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East Wanneroo Precinct 15 Local Structure Plan

Transport Impact Assessment

PREPARED FOR:
Stockland

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Author: Robin White

Project manager: Behnam Bordbar

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1 Introduction

This Transport Impact Assessment has been prepared by Transcore on behalf of Stockland with regard to the Local Structure Plan (LSP) for East Wanneroo Precinct 15 in the City of Wanneroo.

The subject site is located approximately 4 kilometres northeast of the Wanneroo town centre and is bounded by Coogee Road to the north, Mariginiup Road to the west, Lakeview Street to the south and Boundary Road to the east.

The subject site is Precinct 15 of the *East Wanneroo District Structure Plan* (DSP), as shown in **Figure 1.** The DSP proposes Precinct 15 to include a neighbourhood activity centre, urban and suburban residential neighbourhoods, a high school and 50ha regional sporting facility. The DSP also indicates an underground transit corridor running north south through the middle of this precinct with a future Mariginiup Station and associated park & ride facility located adjacent to the neighbourhood centre site.

This report assesses the traffic flows that will be generated by the land uses proposed in the LSP and the corresponding road network requirements within the LSP area.

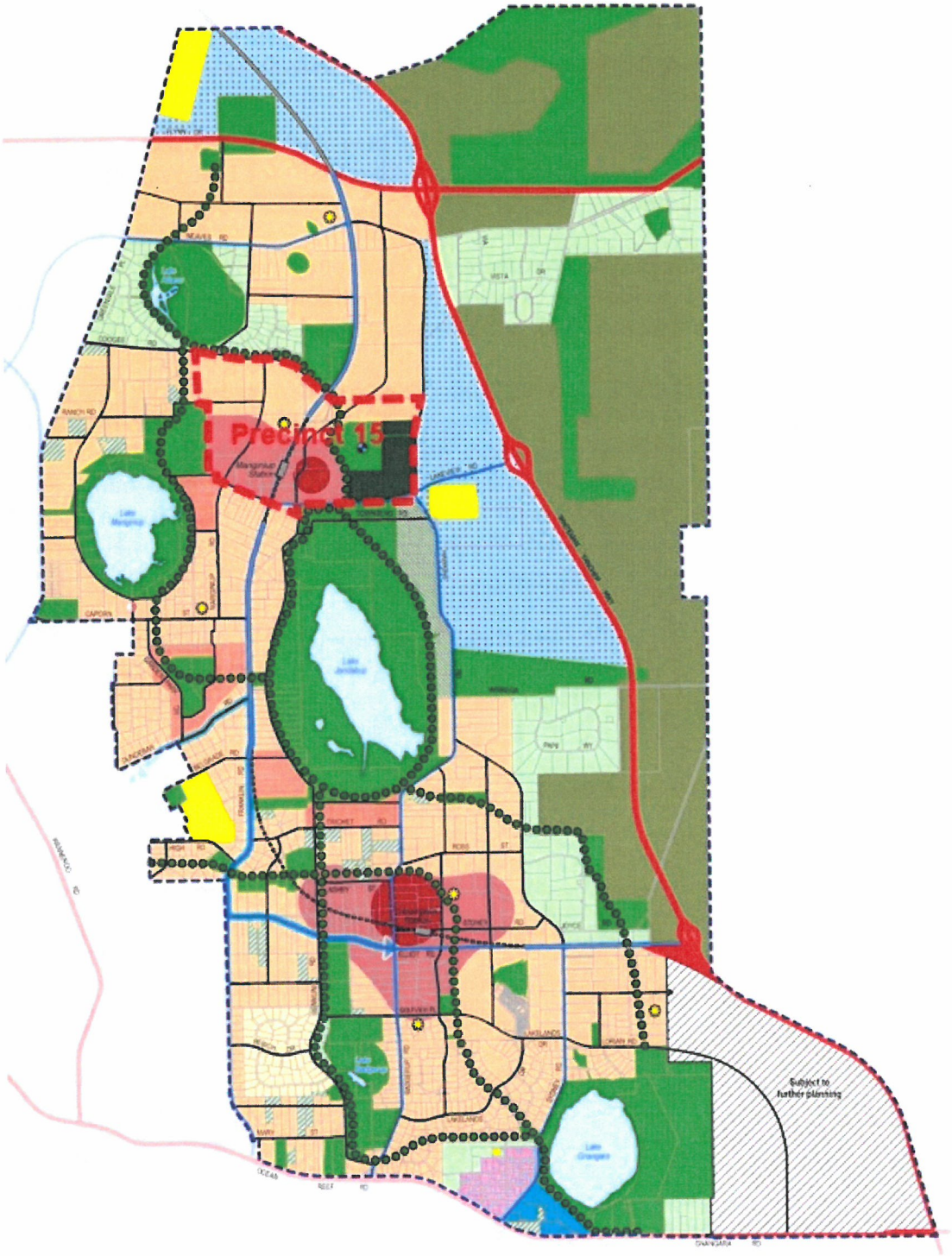

Figure 1: Site location on East Wanneroo District Structure Plan

2 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) for East Wanneroo Precinct 15 is included at **Appendix A** and a smaller copy (without legend) is shown in **Figure 2**.

Figure 2: Local Structure Plan

The proposed land uses in the LSP area and anticipated size or quantity for the purpose of this Transport Impact Assessment, are summarised in **Table 1**.

Table 1: Proposed land uses

Land Use	Quantity
Residential	3,500 dwellings
Neighbourhood Centre	6,000m^2 NLA
K-12 School	2,000 students
Primary School	540 students
Mariginiup Station	1
Park & Ride car park	2,000 spaces
Regional sporting facility	47.4 hectares

The main north south arterial road corridor through the middle of the LSP area is Franklin Road. A future underground transit corridor is indicated on the eastern side of this road corridor, which is ultimately anticipated to be a railway line with a rail station located on the western side of the proposed neighbourhood centre.

The future Mariginiup rail station will be located on the western side of the neighbourhood centre. A park & ride car park is planned for this Mariginiup station. The LSP proposes this park & ride car park to be located on the eastern side of the neighbourhood centre so that the pedestrian movements between car park and station will travel via the east west 'main street' of the neighbourhood centre to activate this main street social and shopping environment.

A 1.78ha site is shown on the LSP for the proposed park & ride car park. It is anticipated this would be developed as a multi-storey car park of up to four levels to accommodate more than 2,000 parking spaces, if required in future. (2,000 spaces are assumed for the purposes of this assessment.)

A high school site is nominated in this precinct in the DSP but this is proposed as a combined high school and primary school site (Kindergarten to Year 12) in the LSP and is therefore anticipated to accommodate in the order of 2,000 students.

The regional sporting facility on the eastern side of the LSP area will provide a wide variety of sporting facilities including football ovals and other playing fields, tennis and netball courts, clubrooms and indoor recreation facilities. Highest usage would occur on weekends.

3 Existing Situation

3.1 Existing Land Use

Existing land uses within the subject site are predominantly rural, as shown in **Figure 3**.

Figure 3: Existing Land Use

3.2 Existing Road Network

The existing road network and its classification in the Main Roads WA functional road hierarchy is illustrated in **Figure 4**.

Figure 4: Existing road hierarchy

Coogee Road is classified as a Local Distributor in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders, adjacent to the subject site. It terminates as a cul-de-sac at its eastern end. The posted speed limit on this section of Coogee Road is 60km/h.

Rousset Road is also classified as a Local Distributor in the Main Roads WA functional road hierarchy. Rousset Road is constructed northwards from the Franklin Rd / Caporn St intersection as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders. It has a posted speed limit of 80km/h, reducing to 50km/h north of the Lakeview Road intersection.

The sealed section of Rousset Road ends inside the LSP area, approximately 500m north of the Lakeview Road intersection. The remainder of Rousset Road through the LSP area is an unsealed road.

Lakeview Street is classified as an Access Road in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 5.5 to 6m and unsealed shoulders.

Mariginiup Road is classified as an Access Road in the Main Roads WA functional road hierarchy. It is constructed as a two-lane rural road with sealed width of approximately 6m and unsealed shoulders south of Lakeview Road. North of Lakeview Road it is only an unsealed track for property access.

Boundary Road does not have a classification in the Main Roads WA functional road hierarchy. It is closed off by a gate north of Townsend Road and is not open to the public. It is currently only an unsealed track for property access.

3.3 Existing Traffic Volumes

No existing traffic counts are available within the LSP area. All existing roads in the LSP area are anticipated to have relatively low traffic volumes consistent with their relatively narrow sealed road widths.

3.4 Heavy Vehicle Routes

Restricted Access Vehicle (RAV) Network routes are designated for access by large heavy vehicle combinations that require special permits for each trip. Main Roads WA manages the RAV Networks and the permits for trucks to use them. **Figure 5** shows the roads that are permitted for use by Tandem Drive RAV Networks 2 (orange), 3, (light blue) and 4 (dark blue) vehicles in the surrounding area. RAV Networks 2, 3 and 4 permit access by a number of vehicle combinations up to 27.5m long subject to relevant height, width and weight limits.

Rousset Road is currently included in Tandem Drive RAV Network 4 with access south to and from Ocean Reef Road via Franklin Road – Lenore Road or via Townsend Road – Hawkins Road. (This section of Rousset Road is also included in other RAV Networks including Tandem Drive Network 4 Concessional Level 1, Tri Drive Network 1 including Concessional Level 1, PBS Tandem Drive Network 1 Concessional Level 1, PBS Tri Drive Concessional Level 1 and 27.5m Oversize B-Double, which offer other variations on maximum load and vehicle configurations.)

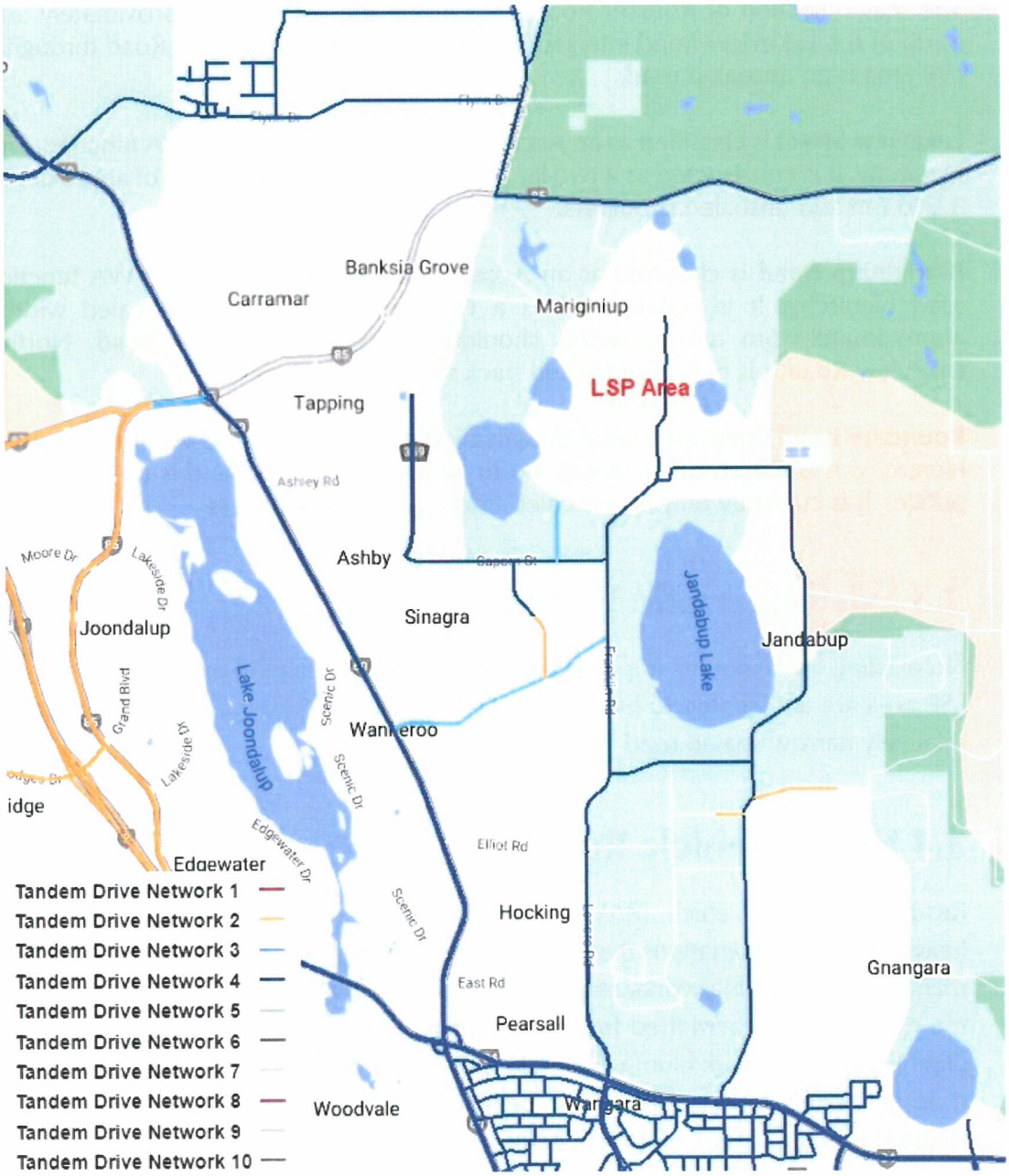

Figure 5: Restricted Access Vehicles Network

3.5 Public Transport

The closest existing bus routes to the subject site include:

- Route 389: Perth – Wanneroo (closest stop Steven St before Dundebar Rd, Wanneroo)
- Route 390: (Joondalup Station – Banksia Grove (closest stop Joondalup Dr before Pinjar Rd, Banksia Grove)
- Route 467: Whitfords Station – Joondalup Station (closest stop Elizabeth Rd before Dundebar Rd, Wanneroo)

The closest bus stop for route 390 is approximately 2.5km west of the LSP area and the closest bus stops for routes 389 and 467 are approximately 4km southwest of the LSP area.

3.6 Pedestrian and Cyclist Facilities

Existing bicycle facilities in the surrounding area are illustrated on the Perth Bike Maps published by the Department of Transport, as shown in **Figure 6**. There are currently no bicycle facilities within the LSP area.

