ATTACHMENT 6

Transport Impact Assessment

Sorrento Activity Centre Structure Plan

CW1200106

Prepared for

Megara

10 June 2022

Cardno

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Stantec

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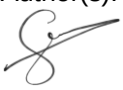

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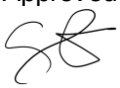

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1 Introduction

1.1 Background

Cardno has been commissioned by Megara to prepare a Transport Impact Assessment (TIA) for the proposed redevelopment of the Sorrento Plaza at the intersection of West Coast Drive, The Plaza and Padbury Circle, Joondalup.

Specifically, this report aims to assess the impacts of the proposed development upon the adjacent road network, as well as the need for and use of parking and the opportunities related to pedestrian, cycling and public transport access.

This report has been prepared in accordance with the *Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines Volume 2 – Planning Schemes, Structure Plans & Activity Centre Plans (2016).* The checklist form, included in these guidelines is enclosed in **Appendix A**.

An aerial image of the Site is shown in **Figure 1-1**.

Figure 1-1 Site Location

2 Existing Situation

2.1 Existing Site Context

The proposed development site (the Site) is located on the eastern side of West Coast Drive. Lots 2, 147, 148 and 149 West Coast Drive are currently occupied by restaurants and commercial developments, while Lot 146 Padbury Circle is currently vacant and Lot 145 is occupied by a single dwelling.

The Site is bounded by a service station to the south, short-stay accommodation to the north, residential lots to the east, and Marmion Beach to the west.

The location of the Site is illustrated in **Figure 2-1.**

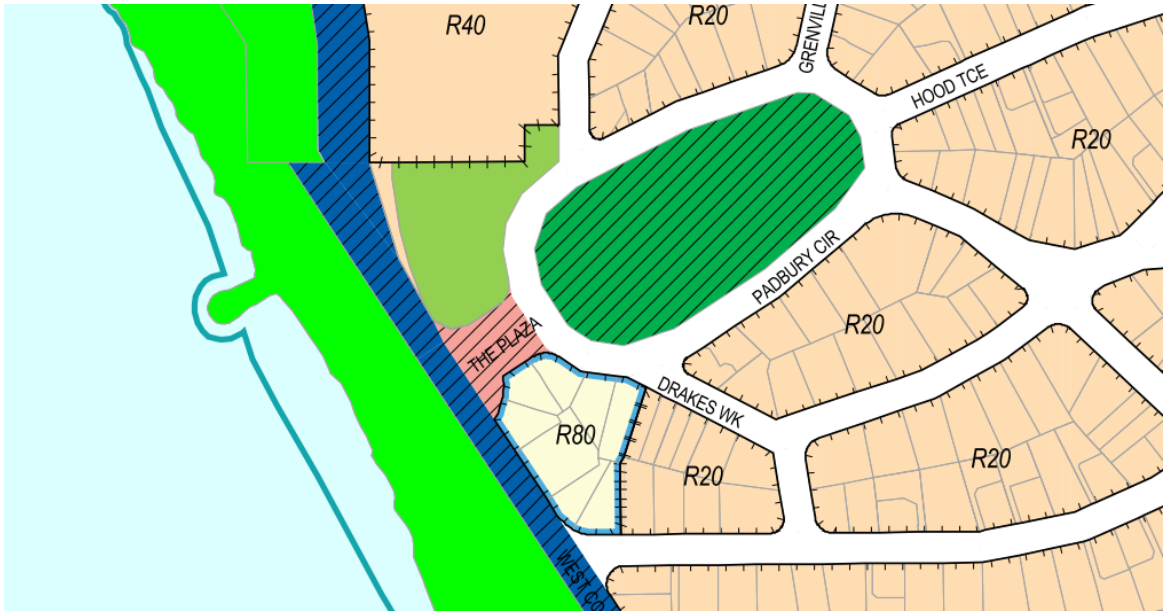
Figure 2-1 Site Location

Source: Metromap (2021)

2.2 Existing Zoning

According to the City of Joondalup Local Planning Scheme (LPS) No. 3 illustrated in **Figure 2-2**, the Site is currently zoned as 'Centre' with R Codes R80 category. Adjacent lots are also zoned as 'Centre'. Geneff Park located in the northeast direction is currently reserved for 'Public Open Space'. The Sorrento beachfront is reserved as 'Public Open Space'. A lot zoned as 'Private Community Purposes' is located to the northwest. Other surrounding lots are zoned as 'Residential'.

Figure 2-2 LPS3 Zoning Map

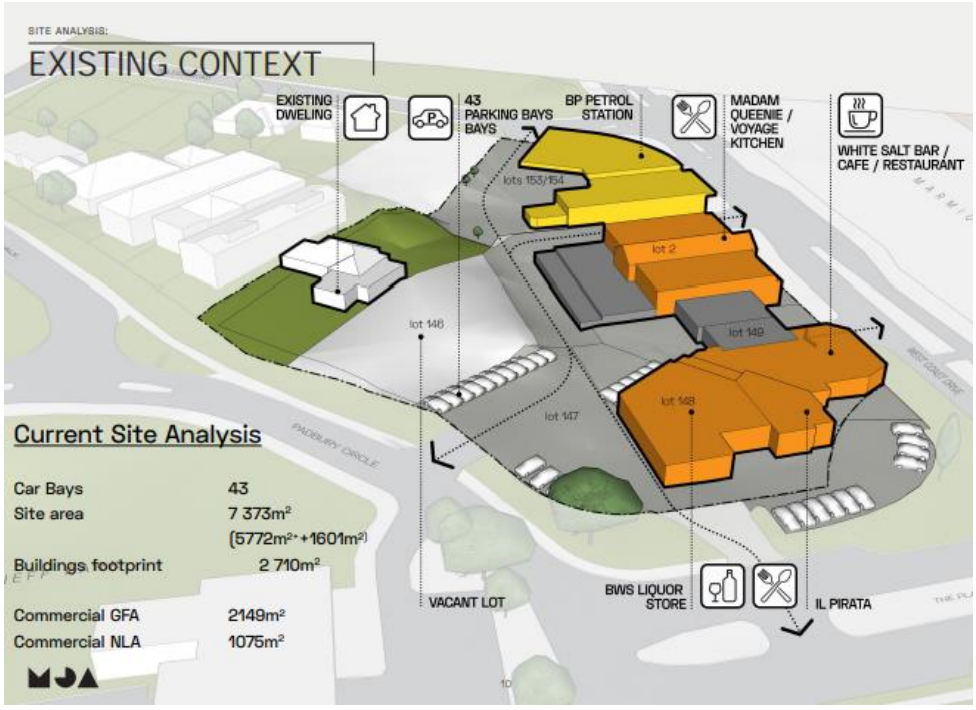


Source: City of Joondalup

2.3 Existing Land Uses

Within the proposed Site Planning Area, there are a number of existing food and beverage developments, as well as a liquor store (see below, **Figure 2-3**)

Figure 2-3 Existing Site Context



Source: MJA

2.4 Existing Road Network

Figure 2-4 shows the layout and classification of the roads surrounding the Site.

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

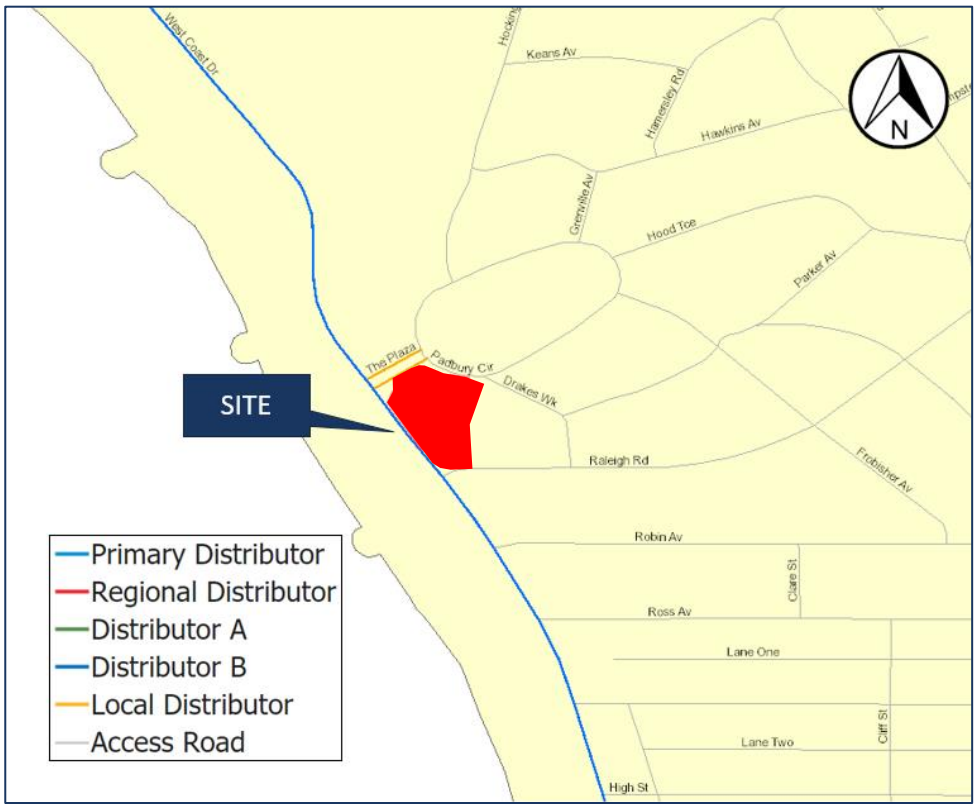
District Distributor B (dark blue): Perform a similar function to "District Distributor A" but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.

In this instance West Coast Drive also an 'other regional road' (a Blue Road) under the Metropolitan Region Scheme (MRS), and therefore planning authority for adjacent developments is shared by both DPLH and the City of Joondalup.

Local Distributors (orange): Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local Government.

Access Roads (grey): Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local Government.

Figure 2-4 Existing Road Network Surrounding the Site



Source: Main Roads Mapping Information Centre (2021)

The characteristics of the surrounding road network are further described in **Table 2-1**.

Table 2-1 Road Network Description

Road Name	Road Hierarchy	Jurisdiction	No. of Lanes	No. of Footpaths	Pavement Width (m)	Posted Speed Limit (km/h)
West Coast Drive	Distributor B	Local govt.	2	2	11.5 (incl. 2m median)	50
The Plaza	Local Distributor	Local govt.	2	2	15.0 (incl. 5m median)	50
Padbury Circle	Access Road	Local govt.	2	2 (between The Plaza and Drakes Walk) 1 (east of Drakes Walk)	6.0	50
Drakes Walk	Access Road	Local govt.	2	1	7.0	50
Raleigh Road	Access Road	Local govt.	2	2 (between West Coast Dr and Drakes Walk) 1 (east of Drakes Walk)	7.0	50

2.5 Existing Key Intersections

Key intersections surrounding the proposed Site which are likely to be affected by the trips generated by the development are discussed in the following sections.

2.5.1 West Coast Drive and The Plaza Intersection

Located northwest of the Site, this intersection is a 3-way give-way sign-controlled intersection. The northwest bound approach of the intersection has a 25.0m right turn pocket while the southeast bound approach has a high-angle left-turn slip lane (give-way controlled) with storage capacity for at least 3 cars. The existing intersection is shown in **Figure 2-5**.

Figure 2-5 West Coast Drive and The Plaza Intersection

Source: Metromap (2021)

It is noted that while observations show that vehicles turning right out of The Plaza tend to stage in the 4.0m-wide central median, this space is not consistent with Main Roads requirements for two-stage crossing, which specify a minimum of 6.0m (ideally 7.0m).

2.5.2 West Coast Drive and Raleigh Road Intersection

Located south of the Site, this intersection is a 3-way give-way sign-controlled intersection. The existing intersection is shown in **Figure 2-6**.

Figure 2-6 West Coast Drive and Raleigh Road Intersection

Source: Metromap (2021)

2.5.3 The Plaza and Padbury Circle Intersection

Located north of the Site, this intersection is a 3-way uncontrolled intersection. The existing intersection is shown **Figure 2-7**.

Figure 2-7 The Plaza and Padbury Circle Intersection

Source: Metromap (2021)

2.6 Existing Traffic Volumes

Existing traffic volume data was sourced from Main Roads WA Traffic Data and City of Joondalup and is presented in **Table 2-2** below.

Table 2-2 Existing Mid-block Traffic Volumes (Two-way)

Road Name	Year of Data	Monday-Friday Two-way Traffic Volumes		
		AM Peak	PM Peak	Average Daily
West Coast Dr North of Beach Rd (SLK 0.10)	2020/2021	1,514	1,465	16,459
West Coast Dr South of Hepburn Av (SLK 2.56)	2020/2021	1,355	1,330	15,572
West Coast Dr South of Helier Dr	2019	-	-	13,723
West Coast Dr South of Ross Ave	2019	-	-	14,124

Source: MRWA SCATS data/City of Joondalup

2.7 Existing Pedestrian/Cycle Networks

Existing pedestrian/cycle networks are illustrated in **Figure 2-8**.

A shared path is located along the entire west side of West Coast Drive, which is extremely popular for recreation purposes and beach access. This path is heavily used by pedestrians, cyclists and other micro-mobility users, as well as for dog-walking.

A shared path is also provided on the east side of West Coast Drive, connecting to and beyond Sacred Heart College, which is located approximately 500m north of the Site. On-road cycle lanes are available along West Coast Drive north of The Plaza. However, these do not connect into any other higher-order cycling facilities, and the cross-section of West Coast Drive further to the south is generally hostile for cyclists. Nevertheless, this route is popular among recreational cyclists, and particularly for group rides.

For pedestrians/cyclists travelling east-west direction, the predominant routes for local movements are along the “local bicycle friendly” roads of Helier Drive / Seacrest and Chandler Rd. Regional cycling is more likely to occur along Marmion Avenue and Hepburn Avenue.

Overall, the existing pedestrian and cycle infrastructure surrounding the Site is average for all user. Pedestrian crossings across West Coast Drive also needs improvement as it can be difficult for pedestrians to safely cross the road.

Figure 2-8 Pedestrian / Cyclist facilities in the vicinity

Source: Department of Transport (2021)

2.8 Existing Public Transport Facilities

Details of Bus Route 423 which passes the Site via West Coast Drive are shown in **Table 2-3**.

Table 2-3 Bus Services within the Vicinity of the Site

Route Number	Route name	Weekday Peak Frequency	Weekend Peak Frequency
423	Stirling Stn – Warwick Stn via Karrinyup Bus Stn & Hillarys Boat Harbour	10 mins	30 mins

The routes of nearby bus services and the nearest bus stops to the Site are shown in **Figure 2-9**.

Two bus stops on West Coast Drive (served by Bus Route 423) are located immediately adjacent to the Site. Two other bus stops on Padbury Circle served by the same bus route are also located within 300 metres of the Site.

Figure 2-9 Public Transport Routes Vicinity of the Site

Source: Transperth

The presence of the bus stops fronting the Site and frequent peak period service ensures the Site has adequate connectivity both to local destinations (Karrinyup, Hillary's Boat Harbour), and to the wider public transport network (via Warwick Station, Stirling Station).

2.9 Crash Assessment

A search of the Main Roads WA Reporting Centre for crash data has been undertaken. This covered all recorded traffic accidents within 200 metres from the Site between 1 January 2016 and 31 December 2020.

The results are summarised below in **Table 2-4** to **Table 2-6**.

Table 2-4 Total Crashes

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Rear End	-	-	2	3	-	5
Sideswipe Same Direction	-	-	-	1	-	1
Right Turn Thru	-	1	-	-	-	1
Right Angle	-	-	-	1	-	1
Non Collision	-	-	-	1	1	2
Total	-	1	2	6	1	10

Table 2-5 Intersection Crashes

Intersection Name	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
West Coast Dr - Raleigh Rd	-	1	-	1	-	2
West Coast Dr - The Plaza	-	-	-	1	1	2
Total	-	1	-	2	1	4

Table 2-6 Midblock Crashes

Road Name	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
West Coast Dr	-	-	2	4	-	6
Total	**-**	**-**	**2**	**4**	**-**	**6**

Crashes recorded are summarised below:

- One crash required hospitalisation and two crashes required medical attention
- All of the crashes within 200 metres from the Site occurred on West Coast Drive
- Rear-end crashes are the most common type of crash
- 4 crashes were recorded at intersections while 6 crashes were recorded on a midblock section

The number of crashes recorded is not considered excessive and there are no unusual patterns of crash types that would indicate existing geometric concerns.

The proposed redevelopment is not anticipated to have any material impact on the number of crashes. The consolidated, legible access points proposed for the Site are not considered to have any particular intrinsic risks.

3 Changes to Surrounding Transport Network

3.1 Road Network

The City of Joondalup has advised that modifications to the existing cross-section of West Coast Drive from St Helier Drive to Raleigh Road are being considered for implementation in the medium to long term.

This may include improvements to the intersection of West Coast Drive and The Plaza, with the opportunity to improve the quality of the interface with the public realm. This might include the creation of pedestrian priority zone with seating, shade and high quality surface treatments, as well as improving traffic function and safety. The proposed development provided an opportunity for this to be fast tracked and partially funded through the community benefits proposed.

However, no detailed information on the proposed modifications was provided.

3.2 Pedestrian/Cycle Networks

Cardno has contacted the City of Joondalup and received no information on proposed changes to the surrounding pedestrian and cycle networks surrounding the Site.

The Department of Transport *Long Term Cycling Network* shows The Plaza as a Local Route connecting to the Principle Shared Path along the coast.

Figure 3-1 Long Term Cycling Network

Source: DoT

3.3 Public Transport Services

Cardno contacted the Public Transport Authority and was advised that there are no proposed changes to bus Route 423 serving the Site in the short to medium term. They also advised of a long-term strategy to split Route 423 into two different services.

This is unlikely to impact public transport access for the Site.

4 Proposed Changes to the Surrounding Environment

4.1 West Coast Drive

The existing pedestrian crossing facilities on West Coast Drive are recommended to be upgraded for safety and accessibility, in line with Austroads Guidelines. Ideally crossings are located at desirelines, either for access to the beach or a bus stop.

It is good design practice to provide the shortest crossing of the road that is practicable in the circumstances. Therefore, the northern median / pedestrian refuge should remain at 4m wide, but the southern pedestrian crossing with a 1.8m wide refuge should be widened if possible. Where a refuge connects significant shared use paths the minimum width of 2.0m is likely to be inadequate and a minimum of 3.0m width should be provided.

Figure 4-1 Existing Pedestrian Crossings on West Coast Drive

Source: Metromap

It is recommended that the bus embayment along the frontage of West Coast Drive be modified to on-street stopping and relocated north of The Plaza, as shown in **Figure 4-2**, with the aim of creating a pedestrian friendly environment. Currently, the location of the bus shelter abuts the alfresco dinning furniture of the nearby restaurants which significantly impedes pedestrian movement. The relocation of the bus embayment would maximise opportunities for alfresco dining and enhance the area's social and economic function.

This stop is not timed, and the proposed changes are not expected to significantly impact the operation of West Coast Drive. On-street stopping would improve the operation of the bus route by eliminating the need to re-join traffic flow.

The bus stop on the western side is recommended to be modified by removing the existing embayment and allowing in-lane stopping. This will reduce conflict with bus passengers disembarking the bus, or waiting for a bus, and users of the shared path.

Removing the bus embayments (and relocating the bus stop on the eastern side) will provide an opportunity for additional on-street parking on West Coast Drive. Best practice design would locate these bays near the carriageway with the on-road bicycle lane located next to the footpath.

4.1.2 Bus Stop Locations

It is recommended that the bus embayment along the frontage of West Coast Drive be modified to on-street stopping or relocated north of The Plaza, as shown in **Figure 4-2**, with the aim of creating a pedestrian friendly environment. Currently, the location of the bus shelter abuts the alfresco dining furniture of the nearby restaurants which significantly impedes pedestrian movements and sightlines. The relocation of the bus embayment would maximise opportunities for alfresco dining and enhance the area's social and economic function.

This stop is not timed, and the proposed changes are not expected to significantly impact the operation of West Coast Drive. On-street stopping would improve the operation of the bus route by eliminating the need to re-join traffic flow.

The bus stop on the western side is recommended to be relocated into the current bus embayment, removing the bus embayment as proposed above. This will reduce conflict with bus passengers disembarking the bus or waiting for a bus and users of the shared path.

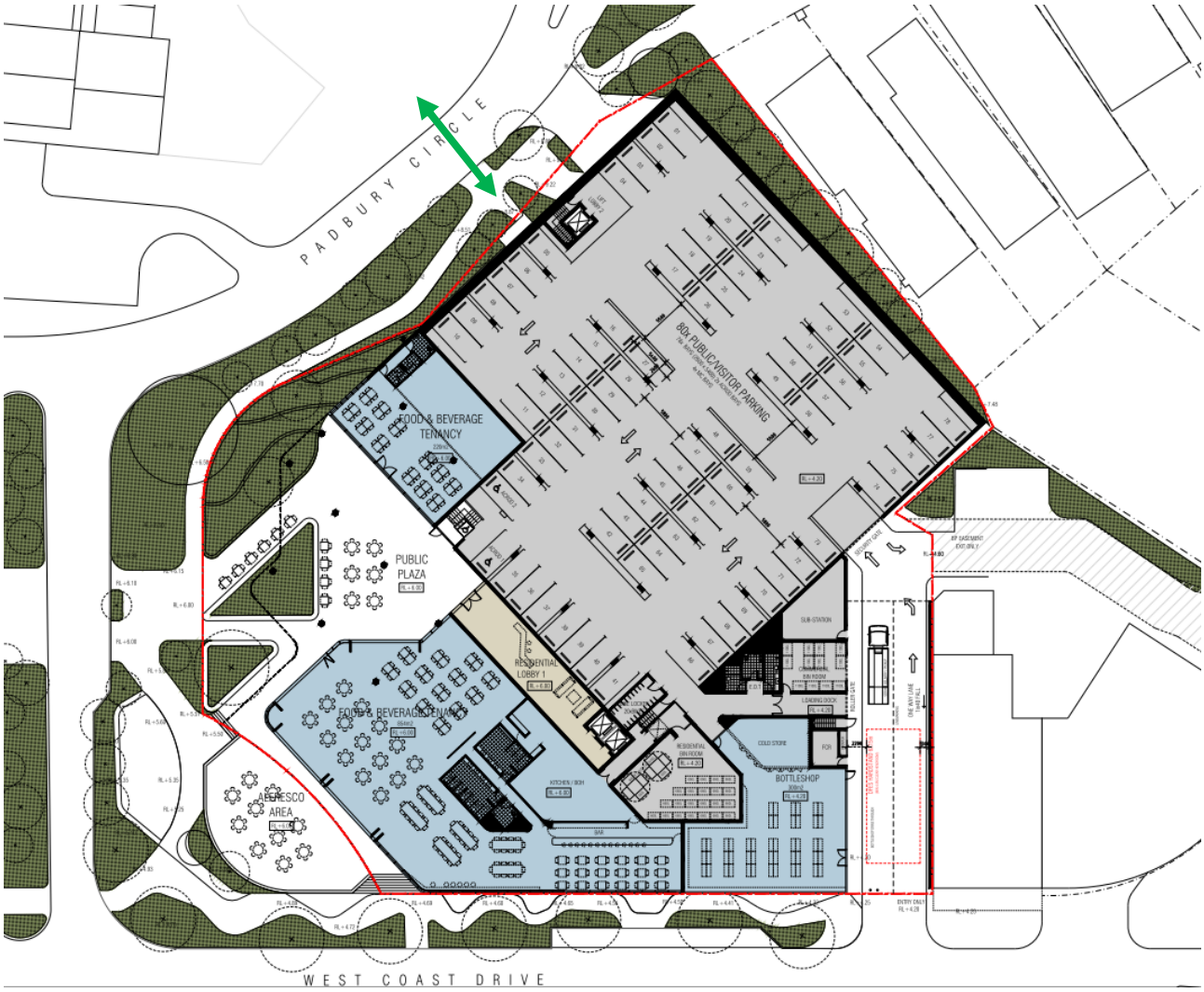
Figure 4-2 Bus Stop Locations and Proposed Re-Location

Source: Metromap

4.2 Padbury Circle

There are currently no pedestrian crossing facilities along Padbury Circle. It is recommended that a pedestrian ramp be constructed to provide access to Geneff Park (**Figure 4-3**).

Figure 4-3 Proposed Pedestrian Crossing to Geneff Park



Source: MJA Studio

There may also be future opportunities for on-street parking along Padbury Circle to service Geneff Park and provide convenient short-stay opportunities for the adjacent F&B uses.

4.3 The Plaza

The current cross-section of The Plaza, consisting of a dual carriageway with wide central median, has been constructed specifically to support vehicle movements. By doing so, it reduces the safety and use of The Plaza as a pedestrian space.

Modifying the cross-section, differentiating the pavement, improving on-street parking and introducing trees and shade would all assist in reducing traffic speeds and creating an attractive space for pedestrian and cycling access.

More significant changes to The Plaza, which could include creating a 'Shared Zone' for The Plaza (See **Figure 4-4**), would greatly improve pedestrian function. These changes could only be made in the context of wider changes to the network, and the impacts of this change would need to be carefully considered.

Some of these opportunities are discussed below:

- The road reservation of The Plaza is 40m, with a current carriageway width of 20m. Reducing this to a single carriageway would allow for shorter and safer crossing movements.
- Reducing the carriageway footprint would allow footpaths and verges to be widened, with substantial landscaping and trees included for shelter and shade.
- Differentiated pavement would create a threshold effect, marking this zone as a slow speed space different from West Coast Drive.
- Removing the slip lane would reduce entry speeds on the approach.
- On-street parking provides a buffer for activity while also giving additional utility for delivery drivers, and other short-stay customers.

While none of these are currently required under the planning framework it is recommended the application be a trigger for negotiations between the applicant and the City of Joondalup to fast track and provide these improvements as part of the community benefits proposed.

Figure 4-4 Proposed Changes to The Plaza

Source: Metromap

5 Integration with Surrounding Area

5.1 Surrounding Attractors/Generators

It is anticipated that trips generated/attracted by the activity centre will come primarily from the residential areas of Sorrento. Visitors to Hillarys Boat Harbour or Marmion Beach may also be attracted to the proposed Site along their route.

Key transport modes for consideration are therefore pedestrian and cycling connections from West Coast Drive and from the local residential catchment, in addition to vehicular access from West Coast Drive.

Figure 5-1 Surrounding attractors/generators

Source: Metromap

5.1.2 School Movements

Sacred Heart College's bus access relies on The Plaza for right turn movements from West Coast Drive.

Parent driver behaviour is also affected by the left in/left out only for the school from West Coast Drive. Those seeking to travel north will exit onto West Coast Drive southbound and use Raleigh Road to turn around and head northbound.

A pedestrianised Shared Zone with self-explaining street design on The Plaza would assist in providing a safe environment for the street users.

5.2 Proposed Changes to Surrounding Land Uses

There are some changes anticipated for developments in the broader Sorrento area. In particular, the potential redevelopment of the Sorrento Surf Club, which is likely to create a more attractive destination for Sorrento Beach users.

5.3 Level of Accessibility

Access to the Site is anticipated to be mainly via West Coast Drive in the north-south direction. Trips coming from the residential areas in the east are anticipated to be via local roads including Padbury Circle, Raleigh Road, Frobisher Avenue, Hocking Parade, and Hood Terrace, among others.

6 Development Proposal

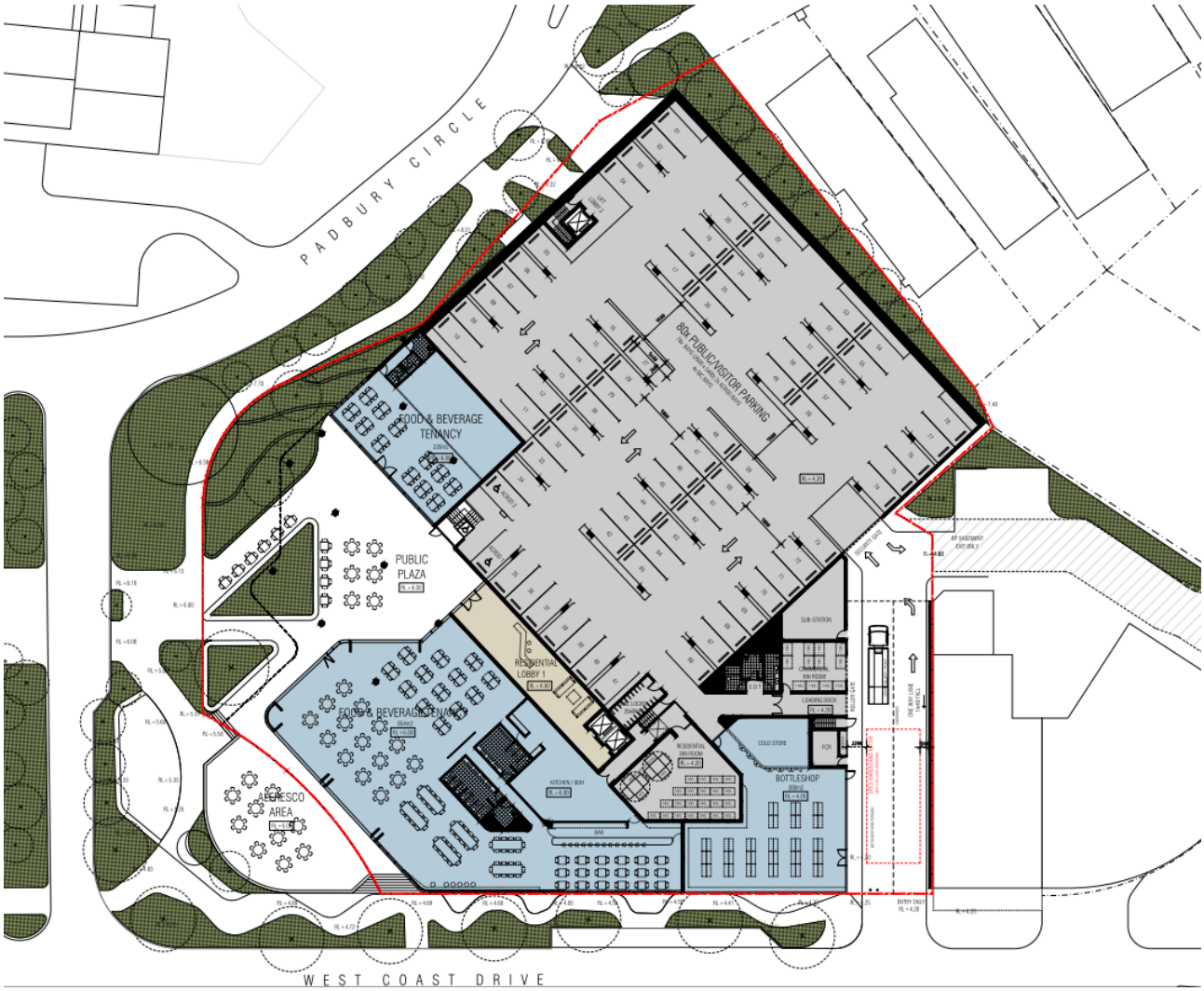
6.1 Proposed Development

The proposed development comprises following components:

- 75 residential apartments
- Food and beverage tenancies (1,074m^2)
- Bottle shop (300m^2)

Figure 6-1 shows the ground floor layout of the proposed Site with the full set of Site plans are provided in **Appendix B**.

Figure 6-1 Ground Floor Plan Layout



Source: MJA Studio

6.2 Vehicle Parking Requirements and Provision

The Statutory parking requirements, in accordance with the *City of Joondalup's District Planning Scheme 2 and R-codes,* have been considered in the context of the proposed development and SACP and summarised below in **Table 6-1**.

Table 6-1 Statutory Parking Requirements

Development Classification	Requirements	Yield	Parking Required	Parking Provided
*Residential				
▪ 1 bedroom dwelling	1 bay per dwelling	6	6 Bays	155 Bays
▪ 2+ bedroom dwelling	1.25 bay per dwelling	69	87 Bays	
▪ Visitor	▪ 1 bay per four dwellings up to 12 dwellings ▪ 1 bay per eight dwellings for the 13th dwelling and above	75	11 Bays	80 Bays total
Bottle Shop Food and Beverage	1 per 20m^2 NLA	1,374m^2	68 Bays	
Total			**172 Bays**	**235 Bays**

For the purpose of this assessment, Location B requirements have been used for the residential component. While a frequent bus route is available in the vicinity of the development, as a result of the long travel times associated with connection to the nearest rail hub (23 minutes to Warwick and 32 minutes to Stirling Station), the service is likely to be less attractive, resulting in a requirement for a higher vehicle ownership by residents. The residential component of the development meets this statutory requirement.

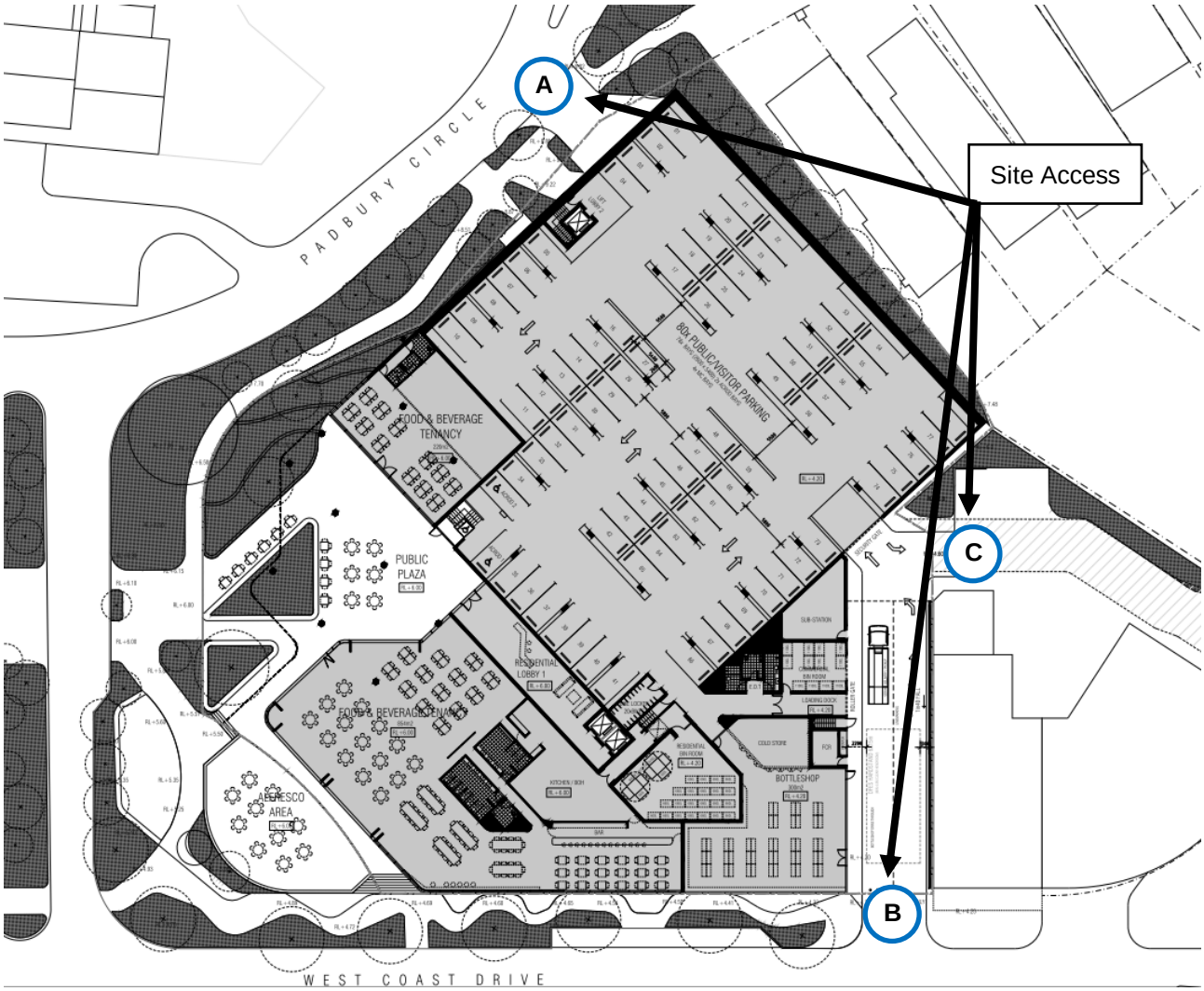
The public parking provision designated for residential visitors and commercial uses comprises 80 bays, which meets the statutory requirements.

6.3 Vehicular Access Arrangements

Two site access are proposed for the development as summarised below and shown in **Figure 6-2**.

