

Transport Impact Statement

Curtin Central Student Accommodation

CW1123600



Prepared for
Curtin Central Pty Ltd

23 November 2020

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1 Introduction

1.1 Background

Cardno was commissioned by Curtin Central Pty Ltd ('the Client') to prepare a Transport Impact Statement (TIS) for the proposed student accommodation development located at the corner of McKay Street and Keaney Place within the City of South Perth.

This TIS has been prepared in accordance with the *Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines for Developments: Volume 4 – Individual Developments (2016)* and the checklist is included at **Appendix A**.

1.2 Existing Site

The Site is located on the corner lot of McKay Street and Keaney Place, Waterford, about 5.5 km from the Perth CBD, to the south west of Curtin University and within the City of South Perth. **Figure 1-1** shows an aerial image of the Site.

The Site is bound by McKay Street, Garvey Street and Keaney Place, and in close proximity to a number of significant educational institutions, including Curtin University (immediately adjacent), Canning College (immediately north), Clontarf Aboriginal Education and Training Centre (300m), Curtin College (350m), and South Metropolitan TAFE (1.4km).

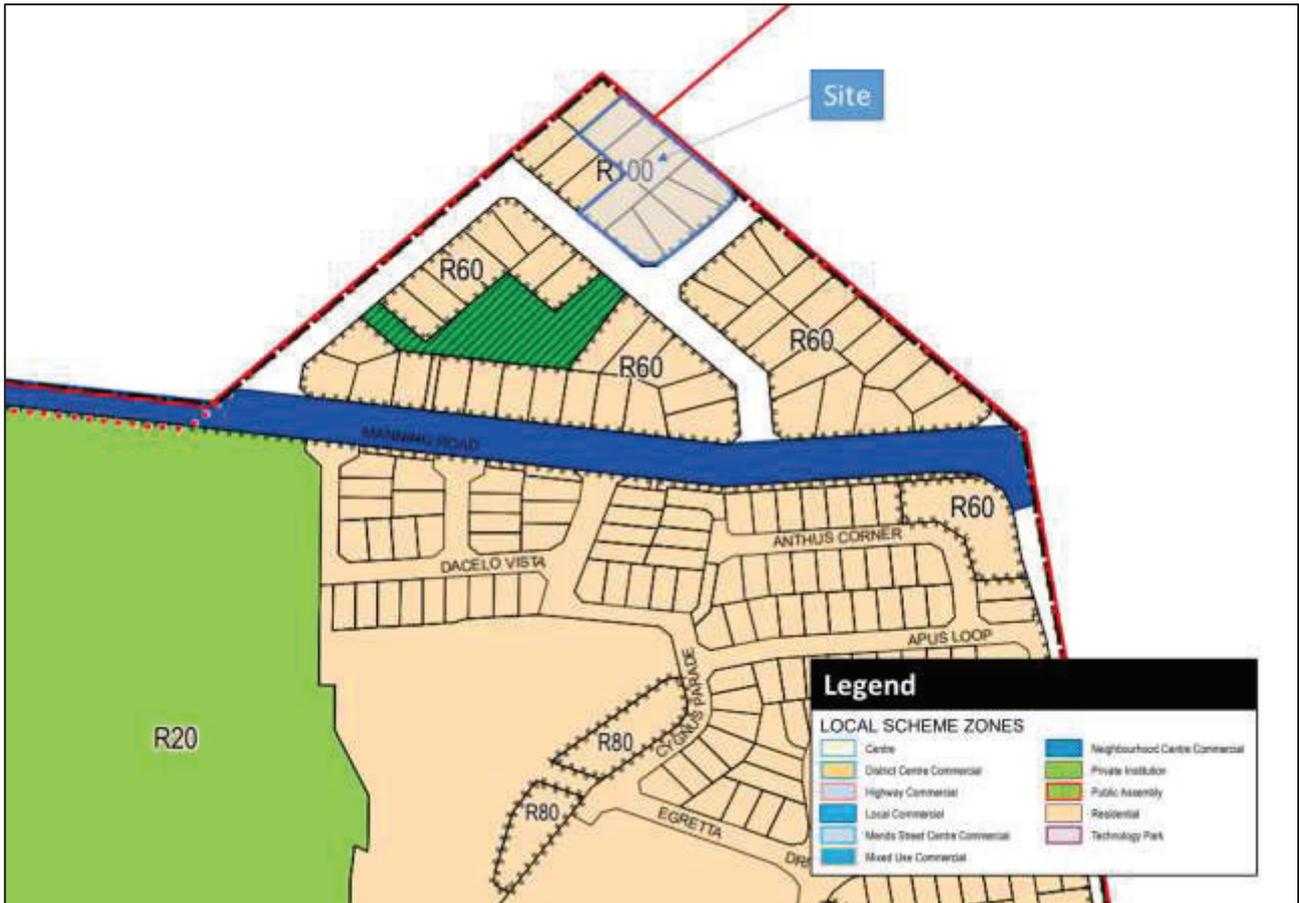
Figure 1-1 Site Location - Aerial Image



Base Map Source: Nearmap

The Site is zoned as 'Residential' under the *City of South Perth Local Planning Scheme No. 63* as shown in **Figure 1-2**. The Site is surrounded by several residential development across the locality of Waterford. The site is also located within a short walking distance of a local shopping destinations, including Bentley IGA (350m) and Waterford Plaza (500m). Waterford Plaza features a number of dining options, as well as supermarkets, post office, and a chemist.

Figure 1-2 Zoning



Source: City of South Perth Local Planning Scheme No. 63

1.3 Existing Road Network

The surrounding road network is further described in **Table 1-1** as per the *Main Roads WA Road Information Mapping System*.

Table 1-1 Road Network Classification

Street Names	Road Hierarchy			Road Network		
	Road Hierarchy	Jurisdiction	No. of Lanes	No. of Footpaths	Width (m)	Posted Speed (km/h)
McKay Street	Local Access	Local Government	2	2	8.00	50
Keaney Place	Local Access	Local Government	2	2	7.20	50
Garvey Street	Local Access	Local Government	2	2	7.00	50

Source: Main Roads: Road Information Mapping System

1.4 Traffic Volumes

While there are currently no available traffic data for the streets of Garvey Street, Keaney Place and McKay Street, these streets serve only a local purpose, and can be expected to experience low traffic volumes well below 1,000 vehicles per day.

1.5 Crash Assessment

A search of the *Main Roads WA Reporting Centre* for traffic crash data was carried out for reported crashes between 1 January 2015 and 31 December 2019 for the following road sections:

- Garvey Street SLK 0.00 to 0.24 (Conlon Street to Keaney Place)
- Keaney Place SLK 0.00 to 0.10 (Garvey Street to McKay Street)
- McKay Street SLK 0.00 to 0.22 (Marquis Street to Sill Street)
- Intersection of McKay Street and Keaney Place
- Intersection of Keaney Place and Garvey Street

Table 1-2 McKay Street SLK 0.00 to 0.22 (Marquis Street to Sill Street)

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	-	-	1	1
Right Turn Thru	-	-	-	1	-	1
Total	-	-	-	1	1	2

Table 1-3 Keaney Place SLK 0.00 to 0.10 (Garvey Street to McKay Street)

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Right Angle	-	-	-	-	1	1
Unspecified	-	-	-	-	1	1
Total	-	-	-	-	2	2