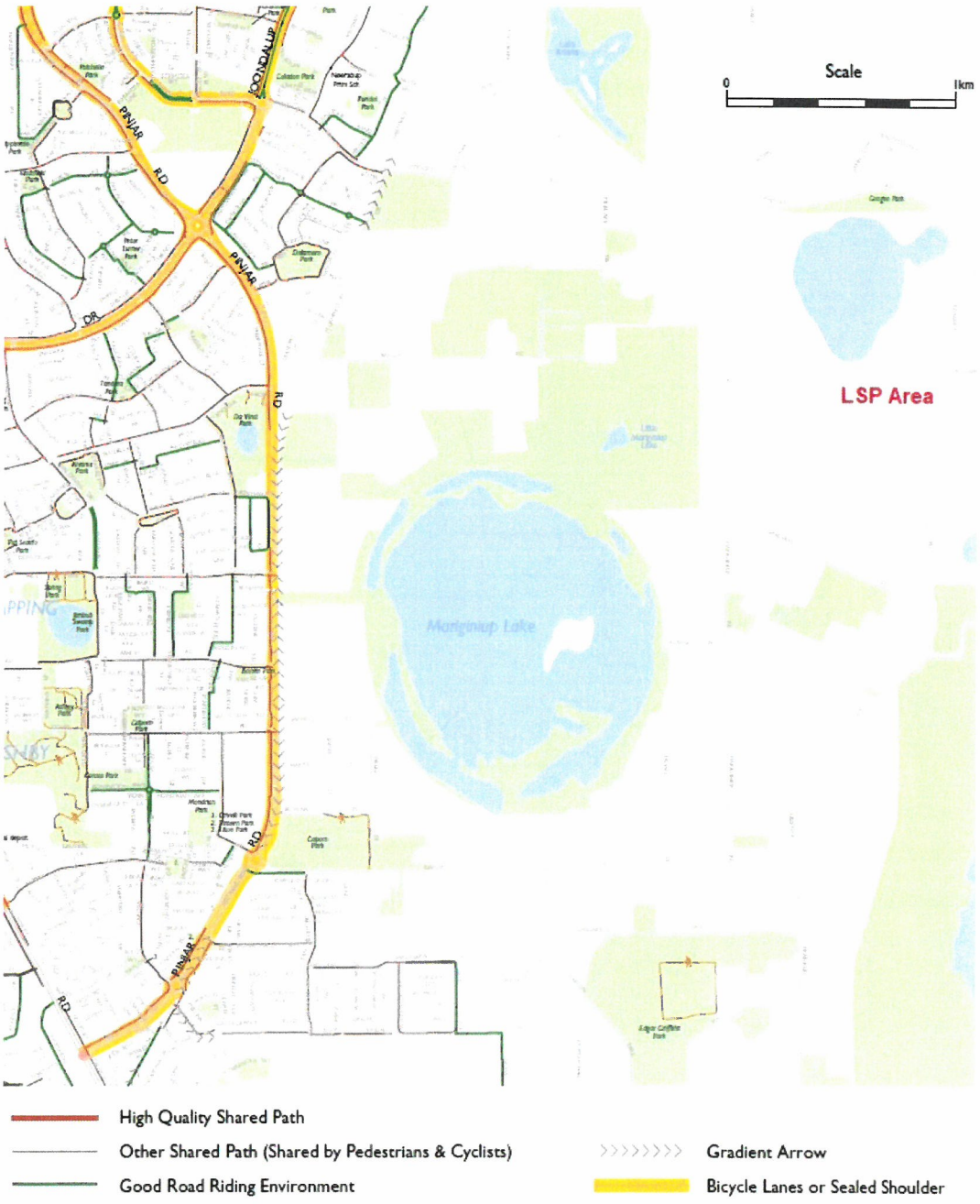

Figure 6: Existing bicycle facilities

High-level future planning for cycling facilities is now set out in Western Australia's Long Term Cycle Network (LTCN), which identifies an aspirational blueprint to ensure State and local governments continue to work together towards the delivery of a continuous cycling network providing additional transport options, recreational opportunities and support for tourism and commercial activity. The LTCN identifies the function of a route - primary, secondary or local - rather than the form it should take. Function considers the type of activities that take place along a route, and the level of demand (existing and potential). A route's built form is based on the characteristics of the environment, including space availability, topography, traffic conditions (speed, volumes), primary users, and so on.

The LTCN in the East Wanneroo area is illustrated in **Figure 7**, which shows future primary routes (red), secondary routes (blue) and local routes (green).

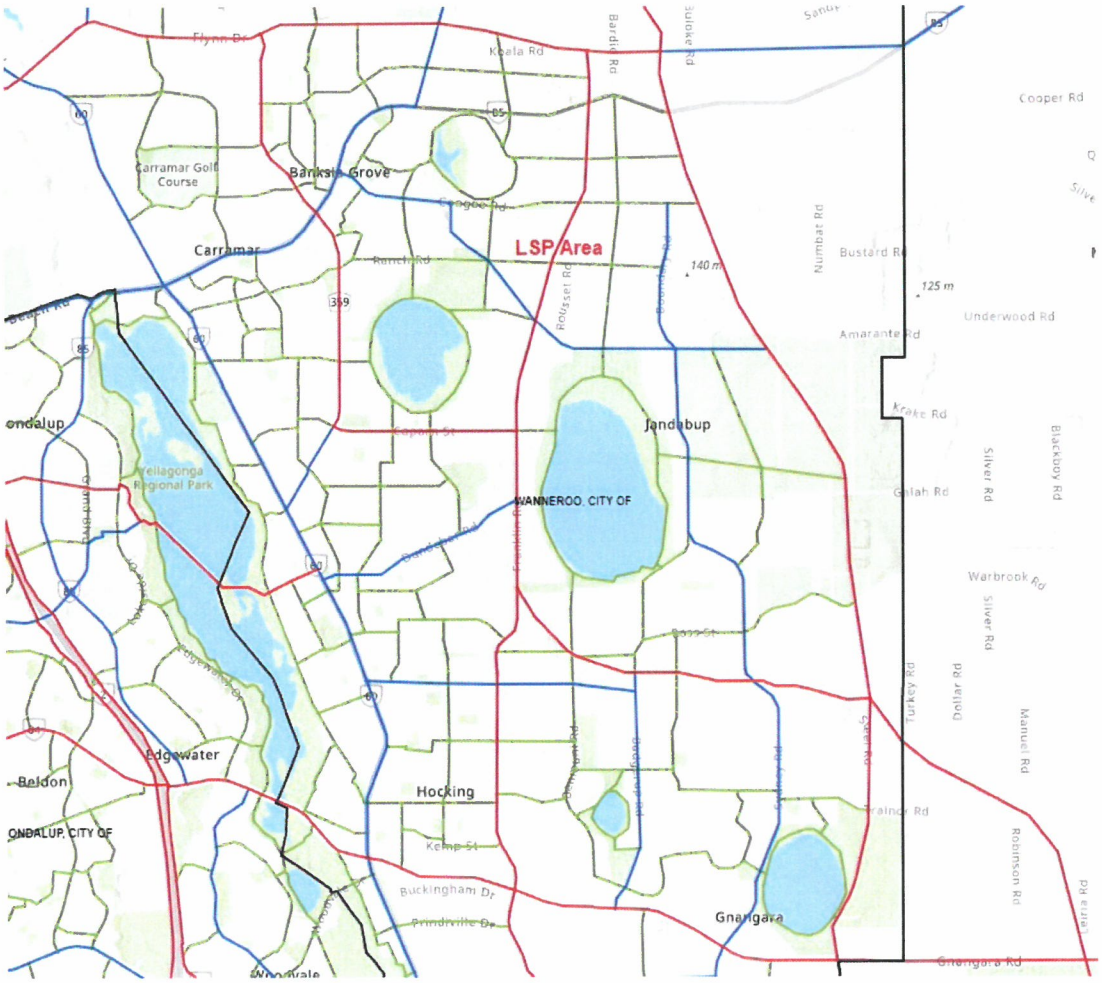

Figure 7: Long Term Cycle Network

A primary route is planned on the north south arterial / transit corridor through the LSP area. A north south secondary route is planned on Boundary Road – Hawkins Road (eastern boundary of the LSP area) and an east west secondary route is planned

on Townsend Road – Lakeview Road and diagonally northwest across the corner of the LSP area to Coogee Road. A number of local routes are also shown within the LSP area.

3.7 Changes to Surrounding Transport Network

The subject site is Precinct 15 of the *East Wanneroo District Structure Plan* (DSP), as shown in **Figure 1.**

The future arterial road network within the DSP area is illustrated in **Figure 8**. Key features of the future road network that are of particular relevance to Precinct 15 include:

- Whiteman Yanchep Highway (primary distributor) – a future 6-lane, controlled access highway along the eastern boundary of the DSP area;
- Lenore/Franklin Road (integrator arterial) – north south arterial road running through the centre of Precinct 15;
- Lakeview Road (integrator arterial) – east west arterial road along the southern boundary of Precinct 15 from Lenore/Franklin Road to Whiteman Yanchep Highway;
- Hawkins Road (integrator arterial) – north south arterial south of Lakeview Road; and
- Boundary Road (neighbourhood connector) – eastern boundary of Precinct 15.

The DSP shows a future transit corridor along the Lenore/Franklin Road alignment in the northern half of the DSP area but it should be noted that the DSP also identifies an alternative alignment for this future railway line within a 22-metre median along the Whiteman Yanchep Highway. The proposed LSP is designed to cater for the Lenore/Franklin transit corridor alignment to accommodate this option pending a final decision on this future rail alignment.

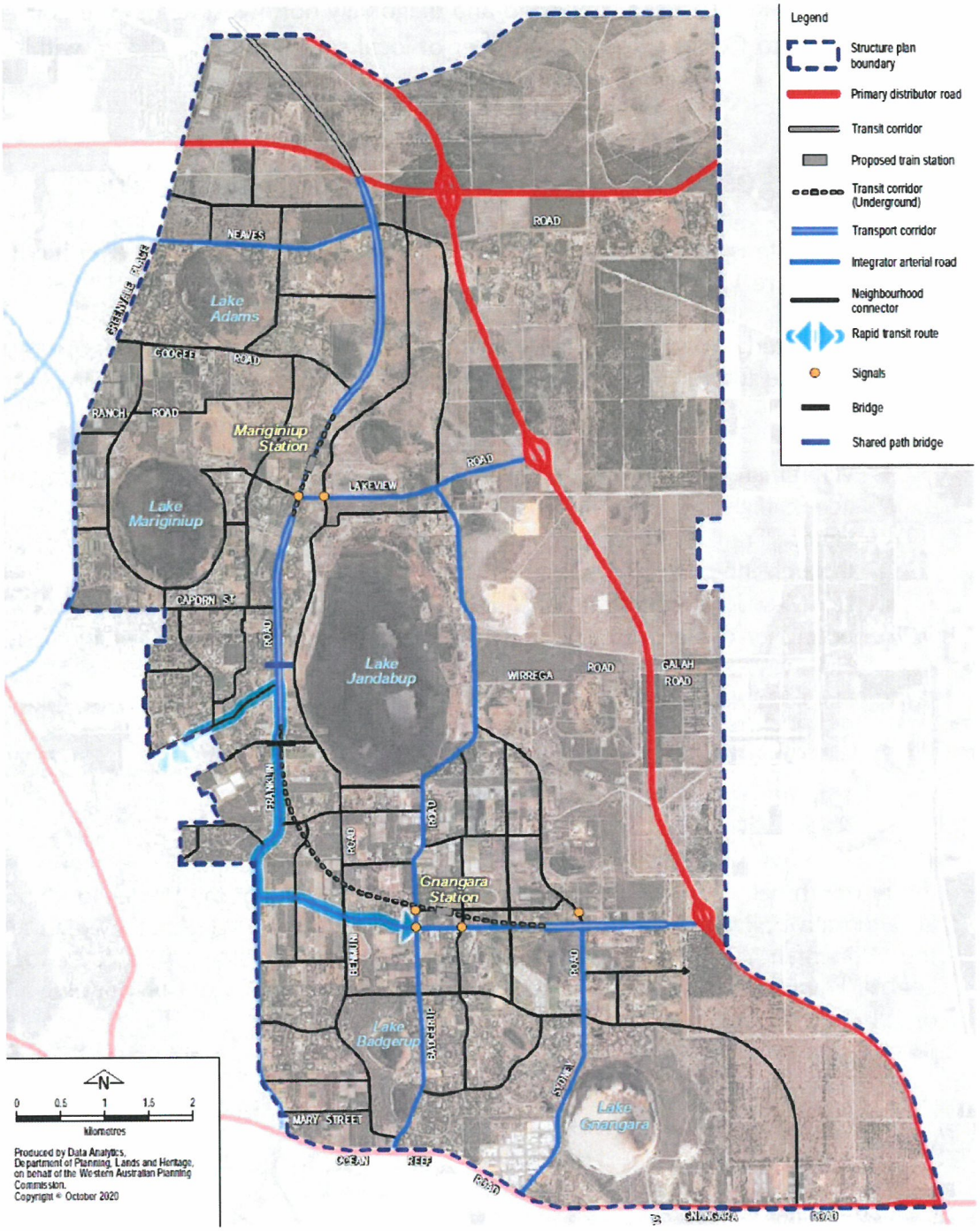

Figure 8: East Wanneroo DPS movement network

4 Proposed Transport Network

4.1 Road Hierarchy

The proposed hierarchy of roads in and around the LSP area is illustrated in **Figure 9** using the road hierarchy defined in the Western Australian Planning Commission *Liveable Neighbourhoods* (LN) policy.

