

Appendix Four – Transport Assessment

Note: A supplementary Traffic Impact Assessment was prepared to support Amendment 4 to the East Baldivis Local Structure Plan - refer to Appendix 10.



EAST BALDIVIS LOCAL STRUCTURE PLAN

**TRANSPORT ASSESSMENT
(REVISED MARCH 2014)**

East Baldivis Local Structure Plan

Transport Assessment

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Revised March 2014

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Appendix A. East Baldvis Local Structure Plan

Appendix B. SIDRA Intersection Analysis

1 Introduction

This Transport Assessment has been prepared by Transcore on behalf of Australand Holdings Limited. The subject of this report is the proposed East Baldvis Local Structure Plan (LSP) in the City of Rockingham.

The LSP area includes various lots east of Baldvis Road in Baldvis, as shown in Figure 1 in relation to the various zones and reservations of the Metropolitan Region Scheme (MRS).

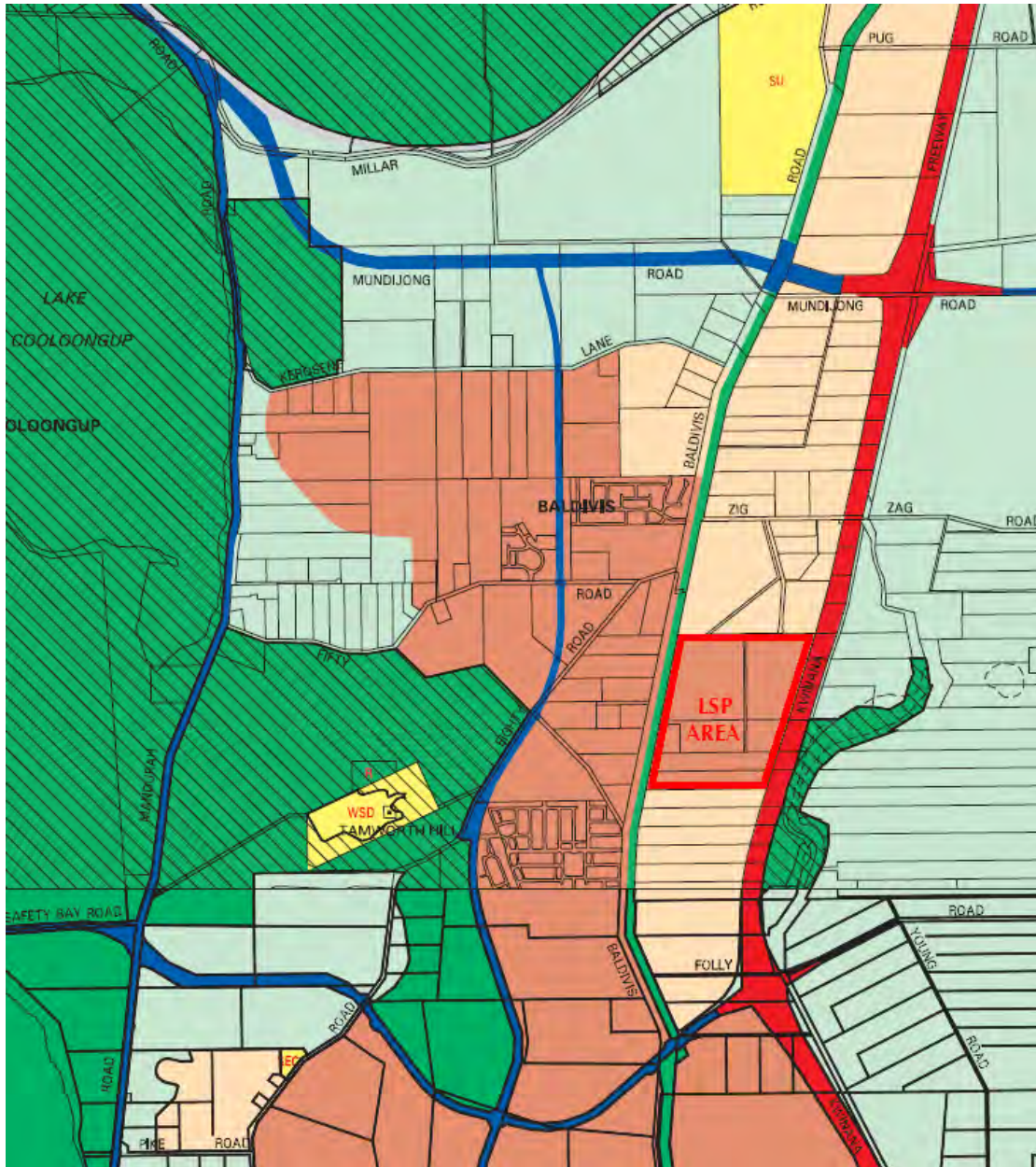


Figure 1. Site location

2 Proposed Local Structure Plan

The proposed East Baldvis Local Structure Plan (LSP, revised March 2013) is shown in Figure 2 and a full copy including the legend is included at Appendix A.



Figure 2. East Baldvis Local Structure Plan

As shown on the LSP plan the LSP proposes residential land ranging from R25 to R60 density.

The LSP area is anticipated to yield approximately 930 residential lots.

3 Existing Situation

3.1 Existing Land Use

Existing land uses in the LSP area are rural with only 4 dwellings and a few outbuildings on the site.

Adjacent land uses to the north and south are also rural with very few dwellings.

On the west side of Baldivis Road north of Ingram Road the existing uses are predominantly rural including a poultry farm.

Immediately southwest of the Baldivis Road / Ingram Road is an existing church.

On the other land on the west side of Baldivis Road south of Ingram Road new residential subdivisions are currently being developed.

On the eastern side of Baldivis Road (abutting the LSP area) is a former tramway reserve that is now reserved for parks and recreation in the MRS, as can be seen on Figure 1.

The Kwinana Freeway forms the eastern boundary of the LSP area, as can also be seen on Figure 1.

3.2 Existing Road Network

Baldivis Road is constructed as a single carriageway, two-lane, rural road providing north south access through Baldivis for connections to the Kwinana Freeway at Mundijong Road, Safety Bay Road and Karnup Road. Baldivis Road has a 70km/h speed limit between Safety Bay Road and the LSP area. A speed limit of 80km/h applies about 500m north of Eighty Road (north of the LSP area).

Baldivis Road south of the church has been upgraded to a 12m-wide seal width between kerbs and marked as two 1.5m cycle lanes, two 3.5m traffic lanes and a 2m painted median with raised traffic islands.

Main Roads WA recorded weekday traffic flows of approximately 5,030 vehicles per day (vpd) on Baldivis Road north of Safety Bay Road in August 2010 and 5,490 vpd south of Mundijong Road in July 2012. The August count indicated that heavy vehicles make up 6.3% of this existing traffic flow on Baldivis Road.

There are three existing intersections on Baldivis Road adjacent to the LSP area. The Baldivis Road / Ingram Road intersection is a priority-controlled (i.e. give way) T-junction (see Photo 1), whereas the Baldivis Road / Amazon Drive intersection has been constructed as a single-lane roundabout (see Photo 2). Another access road connects to Baldivis Road as a priority-controlled T-junction 150m north of Amazon Drive. There are also several existing driveways from the rural properties within the LSP area that connect onto this section of Baldivis Road.



Photo 1. Baldivis Rd / Ingram Rd intersection (looking south)



Photo 2. Baldivis Rd / Amazon Dr roundabout (looking north)

Amazon Drive is a new Neighbourhood Connector road being constructed to provide access for subdivisional development west of Baldivis Road. It currently extends westward from Baldivis Road as a 7.4m-wide single carriageway urban road and will be constructed further westwards to connect to the existing Eighty Road and beyond.

Ingram Road currently runs westward from Baldivis Road halfway to Eighty Road. It is a single carriageway, two-lane, rural road and is classified as an access road.

Paparone Road runs from the northern boundary of the LSP area northward to **Zig Zag Road**, which connects to Baldivis Road at a priority-controlled 4-way intersection about 600m north of the LSP area. Both are single-carriageway rural roads and are classified as access streets. Paparone Road ends in a cul-de-sac just north of the LSP area and Zig Zag Road ends at a cul-de-sac on the western side of the Kwinana Freeway.