- Access A – located on Padbury Circle and provides access to the mezzanine and level 1 residential car parks.
- Access B – located of West Coast Drive and serves an entry only access to the commercial and visitor car park.
- Access C – located along the southern boundary of the Site which links to the adjacent BP Site and serves as an exit only access for the commercial and visitor car park allowing these users to travel through the BP site and exit onto Raleigh Road.

Figure 6-2 Site Access Location

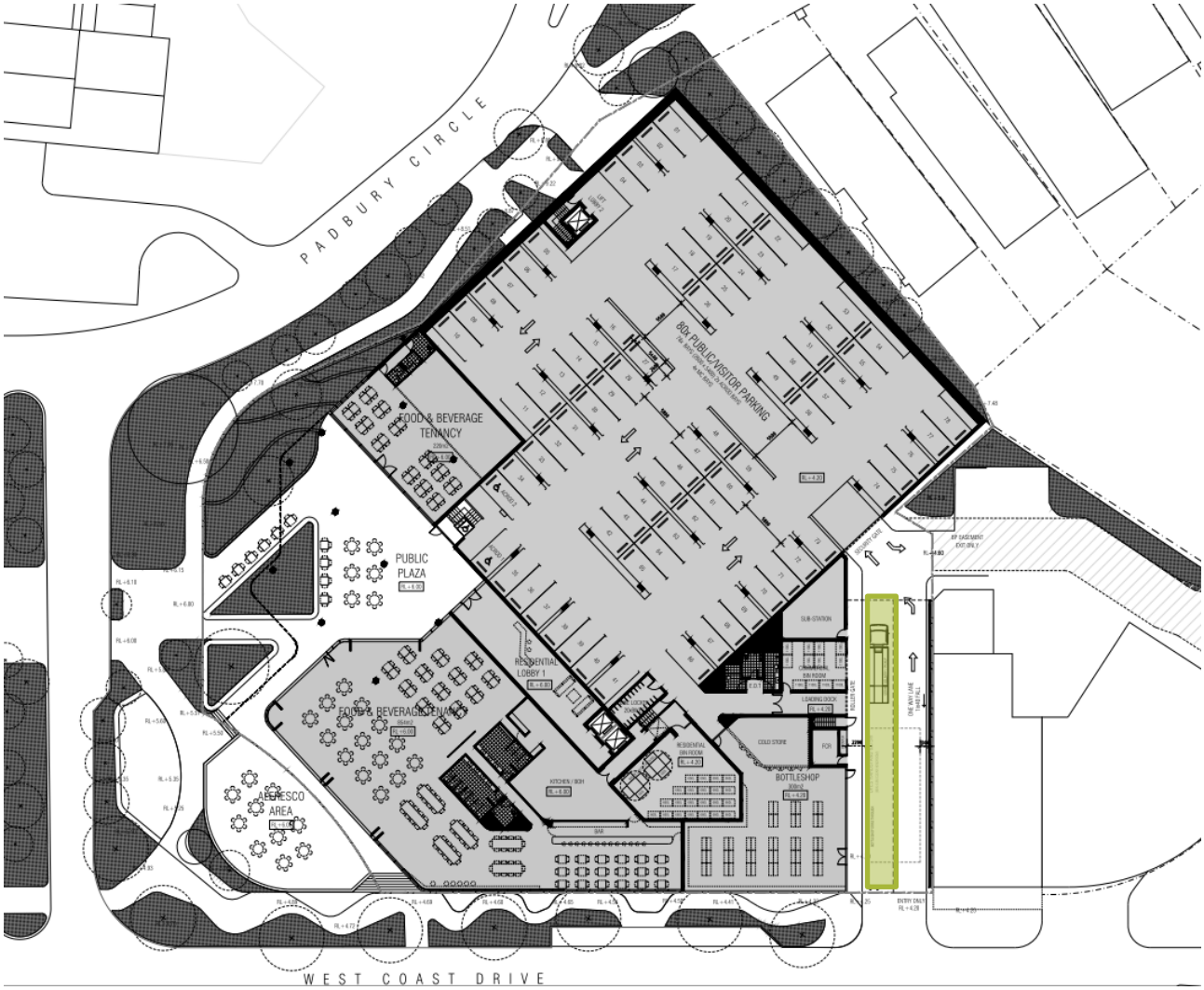


Source: MJA Studio (2022)

6.4 Service and Waste Vehicle Provision

Servicing and waste collection for the Site occurs at the service bays located on the ground floor near the West Coast Drive Site Access as shown in **Figure 6-3**.

Figure 6-3 Service and Waste Collection Bay



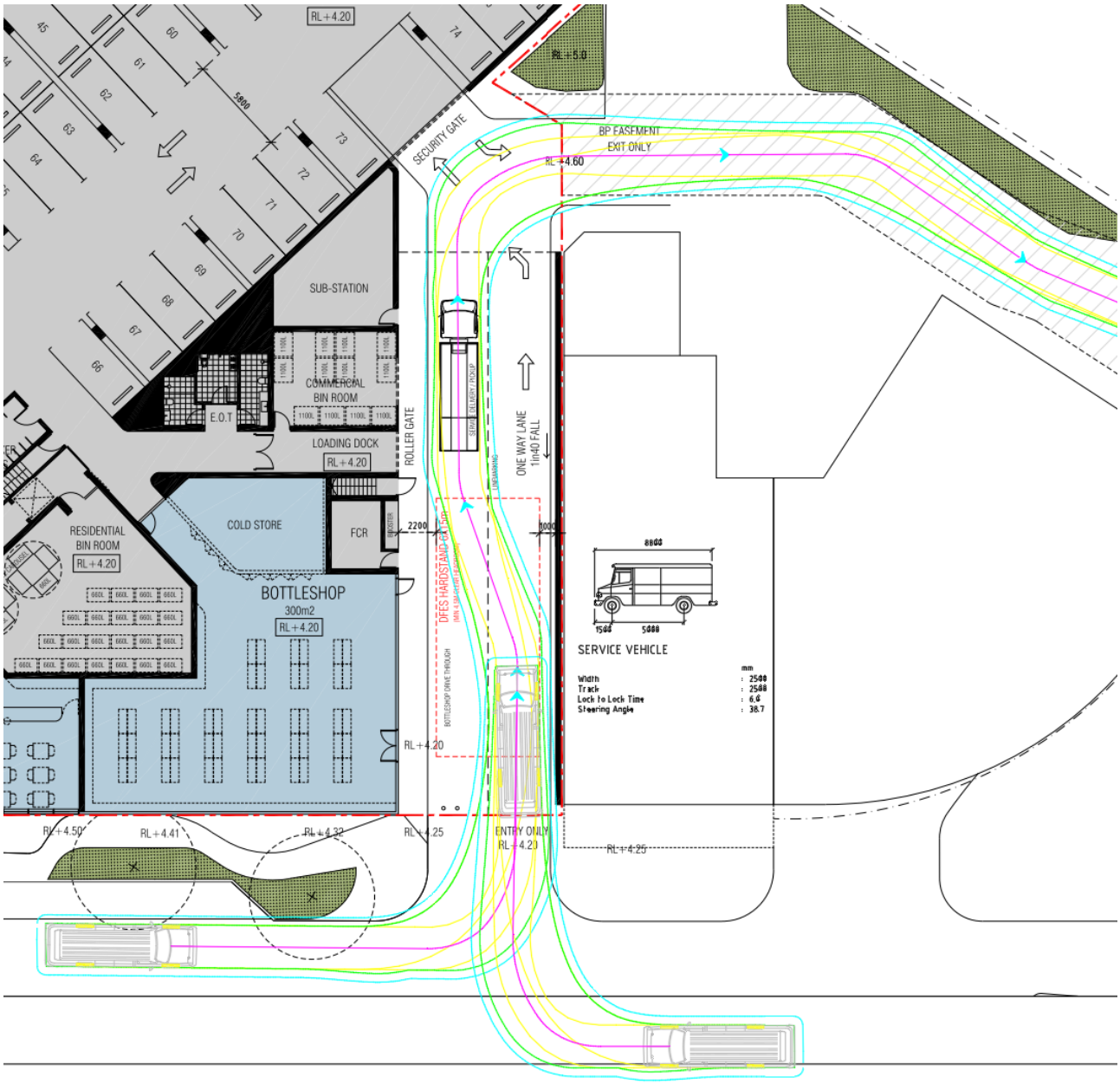
Source: MJA Studio (2022)

The service/waste collection arrangement is as follows:

- Service/waste vehicle will enter the Site from West Coast Drive to access the service bay,
- Once collection or servicing is complete, the truck will drive forward and turn right into the BP roadway link (Access 3),
- The service/waste vehicle will then drive through the BP site and exit onto Raleigh Road.

A swept path assessment has been conducted for an 8.8m as shown in **Figure 6-4** below.

Figure 6-4 Swept Path Diagram for an 8.8m Truck

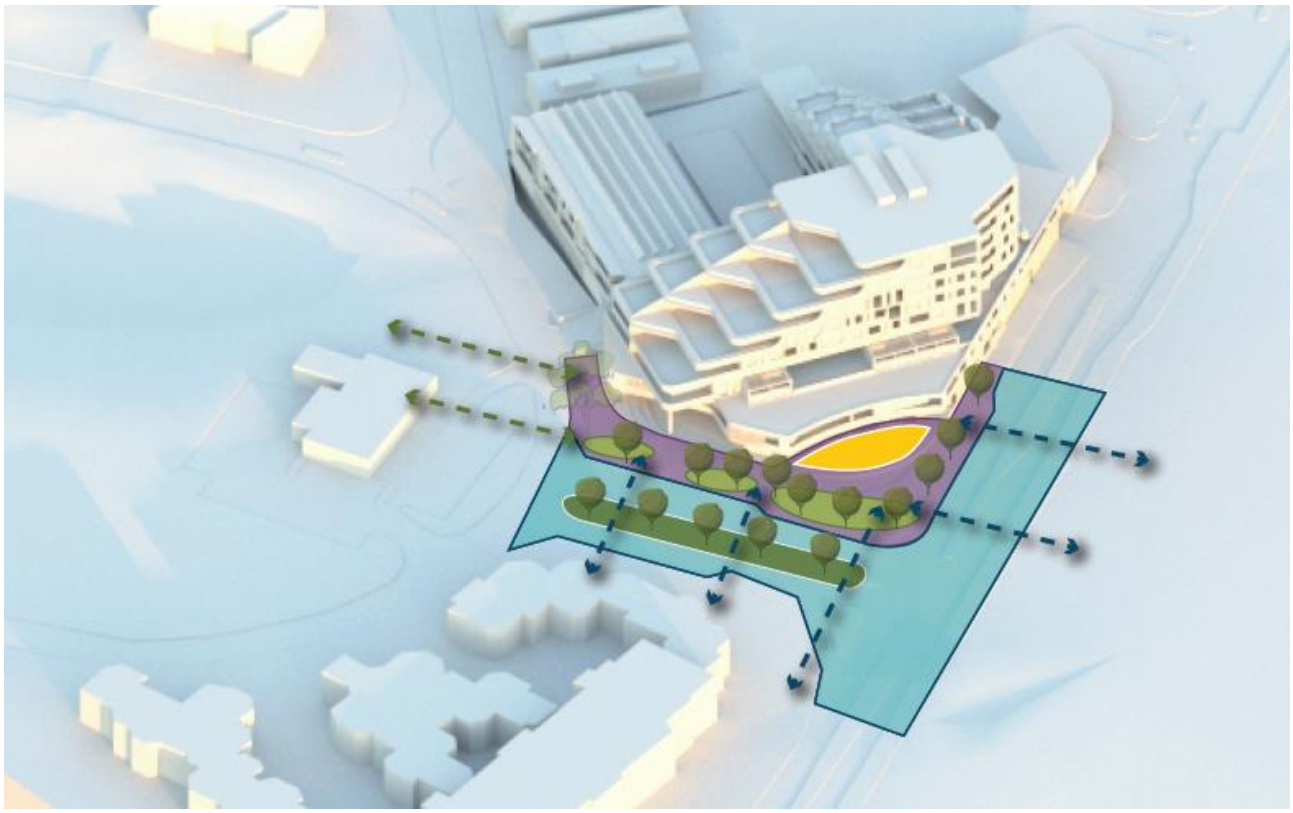


6.5 Pedestrian and Cyclist Access

Pedestrian and cyclist access has not yet been defined, however it should be provided generally in accordance with the requirements of *Liveable Neighbourhoods*.

Indicative drawings show the expected pedestrian movements (**Figure 6-5**).

Figure 6-5 Proposed Pedestrian Movements



Source: Aspect Studios

Additionally, a secure residential bike store is provided on level 1 as shown in **Figure 6-6**.

Figure 6-6 Residential Bike Store

7 Analysis of Transport Network

7.1 Assessment Years and Time Period

Peak times selected are 3:00 PM to 4:00 PM and 11:00 AM to 12:00 PM respectively for the weekday afternoon peak and weekend peak periods, based on mid-block traffic volume data provided by the Main Roads WA.

In order to test the adequacy of the road network, particularly the intersections at West Coast Drive, the following four scenarios have been assessed:

- **Scenario 1** – 2021 background traffic without proposed development traffic
- **Scenario 2** – 2021 background traffic with proposed development traffic
- **Scenario 3** – 10-year growth (2031) without proposed development traffic
- **Scenario 4** – 10-year growth (2031) with proposed development traffic

7.2 Background Traffic

The background traffic for this assessment has been obtained from the traffic counts provided by the City of Joondalup for the weekday peak period. With regards to the background traffic volumes for the weekend peak, this was obtained from the previous Sorrento Activity Centre Transport Assessment.

7.3 Traffic Generation

Trip generation has been calculated for the proposed development utilising trip generation rates from the *Institute of Transportation Engineers (ITE) "Trip Generation" 10th Ed*.

7.3.1 Existing Traffic Generation

Table 7-1 provides the trip generation rate during the Weekday AM, Weekday PM, and Weekend peak hours, **Table 7-2** outlines the directional distribution acquired from ITE for the existing development and **Table 7-3** states the total trip generation for the existing development. Given the small size of the proposed kiosk, the trip generation for this component is considered to be negligible and has been excluded.

Table 7-1 Trip Generation Rates

Land Use	Source	Weekday AM Peak	Weekday PM Peak	Weekend Peak
Office	ITE 712	3.51	4.02	0.43
Bottle shop	ITE 899	0*	18.43	18.43**
Food and Beverage	ITE 932	15.11	18.41	12.05
Fitness Studio	ITE 492	1.51	4.22	3.19

** The operating hours of the bottle shop is assumed to be outside of the AM peak period.*
*** ITE does not provide a weekend rate for this land use, therefore the trip rate for the weekday PM peak has been used.*

Table 7-2 Directional Distribution

Land Use	Weekday AM Peak		Weekday PM Peak		Weekend Peak	
	In	Out	In	Out	In	Out
Office	60%	40%	46%	54%	50%	50%
Bottle shop	51%	49%	50%	50%	50%	50%
Food and Beverage	57%	43%	52%	48%	51%	49%
Fitness Studio	46%	54%	52%	48%	49%	51%

Table 7-3 Total Trip Generation

Land Use	Weekday AM Peak		Weekday PM Peak		Weekend Peak	
	In	Out	In	Out	In	Out
Office	4	3	4	4	1	1
Bottle shop	0	0	28	28	28	28
Food and Beverage	62	47	69	64	45	43
Fitness Studio	2	2	4	3	3	3
Total	**68**	**52**	**105**	**99**	**77**	**75**
	120		**204**		**152**	

The existing development represents a two-way trip generation of approximately 120 vehicles during the weekday AM peak hour, 204 vehicles during the weekday PM peak hour and 152 vehicles during the weekend peak hour.

7.3.2 Proposed Development Traffic Generation

Table 7-4 provides the trip generation rate during the Weekday AM, Weekday PM, and Weekend peak hours, **Table 7-5** outlines the directional distribution acquired from ITE for the proposed development and **Table 7-6** states the total trip generation for the proposed development.

Table 7-4 Trip Generation Rates

Land Use	Source	Weekday AM Peak	Weekday PM Peak	Weekend Peak
Residential	ITE 221	0.32	0.41	0.44
Bottle shop	ITE 899	0*	18.43	18.43**
Food and Beverage	ITE 932	15.11	18.41	12.05

** The operating hours of the bottle shop is assumed to be outside of the AM peak period.*
*** ITE does not provide a weekend rate for this land use, therefore the trip rate for the weekday PM peak has been used.*

Table 7-5 Directional Distribution

Land Use	Weekday AM Peak		Weekday PM Peak		Weekend Peak	
	In	Out	In	Out	In	Out
Residential	27%	73%	60%	40%	49%	51%
Bottle shop	51%	49%	50%	50%	50%	50%
Food and Beverage	57%	43%	52%	48%	51%	49%

Table 7-6 Total Trip Generation

Land Use	Weekday AM Peak		Weekday PM Peak		Weekend Peak	
	In	Out	In	Out	In	Out
Residential	7	18	19	13	17	17
Bottle shop	0	0	28	28	28	28
Food and Beverage	93	70	103	95	67	64
Total	100	88	150	136	112	109
	188		**286**		**221**	

The opening year development represents a two-way trip generation of approximately 188 vehicles during the weekday AM peak hour, 286 vehicles during the weekday PM peak hour and 221 vehicles during the weekend peak hour.

7.3.3 Net Increase in Traffic

Table 7-7 provides comparison of the estimated traffic generated by the existing site and the proposed development. Overall, the anticipated increase in traffic generated by the proposed development is approximately 60-80 additional vehicles during the respective peaks.

Table 7-7 Comparison of Existing Traffic and Proposed Development Traffic

Land Use	Weekday AM Peak		Weekday PM Peak		Weekend Peak	
	In	Out	In	Out	In	Out
Existing Development	68	52	105	99	77	75
Proposed Development	100	88	150	136	112	109
Net increase/decrease	**32**	**36**	**45**	**37**	**35**	**34**

7.4 Future Year Traffic Growth

The future traffic growth of the surrounding road network was determined based on the historic traffic growth rate from *MRWA Road Traffic Map* which was determined to be around 1% per annum. This growth rate has been applied for the background traffic along West Coast Drive. No traffic growth for the background traffic is expected along The Plaza and Raleigh Road as there are no significant developments anticipated nearby which will use these roads.

7.5 Key Assumptions

The following provides a list of assumptions use in the assessment.

- Though Lot 800 is part of the Sorrento Activity Centre Area, it has not been included as part of this assessment as the development within this lot is already established (currently a BP Service Station) and the traffic impacts of this development is already captured in the background traffic volumes. Additionally, no significant changes to the existing service station site are anticipated in the next 10-20 years (or for the life of the development which is estimated to be approximately 30 years).
- For the purpose of this assessment, the AM peak period has not been assessed as the background traffic volumes as well as the associated peak trip generation are anticipated to be lower than the PM and weekend peak periods.
- For the scenarios that include the proposed development traffic (Scenario 2 and 4), the traffic volumes generated by the existing development has been removed from the network.
- A growth rate of 1% per annum has been used to growth traffic volumes along West Coast Drive for the future assessment Scenarios (Scenario 3 and 4).
- Heavy vehicle volumes were obtained from Main Roads Traffic Map.

7.6 Traffic Distribution and Assignment

As summarised in **Section 6.3**, the residential and commercial access are separated with the residential access off Padbury Circle and the commercial/visitor access off West Coast Drive.

- Residential distribution – the majority of residential traffic is assumed to travel to/from West Coast Drive (80%) as it serves as a key arterial link when travelling to the north and south with the north/south distribution based on the current distribution for the respective peak periods. A small proportion assumed to travel to/from the east (20%) via the local roads.
- Commercial/visitor distribution – as a result of the access arrangement, all commercial and visitor traffic will enter the Site from West Coast Drive and exit onto Raleigh Road and back onto West Coast Drive with the north/south distribution based on the current distribution for the respective peak periods.

The estimated distribution is presented in **Figure 7-1** for the residential component and on **Figure 7-2** for the commercial/visitor component.

Figure 7-1 Residential Development Traffic Distribution

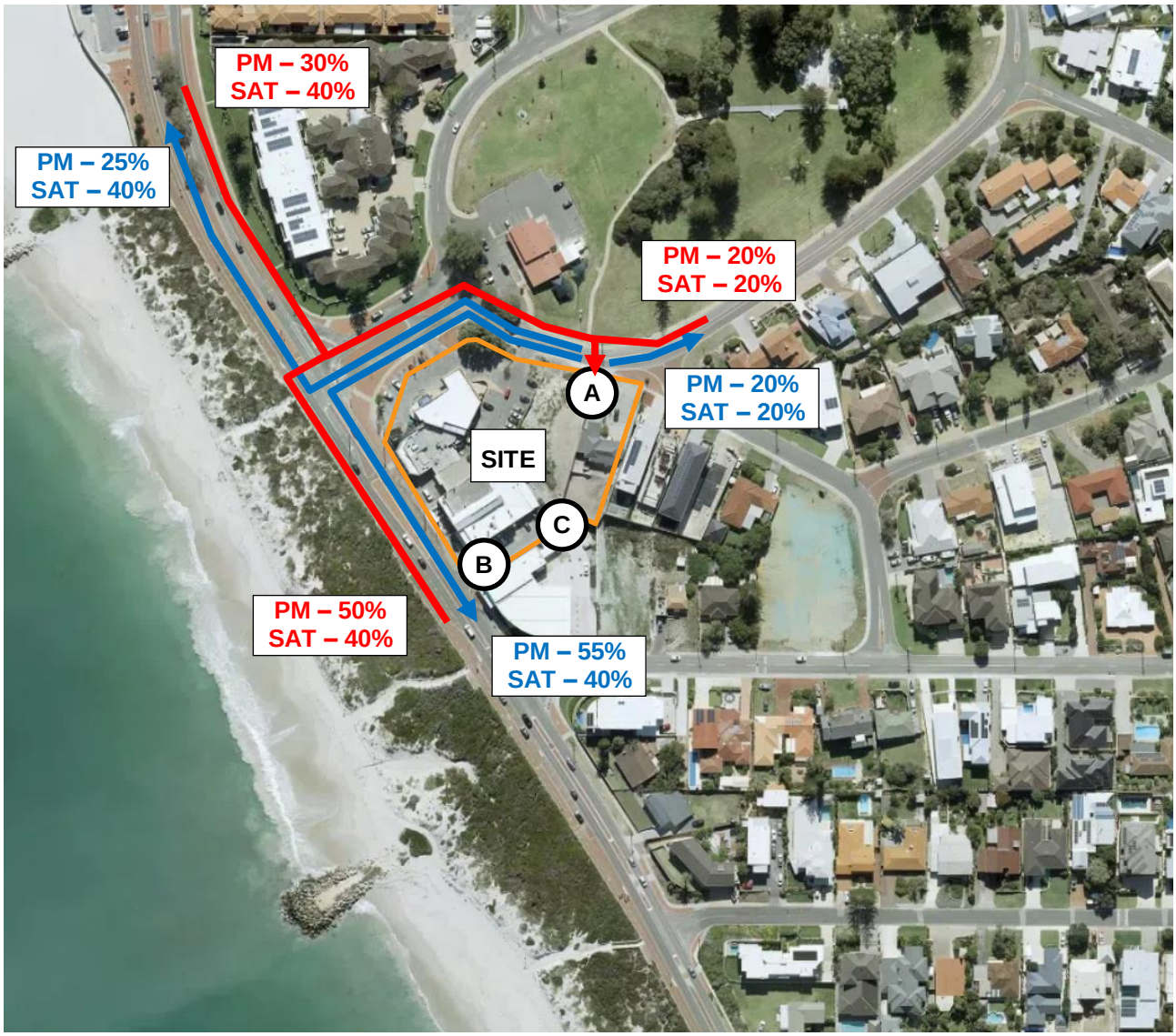
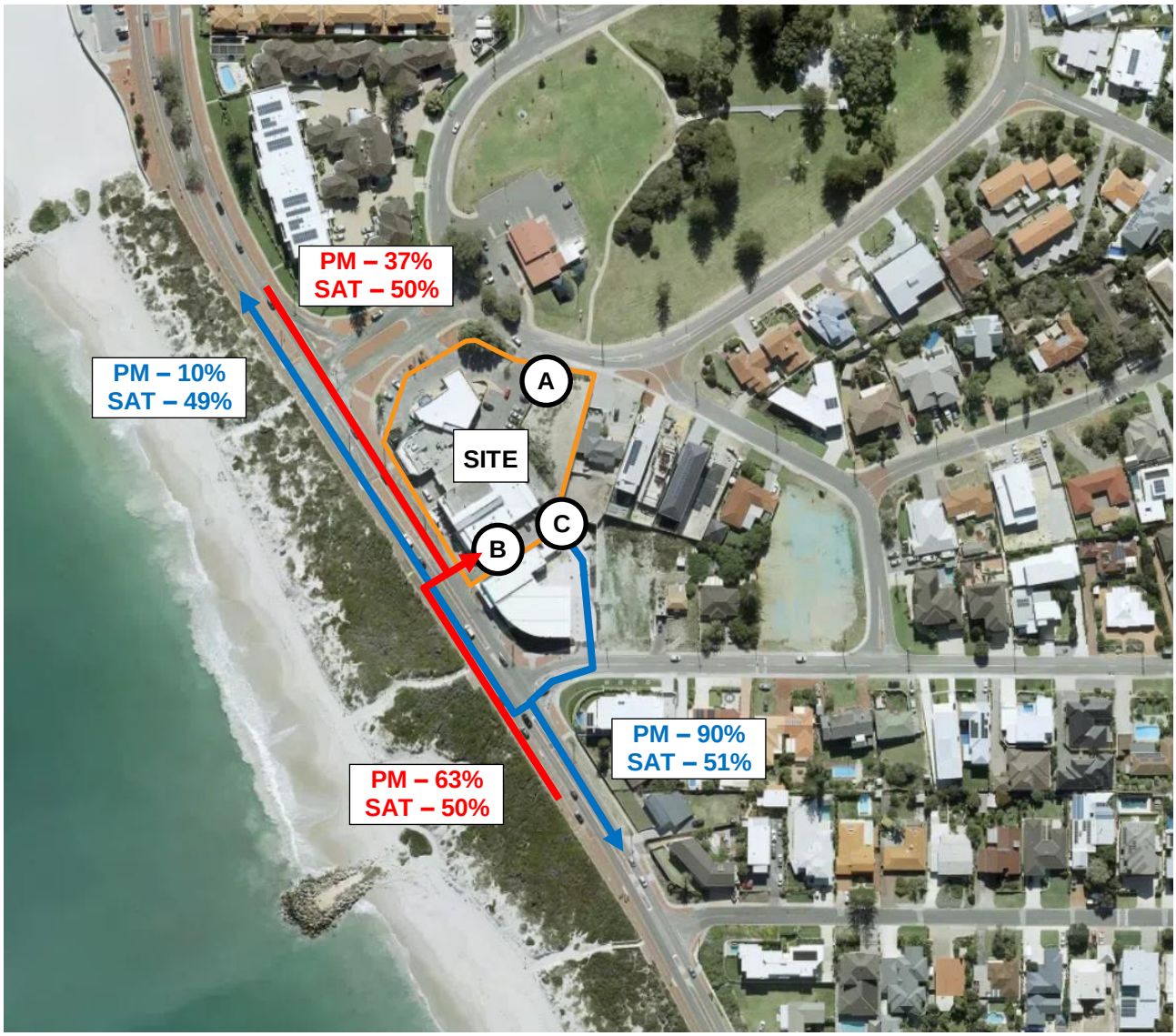


Figure 7-2 Commercial/Visitor Development Traffic Distribution



7.6.2 Background and Development Traffic Volumes

Figure 7-3 through to **Figure 7-6** provides a summary of the traffic volumes for Scenarios 1, 2, 3 and 4 respectively.