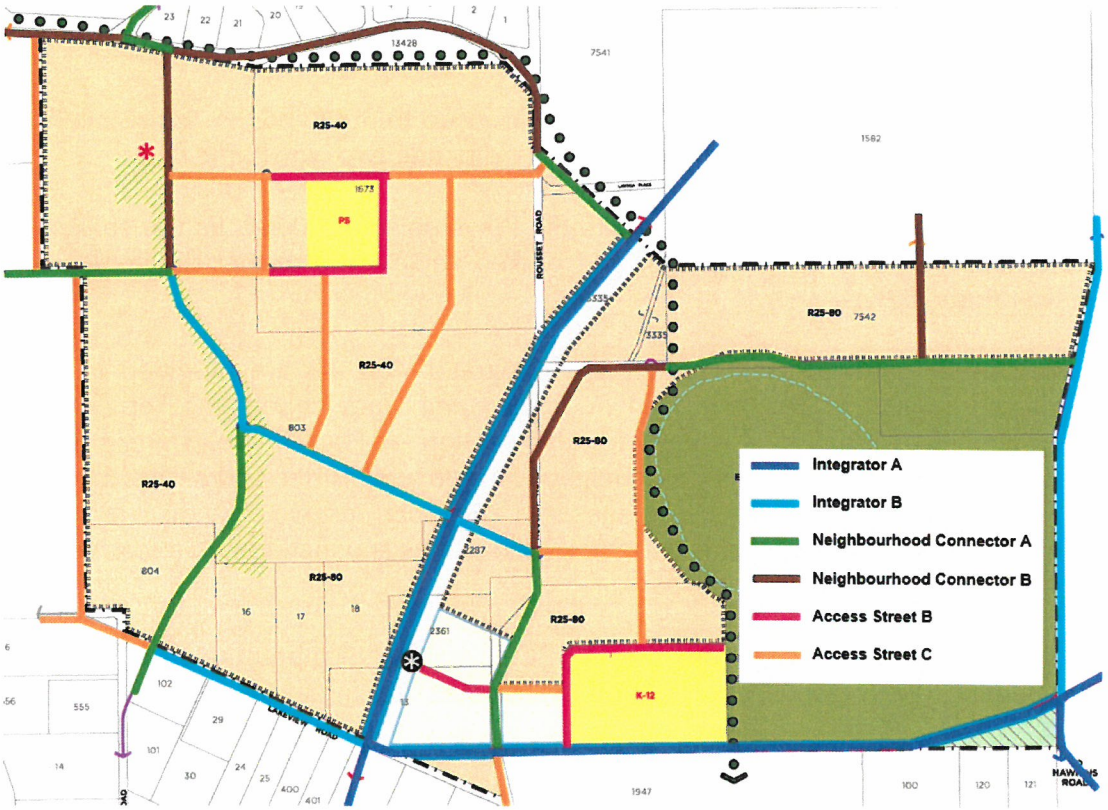

Figure 9: Proposed road hierarchy

The classification of roads in **Figure 9** is based on preliminary analysis of future traffic flows at section 6.3 of this report.

Integrator A roads are suitable for traffic flows up to 35,000vpd as dual carriageway roads (two lanes each way).

Integrator B roads are suitable for traffic flows up to 15,000vpd and can accommodate traffic flows up to 20,000vpd with suitable intersection treatments.

Neighbourhood Connector A roads are suitable for up to 7000vpd but some degree of flexibility with this upper limit may be appropriate in localised situations to avoid overdesigning some lengths of road. The main difference between Integrator B and Neighbourhood Connector A cross-sections is only the width of the median (6m

versus 2m) and the Liveable Neighbourhoods policy does allow for the median of an Integrator B to be reduced in width on sections that do not require right turn lanes in the median.

Neighbourhood Connector B roads are suitable for traffic flows up to 3000vpd but again some degree of flexibility with this upper limit should be considered appropriate in localised situations.

An Access Street B is suitable for traffic flows up to 3000vpd and can accommodate embayed parking on both sides. Access Street B is recommended for access streets abutting school sites but would typically only have parking on one side adjacent to the school site to avoid having students cross the road to access parked cars.

An Access Street C is suitable for traffic flows up to 3000vpd. Its 7.2m sealed width accommodates on-street parking without restricting two-way traffic flow.

An Access Street D is suitable for traffic flows up to 1000vpd. Its 6m sealed width accommodates on-street parking but parked vehicles do restrict simultaneous two-way traffic flow.

Proposed road cross-sections for the Integrator A roads are provided in the *East Wanneroo District Structure Plan Road Planning Study* report (11 Sep 2019). For convenience two cross-sections for this section of Franklin Road are included at **Appendix B**. Option 1 (outside of neighbourhood and district centres) has 6m median, 3.5m traffic lanes and 2m cycle lanes in a 35m road reserve. Option 5 (through the neighbourhood centre) adds two 3m parking lanes and increases the road reserve to 40.5m.

Standard cross-sections from the WAPC Liveable Neighbourhoods policy for the Integrator B, Neighbourhood Connectors and Access Streets are shown in **Appendix B.**

4.2 Public Transport

The planned transit corridor along the Lenore/ Franklin Road alignment through the LSP area will be the main public transport spine through the LSP area, with a future rail station and park & ride car park adjacent to the proposed neighbourhood centre.

All of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would be of suitable standard to accommodate bus services through this area, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

4.3 Pedestrian and Cyclist Facilities

All of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would have paths on both sides in accordance with Liveable Neighbourhoods guidelines, including a shared path on one side.

Paths would be required on at least one side of all roads in accordance with Liveable Neighbourhoods guidelines.

On-street cycle lanes are normally included only on Neighbourhood Connector A roads and above, due to traffic flows above 3000vpd on these categories of roads.

The resultant path network associated with the road network within the LSP area is indicated in **Figure 10.** This does not include paths outside of the road network, such as within public open space, which will be addressed by other consultants for this LSP.

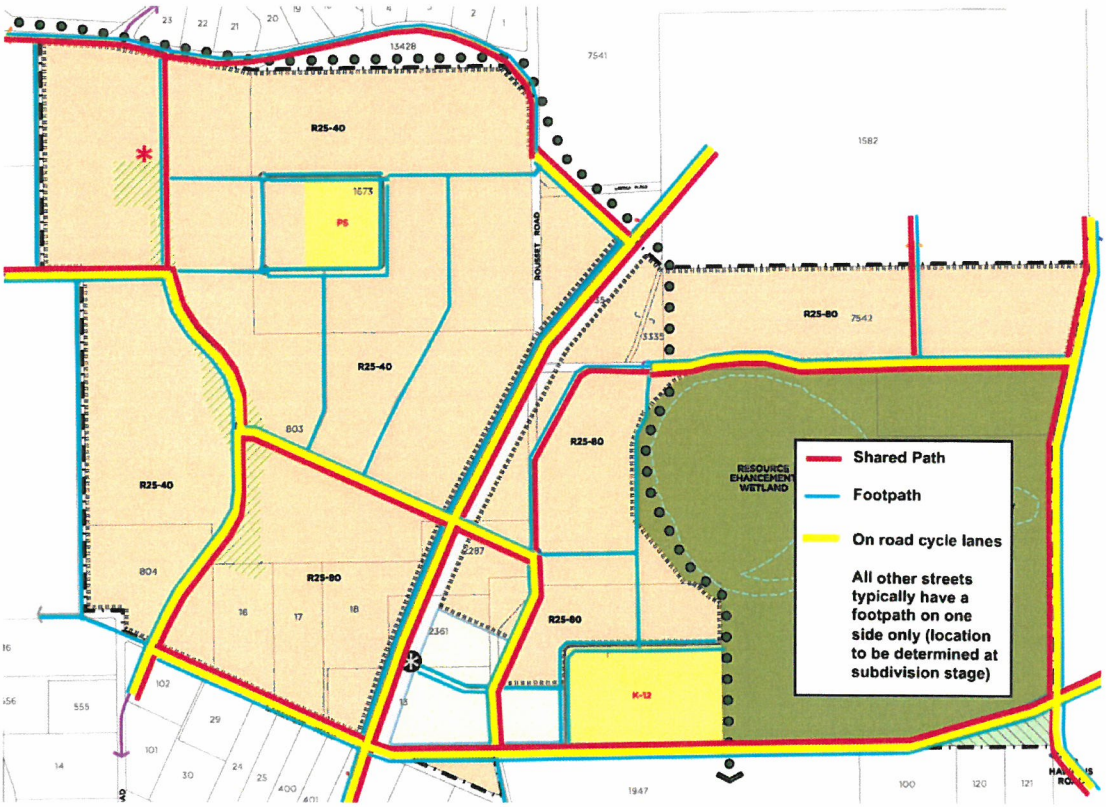

Figure 10: Pedestrian / Cycle Network

5 Integration with Surrounding Area

The *East Wanneroo District Structure Plan* (DSP) provides an overall plan to ensure coordination of future development of the subject site and the surrounding area. The proposed local structure plan for the subject site respects the principles and external connections of the DSP to ensure that good connectivity and integration with the surrounding area are achieved.

6 Analysis of the Transport Network

6.1 Assessment Period

The traffic assessment undertaken for the subject site is guided by the 2051 traffic projections reported for the arterial road network of the DSP area in the *East Wanneroo District Structure Plan Road Planning Study* report (11 Sep 2019) with full development of all land uses within the DSP area.

6.2 Traffic Generation and Distribution

The residential daily traffic generation rate used in the LSP area is 8 vehicle trips per day (vpd) per dwelling, which corresponds to peak hour trip generation rates of 0.8vph per dwelling recommended in the Western Australian Planning Commission (WAPC) *Transport Impact Assessment Guidelines* (2016). The anticipated yield of approximately 3,500 dwellings in the LSP area will therefore generate approximately 28,000vpd.

Information provided in the Department of Education's *Primary School Brief* indicates a daily trip rate of 2.6vpd per student is appropriate for new schools, with 1.0vph per student during before and after school peak periods. This is consistent with peak hour trip rates for schools in the WAPC TIA Guidelines. Therefore, the proposed K-12 school (2,000 students) is anticipated to generate approximately 5,200vpd and the primary school (540 students) approximately 1,400vpd.

Trip rates published in the NSW *Guide to Traffic Generating Developments* indicate a 6,000m^2 shopping centre under 10,000m^2 GLFA typically generates 121vpd/100m^2 GLFA on a Thursday, so the proposed 6,000m^2 neighbourhood shopping centre is anticipated to generate traffic flows of approximately 7,260vpd on a busy weekday.

The future park & ride car park (assumed 2,000 bays for this analysis) for the planned railway station is assumed to attract 2,000vpd inbound and 2,000vpd outbound for a total of 4,000vpd.

The regional sporting facility would have highest traffic generation on weekends and is anticipated to have much lower traffic generation on weekdays, particularly during road network weekday peak hours. The regional sporting facility weekday traffic generation is currently unknown but is not anticipated to be significant in comparison to the overall traffic generation of the LSP area and surrounding DSP area.

It should be noted that some of the trips calculated above will be internal trips within the LSP area, so the total trips generated within the LSP area is not simply the sum of traffic generations listed above. For example, a trip from home to the neighbourhood centre would be a single, combined trip rather than separate residential and shopping centre trips. The NSW *Guide to Traffic Generating Developments* suggests, "as a guide, about 25% of trips are internal to the subdivision, involving local shopping, schools

and local social visits." After allowing for internal trips to the park & ride facility as well, it is anticipated that approximately 30% of the total traffic generation will be internal trips within the LSP area.

The sum of traffic generations listed above is approximately 45,860 trip ends within the LSP area, with approximately 32,000 of those being internal-to-external trips or external-to-internal trips across the LSP area boundary.

Trip distribution of these external trips for the LSP area has been modelled to approximately reproduce the same overall trip pattern evidenced by the DSP traffic projections in the *East Wanneroo District Structure Plan Road Planning Study* report. The resultant external traffic distribution of traffic to and from the LSP area is as follows:

- 19% North (Franklin Rd, Boundary Rd and local roads)
- 10% West (Coogee Rd, Ranch Rd)
- 24% East (Lakeview Rd)
- 47% South (Franklin Rd, Hawkins Rd and local roads)

6.3 Traffic Flow Forecasts

Daily traffic flows generated by the LSP area and through traffic through this precinct generated by the rest of the DSP area have been assigned on the LSP area road network to determine future, full development, daily traffic flows on the LSP area road network.

The resultant total daily traffic flows on the LSP area road network are shown in **Figure 11**. The component of these total traffic flows that has an origin or destination within the LSP area is shown in brackets.

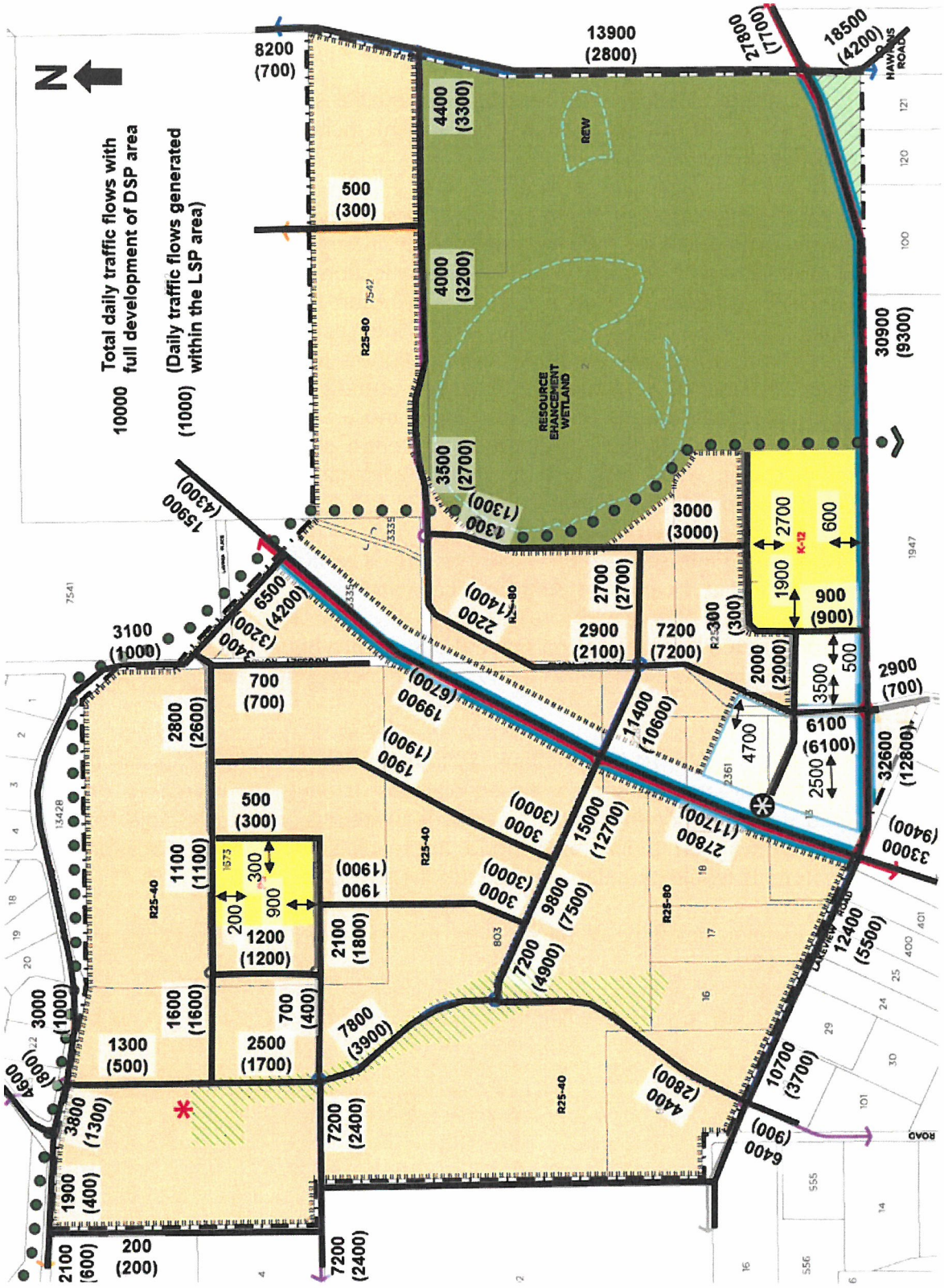

Figure 11: Future total daily traffic flows

6.4 Roads and Intersections

The anticipated future road network around the subject site has been detailed in section 4 of this transport impact assessment, including discussion of the proposed road hierarchy in section 4.1.