Kwinana Freeway is classified as a Primary Distributor and is reserved as a Primary Regional Road in the MRS. It is currently constructed as dual 2-lane carriageways in this area and has a posted speed limit of 100km/h. The closest freeway interchanges are at Safety Bay Road, about 1km south of the LSP area and at Mundijong Road, 2km north of the LSP area. The most recent available Main Roads WA traffic count on the freeway in this area was approximately 45,000 vpd (average weekday traffic, south of Mundijong Road) in June 2010, with 9.7% being heavy vehicles.

3.3 Public Transport

The closest existing bus route to the LSP area is Bus Route No. 568 from Warnbro Train Station, which currently terminates at Nairn Drive / Kingaroy Drive, as shown in Figure 3. The closest bus stops are on Tamworth Boulevard or Pemberton Boulevard about 800m south or southwest of the LSP area

Bus route 568 provides an hourly service Monday to Friday between 8.30am and 9pm (with more frequent service in the peak direction in AM and PM peak periods) and hourly on Saturday and Sunday from 8 or 9am to 7pm, approximately.

A deviation of route 568 links to the Stockland Baldivis Shopping Centre on Safety Bay Road, with this deviation operating from approximately 8.30am to 4pm on weekdays and 9am to 5pm on Saturdays.

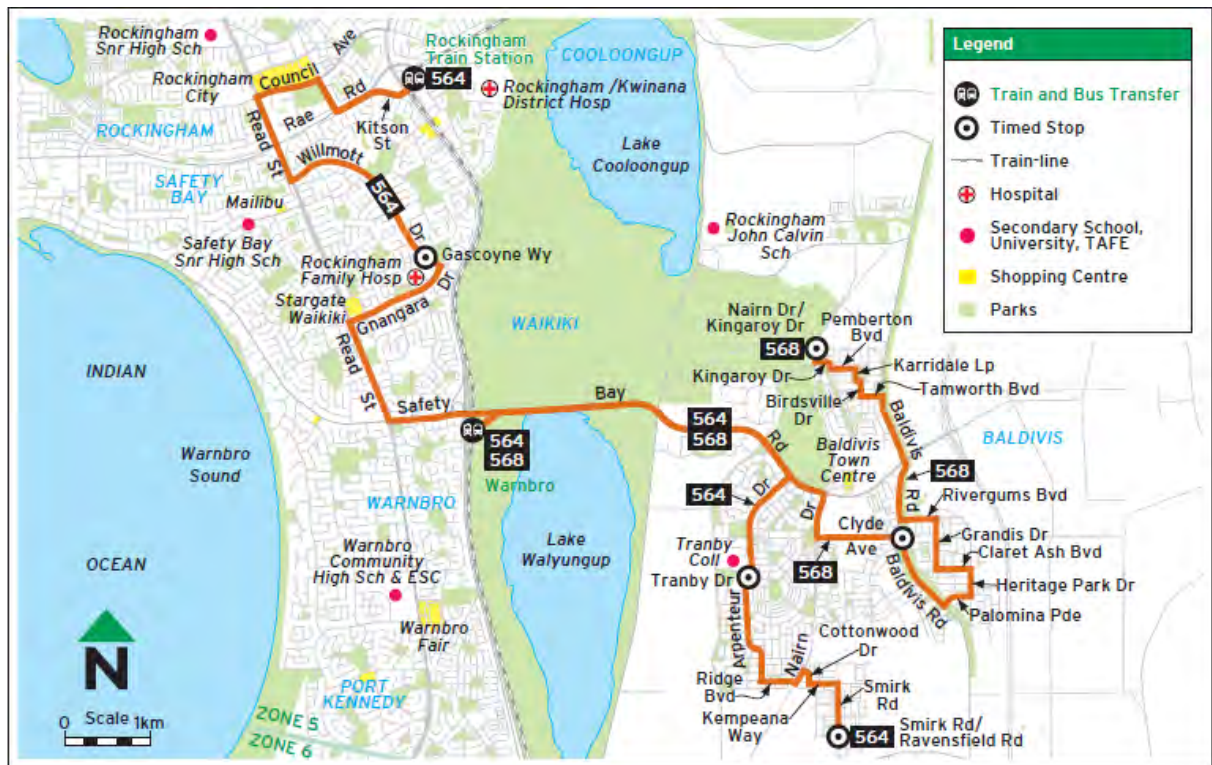


Figure 3. Existing bus routes

3.4 Pedestrian and Cyclist Facilities

The entirely rural northern section of Baldvis Road adjacent to the LSP area has no existing footpaths or cycle facilities but there is a shared path on the west side of Baldvis Road from south of the church (approximately 200m north of Amazon Drive) which extends as far south as Tamworth Boulevard then connects to the path network on other residential streets parallel to Baldvis Road.

The two-lane boulevard section of Baldvis Road adjacent to the LSP area includes 1.5m on-road cycle lanes from south of the church site to approximately 350m south of Amazon Drive.

The Department of Transport's Perth Bike Map series (see Figure 4) shows that Baldvis Road was considered a good road riding environment. That map was prepared in 2009 and does not show the shared paths mentioned above, which have been constructed as part of recent subdivisional development in this area. It does show the Principal Shared Path on the western side of the Kwinana Freeway, which runs along the eastern boundary of the LSP area.

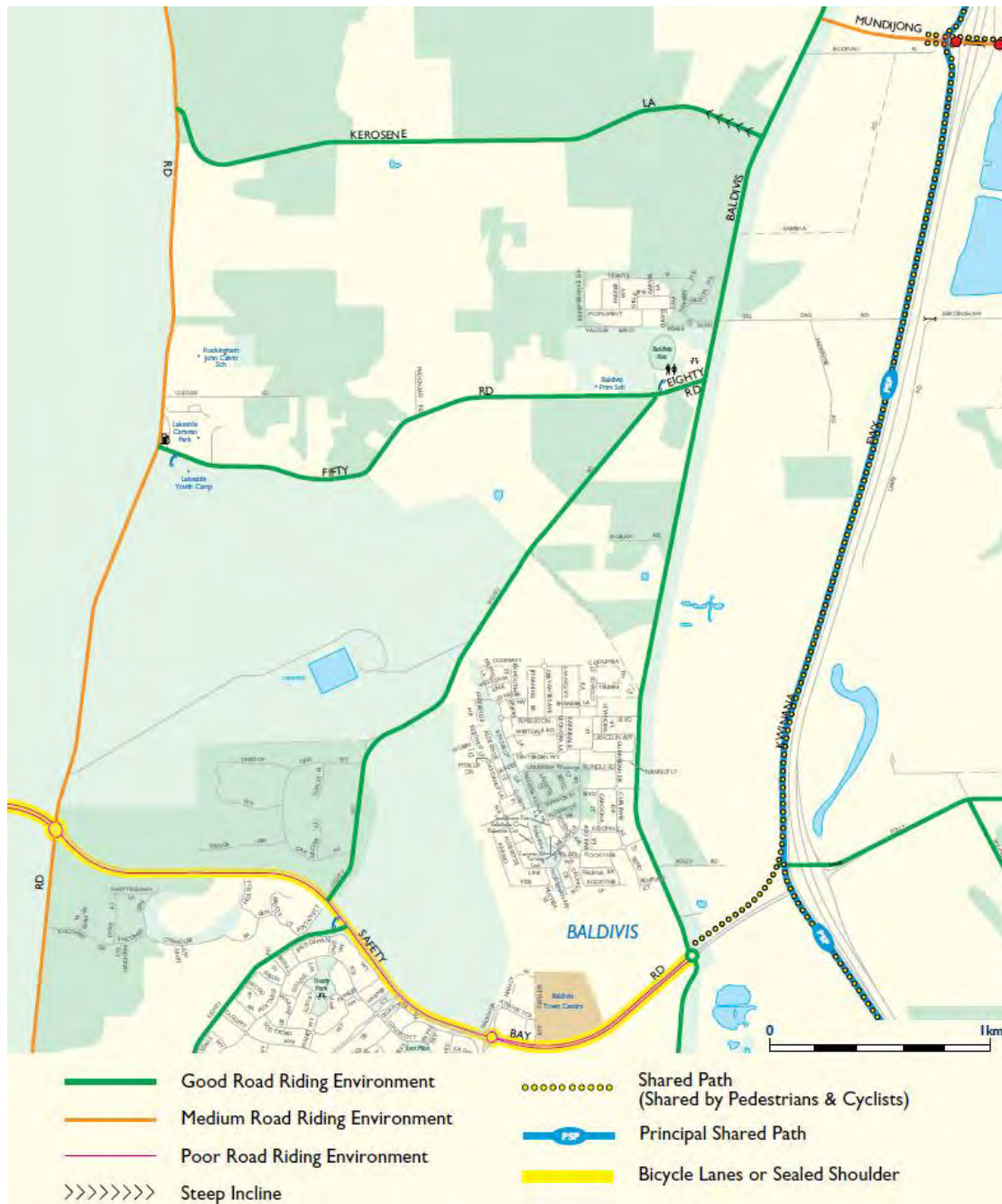


Figure 4. Bike map

3.5 *Changes to Surrounding Road Network*

Long-term road network planning for this part of the Metropolitan Region includes the future extension of Nairn Drive as the main north south district distributor road through Baldivis and Karnup. The alignment of this planned Other Regional Road (also referred to as a blue road) in the Metropolitan Region Scheme (MRS) is shown in Figure 1. This will include a four-way intersection at Amazon Drive and a four-way intersection at Fifty Road, which is further north of the LSP area.

