KALAMUNDA ACTIVITY CENTRE PLAN

Transport Assessment

Prepared for:

City of Kalamunda

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EXECUTIVE SUMMARY

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with City of Kalamunda (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
620.12121.00000-R01-v1.0	13 September 2018	Benjamin Park	Kris Stone	Kris Stone
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1 Introduction

The Kalamunda Activity Centre Plan will facilitate the ongoing development of the Kalamunda town centre, shaping its future positioning as a contemporary, attractive and functional centre for residents and visitors. The town centre is at a crossroad, whereby its future and function need an effective combination of vision and practical implementation to enable its ongoing relevance and commerciality whilst retaining key of its character and identity.

This Transport Assessment has been prepared in relation to the Kalamunda Activity Centre Plan which has been prepared in collaboration with a multi-disciplinary project team. The Activity Centre Plans include comprehensive:

- Design guidelines for private and public realms
- Economic and retail analysis
- Transport and parking analysis
- Infrastructure and servicing analysis
- Bushfire management plans; and
- Community and stakeholder engagement.

1.1 Purpose

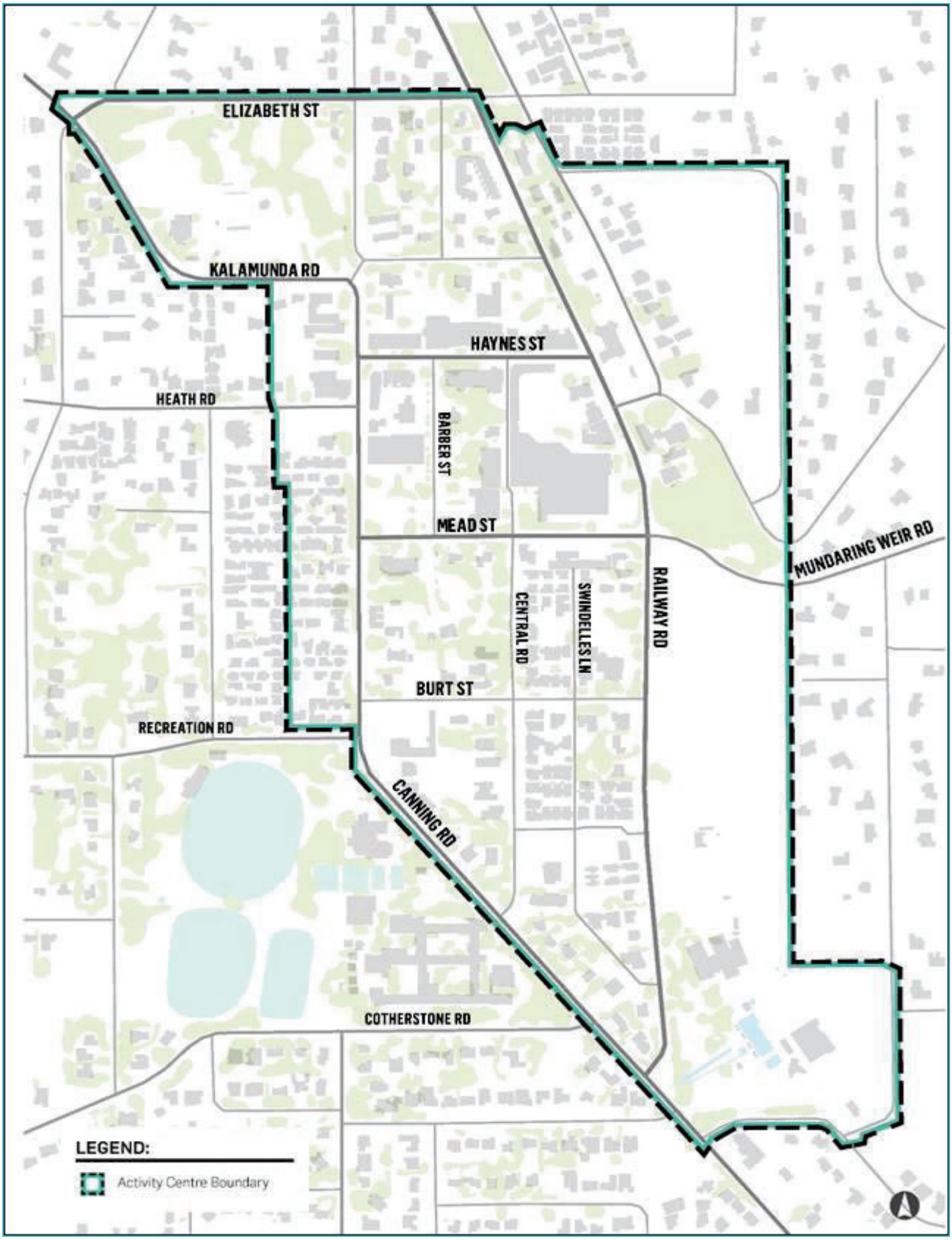
The purpose of the Kalamunda Activity Centre Plan is to facilitate the development of a district activity centre in Kalamunda, Western Australia, as contemplated and planned for in a variety of state and local planning documents.

This Transport Assessment accompanies the Kalamunda Activity Centre Plan.

1.2 Study Area

The Kalamunda Activity Centre Plan study area is illustrated on Figure 1 overleaf.

Figure 1 Study Area Extent



1.3 Transport Assessment Scope

This Transport Assessment outlines the key considerations and findings of the traffic and car parking analysis which has informed the activity centre planning. The key objectives of the assessment are to:

- Evaluate the proposed internal transport networks with respect to:
  - accessibility
  - safety
  - car parking
- Evaluate the level of non-vehicle integration (public and active transport)
- Determine the impacts of the traffic generated by the activity centre plan area on the surrounding land uses; and
- Determine the impacts of the traffic generated by the activity centre plan area on the surrounding transport networks.

1.4 Transport Assessment Structure

The Transport Assessment has been documented in the following structure:

1. Introductionss
2. Background
3. Existing situation
4. Road network
5. Public transport
6. Active transport
7. Traffic capacity
8. Car parking
9. Conclusions.

2 Background

Several key traffic engineering studies have been prepared on behalf of the City for the Kalamunda in the period 2011-present. SLR Consulting has reviewed, adopted, and expanded upon the findings of these studies in the process of developing and informing the activity centre planning.

- *Parking Study, Kalamunda Town Centre* (Shawmac, August 2011)
- *Intersection Layout and Level of Service Study* (Opus, May 2016)
- *Kalamunda Bicycle Plan* (Cardno and City of Kalamunda, November 2017)
- *Local Area Traffic Management Study* – Canning Road and Mead Street (Cardno, July 2018)
- *Kalamunda Town Centre Pedestrian Crossing Assessment* (GHD, July 2018).

2.1 Parking Study, Kalamunda Town Centre - Shawmac – 2011

Shawmac undertook a comprehensive parking study in 2011 with the purpose of developing a strategy for the management of parking supply within the Kalamunda town centre.

The study comprised physical surveys of parking supply and demand including the quantification of on/off-street parking utilisation. The assessment also involved a desktop analysis of the car parking requirement for the then current situation and a presumed redevelopment scenario. Comparisons were made between the observed parking demand and that required in accordance with the Local Planning Scheme (LSP 3).

The study also assessed the traffic generation and impact on the local road network in association with a presumed future development scenario. The key findings of the 2011 Shawmac study were:

- Surveyed parking demands are low in comparison to the available supply, generally
- On-street parking had a higher utilisation compared to off-street parking. Haynes Street was observed as having a peak utilisation of 98% on the surveyed weekday and weekend days
- Surveyed parking demands are low in comparison to the Planning Scheme requirement indicating that the rate specified in planning documents was too high
- A significant parking shortfall approximating 1,400 spaces was projected in association with the presumed future land use scenario
- The then current road network was determined as sufficient in catering for projected future traffic demands, albeit the Canning Road / Mead Street intersection would require upgrading.

2.2 Intersection Layout and Level of Service Study – Opus – 2016

Opus assessed the 2015 and 2031 road network operations with the aim of identifying intersection capacity improvements. The study comprised physical surveys of traffic demands and a desktop analysis of intersection performance utilising SIDRA. The study assumed a background demand growth rate of 1.5% per annum.

The key findings of the 2016 Opus study were:

- Traffic demands were established to be growing at approximately 1-3% per annum

- The road network was determined as having sufficient capacity to cater for the surveyed 2015 traffic demands, albeit the right turn movements from Mead Street and Heath Road to Canning Road were assessed as having higher delays (26-37 seconds)
- The future road network was determined as generally operating within capacity thresholds, except at the intersections of Canning Road/Mead Street and Canning Road/Heath Road where Degrees of Saturation (DOS) and delays exceeded acceptable limits
- Capacity improvements were recommended at Canning Road/Mead Street and Canning Road/Heath Road.

2.3 Kalamunda Bicycle Plan – Cardno and City of Kalamunda – 2017

Cardno undertook the technical assessment which informed the City of Kalamunda's Bicycle Plan which, at the time of writing this report, has been finalised and available for review.

The study reviewed previous planning, key origins and destinations, bicycle demand and travelled route surveys and crashes involving bicycles to determine a recommended bicycle facility hierarchy which was then resolved into an infrastructure implementation schedule.

2.4 Local Area Traffic Management Study – Canning Road and Mead Street – Cardno – 2018

Cardno undertook an assessment of possible Local Area Traffic Management (LATM) solutions that would address stated resident concerns relating to the right turn from Mead Street into Canning Road, which as per the LOS Study completed by Opus, would ultimately exceed DOS thresholds in the future if its existing intersection configuration were to be retained.

The assessment recommended a capacity upgrade that would deliver an additional intersection approach lane on the Mead Street approach to Canning Road such that there are separate left and right turn lanes. Whilst there was no analysis of the upgrade benefit, the new lane would improve performance.

SLR understands that the City of Kalamunda is progressing with the installation of the Cardno recommended upgrade.

2.5 Kalamunda Town Centre Pedestrian Crossing Assessment – GHD – 2018

GHD was engaged to assess pedestrian crossings within the Kalamunda town centre, specifically located on, and in close proximity to Haynes Street. The study concluded that none of the eight subject locations met or exceeded the Main Roads Western Australia (MRWA) warrants for the installation of zebra crossing, principally because of a lack of combined traffic and pedestrian demands. Additional safety upgrades or optimisations were recommended based on the result of on-site inspections.

3 Existing Situation

3.1 Road Network Infrastructure

The existing road network encapsulating the Kalamunda Activity Centre consists of a range of different road classifications, as defined by the Main Roads Western Australia (MRWA) *Road Information Mapping System.*

The functional hierarchy of the higher order routes including Canning Road, Mandaring Weir Road, Haynes Street and Mead Street is likely to remain consistent given their connectivity and role in the broader network. Whilst the form of the road connections may be altered as part of the activity centre plan, the hierarchical function of these connections is generally maintained, unless future road function is significantly altered.

The hierarchy of the key roads within the Kalamunda Activity Centre is illustrated overleaf on Figure 2.

It is anticipated that based on the form and function of the existing connections, the daily traffic demands utilising each road type can be classified as per this hierarchy. The daily traffic demands summarised in Table 1 should be considered for each road hierarchy designation.

Table 1 Road Hierarchy Characteristics

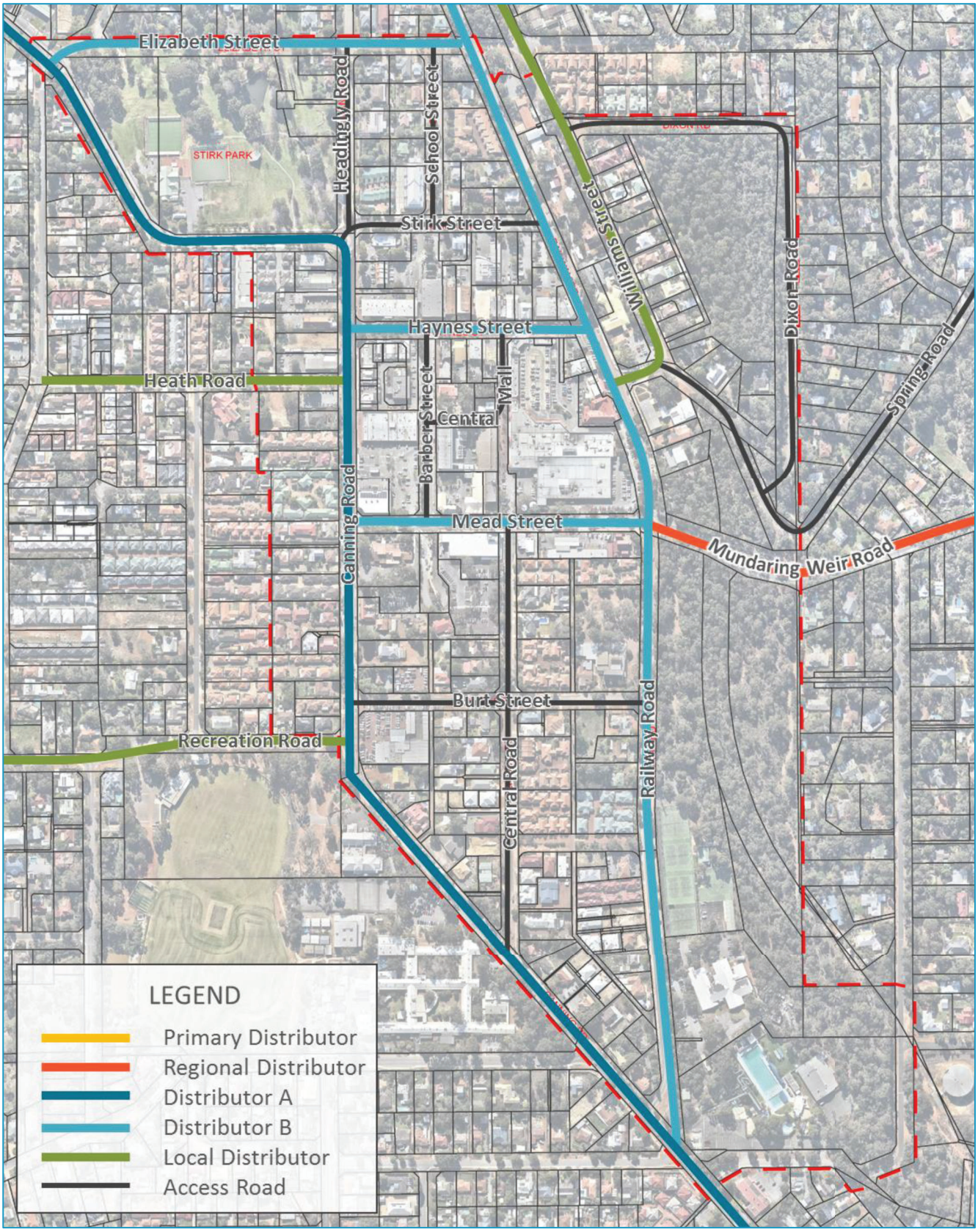
Road Classification	Number of Lanes	Typical Speed Limits	Typical Volumes (vpd)
Regional Distributor	2-4	60km/hr- 80km/hr	>15,000
Distributor A	2	60km/hr-70km/hr	10,000 – 15,000
Distributor B	2	50km/hr	5,000 - 10,000
Local Distributor	2	50km/hr	3,000 – 5,000
Access Road	2	40km/hr-50km/hr	<3,000

Recent traffic demand data was sourced from the City of Kalamunda by way of consultant investigations conducted on behalf of the City. The most pertinent demand data is summarised in Table 2.

Table 2 Recent Surveyed Traffic Demands

Road	Count Location	Year of Data	Average Weekday Demand (vpd)	85th Percentile Speed (km/h)
Railway Road	North **of Burt Street**	2011	4,863	60.5
	North **of Burt Street**	2013	5,384	56
	South **of Burt Street**	2015	5,038	61
Canning Road	North of Burt Street	2012	11,255	57
	North of Burt Street	2015	7,857	57
Haynes Street	West of Barber Street	2015	3,726	30
	West of Railway Road	2015	3,081	31
Mead Street	West of Railway Road	2011	4,091	42.1
	West of Railway Road	2015	4,521	35
	West of Central Road	2015	4,543	45
	West of Barber Street	2015	4,209	41
Barber Street	South of Nestobrae Lane	2015	1,638	37
	South of Haynes Street	2015	1,789	28

Figure 2 Kalamunda Activity Centre Road Hierarchy



3.2 Traffic Operations

Based on turning movement surveys and analysis undertaken by Opus in 2016, the existing road network can be assessed as operating well within typically accepted performance thresholds during the peak hour periods. Table 3 reproduces the key performance metrics reporting by Opus for the study intersections situated within the study area.

Table 3 2015 Road Network Intersection Performance

Intersection	Critical Intersection Approach Level of Service	Intersection Degree of Saturation	95th Percentile Vehicle Queue (veh)
Haynes St / Barber St	A	0.12	0.4
Haynes St / Canning Rd	B	0.33	1.1
Haynes St / Railway Rd	A	0.24	0.6
Canning Rd / Heath Rd	C	0.35	1.6
Mead St / Barber St	A	0.13	0.5
Canning Rd / Mead St	C	0.40	2.2
Mead St / Railway Rd	A	0.37	2.3
Canning Rd / Stirk Rd	A	0.49	3.6

The Table 3 results clearly indicate that recent traffic demands can be accommodated by the current road network with Degree of Saturation (DOS), Level of Service (Los) and queues all being within reasonable performance thresholds.

The 2015 Opus findings are still considered applicable to the current situation given recent traffic growth has been limited and there have been no significant local redevelopments or road network changes.

3.3 Safety (Crash History)

Crash data has been sourced from MRWA for the Kalamunda Activity Centre study extents for the periods between 1 January 2013 and 31 December 2017. Table 4 summarises all crashes within the extents based on severity and unit type (i.e. car, bicycle, pedestrian, etc).

Table 4 Crash History Matrix (2013-2017)

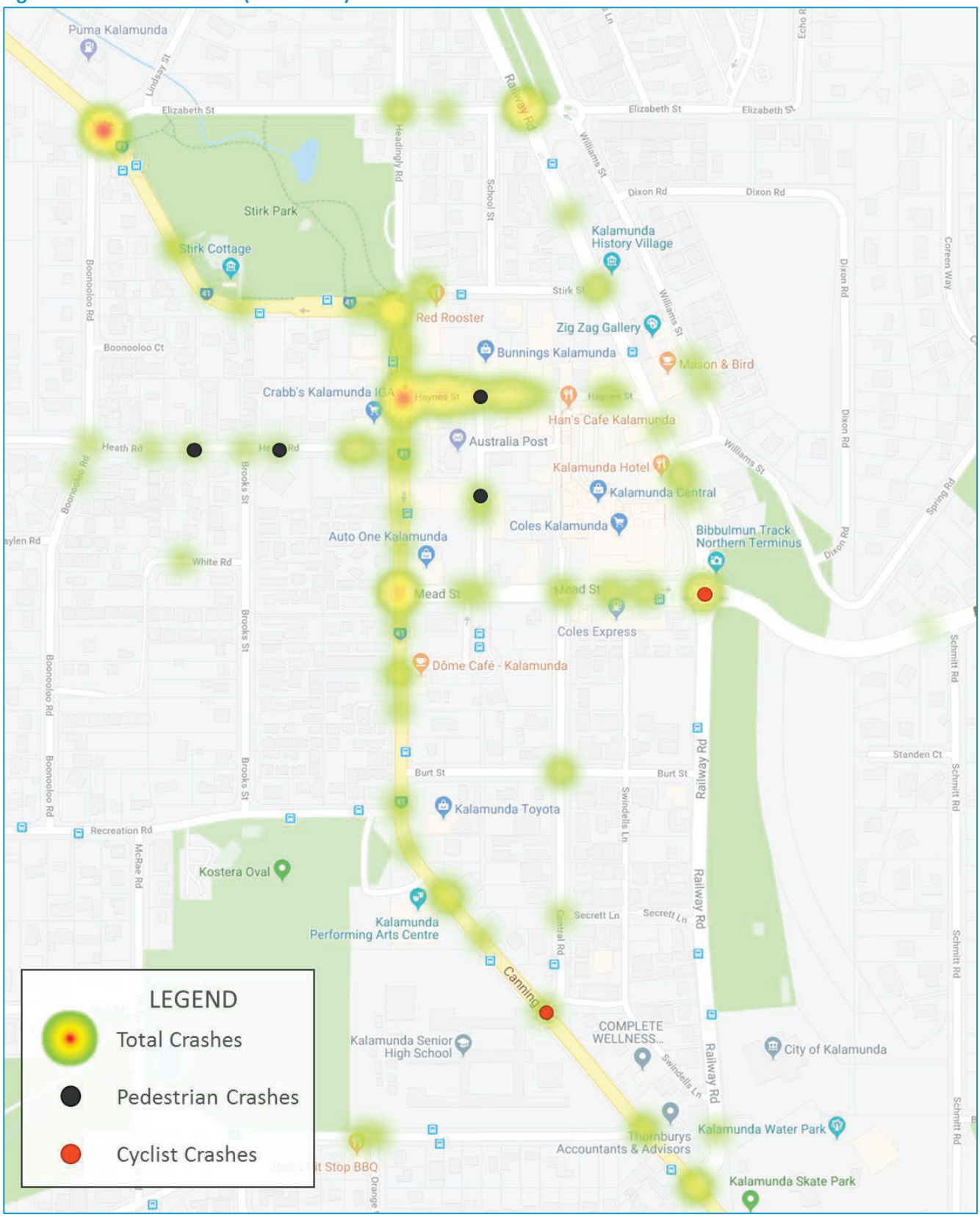
Unit Type Involved	Crash Severity					
	Fatal	Hospital	Medical	PDO Major	PDO Minor	Total
Bicycle			1		1	**2**
Bus				2	4	**6**
Car	1	3	19	61	50	**134**
Four Wheel Drive (Not Car Design)			2	4	5	**11**
Motor Cycle		3	1	4	2	**10**
Multi - Seated Van				1		**1**
Panel Van				4	3	**7**
Pedestrian	2	2				**4**
Station Wagon	1	1	3	15	18	**38**
Truck				3	3	**6**
Utility			2	24	10	**36**
Not Identified		1	3	19	9	**32**
Total	**4**	**10**	**31**	**137**	**105**	**287**

The data summarised in Table 4 indicates that the majority of crashes within the Kalamunda study extents involved multiple vehicle conflicts, and typically resulted in property damage only (PDO).