Figure 7-3 Scenario 1 Traffic Volumes

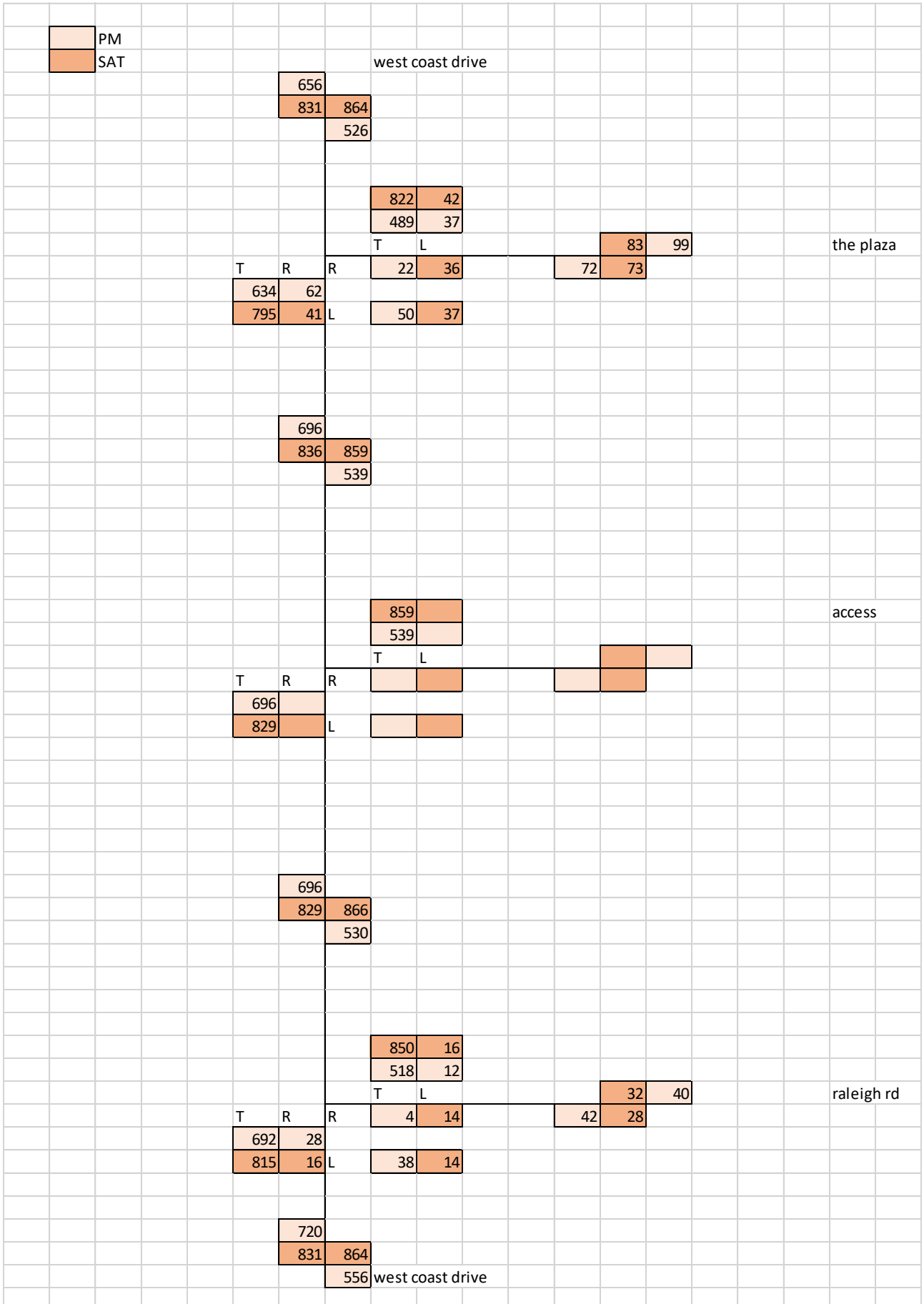


Figure 7-4 Scenario 2 Traffic Volumes

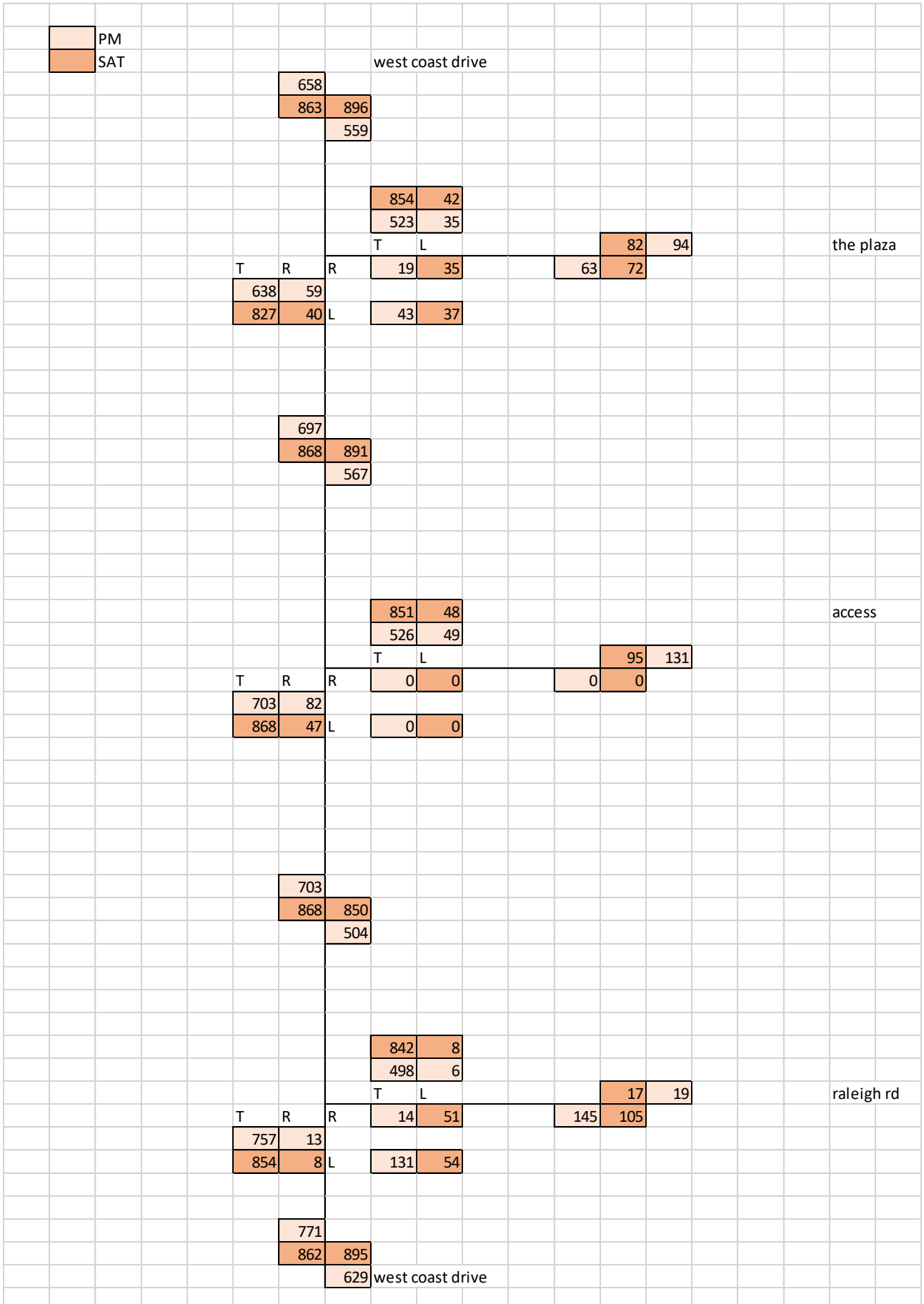


Figure 7-5 Scenario 3 Traffic Volumes

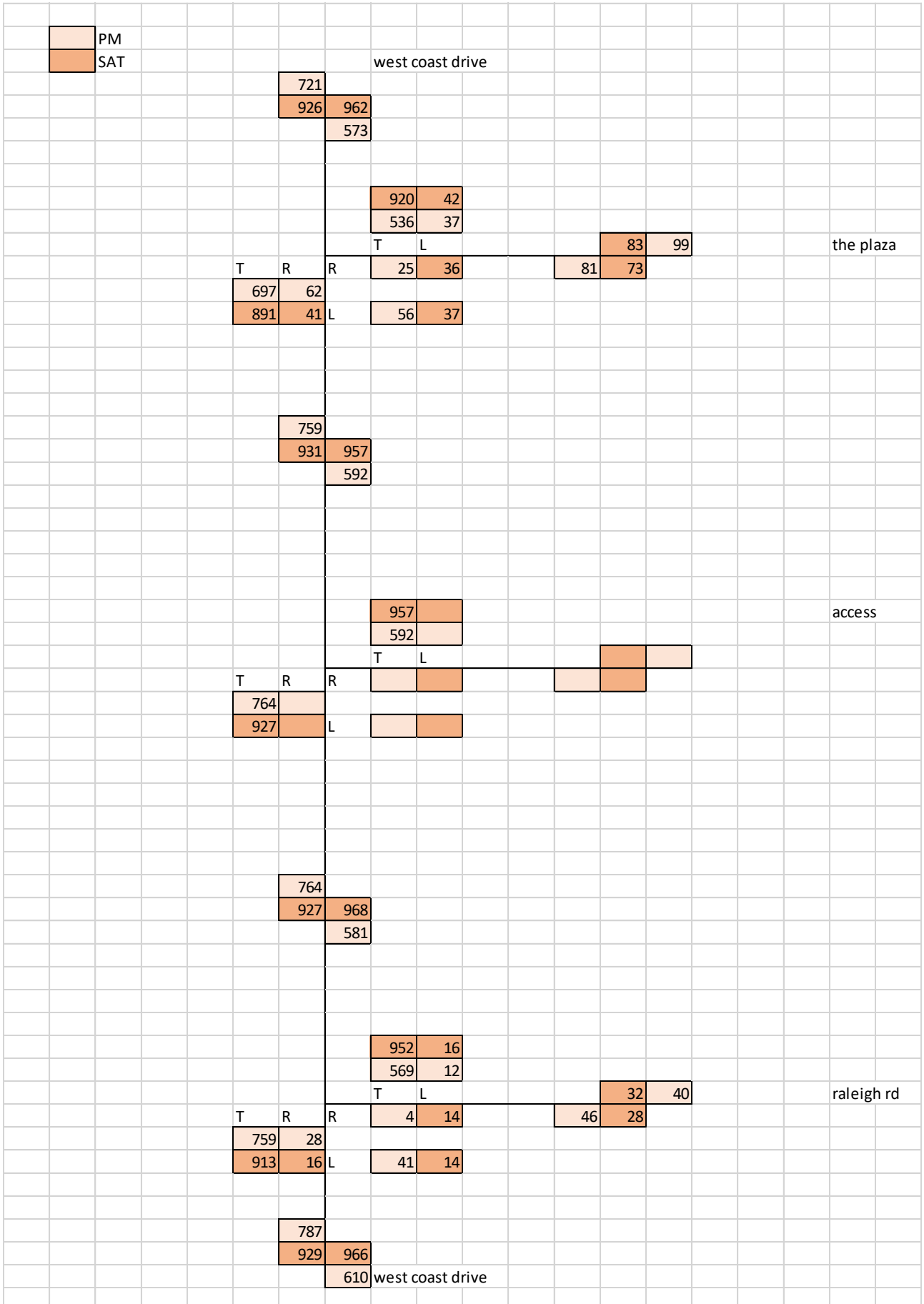
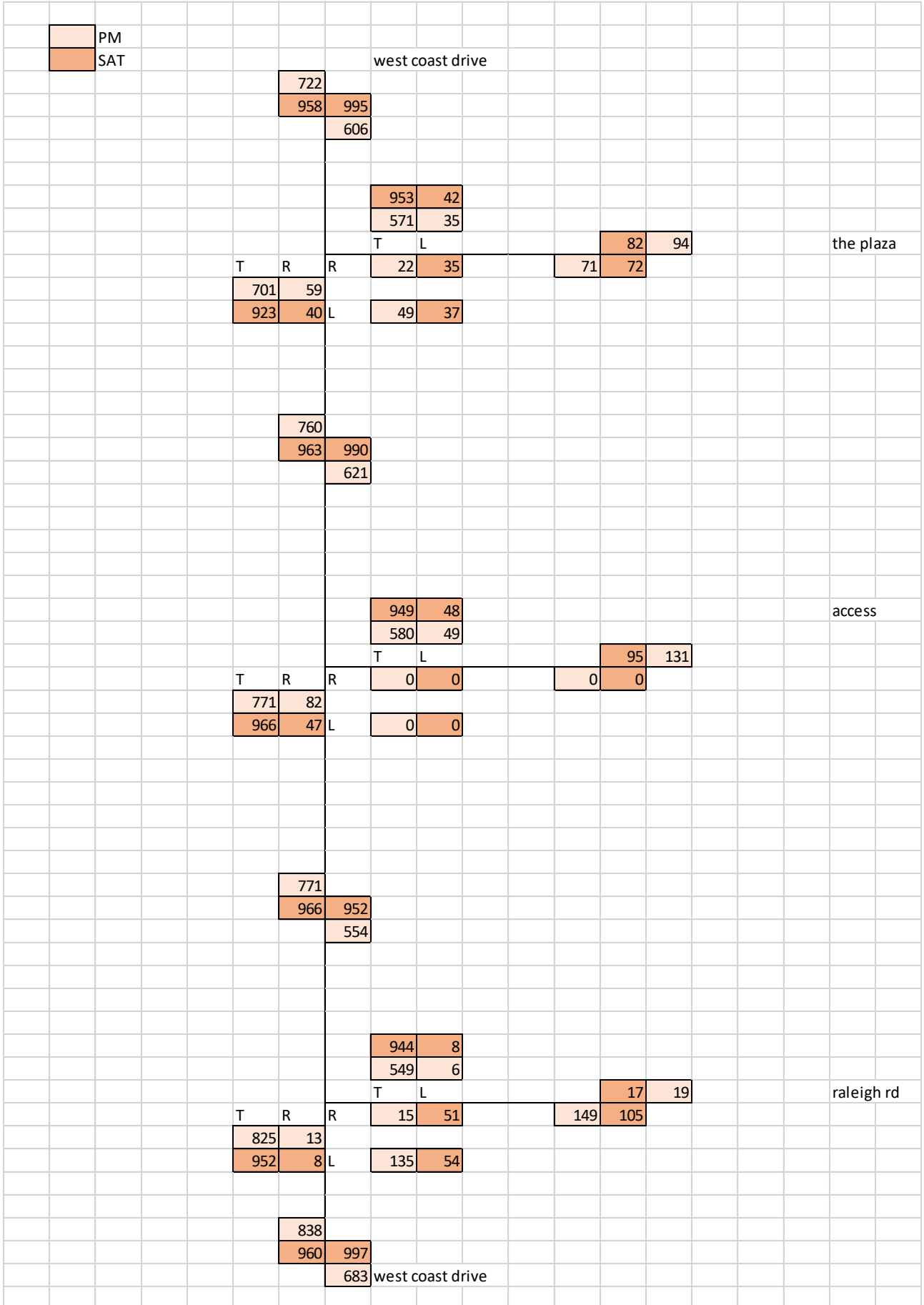


Figure 7-6 Scenario 4 Traffic Volumes



7.7 Intersection Performance

SIDRA analysis was undertaken at the following intersections to estimate the impact of the development generated traffic on the surrounding transport network:

- West Coast Drive/The Plaza
- West Coast Drive/Raleigh Road
- West Coast Drive/Site Access (Scenario 2 and 4 only)

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

- **Degree of Saturation (DOS)**: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalized intersection where DOS > 0.80;
- **95% Queue**: is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected;
- **Average Delay**: is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection can be considered to be operated at capacity where the average delay exceeds 40 seconds for any movement; and
- **Level of Service (LOS)**: is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table 7-8**.

Table 7-8 Level of Service (LOS) Performance Criteria

LOS	Description	Signalised Intersection	Unsignalised Intersection
A	Free-flow operations (best condition)	≤10 sec	≤10 sec
B	Reasonable free-flow operations	10-20 sec	10-15 sec
C	At or near free-flow operations	20-35 sec	15-25 sec
D	Decreasing free-flow levels	35-55 sec	5-35 sec
E	Operations at capacity	55-80 sec	35-50 sec
F	A breakdown in vehicular flow (worst condition)	≥80 sec	≥50 sec

7.7.2 Scenario 1

7.7.2.1 West Coast Drive/The Plaza

The following presents the analysis of the West Coast Drive/The Plaza intersection. **Figure 7-7** is a SIDRA layout representation of the proposed intersection and **Table 7-9** shows the SIDRA results of the analysis.

Figure 7-7 SIDRA Layout - West Coast Drive/The Plaza Intersection

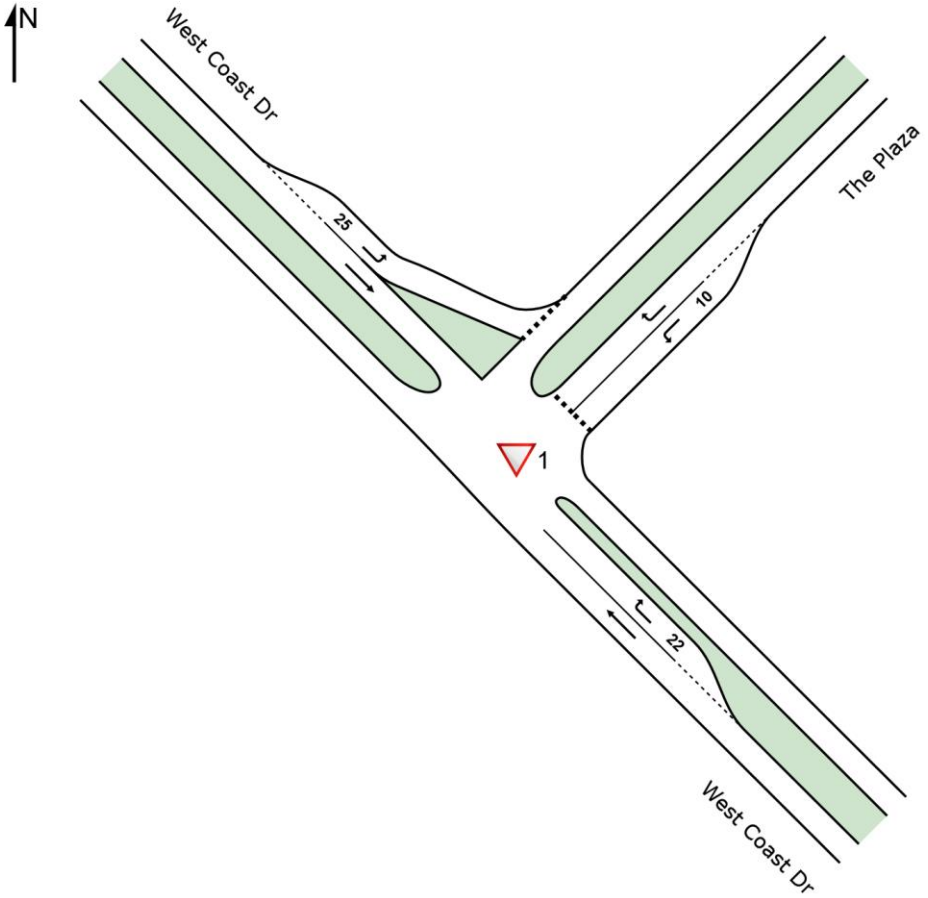


Table 7-9 Scenario 1 - SIDRA Results – West Coast Drive/The Plaza Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.336	0.1	A	0	0.422	0.2	A	0
	R	0.058	6.6	A	1.7	0.064	9.4	A	1.7
The Plaza (NE)	L	0.051	6.5	A	1.3	0.062	9.4	A	1.5
	R	0.112	22.5	C	2.5	0.519	80.2	F	11.9
West Coast Dr (NW)	L	0.024	4.7	A	0.7	0.027	4.6	A	0.8
	T	0.257	0.1	A	0	0.432	0.2	A	0
All Vehicles		0.336	1.2	A	2.5	0.519	2.3	A	11.9

7.7.2.2 West Coast Drive/Raleigh Road

The following presents the analysis of the West Coast Drive/Raleigh Road intersection. **Figure 7-8** is a SIDRA layout representation of the proposed intersection and **Table 7-10** shows the SIDRA results of the analysis.

Figure 7-8 SIDRA Layout - West Coast Drive/Raleigh Road Intersection

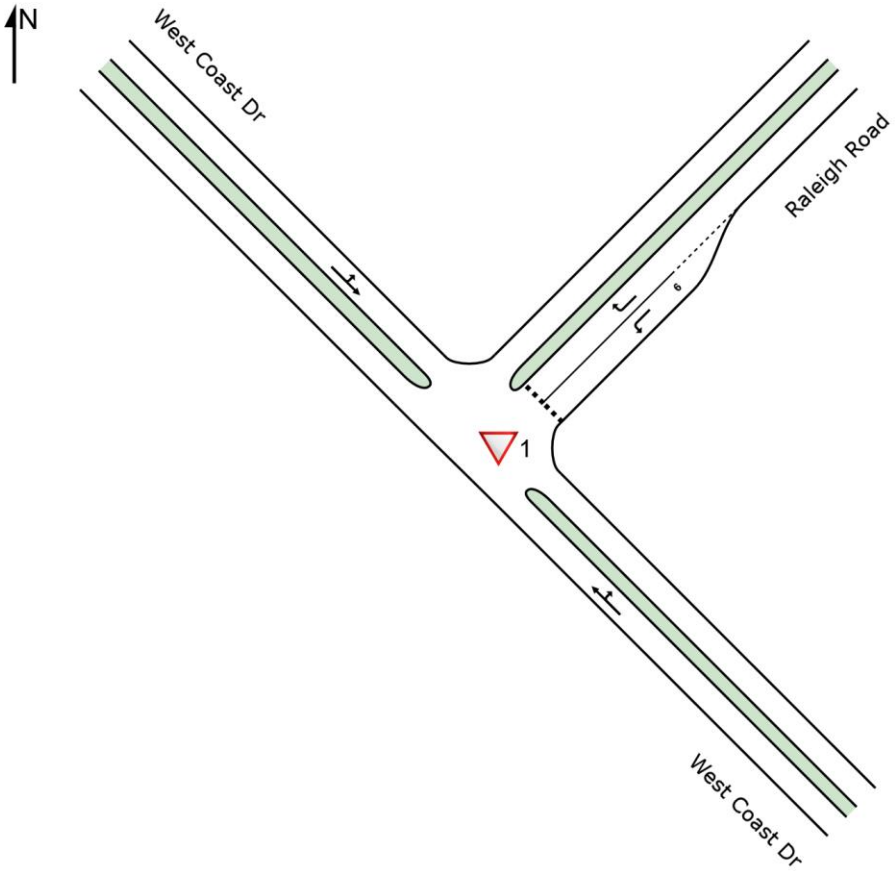


Table 7-10 Scenario 1 - SIDRA Results – West Coast Drive/Raleigh Road Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.392	0.3	A	3.9	0.456	0.6	A	4.9
	R	0.392	9.3	A	3.9	0.456	15.9	C	4.9
Raleigh Rd (NE)	L	0.04	7.7	A	1.1	0.025	10.5	B	0.6
	R	0.015	16.4	C	0.3	0.119	33.2	D	2.3
West Coast Dr (NW)	L	0.279	4.7	A	0	0.456	4.8	A	0
	T	0.279	0.1	A	0	0.456	0.2	A	0
All Vehicles		0.392	0.7	A	3.9	0.456	0.9	A	4.9

7.7.3 Scenario 2

7.7.3.1 West Coast Drive/The Plaza

Table 7-11 shows the SIDRA results of the analysis at West Coast Drive/The Plaza intersection for Scenario 2.

Table 7-11 Scenario 2 - SIDRA Results – West Coast Drive/The Plaza Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.338	0.1	A	0	0.439	0.2	A	0
	R	0.058	6.8	A	1.7	0.066	9.8	A	1.7
The Plaza (NE)	L	0.046	6.7	A	1.2	0.066	9.8	A	1.6
	R	0.103	23.6	C	2.3	0.594	102	F	13.6
West Coast Dr (NW)	L	0.023	4.7	A	0.6	0.027	4.6	A	0.8
	T	0.275	0.1	A	0	0.449	0.2	A	0
All Vehicles		0.338	1.1	A	2.3	0.594	2.6	A	13.6

7.7.3.2 West Coast Drive/Raleigh Road

Table 7-12 shows the SIDRA result of the analysis at West Coast Drive/Raleigh Road intersection for Scenario 2.

Table 7-12 Scenario 2 - SIDRA Results – West Coast Drive/Raleigh Road Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.411	0.1	A	1.9	0.463	0.3	A	2.4
	R	0.411	9.2	A	1.9	0.463	15.7	C	2.4
Raleigh Rd (NE)	L	0.135	7.8	A	3.7	0.094	10.7	B	2.3
	R	0.056	17.8	C	1.1	0.45	44.5	E	9.8
West Coast Dr (NW)	L	0.265	4.7	A	0	0.447	4.8	A	0
	T	0.265	0.1	A	0	0.447	0.2	A	0
All Vehicles		0.411	1.1	A	3.7	0.463	1.9	A	9.8

7.7.3.3 West Coast Drive/Site Access

The following presents the analysis of the West Coast Drive/Site Access intersection. **Figure 7-9** is a SIDRA layout representation of the proposed intersection and **Table 7-13** shows the SIDRA results of the analysis.

Figure 7-9 SIDRA Layout - West Coast Drive/Site Access Intersection

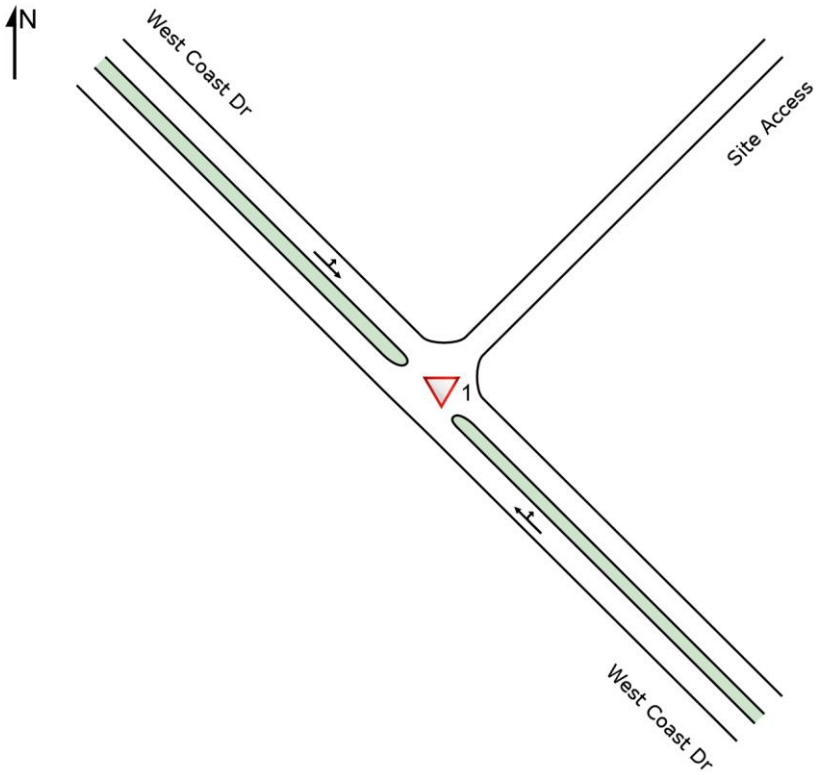


Table 7-13 Scenario 2 - SIDRA Results – West Coast Drive/ Site Access Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.456	1	A	12.9	0.54	1.8	A	16.3
	R	0.456	10.3	B	12.9	0.54	17.8	C	16.3
West Coast Dr (NW)	L	0.303	4.7	A	0	0.474	4.8	A	0
	T	0.303	0.2	A	0	0.474	0.2	A	0
All Vehicles		0.456	1.4	A	12.9	0.54	1.6	A	16.3

7.7.4 Scenario 3

7.7.4.1 West Coast Drive/The Plaza

Table 7-14 shows the SIDRA results of the analysis at West Coast Drive/The Plaza intersection for Scenario 3.

Table 7-14 Scenario 3 - SIDRA Results – West Coast Drive/The Plaza Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.37	0.1	A	0	0.473	0.2	A	0
	R	0.062	6.9	A	1.8	0.078	10.8	B	2
The Plaza (NE)	L	0.06	6.9	A	1.6	0.075	10.8	B	1.8
	R	0.16	27.8	D	3.6	0.874	217.4	F	23.5
West Coast Dr (NW)	L	0.024	4.7	A	0.7	0.027	4.6	A	0.8
	T	0.282	0.1	A	0	0.484	0.2	A	0
All Vehicles		0.37	1.3	A	3.6	0.874	4.7	A	23.5

The SIDRA results show significant delays for the right turn movement onto West Coast Drive. These results are under the assumption that no vehicles are using the central median along West Coast Drive to perform a staged right turn. The width of the central median is approximately 4m which does not provide sufficient width a vehicle to stage safely however, on-site observations suggests that this is still common practice. By widening the median to 6m (the minimum median width required for safe staging), the operation can be significantly improved. The layout of this modified intersection arrangement is shown in **Figure 7-10** and the SIDRA results are summarised in **Table 7-15**.

Figure 7-10 SIDRA Layout - West Coast Drive/The Plaza Intersection (with modifications)

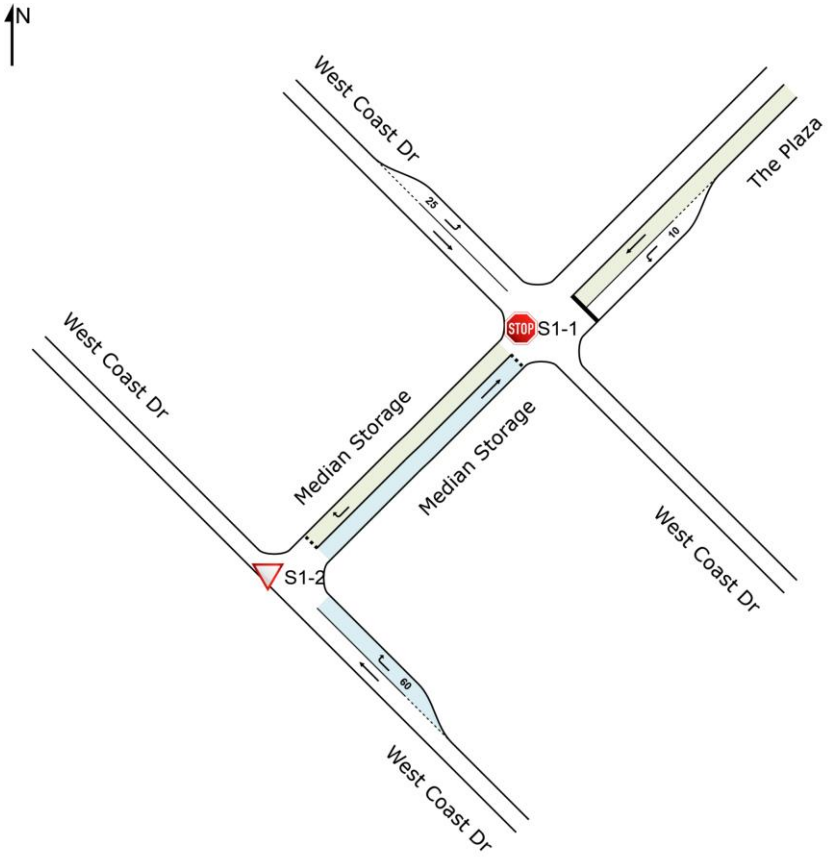


Table 7-15 Scenario 3 - SIDRA Results – West Coast Drive/The Plaza Intersection (with modifications)

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.367	0.1	A	0	0.469	0.2	A	0
	R	0.034	8.2	A	0	0.078	12.2	B	0
The Plaza (NE)	L	0.074	11.1	B	1.9	0.101	16.9	C	2.4
	R	0.055	16.2	C	1.5	0.199	32.1	D	4.9
West Coast Dr (NW)	L	0.02	5.6	A	0	0.023	5.6	A	0
	T	0.282	0.1	A	0	0.484	0.2	A	0
All Vehicles		0.367	1.3	A	1.9	0.484	1.5	A	4.9

7.7.4.2 West Coast Drive/Raleigh Road

Table 7-16 shows the SIDRA results of the analysis at West Coast Drive/Raleigh Road intersection for Scenario 3.

Table 7-16 Scenario 3 - SIDRA Results – West Coast Drive/Raleigh Road Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.43	0.4	A	4.6	0.514	0.8	A	7
	R	0.43	10.2	B	4.6	0.514	20.6	C	7
Raleigh Rd (NE)	L	0.046	8	A	1.2	0.03	12.1	B	0.7
	R	0.019	19.6	C	0.4	0.195	53.4	F	3.6
West Coast Dr (NW)	L	0.306	4.7	A	0	0.51	4.8	A	0
	T	0.306	0.1	A	0	0.51	0.3	A	0
All Vehicles		0.43	0.8	A	4.6	0.514	1.2	A	7

7.7.5 Scenario 4

7.7.5.1 West Coast Drive/The Plaza

Table 7-17 shows the SIDRA results of the analysis at West Coast Drive/The Plaza intersection for Scenario 4. Additionally, **Table 7-18** shows the SIDRA results with the inclusion of the median modifications mentioned in *Section 6.7.4.1*.

Table 7-17 Scenario 4 - SIDRA Results – West Coast Drive/The Plaza Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.372	0.1	A	0	0.488	0.2	A	0
	R	0.062	7.1	A	1.8	0.081	11.4	B	2.1
The Plaza (NE)	L	0.055	7.1	A	1.4	0.08	11.4	B	1.9
	R	0.151	29.2	D	3.3	1.024	323	F	34.9
West Coast Dr (NW)	L	0.023	4.7	A	0.6	0.027	4.6	A	0.8
	T	0.3	0.1	A	0	0.501	0.2	A	0
All Vehicles		0.372	1.2	A	3.3	1.024	6.3	A	34.9

Table 7-18 Scenario 4 - SIDRA Results – West Coast Drive/The Plaza Intersection (with modifications)

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.369	0.1	A	0	0.486	0.2	A	0
	R	0.073	8.5	A	0	0.092	12.7	B	0
The Plaza (NE)	L	0.068	11.4	B	1.8	0.109	17.8	C	2.5
	R	0.055	17.5	C	1.4	0.214	35.1	E	5.2
West Coast Dr (NW)	L	0.019	5.6	A	0	0.023	5.6	A	0
	T	0.3	0.1	A	0	0.501	0.2	A	0
All Vehicles		0.369	1.2	A	1.8	0.501	1.5	A	5.2

7.7.5.2 West Coast Drive/Raleigh Road

Table 7-19 shows the SIDRA results of the analysis at West Coast Drive/Raleigh Road intersection for Scenario 4.

Table 7-19 Scenario 4 - SIDRA Results – West Coast Drive/Raleigh Road Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.448	0.2	A	2.2	0.517	0.4	A	3.5
	R	0.448	10.1	B	2.2	0.517	20.3	C	3.5
Raleigh Rd (NE)	L	0.148	8.1	A	4.1	0.115	12.3	B	2.7
	R	0.075	21.5	C	1.5	0.736	97.6	F	17
West Coast Dr (NW)	L	0.292	4.7	A	0	0.501	4.8	A	0
	T	0.292	0.1	A	0	0.501	0.2	A	0
All Vehicles		0.448	1.1	A	4.1	0.736	3.2	A	17

7.7.5.3 West Coast Drive/Site Access

Table 7-20 shows the SIDRA results of the analysis at West Coast Drive/Site Access intersection for Scenario 4.

Table 7-20 Scenario 4 - SIDRA Results – West Coast Drive/Site Access Intersection

Intersection Approach		Weekday PM peak				Weekend Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
West Coast Dr (SE)	T	0.498	1.3	A	15.4	0.611	2.7	A	23.6
	R	0.498	11.4	B	15.4	0.611	23.3	C	23.6
West Coast Dr (NW)	L	0.332	4.7	A	0	0.525	4.8	A	0
	T	0.332	0.2	A	0	0.525	0.3	A	0
All Vehicles		0.498	1.5	A	15.4	0.611	2.1	A	23.6

7.7.6 SIDRA Results Summary

A summary of the SIDRA results are provided below:

- The results of the SIDRA assessment at West Coast Drive/The Plaza intersection shows that all the approaches apart from the right turn movement out of The Plaza to West Coast Drive in the Saturday Peak, have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios.

  Furthermore, as shown in the results with the modified intersection arrangement, the operation for the right turn movement can be improved significantly by widening the median to allow vehicles to safely stage at the central median.

- The results of the SIDRA assessment at West Coast Drive/Raleigh Road intersection shows that all approaches have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios.

  Right-turn egress from Raleigh Road on the weekend peak operates at a relatively poor level of service. However, given the short queue length for this movement even during the peak periods, approximately 1-3 vehicles for Scenarios 3 and 4, the overall impact is considered to be negligible. Therefore, no modifications to this intersection are considered necessary to support the proposed development.

The results of the SIDRA assessment at West Coast Drive/Site Access intersection shows that all approaches have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios. Therefore, no modifications to this crossover geometry are considered necessary to support the proposed development.

8 Summary and Conclusions

This report has been prepared in accordance with the *Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines Volume 2 – Planning Schemes, Structure Plans & Activity Centre Plans (2016).*

The following conclusions have been made in regards to the proposed development:

- The main access for visitors to the Site is proposed south of the existing West Coast Drive/The Plaza intersection, retaining full movements under priority control.
- The residential access to the Site is proposed from Padbury Circle.
- The Site has access to shared paths along West Coast Drive, though pedestrian crossings across West Coast Drive will need improvement as it can be difficult for pedestrians to safely cross the road.
- The Site benefits from public transport facilities with Route 423 bus services operating along West Coast Highway stopping at Stirling Station, Warwick Station and Karrinyup Bus Station.
- The Site is expected to generate a total of 188 vehicles in the weekday AM peak hour, 286 vehicles in the weekday PM peak hour and 221 vehicles in the weekend peak hour. With the exclusion of the existing development traffic, the total increase in vehicle trips onto the road network is between 60-80 vehicles.
- The results of the SIDRA assessment at West Coast Drive/The Plaza intersection shows that all the approaches apart from the right turn movement out of The Plaza to West Coast Drive in the Saturday Peak, have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios.

  Furthermore, as shown in the results with the modified intersection arrangement, the operation for the right turn movement can be improved significantly by widening the median to allow vehicles to safely stage at the central median. As part of the previous assessment for the SAC, this proposed arrangement was discussed with the City of Joondalup, who were receptive of the idea. It is likely that further consultation with the City and MRWA will be required as the application progresses.
- The results of the SIDRA assessment at West Coast Drive/Raleigh Road intersection shows that all approaches have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios.

  Right-turn egress from Raleigh Road on the weekend peak operates at a relatively poor level of service. However, given the short queue length for this movement even during the peak periods, approximately 1-3 vehicles for Scenarios 3 and 4, the overall impact is considered to be negligible. Therefore, no modifications to this intersection are considered necessary to support the proposed development.
- The results of the SIDRA assessment at West Coast Drive/Site Access intersection shows that all approaches have sufficient capacity to accommodate the traffic demand during the weekday PM and weekend peak hour periods for all scenarios. Therefore, no modifications to this crossover geometry are considered necessary to support the proposed development.

APPENDIX

A

WAPC TRANSPORT IMPACT ASSESSMENT CHECKLIST

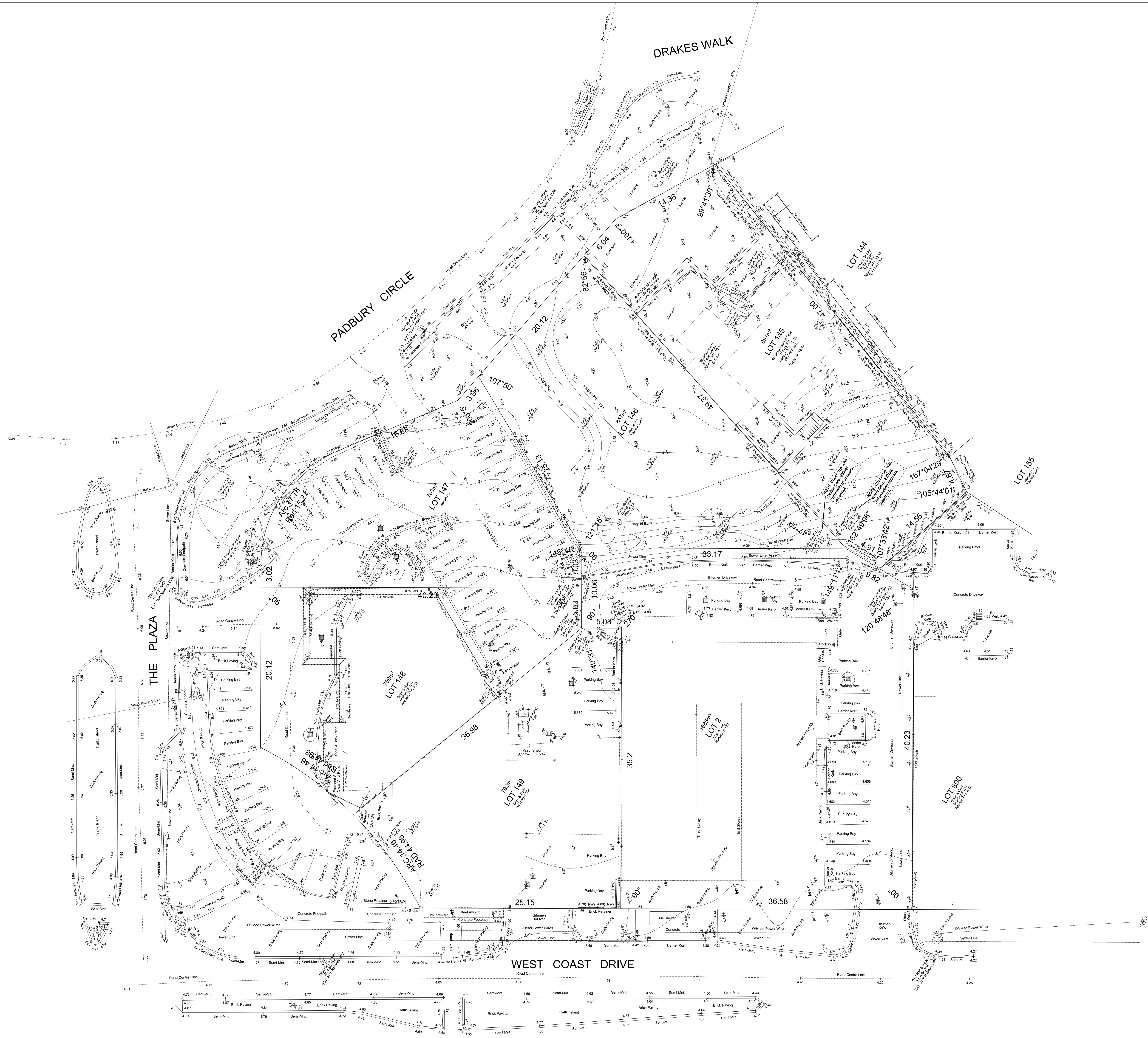
Item	Provided	Comments/Proposals
Summary		
Introduction/Background	Included in Section 1	
Structure plan proposal	Included in Section 6	
▪ regional context	Included in Section 2	
▪ proposed land uses	Included in Section 2	
▪ table of land uses and quantities	Included in Section 6	
▪ major attractors/generators	Included in Section 5	
▪ specific issues	N/A	
Existing situation		
▪ existing land uses within structure plan	Included in Section 2	
▪ existing land uses within 800 metres of structure plan area	Included in Section 2	
▪ existing road network within structure plan area	Included in Section 2	
▪ existing pedestrian/cycle networks within structure plan area	Included in Section 2	
▪ existing public transport services within structure plan area	Included in Section 2	
▪ existing road network within 2 (or 5) km of structure plan area	Included in Section 2	
▪ traffic flows on roads within structure plan area (PM and/or AM peak hours)	N/A	
▪ traffic flows on roads within 2 (or 5) km of structure plan area (AM and/or PM peak hours)	Included in Section 2	
▪ existing pedestrian/cycle networks within 800m of structure plan area	Included in Section 2	
▪ existing public transport services within 800m of structure plan area	Included in Section 2	
Proposed internal transport networks		
▪ changes/additions to existing road network or proposed new road network	N/A	
▪ road reservation widths	N/A	
▪ road cross-sections & speed limits	N/A	
▪ intersection controls	N/A	
▪ pedestrian/cycle networks and crossing facilities	N/A	
▪ public transport routes	N/A	
Changes to external transport networks		
▪ road network	Included in Section 3	
▪ intersection controls	Included in Section 3	
▪ pedestrian/cycle networks and crossing facilities	Included in Section 3	
▪ public transport services	Included in Section 3	
Integration with surrounding area		
▪ trip attractors/generators within 800 metres	Included in Section 5	
▪ proposed changes to land uses within 800 metres	Included in Section 5	
▪ travel desire lines from structure plan to these attractors/generators	N/A	
▪ adequacy of external transport networks	N/A	
▪ deficiencies in external transport networks	N/A	

▪ remedial measures to address deficiencies	N/A	
Analysis of internal transport networks		
▪ assessment year(s) and time period(s)	Included in Section 7	
▪ structure plan generated traffic	Included in Section 7	
▪ extraneous (through) traffic	Included in Section 7	
▪ design traffic flows (ie. total traffic)	Included in Section 7	
▪ road cross-sections	N/A	
▪ intersection controls	Included in Section 7	
▪ access strategy	N/A	
▪ pedestrian / cycle networks	Included in Section 2	
▪ safe routes to schools	N/A	
▪ pedestrian permeability & efficiency	Included in Section 2	
▪ access to public transport	Included in Section 2	
Analysis of external transport networks		
▪ extent of analysis	Included in Section 7	
▪ base flows for assessment year(s)	Included in Section 7	
▪ total traffic flows	Included in Section 7	
▪ road cross-sections	N/A	
▪ intersection layouts & controls	Included in Section 7	
▪ pedestrian/cycle networks	Included in Section 2	
Conclusions	Included in Section 8	