The East Baldivis District Structure Plan proposes a Neighbourhood Connector road link running generally north south through this area east of Baldivis Road with connections back to Baldivis Road at various locations. Hence road connections are planned on the north and south sides of the LSP area.

3.6 Public Transport Network Planning

The *City of Rockingham Baldivis Road Needs Study Update Traffic and Infrastructure Report* (draft, January 2012) includes a Transperth service development plan prepared by the Public Transport Authority (see Figure 5 below). This includes a proposed future bus route along the proposed north south Neighbourhood Connector road link in the East Baldivis area east of Baldivis Road.

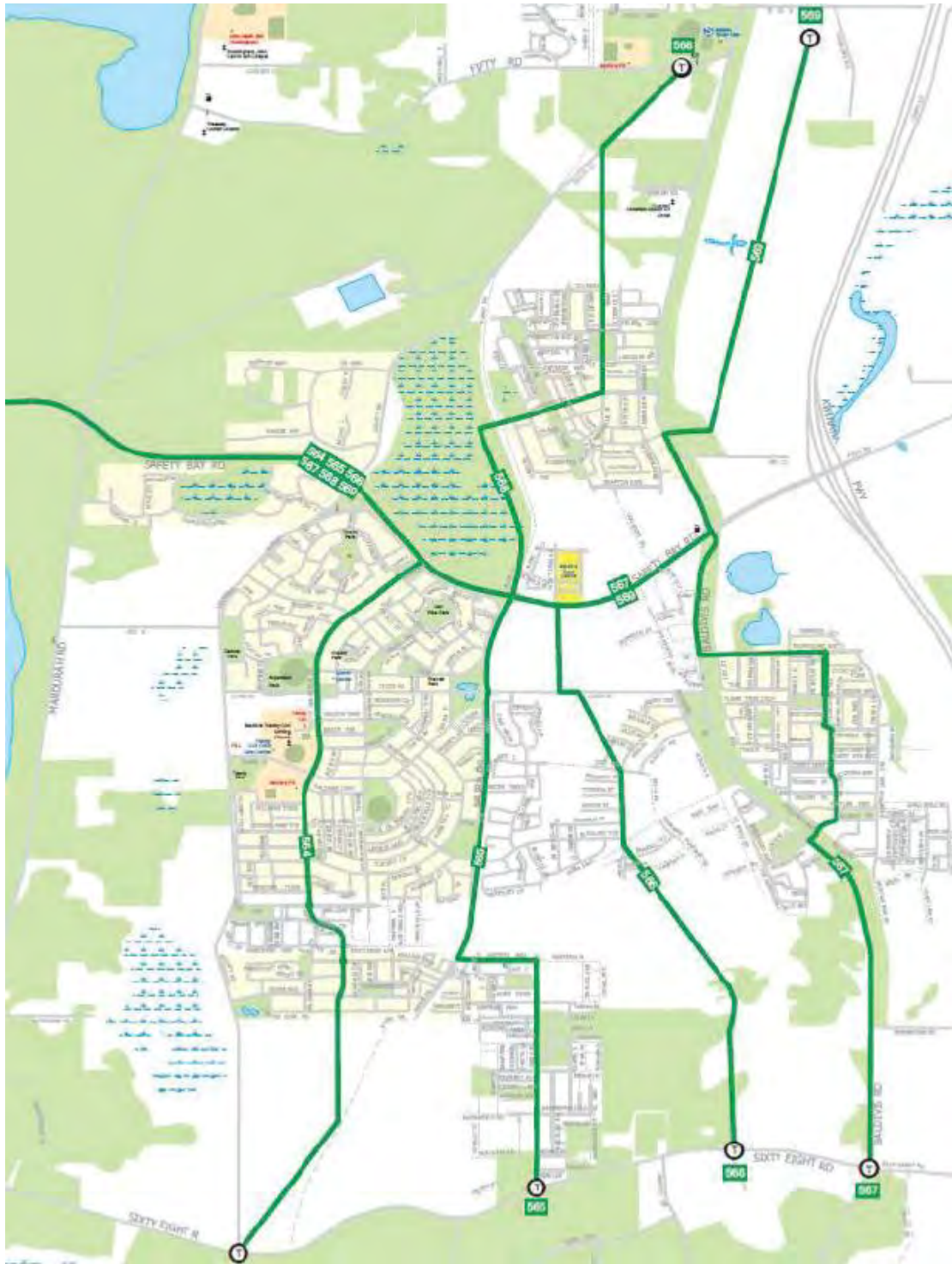


Figure 5. Transperth Service Development Plan Map

4 Proposed Transport Network

4.1 Road Hierarchy

The hierarchy of roads within the LSP area is illustrated in Figure 6 using the road hierarchy defined in *Liveable Neighbourhoods (2007)*.

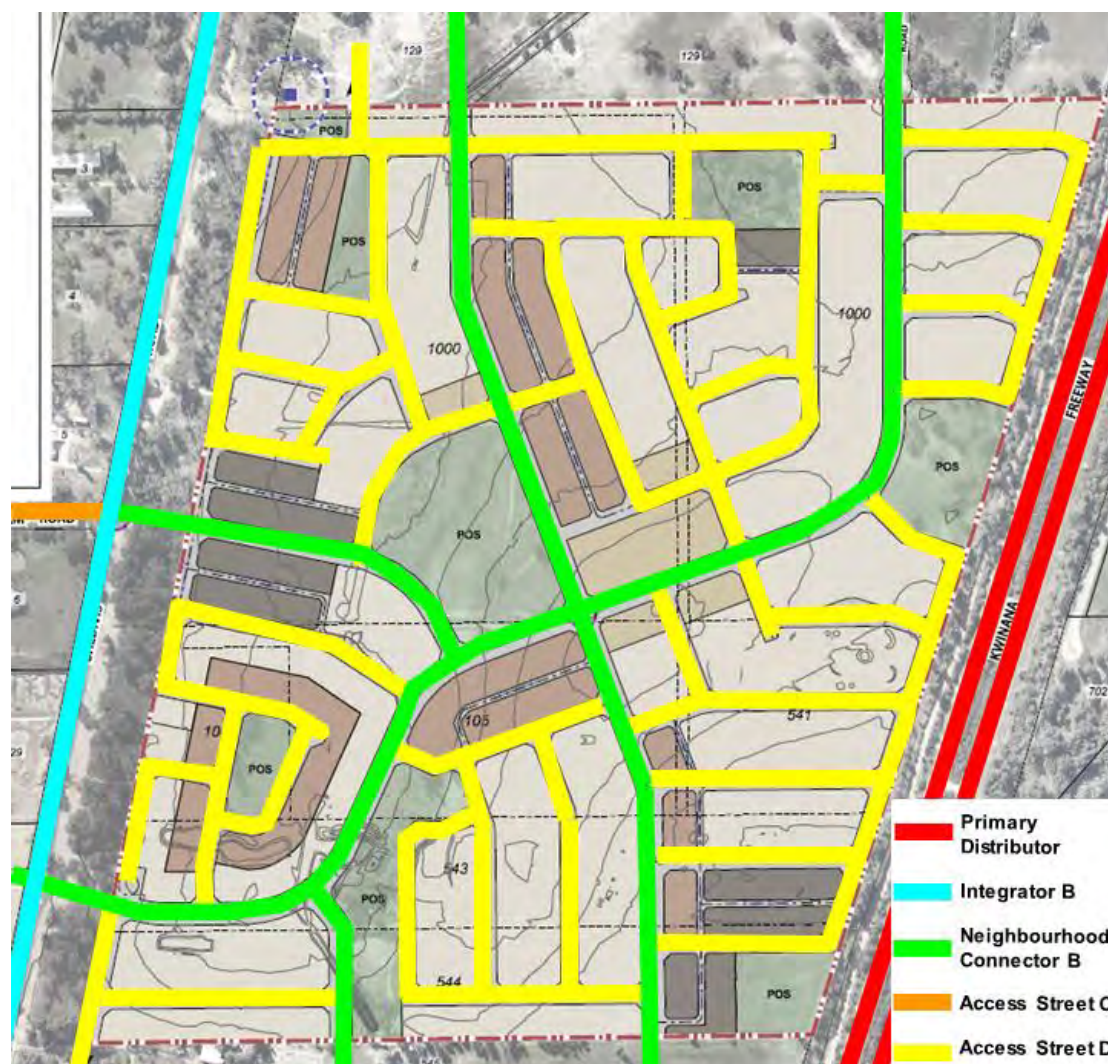


Figure 6. Road Hierarchy

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 do vary slightly from the standard Liveable Neighbourhoods cross-section diagrams.