The *East Wanneroo District Structure Plan Road Planning Study* report (2019) identifies the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / Hawkins Road / Boundary Road 4-way intersection as future signalised intersections. The *East Wanneroo District Structure Plan* report (2021, figure 2.12) indicates the Franklin Road / Lakeview Road 4-way intersection and the Lakeview Road / neighbourhood connector 4-way intersection as future signalised intersections but does not indicate a signalised intersection at the Lakeview Road / Hawkins Road / Boundary Road intersection. Accordingly, those two major 4-way intersections on Lakeview Road at the neighbourhood centre should be planned as signalised intersections, which will also facilitate pedestrian and cyclist movements across Lakeview Road to this activity centre.

Other major intersections on the arterial roads would either require traffic signals or a roundabout to provide sufficient capacity for right turn movements. There is generally a preference for roundabouts at these intersections unless it can be demonstrated that traffic signals would operate at a better level of service than signals. Accordingly, those other intersections will generally be indicated as roundabouts in the LSP.

Other minor 4-way intersections at intermediate locations can be treated with threshold treatments such as raised plateaus or brick-paved sections on the minor road legs to reduce speed and raise driver awareness of the intersection and the need to give way on those minor road approaches. Appropriate locations for such treatments would be determined at subdivision stage.

The location and type of intersection treatment of key intersections are shown in **Figure 12**.

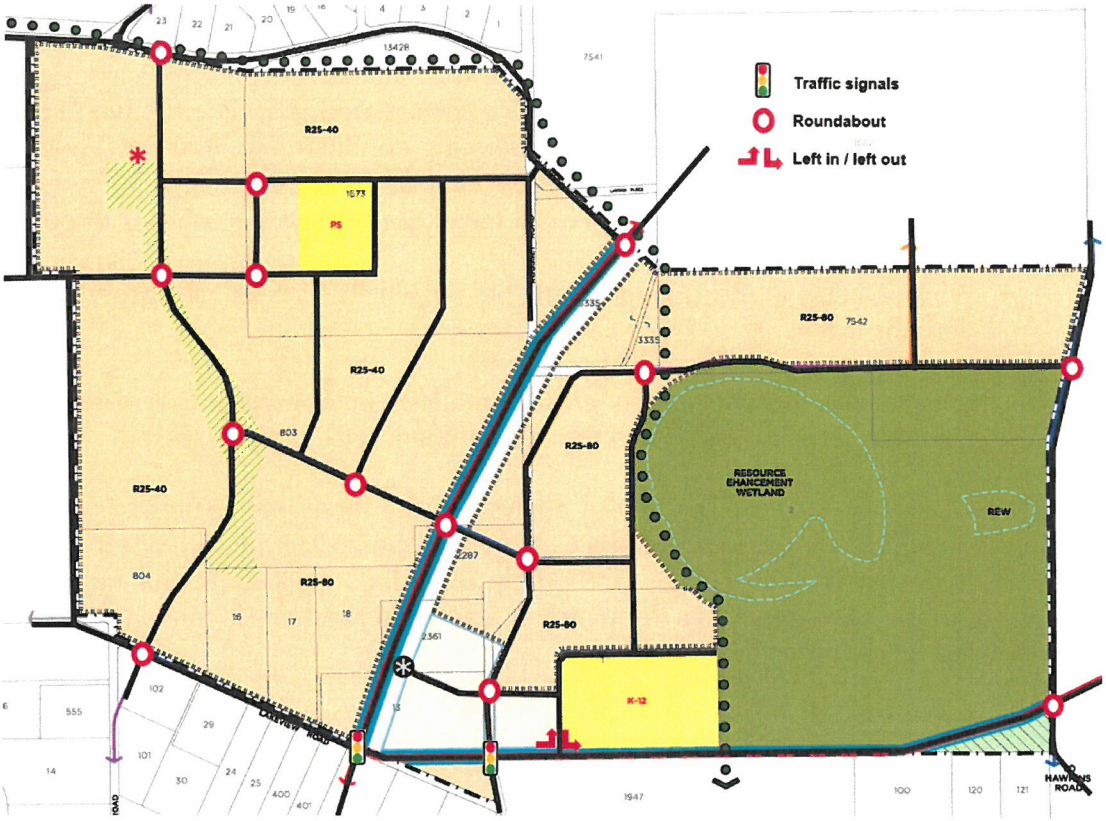

Figure 12: Key intersections

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for three key intersections near the neighbourhood activity centre for the weekday AM peak and PM peak hour flows that correspond to the modelled 2051 daily traffic flows in **Figure 11**. The peak hours adopted for this analysis are 8-9AM and 3-4PM to include before and after school peak traffic, which is anticipated to be a particularly significant factor in determining peak periods in this vicinity.

The three key intersections analysed are the two signalised intersections on Franklin Road and Lakeview Road, and the 4-way roundabout on Franklin Road north of the rail station.

Capacity analysis of these intersections has been undertaken using SIDRA Network analysis in the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.

- Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- Average Delay is the average of all travel time delays for vehicles through the intersection.
- 95% Queue is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in **Appendix C** and satisfactory intersection performance is shown for each of the intersections assessed.

Schematic diagrams from the SIDRA analysis of the three intersections assessed are shown in **Figure 13** and in **Appendix C**. Note that these diagrams are not to scale and are not design drawings. They are purely intended to illustrate the number and arrangement of traffic lanes required at each intersection to accommodate the modelled future traffic flows.

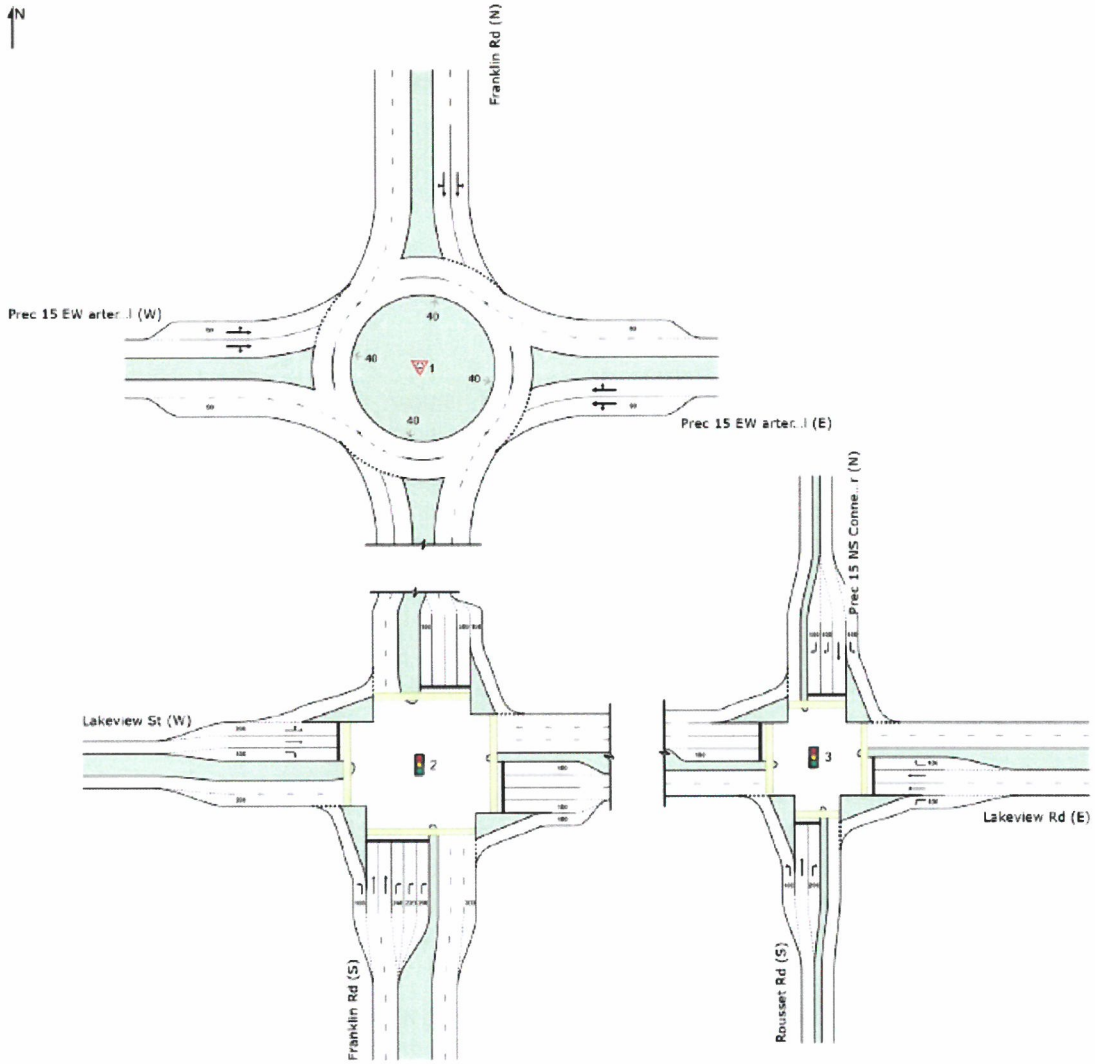

Figure 13: Intersection layouts analysed in SIDRA Network

6.6 Access to Frontage Properties

The WAPC *Liveable Neighbourhoods* policy requires that *"Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over 5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access."*

There is to be no direct driveway access to residential development on zoned land within the LSP area from the Integrator A roads – Franklin Road and Lakeview Road. Driveway access to car parks for the K-12 school and regional sporting facilities would be appropriate subject to detailed design of access arrangements as part of those future development applications.

Other roads within the LSP area carrying more than 5,000vpd can be seen in **Figure 11**, including each of the Integrator B roads and some of the Neighbourhood Connector A roads, particularly around the neighbourhood centre. Residential subdivisions along those roads would typically involve lot access via side roads or rear laneways. Another alternative suggested in Liveable Neighbourhoods involves wider lots with paired driveways and protected reversing areas in the parking lane but this would need to be coordinated by local development plans for those local areas.

All of the other roads in the LSP area are expected to carry less than 5,000vpd, so no restriction on vehicular access is required.

6.7 Pedestrian / Cycle Networks

The proposed network of footpaths and shared paths for pedestrians and cyclists is described in section 4.3 of this Transport Impact Assessment. This network of paths will provide an excellent level of accessibility and permeability for pedestrians and cyclists within the LSP area, and connections to neighbouring precincts at strategic locations.

The WAPC *Transport Impact Assessment Guidelines* (2016) provides guidance on the levels of traffic volumes that are likely to affect the ability for pedestrians to cross various types of road. Based on that guidance an undivided two-lane road should be acceptable for pedestrians crossing traffic volumes of up to approximately 11,000 vpd and this threshold can be increased to around 28,000 vpd by adding a central median or pedestrian refuge islands. On a four-lane road, because of its greater carriageway width, this threshold is lower; even with a median island the threshold is only around 16,000 vpd.

Only Franklin Road and Lakeview Road are expected to carry future traffic flows above these levels. The future K-12 school site north of Lakeview Rd, the railway station east of Franklin Road, the neighbourhood centre and the regional sporting facility will all be significant generators of pedestrian and cyclist movements across Franklin Road and Lakeview Road within the LSP area.

The signalised intersections at Franklin Rd / Lakeview Rd and at the north south neighbourhood connector intersection on Lakeview Road will include appropriate pedestrian facilities to assist pedestrians and cyclists crossing those roads at those locations. An additional pedestrian crossing facility should be provided on Franklin Road at the future rail station location to assist pedestrian and cyclist movements from residential areas west of Franklin Road to access the station, neighbourhood centre main street, K-12 school and regional sporting facilities. This could be in the form of a signalised pedestrian crossing when traffic and pedestrian numbers meet the warrants for that type of facility, or potentially a pedestrian underpass as part of a future underground rail line project within this LSP area.

It is anticipated that guard-controlled school crossings would be appropriate at the combined K-12 school site on Lakeview Road and the primary school site to assist students crossing the adjacent roads before and after school. Guard-controlled school crossings can easily be accommodated on Lakeview Road and on the Access Street B roads around those school sites at any location that suits the internal and external access routes of both schools at detailed design stage.

Information from the 2002-2006 Perth & Regions Travel Survey (PARTS) indicated that 25.4% of primary school students and 17.1% of high school students walk or cycle to school while 26.7% of primary and 21.9% of high school students walk or cycle home from school. Therefore a 540-student primary school would typically have about 140 students walking or cycling and a 1450-student high school would typically have about 250-320 students walking or cycling.

Warrant criteria provided on the WA Police website indicate that a Type A Children's Crossing may be provided where a minimum of 20 students and 200 vehicle movements occur within the hour immediately before and immediately after school, for a primary school, or 20 students and 700vph for high schools. The warrants are lower for a Type B Children's Crossing at 10 students and 100vph for a primary school or 10 students and 350vph for a high school. Such facilities can only be applied for by a School Principal or the President / Secretary of the relevant school/parent organisation (eg. P&C or P&F). The anticipated numbers of students crossing the Access Street B roads around the school sites would potentially meet these warrants in future, so it would be expected that the schools would apply for this type of facility when future student numbers and movements meet those warrants.

6.8 Access to Public Transport

At this stage of the structure planning process future bus routes are not known. As noted in section 4.2, all of the proposed neighbourhood connectors and integrator arterial roads shown on **Figure 9** would be of suitable standard to accommodate bus services through this area, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

7 Conclusions

This Transport Impact Assessment relates to the Local Structure Plan (LSP) for Precinct 15 of the East Wanneroo District Structure Plan in the City of Wanneroo.

The subject site is located approximately 4 kilometres northeast of the Wanneroo town centre and is bounded by Coogee Road to the north, Mariginiup Road to the west, Lakeview Street to the south and Boundary Road to the east.

Precinct 15 will include a neighbourhood activity centre, urban and suburban residential neighbourhoods for approximately 3,500 dwellings, a K-12 school, a primary school and a regional sporting facility.

