Banjup District Structure Plan

Transport Impact Assessment

PREPARED FOR:
Perron Developments

February 2017

Document history and status

Author	Revision	Approved by	Date approved	Revision type
M Rasouli	r01	R White	24/06/2016	Draft
M Rasouli	r01a		30/06/2016	Drat Final
M Rasouli	r01b	R White	21/10/2016	Draft Final
M Rasouli	r01c	R White	24/10/2016	Draft Final
M Rasouli	r01d		13/02/2017	Final
A Rasouli	r01e	B Bordbar	03/03/2017	Revised Final

File name: t15.260.mr.r01e.docx

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Client: Perron Developments

Project: Banjup District Structure Plan

Document revision: r01e

Project number: t15.260

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1.0 Introduction

Transcore prepared a Transport Impact Assessment (TIA) report on behalf of Perron Developments for the proposed Banjup District Structure Plan (DSP) in June 2016. The outcome of the TIA report was presented to the relevant authorities including the City of Cockburn, Main Roads WA and Public Transport Authority (PTA) during a Stakeholder Meeting on 20 September 2016.

During the Stakeholder Meeting Main Roads WA indicated that the existing traffic lights at Ghostgum Avenue/ Armadale Road would be converted to a left in/ left out intersection in the long term if the Armadale Road Deviation project and the construction of a grade separated interchange at Armadale Road/ Verde Drive/ Tapper Road was to proceed. Main Roads WA also expressed some concerns regarding the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road.

Accordingly, the June 2016 TIA report has been amended to include the outcome of the transport modelling and analysis for the proposed access arrangements along Armadale Road fronting the DSP area as per Main Roads WA request. The proposed Main Roads WA access arrangements (assuming that the Armadale Road Deviation project occurs in future) include:

- Downgrading the intersection of Armadale Road/ Ghostgum Avenue to a Left in/ Left out intersection in the long term;
- Removing the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road; and
- Installation of a roundabout at Armadale Road/ Liddelow Road/ DSP access road.

PTA and City of Cockburn also indicated that in the longer term if the intersection of Ghostgum Avenue/ Armadale Road is converted to a left in/ left out intersection, an alternative bus route should be prepared to replace the original proposed bus route within the Calleya LSP area.

This Transport Impact Assessment (TIA) report is an amendment to the June 2016 TIA report and provides the outcome of the additional modelling and analysis which has been undertaken to reflect the access arrangements proposed by MRWA along Armadale Road fronting the DSP area in the long term. The TIA also provides an alternative bus route option should the intersection of Ghostgum Avenue/ Armadale Road be converted to a left in/ left out intersection.

The boundary of the DSP is defined by Solomon Road, Armadale Road, Warton Road and Jandakot Road. The DSP area is approximately 641 ha and includes the existing 118.5 ha of regional reserves and the following Lots:

- Lots 132 and 9004 (Calleya Estate), 105.9 ha;
- Lot 1 east (previously Lot 821) Armadale Road, about 20.35 ha;
- Lot 2 Armadale Road, 3.15 ha;
- Lots 4 Armadale Road, 58.77 ha;
- Lot 131 Jandakot Road, 64.75 ha; and
- Lot 1 west Armadale Road.

Figure 1 shows the location of the DSP in relation to the surrounding regional roads.

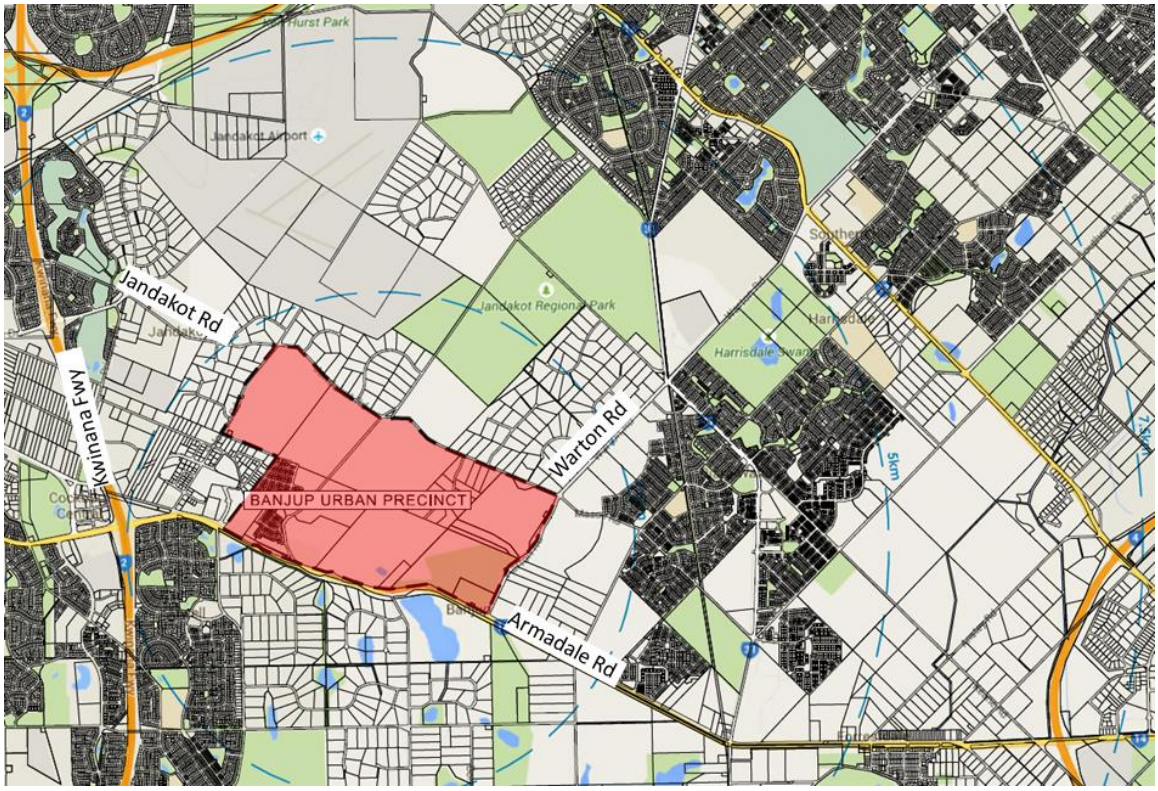


Figure 1: Location of Banjup District Structure Plan

2.0 Proposed District Structure Plan

The proposed Banjup District Structure Plan is shown in **Figure 2**. The proposed DSP entails the approved Banjup Quarry (Calleya) Local Structure Plan, the existing 14 Lots within the Skotsch Road Rural Residential Precinct, existing 118.5 ha of regional reserves and four potential development sites at Lots 1 west & east, 2, 4 and 131 Armadale Road.

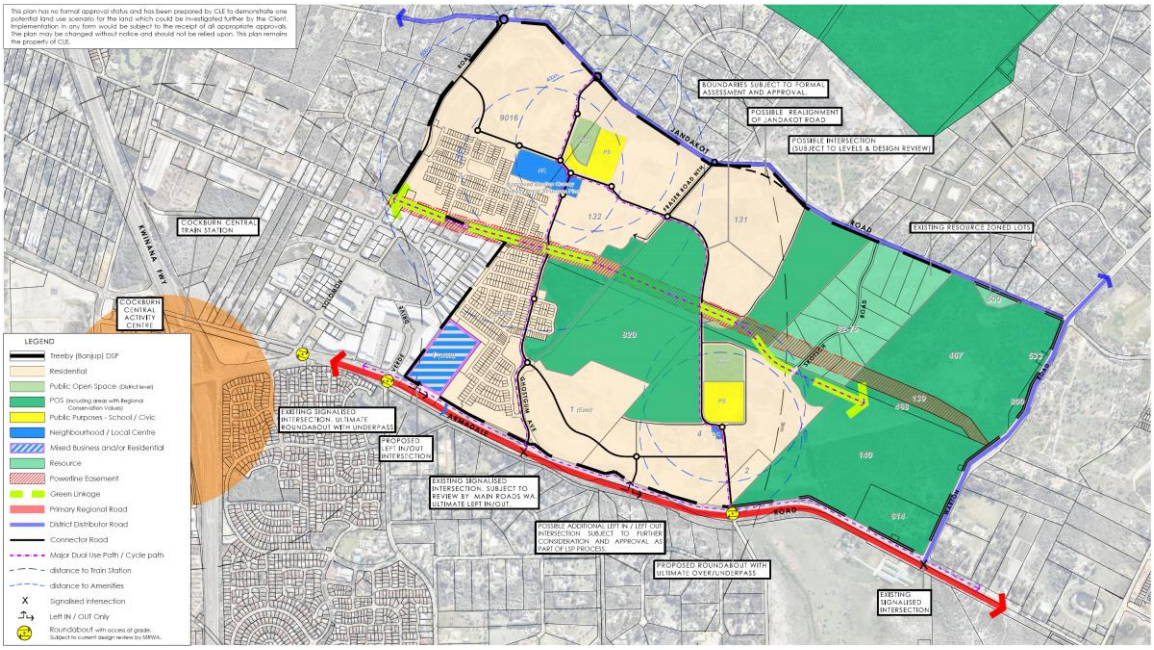


Figure 2: Proposed Banjup District Structure Plan

The proposed DSP internal road network is established through a number of Neighbourhood Connector roads which provides sufficient and logical connectivity through different Lots within the DSP area. The proposed internal road network facilitates the traffic circulation within the DSP area and provides connectivity to the surrounding regional roads including Armadale Road and Jandakot Road.

The access arrangements along Jandakot Road include three roundabout intersections at Solomon Road, the N-S spine road (within Calleya LSP) and Fraser Road. The existing priority controlled T-intersection of Jandakot Road/ Skotsch Road also provides access to the DSP area.

Jandakot Road in the vicinity of the DSP area will be upgraded to a dual divided carriageway standard with localised widening at intersections to cater for turn lanes. The proposed concept design for Jandakot Road includes 2x7.0m carriageways, 6.0m median with variable verges.

According to the information obtained from Main Roads WA Armadale Road in the vicinity of the DSP area will be duplicated in near future (Funding for

duplication of Armadale Road between Anstey and Tapper roads has been approved). Ultimately, Armadale Road is planned to be upgraded to six lanes.

The proposed DSP access arrangements along Armadale Road entail the existing traffic lights at Fraser Road/ Armadale Road and a proposed 4-way roundabout intersection at Liddelow Road/ Armadale Road/ DSP access road (to Lots 2&4 Armadale Road). In order to improve permeability and connectivity of the proposed DSP area a left in/ left out intersection is also proposed on Armadale Road between Ghostgum Avenue and Liddelow Road.

It is Transore's understanding that Main Roads WA has some concerns regarding the proposed left in/ left out intersection on Armadale Road. Accordingly the revised modelling and analysis undertaken for the long term option (assuming implementation of Armadale Road Deviation project) does not include the proposed left in/ left out intersection.

The proposed DSP area also shows a left in/ left out intersection for Lot 1 west as approved. It is Transcore's understanding that the final location and layout of the proposed left in/ left out intersection along Armadale Road for Lot 1 west is subject to future planning of this Lot.

The total number of residential lots within the DSP area is estimated to be about 3,500 lots with the following distribution on each Lot:

- About 2,000 Lots on Calleya LSP;
- About 330 Lots on Lot 1 east Armadale Road;
- About 700 Lots on Lots 2 & 4; and,
- About 500 Lots on Lot 131.

It must be noted that the proposed 3,500 Lots for the DSP area does not include any residential Lots on Lot 1 west or Skotsch Road locality.

According to the information provided to Transcore, the current status of planning for Lot 1 west is not clear yet, however for the purpose of traffic modelling and analysis and in the absence of more detailed planning for Lot 1 west, it has been assumed that Lot 1 west would accommodate about 60% service commercial with a lesser proportion (about 40%) residential Lots. Any changes to the above percentages would not change the traffic outcome of this report.

3.0 Existing Situation

3.1 Existing Land Use

The site currently is mainly vacant. There are about 14 residential Lots along Skotsch Road. The northern precinct of the Calleya LSP area is currently vacant but the southern precinct is under construction with the majority of the internal roads and some residential dwellings already constructed. About 118.5 ha (about 25%) of the DSP area is allocated to the Regional Reserve.

