

TRANSPORT IMPACT ASSESSMENT

Woolworths,
Banksia Grove

November 2015

Rev D



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Appendix 1 – The layout of the proposed development

Appendix 2 – Transport Planning and Traffic Plans

Appendix 3 – Vehicle Turning Circle Plans

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1. Introduction

1.1 Transport Impact Assessment Layout

KCTT have been requested to provide a Transport Impact Assessment for the proposed commercial development being a part of Banksia Grove Shopping Centre. This Transport Impact Assessment has been completed in accordance with the guidelines as shown in the WAPC Transport Impact Assessment Guidelines – Part 4 (Developments).

The purpose of this document is to provide commentary and analysis on the parking requirements and potential traffic and transport impacts that the proposed development of this site may have on the surrounding road and transportation networks. The scope of this report therefore is to provide a detailed assessment of the following: -

Phase 1 – Transport Impact Assessment

- Collate all available traffic volumes from the Main Roads WA and the City of Wanneroo in the vicinity of the subject site.
- Provide a preliminary review of any existing sight distance / road geometry issues which should be considered in the reporting.
- Collate all crash data for relevant roadways and intersections in the vicinity of the subject site.
- Collate the road hierarchy information, roadway and carriageway widths for all roads directly fronting the subject site.
- Estimate the subject sites' trip generation / attraction on the basis of the proposed land-use quantities and areas.
- Comment on appropriate intersection / access configurations.
- Analyse the existing pedestrian and cyclist paths as well as the existing bus routes.
- Analyse Parking Requirements and potential reciprocal schemes.
- Prepare Turning Templates for the service vehicles for each of the facilities.
- Prepare SIDRA Analysis for following intersections (intersections will be analysed in PM peak, in the year of estimated completion and 10 years upon the estimated completion):-
 - 5 access / egress points on Ghost Gum Boulevard, Joseph Banks Boulevard and Joondalup Drive;
 - Ghost Gum Boulevard / Joondalup Drive;
 - Joseph Banks Boulevard / Joondalup Drive;
 - Joseph Banks Boulevard / Ghost Gum Boulevard.
- Prepare report detailing all findings to be submitted to the Client and to the City of Wanneroo.
- Prepare traffic and transport plans showing the background information and traffic distribution to be included in the submission.

Additional Requirements as per Woolworths Brief

STAGE 1 – CONCEPT / FEASIBILITY

- a) Meet with the Representative / Project Team to receive the initial Project Brief, development / tenant / stakeholder requirements and any known Site data.
- b) Become familiar with the Site and the site conditions, incl. geographical constraints, traffic and pedestrian movements, location of major utilities services, etc.

- c) Evaluate zoning restrictions and likely Authorities requirements to determine current and future pedestrian and traffic flows in and around the Site. Research historical information to establish any trends.
- d) Assist the Project Team with traffic engineering advice to facilitate the preparation of concept drawings and investigation of various suitable development options for the Site.
- e) Determine in conjunction with the Project Team and various stakeholders possible alternate Supermarket / Store, footpath and car park configurations. Evaluate pedestrian and traffic implications and prepare a schematic layout of the proposals showing general building configuration, access pathways and car parking.
- f) Co-ordinate with other Consultants as appointed by the Principal to prepare the concept plans.
- g) Attend meetings with the Representative / Project Team to review the concept plans and amend concept plans as required.
- h) Produce drawings of sufficient detail to enable feasibility studies to be carried out on the proposed options and production of a Cost Plan.
- i) Attend meetings with Council to discuss the merits of the proposal and assist with negotiations as required.
- j) Assist the Representative / Project Manager as required in making presentations to Council, major tenants, and the Woolworths Board.
- k) Supply multiple copies of the concept plans as directed by the Representative.
- l) Secure written approval from the Representative before proceeding to the next Stage.

STAGE 2 – DEVELOPMENT APPLICATION (DA) APPROVAL

- a) Develop the approved concept design, and meet regularly with the Project Team to refine the design in accordance with cost constraints.
- b) Liaise and meet regularly with the Project Team to refine the Cost Plan.
- c) Assist the Architect to prepare the formal DA for submission to Council. Provide all documents including plans, car park layouts, etc, as required for DA.
- d) Co-ordinate with other Consultants as appointed by the Principal to prepare the Statement of Environmental Effects.
- e) Contribute to other studies as required by Council such as Retail Impact Studies, Dock Management Studies and Social Impact Studies.
- f) Meet with Woolworths' user groups and other stakeholders to identify their requirements and produce a Pedestrian and Traffic Management Plan. Brief the Project Team on the content and specific design requirements of the Pedestrian and Traffic Management Plan.
- g) Attend meetings with Council as required to assist the approval process, amend drawings where necessary and assist the Representative / Project Manager in negotiating conditions.
- h) Review the DA approval, analyse the conditions of consent and recommend amendments where appropriate.
- i) Secure written approval from the Representative before proceeding to the next Stage.

This Transport Impact Assessment is presented in the following logical sequence: -

- Section 1 – Introduction

This section provides a brief description on the role of this report in the Development Application process, the general layout of the report and a list of the guideline and reference documents used in its composition.

- Section 2 – Transport Impact Assessment

This section provides research and analysis of the key items required for submission of a Transport Impact Assessment for Developments in accordance with the Transport Assessment Guidelines nominated above. In this section, KCTT have examined the following subject areas: -

- Section 2.1 – Outline of the Development Proposal

This section provides a brief description of the proposed land uses, as will be submitted to the City of Wanneroo for this Development Application.

- Section 2.2 – Vehicle Access and Parking Requirements

This section provides a detailed description of the parking requirements using the local authority planning scheme provisions and providing a detailed assessment of where reciprocity of parking calculations are appropriate in this proposal.

- Section 2.3 – Provision for Delivery and Service Vehicles

This section provides a detailed assessment of the requirements for delivery and service vehicles, both within the subject site and at intersections with the surrounding road networks.

- Section 2.4 – Hours of Operation

This section will describe the general operating times for the land usage as proposed under this Development Application. This information will assist in determining the likely timing of the AM and PM peaks, and therefore the peak impact on the existing and surrounding transportation network. The peak vehicle generation is the key for determining intersection capacities within a road network.

- Section 2.5 – Daily Vehicular Volumes and Vehicular Types

This section provides details on the traffic generation rates used to determine daily traffic generation from the proposed development. It also discusses the estimated peak hour traffic as well as the expected predominant type of vehicle which will be accessing the proposed development.

- Section 2.6 – Management of Traffic Generated by the Subject Site

This section summarises the expected traffic generated by the land uses as proposed in the Development Application for the subject site and provides an assessment of the cumulative impact of the existing traffic volumes and the proposed traffic volumes as generated by the development.

- Section 2.7 – Public Transport Access

This section provides a summary of the existing public transportation services available within an 800 metre radius of the subject site and whether any improvements to the network should be considered.

- Section 2.8 – Pedestrian and Cyclist Access

This section provides a summary of the existing pedestrian and cyclist infrastructure available within an 800 metre radius of the subject sites boundaries and whether any improvements to the networks should be considered.

- Section 3 – Transport Impact Assessment Checklist

This section provides a concise, tabulated Executive Summary of the detailed information presented in Section 2 of this report. The intention of this checklist is to document the findings of this report, and / or any of the likely transportation / safety issues which should be considered as part of the Development Application submission. This checklist has been developed in accordance with the requirements of the Transport Assessment Guidelines for Developments.

1.2 Notes Pertaining To This Report

This report has been provided as one of the key inputs into the overall Development Application submission to the City of Wanneroo for the Banksia Grove Shopping Centre on behalf of the proponent.

The following key points are relevant to the collection of data which has been undertaken for this project: -

- Parking requirements have been assessed in accordance with the City of Wanneroo's District Planning Scheme No 2;
- Traffic data were compiled through the Main Roads WA website;
- Aerial imagery as available through commercial arrangements.

KCTT have completed recently an update to Banksia Grove Traffic Impact Assessment. Some of the modelling outcomes for optimal intersection configurations was relied upon in this reporting.

The above background information has provided a technical basis for the trip rates and parking requirements discussed in this report.

1.3 Available Information and Technical Literature

This section provides a brief description of the inputs used in the compilation of this report: -

- WAPC Transport Impact Assessment Guidelines – Volume 4 Developments
- WAPC Transport Impact Assessment Guidelines – Volume 5 (referenced for PM peak hour and traffic splits)
- RTA NSW Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses).
- Guide to Traffic Management - Part 3: Traffic Studies and Analysis, Austroads, 2008
- Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections
- Guide to Traffic Management - Part 11: Parking, Austroads, 2008
- Guide to Traffic Management - Part 12: Traffic Impacts of Developments, Austroads, 2008
- City of Wanneroo's District Planning Scheme No 2.
- Banksia Grove District Centre Local Structure Plan No. 65.

1.4 Executive Summary

- This report was prepared in order to examine the full impact on surrounding road and transportation network that the proposed development might have.
- The proposed development comprises of a mixture of commercial uses (retail, office, private recreation and childcare) where most of the uses will have coinciding peak hour operation times.
- The proposed development will contain three pad sites that are not a part of this development application. The intended use of pad sites is not completely defined at the time of writing of this report therefore following assumptions were made:-
 - Pad Site 1 will be assessed where required as a Petrol Station with a convenience store;
 - Pad Site 2 will be assessed where required as a Car Wash that will have a complementary use to Pad Site 1;
 - Pad Site 3 will be assessed where required as Retail.
- Each Pad Site will have parking required allocated within boundaries of the Pad Site therefore Pad Sites were not taken into account during the parking assessment.
- For purposes of the analysis KCTT have taken into account potential traffic attracted by the Pad Sites.
- The subject site forms part of Banksia Grove District Centre. The site is highly accessible and benefits great exposure fronting Joondalup Drive. It is expected that a significant portion of trade will be derived from the passing traffic on Joondalup Drive in particular.
- The subject site has a minimum parking requirement of 492 standard and 6 ACROD parking bays while the proposed development offers 511 standard and 7 ACROD parking bays.
- The subject site is expected to generate 9,129 vehicles per day prior to construction of Pad Sites and 10,460 vehicles per day upon construction of Pad Sites with estimated uses and capacities.
- Utilising SIDRA Intersection software KCTT have modelled the estimated impact of the proposed development on the existing intersections and the performance of the proposed intersections. The estimate was completed for 2016 (the estimated year of completion) and 2026 (10 years upon completion).
- For the future projections KCTT have assumed annual average traffic growth rate of 4% given the significant volume of development occurring in the area. Also the duplication of Joondalup Drive carriageway was assumed (north from the intersection with Joseph Banks Boulevard).
- The intersections show satisfying levels of performance. For more information please refer Appendix 4.
- PTA is working on optimisation of bus routes as the area densifies therefore some of the bus routes will be realigned and new routes will be introduced. The existing bus stop 26499 (Joondalup Drive before Joseph Banks Boulevard) will be relocated to accommodate the new proposed intersection of Ghostgum Boulevard and Joondalup Drive. The new bus stop on 391 route is proposed to be located near shopping centre on Ghostgum Boulevard. The exact location and configuration is yet to be confirmed.
- Pedestrian movement was strongly considered during the design phase. All major pedestrian desire lines tie in with the existing and proposed pedestrian paths.
- Service vehicles will utilise only designate routes, entries and exits. The design is aiming to segregate heavy vehicles from passenger vehicles as pedestrians as much as possible. The largest vehicle accessing the site will be semi-trailer.