APPENDIX

B

SORRENTO ACTIVITY CENTRE PLAN



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REV.	DATE	AMENDMENT	INIT.
-	17.12.21	DEVELOPMENT APPLICATION	TD
-	15.03.22	FOR INFORMATION / SDRP 2	TD
-	03.05.22	FOR INFORMATION / SDRP 3	TD
-	03.06.22	DEVELOPMENT APPLICATION	TD

PLANNING: PLANNING SOLUTION
LANDSCAPE : ASPECT STUDIO
WASTE: TALIS
TRAFFIC: CARDNO
ENERGY: CUNDALL

1x1 BED/BATH APARTMENT
2x1 / 2x2 BED/BATH APARTMENT
3x2 BED/BATH APARTMENT
4x2+ BED/BATH APARTMENT

CLIENT
MEGARA

PROJECT
SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS
WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER: 20057
NORTH

SCALE
1:250 @ A1 (0 – 5 – 12.5)

STATUS
DEVELOPMENT APPLICATION

DRAWING
SORRENTO ACTIVITY CENTRE
FEATURE SURVEY

DRAWING NO.	DRAFTER	CHECKED	REV.
0.01	--	TD	

EXTENT OF AREA TO BE DEMOLISHED AND CLEARED

DRAKES WALK

PADBURY CIRCLE

THE PLAZA

WEST COAST DRIVE

LOT 144

LOT 145

LOT 146

LOT 147

LOT 148

LOT 149

LOT 2

LOT 800

LOT 165

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-	03.06.22	DEVELOPMENT APPLICATION	TD

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- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:250 @ A1

0 5 12.5

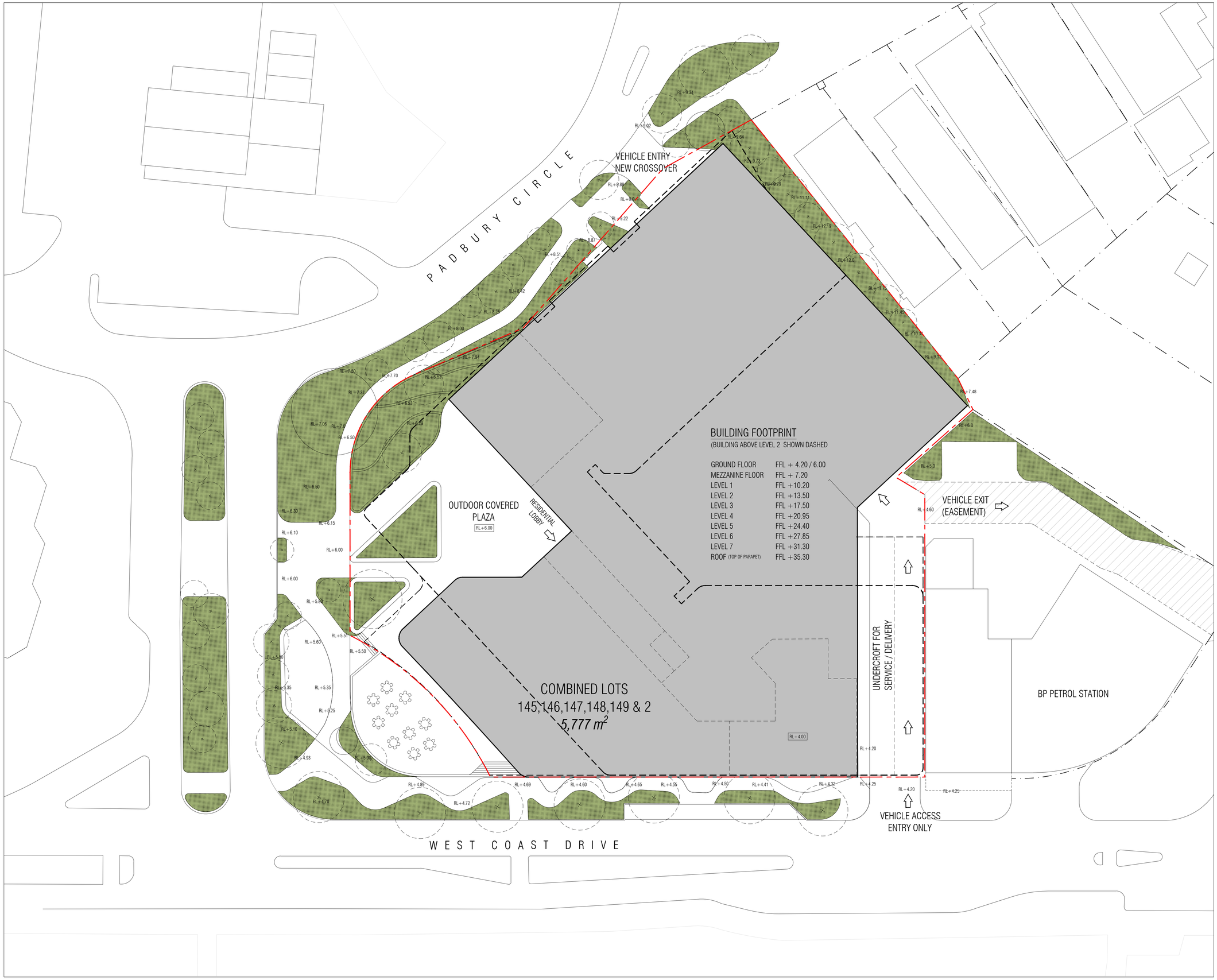
STATUS

DEVELOPMENT APPLICATION

DRAWING

SORRENTO ACTIVITY CENTRE
DEMOLITION PLAN

DRAWING NO.	DRAFTER	CHECKED	REV.
0.02	--	TD	



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CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:250 @ A1

0 5 12.5

STATUS

DEVELOPMENT APPLICATION

DRAWING

SORRENTO ACTIVITY CENTRE
OVERALL SITE PLAN

DRAWING NO.	DRAFTER	CHECKED	REV.
0.03	--	TD	

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ENERGY:	CUNDALL

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CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1

0 4 8

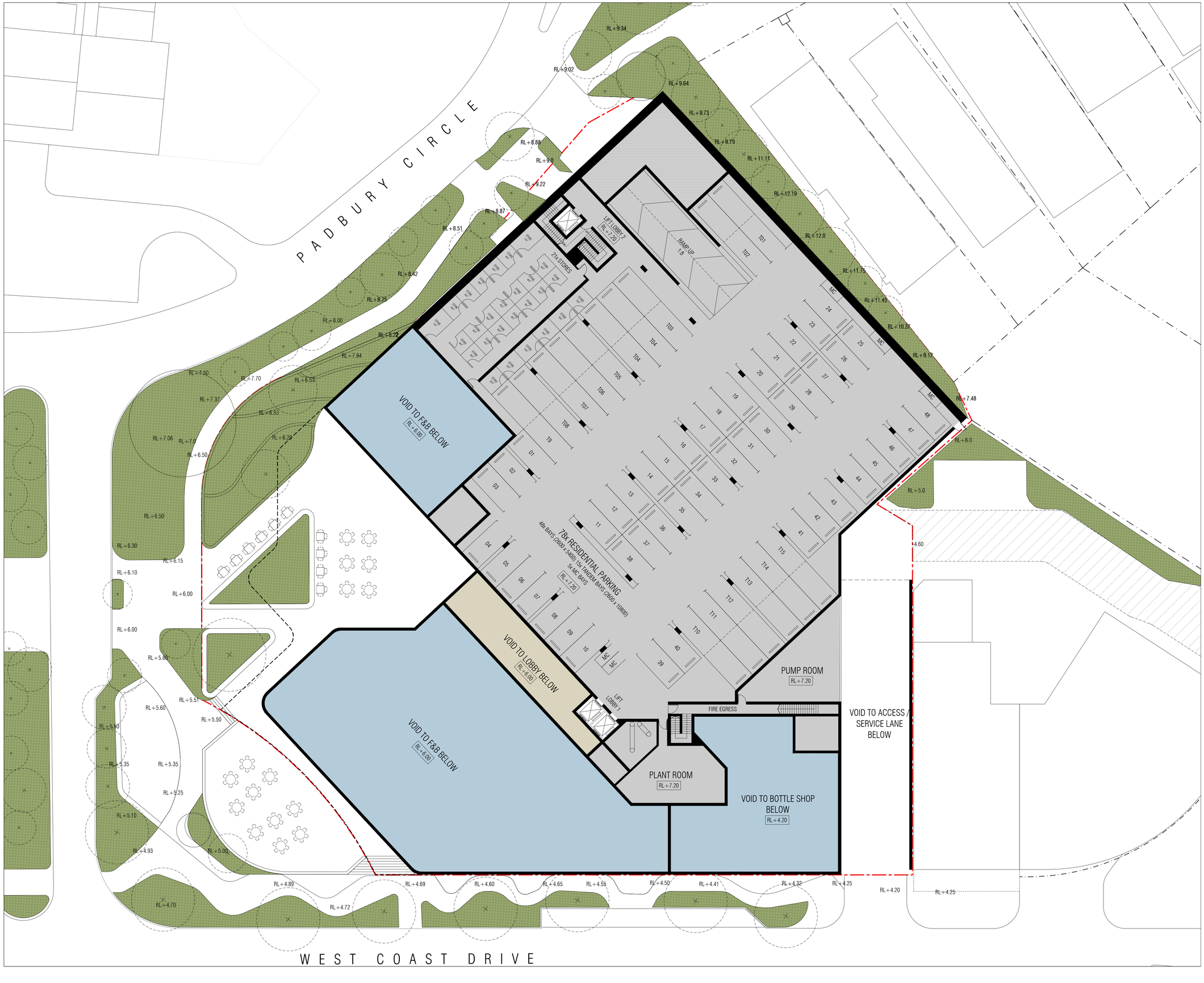
STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
GROUND FLOOR

DRAWING NO.	DRAFTER	CHECKED	REV.
1.02	--	TD	



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-	03.06.22	DEVELOPMENT APPLICATION	TD

PLANNING:	PLANNING SOLUTION
LANDSCAPE :	ASPECT STUDIO
WASTE:	TALIS
TRAFFIC:	CARDNO
ENERGY:	CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1

0 4 8

STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
MEZZANINE FLOOR

DRAWING NO.	DRAFTER	CHECKED	REV.
1.02	--	TD	

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CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1 (0 4 8)

STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
LEVEL 1

DRAWING NO.	DRAFTER	CHECKED	REV.
1.03	--	TD	

ATTACHMENT 7

Waste Management Plan

Sorrento Activity Centre – West Coast Drive, Sorrento

Prepared for Megara

27 May 2022

Project Number: TW21164

DOCUMENT CONTROL					
Version	**Description**	**Date**	**Author**	**Reviewer**	**Approver**
1.0	First Approved Release	16/12/2021	DM	DP	DP
2.0	Second Approved Release	27/05/2022	DM	DP	DP

Approval for Release

Name	**Position**	**File Reference**
Dilan Patel	Project Manager – Waste Management Consultant	TW21164-02_Waste Management Plan_2.0
Signature	Dilan Patel Digitally signed by Dilan Patel Date: 2022.05.27 11:59:29 +08'00'	

Executive Summary

Megara is seeking development approval for the proposed mixed-use development located at the corner of The Plaza and West Coast Drive, Sorrento (the Proposal).

To satisfy the conditions of the development application the City of Joondalup (the City) requires the submission of a Waste Management Plan (WMP) that will identify how waste is to be stored and collected from the Proposal. Talis Consultants has been engaged to prepare this WMP to satisfy the City's requirements.

A summary of the bin size, numbers, collection frequency and collection method is provided in the below table.

Proposed Waste Collection Summary

Waste Type	Generation (L/week)	Bin Size (L)	Number of Bins	Collection Frequency	Collection
Bin Storage Area – Residential					
Refuse	9,300	660	Five	Once each week	City of Joondalup
Recycling	6,960	660	Thirteen	Fortnightly	City of Joondalup
Bin Storage Area – Commercial					
Refuse	50,669	1,100	Ten	Five times each week	Private Contractor
Recycling	10,823	1,100	Two	Five times each week	Private Contractor

The City's and private contractors rear loader waste collection vehicles will travel with left hand lane traffic flow along West Coast Drive and pull into the Proposal's Service Bay adjacent to the Commercial Bin Storage Area for servicing.

Building management/caretaker will oversee the relevant aspects of waste management at the Proposal.

Table of Contents

Tables

Diagrams

Figures

1 Introduction

Megara is seeking development approval for the proposed mixed-use development located at West Coast Drive, Sorrento (the Proposal).

To satisfy the Development Application requirements, the State Development Assessment Unit (SDAU) requires the submission of a Waste Management Plan (WMP) that will identify how waste is to be stored and collected from the Proposal. Talis Consultants has been engaged to prepare this WMP to satisfy the City's requirements.

The Proposal is bordered by Padbury Circle to the north, residential tenancies to the east, West Coast Drive to the south and The Plaza to the west, as shown in Figure 1.

1.1 Objectives and Scope

The objective of this WMP is to outline the equipment and procedures that will be adopted to manage waste (refuse and recyclables) at the Proposal. Specifically, the WMP demonstrates that the Proposal is designed to:

- Adequately cater for the anticipated volume of waste to be generated;
- Provide adequately sized Bin Storage Areas, including appropriate bins; and
- Allow for efficient collection of bins by appropriate waste collection vehicles.

To achieve the objective, the scope of the WMP comprises:

- Section 2: Waste Generation;
- Section 3: Internal Transfer of Waste;
- Section 4: Waste Storage;
- Section 5: Waste Collection;
- Section 6: Waste Management; and
- Section 7: Conclusion.

2 Waste Generation

The following section shows the waste generation rates used and the estimated waste volumes to be generated at the Proposal.

2.1 Proposed Tenancies

The anticipated volume of refuse and recyclables is based on the number of apartments and the floor area (m^2) of the commercial tenancies at the Proposal. The Proposal consists of the following:

Residential:

- One Bedroom Apartments – 6;
- Two Bedroom Apartments – 28;
- Three Bedroom Apartments – 34; and
- Four Bedroom Apartments – 7.

Commercial:

- Food & Beverage Tenancies – 854m^2; and
- Bottleshop – 300m^2; and
- Food & Beverage Tenancy – 220m^2.

2.2 Waste Generation Rates

In order to achieve an accurate projection of waste volumes for the Proposal, consideration was given to the Western Australian Local Government Association's (WALGA) *Commercial and Industrial Waste Management Plan Guidelines* (2014), the City of Melbourne's *Guidelines for Preparing a Waste Management Plan* (2017) as well as previous discussions with the council providing direct advice for residential waste generations rates.

It should also be noted that a conservative approach has been taken with regards to waste generation across the Proposal by overestimating the potential waste volumes and assuming seven days of operation for all commercial tenancies.

Table 2-1 shows the waste generation rates which have been applied to the Proposal.

Table 2-1: Waste Generation Rates

Tenancy Use Type	Guideline Reference	Refuse Generation Rate	Recycling Generation Rate
Residential			
One Bedroom Apartments	Joondalup – 1 Bedroom	80L/week	60L/week
Two Bedroom Apartments	Joondalup – 2 Bedroom	110L/week	60L/week
Three Bedroom Apartments	Joondalup – 3+ Bedroom	140L/week	120L/week
Four Bedroom Apartments	Joondalup – 3+ Bedroom	140L/week	120L/week
Commercial			
Food & Beverage Tenancies	WALGA – Restaurants	660L/100m^2/day	130L/100m^2/day
Bottleshop	WALGA – Retail Shops (non-food) > 100m^2	50L/100m^2/day	50L/100m^2/day
Food & Beverage Tenancy	WALGA – Restaurants	660L/100m^2/day	130L/100m^2/day

2.3 Waste Generation Volumes

2.3.1 Residential Waste

Residential waste generation volumes in litres per week (L/week) adopted for this waste assessment are shown in Table 2-2. It is estimated that the residential apartments at the Proposal will generate 9,300L of refuse and 6,960L of recyclables each week.

Table 2-2: Estimated Waste Generation – Residential

Residential Apartments	Number of Apartments	Waste Generation Rate (L/week)	Waste Generation (L/week)
Refuse			
One Bedroom Apartments	6	80	480
Two Bedroom Apartments	28	110	3,080
Three Bedroom Apartments	34	140	4,760
Four Bedroom Apartments	7	140	980
		Total	**9,300**
Recyclables			
One Bedroom Apartments	6	60	360
Two Bedroom Apartments	28	60	1,680
Three Bedroom Apartments	34	120	4,080
Four Bedroom Apartments	7	120	840
		Total	**6,960**

2.3.2 Commercial Waste

Commercial waste generation volumes in litres per week (L/week) adopted for this waste assessment are shown in Table 2-3. It is estimated that the commercial tenancies at the Proposal will generate 50,669L of refuse and 10,823L of recyclables each week.

Table 2-3: Estimated Waste Generation – Commercial

Commercial Tenancies	Area (m^2)	Waste Generation Rate (L/100m^2/day)	Waste Generation (L/week)
REFUSE			
Food & Beverage Tenancies	854	660	39,455
Bottleshop	300	50	1,050
Food & Beverage Tenancy	220	660	10,164
		Total	**50,669**
RECYCLABLES			
Food & Beverage Tenancies	854	130	7,771
Bottleshop	300	50	1,050
Food & Beverage Tenancy	220	130	2,002
		Total	**10,823**

3 Internal Transfer of Waste

To promote positive recycling behaviour and maximise diversion from landfill, internal bins will be available throughout the Proposal for the source separation of refuse and recycling.

3.1 Residential Internal Bins

To promote positive recycling behaviour and maximise diversion from landfill, the residential apartments will have room to accommodate two under counter/kitchen bins for the separate disposal of refuse and commingled recyclables. The resident will then take the contents of these internal bins to the waste chute system, as described below.

3.1.1 Waste Chute System

To assist with efficient disposal of waste to the Residential Bin Storage Area, a dual chute waste system will be utilised. The dual chute utilises separate chutes for refuse and recycling waste.

The waste chutes will be located in close proximity to the elevators on each residential level have self-closing doors with and bottom hinge and fire rated to AS1530.4-2005. Chutes are typically 610mm in diameter and are ventilated with an extraction fan at the top to reduce odour and insulated for noise reduction. The chutes will be routinely cleaned via chute flushing operations. Please note, the exact design of the systems to be utilised at the Proposal will be determined at a later date following discussions with waste chute providers as the designs are finalised.

The Proposal is intending to utilise a carousel track system at the terminus of each of the waste chute systems to improve the efficiency of the building manager/caretaker manoeuvring bins within the Residential Bin Storage Area. Each carousel track system will be capable of accommodating four 660L bins which can be automatically or manually rotated to ensure the capture of waste material exiting the chute system. It can also be designed to send the building manager/caretaker a digital alert of the bins capacity to ensure the swapping of empty and full bins is done in a timely manner.

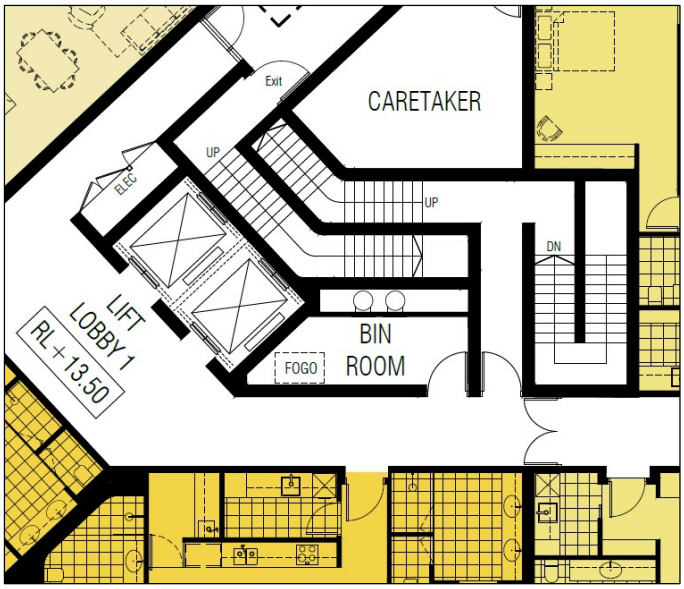
The building manager/caretaker will be required to manually swap full bins with empty bins on the system, as necessary.

It is proposed that the carousel track system at the terminus of the refuse chute will be fitted with a compaction unit. Refuse would be compacted to maximum compaction of 2 to 1 as higher compaction rates may result in heavier bins, causing Occupational Health and Safety (OH&S) problems and/or mechanical damage.

The building manager/caretaker will provide training materials for all new residents on how to use the waste system (typically within a resident handbook). The building manager/caretaker will advise residents of any changes to the waste system. In addition, signage will be included in the waste chute rooms to remind residents how to correctly dispose of their waste materials in the chute, and to provide relevant contact details for waste management at the Proposal.

Diagram 1 indicates the waste chute room for a typical residential floor at the development. The waste chute room on each level could also be used to temporarily house large cardboard items or bulky waste materials that should not be placed in the chute system to reduce the likelihood of blockage in the waste chutes.

Diagram 1: Typical Residential Waste Chute Room



3.2 Commercial Internal Bins

The commercial tenancies will have a minimum of two internal bins to facilitate the separate disposal of refuse and recyclables. The contents of these internal bins will be transferred by the tenant, staff or cleaners to the Commercial Bin Storage Area and be deposited into the appropriate bins.

4 Waste Storage

Waste materials generated within the Proposal will be collected in the bins located in the Bin Storage Areas, as shown in Diagram 2 and Diagram 3, and discussed in the following sub-sections.

4.1 Bin Sizes

Table 4-1 gives the typical dimensions of standard bins sizes that may be utilised at the Proposal. It should be noted that these bin dimensions are approximate and can vary slightly between suppliers.

Table 4-1: Typical Bin Dimensions

Dimensions	Bin Sizes			
	240L	360L	660L	1,100L
Depth (mm)	730	848	780	1,070
Width (mm)	585	680	1,260	1,240
Height (mm)	1,060	1,100	1,200	1,300
Area (mm^2)	427	577	983	1,327

Reference: SULO Bin Specification Data Sheets

4.2 Residential Bin Storage Area Size

To ensure sufficient area is available for storage of the residential bins, the amount of bins required for the Residential Bin Storage Area was modelled utilising the estimated waste generation in Table 2-2, bin sizes in Table 4-1 and based on weekly collections of refuse and fortnightly collections of recyclables.

Based on the results shown in Table 4-2 the Residential Bin Storage Area has been sized to accommodate:

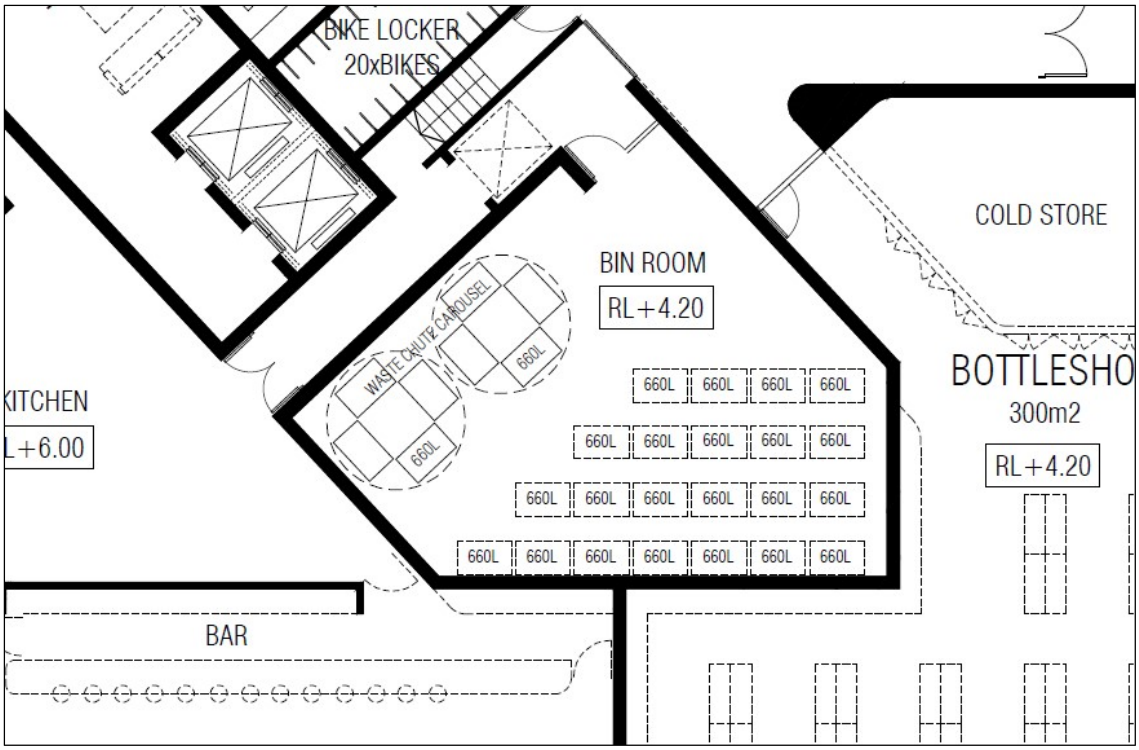
- Eight 660L refuse bins; and
- Twenty-Two 660L recycling bins.

Table 4-2: Bin Requirements for Bin Storage Area – Residential

Waste Stream	Waste Generation (L/week)	Number of Bins Required		
		240L	660L	1,100L
Refuse (compacted 2:1)	9,300	20	8	5
Recycling	6,960	58	22	13

The configuration of these bins within the Residential Bin Storage Area is shown in Diagram 2. It is worth noting that the number of bins and corresponding placement of bins shown in Diagram 2 represents the maximum requirements assuming collections once each week of refuse and fortnightly collections of recyclables.

Diagram 2: Residential Bin Storage Area



4.2.1 Provision for Food Organics Garden Organics (FOGO)

In the near future it is expected that the City will be introducing bins for the separate collection of food organics and garden organics (FOGO) within multi-unit residential properties in line with the state government's Waste Avoidance and Resource Recovery (WARR) Strategy 2030. As such, the development has provided sufficient space to accommodate additional 240L FOGO bins, should the development be required to separate food waste for collection in the future.

Kitchen caddies would be used in each residential apartment to collect FOGO, which will then be taken by residents directly to the Residential Bin Storage Area located on the Ground Floor for depositing into communal 240L lime green lidded FOGO bins.

4.3 Commercial Bin Storage Area Size

To ensure sufficient area is available for storage of the commercial bins, the amount of bins required for the Commercial Bin Storage Area was modelled utilising the estimated waste generation in Table 2-3, bin sizes in Table 4-1 and based on collection of refuse and recyclables five times each week.

Based on the results shown in Table 4-3 the Commercial Bin Storage Area has been sized to accommodate:

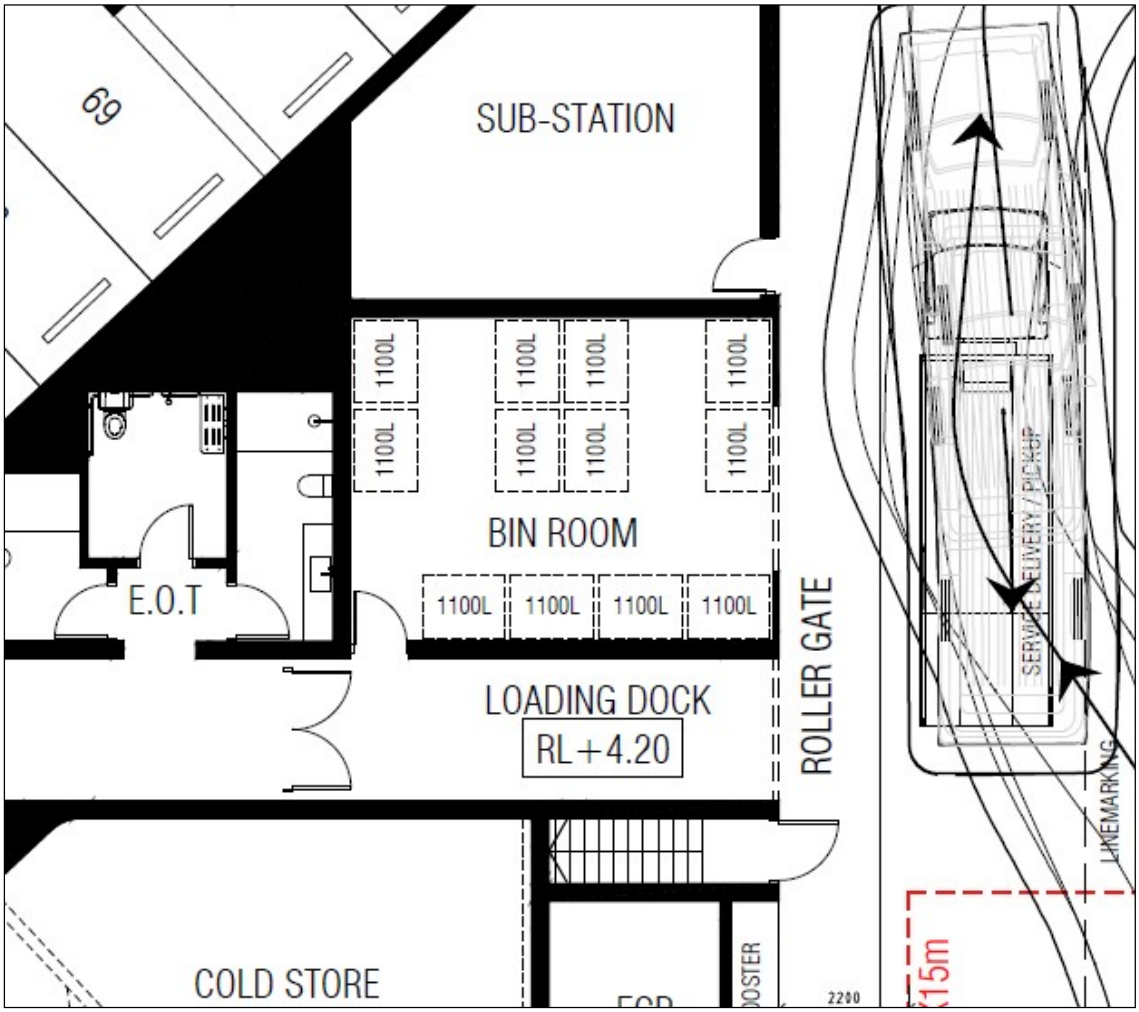
- Ten 1,100L refuse bins; and
- Two 1,100L recycling bins.

Table 4-3: Bin Requirements for Bin Storage Area – Commercial

Waste Stream	Waste Generation (L/week)	Number of Bins Required			
		240L	360L	660L	1,100L
Refuse	50,669	43	29	16	10
Recycling	10,823	10	7	4	2

The configuration of these bins within the Commercial Bin Storage Area is shown in Diagram 3. It is worth noting that the number of bins and corresponding placement of bins shown in Diagram 3 represents the maximum requirements assuming five collections each week of refuse and recyclables.

Diagram 3: Commercial Bin Storage Area



4.4 Bin Storage Area Design

The design of the Bin Storage Areas will take into consideration:

- Smooth impervious floor sloped to a drain connected to the sewer system;
- Taps for washing of bins and Bin Storage Areas;
- Adequate aisle width for easy manoeuvring of bins;
- No double stacking of bins;
- Doors to the Bin Storage Area self-closing and vermin proof;
- Doors to the Bin Storage Area wide enough to fit bins through;
- Ventilated to a suitable standard;
- Appropriate signage;
- Undercover where possible and be designed to not permit stormwater to enter into the drain;
- Located behind the building setback line;
- Bins not to be visible from the property boundary or areas trafficable by the public; and
- Bins are reasonably secured from theft and vandalism.

Bin numbers and storage space within the Bin Storage Areas will be monitored by building management/caretaker during the operation of the Proposal to ensure that the number of bins and collection frequency is sufficient.

5 Waste Collection

It is proposed that the City's rear loader waste collection vehicle will service the residential apartments and provide:

- Eight 660L refuse bins, collected once each week; and
- Twenty-Two 660L recycling bins, collected fortnightly.

It is proposed that a private contractor's rear loader waste collection vehicle will service the commercial tenancies and provide:

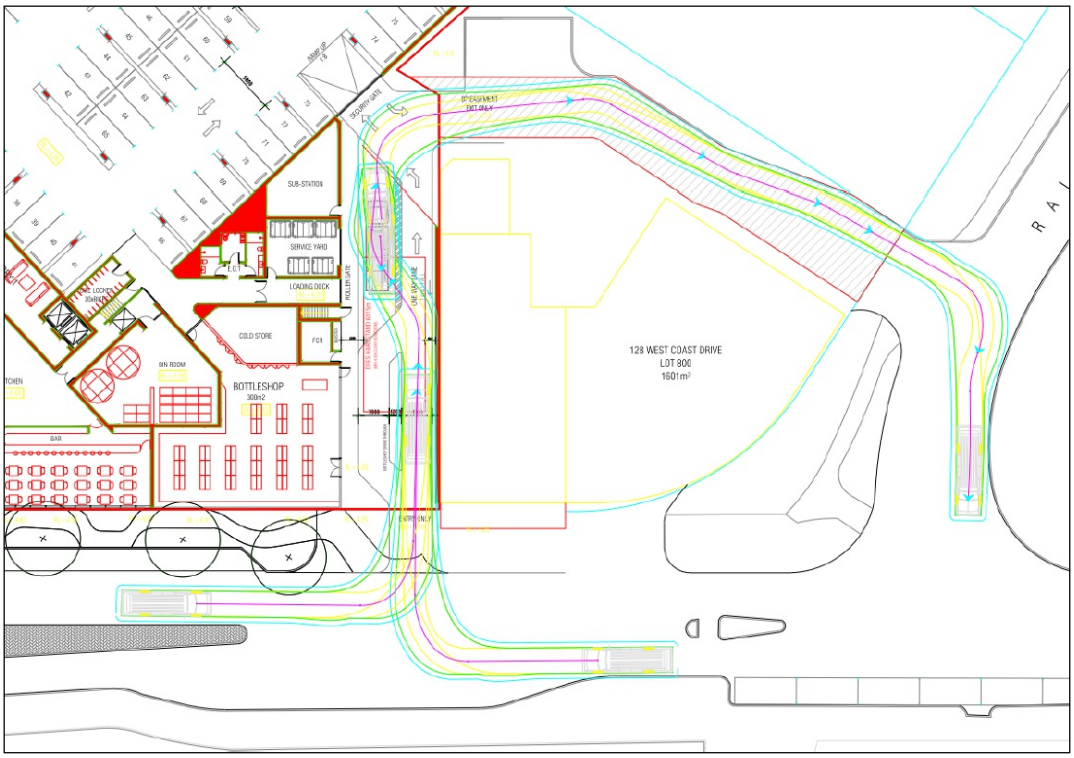
- Ten 1,100L refuse bins, collected five times each week; and
- Two 1,100L recycling bins, collected five times each week.

The City's and private contractor's rear loader waste collection vehicle will service the bins onsite from Service Bay. The City's and private contractors rear loader waste collection vehicle will travel with left hand lane traffic flow along West Coast Drive in forward gear, turn into the Proposal and pull up adjacent to the Commercial Bin Storage Area in the Service Bay for servicing, as shown in Diagram 4.

The City and private contractor will be provided with key/PIN code access to the Bin Storage Areas and security access gates to facilitate servicing, if required.

Once servicing is complete the City's and private contractor's waste collection vehicle will continue in a forward motion through the BP Easement Exit Only, moving with traffic flow, refer Diagram 4.

Diagram 4: Swept Path Analysis



Reference: Cardno Transport Impact Assessment (26 May 2022)

5.1 Residential Bulk Waste

The City offers residents the following on demand bulk waste collection services annually:

- One collection of up to four white goods;
- One collection of up to six mattresses; and
- One three cubic metre skip bin ($3m^3$) or lounge suite collection.

Store Rooms are located throughout the Proposal which will be used for the temporary storage of bulk waste waiting collection. The Service Bay/visitor bay will be designated for the temporary placement of a $3m^3$ skip bin, and for use as a collection point for e-wastes, whitegoods and mattresses, as required.

Building management/caretaker will be required to organise collection of bulk waste with the City, as required.