The LSP also accommodates the underground transit corridor indicated in the DSP running north south through the middle of this precinct with a future Mariginiup Station and associated park & ride facility located adjacent to the neighbourhood centre site.

The traffic flows generated within the LSP area will result in approximately 32,000vpd of internal-to-external trips or external-to-internal trips across the LSP area boundary, as well as internal traffic flows between land uses within the LSP area.

The main arterial roads within the LSP area include Franklin Road running north south through the middle of the LSP area and Lakeview Road running east west along the southern boundary east of Franklin Road.

Three key intersections within the LSP area have been analysed to determine likely future intersection requirements. These are two signalised intersections on Franklin Rd and Lakeview Road, and a 4-way roundabout on Franklin Road north of the rail station.

A comprehensive network of paths and on-road cycle lanes will be provided on the LSP area road network in accordance with *Liveable Neighbourhoods* policy guidelines. The two proposed signalised intersections on Franklin Road and Lakeview Road will assist pedestrians and cyclists crossing those arterial roads in the vicinity of the neighbourhood centre. Another appropriate pedestrian crossing facility should be planned on Franklin Road at the future rail station location and a guard-controlled school crossing would be anticipated on Lakeview Road at the K-12 school site, as well as other guard-controlled crossings around the two school sites in future.

Future bus routes are not known at this stage but all of the proposed neighbourhood connectors and integrator arterial roads in the LSP area would be of suitable standard to accommodate bus services, providing suitable options for future feeder bus routes to the station and neighbourhood centre to service this area. This allows suitable flexibility for the Public Transport Authority to plan future bus routes within this area.

Appendix A

LOCAL STRUCTURE PLAN

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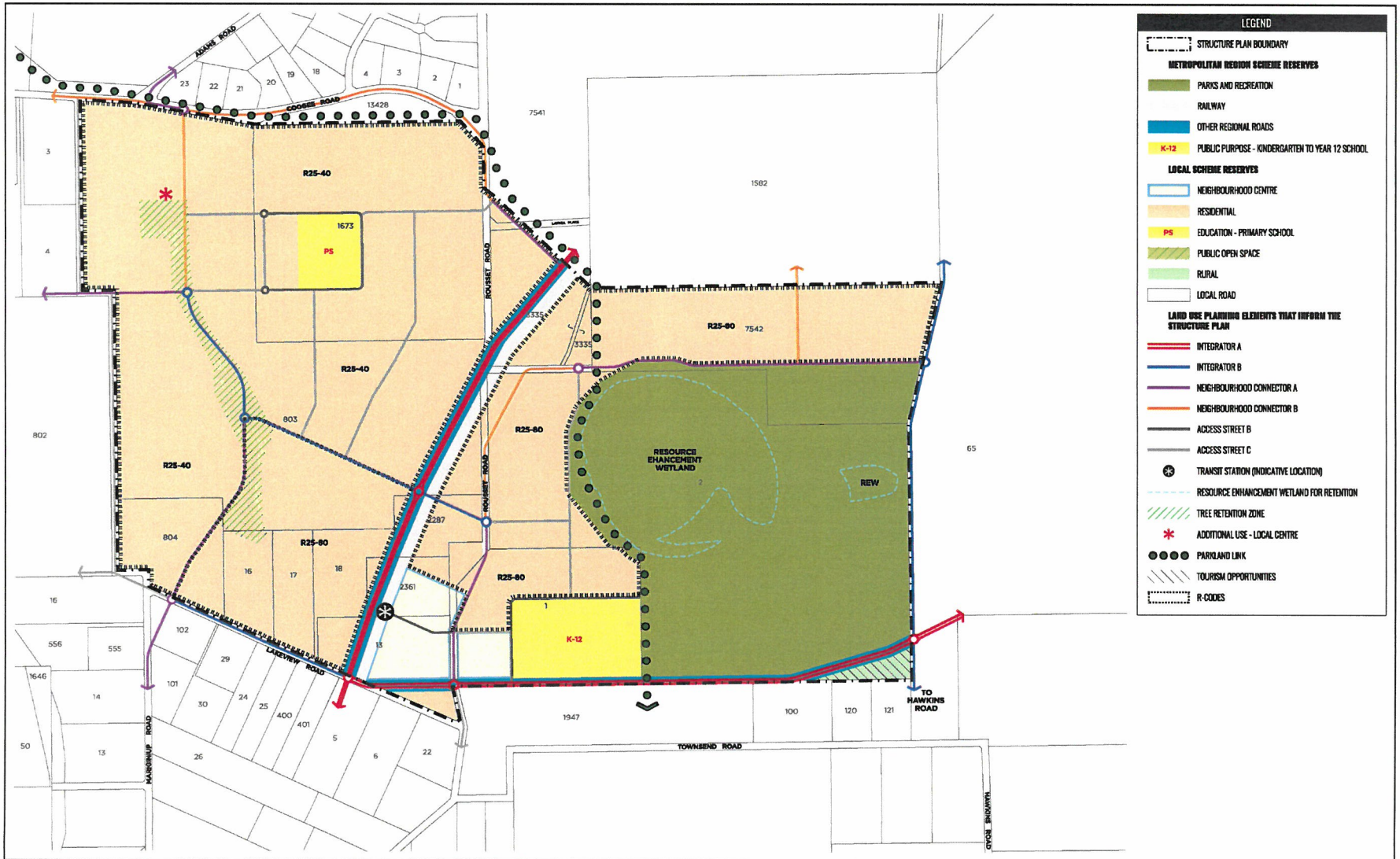
Engineering a better future for over 20 years!



PRECINCT 15 STRUCTURE PLAN

Various Lots, MARIGINIUP

A Stockland Project

DRAFT

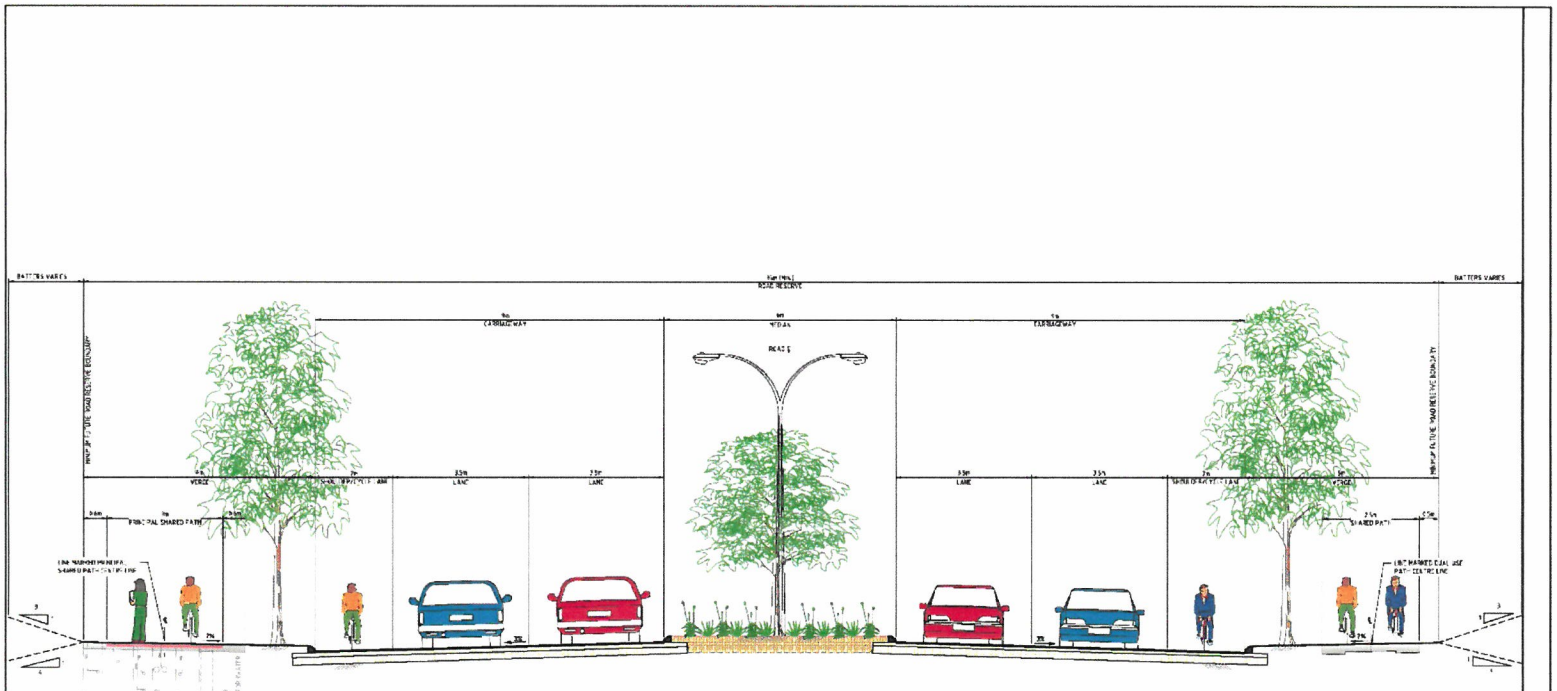
Unit 2, 464 Murray Street
Perth WA 6000
(08) 6333 1888
info@cdpaus.com.au
www.cdpaus.com.au

Appendix B

TYPICAL ROAD CROSS-SECTIONS

transcore

Engineering a better future for over 20 years!



TYPICAL CROSS-SECTION – OPTION 1

SCALE 1:50

ARTERIES OUTSIDE OF NEIGHBOURHOOD & DISTRICT CENTRES

- ETHORE ROAD – FRANKLIN ROAD
- SYDNEY ROAD
- HARRIS ROAD
- HIGH ROAD
- BADGERUP ROAD
- LAKEVIEW ROAD

NOTE:

1. CENTRAL MEDIAN TO BE LANDSCAPED WITH MATURE TREES, TREES TO BE OFFSET TO POWERPOLE LOCATIONS.
2. MEDIAN WIDTH SUFFICIENT FOR TURNING POCKETS, AS REQUIRED.
3. VERGE AND MEDIAN LANDSCAPING TO CITY OF WANNEROO SPECIFICATIONS.

Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Cardno
Shaping the Future

DESIGN SPEEDS:

ALL ROADS
POSTED SPEED LIMIT 70km/h
DESIGN SPEED 80km/h

STAGES SHOWN ON THIS PLAN ARE PRELIMINARY ONLY. STAGE CONSTRUCTION AND ULTIMATE DEVELOPMENT MAY DIFFER FROM DETAILS SHOWN.

BASE INFORMATION SUPPLIED BY WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY
DATE OF AERIAL PHOTOGRAPHY: 2017

DRAFT

AMENDMENTS				
No.	DESCRIPTION	DRAWN DATE	APPROVED DATE	NUMBER SHEETS
A	ISSUED FOR INFORMATION	PR	CR	TP

IN THE ABSENCE OF THE APPROVED SIGNATURE THIS DRAWING SHALL BE TREATED AS PRELIMINARY

DESIGNED :	P.R	DRAWN :	C.B
CHECKED :	P.R	APPROVED :	...
TITLE :			
FILE NO :			

NORTH

AS SHOWN

SHEET SIZE

A1

ROAD PLANNING STUDY FOR THE EAST WANNEROO DISTRICT STRUCTURE PLAN

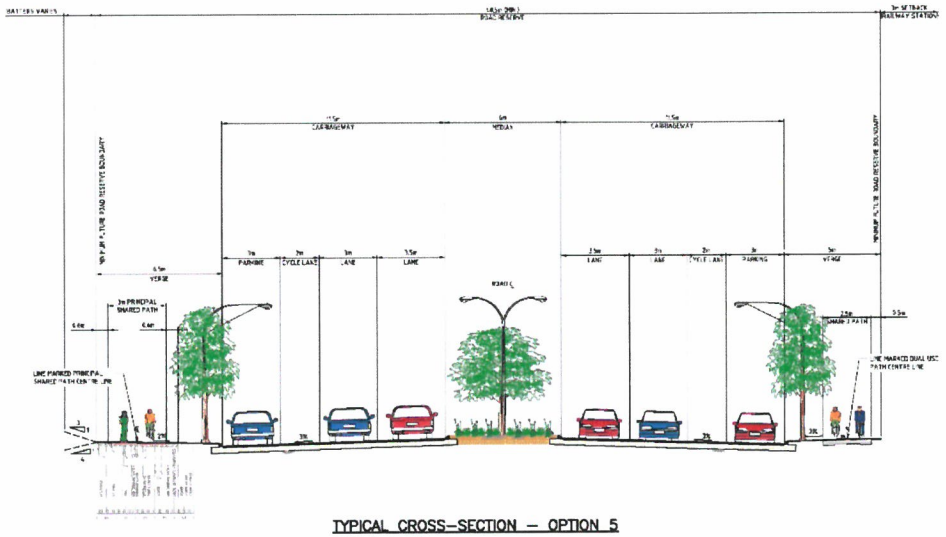
TYPICAL CROSS SECTION

CITY OF WANNEROO

INFRASTRUCTURE AND LAND USE COORDINATION

PLAN No.

1.7650



TYPICAL CROSS-SECTION – OPTION 5

SCALE 1:100

FRANKLIN ROAD - DISTRICT CENTRE

NOTE:

1. STREETSCAPE TO BE DESIGNED TO PROVIDE MAXIMUM TREE CANOPY WHILST MAINTAINING SAFE ROAD AND PATH LIGHTING.
2. PEDESTRIAN REFUGE ISLANDS TO BE PROVIDED TO FACILITATE SAFE PEDESTRIAN AND CYCLIST ROAD CROSSING.
3. CENTRAL MEDIAN TO BE LANDSCAPED WITH MATURE TREES. TREES TO BE OFFSET TO PRINCIPLE LOCATIONS.
4. MEDIAN WIDTHS ZEYOND FOR TURNING POCKETS, AS REQUIRED.
5. VERGE AND MEDIAN LANDSCAPING TO CITY OF WANNEROO SPECIFICATIONS
6. PARKING LANE TO BE CONSIDERED FOR BUS, TAXI & RIDESHARE FACILITY WHERE 2.7 / PEDESTRIAN SEPARATION TO BE PROVIDED AT PEDESTRIAN / CYCLIST MEDIAN BREAK LOCATIONS AS REQUIRED BY LANDGATE.

DESIGN SPEEDS

ALL ROADS:

DETAILS SHOWN ON THIS PLAN ARE PRELIMINARY ONLY. STAGE CONSTRUCTION AND ULTIMATE DEVELOPMENT MAY DIFFER FROM DETAILS SHOWN.