Table 1. Road Hierarchy

Road Classification	Indicative upper volume (vpd)	Indicative road reserve width (m)	Indicative road pavement width (m)
Integrator B	15,000	29m	2 x 5m (incl. cycle lanes), 6m median and embayed parking
Neighbourhood Connector A	7,000	23m	2 x 5m (incl. cycle lanes), 2m median and embayed parking
Neighbourhood Connector B	3,000	20m (18m min)	7.4m (plus embayed parking)
Access Street C	3,000	16m	6m (plus embayed parking) or 7.2m (with no embayed parking)
Access Street D	1,000	15m	6m
Laneway	300	6m	6m typical

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

Baldivis Road

Baldivis Road will be an Integrator B road in the Liveable Neighbourhoods road hierarchy. The existing upgraded section south of the church demonstrates the road cross section that has been considered appropriate adjacent to previous subdivision areas. It involves two 5m carriageways and a 2m median.

Neighbourhood Connectors

The current draft East Baldivis District Structure Plan indicates an east west Neighbourhood Connector road connecting at Baldivis Road at Amazon Drive and a north south Neighbourhood Connector road route through the site. The proposed LSP plan makes allowance for both of these main Neighbourhood Connector links.

The proposed LSP provides connections to both Ingram Road and Amazon Drive in the western part of the site but draws them together in the middle of the site as traffic volumes and road function do not require both these Neighbourhood Connectors in the eastern part of the site.

Conversely, the proposed LSP provides three north south connections at both the north and south boundaries and route options through the site between each of them. At the southern boundary the eastern road provides a much more direct route through the site and is the logical choice for a future bus route. Accordingly it is designed as a future Neighbourhood Connector. A second north south link also provides a convenient link to future development south of this site and is also designated as a future Neighbourhood Connector.

In the north the eastern road connects to Paparone Road and this is planned as the main north south Neighbourhood Connector route in the draft East Baldivis District Structure Plan. However the central road link at the northern boundary potentially provides a direct link to the future District Playing Field and High School / Primary School sites further to the north of this LSP area, so it is considered appropriate to classify both of these northern north south routes as Neighbourhood Connector roads to maintain flexibility for future planning of the neighbouring precincts to the north and the future bus route serving this area.

Traffic flows on all of these potential Neighbourhood Connectors within the LSP area will be below 3000 vpd, so it is appropriate for them to be classified as Neighbourhood Connector B roads. The type B is proposed as an 18m wide road reserve as the minimum permitted in Liveable Neighbourhoods, with a standard 7.4m carriageway (two 3.7m traffic lanes) and a typical verge width of 5.3m including embayed parking where appropriate for adjacent development.

Access Streets

The basic standard of access street proposed in this subdivision is a 6m wide carriageway in a 15m road reserve. This *Access Street D* results in 4.5m verges on both sides, with embayed parking accommodated in the verges where required, such as to provide visitor parking for lots serviced by rear laneways. This road standard is proposed where the future total traffic volumes are less than 1000 vpd.

Access Streets with a future traffic volume over 1000 vpd would be designed as an Access Street C. This is based on a 16m road reserve width and either a 7.2m carriageway width or 6m plus embayed parking where required.

Laneways

The proposed road reserve width of the laneways is 6.0 metres. These would typically be designed with flush kerbing (i.e. at the same level as the laneway pavement) and central drainage, and can accommodate two-way vehicle movement and rubbish collection. Details relating to the design of these laneways will be addressed in more detail during the subdivision planning stages.

Visitor car parking is to be constructed in the road reserve adjacent to proposed lots serviced by laneways at a minimum rate of one bay per every two dwellings.

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.

Current planning anticipates a future bus route running north south through this LSP area. The north south Neighbourhood Connector B roads shown in Figure 6 provide two options for this future bus route through the LSP area, either of which would provide satisfactory bus service for this area.

4.3 Pedestrian and Cyclist Facilities

A highly permeable road network within the LSP area creates excellent opportunities for the provision of good pedestrian and cyclist facilities that maximise use of non-motorised transport modes.

Figure 7 outlines the proposed pedestrian and cyclist network for the LSP area.

In accordance with current practice adopted by the City of Rockingham it is proposed to construct all paths to a minimum width of 2.0 metres so that they can all be designated as shared paths for pedestrians and cyclists. A 2.5m width would be required in high pedestrian-traffic locations such as adjacent to schools and activity centres but this does not apply in this LSP area.

Paths will be provided on at least one side of all roads. There would be paths on both sides on Integrator Arterial and Neighbourhood Connector roads. In the case of Baldivis Road the existing path (where constructed) is provided on the western side of Baldivis Road. As shown on Figure 7 the paths along the frontage roads bordering the tramway reserve can be linked to provide a path along the eastern side of the combined Baldivis Road and tramway reserve.

Laneway lots are to have footpath access to visitor parking bays provided in a nearby road reserve.

On-street cycle lanes are normally included on Integrator A, Integrator B and Neighbourhood Connector A roads, as indicated in the details of the road hierarchy listed in Table 1. There are none of these categories of roads within the LSP area apart from Baldivis Road itself. As noted earlier, on-road cycle lanes have been included on previously upgraded sections of Baldivis Road in this area and it is anticipated this standard will continue to be applicable.

Two potential shared path connections are proposed within the LSP area to the Principle Shared Path on the western side of Kwinana Freeway, as shown in Figure 7.