5.2 Commercial Bulk and Speciality Waste

Bulk and speciality waste materials will be removed from the Proposal as they are generated on an 'as required' basis. Adequate space to be allocated throughout the Proposal for placement of cabinets/containers for collection and storage of bulk and specialty wastes that are unable to be disposed of within the bins in the Commercial Bin Storage Area.

These may include items such as:

- Refurbishment wastes from fit outs;
- Batteries and E-wastes;
- White goods/appliances;
- Cleaning chemicals; and
- Commercial Light globes.

Bulk and specialty waste collection will be monitored by building management/caretaker who will organise their transport to the appropriate waste facility, as required.

6 Waste Management

Building management/caretaker will be engaged to complete the following tasks:

- Monitoring and maintenance of bins, waste systems, equipment and the Bin Storage Areas;
- Cleaning of bins and Bin Storage Areas, when required;
- Exchange full bins with empty bins at the terminus of the waste chute;
- Rotating full and empty bins within the Residential Bin Storage Area, as required;
- Rotating full and empty bins within the Commercial Bin Storage Area, as required;
- Ensure all tenants/residents at the Proposal are made aware of this WMP and their responsibilities thereunder;
- Monitor tenants/residents behaviour and identify requirements for further education and/or signage;
- Monitor bulk and speciality waste accumulation and assist with its removal, as required;
- Regularly engage with tenants/residents to develop opportunities to reduce waste volumes and increase resource recovery; and
- Regularly engage with the City and private contractors to ensure efficient and effective waste service is maintained.

7 Conclusion

As demonstrated within this WMP, the Proposal provides sufficiently sized Bin Storage Areas for storage of refuse and recyclables, based on the estimated waste generation volumes and suitable configuration of bins. This indicates that adequately designed Bin Storage Areas have been provided, and collection of refuse and recyclables can be completed from the Proposal.

The above is achieved using:

Residential Apartments:

- Eight 660 refuse bins, collected once each week; and
- Twenty-Two 660L recycling bins, collected fortnightly.

Commercial:

- Ten 1,100L refuse bins, collected five times each week; and
- Two 1,100L recycling bins, collected five times each week.

The City's and private contractors rear loader waste collection vehicles will travel with left hand lane traffic flow along West Coast Drive and pull into the Proposal's Service Bay adjacent to the Commercial Bin Storage Area for servicing.

Building management/caretaker will oversee the relevant aspects of waste management at the Proposal.

Figures

P PO Box 454, Lederville WA 6903 | A 604 Newcastle St, Leederville WA 6007 | T 1300 251 070 | W www.talisconsultants.com.au

LEGEND

- Site Layout
- Cadastre

LOCALITY PLAN

Sorrento Activity Centre
Sorrento, WA 6020

Megara

0 10 20 30 40 m

Coordinate System: GCS GDA 1994, Datum: GDA 1994
Scale @ A3: 1:1,000

Prepared: W Robertson	Date: 30/11/2021
Reviewed: D Marchant	Revision: A
Project: TW21164	

talis consultants

Figure 1

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Assets | Engineering | Environment | Noise | Spatial | Waste

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ATTACHMENT 8

HERRING STORER ACOUSTICS

MEGARA

MULTI-USE DEVELOPMENT
WEST COAST DRIVE
SORRENTO

SPP 5.4 NOISE MANAGEMENT PLAN

DECEMBER 2021
Updated Plans from May 2022

OUR REFERENCE: 28857-1-21485

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
P.O. Box 219, Como, W.A. 6952
(08) 9367 6200
hsa@hsacoustics.com.au

DOCUMENT CONTROL PAGE

SPP 5.4 NOISE MANAGEMENT PLAN
WEST COAST DRIVE
SORRENTO

Job No: 21485

Document Reference: 28857-1-21485

FOR

MEGARA

DOCUMENT INFORMATION			
Author:	Geoffrey Harris	**Checked By:**	George Watts
Date of Issue:	14 December 2021		

REVISION HISTORY

Revision	Description	Date	Author	Checked

DOCUMENT DISTRIBUTION

Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Megara Attn: Trent Durward Email: trent.durward@megara.net.au		☒

CONTENTS

APPENDICES

1. INTRODUCTION

Herring Storer Acoustics were commissioned through Megara to carry out an acoustic study with regards to traffic related noise for the proposed multi-use development at Lots 2 and 149 West Coast Drive, Lot 148 The Plaza, Lots 146 and 147 Padbury Circle, and Lot 145 Drakes Walk, Sorrento.

The purpose of the study was to:

- Assess the noise that would be received within the development area from vehicles travelling on West Coast Drive for future traffic volumes.
- Compare the results with accepted criteria and if exceedances exist, develop the framework for the management of noise.

A plan is attached in Appendix A.

2. ACOUSTIC CRITERIA

2.1 NOISE

The Western Australian Planning Commission (WAPC) released on 6th September 2019 State Planning Policy 5.4 *"Road and Rail Noise".* The requirements of State Planning Policy 5.4 are outlined below.

POLICY APPLICATION (Section 4)

When and where it applies (Section 4.1)

SPP 5.4 applies to the preparation and assessment of planning instruments, including region and local planning schemes; planning strategies, structure plans; subdivision and development proposals in Western Australia, where there is proposed:

a) *noise-sensitive land-use within the policy's trigger distance of a transport corridor as specified in **Table 1**;*
b) *New or major upgrades of roads as specified in **Table 1** and maps **(Schedule 1,2 and 3);** or*
c) *New railways or major upgrades of railways as specified in maps (**Schedule 1, 2 and 3);** or any other works that increase capacity for rail vehicle storage or movement and will result in an increased level of noise.*

Policy trigger distances (Section 4.1.2)

***Table 1** identifies the State's transport corridors and the trigger distances to which the policy applies.*

*The designation of land within the trigger distances outlined in **Table 1** should not be interpreted to imply that land is affected by noise and/or that areas outside the trigger distances are un-affected by noise.*

*Where any part of the lot is within the specified trigger distance, an assessment against the policy is required to determine the likely level of transport noise and management/ mitigation required. An initial screening assessment (**guidelines: Table 2: noise exposure forecast**) will determine if the lot is affected and to what extent."*

TABLE 1: TRANSPORT CORRIDOR CLASSIFICATION AND TRIGGER DISTANCES

Transport corridor classification	***Trigger distance***	***Distance measured from***
Roads		
Strategic freight and major traffic routes *Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume*	*300 metres*	*Road carriageway edge*
Other significant freight/traffic routes *These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meet the criteria of either >=23,000 daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes)*	*200 metres*	*Road carriageway edge*
Passenger railways		
	100 metres	*Centreline of the closest track*
Freight railways		
	200 metres	*Centreline of the closest track*

Proponents are advised to consult with the decision making authority as site specific conditions (significant differences in ground levels, extreme noise levels) may influence the noise mitigation measures required, that may extend beyond the trigger distance.

POLICY MEASURES (Section 6)

The policy applies a performance-based approach to the management and mitigation of transport noise. The policy measures and resultant noise mitigation will be influenced by the function of the transport corridor and the type and intensity of the land-use proposed. Where there is risk of future land-use conflict in close proximity to strategic freight routes, a precautionary approach should be applied. Planning should also consider other broader planning policies. This is to ensure a balanced approach takes into consideration reasonable and practical considerations.

Noise Targets (Section 6.1)

***Table 2** sets out noise targets that are to be achieved by proposals under which the policy applies. Where exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.*

In the application of the noise targets the objective is to achieve:

- *indoor noise levels as specified in **Table 2** in noise sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and child care centres the design of outdoor areas should take into consideration the noise target.*

It is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.

TABLE 2: NOISE TARGETS

Proposals	***New/Upgrade***	***Noise Targets***		
		Outdoor		***Indoor***
		Day (L_{Aeq}(Day) dB) (6 am-10 pm)	***Night (L_{Aeq}(Night)dB) (10 pm-6 am)***	***(L_{Aeq} dB)***
Noise-sensitive land-use and/or development	*New noise sensitive land use and/or development within the trigger distance of an existing/proposed transport corridor*	*55*	*50*	*L_{Aeq} (Day) 40(Living and work areas) L_{Aeq} (Night) 35 (bedrooms)*
Roads	*New*	*55*	*50*	*N/A*
	Upgrade	*60*	*55*	*N/A*
Railways	*New*	*55*	*50*	*N/A*
	Upgrade	*60*	*55*	*N/A*

Notes:

- *The noise target is to be measured at one metre from the most exposed, habitable façade of the proposed building, which has the greatest exposure to the noise-source. A habitable room has the same meaning as defined in State Planning Policy 3.1 Residential Design Codes.*
- *For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.*
- *The 5dB difference in the criteria between new and upgrade infrastructure proposals acknowledges the challenges in achieving noise level reduction where existing infrastructure is surrounded by existing noise-sensitive development.*
- *Outdoor targets are to be met at all outdoor areas as far as is reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines. For example, it is likely unreasonable for a transport infrastructure provider to achieve the outdoor targets at more than 1 or 2 floors of an adjacent development with direct line of sight to the traffic.*

<u>Noise Exposure Forecast (Section 6.2)</u>

*When it is determined that SPP 5.4 applies to a planning proposal as outlined in Section 4, proponents and/or decision makers are required to undertake a preliminary assessment using **Table 2**: noise exposure forecast in the guidelines. This will provide an estimate of the potential noise impacts on noise-sensitive land-use and/ or development within the trigger distance of a specified transport corridor. The outcomes of the initial assessment will determine whether:*

- *no further measures are required.*
- *noise-sensitive land-use and/or development is acceptable subject to deemed-to-comply mitigation measures; or*
- *noise-sensitive land-use and/or development is not recommended. Any noise-sensitive land-use and/ or development is subject to mitigation measures outlined in a noise management plan."*

3. ACOUSTIC ENVIRONMENT

The noise measurements were conducted on 8:30AM, 6 December 2021 for a short term period to determine the L_{A10} noise level traffic for approximately 15 minutes. This time period has been identified as peak traffic period for the road to ensure of a conservative measurement. Traffic volume details for this road section are included in Appendix C.

Utilising this measurement, reference to the DEFRA publication has been sought and the difference between the $L_{A10,18hr}$ and the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ has been calculated. The location of the measurements is shown in Appendix A.

Noise measurements were conducted with a Larson Davis 831 Sound Level Meter. The Sound Level Meter was calibrated prior to and after use with a Bruel and Kjaer 4230 Calibrator. All equipment used is currently NATA laboratory calibrated. Calibration certificates are available on request.

TABLE 3.1: SUMMARY OF MEASURED NOISE LEVELS

Measurement Location	Measured/Calculated Noise Level, dB(A)		
	L_{A10}	$L_{Aeq,\ day\ (6am\ to\ 10pm)}$	$L_{Aeq,\ night\ (10pm\ to\ 6am)}$
149 West Coast Drive	69.1	65.9	58.4

4. MODELLING

To determine the noise levels from traffic on West Coast Drive, acoustic modelling was carried out using Sound Plan, using the Calculation of Road Traffic Noise (CoRTN)[1] algorithms.

The input data for the model included:

- Topographical and cadastral data supplied by client (Shown in Appendix A).
- Traffic data as per Table 4.1 (Obtained from MRWA Traffic Map, Attached in Appendix C).
- Adjustments as listed in Table 4.2.

TABLE 4.1 - NOISE MODELLING INPUT DATA

Parameter	West Coast Drive (Current) 2020	West Coast Drive (Future) 2041
Traffic Volumes	15,880 vpd	23,600 vpd
Percentage traffic 0600 – 2400 hours (Assumed)	94%	94%
Heavy Vehicles (%) (Assumed)	6.0%	6.0%
Speed (km/hr)	50 km/hr	50 km/hr
Road Surface	Chip Seal	Dense Graded Asphalt

TABLE 4.2 – ADJUSTMENTS FOR NOISE MODELLING

Description	Value
Façade Reflection Adjustment	+2.5 dB
Conversion from $L_{A10\ (18\ hour)}$ to $L_{Aeq\ (16\ hour)}$ (Day)	-3.2 dB*

1 *Calculation of Road Traffic Noise* UK Department of Transport 1987

5. TRAFFIC NOISE ASSESSMENT

Using the data contained in Tables 3.1, 4.1 and 4.2, modelling was carried out under existing conditions for calibration. The Sound Plan model for the site has been set up for the 2041 scenario as defined in Table 4.1. The following assumptions have been made:

- 18 hour traffic count will be 94% of daily figures.
- Noise model calibrated to measured noise level as per Table 3.1
- The same diurnal relationship will exist in the future between the $L_{A10\ (18\ hour)}$ and the L_{Aeq} parameters; and
- 2.5 dB(A) has been added to the results for façade reflection.

The noise requirements based on the above have been listed in Appendix B.

It is noted that these requirements pertain to acoustic requirements only, with regard to *State Planning Policy 5.4,* and may be superseded by other requirements (BAL, Thermal, etc).

6. CONCLUSION

In accordance with the WAPC Planning Policy 5.4, an assessment of the noise that would be received within the development, from vehicles travelling on West Coast Drive has been undertaken.

In accordance with the Policy, the following would be the acoustic criteria applicable to this project:

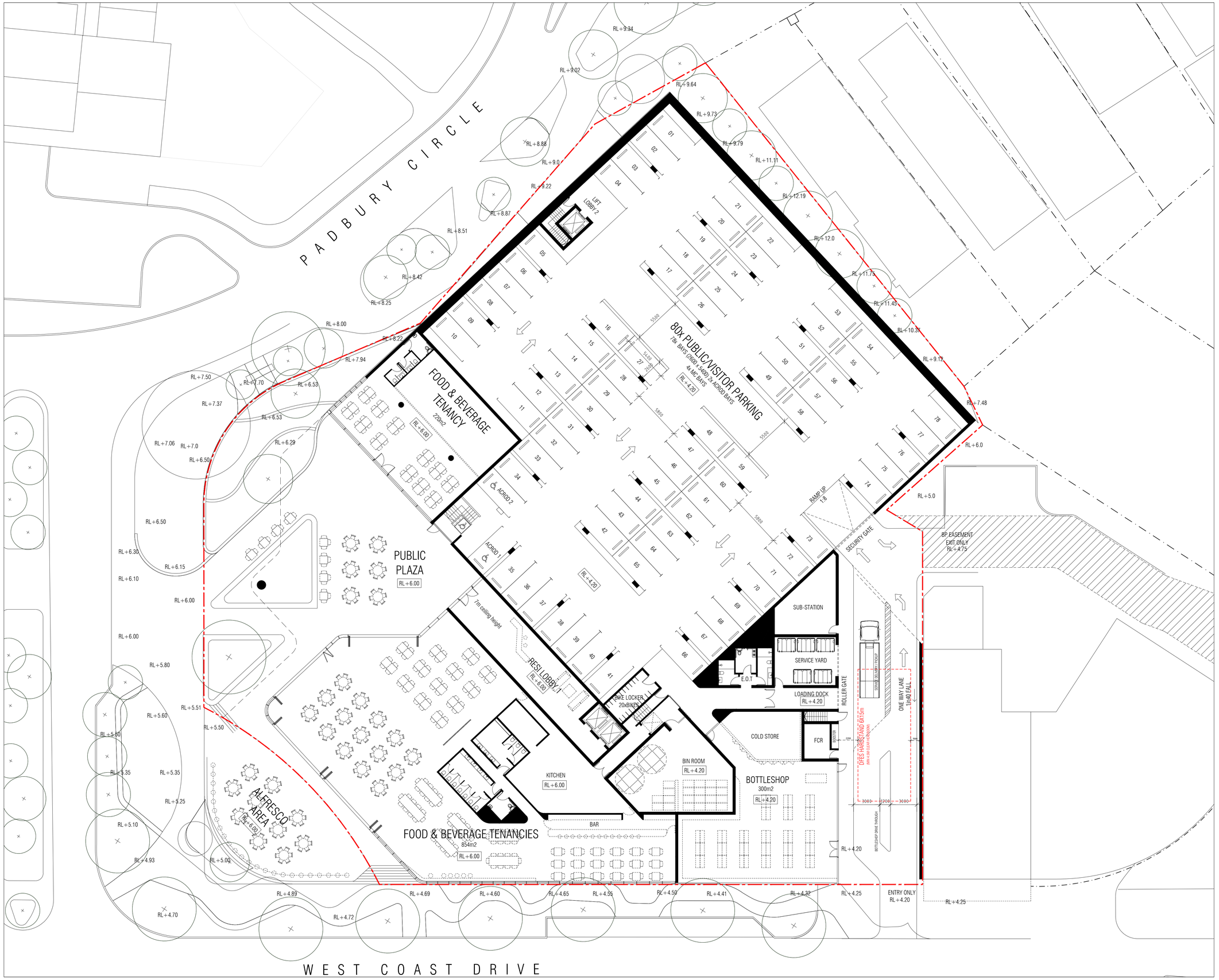
External	
Day	55 dB(A) L_{Aeq}
Night	50 dB(A) L_{Aeq}
Internal	
Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

It is noted that walls of the development would be required to be constructed of either masonry or tilt up concrete panel. If a lightweight construction or similar is desirable, investigation into constructions that would meet the requirement of State Planning Policy 5.4 would have to be undertaken.

The results of the acoustic assessment indicate that noise received at the development from future traffic, exceed external noise level criteria. Therefore, noise amelioration in the form of quiet house design listed in Appendix B, as well as notifications on the title is required.

APPENDIX A

PLANS



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-	03.05.22	FOR INFORMATION / SDRP 3	TD

PLANNING:	PLANNING SOLUTION
LANDSCAPE :	ASPECT STUDIO
WASTE:	TALIS
TRAFFIC:	CARDNO
ENERGY:	CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1

0 4 8

STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
GROUND FLOOR

DRAWING NO.	DRAFTER	CHECKED	REV.
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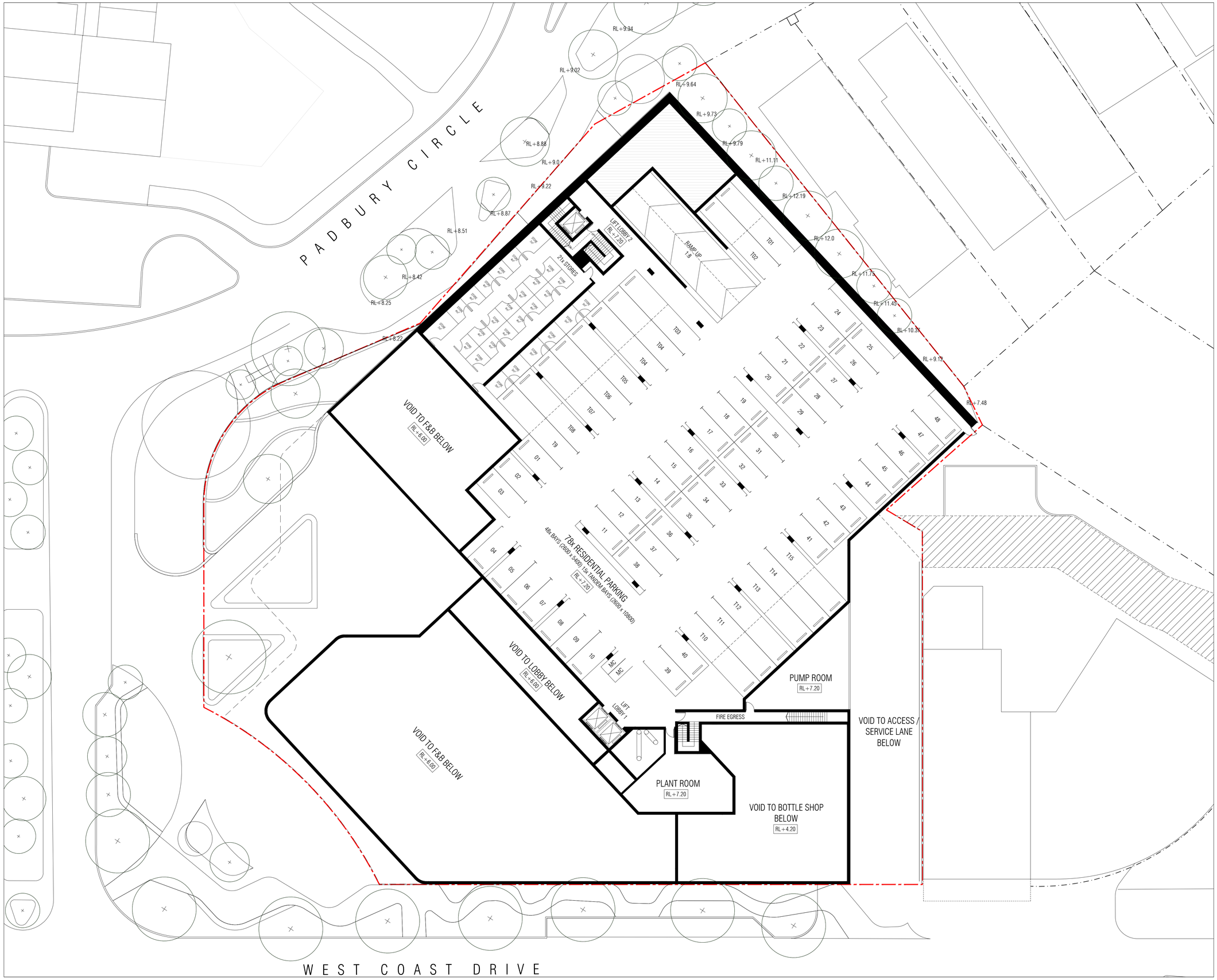

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NORTH

SCALE
1:200 @ A1
0 4 8

STATUS
DEVELOPMENT APPLICATION

DRAWING
GENERAL ARRANGEMENT
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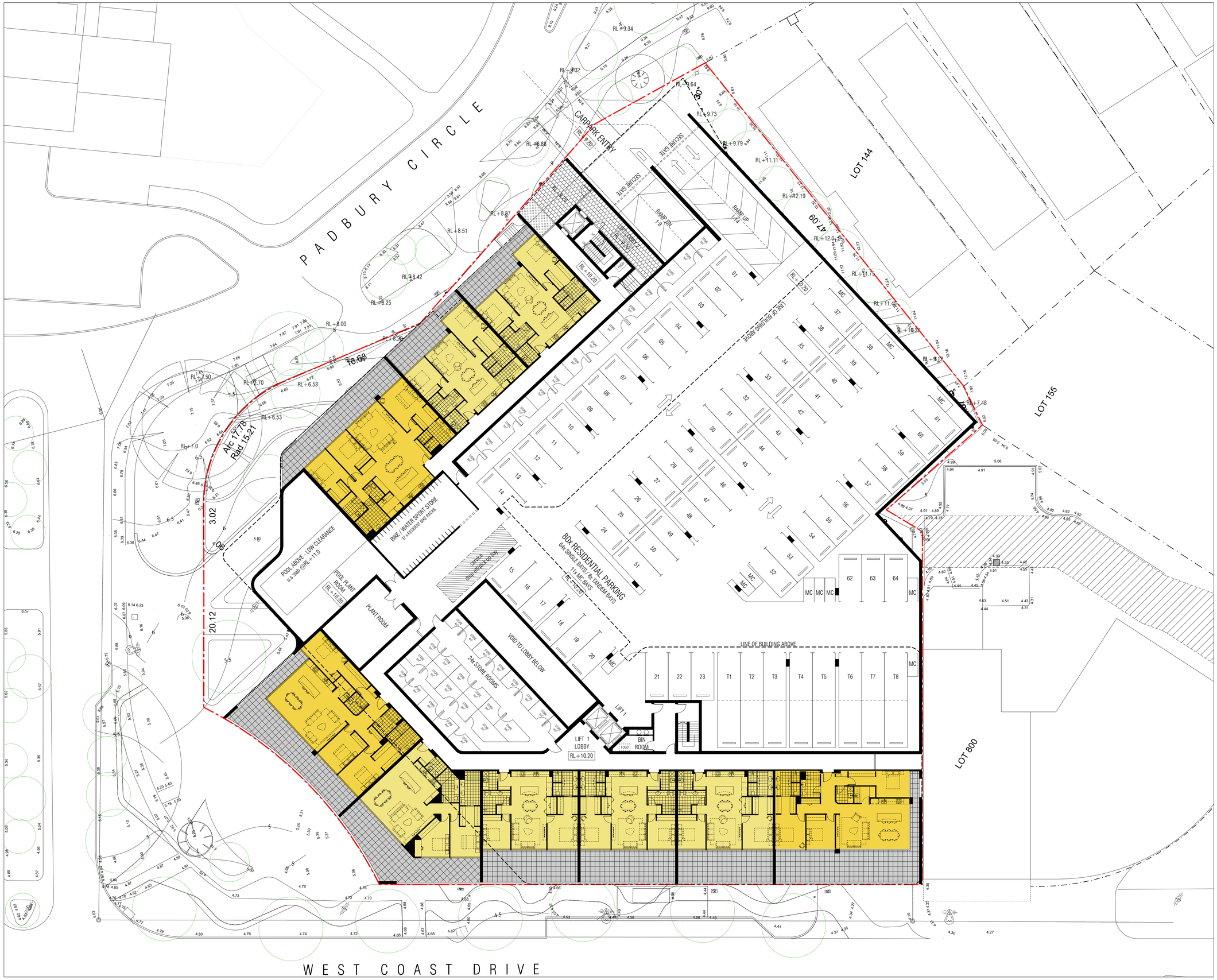

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SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS
WEST COAST DRIVE
SORRENTO, WA

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NORTH

SCALE
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STATUS
DEVELOPMENT APPLICATION

DRAWING
GENERAL ARRANGEMENT
LEVEL 1

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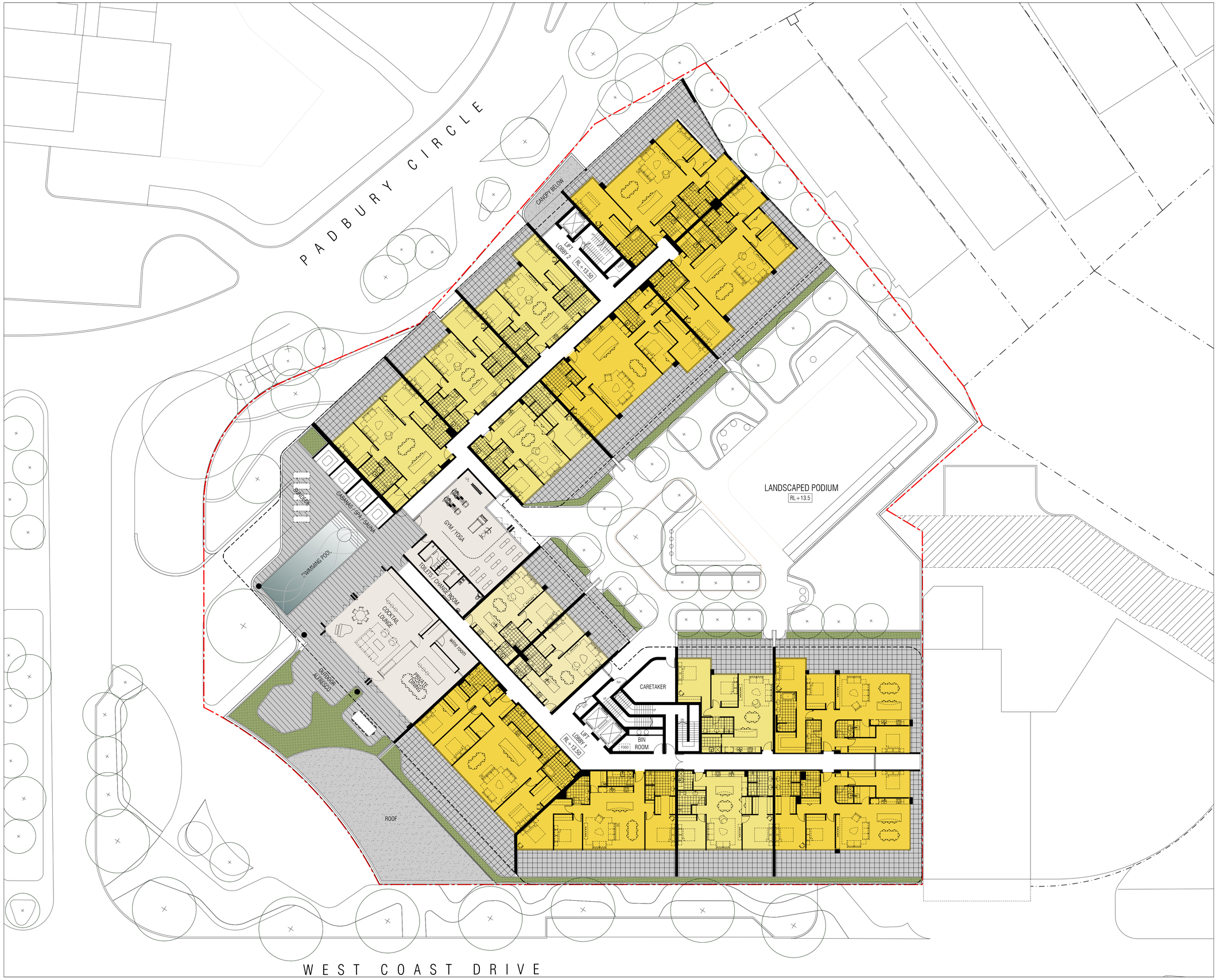

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PLANNING: PLANNING SOLUTION
LANDSCAPE : ASPECT STUDIO
WASTE: TALIS
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CLIENT
MEGARA

PROJECT
SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS
WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER
20057

NORTH

SCALE
1:200 @ A1
0 4 8

STATUS
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GENERAL ARRANGEMENT
LEVEL 2

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-	03.05.22	FOR INFORMATION / SDRP 3	TD

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MEGARA

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SORRENTO ACTIVITY CENTRE

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WEST COAST DRIVE
SORRENTO, WA

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NORTH

SCALE
1:200 @ A1
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STATUS
DEVELOPMENT APPLICATION

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1:200 @ A1

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STATUS

DEVELOPMENT APPLICATION

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GENERAL ARRANGEMENT
LEVEL 4

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- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1

0 4 8

STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
LEVEL 5

DRAWING NO.	DRAFTER	CHECKED	REV.
1.07	--	TD	

MJA STUDIO

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REV.	DATE	AMENDMENT	INIT.
-	17.12.21	DEVELOPMENT APPLICATION	TD
-	15.03.22	FOR INFORMATION / SDRP 2	TD
-	03.05.22	FOR INFORMATION / SDRP 3	TD

PLANNING:	PLANNING SOLUTION
LANDSCAPE :	ASPECT STUDIO
WASTE:	TALIS
TRAFFIC:	CARDNO
ENERGY:	CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1 (0, 4, 8)

STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
LEVEL 6

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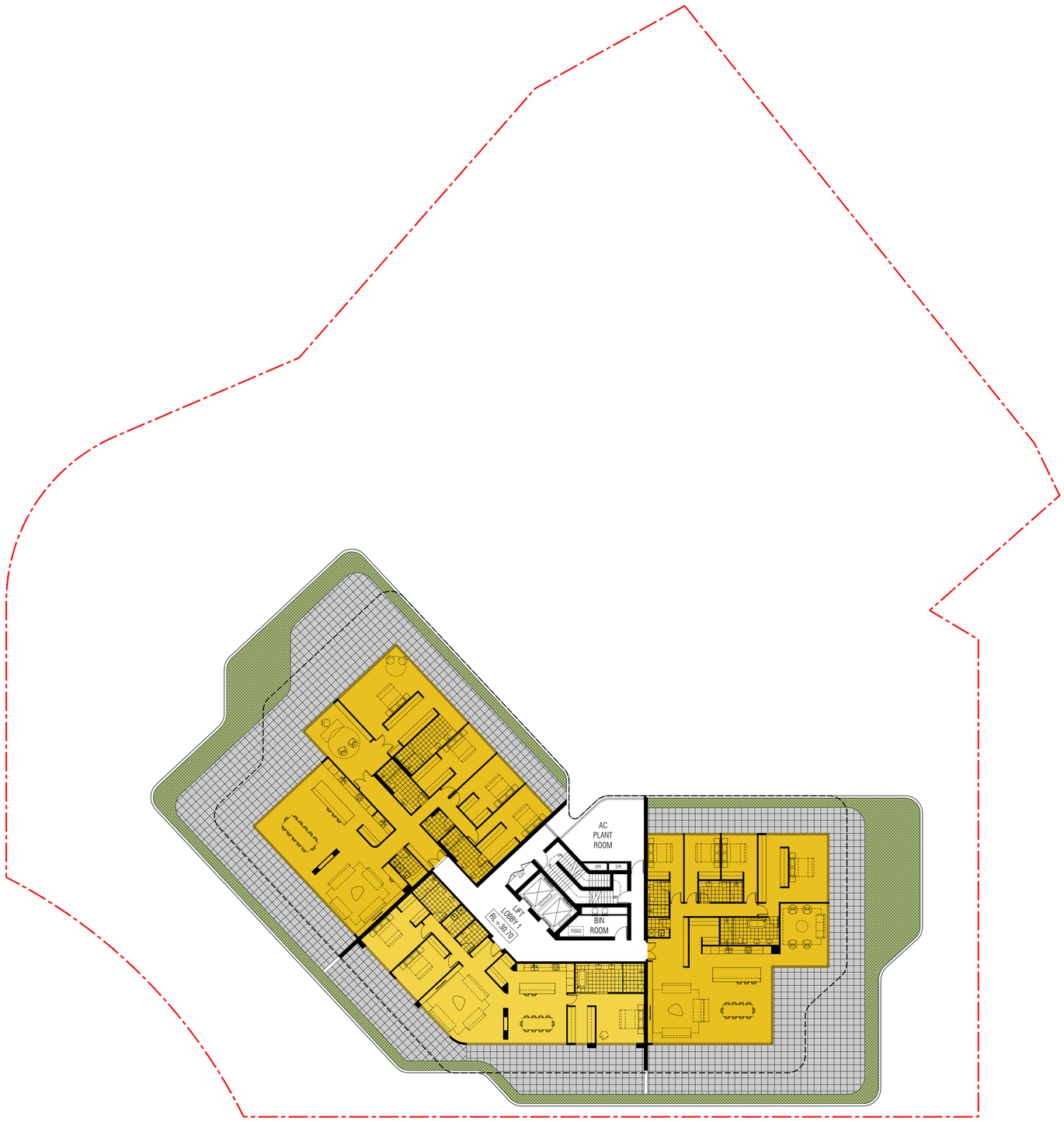

MJA STUDIO

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REV.	DATE	AMENDMENT	INIT.
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-	15.03.22	FOR INFORMATION / SDRP 2	TD
-	03.05.22	FOR INFORMATION / SDRP 3	TD

PLANNING: PLANNING SOLUTION
LANDSCAPE : ASPECT STUDIO
WASTE: TALIS
TRAFFIC: CARDNO
ENERGY: CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT
MEGARA

PROJECT
SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS
WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER
20057

NORTH

SCALE
1:200 @ A1
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STATUS
DEVELOPMENT APPLICATION

DRAWING
GENERAL ARRANGEMENT
LEVEL 7

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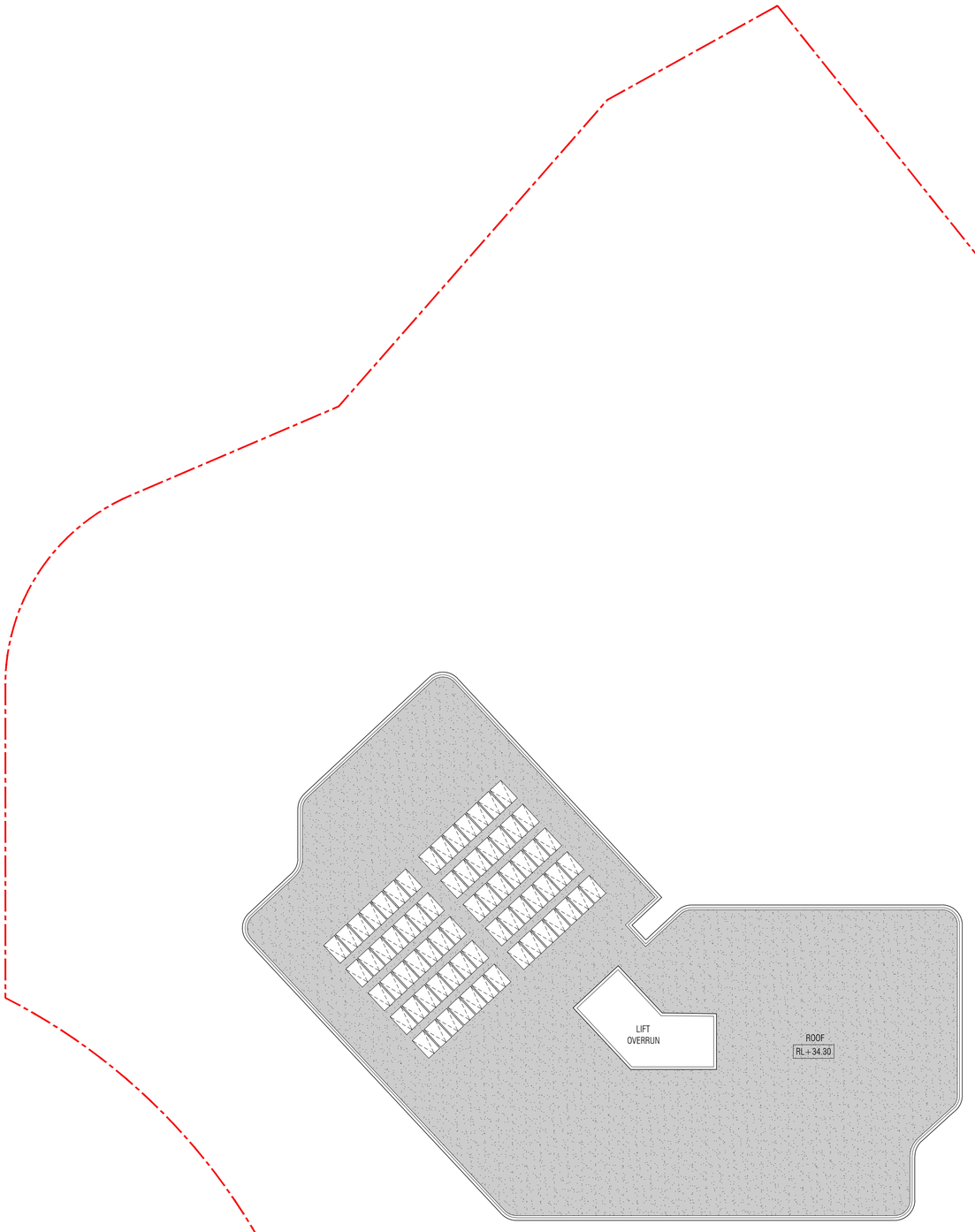