3.2 Existing Road Network

Armadale Road is a Primary Distributor road according to the Main Roads WA Functional Road Hierarchy and a Primary Regional Road in the Metropolitan Region Scheme. Armadale Road has been recently upgraded to dual carriageway standard at the intersection with Ghostgum Avenue. Armadale Road is of single carriageway standard with a speed limit of 80 km/h to the east of the Calleya LSP area and becomes dual carriageway again immediately to the west of Calleya. According to traffic counts published by Main Roads WA Armadale Road in this vicinity (west of Liddelow Road) carried 28,000vpd with 10% heavy vehicles in June 2015.

Jandakot Road is of single carriageway standard with a speed limit of 80km/h in the vicinity of the DSP area. According to Main Roads WA, Jandakot Road is a Regional Distributor and a District Distributor (B) in accordance with City of Cockburn classification. According to traffic counts provided by the City of Cockburn, Jandakot Road, 220m west of Skotsch Road, carried about 11,200vpd in 2015.

Jandakot Road continues to the east to form a dual lane roundabout intersection with Warton Road. Jandakot Road forms a 4-way roundabout with Berrigan Drive. This roundabout currently has single lane approaches on all legs. According to traffic counts provided by Main Roads WA Berrigan Drive, east of Kwinana Freeway, carried about 19,000vpd in 2014/2015.

Solomon Road is a District Distributor B Road of single carriageway standard with a speed limit of 70km/h in the vicinity of the DSP area. According to traffic counts provided by the City of Cockburn, Solomon Road, south of Jandakot Road, carried about 6,500vpd in 2015. Solomon Road connects to Jandakot Road at a T-intersection without any turn lanes or widening on Jandakot Road. Solomon Road connects to Armadale Road at a T-intersection with a 45m left turn pocket and a 70m right turn pocket on Armadale Road as well as a 45m flare on Solomon Road.

Skotsch Road is an access road which provides access to the existing residential dwellings to the south of Jandakot Road. The existing intersection of

Skotsch Road/ Jandakot Road is a priority controlled T-intersection with right turn pocket on Jandakot Road.

Warton Road is a District Distributor A Road of dual carriageway standard with a speed limit of 70km/h in the vicinity of the DSP area. According to traffic counts provided by Main Roads WA, Warton Road, south of Jandakot Road, carried about 18,600vpd in 2014/2015. Warton Road connects to Jandakot Road at a roundabout intersection. Warton Road connects to Armadale Road at a signalised intersection.

3.3 Public Transport

The closest bus service in the vicinity of the DSP area is the existing bus route 518 (from Challenger Institute of Technology to Cockburn Central Station) running along Armadale Road to the south of the DSP area.

The closest train station in the vicinity of the subject site is the Cockburn Central train station (refer **Figure 3**) which is located about 1.5km and 3km from the western and eastern boundary of the DSP area, respectively. On average the walking distance between the DSP area and the Cockburn Central Station is about 2 to 3km.

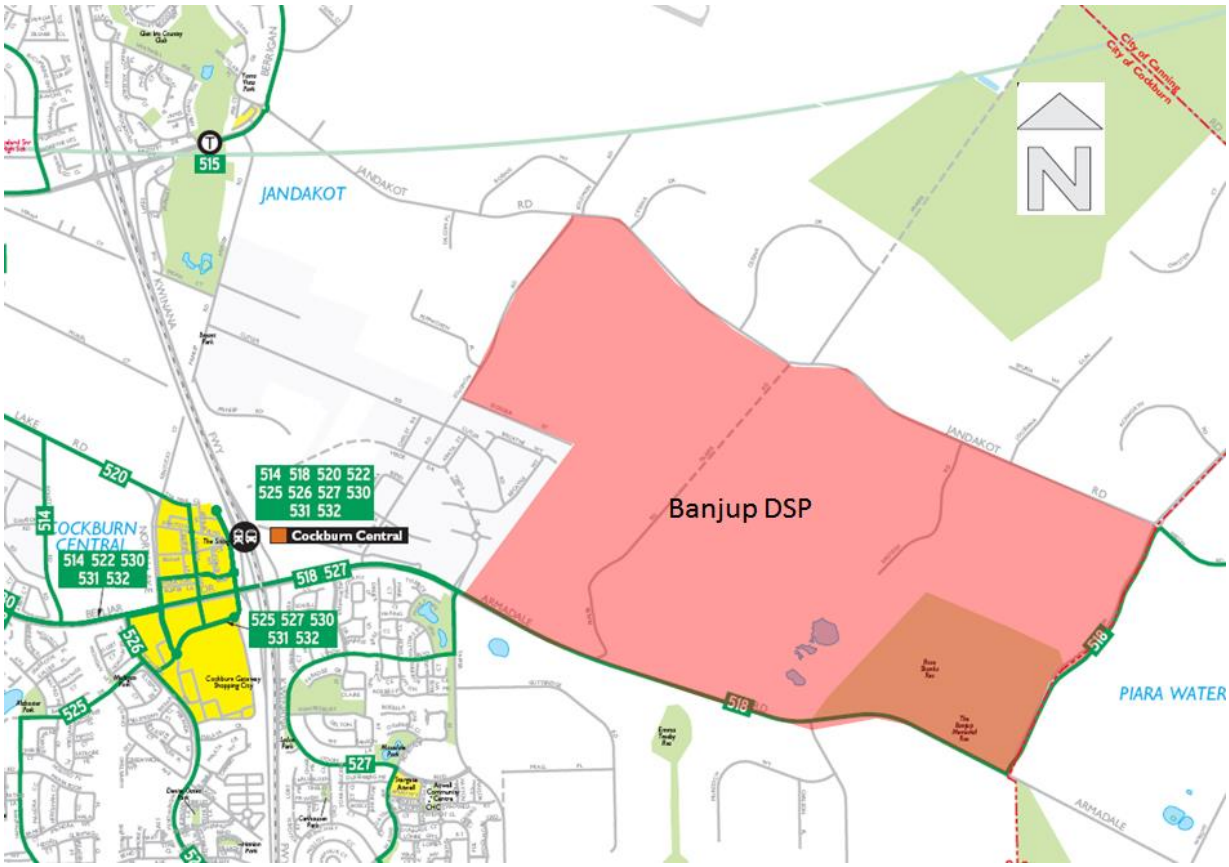


Figure 3: Existing Bus Routes

3.4 Pedestrian and Cyclist Facilities

There are no existing pedestrian or cyclist facilities on Jandakot Road or Solomon Road in the vicinity of the DSP area. The recent upgrading of Armadale Road through the Ghostgum Avenue intersection has provided on-road cycle lanes on Armadale Road along the frontage of the Calleya LSP although other sections of Armadale Road to the east and west have not yet been upgraded to this standard. A 2.5m concrete shared path is in place at the eastern side of Warton Road.

The Department of Transport's Perth Bike Map series (see **Figure 4**) shows that bicycle lanes or sealed shoulder are provided either side of Armadale Road and Jandakot Road.

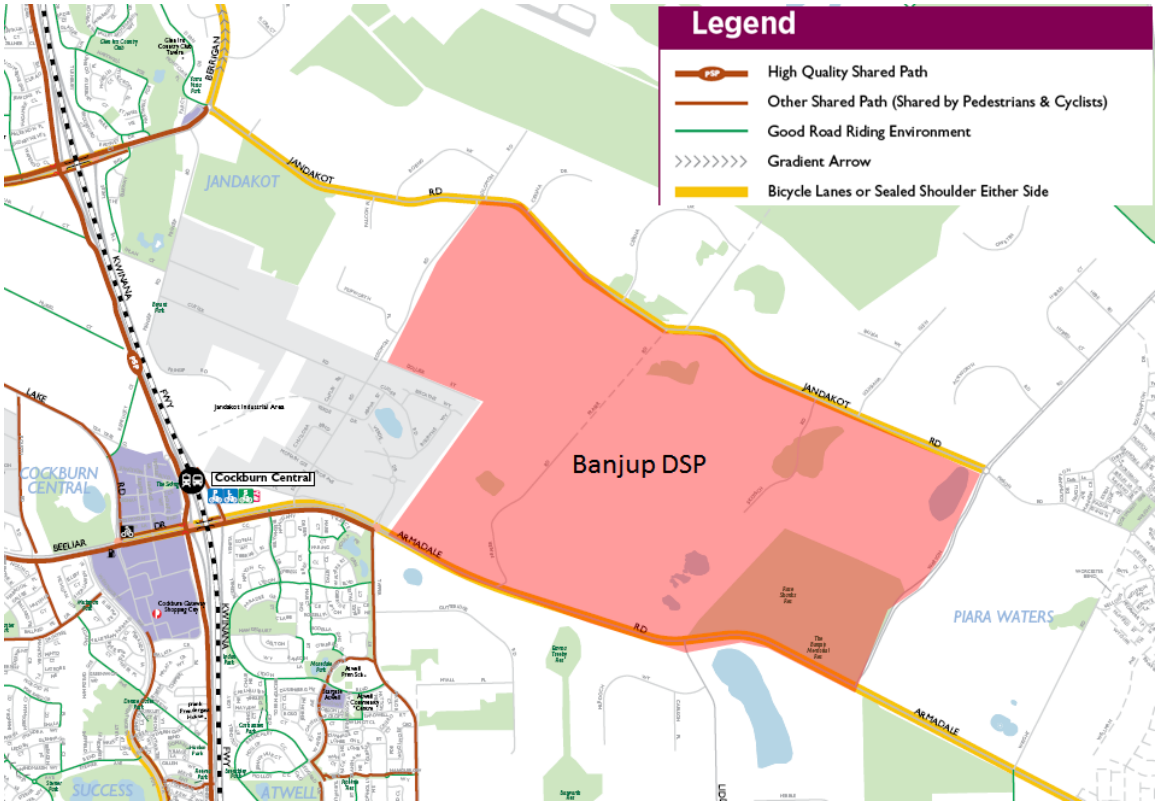


Figure 4: Bike Map

3.5 Changes to the Surrounding Road Network

There are regional and local proposed changes to the surrounding road network in this area. Armadale Road is expected to be upgraded to 4 lanes in the medium term and 6 lanes in the longer term. Jandakot Road is also expected to be upgraded to 4 lanes in future to provide another strong east-west link parallel to Armadale Road.

The Western Australian Planning Commission (WAPC) has recently issued a Planning Control Area (PCA No 122) for the Armadale Road Deviation (ARD) which indicates the realignment proposal of Armadale Road in this area. **Appendix A** contains a copy of PCA No 122.

The following statement provides City of Cockburn's advice on this project:

''Even with the Armadale Road Deviation project it should be noted that the existing North Lake Road (Verde Drive) Other Regional Roads alignment (established as part of MRS amendment 1038/33) remains unaffected by this proposal. That is, the Armadale Road Deviation does not in itself represent an overall road arrangement which in total would perform the general functions and objectives equivalent to those of the specific Other Regional Road alignment achieved by MRS Amendment 1038/33. Thus as established by the MRS amendment, the Other Regional Roads reserved portion representing North lake Road (Verde Drive) retains its function of providing regional access to the regionally significant Industrial area''.

It is understood that the ARD proposes lowering Armadale Road and placing it in a trench from west of Solomon Road all the way to the east of Verde Drive. As a result, the existing intersections of Armadale Road/ Solomon Road and Armadale Road/ Tapper Road/Verde Drive would need to be converted to roundabout at surface level, with on and off ramps connecting the roundabouts to the Armadale Road (referred to as a "duck and dive" treatment).

Due to the close proximity of the existing signalised intersection on Ghostgum Avenue/ Armadale Road to the future potential grade separated intersection on Armadale Road/ Tapper Road/Verde Drive, there would be a risk of safety issues associated with weaving movements for the section of Armadale Road between the end of the Armadale Road trench (the grade separation would involve lowering the through traffic lanes on Armadale Road) and the signalised intersection on Ghostgum Avenue. The length of the weaving would be affected by the queue back on Armadale Road at the traffic lights.

Main Roads WA is currently investigating the details of the traffic operation along Armadale Road assuming the proposed ARD project occurred. It is likely that the existing traffic lights at Ghostgum Avenue intersection would be converted to a left in / left out intersection to facilitate the future traffic operation on Armadale Road in this locality.

With respect to Jandakot Road upgrades (responsibility of the City of Cockburn and various developers), the plan is to:

- Upgrade Jandakot Road to dual carriageway ultimately. The ultimate standard would include two traffic lanes each way and 6m median (the proposed cross section does not fit with the existing road reserve of Jandakot Road and requires land take from both sides) and;
- The intersection of Jandakot Road/ Berrigan Drive/ Airport south link would be converted to traffic lights and Berrigan Drive would be duplicated between the Freeway and Jandakot Road (construction to commence in 2016).