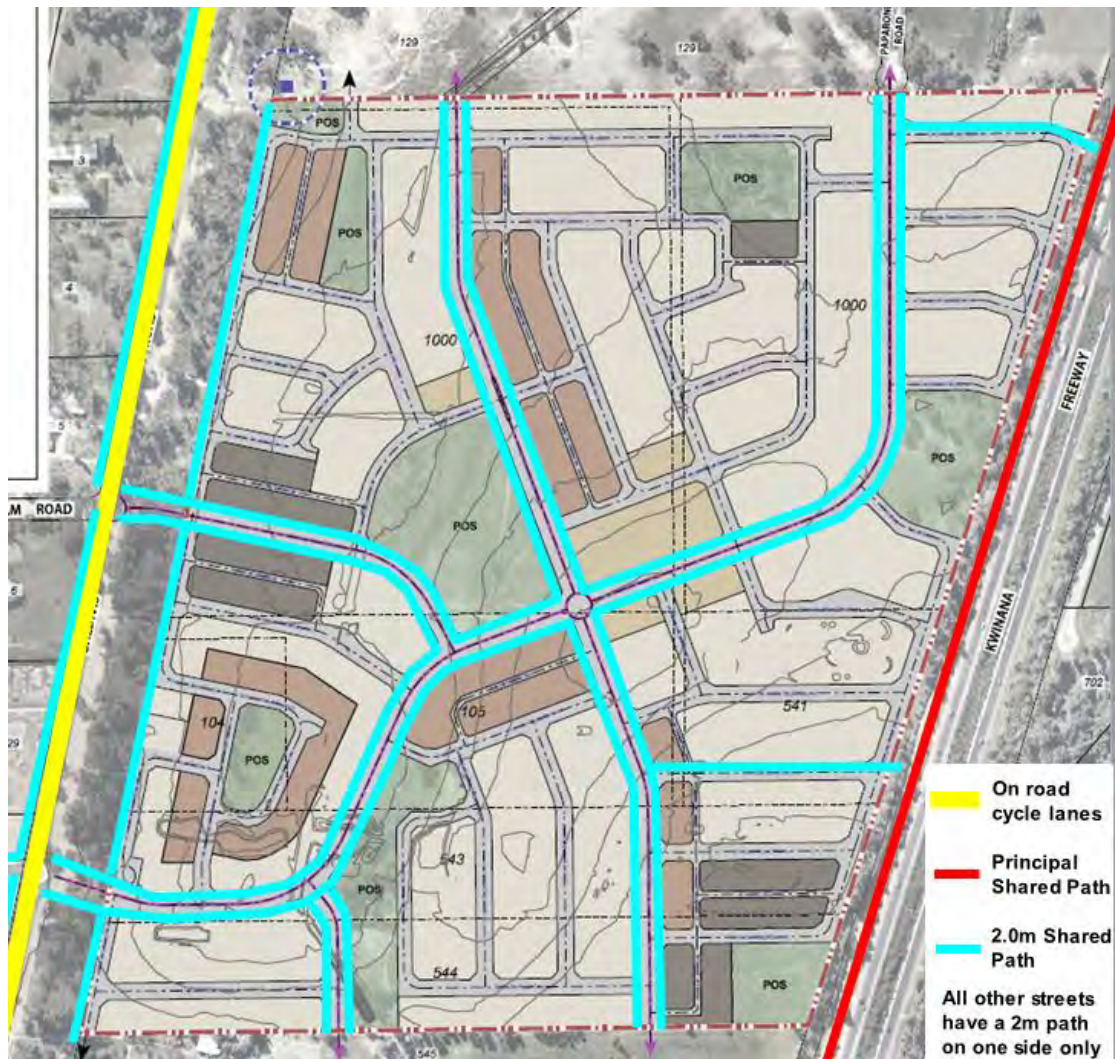


Figure 7. Pedestrian and cyclist facilities

5 Integration with Surrounding Area

The road network of the LSP area will connect to the surrounding road network at a number of locations.

This will include two intersections onto Fifty Road, connecting with the existing Ingram Road and Amazon Drive west of Baldvis Road.

To the north and south there will be several connections to future residential areas on neighbouring landholdings. Planning in these areas has not progressed past district structure plan stage but suitable road connections have been allowed for future connections to these areas.

The LSP path network will also provide opportunities for connection with future development in these areas and to the Principle Shared Path on the western side of Kwinana Freeway.

6 Analysis of the Transport Network

6.1 Assessment Period

The assessment year that has been adopted for this analysis is 2031, with full development of Baldivis as envisaged in the Western Australian Planning Commission's *Directions 2031 and Beyond* planning framework (Aug 2010) and *Outer Metropolitan Perth and Peel Sub-regional Strategy* (draft, Aug 2010).

6.2 Traffic generation and distribution

Transcore has developed a subregional traffic model of weekday traffic flows for the Mandurah-Rockingham area using the EMMÉ transport modelling software package. This model has been developed in more detail for various projects in the Karnup-Baldivis area in this proposed LSP. Overall, the future scenario modelled in this area reflects the land use aspirations of *Directions 2031* as detailed in the *Outer Metropolitan Perth and Peel Sub-regional Strategy*.

The daily traffic generation rate used in the East Baldivis LSP 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 930 dwellings of the LSP area will therefore generate approximately 7400 vpd.

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. The distribution of trips to and from the ODP area is summarised in Table 2.

Table 2. Trip distribution

External node	Vehicles per day
Baldivis Road (north)	700
Subdivision roads (north)	2300
Ingram Road (west)	200
Amazon Drive (west)	500
Baldivis Road (south)	2200
Subdivision roads (south)	1500

6.3 Traffic Flow Forecasts

The future total daily traffic flows on the road network in and around the LSP area has been modelled for the future scenario of full development of this area as discussed above. The modelled surrounding district road network reflects advice from City of Rockingham officers including constraints on future intersection capacity further north at Baldivis Rd / Mundijong Rd intersection. It should be noted that a lower speed limit has been modelled on Baldivis Road

than on the parallel Nairn Drive route to reflect the higher standard of Nairn Drive.

Figure 8 illustrates future total daily traffic flows anticipated on the road network of the LSP area and also shows how much of this traffic is associated with the land uses proposed in the LSP area.

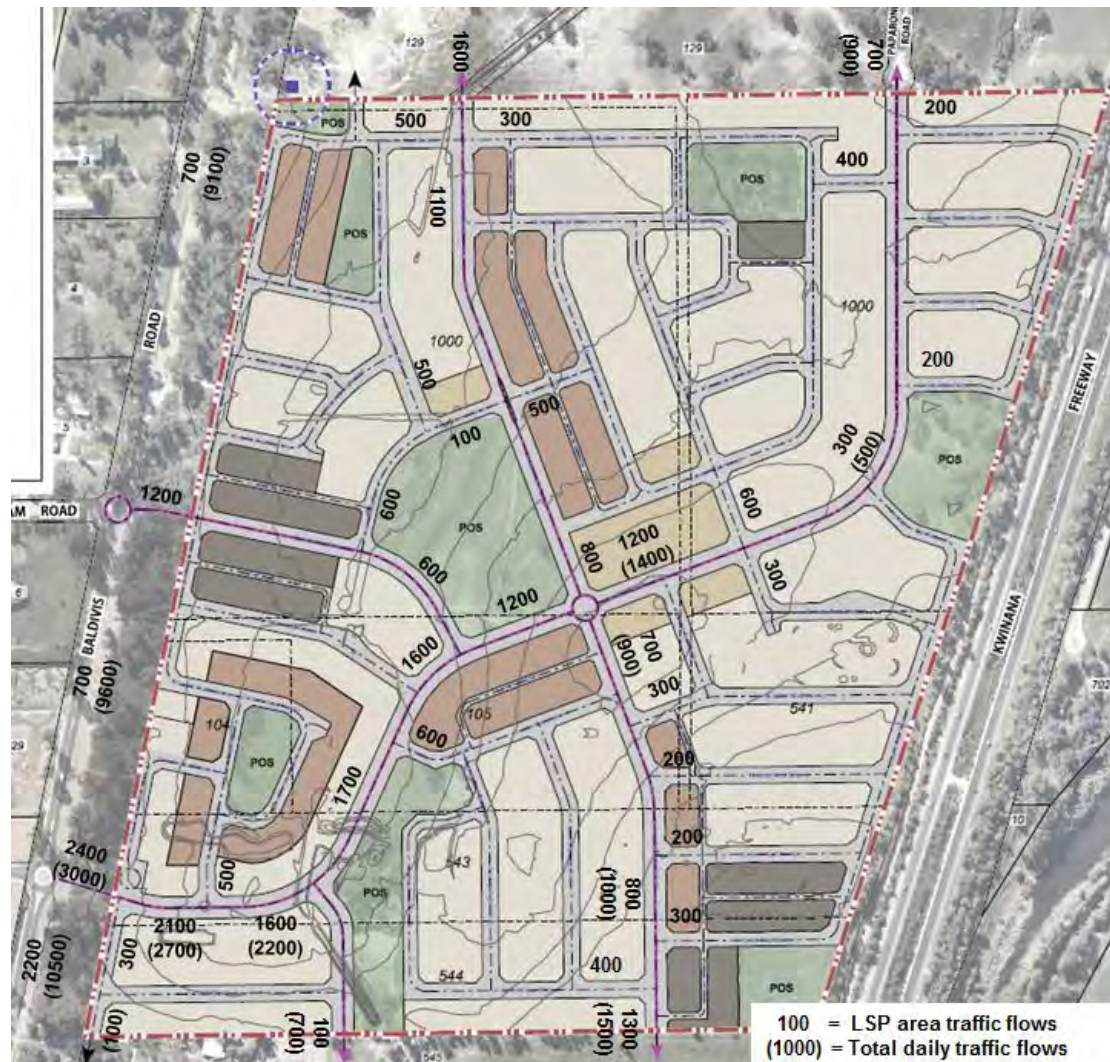


Figure 8. Future Daily Traffic Volumes

6.4 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 9 details the proposed intersection controls for intersections within the LSP area.