In summary the proposed development will have a large impact on surrounding network however the impact is quite standard for the proposed type and quantum of development. The proposed development offers parking surplus to the minimum requirements, strongly considers pedestrian movement and movement of delivery / servicing vehicles. The proposed design of intersections and access / egress points is suited to the main purpose and is expected to perform to a satisfying level.

2. Transport Impact Assessment

2.1 Outline of the Development Proposal

This Development Application considers the proposed development of a commercial development comprising a part of the Banksia Grove Shopping Centre. The proposed development is under the jurisdiction of the City of Wanneroo. The subject site is currently a vacant landholding.

The proposed development is a mixed development comprising of retail land uses (Supermarket, Specialty Shops and Bulky Goods), commercial tenancies, offices, childcare, gym and aquatic centres. The proposed building areas are provided below in Table 1.

Table 1 - Proposed Land Uses within the Development

Land Use	Yield		
	Site Area	GFA	NLA (75% of GFA)
Supermarket (Woolworths)	n/a	4,014m ²	3,010m ²
BWS (Liquor Store)	n/a	197m ²	150m ²
Retail / Commercial Tenancies	n/a	920m ²	690m ²
Office	n/a	350m ²	270m ²
Gym	n/a	259m ²	195m ²
Childcare	n/a	700m ²	525m ²
Aquatic Recreation Centre	n/a	500m ²	375m ²
Bulky Goods	n/a	9,000m ²	6,750m ²
Total - without Pad Sites	n/a	15,940m²	11,965m²
Pad Site [01] - Retail	1,282m ²	400m ² *	300m ²
Pad Site [02] - Petrol Station (8 fuel positions)	1,993m ²	600m ² *	450m ²
Pad Site [03] - Car wash	6,238m ²	2,000m ² *	1,500m ²
Future development - Retail	523 m ²	477m ²	358m ²
Total - Pad Sites	10,036m²	3,477m²	2,608m²
Total - including Pad Sites	n/a	19,417m²	14,573m²

* Note: KCTT assume that GFA for the Pad Sites facilities is approximately 30% of site area.

Net lettable area (NLA) is preferred to gross floor area for these land use categories, because it refers most specifically to the factor that generates / attracts trips. The term net lettable area means the sum of the areas at each floor of a building. In this instance, the area of each floor is taken to be the area within the internal faces of the walls, excluding stairs, amenities, lifts, corridors and other public areas, but including all stock storage areas. As a guide, about 75% of the gross floor area is deemed net lettable area (*we have substituted the term GLFA with NLA since their meaning is the same*).

The proposed development will include a total gross floor area of approximately 15,940m². Plans for the proposed development have been provided in Appendix 1 of this report.

The adjoining Pad Sites and the future development to the west of the subject site are not a part of this Development Application; however in order to provide a robust analysis KCTT have examined the potential traffic impact of Pad Sites and the future development as well. The GFA areas for each respective site were assumed based on our recent experience with similar developments.

2.2 Vehicular Access and Parking

2.2.1 Vehicular Access

The subject site fronts and offers direct vehicular access to / from Joseph Banks Boulevard, Joondalup Drive and the proposed road to the west of the development (Ghost Gum Boulevard north – south) and south of the development (Ghost Gum Boulevard east – west). There are a total of 6 access / egress points (including one access point only fronting Joseph Banks Boulevard and one access point only fronting Joondalup Drive).

Joondalup Drive is a two-way road divided by a central median south of the intersection with Joseph Banks Boulevard. Joondalup Drive is classified as a Significant Urban Local Road - Distributor A with a sign-posted speed limit of 70kph. Bus service (Route No 390) runs along this street. A shared path is provided on the western side and a pedestrian path is provided on the eastern side of the road reservation. There is one access / egress point to / from the site (left in left out only) and one access point (left in only) from Joondalup Drive. The access and egress points will be designed to be suitable for navigation of semi-trailers delivery vehicles.

In the vicinity of the subject site, **Joseph Banks Boulevard** is a two-way carriageway divided by a central median, classified as an Urban Local Road - Access Road by Main Roads WA. The legal speed limit on Joseph Banks Boulevard is 50kph. Bus services (Route No's 390 and 391) run on Joseph Banks Boulevard in the vicinity of the subject site. Shared paths are provided on the southern side of the road reservation. There is one access / egress point and one access point only to the site from Joseph Banks Boulevard.

There is one access / egress point to the site from the proposed road to the west of the subject area (Ghost Gum Boulevard north – south) and another one to the south (Ghost Gum Boulevard east – west).

The table below shows the most recent available traffic data for the surrounding network. The following information has been obtained from Main Roads WA and the City of Wanneroo. This information is provided graphically on plan KC00202.010_S05 in Appendix 2.

Table 2 - Traffic Volumes for Roads Adjacent to the Subject Site

Road Name	Road Hierarchy	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)	Heavy Vehicle %	Year	Legal Speed Limit
Joseph Banks Boulevard	Urban Local Road / Access Road	South of Woolly Road	1,911	AM 0800 - 140 PM 1600 - 178	n.a.	Sept 2012	50kph
		West of Porrecta Link	1,784	AM 0900 - 142 PM 1800 - 163	n.a.	Sept 2012	
		West of Joondalup Drive	2,711	AM 08:00 - 222 PM 17:00 - 230	n.a.	Sep 2012	
Joondalup Drive	Significant Urban Local Road / Distributor A	West of Pinjar Road	16,231	AM 07:45 - 1,279 PM 16:30 - 1,488	7.9	Dec 2012	70kph
			23,258	AM 07:30 - 1,811 PM 16:15 - 1,946	n.a.	Nov 2014	
		East of Mistletoe Drive	7,238	AM 0800 - 558 PM 1700 - 668	n.a.	Sept 2012	70kph
		South of Tumbleweed	14,173	AM 0900 - 1,172 PM 1600 - 1,209	n.a.	Sept 2012	70kph

		Drive					
Tumbleweed Drive	Significant Urban Local Road / Local Distributor	East of Joondalup Drive	3,651	AM 08:00 - 406 PM 15:00 - 362	n.a.	Sep 2011	50kph
Pinjar Road	Distributor A / Significant Urban Local Road	North of Joondalup Drive	4,728	AM 07:00 - 367 PM 17:00 - 466	n/a	Sep 2012	70kph
Ghost Gum Boulevard	Local Distributor / Urban Local Road	South of Splendens Avenue	1,522	AM 07:00 - 112 PM 17:00 - 143	n/a	Sep 2012	50kph

Formal peak hour data has been recorded and shown in Table 2 for the location on Joseph Banks Boulevard in the vicinity of the vehicular access to the subject site. Analysis of the available data within 400 metres of the proposed development suggests the following:-

- Joondalup Drive (West of Pinjar Road):-
 - AM peak occurs in period 07:30-08:30. Traffic volumes in AM peak are approximately 7.8% of total daily volumes;
 - PM peak occurs in period 16:15-17:15. Traffic volumes in PM peak are approximately 8.4% of total daily volumes.

2.2.2 Crash Data

The following table has collated the applicable crash data from the Main Roads WA database for crashes and incidents for roads adjacent to the subject site between the 1st January 2010 and 31st December 2014.

Table 3 - Crash Data

Road Name	Road Hierarchy	Functional Classification	Speed Limit	Crash Statistics
Joondalup Drive & Pinjar Road [SLK 4.04]	Distributor A / Distributor A	Significant Urban Local Road / Significant Urban Local Road	70kph / 70kph	Total of 56 incidents: <ul style="list-style-type: none"> • 1 Hospital • 9 Medical • 21 PDO Major • 25 PDO Minor MR Type: <ul style="list-style-type: none"> • 3 Involving Overtaking • 1 Involving Pedestrian • 52 Other / Unknown
Joondalup Drive & Tumbleweed Drive & Joseph Banks Boulevard	Distributor A / Local Distributor / Access Road	Significant Urban Local Road / Significant Urban Local Road / Urban Local Road	70kph / 50kph / 50kph	Total of 15 incidents: <ul style="list-style-type: none"> • 2 Hospital • 2 Medical • 7 PDO Major • 4 PDO Minor MR Type: <ul style="list-style-type: none"> • 15 Other / Unknown
Joseph Banks Boulevard &	Access Road / Local Distributor	Urban Local Road/ Urban Local Road	50kph / 50kph	Total of 2 incidents: <ul style="list-style-type: none"> • 2 PDO Major

Ghost Gum Boulevard				MR Type: • 2 Other / Unknown
Joseph Banks Boulevard & Porrecta Link	Access Road / Access Road	Urban Local Road/ Urban Local Road	50kph / 50kph	Total of 1 incident: • 1 PDO Major MR Type: • 1 Other / Unknown
Pinjar Road [SLK 4.47] & Golf Drive	Distributor A / Access Road	Significant Urban Local Road / Rural Local Road	70kph / 50kph	Total of 6 incident: • 3 Medical • 3 PDO Major MR Type: • 6 Other / Unknown
Joondalup Drive (2.95 – 3.55)	Distributor A	Significant Urban Local Road	70kph	Total of 6 incidents: • 1 Hospital • 1 Medical • 3 PDO Major • 1 PDO Minor MR Type: • 6 Other / Unknown
Joseph Banks Boulevard (0.00-0.57)	Access Road	Urban Local Road	50kph	Total of 1 incident: • 1 PDO Major MR Type: • 1 Involving Animal
Porrecta Link (0.00-0.23)	Access Road	Urban Local Road	50kph	Total of 2 incidents: • 1 PDO Major • 1 PDO Minor MR Type: • 1 Involving Parking • 1 Other / Unknown
Pinjar Road (4.04-4.70)	Distributor A	Significant Urban Local Road	70kph	Total of 2 incidents: • 2 Medical MR Type: • 2 Other / Unknown

KCTT have reviewed extensively the crash data above. We have reviewed the likelihood of incidents at the intersection of Joondalup Drive and Pinjar Road.

Intersection of Joondalup Drive and Pinjar Road

- Killed and Serious Injury (KSI) Crashes (Fatality + Hospital) = 1 per every 5 years;
- All Crashes = 56 per every 5 years.

Main Roads WA uses a criterion called Crash Rate / MVKT (million vehicle kilometres travelled). The calculations for MVKT are shown below: -

Intersection of Joondalup Drive and Pinjar Road

- Approximately 35,000 VPD
- VKT (5 year period) = 35,000 * 365 * 5 years * 0.4km = 25.55 MVKT
- KSI Crash Rate = 1 per 25.55 MVKT = 0.039
- All other crash Rate = 56 per 25.55 MVKT = 2.19

Therefore the crash rate at the intersection of Joondalup Drive and Pinjar Road is 54 incidents per 25.55 million kilometres travelled or equivalent to an incident rate of 2.19 crashes / MVKT. This rate of crashes is therefore lower than the network average of 7.69 crashes / MVKT over the 5 year period.