The proposed local changes within the DSP area include provision of the proposed internal neighbourhood connector roads and in particular the N-S spine road within Calleya Master Plan area which provides a north-south link between

Armadale Road and Jandakot Road and would assist in the distribution of traffic onto Armadale Road and Jandakot Road.

The other proposed local changes to Armadale Road include conversion of the existing T-intersection of Armadale Road/ Liddelow Road into a roundabout intersection. A potential left in/ left out intersection on Armadale Road is also proposed in the DSP area.

Transcore understands that Main Roads WA has provided “in principal” approval for the proposed 4-way roundabout intersection at Armadale Road/ Liddelow Road; however Main Roads WA has concerns about the proposed left in/ left out intersection on Armadale Road. For the purpose of this report additional modelling and analysis are undertaken to reflect the removal of the proposed left in/ left out intersection from Armadale Road as per Main Roads WA request.

3.6 Public Transport Network Planning

According to the information provided by the Public Transport Authority (PTA) in February 2015 as part of the Calleya Master Plan development application, a bus route is likely to be run through the Calleya LSP area. This bus route would travel north-south through Calleya (refer **Figure 5**). This potential bus route could be:

- A new PTA bus route between Cockburn and Murdoch stations;
- A connection with Route 515 (Glen Iris); or
- An extension or alternative route to Route 515 (Glen Iris).

The timing of any future bus route is unknown at this stage and is subject to Government funding that may be influenced by passenger demand and the developers providing adequate road access/connections. Figure 5 also shows the potential bus stops along the proposed bus route within the Calleya LSP area.

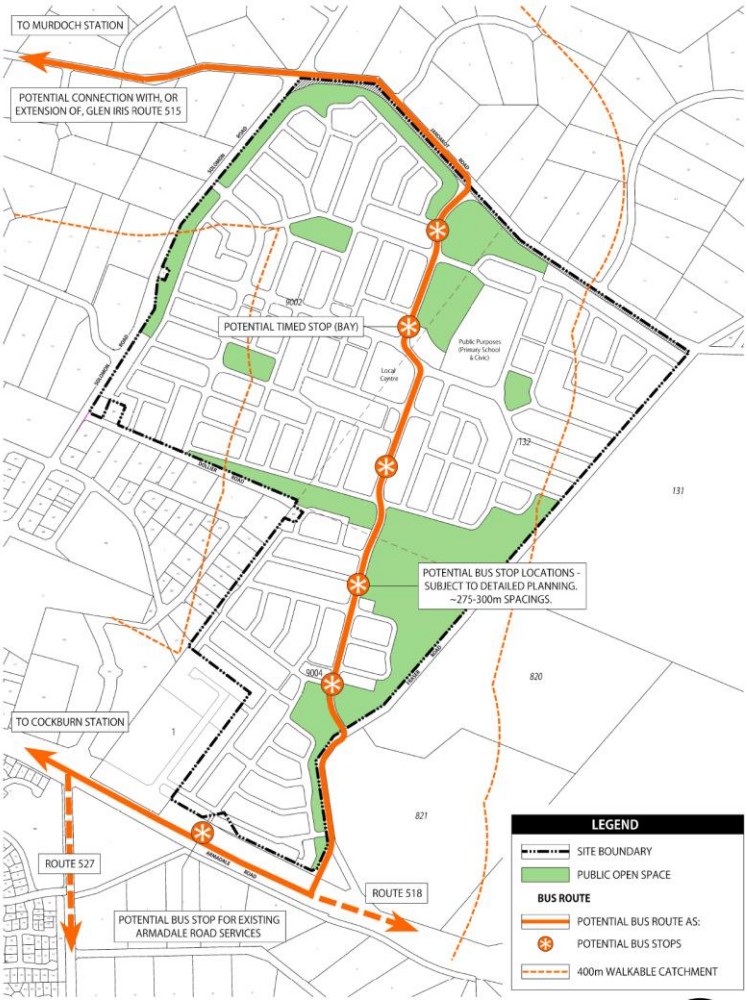


Figure 5: Proposed Bus Route through Calleya LSP Area

The latest information received from PTA in June 2016 confirms the above planning is still valid. According to the same information, a 1km separation distance between parallel bus routes in this area has been recommended. Accordingly, the proposed north south route through Calleya LSP area is not likely to be replicated through future developments further east and the existing bus route which currently travels on Warton Road will shift to Wright Road (in Piara Waters) once Wright Road is fully constructed.

However, PTA suggested that in the event that residential development extends east of the Calleya Master Plan and sufficient demand arises for secondary bus services, then there is likely to be a need for a supplementary bus route (indicated as the red line in **Figure 6**). The route would likely operate from Cockburn Central, along Armadale Road, then north- south through the eastern development across to the proposed Neighbourhood Activity Centre.

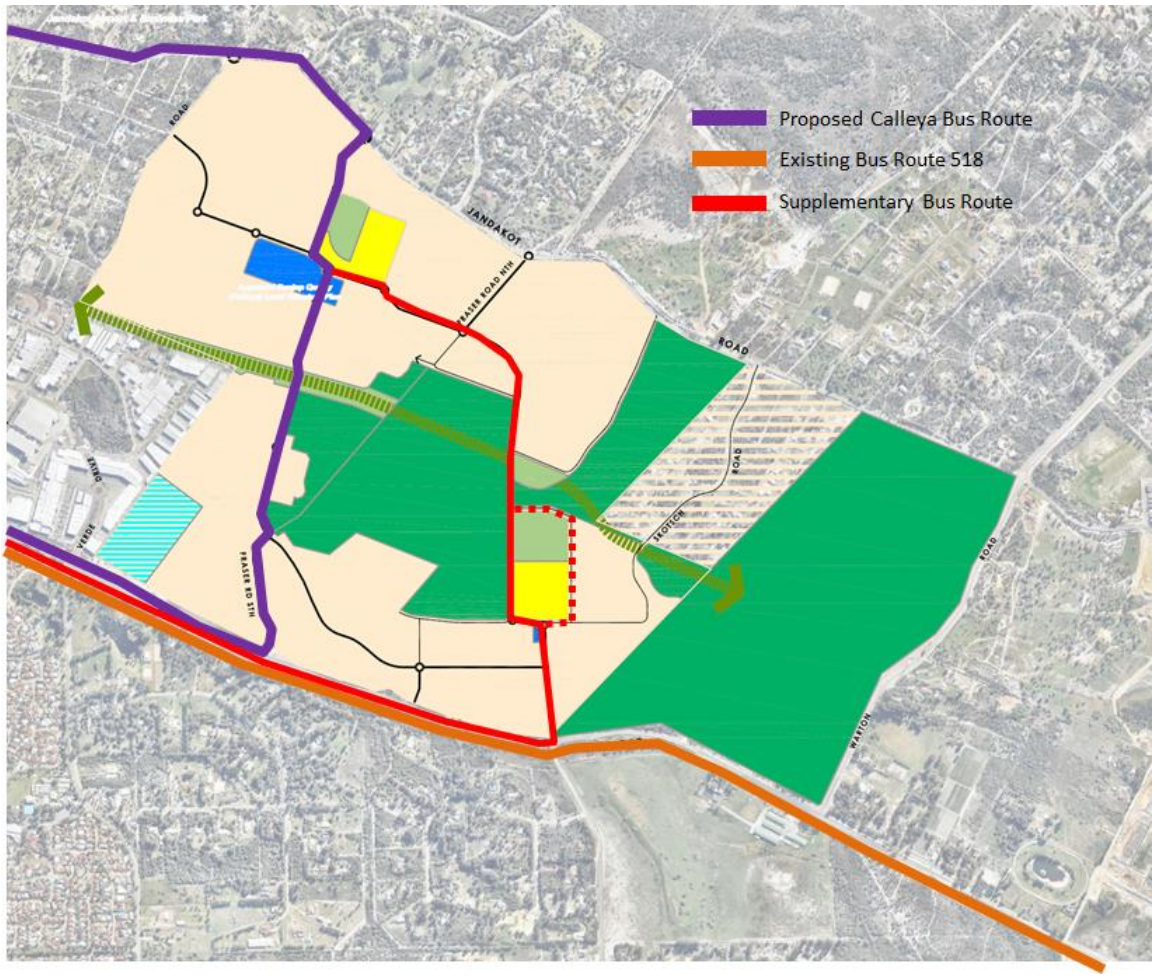


Figure 6: Potential future bus routes (PTA)

The proposed bus route within the Calleya LSP area shown in Figure 5 is subject to the availability of the full movement intersection at Ghostgum Avenue/ Armadale Road in future. However, if the existing signalised intersection at Ghostgum Avenue converts to a left in/ left out intersection in the longer term as a result of the proposed ARD project, then an alternative bus route option would be required to replace the current proposed bus route.

It is Transcore's understanding that City of Cockburn and PTA are collectively investigating the possible potential options for the proposed alternative bus route through consultation with Stockland. As a result of the current investigations PTA and City of Cockburn have prepared a potential alternative bus route option as shown in **Figure 7**.

The proposed alternative bus route option travels between Jandakot Road and Solomon Road through the northern part of the N-S spine road and some of the local roads within Calleya LSP area.

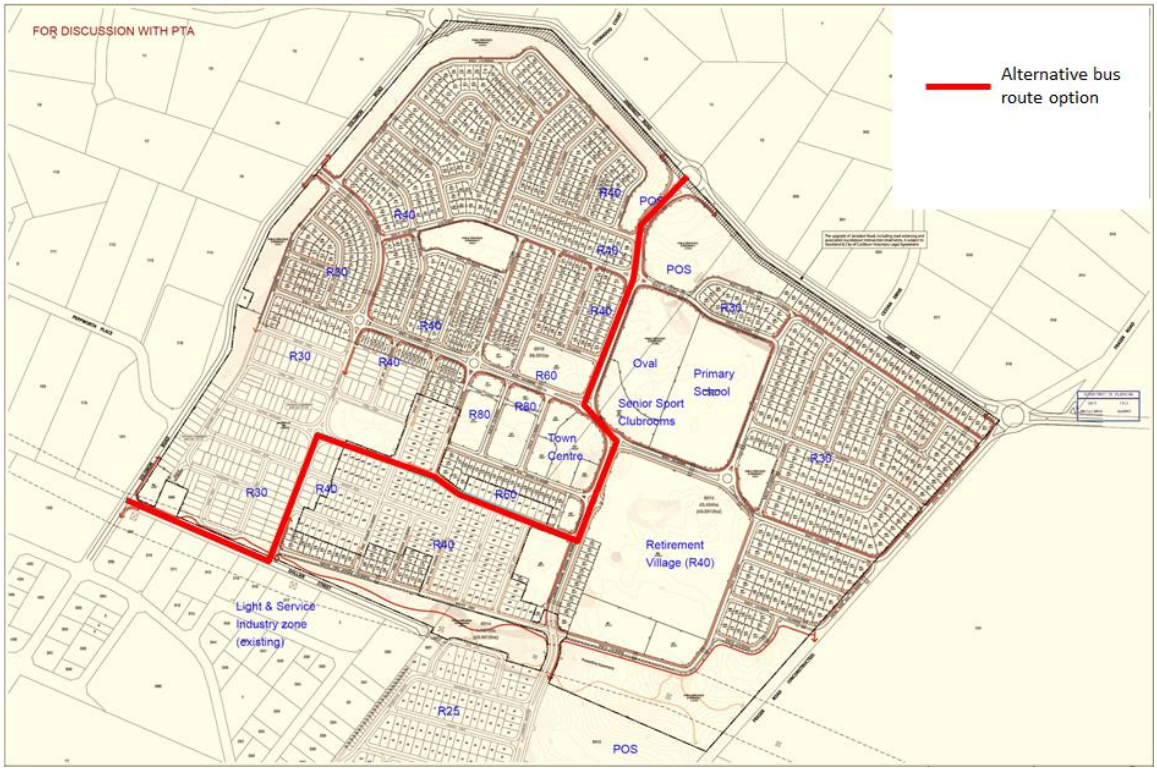


Figure 7: Proposed alternative bus route option

The Department of Transport plan, Public Transport for Perth in 2031, envisages a future bus rapid transit route from Armadale to Cockburn Central providing a cross-suburban link between the Mandurah and Armadale railway lines. However this is part of the ultimate network for a city of 3.5 million people and is indicated as beyond 2031 (refer **Figure 8**). According to the same plan extension of Thornlie rail line is also expected to connect Cannington to Cockburn Central and continuing further south-west towards Rockingham.