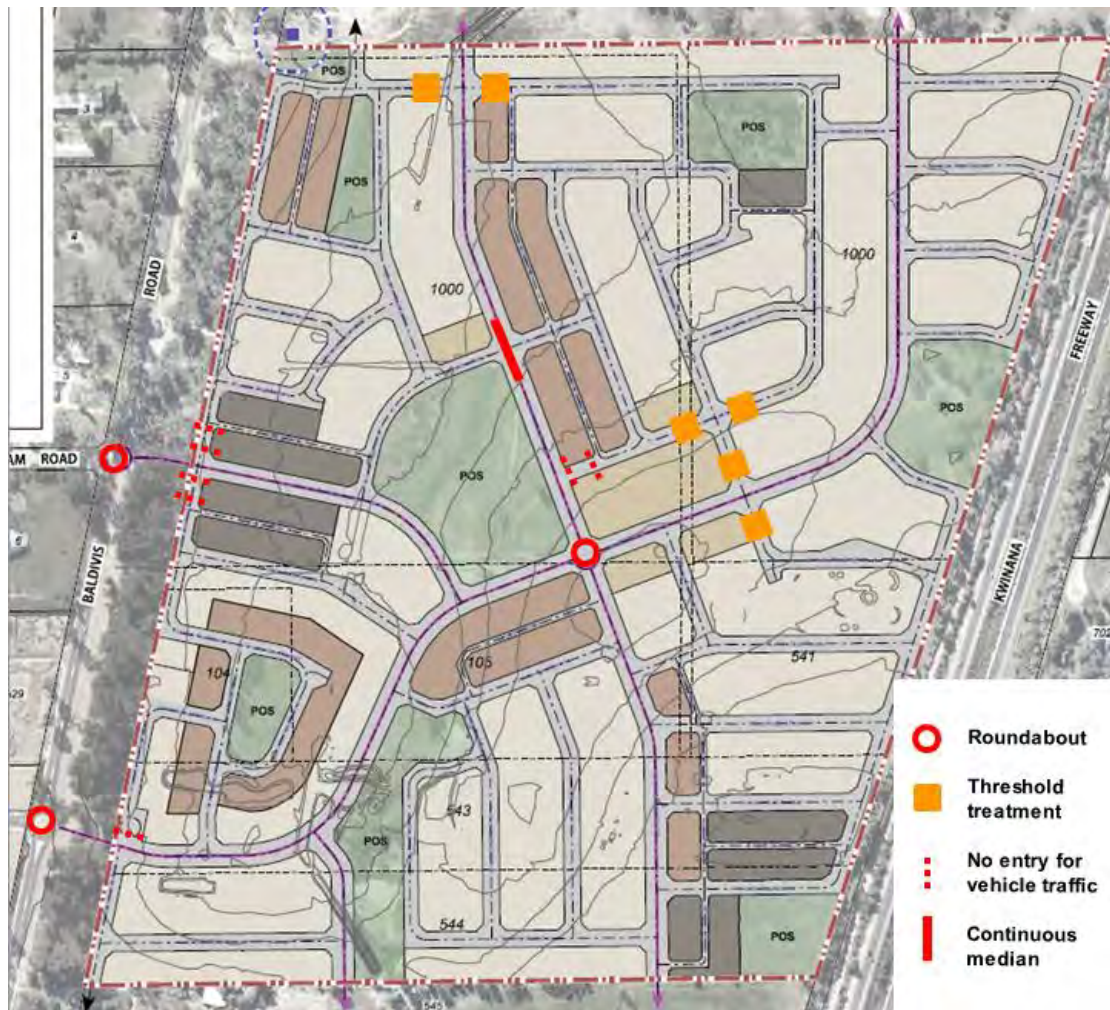


Figure 9. Intersection treatments

Baldvis Road Intersections

The future planning for Baldvis Road assumes it will be upgraded to a two-lane boulevard as has already been constructed on some sections south of the LSP area. The future traffic volume of 9-10,000 vpd adjacent to the LSP area modelled in this transport assessment is consistent with this road standard.

Access to the LSP area will be provided by two 4-way intersections on Baldvis Road, at Ingram Road and at Amazon Drive. The Amazon Drive intersection has already been constructed as a single-lane roundabout and that is considered the most appropriate treatment for both these intersections.

Internal Intersections

Within the structure plan area there are a number of proposed four-way intersections. One of these is at the intersection of two Neighbourhood Connector B roads in the middle of the LSP area and is recommended to be constructed as a roundabout, as shown in Figure 9. This will help manage crossing traffic flows and assist with speed management on both neighbourhood connector roads.

There is another 4-way intersection shown further north of this proposed roundabout, which is proposed to be restricted to left in / left out movements to/from the side streets by constructing a continuous section of median island along the north south neighbourhood connector road in this area.

There are also several other four-way intersections formed on other low-traffic-volume access streets or low-volume sections of Neighbourhood Connector B roads. These are recommended to be constructed as priority-controlled intersections with give way signs on the minor road approaches as suggested in *Liveable Neighbourhoods* (LN Element 2 pages 31-33). Appropriate entry treatments will be provided on the side roads to help to alert drivers to the presence of the intersection and that traffic on the major road has priority. Existing threshold treatments on side roads crossing Amazon Drive west of Baldivis Road are a suitable example of the type of treatment that could be implemented at these 4-way intersections.

In some places a public access way (PAW) link was proposed but at the request of the City of Rockingham these have been widened and designated as road reserves. There is still no intention for these connections to carry any vehicle traffic, only pedestrians and cyclists, so they are indicated on Figure 9 as no entry for vehicle traffic.

6.5 Intersection Analysis

Intersection capacity analysis has been undertaken for the two key intersections on Baldivis Road for the AM and PM peak hour flows that correspond to the modelled 2031 daily traffic flows in Figure 8.

The two locations analysed are:

- Baldivis Road / Amazon Drive intersection (roundabout)
- Baldivis Road / Ingram Road intersection (roundabout)

Capacity analysis of these intersections has been undertaken using 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 B.

The SIDRA analysis indicates that both roundabouts will operate satisfactorily in both peak periods with the forecast traffic flows for full development of Baldivis. Both roundabouts will operate at level of service A overall (the best possible level of service in this type of analysis) and the through movements on Baldivis Road will all operate at level of service A with average delays less than 10 seconds in both peak hours. At each intersection all movements will be at level of service A or B (very good). The longest traffic queues will occur on Baldivis Road in the peak direction of flow in each peak hour. The longest 95th percentile queue is anticipated to extend approximately 66m north of the Amazon Drive roundabout, which should be considered quite satisfactory as there will be around 300m queuing distance available between these two roundabouts on Baldivis Road. Queue lengths on the side roads are anticipated to be much shorter (generally only one vehicle at a time).

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 5000 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 7000 vehicles per day.”

There will be no direct driveway access from abutting residential development to Baldivis Road and all of the other roads in the LSP area are expected to carry less than 3000 vpd, so no restriction on vehicular access is required.

6.7 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 LSP area, and connections to neighbouring precincts at strategic locations.

The WAPC *Transport Assessment Guidelines for Developments* (2006) 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.

Future traffic volumes on Baldivis Road could potentially be up to 10,500 vpd adjacent to the LSP area but in this area the pedestrian demand should not be particularly significant. If Baldivis Road is designed as a two-lane boulevard as has been constructed on some sections further south this would satisfy the guidance in the Transport Assessment Guidelines.

6.8 Access to Public Transport

At this stage of the structure planning process neither bus stop locations nor subdivision lot layout are known. However, in these circumstances the 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 future bus route shown east of Baldivis Road on Figure 5 could be routed on either of the north south Neighbourhood Connector B roads shown on Figure 6. Both would have similar results in terms of dwellings within 400m, with a small number of lots in two corners of the site being up to 540m from either of these two potential bus routes. Preliminary analysis indicates that approximately 60 to 80 lots would be more than 400m from the bus route, which is only 7% to 9% of the total number of lots and therefore satisfies the guideline of 90% of the dwellings in the LSP area to be within 400m straight line distance of a bus route.

7 Conclusions

The main findings of the transport assessment for the East Baldivis Local Structure Plan are outlined below.

The LSP area is anticipated to accommodate approximately 930 dwellings.

This residential area is anticipated to generate traffic flows of approximately 7400 vpd.

The road network of the LSP area has been designed based on WAPC *Liveable Neighbourhoods* guidelines to accommodate the future traffic flows that will be generated in this area.

The future planning for Baldivis Road assumes it will be upgraded to a two-lane boulevard and the future traffic volumes adjacent to the LSP area modelled in this transport assessment are consistent with this road standard.

Access to the LSP area will be served by two four-way intersections on Baldivis Road at Ingram Road and at Amazon Drive. Baldivis Road / Amazon Drive is already constructed as a single-lane roundabout and this is considered an appropriate treatment for both of these proposed 4-way intersections. These two intersections have been analysed for future traffic flows when Baldivis is fully developed and the analysis indicates that both roundabouts will operate satisfactorily during weekday AM and PM peak periods.

A roundabout is also recommended at the 4-way intersection of two internal neighbourhood connector roads in the LSP area.