The crash rate for KSI crashes at the intersection of Joondalup Drive and Pinjar Road is 1 incident recorded in the 5 year period per 25.55 million kilometres travelled or equivalent to an incident rate of 0.039 crashes / MVKT. This crash rate is lower than the network average of 0.37 over the 5 years.

The following table shows the Crash Density and Crash Rates on Metropolitan Local Roads as obtained from Main Roads WA on the 16th October 2014 by email request: -

CRASH DENSITY AND CRASH RATE ON METROPOLITAN LOCAL ROADS NETWORK ONLY				
	ALL CRASHES		KSI CRASHES (FAT+HOS)	
	DENSITY ALL CRASHES/KM over 5 years	CRASH RATE/MVKT	DENSITY KSI CRASHES/KM over 5 years	CRASH RATE/MVKT
LOCAL - MIDBLOCK	3.52	1.17	0.18	0.06
LOCAL - ALL	7.69	2.54	0.37	0.12
NOTE: BASED ON 5-YEARS DATA FOR THE PERIOD 2009 TO 2013.				

Based on the comparative analysis, KCTT believe that this location does not raise outstanding safety concerns.

2.2.3 Vehicle Parking Requirements

The Banksia Grove District Centre Local Structure Plan No 65; Part One Statutory Planning Section states “*Parking provision shall be in accordance with the Scheme, though concessions may be approved where reciprocal use is provided (excluding for residential components, which must provide dedicated bays, in accordance with the R-Codes)*”. This document was adopted under the Banksia Grove Agreed Local Structure Plan (21A), Carramar South / Tapping North Agreed Local Structure Plan (21B), Part 9 of the City of Wanneroo District Planning Scheme No 2 and by the Western Australian Planning Commission.

To determine the relevant parking requirements for the development of Banksia Grove Shopping Centre, KCTT have undertaken an analysis based on the minimum requirements for parking in accordance with the City of Wanneroo’s District Planning Scheme No 2 (Table 2 (Clause 4.14) - Car Parking Standards) and we have provided explanations for reciprocal parking across the proposed development.

The City of Wanneroo’s District Planning Scheme No 2 stipulates that parking provisions for developments should be made in accordance with the following ratio’s and rates: -

- Shopping Centre (under 10,000m²) - 7 parking bays per 100m² NLA;
- Supermarket - See Shopping Centre;
- Market (Retail) - See Shopping Centre;
- Liquor Store - See Shopping Centre;
- *Child Care Centre - Per Local Planning Policy but not less than 5;
- Recreation Centre - 1 per 4 people accommodated;
- Service Station - 5 bays per service bay plus 7 per 100m² non service bay NLA. Up to 50% of non-service bays may be located in re-fueling positions;
- Convenience Store - 7 per 100m² NLA. Up to 50% of bays may be located in refueling positions.
- Office - 1 per 30 m² NLA

*The City of Wanneroo’s Local Planning Policy (Planning and Sustainability; Local Planning Policy Framework; Local Planning Policy 2.3: Child Care Centres) states:

“All Child Care Centres must provide a minimum of one parking bay for each staff member and at least five parking bays for up to 25 children. For Centres with more than 25 children the required parking bays are determined by reference to Figure 1. The actual parking requirement for Centres in this category varies with the configuration of the parking area and the number of children.”

KCTT assume that there will be 80 children and 20 staff members. The Figure 1 (Planning and Sustainability; Local Planning Policy Framework; Local Planning Policy 2.3: Child Care Centres, page 7) shows that the number of required parking bays for 80 children is 10 plus 20 car parking bays for staff members.

Given that the City of Wanneroo’s District Planning Scheme No 2 does not offer parking rate for Bulky Goods Retail land use, we have used the rate that the Large Format Retail Association (LFRA) suggests. In other words, LFRA (<http://www.lfra.com.au/development-and-planning/planning-requirements-2/>) states that a minimum requirement for customer car parking ratio should be 3 spaces per 100 square metres of floor space. For purposes of this analysis we have assumed that 3.5 parking bays per 100m² will be sufficient to cater for the parking requirements of clients and employees.

The table below shows car parking requirements for the proposed development which have been calculated in accordance with the City of Wanneroo’s District Planning Scheme No 2 and LFRA.

Table 4 - Car Parking Requirements Using the City of Wanneroo’s District Planning Scheme No 2 and LFRA

Land Use	Requirement	GFA (m ²)	NLA (m ²)	Total	Reciprocal Parking	Total (after reciprocity)
Supermarket	7 parking bays per 100m ² NLA	4,014m ²	3,010m ²	211	Allow 100% of required parking i.e. no allowance for reciprocity.	211
BWS (Liquor Store)		197m ²	150m ²	11	Allow 50% reciprocal parking as some customers will also be attracted to the supermarket.	6
Retail / Commercial Tenancies		920m ²	690m ²	49		25
Office	1 per 30 m ² NLA	350m ²	270m ²	9	Allow 100% of required parking i.e. no allowance for reciprocity.	9
Gym	1 per 4 people accommodated	259m ² GFA and 195m ² NLA (20 people)		5	Allow 100% of required parking i.e. no allowance for reciprocity.	5
Childcare	One parking bay for each staff member plus 10 parking bays for 80 children	700m ² GFA and 525m ² NLA (80 children and 20 staff members)		30	Allow 100% of required parking i.e. no allowance for reciprocity.	30
Aquatic Recreation Centre	1 per 4 people accommodated	500m ² GFA and 375m ² NLA (40 people)		10	Allow 100% of required parking i.e. no allowance for reciprocity.	10
Bulky Goods Retail	3.5 parking bays per 100m ² NLA	9,000m ²	6,750m ²	203	Similar opening hours to supermarket and retail shops. However, higher percentage of customers attracted on weekends. Allow 10% reciprocal	183

					parking with supermarket.	
Total without Pad Sites				528		479
Pad Site [01] - Car wash	1 waiting bay per service bay + 1 bay per employee	2,000m ²	*estimate – 4 service bays; 2 employees	10 ¹	-	-
Pad Site [02] Petrol Station	1 waiting bay per bowser + 1 bay per employee + 7 parking bays per 100m ² NLA for convenience store	600m ²	450m ²	25 ²	-	-
Pad Site [03]	7 parking bays per 100m ² NLA (expected)	400m ²	300m ²	21	-	-
Future development - Retail	7 parking bays per 100m ² NLA (expected)	477m ²	358m ²	25	Allow 50% reciprocal parking as the customers will also be attracted to the supermarket.	13
Pad Sites				81	-	-
Total without Pad Sites, but with the future development to the west				553		492
Total Provided bays				511		511
Deficit				-42	Surplus	+19

The Pad Site 3 has been analysed as a retail land use. Pad Site 2 is expected to be a petrol station with estimated 8 fuel positions. Pad Site 1 is expected to be an automated car wash facility, complementary to the Pad Site 2 use. Each Pad Site will have parking associated with the use located within the boundaries of the Pad Site. KCTT have noted the expected parking ratios for each assumed use.

The car parking provisions are based on unrestrained demand for parking, in isolation to adjacent developments. When it can be demonstrated that the time of peak demand for parking associated with the proposed shopping centre and the adjacent land uses do not coincide, or where common usage reduces total demand, a lower level of parking provision may be acceptable. Provision of public transport may also reduce the demand for car parking spaces.

KCTT have recently undertaken surveys of shopping centres in Brighton, Belmont, Kalgoorlie and Waikiki which support the above comments. In each of these surveys the peaks have been similar on Thursday evening, Friday evening and Saturday mornings. These surveys show weekly peak operating times are now being spread over a greater timeframe due to the recently-expanded trading hours. Further, each of the studies we have undertaken have shown the peak carpark usage correlates to a multiplier of 5 bays per 100m² NLA for a complex comprising of a major super market and specialty retail shops.

According to the City of Wanneroo's District Planning Scheme No 2 and LFRA, however not allowing for any reciprocity of uses, the proposed development will require 553 car parking bays. KCTT strongly believe that the

¹ Inclusive of service bays and waiting bays.

² Inclusive of service bays and waiting bays.

above reciprocity can be taken into account and that the proposed development would be compliant with 492 car parking bays.

The layout for the proposed development shows a total of 511 car parking bays, therefore is compliant with good design and allows some excess of parking.

2.2.4 Bicycle Parking

The City of Wanneroo Town Planning Scheme No 2 states the following: -

“ Council may require the provision of bicycle parking and end of trip facilities such as showers, change rooms and lockers in commercial developments and other employment centres in accordance with Austroads’ Guide to Engineering Practice Part 14: Bicycles” (page 133).

This item has been superseded by following items:

- AGRD: Guide to Road Design — SET
- AGRD04-09: Guide to Road Design Part 4: Intersections and Crossings – General
- AGRD06A-09: Guide to Road Design Part 6A: Pedestrian and Cyclist Paths
- AGTM: Guide to Traffic Management — SET

The following table provides a preliminary calculation for the bicycle parking for the proposed development on the basis of the development yields.

Table 5 - Bicycle Parking Requirements (Guide to Traffic Management Part 11; Parking – Table C2.7 Bicycle Parking Provisions)

Land Use	Area (m ²)	Employee/ Resident Parking Spaces	Class	No of Parking Spaces	Visitor / Shopper Parking Spaces	Class	No of Parking Spaces	Total
Supermarket (Woolworths)	4,014m ²	1 per 300m ² GFA	1	14	1 per 500m ² over 1,000m ²	3	7	21
BWS (Liquor Store)	197m ²	1 per 300m ² GFA	1	1	1 per 500m ² over 1,000m ²	3	0	1
Retail / Commercial Tenancies	920m ²		1	4		3	0	4
Office	350m ²	1 per 200m ² GFA	1 or 2	2	1 per 750m ² over 1,000m ²	3	0	2
Childcare	700m ²	1 per 400m ² *	n/a	2	n/a	n/a	0	2
Gym	259m ²	1 per 400m ² *	n/a	1	1 per 100m ² *	n/a	3	4
Aquatic Recreation Centre	500m ²	1 per 400m ² *	n/a	2	1 per 100m ² *	n/a	5	7
Bulky Goods	9,000m ²	1 per 750m ² GFA	1	12	1 per 1,000m ²	3	9	21
Total without Pad Sites				38	-	-	24	62
Pad Site [01] -	300m ²	1 per 300m ²	1	1	1 per 500m ²	1	1	2

Retail		GFA			over 1,000m ²			
Pad Site [02] - Petrol Station (8 fuel positions)	450m ²	/	/	/	/	/	/	/
Pad Site [03] - Car wash	1,500m ²	/	/	/	/	/	/	/
Future development - Retail	523m ²	1 per 300m ² GFA	1	2	1 per 500m ² over 1,000m ²	3	1	4
Total Pad Sites				3	/		2	6
Total with Pad Sites				41	/		26	68

*Note: Given that *Guide to Traffic Management part 11; Parking – Table C2.7 Bicycle Parking Provisions* does not provide any ratio, KCTT assume this rate to be adequate.

