All MCs	40	0.0	40	0.0	0.047	3.4	LOS A	0.0	0.0	0.00	0.19	0.00	38.4
2	T1	All MCs	56	3.6	56	3.6	0.047	0.0	LOS A	0.0	0.0	0.00	0.19	0.00	38.4
Approach			96	2.1	96	2.1	0.047	1.4	NA	0.0	0.0	0.00	0.19	0.00	38.4
North: Wellsvale Dr															
8	T1	All MCs	5	20.0	5	20.0	0.015	0.0	LOS A	0.0	0.2	0.20	0.34	0.20	37.7
9	R2	All MCs	21	0.0	21	0.0	0.015	3.6	LOS A	0.0	0.2	0.20	0.34	0.20	34.9
Approach			26	4.0	26	4.0	0.015	2.9	NA	0.0	0.2	0.20	0.34	0.20	35.9
West: Harvest St															
10	L2	All MCs	132	0.0	132	0.0	0.102	3.6	LOS A	0.2	1.2	0.15	0.44	0.15	34.2
12	R2	All MCs	21	0.0	21	0.0	0.102	3.6	LOS A	0.2	1.2	0.15	0.44	0.15	36.9
Approach			153	0.0	153	0.0	0.102	3.6	LOS A	0.2	1.2	0.15	0.44	0.15	34.9
All Vehicles			275	1.1	275	1.1	0.102	2.8	NA	0.2	1.2	0.10	0.34	0.10	36.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 5 [5: Harvest St / Glenrock Dr PM (Site Folder: GOOGONG HS PM PEAK)]

Output produced by SIDRA INTERSECTION Version: 9.1.2.202

Network: N102 [School Network - PM (Network Folder: General)]

5: Harvest St / Glenrock Dr PM
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	Aver. Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Glenrock Dr															
2	T1	All MCs	40	0.0	40	0.0	0.049	0.0	LOS A	0.1	0.6	0.36	0.36	0.36	37.4
3	R2	All MCs	40	0.0	40	0.0	0.049	5.2	LOS A	0.1	0.6	0.36	0.36	0.36	37.4
Approach			80	0.0	80	0.0	0.049	2.6	NA	0.1	0.6	0.36	0.36	0.36	37.4
East: Harvest St															
4	L2	All MCs	40	0.0	40	0.0	0.070	4.0	LOS A	0.1	0.7	0.31	0.50	0.31	36.9
6	R2	All MCs	40	0.0	40	0.0	0.070	4.7	LOS A	0.1	0.7	0.31	0.50	0.31	33.4
Approach			80	0.0	80	0.0	0.070	4.3	LOS A	0.1	0.7	0.31	0.50	0.31	35.9
North: Glenrock Dr															
7	L2	All MCs	132	0.0	132	0.0	0.150	3.9	LOS A	0.3	2.0	0.17	0.27	0.17	37.3
8	T1	All MCs	108	0.0	108	0.0	0.150	0.0	LOS A	0.3	2.0	0.17	0.27	0.17	38.8
Approach			240	0.0	240	0.0	0.150	2.1	NA	0.3	2.0	0.17	0.27	0.17	38.2
All Vehicles			400	0.0	400	0.0	0.150	2.7	NA	0.3	2.0	0.24	0.34	0.24	37.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Override Site Data tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

A.2.1.4 Traffic comparison with Queanbeyan City Council TRACKS model

Report background

The *Queanbeyan City Council TRACKS Model South Jerrabomberra and Queanbeyan Traffic Analysis 2014* report (attached) is based off a strategic transport model (QCC TRACKS Model of Queanbeyan) reporting on the years 2014, 2016, 2018, 2020, 2022, 2024, 2026 and 2031.

The primary purpose of the report was used to assess the impact of residential and employment growth and effectiveness of major road upgrades across South Jerrabomberra and Queanbeyan.

Road link volumes link volumes outputs across the road network were provided as part of this report, including around the Googong area. These volumes have been extracted and compared with the traffic volumes derived in this SIDRA model to validate calculated traffic volumes.

Land-use

TRACKS 2026 model year was selected as the most comparable to this SIDRA model. It assumes Neighbourhoods 1 – 3 are delivered, aligning most closely with the SIDRA model land-use assumptions. Land use has been compared in Table 44.

The number of dwellings planned in Googong has increased since the 2014 report development. The number of dwellings planned in Neighbourhoods 1 – 3 is 23% higher than accounted for in the TRACKS model. For benchmarking purposes, the TRACKS 2026 model volumes have been factored up to account for this.

The TRACKS 2031 model year has also been included for comparison and represents a full build-out of Googong with approximately 4,875 dwellings completed. This exceeds the number of dwellings anticipated in the SIDRA model (4,578 dwellings).

Note, the most recent development plans for the entire Googong Masterplan area anticipates 6,500 dwellings upon completion, exceeding what has been assumed and tested in the SIDRA model and TRACKS 2031 model. Full build-out of Googong is expected by the late 2030s (as advised by an QPRC officer in 2023) which extends beyond the planning horizon of this report.

Table 44: Comparison of land-use assumptions in 2014 TRACKS model and 2025 SIDRA model developed for the new high school for Googong transport assessment

Model	Established neighbourhoods	Total dwellings	High school students
TRACKS 2026	1 – 3	3,557	400
SIDRA (this report)	1 – 3	4,578	700
TRACKS 2031	1 – 5	4,875	1,600

Road network comparison

The TRACKS model network includes trunk roads only within the Googong subdivision. In the vicinity of the new high school for Googong it includes Wellsvale Drive, Observer Street, Glenrock Drive (south) and Harvest Street. The absence of secondary roads in this model means that volumes on Glenrock Drive and Wellsvale Drive are likely overstated.

As discussed in A2.1.2, the SIDRA model expects that the majority of the background traffic uses Edward Drive instead of Glenrock Drive to connect to Old Cooma Road.

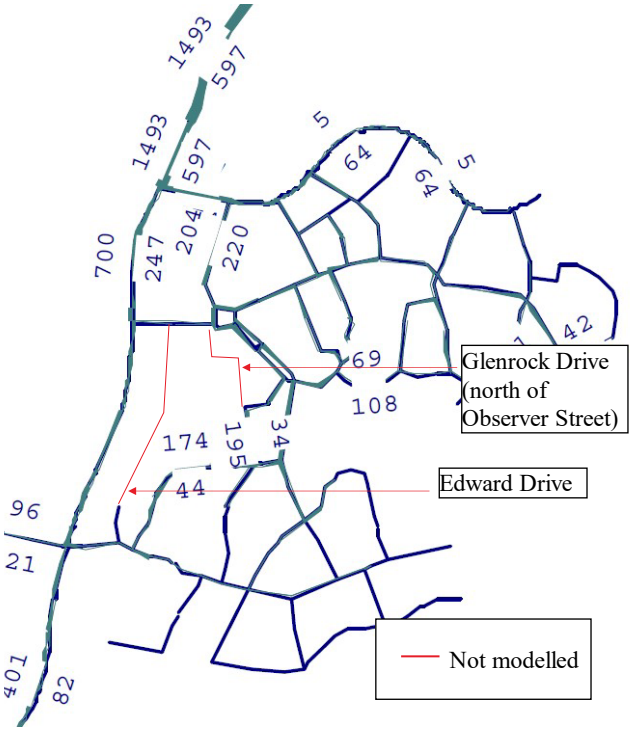


Figure 65: Tracks model road network

TRACKS model volumes

The TRACKS model outputs shown in Figure 66, report the following volumes for Glenrock Drive:

- 195 vehicles traveling northbound during the AM peak hour (8-9am) in the improved 2026 network.
- 193 vehicles traveling[7] southbound during the PM peak hour (5-6pm) in the improved 2026 network.
- 243 vehicles traveling northbound during the AM peak hour (8-9am) in the improved 2031 network
- 220 vehicles traveling southbound during the PM peak hour (5-6pm) in the improved 2031 network

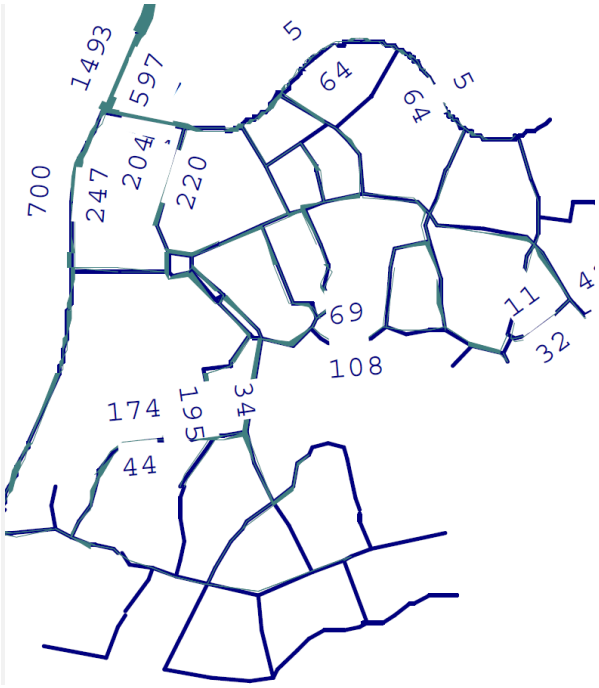
Volume labels are not provided for Wellsvale Drive, however, based on the road link output line thickness in Figure 66 is estimated to have a similar volume and direction to Glenrock Drive.

Combining the 2026 model volumes of Glenrock Drive and Wellsvale Drive and applying a dwelling increase factor of 23%, the total volumes are approximately 480 vehicles traveling northbound in the AM peak and 475 vehicles traveling southbound in the PM peak.

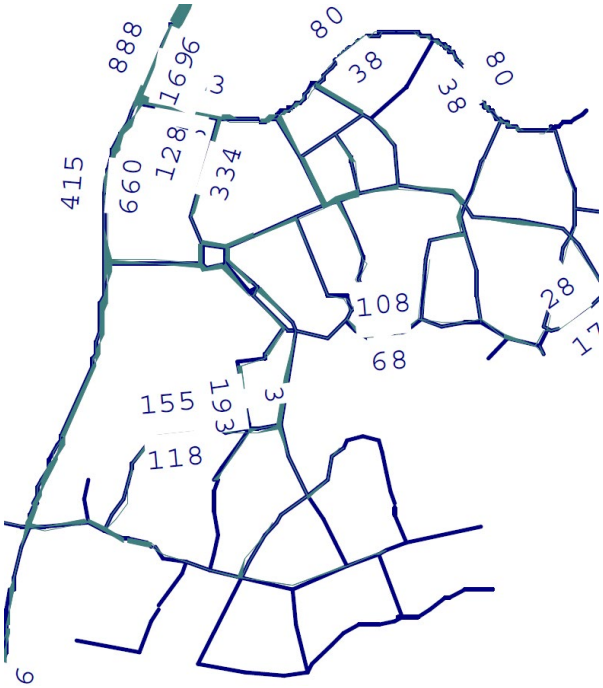
The 2031 model volumes of Glenrock Drive and Wellsvale Drive total to 486 vehicles traveling northbound in the AM peak and 440 vehicles traveling southbound in the PM peak.

[7] Likely southbound, direction of volumes is hard to discern in the QCC 2014 report PDF

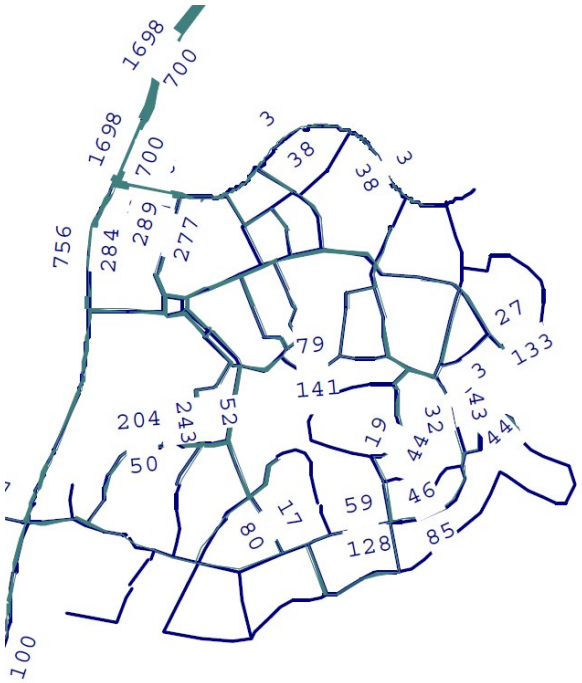
AM 2026



PM 2026



AM 2031



PM 2031

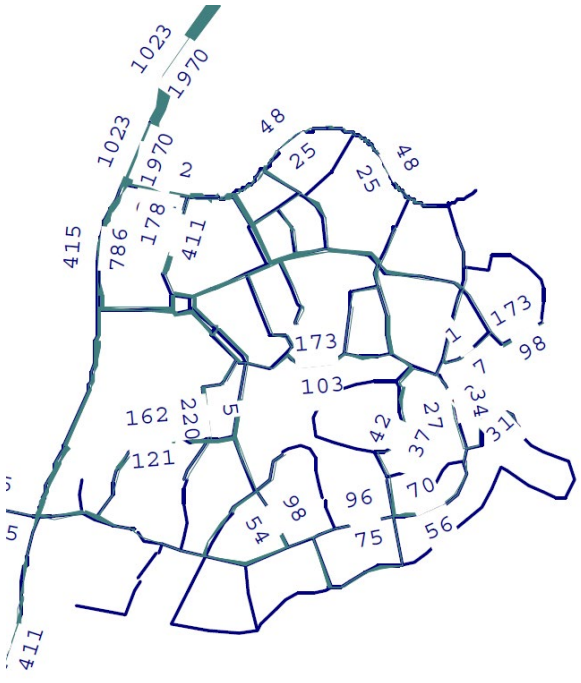


Figure 66: TRACKS road link volumes in 2026 and 2031 AM and PM 1-hr peaks (Source: QCC 2014)

SIDRA model volumes

In comparison, the SIDRA model calculated the following base demand across Glenrock Drive, Wellsvale Drive, and Edward Drive:

- ~1,200 vehicles travelling northbound, of which ~900 vehicles are background traffic in the AM peak hour
- ~1,200 vehicles travelling northbound, of which ~900 vehicles are background traffic in the PM peak hour.

The SIDRA model applies a 50% peak hour factor these vehicle demands, which effectively doubles the calculated peak hour volumes. The final traffic volumes used in the SIDRA model are as follows:

- ~2,400 vehicles travelling northbound, of which ~1800 vehicles are background traffic in the AM peak hour
- ~2,400 vehicles travelling southbound, of which ~1800 vehicles are background traffic in the PM peak hour.

Comparison of model volumes

Volumes for the various models have been visualised in Figure 67 and Figure 68.

It is reasonable to assume that a significant proportion of background commuting traffic would use Edward Drive for quicker access to Old Cooma Road, instead of using Gorman Drive or Wellsvale Drive. Edward Drive is a 2-lane sub arterial road with a similar capacity to Wellsvale Drive.

When comparing the TRACKS 2026 and TRACKS 2031 demand with the SIDRA all traffic demand, the SIDRA model shows approximately 400 additional vehicles in the AM peak and 700 additional vehicles in the PM peak. This is sufficient to account for 300 student shortfall in the TRACKS model, noting that it assumes a smaller high school of 400 students instead of 700 (see Table 44).

When comparing the TRACKS 2026 demand with the SIDRA all traffic demand, the SIDRA model shows approximately 400 additional vehicles in the AM peak and 700 additional vehicles in the PM peak. This is sufficient to account for 300 student shortfall in the TRACKS 2026 model (assumes a smaller high school of 400 students instead of 700). There is no shortfall of high school students in TRACKS 2031 model which assumes 1,600 students.

