

Acumen Development Solutions

Carabooda District Structure Plan

Transport Impact Assessment

September 2026

Project Code: 06824



Version Control and Approval

Version	Date	Main Contributor	Issued by	Approved by
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Executive Summary

PJA has been engaged by Acumen Development Solutions (“the Applicant”) on behalf of the land owner groups, to prepare a Transport Impact Assessment (TIA) to assist in the development of a District Structure Plan (DSP) for a portion of land located in Carabooda, Western Australia (“the Site”). The Site is located within 40km radius from the Perth CBD and is less than 5km to both the Alkimos Railway and Bus Station and the Alkimos Secondary Activity Centre, while being around 6km from Alkimos Beach from the western boundary of the Site. The Site currently comprises approximately 980ha of total land area with around 910ha of Brownfield land including existing roads and conservation areas (existing road reserves and Water Corporation owned land). The boundaries of the Site consist of Carabooda Road (north), Cutler Road/Bush Forever Land (east), Wesco Road (south) and Karoborup Road/Gibbs Road (west). Wanneroo Road is located approximately 800m west of the Site with Carabooda Lake and Lake Nowergup providing a natural recreational / open space boundary. The Site sits under the jurisdiction of the City of Wanneroo Local Government Area (LGA).

The District Structure Planning stage within the *WA Planning Framework* is formed on the basis of the overarching Sub-Regional Planning Frameworks/Structure Plans (*Perth and Peel at 3.5million people – North West Sub-Regional Framework 2018*), Local Planning Strategy (*City of Wanneroo Draft Local Planning Strategy 2041, City of Wanneroo Place Strategy 2023-2027, City of Wanneroo Active Transport Plan 2022/23 – 2025/26 and City of Wanneroo Transport Strategy 2019/20*) and Local Planning Scheme (*City of Wanneroo District Planning Scheme No. 2/ City of Wanneroo draft Local Planning Scheme No.3*). The *Perth and Peel at 3.5million people – North West Sub-Regional Framework (2018)* indicates a number of proposals to the external transport network including the Yanchep Rail Extension (YRE) (completed in July 2024), the Mitchell Freeway extension (to Romeo Road completed in July 2023, with the staged extensions to Eglinton and Indian Ocean Drive anticipated between 2031 and 2050) and Whiteman-Yanchep Highway (anticipated to be completed post 2051). The City of Wanneroo draft Local Planning Strategy 2041, Place Strategy 2023-2027, Active Transport Plan 2022/23-2025/26 and Transport Strategy 2019/20 were reviewed and highlight a desire to promote alternative and sustainable transport modes across the LGA.

The major roads comprising of Wanneroo Road, Romeo Road, Mitchell Freeway, Old Yanchep Road and Marmion Avenue are within 5km of the Site. Additionally, Tonkin Highway and Great Northern Highway are around 30-40km east of the Site.

The Site has recently been unlocked with a new bus and train station services recently opened at Alkimos Railway and Bus Station located some 3.5km away.

There are no formal active transport provisions within the Site at present. The nearest existing path networks are on Romeo Road (shared path) and the Mitchell Freeway corridor (principal shared path). Additionally,

Romeo Road connects to the Yaberoo Budjara Heritage Trail which is an unsealed walking/mountain biking trail and ultimately connects to Burns Beach Road, between Mitchell Freeway and Joondalup Drive.

The DSP is proposed as an urban development with 9,221 residential dwellings, around 68,400m² GFA of commercial centres, six primary schools, one government secondary school and one private college, in addition to 61ha of public open space (POS) and 224ha of conservation reserve, with an anticipated full development forecast year of 2048.

The proposed road access locations from the DSP boundary comprise of six connections, two on the north (via Karoborup Road and Cutler Road), one on the west (via Karoborup Road/Carabooda Road and Karoborup Road/McLennan Drive) and three on the south (via Nowergup Road, Gibbs Road and Wesco Road). The DSP comprises a network of existing and development roads including Integrator A, Integrator B and Neighbourhood Connectors running north to south and east to west, and local access roads.

For the purposes of the DSP, the modal share targets identified in the *Perth and Peel Transport Plan for 3.5 Million People and Beyond (Summary) (2016)* have been considered. The proposed transport infrastructure has been planned to support achievement of these targets, to the extent practicable, through the delivery of connected and accessible walking and cycling networks that promote active transport and contribute to the target modal share outcomes.

Ultimately, the DSP is estimated to generate in the order of 89,500vpd of which around 74% are distributed onto the external road network and the remaining 26% are distributed among the internal DSP road network. Of the internal 26%, some 70% are commercial based and 30% are school based vehicle trips.

The 2046 Main Roads WA (MRWA) Regional Operations Model 24 Hours (ROM24) sub-area cordon matrices indicate of the internal generated trips, 31.6% have internal destinations and 68.4% have external destinations. Furthermore, the data indicates 18.9% of trips inside the DSP have internal origins and destinations, 40.8% have internal origins and external destinations, and 40.3% have external origins with internal destinations.

The trips external to the DSP are split accordingly to the MRWA ROM24 data with around 29% via Romeo Road west, 22% via Wanneroo Road south, 19% via Wanneroo Road north, 19% via Whiteman-Yanchep Highway south, 10% via Gibbs Road (south of Wesco Road) and 1% via Whiteman-Yanchep Highway north.

The road hierarchy is proposed to comprise of the following, based on the distributed daily traffic volumes and indicative midblock two-way daily traffic volumes, with the ultimate road reservation widths and typical cross-section profiles to be determined within the subsequent planning stages.

Ultimate (full) development road hierarchies are:



- **Integrator A/B:** Karoborup Road (east of Romeo Road), McLennan Drive, Karoborup Road (between McLennan Drive and Greenlees Way), Gibbs Road, Wesco Road/Nowergup Road and the NS Road (between Wesco Road and the northern road of the high school/commercial area).
- **Neighbourhood Connector A/B:** Kiln Road, Karoborup Road (between Greenlees Way and Carabooda Road), Carabooda Road, Greenlees Way, the NS Road (between the Integrator B portion and Carabooda Road), both of the EW Roads (between Gibbs Road and the NS Road) and the NS Road (south of the private college to Wesco Road), Gibbs Road (between Gibbs Road at Godel Road to Karoborup Road).

Staging considerations:

It is noted that the land east of the Carabooda water tank has few constraints to immediate development, being cleared of native vegetation and predominantly in single ownership (as Lot 121 Carabooda Road). A Staging Plan has been presented in Part 2 of the Town Planning DSP report to reflect this, showing this area as a short- to medium-term priority. The intended Local Structure Plan (LSP) boundaries also reflect this intention.

Ultimately, most traffic from the Lot 121 area will obtain east-west access to external routes via McLennan Drive, however, this is a significant piece of infrastructure for which there is no short-term need. The Lot 121 area is proposed to initially obtain access to external routes via an extension of Kiln Road across the conservation estate, south of the water tank. This interim arrangement ensures that Lot 121 can develop concurrently with, or even ahead of, other land in LSP 2 further west. It also ensures that residential traffic will not interact with truck traffic related to the Godel Road quarry, which will be operating until the early 2030s and uses the eastern section of McLennan Drive for access (connecting into Godel Road and Gibbs Road). If McLennan Drive is constructed through to Romeo Road too soon, truck traffic and residential traffic will interact, and this is not preferred.

In the ultimate (full) development scenario, McLennan Drive and Kiln Road will share the role of servicing the east-west traffic from the Lot 121 area. In the meantime, Kiln Road will perform that role alone until the construction of McLennan Drive to its ultimate standard is necessary due to development reaching completion on land east of the conservation estate and enabled by the conclusion of operations at the Godel Road quarry.

In alignment with the City of Wanneroo Pathways Policy (October 2024), all Integrator and Neighbourhood Connectors require a minimum of a 2-2.5m wide concrete shared path on one side with Neighbourhood Connector A and Integrators also requiring a 1.5-1.8m wide concrete pedestrian path on the other side. Alternatively, if the road is identified within the Department of Transport long-term cycle network (LTCN), a 3m wide red asphalt path with centre line marking and wayfinding signage is required. Parts of Carabooda Road, Karoborup Road, McLennan Drive, Wesco Road and the NS Road have been identified as Secondary and Local routes on the LTCN.

The ultimate form and control of the intersections will be determined at the subsequent planning stages, with indicative controls of the intersections on the Integrator roads consisting of signals/roundabouts at intersecting Integrators and roundabouts/priority-controlled intersections at Integrators intersecting Neighbourhood Connectors.

Leveraging the State Government's extension of the Yanchep Rail Extension from Butler Station to Yanchep Station, which provides a train station at Alkimos approximately 3.5km of the Site. It is envisaged bus services will run from Alkimos Station to the DSP area as the area is occupied by residents and demand justifies the service. The Carabooda Urban Precinct offers an ideal location for a bus depot and investigations into a new depot for electric bus services is discussed to deliver a cleaner and lower-emissions public transport network.

The key school routes onto the higher order roads and crossing locations within the typical 800m catchment radius (approximately 5-minute ride or 10-minute walk) were identified. For secondary schools, the catchment radius could be extended to 1,500m to accommodate longer active travel routes of older children/young adults and the uptake of electric powered or assisted devices. Subsequent development planning stages should identify what additional infrastructure will be required to provide safe and convenient routes/crossings to school and determine the appropriate design for them. Additionally, consideration should be given for the provision of bicycle/scooter parking at schools.

There is potential for further active travel routes and trails through the public open space (POS) areas, connecting residential precincts to other trip generating lands uses such as shops and schools.

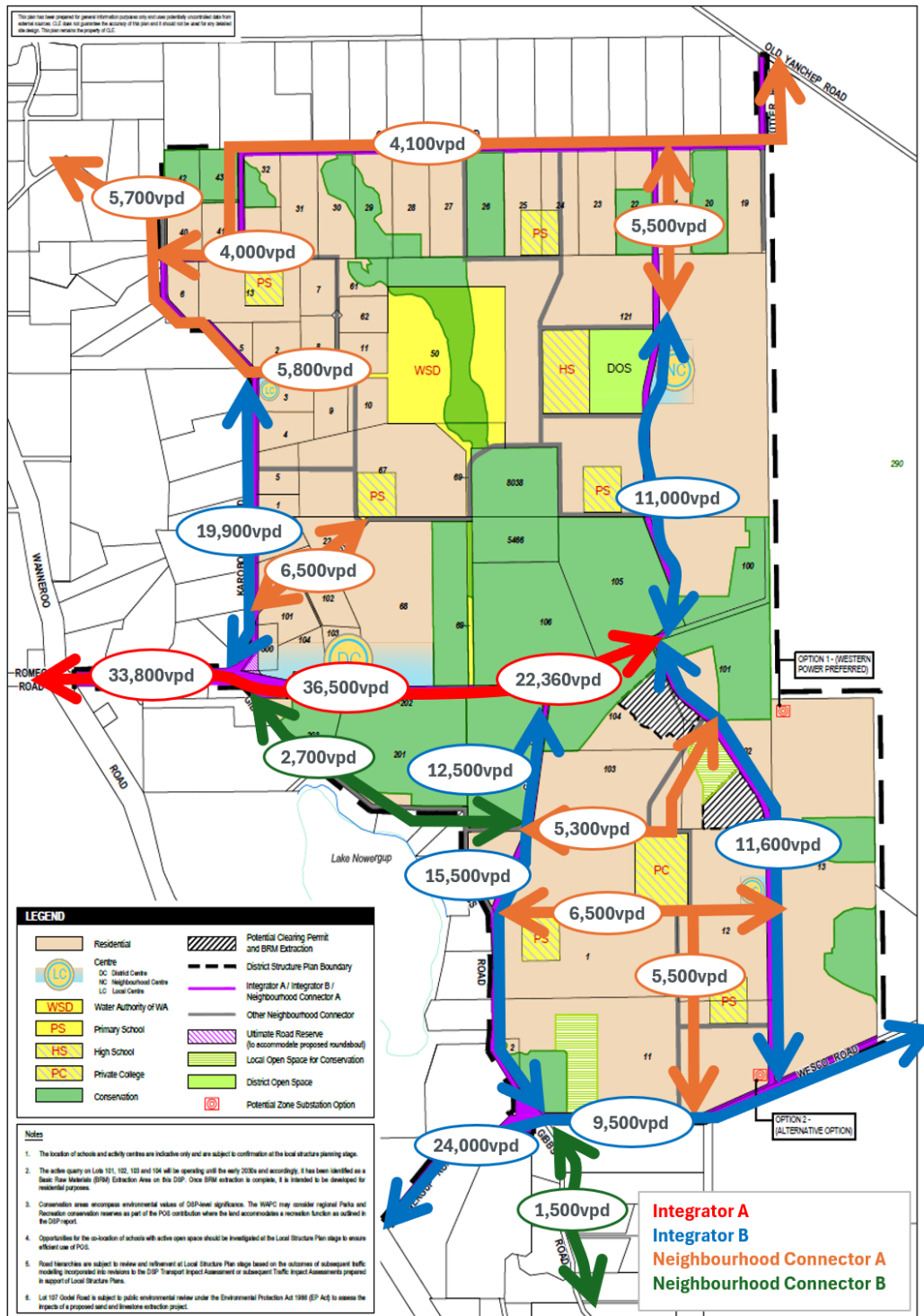
The proposed Road Hierarchy for the DSP area is provided in **Figure E-1**. This will also support bus and electric bus depot investigations.

The high level assessed *indicative* Intersection Controls on Integrator Roads are provide in **Figure E-2**.

The proposed Active Travel Network in consideration of the Department of Transport's Long Term Cycle Network is provided in **Figure E-3**.

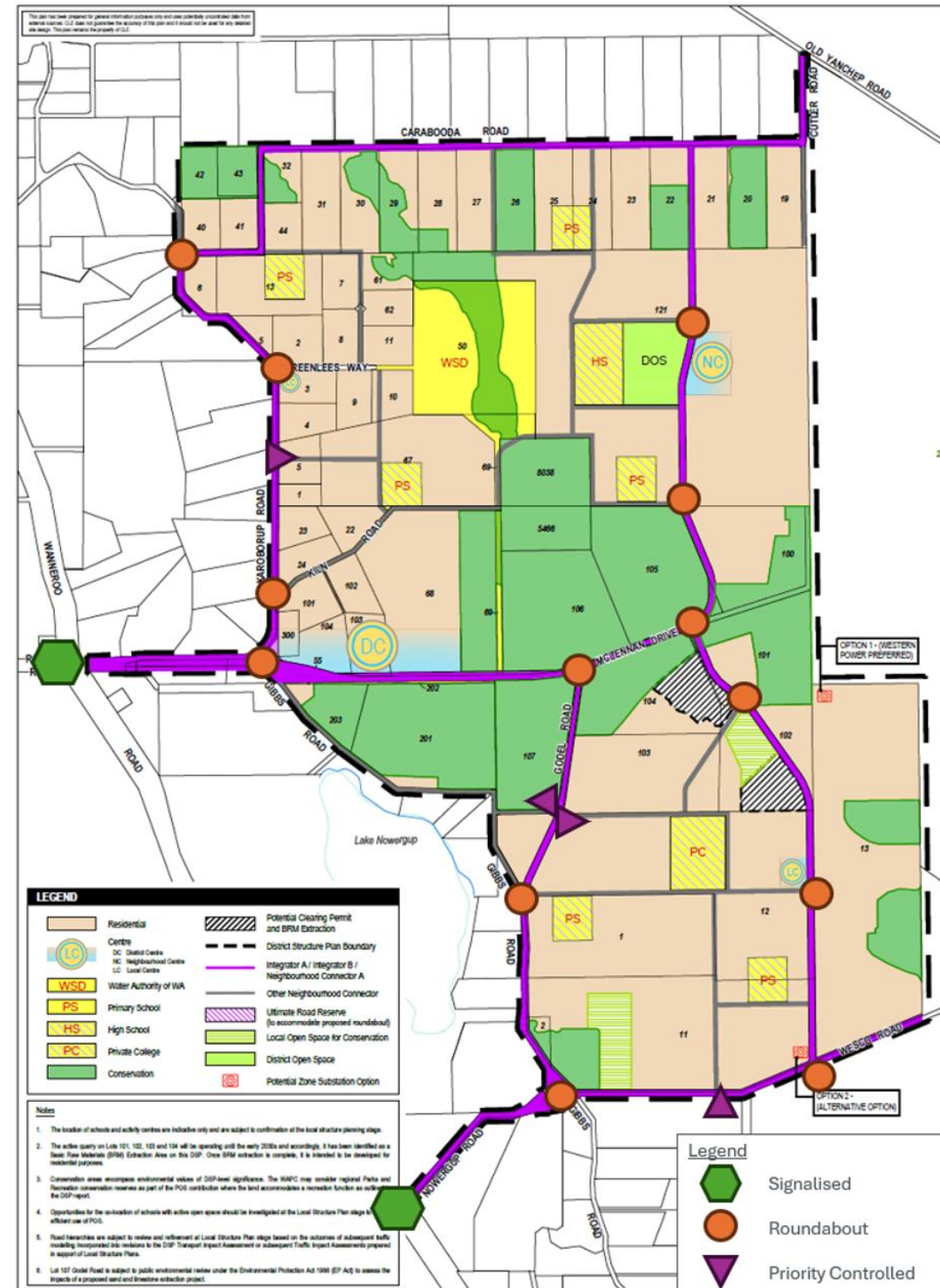
The preliminary proposed Key School Routes and Crossing Locations are provided in **Figure E-4** for future investigations to enhance road safety and support equitable access.

Figure E-1: Proposed Road Hierarchy



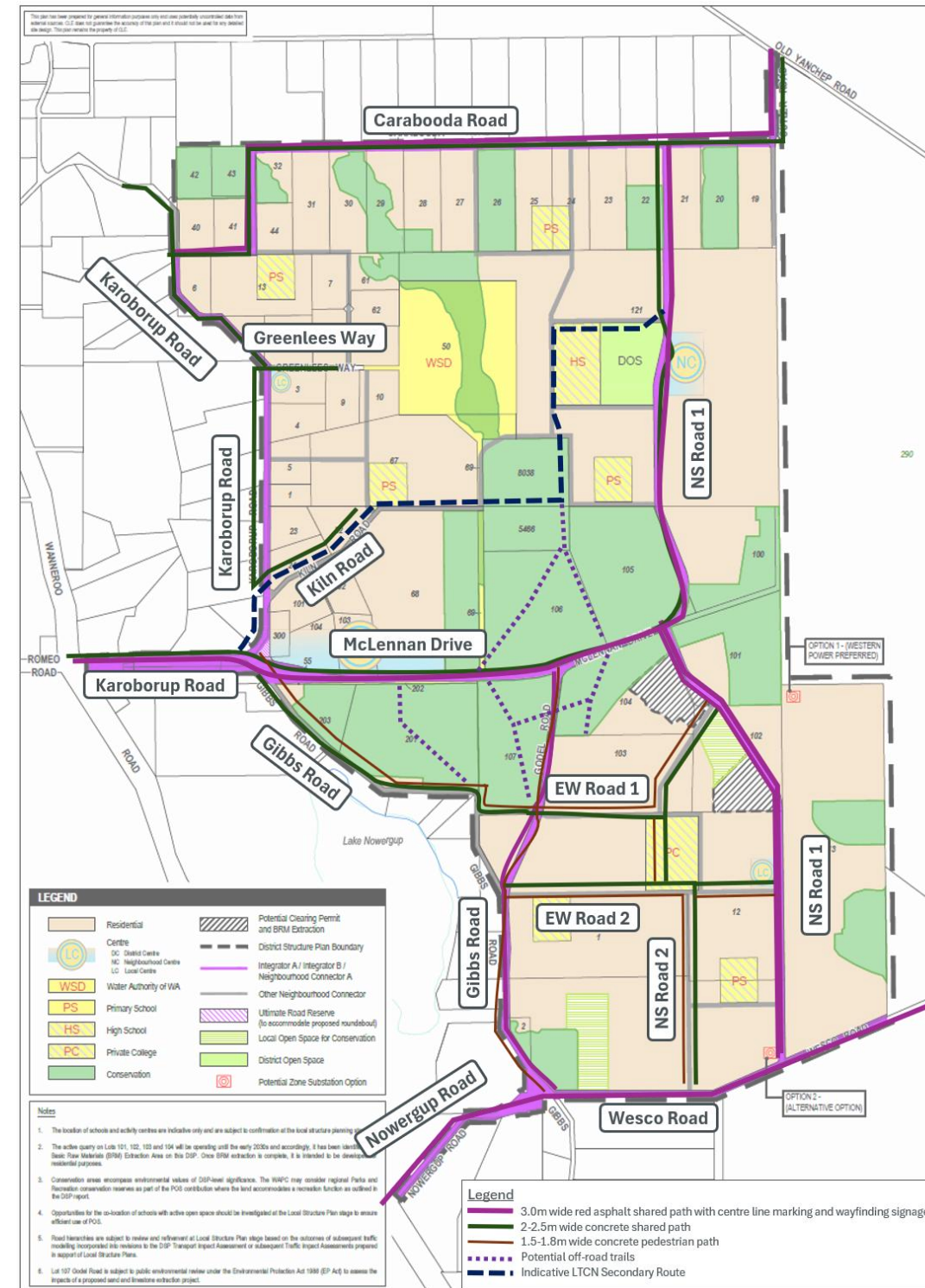
Base Image Source: CLE Town Planning + Design (14 July 2026)

Figure E-2: Indicative Intersection Controls on Integrator Roads



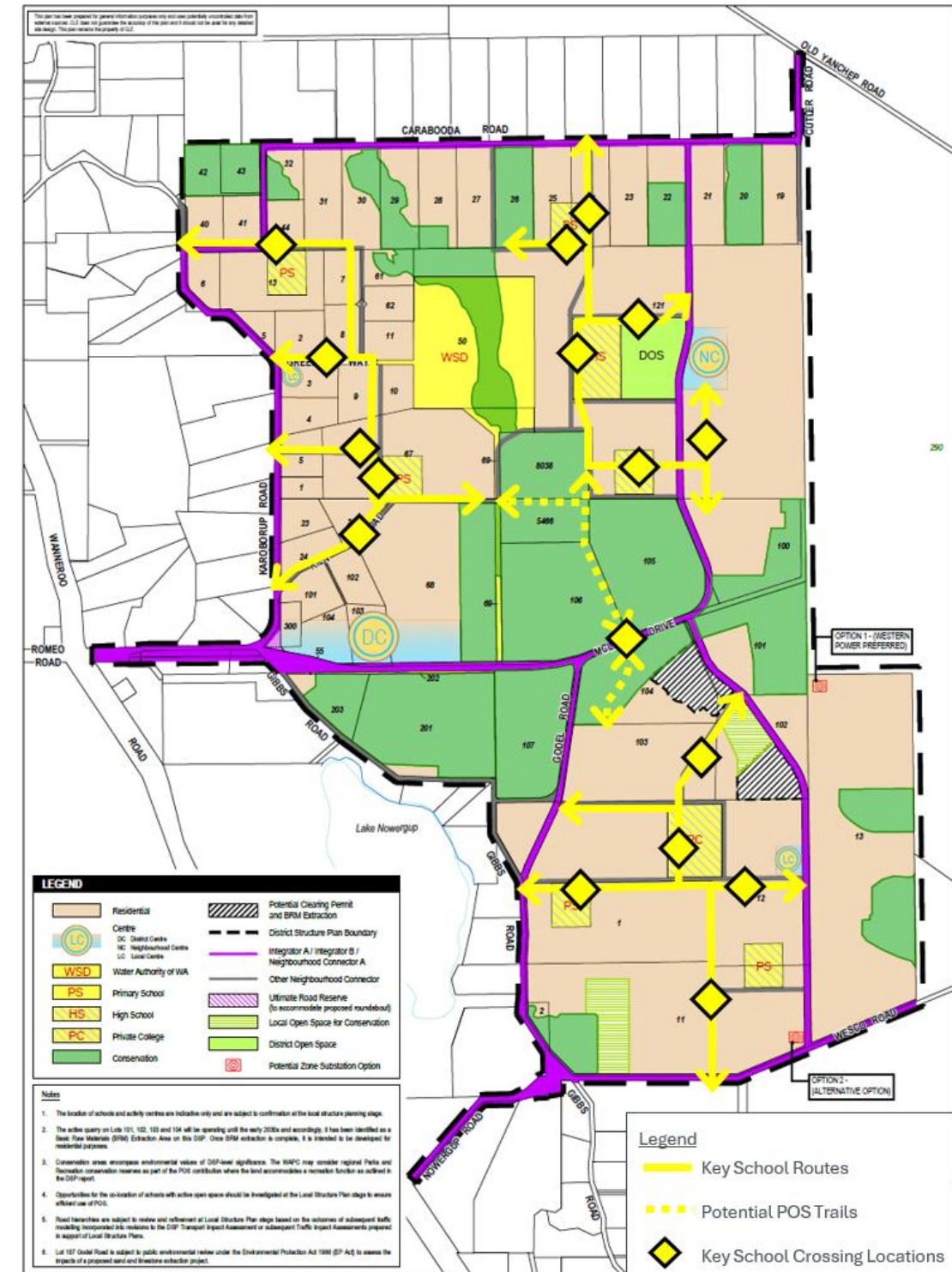
Base Image Source: CLE Town Planning + Design (14 July 2026)

Figure E-3: Proposed Active Travel Network



Base Image Source: CLE Town Planning + Design (14 July 2026)

Figure E-4: Key School Routes and Crossing Locations



Base Image Source: CLE Town Planning + Design (14 July 2026)



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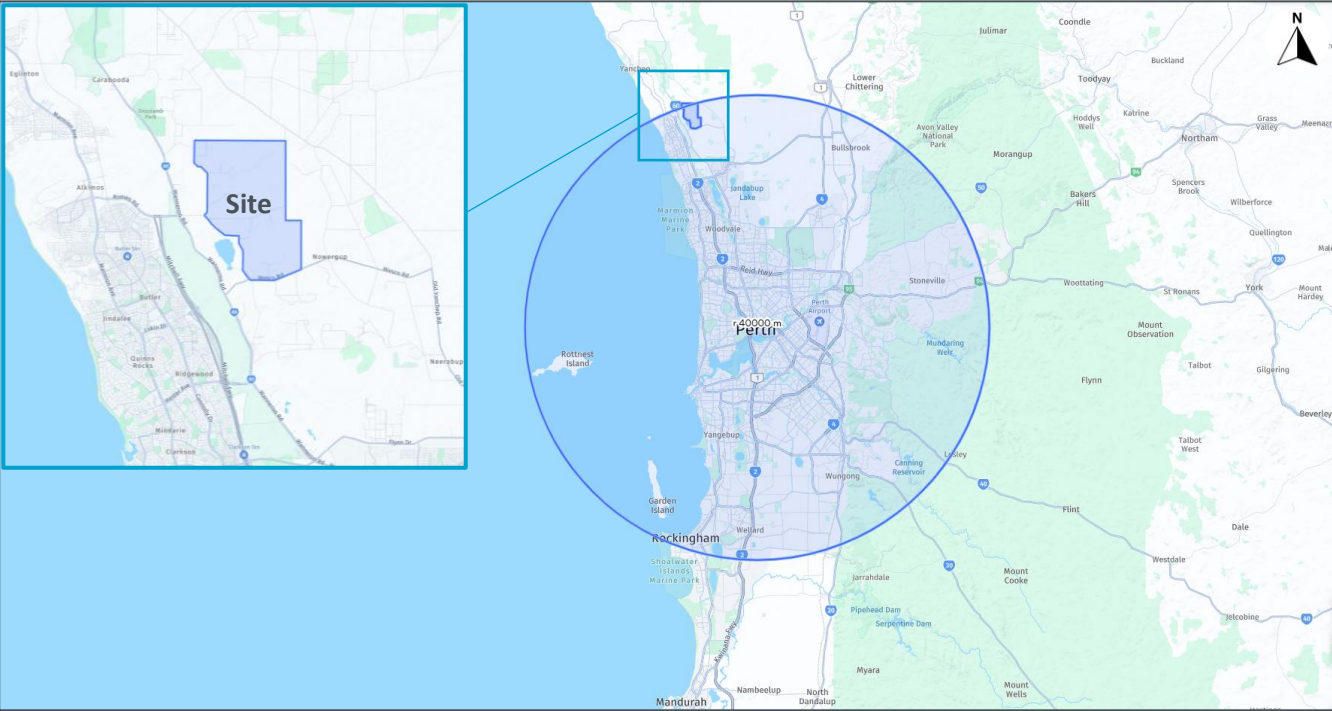
Appendix B District Structure Plan Layout 45

I Introduction

I.1 Background

PJA has been engaged by Acumen Development Solutions (“the Applicant”) on behalf of the land owner groups, to prepare a Transport Impact Assessment (TIA) to assist in the development of a District Structure Plan (DSP) for a portion of land located in Carabooda, Western Australia (“the Site”), under the jurisdiction of the City of Wanneroo Local Government Area (LGA). The Site is located within 40km radius from the Perth CBD and is less than 5km to both the Alkimos Railway and Bus Station and the Alkimos Secondary Activity Centre, while being around 6km from Alkimos Beach from the western boundary of the Site, as shown in **Figure 1-1**.