Department of Planning, Lands and Heritage

Cardno Shaping the Future

BASE INFORMATION SUPPLIED BY WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY DATE: AERIAL PHOTOGRAPHY 2017

DRAFT

AMENDMENT					
A	ISSUED FOR INFORMATION	PE	CR	P	
	DESCRIPTION	DESIGNED	APPROVED	DRAWN	DATE

IN THE ABSENCE OF THE APPROVED SIGNATURE THIS DRAWING SHALL BE TREATED AS PRELIMINARY

DESIGNED	P.R	CHECKED	G.R
DRAWN	P.R	APPROVED	L.P
TRACED			
FILE REF			

NORTH AS SHOWN

SHEET SIZE A1

ROAD PLANNING STUDY FOR THE EAST WANNEROO DISTRICT STRUCTURE PLAN

TYPICAL CROSS SECTION

CITY OF WANNEROO

INFRASTRUCTURE AND LAND USE COORDINATION

PLAN No. 1.7654

SCALE 1:100

Integrator B - arterial streets

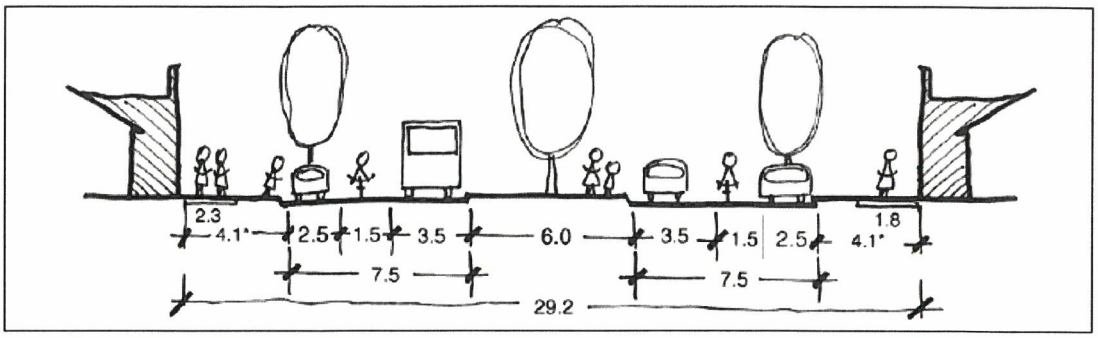


Figure 15: Integrator B – outside centres – 60 km/hr (up to 15 000 vehicles per day - see note 2).

Two lanes, central median, buses, cycle lanes and parking. Development fronting, forward vehicle exiting.

Note:
1. Central median may be reduced along sections where right-hand turn lanes are not required.
2. Traffic volumes up to 20 000 vehicles per day may be acceptable provided that detailed design addresses intersections, parking, access and bus movement (**table 1**).
3. The 6.0 m median is required for staged vehicle crossings and for clearance to trees.
4. The 2.5 m parking bays may be indented into the verge. If parking is indented, then the verge may be increased to 5.5 m minimum including parking, and reserve width may be decreased as a result, to 27 m.

* Where a wider shared path, extensive street furniture or provision for reversing into parking lane is required, the verge width will need to be widened. Typically verges may be up to 4.5 m and total reserve width 30 m.

Neighbourhood connector streets

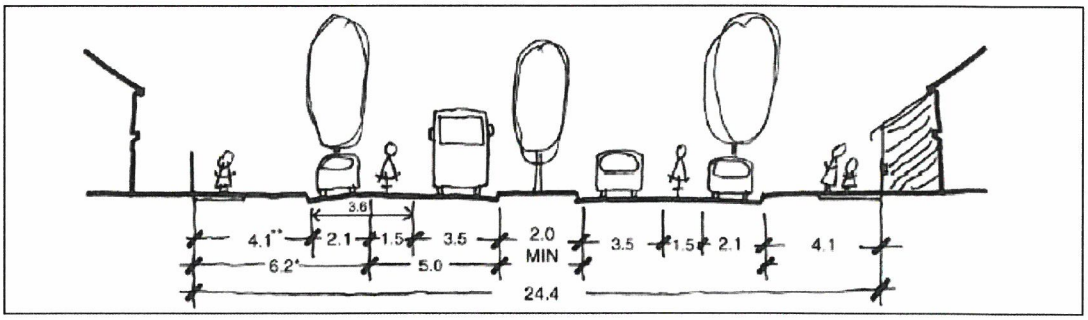


Figure 17: Neighbourhood connector A – 50 km/hr (up to 7000 vehicles per day, with >3000 vehicles per day preferred).

Central median, buses, cycle lanes and parking. Bus stops are normally in travel lane against kerb extensions in parking lane.

Note:
1. * For volumes less than 3000 vehicles per day and the street is not ever likely to be a bus route, the road pavement may be reduced from 5.0 m to 4.0 m with no marked cycle lane, and the total reserve width reduced to 22.4 m.
2. Reversing out from abutting dwellings is acceptable if less than 5000 vehicles per day. For 5000-7000 vehicles per day, protected reversing spaces may be used for larger lots using paired driveway crossovers with ability to reverse into the parking lane.
3. Median will need appropriately located breaks to allow U-turns to frontage-access properties.
4. ** Verge width (including parking) can often be reduced from 6.2 m to 5.5 m with indented parking, to reduce overall reserve width to 23.0 m.
5. For larger trees, central median widths of 2.5-4 m are preferred. For medians with drainage swales, a minimum median width of 6 m is suggested.
6. Where a visually narrower carriageway is needed to assist with speed control, or where parking turnover is high, the parking lane may be widened to 2.3 m and the cycle lane narrowed to 1.2 m.
7. In some circumstances the median may be omitted. On these sections, indented parking should normally be used to assist in visually narrowing the carriageway. If parking is indented, then the reserve width will be 22.4 m.

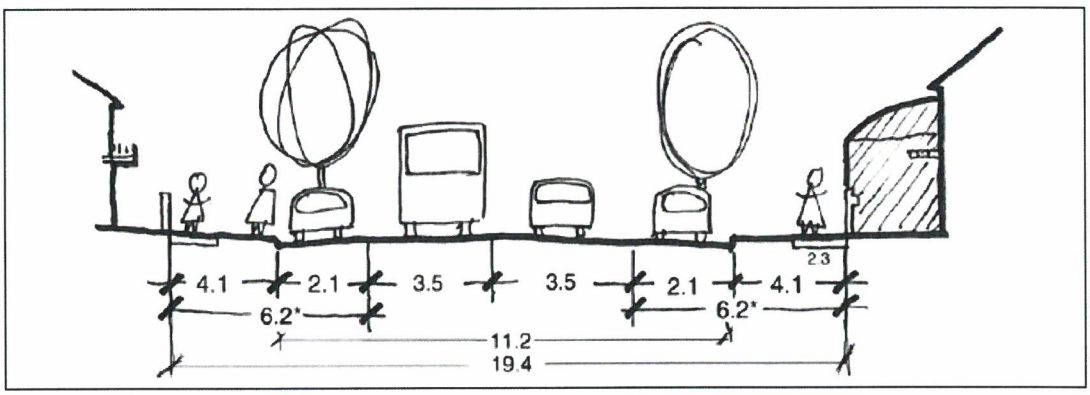


Figure 18: Neighbourhood connector B – 50 km/hr (<3000 vehicles per day).

Lower volume neighbourhood connector, bus route, no cycle lanes, parking. Typically a residential environment with low parking turnover. Detailing of design to visually narrow street (eg including trees in parking lane, painted parking line), together with other speed control mechanisms to limit typical operating speeds to less than 50 km/hr. Bus stops in travel lane against kerb extension in parking lane. A2-2.3 m shared path provided on at least one verge in lieu of on-street cycle lane.

Note: * Verge width (including parking) can often be reduced from 6.2 m to 5.5 m with indented parking, to reduce overall reserve width to 18.0 m.

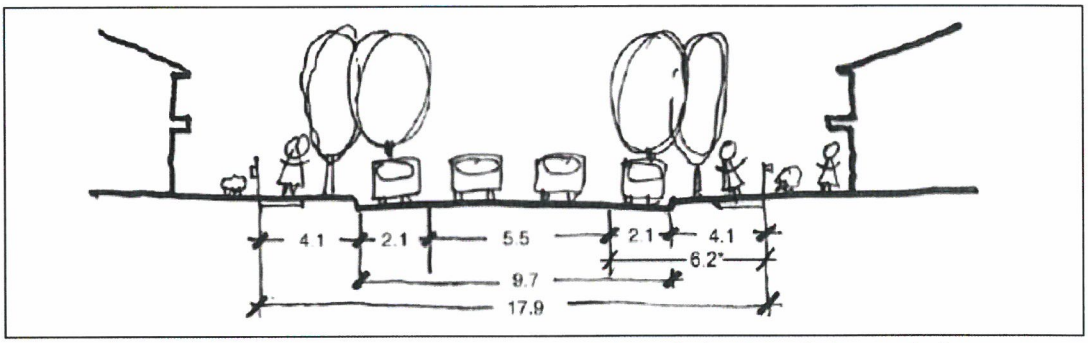


Figure 20: Access street B – wider access street Target speed 40 km/hr (< 3000 vehicles per day).

Wider access street suited to higher density residential areas (typically R30–R40+, or where dwelling density is greater than around 1 per 250 m²) with higher parking demand. Extensive parking, no bike lane, no buses, trees in verge, with additional trees in parking lane if required.

Note:
1. May reduce verge adjacent to park to 1.0 m when fronting public parkland.
2. Trees may be in verge and/or in parking lane.
3. * Verge and parking lane as shown (6.2 m) can often be reduced to 5.5 m if parking is indented, and total street width reduced to 16.5 m.

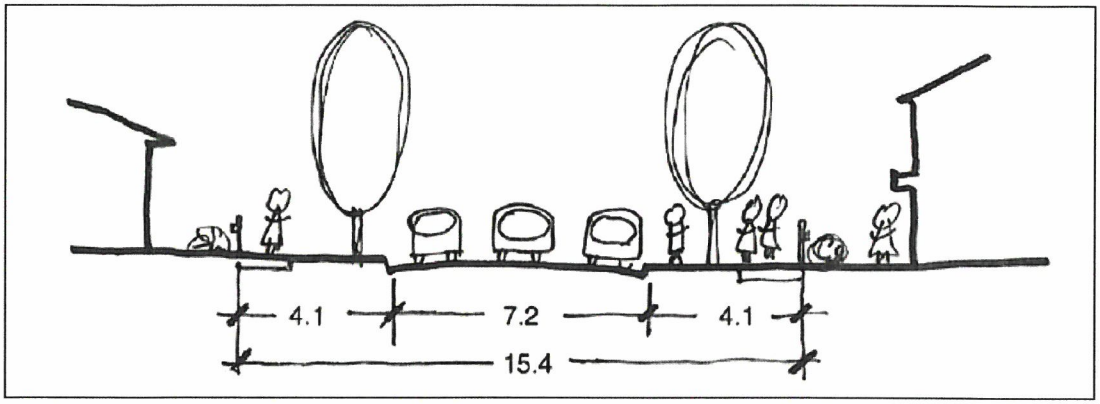


Figure 21: Access street C – yield (or give way) street – Target speed 40 km/hr (< 3000 vehicles per day).

Standard access street or yield (or give way) street. Relatively frequent parking on both sides of street (on the pavement) desirable and needed as part of speed control. No buses, no bike lane. This is likely to be the most common residential street in densities up to and often including R30 - R35 (or a typical lot size down to 250-300 m²).

Note: May reduce verge adjacent to park to 1.0 m when fronting public parkland.

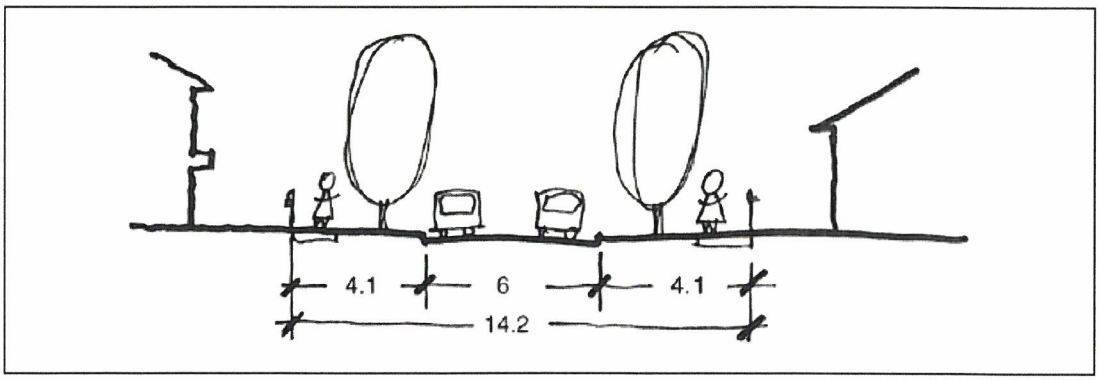


Figure 22: Access street D – narrow yield (or give way) street – Target speed 30 km/hr (< 1000 vehicles per day).

Narrower access street for shorter lengths, low parking demand, serving larger lots. No buses, no bike lanes, no indented parking. Staggered parking on both sides of street as part of speed control, low speed. Not through route, low traffic volume.

Note:
1. May reduce verge adjacent to park to 1.0 m when fronting public parkland.
2. Where the street is short and vehicle volume is less than 150 vehicles per day, pavement may be reconfigured as a slow speed, comprehensively-designed street, with a 3.4 m travel lane and 2.1 m embayed parking spaces. Passing bays are to be provided every 70-80 m, and maximum length 150 m. If a street is comprehensively designed and designated as a shared space for pedestrians and vehicles and target speed is <20 km/hr, no footpath may be required.
3. A pavement width of 5.5 m may be considered, subject to the agreement of the local authority. The reserve should remain at 14.2 m to allow for future flexibility.

