Stockland

North-East Baldivis DSP

District Level Transport Assessment Report

November 2023

Project Code: 06745

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Version Control and Approval

Version	Date	Main Contributor	Issued by	Approved by
A – Preliminary Draft (not for distribution)	10 January 2023	Tanya Moran, Gavin Coupe	Tanya Moran	Tim Judd
B – Draft	14 February 2023	Tanya Moran, Gavin Coupe	Tanya Moran	Tim Judd
B – Revised (following receipt of P.I.A. ROM data outputs)	20 March 2023	Tanya Moran, Gavin Coupe	Tanya Moran	Tim Judd
C – Final	27 June 2023	Tanya Moran, Gavin Coupe	Tanya Moran	Tim Judd
D – Updated with PTA comments for Advertising	6 November 2023	Tanya Moran, Gavin Coupe	Tanya Moran	Tim Judd

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1 Introduction

1.1 Purpose of this report

1.1.1 This transport and access report has been prepared by PJA for Stockland, as part of the North-East Baldivis District Structure Plan (DSP) in Wellard.

1.1.2 It addresses the strategic transport aspects of land use/ transport integration for the North-East Baldivis DSP and, in particular, addresses:

- Pedestrians (people walking and wheeling) and cyclists
- Public transport
- Traffic volumes and street hierarchy
- Street cross-sections
- Traffic management.

1.1.3 The assessment has been prepared in accordance with the *Western Australian Planning Commission (WAPC) Guidelines for Developments, Volume 2 – Structure Plans, August 2006* (WAPC Guidelines).

1.2 Transport Assessment Objectives

1.2.1 From the WAPC Guidelines, the key objectives of a transport assessment for a DSP are:

- to assess the proposed internal transport networks with respect to accessibility and safety for all modes: pedestrians, cyclists/e-mobility, public transport and vehicles
- to assess the level of transport integration between the DSP area and the surrounding land uses
- to determine the impacts of the traffic generated by the DSP area on the surrounding land uses
- to determine the impacts of the traffic generated by the structure plan on the surrounding transport networks.

1.3 District Structure Plan Proposal

Regional Context

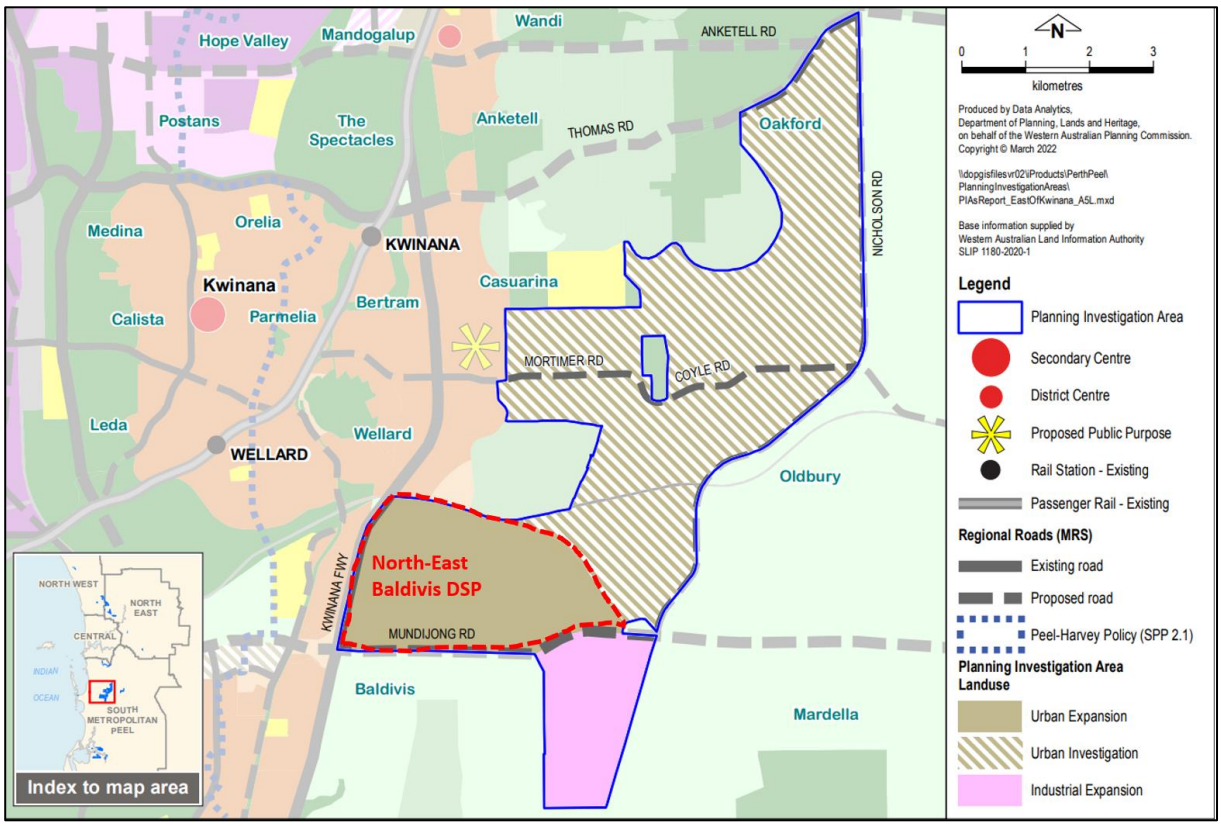
1.3.1 The North-East Baldivis DSP is located in the East of Kwinana sector.

1.3.2 The *Perth and Peel@3.5million Sub-regional Planning Frameworks*, released in 2018, identified 15 Planning Investigation Areas (PIAs) within the Perth and Peel regions. PIAs are sites where further detailed planning is required to determine whether a change to current land use and zoning for more intensive land use is appropriate.

1.3.3 The Department of Planning, Lands and Heritage (DPLH) on behalf of the Western Australian Planning Commission (WAPC) and in conjunction with relevant agencies and local governments, investigated all 15 PIAs. In September 2022, a total of 13 determinations were made.

1.3.4 The WAPC supported to change of land use for the East of Kwinana PIA sector, which encompasses the North-East Baldivis DSP. The endorsed framework land use classifications are Urban Expansion, Urban Investigation and Industrial Expansion and reflects proposed regional road reserves as shown in Figure 1-1.

Figure 1-1: Locality Plan - East of Kwinana Sector



(Source: Perth and Peel@3.5million Planning Investigation Areas Update, September 2022)

The PIA update notes the following key considerations pertaining to transport to be addressed through further detailed planning for Urban Expansion area:

- road transport infrastructure coordination and staging (at a regional and district level)
- interface with the adjoining Urban Investigation area at North-East Baldivis.

Proposed Land Uses

1.3.5 The proposed land uses within the North-East Baldivis DSP is shown in Table 1-1.

Table 1-1: DSP Assumed Land Uses and Quantities

DSP Staging (nominal)	Residential (Dwellings)	Neighbourhood Centres (GFA, 33% of land area)	Employment (GFA, 50% of land area)	Schools
LSP 1	1,124	32,935	20,169	1 x Primary
LSP 2	2,053	6,666	0	1 x Primary + 1 x High
LSP 3	2,283	0	87,035	1 x Primary
LSP 4	503	0	0	1 x Primary
TOTAL (estimates)	**5,963 dwellings**	**39,600 m2**	**107,200 m2**	**4 x Primary + 1 x High**

(Note: As at 7 December2022)

1.3.6 On the basis of the estimated number of dwellings, North-East Baldivis DSP is anticipated to home some 18,000 people. This is based on 3 persons per dwelling referencing the 2021 census data for South Baldivis.

Major Attractors / Generators

1.3.7 The North-East Baldivis DSP is approximately:

- 37km south of the Perth Central Business District
- 10km east of the Rockingham - a Strategic Metropolitan Activity Centre
- 6km south-east of the Kwinana Town Centre - a Secondary Centre (refer Figure 1-1)
- 8km south of Wandi – an emerging District Centre, just north of Anketell Road (refer Figure 1-1)
- 9km west of Mundijong (west)[1] future industrial area that is expected to cater mainly for increase agriculture-related industries, including transport and logistics.

1.3.8 To the south-east of the North-East Baldivis DSP, a parcel of land has also been designated as Industrial Expansion as part of the September 2020 PIA determination. This is located south of Mundijong Road and just west of the Nicholson Road future south extension. The industrial land has been incorporated into the assessment of this DSP.

[1] Denoted as Mundijong (west) in the South Metropolitan Peel Sub-regional Planning Framework

1.3.9 Within the North-East Baldivis DSP site, the key attractors / generators are noted to be (refer Appendix A):

- 1 x Neighbourhood Centre
- 1 x Local Centre
- 3 x Employment Precincts
- 4 x Primary Schools
- 1 x High School.

Key Considerations

1.3.10 From a transport and access perspective, the key considerations are:

- Management of north-south and east-west traffic volumes and minimisation of barrier effects. The Kwinana Freeway to the west is expected to carry the majority of the external-to-external north-south traffic, however, traffic will rely on Mundijong Road east-west road to access the Kwinana Freeway. The North-East Baldivis DSP internal-to-external traffic will also rely on Mundijong Road to access district destinations to/from or west of the Freeway. While the North-East Baldivis DSP is constrained to the north by the freight railway line and west by the Kwinana Freeway, the PIA areas to the south of Mundijong Road are less constrained and have alternative road network access options. A key issue is how the design of these roads, and their integration with surrounding land uses, can minimise potential 'barrier' effects to movement.
- Maintaining a northern local road and active transport connection to Wellard Train Station via Telephone Lane west of Kwinana Freeway across the industrial freight rail line at Wellard/Baldivis Road. A shared path exists already on the southern side of Telephone Lane and this link will assist pedestrians, e-mobility device users, cyclists, motorists and public transport (feeder buses) to access north of the freight railway line and use the passenger rail transport at Wellard Train Station.
- The potential future termination of the existing at-grade intersection between Baldivis Road and Mundijong Road west of the Kwinana Freeway, resultant of the State Government planned upgrade of the Kwinana Freeway and Mundijong Road interchange. This proposal, if proceeding, will no longer permit a connection from Mundijong Road to Baldivis Road, limiting connectivity from the southern areas.
- Integration of a public transport system either to key employment areas for residents of the North-East Baldivis DSP and/or as feeder bus services to/from Wellard Train Station to create an urban development that reduces reliance on private vehicles for local as well as district and regional movements.

- Integration of recreational and commuter walk/cycle/e-mobility networks within the urban environment to facilitate environmentally sustainable transport modes that are interesting, safe, efficient and effective. Commuter networks to cater for access to work, education and shopping, as well as access to transit nodes, such as key bus terminus and train stations.
- Robustness for staging of transport infrastructure. The main transport infrastructure within North-East Baldivis DSP and its fringes will be developed over a 30+ year timeframe with this DSP assessing a 2051 year ultimate scenario. The integrated land use/ transport network must be capable of achieving a quality living environment at all stage of development of North-East Baldivis DSP.

1.4 Layout of this report

1.4.1 This report follows the suggested format of the *WAPC Guidelines Volume 2 Structure Plans* and is divided into six sections:

1 Section 1 Introduction and background (this section)

2 Section 2 Existing Situation

3 Section 3 Proposed Internal Transport Networks

4 Section 4 Changes to External Transport Networks

5 Section 5 Analysis of Transport Network – Internal and External

6 Section 6 Conclusions.

2 Existing Situation

2.1 Existing Land Uses

Existing Land Uses within DSP Area

2.1.1 The site is currently characterised by:

- rural residential uses
- Water Ski Park
- Fish and Marrron Farm
- Landscaping and firewood supply store
- Live Export Depot.

Figure 2-1: Existing Site and Surrounds

(Source: Reproduced with permission using Nearmap)

Existing Land Uses within 800m

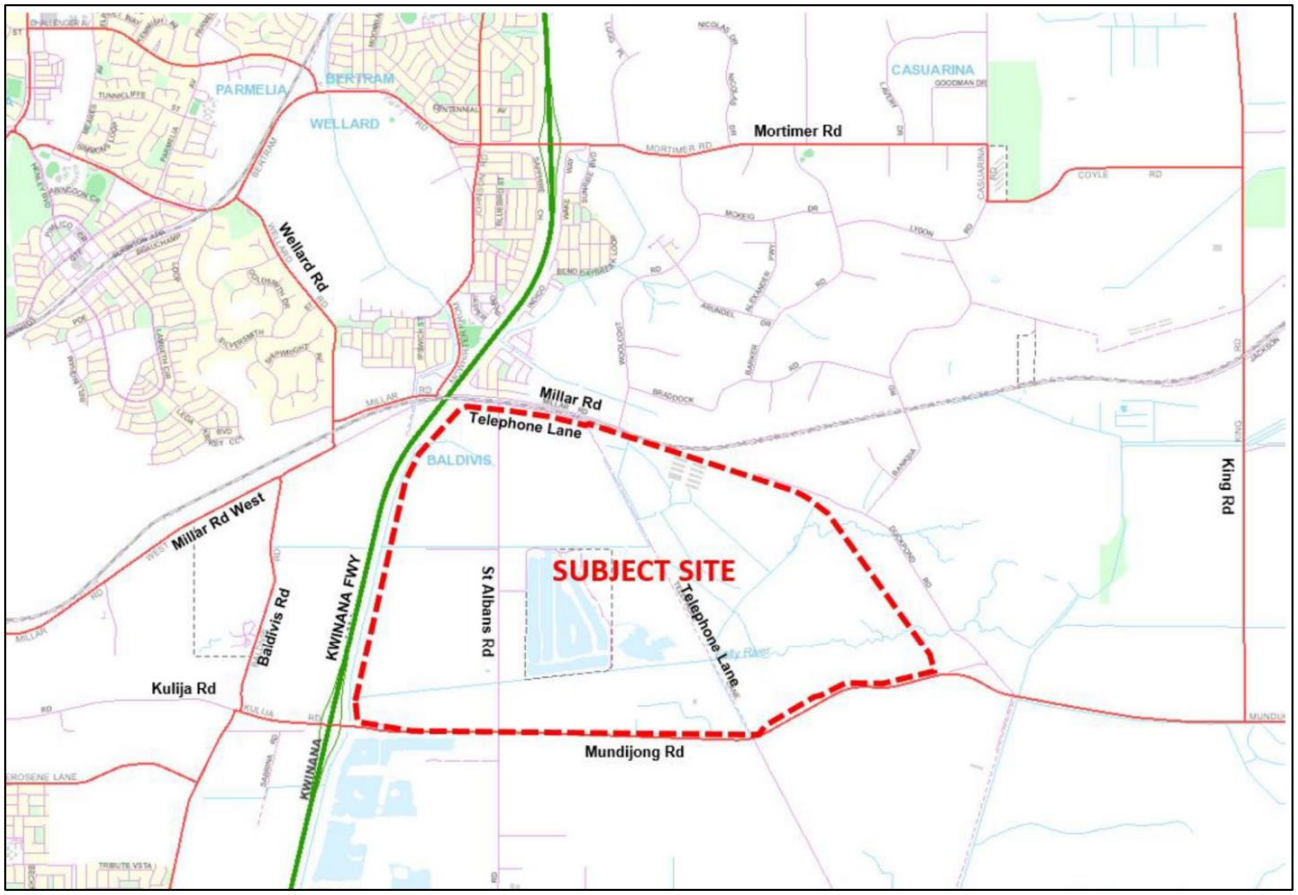
2.1.2 The existing land uses within 800m to the south, east and north east of the site are predominantly rural residential land. To the north, the north west and west are developing urban residential areas comprising Wellard East Cell Local Structure plan, Wellard Village Structure Plan and Millars Landing Structure Plan respectively.

2.2 Existing Movement Network

Road Network within DSP Area

2.2.1 The existing road network in the vicinity of the subject site is shown in Figure 2-2.

Figure 2-2: Existing Road Network



(Source: Transport Planning and Connectivity Study, prepared for Stockland, August 2019)

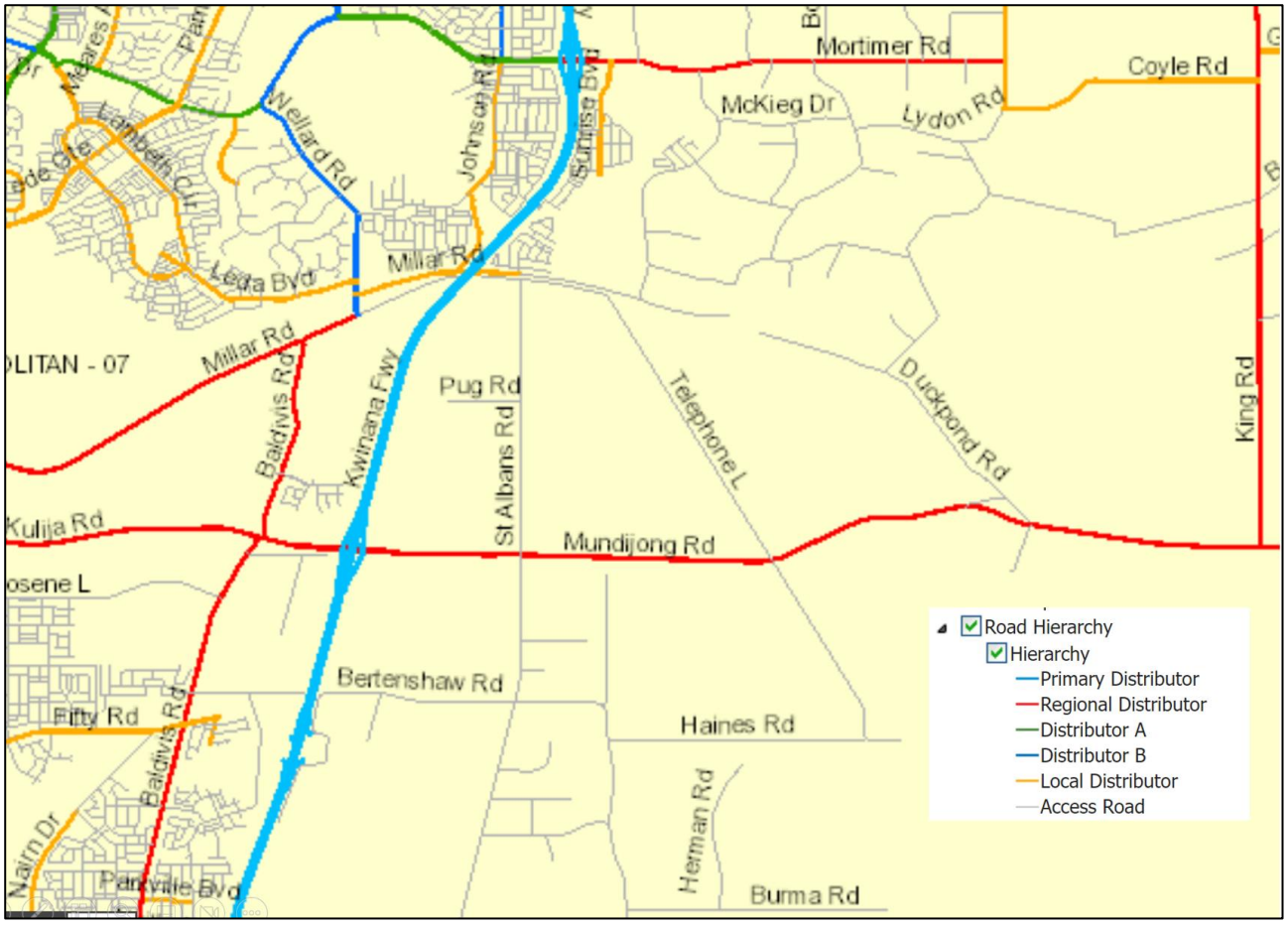
2.2.2

2.2.3 The key roads adjacent to the site include:

- Mundijong Road
- Telephone Lane
- St Albans Road
- Kwinana Freeway.

2.2.4 These roads, their existing hierarchies and their connections are discussed below.

Figure 2-3: Main Roads WA Functional Road Hierarchy



(Source: Main Roads WA Road Information Mapping)

Mundijong Road

2.2.5 Mundijong Road forms the southern boundary of the subject site and is constructed as a single carriageway, two-lane, rural road. Mundijong Road is classified as a Regional Distributor in the Main Roads WA Functional Road Hierarchy. It is also classified as an Other Regional Road (often referred to as a Blue Road) in the Metropolitan Region Scheme (MRS). The road currently sits within a 20m wide road reserve. The posted speed limit varies from 100km/h east of St Albans Road, changes to 80km/h at this point, then changing to 70km/h at the Kwinana Fwy interchange.

2.2.6 Mundijong Road carried average weekday traffic flows (AWT) of:

- 5,591vpd (vehicles per day) to the east of Kwinana Freeway in 2017/18 with a 13.7% heavy vehicle component. This grew to 6,786vpd in the same location, to the east of Kwinana Freeway, in 2020/21 with a drop to 9.9% heavy vehicle component.

- 12,363vpd to the west of the Kwinana Freeway and continuing towards Baldivis Road in 2017/18 with 13.5% heavy vehicles. This grew 16,579vpd in 2020/21 with a small drop of 13.1% heavy vehicle component.

2.2.7 Towards the east, Mundijong Road becomes Watkins Road and eventually connects to the South Western Highway. A future extension of the Tonkin Highway will connect to Mundijong Road between the site and South Western Highway which is further discussed in *Chapter 4 - Changes to External Transport Network*.

2.2.8 Mundijong Road/Watkins Road is noted currently as a key freight connection between Kwinana Freeway to South Western Highway and the future planned southern extension of Tonkin Highway. Mundijong Road provides connectivity to the Kwinana Freeway for commuter and commercial traffic from Mundijong and surrounding areas.

Telephone Lane

2.2.9 Telephone Lane forms the northern boundary of the site as a single carriageway rural road before veering south through the site along the Western Power easement as an unsealed road to an intersection with Mundijong Road. The sealed portion of Telephone Lane extends to the west under the Kwinana Fwy underpass as a 2-lane road and forms the eastern leg of the intersection with Wellard Road and Baldivis Road. This section of road cannot be widened due to the bridge abutments, nor does it require it as discussed in *Chapter 5 - Analysis of the Transport Network*.

2.2.10 Telephone Lane in the northern boundary carried AWT flows of 603vpd to the east of Kwinana Freeway in 2017/18 with a 10.8% heavy vehicle component.

2.2.11 Continuation of Telephone Lane towards the south connects to Mundijong Road as a 4-way intersection towards the south connecting to Haines Road. The current MRS reservation indicates this 4-way intersection will be staggered T-intersections (Figure 2-4).

2.2.12 There have been discussions at a State Government level of a potential future grade separated connection over the industrial freight railway line at Baldivis Road west of the Kwinana freeway, however this is currently neither funded nor in a forward works plan. Further discussion on this is in *Chapter 4 - Changes to External Transport Network*.

St Albans Road

2.2.13 St Albans Road is constructed as a single carriageway, two-lane, rural road and runs in a north-south alignment through the DSP area. It connects to Telephone Lane in the north and extends southwards to Mundijong Road to connect to Folly Road in the south. The existing intersection of St Albans Road/Mundijong Road is a 4-way priority controlled intersection with priority given to vehicles on Mundijong Road.

2.2.14 The current MRS reservation indicates St Albans Road/Mundijong Road 4-way intersection will be staggered T-intersections (Figure 2-4).

Figure 2-4: MRS Reservations for Telephone Lane and St Albans Road to Staggered T Intersections

Duckpond Road

2.2.15 Duckpond Road is constructed as a single carriageway, two-lane, rural road and runs in a northwest to southeast alignment on the eastern boundary of the DSP area. It connects to Mundijong Road as a STOP controlled intersection at two different points, approximately 500m apart. The eastern connection with Mundijong Road is slightly offset as a T-intersection with Wilkinson Road to the south. This section of Mundijong Road between the two Duckpond Road intersections is currently a road safety issue with high posted speeds along Mundijong Road and the presence of a bridge just to the east of Wilkinson Road. There has been 7 recorded crashes in the last five years along this section with a resultant fatality of an out of control car having left the left hand carriageway in low light and wet conditions.