Figure 1-1: Site Location



Base Image Source: Nearmap

The Site currently comprises approximately 979ha of total land area with around 909ha of Brownfield land (deducts existing road reserves and Water Corp owned land). The boundaries of the Site consist of Carabooda Road (north), Cutler Road/Bush Forever Land (east), Wesco Road (south) and Karoborup Road/Gibbs Road (west). Wanneroo Road is located approximately 800m west of the Site with Carabooda Lake and Lake Nowergup providing a natural recreational / open space boundary.

I.2 Purpose of a Transport Impact Assessment

A TIA is required at all stages of structure planning in alignment with the *Western Australia Planning Commission (WAPC) Transport Impact Assessment Guidelines Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans*, which comprises of a “large area/broad brush assessment” with the following objectives:

- Assess the proposed internal transport networks with respect to accessibility, circulation and safety for all modes, that is, vehicles, public transport, pedestrians and cyclists.
- Assess the level of transport integration between the structure plan area and the surrounding land uses.
- Determine the impacts of the traffic generated by the structure plan area on the surrounding land uses.
- Determine the impacts of the traffic generated by the structure plan area on the surrounding transport networks.

On a broader level, the TIA should consider sustainability and travel demand management (TDM) issues. An approach to adopt the “vision and validate” method over the traditional “predict and provide” method will aim to validate the vision of overarching strategic planning with the provision of a transport network designed to facilitate the movement of people as safely and efficiently as possible.

I.3 Extent of Assessment

The extent of the TIA is to cover the following items at a high-level strategic network level.

- District Structure plan outline (refer **Section 2**).
- Existing situation (refer **Section 3**).
- Internal transport networks (refer **Section 4**).
- External transport networks (refer **Section 5**).
- Integration with surrounding area (refer **Section 6**).
- Analysis of transport networks (refer **Section 7**).
- Conclusions and Recommendations (refer **Section 8**).

1.4 Planning Context

The District Structure Planning stage within the *WA Planning Framework* is formed on the basis of the overarching Sub-Regional Planning Frameworks/Structure Plans, Local Planning Strategy and Local Planning Scheme.

A literature review of the key transport planning outcomes from State and Local planning documents is outlined in the following sub-sections.

1.4.1 Perth and Peel at 3.5million people – North West Sub-Regional Framework 2018

The objectives of the *Perth and Peel at 3.5million people* by 2050 planning frameworks are:

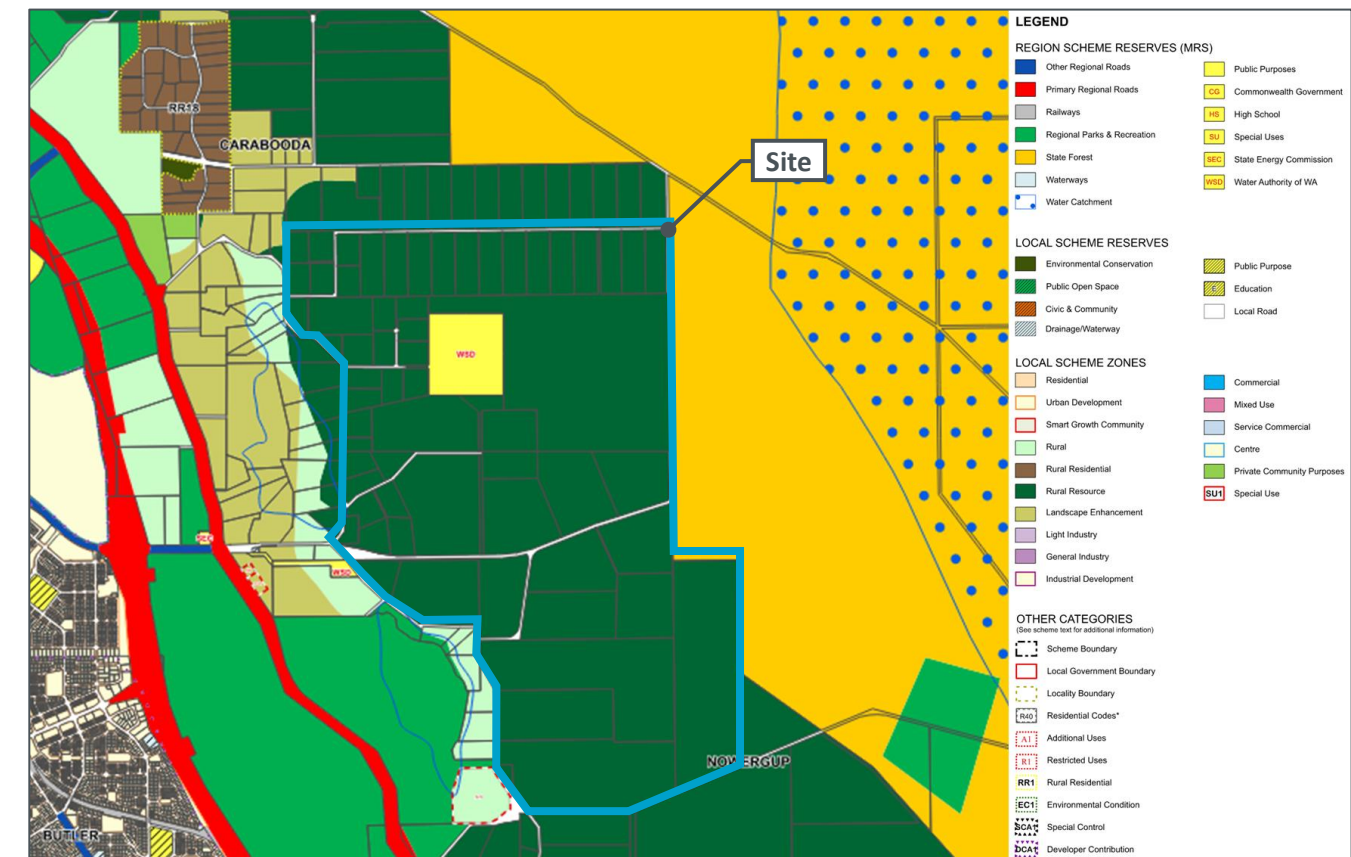
- To create sustainable communities that are attractive places to live and work. The consolidation of urban areas will provide for the more efficient use of urban land and infrastructure with improved access to public transport, sport and recreation, community and commercial facilities while minimising impacts on significant environmental attributes.
- To promote employment opportunities and increase the number of people who live and work within the sub-region, with a focus on attracting strategic economic and employment land uses within strategic metropolitan centres and key industrial centres, while maximising use of existing and proposed infrastructure.
- To provide a wide range of community and social infrastructure to enhance the health and wellbeing of the community and meet the community's needs including health, education sport and recreation, while promoting infrastructure co-location and optimising the use of existing facilities and infrastructure.
- To provide an efficient and effective regional movement network for people and freight that is integrated with land uses, links key economic and employment opportunities and connects the sub-region to the greater Perth, Peel and Wheatbelt regions.
- To ensure the timely, efficient and cost-effective delivery of electricity, water, wastewater and other service infrastructure that is aligned with the staging of development and encourage the shared use of infrastructure corridors by the various service providers.
- To preserve and enhance the environmental and landscape values of the sub-region for future generations to enjoy.
- To manage the availability and use of natural resources to ensure existing and potential land uses can be balanced against broader environmental outcomes.

Further strategic transport projects are outlined within this TIA under the relevant sections.

1.4.2 City of Wanneroo District Planning Scheme No. 2

The *City of Wanneroo District Planning Scheme No. 2* (DPS2) dated 31 October 2024 indicates the Site is zoned for “Rural Resource” land uses with one lot for the Water Authority of WA (Water Corporation) as shown in **Figure 1-2**. Hence an MRS Amendment is required to rezone the land for “Urban Development”.

Figure 1-2: City of Wanneroo District Planning Scheme No. 2 Site Land Use Zoning Context



Source: City of Wanneroo

The *City of Wanneroo* have indicated that a new *Local Planning Scheme No. 3* is being drafted and would supersede the DPS2.



1.4.3 City of Wanneroo Draft Local Planning Strategy 2041

The *City of Wanneroo* aim to adopt the *Draft Local Planning Strategy* in 2025. The draft implications and responses to the transport relevant endorsed strategies, plans and policies is provided in **Table 1-1** in order to determine how these align with the potential outcomes of the *Draft Local Planning Strategy*.

Table 1-1: City of Wanneroo Draft Local Planning Strategy Implications and Responses to Endorsed City Documents

Relevant Strategy/Plan/Policy	Draft Local Planning Strategy Implications and Responses
Transport Strategy 2019/20	The need to encourage a modal shift is broadly acknowledged by the Strategy, and underpins many of the actions listed in Part 1. The promotion of alternative transport modes has both direct and indirect environmental benefits/outcomes, and is addressed in the Infrastructure section of this planning strategy.
Active Transport and Cycle Plan 22/23 – 25/26	In addition to the comments above, an action of this strategy is to encourage greater uptake of alternative transport modes through more comprehensive provisions in the planning scheme, as well as to ensure that structure and precinct plans align with the recommendations and priority cycle routes listed in the plan.

1.4.4 City of Wanneroo Place Strategy 2023-2027

The *City of Wanneroo Place Strategy 2023-2027* outlines the District Sense of Place Statement as the place mechanism at the DSP planning framework level, which would be prepared by the City and aim to outline the approaches to the following drivers:

- To highlight unique place character and sense of place opportunities as part of the planning process.
- To foster a shared vision for a significant green fields or infill development.
- To retain sense of place and unique and important character of a place.

It is important to consider the direct connection between Movement and Place within this DSP TIA. The Site is within the “Established Rural Place Management Area”.



1.4.5 City of Wanneroo Active Transport Plan 2022/23 – 2025/26

The *City of Wanneroo Active Transport Plan 2022/23 – 2025/26* outlines the strategies to encourage active transport and cycling provided in **Table 1-2**.

Table 1-2: City of Wanneroo Active Transport Plan 2022/23–2025/26 Strategies to Encourage Active Transport & Cycling

Strategies	Resources	How this DSP responds to Strategies
1. Building connected LTCN routes	- Department of Transport and Major Infrastructure WA (DoTMI) Long-Term Cycle Network (LTCN) - City of Wanneroo Pathways Policy - City of Wanneroo Local Planning Policy 4.3: Public Open Space	The Carabooda DSP incorporates the LTCN routes: - Primary routes: Whiteman-Yanchep Highway. - Secondary routes: Wanneroo Road, an EW link between Wanneroo Road and Whiteman-Yanchep Highway (following the beginning of Karoborup Road), Wesco Road and a NS link through the DSP. - Local routes: two EW links between Wanneroo Road and Whiteman-Yanchep Highway (one following part of Carabooda Road and one following part of McLennan Drive).
2. A Place Management Approach	City of Wanneroo Place Strategy 2023-2027 Framework	The Carabooda DSP applies Movement and Place concepts into the district network planning, with areas which have a unique place character and sense of place opportunities as part of the planning process, for example Lake Nowergup.
3. Connection to City of Wanneroo Activity Centres	Department of Transport WA (DoTMI) Long-Term Cycle Network (LTCN)	Refer to Carabooda DSP’s Active Travel Network (Figure 7-10).
4. Linking Public Transport to the LTCN and Activity Centres	- A Yanchep Rail Extension Principle Shared Path by State Government - Connected Routes to Station Precincts - End of Trip Infrastructure	Leveraging the State Government’s extension of the Yanchep Rail Extension and the Alkimos Secondary Activity Centre with a bus and train station interchange ~3.5km to/from the Site. It is envisaged bus services will run from Alkimos Station to the DSP area. The Carabooda Urban Precinct is ideally located for investigations into a new bus depot for electric bus services. The DSP futureproofs and embeds sustainable transport enablers within the precinct design.
5. Easily Accessible End of Trip Facilities (EOTFs)	Secure bike/eRideable parking, lockers and showers should be incorporated in new and current developments where there is potential to attract new or cater for existing active travel transport users.	- Important note for next stages of Carabooda planning. - Additionally, the Carabooda DSP acknowledges the take-up of electric vehicles (private and public) is accelerating and as an example, the <i>Building Code 2022</i> has been updated to capture the need for commercial and apartment buildings to have features which facilitate the future installation of on-site renewable energy generation and storage of electric vehicle charging equipment. This DSP points to futureproofing and embedding sustainable transport enablers such as eRideables with EOTFs within precinct design.
6. Educating communities on positive lifestyle benefits of Active Travel	Engagement in educational opportunities.	Important note for next stages of Carabooda planning.

Strategies	Resources	How this DSP responds to Strategies
		Also refer to Carabooda DSP’s Access to Schools (Chapter 7.11) and Key Active Travel Routes and Crossing Locations (Figure 7-9).
7. Travel Planning & Wayfinding	- Your Move - Travel Plans - Wayfinding Signage - eRideable Signage	- Important note for next stages of Carabooda planning. - Also refer to Carabooda DSP’s Access to Schools (Chapter 7.11) and Key Active Travel Routes and Crossing Locations (Figure 7-9).
8. Links to the Natural Environment	Connection of the natural environment (parks and reserves) to the shared path network of the ‘built’ environment from transport hubs and activity centres so that the community can safely and conveniently access them.	- Refer to Carabooda DSP’s Active Travel Network (Figure 7-10). - Also refer to Carabooda DSP’s Access to Schools (Chapter 7.11) and Key Active Travel Routes and Crossing Locations (Figure 7-9).
9. Well-maintained infrastructure	City of Wanneroo Transport Asset Renewal Capital Works Program	Transparent DSP reporting to prioritise projects based on safety, usage, lifecycle costs, aligning with long-term asset management plans and ensure continuous improvement in program delivery.



1.4.6 City of Wanneroo Transport Strategy 2019/20

The principles and focus areas outlined in the *City of Wanneroo Transport Strategy 2019/20* are provided in **Table 1-3**.

Table 1-3: City of Wanneroo Transport Strategy 2019/20 Principles and Focus Areas

Principles	Focus Areas	Responded to in DSP?
1. Place-based land use and transport planning	• Transit Oriented Development: Implementing stronger relationships between land uses and transport. • Urban Villages: Supporting a mix of land uses in neighbourhoods that provide local destinations that can easily be accessed by public transport, walking, cycling and via mobility aids. • Diverse and Accessible Activity Centres: Ensuring Activity Centres are connected to each other and are accessible.	• Yes – transport and land use integration. • Urban villages – to be delivered in next planning phase as part of neighbourhood centre design. • Yes – connected and accessible activity centres and schools.
2. Pedestrian-first environments	• Safety and Amenity: Designing high quality public realms and pedestrian environments that are interesting, attractive and safe. • Connected, Legible Pathway Network for all users: Connecting local residents with local destinations, including activity centres, parks, schools, community services, public transport infrastructure and areas of employment. • Universal Access: Incorporating universal access into street design and public transport infrastructure to cater for the young, the elderly and those with disabilities.	• Yes – Safe system principles and Movement and Place concepts throughout the DSP. • Yes – DSP is cognisant of accessibility for all with “good for some, is good for all”.
3. Prioritised cycle network	• Safe, Fast and Connected Networks: Providing a network of safe, cycling segments connecting key destinations through the shortest available routes. • Supporting Infrastructure: Providing destinations with secure parking and storage for bicycles. • Promoting Cycling Benefits: Promoting cycling by informing the community of the financial, health and environmental benefits. • Cycle Facilities in the Planning Process: Working with developers and considering cycle facilities in the planning process.	• Yes – DSP respects the LTCN and complies with Safe Access to schools. • Secure bike parking - to be delivered in next planning phase.
4. Convenient public transport	• Improving Network Coverage and Accessibility: Advocating for the provision of public transport within walking distance of residents. • Improving the Public Transport Network’s Legibility, Frequency and Connectivity: Identifying and advocating for frequent and a well-connected public transport networks in the key locations. • Priority Public Transport Infrastructure: Implementing intermittent priority lanes in the City for buses.	• Yes – DSP leverages the State Government’s extension of the Yanchep Rail Extension and the Alkimos Secondary Activity Centre with a bus and train station interchange ~3.5km to/from the Site. • Opportunity for Electric Bus Depot in Carabooda.
5. Effective freight network	• Key Freight Connections: Providing key freight networks that are efficient, effective and accessible. • Advocating for the Delivery and Protection of Key Freight Routes: Creating and maintaining a goods and services priority network that strengthens the City’s local economy.	• Yes – provisioning through an appropriate road hierarchy.
6. Well-connected employment precincts	• Well-Connected and Diverse Employment Precincts: Providing sustainable, efficient and affordable transport that connects with employment precincts and residential homes.	• Yes – heavy focus on active and bus transport integrated with land use.

Principles	Focus Areas	Responded to in DSP?
7. Travel behaviour change	• Informing People about Travel Choices: Considering initiatives to inform residents about their travel options.	• Travel Behaviour Initiatives – to be delivered in next planning phase.
8. Embracing technological change	• Exploring New Technological Initiatives: Carefully explore initiatives to encourage technological change. • Facilitating Change: Considering ways in which the City will facilitate technological changes. • Advocating for New Technology: Lobbying for new transport infrastructure to support the City’s population growth.	• Yes - DSP futureproofs and embeds sustainable transport enablers within precinct design. • The Carabooda Urban Precinct is ideally located for investigations into a new bus depot for electric bus services. • Provision for electric vehicles and micro mobility will become increasingly important, and the emergence of autonomous vehicles may form part of the transport mix over time and will become a focus in next phases of planning as a way of reducing transport emissions and achieving net zero by 2050.

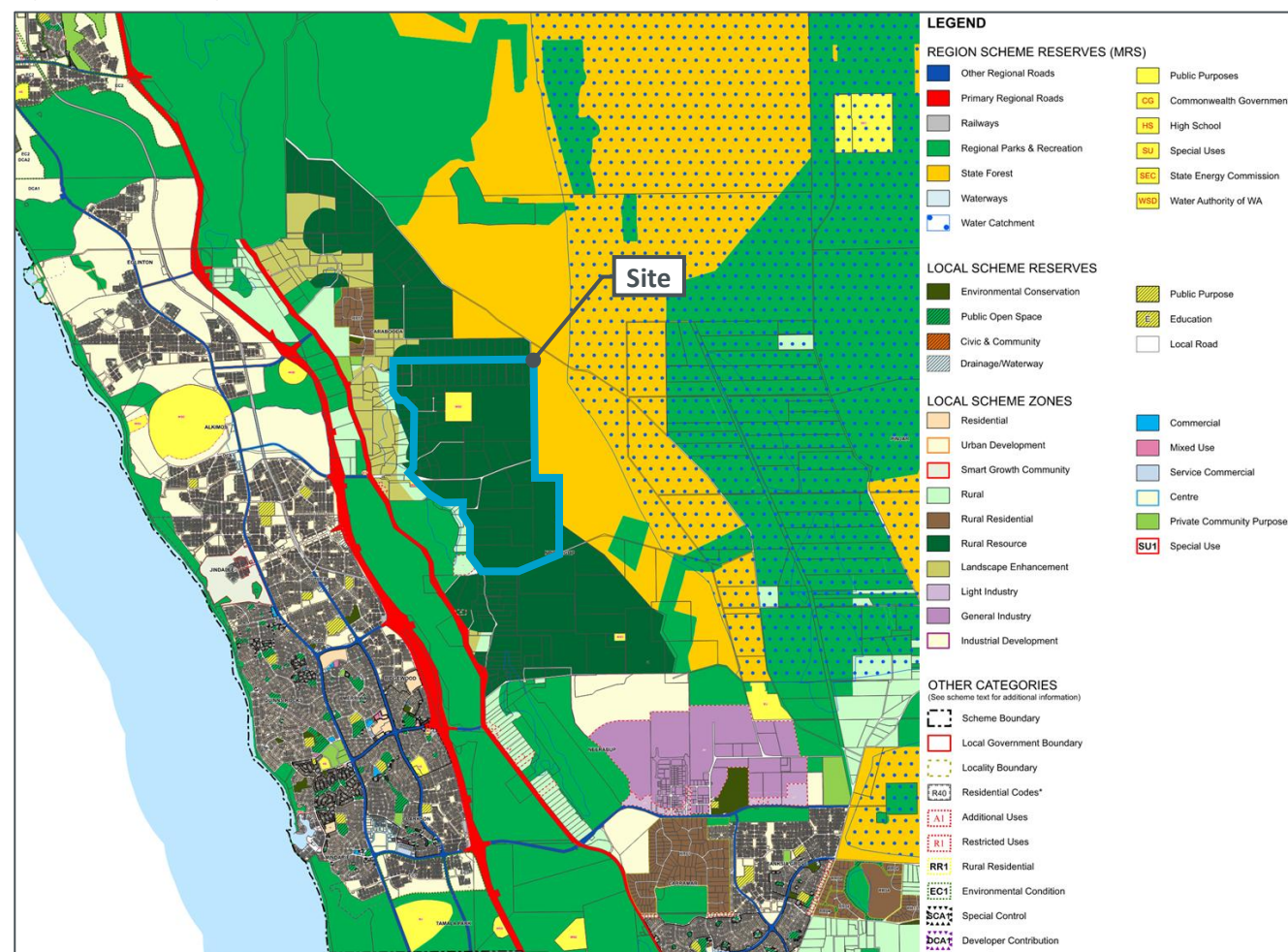
The City of Wanneroo indicate that these principles will be progressed through a Transport Plan to outline the actions, timeframes and milestones to achieve them. For the purpose of the DSP TIA, the principles above assist with determining modal priority and access strategies outlined in **Section 4.1**.

2 District Structure Plan development

2.1 Regional Context

The Site is located roughly half its area in Nowergup and half in Carabooda, east of Alkimos and Eglinton, south of Yanchep and west of Pinjar, with a land use zoning of “Rural Resource”, including one lot which is zoned for the “Water Authority of WA”. The coastal side of the City of Wanneroo LGA primarily forms “urban development” land uses up to Two Rocks. Neerabup, south of Nowergup, is primarily zoned for industrial land uses and the majority of the land to the north and east being zoned for Parks & Recreation and State Forests as shown in **Figure 2-1**.