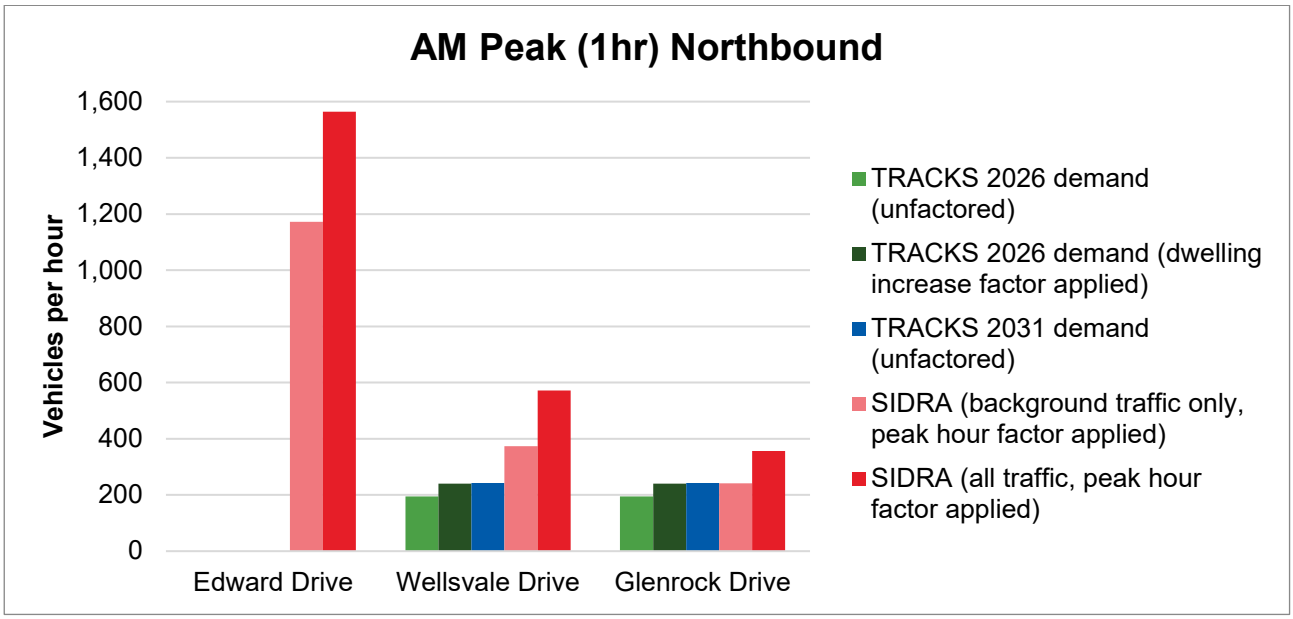


Figure 67: Comparison of model volumes for AM peak, northbound

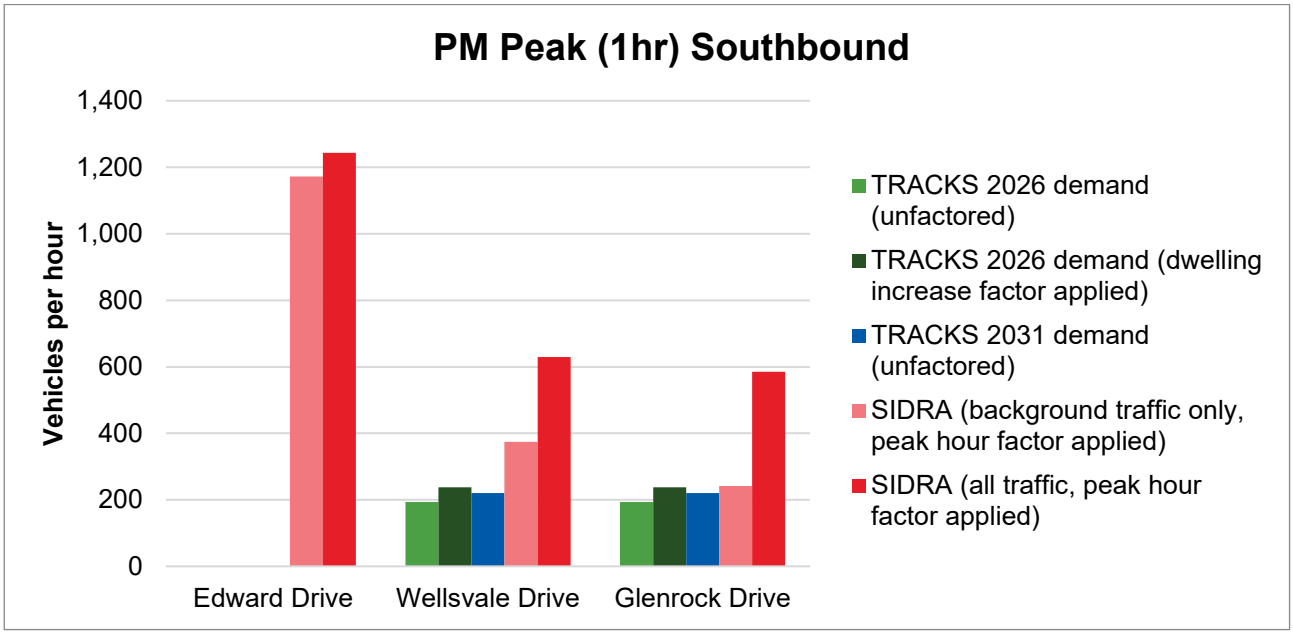


Figure 68: Comparison of model volumes for PM peak, southbound

Conclusion

Land-use assumptions, road network and road link volumes from TRACKS 2026 and 2031 model were compared with those in the SIDRA model.

It was found that the TRACKS model network includes trunk roads only within the Googong subdivision. In contrast, the SIDRA model expects the majority of the background commuting traffic to use Edward Drive instead of Glenrock Drive to connect to Old Cooma Road.

When Edward Drive is included, the SIDRA model's estimated northbound volumes in the AM and southbound volumes in the PM exceed what was modelled in TRACKS 2026 (and factored up to account for the difference in residential land use) and TRACKS 2031 models.

As such, the traffic volumes modelled in SIDRA match or exceed the TRACKS volumes. Given the SIDRA model results deemed intersection performance acceptable, it can be inferred that using the lower traffic volumes projected by the TRACKS models would similarly demonstrate acceptable intersection performance in the assessed scenario.

A.2.1.5 Queanbeyan City Council TRACKS Model South Jerrabomberra and Queanbeyan Traffic Analysis 2014 (excerpt)

Queanbeyan City Council TRACKS Model

South Jerrabomberra and Queanbeyan Traffic Analysis 2014

Part 1 – South Jerrabomberra Network Transportation Assessment Report

December 2014

TDG Ref: 12721 20141204 sth jerrabomberra traffic analysis - part 1.docx

Queanbeyan City Council TRACKS Model

South Jerrabomberra and Queanbeyan Traffic Analysis 2014

Part 1 - South Jerrabomberra Network Transportation Assessment Report

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Table of Contents

1. Executive Summary

This report documents the transport modelling of various potential access arrangements for the proposed South Jerrabomberra Development. This development proposes creating 2348 households and 5337 jobs in the area to the west of the ACT / QCC rail corridor and south of Tompsitt Dr.

The access scenarios analysed for South Jerrabomberra were:

- One access - Tompsitt Drive (when does the single lane dual carriageway require duplication);
- One access - Tompsitt Drive (dual lane dual carriageway when required);
- Two accesses - Tompsitt Drive and Sheppard Street (single lane dual carriageway to Tompsitt Drive and Sheppard Street connection when required);
- Two accesses - Tompsitt Drive and Isabella Drive (single lane dual carriageway to Tompsitt Drive and Isabella Drive connection when required);
- Three accesses - Tompsitt Drive, Sheppard Street and Isabella Drive.

The analysis was undertaken for the AM and PM peak periods for the modelled future years of 2014, 2016, 2018, 2020, 2022, 2024, 2026 and 2031.

The transport modelling used the current QCC TRACKS strategic transportation model of Queanbeyan. The model area covers the region contained within the Queanbeyan and Australian Capital Territory (ACT) LGAs. ACT was included in the model to help reproduce the cross border interaction that occurs between Queanbeyan and ACT. The road network used in the analysis includes all roads within the Queanbeyan area and all roads of collector or higher status in the ACT.

ACT provided a list of infrastructure improvements that are expected to occur within the region from 2011-2016, 2016-2021 and 2021-2031 for inclusion in the future models.

The primary requirement of this analysis was to recommend which of the access options considered in this analysis “best serves the Queanbeyan and ACT community”. This was taken as meaning which access option has the least impact on the surrounding QCC and ACT networks and best distributes the additional traffic travelling to and from the proposed South Jerrabomberra development.

This South Jerrabomberra Traffic Analysis concentrated on the area surrounding the development in its assessment. It included assessments of the differences in Level of Service (LOS) and overall network performance indicators between each of the access options in order to determine the preferred access arrangement.

Based on both the analysis of the local network Level of Service and the overall network performance for each access option, Access Option 5 (Tompsitt / Sheppard / Isabella) produces the best future local and overall network operation of the access options investigated.

2. Introduction

The purpose of this report is to document the transport modelling of the South Jerrabomberra access assessment, taking into account the newly updated South Jerrabomberra Development land use and concept plan provided by the developers. Previous modelling of Queanbeyan futures included preliminary South Jerrabomberra land use which was different to the quantity and distribution of land use now being proposed.

The developer of the site has indicated that they will set aside a road corridor suitable for a single lane dual carriageway heading north to Tompsitt Drive as well as include traffic signals for their connection onto Tompsitt Drive as the primary means of access to the whole development. This assessment was to look at this proposal and other options in terms of its ability to carry the overall traffic volume to and from the proposed South Jerrabomberra development and assess its effects on the surrounding road network. The site location of the development is shown in Figure 1.

The scenarios that were to be analysed for South Jerrabomberra were:

- One access - Tompsitt Drive (when does the single lane dual carriageway require duplication);
- One access - Tompsitt Drive (dual lane dual carriageway when required);
- Two accesses - Tompsitt Drive and Sheppard Street (single lane dual carriageway to Tompsitt Drive and Sheppard Street connection when required);
- Two accesses - Tompsitt Drive and Isabella Drive (single lane dual carriageway to Tompsitt Drive and Isabella Drive connection when required);
- Three accesses - Tompsitt Drive, Sheppard Street and Isabella Drive.

The report is to make recommendations for the types of improvements required on the surrounding network with particular reference to Isabella Dr / Monaro Hwy, Lanyon Dr / Tompsitt Dr, Tompsitt Dr / Jerrabomberra Pkwy / ELP and Lanyon Dr / Monaro Hwy. These intersection improvement recommendations are to ensure the level of service (LOS) is maintained at LOS D or better for all four access options. It is also expected that the assessment will provide advice as to which access option best serves the Queanbeyan and ACT community overall. This information will assist Queanbeyan City Council during negotiations with the South Tralee developer and ACT government.

The analysis was required for the AM and PM peak periods for 2014, 2016, 2018, 2020, 2022, 2024, 2026 and 2031.

This report documents the methodology used in the analysis; the land use inputs for the development, QCC and ACT; lists the road infrastructure improvements included in the future year models; provides LOS and volume plots for the surrounding area and details overall network travel statistics. These outputs will provide a means of comparing the effectiveness of each access option for each of the future years.

Site Location	TDG	1

3. Model Summary

3.1 2011 Base Model

A detailed account of the Queanbeyan City Council (QCC) traffic model is provided in the "Queanbeyan Transport Plan 2011 Model Building Report – February 2013".

The model area covers the region contained within the Queanbeyan and Australian Capital Territory (ACT) LGAs. ACT was included in the model to help reproduce the cross border interaction that occurs between Queanbeyan and ACT. The road network used in the analysis was obtained directly from QCC and ACT GIS systems and includes all roads within the Queanbeyan area and all roads of collector or higher status in the ACT. The ACT area of the model was "broadly" validated but as the model is intended to represent the operation of the QCC network, only flows within the QCC area and in the immediate area of the ACT border were fully validated to required modelling standards.

The model is broken up into zones to represent the land use throughout the model area. The model zone system covers the entire ACT and Queanbeyan model area. The zone system used within the ACT portion of the model is identical to that used in the existing ACT transport model except the Queanbeyan part of the model is detailed in more detail.

The Queanbeyan area of the model is divided into 270 zones with the ACT area divided into approximately 750 zones. In total there are 1200 zones represented in the model with the approximately 180 zones designated as "spares" to provide for future development both within QCC and ACT. The land use used in the base 2011 model was provided by the Australian Bureau of Statistics for the 2011 census year.

Table 1 is a summary of the total 2011 ACT and QCC land use used in the model.

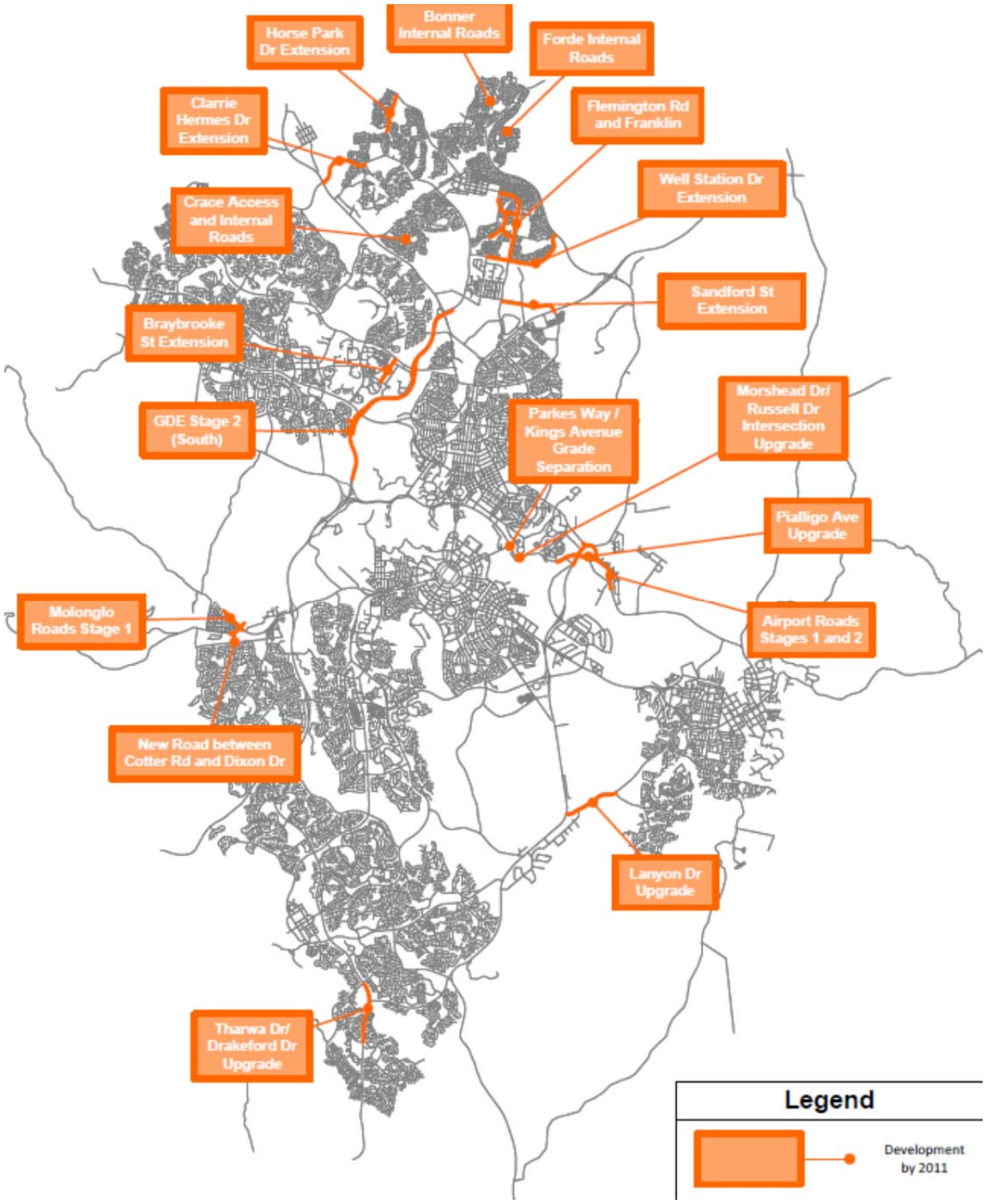
2011 MODEL LAND USE			
Land Use	**Queanbeyan**	**ACT**	**Entire Model Area**
Households	14,086	129,401	143,487
Employees	21,095	194,766	215,861
Vehicles	25,180	218,467	243,647
Primary School Roll	3,204	32,904	36,108
Secondary School Roll	1,532	31,332	32,864
Tertiary Roll	331	31,101	31,432
Retail Jobs	1,200	15,203	16,403
Finance Jobs	128	3,738	3,866
Community Jobs	1,154	21,572	22,726
Manufacturing Jobs	1,430	5,149	6,579
Other Jobs	5,635	151,482	157,117
Total Jobs	9,546	197,198	206,744

Table 1: 2011 Model Land Use

ACT provided a list of infrastructure improvements that had occurred between 2006 and 2011 for inclusion in the validated base 2011 model. Those improvements are detailed in Table 2 and shown in Figure 2.

2006-2011 ACT INFRASTRUCTURE IMPROVEMENTS	
Item	**Description**
Cotter Road and Dixon Drive	New road from Cotter Road to Dixon Drive
Molonglo Road Stage 1	New roadway providing access to residential developments
Pialligo Avenue Upgrades	Duplication from Beltana Road to Brindabella Cct
	Widening of Sylvia Curley Bridge
	Duplication of Fairbairn Ave (Morshead Dr to Pialligo Ave)
	Duplication of Morshead Dr (Fairbairn Ave to Dairy Rd)
	New Signals at Pialligo/Fairbairn
	New Signals at Monaro/Pialligo
Gungahlin Drive Extension Stage 2	Extension from Barton Hwy to Glenloch Interchange
	Duplication from Barton Hwy to Glenloch Interchange
	Upgrade of Glenloch Interchange
Sandford Street Extension	Connect Sandford Street to Federal Highway
Well Station Drive Extension	Connect Well Station Drive to Horse Park Drive
Flemington Road Upgrades	Duplication of Flemington Rd
	Extension of Nullarbor Avenue to connect to Flemington Rd
	Extension of Well Station Drive to connect to Flemington Rd
	Extension of Mapleton Ave to connect to Flemington Rd
	Other Franklin internal roads
Horse Park Drive Extension	Extension of sections east and west of Moncrieff
	Extension from Arrabri Street to Burrumarra Avenue
Forde Internal Roads	New roadway providing access to residential developments
East Lake Internal Roads	New roadways providing access to residential developments
Crace Access (Abena Ave)	New Roundabout on Gundaroo Road to access Crace
Nudurr Drive Extension	Connect Nudurr Drive to Gungahlin Drive
Braybrooke Street Extension	Completion of link from Battye St to Ginninderra Dr
Lanyon Drive Upgrade	Duplication from Monaro Highway to Tompsitt Drive
Tharwa Drive / Drakeford Drive	Upgrade Duplication from Box Hill Ave to Johnson Drive
Clarrie Hermes Drive Extension	Connect Clarrie Hermes Dr to Barton Highway
Morshead Drive – Russell Drive	Intersection Upgrade
Sutton Road Stage 2	Road upgrade
Parkes Way – Kings Avenue	Grade separation of existing roundabout

Table 2: 2006-2011 ACT Infrastructure Improvements Included in TRACKS Model



Source: CSTM Calibration Report Rev5A

2006-2011 ACT Infrastructure Improvements	TDG	2

Clearly, it is important that the validated base 2011 QCC model replicates surveyed 2011 volumes throughout the QCC model area and around the ACT border to ensure that future changes in land use around the South Jerrabomberra area have realistic impacts on the surrounding network.

Tables 3 and 4 provide summaries of the 2011 flow validation along the QCC/ACT border for both the AM Peak (8-9am) and PM Peak (5-6pm).