Appendix C

SIDRA INTERSECTION ANALYSIS

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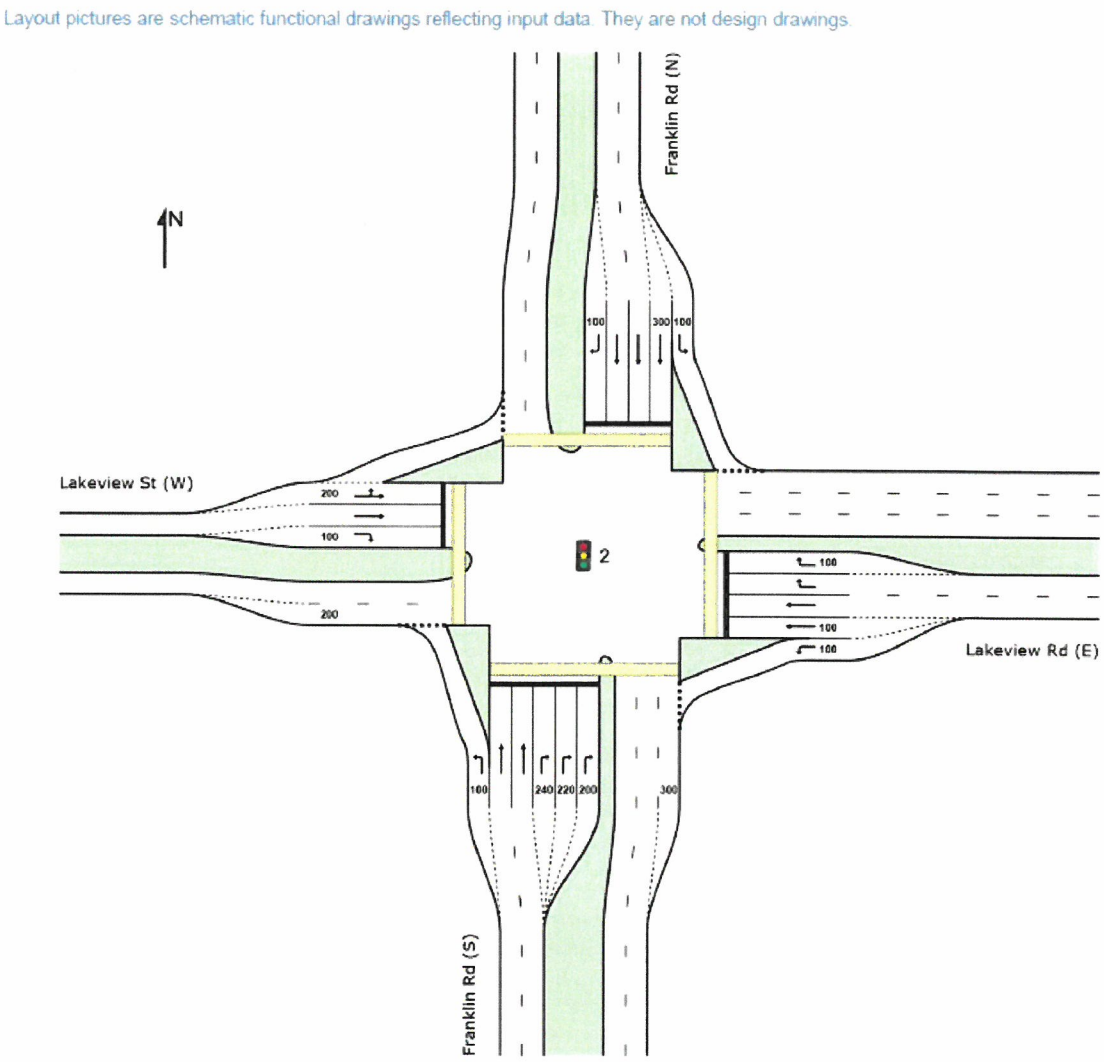

Figure C1. Franklin Rd / Lakeview Rd signalised intersection layout analysed in SIDRA

Table C1a. SIDRA results – Franklin Rd / Lakeview Rd signalised intersection – 2051 weekday 8-9AM peak

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: Franklin Rd (S)															
10	L2	All MCs	42	3.3	42	3.3	0.032	9.2	LOS A	0.4	3.4	0.22	0.63	0.22	50.3
11	T1	All MCs	881	5.5	881	5.5	0.616	34.5	LOS C	22.4	174.7	0.87	0.76	0.87	31.0
12	R2	All MCs	856	5.5	856	5.5	*0.936	84.9	LOS F	29.0	226.8	1.00	1.07	1.37	17.1
Approach			1779	5.4	1779	5.4	0.936	58.1	LOS E	29.0	226.8	0.91	0.91	1.09	22.7
East: Lakeview Rd (E)															
1	L2	All MCs	364	5.5	364	5.5	0.313	13.2	LOS B	5.9	46.0	0.29	0.66	0.29	50.0
2	T1	All MCs	357	5.5	357	5.5	0.312	30.3	LOS C	6.9	54.1	0.65	0.65	0.65	35.9
3	R2	All MCs	232	5.5	232	5.5	0.854	77.3	LOS E	8.0	62.5	1.00	0.92	1.25	12.5
Approach			953	5.5	953	5.5	0.854	35.2	LOS D	8.0	62.5	0.60	0.72	0.66	33.0
North: Franklin Rd (N)															
4	L2	All MCs	346	5.5	346	5.5	0.496	37.4	LOS D	15.0	116.9	0.80	0.91	0.80	30.9
5	T1	All MCs	1053	5.5	1053	5.5	*0.944	78.3	LOS E	27.1	211.4	1.00	1.12	1.35	29.2
6	R2	All MCs	27	3.3	27	3.3	0.328	75.8	LOS E	1.8	13.7	1.00	0.72	1.00	27.1
Approach			1426	5.5	1426	5.5	0.944	68.3	LOS E	27.1	211.4	0.95	1.06	1.21	29.4
West: Lakeview St (W)															
7	L2	All MCs	84	3.3	84	3.3	0.934	35.2	LOS D	41.7	317.8	1.00	1.16	1.24	17.8
8	T1	All MCs	833	3.3	833	3.3	*0.934	74.9	LOS E	41.7	317.8	1.00	1.17	1.28	17.5
9	R2	All MCs	128	3.3	128	3.3	*0.924	85.5	LOS F	9.6	73.0	1.00	1.08	1.46	24.3
Approach			1045	3.3	1045	3.3	0.934	73.0	LOS E	41.7	317.8	1.00	1.16	1.30	18.7
All Vehicles			5203	5.0	5203	5.0	0.944	59.7	LOS E	41.7	317.8	0.88	0.97	1.09	25.4

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Franklin Rd (S)											
P4	Full	53	51.9	LOS E	0.2	0.2	0.89	0.89	68.5	20.0	0.29
East: Lakeview Rd (E)											
P1	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
North: Franklin Rd (N)											
P2	Full	53	49.2	LOS E	0.2	0.2	0.87	0.87	65.9	20.0	0.30
West: Lakeview St (W)											
P3	Full	53	37.8	LOS D	0.1	0.1	0.76	0.76	54.4	20.0	0.37
All Pedestrians		211	49.5	LOS E	0.2	0.2	0.87	0.87	66.2	20.0	0.30

Table C1b. SIDRA results – Franklin Rd / Lakeview Rd signalised intersection – 2051 weekday 3-4PM peak

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: Franklin Rd (S)															
10	L2	All MCs	72	3.3	72	3.3	0.064	33.2	LOS C	1.4	10.9	0.33	0.66	0.33	47.9
11	T1	All MCs	951	5.5	951	5.5	*0.724	49.0	LOS D	30.4	237.4	0.93	0.82	0.93	26.8
12	R2	All MCs	611	5.5	611	5.5	0.687	70.7	LOS E	14.7	114.6	0.99	0.84	1.01	19.5
Approach			1633	5.4	1633	5.4	0.724	56.4	LOS E	30.4	237.4	0.93	0.82	0.93	24.4
East: Lakeview Rd (E)															
1	L2	All MCs	762	5.5	762	5.5	0.617	13.5	LOS B	13.0	101.8	0.33	0.73	0.33	50.8
2	T1	All MCs	846	5.5	846	5.5	0.632	29.2	LOS C	20.0	155.9	0.70	0.71	0.70	36.7
3	R2	All MCs	431	5.5	431	5.5	*0.704	73.5	LOS E	15.3	119.7	1.00	0.85	1.02	13.0
Approach			2039	5.5	2039	5.5	0.704	32.7	LOS C	20.0	155.9	0.62	0.75	0.63	34.7
North: Franklin Rd (N)															
4	L2	All MCs	260	5.5	260	5.5	0.263	17.9	LOS B	8.4	65.2	0.50	0.73	0.50	43.6
5	T1	All MCs	869	5.5	869	5.5	0.668	57.2	LOS E	19.3	150.7	0.97	0.82	0.97	34.8
6	R2	All MCs	56	3.3	56	3.3	*0.662	88.4	LOS F	4.3	33.0	1.00	0.80	1.11	24.9
Approach			1185	5.4	1185	5.4	0.668	50.1	LOS D	19.3	150.7	0.87	0.80	0.87	35.0
West: Lakeview St (W)															
7	L2	All MCs	41	3.3	41	3.3	0.699	22.1	LOS C	22.7	173.3	0.96	0.91	0.96	19.4
8	T1	All MCs	645	3.3	645	3.3	*0.699	59.9	LOS E	22.7	173.3	0.96	0.87	0.96	20.1
9	R2	All MCs	81	3.3	81	3.3	0.612	80.5	LOS F	6.0	46.0	1.00	0.80	1.03	25.1
Approach			767	3.3	767	3.3	0.699	60.0	LOS E	22.7	173.3	0.97	0.87	0.97	20.8
All Vehicles			5624	5.2	5624	5.2	0.724	47.0	LOS D	30.4	237.4	0.81	0.80	0.81	29.7

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Franklin Rd (S)											
P4	Full	53	49.7	LOS E	0.2	0.2	0.82	0.82	66.4	20.0	0.30
East: Lakeview Rd (E)											
P1	Full	53	63.6	LOS F	0.2	0.2	0.92	0.92	80.3	20.0	0.25
North: Franklin Rd (N)											
P2	Full	53	60.0	LOS E	0.2	0.2	0.90	0.90	76.7	20.0	0.26
West: Lakeview St (W)											
P3	Full	53	44.2	LOS E	0.2	0.2	0.77	0.77	60.8	20.0	0.33
All Pedestrians		211	54.4	LOS E	0.2	0.2	0.85	0.85	71.0	20.0	0.28

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.

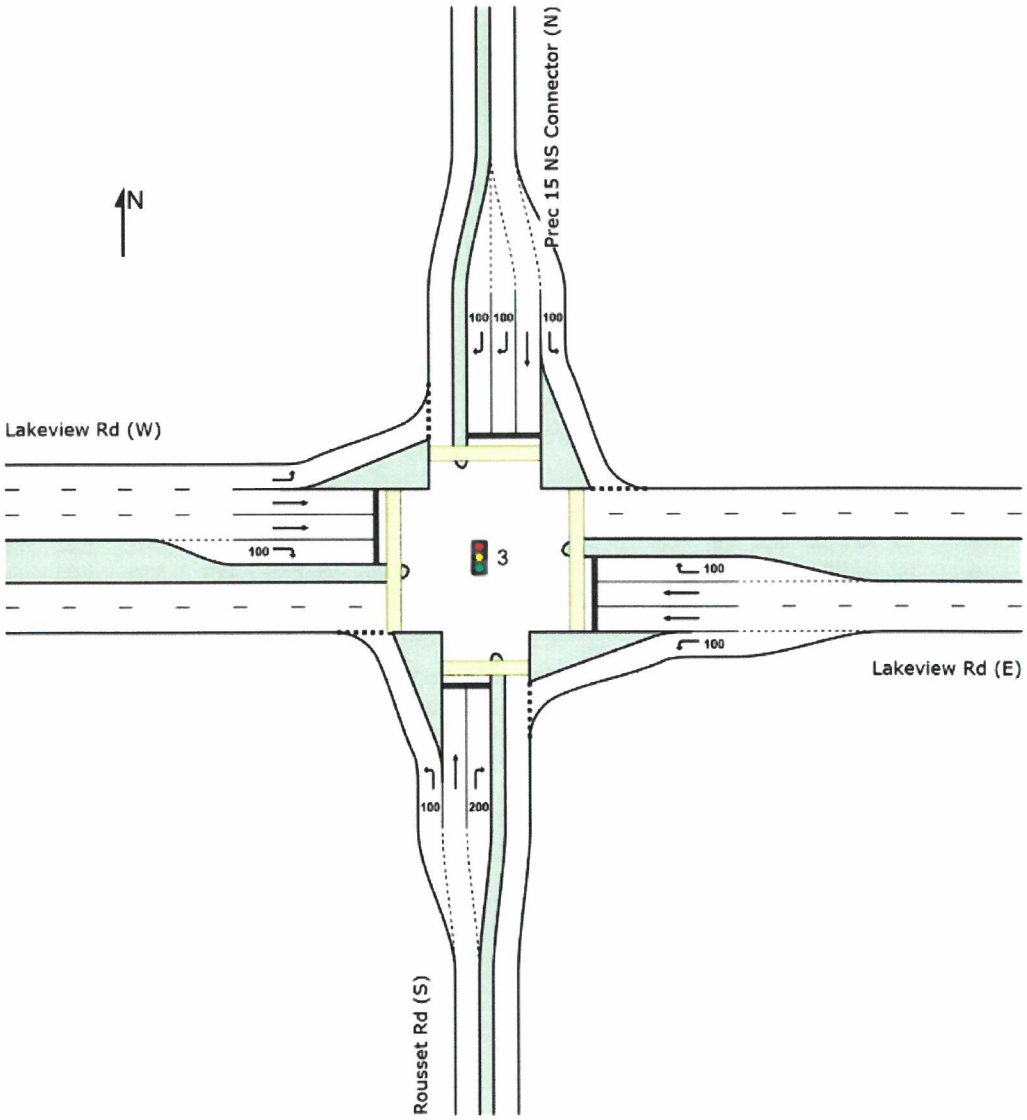

Figure C2. Lakeview Rd / Precinct 15 north south connector signalised intersection layout analysed in SIDRA

Table C2a. SIDRA results – Lakeview Rd / Precinct 15 NS connector signalised intersection – 2051 weekday 8-9AM peak