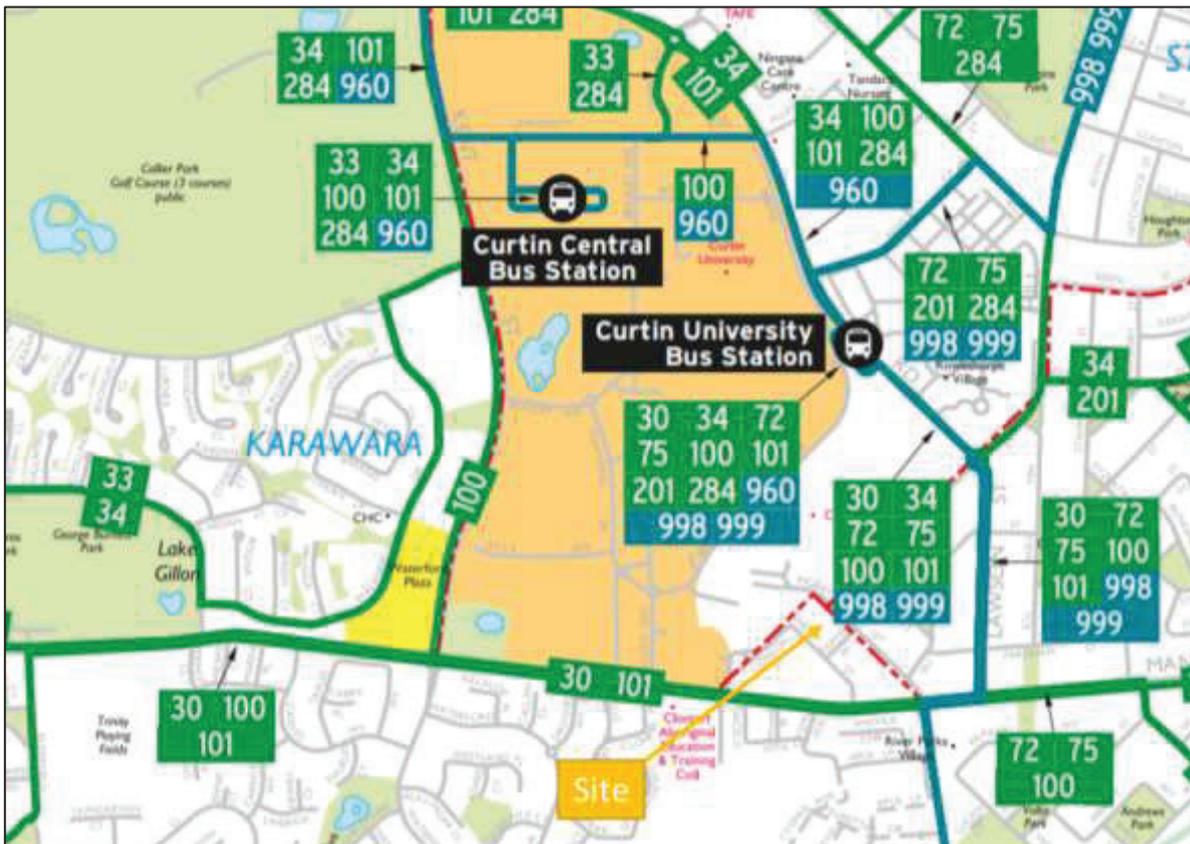
- No crash reported along Garvey Street.
- No crash reported at the intersections of McKay Street/ Keaney Place and Keaney Place/Garvey Stet.
- One Right End crash and one right turn thru crash were reported along the streets of McKay Street which both resulted to property damage.
- Two crashes reported, a right angle and an unspecified report which results to minor property damage.
- The crashes reported for the past 5 years within the Site's proximity is relatively low and does not pose any significant impact on the road safety.

2 Public Transport Facilities

2.1 Existing Public Transport Facilities

There are eight bus routes provided by Transperth which are easily accessible from the Site. The bus routes service provided by Transperth are Route 30, 34, 70, 75, 100, 101, 998 and 999. The nearest bus stop is within walking distance to the Site. In addition, the Curtin University Bus Station is about 550m from the Curtin University Bus Station, which also provides access to Routes 284 and 960 Superbus.

Figure 2-1 Transperth Bus Service



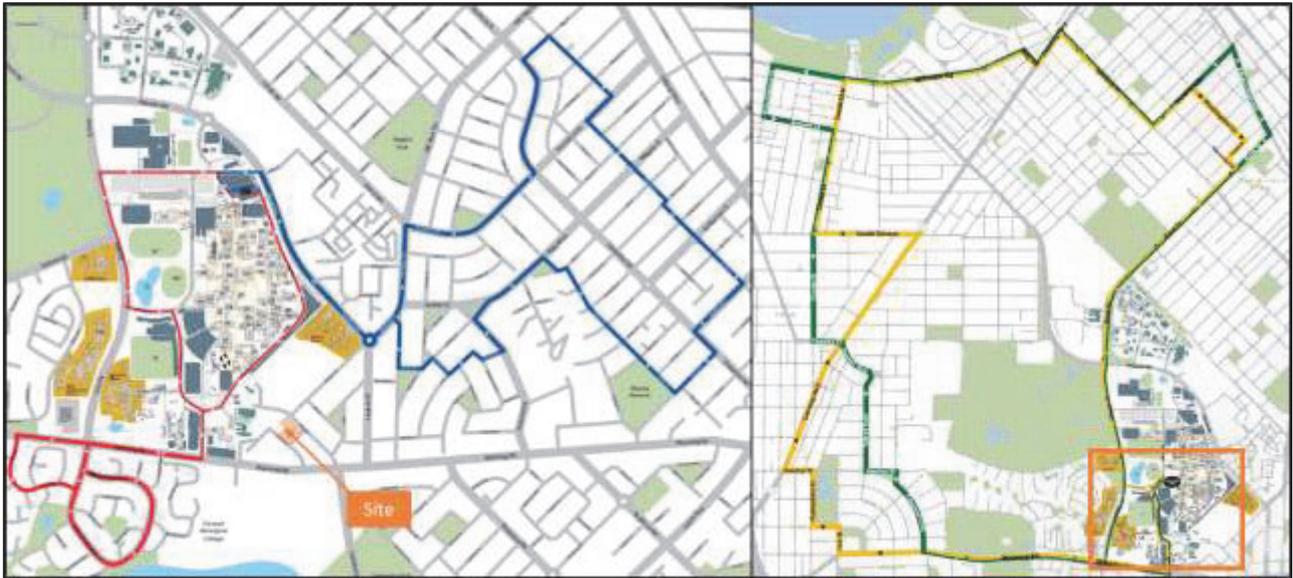
Source: Transperth

Table 2-1 Public Transport Route and Frequency

Bus Routes	Route Description	Frequencies		
		Weekdays	Saturdays	Sundays and Public Holidays
30	Curtin Bus University Bus Station to Perth Busport	15 minutes	60 minutes	60 minutes
34	Canning Station to Perth Busport	30 minutes	60 minutes	60 minutes
75	Elizabeth Quay Bus Station to Canning Vale	15 minutes	30 minutes	30 minutes
100	Cannington Station to Como	15 minutes	30 minutes	30 minutes
101	Cannington Station to Como	15 minutes	No Service	No Service
998	Circle Route – Clockwise (Fremantle Station – Curtin Bus University Station)	15 minutes	30 minutes	30 minutes
999	Circle Route – Anti-Clockwise (Fremantle Station – Morley Bus Station)	15 minutes	30 minutes	30 minutes

In addition, Curtin University provides shuttle bus services identified as the Curtin Access Bus Service or CABS, which operates during the semester and can be hailed at any point along their route. Bikes are allowed on these services, at the driver’s discretion. The current routes for these services are shown in **Figure 2-2**.

Figure 2-2 Current CABS Services



2.2 Future Public Transport Facilities

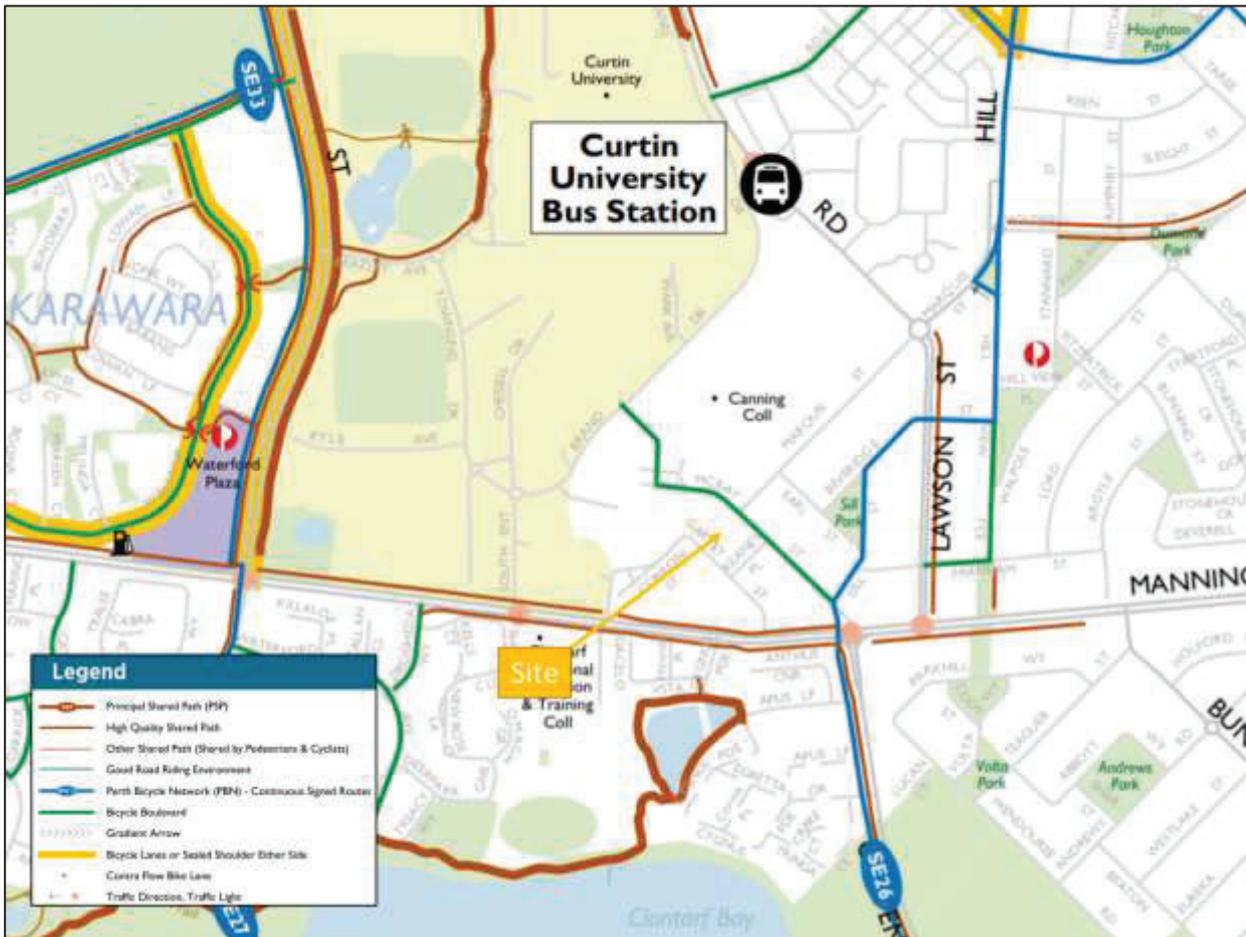
There are no known plans for significant upgrades to public transport in the vicinity of the Site. However, there are ongoing opportunities for minor modifications to the CABS route alignment, depending on the density of student residential accommodation.