**Note: Given that *Guide to Traffic Management part 11; Parking – Table C2.7 Bicycle Parking Provisions* does not provide any ratio, KCTT assume this number to be adequate.

From a customer's perspective, cycling to a bulky goods store, a childcare, a car wash facility and a petrol station is unlikely.

Should council require bicycle parking in reference to *Guide to Traffic Management part 11; Parking – Table C2.7 Bicycle Parking Provisions*, the proposed development would require a total of **62 bicycle spaces without pad sites** and 68 bicycle spaces with pad sites.

Bicycle Parking should be provided in accordance with Australian Standard 2890.3.

2.2.5 ACROD Parking

The retail / commercial tenancies component of the subject development can be classified as Class 6 according to the Australian Building Code and requires provision of a minimum of 1 ACROD bay per 50 standard car bays provided (up to 1,000 car parking spaces); and 1 ACROD bay for each additional 100 car parking spaces or part thereof in excess of 1,000 car parking spaces. Gym can be classified as Class 5 (An office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9) according to the Australian Building Code and requires provision of a minimum of 1 space for every 100 standard car parking spaces. Child Care can be classified as Class 9b (An assembly building, including a trade workshop, laboratory or the like, in a primary or secondary school, but excluding any other parts of the building that are of another class) and requires provision of a minimum of 1 space for every 100 standard car parking spaces.

Therefore, of the 511 bays, there should be 6 ACROD bays within the subject area in accordance with the requirements.

The proposal development offers 7 ACROD bays.

2.3 Provision for Delivery and Service Vehicles

Delivery and service vehicles can approach the site via Joondalup Drive, Joseph Banks Boulevard and the proposed road to the south of the development (Honeybee Parade). There are dedicated access and egress points designated for delivery and service vehicles on Joseph Banks Boulevard (access only - A and A'), Honeybee Parade (egress only - D) and Joondalup Drive (access and egress - B and access only - C). Those access / egress

points are designed to be suitable for semi-trailer turning circles. These routes are also suitable for 12.5 metre rigid vehicles which will be used for deliveries and waste collection.

The minimum requirements for parking for provision of delivery and service vehicles according to the NSW RTA Guide to Traffic Generating Developments (Table 5.1 Provision of areas for delivery and service vehicles) is as follows: -

- Commercial premises (50% of spaces adequate for trucks):
1 space per 4,000m² GFA (if GFA < 20,000m²);
- Supermarkets, shops and restaurants (all spaces adequate for trucks):
1 space per 400m² GFA (if GFA < 2,000m²) or
5 + 1 space per 1,000m² over 2,000m² (if GFA > 2,000m²);
- Other uses (50% of spaces adequate for trucks):
1 space per 2,000m²

The following table provides the total delivery and service vehicle parking requirements for the proposed development based on the nominated yields.

Table 6 - Provision of Delivery and Service Vehicle Parking for Development Sites

Land Use	Parking Requirements	Area (m ²)	Parking Bays
Supermarket (Woolworths)	5 + 1 space per 1,000m ² over 2,000m ²	4,014m ²	7
BWS (Liquor Store)	1 space per 400m ² GFA	197m ²	1
Retail / Commercial Tenancies		920m ²	3
Office	1 space per 4,000m ² GFA	350m ²	1
Childcare	1 space per 2,000m ² GFA	700m ²	1
Gym		259m ²	1
Gym Aquatic Recreation Centre		500m ²	1
Bulky Goods	5 + 1 space per 1,000m ² over 2,000m ²	9,000m ²	12
Total without Pad Sites (no reciprocity taken into account)		15,940m²	27
Pad Site [1] – Retail	1 space per 400m ² GFA	400m ²	1
Pad Site [2] – Service Station	1 space per 2,000m ² GFA	600m ²	1
Pad Site [3] – Car Wash	1 space per 2,000m ² GFA	2,000m ²	1
Future development - Retail	1 space per 400m ² GFA	477m ²	1
Pad Sites			3

The waste bins (recycling and standard bins) for Woolworths are to be placed in a designated area as shown in Appendix 1.

2.4 Hours of Operation

The development is expected to be operational from 08:00 to 21:00 from Monday to Friday, from 08:00 to 17:00 on Saturdays and from 08:00 to 18:00 and 11:00 to 17:00 on Sundays. The expected peak usage of the facility will be between 16:30 and 17:30 on Thursday to Friday evenings, and between 11:00 and 12:00 on Saturday mornings.

We have assumed that the petrol station would be operational 24 hours per day.

Table 7 - Hours of Operation of Different Land Uses within the Proposed Development

Land Use	Monday - Friday	Saturday	Sunday
Supermarket (Woolworths)	08:00 - 21:00	08:00 - 17:00	11:00 - 17:00
BWS (Liquor Store)			
Retail / Commercial Tenencies			
Childcare	06:00 – 19:00	-	-
Office	09:00 – 17:00	-	-
Gym / Aquatic Centre (Gym)	06:00 – 19:00	09:00 - 16:00	09:00-16:00
Bulky Goods	08:00 - 21:00	08:00 - 17:00	08:00 - 18:00
Pad Site [1] - Retail	08:00 - 21:00	08:00 - 17:00	11:00 - 17:00
Pad Site [2] - Service Station	00:00 - 00:00	00:00 - 00:00	00:00 - 00:00
Pad Site [3] – Car Wash	08:00 - 21:00	08:00 - 17:00	11:00 - 17:00
Future Development – Retail	08:00 - 21:00	08:00 - 17:00	11:00 - 17:00

Childcare and Gym are expected to be operational from 06:00 to 19:00. It is expected that the Childcare and offices will be operational on weekdays only, while the Gym will be operational on weekends from 09:00 to 16:00.

The expected peak usage of the proposed development will be between 07:30 - 08:30 in the AM Peak and between 16:00 - 17:00 in the PM Peak.

This information is used to determine the reciprocity of parking uses in Section 2.2.3 of this report and the peak impact on the existing and surrounding transportation network.

2.5 Daily Vehicular Volumes and Vehicular Types

The WAPC Transport Assessment Guidelines for Developments offers the following vehicle trip generation rates for the land uses proposed within the development:

- **Retail / shopping centres (with significant food retail component)** - 10 vehicular trips per 100m² of NLA for PM Peak and 2.5 trips per 100m² for the AM peak hour. A 50%IN / 50%OUT split has been adopted for the PM peak and an 80%IN / 20%OUT split for the AM peak hour;
- **Non-food Retail** - Trip rates also vary significantly for this land use as it covers a wide range of retail developments. The RTA surveys indicate a range from 0.1 to 6.4 trips per 100m² NLA for the weekday PM peak hour, with an average rate of 2.5 trips per 100m². These guidelines have adopted a PM peak hour rate of 4 trips per 100m² NLA, in the upper middle of the range, (with AM rates around a quarter of this), but these rates should be used with caution in view of the large potential range in trip rates.
- **Office / Commercial** - PM Peak - 2 vehicular trips per 100m² of GFA. The same rate is assumed for the AM peak. An 80%IN / 20%OUT split has been assumed for the AM peak and the reverse for the PM peak.

Given that WAPC Transport Assessment Guidelines for Developments does not offer daily vehicle trip generation rates for the land uses proposed within the development, the following rates are provided in the NSW RTA Guide to Traffic Generating Developments:

- **Retail** - 121 vehicular trips per 100m² of NLA;

- **Gymnasium** - 45 vehicular trips per 100m² of GFA (Evening Peak Hour Trips - 9 vehicular trips per 100m²). The peak generation generally occurs between 6.00pm and 7.00pm on a weekday evening;
- **Long day care** – AM peak between 07:00 and 09:00 with 0.8 per child and PM peak between 16:00 and 18:00 with 0.7 vehicle trip per child.
- **Office / Commercial** - 10 vehicular trips per 100m² of GFA (PM Peak - 2 per 100m² of GFA). An 80% / 20% IN/OUT split has been assumed for the AM peak and the reverse for the PM peak.

NSW RTA Guide to Traffic Generating Developments states the following:

Surveys were undertaken in 1990 of a variety of bulky goods retail stores, ranging from specialist furniture stores to lighting and electrical appliance retailers. The trip generation rates varied so widely that average generation rates cannot be recommended. The generation rates were generally less than those of average retail shops. In the Thursday evening peak period the average generation rate surveyed was 2.5 veh/hr/100m² net lettable floor area, with a range extending from 0.1 to 6.4 veh/hr/100m² NLA. The average generation rate was higher on the weekend, with a mean peak rate of 6.6 veh/hr/100m² NLA. However, as with the weekday evening peak period flows, there was a range varying from 0.7 to 16.9 veh/hr/100m² NLA.

We will utilise the higher of these rates for the Bulky Goods facility, therefore 66VPD per 100m² of NLA. We assume that the peak hour traffic generation is 10% of the total daily generated traffic, therefore 6.6 VPH in the peak.

The ITE Trip Generation Handbook (9th edition) suggests the following trip generation rates:

- **Petrol Station (with convenience store)** - 162.78 vehicular trips per fuel position (AM Peak - 10.16 per fuel position, PM Peak - 13.51 per fuel position. A 50%IN / 50%OUT split has been adopted for the AM and PM peak hour periods);
- **Self Service Car Wash** - 108 vehicular trips per 1 stall (AM Peak - 8 vehicular trips per 1 stall, PM Peak - 5.54 vehicular trips per 1 stall);
- **Automated Car Wash** - PM Peak - 14.12 vehicular trips per KSF² (= 15.2 vehicular trips per 100m²).

Table 8 - Daily Traffic Generation of the Proposed Development

Land Use	Yield	WAPC Transport Assessment Guidelines for Developments / NSW RTA Guide To Traffic Generating Developments Requirement	Daily Traffic Generation	Reciprocal requirement	Total (after reciprocity)
Supermarket (Woolworths)	3,010m ² NLA	121 VPD per 100m ² of NLA; 10 vehicular trips per 100m ² of NLA	3,644	No allowance for reciprocity	3,644
BWS (Liquor Store)	150m ² NLA		182	50% reciprocal as the use is incidental to Supermarket, and in general we believe people who are attracted to the facility will	91
Retail (Specialty Shops)	690m ² NLA		835		418

				be attracted to multiple uses	
Office	350m ²	10 VPD per 100m ² of GFA	35	No allowance for reciprocity	35
Childcare	assume 80 children	1.8 vehicular trips per child; 0.9 vehicular trips per child	144	No allowance for reciprocity	144
Gym - Aquatic Recreation Centre	500m ² GFA	45 VPD per 100m ² of GFA	225	No allowance for reciprocity	225
Gym	259m ² GFA		117	No allowance for reciprocity	117
Bulky Goods	6,750m ² NLA	66 VPD per 100m ² of NLA; 6.6 VPH per 100m ² of NLA	4,455	No allowance for reciprocity	4,455
Total (without Pad Sites)			9,637		9,129
Pad Site [1] KCTT assume Retail	300m ² NLA	121 VPD per 100m ² of NLA; 10 vehicular trips per 100m ² of NLA	363	50% reciprocal as the use is incidental to Supermarket, and in general we believe people who are attracted to the facility will be attracted to multiple uses	182
Pad Site [2] Petrol Station	8 fuel positions	162.78 VPD per fuel position; PM Peak - 13.51 per fuel position	1,302	Assume up to 75% of visitors to this land use are 'passing traffic' in Joondalup Drive**	326
Pad Site [3] - Carwash	6 Self-Service Stalls	108 vehicular trips per stall per day; Peak - 8 vehicular trips per stall	648	Assume 20% of car wash facility clients are coming directly from the petrol station and / or other land uses	519
	1 Automated Stall (160m ²)	108 vehicular trips per stall per day; Peak - 15.2 vehicular trips per 100m ²	108		87
Future development - Retail	358m ²	121 VPD per 100m ² of NLA; 10 vehicular trips per 100m ² of NLA	433	50% reciprocal as the use is incidental to Supermarket, and in general we believe people who are attracted to	217

				the facility will be attracted to multiple uses	
Total Pad Sites			2,854*	-	1,331
Total (with Pad Sites)			12,491*	-	10,460

* Note: the number represents cumulative value – no reciprocity between the landuses has been taken into account.

