



# **Lots 545 & 746-750 Baldivis Rd, East Baldivis Local Structure Plan**

## **Transport Assessment**

**PREPARED FOR:  
Mirvac (WA) Pty Ltd**

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# 1.0 Introduction

This Transport Assessment has been prepared by Transcore on behalf of Mirvac (WA) Pty Ltd. The subject of this report is the proposed Local Structure Plan (LSP) for Lots 545 & 746-750 Baldivis Rd, East Baldivis, in the City of Rockingham.

The LSP area is located east of Baldivis Road and west of Kwinana Freeway, as shown in Figure 1 in relation to the various zones and reservations of the Metropolitan Region Scheme (MRS).

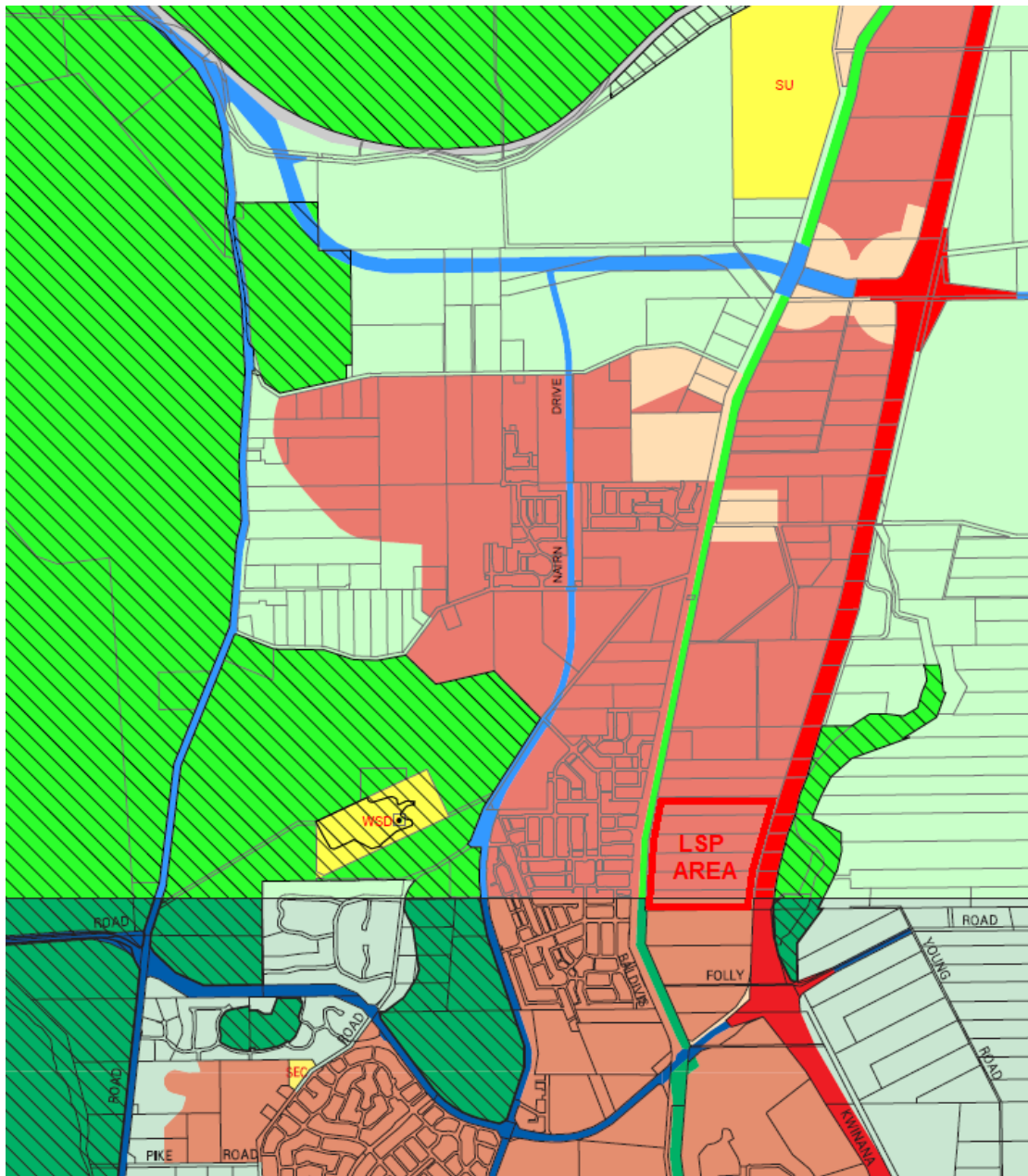
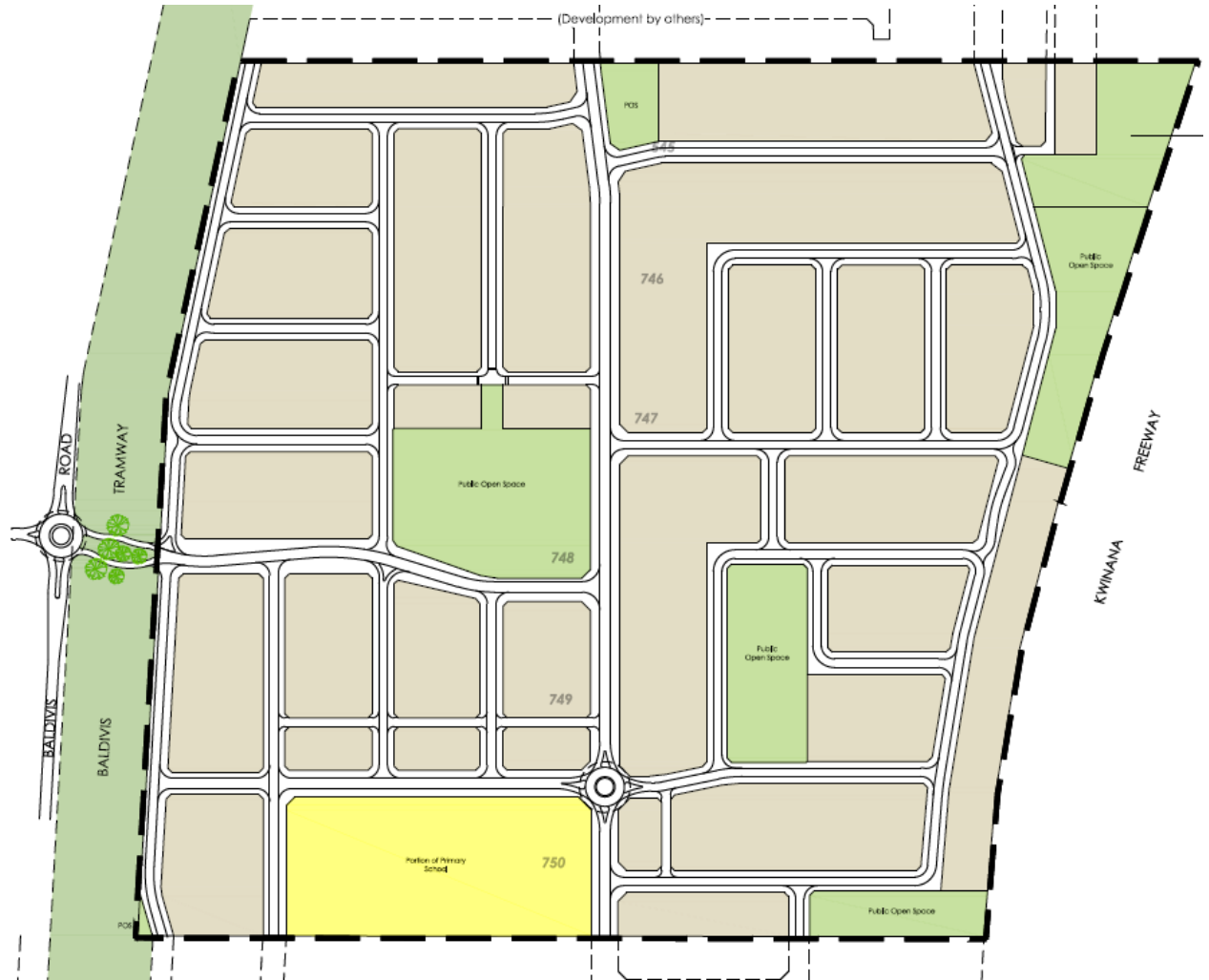