Figure 2-1: Site Regional Context

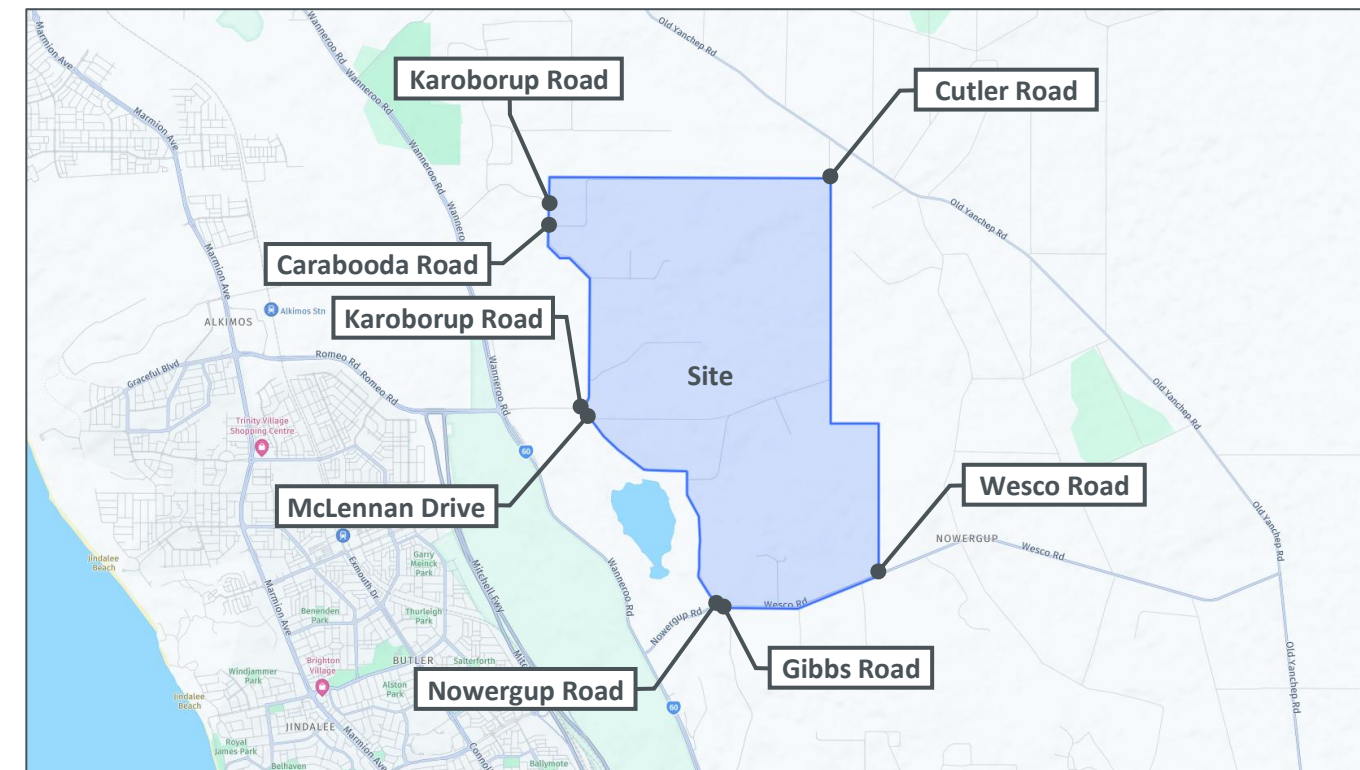


Source: City of Wanneroo

2.2 Access Arrangements

The proposed access locations, shown in **Figure 2-2**, from the DSP boundary comprise of two on the north (via Karoborup Road and Cutler Road), one on the west (via Karoborup Road/Carabooda Road and Karoborup Road/McLennan Drive) and three on the south (via Nowergup Road, Gibbs Road and Wesco Road).

Figure 2-2: Proposed Access Locations



Base Image Source: Nearmap

The proposed internal transport networks and the anticipated intersection forms are outlined in **Section 4** with exact geometric details to be determined in subsequent planning stages.

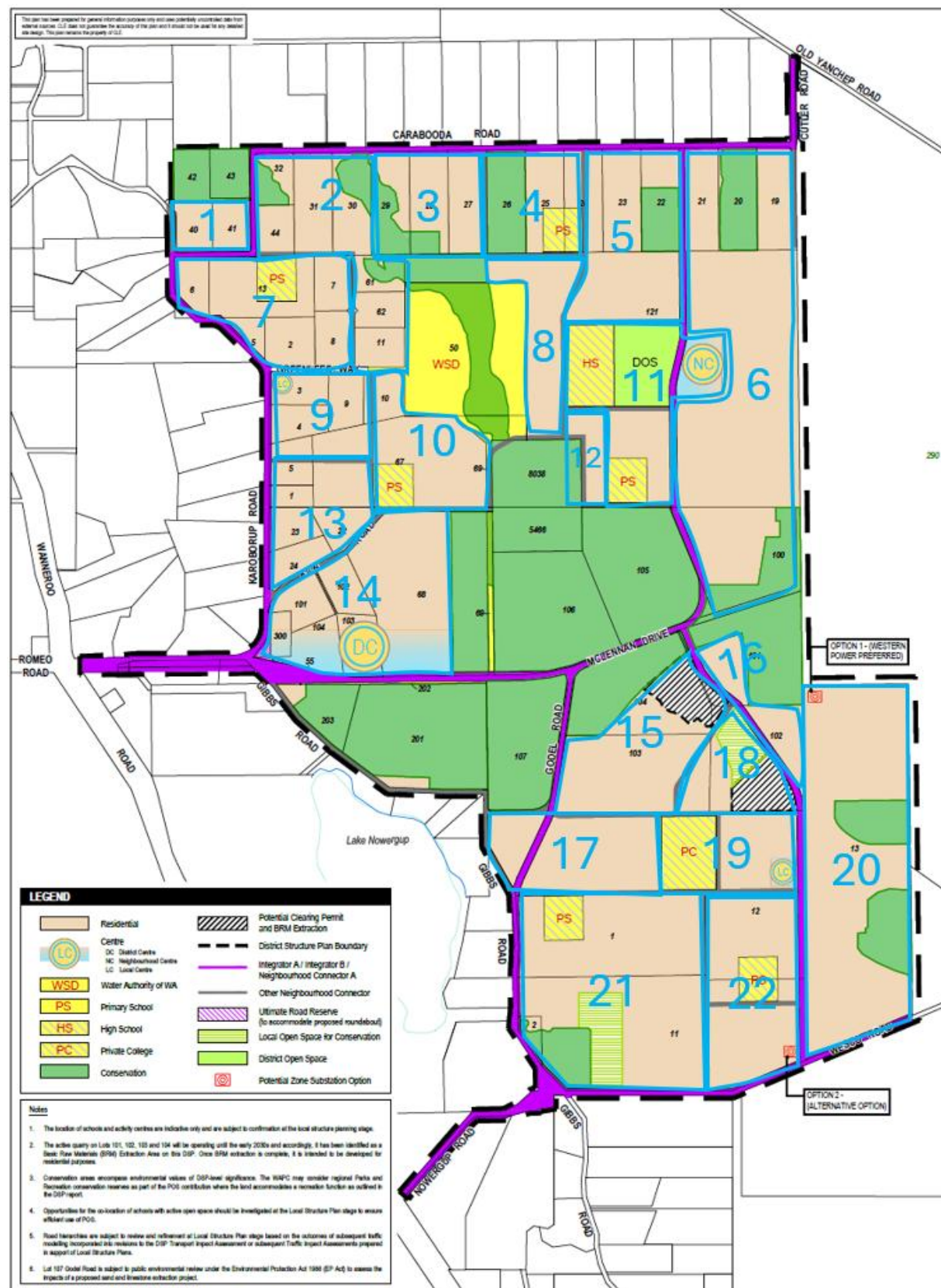
2.3 Layout

The district level road layout, with the traffic generating residential zones, is shown in **Figure 2-3**, overleaf.

The DSP comprises a network of existing and development roads including Integrator A, Integrator B and Neighbourhood Connectors running north to south and east to west, and local access roads. In all cases the road cross-sections will be designed to cater for utility services, on standard verge alignments, street trees, parking embayment's where appropriate, off-street and on-street cycling lanes in accordance with the overall pedestrian and cycling network.



Figure 2-3: Indicative DSP Layout with Yield Zones (refer Table 2-2)



Source: CLE Town Planning + Design (14 July 2026)

2.4 Land Uses

The DSP is proposed as an urban development with residential, commercial and educational land uses. A full breakdown of the proposed land uses and indicative yields, provided by *CLE Town Planning + Design* (11 December 2024) is summarised in **Table 2-1** with a breakdown of the yields per residential zone is provided in **Table 2-2**.

Table 2-1: Carabooda DSP Proposed Land Uses and Yields

Proposed Land Use	Indicative Yield
Residential Urban Development	9,221 Dwellings
District Commercial Centre	1x 46,500m ² GFA *
Local Commercial Centre	3x (1,200m ² , 4,500m ² and 16,200m ² GFA) *
Primary School (public)	6x 600 students per school
High School (public)	1x 2,000 students
Private College	1x 1,200 students
Public Open Space (POS)	61 ha
Water Authority of WA	37.48 ha
Conservation Reserve	224 ha

*Assuming Gross Leasable Floor Area (GLFA) is 30% of the total Lot size.

Table 2-2: Indicative Yield Breakdown per Residential Zone

Zone	Residential Dwellings	Commercial GFA	School Students
1	120	0	0
2	430	0	0
3	295	0	0
4	180	0	600
5	455	0	0
6	1140	0	0
7	470	0	600
8	340	0	0
9	265	1,200	0
10	355	0	0
11	285	16,200	2,600
12	145	0	0
13	305	0	600
14	480	46,500	0
15	485	0	0
16	150	0	0
17	435	0	600
18	235	0	0
19	115	4,500	1,200
20	1025	0	0
21	980	0	0
22	530	0	600

3 Existing Situation

3.1 Land Uses

The Site is currently occupied by various agricultural and light industry land uses, which are connected to the major road network via internal rural access roads. The Alkimos and Eglinton suburbs to the west of the Site are undergoing significant development, while the Butler suburb further south is primarily fully developed. Some of the key land uses are shown in **Figure 3-1**.

Figure 3-1: Existing Aerial Image



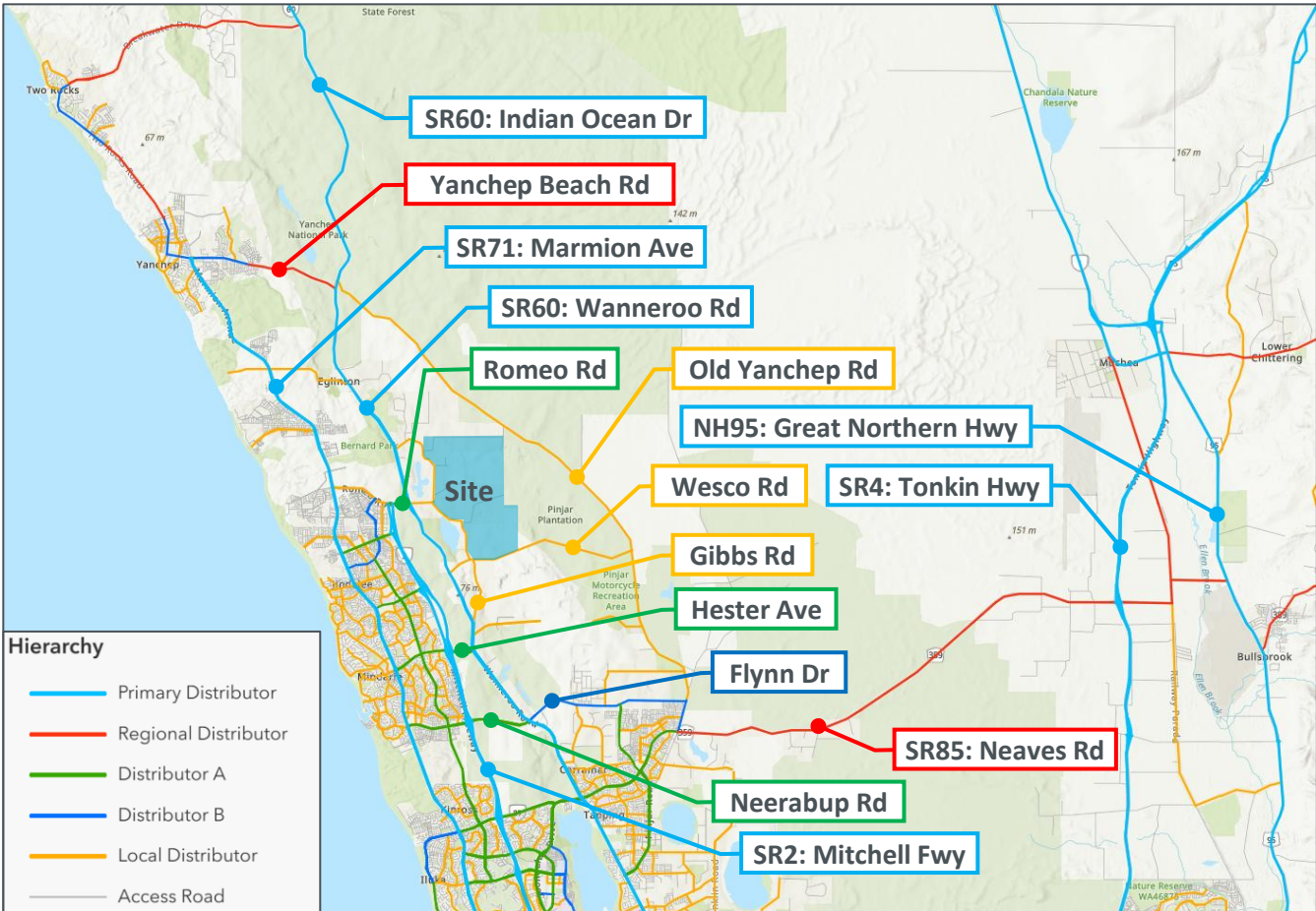
Base Image Source: Nearmap (October 2024)

The Site is less than 5km to both the Alkimos Railway and Bus Station and the Alkimos Secondary Activity Centre, while being around 6km from Alkimos Beach, from the western boundary of the Site.

3.2 Road Network

The *Main Roads WA Functional Road Hierarchy Classification* of the major road network surrounding the broader area is shown in **Figure 3-2**. The Site has existing convenient connections within 5km to Wanneroo Road, Romeo Road, Mitchell Freeway, Old Yanchep Road and Marmion Avenue. Additionally, Tonkin Highway and Great Northern Highway are around 30-40km east of the Site.

Figure 3-2: Surrounding Road Network Main Roads WA Functional Road Hierarchy Classification



Base Image Source: Main Roads WA

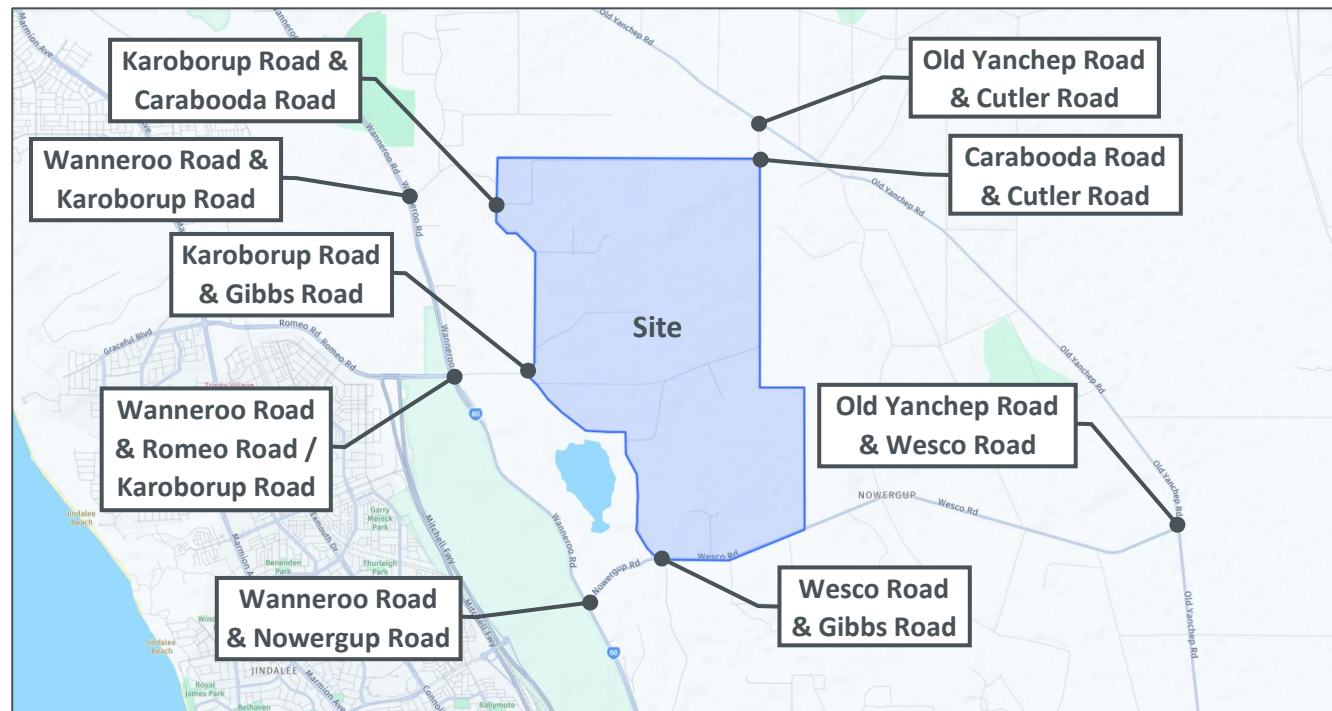
The characteristics of the existing road network providing access and/or bounding the Site are provided in **Table 3-1**.

Table 3-1: Road Network Characteristics of Proposed DSP Accesses

	Karoborup Road	Carabooda Road	McLennan Drive	Nowergup Road	Gibbs Road	Wescos Road	Cutler Road
MRWA Functional Hierarchy	Local Distributor	Access Road	Access Road	Local Distributor	Local Distributor	Local Distributor	Access Road
RAV Network	RAV 4 (SLK 1.35-4.24)	RAV 4 (SLK 0.0-3.26)	N/A	RAV 4 (SLK 0.0-0.89)	RAV 4 (SLK 2.3-3.65)	RAV 4 (SLK 0.0-5.93)	N/A
Speed Zoning	70km/h (posted)	70km/h (posted)	110km/h (default)	110km/h (default)	70km/h (posted)	110km/h (default)	110km/h (default)
Road Reserve Width	20m	20m	24.5m	20m	20m	20m	20m
Pavement Width	7.5m	6.3m	6.3m	7.5m	6.0m	7.5m	6.5m
No. of Traffic Lanes	2 (undivided)	2 (undivided)	2 (undivided)	2 (undivided)	2 (undivided)	2 (undivided)	2 (undivided)

The existing key intersections external to the DSP are shown in **Figure 3-3**.

Figure 3-3: Existing Surrounding Intersection Controls



Base Image Source: Nearmap (December 2024)

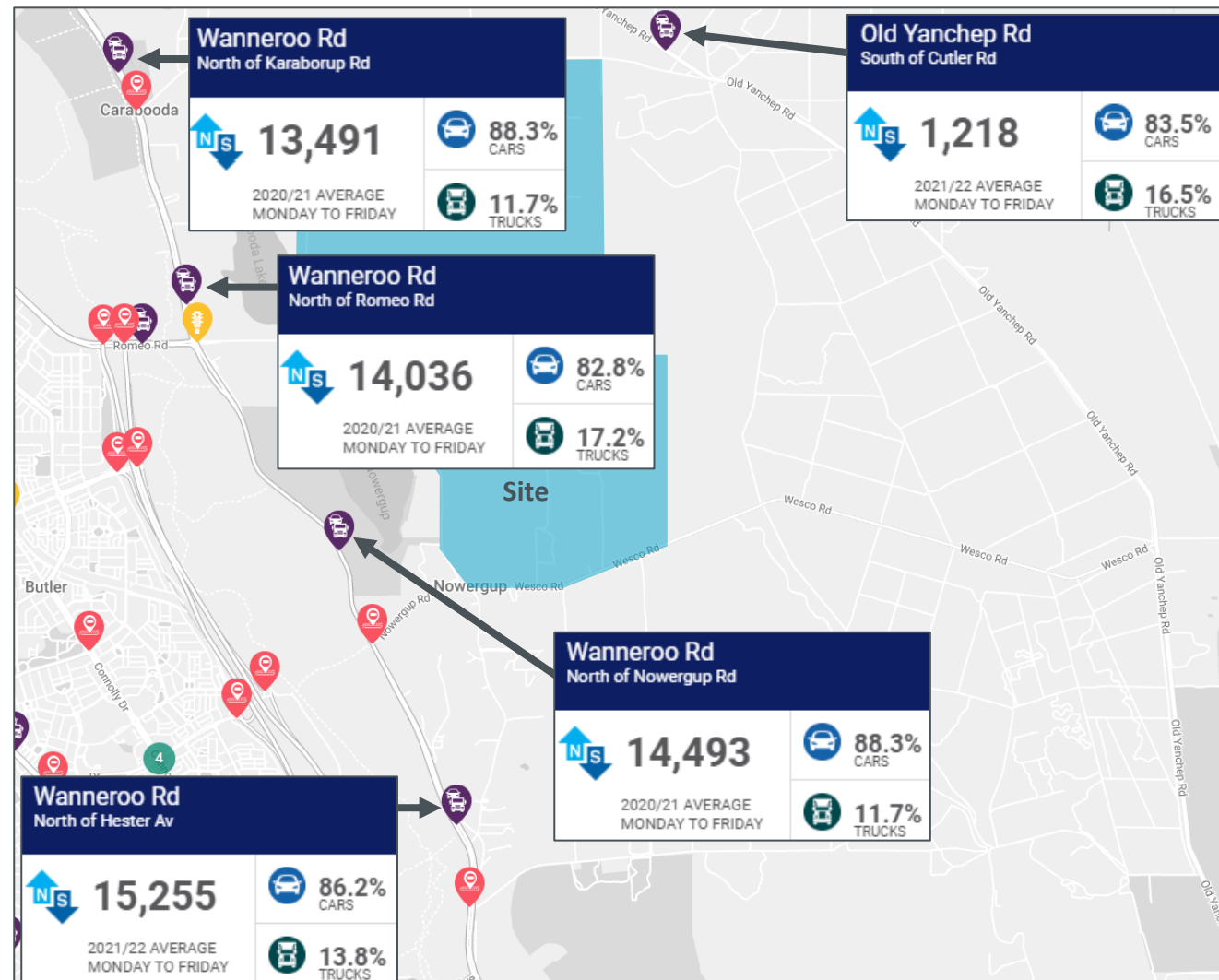
A description of each existing intersection is provided as follows:

- **Wanneroo Road & Romeo Road/Karoborup Road** is a 4-way traffic signal controlled intersection (LM01251) with dual lanes in each direction on Wanneroo Road and Romeo Road and single lanes in each direction on Karoborup Road. Each approach has a priority controlled (Give-Way) left-turn slip lane and additional short right-turn pocket lanes.
- **Wanneroo Road & Karoborup Road (north)** is a priority controlled (Give-Way) staged crossing T-intersection with dual lanes in both directions on Wanneroo Road and channelised left-turn/right-turn treatments (CHL/CHR). The Karoborup Road approach lane width facilitates separated left-turn and right-turn movements of around 50m long. The staged crossing allows for around 15m storage length within the 13m wide raised median on Wanneroo Road. There is a short built-up median dividing the traffic lanes on Karoborup Road at Wanneroo Road.
- **Wanneroo Road & Nowergup Road** is a priority controlled (Give-Way) T-intersection with dual lanes on Wanneroo Road southbound, single lane on Wanneroo Road northbound and Nowergup Road. There is lane widening (up to 6.5m) on the Wanneroo Road northbound lane, facilitating a rural basic right-turn treatment (BAR). The dual lane southbound lane facilitates a basic left-turn treatment (BAL) and a short (around 15m) left-turn lane is provided on Nowergup Road. Wanneroo Road has 2.0m wide sealed shoulders with edge lines and a double white dividing line. There is a short built-up median dividing the traffic lanes on Nowergup Road at Wanneroo Road.

- **Karoborup Road & Carabooda Road** is a priority controlled (Give-Way) T-intersection with a domestic driveway staggered to the north on Karoborup Road (major road). Both roads are undivided without separations lines or sealed shoulders. Karoborup Road has a pavement width of around 8.0m and Carabooda Road has a pavement width of around 6.0m.
- **Karoborup Road & Gibbs Road** is a priority controlled (Give-Way) T-intersection with single lane approach and exit legs on both roads, with Karoborup Road forming the major road. Both roads are undivided with dividing lines and unsealed/kerbed shoulders. Karoborup Road comprises of simple left-turn and right-turn treatments (SL/SR) with Gibbs Road facilitating around 8m of a left-turn onto the major road. The lane widths are around 3.9m on Karoborup Road and 3.1m on Gibbs Road.
- **Carabooda Road & Cutler Road** is a priority controlled (Give-Way) T-intersection with Cutler Road forming the major road and a no-through road to the south. Both roads are undivided and unmarked with unsealed shoulders. The pavement width on Carabooda Road is around 6.0m and Cutler Road north is around 5.0m wide.
- **Old Yanchep Road & Cutler Road** is a priority controlled (Give-Way) T-intersection with single lane approach and exit legs on both roads, with Old Yanchep Road forming the major road. Both roads are undivided with dividing lines and unsealed/kerbed shoulders. Old Yanchep Road comprises of simple left-turn and right-turn treatments (SL/SR) with Cutler Road facilitating around 8m of a left-turn onto the major road. The lane widths on Old Yanchep Road are around 3.0m southbound and 3.2m northbound. Cutler Road has around 3.0m wide traffic lanes.
- **Wesco Road & Gibbs Road** is a staggered priority controlled (Give-Way) T-intersection with single lane approach and exit legs on both roads, with Wesco Road forming the major road. Both legs are undivided with a solid dividing line between each direction of traffic. The roadside shoulders are unsealed on Gibbs Road and have a sealed width of around 1.0m with edge lines on Wesco Road. The traffic lanes widths are around 3.1m on Wesco Road and around 3.0m on Gibbs Road north and 3.9m on Gibbs Road south.
- **Old Yanchep Road & Wesco Road** is a priority controlled (Give-Way) T-intersection with single lane approach and exit legs on both roads, with Old Yanchep Road forming the major road. Both legs are undivided with a solid dividing line between each direction of traffic. The roadside shoulders are unsealed on both legs and the pavement width on Wesco Road is around 8.4m and 6.0-6.8m on Old Yanchep Road.