Of the four crashes resulting in a fatality (and of four total crashes involving pedestrians), it is understood that two of these occurred recently in December 2017, and involved elderly members of the community, aged between 86 and 93 (both drivers and pedestrians involved). Whilst this sudden spike in fatal pedestrian crashes is a substantial outlier from the remaining data-set, it is considered that the extreme ages of the road users involved have a significant role in the crash occurrence, potentially causing slower reaction times or lack of general road awareness. Nevertheless, these crashes have been considered in the overall road enhancement strategy, particularly in areas of high pedestrian traffic.

For ease of reference, the location of all crashes has been illustrated on Figure 3 overleaf, which includes heat mapping that represents clusters of crashes. In addition to these crash clusters, SLR has superimposed the crashes associated with pedestrians and cyclists to determine if there are any crash clusters for active transit users. It does not appear that there are any trends with regards to pedestrian or cyclist crashes that would be a result of existing design deficiencies.

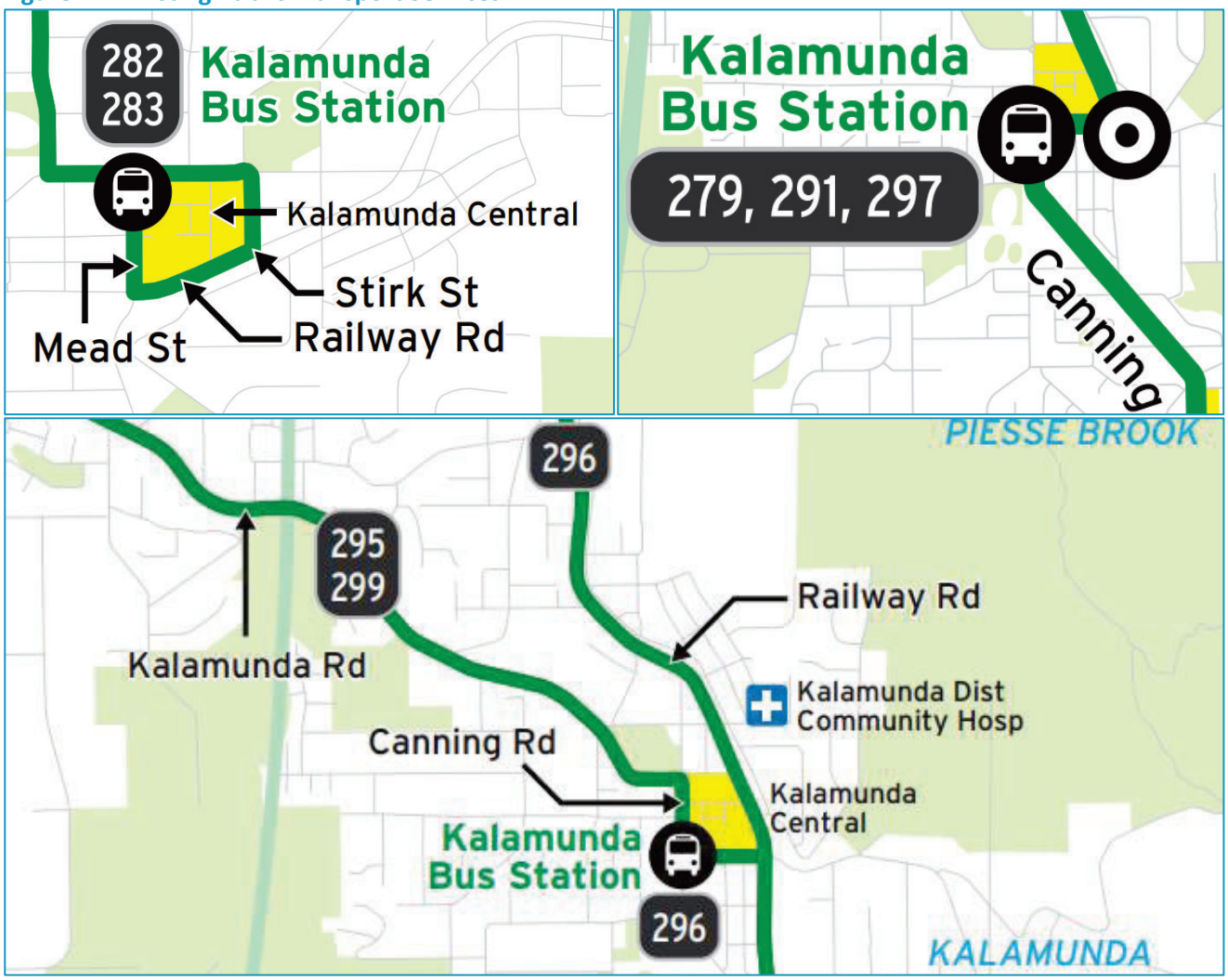
Figure 3 Crash Locations (2013-2017)



3.4 Public Transport

The Kalamunda Bus Station is located on the southern leg of the Mead Street/Barber Street intersection. Eight bus services utilise the station with approach/departure routes travelling along Railway Parade and Canning Road. Bus routes that service the station include 279, 282, 283, 291, 295, 296, 297, and 299.

Figure 4 Existing Public Transport Services



Other bus stops are also located on Canning Road (north/south bound), Mead Street (east/west bound), and Railway Road. There are no other public transport services within the study area. Service frequencies vary by time-of-day and by service but can approach <15 minutes in peak hour periods.

3.5 Active Travel

AS reported in Section 3.3, there have been several traffic crashes that have resulted in pedestrian fatalities, two of which occurred within the most recent 9-10 months.

Pedestrian path facilities located in verges are generally low quality and users are subject to numerous conflict points where vehicles must cross the verge to enter/exit development sites and intersections.

The format and design criteria of existing crossing facilities throughout the study area vary significantly and there is a lack of consistency of design philosophy or approach.

Mid-block connectivity/legibility is limited through development sites given existing buildings and significant off-street car parking facilities. The lack of midblock crossings is important as it requires pedestrians either travel significantly longer distances than desirable, or, forces users to navigate through car parking and vehicle circulation areas that at night have poor levels of passive surveillance.

On-street line-marked or dedicated off-street separated bicycle facilities are non-existent within the study area.

4 Activity Centre Plan Proposal

4.1 Priorities

The *Kalamunda Visioning Document* prepared by Urbis for the purposes of informing the Activity Centre Plan development framework outlines a number of areas of improvement suggested by key stakeholders. The primary transport focus of these improvements included improving pedestrian connectivity and wayfinding. Representatives of the City also identified a series of priorities, the combined set summarised below as:

1. Improved accessibility to public transport facilities
2. Active transport connectivity, amenity, and safety
    a. Pedestrians
    b. Cyclists
3. Confirmation of current/projected traffic operations
4. Confirmation of current/projected car parking situation.

4.2 Key Transport Proposal of the Activity Centre Plan

The following is a summary of the key transport related items which form part of the Activity Centsre Plan:

- Enhanced integration of transport interchange with activity centre core
- Improvement to urban design and built form to support:
    - Pedestrian mobility and safety
    - Cyclist mobility and safety
    - Space activation and improvement in passive surveillance and security
- Sustainable car parking provision.

These items are addressed throughout this assessment.

4.3 Proposed Road Network Structure and Hierarchy

Table 5 outlines the key priorities that were noted during stakeholder engagement. These were used in the determination of the function and intended design intent of the recommended road hierarchy and cross-section forms that would also support the Activity Centre Plan urban design and economic revitalisation goals.

Investigations regarding road hierarchy also made reference to the projected traffic demands reported earlier herein in Section 3.

Table 5 Key Road Functions

Road Classification	Prioritised User Groups	Key Function	Future Considerations & Design Intent
Canning Road	• Private Vehicles • Buses • Cyclists	• Operates as the primary north-south route through Kalamunda • Carries significant vehicle and cycle traffic through the town to south-eastern destinations from Perth	• General function to remain consistent with existing use • Provision of enhanced pedestrian and cycle connectivity
Mead Street	• Private Vehicles • Cyclists	• Operates as the primary east-west route through Kalamunda • Carries significant vehicle and cycle traffic through the town to south-eastern destinations from Perth	• General function to remain consistent with existing use • Provision of enhanced cycle facilities to the allow east-west travel.
Haynes Street	• Private Vehicles • Pedestrians	• Activated lower order road that services pedestrian and vehicle access to surrounding retail tenancies	• Reduction in private vehicle emphasis along road connection • Provision of enhanced tenancy frontages with wide verges encouraging pedestrian use • Restrict servicing access for lots fronting Haynes Street such to minimise vehicle crossing on main pedestrian spine.[1]
Railway Road	• Private Vehicles • Pedestrians • Cyclists	• A north-south route that operates similarly to Canning Road with a smaller traffic throughput • Provides pedestrian access to various community facilities along the eastern activity centre boundary.	• Enhanced road formation to encourage safe travel by pedestrians and cyclists.
Barber Street	• Private Vehicles • Pedestrians	• Activated lower order road that services pedestrian and vehicle access to surrounding retail tenancies	• Existing functionality to generally be maintained.
Central Mall	• Pedestrians	• Provides pedestrian connectivity to a somewhat underutilised outdoor shopping mall • Single one-way laneway for private vehicle and service vehicle access to rear of tenancies	• Provide an enhanced share-way street to reprioritise movements by active users encouraging connectivity to shops. • Allow infrequent access from service vehicles and high priority private vehicles (i.e. PWD and Taxis / Rideshares)
Stirk Street	• Private Vehicles • Pedestrians	• Minor east-west connection that services access to parking and servicing facilities for Haynes St tenancies • Occasional pedestrian utilisation between Stirk Park and surrounding uses.	• Existing functionality to generally be maintained

[1] Servicing strategy for individual lots to be determined during detailed application phase. Servicing access to primarily be gained via Stirk Street using access easements through various landholders, however would be assessed on a case-by-case basis.

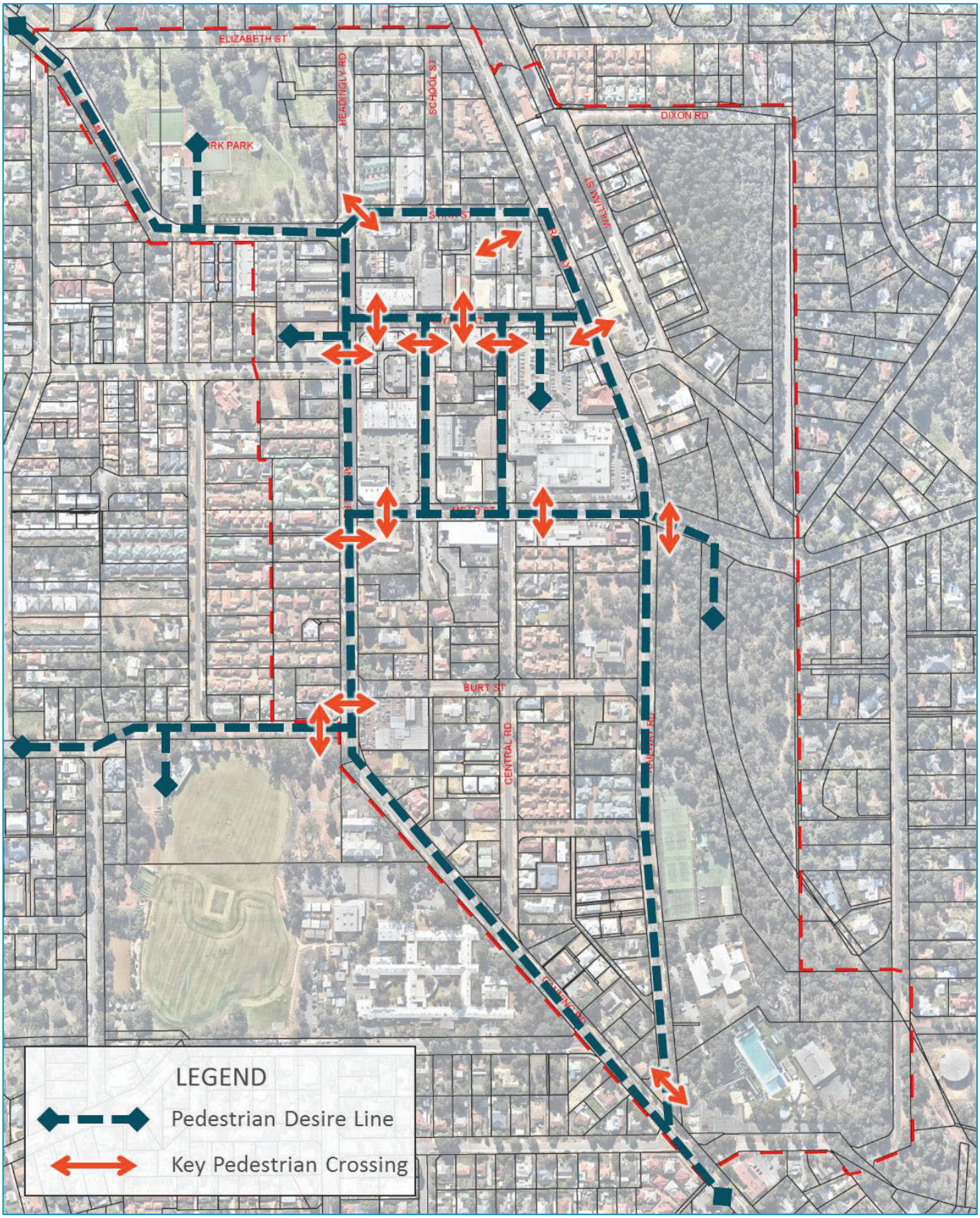
4.4 Pedestrian Facilities

A series of pedestrian facilities improvements are warranted in response to existing deficiencies and also the increased demands likely to result from the Activity Centre Plan improvements. There is existing demand and potential increased demand for pedestrian trips between the following key land uses/destinations:

- Zig Zag Gallery and community services
- Bibbulmun Track entrance
- Coles Kalamunda and surrounding shops
- Kalamunda Bus Station
- Stirk Park
- Kalamunda IGA
- Jack Healey Centre
- City of Kalamunda offices; and
- Community pool.

The desire lines generated from the connection of these major uses has been illustrated on Figure 5, which highlights key pedestrian crossing locations along the central road network.

Figure 5 Pedestrian Desire Lines and Key Crossing Locations



Note: Key Pedestrian Crossings illustrated above do not necessarily confirm the suitability of an exiting crossing, however just confirm location of road crossings where the pedestrian desire line intersects with a significant roadway.

4.4.1 Investigation

In 2018, GHD undertook a study assessing the suitability of several pedestrian crossings within the town centre, principally on/near Haynes Street. The GHD *Pedestrian Crossing Assessment* report included traffic and pedestrian surveys and evaluated the demand of the eight crossing locations illustrated at Figure 6.

Figure 6 Key Crossing Locations – Design Recommendations

The GHD assessment concluded that none of the eight crossing locations strictly met the minimum demand thresholds for combined pedestrian and vehicle iteration that would warrant a line marked zebra crossing.

Furthermore, it has been identified by site observations that pedestrian crossing facilities are inconsistent in their location, design (dimensions and line marking/signage).

It is considered critical that pedestrian crossing facilities are improved such that they are as consistent across the activity centre area so that users (motorists and pedestrians) are aware of their responsibilities and intended actions do not require site specific interpretation on a case by case basis.

4.4.2 Recommendation

In addition to the rectification of the issues identified in the GHD pedestrian crossing study, SLR has identified a number of recommended upgrades to each of these key crossings based on the future demand anticipated throughout the activity centre.

Given the enhanced pedestrian focus envisaged along Haynes St as a part of the ACP, recommended design treatments have been provided in Table 6 to be provided as a part of the modified and revitalised street form. All crossing locations, except those located on Canning Road should comprise the following elements:

- Install TGSIs at all crossing points
- Raised crossing with contrasting pavement treatment
- Reduced crossing distance with kerb build-outs and lane narrowing
- Parking restrictions on approach/departure to improve sight lines.

Table 6 Summary of GHD Recommendations

Crossing ID	Street Name	Recommended Modifications
1	Canning Road	• Install TGSIs at all crossing points • Install dedicated zebra crossing
2	Haynes Street	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines
3	Haynes Street	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines
4	Barber Street	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines • Repair kerb
5	Central Mall	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines • Align ramps with clear travel route • Upgrade drainage treatment for safer crossing
6	Haynes Street	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines
7	Railway Road	• Install TGSIs at all crossing points • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines • Repair kerb
8	Railway Road	• Install TGSIs at all crossing points • Implement raised crossing with contrasting pavement treatment • Reduce crossing distance with kerb build-outs and lane narrowing • Apply parking restrictions to improve sight lines

It is recommended that all crossing locations on roads of similar function incorporate a consistent form so that users (motorists and pedestrians, etc.) expectations and behaviours are consistent. This will reduce confusion when comparing the current arrangements which consist of many different crossing treatments.

4.5 Cyclist Facilities

Previous studies and planning documents prepared on behalf of the City have outlined recommended improvements to the bicycle network. These studies, in combination with site observations and investigations have informed the Activity Centre Plan bicycle network.

4.5.1 Investigation

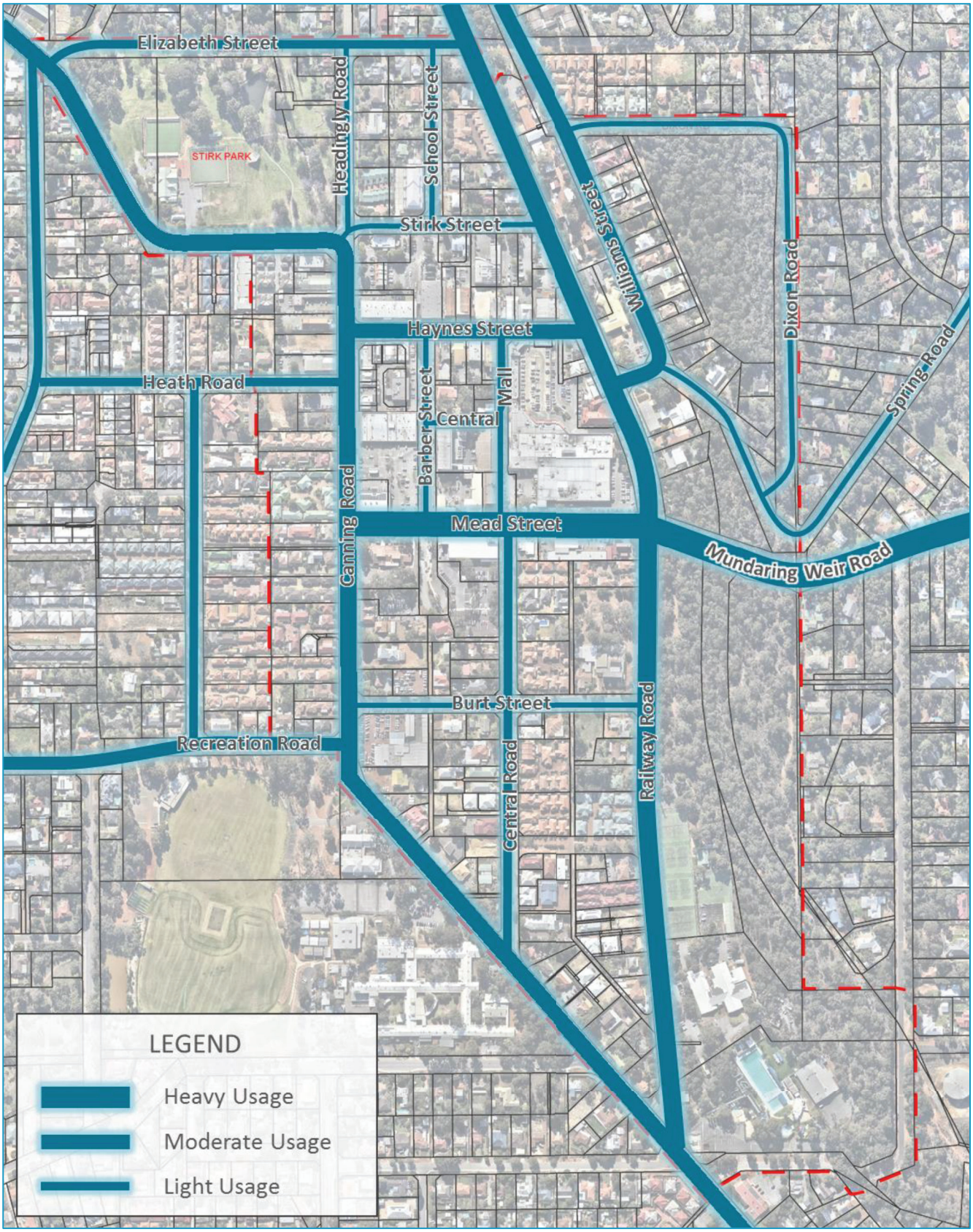
The City of Kalamunda Bicycle Plan identifies Canning Road and Railway Road as Strategic routes which "*provide safe and direct connections between Principal Routes and major trip generators such as shopping centres, industrial areas or major health, education, sporting and civic facilities" (City of Kalamunda 2017).* The Plan also defines Central Road and Headingly Street as a Safe Active Streets which are lower order, lower speed (<30km/h) routes where cyclists and vehicles share the street pavement.