2011 AMP FLOW VALIDATION						
ACT Boundary	**Into QCC**			**Out of QCC**		
	Count	**Model**	**GEH**	**Count**	**Model**	**GEH**
Yass Rd – ACT Border	538	644	4.4	825	746	2.8
McEwan Ave	106	162	4.8	333	365	1.7
Uriara Rd	490	541	2.2	950	850	3.3
Canberra Dr – Nth of Kendall	591	641	1.3	1878	1973	2.2
Lanyon Dr – ACT Border	950	960	0.3	1365	1339	0.7
Old Cooma Rd – Sth of Thoroughbread	32	35	0.5	100	152	4.6
Total	**2707**	**2964**	**4.8**	**5451**	**5425**	**0.4**

Table 3: 2011 AMP Flow Validation

2011 PMP FLOW VALIDATION						
ACT Boundary	**Into QCC**			**Out of QCC**		
	Count	**Model**	**GEH**	**Count**	**Model**	**GEH**
Yass Rd – ACT Border	792	681	4.1	554	555	0.0
McEwan Ave	419	416	0.1	145	181	2.8
Uriara Rd	940	951	0.4	461	507	2.1
Canberra Dr – Nth of Kendall	1757	1630	3.1	828	886	2.0
Lanyon Dr – ACT Border	1406	1346	1.6	969	1034	2.1
Old Cooma Rd – Sth of Thoroughbread	98	116	1.7	49	68	2.5
Total	**5412**	**5140**	**3.7**	**3006**	**3231**	**4.0**

Table 4: 2011 PMP Flow Validation

In addition to the above border flows, flows were compared within the ACT near South Jerrabomberra using count flows taken from the latest CSTM Recalibration Report. It appears that the majority of the counts used in the report have been rounded to the nearest 50 vehicles per hour (vph) and may have been taken from SCATS traffic signal information. The use of SCATS data is not as accurate as counts provided by dedicated count sites or tube counts. It is also unclear if the counts have been adjusted for vehicle classification as a high Heavy Goods Vehicle (HGV) content may significantly overestimate the number of vehicles counted.

These flows are only available in the report for the AM Peak but it is not indicated which hour of the two hour peak period they refer to. The AMP flow comparisons are shown in Table 5.

2011 AMP LOCAL ACT FLOW VALIDATION						
ACT Boundary	**North / East**			**South / West**		
	Count	**Model**	**GEH**	**Count**	**Model**	**GEH**
Tharwa Dr – Sth of Johnson	1000	1011	0.3	250	191	4.0
Johnson Dr – West of Tharwa	500	357	6.9	250	253	0.2
Isabella Hwy	1350	2225	20.7	650	516	5.5
Erindale Dr	2300	2190	2.3	550	426	5.6
Mugga Ln – West of Monaro	200	189	0.8	500	548	2.1
Hindmarsh Dr – West of Mugga	1700	1611	2.2	1100	1087	0.4
Lanyon Dr – ACT Border	950	960	0.3	1365	1339	0.7
Magga Ln – Sth of Hindmarsh	500	519	0.8	200	307	6.7
Monaro Hwy – Nth of Lanyon	3550	2709	15.0	700	532	6.8
Canberra Dr – Nth of Kendall	591	622	1.3	1878	1973	2.2
Total	**12641**	**12393**	**2.2**	**7443**	**7172**	**3.2**

Table 5: 2011 AMP Local ACT Flow Validation

It should be noted that the only locations in the above table where there is a significant difference between count and model flows are for Isabella Hwy and Monaro Hwy. The modelled flow for Isabella Hwy is high for the Eastbound flow and low for the Westbound flow. The modelled Monaro Hwy flow is low for the Northbound direction.

Given how well other flows validate in the area, as shown in Tables 3 and 5, these large differences of 800-900 vph are difficult to explain. If the modelled Eastbound flow along Isabella Hwy were to be reduced to conform with the ACT count, it would result in a significant reduction in flows along Mugga Ln, Monaro Hwy and Lanyon Dr. Additionally, if the modelled flow Northbound on Monaro Hwy were to be increased, to conform with its ACT count, it would result in a significant increase in flow along Mugga Ln, Monaro Hwy, Lanyon Dr and possible Tompsitt Dr.

It should be noted that the CSTM also underestimates the Northbound Monaro Hwy flow and overestimates the Eastbound Isabella Hwy flow to almost identical levels as the QCC TRACKS model. Such consistency of results between the two independent models indicates that the two counts reported in the CSTM may be atypical.

3.2 Future Years Land Use

The background future year land use for this analysis was based on the established 2011, 2016, 2021, 2026 and 2031 land use information provided by QCC and ACT. The land use for the intermediate future years of 2014, 2018, 2020, 2022 and 2024 was generated by interpolation of the above primary land use information and assuming that development occurred at a uniform rate between years.

This new analysis however includes the reconfiguration of the proposed South Jerrabomberra development area both in location of activity and the level of housing and employment activity. The rate of development at Googong was also adjusted to the new rate of development provided by the Googong developers.

The following details the assumed sequence of the South Jerrabomberra development:

- Stage 1 – South Tralee
  - Years of Development: 2016-2026
  - Dwellings: 1,348
  - Commercial Land: 11.75Ha
  - Commercial Employment: 360 jobs
  - Primary School: 1,000 pupils, 100 jobs
- Stage 2 – The Poplars
  - Years of Development: 2016-2031
  - Commercial Land: 7.61Ha
  - Commercial Employment: 233 jobs
  - General Employment land: 31.03Ha
  - General Employment : 3,103 jobs
- Stage 3 – Morrison, Forrest, Walsh (MFW)
  - Years of Development: 2018-2028
  - Dwellings: 1,000
- Stage 4a – North Tralee
  - Years of Development: 2017-2050
  - General Employment Land: 15.0Ha (13.2Ha at 2031)
  - General Employment: 480 jobs (422 jobs at 2031)
- Stage 4b – Environa
  - Years of Development: 2017-2050
  - General Employment Land: 77.0Ha (34.8Ha at 2031)
  - General Employment: 2,450 jobs (1,107 jobs at 2031)

The Googong development was assumed to have the following development staging:

- Stage 1a – Neighbourhood 1A
  - Years of Development: 2012-2016
  - Dwellings: 1,117
  - Commercial employment: 208 jobs
- Stage 1b – Neighbourhood 1B
  - Years of Development: 2016-2017
  - Dwellings: 345
- Stage 2 – Neighbourhood 2
  - Years of Development: 2018-2023
  - Dwellings: 1,462
  - Commercial employment: 1,905 jobs
  - Primary Schools: 800 pupils, 59 jobs
  - Secondary School: 400 pupils, 30 jobs
- Stage 3 – Neighbourhood 3
  - Years of Development: 2023-2026
  - Dwellings: 633
  - Commercial employment: 985 jobs
- Stage 4 – Neighbourhood 4
  - Years of Development: 2026-2030
  - Dwellings: 1,101
  - Commercial Employment: 13 jobs
  - Primary School: 450 pupils, 33 jobs
  - Secondary School: 1,200 pupils, 90 jobs
- Stage 5 – Neighbourhood 5
  - Years of Development: 2031-2034
  - Dwellings: 651 (217 at 2031)
  - Commercial Employment: 14 jobs

Tables 6 and 7 show the assumed breakdown of the total households and jobs, for each of the future years, throughout the Queanbeyan area. The South Jerrabomberra development was modelled using 33 individual zones for this analysis.

FUTURE MODEL HOUSEHOLDS								
	Stage 1 Sth Tralee	Stage 2 Poplars	Stage 3 MFW	Stage 4a Nth Tralee	Stage 4b Environa	Googong	Rest of Queanbeyan	Rest of Model Area
2014	0	0	0	0	0	366	14258	120060
2016	135	0	0	0	0	1117	14438	123135
2018	405	0	100	0	0	1709	14577	126153
2020	675	0	300	0	0	2197	14716	129121
2022	945	0	500	0	0	2685	14855	131795
2024	1215	0	700	0	0	3244	14994	134399
2026	1348	0	900	0	0	3782	15133	136467
2031	1348	0	1000	0	0	4880	15480	168204

Table 6: Future Household Totals

FUTURE MODEL JOBS								
	Stage 1 Sth Tralee	Stage 2 Poplars	Stage 3 MFW	Stage 4a Nth Tralee	Stage 4b Environa	Googong	Rest of Queanbeyan	Rest of Model Area
2014	0	5	0	0	0	145	9617	203462
2016	0	212	0	0	0	465	9617	212082
2018	72	657	0	56	149	907	9693	217569
2020	144	1102	0	114	296	1263	9769	221407
2022	266	1547	0	170	444	1630	9844	225172
2024	388	1992	0	226	593	2071	9920	228844
2026	460	2438	0	284	740	2488	10109	231450
2031	460	3341	0	425	1111	3336	10299	262761

Table 7: Future Job Totals

3.3 Future Years Networks

A number of network improvements were included in the future models at various years to ensure that proposed infrastructure upgrades, by ACT in particular, were included. These infrastructure upgrades could have large impacts on both trip distribution throughout the network and the routes traffic takes between areas.

It was agreed with QCC that the only infrastructure upgrades within Queanbeyan to be included in the future year models would be the local development infrastructures, the Option access arrangements and the four laning of Old Cooma Rd from Googong Rd to Edwin Land Parkway. The four laning of Old Cooma Rd was included once it reached performance along Old Cooma Rd dropped to LOS E so as to ensure that the reduced speed along Old Cooma Rd, as a result of congestion, did not suppress travel between Googong and the rest of the network.

ACT provided a list of infrastructure improvements that are expected to occur the region from 2011-2016, 2016-2021 and 2021-2031 for inclusion in the future models. Those improvements are detailed in Tables 8, 9, 10 and shown in Figures 3, 4 and 5.

2011-2016 ACT INFRASTRUCTURE IMPROVEMENTS	
Item	**Description**
Majura Parkway	Connect Monaro Highway to Federal Highway
	Intersection changes on Pialligo Ave and Fairbairn Ave
Constitution Avenue Duplication	Duplication including all intersection upgrades
Parkes Way Widening	Extra Lane on Parkes Way (Glenloch to Edinburgh Ave)
Monaro Highway Duplication	Duplication over Canberra Ave through Fyshwick
Cotter Road Upgrade	Duplication from Adelaide Avenue to Molonglo North-South Arterial
Barry Drive – Clunies Ross Street	Intersection Upgrade
Bus Lane Connection	Kingsley Street and Rudd Street
Horse Park Drive Extension	Complete missing section of Horse Park Drive
Bonner and Jacka Boundary Road	Access to Bonner Area from the Horse Park Drive – Katherine Avenue Intersection
40km/hr Zones in Town Centres	Civic, Gungahlin, Woden, Belconnen and Tuggeranong

Table 8: 2011-2016 ACT Infrastructure Improvements Included in the QCC Transportation Model

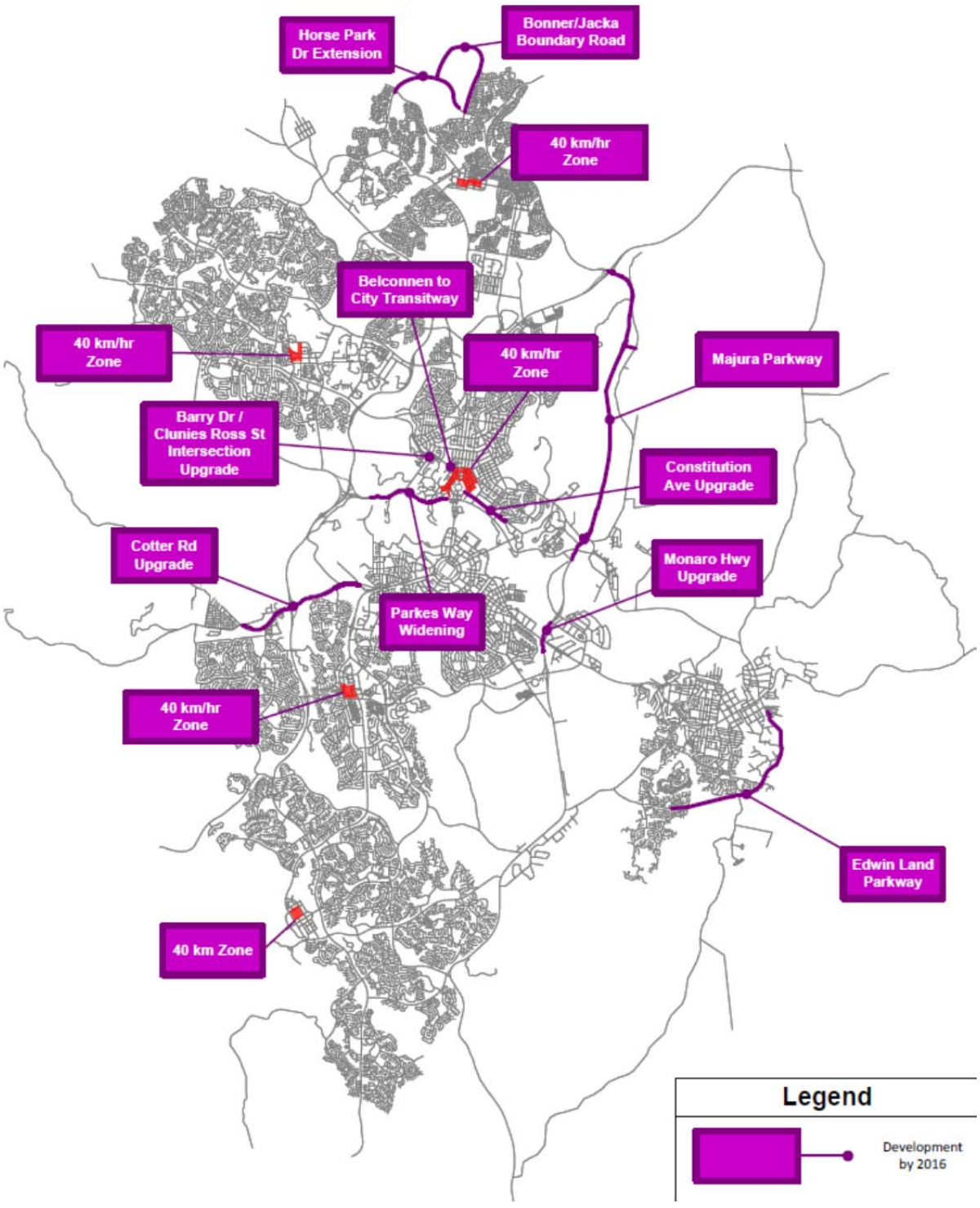
2016-2021 ACT INFRASTRUCTURE IMPROVEMENTS	
Item	**Description**
Clunies Ross Street Upgrade	Duplication of Clunies Ross Street
William Slim Drive Upgrade	Duplication from Baldwin Drive to Barton Highway
Gundaroo Drive Upgrade	Duplication from Barton Highway to Gungahlin Drive
Horse Park Drive Duplication	Duplication from Katherine Ave to Federal Highway

2016-2021 ACT INFRASTRUCTURE IMPROVEMENTS	
Item	**Description**
Clunies Ross - Parkes Interchange	Completion of diamond interchange
Airport Northern Access Road	Connect Glenora Dr to Majura Road (Northern Access to RAAF Fairbairn)
Molonglo Roads Stage 2	New roadways providing access to residential development
Fyshwick - Pialligo Link *	Connect Tennant Street to Gladstone Street and Kallaroo Road (Undecided alignment)
Abattoir Redevelopment	Access Roads for development of Abattoir (Near Harman)
East Lake Internal Roads	Connection to Newcastle Street / Dairy Road
	Connection of Mundaring Drive to Newcastle Street
Tennant Street Extension	Connect Tennant Street to Beaconsfield Street
Jerrabomberra Avenue Extension	Connect Jerrabomberra Avenue to Canberra Avenue
Googong / Tralee Link	Connect Googong/Tralee area to Lanyon Dr West of Tompsitt St
Barry Drive - Clunies Ross Street Intersection	Intersection Upgrade
Northbourne Avenue - London Circuit Intersection	Intersection Upgrade
Northbourne Avenue Transit Lane	From London Circuit to Federal Highway, Kerb side; new additional exclusive lane

Table 9: 2016-2021 ACT Infrastructure Improvements Included in the QCC Transportation Model

2021-2031 ACT INFRASTRUCTURE IMPROVEMENTS	
Item	**Description**
William Slim Drive Upgrade	Duplication from Baldwin Drive to Ginninderra Drive
Molonglo Roads Stage 3	New roadways providing access to residential development
East Lake Bridges	Two bridges over Jerrabomberra Creek
Monaro Highway Interchange	Diamond Interchange at Monaro Highway - Isabella Drive / Mugga Lane
Pialligo Avenue Realignment	For airport runway extension

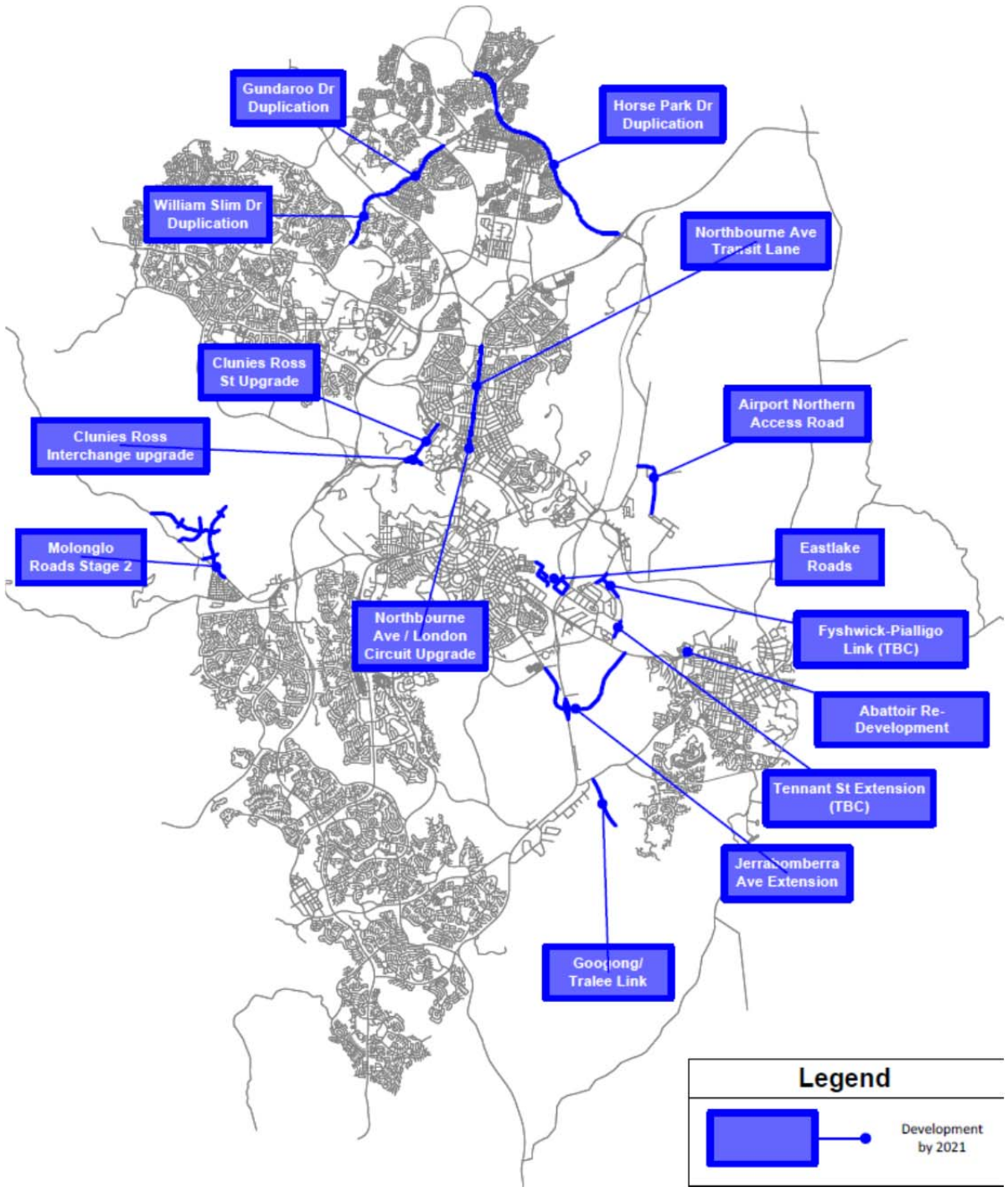
Table 10: 2021-2031 ACT Infrastructure Improvements Included in the QCC Transportation Model