The available traffic volume data has been sourced via the Main Roads WA Traffic Map for the locations shown in **Figure 3-4**.

Figure 3-4: Main Roads WA Traffic Map Count Sites



Base Image Source: Main Roads WA (December 2024)

In addition to the traffic counter sites, daily intersection traffic count survey data classified by vehicle type, was undertaken on Tuesday 13 February 2024 by *SurveyTech* at the following locations.

- Wanneroo Road & Karaborup Road (6am and 4.15pm peak hours)
- Wanneroo Road & Nowergup Road (6am and 4.15pm peak hours).

Furthermore, SCATS data from Main Roads WA was requested for the same survey period at the Wanneroo Road & Romeo Road/Karaborup Road signalised intersection. The peak hours occurred at 6.15am and 4.30pm.

A summary of traffic volume data collated is provided in **Table 3-2**.

Table 3-2: Existing Two-Way Traffic Volume Data (13 February 2024)

Location	Daily (vpd)	AM Peak (vph)	PM Peak (vph)
Wanneroo Road (north of Karaborup Road)	13,327	1,026	1,146
Wanneroo Road (south of Karaborup Road)	13,932	1,062	1,183
Karaborup Road (east of Wanneroo Road)	1,159	108	91
Wanneroo Road (north of Romeo Road)	13,913	232	278
Wanneroo Road (south of Romeo Road)	6,092	112	135
Romeo Road (west of Wanneroo Road)	11,619	193	234
Karaborup Road (east of Wanneroo Road)	862	29	13
Wanneroo Road (north of Nowergup Road)	5,617	499	551
Wanneroo Road (south of Nowergup Road)	5,743	503	546
Nowergup Road (east of Wanneroo Road)	898	76	47

It is observed that the **traffic volumes on Wanneroo Road, south of Romeo Road**, from 2020/21 have **reduced by around 60%** since the extension of the Mitchell Freeway and connection via Romeo Road.

3.3 Public Transport Network

There are no existing public transport routes servicing the Site. The nearest bus and train services are located at Alkimos Railway and Bus Station.

3.4 Active Travel Network

There are no formal active travel provisions within the Site at present. The nearest existing path networks are on Romeo Road (shared path) and the Mitchell Freeway corridor (principal shared path). Additionally, Romeo Road connects to the *Yaberoo Budjara Heritage Trail* which is an unsealed walking/mountain biking trail and ultimately connects to Burns Beach Road, between Mitchell Freeway and Joondalup Drive.

3.5 Road Safety

A extract of the past 5-years of available recorded crashes on the Main Roads WA Crash Map for the period between 1 January 2019 and 31 December 2023 within the area shown in **Figure 3-5**, indicates that a total of 23 crashes were reported.

Figure 3-5: Historic Recorded Crash Data (2019-2023)



Source: Main Roads WA (December 2024)

A total of 12 crashes were recorded at mid-block locations, 10 of which were on Wanneroo Road and one each on Nowergup Road and Wesco Road.

- Two (2) fatalities have occurred on Wanneroo Road from head-on crashes, one involving a passenger car and a truck (March 2020) and one involving a passenger car and a motorcycle (January 2021).
- Both fatalities were recorded on a curved alignment in a section north of Nowergup Road. It is important to note that the Safe System speed threshold for head-on crash types is 70km/h in which the chance of survival rapidly reduces or in these cases were a vulnerable road user and

a heavy vehicle were involved, the threshold speed would be lower. It does not appear that any additional road safety measures have been put in place since these crashes occurred.

- A major property damage only (PDO major) head-on crash severity was recorded at the beginning of the dual carriageway portion; however, it is considered that the future duplication of Wanneroo Road (discussed further in **Section 5**) would involve the construction of a central median and increase the separation between two-way traffic.
- A total of six (6) hit-object/animal mid-block crash types were recorded with one resulting in medical severity, recorded 10m south of Nowergup Road where a driver colliding with a power pole in the dark with no street lights.
- The other five resulting in PDO major severity with two recorded on Wesco Road/Nowergup Road either side of Gibbs Road and two recorded on Wanneroo Road, north of Nowergup Road and one recorded south of Nowergup Road.

A total of 11 crashes were recorded at intersections within the observed boundary.

- Two PDO major severity crashes at both Wanneroo Road & Karoborup Road (north) (sideswipe same direction) and Wanneroo Road & Train Road (rear-end).
- One hospital severity rear-end crash type involving two motorbikes was recorded at the Gibbs Road northern approach to Wesco Road.
- Two PDO major severity crashes were recorded at Karoborup Road & Bailey Road (one right-angle crash type and one unspecified).
- Three crashes were recorded at Wanneroo Road & Romeo Road/Karoborup Road, with only one PDO major rear-end crash type being recorded following the intersection being signalised.
- Three crashes (two PDO major rear-end crash types and one PDO minor hit-object crash type) were recorded at Wanneroo Road & Nowergup Road.

A total of 12 crashes were reported at the intersection of Wanneroo Road and Nowergup Road including the 1km mid-block sections of each approach.

3.6 Mode Share

The ABS 2021 Census data for the Wanneroo LGA indicated that around 80% of residents travel to work by vehicle (as driver or passenger), around 7% by public transport and 1% by active travel.

4 Proposed Internal Transport Networks

4.1 Modal Priority and Access Strategies

The *Perth and Peel Transport Plan - For 3.5 million people and beyond (Summary)* paper (2016) provides the following indicative target mode shares for the transport modes at 3.5 million people:

- Car driver: 50%.
- Public transport: 11%.
- Cycling trips: 4%.
- Other (including freight, car (by passenger), walking and a combination of transport modes): 35%.
- School specific mode share: Department of Transport and Major Infrastructure WA provides a target indicative active travel to school mode share target of 50% (Ref: The declining rate of walking and cycling to school in Perth paper, 2021).

In order to facilitate a transport network promoting a modal shift away from car dependency, it is important at the DSP level to plan for the provision of alternative transport modes to be accommodated within the movement network and around higher people activity land uses, in alignment with the State and City of Wanneroo strategies as discussed previously in **Section 1.4**.

4.2 Active Transport

The Department of Transport and Major Infrastructure WA (DoTMI) long-term cycle network (LTCN) identifies an aspirational blueprint for all ages and abilities cycling infrastructure. The cycle networks identify routes according to the *WA Cycling Network Hierarchy*; with routes being designated by function rather than built form. The routes comprise of the following characteristics:

- **Primary routes** - high demand corridors connecting major destinations and are the backbone of cycle networks. Primary routes are often located next to major roads and railways.
- **Secondary routes** - moderate level of demand and connect primary routes and major activity centres such as shopping precincts, industrial areas, as well as health, education and sporting facilities.
- **Local routes** - lower level of demand than primary and secondary routes, and provide access to other routes, local amenities and recreational spaces.

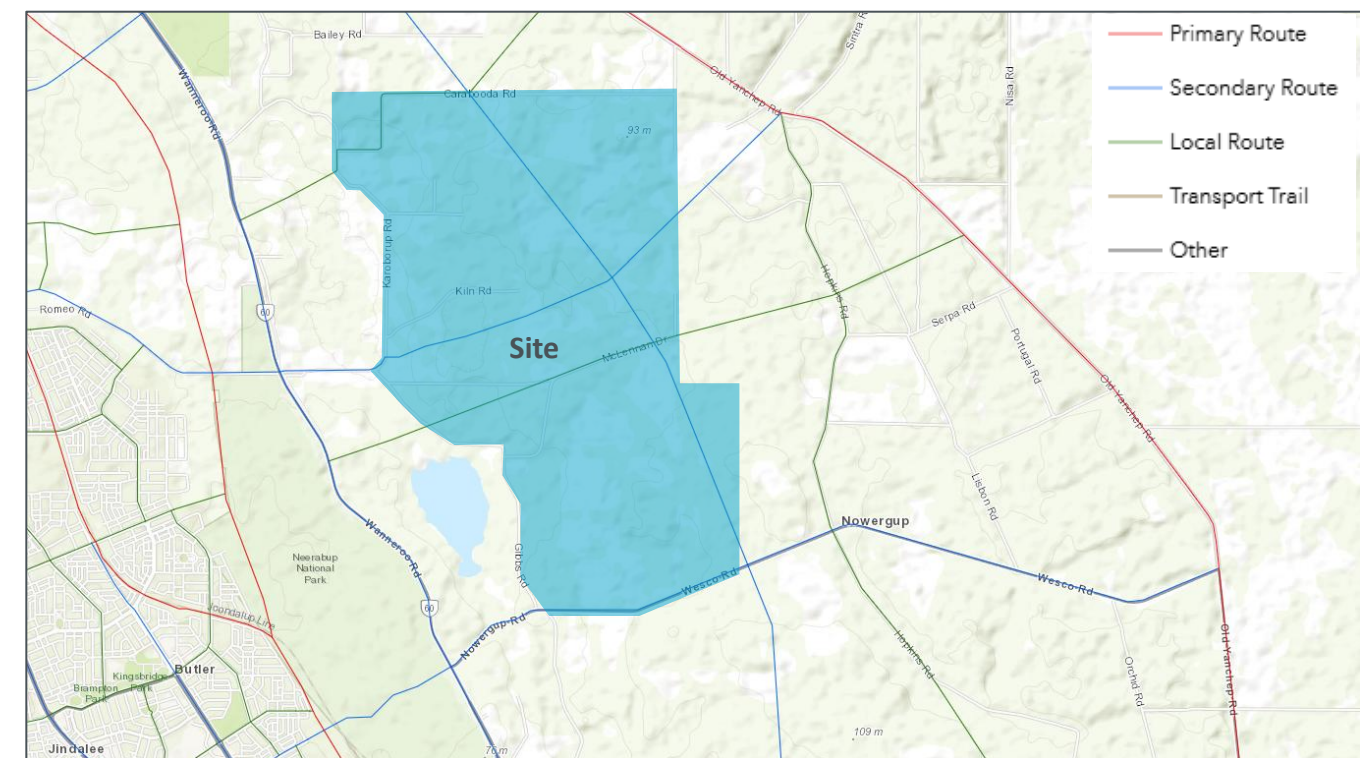
Road cycling routes and transport trails form part of the complementary network, supporting more select user groups, primarily for recreational, sport and/or tourism purposes. These routes comprise of the following characteristics:

- **Road cycling routes** - designated routes for bike riders undertaking long distance rides in (predominantly) on-road environments, for training, sport or recreational purposes.

- **Transport trails** - provide long-distance, off-road (predominantly unsealed) riding experiences through natural settings, away from motorised traffic. They often support recreational and tourism trips between towns and regions.

The LTCN for the Carabooda DSP area is shown in **Figure 4-1**.

Figure 4-1: DoTMI LTCN – Carabooda DSP Area



Source: Department of Transport and Major Infrastructure WA (January 2025)

The LTCN identifies the following routes within and surround the Carabooda DSP area:

- Primary routes: Whiteman-Yanchep Highway.
- Secondary routes: Wanneroo Road, an EW link between Wanneroo Road and Whiteman-Yanchep Highway (following the beginning of Karaburup Road), Wesco Road and a NS link through the DSP.
- Local routes: two EW links between Wanneroo Road and Whiteman-Yanchep Highway (one following part of Carabooda Road and one following part of McLennan Drive).

4.3 Public Transport

There are currently no proposals for public transport networks within the Carabooda DSP area.

4.4 Traffic

The following key road upgrades are proposed as part of the Carabooda DSP:

- A connection between Karaburup Road/Gibbs Road and McLennan Drive.



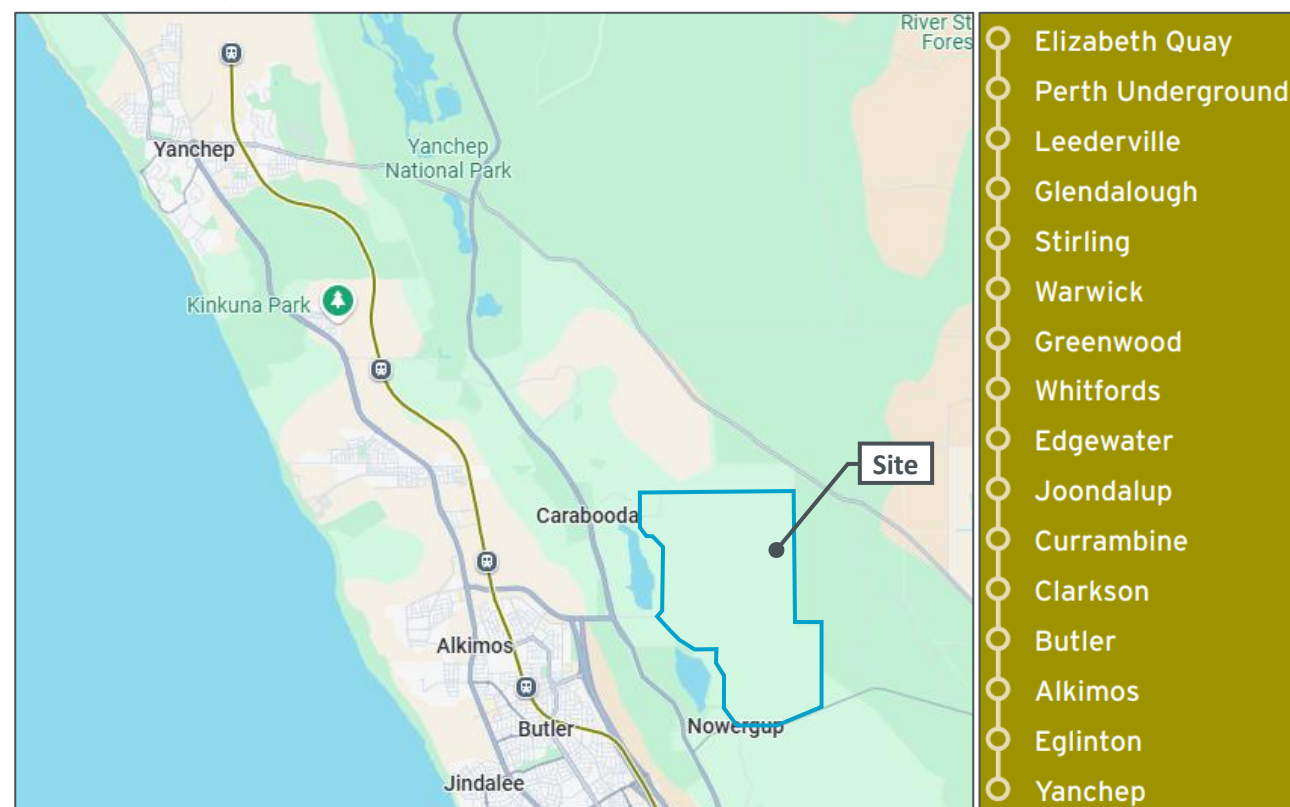
- A continuation of the north-south portion of Gibbs Road, connecting to McLennan Drive.
- A new NS road between Carabooda Road and Wesco Drive via McLennan Drive.
- A series of lower order connecting roads.

5 Changes to the External Transport Network

5.1 Yanchep Rail Extension

The Yanchep Rail Extension (YRE) was identified as a short-term (2015-2021) infrastructure target under the *Perth and Peel @ 3.5million* planning frameworks and was opened for operation in July 2024. This involved the extension of the Joondalup Railway Line from Butler, 14.5 kilometres north to Yanchep and the development of three new stations at Alkimos, Eglinton and Yanchep. Alkimos Station is approximately 3.5km west of the DSP, as shown in **Figure 5-1**.

Figure 5-1: Yanchep Rail Extension



Base Image Source: Google (December 2024) / Transperth (December 2024)

5.2 Mitchell Freeway Extension

The Mitchell Freeway was extended north from Hester Avenue in Clarkson to Romeo Road in Alkimos in July 2023, which also included completion of the optional Bulter Boulevard interchange and widening of Lukin Drive. Additionally, a Principal Shared Path (PSP) on the western side was constructed with a connection to a shared path on Romeo Road and the Neerabup National Park Trail. The extension to Alkimos/Eglinton was identified as a medium-term (2022-2031) infrastructure target under the *Perth and Peel @ 3.5million* planning frameworks but the extension to Eglinton (north of Romeo Road to Pipidiny Road) is now anticipated to be completed after 2031. The future staged extension of the Mitchell Freeway to Indian Ocean Drive was identified as a long-term (2031-2050) infrastructure target.

Figure 5-2: Mitchell Freeway Extension Project Extent



Base Image Source: Main Roads WA (September 2020)

5.3 Wanneroo Road & Romeo Road / Karoborup Road Intersection Upgrade

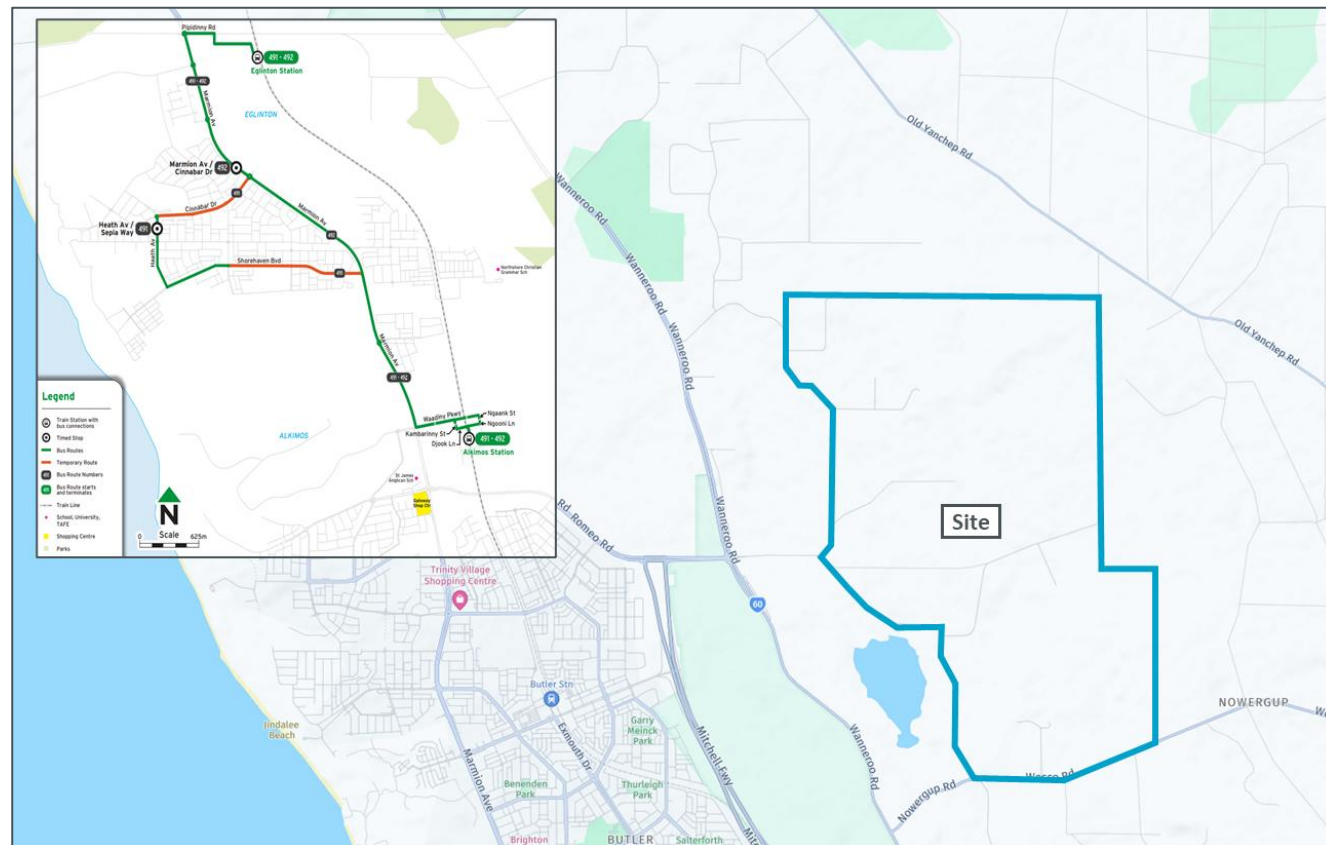
The Wanneroo Road & Romeo Road / Karoborup Road Intersection was upgraded to a 4-way traffic signals in July 2023, following the construction of Romeo Road as part of the Mitchell Freeway extension project.

5.4 Transperth Services – Alkimos-Eglinton

Two additional Transperth High-Frequency Bus Routes 491 and 492 are now operational between Alkimos Station and Eglinton Station west of the Joondalup Line which follow the alignment shown in **Figure 5-3**. The current service frequencies are every 10 minutes in peak hours and 20 minutes outside of peak hours.

- 491 operates inland from the 490 through the Shorehaven and Amberton Beach estates west of Marmion Avenue
- 492 operates along Marmion Avenue.

Figure 5-3: Transperth Bus Routes 491 and 492

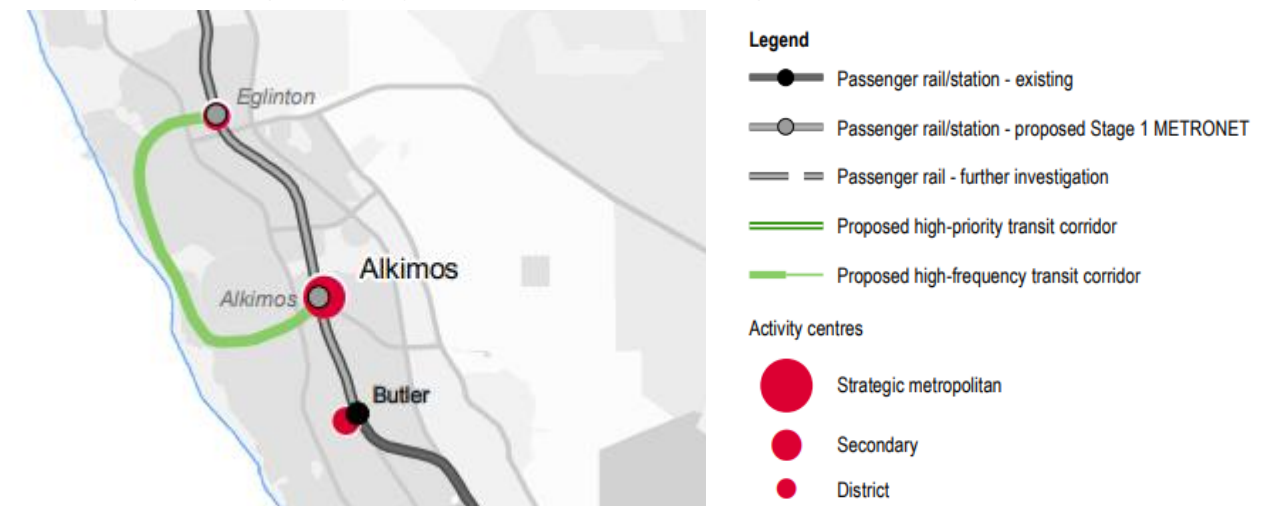


Base Image Source: Nearmap / Transperth (December 2024)

5.4.1 Planned High Frequency Transit Corridor – Alkimos-Eglinton

A high frequency transit corridor (previously called the STS route) between Alkimos and Eglinton was identified as a medium-term (2022-2031) infrastructure target under the *Perth and Peel @ 3.5million* planning frameworks to provide public transport connections between activity centres, population catchments, rail stations and local bus services. The indicative alignment is shown in Error! Reference source not found..

Figure 5-4: High Frequency Transit Corridor - Indicative alignment



Source: Perth and Peel @ 3.5m

The Alkimos-Eglinton District Structure Plan notes that high frequency transit corridor should be enabled and is subject to a number of conditions being fulfilled. If these conditions are not achieved, standard bus services will be delivered.

5.5 Wanneroo Road Duplication – north of Romeo Road

The ROM24 outputs for 2046 provided by Main Roads WA in December 2024 indicates that Wanneroo Road is being planned by State Government to comprise of a 4-lane dual carriageway, from north of Romeo Road to at least Eglinton (extent of plans provided) by 2046. This has also been verbally confirmed in various consultation meetings with Main Roads WA. Accordingly, Wanneroo Road as a dual lane format has been assumed as being in place by 2046 in this DSP assessment.

5.6 Alkimos Drive

Alkimos Drive will be a future east west major arterial road (Integrator Type A) included in the Alkimos Eglinton District Structure Plan which has been adopted by the City of Wanneroo and endorsed by the WAPC. Alkimos Drive will connect Marmion Avenue to the west, interchanging at Mitchell Freeway and connect to Wanneroo Road in the east providing a major arterial road linkage to the area just north of Carabooda.