Kwinana Freeway

2.2.16 Kwinana Freeway is currently constructed as four-lanes, two lanes each way, with a posted speed limit of 100km/h. Kwinana Freeway carried AWT flows of:

- 70,595vpd in 2017/18 on Kwinana Freeway south of Mundijong Road with 11.6% heavy vehicles.
- This daily flow reduced to 66,742vpd in 2020/21 with a similar 12% heavy vehicles.

2.2.17 Kwinana freeway is bridged over Telephone Lane, the freight railway and Millar Road.

2.2.18 Kwinana Freeway is a grade-separated diamond interchange at Mundijong Road with the freeway on/off ramps intersections on Mundijong Road currently controlled by traffic signals. Main Roads WA has planned for future upgrading of this interchange to a standard similar to the recently constructed Tonkin Highway / Roe Highway interchange, further discussed in *Chapter 4 - Changes to External Transport Network*. This interchange will be a responsibility of Main Roads, and will require additional land at the south west corner of the site which has currently been reserved under the MRS.

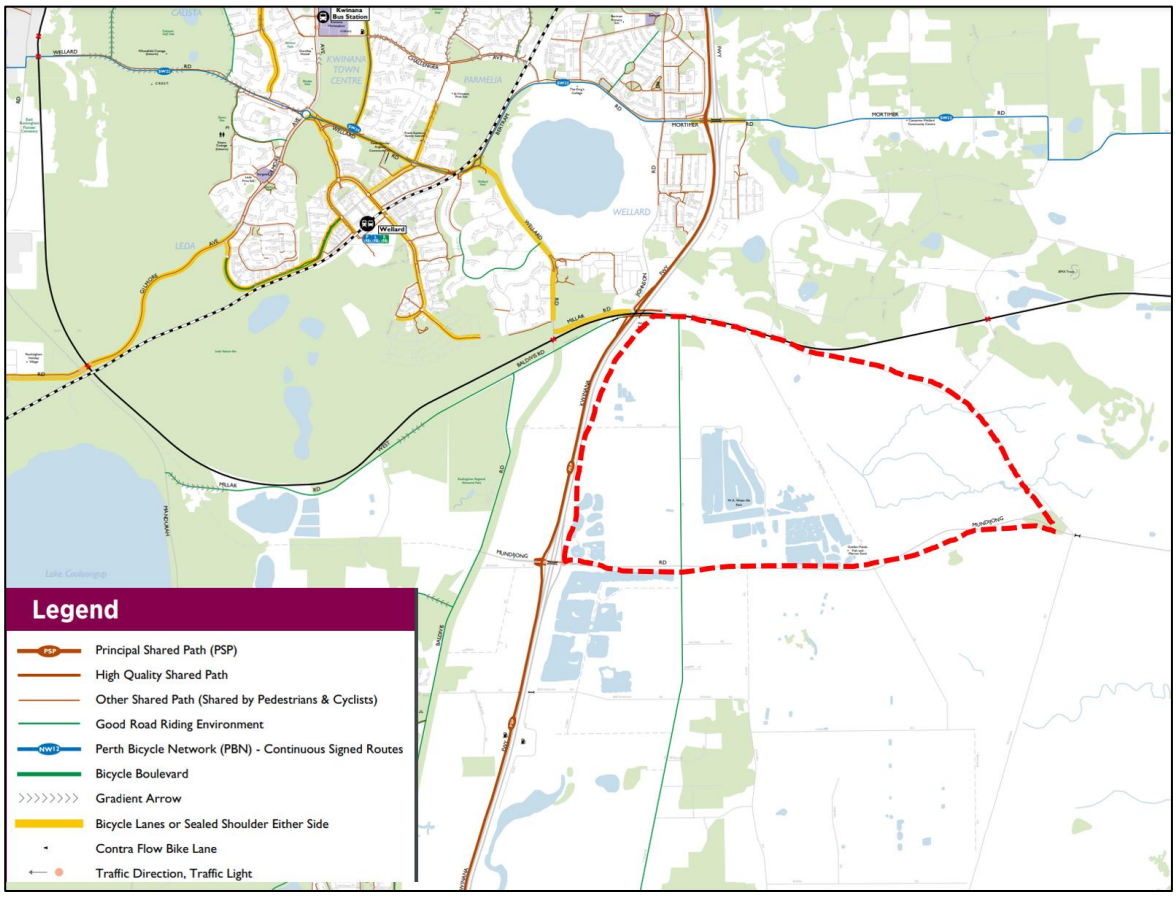
2.2.19 The next freeway interchange to the north is at Mortimer Road and to the south is at Safety Bay Road.

Pedestrian / Cycle Networks within DSP Area and within 800m

Riding

2.2.20 The existing cycling routes were obtained from the Western Australian Department of Transport website as depicted in the following figure.

Figure 2-5: Cockburn and Rockingham Bike Map



(Source: Department of Transport)

2.2.21

2.2.22 Within the site, St Albans Road is currently identified as a "good road riding environment". This road provides riding options for leisure and sport cyclists seeking training routes in the area as it connects with the Kwinana Freeway Principal Shared Path (PSP) at Safety Bay Road in the south and at Millar Road/Baldivis Road in the north-west. There are onward connections here in the form of "bicycle lanes or sealed shoulder either side" that lead to the North-East Baldivis DSP (approximately 6km riding distance). This route could serve future residents of North-East Baldivis DSP for both recreation and commuting purposes (assuming the connection is retained).

2.2.23 The PSP that exists along the southern verge of Telephone Lane in the north-west of the DSP area, provides a continuous connection over the Kwinana Freeway bridge to the PSP on the northern side of the freight railway line. This PSP then to connects to:

- Kwinana Freeway for a north -south connection
- McWhirter Promenade for a north-west connection
- Millar Road for an east-west connection.
-

2.2.24 The PSP on Telephone Lane is shown in and the PSP adjacent the Kwinana Freeway northbound carriageway is shown in Figure 2-7.

It is recommended that this PSP connection from St Albans Road over the Kwinana Freeway bridge is maintained and improved where required within the North-East Baldivis DSP area to support development.

Figure 2-6: Principal Shared Path connections at Telephone Lane and Millar Road

(Source: Reproduced with permission from Nearmap)

Figure 2-7: Principal Shared Path connections at Kwinana Freeway bridge

(Source: Google Maps)

2.2.25 The Kwinana Freeway PSP along its northbound carriageway currently provides excellent freight crossing riding option and can be accessed from both Millar Road and Telephone Lane.

2.2.26 The future Long Term Cycle Network planned for the area is discussed in *Chapter 4 - Changes to External Transport Network*.

Walking

2.2.27 Due to the rural character of the location, path networks within the DSP site are limited. As noted above, a PSP exists along Telephone Lane where it approaches the freeway bridge as shown in Figure 2-8.

Figure 2-8: Telephone Lane southern verge PSP

(Source: Transport Planning and Connectivity Study, for Stockland, August 2019)

It is recommended that the Telephone Lane path connection to the Kwinana Freeway PSP is maintained and improved where required within the North-East Baldivis DSP to support development.

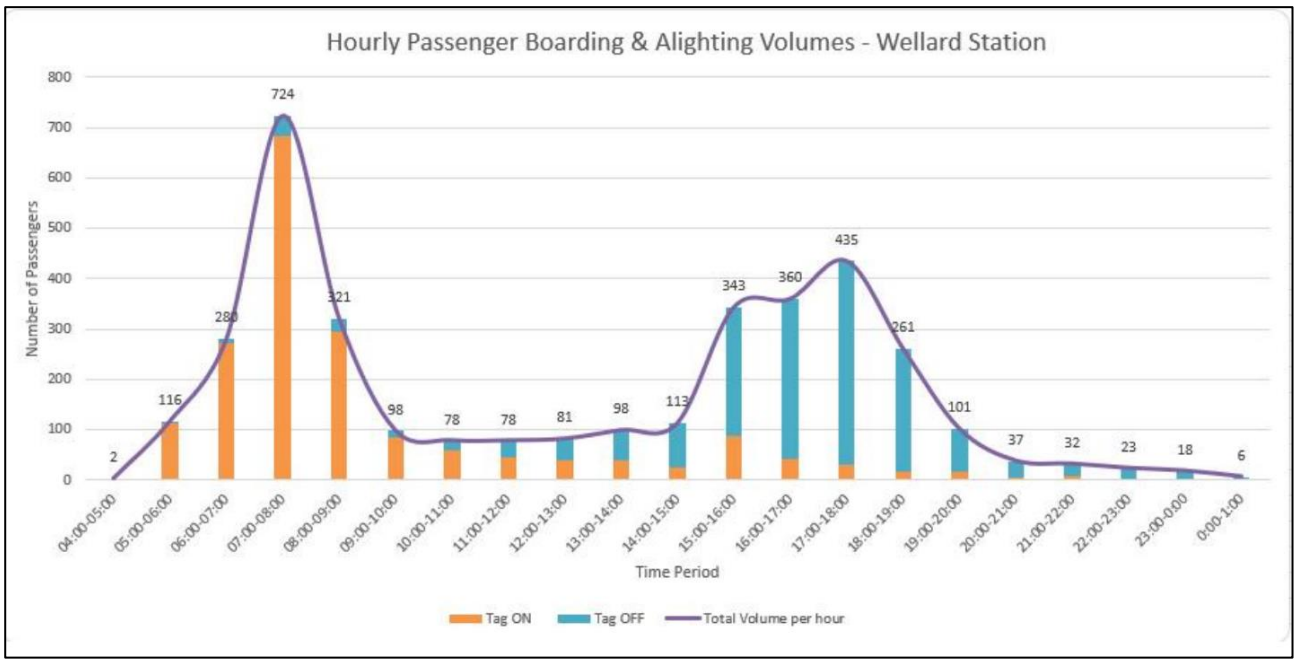
Public Transport Services within DSP area & within 800m

Train

2.2.28 The nearest train station to the DSP is Wellard Train Station, a distance of between 5km and 6km from the existing intersection of Pug Road/St Albans Road in the centre of the North-East Baldivis DSP.

2.2.29 October 2018 Smartrider data obtained from the Public Transport Authority noted approximately 720 passengers board and alight at Wellard Train Station during the morning peak hour as illustrated in Figure 2-9.

Figure 2-9: Wellard Train Station Boarding and Alighting (October 2018)



(Source: Transport Planning and Connectivity Study, for Stockland, August 2019)

2.2.30 From Figure 2-9, there is strong inbound AM Peak train boarding at Wellard Train Station between 7am and 8am. Over the day, the average daily patronage in 2018 was 1,947 passengers[2], and this is anticipated to increase to some 3,400 passengers in 2031, some **72% increase**[3] over the next 10 years.

2.2.31 The PTA has confirmed for Wellard Train Station[4]:

[2] Wellard Access Strategy report, PTA, February 2019
[3] PTA Route Utilisation Strategy (RUS) forecasts – as at 2019.
[4] Transport Planning and Connectivity Study, prepared for Stockland, August 2019.

- The station infrastructure itself does not limit the capacity of the Mandurah line;
- There are no forecast issues with crowding at the station in the medium term (to 2031 and likely beyond); and
- PTA have not determined the maximum patronage, which the current infrastructure can accommodate.

Wellard Train Station Park N Ride

2.2.32 The 2018 PTA Smartrider data indicated the Park N Ride car park is at or near capacity. The car park provides 297 car bays and 15 motorcycle bays which is approximately 95% full from about 8am, commensurate with the train AM Peak boarding peak. Parking spill over is evident on adjacent currently vacant land (see Figure 2-10).

Figure 2-10: Evidence of Overflow Parking (September 2022)

(Source: Reproduced with permission from Nearmap)

2.2.33 The Park N Ride parking at Kwinana Train Station (the next station to the north of Wellard with over 600 car bays) is also currently highly utilised with little capacity[5]. The Kwinana Station Park N Ride

[5] October 2018 SmartRider data, PTA

has a similar utilisation pattern to the Wellard Station Park N Ride, typically fully utilised from about 8am.

2.2.34 Despite the high demand for Park N Ride car spaces noted above, the bicycle parking shelter remains anecdotally underutilised at Wellard. The Wellard Train Station bike shelter is illustrated in the following figure.

Figure 2-11: Bike Parking Shelter at Wellard Station

(Source: Transport Planning and Connectivity Study, for Stockland, August 2019)

Given the Park N Ride bays being at capacity at both Kwinana and Wellard Train Stations, and the low use of bike parking observed at Wellard, encouragement for passengers of rail transport to arrive by bike, e-mobility devices (which can be carried on the train) and/or bus feeder services is recommended with surrounding urban developments.

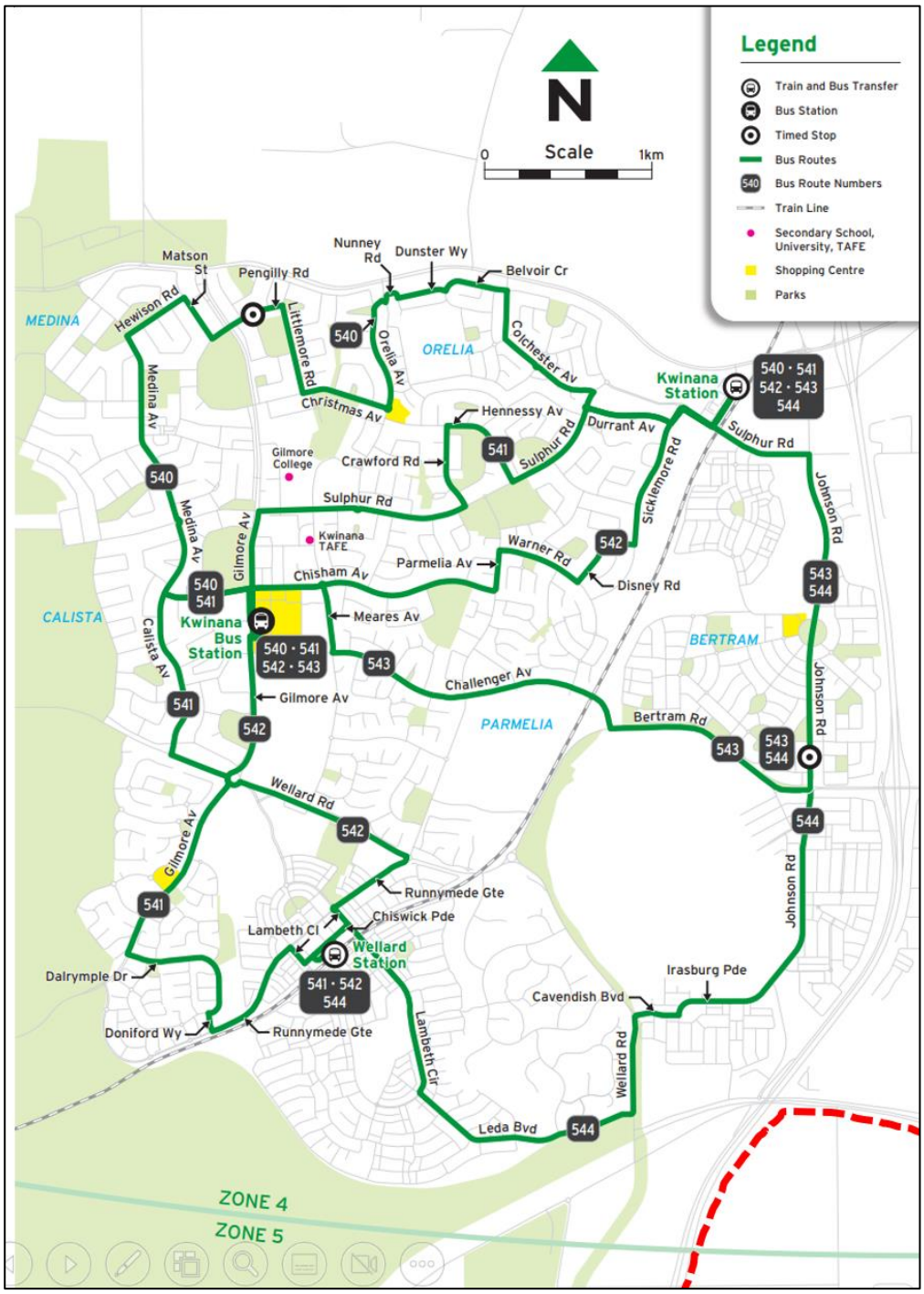
Bus

2.2.35 There are no bus services within the North-East Baldivis DSP area. The nearest bus services are shown in Figure 2-12 which are routes 541, 542, 543 and 544 within Wellard. These routes provide feeder services and connect to both the Wellard and Kwinana Train Stations. It is clear these services would not satisfactorily cover the North-East Baldivis DSP area. The provision of bus services usually lags development until adequate passenger demand can be achieved from an operational perspective. During the DSP's Technical Advisory Group (TAG) consultations, PTA noted that a frequent feeder bus service or introduction of bus services in the early stages of development in the DSP would be unviable. In response, Stockland is willing to discuss the provision of early

private bus services within the DSP, to be pre-funded by Stockland, to be developed in liaison with PTA and DoT for implementation.

Further stages beyond DSP Planning will require Applicants to work with the PTA to provide adequate bus services through the DSP.

Figure 2-12: Existing Bus Service Routes



(Source: Transperth, December 2022)

Road Network within 2-5km of DSP Area

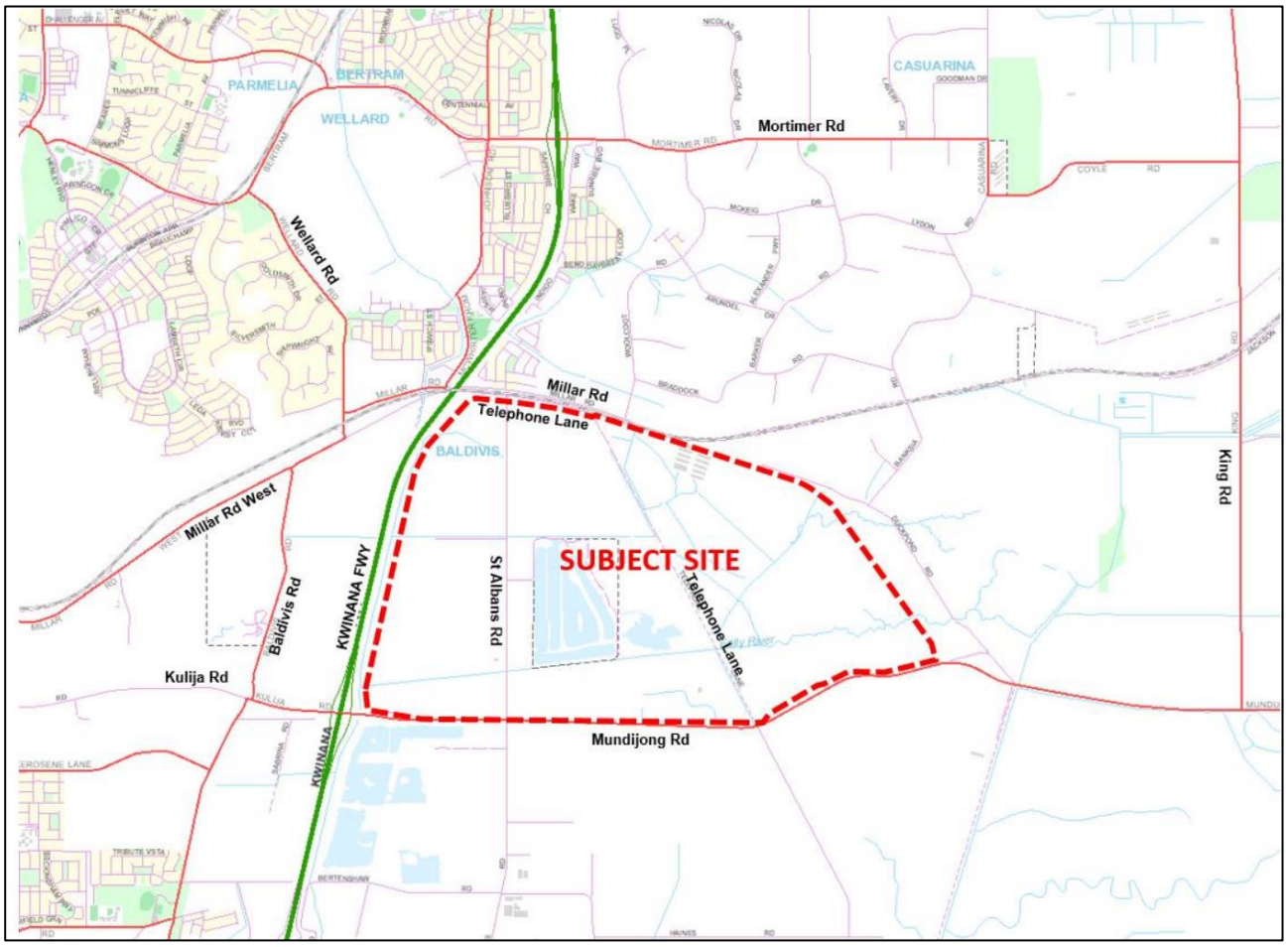
2.2.36 The key roads within a 2-5km radius are noted in Table 2-1.

Table 2-1: Key roads within 2-5km of North-East Baldivis DSP

North	South	East	West
Millar Road Woolcoot Road Banksia Road Wellard Road Mortimer Road / Kwinana Freeway Interchange	Safety Bay Road / Folly Road / Kwinana Freeway Interchange	King Road	Baldivis Road Kulija Road Millar Road West

-

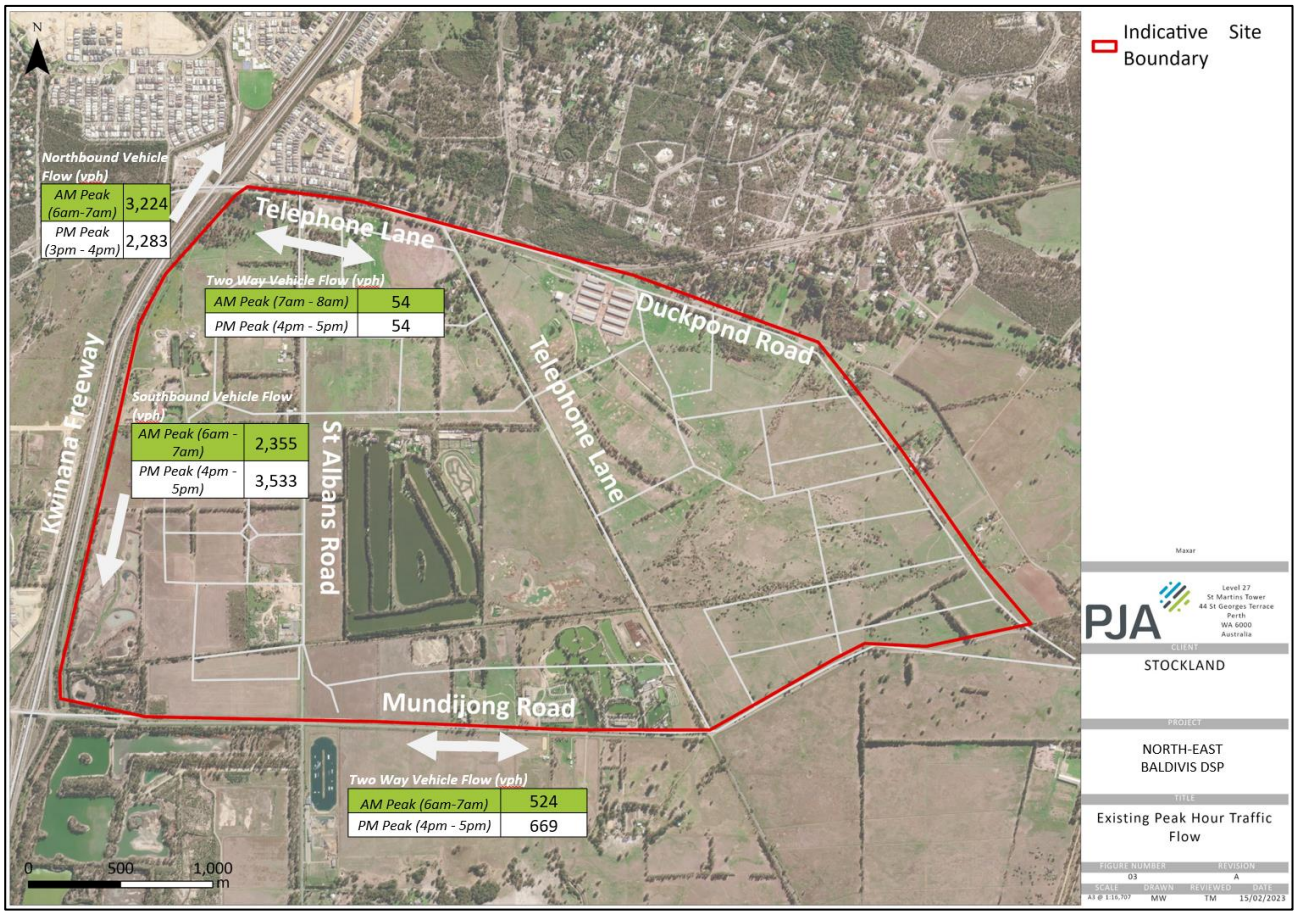
Figure 2-13: Road Network within 2-5km of DSP Area



(source: Transport Planning Investigations for Rezoning, for Sirona, August 2019)

Traffic flows on roads within DSP area (Peak hours)

2.2.37 Current known peak hour flows within and around the DSP area are shown below. There is very little vehicular movement currently within the DSP area as expected. Mundijong Road is carrying some 6,800vpd. Kwinana Freeway is carrying some 67,000vpd both directions (2020/2021 weekday average).