SLR Consulting sourced bicycle demand data from Strava to supplement the demands surveys collected by Cardno in their City of Kalamunda Bicycle Plan technical reporting. The Strava heat map data has been evaluated with recognition made of the fact that cyclists who typically use and post ride data to Strava are recreational or 'sport' cyclists, not commuters of convenience cyclists. Accordingly, certain routes may be overrepresented in terms of their relative use, i.e. mountainous ride favoured by recreational cyclists.

Figure 7 overleaf has been developed to categorise the existing bicycle demand by route based on a review of the prior studies and information collected by SLR.

It is evident from the bicycle data that there is a significant demand for trips along Canning Road, Mead Street, and Railway Road. Other, lower order connections cater for lower levels of rider demand and can be typically described as local or parallel routes.

Figure 7 Existing Bicycle Usage by Route



4.5.2 Recommendation

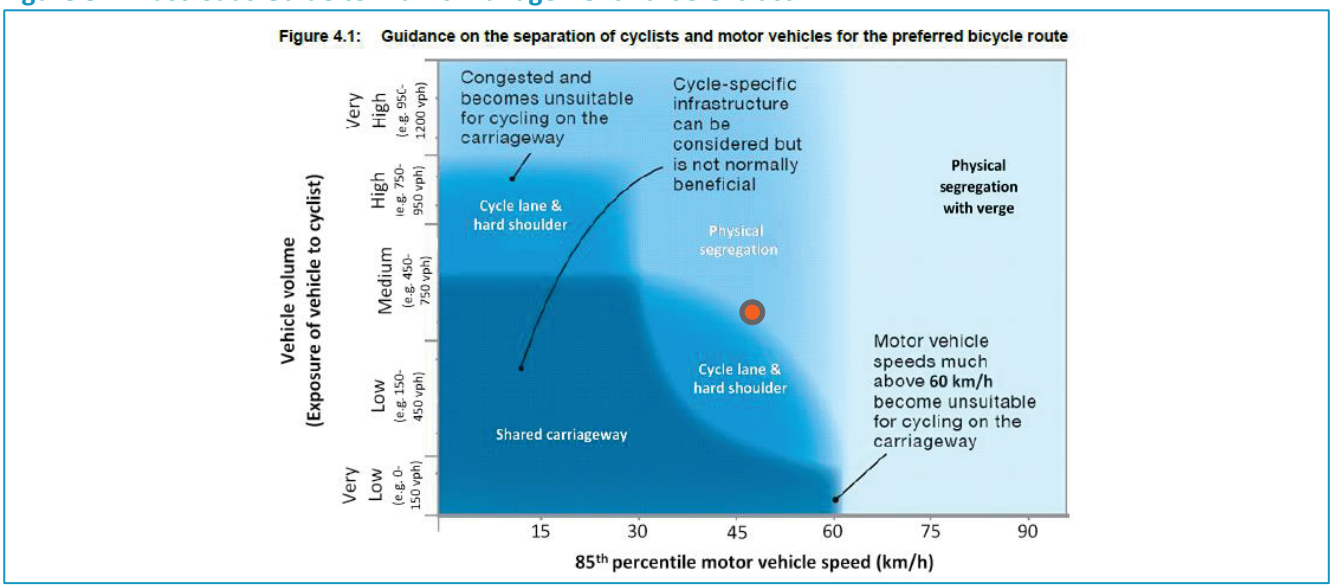
Whilst the Cardno technical report and City of Kalamunda Bicycle Plan do not identify specific facility upgrades within the Kalamunda town centre area, SLR has identified a number of road segments that warrant improved on-road facilities, including:

- Canning Road: dedicated on-street bicycle lanes
- Mead Street: dedicated on-street bicycle lanes

Whilst the Cardno technical reporting and City of Kalamunda Bicycle Plan do not identify upgrades on these specific segments, the installation of on-street facilities would be consistent with their designation as Strategic Routes (Canning Road) and an extension of a Training Route (Mundaring Weir Road). The designation of these dedicated on-street facilities is supported by the existing demand data available on Figure 8 overleaf that identifies this route as one of the most trafficable roads within the ACP area.

Austroads Guide to Traffic Management provides recommended cycle infrastructure based on existing traffic volumes and speeds along a subject road section. Based on available traffic data (referenced in Section 4.6 overleaf) Canning Road currently carries approximately 500vph in each direction during peak periods and has an 85th percentile speed of 47km/hr. Based on this data, the Austroads guidance would suggest that on-road cycle paths would be appropriate considering existing traffic demands, as illustrated in Figure 8.

Figure 8 Austroads Guide to Traffic Management Part 5 extract



Importantly, the design treatment recommended for Canning Road is consistent with that proposed in the Bicycle Plan for another segment approximately 500m south of the study area. The delivery of similar treatments on this route would ensure continuity for all road users, minimising the risk of unnecessary conflict. The road hierarchy and cross-section figures included at Appendix A and Appendix B respectively illustrate the extent and form of the recommended on-road cycle lanes.

Dedicated, on-street facilities are not strictly warranted on other roads/streets within the study area. An approach consistent with the previously defined Safe Active Streets would be reasonable on other lower order, connecting streets where speeds and demands permit, i.e. Central Road, Burt Street, Haynes Street, Stirk Street, Headingly Street, Heath Road, and Elizabeth Street.

4.6 Network Performance and Capacity

Road network operational modelling of the current and anticipated land use scenarios projected to arise in the town centre have been conducted by SLR Consulting in addition to that undertaken previously by Opus and Shawmac.

The three prior technical studies completed in 2011, 2016 and 2018 have each addressed road performance during the peak hour periods in some respect.

- *Parking Study, Kalamunda Town Centre* (Shawmac, August 2011)
- *Intersection Layout and Level of Service Study* (Opus, May 2016)
- *Local Area Traffic Management Study* – Canning Road and Mead Street (Cardno, July 2018).

The most comprehensive road network modelling undertaken in 2011 (Shawmac) and 2016 (Opus) has been critically reviewed in resolving:

1. The need, or otherwise, for capacity upgrades
2. The road hierarchy and cross-sectional form.

4.6.1 Intersections

Prior studies have identified that the following intersection operations are constrained, at present and under future land use scenarios that are more conservative than that now projected as part of the current Activity Centre planning:

- Canning Road / Mead Street – right turn from Mead Street operating with excessive delays
- Canning Road / Heath Road – right turn from Heath Road operating with excessive delays.

With respect to Canning Road / Mead Street, the City of Kalamunda has advised that capacity improvements to address current deficiencies are planned. The upgrades consist of a new lane on the Mead Street approach which will provide dedicated lanes for left and right turning traffic.

Table 7 summarises SIDRA modelling prepared by SLR Consulting with respect to the proposed Mead Street upgrade.

Table 7 Canning Road / Mead Street – Committed Upgrade to Mead Street Approach

Assessment Scenario		Degree of Saturation	Average Delay	Critical Delay / Level of Service	95th Percentile Vehicle Queue (veh)
2015	Existing (Single Lane) Approach	0.418	3.9	28.5 / D	2.1
	Committed Dual Lane Approach	0.414	3.7	26.1 / D	2.1
2031	Existing (Single Lane) Approach	0.750	6.1	53.0 / F	4.4
	Committed Dual Lane Approach	0.548	4.6	45.4/ E	2.3

It is clear from Table 7 that the committed upgrading of the Mead Street approach will not provide sufficient capacity at the 2031 time horizon assuming background growth approximating 1.5% per annum from 2015 is achieved. Only the right turn from Mead Street to Canning Road operates beyond typically accepted performance thresholds; therefore, there are two possible solutions that would address this capacity issue:

1. Signalise the intersection
2. Restrict right turn movement from Mead Street.

A roundabout option has not been identified as it formed part of prior recommendations made by Opus given SLR's understanding that it was not favoured by the City of Kalamunda because of possible land resumption requirements.

Option 1 is recommended on the basis of this study given the banning of the right turn would only shift demand to another, possibly more critical intersection like Haynes Street which is undesirable. Signalisation of the intersection could be accommodated with no additional land resumptions given the already wide road reserve. Signalisation would have the additional benefit of also improving pedestrian safety and amenity at the intersection.

SIDRA modelling of the Canning Road / Heath Road intersection was undertaken to evaluate and confirm the prior 2016 Opus finding which indicated over capacity operations, but no upgrading proposal.

Table 8 Canning Road / Heath Road – Existing Arrangement

Assessment Scenario	Degree of Saturation	Average Delay	Critical Delay / Level of Service	95th Percentile Vehicle Queue (veh)
2015	0.402	2.9	32.3 / D	1.8
2031	0.797	6.2	75.0 / F	5.1

The Table 8 results indicate that the existing right turn delays will increase significantly by 2031, even with relatively low 1.5% per annum background traffic growth from 2015. Similar to that identified earlier for Canning Road / Mead Street, there are two possible solutions that could be progressed to mitigate the right turn issue being signalisation or the banning/restriction of the right turn movement out of Heath Road.

In this instance, the banning or restriction of the right turn movement is preferred (Option 2) given the proximity of the intersection to Haynes Street (55m) would introduce potential up/down stream consequences along Canning Road. Additionally, movements wishing to turn right out of Heath Road have the ability to redistribute to other reasonable routes.

Given the significance of road functions, further traffic analysis is recommended at the following intersections to investigate potential safety or operational upgrades that would provide network benefit:

- Canning Road / Railway Road intersection
- Canning Road / Recreational Road intersection.

It is anticipated that upgrades to these two intersections would include, but not be limited to the following:

- Channelised right turn treatments (short or full-length)
- Localised parking restrictions that would improve sight lines and allow vehicle passing
- Splitter island treatments on minor road legs including pedestrian refuge.

4.6.2 Road Segments

The 2031 traffic demand projections made by Opus in 2016 and reproduced in Table 9 are considered reasonable and conservative with respect to the future demands projected in relation to the Activity Centre Plan.

Table 9 Road Hierarchy Thresholds – Surveyed Daily Volumes

Road Name	Road Classification	Volume Thresholds	2015 Surveyed Volumes	2031 Forecast Volumes
Canning Road	Distributor A	10,000 – 15,000	7,857	9,743
Mead Street	Distributor B	5,000 - 10,000	4,209	5,219
Haynes Street	Distributor B	5,000 - 10,000	3,081	3,820
Railway Road	Distributor B	5,000 - 10,000	5,038	6,247
Barber Street	Access Road	<3,000	1,789	2,218
Central Mall	Access Road	<3,000	0	0
Stirk Street	Access Road	<3,000	2,827*	3,505
Heath Road	Local Distributor	3,000 – 5,000	2,252	2792

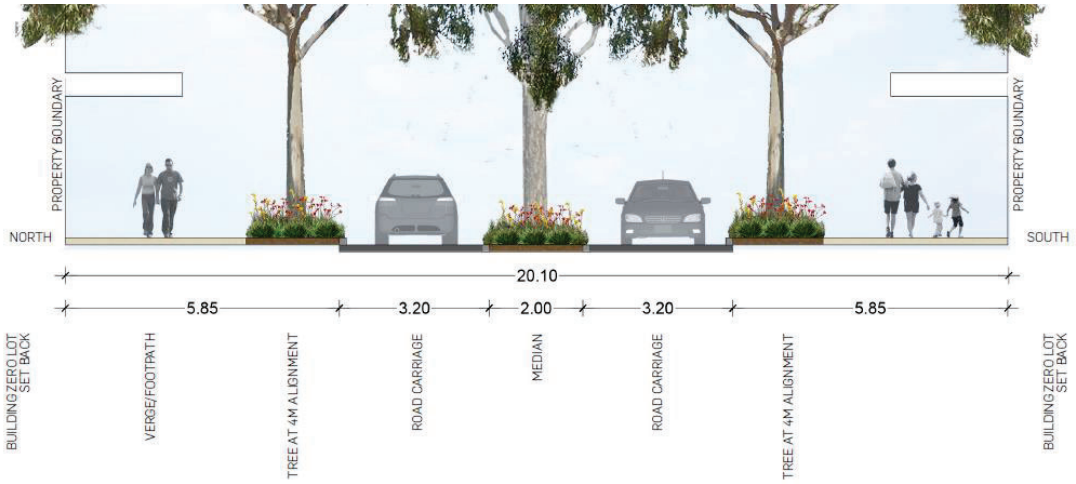
**Note: No data for 2015, supplemented with 2011 counts*

These road segment demand estimates have been adopted for the purposes of developing the Appendix A road hierarchy and Appendix B cross-section solutions – also discussed in the following section.

4.7 Road Network Cross-Sections

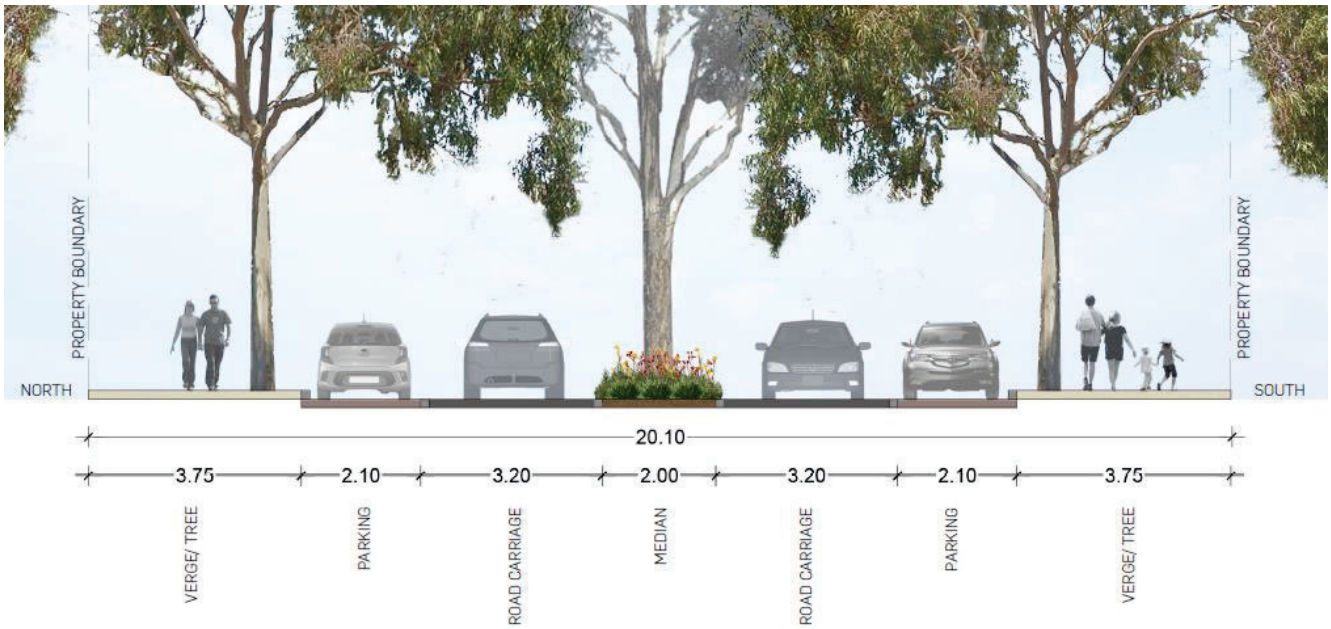
The street/road cross-sections introduced here and included at Appendix B have been developed by the combined team in response to the urban design priorities and also such that they are appropriate with regards to the anticipated function and demand of the roads/streets.

Road Section A-A (Stirk Street Corners)



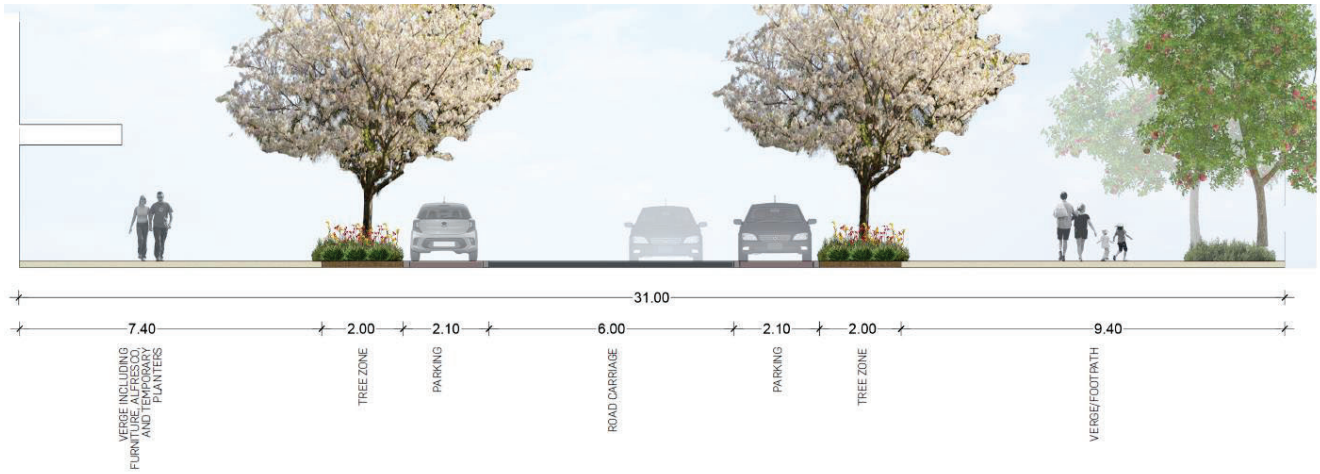
- Wide verges to encourage shared pedestrian and cyclist use
- 2m wide median to provide separation between conflicting traffic streams and to provide a refuge for crossing pedestrians

Road Section B-B (Stirk Street)



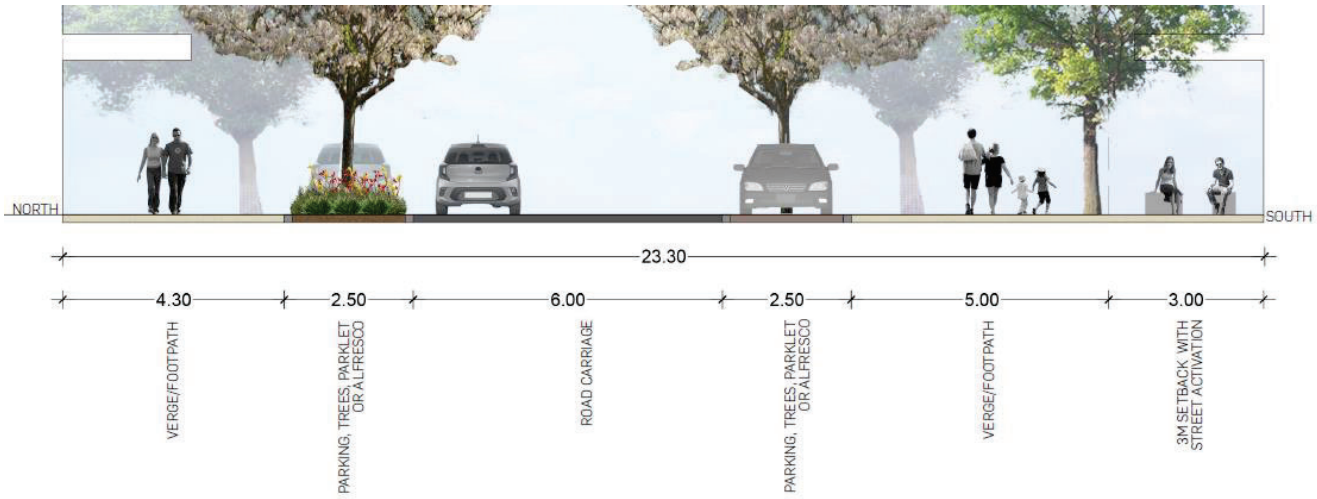
- Wide verges to encourage shared pedestrian and cyclist use
- 2m wide median to provide separation between conflicting traffic streams and to provide a refuge for crossing pedestrians
- Parallel on-street parking to cater for retail tenancies to the south and residential properties to the north

Road Section C-C (Railway Road)



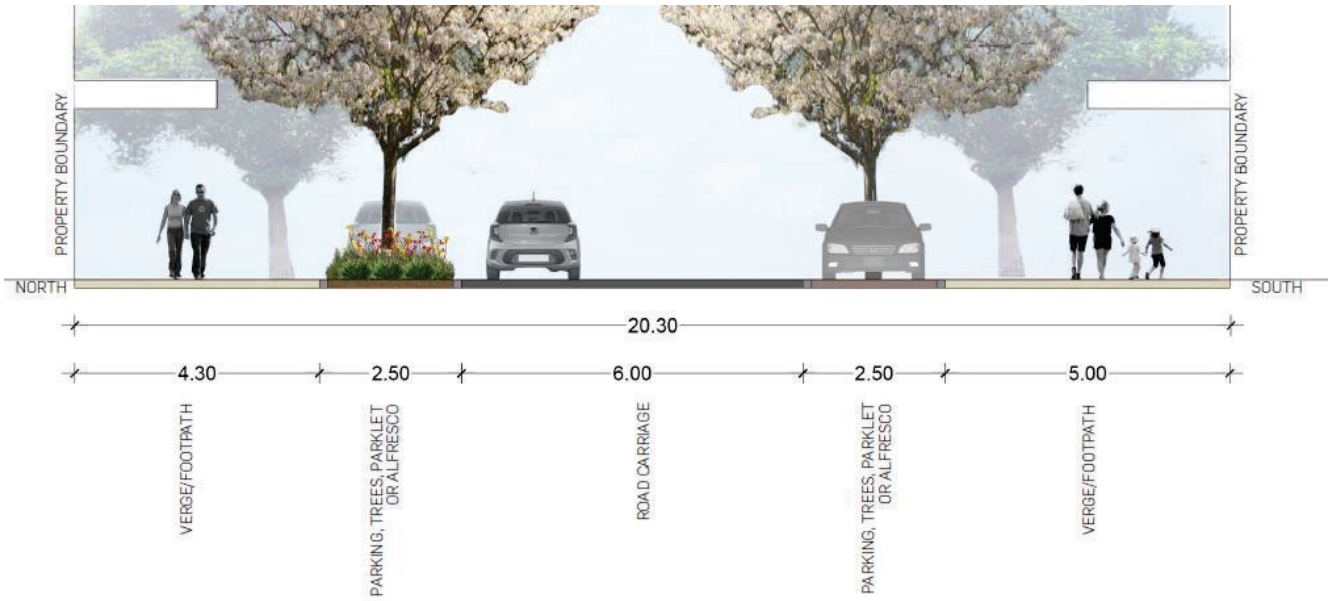
- Wide verges to encourage shared pedestrian use alongside community facilities
- Wider than standard verges to allow for off-street cycle travel (potential protected lane) in lieu of an on-street lane
- Parallel on-street parking to cater for retail tenancies and community facilities
- Threshold treatment and shared space to town square to allow for community events.