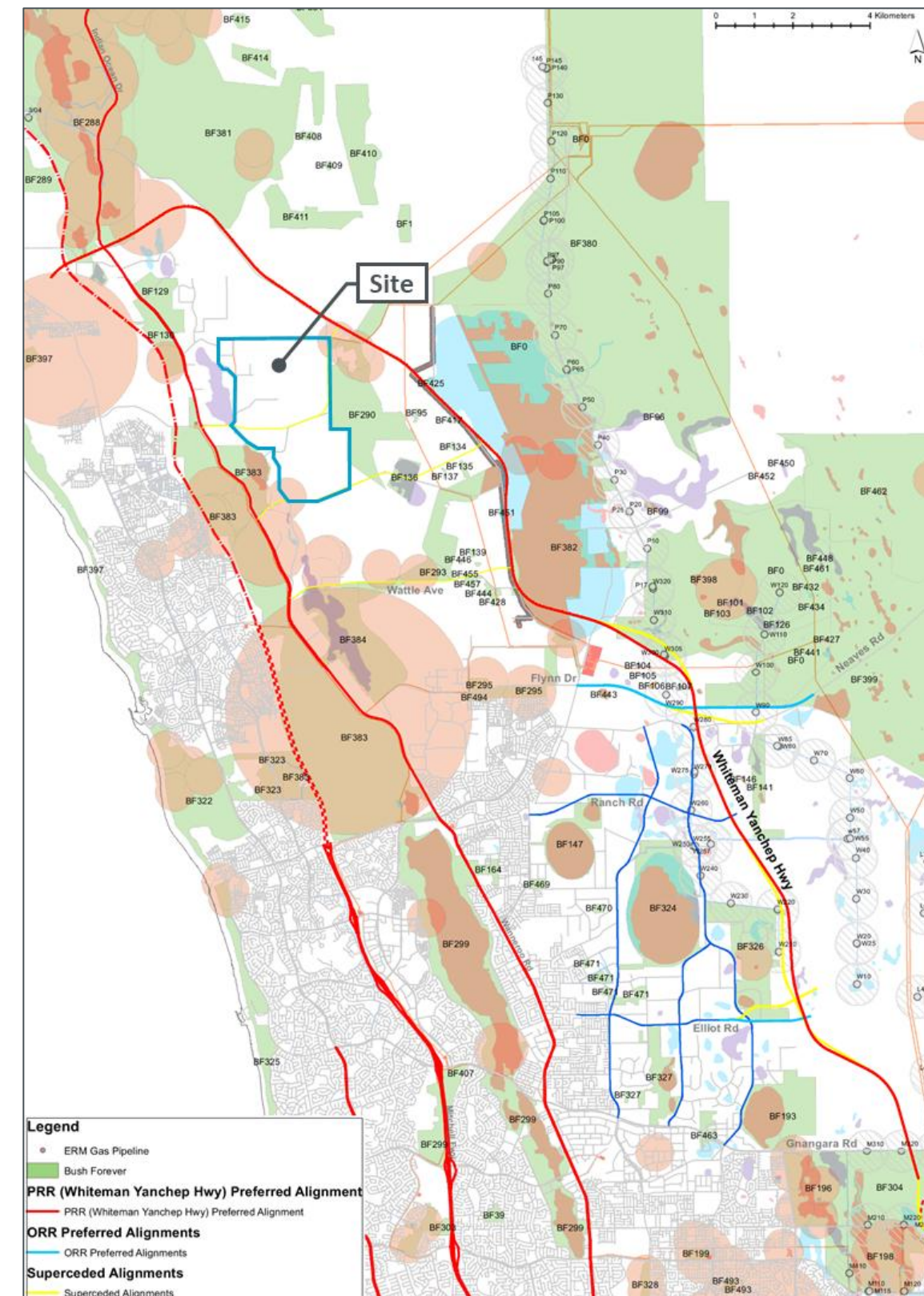
5.7 Planned Whiteman-Yanchep Highway (Post 2051)

Whiteman-Yanchep Highway is a longer-term proposed new north-south Primary Distributor route intended to provide a strategic link between Mitchell Freeway and Yanchep. The ultimate development of Carabooda Urban Precinct is expected to be *prior* to year 2051 and so the Whiteman-Yanchep Highway plan is included herein for information purposes and planned 'Changes to the External Transport Network'.

The staged construction linking Tonkin Highway with Neaves Road was identified as a medium-term (2022-2031) infrastructure target and ultimately to Mitchell Freeway as a long-term (2031-2050) infrastructure target under the *Perth and Peel @ 3.5million* planning frameworks in order to service the north-west corridor and ease traffic pressure on Wanneroo Road and Mitchell Freeway. Planning for the section between Tonkin Highway and Gnaragara Road has already been completed as part of the *NorthLink WA* project and the preferred corridor has been endorsed by the WAPC, as shown in **Figure 5-5**, which runs to the east of the DSP and the *East Wanneroo Structure Plan* area.

The ROM24 outputs for 2051 provided by Main Roads WA in December 2024 indicates that Whiteman-Yanchep Highway is assumed to operate with on and off-ramps around Cutler Road/Carabooda Road and Wesco Road. These are expected to be delivered as part of the Whiteman-Yanchep Highway project.

Figure 5-5: Planned Whiteman-Yanchep Highway (Post 2051)

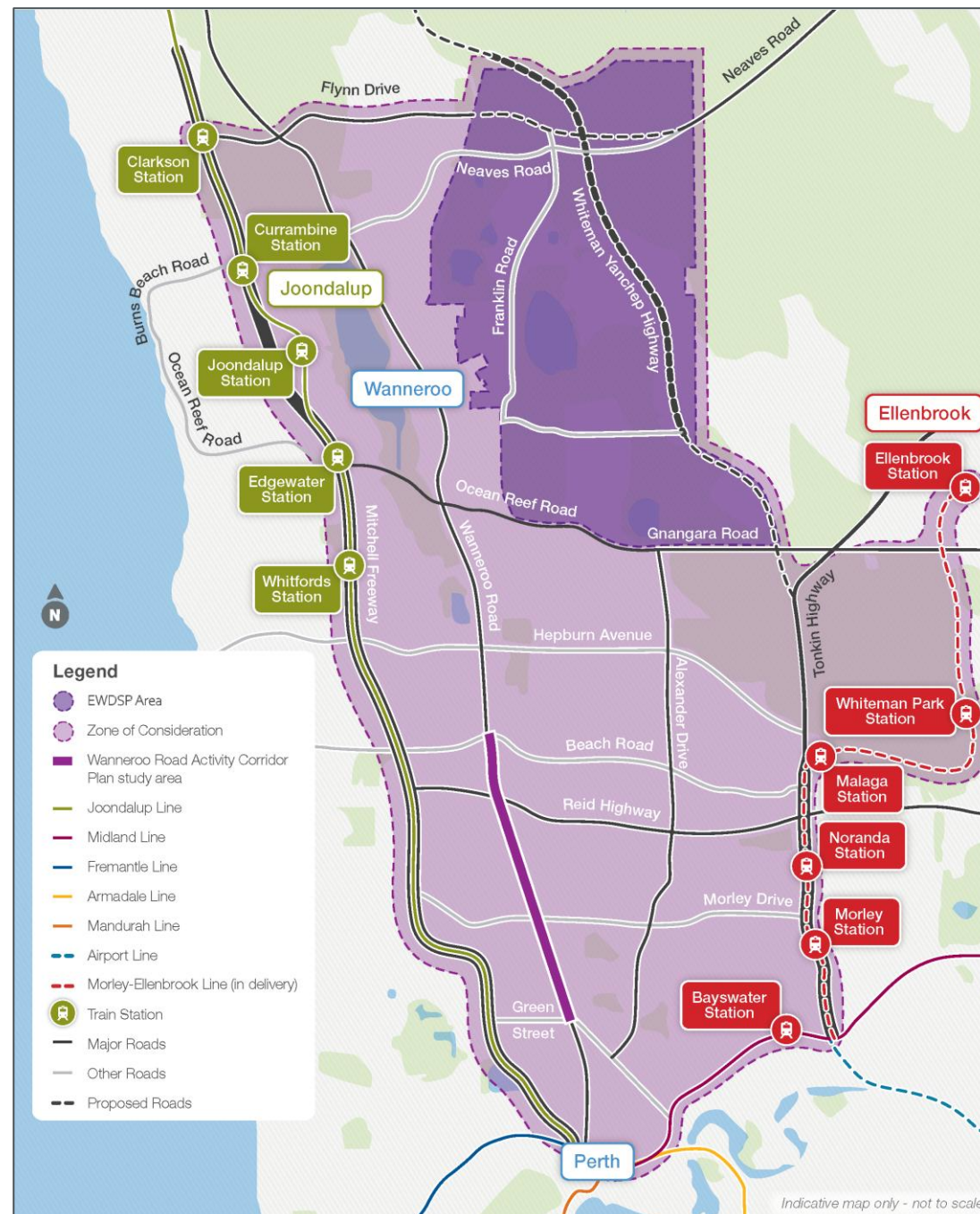


Base Image Source: WAPC

5.8 North East Rapid Transit Feasibility Study Planning

At the time of writing this July 2026 report, the latest North East Rapid Transit Feasibility Study outcomes are that the transit corridor is not contemplated to extend the rapid transport connection north of the East Wanneroo District Structure Plan area. Planning currently goes to Flynn Drive / Neaves Road which is 15km away from Carabooda (from around Romeo Road).

Figure 5-6: North East Rapid Transit Feasibility Study



Base Image Source: Metronet.wa.gov.au



6 Integration with Surrounding Area

Significant Federal, State and Local Government investment to the movement network infrastructure directly adjacent to Carabooda has unlocked the opportunity for urban rezoning of the DSP area. In addition, there is potential for the DSP to facilitate urban growth while reducing urban sprawl through the development of land in relative proximity to surrounding growing urban development areas in Alkimos, Eglinton, Yanchep and Two Rocks and established urban development areas to the south in Butler, Clarkson and Banksia Grove. The DSP is also in relative proximity to the Neerabup Industrial Area and Nowergup Industrial Investigation Area. The context of the DSP to the surrounding area is shown in **Figure 6-1**, overleaf.

The DSP is based on the following guiding principles for the transport system:

- **Connecting Centres.** Not all people want to travel to the central city area. University and school students, people who work at strategic centres, and those who wish to access goods and services from other areas of Perth all have public transport requirements that may not be met adequately by a radial system.
 - A movement network that focusses public transport east-west in the North-West corridor will open opportunities for many more travellers for work, education, and other purposes. The construction of the Mandurah Line allowed the bus network in the southern suburbs to re-orient in an east-west direction between the Armadale Line and Fremantle, providing important cross-city connections to major centres such as Murdoch and Cockburn. A similar cross-connection focus is now needed with the extension of the YRE and the Mitchell Freeway north-south.
- **Managing Congestion.** Currently the public transport network is focused on the central city area, with the majority of trips occurring within 15km of the Perth CBD. During the peak-hour throughout Perth, 17% of the distance travelled by all modes of transport, is by public transport; it is much higher to the Perth CBD (over 60%) and along major transport corridors such as the Mitchell Freeway / Joondalup Line (50%).
 - On major road corridors feeding into the CBD (such as Fitzgerald and Beaufort Streets), bus services are carrying up to 70% of people in 5-10% of the total number of vehicles on the road.
 - Consequently, public transport's contribution to limiting congestion will increase in the future as the city grows. It already makes a significant contribution to commuter travel in the busiest areas of Perth and continues to warrant investment.
- **Creating Development Opportunities.** It is important that Perth locates more of its population close to transit services to enable mobility alternatives. Higher density developments around transit nodes increase accessibility to the network for more people, whilst contributing to housing diversity and affordability and balancing low density urban development on the city's fringes.
 - Achieving high residential densities around transit nodes provide more people with the opportunity to walk or cycle to public transport. Mixed-use precincts also offer employment

opportunities for locals, and for people to access public transport, making these both origin and destination hubs.

- It is also recognised that access to parking at public transport stations is important, and certain stations are good locations for park-and-ride centres where development opportunities are limited. Other station sites are appropriate for development opportunities where mixed-use precincts can be developed and the station is fed by a high frequency bus network.
- **Environmental and Social Benefits.** Studies, such as the Garnaut Climate Change Review (2008), highlight that Australian cities are among the most car dependent in the developed world. Road transport contributes some 11% of Western Australia's total greenhouse gas emissions, with just over half of this being emitted from cars.
 - Wider environmental benefits of increased public transport use, including improved air / water quality and a reduction in noise pollution, can improve the local environment and help to mitigate the negative health impacts experienced within the community from increasing carbon emissions and other particulates associated with motorised transportation.
 - Provision for east-west cross-connection public transport has the added benefit of promoting more active lifestyles simply by encouraging individuals to walk or cycle to a transit node. Research indicates that public transport commuters will, on average, have seven times more incidental exercise than private motorists. These associated personal fitness benefits may lead to improvements in individual health, thereby reducing the burden on WA's health system.

6.1 Alkimos Eglinton District Structure Plan

The Alkimos Eglinton District Structure Plan (AEDSP 18) was prepared in 2006 and has recently been amended by CLE Town Planning + Design (2024) to include the Eglinton East Planning Investigation Area (proposed as service commercial land use). The AEDSP comprises approximately 21,000 dwellings, 26ha of commercial floor space, seven primary schools, two high schools and two private schools.

6.2 Yanchep-Two Rocks District Structure Plan

The Yanchep-Two Rocks District Structure Plan (ASP 43) was approved by the WAPC in February 2011 and comprises around 67,000 residential dwellings, 82ha of commercial floorspace, 62 primary schools, 14 high school and 4 tertiary education land uses.

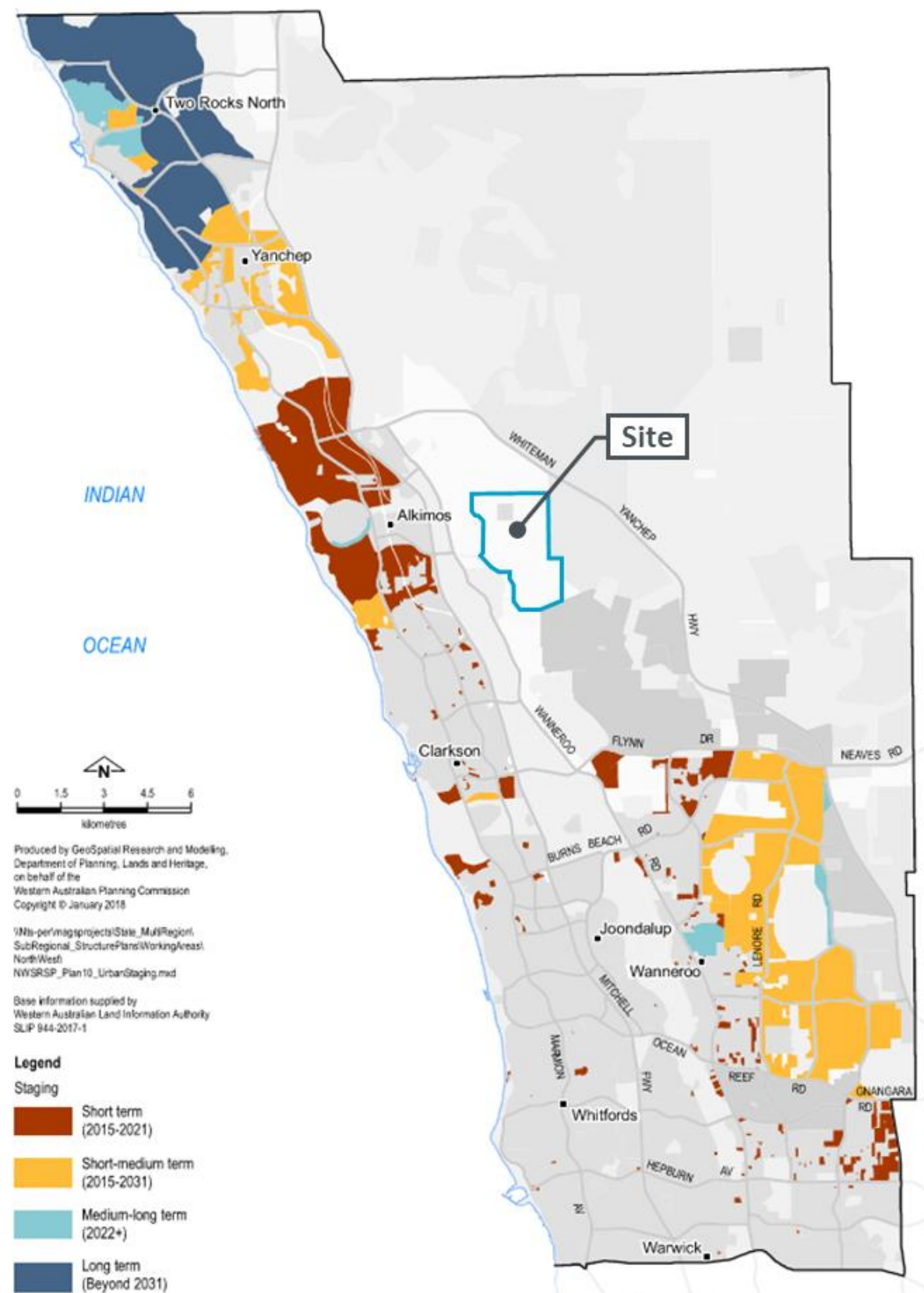
6.3 Neerabup Industrial Area Structure Plan

The Neerabup Industrial Area Structure Plan (ASP 17) was approved by the WAPC in October 2020 and comprises approximately 1,000ha of general industrial, service industrial and business land uses.

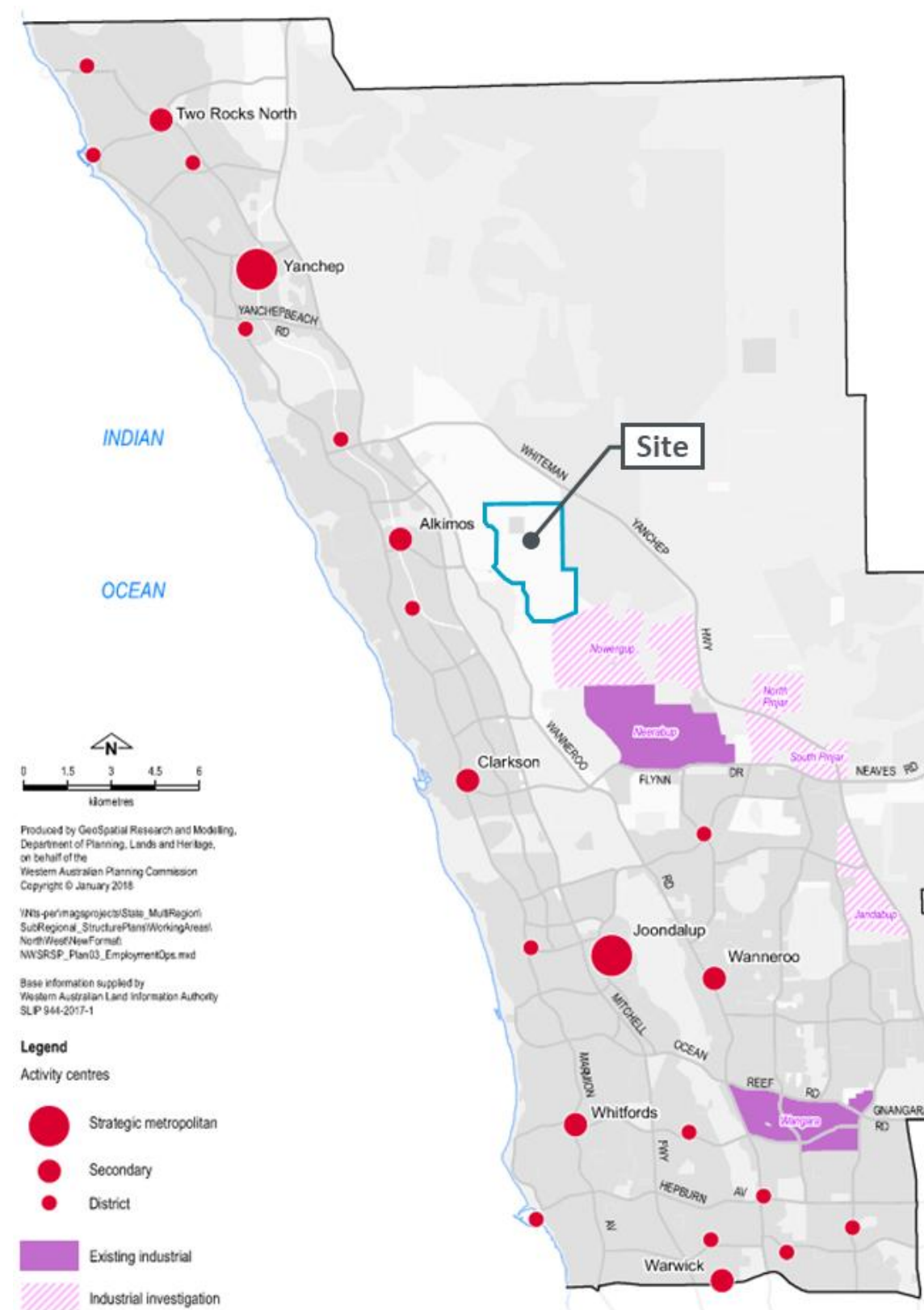
6.4 Nowergup Industrial Investigation Area

The Nowergup Industrial Investigation Area has been identified as a Planning Investigation Area under the North West Sub-Regional Framework and comprises approximately 1,080ha of gross land area.

Figure 6-1: DSP Context with Surrounding Area



Base Image Source: DPLH/WAPC (North West Sub-Regional Framework 2018)





7 Analysis of Transport Networks

7.1 Assessment Scenarios

The assessment has adopted a 2046 forecast full build-out year of the Carabooda DSP. The land use assumptions for the 2046 ROM24 Link Volume Plots are as per the information provided by Main Roads WA by the Road Planning and Technical Services Directorate on 17 December 2024. The network assumptions for 2046 adopt the North of the River Modelling Project, with Carabooda modifications and assume the following key infrastructure to be in place:

- **Mitchell Freeway extension:** widening to 6-lanes from Hester Avenue to Pipidinny Road (link plot from Cinnabar Drive) and 4-lanes north of Eglinton.
- **Wanneroo Road duplication:** 4-lanes from south of Hester Avenue to Pipidinny Road.
- **Wesco Road duplication:** 4-lanes between Wanneroo Road and Whiteman-Yanchep Highway.

An assessment of the transport network has been undertaken for two-way daily traffic volumes and intersection analysis in an AM and PM peak scenario.

7.2 Background Traffic

The ROM24 Link Volume Plots for 2046 for the two-way daily background traffic volumes are presented in **Table 7-1**.

Table 7-1: Main Roads WA ROM24 2046 Background Two-Way Daily Traffic Volumes

Road Section	Two-Way Daily Traffic Volume
Wanneroo Road (north of Karoborup Road)	28,000vpd
Wanneroo Road (south of Karoborup Road)	28,000vpd
Wanneroo Road (north of Romeo Road)	28,000vpd
Wanneroo Road (south of Romeo Road)	43,000vpd
Romeo Road (west of Wanneroo Road)	19,000vpd
Karoborup Road (east of Wanneroo Road)	4,000vpd
Wanneroo Road (north of Nowergup Road)	43,000vpd
Wanneroo Road (south of Nowergup Road)	37,500vpd
Nowergup Road (east of Wanneroo Road)	5,500vpd

7.3 Structure Plan Traffic Generation

For the purpose of the traffic analysis, the trips have been split into trip generating sources and trip attracting destinations both internally and externally to the DSP area. The 2051 MRWA ROM24 sub-area cordon matrices data indicates that of the internal generated trips, 31.6% have internal destinations and 68.4% have external destinations. Furthermore, the data indicates the following trip proportions with relation to the total trips generated by the DSP area.

- Internal – Internal Trips: 18.87%
- Internal – External Trips: 40.84%
- External – Internal Trips: 40.29%.

The land use trip generation rates adopted for the assessment are outlined in **Table 7-2**.

Table 7-2: Adopted Trip Generation Rates

Land Use	Daily			AM Peak			PM Peak			Pass-By Trips
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	
Residential (per dwelling) ¹	4.0	4.0	8.0	0.2	0.6	0.8	0.5	0.3	0.8	0%
Commercial (per 100m ² GFA) ²	23.0	23.0	46.0	0.6	0.4	1.0	1.9	2.1	4.0	34%
School (per Student) ¹	1.0	1.0	2.0	0.5	0.5	1.0	0.5	0.5	1.0	0%

¹ Sourced from the WAPC TIA Guidelines for the peak hour trip rates and represent 10% and 50% of the daily residential and school rates, respectively.

² Sourced from the ITE Trip Generation Manual (9th Ed.) for Land Use 820: Shopping Centre and converted from KSF.

The pass-by trips are representative of the vehicle trips captured as part of another trip purpose (e.g. a residential to work trip stopping at the shopping centre before continuing the trip). These have been assumed to discount the residential trips for the proportion included as commercial trips to avoid double counting both a work-based trip and a shopping-based trip. Taking into account the 34% pass by trips, 36% have been assumed internal and 30% assumed external.

The student intake of the proposed government primary schools is considered to be 100% internal to the DSP area, given that each school is proposed to serve the DSP area with one school per 1,500 dwellings, in alignment with *Liveable Neighbourhoods 2009*. On this basis, up to 39% of all dwellings would have one child attending one of the primary schools.

The student intake of the government secondary school is also considered to be 100% internal to the DSP area, given that *Liveable Neighbourhoods 2009* outlines a requirement of one school per 6,500-7,000 dwellings which indicates a requirement of 1.4 public secondary schools. Therefore, up to 22% of all dwellings would have one child attending the public secondary school.

The student intake for the private college (assumed primary and secondary) is considered to have a wider catchment area. The Carabooda DSP is perceived to generate a similar demographic to that of the Banksia Grove suburb within the City of Wanneroo LGA, located between Wanneroo Road, Flynn



Drive, Old Yanchep Road and Joondalup Drive. The *ABS Census 2021* data indicates a ratio of around 30% private school to public school students. Therefore, the total number of students forming the internal intake would be around 1,700 (85%) with the remaining 300 students (15%) would be generated externally to the DSP area.

The anticipated total daily traffic generation of the DSP (to the nearest 50vpd), including discounts for trip types, is provided in **Table 7-3**.

Table 7-3: DSP Estimated Total Traffic Generation (2046) Summary

Land Use	Yield	Internal	External	Total
Residential	9,221 dwellings	23,300vpd	50,450vpd	73,750vpd
Commercial	68,400m ² GFA	16,300vpd	15,150vpd	31,450vpd
School	7,600 Students	7,000vpd	600vpd	7,600vpd
TOTAL		23,300vpd	66,200vpd	89,500vpd

Ultimately, the DSP is estimated to generate in the order of 89,500vpd of which around 74% are distributed onto the external road network and the remaining 26% are distributed among the internal DSP road network only, comprising of 70% commercial based and 30% school based vehicle trips.