Figure 8: Transperth Future Service Development Plan Map

4.0 Proposed Transport Network

4.1 Road Hierarchy

The proposed hierarchy of roads within the DSP area is illustrated in **Figure 9** using the road hierarchy classification from Liveable Neighbourhoods (2007).

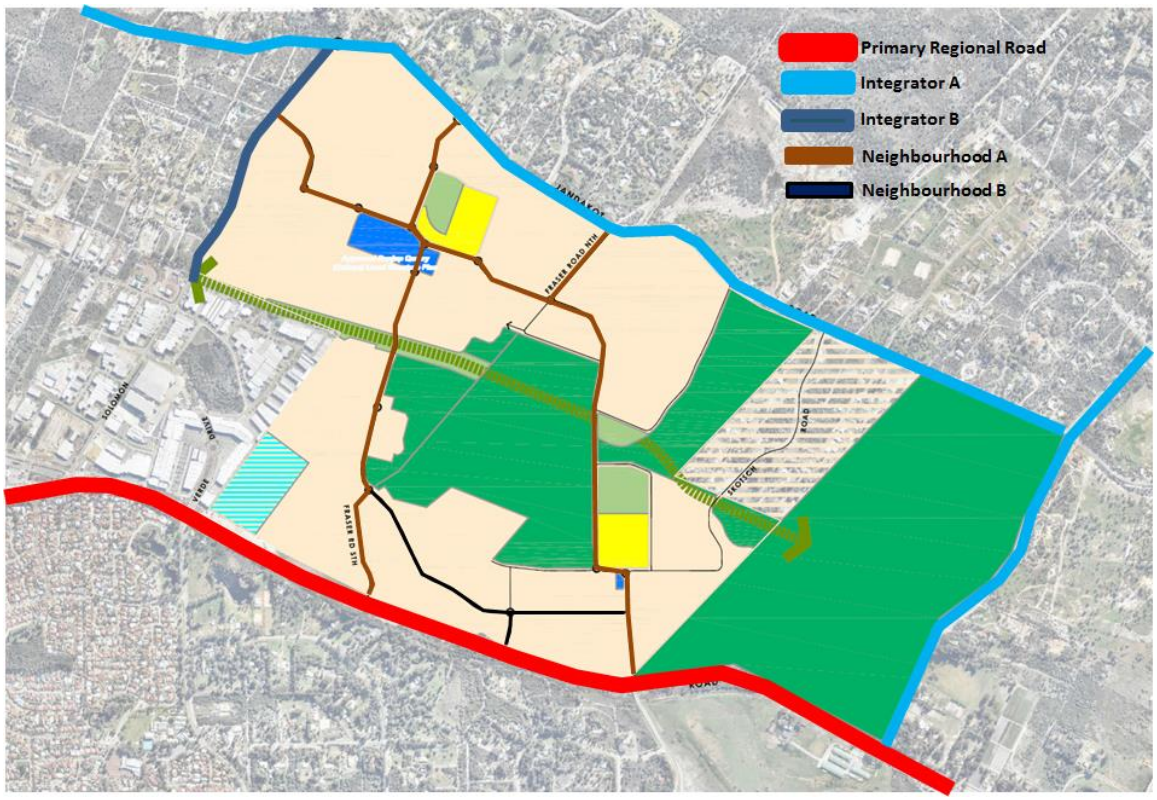


Figure 9: Proposed Road Hierarchy (Original access arrangements along Armadale Road)

Figure 10 illustrates the proposed road hierarchy of the DSP area as per access arrangements proposed by Main Roads WA for the longer term along Armadale Road. Traffic modelling and analysis undertaken indicates that if the intersection of Ghostgum Avenue/ Armadale Road converts to left in/ left out and the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road is removed then the projected daily traffic volume on the southern section of the N-S spine road (Ghosgum Avenue) would drop to less than 3,000vpd and therefore this section of Ghosgum Avenue would be classified as Neighbourhood Connector B road (refer Figure 10).

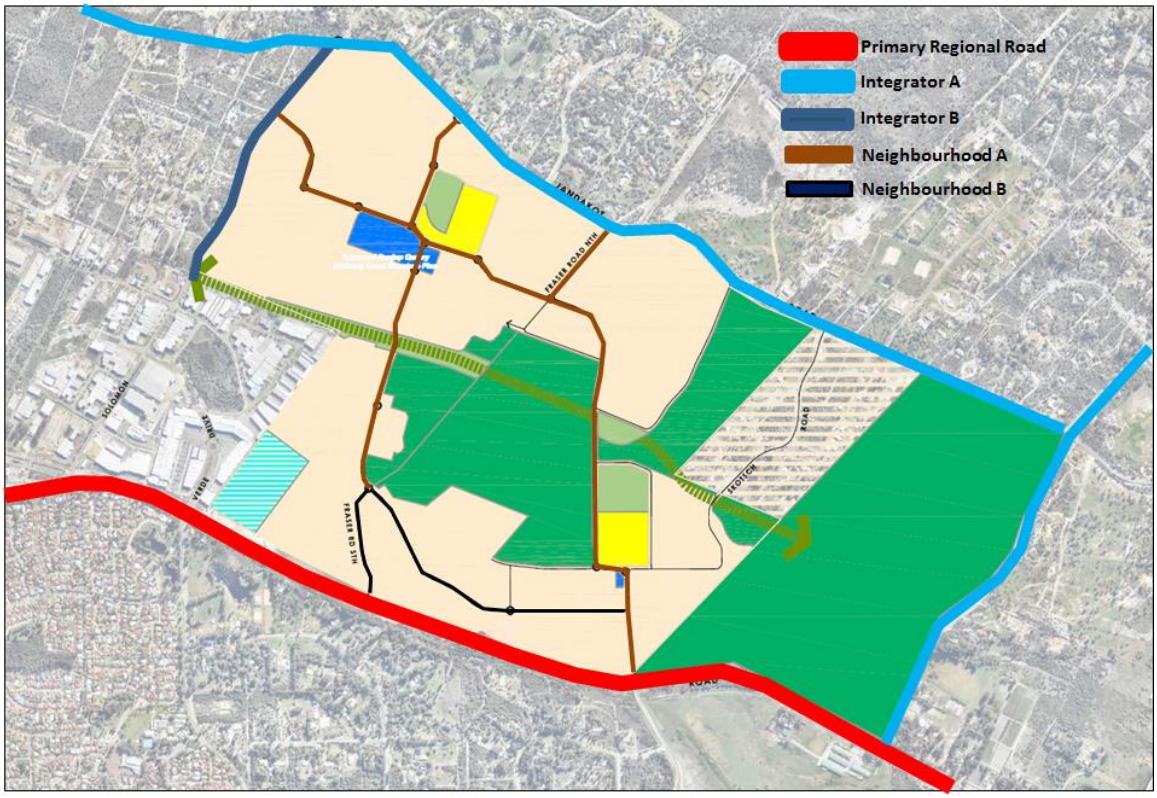


Figure 10: Proposed Road Hierarchy (Main Roads WA proposed access arrangements along Armadale Road)

Armadale Road is a Primary Distributor road according to the Main Roads WA Functional Road Hierarchy and a Primary Regional Road in the Metropolitan Region Scheme. The projected traffic volume along Armadale Road is expected to be over 50,000vpd in future after upgrading Armadale Road to six lanes.

The proposed Banjup DSP only shows the major internal roads within the DSP area. Some key characteristics of the relevant road classifications have been summarised in **Table 1** below. These are generally based on Liveable Neighbourhoods guidelines although the proposed widths would vary slightly from the standard Liveable Neighbourhoods cross-section diagrams.

Table 1: Key Characteristics for the Proposed LSP Road Classifications

Road Classification	Indicative upper volume (vpd)	Indicative road reserve width (m)	Indicative road pavement width (m)
Integrator A	35,000	40m	2 x 8.5m (incl. cycle lanes) + 6m median
Integrator B	15,000	25m	2 x 5m (incl. cycle lanes) + median
Neighbourhood Connector A	7,000	23m	2 x 5m (incl. cycle lanes), 2m median and embayed parking
Neighbourhood Connector B	3,000	20m	7.4m and embayed parking

It should be noted that these reserve widths are indicative only and are subject to further adjustment in consultation with the Department of Planning and City of Cockburn during detailed subdivision design.

Integrator A
Jandakot Road and Warton Road are expected to carry about 20,000vpd to 30,000vpd in the vicinity of the DSP area and therefore are classified as Integrator A Road of dual carriageway standard. The ultimate standard of Jandakot Road would include two traffic lanes each way and6m median.

Integrator B
Solomon road will be an Integrator B road in the Liveable Neighbourhoods road hierarchy. The projected traffic volume on Solomon Road is about 10,000vpd to 12,000vpd in the vicinity of the DSP area.

Neighbourhood Connectors
The proposed north-south and east-west roads within the Calleya Master Plan area are expected to carry about 3,000vpd to 7,000vpd and therefore are classified as Neighbourhood Connector A roads. The southern section of Ghostgum Avenue would be classified as Neighbourhood Connector B road if the intersection of Ghostgum Avenue/ Armadale Road converts to left in/ left out in longer term.

Fraser Road to the south of Jandakot Road is also classified as Neighbourhood Connector A road.

The proposed north-south Road within Lots 4 and 131 which connects Armadale Road to Fraser Road is expected to carry traffic volume of more than 3,000vpd and therefore is classified as Neighbourhood Connector A road.

The proposed east-west Road which travels through Lots 4 and 821 and the proposed left in/left out connector link into Armadale Road are classified as Neighbourhood Connector B Roads.

4.2 Public Transport

Existing bus services in this area are described in section 3.3 of this report and current planning by the Public Transport Authority is discussed in section 3.6.

4.3 Pedestrian and Cyclist Facilities

Figure 11 outlines the proposed pedestrian and cyclist network for the DSP area. The proposed pedestrian and cyclist facilities aim to provide a permeable road network within the DSP area and create excellent opportunities for the provision of good pedestrian and cyclist facilities that maximise the use of non-motorised transport modes.

According to Liveable Neighbourhood Guidelines Shared Paths and Footpaths are proposed along all Neighbourhood Connector A roads. Shared Paths are also proposed along Armadale Road, Solomon Road, Warton Road and Jandakot Road.

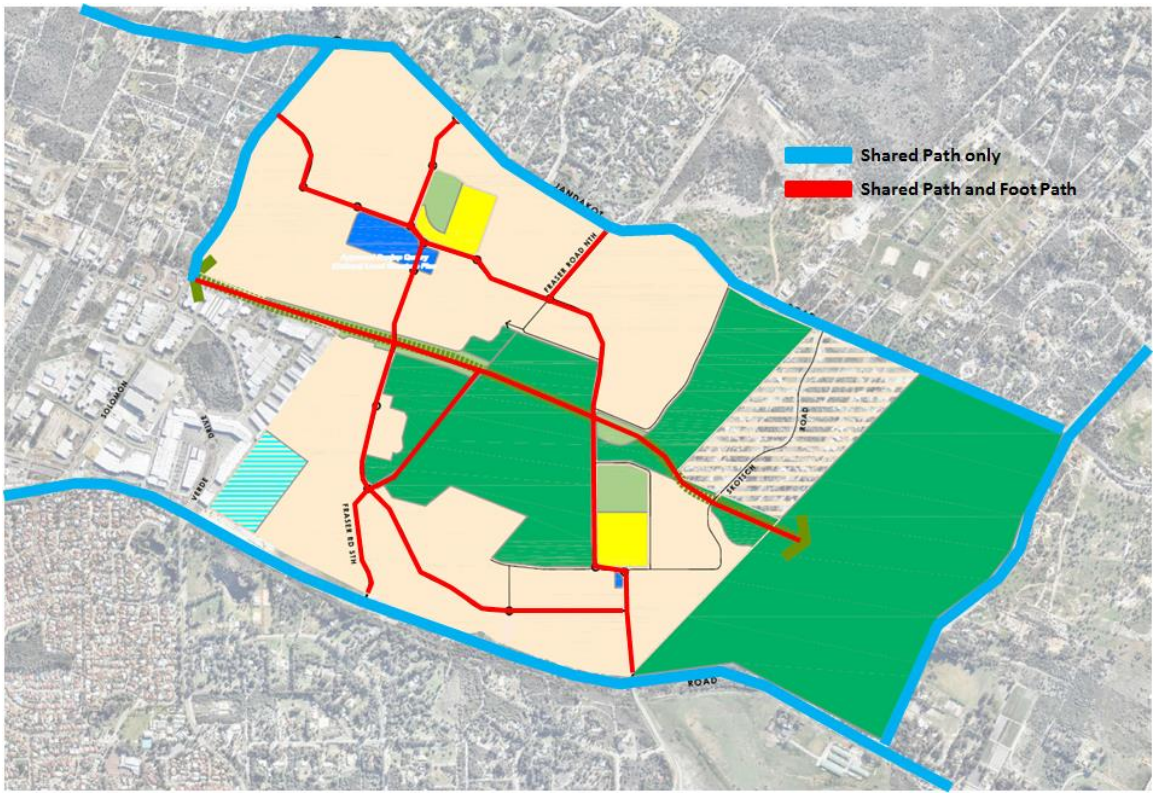


Figure 11: Proposed Pedestrian and Cyclist Network

4.4 Integration with Surrounding Area

The proposed land uses for the DSP area are predominantly residential dwellings which are in line with the existing and future surrounding land uses in this area.