Source: CSTM Calibration Report Rev5A

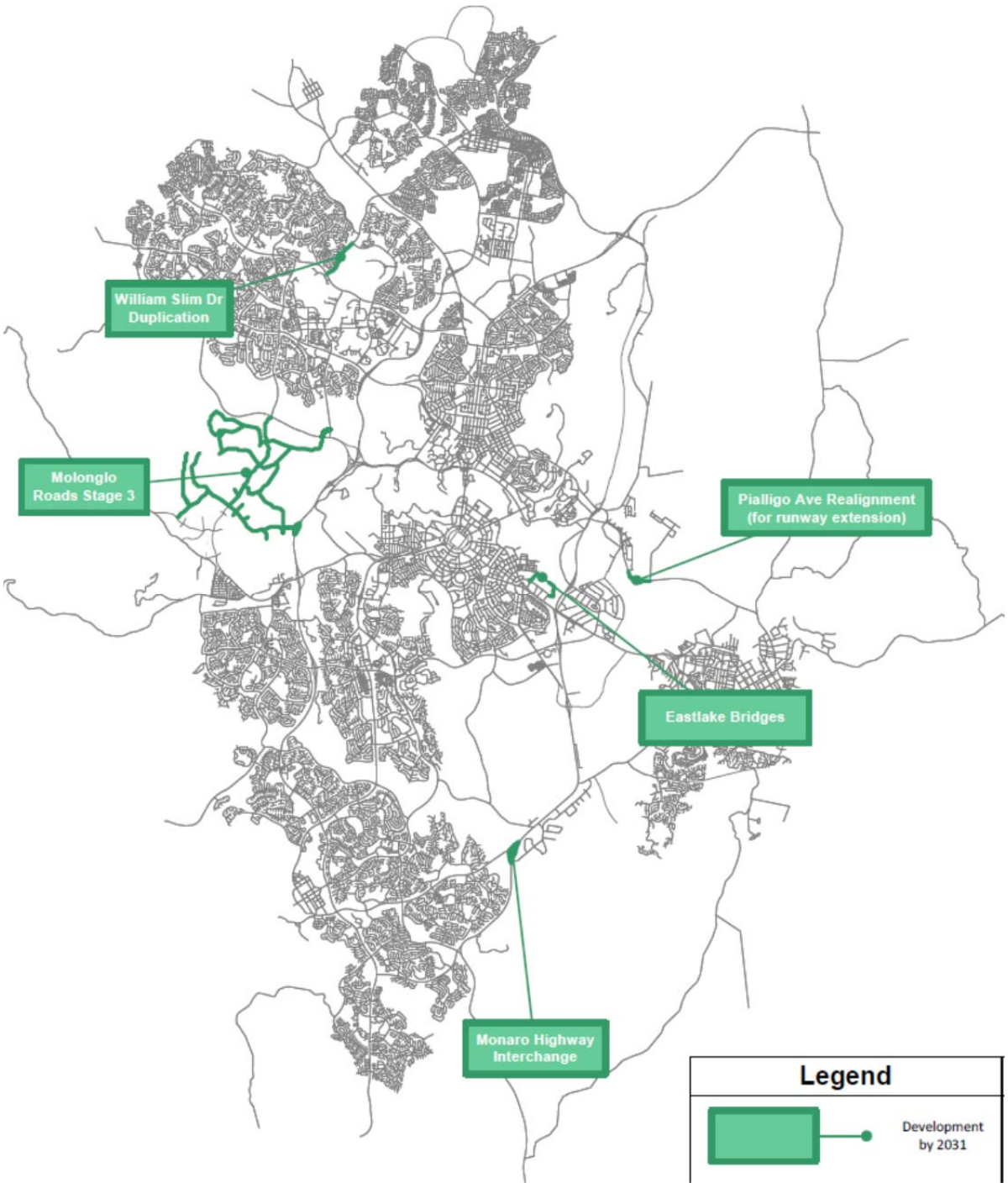
2011-2016 ACT Infrastructure Improvements

3



Source: CSTM Calibration Report Rev5A

2016-2021 ACT Infrastructure Improvements	TDG	4



Source: CSTM Calibration Report Rev5A

2021-2031 ACT Infrastructure Improvements	TDG	5

3.4 Analysis Methodology

The process used for analysing the Sth Jerrabomberra Access Options involved the following process:

- Create the South Jerrabomberra and Googong land use for each year of 2014, 2016, 2018, 2020, 2022, 2024, 2026 and 2031 utilising the development data provided by QCC;
- Update the base 2014, 2016, 2018, 2020, 2022, 2024, 2026 and 2031 future year networks with the new South Jerrabomberra development structure plan and general ACT network improvements;
- Converge each future year AM and PM peak model using each year's base future networks until travel patterns for each year have settled into a converged and consistent distribution. The base networks include a single lane dual carriageway connection to Tompsitt Drive for the South Jerrabomberra Development with traffic signals at its intersection with Tompsitt Drive;
- Create four new access arrangement option networks for each future year and assign respective future year flows to each to determine network performance for each access option. The additional three options were:
    - One access – Four Lane access to Tompsitt Dr
    - Two accesses – Tompsitt Dr and Sheppard St
    - Two accesses – Tompsitt Dr and Isabella Dr
    - Three accesses – Tompsitt Dr, Sheppard St and Isabella Dr
- Create Level of Service (LOS) and volume plots for each access option. Network travel totals in the form of vehicle kilometres, vehicle minutes and network operating speeds will be obtained for each option to help determine which access arrangement best serves the Queanbeyan and ACT communities;
- Recommend any additional intersection or road improvements in the surrounding network that may be required for each of the access options to maintain at least a LOS D standard.

4. Access Option LOS Results

4.1 Option 1 – Two Lane One Access – Tompsitt Dr

4.1.1 LOS Comparisons

Appendix A contains AMP and PMP volume and Level of Service (LOS) plots for the South Jerrabomberra One Access Option with a single lane dual carriageway connection to Tompsitt Drive for the South Jerrabomberra Development with traffic signals at its intersection with Tompsitt Drive.

The volume plots show modelled hourly flow for each direction separately.

The LOS plots show a combination of link LOS, average intersection LOS (circles) and individual approach LOS (short lines).

The modelled LOS values at various critical locations in the South Jerrabomberra area are summarised in Tables 11 and 12 for AMP and PMP periods respectively.

AMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	E	E
Isabella Dr wst of Monaro	D	D	D	D	D	D	D	D
Sth Jerrabomberra Access Rd	-	-	-	-	C	D	E	E
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	F	F	F	F	F	F	F	F
Monaro / Sheppard (worst approach)	F	F	F	F	F	F	F	F
Monaro / Lanyon (worst approach)	D	D	D	D	E	E	E	E
Lanyon / Tompsitt (worst approach)	C	C	D	E	E	F	F	F
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	D	D	E	E	F	F

Table 11: AMP LOS at Critical Location

PMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	F	F
Isabella Dr wst of Monaro	C	C	C	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	C	D	D	E
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	C	C	C	C	C	C	C	C
Monaro / Sheppard (worst approach)	E	E	E	F	E	E	E	F
Monaro / Lanyon (worst approach)	D	D	D	D	D	D	D	D
Lanyon / Tompsitt (worst approach)	E	E	F	F	F	F	F	F
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	E	E	E	F	F	F

Table 12: PMP LOS at Critical Location

4.1.2 Discussion

It is clear that many of the links and intersection approaches at critical locations around the South Jerrabomberra area are already at LOS E/F, or are expected to be by 2014. This is especially true for the Monaro Hwy corridor where the corridor is already operating at LOS E/F and most of the intersections along the corridor have approaches at LOS E/F during either peak period.

The LOS deficiency at the Monaro / Sheppard traffic signals appears to relate to the merging of traffic with the northbound carriageway in the AM peak and the Sheppard St left turn Give Way in the PM Peak rather than the operation of the traffic signals.

The modelling of the southbound slip lane from Lanyon Dr onto the Monaro Hwy indicates that it is already operating at LOS F during the PM peak. Only the signal operation LOS has been reported in the LOS tables.

As the land use throughout the model increases over time, the LOS throughout the area generally worsens. Those locations already operating at LOS F cannot attain a worse LOS but delay and speeds do continue to deteriorate. Intersections operating at LOS E move to LOS F generally by 2020, particularly in the PMP. This is especially true for intersections along Tompsitt Dr where approaches already operating at LOS E in the PMP deteriorate to LOS F by 2018. During the AMP, the Tompsitt Dr intersections are expected to cope better with projected traffic flows but still deteriorate to LOS E at around 2022/2024.

The single lane dual carriageway access road to the South Jerrabomberra development is expected to maintain a link LOS of D or better until approximately 2026 when predicted directional vehicle flow exceeds 1200 vehicles per lane (vph).

However, from 2018 onwards, a number of individual approaches at the signalised intersection with Tompsitt Dr are expected to have approach delays that exceed LOS E conditions even though the intersection has an overall satisfactory performance. The signalised intersection has been assumed to have dual lanes for all critical movements to take advantage of the four lane Tompsitt Dr carriageway. However, during the PM peak the eastbound flow dominates the signal operation resulting in large delays for other movements.

It is therefore expected that an option with an additional access will be needed to maintain a reasonable LOS at the Tompsitt Dr / Sth Jerrabomberra Access Rd intersection from approximately 2020 assuming the proposed rate of development.

4.1.3 Possible Network Improvements

The study brief indicated that recommendations were to be made for improvements required to return the surrounding network to LOS D or better. These recommended improvements have not been modelled and are suggested as possible improvements for each network element in isolation. It is possible that local operational improvements may be obtained by other means such as upgrading alternative routes elsewhere to redistribute traffic flow away from the area. It is also possible that no reasonable solution may be available to return some elements of the local network back to LOS D or better.

The suggested improvements are shown Table 13.

POTENTIAL CRITICAL LOCATION IMPROVEMENTS									
Location	**Possible Improvement**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	Six Lane	X							
Monaro Hwy nth of Isabella	Six Lane	X							
Monaro Hwy nth of Mugga	Six Lane	X							
Isabella Dr wst of Monaro	-								
Sth Jerrabomberra Access Rd	Four Lane							X	
Isabella / Monaro Roundabout	Traffic Signals	X							
Monaro / Mugga TS	Reconfigure	X							
Monaro / Sheppard TS	Reconfigure	X							
Monaro / Lanyon TS	Reconfigure					X			
Lanyon / Tompsitt Roundabout	Traffic Signals			X					
Tompsitt / ELP Roundabout	-								
Tompsitt / Access Rd TS	Reconfigure			X					

Table 13: Potential Critical Location Improvements

4.2 Option 2 – Four Lane One Access – Tompsitt Dr

4.2.1 LOS Comparisons

Appendix B contains AMP and PMP volume and Level of Service (LOS) plots for the South Jerrabomberra One Access Option with a dual lane dual carriageway connection to Tompsitt Drive for the South Jerrabomberra Development with traffic signals at its intersection with Tompsitt Drive. The four lanes have been assumed to be in place for Stages 1 and 3 of the access road alignment from Tompsitt Dr. However, the four lanes may need to be constructed further to include parts of Stage 2 depending on the final development layout.

Analysis of this option is undertaken for the years after the need to upgrade the operation of the Tompsitt Dr / Sth Jerrabomberra Access Rd intersection i.e. from 2020-2031.

The volume plots show modelled hourly flow for each direction separately.

The LOS plots show a combination of link LOS, average intersection LOS (circles) and individual approach LOS (short lines).

The modelled LOS values at various critical locations in the South Jerrabomberra area are summarised in Tables 14 and 15 for AMP and PMP periods respectively.

AMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	E	E
Isabella Dr wst of Monaro	D	D	D	D	D	D	D	D
Sth Jerrabomberra Access Rd	-	-	-	-	C	C	D	D
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	F	F	F	F	F	F	F	F
Monaro / Sheppard (worst approach)	F	F	F	F	F	F	F	F
Monaro / Lanyon (worst approach)	D	D	D	E	E	E	E	E
Lanyon / Tompsitt (worst approach)	C	C	D	E	E	F	F	F
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	D	E	E	E	F	F

Table 14: AMP LOS at Critical Location

PMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	F	F
Isabella Dr wst of Monaro	C	C	C	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	C	C	D	D
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	C	C	C	C	C	C	C	C
Monaro / Sheppard (worst approach)	E	E	E	F	E	E	E	F
Monaro / Lanyon (worst approach)	D	D	D	D	D	D	D	D
Lanyon / Tompsitt (worst approach)	E	E	F	F	F	F	F	F
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	E	E	E	F	F	F

Table 15: PMP LOS at Critical Location

As expected, the operation of the local network is almost identical to the operation of the base Option 1. As the only difference between Option 1 and Option 2 is the four laning of the South Jerrabomberra Access Rd it was expected that the only appreciable difference between the options was the LOS along the Access Rd.

This option creates a dual lane dual carriageway along the Access Rd south from Tompsitt Dr. The four lane access road is expected to maintain a LOS of D or better throughout the analysis period for both peak periods.

However as shown in Option 1, from 2018 onwards, a number of individual approaches at the signalised intersection with Tompsitt Dr are expected to have approach delays that exceed LOS E conditions. As in Option 1, the signalised intersection has been assumed to have dual lanes for all critical movements to take advantage of the four lane Tompsitt Dr carriageway. However, during the PM peak the eastbound flow again dominates the signal operation resulting in large delays for other movements.

4.2.2 Possible Network Improvements

The study brief indicated that recommendations were to be made for improvements required to return the surrounding network to LOS D or better. These recommended improvements have not been modelled and are suggested as possible improvements for each network element in isolation. It is possible that local operational improvements may be obtained by other means such as upgrading alternative routes elsewhere to redistribute

traffic flow away from the area. It is also possible that no reasonable solution may be available to return some elements of the local network back to LOS D or better.

The suggested improvements are shown Table 16.

POTENTIAL CRITICAL LOCATION IMPROVEMENTS									
Location	**Possible Improvement**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	Six Lane	X							
Monaro Hwy nth of Isabella	Six Lane	X							
Monaro Hwy nth of Mugga	Six Lane	X							
Isabella Dr wst of Monaro	-								
Sth Jerrabomberra Access Rd	-								
Isabella / Monaro Roundabout	Traffic Signals	X							
Monaro / Mugga TS	Reconfigure	X							
Monaro / Sheppard TS	Reconfigure	X							
Monaro / Lanyon TS	Reconfigure				X				
Lanyon / Tompsitt Roundabout	Traffic Signals			X					
Tompsitt / ELP Roundabout	-								
Tompsitt / Access Rd TS	Reconfigure			X					

Table 16: Potential Critical Location Improvements

4.3 Option 3 – Two Accesses – Tompsitt Dr / Sheppard St

4.3.1 LOS Comparisons

Appendix C contains AMP and PMP volume and Level of Service (LOS) plots for the South Jerrabomberra Two Access Option with a single lane dual carriageway connection to Tompsitt Drive and to Sheppard Rd for the South Jerrabomberra Development. The Tompsitt Dr access will include traffic signals at its intersection with Tompsitt Drive.

Analysis of this option is undertaken for the years after the need to upgrade the operation of the Tompsitt Dr / Sth Jerrabomberra Access Rd intersection i.e. from 2020-2031.

The volume plots show modelled hourly flow for each direction separately.

The LOS plots show a combination of link LOS, average intersection LOS (circles) and individual approach LOS (short lines).

The modelled LOS values at various critical locations in the South Jerrabomberra area are summarised in Tables 17 and 18 for AMP and PMP periods respectively.

AMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	E	E
Isabella Dr wst of Monaro	D	D	D	D	D	D	D	D
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	C	D
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	F	F	F	F	F	F	F	F
Monaro / Sheppard (worst approach)	F	F	F	F	F	F	F	F
Monaro / Lanyon (worst approach)	D	D	D	D	D	E	E	D
Lanyon / Tompsitt (worst approach)	C	C	D	C	D	D	D	D
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	D	D	D	D	D	E

Table 17: AMP LOS at Critical Location

PMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	F	F
Isabella Dr wst of Monaro	C	C	C	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	C	D
Isabella / Monaro Roundabout (worst approach)	F	F	F	F	F	F	F	F
Monaro / Mugga (worst approach)	C	C	C	C	C	C	C	C
Monaro / Sheppard (worst approach)	E	E	E	E	E	E	F	F
Monaro / Lanyon (worst approach)	D	D	D	E	E	E	E	E
Lanyon / Tompsitt (worst approach)	E	E	F	E	E	E	E	E
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	E	E	E	D	D	D

Table 18: PMP LOS at Critical Location

This access option does not alter the link LOS along either the Monaro Hwy or Isabella Dr. However, the single lane dual carriageway access road to the South Jerrabomberra development from Tompsitt Dr is expected to maintain a link LOS of D or better during peak periods throughout the analysis period.