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: Rousset Rd (S)															
10	L2	All MCs	92	3.3	92	3.3	0.073	9.5	LOS A	1.2	8.9	0.27	0.65	0.27	51.7
11	T1	All MCs	87	3.3	87	3.3	0.271	51.1	LOS D	4.9	37.1	0.91	0.72	0.91	35.6
12	R2	All MCs	143	3.3	143	3.3	*0.858	78.9	LOS E	10.0	76.4	1.00	0.95	1.29	27.2
Approach			322	3.3	322	3.3	0.858	51.6	LOS D	10.0	76.4	0.77	0.80	0.90	32.1
East: Lakeview Rd (E)															
1	L2	All MCs	54	3.3	54	3.3	0.034	7.0	LOS A	0.2	1.6	0.12	0.61	0.12	57.5
2	T1	All MCs	777	5.5	777	5.5	0.405	22.8	LOS C	14.8	115.9	0.66	0.69	0.66	37.9
3	R2	All MCs	101	3.3	101	3.3	*0.808	78.4	LOS E	7.0	53.1	1.00	0.90	1.25	27.3
Approach			932	5.1	932	5.1	0.808	27.9	LOS C	14.8	115.9	0.66	0.71	0.69	36.5
North: Prec 15 NS Connector (N)															
4	L2	All MCs	11	3.3	11	3.3	0.018	33.8	LOS C	0.4	3.3	0.67	0.66	0.67	40.6
5	T1	All MCs	25	3.3	25	3.3	*0.082	49.9	LOS D	1.4	10.4	0.88	0.64	0.88	36.0
6	R2	All MCs	83	3.3	83	3.3	0.272	68.9	LOS E	2.6	19.5	0.97	0.74	0.97	19.7
Approach			119	3.3	119	3.3	0.272	61.8	LOS E	2.6	19.5	0.93	0.71	0.93	25.1
West: Lakeview Rd (W)															
7	L2	All MCs	400	3.3	400	3.3	0.275	5.8	LOS A	3.3	25.0	0.18	0.56	0.18	50.1
8	T1	All MCs	1618	5.5	1618	5.5	*0.889	58.6	LOS E	53.8	419.8	1.00	0.96	1.07	28.3
9	R2	All MCs	16	3.3	16	3.3	0.189	78.6	LOS E	1.0	7.3	0.93	0.68	0.93	24.4
Approach			2034	5.1	2034	5.1	0.889	48.4	LOS D	53.8	419.8	0.84	0.88	0.89	30.9
All Vehicles			3406	4.8	3406	4.8	0.889	43.5	LOS D	53.8	419.8	0.79	0.82	0.84	31.9

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Rousset Rd (S)											
P4	Full	53	21.1	LOS C	0.1	0.1	0.57	0.57	37.8	20.0	0.53
East: Lakeview Rd (E)											
P1	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
North: Prec 15 NS Connector (N)											
P2	Full	53	24.1	LOS C	0.1	0.1	0.61	0.61	40.7	20.0	0.49
West: Lakeview Rd (W)											
P3	Full	53	59.3	LOS E	0.2	0.2	0.96	0.96	75.9	20.0	0.26
All Pedestrians		211	40.9	LOS E	0.2	0.2	0.77	0.77	57.6	20.0	0.35

Table C2b. SIDRA results – Lakeview Rd / Precinct 15 NS connector signalised intersection – 2051 weekday 3-4PM peak

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: Rousset Rd (S)															
10	L2	All MCs	100	3.3	100	3.3	0.141	34.8	LOS C	4.5	34.3	0.67	0.73	0.67	30.5
11	T1	All MCs	52	3.3	52	3.3	0.177	59.7	LOS E	3.3	25.1	0.91	0.69	0.91	32.9
12	R2	All MCs	80	3.3	80	3.3	0.415	75.7	LOS E	5.6	42.8	0.98	0.77	0.98	27.8
Approach			232	3.3	232	3.3	0.415	54.5	LOS D	5.6	42.8	0.83	0.73	0.83	29.8
East: Lakeview Rd (E)															
1	L2	All MCs	129	3.3	129	3.3	0.090	46.8	LOS D	1.6	12.2	0.22	0.64	0.22	56.0
2	T1	All MCs	1585	5.5	1585	5.5	*0.925	74.1	LOS E	62.4	487.4	1.00	1.02	1.12	23.1
3	R2	All MCs	97	3.3	97	3.3	0.670	102.4	LOS F	7.3	55.3	1.00	0.82	1.06	26.5
Approach			1812	5.2	1812	5.2	0.925	73.7	LOS E	62.4	487.4	0.94	0.99	1.06	25.2
North: Prec 15 NS Connector (N)															
4	L2	All MCs	34	3.3	34	3.3	0.048	22.0	LOS C	1.1	8.4	0.50	0.68	0.50	46.7
5	T1	All MCs	97	3.3	97	3.3	*0.332	61.5	LOS E	6.4	48.6	0.94	0.74	0.94	32.3
6	R2	All MCs	354	3.3	354	3.3	*0.918	94.8	LOS F	14.9	113.3	1.00	0.99	1.34	15.5
Approach			484	3.3	484	3.3	0.918	83.1	LOS F	14.9	113.3	0.95	0.92	1.20	20.3
West: Lakeview Rd (W)															
7	L2	All MCs	240	3.3	240	3.3	0.160	6.7	LOS A	3.6	27.6	0.29	0.53	0.29	49.3
8	T1	All MCs	1147	5.5	1147	5.5	0.644	49.3	LOS D	37.0	288.8	0.96	0.74	0.96	31.3
9	R2	All MCs	128	3.3	128	3.3	*0.889	104.7	LOS F	10.2	77.9	1.00	0.94	1.20	20.3
Approach			1516	5.0	1516	5.0	0.889	47.3	LOS D	37.0	288.8	0.86	0.72	0.88	31.7
All Vehicles			4043	4.8	4043	4.8	0.925	63.8	LOS E	62.4	487.4	0.91	0.86	0.99	27.2

Pedestrian Movement Performance

Mov ID	Crossing	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Rousset Rd (S)											
P4	Full	53	24.7	LOS C	0.1	0.1	0.57	0.57	41.4	20.0	0.48
East: Lakeview Rd (E)											
P1	Full	53	69.3	LOS F	0.2	0.2	0.96	0.96	85.9	20.0	0.23
North: Prec 15 NS Connector (N)											
P2	Full	53	25.9	LOS C	0.1	0.1	0.59	0.59	42.5	20.0	0.47
West: Lakeview Rd (W)											
P3	Full	53	69.3	LOS F	0.2	0.2	0.96	0.96	85.9	20.0	0.23
All Pedestrians		211	47.3	LOS E	0.2	0.2	0.77	0.77	63.9	20.0	0.31

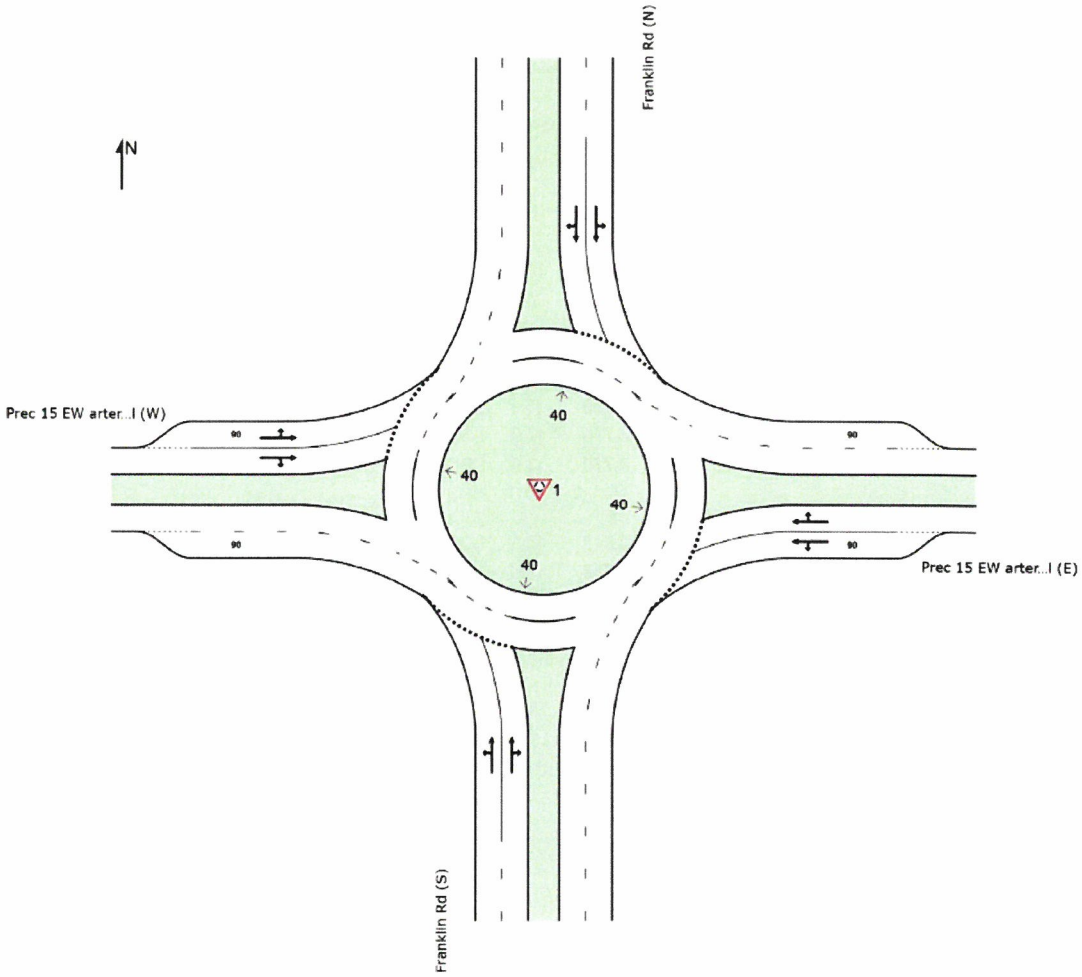

Figure C3. Franklin Rd / Precinct 15 east west arterial roundabout layout analysed in SIDRA

Table C3a. SIDRA results – Franklin Rd / Precinct 15 EW arterial roundabout – 2051 weekday 8-9AM peak

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: Franklin Rd (S)															
10	L2	All MCs	206	3.3	206	3.3	0.645	8.8	LOS A	4.4	34.3	0.68	0.73	0.80	52.0
11	T1	All MCs	893	5.5	893	5.5	0.645	7.7	LOS A	4.4	34.3	0.69	0.77	0.82	57.7
12	R2	All MCs	97	3.3	97	3.3	0.645	14.8	LOS B	4.0	31.0	0.70	0.80	0.84	50.7
Approach			1196	4.9	1196	4.9	0.645	8.5	LOS A	4.4	34.3	0.69	0.76	0.82	56.0
East: Prec 15 EW arterial (E)															
1	L2	All MCs	101	3.3	101	3.3	0.548	9.2	LOS A	3.5	26.8	0.85	0.92	1.08	41.0
2	T1	All MCs	663	3.3	663	3.3	0.770	11.1	LOS B	7.9	60.2	0.93	1.07	1.39	43.3
3	R2	All MCs	132	3.3	132	3.3	0.770	17.9	LOS B	7.9	60.2	0.96	1.14	1.54	46.1
Approach			896	3.3	896	3.3	0.770	11.9	LOS B	7.9	60.2	0.93	1.06	1.38	43.6
North: Franklin Rd (N)															
4	L2	All MCs	324	3.3	324	3.3	0.813	14.3	LOS B	8.6	66.6	0.95	1.07	1.49	48.6
5	T1	All MCs	871	5.5	871	5.5	0.813	13.9	LOS B	8.6	66.6	0.94	1.08	1.50	47.0
6	R2	All MCs	13	3.3	13	3.3	0.813	21.3	LOS C	7.4	58.0	0.93	1.09	1.50	47.3
Approach			1207	4.9	1207	4.9	0.813	14.1	LOS B	8.6	66.6	0.94	1.08	1.49	47.6
West: Prec 15 EW arterial (W)															
7	L2	All MCs	14	3.3	14	3.3	0.517	6.3	LOS A	3.1	23.9	0.77	0.72	0.91	50.5
8	T1	All MCs	619	3.3	619	3.3	0.726	6.8	LOS A	6.7	51.0	0.82	0.83	1.03	45.0
9	R2	All MCs	455	3.3	455	3.3	0.726	12.9	LOS B	6.7	51.0	0.88	0.98	1.20	39.6
Approach			1087	3.3	1087	3.3	0.726	9.4	LOS A	6.7	51.0	0.84	0.89	1.10	43.4
All Vehicles			4386	4.2	4386	4.2	0.813	10.9	LOS B	8.6	66.6	0.84	0.94	1.19	47.9

Table C3b. SIDRA results – Franklin Rd / Precinct 15 EW arterial roundabout – 2051 weekday 3-4PM peak

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: Franklin Rd (S)															
10	L2	All MCs	463	3.3	463	3.3	0.882	15.0	LOS B	10.0	77.3	0.90	1.15	1.49	49.0
11	T1	All MCs	924	5.5	924	5.5	0.882	14.3	LOS B	10.0	77.3	0.91	1.15	1.53	53.7
12	R2	All MCs	36	3.3	36	3.3	0.882	21.6	LOS C	8.6	67.4	0.91	1.15	1.55	47.6
Approach			1423	4.7	1423	4.7	0.882	14.7	LOS B	10.0	77.3	0.90	1.15	1.51	51.9
East: Prec 15 EW arterial (E)															
1	L2	All MCs	100	3.3	100	3.3	0.551	6.7	LOS A	3.3	25.3	0.79	0.80	0.96	42.7
2	T1	All MCs	633	3.3	633	3.3	0.774	7.6	LOS A	7.3	55.6	0.85	0.93	1.15	44.7
3	R2	All MCs	367	3.3	367	3.3	0.774	13.7	LOS B	7.3	55.6	0.90	1.05	1.30	47.4
Approach			1100	3.3	1100	3.3	0.774	9.6	LOS A	7.3	55.6	0.86	0.96	1.18	45.5
North: Franklin Rd (N)															
4	L2	All MCs	233	3.3	233	3.3	0.662	9.7	LOS A	5.2	40.4	0.85	0.82	1.05	50.7
5	T1	All MCs	838	5.5	838	5.5	0.662	8.8	LOS A	5.2	40.4	0.84	0.86	1.05	51.6
6	R2	All MCs	21	3.3	21	3.3	0.662	15.9	LOS B	4.7	36.5	0.84	0.88	1.06	49.9
Approach			1092	5.0	1092	5.0	0.662	9.1	LOS A	5.2	40.4	0.84	0.85	1.05	51.3
West: Prec 15 EW arterial (W)															
7	L2	All MCs	16	3.3	16	3.3	0.590	10.3	LOS B	4.2	31.8	0.89	0.95	1.16	48.7
8	T1	All MCs	688	3.3	688	3.3	0.829	13.3	LOS B	10.4	79.2	0.95	1.12	1.51	42.2
9	R2	All MCs	246	3.3	246	3.3	0.829	21.7	LOS C	10.4	79.2	1.00	1.26	1.80	34.8
Approach			951	3.3	951	3.3	0.829	15.5	LOS B	10.4	79.2	0.96	1.15	1.58	40.9
All Vehicles			4565	4.1	4565	4.1	0.882	12.3	LOS B	10.4	79.2	0.89	1.03	1.34	47.5