The road network of the DSP area will connect to the surrounding road network including Armadale Road and Jandakot Road at a number of locations. This will include two connections to Armadale Road and four connections to Jandakot Road. The proposed pedestrian and cyclist facilities within the DSP area would provide connection to the proposed Shared Paths along Armadale Road and Jandakot Road.

5.0 Analysis of the Transport Network

5.1 Assessment Period

The assessment year that has been adopted for this analysis is 2031, with full development of the DSP area.

5.2 Traffic generation and distribution

Transcore has developed a subregional strategic transport model for weekday traffic flows for the Armadale area using the EMME transport modelling software package. This model was used to estimate the traffic projections of the proposed DSP area.

The daily traffic generation rate used for the DSP area for this transport assessment is 8 vehicle trips per day (vpd) per dwelling, which corresponds to peak hour trip generation rates recommended in the Western Australian Planning Commission (WAPC) Transport Assessment Guidelines for Development (2006).

The anticipated 3,500 (2000+330+700+500= 3,530 say 3,500) dwellings of the DSP area will therefore generate approximately 28,000vpd. It must be noted that the proposed 3,500 Lots for the DSP area does not include any residential Lots on Lot 1 west or the Skotsch Road locality.

According to the information provided to Transcore, the current status of planning for Lot 1 west is not clear yet, however for the purpose of traffic modelling and analysis and in the absence of more detailed planning for Lot 1 west, it has been assumed that Lot 1 west would accommodate primarily about 60% service commercial with a lesser proportion (about 40%) residential Lots.

For the proposed primary schools within the DSP area the trip rate used is 1.0 vph per student during the before and after school peak periods (typically 8-9am and 3-4pm) and 2vpd per student overall. For this assessment the Education Department's standard 430 student primary school design has been assumed, so each of the proposed primary schools are assumed to attract traffic flows of 860vpd.

For the proposed Neighbourhood and Local Centres within the DSP area a trip rate of 121 vpd per 100sqm NLA of the retail area is adopted. Accordingly, the local neighbourhood centre of about 2,800m^2 NLA within the Calleya LSP area is estimated to attract about 3,400vpd. Similarly the proposed 500m^2 Local Centre within Lot 4 would attract about 600vpd.

The distribution of these trips is determined by the traffic model in proportion to the location of trip productions and attractors for work trips, education trips and other trips (shopping, social, recreational, etc.) among all the land uses in the traffic model.

5.3 Traffic Flow Forecasts

Figure 12 illustrates future total daily traffic flows estimated for the road network of the DSP area based on the road network and access arrangements shown in the Banjup DSP (refer Figure 2).

Figure 13 shows the same figures for the long term. In the longer term it is likely that the existing signalised intersection of Armadale Road/ Ghostgum Avenue converts to a left in/ left out intersection. The traffic projections in Figure 13 reflect the proposed changes to the existing traffic lights at Ghostgum Avenue. The modelling and analysis undertaken for the long term option does not include the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road.

The future total daily traffic flows on the road network in and around the DSP area has been modelled for the future scenario of full development of this area. The modelled surrounding district road network reflects latest future road network upgrades for this area. Accordingly 6 and 4 lanes were assumed for Armadale and Jandakot Roads respectively to reflect the future upgrades proposed for these roads in long term.

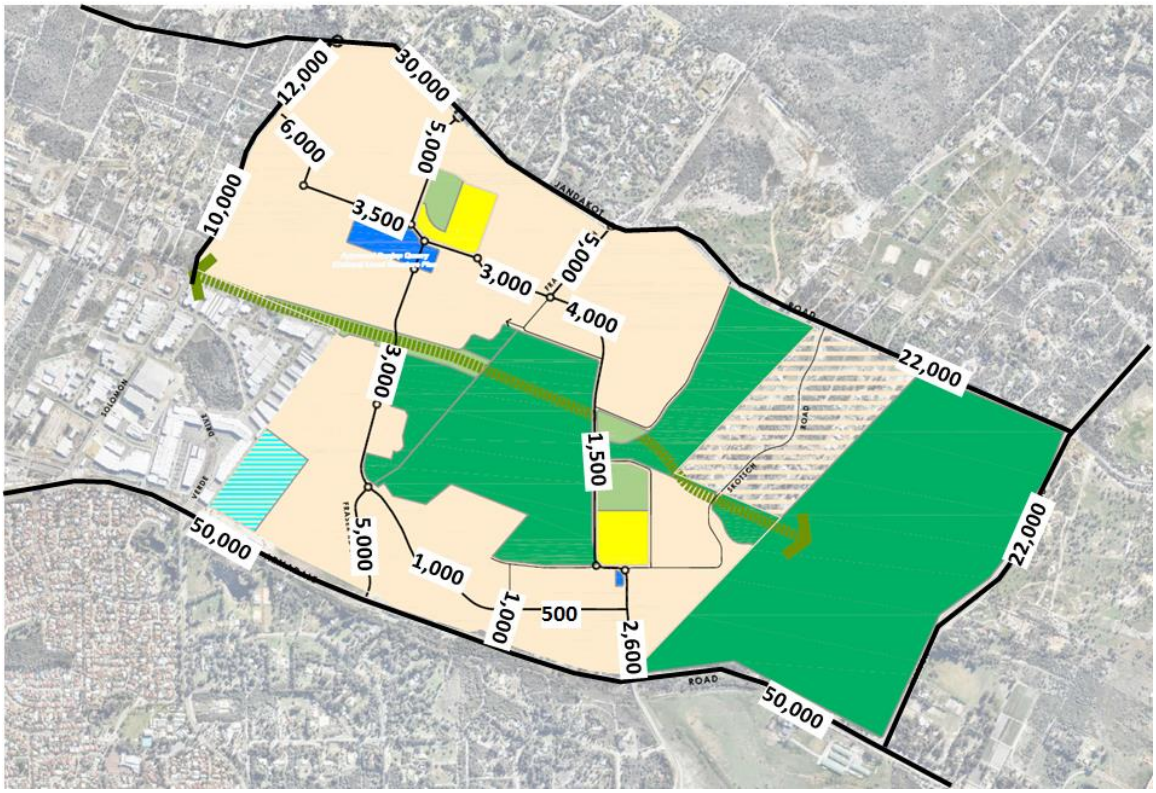


Figure 12: Projected Daily Traffic Volumes (Original access arrangements along Armadale Road)

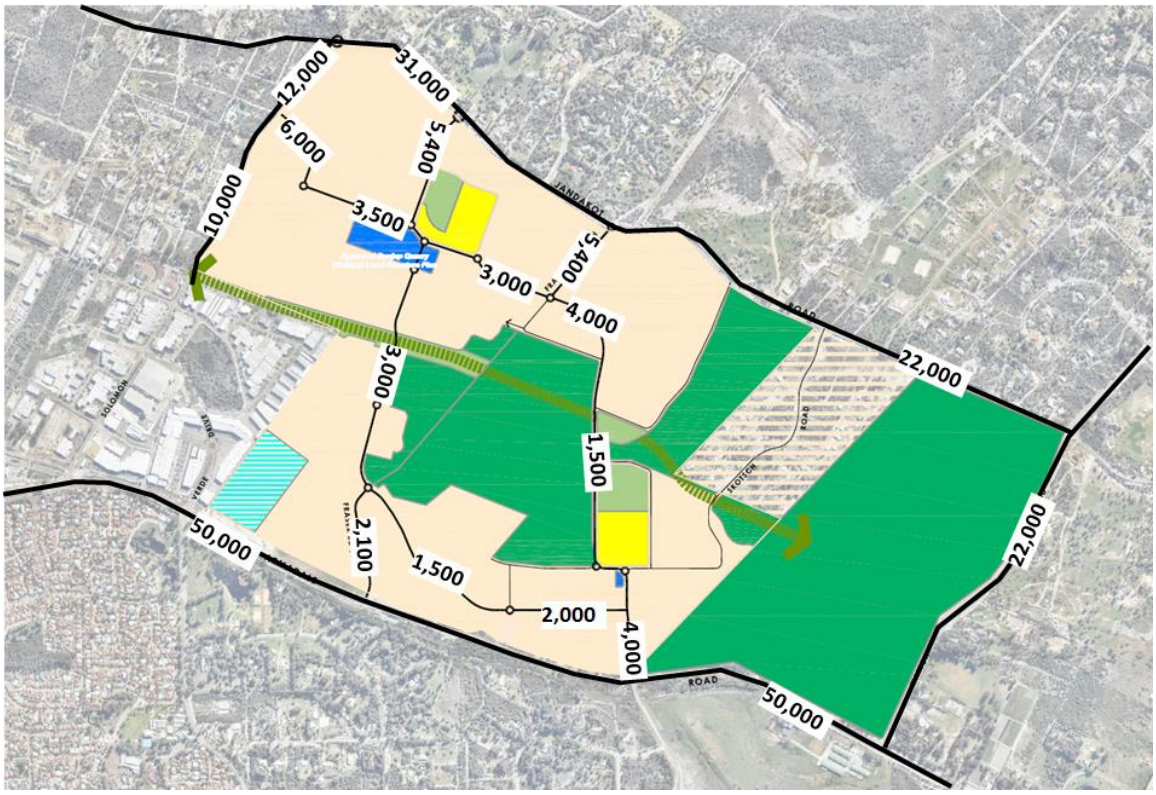


Figure 13: Projected Daily Traffic Volumes (Main Roads WA proposed access arrangements along Armadale Road)

Reviewing the projected traffic volumes in Figures 12 and 13 indicates that in the long term (after downgrading the Ghostgum Avenue/ Armadale Road signalised intersection to left in/ left out intersection and removal of the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road) more traffic would utilise the future roundabout intersection at Armadale Road/ Liddelow Road/ DSP access road. Accordingly the proposed east-west neighbourhood connector B road parallel to Armadale Road would attract more traffic and the projected daily traffic volume on the southern section of the N-S spine road (Ghostgum Avenue) would drop to less than 3,000vpd.

5.4 Roads and Intersections

The proposed road network to accommodate these traffic volumes has been detailed in section 4 of this transport assessment, including the details of the proposed road hierarchy in section 4.1.

Figure 14 details the proposed intersection controls for key intersections within the DSP area.