3 Proposed Internal Transport Networks

3.1.1 This section of the report incorporates an overview of the road classifications and the proposed transport network, including roads, public transport, walking, cycling and the Safe System approach to road safety.

3.2 Road Classifications

3.2.1 Road classifications are defined in the Main Roads WA Functional Hierarchy as follows:

- **Primary Distributors** (shown as light blue): Form the regional and inter-regional grid of Main Roads traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State roads. They are managed by Main Roads.
- **Regional Distributors** (shown as red): Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by Local Government.
- **District Distributor A** (shown as green): These carry traffic between industrial, commercial, and residential areas and connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property. They are managed by Local Government.
- **District Distributor B** (shown as dark blue): Perform a similar function to "District Distributor A" but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.
- **Local Distributors** (shown as orange): Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local government.
- **Access Roads** (grey): Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local government.

3.2.2 Road and street classifications defined in the *Liveable Neighbourhoods* are as follows:

- **Primary Distributors**: Form the regional and inter-regional grid of Main Roads traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State roads. They are managed by Main Roads.

- **Integrator Arterials A and B**: Form a finer grain of routes than the Primary Distributors, with frequent connection to local streets. Low percentage of trucks Usually bus routes. On-street bike lanes (separated if adjacent high speed vehicles per Safe System Principles) and separate dual-use paths are usually required.
- **Neighbourhood Connectors A and B:** Streets with mostly residential frontage that typically provide the lower order sub-arterial network. These streets service and link neighbourhoods and towns.
- **Access Street:** Access Streets are to accommodate shared pedestrian, bike and vehicular movements. The requirement of adjacent land uses should be supported through street design.
- **Laneways:** Provide access to the side or rear of lots principally for access to garages.

3.3 Safe System Road Safety Approach

3.3.1 Safe System is a road safety approach adopted by National and State Governments to generate improvements in road safety. The Safe System approach is underpinned by three guiding principles:

- people will always make mistakes on our roads but should not be killed or seriously injured as a consequence
- there are known limits to the forces the human body can tolerate without being seriously injured
- the road transport system should be designed and maintained so that people are not exposed to crash forces beyond the limits of their physical tolerance.

3.3.2 Central to the Safe System is an acknowledgement of our limited ability as humans to tolerate physical force. The Safe System aims to manage crash energies to prevent death and serious injury. It also recognises that human error in the system is inevitable, no matter how educated and compliant we are in obeying traffic laws.

3.3.3 The likelihood of being involved in a serious casualty crash rises significantly with even minor increases in travelling speed. Research has established a clear relationship between changes in average traffic speed and crash outcomes. For a 5% decrease in mean speed, there are typically about 15% fewer serious injury crashes and 20% fewer fatal crashes.

3.3.4 Recent analysis in Western Australia has shown that if every road user in the state slowed down by 1 km/h for a year this would result in a community benefit of ten fewer people being killed (5% of fatalities in 2009) and about 90 fewer people going to hospital (3.5% of people who were seriously injured in 2009). The chances of surviving a crash decrease rapidly above certain impact speeds, depending on the nature of the collision:

- car/pedestrian (vulnerable road users): 30 km/h;

- car/motorcyclist (vulnerable road users): 30 km/h;
- car/tree or pole (run off road impact object): 40 km/h;
- car/car (side-impact) (right angle): 50 km/h; and
- car/car (head-on): 70 km/h.

3.3.5 Therefore, speeds through the DSP area should be limited as appropriate to improve road safety, especially around the schools and centres.

3.4 Safer Routes to School - Operational Policy 2.4 Planning for School Sites

3.4.1 The WAPC *Operational Policy 2.4 Planning for School Sites* states the following items should be complied with:

- Generally be located centrally to the neighbourhood it is intended to serve
- Have a minimum of three road frontages and be located on at least one local distributor road
- Be serviced by cycle and pedestrian networks
- The surrounding subdivision should be designed so that there is a limited number of intersections and crossovers along the streets fronting the school sites to accommodate for safe and convenient embayment parking within road reserves (preferably on the school side).

3.5 Liveable Neighbourhoods 2009

3.5.1 The *WAPC Liveable Neighbourhoods 2009* outlines that the location of primary schools can be at either of the following options:

- At the edge outside of the 400m radius neighbourhood catchment, serving in the order of three
- neighbourhoods
- On the neighbourhood connector road between two neighbourhoods
- At the centre of one neighbourhood (with reduced size and separate sports fields).
- Additionally, the detailed area plan shall address the following design issues and principles:
- The primary school located one street and/or block away from the main neighbourhood centre intersection – not at the junction of two neighbourhood connectors.
- On-site parking dispersed throughout the primary school site; including a minimum of two separate parking areas
- Each parking area accessed from a separate access street
- Footpaths are required on at least one side of Access Roads with preference for both sides where the path links to a school.

3.6 Proposed Internal Ultimate Road Network

Changes/additions to existing or proposed new roads

3.6.1 The proposed (modelled) ultimate road network for North-East Baldivis DSP is illustrated in Figure 3-1. The road network considers the transport frameworks noted in the September 2022 PIA determinations and sub-regional frameworks. The network incorporates the MRS staggered T-intersections at St Albans Road and Telephone Lane with Mundijong Road and provides due consideration as to the large future industrial area to the south of Mundijong Road. The key features of this ultimate road network internal to the DSP are described below. The external ultimate road network is described in *Chapter 6*.

Figure 3-1: Proposed Internal Ultimate Road Network (as modelled)

Internal Road Reservation Widths, Road Cross-Sections, & Internal Intersection Controls

3.6.2 The internal road and street reservation widths and cross-sections has been developed with cognisance of the ultimate traffic volumes and function. Vissim modelling has been undertaken to enable the internal network volumes to be determined and the methodology and assumptions of the model are discussed later in this report. The Vissim modelled flows are stable and Liveable Neighbourhoods Guidelines were referenced to match the modelled flows for each internal road in

order to derive appropriate reservation widths and cross-sections. These internal roads will be further refined at the Local Structure Plan stage as part of future Transport Impact Assessments.

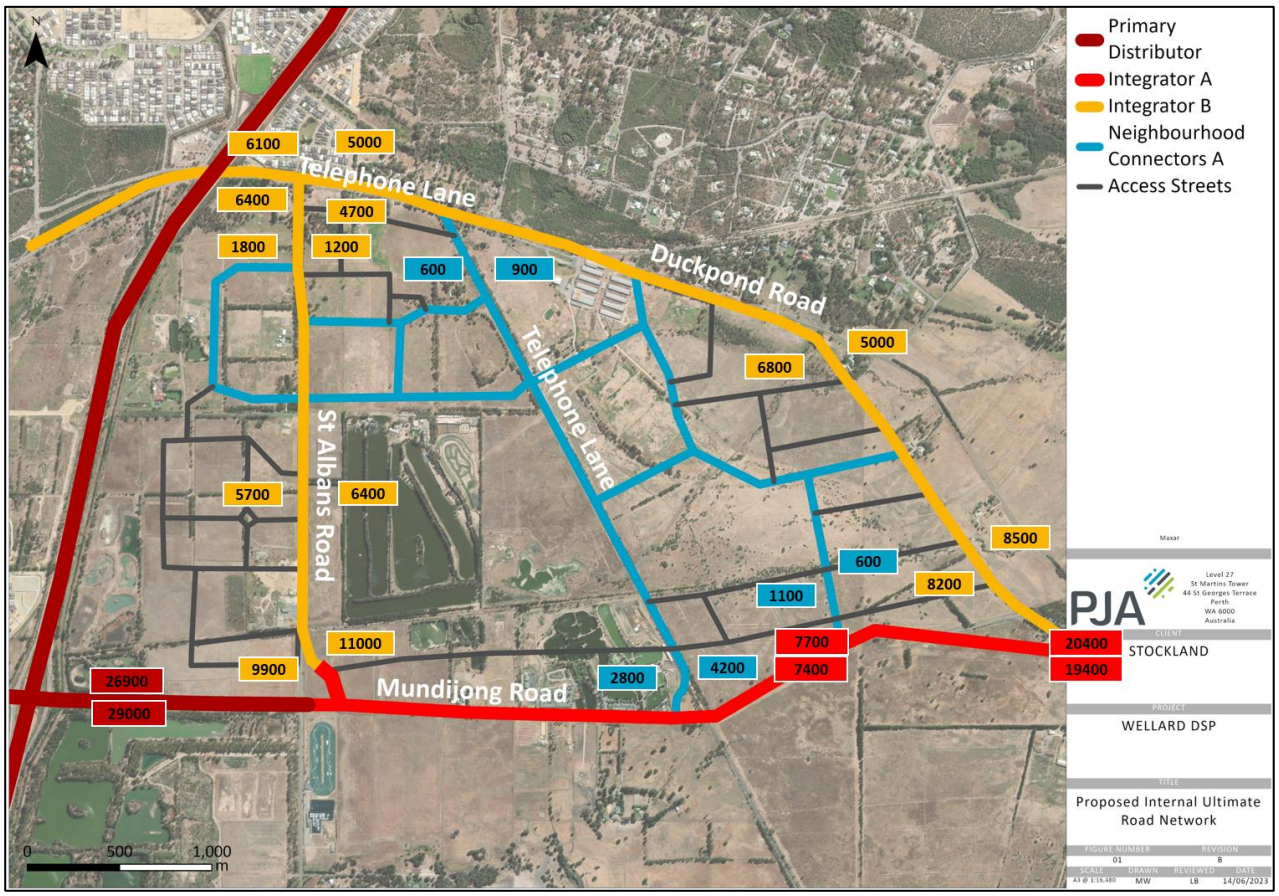
Speed limits

3.6.3 It has been assumed that the internal DSP lower order street network will have a default speed limit of 50kph.

Road Hierarchy

3.6.4 The proposed 2051 road hierarchy for North-East Baldivis DSP and immediate connections is illustrated in Figure 3-2.

Figure 3-2: Proposed 2051 Road Hierarchy



3.6.5 The DSP includes the below proposed street network:

- St Albans Road will need to be upgraded to Integrator B standard (two lanes) from Telephone Lane in the north, some 2.1km to the south then transitioning to Integrator A (four lanes) near the employment centre approaching Mundijong Rd for an extent of approximately 360m. The anticipated 2051 daily flows on St Albans Road is 12,000vpd and ranges considerably from

3,000vpd on the northern end to 21,000vpd on the southern end. The reconstruction of St Albans Road will result in a diversion of the road reserve and pavement at Mundijong Road to avoid a 4-way intersection as per the MRS, and significantly reduce the intersection works required. An example of the intersection between St Albans Road and Mundijong Road is shown in Figure 3-3.

Figure 3-3: Typical intersection St Albans Road / Mundijong Road (Ghostgum Ave, Armadale Rd)

- Telephone Lane in the north west of the DSP extends under the Kwinana Freeway underpass as a 2-lane road and forms the eastern leg of the intersection with Wellard Road and Baldivis Road. This section of Telephone Lane cannot be widened due to the bridge abutments, nor does it require it. Telephone Lane under the bridge is estimated to carry less than 15,000vpd (~12,500vpd) at ultimate development and to be upgraded to Integrator B (2 lanes) standard from just east of the Kwinana Freeway bridge to Duckpond Road. The Integrator B along the northern boundary of the DSP will function adequately as a 22.0m wide road reserve due to it abutting a railway reserve. Similarly, Duckpond Road as an Integrator B without on-street cycle lanes and on-street parking can function as a 22m wide road reserve. The north-south alignment of Telephone Lane is adequate as a Neighbourhood Connector with 2051 flows estimated to be nor more than 7,000vpd (it carries no background traffic). The intersection of Telephone Lane is

also proposed to be offset, to avoid a 4-way intersection with Telephone Lane to the south as per the MRS. An example of the T-Intersection, with the 4 lanes in Mundijong Road, is shown in Figure 3-4.

Figure 3-4: Typical intersection Telephone Lane / Mundijong Road (Wharton Rd, Armadale Rd)

- Mundijong Road currently sits within a 20m wide road reserve. Projected 2051 traffic figures for the extent of Mundijong Road fronting the DSP area ranges from 40,000vpd on the eastern end (of which 9,300vpd is DSP generated traffic) to 55,900vpd near Kwinana Freeway (of which 19,600vpd is DSP generated traffic). These figures were derived following close consultation with Main Roads WA and Department of Planning, Lands and Heritage who have provided expected background (non-DSP development) traffic on Mundijong Road upon ultimate development of the surrounding Planning Investigation Areas. Due to current insufficient capacity, Mundijong Road will require upgrading, anticipated to Integrator A standard with ultimate six lanes between the freeway and the high school site, and four lanes for the remainder. The road reserve will be widened to the north by 20m, for a total of 40m wide road reserve, which has been taken into consideration for the DSP.

The DSP will not prejudice the State Government's ultimate upgrade to Mundijong Road (which could be 4 or 6 lanes in the future) however, DSP traffic would only generate the need for a 4-lane road along the majority of the DSP frontage.

3.7 Proposed Internal Ultimate Pedestrian / Cycle network

Objective

3.7.1 Walking and cycling have an important role within the overall transportation system of an urban area. When integrated with compatible land uses being the schools, employment centres and neighbourhood centre, a strong walk/cycle network can:

- reduce private car dependency for residents
- increase accessibility to employment and other urban activities for residents
- reduce the adverse environmental impacts of vehicular and motorised transport
- increase resource efficiency in a multi-modal transport system
- reduce transport-related crashes or injuries.

The objective of a pedestrian and cycle network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban activity cells to service schools, shops, recreation and other land uses as well as bus stop access.

Pedestrian and Cyclist Provision

3.7.2 The North-East Baldivis DSP aims to maximise pedestrian and cyclist connections to the local and regional pedestrian/ cycle networks to make walking and riding a viable and convenient mode to the private car. Current active transport connection to Wellard Train Station is limited and currently only via the Kwinana Freeway PSP (and to a less extent via Wellard Road). The focus of the active transport infrastructure will be internal to the DSP to/from employment areas, education sites and local retail created internally to encourage local trips to be undertaken by active travel where distances are conducive to active transport.

3.7.3 Riding is realistic mode for the DSP area given the train station is 5km – 6km from existing Pug Road / St Albans Rd intersection in the centre of the development. Connections to the PSP are being prioritised for the development and walking will be encouraged to local bus stops.

3.7.4 The DSP includes the proposed internal strategic cycle/ pedestrian network along the following key roads:

- St Albans Road will be a key north-south Integrator B and expected to carry around 12,000vpd (two-way) at the middle point of the road at ultimate development. The road is expected to carry significantly less traffic at its interface with the Telephone Lane with some 3,000vpd at

ultimate flows. The path connection to the Kwinana Freeway PSP is recommended to be maintained and improved to support the North-East Baldivis DSP development. Any on-street bike lanes proposed along St Albans Road is recommended to be physically separated due to volumes and speeds or adequate paths provided off-street.

- Telephone Lane will also be a key north-west to south-east Integrator B and expected to carry around 9,00vpd (two-way) at the middle point of the road at ultimate development. The road is expected to carry differing volumes at its interfaces with the existing network. Telephone Lane through the North-East Baldivis DSP will connect to Mundijong Road, which is currently planned to be a cycling Secondary Route under the Long Term Cycle Network (Section 4.3). Similar to St Albans Road, Telephone Lane is to have adequate walking and cycling paths likely provided off-street.
- Two additional key east-west connections through the North-East Baldivis DSP will be required, likely a Neighbourhood Connector and expected to carry around 6,000vpd (two-way) at ultimate development. Any on-street bike lanes proposed along these east-west roads will need to be physically separated based on a recommended maximum of 50km/hr posted speeds.

The detailed local cycle network will be provided at the Local Structure Plan or Development Plan stage.

3.7.5 These pedestrian/ cycle/ e-mobility network will form a grid network to provide for efficient access to internal activity nodes such as the internally proposed Neighbourhood Centre, employment centres, schools, as well as public open space and future public transport bus stops. It is proposed to complement separated on street cycle lanes with off-street shared paths on all Neighbourhood Connectors and Integrators.

3.8 Public Transport

Access to Public Transport

3.8.1 The proposed ultimate public transport network includes two components:

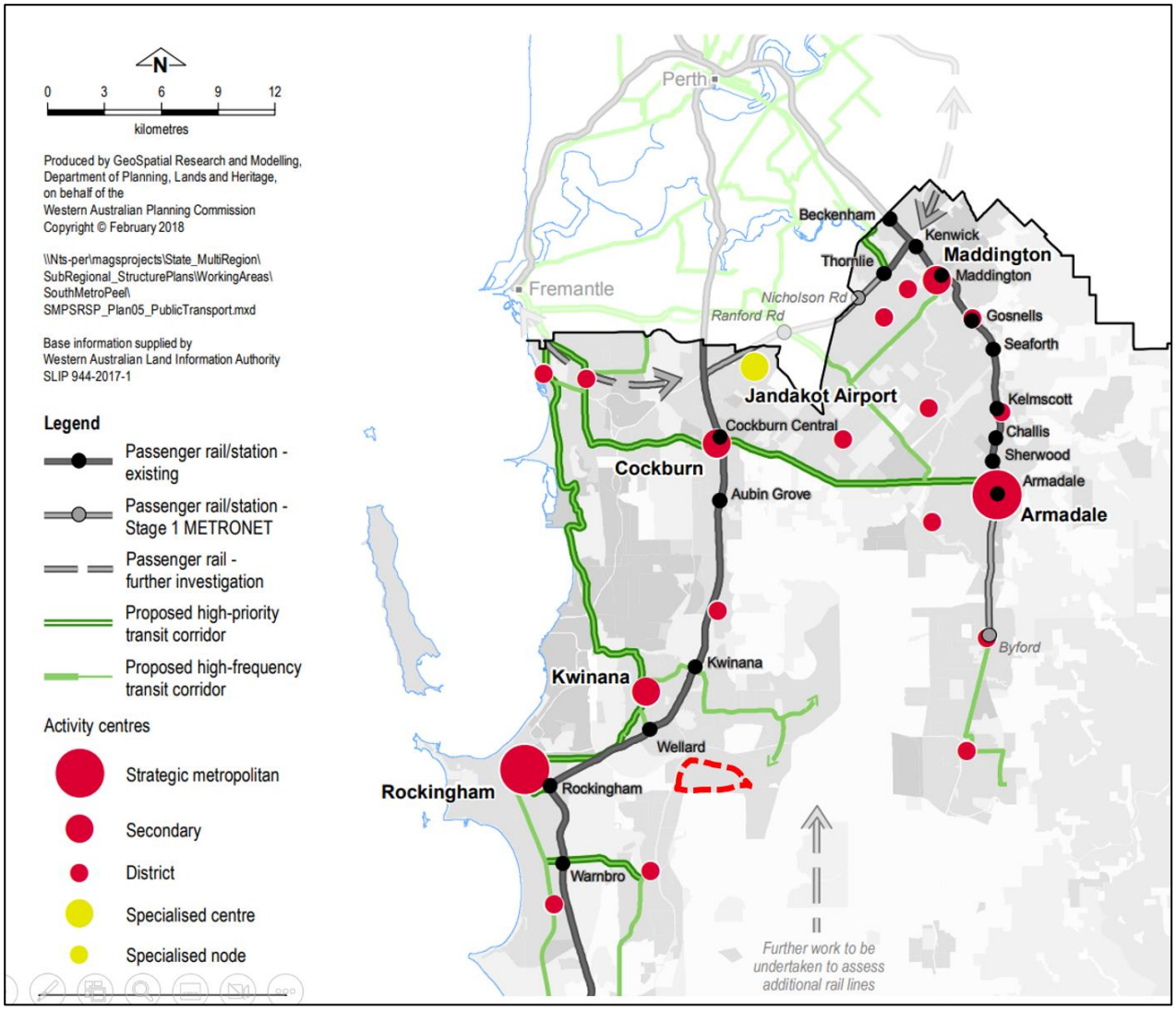
- Mandurah to Perth railway with Wellard Train Station as the nearest station at 5.9km distance for line-haul movements to district and regional destinations
- Eventual bus routes (when viable to operate these) to service the DSP, likely to and from Wellard Train Station.

PTA currently does not have plans to introduce bus routes and services for the North-East Baldivis area.

3.8.2 As bus routes currently do not cover the DSP area, new services (when viable to operate these) will be required. Specific bus routes and the demand/need for a route to Kwinana Station will need to be considered through the planning process. In the longer term, potential new bus routes could

also connect to the future 'High-Frequency Transit Corridor[6]' running between Kwinana Train Station and Wellard Train Station from via the Kwinana City Centre. The sub-regional framework highlights the high priority transit corridors as shown in Figure 3-5.