Figure 1: Site location

## 2.0 Proposed Local Structure Plan

The proposed Local Structure Plan (LSP) for Lots 545 & 746-750 Baldivis Rd, East Baldivis is shown in Figure 2.



**Figure 2: Proposed Local Structure Plan**

The LSP area is anticipated to yield approximately 530 residential lots.

The LSP area includes the northern portion of a proposed primary school site that overlaps the southern boundary of the LSP area.

## 3.0 Existing Situation

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### 3.1 Existing Land Use

Existing land uses in the LSP area are rural with only a few dwellings on the site, as shown in Figure 3.



**Figure 3: Existing land use**

Adjacent land uses to the north and south are also rural with very few dwellings, although residential subdivision development has now commenced within the adjoining LSP area immediately to the north of the subject site.

On the west side of Baldivis Road there are new residential areas that have been developed in recent years with new residential development currently progressing northward from this area.

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 in the vicinity of the LSP area).

In some places Baldivis Road has been upgraded to include a 2m to 3m-wide painted median with raised traffic islands. This includes the section adjacent to the northern part of the LSP area (from approximately 150m north of Pemberton Bvd to 200m north of Amazon Drive) which has 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. Adjacent to the southern part of the LSP area it is constructed as a 7.4m-wide two-lane urban road.

Main Roads WA recorded weekday traffic flows of 6,510 vehicles per day (vpd) on Baldivis Road north of Safety Bay Road in October 2012 and 7,333 vpd south of Mundijong Road in May 2013. The October 2012 count indicated that heavy vehicles make up 6.9% of this existing traffic flow on Baldivis Road. City of Rockingham traffic counts recorded weekday traffic flows of 5867vpd on Baldivis Rd south of Fifty Rd, 7909vpd south of Kerosene Lane and 8616vpd south of Mundijong Rd in September 2014. It should be noted that these counts were after the August 2014 opening of Kulija Rd, which is the new extension of Mundijong Rd between Kwinana Fwy and Mandurah Rd.

There is one existing intersection on Baldivis Road adjacent to the LSP area. The Baldivis Road / Pemberton Bvd intersection is a priority-controlled (i.e. give way) T-junction with central traffic islands on all three approaches. The Baldivis Road / Amazon Drive roundabout is located approximately 480m north of Pemberton Bvd and the Tamworth Bvd roundabout is located approximately 330m south of Pemberton Bvd.

**Pemberton Boulevard** provides a link from Baldivis Road to Nairn Drive via Kingaroy Drive, with a roundabout at the Nairn Dr / Kingaroy Dr intersection. The western section is a 7m-wide two-lane urban street but the eastern section is approximately 13m wide with a 4m median. A City of Rockingham traffic count recorded weekday traffic flows of 1165vpd on Pemberton Boulevard west of Baldivis Road in July 2013.

**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, 500m south of the LSP area and at Mundijong Road, 2.8km north of the LSP area. The most recent available Main Roads WA traffic count on the freeway in this area was approximately 51,200

vpd (average weekday traffic, south of Mundijong Road) in August 2011, with 9.9% 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 4. 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 5.30am 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 8am to 4pm on weekdays, 9am to 5pm on Saturdays and 11am to 5pm on Sundays.

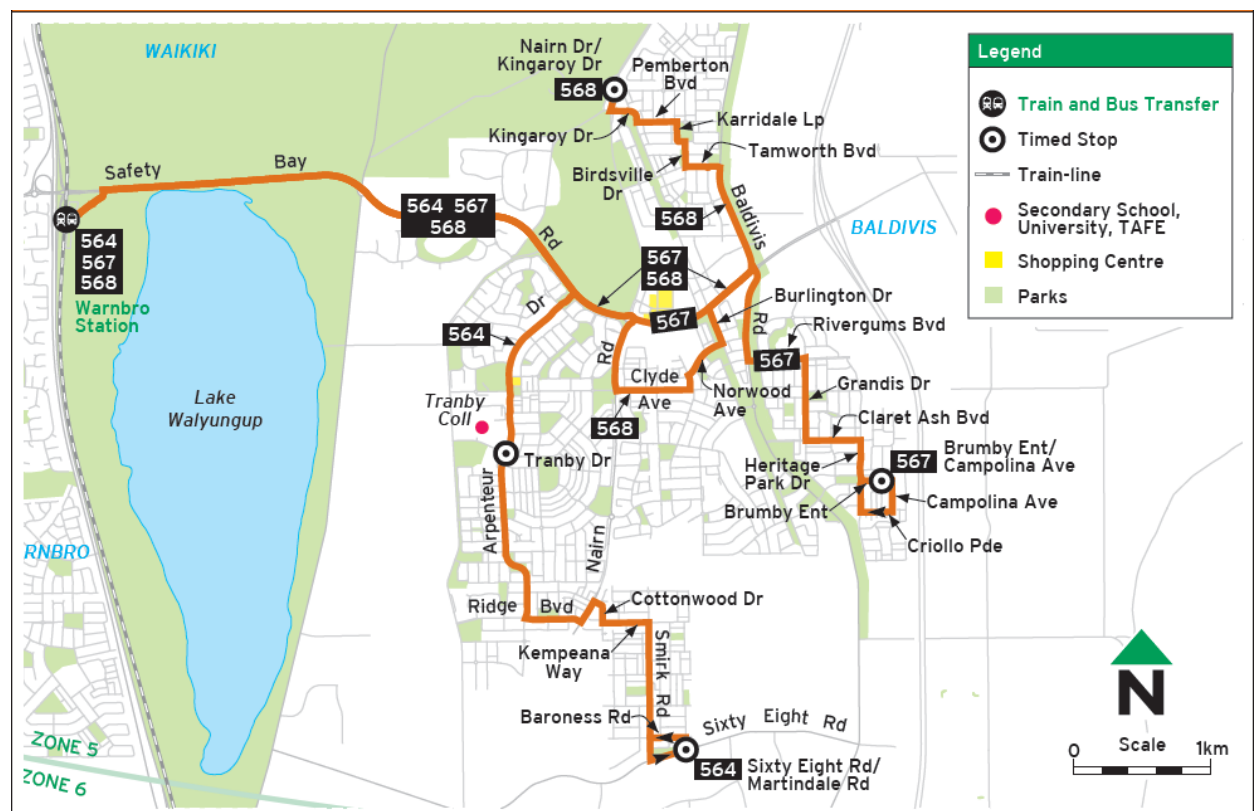


Figure 4: Existing bus routes

### 3.4 Pedestrian and Cyclist Facilities

The entirely rural northern section of Baldvis Road (north of the LSP area) has no existing footpaths or cycle facilities but there is a shared path on the west side of Baldvis Road from 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 northern part of the LSP area includes 1.5m on-road cycle lanes from approximately 150m north of Pemberton Bvd to 200m north of Amazon Drive.