Intersections along Monaro Hwy between Lanyon Dr and Isabella Dr are again expected to have approaches that operate at LOS F during the AM peak. Those intersections are also expected perform in a similar fashion to Options 1 and 2 during the PM peak.

The Lanyon / Monaro intersection is expected to operate slightly worse during the PM peak but slightly better during the AM peak when compared to Options 1 and 2. The degrading of the PM peak LOS operation of the intersection is due to changes in directional flow through the intersection as a result of the additional access. This change in flow balance results in a change in signal operation which in turn changes the delay balance for some movements.

The additional access onto Sheppard St reduces the demand for the Sth Jerrabomberra Development Access Rd. This in turn results in an improvement in future intersection operation for the Lanyon / Tompsitt and Tompsitt / Sth Jerrabomberra Access Rd intersections when compared to Options 1 and 2.

The Lanyon / Tompsitt roundabout is expected to maintain LOS D during the AM peak and no worse than LOS E on one approach during the PM peak until 2031. The Tompsitt / Sth Jerrabomberra Access Rd signals are expected to generally operate at LOS D on its worst approach. This is substantially better than either Access Options 1 or 2.

4.3.2 Possible Network Improvements

The study brief indicated that recommendations were to be made for improvements required to return the surrounding network to LOS D or better. These recommended improvements have not been modelled and are suggested as possible improvements for each network element in isolation. It is possible that local operational improvements may be obtained by other means such as upgrading alternative routes elsewhere to redistribute traffic flow away from the area. It is also possible that no reasonable solution may be available to return some elements of the local network back to LOS D or better.

The suggested improvements are shown Table 19.

POTENTIAL CRITICAL LOCATION IMPROVEMENTS									
Location	**Possible Improvement**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	Six Lane	X							
Monaro Hwy nth of Isabella	Six Lane	X							
Monaro Hwy nth of Mugga	Six Lane	X							
Isabella Dr wst of Monaro	-								
Sth Jerrabomberra Access Rd	-								
Isabella / Monaro Roundabout	Traffic Signals	X							
Monaro / Mugga TS	Reconfigure	X							
Monaro / Sheppard TS	Reconfigure	X							
Monaro / Lanyon TS	Reconfigure				X				
Lanyon / Tompsitt Roundabout	Traffic Signals				X				
Tompsitt / ELP Roundabout	-								
Tompsitt / Access Rd TS	Reconfigure								X

Table 19: Potential Critical Location Improvements

4.4 Option 4 – Two Accesses – Tompsitt Dr / Isabella Dr

4.4.1 LOS Comparisons

Appendix D contains AMP and PMP volume and Level of Service (LOS) plots for the South Jerrabomberra Two Access Option with a single lane dual carriageway connection to Tompsitt Drive and to Isabella Dr for the South Jerrabomberra Development. The Tompsitt Dr access will include traffic signals at its intersection with Tompsitt Drive.

This option requires the replacement of the Isabella / Monaro roundabout with traffic signals in order to allow access from the east. The current roundabout includes a dual lane uninterrupted slip lane from north to south which bypasses the roundabout. Preliminary tests show that removing the slip lane to allow access to the roundabout from the east results in unacceptable delay to the northern approach during the PM peak.

Analysis of this option is undertaken for the years after the need to upgrade the operation of the Tompsitt Dr / Sth Jerrabomberra Access Rd intersection i.e. from 2020-2031. Volume plots show modelled hourly flow for each direction separately. LOS plots show a combination of link LOS, average intersection LOS (circles) and individual approach LOS (short lines).

The modelled LOS values at various critical locations in the South Jerrabomberra area are summarised in Tables 20 and 21 for AMP and PMP periods respectively.

AMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	E	E
Isabella Dr wst of Monaro	D	D	D	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	D	E
Isabella / Monaro Signals (worst approach)	F	F	F	E	E	E	E	F
Monaro / Mugga (worst approach)	F	F	F	F	F	F	F	F
Monaro / Sheppard (worst approach)	F	F	F	F	F	F	F	F
Monaro / Lanyon (worst approach)	D	D	D	C	D	D	D	D
Lanyon / Tompsitt (worst approach)	C	C	D	C	E	E	E	E
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	D	D	D	D	E	E

Table 20: AMP LOS at Critical Location

PMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	F	F
Isabella Dr wst of Monaro	C	C	C	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	C	C
Isabella / Monaro Signals (worst approach)	F	F	F	E	F	F	F	F
Monaro / Mugga (worst approach)	C	C	C	C	C	C	C	C
Monaro / Sheppard (worst approach)	E	E	E	E	E	E	E	F
Monaro / Lanyon (worst approach)	D	D	D	E	E	E	E	E
Lanyon / Tompsitt (worst approach)	E	E	F	E	E	E	E	E
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	E	F	E	E	E	E

Table 21: PMP LOS at Critical Location

This access option does not alter the link LOS along the Monaro Hwy. However, Isabella Dr is expected to improve to LOS C as a result of modelled traffic from the southwestern areas diverting from Isabella Dr onto the Monaro Hwy due to the operation of the new traffic signals.

The single lane dual carriageway access road to the South Jerrabomberra development from Tompsitt Dr is expected to maintain a link LOS of D or better until approximately 2031 when predicted directional vehicle flow exceeds 1200 vehicles per lane (vph) in the AM peak.

Intersections along Monaro Hwy between Lanyon Dr and Isabella Dr are again expected to have approaches that operate at LOS F during the AM peak. Those intersections are also expected perform in a similar fashion to Options 1 and 2 during the PM peak. However, the Isabella / Monaro traffic signals do appear to operate slightly better than the existing roundabout. It is expected that the operation of the traffic signal could be improved further depending on the final intersection configuration and phase arrangements.

The Lanyon / Monaro intersection is again expected to operate slightly worse during the PM peak and slightly better during the AM peak when compared to Option 1 and 2. Modelling suggests however that it is expected to operate similarly to Option 3.

The additional access onto Isabella Dr also reduces the demand for the Sth Jerrabomberra Development Access Rd but to a lesser level than the Sheppard St Access Option 3. Whilst this also results in an improvement in future intersection operation for the Lanyon / Tompsitt and Tompsitt / Sth Jerrabomberra Access Rd intersections, it is not as great as Option 3.

The Lanyon / Tompsitt roundabout is expected to maintain LOS D during the AM peak until 2024 and no worse than LOS E on one approach during the PM peak. The Tompsitt / Sth Jerrabomberra Access Rd signals are expected to generally operate at LOS E on its worst approach.

4.4.2 Possible Network Improvements

The study brief indicated that recommendations were to be made for improvements required to return the surrounding network to LOS D or better. These recommended improvements have not been modelled and are suggested as possible improvements for each network element in isolation. It is possible that local operational improvements may be obtained by other means such as upgrading alternative routes elsewhere to redistribute traffic flow away from the area. It is also possible that no reasonable solution may be available to return some elements of the local network back to LOS D or better.

The suggested improvements are shown Table 22.

POTENTIAL CRITICAL LOCATION IMPROVEMENTS									
Location	**Possible Improvement**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	Six Lane	X							
Monaro Hwy nth of Isabella	Six Lane	X							
Monaro Hwy nth of Mugga	Six Lane	X							
Isabella Dr wst of Monaro	-								
Sth Jerrabomberra Access Rd	Four Lane								X
Isabella / Monaro Roundabout	Traffic Signals	X							
Monaro / Mugga TS	Reconfigure	X							
Monaro / Sheppard TS	Reconfigure	X							
Monaro / Lanyon TS	Reconfigure				X				
Lanyon / Tompsitt Roundabout	Traffic Signals					X			
Tompsitt / ELP Roundabout	-								
Tompsitt / Access Rd TS	Reconfigure								X

Table 22: Potential Critical Location Improvements

4.5 Option 5 – Three Accesses – Tompsitt Dr / Sheppard Rd / Isabella Dr

4.5.1 LOS Comparisons

Appendix E contains AMP and PMP volume and Level of Service (LOS) plots for the South Jerrabomberra Three Access Option with a single lane dual carriageway connection to Tompsitt Drive, Isabella Dr and Shepperd Rd for the South Jerrabomberra Development. The Tompsitt Dr access will include traffic signals at its intersection with Tompsitt Drive.

This option also requires the replacement of the Isabella / Monaro roundabout with traffic signals in order to allow access from the east. The current roundabout includes a dual lane uninterrupted slip lane from north to south which bypasses the roundabout.

Analysis of this option is undertaken for the years after the need to upgrade the operation of the Tompsitt Dr / Sth Jerrabomberra Access Rd intersection i.e. from 2020-2031. Volume plots show modelled hourly flow for each direction separately. LOS plots show a combination of link LOS, average intersection LOS (circles) and individual approach LOS (short lines).

The modelled LOS values at various critical locations in the South Jerrabomberra area are summarised in Tables 23 and 24 for AMP and PMP periods respectively.

AMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	E	E
Isabella Dr wst of Monaro	D	D	D	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	C	D
Isabella / Monaro Signals (worst approach)	F	F	F	E	E	E	E	E
Monaro / Mugga (worst approach)	F	F	F	F	F	F	F	F
Monaro / Sheppard (worst approach)	F	F	F	F	F	F	F	F
Monaro / Lanyon (worst approach)	D	D	D	D	D	D	D	D
Lanyon / Tompsitt (worst approach)	C	C	D	C	D	D	D	D
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	D	D	D	D	D	E

Table 23: AMP LOS at Critical Location

PMP LOS AT CRITICAL LOCATIONS								
Location	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	E	E	E	E	E	E	E	E
Monaro Hwy nth of Isabella	F	F	F	F	F	F	F	F
Monaro Hwy nth of Mugga	E	E	E	E	E	E	F	F
Isabella Dr wst of Monaro	C	C	C	C	C	C	C	C
Sth Jerrabomberra Access Rd	-	-	-	-	-	-	C	D
Isabella / Monaro Signals (worst approach)	F	F	F	E	E	E	E	E
Monaro / Mugga (worst approach)	C	C	C	C	C	C	C	C
Monaro / Sheppard (worst approach)	E	E	E	E	E	E	E	F
Monaro / Lanyon (worst approach)	D	D	D	E	E	E	E	E
Lanyon / Tompsitt (worst approach)	E	E	F	E	E	E	F	E
Tompsitt / ELP (worst approach)	-	-	-	-	-	-	-	-
Tompsitt / Sth Jerrabomberra Access Rd (worst approach)	-	D	E	E	E	D	D	E

Table 24: PMP LOS at Critical Location

This access option does not alter the link LOS along the Monaro Hwy. However, Isabella Dr is again expected to improve to LOS C as a result of modelled traffic from the southwestern areas diverting from Isabella Dr onto the Monaro Hwy.

The single lane dual carriageway access road to the South Jerrabomberra development from Tompsitt Dr is expected to maintain a link LOS of D or better during peak periods throughout the analysis period.

The intersections along Monaro Hwy between Lanyon Dr and Isabella Dr are again expected to operate at LOS F during the AM peak. Those intersections are also expected perform in a similar fashion to Options 1 and 2 during the PM peak. However, the Isabella / Monaro traffic signals do appear to operate slightly better than both the roundabout and Option 4 signals. The modelled traffic signals appear to maintain LOS E throughout the analysis period and it is expected that the operation of the traffic signal could be improved further depending on the final intersection configuration and phase arrangements

The spreading of the development traffic demand between three accesses appears to result in the Lanyon / Monaro, Lanyon / Tompsitt and Tompsitt / Sth Jerrabomberra Access intersections all operating as well as both Options 3 and 4. The Lanyon / Tompsitt roundabout is expected to maintain LOS D during the AM peak and no worse than LOS E on one approach during the PM peak. The Tompsitt / Sth Jerrabomberra Access Rd signals are expected to generally operate at LOS D on its worst approach.

4.5.2 Possible Network Improvements

The study brief indicated that recommendations were to be made for improvements required to return the surrounding network to LOS D or better. These recommended improvements have not been modelled and are suggested as possible improvements for each network element in isolation. It is possible that local operational improvements may be obtained by other means such as upgrading alternative routes elsewhere to redistribute traffic flow away from the area. It is also possible that no reasonable solution may be available to return some elements of the local network back to LOS D or better.

The suggested improvements are shown Table 25.

POTENTIAL CRITICAL LOCATION IMPROVEMENTS									
Location	**Possible Improvement**	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**	**2026**	**2031**
Monaro Hwy nth of Lanyon	Six Lane	X							
Monaro Hwy nth of Isabella	Six Lane	X							
Monaro Hwy nth of Mugga	Six Lane	X							
Isabella Dr wst of Monaro	-								
Sth Jerrabomberra Access Rd	-								
Isabella / Monaro Roundabout	Traffic Signals	X							
Monaro / Mugga TS	Reconfigure	X							
Monaro / Sheppard TS	Reconfigure	X							
Monaro / Lanyon TS	Reconfigure				X				
Lanyon / Tompsitt Roundabout	Traffic Signals				X				
Tompsitt / ELP Roundabout	-								
Tompsitt / Access Rd TS	Reconfigure								X

Table 25: Potential Critical Location Improvements

5. Access Option Operational Results

In order to show how each option network is performing overall and in QCC in particular, a network operation analysis of each option for each year has been undertaken. This analysis provides overall operational indicators for travel times, distances, delays and fuel consumption.

Tables 26-35 detail these indicators for each access option, for each year from 2020-2031 and for the AMP and PMP separately. Analyses were only undertaken for years in which Access Options were necessary in order to show any differences between Options.

Performance indicators are shown for the QCC and ACT model areas separately as well as the combined model area. Results that are the "best" for each indicator are highlighted in red. For the vehicle kilometres, vehicle minutes and fuel use the "best" result is the lowest figure. For mean network speed the highest figure among the options is highlighted.

The performance indicators indicate the following general trends:

(i) Access options that provide multiple access routes consistently produce better network performance for the QCC than the single access options;

(ii) Access options that provide a single access route only generally produce better network performance for the ACT than the multiple access options;

(iii) Access Options 3, 4 and 5 all produce very similar overall network performance results for both peak periods;

(iv) Overall, Option 5 (Tompsitt/Sheppard/Isabella) produces the best future network performance of all the access options for both peak periods. Option 3 (Tompsitt / Sheppard) is consistently a close second best performer.

2020 AMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	113631	113631	111168	112026	111159
Vehicle Minutes	143462	143437	138805	140121	138751
Mean Network Speed kph	47.5	47.5	48.1	48.0	48.1
Fuel Use '000 litres	11.65	11.65	11.36	11.45	11.36
ACT Area Only					
Vehicle Kilometres	1133199	1133199	1133735	1133677	1133600
Vehicle Minutes	1645007	1645084	1647905	1646677	1643979
Mean Network Speed kph	41.3	41.3	41.3	41.3	41.4
Fuel Use '000 litres	120.04	120.04	120.14	120.16	120.05
Total Model Area					
Vehicle Kilometres	1246830	1246830	1244903	1245703	1244759
Vehicle Minutes	1788469	1788521	1786710	1786798	1782730
Mean Network Speed kph	41.8	41.8	41.8	41.8	41.9
Fuel Use '000 litres	131.69	131.69	131.50	131.61	131.41

Table 26: 2020 AMP Performance Indicators

2020 PMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	121607	121607	119134	120100	119193
Vehicle Minutes	154015	154003	149850	151266	149974
Mean Network Speed kph	47.4	47.4	47.7	47.6	47.7
Fuel Use '000 litres	12.49	12.49	12.22	12.32	12.22
ACT Area Only					
Vehicle Kilometres	1240430	1240430	1241041	1240565	1240504
Vehicle Minutes	1743656	1743655	1742070	1745543	1745502
Mean Network Speed kph	42.7	42.7	42.7	42.6	42.6
Fuel Use litres	130.11	130.11	130.12	130.23	130.21
Total Model Area					
Vehicle Kilometres	1362037	1362037	1360175	1360665	1359697
Vehicle Minutes	1897671	1897658	1891920	1896809	1895476
Mean Network Speed kph	43.1	43.1	43.1	43.0	43.0
Fuel Use '000 litres	142.60	142.60	142.34	142.55	142.43

Table 27: 2020 PMP Performance Indicators

2022 AMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	112129	112127	109127	110160	109088
Vehicle Minutes	143577	143526	138161	140067	138117
Mean Network Speed kph	46.9	46.9	47.4	47.2	47.4
Fuel Use '000 litres	11.55	11.54	11.20	11.32	11.19
ACT Area Only					
Vehicle Kilometres	1172976	1172976	1173660	1173431	1173623
Vehicle Minutes	1704346	1704346	1708394	1705390	1701935
Mean Network Speed kph	41.3	41.3	41.2	41.3	41.4
Fuel Use '000 litres	124.33	124.34	124.49	124.43	124.36
Total Model Area					
Vehicle Kilometres	1285105	1285103	1282787	1283591	1282711
Vehicle Minutes	1847923	1847872	1846555	1845457	1840052
Mean Network Speed kph	41.7	41.7	41.7	41.7	41.8
Fuel Use '000 litres	135.88	135.88	135.69	135.75	135.55

Table 28: 2022 AMP Performance Indicators

2022 PMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	121548	121550	118186	119449	118225
Vehicle Minutes	157943	157914	152101	153902	152129
Mean Network Speed kph	46.2	46.2	46.6	46.6	46.6
Fuel Use '000 litres	12.62	12.62	12.24	12.37	12.24
ACT Area Only					
Vehicle Kilometres	1284403	1284384	1285371	1284820	1284626
Vehicle Minutes	1807169	1807306	1808911	1811091	1805958
Mean Network Speed kph	42.6	42.6	42.6	42.6	42.7
Fuel Use '000 litres	134.71	134.71	134.83	134.88	134.70
Total Model Area					
Vehicle Kilometres	1405951	1405934	1403557	1404269	1402851
Vehicle Minutes	1965112	1965220	1961012	1964993	1958087
Mean Network Speed kph	42.9	42.9	42.9	42.9	43.0
Fuel Use '000 litres	147.33	147.33	147.07	147.25	146.94