Road Section D-D (Haynes Street)



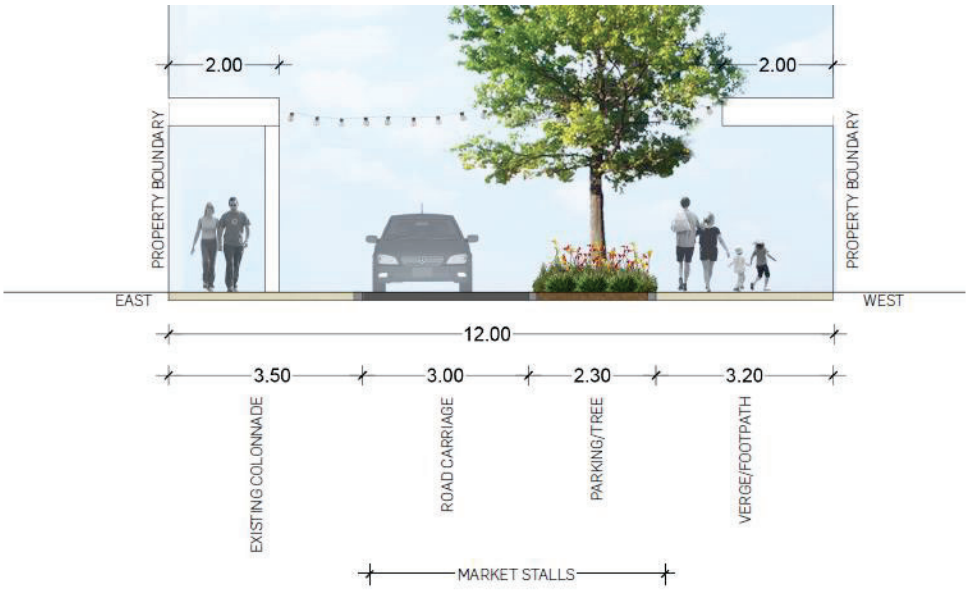
- Increased verge width for potential alfresco spill for tenancies along this section
- Parallel on-street parking to cater for retail tenancies and food and beverage locations
- Suggest lower speed environment than surrounding streets to increase awareness for all users

Road Section E-E (Haynes Street)



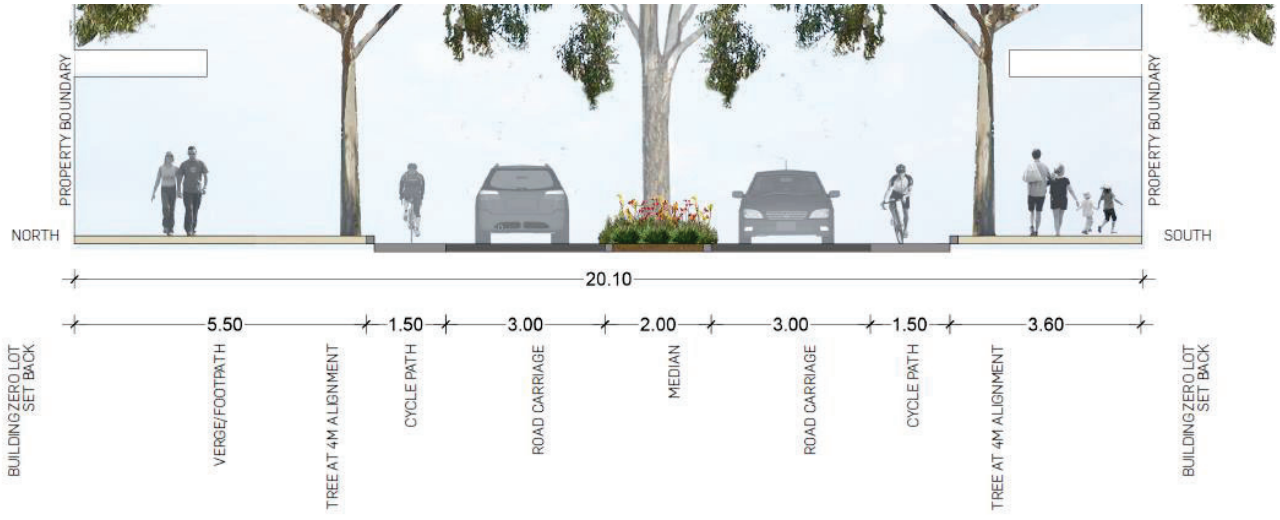
- As above

Road Section F-F (Central Mall)



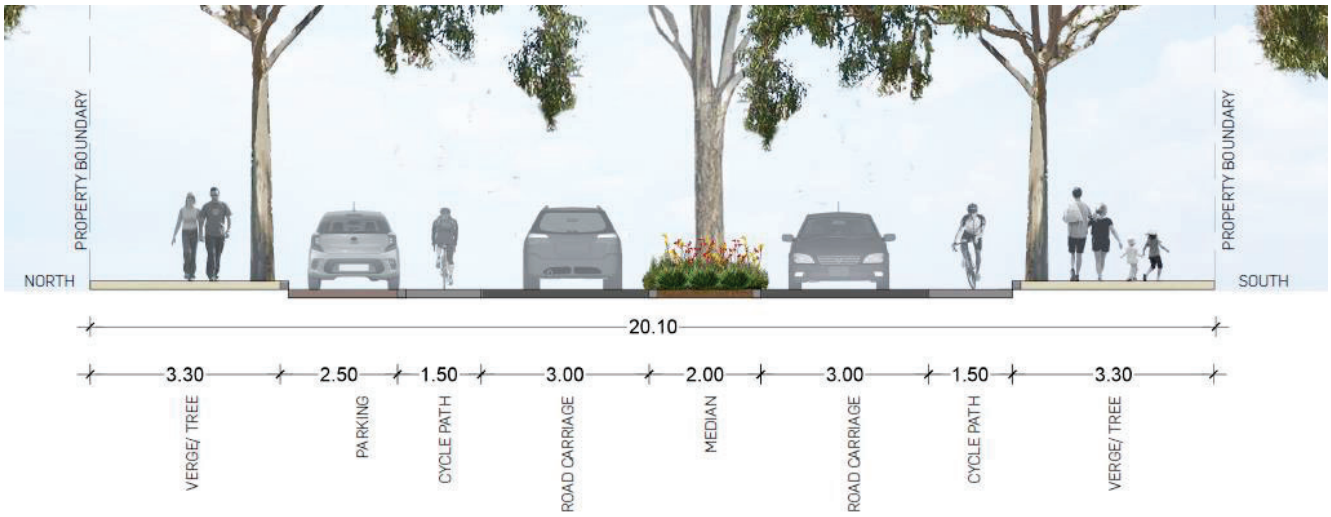
- Single southbound travel lane for vehicles
- Consistent pavement treatment across footpaths and road carriage to emphasis shared user environment
- Limited parking spaces to discourage unnecessary through-traffic
- Limited shared space width so as to reinforce low traffic speeds

Road Section G-G (Mead Street)



- Dedicated 1.5m on-street cycle lanes to facilitiate higher demand along this major east-west connection
- 2m wide median to provide separation between conflicting traffic streams and to provide a refuge for crossing pedestrians

Road Section H-H (Mead Street)

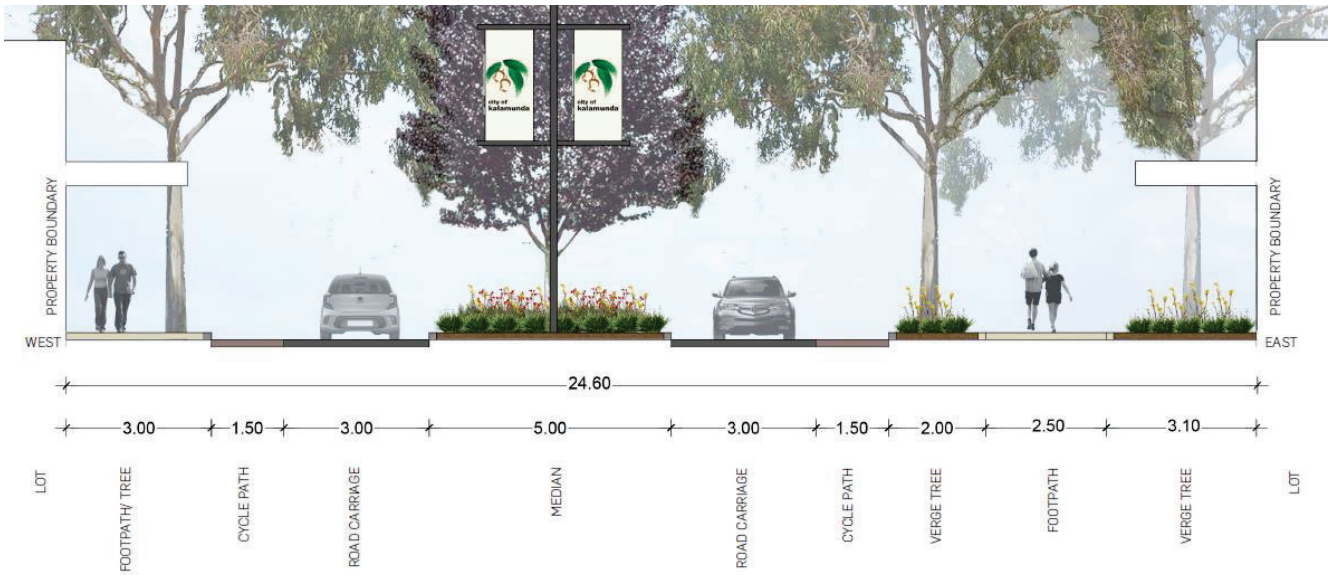


- Dedicated 1.5m on-street cycle lanes to facilitiate higher demand along this major east-west connection
- 2.5m parking lane allowance provides a buffer between cycle and parked vehicles that would allow a reduction to the risk of bicycle collision with car doors
- 2m wide median to provide separation between conflicting traffic streams and to provide a refuge for crossing pedestrians
- Single parking lane to provide access to retail tenancies and activity centre core to the north

Road Section I-I (Canning Road)

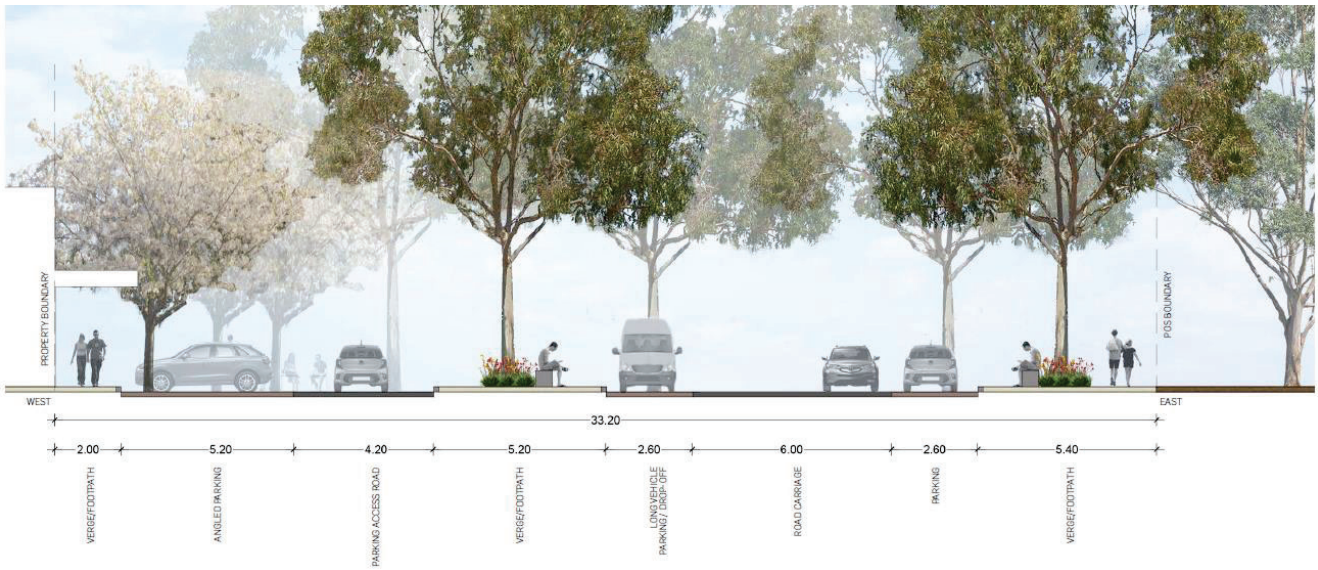
- Dedicated 1.5m on-street cycle lanes to facilitiate higher demand along this major north-south connection
- 5m wide median to provide separation between conflicting traffic streams and to provide a refuge for crossing pedestrians.
- Median will also accommodate dedicated turning lanes where required.

Road Section J-J (Canning Road)



- As previous section
- Dedicated separated footpath for highly utilised north-south pedestrian connection to the activity centre core

Road Section K-K (Barber Street)



- Provision for long vehicle parking and loading zone along western frontage to service surrounding tenancies
- Retention of existing Australia Post parking and circulation aisle along the western section
- Wide footpaths on both sides to accommodate pedestrian movement to existing bus terminal from Haynes Street

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4.8 Road Network Connectivity

The Activity Centre Plan proposes the following major changes to the existing road network arrangements (layout and connectivity):

1. Central Mall reconfiguration to allow one-way vehicle movement
2. Town Square threshold treatment.

These changes were identified in response to urban design and revitalisation priorities/goals, being:

- Improve amenity and of the activity centre area
- Improve market holding capacity.

4.8.1 Central Mall Investigation

The Central Mall does not currently permit vehicle traffic between the Central Road (Kalamunda Central car park north of Mead Street) and Nestobrae Lane south of Haynes Street.

The Pedestrian Priority Zone (PPZ) / Shareway arrangement would differ to the current situation in that vehicles would be legally permitted to travel through the link formed between Mead Street and Haynes Street. Both north and southbound one-way options were examined.

The high-level findings of the north vs south review can be summarised as:

- A southbound arrangement would introduce:
  - Operational impacts on Haynes Street as vehicles entering the Shareway would queue and block Haynes Street while they are waiting for opposing pedestrians and westbound traffic
  - Operational and legibility issues at the Mead Street intersection which would be directly opposite the existing Central Road intersection, thereby creating an unsignalised four-way intersection
  - Safety concerns as vehicles entering the Shareway from Haynes Street would turn across the southern pedestrian verge at higher speeds compared given the preceding road environment
- A northbound arrangement would provide:
  - Flexibility for the intersection with Haynes Street to be reconfigured to left in/left out should this be desired to improve traffic flow and/or pedestrian safety. Sight distance would be achieved through the localised restriction of car parking in close proximity to the intersection
  - Safer interactions between vehicles and pedestrians given vehicles would only approach the conflict area from the 10km/h Shareway, perpendicular to Haynes Street with good sight lines
- The north and southbound arrangements are similar with respect to:
  - Their convenience and ability to service fronting development
  - Their ability to connect with the Central Mall that extends to Barber Street.

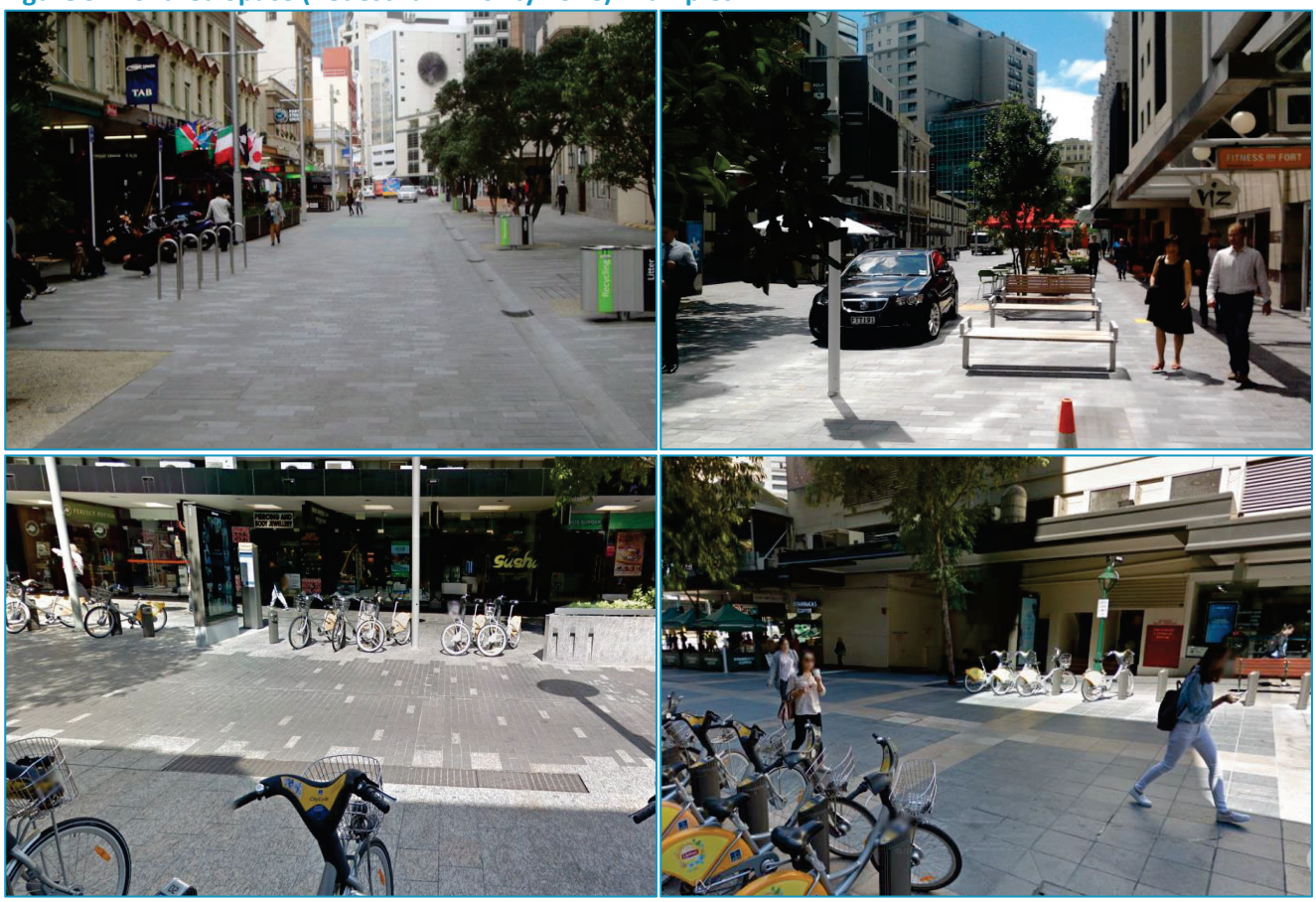
Whilst the reconfiguration of the pedestrian Central Mall isn't required to address or mitigate traffic or transport issues, it is seen to improve or provide for the following:

- Increased amenity for pedestrians and cyclists given the higher standard of urban design and activation
- Potential for more convenient loading opportunities for fronting/nearby businesses
- Potential for improved parking opportunities for persons with a disability
- Potential for pick-up/set-down facilities for taxis and ride-share.