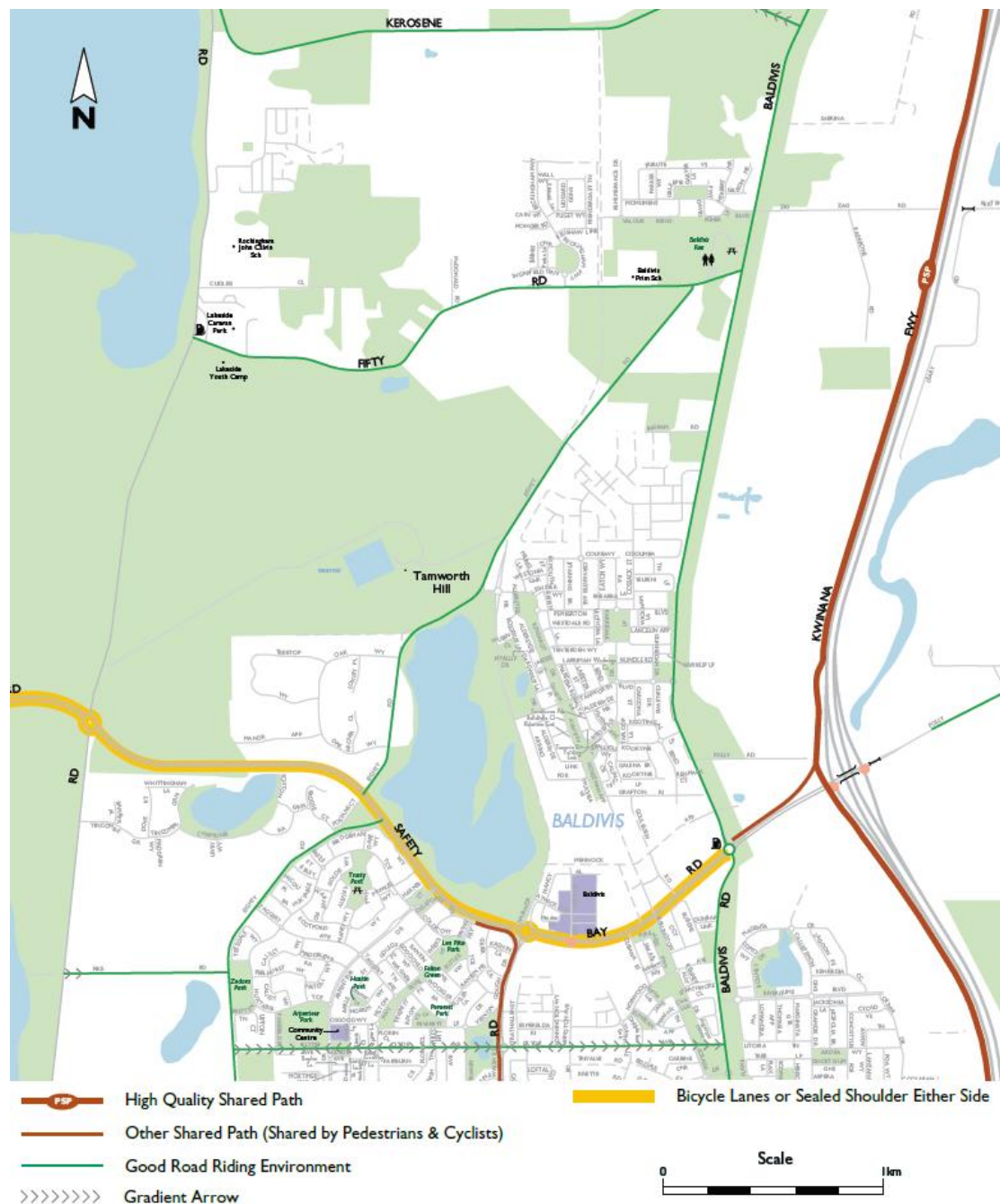


Figure 5: Bike map

### **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. The first 2-lane carriageway of Nairn Drive is currently constructed up to Amazon Drive, linking into Eighty Road.

### **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 (PTA) (see Figure 6 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.

More recent advice from PTA in December 2014 indicated minor revisions to some of these bus route alignments to reflect changes to existing bus routes. They also indicated that Route 568 (west of Baldivis Rd) would continue northwest to Kerosene Lane and Route 569 (east of Baldivis Rd) would continue north to Kulija Rd (the new extension of Mundijong Rd west of Kwinana Fwy).