Table 29: 2022 PMP Performance Indicators

2024 AMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	118614	118615	115101	116168	114982
Vehicle Minutes	153534	153435	146629	148489	146341
Mean Network Speed kph	46.4	46.4	47.1	46.9	47.1
Fuel Use '000 litres	12.26	12.26	11.83	11.95	11.82
ACT Area Only					
Vehicle Kilometres	1200538	1200539	1201384	1201354	1201278
Vehicle Minutes	1765280	1765221	1767901	1771916	1766319
Mean Network Speed kph	40.8	40.8	40.8	40.7	40.8
Fuel Use '000 litres	128.02	128.02	128.17	128.31	128.14
Total Model Area					
Vehicle Kilometres	1319152	1319154	1316485	1317522	1316260
Vehicle Minutes	1918814	1918656	1914530	1920405	1912660
Mean Network Speed kph	41.2	41.3	41.3	41.2	41.3
Fuel Use '000 litres	140.28	140.28	140.00	140.26	139.96

Table 30: 2024 AMP Performance Indicators

2024 PMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	129081	129075	124985	126416	124964
Vehicle Minutes	169460	169417	161756	163820	161700
Mean Network Speed kph	45.7	45.7	46.4	46.3	46.4
Fuel Use '000 litres	13.45	13.45	12.97	13.12	12.96
ACT Area Only					
Vehicle Kilometres	1311102	1311107	1312245	1311836	1311604
Vehicle Minutes	1893106	1892798	1894705	1897098	1893986
Mean Network Speed kph	41.6	41.6	41.6	41.5	41.6
Fuel Use '000 litres	139.28	139.27	139.41	139.48	139.37
Total Model Area					
Vehicle Kilometres	1440183	1440182	1437230	1438252	1436568
Vehicle Minutes	2062566	2062215	2056461	2060918	2055686
Mean Network Speed kph	41.9	41.9	41.9	41.9	41.9
Fuel Use '000 litres	152.73	152.72	152.38	152.60	152.33

Table 31: 2024 PMP Performance Indicators

2026 AMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	124314	124309	120527	121602	120332
Vehicle Minutes	162911	162633	154679	156520	154158
Mean Network Speed kph	45.8	45.9	46.8	46.6	46.8
Fuel Use '000 litres	12.92	12.91	12.44	12.56	12.41
ACT Area Only					
Vehicle Kilometres	1224933	1224936	1225838	1225852	1225695
Vehicle Minutes	1833348	1833446	1833820	1835614	1832592
Mean Network Speed kph	40.1	40.1	40.1	40.1	40.1
Fuel Use '000 litres	131.77	131.76	131.86	131.93	131.83
Total Model Area					
Vehicle Kilometres	1349247	1349245	1346365	1347454	1346027
Vehicle Minutes	1996259	1996079	1988499	1992134	1986750
Mean Network Speed kph	40.6	40.6	40.6	40.6	40.7
Fuel Use '000 litres	144.69	144.67	144.30	144.49	144.24

Table 32: 2026 AMP Performance Indicators

2026 PMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	135610	135636	131295	132760	131216
Vehicle Minutes	180123	180053	171234	173575	171034
Mean Network Speed kph	45.2	45.2	46.0	45.9	46.0
Fuel Use '000 litres	14.21	14.20	13.67	13.83	13.66
ACT Area Only					
Vehicle Kilometres	1335353	1335329	1336530	1335793	1335982
Vehicle Minutes	1971182	1971880	1974875	1978537	1975812
Mean Network Speed kph	40.6	40.6	40.6	40.5	40.6
Fuel Use '000 litres	143.26	143.29	143.48	143.54	143.48
Total Model Area					
Vehicle Kilometres	1470963	1470965	1467825	1468553	1467198
Vehicle Minutes	2151305	2151933	2146109	2152112	2146846
Mean Network Speed kph	41.0	41.0	41.0	40.9	41.0
Fuel Use '000 litres	157.47	157.49	157.15	157.37	157.14

Table 33: 2026 PMP Performance Indicators

2031 AMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	133455	133438	130039	131121	129909
Vehicle Minutes	179633	177176	168726	170947	168460
Mean Network Speed kph	44.6	45.2	46.2	46.0	46.3
Fuel Use '000 litres	14.03	13.94	13.49	13.62	13.47
ACT Area Only					
Vehicle Kilometres	1282791	1282777	1283476	1283541	1283580
Vehicle Minutes	1982405	1981476	1984223	1984173	1981622
Mean Network Speed kph	38.8	38.8	38.8	38.8	38.9
Fuel Use '000 litres	139.89	139.86	139.98	140.03	139.96
Total Model Area					
Vehicle Kilometres	1416246	1416215	1413515	1414662	1413489
Vehicle Minutes	2162038	2158652	2152949	2155120	2150082
Mean Network Speed kph	39.3	39.4	39.4	39.4	39.4
Fuel Use '000 litres	153.92	153.80	153.47	153.65	153.43

Table 34: 2031 AMP Performance Indicators

2031 PMP PERFORMANCE INDICATORS					
QCC Area Only	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**
Vehicle Kilometres	145831	145969	141877	143373	141903
Vehicle Minutes	196902	196770	187640	190067	187493
Mean Network Speed kph	44.4	44.5	45.4	45.3	45.4
Fuel Use '000 litres	15.40	15.39	14.87	15.03	14.86
ACT Area Only					
Vehicle Kilometres	1400901	1400978	1401939	1401001	1401202
Vehicle Minutes	2138900	2137953	2139924	2141350	2137389
Mean Network Speed kph	39.3	39.3	39.3	39.3	39.3
Fuel Use '000 litres	152.66	152.63	152.76	152.75	152.65
Total Model Area					
Vehicle Kilometres	1546732	1546947	1543816	1544374	1543105
Vehicle Minutes	2335802	2334723	2327564	2331417	2324882
Mean Network Speed kph	39.7	39.8	39.8	39.7	39.8
Fuel Use '000 litres	168.06	168.02	167.63	167.78	167.51

Table 35: 2031 PMP Performance Indicators

6. Discussion

The primary requirement of this analysis is to recommend which of the access options considered in this analysis "best serves the Queanbeyan and ACT community". This is taken as meaning which access option has the least impact on the surrounding QCC and ACT networks and best distributes the additional traffic travelling to and from the proposed South Jerrabomberra development.

This analysis evaluated the South Jerrabomberra development as part of the overall QCC/ACT network area and therefore took into account changing background travel patterns as a result of other development throughout the area. This background development included developments at Googong and Jumping Creek, expected general infill housing throughout Queanbeyan and expected changes in housing and employment throughout the greater ACT.

The analysis of the 5 access options used the latest 2011 Queanbeyan Transportation Model for both the AM and PM peak periods. Every effort was made to ensure that the future models included the latest available land use projections as well proposed network infrastructure changes throughout the QCC and ACT areas.

The TRACKS model uses an assignment procedure that includes the calculation of intersection behaviour in its analysis. The QCC model is by definition a strategic model and whilst the intersection modelling is detailed, it is not expected to replace a detailed assessment of intersection behaviour using specialist intersection or microsimulation programs. However, efforts have been made throughout the analysis to ensure that modelled intersection behaviour was as realistic as possible.

This South Jerrabomberra Traffic Analysis concentrated on the area surrounding the development in its assessment. It included assessments of the differences in Level of Service (LOS) and overall network performance indicators between each of the access options.

Overall the analysis indicated the following:

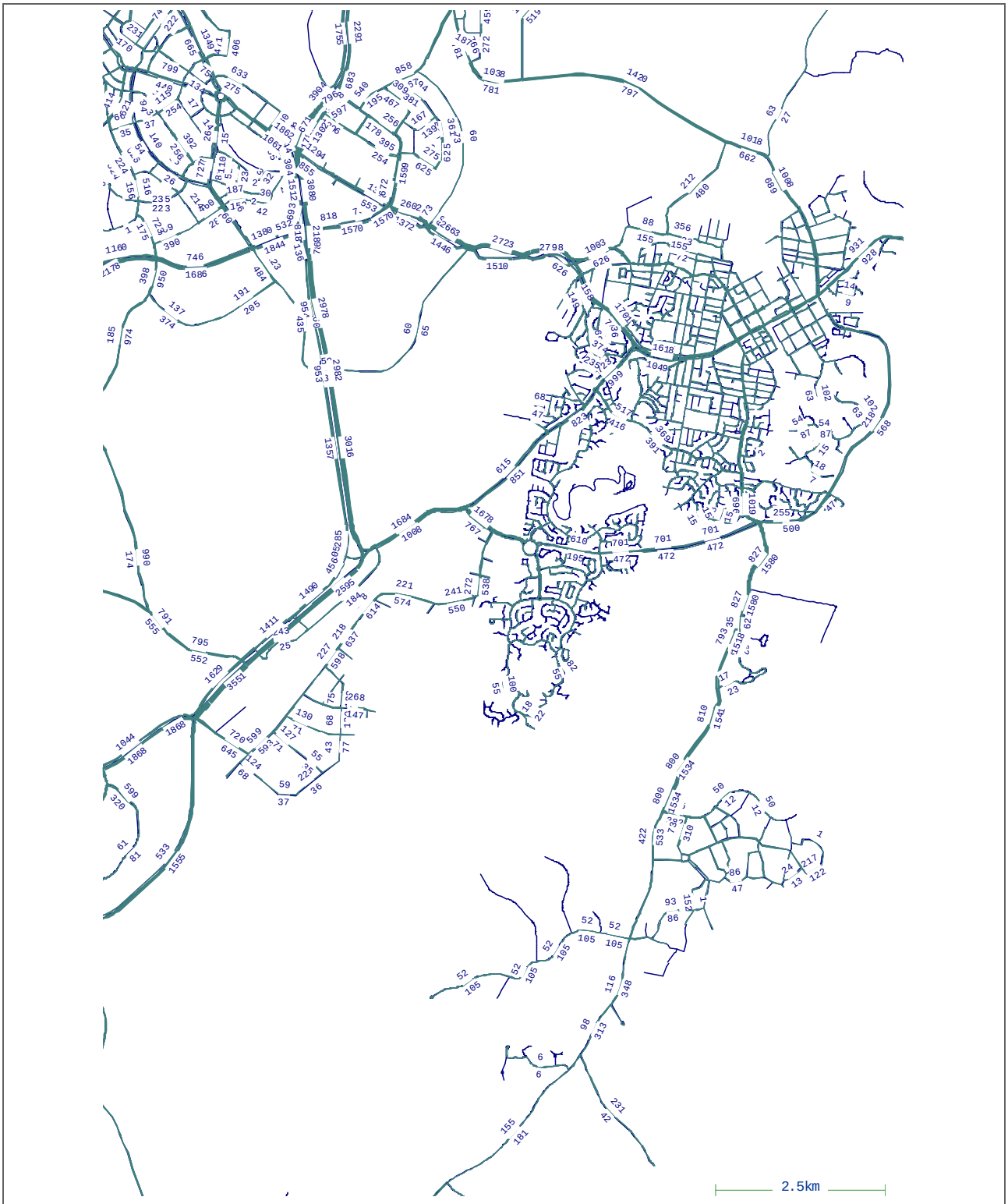
- Many of the links and intersection approaches at critical locations around the South Jerrabomberra area are already at LOS E/F during peak periods, or are expected to be by 2014. This is especially true for the Monaro Hwy corridor and most of the intersections along the corridor which appear to be operating at LOS E/F during either peak period;
- The single lane dual carriageway access road to the South Jerrabomberra development is expected to maintain a link LOS of D or better until approximately 2026 when predicted directional vehicle flow exceeds 1200 vehicles per lane (vph);
- For the single access route options (Option 1 and 2), from 2018 onwards a number of individual approaches at the Access Rd signalised intersection with Tompsitt Dr are expected to have approach delays that exceed LOS E conditions;
- Access options that involve an Isabella Dr access require the need for the existing roundabout to be replaced with traffic signals;
- The Lanyon / Tompsitt roundabout may require upgrading to traffic signals by 2018/2020 if a single access route option is used i.e. Options 1 and 2;

- The Monaro / Sheppard and Monaro / Mugga traffic signals may need reconfiguration to reduce calculated LOS issues on various movements irrespective of which access option is chosen;
- Access Option 5 (Tompsitt / Sheppard / Isabella) appears to produce the best overall LOS conditions for local roads and intersections;
- Access options that provide multiple access routes consistently produce better network performance results for the QCC than the single access options;
- Access options that provide a single access route only, generally produce better network performance results for the ACT than the multiple access options;
- Access Options 3, 4 and 5 all produce very similar overall network performance results for both peak periods;
- Overall, Option 5 (Tompsitt / Sheppard / Isabella) produces the best future network performance results of all the access options for both peak periods. Option 3 (Tompsitt / Sheppard) is consistently a close second best performer.

7. Recommendation

Based on the strategic model analysis undertaken, Access Option 5 (Tompsitt / Sheppard / Isabella) produces the best future overall network performance and local operation of the access options investigated.

Traffic Design Group Ltd


2.5km


2.5km

Queanbeyan Model – Improved Network
2024 PMP VOLUME

TDG

36


500m


500m


500m

Queanbeyan Model – Improved Network
2024 PMP VOLUME

TDG

40

Queanbeyan Model – Base Network
2026 AMP VOLUME

Queanbeyan Model – Base Network
2026 PMP VOLUME


2.5km


2.5km


500m

Queanbeyan Model – Base Network
2026 PMP VOLUME

TDG

46


500m


500m

Queanbeyan Model – Base Network
2031 AMP VOLUME

Queanbeyan Model – Base Network
2031 PMP VOLUME

TDG

50

Queanbeyan Model – Improved Network
2031 AMP VOLUME

Queanbeyan Model – Improved Network
2031 PMP VOLUME

TDG

52


500m

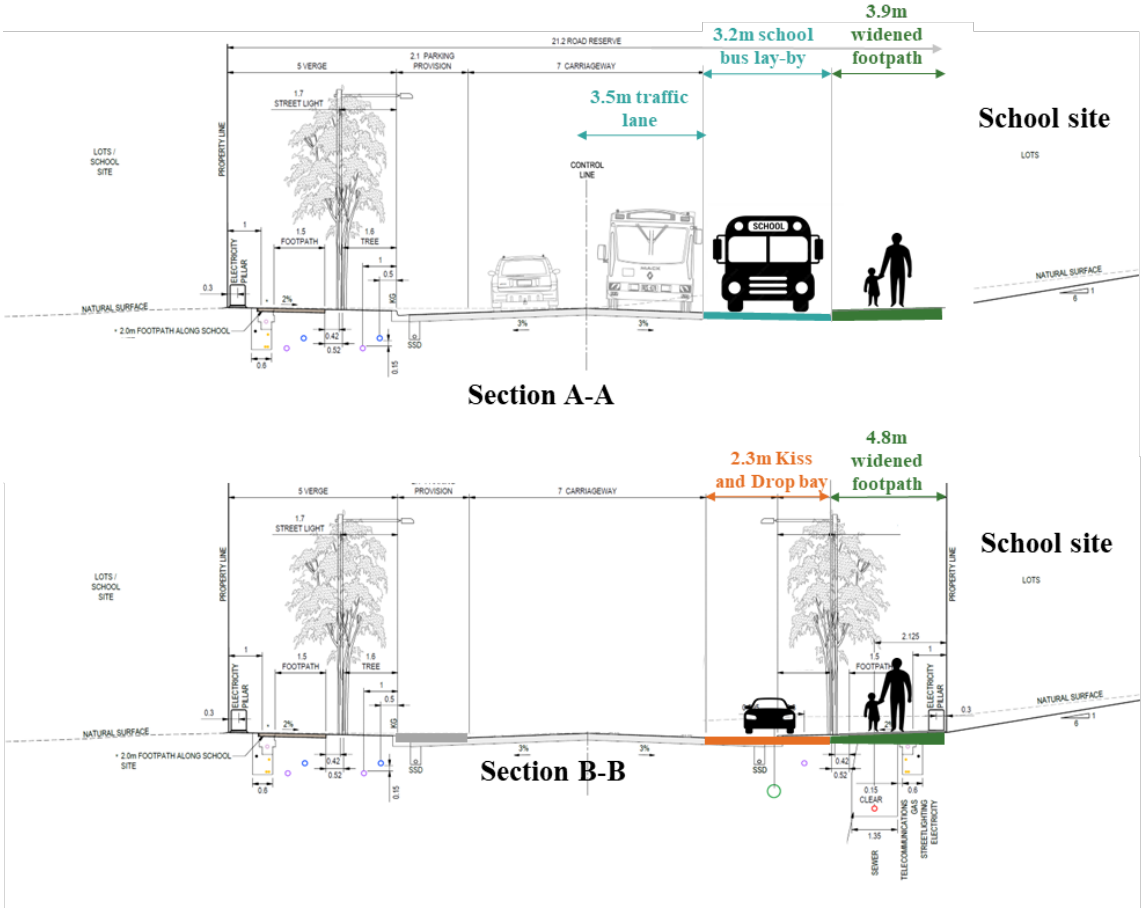
Queanbeyan Model – Base Network
2031 PMP VOLUME

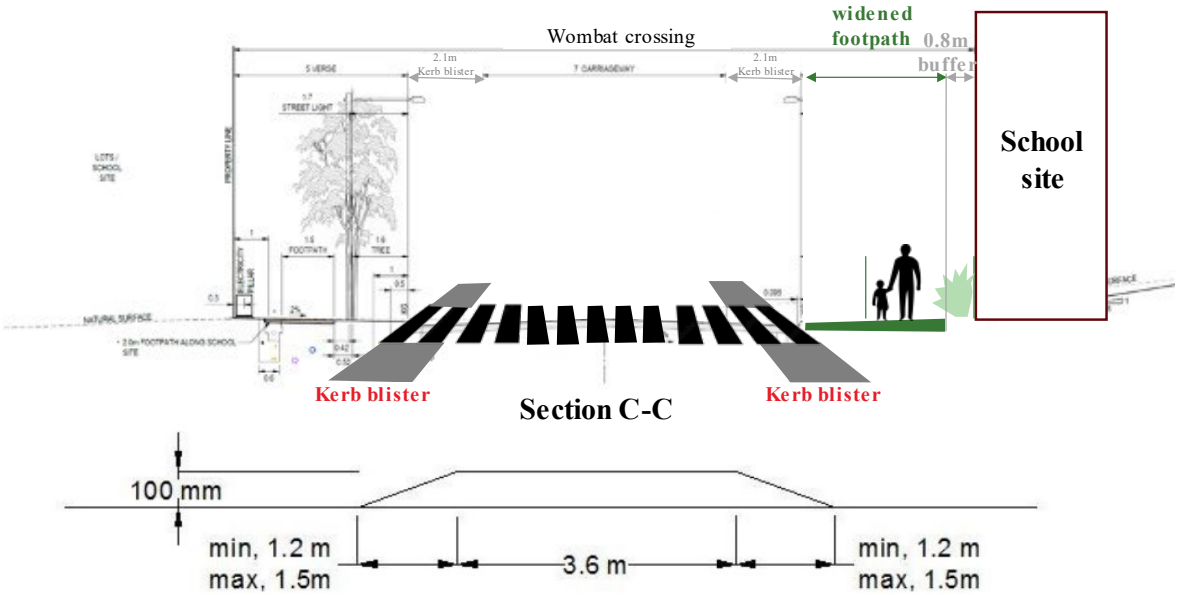

500m


500m

A.3 Layout of Glenrock Drive

The main school entry is located on Glenrock Drive, as well as the bus stop and Kiss and Drop. The figures below provide further detail on the proposed cross-section of Glenrock Drive.