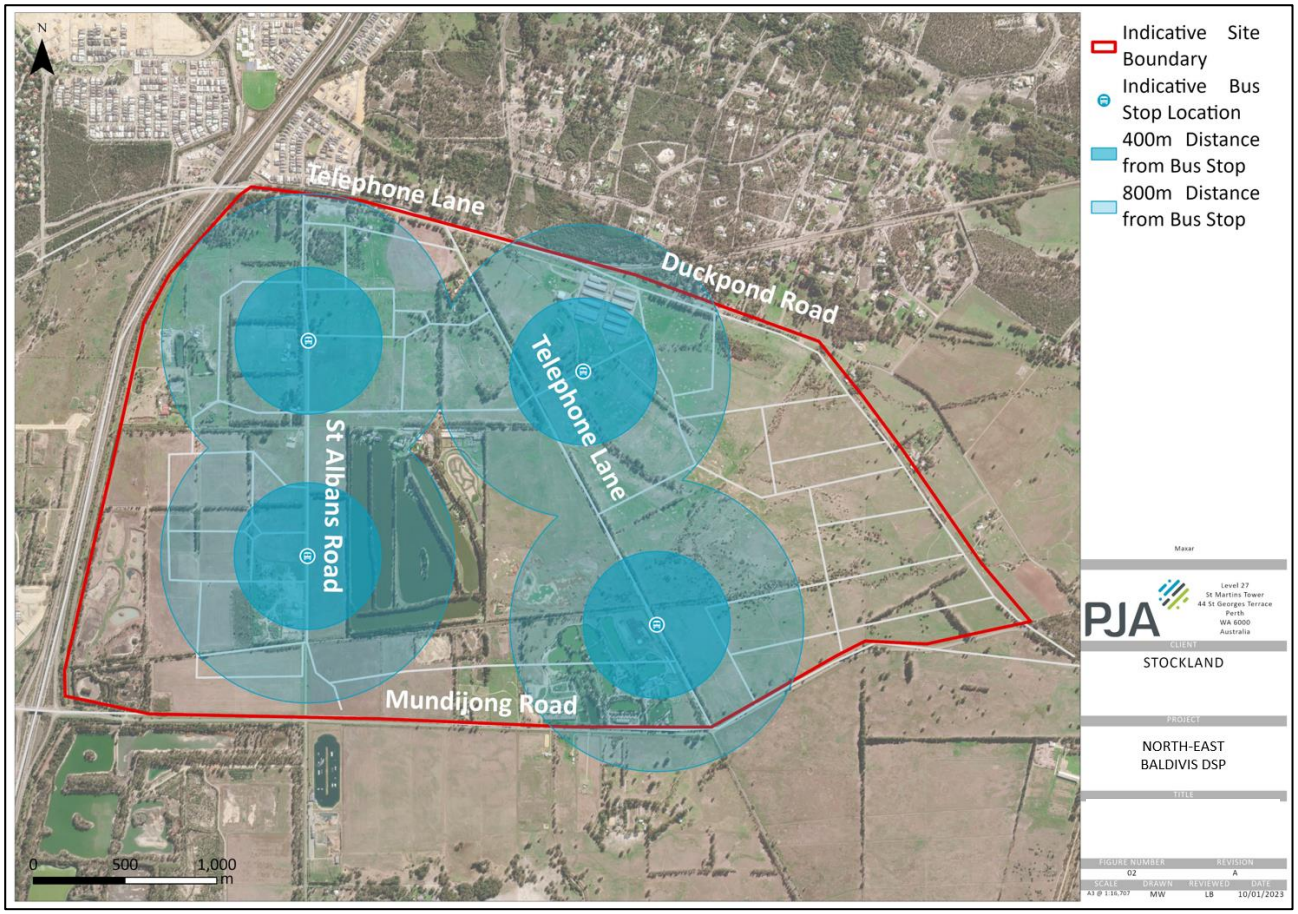
Figure 3-5: Public Transport Network – High Priority/Frequency Corridors



(source: Perth and Peel @ 3.5million, March 2018)

[6] City of Kwinana's Integrated Landuse and Transport Strategy, April 2019.

Figure 3-6: Proposed Internal Public Transport Routes/Catchments – Indicative Only



3.8.3 Figure 3-6 highlights the 400m and 800m catchments to inform future bus routes and stops[7]. The proposed public transport network could provide a service within 800m of approximately 75% - 85% of households (some 4,500 – 5,000 households). At the DSP stage, the bus routes and catchments are indicative and subject to refinement as detailed planning progresses for each of the development areas.

[7] These bus stops are indicative only to show spatial context. Additional bus stop spacings will be required for a residential setting, typically 280-350m apart and to be determined following route alignment planning.

4 Changes to External Transport Networks

4.1 External Road Network

Network, Intersections and DSP Modelled Assumptions

4.1.1 The vision for the urban development of North-East Baldivis DSP is to provide housing for workers ('tradies' etc) in Rockingham, Kwinana and Mundijong industrial areas. The predominant people and vehicle movements will be east west on Mundijong Road. The focus of the DSP is therefore to provide connectivity internally (within DSP) and to/from Mundijong Road. The option of connecting across the freight rail line in proximity of the development site would result in additional traffic along Woolcoot Road and Mortimer Road towards the freeway intersection. Woolcoot Road is not of sufficient standard to cater for increases in traffic volume, has not been planned and would unnecessarily impact the amenity of the existing residential suburbs to the north of the freight line. Future north-south connections will be provided in the future as per the planned extension of Nicholson Road and Tonkin Highway. As a connection from the DSP area north over the rail line is not physically possible within the DSP site, should an additional north-south connection be required opportunities at King Road where a crossing already exists approximately 1.7km east of the DSP site (refer Appendix C also).

4.1.2 The key road infrastructure being planned/committed by Main Roads WA and/or Local Government Authority for the Wellard, Baldivis and Mundijong areas and how these have been considered in the DSP model follows:

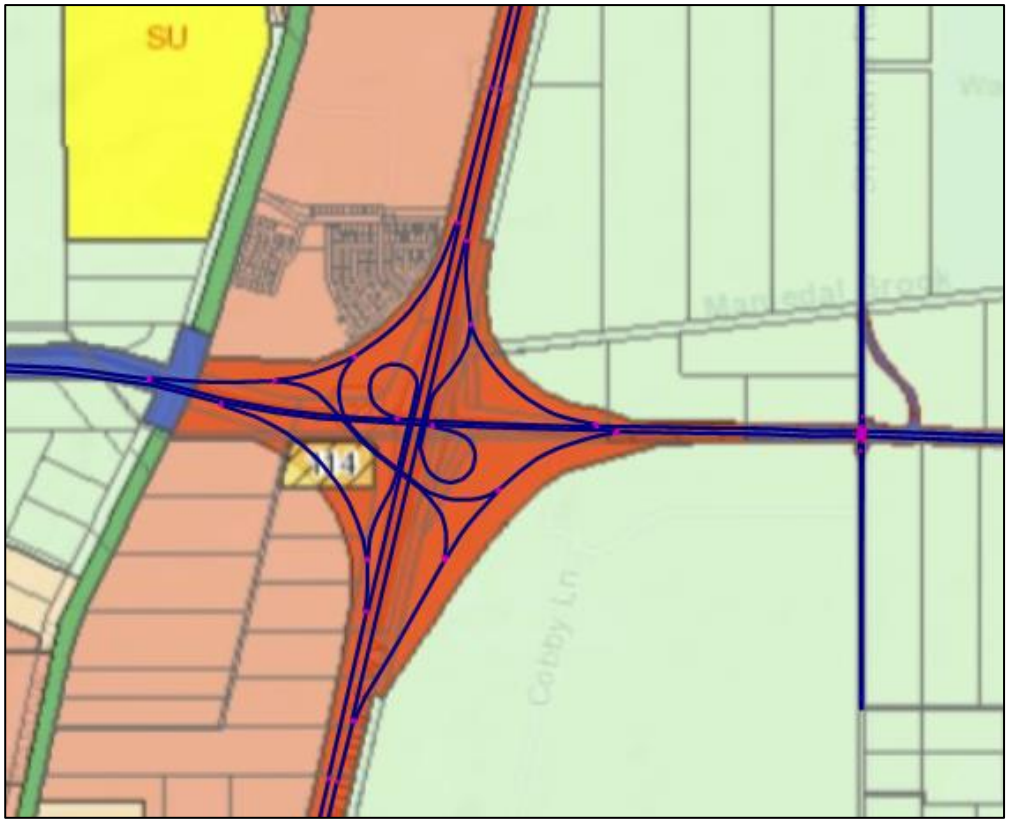
a Extension of Tonkin Highway southward to connect through to Mundijong Road (as per State framework). This is a funded project and likely to be completed by 2027. By 2050, the Kwinana Freeway and Tonkin Highway will provide the main network for north–south road movement within the area. The Main Roads Regional Operations Model (ROM) includes this extension for modelled year 2051.

b Kwinana Freeway is planned to be ultimately eight lanes, four lanes in each direction, to Safety Bay Road but this is not committed (not funded). The DSP modelling assumes six lanes within the Vissim modelling for 2051. Increasing to eight lanes will increase the traffic carrying capacity, which would be of benefit to the DSP in the future.

c Fremantle Rockingham Controlled Access Highway (FRCAH) – Main Roads has noted detailed road planning studies are required for Rockingham/Patterson Roads, and Rowley Road to anticipate a 'no FRCAH' scenario. At this stage there is no timeframe to complete further planning. The 'no' FRACH scenario is a strategic road network modelling option that continues to be considered by the State. Detailed modelling for FRCAH is a scope which must be undertaken as a strategic modelling exercise (ROM). Approval of the DSP and its subsequent implementation for urban purposes is not contingent upon the FRCAH being delivered.

d Intersection of Baldivis/Kulija/Mundijong Road to be grade separated, as advised by City of Rockingham[8]. DSP modelling has assumed this connection would be severed in 2051 by the freeway interchange. It is understood Main Roads has prepared concept plans for future upgrading of the Kwinana Freeway / Mundijong Road interchange to a standard similar to the recently constructed Tonkin Highway / Roe Highway interchange (Figure 4-1).

Figure 4-1: Kwinana Freeway / Mundijong Road Interchange – Illustration only



e Baldivis Road grade separated crossing of the industrial freight rail line west of the Kwinana Freeway has been highlighted due to a Main Roads WA initiative to review and where necessary upgrade level rail crossings to ensure road safety standards are being met. This proposal is subject to Public Transport Authority / Department of Transport priorities. The rail crossing is not committed at this stage (not funded) and so the DSP modelling adopts the current road layout with Telephone Lane included in the modelled area to just west of the freeway. The DSP does not prejudice this outcome from being implemented at a future stage.

f Realignment of Mundijong Road near Duckpond Road is noted by City of Rockingham and this is incorporated in the DSP modelling (east-west 'straightening' in lieu of current 'curved' alignment). Given the current road safety issues on this section of Mundijong Road, this

[8] Technical Working Group (TAG) feedback, 30 March 2023.

realignment will facilitate an upgraded signalised intersection form with Duckpond Road to the north and Wilkinson Street to the south as assumed in the DSP modelling.

g New and upgraded primary distributors and integrator arterial roads (as per State framework). Within the industrial zone (West Mundijong Industrial Area which sits directly to the west of Tonkin Highway extension) these include Mundijong Road West, Kargotich Road and Bishop Road West. These are outside the DSP modelling area.

h Nicholson Road will be extended south to connect to Mundijong Road (as per State framework). As highlighted in 4.1.1, this has not been included in the DSP modelling matrix but as this proposal provides an alternate north-south district level traffic carrying road across the freight railway line, would be of benefit to the area. Main Roads has noted Nicholson Road extension to Mundijong Road was planned for 2051 or beyond in Perth and Peel at 3.5 million, however with the new PIA, Main Roads note it may be required by 2041 but subject to further planning to understand the rate of development within the PIA.

4.1.3 Assessment of the impacts of development growth both within and beyond the North-East Baldivis DSP area has been facilitated through Main Roads' Regional Operations Model (ROM24) strategic model. This model relies on land use projections provided by Local and State Government agencies to generate vehicle trips across the network.

4.1.4 Full build-out of this land area is long term (30+ years) to 2051 horizon, which is the only ROM24 time scale currently supplied by Main Roads WA to establish an anticipated development and traffic scenario at the point when build-out of the DSP development planning is likely to be achieved.

4.1.5 Further to this, a mesoscopic traffic model was developed by PJA to model the forecast traffic situation and to determine the likely future traffic impacts resultant of the DSP (Section 5).

Speed Limits

4.1.6 It has been assumed that Kwinana Freeway will remain as having a 100km/h speed limit, since the grade of road as a freeway is to be unaltered, and Mundijong Road will adopt a 100km/h speed limit to the west of the upgraded interchange, as this section of road is to be upgraded to freeway status, as a dual carriageway of four lanes in either direction.

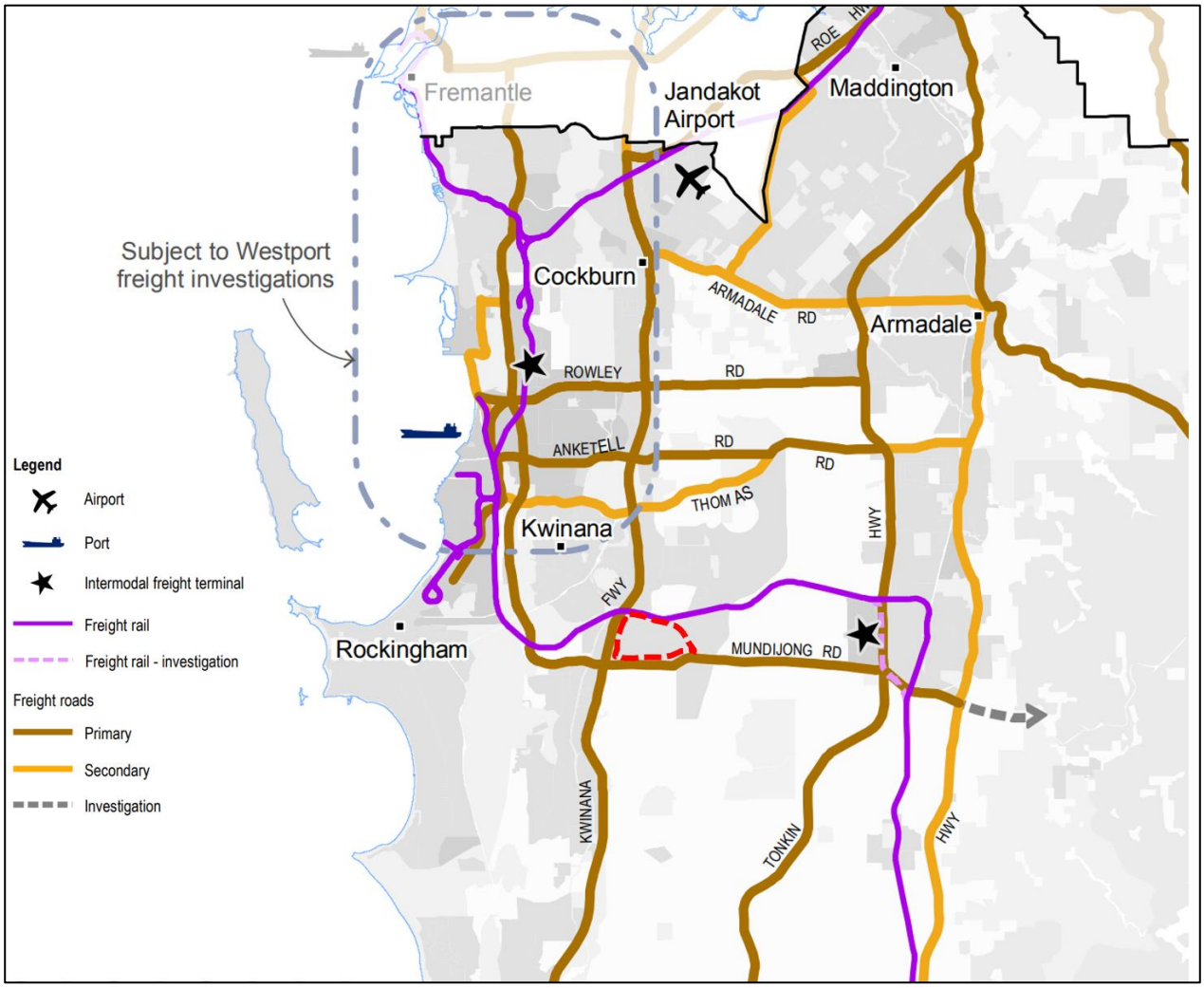
4.1.7 East of the interchange, Mundijong Road is currently assumed to adopt a 60km/h speed limit for the purposes of the model, across the frontage of the DSP site where there may be an employment centre/school nearby. While Main Roads WA has indicated Mundijong Road will be a regional road and the speed limit of 60 km/hr may not be fit for purpose, it is likely the speed limit would need to be reviewed by Main Roads WA at the time Mundijong Road is upgraded to an urban standard to allow for safe travel at an appropriate speed.

4.1.8 All other roads, where there is no discernible reason for change, have had their present speed limits used within the model.

4.2 External Freight Network

4.2.1 The South Metropolitan Peel sub-region existing and planned freight network for 2050 is shown in Figure 4-2.

Figure 4-2: 2050 Freight Network



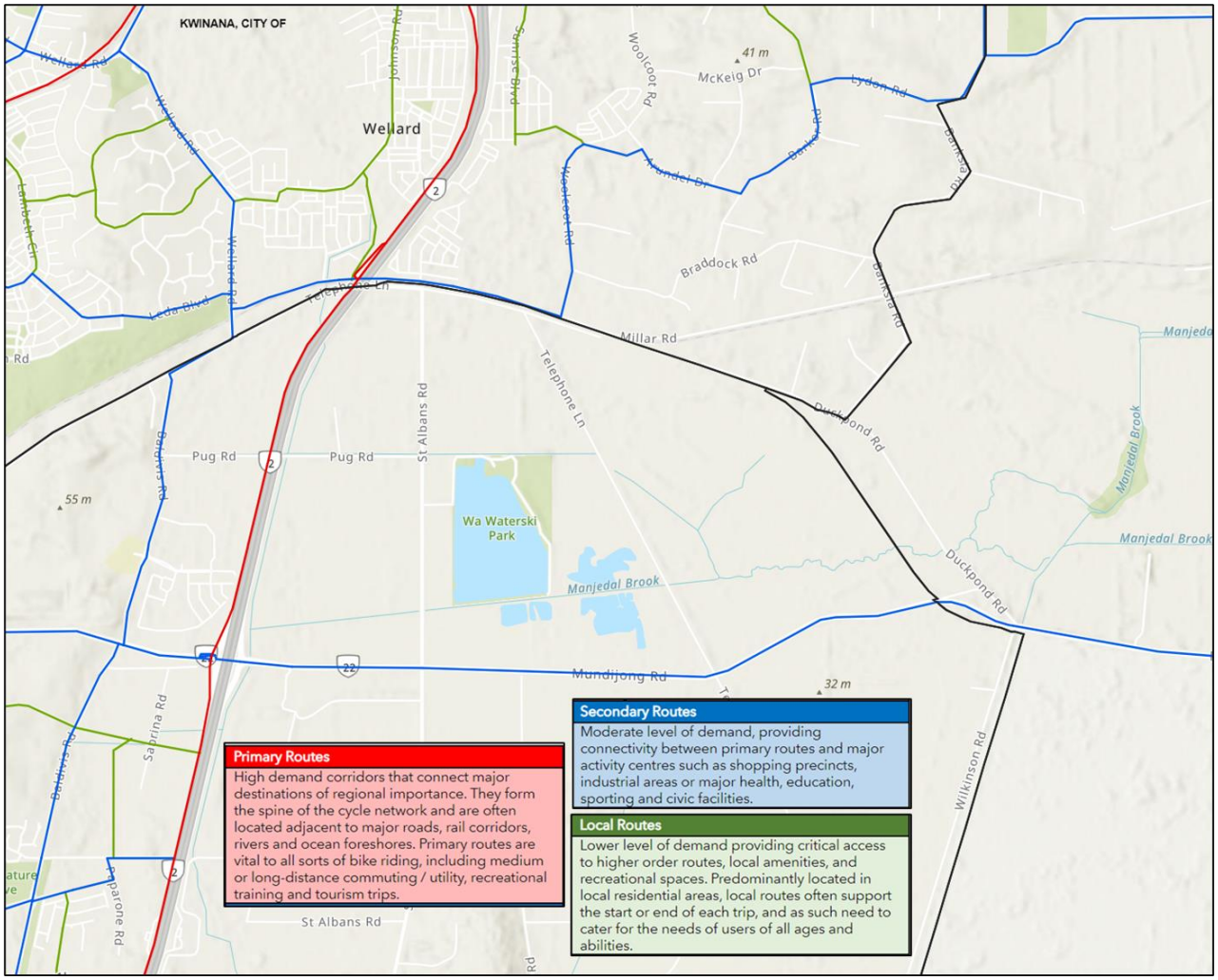
(source: Perth and Peel @ 3.5million, March 2018)

4.2.2 Tonkin Highway interchange with Mundijong Road to the east of North-East Baldivis DSP and the impacts of development growth along Mundijong Road towards the North-East Baldivis DSP area has been facilitated through Main Roads' ROM24 strategic model.

4.3 External Pedestrians / Cycle Networks and Crossing Facilities

4.3.1 The Long-Term Cycle Network (LTCN) is an aspirational plan with the cycle networks designated by function according to the WA Cycling Network Hierarchy. The LTCN responds to the Long-Term Cycle Strategy developed in collaboration with Local Government Authorities and aims to ensure State and Local Governments continue to work together towards the delivery of a continuous cycling network providing additional transport options, recreational opportunities and support for tourism and commercial activity.

Figure 4-3: Department of Transport's Long Term Cycle Network for Wellard and Mundijong



(source: Department of Transport)

4.3.2 The LTCN currently designates Mundijong Road and Millar Road as Secondary Routes (blue) providing critical access to higher order routes, local amenities (such as Wellard Train Station) and recreational spaces. These routes provide connectivity between primary routes (Kwinana Freeway PSP) and major activity centres.

4.3.3 Local cycling route designations through the DSP area will occur with investigations ongoing.

4.3.4 Cycle and pedestrian internal linkages should form part of the pedestrian and cycle movement network through the DSP area, connecting focal points and features such as the centres and schools and encourage and facilitate walkability and reduction in the use of cars for short trips within the development.

4.3.5 The external DSP linkages which cross major barriers such as Integrator Roads and rail should consider providing some form of safe and convenient pedestrian access across these barriers to enable the WAPC's support to change of land use for the East of Kwinana PIA sector. The linkages could take several forms; from a linkage, which retains and enhances the natural environment to a view corridor that combines several landscaped elements of passive and active open space. The general principle to retain as much natural vegetation in the linkages as possible should be applied.

4.4 External Public Transport Services

4.4.1 Passenger rail infrastructure proposed for the sub-region near the DSP area includes the following proposals:

- the 14.5 km extension of the Thornlie Line to Cockburn Central with two new stations proposed at Nicholson Road and Ranford Road
- extending the Armadale rail line to Byford – with the station being located to integrate with Byford and surrounding localities.

4.5 Integration with Surrounding Area

Proposed changes to Land Uses within 800m

4.5.1 The Wellard East Estate to the north of the freight railway line continues to be developed comprising primarily residential lots with a primary school. This estate sits east of the Kwinana Freeway and between Mortimer Road to the north and Millar Road to the south. There are no vehicular intersections existing between this estate and the DSP boundary.

4.5.2 The WAPC has also supported to change an area of land south of Mundijong Road and west of Nicholson Road extension to 'Industrial Expansion' as previously shown in Figure 1-1.

4.5.3 The East of Kwinana PIA boundary relative to the North-East Baldivis DSP are shown in Appendix C. The classification of a 'planning investigation area' does not necessarily mean WAPC support for a change from the existing land use/zoning, as this will depend upon the outcome of further investigation.

Adequacy / Deficiencies of External Transport Networks

4.5.4 Main Roads and DPLH are cognisant the above land use changes will place road capacity pressures on Mundijong Road and strategic modelling revisions are underway by Main Roads in ROM24 to investigate upgrade requirements for the Regional Distributor from its current 2-lane rural standard road. Land surrounding the intersection of Mundijong Road and Kwinana Freeway is also reserved in the MRS for an upgraded interchange which could function as free flow lanes without the need for traffic signals. The DSP does not prejudice the State Government's ultimate upgrade plans for Mundijong Road (which could be 4 or 6 lanes in the future) however, DSP traffic would only generate the need for a 4-lane road along the majority of the DSP frontage.

4.5.5 Public transport connections to the DSP may be considered as development grows to a reasonable level that public transport services could be needed.

5 Analysis of Transport Network

5.1.1 Assessment of both the internal DSP network and the interfaces with the external road network have been assessed using Version 2023 of the industry standard Vissim software.

5.2 Basic Model Setup

5.2.1 The model has been setup following best practice guidance contained in the follow documents:

- Operational Modelling Guidelines – Version 2.0, Main Roads Western Australia
- Transport Modelling Guidelines for Activity Centre Structure Plans – June 2016, Department of Transport.