4.8.2 Recommendation

Whilst Perth specific examples are limited at this time, the PPZ / Shareway approach would be consistent with that recently approved by the City of Perth for the Hay Street Pedestrian Priority Zone project. Figure 9 outlines other Australian and New Zealand examples of similar installations.

Figure 9 Shared Space (Pedestrian Priority Zone) Examples



Source: Google (2018)

The urban design of the shared street should allow local traffic but discourage through or unnecessary trips. This can be achieved via a combination of the following:

- The PPZ/Shareway should be signed as a Shared Zone and vehicles accordingly be legally subjected to a 10km/h speed limit
- Adoption of design elements incorporating the following:

- Contrasting surface/pavement treatment which reinforces that it is not a typical road with threshold treatments at vehicle entries/exits
- Flush levels between pedestrian spaces and shared spaces
- Bollards, paving and other streetscape furniture delineating exclusive pedestrian spaces from shared vehicle/pedestrian spaces
- Limited shared space width so as to reinforce low traffic speeds
- Constrained number of parking and loading opportunities
    - Parking only for persons with a disability or special purpose, i.e. emergency vehicles
    - Loading only during pre-determined periods and taxi/rideshare at other times of day.

4.8.3 Town Square Investigation

The raising of the Railway Road pavement surface between Haynes Street Williams Street has been investigated as an urban design treatment to improve pedestrian connectivity east of Haynes Street and which could be closed to vehicular traffic during events. The treatment would be approximately 40m in length.

4.8.4 Town Square Investigation

Traffic and pedestrian surveys undertaken in 2018 (Table 10) indicate traffic demands on Railway Road immediately south of Haynes Street exceed 400-500vph for the majority of the day whilst pedestrian movements are generally low.

Table 10 Railway Road Traffic Demand South of Haynes Street

Time (hour starting)	Monday		Tuesday		Wednesday		Thursday		Friday		Weekday Average	
6:00 AM	87	(3)	93	(4)	87	(2)	94	(0)	95	(1)	91	(2)
7:00 AM	255	(0)	280	(2)	280	(1)	269	(4)	237	(2)	264	(2)
8:00 AM	608	(4)	578	(6)	593	(2)	604	(5)	536	(10)	584	(5)
9:00 AM	428	(41)	422	(14)	430	(15)	460	(10)	476	(17)	443	(19)
10:00 AM	413	(10)	382	(8)	414	(16)	420	(13)	469	(28)	420	(15)
11:00 AM	475	(35)	427	(19)	476	(19)	488	(12)	492	(31)	472	(23)
12:00 PM	494	(33)	495	(22)	532	(20)	465	(10)	482	(21)	494	(21)
1:00 PM	413	(4)	380	(17)	526	(30)	367	(7)	504	(27)	438	(17)
2:00 PM	506	(11)	524	(12)	544	(6)	501	(6)	526	(35)	520	(14)
3:00 PM	619	(11)	637	(17)	658	(10)	655	(14)	651	(14)	644	(13)
4:00PM	535	(5)	513	(12)	541	(14)	557	(2)	600	(8)	549	(8)
5:00 PM	439	(5)	517	(9)	455	(3)	507	(6)	516	(8)	487	(6)

Vehicle demands

(##) Pedestrian crossing demands

When closed to traffic during events, traffic otherwise using this segment of Railway Road would be required to divert via other routes north-south routes including either/both Canning Road and Williams Street. At this time, it isn't understood how frequently, how long, and on what days this section of road could be closed in support of events.

4.8.5 Town Square Recommendation

A Traffic Management Plan should be prepared with supporting analysis to determine impacts and mitigation strategies associated with closing the segment of Railway Road during events.

The existing combination of traffic and pedestrian movements is not projected to change materially on typical (non-market/non-event days). Accordingly, the facility should not be signed as a Shared Zone as it the overwhelmingly majority of use is by vehicles and is not 'shared'.

Pedestrians crossing Railway Road would therefore do so as per a typical road crossing which could be accommodated within the raised segment. A lower speed limit is recommended in this zone to support amenity improvements.

The design of the raised threshold should incorporate similar principles to that outlined in Section 4.9.2, being:

- Contrasting surface/pavement treatment
- Flush levels between pedestrian verge
- Bollards, paving and other streetscape furniture delineating exclusive pedestrian spaces roadway
- Limited road cross-section to reinforce low traffic speeds

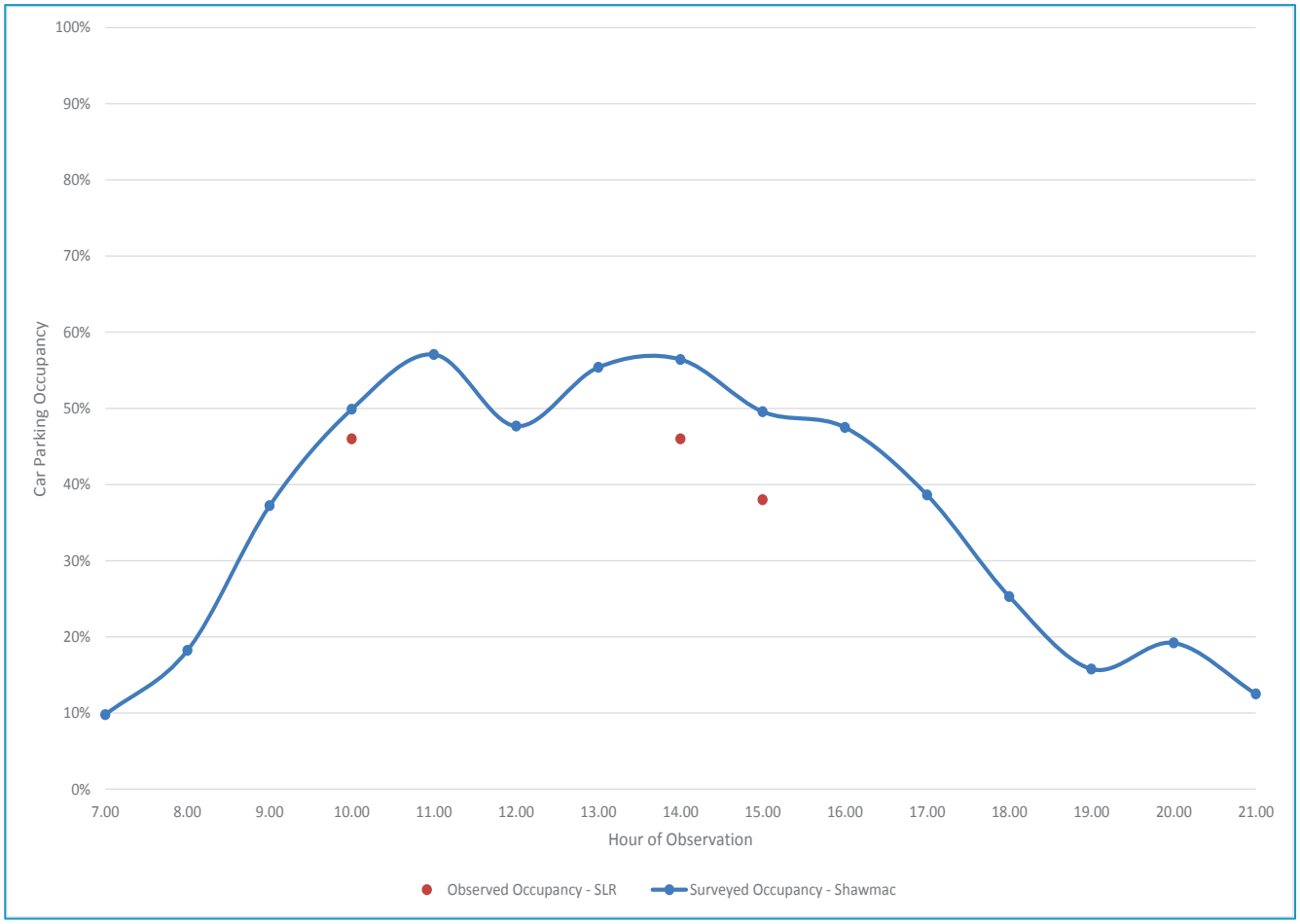
5 Car Parking

5.1 Existing Utilisation

Car parking surveys completed in 2011 by Shawmac indicate that whilst some parking areas were well utilised during peak periods, i.e. (75-100% occupancy), the cumulative peak demand observed across the wider activity centre area was relatively low and did not exceed ~60% of the available supply. Figures 10 and 11 summarise the parking demand profile surveyed by Shawmac in 2010 and also three discrete desktop observations made by SLR Consulting using aerial imagery.

Note, the Shawmac study area is smaller than that adopted for the Activity Centre Plan; hence, occupancy is reported as a comparative output for both data sets to enable some type of comparison to be made.

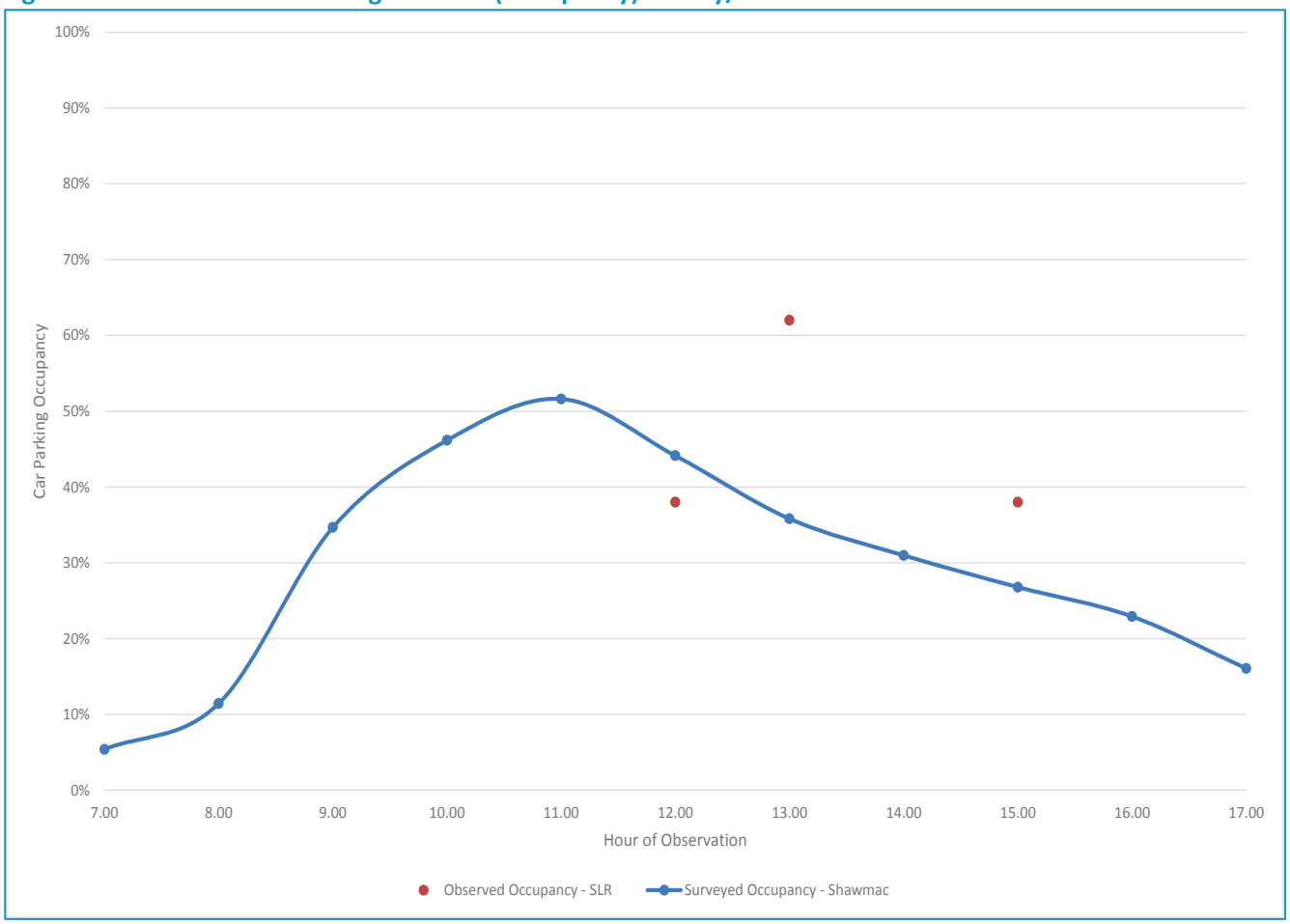
Figure 10 Weekday Car Parking Demand (Occupancy) Survey/Observations



The following can be surmised regarding the Figure 10 parking occupancy survey/observations:

- On and off-street parking demands across the activity centre area did not exceed 60%
- Despite observations being made across a period of several years and on different days, the occupancies are generally consistent
- The demand profile is reasonably flat between 10AM and 3-4PM.

Figure 11 Weekend Car Parking Demand (Occupancy) Survey/Observations



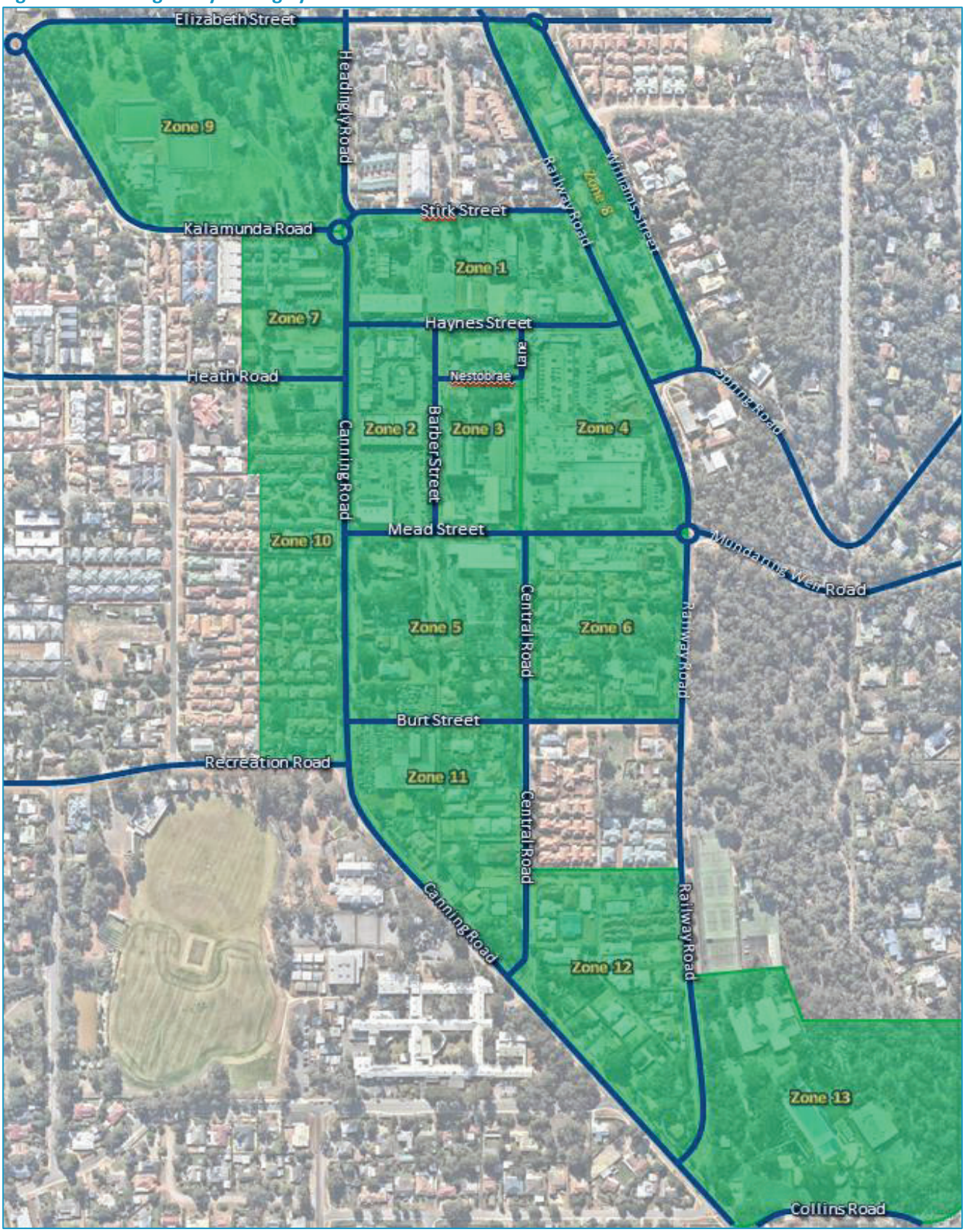
The following can be surmised regarding the Figure 11 parking occupancy survey/observations:

- On and off-street parking demands across the activity centre area did not exceed 60%, even on market days
- Despite observations being made across a period of several years and on different days, the occupancies are generally consistent albeit there is greater variance when compared to the weekday sample
- The demand profile has a pronounced peak occurring at 11AM and demands taper off into the afternoon/evening. SLR desktop observations confirm that the profile is less consistent than that reported for the weekday sample.

Many of the on-street parking supplies were surveyed as having peak occupancies in the order of 40-75%. Typically, on-street parking is much more heavily used and this result indicates that there is an oversupply of street parking. Based on the quantitative 2011 car parking demand surveys and a qualitative review of the study area, there also appears to be an oversupply of off-street car parking within the study area.

The SLR desktop assessment of parking demand utilised aerial imagery to expand upon the prior 2011 Shawmac findings. The car parking assessment zone categorisation is illustrated in Figure 12 which was developed as an extension of that originally prepared by Shawmac so zonal results could be compared.

Figure 12 Parking Study Zoning System



Tables 11 and 12 summarise the SLR desktop parking occupancy findings for the instantaneous demand captured at the time of the aerial fly-over. These same findings are illustrated graphically at Appendix C.

Table 11 Weekday Parking Occupancy

Zone	Observation Date			Average Occupancy
	08/09/2011	02/04/2014	12/02/2018	
1	41%	41%	37%	40%
2	55%	45%	41%	47%
3	51%	40%	37%	43%
4	59%	62%	54%	58%
5	45%	54%	27%	42%
6	68%	46%	58%	57%
7	71%	56%	47%	58%
8	34%	42%	34%	37%
9	9%	52%	18%	26%
10	50%	35%	61%	49%
11	77%	81%	50%	69%
12	35%	48%	44%	42%
13	26%	22%	23%	24%
Average Occupancy	**48%**	**48%**	**41%**	

Table 12 Weekend (Market Day) Parking Occupancy

Zone	Observations Date			Average Occupancy
	27/05/2012	02/11/2013	04/06/2017	
1	72%	34%	44%	50%
2	89%	51%	36%	59%
3	87%	59%	40%	62%
4	94%	71%	76%	80%
5	42%	19%	39%	33%
6	55%	8%	33%	32%
7	23%	10%	21%	18%
8	83%	41%	61%	62%
9	75%	65%	25%	55%
10	79%	44%	45%	56%
11	0%	18%	0%	6%
12	2%	0%	0%	1%
13	0%	0%	10%	3%
Average Occupancy	**54%**	**32%**	**33%**	

Consistent with the Shawmac findings, the expanded desktop observations made by SLR Consulting also confirm that the current/recent demand for car parking is materially lower than the available off and on-street supply. Peak weekday parking utilisation approaches 70-80% only for a few zones.

In comparing the Table 13 and 14 findings, it is evident that parking demands are higher on weekends, particularly during market events. Parking occupancy approaches 90-100% in central areas on market days; however, it is still <50% in outer zones. Accordingly, it can be determined that:

- The demand for parking on weekdays and non-market weekend days is comparatively low, lower than that which can be determined in accordance with the Planning Scheme rates
- The demand for parking on market weekend days is significantly higher than other days, however, there is still underutilised parking available in the outer zones of the study area.

The 2011 Opus study identified that for core Zones 1-8, a theoretical parking requirement of 1,987 spaces when calculated in accordance with the then current Planning Scheme. This equated to a requirement rate of 6.1 spaces per 100sq.m of then current floor area.

For the same core Zones 1-8, Opus also identified an off-street parking supply of 1,575 spaces which equated to a supply rate of 4.8 spaces per 100sq.m of combined use. The SLR desktop audit relied on aerial imagery and hence may be prone to some survey error. To address this issue, the same aerial imagery review process was also undertaken for the 2011 situation so the observable difference could be quantified.

This approach identified only minor changes in the available off-street car parking supply within the core Zones 1-8. The most significant change occurred as a result of the development of Central Heights at 10 Barber Street which redeveloped a pre-existing at-grade car park. For the purposes of this study, the supply rates are assumed to be generally the same given there has been an opposing increase in floor area.

5.2 State Planning Policy 4.2 Comparison

The State Planning Policy 4.2 *Activity Centres for Perth and Peel* describes a sustainable car parking rate of provision:

- 2 spaces per 100sq.m for showrooms and office
- 4-5 spaces per 100sq.m for shops.

Based on the car parking studies completed to date, the existing rate of requirement and supply for parking exceeds these rates within the Kalamunda Activity Centre area.

5.3 Local Government Car Parking Rate Comparison

A comparison of the planning scheme requirements/rates for car parking provision has been undertaken with regard to the City of Kalamunda and a selection of other Western Australian local government areas. The reason for the review or benchmarking is due to the Shawmac and SLR parking demand assessments both confirming that the actual car parking demand is significantly less than that which would be required in accordance with the City's Planning Scheme.