3 Pedestrian/Cycle Networks and Facilities

3.1 Existing Pedestrian/Cycle Network Facilities

The site is connected to local and strategic cycling routes which provide safe access to local retail and recreational destination. In the existing network maps by the Department of Transportation, the Site benefits from bicycle boulevard along McKay Street which connects to the Curtin University and high-quality shared Path along Manning Road which provides safe and convenient bicycle connection via east-west direction.

Figure 3-1 Pedestrian and cycling network



Source: Department of Transport

3.2 Future Pedestrian/Cycle Network Facilities

The Town of Victoria Park and City of South Perth have collaborated to form a *Joint Bike Plan* (2018) to improve the current cycle network, to promote cycling and also to reduce the environmental impact from vehicle usage. The project will involve the construction infrastructure including footpaths, shared paths, separate cycle paths, principle shared paths, on road cycle lanes and Safe Active Streets.

Figure 3-2 City of South Perth and Town of Victoria Park Joint Bike Plan (2018)



In addition, the Site is located beside the Bentley-Curtin Specialized Activity Centre Plan (Active Network). The site could benefit from the additional improvement of active transport routes which connects to the Curtin University.

Figure 3-3 Bentley-Curtin Specialised Activity Centre Plan (2018) Active Network

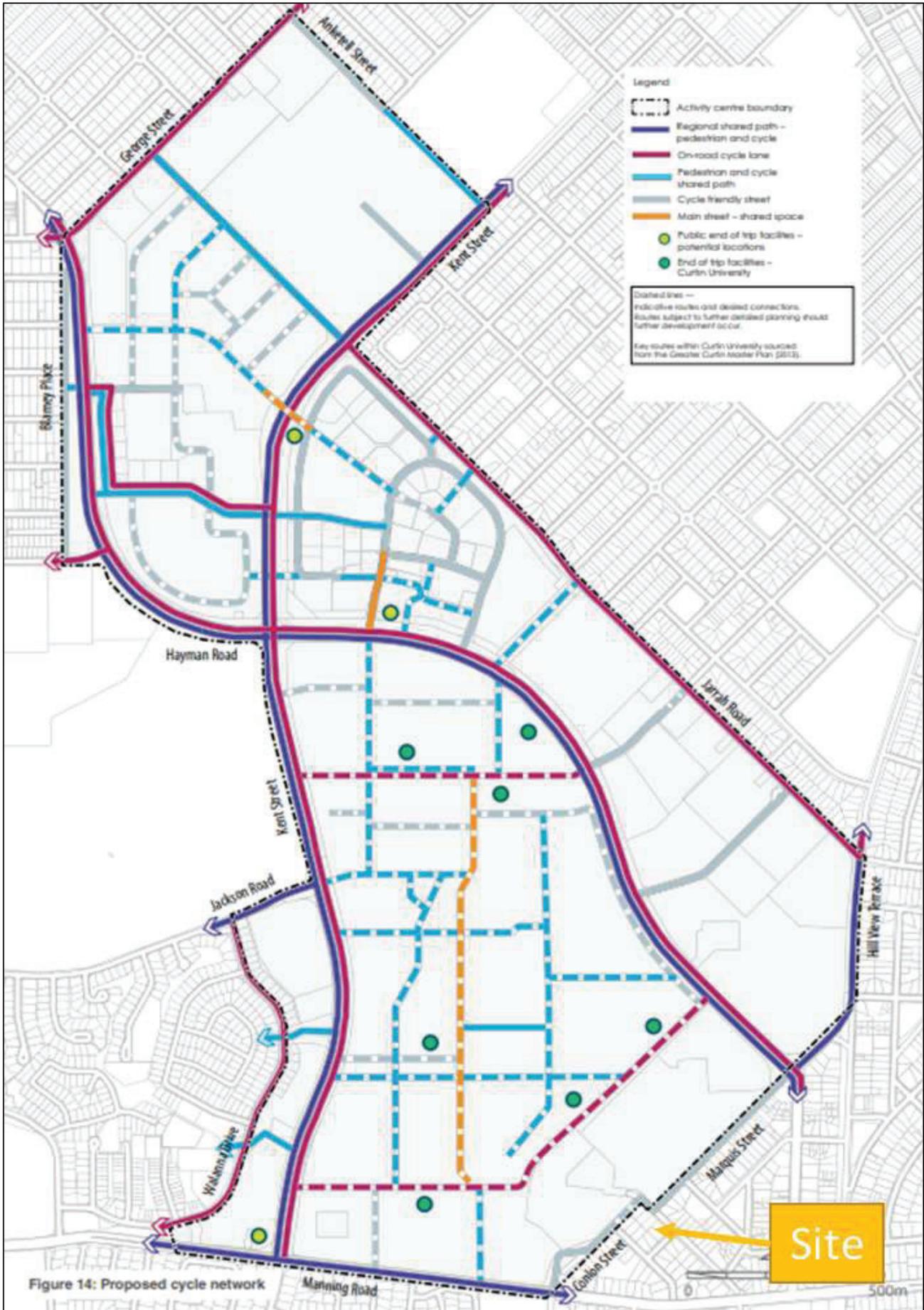


Figure 14: Proposed cycle network

4 Proposed Development

4.1 Overview

The proposed development consists of 906 purpose-built student accommodation beds, plus ancillary food & beverage to support on-site function.

Figure 4-1 shows the floor plan of the proposed development. Development plans are provided in **Appendix B** of this report.

Figure 4-1 Floor Plan



Source: DKO Architects

4.2 Access Arrangements

Vehicular access to the Site is proposed to be via two crossovers. The Keaney Place crossover, at the eastern boundary, provides access to the majority of on-site residential/share-car parking bays and resident bicycle parking spaces, as well as to staff parking for the restaurant uses.

The Garvey Street crossover similarly provides access to a small number of resident parking spaces and bicycle parking spaces.

These accesses and areas are shown below, **Figure 4-2**.

Figure 4-2 Site Accesses



4.3 Parking Review

Parking requirements for the Site were checked in accordance with the relevant planning documents. The Site's car park layout has been reviewed with reference to the Australian Standard AS2890.1: Off-Street Parking. Given the very low peak traffic generation anticipated for this development, the proposed car parking arrangement is considered to be fit-for-purpose.

4.3.1 Car Parking

Cardno has completed a Parking Needs Assessment, referencing the precise function of the proposed development. Based on benchmarking against other locations, it has been determined that an **unconstrained** 906-bed facility would require as much as 363 parking spaces, 1 space per 2.5 students.

However, **constrained** development sites function with significantly lower parking provision rates. Benchmarking against other suburban student accommodation locations suggests that a supply of 1 parking bay per 7 beds is sustainable without any additional intervention.

This development proposes to operate under an active management system that provides bike share and car share services, in addition to very high levels of resident bike parking and excellent peripheral public transport, to substantially decrease the need for on-site residential car parking.

This supports the growing population of car-free young people, and a strong self-selection model reinforced with unbundled parking provision and strict management.

On-site provision of shared pool cars has been shown to significantly reduce private vehicle ownership requirements at residential university accommodation sites worldwide, with a replacement rate of between 5 - 15 cars for each share car made available. However, in Australia there are relatively few suitable studies, due to the relative infancy of the service. Nevertheless, Student Car Share Australia has partnered with this development, recommending a replacement rate of 1:10, where 10 private parking bays can be replaced by the provision of 1 share car. This rate has been applied to the unconstrained parking demand of 1 space per 2.5 beds defined above.