Typical wombat crossing section

Figure 69. Sections A-A, B-B and C-C on Glenrock Drive

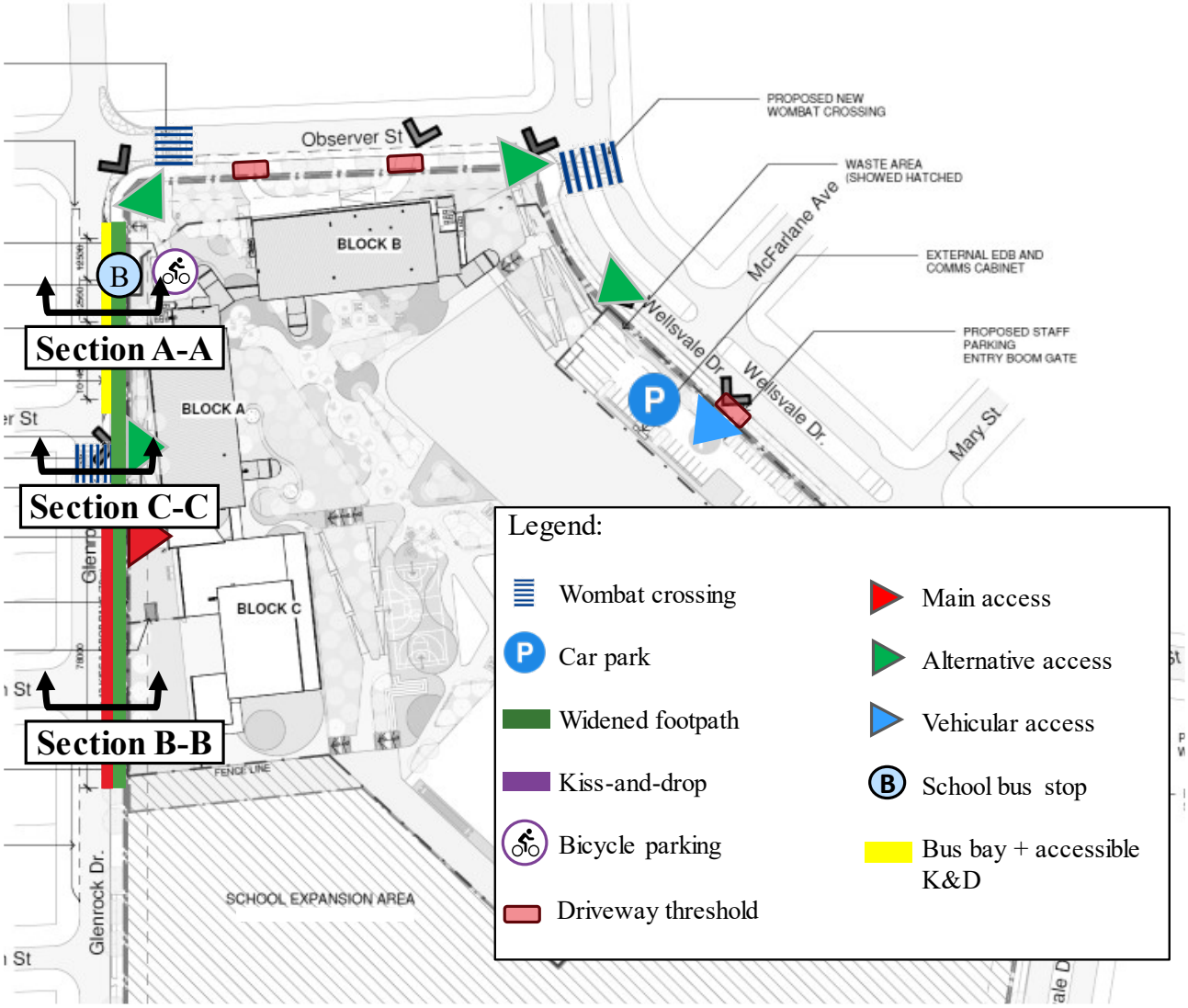


Figure 70. Location of road sections A-A, B-B and C-C on Glenrock Drive

A.3.1 Kiss and Drop zone

- Layout plan has designed the Kiss and Drop zone to be 2.3m wide as per standards (AS2890.5 – On-Street Parking, Section 3.2, Figure 3.1)
- DDA parallel parking bay is located at bus bay, which is wider, to meet design requirements (AS2890.5 – On-Street Parking, Section 4.5, Figure 4.3).

A.3.2 Traffic lane

According to NSW Movement and Place – Design of Roads and Streets, traffic lanes for buses or where bus routes are planned should be minimum 3.2m wide where possible for signposted speeds up to and including 50kmh, or minimum 3.5m wide where possible for signposted speeds at 60km/h and above.

A.3.3 Bus bay

According to TfNSW Guidelines for Public Transport Capable Infrastructure, minimum width of 3.0 metres where the kerb side lane operates as a parking lane, to allow for bus stops and allow the bus to move out of the through traffic lane.

A.4 Swept paths

A.4.1 Waste

Swept paths for the HRV left-out movement shown below demonstrate that the car park modifications that would be required to accommodate a heavy rigid vehicle i.e. driveway splay. Waste collection by a medium rigid vehicle can be accommodated without modifications to the car park.

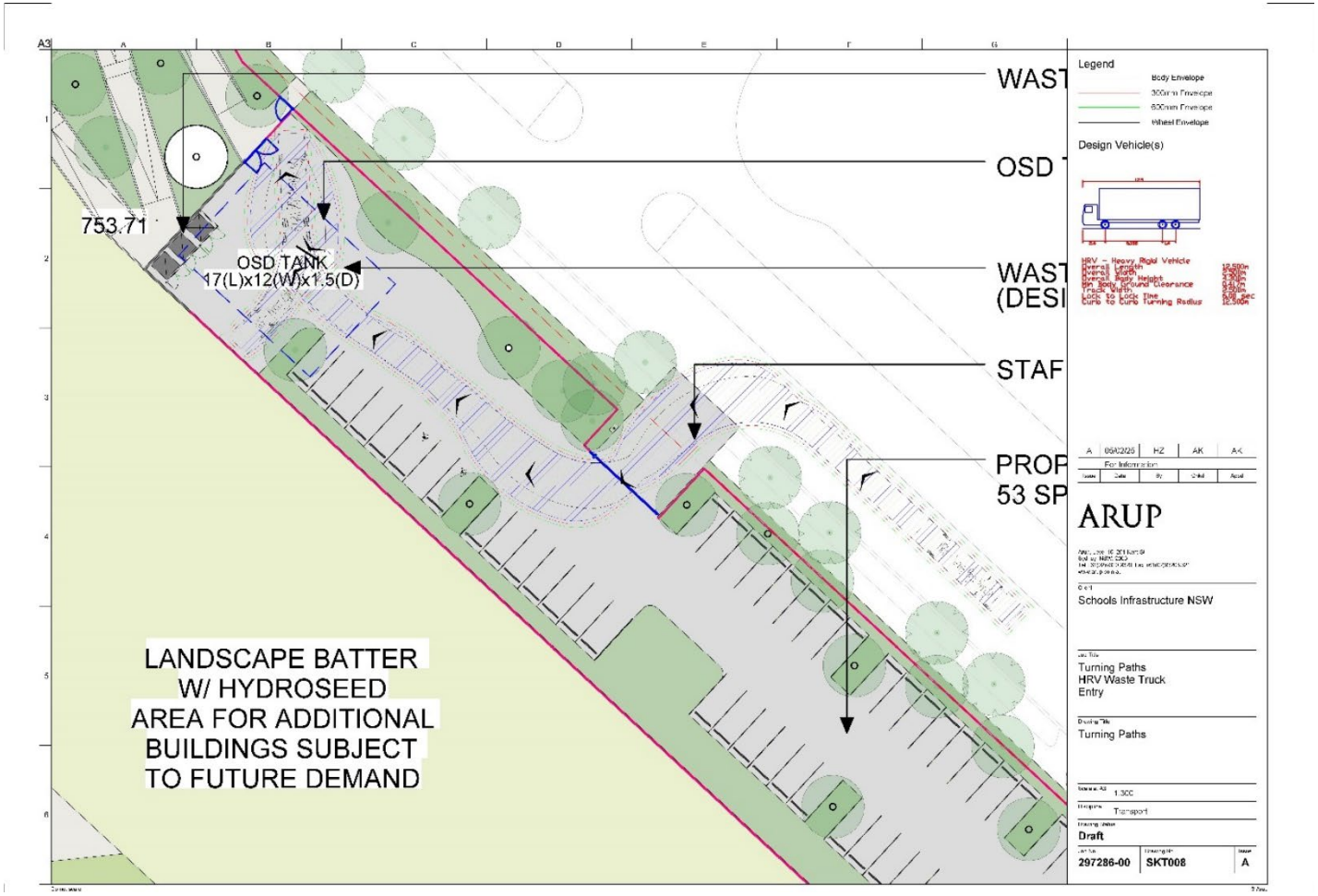


Figure 71 HRV swept path for waste vehicle entering car park on Wellsvale Drive

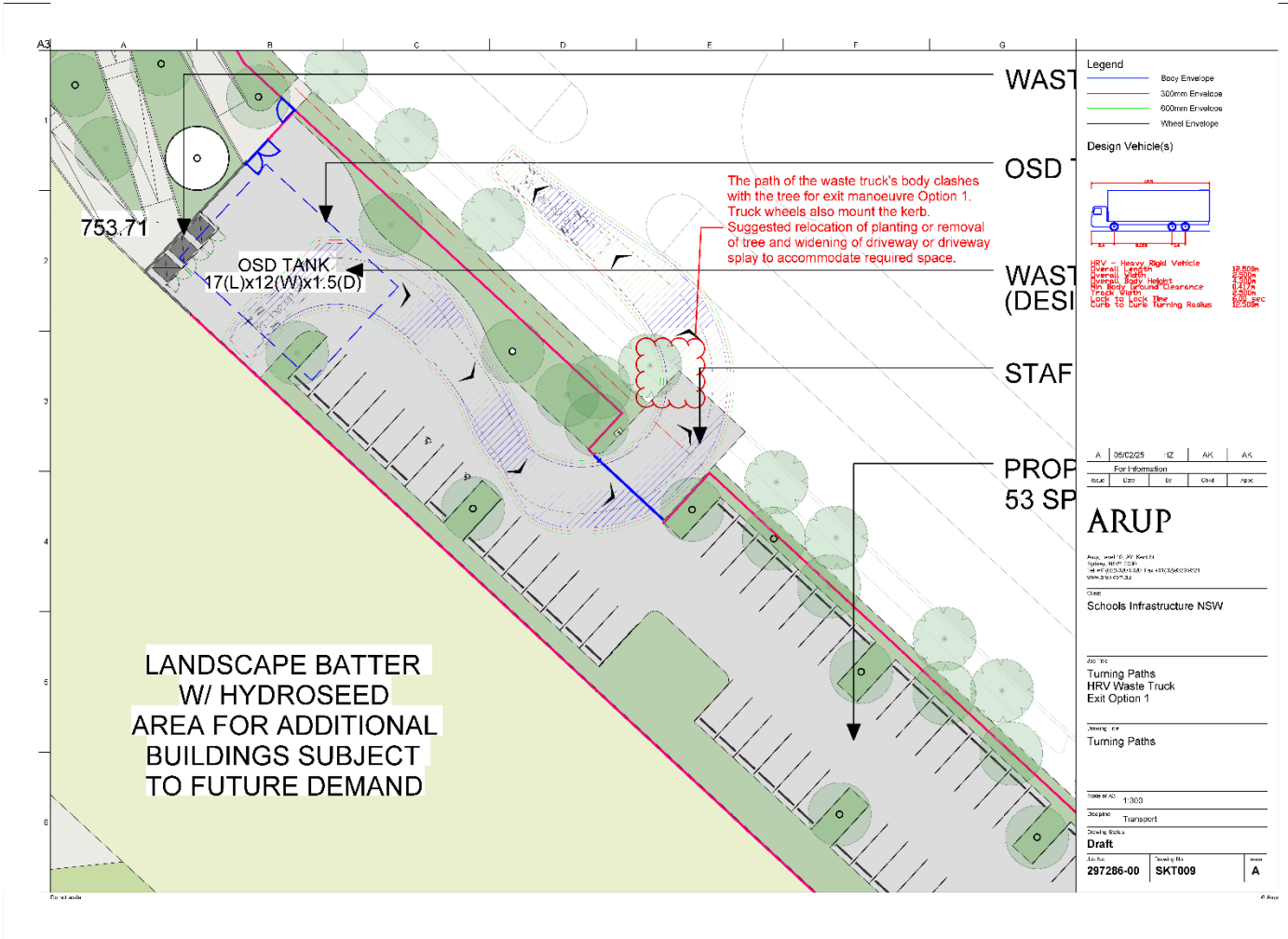


Figure 72 HRV swept path for waste vehicle exiting car park on Wellsvale Drive

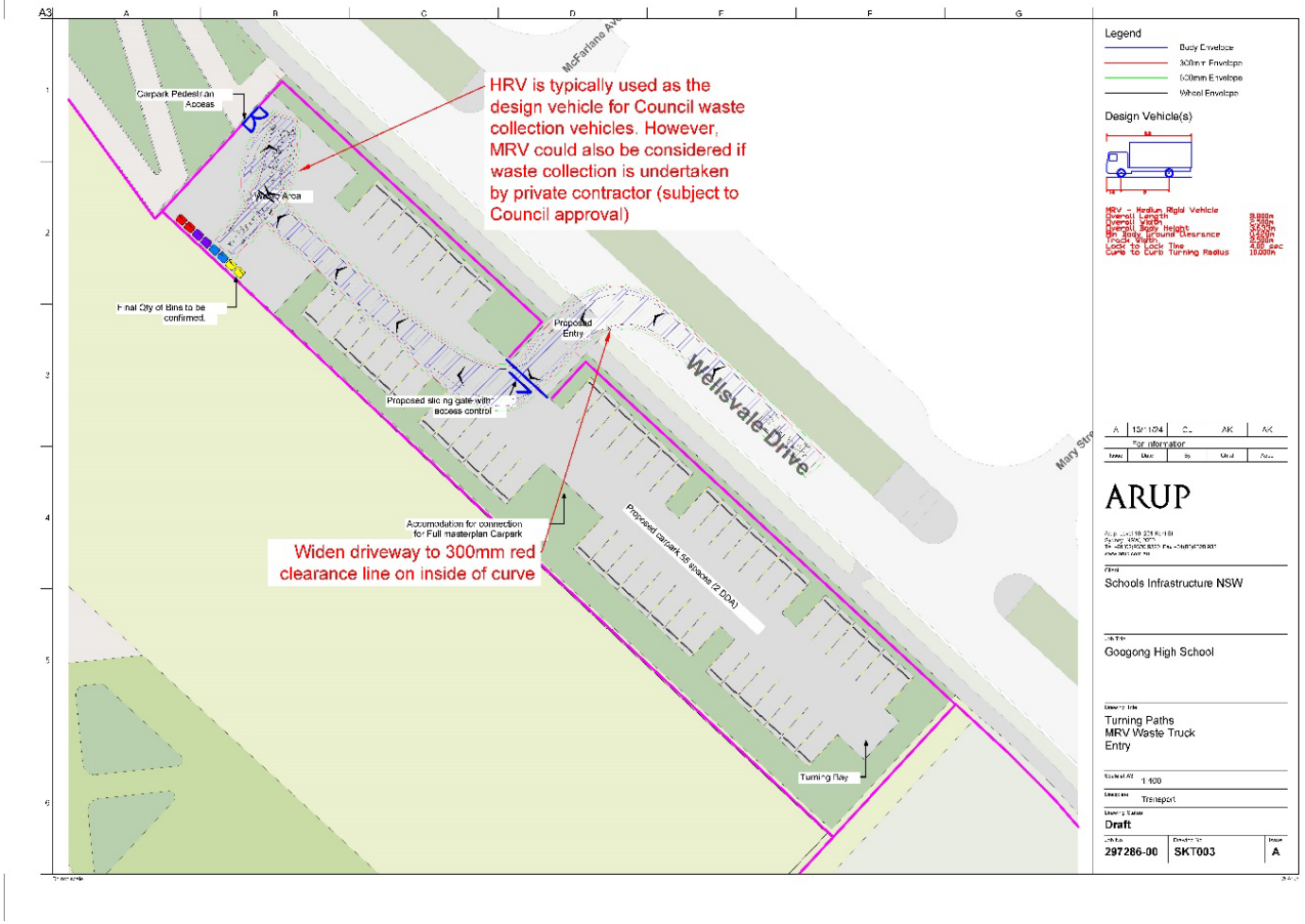


Figure 73: MRV swept path for waste vehicle entering car park on Wellsvale Drive

Figure 74: MRV swept path for waste vehicle exiting car park on Wellsvale Drive

A.4.2 Bus and car swept paths

Turning paths for a B99 car and a 12.5m bus have been analysed to evaluate their manoeuvrability around the school site. The turning paths show that wombat crossings with kerb blisters on Observer Street and Harvest Street can accommodate these vehicles without veering into the other lane.