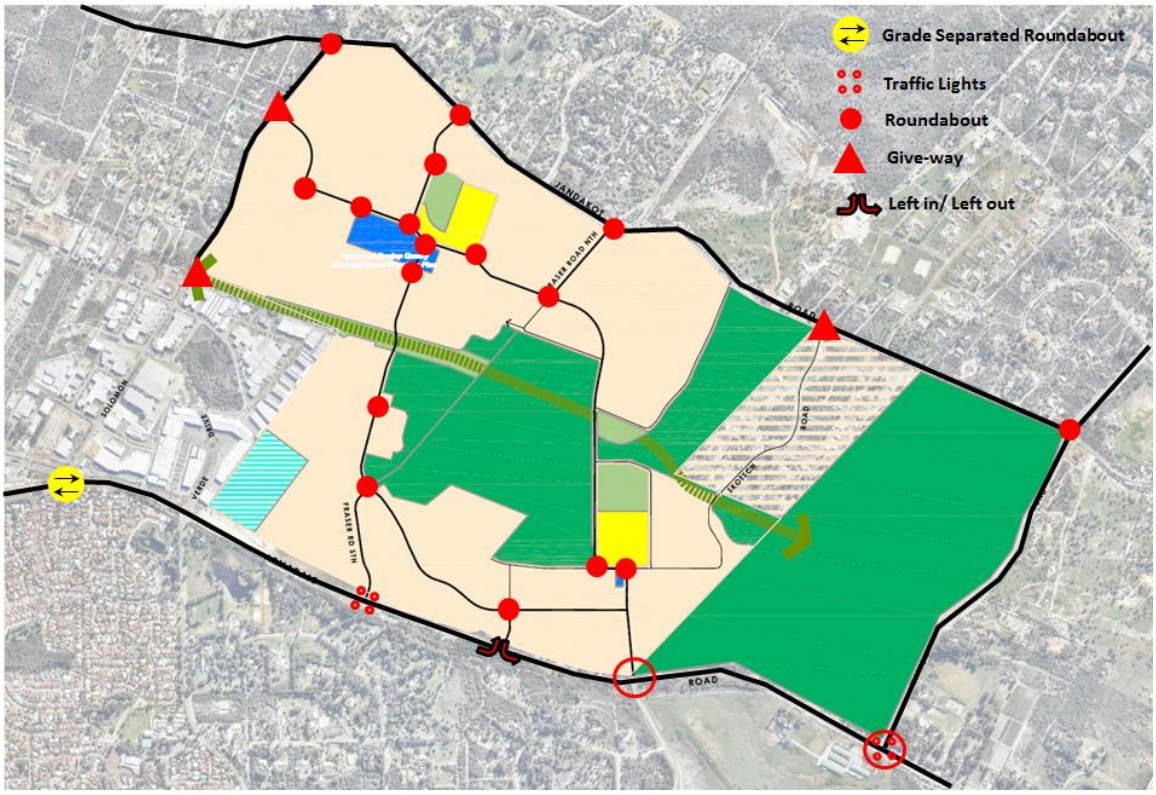


Figure 14: Intersection Treatments

Armadale Road Intersections

The primary access to the DSP area on Armadale Road is proposed by two 4-way intersections at Ghostgum Avenue and Liddelow Road as shown in Figure 14.

Currently the intersection of Ghostgum Avenue/ Armadale Road is controlled by traffic lights, however in the longer term (after the Armadale Road Deviation project), this intersection would be downgraded to a left in left out intersection and the existing traffic lights would be removed. The proposed 4-way intersection of Armadale Road/ Liddelow Road/ DSP access road is proposed to operate as a roundabout.

The DSP shows a left in/ left out access intersection on Armadale Road between Ghostgum Avenue and Liddelow Road. The proposed left in/ left out intersection would improve connectivity and permeability of the DSP area. Main Roads WA expressed some concerns with the proposed left in/ left out intersection and therefore the traffic modelling and analysis in the amended TIA report includes the option without the left in/ left out intersection.

Jandakot Road Intersections

The proposed DSP provides four connections to Jandakot Road including three roundabout intersections at Solomon Road, N-S road and Fraser Road. The existing intersection of Skotsch Road and Jandakot Road is expected to operate as a priority controlled T-intersection. It is Transcore's understanding that Skotsch Road would not connect to the Lot 4 from south to minimise the level of through traffic on this road.

Solomon Road Intersections
Two priority controlled T-intersections are proposed on Solomon Road from Dolier Road and main east-west road in the Calleya LSP area.

Internal Intersections
A number of roundabouts are proposed within the DSP area for the proposed internal 4-way intersections and major T-intersections. These roundabouts will help manage circulating traffic flows and assist with speed management on the neighbourhood connector roads.

5.5 Intersection Analysis

Capacity analysis of the proposed intersections on Armadale Road and Jandakot Road has been undertaken using the SIDRA computer software package for the typical peak hour. 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 B**.

The SIDRA analysis indicates that the existing traffic lights on Armadale Road/Ghostgum Avenue and proposed roundabout at Liddelow Road/ Armadale Road/ DSP access road would operate satisfactorily and within capacity.

The proposed roundabout intersections along Jandakot Road would also operate satisfactorily with acceptable levels of service at the intersections. The existing intersection of Skotsch Road/ Jandakot Road is also expected to operate satisfactorily as priority controlled T-intersection in future. The proposed large median along Jandakot Road would provide the opportunity for right turn traffic from Skotsch Road to Jandakot Road to occur in two stages.

Additional transport modelling and intersection analysis are undertaken for the future roundabout intersection of Armadale Road/ Liddelow Road/ DSP access road during the longer term and assuming that the intersection of Ghostgum

Avenue/ Armadale Road converts to a left in/ left out intersection. Figure B7 and Table B7 in Appendix B show the intersection layout and intersection operation respectively. SIDRA analysis undertaken indicates that the proposed roundabout intersection would work satisfactorily with overall level of service A and maximum queue of about 48m on Armadale Road.

5.6 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. Wider lots with paired driveways and protected reversing areas in the parking lane may be used on streets with up to 7,000 vehicles per day."

All of the neighbourhood connector roads within the DSP area are expected to carry less than 5,000vpd, so no restriction on vehicular access is required on the proposed neighbourhood connector roads.

No direct access is permitted for the properties along Armadale Road, Jandakot Road and Solomon Road.

5.7 Pedestrian / Cycle Networks

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

5.8 Access to Public Transport

WAPC Transport Assessment Guidelines for Developments (2006) suggest that it is desirable for at least 90 per cent of dwellings to be within 400m straight line distance of a bus route.

The original proposed PTA bus routes within the Calleya LSP area and potential secondary bus route within the residential developments to the east of Calleya (indicated as the red line in Figure 6) would cover the majority of the proposed residential developments within the DSP area.

The proposed alternative bus route option which would replace the original PTA bus route within the Calleya LSP (should the intersection of Ghostgum Avenue/ Armadale Road be converted to a left in/ left out intersection, should the ARD project occure) would cover only the northern part of the Calleya LSP.

Therefore the southern part of the Calleya LSP would be outside of the 400m straight line distance of the proposed alternative bus route. It is desirable that further consideration be given to public transport accessibility of the southern part of Calleya LSP during the detailed planning stages of ARD project.

6.0 Conclusions

The DSP area is anticipated to accommodate approximately 3,500 dwellings, two primary schools, a neighbourhood centre and a local centre.

This residential area is anticipated to generate traffic flows of approximately 28,000vpd. The proposed schools are estimated to attract about 1,700vpd. The proposed local and neighbourhood centres are expected to attract about 4,000vpd.

The proposed key road network of the DSP area has been planned based on WAPC Liveable Neighbourhoods guidelines to accommodate the future traffic flows that will be generated in this area.

Access to the DSP area will be served by two four-way intersections and a left in/ left out intersection on Armadale Road, Three roundabout intersections and a priority controlled T-intersection on Jandakot Road.

Main Roads WA has provided “in principal” support for the proposed 4-way intersection of Armadale Road/ Liddelow Road and installation of a roundabout at this intersection. However, Main Roads WA have expressed concerns regarding the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road.

Main Roads WA also indicated that the existing signalised intersection of Ghostgum Avenue/ Armadale Road could be converted to left in/ left out intersection should the Armadale Road Deviation and construction of a grade separated intersection on Verde Drive/ Tapper Road/ Armadale Road intersection occure.

Due to the uncertainty of the timing of confirmation of the Armadale Road Deviation project this TIA report provides the outcome of the modelling and analysis for the proposed access arrangements shown in the DSP area and the proposed access arrangements by Main Roads WA along Armadale Road assuming implementation of Armadale Road Deviation and construction of the grade separated intersection on Verde Drive/ Tapper Road/ Armadale Road.

Transport modelling and analysis undertaken indicate that if the intersection of Ghostgum Avenue/ Armadale Road converts to left in/ left out and the proposed left in/ left out intersection on Armadale Road between Ghostgum Avenue and Liddelow Road is removed then more traffic would utilise the future roundabout intersection at Armadale Road/ Liddelow Road/ DSP access road.

SIDRA analysis undertaken indicates that the proposed roundabout intersection at Armadale Road/ Liddelow Road/ DSP access road would work satisfactorily in the longer term with overall level of service A and maximum queue of about 48m on Armadale Road.

SIDRA analysis undertaken for future traffic flows (when the DSP area is fully developed) indicates that the proposed intersections on Jandakot Road would operate satisfactorily and within capacity and therefore they can accommodate the DSP traffic after full development and future traffic growth along Armadale Road and Jandakot Road.

The proposed DSP area provides for a comprehensive network of shared paths and footpaths to encourage and facilitate non-motorised travel as well.

The original PTA bus routes within the Calleya LSP area and potential secondary bus route within the residential developments to the east of Calleya would cover the majority of the proposed residential developments within the DSP area.

The proposed alternative bus route option prepared by PTA and City of Cockburn which would replace the original PTA bus route within the Calleya LSP in the longer term (should the intersection of Ghostgum Avenue/ Armadale Road be converted to a left in/ left out intersection) would cover only the northern part of the Calleya LSP. Therefore the southern part of the Calleya LSP would be outside of the 400m straight line distance of the proposed alternative bus route.

It is desirable that further consideration be given to public transport accessibility of the southern part of Calleya LSP during the detailed design stage of the Armadale Road Deviation Project.

Appendix A

Planning Control Area No 122
Armadale Road Deviation

Planning control area
No: 122

Planning Control Area No. 122 - Armadale Road Deviation (Cockburn Central)

Department of Planning

Western Australian Planning Commission

Created on date: 9 February 2016
Produced by Geo/Spatial Research and Modelling, Department of Planning, Perth WA
Base information supplied by Western Australian Land Information Authority (2) 782-2015-1

Legend

Planning control area

Program Manager: I. Szilo
Geospatial Officer: S. Jenkins
Examined: J. Ballarotta
Revised:
Version No: 1
Date: WAPC/240.10.3.2 February 2016

N

0 10 20 30 40 50
metres

Plan Number
1.7415
2874 Sheet 1 of 1

File number: 835/02/23/11 (RLS/052)
Plan reference:
Metropolitan Region Scheme
1:25,000 sheet 2.4

Appendix B

Intersection Analysis

(2031 Typical Peak Hours)

Figure B1: Proposed roundabout Intersection on Armadale Road/ Liddelow Road/DSP Road (based on DSP access arrangements along Armadale Road)

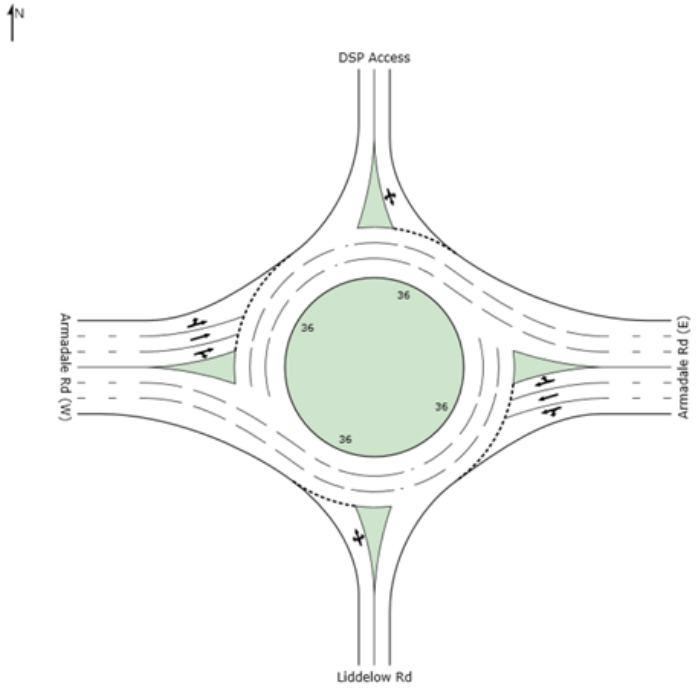


Table B1. SIDRA results for Armadale Road/ Liddelow Road/ DSP Road (based on DSP access arrangements along Armadale Road)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Liddelow Rd											
1	L	11	0.0	0.454	15.8	LOS B	2.2	15.4	0.86	0.99	41.1
2	T	24	0.0	0.454	14.8	LOS B	2.2	15.4	0.86	0.98	41.3
3	R	151	0.0	0.454	22.2	LOS C	2.2	15.4	0.86	1.04	38.9
Approach		185	0.0	0.454	20.9	LOS C	2.2	15.4	0.86	1.03	39.3
East: Armadale Rd (E)											
4	L	175	0.0	0.637	5.8	LOS A	5.2	38.8	0.39	0.52	50.2
5	T	2446	10.0	0.637	4.5	LOS A	5.3	40.3	0.38	0.40	51.0
6	R	72	0.0	0.637	11.8	LOS B	5.2	39.1	0.39	0.82	46.9
Approach		2693	9.1	0.637	4.8	LOS A	5.3	40.3	0.38	0.42	50.8
North: DSP Access											
7	L	53	0.0	0.419	16.6	LOS B	2.0	14.2	0.89	0.99	41.0
8	T	36	0.0	0.419	15.7	LOS B	2.0	14.2	0.89	0.98	41.2
9	R	53	0.0	0.419	23.0	LOS C	2.0	14.2	0.89	1.04	38.8
Approach		141	0.0	0.419	18.8	LOS B	2.0	14.2	0.89	1.01	40.2
West: Armadale Rd (W)											
10	L	34	0.0	0.668	7.0	LOS A	5.5	41.3	0.58	0.64	49.2
11	T	2474	10.0	0.668	5.6	LOS A	5.5	41.4	0.57	0.51	49.5
12	R	11	0.0	0.668	12.9	LOS B	5.5	41.4	0.58	0.87	46.7
Approach		2518	9.8	0.668	5.6	LOS A	5.5	41.4	0.57	0.52	49.5
All Vehicles		5537	8.9	0.668	6.1	LOS A	5.5	41.4	0.50	0.50	49.3