Off-Street Parking

From the analysis of current research, demographics and site-specific details, as detailed in the Parking Needs Assessment in **Appendix B**, the following conclusions have been drawn:

- > Unconstrained demand for private vehicles by students is approximately 1 car per 2.5 rooms, however existing parking supply for PBSA developments in similar locations is consistently lower; approximately 1 space per 7 beds.
- > Constraining on-site residential parking supply is an effective way to reduce vehicle ownership patterns, provided the surrounding on-street parking environment is effectively managed to prevent overspill. This relies on access to alternative transport modes including public transport, walking and cycling.
- > Industry benchmarks show that car share is able to replace private car parking bays at a ratio of 1:10.
- > Bike share will support the transition to active transport modes in a low-car environment, with a target rate of one share bike per 8-10 students.
- > The maximum and minimum parking rates depend on constrained parking supply and the uptake of car share.
- > Previous studies show that visitation to PBSA in suburban contexts is very low, and that no specific provision is required.

For this development, it is expected that an uptake rate of approximately 73% can be achieved, requiring a total of 69 parking spaces, of which 58 bays would be constructed in Stage 1, and 11 more bays constructed in Stage 3.

Port Cochere

The proposed development includes an off-street port cochere with entry and exit via McKay Street to allow for resident pick-up/drop-off, food delivery etc. This access will be limited to one-way from east to west, and controlled via signage and linemarking. Sufficient space is available for two vehicles to park without affecting vehicular flow.

Use would be restricted to 5 minute duration at all times, to prevent illegitimate use by students, and to ensure that the system operates efficiently and safely. On-site management staff will assume the responsibility for keeping the port cochere functioning as intended.

On-Street Parking

In addition to these on-site bays, on-street parking is proposed which includes a total of 8 parking spaces, consisting of:

- > 2 parallel bays along McKay St (to be available for use by service/waste collection vehicles and managed through parking restriction signage and enforcement)
- > 3 parallel bays along Keaney St (limited to short-stay use only through parking restriction signage)
- > 3 perpendicular bays on Garvey St (limited to short-stay use only through parking restriction signage)

This parking has been discussed with the City, with no objections identified. It is assumed that all parking will be designed to comply with relevant Australian Standards.

4.3.2 Electric Vehicle Charging

It is very likely that the future of automotive transport will include a substantially higher proportion of electric vehicles (EVs), particularly when supplied as share cars or Mobility as a Service (MaaS) packages.

Therefore, enabling works for on-site provision for EVs should be considered as part of the initial construction. This would include conduit for electrical reticulation to all parking spaces, and fast EV charging for at least 20% of the share car spaces. Additional slow EV charging facilities should be installed according to the observed requirements (e.g. share car and residential vehicle fleet).

4.3.3 Bike Parking

A large quantum of secure bike racks is located on-site, comprising up to 36 shared pool bikes (at full development) and 170 private resident bike parking spaces. These racks are located in two areas:

- > For Stage 1&2 development, bike parking can be accessed from the Keaney Street crossover or via the lifts from McKay Street.
- > For Stage 3 development, bike parking can be accessed from the Garvey Street crossover.

There is an opportunity to increase the share of bike parking depending on the uptake of the service.

4.3.4 Parking Provision

Parking requirements have been assessed through a *Parking Needs Assessment* for the proposed development and included in **Appendix B**. A summary of the outcomes of this study is presented below, **Table 4-1**.

Table 4-1 Car Parking and Bike Parking Provision

Yield	Resident Parking	Share Car Parking	Staff Parking	Total Car Parking	Resident Bike Parking	Share Bike Parking
Stage 1 297 beds	50	0	8	58	112	28 (sufficient for 224 students)
Stage 2: 660 beds	33	17				
Stage 3: 906 beds	33	28	8	69	170	36 (sufficient for 288 students)

4.4 Traffic Generation

Trip generation rates for the on-site uses are expected to be extremely low, based on the constrained parking supply. Peak generation can be expected to be significantly less than 1 trip per parking space, as the majority of private residential vehicles will be used outside of peak periods. Higher than average generation can be expected by share cars, both during the peak period and throughout the day and weekend. Nevertheless, this development is expected to result in a negligible impact on the adjacent road network due to the reduced supply and development function.

The following Table 4-2 describes a reasonable worst-case for vehicle movements in and out of the Site during the corresponding roadway peak periods.

Table 4-2 Trip Generation Rate – Peak Hour

	No. Vehicles	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Share Car Bays	28	0.1	0.9	0.8	0.8
Staff Car Bays	8	1.0	0	0.5	0.5
Private Resident Bays	33	0.1	0.3	0.3	0.2

Table 4-3 Total Trip Generation – Peak Hour

	No. Vehicles	AM Peak IN	AM Peak OUT	PM Peak IN	PM Peak OUT
Share Car Bays	28	3	25	22	22
Staff Car Bays	8	8	0	4	4
Private Resident Bays	33	3	10	10	7
Total	69	14	35	36	33

4.5 Provision for Waste Collection and Service Vehicles

Waste collection and service/delivery is proposed to be undertaken along the street frontage, with bin pad areas located on the Lot adjacent to trafficable collection points nominated along Garvey Street and Keaney Place. Waste collection is also proposed from the designated embayment on McKay Street.

All areas have been designed in accordance with appropriate AS2890.5 standards and checked using standard swept path analysis for a 12.5m HRV.

5 Site-Specific Issues

This Site will operate under a constrained parking regime, requiring support for alternative transport modes and active management of on-site parking. The following interventions are proposed in support of this constraint:

1. Private residents' on-site vehicle parking on-site will be strictly according to a permit system unbundled from the room leasing charge. This will be managed such that the number of permits is exactly equal to the number of available spaces.
2. An on-site share car service will operate from the Site, for use by residents only. This system will function for short-term use of a pool of up to 27 cars using a subscription app.
3. A similar service will be used to manage approximately 36 shared bikes, available to residents of the student accommodation only.
4. Additional secure parking for up to 170 resident bikes will also be provided.
It is anticipated that cycling will make up the majority of medium-length trips, including to the Curtin Bentley Campus and Waterford Plaza. Longer distance trips are more likely to be taken via bus services supplied by Transperth and CABS.
5. Building management will also function as a travel advisory service, informing students of the available public transport and shared transport service options. This will include easy access to hardcopy and electronic information.

6 Summary

This Transport Impact Statement outlines the transport aspects of the proposed development focusing on traffic operations, access and provision of car parking. Included are discussions regarding pedestrian, cycle, and public transport considerations.

This statement has been prepared in accordance with the *WAPC Transport Assessment Guidelines for Developments: Volume 4 – Individual Developments (2016)*, with a checklist for associated items provided in **Appendix A**.

APPENDIX

A

WAPC CHECKLIST

Item	Status	Comments/Proposals
Proposed development		
proposed land use	Section 4	
existing land uses	Section 1	
context with surrounds	Section 1	
Vehicular access and parking		
access arrangements	Section 4	
public, private, disabled parking set down / pick up	Section 4	
Service vehicles (non-residential)		
access arrangements	Section 4	
on/off-site loading facilities	Section 4	
Service vehicles (residential)		
Rubbish collection and emergency vehicle access	Section 4	
Hours of operation (non-residential only)		
	N/A	
Traffic volumes		
daily or peak traffic volumes	Section 4	
type of vehicles (e.g. cars, trucks)	N/A	
Traffic management on frontage streets		
	N/A	
Public transport access		
nearest bus/train routes	Section 2	
nearest bus stops/train stations	Section 2	
pedestrian/cycle links to bus stops/train station	Section 3	
Pedestrian access/facilities		
existing pedestrian facilities within the development (if any)	Section 3	
proposed pedestrian facilities within development	Section 3	
existing pedestrian facilities on surrounding roads	Section 3	
proposals to improve pedestrian access	Section 3	
Cycle access/facilities		
existing cycle facilities within the development (if any)	Section 3	
proposed cycle facilities within the development	Section 3	
existing cycle facilities on surrounding roads	Section 3	
proposals to improve cycle access	N/A	
Site specific issues		
	Section 5	
Safety issues		
identify issues	Section 1	
remedial measures	N/A	

Curtin Central Student Accommodation

APPENDIX

B

PARKING NEEDS ASSESSMENT

Technical Memorandum

Title	Curtin Central Parking Needs Assessment		
Client	Curtin Central Pty Ltd	Project No	CW1123600
Date	20 November 2020	Status	Rev C
Author	Jessie Moore / Jacob Martin	Discipline	Traffic and Transport
Reviewer	Ray Cook	Office	Perth

Executive Summary

International education is a key economic growth sector for the Western Australian economy. To cater for these international students the development of additional accommodation is required.

The development of new, purpose-built student accommodation in appropriate locations close to University campuses, public transport, and active transport connections, presents an opportunity to restrain growth in the amount of private vehicle trips generated.