The parking requirement rates for similar/comparative uses is summarised in Table 13 overleaf.

Table 13 Comparison of Local Government Car Parking Requirements

Land Use	Local Government Area				
	Kalamunda	Belmont	Gosnells	Mundaring	South Perth
Amusement Parlour	7 spaces per 100sq.m	10 spaces per 100sq.m	N/A	1 space per 10sq.m	N/A
Art Gallery	1 space per employee	N/A	N/A	N/A	N/A
Bed & Breakfast	1 space per bedroom plus 2 spaces for the primary residence	N/A	N/A	1 space per bedroom plus residential requirement	N/A
Betting Agency	7 spaces per 100sq.m	10 space per 100sq.m	N/A	N/A	N/A
Childcare Centre	1 space per employee plus 1 space per 10 children	1 space per employee plus 1 space per 8 children	1 space per employee plus 1 space per 10 children	1 space per employee plus 1 space per 8 children	1 space per employee plus 1 space per 10 children
Cinema / Theatre	1 space per 2.5sq.m (seating area)	N/A	1 space per 2.5sq.m (seating area)	1 space per 4 persons	1 spaces per 5sq.m auditorium area
Civic Use	1 space per 5 persons	1 space per 4 persons	1 space per 4 persons	N/A	N/A
Community Purpose	1 space per 5 persons	N/A	N/A	N/A	N/A
Consulting Rooms	4 spaces per medical practitioner plus 1 space per staff	4 spaces per medical practitioner	4 spaces per medical practitioner	5 spaces per 1 consulting room	1 space per 19sq.m plus 1 space per employee
School	1 space per staff member, plus: 1 space per 3 students (pre-primary) 14 drop-of spaces per 100 students (primary) 7 drop-off spaces per 100 students (secondary)	1 space per 4 students (pre-primary) 1 space per classroom (primary) 1 space per 25 year 12 students (secondary)	1 space per staff member, plus: 1 space per 2 students (pre-primary) 14 drop-of spaces per 100 students (primary) 7 drop-off spaces per 100 students (secondary)	1 space per staff member, plus: 1 space per 2 students (pre-primary) 14 drop-of spaces per 100 students (primary) 7 drop-off spaces per 100 students (secondary)	N/A
Fast Food	10 spaces per 100sq.m	1 space per 4 persons	1 space per 2.5sq.m queueing area plus 1 space per 5sq.m dining area	The greater of: 1 space per 10sq.m or 6 spaces	N/A
Health/Fitness	5 spaces per 100sq.m	5 spaces per 100sq.m	1 space per 20sq.m	N/A	N/A
Hotel/Motel	1 space per unit plus 1 space per 4 restaurant seats plus 1 space per 5sq.m bar/other public area	1 space per bedroom	1 space per bedroom plus 1 space per 2sq.m bar area plus 1 space per 4sq.m lounge area	1 space per employee plus 1 space per 2.5sq.m indoor licenced area plus 1 space per 5sq.m outdoor licensed area plus the greater of 1 space per 6 seats of 1 space per 4.5sq.m	1 space per bedroom plus 1 space per 3sq.m of public area
Market	6 spaces per 100sq.m	N/A	N/A	N/A	N/A
Medical Centre	6 spaces per practitioner plus 1 per staff	4 spaces per practitioner plus 5 spaces per 100sq.m public space	N/A	5 spaces per consulting room	N/A
Night Club	1 space per 2.5sq.m bar/public area plus 1 space per 5sq.m lounge area	1 space per 4 persons	1 space per 2sq.m bar area plus 1 space per 4sq.m lounge area	N/A	1 space per 5sq.m
Office	4 spaces per 100sq.m	1 space per 30sq.m or 1 space per employee, whichever is greater	1 space per 30sq.m plus 1 space per 10sq.m for public areas	1 space per 35sq.m	1 space per 25sq.m
Place of Worship	1 space per 5sq.m	1 space per 4 persons	Greater of 1 space per 4 seats/persons or 1 space per 2.5sq.m seating area	1 space per 4 persons	1 space per 5sq.m
Reception Centre	1 space per 4 persons or 1 space per 5sq.m of dining area, whichever is greater	1 space per 4 persons	1 space per employee plus the greater of: 1 space per 4 seats / 4 persons / 4sq.m seating area	N/A	1 space per 5sq.m
Restaurant	1 space per 4 persons	1 space per 4 persons	1 space per employee plus the greater of: 1 space per 4 seats / 4 persons / 4sq.m seating area	The greater of: 1 space per 10sq.m or 6 spaces	1 space per 5sq.m dining area
Shop	5 spaces per 100sq.m	6 spaces per 100sq.m	1 space per 15sq.m	1 space per 12.5sq.m	1 space per 25sq.m
Tavern	1 space per 5sq.m bar and public area	1 space per 2sq.m bar and public area or 1 space per 4sq.m lounge area	1 space per bedroom plus 1 space per 2sq.m bar area plus 1 space per 4sq.m lounge area	N/A	1 space per 3sq.m public area

5.4 Recommendation and Strategies

Generally, the City of Kalamunda Planning Scheme rates are comparable to those required in other local government areas; however, based on the level of current parking oversupply, it may be reasonable that some of the land use rates are reduced.

The combined rate of existing requirement and supply are higher than that noted in SPP 4.2.

It is recommended that Planning Scheme rates could be reduced based on the comparative requirement stated in other planning instruments, and also the parking study results which confirm an existing oversupply of parking.

Whilst the determination of a suite of land use parking rates is outside the scope of this study; it would be reasonable to adopt an upper limit range rate of 4.2-4.5 spaces per 100sq.m for retail uses and 2 spaces per 100sq.m for office uses. These rates represent a reduction in the requirement and supply parking rate approximating 7-40% respectively.

On the basis of the above, the overall parking strategy for the Centre is as follows:

- Provide an integrated set of land uses that will enable reciprocal parking, thereby reducing overall demand
- Transition towards more consistent seven-day trading as opposed to the current weekday and weekend disparity arising from market led trade, assisting to spread traffic and parking demands over an extended period
- Prepare, implement and commit to a parking management strategy
- Prioritise the provision (location and quantum) for older persons and those with disabilities in response to the current and projected Kalamunda demographics
- Conceal parking in basements and behind or above street level to promote an active street environment and one that reduces significant at-grade car parking supplies.
- Dedicated parking for persons with disabilities (PWD) to be provided in several locations across the Kalamunda Town Centre, located ideally proximate to land uses that would be visited by these user groups (including to, but not limited to, medical centres, community facilities, post office, banks, shopping centres).
- On-street or public PWD parking should always be located in areas that feature a substantial clearance zone within the verge (equal to the size of the carpark) that would allow PWD to enter and exit vehicles without obstructions.

6 Conclusions

This study has provided an assessment of the transport network impacts associated with and determined a framework by which to develop the various uses of the Kalamunda Activity Centre. In undertaking this study, various policy and guideline documents have been used, of particular note:

- State Planning Policy 4.2
- Transport Assessment Guidelines for Developments – Volume 2 – Structure Plans; and
- City of Kalamunda Planning Scheme.

The assessment has been based on a future design horizon (2031) consistent with prior transport studies. A review of the transport networks concluded the following:

- The existing centre has good access to higher order roads for vehicles from local and regional areas
- The roads and intersections within the Kalamunda centre operate well within typically adopted performance thresholds, except for:
  - The right turn from Mead Street to Canning Road
  - The right turn from Heath Road to Canning Road
- The Kalamunda centre is serviced by moderate frequency public transport services (bus), with appropriate pedestrian connections to and from the bus terminal to surrounding uses.
- Pedestrian facilities and amenity are generally average-poor with road crossings and mid-block connections being limited
- Dedicated cycling facilities are not provided
- Road crashes are not a-typical, although there have been several fatal pedestrian crashes in recent history and all involve persons aged older than 80 which may require a more detailed evaluation
- There is significant, underutilised on and off-street car parking, albeit occupancy does increase on market days. Reductions in the rate of supply for parking should be adopted to promote both sustainable travel choices and an improved urban design outcome.

Improvements to the Central Mall are also proposed and would accommodate one-way traffic movement. This change is proposed in response to urban design goals/priorities that seek to improve amenity and vibrancy in the activity centre core.

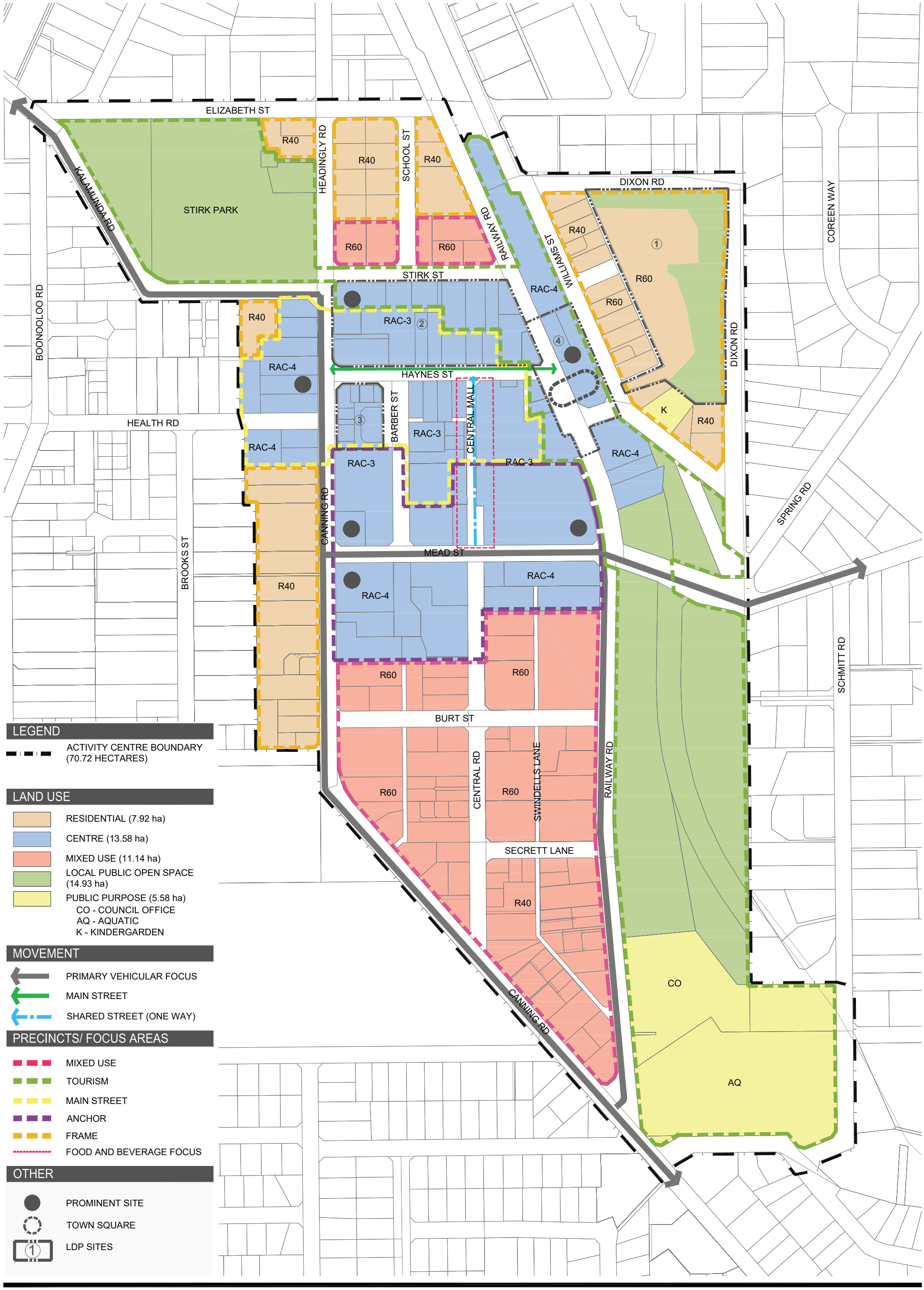
A comprehensive assessment of the future traffic impacts was not undertaken specifically as part of this study, instead prior analysis undertaken by Shawmac (2011) and Opus (2016) was critically examined to ensure that it was still fit for purpose and adequately addressed the now current projections for land use, yield and population projected as part of the Kalamunda Activity Centre Plan. The findings identified that upgrade works were warranted at the following locations:

- Canning Road / Mead Street
- Canning Road / Heath Road

Based on discussions with City Kalamunda officers, capacity improvement works are already proposed and committed on the Mead Street approach. In the future, this intersection may also need to be signalised should the improvements not provide sufficient capacity. At the intersection of Heath Road, the restriction of the right turn out to Canning Road is recommended at such time that delays are deemed to be too great.

APPENDIX A

Kalamunda Activity Centre Plans



LEGEND

ACTIVITY CENTRE BOUNDARY (70.72 HECTARES)

LAND USE

- RESIDENTIAL (7.92 ha)
- CENTRE (13.58 ha)
- MIXED USE (11.14 ha)
- LOCAL PUBLIC OPEN SPACE (14.93 ha)
- PUBLIC PURPOSE (5.58 ha)
  - CO - COUNCIL OFFICE
  - AQ - AQUATIC
  - K - KINDERGARDEN

MOVEMENT

- PRIMARY VEHICULAR FOCUS
- MAIN STREET
- SHARED STREET (ONE WAY)

PRECINCTS/ FOCUS AREAS

- MIXED USE
- TOURISM
- MAIN STREET
- ANCHOR
- FRAME
- FOOD AND BEVERAGE FOCUS

OTHER

- PROMINENT SITE
- TOWN SQUARE
- LDP SITES

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PLOT DATE: 28.02.2019
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KALAMUNDA ACTIVITY CENTRE DRAFT

ACTIVITY CENTRE PLAN

Level 14, The Quadrant, 1 William Street | Perth WA 6000 Australia | +61 8 9346 0500 | URBIS Pty Ltd | ABN 50 105 256 228

CLIENT

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1:4,000 @ A3

0 10 50 100m

PROJECT NO. PA1490

DATE 28.02.19

DRAWING NO. .

REVISION .

ELIZABETH ST
KALAMUNDA RD
STIRK PARK
HEADINGLY RD
SCHOOL ST
RAILWAY RD
WILLIAMS ST
DIXON RD
COREEN WAY
STIRK ST
BOONOOLOO RD
HAYNES ST
BARBER ST
CENTRAL MALL
HEALTH RD
K
SPRING RD
CANNING RD
MEAD ST
BROOKS ST
SCHMITT RD
BURT ST
RECREATION RD
CENTRAL RD
SWINDELLS LANE
RAILWAY RD
SECRETT LANE
CANNING RD
CO
AQ

LEGEND

ACTIVITY CENTRE BOUNDARY (70.72 HECTARES)

MOVEMENT

- PRIMARY VEHICULAR FOCUS
- MAIN STREET (RESTRICTED SERVICING ACCESS)
- PUBLIC TRANSPORT FOCUS
- SERVICE ACCESS EXISTING
- SHARED STREET (ONE WAY)
- KEY PEDESTRIAN CROSSING POINTS
- PROPOSED PEDESTRIAN LINKAGE
- PEDESTRIAN FOCUS
- CYCLE FOCUS
- EXISTING BUS STATION
- THRESHOLD TREATMENT

PLOTTED BY: LARA VARTOUNIAN
PAGE SETUP: ---
PLOT STYLE: URBIS_A3.CTB
PLOT DATE: 28.02.2019
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URBIS

KALAMUNDA ACTIVITY CENTRE DRAFT

MOVEMENT

Level 14, The Quadrant, 1 William Street | Perth WA 6000 Australia | +61 8 9346 0500 | URBIS Pty Ltd | ABN 50 105 256 228

CLIENT
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1:4,000 @ A3
0 10 50 100m

PROJECT NO. PA1490
DATE 28.02.19
DRAWING NO. .
REVISION .

ELIZABETH ST
KALAMUNDA RD
STIRK PARK
HEADINGLY RD
SCHOOL ST
STIRK ST
DIXON RD
WILLIAM ST
RAILWAY RD
HAYNES ST
CANNING RD
MEAD ST
BURT ST
CENTRAL RD
RAILWAY RD
CANNING RD

LEGEND

ACTIVITY CENTRE BOUNDARY
(70.72 HECTARES)

PRECINCTS/ FOCUS AREAS

- MIXED USE
- TOURISM
- MAIN STREET
- ANCHOR
- FRAME
- FOOD AND BEVERAGE FOUCS

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URBIS

KALAMUNDA ACTIVITY CENTRE DRAFT

PRECINCTS

Level 14, The Quadrant, 1 William Street | Perth WA 6000 Australia | +61 8 9346 0500 | URBIS Pty Ltd | ABN 50 105 256 228

CLIENT
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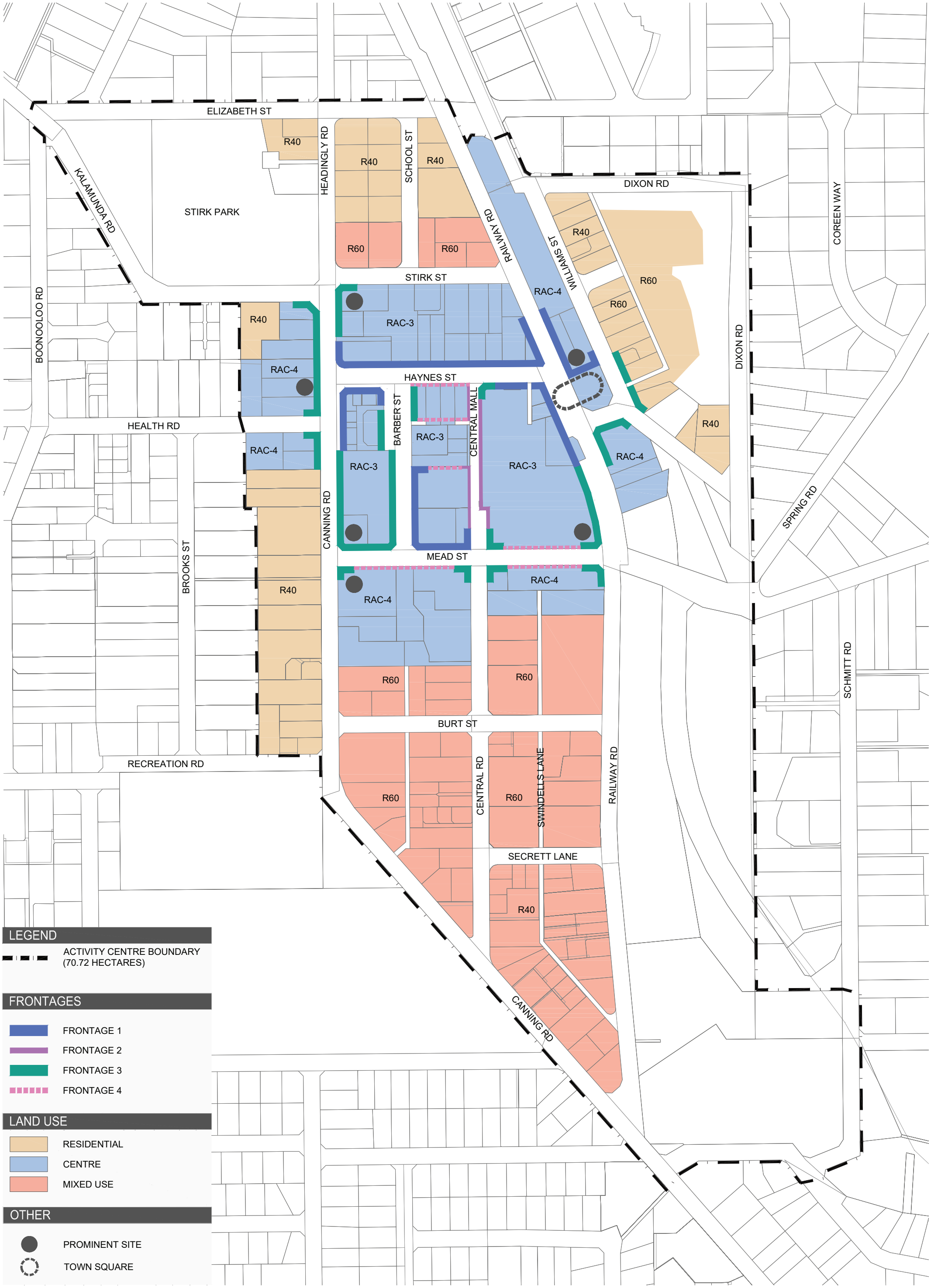
1:4,000 @ A3
0 10 50 100m

PROJECT NO. .
DATE .
DRAWING NO. .
REVISION .