Model Version

5.2.2 The model has been built using Version 2023.04 of the Vissim software. This is the latest version of Vissim at the time of production of the modelling work.

Assignment Method

5.2.3 Given the scale of this model, the model has been setup using the Dynamic Assignment method as opposed to the static assignment method. This will allow vehicles to choose routes within the modelled network between their origin and destination.

5.3 Assessment Years and Time Periods

5.3.1 The model has been setup to assess a single forecast year of 2051. The model contains scenarios for both the Morning and Evening Peak periods as below:

- Morning Peak
    - Model Period – 07:00-10:00
    - Assessment Period - 08:00-09:00
- Evening Peak
    - Model Period – 16:00-19:00
    - Assessment Period - 17:00-18:00

5.4 Physical Model Coverage

5.4.1 The model covers the area subject to the DSP, discussed previously, and the immediate surrounding road network.

Captured Network

5.4.2 The existing road network captured by the modelled area covers the junction of the Kwinana Freeway and Mundijong Road as well of the lengths of those roads equivalent to the area covered by the DSP. It also includes Telephone Lane, on the northern boundary of the DSP area and St Albans Road.

5.4.3 The existing road network captured by the modelled is illustrated in Figure 5-1.

Figure 5-1: Illustration of the existing road network (Modelled in Vissim)

5.4.4 As the development fits wholly within the area covered by the existing network that has been modelled, the physical scope of the model is not increased in order to include the proposed network.

5.5 Modelled Network

5.5.1 The following assumptions have been made when coding in the network in Vissim.

Existing Network

5.5.2 The model reflects Kwinana Freeway as 'Freeway' standard in Vissim as per the Operational Modelling Guidelines and all other roads as 'Urban'.

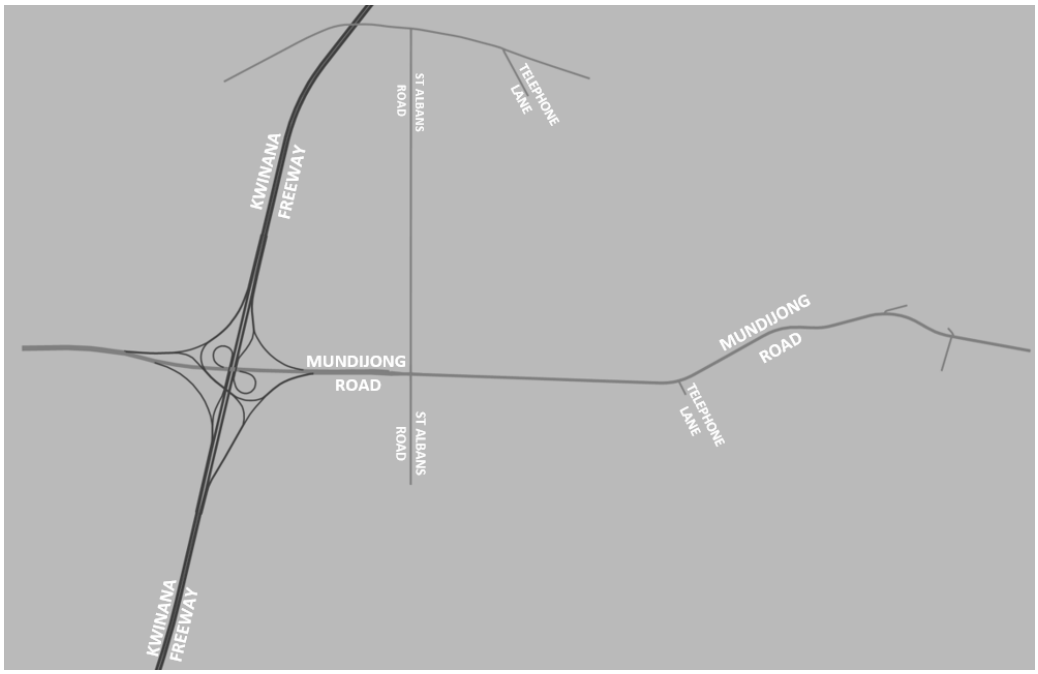
Committed and Assumed Network Upgrades

5.5.3 The model assumes that by 2051, a series of committed and aspirational infrastructure improvements of the surrounding road network will be in place. The following changes are assumed in the model:

- Kwinana Freeway – Upgraded to three lanes in each direction, coded as Freeway
- Mundijong Road – Upgraded to three lanes in each direction between the Kwinana Freeway and St Albans Road and then two lanes in each direction. Coded as Urban
- Junction of the Kwinana Freeway and Mundijong Road – Upgraded to partial cloverleaf fully grade separated interchange.

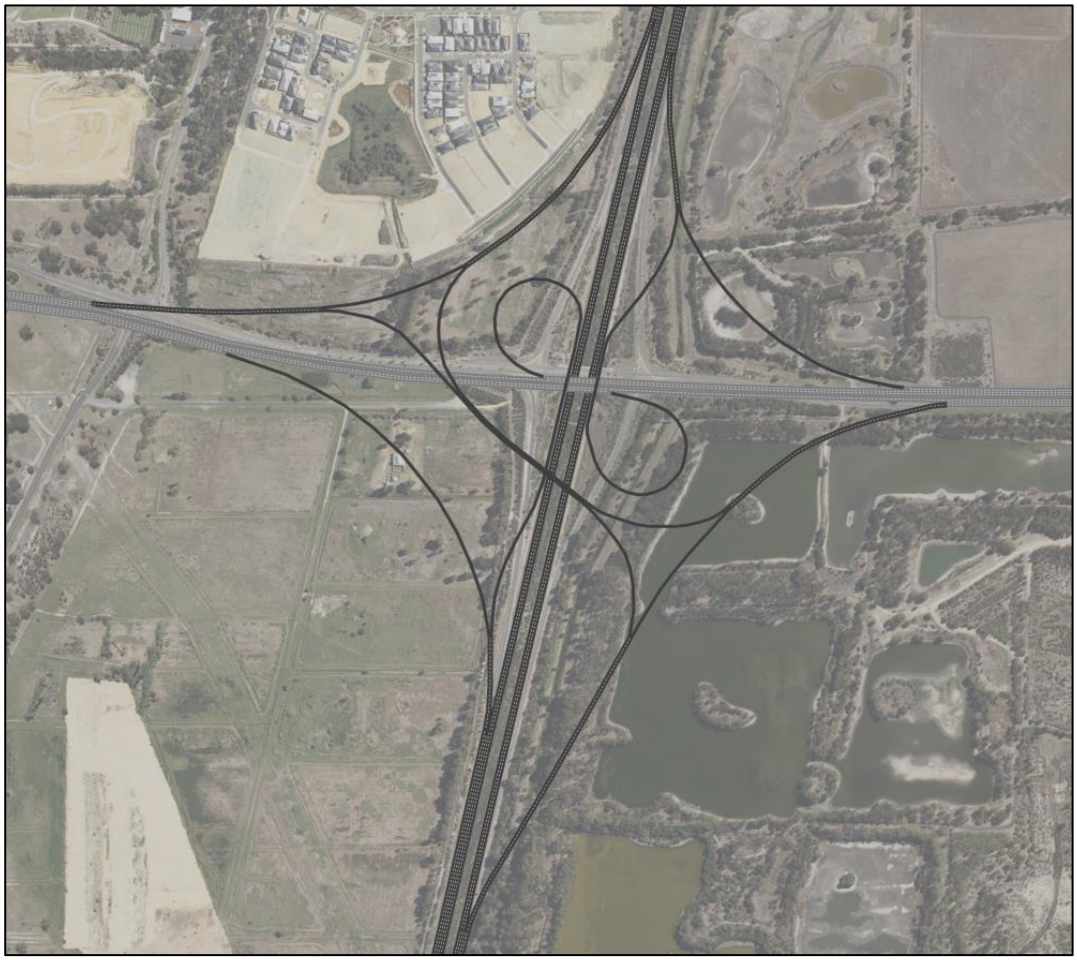
5.5.4 The assumed 2031 surrounding road network captured by the modelling is illustrated in the following figure.

Figure 5-2: 2031 Modelled External Road Network Overview



5.5.5 The assumed layout for the Junction of the Kwinana Freeway and Mundijong Road is illustrated in the following figure.

Figure 5-3: Assumed Layout of Kwinana Freeway/Mundijong Road Interchange



Internal Network Standards

5.5.6 The model includes the major road network within the DSP site (Primary, Integrators and Neighbourhood Connectors). It does not include Access Streets and Laneway roads due to the high-level strategic nature of the DSP.

5.5.7 For the purpose of this assessment, the following internal road types have been defined:

- Existing Network - grey
- Primary Network –brown
- Secondary Network – orange
- Zone Loading Points –pink

Modelled Internal Network

5.5.8 Based on the above hierarchy, the modelled internal network is illustrated in the following figure.

Figure 5-4: Modelled Internal Road Network

Internal Network Junctions

5.5.9 The model assumes that all of the internal junctions within the DSP will operate under priority control. For smaller junctions, simple priority junctions are assumed and for larger junctions, roundabouts are assumed. Specific intersection controls will be determined at Local Structure Plan stage as part of the associated Transport Impact Assessments.

Network Interfaces

5.5.10 The internal network interfaces with the external network in three locations, namely;

- At Telephone Lane;
- Along St Albans Road; and
- Along Mundijong Road.

Telephone Lane

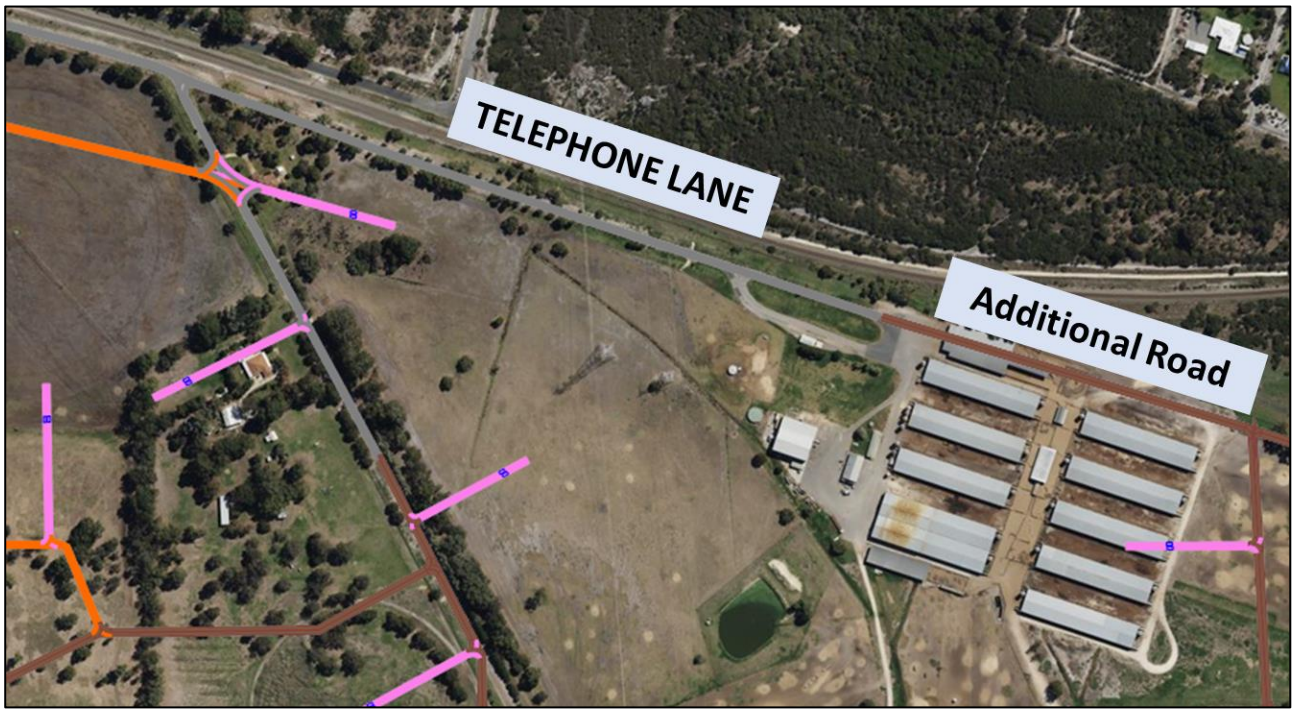
5.5.11 The road network is planned to extend Telephone Lane to the east to connect with Duckpond Road, and then to the southeast towards Mundijong Road. There is also a direct connection from one of the development zones onto Telephone Lane between the Kwinana Freeway and St Albans Road.

5.5.12 The following figure provides an overview of the road network with the connections in place.

Figure 5-5: Overview of Connections to Telephone Lane

5.5.13 The following figure provides more detail as to how the existing road network is extended in the model.

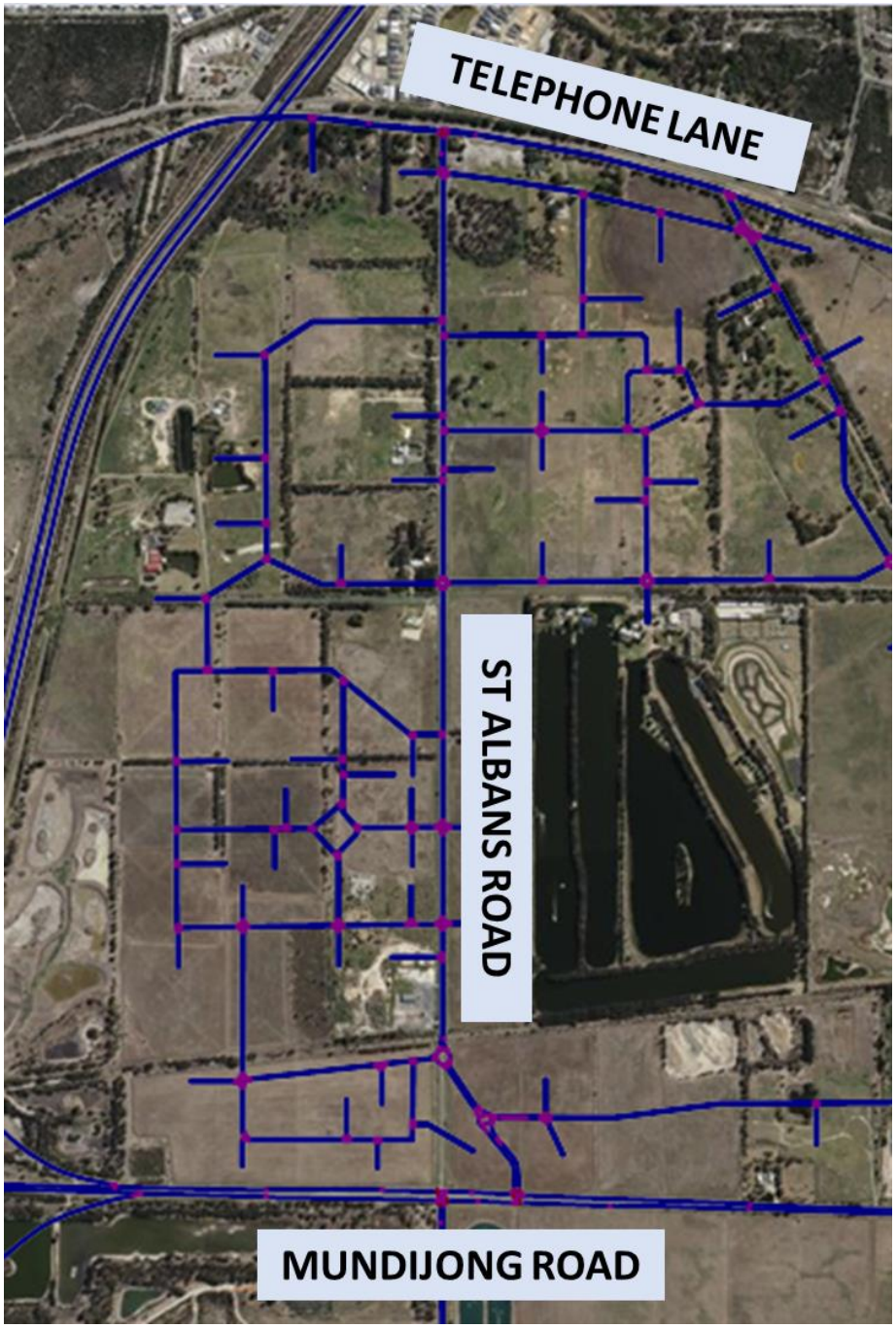
Figure 5-6: Detail of Connections to Telephone Lane



St Albans Road

5.5.14 St Albans Road effectively becomes an internal road within the DSP. There are eight junctions with the major road network as well as junctions with lower order access streets that are not modelled in Vissim. In each case, the junctions are either full-turn major/minor priority junctions or roundabouts. The figure below illustrates St Albans Road with the connections in place.

Figure 5-7: Overview of Connections to St Albans Road



Mundijong Road

5.5.15 The DSP has four interfaces with Mundijong Road. An overview of the interfaces is provided in the following figure.

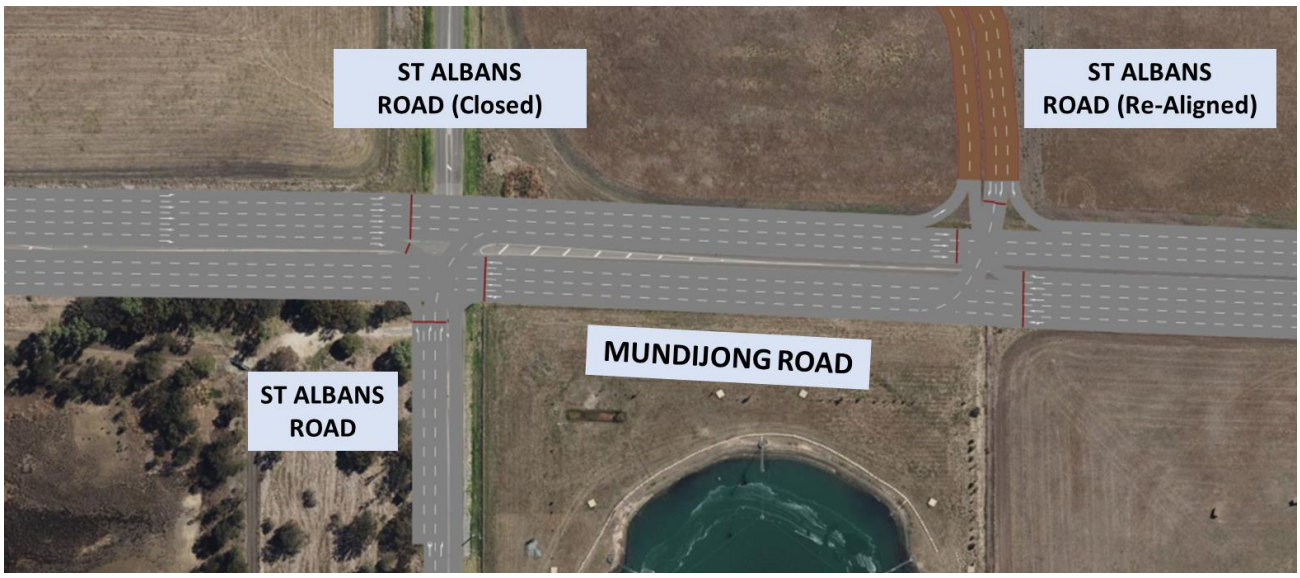
Figure 5-8: Overview of Connections to Mundijong Road

5.5.16 The connection at St Albans Road involves diverting the existing alignment to the north of Mundijong Road such that a staggered junction is created with the two minor arms being approximately 170m apart.

5.5.17 The proposed junction is assumed signalised at both of the minor arms. For the DSP access arm, a free-flow left turn into the development is proposed along with a dedicated right turn lane under signal control. Outbound from the development, three lanes are proposed with two each dedicated to right turning traffic and one for left turning traffic, which will have lower demand and will have green in more stages.

5.5.18 The junction is illustrated in the following figure.

Figure 5-9: Junction of Mundijong Road and St Albans Road



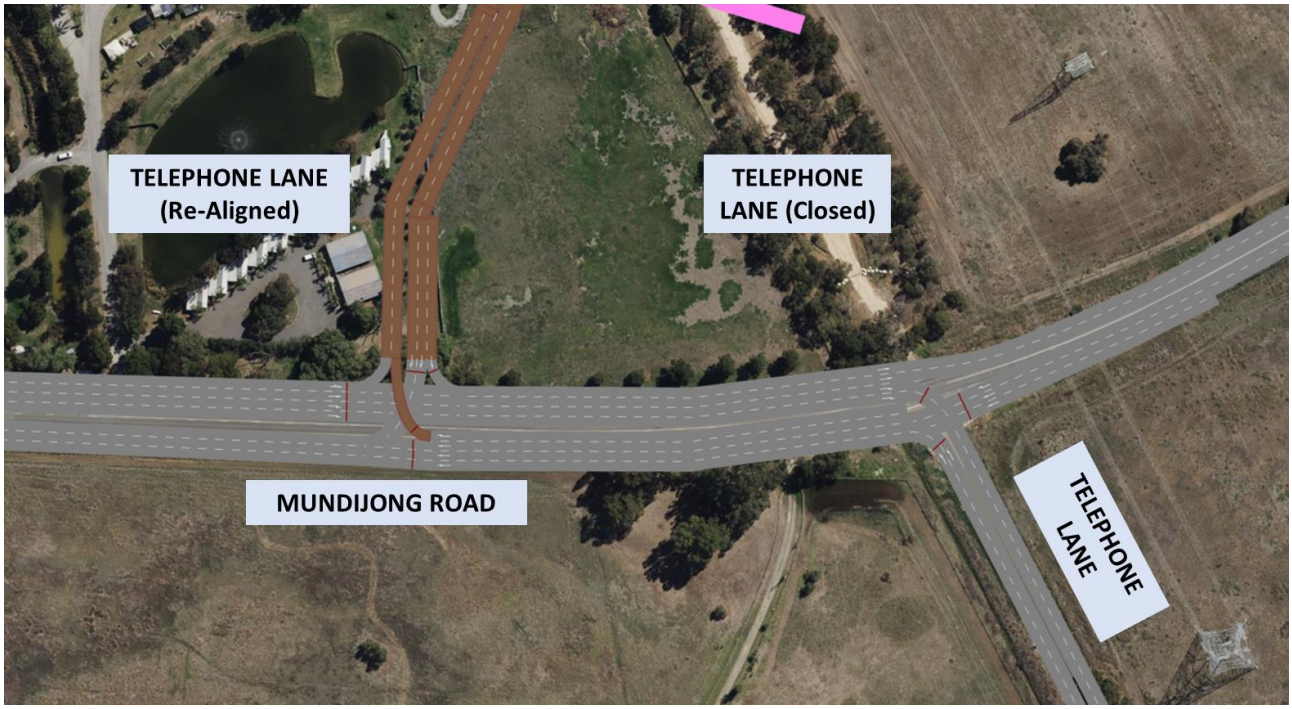
5.5.19 The connection at Telephone Lane involves diverting the existing alignment to the north of Mundijong Road such that a staggered junction is created with the two minor arms being approximately 175m apart.

5.5.20 The proposed junction is assumed signalised at both of the minor arms. Outbound from the development, three lanes are proposed with two each dedicated to right turning traffic and one for left turning traffic, which will have lower demand and will have green in more stages.

5.5.21 The junction with Telephone Lane to the South is assumed to be a restricted 'Left out / right in' junction under signal control with the exception of the eastbound traffic on Mundijong road which has no conflicting movements and is therefore not under control.