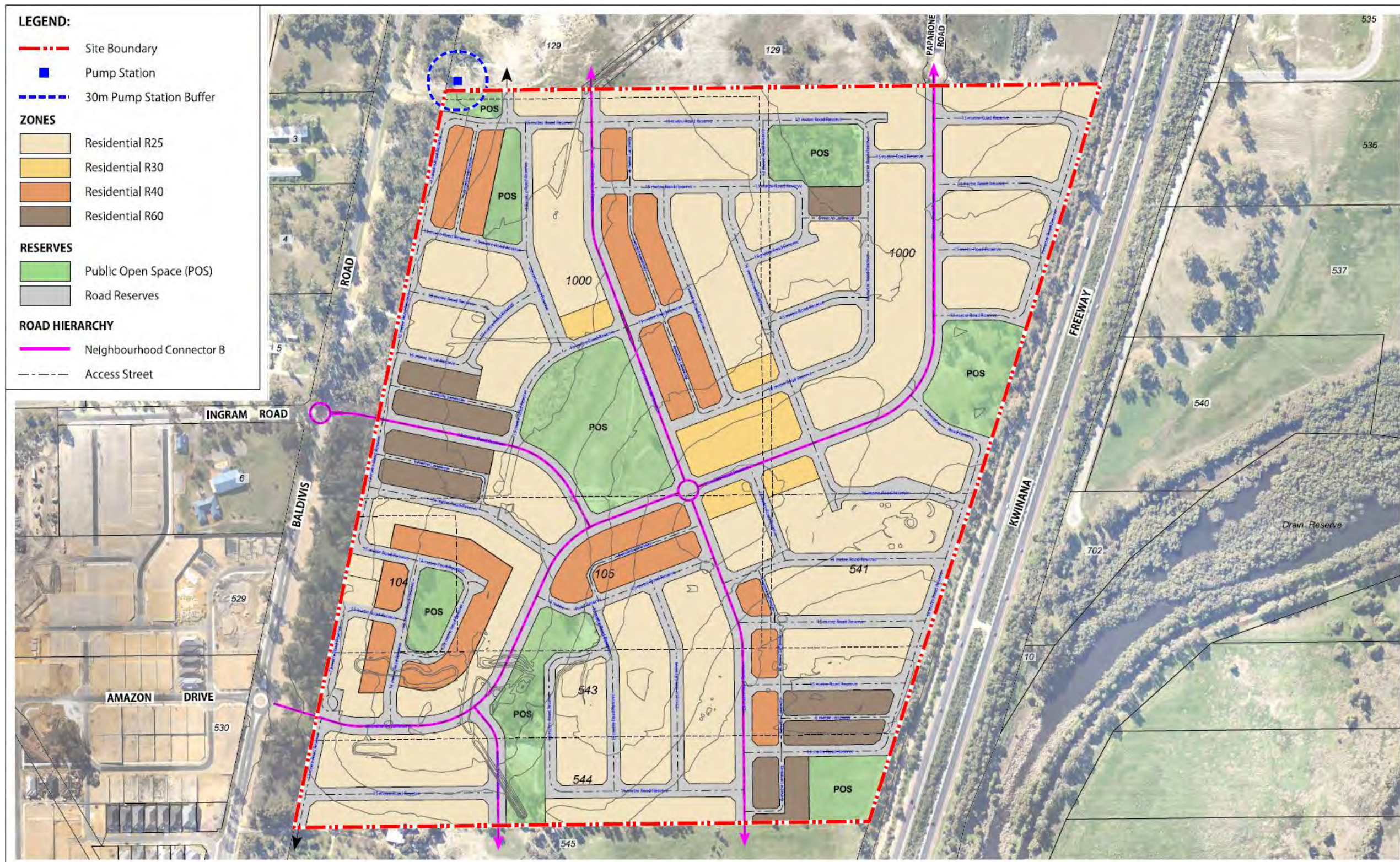
The proposed road network provides three road links at the northern boundary and three at the southern boundary to facilitate integration with future development of other landholdings north and south of this site within the wider East Baldivis District Structure Plan (currently in preparation).

The proposed road network provides two route options for a planned future bus route east of Baldivis Road, which will provide satisfactory public transport access in future.

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

APPENDIX A

EAST BALDIVIS
LOCAL STRUCTURE PLAN



PLAN 1 - East Baldvis Local Structure Plan

Lots 104, 105, 541, 543, 544, 1000 Baldvis Road, BALDIVIS

for: AUSTRALAND



Scale 1:2000 @ A1 1:4000 @ A3	
0 50 100 150 200 metres	
COMPILED: DPS	DRAWN BY: RF
DATE: 22/03/2013	REVISED: 26/02/2014
GRID: MGA 50	DATUM: AHD
DRAWING NUMBER: AUSEB-2004k	JOB CODE: AUSEBLS
FILE ID: M:\AUSEB\BASE\STRUCTURE PLANS\AUSEB-2004k LSP.dgn	



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APPENDIX B
SIDRA INTERSECTION ANALYSIS

Baldivis Road / Amazon Drive intersection

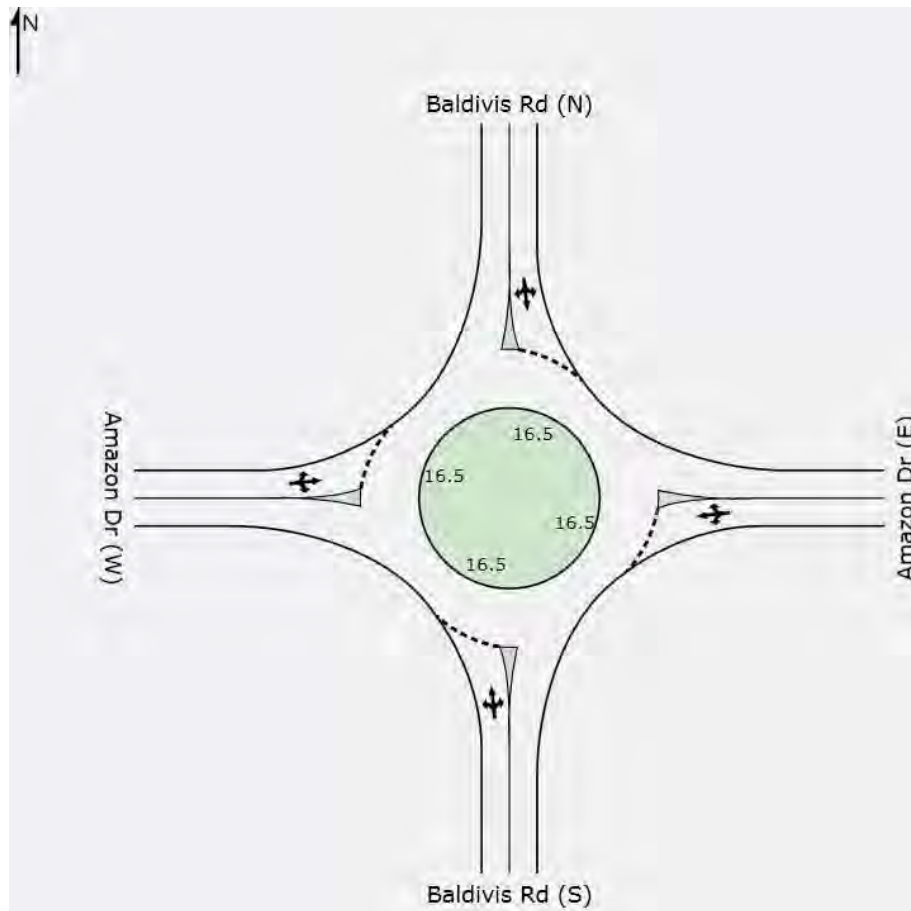


Figure B1. Baldivis Road / Amazon Drive roundabout proposed layout

Table B1a. SIDRA results – Baldvis Road / Amazon Drive roundabout – 2031 weekday AM peak with full development