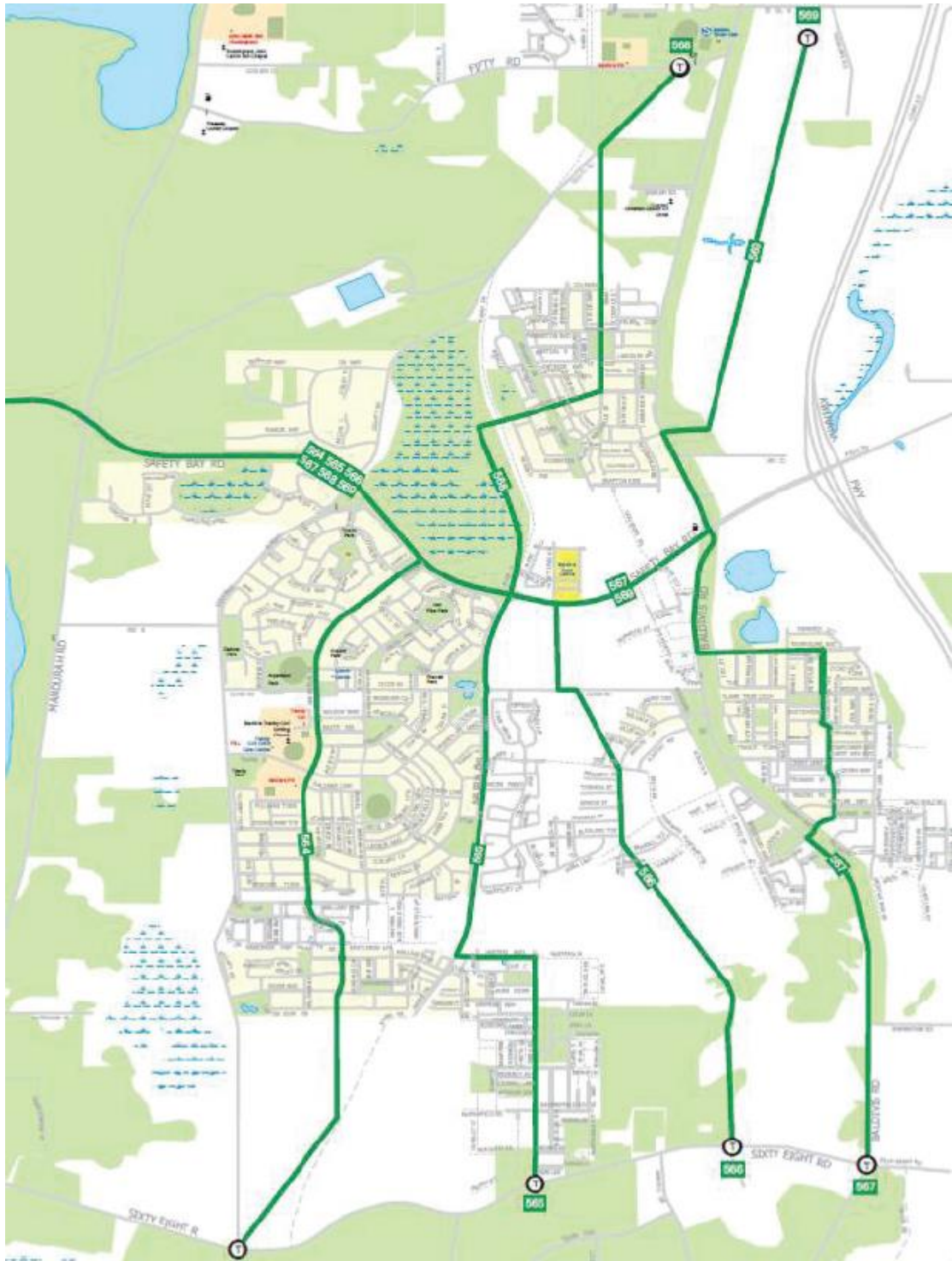


Figure 6: Transperth Service Development Plan Map

## 4.0 Proposed Transport Network

### 4.1 Road Hierarchy

The hierarchy of roads in and around the LSP area is illustrated in Figure 7 using the road hierarchy defined in Liveable Neighbourhoods (2007).

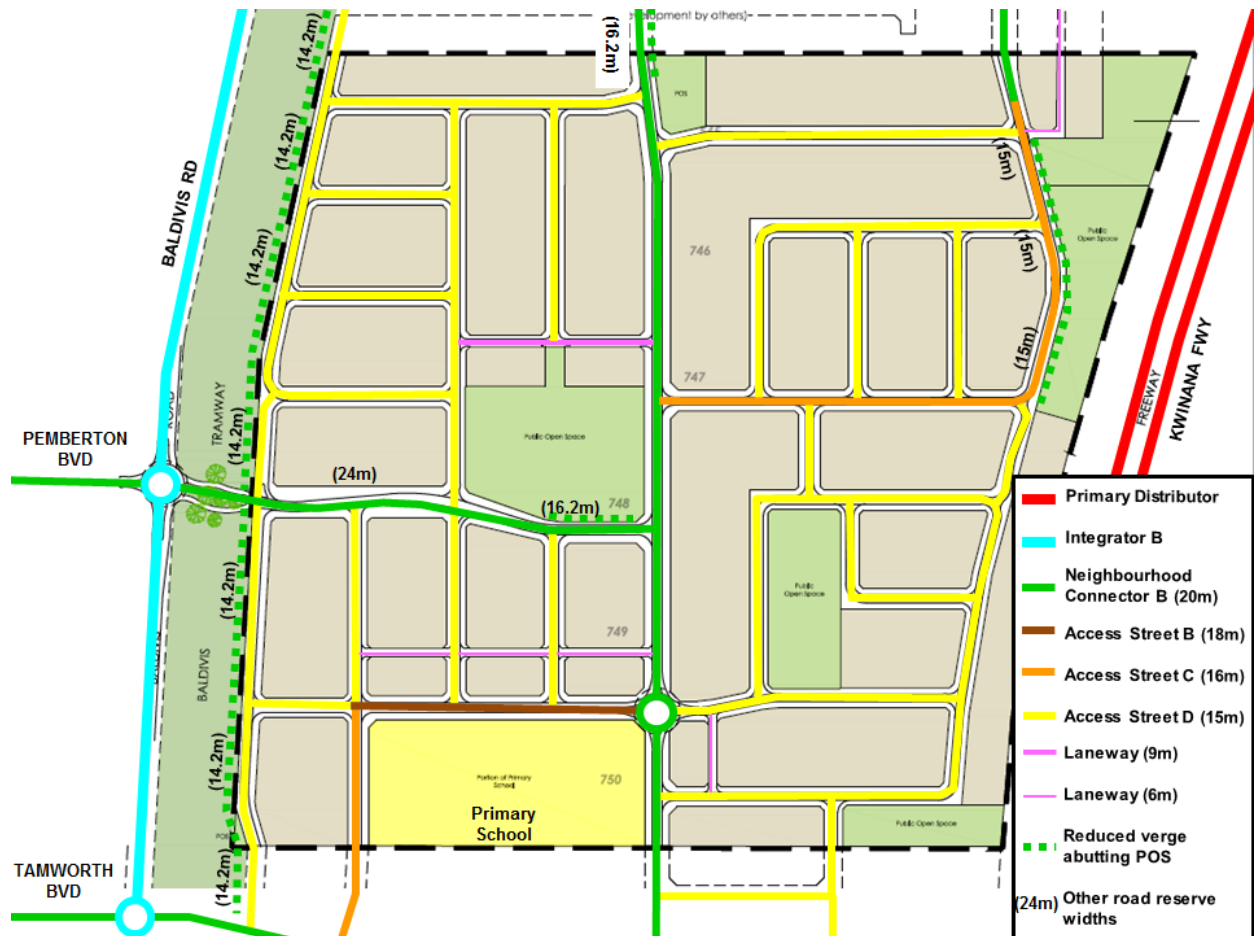


Figure 7: Road Hierarchy

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**

<b>Road Classification</b>	<b>Indicative upper volume (vpd)</b>	<b>Indicative road reserve width (m)</b>	<b>Indicative road pavement width (m)</b>
Integrator B	15,000	29.2m	2 x 5m (incl. cycle lanes), 6m median & embayed parking
Neighbourhood Connector A	7,000	24.4m (23m min)	2 x 5m (incl. cycle lanes), 2m median & embayed parking
Neighbourhood Connector B	3,000	20m (18m min)	7.4m (plus embayed parking)
Access Street B	3,000	17.9m	6m (plus embayed parking)
Access Street C	3,000	16m	7.2m
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 adjacent to the northern end of the LSP area 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 East Baldivis District Structure Plan (DSP) indicates east west Neighbourhood Connector roads connecting to Baldivis Road at Amazon Drive (north of the LSP area and at Tamworth Bvd (south of the LSP area. A new east west Neighbourhood Connector was subsequently added connecting at Pemberton Bvd to allow independent development of this LSP area as well. The DSP also indicates a north south Neighbourhood Connector road route through the site. The proposed LSP plan makes allowance for these main Neighbourhood Connector links.