Figure B2: Proposed Roundabout at Jandakot Road/N-S Spine Road

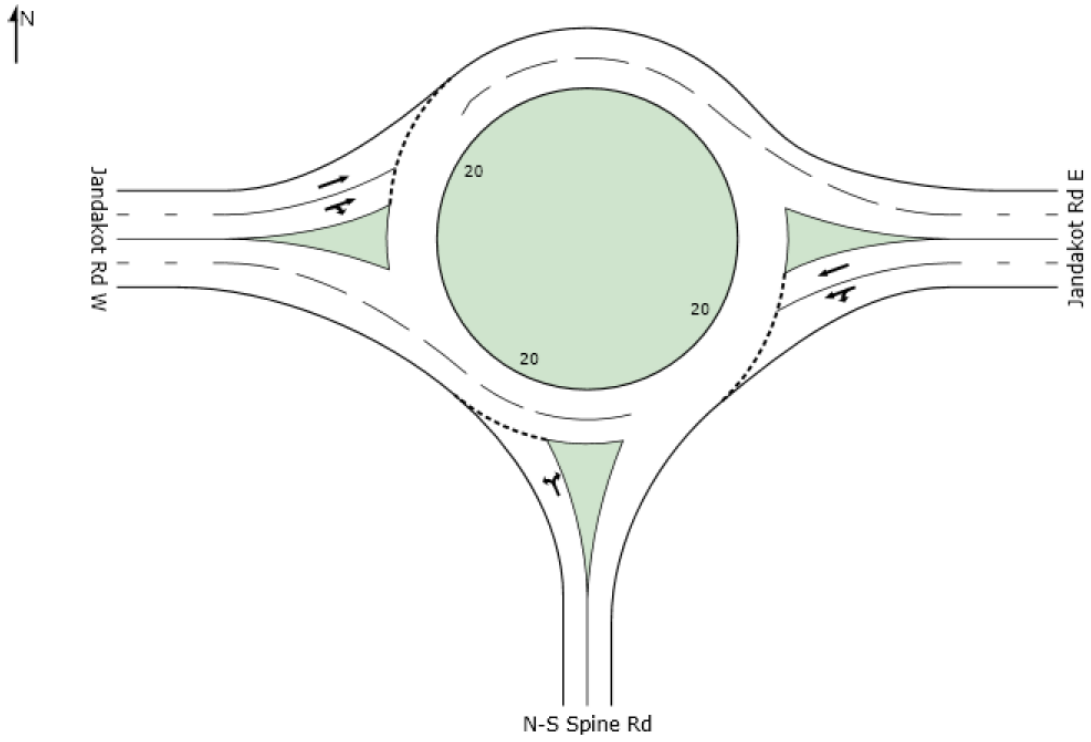


Table B2: SIDRA result for the Jandakot Road/N-S Spine Road intersection

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: N-S Spine Rd											
1	L	232	0.0	0.548	13.9	LOS B	3.1	21.9	0.82	0.99	43.3
3	R	53	0.0	0.548	18.7	LOS B	3.1	21.9	0.82	1.04	40.8
Approach		284	0.0	0.548	14.8	LOS B	3.1	21.9	0.82	1.00	42.8
East: Jandakot Rd E											
4	L	21	0.0	0.535	7.8	LOS A	4.4	32.4	0.53	0.63	48.4
5	T	1393	6.0	0.535	6.9	LOS A	4.4	32.4	0.55	0.58	48.5
Approach		1414	5.9	0.535	6.9	LOS A	4.4	32.4	0.55	0.58	48.5
West: Jandakot Rd W											
11	T	1495	6.0	0.550	5.9	LOS A	5.7	41.9	0.32	0.44	50.0
12	R	211	0.0	0.550	11.5	LOS B	5.6	40.8	0.34	0.73	46.1
Approach		1705	5.3	0.550	6.6	LOS A	5.7	41.9	0.32	0.48	49.4
All Vehicles		3403	5.1	0.550	7.4	LOS A	5.7	41.9	0.46	0.56	48.4

Figure B3: Proposed Roundabout at Jandakot Road/Solomon Road

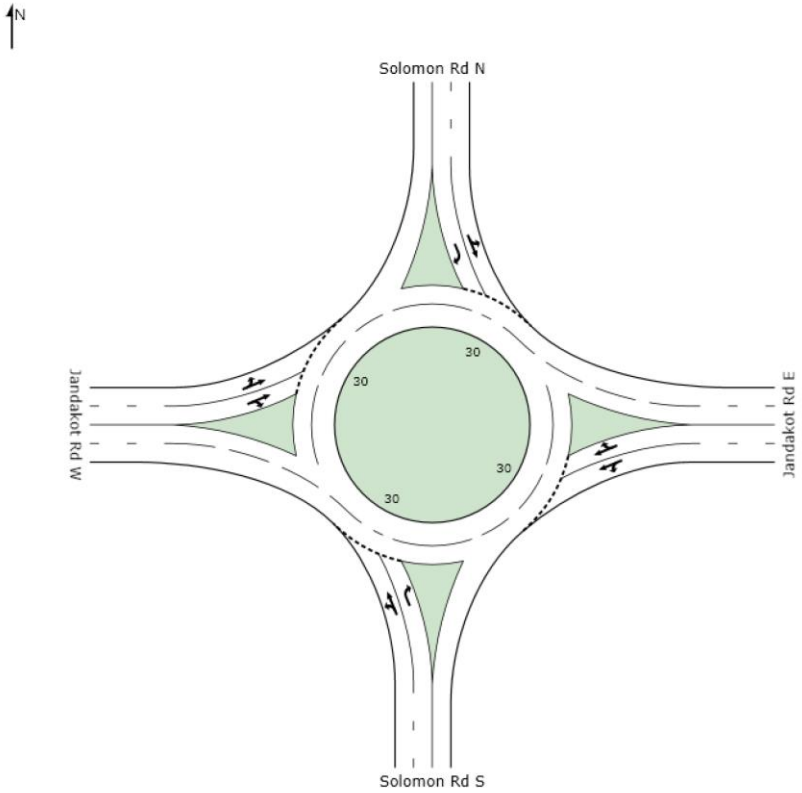


Table B3: SIDRA result for the Jandakot Road/Solomon Road intersection

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Solomon Rd S											
1	L	145	0.0	0.349	11.1	LOS B	1.7	12.2	0.79	0.92	46.2
2	T	37	0.0	0.349	9.9	LOS A	1.7	12.2	0.79	0.89	46.5
3	R	358	0.0	0.492	16.4	LOS B	3.1	22.0	0.84	1.01	42.4
Approach		540	0.0	0.492	14.5	LOS B	3.1	22.0	0.82	0.98	43.6
East: Jandakot Rd E											
4	L	238	0.0	0.645	6.8	LOS A	5.4	39.5	0.57	0.60	48.7
5	T	1389	6.0	0.645	5.9	LOS A	5.4	39.6	0.59	0.52	48.9
6	R	26	0.0	0.645	12.7	LOS B	5.4	39.6	0.60	0.83	46.6
Approach		1654	5.0	0.645	6.1	LOS A	5.4	39.6	0.59	0.54	48.8
North: Solomon Rd N											
7	L	26	0.0	0.129	12.0	LOS B	0.8	5.4	0.89	0.92	45.7
8	T	38	0.0	0.129	10.8	LOS B	0.8	5.4	0.89	0.90	46.0
9	R	35	0.0	0.100	19.6	LOS B	0.5	3.6	0.85	0.95	40.1
Approach		99	0.0	0.129	14.2	LOS B	0.8	5.4	0.88	0.92	43.6
West: Jandakot Rd W											
10	L	35	0.0	0.717	9.4	LOS A	7.7	56.7	0.81	0.86	47.8
11	T	1347	6.0	0.717	8.6	LOS A	7.7	56.7	0.81	0.84	47.2
12	R	142	0.0	0.717	15.8	LOS B	7.5	54.8	0.82	0.98	44.1
Approach		1524	5.3	0.717	9.3	LOS A	7.7	56.7	0.81	0.86	46.9
All Vehicles		3817	4.3	0.717	8.8	LOS A	7.7	56.7	0.72	0.74	47.1

Figure B4: Proposed Roundabout at Jandakot Road/Fraser Road

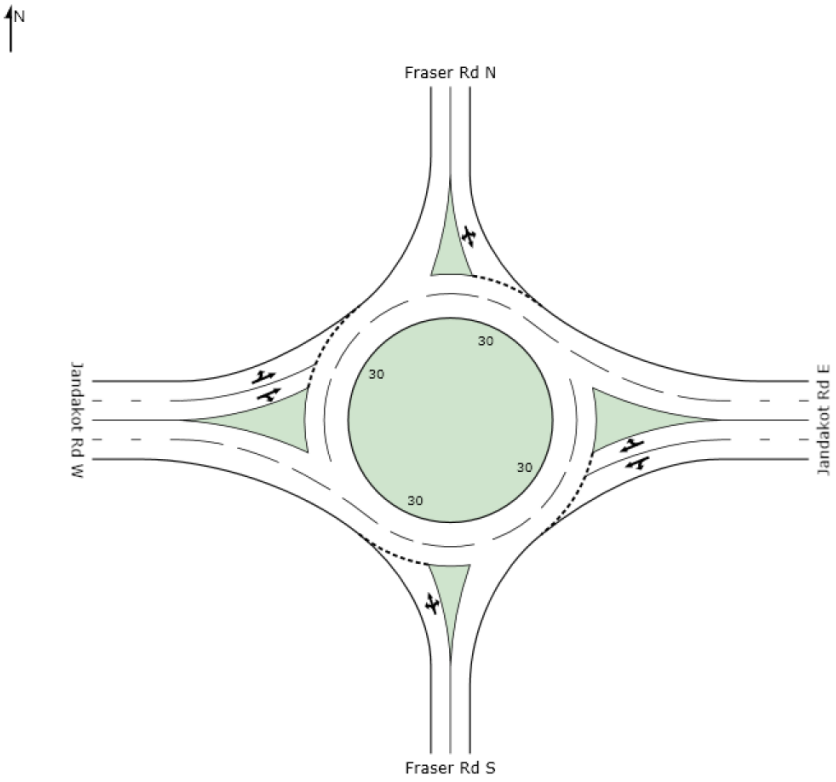


Table B4: SIDRA result for the Jandakot Road/Fraser Road intersection

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Fraser Rd S											
1	L	118	0.0	0.484	11.9	LOS B	2.9	20.2	0.83	0.97	44.9
2	T	54	0.0	0.484	11.0	LOS B	2.9	20.2	0.83	0.95	45.1
3	R	101	0.0	0.484	17.8	LOS B	2.9	20.2	0.83	1.03	42.0
Approach		273	0.0	0.484	13.9	LOS B	2.9	20.2	0.83	0.99	43.8
East: Jandakot Rd E											
4	L	89	0.0	0.552	8.1	LOS A	4.4	32.3	0.70	0.73	48.2
5	T	1053	6.0	0.552	7.3	LOS A	4.4	32.3	0.70	0.67	48.1
6	R	26	0.0	0.552	14.3	LOS B	4.3	31.9	0.71	0.92	45.4
Approach		1168	5.4	0.552	7.5	LOS A	4.4	32.3	0.70	0.68	48.0
North: Fraser Rd N											
7	L	53	0.0	0.594	13.4	LOS B	4.0	28.2	0.85	1.02	43.3
8	T	57	0.0	0.594	12.4	LOS B	4.0	28.2	0.85	1.00	43.5
9	R	252	0.0	0.594	19.3	LOS B	4.0	28.2	0.85	1.06	40.7
Approach		361	0.0	0.594	17.3	LOS B	4.0	28.2	0.85	1.05	41.4
West: Jandakot Rd W											
10	L	360	0.0	0.581	6.5	LOS A	4.8	34.7	0.51	0.58	48.9
11	T	1053	6.0	0.581	5.6	LOS A	4.8	34.7	0.53	0.50	49.2
12	R	107	0.0	0.581	12.4	LOS B	4.7	34.3	0.54	0.79	46.5
Approach		1520	4.2	0.581	6.3	LOS A	4.8	34.7	0.52	0.54	48.9
All Vehicles		3322	3.8	0.594	8.5	LOS A	4.8	34.7	0.65	0.68	47.2