**Note: The expected traffic impact from the Petrol Station is based on the assumption that up to 25% of the total daily vehicular traffic calculated in this report and assigned to Joondalup Drive is added to the future VPD in Joondalup Drive. Therefore up to 75% of visitors to this development are deemed to be 'passing traffic' in Joondalup Drive.

The proposed development is likely to generate approximately 9,129 VPD in addition to the existing traffic without pad sites and a total of 10,460 when pad sites and the future development are completed.

2.6 Management of Traffic Generated by the Subject Site

The subject site fronts and offers direct vehicular access to / from Joseph Banks Boulevard, Joondalup Drive and the proposed road to the west of the development (Ghost Gum Boulevard extension) and south of the development (Honeybee Parade). There are a total of 6 access / egress points (including one access point only fronting Joseph Banks Boulevard and one access point only fronting Joondalup Drive).

Based on the analysis of the nature of the businesses utilising the facilities within the subject area and the proposed designated access / egress points to the site, we believe the generated traffic from the development would be distributed onto the adjacent road network as follows:

- 26% on Joondalup Drive (north of the subject site) -> distributed to the residential area to the north and northeast of the subject site;
- 54% on Joondalup Drive (south of the subject site) -> distributed to the residential area to the south, southwest and southeast of the subject site (via Joondalup Drive and Pinjar Road);
- 6% on Pinjar Road and Golf Links Drive (northwest and west of the subject site) -> distributed to the residential area to the north, northwest and west of the subject site (via Joseph Banks Boulevard and Porrecta Link);
- 5% on Ghost Gum Boulevard (north of the subject site) -> distributed to the residential area to the north and northeast of the subject site;
- 3% on Joseph Banks Boulevard (northwest of the subject site) -> distributed to the residential area to the north and northwest of the subject site;
- 6% on Tumbleweed Drive (east of the subject site) -> distributed to the residential area to the east of the subject site.

When Banksia Grove District Centre is completed, it is expected that the traffic attracted to the development will be distributed from / onto Pinjar Road and Golf Links Drive via the future roads to the south of the subject site.

In summary, the total daily traffic generation in this phase of development will be approximately **9,129 vehicular movements per day**.

The following table highlights the expected vehicular movements per day for the subject site: -

Table 9 - Traffic Flow from the Subject Site onto the Adjacent Roads

Direction of Traffic Flow	% of Total Traffic Flow	Total Vehicular Distribution - without Pad Sites	Total Vehicular Distribution - with Pad Sites
Joondalup Drive (north of the subject site) -> distributed to the residential area to the north and northeast of the subject site	26%	9,129 VPD * 26% = 2,374 VPD or 1,187 VPD in each direction	10,460 VPD * 26% = 2,720 VPD or 1,360 VPD in each direction
Joondalup Drive (south of the subject site) -> distributed to the residential area to the south, southwest and southeast of the subject site (via Joondalup Drive and Pinjar Road)	54%	9,129 VPD * 54% = 4,930 VPD or 2,465 VPD in each direction	10,460 VPD * 54% = 5,648 VPD or 2,824 VPD in each direction
Pinjar Road and Golf Links Drive (northwest and west of the subject site) -> distributed to the residential area to the north, northwest and west of the subject site (via Joseph Banks Boulevard and Porrecta Link)	6%	9,129 VPD * 6% = 548 VPD or 274 VPD in each direction	10,460 VPD * 6% = 628 VPD or 314 VPD in each direction
Ghost Gum Boulevard (north of the subject site) -> distributed to the residential area to the north and northeast of the subject site	5%	9,129 VPD * 5% = 456 VPD or 228 VPD in each direction	10,460 VPD * 5% = 523 VPD or 262 VPD in each direction
Joseph Banks Boulevard (northwest of the subject site) -> distributed to the residential area to the north and northwest of the subject site	3%	9,129 VPD * 3% = 274 VPD or 137 VPD in each direction	10,460 VPD * 3% = 314 VPD or 157 VPD in each direction
Tumbleweed Drive (east of the subject site) -> distributed to the residential area to the east of the subject site.	6%	9,129 VPD * 6% = 548 VPD or 274 VPD in each direction	10,460 * 6% = 628 VPD or 314 VPD in each direction
Total	100%	9,129 VPD or 4,565 VPD in each direction	10,460 VPD or 5,231 VPD in each direction

The estimated traffic flow is expected to be equal for the in and out direction on the access/egress points for daily generated traffic. A large percentage of vehicles would be light vehicles, with less than 0.5% of all vehicles being service vehicles.

The following table highlights the expected vehicular traffic flow split to and from the subject site: -

Table 10 - Traffic Flow Distribution to / from the Proposed Development

Direction of Traffic Flow	Traffic Flow Distribution to / from the Proposed Development						
	% of Total Traffic Flow	IN Direction			OUT Direction		
		VPD - without Pad Sites	VPD - with Pad Sites	Path	VPD - without Pad Sites	VPD - with Pad Sites	Path

Joondalup Drive (north of the subject site)	[58.7% in 55% out] *26%	698	797	-> Turn right into Joseph Banks Boulevard, -> Turn left into the subject site on Access / Egress Point A.	653	747	-> Turn right into Joseph Banks Boulevard, -> Turn left through the roundabout on the intersection with Joondalup Drive.
	30.8% in 10% out] *26%	366	419	-> Turn right into Ghost Gum Boulevard east – west; -> Turn right into the subject site on Access / Egress Point D.	119	136	-> Turn left into Ghost Gum Boulevard east – west -> Turn left into Joondalup Drive.
	10.5% in 10% out] *26%	125	143	-> Turn right into Joseph Banks Boulevard, -> Turn left into Ghost Gum Boulevard north – south, -> Turn left into the site on Access / Egress Point E.	119	136	-> Turn right into Ghost Gum Boulevard north – south, -> Turn right into Joseph Banks Boulevard, -> Turn left into Joondalup Drive.
	0%in 25% out] *26%	0	0	n/a	297	340	-> Turn left on Joondalup Drive
Joondalup Drive (south of the subject site)	40% *54%	986	1130	-> Turn left into Ghost Gum Boulevard east – west, -> Turn right into the site on Access / Egress Point D.	986	1130	-> Turn left into Ghost Gum Boulevard east – west, -> Turn left on intersection into Joondalup Drive. -> U-turn through the roundabout on the intersection with Joseph Banks Boulevard.
	13% *54%	320	367	-> Turn left into Ghost Gum Boulevard east – west, -> Turn right into Ghost Gum Boulevard north – south, -> Turn right into the site on Access / Egress Point E.	320	367	-> Turn left into Ghost Gum Boulevard north – south, -> Turn left into Ghost Gum Boulevard east – west, -> Turn right into Joondalup Drive.
	2% *54%	49	56	-> Turn left into Joseph Banks Boulevard on the intersection with	49	56	-> Turn right into Ghost Gum Boulevard north – south, -> Turn right into Joseph

				Joondalup Drive, -> Turn left Ghost Gum Boulevard north – south, -> Turn left into the site on Access / Egress Point E .			Banks Boulevard, -> Turn right into Joondalup Drive.
	40%/ 30% in 40% out] *54%	986	847	-> Turn left into the site on Access Point B .	986	1130	-> Turn left on Egress Point B into Joondalup Drive. -> U-turn through the roundabout on the intersection with Joseph Banks Boulevard.
	5% *54%	123	141	-> Turn left into Joseph Banks Boulevard on the intersection with Joondalup Drive, -> Turn left into the subject site on Access / Egress Point A .	123	141	-> Turn right into Joseph Banks Boulevard, -> Turn right through the roundabout on the intersection with Joondalup Drive.
	0% / 10% in 0% out *54%	0	282	-> Turn left into the site on Access Point C .	0	0	N/A
Pinjar Road and Golf Links Drive	50% * 6%	137	157	From Ghost Gum Boulevard east – west on Access Point D	137	157	To Ghost Gum Boulevard east – west
		137	157	From Ghost Gum Boulevard north – south on Access Point E	137	157	To Ghost Gum Boulevard north – south
Ghost Gum Boulevard (north of the subject site)	60% *5%	137	157	-> Turn left into the site on Access / Egress Point E .	137	157	-> Turn right into Ghost Gum Boulevard.
	15% in 10% out *5%	34	39	-> Turn left into Ghost Gum Boulevard east – west, -> Turn left into the site on Access / Egress Point D .	23	26	-> Turn right into Ghost Gum Boulevard east – west, -> Turn right into Ghost Gum Boulevard.
	25% *5%	57	66	-> Turn left into Joseph Banks Boulevard. -> Turn right into the site on Access / Egress Point A .	57	66	-> Turn left into Joseph Banks Boulevard. -> Turn right into Ghost Gum Boulevard.
	0% in	0	0	N/A	11	13	-> Turn left on Egress

	5% out] *5%						Point B into Joondalup Drive. -> Turn left into Joseph Banks Boulevard, -> Turn right into Ghost Gum Boulevard.
Joseph Banks Boulevard (northwest of the subject site)	45% IN 42.5% out] *9%	62	71	-> Turn right into the proposed road to the west of the subject site, -> Turn left into the site on Access / Egress Point E .	58	67	-> Turn right into the proposed road to the west of the subject site, -> Turn left into Joseph Banks Boulevard.
	17% in 14.8% out] *9%	23	26	-> Turn right into Ghost Gum Boulevard north – south, -> Turn left into Ghost Gum Boulevard east – west, -> Turn left into the site on Access / Egress Point D .	20	22	-> Turn right Ghost Gum Boulevard east – west, -> Turn right into Ghost Gum Boulevard north – south, -> Turn left into Joseph Banks Boulevard.
	38% in 36% out] *9%	52	60	-> Turn right into the site on Access / Egress Point A .	49	57	-> Turn left into Joseph Banks Boulevard.
	0% in 6.7% out] *9%	0	0	N/A	9	11	-> Turn left on Egress Point B into Joondalup Drive. -> Turn left into Joseph Banks Boulevard.
Tumbleweed Drive (east of the subject site)	80% (70%) *6%	219	192	-> Turn left into the site on Access / Egress Point A .	251	219	-> Turn right into Joseph Banks Boulevard.
	10% in 5% out *6%	27	14	-> Turn left into Ghost Gum Boulevard north – south, -> Turn left into the site on Access / Egress Point E .	31	16	-> Turn right Ghost Gum Boulevard north – south, -> Turn right into Joseph Banks Boulevard.
	10% in 5% out *6%	27	14	-> Turn left into Joondalup Drive. -> Turn right into Ghost Gum Boulevard east – west, -> Turn right into the site on Access / Egress Point D .	31	16	-> Turn left into Ghost Gum Boulevard east – west, -> Turn left into Joondalup drive, -> Turn right into Tumbleweed Drive.