MJA STUDIO

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REV.	DATE	AMENDMENT	INIT.
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-	15.03.22	FOR INFORMATION / SDRP 2	TD
-	03.05.22	FOR INFORMATION / SDRP 3	TD

PLANNING:	PLANNING SOLUTION
LANDSCAPE :	ASPECT STUDIO
WASTE:	TALIS
TRAFFIC:	CARDNO
ENERGY:	CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT

CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

1:200 @ A1

0 4 8

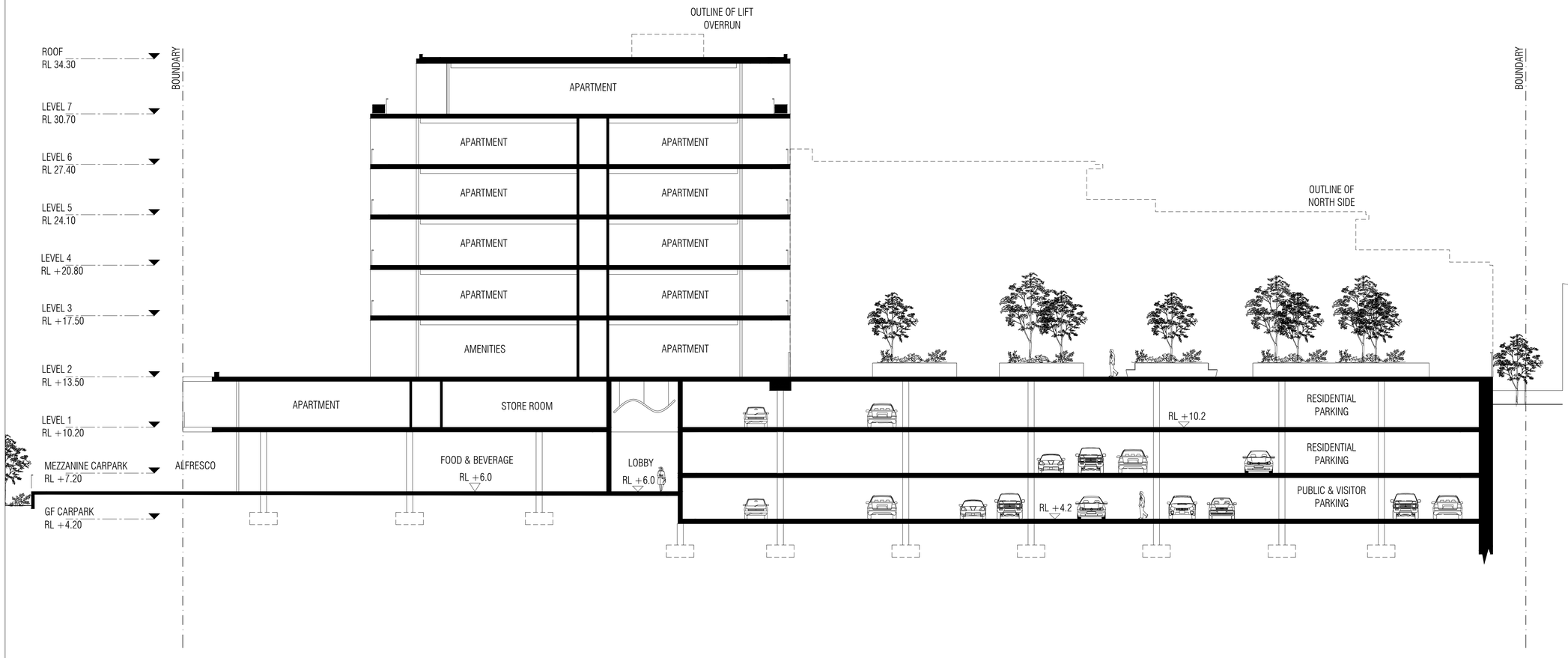
STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
ROOF

DRAWING NO.	DRAFTER	CHECKED	REV.
1.10	--	TD	



MJA STUDIO

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REV.	DATE	AMENDMENT	INIT.
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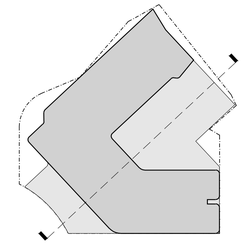
-	15.03.22	FOR INFORMATION / SDRP 2	TD
-	03.05.22	FOR INFORMATION / SDRP 3	TD

PLANNING:	PLANNING SOLUTION
LANDSCAPE :	ASPECT STUDIO
WASTE:	TALIS
TRAFFIC:	CARDNO
ENERGY:	CUNDALL

- 1x1 BED/BATH APARTMENT
- 2x1 / 2x2 BED/BATH APARTMENT
- 3x2 BED/BATH APARTMENT
- 4x2+ BED/BATH APARTMENT



CLIENT

MEGARA

PROJECT

SORRENTO ACTIVITY CENTRE

PROJECT ADDRESS

WEST COAST DRIVE
SORRENTO, WA

MJA PROJECT NUMBER

20057

NORTH

SCALE

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STATUS

DEVELOPMENT APPLICATION

DRAWING

GENERAL ARRANGEMENT
CROSS SECTION

DRAWING NO.	DRAFTER	CHECKED	REV.
2.02	--	TD	

APPENDIX B

GLAZING REQUIREMENTS

Calculated Noise Levels and Required R_w and C_{tr} Ratings				
Location	**Floor**	**Level**	**Bedroom $R_w + C_{tr}$**	**Living Room $R_w + C_{tr}$**
South Facing	All Levels	65	36	32
North West Facing	Level 2	66	37	33
	Levels 3 to 9	62	33	29
West Facing	Level 2	72	43	39
	Levels 3 to 4	67	38	34
	Levels 5 to 9	57	28	24
North East Facing	All Levels	<55	23	23
All Other Residential Windows	All Levels	<55	23	23
Commercial	Ground Floor	72	30	

Notes: The required R_W rating can be reduced by reducing the area of glazing.
Locations shown on plan below
Requirements pertain to only acoustic advice in regard to *State Planning Policy 5.4* and may be superceded by other requirements (BAL, Thermal, etc).

MJA STUDIO

MEGARA

SORRENTO ACTIVITY CENTRE

WEST COAST DRIVE
SORRENTO, WA

20057

1:250 @ A1

CONCEPT DESIGN

GENERAL ARRANGEMENT
LEVEL 3

1.04 TD/LK TD

APPENDIX C

MRWA TRAFFIC FLOW DATA

mainroads WESTERN AUSTRALIA

SITE 5547

Hourly Volume

West Coast Dr (1312648)

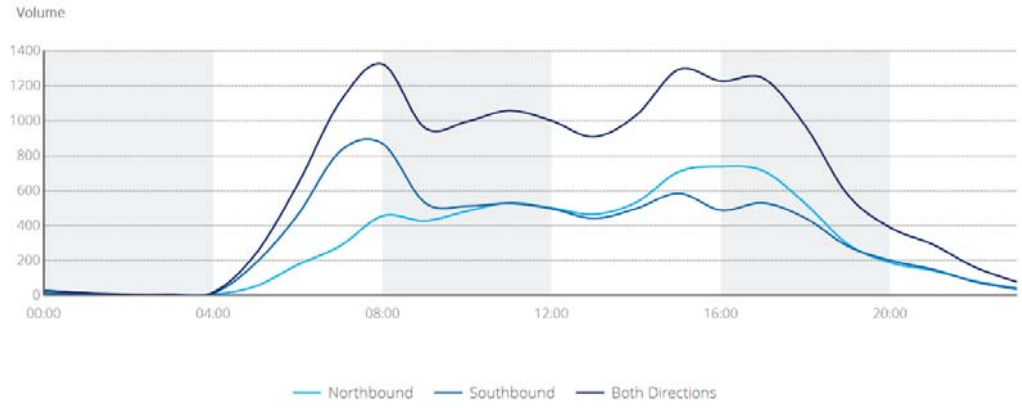
South of Hepburn Av (SLK 2.56)

2020/21
Monday to Friday

	All Vehicles			Heavy Vehicles			
	NB	SB	Both	NB	SB	Both	%
00:00	16	12	28	2	0	2	7.1
01:00	8	7	15	0	0	0	0.0
02:00	4	2	6	0	0	0	0.0
03:00	3	3	6	0	1	1	16.7
04:00	6	12	18	1	2	3	16.7
05:00	53	185	238	10	7	17	7.1
06:00	176	463	639	22	34	56	8.8
07:00	284	826	1110	30	32	62	5.6
08:00	456	869	1325	35	28	63	4.8
09:00	428	532	960	41	23	64	6.7
10:00	484	512	996	42	22	64	6.4
11:00	531	528	1059	38	24	62	5.9
12:00	502	498	1000	43	20	63	6.3
13:00	466	442	908	42	24	66	7.3
14:00	534	499	1033	56	22	78	7.6
15:00	709	585	1294	70	17	87	6.7
16:00	739	489	1228	67	14	81	6.6
17:00	714	530	1244	50	14	64	5.1
18:00	525	443	968	34	15	49	5.1
19:00	294	282	576	12	8	20	3.5
20:00	188	201	389	7	4	11	2.8
21:00	143	150	293	5	3	8	2.7
22:00	83	79	162	2	1	3	1.9
23:00	42	35	77	3	1	4	5.2
TOTAL	7388	8184	15572	612	316	928	6.0

Peak Statistics

AM	TIME	11:00	07:30	07:45	09:30	06:15	09:30
	VOL	531	947	1355	48	38	70
PM	TIME	15:30	15:15	15:15	15:15	12:30	15:15
	VOL	762	586	1330	73	26	91



ATTACHMENT 9

CUNDALL

Sorrento Activity Centre

Sustainable Design Assessment Report

Megara

Job No:	1031937
Doc Ref:	1031937-RPT-SY-001
Revision:	B
Revision Date:	03 June 2022

Project title	Sorrento Activity Centre	**Job Number**
Report title	Sustainable Design Assessment Report	1031937

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
—	15 December 2021	Issued for Development Approval (DA)
A	17 December 2021	Issued for Development Approval (DA), minor updates as per client comments
B	03 June 2022	Issued for Development Approval (DA), updated to latest design

Document Validation (latest issue)

7/06/2022

X

Principal author

Signed by: Hill, Stefan

7/06/2022

X

Checked by

Signed by: Grimaldi, Oliver

7/06/2022

X

Verified by

Signed by: Grimaldi, Oliver

Executive summary

This report outlines the Ecological Sustainable Design (ESD) strategy for the proposed development at Sorrento Activity Centre, Sorrento, WA. The new 8-storey building comprises apartments and commercial / food & beverage tenancies, as well as car parking.

A key part of this development is integrating sustainable strategies and design into the design and construction of the building.

Table 1 below confirms that the proposed development responds to these requirements.

Table 1 - ESD target

Development must demonstrate that:	Requirement will be met	Comments
Sustainable Design Assessment Report to demonstrate the proposed development has been designed to support amenity, reduce resident running costs, provide a marketing point of difference and to gain wider community support.	✓	The proposed development has been designed to exceed these requirements and deliver a 5-star Green Star certified building. Please refer to Section 11.3 of this report.

Contents

Appendices

Figures

Tables

1.0 Introduction

The proposed development, is a multi-unit residential mixed-use development. The project site is to be located at Sorrento Activity Centre, in Sorrento. The development will be 8-storeys and consists of apartments and commercial / food & beverage tenancies as well as car parking.

Table 2 - Development space allocation

Space Type	Area / Number
Commercial / food & beverage tenancies	1374 m^2
Apartments	75 aparmtents

1.1 Project information

Below is an overview of the project:

Table 3 - Project Information

Item	Detail
Project address	Sorrento Activity Centre, Sorrento WA 6011
Project applicant / developer	Megara
Development approval details	N/A
Development approval sustainability requirements	SDAR Report
Sustainability vision / general approach	See Sections 2.0 to 11.0 of this report

“The physical form will create a sense of arrival and a transition into the intensity of the beach front core from the surrounding residential areas. This precinct will also cater for medium to high-density residential development and tourism accommodation. Reflecting Sorrento’s relaxed coastal aesthetic, buildings are required to be positioned in landscaped settings to provide privacy and recreation spaces for residents and a softening of the built form.”

This report outlines how the development has been designed to meet the above requirements.

Figure 1.1 - Visualisation of the Sorrento Activity Centre development

1.2 Sustainability targets

The development is designed to fulfil the requirement in terms of sustainable design and is aiming to achieve the following:

- 5-star Green Star – Design & As-Built v1.3 certified rating; and
- Average 7-star NatHERS rating for the residential components of the development.

The project is also required to comply with the National Construction Code (NCC) Section J 2019 for Energy Efficiency. These commitments are outlined in more detail in the following sections of this report.

2.0 Indoor environmental quality

The Indoor Environment Quality of a building aims to achieve sustainability performance improvements in a manner that also improves occupants' experience of the space. Sustainable buildings are designed for people and reductions in energy use should never be made at the expense of the occupants' health and wellbeing.

A holistic approach to sustainability will result in multiple benefits both in energy efficiency and encouraging occupant wellbeing. This can be achieved by improvements to air quality through appropriate ventilation, the provision of high levels of thermal, visual and acoustic comfort, reduction to occupant stress and the creation of low-toxicity environment through reductions to pollutants.

2.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to Indoor Environment Quality:

Table 4 - Indoor Environment Quality initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Thermal comfort	High-performance glazing External shading Airtightness	Green Star Credit 14 – Thermal Comfort: average NatHERS of 7 stars	Average 7 stars NatHERS or higher
Natural ventilation	Natural cross ventilation for 65% of the proposed dwellings	AS1668.4 and CIBSE Guide A – 60% of dwellings	At least 73% of the proposed dwellings
Daylight	Large windows with moderate Visual Light Transmittance (VLT) optimised for sufficient natural daylight	Green Star Credit 12.1 – Daylight: daylight factor of 1.5% for living and bedrooms spaces for 40% floor area	Daylight factor of 1.5% for living and bedrooms spaces for at least 60% of the floor area
External Views	Good orientation Large windows with moderate Visual Light Transmittance (VLT)	Green Star Credit 12.2 – External Views: 60% of living and bedroom spaces within 8m of view	At least 60% of living and bedroom spaces within 8m of view
Hazardous materials and VOCs	Specification of low VOCs in paints adhesives and sealants Low formaldehyde in engineered woods	Green Star Credit 13 – Indoor Pollutants: 95% of relevant products to comply	At least 95% of relevant products to comply
Internal lighting levels	All LED, low energy and flicker-free lighting	Green Star Credit 11 – Lighting Comfort: Low energy and flicker-free lighting	All LED, low energy and flicker-free lighting
Acoustics	Acoustic separation between residential units Compliance with acoustic requirements for external and internal noise levels	Green Star Credit 10 – Acoustic Comfort: acoustic separation and internal noise levels complying with Table 1 of AS/NZS2107:2016	Acoustic separation and internal noise levels complying with Table 1 of AS/NZS2107:2016

The following indoor environment quality improvements have been considered throughout the detailed design of the development.

2.2 Thermal comfort

The human body regulates its core temperature via the hypothalamus within a narrow range of 36 to 38 degrees. An indoor environment that is too hot or too cold can affect mood, performance and productivity. However, at which temperature a resident feels comfortable varies significantly from person to person. To control internal comfort and minimise excessive heat loss in winter and heat gains in summer, a number of strategies will be investigated for the proposed development:

- Façade design and glass selection is very important; heat gains and losses must be moderated, and thermal bridging should be avoided. Double glazing systems are considered for this development to improve the thermal performance of the building envelope.
- The high-performance glazing will additionally help to manage acoustic aspects of the building. Separated party walls between apartments will also reduce noise impacts from neighbouring flats.
- The façade should be well sealed to avoid draughts and air leakage.

2.3 Shading devices

Shading is a critical component of the building design. Large overhangs, both vertical and horizontal, should be incorporated, and the north facing glazing should aim to reduce the amount of direct solar radiation for all times during the year. The development provides some shading to the glazed facades by means of extended floor plates.

Figure 2.1 Building design showing shaded glazed facades.

2.4 Glazing performance

The proposed high-performance glazing provides solar control to prevent summer heating while allowing useful passive solar heating in winter. The low U-value of the glazing would minimise the conductive loss or gain. These result in an improved thermal comfort, improved energy rating of apartments as well as a reduced overall carbon footprint of the development.

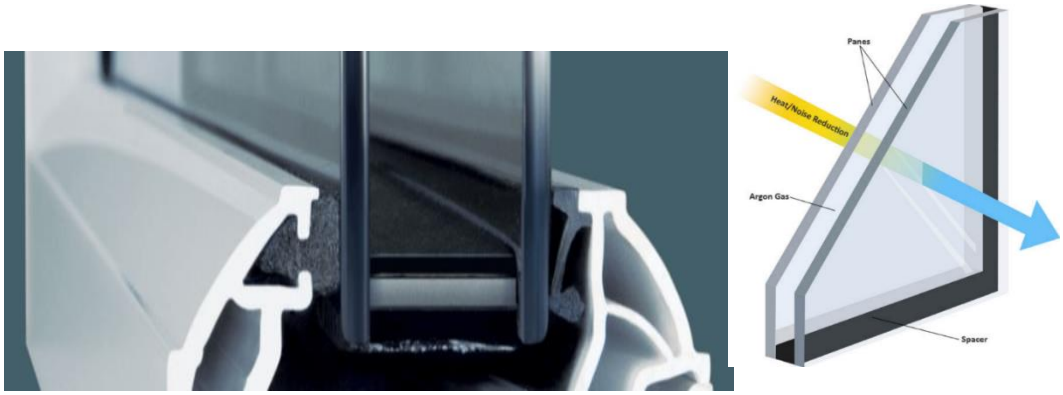


Figure 2.2 – High performance glazing options are proposed for the development

2.5 Emissions & toxicity

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short and long term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers).

The development will aim to specify materials with low emissions content including low-VOC and low formaldehyde content to avoid contaminating the indoor air.

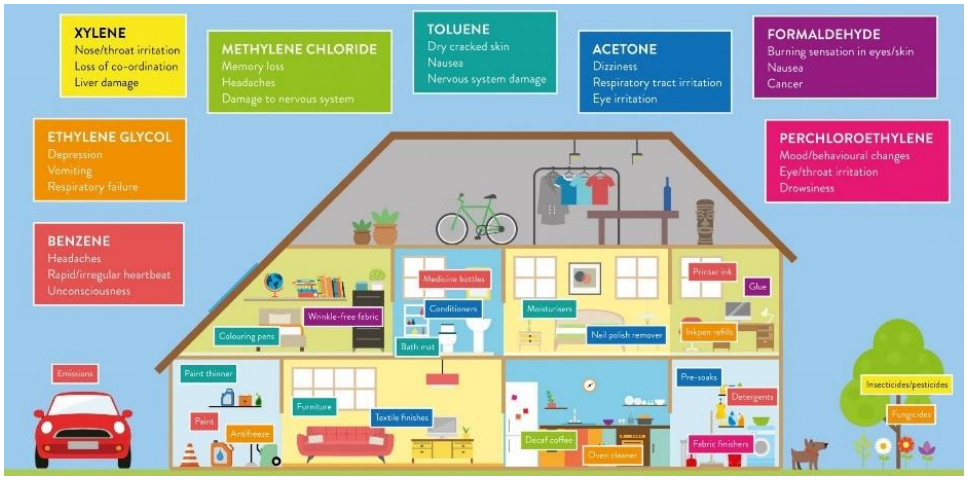


Figure 2.3 - VOCs that result in sick building syndrome

2.6 Natural lighting

Appropriate daylight is essential for users' wellbeing and connection to the outdoors, and for energy efficiency. However, excessive daylight can cause glare which is a major IEQ concern and must be avoided. The development is designed such that every living space is designed to have large sliding doors to the balconies in addition to large full height windows to maximise daylight levels while shading devices are proposed to reduce glare. The location and height of the development offer extensive views over the Indian ocean and surrounding area.

The following design opportunities are considered throughout the detailed design process to maximise the daylighting potential:

- Given the extent of proposed glazing, glass with a moderate visual light transmittance (VLT) allows sufficient daylight to penetrate the space.

2.7 Airtightness

Airtightness is the fundamental building property that impacts infiltration and exfiltration (the uncontrolled inward and outward leakage of outdoor air through cracks, interstices or other unintentional openings of a building, caused by pressure effects of the wind and/or stack effect).

The development will include measures and specifications to limit air leakage from the building envelope elements such as glazing systems and external walls.

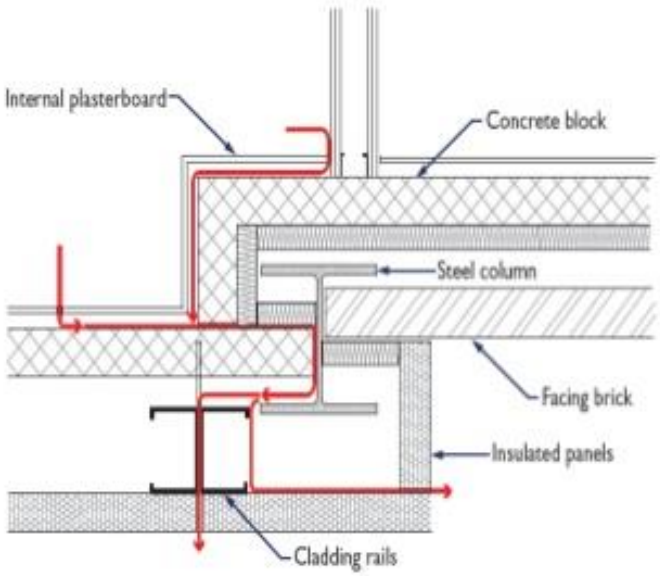


Figure 2.4 - Continuous airtightness line of building details

3.0 Energy efficiency

The construction industry is responsible for around 20% of Australia's carbon footprint. These emissions include embodied energy and water consumption that goes into the building during construction as well as operational energy and water usage of the completed building, maintenance during the life span and the demolition at the end of the building's life.

The following sections set out design strategies utilised for this development to reduce the buildings energy demand and greenhouse gas emissions.

3.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to energy efficiency:

Table 5 Energy efficiency initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Building fabric enhanced over NCC requirements	High-performance fabric and insulation	Green Star Credit 15 – Greenhouse Gas Emissions: minimum NatHERS of 5.5 stars and average NatHERS of 6.5 stars	Minimum NatHERS of 6 stars and average NatHERS of 7 stars
Operating energy and peak demand reduction	High-efficiency building services High-performance building fabric and glazing	Green Star Credit 16 – Peak Demand Reduction: reduce total peak demand by 15% through on-site renewables	Target reducing total peak demand by 15% through on-site renewables
On-site energy generation	Solar PV panels are to be installed	As above	As above
Energy sub-metering	Separate sub-metering for each tenant for energy and water Smart metering installed	Green Star Credit 6 – Metering: accessible metering to be provided to monitor building energy and water consumption	Accessible metering to be provided to monitor building energy and water consumption
Air leakage	The building will be designed and built with airtightness in mind and an airtightness test will be undertaken	Green Star Credit 2.2 – Commissioning: target 15 $m^3/h.m^2$ for air tightness	Target a maximum of 15$m^3/h.m^2$ for air tightness
Lighting efficiency	All lighting will be LED, low energy lighting	Green Star Credit 15 – Greenhouse Gas Emissions: lighting power density is reduced by 10%	Target lighting power density reduction by at least 10%
Ventilation and air-conditioning	Energy-efficient HVAC will be installed	Green Star Credit 15 – Greenhouse Gas Emissions: air conditioning equipment is at least 3-star as per AS 3823.2-2011	Air conditioning equipment will be at least 3-star as per AS 3823.2-2011
Appliances and equipment	All appliances installed will be energy and water efficient	Green Star Credit 15 – Greenhouse Gas Emissions: appliances to have a minimum Energy Star rating of 1-star below the maximum	Appliances to have a minimum Energy Star rating of 1-star below the maximum

3.2 NatHERS

The Nationwide House Energy Rating Scheme (NatHERS) is a tool to assess the energy usage of residential dwellings. For a multi-residential development, every apartment is investigated as a separate unit with its own rating before an overall average rating is calculated. The NatHERS tool considers a wide range of parameters like orientation, glazing, insulation, size of rooms and door openings, shading and awnings and ceiling fans.

The NCC requires a minimum of a 5-star NatHERS rating for the worst-performing apartment in the complex and an overall average of 6-star. The proposed development is targeting to exceed these requirements by targeting a minimum of a 6-star rating and an overall average of 7-stars.

3.3 Artificial lighting and controls

It will be considered to specify all light fittings as LED fittings including lighting in the 'communal' corridors, stairwells, garage and external lighting. All common area lighting will incorporate light controls such as occupancy sensing (PIRs) and time switch to reduce lighting consumption when lighting is not required.

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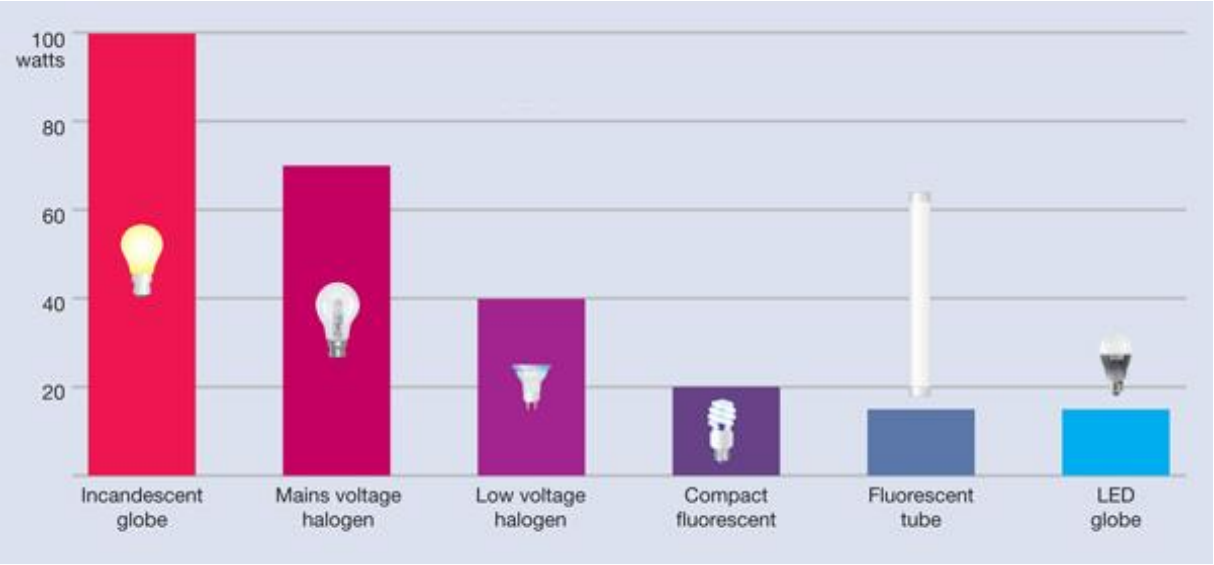

Figure 3.1 - Comparison of LED lighting with other conventional lighting system

3.4 Transparent consumption

Smart metering

Provision of smart metering for the energy and water usage recording, tracking with user interface would be a novel feature on this development. The software could also provide a snapshot view of how the building is performing. This provides a means to inform the building occupants well as engage them in a sustainable lifestyle.

Live display

Live displays could be installed in each apartment that show the building's energy, water and waste consumption. This would be linked to the BMS and other inputs and could display live data about the building's consumption and how it is performing in relation to a typical building. This would also encourage users of the building and educate them about their own behaviour in relation to energy, water and waste.

3.5 Commissioning and building tuning

Comprehensive pre-commissioning and commissioning activities will be undertaken for all building systems as a standard practice for the development.

Further to commissioning, seasonal building tuning would be considered on the building for at least 12 months following occupancy to ensure systems are performing to their design potential at full and part load conditions. Quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties will help improve on the building's energy performance.

3.6 Solar photovoltaic (PV) panels

Solar Photovoltaic (PV) panels will be considered to be installed on the roof of the building to supply power for the common areas, including corridors, car parking, stairwells, reception and pool area.

Figure 3.2 Rooftop PV system

4.0 Water efficiency

The water consumption of Western Australian is the second highest in Australia with an average of 241,000 litres per household per annum, well above the Australian average of 190,000 litres (Australian Bureau of Statistics, 2017). A reduction of water usage does not only alleviate pressure from the local water supply but also means reduced costs of living in WA.

The following sections set out design strategies utilised for this development to reduce the building's water consumption. Rainwater harvesting and reuse is not recommended for domestic consumption.

4.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to water efficiency:

Table 6 - Water efficiency initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Potable water consumption	All water fittings and fixtures to be water efficient	Green Star Credit 18 – Potable Water: 7.5% reduction in potable water consumption	Target at least 7.5% reduction in potable water consumption
Water metering	Separate sub-metering for each tenant for energy and water Smart metering installed	Green Star Credit 6 – Metering: accessible metering to be provided to monitor building energy and water consumption	Accessible metering to be provided to monitor building energy and water consumption
Landscape irrigation	All landscape irrigation will be drip irrigation with moisture sensing override	Green Star Credit 18B.4 – Landscape Irrigation: drip irrigation with a moisture sensor is installed	All landscape irrigation will be drip irrigation with moisture sensing
Heat rejection water	The HVAC system will not use any potable water for heat rejection	Green Star Credit 18B.3 – Heat Rejection: no water is used for heat rejection	No water is used for heat rejection
Sanitary fixture efficiency	All sanitary fixtures and fittings will be water efficient	Green Star Credit 18 – Potable Water: all fixtures are within one star of the WELS rating	All fixtures are within one star of the WELS rating

4.2 Water fixtures & fittings

Occupant consumption is a major contributor to potable water usage. The following water fixture WELS ratings will be considered to ensure the efficient use of potable water by building occupants (must be within 1-star).

Table 7 - Proposed water fittings WELS rating

Fixture / Fitting Type	WELS Rating
Taps	6-star
Urinals	6-star
Toilets	5-star
Showers	3-star
Clothes Washing Machine	5-star
Dishwasher	6-star

4.3 Rainwater harvesting

Rainwater harvesting involves the collection, storage and distribution of rainwater from the roof and other areas, for use inside and outside the building. The collected water can be used for irrigation as well as toilet flushing.

Figure 4.1 - Use of harvested rain water and drip irrigation system for landscaping

4.4 Drip irrigation

A major amount of potable water usage goes back to landscape irrigation. To reduce the amount of water used for the landscaped areas on the ground floor, a drip system with moisture sensor control may be installed for irrigation.

5.0 Building materials

Buildings consume considerable natural resources in their construction, operation and demolition. This section of the report will provide details about the potential impacts caused by the building and how these impacts have been reduced when compared to typical buildings of this nature. The building will aim to reduce the total embodied energy and carbon considered in the construction and then aim to maximise the operational efficiency of the buildings services to provide and enhance tenant provisions for the minimum amount of energy and water. Furthermore, methods for maintaining operational efficiency over the life of the building will be investigated to ensure that the benefits are maximised over the life of the building.

5.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to building materials:

Table 8 - Building materials initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Embodied carbon in the building materials	The building design and material selection will reduce the extent of environmental impact as much as possible	Green Star Credit 19 – Materials: cumulative impact reduction of 30%	Target cumulative impact reduction of at least 30%
Concrete	All concrete in the building will reduce Portland cement use	Green Star Credit 19 – Materials: Portland cement content is reduced by 30%	Target Portland cement content is reduced by at least 30%
Sustainable timber	Timber in the project will be either recycled / reused or certified from a sustainable source	Green Star Credit 20 – Materials: 95% of timber used in the building and construction will be from sustainable source or be reused	Target at least 95% of timber used in the building and construction to be from a sustainable source or be reused
Permanent formwork, pipes, ducts, cables	PVC products will meet Best Practice Guidelines for PVC	Green Star Credit 20 – Materials: 90% of all PVC products are to meet Best Practice Guidelines for PVC	Target at least 90% of all PVC products are to meet Best Practice Guidelines for PVC
Structural and reinforcing steel	Steel will be procured from an energy-reducing processing plant	Green Star Credit 20 – Materials: 95% of steel sourced from a Responsible Steel Maker	Target at least 95% of steel sourced from a Responsible Steel Maker

The design team will actively target reduced carbon footprint during construction and embodied energy within building materials. The design team aims to specify at least 60% of the steel used for reinforcing bar and mesh having been produced using energy-reducing manufacturing methods. Timber used for construction works shall be either certified as responsibly sourced or recycled material.

5.2 Embodied carbon

While building operations such as the use of electricity or water generate greenhouse gases, carbon and carbon equivalent gases are also emitted through the production and delivery of products and materials for construction.

For example, to produce Portland cement, a main ingredient in concrete, raw materials are crushed and then heated to over 1400 degrees Celsius. This requires a significant amount of energy and emits large amounts of greenhouse gases

during this production process. These gases are accounted as carbon equivalents in form of 'embodied carbon' in a building.

Embodied carbon, therefore, comprises a major proportion of the total carbon footprint of a building. An option to provide a life cycle analysis (LCA) of total carbon and environmental footprint will be considered at key design stages to ensure that design options are prioritised in terms of life-cycle impact and embodied energy/water rather than just day one impacts.

The following measures will be considered throughout the design development to reduce the amount of embodied carbon:

- **Sub-structure**
  - Maximise recycled content of materials in structural components.
- **Super-Structure**
  - Maximise recycled content in concrete and formwork;
  - Use of lightweight and reusable materials where possible.
- **Envelope**
  - Adopt a low-carbon, lightweight approach;
  - Consider necessity of massing elements;
  - Consider composite materials or dual function elements;
  - Considering the use of recycled materials
- **Internal Walls**
  - Consider necessity of internal walls;
  - Consider recycled content or reused materials;
  - Consider low carbon steel framing;
  - Designing for flexibility and future-proofing to reduce renovation efforts.
- **Internal Finishes**
  - Consider setting a recycled content target for all finishes;
  - Consider long life and highly durable finished is areas of high foot traffic;
  - Considering Carbon Neutral certified products.

6.0 Transport

Sustainable projects facilitate a reduction of the dependency of occupants on private car use as an important means of reducing overall greenhouse gas emissions. The use of motor vehicles directly contributes to climate change in two ways; through the high amounts of energy required to produce cars and build and maintain supporting road transport infrastructure and services; and the direct emissions that result from car operations.

If reliance on individual motor vehicle transportation is to be reduced, it is necessary to maximise alternative transportation options. This may include initiatives that encourage and make possible the use of mass transport options, cycling or walking, and the selection of sites that are close to a large number of amenities.