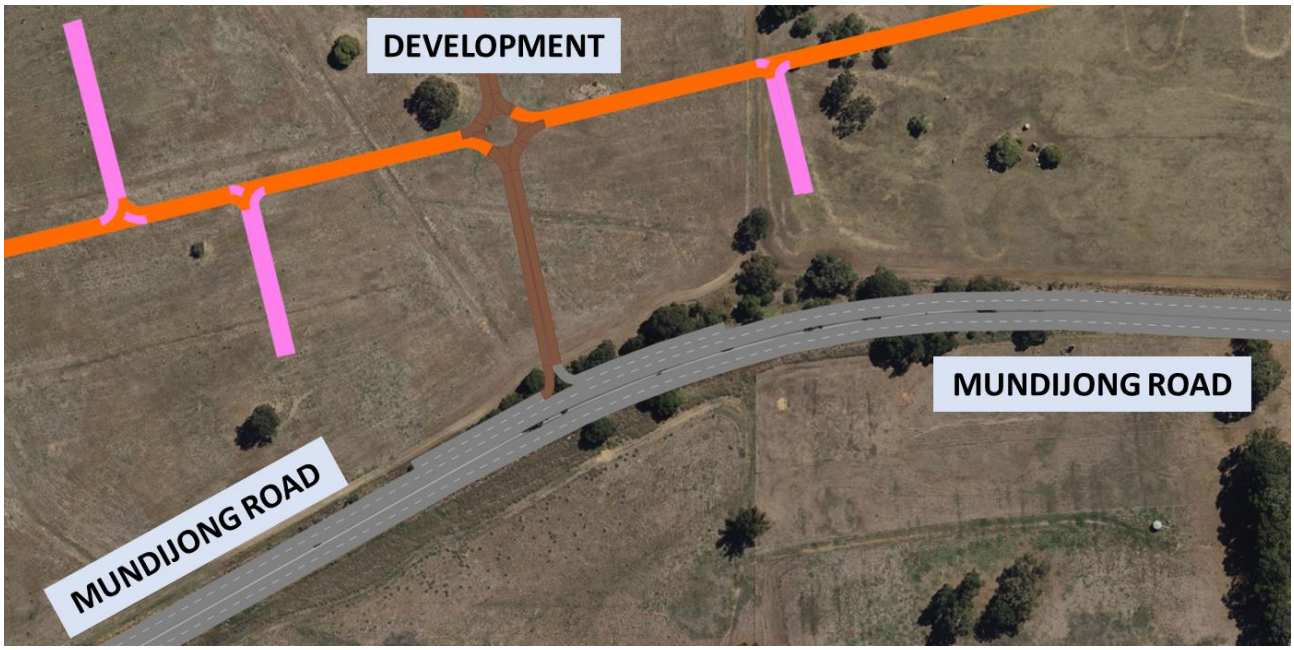
5.5.22 The junction is illustrated in the following figure.

Figure 5-10: Junctions of Mundijong Road and Development either side or Telephone Lane



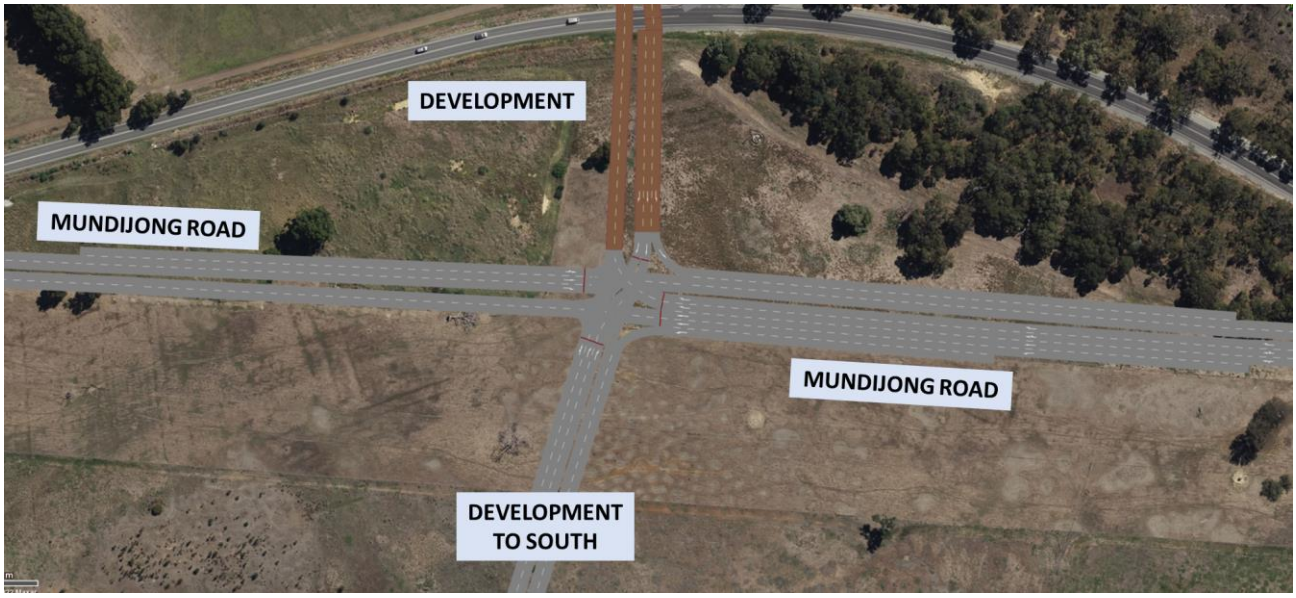
5.5.23 The third point of access is a simple 'left in / left out' junction, modelled with climbing lanes. The junction is illustrated in the following figure.

Figure 5-11: Junction of Mundijong Road and Development Access 3



5.5.24 The final point of access is proposed as a full turn signalised junction with Duckpond Road. This junction also assumes an access to the planned development to the south of Mundijong Road at this location. It is noted that Mundijong Road is assumed to have been re-aligned in this location as part of the proposal to upgrade it to Dual-2 standard. The junction is illustrated in the following figure.

Figure 5-12: Junction of Mundijong Road and Duckpond Road and Development Access 4



5.6 Model Zone Structure

5.6.1 The model zone structure has been created through a series of layers reflecting both the points of entry to the external network and the points of entry to the internal network.

External Network

5.6.2 The external network has 10 zones reflecting one zone for each entry point to the network with the exception of the eastern end of Telephone Lane where there are negligible movements currently and where the existing road network will interface with the internal network.

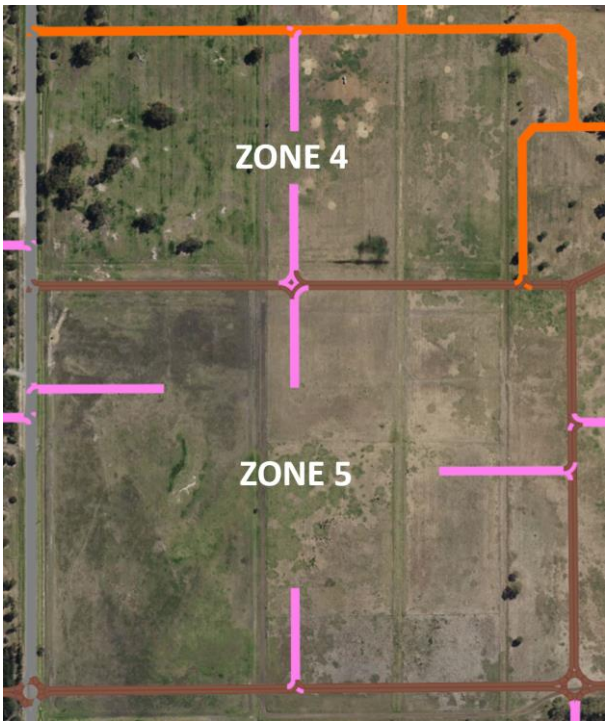
Internal Network

5.6.3 The internal network has 38 zones, broken down as follows:

- 31 zones reflecting plots for housing and numbered from 101 onwards
- 4 zones reflecting plots for activity centres and numbered from 201 onwards
- 3 zones reflecting plots for employment plots and numbered from 301 onwards

5.6.4 For smaller plots, a zone will have one or two points of entry to the network. For larger zones, up to four points of entry have been modelled. An example of this approach is illustrated in the following figure.

Figure 5-13: Example of adjacent zones with differing quantities of points of entry



5.7 Modelled Traffic Flows

5.7.1 The estimation of modelled traffic flows is discussed in the following sub-sections.

Future Year Background Traffic Sources

5.7.2 A data set was made available for use in this project from the 'ROM' strategic modelling tool. The ROM model provides a matrix for the area illustrated in the following figure.

Figure 5-14: ROM Model Coverage

5.7.3 The flows provided for the ROM study area are provided as Daily Totals for all vehicles. A summary of the flows is provided in the following figure.

Figure 5-15: ROM Model Flows (Daily Totals)

	1	2	3	4	5	6	7	8	9		
1	0	6975	2286	11782	0	0	5852	8801	7580	**43277**	1
2	7306	0	601	11515	0	0	3438	6072	4401	**33334**	2
3	2474	622	0	591	0	0	442	730	508	**5368**	3
4	10206	10786	578	0	0	0	3434	5400	54	**30457**	4
5	4307	2416	332	1918	0	0	0	3494	49154	**61621**	5
6	8396	5058	578	213	0	0	46147	7670	0	**68062**	6
7	0	0	0	0	0	0	0	0	0	**0**	7
8	9585	6882	816	5861	0	0	2121	0	10412	**35676**	8
9	0	0	0	0	0	0	0	0	0	**0**	9
	42273	**32739**	**5192**	**31880**	**0**	**0**	**61434**	**32168**	**72109**	**277795**	
	1	2	3	4	5	6	7	8	9		

5.7.4

Future Year Background Traffic Processing

5.7.5 The provided ROM flows have been converted to peak hour flows by factoring them by 0.1. A two-way conversion was undertaken by assuming 50% of the traffic is travelling in each direction in lieu of better information.

5.7.6 It is important to note that traffic generated by the development to the south of the North-East Baldivis DSP (Zone 2 in the ROM) has then been amended to counteract the coarse modelling of the development in the ROM whereby all of the traffic loads onto Mundijong Road (some 76,000vpd from the south with some of these to/from North-East Baldivis DSP Zone 1 in the ROM). Given Kwinana Freeway itself is carrying less than this presently, at 67,000vpd two-way, within a full free flow Freeway standard, this 100% loading of Zone 2 onto Mundijong Road is deemed unrealistic especially given the access possibilities to the south. Accordingly, the following adjustments have been made:

- Traffic travelling to/from the south from this development is assumed to route to the south without entering the modelled network. 100% of this traffic is removed from the matrix
- Traffic travelling to/from St Albans Road (South) is treated similarly to that travelling south. 100% of this traffic is removed from the matrix
- Traffic travelling to/from the East and West is assumed to partly do so using routes that do not impact upon the modelled network. 30% of the traffic is therefore removed from the matrix.

Overall, the net impact of above changes is that approximately 50% of the traffic generated by the development to the south of the North-East Baldivis DSP is included in the modelled matrix and therefore impacts upon the modelled network.

5.7.7 As the ROM does not include Telephone Lane to the northwest of the DSP, an initial assumption was made that there is a flow entering and exiting the model at this location of 400 vehicles per

direction. Further, the only logical destination for traffic entering the modelled network at this location given the surrounding road network, is Mundijong Road to the East. As such, the initial matrix assumes all of the flow entering and exiting the modelled network at Telephone Lane comes from or goes to Mundijong Road to the East.

5.7.8 Peak hour matrices were created using the derived flows from each model with the ROM flows taking precedence. This meant that for all O-D pairs in the ROM model, these flows were used as a starting point but for flows on Telephone Lane in the northwest corner of the study area, flows were taken from Figure 5-16 as there are no values in the provided ROM outputs.

5.7.9 The initial matrix was then furnessed against O-D totals from the respective models to get a starting matrix where cell totals match target O-D totals. Once the peak hour matrix was complete, matrices covering a warm-up hour, peak hour, and warm-down hour were created for both Light and Heavy vehicles by assuming a blanket HGV percentage of 10% and by profiling the warm-up and warm-down periods by 0.9.

5.7.10 The outturn matrices from that process were then loaded into the model.

Development Traffic

Development Traffic Generation

5.7.11 The residential development traffic has been generated by taking the total zone area in hectares and assuming that the purely residential area within that will be 72% of the total, allowing for 28% to reflect internal tertiary roads. A unit density of 26 homes per hectare has then been assumed.

5.7.12 A two-way peak hour trip generation of 0.8 trips per unit is then assumed. This has been converted to one-way trips by applying factors of 25% in; 75% out for the Morning Peak, and 62.5% in; 37.5% out for the Evening Peak.

5.7.13 Overall, this gives the following trip rates:

- Morning Peak
    - 0.20 inbound trips per unit
    - 0.60 outbound trips per unit
- Evening Peak
    - 0.50 inbound trips per unit
    - 0.30 outbound trips per unit

5.7.14 The traffic generated by the activity centres have differing rates depending on the zone as both shopping centres and supermarkets are currently assumed. These have two-way trip rates that vary from 1.5 trips / 100m2 GLFA to 11.3 trips / 100m2 GLFA. These rates have been converted to one-way trips by applying factors of 80% in; 20% out for the Morning Peak, and 50% in; 50% out for the Evening Peak.

5.7.15 Overall, this gives the following trip rates:

- Morning Peak
    - 1.20 or 3.12 inbound trips per 100m2 GLFA depending on the zones
    - 0.30 or 0.78 outbound trips per 100m2 GLFA depending on the zones
- Evening Peak
    - 0.60 or 1.56 inbound trips per 100m2 GLFA depending on the zones
    - 0.60 or 1.56 outbound trips per 100m2 GLFA depending on the zones

5.7.16 The traffic generated by the employment zones have differing rates depending on the zone as both bulky goods and warehouse uses are currently assumed. These have two-way trip rates that vary from 0.54 trips / 100m2 GLFA to 3.8 trips / 100m2 GLFA. These rates have been converted to one-way trips by applying factors of 80% in; 20% out for the Morning Peak, and 20% in; 80% out for the Evening Peak.

5.7.17 Overall, this gives the following trip rates:

- Morning Peak
    - 0.44 or 1.344 inbound trips per 100m2 GLFA depending on the zones
    - 0.108 or 0.336 outbound trips per 100m2 GLFA depending on the zones
- Evening Peak
    - 0.11 or 0.336 inbound trips per 100m2 GLFA depending on the zones
    - 0.432 or 1.344 outbound trips per 100m2 GLFA depending on the zones.

Development Traffic Distribution

5.7.18 Development traffic is distributed both internally within the development and externally outside of the development.

5.7.19 The starting point for internal trips is to make assumptions about the level of internalisation. Based on experience, the following factors have been used:

- Centres – 100% internalisation
- Employment - 50% internalisation
- Housing – all external after discounting trips to/from the centres and employment zones.

5.7.20 In order to distribute the internalised trips, the overall proportion of housing within each zone was used. The distribution does not therefore take into account of proximity to each of the centres and employment areas at this high-level strategic stage. Schools are also assumed to be all internal trips to service the new housing developments.

5.7.21 As with the background traffic, the starting point for the external distribution of development traffic is the ROM model matrix for the development zone. O-D pairs were extracted for each point of entry to the network. An assumption was made for the demand to/from Telephone Lane to the northwest as this road is not in the ROM. The assumption is that Telephone Lane going to/from Wellard would have 10.5% of the development distribution and the network would then distribute the remaining 89.5% in line with the ROM.

5.7.22 The resulting distribution is as follows:

- Kwinana Freeway (North) – 16.7%
- Telephone Lane (West) – 10.5%
- Mundijong Road (West) – 19.2%
- Kwinana Freeway (South) – 10.6%
- St Albans Lane (South) – 5.0%
- Telephone Lane (South) – 14.9%
- Mundijong Road (East) – 23.0% (towards Tonkin Highway extension and Southwest Highway).

5.7.23 Once trips were distributed both internally and externally for the Morning and Evening Peak hours, each peak had a one-hour matrix.

5.7.24 Peak Hour Matrices were created for both Light and Heavy vehicles by assuming a HGV percentage of 0% for housing and centres and a HGV percentage as 10% for external employment trips. Matrices for the warm-up and warm-down hours were created by profiling the peak hour by 0.9.

5.7.25 The outturn matrices from that process were then loaded into the model.

5.8 Modelled Outputs

5.8.1 At this stage of the study, key outputs to aid the development of the design of the internal road network and the interfaces are network statistics, traffic volumes on the network, and the achieved Level of Service at the junctions. Each of these is discussed under the following sub-headings.

Network Performance

5.8.2 The following table summarises the network performance statistics for the modelled network.

Table 5-1: Network Performance Statistics

Peak Hour	Average Speed (KPH)	Average Delay (Seconds)
Morning	70	41
Evening	70	42

5.8.3 It can be seen from the above table that the average modelled speed in the Morning Peak hour across the whole modelled network is 65kph rising to 70kph in the Evening Peak hour. In part, this reflects the fact that the Kwinana Freeway is modelled, which will increase the average.

5.8.4 The average modelled delay in the Morning Peak hour is 59 seconds per vehicle, falling to 40 seconds in the Evening Peak hour.

5.8.5 Overall, the network performance statistics show that both peak periods are predicted to operate with good average speeds and low levels of delay, with the Evening Peak period being predicted to have lower levels delay and higher speeds than the Morning Peak.

Peak Period Traffic Volumes

5.8.6 The following figures present the traffic volumes for the key links during the morning peak period.

Figure 5-16: Morning Peak Hour Volumes - Overview

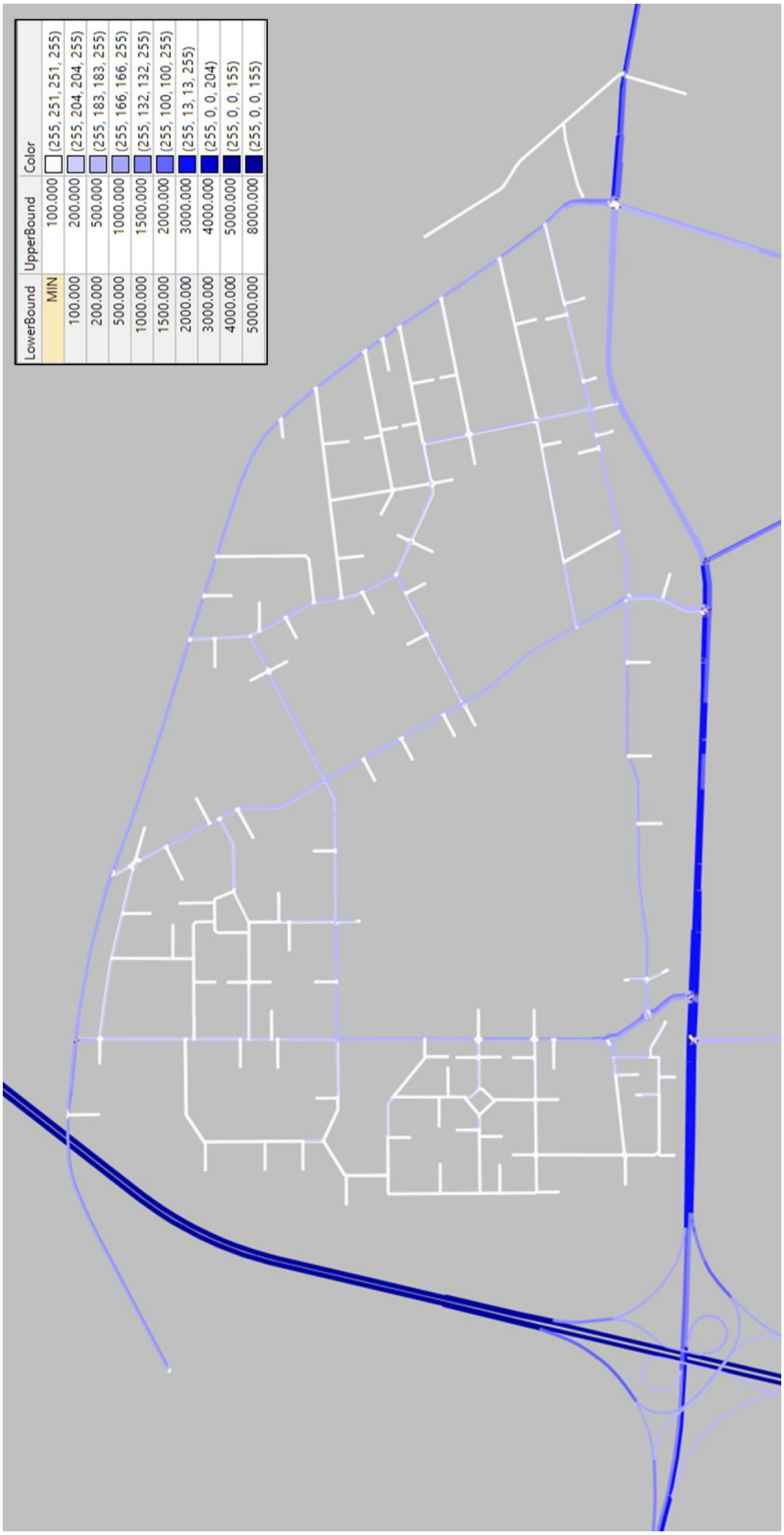


Figure 5-17: Morning Peak Hour Volumes – Mundijong Road

5.8.7 It can be seen from the above figures that the highest predicted volumes in the Morning Peak are on the Kwinana Freeway, as would be expected. The volumes on Mundijong Road reduce the further away from the Kwinana Freeway, as traffic is accessing the development and the roads to the south. The flows drop considerably across the DSP frontage site at Telephone Lane. East of the 4-way signalised intersection with Duckpond Road, the volumes increase again as this services the industrial development to the south.

5.8.8 As would be expected for a residential development, there are higher flows in the outbound direction than the inbound direction at the development's interfaces with the existing road network in the Morning Peak Period.

5.8.9 Predicted flows on the new road bounding the DSP on the northern and eastern sides, can be seen to be significantly lower than on Mundijong Road but higher than most of the internal roads with the exception of St Albans Road within the development which is serving as a north-south connector.