The LSP for the area immediately to the north of the subject site actually provides an additional north south Neighbourhood Connector link that crosses the northern boundary of the subject site closer to the eastern edge. That is a logical place for a neighbourhood connector spine road in that northern site but not through Lots 545 & 746-750 as it is close to the eastern edge of this LSP area. Consequently, this eastern road is shown as tapering down to an ordinary Access Street C in the proposed LSP for Lots 545 & 746-750, as shown in Figure 7. The use of Access Street C for this connection maintains a 7.2m road carriageway width that will be blended seamlessly with the road carriageway width of the Neighbourhood Connector B to the north.

Traffic flows on both of the proposed 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 normally 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.

The main north south Neighbourhood Connector B across the northern boundary of the LSP area has been approved with a road reserve width of 16.2m in the subdivision approval for the adjoining site north of this boundary (WAPC Application No. 148669) due to a reduced verge width adjacent to POS. This width of 16.2m is continued southward within the LSP area adjacent to the continuation of that same POS. This principle of 16.2m width adjacent to POS is also applied on the east west Neighbourhood Connector B within the LSP area, as noted on Figure 7.

### **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.

The eastern Access Street C should have a 7.2m road carriageway as a continuation of the road width of the Neighbourhood Connector B across the northern boundary of the LSP area. A one-metre reduction of the road reserve width from 16m to 15m adjacent to POS is applied on part of this road, which is permitted in the WAPC *Liveable Neighbourhoods* policy. Future traffic volumes on this route will be less than 1000 vpd, so there is no justification for continuing this at Neighbourhood Connector B standard within this LSP area.

On the frontage roads abutting the Baldivis Tramway reserve (which is a Parks and Recreation reservation in the MRS) there will be little, if any, requirement for underground services or parking in the western verge, so the western verge abutting the Tramway Reserve is proposed to be reduced in accordance with guidance in Liveable Neighbourhoods. The City of Rockingham has indicated that 14.2m is the minimum road reserve width it will accept for an Access Street abutting POS.

### **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 where possible.

One laneway on the northern side of the central POS is indicated as 9.0 metres wide, which will allow on street parking to be provided for the adjacent laneway lots fronting the POS.

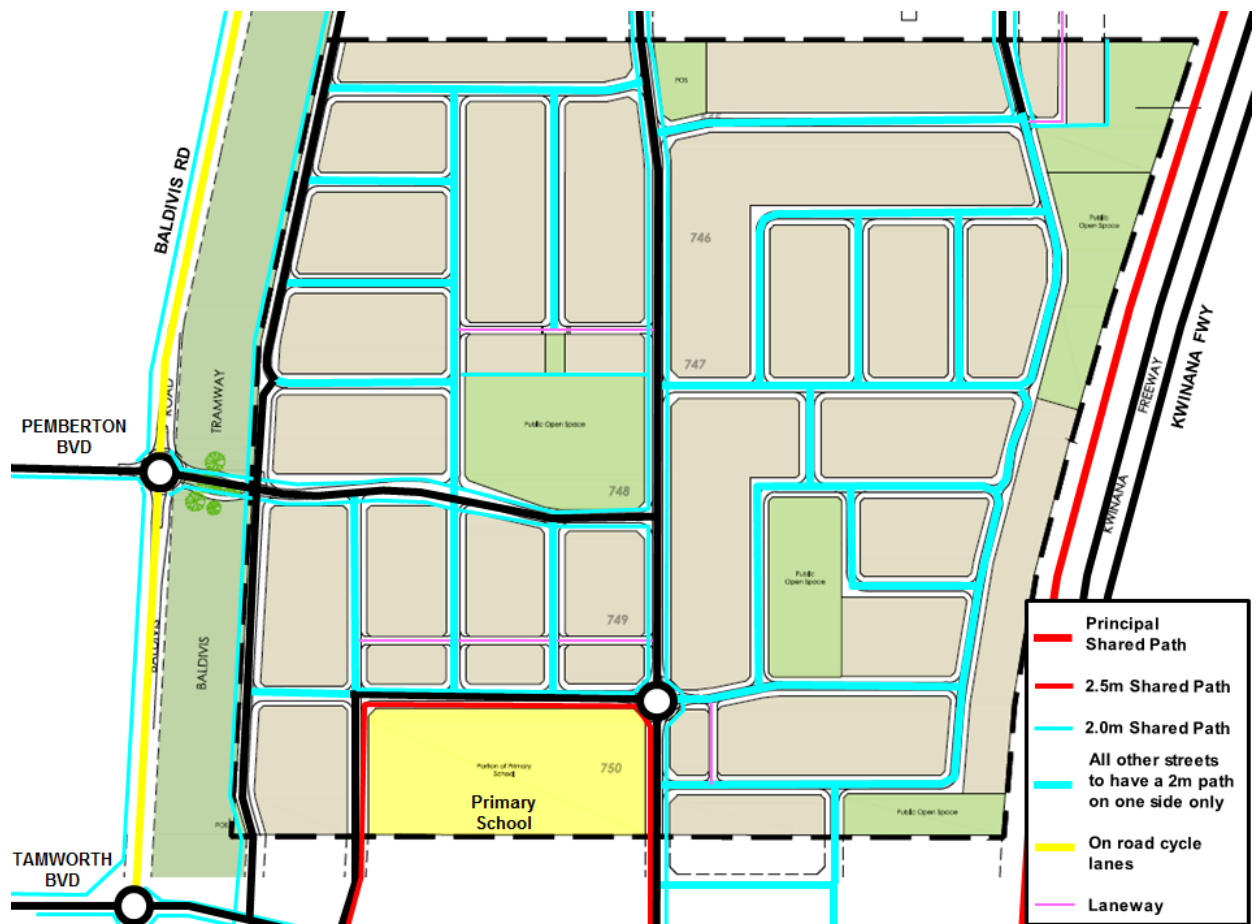
## **4.2 Public Transport**

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. This includes a proposed future bus route along the proposed north south Neighbourhood Connector road link through this LSP area.

## **4.3 Pedestrian and Cyclist Facilities**

The proposed pedestrian and cyclist network for the LSP area is outlined in Figure 8.

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, so Figure 8 indicates a 2.5m shared path on all frontages around the primary school site in this LSP area.



**Figure 8: Pedestrian and cyclist facilities**

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 8 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.

A shared path connection to the Principle Shared Path on the western side of Kwinana Freeway is anticipated within the adjacent LSP area to the south in the vicinity of the Tamworth Bvd alignment.

## 5.0 Integration with Surrounding Area

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

This will include one intersection onto Baldivis Road, connecting with the existing Pemberton Bvd west of Baldivis Road.