6.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to transport:

Table 9 - Transport initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Providing bike storage	Bike storage will be provided for residents	Green Star Credit 17B.4 – Active Transport Facilities: 79 bays plus 1 per 2.5 dwellings over 100 (residents), plus 5% of dwellings for visitors	The project will provide the benchmark required with 5 spaces for secure bike parking.
Providing access to showers and end of trip facilities	End of trip facilities are provided for the commercial part of the development.	Green Star Credit 17B.4 – Active Transport Facilities: 1 shower including drying space and locker	1 UAT with shower and 5 lockers is provided for the commercial units.
Car sharing and other low emission vehicle infrastructure	Car parking bays and infrastructure for Electric Vehicles (EV) will be provided.	Green Star Credit 17B.3 – Low Emission Vehicle Infrastructure: 5% of parking is dedicated to EV.	5% of car bays will be equipped with the infrastructure for EV charging, with 100% of the bays being future proofed.
Improving pedestrian spaces	The building provides excellent access to amenities such as shops, cafes, bars, medical, banking and others	Green Star Credit 17B.5 – Walkable Neighbourhoods: At least 8 amenities are within 400m of the building	The development with a vast number of amenities is less than 400m away from the building. Commercial units and amenities on ground floors promoting pedestrian traffic. Further funds and plans will be expended aiming to improve the pedestrian experience through wayfinding, softening the landscaping and providing shade structures.

6.2 Walkable neighbourhood

The proposed development is located at a convenient walking distance to the Sorrento Activity Centre which hosts a range of shops, eateries, services, employment and amenities to residents, visitors and workers, with Hillary's Marina beach a mere 3 minute bus ride away. The development will also include private amenities for the residents such as pool, dining/lounge, games room and rest areas with an assortment of eateries at street level.

The development area offers picnic tables, barbecues, toilets, cafes and shaded rest areas including Geneff Park and Sorrento beach.

The close proximity to these amenities would reduce the need for residents to use private vehicles to utilise these facilities and land uses, this is further aided by the local convenience store on the BP site.

Figure 6.1 - Project location and neighbourhood.

6.3 Cyclist facilities

In Perth 48% of all car trips are less than 5 km distance. Cars produce an average of 0.3 kg of CO_2 per km travelled, whereas, a cyclist emits negligible greenhouse or other pollution. For each kilometre a person cycles instead of driving, approximately 0.3 kg of CO_2 are saved from being emitted to the environment. Furthermore, cycling will encourage an active and healthy lifestyle for the residents.

The development includes cycle storage facilities for the residents. Additional visitors bike racks may be provided outside the building.

6.4 Access to public transport

With its location in Sorrento, the proposed development is located in close proximity to public bus routes on west coast drive that go to Hillary's Marina Beach 1km away or a 25-30 minute ride to Stirling or warwick train station.The closest bus stop is just infront of the development site, therefore easily accessible by foot or bicycle, this accessible stop has high frequency buses available at peak hours at only 10 to 15 minute intervals.

6.5 Electric vehicles

The number of electric cars on the road grew to 3 million worldwide between 2016 and 2017. This is an expansion of 56%. With further expected exponential growth, the number of electric cars on the roads will reach between 125 and 220 million by 2030 according to the International Energy Agency (International Energy Agency, 2018).

The proposed development intents to support the uptake of low-emissions and electric vehicles. A number of car parking spots are planned to be dedicated to electric vehicles while 100% of the bays will be capable of the addition of electric charging infrastructure for future charging.

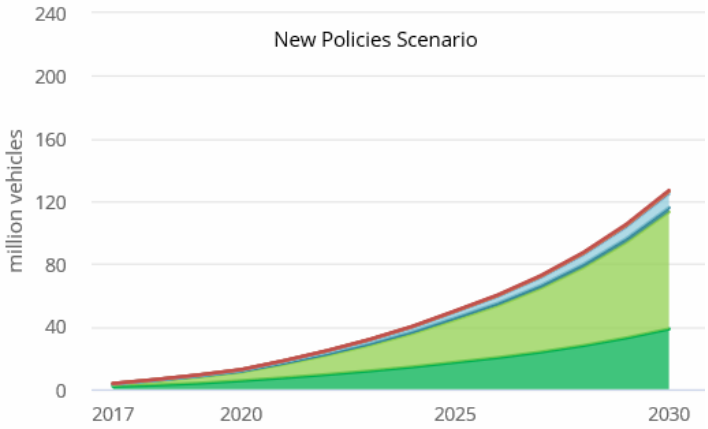

Figure 6.2 - Global Electric Vehicle Deployment by 2030

7.0 Waste management

The main objectives for the waste management strategies for construction and operational waste are to ensure that waste is avoided and recycled during design, construction and operation.

Waste within a building construction context can be avoided by encouraging the selection of lower-impact and long-term materials. Operational waste to landfill can be reduced by providing relevant and easily accessible facilities for recyclable waste and other waste that can be diverted from landfill such as organic waste, batteries or e-waste.

7.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to waste management:

Table 10 - Waste initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	The Sorrento Activity Centre target
Construction waste management plan	The head contractor will have an Environmental Management Plan (EMP) and Environmental Management System (EMS) in place	Green Star Credit 7 – Responsible Production Practices: Best practice EMP to be developed; head contractor to be ISO 14001 certified	A best practice EMP including waste aspects will be developed and the head contractor will have an ISO 14001 certification in place
Construction waste	The amount of construction waste that is diverted from landfill will be maximised	Green Star Credit 22B – Construction and Demolition Waste: 90% of waste from construction to be diverted from landfill	Minimum 90% of waste from construction to be diverted from landfill
Operation waste management plan	Adequate facilities will be provided to store separate waste streams	Green Star Credit 8B – Operational Waste: Facilities to be in place to collect and separate waste streams and provide best practice access requirements for pick-up	Bin store is provided to cater for different waste streams. Good external and internal access to the storeroom to be provided
Access and storage for recycling and green waste	Recycling and organic/food waste are addressed in the operational waste concept	Green Star Credit 8B – Operational Waste: 3 Waste Streams must be served	Three waste streams will be collected and separated in the building including landfill and recycling waste. Composting/organic waste is considered as a waste stream as well. Further streams to be confirmed

7.2 Building materials and resource minimisation

In 2014-15 Australia produced the equivalent of 565 kg per capita of municipal waste and 831 kg of construction and demolition waste. While around 60% of this waste is recycled, a large part still goes to landfill (Pickin & Randell , 2017). A reduction of both construction and operational waste is therefore an important target for the development of Sorrento Activity Centre.

7.3 Waste management

A dedicated waste storage area will be provided for the separation and storage of recyclable waste during operation, allowing for the different waste streams to be separated to match the local recycling scheme. At least three streams will be covered including landfill, recycling and a third stream which may be organic/food waste.

Throughout project design, operation and construction, principles of resource recovery will be applied, so that materials and products are recovered and reused where possible, reducing landfill and saving money. Some strategies that will be investigated include:

- Innovative waste separation and collection strategies to allow materials to be isolated for reuse;
- A purchasing policy which aims to minimise waste from products and packaging, encourage the use of products which have minimum environmental impact; and
- Manufacturers and suppliers will be encouraged to take full responsibility for the life cycle impact of products including ownership at end of life.

7.4 Composting organic waste strategy

The development is exploring the possibility of recycling all forms of food and organic waste by identifying waste streams and incorporate a strategy that reduces food or organic waste going to landfills. Supporting schemes such as Kooda provides composting bins in a central location and then pick up the waste to produce compost.

Figure 7.1 - Sample composting scheme

7.5 Design for off-site construction

Prefabricated construction methods considered to be more energy and waste efficient because production processes can be better controlled and made more efficient in the factory than on site, for example. better machinery, less cut-offs, better reuse of materials, material cycles, etc.

8.0 Urban ecology

With continuously growing cities, urban ecology plays a large role in conserving biodiversity and improving life quality for urban residents. Well planned buildings and landscape architecture protects and enhances biodiversity, provides sustainable landscaping such as low water use, low fertiliser requirements and local native and indigenous plant species selection. If possible, remnant indigenous plant communities should be managed and protected.

8.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to urban ecology:

Table 11 - Urban ecology initiatives

Design Issue	Design initiative included the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Maintaining / enhancing ecological value	Native vegetation is reintroduced to the site throughout the building and the development will maximise retention of existing significant trees	Green Star Credit 23.1 – Ecological Value: Site improvement by for example replacing hardscape with native vegetation	The vegetation, especially native vegetation will be maximised wherever possible throughout the development
Heat Island Effect Reduction	Use of vegetation/green spaces, pool and SRI approved roofing will actively reduce the heat island effect	Green Star Credit 25.1 – Heat Island Effect Reduction: 75% of site area reduces impact of heat island effect	A minimum of 75% compliance is targeted

8.2 Enhancing ecological value

The site location near the coast is largely parking spaces with few buildings and spotted with trees as seen in the aerial image of the site below (Figure 8.1 - Aerial Image of Sorrento Activity Centre site 2021).

The growing urban population fuels the raising demand for building structures with higher densities. The R development caters for these requirements by using the major part of the site as a building footprint. To still achieve a relatively high level of vegetation coverage on the site, landscaped areas are woven through the building design by placing trees and planters on most of the balconies and by generously sized planters, external greean areas can also be found outside the building itself.

Figure 8.1 - Aerial Image of Sorrento Activity Centre site 2021

Figure 8.2 - Illustration of the proposed vegetation coverage

8.3 Minimising heat island effect

The heat island effect describes the condition where urban areas have a higher average temperature than its rural surroundings owing to the make-up of the built environment. The use of light roof materials combined with shaded and landscaped areas can reduce the heat island effect significantly and contributes to further energy savings. The development includes roof gardens as well as landscaped ground floor to minimise the heat island effect.

Figure 8.3 - Design ideas included in the development – roof gardens, lighter coloured paving and landscaping

9.0 Innovation

Innovative technology, design and processes in all developments should be encouraged due to the positive influence on the sustainability of buildings.

The design will reduce its impact on the environment as far as possible and has optimised its sustainability credentials. However, further to this the development will maximise the health and wellbeing elements within the building. These principles are outlined in the table below.

9.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to innovation:

Table 12 - Innovation initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
VOCs in paints	The specification of the paints will ensure ultra-low VOCs are specified	50% of paints (by volume) specified in the building will have a maximum TVOC content of 5g/L	50% of paints (by volume) specified in the building will have a maximum TVOC content of 5g/L
Air leakage	The building will be designed and built with airtightness in mind and an airtightness test will be undertaken	Green Star Credit 2.2 – Commissioning: target 15 $m^3/h.m^2$ for air tightness	Target 5$m^3/h.m^2$ for air tightness for industry leading tightness. Depends on outcome of testing

9.2 Ultra-Low VOCs

Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors than outdoors. VOCs are emitted by a wide array of products numbering in the thousands (typically paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers).

The development will aim to specify materials with an ultra-low emissions content including ultra-low-VOC paints.

10.0 Construction / building management

Good construction and building management play an integral part in achieving best practice outcomes associated with building quality and long-livety and reduced resource consumption and greenhouse gas emissions. Good construction management also supports construction staff in their safety, health and wellbeing and their professional development. The building management must be made aware of sustainable practices and targets integrated in the building for a successfully operating building with a minimum carbon footprint and maximum resident's comfort.

10.1 Design initiatives

The following table summarises the specific initiatives included in the design in relation to construction management:

Table 13 - Construction management initiatives

Design Issue	Design initiative included in the Sorrento Activity Centre design	Benchmark	Sorrento Activity Centre target
Construction environmental management plan	A project specific environmental management plan (EMP) will be developed and implemented	Green Star Credit 7.0 – Environmental Management Plan: A best practice EMP to be developed and put in place.	A best practice project specific EMP will be developed and implemented.
Contractor has valid ISO 14001 accreditation	The head contractor will have a valid ISO 14001 accreditation	Green Star Credit 7.1 Formalised Environmental Management System: The head contractor has a formalised approach to ensure conformance with the EMP.	The head contractor will have a valid ISO 14001 accreditation
Building tuning	Above standard building tuning and commissioning will be undertaken	Green Star Credit 2 – Commissioning and Tuning: Ensure correct commissioning of services and building tuning for 12 months after Practical Completion	A commissioning plan will be developed and implemented. Tuning will be undertaken for 12 months after practical completion
Building user's guide	A Building user's guide will be provided to all relevant stakeholders	Green Star Credit 4.1 – Building Information: O&Ms and Building Log Book (reference directory on where to find building information, regularly updated) generated in accordance with standards	Comprehensive building information will be provided to all relevant stakeholders in line with Green Star requirements

10.2 Commissioning

Commissioning, handover and tuning practices will be implemented to ensure that all building services operate to their full potential and as they were designed.

A Service and Maintainability Report can be prepared based on a review of the following aspects of all building systems:

- Commissionability;
- Controllability;
- Maintainability;
- Operability; and
- Safety

Actions from this report can be incorporated into an owner's project requirements (OPR) document which will be prepared at the design stage of the project.

Pre- Commissioning and commissioning activities can ensure that the building systems function to their full potential and as intended in the design. A commissioning plan will assist the project team through the commissioning process.

Figure 10.1 - Example of airtightness testing

10.3 Air permeability performance testing

Part of the building commissioning is air permeability performance testing which investigates whether the building envelope has been sealed off in accordance to the architect's details. A well designed and constructed building envelope minimises uncontrolled air flows in and out the building and reduces the associated losses of heating and cooling energy.

10.4 Tuning

Building tuning will be undertaken for 12 months after Practical Completion. The tuning process will include data analysis from the building systems as well as feedback from building occupants. Operations and maintenance and a tuning manual will assist the tuning team to address any issues with the building systems that arise during the tuning period.

11.0 Codes and Ratings

The building will be subject to voluntary and mandatory building codes and metrics to measure the performance of the rating. This section of the report outlines the main codes and ratings and identifies the project's response.

11.1 National Construction Code – Section J 2019

The development is required to comply with the National Construction Code (NCC) Section J 2019 for Energy Efficiency. NCC Section J covers items including:

- Building fabric;
- External glazing;
- Building sealing;
- Air movement;
- Air conditioning;
- Artificial lighting and power;
- Hot water supply;
- Access to maintenance.

11.2 NatHERS

Residential building compliance is achieved through a thermal modelling process defined as the Nationwide House Energy Rating Scheme (NatHERS). This process requires a minimum star rating to be achieved for the building's thermal comfort, which informs the energy efficiency of the building.

The Nationwide House Energy Rating Scheme (NatHERS) is a tool to assess residential dwellings' energy usage. For a multi-residential project such as Sorrento Activity Centre, every apartment/room is investigated as a separate unit with its own rating before an overall average rating is calculated. The NatHERS tool considers a wide range of parameters like orientation, glazing, insulation, size of rooms and door openings, shading and awnings and ceiling fans.

The National Construction Code (NCC) requires a minimum of a 5 Star NatHERS rating for the worst-performing apartment in the complex and an overall average NatHERS rating of 6 Stars. The proposed development is designed to exceed these requirements, reducing the building's average energy consumption by approximately 46%.

The proposed development is located at NatHERS Climate Zone 52 (Carine).

Table 11.1 - NatHERS target

	Minimum NCC Requirement	Target for the proposed development
Worst case NatHERS rating	5 Stars	5.5 Stars
Overall average NatHERS rating	6 Stars	7 Stars
Estimated Average Energy Usage	70 MJ/m^2	28 MJ/m^2 (40% reduction)

11.3 Green Star

The development is being designed to fulfil all requirements in terms of Ecologically Sustainable Design (ESD) and is aiming to achieve an Uncertified 5-star Green Star Design and As-Built v1.3 rating. Green Star is a comprehensive sustainability design tool that assesses the environmental impact of a building over a range of environmental indicators, from management and ecology to energy and water use, material selection and waste production.

A 5-star Green Star benchmark rating requires a total of 60 points to be achieved in the aforementioned categories. Sufficient weighted credits have been selected to achieve this requirement rating, and further opportunities will be pursued during the design stages of the project.

Based on the proposed design response, the predicted performance in each respective environmental category is tabulated in ***Appendix A***. The sustainability strategy of this development demonstrates how the development is proposing to achieve the 5-star Green Star benchmark rating.

Table 11.2 - Green Star target

Total available points	Minimum points required for 5-star rating	Target for the proposed development
110 Points	60 Points	**66 Points** **(5-star with approx. 10% buffer)**

12.0 References

Australian Bureau of Statistics. (2017). *4610.0 - Water Account, Australia 2015-16*. Retrieved 10 05, 2018, from http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4610.0Main%20Features32015-16?opendocument&tabname=Summary&prodno=4610.0&issue=2015-16&num=&view=

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International Energy Agency. (2018). *Global EV Outlook 2018*. (International Energy Agency) Retrieved 10 05, 2018, from https://www.iea.org/gevo2018/

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Appendix A Green Star strategy

Green Star - Design & As Built Scorecard

Project:	1031937 - Sorrento Activity Centre	**Round:**	1
Targeted Rating:	5 Star - Australian Excellence		

Core Points Available	Total Score Targeted
98	66

CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA		POINTS AVAILABLE	POINTS TARGETED
Management					14	
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.1	Accredited Professional		1	1
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets		-	Complies
		2.1	Services and Maintainability Review		1	1
		2.2	Building Commissioning		1	1
		2.3	Building Systems Tuning		1	1
		2.4	Independent Commissioning Agent		1	
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan		2	2
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information		1	1
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance		1	1
		5.2	End of Life Waste Performance	A. Contractual Agreements	1	1
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering		-	Complies
		6.1	Monitoring Systems		1	1
Responsible Construction Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan		-	Complies
		7.1	Environmental Management System		1	1
		7.2	High Quality Staff Support		1	1
Operational Waste	B. Prescriptive Pathway	8A	Performance Pathway: Specialist Plan		0	
		8B	Prescriptive Pathway: Facilities		1	1
Total					**14**	**13**

Indoor Environment Quality					16	
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes		1	1
		9.2	Provision of Outdoor Air	☑ A. Comparison to Industry Standards ☑ B. Performance Based Approach ☐ C. Natural Ventilation	2	1
		9.3	Exhaust or Elimination of Pollutants	☑ A. Removing the Source of Pollutants ☑ B. Exhausting the Pollutants Directly to the Outside	1	1
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels		1	1
		10.2	Reverberation		0	
		10.3	Acoustic Separation	C. Residential Projects	1	1
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort		-	Complies
		11.1 General Illuminance and Glare Reduction	11.1.1 General Illuminance	☐ A. Non Residential Spaces ☑ B. Residential Spaces	1	1
			11.1.2 Glare Reduction	☑ A. Prescriptive Method 1 ☑ B. Prescriptive Method 2 ☑ C. Performance Method		
		11.2	Surface Illuminance	☐ A. Prescriptive Method ☐ B. Performance Method ☑ C. Residential Spaces (Prescriptive Method)	1	1

		11.3	Localised Lighting Control		1	1
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	☐ A. Fixed Shading Devices ☑ B. Blinds or Screens ☐ C. Daylight Glare Model	-	Complies
		12.1	Daylight	☐ A. Prescriptive Methodology ☑ B. Compliance Using Daylight Factor ☐ C. Compliance Using Daylight Autonomy	2	2
		12.2	Views		1	1
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1 Paints, Adhesives, Sealants and Carpets	13.1.1 Paints, Adhesives and Sealants	☑ A. Product Certification ☑ B. Laboratory Testing ☐ C. No Paints, Adhesives or Sealants	1	1
			13.1.2 Carpets	☑ A. Product Certification ☑ B. Laboratory Testing ☐ C. No Carpets		
		13.2	Engineered Wood Products	☑ A. Product Certification ☑ B. Laboratory Testing	1	1
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	☐ A. Naturally Ventilated Spaces ☐ B. Mechanically Ventilated Spaces ☑ C. Residential Spaces	1	1
		14.2	Advanced Thermal Comfort	☐ A. Naturally Ventilated Spaces ☐ B. Mechanically Ventilated Spaces ☐ C. Residential Spaces	1	
Total					**16**	**14**

Energy					**22**	
Greenhouse Gas Emissions	B. NatHERS Rating Pathway	15A.0	Conditional Requirement: Prescriptive Pathway		-	Does not comply
		15A.1	Building Envelope		0	
		15A.2	Wall-Glazing Construction and Retail Display Glazing		0	
		15A.3	Lighting		0	
		15A.4	Ventilation and Air Conditioning		0	
		15A.5	Domestic Hot Water		0	
		15A.6	Transition Plan		0	
		15A.7	Fuel Switching		0	
		15A.8	On-Site Storage		0	
		15A.9	Vertical Transportation		0	
		15A.10	Off-Site Renewables		0	
		15B.0	Conditional Requirement: NatHERS Pathway		-	Complies
		15B.1	Thermal and Energy Performance		6	3
		15B.2 Building Services and Appliances	15B.2.1 Lighting		1	1
			15B.2.2 Ventilation and Air Conditioning	☑ A. Mechanically Conditioned Spaces ☐ B. Spaces With Mechanical Heating Only ☐ C. Naturally Ventilated Spaces	2	2
			15B.2.3 Domestic Hot Water		2	
			15B.2.4 Appliances & Equipment		1	
			15B.2.5 Fuel Switching		1	
			15B.2.6 On-Site Storage		1	
			15B.2.7 Vertical Transportation		1	
			15B.2.8 Passive Laundry Facilities		1	1
			15B.2.9 Unoccupied Areas		1	
			15B.2.10 Off-Site Renewables		5	
		15C.0	Conditional Requirement: BASIX Pathway		-	
		15C.1	BASIX Greenhouse Gas Reductions		0	
		15C.2	Off-Site Renewables		0	
		15D.0	Conditional Requirement: NABERS Pathway		-	
		15D.1	NABERS Energy Greenhouse Gas Emissions Reduction		0	
		15D.2	Off-Site Renewables		0	
		15D Additional Prescriptive	15D.3.1 Transition Plan		0	
			15D.3.2 Fuel Switching		0	
			15D.3.3 On-Site Storage		0	
		15E.0	Conditional Requirement: Reference Building Pathway		-	
		15E.1	GHG Emissions Reduction: Building Fabric		0	
		15E.2	GHG Emissions Reduction		0	
		15E.3	Off-Site Renewables		0	
		15E.4	District Services		0	
		15E.5 Additional Prescriptive	15E.5.1 Transition Plan		0	
			15E.5.2 Fuel Switching		0	
			15E.5.3 On-Site Storage		0	
Peak Electricity Demand Reduction	B. Performance Pathway	16A	Prescriptive Pathway: On-Site Energy Generation		0	
		16B	Modelled Performance Pathway: Reference Building		2	1
Total					**18**	**8**

Transport							
					10		
Sustainable Transport	B. Prescriptive Pathway	17A	Performance Pathway		0		
		17B.1	Access by Public Transport		3	1	
		17B.2	Reduced Car Parking Provision		1		
		17B.3	Low Emission Vehicle Infrastucture	B. Parking for Electric Vehicles	1	1	
		17B.4	Active Transport Facilities		1	1	
		17B.5	Walkable Neighbourhoods	A. Proximity to Amenities	1	1	
Total					7	4	

Water							
					12		
Potable Water	B. Prescriptive Pathway	18A	Potable Water - Performance Pathway		0		
		18B.1	Sanitary Fixture Efficiency		1	1	
		18B.2	Rainwater Reuse		1		
		18B.3	Heat Rejection		2	2	
		18B.4	Landscape Irrigation		1	1	
		18B.5	Fire Protection System Test Water		1	1	
Total					6	5	

Materials							
					14		
Life Cycle Impacts	A. Performance Pathway - Life Cycle Assessment	19A.1	Comparative Life Cycle Assessment		6	3	
		19A.2	Additional Reporting	☑ A. Additional Life Cycle Impact Reporting ☐ B. Material Selection Improvement ☐ C. Construction Process Improvement ☐ D. LCA Design Review	4	1	
		19B.1 Concrete	19B.1.1 Portland Cement Reduction		0		
			19B.1.2 Water Reduction		0		
			19B.1.3 Aggregates Reduction	A. Course Aggregate Reduction	0		
		19B.2 Steel	A. Reduced Mass of Steel Framing	A. High Strength Steel	0		
		19B.3	Building Reuse	19B.3.1 Façade Reuse	0		
				19B.3.2 Structure Reuse	0		
		19B.4	Structural Timber	19B.4.0 Responsible Sourcing	-		
				19B.4.1 Reduced Embodied Impacts	0		
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	20.1.0 Responsible Steel Maker	-	Complies	
				B. Energy-Reducing Processes in Steel Reinforcement Production	1	1	
		20.2	Timber	☑ A. Certified Timber ☐ B. Reused Timber	1	1	
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	B. Best Practice Guidelines for PVC	1	1	
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	☑ A. Reused Products ☑ B. Recycled Content Products ☑ C. Environmental Product Declarations (EPDs) ☑ D. Third Party Certification ☑ E. Stewardship Programs	3	1	
Construction and Demolition Waste	B. Percentage Benchmark	22.0	Reporting Accuracy	A. Compliance Verification Summary	-	Complies	
		22A	Fixed Benchmark		0		
		22B	Percentage Benchmark		1	1	
Total					14	9	

Land Use & Ecology							
					5		
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	A. EPBC	-	Complies	
		23.1	Ecological Value		3		

Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement		-	Complies
		24.1	Reuse of Land	A. Previously Developed Land	1	
		24.2	Contamination and Hazardous Materials	☐ A. Site Contamination ☐ B. Hazardous Materials	0	
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.1	Heat Island Effect Reduction		1	1
Total					**5**	**1**

Emissions					**5**	
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge		1	1
		26.2	Stormwater Pollution Targets		1	1
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies		-	Complies
		27.1	Light Pollution to Night Sky	A. Control of Upward Light Output Ratio (ULOR)	1	1
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28	Legionella Impacts from Cooling Systems	B. Waterless Heat Rejection Systems	1	1
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.1	Refrigerants Impacts	A. Calculating TSDEI	1	
Total					**5**	**4**

Innovation					**10**	
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process		10	
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia	30B	Market Transformation			
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks			2
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge			4
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star	30E	Global Sustainability			1
Total					**10**	**7**

TOTALS	**AVAILABLE**	**TARGETED**
CORE POINTS	**98**	**58.0**
CATEGORY PERCENTAGE SCORE		**59.2**
INNOVATION POINTS	**10**	**7.0**
TOTAL SCORE TARGETED		**66.2**

Appendix B List of reference documents

Table B.1 - Drawings and models used for developing the analysis

Drawing Number / File name	Drawing Title	Revision	Date Issued
1.01	General Arrangement Ground Floor	-	22.05.2022
1.02	General Arrangement Mezzannine Floor	-	22.05.2022
1.03	General Arrangement Level 1	-	22.05.2022
1.04	General Arrangement Level 2	-	22.05.2022
1.05	General Arrangement Level 3	-	22.05.2022
1.06	General Arrangement Level 4	-	22.05.2022
1.07	General Arrangement Level 5	-	22.05.2022
1.08	General Arrangement Level 6	-	22.05.2022
1.09	General Arrangement Level 7	-	22.05.2022
1.10	General Arrangement Roof	-	22.05.2022

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URBIS

SORENTO ACTIVITY CENTRE WEST COAST DRIVE, SORRENTO

Economic Benefit Study

Prepared for Megara
30 May 2022

CONTENTS

KEY FINDINGS

The proposed mixed-use development of the Sorento Activity Centre, West Coast Drive, Sorrento is anticipated to provide new commercial and residential offerings in the beachside location.

The project will provide **1,374 sq.m of food and beverage / retail floorspace** as well as **75 new apartments**.

Construction of the entire development will support a total of **255 FTE direct & indirect job years** during construction of the development, with many accruing locally. This equates to **$55.1 million in total value added** in the WA economy.

Once construction is completed, and during the operational phase, the project will support **73 ongoing jobs (directly and indirectly).** There will be an estimated **$6.8 M per annum direct and indirect value-added** contribution generated from the daily operation and management of the project to the Western Australian economy.

CONSTRUCTION PHASE BENEFITS

$83.3 M
Total development cost (inc. GST) for all components

255
Total FTE construction job years supported (directly and indirectly)

$55.1 M
Total value added in the WA economy over the construction phase

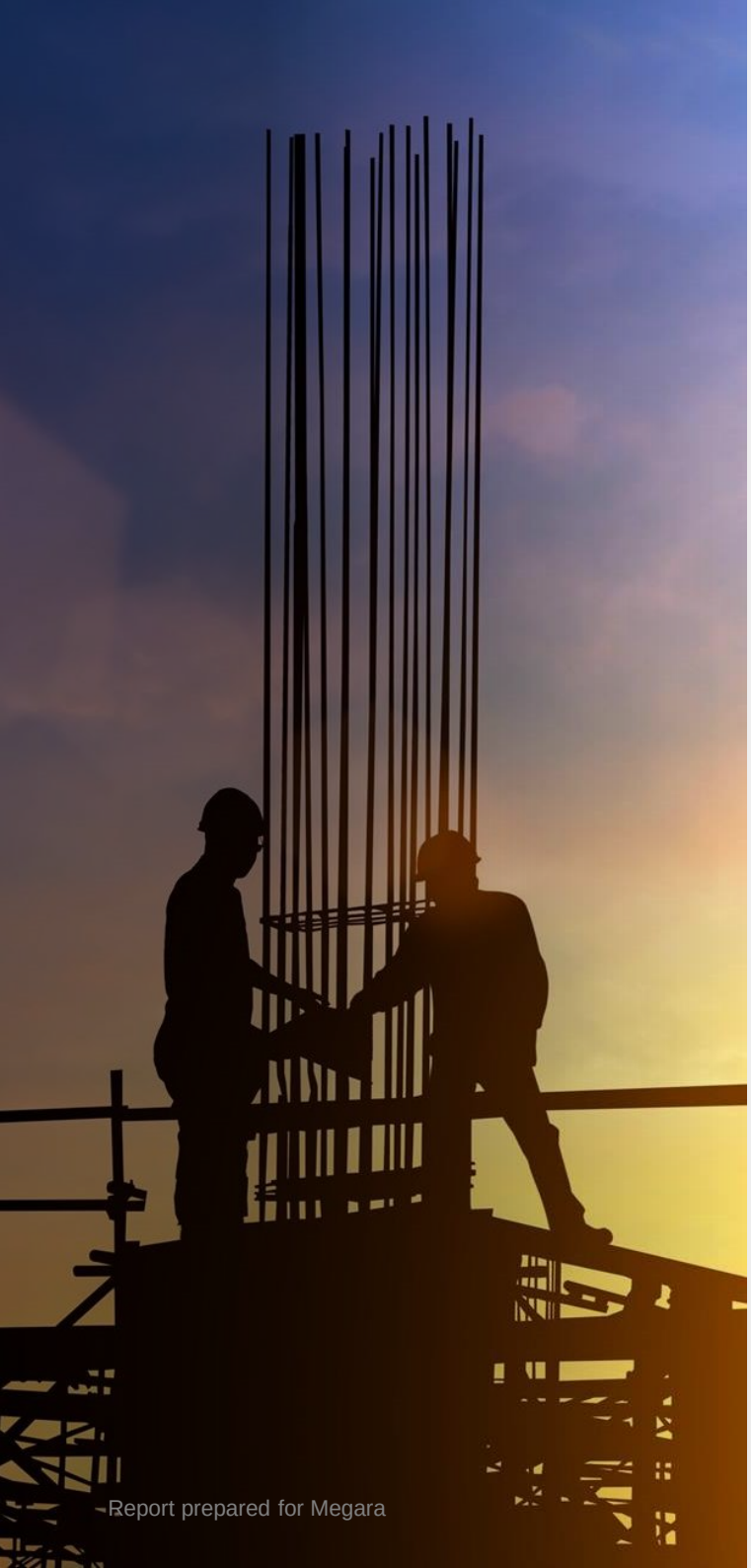
ONGOING EMPLOYMENT & ECONOMIC BENEFITS

73
Ongoing jobs supported per annum (directly and indirectly)

$6.8 M
Value added in the WA economy per annum attributable to operations on-site

$2.5 M
Total Estimated Resident Expenditure

~ 152
New Residents



Report Purpose

Urbis has been engaged by Megara to conduct an independent Economic Benefit Report for the proposed development of the Sorrento Activity Centre on West Coast Drive.

This analysis supplements Urbis' in-house knowledge with data from the REMPLAN modelling tool to quantify the potential employment and economic benefits likely to be generated by the development. These benefits will accrue during both the construction phase and on an ongoing operational basis. The methodology is explained further later in this report.

Potential employment and economic benefits are presented for each individual component of development, as well as aggregated contributions generated from the entire project at the completion of the construction phase for the entire development.

Proposed Development

According to information received from Megara, development in the Sorrento Activity Centre on West Coast Drive is anticipated to see the delivery of the following uses:

- **1,074 sq. m of food and beverage** tenancies;
- A **300 sq. m bottle shop**; and
- **6 one-bedroom apartments, 28 two-bedroom apartments, 34 three-bedroom apartments and 7 four-bedroom apartments**.
- These components will be developed simultaneously, with a total anticipated **construction timeframe of 2.5 years.**

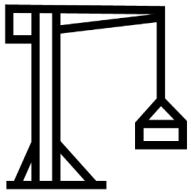
The existing BP service station development on Lot 800 West Coast Drive is not included in this study as the report assesses the proposed new development that will occur in the short term only. Urbis has been advised that there are no significant changes to the existing BP service station site anticipated for the life of the development and this has not been included in the assessment.

Assumptions

Urbis has been provided with construction costs and timing by Megara:

- The construction cost is estimated to be **$73.7 (inc GST).**
- There is an additional cost of **$3.3 million (inc GST)** in documentation and other related costs.
- **$6.3 million (inc GST)** in interest payments.

CONSTRUCTION PHASE BENEFITS



The proposed development is estimated to have a total construction cost of around **$73.7 million (inc GST) with an additional cost of $3.3 million (inc GST) in documentation and other related costs and $6.3 million (inc GST) in interest payments** over an assumed construction timeframe of two years. This results in an **annualised construction cost of $41.6 million inclusive of GST.**

On average, **127 FTE direct & indirect** construction job years are likely to be created for the State on an annualised basis during construction of the development (totalling to **255 FTE construction job years, directly & indirectly** over the development timeframe) with many accruing locally.

Total direct and indirect Gross Value-Added to the State economy is estimated at **$27.5 million per annum** over the construction period of the development in constant 2021 dollars.

Annual Average full-time equivalent jobs created

54

DIRECT FTE* JOBS

Avg. direct FTE jobs per year during construction

73

INDIRECT FTE* JOBS

Avg. indirect FTE jobs per year during construction

Annual Gross value added to the State economy

$13.1 M

DIRECT GVA*

Avg. annual direct GVA to the State economy

$14.4 M

INDIRECT GVA*

Avg. annual indirect GVA to the State economy

** FTE = Full-Time Equivalent, GVA = Gross Value Added, Indirect benefits refer to Supply Chain effects, but not Consumption Effects. See Definitions in the Appendix for more information.*

Source: REMPLAN; Megara; Urbis

ONGOING EMPLOYMENT & ECONOMIC BENEFITS

Upon completion, the proposed development will support around **62 direct jobs** (full-time, part-time and casual) across the commercial space. These jobs represent **27 additional direct jobs**. This estimate accounts for the existing commercial use on the development site. The existing use is estimated to provide 35 jobs and 6 indirect jobs. The jobs supported by the proposed development will be ongoing over the life of the asset with that activity in turn creating permanent jobs elsewhere through the economy.

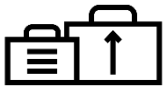
The direct jobs are estimated to induce a further **5 additional indirect jobs** within Western Australia as a result of flow-on effects.

There will be an estimated **$6.8 M** per annum in direct and indirect GVA contribution generated from the daily operation and management of the development to the WA economy.

Total on-going jobs supported by on-site operations

62
DIRECT JOBS

Total direct jobs on an ongoing basis at capacity



11
INDIRECT JOBS

Total indirect jobs supported by on-site employment

Gross value added to the State economy

$4.4 M
DIRECT GVA*

Avg. annual direct GVA to the State economy

$2.4 M
INDIRECT GVA*

Avg. annual indirect GVA to the State economy

** GVA = Gross Value Added, Indirect benefits refer to Supply Chain effects, but not Consumption Effects. See Definitions in the Appendix for more information.*

Note: Ongoing jobs may not be new to the state economy as there may be some transfer from other locations. However in the absence of the proposed investment, they would unlikely be provided elsewhere in the short-term, and in that respect are considered additional.

Source: REMPLAN; Megara; Urbis

OTHER BENEFITS OF DEVELOPMENT

Revenue Generated by Development

The proposed development mix is estimated to support a resident population of ~152 people. This is based on 6 one-bedroom, 28 two-bedroom, 34 three-bedroom and 7 four-bedroom apartments.

The population is expected to be supported by additional amenity in the beachside location.

These residents are anticipated to add an additional $2.5 million of retail expenditure to the area after completion of the development, which is expected to continue on an annual basis going forward. This estimate is expected to be conservative, as additional spending by new residents in the premium quality apartment development are likely to have higher than average levels of retail spending.