5.8.10 The following figures present the traffic volumes for the key links during the evening peak period.

Figure 5-18: Evening Peak Hour Volumes - Overview

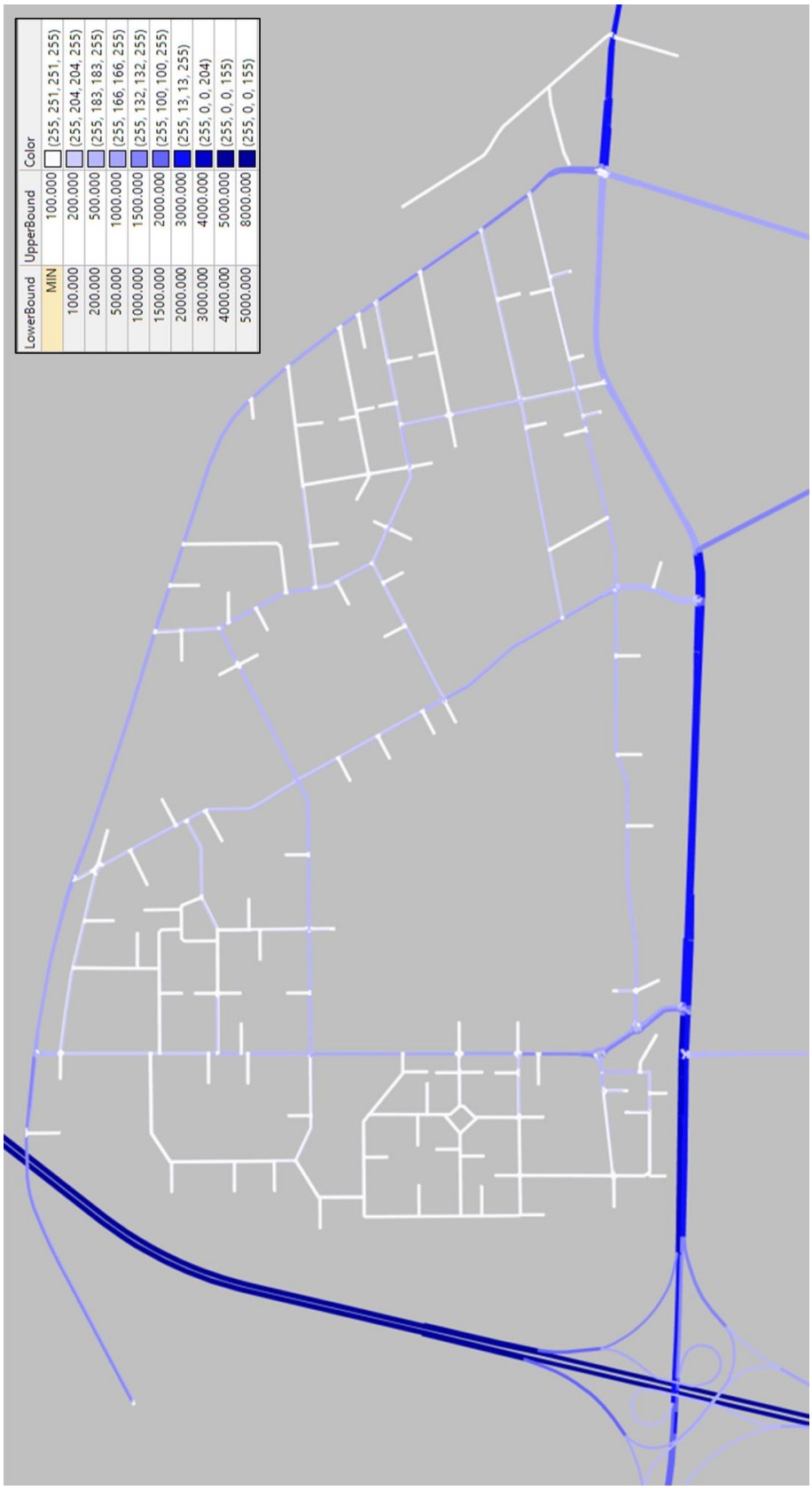
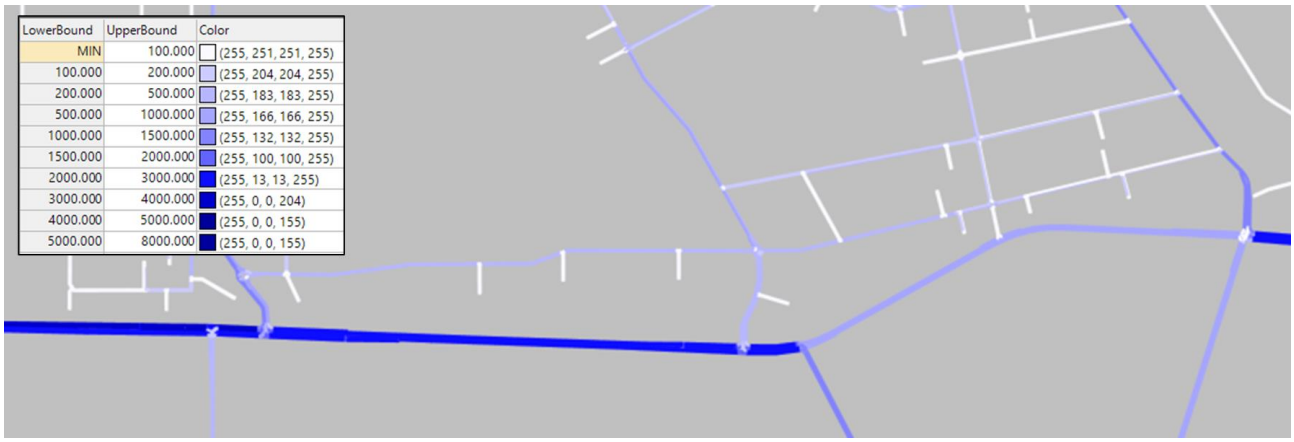


Figure 5-19: Evening Peak Hour Volumes – Mundijong Road



5.8.11 It can be seen from the above figures that the flows on the network are broadly similar to the Morning Peak. The highest predicted volumes are on the Kwinana Freeway, as would be expected.

5.8.12 As would be expected for a residential development, there are higher flows in the inbound direction than the outbound direction at the development's interfaces with the existing road network in the Evening Peak Period.

5.8.13 Predicted flows on the new road bounding the DSP on the northern and eastern sides, can be seen to be significantly lower than on Mundijong Road but higher than most of the internal roads with the exception of St Albans Road within the development which is serving as a north-south connector.

Daily Traffic Volumes

5.8.14 For the development, a total of 4,800 vehicles is generated in the Morning Peak hour and 5,600 vehicles is generated in the Evening Peak Hour.

5.8.15 Daily traffic volumes have been estimated by taking an average of the peak hour flows and multiplying up by a factor of 10. This equates to some 51,850vpd being generated by the North-East Baldivis DSP.

5.8.16 The following figures give an estimate of daily traffic flows from this process for key links in the network. They present development traffic only (ultimate), ROM background flows (2051) only and the total traffic (2051).

Figure 5-20: Daily Estimated Traffic Volumes – Development Traffic Only

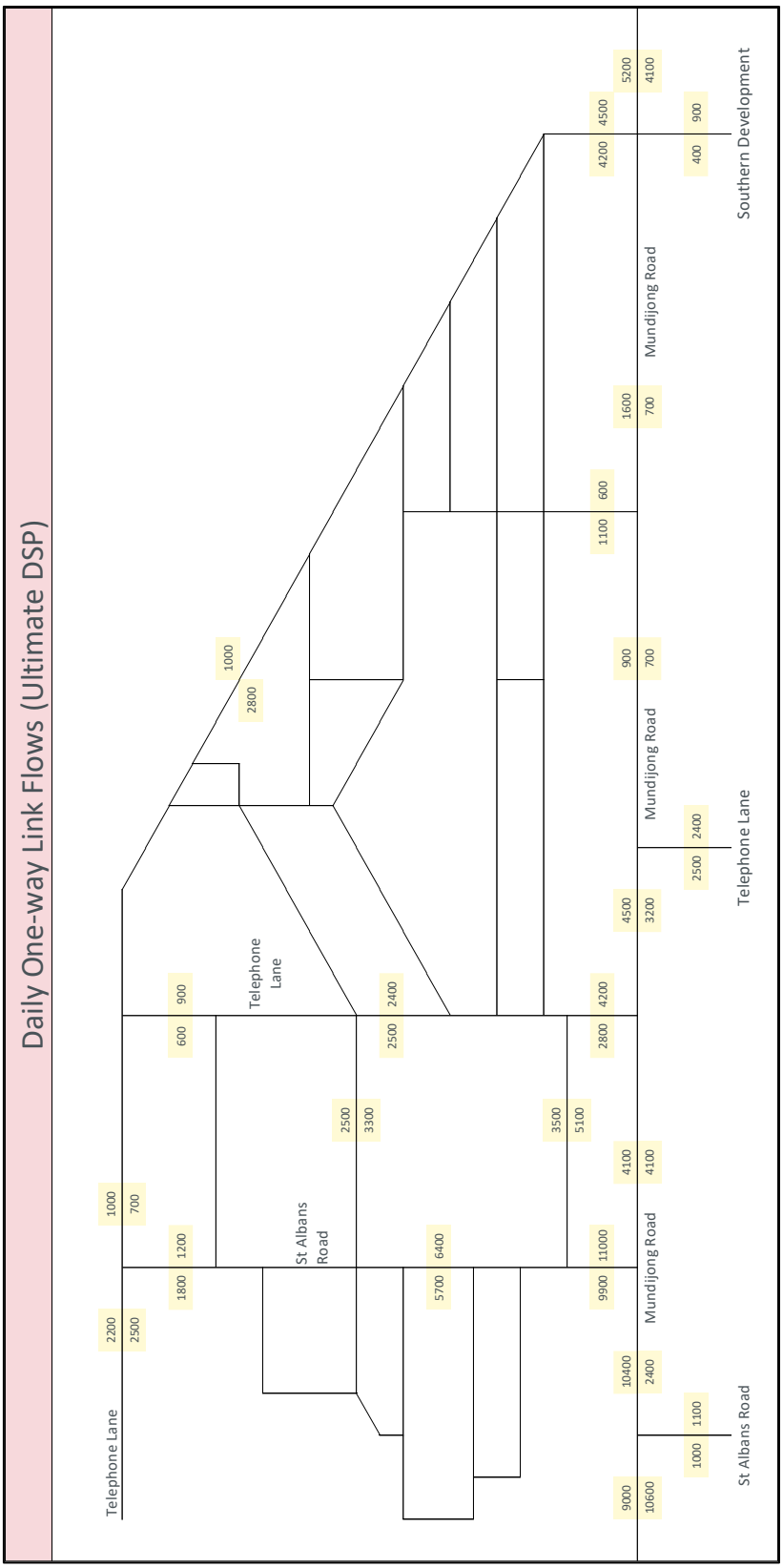


Figure 5-21: Daily Estimated Traffic Volumes – Background Traffic Only

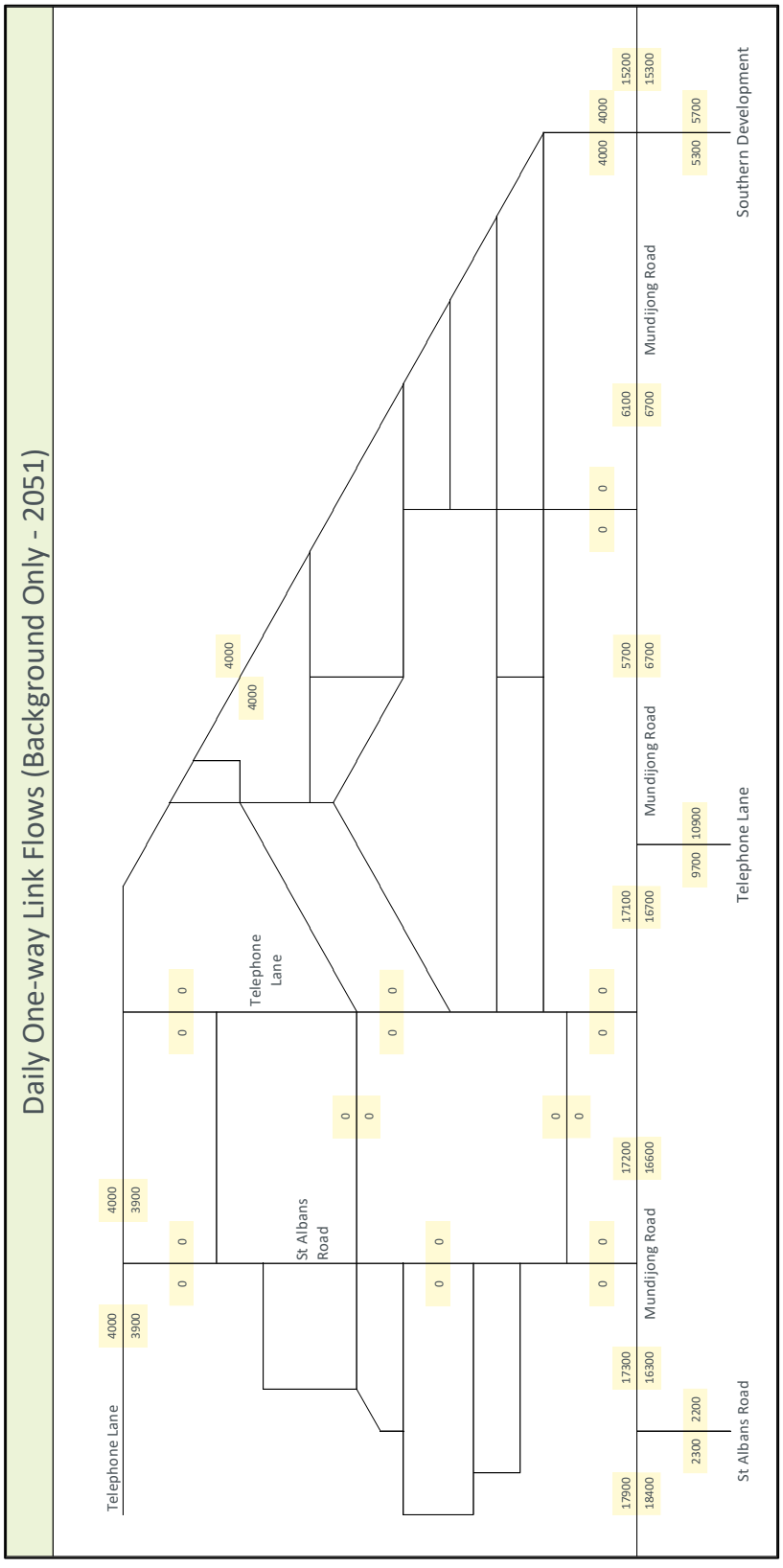
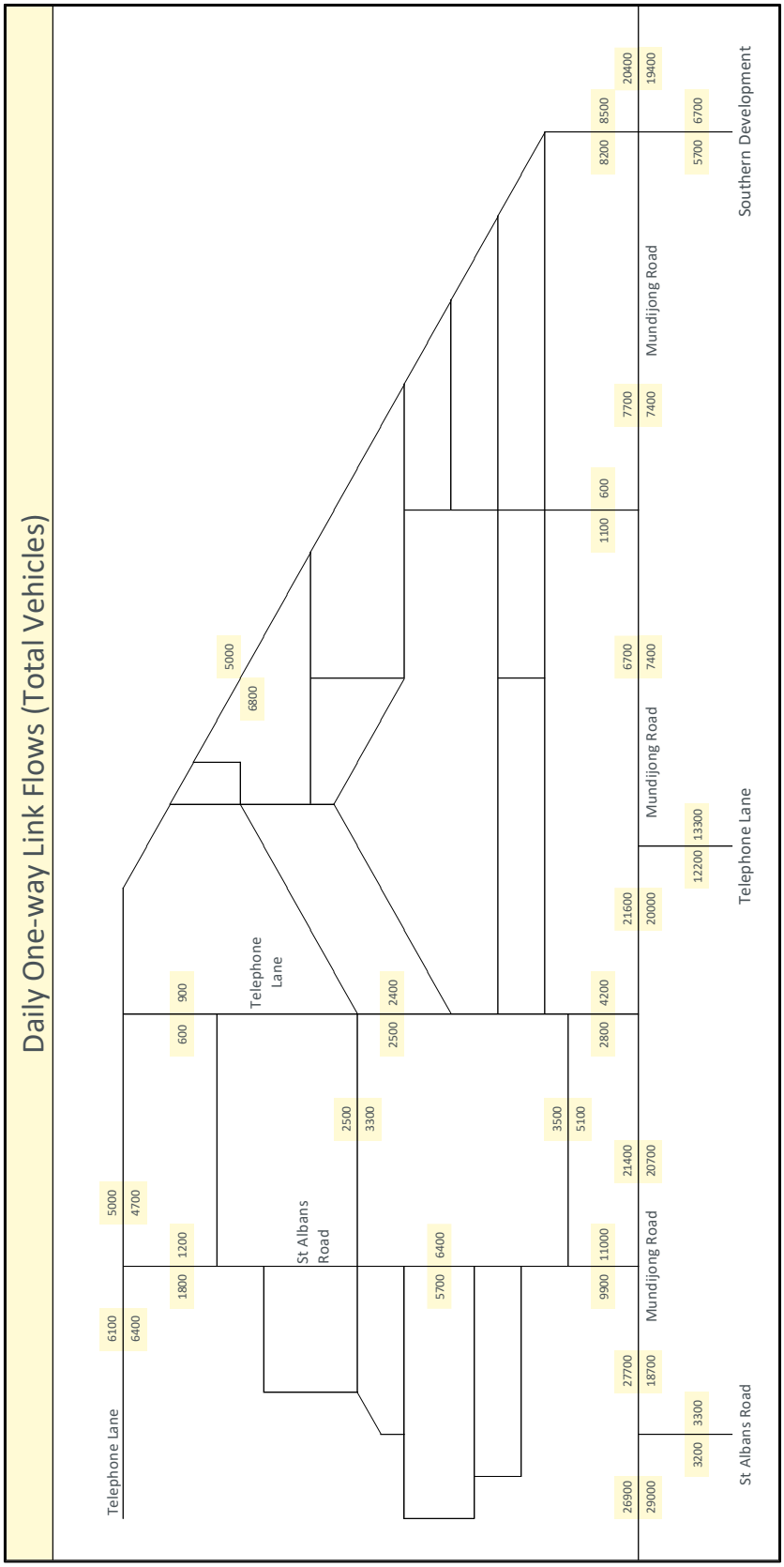


Figure 5-22: Daily Estimated Traffic Volumes – Total (2051)



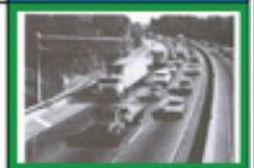
5.8.17 It can be seen that the modelling predicts total 2051 daily flows on Mundijong Road of above 56,000 vehicles with flows on St Albans Road of up to 21,000 vehicles at its interface with Mundijong Road. Flows of up to 7,000 vehicles can be seen on Telephone Lane to the south.

Level of Service (LoS)

5.8.18 Level of Service is a key indicator of operational performance for signal and priority-controlled junctions. It is similar to both Degree of Saturation (DoS), used in traditional signal capacity analysis, and Ratio of Flow to Capacity (RFC) used in traditional priority junction analysis.

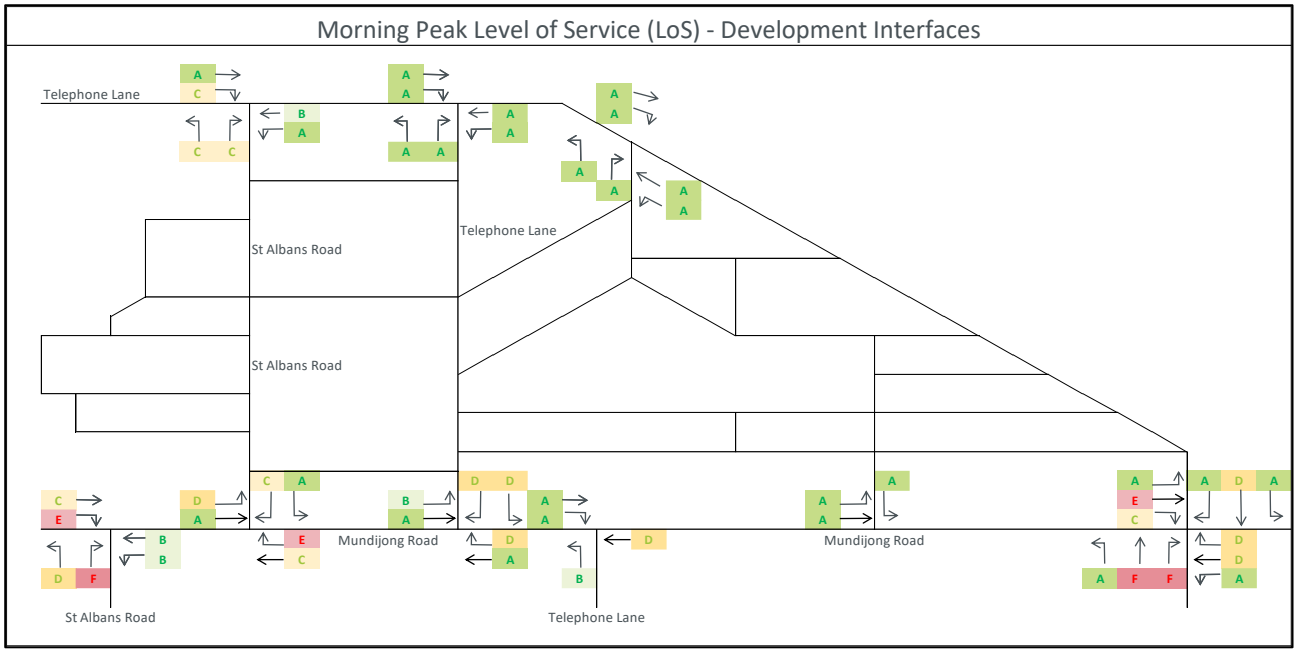
5.8.19 Level of Service within Vissim is aligned to the standards set out in the US Highway Capacity Manual and an illustration of those values is provided in the following table.

Table 5-2: Highway Capacity Manual – Level of Service Standards

LOS		Definition	Typ. Illustration
Acceptable	A	Represents a free-flow operation. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	
	B	Represents reasonably free-flow operation. The ability to maneuver within the traffic stream is slightly restricted.	
	C	Represents a traffic flow with speeds near or at free-flow speed of the freeway. Ability to maneuver within the traffic stream is noticeably restricted.	
	D	Represents speeds that begin to decline with increased density. Ability to maneuver within the traffic stream is noticeably limited.	
Unacceptable	E	Represents operation at its capacity. Vehicles are closely spaced within the traffic stream and there are virtually no useable gaps to maneuver.	
	F	Represents a breakdown of vehicle flow. This condition exists within queues forming behind the breakdown points.	

5.8.20 The following figure present the predicted Level of Service (LoS) for the interface junctions for the Morning Peak period.

Figure 5-23: Morning Peak Modelled Level of Service – Development Interfaces



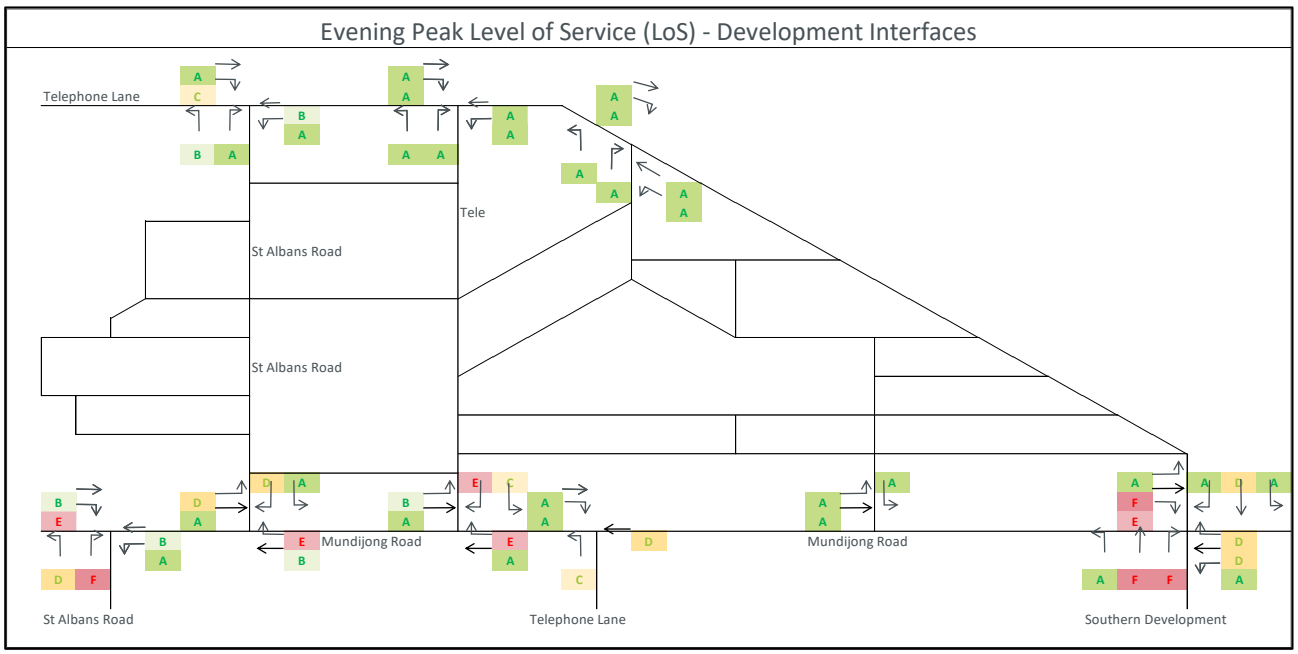
5.8.21 The figure shows that in the Morning Peak, the model predicts good and generally low LoS values across the network within the site and at most interfaces to Mundijong Road. The internal network reflects an operation with limited to no delays.