To the north and south there will be several connections to future residential areas on neighbouring landholdings. These tie into planned road connections in the Local Structure Plans already prepared for those neighbouring landholdings.

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.

## 6.0 Analysis of the Transport Network

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### 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 EMME transport modelling software package. This model has been developed in more detail for various projects in the Karnup-Baldivis area including 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 Baldivis West 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 530 dwellings of the LSP area will therefore generate approximately 4240 vpd, with some of these being internal trips including trips to and from the primary school.

The traffic model has assigned 1160 vehicle trips per day for the primary school that straddles the southern boundary of the LSP area (nominally 430 students as the standard primary school format currently adopted by the state government), which is higher than the trip rate of 2vpd/day per student normally used for school sites. This is considered appropriate for this site as it makes allowance for higher student numbers in the early years while the surrounding development is occupied mainly by young families.

The traffic model has been revised for the current version of this report to reflect recent traffic count information in the area west of Baldivis Road.

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. Assigned traffic flows have been adjusted to improve representation of the school catchment extending west of Baldivis Road. The resultant distribution of trips to and from the ODP area is summarised in Table 2.

**Table 2: External Trip Distribution**

<b>Approach Road</b>	<b>Proportion</b>
Baldivis Road (north of Pemberton Bvd)	6.2%
Neighbourhood connector (north)	20.2%
Subdivision roads (north)	16.8%
Pemberton Bvd (west)	9.6%
Tamworth Bvd (west)	10.6%
Baldivis Road (south of Tamworth Bvd)	11.0%
Neighbourhood connector (south)	20.0%
Subdivision roads (south)	5.6%
<b>Total</b>	<b>100%</b>

### **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 9 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.

When the transport assessment was previously prepared for the adjacent LSP area to the north it was assumed that there would be an eastern north south Neighbourhood Connector B running diagonally across this site, despite not being shown in the district structure plan. That concept has not turned out to be practical in the current LSP, so the traffic flows modelled on that eastern link are lower in this report than they were in the transport assessment for the LSP area to the north.

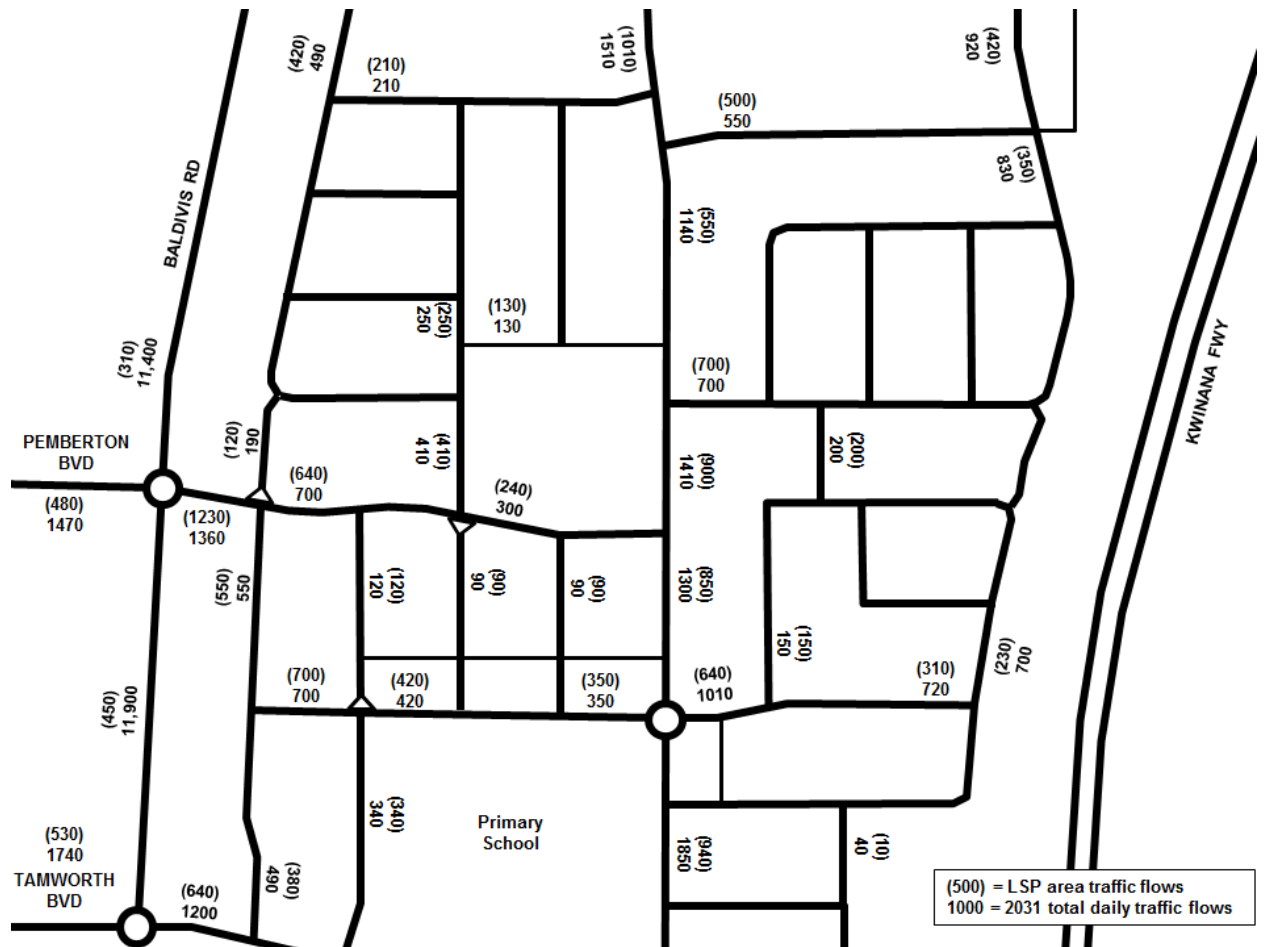
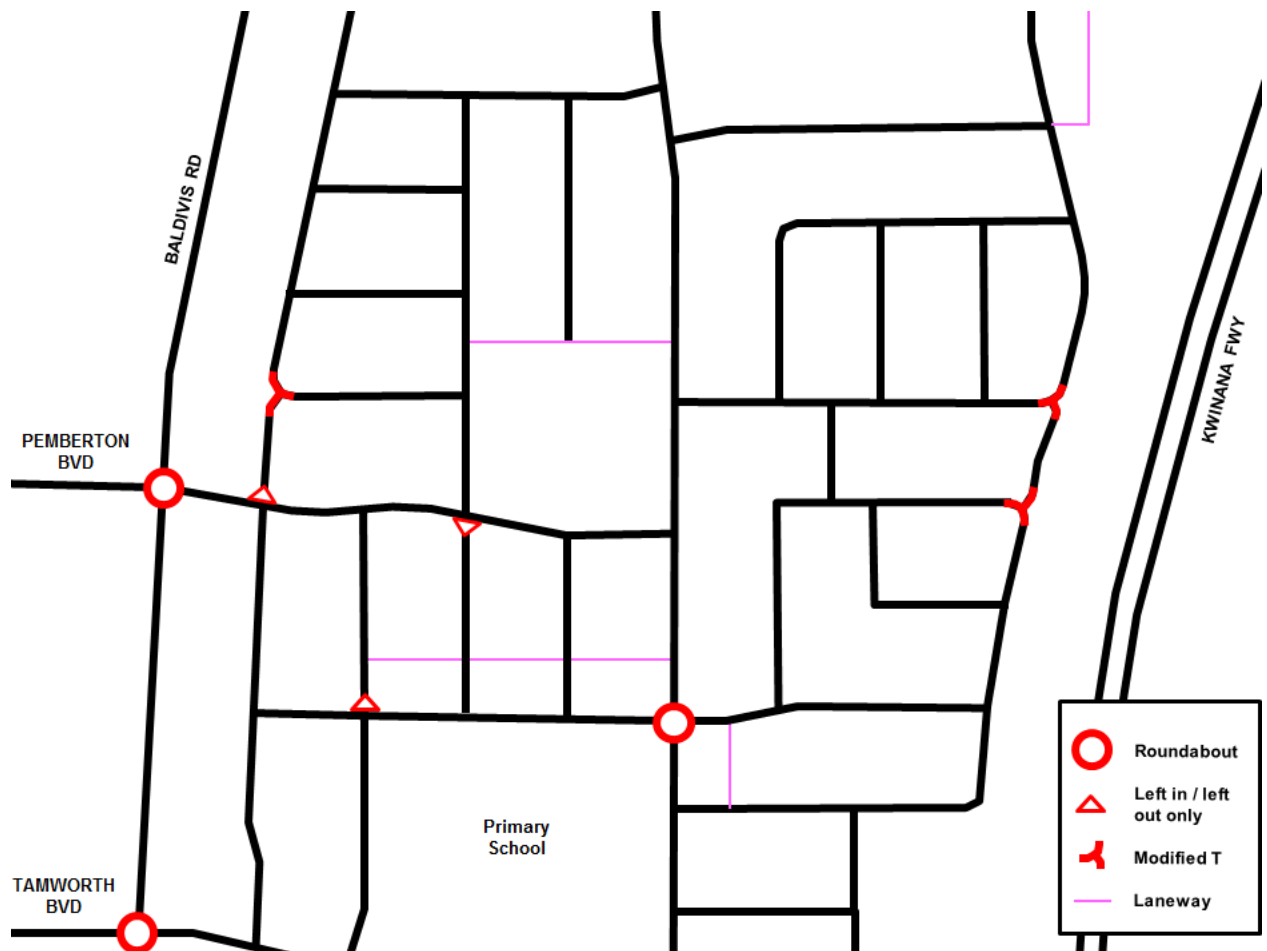