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	Distance m
South: Baldvis Rd (S)								
1	L	40	1.0	0.317	6.9	LOS A	2.2	15.4
2	T	405	2.0	0.317	6.0	LOS A	2.2	15.4
3	R	19	1.0	0.317	11.3	LOS B	2.2	15.4
Approach		464	1.9	0.317	6.3	LOS A	2.2	15.4
East: Ingram Rd (E)								
4	L	32	1.0	0.074	8.6	LOS A	0.4	2.6
5	T	5	1.0	0.074	7.7	LOS A	0.4	2.6
6	R	38	1.0	0.074	13.0	LOS B	0.4	2.6
Approach		73	1.0	0.074	10.7	LOS B	0.4	2.6
North: Baldvis Rd (N)								
7	L	12	1.0	0.260	6.9	LOS A	1.6	11.3
8	T	363	2.0	0.260	6.0	LOS A	1.6	11.3
9	R	2	1.0	0.260	11.2	LOS B	1.6	11.3
Approach		377	2.0	0.260	6.1	LOS A	1.6	11.3
West: Ingram Rd (W)								
10	L	2	1.0	0.028	8.9	LOS A	0.1	1.0
11	T	9	1.0	0.028	8.0	LOS A	0.1	1.0
12	R	14	1.0	0.028	13.3	LOS B	0.1	1.0
Approach		25	1.0	0.028	11.0	LOS B	0.1	1.0
All Vehicles		939	1.8	0.317	6.7	LOS A	2.2	15.4

Table B1b. SIDRA results – Baldvis Road / Amazon Drive roundabout – 2031 weekday PM peak with full development

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	Distance m
South: Baldvis Rd (S)								
1	L	12	1.0	0.246	6.9	LOS A	1.5	10.9
2	T	209	2.0	0.246	6.0	LOS A	1.5	10.9
3	R	137	1.0	0.246	11.3	LOS B	1.5	10.9
Approach		358	1.6	0.246	8.0	LOS A	1.5	10.9
East: Amazon Dr (E)								
4	L	47	1.0	0.121	12.3	LOS B	0.8	5.6
5	T	14	1.0	0.121	11.4	LOS B	0.8	5.6
6	R	6	1.0	0.121	16.7	LOS B	0.8	5.6
Approach		67	1.0	0.121	12.5	LOS B	0.8	5.6
North: Baldvis Rd (N)								
7	L	101	1.0	0.752	9.7	LOS A	9.3	65.9
8	T	801	2.0	0.752	8.8	LOS A	9.3	65.9
9	R	20	1.0	0.752	14.1	LOS B	9.3	65.9
Approach		922	1.9	0.752	9.0	LOS A	9.3	65.9
West: Amazon Dr (W)								
10	L	1	1.0	0.061	8.4	LOS A	0.3	2.2
11	T	46	1.0	0.061	7.5	LOS A	0.3	2.2
12	R	14	1.0	0.061	12.8	LOS B	0.3	2.2
Approach		61	1.0	0.061	8.7	LOS A	0.3	2.2
All Vehicles		1408	1.7	0.752	8.9	LOS A	9.3	65.9

Baldivis Road / Ingram Road intersection

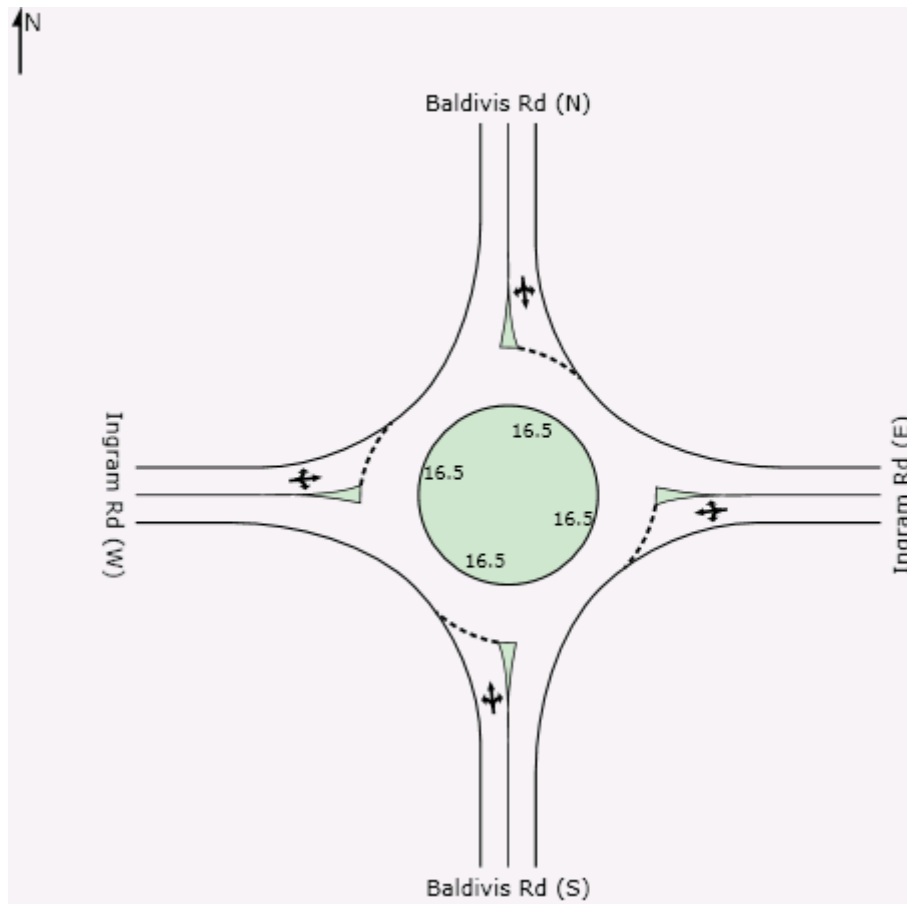


Figure B2. Baldivis Road / Ingram Road roundabout proposed layout

Table B2a. SIDRA results – Baldvis Road / Ingram Road roundabout – 2031 weekday AM peak with full development

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m
South: Baldvis Rd (S)								
1	L	40	1.0	0.317	6.9	LOS A	2.2	15.4
2	T	405	2.0	0.317	6.0	LOS A	2.2	15.4
3	R	19	1.0	0.317	11.3	LOS B	2.2	15.4
Approach		464	1.9	0.317	6.3	LOS A	2.2	15.4
East: Ingram Rd (E)								
4	L	32	1.0	0.074	8.6	LOS A	0.4	2.6
5	T	5	1.0	0.074	7.7	LOS A	0.4	2.6
6	R	36	1.0	0.074	13.0	LOS B	0.4	2.6
Approach		73	1.0	0.074	10.7	LOS B	0.4	2.6
North: Baldvis Rd (N)								
7	L	12	1.0	0.260	6.9	LOS A	1.6	11.3
8	T	363	2.0	0.260	6.0	LOS A	1.6	11.3
9	R	2	1.0	0.260	11.2	LOS B	1.6	11.3
Approach		377	2.0	0.260	6.1	LOS A	1.6	11.3
West: Ingram Rd (W)								
10	L	2	1.0	0.028	8.9	LOS A	0.1	1.0
11	T	9	1.0	0.028	8.0	LOS A	0.1	1.0
12	R	14	1.0	0.028	13.3	LOS B	0.1	1.0
Approach		25	1.0	0.028	11.0	LOS B	0.1	1.0
All Vehicles		939	1.8	0.317	6.7	LOS A	2.2	15.4

Table B2b. SIDRA results – Baldvis Road / Ingram Road roundabout – 2031 weekday PM peak with full development

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	85% Back of Queue Vehicles veh	Distance m
South: Baldvis Rd (S)								
1	L	17	1.0	0.146	6.8	LOS A	0.9	6.2
2	T	157	2.0	0.146	5.9	LOS A	0.9	6.2
3	R	43	1.0	0.146	11.2	LOS B	0.9	6.2
Approach		217	1.7	0.146	7.0	LOS A	0.9	6.2
East: Ingram Rd (E)								
4	L	14	1.0	0.055	13.1	LOS B	0.3	2.4
5	T	2	1.0	0.055	12.2	LOS B	0.3	2.4
6	R	15	1.0	0.055	17.5	LOS B	0.3	2.4
Approach		31	1.0	0.055	15.1	LOS B	0.3	2.4
North: Baldvis Rd (N)								
7	L	28	1.0	0.655	7.6	LOS A	6.7	47.7
8	T	876	2.0	0.655	6.8	LOS A	6.7	47.7
9	R	5	1.0	0.655	12.0	LOS B	6.7	47.7
Approach		909	2.0	0.655	6.8	LOS A	6.7	47.7
West: Ingram Rd (W)								
10	L	1	1.0	0.049	7.6	LOS A	0.2	1.7
11	T	21	1.0	0.049	6.8	LOS A	0.2	1.7
12	R	33	1.0	0.049	12.1	LOS B	0.2	1.7
Approach		55	1.0	0.049	10.0	LOS A	0.2	1.7
All Vehicles		1212	1.9	0.655	7.2	LOS A	6.7	47.7