Appropriate minimum and maximum car parking rates for residents and visitors have been developed in consideration of:

- > Rates of vehicle ownership among international students
- > Affecting car parking demand by restricting supply
- > Replacement rate of private vehicle bays by car sharing facilities
- > Replacement rate of private vehicle bays by bicycle sharing facilities
- > Acceptable parking rates for existing purpose-built student accommodation developments in similar environments across Australia and around Curtin University
- > Connection of the site to surrounding active and sustainable transport networks (to promote use of cycling, walking, and public transport)
- > Accessibility of necessary services and amenities in the surrounding locality

For unconstrained parking (supplied at a rate matching current demand: 1 car per 2.5 students) the results of this study indicate a maximum parking demand of 363 parking bays at full build-out (where all vehicles are privately owned), and a minimum requirement of 37 parking bays (where all bays are dedicated to share cars).

Where on-site parking is restrained as recommended by this study (at a rate of 1 parking bay per 7 beds) and bays available are allocated based on a strict management framework, the results of this study indicate a maximum car parking demand of 130 bays (where all vehicles are privately owned) and a minimum requirement of 37 parking bays (where all bays are dedicated to share cars).

An additional requirement for tenant parking bays associated with on-site food retail service has been recognised, and 9 parking spaces provided in support of this use.

A rate of 0 visitor bays is considered appropriate based on the context of the development and surrounding environment, and consistent with rates adopted by the City of Monash for similar situations.

The provision of share bikes would support the low-car development, with an appropriate supply considered to be in the order of 1 bike per 8-10 students subscribed to the scheme, plus provision for 1 personal bike per 3 students not subscribed to the scheme.

Objective

This Parking Needs Assessment is intended to develop an appropriate band of parking supply for purpose-built student accommodation (PBSA) at the Waterford Triangle Apartment Precinct ('the Subject Site' or 'the Site').

Curtin Central is expected to provide a place of residence for undergraduate students, mostly 18-24 years old, studying at the Curtin University, Bentley campus. The majority of these are expected to be international students, with some regional domestic students.

Curtin University already has a significant international student population, with nearly 7,000 International students enrolled as 'onshore fee-paying' students across its Australian campuses. Of these, the Bentley Campus is calculated to provide education to approximately 5,300 students. If the additional requirement for remote and regional student accommodation is included, the demand may be for as much as 10,000 beds, greatly exceeding the current supply of student housing. There is therefore a significant latent demand for PBSA in this vicinity.

In Western Australia, international higher education enrollment grew by over 13% between June 2018 and June 2019¹, indicating that the requirement for accommodation can be expected to continue to increase in the coming years.

Methodology

An appropriate band of parking rates for resident and visitor parking has been developed using benchmarking of existing purpose-built student accommodation across a variety of Australian contexts, including similar contexts in Victoria and NSW, and sites immediately surrounding Curtin University.

To develop the rates, consideration has also been given to restricting supply of car parking for the strategic purposes of reducing private vehicle car trips. An industry standard replacement rate of car sharing to replace private vehicles has also been adopted.

These rates have additionally been considered in relation to the surrounding active and public transport environment and proximity of day to day amenities in the locality.

Site Context

The subject site is located 6.5km from the Perth CBD, to the south west of Curtin University, in the suburb of Waterford, City of South Perth.

Figure 1-1 illustrates the regional context of the Site, with **Figure 1-2** illustrating the local surroundings.

The site is bound by McKay Street, Garvey Street and Keaney Place, and in close proximity to a number of significant educational institutions, including Curtin University (immediately adjacent), Canning College (immediately north), Clontarf Aboriginal Education and Training Centre (300m), Curtin College (350m), and South Metropolitan TAFE (1.4km).

The site is also located within a short walking distance of a local shopping destinations, including Bentley IGA (350m) and Waterford Plaza (500m). Waterford Plaza features a number of dining options, as well as supermarkets, post office, and a chemist.

There is a gym located at Curtin Stadium, in addition to the many recreation opportunities prevalent along the Canning River and in local parks, all located within 1km of the Site.

¹ Urbis, 2019, *Student Accommodation – Mid Year Market Update 2019*

Figure 1-1 Subject Site Regional Context

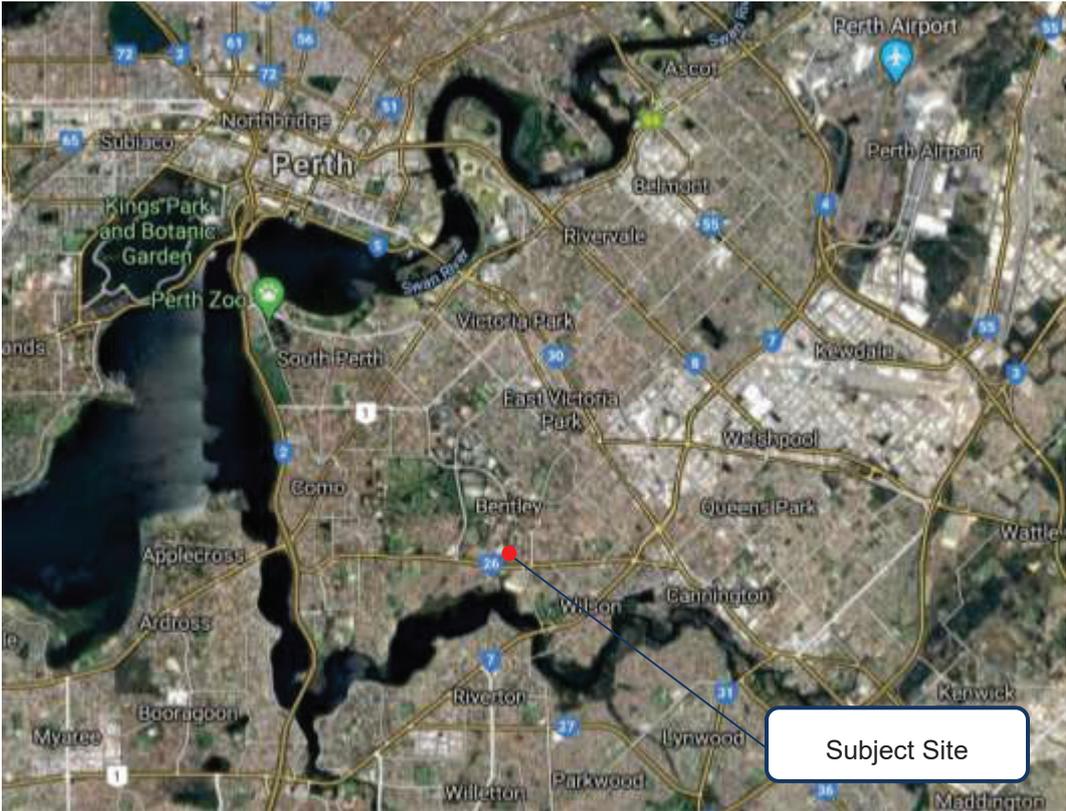


Figure 1-2 Subject Site Location



Sustainable Transport

Curtin's Bentley campus is a highly connected location, easily accessible by bus and train, as well as cycling and walking modes. It's proximity to the Perth CBD and to both the Mandurah and Armadale train lines makes non-car transport viable for the vast majority of employment, recreation, entertainment and shopping trips.

Active Transport

The Town of Victoria Park and City of South Perth have collaborated to form a Joint Bike Plan (2018) to improve the current cycle network, to promote cycling and also to reduce the environmental impact from vehicle usage. The project will involve the construction infrastructure including footpaths, shared paths, separate cycle paths, principle shared paths, on road cycle lanes and Safe Active Streets.

The Site is connected to local and strategic cycling routes which provide safe access to local retail and recreation destinations.

Figure 1-3 shows the aspirational cycle network which connects both the City of South Perth and the Town of Victoria Park; **Figure 1-4** shows the site-specific joint bike plan.