7.4 Ultimate Development Traffic Distribution

Main Roads WA provided PJA with sub-area cordon matrices for the Carabooda DSP with the same land use and network assumptions as the link volume plots. An analysis of the origin and destination trips indicate the trip distribution of the structure plan generated traffic as provided in **Table 7-4**.

Table 7-4: Main Roads WA ROM24 2046 Trip Distribution of DSP Traffic

Location	Proportion of Trips IN	Proportion of Trips OUT
Wanneroo Road North	8.58%	9.05%
Wanneroo Road South	7.16%	6.86%
Whiteman-Yanchep Highway North	0.00%	0.02%
Whiteman-Yanchep Highway South	20.99%	17.74%
Alkimos/Mitchell Freeway via Romeo Road West	27.91%	30.46%
Eglinton via Wanneroo Road North	9.69%	9.43%
South of Wesco Road	10.50%	9.65%
Wattle Avenue	3.50%	5.88%
Hester Avenue	10.33%	9.59%
North of Carabooda Road	0.57%	0.59%
East of Whiteman-Yanchep Highway	0.60%	0.56%
Access Driveway on Wanneroo Road north of Romeo Road	0.04%	0.03%
Access Driveway on Wanneroo Road south of Romeo Road	0.13%	0.14%

The original ROM24 daily trip distribution splits of the external zones have been summarised as follows:

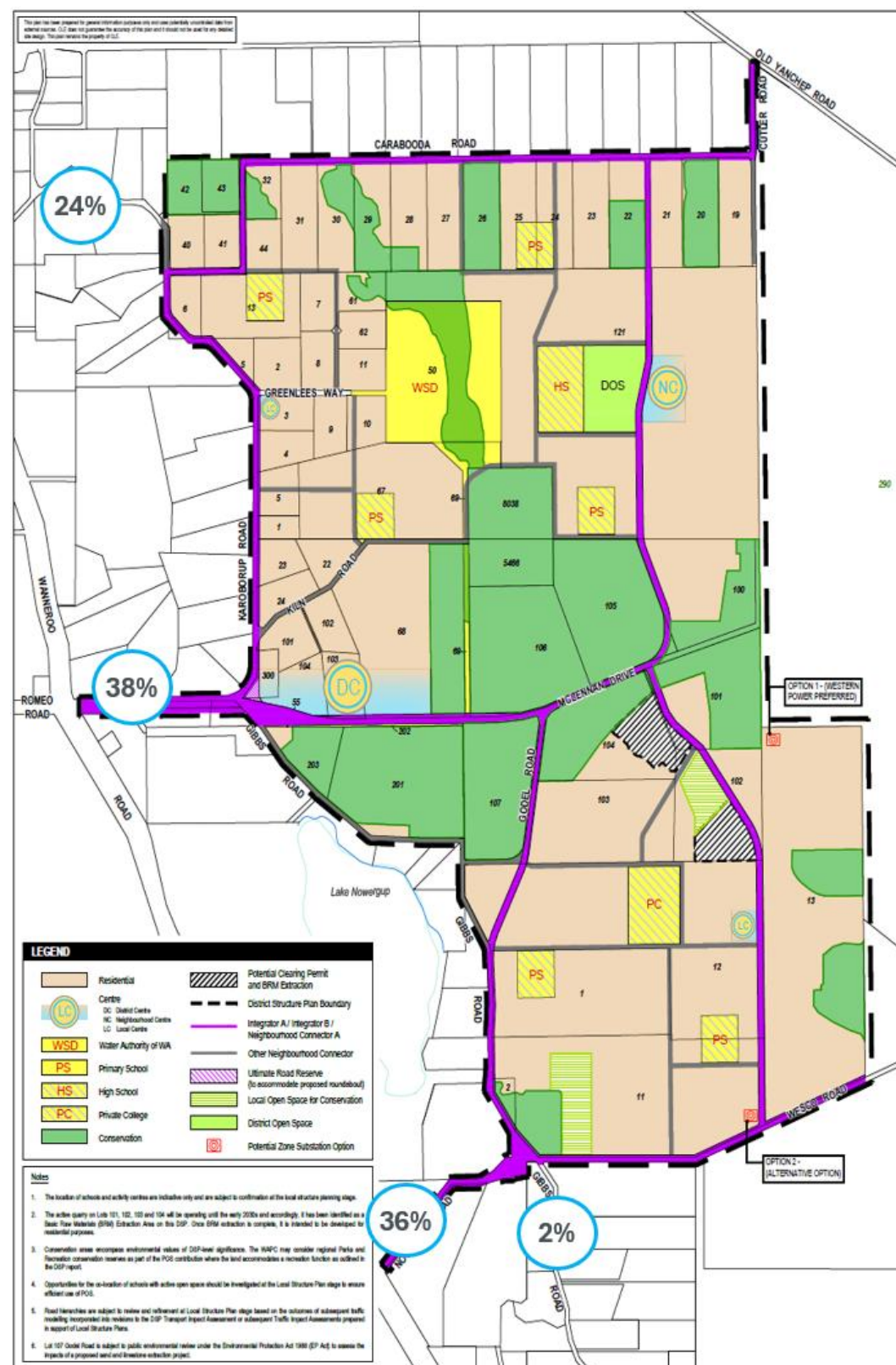
- Wanneroo Road North: 18.98%
- Wanneroo Road South: 21.80%
- Whiteman-Yanchep Highway North: 0.59%
- Whiteman-Yanchep Highway South: 19.37%
- Alkimos/Mitchell Freeway via Romeo Road West: 29.18%
- Gibbs Road (south of Wesco Road): 10.08%.

Notwithstanding the above, during the consultation phase for this DSP, the City of Wanneroo advertising comments received focussed on protecting the rural character of Gibbs Road south of Nowergup Road. Accordingly, PJA has made a minor redistribution away from Gibbs Road to specifically address this, as follows, and as shown in **Figure 7-1**:

- Wanneroo Road North: 24.4%
- Wanneroo Road South: 37.5%
- Whiteman-Yanchep Highway North: 0%
- Whiteman-Yanchep Highway South: 0%
- Alkimos/Mitchell Freeway via Romeo Road West: 36.1%
- Gibbs Road (south of Wesco Road): 2%.

Additionally, to test the full build out of the DSP in 2046, in the absence of the Whiteman-Yanchep Highway, the assumption that all development traffic will be routed via Wanneroo Road has been adopted. Furthermore, traffic using Gibbs Road south has also been redistributed via Wanneroo Road south. The traffic redistribution is summarised in Table 7-6.

Figure 7-1: Trip Distribution Splits of External Residential Trips and External Generated Trips

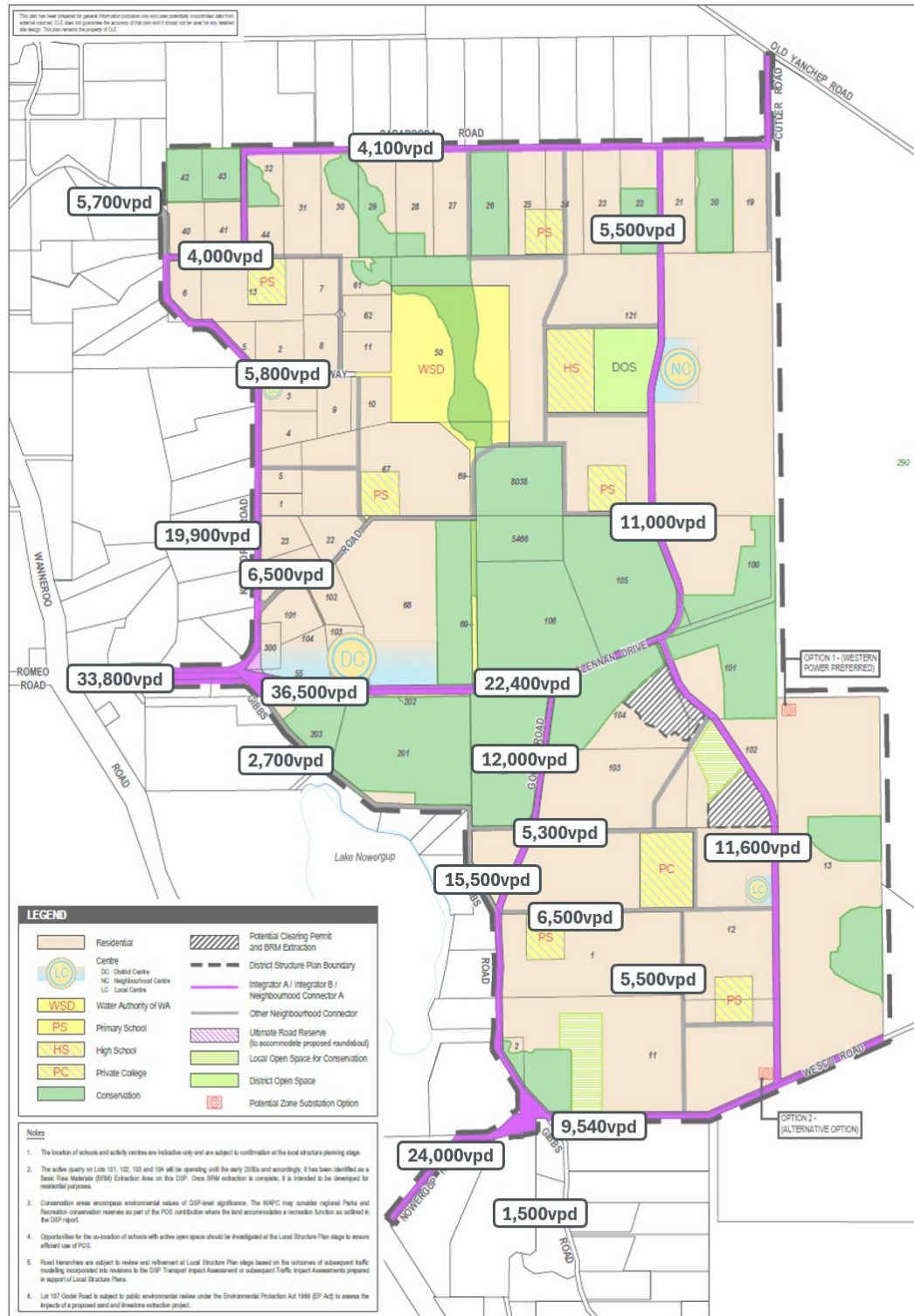


Base Image Source: CLE Town Planning + Design (14 July 2026)

7.5 Ultimate Development Design Traffic Flows

The ultimate 2046 daily two-way traffic volumes are shown in **Figure 7-2**.

Figure 7-2: Ultimate 2046 Daily Two-Way Traffic Volumes



Base Image Source: CLE Town Planning + Design (14 July 2026)

7.6 Proposed Road Hierarchy

Liveable Neighbourhoods (2009) (to be superseded by SPP7.1: Neighbourhood Design) provides the following indicative daily traffic volumes (two-way) for each road type.

- Primary Distributor (4-lanes): 35,000vpd
- Integrator A (4-lanes outside centres): 15,000vpd – 35,000vpd
- Integrator A (4-lanes inside centres): <25,000vpd
- Integrator A (2-lanes outside centres): 7,000vpd – 20,000vpd
- Integrator A (2-lanes, inside centres): 15,000vpd
- Neighbourhood Connector A: 7,000vpd
- Neighbourhood Connector B: 3,000vpd
- Access Streets: <3,000vpd

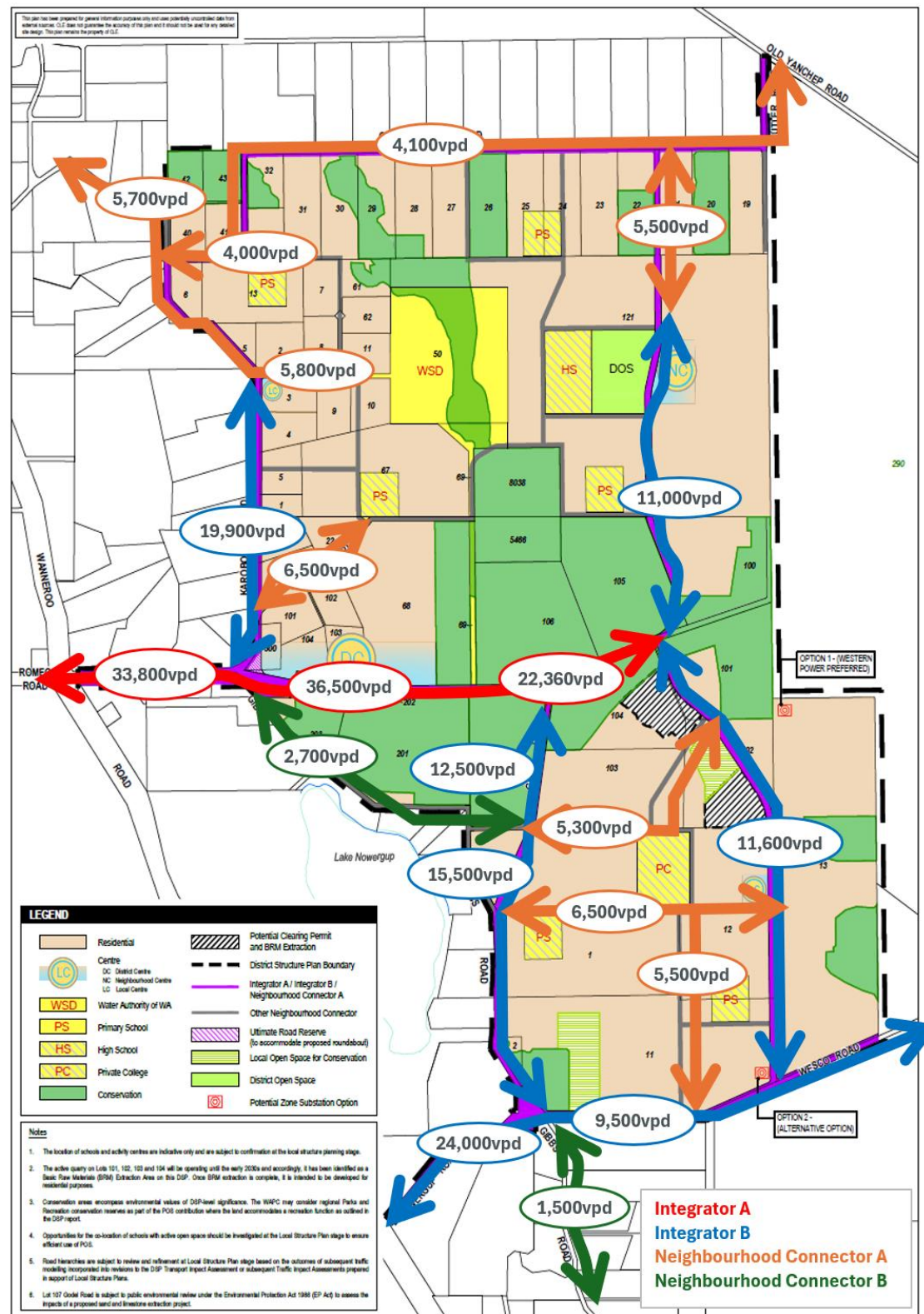
The ultimate 2046 daily two-way traffic volumes have been compared to these indicative midblock traffic volumes to produce a proposed road hierarchy for the roads within the DSP (refer **Figure 7-3**) and the future subdivision development together with recommendations for public transport services, pedestrian and cyclist facilities.

The road hierarchy which clearly emphasises the Mitchell Freeway and future upgraded Whiteman Yanchep Highway for regional trips, Marmion Avenue, Wanneroo Road and the east-west roads for district trips, all supported by a local road network and other high quality transport options in order to appropriately spread travel demand across multiple nodes. In this way a more efficient use of infrastructure can be achieved particularly since Marmion Avenue is not required to undertake the regional function, providing better amenity for people walking and riding and otherwise using or crossing the route.

The road hierarchy is proposed to comprise of the following:

- Integrator A:** Karoborup Road (east of Romeo Road) and McLennan Drive.
- Integrator B:** Karoborup Road (between McLennan Drive and Greenlees Way), Gibbs Road, Wesco Road/Nowergup Road and the NS Road (between Wesco Road and the northern road of the high school/commercial area).
- Neighbourhood Connector A:** Karoborup Road (between Wanneroo Road and Greenlees Way), Carabooda Road, Greenlees Way, Kiln Road, the NS Road (between the Integrator B portion and Carabooda Road), both of the EW Roads (between Gibbs Road and the NS Road) and the NS Road (south of the private college to Wesco Road).
- Neighbourhood Connector B:** Gibbs Road (between Gibbs Road at Godel Road to Karoborup Road).

Figure 7-3: Proposed Road Hierarchy



Base Image Source: CLE Town Planning + Design (14 July 2026)

The indicative road reserve width, based on *Liveable Neighbourhoods* (2009) for each road hierarchy type is summarised as follows (a nominal range of possible widths provided) with the final ultimate road reservation determined within the subsequent planning stages.

- Integrator A** (4-lanes outside centres): 45 – 55m
- Integrator A** (4-lanes inside centres): 30 – 40m
- Integrator B** (2-lanes outside centres): 25 – 30m
- Integrator B** (2-lanes, inside centres): 20 – 25m
- Neighbourhood Connector A:** 20 – 25m
- Neighbourhood Connector B:** 18 – 20m

The *City of Wanneroo Pathways Policy* (October 2024) outlines the active transport facilities required for each road type, as provided in **Table 7-5**.

Table 7-5: City of Wanneroo Pathways Policy Facility Requirements per Road Type

Road Type	Characteristics	Minimum Facility Required
Integrator A	60-70km/h speed, access to Activity Centres, Schools and Train Stations.	2-2.5m concrete shared path one side and 1.5m pedestrian path on the other side (1.8m if abutting a property boundary or kerb).
Integrator B	50-60km/h speed, access to Activity Centres, Schools and Train Stations.	2-2.5m concrete shared path one side and 1.5m pedestrian path on the other side (1.8m if abutting a property boundary or kerb).
Neighbourhood Connector A	50-60km/h speed, access to Residential properties, Activity Centres and Train Stations.	2-2.5m concrete shared path one side and 1.5m pedestrian path on the other side (1.8m if abutting a property boundary or kerb).
Neighbourhood Connector B	50-60km/h speed, access to Residential properties, Activity Centres and Train Stations.	2-2.5m concrete shared path one side.

In addition to the pathway requirements, for the routes identified within the DoTMI LTCN, the concrete shared path should be replaced with the following active transport infrastructure on the route type, in alignment with the DoTMI *Planning and Designing for Bike Riding in Western Australia Guideline for Shared and Separated Paths* (September 2021). Furthermore, the Pathways Policy indicates that on-street cycle lanes should also be provided in accordance with *Liveable Neighbourhoods 2009*. However, it is worth noting that specific consideration of the riding environment and traffic speeds in accordance with *Safe System Engineering Principles* should be undertaken, to select appropriate cycling infrastructure.

- Primary Route:** 3.5m red asphalt shared path with centre and edge line marking and wayfinding signage.
- Secondary Route:** 3m red asphalt shared path with centre line marking and wayfinding signage.
- Local Route:** 3m red asphalt shared path with centre line marking and wayfinding signage.

The EW corridor towards the NE from Karoborup Road, a NS corridor through McLennan Drive and Wesco Road have been identified as Secondary Routes (as shown previously in **Section 4.2**). Additionally, part of Carabooda Road and McLennan Drive have been identified as Local Routes.

7.6.1 Staging Considerations

It is noted that the land east of the Carabooda water tank has few constraints to immediate development, being cleared of native vegetation and predominantly in single ownership (as Lot 121 Carabooda Road). A Staging Plan has been presented in Part 2 of the Town Planning DSP report to reflect this, showing this area as a short- to medium-term priority. The intended Local Structure Plan (LSP) boundaries also reflect this intention.

Ultimately, most traffic from the Lot 121 area will obtain east-west access to external routes via McLennan Drive, however, this is a significant piece of infrastructure for which there is no short-term need. The Lot 121 area is proposed to initially obtain access to external routes via an extension of Kiln Road across the conservation estate, south of the water tank. This interim arrangement ensures that Lot 121 can develop concurrently with, or even ahead of, other land in LSP 2 further west. It also ensures that residential traffic will not interact with truck traffic related to the Godel Road quarry, which will be operating until the early 2030s and uses the eastern section of McLennan Drive for access (connecting into Godel Road and Gibbs Road). If McLennan Drive is constructed through to Romeo Road too soon, truck traffic and residential traffic will interact, and this is not preferred.

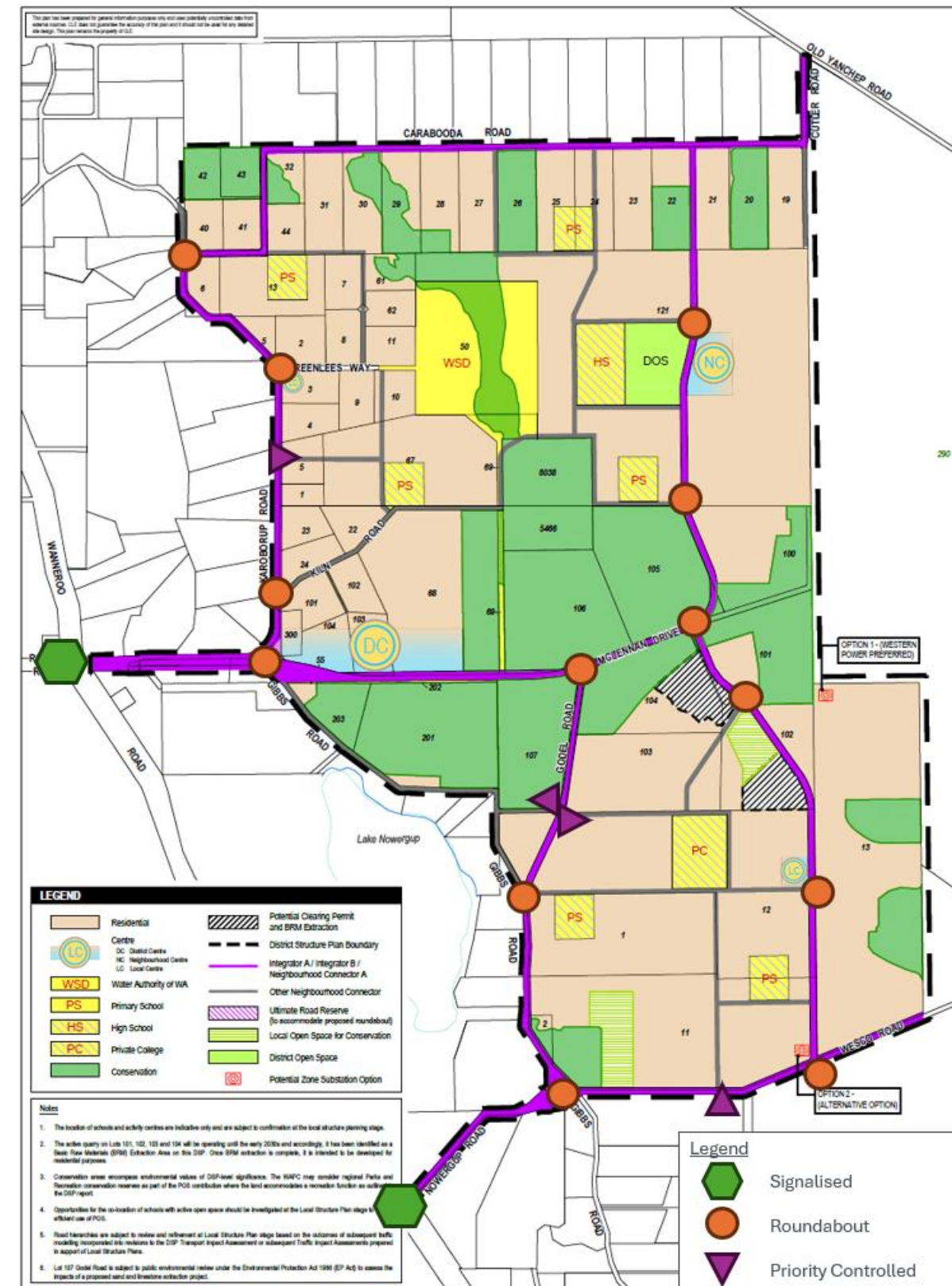
In the ultimate (full) development scenario, McLennan Drive and Kiln Road will share the role of servicing the east-west traffic from the Lot 121 area. In the meantime, Kiln Road will perform that role alone until the construction of McLennan Drive to its ultimate standard is necessary due to development reaching completion on land east of the conservation estate and enabled by the conclusion of operations at the Godel Road quarry.

Additionally, interim staging upgrades working towards the ultimate layouts as suggested in this TIA are acknowledged and expected, and as modelled in this DSP under the assumed absence of the Whiteman Yanchep Highway. Interim upgrades will be as informed by SIDRA analysis and subsequent, detailed traffic modelling to be prepared at the LSP stage.

7.7 Indicative Intersection Controls

The ultimate form and control of the intersections will be determined at the subsequent planning stages, with the indicative controls of the intersections on the Integrator roads shown in **Figure 7-4**. It is considered that intersecting Integrators would comprise of traffic signals or roundabouts and intersecting Integrators with Neighbourhood Connectors would form roundabouts or priority controlled intersections. Consideration for the safety of road users of all ages and abilities at intersections should be given during the selection process.