Figure 9: Future Daily Traffic Volumes

#### 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 10 details the proposed intersection controls for intersections within the LSP area.



**Figure 10: Intersection treatments**

Traffic management treatments such as entry statements on side roads at key intersections and slow points such as speed humps or raised plateau treatments are likely to be required on the longer sections of Access Streets within the LSP area to meet the speed management requirements identified in Liveable Neighbourhoods (Element 2, Table 6). It should be noted that the footnote under that table indicates, “Additional speed constraint measures may not be needed on access street C or D up to 200m in length where the traffic volume is less than 1500vpd and the street pavement width combined with the adjacent land use will generate periodic parking on the pavement (not just on the verge).” These traffic management treatments will be determined as part of the detailed design process at subdivision approval stage.

**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 approximately 11,000vpd 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 a 4-way intersection on Baldvis Road at Pemberton Bvd, which is proposed to be constructed as a single-lane

roundabout similar to those constructed at the Baldivis Rd/Amazon Dr and Baldivis Rd/Tamworth Bvd intersections.

### **Internal Intersections**

Within the structure plan area there are several proposed four-way intersections. One of these on the north south Neighbourhood Connector B road is recommended to be constructed as a roundabout, as shown in Figure 10. This will help manage crossing traffic flows and assist with speed management on this long neighbourhood connector road.

Two other four-way intersections on the east west Neighbourhood Connector B road and on one Access Street adjacent to the primary school site are proposed to be treated to prevent the through movements straight across the neighbourhood connector. This will completely eliminate the perceived potential for those vehicles to enter the intersection without slowing down first, which could potentially happen if drivers are careless or not paying attention. It is proposed that one side road at each intersection will be restricted to left in / left out by installing a triangular 'seagull island' treatment on that approach at these intersections as illustrated in Figure 10.

Three T-intersections within the LSP area are planned to be constructed as "modified T-intersections", where the major road route bends around the corner and the other approach connects in on the bend, as illustrated on Figure 10. This is to reinforce the higher order road route or the route without access restrictions at the next intersection, to improve legibility of the local road network in the LSP area.


## **6.5 Intersection Analysis**

Intersection capacity analysis has been undertaken for the key intersection on Baldivis Road for the AM and PM peak hour flows that correspond to the modelled 2031 daily traffic flows in Figure 9.

The location analysed is:

-  Baldivis Rd / Pemberton Bvd intersection (roundabout)

Capacity analysis of this intersection 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 A.

The SIDRA analysis at Tables A1a and A1b in Appendix A indicates that the Baldivis Rd / Pemberton Bvd roundabout will operate satisfactorily in the AM and PM peak periods with the forecast traffic flows for full development of Baldivis. 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 queues are anticipated to extend approximately 46m north of the Pemberton Bvd roundabout, which should be considered quite satisfactory as there will be around 480m and 330m queuing distance available before the existing roundabouts to the north and south, respectively, on Baldivis Road. Queue lengths on the side roads are anticipated to be much shorter (generally only one or two vehicles 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 11,000 vpd adjacent to the LSP area. If Baldivis Road is designed as a two-lane boulevard as has been constructed on the section adjacent to the northern part of the LSP area this would satisfy the guidance in the Transport Assessment Guidelines.

However, the catchment area for the proposed primary school is expected to extend westward across Baldivis Road, potentially generating sufficient student pedestrian and cyclist movements across Baldivis Road to warrant a warden-controlled school crossing in future. Warrant criteria provided on the WA Police website indicate that a Type A Children's Crossing may be provided where a minimum of 20 students and 200 vehicle movements occur within the hour immediately before and immediately after school, for a primary school. The warrants are lower for a Type B Children's Crossing at 10 students and 100 vehicle movements. The numbers of primary students crossing Baldivis Road would be likely to meet these warrants in future. Such facilities can only be applied for by a School Principal or the President / Secretary of the relevant school/parent organisation (eg. P&C or P&F).

## **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 6 would be routed on the north south Neighbourhood Connector B road shown on Figure 7. Residential development within the LSP area will extend approximately 300m east and west from this future bus route, so this 400m guideline is clearly satisfied.

## 7.0 Conclusions

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The main findings of the transport assessment for the Local Structure Plan (LSP) for Lots 545 & 746-750 Baldivis Rd, East Baldivis are outlined below.

The LSP area is anticipated to accommodate approximately 530 dwellings and the northern half of a primary school site.