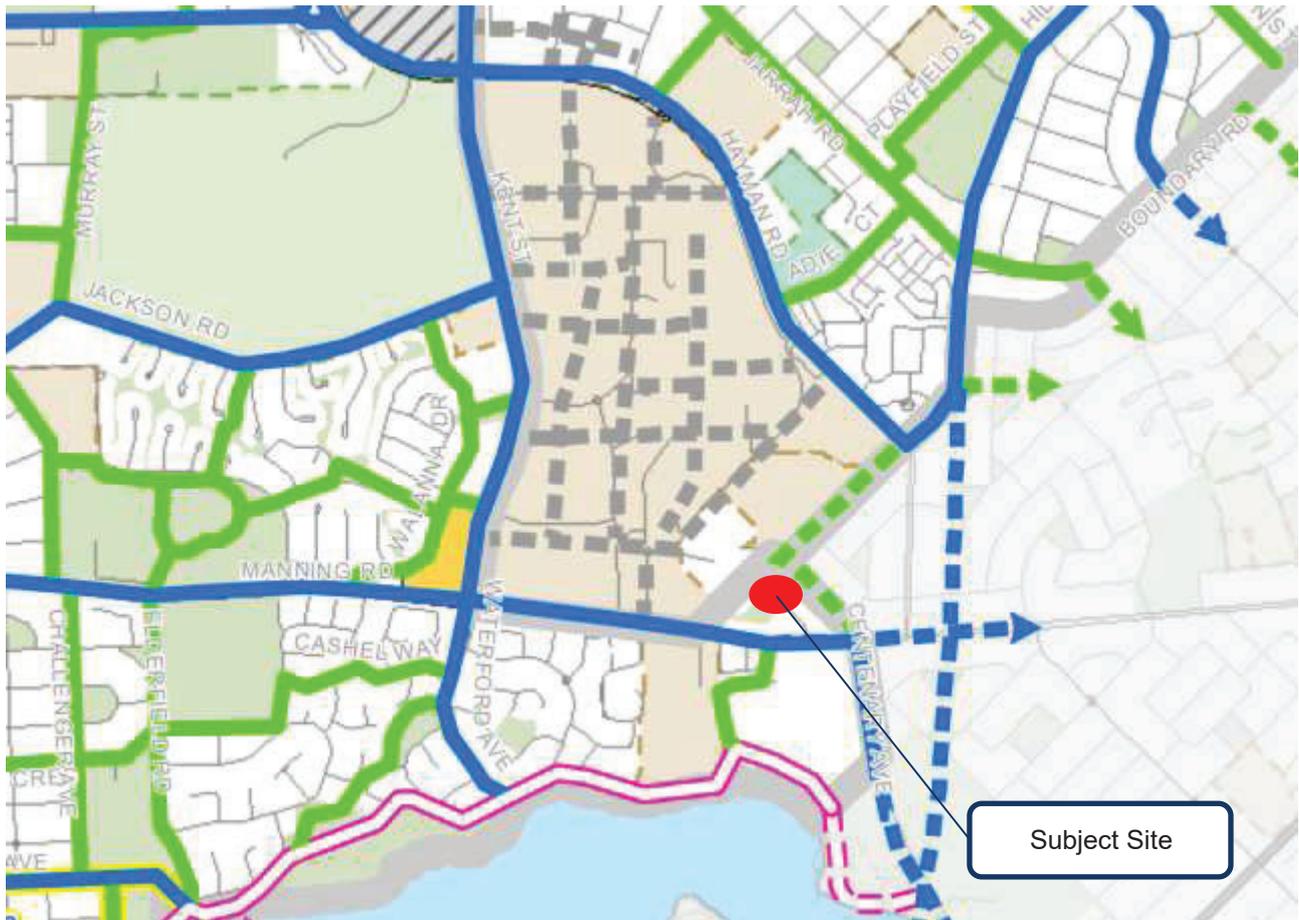
Figure 1-3 City of South Perth and Town of Victoria Park Joint Bike Plan (2018)



Legend

	Rail Stop	Aspirational Network	Overpass/Underpass
	Railway	Principal Route	Existing Overpass/Underpass
	Freeway	Principal Route - by others	Proposed Overpass/Underpass
	Highway	Strategic Routes	
	Main	Strategic Routes - by other	
	Minor	Local Routes	
		Local Routes - by others	
		Within Curtin University	

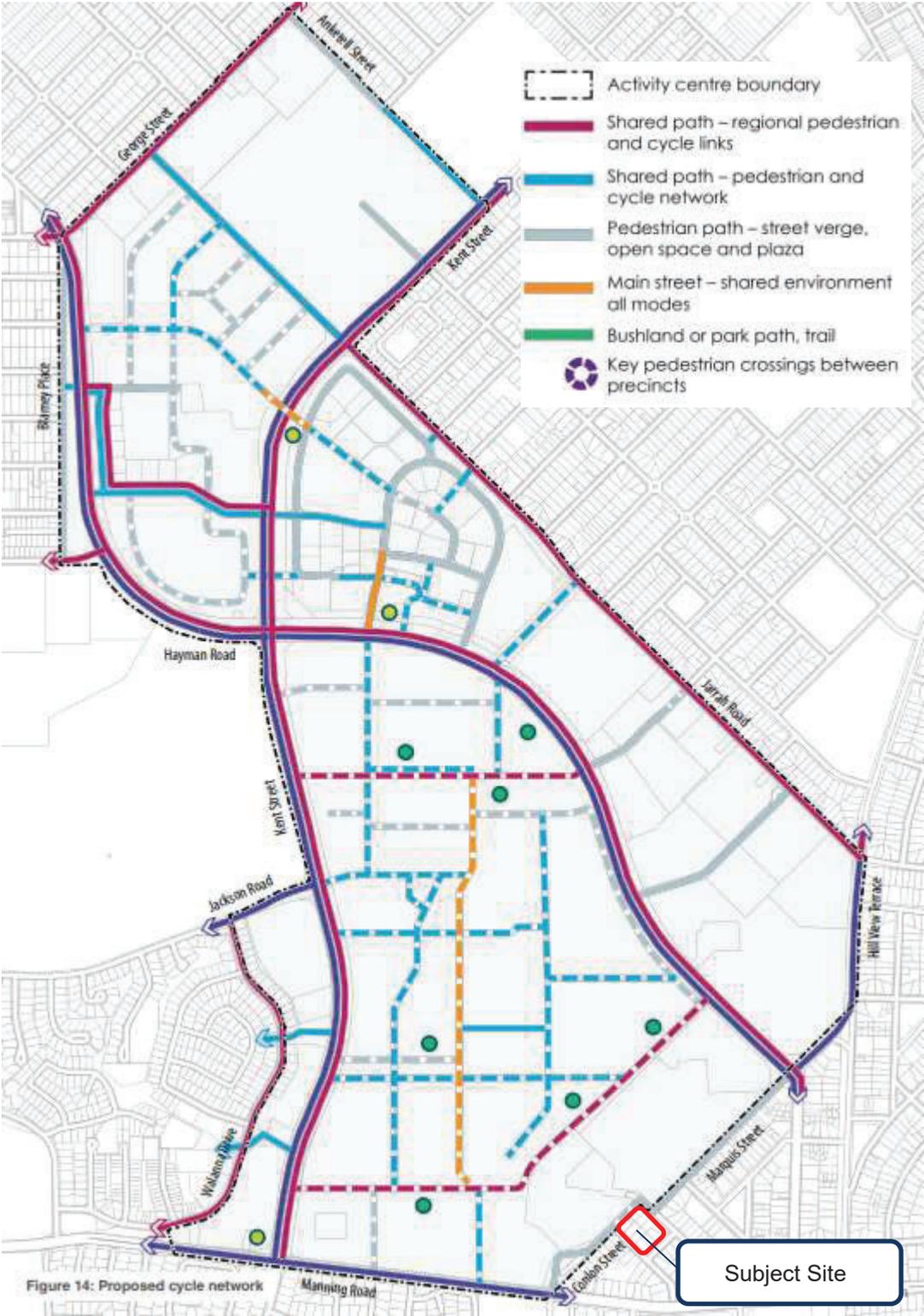
Figure 1-4 Site Specific Joint Bike Plan



The subject site also connects to the Curtin University campus providing additional permeability of active transport routes, as seen in **Figure 1-5** on the following page.

The adjacent pedestrian route on Marquis Street is identified as a local cycling route as per the Joint Bike Plan, providing connectivity to the extensive Strategic Cycling network around the Bentley campus.