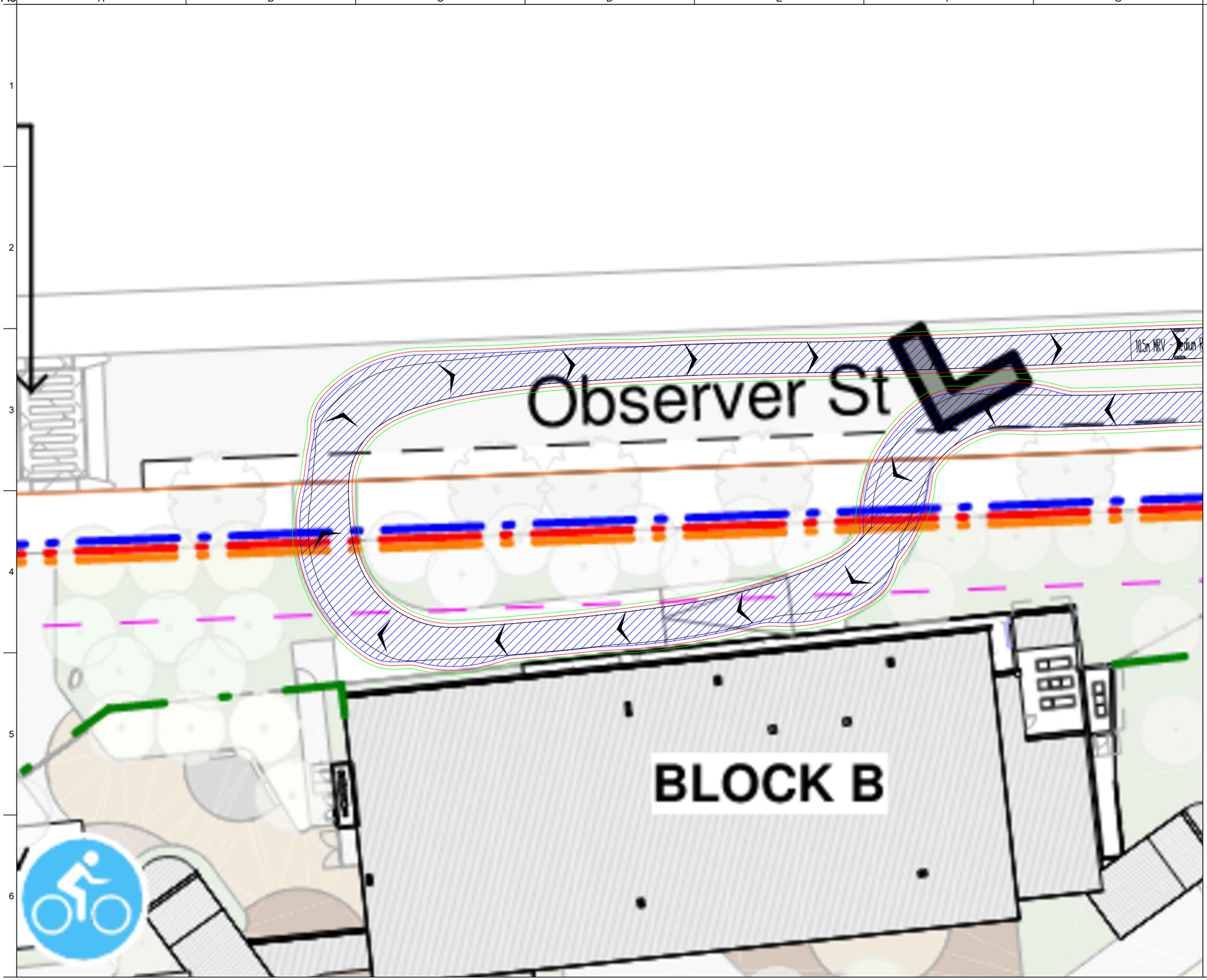
Figure 75. Proposed activity turning paths for 12.5 bus and B99 at Observer Street/ Glenrock Drive intersection

Figure 76. Examples of wombat crossings with kerb blisters in NSW.

Figure 77.Turning paths for 12.5 bus and B99 at Harvest Street / Glenrock drive intersection (left) Wellsvale Drive / Observer Street intersection (top right) Wellsvale Drive / Harvest Street intersection (bottom right)

A.4.3 Delivery access swept paths

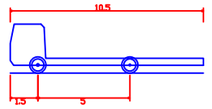
A3



Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



10.5m MRV - Medium Rigid Vehicle	
Overall Length	10.500m
Overall Width	2.500m
Overall Body Height	2.662m
Min Body Ground Clearance	0.428m
Track Width	2.500m
Lock to Lock Time	4.00s
Curb to Curb Turning Radius	10.000m

Issue	Date	By	Chkd	Appd
A	03/02/25	HZ	JG	AK

For Information

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SINSW

Job Title
Googong High School Stage 1
Transport Assessment

Drawing Title
10.5m Truck Driveway Entry and Exit
Right Turn

Scale at A3 1:300

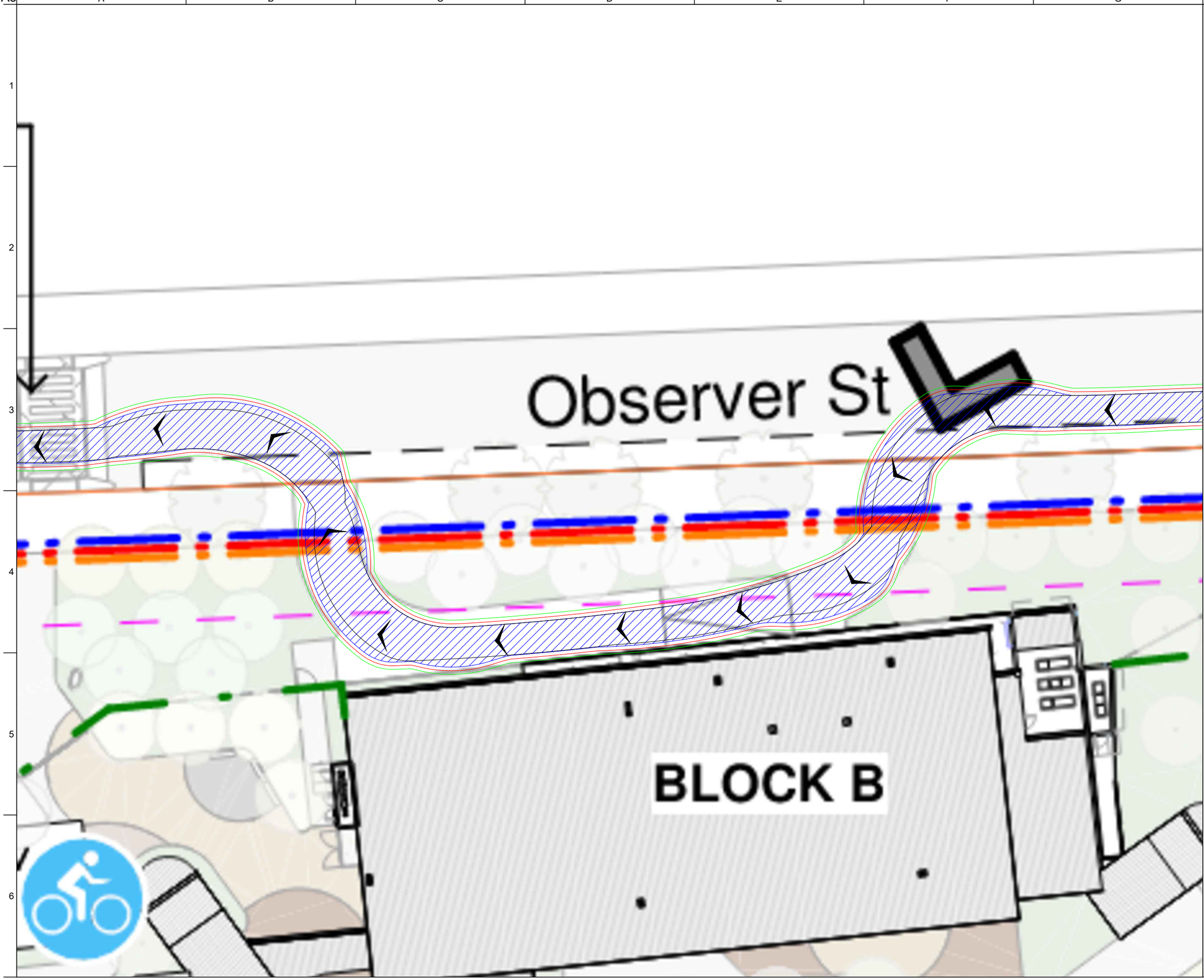
Discipline Transport

Drawing Status
Draft

Job No	Drawing No	Issue
297286-00	**SKT005**	**A**

Do not scale

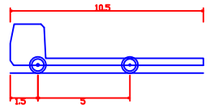
A3



Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



10.5m MRV - Medium Rigid Vehicle	
Overall Length	10.500m
Overall Width	2.500m
Overall Body Height	2.662m
Min Body Ground Clearance	0.428m
Track Width	2.500m
Lock to Lock Time	4.00s
Curb to Curb Turning Radius	10.000m

Issue	Date	By	Chkd	Appd
A	03/02/25	HZ	JG	AK

For Information

ARUP

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www.arup.com.au

Client
SINSW

Job Title
Googong High School Stage 1 Transport Assessment

Drawing Title
10.5m Truck Driveway Entry and Exit Left Turn

Scale at A3 1:300

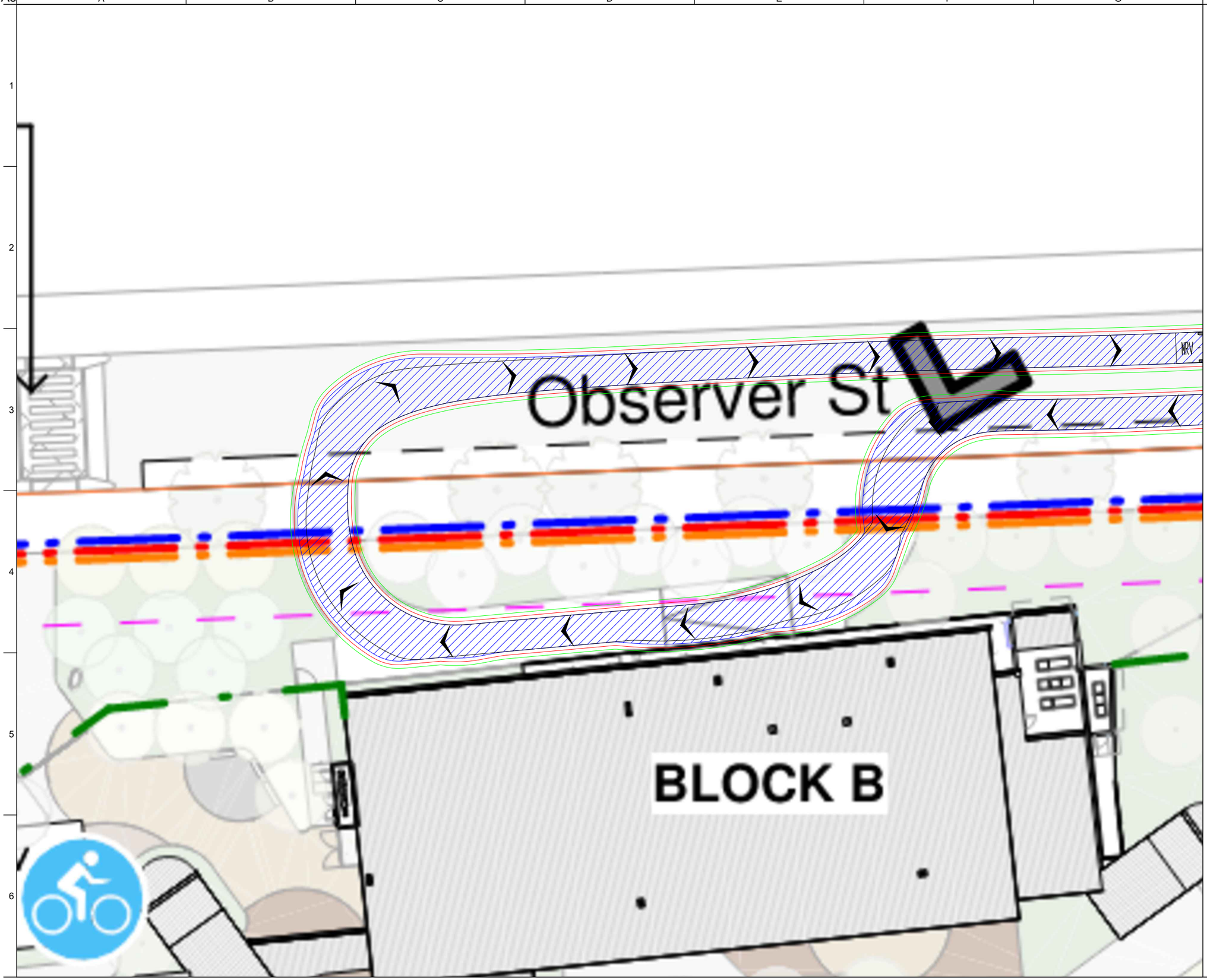
Discipline Transport

Drawing Status
Draft

Job No	Drawing No	Issue
297286-00	**SKT006**	**A**

Do not scale

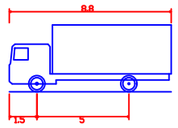
A3



Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Design Vehicle(s)



MRV - Medium Rigid Vehicle

Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	3.633m
Min Body Ground Clearance	0.428m
Track Width	2.500m
Lock to Lock Time	4.00 sec
Curb to Curb Turning Radius	10.000m

Issue	Date	By	Chkd	Appd
A	03/02/25	HZ	JG	AK

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Client
SINSW

Job Title
Googong High School Stage 1
Transport Assessment

Drawing Title
Supermarket Delivery Truck
From Wellsvale Drive
Right Turn Exit

Scale at A3 1:300

Discipline Transport

Drawing Status
Draft

Job No	Drawing No	Issue
297286-00	**SKT007**	**A**

Do not scale

A.4.4 Construction access swept paths

Option 1: Site access via Observer Street

Heavy rigid vehicles and articulated vehicles are able to easily navigate the right turn from Wellsvale Drive onto Observer Street. Entry into site is made through a left turn from Observer Street.

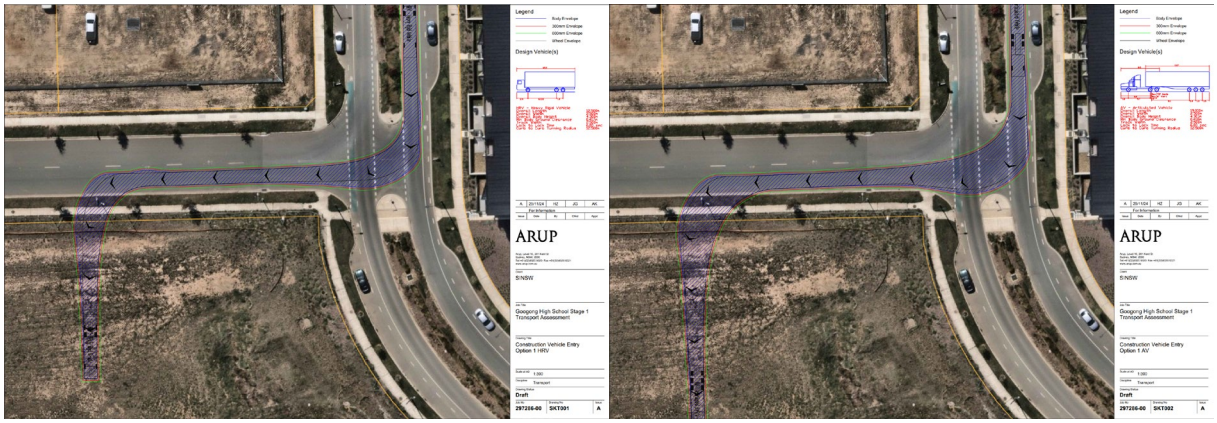

Figure 78. Construction vehicle entry Option 1 HRV and AV.

Option 2: Site access via Wellsvale Drive opposite McFarlane Avenue

The size limit of vehicles that can be accommodated by the road network for Option 2 is the 12.5m long heavy rigid vehicle. Articulated vehicles are unable to perform the right turn from Wellsvale Drive onto Site without mounting the median. Entry into site is made through a right turn from Wellsvale Drive.

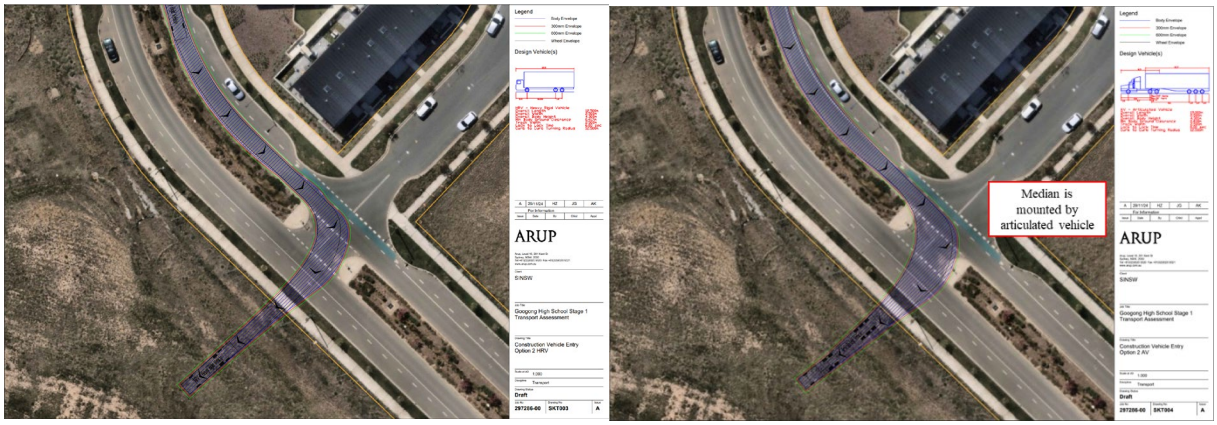

Figure 79. Construction vehicle entry Option 2 HRV and AV.