Figure 7-4: Indicative Intersection Controls on Integrator Roads



Base Image Source: CLE Town Planning + Design (14 July 2026)

7.8 Intersection Modelling

Overview

In line with the WAPC Guideline requirements, and the extensive consultations undertaken for this DSP with DPLH, Main Roads WA and the City of Wanneroo, key site access intersections identified by DPLH for the DSP Transport Impact Assessment has been undertaken, for 20 years into the future. The projected year of full development is estimated around 2048, ROM24 outputs have been provided by MRWA for the years 2046 and 2051; however, the 2051 scenario assumes the Whiteman-Yanchep Highway upgrade has been fully constructed. As the DSP is expected to be developed prior to the highway construction, to ensure the assessment of DSP at completion is consistent, and in agreement with MRWA, the 2046 ROM24 outputs have been utilised to forecast the background traffic growth in the study area. The following confirmation was made by MRWA in relation to use of the ROM 2046 outputs:

“If you choose to use the 2046 time horizon, this run has two north-south local road connections (east of Wanneroo Rd and west of Old Yanchep Rd) linking Wattle Av with Wesco Rd. These links reduce volume on Wanneroo Rd to around 40,000 vpd. We question whether these local roads will be built, considering environmental constraints. If you consider that they will be included in the DSP or built by others by 2046, the modelling is fit-for-purpose. If not, this should be taken into account in the DSP modelling” – Main Roads WA Planning and Technical Services Directorate, 27 March 2026.

“Thanks for confirming that PJA will use 2046 time horizon (as this better fits the ultimate development timeline)” – Main Roads WA Planning and Technical Services Directorate, 1 May 2026.

The worst-case modelling scenario where the two north-south connections are not included in 2046, has been accounted for. The respective zones (within the provided sub-area matrices) have been concatenated into the Wanneroo Road zone to accurately capture the growth proposed within the 2046 ROM24 outputs. Additionally, to test the full build out of the DSP in 2046, in the absence of the Whiteman-Yanchep Highway, the assumption that all development traffic will be routed via Wanneroo Road has been adopted. Furthermore, traffic using Gibbs Road south has also been redistributed via Wanneroo Road south. The traffic redistribution is summarised in **Table 7-6**.

Table 7-6: DSP Distribution Assumption for Stress Testing

Origin / Destination	Original ROM24 output	Redistributed
Wanneroo Road North	18.98%	24.4%
Romeo Road	29.18%	37.5%
Wanneroo Road South	21.80%	36.1%
Old Yanchep Highway North	0.59%	-
Old Yanchep Highway South	19.37%	-
Gibbs Road South	10.08%	2%

The intersections which have been identified by DPLH, for assessment include:

- Wanneroo Road / Karoborup Road (north)
- Wanneroo Road / Romeo Road / Karoborup Road
- Wanneroo Road / Nowergup Road
- Old Yanchep Road / Wesco Road
- Old Yanchep Road / Cutler Road
- Gibbs Road / McLennan Drive / Karoborup Road.

Based on DSP development distribution assumption, the two Old Yanchep Road intersections (via Culter Road and the other via Wesco Road) have not been included within this DSP assessment. There is no need to do so, as the distributions assume 0% of DSP traffic will use these rural intersections further in the east, with no logical origin or destination along Old Yanchep Road. Further, the excerpt from WAPC Guidelines (Vol 2 – Section 10.11.2 Extent of Analysis) states:

“The area to be analysed for the road network is generally to be all those sections of road where the structure plan traffic would be likely to increase traffic on any lane by more than 100 vehicles per hour”.

Accordingly, the DSP will not increase traffic on any lane on Cutler Road or Wesco Road by more than 100 vehicles per hour. Additionally, the ROM24 outputs for 2046 outline Old Yanchep Road accommodating only 5,000 two-way vehicles per day, with the Wesco Road and Cutler Road carrying less than 3,000 two-way vehicle movements per day. These relatively low daily volumes are expected to be comfortably accommodated by the existing intersection arrangement.

Volume Assignment

A microsimulation model was developed for the Carabooda DSP which captures the connections with Wanneroo Road. The 2026 Base Model, developed in PTV Vissim 2024, was constructed in accordance with the *MRWA Operational Modelling Guidelines V2.0 (January 2021)* and provided the platform with which the 2046 modelling was undertaken.

The background traffic growth was derived using the concatenated sub-area matrices with the percentage growth applied to the 2026 calibrated flows. The key growth changes are presented in **Table 7-7**.

Table 7-7: ROM24 Key Growth Origin / Destination Pairs

Origin	Destination	Growth (%)
Wanneroo Road North	Romeo Road	-99%
	Wanneroo Road South	+396%
Romeo Road	Wanneroo Road North	-98%
	Wanneroo Road South	+55%
Wanneroo Road South	Wanneroo Road North	+199%
	Romeo Road	+178%

Using the land use (Section 2.3 and 2.4) and trip generation (Section 7.3) assumptions and calculations previously derived, the DSP development matrices were developed for each of the AM and PM peaks to be input the Vissim Model.

The 2046 Vissim AM and PM peak scenarios were ran with the software assigning the trips to the network. Following the assignment, the scenarios were re-ran with the removal of signals, priority markers and conflict areas to extract the full volumes through each intersection during the peak periods. The volumes were then extracted to be input into SIDRA for each of the intersections, it is noted that this was an iterative process as the proposed intersection road upgrades needed for satisfactory intersection performances were refined.

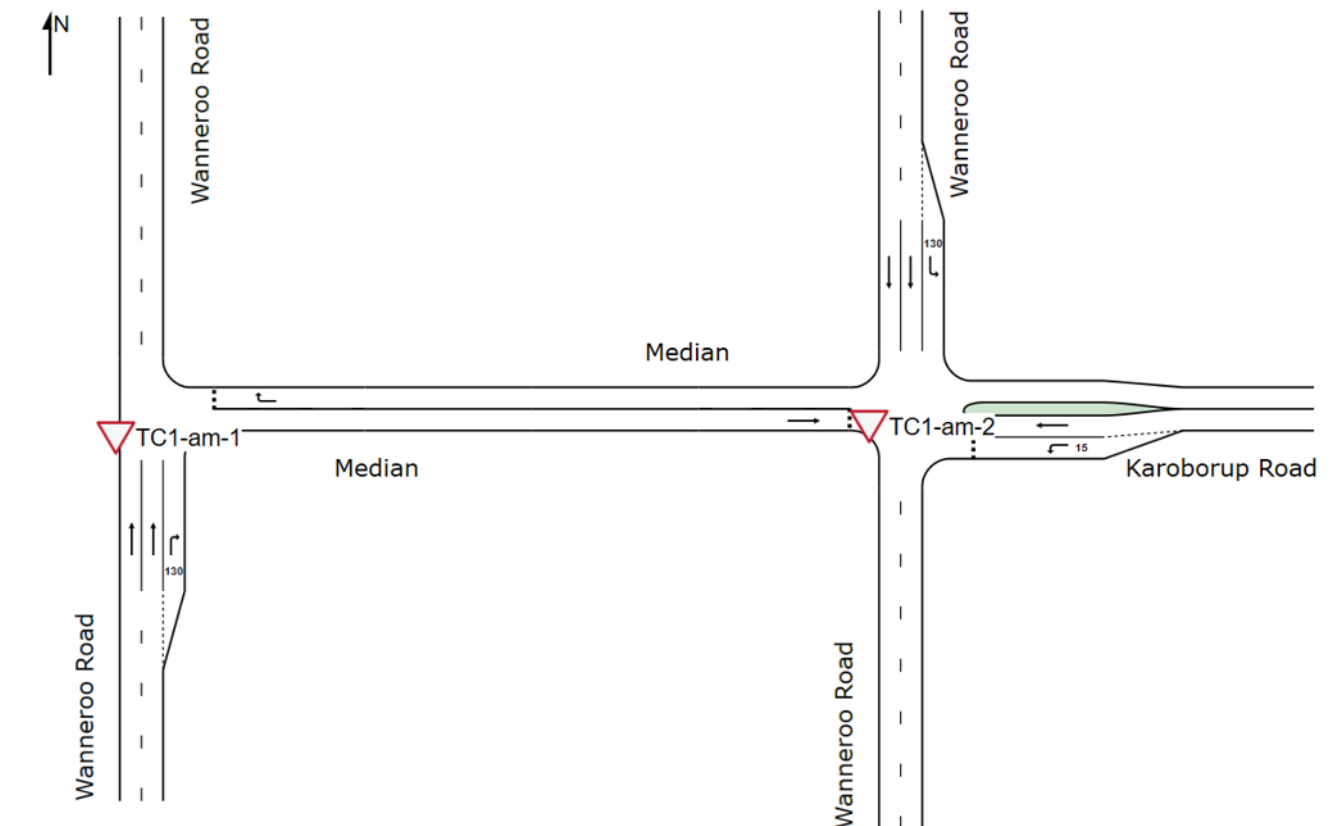
SIDRA Modelling

SIDRA results for each approach are presented below in the form of Degree of Saturation (DOS), Average Delay, Level of Service (LOS) and 95th Percentile Queue. These characteristics are defined as follows:

- **Degree of Saturation (DOS):** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalised intersection where $DOS > 0.80$;
- **95% Queue:** is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected;
- **Average Delay:** is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection is considered to be operated at capacity where the average delay exceeds 40 seconds for any movement; and
- **Level of Service (LOS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers.

Wanneroo Road / Karoborup Road (north)

The existing Wanneroo Road / Karoborup Road (north) intersection demonstrates sufficient capacity to accommodate additional demand in the 2046 scenario across both peaks, as such no intersection upgrades are required or proposed. The SIDRA outputs for the worst performing movements are shown in **Table 7-8** with the SIDRA network presented in the **Figure 7-5**.

Figure 7-5: Wanneroo Road / Karoborup Road (north)

Table 7-8: Wanneroo Road / Karoborup Road (north) - 2046 SIDRA Results

Wanneroo Road / Karoborup Road (north) 2046 Results	AM Peak	PM Peak
Average Delay (seconds)	8	16
Level of Service (LOS)	A	C
Degree of Saturation (DOS)	0.304	0.652
95% Back of Queue Length (metres)	11	28

Analysis of the Wanneroo Road / Karoborup Road (north) - Priority Controlled T-Intersection at the 2046 design horizon shows that there are predicted to be no detrimental issues with respect to traffic queuing and delays for any movement in both the AM and PM peak periods. All parameters of this capacity assessment are within recognised thresholds for acceptable intersection operation with the

intersection predicted to operate at less than 70% of its theoretical maximum in both peak periods. An acceptable 95%ile vehicle queue of 11m and 27m in the AM peak and PM peak periods respectively are the results for the worst performing movement (Karoborup Road east approach in the AM peak and the Wanneroo Road right turn into Karoborup Road in the PM peak).

Wanneroo Road / Romeo Road / Karoborup Road

The Wanneroo Road / Romeo Road / Karoborup Road intersection was shown to operate over capacity in 2046 if adopting the current configuration, as such the following upgrades, shown in **Figure 7-6**, are proposed to accommodate the development traffic plus the Wanneroo Road background growth through to 2046. The SIDRA outputs for the upgraded intersection are shown in **Table 7-9**, it is noted that no movements record an LOS F.

Figure 7-6: Wanneroo Road / Romeo Road / Karoborup Road

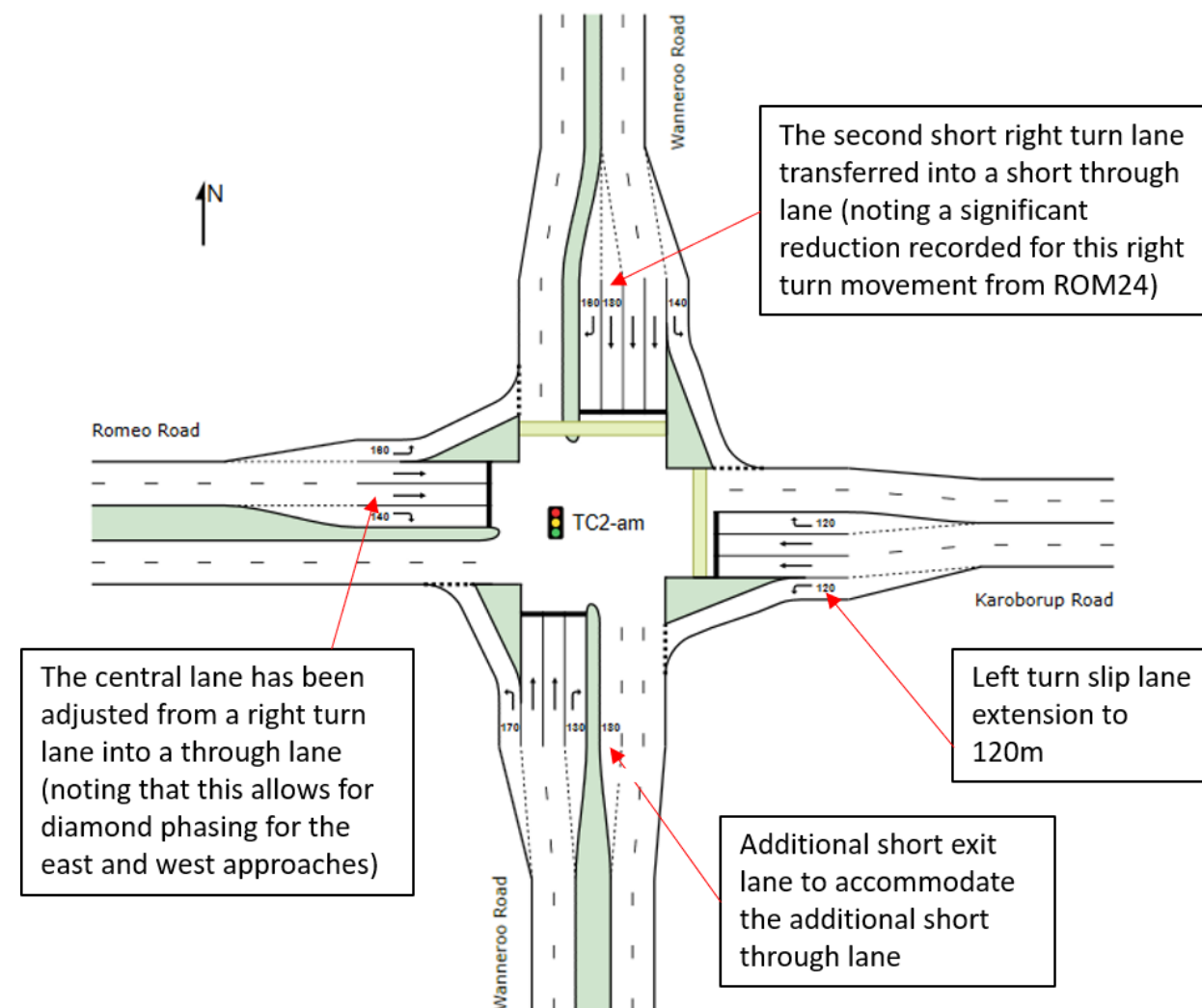


Table 7-9: Wanneroo Road / Romeo Road / Karoborup Road - 2046 SIDRA Results

Wanneroo Road / Romeo Road / Karoborup Road 2046 Results	AM Peak	PM Peak
Average Delay (seconds)	43	47
Level of Service (LOS)	D	D
Degree of Saturation (DOS)	0.818	0.897
95% Back of Queue Length (metres)	209	237

Under the above layout assumptions, the 2046 results demonstrate the intersection will operate within capacity with a Degree of Saturation of 0.818 and 0.897 recorded in the AM and PM peaks respectively and a Level of Service D, which is below the MRWA threshold of 0.9 for critical movements at a signalised intersection.

Wanneroo Road / Nowergup Road

The Wanneroo Road / Nowergup Road intersection was shown to operate over capacity in 2046 if adopting the current configuration (currently a priority controlled intersection), as such the following signalised configuration, as shown in **Figure 7-7**, is proposed to accommodate the development traffic plus the Wanneroo Road background growth through to 2046. The SIDRA outputs for the upgraded intersection are shown in **Table 7-10**. it is noted that NO movements record an LOS F.

Figure 7-7: Wanneroo Road / Nowergup Road

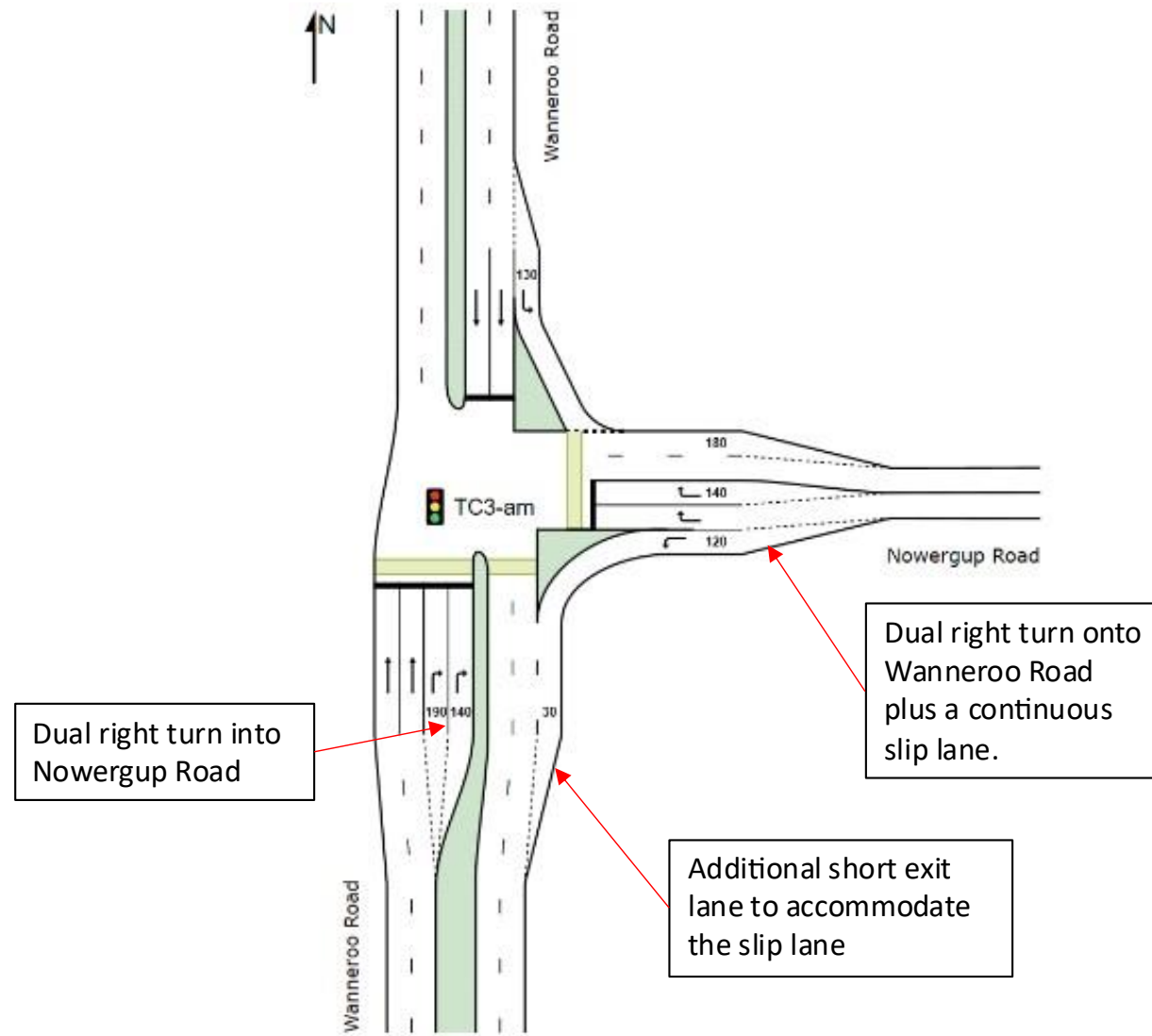


Table 7-10: Wanneroo Road / Nowergup Road - 2046 SIDRA Results

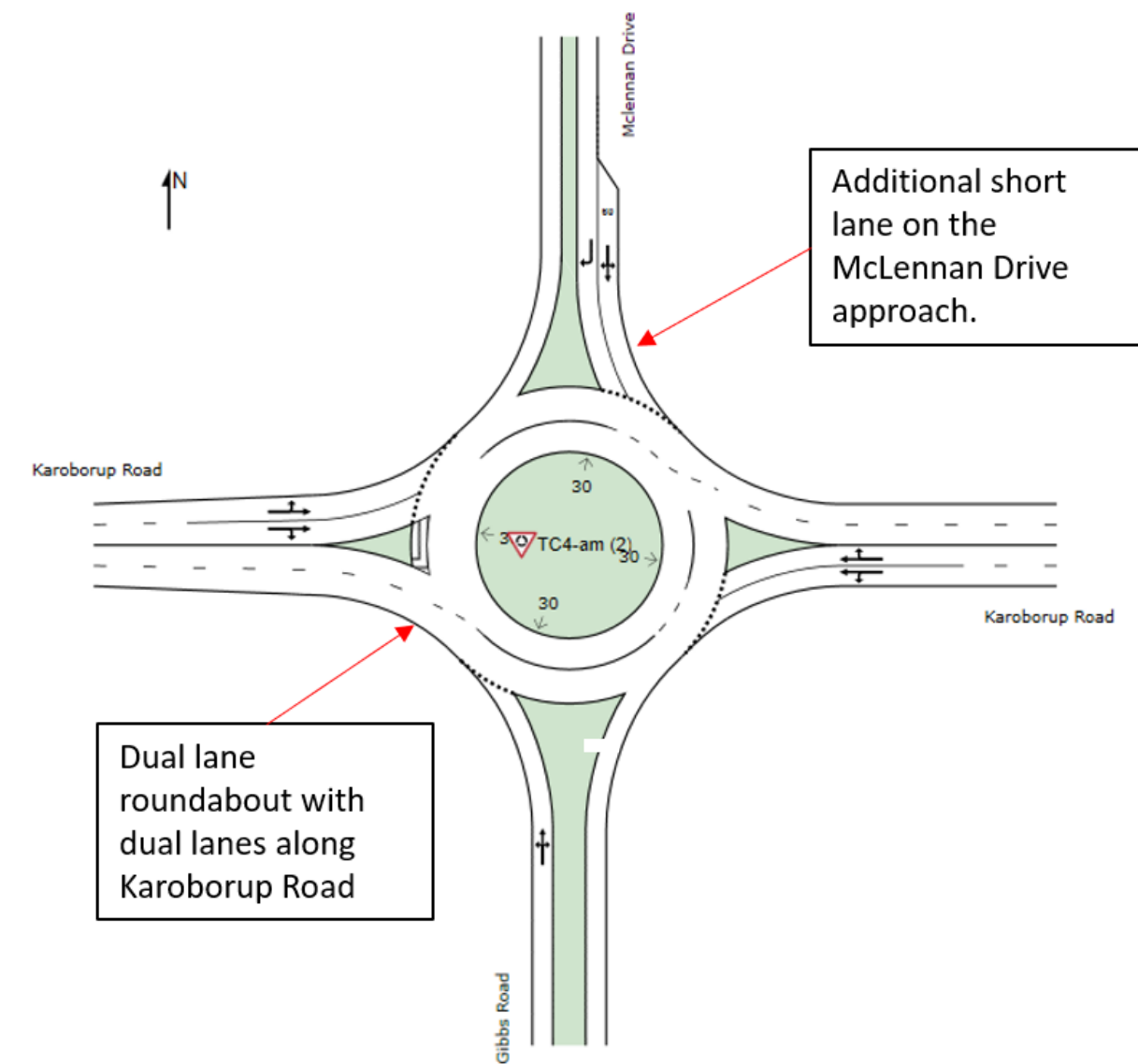
Wanneroo Road / Nowergup Road 2046 Results	AM Peak	PM Peak
Average Delay (seconds)	42	24
Level of Service (LOS)	D	C
Degree of Saturation (DOS)	0.898	0.653
95% Back of Queue Length (metres)	498	189

Under the above layout assumptions, the 2046 results demonstrate the intersection will operate within capacity with a Degree of Saturation of 0.898 and 0.804 recorded in the AM and PM peaks respectively and a Level of Service D and C, which is below the MRWA threshold of 0.9 for critical movements.

Gibbs Road / McLennan Drive / Karaborup Road

The proposed configuration for the Gibbs Road / McLennan Drive / Karaborup Road intersection, as shown in **Figure 7-8**, is proposed to accommodate the development traffic through to 2046. The SIDRA outputs for the upgraded intersection are shown in **Table 7-11**.

Figure 7-8: Gibbs Road / McLennan Drive / Karaborup Road



**Table 7-11: Gibbs Road / McLennan Drive / Karoborup Road - 2046 SIDRA Results**

Gibbs Road / McLennan Drive / Karoborup Road 2046 Results	AM Peak	PM Peak
Average Delay (seconds)	24	11
Level of Service (LOS)	C	B
Degree of Saturation (DOS)	0.981	0.791
95% Back of Queue Length (metres)	229	92

Under the above layout assumptions, the 2046 results demonstrate the intersection will operate within capacity with a Degree of Saturation of 0.981 and 0.791 recorded in the AM and PM peaks respectively and a Level of Service C and B. While it is noted that the AM peak records a higher Degree of Saturation, the maximum **Level of Service** for any movement is D with the **overall a C**, which is line with the target levels outlined by MRWA.

7.9 Intersection Design Land Protection

As requested by DPLH for inclusion in this DSP TIA, intersection designs are to be prepared by the developer and submitted at MRS Amendment stage to inform road widening considerations and protection through a planning control area by the WAPC as needed.

7.10 Access to Frontage Properties

The subsequent planning stages should consider the access needs for properties fronting Integrator and Neighbourhood Connector roads to minimise the vehicles exiting driveways onto higher volume roads (>5,000vpd), with frontage management techniques outlined in the *WAPC Residential Road Planning Policy No. Development Control 2.6*.