LEGEND

ACTIVITY CENTRE BOUNDARY (70.72 HECTARES)

FRONTAGES

- FRONTAGE 1
- FRONTAGE 2
- FRONTAGE 3
- FRONTAGE 4

LAND USE

- RESIDENTIAL
- CENTRE
- MIXED USE

OTHER

- PROMINENT SITE
- TOWN SQUARE

PLOT STYLE: URBIS_A3.CTB
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KALAMUNDA ACTIVITY CENTRE DRAFT

BUILT FORM

Level 14, The Quadrant, 1 William Street | Perth WA 6000 Australia | +61 8 9346 0500 | URBIS Pty Ltd | ABN 50 105 256 228

CLIENT

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PROJECT NO. PA1490

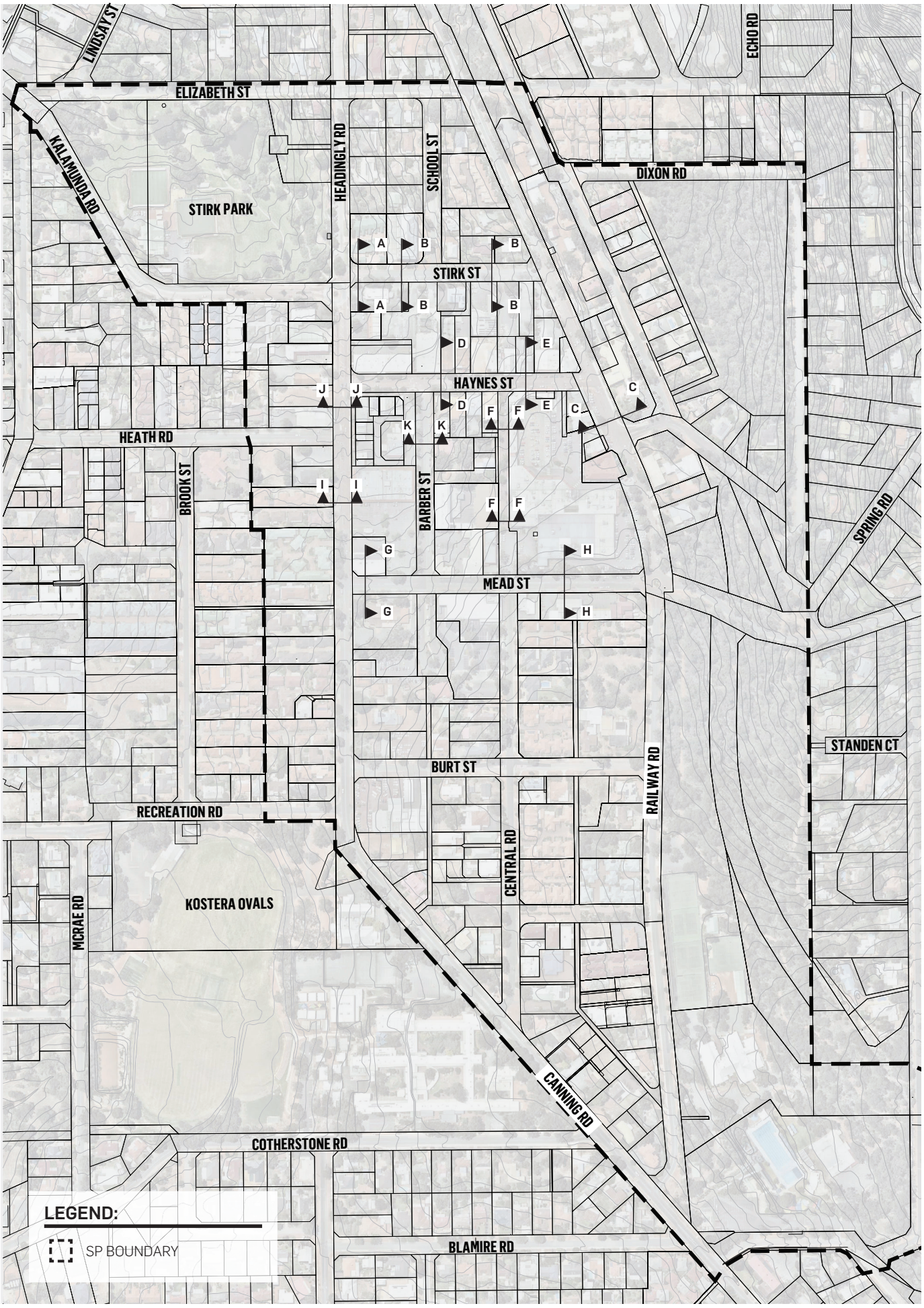
DATE 28.02.19

DRAWING NO. .

REVISION .

APPENDIX B

Road Cross-Section Plans



URBIS

KALAMUNDA ACTIVITY CENTRE
STREET TYPOLOGIES SECTIONS

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0 50 100 150 200 250 300

DATE: 23.08.18
JOB NO: PA1490
DWG NO:
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION A-A (CORNERS)

1:100 @ A3

0 1 2 3 4 5

DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-001
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE
STREET SECTION B-B

1:100 @ A3
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DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-002
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION C-C

DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-003
REV: A

1:100 @ A3
0 1 2 3 4 5

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION D-D

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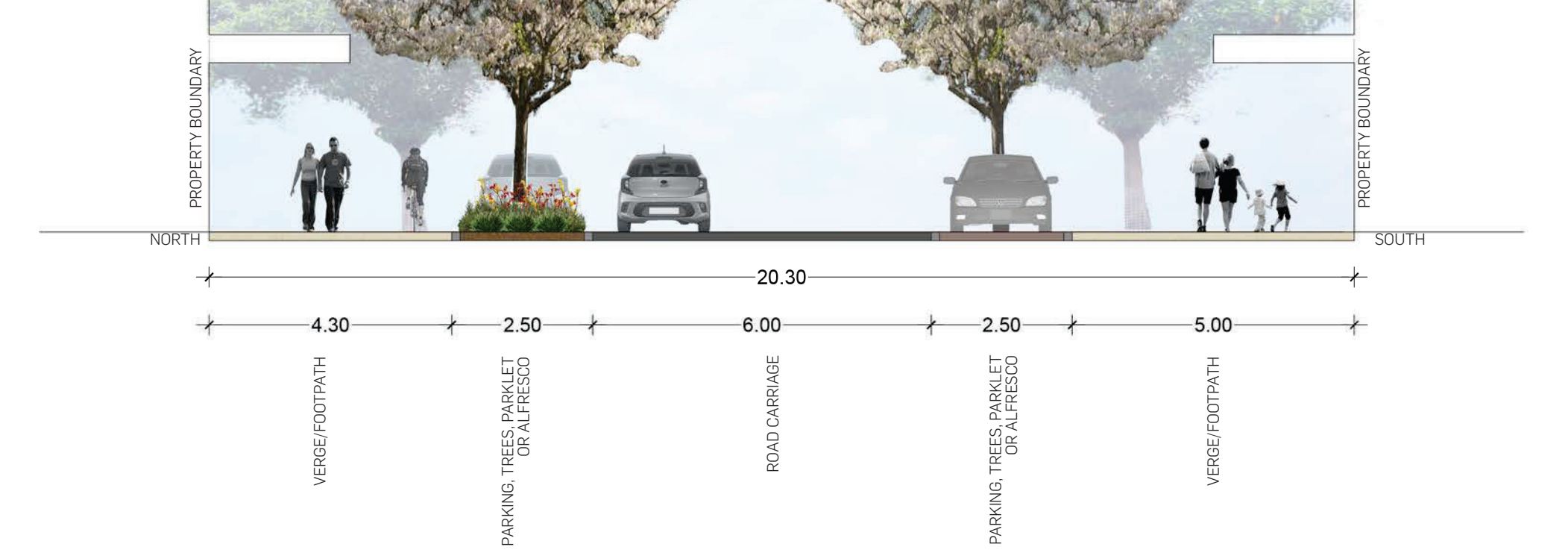
DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-004
REV: A



URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION E-E

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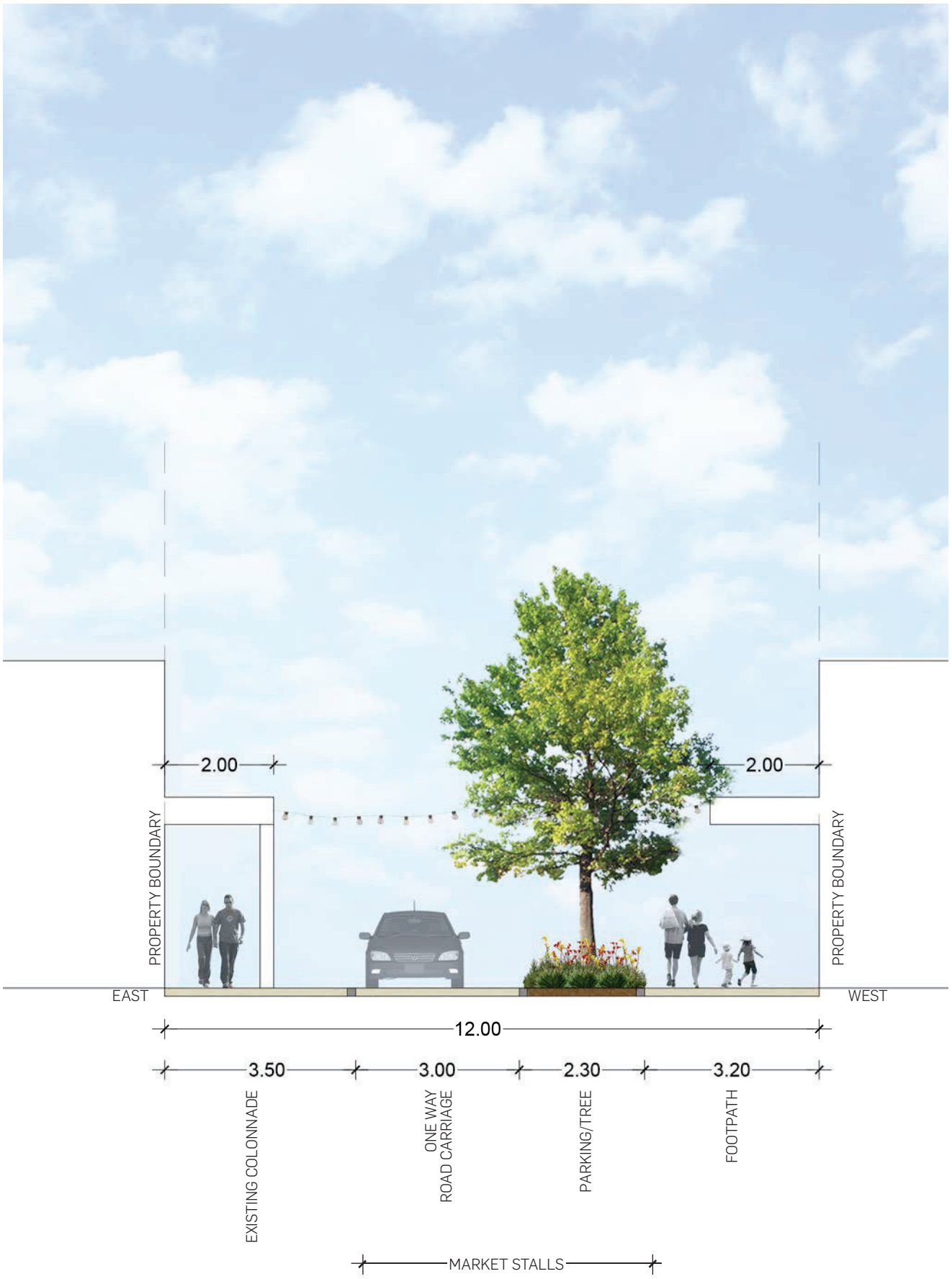
DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-005
REV: A



URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION F-F

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DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-006
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION G-G (CORNERS)

1:100 @ A3

0 1 2 3 4 5

DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-007
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION H-H

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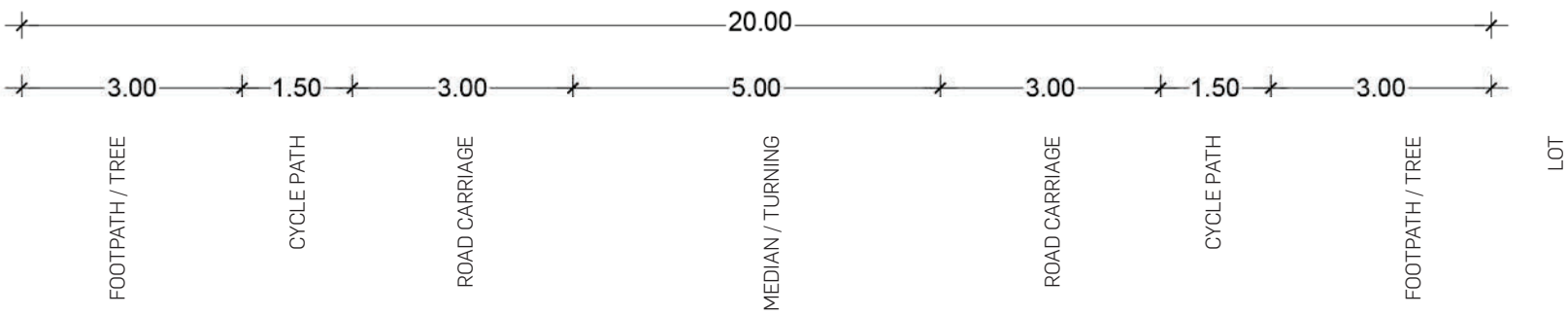
DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-008
REV: A



URBIS

KALAMUNDA ACTIVITY CENTRE
STREET SECTION I-I

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DATE: 05.09.2018
JOB NO: PA1490
DWG NO: SC-009
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION J-J

1:100 @ A3

0 1 2 3 4 5

DATE: 05.09.2018
JOB NO: PA1490
DWG NO: SC-010
REV: A

URBIS

KALAMUNDA ACTIVITY CENTRE

STREET SECTION K-K

DATE: 22.08.2018
JOB NO: PA1490
DWG NO: SC-0011
REV: A

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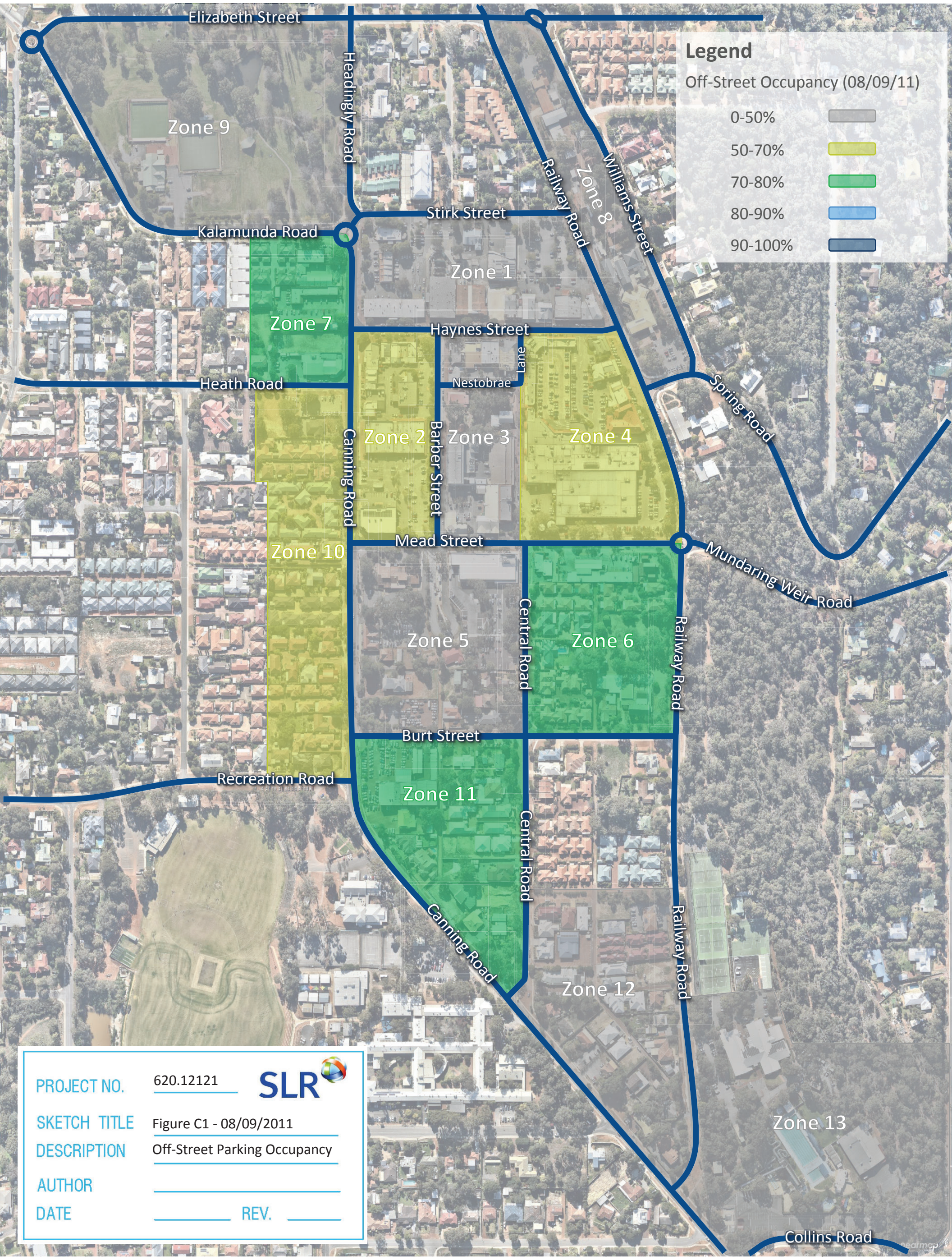
APPENDIX C