Figure B5: Proposed Traffic Lights at Armadale Road/Ghostgum Avenue (N-S Spine Rd)

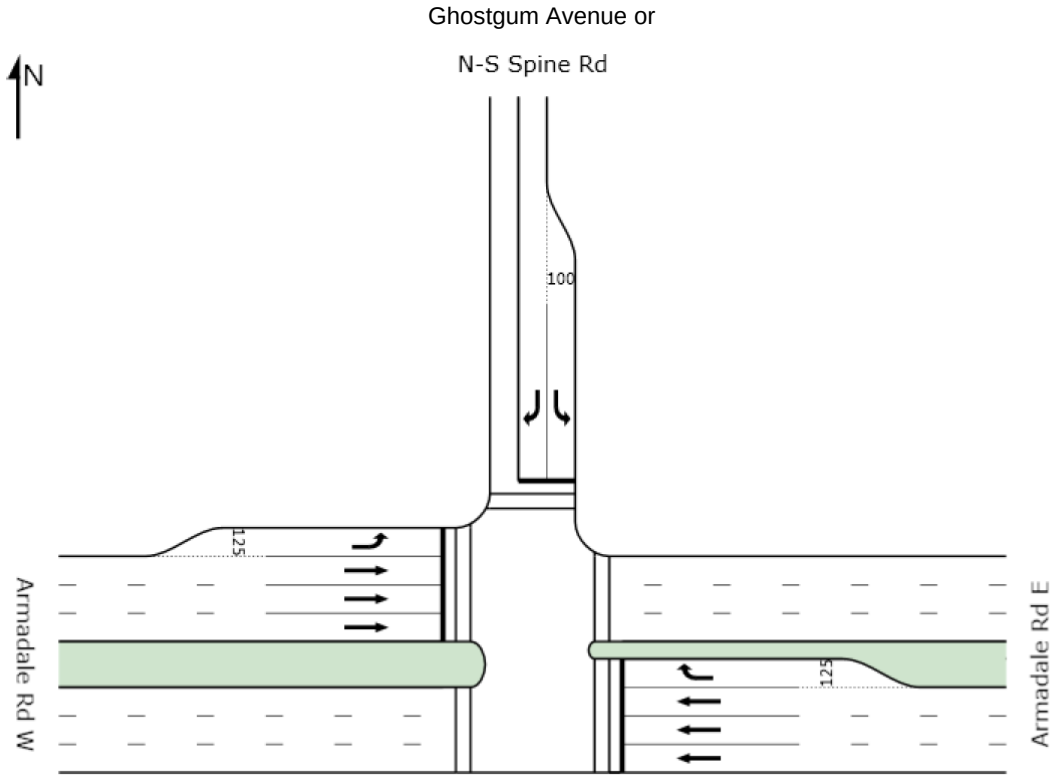
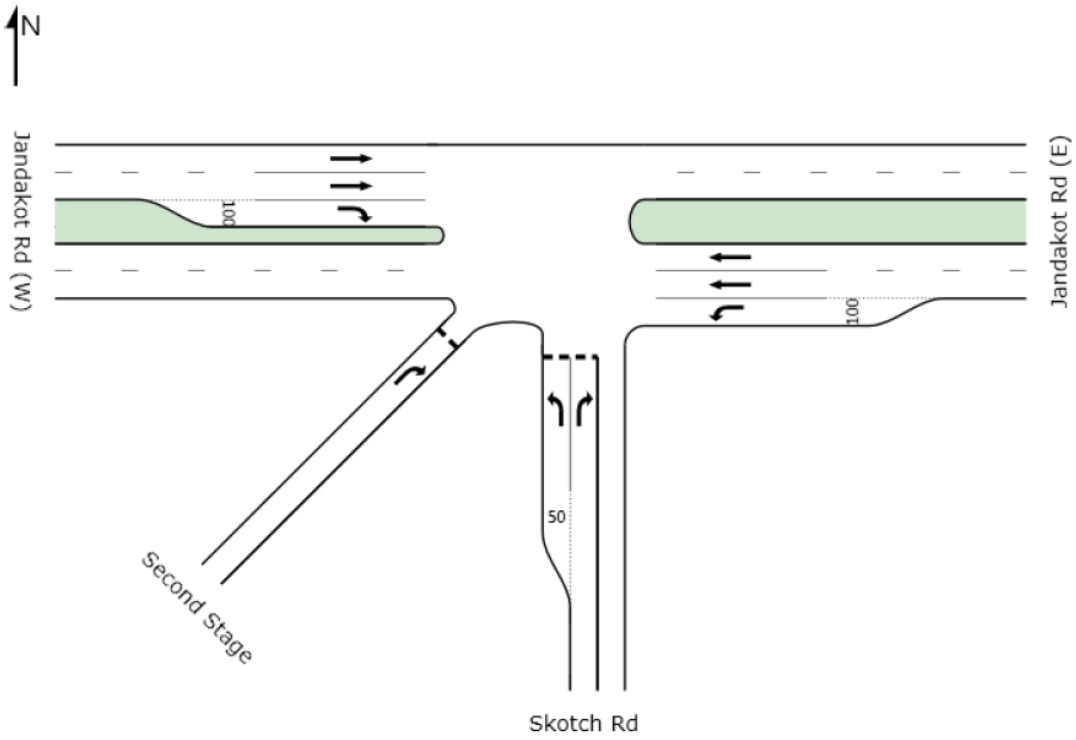


Table B5: SIDRA result for the Armadale Road/Ghostgum Avenue (N-S Spine Rd) intersection

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Armadale Rd E											
5	T	2632	4.0	0.705	12.9	LOS B	29.7	215.4	0.70	0.64	42.2
6	R	53	0.0	0.554	67.3	LOS E	3.0	20.9	1.00	0.76	21.1
Approach		2684	3.9	0.705	14.0	LOS B	29.7	215.4	0.70	0.65	41.3
North: N-S Spine Rd											
7	L	53	0.0	0.120	43.7	LOS D	2.2	15.5	0.82	0.75	27.2
9	R	211	0.0	0.480	47.3	LOS D	9.8	68.9	0.91	0.81	26.1
Approach		263	0.0	0.480	46.6	LOS D	9.8	68.9	0.89	0.80	26.3
West: Armadale Rd W											
10	L	211	0.0	0.134	8.6	LOS A	0.7	4.8	0.13	0.69	48.4
11	T	2632	4.0	0.846	26.1	LOS C	42.1	305.0	0.92	0.88	33.2
Approach		2842	3.7	0.846	24.8	LOS C	42.1	305.0	0.86	0.87	34.0
All Vehicles		5789	3.6	0.846	20.8	LOS C	42.1	305.0	0.79	0.76	36.5

Figure B6: Proposed priority controlled T-intersection at Jandakot Road/Skotsch Road



Note: The diagonal link is not a physical traffic lane at this intersection. This is just a technique to represent the second stage of the Skotsch Road right turn movement from the median to Jandakot Road eastbound.

Table B6: SIDRA result for controlled T-intersection at Jandakot Road/Skotsch Road

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Skotch Rd											
1	L	11	0.0	0.032	17.3	LOS C	0.1	0.7	0.73	0.91	40.6
3	R	26	0.0	0.080	17.6	LOS C	0.3	1.8	0.74	0.91	40.4
Approach		37	0.0	0.080	17.5	LOS C	0.3	1.8	0.74	0.91	40.5
East: Jandakot Rd (E)											
4	L	37	0.0	0.020	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	1053	0.0	0.270	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1089	0.0	0.270	0.3	NA	0.0	0.0	0.00	0.02	59.5
West: Jandakot Rd (W)											
11	T	1053	0.0	0.270	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	11	0.0	0.024	15.1	LOS C	0.1	0.6	0.70	0.85	42.4
Approach		1063	0.0	0.270	0.1	NA	0.1	0.6	0.01	0.01	59.8
South West: Second Stage											
32	R	26	0.0	0.046	14.9	LOS B	0.2	1.2	0.69	0.88	42.5
Approach		26	0.0	0.046	14.9	LOS B	0.2	1.2	0.69	0.88	42.5
All Vehicles		2216	0.0	0.270	0.7	NA	0.3	1.8	0.02	0.04	58.9

Figure B7: Proposed roundabout Intersection on Armadale Road/ Liddelow Road/ DSP Road (based on Main Roads WA access arrangements along Armadale Road)

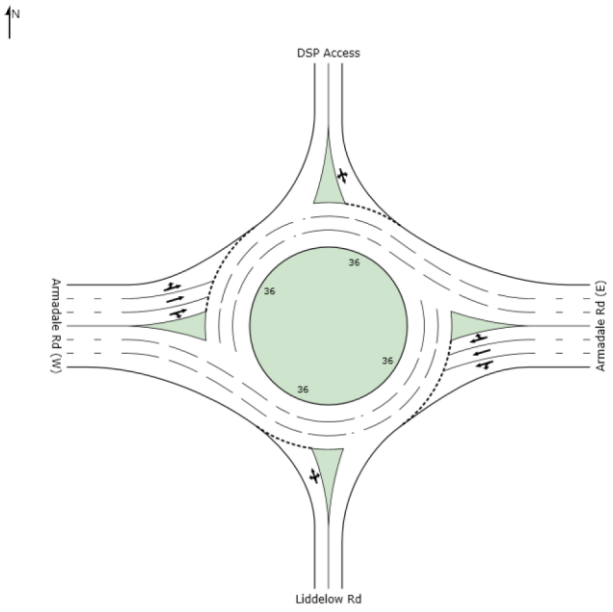


Table B7: SIDRA result for roundabout Intersection on Armadale Road/ Liddelow Road/ DSP Road (based on Main Roads WA access arrangements along Armadale Road)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Liddelow Rd											
1	L	11	0.0	0.700	24.3	LOS C	4.3	29.8	0.93	1.14	35.4
2	T	37	0.0	0.700	23.3	LOS C	4.3	29.8	0.93	1.13	35.6
3	R	195	0.0	0.700	30.7	LOS C	4.3	29.8	0.93	1.16	34.3
Approach		242	0.0	0.700	29.3	LOS C	4.3	29.8	0.93	1.16	34.5
East: Armadale Rd (E)											
4	L	172	0.0	0.677	6.3	LOS A	5.7	43.0	0.55	0.56	49.3
5	T	2398	10.0	0.677	4.9	LOS A	5.9	45.1	0.54	0.44	49.7
6	R	106	0.0	0.677	12.2	LOS B	5.7	43.2	0.55	0.80	46.8
Approach		2676	9.0	0.677	5.3	LOS A	5.9	45.1	0.54	0.46	49.5
North: DSP Access											
7	L	72	0.0	0.735	26.3	LOS C	4.6	32.2	0.95	1.16	34.6
8	T	56	0.0	0.735	25.4	LOS C	4.6	32.2	0.95	1.15	34.7
9	R	107	0.0	0.735	32.8	LOS C	4.6	32.2	0.95	1.18	33.6
Approach		235	0.0	0.735	29.1	LOS C	4.6	32.2	0.95	1.17	34.1
West: Armadale Rd (W)											
10	L	51	0.0	0.685	8.1	LOS A	6.2	46.5	0.68	0.76	48.7
11	T	2349	10.0	0.685	6.6	LOS A	6.3	47.7	0.67	0.64	48.8
12	R	11	0.0	0.685	14.0	LOS B	6.2	46.7	0.68	0.92	46.0
Approach		2411	9.7	0.685	6.7	LOS A	6.3	47.7	0.67	0.64	48.7
All Vehicles		5563	8.5	0.735	8.0	LOS A	6.3	47.7	0.63	0.60	47.3