7.11 Access to Schools

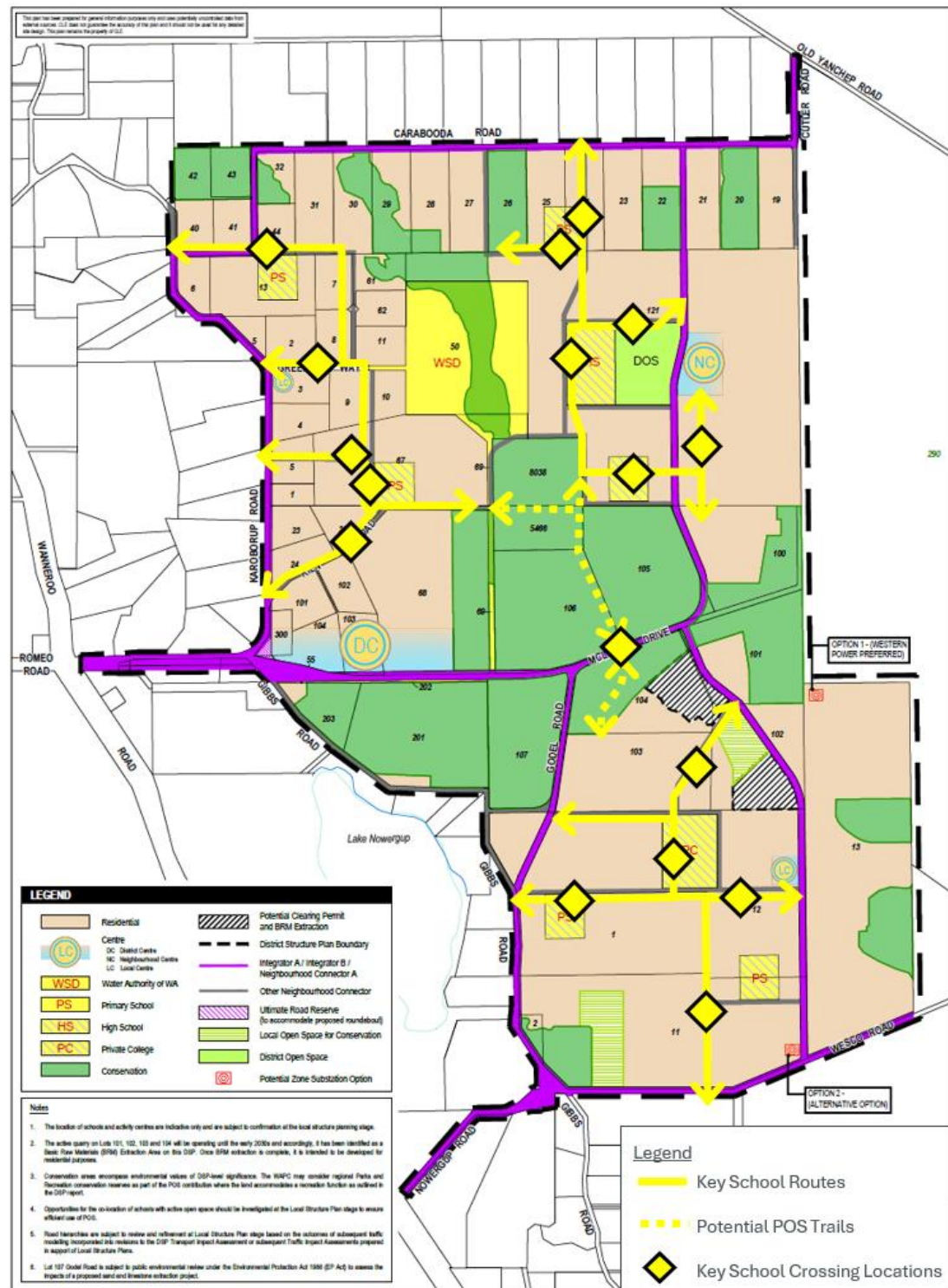
Prioritising safe, direct, and convenient routes for walking and cycling in safe routes to school planning encourages active travel and addresses sustainability outcomes, which have benefits for both individual health and community wellbeing. Detailed consideration of factors influencing mode selection and strategies to support active travel to school will be required at subsequent planning stages. This includes practical considerations, evidence based similar examples and matters raised in DTMI's Active Travel to School initiatives and the following factors:

Reducing traffic volumes and speeds around schools, along with implementing infrastructure such as Raised Safety Platforms (RSPs) and Wombat Crossings where appropriate, with high-quality footpaths that separate children from motor vehicles, significantly lowers the risk of road accidents.

These measures make active travel a more viable and attractive option. Encouraging regular physical activity for children, parents/carers and staff through active travel, such as walking, wheeling or cycling, has significant benefits for children's physical and mental health. It lowers the risk of chronic diseases, boosts cognitive function, and fosters a sense of independence. A safe walk/cycle to school assessment process ensures that students can travel safely while promoting healthier, more active lifestyles during childhood and beyond.

The key school routes onto the higher order roads and crossing locations within the typical 800m catchment radius (approximately 5-minute ride or 10-minute walk) shown in **Figure 7-9**. For secondary schools, the catchment radius could be extended to 1,500m to accommodate longer active travel routes of older children/young adults and the uptake of electric powered or assisted devices. Subsequent development planning stages should identify what additional infrastructure will be required to provide safe and convenient routes/crossings to school and determine the appropriate design for them. Additionally, consideration should be given for the provision of bicycle/scooter parking at schools.

Figure 7-9: Key School Routes and Crossing Locations - Indicative DSP Level

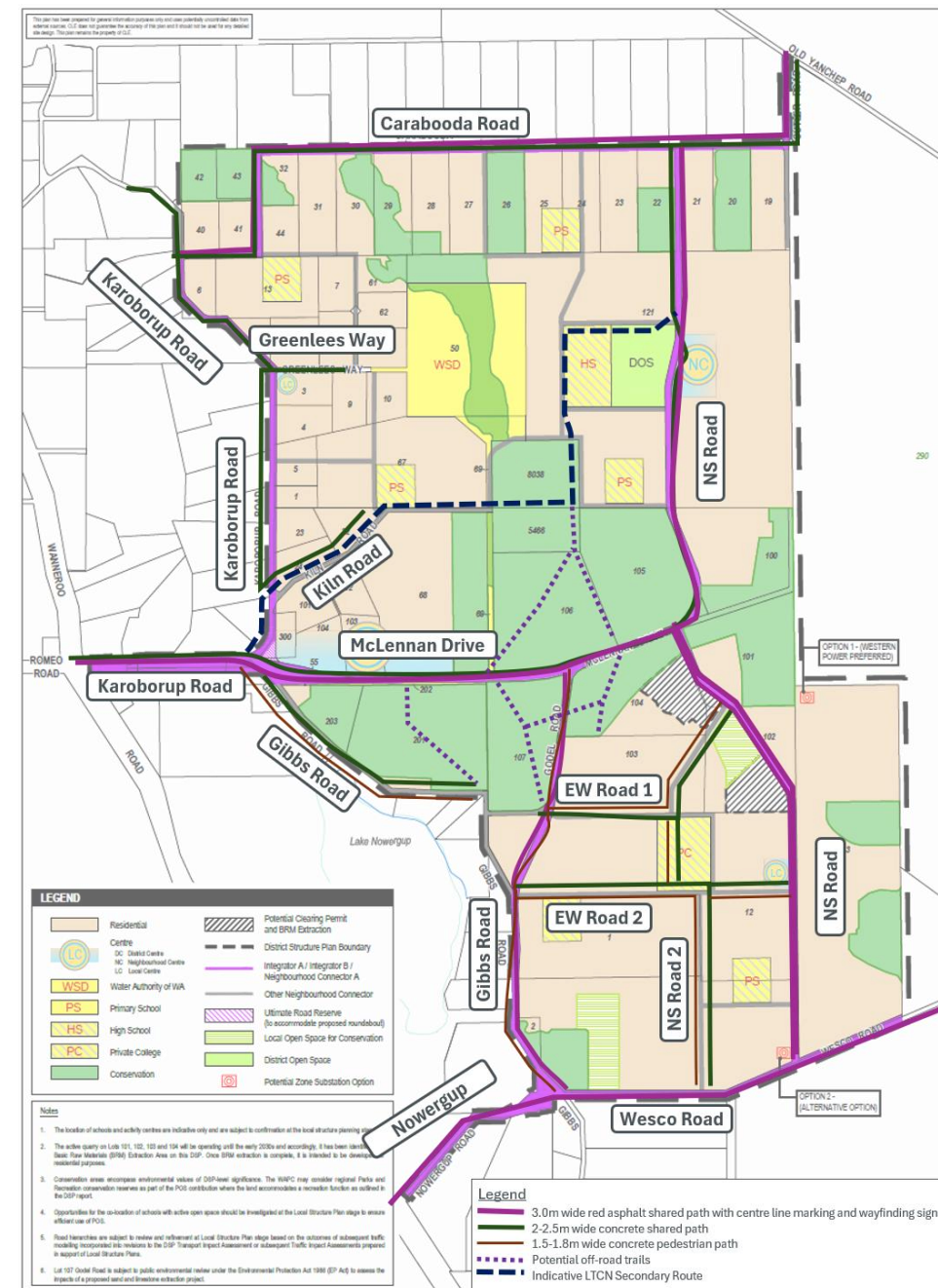


Base Image Source: CLE Town Planning + Design (14 July 2026)

7.12 Active Travel Access and Amenity

The active travel network on the basis of the minimum infrastructure required as part of the road hierarchy classification is shown in **Figure 7-10**. Additionally, there is potential for further active travel routes and trails through the public open space (POS) areas, connecting residential precincts to other trip generating lands uses such as shops and schools.

Figure 7-10: Proposed Active Travel Network - Indicative DSP Level



Base Image Source: CLE Town Planning + Design (14 July 2026)



8 Conclusions & Recommendations

8.1 Site Context Summary

- Located in Carabooda, Western Australia under the jurisdiction of the City of Wanneroo Local Government Area (LGA), within 40km radius from the Perth CBD and less than 5km to both the Alkimos Railway and Bus Station and the Alkimos Secondary Activity Centre, while being around 6km from Alkimos Beach from the western boundary of the Site
- The Site currently comprises approximately 979ha of total land area with around 909ha of Brownfield land (deducts existing road reserves and Water Corp owned land), which is currently occupied by various agricultural and light industry land uses, which are connected to the major road network via internal rural access roads.
- The boundaries of the Site consist of Carabooda Road (north), Cutler Road/Bush Forever Land (east), Wesco Road (south) and Karoborup Road/Gibbs Road (west). Wanneroo Road is located approximately 800m west of the Site with Carabooda Lake and Lake Nowergup providing a natural recreational / open space boundary.
- The major roads comprising of Wanneroo Road, Romeo Road, Mitchell Freeway, Old Yanchep Road and Marmion Avenue are all within 5km of the Site. Additionally, Tonkin Highway and Great Northern Highway are around 30-40km east of the Site.
- The Site has recently been unlocked with a new bus and train station services recently opened at Alkimos Railway and Bus Station located only 3.5km away.
- There are no formal active travel provisions within the Site at present. The nearest existing path networks are on Romeo Road (shared path) and the Mitchell Freeway corridor (principal shared path). Additionally, Romeo Road connects to the Yaberoo Budjara Heritage Trail which is an unsealed walking/mountain biking trail and ultimately connects to Burns Beach Road, between Mitchell Freeway and Joondalup Drive.

8.2 Planning Context Summary

- The District Structure Planning stage within the *WA Planning Framework* is formed on the basis of the overarching Sub-Regional Planning Frameworks/Structure Plans, Local Planning Strategy and Local Planning Scheme.
- The Site is zoned for “Rural Resource” under the City of Wanneroo District Planning Scheme No. 2 (DPS2) dated 31 October 2024.
- The *Perth and Peel at 3.5million people* – North West Sub-Regional Framework (2018) indicates a number of proposals to the external transport network including the Yanchep Rail Extension (YRE) (completed in July 2024), the Mitchell Freeway extension (extension to Romeo Road completed in July 2023, with the staged extensions to Eglinton and Indian Ocean Drive anticipated between 2031 and 2050) and Whiteman-Yanchep Highway (anticipated to be completed after 2051).

- The City of Wanneroo draft Local Planning Strategy 2041, Place Strategy 2023-2027, Active Transport Plan 2022/23-2025/26 and Transport Strategy 2019/20 were reviewed and highlight a desire to promote alternative transport modes other than private vehicle trips.

8.3 Proposed DSP Summary

- The DSP is proposed as an urban development with 9,221 residential dwellings, around 68,400m² GFA of commercial centres, six primary schools, one government secondary school and one private college, in addition to 61ha of public open space (POS) and 224ha of conservation reserve, with an anticipated full development forecast year of 2046.
- The proposed access locations from the DSP boundary comprise of two on the north (via Karoborup Road and Cutler Road), one on the west (via Karoborup Road/Carabooda Road and Karoborup Road/McLennan Drive) and three on the south (via Nowergup Road, Gibbs Road and Wesco Road).
- The proposed internal road network comprises a network of existing and development roads including Integrator A, Integrator B and Neighbourhood Connectors running north to south and east to west, and local access roads.
- For the purposes of the DSP, the modal share targets identified in the *Perth and Peel Transport Plan for 3.5 Million People and Beyond (Summary) (2016)* have been considered. The proposed transport infrastructure has been planned to support achievement of these targets, to the extent practicable, through the delivery of connected and accessible walking and cycling networks that promote active transport and contribute to the target modal share outcomes.

8.4 Transport Assessment Summary

- Ultimately, the DSP is estimated to generate in the order of 89,500vpd of which around 74% are distributed onto the external road network and the remaining 26% are distributed among the internal DSP road network only, comprising of 70% commercial based and 30% school based vehicle trips.
- The 2046 MRWA ROM24 sub-area cordon matrices data indicates that of the internal generated trips, 31.6% have internal destinations and 68.4% have external destinations. Furthermore, the data indicates 18.9% of trips between the DSP have internal origins and destinations, 40.8% have internal origins and external destinations, and 40.3% have external origins with internal destinations.
- The trips external to the DSP are split accordingly to the MRWA data with around 29% via Romeo Road west, 22% via Wanneroo Road south, 19% via Wanneroo Road north, 19% via Whiteman-Yanchep Highway south, 10% via Gibbs Road (south of Wesco Road) and 1% via Whiteman-Yanchep Highway north.
- The ultimate (full) development road hierarchy is proposed to comprise of the following, based on the distributed daily traffic volumes and indicative midblock two-way daily traffic volumes, with the ultimate cross-section profiles to be determined within the subsequent planning stages.

- **Integrator A/B:** Karoborup Road (east of Romeo Road), McLennan Drive, Karoborup Road (between McLennan Drive and Greenlees Way), Gibbs Road, Wesco Road/Nowergup Road and the NS Road (between Wesco Road and the northern road of the high school/commercial area).
- **Neighbourhood Connector A/B:** Kiln Road, Karoborup Road (between Greenlees Way and Carabooda Road), Carabooda Road, Greenlees Way, the NS Road (between the Integrator B portion and Carabooda Road), both of the EW Roads (between Gibbs Road and the NS Road) and the NS Road (south of the private college to Wesco Road), Gibbs Road (between Gibbs Road at Godel Road to Karoborup Road).
- SIDRA Intersection modelling has been undertaken for key intersections. It is demonstrated that the assumed upgraded intersection layouts for the access points and key internal intersections noted by the DPLH can accommodate the ultimate DSP demand along with the envisaged background growth per the ROM24, with the identified road upgrades. With these suggested upgrades, the SIDRA results demonstrate suitable levels of service and degrees of saturation in line with the target levels outlined by MRWA.
- Prior to the ultimate development described above, the land east of the Carabooda water tank has a few constraints to immediate development, being cleared of native vegetation and predominantly in single ownership (as Lot 121 Carabooda Road). A Staging Plan has been presented in Part 2 of the Town Planning DSP report to reflect this, showing this area as a short- to medium-term priority. The intended Local Structure Plan (LSP) boundaries also reflect this intention.
Ultimately, most traffic from the Lot 121 area will obtain east-west access to external routes via McLennan Drive, however, this is a significant piece of infrastructure for which there is no short-term need. The Lot 121 area is proposed to initially obtain access to external routes via an extension of Kiln Road across the conservation estate, south of the water tank. This interim arrangement ensures that Lot 121 can develop concurrently with, or even ahead of, other land in LSP 2 further west. It also ensures that residential traffic will not interact with truck traffic related to the Godel Road quarry, which will be operating until the early 2030s and uses the eastern section of McLennan Drive for access (connecting into Godel Road and Gibbs Road). If McLennan Drive is constructed through to Romeo Road too soon, truck traffic and residential traffic will interact, and this is not preferred.
In the ultimate (full) development scenario, McLennan Drive and Kiln Road will share the role of servicing the east-west traffic from the Lot 121 area. In the meantime, Kiln Road will perform that role alone until the construction of McLennan Drive to its ultimate standard is necessary due to development reaching completion on land east of the conservation estate and enabled by the conclusion of operations at the Godel Road quarry.
- In alignment with the *City of Wanneroo Pathways Policy* (October 2024), all Integrator and Neighbourhood Connectors require a minimum of a 2-2.5m wide concrete shared path on one side with Neighbourhood Connector A and Integrators also requiring a 1.5-1.8m wide concrete pedestrian path on the other side. Alternatively, if the road is identified within the *Department of*

Transport and Major Infrastructure long-term cycle network (LTCN), a 3m wide red asphalt path with centre line marking and wayfinding signage is required. Parts of Carabooda Road, Karoborup Road, McLennan Drive, Wesco Road and the NS Road have been identified as Secondary and Local routes on the LTCN.

- The ultimate form and control of the intersections will be determined at the subsequent planning stages, with indicative controls of the intersections on the Integrator roads consisting of signals/roundabouts at intersecting Integrators and roundabouts/priority controlled intersections at Integrators intersecting Neighbourhood Connectors.
- Leveraging the State Government's extension of the Yanchep Rail Extension from Butler Station to Yanchep Station provides a train station at Alkimos approximately 3.5km of the Site. It is envisaged bus services will run from Alkimos Station to the DSP area as the area is occupied by residents and demand justifies the service. The Carabooda Urban Precinct offers an ideal location for a bus depot and for investigations into a new depot for electric bus services to deliver a cleaner and lower-emissions public transport network.
- The key school routes onto the higher order roads and crossing locations within the typical 800m catchment radius (approximately 5-minute ride or 10-minute walk) were identified. For secondary schools, the catchment radius could be extended to 1,500m to accommodate longer active travel routes of older children/young adults and the uptake of electrical powered or assisted devices. Subsequent development planning stages should identify what additional infrastructure will be required to provide safe and convenient routes/crossings to school and determine the appropriate design for them. Additionally, consideration should be given for the provision of bicycle/scooter parking at schools.
- There is potential for further active travel routes and trails through the public open space (POS) areas, connecting residential precincts to other trip generating lands uses such as shops and schools.

transport ● engineering ● placemaking



Appendix A **TIA Checklist**



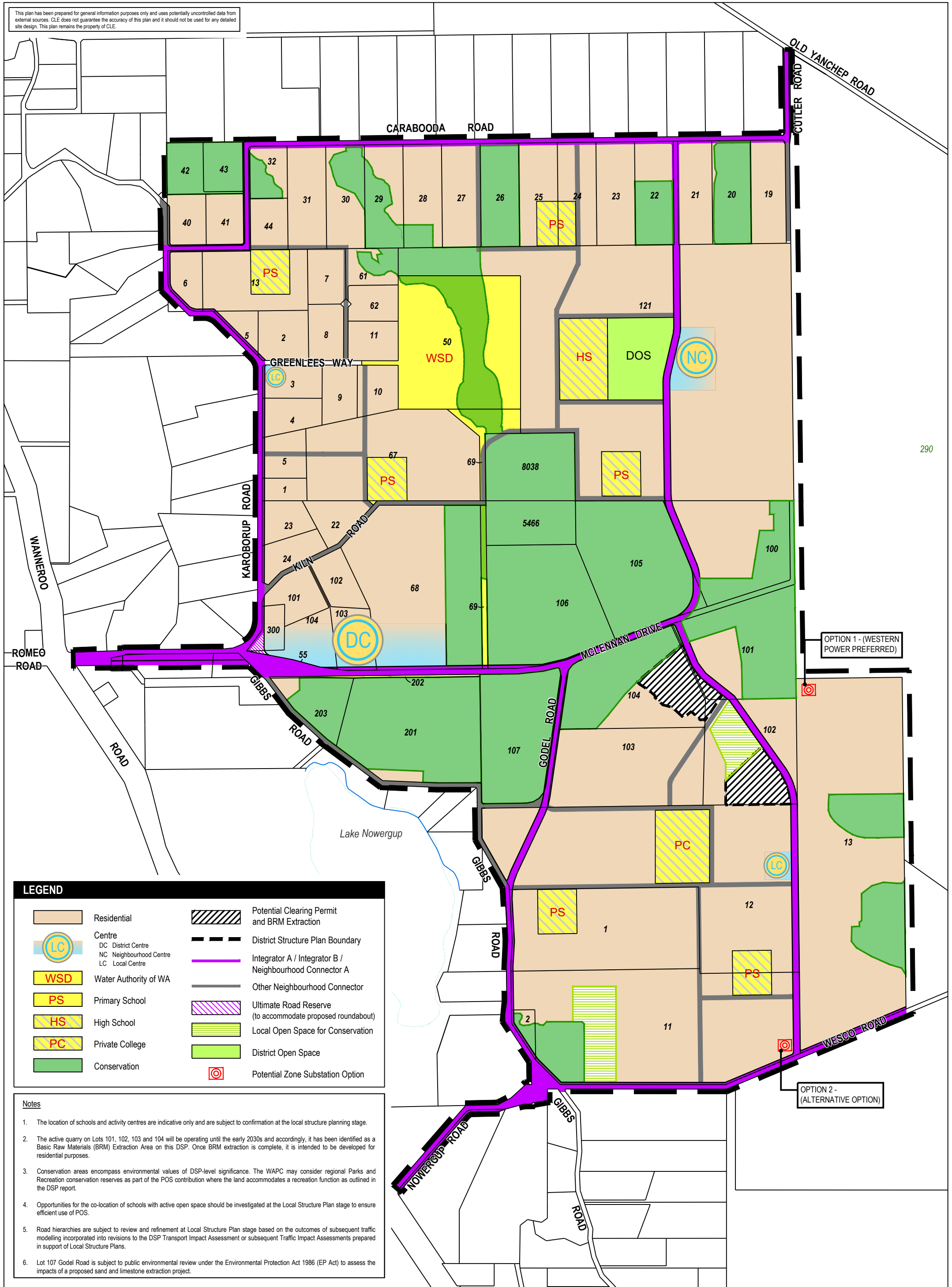
Appendix A TIA Checklist

Item	Provided	Comments/Proposals
Summary	Y	Refer Section 8
Introduction / Background	Y	Refer Section 1
Structure Plan Proposal	Y	Refer Section 2
Regional context	Y	Refer Section 2.1
Proposed land uses	Y	Refer Section 2.4
Table of land uses and quantities	Y	Refer Section 2.4
Major attractors / generators	Y	Refer Section 2.4
Specific issues	N/A	
Existing Situation	Y	Refer Section 3
Existing land uses within structure plan	Y	Refer Section 3.1
Existing land uses within 800m of structure plan area	Y	Refer Section 3.1
Existing road network within structure plan area	Y	Refer Section 3.2
Existing pedestrian / cycle network within structure plan area	Y	Refer Section 3.4
Existing public transport services within structure plan area	Y	Refer Section 3.3
Existing road network within 2 (or 5) km of structure plan area	Y	Refer Section 3.2
Traffic flows on roads within structure plan area (PM and/or AM peak hours)	Y	Refer Section 3.2
Existing pedestrian / cycle networks within 800m of structure plan area	Y	Refer Section 3.4
Existing public transport services within 800m of structure plan area	Y	Refer Section 3.3
Proposed Internal Transport Networks	Y	Refer Section 4
Changes / additions to existing road network or proposed new road network	Y	Refer Section 4.4
Road reservation widths	Y	Refer Section 7.6
Road cross-sections & speed limits	N/A	TBD in further planning stages.
Intersection controls	N/A	TBD in further planning stages.
Pedestrian / cycle networks and crossing facilities	Y	Refer Section 4.2/7.10/7.11
Changes to External Transport Networks	Y	Refer Section 5
Road network	Y	Refer Section 5.2/5.6/5.7/5.10
Intersection controls	Y	Refer Section 5.3/5.11
Pedestrian/cycle networks and crossing facilities	Y	Refer Section 5.2
Public transport services	Y	Refer Section 5.1/5.4/5.5/5.8/5.9

Integration with surrounding area	Y	Refer Section 6
Trip attractors / generators within 800 metres	N/A	
proposed changes to land uses within 800 metres	N/A	
travel desire lines from development to these attractors/ generators	Y	Refer Section 6.
adequacy of external transport networks	Y	Refer Section 6
deficiencies in external transport networks	Y	Refer Section 6
remedial measures to address deficiencies	Y	Refer Section 6
Analysis of internal transport networks	Y	Refer Section 7
assessment years	Y	Refer Section 7.1
time periods	Y	Refer Section 7.1
Structure plan generated traffic	Y	Refer Section 7.3
Extraneous (through) traffic	Y	Refer Section 7.3
Design traffic flows (that is, total traffic)	Y	Refer Section 7.5
Road cross-sections	N/A	TBD in further planning stages.
Intersection controls	Y	Refer Section 7.7 - TBD in further planning stages.
Access strategy	Y	Refer Section 4.1
Pedestrian / cycle networks	Y	Refer Section 7.11
Safe routes to schools	Y	Refer Section 7.10
Pedestrian permeability & efficiency	Y	Refer Section 7.11
Access to public transport	Y	Refer Section 7.9
Analysis of external transport networks	Y	Refer Section 7
Extent of analysis	Y	Refer Section 1.3
Base flows for assessment year(s)	Y	Refer Section 7.2
Total traffic flows	Y	Refer Section 7.5
Road cross-sections	N/A	TBD in further planning stages.
Intersection layouts and controls	N/A	TBD in further planning stages.
Pedestrian / cycle networks	Y	Refer Section 3.4
Conclusions	Y	Refer Section 8

Appendix B
District Structure Plan Layout

This plan has been prepared for general information purposes only and uses potentially uncontrolled data from external sources. CLE does not guarantee the accuracy of this plan and it should not be used for any detailed site design. This plan remains the property of CLE.



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