	0% in 20% out] *6%	0	0	N/A	55	63	-> Turn left on Egress Point B into Joondalup Drive. -> Turn right into Tumbleweed Drive.
Total	-	4,565	5,228	-	4,565	5,228	-

According to the traffic distribution previously described in Table 10 above, the volume of vehicular traffic on each of the access / egress points will be as follows:

Table 11 - Vehicular Traffic Flow at Access / Egress Points

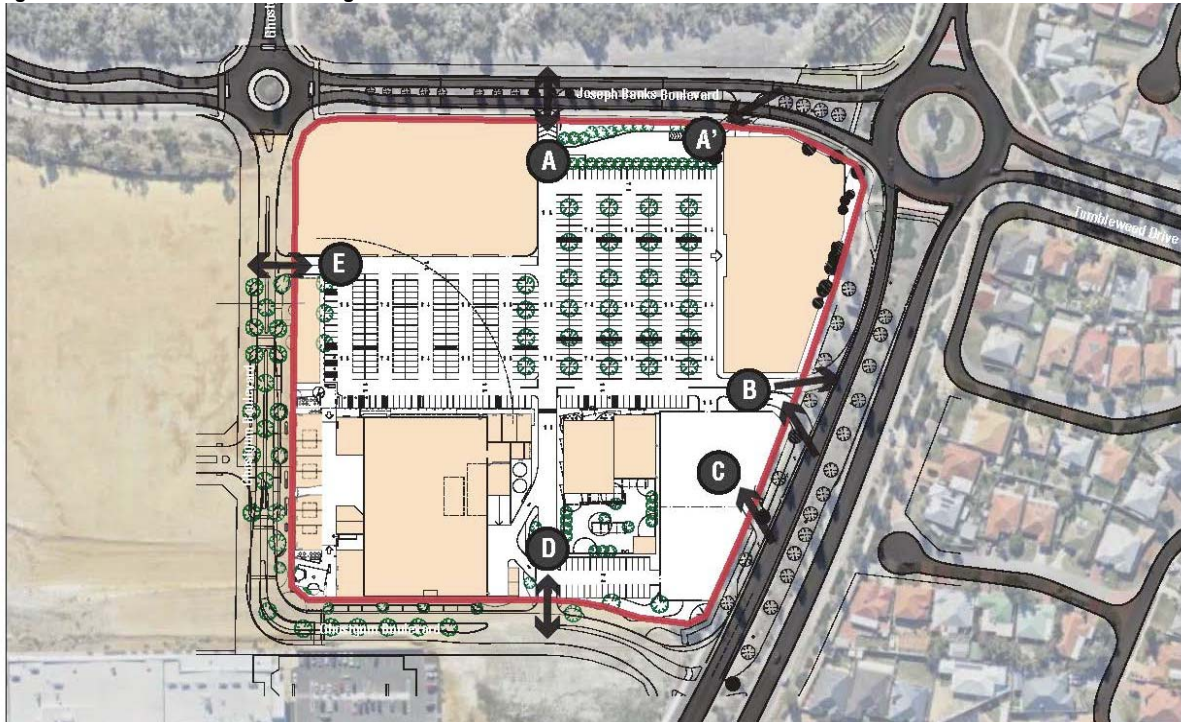
Access / Egress Point	Traffic Flow - IN Direction		Traffic Flow - OUT Direction		Total Traffic Flow		% of Total Traffic Flow
	VPD - without Pad Sites	VPD - with Pad Sites	VPD - without Pad Sites	VPD - with Pad Sites	VPD - without Pad Sites	VPD - with Pad Sites	
A	1,092	1,249	1,074	1,230	2,166	2,480	23.70%
A'	57	66	0	0	57	66	0.63%
B	986	847	1,358	1,557	2,344	2,404	22.99%
C	0	282	0	0	0	282	2.70%
D	1,573	1,802	1,299	1,487	2,872	3,289	31.45%
E	857	982	834	956	1,690	1,938	18.53%
Total	4,565	5,228	4,565	5,230	9,129	10,460	100%

It is important to note that not all the traffic that is expected to be attracted to Pad Site [2] – Petrol Station will be additional to the existing traffic on Joondalup Drive. It is assumed that approximately **976 VPD** of this traffic is already included in the traffic on Joondalup Drive. However, half of 976 VPD will access the site and another half will leave i.e. the total expected traffic of 1,302 VPD will use the Petrol Station.

Table 12 - Vehicular Traffic Flow at Access / Egress Points

Access / Egress Point	Traffic Flow - IN Direction		Traffic Flow - OUT Direction		Total Traffic Flow	
	VPD - without Pad Sites	VPD - with Pad Sites	VPD - without Pad Sites	VPD - with Pad Sites	VPD - without Pad Sites	VPD - with Pad Sites
A	1,092	1,249	1,074	1,230	2,166	2,480
A'	57	66	0	0	57	66
B	986	847	1,358	2,045	2,344	2,892
C	0	770	0	0	0	770
D	1,573	1,802	1,299	1,487	2,872	3,289
E	857	982	834	956	1,690	1,938
Total	4,565	5,716	4,565	5,718	9,130	11,435

Figure 1 - Location of Access / Egress Points



A detailed plan with the estimated daily vehicular traffic flow and distribution is shown on KC00202.010_S06 in Appendix 2.

AM / PM Peak Hour Traffic Generation from the Proposed Development

WAPC Transport Assessment Guidelines for Developments states the following:-

For retail uses the peak development periods are typically the Thursday evening peak-hour (Friday evening peak in the City of Perth) and a late morning or early afternoon-Saturday peak hour. Both peaks will initially need to be considered. Traffic flows may show that one or the other is clearly the 'worst case' and the assessment can then concentrate on that one peak.

The following tables show **AM peak** traffic flows with an in-bound to out-bound flow split of 80% / 20% for the retail land use, in accordance with the statistics quoted in the WAPC Transport Assessment Guidelines for Developments - Volume 5 (Technical Appendix).

The **PM peak** traffic flows have been assessed as having the largest traffic generation from the land-uses nominated in the Development, with an in-bound to out-bound flow split of 50% / 50%, in accordance with the statistics quoted in the WAPC Transport Assessment Guidelines for Developments - Volume 5 (Technical Appendix).

The table below shows the AM and PM peak traffic generation for the proposed development.

Table 13 - AM / PM Peak Traffic Generation from the Proposed Development

Land Use	Yield (m ²)	WAPC Transport Assessment Guidelines for Developments / NSW RTA	AM Peak Hour Traffic Generation	PM Peak Hour Traffic

		Guide To Traffic Generating Developments Requirement		Generation
Supermarket (Woolworths)	3,010m ² NLA	AM 2.5 VPH per 100m ² ; PM 10 VPH per 100m ² ; (of NLA)	75	301
BWS (Liquor Store)	150m ² NLA		4 2**	15 8**
Retail (Specialty Shops)	690m ² NLA		17 9**	69 35**
Office	350m ²	2 VPH per 100m ² GFA	7	7
Childcare	assume 80 children	AM 0.8 VPH per child; PM 0.7 VPH per child	64	56
Gym	259m ²	AM 9 VPH per 100m ²	23	23
Gym Aquatic Recreation Centre	500m ² GFA	PM 9 VPH per 100m ²	45	45
Bulky Goods	6,750m ² NLA	6.6 VPH per 100m ² of NLA	446	446
Total without Pad Sites			681*	962*
Total without Pad Sites with reciprocity			671**	921**
Pad Site [01] - Retail	300m ² NLA	AM 2.5 VPH per 100m ² ; PM 10 VPH per 100m ² ; (of NLA)	8 4**	30 15**
Pad Site [02] – Petrol Station (8 fuel positions)	8 fuel positions	AM Peak - 10.16 vehicular trips per fuel position, PM Peak - 13.51 vehicular trips per fuel position	82 21**	108 27**
Pad Site [03] – Car wash	6 Self-Service Stalls	AM Peak - 8 vehicular trips per 1 stall, PM Peak - 5.54 vehicular trips per 1 stall	48 39**	33 26**
	1 Automated Stall (160m ²)	AM Peak - 8 vehicular trips per 1 stall, PM Peak - 15.2 vehicular trips per 100m ²	8 6**	25 20**
Future development - Retail	358m ²	AM 2.5 VPH per 100m ² ; PM 10 VPH per 100m ² ; (of NLA)	9 5**	36 18**
Total with Pad Sites			836*	1,194*
Total with Pad Sites with reciprocity			748**	1,027**

*the number represents cumulative value – no reciprocity between the land uses has been taken into account.

**the same reciprocity as for daily traffic generation shown in Table 11 is applied.

Refer plan KC00202.010_S07 in Appendix 2 showing the estimated vehicular traffic flow and distribution in the PM peak hour. Detailed plan with the estimated vehicular traffic flow and distribution in the AM peak hour is shown on plan KC00202.010_S08 in Appendix 2.

2.6.1 Road and Intersection Geometry

As part of this report, we have proposed a number of amendments to the road network for consideration given the existing geometry in Joondalup Drive and Joseph Banks Boulevard and the proposed road geometry in the roads to the west and south of the development. The options presented are as follows: -

Table 14 - Analysis of the Existing and the Proposed Road and Intersection Geometry

Location	Existing Road and Intersection Geometry	Amendment Required
Access / egress Point A	In the vicinity of the subject	Full movement. Provide a median break. It is expected that Joseph Banks Boulevard will

	site, Joseph Banks Boulevard is a two-way carriageway divided by a central median, classified as an Urban Local Road - Access Road by Main Roads WA. The legal speed limit on Joseph Banks Boulevard is 50kph.	have approximately 261 VPH (in 2016) and 402 VPH (in 2016) in peak time where approximately 100 VPH will aim to turn left into the proposed development. According to the figure 4.9 in Austroads Guide to Road Design, Part 4A (page 46), this access / egress will require an Auxiliary Left Turn lane to accommodate for the requirements of turning traffic. KCTT have analysed this intersection in SIDRA. The results have shown LOS A without Auxiliary Left Turn.
Access Point A'		Left IN only and only for Service vehicle. KCTT assume that around 0.6% of the total traffic generated by the proposed development will use this access point.
Access / egress Point B	Joondalup Drive is a two-way road divided by a central median south of the intersection with Joseph Banks Boulevard. Joondalup Drive is classified as a Significant Urban Local Road - Distributor A with a sign-posted speed limit of 70kph.	Left In Left Out only intersection. Provide left turn deceleration lane in Joondalup Drive northbound in order to contribute to road safety and enhance the approach for vehicles coming from the south. Deceleration lane should be 70 metres in length including the taper for a 70kph speed environment.
Access Point C		Left IN only and only for Petrol Station users. This Access will have a Deceleration lane, which will be shared with Access B.
Proposed Joondalup Drive / Ghost Gum Boulevard east – west intersection	The proposal suggests LILORI at this intersection. However, there is no median break suggested.	Left In Left Out Right In intersection. Provide a median break in order to suit right turn movements IN from Joondalup Drive. KCTT analysed this interception in SIDRA which have shown LOS C on Right In deceleration lane. Deceleration lane should be 85 metres in length including the taper for a 70kph speed environment.
Existing median opening - Joseph Banks Boulevard	Median opening for former driveway crossover location on the subject site.	Close the existing median opening for the existing driveway crossover approximately 30m to the west of the intersection with Joondalup Drive.
Joondalup Drive	Bus service (Route No 390) runs along this street.	Existing Bus Stop to be relocated.