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New Residents

$2.5 M

PER YEAR

Estimated Total Retail Expenditure Generated by New Residents

Source: MarketInfo spending profile for City of Joondalup; REMPLAN; Urbis

Other Benefits

Beyond the quantification of economic contributions already identified, the proposed investment also presents broader benefits to the local area, including, but not limited to:

- Providing additional employment opportunities to residents in the Sorrento area;
- Bringing additional residents to the area to support the existing retailers and activate the precinct;
- Providing additional aesthetic value and amenity for the beachside location;
- Prove new accommodation for people;
- Supporting additional visitation to Sorrento and supporting the existing businesses in the area;
- Providing businesses with the opportunity to occupy new, modern, well-serviced and fit-for-purpose dining establishments;
- Attract further investment to the precinct; and
- Provide additional rates and taxes to federal, state and local government from new residents and workers in the development.

METHODOLOGY, DEFINITIONS & ASSUMPTIONS

DEFINITIONS & ASSUMPTIONS

Definitions

Construction cost is the estimated investment value for the project over the anticipated delivery period, measured in constant 2021 dollar (i.e. excluding inflation) including GST.

Gross Value Added or **GVA** is a measure of the value of goods and services produced in an area, industry or sector of an economy during a certain period of time. In this case, GVA represents the total economic contribution of the investment in the project. GVA is measured in constant 2021 dollar (i.e. excluding inflation) including GST.

Construction job years is a measurement of the volume of output required to support a construction job for a 12 month period.

Data Sources

Costs and Timeframes – Megara 26/05/2022
Plans – MJA Studio 3/05/2022

Assumptions

Average workspace ratios for this analysis have been taken from the results of the Perth Land Use and Employment Survey published in 2017. The relevant ratios used for this analysis by each component are the WASLUC and PLUC Codes as per the following:

Component	Ratio	PLUC Code / WASLUC Code
Food & beverage tenancies	19.6	Restaurants and cafes
Bottle shop	40.9	Liquor – retail (Shop / Retail PLUC code)

The number of separate house residents has been determined by number of people per separate house by bedroom type, based on the ABS Census across the Greater Perth region. We have assumed a ratio of 1.4 people per dwelling for a studio, 1.4 people per dwelling for a 1 bedroom apartment, 1.8 for a 2 bedroom apartment, 2.2 people per dwelling for a 3 bedroom apartment and 2.8 people per dwelling for a 4 bedroom apartment.

METHODOLOGY

The REMPLAN Methodology

Analysis presented here uses REMPLAN economic modelling to assess current and potential economic impacts. REMPLAN provides a modelling tool that is accepted and used by various government bodies in Australia. It uses an Input-Output model that captures inter-industry relationships within an economy, based on the ABS 2016/17 National Input Output Tables (I/O Tables). It can assess the area-specific direct and flow-on implications across industry sectors in terms of employment, wages and salaries, output and value-added, allowing for analysis of impacts at the State of Western Australia level.

Key points regarding the workings or terminology of the model are as follows:

- REMPLAN uses either the value of investment or employment generation as the primary input. For this analysis, the value of total upfront investment has been used as the key input to assess the benefits of the construction phase.
- Outputs from the model include employment generated through the project and economic Gross Value Added (GVA) at the State level.
- Outputs from the model include employment generated through the project at both the local and the state level.
- Employment generated is calculated over the life of the construction phase; or in terms of the on-going operations, total on-going jobs generated.
- Both the direct and indirect employment are modelled:
  - *Direct* refers to the effect felt within the industry as a result of the investment. For example, the construction phase will directly result in the creation of construction jobs.
  - *Indirect* effects are those felt within industries that supply goods to the industries directly affected.
- It should be noted that the results presented in this report are estimates only based on the existing state of economic activity in the area. Due to the static nature of input-output modelling, they have the potential to overstate the actual effects. The approach Urbis adopts in accounting for this is presented adjacent. Nonetheless, the analysis still reflects the fact that employment growth will be positive for the State and the local area.
- Urbis consider that in the absence of the investment package it is unlikely that similar projects would be undertaken within the same period, and therefore the investments can be considered *additional*.

Reporting of Impact Modelling Results

Urbis have adopted a conservative approach to estimating and reporting economic and employment benefits using the REMPLAN modelling tool so as to not overstate the likely effects. Key areas where Urbis' approach is designed to not overstate the effects include:

- While REMPLAN defines the supply chain linkages between local industries and allows the assessment of multiplier effects as a result of a direct input into an industry, the nature of the ABS I/O Tables and indeed the set-up of the model suggests there is likely some double-counting therefore overstatement of the flow-on effects.
- More specifically, REMPLAN defines 'Indirect Effect' as consisting of both the 'Supply-chain Effect' and 'Consumption Effect'. However, Urbis believe that the consumption effect (i.e. workers with more income spend elsewhere in the economy) has already been counted to an extent as part of the supply-chain effect in the modelling process and is a more tenuous link to the direct effects. As such, Urbis have only excluded consumption effect from benefit reporting and consider supply-chain effect as the only indirect effect generated from the direct input.
- Construction-related jobs are reported as FTE jobs for the period of one year, rather than the number of workers who might work on a site over the construction period which building contractors might report. For example, a project might have 200 workers on-site over the course of a two-year construction, but that may only equate to say 50 FTE jobs per year. Each trade is not onsite for the whole time (e.g. plumbers, joiners, painters etc. all come on site at different stages). Therefore, FTE for one year accounts for the total hours required by workers over the year and avoids the potential to overstate or misinterpret job figures that relate to part time workers. It also allows for direct comparison of jobs with different construction timeframes, as the jobs accrue each year over the length of construction.
- Wherever applicable, Urbis have chosen to report *Gross Value Added (GVA)* rather than '*Output*' as the economic benefit of a certain development project or activity, as it is considered a more accurate, albeit conservative, estimate of benefit which excludes items such as tax and subsidies which are included in '*Output*'.

DATA TABLES

Construction Phase - Total			
Impact Summary	**Direct Effect**	**Supply-Chain Effect**	**Total Effect**
Output ($M)	$83.27	$77.12	$160.39
Employment (FTE Jobs)	108	147	255
Wages and Salaries ($M)	$12.01	$16.10	$28.10
Value-added ($M)	$26.20	$28.86	$55.06

Ongoing Employment			
Impact Summary	**Direct Effect**	**Supply-Chain Effect**	**Total Effect**
Output ($M)	$9.50	$5.79	$15.28
Employment (Jobs)	62	11	73
Wages and Salaries ($M)	$3.06	$1.15	$4.21
Value-added ($M)	$4.38	$2.40	$6.78

** FTE = Full-Time Equivalent, GVA = Gross Value Added, Indirect benefits refer to Supply Chain effects, but not Consumption Effects. See Definitions in the Appendix for more information.*

Source: REMPLAN; Megara; Urbis

This report is dated 30 May 2022 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Pty Ltd's (Urbis) opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of Megara (Instructing Party) for the purpose of an Economic Benefit Snapshot (Purpose) and not for any other purpose or use. Urbis expressly disclaims any liability to the Instructing Party who relies or purports to rely on this report for any purpose other than the Purpose and to any party other than the Instructing Party who relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

In preparing this report, Urbis was required to make judgements which may be affected by unforeseen future events including wars, civil unrest, economic disruption, financial market disruption, business cycles, industrial disputes, labour difficulties, political action and changes of government or law, the likelihood and effects of which are not capable of precise assessment.

All surveys, forecasts, projections and recommendations contained in or made in relation to or associated with this report are made in good faith and on the basis of information supplied to Urbis at the date of this report. Achievement of the projections and budgets set out in this report will depend, among other things, on the actions of others over which Urbis has no control.

Urbis has made all reasonable inquiries that it believes is necessary in preparing this report but it cannot be certain that all information material to the preparation of this report has been provided to it as there may be information that is not publicly available at the time of its inquiry.

In preparing this report, Urbis may rely on or refer to documents in a language other than English which Urbis will procure the translation of into English. Urbis is not responsible for the accuracy or completeness of such translations and to the extent that the inaccurate or incomplete translation of any document results in any statement or opinion made in this report being inaccurate or incomplete, Urbis expressly disclaims any liability for that inaccuracy or incompleteness.

This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the belief on reasonable grounds that such statements and opinions are correct and not misleading bearing in mind the necessary limitations noted in the previous paragraphs. Further, no responsibility is accepted by Urbis or any of its officers or employees for any errors, including errors in data which is either supplied by the Instructing Party, supplied by a third party to Urbis, or which Urbis is required to estimate, or omissions howsoever arising in the preparation of this report, provided that this will not absolve Urbis from liability arising from an opinion expressed recklessly or in bad faith.

Urbis staff responsible for this report were:

Director	David Cresp
Consultant	Yashwini Halai
Research Analyst	Katherine Rayner

Project code	P0036367
Report Version	4

COVID-19 AND THE POTENTIAL IMPACT ON DATA INFORMATION

The data and information that informs and supports our opinions, estimates, surveys, forecasts, projections, conclusion, judgments, assumptions and recommendations contained in this report (Report Content) are predominantly generated over long periods, and is reflective of the circumstances applying in the past. Significant economic, health and other local and world events can, however, take a period of time for the market to absorb and to be reflected in such data and information. In many instances a change in market thinking and actual market conditions as at the date of this report may not be reflected in the data and information used to support the Report Content.

The recent international outbreak of the Novel Coronavirus (COVID-19), which the World Health Organisation declared a global health emergency in January 2020 and pandemic on 11 March 2020, has and continues to cause considerable business uncertainty which in turn materially impacts market conditions and the Australian and world economies more broadly.

The uncertainty has and is continuing to impact the Australian real estate market and business operations. The full extent of the impact on the real estate market and more broadly on the Australian economy and how long that impact will last is not known and it is not possible to accurately and definitively predict. Some business sectors, such as the retail, hotel and tourism sectors, have reported material impacts on trading performance. For example, Shopping Centre operators are reporting material reductions in foot traffic numbers, particularly in centres that ordinarily experience a high proportion of international visitors.

The data and information that informs and supports the Report Content is current as at the date of this report and (unless otherwise specifically stated in the Report) does not necessarily reflect the full impact of the COVID-19 Outbreak on the Australian economy, the asset(s) and any associated business operations to which the report relates. It is not possible to ascertain with certainty at this time how the market and the Australian economy more broadly will respond to this unprecedented event and the various programs and initiatives governments have adopted in attempting to address its impact. It is possible that the market conditions applying to the asset(s) and any associated business operations to which the report relates and the business sector to which they belong has been, and may be further, materially impacted by the COVID-19 Outbreak within a short space of time and that it will have a longer lasting impact than we have assumed. Clearly, the COVID-19 Outbreak is an important risk factor you must carefully consider when relying on the report and the Report Content.

Where we have sought to address the impact of the COVID-19 Outbreak in the Report, we have had to make estimates, assumptions, conclusions and judgements that (unless otherwise specifically stated in the Report) are not directly supported by available and reliable data and information. Any Report Content addressing the impact of the COVID-19 Outbreak on the asset(s) and any associated business operations to which the report relates or the Australian economy more broadly is (unless otherwise specifically stated in the Report) unsupported by specific and reliable data and information and must not be relied on.

To the maximum extent permitted by law, Urbis (its officers, employees and agents) expressly disclaim all liability and responsibility, whether direct or indirect, to any person (including the Instructing Party) in respect of any loss suffered or incurred as a result of the COVID-19 Outbreak materially impacting the Report Content, but only to the extent that such impact is not reflected in the data and information used to support the Report Content.

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Assessment against the Sorrento Activity Centre Plan (SACP)

As the draft Sorrento Precinct Plan has yet to be determined, the proposed development has been assessed against the provisions of the existing SACP.

Lot 145 (2) Drakes Walk is located within the Sorrento Activity Centre boundary, but is not subject to provisions of the Sorrento Activity Centre Plan. As such, regard has been given to the requirements of the R-Codes Volume 2 – Apartments in assessing the component of the development on this lot.

Provision	Required	Proposed
Land use permissibility	Shall be in accordance with the with the corresponding zone under *Local Planning Scheme No. 3* (LPS3). In addition, within the "Commercial zone" of the Scheme, a "Multiple Dwelling" is considered a 'P' (permitted use).	Restaurant/Café = permitted ("P") use Liquor Store-Small = permitted ("P") use Multiple Dwelling = permitted ("P") use in the 'Commercial' zone and discretionary ("D") use in the 'Residential' zone.
Dwelling target	To provide approximately 77 dwellings within the activity centre plan area.	75 dwellings
Commercial zone	Active uses to ground floor. Residential land uses not permitted to ground floor. The retail NLA is to be in accordance with the maximum 'recommended threshold' of the Local Commercial Strategy (1,500m² NLA). The recommended NLA shall be distributed across the SACP on a pro-rata land area.	Active uses proposed to the ground floor. Residential proposed to the ground floor for a small portion of the Commercial zone fronting Padbury Circle (Level 1). The retail NLA for the Sorrento Activity Centre is less than 1,500m^2. Whilst the NLA is not distributed strictly on a pro-rata basis based on the current lot configuration, most of the activity centre will be redeveloped as a single development and current lots amalgamated. The distribution is therefore considered appropriate.

Provision	Required	Proposed
Plot ratio	No maximum plot ratio applies under the SACP. As per the R-Codes: Lot 145 (2) Drakes Walk – 1.0	Plot ratio of 2.1 for the whole development. It is noted that technically the individual plot ratio on Lot 145 (2) Drakes walk would be less than 1.0.
Building height	Maximum building heights: Lots 2, 148 and 149: 5 storeys Lot 147: 4 storeys Lot 146: 3 storeys Lot 145: 4 storeys (as per R-Codes Vol 2 – Apartments) With the exception of Lots 146 and 147 a minimum building height of 3 storeys is applicable.	Lot 2 Minimum 2 storeys (landscape podium) Maximum 8 storeys Lot 148 Minimum and maximum 8 storeys Lot 149 Minimum 2 storeys (pool deck) Maximum 8 storeys Lot 147 Padbury Circle: 8 storeys maximum 2 storeys minimum Lot 146 Padbury Circle: 5 storeys maximum Lot 145 Drakes Walk: 4 storeys maximum
Street setbacks	Commercial zone Minimum: nil Maximum: 2.0m Minor variations permitted for building entries and architectural articulation. Residential zone (Lot 146) Minimum: 2.0m	Commercial zone Nil to 5.0m along West Coast Drive. Nil to 5.5m along Padbury Circle. Variations along public plaza entrance. Residential zone (Lot 146) Minimum: 1.0m
Lot boundary setbacks	Lot 2 An 8.0m wide view corridor shall be provided between Lot 2 (south western boundary of the proposed development site) and Lot 153 (the service station) which requires a 4.0m side	Lot 2 Nil setback proposed to the south western boundary of Lot 2 (adjacent BP services station) to the 5th storey.

Provision	Required	Proposed
	setback above the 3rd storey of development to the south western boundary. <u>Lot 145 eastern boundary</u> 3.0m setback (as per the R-Codes).	<u>Lot 145</u> Basement: 0.5m setback Upper levels: >3.0m setback Landscape podium and Level 1 parking setback approximately 0.5m to Lot 155 (3) Raleigh Road.
Built form – building design	A continuous awning shall be provided along the street frontage (excluding Lots 145 and 146). All awnings and colonnades shall have a minimum clearance of 2.75m and a minimum depth of 2.0m. A minimum of 60% of the total length of the building façade at the ground floor level is to be clear glazing (Lots 2, 147, 148 and 149).	Awnings proposed to the development along West Coast Drive. Awning depth and clearance is unclear. Greater than 60% clear glazing to the building façade (West Coast Drive frontage).
Street interface	Developments are to activate the street frontages and create a safe urban environment in accordance with CPTED principles. Adjacent verge and footpath areas are to be upgraded to a high quality and to facilitate space activation. Development addressing primary streets to provide a minimum of 80% activated frontage at street level. Development addressing secondary streets to provide a minimum of 50% activated frontage at street level. Active frontage is defined as a *"ground floor space where there is visual engagement between those in the street and those on the ground floors of the buildings.*	Active street frontages provided to West Coast Drive, The Plaza and Padbury Circle. Proposal incorporates significant upgrades to adjacent verge and footpath. Greater than 80% of the façade considered active frontage.
Parking and access	<u>Residential car parking</u> To be provided in accordance with the R-Codes Volume 2 - Apartments.	<u>Residential car parking</u> 155 residential bays provided 12 bays indicated for residential visitor bays

Provision	Required	Proposed
	92.25 (93) residential bays required. 11 visitor bays required. <u>Non-residential car parking</u> 1 bay per 20m^2 net lettable area. As net lettable area has not been specified, gross leasable area has been used. 1374m^2 GLA = 68.7 (69) bays required. Car parking should generally be contained within the building envelope or sleeved and screened from view. Shared parking arrangements generally permitted.	<u>Non-residential car parking</u> 68 bays indicated for non-residential car parking. Carparking contained within the building envelope.
Vehicular access	Access shall be limited as per Plan 2 of the SACP. A minimum 6.0m wide public access easement is to be provided to the rear of the sites, providing access between Raleigh Road and The Plaza.	Raleigh Road and West Coast Drive access is as per Plan 2. Padbury Circle access does not align with Plan 2 and has been relocated further east to Lot 146 (2) Drakes Walk. A public access easement has been provided on the service station that facilitates access at the rear of the service station to and from the proposed development site. There would be negligible benefit to require this easement given the nature of the proposed development.

City of Joondalup 'without prejudice' conditions – SDAU referral development application for eight storey mixed use development in the Sorrento Activity Centre

Conditions

1. This decision constitutes planning approval only and is valid for a period of 12 months from the date of approval. If the development is not substantially commenced within the specified period, the approval shall lapse and be of no further effect.

2. The development is to be undertaken in accordance with the approved plans and documents attached to the approval, subject to modifications required by any condition of this approval, final details of which are to be submitted at working drawings stage (condition clearance stage), to the satisfaction of the Western Australian Planning Commission.

3. Prior to occupancy certification, arrangements are to be made for the amalgamation of existing lots into a single lot on one Certificate of Title, to the satisfaction of the Western Australian Planning Commission.

4. A notification, pursuant to section 70A of the Transfer of Land Act 1893, shall be placed on the certificate of title for the subject lot. The notification shall be at the owner/developer's expense and lodged with the Registrar of Titles for endorsement on the certificate of title, prior to the commencement of development. The notification is to state as follows:

   'VULNERABLE COASTAL AREA - This lot is located in an area likely to be subject to coastal erosion and/or inundation over the next 100 years.'

5. Prior to the commencement of development, plans and details demonstrating the works within the public realm shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. Works within the public realm shall be undertaken at the applicant's expense in accordance with the approved plans and details and thereafter maintained to the satisfaction of the Western Australian Planning Commission.

6. Prior to the commencement of development, the applicant shall coordinate with the City of Joondalup to produce an updated Transport Impact Assessment to determine the design of the intersections for The Plaza and West Coast Drive, and Raleigh Road and West Coast Drive, to the specification of the City of Joondalup and satisfaction of the Western Australian Planning Commission. All costs associated with the preparation of the Traffic Impact Assessment shall be at the expense of the applicant.

7. The upgrades to the intersection of West Coast Drive and The Plaza shall be at the expense of the applicant, to the specification of Main Roads WA and the City of Joondalup. The City of Joondalup will manage the delivery of works as part of a broader upgrade to the intersection, with the cost of construction for improvements to be apportioned to the applicant. The total cost of construction will be determined by an estimate by the City of Joondalup and costs apportioned to the applicant are to be paid directly to the City of Joondalup prior to the occupation of the development.

8. Prior to the commencement of development an arborist report shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. The arborist report shall include an assessment of the tree within the verge indicated for retention and include appropriate measures to ensure its retention and protection during construction and thereafter, to the satisfaction of the Western Australian Planning Commission. The measures indicated in the approved Arborist report are to be implemented during construction and incorporated into the Construction Management Plan to the satisfaction of the Western Australian Planning Commission.

9. Prior to the commencement of development, detailed landscaping plans and specifications for both the subject site and public realm are to be submitted to and approved by the Western Australian Planning Commission, on advice from the City of Joondalup. The landscaping plans are to provide all details relating to hard and soft landscaping and shall:
   - provide plant species, plant spacing, pot size and quantities;
   - provide details of planting on structure, including size and depth of soil areas;
   - provide details of tree species, pot size and deep soil areas that meet the requirements of *State Planning Policy 7.3 Residential Design Codes Volume 2 – Apartments;*
   - provide an irrigation design prepared by a certified Irrigation Designer;
   - be based on water sensitive urban design and designing out crime principles;
   - show spot levels and/or contours;
   - be drawn at an appropriate scale of either 1:100, 1:200 or 1:500.

10. Prior to occupation of the development, landscaping and reticulation shall be established in accordance with the approved landscaping plans, Australian Standards and best trade practice and thereafter maintained to the satisfaction of the Western Australian Planning Commission.

11. A Construction Management Plan shall be submitted to and approved by the City prior to the commencement of development. The management plan shall detail how it is proposed to manage:
   - all forward works for the site;
   - the delivery of materials and equipment to the site;
   - the storage of materials and equipment on the site;
   - the parking arrangements and access for the contractors and subcontractors;
   - the management of dust during the construction process;
   - The protection of the verge tree;
   - other matters likely to impact on the surrounding properties;

   and works shall be undertaken in accordance with the approved Construction Management Plan.

12. Prior to the commencement of development, a Waste Management Plan, indicating the method of rubbish collection, shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. Waste management shall then be in accordance with the approved Waste Management Plan.

13. Prior to the commencement of development, a Delivery Management Plan, indicating the timing of deliveries and modelling demonstrating service vehicles can manoeuvre through the site, shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. Delivery management shall then be undertaken in accordance with the approved Delivery Management Plan.

14. Prior to the commencement of development, a full schedule of colours and materials for all exterior parts to the development shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. The plans shall demonstrate clear glazing at an appropriate sill height to provide activation to the public realm to the satisfaction of the Western Australian Planning Commission.

    Development shall be in accordance with the approved schedule and all external materials and finishes shall be maintained to a high standard, including being free of vandalism, to the satisfaction of the Western Australian Planning Commission.

15. Any proposed air-conditioning condensers, external building plant, lift overruns, piping, ducting, transformers and fire control rooms being integrated into the design of the buildings and located or screened to minimise any visual and noise impact on the residents of the neighbouring properties and public realm. Prior to the commencement of development details of the location and screening of such plant and services shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup.

16. Screening to the residential dwellings and landscape podium shall be provided to comply with visual privacy setbacks under *State Planning Policy 7.3 Residential Design Codes Volume 2 – Apartments.* The screening shall be a minimum of 1.6 metres above the finished floor level, at least 75 percent obscure, permanently fixed, made of durable material, and restrict view in the direction of overlooking into any adjoining residential dwellings. All screening shall be installed to the satisfaction of the Western Australian Planning Commission prior to occupation of the development.

17. Prior to the commencement of development, a Lighting Strategy detailing external illumination of the development which is sympathetic to the surrounding properties and enhances the amenity and safety of the area is to be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup.

18. The development is to achieve a 5 star green star rating and average 7 Star NatHERS design rating or equivalent. Prior to the commencement of development, the applicant is to submit an updated sustainability report demonstrating how 5 star green star rating and average 7 Star NatHERS design rating is to be achieved and confirming the final strategy that will guide construction. The accepted sustainability initiatives shall be incorporated into the development and thereafter maintained by the owners of the development to the satisfaction of the Western Australian Planning Commission.

19. Prior to commencement of development, plans shall be submitted to and approved by the Western Australian Planning Commission demonstrating the number of car bays for the non-residential land uses meets the requirements of the *Sorrento Activity Centre Plan.*

20. The car parking bays, driveways and access points shall be designed, constructed, drained and marked to the specification of the City and in accordance with the Australian Standard for Off-street Car Parking (AS/NZS2890.1 2004), Off-street Parking for People with Disabilities (AS/NZS2890.6 2009) and Off-street Commercial Vehicle Facilities (AS2890.2:2002), prior to the occupation of the development. These bays, driveways and access points shall thereafter be maintained to the satisfaction of the Western Australian Planning Commission.

21. Bicycle parking facilities shall be provided in accordance with the Australian Standard for Off-street Carparking – Bicycles (AS2890.3-1993 as amended) prior to the development first being occupied. Prior to the commencement of development details of bicycle parking areas shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup.

22. Prior to the commencement of development a Wayfinding Strategy detailing signage and other measures to enhance identification of the location of the visitor car parking area shall be submitted to and approved by the Western Australian Planning Commission on advice from the City of Joondalup. The recommendations of the strategy shall be implemented to the satisfaction of the Western Australian Planning Commission prior to occupation of the development.

23. Prior to occupation of the dwellings, each dwelling shall be provided with an adequate area for clothes drying facilities that is screened from view from the street(s) to the satisfaction of the City. Clothes drying is not permitted on balconies or in courtyards.

24. All stormwater shall be contained on-site and disposed of in a manner acceptable to the Western Australian Planning Commission on advice from the City of Joondalup.

Advice notes

1. With regard to condition 1, and in accordance with s.279(4) of the *Planning and Development Act 2005,* the Western Australian Planning Commission cannot do anything that would have the effect of extending the period within which the development must be substantially commenced.

2. This is a development approval only. The applicant/owner is advised that it is their responsibility to ensure that the proposed development complies with all other applicable legislation, local laws and licence or permit requirements that may relate to the development.

3. The approved land uses for the development are Multiple Dwellings, Restaurant/Café and Liquor Store – Small as defined under the City of Joondalup *Local Planning Scheme No. 3*.

4. With regard to condition 4, the owner/applicant is advised that the subject site has been identified by the City as being subject to coastal hazard risk within the next 100 years. Condition 4 is required in accordance with the City's *Coastal Local Planning Policy* and *State Planning Policy 2.6 State Coastal Planning Policy*. Further information on the City's coastal hazard assessment and action the City is taking to plan and adapt for potential future impacts be found on the City's website, joondalup.wa.gov.au.

5. In regard to condition 5, any proposed works outside the development lot boundaries will require consent from the City of Joondalup as the road reserve owner/manager, prior to implementation.

6. Further to condition 6 and 7, the upgrade to the right turn pocket identified in the development application Transport Impact Assessment is not supported. The City has a preliminary design for a broader upgrade to the intersection of West Coast Drive and The Plaza and The Plaza public realm that is to inform the Traffic Impact Assessment required under condition 6 and upgrade in condition 7.

7. In regard to condition 13, the delivery management plan shall include modelling demonstrating service vehicles up to 12m long can manoeuvre through the site.

8. In regard to condition 19, the proposed development currently has a shortfall of one car bay for non-residential land uses. This may be addressed through the addition of car parking or reducing the net lettable area for non-residential land uses.

9. With respect to the schedule of colours and materials, the developer is encouraged to incorporate materials and colours to the external surface of the building and associated structures, including roofing, that have low reflective characteristics to minimise potential glare from the development impacting the amenity of the adjoining or nearby neighbours.

10. The development is required to meet the *Environmental Protection (Noise) Regulations 1997.* Consideration will need to be given to the positioning and nature of mechanical plant and equipment.
11. The bin storage areas are required to be provided with a concrete floor that grades evenly to an industrial floor waste gully that is connected to sewer. A hose cock is required to be provided in the bin storage areas.

12. Mechanical ventilation will be required for the bin storage areas.

13. It is recommended that condensation dryers be provided in laundry areas to reduce the risk of mould growths, which are commonly associated with multi-residential developments.

14. Ventilation is required to be provided to all laundries, bathrooms and toilets in accordance with the Building Code of Australia. Mechanical ventilation to toilets is required to be flumed to external air in accordance with the *Sewerage (Lighting, Ventilations and Construction) Regulations 1971*. Floors to wet areas shall be graded to a floor waste.

15. Food businesses are required to meet the *Food Act 2008*, including registering with the City.

16. It is recommended that a service entrance is provided to food businesses to allow the safe delivery of food and removal of waste.

17. The development is required to comply with the *Health (Aquatic Facilities) Regulations 2007*. The applicant will be required to make application to the Department of Health (WA) for the construction of an aquatic facility. An approval from the Department of Health (WA) is required before a Building Permit can be issued.

18. Alfresco dining occurring on the City's land will require an Outdoor Eating Permit under the City's *Local Government and Public Property Local Law 2014*.

19. Any septic tank and effluent disposal systems are required to be decommissioning in accordance with the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*.

City of Joondalup Technical Advice - SDAU referral development application for eight storey mixed use development in the Sorrento Activity Centre

Traffic

Development impact on road network

a. Development net increase in Traffic
   On the basis of the report, the development is not likely to have a significant impact on the surrounding road network with the exception of negative consequences for both The Plaza and Raleigh Road intersections with West Coast Drive that needs to be considered.

b. Traffic Modelling
   The traffic modelling undertaken for the proposed development is based on forecast traffic volume growth for West Coast Drive of 1%. The growth prediction of 1% expanded over ten years is considered appropriate in this instance and is consistent with the City's historic traffic count data trends looking backwards over time.

c. West Coast Drive
   West Coast Drive traffic volumes are approximately 14,000 to 15,000 vpd in the vicinity of the development. At this level of traffic volume the road is nearing capacity due to its two lane configuration. However, there will be a reduction in intersection performance with Raleigh Road and The Plaza due to the increase in vehicle trips with the development. This is particularly apparent with delay times during peak periods for right turn manoeuvres from both these roads.

d. The Plaza
   The Plaza provides the primary access road for the residential development. The increase in traffic volumes once the development is in place is not considered to have a significant impact on overall traffic volumes for this road however there will be the potential for significant delays during peak periods for right turn manoeuvres at the intersection with West Coast Drive.

e. Raleigh Road.
   Raleigh Road provides egress for the public carpark plus commercial deliveries and waste pick up for the proposed development. The increase in traffic volumes for Raleigh Road once the development is in place is not considered to be significant and it is anticipated that the traffic volumes will remain within acceptable limits for a road of this type.

Vehicle Access points to site

It is considered the access points will function in accordance with their purpose as part of the operation for the development. It is important that the public parking which utilises the commercial car parking and service access be clearly identified with appropriate signage to raise awareness to the available parking area.

It is not clear that delivery vehicles will be able to manoeuvre through the site. If the site is accessed via West Coast Drive, the design vehicle will need to be a single unit 12m long truck which is longer than the 8.8m long waste truck as stated in the report. Further clarification as to the method and location for commercial delivery vehicles is required to better understand the situation and infrastructure requirements involved.

Proposed on-street parking arrangements

An on-street parking embayment approximately three car bays in length adjacent the site on West Coast Drive is proposed. There are road safety concerns with the proposed parking embayment and the high traffic volumes and traffic speeds along West Coast Drive for this to proceed. It is suggested that on-street parking be considered for lower order roads such as Padbury Circle or The Plaza. There are no options available for additional on-street parking along Raleigh Road given that parking is currently at a maximum.

Proposed intersection and median treatments

An analysis of the Transport network proved in the TIA report for the development confirmed the following:

- Afternoon weekday and weekend peaks are greater than morning peak periods.
- The majority being 80% of residential traffic distribution is assumed to travel to/from via West Coast Drive. 20% of traffic to be to/from the east.
- Four scenarios were assessed Scenarios 2 and 4 include the existing traffic volumes plus trip generation from the development. Scenario 4 is based on forecast traffic volume growth over ten years being 1% to 2031 for West Coast Drive plus the developments trip generation.
- The Level of Service for scenarios 2 and 4 being the existing and forecast scenarios as detail in section 7.7 pages 41, 42, 45 and 46 confirmed that the majority of approaches to the intersections with West Coast Drive including The Plaza plus Raleigh Road will operate with acceptable limits once the development is in place. The exception to this is the right turn manoeuvres at both intersections. The Plaza is of particular concern as the performance of the weekend peak period indicates the intersections right turn manoeuvres will result in poor level of service (LOS) with a predicted delay time of 323 seconds in 2031. There is a suggestion in the TIA that LOS may be improved by widening the central median on West Coast Drive for vehicle storage to enable a two stage crossing to occur from The Plaza north bound on West Coast Drive.
- The proposed shared zone for The Plaza plus associated median treatment work on West Coast Drive is acknowledged. Alternative intersection and median treatments will need to be considered for The Plaza and West Coast Drive based on road safety and performance levels. Other options to be considered include a roundabout at the intersection with West Coast Drive and The Plaza, providing on-street parking within The Plaza intersection and strengthening pedestrian access and crossing points. There will be a requirement to further discuss this with the developers and stakeholders to identify and agree on the most appropriate treatments.

Bus Stop Relocation (Refer 4.1.2 page 17)

The relocation of the bus stop north of The Plaza will require further assessment as to potential negative impact on resident amenity. One option subject to patronage numbers is to retain the bus stop in its current location and remove the embayment. This would mean that buses will need to stop within the carriageway adjacent the site.

Pedestrian/Cycling Access (Refer 6.5 page 27)

The pedestrian connections and cyclist desire lines will require further analysis as part of the detailed design process for the development.

Disability access

Disability access will require further analysis and consideration as part of the design process for the development.

Landscaping and works within the public realm

- The following proposed works on the verge are not supported:
  - Permanent structures, including retaining walls and decking. The critical purpose of road verges is to accommodate above and below ground services, pedestrian safe refuge, and pedestrian movement. The construction of permanent structures will conflict and compromise these primary functions. Furthermore, the construction of decks for adjacent commercial use effectively privatises the verge which is a public environment. This raises concerns regarding the City's responsibility regarding public liability and indemnity in these now "private" areas.
  - Showers are not supported on the east side of West Coast Drive as this creates public risk as beach users are required to cross the road to access this facility. Currently there is adequate provision of beach showers at Sorrento Foreshore Park to accommodate beach users.

- No trees are permitted within the truncation area of The Plaza and West Coast Drive as this conflicts with traffic sightline requirements.

- The purpose of a footpath is to provide pedestrian thoroughfare along the road and provide a step-up safety refuge from the road. The footpath curvilinear design also does not provide an unencumbered pedestrian thoroughfare along West Coast Drive. The proposed footpath design also does not provide a step-up safety refuge from the road as it is set back behind planted beds, thus facilitating only the commercial building front.

- Trees are to be set back a minimum of 1m from back of kerb (2m is preferred) to reduce kerb and road damage from roots and allow the growth of an uncompromised tree canopy.

- Tree species need to be appropriate for the coastal location.

- The Plaza Road median is managed and maintained by the City. It has been paved to accommodate safe pedestrian refuge and crossing. Treatment and maintenance of this area does not fall under the responsibility of the Developer. The City will not consider the landscaping of this median as it will impede pedestrian safety and the City's bore license is currently fully allocated, therefore planting cannot be supported in this location.

Waste Management

Waste Generation Rates

Under 2.3 it is requested that the recycling rate for the food and beverages tenancies be recalculated as the City's calculation is 15036L for recycling and the bottle shop recycling 5040L. Refer to https://calculators.sustainability.vic.gov.au/mud-waste-management/.
As the commercial tenancies are going to produce food waste they should be planning to separate their food organics for separate collection

Waste and recycling chute system (Section 3.1)

- Recycling cannot be placed in bags so it is recommended that clear signs are provided to say that there are no soft plastic allowed in the recycling and the recycling cannot be bundled in plastic bags.
- The chute must be designed to ensure that recycling material does not fly away from the chute and cause litter problems as it will not be in bags. It is noted that some multi-unit properties supply residents with carry bags for transferring their recycling to the recycling bins or alternatively the kitchen bins could be to easily remove from the kitchen and then be used to carry the recycling to the chute for empty.

Provision for Food Organics and Garden Organics (FOGO) (Section 4.2.1)

The report states that residential will need to take kitchen caddis to the ground floor for depositing into the communal FOGO bin. For the residents to take the separated organic waste the to the ground floor bin storage area would be onerous with the other two waste streams so easily disposed of at each level. A better situation would be provision for a FOGO bin to be accessed on each floor near the waste chutes for the recycling and waste.

Bin storage area design (Section 4.4)

- The bin rooms and storage areas diagrams need measurements to show the size of the bins store. The location of the wash down station, tap, drain and ventilation also needs to be indicated.
- If the residential bin store room is going to be used to store the FOGO bins then the measurements of this room should also be supplied and the number of bins predicted.

Residential bulk waste (Section 5.1)

If the skips are to be placed in the service bay/visitor bay this needs to be shown in a diagram and it should also be noted that with 77 residential tenancies that they are entitled to more than one a week so this location or service bay may be constantly filled. An alternative location is recommended if this impacts on accessible to the service bay/visitor bay.

Environmental Health

Location next to the service station

Given that residential development is proposed it is recommended that advice is sought from the Department of Mines, Industry Regulation and Safety to confirm separation distances are adequate.

Contaminated sites

The service station was classified in 2011 by DWER as possibly contaminated – investigation required. This may have been rectified, but clarification should be sought from the applicant or Department of Water and Environmental Regulation.