Figure 1-5 Bentley-Curtin Specialised Activity Centre Plan (2018) Active Network



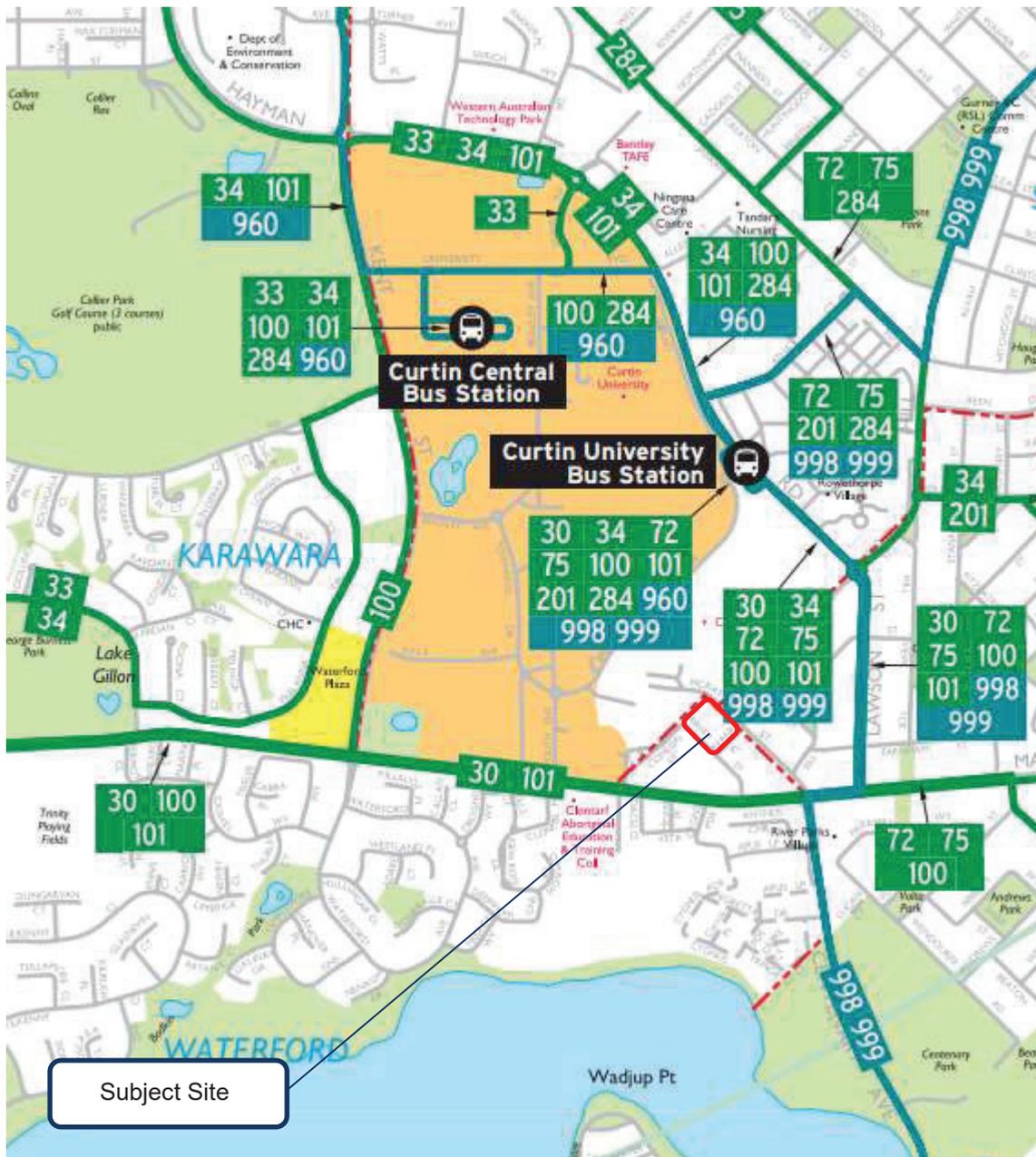
Public Transport

The existing public transport context surrounding the site is illustrated in **Figure 1-6** below.

The site is located within walking distance to the existing shuttle bus routes provided by Curtin University and to a large number of frequent Transperth bus services, including bus Route 30, 34, 70, 75, 100, 101, 998 and 999.

The site is located approximately 550m from the Curtin University Bus Station, which also provides access to the Route 284 and the 960 Superbus.

Figure 1-6 Existing Public Transport Context



These services provide intermodal connection to the Canning Bridge (3.7km away), Oats Street (3.2km away) and Murdoch Stations (approximately 7.5km away).

Future public transport developments are expected to improve public transport connectivity still further.

In addition, Curtin University provides shuttle bus services (Curtin Access Bus Service, or CABS), which operate during the semester and can be hailed at any point along their route. Bikes are allowed on these services, at the drivers' discretion. The current routes for these services are shown in **Figure 1-7** below.

Figure 1-7 Current CABS Services



These services provide access to local destinations as well as surrounding residential areas.

Patterns of Parking Supply – Benchmarking

A benchmarking study has been undertaken, using a range of primary and secondary sources to establish the provision of parking spaces at a number of purpose-built student accommodation facilities across Australia.

Table 1-1 provides a summary of the parking rates for these existing facilities.

Table 1-1 Existing Parking Supply at PBSA Facilities

City	Development	Location	Beds	Car Parking Spaces provided	Car Parking Spaces per Bed
Brisbane	Margaret Street	CBD	274	15	1 space / 18 beds
	UniLodge, Shafston Avenue	CBD	238	16	1 space / 14 beds
	121A and 125 Colchester Street, South Brisbane	CBD	850 rooms	26 (including 5 Car Share Bays)	1 space / 33 rooms
	53 Tribune Street and 188 Vulture Street, South Brisbane	CBD	787 rooms	17	1 space / 46 rooms
	116 Merivale Street, 88 and 90 Ernest Street, South Brisbane	CBD	625 rooms	24 (including 5 Car Hire bays)	1 space / 26 rooms
	25 Archer Street, Toowong	CBD	550	110	1 space / 20 beds
Melbourne	UniLodge on Lonsdale	CBD	320	0	-
	UniLodge on Villers	CBD	195	10	1 space / 20 beds
Canberra	UniLodge Academie House	CBD	90	0	-
Adelaide	UniLodge on Waymouth	CBD	204	0	-
	UniLodge Student Living	CBD	288	0	-
Wollongong	9 Crown Lane	Suburban	95	19	1 space / 5 beds
Perth	UniLodge Erica Underwood House	Suburban	324	74	1 space / 5 beds
	UniLodge Vickery House	Suburban	294	55	1 space / 6 beds
	UniLodge Kurrajong Village	Suburban	327	107	1 space / 3 beds
	UniLodge Guild Hall	Suburban	202	52	1 space / 4 beds

Based on the above, there is a clear distinction between the existing parking provision for PBSA in suburban as opposed to city centre locations.

In their *Student Accommodation Study 2009*, the City of Monash established a rate of 1 car parking space per 3.33 beds in preferred locations close to campus; marginally higher the average supply in the suburban benchmarks in **Table 1-1** above. This study also identified *no need* for visitor parking spaces.

Monash is contextually quite similar to Curtin University's Bentley campus, being a largely suburban area dominated by the University campus.

This subject site is immediately adjacent to the Curtin University campus, for which the Curtin University Master Plan provides a rate of parking provision for student accommodation at 1 space per 7 beds. While this rate is lower than the existing benchmarks discussed, the proximity of the campus, public and active transport alternatives, recreation and shopping, suggests that this is a reasonable supply rate.

Patterns of Parking Demand

A 2019 paper (Shafi et al 2019 ATRF Forum) detailed residential travel preferences of South Asian international students residing in Australia and attending Monash University (Victoria).

South Asian students represent a significant portion of Curtin's international student body. The paper notes that for many students, including those living off-campus, carpooling and car sharing with friends and family is an already established, integral part of their commute, and that South Asian students made more trips by car than their Australian counterparts, but with a lower car ownership rate. This finding suggests that there is a significant opportunity for successful car share arrangements to be implemented for the international student market.

When combined with the results of a 2018 study² which indicated that a significant portion of international students from Asian countries dislike long commutes, high transport costs and automobile dependence, this result supports the value of dense living arrangements leveraging shared transport, public transport and active transport rather than car ownership.

Younger generations (more likely to be students and more likely to live in on-campus or nearby off-campus housing) have been identified as having typically lower rates of vehicle ownership than previous generations. Some figures indicate that the likelihood of Australian under 25s having a driver's license has fallen from 77% in 2001 to 66% in 2015³.

Cardno has undertaken an analysis of ABS data on vehicle ownership for full-time international students⁴ in group housing across Australia, including the suburbs surrounding Curtin University (summarized in **Table 1-2** below)

Table 1-2 Full-Time International Students in Group housing: Car Ownership Rates

Location	Numbers of households	Car ownership per bed
Australia	61,507	1 car per 3.63 bedrooms
Greater Perth	2,964	1 car per 2.10 bedrooms
Inner Perth	838	1 car per 2.75 bedrooms
City of South Perth	210	1 car per 2.52 bedrooms

The above indicates that current vehicle ownership patterns are higher than the Curtin University Masterplan parking rates, and marginally higher than the Monash study identified. However, parking supply has a substantial impact on this rate. Car share and bike share programs can also reduce car parking demand, and combined these measures support behavior change to meet the City's strategic goals of reducing private vehicle dependence.

² Kerstens, J. and D. Pojani, 2018, "Urban Living Preferences of Youth International Migrants: An Investigation of Asian Students in Australia", *Australian Planner*

³ Wynne, E. 2015, "Young people less interested than their parents in learning to drive" <https://www.abc.net.au/news/2015-01-06/young-people-less-likely-to-get-a-driver27s-license/6002600>

⁴ Persons Location of Census night, Not Australian, University or other tertiary institution: full time student, age 15 – 24 years, member of group household. ABS 2016.

Sustainable Solutions and Reduced Parking

There is a significant opportunity as part of the Curtin Central development to reduce parking provision through implementing car and bike share arrangements, as well as encouraging the use of active and sustainable transport through the restriction of parking supplies.

Reducing Parking Supply

The relationship between land use and vehicle trip generation is largely defined by parking, so limiting parking in an area can be an effective way of limiting vehicle trip generation. Constraining residential parking has a dramatic impact on traffic generation for all trip purposes, as this measure ultimately reduces vehicle ownership.

Surveys undertaken across NSW (RTA, 2010 and RMS, 2013) indicate that transitioning from single-unit dwellings with 2 car bays to multi-unit dwellings with 1 car bay results in up to a 4-fold decrease in vehicle trip generation.