Table 15 - Existing Intersections

Intersection Name	Intersection Standard
Joondalup Drive / Joseph Banks Boulevard / Tumbleweed Drive	<ul style="list-style-type: none"> Full Movement – 4-Intersection Roundabout
Joseph Banks Boulevard / Ghost Gum Boulevard	<ul style="list-style-type: none"> Full Movement – 3-Intersection Roundabout
Joondalup Drive / Pinjar Road	<ul style="list-style-type: none"> Full Movement – 4-Intersection Roundabout

2.6.2 Road Safety

- Access / Egress B on Joondalup Drive (Left In Left Out)

It is expected that Joondalup Drive will have approximately 2,500 VPH in peak time where approximately 150 VPH will aim to turn left into the proposed development. According to the figure 4.9 in Austroads Guide to Road Design, Part 4A (page 46), this access / egress will require an Auxiliary Left Turn lane to accommodate for the requirements of turning traffic.

In accordance with the Table 5.2 of the same document (page 65), the required length of the left turn auxiliary lane on Joondalup Drive (inclusive of taper) is 70m³. This is a minimum length for auxiliary lane.

Table 16 - Table 5.2 Austroads GtRD 4A - Deceleration distances required for cars on a level grade

Design speed of approach Road (km/h)	Length of deceleration D – including diverge taper T										Diverge length Ld3 for lane widths	
	Stop condition1		Design speed of exit curve (km/h)2									
	0 0		20	30	40	50	60	70	80	90	3.5 m ⁴	3.0 m ⁴
50 60 70 80 90 100 110	Comf. 2.5	Max. 3.5 m/s ²	Comfortable average rate of deceleration 2.5m/s ²								33 40 47 54 60 67 74	27 33 40 44 50 57 62
	m/s ²	30	30	25	15							
	40	40	50	40	30	15						
	55	55	70	60	50	40	20					
	75	70	95	85	75	60	45	25				
	100	90	120	110	100	85	70	50	25			
	125	110	150	140	130	115	100	80	55	30		
	155	135	180	175	160	150	130	110	90	60		

The deceleration distance determined from Table 5.2 should be increased for a downgrade and may be reduced for an upgrade in accordance with Table 5.3.

Table 5.3: Correction to deceleration distance D for grade

Grade	Ratio of 'length on grade' to 'length on level'	
	Upgrade	Downgrade
0 – 2%	1.0	1.0
3 – 4%	0.9	1.2
5 – 6%	0.8	1.35

The proposed grade = 1.8% to 2.3% on Joondalup Drive, therefore a reduction in length for grade is not possible.

Provision of two access points interfacing Joondalup Drive (to the proposed district centre north-east and to the proposed pad site 1) will require provision of two deceleration lanes. When provision of two slip lanes in close proximity is required, the most common practise in the metro area is joining two slip lanes. This provides sufficient manoeuvring space for vehicles cruising at a speed limit to slow down and safely navigate intersection. The plan of the proposed development depicts combined slip lanes in accordance with the good design principles.

We have reviewed the intersection location in accordance with two of the criteria outlined below:

- Approach Sight Distance (ASD)

³ Design speed is 10kph higher than signposted speed.

- Safe Intersection Sight Distance (SISD)

The following table provides volumes for ASD and SISD in accordance with AustRoads Part 4A Table 3.1 Approach Site Distance (ASD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 18)) and with AustRoads Part 4A Table 3.2 Safe Intersection Sight Distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 21)).

Table 17 - Required Approach Site Distance and Safe Intersection Sight Distance Volumes

Streets	Speed Limit (kph)	Design speed (kph)	Reaction Time (s)	Approach Sight Distance (m)	Safe Intersection Sight Distance (m)
Joondalup Drive	70	80	2.0	114	181
Joseph Banks Boulevard	50	60	2.0	73	123

The exact configuration for the proposed intersections shall be confirmed through the design phase, however on the basis that there are uninterrupted sight distance along Joondalup Drive and Joseph Banks Boulevard, we believe that the proposed intersection configurations are reasonable.

We have provided several photographs below which highlight the uninterrupted sight distances available in Joondalup Drive and Joseph Banks Boulevard.

Figure 2 - Joondalup Drive and Access / Egress B - view to the north



Figure 3 - Joondalup Drive and Access / Egress B - view to the south



Figure 4 - Joseph Banks Boulevard and Access / Egress A - view to the east



Figure 5 - Joseph Banks Boulevard and Access / Egress A - view to the west



2.7 Public Transport Access

This section describes the accessibility to public and alternative modes of transportation. KCTT have reviewed Transperth and Walk Score for the information found below.

2.7.1 Transperth Bus Routes

The following public transport routes are within proximity of the subject site. The key information provided below includes: -

- Bus route number;
- Description of the bus route; and
- Their indicative peak and off-peak frequencies.

Table 18 - Bus Routes and Frequencies

Bus Route	Description	Peak and Off-Peak Frequencies		
		Monday to Friday	Saturday	Sunday
390	Joondalup Station - Banksia Grove via Tapping	20 minutes	60 minutes	
391	Joondalup Station - Banksia Grove via Carramar	20 minutes	60 minutes	

Existing public transportation services are available within close proximity to the subject site including: -

- Route 390 - Joondalup Station - Banksia Grove via Tapping, with 20 minutes frequencies.
- Route 391 - Joondalup Station - Banksia Grove via Carramar, with 20 minutes frequencies.

Bus stops for Routes No 390 and 391 are immediately in front of the Banksia Grove District Centre on Joondalup Drive and Porrecta Link i.e. within 400m (5 minute walking distance) from the proposed development.

We have confirmed the following amendments with the Public Transport Authority in April 2014, which were supposed to be introduced from August 2014: -

- *Routes 390 and 391 will operate through the Banksia Grove Town Centre / District Centre once Main Street is constructed.*
- *Route 390 will operate north along Pinjar Road (cross Joondalup Drive), onto Main Street, right into Joseph Banks Boulevard, left into Joondalup Dr to resume normal route.*
- *Route 391 will operate along Golf Links Drive, through Main Street and onto Ghost Gum Boulevard (removed from Porrecta Link and Joseph Banks Boulevard)*
- *Route 469 will no longer serve the Town Centre as this route was truncated back in Wangara a couple of years ago*

2.7.2 Accessibility to Public Transportation

The following table highlights the proximity of the various bus routes to the subject site and highlights the “walkability” to alternative transport modes. This information has been sourced from “Walk Score” at <http://www.walkscore.com>

Table 19 - Bus Route Description and Walkable Distance to / from the Subject Site

Bus Route	Description	Distance from Subject Site
390	Joondalup Station - Banksia Grove via Tapping	In front of the development
391	Joondalup Station - Banksia Grove via Carramar	Approximately 400 meters

KCTT believe that the development has good access to public transport with convenient distances that should promote the use of public transport.

We understand that the exact location of bus stop “Joondalup Drive after Pinjar Road” for route 390 in northbound direction will need to be relocated given it coincides with the proposed access point.

Upon re-routing of route 391 it is expected that a new bus stop will be established on Ghost Gum Boulevard. The design should be finalised at the later stage.

The public transportation options are shown on the attached plans KC00202.010_S03, KC00202.010_S03a in Appendix 2 for clarity.

2.8 Pedestrian and Cyclist Access

The Perth Bicycle Network in the vicinity of the subject site is shown on the drawing KC00202.010_S02 PBN Plan. The following is the list of the major infrastructure within an 800 metre radius of the subject site: -

- Joondalup Drive is classified as PBN “Good Road Riding Environment” route to the north of the proposed development, and as a “Bicycle Lanes or Sealed Shoulder Either Side” in front of the subject site;
- Mornington Drive is classified as PBN “Medium Road Riding Environment” route;
- Shared Paths (Shared by Pedestrian & Cyclists) along Joondalup Drive, Ghost Gum Boulevard, Joseph Banks Boulevard, Tumbleweed Drive, Viridian Drive, Parakeelya Road, Pinjar Road, Castledene Way, Edgeworth Circuit, Labianca Vista, Keanefield Drive, Golf Links Drive, Tutquoise Loop, Kurrajong Boulevard, Alpina Promenade, Mistletoe Drive and Elderiana Link.

KCTT have reviewed the Walk Score (information has been sourced from “Walk Score” at <http://www.walkscore.com>) and found the following information for the roads surrounding the proposed development: -

Table 20 - Walk Score Ratings

Location	Walk Score	Description
Joondalup Drive	40	Car-Dependent. Some errands can be accomplished on foot.
Joseph Banks Boulevard	22	Car-Dependent. Some errands can be accomplished on foot.
Ghost Gum Boulevard	36	Car-Dependent. Some errands can be accomplished on foot.

The existing network of pedestrian paths is shown on the drawing KC00202.010_S04 Pedestrian Paths.

Analysis of ped-sheds confirms that bus stops are within walking distance (5 minutes) from the proposed development.

The development proposes acceptable pedestrian site linkages, as shown in Appendix 1.

3. Transport Impact Assessment Checklist for a Development Site

The following is the summary / checklist for a Transport Impact Assessment as shown in the Department for Planning and Infrastructure's Transport Assessment Guidelines – Part 4.