This residential area is anticipated to generate traffic flows of approximately 4240 vehicles per day and the primary school could attract traffic flows up to 1160 vehicles per day.

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 (one lane each way, separated by a central median island) 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 a four-way intersection on Baldivis Road at Pemberton Boulevard, which is recommended to be constructed as a single-lane roundabout similar to the existing Baldivis Road / Amazon Drive and Baldivis Road / Tamworth Bvd intersections. The proposed roundabout has been analysed for future traffic flows when Baldivis is fully developed and the analysis indicates that it will operate satisfactorily during weekday AM and PM peak periods.

A roundabout is also recommended at one other 4-way intersection along the planned neighbourhood connector road running north south through the LSP area adjacent to the primary school site. Other intersection treatments are recommended in the report to ensure safe operation of three other four-way intersections within the LSP area.

The proposed road network provides three road links at the northern boundary and four at the southern boundary to integrate with future development planned in the local structure plans of neighbouring landholdings north and south of this site within the wider East Baldivis District Structure Plan.

The proposed north south neighbourhood connector is an appropriate alignment 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. A warden-controlled school crossing is anticipated to be warranted on Baldivis Road

adjacent to the LSP area in future to assist students walking or cycling to the primary school if the school catchment area extends westward across Baldivis Road as currently anticipated.

# Appendix A

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## SIDRA Intersection Analysis

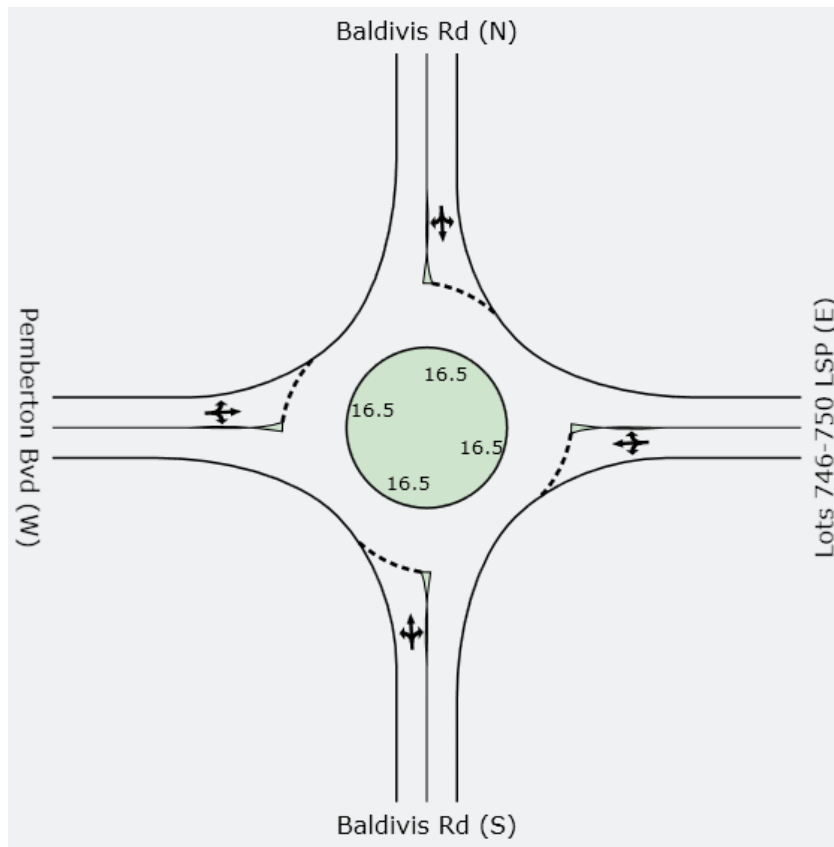


Figure A1. Baldvis Rd / Pemberton Bvd roundabout layout analysed in SIDRA

Table A1a. SIDRA results – Baldvis Rd / Pemberton Bvd roundabout – 2031 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	22	1.0	0.512	7.9	LOS A	4.4	31.8
2	T	665	5.0	0.512	8.4	LOS A	4.4	31.8
3	R	17	1.0	0.512	12.0	LOS B	4.4	31.8
Approach		704	4.8	0.512	8.5	LOS A	4.4	31.8
East: Lots 746-750 LSP (E)								
4	L	32	1.0	0.108	8.3	LOS A	0.6	4.0
5	T	41	1.0	0.108	6.0	LOS A	0.6	4.0
6	R	29	1.0	0.108	13.0	LOS B	0.6	4.0
Approach		102	1.0	0.108	8.7	LOS A	0.6	4.0
North: Baldvis Rd (N)								
7	L	12	1.0	0.283	7.6	LOS A	1.9	13.5
8	T	363	5.0	0.283	8.1	LOS A	1.9	13.5
9	R	17	1.0	0.283	11.6	LOS B	1.9	13.5
Approach		392	4.7	0.283	8.2	LOS A	1.9	13.5
West: Pemberton Bvd (W)								
10	L	7	1.0	0.073	10.3	LOS B	0.4	3.0
11	T	12	1.0	0.073	8.1	LOS A	0.4	3.0
12	R	33	1.0	0.073	15.0	LOS B	0.4	3.0
Approach		52	1.0	0.073	12.8	LOS B	0.4	3.0
All Vehicles		1250	4.3	0.512	8.6	LOS A	4.4	31.8

**Table A1b. SIDRA results – Baldvis Rd / Pemberton Bvd roundabout – 2031 PM peak with full development**

<b>Movement Performance - Vehicles</b>								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m
<b>South: Baldvis Rd (S)</b>								
1	L	52	1.0	0.275	7.7	LOS A	1.7	12.4
2	T	285	5.0	0.275	8.1	LOS A	1.7	12.4
3	R	39	1.0	0.275	11.7	LOS B	1.7	12.4
<b>Approach</b>		376	4.0	0.275	8.4	LOS A	1.7	12.4
<b>East: Lots 746-750 LSP (E)</b>								
4	L	14	1.0	0.075	12.4	LOS B	0.5	3.2
5	T	18	1.0	0.075	10.2	LOS B	0.5	3.2
6	R	12	1.0	0.075	17.1	LOS B	0.5	3.2
<b>Approach</b>		44	1.0	0.075	12.8	LOS B	0.5	3.2
<b>North: Baldvis Rd (N)</b>								
7	L	28	1.0	0.628	7.9	LOS A	6.3	45.7
8	T	847	5.0	0.628	8.4	LOS A	6.3	45.7
9	R	39	1.0	0.628	11.9	LOS B	6.3	45.7
<b>Approach</b>		914	4.7	0.628	8.5	LOS A	6.3	45.7
<b>West: Pemberton Bvd (W)</b>								
10	L	3	1.0	0.030	7.6	LOS A	0.1	1.0
11	T	13	1.0	0.030	5.4	LOS A	0.1	1.0
12	R	14	1.0	0.030	12.4	LOS B	0.1	1.0
<b>Approach</b>		30	1.0	0.030	8.9	LOS A	0.1	1.0
<b>All Vehicles</b>		1364	4.3	0.628	8.6	LOS A	6.3	45.7