Management of residential parking and reducing vehicle ownership rates is therefore an important and effective tool to reduce congestion. This includes a maximum supply of parking per unit, supported through restrictions in on-street parking use to prevent overspill demand into the street network.

In this context, where residents comprise a captive market, vehicle ownership can be managed by constraining parking supply (supplying fewer bays than current demand indicates) and instead supporting active and sustainable travel behaviour. This is proposed to include car and bike share programs, secure bike parking, and effective communication of local active transport routes.

Car and Bike Share

Excessive dependence on private vehicles has a range of negative outcomes for the community and the environment. A major issue caused by dependence on private vehicles is the significant cost of car parking, expressed in terms of both the construction of parking spaces and the opportunity cost associated with vehicle storage. This is in addition to the ongoing costs of vehicle and upkeep maintenance.

Millennials and Gen Z in particular show a preference towards subscription-based mobility services rather than traditional ownership models^{5,6}. In the Western Australian context, student accommodation throughout Perth suburbs are already supported by Student Car Share, a car sharing company and partner to the Curtin Central project, which locates share cars and manages their bookings through a phone app and keyless locking system.

Car sharing has been developed as an answer to the many negative consequences of overreliance on private vehicles, and is intended to reduce the overall quantity of private vehicles required by communities. Car sharing has grown significantly in recent years, attributable in large part to the proliferation of technologies enabling on-demand access. Car sharing provides people with short-term access to vehicles for a range of uses, allowing personal mobility without associated costs of vehicle upkeep and operation.

While car sharing is in early stages in Australia, RAC research indicates that Bentley is home to many factors that would encourage successful car sharing⁷. The extent of substitution depends on many factors, but in the purpose-built student accommodation context, the following factors have been identified:

- > Population density
- > Mix of land uses
- > Parking pressures, restrictions or controls which limit the availability of parking
- > Good alternative transport options
- > Lower levels of car ownership

⁵ Evans, S. 2019, "New car sales slide as car sharing revs up" *Financial Review*

⁶ RAC, 2015, *Exploring the role of car sharing in Perth*

⁷ RAC, 2015, *Exploring the role of car sharing in Perth*

In Australia, previous research has indicated that between 11% to 65% of car share members reduce their car ownership⁸. While this is a wide variance and has been determined from a range of circumstances, studies indicate a net reduction in vehicle ownership as a result of car share membership⁹.

A US study for carsharing in a residential university setting in Ithaca, New York, showed a reduction of over 15 personal vehicles for every car sharing vehicle¹⁰. Worldwide, replacement rates are around 5 – 15 cars for each share care made available¹¹. However, there are limited Australian-specific studies, and even fewer studies related to impact of car sharing on Australian university student accommodation car ownership, perhaps due to the relative infancy of car share programs in Australia.

Student Car Share Australia has recommended an industry-standard replacement rate of 1:10, where 10 private parking bays can be replaced by the provision of 1 share car.

Conveniently located bike share programs also provide additional mobility options for residents. While metropolitan-wide bike share schemes may not have been successful in Australia, there is demonstrated success of bike share in contained locations such as University campuses (including Curtin University), and particularly with residential populations¹². Accommodation-based bike-share would facilitate reduced vehicle ownership by providing a convenient alternative for short-distance travel.

Beyond the provision of available share bikes, it is expected that international students would require parking for personal bikes – particularly in an environment where private vehicle ownership is maintained at a low level. As such, a supply of bicycle parking sufficient to accommodate 1 bike per 3 students is recommended.

Cardno sought advice from Urbi, based on their experience in this type of installation. A preliminary recommendation was given for provision of share bikes at a rate of approximately per 8-10 per resident. This would vary depending on the type of model used, and would likely change over the lifetime of the scheme to support the needs of the residents.

Maximum Parking Requirements

Table 1-3 indicates the required number of car parking required for a 906-bed facility at current rates of unconstrained parking demand (approximately 1 car per 2.5 students), including possibilities for car share uptake.

Table 1-3 Calculation of Unconstrained Demand Parking with Car Share

Car Share Uptake	Share Car Bays Required	Private Car Bays Required	Total Car Bays Required
0%	0	363	363
25%	10	272	282
50%	19	182	201
75%	28	91	119
90%	33	37	70
100%	37	0	37

The above indicates a maximum parking demand of 363 parking bays (where all vehicles are privately owned), and a minimum requirement of 37 parking bays (where all bays are dedicated to share cars).

However, this development has the capacity to restrain on-site parking, allocating those few bays available based on a strict management framework. If parking supply for privately owned vehicles is constrained to a rate of 1 parking bay per 7 beds, the requirements for parking can be calculated as shown in **Table 1-4**.

⁸ Feigon and Murphy, 2016, Shaheen and Cohen, 2012, Martin et al., 2010, Nijland and van Meerkerk, 2017)

⁹ Jain, T., G. Rose and M. Johnson 2018, "Unpacking impacts of car sharing: Insights from a qualitative research study in Melbourne, Australia", ATRF Forum 2018

¹⁰ Stasko, T.H., A.B. Buck, and H.O. Gao. 2013, "Carsharing in a university setting: Impacts on vehicle ownership, parking demand, and mobility in Ithaca, NY" *Transport Policy*, 30: 262 - 268

¹¹ Bondorova, B. and G. Archer, 2017, *Does Sharing Cars Really Reduce Use?* Transport and Environment

¹² Kellstedt, D., J.O. Spengler, K. Bradley, J.E. Maddock, 2019, "Evaluation of free-floating bike share on a university campus using a multi-method approach" *Preventative Medicine Reports* 16. <https://doi.org/10.1016/j.pmedr.2019.100981>

Table 1-4 Calculation of Constrained Parking Supply with Share Cars

Car Share Uptake	Share Car Bays Required	Private Car Bays Required	Total Car Bays Required
0%	0	130	130
25%	10	98	108
50%	19	65	84
75%	28	33	61
90%	33	13	46
100%	37	0	37

Tenant Parking

The proposed development includes a small quantum of ancillary retail/food & beverage services intended to cater for on-site demand. Tenant parking will be required to support staff parking, with a total of 9 bays to be supplied for this purpose. All tenant parking will be constructed in Stage 1 of development.

Visitor Parking

The City of Monash, similar in context to the subject site, being generally suburban, and close to University campus and public transport, produced a detailed parking study for student accommodation¹³.

The study indicated that due to the type and frequency of visitation, 0 visitor parking bays were required. Given the similarities of the Bentley campus to Monash University, this finding is considered to be applicable for the Curtin Central project.

Other Features

The proposed development includes an off-street port cochere with entry and exit via McKay Street to allow for resident pick-up/drop-off, food delivery etc. This access will be limited to one-way from east to west, and controlled via signage and linemarking. Sufficient space is available for two vehicles to park without affecting vehicular flow.

Use would be restricted to 5 minute duration at all times, to prevent illegitimate use by students, and to ensure that the system operates efficiently and safely. On-site management staff will assume the responsibility for keeping the port cochere functioning as intended.

The development provides storage area for deliveries, allowing residents to receive deliveries via Reception. even if the resident is not on-site. Dedication of this space may also replace the need for some vehicle trips by residents. Delivery parking can be accommodated within the drop off/pick up area.

Additionally, the development contains commercial spaces to cater to residents' and surrounding neighbours' daily needs, including convenience store, café and restaurant space.

¹³ City of Monash, 2009, Student Accommodation Car Parking Study

Conclusion

From the above analysis of current research, demographics and site-specific details, the following conclusions can be drawn:

- > While unconstrained demand for private vehicles is approximately 1 car per 2.5 rooms, Existing parking supply for PBSA developments in similar locations is consistently lower; generally, between 1 space per 3 beds and 1 space per 7 beds.
- > It is appropriate and effective to constrain on-site residential parking supply to reduce vehicle ownership patterns, provided the surrounding on-street parking environment is effectively managed to prevent overspill
- > Industry benchmarks show that car share is able to replace private car parking bays at a ratio of 1:10
- > Bike share will support the transition to active transport modes in a low-car environment, with a target rate of one share bike per 8-10 students.
- > The maximum and minimum parking rates depend on constrained parking supply and the uptake of car share
- > As established in previous studies, no visitor parking is required for PBSA in suburban contexts

For this development, it is expected that an uptake rate of approximately 73% can be achieved, requiring a total of 69 parking spaces to be constructed in two stages, as follows:

Yield	Private Residential Parking	Share Car Parking	Staff Parking	Total Car Parking	Private Residential Bicycle Parking	Share Bike Parking
Stage 1 297 beds	50	0	8	58	112	28 (sufficient for 224 students)
Stage 2: 660 beds	33	17				
Stage 3: 906 beds	34	27	8	69	170	36 (sufficient for 288 students)

This uptake rate is not wholly independent of parking management – maintaining a constrained parking supply and strong allocation management regime will support low private vehicle ownership and high utilisation of the car share service. As such, additional parking bays could be allocated to car share as demand grows, with a corresponding change in private car allocation.