Car Parking Demand Observations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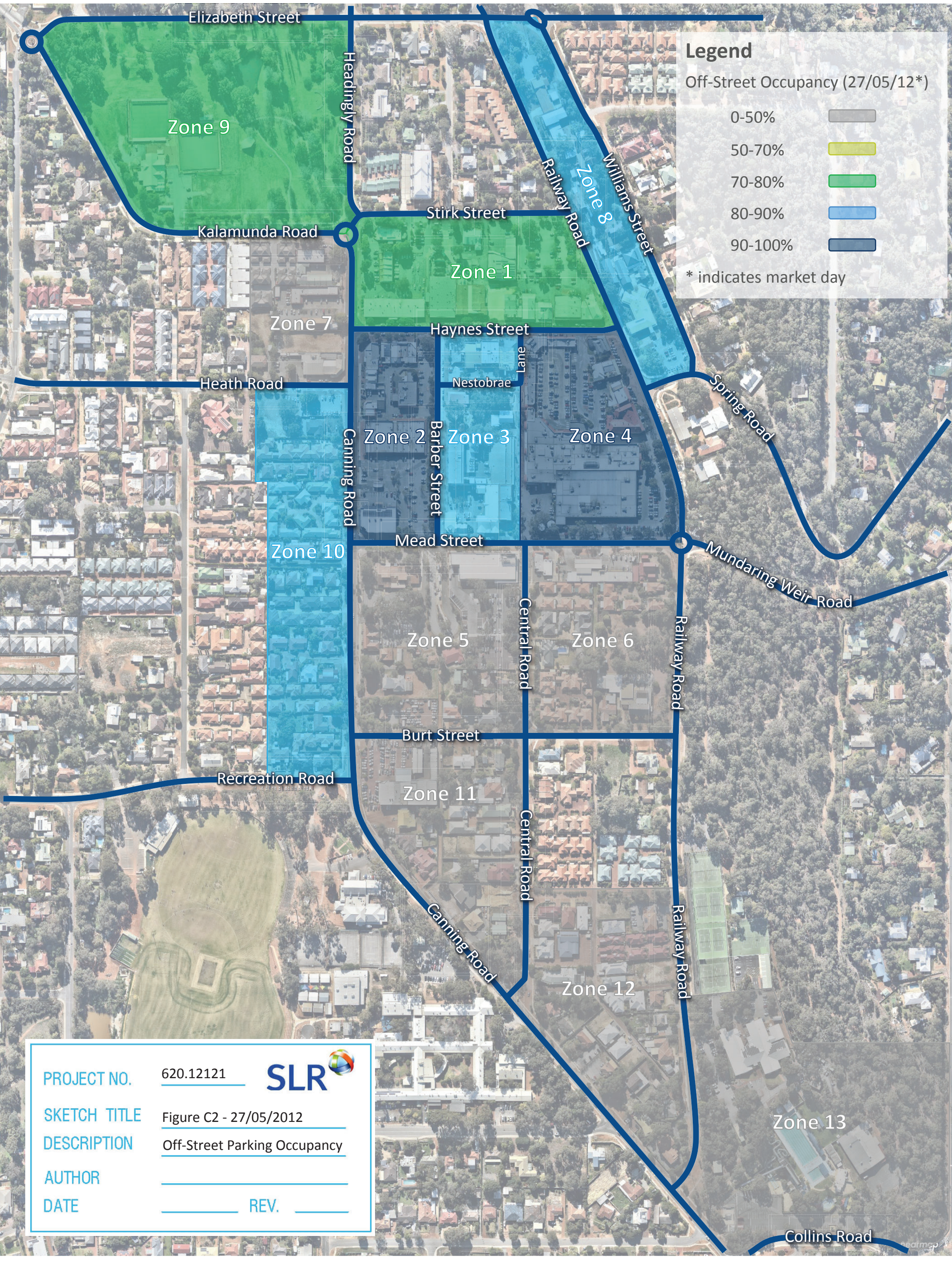
Off-Street Occupancy (08/09/11)
0-50%
50-70%
70-80%
80-90%
90-100%
Elizabeth Street
Headingly Road
Railway Road
Williams Street
Zone 9
Zone 8
Stirk Street
Kalamunda Road
Zone 1
Zone 7
Haynes Street
Lane
Nestobrae
Heath Road
Spring Road
Canning Road
Zone 2
Barber Street
Zone 3
Zone 4
Zone 10
Mead Street
Mundaring Weir Road
Central Road
Zone 5
Zone 6
Railway Road
Burt Street
Recreation Road
Zone 11
Canning Road
Central Road
Railway Road
Zone 12
Zone 13
Collins Road
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C1 - 08/09/2011
DESCRIPTION Off-Street Parking Occupancy
AUTHOR
DATE
REV.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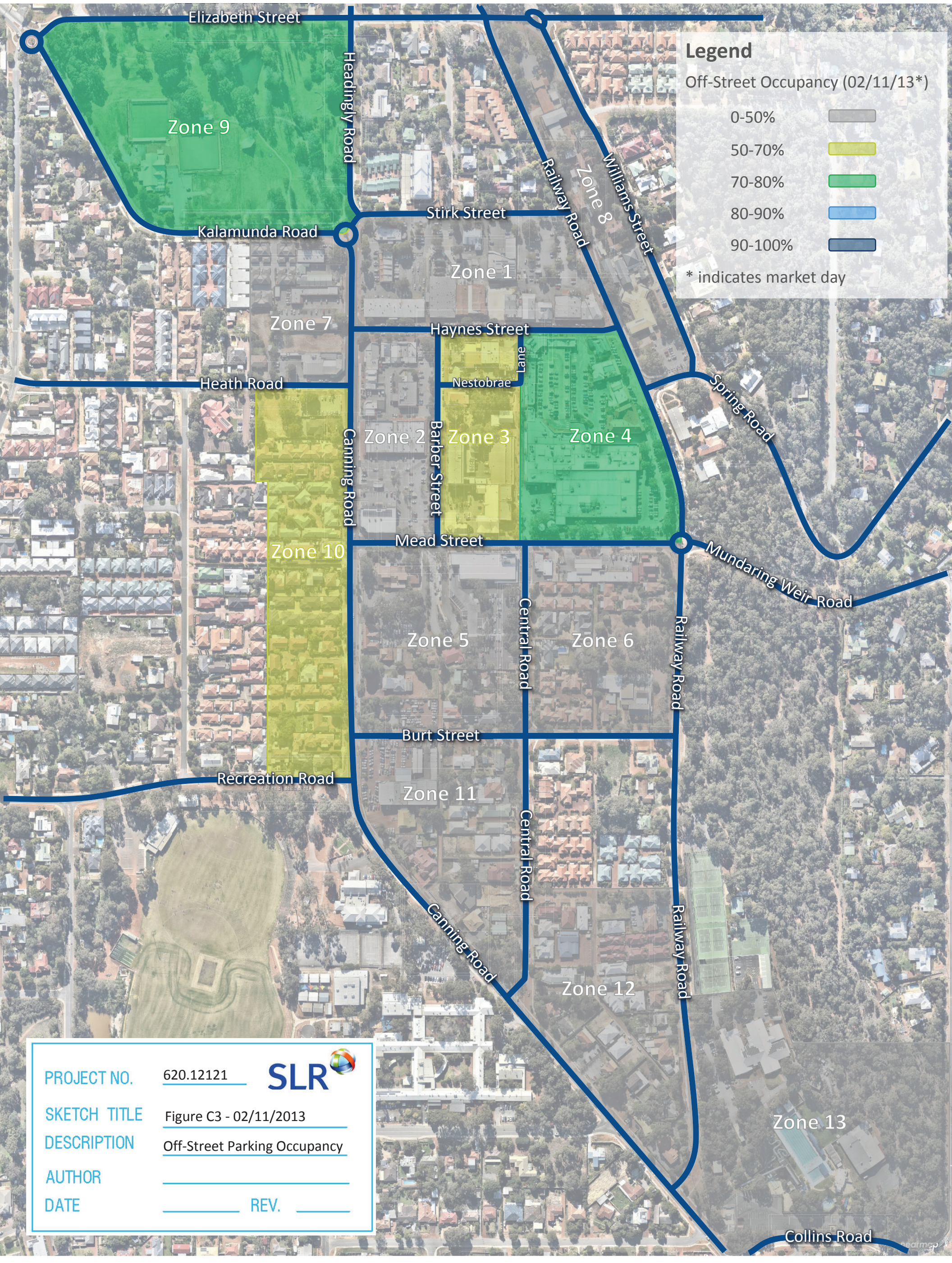
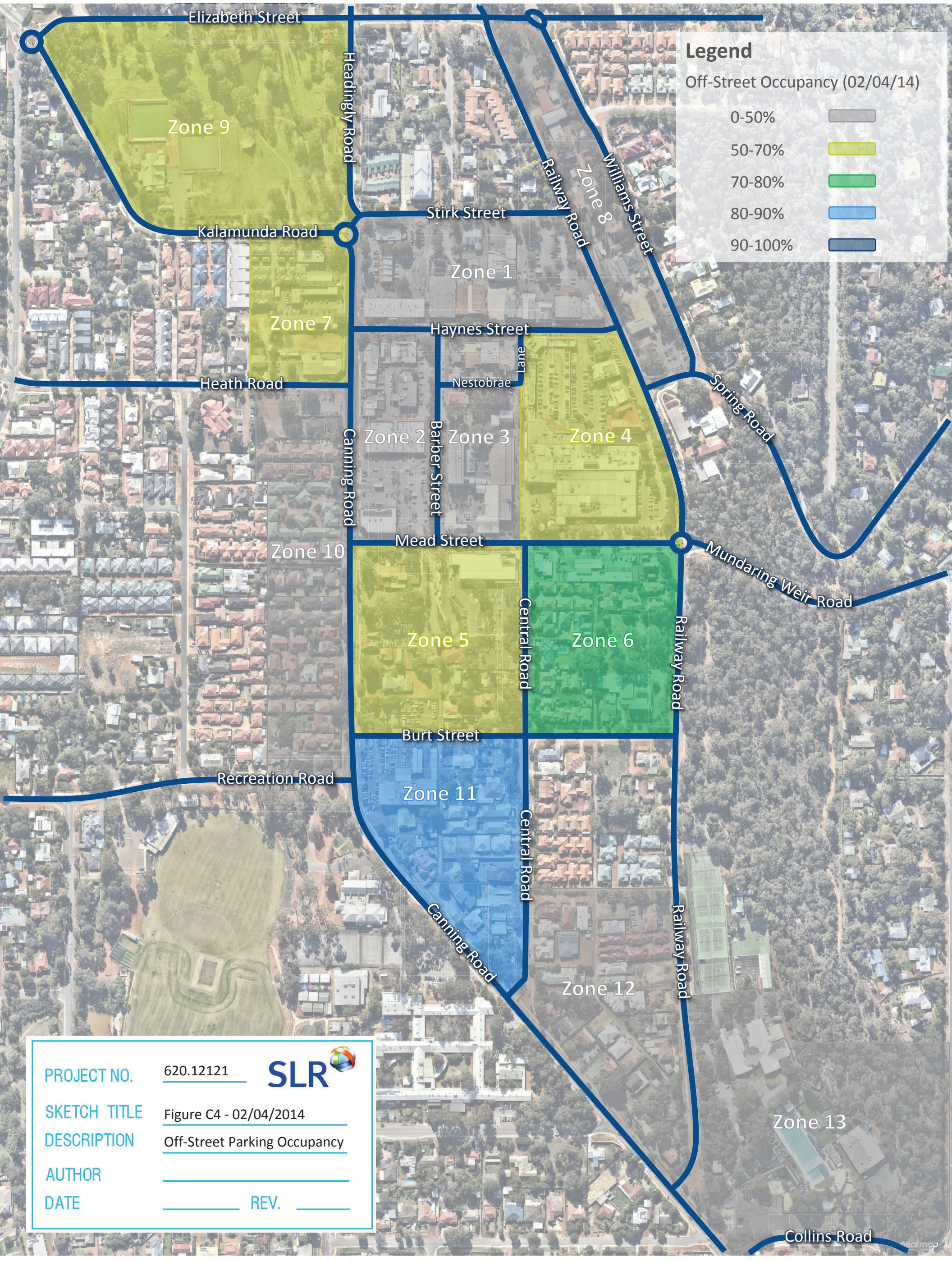
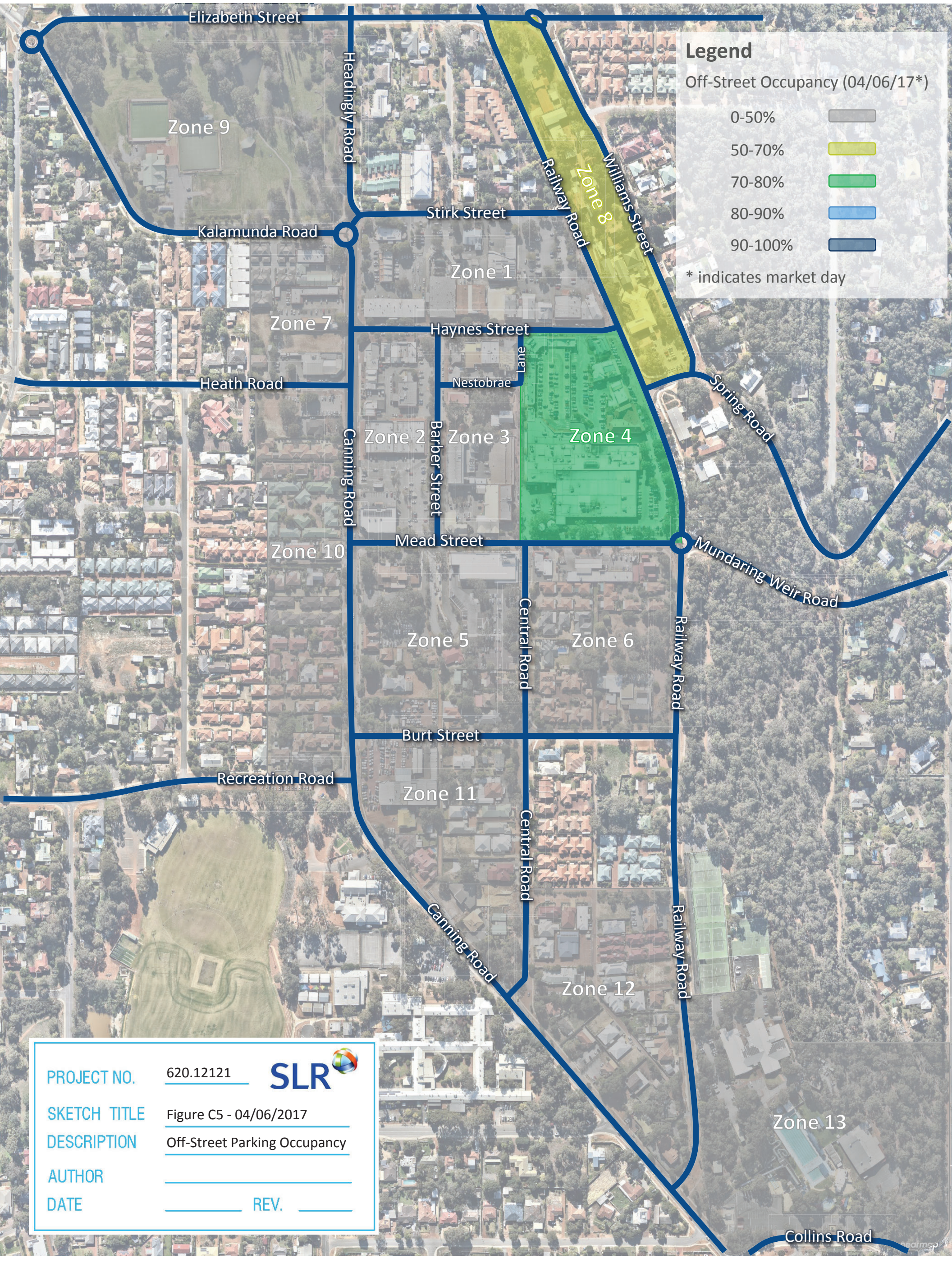
Headingly Road
Zone 9
Kalamunda Road
Stirk Street
Railway Road
Zone 8
Williams Street
Zone 1
Zone 7
Haynes Street
Lane
Nestobrae
Heath Road
Canning Road
Zone 2
Barber Street
Zone 3
Zone 4
Spring Road
Zone 10
Mead Street
Mundaring Weir Road
Zone 5
Central Road
Zone 6
Railway Road
Burt Street
Recreation Road
Zone 11
Canning Road
Zone 12
Railway Road
Zone 13
Collins Road
Legend
Off-Street Occupancy (27/05/12*)
0-50%
50-70%
70-80%
80-90%
90-100%
* indicates market day
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C2 - 27/05/2012
DESCRIPTION Off-Street Parking Occupancy
AUTHOR
DATE
REV.


Elizabeth Street
Headingly Road
Zone 9
Kalamunda Road
Stirk Street
Railway Road
Zone 8
Williams Street
Zone 1
Zone 7
Haynes Street
Lane
Nestobrae
Heath Road
Zone 2
Zone 3
Zone 4
Barber Street
Canning Road
Spring Road
Zone 10
Mead Street
Mundaring Weir Road
Zone 5
Central Road
Zone 6
Railway Road
Burt Street
Recreation Road
Zone 11
Central Road
Canning Road
Zone 12
Railway Road
Zone 13
Collins Road
Legend
Off-Street Occupancy (02/11/13*)
0-50%
50-70%
70-80%
80-90%
90-100%
* indicates market day
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C3 - 02/11/2013
DESCRIPTION Off-Street Parking Occupancy
AUTHOR
DATE REV.



PROJECT NO.	620.12121	SLR
SKETCH TITLE	Figure C4 - 02/04/2014	
DESCRIPTION	Off-Street Parking Occupancy	
AUTHOR		
DATE	REV.	


Elizabeth Street
Headingly Road
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Railway Road
Zone 8
Williams Street
Stirk Street
Kalamunda Road
Zone 1
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Haynes Street
Lane
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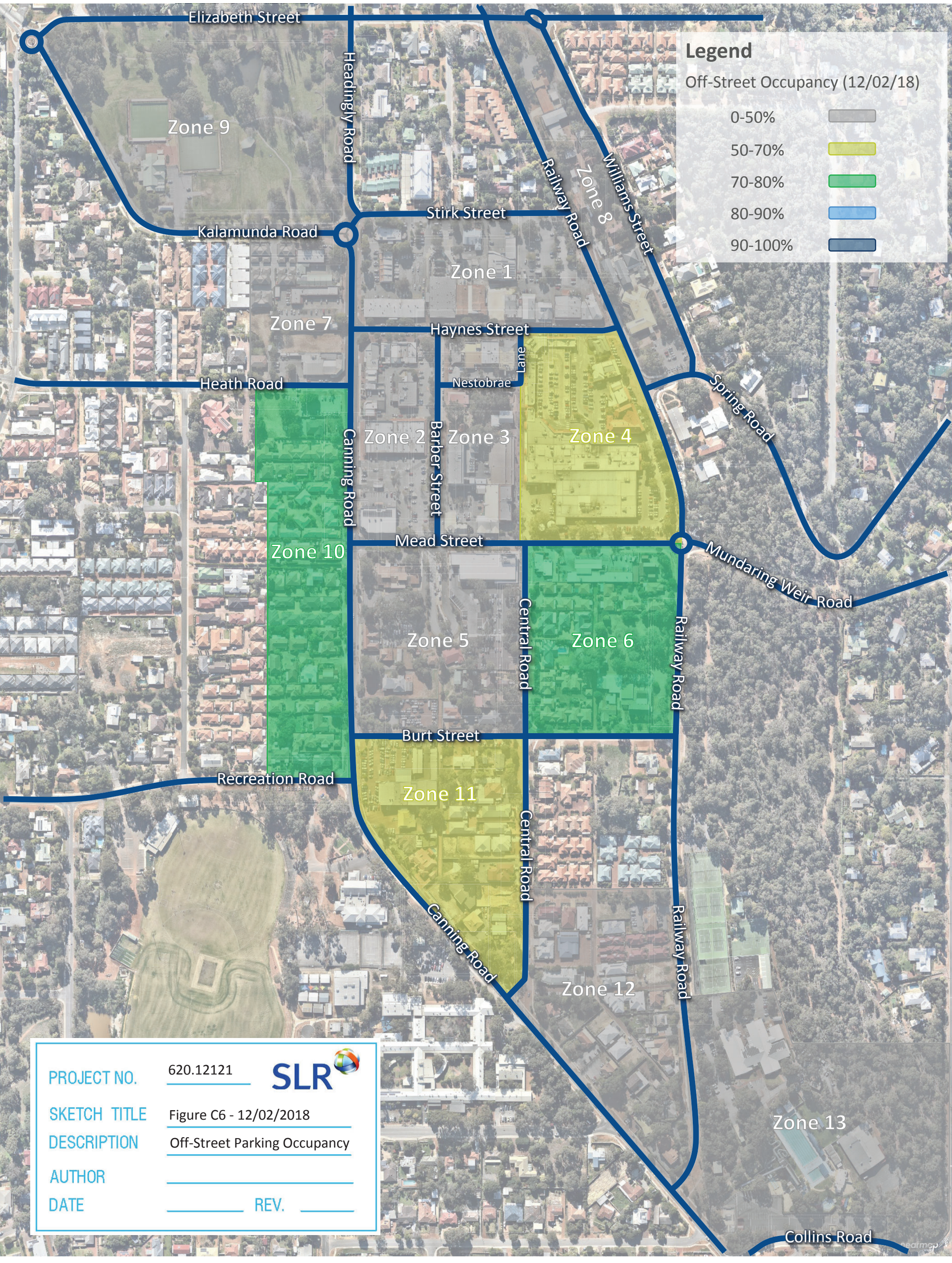
Spring Road
Canning Road
Zone 2
Barber Street
Zone 3
Zone 4
Mead Street
Zone 10
Mundaring Weir Road
Central Road
Zone 5
Zone 6
Railway Road
Burt Street
Recreation Road
Zone 11
Central Road
Canning Road
Zone 12
Railway Road
Zone 13
Collins Road
Legend
Off-Street Occupancy (04/06/17*)
0-50%
50-70%
70-80%
80-90%
90-100%
* indicates market day
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C5 - 04/06/2017
DESCRIPTION Off-Street Parking Occupancy
AUTHOR
DATE REV.


Elizabeth Street
Headingly Road
Zone 9
Railway Road
Zone 8
Williams Street
Stirk Street
Kalamunda Road
Zone 1
Zone 7
Haynes Street
Lane
Nestobrae
Heath Road
Canning Road
Zone 2
Zone 3
Barber Street
Zone 4
Spring Road
Mead Street
Zone 10
Mundaring Weir Road
Central Road
Zone 5
Zone 6
Railway Road
Burt Street
Recreation Road
Zone 11
Canning Road
Central Road
Railway Road
Zone 12
Zone 13
Collins Road
Legend
Off-Street Occupancy (12/02/18)
0-50%
50-70%
70-80%
80-90%
90-100%
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C6 - 12/02/2018
DESCRIPTION Off-Street Parking Occupancy
AUTHOR
DATE
REV.


Elizabeth Street
Williams Street
Haynes Street
Railway Road
Barber Street
Mead Street
Central Road
Legend
On-Street Occupancy (08/09/11)
0-50%
50-70%
70-80%
80-90%
90-100%
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C7 - 08/09/2011
DESCRIPTION On-Street Parking Occupancy
AUTHOR
DATE REV.
nearmap


Elizabeth Street
Williams Street
Haynes Street
Railway Road
Barber Street
Mead Street
Central Road
Legend
On-Street Occupancy (27/05/12*)
0-50%
50-70%
70-80%
80-90%
90-100%
* indicates market day
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C8 - 27/05/2012
DESCRIPTION On-Street Parking Occupancy
AUTHOR
DATE REV.
nearmap

Elizabeth Street

Williams Street

Haynes Street

Railway Road

Barber Street

Mead Street

Central Road

Legend

On-Street Occupancy (02/11/13*)

- 0-50%
- 50-70%
- 70-80%
- 80-90%
- 90-100%

* indicates market day

PROJECT NO.	620.12121
SKETCH TITLE	Figure C9 - 02/11/2013
DESCRIPTION	On-Street Parking Occupancy
AUTHOR	
DATE	REV.

SLR

nearmap


Elizabeth Street
Williams Street
Haynes Street
Railway Road
Barber Street
Mead Street
Central Road
Legend
On-Street Occupancy (02/04/14)
0-50%
50-70%
70-80%
80-90%
90-100%
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C10 - 02/04/2014
DESCRIPTION On-Street Parking Occupancy
AUTHOR
DATE
REV.
nearmap


Elizabeth Street
Heading Road
Williams Street
Haynes Street
Railway Road
Barber Street
Mead Street
Central Road
Legend
On-Street Occupancy (04/06/17*)
0-50%
50-70%
70-80%
80-90%
90-100%
* indicates market day
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C11 - 04/06/2017
DESCRIPTION On-Street Parking Occupancy
AUTHOR
DATE REV.
nearmap


Elizabeth Street
Headingly Road
Williams Street
Haynes Street
Railway Road
Barber Street
Mead Street
Central Road
Legend
On-Street Occupancy (12/02/18)
0-50%
50-70%
70-80%
80-90%
90-100%
PROJECT NO. 620.12121
SLR
SKETCH TITLE Figure C12 - 12/02/2018
DESCRIPTION On-Street Parking Occupancy
AUTHOR
DATE
REV.
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