However, there are a few higher predicted LoS levels as follows:

- The right turn from Mundijong Road into St Albans Road (North) into the DSP has a predicted LoS of 'E'. This could be mitigated for by providing signals operating with Vehicle Actuation, by optimising the signal timings around the observed flows, or by lower the demand by providing additional accesses for the industrial development to the south.
- The ahead movements at the fourth access to the development from Mundijong Road has an LoS values of 'E' suggesting long delays. This is because the junction is using a long cycle time.
- The right turn from Mundijong Road into St Albans Road (South) has a predicted LoS of 'E' with the right turn out of St Albans Road south having an LoS of 'F', suggesting long delays. This could be mitigated for by providing signals operating with Vehicle Actuation, by optimising the signal timings around the observed flows, or by lower the demand by providing additional accesses for the industrial development to the south.

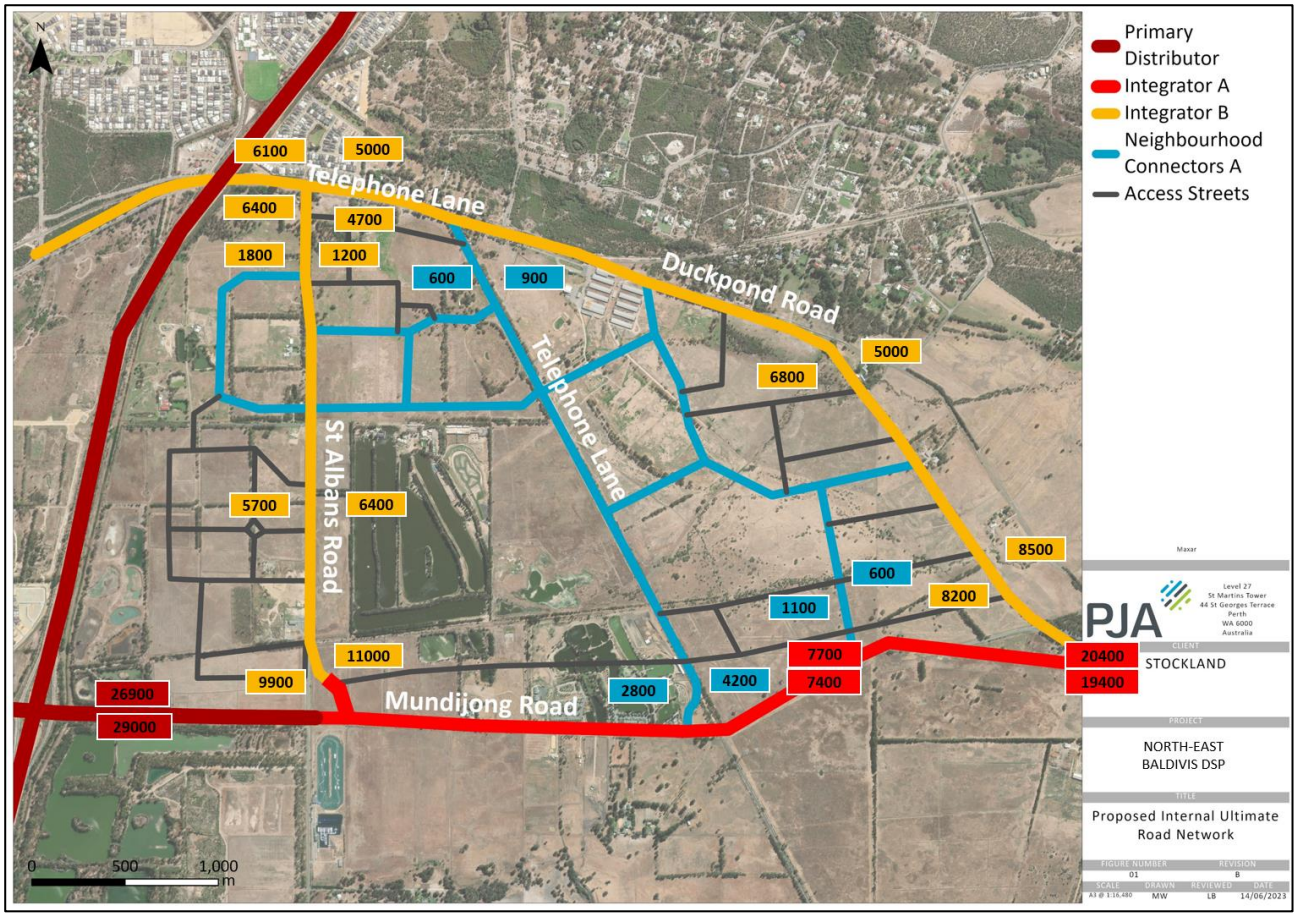
5.8.22 The following figure present the predicted Level of Service (LoS) for the interface junctions for the Evening Peak period.

Figure 5-24: Evening Peak Modelled Level of Service – Development Interfaces



5.8.23 The figure shows that in the Evening Peak, the model predicts generally low LoS values across the network, reflecting good operation with limited to no delays. However, there are some notable delays on the Mundijong Road section in the same locations as were predicted in the Morning Peak, largely due to the background traffic.

Figure 5-25: Total 2051 Flows



6 Summary and Conclusions

6.1.1 This District Level Transport Assessment report has been prepared to address the strategic transport aspects of land use/transport integration for North-East Baldivis DSP. The key objectives of the transport assessment for the North-East Baldivis DSP have been:

- To assess the proposed internal transport networks with respect to accessibility and safety for all modes: pedestrians, cyclists and e-riders, public transport and vehicles
- To assess the level of transport integration between the DSP area and the surrounding land uses
- To determine the impacts of the traffic generated by the DSP area on the surrounding land uses
- To determine impacts of the traffic generated by the DSP on the surrounding transport networks.

6.1.2 The North-East Baldivis DSP coordinates the development within the DSP area as an urban area with an employment zone and neighbourhood zone and education precincts. It is proposed to have a population of some 18,000 people (based on 5,963 residential dwellings), four primary schools, one high school plus two neighbourhood centres and a total employment land area of 21.4ha.

6.1.3 The vision for the urban development of North-East Baldivis DSP is to provide housing for workers ('tradies' etc) in Rockingham, Kwinana and Mundijong industrial areas. The predominant vehicle movements will be east west on Mundijong Road. The focus of the DSP is therefore to provide connectivity internally (north south within DSP) and to/from Mundijong Road. A series of regional network infrastructure elements were workshopped via Technical Advisory Group (TAG) consultations in March and April 2023 and their consideration for this DSP are detailed in Chapter 4.1.

6.1.4 The proposed DSP ultimate road network incorporates the transport framework included within the WAPC's land use classification to Urban Expansion and reflects the proposed road network features:

- The internal road and street reservation widths and cross-sections has been developed with cognisance of the ultimate traffic volumes and function. Vissim modelling has been undertaken to enable the internal network volumes to be determined. The Vissim modelled flows are stable and Liveable Neighbourhoods Guidelines were referenced to match the modelled flows for each internal road in order to derive appropriate reservation widths and cross-sections. These internal roads will be further refined at the Local Structure Plan stage as part of future Transport Impact Assessments.
- It has been assumed that the internal DSP lower order street network will have a default speed limit of 50kph.

- The proposed 2051 road hierarchy for North-East Baldivis DSP and immediate connections is illustrated in Appendix B.
- The Kwinana Freeway will form the western boundary of the North-East Baldivis DSP area. Main Roads WA has indicated the freeway may ultimately be upgraded to 8-lanes to Safety Bay Road but currently does not have funding. For this DSP, Kwinana freeway is assumed to be 6-lanes in 2051 and can accommodate the projected traffic flows of the North-East Baldivis DSP.
- St Albans Road will need to be upgraded to Integrator B standard (two lanes) from Telephone Lane in the north, some 2.1km to the south then transitioning to Integrator A (four lanes) near the employment centre approaching Mundijong Road for an extent of approximately 360m. The anticipated 2051 daily flows on St Albans Road is 12,000vpd and ranges considerably from 3,000vpd on the northern end to 21,000vpd on the southern end. The reconstruction of St Albans Road will result in a diversion of the road reserve and pavement at Mundijong Road to avoid a 4-way intersection as per the MRS and significantly reduce the intersection works required.
- Telephone Lane in the north west of the DSP extends under the Kwinana Freeway underpass as a 2-lane street and forms the eastern leg of the intersection with Wellard Road and Baldivis Road. This section of Telephone Lane cannot be widened due to the bridge abutments, nor does it require it. Telephone Lane under the bridge is estimated to carry less than 15,000vpd (~12,500vpd) at ultimate development and is proposed to be upgraded to Integrator B (2 lanes) standard from just east of the Kwinana Freeway bridge to Duckpond Road. The Integrator B along the northern boundary of the DSP will function adequately as a 22.0m wide road reserve due to it abutting a railway reserve. Similarly, Duckpond Road as an Integrator B without on-street cycle lanes and on-street parking can function as a 22m wide road reserve. The north-south alignment of Telephone Lane is adequate as a Neighbourhood Connector with 2051 flows estimated to be no more than 7,000vpd (it carries no background traffic). The intersection of Telephone Lane is to be offset, to avoid a 4-way intersection with Telephone Lane to the south as per the MRS.
- Mundijong Road currently sits within a 20m wide road reserve. Projected 2051 traffic figures for the extent of Mundijong Road fronting the DSP area ranges from 40,000vpd on the eastern end (of which 9,300vpd is DSP generated traffic) to 55,900vpd near Kwinana Freeway (of which 19,600vpd is DSP generated traffic). These figures were derived following consultation with Main Roads WA and Department of Planning, Lands and Heritage from December 2022 to May 2023. Main Roads have provided expected background (non-DSP development) traffic on Mundijong Road upon ultimate development of the surrounding Planning Investigation Areas. Due to current insufficient capacity, Mundijong Road will require upgrading, anticipated to Integrator A standard with ultimate six lanes between the freeway and near St Albans Road, and four lanes for the remainder. The road reserve will be widened to the north by 20m, for a total of 40m wide road reserve, which has been taken into consideration in this DSP.

The DSP as proposed does not prejudice the State Government's ultimate upgrade to Mundijong Road (which could be 4 or 6 lanes in the future) however, DSP traffic would only generate the need for a 4-lane road along the majority of the DSP frontage.

6.1.5 The proposed ultimate public transport network is to include two components as per the sub-regional framework:

a) Mandurah to Perth railway with Wellard Train Station as the nearest station at 5-6km distance for line-haul movements to district and regional destinations. This will also provide external connections to Thornlie via the new 14.5 km rail extension from Cockburn Central Station, with two new stations at Nicholson Road and Ranford Road, scheduled to open in 2025.

b) There are no existing bus services within the North-East Baldivis DSP area. PTA also does not have plans currently to introduce bus routes and services in the area. The provision of bus services usually lags development until adequate passenger demand can be achieved from an operational perspective. During the DSP's Technical Advisory Group (TAG) consultations, PTA noted that a frequent feeder bus service or introduction of bus services in the early stages of development in the DSP would be unviable. In response, Stockland is willing to discuss the provision of early private bus services within the DSP, to be pre-funded by Stockland, to be developed in liaison with PTA and DoT for implementation. Further stages beyond DSP Planning will require Applicants to work with the PTA to provide adequate bus services through the DSP. Routes and final bus stop locations are to be determined in next stages of planning, however this DSP analysis notes St Albans Road and Telephone Lane can service 400m and 800m walk catchments to cover some 75-85% of the DSP dwellings proposed.

6.1.6 The North-East Baldivis DSP will maximise pedestrian and cyclist/e-mobility connections to the local and regional pedestrian / cycle network. These links will provide for efficient access to activity nodes of the two Neighbourhood Centres, schools, as well as public open space and public transport stops. The DSP recommendations include:

- The existing Principal Shared Path (PSP) connection from St Albans Road to Telephone Lane and over the Kwinana Freeway bridge is maintained and improved where required within the North-East Baldivis DSP.
- Based on the train infrastructure and patronage analysis, there are no constraining factors as to why the North-East Baldivis DSP development cannot rely on the Wellard Station infrastructure.
- The Park N Ride bays are currently at capacity at both Kwinana and Wellard Train Stations. However, based on the low use of bike parking observed at Wellard Station, encouragement for passengers of rail transport to arrive by bike, e-mobility devices (which can be carried on the train) and/or use of bus feeder services is recommended with surrounding urban developments.

- In accordance with Safe System Principles, vehicle speeds are limited wherever possible through the DSP area to improve road safety, especially around the schools and centres.

Appendix A North-East Baldivis DSP Concept Plan

This plan has no formal approval status and has been prepared by CLE to demonstrate one potential land use scenario for the land which could be investigated further by the Client. Implementation in any form would be subject to the receipt of all appropriate approvals. The plan may be changed without notice and should not be relied upon. This plan remains the property of CLE.

Disclaimers

- This preliminary concept plan is prepared to illustrate a potential development scenario based on the key findings of DWER's 2021 "*East of Kwinana and Pinjarra and Ravenswood planning investigation areas - Flood risk management land capability assessment*". It is informed by high-level inputs and site constraints and may change as a result of more detailed planning for the site.
- The land shown as 'Flood Storage' represents a comparably sized area to that shown at Figure 24 (scenario 1 Option B) of DWER's "*East of Kwinana and Pinjarra and Ravenswood planning investigation areas - Flood risk management land capability assessment*" but in a different configuration.

DSP AREA (ha)	757.22
less	
Flood storage (Excluding POS within Flood Storage)	289.82
Wetlands	31.65
Powerline easement (Excluding Flood Storage)	2.76
MRS road widening	6.80
Total	331.03
NET SITE AREA (NSA)	426.18
Deductions	
Centre	12.34
Employment	21.44
School	24.50
Total	58.28
GROSS SUBDIVISIBLE AREA (GSA)	367.90
8% POS Requirement	29.43
POS Provided	31.35
Gross Residential (Including Roads)	336.55

DSP Area Total Flood Storage 310.94ha
(inc P.O.S. and Powerline Easement within Flood Storage plus 40% of Lot 470)

STOCKLAND OWNERSHIP AREA (SOA)	466.29
less	
Flood storage (Excluding POS within Flood Storage)	176.22
Wetlands	12.59
Powerline easement (Excluding Flood Storage)	2.76
MRS road widening	1.29
Total	192.86
NET SITE AREA (NSA)	273.43
Deductions	
Centre	2.00
Employment	12.54
School	11.00
Total	25.54
GROSS SUBDIVISIBLE AREA (GSA)	247.89
8% POS Requirement	19.83
POS Provided	19.83
Gross Residential (Including Roads)	228.06

Stockland Ownership Area Total Flood Storage 189.22ha
(inc P.O.S. and Powerline Easement within Flood Storage)

LEGEND

- DSP Area - 757.22ha
- Stockland Landholdings
- Residential
- Employment
- Centre
- Primary School / High School
- Flood Storage (exc. P.O.S.)
- Public Open Space
- POS Within Flood Storage
- Wetlands
- Powerline Easement
- Road Widening
- Neighbourhood Connector
- Potential Neighbourhood Connector (To be discussed)
- Existing Stockyards
- 1000m Buffer To Existing Stockyards

MILLAR ROAD
FREEWAY
KWINANA FREEWAY
ST ALBANS ROAD
TELEPHONE LANE
DUCKPOND ROAD
MUNDIJONG ROAD
Millars Landing
P.S. 1
P.S. 2
P.S. 3
P.S. 4
D.O.S.
H.S.
1000m
Existing Road Access to be Retained in Short/Medium Term
Possible Access off Mundijong Road to be Confirmed by P.J.A.
Industrial Expansion (Planning Investigation Areas Update Sept 2022)
17.06.2016 nearmap.com

0 100 200 300 400 500 750m 1km

CLE Town Planning + Design

PRELIMINARY CONCEPT PLAN

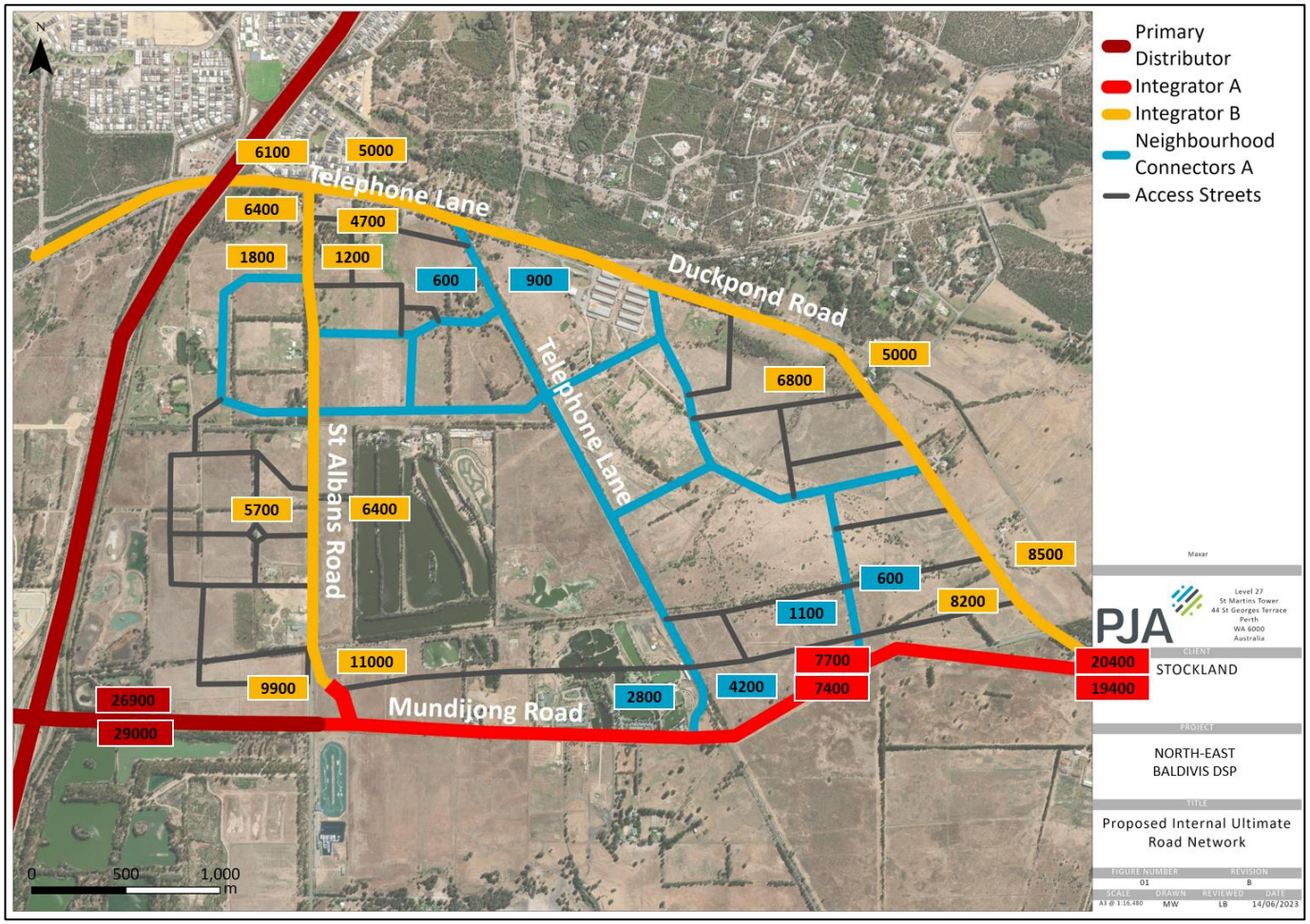
Mundijong Road, Baldivis

DRAFT

plan no: 3097-24C-01
date: 10 November 2022
scale: 1:12,500 @A3

N

Appendix B Road Hierarchy and Total Traffic Flows (2051)

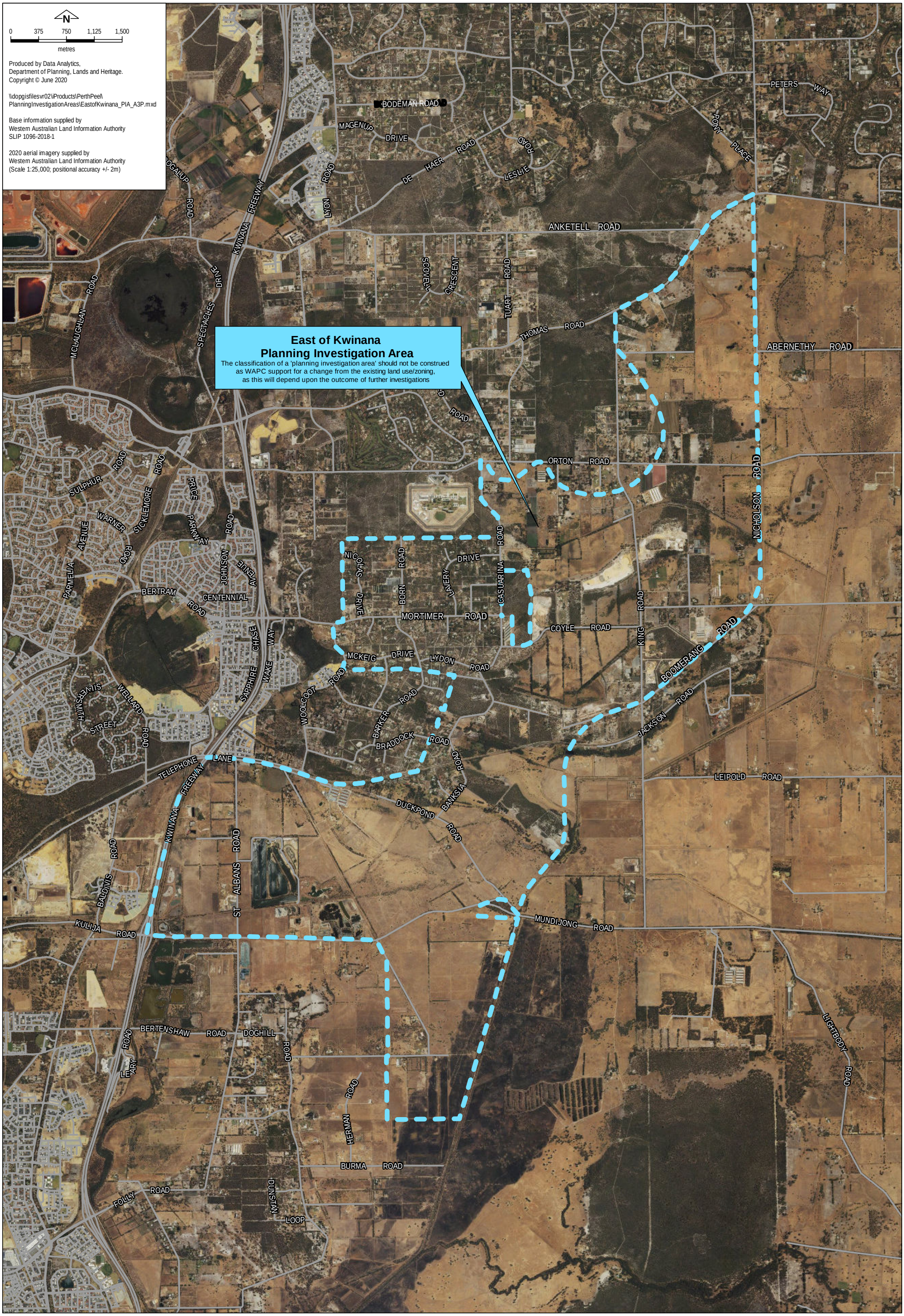


Road hierarchy classifications per Liveable Neighbourhoods.

Appendix C East of Kwinana Planning Investigation Areas

(source: wa.gov.au)

East of Kwinana Area



East of Kwinana Planning Investigation Area