Item	Status	Comments/Proposals
Summary		
Introduction / Background		
Name Of Applicant And Consultant	Y	Applicant: Woolworths Consultant: KCTT (trading as KC Traffic and Transport) Local Authority: City of Wanneroo
Development Location And Context	Y	This Development Application considers the proposed development of Woolworths (Banksia Grove Shopping Centre) in Banksia Grove (under the jurisdiction of the City of Wanneroo). The subject site is currently a vacant landholding.
Brief Description Of Development Proposal	Y	The proposed development is a commercial development comprising of retail land uses (Supermarket plus Specialty Shops and Bulky Goods), the offices, a childcare and a gym.
Key Issues	Y	<ul style="list-style-type: none"> Provision of sufficient parking bays to cater for the requirements of the development. Traffic impact on the surrounding road network. Design of access/egress points to suit the swept path movements required for a semi-trailer and rigid truck.
Background Information	Y	Vacant Lot
Development Proposal		
Regional Context	Y	Complementary
Proposed land uses	Y	The proposed development will include a total gross floor area of approximately 15,940m ² . Plans for the proposed development have been provided in Appendix 1 of this report.
Table of Land Uses and Quantities	Y	Please refer to Table 1.
Access Arrangements	Y	The subject site fronts and offers direct vehicular access to / from Joseph Banks Boulevard, Joondalup Drive and the proposed road to the west of the development (Ghost Gum Boulevard extension) and south of the development (Honeybee Parade). There are a total of 6 access / egress points (including one access point only fronting Joseph Banks Boulevard and one access point only fronting Joondalup Drive).
Parking Provision	Y	According to the City of Wanneroo's District Planning Scheme No 2 and LFRA, however not allowing for any reciprocity of uses, the proposed development will require 553 car parking bays. KCTT strongly believe that the above reciprocity can be taken into account and that the proposed development would be compliant with 492 car parking bays.

End of Trip Facilities	Y	Should council require bicycle parking in reference to <i>Guide to Traffic Management part 11; Parking – Table C2.7 Bicycle Parking Provisions</i> , the proposed development would require a total of 62 bicycle spaces without pad sites and 68 bicycle spaces with pad sites. This was discussed in the section 2.2.4
Any Specific Issues	N	None.
Existing Situation		
Existing Site Uses (If Any)	N	Vacant Lot
Existing Parking And Demand (If Appropriate)	N/A	N/A
Existing Access Arrangements	N/A	N/A
Existing Site Traffic	Y	Refer to Table 2.
Surrounding Land Uses	Y	Complimentary - the subject area is located within the Banksia Grove District Centre in Banksia Grove.
Surrounding Road Network	Y	The subject site fronts and offers direct vehicular access to / from Joseph Banks Boulevard, Joondalup Drive and the proposed road to the west of the development (Ghost Gum Boulevard north – south) and south of the development (Ghost Gum Boulevard east – west). There are a total of 6 access / egress points (including one access point only fronting Joseph Banks Boulevard and one access point only fronting Joondalup Drive).
Traffic Management on Frontage Roads	Y	<p>Joondalup Drive is a two-way road divided by a central median south of the intersection with Joseph Banks Boulevard. Joondalup Drive is classified as a Significant Urban Local Road - Distributor A with a sign-posted speed limit of 70kph. Bus service (Route No 390) runs along this street. A shared path is provided on the western side and a pedestrian path is provided on the eastern side of the road reservation. There is one access / egress point to / from the site (left in left out only) and one access point (left in only) from Joondalup Drive. The access and egress points will be designed to be suitable for semi-trailers.</p> <p>In the vicinity of the subject site, Joseph Banks Boulevard is a two-way carriageway divided by a central median, classified as an Urban Local Road - Access Road by Main Roads WA. The legal speed limit on Joseph Banks Boulevard is 50kph. Bus services (Route No's 390 and 391) run on Joseph Banks Boulevard in the vicinity of the subject site. Shared paths are provided on the southern side of the road reservation. There is one access / egress point and one access point only to the site from Joseph Banks Boulevard.</p> <p>There is one access / egress point to the site from the proposed road to the west of the subject area (Ghost Gum Boulevard north – south) and another one to the south (Ghost Gum Boulevard east – west).</p>
Traffic Flows On Surrounding Roads (Usually AM And	Y	Refer to Table 2.

PM Peak Hours)										
Traffic Flows At Major Intersections (Usually Am And Pm Peak Hours)	Y	Refer to Table 2.								
Operation of the Surrounding Intersections	Y	<table><tr><th>Intersection Name</th><th>Intersection Standard</th></tr><tr><td>Joondalup Drive / Joseph Banks Boulevard / Tumbleweed Drive</td><td><ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts</td></tr><tr><td>Joseph Banks Boulevard / Ghost Gum Boulevard</td><td><ul style="list-style-type: none">• Full Movement – 3-Intersection• Roundabout</td></tr><tr><td>Joondalup Drive / Pinjar Road</td><td><ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts</td></tr></table>	Intersection Name	Intersection Standard	Joondalup Drive / Joseph Banks Boulevard / Tumbleweed Drive	<ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts	Joseph Banks Boulevard / Ghost Gum Boulevard	<ul style="list-style-type: none">• Full Movement – 3-Intersection• Roundabout	Joondalup Drive / Pinjar Road	<ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts
Intersection Name	Intersection Standard									
Joondalup Drive / Joseph Banks Boulevard / Tumbleweed Drive	<ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts									
Joseph Banks Boulevard / Ghost Gum Boulevard	<ul style="list-style-type: none">• Full Movement – 3-Intersection• Roundabout									
Joondalup Drive / Pinjar Road	<ul style="list-style-type: none">• Full Movement – 4-Intersection• Roundabouts									
Existing Pedestrian and Cycle Networks	Y	<p>The following is the list of the major infrastructure within an 800 metre radius of the subject site: -</p> <ul style="list-style-type: none">• Joondalup Drive is classified as PBN "Good Road Riding Environment" route to the north of the proposed development, and as a "Bicycle Lanes or Sealed Shoulder Either Side" in front of the subject site;• Mornington Drive is classified as PBN "Medium Road Riding Environment" route;• Shared Paths (Shared by Pedestrian & Cyclists) along Joondalup Drive, Ghost Gum Boulevard, Joseph Banks Boulevard, Tumbleweed Drive, Viridian Drive, Parakeelya Road, Pinjar Road, Castledene Way, Edgeworth Circuit, Labianca Vista, Keanefield Drive, Golf Links Drive, Tutquoise Loop, Kurrajong Boulevard, Alpina Promenade, Mistletoe Drive and Elderiana Link.								
Existing Public Transport Services Surrounding the Development	Y	<p>Existing public transportation services are available within close proximity to the subject site including: -</p> <ul style="list-style-type: none">• Route 390 - Joondalup Station - Banksia Grove via Tapping, with 20 minutes frequencies.• Route 391 - Joondalup Station - Banksia Grove via Carramar, with 20 minutes frequencies.								
Crash Data	Y	Refer to Table 3.								
Changes to Surrounding Transport Network										
Road Network	N	No changes proposed as a part of this development application.								
Intersection Layouts and Controls	N	No changes proposed as a part of this development application.								
Pedestrian / Cycle Networks and Crossing Facilities	N	No changes proposed as a part of this development application.								
Public Transport Services	N	No changes proposed as a part of this development application.								

Integration with Surrounding Area		
Surrounding Major Attractors/Generators	Y	The proposed development is a part of Banksia Grove Shopping Centre which is the major attractor. Other attractors are Joseph Banks Secondary College to the north-west, Banksia Grove Catholic Primary School to the north and Neerabup Primary School to the north-east of the development. The major generator is the residential areas to the north, west, south and east of the subject area.
Proposed Changes to Land Uses Within 1200 Metres	Y	The future Banksia Grove District Centre.
Travel Desire Lines from Development to These Attractors / Generators	Y	Via Joondalup Drive, Joseph Banks Boulevard and Pinjar Road.
Adequacy of the Existing Networks	Y	The existing networks are deemed to have sufficient capacity to cater for the expansion of the shopping centre. This has been reviewed in SIDRA in Appendix 4 of this report.
Deficiencies in existing transport network	N	None
Remedial Measures to Address Deficiencies	N/A	N/A
Analysis of Transport Networks		
Assessment Years	Y	SIDRA analysis was completed for this development in this report (modelled for 2016 and 2026).
Time Period	Y	Expected year of completion - 2016.
Development Generated Traffic	Y	Refer to Section 2.5.
Distribution of Generated Traffic	Y	Refer to Table 8 - Daily Traffic Generation of the Proposed Development
Parking Supply and Demand	Y	According to the City of Wanneroo's District Planning Scheme No 2 and LFRA, however not allowing for any reciprocity of uses, the proposed development will require 553 car parking bays. KCTT strongly believe that the above reciprocity can be taken into account and that the proposed development would be compliant with 492 car parking bays.
Committed Developments and Transport Proposals	N	None known at the time of writing this report.
Base and "With Development"	Y	Refer SIDRA Analysis in Appendix 4.

Traffic Flows		
Analysis of Development Accesses	Y	Refer SIDRA Analysis in Appendix 4.
Impact on Surrounding Roads	Y	The proposed development is likely to generate approximately 9,129 VPD in addition to the existing traffic without pad sites and a total of 10,460 when pad sites and future development are completed.
Impact on the Intersections	Y	The local intersections are designed to suit the proposed volumes of traffic. Refer to Appendix 3 for service vehicle movements and Appendix 4 for confirmation of results of SIDRA analysis.
Impact on Neighbouring Areas	Y	We believe that the subject site will have a high impact on the existing road network. We believe the Thursday and Friday evening PM peak flows and the Saturday mid-morning to early afternoon flows will be representative of the peak trip distribution into the network.
Traffic Noise and Vibration	N/A	N/A
Road Safety	Y	Based on the comparative analysis, KCTT believe that this location does not exhibit higher than network average safety concerns at present.
Public Transport Access	Y	Analysis of ped-sheds confirms that bus stops are within walking distance (5 minutes) from the proposed development.
Pedestrian Access / Amenity	Y	The development proposes acceptable pedestrian site linkages, as shown in Appendix 1.
Cycle Access / Amenity	N	None.
Analysis of Pedestrian and Cycle Networks	Y	The development is easily accessible for pedestrians and cyclists due to a considerable pedestrian and cycling network adjacent to the development, as noted above.
Safe Walk/Cycle To School (For Residential And School Site Developments Only)	N/A	N/A
Traffic Management Plan (Where Appropriate)	N/A	N/A
Conclusions	Y	<ol style="list-style-type: none"> Does the development propose sufficient parking for the proposed land uses? Describe the traffic impact of proposed development. Does the development offer suitable access / egress to the external road network? Any other specific issues? <ol style="list-style-type: none"> The layout of the proposed development illustrates a provision of 511 parking spaces. KCTT conclude that this development has sufficient parking spaces and sufficient queuing areas given our experience in surveying of other sites. KCTT believe that the proposed development (with Pad Sites) is likely to

		<p>generate up to additional 10,460 vehicular movements per day with a forecasted impact of around 1,027 vehicles per hour in the PM peak hour. We believe that the subject site will have a high impact on the existing road network and the intersection design addresses this impact. We believe the Thursday and Friday evening PM peak flows and the Saturday mid-morning to early afternoon flows will be representative of the peak trip distribution into the network. This is in accordance with the statistics quoted in the WAPC Transport Assessment Guidelines for Developments - Volume 2 and Volume 5 (Technical Appendix).</p> <p>3. Yes – the development offers 6 access / egress points (including one access point only fronting Joseph Banks Boulevard and one access point only fronting Joondalup Drive).</p> <p>4. Please Refer to Table 14 - Analysis of the Existing and the Proposed Road and Intersection Geometry.</p>
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